4. FACILITY REQUIREMENTS

This chapter describes the facility improvements required to accommodate the forecasted demand at Gary Chicago International Airport (GYY) over the course of the planning period. Facility requirements were determined by comparing the Airport's existing inventory described in Chapter 2, to aviation demand derived from the forecast scenarios described in Chapter 3. Improvements to facilities would allow the Airport to accommodate demand safely and efficiently. The analysis and findings presented in this chapter establish the foundation for the development and evaluation of alternative concepts, the next step in the planning process. Most categories of analysis, in particular those that assess facility requirements, consider only civil aviation activity. Only the airfield analysis considers military and civil aviation.

The facility requirements are presented in the following categories:

- Airfield
- Passenger Terminal
- General Aviation
- Air Cargo
- Support Facilities
- Landside (Parking & Access)
- Ground Transportation

4.1 Operations Planning Forecasts

Forecasts define the activity to be accommodated in the various functional areas of the airport. Annual enplanement and operations projections are translated into peak month, average day, and peak hour metrics for the area of study. **Table 4-1, Table 4-2, and Table 4-3** summarize forecast activity for the 20-year planning period at GYY under the Base Forecast and the High Scenario, as well as peak factors for operations and passengers. The FAA approved the Base Forecast in March 2018 for facility planning in this master plan. The High Scenario was recognized as "developed to explore the demands that would be placed on the Airport if scheduled passenger service returns to GYY."

Forecasts were based on a calendar timeframe to apply annual growth factors and test for reasonableness against FAA and other projections. However, activity may not occur in the time frame or the way it was originally anticipated. It could occur earlier or later than planned, or commercial service could begin with larger aircraft than anticipated. Therefore, rather than focusing on the year as a benchmark associated with demand, Planning Activity Levels, or PALs are defined to characterize the activity associated with specific demand. In this study, PAL 1 is associated with the activity forecast in 2020, PAL 2 with the activity forecast in 2025, and PAL 3 with the activity forecast in 2035 under the Base Forecast. PAL 4 and PAL 5 are representative of activity in 2020 and 2035, respectively, under the High Scenario. Planning will focus on meeting requirements for PAL 3, using PALs 4 and 5 to explore future demands with scheduled passenger service.

Table 4-1 - Forecast of Annual Aviation Activity

	Actual	Base Forecast			High Scenario		
	2015	PAL 1 2020	PAL 2 2025	PAL 3 2035	PAL 4 2020	2025	PAL 5 2035
Passenger Enplanements	**2,547**	**9,500**	**17,000**	**27,000**	**100,000**	**200,000**	**350,000**
Air Carrier	2,458	9,167	16,404	26,054	99,667	199,404	349,054
Commuter	89	333	595	945	333	595	945
Aircraft Operations	**25,229**	**26,322**	**26,648**	**27,263**	**32,298**	**40,286**	**49,781**
Commercial Operations	1,748	1,920	1,995	2,145	3,123	4,385	6,247
Air Carrier	494	600	650	750	1,803	3,040	4,852
Commuter/Air Taxi	1,254	1,320	1,345	1,395	1,320	1,345	1,395
General Aviation	21,500	22,422	22,673	23,138	27,195	33,921	41,555
Military	1,981	1,980	1,980	1,980	1,980	1,980	1,980
Based Aircraft	**97**	**135**	**140**	**145**	**160**	**200**	**245**

Sources: Actual—U.S. DOT, Schedule T100; Gary/Chicago International Airport records; FAA TAF. Forecast—LeighFisher, January 2018.

The analysis of passenger peaking began by obtaining, from DOT, a monthly time series of enplaned passenger data covering the period 2011 through 2015. The peak month was determined for each year and the percentage of annual enplanements that occurred in that month was calculated. The average of the peak-month percentages for the 5 years was used as the Peak Month factor in the Base Forecast of monthly enplanement peaks. For the High Scenario, the Peak Month factor was reduced somewhat in future years, to approximate the reduction in seasonal variation expected to occur with increases in scheduled passenger service. Daily peak passenger flows were calculated by dividing the peak monthly flows by 31 (days in the month). The analysis of flight operations peaking began by obtaining, from Airport tower records, a monthly time series of flight operations covering the period 2011 through 2015. The peak month was determined for each year and the percentage of annual operations that occurred in that month was calculated. The average of the peak-month percentages for the 5 years was used as the Peak Month factor in the forecasts of monthly enplanement peaks. Daily peak operations flows were calculated by dividing the peak monthly flows by 31 (days in the month). Peaking Forecasts for operations and passengers are shown in Tables 4-2 and 4-3.

Table 4-2 - GYY Operations Peaking Forecast (calendar years)

	Actual	Forecast		
	2015	2020	2025	2035
Base Forecast		PAL 1	PAL 2	PAL 3
Total Operations	25,229	26,322	26,648	27,263
Peak Month	3,160	3,559	3,603	3,686
% of Total	12.5%	13.5%	13.5%	13.5%
Average Day	102	115	116	119
High Scenario		**PAL 4**	2025	**PAL 5**
Total Operations	25,229	32,298	40,286	49,781
Peak Month	3,160	4,366	5,446	6,730
% of Total	12.5%	13.5%	13.5%	13.5%
Average Day	102	141	176	217

Sources: Actual—Gary/Chicago International Airport records. Forecast—LeighFisher, January 2018.

Table 4-3 - GYY Passenger Peaking Forecast (calendar years)

	Actual	Forecast		
	2015	2020	2025	2035
Base Forecast		PAL 1	PAL 2	PAL 3
Total Enplaned Passengers	2,547	9,500	17,000	27,000
Peak Month	543	1,666	2,981	4,735
% of Total	21.3%	17.5%	17.5%	17.5%
Average Day	18	54	96	153
High Scenario		PAL 4	2025	PAL 5
Total Enplaned Passengers	2,547	100,000	200,000	350,000
Peak Month	543	16,500	30,000	52,500
% of Total	21.3%	16.5%	15.0%	15.0%
Average Day	18	532	968	1,694

Sources: Actual—U.S. DOT, Schedule T100. Forecast—LeighFisher, January 2018.

4.2 Airfield Capacity

The relationship between demand and capacity and how that relationship impacts the planning of future facilities is complex. Numerous factors affect how efficiently a certain level of activity (demand) can be accommodated within a specific system or facility (capacity). Acceptable levels of service or convenience vary by user, facility, and airport sponsor.

Airfield capacity is typically defined as the maximum number of annual or peak-period aircraft operations an airfield can accommodate. The FAA defines annual airfield capacity in terms of Annual Service Volume (ASV), and peak periods are typically measured in peak hours. When demand approaches capacity, even for periods within the peak hour, delays may occur. Conversely, if airfield facilities provide excess capacity, then an airport has room for growth and expansion.

The capacity of GYY's existing two-runway system and its ability to meet forecast demand was evaluated using the FAA's AC 150/5060-5, *Airfield Capacity and Delay*. Key considerations when evaluating the capacity include runway-use configurations, fleet mix, and weather, which are discussed in the following sections.

4.2.1 Runway Use

The utilization of a runway is determined primarily by prevailing winds and runway length. Aircraft operations generally take off and land into the wind, in order to reduce the runway length needed for an operation. Aircraft can also operate in varying levels of crosswinds, which occur when the wind is blowing across the runway and not directly in line with it. The use of any runway is ultimately limited by the aircraft performance characteristics, which governs the conditions (including crosswinds and runway lengths for takeoff and landing) within which a particular aircraft can operate safely.

There are two active runways at GYY, a primary east-west runway, Runway 12-30, and a shorter north-south runway, Runway 2-20. Runway 12-30 serves as the primary runway for all aircraft operations at a length of 8,859 feet. Runway 2-20, which has a length of 3,604 feet, is used by light GA aircraft in calm conditions and by other aircraft in the fleet when crosswinds restrict the use of Runway 12-30.

4.2.2 Fleet Mix

The types of aircraft that utilize an airfield can have a significant impact on capacity. Air traffic controllers and pilots consider factors such as aircraft size, wake-turbulence and speed to maintain safe and efficient operations in the airport environment. Larger aircraft typically fly at faster speeds and can create larger wake-turbulence which can affect safe flight of lighter GA aircraft. Air Traffic Control uses defined standards for speed, heading, and altitude to separate various aircraft types as they approach and depart an airport. A greater diversity in fleet can lead to less capacity per hour as proper spacing and operational considerations are applied.

The PALs derived from the Base Forecast and High Scenario vary in both the amount and type of activity. The fleet mix changes from PAL to PAL as shown in **Table 4-4**, which also segments annual operations by Aircraft Design Group (ADG). Although ADG III (i.e. Boeing 737) is the critical aircraft[1] in PALs 1 through 4, the operations percentages are higher for the smaller business jets (i.e. Cessna Citation) and single engine propeller planes (i.e. Cessna 172). The increase in ADG III and IV (Boeing 757 and 767) activity will have an impact on airfield capacity over the planning period.

1 Critical aircraft is also referred to as "design aircraft" or "critical design aircraft". The FAA defines "critical aircraft" as a specific aircraft model or a composite of several aircraft currently using or expected to make regular use (500 annual operations excluding touch-and-go operations) at the airport or part of the airport. A separate critical aircraft determination is required for each runway.

Table 4-4 - GYY Annual Operations by Planning Activity Level and ADG

Aircraft Design Group (Aircraft Classification)	Actual	Forecast				
	2015	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
I (A)	10,600	10,994	11,085	11,268	12,931	18,741
II (B)	11,741	12,083	11,949	11,673	14,243	19,640
III (C)	2,281	2,625	2,981	3,665	4,246	9,909
IV (D)	118	129	141	164	376	955
V (D)	45	45	45	45	45	45
Other	444	447	447	448	458	492

a) Includes general aviation, as well as flights that are not classified in any other category shown.

b) Operations by aircraft type were allocated based on the FAA's Traffic Flow Management Systems data and applied to the annual activity. This data is available for flights operated under Instrument Flight Rules and excludes flights operated under Visual Flight Rules.

Sources: Actual—Passenger and All-Cargo airlines: U.S. DOT, Schedule T100; GA & Other Military: Gary/Chicago International Airport records; FAA, Traffic Flow Management System (TFMS). Forecast—LeighFisher, January 2017.

To analyze fleet mix for airfield capacity estimates, aircraft are grouped into three categories based on maximum certified take-off weight, Small, Large, and Heavy. This fleet mix is refined into a Mix Index (MI), which is a weighted percentage of aircraft using the Airport with a maximum takeoff weight greater than 41,000 pounds. The index is derived using the following equation: MI % = %C + 3 x %D, where C and D are aircraft classification categories are shown in **Table 4-5**.

Table 4-5 - Aircraft Characteristics

Aircraft Classification	Max. Certified Takeoff Weight (lbs)	Aircraft Type	Average Approach Speed
A	41,000 or less	Single Engine Propeller Aircraft (C172, C-207, PA-28)	95
B	41,000 or less	Twin-Engine Aircraft (PA-31, C-310, Cessna Citation)	120
C	41,00 – 225,000	Large Aircraft (CRJ, B737, A320)	130
D	225,000 or greater	Heavy Aircraft (B767, B757)	150

Source: AC 150/5060-5, Airport Capacity and Delay, Jacobsen|Daniels, April 2018.

As shown in **Table 4-6**, fleet mix changes over the planning period result in an increase in the MI, most notable in PALs 4 and 5, as the percentage of Group IV and V operations increase. As a result, it is anticipated that the typical hourly and throughput capacity could go down slightly as additional spacing would be required between arriving and departing aircraft.

Table 4-6 - GYY Aircraft Fleet Mix Index by PAL

	Actual	Forecast				
	2015	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Mix Index	11%	12%	13%	16%	17%	26%

Source: AC 150/5060-5, Airport Capacity and Delay, Jacobsen|Daniels, April 2018.

4.2.3 Weather

Weather conditions can significantly impact the capacity and utilization of airfield facilities. Weather conditions are categorized into two main categories, Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC). VMC occurs when visibility is greater than or equal to three statute miles and the ceilings 1,000 feet above ground level (AGL) or higher. IMC occurs when the visibility is less than three statute miles or the ceiling is less than 1,000 feet AGL.

These weather conditions are closely related to two operational flight rules used by pilots: Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). In VMC, aircraft may operate under VFR and the pilot is primarily responsible for safety and proper separation between his aircraft, terrain, and other aircraft. Additionally, separation required between aircraft is reduced and capacity levels increase compared to IFR. In IMC, aircraft operate under IFR and Air Traffic Control becomes primarily responsible for safety and adequate separation between aircraft. Weather conditions under IMC, particularly cloud ceiling and visibility, adversely impact airfield capacity. As weather conditions deteriorate, spacing between aircraft must increase to provide an additional level of safety. The increase in distance between aircraft contributes to fewer operations in a given period at the Airport and therefore reduces overall airfield capacity.

The majority of turbo prop and jet air traffic, regardless of weather, operates under IFR, using a published Instrument Approach Procedure (IAP). To increase capacity in both the airspace and the airports in the area, ATC will allow IFR aircraft to maintain visual separation when weather permits. Visual approaches reduce pilot and ATC workload, and expedite traffic by shortening flight paths to the airport. Visual approaches are authorized by ATC under an IFR flight plan and require the pilot to have the airport or preceding aircraft in sight. The airport must also be reporting a ceiling at or above 1,000' and visibility at 3 miles or greater, additional cloud clearance requirements are not required to be met. Conversely, IFR separation is maintained whenever the ceiling is less than 1,000 feet above ground level (AGL) or visibility is less than 3 miles. GYY operates under VFR conditions approximately 89 percent of the year, and IFR conditions approximately 11 percent of the year.

4.2.4 Annual Service Volume

Annual Service Volume (ASV) is a reasonable estimate of an airport's capacity on an annual basis and is a useful assessment for long-range planning. FAA's AC 150/5060-5, *Airport Capacity and Delay*, was used to estimate the Airport's ASV. The ASV is function of the airport's fleet mix; as the mix of aircraft using the airport increases, the ASV will decrease. The ASV for the current GYY airfield configuration and operations was calculated to be 230,000 operations. With a change in the forecasted fleet mix, if the activity represented beyond PAL 4 were to be realized, the ASV decreases to 195,000 operations.

Hourly capacity estimates were established using the same approach as ASV. The hourly VFR capacity from existing to PAL 4 is 98 operations an hour, while the IFR capacity is 59 operations an hour. Similarly, to ASV, if the activity represented beyond PAL 4 were to be realized, the hourly VFR capacity decreases to 77 operations an hour, while the IFR capacity decreases to 57 operations an hour.

The ASV (capacity) was compared to the existing and forecasted operations (demand) to identify deficiencies in the airport system. As summarized in **Table 4-7**, the existing airfield system provides adequate existing and future capacity for the forecasted demand.

