Chapter Three

Facility Requirements

The objective of this section is to identify, in general terms, the adequacy of the existing facilities at the Apple Valley Airport (APV) and outline what facilities may be needed to accommodate future demands. Airport facilities include both airside and landside components. Airside components include the runway system (runways and taxiways), navigational aids, lighting, and marking. The landside e components include terminal facilities, storage and maintenance hangars, auto parking, access, and support facilities. Having established these facility needs, alternatives for providing these facilities will be evaluated in the following chapter.

Recognizing that facility needs are based upon demand (rather than a point in time), the requirements may be expressed in short-, intermediate-, and long-range planning horizons, which correlate generally to 2026, 2031, and 2041 projections as developed in the previous chapter. This chapter will examine several components of the Airport and their respective capacities to determine future facility needs over the planning period. The identified deficiencies will then be examined in the alternative's evaluation.

The facility requirements were evaluated using guidance contained in Federal Aviation Administration (FAA) publications, including:

- Advisory Circular (AC) 150/5300-13B, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B, *Runway Length Requirements for Airport Design*
- 14 Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems* (NPIAS) *and the Airports Capital Improvement Plan (ACIP)*

PLANNING HORIZONS

An updated set of aviation demand forecasts for the Airport has been established, with a summary of the primary forecasting elements presented previously on Exhibit 2D. These activity forecasts include annual operations, based aircraft, based aircraft fleet mix, and peak activity periods. With this information, specific components of the airfield and landside systems can be evaluated to determine their capacity to accommodate future demand.

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. To develop a study that is demand-based rather than time-based, a series of planning horizon milestones are established. The planning horizons presented in **Table 3A** are segmented as the Short Term (approximately years 1-5), the Intermediate Term (approximately years 6-10), and the Long Term (years 11-20).

TABLE 3A | Planning Horizon Activity Levels

		PLANNING HORIZON		
	Base Year 2022	**Short Term**	**Intermediate Term**	**Long Term**
ANNUAL OPERATIONS				
Itinerant				
General Aviation	14,325	14,732	15,032	16,132
Air Taxi	40	400	900	1,500
Total Itinerant Operations	*14,365*	*15,132*	*15,932*	*17,632*
Local				
General Aviation	28,735	30,268	31,868	35,268
Total Local Operations	*28,735*	*30,268*	*31,868*	*35,268*
Total Annual Operations	**43,100**	**45,400**	**47,800**	**52,900**
BASED AIRCRAFT	**117**	**127**	**132**	**141**

Source: Coffman Associates analysis

Actual activity at the Airport may be higher or lower than what the annualized forecast portrays. By planning according to planning horizon milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand so that Airport officials can respond to unexpected changes in a timely fashion.

Utilizing milestones allows Airport management the flexibility to make decisions and develop facilities according to needs generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides Airport officials with a financially responsible and needs-based program.

Throughout this chapter, references to "current" mean the base year of 2022. References to "future" mean within the next five years. References to "ultimate" means sometime in the next 5-20 years. The purpose of this differentiation is that any potential projects identified for the "current" or "future" timeframe must include actual justification. Projects that may be needed beyond the five-year timeframe likely will not be justified currently but will require justification at that time.

AIRFIELD CAPACITY

An airfield's capacity is expressed in terms of its annual service volume (ASV). ASV is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without incurring significant delay factors. As operations near, or surpass, the ASV, delay factors increase exponentially. Guidance on calculating ASV is found in FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*.

FACTORS AFFECTING ANNUAL SERVICE VOLUME (ASV)

Many factors are considered in the calculation of an airport's ASV including airfield characteristics, meteorological conditions, aircraft mix, and demand characteristics (aircraft operations). These factors are described below.

Airfield Characteristics

The layout of runway and taxiways directly affects an airfield's ASV. This not only includes the orientation of the runway, but also the percentage of time that a runway is in use. Additional airfield characteristics include the length, width, load bearing strength, and instrument approach capability of each runway at an airport, all of which determine the type of aircraft that may operate on the runway and if operations can occur during poor weather conditions.

- **Runway Configuration -** The existing runway configuration at APV consists of primary Runway 18-36 and crosswind Runway 8-26.

- **Instrument Approach Procedures** – Runway 18 has an RNAV (GPS) LPV instrument approach with 318-foot cloud ceiling height minimum and ⅞-mile visibility minimums. All other runway ends are available for visual approaches only.

- **Runway Use -** Runway use is normally dictated by wind conditions. The direction of takeoffs and landings is generally determined by the speed and direction of wind. It is generally safest for aircraft to depart and land into the wind, avoiding a crosswind or tailwind component during these operations. Prevailing winds favor the use of Runway 18 in all-weather conditions and account for an estimated two-thirds of total operations.

- **Exit Taxiways -** Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determine the occupancy time of an aircraft on the runway. Based upon the aircraft mix using the Airport, taxiways located between 2,000 and 4,000 feet from the landing threshold and separated by at least 750 feet are factored in the exit rating for the airfield. The greater the number of taxiway exits that are appropriately spaced, the lower the runway occupancy time for an aircraft, which contributes to a higher overall capacity for the airfield. Runway 18-36 has one qualifying taxiway exit (Taxiway A4).

- **Meteorological Conditions -** Weather conditions have a significant effect on airfield capacity. Airfield capacity is usually highest in clear weather when flight visibility is at its best. Airfield capacity is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety. The increased distance between aircraft reduces the number of aircraft which can operate at the airport during any given period. Consequently, this reduces overall airfield capacity.

  There are three categories of meteorological conditions, each defined by the reported cloud ceiling and flight visibility. Visual Flight Rule (VFR) conditions exist whenever the cloud ceiling is greater than 1,000 feet above ground level and visibility is greater than three statute miles. VFR flight conditions permit pilots to approach, land, or take-off by visual reference, and to see and avoid other aircraft.

  Instrument Flight Rule (IFR) conditions exist when the reported cloud ceiling is less than 1,000 feet above ground level and/or visibility is less than three statute miles. Under IFR conditions, pilots must rely on instruments for navigation and guidance to the runway. Safe separations between aircraft must be assured by following air traffic control rules and procedures. This leads to increased distances between aircraft, which diminishes airfield capacity.

  Poor Visibility Conditions (PVC) exist when cloud ceilings are less than 500 feet above ground level or visibility is less than one mile.

  APV does not have an on-field weather observation system such as an AWOS or ASOS. The closest weather observation station is at Victorville Airport (VCV), ten miles to the west. According to the last 10-years of data retrieved from the VCV weather station, VFR conditions are in effect 99.7 percent of the time. Therefore, poor weather conditions have a relatively minor impact on airfield capacity.

- **Aircraft Mix -** Aircraft mix refers to the speed, size, and flight characteristics of aircraft operating at the Airport. As the mix of aircraft operating at an airport increases to include larger aircraft, airfield capacity begins to diminish. This is due to larger separation distances that must be maintained between aircraft of different speeds and sizes.

  Aircraft mix for the capacity analysis is defined by the FAA in terms of four aircraft classes (although only three are reflected in the mix at APV). Classes A and B consist of single and multi-engine aircraft weighing less than 12,500 pounds. Aircraft within these classifications are primarily associated with general aviation operations, but this classification also includes some air taxi aircraft. Class C consists of aircraft weighing over 12,500 pounds but not exceeding 300,000 pounds.

  For the capacity analysis, the percentage of Class C aircraft operating at the airport impacts the ASV, as these classes include the larger and faster aircraft in the operational mix. The existing and projected operational fleet mix for was previously shown in Table 2T. It shows that more activity by larger business jets and turboprops is anticipated. By the long-term planning period, business jet and turboprop activity is forecast to represent approximately seven percent of overall operations. In the capacity model, capacity is constrained when operations by aircraft in Class C exceeds 20 percent. Therefore, the increasing activity by larger business jets is not a significant factor.

Demand Characteristics

Operations--not only the total number of annual operations but also the way they are conducted--have an influence on airfield capacity. Peak operational periods, touch-and-go operations, and the percent of arrivals impact the number of annual operations that can be conducted at the airport.

- **Peak Period Operations -** For the airfield capacity analysis, average daily operations during the peak month are calculated based upon data which was estimated and presented previously in Table 2T**.** Typical operational activity is important in the calculation of an airport's ASV, as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times through the year.

- **Touch-and-Go Operations -** A touch-and-go operation involves an aircraft making a landing and then an immediate takeoff without coming to a full stop or exiting the runway. Touch-and-go activity is counted as two operations, as there is an arrival and a departure involved. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and one takeoff occurs within a shorter time period than individual operations. These operations are normally associated with general aviation training operations and are included in local operations data. Touch-and-go operations at the Airport have historically averaged approximately 66 percent of total annual operations.

- **Percent Arrivals -** Under most circumstances, the lower the percentage of arrivals, the higher the hourly capacity. Except in unique circumstances, the aircraft arrival-departure split is typically 50-50.

ESTIMATION OF ANNUAL SERVICE VOLUME

The preceding information was used in conjunction with the airfield capacity methodology developed by the FAA to determine airfield capacity for APV. Under ideal conditions, the crosswind runway configuration for APV can provide an ASV of up to 230,000 annually. Due to the availability of only one qualifying taxiway exit, the actual ASV is estimated at 220,000 annual operations. Currently, total operations represent approximately 19 percent of the ASV. In the long term, operations represent 26 percent of ASV.

FAA Order 5090.5, *Formulation of the NPIAS and ACIP*, indicates that improvements for airfield capacity purposes should be considered when operations reach 50-60 percent of the ASV. Therefore, no projects specifically intended to improve capacity are necessary at this time.

AIRSIDE REQUIREMENTS

The following section will examine the projected airside requirements, including runway length, runway width, pavement strength, line-of-sight, and gradient. The taxiway system will be examined with respect to current and future design standards for safety, including separation and wingtip clearances.

RUNWAY CONFIGURATION

Runway 18-36 is the primary runway and is oriented in a north/south manner. For the operational safety and efficiency of an airport, it is desirable for the primary runway to be oriented as close as possible to the direction of the prevailing winds, which reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off.

According to FAA Order 5100.38D, *Airport Improvement Handbook*, only one runway at any NPIAS airport is eligible for on-going maintenance and rehabilitation funding unless the FAA Airport District Office (ADO) has made a specific determination that a crosswind or secondary runway is justified. A runway that is not a primary runway, crosswind runway, or secondary runway, is an *additional* runway, which is not eligible for FAA funding. It is not unusual for a two-runway airport to have a primary runway and an additional runway, and no crosswind or secondary runway. **Table 3B** presents the eligibility requirements for runway types.

TABLE 3B | Runway Eligibility

For the following runway type…	Must meet all the following criteria…	And is…
Primary Runway	1. A single runway at an airport is eligible for development consistent with FAA design and engineering standards.	Eligible
Crosswind Runway	1. The wind coverage on the primary runway is less than 95%	Eligible if justified
Secondary Runway	1. There is more than one runway at the airport. 2. The non-primary runway is not a crosswind runway. 3. Either of the following: a) The primary runway is operating at 60% or more of its annual capacity. b) FAA has made a specific determination that the runway is required.	Eligible if justified
Additional Runway	1. There is more than one runway at the airport. 2. The non-primary runway is not a crosswind runway. 3. The non-primary runway is not a secondary runway.	Ineligible

Source: FAA Order 5100.38D, AIP Handbook

FAA AC 150/5300-13B, *Airport Design,* recommends a crosswind runway when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed based on wind not exceeding a 10.5-knot (12 mph) component for runway design code (RDC) A-I and B-I; 13-knot (15 mph) component for RDC A-II and B-II; 16-knot (18 mph) component for RDC A-III, B-III, C-I through C-III, and D-I through D-III; and 20 knots for wider wingspans.

It is preferable to analyze weather data that is local to the airport being studied. There is not a weather sensor located at APV currently. The closest weather sensor is the automated weather observing system (AWOS) at Southern California Logistics Airport (VCV). The AWOS is connected to the National Oceanic and Atmospheric Administration (NOAA), and the data is therefore available for analysis.

According to FAA guidelines, the most recent 10-years of wind data should be analyzed to determine various facility requirements including the appropriate runway configuration. **Exhibit 3A** shows wind rose analysis of 10-years of wind data from VCV. A wind rose is a graphic tool that gives a succinct view of how wind speed and direction are historically distributed at a location. The table at the top of the wind rose indicates the percent of wind coverage for the runway at specific wind intensity.

