Appendix F

ATCT LINE-OF-SIGHT ANALYSIS

BACKGROUND

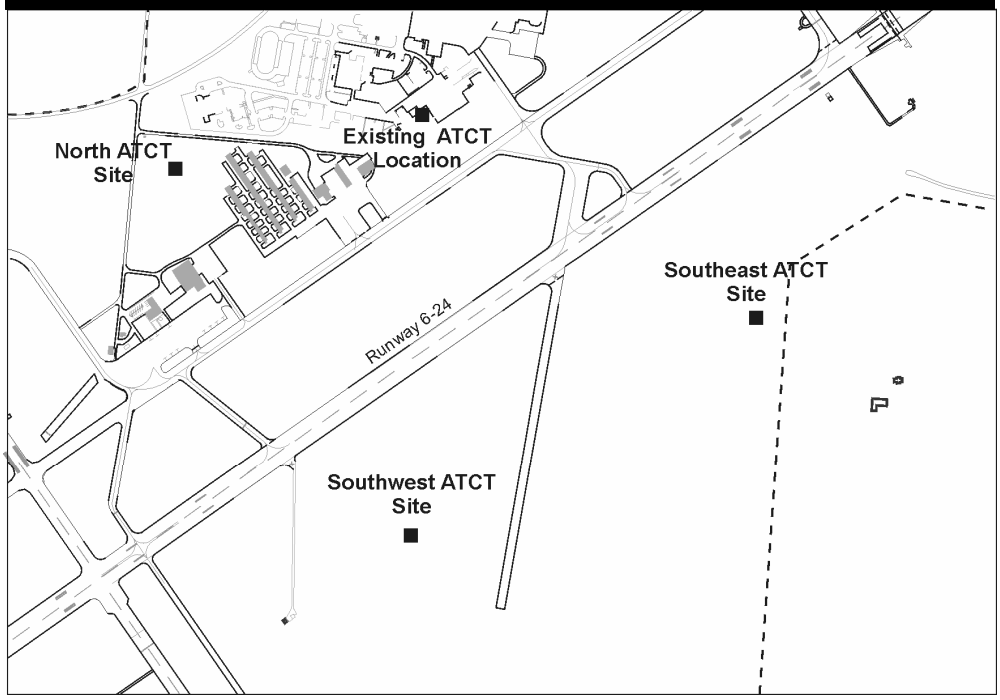
The Springfield-Beckley Municipal Airport has an operating Airport Traffic Control Tower (ATCT) that is owned and operated by the Ohio Air National Guard (OANG). Controllers in the ATCT need to be able to see all areas of the airport for which air traffic control services are provided. These areas are classified as "movement areas," and encompass the runways and parallel taxiway systems including their associated safety areas. Taxilanes, apron areas and hangar areas are considered "nonmovement areas," meaning aircraft movement in these areas is not provided with air traffic control services. Before an aircraft leaves a nonmovement area, it must contact air traffic and receive taxiing instructions.

The existing ATCT has an obscured line-of-sight to a portion of Taxiway F caused by Maintenance Hangar #2, which has existed for more than 30 years. This obscured line-of-sight is referred to as a shadow by the FAA. An FAA modification to design standards has been provided for the Maintenance Hangar #2 shadow on Taxiway F.

POTENTIAL ATCT LOCATIONS

An important factor that affects the areas available for future landside development is a clear line-of-sight view from the ATCT of the airfield movement areas. Due to a lack of space to accommodate equipment modernization, the OANG has proposed replacing the existing ATCT at another location on the airport as one of their development projects. A new ATCT would need to have a clear line-of-sight to all controlled airfield movement areas. To assess the potential impact of a new ATCT on the viable areas available for general aviation development, four potential ATCT locations, as shown on **Exhibit F1** have been evaluated.

EXHIBIT F1
ATCT SITE ALTERNATIVES



Source: Statement of Intent for Proposed Construction of New Control Tower at Springfield ANGB, Ohio, June 20, 2004, OANG; Aerofinity, Inc., 2004.

In addition to assessing potential ATCT locations, the potential benefits of relocating Taxiway F closer to Runway 15 -33 to open additional developable area was also assessed. Taxiway F is currently 725 feet runway centerline to taxiway centerline from Runway 15-33. The potential benefits of relocating it to 300 feet runway centerline to taxiway centerline aligned with Taxiway E were studied for each of the potential ATCT locations.

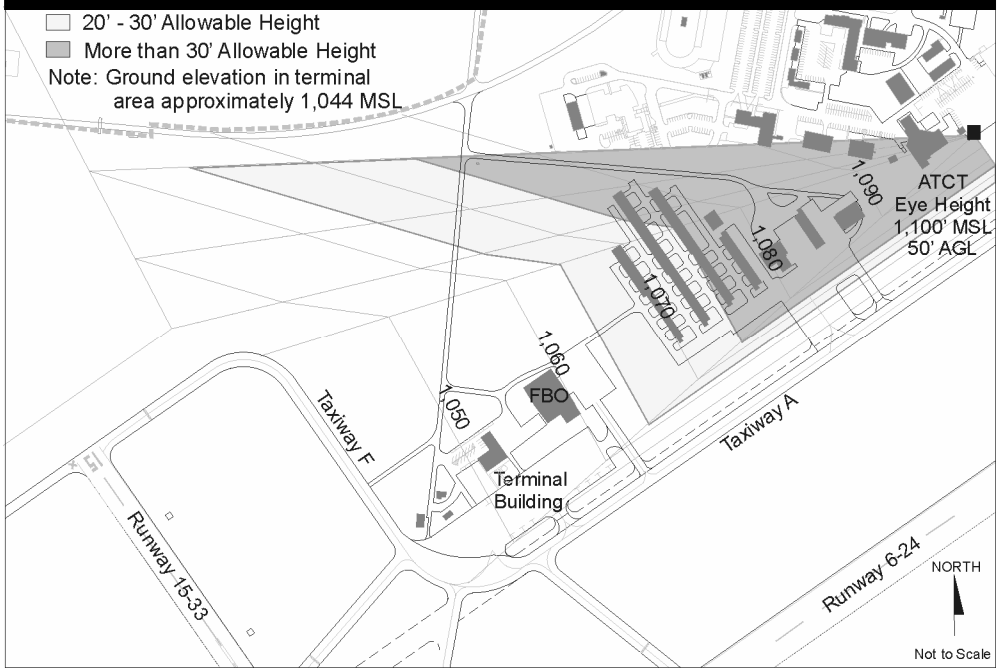
Existing ATCT Site

The airport has a modification to design standards for the ATCT's obscured view of Taxiway F caused by shadows from the Maintenance Hangar #2. If the existing ATCT remains, the need to avoid any additional shadows to the line-of-sight significantly limits the undeveloped area in the existing terminal area that could support facilities.

