4.1 Introduction

With a constantly evolving air transportation system, the Federal Aviation Administration (FAA) continually evaluates and updates their design standards, which may result in revised standards that need to be taken into consideration when making changes at an airport. To identify the anticipated future facility requirements at SGH, aviation forecasts developed in Chapter 2, along with community input (see **Appendix D**), are compared to the existing facilities and current FAA standards with the understanding that these standards may change over time. These comparisons are made while keeping the Airport's vision and mission in mind, which are as follows:

- Mission: To provide a quality environment that meets the needs of the Airport's diverse customer base and contributes to the economic health of the region.
- Vision: to be recognized as the premier center for aviation, innovation and business development in the region

Using quantitative and qualitative factors in conjunction, the airfield, airside, and landside facilities are reviewed to identify the anticipated future facility needs. The requirements for new or expanded facilities reflect the unique circumstances at SGH and include, but are not limited to, the runways, navigational aids, taxiways, marking and lighting, aircraft hangars, aircraft apron areas, fueling facilities, terminal facilities, auto parking, and ground access. The projected facility needs are based on the FAA approved activity forecast for based aircraft and operations, and peak day activity.

While this chapter identifies the potential facility needs, the alternatives analysis in the next chapter considers alternatives for development taking into account items such as priority for development, benefits and costs, and ease of implementation and provides the final recommendations with Airport Sponsor selection for the 20-year facility development placed on the Airport Layout Plan.

4.2 Stakeholder Input

As part of the initial public involvement program for the master plan, a user survey was also provided to stakeholders and those results are shown in Appendix D**.** The top comments for SGH included maintaining the existing runway lengths and approach visibility minimums. These are further discussed in Section 4.4 through Section 4.6 and the Alternatives Chapter.

Most response received included good to excellent rating, with only a few including poor or fair ratings. Of those with poor or fair, most seemed to be related to NAVAIDS and the terminal. The most commonly noted improvement included the ILS being out-of-service (Section 4.6) and poor T-hangar condition (Section 4.9 and Airport Inventory Chapter).

The stakeholder input is considered as part of the facility requirements analysis that follows as mentioned above.

4.3 Wind Coverage

Wind patterns and runway crosswind conditions are an important meteorological factor in assessing runway utilization and determining runway design requirements in accordance with FAA aircraft category standards. Crosswind coverage is the component of wind speed and relative direction acting at right angles to the runway. The FAA desirable threshold for adequate crosswind coverage is 95 percent.

The wind coverage for the airport (**Exhibit 4.3-1**) is computed using 10 historic years of data for Springfield retrieved from FAA Airport GIS for Station 724295 Springfield-Beckley Municipal annual period record 2007 - 2016. From this data, the following historic crosswind components are calculated for Runway 6-24 and 15-33 in IFR and all-weather conditions.

Exhibit 4.3-1: Crosswind Data Table

RUNWAY	10.5-KNOTS	13-KNOTS	16-KNOTS	20-KNOTS
All-Weather Wind Data Observations				
Runway 6-24 (Primary)	90.56%	95.35%	98.83%	99.77%
Runway 15-33	84.40%	91.08%	97.03%	99.25%
Combined	97.93%	99.51%	99.94%	100.00%
Instrument (IFR) Wind Data Observations				
Runway 6-24 (Primary)	88.83%	94.11%	98.21%	99.62%
Runway 15-33	86.12%	92.12%		
Combined	97.67%	99.42%	99.90%	99.99%

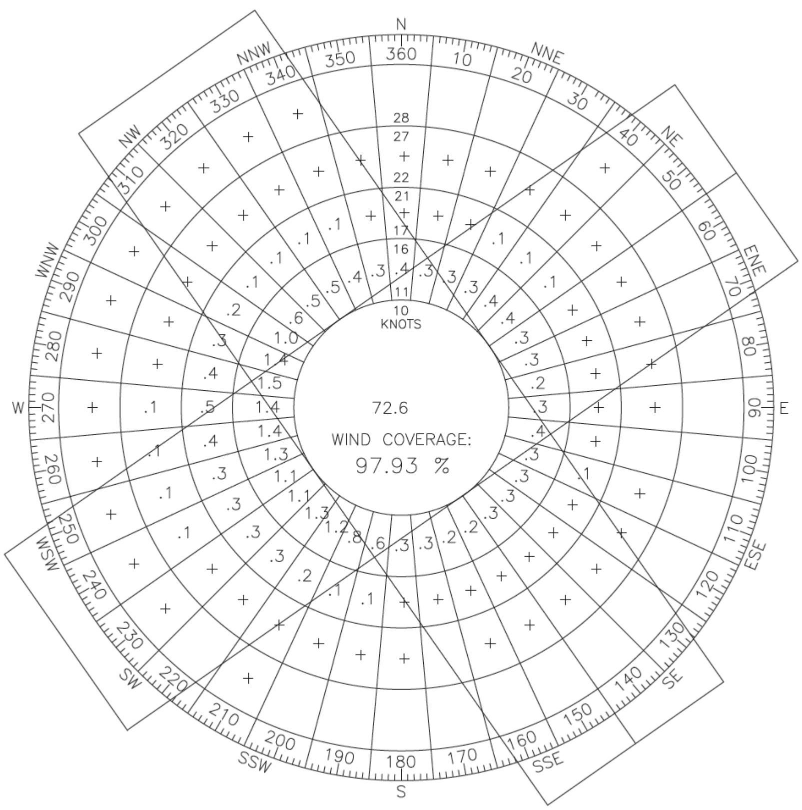
Note: Crosswind component computed using runway true bearing (145.03 & 55.03)

Note: Plus signs (+) on the wind rose represent wind direction and speed combinations which occur less than one-tenth of 1 percent of time

Source: FAA Airport GIS - Station 724295 Springfield-Beckley Municipal annual period record 2007 - 2016

Exhibit 4.3-2 provides the FAA Wind Rose created from the FAA Airport GIS files that were used to compute the above wind coverage percentages. Because it does not provide a clear-cut visualization of the data, **Exhibit 4.3-3** was created to provide more clarity by importing the FAA Airport GIS PRN file into Microsoft Excel.

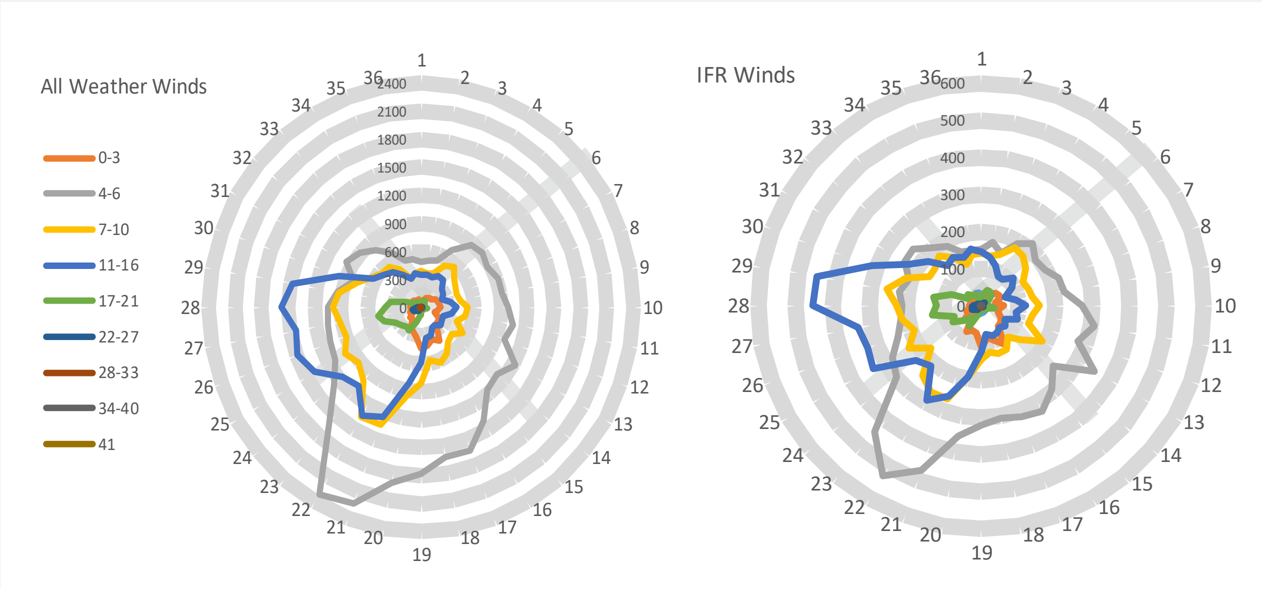
Exhibit 4.3-2: FAA Wind Rose



COMBINED ALL WX

Source: FAA Airport GIS - Station 724295 Springfield-Beckley Municipal annual period record 2007 - 2016

Exhibit 4.3-3: Wind Graphs



Source: FAA Airport GIS - Station 724295 Springfield-Beckley Municipal annual period record 2007 – 2016. PRN files imported into Microsoft Excel.

FAA AC 150-5300-13A states that a crosswind runway is recommended when the primary runway orientation provides less than 95.0 percent wind coverage for aircraft that are forecast to use the airport on a regular basis. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding the allowable value for the Runway Design Code (RDC). As can be seen in Exhibit 4.3-1, a required 95 percent crosswind coverage is not met at SGH considering 10.5 knots with a single runway, but is achieved with the two existing runways. At 13 knots, the primary runway meets the required 95 percent crosswind coverage. According to the FAA, only those aircraft with a crosswind runway component less than 13 knots or Group A/B-I RDC are considered critical users to the crosswind runway.

It is important to note that the winds have changed over time at SGH, and as detailed during the last ALP dated 08-10-2005, the airport had better wind coverage than it does now, indicating the wind coverage is decreasing. The primary runway had 97.54 percent at 13 knots in all-weather conditions in 2002 as shown on the last ALP and it has dropped to 95.35 in 2016. It had 97.06 percent coverage at 13 knots in IFR conditions in 2002 and it dropped to 94.11 percent in 2016. Should this trend continue, further loss of crosswind coverage on the primary runway can easily be anticipated at 13-16 knots. Accordingly, the wind condition trend should continue to be monitored.

4.4 Critical Design Aircraft

The design standards found in AC 150/5300-13A that are applicable to an airport are determined by a coding system that factors in the physical and operational characteristics of the airport's critical aircraft design, with safety setback distances for the facility. According to AC 150/5000-17, Critical Aircraft and Regular Use Determination, the critical design aircraft is the most demanding aircraft operating or forecast to operate at that facility on a regular basis. The characteristics of the design aircraft used in airport planning are approach speed, wingspan, tail height, main gear width, cockpit to main gear length, aircraft weight, and takeoff and landing distances. Dimensions for the layout of the airport that are determined by the design aircraft include runways, taxiways, taxilanes, and aprons, and associated setbacks, and clearances. The design aircraft may be a specific aircraft type, or a combination of aircraft characteristics, but they all fall into three parameters: Aircraft Approach Category (AAC), Aircraft Design Group (ADG) and Taxiway Design Group (TDG) as detailed previously in Exhibit 3.4-1: Runway Design Code (RDC) System. These parameters and more details related to the identification of design aircraft are outlined in the following pages.

The ***RDC of the primary runway*** on the previous ALP approved by the FAA was a D-IV, with design aircraft being the F-16/C-141. Those aircraft no longer regularly use the airport, so the RDC has been revaluated in the Forecast Chapter and determined to be a C-II with the Challenger 600 being the representative design aircraft (see Section 3.4 in Chapter 3).

The ***RDC of the crosswind runway*** on the previous two ALP ALP's approved by the FAA was a C-II. The design aircraft for the crosswind runway was also the Challenger 600. The last master plan stated the following:

> The large transient corporate aircraft are the most demanding general aviation aircraft using the airport. Taking into account all the operations by the large transient aircraft, results in an ARC of C-II for the crosswind runway and terminal area. This is the same ARC that was used for the crosswind runway in the 1992 Master Plan.

The crosswind analysis is only 0.36 percent away from validating the need for a Group II wind coverage in all weather. Regardless of this and the decreasing wind coverage over time as mentioned above and less than desired IFR coverage today, the FAA Detroit ADO does not support this runway being a C-II for AIP funding even though the Challenger 600 still operates at the airport, operates on Runway 15-33, is serviced by Spectra Jet, and only has a 15-knot maximum crosswind component. FAA AC 150/5300-13A, paragraph 201b states that for airports with two or more runways, "it is often desirable to design all airport elements to meet the requirements of the most demanding RDC and Taxiway Design Group (TDG)". This is what SGH has done and continues to support based on the needs of their users. Paragraph 201b of AC 150/5300 goes on to state, "it **may** be more practical and economical to design some airport elements, e.g., a secondary runway and its associated taxiway, to standards associated with a lesser demanding RDC." Although it is not required to reduce the RDC and often desirable not to, as in the case of SGH, the ADO is stipulating that the runway can only support an A/B-I RDC for funding as a crosswind if reconstruction is needed. Regardless, Airport Sponsor maintains the critical aircraft for the crosswind runway is a Challenger 600.

The ADO has indicated that the Airport Sponsor may wish to document the unique operations circumstances at the airport, or need of the crosswind runway by the community, and request the runway be designated as a secondary runway meeting C-II standards. This would include documentation of 500 annual operations of the critical aircraft if the Runway were to be reconstructed. The sponsor believes the forecast, following pages, and the forecasts show the additional aircraft needed for a secondary runway designation.