Runway 18-36 provides 91.03 percent coverage at 10.5 knots and 94.35 percent wind coverage at 13 knots. Runway 8-26 provides 90.38 and 93.38 percent wind coverage at 10.5 and 13 knots respectively. Combined, both runways provide for greater than 95 percent wind coverage at 10.5 knots and above. Because the primary runway provides less than 95 percent wind coverage, a crosswind runway is justified. The crosswind runway is currently designed RDC A/B-I standards, however, it would be eligible for the 16 knot standards outlined above if the airport critical aircraft were to transition to RDC C/D-I/II/III.

Based on the wind coverage being below 95 percent for 13 knots, there is justification for applying A/B-II design standards to the crosswind runway today. It currently meets A/B-I design standards. Upgrading the crosswind runway to A/B-II standards would be expensive with little return. It is recommended that airport management maintain Runway 8-26 as an RDC A/B-I runway to meet the needs of the small aircraft operators who are more susceptible to crosswinds.

When the airport transitions to a critical aircraft in ARC C-II, as outlined in the forecasts, then the crosswind runway would be eligible for design around a C/D-II critical aircraft. However, FAA AC 150/5300-13B, *Airport Design* (Appendix B.2.3.2) outlines an alternate scenario, where a wider primary runway can be considered in lieu of upgrading or constructing a crosswind runway. Since Runway 18-36 is currently 150-feet wide, it can accommodate those larger aircraft that cannot use the crosswind because it is designed for small aircraft (RDC A/B-I).

PAVEMENT CONDITION

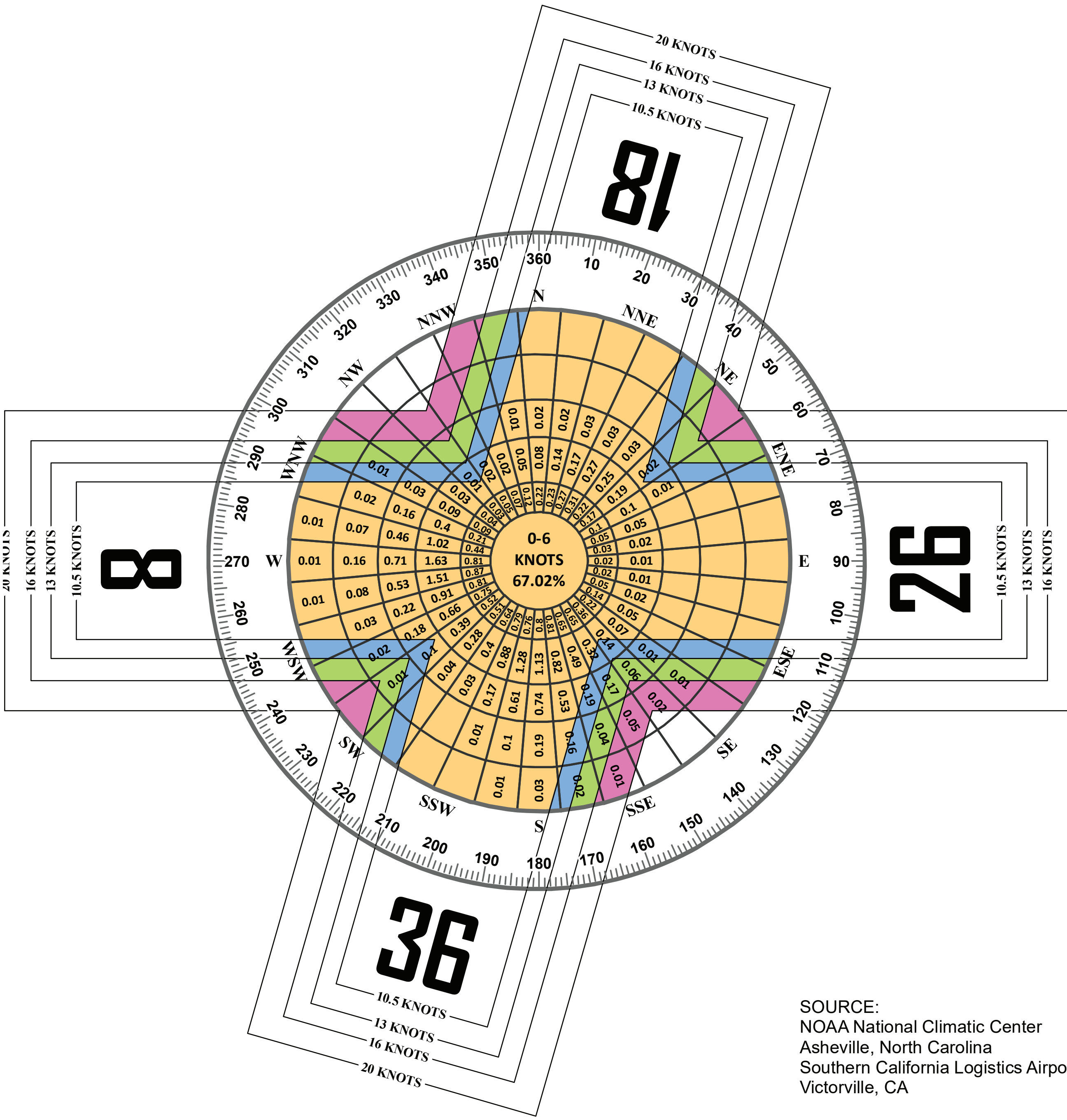
In the summer of 2022, the Airport engaged a firm specializing in pavement condition assessments. The assessment serves as a tool to identify system pavement needs, shape programming decisions for federal and state grant aid, provide information for legislative decision-making, and assist airport sponsors in making informed planning decisions. The assessment also develops accurate pavement inventories and identifies necessary maintenance, repair, rehabilitation, and reconstruction projects.

The assessment is conducted using the pavement condition index (PCI) procedure documented in the following publications:

1. The Federal Aviation Administration's (FAA's) Advisory Circular 150/5380-6B, *Guidelines and Procedures for Maintenance of Airport Pavements*.

2. The American Society for Testing and Material's (ASTM's) D-5340, *Standard Test Method for Airport Pavement Condition Index Surveys*.

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 18-36	91.03%	94.35%	97.48%	99.28%
Runway 8-26	90.38%	93.38%	96.65%	98.79%
All Runways	98.99%	99.64%	99.90%	99.99%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Southern California Logistics Airport
Victorville, CA

OBSERVATIONS:
197,713 All Weather Observations
Jan. 1, 2011 - Dec, 31 2020

Exhibit 3A
ALL WEATHER WIND ROSE

The PCI procedure is the standard used by the aviation industry to visually assess pavement condition. It was developed to provide engineers with a consistent, objective, and repeatable tool to represent the overall pavement condition. During a PCI survey, visible signs of deterioration within a selected sample area are identified, recorded, and analyzed.

The results of a PCI evaluation provide an indication of the structural integrity and functional capabilities of the pavement. However, it should be recognized that during a PCI inspection, only the top layer of the pavement is examined and that no direct measure is made of the structural capacity of the pavement system. Nevertheless, the PCI does provide an objective basis for determining maintenance and repair needs, as well as for establishing rehabilitation priorities in the face of constrained resources. Furthermore, the results of repeated PCI monitoring over time can be used to determine the rate of deterioration and to estimate the time at which certain rehabilitation measures can be implemented.

Exhibit 3B shows the PCI map produced for the Airport following the 2022 inspections. PCI pavement condition values are rated on a 0-100 scale with zero being failed pavement and 100 being new pavement. The map is color coded as follows:

PCI	Repair Type
86-100	Preventive Maintenance
71-85	
56-70	Major Rehabilitation
41-55	
26-40	Reconstruction
11-25	
0-10	

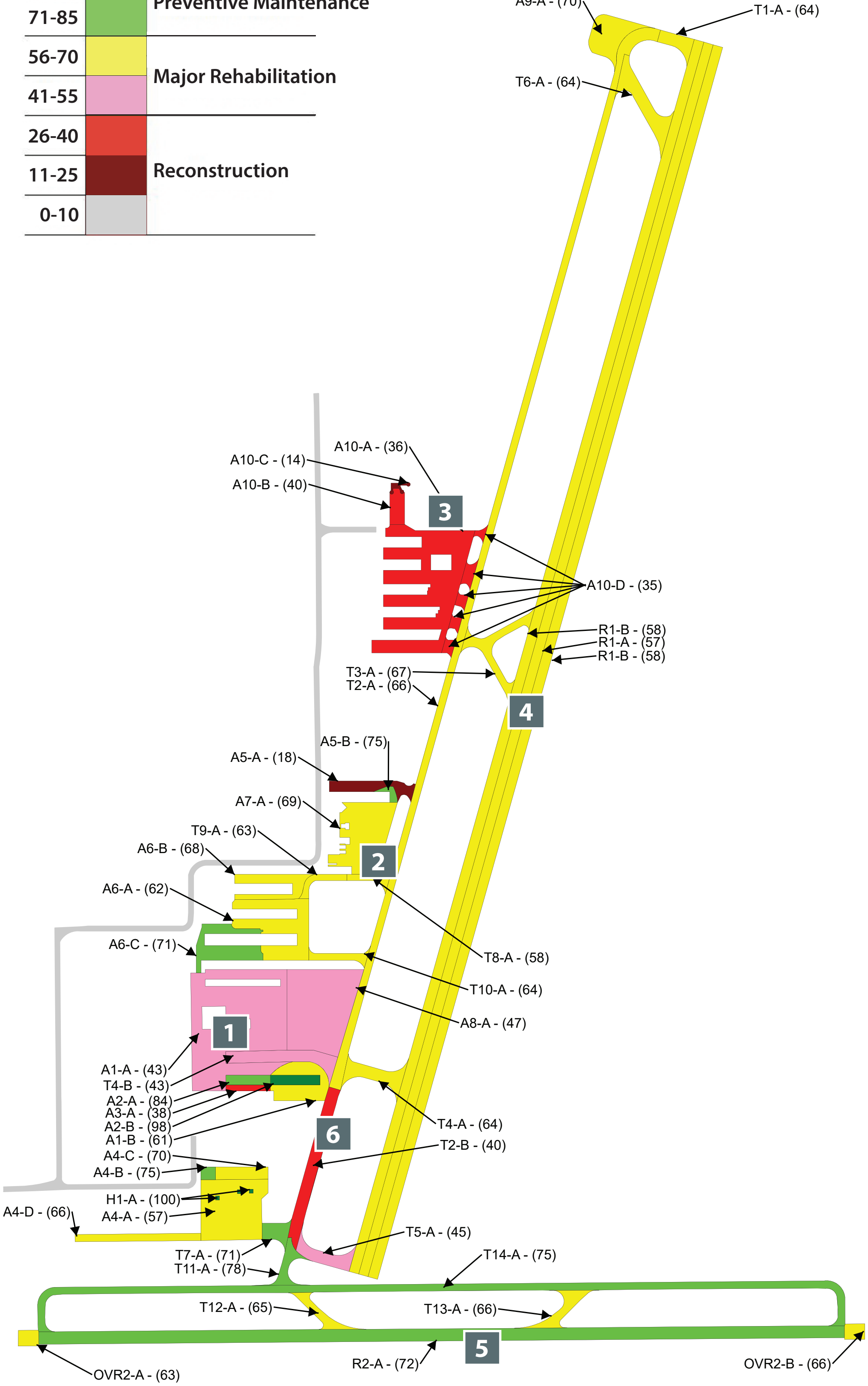
Figure 3-1: PCI Rating

Primary Runway 18-36 has a PCI value of approximately 58, which is low for a runway surface and an indication of the need for major rehabilitation. Most of parallel Taxiway A, several taxilanes, and the fuel apron are also in this category. The portion of Taxiway A between Taxiways A5 and A6 has a PCI rating of 40 indicating that it may need to be reconstructed soon. Several taxilanes on the northwest side of the runway are currently in a failed condition and should be scheduled for reconstruction soon. Runway 8-26 and Taxiway B have a PCI rating of 72 and 75, respectively. Routine preventative maintenance will extend the life of these surfaces but, ultimately, a significant rehabilitation project will be needed sometime in the next 20 years.