To eliminate the Maintenance Hangar #2 shadow, the existing ATCT controller eye height would need to be approximately 100 feet above ground level (AGL). The existing eye height is 50 feet AGL. FAR Part 77 regulations allow a building height of only approximately 80 feet at the location of the existing ATCT, which would not allow the ATCT to be developed at an adequate height to eliminate shadows. Unless, U.S. Terminal Instrument Procedures (TERPS), the standards used to design the instrument approaches, allow for a somewhat taller ATCT, full development of the undeveloped property in the existing terminal area would be impossible at the current tower location.

Common general aviation building heights are approximately 20 feet for t-hangars, which accommodate up to twin-piston engine aircraft, and at least 30 feet for corporate or conventional hangars that accommodate business jet aircraft. **Exhibit F2** shows the existing allowable height for terminal area development.

EXHIBIT F2
ALLOWABLE HEIGHT EXISTING ATCT

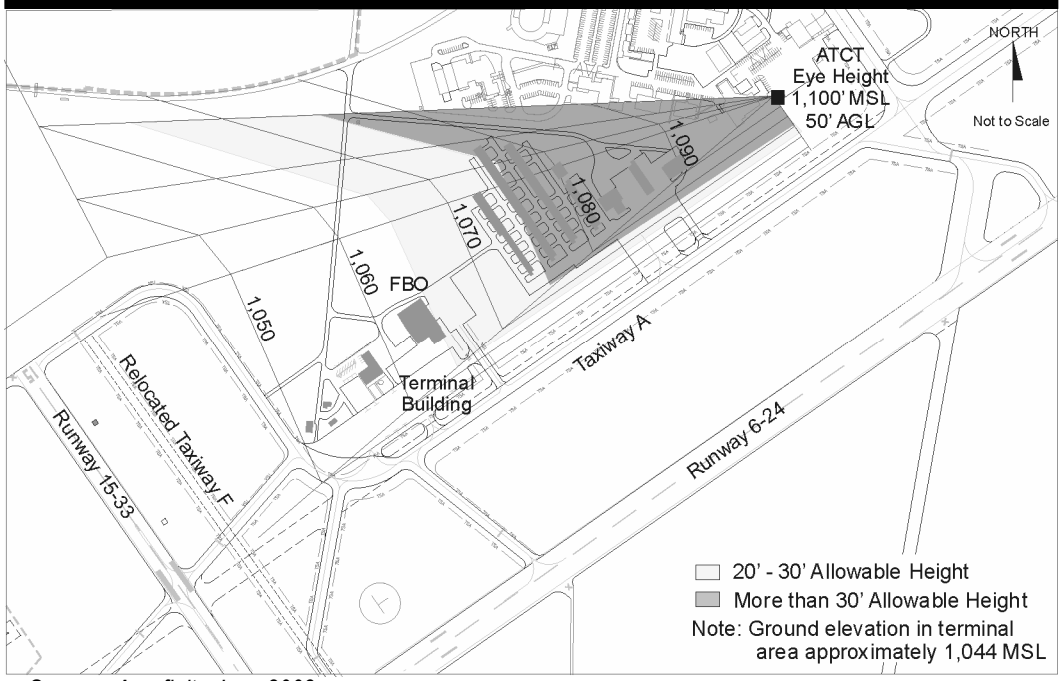


Source: Aerofinity, Inc., 2003.

With the existing ATCT, there are approximately 12 acres with 20 to 30 feet allowable height and approximately 10 acres with more than 30 feet allowable height for a total of approximately 22 developable acres of the 50-acre existing general aviation area. Nine acres of the 22 developable acres already contain the existing hangar facilities. The balance of the 22 developable acres is primarily within the drainage swale areas, thus limiting its potential.

As previously discussed, one potential improvement to increase the area available with a usable allowable height is to relocate Taxiway F toward Runway 15-33 to 300-foot runway centerline to taxiway centerline separation in order to form a full parallel taxiway with Taxiway E. As shown in **Exhibit F3**, this increases the available development area only slightly and does not resolve the Maintenance Hangar #2 shadow. By moving Taxiway F, there would be approximately 14 acres with between 20 feet and 30 feet allowable height and approximately 11 acres with more than 30 feet allowable height. Again, the majority of this area already contains the existing hangar facilities or is within the drainage swales. Therefore, for any significant development to occur within the existing general aviation terminal area, a replacement ATCT is needed at the airport.