Table 4-7 - Demand vs. Airfield Capacity

	Actual	Forecast				
	2015	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Forecast Demand	25,229	26,323	26,648	27,263	32,299	49,782
Existing Capacity	230,000	230,000	230,000	230,000	230,000	195,000
Capacity Level	11%	11%	12%	12%	14%	26%
Operational Deficiency	No	No	No	No	No	No

Source: Jacobsen|Daniels, April 2018.

4.2.5 Annual and Average Aircraft Delay

An additional factor in determining an airport's capacity is to calculate the amount of delay an aircraft may experience at the facility, which is described in minutes per operation. The relationship between the ratio of demand to ASV and delay is shown in **Table 4-8** and is expressed by Average Delay. The Average Delay is multiplied by the Annual Demand to determine Annual Delay, which is expressed in hours. In PAL 3, aircraft delay is projected to reach 0.10 minutes per aircraft operation. In PAL 5 aircraft delay is expected to reach 0.24 minutes per aircraft operation. Airfield capacity is typically reached when airfield delay reaches four minutes of delay per aircraft operation.

Table 4-8 - Average Aircraft Delay

	Actual	Forecast				
	2015	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Annual Demand	25,229	26,323	26,648	27,263	32,299	49,782
Average Delay (min.)	0.09	0.10	0.10	0.10	0.12	0.24
Annual Delay (hr.)	38	44	44	45	65	199

Source: AC 150/5060-5, Airport Capacity and Delay, Jacobsen|Daniels, April 2018.

GYY's proximity to Chicago adds complexity to air traffic movements in and around the airport. Standard arrival procedures are in place to ensure that there are smooth flows of aircraft into the Chicago area. The effects that these controls may have on the operations occurring at GYY are well known by pilots operating in the region, and therefore should be considered in the context of potential delays to departing aircraft as they are sequenced into the flow of aircraft departing the other airports.

4.3 Airfield Requirements

4.3.1 Existing and Future Critical Aircraft

The FAA defines the critical aircraft for an airport as the aircraft representing the combination of the most demanding Aircraft Approach Category (AAC) and Aircraft Design Group (ADG) with greater than 500 annual operations at an airport. The critical aircraft determines the specific separation standards that should be applied to airport facility design, such as runway/taxiway separation, runway/taxiway widths. These standards for critical aircraft can be specified for each runway and associated taxiway at an airport.

Historically, taxiway design standards were based upon ADG, which included wingspan and tail height of the critical aircraft. However, in the last update to FAA 150/5300-13A, *Airport Design*, new taxiway standards were established as Taxiway Design Groups, or TDGs. The TDG considers the ADG, Cockpit to Main Gear (CMG), and the Main Gear Width (MGW) distance of the largest aircraft operating on a frequent basis.

Based on current flight activity, the critical aircraft at GYY is the Boeing Business Jet1 (BBJ1), a modified Boeing 737-700, with an Airport Reference Code (ARC) designation C-III, Taxiway Design Group (TDG) III, and a maximum takeoff weight of 171,000 pounds. Although the B737 is the critical aircraft for GYY, its operations are limited to Runway 12-30. No change in the ADG of the critical aircraft is projected through PAL 4. Boeing Executive Flight Operations may upgrade their existing BBJ1 fleet within the planning horizon, to the Boeing 737-BB2. In PAL 5, the critical aircraft would shift to ADG IV, represented by the Boeing 757 or 767.

Runway 2-20 is currently used mostly by smaller GA aircraft and designated as ADG B-II. According to the current Airport Layout Plan Data Sheet, the designated critical aircraft for Runway 2-20 is the King Air 200.

Requirements associated with the existing and future critical aircraft are presented in **Table 4-9**.

Table 4-9 - Existing and Future Critical Aircraft Requirements

	Runway 2-20		Runway 12-30 and Airport			
	2015 King Air 200	2015 Citation X	2015 BBJ	PALs 1-4 B737-700w	PAL 5 B757-200	PAL 5 B767-200
Length (ft.)	43.9	72.3	110.4	110.4	155.3	159.2
Wingspan (ft.)	54.6	63.6	117.5	117.5	124.1	156.1
Tail Height (ft.)	15	19.3	41.2	41.6	44.3	51.2
Maximum Take-off Weight (lbs.)	12,500	36,100	171,000	154,500	255,000	315,000
Approach Speed (knots)	115	112	132	130	137	135
Aircraft Approach Category	B	B	C	C	C	C
Airplane Design Group	II	II	III	III	IV	IV
Taxiway Design Group	1A	1B	3	3	4	5

Source: Boeing Aircraft Characteristics Manuals, AC 150/5300-13A, Jacobsen|Daniels, April 2018.

The taxiway system at GYY provides adequate capacity and efficient flow for aircraft operations. The full-length parallel taxiways -- Taxiway A, parallel to Runway 12-30 and Taxiway B, parallel to Runway 2-20 – provide sufficient access to the runways. However, Taxiway A does not meet ADG III standards for runway to parallel taxiway separation, which requires full length 400 feet separation from runway centerline to parallel taxiway centerline. Taxiway A, from Taxiway A2 south to Taxiway A8 has a centerline to centerline separation of 392 feet. Taxiway B meets criteria for ADG B-II with a centerline to centerline separation of at least 250 feet, and with adequate pavement width of 40 feet for TDG-II.

If the activity represented by PAL 5 were to be realized and the critical aircraft shifted to ADG IV, runway and taxiway improvements to accommodate larger aircraft may be required. Airfield elements that do not meet ADG IV and TDG V standards but which are regularly used by those aircraft would need to be modified, or a modification of design standards (MOS) should be put in place.

4.3.2 Modification of Design Standards

The Airport currently has MOS in place to allow operations for a variety of non-conforming geometries across the airfield. These MOS are assumed to remain in place throughout the planning horizon, or until the facilities can be brought into compliance as part of airfield redesign projects when financially feasible. The current list of modification of design standards can be found on Sheet 2 – Airport Data Summary, of the Airport Layout Plan.

4.3.3 Wind Coverage

The wind coverage percentages for each of the four crosswind component speeds (10.5, 13, 16, & 20 knots) that are considered critical by the FAA, are shown in **Tables 4-10 and 4-11**. Although neither runway on its own meets the 95% coverage requirement for all conditions, the combined wind coverage for the airfield in all-weather, and IMC conditions exceed 95%. The analysis indicates that the existing two-runway system exceeds FAA guidelines to evaluate additional runway or crosswind runway needs, therefore additional runways to meet wind coverage requirements are not required.

Table 4-10 - Runway Wind Coverage (All Weather)

Wind Speed (Knots)	Runway 2-20	Runway 12-30	Combined
10.5	89.70%	88.16%	97.22%
13	94.47%	93.81%	99.07%
16	98.24%	98.31%	99.70%
20	99.50%	99.56%	99.93%

Source: NOAA National Climatic Data Center, January 1, 2006 to January 1, 2015. Jacobsen|Daniels, October 2016.

Table 4-11 - Runway Wind Coverage (IMC Weather)

Wind Speed (Knots)	Runway 2-20	Runway 12-30	Combined
10.5	89.83%	87.31%	97.32%
13	94.66%	92.86%	99.00%
16	98.14%	97.65%	99.71%
20	99.34%	99.26%	99.94%

Source: NOAA National Climatic Data Center, January 1, 2006 to January 1, 2015. Jacobsen|Daniels, October 2016.

Further analysis was performed to determine when wind coverage precludes the safe use of Runway 12-30, requiring the use of Runway 2-20. **Table 4-12** presents the percentage of time that Runway 12-30 is not available under all weather and IMC weather, during which Runway 2-20 would be required. A 13-knot crosswind is the maximum crosswind wind speed for B-II aircraft as specified in AC/150/5300-13A, **Table**

3-1. Therefore, the percentage of time that Runway 2-20 is required due to wind is between 6.19% and 7.14%.

Table 4-12 – Percentage of Time That Runway 2-20 is Needed

Wind Speed (Knots)	All Weather	IMC Weather
10.5	11.84%	12.69%
13	6.19%	7.14%
16	1.69%	2.35%
20	0.44%	0.74%

Source: NOAA National Climatic Data Center, January 1, 2006 to January 1, 2015. Jacobsen|Daniels, May 2018.Runway Length

FAA standards state that runways should be long enough to accommodate arrivals and departures for an airport's critical design aircraft. If a runway cannot accommodate the arrival and departure lengths required for the critical design aircraft, consideration should be given for runway extensions. Various factors govern an aircraft's operational ability to land and depart on various runway lengths. Some of the most critical factors include airport elevation, weather, aircraft operating weights, and runway surface conditions. The analysis used to determine runway length needs for GYY was performed in two parts, using guidance from FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*.

- For aircraft weighing less than 60,000 pounds, guidance from FAA AC 150/5325-4B was used to determine runway length needs. Aircraft are grouped into families based on aircraft performance characteristics and operating weights. These groupings distinguish aircraft from those that require at least 5,000 feet of runway at mean sea level, versus those that do not. The analysis also assumed these aircraft to be operating at 90% of their useful load.
- For aircraft weighing 60,000 pounds or more, analysis is based on requirements for individual aircraft using the manufacturer's published performance characteristics.

All analyses assume hot temperature conditions (approximately 86°F for GYY), airport elevation of 596.8 feet MSL and maximum takeoff weight (MTOW). In addition to the current fleet, the Boeing 757 and Boeing 767 were evaluated because of the number of operations of ADG IV in PAL 5, which are just short of the criteria for critical design aircraft. (ADG IV aircraft are a portion of the operations mix in all PALs.)

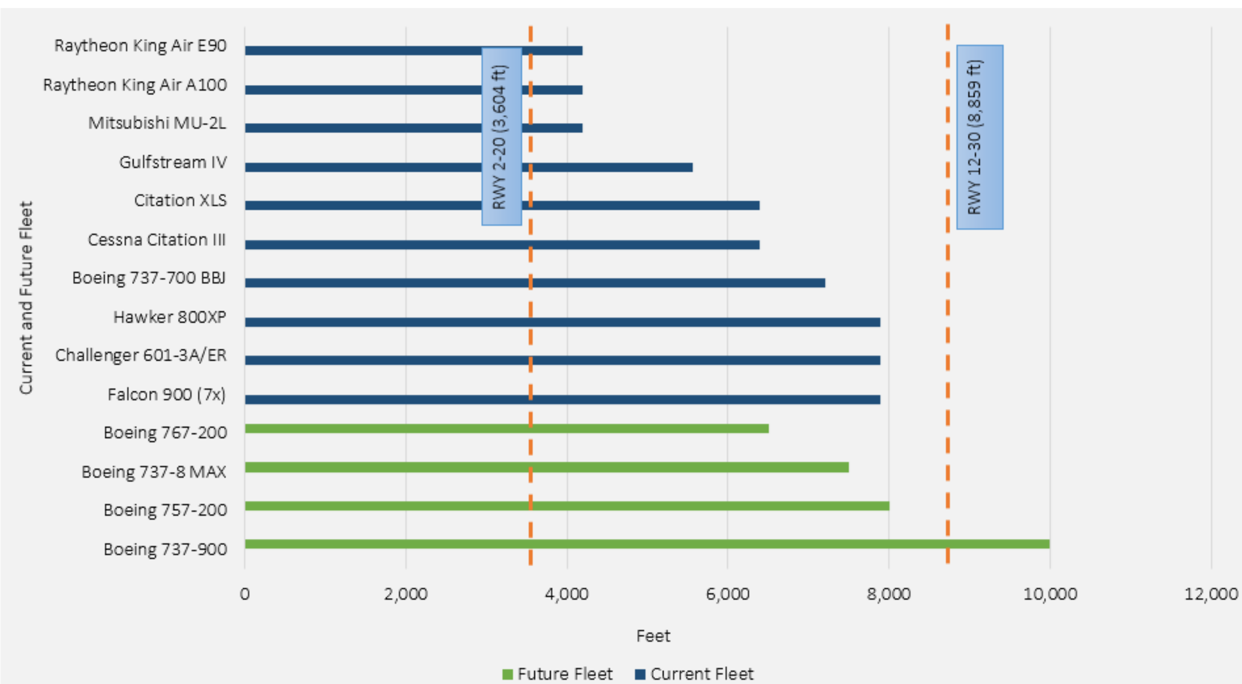
Based on the analysis, Runway 12-30 has adequate length to accommodate the existing and projected fleet mix at GYY, except for the Boeing 737-900 at maximum take-off weight. Aircraft larger than the B767 or that are more demanding in terms of take-off length are not projected to use the Airport on a regular basis within the 20-year planning horizon under the Baseline forecast, and therefore Runway 12-30 should be of adequate length to serve the projected future fleet.

Runway 2-20, at 3,604 feet, does not meet runway length requirements for departures for most of the GA fleet (Gulfstream IV, Citation, Falcon 900, Challenger, and Hawker 800) which are all ADG II. These jets, when conditions require use of the crosswind runway, would be operating at limits far below capacity, and therefore, Runway 2-20 is inadequate for existing and future critical aircraft at MTOW. For Runway 2-20 to accommodate departures for the majority of the ADG II GA fleet, the runway would need to be extended to at least 5,700 feet, and up to 6,000 feet. The longer the extension, the less load restrictions would need to be taken by aircraft using the runway. Results of the departure length analysis are shown in **Exhibit 4-1**, which shows the required runway length for majority/largest aircraft that operate out of GYY.

Landing length requirements were also assessed for the larger B-II aircraft (Hawker 800XP, Challenger 601-3A/ER, and Falcon 900 as well as the C/D-III aircraft (BBJ and the B-737-800/900, B757 and B767). Those aircraft represent the most demanding aircraft in the current fleet that regularly use the Airport, as well as the future fleet identified in PALs 4 and 5. The analysis used the same approach for determining runway departure length requirements, and were based on a dry runway, with the aircraft configured at Maximum Landing Weight with 30-degree flaps deployed, the results are shown in **Exhibit 4-2**. Runway 12-30 is adequate to serve all of the fleet analyzed except for a fully loaded B737-900. For Runway 2-20, additional length would be required to meet current and future GA fleet operations. An extension to 5,000 feet would meet the requirements of the current fleet, while an extension to 6,000 feet would meet both current and projected fleet.

