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4 FACILITY REQUIREMENTS

4.1 INTRODUCTION

This chapter assesses the facilities at Yakima Air Terminal/McAllister Field (YKM) and their ability to accommodate the activity levels developed in the Aviation Demand Forecasts. Capacity deficiencies are identified as are the actions needed to correct them. The first issue addressed is the ultimate configuration of the airfield followed by an analysis of the passenger terminal, air cargo facilities, aircraft hangar and apron areas, Fixed Base Operator (FBO) facilities, access and vehicle parking, utilities, and aviation support facilities. Table 4-1 summarizes the conclusions from this chapter.

Table 4-1: Existing Facilities Assessment

Actual	Conclusions
Airfield System	The wind coverage and capacity needs at YKM are met by a single runway. Runway 9/27, at 7,604 feet, provides sufficient take-off length for all of the aircraft forecast to use the airport.
Passenger Terminal	The existing passenger terminal building needs to be remodeled and renovated to serve short-term needs and will require expansion before 2020. Terminal layout and maintenance issues may require action sooner to maintain an acceptable level of service.
Automobile Parking	The current public parking lot should be adequate through the year 2020. URS recommends expanding the rent-a-car ready/return and rental car parking area prior to this time.
Air Cargo	Although air cargo is forecasted to continue to consist of feeder service using small aircraft, additional space will need to be provided in the future, either by remarking existing pavement or by constructing new air cargo apron.
Based Aircraft Hangar Storage	With the forecasted growth in based aircraft, as well as the existing unmet demand for hangar space, additional area for hangar development will need to be made available for future development.
FBO and support facility expansion	Expanded FBO facilities are required to provide support for the general aviation community. These facilities will provide not only aircraft maintenance hangars, but also pilot lounge areas, area for fueling aircraft, and sufficient space for transient aircraft parking.
Fueling	The current system is adequate, assuming the private sector continues to upgrade its facilities and improve delivery as needed.

4.2 AIRFIELD REQUIREMENTS

There are two active runways at YKM, primary Runway 9/27 and crosswind Runway 4/22. Runway 9/27 is 7,604 feet long and 150 feet wide. Runway 4/22 is 3,835 feet long by 150 feet wide. Both runways have parallel taxiway systems, with Taxiway A serving Runway 9/27 and Taxiway B serving Runway 4/22. Taxiway A is 81 feet wide and B is 75 feet.

Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13, Airport Design (Change 14), requires that the future classification of the airport be used as the basis for airfield design. In the forecast chapter, the critical aircraft at YKM was determined to be the Bombardier Q400 operated by Alaska/Horizon Airlines. The Q400 has an Airport Reference Code (ARC) of C-III.

Runway 4/22 will continue to serve only small aircraft, and the existing B-I (small) classification will to remain unchanged.

4.2.1 Runway Length Requirements

The required length of a runway at an airport is calculated based on the types of aircraft regularly using it. The types of aircraft using YKM were identified using flight-tracking data obtained from FlightAware. These data recorded 40,698 instrument arrivals and/or departures at YKM over a three-year period (an average of 13,566 instrument operations per year, or 28 percent of the airport's total annual operations). The data shows business jet aircraft accounted for 3 percent of all activity at YKM. These range from small business jets, such as the Cessna Citation, to limited use by the Boeing 737. The Q400 will remain the critical aircraft because Alaska continues to serve Yakima with these aircraft. Beyond 2020, fleet changes may occur as business and corporate aviation become a larger factor at YKM. This could lead to increased use by large corporate jets such as the Gulfstream G-V and the Global Express, which FAA classifies as D-III and weigh up to 90,000 pounds.

Table 4-2 shows the types of aircraft using YKM today or forecast to use the airport in the future, and shows the runway take-off length required for each. The runway lengths assume an airport elevation of 1,099 feet and a mean maximum temperature of 87 degrees Fahrenheit. The FlightAware data indicate the average trip length will be 1,000 to 1,500 miles. Take-off lengths were calculated for each aircraft using the aircraft operations manuals, the website Jetadvisors.com, or conversations with the aircraft manufacturers' representatives.

Table 4-2: Existing and Future Aircraft Use

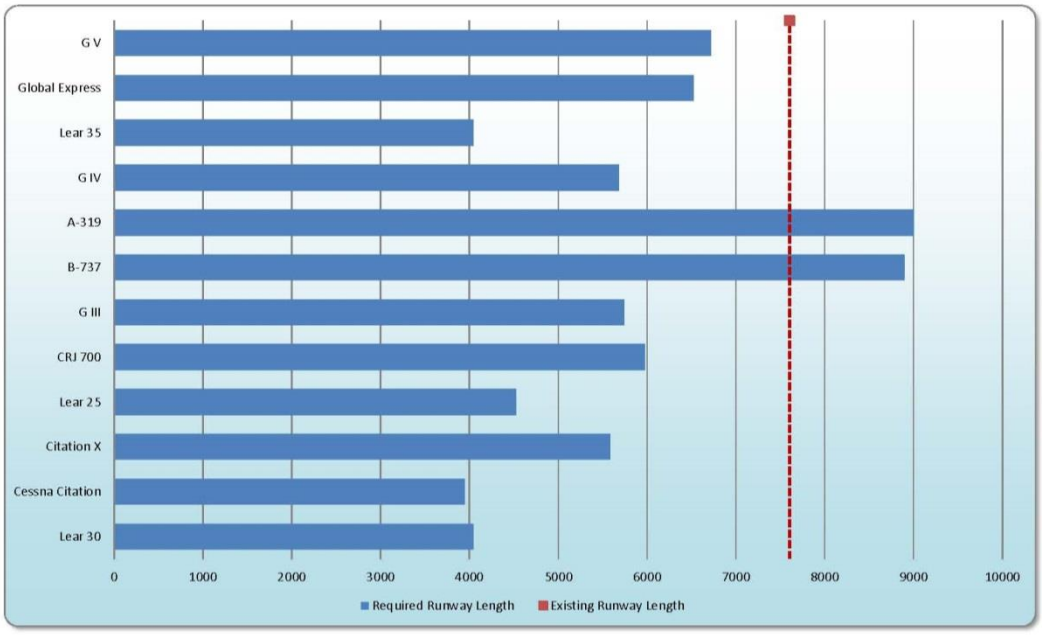
FAA Class	Aircraft Type	Required Take-off Runway Length (Feet)	Annual Operations				
			2010	2015	2020	2025	2030
Jets							
B-I	Learjet 30	4,042	23	24	25	26	29
B-II	Cessna Citation	3,942	1,034	1,183	1,272	1,637	2,225
B-III	Citation X	5,582	0	263	275	585	636
C-I	Learjet 25	4,520	36	39	50	58	102
C-II	CRJ-700	5,978	106	147	154	164	178
C-II	Gulfstream GIII	5,738	0	0	0	0	0
C-III	Boeing 737 - all series	8,900	187	195	204	217	235
C-IV	Airbus A330	9,000	1	1	1	1	1
D-II	Gulfstream GIV	5,684	0	0	0	0	0
D-II	Learjet 35	4,042	0	79	127	205	305
D-III	Global Express	6,528	0	131	165	234	318
D-III	Gulfstream V	6,718	0	131	154	234	318
D-IV	Boeing 777	9,000	1	1	1	1	1
D-VI	Boeing 747-8	10,000	2	2	2	2	2
Subtotal			**1,392**	**2,196**	**2,181**	**3,363**	**4,350**
Turboprop							
B-I	Beech King Air, Beech 1900	3,500	5,777	6,220	6,701	7,221	6,358
C-III	Bombardier Q-400	4,000	2,190	2,187	2,192	2,917	5,086
Twin-Engine Piston	Beech Baron, Cessna 404	3,500	8,664	9,465	9,967	10,524	11,444
Single-Engine Piston	Piper Cub, Beech 180	1,200	31,599	31,444	32,543	33,033	37,893
Rotor	Robinson, Bell		866	1,052	1,211	1,403	1,653
Total			**50,488**	**52,582**	**55,064**	**58,466**	**63,579**

