FIGURE 3-1: BASED AIRCRAFT FORECASTS

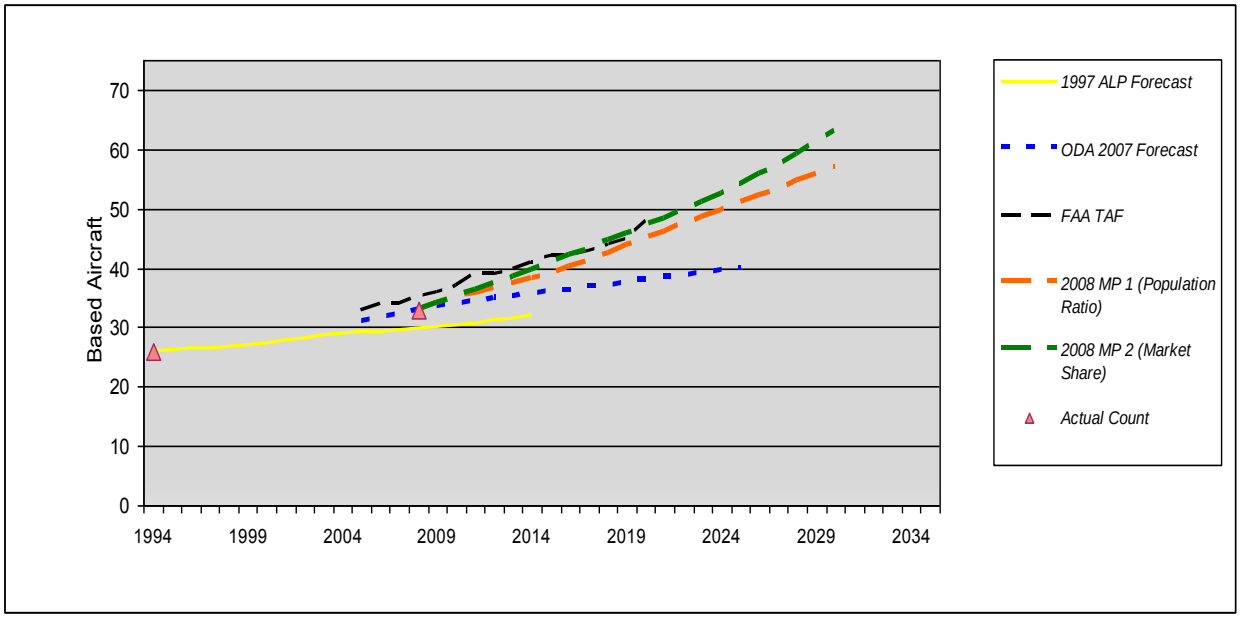
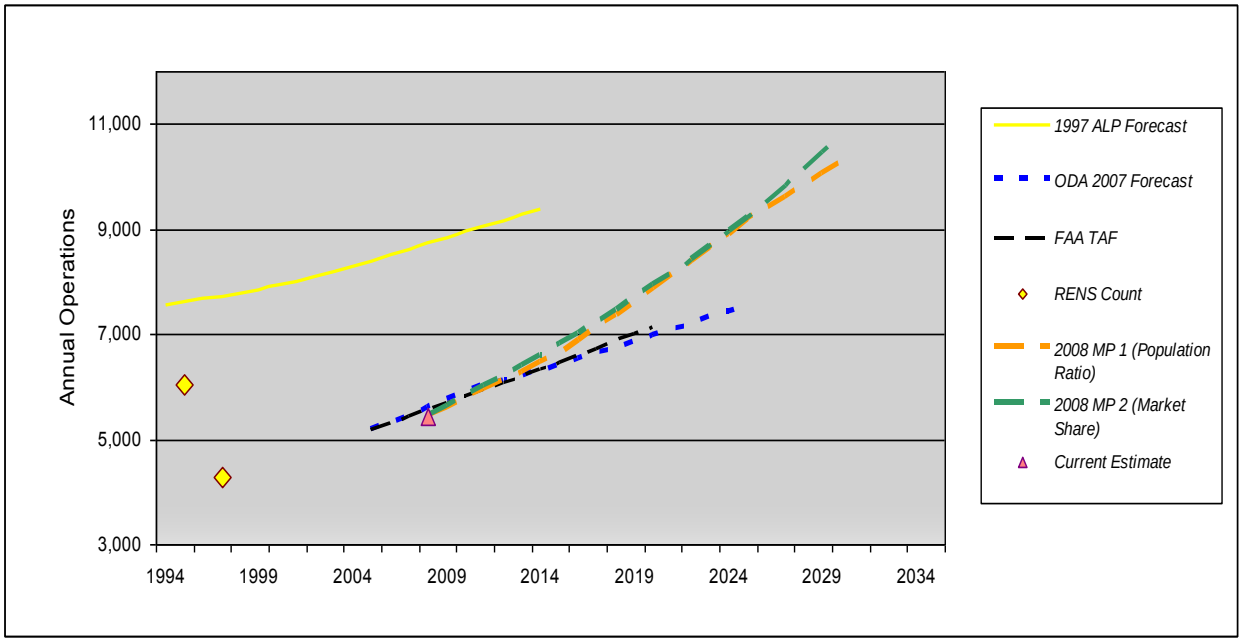


FIGURE 3-2: AIRCRAFT OPERATIONS FORECASTS



Chapter Four
Facility Requirements

CENTURY WEST
ENGINEERING CORPORATION

Florence Municipal Airport

CHAPTER FOUR
AIRPORT FACILITY REQUIREMENTS

Introduction

This chapter uses the results of the inventory and aviation activity forecasts conducted in Chapters Two and Three, as well as established planning criteria, to determine the airside and landside facility requirements through the current twenty-year planning period. Airside facilities include runways, taxiways, navigational aids and lighting systems. Landside facilities include hangars, fixed base operator (FBO) facilities, aircraft parking apron, aircraft fueling, automobile parking, utilities and surface access.

Detailed descriptions of the primary planning assumptions and applicable FAA airport design and airspace planning standards applied to Florence Municipal Airport are provided in this chapter. These standards are consistent with the current and forecast activity (including the design aircraft) presented in the previous chapter and for runways used by small single-engine and multi-engine aircraft. Airspace planning for Runway 15/33 is based on current and future visual approach capabilities, which is consistent with other runway capabilities. Airspace protections for visual runways are also compatible with nonprecision instrument approach procedures to an airport environment, rather than to a specific runway end.

The facility requirements evaluation is used to identify the adequacy or inadequacy of existing airport facilities and to identify what new facilities may be needed during the planning period based on forecast demand. Options for providing these facilities will be evaluated in Chapter Five to determine the most cost effective and efficient means for implementation.

ORGANIZATION OF MATERIALS

This chapter evaluates facility requirements from two different perspectives: (1) conformance with Federal Aviation Administration (FAA) airport design and airspace planning standards; and (2) demand-based facility needs that reflect the updated aviation activity forecasts presented in Chapter Three.

The first section summarizes Florence Municipal Airport's conformance with the FAA airport design standards and FAR Part 77 airspace planning criteria that are currently in place (small aircraft and

visual approaches). The second section provides an in-depth evaluation of these standards and an assessment of the standards for both the existing and future airfield configurations. The second section also reflects in gross numbers, new facility needs such as runway length requirements, hangar spaces and aircraft parking positions based on forecast demand and the needs of the design aircraft. Items such as lighting and navigational aids will be evaluated based on the type of airport activity, airport classification and current capabilities.

This approach is consistent with methodology used to develop the aviation activity forecasts. As noted in the previous chapter, the preferred forecasts, facility requirements, and development alternative are interdependent elements that will be used to guide future improvements at Florence Municipal Airport.

SUMMARY OF AIRPORT CONFORMANCE WITH FAA STANDARDS

An evaluation of Florence Municipal Airport's conformance with FAA Airport Design Standards and FAR Part 77 imaginary surfaces was conducted for this project through site visits, review of aerial photography and review of existing airport drawings. **Figures 4-1 and 4-2** on the following pages illustrate the general locations of the non-conforming items identified for airport design standards and the close-in FAR Part 77 airspace imaginary surfaces. The detailed technical evaluations for each of the items and a summary of activity-driven facility requirements are provided later in this chapter. The general assessment of conformance indicates that most existing facilities at Florence Municipal Airport meet FAA standards. In instances where standards are not met, it appears that correcting most items is feasible.

The standards assumed for Runway 15/33 are based on small aircraft included in Airplane Design Group I (ADG I) and Aircraft Approach Category B, which is consistent with Airport Reference Code (ARC) B-I (small). The airspace planning criteria are based on utility runways with visual approaches, which represent the current level of capabilities at the airport. The addition of a nonprecision instrument approach has been identified as a high priority improvement for the airport. For Florence Municipal Airport, developing a non-precision instrument approach with a circling procedure (directing aircraft to the airport environment, rather than a particular runway end) appears to be the most practical option based on the airfield configuration, particularly the proximity of hangars and parked aircraft to the runway. This type of instrument approach is compatible with the airspace currently defined for visual approaches.