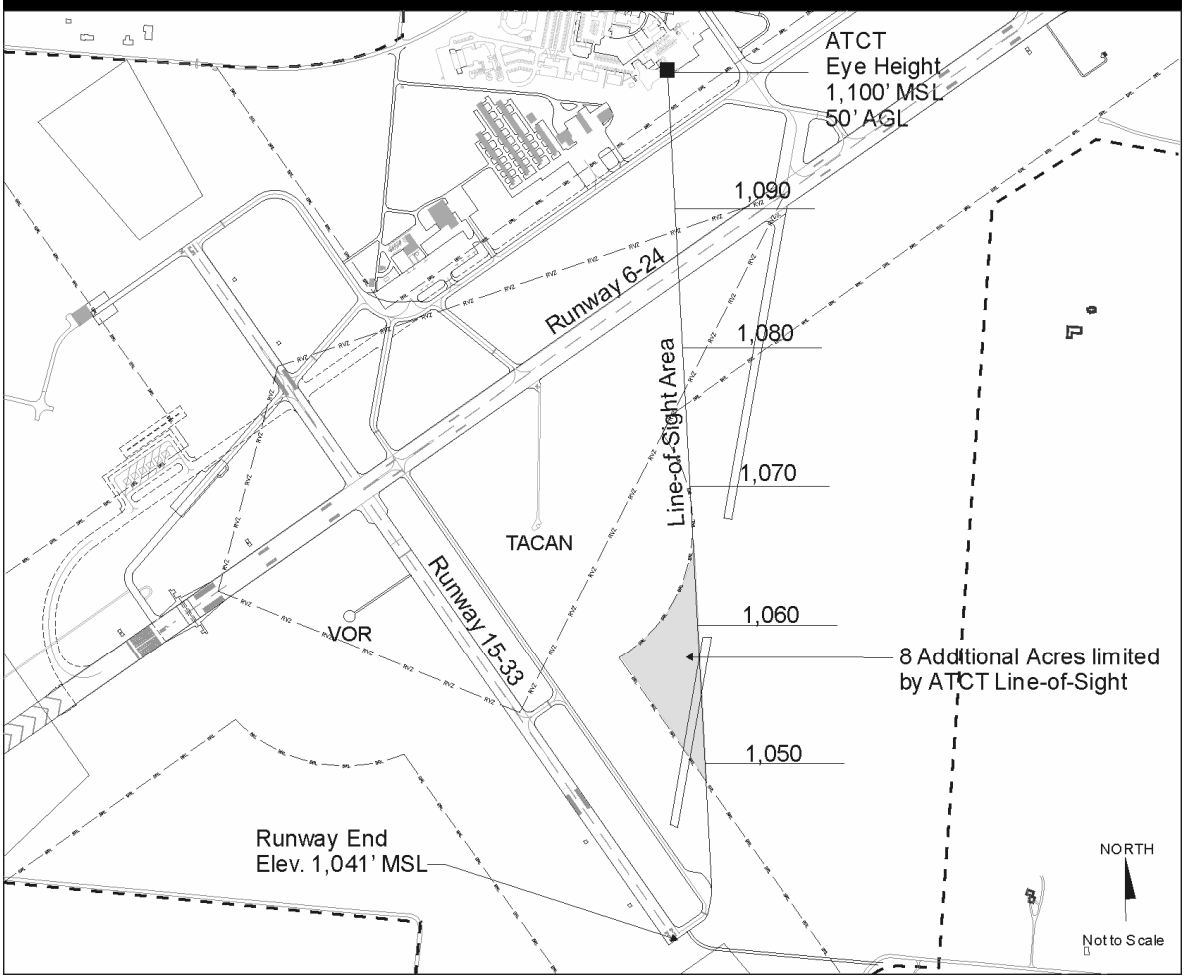
EXHIBIT F3
ALLOWABLE HEIGHT EXISTING ATCT WITH TAXIWAY F RELOCATED



Source: Aerofinity, Inc., 2003.

The existing ATCT would have minimal impact on a general aviation terminal area development on the south side of Runway 6-24, as most of development area is located beyond the controlled airfield movement areas. The one exception is the need to have a clear view to the end of Taxiway E and Runway 33. This should be able to be provided by setting any development back from Taxiway E to provide the clear line-of-sight, as shown on **Exhibit F4**. The line-of-sight area primarily overlaps the required runway visibility zone (RVZ) and the clear area for the TACAN, with only approximately 8 acres located outside the area.

EXHIBIT F4
EXISTING ATCT LINE-OF-SIGHT SOUTH OF RUNWAY 6-24



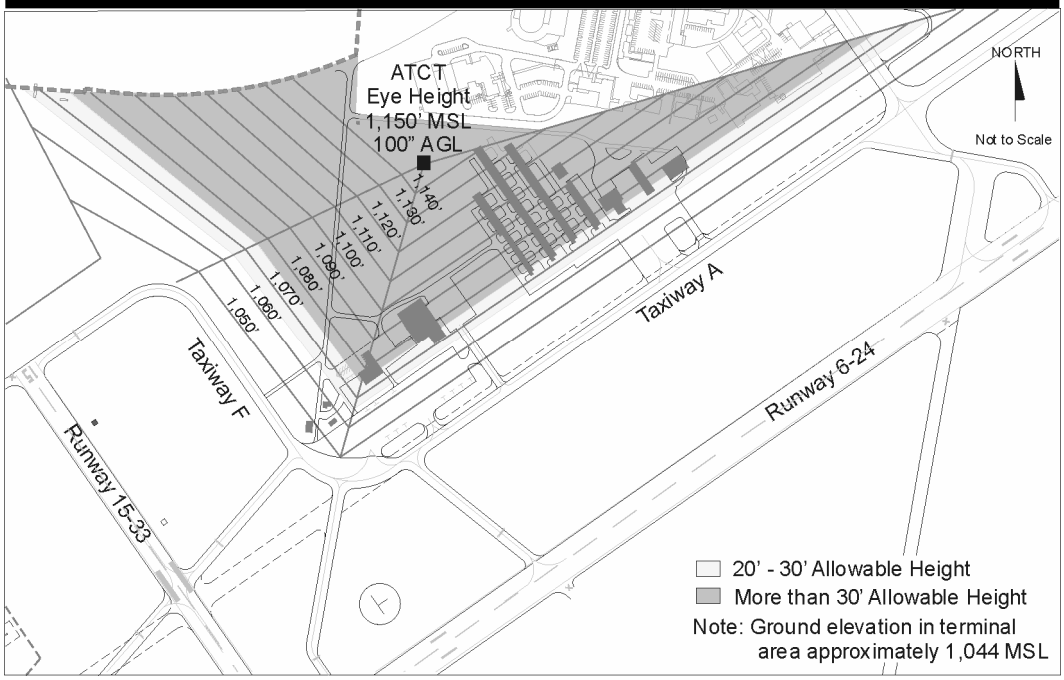
Source: Aerofinity, Inc., 2003.

North ATCT Site

One of the alternatives identified on OANG development plans is to replace the ATCT in the existing general aviation terminal area north of the existing t-hangars. This potential ATCT location was identified in the OANG's *June 20, 2001, Statement of Intent for Proposed Construction of New Control Tower at Springfield ANGS, Ohio* and identified as the preferred location based on that analysis. In this location, it is anticipated that the ATCT would need to be significantly taller that the existing tower. Based on a presentation by the OANG in December 2002, a preliminary assumed eye height of 100 feet has been used for this review. **Exhibit F5** shows the allowable development heights for the existing general aviation terminal area with a 100-foot eye height at the replacement ATCT.

