# CHAPTER 2: RUNWAYS & TAXIWAYS

## Introduction

This Chapter of the Airport Master Plan is focused on the Runway and Taxiway system at Gordon Municipal Airport (GRN). These areas are commonly referred to as the airfield, where aircraft takeoff, land and maneuver on the ground. Please note that **Chapter 3: Terminal Area and Support Facilities** will look at the apron, hangars and other facilities supporting the airport. These two chapters will address existing and future facility needs at the airport.

As the chapter analyzes various components of the runway and taxiways at GRN, it will review current conditions and any deficiencies that do not meet FAA design standards. It will consider the future critical design aircraft and provide facility requirements to accommodate these aircraft through the planning period. The chapter will further present the alternatives that were considered to meet future needs and the preferred airfield alternative that was chosen. Included in this chapter will be the following elements:

- Critical Design Aircraft
- Meteorological Information
- Runways
- Taxiways
- Evaluation Process
- Alternatives

## Critical Design Aircraft

The critical design aircraft types must be identified to determine the appropriate airport design standards to incorporate into airport planning. As discussed in the previous chapter, the current and future critical design aircraft is a B-II aircraft which has a taxiway design group (TDG) 2A and less than 12,500 pounds. This is based on Gordon Memorial Health Services operating the Pilatus PC-12, though the airport does experience operations by aircraft of a larger size, including the Beechcraft King Air C90, Beechcraft King Air 350 as well as the Beech King Air 200. Detailed operations were outlined in **Table 1-15** of the previous chapter. The existing/future critical design aircraft will be **ARC B-II (Small), TDG 2A**. The existing and future critical design aircraft characteristics at Gordon Municipal Airport are summarized in the following sections.

*Table 2-1 – Airfield Design Aircraft Summary*

| Design Characteristics | Runway 4/22 | Runway 11/29 |
|---|---|---|
| Aircraft Make/Model | Pilatus PC 12 | Various |
| Airplane Approach Category | A | A/B |
| Airplane Design Group | II | I |
| Taxiway Design Group | 2A | 1A |
| Wingspan | 53’ 3” | <49’ |
| Length | 47’ 3” | - |
| Height | 14’ 0” | - |
| Cockpit to Main Gear | 7’ 0” | <20’ |
| Main Gear Width | 15’ 2” | <15’ |
| Approach Speed (1.3 x Stall) | 85 knots | 90 knots |
| Maximum Takeoff Weight | 10,450 pounds | 12,500 pounds |
| Landing Gear Configuration | Single Wheel | Single Wheel |

*Source: FAA Aircraft Characteristics,, KLJ Analysis*

# Meteorological Factors

Meteorological conditions that affect the facility requirements of an airport include but are not limited to wind direction, wind speed, cloud ceiling, visibility, and temperature. Hourly metrological data was reviewed data from the GRN Automated Weather Observation System (AWOS) facility available from the National Climatic Data Center (NCDC). Periodic “special” weather observations within each hour were removed. This method considers the true average weather trends at an airport without skewing conditions toward IFR where multiple observations may be taken each hour due to changing conditions.

Wind coverage and weather conditions are evaluated based on both Visual Flight Rules (VFR) and Instrument Flight Rule (IFR). Visual Meteorological Conditions (VMC) are encountered when the visibility is 3 nautical miles or greater, and the cloud ceiling height is 1,000 feet or greater. Conditions less than these weather minimums are considered Instrument Meteorological Conditions (IMC) requiring all flights to be op

## METEOROLOGICAL FACILITIES

Metrological facilities provide users with up-to-date weather information at the airport to aid in pilot decision making for safe flight operations.

### Wind Indicator(s)

Wind direction indicators provide an immediate visual indication of the wind direction and velocity. A segmented circle provides a visual indication of the wind direction and velocity together with runway alignment and/or traffic pattern information.

The primary wind cone for the airport is located north of Runway 11/29 and east of Runway 4/22. There is no segmented circle. A supplemental wind tee is on site, south of the runway system and adjacent to the pilot’s lounge. These facilities can be identified on the Airfield Map presented in later sections of this chapter.

### Airport Beacon

The airport beacon serves as the airport identification light so approaching pilots can visually identify the airport location from sunset to sunrise. GRN has a beacon and it adequately serves the airport without known obstructions to its line of sight. The minimum light beam angle is 2 degrees.

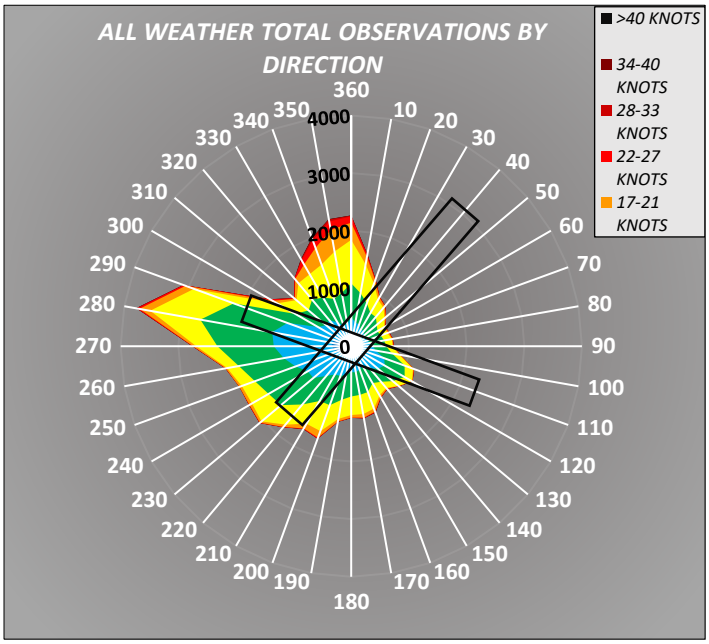
### Weather Reporting

There are two types of on-site weather reporting systems available to an airport. The Automated Surface Observing System (ASOS) program was a joint effort between the Federal Aviation Administration and the National Weather Service (NWS) to deploy a network of high-grade weather monitoring stations across the United States. ASOS serves as a primary climatological observing network in the United States and have equipment that provides weather observations every minute. A second-tier Automated Weather Observation System (AWOS) has varying sets of equipment packages to provide local weather observations. These systems operate 24/7 and ensure weather data is available which can be critical for landing, takeoff and en-route decision making. Generally, the data provided includes wind speed and direction, visibility, cloud ceiling, temperature and dew point and the altimeter setting. GRN has an AWOS-III which has been operational since April of 2017.

### Temperature

Average high temperature data for the hottest month was reviewed from climate data available from the NCDC for GRN. Using locally available data, the average high temperature in the hottest month from 1991-2020 was 72.0 degrees Fahrenheit. This temperature is used to calculate recommended runway lengths for the airport, which will be addressed in later sections. Detailed weather information for Gordon can be found in **Table 1-4** of the previous chapter.

## WIND COVERAGE AND APPROACH CONDITIONS




Prevailing winds at GRN originate from the west and north and are generally aligned with the airport's runway configuration. Crosswind or tailwind conditions can be hazardous to aircraft operations if they exceed the operational capabilities of the airplane or flight crew. The smallest aircraft are typically the most affected operationally by crosswinds.