FAA AIRPORT DESIGN STANDARDS

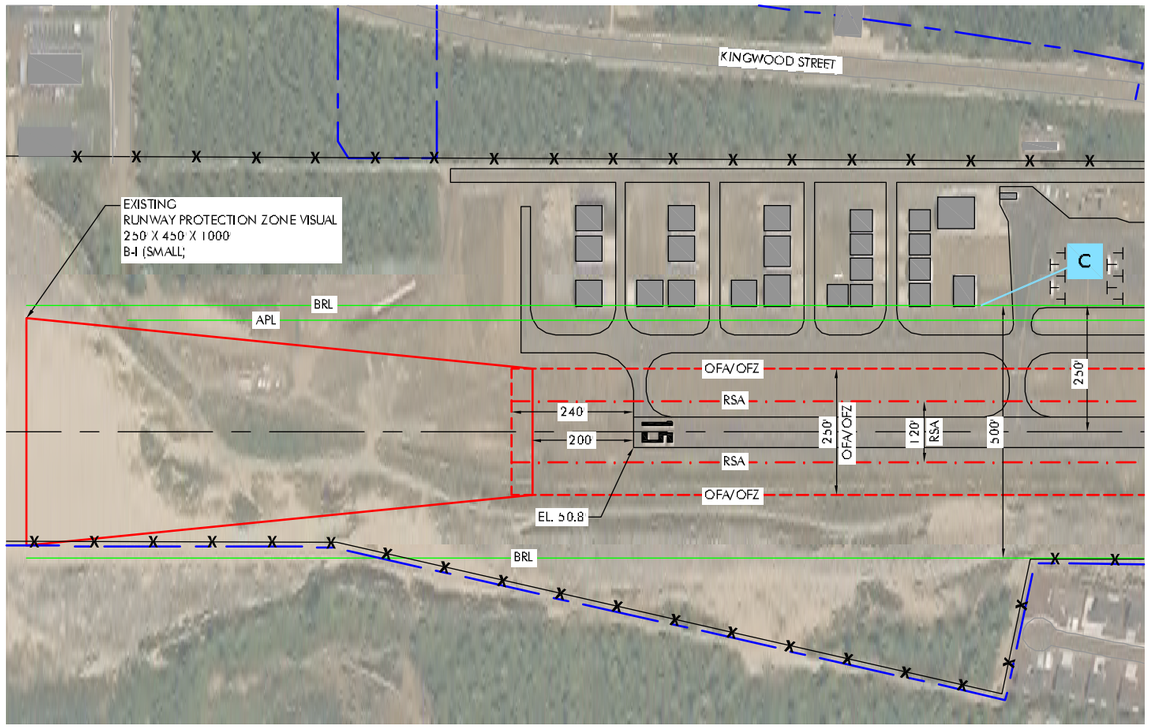
1. RPZ: ROAD, PROPERTY OWNERSHIP (CONTROL)
2. OFA/OFZ: BUSHES, TERRAIN

FAR PART 77 SURFACE PENETRATIONS/CONFLICTS

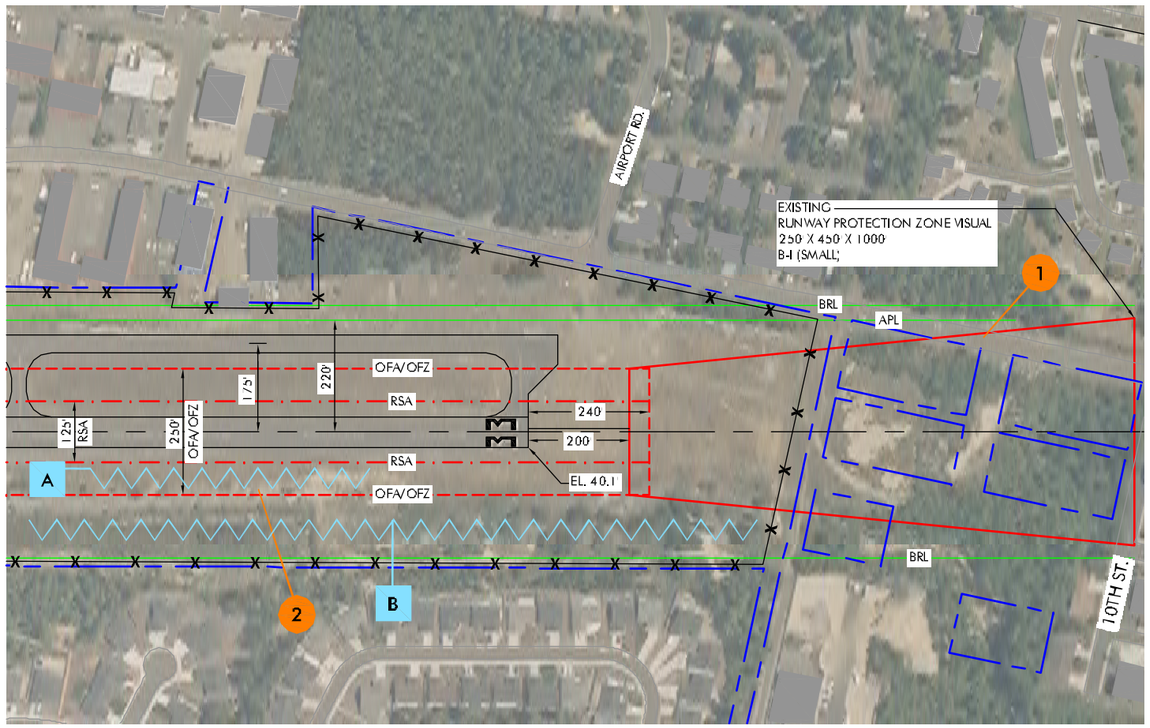
- A PRIMARY SURFACE: BUSHES, TERRAIN
- B TRANSITIONAL SURFACE: TREES, BUSHES, TERRAIN
- C TRANSITIONAL SURFACE: SOME HANGARS MAY PENETRATE SURFACE

LEGEND

	EXISTING	FUTURE
FACILITIES		
BUILDINGS		
RUNWAY		
BUILDING RESTRICTION LINE (BRL)	BRL (E)	
AIRCRAFT PARKING LINE (APL)	APL (E)	
AIRPORT PROPERTY LINE		
RUNWAY SAFETY AREA (RSA)		
OBJECT FREE AREA (OFA)		
TAXIWAY OBJECT FREE AREA (TOFA)		
OBSTACLE FREE ZONE (OFZ)		
RUNWAY PROTECTION ZONE (RPZ)		
GROUND CONTOURS	10	
AIRPORT REFERENCE POINT (ARP)		
REIL		
VISUAL GUIDANCE INDICATORS	PAPI	
WIND INDICATOR		
FENCE		
BEACON		
THRESHOLD LIGHTS		
SEGMENTED CIRCLE WIND INDICATOR		



RWY 15 END



RWY 33 END

FLORENCE MUNICIPAL AIRPORT
NONCONFORMING ITEMS

CENTURY WEST ENGINEERING CORPORATION

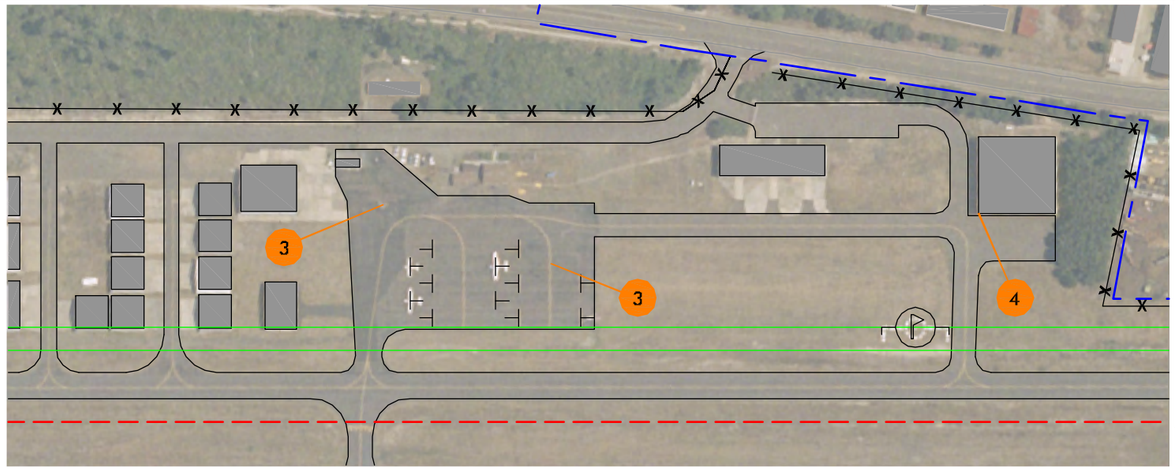
FIGURE NO. 4-1

FAA AIRPORT DESIGN STANDARDS

- 3 TAXILANE OFA: PARKED A/C AND FUELING
- 4 TAXILANE OFA: HANGAR
- 5 RPZ: ROAD, PROPERTY OWNERSHIP (CONTROL)

FAR PART 77 SURFACE PENETRATIONS/CONFLICTS

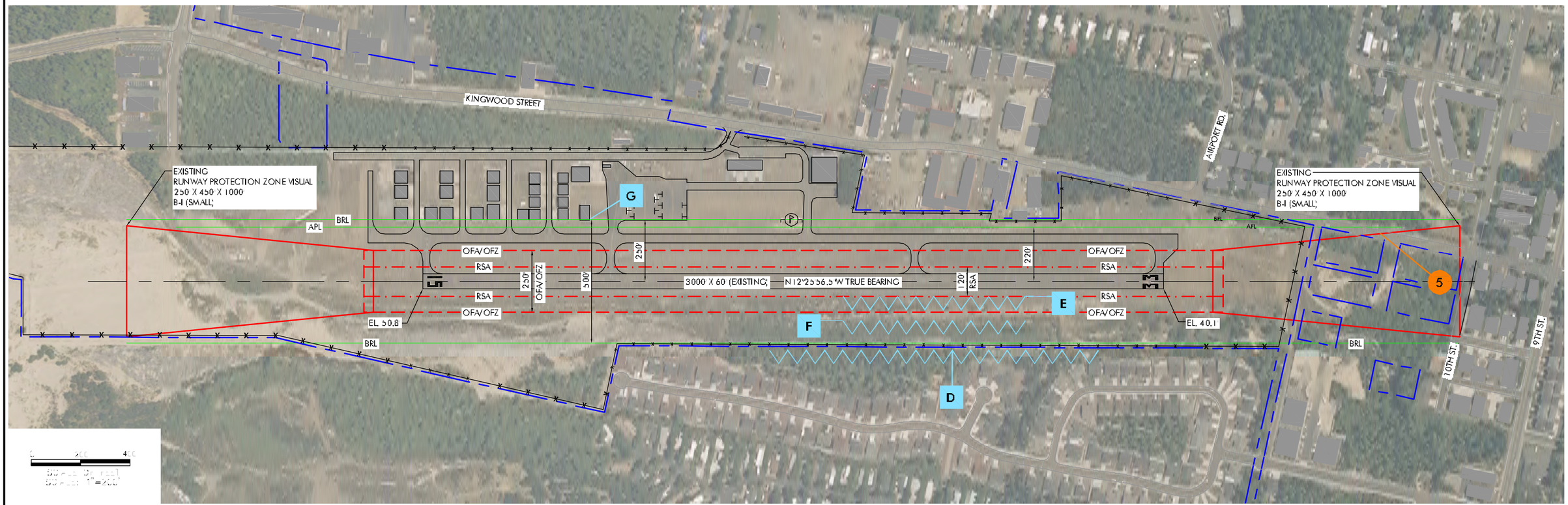
- D TRANSITIONAL SURFACE: TREES
- E PRIMARY SURFACE: TREES, BUSHES, TERRAIN
- F TRANSITIONAL SURFACE: TREES, BUSHES, TERRAIN
- G TRANSITIONAL SURFACE: SOME HANGARS MAY PENETRATE SURFACE



APRON AREA

LEGEND

	EXISTING	FUTURE
FACILITIES		
BUILDINGS		
RUNWAY		
BUILDING RESTRICTION LINE (BRL)	BRL (E)	
AIRCRAFT PARKING LINE (APL)	APL (E)	
AIRPORT PROPERTY LINE		
RUNWAY SAFETY AREA (RSA)		
OBJECT FREE AREA (OFA)		
TAXIWAY OBJECT FREE AREA (TOFA)		
OBSTACLE FREE ZONE (OFZ)		
RUNWAY PROTECTION ZONE (RPZ)		
GROUND CONTOURS	10	
AIRPORT REFERENCE POINT (ARP)		
REIL		
VISUAL GUIDANCE INDICATORS	PAPI	
WIND INDICATOR		
FENCE		
BEACON		
THRESHOLD LIGHTS		
SEGMENTED CIRCLE WIND INDICATOR		



N

CENTURY WEST ENGINEERING CORPORATION

FLORENCE MUNICIPAL AIRPORT NONCONFORMING ITEMS

FIGURE NO. 4-2

AIRPORT FACILITY REQUIREMENTS EVALUATION

Historic Airport Planning Overview

The most recent FAA-approved airport layout plan (ALP) for the airport was prepared in 1997, with several minor updates completed following construction projects between 2001 and 2007. Recent airport improvements include renovations to the FBO building, auto parking, two fencing projects (13,300 linear feet combined) and automated vehicle gate, taxilanes and utilities for the north hangar development, an above ground fuel storage tank, an automated weather observation system (AWOS) and a new airport rotating beacon. In the eleven years since the 1997 Airport Layout Plan study was completed, twelve new privately-owned hangars have been constructed at the airport. Five older hangars previously located near the south end of the runway have been removed.