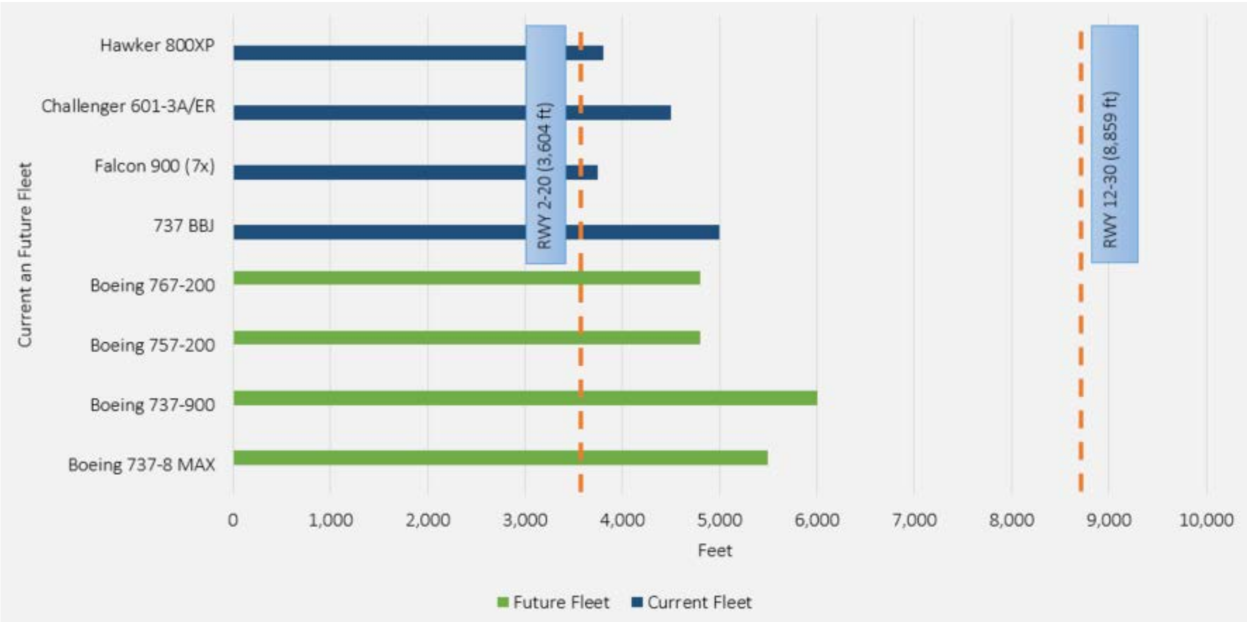
Potential lengthening and obstructions that limit runway length will be evaluated in the Alternatives phase of the master plan. The Runway Length Justification Analysis for Runway 2-20, found in Appendix **B**, provides a more detailed analysis of Runway 2-20 length requirements using FAA-prescribed methodology for those aircraft groups that are most likely to use the runway.

Exhibit 4-1- Runway Departure Length Requirements



Source: Manufacturer Operating Manuals, and Airport Characteristics, Jacobsen|Daniels, May 2018.

Exhibit 4-2- Runway Landing Length Requirements



Source: Manufacturer Operating Manuals, and Airport Characteristics, Jacobsen|Daniels, May 2018.

4.3.4 Declared Distances

Declared distances identify the usable runway length available to aircraft to meet obstruction clearances. As defined by the FAA, declared distances include takeoff distance available (TODA), takeoff run available (TORA), landing distance available (LDA), and accelerate-stop distance available (ASDA).

Runway 30 end has a displaced threshold of 900 feet due to proximity of the Grand Calumet River. The river's location prohibits a full-length and fully compliant RSA beyond the physical end of Runway 30 and therefore the threshold displacement is required. Runway 12-30's full runway takeoff distance is still available for aircraft departures. Only the LDA and ASDA are impacted by the displaced threshold. Runway 2-20 does not have displaced thresholds. The need to impose declared distances will be assessed with the possible Runway 2-20 extension as part of the Alternatives analysis. Table 4-13 presents the current declared distances for each runway end for TORA, TODA, ASDA, and LDA.

Table 4-13 - GYY Runway Declared Distances

	Runway 12	Runway 30	Runway 2	Runway 20
Take Off Distance Available (TODA)	8,859	8,859	3,604	3,604
Take Off Run Available (TORA)	8,859	8,859	3,604	3,604
Landing Distance Available (LDA)	7,959	7,959	3,604	3,604
Accelerate Stop Distance Available (ASDA)	7,959	7,959	3,604	3,604

Source: FAA Form 5010, Airport Master Record, Jacobsen|Daniels, April 2018.

4.3.5 Safety Areas

Dimensional standards pertaining to runway and taxiway safety areas provide adequate separation from hazards that could impact aircraft operations on the airfield. Airfield design standards are shown in **Table 4-14.**

Table 4-14 - Airfield Design Standards

	Runway 2-20 ADG II (Not Lower than 1 mile)	Runway 12 ADG III (Not Lower than ¾ mile)	Runway 30 ADG III (Lower than ½ mile)
RSA Length Beyond Runway End x Width (FT)	300 x 150	1,000 x 500	1,000 x 500
ROFA Length Beyond Runway End x Width (FT)	300 x 500	1,000 x 800	1,000 x 800
RPZ Length (FT)	1,000	1,700	2,500
RPZ Inner Width (FT)	500	500	1,000
RPZ Outer Width (FT)	700	1,010	1,750
RPZ Area (acres, each end)	13.77	29.47	78.91
Taxiway Safety Area Width from Centerline (FT)	79	118	118/171
Taxiway OFA Width from Centerline (FT)	131	186	186/259

Source: AC 150/5300-13A, Jacobsen|Daniels, May 2018.

4.3.5.1 Runway Safety Area (RSA)

The Runway Safety Area (RSA) is a surface that surrounds the runway that is precisely designed to reduce the risk of damage to aircraft in the event of an excursion from the paved surface, overshoot, or undershoot. The FAA also requires the RSA to be free of non-frangible objects, except when fixed by function.

- **Current conditions at GYY:** Runway 2-20 complies with FAA standards for ADG B-II. Runway 12 is compliant for ADG C-II standards. Runway 30 is not in compliance for ADG C-III due to the location of the Grand Calumet River located south of the runway threshold, thus necessitating the displaced threshold.

4.3.5.2 Runway Object Free Area (OFA)

A runway Object Free Area (OFA) is an area on the ground, fixed on the centerline of a runway that enhances aircraft operational safety by clearing the space of aboveground objects. Objects that need to be located within the OFA for aircraft ground maneuvering or for air navigation are acceptable. These objects within the OFA must be frangible, or less than three inches aboveground. Like the RSA, the OFA must extend beyond the start of the takeoff, and is unavailable for takeoff run, takeoff distance, and accelerate-stop distance per FAA AC 150/5300-13A standards.

- **Current conditions at GYY:** Runway 2-20 and Runway 12-30 comply with FAA OFA standards based on their runway classifications (ADG B-II and ADG C-III).

4.3.5.3 Runway Protection Zone

The Runway Protection Zone (RPZ) is an area beyond each runway end to enhance the protection of property and people on the ground. To keep the RPZs clear of incompatible uses, land within the RPZ should be protected by an avigation easement or owned by the Airport. This gives the airport the ability to control the presence and height of objects within the RPZ, as well as the use of land.

- **Current conditions at GYY:** At GYY, portions of the RPZ for Runways 12-30 and Runway 2-20 are under the protection of an avigation easement; however, areas in the Runway 20 RPZ are not owned by the Airport or in an avigation easement.

4.3.5.4 Taxiway Safety Area

The Taxiway Safety Area (TSA) is a defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft deviating from the taxiway. Similar to the RSA, the FAA also requires the TSA to be free of non-frangible objects, except when fixed by function.

- **Current conditions at GYY:** At GYY, the TSAs meet ADG II and III requirements across the airfield, as applicable for critical aircraft movements.

4.3.5.5 Taxiway Object Free Area

A Taxiway Object Free Area (TOFA) is an area on the ground, fixed on the centerline of a taxiway, or taxilane that enhances aircraft operational safety by clearing the space of aboveground objects. Similar to the ROFA, objects that need to be located within the TOFA for aircraft ground maneuvering purposes are acceptable within the TOFA. These objects within the OFA must be frangible, or less than three inches aboveground.

- **Current conditions at GYY:** At GYY, the TOFAs meet ADG II and III requirements across the airfield, as applicable for critical aircraft movements.

4.3.5.6 Safety Area Requirements

Table 4-14 presents the Airport's existing safety area standard dimensions, which meet FAA requirements. Should the instrument approach minimums at GYY be implemented and improved, the need for expanded safety areas is critical.

4.3.6 Pavement Strength

Existing pavement strength for Runway 12-30 should be adequate through the forecast period. The runway can handle aircraft weights up to 250,000 pounds, based on the strengths shown in Table 2-4. Critical aircraft and anticipated larger aircraft are well within this weight. The BBJ's (critical aircraft) MTOW is 171,000 pounds and is the B757's MTOW is 241,000 pounds. Runway 2-20 is used primarily by small ADG II aircraft and smaller, due to its short length. Its pavement strength is rated to handle aircraft with single wheel gear load of up to 18,000 pounds or dual wheel gear load up to 28,000 pounds. This strength is more than adequate to accommodate the B-II fleet that uses the runway. If the runway were extended and its classification changed to allow use by a broader portion of the fleet, pavement strength should be reevaluated to ensure that it accommodates the larger aircraft expected to use the runway.

4.3.7 Instrumentation and Lighting

Runway approaches/instrumentation, lighting and other navigational aids provide pilots with the necessary means to navigate safely and efficiently in most weather conditions. A variety of different navigational aids that provide both precision and non-precision approach capabilities are in place at GYY. **Table 4-15** summarizes the equipment being used for Runway 12-30 and Runway 2-20. The installation of the Medium Approach Lighting System (MALSR) for the approach of Runway 30 allows the approach to have lower minimums, which provide additional landing capability for pilots in adverse weather conditions.

Table 4-15 - Runway Navigational and Lighting Aids

Equipment	Runway 2	Runway 20	Runway 12	Runway 30
Navigational Aids[a]	GPS	GPS	GPS	LOC, GS, DME, GPS
Runway Lighting[b]	MIRL, REIL		HIRL-CL, REIL	HIRL-CL
Approach Lighting/VISAIDS[c]	PAPI-2L		PAPI-4L	PAPI-4L, MALSR
Pavement Marking	Non-Precision		Precision	

a) Navigational Aids - GPS (Global Positioning System), LOC (Localizer), GS (Glide Slope), DME (Distance Measuring Equipment)

b) Runway Lighting - MIRL (Medium Intensity Runway Lights, REIL (Runway End Identifier Lights), HIRL-CL (High Intensity Runway Lights with Centerline Lights),

c) Approach Lighting/VISAIDS - MALSR (Medium Intensity Approach Lighting System), PAPI (Precision Approach Path Indicator).

Source: Federal Aviation Administration, National Flight Data Center (NFDC), GYY Airport Data, Jacobsen|Daniels, April 2018.

The precision approach capabilities on Runway 12-30 provide both vertical and horizontal guidance, allowing aircraft to land in IFR conditions, when the cloud ceiling is less than 1,000 feet and the visibility is less than three statute miles. GYY operates in IFR approximately 11% of the time. Aircraft also use the instrument approaches during VFR for additional guidance. The type of instrumentation available for a runway determines the minimum ceiling and visibility, or “minimums”, during which landings can occur while under IFR conditions. Approach types and minimums are shown in **Table 4-16**.

Table 4-16 - GYY Runway Approach Minimums

Runway	Approach Type	Approach Minimum
Runway 2	Non-Precision	1-Mile
Runway 20	Non-Precision	1-Mile
Runway 12	Precision	¾-Mile
Runway 30	Precision	1/2-Mile

Source: Federal Aviation Administration, National Flight Data Center, GYY Airport Data, Jacobsen|Daniels, April 2018.

The complexity of the Chicago airspace requires strict air traffic coordination for safety and efficiency. Although a portion of the GYY's Class D airspace lies directly below the Class B airspace of ORD, the proximity does not have any impacts as it relates to instrumentation capabilities. The primary limitations are the surrounding runway obstacles and lighting, as described below.

Runway 30 currently has a 1,400-foot Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) in the runway approach zone, extended along the centerline of the runway.

Runway 2-20 currently has no approach lighting system, as the runway's visibility minimums are one-mile. The FBOs have voiced interest in the airport getting a precision approach with lower minimums for Runway 2-20, which could require an approach lighting system (ALS). The ALS extends visual cues to the approaching pilot and make the runway environment apparent with less visibility than when such lighting is not available. While the system is not required, lower straight-in visibility minimums may be established when standard or equivalent lighting systems are present.

Another GPS-based alternative may be establishing a localizer performance with vertical guidance (LPV) approach. An LPV is a modern aviation instrument approach procedure that uses the precision GPS capabilities to attain an airplane's position, allowing pilots to achieve lower minimums under adverse conditions. Typically, an LPV approach has a decision height of 250 feet and visibility of 3/4 mile. An LPV is not a precision approach but is an approach with vertical guidance (APV). Implementing an APV approach would require a flatter approach surface (30:1) than the 20:1 currently required. This would affect the threshold siting, which should be considered – along with the FBO's specific operational needs – if the option is pursued.

4.3.8 Deice Pad

The existing deicing pad is currently located 93 feet from the Taxiway A centerline, adjacent to Taxiway C. The deicing ramp is approximately 130 feet in length, which accommodates the length of the Boeing Business Jet, but it does not accommodate the length of the future critical aircraft, the Boeing 757 at 155 feet, and the Boeing 767 length at 159 feet. With entry of those aircraft into airport operations, the deicing pad would need to be relocated and expanded.

In 2013, FAA published an update to AC 150/5300-14C, *Design of Aircraft Deicing Facilities*. The updated AC provides clearances for Vehicle Movement Area (VMA), which is newly introduced. The lack of VMAs reduces the efficiency of the deicing operation and can add to the minimum time required to deice an aircraft during peak periods. The VMA allows for mobile deicing vehicles to complete deicing to both sides of the aircraft simultaneously as needed, allowing greater turn-around times for deicing aircraft.

With an average of 7.5 minutes per aircraft, the existing pad could accommodate 8 aircraft per hour in its existing configuration, the operational efficiency of the pad could be improved with the VMAs, increasing the operational capacity of the pad to 12 aircraft per hour, which is the forecasted peak hour demand for PALs 1 through 3.

As the size of aircraft and peak hour demand increases, specifically those realized in PALs 4 and 5 (Boeing 757 – 155 feet, and Boeing 767- 159 feet), consideration should be given to provide additional deice pad positions in one or more other locations, to reduce delay and increase operational efficiency. The number of deice positions, as well as alternative locations will be addressed in the alternatives chapter.

4.3.9 Apron Access

There are several locations along the apron in which aircraft can gain direct access to the runway from the apron. These types of direct connections are not recommended by FAA AC 150/5300-13A. These direct connections occur between Runway 12-30 and the apron at Taxiways C, A5, and A7. Options to correct these will be evaluated during Alternatives analysis.

4.4 Terminal Facilities

This section details the demand/capacity analysis and the future facility requirements for each of the individual functions associated with the terminal building.

