Chapter 4 – Airport Facility Requirements

Introduction

The facility requirements evaluation identifies the adequacy or inadequacy of existing airport facilities and identifies what new facilities may be needed at Hermiston Municipal Airport (HRI) during the planning period based on forecast demand or conformance to FAA standards.

Airside facilities include runways, taxiways, navigational aids and lighting systems. **Landside** facilities include aircraft aprons, taxilanes, hangars, aircraft tiedowns/parking, terminal and fixed base operator (FBO) facilities, and aircraft fueling. All airfield items are evaluated based on established FAA standards. Support items such as surface access, automobile parking, security, and utilities are also examined based on site-specific needs.

The evaluation of demand-driven elements will reflect in gross numbers, new facility needs such as runway length requirements, hangar space, and aircraft parking positions based on forecast demand and the needs of the type of aircraft being accommodated. Items such as lighting, navigational aids, and approach capabilities are evaluated based on overall airport activity and facility classification. Options for addressing facility needs will be evaluated in the Airport Development Alternatives (Chapter 5) to determine the most cost-effective and efficient means for meeting projected facility needs.

Part 1 - Facility Requirements Evaluation Overview

The updated aviation activity forecasts presented in Chapter 3 identified the current and future design aircraft to be used in evaluating airport facility requirements at HRI. The FAA's design aircraft designation requires meeting a threshold of 500 annual aircraft operations by the specific aircraft type or family of similar aircraft. This "regular use" standard is applied to both current and future activity reflected in the updated aviation activity forecasts. The design aircraft will then determine the appropriate design standards and other planning criteria to be applied in the master plan.

Aircraft operations are also expected to grow, which will drive a gradual increase in transient parking requirements. The evaluation of demand-driven elements will reflect in gross numbers, new facility needs such as runway length requirements, hangar space, and aircraft parking positions based on forecast demand and the needs of the design aircraft. Items such as lighting and navigational aids are evaluated based on the type of airport activity, airport classification, and approach capabilities. The twenty-year aircraft operations forecast does not identify any anticipated capacity issues for the runway-taxiway system.

The updated aviation activity forecasts confirmed that it is appropriate to continue use of Airport Reference Code (ARC) B-II as the future planning criteria for HRI, consistent with the standards reflected on the most recent FAA-approved Airport Layout Plan (ALP).[1]

<u>Airport Design and Airspace Planning Standards</u>

Airport Reference Code (ARC) A/B-II *standards are recommended for use and evaluation on Runway 5/23 and its taxiway system*

Aircraft Approach Category (AAC) A & B *with not lower than 1-Mile approach visibility minimums are recommended for use and evaluation on Runway 5/23.*

FAR Part 77 Airspace Planning Criteria*:*

- *Larger than Utility*
- *Visual Runway*

Note: The two existing instrument approaches at HRI are classified as "circling" procedures to the runway environment, rather than to a specific runway end. These procedures are consistent with a "visual" runway designation since pilots are required to maintain visual contract with the runway environment upon reaching/passing the electronically-guided missed approach point for landing. For planning purposes, it is assumed that the existing visual runway designation and associated airspace will be maintained. See Airspace Evaluation section of this chapter for additional information.

All references to the "standards" are based on these assumptions, unless otherwise noted. (Per FAA Advisory Circular 150/5300-13A, as amended; FAR Part 77.25)

[1] Airport Layout Plan –HRI – Airport Layout Plan (Aron Faegre & Associates, Century West Engineering, 2001)

Part 2 – Design Standards Conformance Review

The facility requirements evaluation also includes a review of existing facilities to identify conformance with current/future ARC B-II design criteria. The airspace planning criteria noted earlier are also reviewed for consistency with updated facility needs, including runway approach capabilities. Detailed definitions of the standards and individual facility assessments are provided later in the chapter. The reader is encouraged to consult the Glossary of Aviation Terms to clarify technical information.

Figure 4-1 depicts the runway-taxiway system at HRI, including key ARC B-II design standards. There is no change in the ARC B-II design standards and airspace planning criteria recommended for Runway 5/23 from the previous (2001) ALP.

As noted in the inventory chapter, the main components of the runway-taxiway system have been updated to fully meet ARC B-II standards since the 2001 ALP was completed. As a result, no non-conforming items have been identified for the built items in the runway and parallel taxiway system. Non-conforming items are identified for both runway protection zones (RPZ), and the existing visual approach surface and PAPI clearing surface for Runway 5 (tree penetrations). The RPZ issues are related to property control of the RPZ (portions of both RPZs extend off airport property) and FAA-defined incompatible land uses (public roads) located within the RPZs.

Figure 4-2 depicts the landside development at HRI with a combination of ADG-I and ADG-II taxilanes that serve the hangars and tiedown areas.

Table 4-1 summarizes the non-conforming facilities depicted in **Figures 4-1 and 4-2**. Options for addressing non-conforming items will be provided in the evaluation of development alternatives (Chapter 5).

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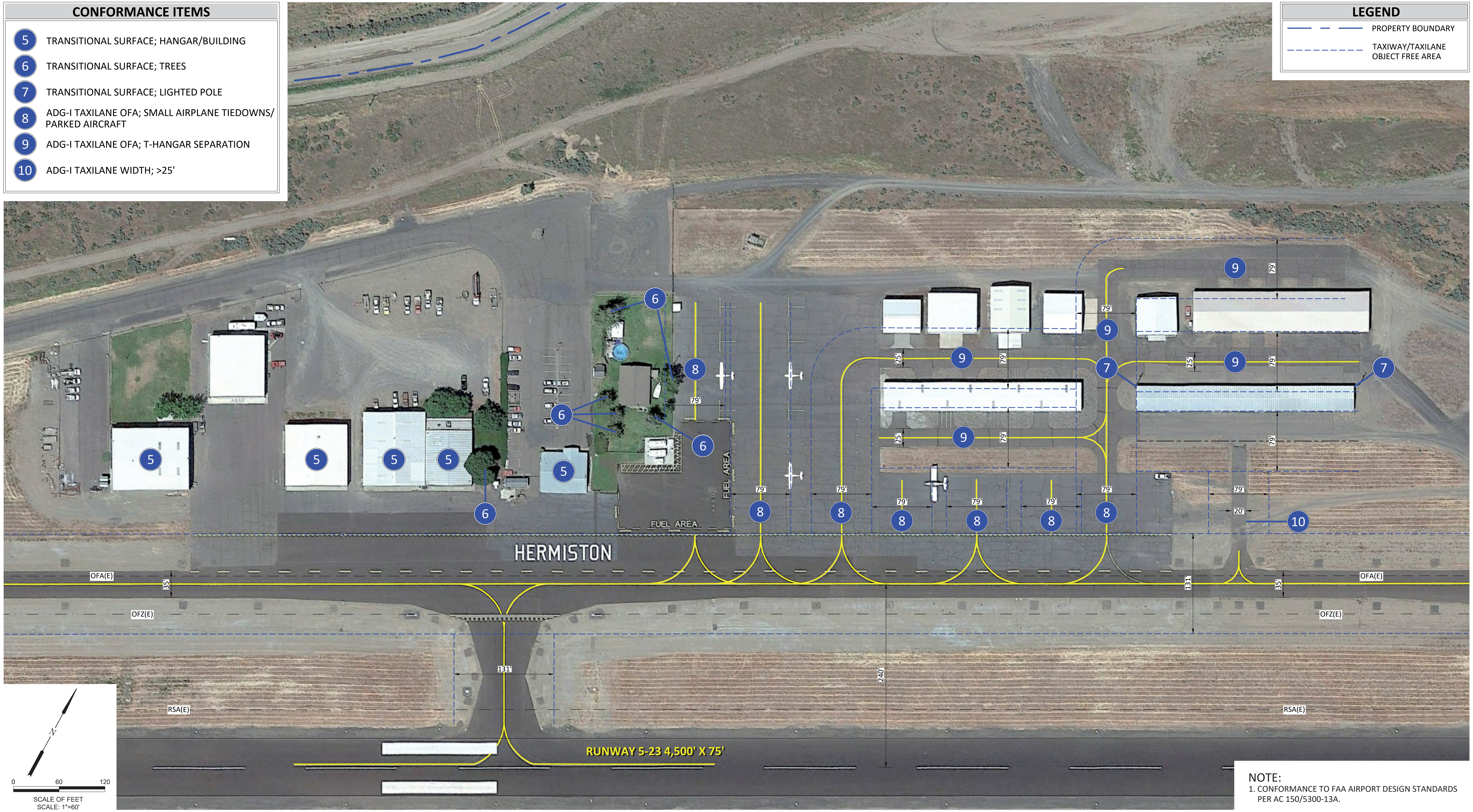
CONFORMANCE FIGURE
FIGURE 4.1

HERMISTON MUNICIPAL AIRPORT
AIRPORT MASTER PLAN

CENTURY WEST ENGINEERING

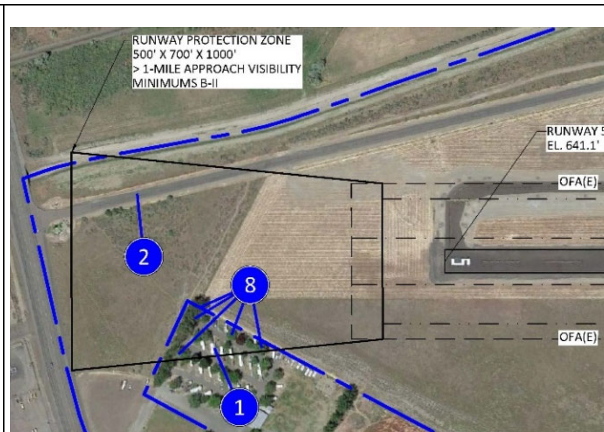
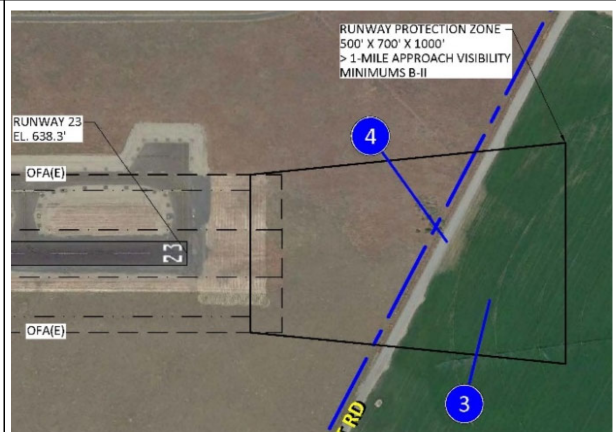
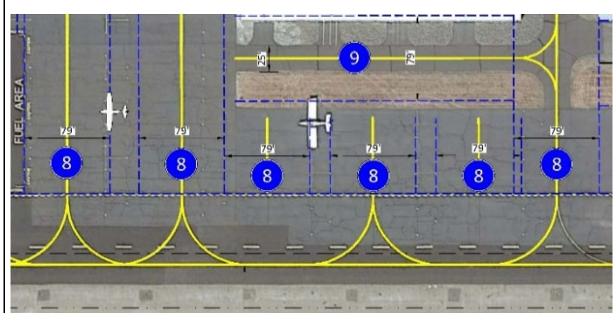