The 1997 ALP depicts Runway 15/33 with an existing length of 3,000 feet and a future length of 3,430 feet. The planned runway extension is located at the north end of the runway.

The 1997 ALP identifies the existing and future airport reference code (ARC) as B-I, with design characteristics consistent with small aircraft. A twin-engine piston aircraft (Cessna 402) and a twin-engine turboprop (King Air 100) were identified as existing and future design aircraft.

Land Utilization

The current Exhibit "A" Property Plan identifies 139.77 acres of property in airport ownership. The city has acquired an additional 47 acres of avigation easements for privately-owned and publicly-owned parcels surrounding the airport, including portions of the existing Runway Protection Zones (RPZ) and the residential subdivision abutting the west side of the airport.

The airport land area includes developed areas (the runway-taxiway system and protected areas, the west landside areas) and undeveloped areas. A portion of the undeveloped property is included in the planned industrial park development on both sides of Kingwood Street. **Table 4-1** summarizes the existing areas and land uses, with acreages estimated based on aerial photography and property line review.

The airport's north landside area has approximately 14 hangar sites currently available with taxiway access. It appears that the current capacity will accommodate forecast demand well into the twenty-year planning period, with development of additional spaces required later in the planning period. The landside area has limited space for apron expansion immediately south of the main apron. The existing parallel taxiway and the access taxiway that extends from rear corner of the apron to the south, defines the useable areas of the apron for aircraft parking, fueling, etc.

The existing airport property can accommodate the previously planned 430-foot north runway extension and the future Runway 15 RPZ. No areas of future property acquisition are identified on the 1997 ALP.

TABLE 4-1: FLORENCE MUNICIPAL AIRPORT LAND USE CONFIGURATION

Existing Land Use	Acreage *(rounded)*	Percentage of Total Airport Property
Airside Area Runway, Parallel Taxiway, Runway Protection Zones, Object Free Area, Runway Safety Area, Obstacle Free Zone, Primary Surface	62	44%
East Landside Area Aircraft apron, hangar area, access road, vehicle parking	15	11%
Remaining Undeveloped Areas Undeveloped land located within airport property, includes industrial park parcels.	63	45%
Total	**140**	**100%**

Airspace

The airspace structure in the vicinity of Florence Municipal Airport is uncomplicated and is not expected to constrain future airport development or operation. The traffic pattern for both runway ends is located on the west side of the runway (right traffic Runway 15, left traffic Runway 33) to reduce flight activity over the more densely populated areas of the community located along U.S. Highway 101, east of the airport.

The current FAR Part 77 airspace surfaces associated with Runway 15/33 are based on visual approach capabilities and use by small aircraft (weighing less than 12,500 pounds).[13,14] The visual airspace surfaces are also compatible with a circling instrument approach procedure. A circling instrument approach provides guidance to the airport environment, rather than a particular runway end, and the pilot must maintain visual contact with the airport environment once passed the missed approach point.

The 1997 Airspace Plan depicts relatively small areas of terrain penetration within the defined FAR Part 77 airspace surfaces to the north and south of the runway.

[13] In FAR Part 77, utility runways are designed to accommodate aircraft weighing less than 12,500 pounds.
[14] As depicted on current FAA-approved Airport Airspace Drawing (SFC Engineering, 1992)

Design Aircraft

The selection of the appropriate design standards for the development of airfield facilities is based primarily upon the characteristics of the aircraft that are expected to use the airport. The most critical characteristics are the approach speed and wingspan of the design aircraft anticipated for the airport. The **design aircraft** is defined as the most demanding aircraft type operating at the airport with a minimum of 500 annual itinerant operations (takeoffs and landings). This level of annual activity is considered to be "substantial use" by FAA.

FAA **Advisory Circular 150/5300-13** groups aircraft into five categories based upon their approach speed. Categories A and B include small propeller aircraft, some smaller business jet aircraft, and some larger aircraft with approach speeds of less than 121 knots. Categories C, D, and E consist of the remaining business jets as well as larger jet and propeller aircraft generally associated with commercial and military use; these aircraft have approach speeds of 121 knots or more. The advisory circular also establishes six airplane design groups (ADG), based on the physical size (wingspan) of the aircraft. The categories range from ADG I, for aircraft with wingspans of less than 49 feet, to ADG VI for the largest commercial and military aircraft. ADG I is further divided into two subcategories: runways serving "small airplanes exclusively" and runways serving aircraft weighing more than 12,500 pounds. Aircraft with a maximum gross takeoff weight of less than 12,500 pounds are classified as "small aircraft" by the FAA. The combination of airplane design group and approach category creates the Airport Reference Code (ARC), which is used to define the dimensional standards for the runway/taxiway system. A summary of typical aircraft and their respective design categories is presented in **Table 4-2** and depicted in **Figure 4-3.**

TABLE 4-2:
TYPICAL AIRCRAFT & DESIGN CATEGORIES

Aircraft	Airplane Design Group	Aircraft Approach Category	Maximum Gross Takeoff Weight (Lbs)
Piper PA-28/32 Cherokee	A	I	2,550
Cessna 172TD	A	I	2,552
Cessna 182	A	I	2,950
Cirrus Design SR22	A	I	3.400
Mooney Acclaim (Type S)	A	I	3,374
Cessna 400	A	I	3,600
Cessna 206	A	I	3,600
Beechcraft Bonanza A36	A	I	3,650
Cessna 210	A	I	3,850
Diamond Twin Star (DA42-TDI)	A	I	3,935
Socata/Aerospatiale TBM 700	A	I	6,579
Beechcraft Baron 58	B	I	6,200
Eclipse 500	B	I	5,640
Piper Aerostar 602P	B	I	6,000
Cessna P337 Skymaster	B	I	4,630
Cessna 402	B	I	6,300
Piper PA-31-350 Chieftan	B	I	7,000
Cessna 421	B	I	7,450
Cessna Citation CJ1 (CE525)	B	I	10,600
Beechcraft Super King Air 200	B	II	12,500
Piper Malibu	A	II	4,300
Cessna Grand Caravan	A	II	8,750
Pilatus PC-12	A	II	9,920
Piper Cheyenne II	B	I	9,000
Aero Commander 690A	B	I	10,300
Cessna Citation CJ2+ (CE525A)	B	II	12,500
Cessna Citation Bravo (CE550)	B	II	14,800
Cessna Citation Encore (CE560)	B	II	16,630
Cessna Citation Excel (CE560XL)	B	II	20,000
Dassault Falcon 20	B	II	28,660
Learjet 60	C	I	23,100
Canadair Challenger	C	II	45,100
Gulfstream IV (G450)	D	II	71,780

Source: FAA Advisory Circular (AC) 150/5300-13 (as amended); Jane's Aircraft Guide; aircraft manufacturer data.

A-I less than 12,500 lbs. or less (small)	B-I less than 12,500 lbs. or less (small)	A-II, B-II less than 12,500 lbs. or less (small)	B-II greater than 12,500 lbs.	A-III, B-III greater than 12,500 lbs.
Beech Baron 55 Beech Bonanza Cessna 150 Piper Archer Piper Seneca	Beech Baron 58 Beech King Air 100 Cessna 402 Cessna 421 Piper Navajo Piper Cheyenne Cessna Citation I	Super King Air 200 Cessna 441 DHC Twin Otter Cessna Caravan King Air C90	Super King Air 300, 350 Beech 1900 Jetstream 31 Falcon 20, 50 Falcon 200, 900 Citation II, Bravo, XLS+ Citation CJ3	DHC Dash 7 DHC Dash 8 Q-300, Q-400 DC-3 Convair 580 Fairchild F-27 ATR 72 ATP
				

C-I, D-I	C-II, D-II	C-III, D-III	C-IV, D-IV	D-V
Lear 25, 35, 55, 60 Israeli Westwind HS 125 - 700	Gulfstream II, III, IV Canadair 600 Canadair Regional Jet Lockheed JetStar Citation X Citataton Sovereign Hawker 800 XP	Boeing Business Jet B 727-200 B 737-300 Series MD-80, DC- 9 Fokher 70, 100 A319, A320 Gulfstream V Global Express	B- 757 B- 767 DC- 8-70 DC- 10 MD- 11 L 1011	B- 747 Series B- 777
				

CENTURY WEST
ENGINEERING CORPORATION

AIRCRAFT AIRPORT REFERENCE CODES (ARC)

FIGURE

4-3

As noted in Chapter Three, current and forecast activity consists of predominantly small single-engine and multi-engine aircraft (piston and turbine). Based on existing and forecast activity, **the recommended design aircraft for Runway 15/33 is a multi-engine airplane with a maximum gross takeoff weight less than 12,500 pounds, included in Aircraft Approach Category B and Airplane Design Group I.** The characteristics for typical piston and turbine multi-engine piston aircraft that regularly operate on Runway 15/33 are summarized below:

Aircraft used in daily cargo/express service	**Locally-based business class turboprop**
Piper Chieftan *(typical cabin-class piston twin; 6-10 passengers; maximum gross takeoff weight 7,000 pounds)*	**Piper Cheyenne II** *(typical small/medium turboprop; 5-6 passengers; maximum gross takeoff weight 9,000 pounds)*
• Aircraft Approach Category B *(approach speed: 100 knots)* • Airplane Design Group I *(wingspan: 40.6 feet)* • Small Airplane *(maximum gross takeoff weight < 12,500#)*	• Aircraft Approach Category B *(approach speed: 110 knots)* • Airplane Design Group I *(wingspan: 42.6 feet)* • Small Airplane *(maximum gross takeoff weight < 12,500#)*
Airport Reference Code: B-I (small)	**Airport Reference Code: B-I (small)**

AIRPORT DESIGN STANDARDS

Federal Aviation Administration (FAA) **Advisory Circular (AC) 150/5300-13, Airport Design**, serves as the primary reference in planning airfield facilities. Federal Air Regulation (**FAR) Part 77, Objects Affecting Navigable Airspace**, defines airport imaginary surfaces, which are established to protect the airspace immediately surrounding a runway. The airspace and ground areas surrounding a runway should be free of obstructions (i.e., structures, parked aircraft, terrain, trees, etc.) to the greatest extent possible.

The design standards for ADG I (small aircraft) are summarized in **Table 4-3.** For comparison, the standards for ADG I (including large and small aircraft) and ADG II are also summarized. A summary of Florence Municipal Airport's current conformance with both existing ADG I (small) and the other design standards and FAR Part 77 airspace surfaces is presented in **Table 4-4**. It should be noted that not meeting various design standards does not necessarily indicate an inability to meet standards, but illustrates a need to upgrades facilities to be consistent with FAA standards.

