
FACILITY NEEDS EVALUATION



Master Plan Feasibility and Alternate Site Selection Study Angwin Airport/Parrett Field

CHAPTER THREE

Facility Needs Evaluation

To properly plan for the future of Angwin Airport, it was necessary to translate forecast aviation demand into the specific types and quantities of facilities that adequately serve the identified demand. This chapter used the results of the forecasts conducted in Chapter Two, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, general aviation terminal building, aircraft parking apron) facility requirements.

The objective of this effort was to identify, in general terms, the adequacy of the existing airport facilities, outline what new facilities may be needed, and when these may be needed to accommodate forecast demands.

The cost-effective, efficient, and orderly development of an airport should rely more upon actual demand at an airport than on a time-based forecast figure. In order to develop a plan that is demand-based rather than time-based, a series of planning horizon milestones were established for Angwin Airport that take into consideration the reasonable range of aviation demand projections prepared in Chapter Two. It is important to consider that the actual activity at the airport may be higher or lower than projected activity levels. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand.

The most important reason for utilizing milestones is that they allow the airport to develop facilities according



to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to actual demand at any given time over the plan-

ning period. The resultant plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the planning horizon milestones for each activity demand category.

| TABLE 3A Planning Horizon Activity Levels Angwin Airport | | | | |
|---|--------------|-----------------------|------------------------------|----------------------|
| | 2008 | Short Term | Intermediate Term | Long Term |
| <i>OPERATIONS</i> | | | | |
| Local | 8,250 | 8,600 | 9,400 | 10,500 |
| <u>Itinerant</u> | <u>2,750</u> | <u>2,900</u> | <u>3,100</u> | <u>3,500</u> |
| Total | 11,000 | 11,500 | 12,500 | 14,000 |
| Based Aircraft | 43 | 45 | 49 | 55 |

In the following chapter, existing components of the airport were evaluated so that the capacities of the overall system could be identified. Once identified, the existing capacity was compared to the planning horizon milestones to determine where deficiencies currently exist or may be expected to materialize in the future. Once deficiencies in a component were identified, a more specific determination of the appropriate sizing and timing of the new facilities was made.

AIRFIELD REQUIREMENTS

Airfield requirements include the need for those facilities related to the arrival and departure of aircraft. The adequacy of existing airfield facilities at Angwin Airport has been analyzed from a number of perspectives, including airfield capacity, runway length, runway pavement strength, airfield lighting, navigational aids, and pavement markings.

AIRFIELD DESIGN STANDARDS

The selection of appropriate Federal Aviation Administration (FAA) design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using or are expected to use the airport. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. These standards must be determined now, since the relocation of these facilities will likely be extremely expensive at a later date.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This code, the airport reference code (ARC), has two components. The first component, depicted by a letter, is the aircraft approach speed (operational characteristic). The second

component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while aircraft wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more, but less than 121 knots.

Category C: Speed 121 knots or more, but less than 141 knots.

Category D: Speed 141 knots or more, but less than 166 knots.

Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan and tail height. The six ADGs used in airport planning are as follows:

Group I: Up to but not including 49 feet wingspan or tail height up to but not including 20 feet.

Group II: 49 feet up to but not including 79 feet wingspan or tail height

from 20 up to but not including 30 feet.

Group III: 79 feet up to but not including 118 feet wingspan or tail height from 30 up to but not including 45 feet.

Group IV: 118 feet up to but not including 171 feet wingspan or tail height from 45 up to but not including 60 feet.

Group V: 171 feet up to but not including 214 feet wingspan or tail height from 60 up to but not including 66 feet.

Group VI: 214 feet up to but not including 262 feet wingspan or tail height from 66 up to but not including 80 feet.

In order to determine facility requirements, an ARC should first be determined, and then appropriate airport design criteria can be applied. This begins with a review of the type of aircraft using and expected to use Angwin Airport. **Exhibit 3A** provides a listing of typical aircraft and their associated ARC.

The FAA recommends designing airport functional elements to meet the requirements of the most demanding ARC for that airport (minimum of 500 annual itinerant operations). Angwin Airport currently accommodates a wide variety of civilian aircraft, including small single and multi-engine aircraft which fall within approach categories A and B and airplane design groups I and II. No single air-

craft contributes 500 annual operations at Angwin Airport. Rather, a combination of aircraft in ARCs A-I (Beech Bonanza, Cessna 172, Eclipse 500, Piper Seneca) and B-I (Cessna 421, Piper Navajo, Cessna Citation 1) define the critical aircraft for the airport. While aircraft within the higher ARCs may occasionally use the airport, they are not expected to contribute more than 500 annual itinerant operations.

Therefore, the existing ARC for Angwin Airport is A-I (small aircraft exclusively). The forecasts anticipate increasing utilization by small single engine and multi-engine aircraft throughout the planning period. The potential mix of aircraft in future years may place the airport in the B-II category; therefore, the dimensional standards for the B-II ARC has been discussed in the following section.

AIRPORT IMAGINARY SURFACES

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions that could affect the safe operation of aircraft. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ).

The RSA is “a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or an excursion from the runway.” An object free area

is an area on the ground centered on the runway, taxiway, or centerline, provided to enhance the safety of aircraft operations, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. An obstacle free zone is a volume of airspace that is required to be clear of objects, except for frangible items required for navigation of aircraft. It is centered along the runway and extended runway centerline. The RPZ is defined as an area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape and centered about the extended runway centerline. The dimensions of an RPZ are a function of the runway ARC and approach visibility minimums.