RUNWAY DESIGN STANDARDS

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

PCI		Repair Type
86-100		Preventive Maintenance
71-85		
56-70		Major Rehabilitation
41-55		
26-40		Reconstruction
11-25		
0-10		



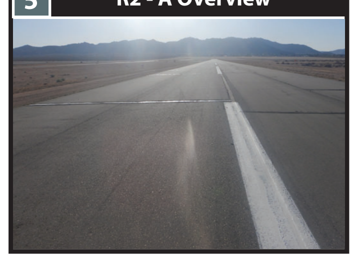
1 A1- A Alligator Cracking

2 A7 - A L+T Cracking

3 A10 - A Patching

4 R1 - A Overview

5 R2 - A Overview



6 T2 - B Alligator Cracking

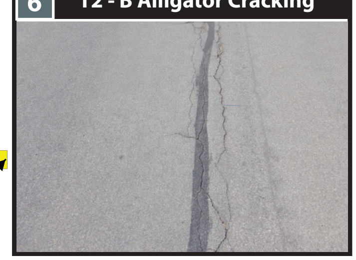


Exhibit 3B
PAVEMENT CONDITION

The entire RSA, ROFA, OFZ, and RPZ should be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. It is not required that the RPZ be under airport ownership, but it is strongly recommended by the FAA. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having land use control measures in place (i.e., zoning) to ensure the RPZ remains free of incompatible development. Currently, the RSA, ROFA, and OFZ are all on Airport property. The small corner of the RPZ for Runway 8 encroaches on Corwin Road and portion of the Runway 18 RPZ extend beyond Airport property, but the land is undeveloped and is compatible with the function of the RPZ.

Dimensional standards for the various safety areas associated with the runways are a function of the type of aircraft expected to use the runways, as well as the instrument approach visibility minimums. Currently, Runway 18-36 should meet the design standards for a runway design code (RDC) of B-II-4000 (and future RDC of C-II-2400 if visibility minimums are lowered to ½-mile). **Table 3C** presents the current and ultimate design standards for both runways.

Runway 18-36 has long been designed to ARC C-II standards. However, as noted in Chapter Two – Forecasts, current activity levels provide justification for the less restrictive ARC B-II standards. Ultimately, the Airport should plan for a transition back to C-II standards. Since many of the design surfaces for the future C-II standards are already met, the Airport should maintain those C-II standards to the greatest degree possible in anticipation of a transition to C-II.

Runway Safety Area (RSA)

The RSA is defined in FAA AC 150/5300-13B, *Airport Design,* as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance with the approach speed of the critical aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose.

For Runway 18-36, the B-II RSA design standard is for it to be 150 feet wide as centered on the runway and extending 300 feet beyond the ends of the runway. The RSA meets this standard and should be maintained until the airport transitions to ARC C-II design standards. The C-II RSA is 500 feet wide, and it extends 1,000 feet beyond the runway ends. The RSA also meets this standard. The C-II RSA should be maintained if feasible through the planning period.

The standard RSA for crosswind Runway 8-26 is 120 feet wide as centered on the runway, and it extends 240 feet beyond the runway ends. This runway is planned to remain a B-I runway through the 20-year planning period. Therefore, the RSA dimensions for Runway 8-26 will remain the same through the long-term planning period.

TABLE 3C | Runway Design Standards					
AIRPORT DATA	**RUNWAY 18-36**			**RUNWAY 8-26**	
	Existing Standard	**Ultimate Standard**	**Current Condition**	**Current/Ultimate Standard**	**Current Condition**
Airport Design Aircraft	B-II-2A	C-II-2A	C-II-2A	B-I-1B	B-I-1B
Runway Design Code	B-II-4000	C-II-2400	C-II-4000	B-I-VIS	B-I-VIS
Visibility Minimums	⅞-Mile	½-Mile	⅞-Mile	VIS	VIS
RUNWAY DESIGN					
Runway Width	75	100	***150***	60	60
Runway Shoulder Width	10	10	10	10	10
Blast Pad Length/Width (if provided)	150 x 95	150 x 120	NA	100 x 80	100 x 80
RUNWAY PROTECTION					
Runway Safety Area (RSA)					
Width	150	500	500	120	120
Length Beyond Departure End	300	1,000	1000	240	240
Length Prior to Threshold	300	600	600	240	240
Runway Object Free Area (ROFA)					
Width	500	800	800	400	400
Length Beyond Departure End	300	1,000	1000	240	240
Length Prior to Threshold	300	600	600	240	240
Runway Obstacle Free Zone (OFZ)					
Width	400	400	400	250	250
Length Beyond End	200	200	200	200	200
Approach Runway Protection Zone (RPZ)					
Length	1,700	2,500	1,700	1,000	1,000
Inner Width	1000	1,000	1,000	500	500
Outer Width	1,510	1,750	1,510	700	700
Departure Runway Protection Zone (RPZ)					
Length	1,000	1,700	1,000	1,000	1,000
Inner Width	500	500	500	500	500
Outer Width	700	1010	700	700	700
RUNWAY SEPARATION					
Runway Centerline to:					
Holding Position	200	250	250	200	***130***
Parallel Taxiway	240	400	400	225	240
Aircraft Parking Area	302	462	***465.5***	284.5	284.5
Note: All dimensions in feet.					

Source: FAA AC 150/5300-13B, Airport Design

Overlapping Runway Safety Areas

FAA AC 150/5300-13B, *Airport Design*, indicates that overlapping RSAs introduce safety risks and potential operational limitations. The RSAs for both runways overlap at APV. RSAs should not overlap because these configurations do not provide sufficient physical space for designing entrance taxiways or associated markings and signage, thus increasing the potential for pilot confusion and loss of situational awareness. Development options to eliminate the overlapping RSAs will be considered in the alternatives chapter of this master plan.

Runway Object Free Area (ROFA)

The ROFA is "a two-dimensional ground area, surrounding runways, taxiways, and taxilanes, which is clear of objects except for objects whose location is fixed by function (i.e., airfield lighting)." The ROFA does not have to be graded and level like the RSA; instead, the primary requirement for the ROFA is that no object in the ROFA penetrate the lateral elevation of the RSA. The runway ROFA is centered on the runway, extending out in accordance with the critical aircraft design category utilizing the runway.

The ROFA for Runway 18-36 is 500 feet wide, centered on the runway, and extends 300 feet beyond the runway ends (B-II standards). While there are no penetrations to the existing ROFA, it does enter or cross Taxiway B and B2, and Runway 8-26. Under recommended runway/taxiway geometry, these safety areas would not overlap unless the runways themselves were crossing.

When the Airport transitions to the C-II category, the ROFA dimensions become more restrictive. The ROFA is then 800 feet wide and extends 1,000 feet beyond the runway ends. As noted previously, Runway 18-36 has long been designed to C-II standards, so the ultimate expanded ROFA remains on airport property and meets standard.

The ROFA for Runway 8-26, currently and in the ultimate condition is 400 feet wide and extends 240 feet beyond the runway ends. The ROFA meets standard and should be maintained. Consideration will be given to de-coupling the ROFA of the two runways as an enhancement to ground movement safety and efficiency.

Obstacle Free Zone (OFZ)

The OFZ is an imaginary surface that precludes object penetrations, including taxiing and parked aircraft. The only allowance for OFZ obstructions is navigational aids mounted on frangible bases, which are fixed in their location by function, such as airfield signs. The OFZ is established to ensure the safety of aircraft operations. If the OFZ is obstructed, the airport's approaches could be removed, or approach minimums could be increased.

The OFZ for Runway 18-36 is 400 feet wide, and it extends 200 feet beyond the runway ends. The existing OFZ meets the design standard. The ultimate OFZ has the same dimensions and will, therefore, meet standard in the future. The OFZ for Runway 8-26 has the same dimensions currently and ultimately. The OFZ is encroached by the RSA, ROFA, and OFZ of Runway 18-36. The safety areas of the two runways should fully cross or be de-coupled to improve the safety of ground movements.

Runway Protection Zone (RPZ)

The RPZ is a trapezoidal area centered on the runway, typically beginning 200 feet beyond the runway end. When an RPZ begins at a location other than 200 feet beyond the end of a runway, two RPZs are required (i.e., a departure RPZ and an approach RPZ). The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses to enhance the protection of people and property on the ground.

According to AC 150/5300-13B, *Airport Design*, the following land uses are permissible within the RPZ:

- Farming activities meeting airport design clearance standards.
- Irrigation channels meeting the standards of FAA AC 150/5200-33, *Hazardous Wildlife Attractants on or near Airports*, and FAA/USDA manual, *Wildlife Hazard Management at Airports*.
- Airport service roads, as long as they are not public roads and are under direct control of the airport operator.
- Underground facilities, as long as they meet other design criteria, such as RSA standards, as applicable.
- NAVAIDs and aviation facilities, such as equipment for airport facilities considered fixed-by-function in regard to the RPZ.
- Above-ground fuel tanks associated with back-up generators for unstaffed NAVAIDs.

Any other land uses considered within RPZ land owned by the airport sponsor must be evaluated and approved by the FAA Office of Airports. The FAA published *Interim Guidance on Land Uses Within a Runway Protection Zone* (September 27, 2012), which identifies several potential RPZ land uses that must be evaluated and approved prior to implementation. The specific land uses requiring FAA evaluation and approval include:

- Buildings and structures (residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.).
- Recreational land use (golf courses, sports fields, amusement parks, other places of public assembly, etc.).
- Transportation facilities (rail facilities, public roads/highways, vehicular parking facilities, etc.).
- Fuel storage facilities (above and below ground).
- Hazardous material storage (above and below ground).
- Wastewater treatment facilities.
- Above-ground utility infrastructure (i.e., electrical substations), including any type of solar panel installations.

The *Interim Guidance on Land Uses Within a Runway Protection Zone* states: "RPZ land use compatibility also is often complicated by ownership considerations. Airport owner control over the RPZ land is emphasized to achieve the desired protection of people and property on the ground. Although the FAA recognizes that in certain situations the airport sponsor may not fully control land within the RPZ, the FAA expects airport sponsors to take all possible measures to protect against and remove or mitigate incompatible land uses."

Currently, the RPZ review standards are applicable to any ***new or modified*** RPZ. The following actions or events could alter the size or location of an RPZ, potentially introducing an incompatibility:

- An airfield project (e.g., runway extension, runway shift).
- A change in the critical design aircraft that increases the RPZ dimensions.
- A new or revised instrument approach procedure that increases the size of the RPZ.
- A local development proposal in the RPZ (either new or reconfigured).

The FAA recommends that an airport have ownership of the RPZ land where feasible which could include outright fee simple ownership or an avigation easement. If an airport cannot fully control the entirety of the RPZ, the FAA can require a change to the runway environment to properly secure the entirety of the RPZ. Objects such as public roads have been allowed within RPZs under previous guidance unless they posed an airspace obstruction. FAA's current guidance, however, does not readily allow for public roads in the RPZ.

Because the RPZ guidance addresses ***new or modified*** RPZs, existing incompatibilities may be acceptable under certain conditions. For example, roads that are in the current RPZs are typically allowed to remain unless the runway environment changes, which may include a change in the Runway Design Code (RDC) as well as instrument approach visibility minimums. The airport sponsor must continue to take reasonable actions to meet RPZ design standards to the extent practicable.

Table 3D shows the dimensions of the RPZs serving APV. The dimensions of the RPZs vary according to the visibility minimums serving the runway and the type of aircraft operating on the runway. On the Runway 18 end, the approach RPZ meets the land use compatibility standards. The Airport owns 40.1 acres, or 83 percent, of the 48.9-acre approach RPZ. The Runway 36 departure RPZ is contained within the Runway 18 approach RPZ, and it is 100 percent owned by the Airport.

TABLE 3D | Runway Protection Zone Detail

Runway RPZ/Visibility Minimum	RPZ Dimensions (ft.)		RPZ Size (ac.)	Owned in Fee (ac.)/% Owned	Existing Incompatible Land Uses	Percent Incompatible
Rwy 18 RPZs/ ⅞-Mile	Inner Width: Outer Width: Length:	1,000 1,510 1,700	48.978	40.84/83.38%	None	0.00%
Rwy 36 RPZs/ Visual	Inner Width: Outer Width: Length:	500 700 1,000	13.77	13.77/100%	None	0.00%
Rwy 8-26 RPZs/ Visual	Inner Width: Outer Width: Length:	500 700 1,000	13.77	13.77/100%	None	0.000%

Source: Coffman Associates analysis.