Exhibit 4.4-1: Challenger 600

Source: https://en.wikipedia.org/wiki/File:Bombardier.cl-600.n598mt.arp.jpg; https://commons.wikimedia.org/wiki/File:Cessna.citation550.arp.750pix.jpg

4.5 Airfield Capacity

Airfield capacity is the measure of the runway system's ability to accommodate the existing and future demand for airfield operations. Capacity is expressed both as an hourly capacity figure and as an annual figure. Hourly capacity is a measure of the maximum number of aircraft operations that can be accommodated in one hour. Annual capacity is expressed as the Annual Service Volume (ASV) and is a reasonable estimate of an airport's annual capacity. ASV is dependent on several factors: the hourly capacity, the differences in runway use, aircraft mix, and weather conditions, all of which are considered in the ASV calculation.

FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, provides the guidance for calculating the ASV. This advisory circular presents two methods for calculating capacity: long-range planning and specific facility assessment. The long-range planning method assumes that:

- Arrivals equal departures
- The percent of touch and goes (an aircraft landing followed by a takeoff without the aircraft coming to a full stop) is within a specified range
- There is a full-length parallel taxiway, ample runway entrance and exit taxiways, and no taxiway crossing problems
- There are no airspace limitations that would adversely impact flight operations
- The airport has at least one runway equipped with an instrument landing system (ILS)
- Instrument flight rule (IFR) conditions occur roughly 10 percent of the time
- Approximately 80 percent of the time, the airport is operated with the runway use configuration that produces the greatest hourly capacity

Operations at SGH roughly meet the above assumptions. To determine the airport capacity, the mix index for the airport needs to be calculated. The mix index is the relative percent of operations conducted by each of the four classes of aircraft shown in Exhibit I-1. The aircraft classifications are used to determine the mix index, which is required to calculate the theoretical capacity of an airfield. The mix index is defined as the percent of Class C aircraft (12,500 – 300,000 pounds) plus three times the percent of Class D aircraft (over 300,000 pounds), written as %(C+3D). (See **Exhibit 4.5-1.**) The percent of A and B class aircraft is not considered because the wake turbulence generated by these small aircraft dissipates fairly rapidly, thus other aircraft can be spaced closer to Class A and B aircraft than to a C or D class aircraft.

Exhibit 4.5-1: Aircraft Classifications for Capacity and Delay Analysis

Aircraft Class	Maximum Takeoff Weight	Number of Engines	Wake Turbulence Classification
A	12,500 or less	Single	Small
B	12,500 or less	Multi	Small
C	12,500-300,000	Multi	Large
D	Over 300,000	Multi	Heavy

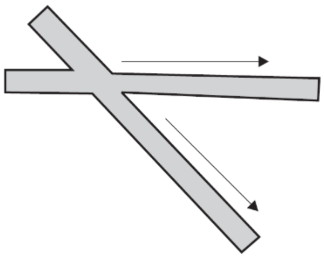
Source: FAA Advisory Circular 150/5060-5 Airport Capacity and Delay, Table 1-1.

All of the aircraft operating at SGH with maximum certified takeoff weights of more than 12,500 pounds fall within the wake turbulence classification of C. No D class aircraft, which are large air carrier jets, operate at SGH. Approximately seven percent of the annual operations at SGH are estimated to be by C - large aircraft for a mix index of seven percent.

Reviewing the long-term planning runway user configurations in FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, the two runway-use configurations represent the operations at SGH (primary and crosswind), as shown on **Exhibit 4.5-2**. Without an airport traffic control tower (ATCT) to direct traffic, takeoffs and landings occur on both runways with the aircraft flight paths crossing is larger aircraft can't use the crosswind runway.

With a mix index of 0-20, as shown on Exhibit 4.X-2, the long-range planning annual service volume (ASV) is estimated at 230,000 operations. The hourly capacity under visual flight rules (VFR) conditions is estimated at 98 operations per hour and under IFR at 59 operations per hour.

EXHIBIT 4.5-2: Capacity and Annual Service Volume for Long Range Planning



Runway Use Configuration	Mix Index % (C=3D)	Hourly Capacity Ops/Hr VFR	IFR	Annual Service Volume Ops/Yr
	0 to 20	98	59	230,000
	21 to 50	77	57	200,000
	51 to 60	77	56	215,000
	81 to 120	76	59	225,000
	121 to 180	72	60	265,000

Source: FAA Advisory Circular 150/5060-5, Airport Capacity and Delay

4.6 Runway System

Primary Runway 06-24

Length

Many factors go into determine the appropriate runway length for an airport: airport elevation, temperature, elevation change in the runway centerline, dry or contaminated pavement, and density altitude to name a few. These factors are critical because aircraft performance declines as elevation, temperature, pressure altitude, runway gradient and contamination increases.

The primary runway at SGH is 9,000 feet long and 150 feet wide. To determine the appropriate runway length for this runway, six independent analysis were completed:

1) Review of FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, Chapter 3
2) Review of actual aircraft operating manuals
3) Airport user survey
4) National Business Aircraft Association recommendations
5) Global Climate Change recommendations
6) FAA AC 91-79A, Mitigating the Risks of a Runway Overrun Upon Landing

Each of these independent analyses resulted in very similar results. **The analysis performed using FAA AC 150/53254-B, Chapter 3 are shown below as they are required to be used by airports receiving federal funding.** The other analysis have been moved to **Appendix E** at the request of the Detroit ADO since they are not deemed relevant by the ADO for FAA funding from the Airport Improvement Program, and the ADO is most interested in funding requirements for justifying a supported runway length condition. The aircraft operations analyzed were collected from instrument flight plans (IFR) filed with the FAA departing from and arriving at SGH. The following section reviews the process for applying FAA AC 150/5325-4B, Runway Length Requirements for Airport Design to SGH:

A) Overview

The FAA has historically categorized aircraft on several other characteristics in addition to those used in RDC coding. In FAA AC 150/5325-4B, aircraft are categorized as follows:

I. Maximum takeoff weight of 12,500 lbs. or less (Small)
   - Small airplanes with less than 10 passengers
   - Small airplanes with 10 or more passengers
II. Maximum takeoff weight of more than 12,500 lbs. up to and including 60,000 lbs. (Large)
   - Large airplanes that make up 75% of fleet
   - Large airplanes that make up the remaining 25% of the fleet
III. Maximum takeoff weight of more than 60,000 lbs.

SGH serves both small piston aircraft and business jets. FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, provides the recommended runway length for the first two above described weight categories of airplanes based on performance curves developed from FAA-approved airplane flight manuals. This AC states the following:

> General aviation (GA) airports have witnessed an increase use of their primary runway by scheduled airline service and privately owned business jets. Over the years business jets have proved themselves to be a tremendous asset to corporations by satisfying their executive needs for flexibility in scheduling,

speed, and privacy. In response to these types of needs, GA airports that receive regular usage by large airplanes over 12,500 pounds (5,670 kg) MTOW, in addition to business jets, should provide a runway length comparable to non-GA airports.

The FAA TFMSC data showed approximately 1,190 business jets, 294 Air Carrier, and 35 Air Taxi aircraft used SGH in 2017. TFMSC source data are created when pilots file flight plans and/or when flights are detected by the National Airspace System (NAS), usually via RADAR.

For primary runways, FAA AC 150/5325 states that "The design objective for the main primary runway is to provide a runway length for all airplanes that will regularly use it without causing operational weight restrictions" with "regular use" meaning 500 annual operations. This is the threshold used by the FAA to make AIP eligibility and justification determinations. Runway length requirements are determined by analyzing the requirements of SGH's current and forecasts critical aircraft. AC 150/5325-4B states that "the **recommended** length for the primary runway is determined by considering either the family of airplanes having similar performance characteristics or a specific airplane needing the longest runway." [1] The AC provides recommended runway lengths for aircraft that weigh more than 60,000 pounds, and for aircraft that weigh 60,000 pounds or less.

B) Fleet Category

Paragraph 302 of AC 5325-4B instructs that if the airport is planned for operations that will include only turbojet-powered airplanes weighing under 60,000 pounds (27,200 kg) maximum certificated takeoff weight (MTOW) in conjunction with other small airplanes of 12,500 pounds (5,670 kg) or less, the planner should use the large airplane curve for either 75 percent of the fleet, or the large airplane curve for the remaining 25 percent of the fleet. To determine which of these two curves to use, the planner must first determine which one of the two "percentage of fleet" categories represents the critical design airplanes under evaluation.

The FAA forecasts approved for SGH detailed in the Aviation Forecasts chapter show a range of approximately 1,450 to 3,550 operations by turbine aircraft at SGH over the forecast period. While over 50 percent of these have been in in the 75 percent fleet category, over 42 percent are in the remaining 25 percent of the fleet category (100 percent fleet). **Exhibit 4.6-1** shows the turbine aircraft that used SGH as tracked by the FAA TFMSC in 2017. TFMSC source data are created when pilots file flight plans and/or when flights are detected by the National Airspace System (NAS), usually via RADAR. As shown in **Exhibit 4.6-2**, ***in 2017 over 550 operations of these aircraft are in the remaining 25% of fleet, which meets the FAA's criteria of regular use justifying the use of the 100 Percent of Fleet curves***. (Note: Not all aircraft operators file IFR flight plans or are captured by FAA enroute computers so this is only a partial list of operations that occurred at the airport.) ***This is an increase of over 30 percent from 2015 and over 25 percent from 2016***, which shows a climbing trend matching the economic upswing being felt by the community. No further tend analysis was complete as this reflects the most current years, the forecast year and prior to the forecast year, and the economy has rebounded since the Great Recession showing stable values trending in the positive direction.

[1] 1. FAA AC 150/5325-4B states the purpose of AC: "This Advisory Circular (AC) provides guidelines for airport designers and planners to determine **recommended** runway lengths for new runways or extensions to existing runways."

Exhibit 4.6-1: 2017 FAA Tracked Aircraft to/from SGH by Turbine Aircraft

Aircraft	Operations
AC90 - Gulfstream Commander	4
B350 - Beech Super King Air 350	8
BE10 - Beech King Air 100 A/B	2
BE20 - Beech 200 Super King	6
BE30 - Raytheon 300 Super King Air	1
BE40 - Raytheon/Beech Beechjet 400/T-1	10
BE9L - Beech King Air 90	23
BE9T - Beech F90 King Air	3
C208 - Cessna 208 Caravan	4
C25A - Cessna Citation CJ2	70
C25B - Cessna Citation CJ3	6
C25C - Cessna Citation CJ4	6
C25M - Cessna Citation M2	2
C441 - Cessna Conquest	2
C501 - Cessna I/SP	4
C510 - Cessna Citation Mustang	8
C525 - Cessna CitationJet/CJ1	18
C550 - Cessna Citation II/Bravo	8
C560 - Cessna Citation V/Ultra/Encore	12
C56X - Cessna Excel/XLS	23
C650 - Cessna III/VI/VII	6
C680 - Cessna Citation Sovereign	10
C68A - Cessna Citation Latitude	2
C750 - Cessna Citation X	8
CL30 - Bombardier (Canadair) Challenger 300	65
CL35 - Bombardier Challenger 300	23
CL60 - Bombardier Challenger 600/601/604	72
E120 - Embraer Brasilia EMB 120	2
E135 - Embraer ERJ 135/140/Legacy	4
E35L - Embraer 135 LR	2
E45X - Embraer ERJ 145 EX	1
E55P - Embraer Phenom 300	4
F2TH - Dassault Falcon 2000	4
F900 - Dassault Falcon 900	10
FA20 - Dassault Falcon/Mystère 20	9
FA50 - Dassault Falcon/Mystère 50	6
G150 - Gulfstream G150	1
G280 - Gulfstream G280	3
GLEX - Bombardier BD-700 Global Express	6
GLF4 - Gulfstream IV/G400	10
GLF5 - Gulfstream V/G500	8
H25B - BAe HS 125/700-800/Hawker 800	39
LJ25 - Bombardier Learjet 25	15
LJ31 - Bombardier Learjet 31/A/B	42
LJ35 - Bombardier Learjet 35/36	70
LJ40 - Learjet 40; Gates Learjet	23
LJ45 - Bombardier Learjet 45	105
LJ55 - Bombardier Learjet 55	19
LJ60 - Bombardier Learjet 60	277
LJ75 - Learjet 75	7
LR60 - Bombardier Learjet 60	1
MU2 - Mitsubishi Marquise/Solitaire	4
P180 - Piaggio P-180 Avanti	7
P46T - Piper Malibu Meridian	5
PAY4 - Piper Cheyenne 400	2
PC12 - Pilatus PC-12	29
PRM1 - Raytheon Premier 1/390 Premier 1	177
SBR1 - North American Rockwell Sabre 40/60	2
SW4 - Swearingen Merlin 4/4A Metro2	4

Aircraft	Operations
TBM7 - Socata TBM-7	2
TBM8 - Socata TBM-850	4
TBM9 - Socata TBM	2
Total	1312

Source: FAA Detroit ADO from TFMSC Report (City Pair) 2017; This data was provided from the FAA.
*Note: Not all aircraft operators file IFR flight plans or are captured by FAA enroute computers so this is only a partial list of operations that occurred at the airport.