Totals may not add due to rounding.

Source: Actual - FlightAware
Forecast - URS Corporation

As shown, the take-off length requirements vary from 4,000 feet for the Learjet to 8,900 feet for the Boeing 737. The Boeing 747-8 and 777 aircraft technically require longer runways but their use of YKM is limited to tough-and-go activity. As Figure 4-1 below shows, only the largest aircraft require a runway length longer than the existing 7,604 feet.

Figure 4-1: Aircraft Runway Length Requirements



Guidance included in the FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, was also used to calculate required runway length. The AC attests that the existing runway length at YKM is adequate for the airport, as shown in Table 4-3.

Table 4-3: FAA Runway Design Program Output Airport and Runway Data

Airport and Runway Data	
Airport elevation (mean sea level)	1,094 feet
Mean daily maximum temperature of the hottest month	81°F
Maximum difference in runway centerline elevation	49.8 feet
Length of haul for airplanes of more than 60,000 pounds	1,500 miles
Runway Length Recommended for Airport Design	
Small airplanes with approach speeds of less than 30 knots	300 feet
Small airplanes with approach speeds of less than 50 knots	800 feet
Small airplanes with less than 10 passenger seats:	
95 percent of these small airplanes	3,100 feet
100 percent of these small airplanes	4,700 feet
Large airplanes of 60,000 pounds or less:	
75 percent of these large airplanes at 60 percent useful load	4,700 feet
75 percent of these large airplanes at 90 percent useful load	6,200 feet
100 percent of these large airplanes at 60 percent useful load	5,500 feet
100 percent of these large airplanes at 90 percent useful load	8,000 feet

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

4.2.2 Runway Orientation and Wind Coverage

Wind and weather conditions affect airport runway capacity and use because of the combined effects of wind direction, wind velocity, and visibility. Prevailing wind and visibility conditions determine the direction in which takeoffs and landings are conducted and frequency that each runway is used.

FAA AC 150/5300-13, Airport Design, presents guidelines for runway wind coverage. The circular states that when a single runway provides less than 95 percent wind coverage for the class of aircraft anticipated to use it on a regular basis, a crosswind runway is recommended and supported by FAA.

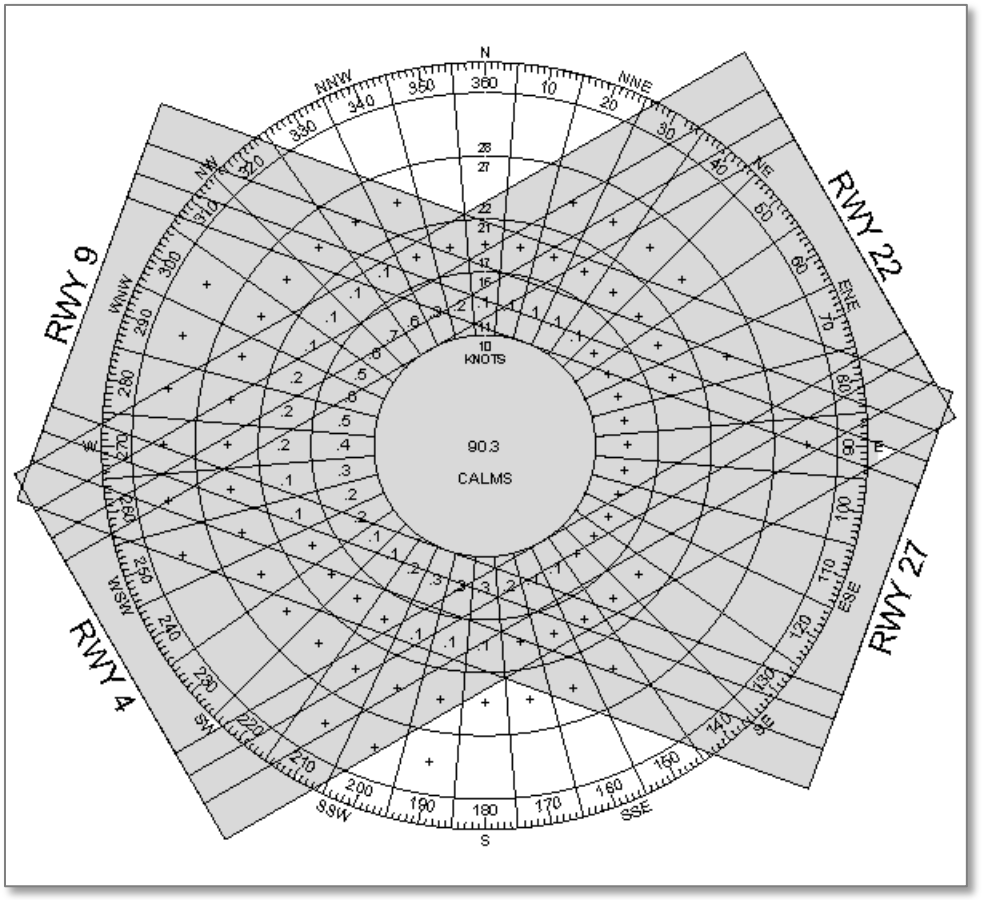
In the following wind analyses, the term Visual Meteorological Conditions (VMC) is used when visibility is at least three statute miles and the cloud ceiling is at least 1,000 feet above ground level (AGL). Visual Flight Rules (VFR) are in effect under VMC. Instrument Meteorological Conditions (IMC) are used when visibility is at least one statute mile but less than three statute miles and/or the cloud ceiling is at least 500 feet but less than 1,000 feet AGL. Instrument Flight Rules (IFR) are in effect under IMC.