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, FAA has defined the maximum direct crosswind for small aircraft as 12 miles per hour (10.5 knots). For increasingly larger aircraft, a 15-mile per hour (13 knot) direct crosswind is used up through 23-mile per hour (20 knots) for the largest aircraft. Aircraft can operate safely in progressively higher wind speeds as the crosswind angle decreases and the wind direction aligns more closely with the opposing the direction of flight. In addition, some aircraft are designed to safely operate with higher crosswind components. Ideally, an aircraft will take off and land directly into the wind or with a light crosswind. 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 development of a secondary (crosswind) runway.

### *Table 2-2 – FAA Wind Coverage Standards*

| AAC-ADG | Maximum Crosswind Component |
|---|---|
| A-I & B-I | 10.5 knots |
| A-II & B-II | 13.0 knots |

*Source: FAA AC 150/5300-13B*

Runway 4/22 has 87.92% coverage in all-weather conditions at 10.5 knots, and when combined with Runway 11/29, the airport has 95.96% coverage. **Table 2-3** provides the calculated all-weather wind coverage for the airport.

### *Table 2-3 – All-Weather Wind Coverage*

| Runway | Crosswind Component (Wind Speed) | | | |
|---|---|---|---|---|
| | 10.5 knots | 13.0 knots | 16.0 knots | 20.0 knots |
| Runway 4/22 | 87.92% | 93.59% | 97.10% | 99.01% |
| Runway 11/29 | 88.67% | 94.66% | 98.11% | - |
| **Combined*** | **95.96%** | **98.23%** | **99.40%** | **99.01%** |

*Source: GRN AWOS (April 2017-March 2025, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER*
*66,688 TOTAL OBSERVATIONS *Combined assumes up to maximum design aircraft crosswind component for each runway*

Pilots can fly with visual reference to the ground and other aircraft during most weather conditions. This is known as Visual Meteorological Conditions (VMC). Pilots are required to reference flight instruments and be on a FAA Instrument Flight Riles (IFR) flight plan when the cloud ceiling is less than 1,000 feet above the ground or the flight visibility is less than 3 statute miles. These conditions are known as Instrument Meteorological Conditions (IMC) and require a pilot to be instrument rated. Wind coverage during VMC is evaluated to determine the ideal alignment for runways used during visual operations, such as VFR flight training. Under VMC conditions, the coverage for both runways individually is below 95% at 10.5 kts, but when coverage is combined, coverage increased to 96.33%. See **Table 2-4**. Wind coverage during IMC is evaluated to determine the ideal alignment for instrument approach to an airport's runway. As shown in **Table 2-5**.

### *Table 2-4 – VMC Wind Coverage*

| Runway | Crosswind Component (Wind Speed) | | | |
|---|---|---|---|---|
| | 10.5 knots | 13.0 knots | 16.0 knots | 20.0 knots |
| Runway 4/22 | 88.45% | 94.04% | 97.37% | 99.14% |
| Runway 11/29 | 89.41% | 95.12% | 98.31% | - |
| **Combined*** | **96.33%** | **98.44%** | **99.46%** | **99.14%** |

*SOURCE: GRN AWOS (April 2017-March 2025, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER 61,778 TOTAL OBSERVATIONS *Combined assumes up to maximum design aircraft crosswind component for each runway*

### *Table 2-5 – IMC Wind Coverage*

| Runway | Crosswind Component (Wind Speed) | |
|---|---|---|
| | 10.5 knots | 13.0 knots |
| Runway 4/22 | 81.20% | 87.92% |
| Runway 4 Only | 65.34% | 70.88% |
| Runway 22 Only | 26.03% | 27.21% |

*Source: GRN AWOS (April 2017-March 2025, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER 4,910 TOTAL OBSERVATIONS*
**Combined assumes up to maximum design aircraft crosswind component for each runway*

Based on true hourly weather data summarized in **Table 2-6**, the airport experiences VMC weather conditions 92.64 percent of the year. When considering the current instrument approach to Runway 4/22, which includes a 400-foot cloud ceiling and 1 ¼ -mile flight visibility, the airport experiences weather conditions below this criterion approximately 2.17 percent of the time, which translates to 7.9 days per year where the airport is not usable. Overall, under the existing approaches, GRN is usable 97.83 percent of the time, resulting in approximately 357 total days of availability.

*Table 2-6 – Meteorological Analysis*

| Weather Condition | Percentage | Days per Year | Hours per Year |
|---|---|---|---|
| VMC | 92.64% | 338.1 | 8,115 |
| Usable IMC | 5.19% | 18.9 | 455 |
| **Usability** | **97.83%** | **357.1** | **8,570** |
| Below Weather Minimums* | 2.17% | 7.9 | 190 |
| ***Total*** | **100.00%** | **365.0** | **8,760** |

*Source: GRN AWOS (April 2017- March 2025, HOURLY) reported by the National Climatic Data Center*

## INSTRUMENT APPROACH CONDITIONS

Instrument approach procedures to a runway end are used by landing aircraft to navigate to the airport during instrument conditions when the cloud ceiling is less than 1,000 feet and/or visibility is less than 3 miles. Establishing approaches with the lowest possible weather minimums allow the airport to maximize its operational utility. Each approach type requires differing infrastructure and navigational aids. Types of approach procedures include non-precision approach (NPA), approach with vertical guidance (APV) and precision instrument approach (PA). See **Appendix B – General Aviation Airports – 101** for details on the requirements of different levels of instrument approach procedures. **Table 2-7** outlines a list of the major approach categories and associated capabilities.

*Table 2-7 – Instrument Approach Procedure Visibility Minimums*

| Typical Categories of Approaches | | | | | |
|---|---|---|---|---|---|
| **Approach** | **Category** | **Vertical Guidance** | **Lowest Ceiling** | **Lowest Visibility** | **Ground Based Aids** |
| Visual | | | 1,000’ | 3 miles | |
| RNAV LNAV | NPA | No | 250’ | ¾ mile | MIRL, VGSI* |
| RNAV LNAV/VNAV | APV | Yes | 250’ | ¾ mile | MIRL, VGSI* |
| RNAV LPV** | APV | Yes | 250’ | ¾ mile | MIRL, VGSI* |
| VOR | NPA | No | 250’ | ¾ mile | VOR, MIRL, VGSI* |
| ILS CAT I | PA | Yes | 200’ | ½ mile | GS, LOC, MIRL, MALSR |
| ILS CAT II | PA | Yes | 100’ | ¼ mile | GS, LOC, HIRL, ALSF-1 or ALSF-2, TDZ/CL |
| ILS CAT III a | PA | Yes | 0’ | RVR 700’ | GS, LOC, RVR, HIRL, ALSF, TDZ/CL |
| ILS CAT III b | PA | Yes | 0’ | RVR 600’ | GS, LOC, RVR, HIRL, ALSF, TDZ/CL |
| ILS CAT III c | PA | Yes | 0’ | 0’ | GS, LOC, RVR, HIRL, ALSF, TDZ/CL |

*Source: KLJ Analysis; * Recommended; ** Often the best RNAV minimums but requires aircraft equipped with WAAS receiver*

Instrument approach weather minimums are a result of the approach type, airport infrastructure, and any prevailing airspace obstructions. This section discusses possible instrument procedure upgrades/options that can be explored for GRN. Coordination with FAA Flight Procedures Office is

recommended to review the feasibility of implementing any new approach procedures. **Table 2-8** depicts the existing approaches for the Runway system at GRN.

