

Phoenix-Mesa Gateway Airport

Mesa, Arizona



Airport Traffic Control Tower Site Survey

FINAL Report

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SECTION 1 EXECUTIVE SUMMARY

The Phoenix-Mesa Gateway Airport Authority (Sponsor) and the Federal Aviation Administration entered into reimbursable agreement number AJW-FN-WSA-14-W514 on January 8, 2015. The stated purpose of the agreement is “to prepare a complete Siting Study for the potential relocation of the existing Federal Contract Tower (FCT) at the Phoenix-Mesa Gateway Airport in accordance with FAA Order 6480.4A. This agreement provides funding for the FAA to establish these services.”

In compliance with the reimbursable agreement, this report documents the study to determine the optimum location and height for a new Airport Traffic Control Tower (ATCT) facility at Phoenix- Mesa Gateway Airport in Mesa, Arizona. The study, prepared by the Los Angeles Terminal Engineering Center, with extensive participation of the Phoenix-Mesa Gateway Airport representatives, and local, Regional, and Service Area Federal Aviation Administration (FAA) offices, establishes a recommendation for the location and height of a new ATCT.

This report documents the site survey process and includes background information concerning the request from the Airport Authority for a new control tower at Phoenix-Mesa Gateway Airport, a discussion of the site survey process, evaluation criteria for the new tower, an overview of all potential sites considered, a detailed evaluation of the primary site options, and the final conclusions and recommendations.

The Phoenix-Mesa Gateway Airport currently has a FCT built by the Air Force in 1970. The airport was part of the Base Realignment and Closure program in 1993. The current ATCT does not comply with current code requirements for new construction, in addition to facing other issues with their electrical and elevator systems.

The Los Angeles Terminal Engineering Center will be developing an engineering study to determine the best location and height for the new ATCT. This report will be completed per the reimbursable agreement regardless of the construction funding status.

The first visit to the Airport Facilities Terminal Integration Laboratory (AFTIL) in Atlantic City, New Jersey, was conducted on May 12-14, 2015. Representatives from the Western Service Area Engineering Services, Flight Procedures, IWA Airport Planner, Washington DC Program Office, PHX Air Traffic and Airport District Office participated in this meeting. The meeting began with 3 sites (identified as site 1 thru 3) available for discussion. During the course of the meeting, sites 4 and 5 were added for consideration.

Sites 2 and 3 were eliminated due to conflicts with line of sight, and/or severe sunlight glare.

Sites 1, 4, and 5 were identified as suitable candidates for further analysis. Preliminary TERPS analysis was completed at AFTIL and identified no IFR departure effects, no non-precision effects and no precision instrument approach effects on any of the sites in considered.

After the economic analysis was completed and the line of sight at each location was evaluated, Site 4 was found to be the best site to locate a new Air Traffic Control Tower for IWA.

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Introduction

At the request of the Phoenix-Mesa Airport Authority, the Federal Aviation Administration (FAA) is participating in undertaking a study to help the Airport Authority determine the most suitable location and height for a new Airport Traffic Control Tower (ATCT) for Phoenix-Mesa Gateway Airport (IWA) in Mesa, Arizona. The FAA's Terminal Engineering Center is performing the site study per reimbursable agreement AJW-FN-WSA-14-W514 signed in January 2015.

This report documents the analyses and evaluations conducted during the site study process. It provides background information on Phoenix-Mesa Gateway Airport, a discussion of the site study and evaluation criteria, an overview of all sites considered, and an evaluation of the primary site options. It also presents conclusions of the site study, and a recommendation for the location and height for the new ATCT.

Criteria used in the analyses and evaluations are based primarily on FAA Order 6480.4A, Airport Traffic Control Tower Siting Process, FAA Order 6480.7d, Airport Traffic Control Tower, Terminal Radar Approach Control Facility Design Guidelines, the FAA approved national design standards and the existing IWA Airport Development Plan created dated 2008. These orders and standards were supplemented by FAA Federal Aviation Regulations (F.A.R's), Advisory Circulars (AC's), and other documents from which airspace and navigational aide (NAVAID) clearance and obstruction criteria were established. In addition, a variety of other considerations, not cited specifically in FAA documents were deemed to be relevant to the analyses of the potential site options, and were included in the evaluations.

The general methodology followed in this site study was to work with the airport authority to identify potential ATCT sites. Each prospective site is evaluated to define any issues with constructability as well as long term Air Traffic Operations. In the case of Phoenix-Mesa Gateway Airport, three Non-Rulemaking Airspace Action (NRA) cases were opened by filing a notice of proposed construction with the FAA's airports division.

Two trips to the FAA's Airway Facilities Tower Integration Lab (AFTIL) are normally conducted to evaluate the line of sight from the prospective ATCT site to the airport movement areas as well as the orientation and equipment layout of the cab. The orientation and layout of the cab was discussed during the second visit to AFTIL the week of September 21, 2015.

Pertinent results from the AFTIL simulation are included in this report and the SMS report as well. TERPS issues are analyzed and are also included in the site ranking process.

The ATCT height is evaluated at AFTIL to determine the following:

- Minimum tower height that provides a minimum 0.8° viewing angle to existing and future runway surfaces.

- Maximum possible tower height considering existing and future airspace clearance requirements.
- Minimum tower height required to provide clear viewing to nearest taxiway safety area edge
- Required tower height at each site, based on highest 0.8° viewing angle height requirements and taxiway safety area viewing height
- Any sight obstructions caused by buildings.
- The most feasible site options in relation to the established criteria and other relevant factors.

Documentation of the analyses, evaluations, and conclusions of the site study is included in this report. The documentation is organized as follows:

Section 1: Executive summary

Section 2: Background Information on the Phoenix-Mesa Gateway Airport, the justification for a new ATCT, and the scope of the site study.

Section 3: Initial Sites Considered. Discussion of initial sites identified for the new ATCT, evaluation of these initial sites, and determination of the most feasible site options based on the initial identification and evaluation

Section 4: Preferred Sites. Analyses of the most feasible site options identified in the initial investigations.

Section 5: Final Site Summary

SECTION 2 BACKGROUND INFORMATION

2.1 General Information on Phoenix-Mesa Gateway Airport

The Phoenix-Mesa Gateway Airport formerly known as the Williams Air Force Base, is located in Mesa, Arizona, about 30 miles southeast of Phoenix. It was active as a training base for the United States Army Air Forces and the USAF from 1941 until its closure in 1993. The Airport was part of the Base Realignment and Closure (BRAC) program of 1993 and it officially reopened as Williams Gateway Airport on March 1994. In 2008, the name of the airport was changed to Phoenix-Mesa Gateway Airport.

The airport is owned and operated by the Phoenix-Mesa Gateway Airport Authority and is a reliever airport for Phoenix Sky Harbor International Airport. The airport hosts more than 40 companies, serves more than 35 cities and contributes approximately \$1.3 billion annually to the Arizona economy ¹.

The Airport consists of the following runways: 10,401 foot runway (12R-30L), 10,201 foot runway (12C-30C) and 9,301 foot runway (12L-30R). The second update of the Airport Layout Plan (2008) attached as an appendix to this report, shows a recommended extension of Rwy 12R-30L to an ultimate length of 12,501'. The airport does not have an exact timeframe, at this time, to complete these extensions.

The table shown below taken from the current Airport Master Plan adopted in 2008, predicts total operation numbers for Phoenix-Mesa Gateway Airport for 2012, 2017 and 2027 based on baseline operation from 2007.

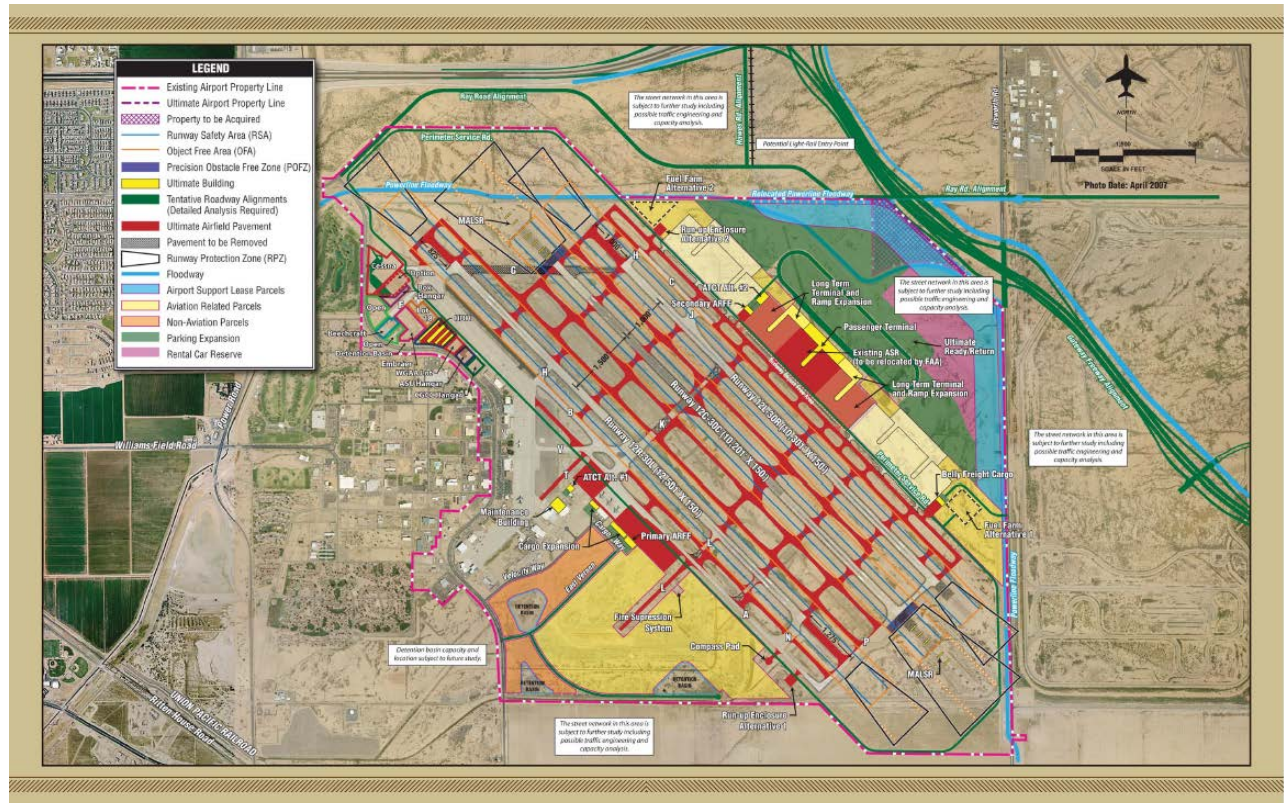
FIGURE 1: FORECAST PLANNING SUMMARY¹

Planning Horizon	Baseline	Short Term	Intermediate Term	Long Term
	2007	2012	2017	2027
Enplanements	177,649*	350,000	850,000	2,200,000
Air Carrier Operations	1,961	9,449	20,806	48,166
Air Cargo Operations	0	800	1,700	3,500
Air Taxi Operations	8,675	12,772	16,171	22,866
Military Operations	9,380	12,500	12,500	12,500
General Aviation Operations	276,670	321,479	363,823	447,968
Total Operations	296,686	357,000	415,000	535,000
Enplaned Air Cargo (Tons)	0	10,000	21,000	44,000
Based Aircraft	115	200	241	350
* 2008 Enplanement				

¹ See Phoenix –Mesa Gateway Airport Master Plan Executive Summary dated 2008
<http://www.phxmesagateway.org/Documents/DocumentLibrary/Current%20Planning%20Studies/Phoenix-Mesa%20Gateway%20Airport%20-%20Airport%20Master%20Plan%20Executive%20Summary.pdf>

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FIGURE 2: MASTER PLAN SUMMARY²



² Figure 2 obtained from Mesa Gateway Airport Master Plan Executive Summary dated 2008.
<http://www.phxmesagateway.org/Documents/DocumentLibrary/Current%20Planning%20Studies/Phoenix-Mesa%20Gateway%20Airport%20-%20Airport%20Master%20Plan%20Executive%20Summary.pdf>

FIGURE 3: PROSPECTIVE SITES ON AERIAL MAP



2.2 Need for New Airport Traffic Control Tower

The Phoenix-Mesa Airport Authority has identified the need for the construction of a new Air Traffic Control Tower (ATCT) due to parallax, line of sight and safety concerns. The Airport Authority has determined in a recent study an annual service volume (ASV) of 498,000 operations. They have expressed their concern regarding the capabilities of the existing tower to accommodate planned operations and airport growth. The existing tower cab has only 4 controller positions with no controller in charge (CIC) dedicated space. The airport has maintained the existing tower building for the last 20 years and plans to spend an additional \$1 million dollars in the next five years to correct mechanical, electrical and structural deficiencies. These improvements will not address the cab size or height concerns.

The tower visibility analysis tool was used (see APPENDIX 7) to evaluate the Object Discrimination, and Line of Sight (LOS) Angle of Incidence from the existing IWA tower location to a key point on all runways to check for compliance with FAA Order 6480.4A for new towers. The results showed that the Object Discrimination Analysis for all IWA runways passed the necessary criteria thresholds (see Section 4.1). The line of sight (LOS) angle of incidence was also evaluated from the existing tower site at an eye level of 106' to a key point on all runways. The analysis passed for all other runways except for runway 30R and 30C. The results at these locations were .54 degrees and .62 degrees respectively. The LOS angle of incidence for these locations did not pass the visibility analysis. For new towers the threshold shall be is a minimum of 0.8 degrees or larger.

Additional data below (*provided by: Tony Bianchi, Airport Planner, Phoenix-Mesa Gateway Airport*) shows an overview of present and projected future airport operations, along with a description of the existing Air Traffic Control Tower conditions.

- Of 516 towered airports nationwide, Gateway is the 41th busiest by operations, 102nd busiest by enplanements.
- Gateway airspace complexity continues to grow, with the region home to the country's seventh busiest commercial airport (Phoenix Sky Harbor International) and three of the 10 busiest general aviation airports (Phoenix Deer Valley, Mesa Falcon Field, and Chandler Municipal).
- The most recent FAA demand/capacity analysis (FACT 2, May 2007) determined that air traffic would exceed Sky Harbor runway capacity by 2015, noting increased use of Gateway as the region's solution for addressing commercial service needs.
- The tower is the busiest commercial contract tower (ranked 1nd in CY2014 Contract Tower Program (FCT)).

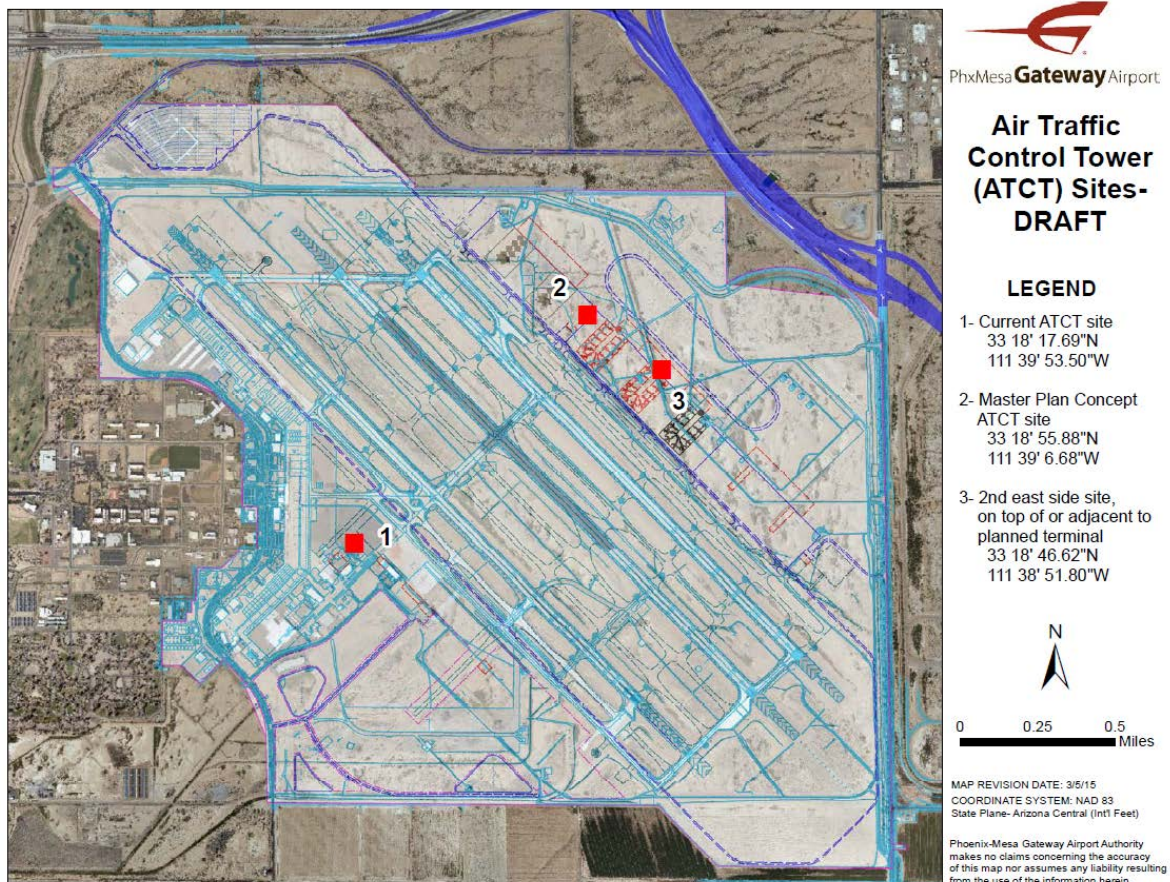
ITEM	EXISTING
Tower Cab Area	225± SF
Tower Eye Level Height	106'±
ADA Compliance	No
Operating Positions	4
Life/Fire Safety	No sprinklers or redundant cab ventilation

The Phoenix- Mesa Airport Authority has entered in a reimbursable agreement with the Federal Aviation Administration (FAA) to sponsor the site selection process, which includes siting report, cost estimates, safety hazards evaluations and environmental studies.

SECTION 3 INITIAL SITES CONSIDERED

Prior to the AFTIL visit, the Phoenix-Mesa Airport Authority identified 3 possible sites. During discussions at the AFTIL lab, the group added 2 additional sites. The AFTIL one discussions resulted in a consensus that analysis of sites 1, 4, and 5 would continue. The sites are briefly described here and are shown in figure 4.

FIGURE 4: INITIAL SITES CONSIDERES (DRAFT) AFTIL



Site 1 (Orientation: East) – Site coordinates are 33° 18' 17.69" N, 111° 39' 53.54" W. The site is located next to the existing Air Traffic Control Tower building. This site was included as the second best direction for controllers. It offered a good general line of sight however it required a better view of the 12R non-movement taxiway area. During early morning hours the sun will interfere with the vision of the staff when facing east and additional hazards were also found at this location which noted that the tower shaft at this site was to become an obstruction to the view of Air Traffic Controllers during the tower construction.

Site 2 – Site coordinates are 32° 18' 55.88"N, 111° 39' 6.68"W. Site was eliminated because the line of sight to the general aviation ramp was limited, and it created severe sun glare.

Site 3 – Site coordinates are 33° 18' 46.62"N, 111° 38' 51.80"W. Site was eliminated because the line of sight to the general aviation ramp was limited, and it created severe sun glare.

Site 4 (Orientation: East) – Site coordinates are 33° 18' 18.2060" N, 111° 39' 55.1302" W. Site 4 provides overall the best line of sight to the 12R taxi lane and hold short line (hot spot) for entering and exiting the non-movement area. Some glare was noted at this location during AFTIL 1 but, this was not identified as a disadvantage for this site. It was noted that this location improved the parallax for arrivals that exists from the current tower location. Additional hazard analysis was performed identifying the tower shaft at this site as a minor hazard during construction. The site meets criteria for further analysis and will be explored in more detail.

Site 5 (Orientation: West) – Site coordinates are 33° 19' 03.0946"N, 111° 39' 13.2216" W. This site offers the third best orientation for controllers. The disadvantages of this location are that Air Traffic will encounter issues with intense sun glare for 2-3 hours during high traffic periods along with overall glare from artificial lightning. Also, the controller's line-of-sight will be restricted to the General Aviation Ramp at this location.

FIGURE 5: SITES SELECTED FOR CONSIDERATION POST AFTIL 1

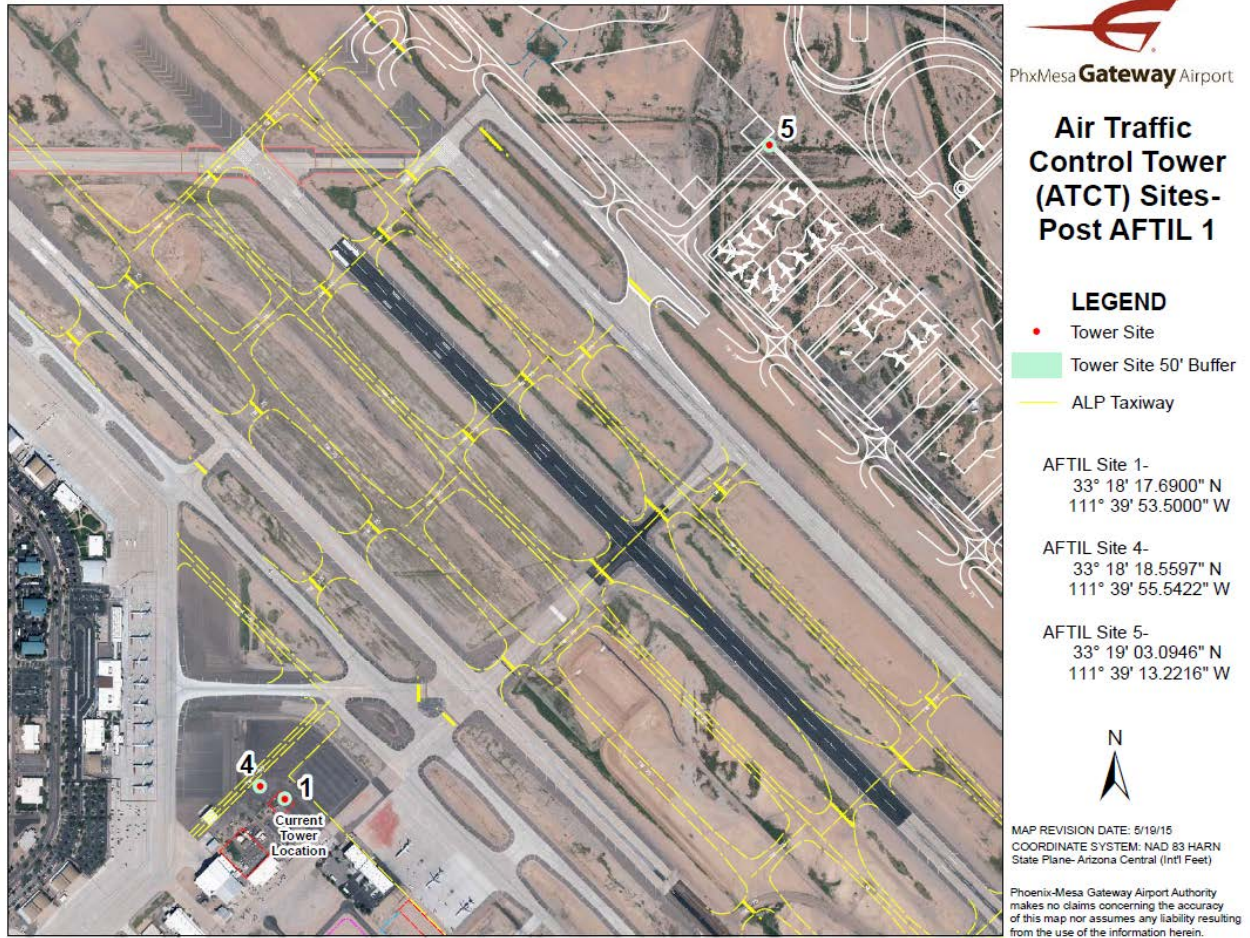
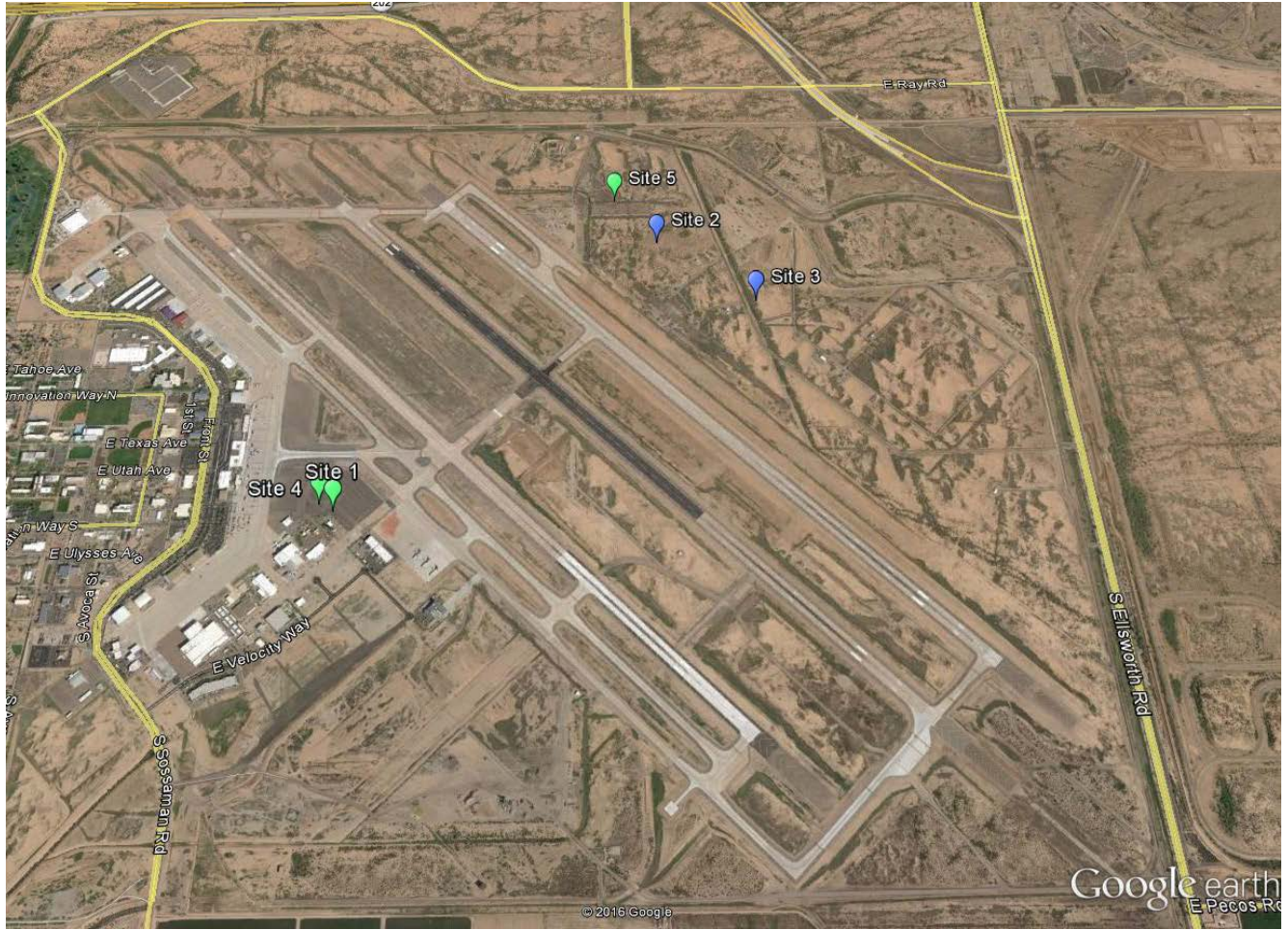


FIGURE 6: GOOGLE EARTH SHOWING ALL SITES CONSIDERED



SECTION 4 PREFERRED SITES

4.1 CRITERIA PER FAA ORDER 6480.4A

GENERAL. The site survey process shall take into consideration criteria relating to the safety of air traffic operations for each site. While all site criteria shall be considered, the greatest emphasis is to be placed on the criteria included in Visibility Performance Requirements; instrument approach procedures with vertical guidance; impacts to communications, navigation and surveillance equipment; and cost. The optimum height and location is the result of balancing many requirements and considerations, based on the current approved Airport Layout Plan (ALP). The goal of this process is to provide the shortest possible ATCT that meets all site survey criteria. The site survey report shall document how this goal has been achieved.