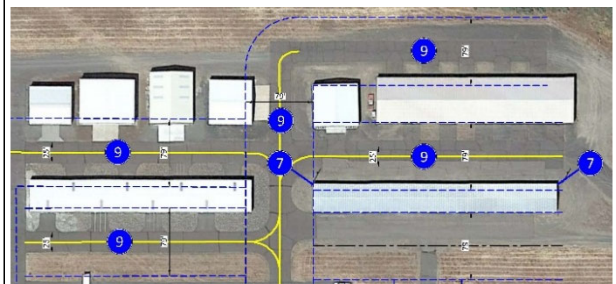
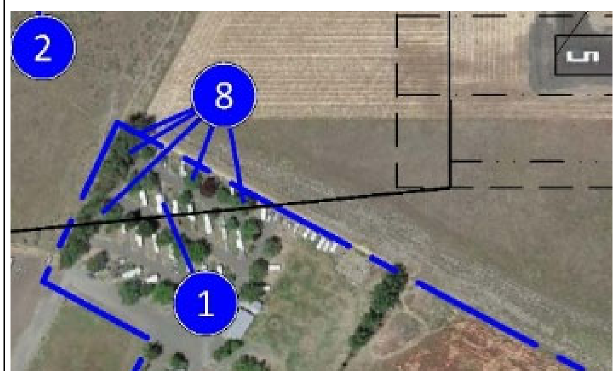
CONFORMANCE FIGURE
FIGURE 4.2

HERMISTON MUNICIPAL AIRPORT
AIRPORT MASTER PLAN

CENTURY WEST ENGINEERING

TABLE 4-1: HRI - AIRFIELD CONFORMANCE FAA STANDARDS (EXISTING)

Non-Conforming Item: The northwest corner of the RPZ for Runway 5 extends over a road (Airport Way) and a small section of the RPZ (south edge, mid-RPZ) extends over a privately owned land parcel (residential mobile home park). *The FAA's guidance on Incompatible Land Uses in RPZs discourages roads and other items within RPZs; airport control over RPZs (fee simple or avigation easement) is also recommended.*	
Non-Conforming Item: The middle and outer sections of the RPZ for Runway 23 extend over a road (South Ott Road) and beyond airport property. *FAA guidance: Same as above.*	
Non-Conforming Item: Several existing apron taxilanes do not meet ADG-I (79 feet) or ADG-II (115 feet) taxilane object free area (TOFA) clearing standards. *The distance from the taxilane centerline and a fixed of moveable object (e.g., parked aircraft, hangars) is less than FAA standard.*	

Non-Conforming Item: Hangar taxilanes do not meet ADG-I taxilane OFA clearing standards of 79 feet. *The distance from the taxilane centerline and a fixed of moveable object (e.g., structure) is less than FAA standard.*	
Non-Conforming Item: Runway 5 approach penetrations (trees) identified in AGIS survey. • **FAR Part 77 Approach Surface** • **Precision Approach Path Indicator (PAPI) Siting Surface (unobstructed glide path)** *The Runway 5 PAPI was turned off due to trees penetrating its defined 3.0-degree glide path. Trees also penetrate the FAR Part 77 approach surface.* *Note: Airport management reports that the trees penetrating the 20:1 PAPI siting surface were lowered/removed in spring 2018. Review AGIS survey to identify specific penetrators (trees) which no longer obstruct airspace. Verify if PAPI returned to service.*	
Non-Conforming Item: Transitional Penetrations (Buildings, Light Poles and Trees) on north side of Runway 5/23. *Several items penetrate the FAR Part 77 transitional surface (confirmed heights and locations in AGIS survey). Adding obstruction lights is recommended for all built items that cannot easily be lowered or removed. Trees penetrating the transitional surface should be lowered or removed.*	

Part 3 – Airport Standards (Airspace & Airfield Design)

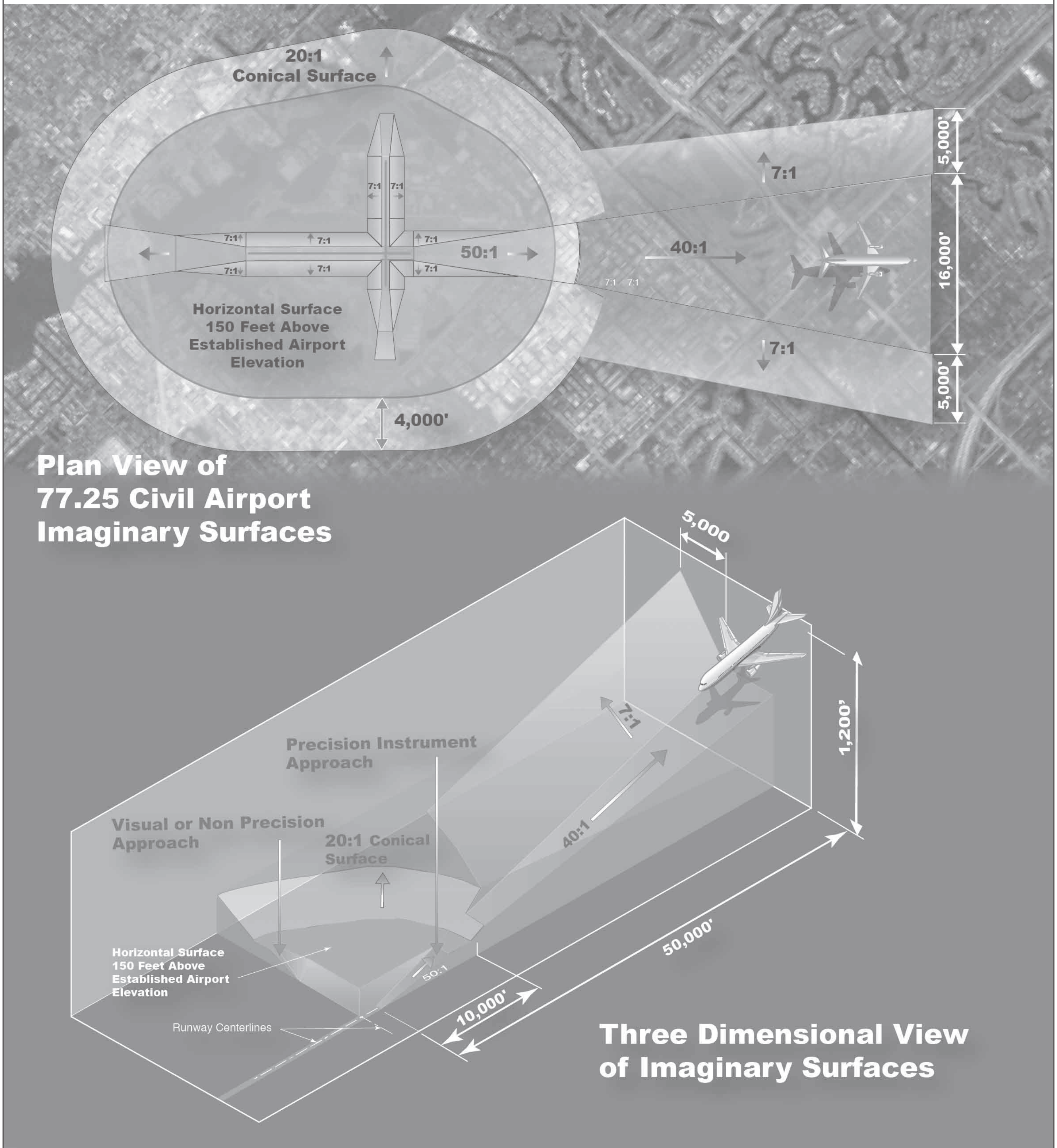
Airspace - FAR Part 77 Surfaces

U.S. airport airspace is defined by **Federal Aviation Regulations (FAR) Part 77.25 – Objects Affecting Navigable Airspace**. FAR Part 77 defines airport imaginary surfaces that 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, trees, etc.) to the maximum extent possible to provide a safe aircraft operating environment. **Figure 4-3** on the following page illustrates plan and isometric views of generic Part 77 surfaces.

The physical characteristics of the imaginary surfaces are determined by runway category and the approach capabilities of each runway end. Three general approach categories are assigned to runways: **Visual**, **Non-precision Instrument** (electronic course guidance only), and **Precision Instrument** (electronic curse and vertical descent guidance).

- **Precision** or **non-precision instrument** runways have at least one instrument procedure to a specific runway end:
  - These instrument approaches are classified as "straight-in" procedures and are typically aligned within 15 degrees of the extended runway centerline.
  - Both approach types provide electronic course guidance leading aircraft to a prescribed runway end; and
  - Precision instrument approaches also provide electronic descent guidance (glide path) to a prescribed runway end.

- **Visual** runways require aircraft to land by visual reference only, without electronic course or descent guidance:
  - This includes non-precision instrument approaches to the airport environment rather than to a specific runway end and basic VFR flight operations (e.g., traffic pattern);
    - This type of instrument approach is classified as a "circling" procedure, often referred to as "circle to land;"
    - Once reaching the missed approach point, pilots are required to maintain visual contact with the airport environment during final approach and landing.
    - Loss of visual contact during this transitional segment requires an immediate missed approach procedure and may violate FAA regulations for conducting instrument flight operations (FAR 91.1039(e)).


20:1
Conical Surface
7:1
50:1
40:1
5,000'
16,000'
5,000'
Horizontal Surface
150 Feet Above
Established Airport
Elevation
4,000'
Plan View of
77.25 Civil Airport
Imaginary Surfaces
5,000
7:1
1,200'
Precision Instrument
Approach
Visual or Non Precision
Approach
20:1 Conical
Surface
40:1
50,000'
Horizontal Surface
150 Feet Above
Established Airport
Elevation
50:1
10,000'
Runway Centerlines
Three Dimensional View
of Imaginary Surfaces

Consistent with FAA planning standards, the updated FAR Part 77 Airspace Plan will depict the "ultimate" airspace for the recommended future runway configuration depicted on the updated **Airport Layout Plan** (ALP) that will be submitted for FAA review and approval at the end of the master planning process.

Airspace Planning at HRI

The two instrument approach procedures currently available at HRI direct aircraft to the airport environment from the southeast, toward the approximate mid-point of the runway. The inbound approach course (280 degrees) is offset by approximately 50 degrees from the 050-230-degree runway alignment. Upon reaching the end of the electronically-guided approach procedure (missed approach point)[2], pilots are required to select a runway end and land using visual references only or executive a missed approach procedure.