There is both an approach and departure RPZ on the Runway 36 end because the landing threshold is displaced. Both are entirely on Airport property and have compatible land uses. The RPZ serving both ends of Runway 8-26 are on Airport property and have 100 percent compatible land uses. It is recommended that the Airport acquire any RPZ land not currently owned and maintain the current 100 percent land use compatibility.

Runway/Taxiway Separation

The design standards for the separation between runways and parallel taxiways are determined by the critical aircraft and the instrument approach visibility minimums. The current critical aircraft is represented by those aircraft in ARC B-II which require a minimum separation of 240 feet. The existing separation between Runway 18-36 and parallel Taxiway A is 400 feet. The future C-II runway separation standard is 300 feet for ¾-mile visibility minimums and 400 feet for ½-mile visibility minimums. To preserve the future possibility of lower visibility minimums, the existing runway/taxiway separation of 400 feet should be maintained.

Parallel Taxiway B is 240 feet from Runway 8-26 which meets the standard for B-II runways. Runway 8-26 is a B-I runway currently which has a separation standard of 225 feet. As noted previously, based on the wind coverage of the primary runway, it is justified to apply B-II standards to Runway 8-26; however, the benefit is limited, and B-I standards are planned to remain throughout the planning period. If Taxiway B were to be reconstructed in the future, then additional analysis should be conducted to determine if the taxiway should remain at 240 feet or be reduced to 225 feet. The recommendation here is to maintain the 240 feet of separation which provides the flexibility to apply long-term B-II standards to the runway (sometime beyond 20-years).

Hold Line Separation

The hold lines on all taxiways connecting to Runway 18-36 are 250 feet from the runway centerline which meets the ultimate C-II standard. The current B-II standard is 200 feet. Considering the possible transition to ARC C-II, the hold lines should be maintained at 250 feet from the runway centerline. The hold lines on taxiways connecting to Runway 8-26 are 130 feet from the runway centerline. The B-I design standard is for hold lines to be 200 feet from the Runway 8-26 centerline. Consideration will be given to relocating the hold lines on taxiways connecting to Runway 8-26.

Aircraft Parking Area Separation

Aircraft parking positions should be situated in a manner that ensures aircraft components (wings, tail, fuselage) do not conflict with the ROFA, TOFA, and TLOFA. In addition, they should not violate runway approach or departure surfaces, the runway visibility zone, ROFA, or any NAVAID critical area.

Aircraft parking areas adjacent Runway 18-36 should be no closer than 302 feet from the runway centerline under the current B-II design standards. Under C-II standards parking areas should begin no closer than 462 feet (outside the Taxiway Object Free Area for Taxiway A). Currently, all aircraft parking areas meet the ultimate C-II separation standard. This condition should be maintained through the planning period.

Aircraft parking areas adjacent Runway 8-26 should begin no closer than 284.5 feet from the runway centerline which is outside the Taxiway B OFA. The current airfield geometry meets this standard and should be maintained.

RUNWAY LENGTH REQUIREMENTS

Aircraft operate on a wide variety of available runway lengths. Many factors will govern the suitability of those runway lengths for aircraft, such as elevation, temperature, wind velocity, aircraft operating weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, and any special operating procedures. Runway 18-36 is 6,498 feet long, and it serves as the primary runway. Runway 8-26 is 4,099 feet long, and it is the crosswind runway.

Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*, provides a five-step process for determining runway length needs.

1. Identify the list of critical design airplanes or airplane group.
2. Identify the airplanes or airplane group that will require the longest runway length at maximum certificated takeoff weight (MTOW).
3. Determine which of the three methods, described in the AC, will be used for establishing the runway length.
4. Select the recommended runway length from the appropriate methodology.
5. Apply any necessary adjustments to the obtained runway length.

There are three methodologies for determining runway length requirements which are based on the MTOW of the critical aircraft or the airplane group for each runway. The airplane group consists of multiple aircraft with similar design characteristics. The three weight classifications are those with a MTOW of 12,500 pounds or less, those airplanes weighing over 12,500 pounds but less than 60,000 pounds, and those weighing 60,000 pounds or more. **Table 3E** shows these classifications and the appropriate methodology to use in runway length determination.

TABLE 3E | Airplane Weight Classification for Runway Length Requirements

Airplane Weight Category (MTOW)		Design Approach	Methodology
12,500 pounds or less	Approach speeds of less than 30 knots	Family grouping of small airplanes	Chapter 2: para. 203
	Approach speeds of at least 30 knots but less than 50 knots	Family grouping of small airplanes	Chapter 2: para. 204
	Approach speeds of 50 knots or more with fewer than 10 passenger seats	Family grouping of small airplanes	Chapter 2: para. 205, Figure 2-1
	Approach speeds of 50 knots or more with 10 or more passenger seats	Family grouping of small airplanes	Chapter 2: para. 205, Figure 2-1
Over 12,500 pounds but less than 60,000 pounds[1]		Family grouping of large airplanes	Chapter 3: Figures 3-1 or 3-2 and Tables 3-1 or 3-2
60,000 pounds or more or Regional Jets		Individual large airplanes	Chapter 4: Airplane performance manuals

[1]Applicable methodology for determining Primary Runway 8R-26L length requirements.

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

Utilizing FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, the following is the five-step process for determining the recommended runway length for Runway 12-30.

Step 1: Identify the critical airplanes or airplane group.

The first step in determining the recommended runway length for an airport is to identify the critical aircraft or family grouping of aircraft with similar design characteristics. The critical aircraft or airplane group accounts for at least 500 annual operations. As outlined in the forecast chapter, the critical aircraft is classified as B-II-2A. Representative aircraft in this category include the Beech King Air 300 which has a MTOW of 14,000 pounds and business jets such as the Cessna CJ2, CJ3, CJ4, and V, all of which have a MTOW greater than 12,500 pounds. Therefore, appropriate runway length methodology is to examine the general runway length tables from Chapter 3 of AC 150/5325-4B for aircraft weighing between 12,500 pounds and 60,000 pounds.

Step 2: Identify the airplanes or airplane group that require the longest runway length at maximum certificated takeoff weight (MTOW).

Jet aircraft typically require the longest runway lengths; therefore, the runway length curves in Chapter 3 of AC 150/5325-4B will be examined for future conditions.

Step 3: Determine which of the three methods, described in the AC, will be used for establishing the runway length.

In consideration of the growing number of business jets (and their designation as the future aircraft), it is necessary to select the specific methodology to use for the business jets. Chapter 3 of the AC groups business jets weighing over 12,500 pounds but less than 60,000 pounds into the following two categories:

- 75 percent of the fleet; and
- 100 percent of the fleet.

The AC states that the airplanes in the 75 percent of the fleet category generally need 5,000 feet or less of runway at mean sea level and standard day temperature (59° F), while those in the 100 percent of the fleet category need more than 5,000 feet of runway under the same conditions.

The AC indicates that the airport designer must determine which category to use for runway length determination. From the limited data available, it appears that the jet aircraft utilizing the Airport generally fall in the 0-75 percent of the fleet category. Jets in the 100 percent category rarely utilize the Airport currently. Therefore, the 75 percent of the fleet category is used to determine the current recommended runway length for APV. **Table 3F** shows example aircraft for each runway length category.

There are two runway length curves presented in the AC under the 75 percent of the fleet category:

- 60 percent useful load; and
- 90 percent useful load.

TABLE 3F | Aircraft Categories for Runway Length Determination			
0-75 precent of the national fleet	**MTOW**	**75-100 percent of the national fleet**	**MTOW**
Lear 35	20,350	Lear 55	21,500
Lear 45	20,500	Lear 60	23,500
Cessna 550	14,100	Hawker 800XP	28,000
Cessna 560XL	20,000	Hawker 1000	31,000
Cessna 650 (VII)	22,000	Cessna 650 (III/IV)	22,000
IAI Westwind	23,500	Cessna 750 (X)	35,700
Beechjet 400	15,800	Challenger 604	47,600
Falcon 50	18,500	IAI Astra	23,500
MTOW: Maximum Take Off Weight			

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

The useful load is the difference between the maximum allowable structural weight and the operating empty weight (OEW). The useful load consists of passengers, cargo, and usable fuel. The determination of which useful load category to use will have a significant impact on the recommended runway length; however, it is inherently difficult to determine because of the variable needs of each aircraft operator. For shorter flights, pilots may take on less fuel; however, pilots may prefer to ferry fuel so that they don't have to refuel frequently. Because of the variability in aircraft weights and haul lengths, the 60 percent useful load category is considered the default, unless there are specific known operations that would suggest using the 90 percent useful load category. Examples of a need to use the 90 percent useful load include regular air cargo flights, long haul flights (i.e., cross-country), or known fuel ferrying needs. For this analysis, the default 60 percent useful load category will be used.

Step 4: Select the recommended runway length from the appropriate methodology.

The next step is to examine the 75 percent of the fleet at 60 percent useful load performance chart in the AC (**Figure 3-2**). This chart requires the following knowledge:

- The mean maximum daily temperature of the hottest month: July at 97.5°(F).
- The airport elevation: 3,061.7 feet above mean sea level (MSL).

By locating the appropriate temperature and airport elevation on the performance chart, the recommended runway length, without any adjustments, is 5,825 feet as shown on **Figure 3-2**.

Step 5: Apply any necessary adjustments to the obtained runway length.

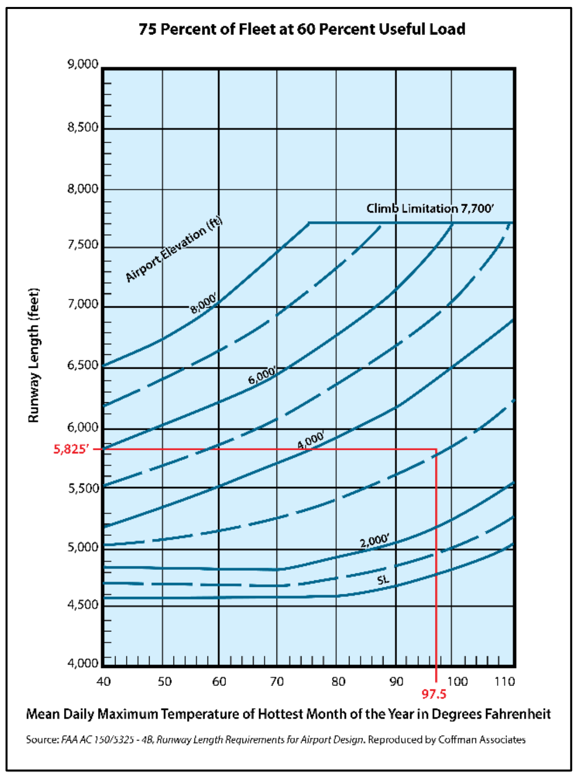


Figure 3-2: Business Jet Runway Length

The recommended runway length determined in Step #4 is based on no wind, a dry runway surface, and zero effective runway gradient. Therefore, the following criteria are applied:

- Wet runway surface
- 1.47% effective runway gradient (96 feet of elevation difference for Runway 18-36)

By regulation, the runway length obtained from the 60 percent useful load performance chart used in Step #4 is increased by 15 percent or up to 5,500 feet, whichever is less, to account for a wet surface.

The runway lengths obtained from Step #4 are increased at the rate of 10 feet for each foot of elevation difference between the high and low points of the runway centerline. At APV, this equates to an additional 660 feet of required runway length.

Table 3G summarizes the data inputs and the final recommended runway length of 6,800 feet for the Airport. The 100 percent category at 60 percent useful load was also examined, which resulted in a recommended runway length of 8,800 feet. Based on the growth of the Apple Valley Region, and the fact that the Airport is the hub for the North Appley Valley Industrial Specific Plan, an alternative will be considered for an 8,800-foot-long runway in the next chapter. The 90 percent useful load categories are also shown for reference; however, the forecast does not indicate regular use of the runway by these aircraft.

TABLE 3G | Runway Length Requirements

Airport Elevation	3,061.7' feet above mean sea level			
Average High Monthly Temp.	97.5 degrees F (July)			
Runway Gradient	1.47% Runway 18-36 (96')			
Fleet Mix Category	**Raw Runway Length from FAA AC**	**Runway Length with Gradient Adjustment**	**Wet Surface Landing Length for Jets (+15%)***	**Final Runway Length**
75% of fleet at 60% useful load	5,825'	6,785'	5,500'	6,800'
100% of fleet at 60% useful load	7,788'	8,748'	5,500'	8,800'
75% of fleet at 90% useful load	8,675'	9,635'	7,000'	9,700'
100% of fleet at 90% useful load	10,286'	11,246'	7,000'	11,300'

*Max 5,500' for 60% useful load and max 7,000' for 90% useful load in wet conditions

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design.