4.1.1 VISIBILITY PERFORMANCE REQUIREMENTS.

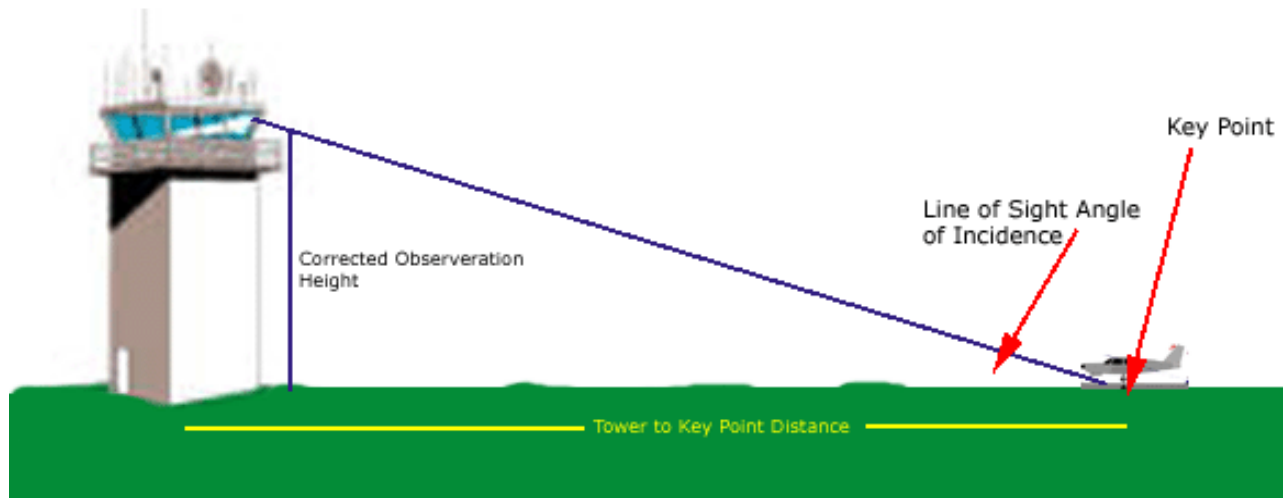
- a. **General.** A Visibility Requirements Analysis shall be conducted to address the Unobstructed View, Object Discrimination, and Line of Sight (LOS) Angle of Incidence requirements.
- b. **Unobstructed View.** Visibility from the ATCT Cab shall allow an unobstructed view of all controlled movement areas of an airport, including all runways, taxiways, and any other landing areas, and of air traffic in the vicinity of the airport. The simulation tool at AFTIL shall be used to do a dynamic visibility analysis including the evaluation of both moving and parked aircraft.
- c. **Object Discrimination.** ATCT distance from critical airport locations and ATCT height shall support requirements for object visibility from the ATCT cab. An Object Discrimination Analysis shall be performed as described in Appendix 11, Section 11-0, to assess observers' probability of detection and recognition of an object on the airport surface according to the criteria below:

Observation Capability Requirements	Observation Description	Front View Probability Criteria ¹ Minimum
Detection	Ability to notice the presence of an object on the airport surface without regard to the class, type, or model (e.g., an object such as an aircraft or vehicle). The observer knows something is present but may not recognize or identify the object.	95.5%
Recognition	Ability to discriminate a class of objects (e.g., a class of aircraft such as single engine general aviation aircraft).	11.5%

¹ Front View Probability Criteria are calculated by the Airport Traffic Control Tower Visibility Analysis Tool (ATCTVAT) for the front view of a minivan. The ATCTVAT is available during visits to the Airport Facilities Terminal Integration Laboratory (AFTIL).

d. **Line of Sight (LOS) Angle of Incidence.** ATCT distance from critical airport locations and ATCT height shall support requirements for viewing objects on the airport movement areas, taxiways, and non-movement areas from the ATCT cab. A LOS Angle of Incidence Analysis shall be performed as described in Appendix 11, Section 11-1 to assess the angle at which the observers' view of a distant object intersects with the airport surface in accordance with the criterion below:

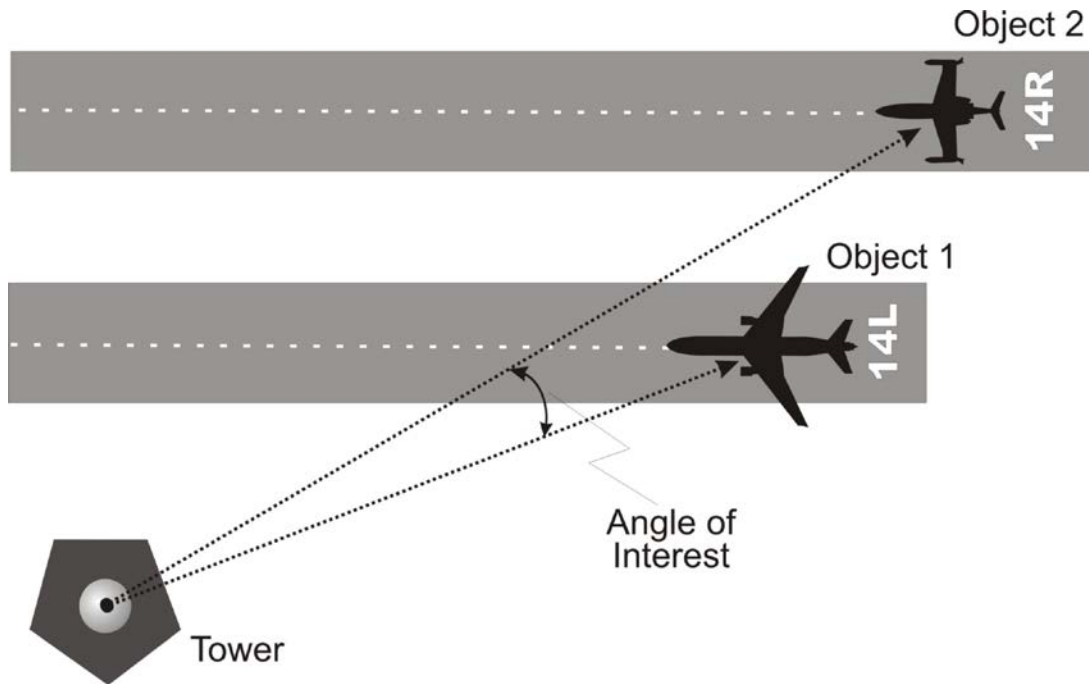
LOS Viewing Criteria LOS Viewing Angle of Incidence



Minimum Equal to or greater than 0.80 degrees

4.1.2 VISIBILITY PERFORMANCE CONSIDERATIONS.

a. **Two-Point Lateral Discrimination.** Consideration shall be given to the two-point lateral discrimination to ensure that ATCT location and height enhance visibility performance as much as possible. A Two-Point Lateral Discrimination Analysis may be performed as described in Appendix 11, Section 11-2 to ensure that operations at critical points of the airport surface provide the observer sufficient lateral discrimination. Consideration shall be given to laterally separating the observer's viewing angle between the two points by 0.13 degrees (8 minutes) or greater.



4.1.3 FEDERAL LAWS, REGULATIONS, ORDERS AND STANDARDS THAT PERTAIN TO THE SITING OF AN ATCT.

a. **Terminal Instrument Procedures (TERPS).** TERPS for the airport shall be studied to determine what impact a new ATCT would have on Instrument Terminal Procedures into and out of the airport. The ATCT shall be sited such that it does not degrade any current or planned terminal instrument procedures. Where any siting options would degrade these procedures, an assessment of impacts shall be coordinated with all stakeholders. Particular emphasis shall be made to protect for approaches with vertical guidance according to the current approved ALP. Non-precision approach and circling minimums may only be adjusted to accommodate a proposed ATCT, if the impacts of such adjustments are understood and agreed to by all stakeholders.

b. **14 CFR (Code of Federal Regulations) Part 77, Objects Affecting Navigable Airspace, and Advisory Circular 150-5300-13, Airport Design Standards,** shall be reviewed and complied with as applicable. Airport surfaces of particular concern are the Runway Obstacle Free Zone, including the Precision Runway Obstacle Free Zone, the Approach Obstacle Free Zone, the Runway Object Free Area, the Runway Protection Zone, Runway Safety Area, and Building Restriction Line. The Airport Layout Plan, as approved by FAA, shall be reviewed for conformance. A Non Rule Making Airport Study (NRA) shall be conducted in accordance with FAA Order 7400.2, Procedures for Handling Airspace Matters and Part 77OE/AAA requirements.

c. **Communications, Navigation and Surveillance Equipment:** The ATCT shall be sited where it does not degrade or affect the performance of existing or planned facilities and/or equipment, unless deviations are necessary to meet other site criteria and/or mitigation strategies are implemented.

d. **Environmental:** The recommended ATCT location shall be subject to an Environmental Due Diligence Audit (EDDA) review and to the National Environmental Protection Act (NEPA) process outlined in FAA Order 1050.1, Environmental Impacts: Policies and Procedures, to determine impacts.

4.1.4 OPERATIONAL REQUIREMENTS

a. **General.** For any given site, the ATCT shall be constructed at the minimum height required to satisfy all site criteria.

b. **ATCT Orientation.** Consideration shall be given to the following; direct sun glare; indirect sun glare off natural and manmade surfaces; night-time lighting glare; external light sources; and thermal distortion; in determining ATCT orientation. The ATCT shall be orientated where the primary operational view faces north or alternately east, or west, or finally south in that order of preference for an ATCT in the northern hemisphere. In areas where snow accumulates on the ground, or the ATCT site is surrounded by sand or a large body of water, a southern orientation should be avoided.

c. **Weather.** Using a 10-year weather history, consideration shall be given to local weather phenomena that impair visibility. Weather affecting the predominant flow of traffic should be considered in the siting process. Ceilings and visibility should be considered in determining ATCT height.

d. **Look-down Angle.** Consideration shall be given to impacts of lookdown angle due to the potential of a larger cab and/or taller ATCT. Visibility from the ATCT Cab shall consider the view of controlled movement areas around the base of the ATCT.

e. **Look Across Line-of-Site (LOS).** Consideration shall be given to visibility from operational positions in the ATCT cab and potential impacts to line-of-site due to an increase in cab size and/or ATCT height. The AFTIL should be used to assess potential line-of-site impacts due to the placement of operational positions in the ATCT cab.

f. **Cab Orientation.** Consideration shall be given to LOS impacts resulting from placement and configuration of mullions. The AFTIL shall be used to model the placement of mullions to minimize LOS impacts.

g. **Look-up Angle for Missed Approaches.** Consideration shall be given to look up angle for adverse impacts on air traffic operations. The AFTIL should be used to simulate view of missed approaches and assess potential impacts.

h. **Construction.** Consideration shall be given to LOS from the existing ATCT during construction of the new ATCT and impacts from the old ATCT when operating from the new ATCT.

i. **Access.** Access to the ATCT shall avoid crossing areas of aircraft operations.

j. **Non-Movement Areas.** Visibility of all airport surface areas for ground operations of aircraft and of airport ground vehicles on ramps, aprons and tie-down areas, and test areas shall be considered.

4.1.5 ECONOMIC CONSIDERATIONS

a. **General.** Consideration shall be given to economic factors when proposing ATCT sites.

b. **Cost Estimates.** Detailed cost estimates, to include at a minimum the following items, shall be documented for the preferred sites in the siting report.

(1) **Height.** Consideration shall be given to the height of a proposed ATCT as it is typically the largest contributing factor to the project cost.

(2) **Land Use Planning.** The ATCT plot shall have sufficient area to accommodate the initial building, parking, and future expansion. Environmental concerns shall be documented as part of the construction cost estimate.

(3) **Utilities and Cabling.** Consideration shall be given to the connectivity of existing FAA cabling and utilities to the preferred ATCT sites.

(4) **Site Access.** Consideration shall be given to any necessary new or redesigned site access roadways.

(5) **Security.** Consideration shall be given to the impacts of security compliance at the preferred ATCT sites.

4.2 Analysis of Initial Sites

4.2.1 SITE 1

a. Description: Site 1 – This site is located South east of RWY 12R-30L and is located about 250 ft. NNW of the existing IWA tower building.

b. Site Reference Data: Site 1 coordinates are 33° 18' 17.6900"N, 111° 39' 53.5000"W. Minimum height selected was 194'. Site elevation is 1350' AMSL. Controller eye height of 164' AGL was used for the AFTIL simulation.

c. Siting Criteria: The site is expected to provide unobstructed Line of Sight (LOS) to airborne traffic patterns and most surface areas, except of the 12R non movement taxiway area for which it will require a better view.

There were some hazards identified for this site. Minor Hazards include sun interference with Air Traffic Controllers vision when facing east; view of runway 12R hold short line will be obscured during tower construction; the view from current ATCT to taxiways B, H, V will be blocked and small portion of runway 12R will be partially blocked also due to the new tower construction. Some major hazards identified on the Hazards Analysis Worksheet include: blockage of view to runway 12C short final and obstruction of view of a small portion of taxiway G, including the hold line west of runway 12C. The existing IWA Air Traffic Control Tower building does not create any visibility hazards for sites 1.

The performance criteria for probability of detection and probability of recognition are set at 95.5% and 11.5% respectively. Site 1 passes the performance criteria for all runways. At an eye level height of 164' AGL, the site also meets the LOS angle of incidence requirement for all runways.

The primary operational view to existing runways is toward the EAST. The preferred direction per the FAA ATCT siting order is north, followed by east, west and south

The recommended controller eye height is 164' placing the top of the ATCT at 194'AGL. The NRA case (2015-AWP-1396-NRA) was filed at 194'. The NRA case final determination is attached to this report and states no objection to the tower site location proposed. Flight standards stated the following "Very Good Site. Low Glare, good taxiway and runway visibility." The letter includes additional information which states that certain procedures will have to exist in the future if the Airport follows their master plan to extend runway 12L an additional 1000 ft. Site 1 was not a controlling obstacle the existing flight procedures.

Phase I Environmental Due Diligence Audit (EDDA) for site #1 (*by Amec Foster Wheeler Env & Infrastructure on 9/10/2015*), does not presents any evidence of site contamination or hazardous waste material at this location. Remediation

activities associated to Liquid Fuel Storage is ongoing on several locations of the property. Groundwater located 150 ft. below ground is contaminated with jet fuel and is also under remediation. No risks to human health or negative impacts to the site were identified by this assessment. Based on the information gathered by the consultant, there was no additional assessment recommended at this time.

The site initial risk ranking shows 1 high risk, 1 medium and 3 low risks identified. The residual risk ranking indicates 2 risks are eliminated and 3 low risks remain.

d. Estimated Construction Cost: Construction cost at this site is estimated at \$20,896,813. Some detail is included in the spreadsheet attached as an appendix to this report.

e. NASWATCH Summary: No NASWATCH write-up was provided. Airway Facilities (Technical Operations) response to the NRA case indicates no objection.

f. Conclusions: The AFTIL simulation revealed a good line of sight for this location to the airport in general and to the general aviation ramp. The Hazards Worksheet Analysis identifies several hazards on this location that will occur during tower construction. The main hazard was found to be the blockage of RWY 12C. LOS for this location will be blocked during the tower construction. The alternative to mitigate this hazard is to suspend arrivals on this runway during tower construction. Additional sun glare issues during morning hours placed this site as the second best location preferred by controllers.

4.2.2 SITE 4

a. Description: This site is located South east of RWY 12R-30L and is located about 410 ft. NW of the existing IWA tower building.

b. Site Reference Data: Site 4 coordinates are 33° 18' 18.2060"N, 111° 39' 55.1302"W. Minimum height selected was 194'. The site elevation is 1349' AMSL. Controller eye height of 164' AGL was used for the AFTIL simulation.

Siting Criteria: The site is expected to provide the overall best LOS for the entire airport; especially areas on the General Aviation Ramp and 12R hold Short Line. The hazard evaluation analysis identified two minor hazards at this location. The first hazard found was possible sun glare at dawn. The second hazard would be the possibility of the controller's view of taxiways V & W being obscured from the existing tower during the tower construction at site 4. Existing controls and additional safety requirements have to be implemented to mitigate hazards. The existing IWA Air Traffic Control Tower building does not create any visibility hazards for site 4.

Object discrimination was analyzed for each active runway and is broken down into two separate categories: Probability of detection; and Probability of recognition. The performance criteria are set at 95.5% and 11.5% respectively. Site 4 passes the performance criteria for all runways.

The primary operational view, toward the existing runways, is EAST. The preferred direction per the FAA ATCT siting order is north, followed by east, west and south

The recommended eye level is 164' AGL resulting in an ATCT height of 194'. The NRA case (2016-AWP-181-NRA) was filed for an ATCT height of 194' AGL. The preliminary TERPS analysis completed during our AFTIL visit predicts no IFR departure effects, no non-precision instrument approach effects, and no precision instrument approach effects. The NRA case final determination is attached to this report shows that this Site 4 location for a new tower has no effect on existing flight procedures. The letter presents proposed flight procedures for RWY 12L, 30L, 12C and 30C which does not currently exist. The Airport Master Plan shows the extension of runway 12L by 1000 ft, in this event the HAT procedures for Runways 12L, 30L and 12R would need to be adjusted.

Phase I Environmental Due Diligence Audit (EDDA) for Site #4 (*by Amec Foster Wheeler Env & Infrastructure on 9/10/2015*), does not presents any evidence of site contamination or hazardous waste material at this location. Remediation activities associated to Liquid Fuel Storage is ongoing on several locations of the property. Groundwater located 150 ft. below ground is contaminated with jet fuel and is also under remediation. No risks to human health or negative impacts to the site were identified by this assessment. Based on the information gathered by the consultant, there was no additional assessment recommended at this time.

The initial safety assessment contains 2 low risk items. The residual assessment predicts 2 low. The details are contained in the attached SMS report.

c. Estimated Construction Cost: The estimated construction cost at this site is \$20,896,813. Some cost detail is shown in the spreadsheet attached as an appendix to this report.

d. NASWATCH Summary: No NASWATCH write-up was provided. Technical Operations (Airway Facilities) response to the NRA case indicates no objection.

e. Conclusions: The site meets all visibility performance analysis parameters; the site construction estimate is less than site 5 and equal to site 1. There are no TERPS impacts and the residual risk assessment predicts 2 low risks to the NAS. The site presents no line of sight or operational concerns based on the AFTIL simulation. Site 4 is identified as the preferred location at 164' AGL eye height since it provides the best overall view of the airport; the least hazards were presented at this location and has the least sun glare affecting the controllers during morning hours.

4.2.3 SITE 5

a. Description: This site is located north of RWY 12L- 30R. This location is the farthest one away from the existing tower.

b. Site Reference Data: Site 5 coordinates are 33° 19' 03.0946"N 111° 39' 13.2216"W. Minimum height selected was 187'. Site elevation is 1361' AMSL. Controller eye height of 157' AGL was used for the AFTIL simulation.

c. Siting Criteria: This site was found viable but, the least preferred by controllers from all alternatives. The main disadvantages identified during AFTIL (trip 1) were that the tower staff was going to be exposed to approximately 2-3 hrs. of intense sun during high traffic period due to its orientation to the west; this affects the safety criteria of the General Aviation arrivals and was going to affect safe operations in general. Also, the LOS view of the General Aviation ramp was going to be restricted on this location because controllers would not be able to distinguish aircraft without continuous use of binoculars. This creates a safety concern regarding this site location since these restrictions will prevent the controller from having situational awareness of the traffic flow and maintain overall separation requirements. The existing IWA Air Traffic Control Tower building does not create any visibility hazards for any for site 5.

The site was evaluated using the visibility criteria including object discrimination which is broken down into two separate categories: Probability of detection; and Probability of recognition. The performance criteria are set at 95.5% and 11.5% respectively. Site 5 meets all criteria for all runways. LOS angle of incidence also passes the analysis.

The primary operational view is toward the WEST. The preferred direction per the FAA ATCT siting order is north, followed by east, west and south.

The NRA case (2015-AWP-1398-NRA) was filed for an ATCT height of 187' AGL. The preliminary TERPS analysis completed during our AFTIL visit predicts no IFR departure effects, no non-precision instrument approach effects, and no precision instrument approach effects. Procedures were proposed for RWY 12L, 30R, 12C, 12R for existing and ultimate thresholds. The NRA case final determination is attached to this report. It states "Site 5 very poor site. High sun glare, distance and angle to approaching aircraft results in poor visibility to approach end taxi and runway ends".

The FAA Technical Operations response to the NRA case indicates no objections.

Phase I Environmental Due Diligence Audit (EDDA) for Site #5 (*by Amec Foster Wheeler Env & Infrastructure on 9/10/2015*), does not presents any evidence of site contamination or hazardous waste material at this location. Remediation activities associated to Liquid Fuel Storage is ongoing on several locations of the property.

Groundwater located 150 ft. below ground is contaminated with jet fuel and is also under remediation. No risks to human health or negative impacts to the site were identified by this assessment. Based on the information gathered, there was no recommendation of the need to additional assessments.

The initial safety assessment identified 4 low risks. The residual assessment shows 3 low residual risks.

d. Estimated Construction Cost: Construction cost for this site is estimated at \$21,002,627. Cost for this site came out higher; we are estimating that the cost relocating the utilities for this site will be higher than the other two selected sites. The details are shown in the spreadsheet attached as an appendix to this report.

e. NASWATCH Summary: No NASWATCH write-up was provided. Airway Facilities (Technical Operations) response to the NRA case indicates no objection.

f. Conclusions: This site is was the least preferred location by the Air Traffic controller. The findings of the NRA case determination identified that high sun glare during high traffic periods is a main concern due to the orientation of the tower. Additional safety concerns are created by the restriction of the line of sight view to the General Aviation Ramp at this location. Overall, the estimated cost for this site was found to be larger than the other two sites due to the relocation of the existing utilities and the need to create vehicle access to the location. This site does not provide any visibility, safety or cost advantages to the other locations.