Research indicates that recent airspace planning for Runway 5/23 has applied both visual and non-precision instrument approach capabilities for larger-than-utility aircraft. As recently as the 1987 update of the HRI airspace plan[3], a non-precision instrument designation was applied to the runway. The 2001 update of the airspace plan depicts a visual runway designation with visual approaches to both runway ends.

The 2001 Hermiston Municipal Airport - Airport Layout Plan Report noted several items that appear to be related to the evolving airspace defined for the runway and the type of instrument approaches currently available at HRI:

- The 1987 Airspace Plan depicted airspace consistent with a larger than utility runway with a future non-precision instrument approach surface for Runway 22 [currently Runway 23] (10,000 feet long, 34:1 slope) and a visual approach surface for Runway 4 [currently Runway 5] (5,000 feet long, 20:1 slope);
- The Cold Springs National Wildlife Refuge is located approximately 3.5 nautical miles (NM) northeast of the airport, along the extended centerline of Runway 5/23:
    - o Based on federal regulations, aircraft are requested to remain an altitude of at least 2,000 feet above ground level (AGL) when overflying wildlife refuges;
    - o Avoiding potential bird strikes associated with the large water impoundments were cited in support of maintaining inbound instrument approaches south of the refuge;

[2] Missed Approach Point (MAP) for HRI procedures located at MLIPS GPS waypoint/15.4 DME from the PDT VORTAC

[3] Hermiston Municipal Airport Airspace Plan Update (1987, CH2M Hill)

- The eastern end of the Boardman Military Operations Area (MOA), located approximately 5 miles west of HRI, was identified as an operational factor limiting the potential development of an instrument approach to Runway 4 [currently Runway 5]; and

- A 1991 Airport Obstruction Chart (OC) prepared by the National Ocean Service (NOS) to support airspace obstruction evaluations at HRI, depicted airspace consistent with a larger than utility runway with visual approaches on both runway ends.

No formal confirmation of interagency coordination was provided by FAA about changes in airspace planning criteria reflected in the NOS obstruction evaluation, although all FAA instrument procedures developed since the 1991 NOS Obstruction Chart have been consistent with the visual airspace surfaces depicted on the 1991 NOS chart.

Prior to the development of Airport GIS (AGIS) obstruction surveys, NOS OC charts provided the highest standard of obstruction mapping for airport with instrument approaches. The 2001 update of the airspace plan was consistent with the airspace planning criteria most recently applied in the 1991 NOS Obstruction Chart.

Table 4-2 summarizes the existing FAR Part 77 airspace criteria applied to Runway 5/23, and the next incremental upgrade that could be considered (non-precision instrument approach to Runway 25).

TABLE 4-2: FAR PART 77 AIRSPACE SURFACES (RWY 5/23)

	FAA-APPROVED AIRSPACE PLAN (2001) (ULTIMATE CONDITIONS)	CURRENT NPI STANDARD
	LARGER THAN UTILITY VISUAL	LARGER THAN UTILITY NON-PRECISION INSTRUMENT
Width of Primary Surface	500 feet	500 feet
Approach Surface Length	5,000 feet	10,000 feet
Approach Surface Width (Outer End)	1,500 feet	3,500 feet
Approach Surface Slope	20:1	34:1
Transitional Surface	7:1 Slope to 150 feet above runway	Same
Horizontal Surface Elevation	150 feet above airport elevation	Same
Horizontal Surface Radius	5,000 feet	10,000
Conical Surface	20:1 for 4,000 feet	Same

Efforts to improve instrument approach capabilities, including the possibility of designing a procedure that reduces the inbound course offset, while avoiding direct overflights of the refuge may be considered, although it is unknown if a new procedure would provide reduced descent minimums.

Airspace Overview/AGIS Obstruction Evaluation

The Airports Geographic Information System (AGIS) survey conducted in 2017 identified thirty-four obstructions to FAR Part 77 airspace for Runway 5/23, including items located off airport property. The previous (2001) Airspace Plan drawing identified eleven obstructions, the majority of which were built items located on airport property. The updated obstructions will be added to the applicable Airport Layout Plan (ALP) drawings, with recommended mitigation actions.

Removal or lowering of obstructions is recommended when feasible. Lighting and/or marking obstructions may also be acceptable to FAA in some cases if the marked or lighted obstruction does not create a significant hazard to air navigation.

As noted earlier, several trees located in the approach to Runway 5 that were identified in the AGIS survey have been removed/lowered to eliminate penetrations.

APPROACH SURFACE

The Approach Surface extends outward and upward from each end of the primary surface, along the extended runway centerline. The dimensions and slope of the approach surfaces are determined by the type of aircraft intended to use the runway and the most demanding approach planned for the runway (See Table 4-2). The approach surface is intended to provide a clear descent path for landing aircraft in both daylight and darkness.

2017 AGIS Survey Data (20:1 Approach Surfaces):

- Runway 5 – Eight (8) trees penetrate the surface
- Runway 23 – No penetrations identified

PRIMARY SURFACE

The Primary Surface is a rectangular plane longitudinally centered on the runway (at centerline elevation) extending 200 feet beyond each runway end. The width of the primary surface depends on runway category, approach capability, and approach visibility minimums (See Table 4-2).

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.). The outer ends of the primary surface connect to the inner end of the runway approach surfaces.

2017 AGIS Survey Data (Primary Surface):

- Three (3) bushes penetrate the surface
- A wind cone (with an obstruction light) penetrates the surface

TRANSITIONAL SURFACE

The Transitional Surface is located along the lateral edges of the primary surface and is represented by a plane rising perpendicularly to the runway centerline at a slope of 7 to 1. The transitional surface extends outward and upward to an elevation 150 feet above the airport elevation. The outer edges of the transitional surface connect with the horizontal surface and the edges of the approach surfaces. The transitional surface should be free of obstructions (i.e., parked aircraft, structures, trees, terrain, etc.).

2017 AGIS Survey Data (Transitional Surface):

- Twenty-two (24) penetrations to the surfaces, including light poles, buildings, and trees

HORIZONTAL SURFACE

The Horizontal Surface is a flat plane located 150 feet above the airport elevation. The horizontal surface boundaries are defined by the radii (10,000 feet for larger than utility instrument runways, 5,000 feet for larger than utility visual runways, and 5,000 feet for utility runways) constructed from each runway end. The outer edges of the radii for each runway are connected with tangent lines, which taken together define the horizontal surface.

2017 AGIS Survey Data (Horizontal Surface):

- No penetrations identified

CONICAL SURFACE

The Conical Surface is an outer band of airspace that encircles the horizontal surface. The conical surface begins at the outer edge of the horizontal surface and extends outward 4,000 feet and upward at a slope of 20:1.

2017 AGIS Survey Data (Conical Surface):

- No penetrations identified

TERMINAL INSTRUMENT PROCEDURES (TERPS)

FAA Order 8260.3B - United States Standard for Terminal Instrument Procedures (TERPS) defines protected airspace surfaces associated with instrument approaches and departures. The purpose of Terminal Instrument Procedures (TERPS) is to prescribe the criteria for the formulation, review, approval and publishing of procedures for Instrument Flight Rules (IFR) operations to and from civil and military airports.

TERPS criteria specify the minimum measure of obstacle clearance that is considered by the FAA to supply a satisfactory level of vertical protection from obstructions. Runways with instrument approaches are typically required to protect the 40:1 departure slope. The 40:1 slope extends 10,200 feet from the departure end of the runway centered along the extended runway centerline.

This surface has not been depicted for the runway on previous ALP drawings. Additional coordination with FAA is required to determine the applicability of the standard departure surface based on the airport's proximity to environmentally-sensitive areas east of the runway and military use airspace west of the runway, and the impact of those areas on the normal departure routing of aircraft on instrument flight plans.

Airport Design Standards

Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13A (incorporating Change 1), Airport Design, serves as the primary reference in establishing the geometry of airfield facilities. The existing and future design aircraft, and their corresponding aircraft reference codes (ARC) was described in Chapter 3. A comparison of existing and future design standards is summarized in **Table 4-3**.

TABLE 4-3: RUNWAY 5/23 DESIGN STANDARDS SUMMARY (DIMENSIONS IN FEET)

FAA STANDARD	EXISTING CONDITIONS[1] ARC A/B-II NOT LOWER THAN 1-MILE	EXISTING/FUTURE STANDARD ARC A/B-II NOT LOWER THAN 1-MILE
Runway Length	4,500	4,800[4]
Runway Width	75	75
Runway Shoulder Width	10	10
Runway Safety Area • Width • Beyond RWY End • Prior to Landing Threshold	 150 300 300	 150 300 300
Runway Obstacle Free Zone • Width • Beyond RWY End • Prior to Landing Threshold	 400 200 200	 400 200 200
Object Free Area • Width • Beyond RWY End • Prior to Landing Threshold	 500 300 300	 500 300 300
Runway Protection Zone Length	RWY 5 & 23: 1,000	RWY 5 & 23: 1,000
Runway Protection Zone Inner Width	RWY 5 & 23: 500	RWY 5 & 23: 500
Runway Protection Zone Outer Width	RWY 5 & 23: 700	RWY 5 & 23: 700
Runway Centerline to: Parallel Taxiway/Taxilane CL Aircraft Parking Area Building Restriction Line (BRL)	 240 314[2] 360/404[3]	 240 320[5] 376[6]

Notes:

1. Airfield dimensions as currently observed; ARC B-II standards depicted on 2001 ALP
2. Distance between Runway 5/23 centerline and the North GA Apron tiedowns.
3. Distance between Runway 5/23 centerline and the closest building (FBO)/22' North & South BRLs depicted 404' from runway centerline.
4. Per FAA AC 150/5325-4B: Runway lengths required to accommodate 75 percent of large airplanes (60,000 pounds or less) at 60 percent useful load at HRI.
5. Runway 5/23 centerline to aircraft parking area separation required to accommodate a 10-foot aircraft tail height.
6. A 376-foot BRL setback north of Runway 5/23 is required to accommodate an 18-foot structure (building roof elevation above runway elevation) based on the 7:1 transitional slope and 250-foot wide primary surface.

Runway Evaluation

RUNWAY DESIGN CODE

The ***Runway Design Code*** (RDC) is comprised of the selected Aircraft Approach Category (AAC), the Airplane Design Group (ADG), and the approach visibility minimums of a specific runway end. The RDC provides the information needed to determine specific runway design standards. The approach visibility minimums refer to the visibility minimums expressed by runway visual range (RVR) values in feet (with corresponding instrument flight visibility category in statute miles).