Supplemental Analysis Undertaken for Typical Business Jets Operating at Local Conditions

The required take-off and landing lengths for maximum load and range (adjusted for temperature and elevation) for many of the turbine aircraft utilizing the Airport are presented in **Table 3G**, for both dry and wet pavement conditions. The takeoff distance requirements reflect the maximum gross weight for the aircraft; however, the percentage of useful load has also been calculated for the existing 6,498-foot runway length. When the runway length requirement exceeds the available runway length at the given design temperature, aircraft operators may be required to reduce payload. Runway length requirements that exceed the current length of Runway 18-36 are noted in red type.

Business jets may operate under different regulations depending on the type of flight being conducted, as noted in **Table 3H**. These regulations may impact the calculated runway available for landing. CFR Part 91k refers to operations conducted via fractional ownership, and Part 135 refers to commuter/on-demand (charter) operations. Fractional operators must be capable of landing within 80 percent of the landing distance available (LDA) and commuter/on-demand operators must be capable of landing within 60 percent of LDA. Operations conducted under CFR Part 25 are general aviation operations conducted by private owners, which are unfactored.

TABLE 3H | Runway Length Requirements for Business Jets

AIRFIELD PARAMETERS										
	Elevation: 3,061.7' MSL									
	Temp: 97.5°F/36.4°C									
	1.47% Runway 18-36 (96' difference)									
RUNWAY PARAMETERS	Takeoff Length Required at MTOW		% Useful Load for Takeoff on 6,498' Runway		LANDING LENGTH REQUIREMENTS					
					C.F.R. Part 25 (Unfactored)		C.F.R. Part 135 (60% factored)		C.F.R. Part 91k (80% factored)	
RUNWAY CONDITION	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Lear 60	B/L	B/L	61%	55%	3,940	5,318	6,567	8,863	4,925	6,648
Gulfstream V	9,787	O/L	72%	64%	2,983	3,431	4,972	5,718	3,729	4,289
Citation X	O/L	O/L	77%	64%	3,676	5,180	6,127	8,633	4,595	6,475
Falcon 50EX	O/L	O/L	77%	74%	3,116	3,583	5,193	5,972	3,895	4,479
Gulfstream IV	O/L	O/L	74%	63%	3,633	6,964	6,055	11,607	4,541	8,705
Challenger 300	7,828	8,309	79%	72%	2,779	5,326	4,632	8,877	3,474	6,658
Lear 45XR	6,827	6,820	95%	95%	3,105	3,985	5,175	6,642	3,881	4,981
Citation (525) CJ1	O/L	O/L	82%	82%	3,122	4,233	5,203	7,055	3,903	5,291
Beechjet 400A	O/L	O/L	84%	71%	N/A	N/A	N/A	N/A	N/A	N/A
Citation Bravo	5,684	6,354	100%	100%	4,043	6,370	6,738	10,617	5,054	7,963
Citation 560 XLS	O/L	O/L	98%	94%	3,665	5,830	6,108	9,717	4,581	7,288
Citation Encore	5,846	6,224	100%	100%	3,285	4,946	5,475	8,243	4,106	6,183
Citation (525A) CJ2	O/L	O/L	95%	95%	3,391	4,888	5,652	8,147	4,239	6,110
Citation Sovereign	4,963	5,206	100%	100%	3,018	3,875	5,030	6,458	3,773	4,844
Citation CJ3	5,016	5,314	100%	100%	3,223	4,379	5,372	7,298	4,029	5,474
Citation I/SP	O/L	O/L	80%	N/A	2,574	2,961	4,290	4,935	3,218	3,701

KEY:
MSL - Mean Sea Level
MTOW - Maximum takeoff weight
CFR - Code of Federal Regulations.
CFR Part 25: Standard unfactored landing lengths.
CFR Part 135: 60% factored landing length as required by commuter/on-demand operators.
CFR Part 91k: 80% factored as required by fractional operators.
BL: Brake Limited
O/L: Weight limited due to climb performance
N/A: No data available
Figures is red exceed the available runway length.

Source: Aircraft operating manuals from UltraNav software.

As can be seen in the table, most small- and medium-sized business jets can take off under maximum loading conditions. It is only the largest business jets that may have to reduce payload to take off at Apple Valley under the conditions presented. Currently, there are very few operations by the largest business jets. If the number of operations by large business jets were to exceed the 500 operations threshold, then additional runway length may be justified. For planning purposes, a total primary runway length of up to 8,800 feet will be considered in the alternatives discussion.

Runway Length Summary

The existing runway length of 6,498 feet is adequate to meet the needs of current airport users. Therefore, the current length should be preserved and maintained. In the future, the Airport could expect increased activity by larger business jets. These aircraft can and do currently operate at the Airport, although on an infrequent basis (less than 500 combined operations annually). Past planning for the runway has included a runway extension of 400 feet for a total length of 6,900 feet. This planning was intended to accommodate frequent operations (500 or more) by small and medium business jets. Refinements in runway length determination, as well as a slight decrease in the average high monthly temperature (from 98° to 97.5°), results in a recommended runway length of 6,800 feet to accommodate 75 percent of business jets at 60 percent useful load.

Analysis of the runway length needs of individual business jets was also presented. A runway length of up to 8,800 feet would fully accommodate nearly all business jets.

In the alternatives chapter, opportunities to extend the runway by up to 2,000 feet, for a total length of 8,500 feet, will be examined. This length would accommodate not only small and medium sized business jets but also large business jets to a large degree. Specific justification will be required to have FAA participation in an extension of this length. That justification would be documentation of 500 or more operations by aircraft (large business jets) that need the additional length.

RUNWAY WIDTH

Runway 18-36 is 150 feet wide. The B-II standard is 75 feet wide. In the future, when the Airport transitions to C-II, the runway width standard is 100 feet. The existing runway width should be maintained until such a time that the runway needs to be reconstructed. At that time, consideration should be given to maintaining its 150' width to continue to accommodate the impact of crosswinds to medium sized aircraft that cannot use the crosswind runway. According to FAA AC 150/5300-13B, *Airport Design* (Appendix B.2.3.2), "it is acceptable to increase the width of the primary runway to the next standard in lieu of providing a crosswind runway. The greater width allows for better operational tolerance to crosswinds." If there is an FAA finding that Runway 18-36 is only eligible for a 100-foot-wide runway, then the airport would have to maintain the extra 50 feet if the intent is to maintain a 150-foot-wide runway.

Runway 8-26 is 60 feet wide, which meets the applicable design standard, and it should be maintained.

RUNWAY BLAST PADS

Blast pads are paved or prepared areas beyond the runway threshold that are intended to reduce erosion from prop wash and jet blast. Blast pads are not a required element of the runway system. There are currently no blast pads on either end of Runway 18-36, and none are planned in the future. If future planning considers blast pads for Runway 18-36, they should be 120 feet wide and 150 feet long. Runway 8-26 does have blast pads on each end of the runway. They are 100 feet long and 80 feet wide, which meets the design standard for this runway.

RUNWAY PAVEMENT STRENGTH

The most important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. The current published strength rating for Runway 18-36 is 70,000 pounds single wheel landing type gear, 90,000 pounds for dual wheel, and 150,000 pounds for double tandem wheel landing gear struts. This pavement rating is high enough to accommodate all general aviation aircraft, and it should be maintained through the planning period.

Runway 8-26 has a pavement strength rating of 40,000 pounds SWL, 60,000 pounds DWL, and 100,000 pounds DTWL. This strength rating is high enough to accommodate all aircraft that will use the runway, and it should be maintained.

Runway pavement is also rated utilizing the new pavement classification number (PCN) methodology. Neither of the runways at APV have been evaluated with the PCN methodology. If and when the runways are reconstructed, a PCN evaluation needs to be done as well.

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

RUNWAY LINE-OF-SIGHT AND GRADIENT

FAA has instituted various line-of-sight requirements to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. This allows departing and arriving aircraft to verify the location and actions of other aircraft and vehicles on the ground that could create a conflict.

Line-of-sight standards for an individual runway are based on whether there is a parallel taxiway available. When a full-length parallel taxiway is available (as it is for both runways), thus facilitating faster runway exit times, then any point five feet above the runway centerline must be mutually visible, with any other point five feet above the runway centerline that is located at less than half the length of the runway. Both runways meet the line-of-sight standard.

The surface gradient of a runway affects aircraft performance and pilot perception. The surface gradient is the maximum allowable slope for a runway. For runways designated for approach categories A and B, the maximum longitudinal grade is 2.0 percent. The maximum longitudinal grade for runways in approach category C, D, and E is 1.5 percent; however, longitudinal grades exceeding 0.8 percent are not acceptable within the lesser of the following criteria:

- In the first and last quarter of the runway length; or
- The first and last 2,500 feet of the runway length.

The Runway 18 end is 96 feet higher than the Runway 36 end which results in a runway gradient of 1.47 percent. Since Runway 18-36 is currently classified in aircraft approach category B, which has a gradient standard of not more than 2.0 percent, the runway gradient is currently within standard. In the future, when the runway transitions to aircraft design group C, stricter standards will apply, and the longitudinal gradient will no longer be within standard for the first and last quarter sections of the runway.

The Runway 26 end is 18 feet higher than the Runway 8 end which results in a longitudinal gradient of 0.44 percent. Since this runway is planned to remain a B-I runway, it meets gradient standard now and in the future.

TAXIWAY DESIGN STANDARDS

The design standards associated with taxiways are determined by the taxiway design group (TDG) and the airplane design group (ADG) of the critical design aircraft that would potentially use that taxiway. **Table 3J** presents the taxiway design standards to be applied at APV. The Airport currently meets these standards; however, in some cases, the width of taxiways and taxilanes exceeds the design standard.

TABLE 3J | Taxiway Design Standards

STANDARDS BASED ON WINGSPAN (ADG)	ADG II (Runway 18-36)	ADG I (Runway 8-26)
Taxiway/Taxilane Protection		
Taxiway Safety Area (TSA) width	79'	49'
Taxiway Object Free Area (TOFA) width	124'	89'
Taxilane Object Free Area (TLOFA) width	110'	79'
Taxiway/Taxilane Separation		
Taxiway Centerline to:		
Parallel Taxiway/Taxilane	102'	170'
Fixed or Movable Object	62'	44.5'
Taxilane Centerline to:		
Parallel Taxilane	94'	64'
Fixed or Movable Object	55'	39.5'
Wingtip Clearance		
Taxiway Wingtip Clearance	23'	20'
Taxilane Wingtip Clearance	16'	15'
STANDARDS BASED ON TDG	**TDG 2A (Future)**	**TDG 1A**
Taxiway Width Standard	35'	25'
Taxiway Edge Safety Margin	7.5'	5'
Taxiway Shoulder Width	15'	10'
ADG: Airplane Design Group TDG: Taxiway Design Group		

Source: FAA AC 150/5300-13B, Airport Design

Taxiways typically provide direct access to the runway either via a parallel taxiway or connecting taxi-ways. Taxiways typically allow for faster ground movements than taxilanes. Taxilanes typically extend from taxiways to hangar areas, and they facilitate slower movement speeds than taxiways. As result, certain separation standards are different for taxiways and taxilanes. While taxiways should be planned to meet the critical aircraft standards, taxilanes can be designed to accommodate aircraft that will use it. For example, a taxilane leading to a row of small T-hangars only needs to meet the separation requirement for small aircraft and not for the larger critical aircraft.

Taxiway Width Standards

All taxiways and taxilanes should be constructed at the standard uniform width that applies to them. All taxiways/taxilanes that will serve the critical aircraft should be 35 feet wide which is the standard associated with TDG 2A for the critical aircraft. Since Runway 8-26 is intended to serve smaller aircraft in TDG 1A, the associated taxiways/taxilanes should be 25 feet wide. **Table 3K** summarizes the taxiway width standards as compared to the current geometry. Taxiway A south of the intersection with Taxiway A5 is 60 feet wide, exceeding the 35-foot design standard. Taxiways A1, A2, A4, A5, and A6 also exceed the taxiway width standard. Taxiways B, B1, B2, B3, and B4 are all 35 feet wide, which exceeds the 25-foot design standard.