SECTION 5 FINAL SITE SUMMARY

5.1 Summary Chart

A summary comparison of all three initial sites is provided in the matrix of Table 2. The comparison chart summarizes a variety of factors and considerations pertinent to the ATCT siting analysis as outline in section 4 of this report and Chapter 2 of FAA order 6480.4A.

Table 2: Site Comparison Chart

IWA Preferred Site Comparison Chart									
Item Description	Site 1			Site 4			Site 5		
Recommended Site	2			1			3		
Eye-Level (AGL)	164			164			157		
HF Tool Minimum Eye-Level (AGL)	142			145			130		
Site Access	No issues			No issues			Access road will have to be constructed.		
Latitude	33 18' 17.69" N			33 18' 18.2060" N			33 19' 03.0946" N		
Longitude	111 39' 53.54" W			111 39' 55.1302" W			111 39' 13.2216" W		
Site Elevation (AMSL)	1350			1349			1361		
Eye Level (AGL)	164			164			157		
Top of Tower (AGL)	194			194			187		
Top of Tower (AMSL)	1544			1543			1548		
Maximum Distance (to farthest point on all runways and taxi ways)	7798'			7997'			7732'		
2-Point Lateral Discrimination (Deg)	N/A			N/A			N/A		
Object Discrimination Pass/Fail Front View Dodge Caravan	PASS			PASS			PASS		
Pass/Fail Front View C-172	PASS			PASS			PASS		
Line of Sight Angle of Incidence at Max. Distance	0.96 degrees			0.93 degrees			1.00 degrees		
ATCT Orientation Direction	East			East			West		
Access to ATCT Site (yes/no)	Yes			Yes			No		
Environmental Issues	None			None			None		
ATCT Potential Impacts to Future & Existing Nav aids	None			None			None		
TERP/Part 77 Impacts	No			No			No		
Construction Cost Estimates	\$20,896,813			\$20,896,813			\$21,002,627		
Safety Assessment Initial Risk Ranking	H	M	L	H	M	L	H	M	L
	1	1	3	0	0	2	0	0	4
Safety Assessment Predicted Residual Risk Ranking	H	M	L	H	M	L	H	M	L
	0	0	3	0	0	2	0	0	3

5.2 Final Site Recommendation

Based on the discussions at AFTIL 1 and the analysis completed since, site 4 is the best site to serve the Phoenix-Mesa Gateway Airport.

The site 4 construction cost estimate is equal than site 1, but provides better line of sight, less obstruction during construction phase, and less sun glare for controllers. This location did not have any adverse effect on existing TERPS and the hazards assessed were less than the other two sites evaluated. All hazards identified for this location were of low risk and mitigation for these risks was provided.

Site 1 had the same cost as site 4 but, additional issues with sun glare and limited LOS were identified, specifically during the construction phase of the new tower. Site 1 will remain as the second best site location for the tower.

Site 5 was provided the highest cost estimate of the three sites evaluated, during the AFTIL 2 meeting this site was eliminated by the airport representative as non-viable due to construction costs. Additional safety hazards were encountered at this location due to its orientation (WEST) which is not the preferred direction per FAA siting order and restricted line of sight.

Finally, during AFTIL 2, it was determined that a cab size of 550 sq. ft. was adequate for this air traffic control tower. The use of three columns was selected for Site 1 and Site 4 as they provided the best overall view of the airport.

Appendix 1: Federal Contract Tower Minimum Equipment List

FEDERAL CONTRACT TOWER MINIMUM EQUIPMENT LIST

January, 2007

a. Voice switch communication equipment capable of radio and telephone ATC communication as appropriate. This must include the capability of headset use and instructor/student override capabilities.

b. One headset per controller and one handset per position, with appropriate spares.

c. Very High Frequency radios for ground/air communication, as required, to support level of traffic; i.e. Local Control, Ground Control, Automated Terminal Information Service, Clearance Delivery, and Emergency; one transmitter and one receiver for each frequency. Handheld radios are not authorized as primary units.

d. Ultra High Frequency radios for ground/air communication, as required, to support military operations. Handheld radios are not authorized as primary units.

e. Landline communication system with direct access line to controlling instrument flight rules facility.

f. Tunable emergency backup transceiver with battery backup supply.

g. Dual deck, multi-channel, voice recorder system, for continuous unattended recording of each position used for receiving/transmitting ATC clearances, coordination, and instructions. Capabilities must include: synchronized recording of time, playback without recording interruption, re-recording to suitable portable storage media and/or a portable recorder with re-recording capability, any internal storage media must be configurable to preclude retention of data older than 45 days, remote alarm. Appropriate storage media must be provided (one for each of 45 days, plus spares). Additionally, the portable recorder should be capable of stereo recording in order to record data on one channel and the time source on the other channel.

h. Back-up power source for essential equipment, i.e. radios, voice switch, cab HVAC, etc.

i. Two altimeter-setting indicators. A certifiable Digital Altimeter Setting Indicator (DASI) is preferred and required if ASOS/AWOS or a "traceable pressure standard" is not available within 10 miles for precision approaches and 25 miles for non-precision approaches. Re: FAA Order 7210.3, Section 8 and FAA Notice 7210.477. Aircraft altimeters are not acceptable.

Note: DASI requires documentation to validate traceability to the National Institute of Standards (NIST). If manufacturer cannot provide it, DASI cannot be used at LAWRS sites.

j. Temperature and Dew Point Equipment

k. Two direct reading wind information indicators.

l. If AWOS/ASOS is available on the airport, locate ASOS/AWOS Operator Input Device (OID) in the tower cab. Include an ASOS/ATIS interface device.

m. Two pair of operable binoculars.(7x50 or greater)

n. Signal light gun with a back-up power source.

o. At least one 24-hour clock with seconds display, ie: digital LED.

p. Alert system to notify airport emergency equipment operator.

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey FINAL Report

- q. Airport lighting controls.
 - r. Window shading as prescribed in FAA regulations for all tower cab windows (adjustable). (FAA specification E 2470)
 - s. Mechanical or electronic traffic counting device.
 - t. Position lighting (to support established operating positions with rheostat control).
 - u. Electro Static Discharge (ESD) resistant controller chairs of appropriate height for the conduct of tower operational duties.
 - v. Floor covering must be ESD resistant.
- Note - U and V: other floor grounding apparatus may be necessary dependant upon specifications of the electronic equipment installed.*
- w. Administrative telephone with handsets in the operating and administrative quarters.
 - x. Automatic Terminal Information Service (ATIS)
 - y. Appropriate non-operational space and equipment will also be provided. This must include:
 - (1) Lockable Air Traffic Managers office
 - (2) Restroom one floor below the tower cab
 - (3) Training/break room
 - (4) Appropriate desk, chairs, table, and locking file cabinet

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Appendix 2: List of Contacts

<p>Tony Bianchi Airport Planner Phoenix-Mesa Gateway Airport 5835 South Sossaman Road Mesa, Arizona 85212-6014 Office: 480-988-7649</p>	<p>Kyler Erhard Community Planner FAA Phoenix PHX-ADO 3800 Central Ave Phoenix, AZ 85012 Office: 602-792-1073</p>
<p>Jill Gough FAA Program Implementation Mgr. 1601 Lind Ave., SW Renton, WA 98057 Office: 425-203-4722</p>	
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<p>Kent Freeman FAA Manager, Los Angeles Engineering Center A P.O. Box 92007 Los Angeles, CA 90009-2007 Office: 310-725-7642</p>	
<p>Lyndon Lawyer FAA General Engineer, Terminal Engineering Center A P.O. Box 92007 Los Angeles, CA 90009-2007 Office: 310-725-7621</p>	
<p>Elizabeth A. Houghton Flight Procedures, TERPS FAA Northwest Mountain Regional Office 1601 Lind Ave., SW Renton, WA 98057 Office: 425-917-6775</p>	

Appendix 3: Cost Estimate for Site Cost Comparison

	Site 1	Site 4	Site 5
Proposed ATCT Height (ft)	194	194	187
Height X \$65,000	\$12,610,000	\$12,610,000	\$12,155,000
Inflation yr 1	\$13,240,500	\$13,240,500	\$12,762,750
Inflation yr 2	\$13,902,525	\$13,902,525	\$13,400,888
Inflation yr 3	\$14,597,651	\$14,597,651	\$14,070,932
Inflation yr 4	\$15,327,534	\$15,327,534	\$14,774,478
Cost estimate ATCT only	\$15,327,534	\$15,327,534	\$14,774,478
Base Building Size (sq ft)	7,000	7,000	7,000
Bldg size X \$420 per sq ft	\$2,940,000	\$2,940,000	\$2,940,000
Inflation yr 1	\$3,087,000	\$3,087,000	\$3,087,000
Inflation yr 2	\$3,241,350	\$3,241,350	\$3,241,350
Inflation yr 3	\$3,403,418	\$3,403,418	\$3,403,418
Inflation yr 4	\$3,573,588	\$3,573,588	\$3,573,588
Site Work (20% of bldg cost)	\$714,718	\$714,718	\$714,718
Trenching for Utilities	\$142,943.54	\$142,943.54	\$357,358.84
Base Building + Site Work + trenching	\$4,431,250	\$4,431,250	\$4,645,665
Access Road			225,000
Total Construction Cost	\$19,901,727	\$19,901,727	\$20,002,502
Total + Contingency 5%	\$20,896,813	\$20,896,813	\$21,002,627

Appendix 4: TERPS Results for Site 1

Phoenix Mesa Gateway Airport (KIWA), Phoenix, Arizona
 May 11-15, 2015
 Elizabeth Houghton, WFPT, AJV-W24

ATC TOWER 1

Coordinates: 33° 18' 17.69" N - 111° 39' 53.54" W

Ground AMSL: 1350 ft.

Eye Level AGL: 164 ft.

Top of Tower AGL: 194 ft.

Top of Tower AMSL: 1544 ft.

RNAV (GPS) RWY 12L— This procedure does not presently exist; this is a proposed procedure. Control Tower 1 will penetrate the LNAV/VNAV missed approach surface by 59 ft. The HAT would need to be adjusted 40 ft. resulting in a HAT of 290 ft. Ultimate runway 12L will be extended 1000 ft. After the runway extension, the LNAV/VNAV missed approach surface will be penetrated by 34 ft. The HAT would need to be adjusted 23 ft. resulting in a 273 ft. HAT. Tower 1 was not a controlling obstacle for the LPV or the LNAV minimums.

RNAV (GPS) RWY 12R— Tower 1 has no effect on the existing procedure LP, LNAV minimums. A feasibility study was done for LPV and LNAV/VNAV HATS. The Tower will penetrate the LNAV/VNAV missed approach surface by 7 ft. resulting in a HAT of 257 ft. Ultimate runway 12R threshold extension would move the missed approach surface back resulting in a 250 ft. HAT. Tower 1 was not a controlling obstacle for the LPV or the LNAV minimums.

ATC Tower 1 was not a controlling obstacle to the following procedures

ILS or LOC RWY 30C	RNAV (RNP) RWY 30R
RNAV (GPS) RWY 30C	RNAV (GPS) RWY 12C
RNAV (RNP) RWY 30C	RNAV (RNP) RWY 12C (proposed)
RNAV (GPS) RWY 30L (proposed for existing and ultimate thresholds)	RNAV (RNP) RWY 12L
RNAV (RNP) RWY 30L (proposed for existing and ultimate thresholds)	RNAV (RNP) RWY 12R
ILS RWY 30R (Proposed)	VOR or TACAN RWY 30C
RNAV (GPS) RWY 30R	

Appendix 5: TERPS Results for Site 4

ATC TOWER 4

Coordinates: 33° 18' 18.5597" N - 111° 39' 55.5422" W (Original Location)

33° 18' 18.2060" N, 111° 39' 55.1302" W (Final Location)

Ground Level AMSL: 1349 ft.

Eye Level AGL: 164 ft.

Top of Tower AGL: 194 ft.

Top of Tower AMSL: 1543 ft.

RNAV (GPS) RWY 12L—This procedure does not presently exist; this is a proposed procedure. The LNAV/VNAV missed approach surface will be penetrated by approximately 63 ft. The HAT would need to be adjusted 43 ft., resulting in a 293 ft. HAT. Ultimate runway 12L threshold will be extended 1000 ft. The LNAV/VNAV missed approach surface will be penetrated by 38 ft. The HAT would need to be adjusted 26 ft. resulting in a 276 ft. HAT. Tower 4 was not a controlling obstacle for the LPV or the LNAV minimums.

RNAV (GPS) RWY 12R—Tower 4 has no effect on the existing procedure LP, LNAV minimums. A feasibility study was done for LPV and LNAV/VNAV HATS. The Tower will penetrate the LNAV/VNAV missed approach surface by 12 ft. The HAT would need to be adjusted by 8 ft. resulting in a HAT of 258 ft. Ultimate runway 12R threshold extension would move the missed approach surface and the Tower 4 will no longer penetrate the missed approach surface. Tower 4 was not a controlling obstacle for the LPV or the LNAV minimums.

ATC Tower 4 was not a controlling obstacle to the following procedures

ILS or LOC RWY 30C	RNAV (RNP) RWY 30R
RNAV (GPS) RWY 30C	RNAV (GPS) RWY 12C
RNAV (RNP) RWY 30C	RNAV (RNP) RWY 12C (proposed)
RNAV (GPS) RWY 30L (proposed for existing and ultimate thresholds)	RNAV (RNP) RWY 12L
RNAV (RNP) RWY 30L (proposed for existing and ultimate thresholds)	RNAV (RNP) RWY 12R
ILS RWY 30R (Proposed)	VOR or TACAN RWY 30C
RNAV (GPS) RWY 30R	

Appendix 6: TERPS Results for Site 5

ATC TOWER 5

Coordinates: 33° 19' 03.0946" N - 111° 39' 13.2216" W

Ground AMSL: 1361 ft.

Eye Level AGL: 157 ft.

Top of Tower AGL: 187 ft.

Top of Tower AMSL: 1548 ft.

RNAV (GPS) RWY 12L— This procedure does not presently exist; this is a proposed procedure. Tower 5 is the controlling obstacle in the LNAV/VNAV FINAL segment resulting in a HAT of 353 ft. The LPV missed approach will not be affected because Tower 5 does not fall into the LPV missed approach trapezoid. Ultimate runway 12L would be extended 1000 ft. Tower 5 will no longer be the controlling obstacle in the LNAV/VNAV final segment but will still penetrate the missed approach surface by 60 ft. The HAT would need to be adjusted 41 ft. resulting in a 291 ft. HAT. The LPV missed approach surface will also move back and tower 5 will now fall into the missed approach trapezoid, penetrating the missed approach surface by 22 ft. The HAT would have to be adjusted by 18 ft., increasing the LPV HAT from 200 to 218 ft.

RNAV (GPS) RWY 12R- Tower 5 has no effect on the existing procedure LP, LNAV minimums. A feasibility study was done for LPV and LNAV/VNAV HATS. Tower 5 will penetrate the LNAV/VNAV missed approach surface by 34 ft. The HAT would have to be adjusted 23 ft. resulting in a HAT of 273 ft. Ultimate runway 12R threshold extension would result in a missed approach penetration of 14 ft. The HAT would need to be adjusted 10 ft. resulting in a 160 ft. HAT. Tower 5 was not a controlling obstacle for the LPV or the LNAV minimums.

ATC Tower 5 was not a controlling obstacle to the following procedures

ILS or LOC RWY 30C	RNAV (RNP) RWY 30R (Proposed)
RNAV (GPS) RWY 30C	RNAV (GPS) RWY 12C
RNAV (RNP) RWY 30C	RNAV (RNP) RWY 12C (proposed)
RNAV (GPS) RWY 30L (proposed for existing and ultimate thresholds)	RNAV (RNP) RWY 12L (Proposed)
RNAV (RNP) RWY 30L (proposed for existing and ultimate thresholds)	RNAV (RNP) RWY 12R (Proposed)
ILS or LOC RWY 30R (Proposed)	VOR or TACAN RWY 30Cs
RNAV (GPS) RWY 30R (Proposed)	

Appendix 7: Visibility Tool Results

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Existing IWA ATCT – RWY 12C**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **106**

Vertical Elevation Change Between Observer and Key Point (feet): **107**

Ground Elevation at Tower (MSL): **1351**

Ground Elevation at Key Point (MSL): **1350**

Tower to Key Point Distance: **4858** (feet) **1.48** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.6%	Pass
probability(recognition)	11.5%	56.7%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.26 degrees	PASS: Change in elevation between observer and key point should be no less than 68 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Existing IWA ATCT – RWY 12L**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **106**

Vertical Elevation Change Between Observer and Key Point (feet): **100**

Ground Elevation at Tower (MSL): **1351**

Ground Elevation at Key Point (MSL): **1357**

Tower to Key Point Distance: **5018** (feet) **1.53** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.5%	Pass
probability(recognition)	11.5%	53.2%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.14 degrees	PASS: Change in elevation between observer and key point should be no less than 70 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Existing IWA ATCT – RWY 12R**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **106**

Vertical Elevation Change Between Observer and Key Point (feet): **100**

Ground Elevation at Tower (MSL): **1351**

Ground Elevation at Key Point (MSL): **1357**

Tower to Key Point Distance: **5525** (feet) **1.68** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.3%	Pass
probability(recognition)	11.5%	43.3%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.04 degrees	PASS: Change in elevation between observer and key point should be no less than 77 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Existing IWA ATCT – RWY 30C**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **106**

Vertical Elevation Change Between Observer and Key Point (feet): **81**

Ground Elevation at Tower (MSL): **1351**

Ground Elevation at Key Point (MSL): **1376**

Tower to Key Point Distance: **7153** (feet) **2.18** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	97.8%	Pass
probability(recognition)	11.5%	20.0%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	0.65 degrees	FAIL: Change in elevation between observer and key point should be no less than 100 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Existing IWA ATCT – RWY 30L**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **106**

Vertical Elevation Change Between Observer and Key Point (feet): **89**

Ground Elevation at Tower (MSL): **1351**

Ground Elevation at Key Point (MSL): **1368**

Tower to Key Point Distance: **5386** (feet) **1.64** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.4%	Pass
probability(recognition)	11.5%	45.9%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	0.95 degrees	PASS: Change in elevation between observer and key point should be no less than 75 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Existing IWA ATCT – RWY 30R**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **106**

Vertical Elevation Change Between Observer and Key Point (feet): **74**

Ground Elevation at Tower (MSL): **1351**

Ground Elevation at Key Point (MSL): **1383**

Tower to Key Point Distance: **7732** (feet) **2.36** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	97.0%	Pass
probability(recognition)	11.5%	14.9%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	0.55 degrees	FAIL: Change in elevation between observer and key point should be no less than 108 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 1 – RWY 12C**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **164**

Ground Elevation at Tower (MSL): **1350**

Ground Elevation at Key Point (MSL): **1350**

Tower to Key Point Distance: **4544** (feet) **1.39** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.7%	Pass
probability(recognition)	11.5%	63.2%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	2.07 degrees	PASS: Change in elevation between observer and key point should be no less than 63 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 1 – RWY 12L**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **157**

Ground Elevation at Tower (MSL): **1350**

Ground Elevation at Key Point (MSL): **1357**

Tower to Key Point Distance: **4678** (feet) **1.43** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.6%	Pass
probability(recognition)	11.5%	60.4%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.92 degrees	PASS: Change in elevation between observer and key point should be no less than 65 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 1 – RWY 12R**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **157**

Ground Elevation at Tower (MSL): **1350**

Ground Elevation at Key Point (MSL): **1357**

Tower to Key Point Distance: **4738** (feet) **1.44** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.6%	Pass
probability(recognition)	11.5%	59.7%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.90 degrees	PASS: Change in elevation between observer and key point should be no less than 66 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 1 – RWY 30C**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **138**

Ground Elevation at Tower (MSL): **1350**

Ground Elevation at Key Point (MSL): **1376**

Tower to Key Point Distance: **7054** (feet) **2.15** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	98.0%	Pass
probability(recognition)	11.5%	21.1%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.12 degrees	PASS: Change in elevation between observer and key point should be no less than 99 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 1 – RWY 30L**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **146**

Ground Elevation at Tower (MSL): **1350**

Ground Elevation at Key Point (MSL): **1368**

Tower to Key Point Distance: **5503** (feet) **1.68** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.3%	Pass
probability(recognition)	11.5%	43.5%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.52 degrees	PASS: Change in elevation between observer and key point should be no less than 77 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 1 – RWY 30R**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **131**

Ground Elevation at Tower (MSL): **1350**

Ground Elevation at Key Point (MSL): **1383**

Tower to Key Point Distance: **7798** (feet) **2.38** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	96.9%	Pass
probability(recognition)	11.5%	14.5%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	0.96 degrees	PASS: Change in elevation between observer and key point should be no less than 109 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 4 – RWY 12C**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **163**

Ground Elevation at Tower (MSL): **1349**

Ground Elevation at Key Point (MSL): **1350**

Tower to Key Point Distance: **4342** (feet) **1.32** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.7%	Pass
probability(recognition)	11.5%	68.1%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	2.15 degrees	PASS: Change in elevation between observer and key point should be no less than 61 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 4 – RWY 12L**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **156**

Ground Elevation at Tower (MSL): **1349**

Ground Elevation at Key Point (MSL): **1357**

Tower to Key Point Distance: **4535** (feet) **1.38** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.7%	Pass
probability(recognition)	11.5%	63.9%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.97 degrees	PASS: Change in elevation between observer and key point should be no less than 63 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 4 – RWY 12R**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **156**

Ground Elevation at Tower (MSL): **1349**

Ground Elevation at Key Point (MSL): **1357**

Tower to Key Point Distance: **4667** (feet) **1.42** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.7%	Pass
probability(recognition)	11.5%	61.1%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.91 degrees	PASS: Change in elevation between observer and key point should be no less than 65 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 4 – RWY 30C**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **137**

Ground Elevation at Tower (MSL): **1349**

Ground Elevation at Key Point (MSL): **1376**

Tower to Key Point Distance: **6991** (feet) **2.13** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	98.1%	Pass
probability(recognition)	11.5%	21.7%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.12 degrees	PASS: Change in elevation between observer and key point should be no less than 98 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 4 – RWY 30L**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **145**

Ground Elevation at Tower (MSL): **1349**

Ground Elevation at Key Point (MSL): **1368**

Tower to Key Point Distance: **5709** (feet) **1.74** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.2%	Pass
probability(recognition)	11.5%	40.0%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.45 degrees	PASS: Change in elevation between observer and key point should be no less than 80 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 4 – RWY 30R**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **164**

Vertical Elevation Change Between Observer and Key Point (feet): **126**

Ground Elevation at Tower (MSL): **1349**

Ground Elevation at Key Point (MSL): **1383**

Tower to Key Point Distance: **7997** (feet) **2.44** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	96.5%	Pass
probability(recognition)	11.5%	13.2%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	0.93 degrees	PASS: Change in elevation between observer and key point should be no less than 112 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 5 – RWY 12C**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **157**

Vertical Elevation Change Between Observer and Key Point (feet): **168**

Ground Elevation at Tower (MSL): **1361**

Ground Elevation at Key Point (MSL): **1350**

Tower to Key Point Distance: **3727** (feet) **1.14** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.9%	Pass
probability(recognition)	11.5%	79.6%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	2.58 degrees	PASS: Change in elevation between observer and key point should be no less than 52 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 5 – RWY 12L**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **157**

Vertical Elevation Change Between Observer and Key Point (feet): **161**

Ground Elevation at Tower (MSL): **1361**

Ground Elevation at Key Point (MSL): **1357**

Tower to Key Point Distance: **2394** (feet) **0.73** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	100.0%	Pass
probability(recognition)	11.5%	96.0%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	3.85 degrees	PASS: Change in elevation between observer and key point should be no less than 33 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 5 – RWY 12R**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **157**

Vertical Elevation Change Between Observer and Key Point (feet): **161**

Ground Elevation at Tower (MSL): **1361**

Ground Elevation at Key Point (MSL): **1357**

Tower to Key Point Distance: **5233** (feet) **1.6** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	99.4%	Pass
probability(recognition)	11.5%	48.6%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.76 degrees	PASS: Change in elevation between observer and key point should be no less than 73 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 5 – RWY 30C**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **157**

Vertical Elevation Change Between Observer and Key Point (feet): **142**

Ground Elevation at Tower (MSL): **1361**

Ground Elevation at Key Point (MSL): **1376**

Tower to Key Point Distance: **6700** (feet) **2.04** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	98.4%	Pass
probability(recognition)	11.5%	25.1%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.21 degrees	PASS: Change in elevation between observer and key point should be no less than 94 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 5 – RWY 30L**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **157**

Vertical Elevation Change Between Observer and Key Point (feet): **150**

Ground Elevation at Tower (MSL): **1361**

Ground Elevation at Key Point (MSL): **1368**

Tower to Key Point Distance: **7718** (feet) **2.35** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	97.0%	Pass
probability(recognition)	11.5%	15.2%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.11 degrees	PASS: Change in elevation between observer and key point should be no less than 108 feet.

Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: the tower visibility analysis tool (<http://www.hf.faa.gov/visibility>) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 5 – RWY 30R**

Light Level: **Sunlight Clouds**

Ground Turbulence: **Medium**

Target Object: **Dodge Caravan**, target orientation: **Front View**

Observer Eye Height: **157**

Vertical Elevation Change Between Observer and Key Point (feet): **135**

Ground Elevation at Tower (MSL): **1361**

Ground Elevation at Key Point (MSL): **1383**

Tower to Key Point Distance: **7732** (feet) **2.36** (km)

Visibility Range: **10**(Miles) **16.09** (km)

1. Object Discrimination Analysis Results

Criteria	Threshold	Tower Results	Pass/Fail
probability(detection)	95.5%	97.0%	Pass
probability(recognition)	11.5%	15.0%	Pass

2. Line of Sight (LOS) Angle of Incidence

Threshold	Tower Results	Pass/Fail
0.8 degrees or 48 minutes	1.00 degrees	PASS: Change in elevation between observer and key point should be no less than 108 feet.

Appendix 8: NRA Case Final Determination Letters for Proposed Sites

Site 1:



U.S. Department
of Transportation

**Federal Aviation
Administration**

August 20, 2015

TO:
Kent Freeman
Attn: Kent Freeman
15000 Aviation Blvd
Hawthorne, CA 90250
Kent.Freeman@faa.gov

CC:
FAA
Attn: Lyndon Lawyer
15000 Aviation Blvd
Hawthorne, CA 90250
Lyndon.Lawyer@faa.gov

RE: *(See attached Table 1 for referenced case(s))*
****FINAL DETERMINATION****

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2015-AWP-1396-NRA		PHOENIX, AZ	33-18-17.69N	111-39-53.50W	194	1544

Description: Airport Traffic Control Tower Replacement Three proposed site were determined at AFTIL Siting.

We do not object with conditions to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2, "Operational Safety on Airports During Construction."

FOR SITING PURPOSE ONLY. WHEN SITE HAS BEEN DETERMINED A 7460 MUST BE SUBMITTED.

Air Traffic Obstruction Evaluation Group
 "No objection provided the structure is obstruction lighted in accordance with FAA Advisory Circular 70/7460-1K"

Flight Standards
 "Very Good site. Low Glair, good Taxi and Runway Visibility."

Flight Procedures (Document can be found inside the case)

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey

FINAL Report

"RNAV (GPS) RWY 12L— This procedure does not presently exist; this is a proposed procedure. Control Tower 1 will penetrate the LNAV/VNAV missed approach surface by 59 ft. The HAT would need to be adjusted 40 ft. resulting in a HAT of 290 ft. Ultimate runway 12L will be extended 1000 ft. After the runway extension, the LNAV/VNAV missed approach surface will be penetrated by 34 ft. The HAT would need to be adjusted 23 ft. resulting in a 273 ft. HAT. Tower 1 was not a controlling obstacle for the LPV or the LNAV minimums.

RNAV (GPS) RWY 12R— Tower 1 has no effect on the existing procedure LP, LNAV minimums. A feasibility study was done for LPV and LNAV/VNAV HATS. The Tower will penetrate the LNAV/VNAV missed approach surface by 7 ft. resulting in a HAT of 257 ft. Ultimate runway 12R threshold extension would move the missed approach surface back resulting in a 250 ft. HAT. Tower 1 was not a controlling obstacle for the LPV or the LNAV minimums.

ATC Tower 1 was not a controlling obstacle to the following procedures

ILS or LOC RWY 30C RNAV (RNP) RWY 30R

RNAV (GPS) RWY 30C RNAV (GPS) RWY 12C

RNAV (RNP) RWY 30C RNAV (RNP) RWY 12C (proposed)

RNAV (GPS) RWY 30L (proposed for existing and ultimate thresholds) RNAV (RNP) RWY 12L

RNAV (RNP) RWY 30L (proposed for existing and ultimate thresholds) RNAV (RNP) RWY 12R

ILS RWY 30R (Proposed) VOR or TACAN RWY 30C

RNAV (GPS) RWY 30R

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

If you have any questions concerning this determination contact Lloyd E. Lewis (310) 725-3650
lloyd.e.lewis@faa.gov.

Lloyd E. Lewis
DivUser

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey
 FINAL Report

Site 4 (FINAL):



Federal Aviation Administration

March 11, 2016

TO:
 Kent Freeman
 Attn: Kent Freeman
 15000 Aviation Blvd
 Hawthorne, CA 90250
 Kent.Freeman@faa.gov

CC:
 FAA
 Attn: Lyndon Lawyer
 15000 Aviation Blvd
 Hawthorne, CA 90250
 Lyndon.Lawyer@faa.gov

RE: *(See attached Table 1 for referenced case(s))*
 FINAL DETERMINATION

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2016-AWP-181-NRA	2015-AWP-1397-NRA	PHOENIX, AZ	33-18-18.21N	111-39-55.54W	194	1543

Description: This Notice is for the new IWA ATCT. AFTIL 2 has been completed and this is the finalized location. Please reference 2015-AWP-1397-NRA.

We do not object with conditions to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2, "Operational Safety on Airports During Construction."

The proponent is required to coordinate all associated activities with the Airport Manager/Airport Traffic Control Tower (ATCT) 5 business days prior to the beginning of the project.

This determination is subject to review if disruption to FAA Operations should occur.

The new development must be coordinated with the airport sponsor and included in the next update to the Airport Layout Plan

You comply with Chapters of Advisory Circular 70/7460-1L, Obstruction Marking and Lighting.

exceeds horizontal surface by 10 feet. obstruction light in accordance with FAA AC 70/74670-1L, chapters 4,5 and 12. red lights.

See the attachments under the documents tab, "WFPT Response 2016-AWP-181-NRA FINALIWA ATCT" located in Documents.

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey FINAL Report

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

This determination expires on September 11, 2017 unless:

- (a) extended, revised or terminated by the issuing office.
- (b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for the completion of construction, or the date the FCC denies the application.

NOTE: Request for extension of the effective period of this determination must be obtained at least 15 days prior to expiration date specified in this letter.

If you have any questions concerning this determination contact Lloyd E. Lewis (310) 725-3650
lloyd.e.lewis@faa.gov.

Lloyd E. Lewis
DivUser

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey
FINAL Report



U.S. Department
of Transportation

**Federal Aviation
Administration**

August 20, 2015

TO:
Kent Freeman
Attn: Kent Freeman
15000 Aviation Blvd
Hawthorne, CA 90250
Kent.Freeman@faa.gov

CC:
FAA
Attn: Lyndon Lawyer
15000 Aviation Blvd
Hawthorne, CA 90250
Lyndon.Lawyer@faa.gov

RE: (See attached Table 1 for referenced case(s))
FINAL DETERMINATION

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2015- AWP-1397-NRA		PHOENIX, AZ	33-18-18.56N	111-39-55.54W	194	1543

Description: Airport Traffic Control Tower Replacement Three proposed site were determined at AFTIL Siting.

We do not object with conditions to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2, "Operational Safety on Airports During Construction."

FOR SITING PURPOSE ONLY. WHEN SITE HAS BEEN DETERMINED A 7460 MUST BE SUBMITTED.

Air Traffic Obstruction Evaluation Group

"No objection provided the structure is obstruction lighted in accordance with FAA Advisory Circular 70/7460-1K"

Flight Standards

"Site 4 Very Good site. Low Glair, good Taxi and Runway Visability."

Flight Procedures (Document can be found in case documents)

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey FINAL Report

"RNAV (GPS) RWY 12L—This procedure does not presently exist; this is a proposed procedure. The LNAV/VNAV missed approach surface will be penetrated by approximately 63 ft. The HAT would need to be adjusted 43 ft., resulting in a 293 ft. HAT. Ultimate runway 12L threshold will be extended 1000 ft. The LNAV/VNAV missed approach surface will be penetrated by 38 ft. The HAT would need to be adjusted 26 ft. resulting in a 276 ft. HAT. Tower 4 was not a controlling obstacle for the LPV or the LNAV minimums.

RNAV (GPS) RWY 12R—Tower 4 has no effect on the existing procedure LP, LNAV minimums. A feasibility study was done for LPV and LNAV/VNAV HATS. The Tower will penetrate the LNAV/VNAV missed approach surface by 12 ft. The HAT would need to be adjusted by 8 ft. resulting in a HAT of 258 ft. Ultimate runway 12R threshold extension would move the missed approach surface and the Tower 4 will no longer penetrate the missed approach surface. Tower 4 was not a controlling obstacle for the LPV or the LNAV minimums.

ATC Tower 4 was not a controlling obstacle to the following procedures

ILS or LOC RWY 30C RNAV (RNP) RWY 30R

RNAV (GPS) RWY 30C RNAV (GPS) RWY 12C

RNAV (RNP) RWY 30C RNAV (RNP) RWY 12C (proposed)

RNAV (GPS) RWY 30L (proposed for existing and ultimate thresholds) RNAV (RNP) RWY 12L

RNAV (RNP) RWY 30L (proposed for existing and ultimate thresholds) RNAV (RNP) RWY 12R

ILS RWY 30R (Proposed) VOR or TACAN RWY 30C

RNAV (GPS) RWY 30R

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

If you have any questions concerning this determination contact Lloyd E. Lewis (310) 725-3650
lloyd.e.lewis@faa.gov.

Lloyd E. Lewis
DivUser

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey FINAL Report

Site 5:



U.S. Department
of Transportation

**Federal Aviation
Administration**

August 20, 2015

TO:
Kent Freeman
Attn: Kent Freeman
15000 Aviation Blvd
Hawthorne, CA 90250
Kent.Freeman@faa.gov

RE: *(See attached Table 1 for referenced case(s))*
DETERMINATION OF HAZARD TO AIR NAVIGATION

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2015- AWP-1398-NRA		PHOENIX, AZ	33-19-03.09N	111-39-13.22W	187	1548

The Federal Aviation Administration has completed an aeronautical study under the provisions of 49 U.S.C, Section 44718 and, if applicable, Title 14 of the Code of Federal Regulations, part 77, concerning:

Description: Airport Traffic Control Tower Replacement Three proposed site were determined at AFTIL Siting.

This aeronautical study revealed that the structure as described above would have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft and/or on the operation of air navigation facilities. Therefore, pursuant to the authority delegated to me, it is hereby determined that the structure would be a hazard to air navigation.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

This aeronautical study considering and analyzed the impact on existing and proposed arrival, departure, and en route procedures for aircraft operating under both visual flight rules and instrument flight rules; the impact on all existing and planned public-use airports, military airports and aeronautical facilities; and the cumulative impact resulting from the studied structure when combined with the impact of other existing or proposed structures. The study disclosed that the described structure would have a substantial adverse effect on air navigation.

An account of the study findings, aeronautical objections received by the FAA during the study (if any), and the basis for the FAA's decision in this matter can be found on the following page(s).

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey FINAL Report

Your proposal impacts the following National Airspace System (NAS) equipment:
FOR SITING PURPOSE ONLY. WHEN SITE HAS BEEN DETERMINED A 7460 MUST BE SUBMITTED.

Air Traffic Obstruction Evaluation Group

"No objection provided the structure is obstruction lighted in accordance with FAA Advisory Circular 70/7460-1K"

Flight Standards (OBJECTION)

"Site 5 Very poor site. High Sun Glare. Distance and angle to approaching aircraft results in poor visibility to approach end Taxi and Runway ends."

Flight Procedures (Document can be found in case documents)

RNAV (GPS) RWY 12L— This procedure does not presently exist; this is a proposed procedure. Tower 5 is the controlling obstacle in the LNAV/VNAV FINAL segment resulting in a HAT of 353 ft. The LPV missed approach will not be affected because Tower 5 does not fall into the LPV missed approach trapezoid. Ultimate runway 12L would be extended 1000 ft. Tower 5 will no longer be the controlling obstacle in the LNAV/VNAV final segment but will still penetrate the missed approach surface by 60 ft. The HAT would need to be adjusted 41 ft. resulting in a 291 ft. HAT. The LPV missed approach surface will also move back and tower 5 will now fall into the missed approach trapezoid, penetrating the missed approach surface by 22 ft. The HAT would have to be adjusted by 18 ft., increasing the LPV HAT from 200 to 218 ft.

RNAV (GPS) RWY 12R- Tower 5 has no effect on the existing procedure LP, LNAV minimums. A feasibility study was done for LPV and LNAV/VNAV HATS. Tower 5 will penetrate the LNAV/VNAV missed approach surface by 34 ft. The HAT would have to be adjusted 23 ft. resulting in a HAT of 273 ft. Ultimate runway 12R threshold extension would result in a missed approach penetration of 14 ft. The HAT would need to be adjusted 10 ft. resulting in a 160 ft. HAT. Tower 5 was not a controlling obstacle for the LPV or the LNAV minimums.

ATC Tower 5 was not a controlling obstacle to the following procedures

ILS or LOC RWY 30C RNAV (RNP) RWY 30R (Proposed)

RNAV (GPS) RWY 30C RNAV (GPS) RWY 12C

RNAV (RNP) RWY 30C RNAV (RNP) RWY 12C (proposed)

RNAV (GPS) RWY 30L (proposed for existing and ultimate thresholds) RNAV (RNP) RWY 12L (Proposed)

RNAV (RNP) RWY 30L (proposed for existing and ultimate thresholds) RNAV (RNP) RWY 12R (Proposed)

ILS or LOC RWY 30R (Proposed) VOR or TACAN RWY 30Cs

RNAV (GPS) RWY 30R (Proposed)

The Airport sponsor shall notify the FAA's Air Traffic Organization (ATO) Planning and Requirements (P&R) Service Area office a minimum of 45 days prior to the "physical construction start date" for this project. Submit FAA Form entitled [Airport Sponsor Strategic Event Submission Form](#) including all date, time and/or duration changes via email to 9-AJV-SEC-WSA@faa.gov.

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey FINAL Report

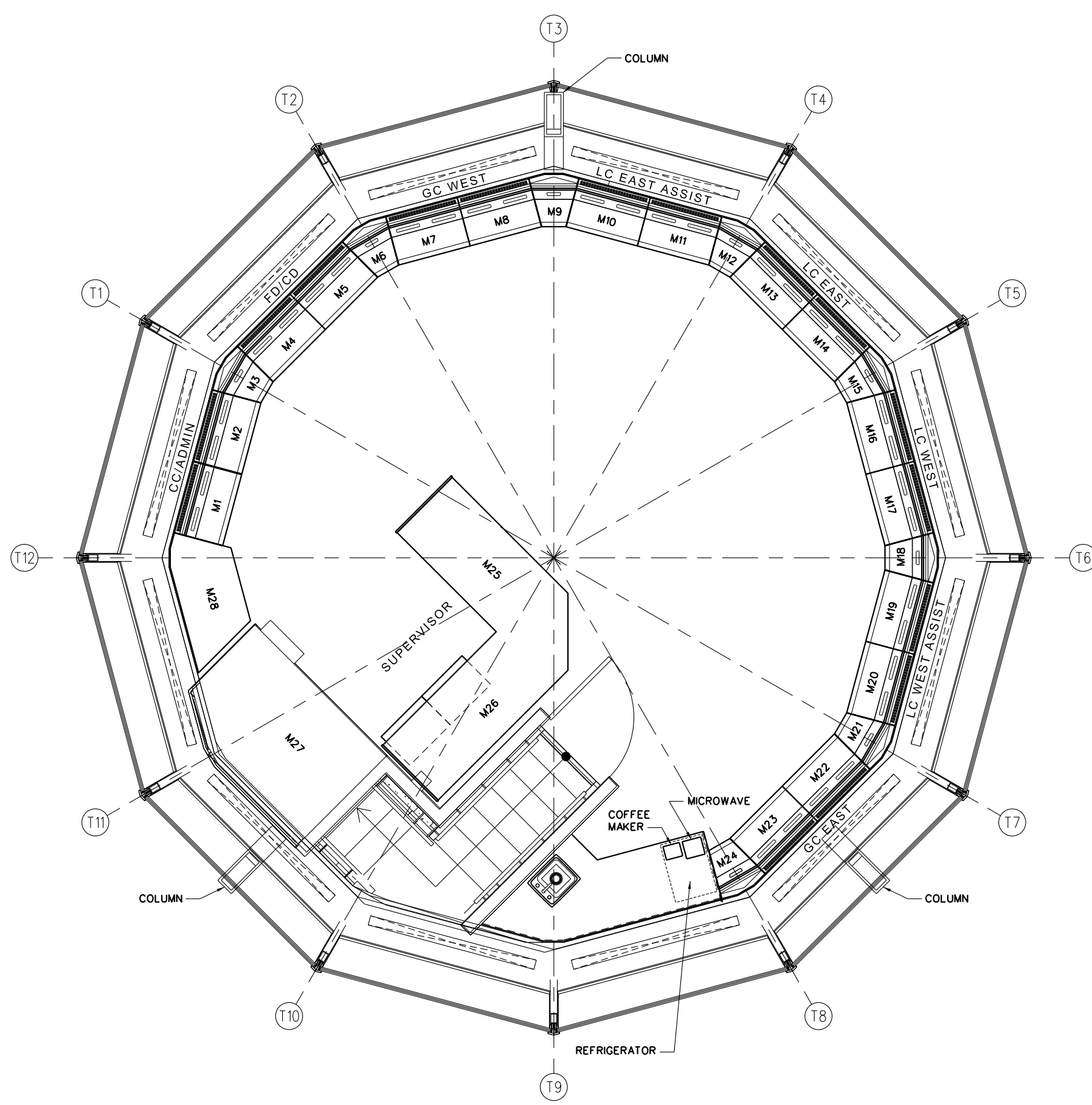
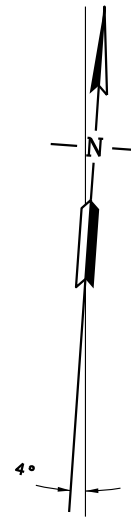
If you have any questions concerning this determination contact Lloyd E. Lewis (310) 725-3650
lloyd.e.lewis@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study
Number 2015-AWP-1398-NRA.

Lloyd E. Lewis
DivUser

Appendix 9: Cab Layout Drawings

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REV	APPROVED DATE	DESCRIPTION	JCN	REDLINE DATE	APVD
DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION ATO - TECHNICAL OPERATIONS WESTERN SERVICE AREA					
ATCT PHOENIX-MESA AIRPORT CAB CONSOLE REPLACEMENT TOWER CAB LAYOUT					
MESA		WILLIAMS GATEWAY		AZ	
REVIEWED BY		APPROVED BY			
PROJECT ENGINEER	KEVIN VO	MGR: ENGINEERING	STEVE YANG	DATE	10/09/2015
DESIGNED	RLH	ISSUED BY	ENGINEERING SERVICES TERMINAL	JCN	LOE6545
DRAWN	TB	DRAWING NO	IWA-D-ATCT-A003	REV	
CHECKED					

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ISSUED FOR CONSTRUCTION

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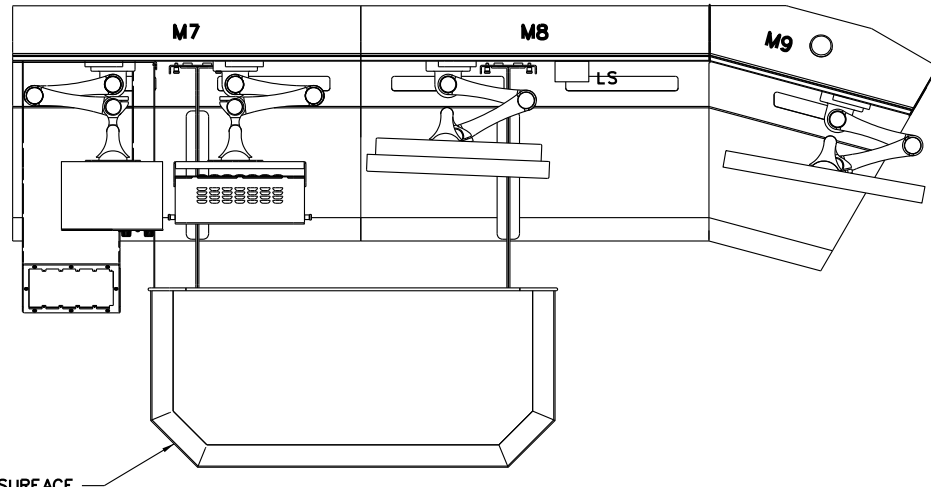
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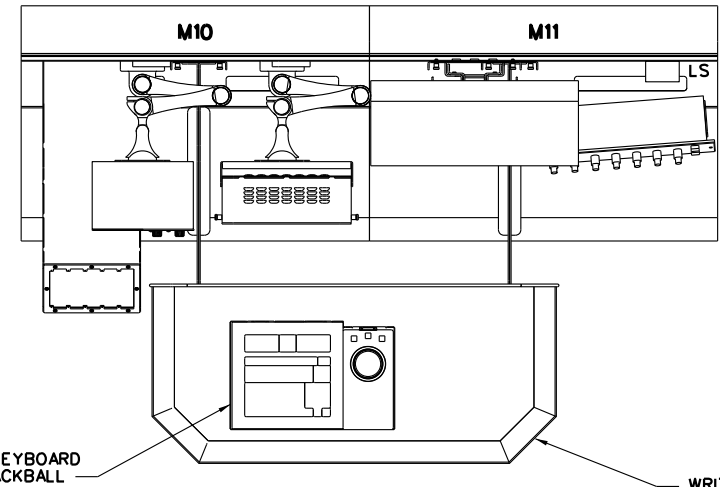
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WRITING SURFACE

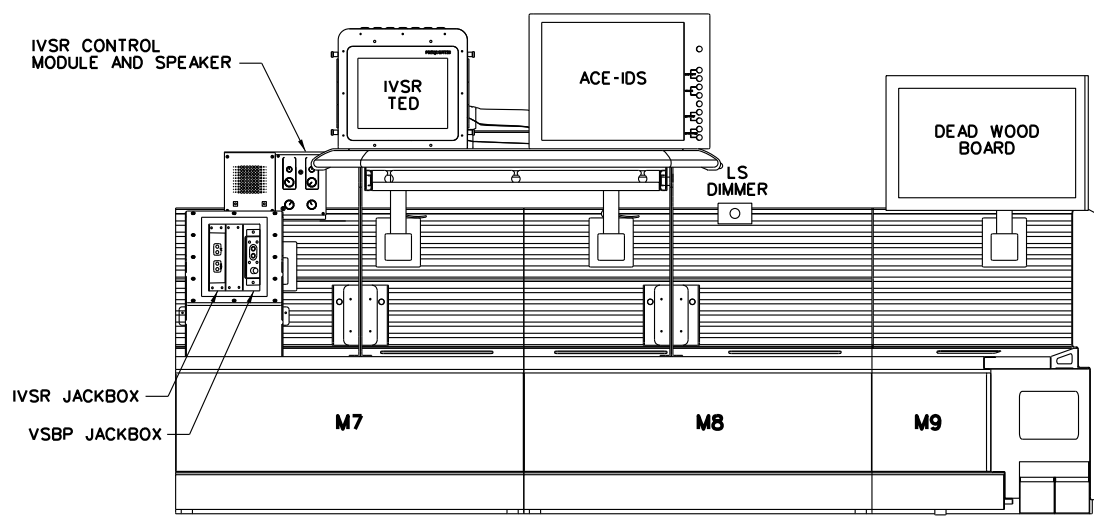
GC WEST PLAN VIEW



STARS KEYBOARD AND TRACKBALL

WRITING SURFACE

LC EAST ASSIST PLAN VIEW



IVSR CONTROL MODULE AND SPEAKER

IVSR TED

ACE-IDS

LS DIMMER

DEAD WOOD BOARD

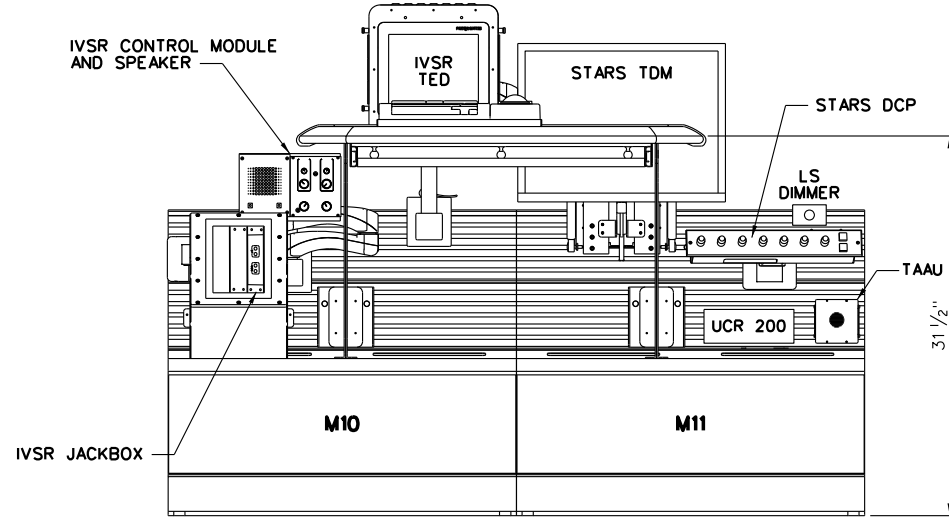
M7

M8

M9

IVSR JACKBOX
VSBP JACKBOX

GC WEST ELEVATION



IVSR CONTROL MODULE AND SPEAKER

IVSR TED

STARS TDM

STARS DCP

LS DIMMER

TAAU

UCR 200

M10

M11

IVSR JACKBOX

31 1/2"