Approximately 10 acres of the existing terminal area would have 20- to 30-foot allowable building height with this replacement ATCT. Approximately 34 acres would have more than a 30-foot allowable building height. Of this area approximately 13 acres is already under existing development and a portion of it is within the drainage swales. With a north replacement ATCT the allowable height over the existing transient apron ranges from 0 feet to almost 20 feet. A single-engine piston aircraft has a tail height up to approximately 8 feet, with a twin-engine piston aircraft having a tail height up to approximately 12 feet. Corporate jet aircraft can have tail heights as tall as approximately 25 feet. The north replacement ATCT would make the existing transient apron unusable except for smaller piston aircraft, necessitating its replacement elsewhere in the terminal area.

EXHIBIT F5
NORTH REPLACEMENT ATCT ALLOWABLE HEIGHT



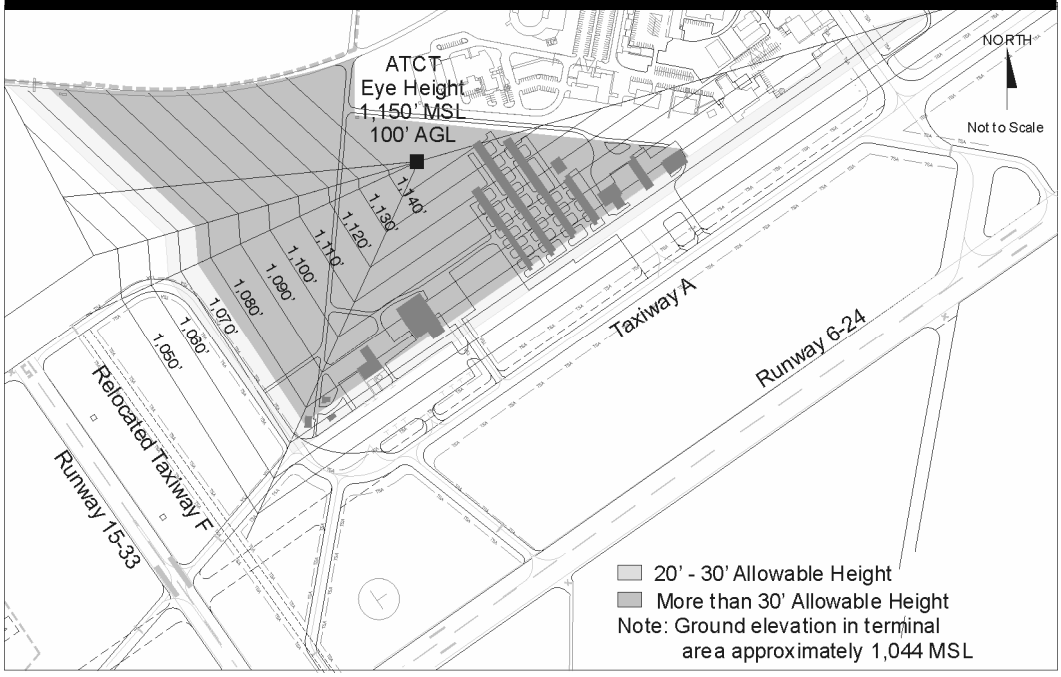
Source: Aerofinity, Inc., 2003.

With the close proximity of Taxiway A to the existing transient apron, an approximately 350-foot tall north replacement ATCT would be needed to keep the full transient apron usable. This ATCT height is unrealistic for Springfield-Beckley Municipal Airport, as it would exceed the ATCT height at many larger primary commercial service airports.

The alternative of relocating Taxiway F in conjunction with the replacement ATCT has also been evaluated as shown on **Exhibit F6**. This increases the developable acreage to approximately 11 acres, with 20- to 30-foot allowable height, and approximately 40 acres with more than 30-foot allowable height. A portion of this area is still under existing development and within the drainage swale. Relocating Taxiway F does not change the allowable height over the existing transient apron making it unusable except by smaller piston aircraft.

Because a north replacement ATCT creates the need to replace the existing transient apron, it is recommended that any alternative where general aviation terminal facilities remain within the existing terminal area include the relocation of Taxiway F to maximize the potential developable area.

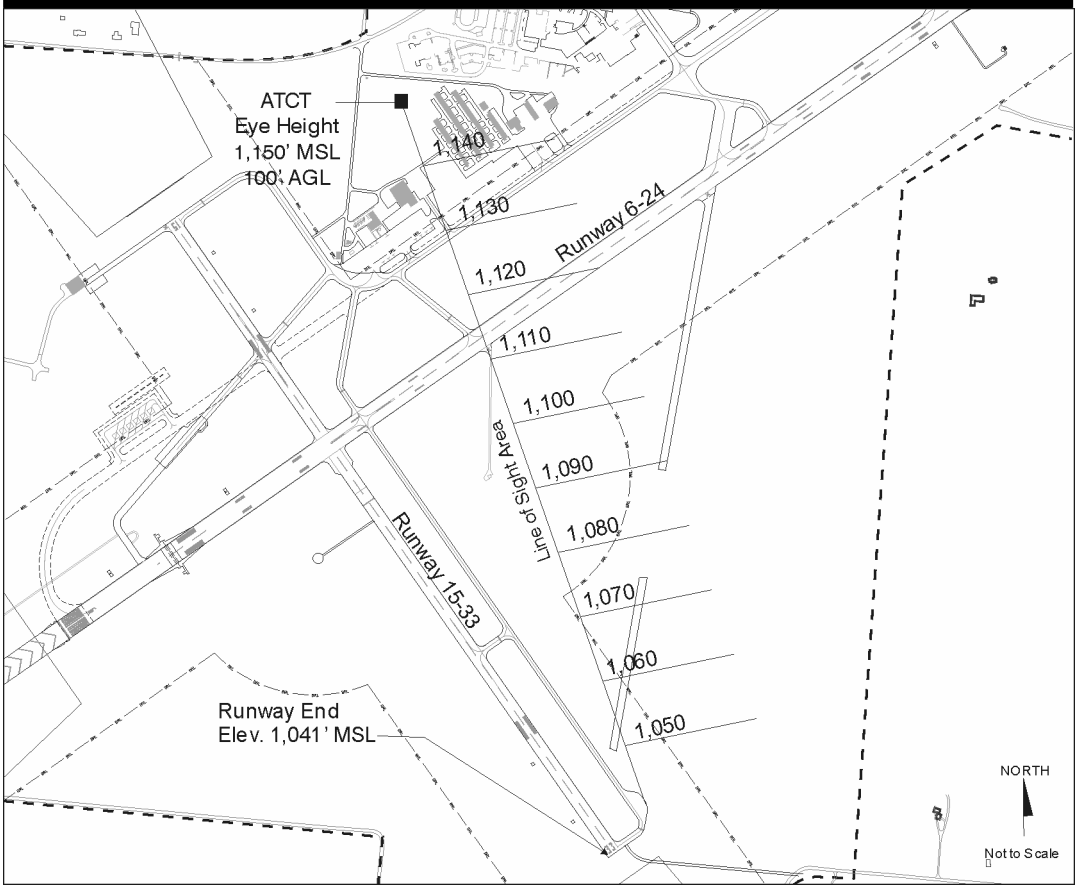
EXHIBIT F6
NORTH REPLACEMENT ATCT ALLOWABLE HEIGHT WITH TAXIWAY F RELOCATED



Source: Aerofinity, Inc., 2003.