*Table 2-8 – Instrument Approach Procedures*

| Approach Procedure | Approach Type | Lowest Cloud Ceiling Minimum (HAT) | Lowest Visibility Minimum (n.m.) |
|---|---|---|---|
| RNAV (GPS) RWY 4 | Non-Precision Approach with Vertical Guidance | LPV: 400 feet<br>LNAV/VNAV: 500 feet<br>LNAV MDA: 800 feet<br>Circling: 800 feet | 1 ¼ mile |
| RNAV (GPS) RWY 22 | Non-Precision Approach with Vertical Guidance | LPV: 400 feet<br>LNAV/VNAV: 400 feet<br>LNAV MDA: 600 feet<br>Circling: 600 feet | 1 mile |
| NDB RWY 22 | Non-Precision Approach | Standard: 900 feet<br>Circling: 900 feet | 1 mile |

*Source: SOURCE*
*Note: HAT = Height Above Touchdown, n.m. = nautical miles (reported), VG = Vertical Guidance, NVG = Non-Vertical Guidance, ILS = Instrument Landing System, LPV = Localizer Performance with Vertical Guidance, LNAV = Lateral Navigation, VNAV = Vertical Navigation, VOR = Very High Frequency Omni-Directional Range, DME = Distance Measuring Equipment*

### CROSSWIND RUNWAY REQUIREMENTS

The existing crosswind at GRN is 11/29 and is 2,389' x 50'. It is important to first note that it is clearly shown from a wind coverage standpoint that the crosswind runway at GRN is required to achieve 95% coverage. The crosswind runway 11/29 actually has better coverage (88.67%) than the primary runway 4/22 (87.92%). For airfield improvements like a crosswind runway, the requirement has been sufficient regular use which is quantified as a minimum of 500 annual operations. At GRN there are not projected to be 500 annual operations on the crosswind runway through the planning period.

For the crosswind runway at GRN, a reconstruction justification will be based on *FAA Program Guidance Letter (PGL) 25-01: Runway Projects* which states based on the FAA Reauthorization Act of 2024 §702(2)(G) that "rehabilitation and reconstruction eligibility for existing crosswind runway if it is on the most recently approved ALP, regardless of wind coverage." According to FAA, these will be considered for funding as Legacy Crosswind Runways.

*Figure 2-1 – Airfield Facilities Map*



# Runway System

## *Runways*

GRN has two runways. Runway 4/22 is the airport's primary runway and currently serves in all weather conditions with an RNAV instrument approach procedure to both ends, as was outlined in **Table 2-8**. Runway 11/29 operates as the crosswind runway available only for flights under visual flight rule (VFR) conditions. **Table 2-10** depicts the existing dimensions and design standards for each runway at GRN. Specific details of each runway including condition, dimensional standards, and pavement design will be discussed in greater detail the following sections.

*Table 2-10– Runway Facility Summary*

| Component | Runway 4/22 | Runway 11/29 |
|---|---|---|
| Runway Length (feet) | 5,196 | 2,284 |
| Runway Width (feet) | 75 | 50* |
| Runway Surface Material | Asphalt | Asphalt |
| Runway Surface Treatment | None | None |
| Pavement Strength | 12,000 lbs (Single Wheel) | 12,000 lbs (Single Wheel) |
| Runway Design Code | A/B-II (Small)-5000 | A/B-I (Small)-VIS |
| Approach Reference Code | B/III/2400; D/II/4000 | N/A |
| Departure Reference Code | B/III; D/II | N/A |
| Runway Safety Area (RSA) | 150' Wide | 120' Wide |
| Object Free Area (ROFA) | 500' Wide | 250' Wide |
| Object Free Zone (OFZ) | 250' Wide | 250' Wide |
| Runway Protection Zone (RPZ) | 250' X 450' X 1,000' | 250' X 450' X 1,000' |

*Source: AC 5300-13B, Change 1*

**Indicates the pavement is considered nonstandard and deficient for the existing Runway Design Code*

### RUNWAY DESIGN CODES

The Runway Design Code (RDC) is a coding system which communicates the design standards for an individual runway. The RDS is based on the designated design aircraft, otherwise known as the most demanding aircraft type which utilizes the runway annually. The RDC is based on a series of characteristics which describe the aircraft intended to use the runway and visual capabilities of the runway. It is depicted via a three-part code comprised of the Aircraft Approach Category (AAC), Aircraft Design Group (ADG) and Runway Visual Range (RVR). **Table 2-11** summarizes the components which make up the RDC. Further information about Runway Design Codes can be found in **Appendix B: General Aviation Airports 101**. The RDC for each runway at GRN is as follows:

**Runway 4/22:** The existing RDC is A/B-II-5000 for both runway ends.

**Runway 11/29:** The existing RDC is A/B-I-VIS for both runway ends.

*Table 2-11– Runway Design Code Components*

| Aircraft Approach Category | |
|---|---|
| **Approach Category** | **Corresponding Approach Speed** |
| A | < 91 kts |
| B | 91 – 120 kts |
| C | 121 – 141 kts |
| D | 141 – 165 kts |
| E | ≥166 kts |

| Aircraft Design Group | | |
|---|---|---|
| **Design Group** | **Aircraft Wingspan** | **Aircraft Tail Height** |
| I | < 49 ft | < 20 ft |
| II | 49 – 78 ft | 20 – 29 ft |
| III | 79 – 117 ft | 30 – 44 ft |
| IV | 118 – 170 ft | 45 – 59 ft |
| V | 171 – 213 ft | 60 – 65 ft |
| VI | 214 – 261 ft | 66 – 79 ft |

| Runway Visibility | |
|---|---|
| **Runway Visual Range (Feet)** | **Corresponding Visibility Capabilities** |
| VIS | Visual |
| 5,000 | 1-mile or greater |
| 4,000 | Lower than 1 mile but not less than ¾ mile |
| 2,400 | Lower than ¾ mile but not less than ½ mile |
| 1,600 | Lower than ½ mile but not less than ¼ mile |
| 1,200 | Lower than ¼ mile |

*Source: FAA Advisory Circular 150/5300-13B, Change 1*

## RUNWAY REFERENCE CODES

Runway Reference Codes (RRCs) indicate current operational capabilities where no special operations procedures are necessary, and without consideration of the actual runway length. The existing operational capability of the runway is identified based on a taxiway separation distance. Only runway 4/22 has a partial parallel taxiway and therefore it is the only one with an RRC.

## RUNWAY DESIGN STANDARDS

### Basic Safety Standards

One primary purpose of this master plan is to review and achieve compliance with all FAA safety and design standards. The design standards vary based on the RDC and RRC as established by the design aircraft. Some of the safety standards include:

- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)

Other basic design standards include runway width, runway surface gradient, runway shoulder width, blast pad, and required separation distances to markings, objects, and other infrastructure for safety. Critical areas associated with navigational aids as well as airspace requirements are described further in this chapter.