At YKM, VMC occur on average 94.7 percent of the year and IFR conditions only 4.03 percent. The remaining time (1.3% of the year) operations cannot occur.

URS obtained historical wind and weather data for YKM from the National Climatic Center (NCC) for the years 2000 through 2009. Analyses show that based on all-weather wind coverage with a 13-knot crosswind limitation, Runway 9/27 provides 98.01 percent coverage and Runway 4/22, 96.83 percent. The two runways have a combined wind coverage of 99.26 percent. Winds are calm (0 to 10 knots) an average of 90.3 percent of the time. Figure 4-2 presents these data as an all-weather wind rose and includes calculations for 10.5-, 13-, 16-, and 20-knot crosswind coverage.

Under VFR conditions with a 13-knot crosswind, Runway 9/27 is usable 97.90 percent of the time and Runway 4/22 96.66 percent. Combined, the runways provide coverage of 99.22 percent. Winds are calm an average of 89.8 percent of the time, as shown in the VFR wind rose in Figure 4-3. Under IFR conditions with a 13-knot crosswind limitation, Runway 9/27 is usable 99.93 percent of the time. Winds are calm an average of 99.8 percent of the time, as shown in the IFR wind rose in Figure 4-4.

As the wind rose data show, Runway 9/27 provides more than 95 percent wind coverage under all-weather, VFR, and IFR conditions. Given this, FAA Guidelines suggest that a crosswind runway is not required for wind coverage and, therefore, Runway 4/22 will not be eligible for future FAA grants for rehabilitation.

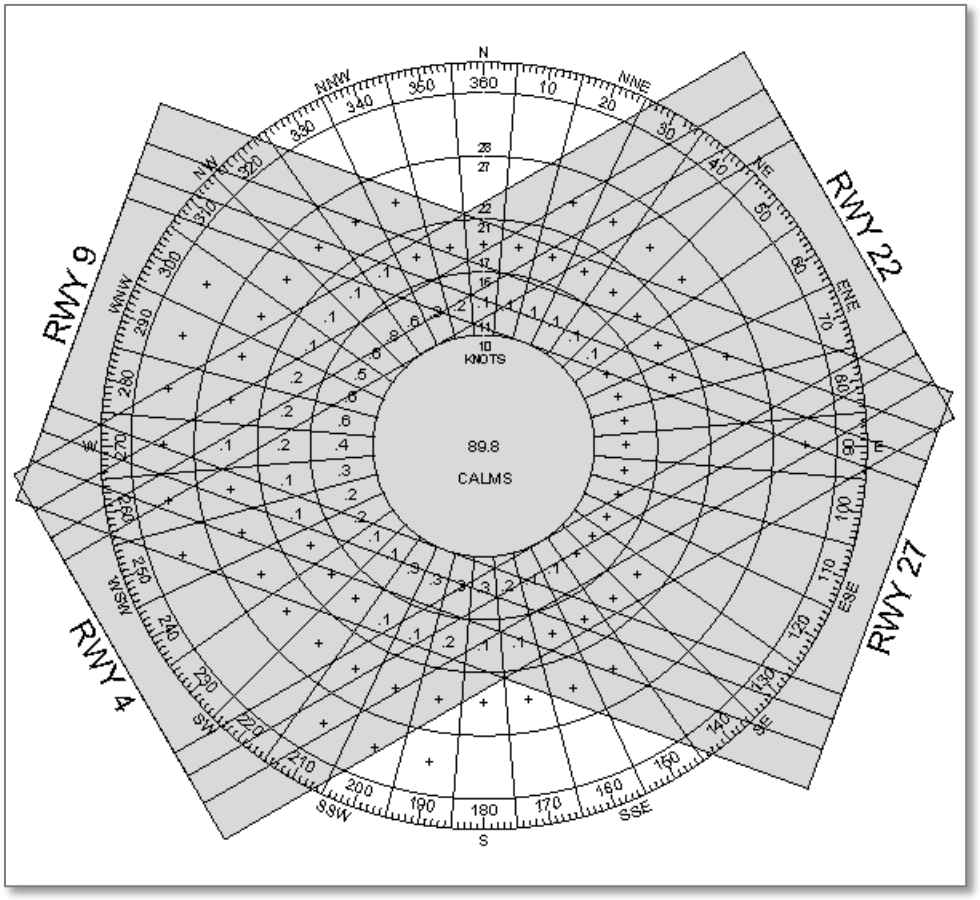


All Weather (78,061 observations)

CROSSWIND	RWY 04/22	RWY 09/27	COMBINED
10.5 knots	94.43%	96.51%	98.18%
13 knots	96.83%	98.01%	99.26%
16 knots	99.07%	99.26%	99.79%
20 knots	99.81%	99.81%	99.97%

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center. Station 72781 - Yakima, Washington. Period of record: 2000-2009