Similar to the existing ATCT, this replacement tower would have less impact on development on the south side of Runway 6-24. The controllers would have a clear view of most of the controlled airfield area in front of the potential development area. With the replacement ATCT, the line-of-sight to the south end of Taxiway E would be virtually entirely with the existing required RVZ and TACAN clear area, thus, having no impact on the available development area, as shown on **Exhibit F7**.

EXHIBIT F7
NORTH REPLACEMENT ATCT LINE-OF-SIGHT SOUTH OF RUNWAY 6-24

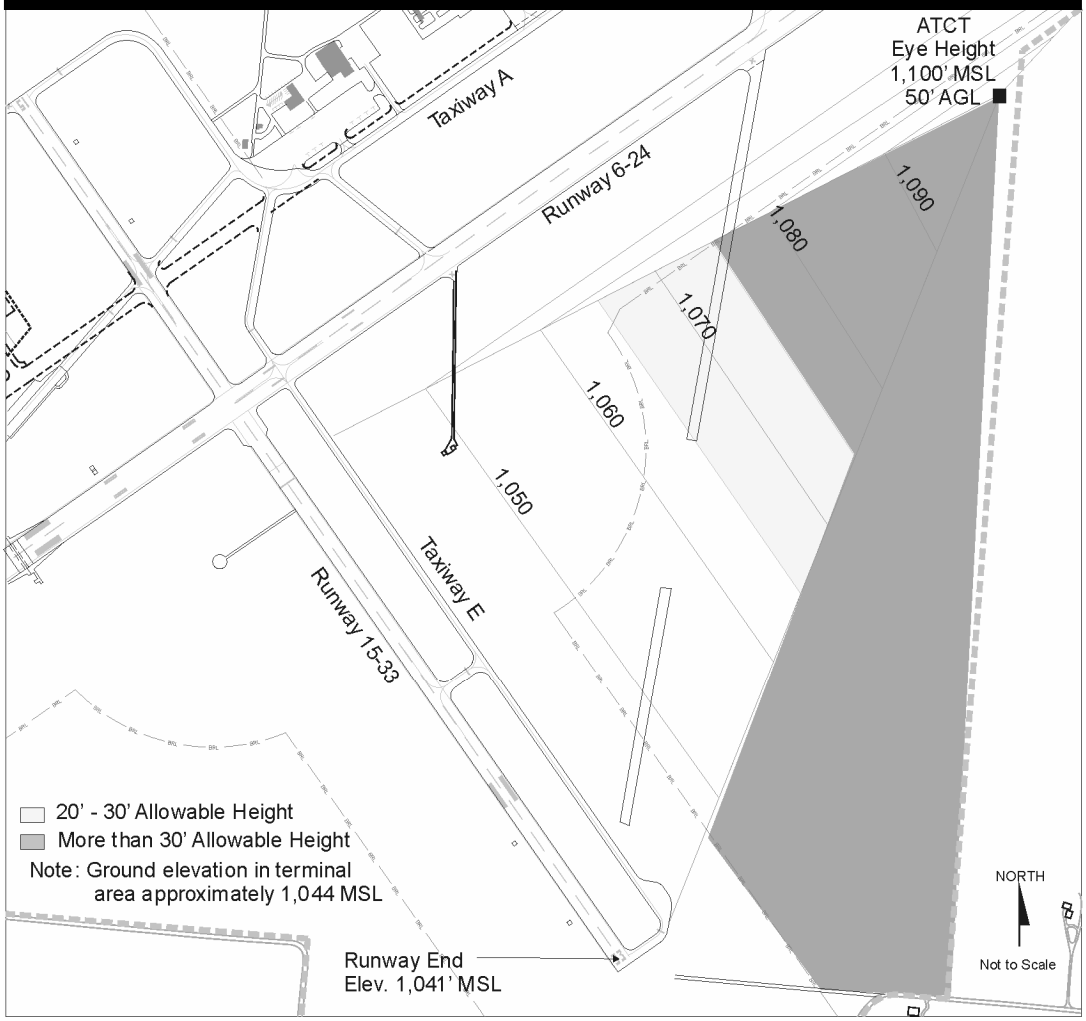


Source: Aerofinity, Inc., 2003.

Southeast ATCT Site

With general aviation facilities commonly at least 30 feet tall, it is anticipated that any replacement ATCT should be at least as tall as the existing ATCT (approximately 50-foot eye height of the controller in the ATCT) so the controllers could see over other facilities that may be developed. In this scenario, the ATCT is located near the east end of the existing airport property to minimize the infrastructure development costs. As shown on **Exhibit F8**, in this location a clear view from the ATCT to Taxiway E limits the available development area to approximately 24 acres with approximately 20- to 30-foot allowable height and 106 acres with more than 30-foot allowable height, all set well back from the runway environment.