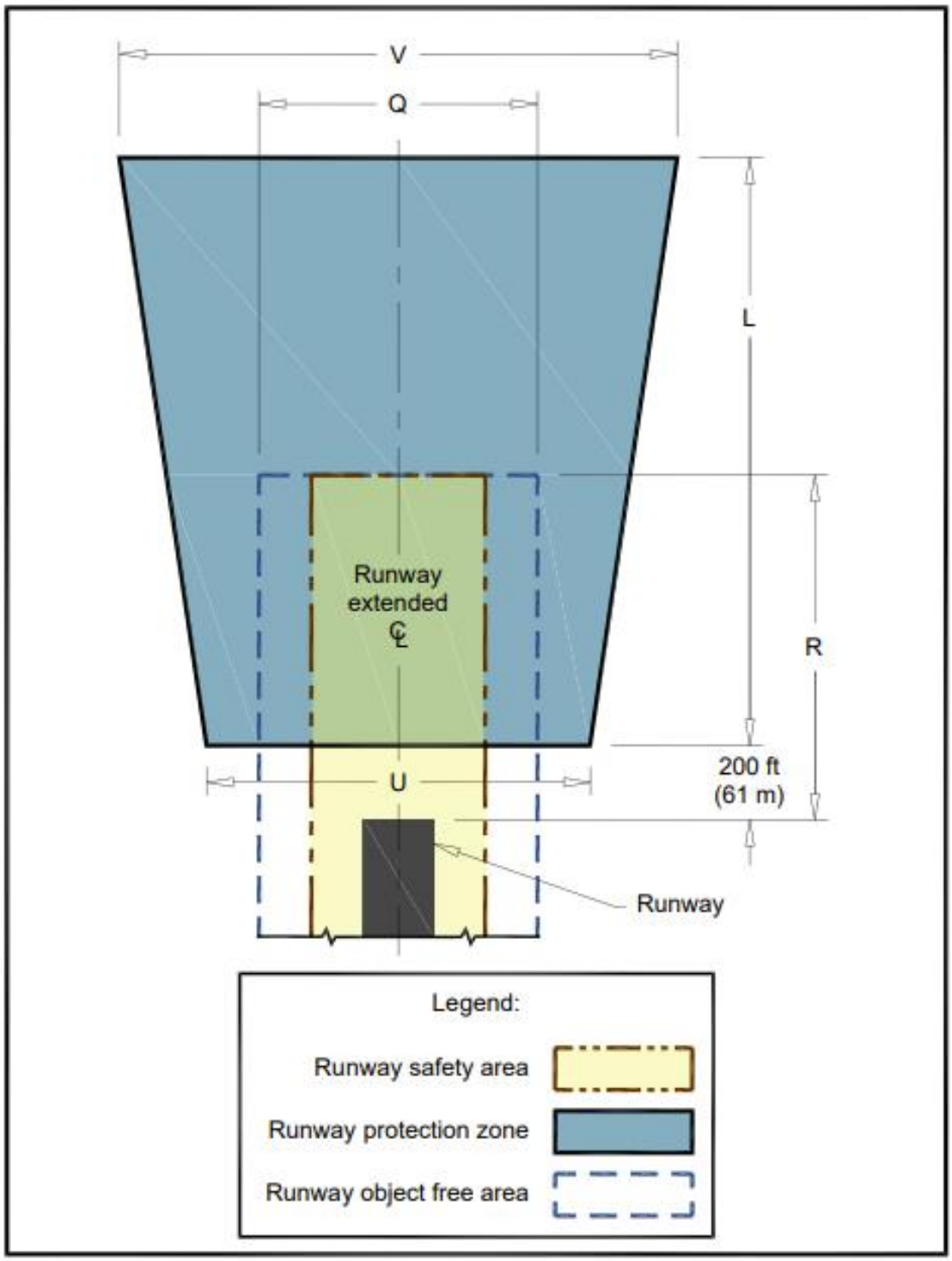
The existing RSA, ROFA and ROFZ standards for all runways meet existing airport design standards. The basic safety standards dimensional requirements for all runways at GRN are summarized in **Table 2-10** and outlined in greater detail in **Table 2-12** below. **Figure 2-2** visually depicts these runway protection areas as they relate to the orientation of a runway.

*Table 2-12– Runway Design Standards*

| | Runway 4/22 | Runway 11/29 |
|---|---|---|
| Runway Safety Area | | |
| Width | 150feet | 120 feet |
| Length beyond departure end | 300 feet | 240 feet |
| Length prior to threshold | 300 feet | 240 feet |
| Runway Object Free Area | | |
| Width | 500 feet | 250 feet |
| Length beyond runway end | 300 feet | 240 feet |
| Length prior to threshold | 300 feet | 240 feet |
| Runway Obstacle Free Zone | | |
| Length Beyond Runway End | 200 feet | 200 feet |
| Width | 250 Feet | 250 Feet |

*Source: FAA Advisory Circular 150/5300-13B, Change 1*

*Figure 2-2– Runway Protection Areas*




Source: FAA Advisory Circular 150-5300-13B, Airport Design, Figure 3-26

## RUNWAY PROTECTION ZONE

The Runway Protection Zone (RPZ) is a trapezoidal land use area at ground level prior to the landing threshold or beyond the runway end. The RPZ's function is to enhance the protection of people and property on the ground. The RPZ size varies based on the runway's RDC. The RPZ is further broken down to Approach RPZ and Departure RPZ.

Airport owners should, at a minimum, maintain the RPZ clear of all facilities supporting incompatible activities, such as residential structures. It is desirable to clear all above-ground objects from the RPZ. Protection of the RPZ is achieved through airport control over RPZs including fee title ownership or clear zone easement.

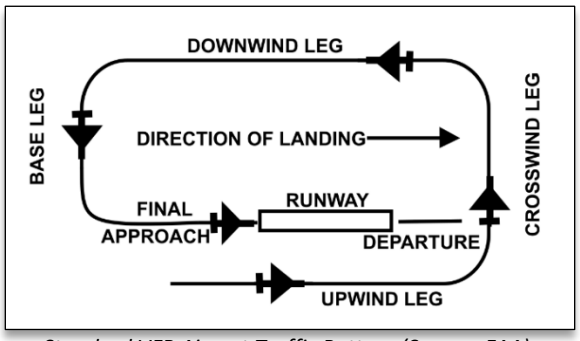
At GRN, there appears to be several incompatible objects within the runway RPZ's. On the Runway 11 end, there is an existing roadway within the RPZ. On the 29 end is an agricultural fence as well as a grouping of trees. Outside of this, land use within the existing Runway 11/29 RPZ is compatible. For Runway 4/22 there are paved roadways within the RPZ at each end. While generally, RPZ's are expected to remain free and clear of public roads, railroads, parking areas, etc. and airport sponsors are expected to work towards relocation, removal or mitigation of such obstacles in order to minimize the risk to people on the ground in the case of an aircraft incursion, that is not always feasible due to land ownership, cost restrictions, etc.

At GRN, the existing roadways and fence likely do not pose a significant risk and it is not recommended to conduct further analysis for relocation or removal. Land use surrounding the airport is widely open space, agricultural use and does not encourage the congregation of people. The existing roadways primarily serve a low to moderate amount of traffic and agricultural movement.