TABLE 4-3: AIRPORT DESIGN STANDARDS SUMMARY (DIMENSIONS IN FEET)

Standard	Runway 15/33 *Existing Conditions*	ADG I[1] *(small aircraft exclusively)*	ADG I[2] *A&B Aircraft*	ADG II[2] *A&B Aircraft*
Runway Length	3,000	2,850/3,370[3]	2,850/3,370[3]	5,240/6,620[4]
Runway Width	60	60	60	75
Runway Shoulder Width	10	10	10	10
Runway Safety Area Width	120	120	120	150
Runway Safety Area Length (Beyond Rwy Roll-out End)	240	240	240	300
Obstacle Free Zone Width	250[5]	250	400	400
Obstacle Free Zone Length (Beyond Rwy Roll-out End)	200	200	200	200
Object Free Area Width	250[5]	250	400	500
Object Free Area Length (Beyond Rwy Roll-out End)	240	240	240	300
Primary Surface Width	250[5]	250	500	500
Primary Surface Length (Beyond Rwy Roll-out End)	200	200	200	200
Runway Protection Zone Length	1,000[6]	1,000	1,000	1,000
Runway Protection Zone Inner Width	250[6]	250	500	500
Runway Protection Zone Outer Width	450[6]	450	700	700
Runway Centerline to:				
Parallel Taxiway/Taxilane CL	175	150	225	240
Aircraft Parking Area	220[7]	220[9]	270[11]	306[13]
Building Restriction Line	250[8]	251[10]	376[12]	376[14]
Taxiway Width	35	25	25	35
Taxiway Shoulder Width	10	10	10	10
Taxiway Safety Area Width	49	49	49	49
Taxiway Object Free Area Width	89+	89	89	131
Taxiway Centerline to Fixed or Movable Object	44.5+	44.5	44.5	65.5
Taxilane Object Free Area Width	<79[15]	79	79	115
Taxilane Centerline to Fixed or Movable Object	<39.5[15]	39.5	39.5	57.5

1. Utility runways (Per FAR Part 77) designed for use by small aircraft. Other dimensions defined for visual runways and runways with not lower than 3/4-statute mile approach visibility minimums; RPZ dimensions based on visual and not lower than 1-mile approach visibility minimums (per AC 150/5300-13, as amended).
2. Larger-Than-Utility runways (Per FAR Part 77) designed for use by small and large aircraft (ADG I or ADG II – A&B Aircraft). Other dimensions defined for visual runways and runways with not lower than 3/4-statute mile approach visibility minimums; RPZ dimensions based on visual and not lower than 1-mile approach visibility minimums (per AC 150/5300-13, as amended).
3. Runway lengths required to accommodate 95 and 100 percent of small airplanes 12,500 pounds or less; 69.3 degrees F, 11-foot change in runway centerline elevation.
4. Runway lengths required to accommodate 75 and 95 percent of large airplanes 60,000 pounds or less with 60% and 90% useful load; 69.3 degrees F, 11-foot change in runway centerline elevation.

5. Majority of runway OFZ, OFA and primary surface meets FAA clearing standard; bushes and terrain located on west side (mid-runway, south).
6. A portion of the Runway 33 RPZ extends beyond airport property.
7. The front edge of the aircraft parking apron is located 220 feet from runway centerline.
8. The nearest building on the airport (hangar) is located approximately 250 feet from runway centerline.
9. Distance required to protect existing east parallel taxiway OFA and clear 8-foot aircraft tail height (typ. small single-engine) in transitional surface for visual approach.
10. Distance required to protect current east parallel taxiway OFA and to accommodate an 18-foot structure (top elevation of structure above runway elevation at the BRL) without penetrating the 7:1 Transitional Surface.
11. Distance required to protect an ADG I (A&B Aircraft) parallel taxiway OFA and clear 8-foot aircraft tail height (typ. small single-engine) in transitional surface for visual approach.
12. Distance required to protect an ADG I (A&B Aircraft) parallel taxiway OFA and to accommodate an 18-foot structure (at the BRL) without penetrating the transitional surface for visual approach.
13. Distance required to protect an ADG II (A&B Aircraft) parallel taxiway OFA and clear 8-foot aircraft tail height (typ. small single-engine) in transitional surface for nonprecision instrument approach.
14. Distance required to protect an ADG II (A&B Aircraft) parallel taxiway OFA and to accommodate an 18-foot structure (at the BRL) without penetrating the transitional surface for nonprecision instrument approach.
15. Aircraft tiedowns and fueling area located within taxilane OFA on apron.

TABLE 4-4: RUNWAY 15/33 CURRENT CONFORMANCE WITH FAA DESIGN STANDARDS & FAR PART 77 AIRSPACE SURFACES

ITEM	**ADG I** (small) *Visual and NTL ¾ Mile Visibility* *FAR Part 77: Visual (current standard)*	**ADG I** (A & B aircraft) *Visual and NTL ¾ Mile Visibility* *FAR Part 77: Visual*	**ADG II** (A & B aircraft) *Visual and NTL ¾ Mile Visibility* *FAR Part 77: Nonprecision Instrument*
Runway Safety Area	Yes	Yes	No
Runway Object Free Area	No *(west side only)*	No	No
Runway Obstacle Free Zone	No *(west side only)*	No	No
Taxiway Safety Area	Yes	No	No
Taxiway Object Free Area	Yes	No	No
Taxilane Object Free Area	No *(main apron and north hangar taxilanes)*	No	No
Building Restriction Line - West	N/A	N/A	N/A
Building Restriction Line – East	Yes	No	No
Aircraft Parking Line – West	N/A	N/A	N/A
Aircraft Parking Line – East	Yes	No	No
Runway Protection Zones	No	No	No
Runway-Parallel Taxiway Separation	Yes	No	No
Runway Width	Yes	Yes	No
Runway Length	Yes (95% of fleet)	Yes (95% of fleet)	No
Taxiway Width	Yes	Yes	Yes
Approach Surfaces (Required Slope/Clear: Yes/No?)	20:1/Yes (Verify Tree Clearance)	20:1/Yes (Verify Tree Clearance)	34:1/No
Primary Surface (Clear)	No *(west side only)*	No	No
Transitional Surface (Clear)	TBD *(verify west side trees on/off airport)*	No	No
Horizontal Surface (Clear)	Yes	TBD	TBD
Conical Surface (Clear)	Yes	TBD	TBD

Runway Safety Area (RSA)

The FAA defines runway safety area (RSA) as "A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." Runway safety areas are most commonly used by aircraft that inadvertently leave (or miss) the runway environment during landing or takeoff.

By FAA design standard, the RSA *"shall be:*

(1) cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations;

(2) drained by grading or storm sewers to prevent water accumulation;

(3) capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft; and

(4) free of objects, except for objects that need to be located in the runway safety area because of their function. Objects higher than 3 inches above grade should be constructed on low impact resistant supports (frangible mounted structures) of the lowest practical height with the frangible point no higher than 3 inches. Other objects such as manholes should be constructed at grade. In no case should their height exceed 3 inches."

The FAA, emphasizing the significance placed on meeting runway safety area standards provides the following guidance *"RSA standards cannot be modified or waived like other design standards. The dimensional standards remain in effect regardless of the presence of natural or man-made objects or surface conditions that might create a hazard to aircraft that leave the runway surface…A continuous evaluation of all practicable alternatives for improving each sub-standard RSA is required until it meets all standards…"*

The recommended transverse grade for the lateral RSA ranges between 1½ and 5 percent from runway shoulder edges. The recommended longitudinal grade for the first 200 feet of extended RSA beyond the runway end is 0 to 3 percent. The remainder of the RSA must remain below the runway approach surface slope. The maximum negative grade is 5 percent. Limits on longitudinal grade changes are plus or minus 2 percent per 100 feet within the RSA. The airport sponsor should regularly clear the RSA of brush or other debris and periodically grade and compact the RSA to maintain FAA standards.

Items located within the RSA, such as runway edge lights or threshold lights are mounted on frangible supports (breakable coupling and disconnect plug). Any future lighting (such as PAPI, REILS, etc.) located within the RSA also need to meet the FAA frangibility standard.

ARC: B-I (small)

The RSA appears to be free of obstructions and is relatively level. Periodic clearing, grading and compaction is recommended for the RSA to maintain FAA surface condition and clearing standards in the future. Any proposed changes in runway length will also require extending the RSA.

Runway Object Free Area (OFA)

Runway object free areas (OFA) are two dimensional surfaces intended to be clear of ground objects that protrude above the runway safety area edge elevation. Obstructions within the OFA may interfere with aircraft flight in the immediate vicinity of the runway. The airport sponsor should regularly clear the OFA of brush or other debris to maintain FAA standards. Items located within the OFA must be mounted on frangible supports (breakable mount). Periodic grading in the area between the runway and parallel taxiway is recommended to maintain effective drainage.

The FAA defines the OFA clearing standard:

"The OFA clearing standard requires clearing the OFA of above ground objects protruding above the runway safety area edge elevation. Except where precluded by other clearing standards, it is acceptable to place objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the OFA. Objects non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the OFA. This includes parked airplanes and agricultural operations."

ARC: B-I (small)

The majority of the OFA is free of obstructions and is level. The west side of the OFA, from near mid-runway to the south end has numerous small bushes and other vegetation that require removal to meet FAA standards. The outer edge of the OFA abuts an area of terrain that rises up to the airport's perimeter fence, west of the runway. Some grading within the OFA may be needed to level terrain within the OFA. Periodic clearing and grading is recommended for the OFA to maintain FAA clearing standards in the future. Any proposed changes in runway length will also require extending the OFA.

Obstacle Free Zone (OFZ)

The OFZ is a plane of clear airspace extending upward to a height of 150 feet above runway elevation, which coincides with the FAR Part 77 horizontal surface elevation. The FAA defines the following clearing standard for the OFZ:

"The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible visual NAVAIDs that need to located in the OFZ because of their function."

The OFZ may include the Runway OFZ, the Inner-approach OFZ (for runways with approach lighting systems), and the Inner-transitional OFZ (for runways with lower than ¾-statute mile approach visibility minimums. At Florence Municipal Airport, only the Runway OFZ is required based on runway configuration and planned approach capabilities. The future development of aircraft

holding areas or new taxiway connections should be designed to allow holding aircraft to remain clear of the OFZ. The FAA defines the Runway OFZ as:

"The runway OFZ is a defined volume of airspace centered above the runway centerline. The runway OFZ is the airspace above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The runway OFZ extends 200 feet beyond each end of the runway."

ARC: B-I (small)

The OFZ for Runway 15/33 has the same lateral dimension as the OFA, described above, although it extends 200 feet from each runway end. Any items that conflict with the OFA described earlier, also conflict with the OFZ. Consequently, actions recommended to meet the OFA standards will also address the OFZ standards. Any proposed changes in runway length will also require extending the OFZ.

Taxiway Safety Area

The taxiways at Florence Municipal Airport include a parallel taxiway, four connecting exit taxiways between the runway and parallel taxiway, a hangar access taxiway that extends southward from the southeast corner of the main apron to serve hangars. The airport also has taxilanes within the north hangar area and on the aircraft apron that are not subject to taxiway safety area standards.