The range of RVR values and corresponding approach visibility increments are:

- 1200 (lower than 1/4 mile);
- 1600 (lower than 1/2 mile but not lower than 1/4 mile);
- 2400 (lower than 3/4 mile but not lower than 1/2 mile);
- 4000 (lower than 1 mile but not lower than 3/4 mile);
- 5000 (not lower than 1 mile); and
- VIS (Visual)

The RDC for Runway 5/23 are described in **Table 4-4**:

TABLE 4-4: RUNWAY DESIGN CODES (RDC)

	RDC
Runway 5	B-II 5000
Runway 23	B-II 5000

APPROACH AND DEPARTURE REFERENCE CODES

The Approach and Departure Reference Codes (APRC and DPRC respectively) represent the approach and operational capabilities of each specific runway end and runway-to-taxiway separation. The approach and departure reference code matrix is built on approach visibility levels ranging from visual to lower than ½-mile, and taxiway separations ranging from ≥ 150 feet to ≥ 550 feet. Within each increment, the applicable Aircraft Approach Category (approach speed), Airplane Design Group (wingspan, tail height), and Approach Visibility Minimums are presented.

The approach reference codes use all three components and the departure reference code omits the Approach Visibility Minimums. **Table 4-5** summarizes the APRCs and DPRCs applicable to Runway 5/23. See FAA AC 150/5300-13A for a full list of the APRCs and DPRCs for all runway types.

TABLE 4-5: APPROACH & DEPARTURE REFERENCE CODES

	APRC	DPRC
Runway 5	B/II 5000	B/II
Runway 23	B/II 5000	B/II

VISIBILITY DATA

An analysis of HRI visibility data[4] was performed to approximate operational limitations created by current approach visibility minimums. The current and future instrument approach capabilities have approach visibility minimums not lower than 1-mile.

The airport's surface observation system (ASOS) records incremental changes in visibility. The number of observations in a given period will vary depending on how rapidly or slowly changes in actual weather conditions occur. However, within a large data set, the overall percentages of specific conditions provide a general indication of common visibility conditions. The data is summarized in **Table 4-6**.

TABLE 4-6: 2016 VISIBILITY DATA

VISIBILITY DATA		
	# of Observations	% of Total Observations
Visual (1-mile or greater visibility)	100,502	97.6%
Not lower than 1-mile visibility	793	0.77%
Not lower than 3/4-mile	640	0.62%
Lower than 3/4-mile	877	0.85%
Lower than 1/2- mile	166	0.16%
Total Observations	**102,978**	**100%**
Source: HRI Automated Surface Observation System (ASOS) Period: January 1, 2008-December 31, 2017		

Measured visibility conditions of one mile or greater account for 98.37 percent of all recorded visibility events. The data indicates that visibility levels below current instrument approach capabilities (1-mile) accounted for 1.63 percent of all observed conditions over the last 10 years.

The existing approach visibility minimums appear to be adequate for current and future demand. An incremental reduction in minimum approach visibility (to 3/4 mile) would marginally increase the airport's accessibility during instrument meteorological conditions (IMC), but would likely require the additional of an approach lighting system (ALS). Improvements to the existing instrument approaches that provide

[4] HRI ASOS (2008-2017 data)

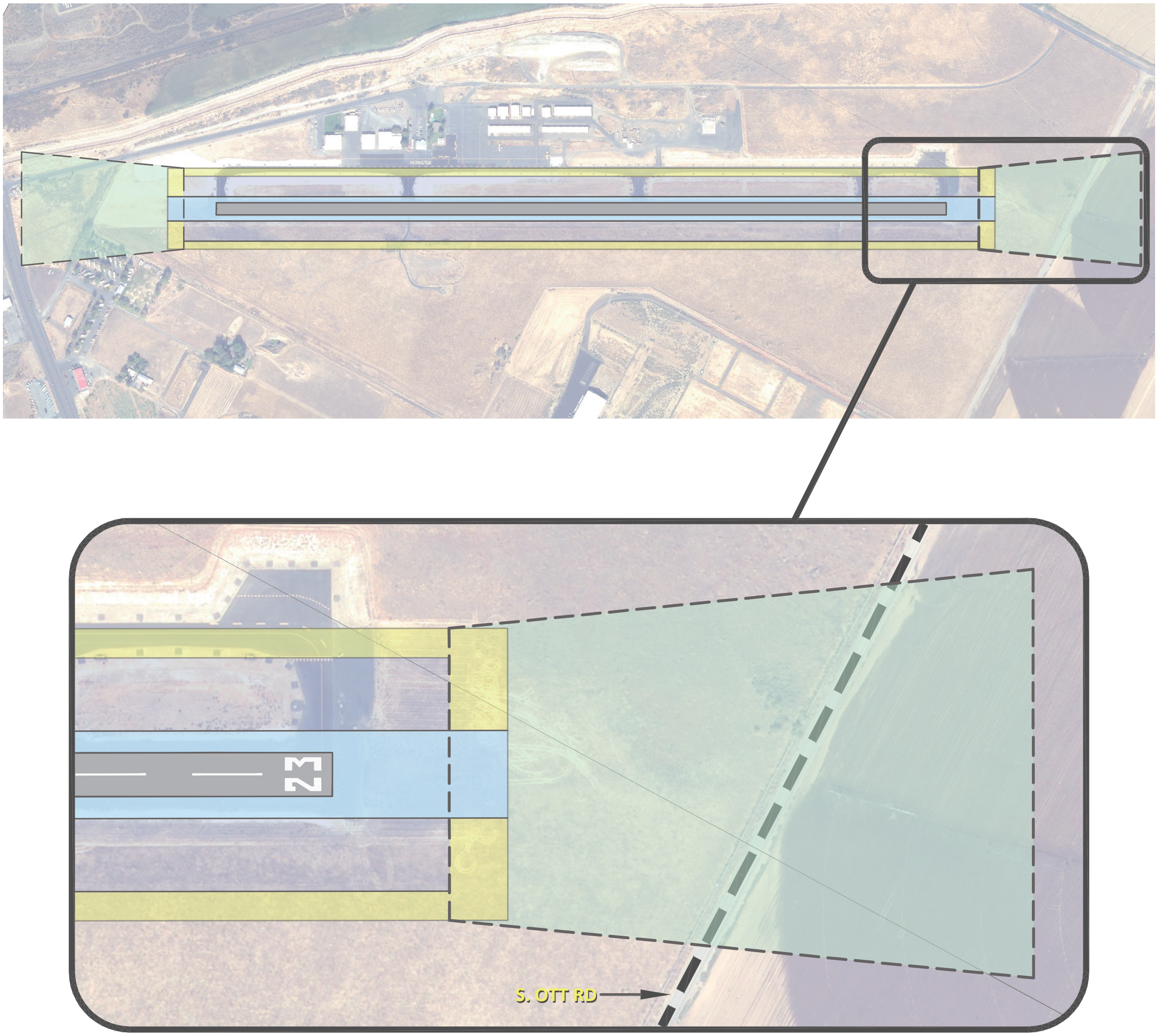
better alignment with the runway may be considered, although the one-mile approach visibility minimums would not change.

A review of 2017 data identified a total of 1,412 instrument flight rule (IFR) plans filed for HRI (either as the origin or destination). It is noted that IFR flight plans are routinely filed for business and commercial aircraft, which does necessarily correspond to the frequency of IMC.

RUNWAY DESIGN STANDARDS

Several protected areas are defined within the immediate runway environment. These areas are intended to provide a safe operating environment for aircraft during takeoff and landing. A variety of obstruction clearing and grade standards are used within the defined areas. Dimensions are determined by the applicable Airport Reference Code (ARC).

Figure 4-4 depicts the footprints of the Runway Safety Area, Object Free Area, Obstacle Free Zone and Runway Protection Zones for Runway 5/23 based on its ARC B-II standards. **Table 4-7** summarizes these designs and their current conditions on Runway 5/23. The runway, parallel taxiway, and exit taxiways have been constructed or reconstructed since the 2001 ALP was completed and meet all FAA ADG II design standards.



NOTE: PORTIONS OF RSA, ROFZ, AND RPZ OVERLAP ROFA

RUNWAY DESIGN STANDARDS B-II

- RUNWAY
- RUNWAY SAFETY AREA (RSA)
- RUNWAY OBSTACLE FREE ZONE (ROFZ)
- RUNWAY OBJECT FREE AREA (ROFA)
- RUNWAY PROTECTION ZONE (RPZ)

RUNWAY DESIGN STANDARDS
FIGURE 4.4

TABLE 4-7: ARC B-II RUNWAY DESIGN STANDARDS

RUNWAY SAFETY AREA (RSA)	
150 feet wide and extends 300 feet prior and beyond each runway end.	The existing RSA for Runway 5/23 appears to meet FAA dimensional and surface condition/obstruction clearing standards.
RUNWAY OBJECT FREE AREA (ROFA)	
500 feet wide and extends 300 feet prior and beyond each runway end.	The existing OFA for Runway 5/23 appears to meet FAA dimensional and surface condition/obstruction clearing standards.
RUNWAY OBSTACLE FREE ZONE (ROFZ)	
400 feet wide and extends 200 feet prior to and beyond each runway end.	The existing OFZ for Runway 5/23 appears to meet FAA dimensional and surface condition/obstruction clearing standards.
RUNWAY PROTECTION ZONE (RPZ)	
Runway 5 and 23 500' x 1000' x 700' Located 200 feet beyond each runway end.	Both Runway 5 and 23 RPZs extend beyond airport property. Public use roads are located in both RPZs.

RUNWAY SAFETY AREA (RSA)

The FAA defines the Runway Safety Area (RSA) as a prepared surface centered on, and surrounding a runway. "*The RSA enhances the safety of aircraft which undershoot, overrun, or veer off the runway, and it provides greater accessibility for fire-fighting and rescue equipment during such incidents.*" The FAA notes that the RSA is intended to enhance the margin of safety for landing and departing aircraft and that RSA standards cannot be modified.

The FAA states that "*The RSA must 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 Fire Fighting (ARFF) 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 RSA because of their function. Objects higher than 3 inches above grade must be constructed, to the extent practical, on frangible mounted structures of the lowest practical height with the frangible point no higher than 3 inches above grade. Other objects, such as manholes, should be constructed at grade and capable of supporting the loads noted above. In no case should their height exceed 3 inches above grade."

RUNWAY OBJECT FREE AREA (ROFA)

Runway Object Free Areas (ROFA) are two-dimensional surfaces "*centered about the runway centerline*" intended to be clear of objects that protrude above the runway safety area edge elevation, including terrain. Obstructions within the ROFA may interfere with aircraft flight in the immediate vicinity of the runway. The FAA clearing standard is:

"The ROFA clearing standard requires clearing the ROFA of above-ground objects protruding above the nearest point of the RSA…Except where precluded by other clearing standards, it is acceptable for objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes to protrude above the nearest point of the RSA, and to taxi and hold aircraft in the ROFA. To the extent practicable, objects in the ROFA should meet the same frangibility requirements as the RSA. Objects non-essential for air navigation or aircraft ground maneuvering purposes must not be placed in the ROFA. This includes parked airplanes and agricultural operations."