Exhibit 4.6-2: 2017 FAA Tracked Aircraft to/from SGH by by 100% of Fleet

Aircraft	Operations
C650 - Cessna III/VI/VII	6
C680 - Cessna Citation Sovereign	10
C68A - Cessna Citation Latitude	2
C750 - Cessna Citation X	8
CL60 - Bombardier Challenger 600/601/604	72
F2TH - Dassault Falcon 2000	4
F900 - Dassault Falcon 900	10
GALX - IAI 1126 Galaxy/Gulfstream G200	4
H25B - BAe HS 125/700-800/Hawker 800	39
LJ45 - Bombardier Learjet 45	105
LJ55 - Bombardier Learjet 55	19
LJ60 - Bombardier Learjet 60	277
Total	552

Note: there are additional aircraft larger than 60,000 pounds using the airport not included in this table.

Exhibit 4.6-3 and **4** shows the curves for SGH's primary runway for 75 percent of the fleet and 100 percent of the fleet, respectively, while **Exhibit 4.6-5** provides a table with the resulting recommended runway lengths for the runway with the appropriate gradient and surface condition adjustments factored into the results.

Exhibit 4.6-3: 75 Percent of Fleet at 60 or 90 Percent Useful Load

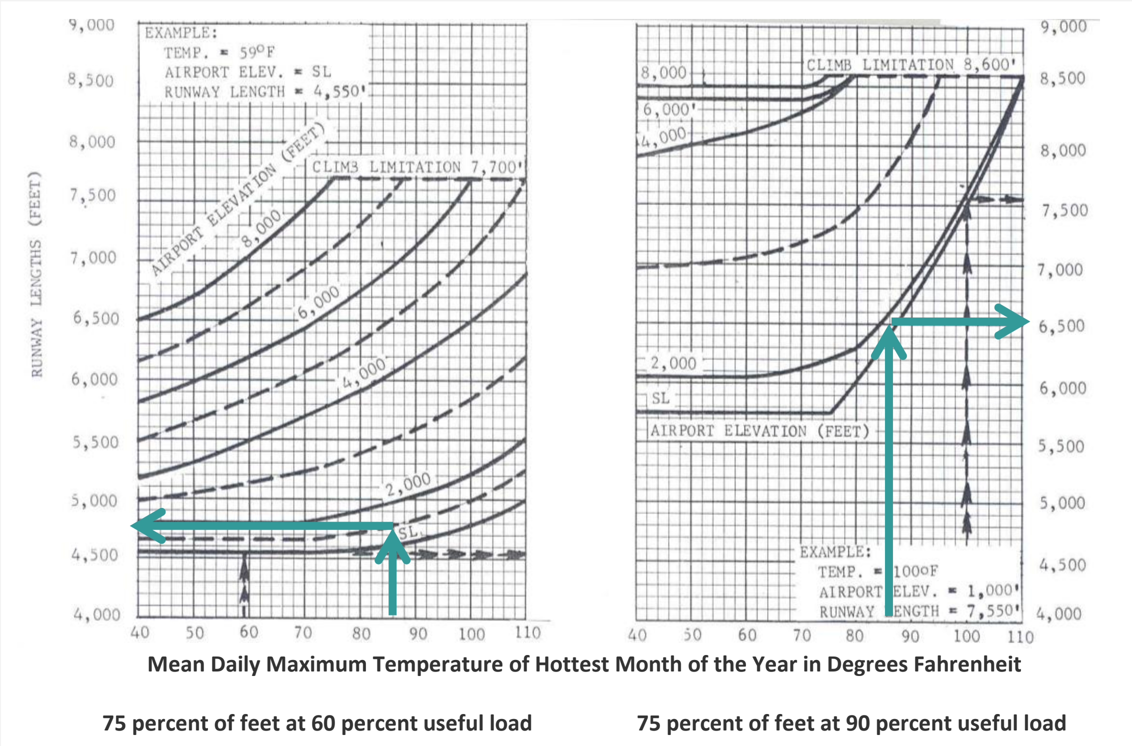
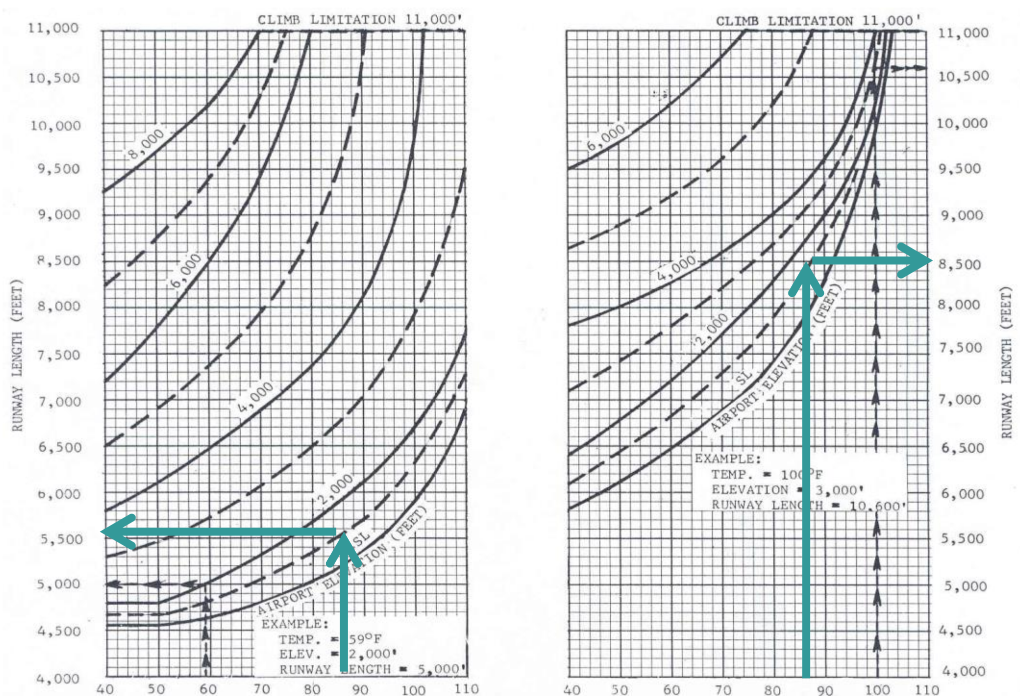


Exhibit 4.6-4: 100 Percent of Fleet at 60 or 90 Percent Useful Load



Mean Daily Maximum Temperature of Hottest Month of the Year in Degrees Fahrenheit

100 percent of feet at 60 percent useful load **100 percent of feet at 90 percent useful load**

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

Exhibit 4.6-5: Runway 06-24 Length Requirements

Airport and Runway Data				
Airport Elevation		1,051 ft. MSL		
Mean daily maximum temperature of the hottest month		86.0 F		
Maximum difference in runway centerline elevation (gradient)		14.3 ft.		
Runway Length Recommended for Airport Design	**Unadjusted**	**Gradient (Adjusted 143 ft.)**	**15% Adjusted Wet Conditions**	**After FAA Maximum Cap Applied for Wet Conditions (Max 5,500 - 60% load Max 7,000 - 90% load)**
Large airplanes of 60,000 pounds or less				
75% of these large airplanes at 60% useful load	4,750	4,893	5,627	5,500
75% of these large airplanes at 90% useful load	6,550	6,693	7,697	7,000
100% of these large airplanes at 60% useful load	5,550	5,693	6,547	5,693
100% of these large airplanes at 90% useful load	8,500	8,643	9,939	8,643

Note: The runway lengths obtained from curves are increased at the rate of 10 feet for each foot of elevation difference between the high and low points of the runway centerline. By regulation, the runway length for turbojet-powered airplanes obtained from the "60 percent useful load" curves are increased by 15 percent or up to 5,500 feet, whichever is less. By regulation, the runway lengths for turbojet powered airplanes obtained from the "90 percent useful load" curves are also increased by 15 percent or up to 7,000 feet, whichever is less. These adjustments are not cumulative.

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

In reviewing the results for these generic FAA curves for the runway length requirements for the remaining 25% of fleet category, 8,643 feet is the recommended length that would accommodate "all airplanes that will regularly use the airport without causing operational weight restrictions."[2] It is also important to note that FAA regulations require that all Part 91(k) and Part 135 (the regulations under which many private jet aircraft operate) flights must be able to land within 60 percent of the available runway length on any given runway.[3] This means that the aircraft must be able to land on 5,400 feet at SGH if operating under Parts 91(K) or 135. There were 329 operations by Air Carrier or Air Taxi operators in 2017, growing 22 percent from 2015. (See **Exhibit 4.6-6**.) Any reduction in the existing 9,000 feet runway length is in effect reducing the landing length to even less than 5,400 feet for aircraft operating under these rules. Couple this with the 13 factors that result in overruns described in FAA AC 91-97A, Mitigating the Risks of a Runway Overrun Upon Landing, makes the Sponsor unsupportive of any runway length reductions. See Appendix E for more information on related analysis for the recommended length for Runway 6-24.

Exhibit 4.6-6: Air Taxi and Air Carrier Operations

Year	Operations	Annual percent increase	2-year percent increase
2015	269		
2016	279	4%	
2017	329	18%	22%

Source: TFMSC City Pair Data, FAA Detroit ADO, 2018

To best determine the recommended runway length for airport design a more detailed review of the useful load is shown below.

C) Useful load

While AC 150/5325-4B does address haul lengths as a factor in the useful load determination, it does not dictate that the haul length needs to be determined by the first leg destination of a trip and it allows for consideration of the service needs of the airport and its users. ***FAA AC 150/5325-4B specifically directs use of either "60 percent useful load" curves or the "90 percent useful load" curves on the basis of the haul lengths and service needs of the critical design airplanes"***.[4] The haul length on the initial leg of a departure from SGH alone is not the only factor in determining if an aircraft is taking off at loads greater than 60 percent. And if an aircraft is taking off at more than 60 percent useful load, the AC directs use of the 90 percent curves. FAA AC 150/5325-4B specifically states that the ***60 percent curves are only "to be used for those airplanes operating with no more than 60 percent load factor".***[5] It also states ***"Interpolation is allowed only within a single set of curves*** (e.g., an elevation at 2,500 feet within the "75 percent of the fleet at 60 percent useful load" set of curves) but not valid between sets of curves (e.g., an 85 percent useful load between the set of curves "75 percent of the fleet at 60 percent useful load" and "75 percent of the fleet at 90 percent useful load."[6]

The FAA Detroit ADO has challenged fully funding and maintaining SGH's primary runway at the length recommended when using the 90 percent useful load curves on a variety of different rationale including that some of these aircraft are being sent for repair and thus would not have a large payload factor or passengers, that they have generally not seen those curves used in master plans, and that aircraft using SGH are not departing to destinations on their first leg that

[2] FAA AC 150-5325-4B, Page 3. At 9,000 feet in length, SGH's primary runway is just slightly longer than this.

[3] FAA AC 91-79A, *Mitigating the Risks of a Runway Overrun Upon Landing*: This equates to 1.76 times the actual dry landing length and 1.92 times the wet landing length (additional 15% for wet) required for the aircraft. The Destination Airport Analysis Program (DAAP) can be used to decrease the dry length to 80% in certain situations.

[4] AC 150/5325-4B, page 9

[5] Ibid., page 9

[6] Ibid., page 9

are far enough away to justify the need for 90 percent useful load. The ADO states that these curves may not be used unless there are a significant number of operations departing with greater than 60% useful payload and that the 2017 City Pair Data show a majority of operations for less than 500 miles.

Fuel load aside, first leg destinations over 500NM received from the FAA were reviewed for aircraft that were in the 100 percent fleet or greater categories (critical design airplanes per AC 150/5325-4B). In 2015, there were 54 departures by aircraft in the 100 percent fleet or larger to first leg destinations of 500 miles or more away. In 2016, there were 74 of these departures and in 2017 there were 98 of these departures. **See Exhibit 4.6-7**.) (Note, these years match the analysis done under Part B.) This is a 72 percent increase in two years and shows a number of users needing or requesting over 60 percent load[7] when taking into consideration fuel reserve requirements for flying to the specified destination, then to an alternate airport, and then for 45 minutes normal cruise after[8]. This growth in 500 NM destination and fuel loading at SGH is further supported by Spectra Jet business volume increases and jet fuel sales at the airport which have grown over 19% since 2015. This is not seen as an anomaly based on Spectra Jet's business plan of 20% growth per year as shown in Appendix E or the Sponsors strategy on fuel pricing.

Exhibit 4.6-7: Departures by 100% fleet with destinations over 500 miles

Year	Departures	Annual percent increase	2-year percent increase
2015	57		
2016	74	30%	
2017	98	32%	72%

Source: City Pair Data, FAA Detroit ADO, 2018

If 500 operations are needed to determine regular use, then the 98 departures shown for 2017 (see Exhibit 4.6-5 for 100 percent fleet going over 500 miles on first leg) represent 40 percent of the aircraft takeoffs needed to use the 100 percent fleet[9] . It is important to note that in this rationale, the FAA has not factored arrivals into the equation, which may include many aircraft that come in greater with than 60 percent load if traveling from short distances. Also noteworthy is that many aircraft takeoff VFR and file flight plans in the air, so total departures by 100 percent fleet are actually underreported by the City/Pair data. The departures and arrivals of aircraft with greater than 60% useful load needs is considered significant to the airport sponsor because of the service needs of the local business, the economic impacts of the users, and the fuel revenue created to support the airport's operation (as described on the next page)[10].