4.4.1 Methodology and Basis of Planning

Terminal facilities planning requires the guidance of industry standards and logical assumptions. The facility program is based on projected growth developed in the forecast, the requirements of local and state building codes and regulations, federal standards and guidelines, and data collected from physical site visits. The Program was created within the framework of the following codes and regulations, as well as other industry accepted planning factors:

- FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans
- FAA AC 150/5360-13A, Airport Terminal Planning
- Airport Cooperative Research Program (ACRP) Airport Passenger Terminal Planning and Design, v1: Guidebook
- International Air Transport Association (IATA) Airport Development Reference Manual, in particular, the following sections:
    - Section F1: Capacity and Level of Service
    - Section J1: Outline of Principle Functions
    - Section J2: Categories of Passenger Terminal
    - Section J3: Small Airport Terminals
    - Section J6: Passenger Processing Facilities Planning
    - Section J7: Concession Planning
    - Section J8: Maintenance
    - Section J9: Check-In

Assumptions were made in determining the terminal building's capacity per function for each passenger activity level (PAL). These include passenger types and origins, flight schedules and peaking, level of service (LOS), as well as other assumptions regarding the nature of the services provided.

Planning criteria assumes 100% domestic, origin and destination (O&D) passengers. In addition, the majority of passengers, particularly in PALs 1 through 3, were assumed leisure travelers whom are more likely to arrive well in advance of departure times, use more terminal facilities (compared to business travelers), and arrive with well-wishers or be received by meeters and greeters.

PALs were used to measure and predict the demands on the Airport facilities. The peak hour of the peak month average day (PH PMAD) for each PAL is used as the planning guideline for sizing terminal facilities and determining capacity. This data is typically derived from existing flight schedules. Since GYY currently has no passenger activity and no historical flight schedules are available, the peak hour was generated by the forecast's daily passenger calculation and the design aircraft per PAL period, as described in Section 4.1. **Table 4-17** presents PAL peak hour assumptions.

Level of Service (LOS) describes the service provided to airport travelers at various points within the airport terminal building. LOS is measured by the amount of waiting time, processing time, length of queues, and general crowding experienced by passengers during the peak hour, assigned as LOS A, LOS B, LOS C, LOS D, or LOS F. A terminal building function assigned as LOS A typically is considered over-programmed; passengers flow freely and come across little to no wait times or delays. A function labeled as LOS F is the opposite; delays and lines are unacceptably long; the space is deficient and in need of expansion or re-configuration. LOS C is considered a good level of service, providing stable flow and acceptable throughput, with passenger processing systems in balance. This facility program assumes LOS C.

In addition to the assumptions mentioned above, several unique conditions required considerations. Certain functions in programming were considered exceptions to the norm due to the size and configuration of the Airport. Those assumptions are described in the following corresponding sections.

Table 4-17 - Peak Hour Assumptions

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Annual Enplanements	2,547	9,500	17,000	27,000	100,000	350,000
PMAD Passengers		54	96	153	532	1,694
% of Passengers Arriving at Peak Hour		100%	100%	100%	50%	25%
PH PMAD Enplanements		54	96	153	266	424
Assumed Aircraft Type		CRJ-700	CRJ-1000	737-800	737-800	737-800
Load factor		80%	80%-100%	80%	80%	80%

Source: Annual and Daily Enplanements from LeighFisher Forecast of Aviation Demand, Jan. 2018; Jacobsen|Daniels, May 2018.

4.4.2 Aircraft Gates

The recommended number and mix of gates were determined by PH PMAD passenger activity and the assumed aircraft for each PAL. The results of this methodology are depicted in **Table 4-18.**

For PALs 1, 2, and 3, one flight per day of varying size aircraft as shown in Table 4-18 would be expected, with a peak hour of 100% enplaning passengers. For PAL 4, two flights per day would be expected. The peak hour is assumed to be 50% of the PMAD passengers. For PAL 5, three flights per day are expected, with a peak hour of 25% of the PMAD passengers. These percentages reflect the concentrated periods of activity that occur with a small number of flights per day. In that situation, a higher percentage of the average daily passengers are at the airport in the peak hour. For an airport with arrivals and departures spread out over a 12-hour period or longer, peak hour as a percentage of average day can be around 12% to 18% for deplaned or enplaned passengers.

A minimum load factor of 80% is used to determine the number of occupied seats, and therefor aircraft type, needed to accommodate the number of passengers. The number of gates required allows for one additional gate to provide flexibility in case of weather or equipment delays that would result in more aircraft at the terminal than under normal operations. Gate frontage is based on the anticipated aircraft types using the terminal. Based on this analysis, the current terminal frontage and gates are adequate through PAL 3. Additional frontage and one additional gate would be needed for PAL 4 and PAL 5 activity.

Table 4-18 - Aircraft Gates

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Annual Enplanements	2,547	9,500	17,000	27,000	100,000	350,000
Peak Hour Enplanements		54	96	153	266	424
Assumed Aircraft Type	n/a	CRJ-700	CRJ-1000	737-800	737-800	737-800
Seats per Assumed Aircraft (#)		68	100	189	189	189
Gates (#)	3	2	2	2	3	4
Terminal Frontage (FT)	365	227	247	301	439	595

Source: Annual and Peak Hour Enplanements from LeighFisher Forecast of Aviation Demand, January 2018; Jacobsen|Daniels, May 2018.

4.4.3 Check-In

Passengers' use of the check-in lobby has changed significantly since the GYY terminal was opened. Passengers now are more likely to check-in to flights online at home and either print boarding passes or load them onto their mobile devices for scanning. Many of the passengers using the ticket counter these days are only checking bags and may use a self-service kiosk before handing the bag off to the ticket agent. As the departure process transitions toward self-service, the demands on the check-in counter and ticketing lobby are reduced.

Technical innovations such as common-use passenger processing systems (CUPPS) can also have a significant impact on the facility requirements. Providing a shared use check-in area where passengers can use self-service kiosks to check-in and self-tag their baggage can reduce the ticketing area (as well as hold room and gate) requirements for the individual airlines. Implementation of these systems require close coordination with the airlines to ensure the system fits their typically diverse needs. The uncertainty of how these processes will be adopted by passengers and implemented by airlines or the Airport provides a challenge to developing future requirements. For this analysis, the following assumptions were made:

- No implementation of common-use passenger processing systems (CUPPS)
- The check-in counter area assumes 10 feet from the face of the counter to the back wall
- The check-in queue area assumes a 30-foot deep queue in front of the check-in counters
- In PALs 1 through 3, passengers will be primarily leisure travelers who will continue to use the ticket counter for assistance and to check bags. In PALs 4 and 5, with more frequent service, a

higher number of business travelers would be anticipated. These passengers are more likely to utilize remote check-in and avoid checking bags.

- Over the planning period, there will be a moderate adoption of self-serve technology.

As the check-in process continues to evolve, the assumptions and analysis should provide the flexibility to accommodate changes and will provide a conservative baseline for the future of the check-in lobby.

Overall, the current check-in lobby is at capacity for PALs 1-3. Queuing space for check-in is suboptimal and will likely need to expand or be reconfigured for the anticipated level of activity to maintain an acceptable level of service during peak hour. **Table 4-19** depicts the future check-in requirements. In PALs 4 and 5, the check in area needs to triple in size to accommodate additional counter positions, frontage and queue.

Table 4-19 - Check-In

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Check-in Positions (#)	8	4	4	4	8	8
Length of Counters (LF)	43	20	20	20	40	40
Check-in Counter Area (SF)	316	300	300	300	600	600
Check-in Queue Area (SF)	208	500	500	500	1000	1000
Subtotal:	524	800	800	800	1600	1600

Source: Jacobsen|Daniels, May 2018.

4.4.4 Baggage Claim

Baggage claim provides space for the public to reclaim their checked baggage upon arriving at their destination. Key elements of baggage claim requirements include the number of carousels, the length of each carousel, and the overall area provided for passengers to congregate while waiting for bags to be delivered.

While many functions in terminal planning utilize the peak hour, typically the peak 20 minutes is used when planning for baggage claim. It is also important to not only consider passengers, but also the number of aircraft operations, the gauge of the aircraft operations, and the number of different airlines. The number of passengers is important for determining the required presentation length of the carousels, while the aircraft operations are important for determining the number of carousels and their recommended size.

Two methods were used to calculate the number of passengers at baggage claim: peak 20-minute passengers and average size by arriving aircraft. Several assumptions were made to estimate the peak 20-

minute number of passengers. It was assumed that 100% of the passengers were originating from or coming to GYY, 75% of the passengers had checked baggage to claim, and of those, 80% would be in the active claim area. This considers the travel party size where often one member of the travel party will approach the baggage carousel while the others remain farther away. Typically, 1.5 feet of baggage claim belt presentation length is provided per passenger in the active claim area, the area typically within six to eight feet of the baggage claim carousel. This provides enough frontage to accommodate all passengers along a carousel no more than two passengers deep, thus providing enough space for passengers to easily maneuver and claim their luggage.

Presentation length was also determined using ACRP methodology based on the anticipated aircraft arrivals in the peak hour. In PAL 1, one baggage claim carousel is recommended to provide 50 linear feet to accommodate a typical regional jet with 54 deplaning passengers. In PAL 3, with one B737 narrowbody aircraft arriving, a length of 110 feet would be required. In either methodology, a single claim device is adequate through PAL 2 and PAL 3 with more presentation length for the anticipated larger aircraft. In PALs 4 and five, two claim devices are recommended with increased presentation length. **Table 4-20** presents baggage claim program requirements.

The baggage claim lobby size is based on the number of passengers within the active claim area and the footprint of the claim device as an estimate a total area required. The existing baggage claim area is undersized to serve PAL 1 and would need to double in size to meet PAL 2 and 3 requirements.

Table 4-20 - Baggage Claim

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Number of Claim Devices (#)	1	1	1	1	2	2
Baggage Carousel Presentation Length (LF)						
Currently Available	47					
Requirement Based on Peak 20-minute Passengers		30	50	80	140	210
Requirement Based on Arriving Aircraft		50	110	110	220	220
Baggage Claim Area (SF)	1,515	1,500	3,300	3,300	6,600	6,600

Source: Jacobsen|Daniels, May 2018.

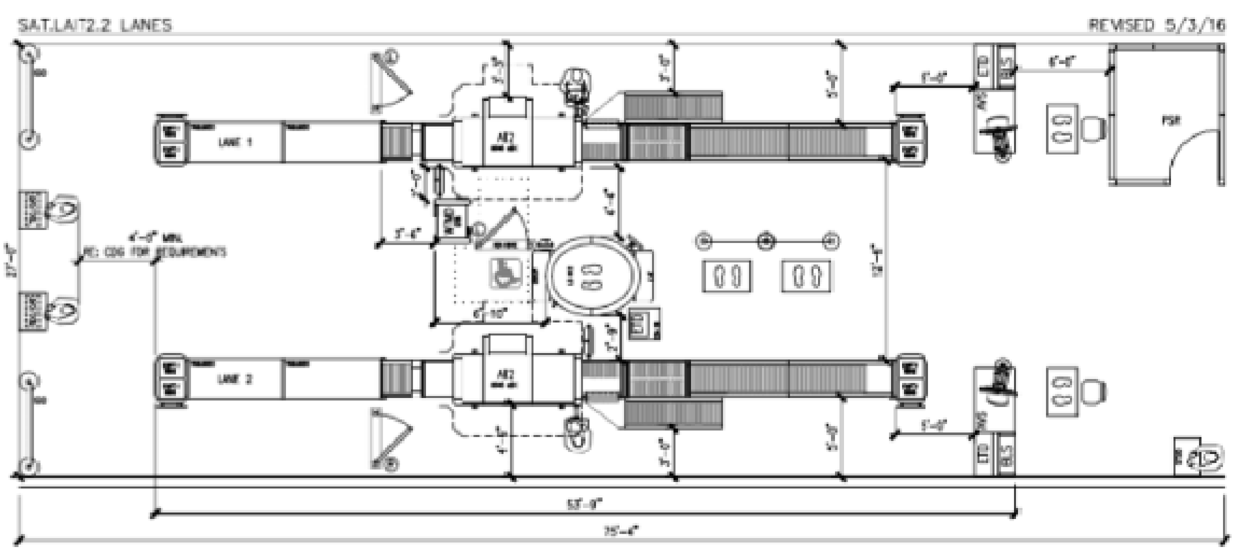
4.4.5 Security Screening Checkpoint

The Transportation Security Agency (TSA) performs screening at US airports. The agency maintains guidelines for the layout of required screening space, equipment, and the security screening checkpoint (SSCP) in the TSA's Checkpoint Design Guide (CDG). Because these areas are federally staffed, configurations must comply with federal design requirements. These guidelines have continued to evolve since the formation of the TSA as threats have changed and technology has provided new methods for screening passengers. There are a number of different checkpoint configurations that vary in size depending on the airport category, type of equipment and lane configuration. Layouts include all equipment and spacing from the check-in podium (where agents verify identification) to the end of the screening belt, re-composition area and personal screening room (PSR). Typical elements include:

- X-ray or other screening unit for carry-on bags
- Walk through metal detector (WTMD)
- Advanced Imaging Technology (AIT) full body screening
- Search area for passengers who set off the WTMD
- ETD machine for checking bags
- Lead-in and roll-out belts to load bags into and collect bags from the screening machine
- Podium at head of conveyor for agents to check identification
- Re-composition area for passengers to re-organize after screening

Exhibit 4-3 depicts a typical layout for a two lane SSCP. Overall dimensions of the area as shown are approximately 76 feet by 28 feet.

Exhibit 4-3- Typical Two-Lane SSCP with AIT



Source: Transportation Security Administration, Checkpoint Design Guide, Revision 6.1, June 01, 2016.

The length of the screening machine alone is approximately 54 feet. Given the restricted layout of the terminal and hold rooms, the space requirement was adjusted to a 65-foot length, acknowledging that tables may need to be removed and the PSR may need to be relocated. Based on these assumptions, two lanes are adequate for PALs 1 through 3; one standard and one pre-check.

Programming for a 10-minute (industry standard) wait time at PAL 5, a checkpoint queue depth of 28 feet is anticipated. This wait time and area allows 21 passengers to queue in the standard lane and 14 passengers to queue in the pre-check lane. **Table 4-21** presents the projected security checkpoint requirements.

Table 4-21 - Security Screening Checkpoint

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
TSA Airport Category	n/a	III	III	III	III	II
Number of Lanes (#)	2	2	2	2	3	3
Checkpoint Area (SF)	572	1,820	1,820	1,820	2,730	2,730
Checkpoint Queue (SF)	261	640	640	640	970	970
Total SSCP Area (SF)	833	2,460	2,460	2,460	3,700	3,700

Source: Jacobsen|Daniels, May 2018.