Table 3B summarizes the design requirements of these safety areas by airport reference code for Runway 16-34. The FAA expects these areas to be free from obstructions. The existing facility meets all of the dimensional standards; however, several of the existing hangars are located within the RPZ of Runway 34.

RUNWAYS

The adequacy of the existing runway system at Angwin Airport was analyzed from a number of perspectives, including airfield capacity, runway configuration, runway use, runway length, runway width, and pavement strength. From this information, requirements for runway improvements were determined for the airport.

A-I



- Beech Baron 55
- Beech Bonanza
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- **Eclipse 500**
- Piper Archer
- Piper Seneca

C-I, D-I



- Beech 400
- **Lear** 25, 31, **35**, 45, 55, 60
- Israeli Westwind
- HS 125-400, 700

B-I *less than 12,500 lbs.*



- Beech Baron 58
- Beech King Air 100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I

C-II, D-II



- Cessna Citation III, VI, VIII, X
- **Gulfstream II, III, IV**
- Canadair 600
- ERJ-135, 140, 145
- CRJ-200, 700, 900
- Embraer Regional Jet
- Lockheed JetStar

B-II *less than 12,500 lbs.*



- **Super King Air 200**
- Cessna 441
- DHC Twin Otter

C-III, D-III



- ERJ-170, 190
- Boeing Business Jet
- B 727-200
- **B 737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

B-I, B-II *over 12,500 lbs.*



- Super King Air 350
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation II, III, IV, V**
- Saab 340
- Embraer 120

C-IV, D-IV



- **B-757**
- B-767
- C-130
- DC-8-70
- DC-10
- MD-11
- L1011

A-III, B-III



- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

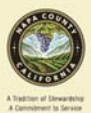
D-V



- **B-747 Series**
- B-777

Note: Aircraft pictured is identified in bold type.

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Exhibit 3A
AIRPORT
REFERENCE CODES

| TABLE 3B Airfield Safety Area Dimensional Standards (feet) Angwin Airport | | |
|--|---|-------------|
| | ARC A-I Standards (Small Aircraft Exclusively) | B-II |
| Runway Safety Area (RSA) | | |
| Width | 120 | 150 |
| Length Prior to Landing Threshold | 240 | 300 |
| Length Beyond Runway End (or stopway) | 240 | 300 |
| Runway Object Free Area (OFA) | | |
| Width | 250 | 500 |
| Length Beyond Runway End (or stopway) | 240 | 300 |
| Runway Obstacle Free Zone (OFZ) | | |
| Width | 250 (> 50 knots) | 400 |
| Length Beyond Runway End (or stopway) | 200 | 200 |
| Runway Protection Zone (RPZ) | | |
| Inner Width | 250 | 500 |
| Outer Width | 450 | 700 |
| Length | 1,000 | 1,000 |
| Source: FAA Advisory Circular 150/5300-13. | | |

Airfield Capacity

Annual capacity of a single runway configuration normally exceeds 150,000 operations (with a suitable parallel taxiway available). Since the forecasts for Angwin Airport are well below this threshold, the capacity of the existing runway and taxiway system will not be reached and the airfield will be able to meet operational demands.

Runway Configuration

Angwin Airport is served by a single runway, which is oriented in a north-south direction and measures 3,217 feet in length by 50 feet in width. Runway 16-34 is constructed of as-

phalt and a 1,500-foot overrun is located at the south end of the runway.

Runway Use/Orientation

Runway use is normally dictated by wind conditions. The direction of take-offs and landings are generally determined by the speed and direction of the wind. For the operational safety and efficiency of an airport, it is desirable for the principal runway of an airport's runway system to be oriented as close as possible to the direction of the prevailing wind. This reduces the impact of crosswind components during landing or takeoff. Since local observations are not available for the site, it will be assumed that the single runway provides adequate wind coverage.

Runway Length

The runway length requirements for an airport are based on five primary factors: airport elevation, mean maximum temperature of the hottest month, runway gradient (difference in runway elevation of each runway end), critical aircraft type expected to use the airport, and stage length of the longest nonstop trip destination.

Aircraft performance declines as each of these factors increase. Summertime temperatures and stage lengths are the primary factors in determining runway length requirements. For calculating runway length requirements at the airport, the airport elevation is 1,848 feet above mean sea level (MSL) and the mean maximum temperature of the hottest month is 86.3 degrees Fahrenheit (F). Runway end elevations vary by approximately 25 feet,

which results in a longitudinal gradient of 0.8 percent. This conforms to FAA design standards, which specify the longitudinal gradient for aircraft in approach categories A and B cannot exceed two percent.