TABLE 3K | Taxiway Width Standards

Taxiway Designation	Current & Future TDG/ Standard Width	Current Width
Taxiway A (Parallel North of A5)	2A/35'	35'
Taxiway A (Parallel South of A5)	2A/35'	**60'**
Taxiway A1 (Rwy 18 Threshold)	2A/35'	**60'**
Taxiway A2	2A/35'	**60'**
Taxiway A4 (Convergence)	2A/35'	**50'**
Taxiway A4 (Legs)	2A/35'	35'
Taxiway A5	2A/35'	**60'**
Taxiway A6 (Rwy 36 Threshold)	2A/35'	**60'**
Taxiway B (Parallel)	1B/25'	**35'**
Taxiway B1 (Rwy 8 Threshold)	1B/25'	**35'**
Taxiway B2	1B/25'	**35'**
Taxiway B3	1B/25'	**35'**
Taxiway B4 (Rwy 26 Threshold)	1B/25'	**35'**

Typically, FAA will support maintaining the existing width of taxiways, even if they exceed the design standard, until the pavement needs to be reconstructed. When the taxiways are reconstructed, they should be designed to meet the current taxiway width standard.

Other Taxiway Design Considerations

FAA AC 150/5300-13A, *Airport Design*, provides guidance on taxiway design that has a goal of enhancing safety by providing a taxiway geometry that reduces the potential for runway incursions. A runway incursion is defined as, "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft."

The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation:

1. **Taxi Method**: Taxiways are designed for "cockpit over centerline" taxiing, with pavement being sufficiently wide to allow a certain amount of wander. On turns, enough pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, upgrading existing intersections should be undertaken to eliminate judgmental over-steering, which is when the pilot must intentionally steer the cockpit outside the marked centerline to assure the aircraft remains on the taxiway pavement.
2. **Steering Angle**: Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, the generally accepted value to prevent excessive tire scrubbing.
3. **Three-Node Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot with a maximum of three choices of travel. Ideally, these are right- and left-angle turns and a continuation straight ahead.
4. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.
5. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.
   - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple using the "three nodes" concept.
   - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.
   - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold – through a simple reduction in the number of occurrences, and through a reduction in air traffic controller workload.
   - *Avoid "High Energy" Intersections*: These are intersections in the middle third of runways. By limiting runway crossings to the first and last thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.
   - *Increase Visibility*: Right-angle intersections, both between taxiways and runways, provide the best visibility. Acute-angle runway exits provide for greater efficiency in runway usage but should not be used as runway entrances or crossing points. A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.
   - *Avoid "Dual Purpose" Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.
   - *Indirect Access*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.
   - *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other hot spots should be corrected as soon as practicable.
6. **Runway/Taxiway Intersections**:
   - *Right Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for a high-speed exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs, so they are visible to pilots.

- *Acute Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage.
- *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.

7. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access into a runway should be avoided. Increase pilot situational awareness by designing taxiways in such a manner that forces pilots to consciously make turns. Taxiways originating from aprons and forming a straight line across runways at mid-span should be avoided.
   - *Wide Throat Taxiways*: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and make lighting and marking more difficult.
   - *Direct Access from Apron to a Runway*: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout that forces pilots to make a conscious decision to turn.
   - *Apron to Parallel Taxiway End*: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

FAA AC 150/5300-13B, *Airport Design,* states that, "existing taxiway geometry should be improved whenever feasible, with emphasis on designated hot spots. To the extent practicable, the removal of existing pavement may be necessary to correct confusing layouts."

Taxiway A2 is an angled taxiway, and it is a wide expanse of pavement. Taxiway A4 is a potentially confusing geometry. Taxiways B2 and B3 are angled taxiways where 90-degree angles are the standard. Taxiway A5 also allows direct access from the apron to the runway.

In addition to ultimately providing a standard taxiway geometry, additional taxiway may be necessary to improve airfield circulation, efficiency, and safety. This is especially true if the runway is extended, in which case the taxiways should also be extended.

The alternatives chapter will examine possible taxiway geometry changes that would improve pilot situational awareness and reduce potential pilot confusion. Any changes will consider the reasonableness of each alternative in terms of cost and benefit.

Taxilane Design Considerations

Taxilanes are distinguished from taxiways in that they do not provide access to or from the runway system directly. Taxilanes typically provide access to hangar areas and thus accommodate a slower movement speed. As a result, taxilanes can be constructed to varying design standards depending on the type of aircraft utilizing the taxilane. For example, a taxilane leading to a T-hangar area only needs to be designed to accommodate those aircraft typically accessing a T-hangar.

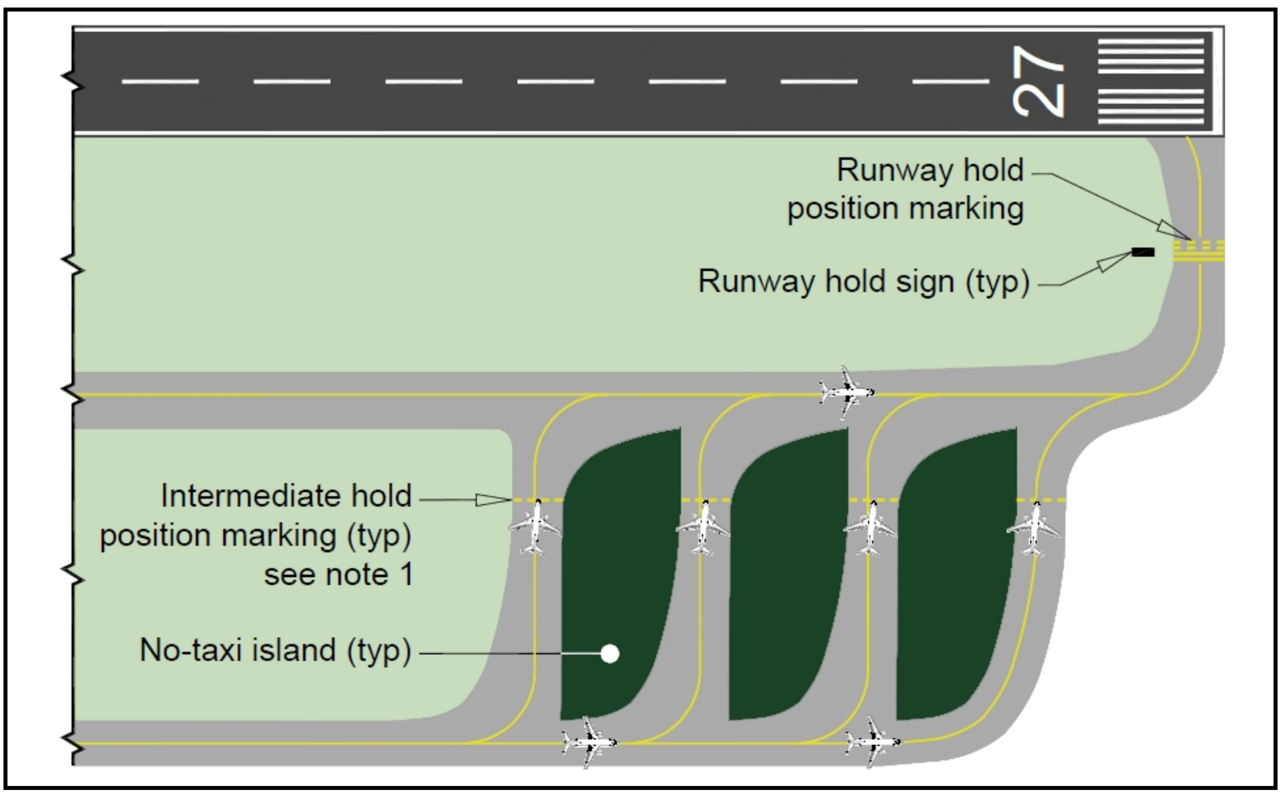
The minimum taxilane object free area (TLOFA) is 79 feet which is based on aircraft with a wingspan on 49 feet or less. All of the taxilanes leading to hangars have a TLOFA of less than 79 feet. If any of the hangar facilities are to be reconstructed in the future, the standard TLOFA width of 79 feet should be provided.

HOLD APRONS

Hold aprons are an important feature at busy airports like APV. Pilots can pull off the main taxiways into a hold apron to perform final pre-flight checks and engine run-ups. These activities can take several minutes and other aircraft that are ready for takeoff are then able to proceed to the runway threshold for departure without delay.

Hold aprons have specific design and separation standards which are intended to allow other aircraft to bypass aircraft using the hold apron. Specifically, the location on the hold apron where aircraft park should meet the taxiway-to-taxiway separation standard. That separation standard is based on the airplane design group of the critical aircraft. The current and future airplane design group is ADG II, which includes all wingspans up to 79 feet wide. The separation standard from the parallel taxiway centerline to the holding position on the hold apron is 55 feet, which is the TOFA line.

There is one designated hold apron on the airfield, which is located at the north end of Taxiway A. This hold apron is of an older design and does not reflect current geometry standards. Current standards outline a hold apron geometry where individual bays or slots are desired. **Figure 3-3** shows the current hold apron design standard.



Note: Locate intermediate hold lines at the outer limit of the inner TOFA.

Figure 3-3: Standard Hold Bay Configuration

INSTRUMENT NAVIGATIONAL AIDS AND APPROACH LIGHTING

Instrumentation for runways is important when weather conditions are less than visual (greater than three-mile visibility and 1,000-foot cloud ceilings). Runway 18 has a non-precision instrument approach (GPS/LPV and GPS/RNAV) with ⅞-mile visibility minimums.

The lowest visibility minimums typically available to general aviation airports is ½-mile. At ½-mile, an approach lighting system is required, along with other ground-based equipment, including a localizer and glideslope antenna (referred to as an instrument landing system [ILS]). However, the FAA is not making new ILS installations as they move toward GPS-based instrument approaches, which are not currently available as stand-alone ILS approaches. Without an approach lighting system, the lowest feasible visibility minimum is ¾-mile.

The instrument approach to Runway 18 is planned to be improved with visibility minimums of ¾-mile. A medium intensity approach lighting system (MALS) is also planned. A new instrument approach to Runway 36 is planned with 1-mile visibility minimums. Runway 8-26 is planned to remain a visual runway.

To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. Both ends of Runway 18-36 are outfitted with two-light precision approach path indicators (PAPI-s). The PAPI on the Runway 18 end is set to a glidepath of 3.5 degrees The PAPIs on Runway 36 are set to a glidepath of 3.0 degrees. These systems should be maintained in the short term. As the Airport experiences more activity by business jets, the PAPI should be upgraded to the four-box units (PAPI-4L).

Runway end identification lights (REILs) are flashing strobe lights located at the outside edge of the landing threshold. REILs provide a quick indication of the location of the threshold to pilots. REILs are typically provided for lighted runways that serve some business jet operations. REILS will be considered for future installation at APV.

Runway 8-26 is currently a visual runway with no instrument approach procedures. An instrument approach is not considered in the future primarily because of the rising terrain both east and west of the runway which presents challenges to obtaining an approach.

AIRFIELD LIGHTING SYSTEMS

Airfield marking, lighting, and signage provide information to pilots to assist in ground movements, and in locating the airport at night.

The Airport has a rotating beacon that projects a green light on one side and a white light on the other. Pilots can see the rotating beacon at night for up to 20 miles. The existing beacon is located east of the terminal building on a beacon pole. The beacon is more than 20 years old and breaks down on occasion. A replacement beacon and pole will be considered in this plan.

Runway 18-36 has medium intensity runway lights (MIRL) which should be maintained in good condition. Taxiway A and the associated connectors have medium intensity taxiway edge lights (MITL). The taxiway edge lights should be maintained in good condition. Runway 8-26 and Taxiway B (and connectors) do not have edge lights currently. Runway 8-26 is closed at night primarily due to the rising terrain beyond both ends. If it were to be opened to nighttime activity, then edge lights should be installed on the runway and taxiway.

Runway markings are designed according to the type of straight-in instrument approaches available to each runway end. Runway 18-36 has non-precision instrument markings. These markings are adequate and should be maintained. If an instrument approach with visibility minimums down to ½-mile is determined to be feasible in the alternatives analysis, then precision runway markings will be required. Runway 8-26 has basic markings (i.e., runway designation, touch down zone markings). Runway markings will fade over time and should be remarked if they deteriorate.