RUNWAY OBSTACLE FREE ZONE

The Runway Obstacle Free Zone (ROFZ) "*is a defined volume of airspace centered above the runway centerline, above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The ROFZ extends 200 feet beyond each end of the runway.*"

"The OFZ clearing standard precludes aircraft and other object penetrations, except for frangible NAVAIDs that need to be located in the OFZ because of their function… The OFZ is a design surface but is also an operational surface and must be kept clear during operations."

The obstacle clearing standards for the OFZ are similar to the OFA, although the OFZ's permitted aircraft operational/airfield development conditions are more restrictive than the OFA. Key design considerations include the placement of aircraft hold lines on connecting taxiways/runway exit taxiways and the location of aircraft holding areas, parallel taxiways, and aircraft parking aprons outside the OFZ.

RUNWAY PROTECTION ZONE (RPZ)

Per FAA definition, a Runway Protection Zone (RPZ) "*is trapezoidal in shape and centered about the extended runway centerline. The central portion and controlled activity area are the two components of the RPZ. The central portion of the RPZ extends from the beginning to the end of the RPZ, centered on the runway centerline. Its width is equal to the width of the runway OFA.*"

"The RPZ may begin at a location other than 200 feet beyond the end of the runway. When an RPZ begins at a location other than 200 feet beyond the end of the runway, two RPZs are required, i.e., a departure RPZ and an approach RPZ. The two RPZs normally overlap."

RPZs with buildings, roadways, or other items do not fully comply with FAA standards. It is recognized that realigning major surface roads located within the RPZs may not always be feasible. As noted earlier, the FAA recommends that airport sponsors control the RPZs through ownership whenever possible, although avigation easements are commonly used when an outright purchase is not feasible.

Note: FAA Guidance on RPZs and Roads (Fall 2012)

In October 2012, the FAA released interim guidance regarding RPZs and incompatible land uses, with a particular focus on roads. This guidance directs airport sponsors to evaluate any planned changes to existing RPZs that introduce or increase the presence of roads in RPZs. Existing roads within RPZs are also to be evaluated during master planning to determine if feasible alternatives exist for realignment of a road outside RPZs or for changes to the RPZs themselves. The FAA Seattle Airports District Office has subsequently indicated that the primary focus of this policy is related to proposed changes to RPZs—as the result of a change to a runway end/RPZ location, approach visibility minimums, or the built items located in an RPZ. FAA funding for the removal of roads located in existing RPZs is currently limited based on the large number of runway ends involved. Changes in FAA funding priorities themselves are subject to change.

Taxiway Evaluation

TAXIWAY DESIGN GROUP (TDG)

Taxiway Design Group (TDG) is based on the dimensions of the aircraft landing gear including distance from the cockpit to the main gear (CMG) and main gear width (MGW). These dimensions affect an aircraft's ability to safely maneuver around the airport taxiways and dictate pavement fillet design. Taxiways and taxilanes can be constructed to different TDGs based on the expected use of that taxiway/taxilane by the design aircraft.

Figure 4-5 illustrates the landing gear configuration of a typical small general aviation aircraft, which is used to define its taxiway design group. The graphic depicted in **Figure 4-6** is used to determine the specific Taxiway Design Group for aircraft based on two physical dimensions.

The major taxiways at HRU accommodate both ADG I and II aircraft, which is best represented by TDG 2.

FIGURE 4-5 TYPICAL LANDING GEAR CONFIGURATION

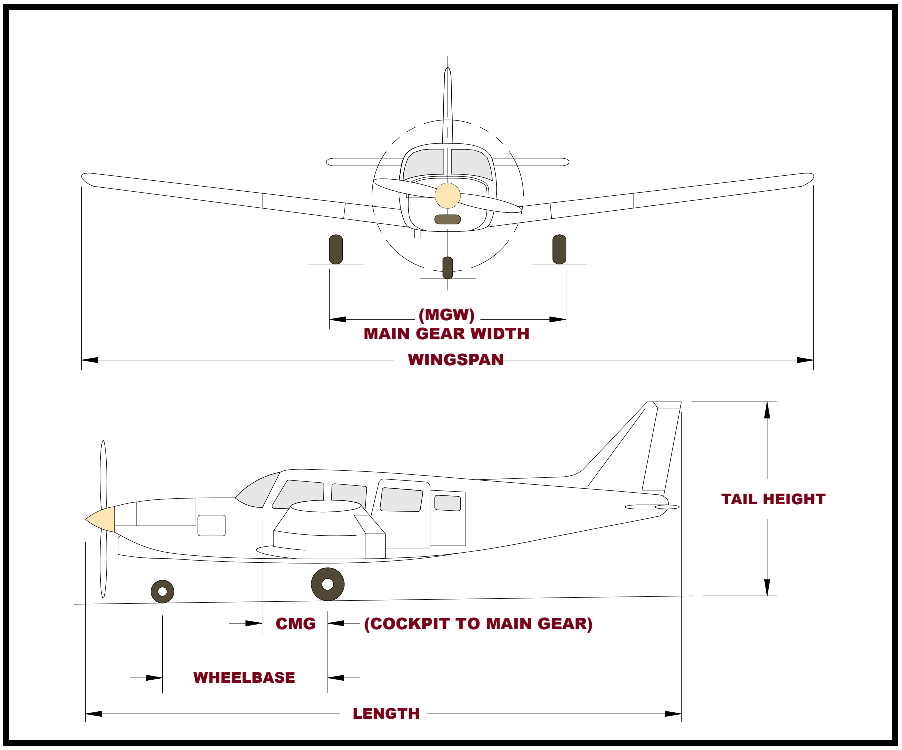
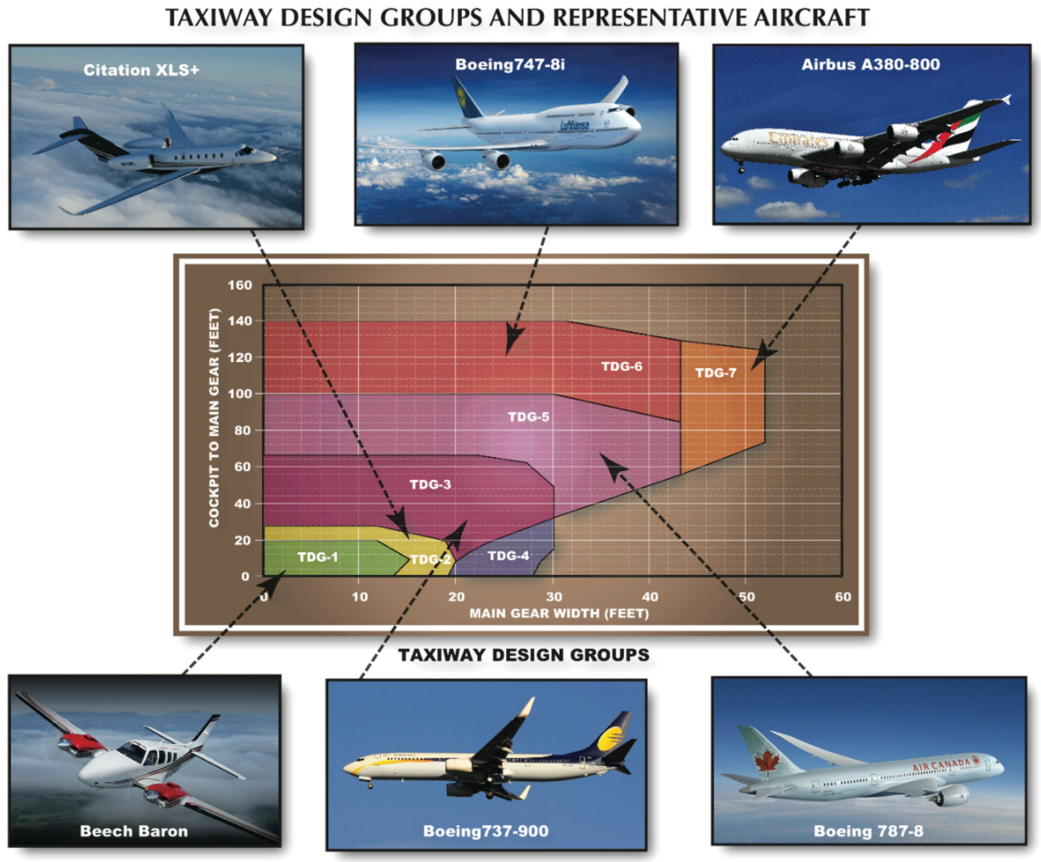


FIGURE 4-6 TAXIWAY DESIGN GROUPS



TAXIWAY/TAXILANE DESIGN STANDARDS

Taxiways provide aircraft ingress/egress for runways and facilitate movement between airside and landside facilities. Taxilanes typically provide aircraft access within landside areas such as aircraft aprons and hangar areas. Obstruction clearance for taxiing aircraft (measured by aircraft wingtip clearance) is a critical design element required for both taxiways and taxilanes.

The majority of taxiways at HRI are designed to accommodate ADG-II aircraft. Taxilanes located on the east aircraft parking aprons and serving small aircraft hangars primarily accommodate ADG I aircraft. ADG-I and II taxiway and taxilane design standards are summarized in **Table 4-8**.

TABLE 4-8: TAXIWAY DESIGN STANDARDS SUMMARY (DIMENSIONS IN FEET)

FAA STANDARD	ADG-I/TDG 1	ADG-II/TDG 2
Taxiway Width	25 feet	35 feet
Taxiway Shoulder Width	10 feet	15 feet
Taxiway Safety Area Width	49 feet	79 feet
Taxiway Object Free Area Width	89 feet	131 feet
Taxiway CL to Fixed/Movable Object	44.5 feet	65.5 feet
Taxilane OFA Width	79 feet	115 feet
Taxilane CL to Fixed/Movable Object	39.5 feet	57.5 feet

TAXIWAY SAFETY AREA (TSA)

Taxiway Safety Areas (TSA) serve a similar function as runway safety areas and use the same design criteria for surface conditions, with varying dimensions based on airplane design group. Items within the safety area that have locations fixed-by-function (taxiway reflectors, edge lights, signs, etc.) must be mounted on frangible (breakaway) mounts.

Runway 5/23 is served by a north parallel taxiway with five 90-degree taxiway connections. The parallel taxiway and the exits were reconstructed in 2016 and comply with ADG II/TDG 2 TSA standards.