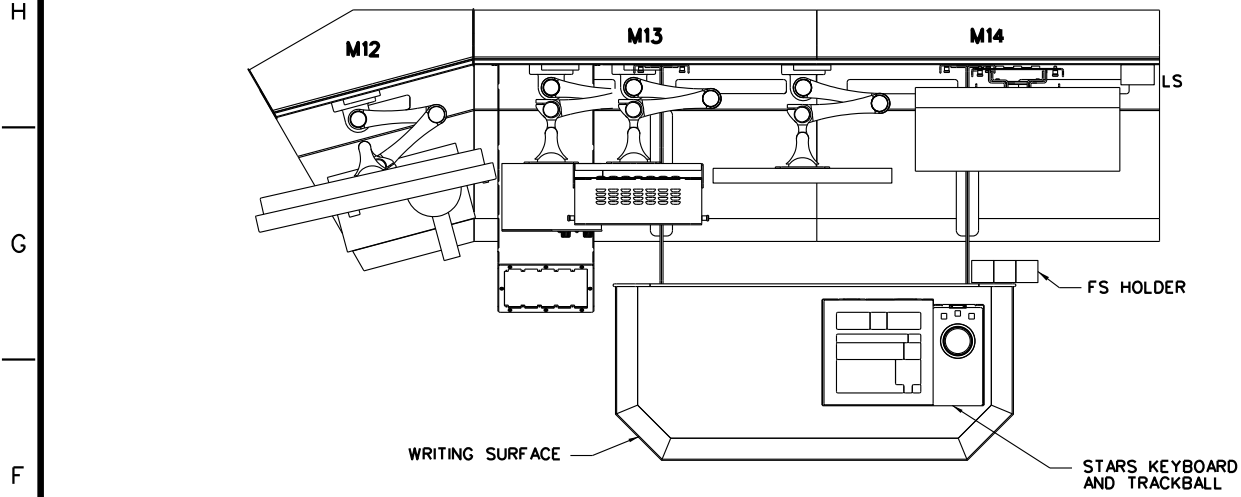
LC EAST ASSIST ELEVATION

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ATCT PHOENIX- MESA AIRPORT CAB CONSOLE REPLACEMENT GC WEST, LC EAST ASSIST PLANS & ELEVATIONS					
MESA			WILLIAMS GATEWAY		
AZ			AZ		
REVIEWED BY	SUBMITTED DATE	APPROVED BY	DATE	JCN	REV
KEN VO		STEVE YANG	10/09/2015		LOE6545
DESIGNED BY	PROJECT ENGINEER	ISSUED BY	ENGINEERING SERVICES	DATE	10/09/2015
DRAWN	TR	TERMINAL	IWA-D-ATCT-A005		
CHECKED					

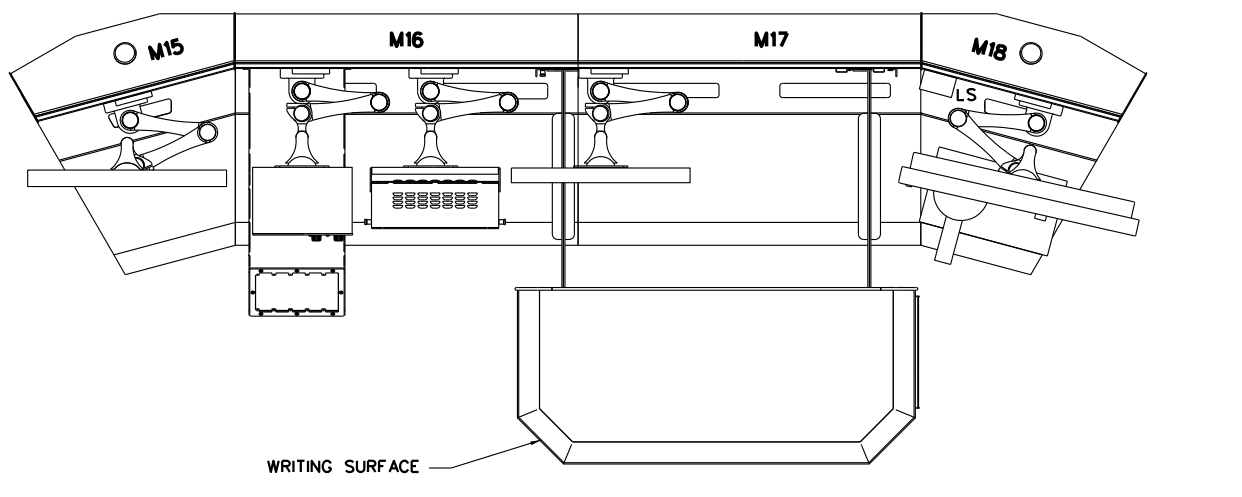
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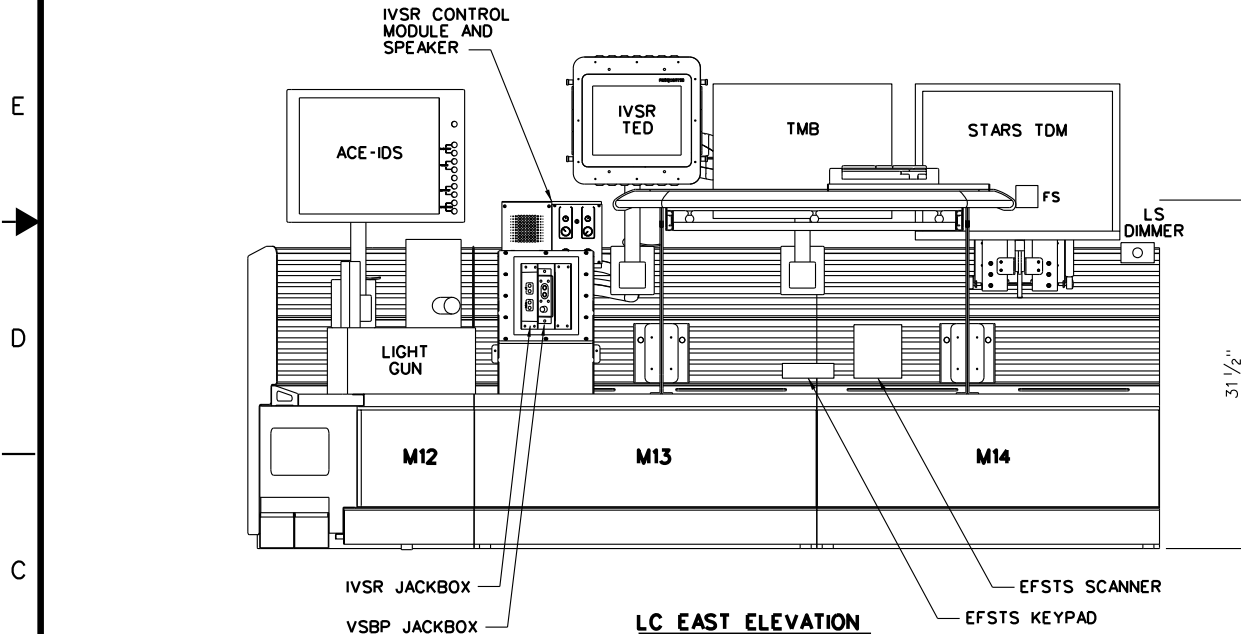
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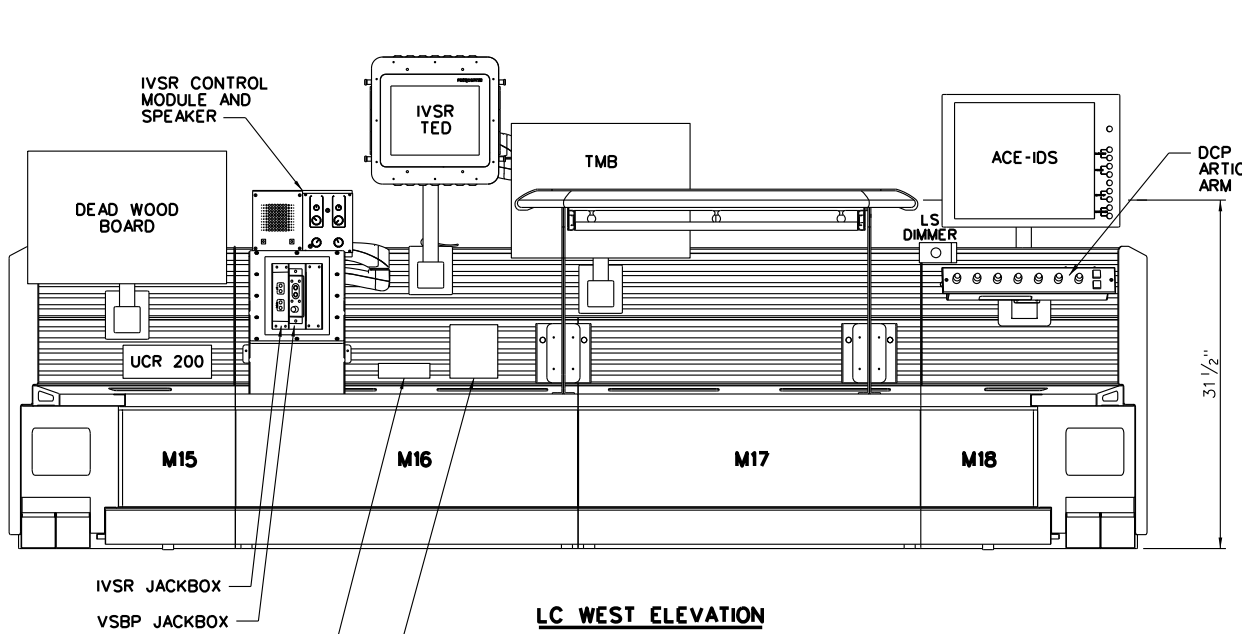
LC EAST PLAN VIEW



LC WEST PLAN VIEW



LC EAST ELEVATION



LC WEST ELEVATION

REV	APPROVED DATE	DESCRIPTION	JCN	REDLINE DATE	APVD
DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION ATO - TECHNICAL OPERATIONS WESTERN SERVICE AREA					
ATCT					
PHOENIX- MESA AIRPORT CAB CONSOLE REPLACEMENT LC EAST, LC WEST PLANS & ELEVATIONS					
MESA			WILLIAMS GATEWAY		AZ
REVIEWED BY	SUBMITTED SIGN	DO NOT SIGN	DO NOT SIGN	DO NOT SIGN	DO NOT SIGN
DESIGNED	PROJECT ENGINEER	ISSUED BY	DATE	JCN	LOE6545
			10/09/2015		
DRAWN	CHECKED	ENGINEERING SERVICES TERMINAL	DRAWING NO		
			IWA-D-ATCT-A006		

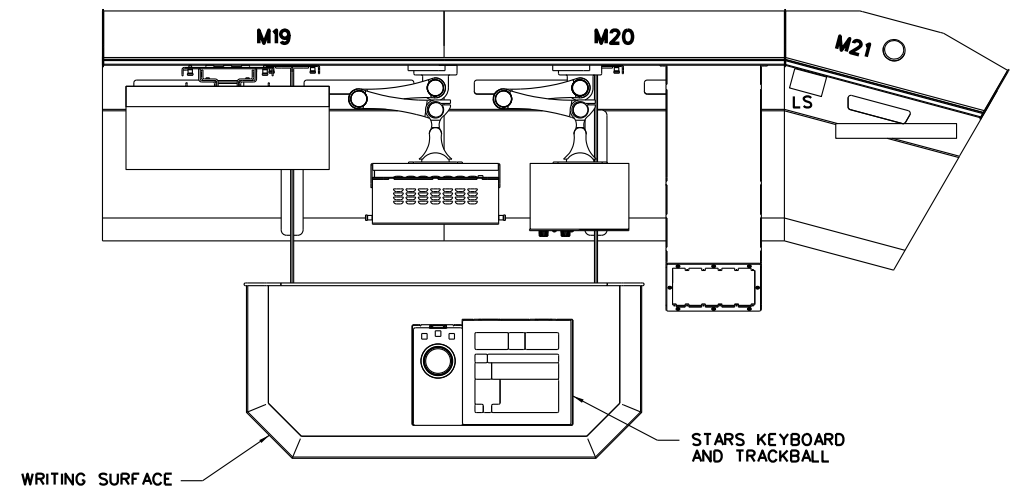
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ISSUED FOR CONSTRUCTION

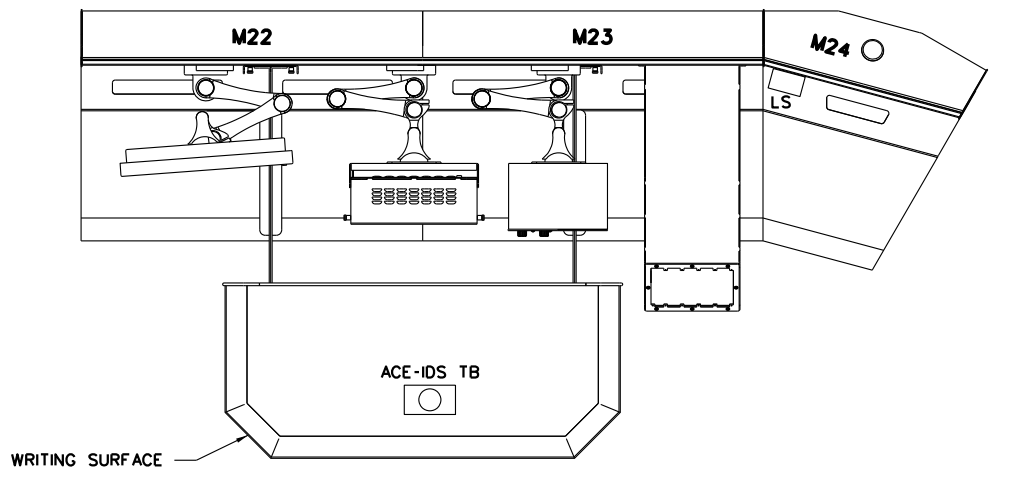
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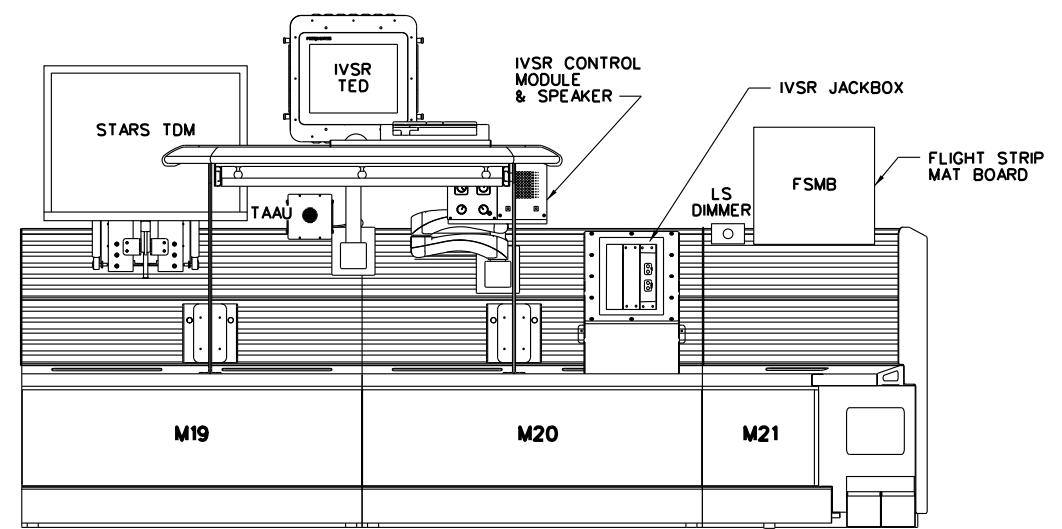
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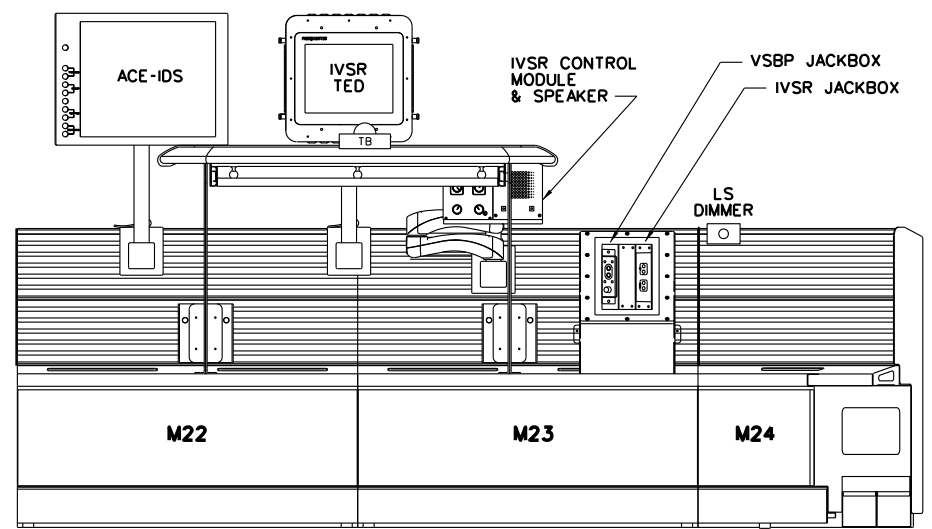
LC WEST ASSIST PLAN VIEW



GC EAST PLAN VIEW



LC WEST ASSIST ELEVATION



GC EAST ELEVATION

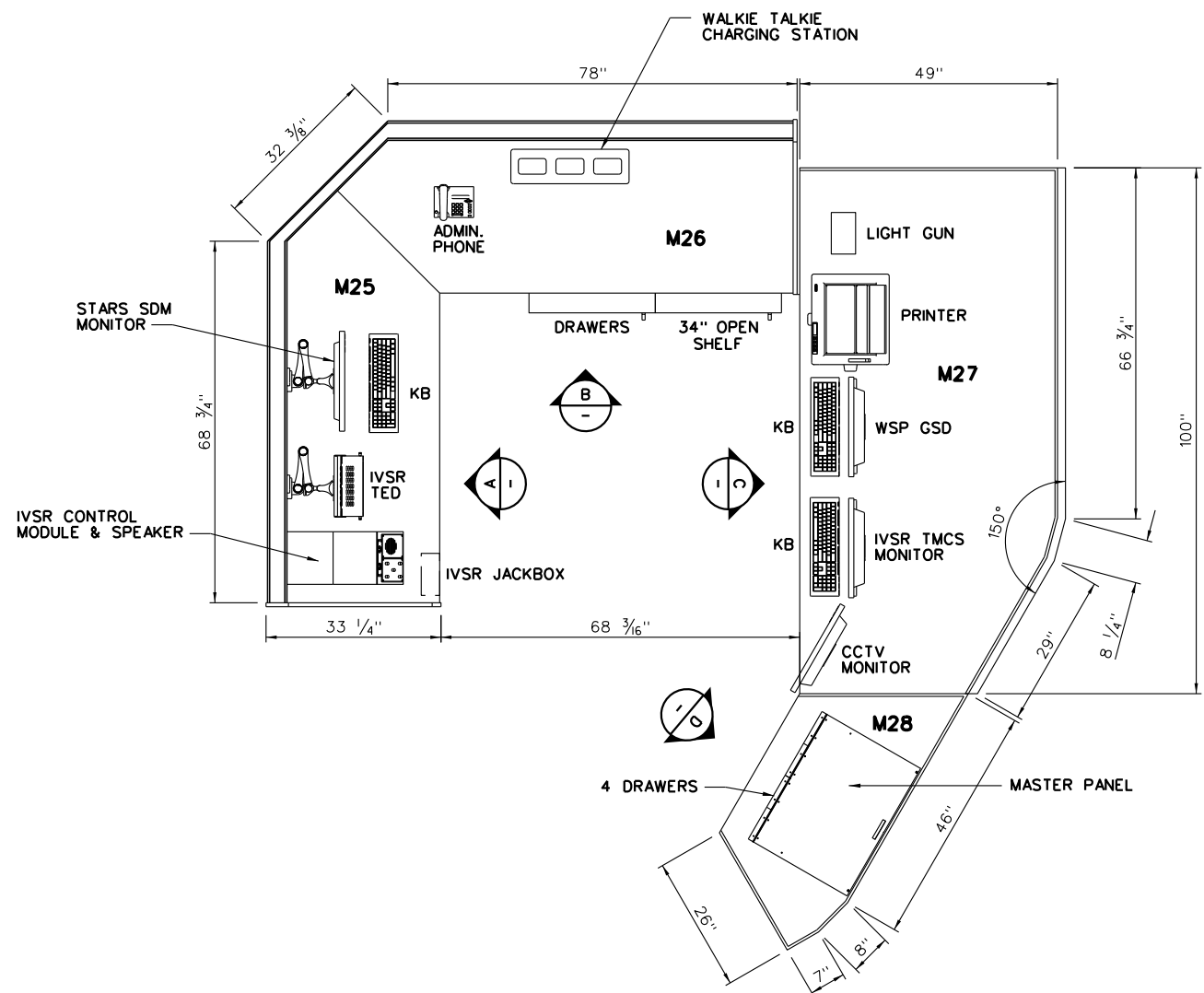
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ATCT PHOENIX- MESA AIRPORT CAB CONSOLE REPLACEMENT LC WEST ASSIST, GC EAST PLANS & ELEVATIONS					
MESA		WILLIAMS GATEWAY		AZ	
REVIEWED BY	SUBMITTED SIGN	APPROVED BY	DATE	JCN	REV
KEVIN VO	DO NOT SIGN	STEVE YANG	10/09/2015	LOE6545	1
PROJECT ENGINEER	DESIGNED	ISSUED BY	DATE	JCN	REV
RLH	RLH	ENGINEERING SERVICES	10/09/2015	LOE6545	1
DRAWN	CHECKED	TERMINAL	DRAWING NO	DRAWING NO	REV
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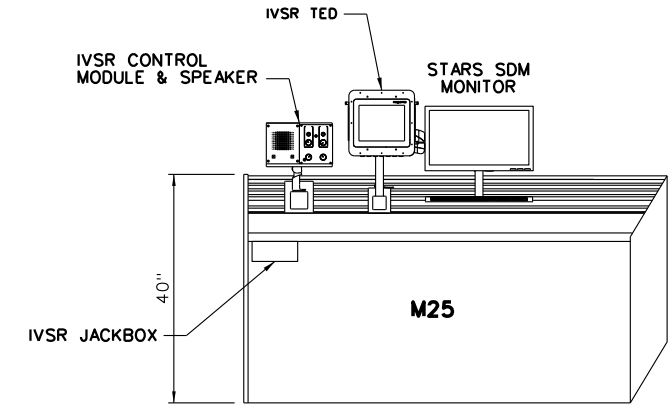
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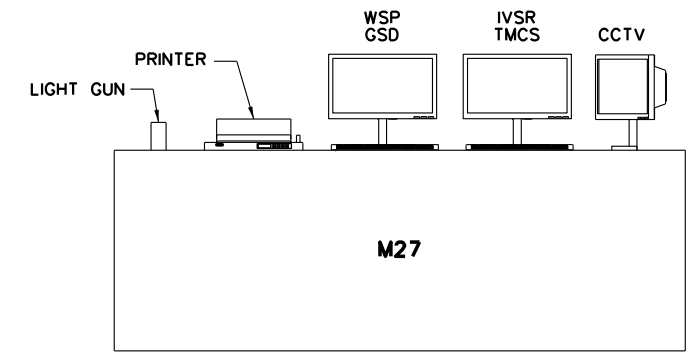
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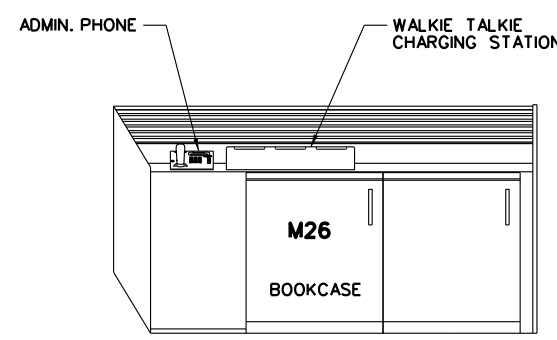
SUPERVISOR PLAN VIEW