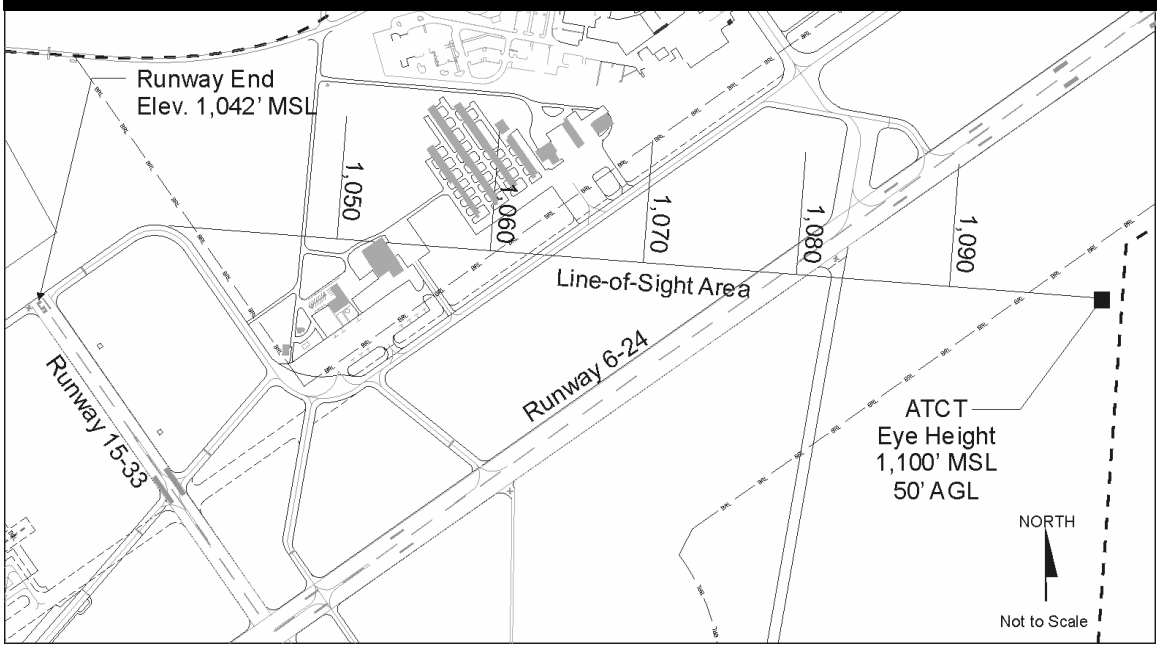
EXHIBIT F8
SOUTHEAST ATCT ALLOWABLE HEIGHT



Source: Aerofinity, Inc., 2003.

This ATCT location would also impact the existing general aviation terminal area. Without increasing the height of the replacement ATCT, the existing terminal building and Maintenance Hangar #2 would cause shadows within the line-of-sight as shown on **Exhibit F9**. Therefore, this is not a viable location for a replacement ATCT.

EXHIBIT F9
SOUTHEAST ATCT LINE-OF-SIGHT NORTH OF RUNWAY 6-24



Source: Aerofinity, Inc., 2003.

Southwest ATCT Site

This ATCT could also be located on the south side of Runway 6-24, but closer to midfield. As shown on **Exhibit F10**, this location increases the potential developable area south of Runway 6-24, but it also increases the replacement ATCT's distance from existing roadways and utilities. With an ATCT south of Runway 6-24 near midfield, line-of-sight would be less of an issue for development on the north side of Runway 6-24, with most of the development beyond the controlled portion of the airfield, as shown on **Exhibit F11**. A portion of the transient apron would be unusable with the existing location of Taxiway F. However, if Taxiway F were relocated to provide 300-foot runway centerline to taxiway centerline separation, all of the transient apron should remain usable with a southwest replacement ATCT, as also shown on Exhibit F11.

EXHIBIT F10
SOUTHWEST ATCT ALLOWABLE HEIGHT

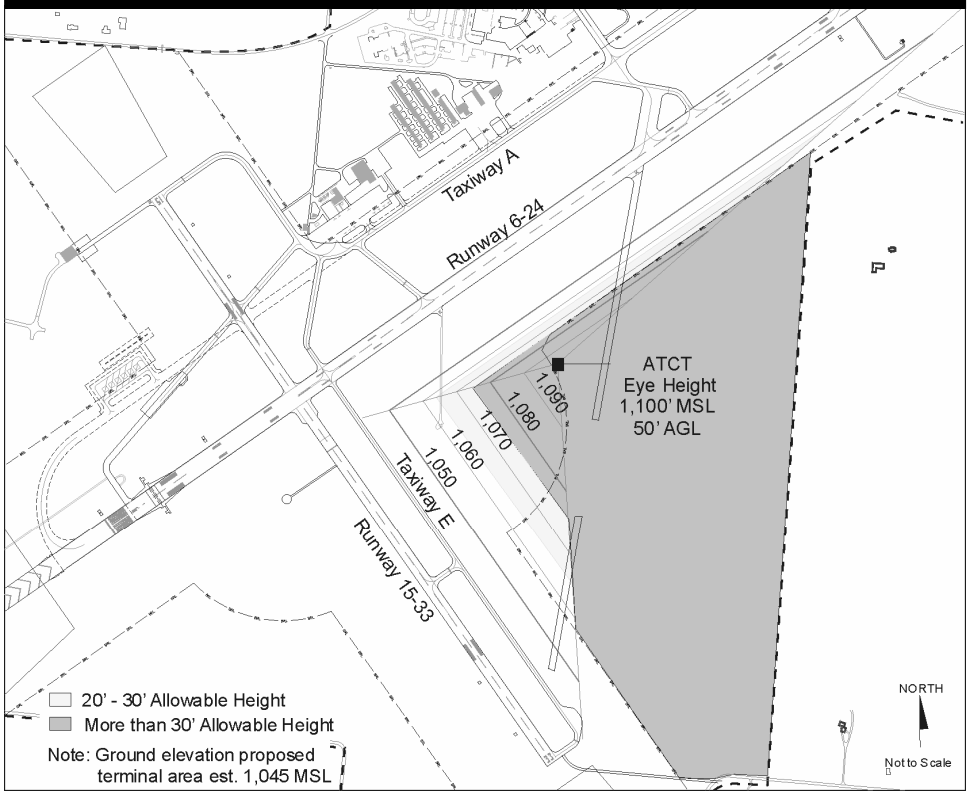
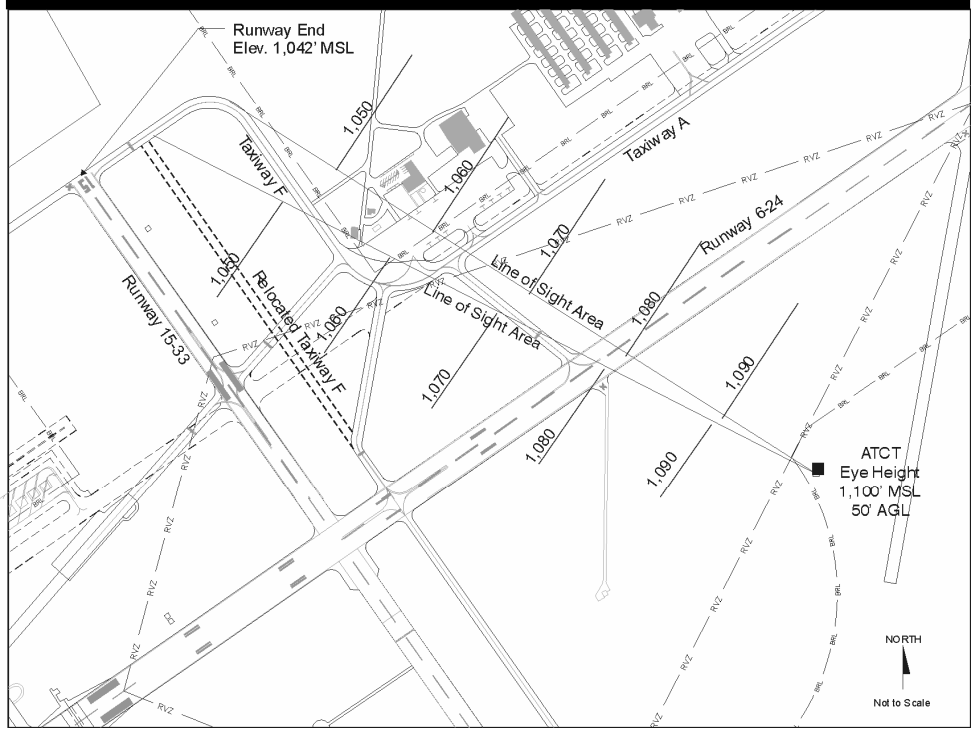