As with runway safety areas, the ground surface located immediately adjacent to the taxiways periodically requires maintenance or improvement to adequately support the weight of an aircraft or an airport vehicle. Grading and/or soil compaction within taxiway safety areas should be completed as needed. Taxiway pavement edges should be periodically inspected to ensure that grass, dirt, or gravel build-ups do not exceed 3 inches.

Safety area standards do not apply to taxilanes (typically located within hangar developments or aircraft parking aprons).

TAXIWAY OBJECT FREE AREA (TOFA)

Taxiway Object Free Areas (TOFA) are intended to provide unobstructed taxi routes (adequate wingtip clearance) for aircraft. The outer edge of the TOFA defines the recommended standard distance from taxiway or taxilane centerline to a fixed or moveable object. The FAA clearing standard prohibits service vehicle roads, parked aircraft, and above ground objects (hangars, other built items, etc.), except for objects with locations fixed-by-function (navigational aids, airfield signs, etc.) that must be frangible (breakaway mounts) to meet FAA standards. Aircraft parking and building setbacks on airports must consider taxiway OFA clearances in addition to protected airspace for the runway. The applicable design standard (ADG I or II), is determined by the largest aircraft that may be accommodated in aircraft parking areas or hangars served by that taxiway/taxilane. In general, major airfield taxiways are designed to accommodate the same aircraft as the runway.

The parallel taxiway and exit taxiways were reconstructed in 2016 and meet all ADG II OFA standards.

TAXILANE OBJECT FREE AREA (TOFA)

Apron taxilanes are typically designed to accommodate specific aircraft types. The existing apron taxilanes at HRI accommodate both ADG I and II aircraft, although the taxilanes were designed to access small aircraft tiedowns. As noted earlier, several of the existing taxilanes do not meet ADG I taxilane OFA clearances to parked aircraft (fixed/moveable object). The majority of hangar taxilanes are intended to accommodate ADG I aircraft. **Figure 4-2,** presented earlier in the chapter, illustrates the existing and standard taxilane OFA clearances at HRI.

Since the type of aircraft located within a particular hangar can change over time, the appropriate method for determining hangar taxilane clearance standards is based on the largest aircraft that can be physically accommodated within the hangar. At HRI, ADG-II standards are applied to taxilanes serving larger hangars (door openings 50 feet wide and larger) and ADG-I standards are applied to taxilanes serving small individual hangars or T-hangars.

While relocation of existing hangars is not considered highly feasible, any planned new hangars (and associated taxilanes) should meet the applicable ADG I/II taxilane OFA clearance standards. An evaluation of taxilane OFA clearances will be incorporated into the landside development alternatives for future apron and hangar projects.

BUILDING RESTRICTION LINE (BRL)

A Building Restriction Line (BRL) identifies the minimum setback required to accommodate a typical building height, such as a hangar. The BRL should be sited to provide all runway and taxiway clearances on the ground and for the FAR Part 77 surfaces. Taller buildings are located progressively farther from a runway in order to clear the 7:1 transitional surface that extends laterally from a runway.

The 2001 ALP identifies north and south BRLs located 404 feet from runway centerline that are labeled "(22' Height)." Based on the width of the runway primary surface (500 feet), the 7:1 transitional surface begins 250 feet from runway centerline, then extends and additional 154 feet to reach +22 feet. The 2001 ALP identifies four existing buildings inside the north BRL. The updated AGIS survey data has identified several existing structure and other items (trees, light poles, etc.) that penetrate the transitional surface. An evaluation of BRL clearances will be incorporated into the landside development alternatives for future hangar projects. Mitigation of existing built item penetrations typically includes adding roof-mounted obstruction lights (red).

All new construction on or in the immediate vicinity of the airport should involve FAA review for airspace compatibility. FAA Form 7460-1, Notice of Proposed Construction or Alternation, should be prepared and submitted to FAA at least 60 to 90 days prior to planned construction. The 7460 form should be submitted by the City for any projects located on the airport and submitted by the applicant for any projects located off airport property. The FAA will review all proposed development to determine if the proposed action would create any obstructions to FAR Part 77 airspace surfaces. In general, the FAA will object to proposals that result in a penetration to any FAR Part 77 airspace surfaces on the basis of safety.

AIRCRAFT PARKING AREA

The aircraft parking area is determined by the minimum setback required for locating aircraft parking in order to clear the adjacent runway-taxiway system. The location of the aircraft parking area is generally determined by the more demanding of runway airspace clearance and taxiway obstruction clearance.

The 2001 ALP identifies north and south aircraft parking lines (APL) located 305.5 feet from runway centerline. The APLs reflect standard ADG II taxiway OFA clearances for parallel taxiways on both sides of the runway. At 305.5 feet, an aircraft tail height of 7.9 feet can be accommodated without penetrating the runway transitional surface. The aircraft parking areas adjacent to Runway 5/23 provide adequate clearances for the runway (airspace) and the north parallel taxiway.

RUNWAY - PARALLEL TAXIWAY/TAXILANE SEPARATION

Runway 5/23 is served by a full-length north parallel taxiway (Taxiway A) with a 240-foot runway to parallel taxiway separation. The west end of the taxiway was relocated to its current location in 2016 to meet ADG II dimensional standards.

Part 4 - Airside Requirements

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

- Runway
- Taxiways
- Airfield Instrumentation and Lighting

Runway

The adequacy of the existing runway system at HRI was analyzed relative to runway configuration/function, orientation, airfield capacity, runway length, pavement strength, and runway lighting and instrumentation.

RUNWAY CONFIGURATION/FUNCTION

Runway 5/23 accommodates a wide variety of aircraft traffic, including single-engine and multi-engine turbine aircraft and business jets.

RUNWAY ORIENTATION & WIND COVERAGE

The orientation of runways for takeoff and landing operations are primarily a function of wind velocity and direction, combined with the ability of aircraft to operate under adverse wind conditions. A runway's wind coverage is determined by an aircraft's ability to operate with a "direct" crosswind, which is defined as 90 degrees to the direction of travel.

For planning purposes, the FAA has defined the maximum direct crosswind for small aircraft as 12 miles per hour (10.5 knots) and 15 miles per hour (13 knots) for larger general aviation aircraft. Ideally, an aircraft will take off and land directly into the wind or with a light crosswind. Aircraft are able to operate safely at progressively higher wind speeds as the crosswind angle decreases and the wind direction aligns more closely to opposing the direction of flight. Larger aircraft can generally tolerate higher crosswind conditions.

An updated evaluation of HRI wind data (All Weather, VFR, and IFR) was conducted based on 2008-2017 data, which indicates that Runway 5/23 (primary runway) accommodates greater than 99 percent of all weather wind conditions for both small and large aircraft. The current tabulated wind data for HRI is summarized in **Table 4-9.**

The FAA recommends that primary runways accommodate at least 95 percent of local wind conditions. When this level of coverage is not provided, the FAA recommends consideration of a crosswind runway.

TABLE 4-9: WIND ANALYSIS

RUNWAY 5/23	
ALL WEATHER	
12 MPH (10.5 KTS)	99.25%
15 MPH (13 KTS)	99.69%
VFR	
12 MPH (10.5 KTS)	99.2%
15 MPH (13 KTS)	99.68%
IFR	
12 MPH (10.5 KTS)	99.66%
15 MPH (13 KTS)	99.86%
Runway 23 Bearing = 244.38 Degrees True Source: National Climate Data Center (2008-2017 HRI ASOS data)	

RUNWAY LENGTH

Runway length requirements are based primarily on airport elevation, mean maximum temperature of the hottest month, runway gradient, and the critical aircraft type expected to use the runway. Runway 5/23 accommodates multi-engine piston and turbine aircraft, including business jets and transport category turboprops weighing more than 12,500 pounds. These aircraft require greater runway lengths than single-engine turboprops which also operate on the runway, particularly when accelerate-stop distances are considered.

As noted in the updated aviation activity forecasts, HRI accommodates two distinct types of multi-engine turbine aircraft activity that represent the most demanding aircraft in terms of runway length requirements: business jets and turboprops.

HRI accommodated approximately 146 business jet operations in 2017, based on FAA instrument flight plan filing data. Current jet activity is well below the FAA's threshold of 500 annual operations required for design aircraft designation. Jet operations at HRI are forecast to grow, and are expected to approach the 500 annual operational threshold near the end of the current twenty-year planning period. Based on the potential for exceeding the current forecast, it is recommended that a runway extension reserve be considered in future planning based on the 75 percent segment of the large airplane fleet described below.

For general aviation airports that accommodate regular large turbine activity, the FAA recommends using a "family of design aircraft" approach to defining runway length requirements. FAA Advisory Circular (AC) 150/5325-4B, Runway Length Requirements for Airport Design identifies a group of large airplanes (60,000 lbs. or less) that make up 75 percent of the fleet, which represents the majority of business jet aircraft operating at HRI. Based on local site conditions, 75 percent of large airplanes require runway lengths ranging from 4,800 feet to 6,700 feet, with 60 and 90 percent useful loads.[5] A summary of the FAA-recommended runway lengths for planning based on the requirements of small and large general aviation aircraft in a variety of load configurations is presented in **Table 4-10**.

The majority of multi-engine turboprop activity at HRI is generated through scheduled air cargo service. The most common aircraft is the Swearingen Metroliner III operated by Ameriflight. The runway length requirements of the Metroliner III were evaluated based on local site conditions and typical operating weights and are summarized in **Table 4-11**.

TABLE 4-10: FAA RECOMMENDED RUNWAY LENGTHS FOR PLANNING

Runway Length Parameters for HRI • Airport Elevation: 644 feet MSL • Mean Max Temperature in Hottest Month: 89° F • Dry Runway • Existing Runway Lengths: 4,500 feet	
Small Airplanes with less than 10 seats	
95 percent of these airplanes	3,100
100 percent of these airplanes	3,700
Small airplanes with 10 or more seats	4,300
Large Airplanes of 60,000 pounds or less	
75 percent of these airplanes at 60 percent useful load	**4,800**
75 percent of these airplanes at 90 percent useful load	6,700
100 percent of these airplanes at 60 percent useful load	5,500
100 percent of these airplanes at 90 percent useful load	8,450
1. Runway lengths determined by FAA Airport Design graphs and tables in AC 150/5325-4B	

[5] Useful load is generally defined as passengers, cargo, and usable fuel.