ARC: B-I (small)

The taxiways on the airport generally appear to meet safety area dimensional and clearing standards. However, it appears that some maintenance (fill and grading) is needed along the south hangar taxiway in areas where the vertical drop from pavement edge to the shoulder exceeds 3 inches, or where the pavement edge is damaged.

It is noted that the parallel taxiway width (35 feet) requires only 7 feet of prepared ground surface beyond the pavement edge to meet the ADG I safety area standard. The taxiway safety areas should be regularly cleared of brush or other debris and periodically graded and compacted to maintain FAA standards.

Taxiway/Taxilane Object Free Area

A taxiway or taxilane object free area (OFA) is intended to protect taxiing aircraft from obstructions that could interfere with safe movement, particularly at night or during reduced visibility conditions. Based on FAA clearance requirements, no parked aircraft, structures or fixed obstructions should be located within a taxiway or taxilane OFA. Items such as airport signage, edge lights, etc., located in a taxiway or taxilane OFA must be installed on frangible (break-away) mounts.

ARC: B-I (small)

The parallel, exit and access taxiways on the airport appear to meet OFA dimensional (extending 44.5 feet either side of taxiway centerline) and clearing standards. The taxiway OFA should be regularly cleared of brush or other debris and periodically graded to maintain FAA standards. Several existing taxilanes on the airfield have obstructions located within the defined OFA (extending 39.5 feet either side of taxilane centerline).

The aircraft parking apron has defined taxilanes that provide access to aircraft parking positions, aircraft fueling, the FBO building, and adjacent hangars. The aircraft tiedowns located on the main apron are configured in three east-west rows that are accessed by taxilanes from the rear of the apron. Aircraft located in some tiedown positions and on the west or south sides of the fuel pump island can be partially located with the taxilane OFA. Options to address the OFA clearance should be included in the evaluation of facility development alternatives.

The north hangar area is configured with five east-west stub taxilanes. The spacing used for the hangar rows varies, with some rows having less than the ADG I standard 79-foot clearance between building fronts facing the taxilane. A modification to standards may be required on some existing hangar rows; future hangar rows should be configured to meet the OFA standard.

The centerline of the south hangar access taxiway is located approximately 34 feet from the northwest corner of the adjacent

large hangar, within the defined taxiway OFA. Options to address the OFA clearance should be included in the evaluation of facility development alternatives.

Runway Protection Zones (RPZ)

Runway protection zones (RPZ) are located at each end of a runway. The FAA provides the following definition for runway protection zones (RPZ):

"The RPZ's function is to enhance the protection of people and property on the ground. This is achieved through airport owner control over RPZs. Such control includes clearing RPZ areas (and maintaining them clear) of incompatible objects and activities. Control is preferably exercised through the acquisition of property interest in the RPZ. The RPZ is trapezoidal in shape and centered about the extended runway centerline. The RPZ begins 200 feet beyond the end of the area useable for takeoff or landing."

As noted above, RPZs with buildings, roadways, or other items do not fully comply with FAA standards. It is recognized that realigning major surface roads routes located within the RPZs may not be highly feasible.

ARC: B-I (small)

The RPZ dimensions for Runway 15 and 33 are 250 x 450 x 1000 feet based on the following criteria: facilities expected to serve small aircraft exclusively with visual and not lower than 1-mile approach visibility minimums. The criteria are consistent with visual approaches for utility runways, which can include nonprecision instrument approaches not designed for a specific runway end.

A small portion of the existing Runway 33 RPZ extends beyond airport property on the east side of Kingwood Street. The City has acquired several parcels of property within the RPZ on the west side of Kingwood, and has an avigation easement for the remaining portion of the RPZ not in ownership. The existing and future RPZs for Runway 15 are contained entirely within airport property.

Building Restriction Line (BRL)

A building restriction line (BRL) identifies areas on an airport where structures can be located to be compatible with airfield operations. Buildings should not conflict with the recommended airport design standards defined for a particular runway-taxiway system or the protected airspace associated with the runway. The location of the BRL is measured from the runway centerline outward in a perpendicular direction. BRL locations are established based on the ability to accommodate common airport building types (e.g., T-hangars, small conventional hangars, large conventional hangars, etc.) while protecting the FAR Part 77 primary and transitional surfaces that extend outward along the sides of a runway.

The 1997 ALP depicts a BRL on the east side of the runway, located 250 feet from runway centerline. At this distance, a building with a roof elevation up to 17.8 feet above runway elevation can be accommodated without penetrating the runway transitional surface. Nine hangars are currently located in sites along the BRL. It appears that some of the hangars may be close to penetrating the runway transitional surface. The elevations of the hangars should be verified to determine whether any obstructions exist that require obstruction lighting.

All hangars and other proposed structures (including signs, towers, etc.) on the airport or in the vicinity, are required to be reviewed by FAA (Form 7460 – Notice of Proposed Construction) to ensure that no hazard to air navigation is created through the construction.

ARC: B-I (small)

Based on the existing parallel taxiway clearances and the visual approaches for Runway 15/33, the existing 250-foot BRL location is adequate to accommodate smaller hangars at the BRL. Larger buildings (greater than 18-foot sidewalls) may require greater separation distances, depending on their roof heights, as noted above. Although the majority of the west side of the runway is not suitable for development of structures, establishing a 250-foot BRL is recommended to protect the runway from incompatible development.

Aircraft Parking Line (APL)

Aircraft parking lines (APL) are used to identify areas on an airport where aircraft can be parked clear of all runway-taxiway protected areas and airspace surfaces. The 1997 ALP depicts an APL on the east side of Runway 15/33 that is 44.5 feet from the taxiway centerline (219.5 feet from runway centerline). The APL is located approximately 30 feet west of the front edge of the aircraft apron. The aircraft parking positions nearest to the runway on the main apron are located approximately 250 feet from runway centerline.

ARC: B-I (small)

The east APL for 15/33 meets all FAA clearance standards. For ADG I, the standard taxiway object free area extends 44.5 feet from taxiway centerline in both directions (89 feet overall width). Based on the current runway-parallel taxiway separation of 175 feet, aircraft must be parked at least 219.5 feet from runway centerline to protect both the parallel taxiway and avoid penetrating the runway primary surface and transitional surface.

This setback is entirely clear of the primary surface and will accommodate a 13.5-foot tail height (above runway elevation) without penetrating the transitional surface.

The 1997 ALP depicts two future helicopter parking pads located adjacent to the APL, just south of the segmented circle and south hangar access taxiway connection to the parallel taxiway. Helicopter parking pads are subject to the same setback requirements that are used for fixed-wing aircraft parking. The location of the future helicopter parking pads should be reviewed during the evaluation of future aircraft parking options, and adjusted as needed based on overall development requirements. An APL of 220 feet will accommodate a 13.5-foot tail (or rotor) height (above runway elevation) without penetrating the transitional surface.

Runway-Parallel Taxiway Separation

ARC: B-I (small)

Runway 15/33 is served by a full-length parallel taxiway on its east side. The runway-parallel taxiway separation is 175 feet, which exceeds the B-I (small) standard of 150 feet.

FAR PART 77 SURFACES

Airspace planning for U.S. airports is defined by Federal Air Regulations (FAR) Part 77 – Objects Affecting Navigable Airspace. FAR Part 77 defines imaginary surfaces (airspace) to be protected around airports. **Figures 4-4 and 4-5** illustrate plan and isometric views of the Part 77 surfaces. As noted earlier in this chapter, the use of "utility" standards based on visual approach capabilities (per Part 77) was determined to be most appropriate for defining long-term airspace planning for Florence Municipal Airport.

Table 4-5 summarizes FAR Part 77 standards for Runway 15/33 based on visual approach capabilities. The airspace surfaces for utility runways with non-precision instrument approaches are also provided for comparison. For utility runways, the visual and nonprecision instrument surfaces are very similar, although for nonprecision instrument runways the primary surface doubles in width (from 250 feet to 500 feet) and the inner and outer widths of the runway approach surfaces also increase. The development setback requirements (hangars, aircraft parking, etc.) for an instrument runway increase due to the wider primary surface and the change in the transitional surface.

The 1997 Airspace Plan identified three groupings of tree or terrain (sand dune) penetrations to the approach surfaces for Runway 15/33. Dune and shrub obstructions were identified in both the existing and future Runway 15 approach surfaces. The future approach obstructions were based on the planned 430-foot extension at the north end of the runway. The third obstruction grouping included trees, bushes and a sand dune in the existing Runway 33 approach surface. Recent projects to lower the sand dune beyond the north end of the runway have been completed. The work eliminated the obstruction to the current 20:1 visual approach surface to Runway 15 and allowed

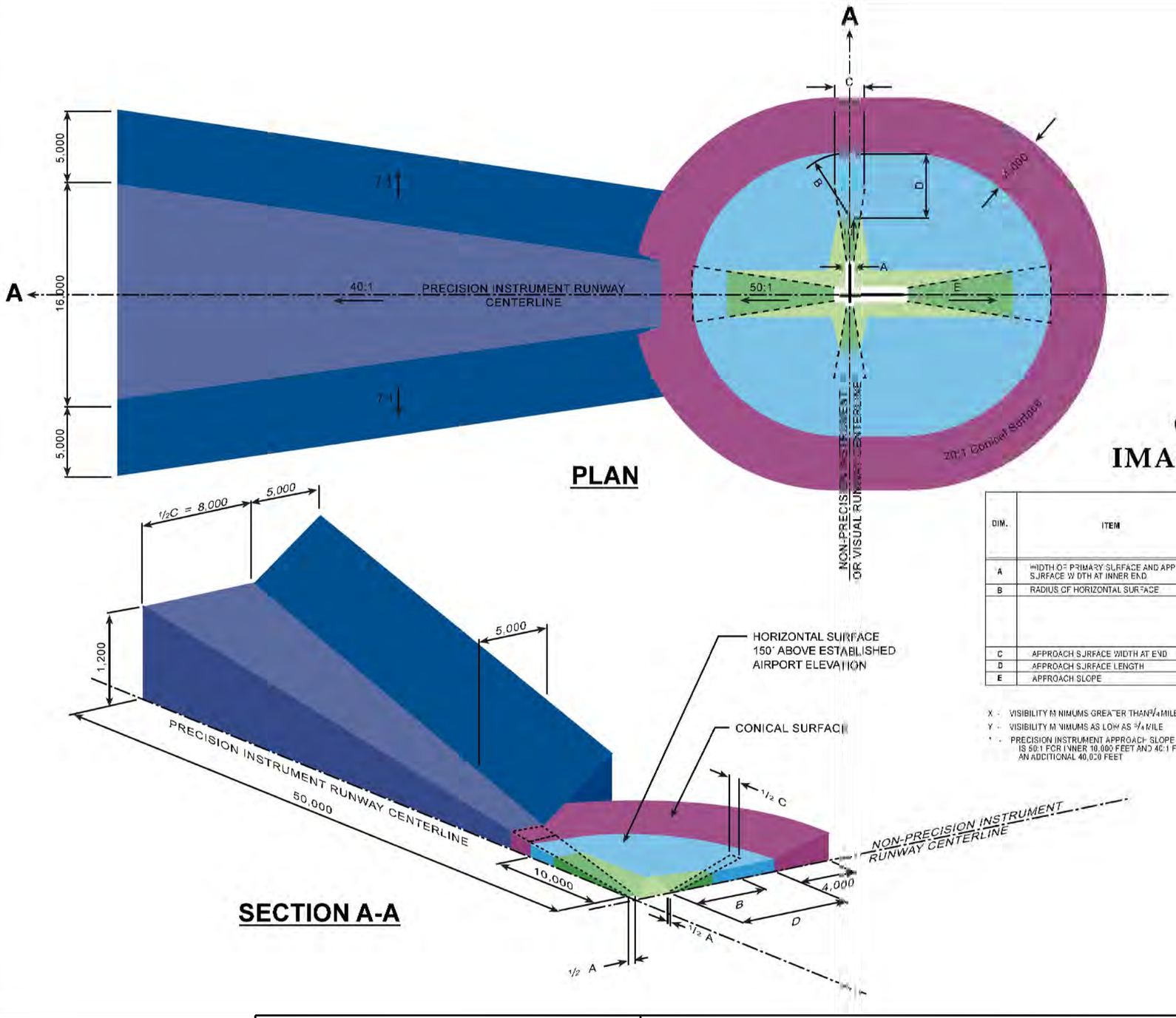
the 100-foot displaced threshold to be eliminated. A review of tree and terrain penetrations and other physical obstructions to Part 77 surfaces will be conducted during the update of the Airport Airspace Plan drawings.