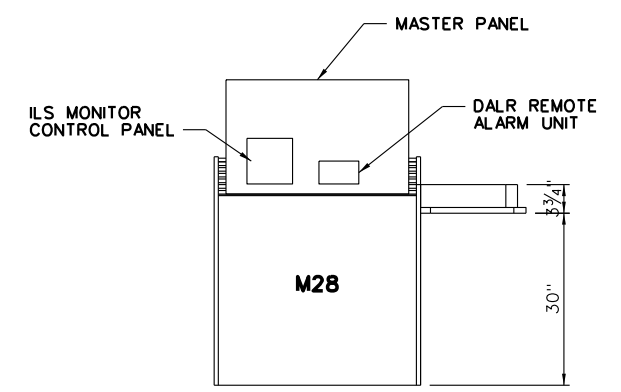
SUPERVISOR ELEVATION - A



SUPERVISOR ELEVATION - C



SUPERVISOR ELEVATION - B



SUPERVISOR ELEVATION - D

1/25/2016 2:37:40 PM Mylisse Matos

REV	APPROVED DATE	DESCRIPTION	JCN	REDLINE DATE	APVD
DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION ATO - TECHNICAL OPERATIONS WESTERN SERVICE AREA					
ATCT PHOENIX- MESA AIRPORT CAB CONSOLE REPLACEMENT SUPERVISOR PLAN & ELEVATIONS					
MESA	WILLIAMS GATEWAY		AZ		
REVIEWED BY	SUBMITTED BY	APPROVED BY	DATE	JCN	REV
	KEVIN VO	STEVE YANG	10/09/2015		LOE6545
DESIGNED	PROJECT ENGINEER	ISSUED BY	ENGINEERING SERVICES	TERMINAL	DRAWING NO
DRAWN	TB	TERMINAL	IWA-D-ATCT-A008		
CHECKED					

ISSUED FOR CONSTRUCTION

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A B C D E F G H

Appendix 10: Document Revision Log

	<u>Originator</u>	<u>Comment</u>	<u>Resolution</u>
1.	Maylisse Matos	Received NRA case determinations dated August 21, 2015	Incorporated NRA case results into report on August 26, 2015
2.	Maylisse Matos	Phase I EDDA's were provided by Tony Bianchi (Airport Planner) dated on 9/10/2015.	EDDA Phase I findings were incorporated on each site description.
3.	Jill Gough	<p>Page 7 paragraph starting "Criteria used ..." Should the approved Airport Development Plan be listed as criteria considered?</p> <p>Page 7 paragraph starting "The general methodology.." Second sentence doesn't read like it was evaluated with respect to air traffic operation even though "long term operations" could mean this, it almost seems to be referring to maintaining the facility.</p> <p>2.1 "(BRAC) program of 1993 (replace on with of)</p> <p>Regarding Figure 1 and the sentence above it – are the 2007 actual operations verses predicted? If so the sentence above should be rewritten to say something like the following :The table shown below predict total operation numbers for Phoenix-Mesa Gateway Airport for 2012, 2017 and 2027 based on baseline operation from 2007. This might not be quite right, but it just seems odd we are predicting from 2007 and 2012 when these are past.</p> <p>2.2 First paragraph: don't know if the Airport Authority really has "identified the need for the construction of a new ATCT due to line of sight and safety concerns." I didn't read this in the Reimbursable Agreement.</p> <p>2.2 second sentence – I wouldn't include "etc." this could be interpreted as items that we aren't planning on providing.</p> <p>Section 3</p> <p>First paragraph last sentence – Figure 3 shows site 1,4 and 5. You could move this sentence up to follow the first sentence – then it makes sense. Then a sentence to reference Fig 3 showing 1,4, and 5.</p> <p>Site 1: "but a better view of the 12R non-movement taxiway area was required." Is it really "required" to view non-movement areas? Instead of required, is it more accurately "desired".</p> <p>Shouldn't the description for Site 1 and 4 be a more similar. No mention on Site 4 about morning sun interference.</p> <p>Site 5: Won't this orientation have sun glare in the evening/afternoon hours?</p> <p>Is this the place to say we are only pursuing Site 4 – the last sentence seems to indicate this because it isn't mentioned for sites 1 and 5.</p>	<p>Yes, Comment Included..</p> <p>Paragraph edited to indicate long term Air Traffic Operations.</p> <p>Corrected.</p> <p>Comment included.</p> <p>See updated section.</p> <p>Comment included.</p> <p>Comment Included.</p> <p>AFTIL 1 minutes state the following as an advantage to site 1: "Good line-of-site; however requires a better view of the 12R non-movement taxiway area" FAA order 6480.4A also states the following on Chapter 2 Part 201d: "Line of Sight (LOS) Angle of Incidence. ATCT distance from critical airport locations and ATCT height shall support requirements for viewing objects on the airport movement areas, taxiways, and non-movement areas from the ATCT cab."</p> <p>Included.</p> <p>Orientation to the west will create high sun glare during afternoon hrs.</p> <p>Yes</p>

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey
 FINAL Report

4.	Lyndon Lawyer	Added SMS Report	
5.	Maylisse Matos	Included Cab Layout Drawings	
6.	Tony Bianchi	Provided email on 2/3/2016 with comments regarding need from Airport of new ATCT.	Comments were incorporated.
7.	Jill Gough	<p>Executive Summary: Paragraph 3: The FAA has not determined there is a "need". Please reword.</p> <p>Paragraph 4: Concerned with with the wording about the current ATCT does not meet current code requirements,... Isn't existing grandfather in ?</p> <p>Paragraph 5: Los Angeles Terminal Engineering Center did not receive a Project Authorization (PA) . A reimbursable agreement was entered into. Need to revise the wording.</p> <p>Introduction: Paragraph 1: First sentence needs to change to something more like "At the request of Phoenix-Mesa Gateway Airport Authority, the FAA participating with them in undertaking a study to help the Airport Authority determine the most suitable location and height for a new ATCT for IWA.</p> <p>Paragraph 2: I believe the position of the FAA is that there isn't a "need" for a new ATCT.</p> <p>Paragraph 5 : Change "will" in the last sentence to past tense. AFTIL 2 has been conducted.</p> <p>Background Information: 2.2 1st paragraph last sentence: A little awkward - might suggest "As the airport keeps expanding and implementing their Master Plan, the line of site of the existing ATCT will not keep up."</p> <p>Section 3: Site 4: No mention of sun. Would think it would have similar sentence to site 1.</p> <p>Site 5: If for site 1 the sun causes issues in the early morning hours, wouldn't Site 5 cause issues at a different time a day. Maybe it's still morning - more like mid morning. Please confirm. This site face west.</p> <p>Section 4: 4.1 Can you site the date of the current ALP? Good to know when and if the airport moves forward on this. 4.2.1 c "except of the 12R non movement taxiway area for which it will require a better view." This doesn't read correct to me. Maybe just stop at "taxiway area." While it is nice to have a view of "non movement areas", I don't think it is required.</p>	<p>Corrected</p> <p>ATCT does not comply with current code requirements for new construction</p> <p>Wording revised</p> <p>Sentence was Updated</p> <p>Sentence Removed</p> <p>Corrected.</p> <p>Paragraph revised</p> <p>Corrected sun glare at dawn was included.</p> <p>Sun will affect during afternoon hours due to west orientation.</p> <p>Current ALP was adopted in 2008. Date of ALP included in Section 2: Background Information AFTIL 1 minutes state the following as an advantage to site 1: "Good line-of-site; however requires a better view of the 12R non-movement taxiway area" FAA order 6480.4A also states the following on Chapter 2 Part 201d: "Line of Sight (LOS)"</p>

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey
 FINAL Report

		<p>4.2.3 d Would expect the costs for Site 5 to be significantly higher than Site 1 and 4. There is no existing infrastructure over on that side of the field. Please confirm that costs included for roads and utilities.</p> <p>5.2 Paragraph 3 Comma in wrong location</p> <p>Appendix 3 Cost Estimate Details Error found for Site 5. Please check numbers. Your numbers don't add up.</p> <p>Does the siting report include costs for electronics? Would the airport be looking for these so they don't what funding they will need if they move forward?</p>	<p>Angle of Incidence. ATCT distance from critical airport locations and ATCT height shall support requirements for viewing objects on the airport movement areas, taxiways, and non-movement areas from the ATCT cab.”</p> <p>Percent of Cost for utilities and trenching was increased for this location. Even then the cost for this site is not significantly higher because the tower height controls the overall cost and this is the lowest tower of the three evaluated.</p> <p>Corrected</p> <p>Table was revised and corrected.</p> <p>The cost for electronics is not included. The FAA has provided IWA with ROM costs</p>
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Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey
 FINAL Report

8.	Tony Bianchi	<p>-Additional reasoning or justification for the needs for a new tower were sent via email on 2/3/16</p> <p>-On Page 7 near the bottom of the introduction the following change is recommended “ The orientation and layout of the cab was discussed during the second visit to AFTIL the week of September 21, 2015.”</p> <p>- Page 9, Section 2 Background Information- While the runway extensions are on the ALP, there is no immediate timeframe to expand to the ultimate length by 2017, so that 2017 reference could be removed.</p> <p>- Page 12- Section 2.2, Look to incorporate additions for additional need for a new ATCT per the 2/3/16 email</p> <p>- Page 13- Site 4- State this site is located approximately 50' NW of Site 1. I thought this was about 200' NW?</p> <p>- Page 28- Table 2: Site Comparison Chart. The Lat/Long coordinates for the 3 sites does not include the full degrees, minutes and seconds for location(s)</p> <p>- I noticed that the site survey document did not seem to state anywhere in the report where the existing tower would not be an obstruction to tower operations or need to be torn down if Site 4 was developed at the recommended height. I believed we modeled that possible impact at AFTIL for Site 4 to make sure the existing tower would not create any obstruction that would be included in the CSA, or similarly in the site survey. Should this be incorporated?</p> <p>- CSA- Exec Summary (page 4) under Findings. It states, “PMGAA has removed Site 5 from consideration due to projected costs of new site development and construction”. I believe it was largely due to controller raised issues due to distance from GA ramp, visibility, and sun glare due to tower orientation.</p>	<p>Comments incorporated</p> <p>Corrected</p> <p>Updated</p> <p>Comment's Incorporated</p> <p>Noted</p> <p>Table updated</p> <p>A note was added on the site analysis to mention the possibility of the Site 4 tower shaft becoming an obstruction to AT during the construction phase.</p> <p>Comment sent to Joe Sims (AFTIL)</p>
9.	Zane Edwards	<p>1-As mentioned earlier they do have more signatures than required on the signature page. .4B version of the Order reduces it to just the three I mentioned in my earlier email. Doesn't mean the 3 we need won't route it to who they would like to review it prior to signing, but that is more an internal process.</p> <p>2- They used the old .4A version of the Order. One of the changes is the look down angle was adjusted to .8 degrees from 35 minutes. Not sure this is an issue in the analysis since they would have used the visibility tool which is set at .8 degrees. Table 2 on page 28 has the .8 degrees in the chart.</p> <p>3- Line of site angle of incidence in table 2 on page 28 does not match the visibility tool printouts in the appendix 7.</p>	<p>Signatures required are based on the existing FAA 6450.1A order used to create this report.</p> <p>Corrected</p> <p>Corrected</p>
10.	Tamara Lee	<p>Page 22, paragraph d. – Typo in estimated cost (\$22,760.695 should be \$22,760,695).</p> <p>Page 33, Appendix 3: Cost Estimate Details – When presenting cost estimate details, be sure to be clear about the purpose of the estimate (assuming that for a siting study, it is for comparison of the sites), what is included in the estimate, and that for any work conducted by the FAA, a more formal cost estimate would be prepared.</p>	<p>Table was corrected</p> <p>Table renamed for comparison.</p>
11.	Tony Bianchi	<p>Please Update date on FINAL report.</p> <p>Cover Date that stated 'August 17, 2015' –</p>	<p>Draft indicated the date of August 17, 2015 and for the Final report the date was updated to March 16, 2016.</p> <p>Updated to March 16, 2016</p>

Phoenix-Mesa Gateway – Airport Traffic Control Tower Site Survey
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<p>12.</p>	<p>Tony Bianchi</p>	<p>I noticed that the preferred site, Site 4, had been moved 50' to the southeast based on revised coordinates. That change should be fine as it is consistent with the CSA noting a change after AFTIL 2 and is still 50' from the previous coordinates, and no new site number needs to be assigned.</p> <p>Again on Page 26 in Section 4.2.2, in the site description it states that Site 4 is adjacent to the existing IWA tower. This site is 375' to 400' northwest of the existing tower. The coordinates are accurate to locate, but Site 1 narrative identifies the appropriate distance from the existing tower, while Site 4 states 'adjacent' and is a further distance from the existing tower than Site 1</p> <p>In section 4.2 'Analysis of Initial Sites', beginning on P. 24, the site reference data states the 'site elevation' for each of the 3 viable sites. Is this meant to be the top of the tower height for airspace analysis, which is as written, or the ground site elevation for reference? The Site Comparison Chart in Table 2 (P. 31) lists the same elevation as the 'Top of Tower (AMSL)'</p> <p>In section 4.2 'Analysis of Initial Sites', beginning on P. 24, & the Site Comparison Chart in Table 2, it states that the Top of Tower elevations show a 19' difference between Sites 1 & 4 based on the same eye level and top of tower (AGL) heights for both sites. These sites are 150' apart on flat ground. So the 'Top of Tower' distance should be 1-2' difference, not 19'. Site 4, the recommended site, looks to have the appropriate elevation based on my in-house topographic data and Site 1 looks like it should be corrected (Perhaps to 1544' Top of Tower (AMSL) in the table and the 'Site Reference Data' narrative on Page 24.</p> <p>On P. 28, the report states that the site elevation for Site 5 is 1548' and then in Table 2 on P. 31 it states 1361'.</p>	<p>Site 4 was moved 50' due to the taxiway. Since the distance was only moved 50' a new site did not have to be created.</p> <p>Corrected.</p> <p>Site elevations have been corrected.</p> <p>Site information has been corrected.</p> <p>Corrected.</p>
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Appendix 11: Safety Management System (SMS) Report

**Comparative Safety Assessment
For Airport Traffic Control Tower Siting
Phoenix-Mesa Gateway Airport
IWA**



**Department of Transportation
Federal Aviation Administration
Version 1.0**

October 29, 2015

Comparative Safety Assessment

CSA Change Page

Action/Change made to the CSA	Date	Version Number
Initial Draft SRMD based on IWA AFTIL Trip 1	5/14/15	0.1
Corrections from SRMP review added	9/14/15	0.2
Final changes added to CSA	10/9/15	1.0

Executive Summary

Title: Airport Traffic Control Tower Siting For Phoenix-Mesa Gateway Airport

Originator: Lyndon Lawyer, Systems Engineer
FAA Western-Pacific Regional Office, AJW-2W11C
Los Angeles, CA

Comparative Safety Assessment Version Number: 1.0

Summary of the NAS Change:

A Comparative Safety Assessment (CSA) has been completed on the new Airport Traffic Control Tower (ATCT) siting for the Phoenix-Mesa Gateway Airport (IWA), Phoenix, AZ. The purpose of conducting the CSA was to apply the Safety Risk Management (SRM) process defined in the Federal Aviation Administration (FAA) Safety Management System (SMS) Manual version 4.0, dated May 30, 2014.

The CSA is a comparison of the relative risk among the two preferred sites as identified in the ATCT Siting Report Phoenix-Mesa Gateway Airport Final Report. A Preliminary Hazard List (PHL) was used to identify the hazards and hazard analysis worksheets were used to document the severity of consequence and likelihood of occurrence to assess the risk. The two preferred sites, as identified in the ATCT siting report for Phoenix-Mesa Gateway Airport, were evaluated against each of the system safety hazards identified in the PHL. The hazards were evaluated using risk assessment techniques and a Risk Matrix for relative hazard ranking. The CSA only considers hazards that may impact aviation safety.

The preliminary safety analysis for the siting of the new IWA ATCT indicated certain potential safety concerns, thus a SMS Risk Analysis was necessary to identify hazards and their associated risks, eliminate risks when possible, and to mitigate the remaining risks as necessary. The safety assessment is additionally limited to only the siting hazards until the cab and shaft design has been selected and approved.

The May 2015 and September 2015 IWA Safety Risk Management Panel (SRMP) consisted of representatives from Phoenix-Mesa Gateway Airport (IWA) ATCT, Phoenix Mesa Gateway Airport Authority (PMGAA), Phoenix Airports District Office (ADO), Western Flight Procedures Office, FAA Real Estate, FAA Western Flight Standards office, and the FAA Western Service Center (WSC) offices of Terminal Engineering and Plans & Requirements (P & R). Members from the Airport Facilities Terminal Integration Lab (AFTIL) at the FAA William J. Hughes Technical Center in Atlantic City NJ, who are Subject Matter Experts (SME) in system safety, airport and Airport Traffic Control Tower (ATCT) modeling, and air traffic control simulation, devised a test plan and conducted the necessary safety assessments. The IWA SRMP discussed hazard identification using the ATCT siting PHL and validated the findings. The table below represents the initial risk findings without the recommended safety requirements in place.

Comparative Safety Assessment

Findings

The IWA SRMP has recommended Site 4 as the location for the new ATCT. The panel believes it provides the best visibility and a capability for ATCS's to safely move traffic on the IWA airfield.

At the request of the IWA airport planner the SRMP reviewed the location of a possible future taxiway. This was looked at outside of the ATCT siting evaluation because it was not in the original design specifications and there is no commitment to its construction. This taxiway would be located west and adjacent to Site 4, connecting to TWY A. The taxiway would be built in 20 to 30 years, if at all, and be used for push backs from the terminal.

The taxiway location puts it in close proximity to Site 4. ATCS's would lose sight of aircraft directly below them on the taxiway for a few seconds but regain it well before aircraft approach the TWY A intersection. The simulation also shows this taxiway producing a potential new Hot Spot at the intersection.

In order to mitigate the potential risks identified, the SRMP has identified the necessary safety requirements depicted in the table below. A detailed listing of hazards for the two preferred sites can be found in Appendix A.

Note: In starting the AFTIL II site evaluations, PMGAA has removed Site 5 from consideration due to projected costs of new site development and construction. The evaluation proceeded with the two remaining sites, Sites 1 & 4. All Site 5 data will remain in the CSA.

SITE 1	HAZARD DESCRIPTION	INITIAL RISK	SAFETY REQUIREMENT	PREDICTED RESIDUAL RISK
1-10	Sun interferes with ATCS vision to the east	4D - Low	Double Shades	4D- Low
1-17-1	ATCS view of RWY 12R Hold Short line from TWY H is blocked	4D- Low	Suspend TWY H use during construction period	Hazard Eliminated
1-17-2	ATCS view of TWY B, H, V and a small portion of RWY 12R is partially blocked	5C- Low	NOTAMS Pilot training ATCS training Runway/Taxiway Construction Council Checklist (RTCCC)	5D- Low
1-17-3	ATCS view of RWY 12C short final is blocked	2C – High	Suspend RWY 12C arrivals during construction	Hazard Eliminated
1-17-4	A small portion of TWY G including the hold line to RWY 12C is obstructed	3C – Medium	Move the hold bars west of current position until in field of view from current tower	3D - Low

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SITE 4	HAZARD DESCRIPTION	INITIAL RISK	SAFETY REQUIREMENT	PREDICTE D RESIDUAL RISK
4-10	Sun interferes with ATCS vision to the east	4D - Low	Recurring training for ATCS Pilots ATIS NOTAMS	4D - Low
4-17	ATCS view from the current ATCT of TWYs V & W is obscured	4D - Low	Recurring training for ATCS Recurring training for pilots ATIS NOTAMS Additional ATC	4D - Low
SITE 5*	HAZARD DESCRIPTION	INITIAL RISK	SAFETY REQUIREMENT	PREDICTE D RESIDUAL RISK
5-9	ATCS has problems viewing General Aviation ramp	5D - Low	None	5D - Low
5-10	ATCS vision to the west is obscured	4D - Low	Double Shades	4D - Low
5-11	ATCS vision to the west is obscured	4D - Low	Double Shades	4D - Low
5-12	ATCS view of the GA ramp area is obscured	4D - Low	None	5D - Low

Table 1: IWA Initial & Predicted Residual Risk Summary

SITE	HI	MEDIUM	LOW	COMMENTS
1	1	1	3	
4	0	0	2	
5*	0	0	4	

Table 2: IWA Initial Risk Ranking Results

SITE	HI	MEDIUM	LOW	COMMENTS
1	0	0	3	
4	0	0	2	
5*	0	0	3	

Table 3: IWA Predicted Residual Risk Ranking Results

Site 5* - Removed from final consideration at the beginning of AFTIL II evaluation.

Signature Page

SRMD Approval Signature(s):

Toby Jones Air Traffic Manager, Phoenix-Sky Harbor International Airport Traffic Control Tower (WSE-PHX)	Date
---	------

David McCann Operations Manager, Serco	Date
---	------

Risk Acceptance Signature(s):

Tom Bowman Western Desert Terminal District Manager, (AJT-WSE)	Date
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Section 1 – Current System

The existing Phoenix-Mesa Gateway Airport (IWA) was activated in December, 1993. It is the former Williams Air Force Base (WAFB) airfield that was deactivated September 30, 1993 because of the congressionally mandated Base Realignment and Closure (BRAC) process. The airport is now owned and operated by the Phoenix Mesa Gateway Airport Authority (PMGAA). IWA has three active runways (RWY); RWY 12L/30R, RWY 12C/30C and RWY 12R/30L.

The current ATCT is 103 feet (ft.) Above Ground Level (AGL) or 1,453 ft. Mean Sea Level (MSL) to the floor tall; 440 sq. ft. free standing Federal Contract Tower (FCT) facility, located west and midfield of RWY 12R/30L. When commissioned in 1971 the ATCT was owned and operated by the United States Air Force (USAF) and USAF Air Traffic Control Specialists (ATCS). As of December 1993 it is owned by PMGAA and operated by Serco Management Services.

RWY 12R/30L is constructed of concrete and is 10,401 feet long and 150 feet wide. It has Medium Intensity Runway Lights (MIRL) and 4-light PAPI (Precision Approach Path Indicator) equipment on both runways. The runway is capable of accommodating aircraft weighing up to 550,000 pounds with a dual double tandem wheel configuration.

RWY 12C/30C is constructed of asphalt/concrete, is 10,201 feet long and 150 feet wide. It has High Intensity Runway Lights (HIRL), 4-light PAPI (Precision Approach Path Indicator) equipment on both runways. RWY 30C has an Instrument Landing System (ILS) or Localizer (LOC) RWY 30C approach. The runway is capable of accommodating aircraft weighing up to 550,000 pounds with a dual double tandem wheel configuration.

RWY 12L/30R is constructed of concrete, is 9,300 feet long and 150 feet wide. It has High Intensity Runway Lights (HIRL) and the runway is capable of accommodating aircraft weighing up to 850,000 pounds with a dual double tandem wheel configuration. RWY 12L/30R has 4-light PAPI (Precision Approach Path Indicator) equipment on both runways.

IWA handled 228,368 ATCT operations in 2014, averaging 626 aircraft movements per day. Air service to IWA is provided by one air carrier and is home to several flight training, corporate and aircraft repair facilities. The ATCS operates 19 hours per day, from 5:00 AM to 12:00 AM seven days per week year round.

Figure 1 shows the current airfield diagram.