TABLE 4-11: SWEARINGEN METROLINER III - RUNWAY LENGTH REQUIREMENTS

METRIC/OPERATION	RUNWAY LENGTH REQUIREMENT
Takeoff Length Requirement	
Takeoff Field Length @ 14,000 lbs., Dry (1)	4,350 feet
Recommended Takeoff Length (Adjusted) (2)	4,370 feet
Landing Length Requirements	
Landing Field Length @ MLW (Unadjusted)	2,900 feet
Landing Field Length @ MLW, Wet (Adjusted) (3)	3,358 feet

Source: Swearingen Metroliner III Airplane Performance Charts
Notes: Runway requirements based on mean max temperature 89° F and airport elevation of 644 feet MSL.
(1) Takeoff field length is the greater of accelerate-stop, accelerate-go with one engine inoperative, or 115% of the all engine takeoff distance to a point 35 feet above the runway.
(2) Runway length is adjusted based on runway gradient at a rate of 10 feet for each foot of elevation difference between the high and low points of the runway centerline (HRI has a 2-foot grade change = +20 feet of length).
(3) Adjusted length includes FAR Part 135 required 60 percent landing distance factor for stopping operations and an additional 15 percent runway wet factor.
MLW = Maximum Landing Weight

At 4,500 feet, Runway 5/23 is capable of accommodating Metroliner III cargo operations under most conditions. The existing length is 300 feet short of being able to accommodate 75 percent of large airplanes (60,000lbs or less) at 60 percent useful load. The existing runway length is adequate for all types of small aircraft (under 12,500 pounds) in most common conditions.

For runway planning purposes, a reserve length of 4,800 to 5,000 feet is recommended to accommodate the segment of jet aircraft (75 percent of fleet with a 60 percent useful load) expected to operate at HRI during the current planning period and beyond. Since the justification of need required for the runway extension is expected to fall beyond the twenty-year planning period, the reserve will not be included in the updated capital improvement program (CIP). However, if activity exceeds the current forecast, the airport sponsor would be required to provide documentation and demonstrate funding justification to FAA in order to move the project forward. Depicting the runway extension reserve on the updated ALP drawing will allow local planners to effectively coordinate land use protections and proposed roadway realignments.

RUNWAY WIDTH

Runway 5/23 is 75 feet wide, which meets the dimensional standard for ARC B-II with current approach visibility minimums (1-mile).

Airfield Pavement

The most recent airfield pavement maintenance and management study for the airport was completed by Oregon Department of Aviation in 2017. The runway, parallel taxiway, exit taxiways, and two sections of apron were rehabilitated or constructed new since the previous pavement ratings were conducted in 2014.

Rehabilitation of asphalt pavements is typically programmed on a 15- to 25-year cycle for planning purposes, depending on use and pavement design. Crack filling and fog/slurry seals should be performed on a regular basis for all asphalt sections to maximize the useful pavement life.

The 2017 Pavement Evaluation/Maintenance Management Plan includes several short-term pavement maintenance or rehabilitation projects. **Table 4-12** summarizes the recommended pavement maintenance priority projects for HRI through 2022. These projects will be included along with any recommended new pavement construction in the updated capital improvement program for the master plan.

TABLE 4-12: FIVE YEAR PAVEMENT MANAGEMENT PLAN - HRI

YEAR	SECTION	WORK
2018	Main Tiedown Apron (north and south sections)	Slurry Seal
2018	East Tiedown Apron	Slurry Seal
2018	FBO Apron	Reconstruct
2018	Hangar Apron (inner section, west of FBO Apron)	Reconstruct/Slurry Seal
2018	Hangar Apron (west end)	Reconstruct
2018	Hangar Taxilanes (East of Tiedown Apron)	Slurry Seal Reconstruct (small sections north and south of shade hangar)
2021	Runway 5/23	Slurry Seal
2022	Hangar Apron (outer section, west of FBO and section east of FBO and fuel island)	Fog Seal
2022	AC Hold Area (Parallel Taxiway @ Runway 23 end)	Fog Seal

PAVEMENT STRENGTH

The published[6] pavement strength for Runway 5/23 is 22,000 pounds (single wheel landing gear).

Ideally, airfield pavements used by all types of aircraft operating at the airport should have the same weight bearing capacity as the primary runway. However, pavements accommodating small aircraft only (tiedown aprons, hangar taxilanes, etc.) are normally designed based on a 12,500-pound aircraft weight.

Many of the larger aircraft regularly using Runway 5/23 have dual-wheel main landing gear configurations. Although a dual wheel rating is not published, the runway routinely accommodates larger business jets aircraft weighing above 30,000 pounds.

Taxiways

The existing taxiway system at HRI provides aircraft access to the runway and all landside facilities. The parallel taxiway is 35 feet wide, consistent with ADG-II standards.

The five exit taxiways (A1-A5) meet current FAA design guidance for fillet design, which results in the angular "hourglass" look rather than the use of traditional curved fillets. Based on TDG 2 standards, the narrowest width on the exit taxiways varies from 46 to 54 feet, with the taxiways widening at the connections with the runway and parallel taxiway. A single exit taxiway extends from the parallel taxiway to the aerial applicator area. It appears that this taxiway was designed to meet TDG 1 standards and was upgraded in conjunction with the other parallel taxiway and exit taxiway paving. An older taxiway (137 x 20 feet) extends from the parallel taxiway to the T-hangar area. The taxiway width is less than the ADG I standard (25 feet).

New access taxiways serving hangar developments should be designed to accommodate the appropriate aircraft being served (e.g., 25 feet wide for ADG I aircraft and 35 feet wide for ADG II aircraft).

Taxilanes

The airport's existing apron and hangar taxilanes are typically designed to accommodate ADG I aircraft. The dedicated taxilanes serving ADG I hangars are typically 20 to 25 feet wide. Taxilanes located within aircraft parking aprons do not have defined widths, although the TOFA clearance (to the adjacent parked aircraft) for ADG I is 79 feet, which is paved. The development of new hangars or aircraft parking areas may require taxilane extensions or new taxilanes. New hangar taxilanes should be planned to meet the same width standards as taxiways.

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[6] FAA Chart Supplement

Airfield Instrumentation, Lighting, and Markings

RUNWAY LIGHTING AND NAVIGATION SYSTEMS

The lighting systems associated with Runway 5/23 are in excellent condition. The PAPIs, REILs, and MIRL were installed in 2015 with LED lights.

Lighting systems are typically replaced every twenty years, although some systems remain reliable, serviceable, and fully functional for a considerably longer period. For planning purposes, the useful life of airfield lighting systems is twenty years and replacement projects for the systems will be included in the twenty-year capital improvement program, as appropriate.

There are no ground-based electronic navigational aids at HRI.

RUNWAY MARKINGS

The basic runway markings at HRI are consistent with a visual runway designation. The markings include runway end numbers, aiming point markings on both runway ends (1,020 feet from runway end), and a centerline stripe. The markings were repainted in 2016 in conjunction with a slurry seal project. The markings are in excellent condition and meet FAA standards for color (white), configuration, and approach type.

TAXIWAY MARKINGS

The taxiway markings at HRI are consistent with FAA standards for color (yellow) and configuration. The markings were repainted in 2016 following taxiway construction and are in excellent condition.

The parallel taxiway (Taxiway A) and the exit taxiways (A1-A5) are marked with centerline stripes, lead-in lines and hold lines. Aircraft hold lines are located on all taxiway connections to runways and consist of two solid yellow lines and two dashed yellow lines; the hold line locations coincide with the outer edges of the runway obstacle free zone (OFZ).

The section of the parallel taxiway that directly abuts adjacent apron areas (approximately 1,285 feet) is marked with a yellow dashed line (15-foot dashes with 25-foot spacing) at its outer edge to distinguish taxiway and apron areas.

Runway and taxiway markings require periodic repainting as they wear or when pavements are sealcoated or are rehabilitated.

AIRFIELD SIGNAGE

The airfield is equipped with LED lighted mandatory hold position signs at each runway exit taxiway. These signs were replaced in 2016 and are in excellent condition.

AIRFIELD LIGHTING

The airfield lighting systems (airport beacon, wind cones, and runway lights) meet standards for location, type, and color. The taxiways at HRI are equipped with blue retroreflective edge markers. Installation of Medium Intensity Taxiway Lights (MITL) may be considered if pilot visibility at night needs to be enhanced.

ON-FIELD WEATHER DATA

The airport has an automated surface observation system (ASOS) which provides all on-site weather data required to support airport operations in both visual and instrument conditions. The ASOS is owned and maintained by the National Weather Service (NWS).

Part 5- Landside Facilities

All landside facilities at HRI are located on the north side of the runway (conventional and T-hangars, parking apron and aircraft tiedowns, FBO building, aircraft fueling, agricultural aircraft loading area).

AIRCRAFT PARKING AND TIEDOWN APRON

Aircraft aprons provide parking for locally based aircraft not stored in hangars, for transient aircraft visiting the airport. The apron areas at HRI used primarily for aircraft parking are located east of the FBO building and total approximately 16,182 square yards. Other apron areas provide access to conventional aircraft hangars, the FBO building, and the aircraft fueling area.

The tiedown aprons are configured with single-rows of west-facing small airplane tiedowns. Larger aircraft and helicopters park in open areas on the aprons, although there are no designated parking areas for these aircraft. Locally-based aerial applicator aircraft (ADG I & II) are also parked on the east small aircraft tiedown apron.

The configuration of the existing aprons and taxilanes will be reviewed in the alternatives evaluation to meet the applicable taxilane OFA clearances. The recent relocation of the parallel taxiway eliminated several aircraft tiedowns located on the south side of the aprons and the potential reconfiguration within the existing aprons to meet taxilane OFA standards may further reduce available tiedown capacity. As part of the overall apron reconfiguration and/or expansion, it is recommended that designated large airplane drive-through positions with ADG-II taxilane access and helicopter parking positions are added.

Conservative development reserves should be established to accommodate a combination of aircraft parking positions, roughly equal to 50 percent of the modest twenty-year forecast (net) demand. The location and configuration of the development reserves will be addressed in the alternatives analysis.

Projected demand for based and transient aircraft parking during the current planning period is summarized in **Table 4-13**. Future aircraft parking needs include small airplane tiedowns, drive through parking positions for larger aircraft and multi-engine aircraft, and helicopter parking as described below.

SMALL AIRCRAFT PARKING DEMAND (LOCAL AND ITINERANT)

A review of the existing aircraft storage breakdown revealed that approximately 95 percent of based aircraft are stored in hangars and 5 percent use tiedowns. For planning purposes, it is assumed that this ratio is representative of future aircraft storage requirements. The FAA planning criterion of 300 square yards per based airplane is used to define locally-based requirements.

FAA Advisory Circular 150/5300-13A suggests a methodology by which itinerant parking requirements can be calculated using busy day operations. Future itinerant small airplane parking demand was estimated based on 40 percent of design day itinerant operations (40% of daily itinerant operations divided by two, to identify peak parking demand). The FAA planning criterion of 360 square yards per small airplane was applied to the number of itinerant spaces to determine future requirements.