Figure 4-2: All Weather Wind Rose

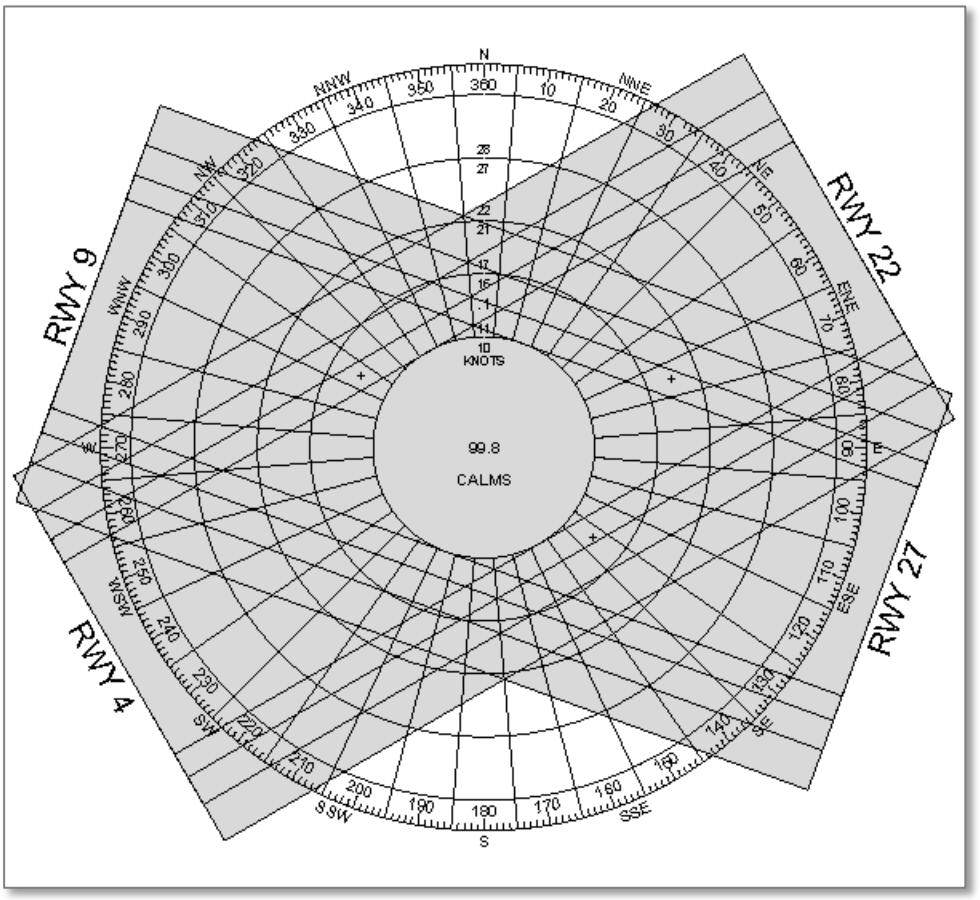


VFR (73,893 observations)

CROSSWIND	RWY 04/22	RWY 09/27	COMBINED
10.5 knots	94.12%	96.32%	98.08%
13 knots	96.66%	97.90%	99.22%
16 knots	99.02%	99.22%	99.78%
20 knots	99.80%	99.80%	99.97%

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center. Station 72781 - Yakima, Washington. Period of record: 2000-2009

Figure 4-3: Visual Flight Rules (VFR) Wind Rose



IFR (3,147 observations)

CROSSWIND	RWY 04/22	RWY 09/27	COMBINED
10.5 knots	99.87%	99.88%	99.92%
13 knots	99.93%	99.93%	99.95%
16 knots	99.97%	99.97%	99.97%
20 knots	99.97%	99.97%	99.97%

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center. Station 72781 - Yakima, Washington. Period of record: 2000-2009

Figure 4-4: Instrument Flight Rules (IFR) Wind Rose

4.3 RUNWAY CAPACITY

Runway capacity measures the theoretical maximum number of aircraft operations that can be accommodated on the runway system over a specified period. A variety of techniques have been developed for determining airfield capacity, with the most widely accepted method described in FAA AC 150/5060-5, Airport Capacity and Delay. The analyses employed herein are based on this publication, which evaluates airfield capacity in two ways:

Annual Service Volume (ASV): This is an estimate of the airport's annual capacity. The ASV accounts for differences in runway use, aircraft mix, weather conditions, and other factors that occur at the airport over a year's time.

Hourly Capacity: This is an estimate of the number of operations that can take place on the runway system during a 1-hour period. Hourly VFR and IFR capacities are calculated based on runway configuration, percent arrivals, percent touch-and-go, taxiways, airspace limitations, and runway instrumentation.

Table 4-4 shows the results of the capacity analysis for YKM's two-runway system compared with the forecast operations levels.

The analysis of capacity shows that demand levels forecast for YKM will not exceed the capacity of the runway system within the 20-year planning period.

Table 4-4: Runway Capacity/Demand Comparison

	2010	2015	2020	2025	2030
Annual					
Annual Service Volume	230,000	230,000	230,000	230,000	230,000
Annual Demand	50,488	52,582	55,064	58,466	63,579
Percent Capacity	21.9%	22.9%	23.9%	25.6%	27.6%
Hourly					
VFR Conditions					
Peak Hour Capacity	98	98	98	98	98
Peak Hour Demand	45	47	49	52	56
Percent Capacity	45.92%	47.96%	50.00%	53.06%	57.14%
IFR Conditions					
Peak Hour Capacity	59	59	59	59	59
Peak Hour Demand	13	14	14	16	19
Percent Capacity	22.03%	23.73%	23.73%	27.12%	32.20%

Source: URS Corporation
Capacity for ASV and peak hour conditions derived from Sketch 9 - AC 150/5060- 5
Notes: ASV – Annual Service Volume
VFR – Visual Flight Rules
IFR – Instrument Flight Rules

4.3.1 Design Standards

The airfield at YKM is classified as ARC C-III. C-III is also the classification for the design of Runway 9/27. The information contained in Table 4-5 shows the standards for this category compared with the current layout features of the airport.

Table 4-5: Existing Conditions vs. C-III Design Criteria (Runway 9/27)

Design Feature	Existing (ft.)	Standard (ft.)	Difference
Runway:			
Width	150	150	Meets Standard
Runway Shoulder Width	10	25	15 feet
Runway Blast Pad Width	150	200	50 feet
Runway Blast Pad Length	200	200	Meets Standard
Runway Safety Area (RSA) Width	522	500	Meets Standard
Safety Area Length (beyond runway end)	1,000	1,000	Meets Standard
Object Free Area Width	800	800	Meets Standard
Object Free Area Length (beyond runway end)	1,000	1,000	Meets Standard
Obstacle Free Zone Width	400	400	Meets Standard
Obstacle Free Zone Length	8,004	8,004	Meets Standard
Taxiway:			
Width	81	75	Meets Standard
Safety Area Width	118	118	Meets Standard
Object Free Area Width	186	186	Meets Standard
Taxilane Object Free Area Width	162	162	Meets Standard
Runway Centerline to:			
Taxiway Centerline	400	400	Meets Standard
Aircraft Parking Area	500	500	Meets Standard
Taxiway Centerline to Fixed or Movable Object	93	93	Meets Standard
Taxilane Centerline to Fixed or Movable Object	81	81	Meets Standard

Source: FAA Advisory Circular 150/5300-13, Airport Design, Change 6

Runway 4/22 is classified differently from 9/27 to account for the fact that operations are limited to small single-engine aircraft. FAA classifies Runway 4/22 as B-I (small). Table 4-6 lists the standards for this classification.

Table 4-6: Existing Conditions vs. B-I (small) Design Criteria (Runway 4/22)

Design Feature	Existing (ft.)	Standard (ft.)	Difference
Runway:			
Width	150	60	Meets Standard
Runway Shoulder Width	5	10	5 feet
Runway Blast Pad Width	None	80	80 feet
Runway Blast Pad Length	None	60	60 feet
Runway Safety Area (RSA) Width	200	120	Meets Standard
Safety Area Length (beyond runway end)	600	240	Meets Standard
Object Free Area Width	400	250	Meets Standard
Object Free Area Length (beyond runway end)	600	240	Meets Standard
Obstacle Free Zone Width	250	250	Meets Standard
Obstacle Free Zone Length	200	200	Meets Standard
Taxiway:			
Width	75	25	Meets Standard
Safety Area Width	49	49	Meets Standard
Object Free Area Width	89	89	Meets Standard
Taxilane Object Free Area Width	79	79	Meets Standard
Runway Centerline to:			
Taxiway Centerline	300	150	Meets Standard
Aircraft Parking Area	420	125	Meets Standard
Taxiway Centerline to Fixed or Movable Object	44.5	44.5	Meets Standard
Taxilane Centerline to Fixed or Movable Object	39.5	39.5	Meets Standard

Source: FAA Advisory Circular 150/5300-13, Airport Design, Change 6
Note: Runway 4/22 and Taxiway B were constructed to meet B-III standards that exceed B-I (small) standards.