TABLE 4-5: FAR PART 77 AIRSPACE SURFACES – FLORENCE MUNICIPAL AIRPORT

Item	Utility (visual)[1]	Utility (nonprecision instrument)[1]
Width of Primary Surface	250 feet	500 feet
Radius of Horizontal Surface	5,000 feet	5,000 feet
Approach Surface Width at End	1,250 feet	2,000 feet
Approach Surface Length	5,000 feet	5,000 feet
Approach Slope	20:1	20:1

1. Utility runways are designed for aircraft weighing 12,500 pounds or less; larger than utility runways are designed to accommodate aircraft weighing more than 12,500 pounds.

The City has avigation easements to control of obstructions within the portions of the existing runway protection zones (RPZ) that extend off airport property. Periodic obstruction surveys are recommended for airports with substantial nearby tree growth to ensure that runway airspace surfaces are protected against obstructions that could pose a potential hazard to aircraft. In cases where obstructions cannot be removed or eliminated outright, red obstruction lights are recommended to increase visual recognition of potential hazards to pilots operating the vicinity of the airport.



SURFACE SLOPE KEY

- HORIZONTAL SURFACE
- 20:1
- 7:1
- 7:1
- VARIES (SEE "E" VALUE IN TABLE BELOW)
- 40:1 (PRECISION INSTRUMENT RUNWAY ONLY)

CIVIL AIRPORT IMAGINARY SURFACES

DIM.	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		UTILITY	LARGER THAN UTILITY	UTILITY	LARGER THAN UTILITY		
					X	Y	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		UTILITY	LARGER THAN UTILITY	UTILITY	LARGER THAN UTILITY		
					X	Y	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20 *	34:1	34:1	*

X - VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
Y - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET

IMAGE SOURCE: WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (AVIATION DIVISION).

CENTURY WEST ENGINEERING CORPORATION

FAR PART 77 DIAGRAM

FIGURE 4-4

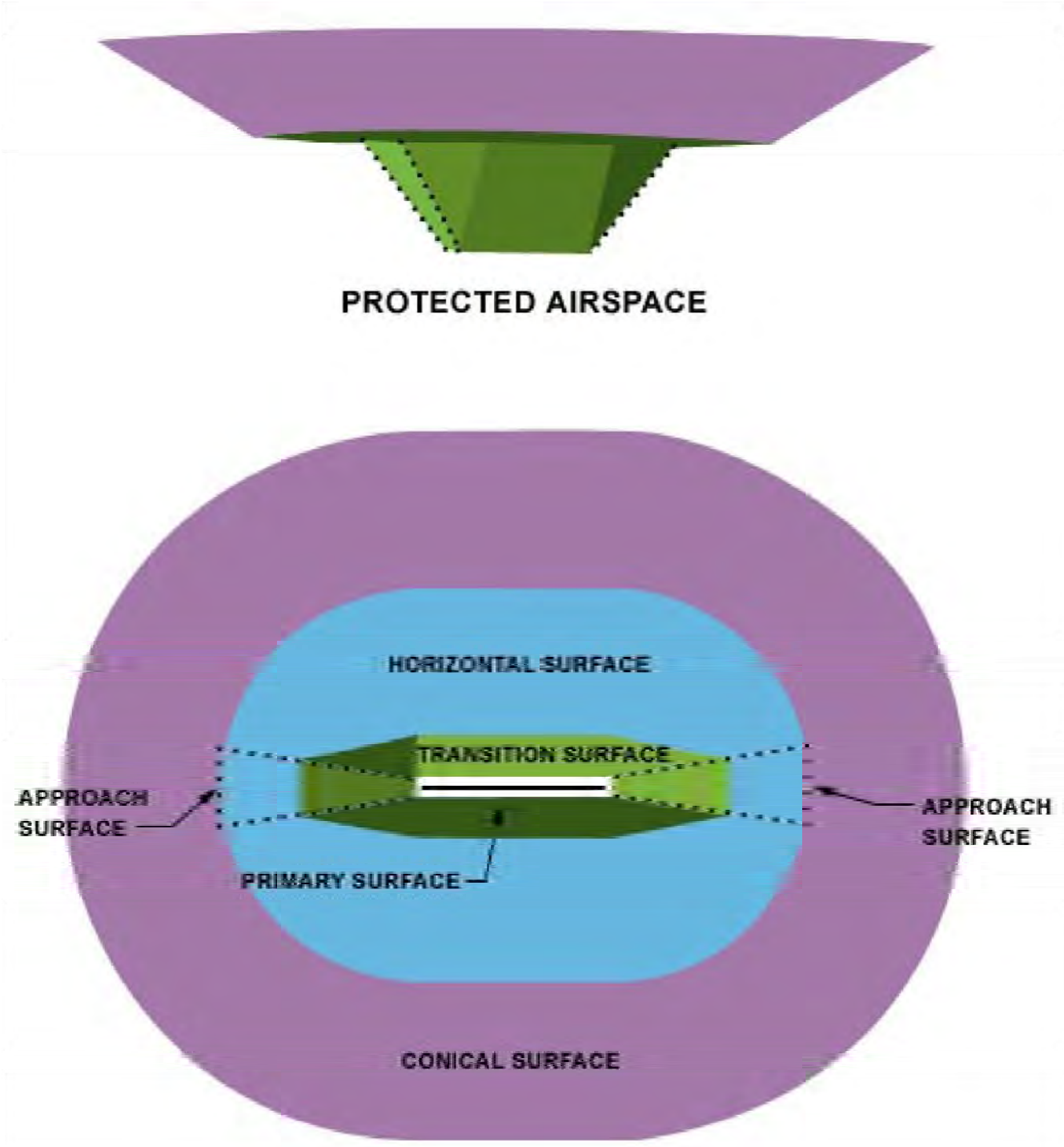


IMAGE SOURCE: WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (AVIATION DIVISION).

CENTURY WEST ENGINEERING CORPORATION

PLAN & PROFILE VIEWS (FAR PART 77 SURFACES)

FIGURE 4-5

Approach Surfaces

Runway approach surfaces extend outward and upward from each end of the primary surface, along the extended runway centerline. As noted earlier, the dimensions and slope of approach surfaces are determined by the type of aircraft intended to use the runway and most demanding approach planned for the runway (e.g., visual, nonprecision, or precision).

Providing unobstructed approaches to runway ends is a high priority item associated with airport safety. When obstructions exist, options include removing, lowering or relocating the obstructions; or modifying runway approaches and/or runway configurations.

Runway 15/33 – Utility Visual Runway

The 1997 ALP estimated the clear approach slopes at 13:1 (Rwy 15) and 22:1 (Rwy 33). However, the 1997 Airspace Plan depicted an area of tree and terrain (sand dune) penetration within the 20:1 approach to Runway 33. The clearance for Runway 15 was estimated prior to the sand dune removal project beyond the north end of the runway. The terrain contouring in this area was based on obtaining an unobstructed 20:1 approach to Runway 15. The status of obstruction removal completed within the Runway 33 approach will be reviewed to verify current clearances.

Primary Surface

The primary surface is a rectangular plane of airspace centered on a runway that follows the runway elevation (typically along the centerline) and extends 200 feet beyond each runway end. The width of the primary surface is determined by the runway category and approach type. Half the width of the primary surface extends on each side of the runway. Any proposed changes in runway length will require extending the primary surface and an upgrade. The primary surface end connects to the inner portion of the runway approach surfaces; the sides of the primary surface connect to the runway transitional surface. The primary surface should be free of any penetrations, except items with locations fixed by function (i.e., PAPI, runway or taxiway edge lights, etc.).

Runway 15/33 – Utility Visual Runway

A 250-foot wide primary surface is required for Runway 15/33 based on utility runway and visual approach standards. The primary surface for the runway has precisely the same dimension as the OFZ, described earlier in this chapter. Any elevated items (trees, bushes, terrain, etc.) located along

the west edge of the OFZ also conflict with the primary surface. These items should be mitigated to the maximum extent possible.

Transitional Surface

The transitional surfaces extend from outer edges of the primary surface and continue beyond the runway ends until they connect with the sides of the approach surfaces for the runway. The transitional surface is represented by planes of airspace that rise perpendicularly at a slope of 7 to 1 until reaching the horizontal surface at an elevation 150 feet above runway elevation. This surface should be free of obstructions (i.e., parked aircraft, hangars, trees, etc.).

Runway 15/33– Utility Visual Runway

No tree or terrain penetrations in the transitional surfaces were depicted on the 1997 Airspace Plan. However, it appears that taller trees located on the west side of the runway, off airport property, may penetrate the transitional surface. As noted earlier, some hangars located along the east parallel taxiway may penetrate the transitional surface. An updated obstruction survey is recommended to identify airspace penetrations.

Horizontal Surface

The horizontal surface is a flat plane of airspace located 150 feet above runway elevation. For Runway 15/33, the outer boundary of the horizontal surface is defined by 5,000-foot radii, extending from the runway ends (the intersection point of the extended runway centerline, the outer edge of primary surface, and the inner edge of the approach surface). The outer points of the radii for each runway end are connected to form a semi-oval shape, which is defined as the horizontal surface. The elevation of the existing horizontal surface is based on the future elevation of the airport (51.5 feet MSL), plus 150 feet (201.5 feet). No areas of terrain penetration in the horizontal surface are depicted on the 1997 Airspace Plan.

Conical Surface

The conical surface is an outer band of airspace, which abuts the horizontal surface. The conical surface begins at the elevation of the horizontal surface and extends outward 4,000 feet at a slope of 20:1. The top elevation (401.5 feet MSL) of the conical surface is 200 feet above the horizontal surface and 350 feet above future airport elevation. No areas of terrain penetration are identified in the conical surface for Runway 15/33 on the 1997 Airspace Plan.