GRN should consider acquiring land to control all existing, future, and ultimate RPZs in fee simple or land use easement.

## APPROACH/DEPARTURE PROCEDURES

Aircraft operate under either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR) depending on weather conditions and/or operational standards.



*Standard VFR Airport Traffic Pattern (Source: FAA)*

### Visual Approach/Departure Procedures

Under VFR, pilots are advised to utilize a standard rectangular traffic pattern around the runway to approach or depart an airport. Standard traffic pattern legs include upwind, crosswind, downwind, base, and final. Departures are typically straight-out from a departing runway, a 90-degree crosswind, or 180 degree downwind. Arrivals typically enter a traffic pattern 45 degrees to a downwind leg for landing. All traffic at GRN follows a standard left traffic pattern.

### Instrument Approach/Departure Procedures

Procedures are published at airports to provide aircraft with adequate obstacle clearance in order to land and takeoff in instrument meteorological conditions. GRN has instrument approach procedures for both Runways 4 and 22.

## RUNWAY APPROACH/DEPARTURE SURFACES

FAA identifies sloping approach surfaces that must be cleared at an absolute minimum for safety for landing aircraft. These surfaces are identified in paragraph 3.6 of FAA AC 150/5300-13B.

The departure surface applies to runways with instrument departures available. It begins at the end of the takeoff distance available and extends upward and outward at a 40:1 slope. No new penetrations are allowed unless an FAA study has been completed and a determination of no hazard has been issued.

The applicable approach/departure surface standards for GRN are identified in **Table 2-12**. As was discussed previously, only runway ends 4 and 22 are available for instrument departures. During the alternatives analysis portion of the report, options for minimums lower than 1 mile statue for Runway 4/22 will be analyzed. The "Future" section of **Table 2-12** below shows the new Approach/Departure surface for the runway should those minimums be lowered.

*Table 2-12– Approach/Departure Surface Requirements*

| Runway End(s) | Par. 3.6 Surface | Description | Slope |
|---|---|---|---|
| **Existing** | | | |
| 4/22 | 4 | Non-Precision Instrument: Approach end of runways expected to support instrument night operations, serving Category A and B aircraft only | 20:1 |
| 11/29 | 2 | Visual Approach: Approach end of runway expected to serve small airplanes with approach speeds of 50 knots or more | 20:1 |
| **Future** | | | |
| 4/22 | 6 | Approach end of runways expected to accommodate instrument approaches having visibility minimums greater than or equal to ¾ mile but less than 1 statute mile | 20:1 |

*Source: FAA AC 150/5300-13B, KLJ Analysis*

## RUNWAY LENGTH & WIDTH

Runway width is driven by the RDC and approach visibility minimums for each runway as identified in FAA AC 150/5300-13B. Runway Length requirements are determined based on a variety of factors, including the elevation of the runway, the temperature of the airport during the hottest month and the type of aircraft intending to takeoff/land on the runway.

Runway 4/22 is the longest runway at GRN with a length of 5,196 feet and width of 75 feet. According to airport grant history information provided by the FAA, the runway was extended in 1989.

Runway 11/29 has a length of 2,283 feet and width of 50 feet. The width is unsatisfactory for the runway design code of A/B-I. It is recommended that the runway be widened to 60 feet to meet design standards, likely during a future pavement maintenance project.

As of the date this Master Plan study was initiated, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* was the current guidance for determining runway lengths at airports. A revision to this guidance, FAA AC 150/5325-4C, *Runway Length Recommendations for Airport Design (DRAFT)* was proposed in 2013. A detailed analysis using these two methods including FAA runway length charts and

aircraft performance data is in **Appendix D: Runway Length Evaluation** and that information is summarized in **Table 2-13** below.

### Primary Runway 4/22

The critical design aircraft, the Pilatus PC 12 was used to determine the necessary runway length for primary Runway 4/22. A length of 4,645 feet for takeoff is required to operate under FAR Part 135, and 3,608 feet is required for landing, under dry conditions. Under wet runway conditions, 5,342 feet is recommended for takeoff and 4,149 feet for landing. These lengths are well within the current runway length of 5,196 feet therefore no change is recommended during this planning study.

### Crosswind Runway 11/29

FAA recommends secondary "crosswind" runways have a length capable of accommodating the lower crosswind capable aircraft expected to use this runway. The length of a runway must be justified to accommodate the aircraft that requires its use. At GRN, Runway 11/29 is 2,283 feet long and necessary to provide the FAA recommended 95 percent wind coverage for ARC A/B-I and A/B-II aircraft types under a 10.5-knot and 13-knot crosswind component. Based on the aircraft fleet mix, the primary aircraft type to utilize the crosswind runway would be the Cessna 182, or similar models. These aircraft require at least 2,242 feet of runway length to takeoff under dry conditions and 1,549 feet to land. Under wet conditions, 2,578 feet would be recommended for takeoff and 1,781 feet is recommended for landing. Options for and feasibility of extending the crosswind runway will be analyzed in later portions of this report.

### Runway Length Analysis - Small Airplanes Up to 12,500 Pounds

The FAA design approach to determine recommended runway length in small aircraft is identified in Chapter 2 of FAA AC 150/5325-4B. The method requires several steps to be performed including identifying percentage of fleet and using airport data to calculate runway length based on curves. Calculations for GRN are identified in **Table 2-13**.

*Table 2-13 – FAA AC 150/5345-4B Runway Length Requirements (≤ 12,500 lbs.)*

| Airport and Runway Data | | |
|---|---|---|
| Existing Runway 4/22 Length | 5,196 feet | |
| Airport Elevation | 3,562 feet | |
| Mean Daily Maximum Temperature of Hottest Month | 87.4°F | |
| **Aircraft Classification** | **Recommended Runway Length** | |
| **Small Airplanes 12,500 Pounds or less** | | |
| 10 or more passenger seats | 5,250 feet | |
| Less than 10 passenger seats at 100 percent of fleet | 5,250 feet | |
| Less than 10 passenger seats at 95 percent of fleet | 4,800 feet | |
| **Specific Aircraft (SARLAT Tool)*** | **Dry** | **Wet** |
| Pilatus PC-12 (Runway 4-22) | 4,645 | 5,342 |
| Beech King Air B200 (Runway 4-22) | 4,286 | 4,929 |
| Cessna 182 (Runway 11-29) | 2,242 | 2,578 |
| Cessna 172 (Runway 11-29) | 2,380 | 2,737 |

*Source: FAA AC 150/5325-4B, KLJ Analysis Note: SARLAT Tool using 1.8% gradient for Runway 4/22 and 0.3% gradient for Runway 11-29.*

For small general aviation aircraft, the FAA runway length requirements of 100 percent of the fleet would apply at GRN due to its location and function in the airport system as an agricultural and medical hub. The recommended runway length for small general aviation aircraft is 5,250 feet. The existing runway length of Primary Runway 4/22 is almost equal to the recommended runway length, and as such is deemed adequate for the planning period.