FAA Advisory Circular 1505325-4B, *Runway Length Requirements for Airport Design*, provides guidelines to determine runway lengths for civil airports. Utilizing this methodology, **Table 3C** outlines the runway length requirements for various classifications of aircraft that operate at Angwin Airport. The largest aircraft based at the airport (KingAir) falls in the “small airplanes with 10 or more passenger seats” category. As with other design criteria, runway length requirements are based upon the critical design aircraft or grouping of aircraft performing 500 annual operations at the airport.

| TABLE 3C | |
|---|------------|
| Runway Length Requirements | |
| Angwin Airport | |
| AIRPORT AND RUNWAY DATA | |
| Airport elevation | 1,848 feet |
| Mean daily maximum temperature of the hottest month | 86.3° F |
| Maximum difference in runway centerline elevation..... | 25 feet |
| Length of haul for airplanes of more than 60,000 pounds | 500 miles |
| RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN | |
| Small airplanes with less than 10 passenger seats | |
| 95 percent of these small airplanes (A-I and B-I ARC)..... | 3,700 feet |
| 100 percent of these small airplanes (B-II ARC)..... | 4,300 feet |
| Small airplanes with 10 or more passenger seats (B-II+)..... | 4,600 feet |
| Reference: FAA Advisory Circular 150/5325-4B. | |

As previously mentioned, the current critical aircraft using the airport falls in ARC A-I, small aircraft exclusively. Based upon the FAA’s requirements, Runway 16-34’s current length of

3,217 feet accommodates less than 100 percent of all small airplanes (less than 12,500 pounds) with less than 10 passenger seats. This should be adequate for the current mix of aircraft

currently operating at Angwin Airport, although a longer runway would serve 100 percent of the small aircraft. It is important to note that some aircraft may experience payload and/or fuel limitations when attempting longer stage lengths during the warmest summer days.

Runway Width

The width of each of the existing runways was also examined to determine the need for facility improvements. Currently, Runway 16-34 has a width of 50 feet, which falls short of the 60-foot design standard for ARC A-I facilities (for visual runways) serving small airplanes exclusively. Upgrading to a B-II standard will require widening to 75 feet.

Runway Pavement Strength

The most important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. The current strength rating on Runway 16-34 is 12,500 pounds single wheel gear loading (SWL). This strength rating is adequate for all aircraft currently serving the airport or expected to serve the airport in the future.

It should be noted that the pavement strength rating is not the maximum weight limit. Aircraft weighing more than the certified strength can operate on the runway on an infrequent basis. However, heavy aircraft operations can shorten the life span of airport pavements.

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and the runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

Runway 16-34 is not served by a parallel taxiway. However, a turnaround is available at the north end of the runway. The construction of a parallel taxiway is recommended at Angwin Airport. This would improve airfield safety. According to FAA design standards, the minimum taxiway width for ADG I is 25 feet and an upgrade to ADG II would require a 35-foot width.

The runway-taxiway separation distance was also examined. This distance is such to satisfy the requirement that no part of an aircraft (tail tip, wing tip) on the taxiway/taxilane centerline is within the runway safety area or penetrates the obstacle free zone (OFZ). FAA design standards require a 150-foot separation distance between the runway centerline and the proposed taxiway centerline for ADG I and 240 feet for ADG II.

NAVIGATIONAL AND APPROACH AIDS

Airport navigational aids, or NAVAIDS, provide electronic navigational assistance to aircraft for approaches to an airport. NAVAIDS are

either visual approach aids or instrument approach aids, the former providing a visual navigational tool, and the latter being an instrument-based navigational tool. The types of approaches available at an airport are based on the NAVAIDS that are provided.

Angwin Airport does not currently have any navigational or approach aids. While pilots flying into or out of Angwin Airport can utilize several navigational aids in the vicinity of the airport, an ARC A-I or B-II facility may consider non-precision approach on Runway 16, consistent with current GPS technology (although visibility minimums would likely remain greater than one mile).

AIRFIELD LIGHTING AND MARKING

Airports commonly include a variety of lighting and pavement markings to assist pilots utilizing the airport. These lighting systems and marking aids are used to assist pilots in locating the airport during the day, at night, during poor weather conditions, and assisting in the ground movement of aircraft.

Airport Identification Lighting

The location of the airport at night is universally indicated by a rotating beacon. For civil airports, a rotating beacon projects two beams of light, one white and one green, 180 degrees apart. Angwin Airport does not currently have a beacon, but should con-

sider adding one, as it would enhance the safety of operations at the airport.

Runway and Taxiway Lighting

Runway edge lighting provides the pilot with a rapid and positive identification of the runway and its alignment. Runway 16-34 is equipped with low intensity runway lighting (LIRL). Upgrading to medium intensity taxiway lighting (MITL) is recommended if the airport upgrades to the B-II category.

Visual Approach Lighting

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. Currently, both ends of Runway 16-34 are served by a tri-color visual approach slope indicator (VASI). As most airports are replacing older VASIs with precision approach path indicator (PAPIs), consideration should be given to replacing the existing VASIs with PAPIs, which are less costly to maintain and operate.

Pilot-Controlled Lighting

Angwin Airport is equipped with pilot-controlled lighting (PCL). PCL allows pilots to control the intensity of the runway and taxiway lighting using the radio transmitter in the aircraft, as well as providing a more efficient

use of energy. This system should be maintained throughout the planning period.

Pavement Markings

Runway markings are designed according to the type of instrument approach available on the runway. FAA Advisory Circular 150/5340-1J, *Marking of Paved Areas on Airports*, provides the guidance necessary to design airport markings. The basic markings on Runway 16-34 identify the runway centerline and runway designation. These markings are adequate for existing operations and if a non-precision circling approach were added.