4.4.6 Departure Lounges

Departure lounges are provided adjacent to aircraft gates to accommodate passengers waiting to board aircraft. Typically, departure lounges are sized to accommodate 80% of the passengers on the maximum size of aircraft for that gate. Seating area is provided based on 15 square feet per seated passenger (80% of total passengers in the departure lounge) and 10 square feet per standing passenger (20% of total passengers in the departure lounge). In addition to the seating area, space is provided for a gate podium and an egress corridor to/from the passenger boarding bridge door. For departure lounges that are shared by multiple gates, a 10% reduction is typically applied to account for the ability to cross-utilize the adjacent departure lounge.

As a whole, the existing departure lounges at GYY are well sized for PAL 3 based on the current fleet mix. Current space would need to nearly double to accommodate PAL 5. A summary of the departure lounge requirements based on the projected gate requirements is shown in **Table 4-22**.

Table 4-22 - Departure Lounges

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Departure Lounges (SF)	4,815	2,070	2,070	4,570	6,860	9,140

Source: Jacobsen|Daniels, May 2018.

4.4.7 Concessions Space

Concessions are a critical component of any airport terminal as they provide revenues and necessary services to the travelling public. In terms of sales potential at U.S. domestic airports, airside locations are the strongest, followed by pre-departures landside locations, and finally, arrivals locations.

Concession area requirements are based on the activity level which can support them. Typically, 10 square feet per 1,000 passengers is the amount of concessions space that can be supported. As shown in **Table 4-23**, the Airport's existing concession space is larger than would be required until PAL 4. In PAL 1, GYY will be able to support 100 square feet of concessions, which would be a 10x10 "grab-n-go" stand and vending. An additional 40 square feet for storage is also recommended, although programming storage square footage could vary under different leasing management methods.

Rental car requirements in the terminal are considered with concessions. Currently, 184 square feet is dedicated to rental car facilities. The analysis assumes that one or two rental car companies would utilize the space as was done during previous passenger activity similar to PAL 3. Therefore, two counters would be needed for PALs 1-3 and four counters needed for PALs 4-5. Requirements are based on 10 feet of counter length per individual space, with a depth of 13 feet which incorporates a 3-foot deep counter, 5 feet of depth for staff, and a 5-foot depth in between the counter and queue as a buffer for customers transacting business. One 100 square foot office is provided per counter. In addition, 10 feet of queue is provided per counter. The existing Rental car is slightly undersized for PALs 1-3 and significantly undersized for PALs 4 and 5. If a single rental car agency provided service in PALs 1-3, then the sizing would be appropriate.

Table 4-23 - Concessions

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Concessions Sales (SF)	890	100	170	270	1,000	3,500
Concession Storage (SF)	0	40	60	90	350	1,230
Rental Car Counter and Office Area (SF)	184	330	330	330	660	660
Rental Car Queue Area (SF)	98	100	100	100	200	200
Total Concessions:	**1,172**	**570**	**660**	**790**	**2,210**	**5,590**

Source: Jacobsen|Daniels, May 2018.

4.4.8 Circulation and Other Public Functions

Public circulation and other general public functions are described in this section. These areas include public circulation, public restrooms, and other public support space such as public seating and greeter lobby. **Table 4-24** summarizes projected requirements for Circulation and Public Functions.

4.4.8.1 Public Circulation

Public circulation includes the areas of the terminal utilized to move within the terminal building. Three areas of public circulation are analyzed for the program: non-secure circulation, secure circulation, and connectors.

The magnitude of these areas is typically a function of the overall terminal configuration. Some building configurations are more efficient than others, using less circulation space.

Table 4-24 - Circulation and Other Public Functions

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Non-Secure Circulation (SF)	2,088	1,700	1,700	1,700	3,390	3,390
Secure Circulation (SF)	1,131	1,500	1,500	1,500	4,500	4,800
Public Seating (SF)	144	90	170	260	440	710
Meeter/Greeter Lobby (SF)	100	70	130	200	310	480

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Public Restrooms - Non-Secure (SF)	662	2,400	2,400	2,400	2,400	2,400
Public Restrooms – Secure (SF)	606	1,600	1,600	1,600	1,600	1,600
Total Circulation and Other Public Functions (SF):	**4,731**	**7,360**	**7,500**	**7,660**	**12,640**	**13,380**

Source: Jacobsen|Daniels, May 2018.

Non-Secure Circulation

Non-secure circulation is the circulation area in the terminal building prior to the security screening checkpoint used to access various functions. It includes the large entry vestibule, hallways and open areas in the check-in lobby and baggage claim hall, as well as general circulation connecting other terminal functions.

Typically, the primary drivers for non-secure circulation are the size of the check-in lobby and the size of the baggage claim hall. At GYY, these areas are minimal. So, in addition to these areas, an allowance 50% was added to the requirement to account for general circulation connecting the various non-secure functions in the terminal building.

Secure Circulation

Secure circulation is the circulation in the terminal and concourses on the secure side of the security screening checkpoint. This circulation is primarily a function of the number and size of gates and the concourse configuration.

This program assumes a primarily single-loaded concourse – a concourse with aircraft gates parked only on one side – due to the existing site constraints which limit aircraft parking to along one face of the concourse. A 15’-0” corridor width was assumed to accommodate circulation. The length of the concourse was determined by the number and type of aircraft recommended in the projected future gate requirements.

4.4.8.2 Public Restrooms

Requirements for public restrooms are also assessed for both the secure and non-secure portions of the terminal building. The planning methodology is based on providing an adequately sized restroom module within an appropriate proximity to a grouping of terminal processing functions. The public restroom fixture counts must meet local code requirements; however, requirements determined during the initial planning frequently exceed those of the local codes. Jurisdictions may require more fixtures for females than males, which should be considered. In addition to the restrooms, each module should incorporate a small custodial closet as well as a companion care restroom or nursing room. These features are incorporated into the requirements analysis for modules. Public restrooms are currently undersized for PAL 1 and throughout the planning period.

Non-Secure

Non-secure restrooms typically have a lower volume of passengers so can be sized with fewer stalls than those in the secure areas. In most facilities, a module of 1,200 square feet will be adequate.

Secure

Public restrooms in the secure areas of the concourses typically have a higher passenger load, particularly upon the arrival of an inbound aircraft. This results in the need for additional restroom fixtures and a larger module for restrooms. Typically, a module of 1,600 square feet would be adequate.

4.4.8.3 Public Seating

Public seating refers to seating areas in the non-secure portion of the terminal which are generally located near the check-in lobby and baggage claim hall. This does not include seating in areas such as food courts, which is programmed within the concession requirements, or the meeter-greeter area, which is programmed specifically.

The requirement for seating areas has decreased in recent years as fewer passengers have well-wishers accompanying them into airport terminals due to security restrictions. However, these areas are still important as aging populations continue to travel and passengers are required to wait in lines to be processed in the terminal. These areas can also be useful as meet-up points for assembly of groups traveling together. This analysis based public seating demand on serving 5% of the peak hour arriving and departing passengers, including well-wishers and greeters. The current public seating areas are adequate in PAL 1, but not thereafter.

4.4.8.4 Domestic Greeter Lobby

The domestic greeter lobby provides space for greeters to wait for an arriving passenger. This space should provide seating and include flight information display boards to keep the greeters updated on arrivals. The space should be located outside of the secure concourse exit to allow monitoring of exiting passengers without impacting passenger flow. Ideally, the greeter lobby should also be located near restrooms and non-secure concessions. GYY's greeter lobby is adequate through PAL 1, slightly undersized in PAL 2, and inadequate for the remainder of the PALs.

4.4.9 Baggage Processing

Baggage processing systems include three primary functions: outbound baggage makeup, baggage screening, and inbound baggage delivery. These functions are critical to the passenger operations at the Airport but have significant deficiencies in the existing terminal.

Outbound Baggage areas are calculated based on the Peak hour passengers checking bags. With an assumption that 60% of passengers will check one bag the number of carts can be found. The area makeup, number of carts needed, and additional space for tug circulation provides the area required for LOS C. **Tables 4-25 and 4-26** present the planning parameters for baggage processing.

Table 4-25 - Outbound Baggage Planning Parameters

Description	Planning Parameter
Originating Passengers	100%
Domestic % Passengers Checking Bags:	60%
Domestic Bags/Passenger	1.0 bag
Bags/Baggage Cart	40 bags
Area per Baggage Cart	410 feet

Source: Jacobsen|Daniels, May 2018.

Baggage screening planning parameters include the assumed inline explosives detection equipment (EDS) and electronic trace detection (ETD) throughput for outbound checked baggage. A surge factor and alarm rate of 10% is included. The EDS and ETD machine areas are calculated by the number of machines needed based on these parameters. Peak hour checked bag screening requirement in PAL 3 totals 102 bags/hour which increases to 176 bags/hour in PAL 4 and 280 bags/hour in PAL 5.

Table 4-26 - Baggage Screening EDS Parameters

Description	Planning Parameter
Inline Throughput	200 bags/hour
ETD Throughput:	60 bags/hour
Surge Factor	10%
Alarm Rate	10%
Area per EDS machine	400 square feet
Area per ETD Machine	600 square feet

Source: Jacobsen|Daniels, May 2018.

Table 4-27 summarizes requirements for Baggage Processing. A stand-alone EDS would serve baggage screening needs through PAL 4. The screening area would also include a separate ETD. This configuration can process from 100 to 230 bags/hour. With PAL 5 activity, multiple units would be required to screen the expected bag flow during peak hour.

Table 4-27 - Baggage Processing Requirements

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Outbound Bag Make-Up (SF)	616	410	820	820	1,640	1,640
Inbound Bag Delivery (SF)	780	1,040	1,040	1,040	2,070	2,070
Baggage Screening (SF)	116	580	580	580	580	900
Subtotal:	**1,512**	**2,030**	**2,440**	**2,440**	**4,290**	**4,610**

Source: Jacobsen|Daniels, May 2018.

4.4.10 Tenant Spaces

Tenant spaces include office and operations space for TSA, Airport Police, airlines, and the visitor Information booth. **Table 4-28** presents the requirements for tenant space.

The TSA does not lease the security screening checkpoint or the baggage screening areas, since these are considered necessary for public safety and security. However, the TSA does require leased space for their staff in support of these functions. The TSA previously leased roughly 200 square feet of support space in the existing terminal. This square footage should be acceptable in PALs 1 through 3,however additional space would be required in PALs 4 and 5.

Airline ticket offices (ATOs) are typically located adjacent to the check-in counters and provide support space for the airline employees staffing check-in. Airline demand for ticket offices has declined in recent years resulting in a reduction to the amount of space traditionally required. At GYY, this space can also be used for baggage service and to a more limited extent for airline operations space. This requirement is based on the number and width of check-in counters, assuming that an office space 22 feet in depth is located behind the counters. The 440 square feet projected demand for ATO space in PALs 1-3 is about 25% more space than currently is available. ATO space is significantly undersized for PALs 4 and 5.

By PAL 4, additional airline space would be required for operations. This space would include offices, storage for aircraft provisioning and supplies, restrooms and breakroom. This space is located at the apron level adjacent to airline gates.

Visitor information booths provide passengers general information regarding the local region. Sixty square feet is recommended for an information booth in the Airport.

Table 4-28 - Tenant Spaces

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
TSA Offices (SF)	193	200	200	200	300	300
Airport Police (SF)	104	150	150	150	150	150
Airline Ticket Offices (SF)	322	440	440	440	880	880
Information Booth (SF)	60	60	60	60	60	60
Subtotal (SF):	**679**	**850**	**850**	**850**	**1,390**	**1,390**

Source: Jacobsen|Daniels, May 2018.

4.4.11 Terminal Support Functions

Terminal support functions are required to maintain an operational terminal building and relate directly to the overall size of the programmed net terminal space. These areas include non-public circulation, non-public restrooms, terminal support, building systems, and non-net space[2]. The calculations for terminal support function requirements are based on factors applied to the programmed area to build up an overall gross area required for the terminal building. Table 4-29 presents requirements for the various terminal support functions.

Non-public circulation is circulation in the terminal building that is not accessible to the public, such as circulation under the concourses and the emergency egress circulation. It is based on the percentage of non-public areas, generally 15%.

Terminal support includes space for building maintenance, janitorial, and general storage space. The existing building has 457 square feet used as terminal support. For PAL 1, 600 square feet is recommended for a properly functioning facility. Requirements increase proportional to total programmed space.

Loading docks are useful for delivery of equipment, janitorial supplies and concessions supplies, and removal of trash and other materials. Requirements are based on general loading dock measurements, with one dock required through the planning period. Given the small number of flights in PALs 1 through 3, a dock may not be required since delivery amounts are small and can be scheduled in hours without flight activity. A loading dock would be beneficial as the amounts of materials that should remain back-of-house increase with an increase in flight activity.

[2] Individual programmed spaces are listed as a net value; a non-not space is provided to make up the difference between the individual net spaces and the overall gross square footage.

Table 4-29 - Terminal Support

	Existing	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Non-Public Circulation (SF)	-	400	500	500	900	1,100
Non-Public Restrooms (SF)	-	-	-	-	100	100
Terminal Support (SF)	457	600	700	800	1,400	1,600
Loading Dock (SF)	-	1,420	1,420	1,420	1,420	1,420
MEP (SF)	2,190	1,800	2,000	2,300	4,000	4,700
Non-net/structure/void (SF)	-	400	500	600	1,000	1,200
Subtotal (SF):	**2,647**	**4,620**	**5,120**	**5,620**	**8,820**	**10,120**

Source: Jacobsen|Daniels, May 2018.

Mechanical, electrical and plumbing (MEP) systems include the critical systems necessary to maintain an operational terminal and include space for mechanical closets, electrical rooms, communications and data rooms, and plumbing chases and systems. MEP requirements are based on a percentage of functional programmed space, typically 10 percent. At GYY, mechanical areas flank the east and west ends of the terminal. Approximately 930 square feet is used on the east and 830 square feet is used on the west. In addition, other MEP spaces within the building total to approximately 2,190 square feet. The gross MEP space should be adequate through PAL 2, although individual elements such as communications and electrical rooms that support security and tenant functions may not be located correctly or be sized appropriately. Additional space will be required in PALs 3 through 5.

4.4.12 Federal Inspection Services

The forecast, and this analysis, assume that all passenger operations will be domestic. If international flights were initiated, the Airport would require a space for Federal Inspection Services (FIS) to perform customs and immigration screening on inbound passengers from foreign airports. The size of an FIS facility is based on the number of passengers per hour that the facility is expected to process. It includes baggage claim, circulation and queueing, booths for U.S. Customs and Border Protection (CBP) officials to interview and check passengers. Office space is also required for CBP and Immigration officers. Passageway between the arriving aircraft and the FIS must be “sterile” to prohibit outside entry and ensure that passengers are routed directly to the FIS.

The minimum facility size under the CBP's Airport Technical Design Standards is based on a throughput of 200 passengers per hour. Assuming one flight by a B-737 daily with approximately 180 passengers, an additional 16,000 to 18,000 square feet would be required for FIS facility to accommodate inbound international passengers. The space would include primary and secondary processing, CBP administration, restrooms, baggage claim area, and circulation.