4.3.2 Requirement Recommendation

The preceding analysis shows the current length of 7,604 feet on Runway 9/27 is sufficient for all future operations by all aircraft types, except for the Airbus A319 and 320 and the Boeing 737, 777, and 747 aircraft. The critical aircraft for the airport, the Bombardier Q400, requires 4,000 feet for take-off during hot weather, and this length is available. It is concluded that the existing length will be sufficient for all operations forecast to occur over the next 20 years. The exception is the continuation of flight diversions from the Seattle-Tacoma International Airport (SEA) that occur periodically. These diversions commonly involve Boeing 737 and Airbus A319/320 aircraft, both of which require a longer runway to operate at peak efficiency. The

number of diversions has historically been low (fewer than 200 per year), and this level of activity alone does not justify a runway extension.

Secondly, the runway system has all-weather wind coverage of 98.18 percent with a 10.5-knot crosswind, so no additional runway is needed to provide for wind coverage. In fact, the wind rose data show that Runway 9/27 provides more than 95 percent coverage for all aircraft under all weather conditions. This results in a determination that Runway 4/22 is not eligible for continued FAA support.

However, other reasons for maintaining Runway 4/22 do exist. Runway 4/22 provides flexibility in operations, with general aviation (GA) aircraft having the ability to operate more efficiently off the runway. Additionally, during periods when Runway 9/27 is unavailable because of construction or other activities, most airport operations can continue on Runway 4/22.

Finally, no airfield capacity constraint has been identified for the 20-year time frame for either the current two-runway airfield configuration, or the single-runway configuration that will result if Runway 4/22 is closed. This analysis showed that no additional runway capacity is required at Yakima.

4.3.3 Runway Safety Areas (RSA)

The RSA is a critical, two-dimensional area surrounding each active runway that must be:

- Cleared, graded, and free of potential hazardous surface variations,
- Properly drained,
- Capable of supporting Aircraft Rescue and Fire Fighting (ARFF) equipment, maintenance equipment, and aircraft under normal weather conditions, and
- Free of objects, except for those mounted using low-impact supports and whose location is fixed by function.

Based on FAA criteria from AC 150/5300-13 for a C-III runway, the RSA for Runway 9/27 needs to be 500 feet wide, extending 1,000 feet beyond each runway end. Presently the RSAs on both ends of the runway comply with these standards.

For Runway 4/22, the RSA should meet the standards for a B-I (small) aircraft. The RSA includes an area 250 feet beyond the runway end measuring 120 feet wide.

4.3.4 Runway Object Free Areas (OFA)

The ROFA is a two-dimensional ground area surrounding each runway. The ROFA clearing standard precludes parked aircraft or other objects from the area, except NAVAIDs and facilities whose locations are fixed by function. For Runway 9/27, the current OFA is 800 feet wide and extends 1,000 feet beyond the end of the runway, in accordance with C-III runway standards. For Runway 4/22, the OFA is 250 feet wide and extends 240 feet beyond the end of the runway. As with the RSAs, the OFA dimensions fall entirely on airport property and meet all FAA criteria.

4.3.5 Runway Protection Zones (RPZs)

The RPZ is trapezoidal in shape and centered on the extended runway centerline for each runway end. Its function is to enhance the protection of people and property on the ground. It begins 200 feet beyond the permanent runway threshold (at the end of the primary surface). The RPZ dimensions are based on the type of aircraft using the runway, type of operations (visual or instrument) being conducted, and the visibility minimums associated with the most demanding approach available. RPZ dimensional standards are defined in the FAA AC 150/5300-13, Airport Design. Table 4-7 shows the YKM RPZ dimensions. All RPZs at YKM meet these standards, and the airport owns all property within the RPZ for each runway end.

Table 4-7: Runway Protection Zone (RPZ)

Runway	Aircraft Served	Approved Approach	Zone Length (feet)	Inner Width (feet)	Outer Width (feet)	Acres
09	Large	Non Precision	1,700	1,000	1,510	48.9
27	Large	Precision	2,500	1,000	1,750	78.9
04	Small	Visual	1,000	250	450	8.0
22	Small	Visual	1,000	250	450	8.0

4.4 TERMINAL REQUIREMENTS

The passenger terminal area is located on the north side of the airport at the approximate intersection of Runways 9/27 and 4/22. The terminal area consists of the passenger terminal building, terminal curbfront, commercial aircraft parking apron, the surface access system and automobile parking areas, and the airport administrative offices. The terminal area is accessed using either West Washington Avenue or South 24th Street onto the airport entry drive. Parking is located in front of the terminal with public parking, rent-a-car, and employee parking provided in different areas.

The apron directly south of the terminal building is designated for airline use. Four aircraft parking positions are marked on this pavement, although they are seldom used at the same time. The apron also provides for airline ground service equipment (GSE) and enplaning/deplaning passenger circulation.

Public automobile parking is provided in a main parking lot north of the terminal. The lot contains 188 spaces. Users can enter the lot either before or after the terminal curbside.

Rental car parking is located east of the terminal with 36 spaces available in a restricted lot.

4.4.1 Passenger Terminal Building Requirements

Within the passenger terminal building, services are required for processing passengers arriving and departing on commercial flights. Enplaning services include ticketing, baggage, passenger service areas, and airline offices. Processing services typically include passenger and bag screening facilities operated by the Transportation Security Administration (TSA). Deplaning services include baggage claim, rental car counters, and parking prepay facilities. Other services necessary to plan for in a terminal building include concessions (restaurants and gift shops), restrooms, advertising and display areas, mechanical and utility rooms, and janitorial service and storage areas.

YKM is currently served by Alaska Airlines, which offers three daily commercial flights to and from SEA using Bombardier Q400 aircraft with 76 passenger seats. Occasional charter operations using narrow body aircraft with 100 to 147 seats operate at YKM on a nonscheduled basis, and YKM serves as a diversion stop for commercial flights when SEA is not accessible. A new terminal needs to be planned to ensure additional airlines and larger aircraft are not precluded from use should demand arise, as well as ensuring current and projected peak loads are accommodated. The following discussion provides details on the facility requirements for a new passenger terminal at YKM, which are summarized in 5-year increments in Table 4-8.