### PAVEMENT STRENGTH AND CONDITION

Airfield pavements should be adequately maintained, rehabilitated and reconstructed to meet the operational needs of the airport. The published pavement strength is based on the construction materials, thickness, aircraft weight, gear configuration and operational frequency for the pavement to perform over its useful life. According to the published information on the FAA Airport Data Information Portal (ADIP), the existing pavement strength of Runway 4/22 is 12,000 pound for single-wheel gear aircraft. Runway 4/22 was reconstructed in 2015 with a combination of full depth reclamation and new 3-inch depth mix of asphalt base and surface course.

Condition of pavement can be determined based on a metric referred to as the Pavement Condition Index (PCI). PCI is communicated through a numerical scale between 0 and 100, with high numbers indicating better conditions. In 2022, the Nebraska Department of Transportation (NDOT) Aeronautics conducted a survey of pavement at Gordon Municipal Airport. Those findings were summarized in a PCI report, published in 2023. At the time of the study, Runway 4/22 had a reported PCI of 80, which is satisfactory. A visual inspection of the runway in October 2025 indicates that the pavement is in fair condition, with surface damage, longitudinal joint cracks and alligator cracking present. At the present time, rehabilitation to include a crack seal, seal coat and new pavement markings is planned for Runway 4/22 in fiscal year 2026. It is recommended to continue to perform routine pavement maintenance as necessary to maintain the integrity of the runway. **Figure 2-3** below shows the existing condition of the runway pavement and markings.

*Figure 2-3-Runway 4/22 Existing Condition*



*Source: KLJ*

The crosswind Runway 11/29 has a published pavement strength of 12,000 pounds single-wheel gear. According to the NDOT 2023 PCI report, the crosswind runway has a PCI rating of 39, which is very poor. Since the time of the pavement survey, the pavement on the crosswind runway has continued to deteriorate, to the point that the runway is essentially unusable. **Figure 2-4** depicts the current condition of the crosswind runway. It is recommended that the crosswind runway undergo a full depth reconstruction and remarking in the near future to restore the runway to safe working condition and provide the necessary runway coverage for aircraft to utilize when wind conditions warrant it.

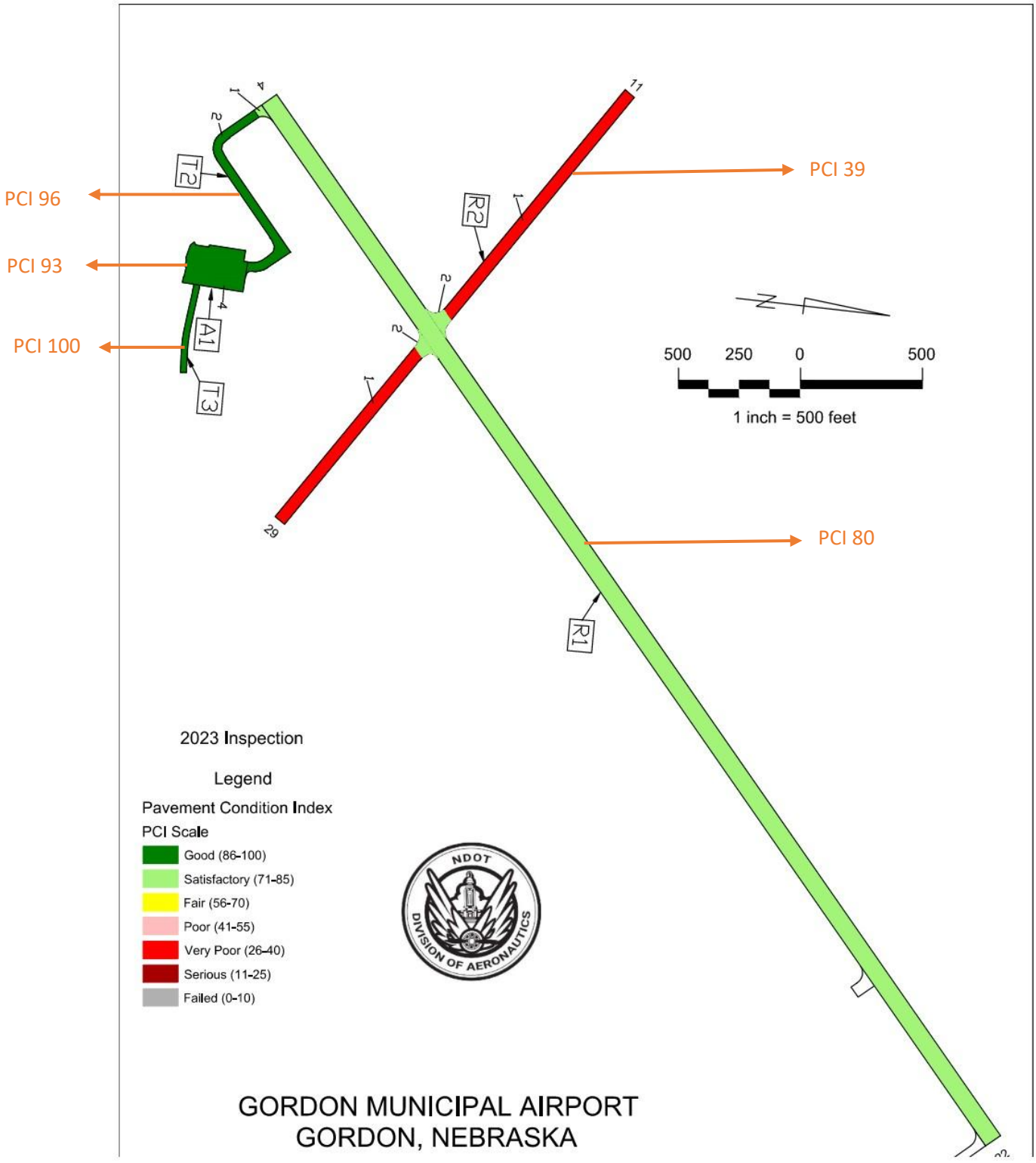
*Figure 2-4 Condition of Runway 11/29*



*Source: KLJ*

**Figure 2-5** depicts the condition of all airfield pavement at GRN.

*Figure 2-5 – Gordon Municipal Airport PCI Report*




*Source: Nebraska DOT, 2023 PCI Report*

## VISUAL NAVIGATION AIDS

Visual aids are installed to provide airport usability during periods of darkness and/or low visibility. Pavement markings and lighting systems available at the airport are summarized in the following sections.

### Runway Lighting

Runway edge lights are placed off the edge of the runway surface to help pilots define the edges and end of the runway during night and low visibility conditions. **Both Runway 4/22 and 11/29 are equipped with Medium Intensity Runway Lighting (MIRL) systems**.

### Pilot-Controlled Lighting

Airfield lighting systems allow for pilots to control the complexity and intensity of runway edge, approach threshold lights in addition to the activation of taxiway edge lights and guidance signage. **At GRN, the lights are pilot controlled via the CTAF frequency 122.8 MHz**

### Visual Approach Slope Lighting

Visual approach slope lighting provide vertical descent guidance to pilots for a specific runway end. These approach aids enable the pilot to acquire and maintain the correct glide path for landing. Precision Approach Path Indicator Lights (PAPI) are the current FAA standard equipment installed for this purpose, however other types of equipment exist, including visual approach slope indicator lights (VASI). Both PAPI and VASI function similarly. They both have red and white lights that are used by the pilot to indicate whether they are too high, too low, or on the appropriate glidepath. Precision approach path indicators project light along a standard glide path to a runway end, with red and white colored lights indicating the aircraft's vertical position (above, below, or on glide path) relative to the defined glide path. Visual approach slope indicators project a beam of light having a white segment in the upper part of the beam and red segment in the lower part of the beam.