Comparative Safety Assessment

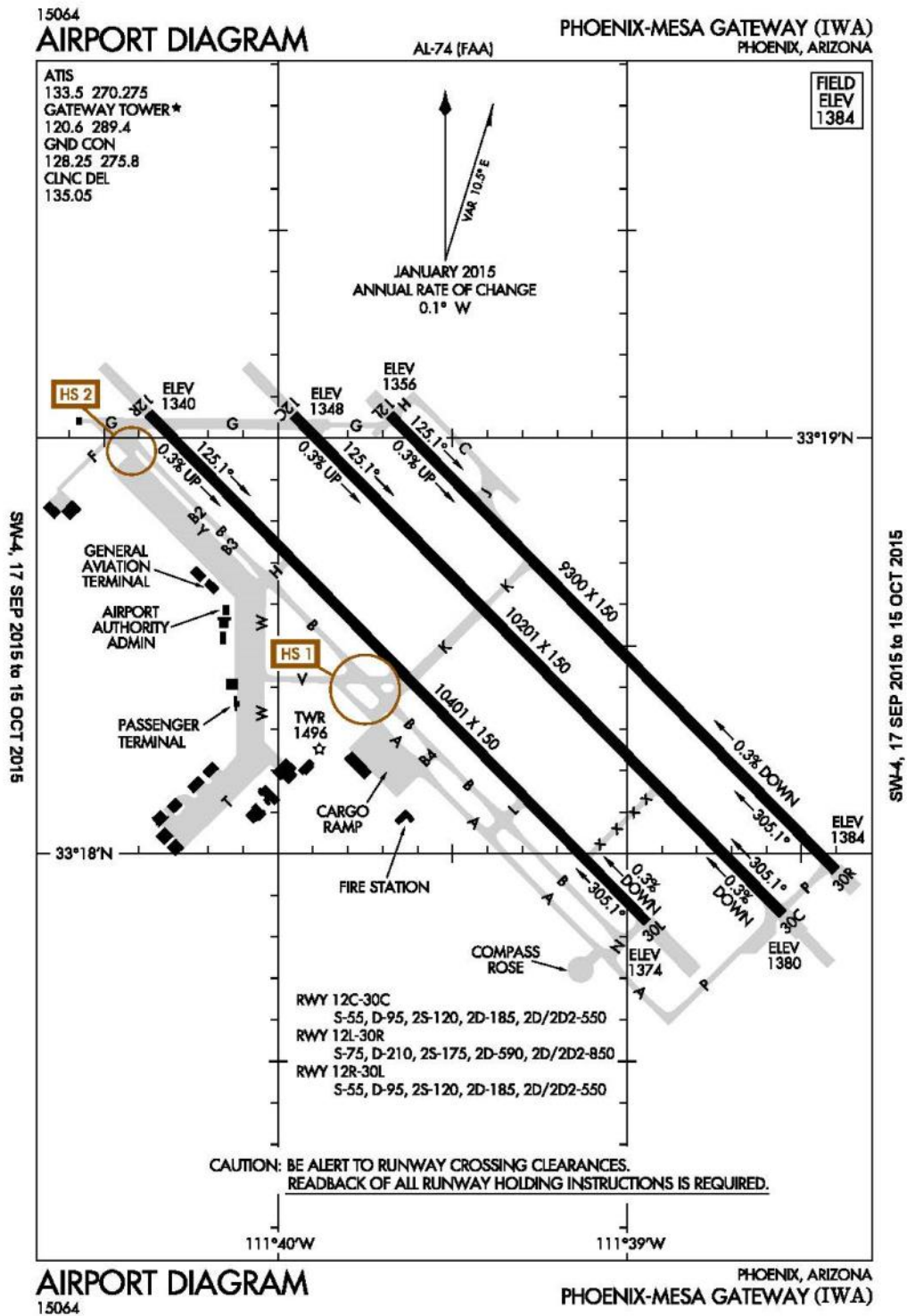


Figure 1: Current Airfield Diagram

Section 2 – Proposed Change

Section 2 identifies the two preferred sites that were determined feasible locations through an initial screening during the combined Trip 1 and Trip 2 activities at the AFTIL. The new ATCT will house a 550 square foot (sq. ft.) cab that will be placed on an intermediate activity sized shaft.

This safety assessment was conducted on the two preferred sites concentrating on system safety hazards and associated safety risk to the National Airspace system (NAS). The intent was to compare the two sites against an identified credible set of system safety criteria. The detailed results are included in Appendix A, Hazard Analysis Worksheets (HAW). This value-added effort meets the intent and goals of the FAA SMS.

The locations of the two sites under consideration are:

Site 1

Lat: 33-18-17.69 N

Long: 111-30-53.54 W

Top of Tower: 194' AGL or 1524' AMSL

Eye Height: 164' AGL or 1494' AMSL

Site 4*

Lat: 33-18-18.21 N

Long: 111-39-55.1302 W

Top of Tower: 194' AGL or 1543' AMSL

Eye Height: 164' AGL or 1513' AMSL

*Revised during AFTIL II

Site 5**

Lat: 33-19-03.0946 N

Long: 111-39-13.2216 W

Top of Tower: 187' AGL or 1548' AMSL

Eye Height: 157' AGL or 1518' AMSL

**Removed from consideration during AFTIL II

Figure 2 displays the location of the two preferred sites (Sites 1 & 4) the SRMP designated and are displayed for background and history. Site 5 remains for evaluation history.

Comparative Safety Assessment

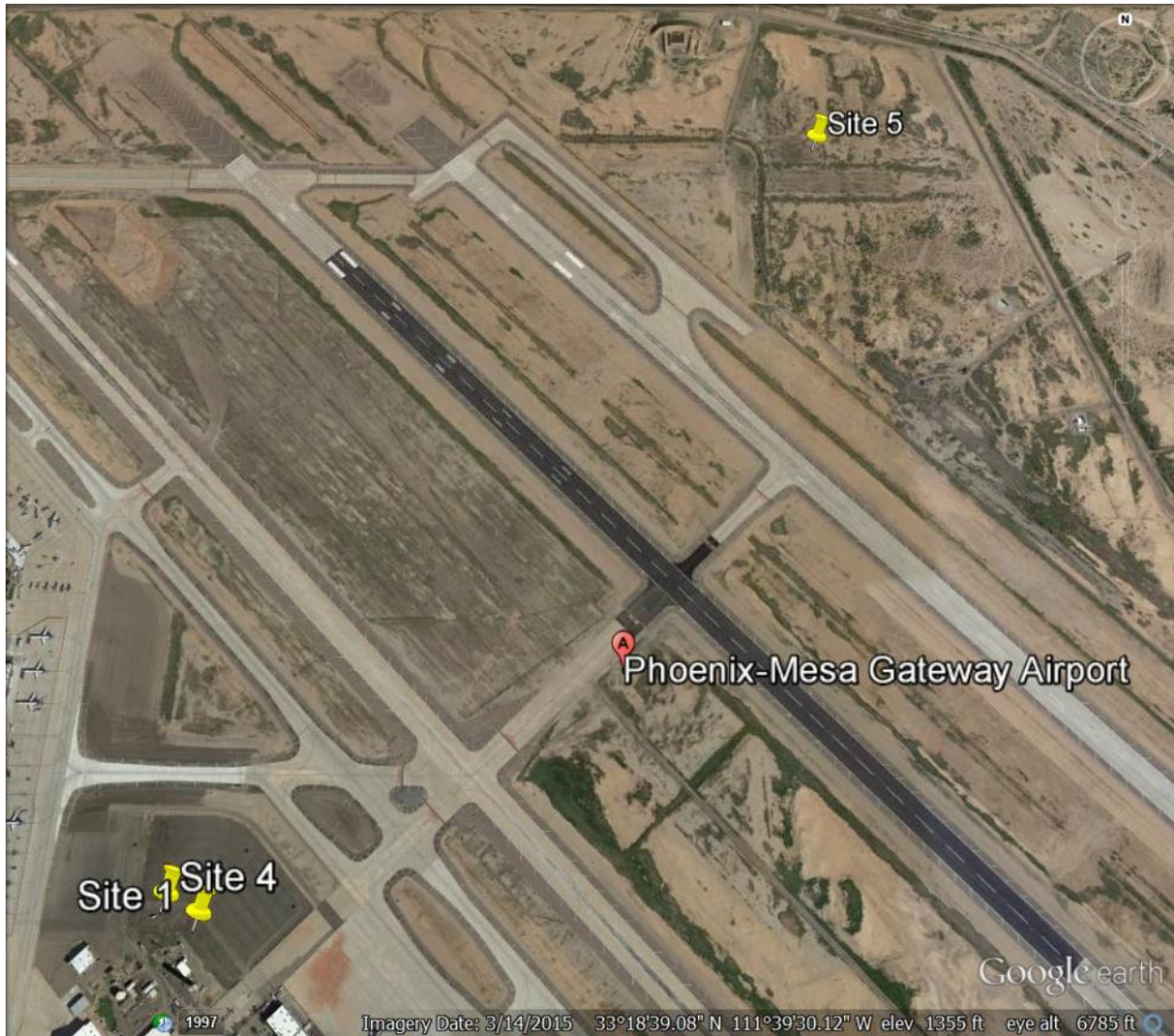


Figure 2: Location of the two preferred sites (Sites 1 & 4) and unconsidered Site 5

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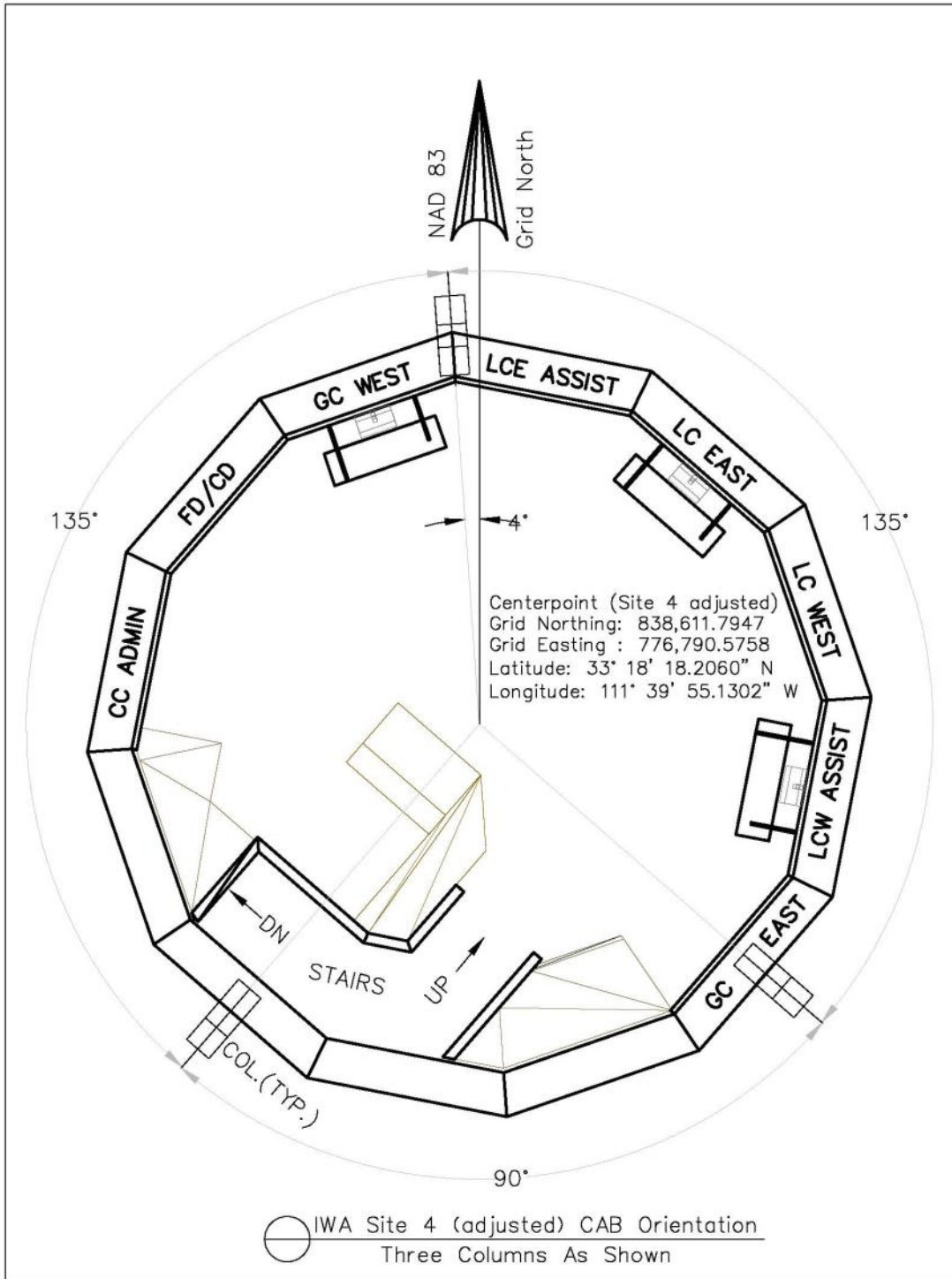


Figure 3: Cab and ATCT position orientation of recommended Site 4

Section 3 – Safety Risk Management Panel

An IWA ATCT SRMP was formed and developed this CSA to identify the potential hazards, assess and analyze the associated risks, and determine existing and recommended safety requirements to mitigate or control the safety risk associated with the siting of the new IWA ATCT. The Trip 1 SRMP met from 5/12/15 to 5/14/15 and the Trip 2 SRMP met from 9/22/15 to 9/24/15 at the AFTIL to identify, analyze, review and mitigate hazards associated with siting the new IWA ATCT.

SRMP members from the Trip 1 siting activities are:

(SRMP Names)	(Organization)
Tony Rodriguez	ANG-E18, AFTIL Manager
Frank Boyer	National Tower Siting Coordinator (Liaison)
Joe Sims	AFTIL - SMS Facilitator
Jim Steinbrecher	ANG-E18, AFTIL Simulation Designer
Beth Houghton	AJV-W24, TERPS, Western Service Center
Jim McMahon	PHX ATCS Operations Manager
Terence D. Moore	ANG-E18, AFTIL ATCS Subject Matter Expert
Raymond Chan	AJW-2W11J, Resident Engineer
Tony Bianchi	Phoenix-Mesa Gateway Airport Authority (PMGAA) Airport Planner
Kyler Erhard	AWP-PHX-ADO, Phoenix Airports District Office
Jill Gough	AJV-W37, Western Service Area (WSA) Terminal Sustainment, Program Implementation Manager (PIM)
Lyndon Lawyer	AJW-2W11J, Systems Engineer
Roland McKee	AWP-220, WSA Flight Standards

SRMP members from the Trip 2 siting activities are:

(SRMP Names)	(Organization)
Tony Rodriguez	ANG-E18, AFTIL Manager
Frank Boyer	AFTIL – National Siting Coordinator
Joe Sims	AFTIL - SMS Facilitator
Jim Steinbrecher	ANG-E18, AFTIL Simulation Designer
Terence D. Moore	ANG-E18, AFTIL ATCS SME
Raymond Chan	AJW-2W11J, Resident Engineer
Lyndon Lawyer	AJW-2W11J, Systems Engineer
Shawn Boyd	Serco, IWA Air Traffic Manager
James Kemper	TUC Air Traffic Manager
Tony Bianchi	Phoenix-Mesa Gateway Airport Authority (PMGAA) Airport Planner
Ron King	Phoenix-Mesa Gateway Airport Authority (PMGAA) Airport Superintendent

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The 5M Model was used to analyze the proposed NAS change in order to distinguish elements that were affected by the proposed NAS change. These elements were used to help identify sources, causes, hazards, and current and proposed risk mitigation strategies.

5 M Model

- Man – Includes the following human elements: All operational personnel at IWA ATCT
- Mission – Reduce risks associated with the operation of the new ATCT at IWA airport.
- Media – The terminal Air Traffic Control (ATC) facility that provides traffic advisories, spacing, sequencing, and separation services to visual flight rules (VFR) and instrument flight rules (IFR) aircraft operating on the surface of the airport and within the designated Class C airspace surrounding the airport. In addition, the ATCS at IWA give pilots instructions to operate on the airport movement area so traffic flows smoothly and efficiently.
- Management – The Management element is bounded by: FAA Order 6480.4 Tower Siting Order Process, FAA Order 7110.65, Air Traffic Control, and local Standard Operating Procedures (SOP's), which describes how operational personnel conduct/apply, required procedures in the ATCT environment.
- Machine - Normal facility operational position equipment (surveillance, communications, information display, weather system equipment, etc.).

Section 4 – Risk Assessment

The IWA ATCT siting hazards were identified using an experienced team of ATCS SME, Safety Risk Management (SRM) experts and the SRMP. This team utilized the ATCT siting PHL utilized at the AFTIL shown below and identified in FAA Order 6480.4. This list is not inclusive of every possible hazard but used as a guide for the most common possible hazards.

1. Potential interference with navigation equipment both planned and existing
2. Potential interference with communication equipment both planned and existing
3. Potential interference with existing and or proposed surveillance equipment
4. TERPS surfaces penetrations
5. Part 77 surfaces penetrations
6. Relevant Airport Design standards violated
7. Direction of view
7 a. North
7 b. East
7 c. West
7 d. South
8. Line of sight/angle of view
8 a. Up
8 b. Down
9. Visual Performance
9 a. Unobstructed view
9 b. Object Discrimination
9 c. Line of Sight (LOS) Angle of Incidence
9 d. Two-Point Lateral Discrimination
10. Lighting and Atmospheric Limitations – Daylight
10 a. Sun Angle
10 b. Sun Glare
10 c. Sun Shadows
10 d. Thermal Distortion
10 e. Light changes/contrast eye adaptation
11. Lighting and Atmospheric Limitations – Night
11 a. Dawn
11 b. Dusk
11 c. Night
12. Artificial Lighting
12 a. Airport lighting equipment outages
12 b. Lighting shadows
12 c. Airport lighting
12 d. Construction lighting
12 e. Residential/industrial lighting
12 f. Background clutter
13. Naturally occurring atmospheric conditions
13 a. Dust

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13 b. Ash
13 c. Smoke
13 d. Haze
13 e. Fog
13 f. Rain
13 g. Sleet
13 h. Snow
13 i. Sun glare off snow
13 j. Minimum ceiling heights (historical data)
14. Industrial/municipal discharges
14 a. Dust
14 b. Ash
14 c. Smoke
15. Access to proposed site does not cross existing ground/air traffic patterns
16. Interior physical barriers
16 a. Position of ATC in Tower Cab
16 b. Position of Tower Cab equipment
16 c. Position of Tower Cab mullions
17. Exterior physical barriers
17 a. Construction equipment
17 b. Proposed new structures and Airport expansion (ALP)
17 c. Existing ATCT
18. Other

Table 4: AFTIL Preliminary Hazard List (PHL)

The SRMP identified five hazards for Site 1:

Hazard	Causes	System State	Effect	Initial Risk
1-10; Sun interferes with ATCS vision to the east	Sun interferes with ATCS vision to the east	Dawn	Increases time ATCS uses to handle the aircraft	4D - Low
1-17-01; ATCS view of RWY 12R Hold Short line from TWY H is blocked	Site 1 ATCT shaft	Daily during construction of Site 1	Increases time ATCS uses to verify the aircraft is holding short of runway	4D - Low
1-17-02; ATCS view of TWY B, H, V and a small portion of RWY 12R is partially blocked	Site 1 ATCT shaft during construction	During construction	Loss of situational awareness	5C - Low
1-17-03; ATCS view of RWY 12C short final is blocked	Site 1 ATCT shaft	During construction	ATCS cannot observe aircraft during critical phase of flight to	2C - High

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			the runway	
1-17-04; A small portion of TWY G including the hold line to RWY 12C is obstructed	Site 1 shaft	During construction	Possibility of runway incursion	3C - Medium

Table 5: Site 1 Hazards

The SRMP identified two hazards for Site 4:

Hazard	Causes	System State	Effect	Initial Risk
4-10; Sun interferes with ATCS vision to the east	Sun angle	Dawn	Increases time ATCS uses to handle the aircraft	4D – Low
4-17; ATCS view from the current ATCT of TWYs V & W is obscured	Site 4 shaft	During construction	Increases time ATCS uses to handle the aircraft	4D-Low

Table 6: Site 4 Hazards

The SRMP identified four hazards for Site 5*:

Hazard	Causes	System State	Effect	Initial Risk
5-9; ATCS has problems viewing General Aviation ramp	Depth perception and distance	During operational hours	Situational awareness	5D – Low
5-10; ATCS vision to the west is obscured	Sun angle and sun glare	During a daily two hour late afternoon period	Increases time ATCS uses to handle the aircraft	4D-Low
5-11; ATCS vision to the west is obscured	Dusk light at sunset	At sunset	Increases time ATCS uses to handle the aircraft	4D-Low
5-12; ATCS view of the GA ramp area is obscured	Commercial and residential lighting off the airport property at night	Nighttime operations during operational hours	Increases time ATCS needs to identify aircraft	4D-Low

Table 7: Site 5 Hazards

A detailed listing of hazards for Sites 1, 4 and 5 can be found in Appendix A. Site 5* removed from final consideration at beginning of AFTIL II evaluation

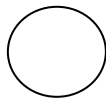
Comparative Safety Assessment

Figure 4 – IWA Initial Risk Matrix

Severity Likelihood	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A					
Probable B					
Remote C	○ 1		○ 1	○ 1	
Extremely Remote D	△ 1	○ 2 □ 2 △ 3			
Extremely Improbable E					*

High Risk
Medium Risk
Low Risk

* Unacceptable with Single Point and/or Common Cause Failures



Site 1



Site 4



Site 5*

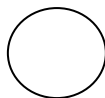
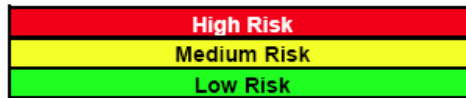
Site 5* removed from final consideration at beginning of AFTIL II evaluation

Comparative Safety Assessment

Figure 5 – IWA Predicted Residual Risk Matrix

Severity Likelihood	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A					
Probable B					
Remote C					
Extremely Remote D	○ 1 △ 1	△ 2 ○ 1 □ 2	○ 1		
Extremely Improbable E					*

* Unacceptable with Single Point and/or Common Cause Failures



Site 1



Site 4



Site 5*

Site 5* removed from final consideration at beginning of AFTIL II evaluation

Section 5 – Risk Treatment and Monitoring

The assumptions associated with the IWA ATCT CSA siting report are discussed below:

1. Any changes to the ATCT Siting Report for the IWA CSA SRMD will be made upon concurrence of the FAA Regional Siting Team.
2. It is expected that risk will increase should the existing safety requirements not be followed or implemented.
3. The CSA is not all-inclusive in that there may be unknown hazards within any operation or process.
4. The existing and recommended safety requirements will be implemented and verified.
5. The Airport Model was developed and accurately based on the current Airport Layout Plan (ALP).
6. The final design of the ATCT will not hinder sight lines for the ATCS in observing the airfield.
7. The CSA is a living document. If at any time during the course of construction and prior to commissioning of the new ATCT, if any new hazards are identified, an SRMP will be formed to evaluate and mitigate the hazard(s).

For each hazard, the SRMP identified existing and recommended safety requirements that mitigate or control the hazards. Safety requirements were developed from the hazard mitigations of all the IWA ATCT risks utilizing the Safety Order of Precedence. These mitigations reduced or maintain the hazard's risk to an acceptable level. (See SMS Manual Version 4.0, section 2.3.4)

The Safety Requirement and Responsible Organization(s) are listed below.

Comparative Safety Assessment

Hazard	Safety Requirement	Responsible Organization	Safety Performance Targets	Predicted Residual Risk
1-10	Double Shades	PMGAA – Bianchi – 480-988-7649	No more than two reported incidents over a three year period	4D – Low
1-17-01	Close TWY H during construction period	PMGAA – Bianchi – 480-988-7649	No breach of the hold bar during taxiway closure	Hazard Eliminated
1-17-02	NOTAMS Pilot training Runway/Taxiway Construction Council Checklist (RTCCC) ATCS training	PMGAA – Bianchi – 480-988-7649 ATM/SERCO	No reported incidents due to situational awareness on the obscured portions of the taxiways	5D - Low
1-17-03	Suspend RWY 12C arrivals during construction	PMGAA – Bianchi – 480-988-7649 ATM/SERCO	None	Hazard Eliminated
1-17-04	Move the hold bars west of current position until in field of view from current ATCT	PMGAA – Bianchi – 480-988-7649 Phoenix ADO – 602-792-1073	No more than two runway incursions for RWY 12C during the three year construction period	3D – Low
4-10	Recurring pilot training ATIS NOTAMS Recurring ATCS training	PMGAA – Bianchi – 480-988-7649 ATM/SERCO	No more than two incidents over a three year period	4D – Low
4-17	Recurring pilot training ATIS NOTAMS Recurring ATCS training Additional ATCS position	PMGAA – Bianchi – 480-988-7649 ATM/SERCO SERCO/ PMGAA – Bianchi – 480- 988-7649	No more than two incidents over a three year period	4D – Low
5-9*	None			5D – Low
5-10*	Double Shades	PMGAA – Bianchi – 480-988-7649	No more than two incidents over a three year period	4D – Low
5-11*	Double Shades	PMGAA – Bianchi – 480-988-7649	No more than two incidents over a three year period	4D – Low
5-12*	None	None	None	5D - Low

Table 8: Safety Requirement and Responsible Organization

Site 5* was removed from consideration at the beginning of the AFTILL II evaluation.

Comparative Safety Assessment

Monitoring Plan:

The PMGAA, IWA ATM and IWA Front Line Managers tasked with watch supervision will be required to ensure compliance with the Safety Requirements. The SMS requires that hazards are tracked to ensure the effectiveness of the mitigations is verified. The SRMD, which is comprised of the ATCT siting report and this CSA, will be entered into the ATO Safety Management Tracking System (SMTS) for tracking and monitoring the status of identified hazards and NAS changes.