Table 4-8: Terminal Building Requirements

		2010	2015	2020	2025	2030
Annual enplanements		58,994	65,134	75,508	96,370	122,995
Peak hour enplanements		67	74	85	109	139
Peak hour airline operations		2	2	2	3	4
Facility Requirements	**Unit**					
Enplaning						
Ticket counter length	l.f	40	40	60	60	60
Agent work area	s.f.	480	480	720	720	720
Passenger queuing	s.f.	800	600	900	900	900
Circulation space	s.f.	400	400	600	600	600
Self-service kiosks	s.f.	40	40	60	60	60
Airline offices	s.f.	800	800	1,200	1,200	1,200
Airline baggage make-up	s.f.	1,000	2,000	3,000	3,000	3,000
TSA baggage screening	s.f.	1,000	1,000	1,000	1,000	1,000
Total enplaning requirement	**s.f.**	**4,520**	**5,320**	**7,480**	**7,480**	**7,480**
Security/Screening						
Passenger security lanes	no.	1	1	1	2	2
Screening area	s.f.	1,050	1,050	1,050	2,100	2,100
Passenger queuing area	s.f.	804	888	1,020	1,308	1,668
TSA administration	s.f.	700	700	700	700	700
Total security requirement	**s.f.**	**3,554**	**3,638**	**3,770**	**5,108**	**5,468**
Gate Areas						
Number of gates		2	2	2	2	4
Gate processing area	s.f.	300	300	600	600	1,200
Seating/waiting area	s.f.	1,072	1,184	1,360	1,744	2,224
Restrooms	s.f.	450	450	450	450	450
Concessions	s.f.	200	200	200	200	200
Circulation	s.f.	157	168	216	254	362
Total gate area requirement	**s.f.**	**2,179**	**2,302**	**2,826**	**3,248**	**4,436**

Table 4-8: Terminal Building Requirements (Continued)

		2010	2015	2020	2025	2030
Deplaning						
Baggage claim devices	units	1	1	1	1	1
Baggage claim active area	s.f.	240	240	240	240	240
Waiting area	s.f.	1,072	1,184	1,360	1,744	2,224
Circulation area	s.f.	131	142	160	198	246
Inbound baggage area	s.f.	375	750	750	750	750
Rental car						
Counter length	l.f.	32	32	32	32	32
Area	s.f.	384	384	384	384	384
Customer queuing	s.f.	320	320	320	320	320
Offices	s.f.	300	300	300	300	300
Parking prepay	s.f.	50	50	50	50	50
Total deplaning requirement	**s.f.**	**2,497**	**2,497**	**2,620**	**2,814**	**3,236**
Offices						
Airport management	s.f.	5,000	5,000	5,000	5,000	5,000
Other	s.f.	500	500	500	500	500
Total office requirement	**s.f.**	**5,500**	**5,500**	**5,500**	**5,500**	**5,500**
Other Needs						
Concessions	s.f.	750	750	750	750	750
Display area	s.f.	200	200	200	200	200
Restrooms	s.f.	450	450	450	450	450
Mechanical/electrical	s.f.	548	581	672	737	799
Janitorial	s.f.	365	388	448	491	533
Total other requirement	**s.f.**	**2,313**	**2,313**	**2,369**	**2,520**	**2,629**
Total Terminal Requirement	**s.f.**	**20,563**	**20,563**	**21,750**	**24,910**	**27,201**

4.4.1.1 Passenger Enplaning Facilities

The terminal at YKM should provide ticket counter space and check-in kiosks for three airlines to accommodate the forecast activity levels and allow for future expansion. URS calculated the requirements at the ticket counter assuming each airline would require two agents with space to process enplaning passengers, separated by a bag well between the agent positions to accommodate checked baggage.

Each airline will also require office space for administrative staff, employee break/locker areas, and air cargo offices. Space requirements for these are included in the calculations under the airline offices heading in Table 4-8.

Additionally each airline will need baggage make-up space. This space includes the area needed to move the bags from the counters to the area where they are loaded onto carts to transport to the aircraft. Prior to, but adjacent to, these bag make-up spaces, a bag screening facility will need to be provided. This facility, operated by TSA, needs to be sufficient to accommodate the equipment and personnel necessary to screen peak-hour baggage.

4.4.1.2 Passenger Screening Checkpoint Facilities

Once passengers are ticketed, they proceed to the passenger-screening checkpoint. There is currently a single processing lane at YKM with a theoretical capacity of accommodating up to 120 passengers per hour. URS recommends that any expansion of the terminal building allow for two screening lanes, with one magnetometer and one carry-on screening machine per lane. TSA design standards require an average of 1,050 square feet per screening lane, including a seating-composure area, response corridor, law enforcement officer, and a private search room. For passengers waiting to access security screening, a queuing area is calculated assuming that no more than 75 percent of the peak-hour enplaning passengers will be in line at any given time and each will require 16 square feet of space.

TSA may also desire ancillary operations support space for employee break room and/or training room functions. These are not necessarily required to be adjacent to the checkpoint.

4.4.1.3 Gate Area

Once ticketed and through security, passengers proceed to the hold room/gate area to await aircraft boarding. This area requires sufficient seating for 90 percent of the peak-hour passengers. An estimated 20 square feet per seat is required for the seat and associated circulation space. In addition to seating, a departure podium, queuing area, and exit corridor add approximately 300 square feet total per airline gate.

Finally, space must be provided for restrooms and concessions, since this area is located behind the security checkpoint and passengers can no longer access nonsecure facilities.

4.4.1.4 Deplaning Services

When passengers deplane, they proceed from the aircraft through the hold room to the baggage claim area. The future baggage claim area should include one automated baggage claim device.

Assuming a 25-foot-long device with a 12-foot-wide retrieval zone in front, the area for baggage claim will need to be approximately 300 square feet. Additionally, the area needs to accommodate people who are meeting incoming passengers. Given the peak-hour passenger levels projected, this "meeter/greeter" area will need to provide waiting area for about 85 people.

This area needs to provide for rental car agencies with customer service areas, queuing space, and parking prepay kiosks.

4.4.1.5 Other Services

In addition to facilities used for processing passengers, the terminal must also provide other public services such as restaurant/concessions (minimum of 1,000 square feet), restrooms in both secure and nonsecure zones (450 square feet per restroom area to include one men's, one women's, and one family facility), a display area for advertising, and building systems and janitorial rooms.

4.4.1.6 Airport Management Space

When a new terminal is constructed, it should include space for airport management. Space requirements include one office for the Airport Manager, as well as one for the Assistant Manager and clerical, and support staff at 150 square feet per office. This space should also include a security badging workstation, conference/meeting area, kitchen/support area, circulation space, and restroom.