Taxiway and apron areas also require marking. A circular yellow taxi line is located adjacent to the Runway 34 threshold. The paved aircraft parking aprons also have centerline markings to indicate the alignment of taxilanes within these areas. Besides routine maintenance of the taxiway striping, these markings will be sufficient through the planning period.

WEATHER REPORTING

Angwin Airport is equipped with a lighted wind cone and a segmented circle, which provides pilots with information about wind conditions and local traffic patterns. A summary of the airside requirements for Angwin Airport is presented on **Exhibit 3B**.

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for the handling of aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs. This includes:

- General Aviation Terminal
- Aircraft Hangars
- Aircraft Parking Apron
- Automobile Parking
- Airport Support Facilities

GENERAL AVIATION TERMINAL FACILITIES

General aviation terminal facilities have several functions. Space is required for a pilot's lounge, flight planning, concessions, management, storage, and various other needs. The existing terminal building, which is located on the southeast corner of the aircraft parking apron, totals approximately 2,000 square feet. This facility provides fuel service and ground transportation. The terminal building also houses the Pacific Union College Flight Center, which conducts extensive flight training. Public bathrooms, as well as a shower, are also available in the terminal building.

The methodology used in estimating general aviation terminal facility

needs is based on the number of airport users expected to utilize general aviation facilities during the design hour. General aviation space requirements were based upon providing 120 square feet per design hour itinerant passenger. Design hour itinerant passengers are determined by multi-

plying design hour itinerant operations by the number of passengers on the aircraft (multiplier). As shown in **Table 3D**, the existing terminal building should satisfy projected demand through the end of the planning period.

| TABLE 3D General Aviation Terminal Building Angwin Airport | | | | |
|---|----------------------------|------------------------|-------------------------------|-----------------------|
| | Currently Available | Short Term Need | Intermediate Term Need | Long Term Need |
| General Aviation Design Hour Itinerant Passengers | 7 | 8 | 9 | 14 |
| General Aviation Building Space (s.f.) | 2,000 | 900 | 1,000 | 1,700 |





AIRCRAFT HANGARS

The demand for aircraft storage hangars typically depends upon the number and type of aircraft expected to be based at the airport. For planning purposes, it is necessary to estimate hangar requirements based upon forecast operational activity. However, hangar development should be based upon actual demand trends and financial investment conditions.

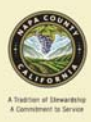
Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is toward more sophisticated (and consequently, more expensive) aircraft. Therefore, many aircraft owners prefer enclosed hangar space to outside tie-downs. This is slightly less evident at Angwin Airport, as only 57 percent of based aircraft are currently located in hangars. However, this is expected to increase

to approximately 65 percent by the end of the planning period.

Total hangar space at Angwin Airport totals approximately 77,900 square feet and is comprised of smaller executive/box hangars, T-hangars, and Port-A-Ports. Approximately 45 percent of hangared aircraft at Angwin Airport are currently stored in T-hangars/Port-A-Ports. T-hangars are individual spaces within a larger contiguous structure and allow privacy and individual access to their space. Port-A-Ports also provide individual aircraft storage, and while portable, are connected to one another. These types of hangars are used for smaller single and multi-engine aircraft storage. Current T-hangar/Port-A-Port space at Angwin Airport totals approximately 34,900 square feet. A planning standard of 1,200 square feet per based aircraft has been used to determine future T-hangar/Port-A Port requirements.

| | Existing Facility | Short Term Need | Long Term Need |
|--|---|--|---|
| RUNWAYS  | <u>Runway 16-34</u> 3,217' x 50' ARC A-I (small aircraft exclusively) | <u>Runway 16-34</u> 3,700 x 60' Same | <u>Runway 16-34</u> 4,600' x 75' ARC B-II |
| TAXIWAYS  | Connecting Taxiways (25' width) | Same | Connecting and Parallel Taxiways (35' width) |
| NAVIGATIONAL AIDS  | Tri-color VASI | Upgrade to PAPI-4 | Add:GPS (Runway 16) |
| LIGHTING & MARKING  | Segmented Circle Wind Cones Low Intensity Runway Lighting | Same Same Same | Same Same Medium Intensity Runway Lighting Airport Beacon |

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The remaining 55 percent of hangared aircraft at Angwin Airport are stored in executive/box hangars. These types of hangars are designed for multiple aircraft storage and are usually less than 10,000 square feet. They are open space facilities with no supporting structure interference. Current executive/box hangar space at Angwin Airport totals approximately 43,000 square feet.

As the trend towards more sophisticated aircraft continues throughout the planning period, it is important to determine the need for more executive/conventional hangars. For executive/conventional hangars, a planning standard of 1,200 square feet was used for single-engine aircraft, while a planning standard of 3,000 square feet was used for multi-engine, jet, and helicopters. These planning standards recognize that some of the larger business jets require a greater amount of space.

Since portions of conventional hangars are also used for aircraft maintenance and servicing, requirements for a maintenance/service hangar area were estimated using a planning standard of approximately 15 percent of the total hangar space needs.