Another important point to the discussion is that many aircraft are at 60 percent useful load on a regular basis. Take for instance the Learjet 60, which is in the 100% fleet category. It has a maximum takeoff weight of 23,500 pounds. The usable load for this aircraft is approximately 8,700 lbs.[11] Taking on full fuel (7660 lbs. usable fuel puts the aircraft at 88% percent useful load with no passengers. The Citation 750, Falcon 900, Falcon 2000 are at 90% or higher in the same situation. (See **Exhibit 4.6-8.**)

[7] A Payload Breakpoint/Payload-Range analysis was not completed as this is referred to under Chapter 4 of AC 150/5325-4B, and Chapter 3 has been used for this runway length analysis.

[8] CFR 91.167 Fuel requirements for flight in IFR conditions.

[9] Both takeoffs and landings are included in regular use.

[10] This same type of analysis was completed on the 75 percent fleet mix of aircraft. Results were similar enough to warrant use of its 90 percent useful load curves and 7,000 feet on Runway 6-24. Results not provided as the 100 percent fleet mix was significant.

[11] Airplane Flight Manual, Learjet 60

Exhibit 4.6-8: Percent Useful Load Used with Fuel and No Passengers

Aircraft	Percent at Full Fuel	Percent at ¾ Fuel
Learjet 60	88%	66%
Citation 750	90%	67%
Falcon 900	91%	68%
Falcon 2000	92%	69%
Learjet 55B	72%	54%
Learjet 45	88%	66%
Challenger 600	85%	64%
Hawker 800A	86%	64%

Sources: Global Aviation Navigator, 2018;
Woolpert, Inc. 20018

As mentioned above, fuel loading plays an important role into an operator's useful load concerns. It is also an important factor of the airport sponsor in striving to remain sustainable as required by the FAA under grant assurance #24. This Federal obligation requires SGH to maintain a fee and rental structure for the facilities and services at the airport that will make the airport as self-sustaining as possible. One of the ways SGH does this it by focusing on competitive fuel prices. (See **Exhibit 4.6-9**.) SGH jet fuel sales have consistently gone up over the same years as analyzed under as the fleet and useful load sections, specifically 19.3 percent.

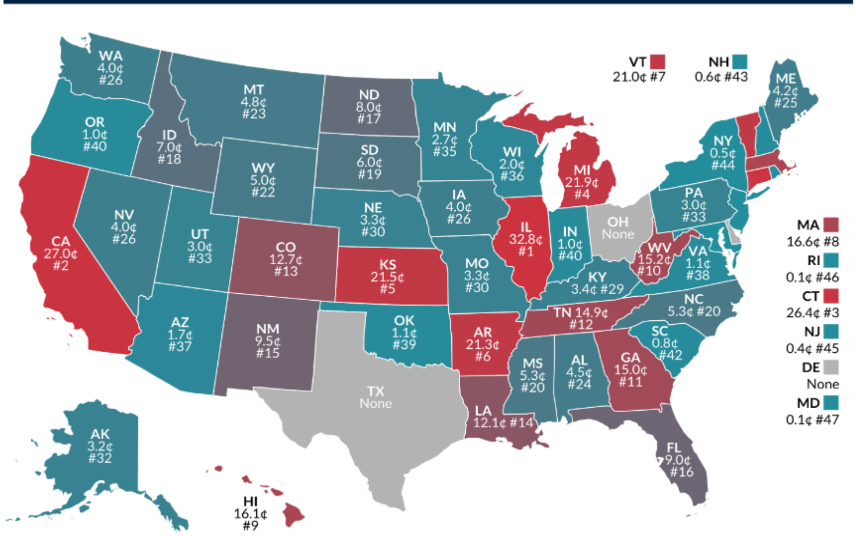
***It is very important to point out that Ohio does not have a jet fuel tax*, and the airport has lower fuel prices than many of the airports SGH's customers are ultimately going to** (see **Exhibit 4.6-9**), so they often leave fully fueled to take advantage of lower fuel costs. As sampling of jet fuel prices at other "arrival" airports where SGH is the departing airport (from AIRNAV reported jet fuel prices on August 30, 2018) is also shown in Exhibit 4.6-9. With the cost of carrying excess fuel at about four percent per hour, the fuel cost at a destination only has to be more than four percent less at SGH for there to be a financial advantage to carrying the extra fuel. And logic goes on to say that carrying excess fuel favors shorter legs as opposed to longer ones. This further justifies that reliance on first leg trip length for determining the percent of useful load that an aircraft is operating use is not rational.

Exhibit 4.6-9: Jet Fuel Price Comparisons

Airport - FBO	Jet Fuel Price $	% Difference	Cost savings of carrying 500 extra pounds one hour
SGH - S Jet	**4.45**		
AKR – Summit Airport Services	4.57	2.7%	$-29
CMH – Lane Aviation	5.28	18.7%	$326
CMH - Signature	6.28	41.1%	$826
CVG – Delta Jet Center	6.33	42.2%	$851
FTY – Hill	6.99	57.1%	$1181
FTY – Signature	7.74	73.9%	$1556
ICT – Signature	6.40	43.8%	$886
ICT – Yingling Aviation	5.74	29.0%	$556
LIT – Lynx	5.04	13.3%	$206
LIT – TAC Air	5.81	30.6%	$591
LUK - Signature	6.92	55.5%	$1146
LUK – Waypoint	6.62	48.8%	$996
MEM - Signature	7.12	60.0%	$1246
MEM – Wilson Air Center	6.92	55.5%	$1146
MIA - Signature	8.52	91.5%	$1946
OSU – OSU	4.79	7.6%	$81
PHL – Atlantic	6.09	36.9%	$731
TEB – Jet Aviation	7.33	64.7%	$1351
TEB – Signature	8.51	91.2%	$1941
TOL – Grand Aire	4.56	2.5%	$-34
TOL- NF	4.59	3.1%	$-19
TXK – TAC Air	5.39	21.1%	$381
VNY – Jet Aviation	5.25	18.0%	$311
VNY – Signature	5.87	31.9%	$621
Sources: Ohio.gov; taxfoundation.org/maps; AIRNAV, 8-30-18.			

Combined Effective Commercial Jet Fuel Tax Rates and Fees per Gallon by State

TAX FOUNDATION Since 1937



Notes: Rates assume a wholesale price of $3/gallon. Does not include 4.4 cent/gallon federal excise tax. Airlines for America has developed a methodology for determining the effective tax rate on a gallon of commercial airliner fuel. Rates may include: state excise taxes, sales taxes, burn-rate adjustments, or other taxes/fees.
Data as of June 1, 2014. Published June 25, 2014.

Source: Airlines for America (A4A) member tax departments

Combined Effective Commercial Jet Fuel Tax Rates and Fees per Gallon by State

Lower Rate — Higher Rate

taxfoundation.org/maps

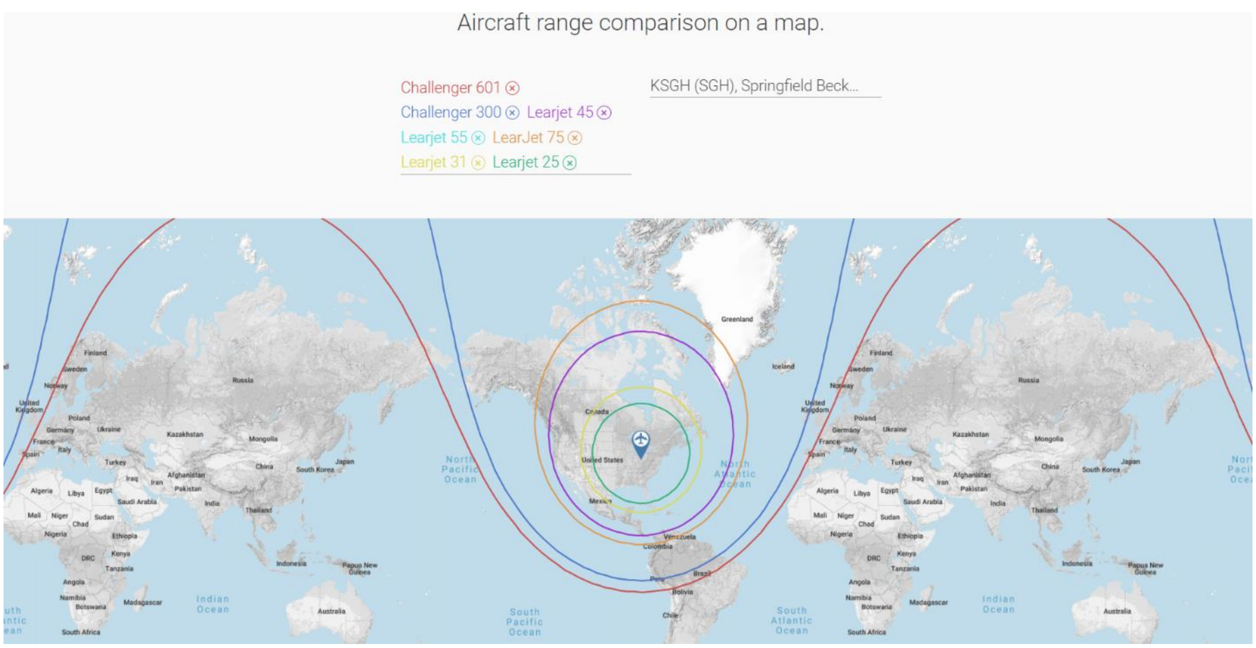
D) Service Needs

As also discussed in the previous section under useful load, FAA AC 150/5325-4B allows for service needs to be accounted for when determining runway lengths. The importance of safety cannot be overemphasized in relation to aircraft maintenance. Spectra Jet, Inc., provides complete repairs for all Learjet models and the Challenger 300 and 600 series of aircraft from all over the world (not just the United States). Transient operations for SGH include destinations all over the entire United States in addition to other countries (Source: Key Airport Tenants and IFR Data, 2018) as shown in **Exhibit 4.6-9A**. The ranges of the Challengers and Learjets are also shown in **Exhibit 4.6-9B.**

Exhibit 4.6-9A: SGH Customer Base Locations

Green indicates where SGH customers are known to fly to or from.

Exhibit 4.6-9B: Aircraft Ranges for Challengers and Learjets



The in-depth maintenance performed by Spectra Jet includes airframe inspections, system troubleshooting, time change items, engine changes, and modifications. This includes full tear downs as shown in **Exhibit 4.6-10,** where the wings, engines, etc. of Learjet aircraft are completed removed during a required inspection.

Exhibit 4.6-10: Lear 35 Flight Controls, Wings, Tip Tanks, Engine Removal

Source: Spectrajetinc.com

Many of the procedures that Spectrajet performs require functional check flight (FCF), which are referred to as non-revenue flights by the FAA. Their purpose is to ensure all the aircraft components are working properly.

"FCFs involve risks beyond those of ordinary line flying. Some checks involve shutting down a necessary system in flight to see if it can be restored. These flights test backup on seldom-used systems or functions and involve procedures normally not used in line operations."[12] FAA InFO 16006, issued 5/29/16, states the following in relation to non-revenue flights, or FCFs: "Accidents and incidents as highlighted by the Flight Safety Foundation's "Functional Check Flight Compendium" show that non-revenue flights have a higher risk of being involved in an accident or incident than revenue flights." The Compendium states the following in relation to an airfield where a FCF is being conducted:

> The airfield to be used is rarely a matter of choice but it is wise to consider any implications stemming from the airfield itself. The runway capability, the height above sea level and its effect on performance, high ground and obstacles, the available navigation aids, and the active NOTAMs all need to be considered as well as the general operational situation. For example before doing a rejected takeoff or braking check, ask the question "is the operational runway the only runway in use?" and consider at what time of day the RTO will be carried out in respect to scheduled traffic. Burst a tire at a busy time and you will not be too popular. At the bigger and busier central hubs, a short flight to another quieter airfield will probably be the answer.

The length of SGH's primary runway, the absence of airline traffic, its clear approaches, and compatible land uses near the airport make it an ideal location for conducing FCFs, which is a major reason why Spectra Jet, Inc. located on the airport. The runway length at SGH is a service need for the operations being conducted at SGH by Spectra Jet, and any loss in runway length will impact Spectra Jet's operation.

[12] https://flightsafety.org/asw-article/functional-check-flights/

E) Runway 06-24 Length Summary

In 2017 over 550 operations were by aircraft that are in the 100 percent fleet category (aka, remaining 25 percent of the fleet), which meets the FAA's criteria of regular use, therefore justifying the use of the 100 percent of fleet curves. Additionally, the trends for these types of aircraft using SGH is up 30 percent since 2015 showing stable operations.

When determining whether to use 60 percent useful load or 90 percent useful load, FAA AC 150/5325-4B allows for the consideration of service needs and haul length and does not require haul length to be determined by the first leg of a trip. Even with limited rationale as requested by the FAA (first leg of trip and departures only), SGH's departures by 100 percent fleet or larger aircraft represent 40 percent of the total takeoffs needed to justify use the 100 percent fleet so surely they must be considered significant in addition to consideration of all other factors as directed in the FAA AC's (as there is no requirement for 500 critical operations requiring application of a useful load chart). With Spectra Jet's plans for a hangar (business) expansion, these numbers are expected to increase.