The current passenger terminal includes 30,838 square feet of space on two levels and the current airport administration building is 4,700 square feet. However, portions of the existing terminal are not used for passenger processing, so the comparison of raw square footage space is not adequate for determining terminal needs. The layout and condition of the building must also be considered. A detailed terminal conditions analysis was conducted as part of this master plan and is included as Appendix B. The analysis concluded the existing building was in fair condition, but requires a number of rehabilitation projects be undertaken over the next several years. These included replacement of mechanical systems, roof repairs, electrical system updates, and physical rehabilitation of interior spaces. Recently it has become clear the addition of a second airline has caused congestion points within the terminal that need to be addressed before enplanement levels increase in the future.

4.4.1.7 Terminal Apron

The existing commercial aircraft apron provides space for four aircraft parking positions that can accommodate the Q400. These are designed to allow for power in/power out aircraft operations.

In addition, the terminal apron has space allocated for taxilanes, area for ground servicing the aircraft, and storage of the ground service equipment (GSE).

The exact size of any future terminal apron will depend on the final footprint and layout of the terminal building. However, a minimum area equal to the current four aircraft gates should be provided into the future.

4.4.1.8 Automobile Parking

At YKM, public automobile parking is provided in the lot on the north side of the passenger terminal. This lot has 188 parking spaces, eight of which are handicapped accessible. The average occupancy for these spaces is about 70 percent. Given this, the calculated need for additional spaces must consider the excess capacity before recommending that new spaces be added.

To the immediate east of the terminal is a parking lot for rental cars with a capacity of 36 spaces. The requirement for additional spaces is based on the increase in annual enplaned passengers.

Additional spaces for cargo and package drop and employee parking is located in a restricted lot directly to the west of the terminal building. Employee parking is also available at the Administration Building, where 12 spaces are provided. Employee parking requirements should remain relatively stable over the forecast period, as the growth rates forecast for YKM will not trigger a need for additional administrative employees. Forecast automobile parking requirements are shown in Table 4-9.

Table 4-9: Automobile Parking Requirements

Year	Enplaned Passengers	Public	Employee	Rental Car	Total
2010	58,994	188	15	36	239
2015	65,134	188	17	40	202
2020	75,508	188	19	46	234
2025	96,370	215	25	59	298
2030	122,995	274	31	75	381

4.4.2 Air Cargo Activity

Three different carriers provide air cargo services at YKM. Empire Airlines operates a feeder route for FedEx using the Cessna Caravan 208 aircraft with occasional ATR 42/72 aircraft. Empire has three daily flights from Spokane, with departures to other cities in Washington State each morning. Afternoon flights consist of two arrivals from Spokane, which then return to Spokane.

Ameriflight operates as a feeder service for UPS using the Embraer 120 aircraft. Ameriflight operates one flight per day, arriving from Boeing Field each morning with a departure in the afternoon. AeroFlight operates using the PA32 or Cessna 340 aircraft. It has a daily flight from Boeing Field with a continuation to Pasco each morning. This route is flown in reverse (Pasco to Yakima to Boeing) each afternoon.

FedEx operates from a building west of the terminal that measures approximately 7,700 square feet. UPS and AeroFlight operate from the west GA ramp. Each of these carriers requires space for aircraft parking and processing.

The amount of space needed for air cargo processing is calculated at one and a half times the physical dimension (wingspan and length) of the airplane itself, multiplied by the number of aircraft expected to be on the ground at the same time. This provides space for both parking and loading/unloading the aircraft.

Table 4-10: Air Cargo Requirements

Year	Annual Operations	Peak Hour Operations	Parking Need (spaces)	Area Required (s.f.)
2010	5,777	7	4	14,469
2015	6,222	8	4	15,582
2020	6,701	9	5	18,080
2025	7,219	9	5	18,080
2030	7,778	10	5	19,480

4.5 AIRCRAFT STORAGE REQUIREMENTS

There are more than 160 general aviation aircraft based at YKM housed in hangars or stored outdoors on tiedowns in four distinct areas; the northwest GA area; the terminal area; the east GA area; and, the southeast GA area.

The northwest area measures more than 53 acres and includes aviation and non-aviation-related buildings. The area includes 29 paved tiedowns and 2 helicopter landing pads. The GA terminal area covers a triangular area measuring approximately 9 acres. Included are several hangars, 35 paved tiedown spaces, and other facilities. The east GA area is the home of the McAllister Air Museum and CubCrafters manufacturing facility. The area encompasses 9 acres and provides space for 11 aircraft tiedowns. The south GA area is a mixture of old hangars owned by the airport and new, privately owned hangar buildings. The area measures about 163 acres, most of

it currently undeveloped with development in some areas limited by flood plains or the existing landfill.

The long-term forecast for based aircraft at YKM anticipates 208 aircraft by 2030. This is an increase of 46 aircraft from the present 162 based aircraft. The majority of these aircraft will need to be hangared. The forecast shows that future based aircraft will consist of an increasingly higher percentage of high-performance twin and turbine aircraft whose owners prefer to shelter them indoors. The number and type of aircraft storage facilities needed over the course of the 20-year planning period is detailed in the sections below.

4.5.1 Hangar Storage Requirements

Covered aircraft storage is in demand at YKM. Forecast growth in based aircraft will lead to a need for additional hangars. Table 4-11 lists the assumed storage preferences for the aircraft types. Combining these with the based aircraft forecast produced the requirements for hangar space as shown in Table 4-12. As shown, demand for open-air tiedowns will remain low with the biggest growth in demand expected to be in corporate hangars.

It should be remembered the demand for aircraft hangars is based on forecasts that can change. Consequently, while URS recommends these larger hangar facilities be reflected in the airport's long-term plans, URS also recommends that hangars only be constructed as specific needs arise.

Table 4-11: Storage Distribution Percentages

Aircraft Type	T-hangars	Corporate Hangars	Tiedown
Single Engine Piston	80%	15%	5%
Multi-Engine Piston	50%	50%	0%
Turbine	0%	100%	0%
Rotor	0%	100%	0%

Table 4-12: Hangar Requirements

Year	T-Hangars	Corporate Hangars	Totals
2010	119	37	163
2015	128	39	175
2020	135	42	185
2025	142	46	196
2030	149	51	208

4.5.2 Based Aircraft Tiedown Storage Requirements

At present, some based aircraft are stored outside on tiedown aprons. These are generally small single engine piston aircraft. Space planning for these aircraft is calculated based on 360 square yards of apron for each parking space. This provides space for aircraft parking and circulation between the rows of aircraft. This space allowance assumes pilots have a certain degree of familiarity with the parking situation and, therefore represents a minimum that should be provided.