AIRSIDE REQUIREMENTS

Airside facilities are those directly related to the arrival and departure and movement of aircraft:

- *Runways*
- *Taxiways*
- *Airfield Instrumentation and Lighting*

Runways

The adequacy of the existing runway system at Florence Municipal Airport was analyzed from a number of perspectives including runway orientation, airfield capacity, runway length, and pavement strength.

Runway Orientation

The orientation of runways for takeoff and landing operations is primarily a function of wind velocity and direction, combined with the ability of aircraft to operate under adverse wind conditions and the limitations of the airport environment. When landing and taking off, aircraft are able to maneuver on a runway as long as the wind component perpendicular to the aircraft's direction of travel (defined as crosswind) is not excessive. For runway planning and design, a crosswind component is considered excessive at 12 miles per hour for small aircraft (gross takeoff weight 12,500 pounds or less) and 15 miles per hour for large general aviation aircraft. FAA planning standards indicate that an airport should be planned with the capability to operate under allowable wind conditions at least 95 percent of the time.

No tabulated wind data is available for Florence Municipal Airport. The 1997 Airport Layout Plan did not include a wind rose. The prevailing winds along the Oregon coast appear to favor north-south runway alignments. In addition to Florence, eight of Oregon’s eleven single-runway public use airports located along the coast either share the same runway alignment (15/33) or are aligned within 10 degrees. The runways at the other two airports are aligned within 20 and 30 degrees of Runway 15/33. Although occasional crosswind conditions can occur due a variety of localized

features, the existing runway alignment appears to provide adequate wind coverage. Tabulating wind data from the airport's AWOS may be considered to verify existing runway crosswind coverage.

Runway Length

Runway length requirements are based primarily upon airport elevation, mean maximum daily temperature of the hottest month, runway gradient, and the critical aircraft type expected to use the runway. Runway 15/33 accommodates predominantly single-engine and multi-engine engine aircraft weighing 12,500 pounds or less. The airport accommodates both piston and turbine aircraft and currently has two twin-engine turboprops and four multi-engine piston aircraft included among its based aircraft fleet. The airport also receives daily cargo express flights by Ameriflight, a contract carrier for United Parcel Service (UPS) that operates a Piper Navajo twin-engine piston aircraft.

The existing runway length of 3,000 feet limits use by multi-engine aircraft and requires some aircraft to operate at reduced weights (reduced passengers, cargo or fuel loads) for takeoff or landing. The existing dimensions and pavement strength of Runway 15/33 are consistent with FAA design criteria established for small airplanes.

For planning purposes, general aviation (GA) runways that accommodate a limited amount of multi-engine aircraft activity are typically planned to accommodate 95 percent of the small airplane fleet. Based on the composition of existing and future aircraft activity, which includes a variety of turbine and multi-engine piston aircraft, the runway length required to accommodate 100 percent of the small airplane fleet provides an appropriate long-term planning standard for Runway 15/33.

Although the region and the airport appear to have the potential to attract increasing volumes of larger business class aircraft activity in the future, the physical characteristics of Florence Municipal Airport and its surroundings present significant limits on airfield expansion that would make conformance with the more demanding FAA airport design and airspace planning standards difficult. Based on these considerations, maintaining the historic functional capability of airport to accommodate small airplanes appears to be the most feasible option for this site.

A summary of FAA-recommended runway lengths for small and large aircraft based on local conditions is presented in **Table 4-6**. The runway length requirements for typical small/medium business jets are also summarized.

TABLE 4-6: FAA-RECOMMENDED RUNWAY LENGTHS

(From FAA Computer Model)

Runway Length Parameters for Florence Municipal Airport

- *Airport Elevation: 51 feet MSL*
- *Mean Max Temperature in Hottest Month: 69.3F*
- *Maximum Difference in Runway Centerline Elevation: 11 feet*
- *Existing Runway Length: Runway 15/33 - 3,000 feet*

Small Airplanes with less than 10 seats:	
75 percent of these airplanes	*2,310 feet*
95 percent of these airplanes	*2,850 feet*
100 percent of these airplanes	***3,370 feet***
Small airplanes with 10 or more seats	*3,910 feet*
Large Airplanes of 60,000 pounds or less:	
75 percent of these airplanes at 60 percent useful load	*5,240 feet*
75 percent of these airplanes at 90 percent useful load	*6,620 feet*
100 percent of these airplanes at 60 percent useful load	*5,500 feet*
100 percent of these airplanes at 90 percent useful load	*7,000 feet*
***Selected Small/Medium Business Jets**:*	
Cessna Mustang (4-5 passengers / 1 crew 8,645# MGW)[1]	*3,250 feet*
Cessna Citation CJI (6-7 passengers / 1 crew 10,600# MGW)[1]	*3,520 feet*
Cessna Citation CJ2 (6-7 passengers / 1 crew 12,375# MGW)[1]	*3,470 feet*
Cessna Citation Encore (7-9 passengers / 2 crew 16,630# MGW)[1]	*3,550 feet*
Cessna Citation II (6-9 passengers / 2 crew 14,100# MGW)[1]	*3,740 feet*

1. FAR Part 25 Balanced Field Length at maximum certificated takeoff weight (accelerated/stop distance). Cessna Citation runway length requirements based on 15 degrees flaps, 68 degrees F, MGTW, distance to 35 feet above the runway, and a runway elevation of sea level; data provided by manufacturer (Cessna, Eclipse Aviation).

Runway 15/33

At 3,000 feet, Runway 15/33 is 150 feet longer than the length required to accommodate 95 percent of the small airplane fleet. Based on current and forecast use by a wide range of general aviation aircraft, it is recommended that planning for Runway 15/33 be based on the ability to accommodate 100 percent of the small airplane fleet. The runway is currently 370 feet shorter than the length required to accommodate 100 percent of the small airplane fleet under the conditions common during a typical summer day in Florence.

The 1997 ALP depicts a 430-foot extension at the north end of Runway 15/33, with a future length of 3,430 feet identified. As noted above, based on updated site and climate data, a length of 3,370 feet corresponds to the length currently identified in the FAA model required to accommodate 100 percent of the small airplane fleet. A length of 3,400 feet (rounded) is recommended as the future length of Runway 15/33.

The existing width of Runway 15/33 is 60 feet, which meets the ADG I standard of 60 feet.

Airfield Pavement

The weight bearing capacity for Runway 15/33 is published at 12,500 pounds for aircraft with single wheel landing gear, which is consistent with use by small aircraft.

The majority of airfield pavements at Florence Municipal Airport were constructed between 1985 and 1989. The aircraft access taxiway located south of the main apron and the four northern-most stub taxilanes located in the north hangar area were constructed after 1997. The runway, major taxiway, apron and two hangar taxilanes were rated "very good" or "excellent" in 2002; these pavements were projected to be rated "good" or "very good" in 2012. Two taxilanes in the north hangar area were rated "fair" or "good" for 2002 and 2012.

The 2002 pavement plan contains a recommended 5-year program of pavement maintenance for the airport. **Table 4-7** summarizes recommended items for the initial five-year period (2002-2007) and items anticipated during the remainder of the current twenty-year planning period (2009-2028).

For planning purposes, it is assumed that the useful life of most airfield asphalt pavements is approximately 20 years. The useful life of pavement can be significantly reduced if preventative maintenance is not performed in a timely manner. In addition, the rate of deterioration increases with age. A regular maintenance program of vegetation control, crack filling, and sealcoating is recommended to extend the useful life of all airfield pavements.

TABLE 4-7: SUMMARY OF RECOMMENDED AIRFIELD PAVEMENT MAINTENANCE

Pavement Section	5-Year Recommended Maintenance	Other Recommended Maintenance During 20-Year Planning Period
Runway 15/33	Slurry Seal (2003); Preventive Maintenance (Vegetation control, crack filling, etc.);	Vegetation removal and crack fill (annual or as needed); Fog Seals or Slurry Seals on 5 to 6 year intervals Overlay 2012
Parallel Taxiway	Slurry Seal (2004); Preventive Maintenance (Vegetation control, crack filling, etc.)	Vegetation removal and crack fill (annual or as needed); Fog Seals or Slurry Seals on 5 to 6 year intervals Overlay 2012-2018
Main Apron	Slurry Seal (2005); Preventive Maintenance (Vegetation control, crack filling, etc.)	Vegetation removal and crack fill (annual or as needed); Fog Seals or Slurry Seals on 5 to 6 year intervals. Overlay 2010
South Hangar Access Taxiway	Slurry Seal (2006); Preventive Maintenance (Vegetation control, crack filling, etc.)	Vegetation removal and crack fill (annual or as needed); Fog Seals or Slurry Seals on 5 to 6 year intervals Overlay 2020
North Hangar Taxilanes	Fog Seal/Slurry Seal (2004, 2004); Preventive Maintenance (Vegetation control, crack filling, etc.)	Vegetation removal and crack fill (annual or as needed); Fog Seals or Slurry Seals on 5 to 6 year intervals Overlay 2012-2022
New Airfield Pavements	Preventive Maintenance (Vegetation control, crack filling, etc.)	Vegetation removal and crack fill (annual or as needed); Fog Seals or Slurry Seals on 5 to 6 year intervals

Airfield Capacity

The capacity of a single runway with a full length parallel taxiway typically at an uncontrolled airport typically ranges between 40 to 60 operations per hour during visual flight rules (VFR) conditions. The 20-year forecast of peak hour activity at Florence Municipal Airport is expected to remain below current capacity. The addition of aircraft holding areas on the parallel taxiway at the Runway 15 end may be considered if the frequency of congestion increases and excessive delays occur. The location, number and configuration of taxiway exits appear to be adequate for forecast demand.

Taxiways

Runway 15/33 is served by an east-side parallel taxiway with four 90-degree exit taxiways located near mid-runway and at each end of the runway. The runway-parallel taxiway separation (175 feet) and taxiway width (35 feet) both exceed the B-I (small) standard. The south hangar access taxiway is 30 feet wide and also exceeds the B-I (small) width standard.

The runway and existing landside areas of the airport have adequate taxiway access. However, any future development in new areas of the airport or future runway extensions will require additional taxiway access.

Airfield Instrumentation, Lighting and Marking

Runway 15/33 has medium intensity runway edge lighting (MIRL) and threshold lights. Runway 15 is equipped with a Precision Approach Path Indicator (PAPI). Adding a PAPI to Runway 15 is recommended.

Runway End Identifier Lights (REIL) are recommended to improve a pilot's visual identification of the runway environment during darkness or reduced visibility. REILs consist of two high-intensity sequenced strobes (pilot-activated by radio) that are located near each corner at the end of a runway.

The airfield also has illuminated signs located at each taxiway connection to the runway. The airport rotating beacon appears to be in good condition and operates normally. The beacon reportedly has adequate visibility from the air, although pilots report the increased density of urban light east of the airport has made airport identification more difficult. Increasing the brightness of the beacon may be an option to improve visibility. All lighting systems appear to be in good condition, although replacement for systems should be assumed near the end of the current planning period.

The taxiways exits on the runway are marked with blue edge lights, although the parallel taxiway and south hangar access taxiway are not marked or lighted. Installation of stake-mounted blue cylindrical edge reflectors on the main taxiways is recommended based on the relatively low level of nighttime operations.