If an aircraft is taking off at more than 60 percent useful load (which many are on a regular basis as shown for the Learjet 60 in a previous section) the AC directs use of the 90 percent curves. Fuel sales at SGH are an important factor for the airport in striving for sustainability under grant assurance #24, and the airport has some of the lowest fuel prices in the country and no State fuel tax on Jet A. Therefore, aircraft often leave fully fueled regardless of their first leg destination (500 NM or Less) or their service need (maintenance only) resulting in more than 60 percent useful loads (which requires use of the 90 percent curves) and providing the airport with a substantial revenue stream. SGH jet fuel sales have consistently gone up significantly over the recent years and the airport is dependent on this revenue stream. This may likely be a result of timing with the Spectra Jet ramp expansion, fuel tank installation and the tax reform change within the last three years. With their plans for a building expansion, this is only expected to continue to generate more significant operations of the larger critical design fleet mix of aircraft.

Spectra Jet located at SGH because of the runway length, lack of airline operations, and clear approaches. The runway length at SGH is a service need for the heavy maintenance operations being conducted (and their associated functional check flights) by Spectra Jet, and any loss in runway length will impact Spectra Jet's operation and the City of Springfield's economic impact from Spectra Jet's business (e.g. fuel revenue and jobs, both of which help the city maintain the airport).

In summary, the airport has a significant number of 100 percent fleet category at over 60 percent load/longer haul distances on a regular basis, a low cost fuel load incentive and a specific service need that warrants use of the 90% useful load curves to justify at least 8,643 feet in runway length and up to 9,700 for the critical design aircraft by review of the aircraft's Airport Planning Manual so as not to limit runway use by new/existing users within the critical design mix of aircraft or damage the economics of the airport environment (e.g. revenue, jobs). Refer to the Alternatives Chapter for a final evaluation and recommendation of the runway length.

Runway 06-24 Width

The width for SGH's primary runway is dictated by FAA AC 150/5300-13A, Airport Design, which states that a C-II runway is to be 100 feet wide. The runway is currently 150 feet wide. Reducing the width should be analyzed at the next large maintenance project required on the runway. While a width reduction may appear fairly obvious, FAA AC 150/5340-30H, Design and Installation Details for Airport Visual Aids, states the maximum distance for runway lights from the edge of the runway is 10 feet. The runway lights for the primary runway at SGH are currently set 10 feet from the runway edge, so narrowing the runway would require relocating the runway lighting system also, or getting modification for standards from the FAA for them to remain in place.

Runway 06-24 Navigational Aids (NAVAIDS) and Instrument Approach Procedures.

The best approach into Runway 6-24 is the GPS(LPV) to Runway 24 with the ILS out of operation. This approach also includes an Approach Lighting System (transferred from OANG to the airport) with Sequenced Flashers (ALSF-II), which is partially located in the pavement over-run beyond the runway threshold. Due to the age, system and modifications to the Glideslope and Localizer, they will be shut down and salvaged for what parts can be sold as it is locally owned by the airport. It is estimated that a new ILS system would cost over $1.5 Million. The benefit-to-cost based on existing systems are too low to warrant FAA/ODOT and/or local funding support for replacement. It is recommended the airport await improvement in FAA technology before investing.

On the Runway 24 approach, when the full ILS (glide slope and localizer) and ALSF-II were operational, the minimums were ½ mile visibility and 200 feet cloud ceiling. Runway 24 is also served by a RNAV(GPS) with LPV minimums of ½ mile visibility and 200 feet cloud ceiling. These approaches align fairly well with the prevailing winds and provide suitable landing capability during inclement weather. In order to maintain these minimums, the airport must keep the approach lighting system operational at all times are the minimums will be increased. Currently, without an ILS, these are the best Runway 24 approach best minimums the airport can obtain from the FAA and should be maintained.

The best approach to Runway 6 is served by RNAV(GPS) minimums of are 1-mile visibility and 303 feet cloud ceiling. This approach is also adequate for the end of the runway not aligned with prevailing winds. It is recommended that obstacles be evaluated to determine what can be mitigated to lower the cloud ceiling or enhance the GPS to LPV where reasonable and feasible.

Runway 06-24 Design and Separation Standards

In addition to length and width, FAA AC 150/5300-3A includes several other standards for airports. These runway design and separation standards are presented in **Exhibit 4.6-11**.

Exhibit 4.6-11: Runway 06-24 C-II Design and Separation Standards

Standard	Requirement	Existing (Actual Condition shown if Exceeding Requirement)
Length	8,643 feet recommended	Meets
Runway Width	100 feet	**Meets (150 feet)**
Shoulder Width	10 feet	Meets
Runway Safety Area	500 feet wide 1000 feet beyond end	Meets
Runway Object Free Area	800 feet wide 1000 feet beyond end	Meets
Runway Obstacle Free Zone	400 feet wide 200 feet beyond runway end	Meets
Precision Runway Obstacle Free Zone	Runway 24: 200 feet wide, 800 feet long Runway 6: NA	Meets
Runway Protection Zone	Runway 24: 78.914 acres (1/2 Mile) Runway 6: 29.465 (1 Mile)	Road Road/Houses
Runway Centerline to Holding Position	250 feet	Meets
Runway Centerline to Parallel Taxiway	400 feet	**Meets (737 ft.)**
Runway Centerline to Aircraft Parking	500 feet	Meets (824 ft.)

Source: Woolpert, 2016
Runway Protection Zone size is based on approach conditions. Refer to Instrument Procedures for Details

Exhibit 4.6-12: Existing Airport Modification of Standards (Runway 06-24 Environment)

FAA Airspace Case Number: 95-AGL-906-NRA	
04-06-1995	Historic shadowing of Taxiway F by Hangar #2. TVOR, TACA, Wind-T, Portion of Runway 06 VASI in RVZ. S.R. 794 is a 3 foot penetration to the Runway 24 50:1 approach and penetrations north edge of RPZ for approximately 150 feet.
FAA Airspace Case Number: 01-AGL-968-NRA	
04-06-1995	Runway 06-24 E5 Barrier Chain Arresting Barrier Installation and operation in overrun
FAA Airspace Case Number: Unknown	
08-10-2005	Runway 15-33 Safety Area Width is 400 feet as allowed per FAA AC 150/5300-13, Table 3-3, note 4. Runway 06-24 Safety Area contains arresting barrier systems that are fixed by function per documented Military Need Statement. Use of C-141 (160 ft. wingspan) as the largest Group IV aircraft operating at the airport to establish taxiway centerline to aircraft parking apron separation.

The arresting barriers have been removed, so this modification is no longer needed

In summary, the primary runway meets most of the design and separation standards. A reduction in the Runway Centerline to Parallel Taxiway Separation to meet FAA design standards is not recommended as the FAA standard is the minimum. A reduction is not reasonable or feasible given that any taxiway extension or taxiway connector would be the only affected interest of the FAA. The costs to cover the 337 additional feet would be minimal compared to relocating the primary taxiway.

Runway 06-24 Strength

The strength of airfield pavement is based on three factors:

Aircraft weight;
Aircraft gear type; and,
Number of aircraft operations.

The Primary Runway at SHG has a pavement strength rating through the FAA of 50,000 pounds single wheel loading (SWL) and 60,000 pounds dual wheel loading (DWL), which is considered adequate for the type of aircraft that is expected to use the airport on a regular basis. The Pavement Classification/Condition Number (PCN)[13] for this runway is 60/R/B/W/T. The PCN and weight limits do not appear to correlate properly and it is recommended that this be further evaluated to determine if there is an error in the information or if a strengthening project in the next 20 years is recommended to prevent premature failure of the pavement due to overweight aircraft.

Refer to the Chapter 1 Inventory for information on existing pavement condition. It is currently noted as in good condition or better with routine and preventative maintenance recommended at this time.

Crosswind Runway 15-33

Crosswind Runway 15-33 Length and Width

According to FAA policy, the allowable crosswind component for a runway is determined by the RDC, not the design aircraft. While the crosswind should be long enough to handle many of the aircraft using the primary[14], which would be the Challenger 600 since it only has a 15-knot maximum crosswind component, the FAA Detroit ADO does not support funding to this length.

The design aircraft for the crosswind runway on the previous two ALPs approved by the FAA was also the Challenger 600. The last master plan stated the following:

> The large transient corporate aircraft are the most demanding general aviation aircraft using the airport. Taking into account all the operations by the large transient aircraft, results in an ARC of C-II for the crosswind runway and terminal area. This is the same ARC that was used for the crosswind runway in the 1992 Master Plan.

It is important to note that the winds have changed over time at SGH, and **during the last ALP, the airport had better wind coverage than it does now, indicating the wind coverage is decreasing. The primary runway had 97.54 percent at 13 knots in all-weather conditions in 2002 and it has dropped to 95.35 in 2016. It had 97.06 percent coverage at 13 knots in IFR conditions in 2002 and it dropped to 94.11 percent in 2016.** Regardless of the decreasing wind coverage over time and less than desired IFR coverage today, the FAA Detroit ADO do not support this runway being a C-II even though the Challenger 600 still operates at the airport, is serviced by Spectra Jet, and only has a 15-knot maximum crosswind component. The ADO stipulates that the runway can only support a B-I RDC for funding.

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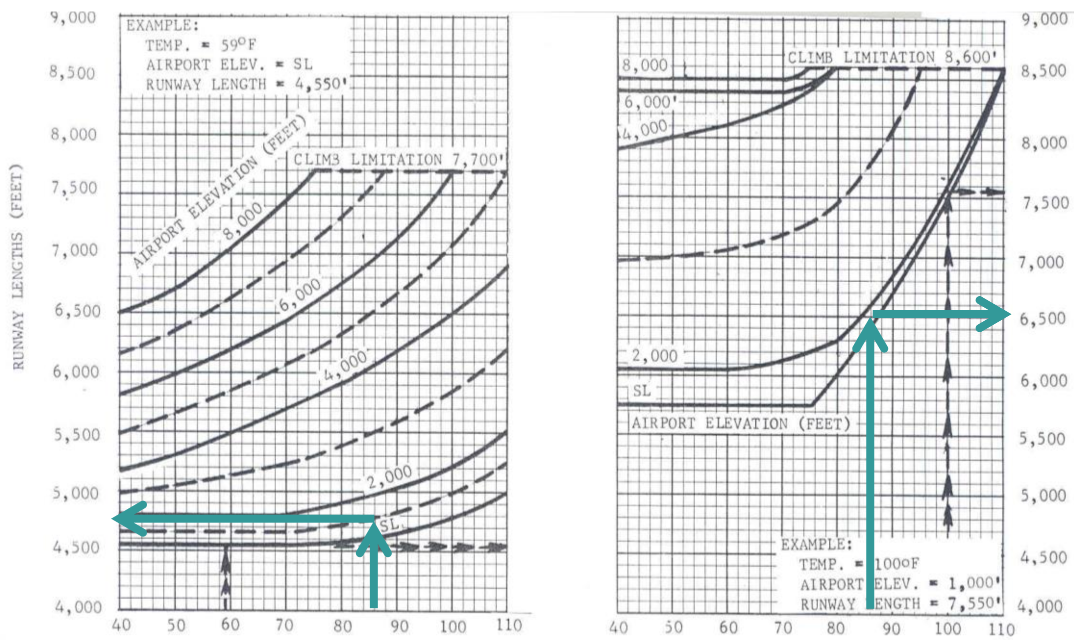
[13] A numerical value that indicates the load-carrying capacity of the pavement. The first letter indicates the rigidity of the pavement; the second (R for rigid and F for flexible) the second letter: it expresses the strength of the subgrade (A for high, B for medium, C for low, D for ultralow), the third letter expresses the maximum tire pressure that the pavement can support, and the fourth letter indicates if the the PCN value was determined by a technical evaluation or by using aircraft. From (FAA AC 150/5335-5B, *Standardized Method of Reporting Airport Pavement Strength PCN*)

[14] FAA AC 150/5325-4b states that the crosswind runway should be "100% of the recommended runway length determined for the lower crosswind capable airplanes using the primary runway."

The crosswind runway is currently approximately 5,500 feet long and 100 feet wide. At 100 feet in width, the runway meets the C-II RDC requirement.

While the existing crosswind runway length is needed by C-II category aircraft like the Challenger 600 in certain conditions, it is also needed by most all of the 75% fleet/B-II aircraft users of the airport. The lengths for these aircraft as recommended in AC 150/5325-4B are shown in **Exhibits 4.6-13** through **4.6-14.**

Exhibit 4.6-13: Airplanes with MTOW Greater than 12,500 Pounds (75 Percent of Fleet at 60 or 90 Percent Useful Load)



Mean Daily Maximum Temperature of Hottest Month of the Year in Degrees Fahrenheit

75 percent of feet at 60 percent useful load **75 percent of feet at 90 percent useful load**

Exhibit 4.6-14: Runway 15-33 Length Requirements

Airport and Runway Data	
Airport Elevation	1,051 ft. MSL
Mean daily maximum temperature of the hottest month	86.0 F
Maximum difference in runway centerline elevation (gradient)	.8 ft.