EXHIBIT F11
SOUTHWEST ATCT LINE-OF-SIGHT NORTH OF RUNWAY 6-24

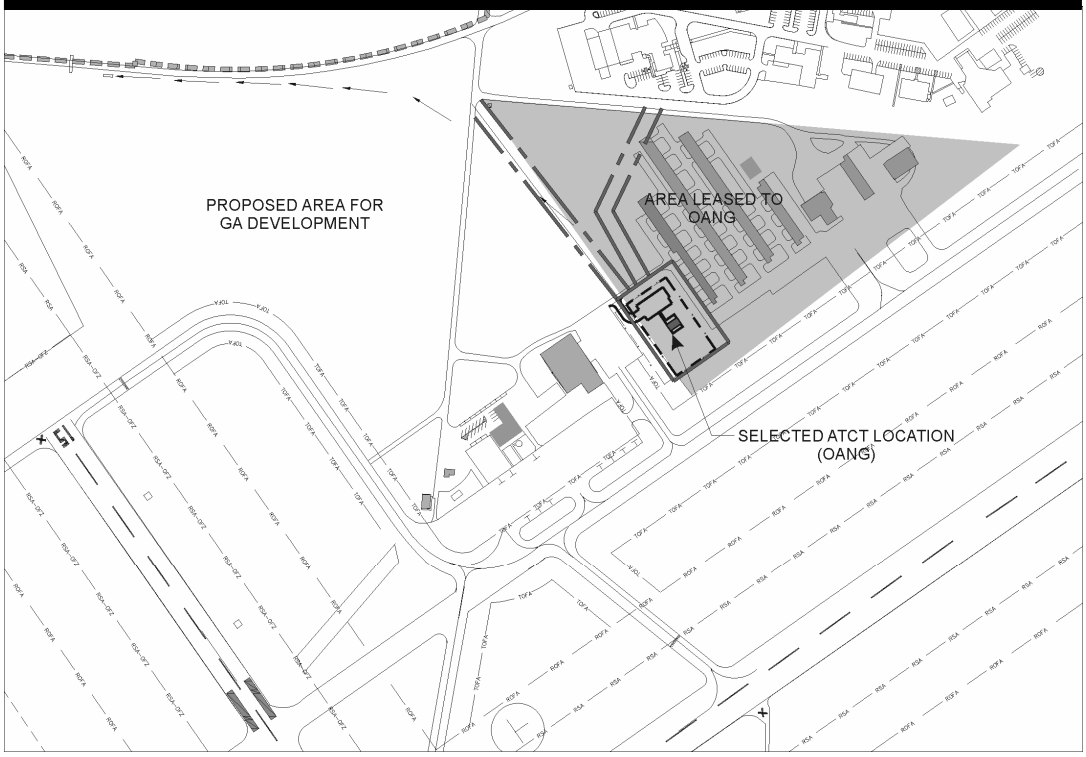


Source: Aerofinity, Inc., 2003.

ATCT SITE SELECTED

Subsequent to the preceding analysis in this Appendix, the OANG conducted additional ATCT siting analysis and in coordination with the City, selected a new preferred ATCT site. The new ATCT will be located between the Maintenance Hangar #2 and its apron and the existing t-hangars, as shown in **Exhibit F12**. Initially, only the ATCT site will be leased to the OANG. As the t-hangars, Maintenance Hangar #1, and Egairo hangar are relocated from the existing t-hangar area, those sites will then be leased to the OANG. This ultimately results in the ATCT site being within the continuous OANG leasehold.