Future hangar requirements for the airport are summarized in **Table 3E**. As shown in the table, additional hangar area could be supported in the long term. It should also be noted that several of the existing hangars are located within the runway protection zone (RPZ). The following chapter will examine the options available for relocating the hangars currently located in the RPZ, as well as new hangar development at the airport and determine the best location for each type of hangar facility.

| | Future Requirements | | | |
|----------------------------------|----------------------------|------------------------|-------------------------------|-----------------------|
| | Currently Available | Short Term Need | Intermediate Term Need | Long Term Need |
| Aircraft to be Hangared | 25 | 30 | 34 | 46 |
| Single Engine Positions | 22 | 25 | 27 | 33 |
| Multi-Engine Positions | 3 | 5 | 7 | 13 |
| T-Hangar/Port-A-Port Hangar Area | 34,900 | 16,100 | 18,500 | 24,700 |
| Executive/Box Hangar Area | 43,000 | 27,600 | 31,800 | 48,000 |
| Total Maintenance Area | N/A | 6,600 | 7,600 | 10,900 |
| Total Hangar Area (s.f.) | 77,900 | 50,300 | 57,900 | 83,600 |

AIRCRAFT PARKING APRON

A parking apron should provide for the number of locally based aircraft that are not stored in hangars and for

those aircraft used for air taxi and training activity. Parking should be provided for itinerant aircraft as well. As mentioned in the previous section, approximately 57 percent of based air-

craft at Angwin Airport are currently stored in hangars, and that percentage is expected to increase to 65 percent by the end of the planning period.

The aircraft parking apron at Angwin Airport is located adjacent to the south end of the runway. This apron totals approximately 11,000 square yards, with a portion of it (approximately 3,600 square yards) being turf. There are 17 asphalt tiedowns and 15 turf tiedowns available on this apron. These tie-downs are available for use by locally based aircraft as well as itinerant aircraft and are also available for weekly or monthly leases.

For planning purposes, 25 percent of the based aircraft total will be used to determine the parking apron requirements of local aircraft, due to some

aircraft requiring both hangar storage and parking apron space. Since the majority of locally based aircraft are stored in hangars, the area requirement for parking of locally based aircraft is smaller than for transient aircraft. Therefore, a planning criterion of 650 square yards per aircraft was used to determine the apron requirements for local aircraft.

Transient aircraft parking needs must also be considered when determining apron requirements. A planning criterion of 800 square yards was used for single and multi-engine itinerant aircraft and 1,600 square yards for itinerant jets. Total aircraft parking apron requirements are presented in **Table 3F**. As shown in the table, additional apron area could be supported by the end of the planning period.

| TABLE 3F General Aviation Aircraft Parking Apron Requirements Angwin Airport | | | | |
|---|----------------------------|-------------------|--------------------------|------------------|
| | Currently Available | Short Term | Intermediate Term | Long Term |
| Single, Multi-Engine Transient Aircraft Positions Apron Area (s.y.) | | 2 1,600 | 2 1,600 | 3 2,400 |
| Transient Jet Aircraft Positions Apron Area (s.y.) | | 1 1,600 | 1 1,600 | 1 1,600 |
| Locally-Based Aircraft Positions Apron Area (s.y.) | | 10 6,500 | 11 7,200 | 13 8,500 |
| Total Positions | 32 | 13 | 14 | 17 |
| Total Apron Area (s.y.) | 11,000 | 9,700 | 10,400 | 12,500 |

AUTOMOBILE PARKING

Automobile parking at Angwin Airport is provided east of the terminal building. Approximately 25 parking spaces are provided in this area, which totals approximately 10,200 square feet.

Future parking demands have been determined based on an evaluation of the existing airport use, as well as industry standards, which consider one-half of based aircraft at the airport will require a parking space. As

shown in **Table 3G**, additional vehicle parking area could be supported in the

short term. This will be examined further in the alternatives analysis.

| TABLE 3G Vehicle Parking Requirements Angwin Airport | | | | |
|---|----------------------------|----------------------------|-------------------------------|-----------------------|
| | Currently Available | Future Requirements | | |
| | | Short Term Need | Intermediate Term Need | Long Term Need |
| Design Hour Passengers | | 3 | 3 | 4 |
| Terminal Vehicle Spaces | | 5 | 6 | 11 |
| Parking Area (s.f.) | | 2,000 | 2,400 | 4,400 |
| General Aviation Spaces | | 24 | 26 | 31 |
| Parking Area (s.f.) | | 9,600 | 10,400 | 12,400 |
| Total Parking Spaces | 25 | 29 | 32 | 42 |
| Total Parking Area (s.f.) | 10,200 | 11,600 | 12,800 | 16,800 |

AIRPORT SUPPORT FACILITIES

Various facilities that do not logically fall within classifications of airfield, terminal building, or general aviation areas have also been identified. These other areas provide certain functions related to the overall operation of the airport and include aircraft rescue and firefighting, fuel storage, and airport maintenance facilities.

Fuel Storage

Fuel storage facilities at Angwin Airport are located on the south end of the aircraft parking apron and include a 6,000-gallon underground tank for 100LL (Avgas) fuel. Fuel storage requirements are typically based upon maintaining a two-week supply of fuel during the peak month.

Airport Maintenance/ Storage Facilities

The majority of maintenance equipment at Angwin Airport is stored in various buildings/hangars. The alternatives analysis will evaluate various locations for the development of a separate facility for airport maintenance and storage. A summary of the land-side requirements, as well as the support requirements for Angwin Airport, are presented on **Exhibit 3C**.