Limited overhead lighting is available in aircraft hangar and apron areas. Additional flood lighting is recommended for all expanded operations areas for improved utilization and security. The installation of new outdoor lighting for hangars and apron areas should be designed to limit light emissions (glare) that can create a hazard for aircraft and adversely affect the natural dark skies setting of the rural area surrounding the airport. Unshielded floodlights, wallpacks, streetlights, and barn lights are examples of commonly used light fixtures that produce excessive glare. The use of full or partial cutoff (shielded) fixtures is recommended, which will limit the amount of light that escapes outward and upward into the sky, rather than illuminating the areas on the ground that require coverage.

Runway 15/33 has basic runway markings (threshold bars, runway numbers, centerline stripe) that are in very good condition. All markings require periodic repainting.

On-Field Weather Data

Florence Municipal Airport has an automated weather observation system (AWOS-3) located on the east side of the runway, near midfield. The AWOS-3 provides automated weather information

including temperature, dew point, altimeter, wind, visibility and cloud/ceiling cover. The AWOS-3 provides the on-airport weather data required to support a future instrument approach. It is noted that the existing AWOS site does not meet the FAA clearing standard (500' radius). However, the existing site was identified as the best available site on the airport at the time the AWOS was installed. There are no known reports of inaccurate weather data associated with the current AWOS.

LANDSIDE FACILITIES

The purpose of this section is to determine the space requirements during the planning period for landside facilities. The following types of facilities are associated with landside aviation operations areas:

- *Hangars*
- *Aircraft Parking and Tiedown Apron*
- *Fixed Base Operator (FBO) Facilities*

Hangars

Florence Municipal Airport currently has 24 conventional hangars, including one three-unit hangar. There are no T-hangars currently located at the airport. All airport buildings are located on the east side of the runway.

There are approximately 14 undeveloped hangar sites located in the airport's north hangar area with existing taxilane access. Additional undeveloped area for future hangars exists beyond the north end of the runway. Two large conventional hangars are located south of the main apron, adjacent to the south hangar access taxiway. The areas located adjacent to the apron and south hangar access taxiway have a limited amount of vacant space that could accommodate additional hangar development.

Based on current airport management counts, it is estimated that 100 percent of the 33 locally based aircraft at the airport are stored in hangars. For planning purposes, it is assumed that this trend will continue. However, a limited amount space for locally based aircraft apron parking should be maintained to accommodate potential changes in demand.

Although a portion of future demand may be accommodated within the existing hangar capacity, it is assumed that the net increase in forecast demand will be met through new construction. This assumption will ensure that adequate space is reserved to accommodate demand for new hangars. A planning standard of 1,500 square feet per based aircraft stored in hangars is used to project gross space requirements.

As indicated in the updated forecasts, the number of based aircraft at Florence Municipal Airport is projected to increase from 33 to 57 aircraft (+24) during the twenty-year planning period. Based on projected hangar utilization levels, long-term demand for new hangar space is estimated to be 22 spaces, or approximately 33,000 square feet. As noted above, Florence Municipal Airport does not currently have T-hangar space available. Airport management indicates that pilot interest in renting small hangar space appears to exist. The airport should be capable of accommodating a combination of conventional hangars and T-hangars in order to respond to potential market demand. The projected hangar needs for the updated forecasts are presented in **Table 4-8**.

It appears that the existing hangar sites will be adequate to accommodate forecast demand well into the planning period, with additional site development needed in the intermediate or long term period. The airport's undeveloped aviation use land on the east side of the runway should be reserved for future hangar or aircraft parking development demand beyond the current planning period.

Aircraft Parking and Tiedown Apron

Aircraft parking apron should be provided for locally based aircraft that are not stored in hangars and for transient aircraft visiting the airport. The aircraft apron at Florence Municipal Airport is currently configured with 12 tiedown positions.

As noted earlier, 100 percent of the airport's current based aircraft are accommodated in hangars. Although this trend is expected to continue, the potential for a limited amount of demand for apron parking does exist. It is assumed that the long term (2028) forecast increase from 33 to 57 based aircraft will require 3 parking positions (approximately 5%) for locally based aircraft. Per FAA design standards, locally based aircraft tiedowns are planned at 300 square yards per position.

FAA **Advisory Circular 150/5300-13** suggests a methodology by which itinerant parking requirements can be determined from knowledge of busy-day operations. At Florence Municipal Airport, the demand for itinerant parking spaces was estimated based on 30 percent of busy day itinerant operations (30% of busy day itinerant operations divided by two, to identify peak parking demand). For planning purposes, busy day activity is estimated to account for 50 percent of the operations that occur in an average week of the peak month. Peak month is estimated to account for 15 percent of annual operations. Based on these planning assumptions and the updated forecasts, typical peak demand for itinerant parking spaces is estimated to range from 9 to 18 aircraft during the twenty-year planning period. The FAA planning criterion of 360 square yards per itinerant aircraft was applied to the number of itinerant spaces to determine future itinerant ramp requirements.

In addition to accommodating the parking needs of small aircraft in tiedown positions, providing drive-through parking spaces designed for multi-engine aircraft is recommended. Initially, two spaces should be adequate to accommodate near term demand, with additional spaces added as activity increases.

The addition of a designated helicopter parking pad is recommended to accommodate itinerant helicopter activity at the airport. The airport accommodates regular helicopter activity including medevac, government, business, personal, and military use. Ideally, itinerant helicopter parking should be physically separated from light aircraft tiedowns to reduce the effects of rotor wash on small airplanes.

The aircraft parking area requirements for the updated forecasts are described below and summarized in **Table 4-8.** As noted earlier, the configuration of the existing apron will be evaluated during the development alternatives to address aircraft parking/fueling and taxilane clearances in addition to addressing overall parking demand requirements.

TABLE 4-8: APRON AND HANGAR FACILITY REQUIREMENTS SUMMARY

Item	Base Year (2008)	2010	2015	2020	2025	2030
Total Based Aircraft	33	35	39	45	51	57
Aircraft Parking Apron						
Light Aircraft Tiedowns	12					
Total Apron Area	7,877 sy					
Projected Needs *(Demand)* [1]						
Itinerant Aircraft Parking (@ 360 SY each)	9 spaces / 3,240 sy	11 spaces / 3,960 sy	12 spaces / 4,320 sy	15 spaces / 5,400 sy	17 spaces / 6,120 sy	17 spaces / 6,120 sy
Locally-Based Tiedowns (@ 300 SY each)	0 spaces / 0 sy	0 spaces / 0 sy	1 space / 300 sy	1 space / 300 sy	2 spaces / 600 sy	3 spaces / 900 sy
Business Aircraft Parking Positions (@ 600 SY each)	0 spaces / 0 sy [3]	2 spaces / 1,200 sy	2 spaces / 1,200 sy	2 spaces / 1,200 sy	3 spaces / 1,800 sy	3 spaces / 1,800 sy
Helicopter Parking (@ 400 SY each)	0 spaces / 0 sy [4]	1 space / 400 sy	1 space / 400 sy	1 space / 400 sy	2 spaces / 800 sy	2 spaces / 800 sy
Aircraft Fueling Area (50' radius around fuel island)	2 spaces / 600 sy	2-3 spaces / 900 sy	2-3 spaces / 900 sy	2-3 spaces / 900 sy	2-3 spaces / 900 sy	2-3 spaces / 900 sy
Total Apron Needs	**11 spaces 3,840 SY**	**16 spaces 6,460 SY**	**18 spaces 7,120 SY**	**21 spaces 8,200 SY**	**26 spaces 10,220 SY**	**27 spaces 10,520 SY**
Aircraft Hangars *(Existing Facilities)*						
Existing Hangar Spaces (estimated)	35+ spaces					
Projected Needs *(Demand)* [2] **(New) Hangar Space Demand (@ 1,500 SF per space)** *(Cumulative 20-year projected new demand: 22 spaces / 33,000 SF)*		**+2 spaces / 3,000 sf**	**+4 spaces / 6,000 sf**	**+5 spaces / 7,500 sf**	**+6 spaces / 9,000 sf**	**+5 spaces / 7,500 sf**

1. Aircraft parking demand levels identified for each forecast year represent forecast gross demand.
2. Hangar demand levels identified for each forecast year represent the net increase above current hangar capacity.
3. Larger aircraft currently park in small airplane tiedown area.
4. Helicopters currently park on apron or in adjacent grass area.

As with aircraft hangars, reserve areas should be identified to accommodate demand for aircraft parking which may exceed current projections. A development reserve area equal to 50 to 100 percent of the 20-year parking demand will provide a conservative planning guideline to accommodate unanticipated demand, changes in existing apron configurations, and demand beyond the current planning period. The location and configuration of the development reserves will be addressed in the alternatives analysis.

FBO Facilities, Aircraft Fuel Storage

Florence Municipal Airport has limited fixed base operator (FBO) facilities including a small terminal building and aircraft fueling. The airport manager oversees airfield maintenance and operations.

In addition to the restrooms located in the terminal building, a portable toilet is located near the northeast corner of the apron, adjacent to the aircraft fuel storage tanks.

As noted in the Inventory Chapter, the airport has a double wall aboveground fuel storage tank that is partitioned to store 6,000 gallons of 100LL aviation gasoline (AVGAS) and 4,000 gallons of Jet Fuel. The fuel pumps are located near the northeast corner of the apron, with a buried fuel lines (approximately 50 feet) extending from the tanks to the pump island. The system is equipped with cardlock system to allow 24-hour self fueling. The fuel system is in good condition and no mechanical problems have been identified. The tank's storage capacity appears to be adequate for current use, although space should be reserved for a second tank or a larger tank in the future. The location and configuration of the fuel island will be evaluated during the development alternatives to address taxilane clearances and demand related issues associated with multiple aircraft fueling.

Surface Access & Security Requirements

Surface access to the airport's landside areas is provided by Airport Way, which connects to Kingwood Street. All access roads on the airport are paved. A designated automobile parking area is located immediately south of the FBO building. Additional vehicle parking is available adjacent to individual hangars.

The existing fencing and vehicle gates located adjacent to the east landside facilities appear to effective. Additional fencing of airport property north of 10th Street, within the runway protection zone (RPZ) for Runway 33, should be considered to limit public access.

Some overhead lighting is mounted on aircraft hangars and adjacent to the apron; additional lighting is recommended to illuminate new landside facilities.

Airport Utilities

The developed landside areas of the airport currently have water, telephone, electrical, and limited sanitary sewer service. Future expansion of landside facilities on the east side of the runway, north of the existing development, will require extension of utilities.

FACILITY REQUIREMENTS SUMMARY

The projected twenty-year facility needs for Florence Municipal Airport are summarized in **Table 4-9**. The forecasts of aviation activity contained in Chapter Three anticipate moderate growth that will result in specific facility demands. However, as noted earlier the airport's existing supply of aircraft tiedowns and buildable hangar sites is adequate to accommodate forecast demand well into the current planning period. Specific facility needs such as helicopter parking and apron expansion can be met within the existing terminal area. Increasing the length of Runway 15/33 from 3,000 to 3,400 feet is recommended to accommodate forecast demand. The airport's taxiway system provides access to the runway and all landside areas. A future runway extension will also require an extension of the parallel taxiway and additional obstruction removal (sand dune) to maintain a clear approach to Runway 15.