A new 2-box PAPI system was installed at GRN to Runway 4/22 in 2024. The previous PAPIs exceeded their useful life and had become increasingly difficult to maintain. Airport management had reported repeated faults within the PAPI circuits over the years. As a result, the existing cabling was removed and replaced in its entirety as part of the project.



*Runway 4/22 REIL at GRN, Source: KLJ*

### Runway End Identifier Lights (REIL)

REILs consist of high-intensity flashing white strobe lights located on the approach ends of runways to assist the pilot in early identification of the runway threshold. An LED REIL system was installed to Runway 4/22 at GRN as part of the 2024 navigational aid project. These REILs should be maintained through the long-term. The location of the REILS and PAPIs are depicted in **Figure 2-1**.

### Pavement Markings

Pavement markings help airport users visually identify important features on the airfield. FAA has defined numerous different pavement markings to promote safety and situational awareness as defined by FAA AC 150/5340-1, *Standards for Airport Markings*.

The minimum required runway markings for a standard runway are as follows:

- Visual (landing designator, centerline)
- Non-Precision (landing designator, centerline, threshold)
- Precision (landing designator, centerline, threshold, aiming point, touchdown zone, edge)

Runway 4/22 is marked with non-precision instrument markings which includes a landing designator, centerline, threshold markings and aiming point. Runway 11/29 has basic visual markings, which includes a landing designator and centerlines. The pavement markings for both runways are in fair to poor condition and should be addressed with a remarking during upcoming pavement maintenance projects.

## Taxiways

Taxiways provide for the safe and efficient movement of aircraft between the runway and other operational areas of the airport. The taxiway system should provide critical links to airside infrastructure, increase capacity and reduce the risk of an incursion with traffic on the runway. The taxiway system should meet the standards design requirements identified in FAA AC 150/5300-13B. Locations and identifiers are depicted in **Figure 2-1**.

The taxiway network at the Gordon Municipal Airport is minimal, consisting of a partial parallel from the apron to Runway 4 end, designated as Taxiway A, a single taxilane to the existing hangar area and a taxiway turnaround at the Runway 22 end. All taxiways/taxilanes at GRN are constructed of concrete. It is recommended to construct a full length parallel taxiway to serve Runway 4/22 in the future. This project would likely occur in phases, starting with a reconfiguration of the existing taxiway turnaround at the Runway 22 end, to create a more accessible by-pass taxiway. As funding permits, sections of the parallel taxiway would need to be constructed with accompanying access points to the runway, eventually resulting in the two ends joining to complete the parallel taxiway.

### SYSTEM DESIGN

FAA has placed a renewed emphasis on taxiway design in their updated airport design standards. Fundamental elements help develop and efficient system to meet demands, reduce pilot confusion and enhance safety. Considerations include:

- Design taxiways to meet FAA design standards for existing and future users considering expandability of airport facilities.
- Design taxiway intersections so the cockpit is over the centerline with a sufficient taxiway edge safety margin.
- Simplify taxiway intersections to reduce pilot confusion using the three-node concept, where a pilot has no more than three choices at an intersection.
- Eliminate “hot spots” identified by the FAA Runway Safety Action Team where enhanced pilot awareness is encouraged.

- Minimize the number of runway crossings and avoid direct access from the apron to the runway.
- Eliminate aligned taxiways whose centerline coincides with a runway centerline.
- Other considerations include avoiding wide expanses of pavement and avoiding "high energy intersections" near the middle third of a runway.

## TAXIWAY DESIGN STANDARDS

FAA identifies the design requirements for taxiways. The design standards vary based on individual aircraft geometric and landing gear characteristics. The Taxiway Design Group (TDG) and Airplane Design Group (ADG) identified for the design aircraft using a particular taxiway. Some of the safety standards include:

- Taxiway Width
- Taxiway/Taxilane Safety Area (TSA)
- Taxiway Edge Safety Margin (TESM)
- Taxiway/Taxilane Object Free Area (TOFA)

Other design standards include taxiway shoulder width to prevent jet blast soil erosion or debris ingestion for jet engines, and required separation distances to other taxiways/taxilanes. More information can be found in **Appendix B: General Aviation Airports 101**.

**Table 4-2** from the FAA Advisory Circular 150/5300-13B outlines the design standards for each taxiway design group.

**Table 4-2. Design Standards Based on Taxiway Design Group (TDG)**

| Item | TDG | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1A | 1B | 2A | 2B | 3 | 4 | 5 | 6 |
| Taxiway/Taxilane Width [2] | 25 ft (7.6 m) | 25 ft (7.6 m) | 35 ft (10.7 m) | 35 ft (10.7 m) | 50 ft (15.2 m) | 50 ft (15.2 m) | 75 ft (22.9 m) | 75 ft (22.9 m) |
| Taxiway Edge Safety Margin [1] | 5 ft (1.5 m) | 5 ft (1.5 m) | 7.5 ft (2.3 m) | 7.5 ft (2.3 m) | 10 ft (3.0 m) | 10 ft (3.0 m) | 14 ft (4.3 m) | 14 ft (4.3 m) |
| Taxiway Shoulder Width [3] | 10 ft (3.0 m) | 10 ft (3.0 m) | 15 ft (4.6 m) | 15 ft (4.6 m) | 20 ft (6.1 m) | 20 ft (6.1 m) | 30 ft (9.1 m) | 30 ft (9.1 m) |

**Note 1:** See Figure 4-4.
**Note 2:** It is acceptable to reduce taxilane widths for TDG 1A and 1B to 20 feet (6 m).
**Note 3:** When the most demanding aircraft has four engines and is TDG 6, the standard taxiway shoulder width is 40 feet (12.2 m).

## PAVEMENT CONDITION

A snapshot of the condition of the taxiway system pavement at GRN can be determined by revisiting the PCI Survey, shown in **Figure 2-5**. While both the hangar taxilane and taxiway A are in excellent condition, with a PCI of 100 and 96, respectively, the turnaround at Runway 22 end is in poor condition, as depicted by the photographs collected in 2025, below.

*Figure 2-6 – Gordon Municipal Airport Runway 22 Turnaround Condition*



*Source: KLJ*

*Figure 2-7 – Gordon Municipal Airport Taxiway A and Taxilane Condition*







*Source: KLJ*

**Taxiway Lighting**

Taxiway edge lighting delineates the taxiway and apron edges. The taxiway system at GRN does not have taxiway edge lighting, and instead utilizes retroreflectors. It is recommend that the airport upgrade with Medium Intensity Taxiway Lighting (MITL).