EXHIBIT F12
SELECTED OANG ATCT SITE



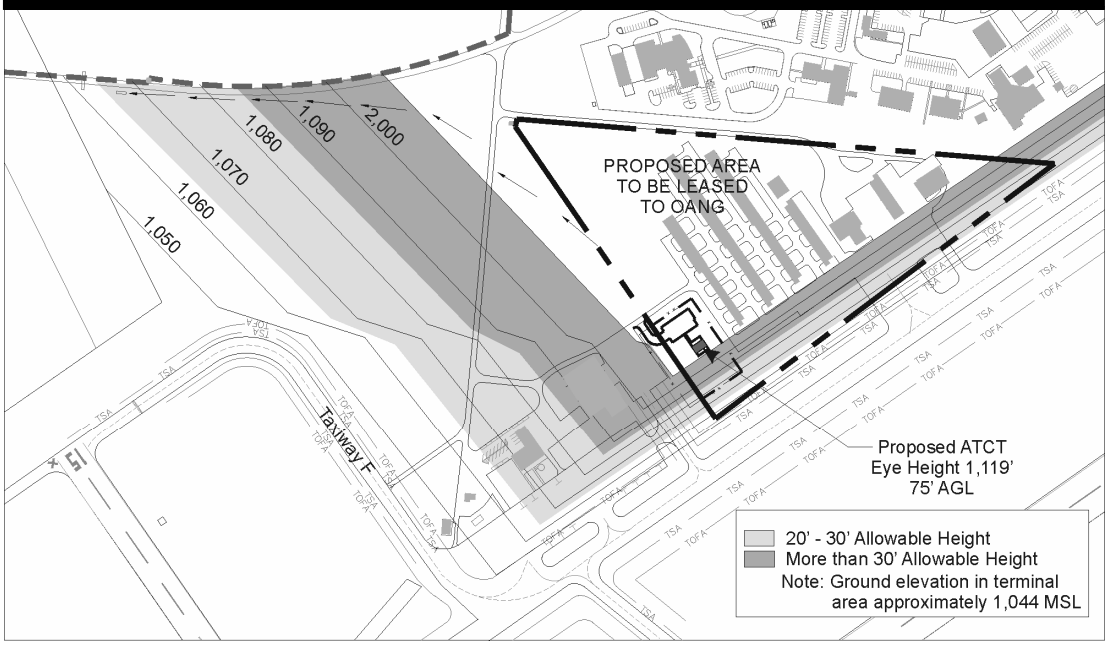
Source: Aerofinity, Inc., 2004.

The new ATCT line-of-sight has been reviewed from a general aviation development perspective. The most restrictive line-of-sight is to the ground of the Taxiway F safety area and to the approach to Runway 15. Although the facility requirements analysis of the master plan did not recommend a precision approach to Runway 15, to allow maximum flexibility for the airport, a precision approach surface has been used to identify areas available for general aviation development. There is minimal difference between the nonprecision approach and precision approach because the inner width of 1,000 feet closest to the runway end is set by the proposed precision approach to Runway 33.

Information from the OANG's preliminary engineering process has identified the proposed finished building floor elevation of the ATCT to be 1,045 MSL (mean sea level), with the cab floor of the ATCT 69 +/- feet above the building floor (AGL – above ground level). The FAA suggests using 5 feet above the cab floor elevation as an estimate of the controller eye height, resulting in a controller eye height of 1,119 feet MSL (1,045' MSL+69' AGL+5' AGL=1,119' MSL) for purposes of this line-of-sight analysis.

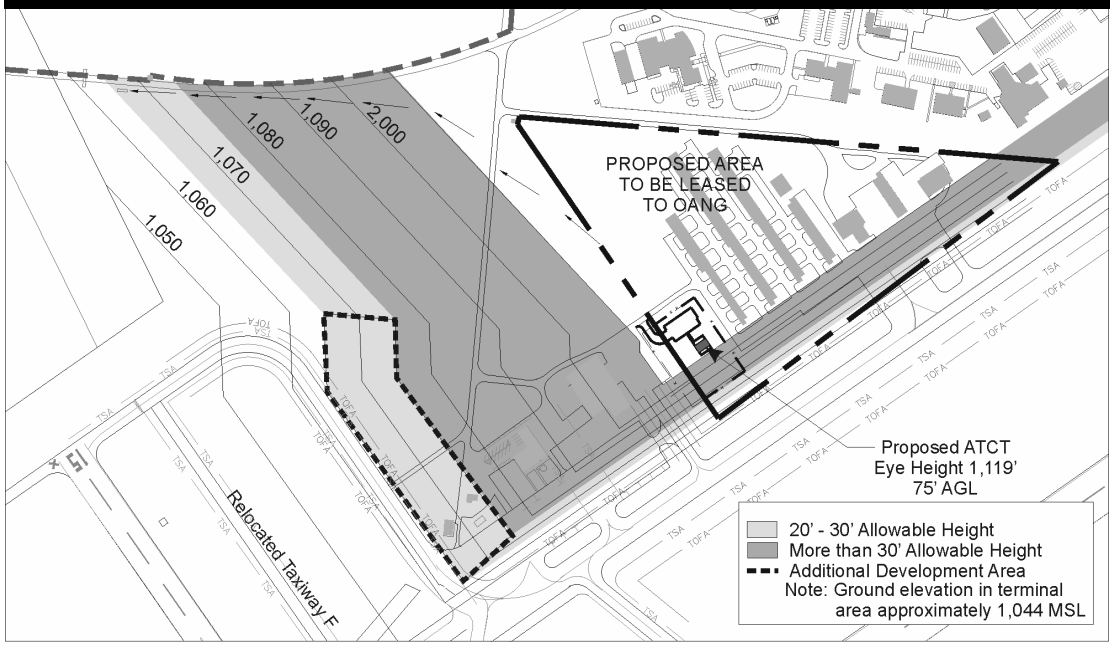
Exhibit F13 shows the allowable height for objects, buildings or aircraft tails in the general aviation expansion area with Taxiway F in its present location. However, Taxiway F could also be relocated from its existing 725-foot centerline to centerline separation from Runway 15-33, to a 300-foot centerline to centerline separation. As shown on **Exhibit F14**, this opens up approximately four acres of additional development area with usable allowable height (20 feet or more). This increase is less than when the ATCT was proposed north of the existing t-hangars because more of the allowable height is dictated by the need to see the approach, which does not change with the relocation of Taxiway F. However, its relocation still maximizes the potential development area and also provides a space for additional apron area to be developed adjacent to the existing apron.

EXHIBIT F13
SELECTED ATCT LINE-OF-SIGHT



Source: Aerofinity, Inc., 2004.

EXHIBIT F14
SELECTED ATCT LINE-OF-SIGHT WITH TAXIWAY F RELOCATED



Source: Aerofinity, Inc., 2004.

SUMMARY

The review of ATCT line-of-sight issues identified four key findings that will be incorporated into the review of potential general aviation terminal area layouts.

- A replacement ATCT is needed to allow additional substantial development in the existing terminal area. With a replacement ATCT, relocating Taxiway F should also be included in any further development in the existing terminal area to maximize the developable area.
- A north replacement ATCT would provide reasonable allowable heights within the existing terminal area providing it has at least a 100-foot eye height and Taxiway F is relocated. However, it would essentially necessitate the development of a replacement transient apron.
- Any replacement ATCT on the south side of Runway 6-24 should be located near the runway intersection to maximize the available development area on both the north and south side of Runway 6-24.
- The development of general aviation facilities on the south side of Runway 6-24 could be compatible with the existing ATCT, a north replacement ATCT or a southwest replacement ATCT.