Table 4-13: Based Aircraft Tiedown Requirements

Year	Tiedown Spaces	Tiedown Area (s.y.)
2010	7	2,520
2015	7	2,520
2020	8	2,880
2025	8	2,880
2030	9	3,240

4.5.3 Transient Aircraft Tiedown Requirements

Tiedown space is also needed for transient aircraft. It is best to provide this space at or adjacent to FBO hangars. In calculating the area required for transient tiedowns, an allowance equal to 700 square yards per aircraft is used. This area is larger than applied to spaces for based aircraft tiedowns for two reasons. First, the user of the transient space may not be as familiar with the airport's ground movement patterns, and providing a greater margin of safety is prudent. Second, all types and sizes of aircraft are parked in the transient tiedown area, and a greater apron allowance provides more flexibility in how the tiedowns can be used. URS employed the following method to calculate the number of aircraft that will require transient aircraft parking spaces.

Table 4-14: Transient Tiedown Requirements

Year	Itinerant Operations				Transient Tiedowns Required
	Annual	Average day	Daily Arrivals	Transient Arrivals	
2010	21,165	74	19	10	5
2015	22,072	77	20	10	5
2020	23,173	81	21	10	5
2025	24,358	85	22	11	5
2030	25,658	90	23	12	6

- Determine the average day number of itinerant aircraft operations.

- Convert the itinerant operations to the number of arrival aircraft by dividing by two.
- Divide the number of aircraft performing itinerant operations by two to account for the fact that based aircraft performs some itinerant operations.
- Assume that no more than 50 percent of the resulting daily transient aircraft operations will require storage at any one period.

Based on Chapter 3, Forecast of Aviation, itinerant operations are forecast to constitute 45 percent of overall operations, or 74 daily operations by 2030. Using the methodology cited above, six itinerant aircraft tiedown positions will be required.

4.5.4 Summary of Aircraft Storage Requirements

The preceding analyses show the focus for future aircraft storage should be on hangars (either group or T-hangars) instead of tiedowns. Table 4-15 shows the amount of space needed for aircraft storage throughout the forecast period.

4.5.5 Fixed Base Operator (FBO) Facilities

In the future, as the number of based aircraft increases and the level of operations continues to rise, the airport will need to ensure that adequate land is set aside for FBO facilities. In this report, this is calculated at 15 percent of the total area designated for based aircraft storage and transient tiedown space. Table 4-16 shows the number of aircraft the facility will need to accommodate.

The area set aside for the FBO expansion should include the transient aircraft parking spaces discussed previously.

Table 4-15: Aircraft Storage Requirements

Facility		2010	2015	2020	2025	2030
Small T-Hangars	Number	110	119	124	131	138
	Space (s.f.)	651,360	701,133	734,162	772,519	814,443
Medium T-Hangars	Number	9	10	10	10	11
	Space (s.f.)	63,000	70,000	70,000	70,000	77,000
Group Hangars	Number	37	39	42	46	51
	Space (s.f.)	275,250	291,629	316,997	343,251	382,500
Based Tiedowns	Number	7	7	8	8	9
	Space (s.f.)	6,300	6,300	7,200	7,200	8,100
Transient Tiedowns	Number	5	5	5	5	6
	Space (s.f.)	12,500	12,500	12,500	12,500	15,000
Total Requirement	s.f.	1,008,410	1,081,562	1,140,858	1,205,470	1,297,043
	acres	23	25	26	28	30

Table 4-16: Total GA Facility Need

	2010	2015	2020	2025	2030
GA Needs					
Square feet	1,008,410	1,081,562	1,140,858	1,205,470	1,297,043
Acres	23.15	24.83	26.19	27.67	29.78
FBO Needs					
Square feet	151,262	162,234	171,129	180,821	194,556
Acres	3.47	3.72	3.93	4.15	4.47

4.6 AUTOMOBILE PARKING AND ACCESS

FAA and TSA are still developing overall security regulations for general aviation. However, it is clear that access to the airfield will become more limited in the future, especially in environments where commercial air carriers are operating, such as YKM. Vehicle access gates at YKM currently limit automobile access to the operations and hangar areas to the owners and operators of aircraft.

4.7 UTILITIES AND DRAINAGE

Existing utility services at YKM are discussed in Chapter 2, Existing Conditions. No deficiency was identified in the current level of services available. Consequently, no recommendation is provided for changes to the existing utility services.

As new facilities are developed, utilities will need to be extended or expanded to provide the necessary services. For the terminal and GA areas, utility services typically include electricity, water, data cables, and the collection of stormwater run-off.

4.8 AIRPORT SUPPORT FACILITIES

Analysis of airport support facilities and services includes requirements for the storage and distribution of aircraft fuel, facilities, and equipment required for maintenance of the airport.

4.8.1 Fuel Service

As noted in Chapter 2, Existing Conditions, fuel service at YKM is available for Jet A and 100LL aircraft fuel. Three aboveground storage tanks each provide 12,000-gallon capacity and are located on the west GA apron. No change is recommended to the existing fuel service at this time.

4.8.2 Perimeter Fencing/Equipment

As indicated in Chapter 2, the Airport Operation Area (AOA) is completely enclosed by a perimeter security fence. It comprises 7- and 8-foot-high chain link fencing topped with 3-strand barbed wire. No change is recommended to the existing security at this time.

However, as new facilities are developed, the security perimeter may need to be reevaluated to accommodate any expansion that may happen.

4.8.3 Summary of Requirements

The result of the analyses contained in this chapter is that numerous facilities will need to be expanded and possibly relocated to meet the demand levels shown in the aviation demand forecasts. Table 4-17 presents a summary of the requirements. Subsequent sections of this master plan will explore where new facilities can be located, as well as develop a plan for long-range implementation.

Table 4-17: Existing Facilities Assessment

Actual	Conclusions
Airfield System	The wind coverage and capacity needs at YKM are met by a single runway. Runway 9/27, at 7,604 feet, provides sufficient take-off length for all of the aircraft forecast to use the airport.
Passenger Terminal	The existing passenger terminal building will need to be expanded before 2020. Terminal layout and maintenance issues may require action to be taken sooner to maintain an acceptable level of service.
Automobile Parking	The current public parking lot should be adequate through the year 2020. It is recommended that the rent-a-car ready/return and rental car parking area be expanded prior to this time.
Air Cargo	Although air cargo is forecast to continue to consist of feeder service using small aircraft, additional space will need to be provided in the future, either by remarking existing pavement or by constructing new.
Based Aircraft Hangar Storage	With the growth in based aircraft that has been forecast, as well as the existing unmet demand for hangar space, additional area for hangar development will need to be made available for future development.
FBO and support facility expansion	Expanded FBO facilities are required to provide support for the general aviation community. These facilities will provide not only aircraft maintenance hangars, but also pilot lounge areas, area for fueling aircraft, and sufficient space for transient aircraft parking.
Fueling	The current system is adequate, assuming the private sector continues to upgrade their facilities and improve delivery as needed.