The airfield is outfitted with a runway/taxiway signage system. The signage system includes runway and taxiway designations, hold positions, routing/directional, runway end and exits, and runway distance remaining signs. These systems should be maintained.

Pilots can activate the Runway 18-36 MIRL and Taxiway A MITL through a series of clicks with their transponder. This pilot-controlled lighting system provides energy savings during low activity times, typically at night. This system should be maintained.

WEATHER AND COMMUNICATION AIDS

The airport has three windsocks. The primary lighted windsock is located on the east side of the runway near the midpoint. It is positioned within the segmented circle. There is a supplemental windsock near each runway end. Each of these visual weather aids meet design standard and should be maintained.

The Airport is equipped with a Super AWOS system that pilots can access via the UNICOM frequency to receive airfield weather conditions. This system is local in nature and does not require the siting criteria of a federally certified AWOS or ASOS. Therefore, the Super AWOS is not considered an approved source of weather information and should be considered advisory in nature. The Airport should consider the installation of a federally certified AWOS system. An appropriate location that meets siting criteria defined in FAA Order JO 6560.20C, *Siting Criteria for Automated Weather Observing Systems*.

AIRSIDE SUMMARY

The Apple Valley Airport has a nice complement of airside systems that should be maintained. Recent pavement condition report indicates that Runway 18-36, Taxiway A and nearly all the apron areas are showing signs of significant deterioration. Rehabilitation projects should be considered for any runway/taxiway pavement with a PCI of 75 or less. At 6,498 in length, Runway 18-36 can accommodate those aircraft currently using the airport on a frequent basis. In the future, with an increase in business jeet activity, an extension of the runway may be considered. The alternatives chapter will consider a future runway length of up to 8,500 feet.

The imaginary safety areas surrounding runway and taxiways are fully provided; however, recent FAA guidance indicates that overlapping runway safety areas (RSAs) should be discouraged. Since the RSA for Runway 18-36 extends over Runway 8-26, various alternatives will be considered to mitigate the overlapping RSAs. **Exhibit 3C** visually shows the primary safety surfaces for the runways and the parallel taxiways and documents the airfield non-standard conditions to be addressed in the alternatives analysis.

The geometry of several taxiways does not meet current FAA standards as outlines previously. The alternatives will consider geometry solutions to the non-standards taxiway elements.

A summary of the airside facility needs is shown on **Exhibit 3D**.

LANDSIDE REQUIREMENTS

Landside facilities provide the essential interface between the airside facilities and ground access to and from the Airport. The capacities of existing facilities have been examined against the projected requirements to gauge anticipated timing of needs. Included in the following analysis are: aircraft hangars and storage, aircraft parking apron, general aviation terminal services, automobile parking, and support elements, such as fuel storage, perimeter fencing, and a potential control tower.

AIRCRAFT STORAGE REQUIREMENTS

The demand for an aircraft storage hangar area is based upon the forecast number and mix of aircraft expected to be based at the Airport in the future. Most based aircraft are stored in either individual hangars or shared conventional hangars. Currently, approximately 35 aircraft are stored outside utilizing a tie-down position (25 percent). Over time, if hangars are available, then many of these aircraft owners would, instead, prefer to have an enclosed hangar space. In the ultimate timeframe, 90 percent of based aircraft are calculated to be in a hangar space. Therefore, over the next 20 years additional hangar space will be needed for 24 new based aircraft and 21 more spaces for current based aircraft owners who would opt for enclosed hangar storage space. A total of 45 new hangar spaces are estimated to be needed.

Utilizing 2,500 square feet per hangar space, a total of 112,500 square feet of aircraft storage space will be needed over the next 20 years. An additional 15 percent or 17,000 square feet will be needed for maintenance functions. A total of 129,500 square feet of hangar space may be needed within the next 20 years.

AIRCRAFT PARKING APRON REQUIREMENTS

Aircraft parking aprons should provide for the locally based aircraft that are not stored in hangars, transient aircraft, as well as for those apron areas used for maintenance functions, such as temporary ramp space when moving aircraft around. In total, it is estimated there are currently 84 apron positions available on the Airport. This includes approximately 50 on the main terminal apron, 24 offered by Midfield Aviation, and 10 more adjacent to the north conventional hangar. The total apron area is estimated at 27,600 square yards. The CHP apron and the fuel apron are excluded from the total apron area count because the CHP apron is a private leasehold, and the fuel apron does not have tie-down positions.

General industry standards have been modeled to estimate future aircraft apron needs. Space for local tie-down positions is estimated at 450 square yards per aircraft (typically single engine aircraft). Transient space is estimated for both small aircraft (650 square yards) and larger turboprops and business jets (1,400 square yards). The model requires an estimate of tie-down aircraft. Currently it is estimated that 30 percent of based aircraft tie-down. Over time, as hangars are made available it is assumed more aircraft owners will choose to store their aircraft inside. By the long-term planning period, it is estimated that 10 percent will choose to tie-down. **Table 3L** shows the results of the aircraft apron estimation model.

TABLE 3L | Aircraft Apron Requirements

			FORECAST		
	Currently Available	Calculated Need	Short Term	Intermediate Term	Long Term
Local Apron Positions	84	45	35	30	24
Local Apron Area (s.y.)	12,000	20,300	15,900	13,400	10,800
Transient Apron Positions	22	22	23	24	27
Piston Transient Positions	18	18	17	17	17
Turbine Transient Positions	4	4	6	7	9
Transient Apron Area (s.y.)	15,600	17,500	19,300	21,200	24,500
Total Apron Area (s.y)	**27,600**	**37,800**	**35,200**	**34,600**	**35,300**

Source: Coffman Associates analysis

The aircraft apron table shows that the local tie-down apron is undersized currently. This is logical as the tie-down positions near the north port-a-pots hangars are very small compared to current design standards and numerous aircraft are stored in non-designated tie-down positions near the north conventional hangar. Ideally, there would be 45 dedicated local tie-down positions encompassing approximately 20,300 square yards of apron pavement. Both of these figures decline over time as more aircraft are stored in hangars (assuming hangars are made available).

Transient apron calculations are primarily a function of estimated busy day transient operations and the number of those aircraft that may be on the ground at any one time. For this analysis it is estimated that 34 percent of operations are transient in nature, and at any one-time 30 percent of these operations are on the ground. An estimate of the mix of transient operations is also calculated where smaller piston aircraft are 80 percent, and larger turboprops and business jets are 20 percent. Over time, this estimate evolves until the split is 60/40 between small and large transient aircraft. The table shows that there is a need currently for additional transient apron which increases over time.

In total, it is estimated that an additional 7,700 square yards of aircraft apron space will be needed over the next 20-years.

GENERAL AVIATION TERMINAL SERVICES

General aviation terminal services have several functions, such as flight planning, a pilots' lounge, airport management, and storage. Many airports will also have leasable space in the terminal building for such features as a restaurant or concessions area, FBO line services, and other needs. These functions at APV are generally included in the terminal building, although other commercial users (e.g., FBOs) on the airport may duplicate many of these functions.

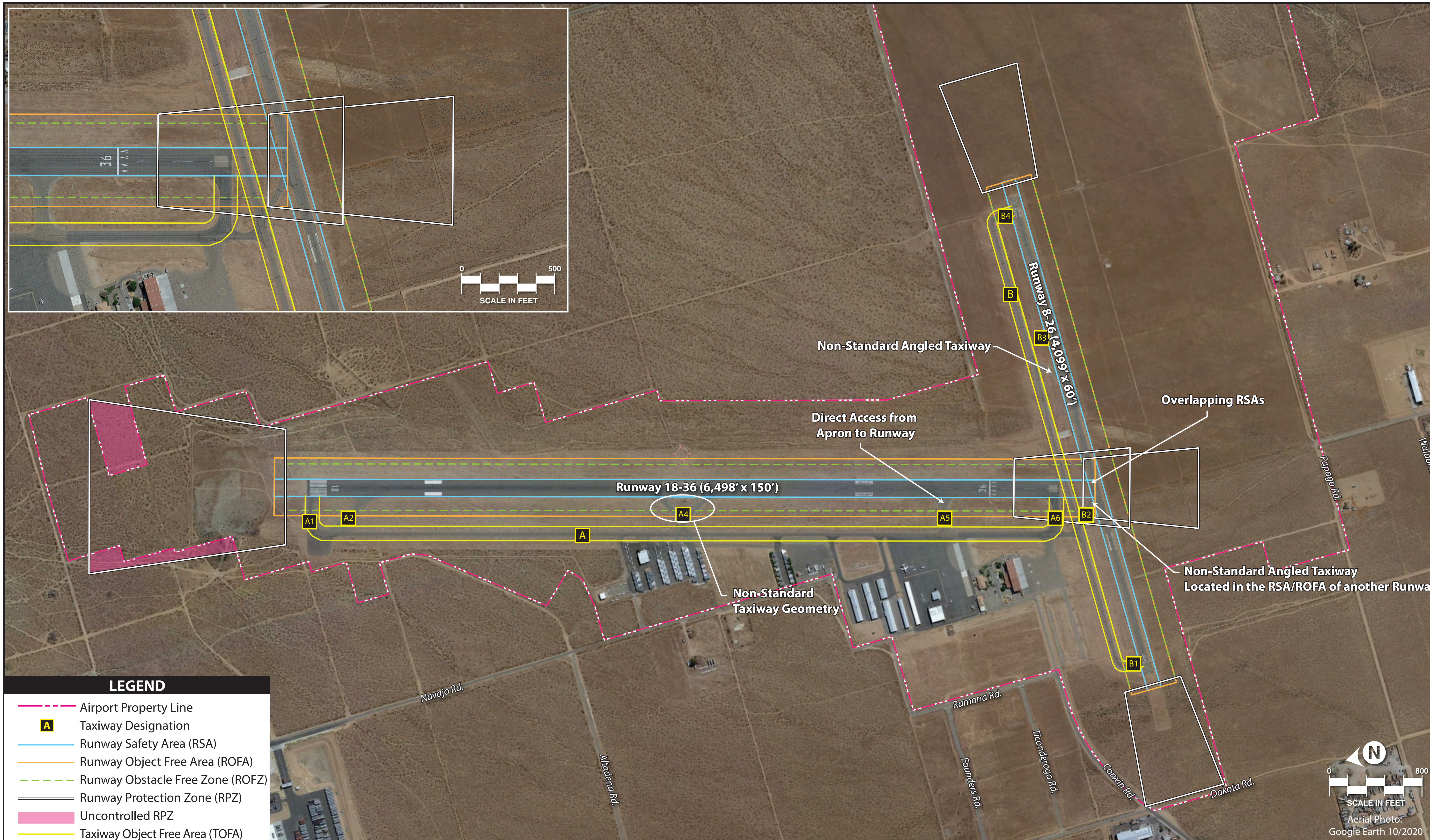


Exhibit 3C
SAFETY AREAS

	AVAILABLE	POTENTIAL IMPROVEMENT/CHANGE
RUNWAYS		
	**RUNWAY 18-36**	
	RDC: B-II-4000	C-II-4000 or C-II-2400
	Visibility minimum: 7/8-mile	Examine 3/4- and 1/2-mile visibility minimums
	Runway length/width: 6,498' x 150'	Consider extension to 8,500'/Maintain 150' width for crosswind coverage
	Pavement strength: 70(S)/90(D)/150(DD)	Maintain
	RSA: 150' wide x 300' beyond runway ends	RSA: 500' wide x 1,000' beyond runway ends
	Overlapping RSAs	Reconfigure to remove overlapping RSAs
	ROFA: 500' wide x 300' beyond runway ends	ROFA: 800' wide x 1,000' beyond runway ends
	Overlapping ROFA	Reconfigure to remove overlapping ROFAs
	OFZ: 400' wide x 200' beyond runway ends	Meets standard - maintain
	RPZ ownership: partial ownership	Acquire if feasible
	RPZ Incompatibilities: None	Maintain compatible RPZ land use
	Nonprecision markings	Meets standard - Maintain
	Precision markings: Currently NA	Add precision markings for ½-mile visibility minimums
	Medium intensity runway lighting (MIRL)	Meets standard - Maintain
	RUNWAY 8-26	
	RDC: B-I-VIS	Same/Maintain
	Pavement strength: 40(S)/60(D)/100(DD)	Same/Maintain
	RSA: 120' wide x 240' beyond runway ends	Same/Maintain
	Overlapping RSAs	Reconfigure to remove overlapping RSAs
	ROFA: 400' wide x 240' beyond runway ends	Same/Maintain
	Overlapping ROFA	Reconfigure to remove overlapping ROFAs
	RPZ ownership: Airport owned	Same/Maintain
	RPZ Incompatibilities: None	Maintain compatible RPZ land use
	Markings: Basic	Same/Maintain
	Edge Lighting: NA	Add MIRL
TAXIWAYS		
	Taxiway A and connectors: TDG - 2A	Same/Maintain
	Taxiway B and connectors: TDG - 1B	Same/Maintain
	Taxiway A and connectors width: 35'-80'	Implement uniform 35' taxiway width
	Taxiway B and connectors width: 35'	Maintain until reconstruction, then consider 25' width
	Taxiway A and connectors: MITL	Same/Maintain
	Taxiway B and connectors: No edge lighting	Add MITL
	Centerline markings	Same/Maintain
	Taxiway layout/geometry deficiencies	Redesign taxiway layout/geometry deficiencies
INSTRUMENT NAVIGATION AND WEATHER AIDS		
	Weather Reporting system: NA	Add AWOS
	Beacon	Replace aging beacon
	3 Windsocks	Maintain
	Segmented circle	Maintain
	7/8-mile non-precision instrument approach (Runway 18)	Consider 1/2-mile minimums
	Visual approaches to Runway 8-26	Maintain
VISUAL AIDS		
	PAPI-2L	Upgrade to PAPI-4L
	REILs: NA	Add REILs to both ends of Runway 18-36