DEVELOPMENT ALTERNATIVES

Two development alternatives have been prepared for the existing Angwin Airport. These alternatives will provide a basis for comparative analysis with subsequent elements in the study. These two alternatives are summarized in the following paragraphs.

Alternative A, which is presented on **Exhibit 3D**, depicts an ultimate runway length of 3,700 feet to meet A-I standards. As indicated by the runway analysis completed earlier in this chapter, this length will accommodate 100 percent of small aircraft in the fleet with less than 10 passenger seats. This is achieved by shifting the Runway 34 threshold 300 feet to the south and marking the runway end at a point 483 feet from the current threshold. Several hangars will be located inside the RPZ, but outside of critical OFZ and threshold siting surfaces.

This exhibit also depicts an additional ten feet of pavement on the west side of the runway. This results in an ultimate runway width of 60 feet, which is the design standard for ARC A-I facilities serving small airplanes exclusively. A full-length parallel taxiway (25 feet wide) is also depicted on the east side of the runway (150 feet from the runway centerline), as well as several connecting taxiways. Area for potential hangar development is also depicted in the southeast corner of the airfield. A connecting taxiway will need to be constructed to access this area.

Alternative B, which is presented on **Exhibit 3E**, depicts an ultimate runway length of 4,600 feet to meet B-II standards for aircraft with greater than 10 seats. The additional runway length is achieved with pavement ex-

tension on the north end and removal of several hangars at the south end.

This exhibit depicts the addition of 25 feet of pavement to the west side of the runway, resulting in ultimate width of 75 feet, which will meet design standards. A full-length parallel taxiway (35 feet wide) is also shown on the east side of the runway (240 feet from the runway centerline), as well as several connecting taxiways. This exhibit also depicts the area for potential hangar development on the southeast corner of the airfield, which will require a connecting taxiway.

In addition to the two development alternatives, a prototype airport has also been developed. This prototype, which is presented on **Exhibit 3F**, represents a generalized airport layout that is not site-specific. This layout outlines the general property requirements necessary to meet identified airfield and general aviation needs.

The following analysis will examine the potential for alternative airport sites in the Upper Napa Valley, the benefit/cost of existing site development versus new site development, and environmental evaluations germane to new site development. The information has been used in the overall feasibility of owning and/or operating the existing airport (or developing an alternative site).

TERMINAL BUILDING REQUIREMENTS

| | Currently Available | Short Term Need | Intermediate Term Need | Long Term Need |
|---|---------------------|-----------------|------------------------|----------------|
| General Aviation Design Hour Itinerant Passengers | 7 | 8 | 9 | 14 |
| General Aviation Building Space (s.f.) | 2,000 | 900 | 1,000 | 1,700 |

HANGAR AREA REQUIREMENTS

| | | | | |
|----------------------------------|---------------|---------------|---------------|---------------|
| Aircraft to be Hangared | 25 | 30 | 34 | 46 |
| Single Engine Positions | 22 | 25 | 27 | 33 |
| Multi-Engine Positions | 3 | 5 | 7 | 13 |
| T-Hangar/Port-A-Port Hangar Area | 34,900 | 16,100 | 18,500 | 24,700 |
| Executive/Box Hangar Area | 43,000 | 27,600 | 31,800 | 48,000 |
| Total Maintenance Area | N/A | 6,600 | 7,600 | 10,900 |
| Total Hangar Area (s.f.) | 77,900 | 50,300 | 57,900 | 83,600 |