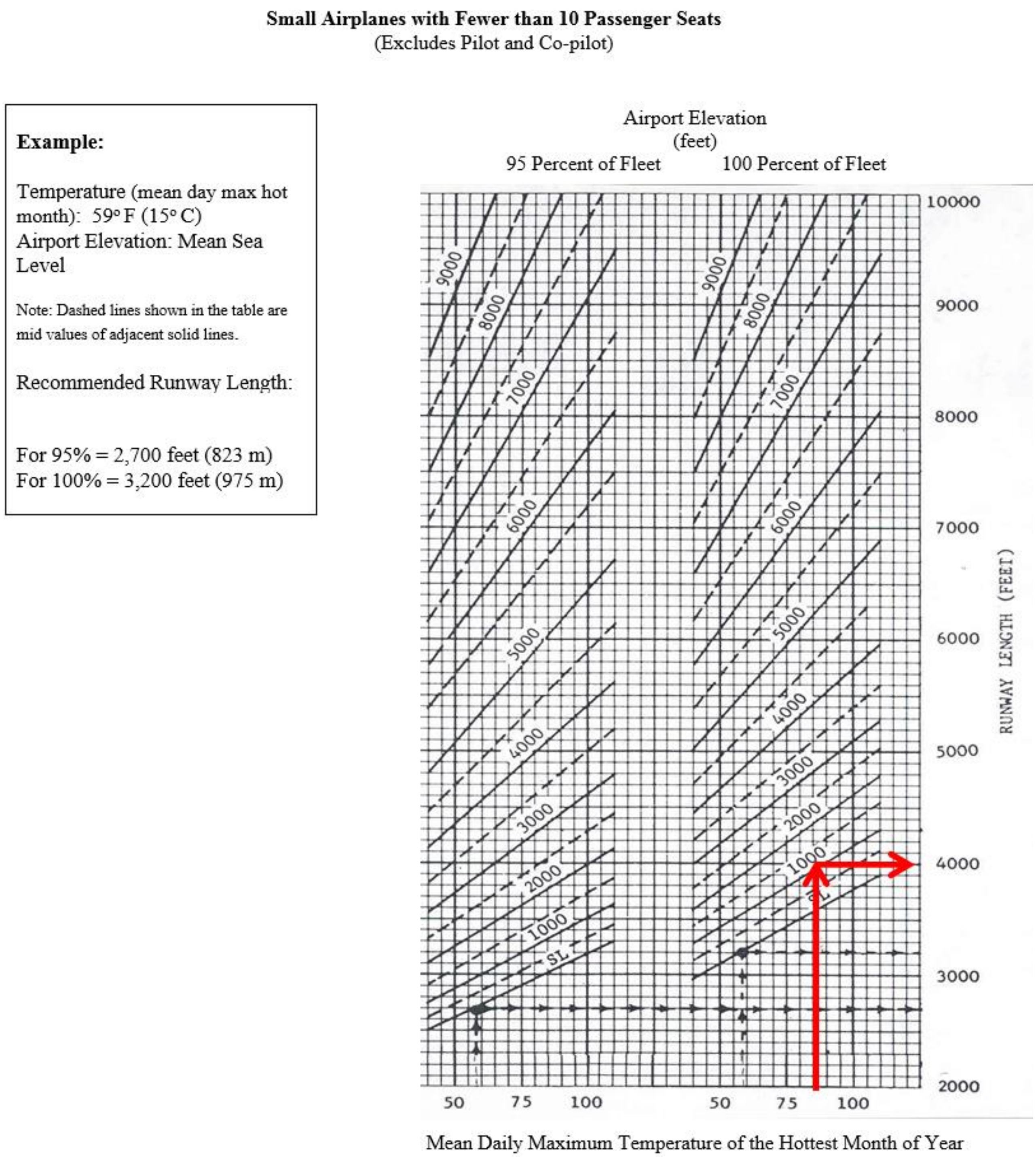
Runway Length Recommended for Airport Design	**Unadjusted**	**Gradient (Adjusted 8 ft.)**	**15% Adjusted Wet Conditions**	**After FAA Maximum Cap Applied for Wet Conditions (Max 5,500 - 60% load Max 7,000 - 90% load)**
Large airplanes of 60,000 pounds or less				
75% of these large airplanes at 60% useful load	4,750	4,758	5,472	5,472
75% of these large airplanes at 90% useful load	6,550	6,558	7,542	7,000

Note: The runway lengths obtained from curves are increased at the rate of 10 feet for each foot of elevation difference between the high and low points of the runway centerline. By regulation, the runway length for turbojet-powered airplanes obtained from the “60 percent useful load” curves are increased by 15 percent or up to 5,500 feet, whichever is less. By regulation, the runway lengths for turbojet powered airplanes obtained from the “90 percent useful load” curves are also increased by 15 percent or up to 7,000 feet, whichever is less. These adjustments are not cumulative.

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

The findings from AC 150/5325-4B were compared to some of the aircraft manufacturer manuals for the Cessna Citation series jets, Bombardier LearJets, and Beechcraft King Air aircraft. These results are shown in Appendix E at the request of the Detroit ADO since they are not deemed relevant for funding. Regardless, for funding purposes, the Detroit ADO may conclude that the runway is only justified to be about 4,000 feet long as shown in **Exhibit 4.6-15**.

Exhibit 4.6-15: FAA Proposed Funding Length



Source: FAA AC 150-5325-4B

Crosswind Runway 15-33 Navigational Aids (NAVAIDS) and Instrument Approach Procedures.

The only approach to Runway 15-33 is a VOR/DME to Runway 33, which provided minimums of 1 mile visibility and 393 feet cloud ceiling. This approach utilizes the Springfield VOR, which is on the Phase 2 Candidate Discontinuance List (FY 2021-2025)[15]. Accordingly, a suitable replacement approach using RNAV (GPS) technology should be sought for this runway prior to loss of the VOR (which the FAA is looking to decommission and remove in the future).

Crosswind Runway 15-33 Design and Separation Standards

In addition to length and width, FAA AC 150/5300-3A includes several other standards for airports. These runway design and separation standards for both B-I and C-II, as they pertain to the crosswind runway, are presented in **Exhibit 4.6-16**

Exhibit 4.6-16

Crosswind Runway 15-33 B-I Design and Separation Standards for FAA Funding

Standard	Requirement	Existing (Dimension in feet)
Runway Length	4000	Meets
Runway Width	60 feet	Meets
Shoulder Width	10 feet	Meets
Runway Safety Area	120 feet wide 240 feet beyond end	Meets
Runway Object Free Area	400 feet wide 240 feet beyond end	Meets
Runway Obstacle Free Zone	400 feet wide 200 feet beyond runway end	Meets
Precision Runway Obstacle Free Zone	NA	NA
Runway Protection Zone	Runway 15 – 13.77 acres Runway 33 – 13.77 acres	Meets
Runway Centerline to Holding Position	200 feet	Meets
Runway Centerline to Parallel Taxiway	225 feet	Meets (300 feet)
Runway Centerline to Aircraft Parking	200 feet	Meets (620 feet)

Source: Woolpert, 2016

Crosswind Runway 15-33 C-II Design and Separation Standards

Standard	Requirement	Existing (Dimension in feet)
Runway Length	5,500 feet	Meets
Runway Width	100 feet	**Meets (100 feet)**
Shoulder Width	10 feet	Meets
Runway Safety Area	500 feet wide 100 feet beyond end	Meets
Runway Object Free Area	800 feet wide 1000 feet beyond end	Small segment of public road
Runway Obstacle Free Zone	400 feet wide 200 feet beyond runway end	Meets
Precision Runway Obstacle Free Zone	NA	NA
Runway Protection Zone	Runway 15 – 29.46 acres Runway 33 – 29.49 acres	Public road, 2 homes, 3 private drives, 1 outbuilding Public road, private drive
Runway Centerline to Holding Position	250 feet	Meets expect E-1 (200 feet)
Runway Centerline to Parallel Taxiway	300 feet	Meets (300 feet)
Runway Centerline to Aircraft Parking	400 feet	Meets (620 feet)

Source: Woolpert, 2016

[15] https://www.federalregister.gov/documents/2016/07/26/2016-17579/provision-of-navigation-services-for-the-next-generation-air-transportation-system-nextgen?utm_campaign=pi+subscription+mailing+list&utm_medium=email&utm_source=federalregister.gov

Exhibit 4.6-17: Existing Airport Modification of Standards (Runway 15-33 Environment)

FAA Airspace Case Number: 95-AGL-906-NRA	
04-06-1995	Historic shadowing of Taxiway F by Hangar #2. TVOR, TACA, Wind-T, Portion of Runway 06 VASI in RVZ. S.R. 794 is a 3 foot penetration to the Runway 24 50:1 approach and penetrations north edge of RPZ for approximately 150 feet.
FAA Airspace Case Number: Unknown	
08-10-2005	Runway 15-33 Safety Area Width is 400 feet as allowed per FAA AC 150/5300-13, Table 3-3, note 4. Runway 06-24 Safety Area contains arresting barrier systems that are fixed by function per documented Military Need Statement. Use of C-141 (160 ft. wingspan) as the largest Group IV aircraft operating at the airport to establish taxiway centerline to aircraft parking apron separation.

In Summary, the crosswind runway meets most of the design and separation standards except for the E-1 taxiway hold line and a small corner of the ROFA. The E-1 hold line could easily be moved 50 feet to the northeast. *A modification to standards should already have been granted for the corner of the runway OFA as this is an existing condition.* The non-compatible land uses with the RPZ are also existing condition with no new or modified land uses being proposed, so no additional analysis is required according to FAA's memorandum on Interim Guidance on Land Uses Within a Runway Protection Zone dated September 27, 2012. Refer to the Alternatives Chapter for a final evaluation and recommendation of the runway length, width, and RDC.

Crosswind Runway 15-33 Strength

The strength of airfield pavement is based on three factors:

Aircraft weight;
Aircraft gear type; and,
Number of aircraft operations.

The Crosswind Runway at SHG has a pavement strength rating through the FAA of 12,000 pounds single wheel loading (25,000 pounds maximum single wheel loading) and no dual wheel loading (DWL). It is recommended this pavement be studied including a PCN developed because based on the fleet mix of aircraft utilizing the pavement, the service life could be deteriorating more quickly due to the weight/traffic volume.

Refer to the Chapter 1 Inventory for information on existing pavement condition. It is currently noted as in fair condition with the need for a rehabilitation or reconstruction at this time.

4.7 Taxiway System

Much like the runway design group, the FAA also uses a coding system for a TDG. The TDG is based upon the aircraft landing gear dimensions and is used to determine taxiway widths and pavement fillets required at taxiway intersections. (Note: Fillet pavement is used by the inner wheel of a turning aircraft to provide a margin of safety between the wheel and edge of pavement.) The current and future AAC and ADG for both Runway 6-24 and Runway 15-33 is C-II. The TDG, however, varies depending on which aircraft typically uses a taxiway or taxilane. With respect to SGH, all taxiway lateral clearances associated with both Runway 6-24 and Runway 15-33 should be planned for TDG 3. This is based on Exhibit 3.4.-2: IFR Flight Plans Filed to SGH, which indicate that the most demanding C-II aircraft using Taxiway A (parallel to Runway 6-24), Taxiway E and F (parallel to Runway 15-33), and the connecting Taxiways B, C, D, E, E1, F, and H are CL60 (Bombardier Challenger 600/601/604). This aircraft is categorized as TDG 3 per FAA AC 150/5300-13A, Appendix A.

Chapter 4, Taxiway and Taxilane Design, of this AC lists several dimension requirements necessary for construction of the airport taxiway system.

An evaluation of this Chapter in relation to SGH for Taxiway Protection standards (TSA and OFA); Taxiway Separation standards; Wingtip Clearance standards; Taxiway Width; Taxiway Edge Safety Margins (TESM); Taxiway Shoulder Width; and Taxiway Centerline to Parallel Taxiway Centerline with 180 Degree Turn indicates all existing standards are met for a B-II and C-II primary runway (see **Exhibit 4.7-1**.)