BUSINESS AIRCRAFT PARKING

The airport accommodates transient business aircraft activity including large (>12,500 pounds) turboprops and business jets. The tiedown aprons do not have designated large aircraft drive-through parking positions with ADG-II taxilane access. The airport accommodates twice daily air cargo flights, each requiring a brief loading/unloading sequence on the apron. Based on this regular requirement creating two business aircraft parking positions with ADG II taxilane access is recommended to accommodate typical transient parking needs. Based on future demand, development of additional large aircraft parking may be required and should be considered in any apron expansion.

HELICOPTER PARKING

Transient helicopters are parked near the fuel area on the main tiedown apron. The addition of a transient helicopter parking position is recommended to address parking needs and provide adequate separation between small fixed-wing aircraft and helicopters to reduce potential damage from prop or rotor wash.

AIRCRAFT HANGARS

The airport has a variety of hangars including commercial hangars used for aviation businesses and hangars used for aircraft storage. As noted previously, approximately 95 percent of the airport's 39 based aircraft are stored in hangars. For planning purposes, it is assumed that the current level of hangar/apron storage will continue in the planning period. For space planning purposes, it is also assumed that all existing hangar space is in use and all additional (forecast) demand would need to be met through new construction.

As noted in the updated aviation activity forecasts, the number of based aircraft at HRI is projected to increase by 11 aircraft during the twenty-year planning period. Demand for new hangar space (aircraft storage only) is estimated to be 11 spaces totaling approximately 16,500 square feet based on a projected 95 percent hangar utilization. A planning standard of 1,500 square feet per based aircraft stored in hangars is used to project gross space requirements. The projected hangar storage requirements are presented in **Table 4-13.**

TABLE 4-13: APRON AND HANGAR FACILITY REQUIREMENTS SUMMARY

ITEM	BASE YEAR (2017)	2022	2027	2032	2037
Based Aircraft Forecast	39	44	46	48	50
Aircraft Parking Apron - Existing Aircraft Parking Type/Capacity					
Existing Apron Areas[1]	16,182 sy				
Small Aircraft Parking [2]	17 Tiedowns				
Large Aircraft Parking[2]	0				
Transient Helicopter Parking [2]	0				
Projected Needs (Gross Demand) [3]					
Locally Based Tiedowns (@ 300 SY each)		2 spaces / 600 sy	2 spaces / 600 sy	3 spaces / 900 sy	3 spaces / 900 sy
Small Airplane Itinerant Tiedowns (@ 360 SY each)		3 spaces / 1,080 sy	4 spaces / 1,440 sy	4 spaces / 1,440 sy	4 spaces / 1,440 sy
Large Aircraft Parking Positions (@ 625 SY each)		2 spaces / 1,250 sy	2 spaces / 1,250 sy	3 spaces / 1,875 sy	3 spaces / 1,875 sy
Small Helicopter Parking Positions (@ 380 SY each)		1 space / 380 sy	1 space / 380 sy	2 spaces / 760 sy	2 spaces / 760 sy
Total Apron Needs		8 spaces / 3,310 sy	9 spaces / 3,670 sy	12 spaces / 4,675 sy	12 spaces / 4,675 sy
Aircraft Hangars (Existing Facilities)					
Existing Hangar Units/Aircraft Storage Capacity	38 spaces[4]				
Projected Needs (Net Increase in Demand) [5]					
(New) Hangar Space Demand (@ 1,500 SF per space) (Cumulative 20-year projected demand: 11 spaces / 16,500 SF)		5 Spaces / 7,500 sf	2 Spaces / 3,000 sf	2 Spaces / 3,000 sf	2 Spaces / 3,000 sf

1. Apron Pavement Area (tiedown aprons only) as defined in ODA Pavement Management Plan (2017 inspection).
2. Estimated 17 small airplanes tiedowns in the Tiedown Apron. No designated helicopter or large aircraft parking spaces; these aircraft are accommodated within the existing apron.
3. Apron parking demand levels identified for each forecast year represents estimated gross demand.
4. Includes 1 (10-unit) shade hangar, 1 (10-unit) T-hangar, 1 (8-unit) T-hangar, and 10 aircraft storage hangars. Several aircraft hangars are large enough to accommodate multiple aircraft; however, for the purpose of planning, one aircraft is assumed in each hangar.
5. Aircraft hangar demand levels identified for each forecast year represent forecast net demand; assumed 95% of new based aircraft will be stored in hangars.

Individual aircraft owner needs vary and demand can be influenced by a wide range of factors beyond the airport's control. In addition, the moderate forecast growth in based aircraft may be exceeded if conditions are favorable. For this reason, it is recommended that hangar development reserves be identified to address uncertain hangar market conditions and demand factors. Given the modest projections of growth, development reserves should be established to accommodate a combination of conventional hangars and T-hangars, roughly equal to 50 to 100 percent of the twenty-year (net) forecast demand. The location and configuration of the development reserves will be addressed in the alternatives analysis.

In addition to aircraft storage, additional demand for business related and commercial hangar needs are anticipated. Specialized aviation service businesses such as flight training, engine & airframe repair, avionics, interior, and paint shops need locations where aircraft can access their facilities. Successful aviation service businesses rely on both locally based aircraft and their ability to attract customers from outside the local area. While there is no specific formula to predict demand for general aviation service businesses, reserving space for additional commercial hangars with access to taxiways is recommended.

SURFACE ACCESS AND VEHICLE PARKING

Surface access to the landside areas is provided by Airport Way, which connects to U.S. Highway 395 (US-395). Parking is available adjacent to the FBO building at the end of Airport Way. Additional parking is available adjacent to hangars.

Support Facilities

FUEL FACILITIES

The airport has self-serve 100-octane low lead (100LL) aviation gasoline (AVGAS) and Jet-A. The fuel facilities are City-owned and managed by the FBO. There are two above-ground double-wall 8,000 gallons fuel tanks operated on a card-lock system that were installed in 2016. The fuel apron was rehabilitated in 2016 and includes an oil/water separator.

The locally based aerial applicators maintain one Jet-A above ground fuel tank at the agriculture pads east of the terminal area.

UTILITIES

The existing airport utilities at HRI appear to be adequate to support future development in the north landside area. Expansion of landside facilities east of the terminal area may require service extensions or upgrades. Electric lines on the airfield should be buried.

SECURITY

The airport has 4-foot chain link fencing along Airport Way and new 6-foot chain link fencing with 3-strand barbed wire between Airport Way and the intersection of S. Ott Road and E. Highland Road. The remainder of the perimeter has field fencing. Fencing to enhance security and wildlife control may be considered in areas with field fencing.

There is one controlled access vehicle gate located at the end of Airport Way. Additional uncontrolled vehicle gates are located next to the FBO building and along Airport Way. Additional gates are located around the airport that is used for limited access, mostly for airport maintenance.

The airport is equipped with minimal overhead lighting. Flood lights can be found on hangars and buildings, and light poles. Flood lighting should be provided in expanded aircraft parking and hangar areas and any other new development areas on the airport to maintain adequate security. The use of full or partial cutoff light fixtures is recommended for all exterior lighting on the airport to limit upward glare.

Facility Requirements Summary

The projected twenty-year facility needs for HRI are summarized in **Table 4-14**. As noted in the table, maintaining existing pavements represents a significant ongoing facility need. The updated forecasts of aviation activity anticipate modest growth in activity that will resulting in similarly moderate airside and landside facility demands beyond existing capabilities. The existing airfield facilities can accommodate the forecast increase in activity, with targeted facility improvements. For the most part, the need for new or expanded facilities, such as aircraft hangars, will be market driven. The non-conforming items noted at the beginning of this chapter can be addressed systematically during the current planning period to improve overall safety for all users.

TABLE 4-14: FACILITY REQUIREMENTS SUMMARY

ITEM	SHORT-TERM	LONG-TERM
Runway 5/23	Remove Approach Obstructions (Trees) on the RWY 5 End (partial removal in 2018)	Pavement Maintenance • Crackfill, Sealcoat, • Repaint Markings (based on instrument approach type) 4,800 to 5,000-foot Runway Reserve (300 to 500-foot extension)
Taxiways and Taxilanes	Pavement Rehabilitation • Tiedown Apron • East Hangar Taxilanes Pavement Maintenance • Crackfill, Sealcoat, Repaint Markings	Pavement Maintenance
Aircraft Aprons	Pavement Rehabilitation Tiedown Aprons: reconfiguration to meet taxilane OFA standards; overlay/reconstruction	Define Apron Expansion Reserve Pavement Maintenance
Hangars	Configure taxilanes and adjacent development to support hangar sites; construction based on demand	Hangar Development Reserves
Navigational Aids and Lighting	Replace Reflectors (as needed)	Replacement (at end of useful life) • ASOS • Windsocks Install MITL (if night operations grow)
Fuel Storage	None	Mobile Jet-A
Utilities	Extend Utilities to New Development Areas	Same
Roadways & Vehicle Parking	Realign and extend roads to new development areas (maintain previous recommendation) Add vehicle parking in existing/future hangar areas	Relocate S. Ott Road outside RWY 23 RPZ and reserve RPZ.
Security	Maintain Existing Fencing/Gates	Install New Fencing/Gates in New Development Areas
Pavement Maintenance: Vegetation control, crack fill, sealcoat, slurry seal, localized patching, joint rehabilitation, etc.		

Airfield Capacity

Annual service volume (ASV) is a measure of estimated airport capacity and delay used for long-term planning. ASV, as defined in FAA Advisory Circular (AC) 150/5060-5, Airport Capacity and Delay, provides a reasonable estimate of an airport's operational capacity. The ratio between demand and capacity helps define a timeline to address potential runway capacity constraints before they reach a critical point. If average delay becomes excessive (greater than 3 minutes per aircraft), significant congestion can occur on a regular basis, which significantly reduces the efficient movement of air traffic. ASV is calculated based on the runway and taxiway configuration, percent of VFR/IFR traffic, aircraft mix, lighting, instrumentation, the availability of terminal radar coverage and the level of air traffic control at an airport.

For long-term planning purposes, the FAA estimates annual capacity (ASV) for a single runway with no air carrier traffic is approximately 230,000 operations; hourly capacity is estimated to be 98 operations during visual flight rules (VFR) conditions and 59 operations during instrument flight rules (IFR) conditions. Airfield capacity analyses at non-towered airports assume that only one runway is in use at any moment, which effectively equals the capacity of a single runway airport. Although these estimates assume optimal conditions (air traffic control, radar, etc.), they provide a reasonable basis for approximating existing and future capacity:

Existing Capacity: 13,140 Annual Operations / 230,000 ASV = 6% (demand/capacity ratio)

Future Capacity: 16,440 Annual Operations / 230,000 ASV = 7% (demand/capacity ratio)

Based on these ratios, the average delay per aircraft is expected to remain below one minute through the planning period and no capacity enhancements are anticipated during the planning period.

On a practical level, the existing taxiway system at HRI provides significant efficiency of aircraft movement between the full-length parallel taxiway and the runway on the five exit taxiways.