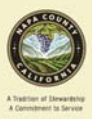
AIRCRAFT PARKING REQUIREMENTS

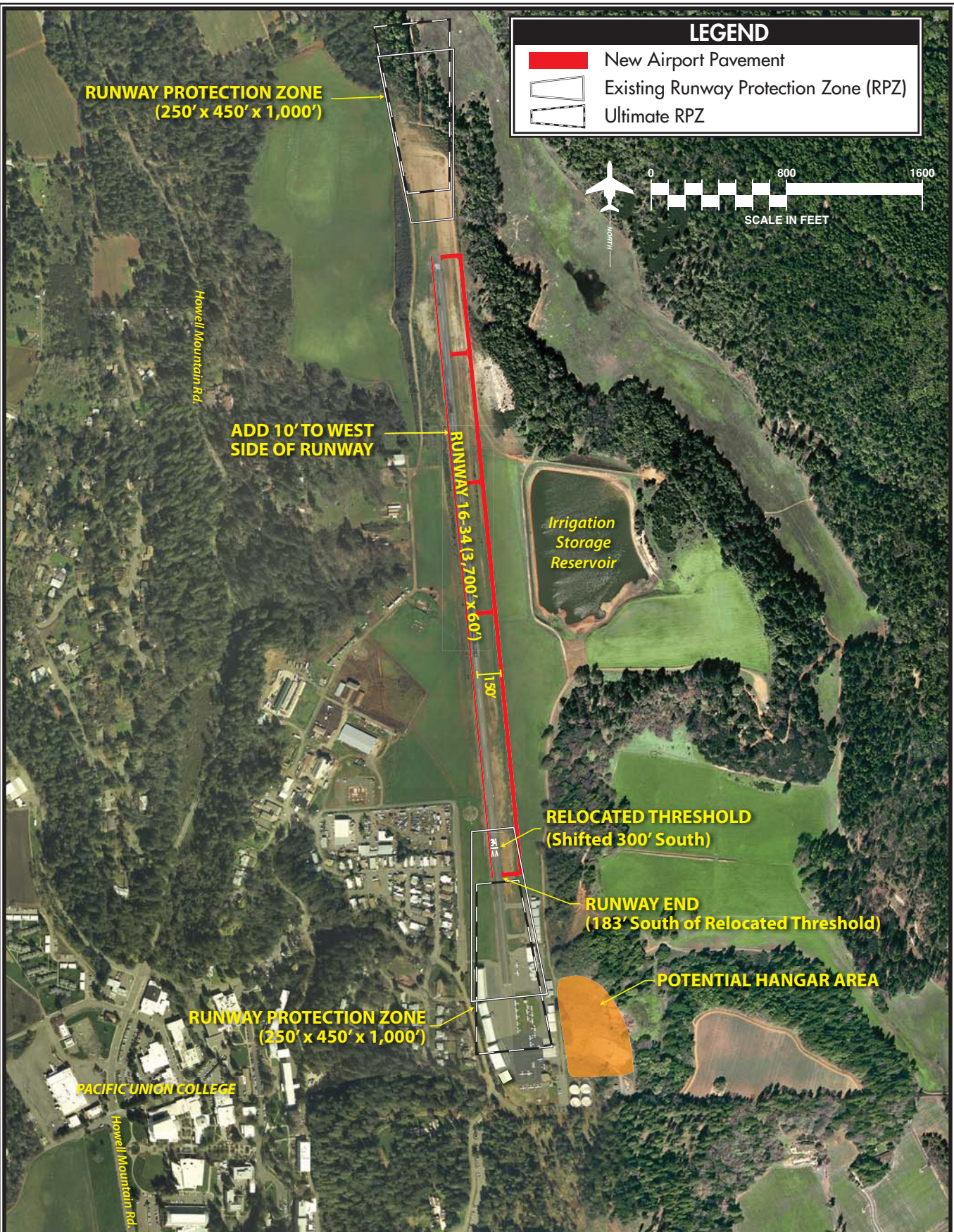
| | | | | |
|---|---------------|--------------|---------------|---------------|
| Single, Multi-Engine Transient Aircraft Positions | | 2 | 2 | 3 |
| Apron Area (s.y.) | | 1,600 | 1,600 | 2,400 |
| Transient Jet Aircraft Positions | | 1 | 1 | 1 |
| Apron Area (s.y.) | | 1,600 | 1,600 | 1,600 |
| Locally-Based Aircraft Positions | | 10 | 11 | 13 |
| Apron Area (s.y.) | | 6,500 | 7,200 | 8,500 |
| Total Positions | 32 | 13 | 14 | 17 |
| Total Apron Area (s.y.) | 11,000 | 9,700 | 10,400 | 12,500 |

VEHICLE PARKING REQUIREMENTS

| | | | | |
|----------------------------------|---------------|---------------|---------------|---------------|
| Design Hour Passengers | | 3 | 3 | 4 |
| Terminal Vehicle Spaces | | 5 | 6 | 11 |
| Parking Area (s.f.) | | 2,000 | 2,400 | 4,400 |
| General Aviation Spaces | | 24 | 26 | 31 |
| Parking Area (s.f.) | | 9,600 | 10,400 | 12,400 |
| Total Parking Spaces | 25 | 29 | 32 | 42 |
| Total Parking Area (s.f.) | 10,200 | 11,600 | 12,800 | 16,800 |