Exhibit 4.7-1: Taxiway Standards

Txwy.	TDG	ADG	Width		Safety Area		Object Free Area		Edge Safety Margin		Shoulder Width	
			Requirement	Existing	Requirement	Existing	Requirement	Existing	Requirement	Existing	Requirement	Existing
A	3	II	50	75	79	ADG III	131	ADG II	10	10	20	20
B	3	II	50	75	79	ADG IV	131	ADG IV	10	10	20	20
C	3	II	50	150	79	ADG IV	131	ADG IV	10	10	20	20
D	3	II	50	50	79	ADG IV	131	ADG IV	10	10	20	25
E	2	II	35	35	79	ADG IV	131	ADG IV	7.5	7.5	15	15
E1	2	II	35	50	79	ADG II	131	ADG II	7.5	7.5	15	15
F	3	II	50	50	79	ADG II	131	ADG II	10	10	20	20
G	3	II	50	75	79	ADG II	131	ADG II	10	10	20	20
H	3	II	50	50	79	ADG II	131	ADG II	10	10	20	20
J	3	II	50	35	79	ADG II	131	ADG II	10	10	20	20

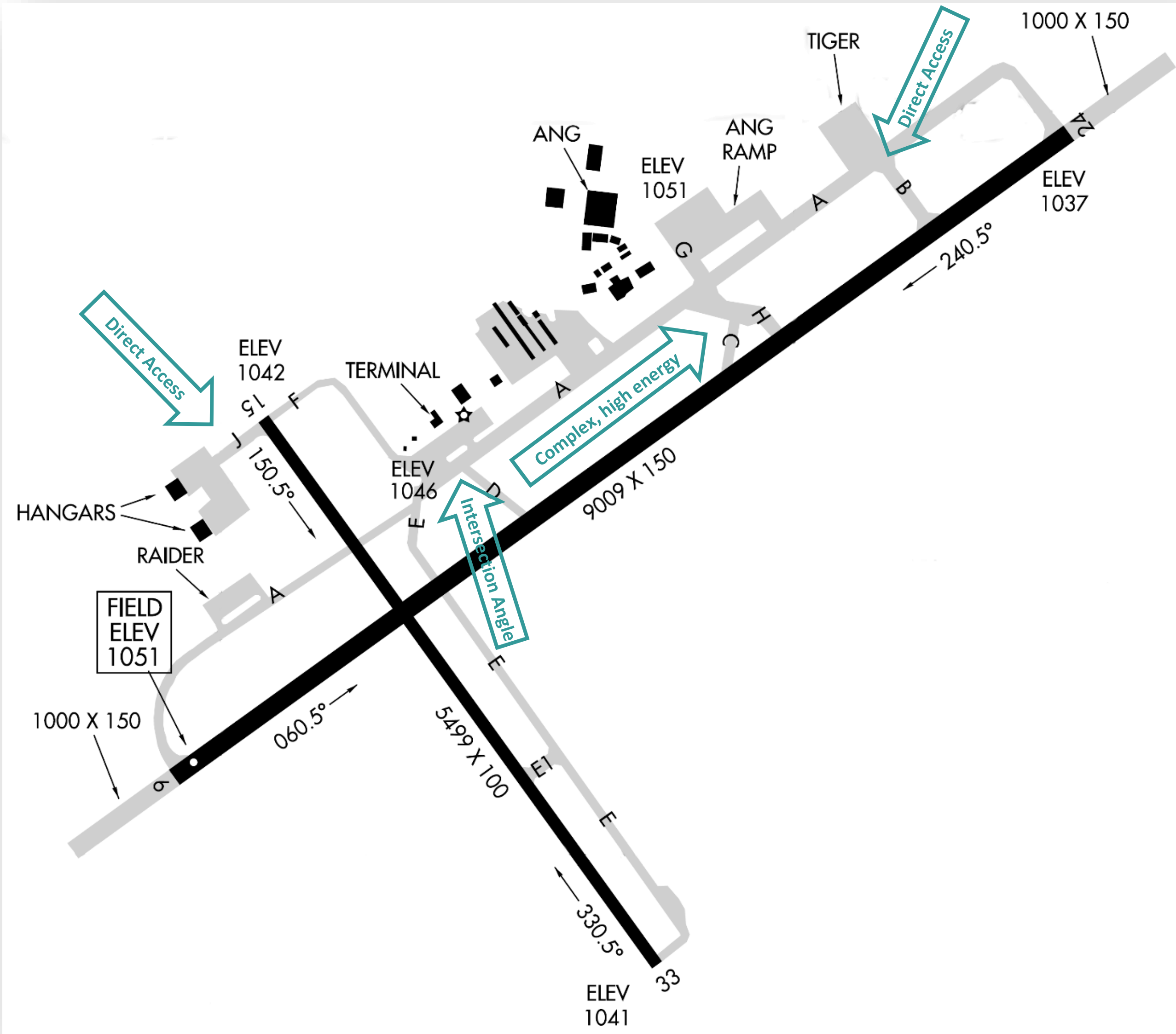
Source: Woolpert

Chapter 4 of AC 150/5300-13A also includes guidelines for optimal situational awareness for pilots at related to the taxiing of aircraft. These guidelines generally include avoiding confusing intersections. The major points are described below:

- designing turns to be 90 degrees wherever possible,
- avoiding wide expanses of pavement,
- limiting runway crossings,
- avoiding high energy and complex intersections,
- avoiding dual purpose pavements, and
- eliminating direct access to a runway from an apron without requiring a turn.

SGH has several taxiway deficiencies as related to optimal situational awareness shown below that will be redesigned to meet standards (see **Exhibit 4.7-2**.)

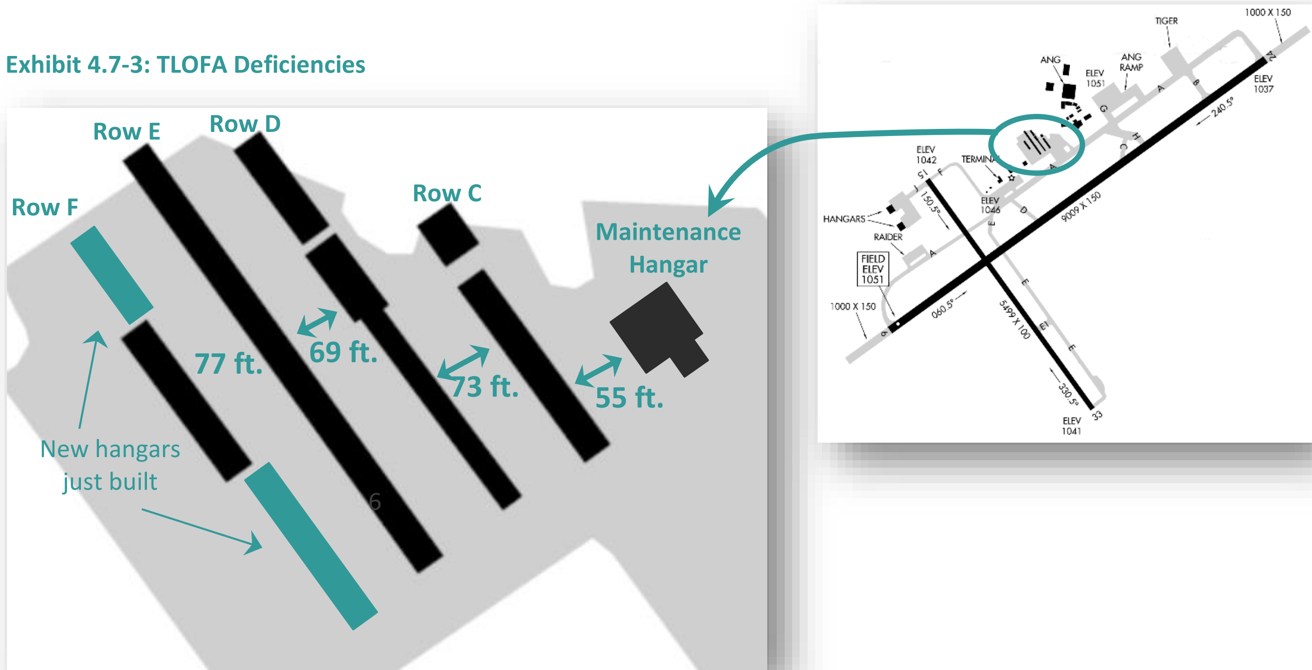
Exhibit 4.7-2: Taxiway Deficiencies (Situational Awareness)



Source: FAA, http://aeronav.faa.gov/d-tpp/1702/00958ad.pdf#search=KSGH, accessed 2-2017.

Taxilanes are part of the taxiway system. Taxilanes are similar to taxiways, but are designed for low speed and precise taxiing. Taxilanes are usually, but not always, located outside the movement area, providing access from taxiways (usually an apron taxiway) to aircraft parking positions and other terminal areas. The taxilane object free areas (TLOFA) between the T-hangar buildings do not meet standards, which is 79 feet. (See **Exhibit 4.7-3**.) A modification to standards exists for Row F because of the new hangars just built in this area. However, additional modification to standards will be required for rows E, D, C, and the maintenance hangar.

Exhibit 4.7-3: TLOFA Deficiencies



Source: FAA, Woolpert; 2017.

Exhibit 4.7-4: Existing Airport Modification of Standards (Taxilanes)

FAA Airspace Case Number: Unknown	
05-16-2016	This MOS involved moving the movement/non-movement boundary 3 feet inside the standard TOFA of 39.5'. The distance from Taxiway Centerline to Fixed/Movable Objects was approved at 36.5 feet with the critical aircraft identified for these taxilanes being the Cessna 402. This MOS was in accordance with Engineering Brief No. 78 (EB #78), Linear Equations for Evaluating the Separation of Airplane Design Group on Parallel Taxiways and Taxiways to Fixed/Movable Objects.

4.8 Airfield Marking, Lighting and Signage

Runway Lighting

The primary runway (Runway 6-24) is served by high intensity runway lights while the crosswind (Runway 15-33) is served by medium intensity. Both are pilot activated on the common traffic advisory frequency (CTAF). This system meets the guidelines outlined in AC 150/5300-13A for the lighting required for SGH's individual runway instrument approach procedure and no improvements are recommended other than consideration for upgrade to LED's once the system has surpassed it's useful life and is eligible for FAA/ODOT removal and replacement. Currently the Runway Edge Lighting is over 10 Years Old.

Taxiway Lighting

The vast majority of SGH's taxiways are served by medium intensity taxiway lights (MITLs), with the only exception being the Taxiway J into Airpark Ohio on the west side of Runway 15-33. Should Airpark Ohio traffic increase significantly in the future, MITL's on Taxiway J may be warranted.; however, they are recommended at this time. Consideration for upgrade to LED's once the system has surpassed it's useful life and is eligible for FAA/ODOT removal and replacement in accordance with FAA LED implementation guidelines. Currently the Taxiway Edge Lighting systems varies with age across the airfield.

Airfield Marking and Signage

The runways and taxiways are equipped with lighted guidance signs. Both ends of Runway 6-24 are marked with precision runway markings (See **Exhibit 4.8-1**). Runway 15 end is marked as basic and Runway 33 end is marked as non-precision. The runway numbers are fading and will need repainted. Both runway markings meet FAA standards. Consideration for upgrade to LED signs once the system has surpassed its useful life (and is eligible for FAA/ODOT removal and replacement) or sooner if the Owner can complete with local funds due to the life cycle cost and energy savings that can be accomplished.

Exhibit 4.8-1: Runway Marking and Signage

Source: Woolpert, 2016.

4.9 Aircraft Parking and Storage

Several business operators on the airport must be accommodated by appropriate aircraft parking and storage facilities. Local companies include SJET (the airport FBO), Spectra Jet (full-service repair and maintenance for Learjet and Challenger aircraft), Champion City Aviation (flight instruction), and Select Tech Geospatial (high tech manufacturing and testing services for the Department of Defense). Additionally, individual based aircraft operators and transient aircraft must be accommodated.

Aircraft Hangars

As detailed in Chapter 1, there are two typical types of hangars that exist at SGH: T-hangars and conventional hangars. The larger hangars are classified as conventional hangars because they generally have the capability to house several aircraft. For planning purposes, an estimation of hangar and apron facilities is made based on forecast peak design periods. However, actual hangar and apron development should be based on the realized demand and financial conditions of SGH. While actual utilization of hangar space varies across airports and climate regions, national trends are moving toward more sophisticated and expensive aircraft. As a result, owners want to protect their investments and thus prefer enclosed space rather than outside storage. For planning future aircraft storage, single engine and multi-engine piston are shown in T-hangars or box hangars while turbo prop, jet, and rotor are shown in conventional hangars. Note that several of the existing T-Hangars are old and dilapidated. While SGH may appear to have a large amount of hangar space, poor conditions render many of them unusable in the future, so they are shown as being replaced. Twenty-four existing units are empty and planned for demolitions in rows C, D, and E. There are no empty hangars now and a waiting list of five aircraft. No based aircraft are shown in tie-downs. **Exhibit 4.9-1** shows the aircraft storage needs for the planning period.

Exhibit 4.9-1: Current and Forecast Aircraft Storage Needs

	SEP	MEP	TP	TJ	R	Total
Existing storage	35	5	0	1	0	41
Future storage needed	41	5	4	3	1	54
Added aircraft to store	6	0	4	2	1	13

SEP = Single Engine Piston

MEP = Multi Engine Piston

TP = Turboprop

TJ = Turbo Jet

Source: Woolpert, 2016

To determine the area needed to store these additional aircraft, different aircraft sizes (with a 5-foot buffer for movements) have been averaged for a representative size for the aircraft to be stored in T-hangars and conventional hangars. (See **Exhibit 4.9-2.**) This has resulted in a planning area of 1,400 square feet for each single and multi-engine piston and 3,600 square feet for each turboprop, jet, and rotor aircraft

Exhibit 4.9-2:

Aircraft	Wingspan (feet)	Length (feet)	SF
Corporate			
Gulfstream II	68.8	79.9	6,265.6
Challenger 600	61.1	68.5	4,858.4
IAI 1124	44.8	52.3	2,853.5
Hawker 800/850	51.4	51.2	3,169.7
Lear 55/60	43.8	55.1	2,932.9
Citation Bravo	52.2	47.2	2,985.8
King Air 90	50.2	35.5	2,235.6
Average Area			**3,614.5**
Piston			
Beech Baron	37.8	28.8	1,446.6
Cessna 182	35.8	28.1	1,350.5
Average Area			**1,398.6**

Source: Woolpert, 2016.

In applying these sizes to the projected aircraft over the planning period, approximately 16,800 square feet of additional space will be needed to store piston aircraft and 23,800 square feet for turbine and rotor aircraft. (See **Exhibit 4.9-3**.) The locations and configurations of this space will further be evaluated under the alternatives section

Exhibit 4.9-3:

T-Hangar Units (SEP and MEP)	Units
Existing units	48
Poor condition and to be replaced	19
Usable units	29
Total units needed	41
Total units to be added	12
Total additional space to be added	**16,800 Square Feet**

Conventional Hangars (TP, TJ, R)	Buildings
Buildings	5
Private	4
Available for Transient	1
Currently Empty	0
Additional aircraft to be stored	7
Total additional space to be added	**23,800 Square Feet**

Source: Woolpert, 2016.