### Pavement Markings

Taxiway and taxilane markings are important for directional guidance for taxiing aircraft and ground vehicles. GRN's taxiway/taxilane markings are in good condition. They include taxiway/taxilane centerlines, enhanced centerlines, movement/non-movement markings, runway hold-lines, and painted holding position signs (markings on pavement) on all runway hold lines and applicable taxiways/taxilanes. There are no long-term modification recommendations for taxiway/taxilane

## Airside Data Summary

*Table 2-15 – Runway 4/22 Design Standard Matrix*

| Design Standard | Actual Condition | Facility Requirement or Recommendation | |
|---|---|---|---|
| | | Existing | Future |
| Runway Identification | 4/22 | 4/22 | 4/22 |
| Runway Classification | Utility | Utility | Utility |
| Aircraft Classification | Small Aircraft | Small Aircraft | Small Aircraft |
| Runway Design Code (RDC) | B-II (S)-5000 | B-II (S)-5000 | B-II (S)-4000 |
| Approach Reference Code (APRC) | B-II (S)-5000 | B-II (S)-5000 | B-II (S)-4000 |
| Departure Reference Code (DPRC) | B-II | B-II | B-II |
| Pavement Strength (Wheel Loading) | 12,000 (SW) | 12,000 (SW) | 12,000 (SW) |
| Pavement Surface Type | Asphalt | Asphalt | Asphalt |
| Line of Sight Requirements Met | Yes | Yes | Yes |
| Runway Length | 5,196' | 5,196' | 5,196' |
| Runway Width | 75' | 75' | 75' |
| Displaced Threshold | 0' | 0' | 0' |
| Runway Safety Area (RSA) Width | 150' | 150' | 150' |
| RSA Length Past Departure End | 300' | 300' | 300' |
| RSA Length Prior to Threshold | 300' | 300' | 300' |
| Runway Lighting Type | MIRL | MIRL | MIRL |
| Approach RPZ Start from Runway | Roads in RPZ (4 & 22) | 200' | 200' |
| Approach RPZ Length | | 1,000' (Both) | 1,000' (Both) |
| Approach RPZ Inner Width | | 500' (Both) | 500' (Both) |
| Approach RPZ Outer Width | | 700' (Both) | 700' (Both) |
| Runway Marking Type | Non-Precision | Non-Precision | Non-Precision |
| 14 CFR Part 77 Approach Category | 20:1 | 20:1 | 20:1 |
| Approach Type | NPI | NPI | NPI |
| Visibility Minimums | 1 mile (Both) | 1 mile (Both) | ¾ mile |
| Runway Departure Surface | Yes | Yes | Yes |
| ROFA Width | 500' | 500' | 500' |
| ROFA Length Past Departure End | 300' | 300' | 300' |
| ROFA Length Prior to Threshold | 300' | 300' | 300' |
| ROFZ Length Past Runway | 200' | 200' | 200' |
| ROFZ Width | 250' | 250' | 250' |
| 13B Paragraph 3.6 Approach Surface | 4 | 4 | 4 |
| Start from Runway End | 200' | 200' | 200' |
| Length | 10,000' | 10,000' | 10,000' |
| Inner Width | 400' | 400' | 400' |
| Outer Width | 3,400' | 3,400' | 3,400' |
| Slope | 20:1 | 20:1 | 20:1 |
| Visual and Instrument NAVAIDs | GPS, REIL, PAPI | GPS, REIL, PAPI | GPS, REIL, PAPI |
| Runway and Taxiway Separation | N/A | N/A | 300' |
| Runway and Parking Separation | N/A | N/A | 250' |
| Runway and Hold Line Separation | N/A | N/A | 200' |

*Note: RED indicates a known deficiency to existing minimum design standards*
*Source: FAA AC 150/5300-13B Change 1, KLJ Analysis*

## *Table 2-16 - Runway 11/29 Design Standard Matrix*

| Design Standard | Actual Condition | Facility Requirement or Recommendation | |
|---|---|---|---|
| | | Existing | Future |
| Runway Identification | 11/29 | 11/29 | 11/29 |
| Runway Classification | Utility | Utility | Utility |
| Aircraft Classification | Small Aircraft | Small Aircraft | Small Aircraft |
| Runway Design Code (RDC) | B-I(S)-VIS | B-I(S)-VIS | B-I(S)-VIS |
| Approach Reference Code (APRC) | N/A | N/A | N/A |
| Departure Reference Code (DPRC) | N/A | N/A | N/A |
| Pavement Strength (Wheel Loading) | 12,000 (SW) | 12,000 (SW) | 12,000 (SW) |
| Pavement Surface Type | Asphalt | Asphalt | Asphalt |
| Line of Sight Requirements Met | Yes | Yes | Yes |
| Runway Length | 2,283’ | 2,283’ | 2,283’ |
| Runway Width | 50’ | 60’ | 60’ |
| Runway Safety Area (RSA) Width | 120’ | 120’ | 120’ |
| RSA Length Past Departure End | 240’ | 240’ | 240’ |
| RSA Length Prior to Threshold | 240’ | 240’ | 240’ |
| Runway Lighting Type | MIRL | MIRL | MIRL |
| Approach RPZ Start from Runway | Road in RPZ (11) | 200’ | 200’ |
| Approach RPZ Length | | 1,000’ | 1,000’ |
| Approach RPZ Inner Width | | 250’ | 250’ |
| Approach RPZ Outer Width | | 450’ | 450’ |
| Runway Marking Type | Visual | Visual | Visual |
| 14 CFR Part 77 Approach Category | 20:1 | 20:1 | 20:1 |
| Approach Type | Visual | Visual | Visual |
| Visibility Minimums | VIS | VIS | VIS |
| Runway Departure Surface | No | No | No |
| ROFA Width | 250’ | 250’ | 250’ |
| ROFA Length Past Departure End | 240’ | 240’ | 240’ |
| ROFA Length Prior to Threshold | 240’ | 240’ | 240’ |
| ROFZ Length Past Runway | 200’ | 200’ | 200’ |
| ROFZ Width | 250’ | 250’ | 250’ |
| 13B Paragraph 3.6 Approach Surface | 2 | 2 | 2 |
| Start from Runway End | 200’ | 200’ | 200’ |
| Length | 5,000’ | 5,000’ | 5,000’ |
| Inner Width | 250’ | 250’ | 250’ |
| Outer Width | 700’ | 700’ | 700’ |
| Slope | 20:1 | 20:1 | 20:1 |
| Visual and Instrument NAVAIDs | N/A | N/A | N/A |
| Runway and Hold Line Separation | N/A | 125’ | 125’ |

*Note: RED indicates a known deficiency to existing minimum design standards*
*Source: FAA AC 150/5300-13B Change 1, KLJ Analysis*

## Airfield Summary

This chapter identifies safety, capacity and development needs for the Gordon Municipal Airport based on forecasted activity levels and needs identified during the inventory phase of the project. These recommendations provide the basis for formulating development alternatives to adequately address recommended improvements. The following summarizes the facility recommendations:

### *Airside Facilities*

- Reconstruct crosswind Runway 11/29 and restore use for aircraft during crosswind conditions.
- Reconstruct and reconfigure Taxiway Turnaround on 22 end and accommodate a full-length parallel taxiway
- Lower the instrument approach minimums of Runway 4/22 to 300-foot cloud ceiling and 1 mile visibility.
- Acquire land in fee simple for the existing Runway 11/29 and Runway 4/22 RPZ's as opportunities arise.
- Mitigate Part 77 and Approach/Departure Surface obstructions to all runway ends.