Appendix A – Hazard Analysis Worksheets (HAW)

Comparative Safety Assessment

Hazard Analysis Worksheet for Site 1

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
1-10	Sun interferes with ATCS vision to the east	Sun angle	Dawn	Shades Binoculars STARS TDW	STARS TDW – Radar display of aircraft Shades – Reduces amount of glare into ATCT cab Binoculars – To observe distant and near aircraft and objects	Possible loss of situational awareness	4-Minor

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Glare may slow down ATCS reaction to control aircraft	D – Extremely Remote	Pilot & ATCS training No reported incidents in past 3 years	4D-Low	Double Shades	PMGAA – Bianchi – 480-988-7649	4D – Low	No more than two incidents over a three year period

Comparative Safety Assessment

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
1-17-01	ATCS view of RWY 12R Hold Short line from TWY H is blocked	Site 1 ATCT shaft	During ATCT construction	7110.65, 3-1-7, radios, light guns, SOP, ATCS training, pilot training, briefings	ATCS verifies location of aircraft under his/her control	Increases time ATCS uses to verify the aircraft is holding short of runway	4 - Minor

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Current training, pilot awareness, lack of reported incidents	D – Extremely Remote	Pilot & ATCS training, briefings	4D-Low	No intersection departures from TWY H	PMGAA – Bianchi – 480-988-7649 Serco, IWA ATM – Boyd – 480-988-7678	Hazard is eliminated	No breach of the TWY H Hold bar during construction period (Typical construction time is three years)

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
1-17-02	ATCS view of TWY B, H, V and a small portion of RWY 12R is partially blocked	Site 1 ATCT shaft	During construction	7110.65, 3-1-7, radios, light guns, SOP, ATCS training, pilot training, briefings	ATCS verifies location of aircraft under his/her control	Loss of situational awareness	5 - Minimal

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Current training, pilot awareness, lack of reported incidents	C – Remote	ATCS may lose sight for only a few seconds	5C - Low	NOTAMS, pilot training, ATCS training, Runway/Taxiway Construction Council Checklist (RTCCC)	PMGAA – Bianchi – 480-988-7649 Serco, IWA ATM – Boyd - 480-988-7678	5D - Low	No reported incidents due to situational awareness on the obscured portions of the taxiways

Comparative Safety Assessment

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
1-17-03	ATCS view of RWY 12C short final is blocked	Site 1 ATCT shaft	During construction	7110.65, 3-1-7, radios, light guns, SOP, ATCS training, pilot training, briefings	ATCS verifies location of aircraft under his/her control	ATCS cannot observe aircraft during critical phase of flight to the runway	2 - Hazardous

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Loss of situational awareness	C – Remote	Every arrival to RWY 12C	2C-High	Suspend RWY 12C arrivals during construction	PMGAA – Bianchi – 480-988-7649 Serco, IWA ATM - 480-988-7678	Risk is eliminated	

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
1-17-04	A small portion of TWY G including the hold line to RWY 12C is obstructed	Site 1 shaft	During construction	7110.65, 3-1-7, radios, light guns, SOP, ATCS training, pilot training, briefings	ATCS awareness of aircraft position & pilot awareness of runway hold lines	Possibility of runway incursion	3 - Major

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
ATCS may not see movement near the RWY 12C hold line on TWY G	C – Remote	Based on operations and duration of construction	3C – Medium	Move the hold bars west of current position until in field of view from current tower	PMGAA – Bianchi – 480-988-7649 Phoenix ADO – 602-792-1073	3D – Extremely Remote	No more than two runway incursions for RWY 12C during the three year construction period

Comparative Safety Assessment

The hazards in the Site 1 Hazard List were identified from the ATCT Preliminary Hazard list in Table 4. The panel determined there were five hazards associated with this site.

Comparative Safety Assessment

Hazard Analysis Worksheet for Site 4

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
4-9	ATCS loses sight of aircraft on proposed TWY T	Site 4 proximity to TWY T Equipment ring on Site 4	Continuous	ATCS awareness JO 7110.65, 3-1-7, radios Binoculars	ATCS awareness of aircraft position	Possible loss of situational awareness ATCS loss of aircraft position	5 - Minimal

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Not a primary use taxiway	D – Extremely Remote	ATCS, pilot training and airfield familiarity	5D-Low	Training SOP NOTAM	PMGAA – Bianchi – 480-988-7649 Serco – IWA ATM – Boyd - 480-988-7678	5D – Low	No more than two surface incidents over a three year period

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
4-10	Sun interferes with ATCS vision to the east	Sun angle	Dawn	Shades Binoculars STARS TDW	STARS TDW – Radar display of aircraft Shades – Reduces amount of glare into ATCT cab Binoculars – To observe distant and near aircraft and objects	Possible loss of situational awareness	4-Minor

Comparative Safety Assessment

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Traffic patterns east of the airport are heavily used by general aviation aircraft	D – Extremely Remote	ATCS, pilot airline training and airfield familiarity	4D-Low	Double Shades	PMGAA – Bianchi – 480-988-7649	4D – Low	No more than two incidents over a three year construction period

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
4-17	ATCS view from the current ATCT of TWYs V & W is obscured	Site 4 shaft	During construction	7110.65, 3-1-7, radios, light guns, SOP, ATCS training, pilot training, briefings	ATCS awareness of aircraft position	Increases time ATCS uses to handle the aircraft	4 - Minor

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
TWYs W & V are heavily used by commercial traffic	D – Extremely Remote	ATCS training, pilot and airline training and airfield familiarity	4D-Low	Recurring training for ATCS, airlines and pilots, ATIS, JO 7210.3Y, Ch. 2-6-5 NOTAMS, additional ATC	PMGAA – Bianchi – 480-988-7649 Serco – IWA ATM – Boyd - 480-988-7678	4D – Low	No more than two incidents over the three year construction period

The hazards in the Site 4 Hazard List were identified from the ATCT Preliminary Hazard list in Table 4. The panel determined there were three hazards associated with this site.

Comparative Safety Assessment

Hazard Worksheets for Site 5

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
5-9	ATCS has problems viewing General Aviation ramp	Depth perception and distance	During operational hours	Binoculars, ATCS knowledge of airfield, ATCS visibility chart	ATCS knowledge of the airfield, aircraft parking	Situational awareness	5 - Minimal

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Possibility of surface incursion	D – Extremely Remote	GA ramp is a non-movement area	5D - Low	None	None	5D - Low	None

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
5-10	ATCS vision to the west is obscured	Afternoon sun angle and sun glare	During a daily two hour late afternoon period	Shades Binoculars STARS TDW	STARS TDW – Radar display of aircraft Shades – Reduces amount of glare into ATCT cab Binoculars – To see aircraft with the glare	Increases time ATCS uses to handle the aircraft	4 - Minor

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Glare may slow down ATCS reaction to control aircraft	C –Remote	Pilot & ATCS training	4D-Low	Double Shades	PMGAA – Bianchi – 480-988-7649	4D – Low	No more than two incidents over a three year period

Comparative Safety Assessment

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
5-11	ATCS vision to the west is obscured	Dusk light at sunset	At sunset	Shades	Shades – Reduces amount of glare into ATCT cab	Increases time ATCS uses to handle the aircraft	4-Minor

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Glare may slow down ATCS reaction to control aircraft	D – Extremely Remote	Pilot & ATCS training	4D-Low	Double Shades	PMGAA – Bianchi – 480-988-7649	4D – Low	No more than two incidents over a three year period

Hazard Name	Hazard Description	Cause	System State	Existing Controls	Existing Control Justification	Effect	Severity
5-12	ATCS view of the GA ramp area is obscured	Commercial and residential lighting off the airport property at night	Nighttime operations during operational hours	Binoculars	Binoculars – To observe nighttime airfield operations	Increases time ATCS needs to identify aircraft	5 - Minimal

Severity Rationale	Likelihood	Likelihood Rational	Initial Risk	Safety Requirements	Organization Responsible for Implementing Safety Requirements	Predicted Residual Risk	Performance Safety Targets
Background lighting may slow down ATCS ability to identify aircraft	D – Extremely Remote	ATCS training and airfield familiarity	5D-Low	None	None	5D - Low	None

The hazards in the Site 5 Hazard List were identified from the ATCT Preliminary Hazard list in Table 4. The panel determined there were four hazards associated with this site. Site 5 is removed from final consideration by PMGAA due to fiscal restraints.

Appendix B – Hazard Photographic Slides

Comparative Safety Assessment

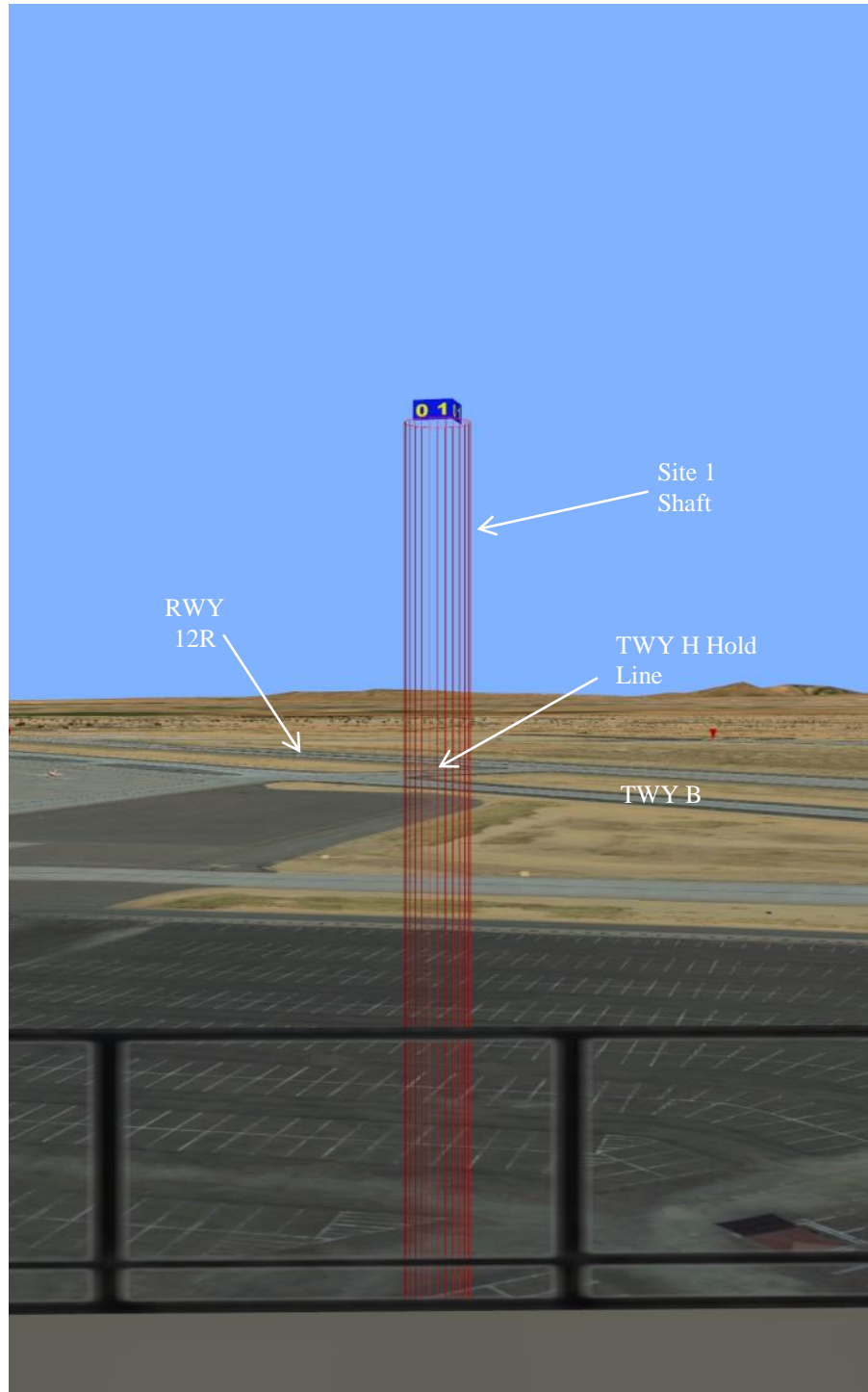


Figure 4: Portion of RWY 12R, TWY B & TWY H hold line blocked by Site 1 shaft

Comparative Safety Assessment

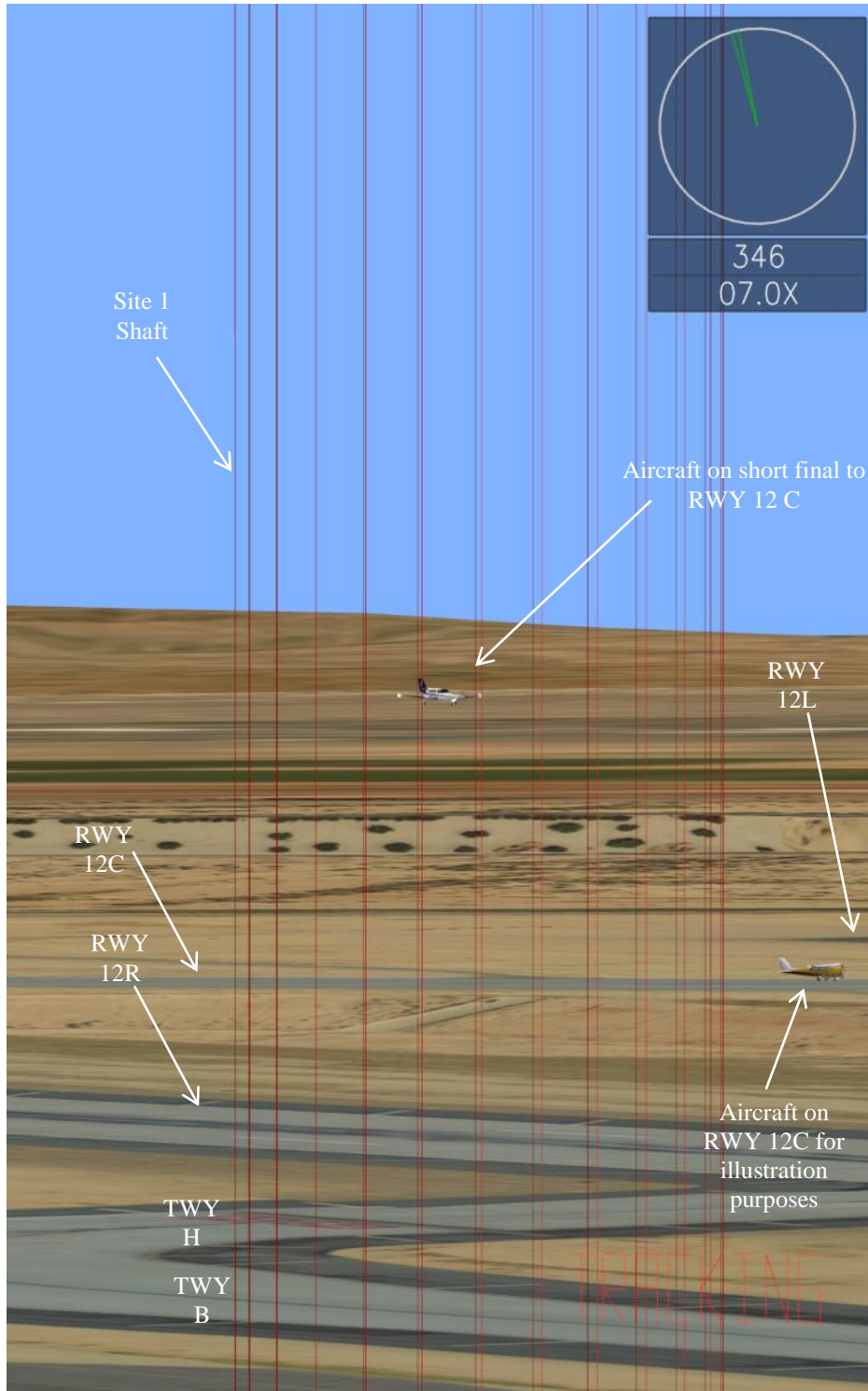


Figure 5: Site 1 shaft blocking ATCS view of aircraft on RWY 12C short final

This is a binocular view of the Site 1 shaft obscuring the ATCS view of taxiways B, H, RWY 12R, and short final to RWY 12C from the current ATCT cab.

Comparative Safety Assessment

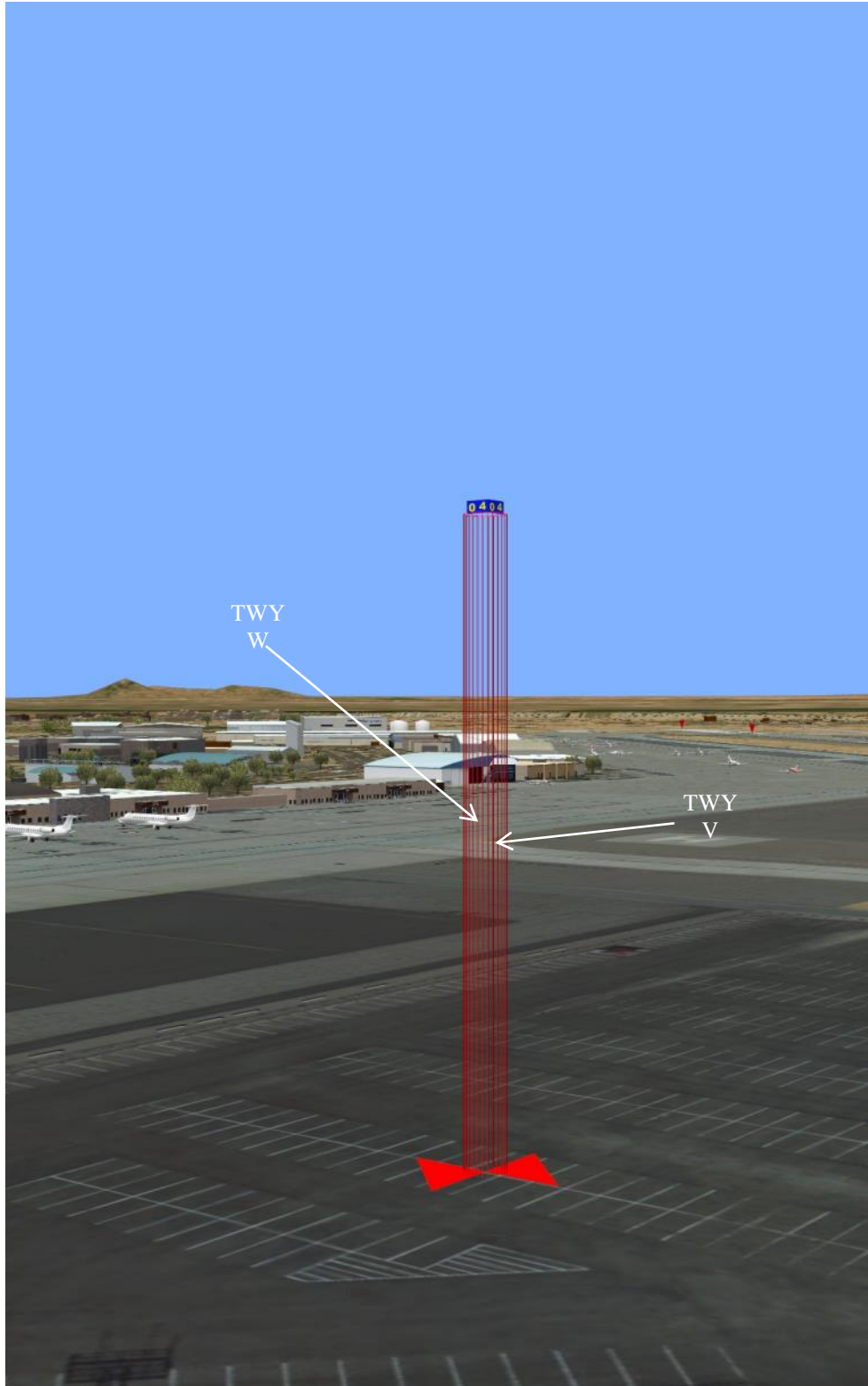


Figure 6: Portion of TWY's V & W blocked by Site 4 shaft during construction

This view is of the Site 4 location and shaft from the current ATCT.

Comparative Safety Assessment

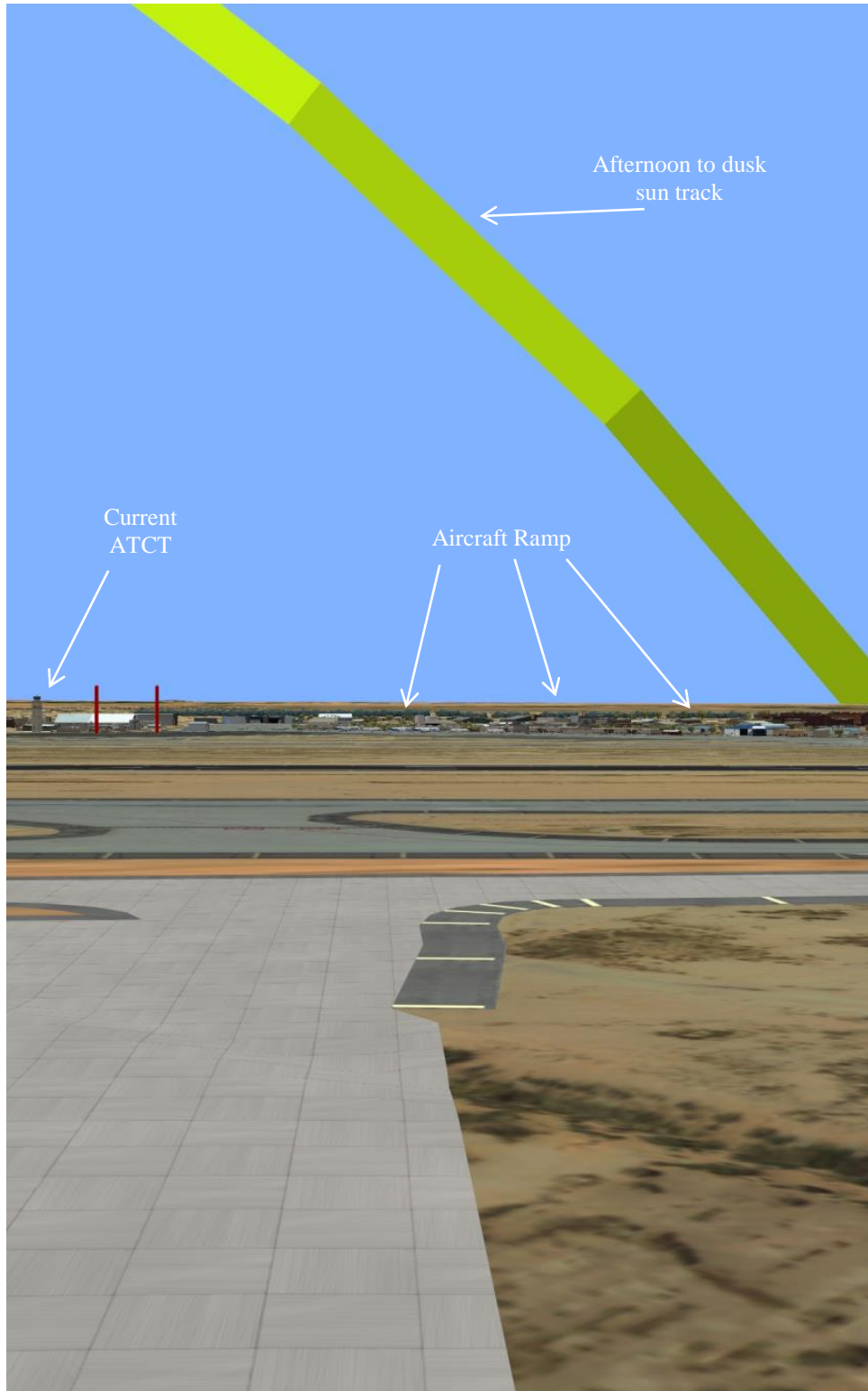


Figure 7: ATCS afternoon western view from Site 5 may have sun glare

Appendix C - Acronyms

ADO – Airports District Office
AFTIL – Airport Facilities Terminal Integration Laboratory
AGL – Above Ground Level
ALP – Airport Layout Plan
AOA – Airport Operations Area
AOV – Office of Air Traffic Oversight
ATC – Air Traffic Control
ATCS – Air Traffic Control Specialist
ATCT – Airport Traffic Control Tower
ATM – Air Traffic Manager
ATO – Air Traffic Organization
CSA – Comparative Safety Assessment
FAA – Federal Aviation Administration
FPO – Flight Procedures Office
HAW – Hazard Analysis Worksheet
HIRL – High Intensity Runway Lights
IFR – Instrument Flight Rules
ILS – Instrument Landing System
IMC – Instrument Meteorological Conditions
IWA – Phoenix-Mesa Gateway Airport
LOS – Line of Sight
LUAW – Line Up And Wait
NAS – National Airspace System
NASWATCH – Airway Facilities Radio Frequency Screening Tool
PHA – Preliminary Hazard Analysis
PHL – Preliminary Hazard List
RVR – Runway Visual Range
RWY – Runway
SME – Subject Matter Expert
SMS – Safety Management System
SMTS – Safety Management Tracking System
SOP – Standard Operating Procedures
SRM – Safety Risk Management
SRMD – Safety Risk Management Document
SRMP – Safety Risk Management Panel
TDW – Tower Display Workstation
TERPS – Terminal Instrument Procedures
TWY – Taxiway
VASI – Visual Approach Slope Indicator
VFR – Visual Flight Rules
VMC – Visual Meteorological Conditions
WSC – Western Service Center

Appendix D – Resources

FAA JO6480.4, Airport Traffic Control Tower Siting Criteria

TERPS Analysis

NASWATCH Analysis

Operational expertise of the PHX and IWA ATCS

AFTIL Modeling and Simulation Staff

SMS Manual Version 4.0, dated May 30, 2014

Google Earth©



IWA Siting Report


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