KEY

AWOS - Automated Weather Observation System
MIRL/HIRL - Medium/High Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
OFZ - Obstacle Free Zone
PAPI - Precision Approach Path Indicator
RDC - Runway Design Code
REIL - Runway End Identification Lights
RSA - Runway Safety Area
RPZ - Runway Protection Zone
ROFA - Runway Object Free Area
SWL - Single Wheel Loading
TDG - Taxiway Design Group

The methodology used in estimating general aviation terminal facility needs is based on the number of airport users expected to utilize these facilities during the design hour. General aviation space requirements are based upon providing 120 square feet per design hour itinerant passenger. Design hour itinerant passengers are determined by multiplying design hour itinerant operations by the estimated number of passengers on the aircraft.

The existing terminal building is approximately 5,300 square feet, and it provides all the typical amenities including a restaurant. The calculations described above show that the existing terminal building size is adequate through the long-term planning period. The existing terminal building is in the ideal location, central to the runway system and fronted by a large transient apron. Since the terminal building also serves as the first introduction travelers may have to the region, it should be maintained and remodeled as necessary to reflect the values of the community.

AUTOMOBILE PARKING

Airport planners should be cognizant of the need for vehicle parking space on general aviation airports. At the same time, parking needs are generally determined by the hangar owner's needs. Those operating a business may have a need for more parking, while private hangars may not have a need for any dedicated parking as they park in their hangars when utilizing their aircraft. For this reason, it is inherently challenging to estimate future parking needs.

Parking needs can be divided between transient airport users and locally based users. Transient users include those employed at the airport and visitors, while locally based users primarily include those attending to their based aircraft. Ideally, both user types would have access to dedicated vehicle parking outside the fence; however, at general aviation airports, it is common for local based aircraft owners to park in their hangar. Rather than attempt to determine a specific number of vehicle positions needed in the future, developers should include vehicle parking, where necessary, in their development plans.

Table 3M presents the calculations for vehicle parking at Apple Valley Airport. Itinerant parking spaces are a function of the design hour itinerant passengers. To account for occasional peak periods, this number is doubled. A certain portion (25 percent) of based aircraft owners will also use parking spaces. A parking space is estimated at 260 square feet which will include the space necessary for handicap spaces.

At Apple Valley Airport, the total number of vehicle parking spaces appears adequate. In the intermediate and long-term planning periods additional parking may be required based on square footage standard today. New parking should be made available in conjunction with new hangar/building construction.

TABLE 3M | GA Vehicle Parking Requirements				
Parameter	**Existing**	**Short Term**	**Intermediate Term**	**Long Term**
Design Hour Itinerant Passengers	13	13	14	16
GA Itinerant Spaces	52	27	28	31
GA Based Spaces	29	32	33	35
Total Parking Spaces	**86**	**58**	**61**	**66**
GA Itinerant Parking Area (s.f.)	15,500	7,000	7,000	8,000
GA Based Parking Area (s.f.)	0	8,000	9,000	9,000
Total Parking Area (s.f.)	**15,500**	**15,000**	**16,000**	**17,000**

Source: Coffman Associates analysis

SUPPORT FACILITIES

Various facilities that do not logically fall within the airside or landside classification are examined in this support facilities section. These support facilities relate to the overall operations of the Airport.

FUEL STORAGE

Fuel sales are managed by the fuel providers on the Airport. They own and operate their own fuel storage and delivery vehicles. Therefore, it is a business decision if additional fuel storage capacity is needed.

Additional fuel storage capacity should be planned if the fuel providers are unable to maintain an adequate supply and reserve—a 14-day reserve being common for general aviation airports. Including delivery trucks, there is a 17,000-gallon capacity for Jet A fuel and 12,750 gallons for Avgas. The estimate of future fuel capacity needs is based on annual fuel flowage from other airports similar to APV. Future fuel consumption assumes an increasing volume per operation as outlined in **Table 3N**. Current fuel capacity for Jet A appears adequate through the long-term planning horizon. Additional Avgas storage capacity may be needed by the long-term planning period.

Table 3N | Fuel Storage Requirements					
			PLANNING HORIZON		
	Current Capacity (gal.)	**Baseline Consumption[1]**	**Short Term**	**Intermediate Term**	**Long Term**
Jet A Gallons per Operation	17,000 gal.	10 gal./op.	15 gal./op.	20 gal./op.	40 gal./op.
Annual Usage (gal.)		9,500	26,625	53,000	186,000
Daily Usage (gal.)		26	73	145	510
14-Day Storage (gal.)		364	1,021	2,033	7,134
Avgas Gallons per Operation	12,750 gal.	1 gal./op.	2 gal./op.	4 gal./op.	8 gal./op.
Annual Usage (gal.)		42,150	87,250	180,600	386,000
Daily Usage (gal.)		115	239	495	1,058
14-Day Storage (gal.)		1,617	3,347	6,927	14,805

Source: [1]Coffman Associates estimate

PERIMETER FENCING

At general aviation airports, full perimeter fencing is not required like it is at commercial service airports. Perimeter fencing serves multiple purposes, including basic airfield security and wildlife deterrence. As development occurs around general aviation airports, the need for full perimeter fencing becomes more necessary.

Currently, Apple Valley Airport has full perimeter fencing which should be maintained through the planning period. The existing fencing is not topped with barbed wire, which should be considered as an additional deterrent to unauthorized airfield access.

AIRCRAFT RESCUE AND FIREFIGHTING FACILITIES

Airports that are certificated under Title 14 Code of Federal Regulations, Part 139 (commercial service airports), are required to have on-site firefighting capabilities. The Apple Valley Airport is not a Part 139 airport and, therefore, is not required to have on-site firefighting capabilities. Instead, local fire departments respond to Airport emergencies.

AIRPORT ACCESS

State Route 18 bisects Apple Valley connecting it with Big Bear City to the east and Palmdale to the west. Apple Valley Airport is located approximately three miles north of downtown Apple Valley. Corwin Road is the airport's primary access road, which enters airport property from the west. Interstate Highway 15, which extends northeast-southwest on the west side of the Airport, has several exits to the Town of Apple Valley. Drive-time from each of these exits to the Airport is approximately 15 minutes. Major roadways around the Airport's perimeter include Dale Evans Parkway along the west side, Central Road to the east, Quarry Road to the north, and Waalew Road to the south.

For many years, a new interstate highway and light rail line dubbed the High Desert Corridor has been considered on an alignment that would pass the southwest boundary of the Airport, which will ultimately provide access between Victor Valley and Antelope Valley to the west. An interchange has been planned at Dale Evans Parkway which would provide excellent access to the Airport. Ultimately, Frisco Road could replace Corwin Road as the main entrance to the Airport. The High Desert Corridor has had challenges in planning and funding and, as of June 2022, was on indefinite hold.

Interior Access

Occasionally, private vehicles use the apron and taxilanes for movement as there is no dedicated interior access road. The segregation of vehicle and aircraft operational areas is supported by FAA guidance established in June 2002. FAA AC 50/5210-20A, *Ground Vehicle Operations on Airports*, states, "The control of vehicular activity on the airside of an airport is of the highest importance." The AC further states, "An airport operator should limit vehicle operations on the movement areas of the airport to only those vehicles necessary to support the operational activity of the airport."

Service roads are typically used to segregate vehicles from the aircraft operational areas. The alternatives analysis will examine options for interior access roads to serve hangar facilities as well as a paved service road extending around the runway and airfield.

WASH RACK

Busier general aviation airports will often desire to establish an aircraft wash rack in a single location for aircraft cleaning purposes. Wash racks and water recovery systems enhance pollution prevention through water reclamation, wash eater filtration, and cleaning solution reclamation. Wash racks provide an environmentally friendly method to contain aircraft cleaning fluids.

A new wash rack is planned to be constructed in 2024 on the south end of the fuel apron.

MAINTENANCE BUILDING

Apple Valley Airport has a dedicated 3,000 square foot maintenance facility located immediately west of the terminal building. This facility is currently adequate for the storage of equipment that is used for various purposes on the Airport. The alternatives analysis will consider locations for a new airport maintenance facility in the future.

LANDSIDE SUMMARY

This section has documented the potential needs of the Airport for landside facilities. The following would be needed over the next 20-years if growth occurs as forecast:

- Hangar positions: 45
- Hangar Area: 112,500 square feet
- Maintenance Hangar Area: 17,000 square feet
- Aircraft Parking Apron Positions: Five transient parking positions (may be converted from existing local tie-down positions)
- Aircraft Parking Apron: 7,700 square yards
- Auto Parking Area: 1,500 square feet
- Terminal Building: Current size meets long-term need.
- Fuel Storage: Potential for additional Avgas storage in the long term.
- Fencing: Maintain full perimeter fencing. Consider adding barbed wire.
- Wash Rack: Consider adding a wash rack.

SUMMARY

This chapter has outlined both airside and landside facility requirements for APV for a 20-year planning period.

At its current length of 6,498 feet, Runway 18-36 meets the needs of current Airport users. By the long-term planning period, the Airport is forecast to transition to a larger critical aircraft by recording more than 500 annual operations by larger business jets. If this happens, then there may be justification for a runway length of up to 8,500 feet; therefore, the alternatives analysis to follow will examine the impacts of meeting these long-term requirements.

Consideration will also be given to potential improvements to the instrument approach procedures. Currently, Runway 18 has an instrument approach with visibility minimums not lower than ⅞-mile. Planning will consider visibility minimums of ¾-mile for runway 18 and 1-mile for Runway 36. Runway 8-26 is planned to remain a visual approach runway.

The RSAs for the runways overlap, which is a non-standard condition. In the alternatives chapter, methods to "decouple" these runways will be examined.

The taxiways associated with Runway 18-36 have a width standard of 35-feet however most are wider. At reconstruction, these taxiways should be a uniform 35 feet in width. The taxiways associated with Runway 8-26 are 25 feet wide and should be maintained at this width. Several taxiways are of a non-standard geometry and provide direct access to the runway from an apron. These geometry issues will be examined in the alternatives chapter.

The current taxiway width standard is 25 feet; however, the Airport is anticipated to transition to a width standard of 35 feet. Some of the taxiways exceed this standard. At the time of the next major reconstruction of those taxiways, additional analysis may be required to maintain the current width. Without special dispensation for taxiway width, this plan will consider a uniform width of 35 feet for all taxiways.

Landside facility requirements indicate an increasing need for more hangar space. Over the 20-year scope of the master plan, approximately 129,500 square feet of hangar space may be needed to accommodate forecast growth at the Airport. Along with that growth comes a commensurate need for an additional aircraft parking apron and vehicle parking.

The following chapter will consider various airside and landside layouts to address forecast growth at the Apple Valley Airport.