Department of Public Works



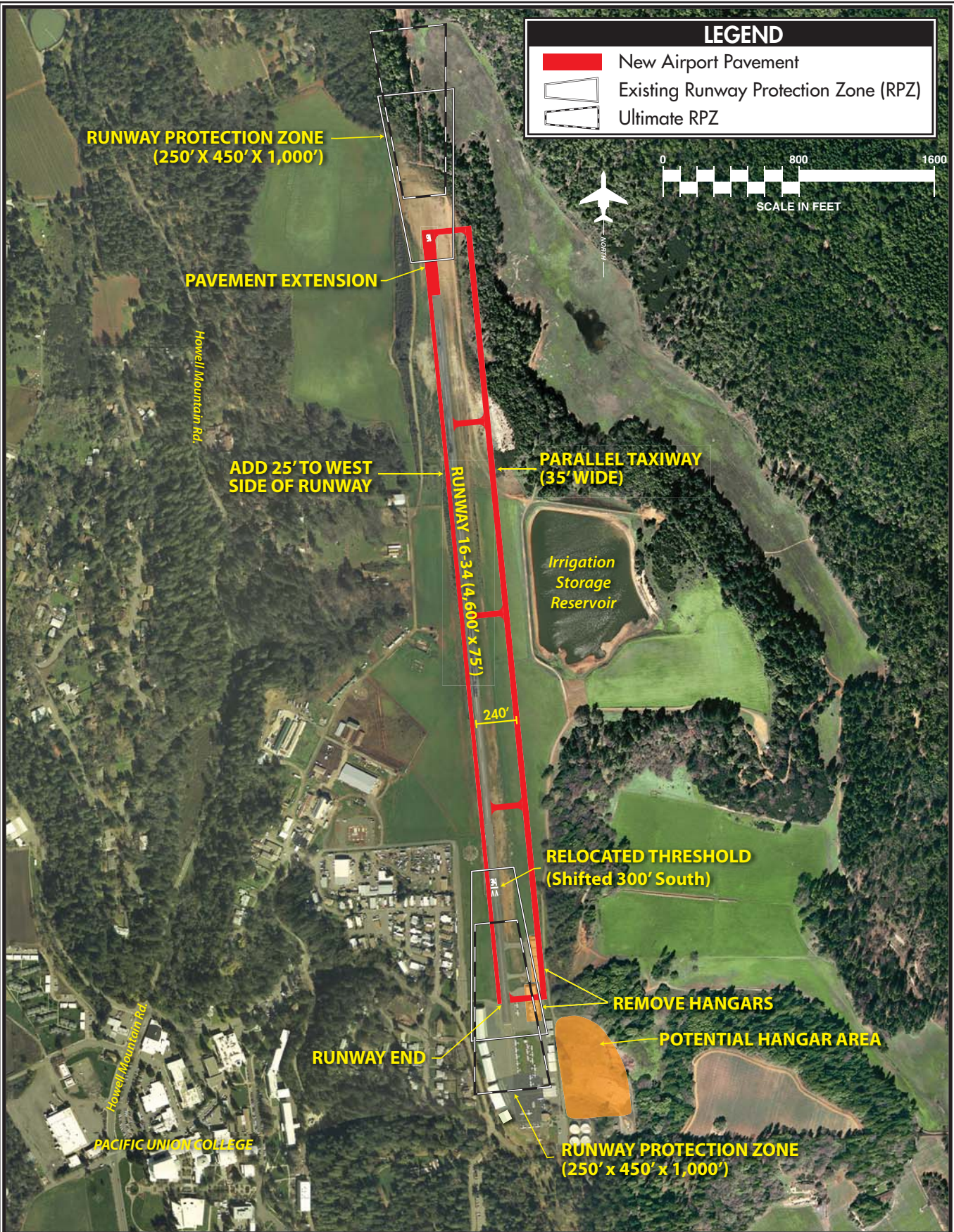


Department of Public Works



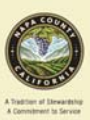
**Master Plan Feasibility
and Alternate Site Selection Study**
Angwin Airport/Parrett Field

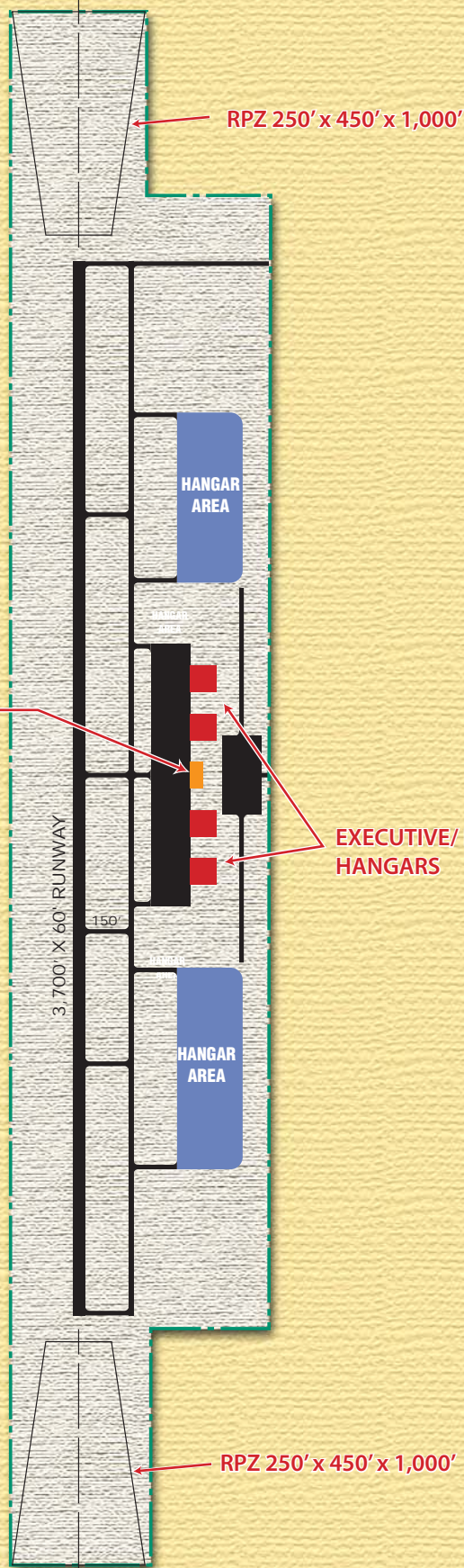
Exhibit 3D
ALTERNATIVE A



**Master Plan Feasibility
and Alternate Site Selection Study**
Angwin Airport/Parrett Field

**Exhibit 3E
ALTERNATIVE B**





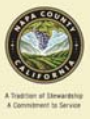
GENERAL AVIATION TERMINAL

EXECUTIVE/ BOX HANGARS

TOTAL ACREAGE:
APPROXIMATELY 90 ACRES



Department of Public Works



**Master Plan Feasibility
and Alternate Site Selection Study**
Angwin Airport/Parrett Field