4.5 General Aviation

The types and number of forecasted GA operations and based aircraft were used to project future GA facility needs. General aviation facility demand is based on space needed for both based aircraft and transient aircraft activity.

At GYY, based aircraft are stored in FBO community hangars, corporate hangars, or T-hangars. A limited number of owners of small single engine aircraft may opt to lease tie-down space on the apron rather than an enclosed T-hangar or space in a community hangar. Itinerant aircraft are parked in FBO hangars and on aprons for the duration of their stay. Passengers arriving on transient aircraft may use conference rooms at FBO facilities or other airport facilities or rent cars to travel off-airport. Flight crews of based and transient aircraft will use the pilot facilities in their corporate hangars or provided by the FBOs for flight planning and rest. The activity associated with based aircraft determines the requirements for airside apron, hangar space, FBO terminal area, and landside parking. Transient aircraft activity affects primarily apron parking and the need for passenger and pilot services in the FBO terminals.

4.5.1 Based Aircraft Storage Requirements

Corporate and FBO tenants maintain facilities at GYY for based aircraft. These include the following types of facilities:

- Hangars, including conventional hangars used to store multiple aircraft of various sizes and t-hangars sized for individual small aircraft.
- Apron, which is either associated with an adjacent hangar (used for aircraft maneuvering and staging) or is used to park based aircraft. It may also be used to park ground service equipment including refueling trucks.
- Vehicle parking for employees, passengers and visitors.
- Office/terminal and other support functions which can include office space, pilot lounges, common areas, flight planning offices, concierge desks, rental car facilities, commercial or catering kitchens, conference rooms and training rooms. All of these functions may be found in FBOs while corporate tenants will include some or all of these functions, based on the size of their operations.
- Maintenance space, which is generally carved out of the hangar footprint.

Demand is a function of the number and size of the based aircraft fleet. According to Airport and FBO records for 2016, there were 110 based, non-military aircraft at GYY, most of which were housed inside the 202,050 square feet of conventional hangar space leased by FBOs and corporate tenants. The 41 T-hangars (of which 35 were leased) represent approximately 46,750 square feet of storage for single and multi-engine piston aircraft. Based aircraft apron was estimated at 139,211 square feet of apron.

The analysis assumed that all based aircraft would continue to be hangared and that the number of T-hangars would be capped at the number available during the base year of the planning study. Storage space was projected using a representative aircraft footprint by aircraft design group. For T-hangars, only ADG I aircraft were assumed to occupy the T-hangars, based on conditions at the time of tenant interviews. Each aircraft was presumed to require 1,080 SF of storage space. **Table 4-30** presents the area required for each aircraft group by location. **Table 4-31** presents the storage distribution of based aircraft and resulting demand by type of storage.

As shown in **Table 4-32**, there currently is a shortage of 15,350 square feet of conventional hangar space, which correlates to Boeing's parking one BBJ on their apron when all of their fleet is in GYY. By PALs 3 and 5, conventional hangar space will exceed capacity by 148,338 square feet and 475,488 square feet, respectively. ADG II jet aircraft, such as the Gulfstream IV, will generate the most demand for conventional hangar storage.

Table 4-30 – Storage Footprint by Aircraft Design Group

Location	Area Required (SF)	Aircraft Design Group
Tie-down	1,500	ADG I
T-Hangar	1,080	ADG I Single/Multi Engine
Conventional Hangar	3,000	ADG II & III GA
Conventional Hangar	18,000	ADG III - BBJ
Apron	13,000	ADG IV

Source: Jacobsen|Daniels. April 2018.

Table 4-31 - Based Aircraft Storage and Storage Demand by ADG

Storage Type	Existing 2016	Forecast PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
ADG I in T-Hangars (#)	35	41	41	41	41	41
ADG I on Apron (#)	11	5	6	6	10	23
ADG I in Conventional Hangars (#)	5	7	8	9	10	18
ADG II in Conventional Hangars (#)	56	75	78	82	92	156
ADG III in Conventional Hangars (#)	3	3	4	5	4	7
Total Number of Based Aircraft	110	128	133	138	153	238
Based Aircraft Storage Demand by ADG						
T-Hangars (SF)	37,800	44,280	44,280	44,280	44,280	44,280
Based Aircraft Apron (no circulation allowance) (SF)	16,500	7,500	9,000	9,000	15,000	34,500
Conventional Hangars - FBO or Corporate (SF)	227,400	277,560	302,640	330,720	342,800	592,440

Source: Jacobsen|Daniels, May 2018.

Table 4-32 - Based Aircraft Storage Requirements

	Existing 2016	PAL 1	PAL 2	Forecast PAL 3	PAL 4	PAL 5
Hangar Space Available (SF)						
T-Hangars (SF)	44,280					
Conventional Hangars - FBO and Corporate (SF)	212,050					
Hangar Surplus/(Deficit) (SF)						
T-Hangars (SF) [a]	6,480	0	0	0	0	0
Conventional Hangars - FBO and Corporate (SF)	(15,350)	(65,510)	(90,590)	(118,670)	(134,750)	(380,390)
25% Office Allowance (SF)[b]		(16,378)	(22,648)	(29,668)	(33,688)	(95,098)
Total Conventional Hangar / Office (SF)		(81,888)	(113,238)	(148,338)	(168,438)	(475,488)

a) Assumes no net new construction of T-hangars, only replacement of the number available in 2016.

b) Office allowance applied to reflect office space constructed with new hangars.

Source: Jacobsen|Daniels. April 2018.

4.5.2 Apron Storage Requirements

Both transient and based aircraft may be parked on the general aviation apron. At GYY, the FBOs park transient aircraft in hangars when space is available and use the apron when hangars are full or when the visiting aircraft expects a short stay. The apron provides access to fueling, parking, and GA terminal facilities.

Transient apron demand is a function of PMAD general aviation operations. Assumptions for the demand in itinerant aircraft apron include the following:

- Larger, more expensive jets will be stored in hangars rather than on the apron.
- About 25% of transient aircraft are stored in hangars on the peak month average day, due to based fleet being away from the airport, creating availability of space in FBO community hangars.
- Based on discussions with air traffic controllers, approximately 40 daily GA operations are assumed to be touch and go operations and therefore do not require apron. (This correlates to the FAA Terminal Area Forecast projection of local non-military operations.)

Requirements were calculated using PMAD operations by aircraft group and deducting a percentage of touch-and-go operations to determine the number of operations that utilized the apron. Of these, 76% are assumed to be transient, and of those, 25% would be hangered during their stay at GYY. Apron requirement was calculated by multiplying a typical parking footprint for each category of aircraft expected to use the apron on the PMAD. Additional area was added to account for clearance around parked aircraft and aircraft maneuvering on the apron. Results of the analysis are shown in **Table 4-33**.

Table 4-33 - General Aviation Apron Requirements

	Current 2015	PAL 1	PAL 2	Forecast PAL 3	PAL 4	PAL 5
PMAD Transient Flights Requiring Apron	19	21	22	22	26	29
Transient Aircraft Apron (SF)						
PMAD Transient Aircraft Parking Footprint	**92,600**	**100,300**	**111,000**	**116,400**	**141,100**	**198,939**
Allowance for Circulation and Aircraft Separation (80%)	74,080	80,240	88,800	93,100	112,880	159,151
Total Transient Apron Demand	166,680	180,540	199,800	209,520	253,980	258,091
Existing Apron Available for Transient GA Parking [a]	330,476					
Transient Apron Surplus/(Deficit) (SF)	**163,796**	**149,936**	**130,676**	**120,956**	**76,496**	**(27,615)**
Based Aircraft Apron (SF)						
PMAD Based Aircraft Parking Footprint	16,500	7,500	9,000	9,000	15,000	34,500
Allowance for Circulation and Aircraft Separation (80%)	13,200	6,000	7,200	7,200	12,000	27,600
Total GA Based Aircraft Apron Demand	29,700	13,500	16,200	16,200	27,000	62,100
Existing Apron Available for GA Parking	197,378					
Based Aircraft Apron Surplus/(Deficit)	**167,678**	**183,878**	**181,178**	**181,178**	**170,378**	**135,278**
Total Apron Surplus/(Deficit) (SF)	**331,474**	**333,814**	**311,854**	**302,134**	**246,874**	**107,663**

a) Available apron includes the covered apron at B. Coleman.

Source: Jacobsen|Daniels, May 2018.

Currently, there is 330,476 square feet of apron available for itinerant aircraft parking and 197,378 square feet available for based aircraft. Because FBOs may not strictly designate one use or the other, existing areas were estimated by location and typical use. The surplus and deficit requirements for transient and based apron are summed to reflect the flexibility in apron use. Apron should be adequate through PAL 5 with flexibility to park both based and transient apron within the same areas.

4.6 Air Cargo

Cargo planning for this study is focused on identifying the area needed for cargo development to accommodate both forecast and potential future freighter activity. Cargo freight activity at GYY has been handled by a variety of types of aircraft through the FBOs. In 2015, there were 244 annual cargo operations, most consisting of just-in-time delivery of light cargo such as auto parts and human organs. The Base Forecast and High Scenario project the same levels of cargo operations in each forecast year, as summarized in **Table 4-34**.

In a continuation of historical activity, the FBOs would likely continue to handle freight movements. With reinstatement of passenger service, the Airport may see a need for belly cargo facilities to handle the cargo transported in the cargo holds of passenger airlines. In addition, the Gary-Chicago International Airport Board and AvPorts have been working to secure a stand-alone cargo operation. Therefore, this section addressed requirements for a typical small stand-alone cargo facility.

Table 4-34 - Cargo Operations Planning Criteria

Aircraft Design Group	Annual Cargo Operations		
	PAL 1/PAL 4	PAL 2	PAL 3/PAL 5
II	50	50	50
III	207	225	262
IV	8	15	28
All	265	290	340

Source: Gary/Chicago International Airport, Forecasts of Aviation Demand, January 2018.

Acreage requirements were determined based on aircraft size, typical cargo building depth, and landside parking and circulation. Potential projected tonnage of both freight and belly cargo were assessed to verify that the typical footprint would be adequate to accommodate activity. Annual tonnage was projected by benchmarking tonnage per flight for freight and belly cargo at other airports and applying reasonable rates to the forecast GYY traffic, considering maturity of operation and fleet mix. Under this methodology, cargo tonnage is expected to range from 3 tons annually in PAL 1 to 185 tons annually in PAL 5.

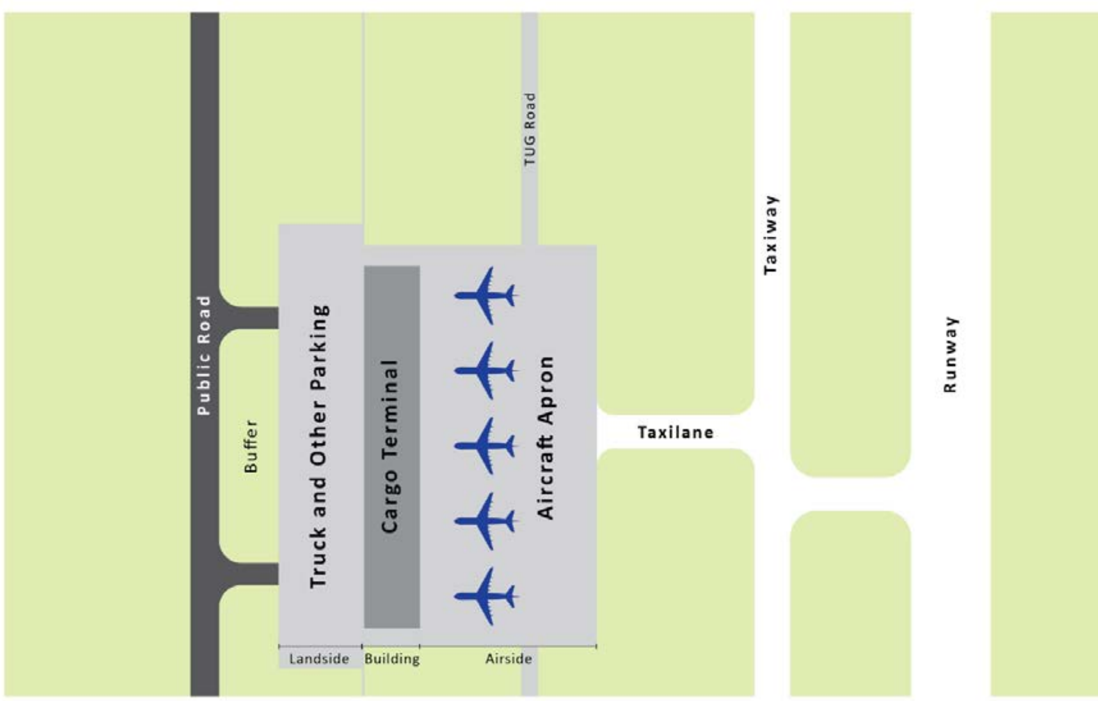
Based on the forecast operations, an independent cargo freight operation would require ADG III/IV aircraft parking apron and circulation. An airside apron depth of 510 feet, with a width of 280 feet should accommodate one ADG III/IV aircraft with space for loading and unloading as well as ground service equipment storage. A buffer of 25 feet should be provided on each side of the facility.

Cargo tonnage indicates the need for a minimally sized facility for offices, cargo receipt, pallet makeup, and some storage. The typical depth of a small cargo building is 100 feet. Width should be adequate to provide truck docks and a storefront office. Cargo operators conduct unloading, sort and loading activities differently depending on company policy and type of cargo. Therefore, actual needs could vary depending on whether the carrier is sorting and performing cargo breakdown on the apron or in the building.

Landside depth should accommodate truck docks at the building face, a truck circulation and maneuvering lane, and off-building trailer parking. A depth of 140 feet is adequate for these functions at the anticipated level of activity. The site should be set back from the road to allow landscape and buffering.

A site area of 6.1 acres (780 feet deep by 340 feet wide) should be reserved for an initial cargo module. Additional expansion in width could accommodate additional activity. Exhibit 4-4 shows a typical air cargo layout for multiple freighter aircraft. The PAL 5 cargo tonnage is expected generate from 4 to 6 daily truck trips a well as a small amount of employee and visitor traffic, based on planning factors in ACRP Synthesis 80, *Estimating Truck Trips for Air Cargo Facilities*. Additional truck traffic would be expected with a daily freighter operation, should that come to GYY.

Exhibit 4-4- Typical Air Cargo Layout for Multiple Aircraft



Source: Jacobsen|Daniels, May 2018.

4.7 Support Facilities

4.7.1 Flight Kitchens/Catering

Flight kitchens are dedicated to the preparation of in-flight meals and the storage of other food and beverage items related to in-flight activities. As such, demand for these services is based on passenger activity. Therefore, the compound annual growth rate for passenger activity at GYY was applied to flight kitchen facilities to determine future demand.