Apron and Ramp Areas

The airport should have enough ramp space to accommodate the design day as determined in the forecast chapter. For SGH this is forecast to be 63 operations, of which 25 are transient. Dividing this in half for number of aircraft results in 12 aircraft parking spots. Square feet needed per aircraft is approximately 5625 SF ((1/2 of the Group I Taxilane centerline to fixed object + 41' long aircraft) X (49' wide aircraft + 21' for pull through {10.5' each side}). (See FAA AC 150/5300-13A). Twelve aircraft at 5,625 SF per aircraft results in 67,500 SF. The apron is currently approximately 120,000 square feet with seven tiedown spots marked, but not all of the area is available due to four entrance and exit points and the fueling area. The ability for the existing apron to accommodate 12 tiedown spots will be evaluated in the alternatives section.

4.10 Terminal Facility

Terminal Building

The terminal at SGH accommodates general aviation aircraft users and includes the space required for a pilot briefings and flight planning, airport management, passenger waiting, restrooms, vending machines and other miscellaneous needs. The terminal space needed is based on the number of customers expected to use the facility during peak operations. An area of 100 to 150 square feet of space per person is considered adequate for accommodating peak hour traffic.[16] Using these figures, the following formula provides a planning size for a GA terminal building for an ALP:

(Peak-hour operations) × (2.5) × (100 sf to 150 sf) = Building square footage (SF)

In the previous chapter, Aviation Forecasts, the peak-hour operations were estimated to be seven (7). A factor of 2.5 people (pilots and passengers) is assumed.

(7) x (2.5) x (100 SF to 150 SF) = 1,750 to 2,625 SF

The existing terminal building is approximately 7,500 square feet, including a three-bay maintenance garage for airport equipment. The main portion of the terminal building is approximately 5,300 square feet. This appear adequate to handle peak operations at SGH; however, the restroom facilities are deficient as there is only one women's and one men's stall. This deficiency is magnified during peak operations.

Auto Parking and Access

Access to an airport should be safe and efficient with good visibility along the road and in the parking lots. Access to SGH is provided off SR 794 (Blee Road) to Peacock Road to the terminal with appropriate signage. (See **Exhibit 4.10-1**.) This access road appears safe (as there have been no accident patterns associated with it), does not impede future development, and performs adequately for needs of the existing and projected future activity. For parking lots, a general rule of thumb for the number of parking spaces at a terminal include 2.5 space per peak-hour operations, plus one space per 200 square feet of office space (five minimum), plus one space per vehicle bay, plus one space per 750 square feet of maintenance shop space (five minimum).[17] For SGH the computation is as follows:

Exhibit 4.10-3: Airport Sign

Source: Woolpert, 2016.

18	+	10	+	3	+	5	=	36
(peak hour operations)		*(assuming 2000 SF office space)*		*(maintenance bays)*		*(maintenance area)*		*parking spaces*

There are currently 48 parking spaces between the Terminal building and Maintenance Hangar 2, which is approximately 15,000 square feet and would warrant a minimum of 20 spaces on its own. Accordingly, additional parking may be needed in the terminal area, especially during peak events. Future space will be analyzed further in the alternatives chapter.

[16] ACRP Report 113, Guidebook on General Aviation Facility Planning, TRB, 2014
[17] Ibid.

4.11 Aircraft Fuel Storage & Dispensing Facilities

SGH is currently served by two 10,000-gallon underground fuel tanks: one for JetA and one for 100LL. With just one tank for each type of fuel, the FBO must plan delivery carefully to ensure adequate time for settling. With a mobile refueler. For avgas, one tank usually is sufficient because of the shorter settling time required. If significant JetA is used in a short amount of time, two tanks may be needed. The size of SGH's tanks are sufficient for now; however, when the tanks are replaced, the JetA tank should be evaluated for a 12,000 gallon take replacement. Since tanker trucks often can carry 8,000 to 10,000 gallons, a 12,000 gallon tank would allow the airport to accept a 10,000 gallon load and leaving the standard 10% empty space for expansion. While the record for gallons of JetA sold in one month was approximately 13,700 gallons, airport users purchase over 10,000 gallons about half the months out of the year. A larger tank would also reduce the truck load trips and associated transport fees. In the meantime, if additional fuel is needed now, the frequency of truck delivery can be increased.

4.12 Airport Fencing, Security and Lighting

The majority of the airport is fenced with a combination of 10-foot fence with a three line-barbed wire out rigger and with some section without. (See **Exhibit 4.12-1**.) According to the wildlife hazard site visit, which is still under review by the FAA, the fence is at grade and does not extend below the ground, which provides entry opportunities for smaller mammals and coyotes. There is also a 200-ft gap in the fence at the entrance to the terminal, which provides a possible entry point for deer and other wildlife. Accordingly, a gated system is recommended for the terminal area to close of the gap. The Ohio Air National Guard has a 7-foot fence perimeter with a three line-barbed wire out rigger, which deer can easily jump. Additionally, the culvert under Blee Road does not appear to have any barriers that allow water and debris to flow out and keep out people or wildlife from entering upstream to the Air Field through the culvert. This should also be remedied. If 10-foot barbed wire and below grade fencing were added to the entire airport perimeter, this would help with wildlife issues and increase airport security.

Exhibit 4.12-1: Airport Fencing

Source: Woolpert, 2016.

4.13 Airport Storage, Maintenance and Electrical Vault Buildings

Airport maintenance equipment is currently stored in the three-bay garage connected to the terminal (~2200 square feet), a storage barn north of SR 794 (~1000 square feet), three T-hangar units (~2700 square feet), and outdoors. The last Master Plan identified the need for another 6,000 to 8,000 square feet of covered storage for airport equipment. SGH is comprised over 1,500 acres of land, so maintenance equipment needs are vast, as it the space needed to store that equipment.

FAA guidelines from FAA AC 150/5220-18A, *Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials*, provides guidance on the equipment safety zones recommended around this equipment. (See **Exhibit 4.13-1**.)

Exhibit 4.13-1: Typical Storage Space for Equipment

Minimum Equipment Space Allocations Using the Equipment Safety Zone Concept

	Minimum Clearances for Equipment Safety Zone (ESZ)			
Parked Equipment *Use the parked vehicle without attachments*	5 feet When next to side walls or other stationary objects.	4 feet When rear of parked equipment faces a wall or other stationary objects.	10 feet Parallel to other parked equipment (parallel parking)	10 feet From door opening.
Moving Equipment On Single or Dual Drive-Through Lane *Assumes a 7-ft carrier vehicle width with attachments at 30-degree perpendicular to vehicle body*	15 feet From parked equipment that includes a safe walk around zone in front of at least 3 feet	Between moving equipment on dual drive-through lanes 10 feet Small Plows 10 ft or less	14 feet Intermediate Plows & Small Sweepers Over 10 ft up to 15 ft	20 feet Large Plows & Large Sweepers Over 15 ft up to 22 ft

Source: FAA AC 150/5220-18A

Based on a 5-foot equipment safety zone, **Exhibit 4.13-2** lists the equipment that SGH is required to store when not in use:

Exhibit 4.13-2: SGH Equipment Storage Needs

Equipment *(Dimensions in Feet)*	Estimated Dimensions		Safety Zone	Total Space
JCB 3230 Tractor	7	8	5	156
○ 20-foot broom	20	5	5	250
○ 10-foot snow blower	10	5	5	150
○ 20-foot batwing mower	20	5	5	250
○ 17-foot box snow blade	17	5	5	220
○ Rear mount air blower	5	5	5	100
6605 John Deere Tractor	16	9	5	294
○ 20-foot batwing mower	20	15	5	500
○ 8-foot front mount snow blower	8	5	5	130
International Dump Truck	25	9	5	420
○ 11-foot snow plow	11	3	5	128
○ Rear mount sand spreader	7	5	5	120
Chevy 1 Ton Dually Pick Up	19	7	5	288
○ 9-foot snow plow	9	3	5	112
Ford ¾ Ton Tool Truck	22	9	5	378
○ 7-foot SNOW PLOW	7	3	5	96
Case 580 Backhoe	23	7	5	336
Anti-Ice Trailer	16	8	5	273
Total				4201

Source: SGH, Woolpert, 2017.

A general guide for determining the space needed for maintenance support items is based on the airport size. The term size "refers to a classification of airports according to the total paved runway area identified by the airport operator's winter storm management plan that will be cleared of snow, ice, and/or slush. This definition takes into account the practice where an airport operator closes a smaller runway, such as a GA runway, to focus its equipment fleet on the identified runway(s). In other words, airport size relates only to opened runways. The total paved area in turn determines the sizing of the building. The values provided below exclude paved taxiways and aprons/gate areas. Note: Landside operation areas do not contribute to the airport size definitions listed below."[18]

1. Small Airport: less than 420,000 square feet of total paved runway.
2. Medium Airport: at least 420,000 but less than 700,000 square feet of total paved runway.
3. Large Airport: at least 700,000 but less than 1,000,000 square feet of total paved runway.
4. Very Large Airport: at least 1,000,000 square feet of total paved runway.

By including only SGH's primary runway, which is 9,009 feet by 150 feet, it would be considered a very large airport having 1,351,350 square feet of runway. If only 100 feet width is plowed it would be considered a large airport and if only 75 feet is plowed it would be a considered a medium size airport.

Guidelines for the total space allocation for support items is also contained in FAA AC 150/5220-18A, which are outlined in **Exhibits 4.13-3** through **4.13-5** as it relates to typical maintenance equipment, support items, special equipment items, and materials.

Exhibit 4.13-3: Typical Storage Space Allocations for Support Items

Typical Storage Space Allocations for Support Items

Items under Support Area	Medium-Sized Airport		Large / Very Large-Sized Airport	
	Low (SF)	High (SF)	Low (SF)	High (SF)
Snow Desk	144	144	200	400
Supervisor's Office	140	140	140	140
Mechanic's Office	150	150	150	150
Administrative Area	200	200	400	400
Training Room and Emergency First Aid Room	400	400	475	475
Lunch room & Kitchen	300	300	800	800
Restroom	500	500	700	700
Lockers	500	500	700	700
Sleeping Quarters OPTIONAL (56 sf bunk area per person)	56	112	56	224
Parts Area associated with snow removal operation	800	800	1000	1000
Parts Area associated directly to snow vehicles	300	300	400	400
Lubrication, Oil, Grease Storage	150	200	150	200
Welding Area	200	200	400	400
Recycled Oil and Used Anti-freeze	200	200	200	200
Mechanic's Bench Area (along walls)	200	200	400	400
Repair Bay – Number of Bays and square footage	1-1,000	3-3,000	2-2,000	4-4,000
Cleaning Bay	1,000	1,000	1000	1000
Total	6,240	8,346	9,171	11,589

Source: FAA AC 150/5220-18A

[18] FAA AC 150/5220-18A, Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials

Exhibit 4.13-4: Typical Storage Allocations for Special Equipment Items

Typical Storage Allocations for Special Equipment Items

Items under Special Equipment Area	Range in Square Feet	
	Low	High
HVAC Area	300	800
Recycled Oil and Used Anti-freeze	150	300
Emergency Power Generation	100	300
Hydraulic Lift, Vacuum Pumps, and Air Compressor	100	200
Steam Generation	100	150
Major/Large Power Tools	100	200
Total	850	1,950

Source: FAA AC 150/5220-18A

Exhibit 4.13-5: Typical Storage Allocations for Material Storage Items

Typical Storage Allocations for Material Storage Items

Snow and Ice Control Material Types	Range in Square Feet	
	Low	High
Sand Storage	150	500
Bagged or Bulk Solid Deicer Storage	100	400
Salt Storage 3	100	300
Total	350	1,200

Note: Sizing needs are highly influenced by the approach used and the quantity of material or combination of materials applied to combat the type of winter storms encountered at the airport.
Source: FAA AC 150/5220-18A

When all of these allocation are added together, the typical size of storage for an airport like SGH ranges 11,640 square feet on the low end to 18,940 square feet on the high end. The airport has approximately 6,000 square feet of existing storage space, so an additional 6,000 to 13,000 square feet is needed. FAA AIP Handbook, Appendix O, Other Building Projects, covers funding eligibility for SRE buildings at GA airports. If the Sponsor uses AIP funds in the future for these projects, AIP eligibility and justification should be evaluated at that time.

4.14 Passenger Convenience and Access to Airport Facilities

Section 131 of the FAA Modernization and Reform Act of 2012 (49 U.S.C. § 47101(g)(2)) requires airport master plans to consider passenger convenience, access to airport facilities, and ground access. Advisory Circular (AC) 150/5060-6B, Airport Master Plans, provides guidance on this and states that the master plan may evaluate considerations that "will improve the overall passenger experience – enhancing the passenger's sense of convenience and facilitating access to and from and through the airport complex." [19] At general aviation airports like SGH, this includes considerations like ample auto parking and road access, restrooms, weather briefing areas, lobbies, Wi-Fi access, and meeting the Americans with Disabilities Act (ADA).

SGH is easily accessible via Highway 68 and State Road 794 (West Blee Road) from the west and Highway 72 and State Road 794 from the east. This road system provides appropriate access to and from the airport. As indicated previously, additional parking may be needed in the terminal area, especially during peak events. Restrooms, lobbies, Wi-Fi, etc., accommodations are all sufficient for SGH users.

[19] Advisory Circular (AC) 150/5060-6B, Airport Master Plans