The need for flight kitchen space has diminished over the past decade due to airline cutbacks on complimentary onboard meal services. Even with the increase in availability of "buy-on-board" meal services, food service for domestic flights, other than snacks, is declining throughout the airline industry. Airlines require provisioning space in the terminal or elsewhere to receive, store and stock snack and beverage items for flights. Demand still exists for food service on international flights. With a resumption of passenger service anticipated in PALs 1 through 3, airlines would use operations space in the terminal for simple provisioning. The FBOs, which currently provide catering for military and other tenant flights, could be expected to serve whatever catering needs arise. The demand for provisioning space could grow in PALs 4 and 5 and would continue to be accommodated by the airlines in their respective operations space. No separate flight kitchen or provisioning facilities are anticipated to be needed.

4.7.2 Administration Offices

The airport administration offices are generally in good condition, as reported by airport staff. The facility includes two buildings, one of which has two levels. The main single-level large conference room, office spaces, storage facilities, and break rooms. The building contains restrooms and storage on the first floor and office space on the second floor, which is currently unused. To plan for future administration facility needs, it was estimated that demand for space would grow proportionally to total operations. Currently approximately 80% of the 9,850 square feet is utilized. **Table 4-35** presents the estimated square footage requirements for administration offices for the planning period.

Using these assumptions, the administration building should be able to accommodate the anticipated growth with no additional space. However, requirements could change if staffing is increased to handle more functions that are currently outsourced, or additional staff are relocated to this facility.

Table 4-35 - Administration Building Requirements

	2015	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Current Building Space (SF)	9,850					
Space Utilized by Airport Staff (SF)	7,880	7,951	7,967	7,983	8,282	8,836
Surplus/(Deficit) (SF)	1,899	1,883	1,867	1,568	1,568	1,014

Source: Jacobsen|Daniels, May 2018.

4.7.3 Aircraft Rescue and Fire Fighting

As presented in Section 2.8.3, Part 139 airport operators are required to meet compliance for emergency response requirements, which includes Aircraft Rescue and Fire Fighting (ARFF) services. Requirements for ARFF services are grouped into indexes and the type of ARFF required for each index is dependent upon the aircraft type serving the Airport. Based on air carrier length groupings, ARFF indexes are divided into five categories, which are shown in **Table 4-36**.

GYY ARFF supports FAR Part 139 with and index of Group B, which includes support for the Gulfstream G500, DC9, and Boeing 717. The ARFF vehicles at GYY currently meet Index C requirements. Although the fire suppression capabilities of the equipment can meet Index C, staffing of the station fulfills Index B, with a capability of providing Index C with 4-hour notice.

Table 4-36 - ARFF Index Categories

Aircraft Length (in feet)	ARFF Index
Less than 90’	A
Greater than or equal to 90’, less than 126’	B
Greater than or equal to 126’ and less than 159’	C
Greater than or equal to 159’ and less than 200’	D
Greater than or equal to 200’	E

Source: FAA AC 150/5220-10E, Guide Specification for Aircraft Rescue and Fire Fighting (ARFF) Vehicles. Prepared By: Jacobsen|Daniels.

Given that GYY’s critical aircraft is the B-737, Index C should be provided now. This level of coverage would serve the Airport through PAL 5. **Table 4-37** lists the ARFF apparatus and fire suppression capabilities while **Table 4-38** compares fire suppression requirements for Index B and C.

Table 4-37 - GYY ARFF Apparatus and Fire Suppression Capabilities

Apparatus	Function	Capabilities		
		Water	Foam[a]	Extinguishing Agent
Rescue 6 Ford F-350	Command Vehicle	n/a	n/a	n/a
Rescue 2 – Oshkosh T1-1500	Primary Rapid Intervention Vehicle	1500 gallons	210 gallons	500 lbs. Halotron
Rescue 3 – Oshkosh Stryker-1500	Primary Rapid Intervention Vehicle	1500 gallons	210 gallons	450 lbs. Purple K

a) Aqueous film forming foam agent (AFFF)

Source: GYY Records and staff interviews, Jacobsen|Daniels, May 2018.

Table 4-38 - Apparatus and Fire Suppression Requirements for ARFF Index B and C

Index B	Index C
Either one or two vehicles	Either two or three vehicles
One vehicle: carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of aqueous film forming foam agent (AFFF) for foam production.	Two vehicles: One vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF for foam production. AND One vehicle carrying water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 3,000 gallons.
Two vehicles: One vehicle carrying 500 pounds of sodium-based dry chemical, halon 1211 or clean agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF to total 100 gallons for simultaneous dry chemical and AFFF application. AND One vehicle carrying an amount of water and the commensurate quantity of AFFF so that the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons.	Three vehicles: One vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF for foam production. AND Two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 3,000 gallons.

Sources: Code of Federal Regulations, Title 14, FAA Part 139; NFPA 1901, Automotive Fire Apparatus. Jacobsen|Daniels, May 2018.

The existing ARFF facility is aging and is recommended to be replaced. A new facility would need to support three ARFF vehicles with drive-through bays, and the staffing to support those vehicles for emergency response. The facility would include common areas, offices, dormitories, building systems and support, and apparatus bays and support. Common areas generally include a kitchen, pantry, dining, primary day room, exercise room, privacy room, conference room, and a laundry room. Building systems and support areas include mechanical room, electrical equipment, alarm room, general storage, first aid and medical storage, and a janitor's closet. Lastly, the apparatus bays and support include vehicle bays, utility/decontamination room, trash/recycling room, equipment workshop, gear washing, foam storage, gear/turnout PPE storage, complementary agent storage, SCBA storage, and a hose drying facility. **Table 4-39** provides estimates of the size needed for the new ARFF facility. Approximately 6,070 square feet is recommended for a new ARFF facility to accommodate required functions. Alternatives for a location of the new ARFF facility will be explored in the Alternatives Analysis.

Table 4-39 - ARFF Building Requirements

Functional Area	Total (SF)
Common Areas	580
Offices	200
Dorms/Lockers/Restrooms	840
Building Systems and Support	320
Apparatus Bays and Support	4,130
Total	6,070

Source: FAA Advisory Circular 150/5210-15A, Aircraft Rescue and Firefighting Station Building Design, Jacobsen|Daniels, May 2018.

4.7.4 Airport Maintenance

Located between the administration building and the GJC Hangar 3, the Airport maintenance facility is used to store tractors, mowers, pickup trucks, snow removal equipment, and snow brooms. The maintenance building was constructed in 1998 and expanded and renovated in 2004. The enclosed facility includes 18,400 square feet of floor space plus mezzanine offices and shops. Adjacent to it is a paved open storage area of approximately 11,300 square feet. The building is currently in fair condition. Covered storage for vehicles and equipment currently stored outside is needed. Based on discussions with Airport staff, only replacement of existing vehicles and equipment is anticipated.

Therefore, requirements are for covered or enclosed parking of 9,000 square feet to fit within the available space. The building should have bays with doors of sufficient height and width to accommodate the equipment to be housed. In the future, as demand for hangar development increases, GCIAA may consider relocating Airport Maintenance to another location on the airfield to allow for community or corporate hangar construction in this prime location.

4.7.5 Ground Service Equipment Storage and Maintenance

Ground Support Equipment (GSE) at GYY is currently provided by the FBOs: Gary Jet Center and B. Coleman Aviation. GSE includes ground power units, baggage carts, servicing vehicles, belt loaders, aircraft tugs, refueler trucks, air stairs, and deicers. GSE equipment is stored on the FBOs aprons. GSE maintenance is performed in the FBO maintenance facilities. The amount of GSE space is currently adequate. Future space is determined by the FBOs' anticipated demand and growth, and adequately meets the demand of existing aircraft operations. An allowance for FBO GSE parking is included in the FBO apron calculations.

With initiation and modest growth of commercial service in PALs 1 through 3, additional GSE will be required in the terminal area to service passenger flights. Airlines initiating service would most likely contract with one of the FBOs to provide ground service handling of their flights. The anticipated level of passenger flight activity is not expected to create a need for separate GSE maintenance facilities, although it will require space on the terminal apron for equipment parking.

In PALs 4 and 5, the higher level of commercial passenger activity could result in an airline either providing their own GSE and ground handling crews or contracting with a new provider for that service. In that case, a small office and single-bay maintenance facility would be needed in reasonable proximity to the terminal area.

4.7.6 Aircraft Fueling

As discussed in Section 2.3.5, GYY has five above-ground Jet-A fuel storage tanks, and three above-ground 100LL storage tanks, for a total of 40,000 gallons of Jet-A, and 32,000 gallons of 100LL aviation fuel for both commercial and general aviation service. The owners and operators of the fuel tanks – Gary Jet Center and B. Coleman Aviation – fuel both based aircraft and transients, holding agreements to serve specific users. This analysis aggregated the fueling activity due to insufficient historical data to analyze the demand on and capacity of each fuel supplier, and in recognition that fueling contracts may change over the course of the planning period.

Based on fuel data provided to the Airport by the FBOs, over 2 million gallons of Jet-A fuel and over 36,000 gallons of 100LL fuel were sold in 2015, with the peak month occurring in August. Total operations for the 2015 peak month were 3,160, with 102 operations (51 arrivals or departures) for the average day. Of these, 33 were jet departures and 19 were non-jets. The analysis of future demand was based on the average fuel upload for either jet or non-jet flights, multiplied by the projected peak month average day flights in each PAL, as shown in **Table 4-40**. Adequate fuel storage is generally considered a three-day supply. Under these assumptions, the analysis shows that there is adequate supply over the planning period.

Given the aggregated approach to this analysis, additional tankage could be required under several circumstances. If one or the other FBO's fueling agreements created a greater demand than they can currently accommodate, additional tanks could be required. Also, if the quantity of Jet A fuel per departure significantly increases with an increase in the size of the aircraft using the Airport, then additional fueling demand may require additional tanks. Therefore, space should be reserved in the fuel farm to allow expansion.

Table 4-40 - Fuel Tank Storage Demand/Capacity

	2015	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Total Operations – PMAD	102	115	116	119	141	217
JET-A Demand/Capacity						
Total Jet-A Flights – PMAD	33	37	38	39	46	72
PMAD Jet-A Use (gal)	4,527	5,076	5,213	5,350	6,311	9,878
Existing Fuel Storage – Jet-A (gal)	40,000	40,000	40,000	40,000	40,000	40,000
Approximate Days of Fuel (Jet-A)	9	8	8	7	6	4
Annual Fuel Flowage – Jet A (gal)	2,408,687	2,517,149	2,553,028	2,619,411	3,137,527	4,932,650
100LL Demand/Capacity						
Total 100LL Flights – PMAD	19	21	21	22	25	37
PMAD 100LL Use (gal)	446	493	493	517	587	869
Existing Fuel Storage – 100LL (gal)	32,000	32,000	32,000	32,000	32,000	32,000
Approximate Days of Fuel (100LL)	72	65	65	62	54	37
Annual Fuel Flowage – 100LL (gal)	36,007	37,460	37,799	38,471	44,671	66,297

a) All helicopters use Jet-A, including military traffic fueled by Gary Jet Center
b) Analysis does not differentiate between FBOs that dispense fuel to their own and other customers.
c) Assumes that average fuel per flight remains constant over the forecast period.

Source: GCIAA fuel records, Jacobsen|Daniels, May 2018.

4.7.7 Airport Traffic Control Tower

Interviews with ATC and Airport staff have indicated that the Airport Traffic Control Tower (ATCT) is outdated and in poor condition. This was confirmed by site visit. ATCT facilities include a small office, small break area, and bathroom, in addition to the tower cab and equipment rooms. The Tower does not have an elevator, so is not in compliance with ADA requirements. OSHA inspections continually have cited numerous improvements for the Tower. Therefore, it is recommended that the ATCT facility be replaced. Alternatives and process for a new ATCT will be explored in Chapter 5, Alternatives Analysis.

The ATCT must have clear visual line-of-sight to all airport movement areas, particularly of the runways. The location of the ATCT on the south and east side of the airfield, and the current controller eye height of 65 feet above ground level allows for clear line-of-sight to both runway ends, except between the intersection runway ends and when brush grows up on the Runway 30 approach. Although the brush should be maintained as short as possible, tower eye height may need to be increased to maintain airfield line-of-sight.

4.8 Landside Requirements

Landside facilities include public and employee parking, rental car parking, terminal curbfront, and roadway access. The growth in passengers defines the demand for terminal curbfront, public and employee parking, and terminal circulation roadways. Airport access considers passenger and overall activity growth at the airport, as well as local and regional traffic growth that affect roads used to travel to and from the Airport.

To account for the ways that passenger activity affects the landside, assumptions are made about the mode of travel that passengers will select to get to and from the airport and terminal. Mode split assumptions for each of the PALs is shown in **Table 4-41**. Traditionally most passengers have used private vehicles (either for drop-off or parking) and taxis. A small portion of passengers use rental cars. The introduction in ride share services such as Lyft and Uber, have begun a shift away from parking and rental cars as more travelers elect to use those services for drop-off. Adoption rates and impacts vary from airport to airport, depending on the types of travelers, the metro area that the airport serves, and availability of services. Greater use of ride share vehicles translates to more curbfront use as passengers are dropped off and picked up rather than going directly to and from the parking lot. The parking and curbfront analyses consider such a shift at GYY, growing from 5% use of ride share vehicles in PAL 1 to 30% in PAL 5. A small percentage of passengers would be shuttled to and from the airport from points in Gary or other points within the region. Shuttles are assumed to carry up to five passengers, on average.

Table 4-41 - Passenger Mode Split Assumptions for Terminal Access

	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Private vehicle passenger drop-off	7%	8%	9%	10%	12%
Short-term Parking	56%	52%	48%	43%	35%
Long-term Parking	30%	28%	26%	24%	20%
Taxi/Ride Share	5%	10%	15%	20%	30%
Rental Car	1%	1%	1%	2%	2%
Shuttles	1%	1%	1%	1%	1%

Source: Source: FAA A/C 150/5360-13; ACRP Report 25; and Jacobsen|Daniels, May 2018.

4.8.1 Terminal Area Parking

The Airport's public parking lot has a capacity of 1,100 parking spaces to accommodate passengers, terminal employees and rental car ready/return. Approximately 100 to 150 spaces are currently leased to B. Coleman. The analysis assumes that as demand for public parking increases, the lease would be modified, and those spaces would be used for public parking. This lot is also used for rental car parking and terminal employee parking. There is currently no fee for parking and all spaces are in one lot with no delineation of parking products (short vs. long term).

For public parking, the analysis assumes that 86% of all passengers will park in PAL 1. (Although there is only one parking lot at GYY today, the analysis segregated parkers into short- and long-term for alternatives planning.) The percentage of parkers declines to 55% in PAL 5 as use of ride sharing and potential use of autonomous vehicles becomes more widely adopted. Private vehicle drop-off is also expected to increase slightly over the planning period. An average of 2 passengers per parking vehicle was assumed. In PALs 1 through 3, an average of 2 to 4 weekly flights and one flight on a peak day is projected. In later PALs, as activity increases and is spread more evenly over the week. Additionally, for PALs 1 through 3, a 5-day average trip duration was assumed to account for a high percentage of leisure travelers, while a 3-day average trip duration was used in the PALs 4 and 5 to account for a mix of business and leisure passengers.

Parking is typically designed so that finding an empty stall during the peak periods is not too difficult. Therefore, parking requirements are usually adjusted upward–typically and in this analysis by 10%–to provide a slight surplus of spaces and therefore reduce the amount of time required to search for an empty stall.

Employee parking space requirements were projected using a typical planning metric of 400 employees per million enplanements, in accordance with Airport Cooperative Research Program (ACRP) Report 25, Airport Passenger Terminal Planning and Design. These would be designated for GCIAA or tenant (airline, rental car and concessions) employees working in or flying from the terminal.

Rental car parking calculations are based on the Airport's historical utilization rate of rental car spaces per annual enplaned passengers. At the 2004 peak passenger activity of about 27,000 enplaned passengers, the Airport allocated 24 rental car ready/return and short-term storage spaces near the terminal. This metric was benchmarked against utilization at other comparable airports and found to be reasonable. It is assumed that the rental car companies would continue to shuttle cars between the Airport and service locations in the region, at least through PAL 4.

Table 4-42 summarizes the analysis and shows the projected number of parking stalls needed under the various PALs for public, employee and rental car parking. A deficit in parking is expected before the 350,000 annual enplanements level in PAL 5.

Table 4-42 - Terminal Parking Lot Requirements

	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Annual Passenger Enplanements	9,500	17,000	27,000	100,000	350,000
PMAD Enplanements	54	96	153	532	1,694
Parking Demand					
Public Parking	144	254	352	651	1,619
Employee Parking	4	7	11	40	140
Rental Car (Ready/Return, Short-term storage)	8	15	24	89	311
Total Parking Requirements	157	276	387	780	2,070
Surplus (Deficit)	943	824	713	320	(970)

Source: Source: FAA A/C 150/5360-13; ACRP Report 25; and Jacobsen|Daniels, May 2018.

Currently there is one entrance and one exit lane at the main parking lot access point, with one additional entrance from the terminal access road turn-around. ACRP Report 25 states that for access control parking lots, entry lanes with ticket dispensing machines can handle approximately 500 vehicles per hour, while exit lanes can handle approximately 150 to 200 vehicles per hour. The number of peak hour parkers ranges from 46 in PAL 1 to 233 in PAL 5. Although there is currently no revenue control in place, the analysis assumes that it could be added at some point during the planning period. Based on the planning throughputs, an additional exit lane will be needed before PAL 5. However, consideration should be given to providing two entry and two exit lanes when revenue controls are installed. Having two lanes will alleviate backups from malfunctioning machines and lost tickets.

4.8.2 Terminal Curbfront

The terminal has two lanes along the curbfront (inner and outer) totaling approximately 775 feet, used for drop-off and pick up by private vehicles, ride share vehicles, taxis, and public transportation. Future requirements under each PAL were calculated using the curbfront model in ACRP Report 25. Calculation is based on the peak 15-minute demand generated by peak hour vehicles expected to use the curb. **Table 4-43** presents the number of vehicles of each mode expected to use the curb, and Table 4-44 shows projected curbside length requirements for each PAL using the ACRP model. The current curb length is expected to be sufficient through the planning period under each activity level.

Table 4-43 - Vehicles Accessing the Terminal Curb, Peak-Hour/PMAD

	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Private Vehicles	4	8	14	27	51
Taxi and Ride Share	3	10	23	53	127
Shuttles	1	1	1	1	1

Source: Source: FAA A/C 150/5360-13; ACRP Report 25; and Jacobsen|Daniels, May 2018.

Table 4-44 - Curb Length Requirements

	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Curb Length (ft.)	21	36	63	120	246
Curb Remaining (775 ft.)	754	739	712	655	529

Source: ACRP Report 25 and Jacobsen|Daniels, May 2018.

4.8.3 Terminal Access Road

The terminal access road also serves the Administration Offices, Maintenance Facilities, Gary Jet Center Hangar III, before reaching the terminal and B. Coleman Aviation just past the terminal. At Airport Road, the terminal access road has one entrance lane and two exit lanes, all of which are 12 feet wide. As the roadway approaches the terminal curbfront, it splits between a three-lane inner road and a two-lane outer road. During peak activity on the curbfront, drivers going to B. Coleman can use the outer lanes to bypass terminal passenger activity.

FAA AC 150/5360-13 recommends that terminal access roads should be planned to accommodate 900 to 1,000 vehicles per lane per hour, with a minimum of two 12-foot lanes provided. Analysis projects that at PAL 3, a total of 151 vehicles will use the Terminal Access Road during peak hour to reach the parking lot and terminal. At PALs 4 and 5, the totals increase to 259 and 412 vehicles, respectively. Slightly more than half of these vehicles would be bound for the parking lot, so would turn in to the first parking entrance, leaving the access road to those remaining vehicles traveling to the terminal. Although two lanes are recommended, the current access road was functional in the past, and should be adequate in the future to accommodate the expected terminal and other tenant and airport traffic through PALs 1 through 3. However, another inbound and outbound lane should be added when passenger traffic grows beyond PAL 3 to ensure that terminal traffic is not obstructed due to stalled vehicles or other operational issues.

4.9 Roadways and Access

This section describes the use of existing traffic count data and the process for estimating future traffic volumes on the roadway network serving the Airport. Because airports serve commerce of the region, the routes of access to major highways is also discussed.

4.9.1 Existing Traffic Counts

Intersection turning movement counts were collected for the AM and PM peak periods in October of 2016 at the following key area intersections, as shown in **Exhibit 4-5**:

- Airport Road and Airport Entrance
- Airport Road and Chicago Avenue
- Airport Road and Northbound Cline Avenue Frontage Road
- Chicago Avenue and Cline Avenue Frontage Roads (northbound and southbound)
- Gary Avenue and Cline Avenue Frontage Roads (northbound and southbound)

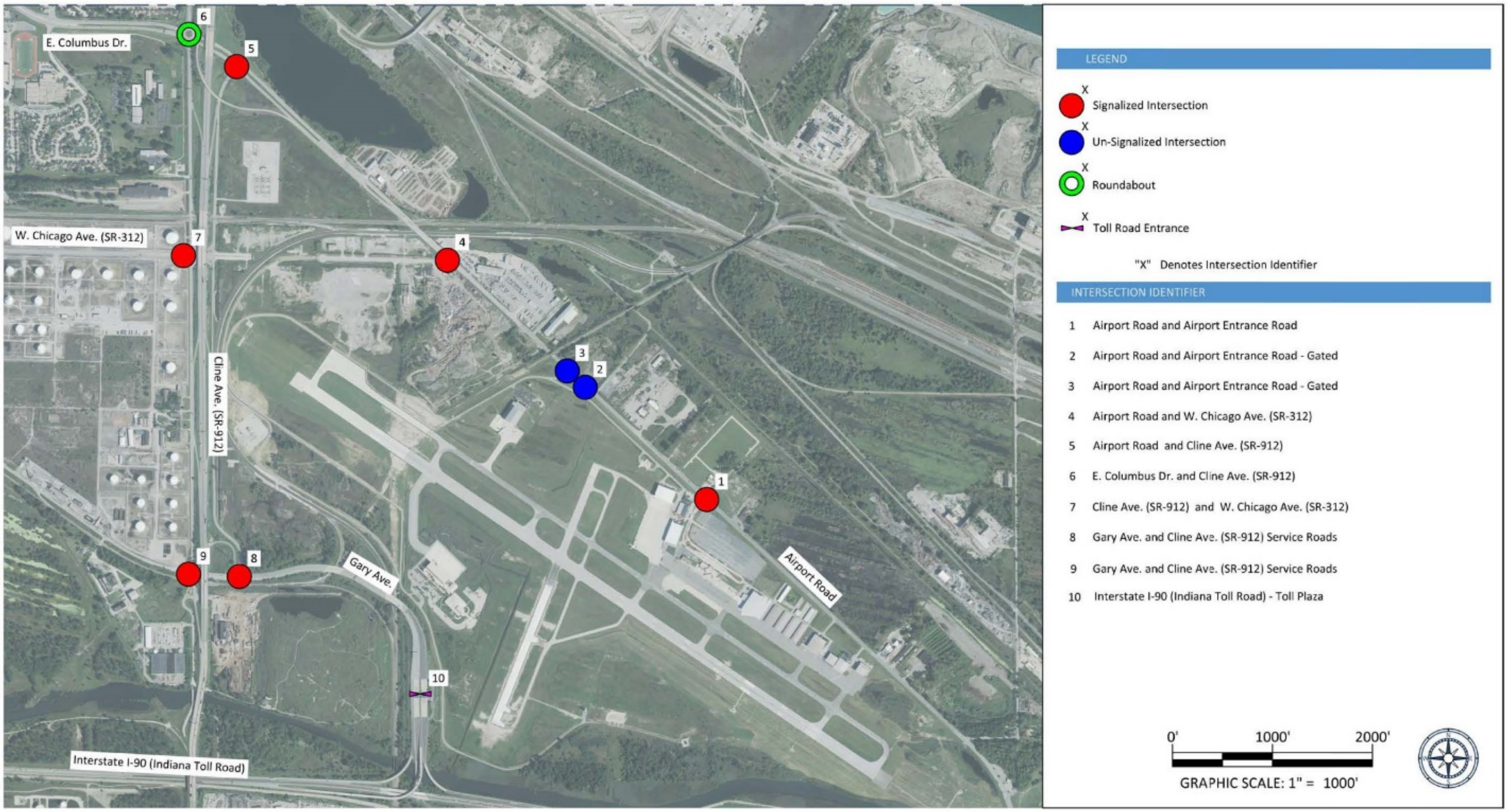
Summaries of the traffic counts are provided in Appendix #. The peak hours of traffic were fairly consistent across the counts, with the AM peak hour generally occurring either from 7:00 - 8:00am or 7:15 - 8:15am, and the PM peak hour typically occurring from 4:00 - 5:00pm.

4.9.2 Forecast Traffic

In order to analyze the capability of the roadway network to handle traffic conditions expected during the planning period, estimates of future traffic volumes were generated through a two-step process: general growth of background traffic, and site-generated traffic.

Based on the potential for significant redevelopment and activity growth in the area, as highlighted in the Airport's master plan and previous Strategic Plan, and also *Plan 2040 for Northwest Indiana*, a 3% annual growth rate was applied to generate estimated background traffic for the year 2035. This results in a 75% increase in traffic volumes compared to the 2016 counts. This growth rate was applied to all movements at each of the key intersections in the analysis area.

Exhibit 4-5- Key Intersections Providing Access to GYY



Source: AES, May 2018.

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In addition, estimates were made for new vehicle trips generated in the peak hours by renewed commercial airline service, for five different activity levels (PAL 1 through PAL 5). These additional vehicle trips were then added to the roadway network on top of the background traffic. As shown in **Table 4-45**, the new vehicle trips were broken out into four different types: cars going to/from the parking lot, privately-owned vehicles (POVs) to the curb, taxis and ride-shares, and shuttles. For the purposes of traffic analysis, vehicle trips must be considered as one-way trips. In other words, either into or out of the airport. A vehicle making a trip to or from the parking lot is considered to only make a single one-way trip during the analysis hour, as it is assumed that these are passengers driving their own vehicles and leaving them at the airport during their trip. However, the other three trip types all produce two one-way trips each. It is assumed that the vehicles enter the airport, either drop off or pick up passengers, and then leave the airport within the same analysis hour.

Table 4-45 - Peak Hour Landside Passenger Movement Estimates

Trip Type	PAL 1 2020	PAL 2 2025	PAL 3 2035	PAL 4 2020	PAL 5 2035
Vehicles to/from parking lot	46	77	113	178	233
POVs to curb	4	8	14	27	51
Taxi and Ride-Share	3	10	23	53	127
Shuttles	1	1	1	1	1
Total Vehicles	54	96	151	259	412

Source: AES, May 2018.

Two scenarios were assessed in the traffic analysis: PAL 3 (Base Forecast) and PAL 5 (High Scenario), which represent different levels of activity in 2035. As shown in Table 4-41, the PAL 3 activity level is estimated to generate 151 total vehicles to and/or from the airport, while PAL 5 would generate 412 vehicles. However, due to the fact that some trip types generate a pair of one-way trips as discussed previously, the total numbers of estimated one-way vehicle trips generated in the peak hours are 189 for PAL 3 and 591 for PAL 5.

For the PAL 3 activity level, the passenger movement numbers are based on passengers either arriving for or departing from one commercial airline flight during the analysis hour. For this traffic analysis, it is assumed that the passengers have just deplaned from a flight arriving at the airport, and thus, all of the vehicle trips utilizing the parking lot were assumed to be leaving the airport. As described earlier, the other trip types produce both a trip into the airport and out of the airport. Therefore, for the analysis, 151 of the 189 one-way trips were assigned as leaving the airport, with the remaining 38 trips entering the airport.

For PAL 5, it is assumed that there are multiple flights arriving and/or departing the airport in the peak periods of the day. Thus, there is a mix of passenger traffic both entering the airport to board a flight and leaving after deplaning from a flight during the analysis hour. For this analysis, 60% of the one-way vehicle trips utilizing the parking lot are assumed to be leaving the airport, with the remaining 40% assumed to be entering the airport. Therefore, the analysis for PAL 5 assumes 319 of the 591 one-way vehicle trips are leaving the airport, and 272 are entering the airport.

The estimated trips were added to the background traffic volumes and distributed through the network using existing traffic count patterns and engineering judgment. Please note that the analyses also assume that the peak hours of airport-generated traffic correspond to the same peak hours for adjacent roadway network traffic. The likelihood of both occurring at the same time are low, but since proposed airline schedules are not available, this assumption results in analyses of "worst-case" scenarios for the area roadway network. In addition, the same values for the additional airport-generated traffic were added to both the AM and PM peak hour analyses, due to unknown airline schedules.

4.9.3 Traffic / Roadway Capacity Analysis

Version 7.5 of the *Highway Capacity Software* (HCS) program was utilized to analyze both existing and future traffic on the network. HCS is developed by the Mc*Trans* Center at the University of Florida, and implements the procedures defined in the *Highway Capacity Manual* (HCM) produced by the Transportation Research Board of the National Academies of Science.

One of the key measures of effectiveness in traffic analysis is the estimated level-of-service (LOS) of a roadway segment, intersection, and/or specific movement. Level-of-service (LOS) is provided on a scale of A to F, with LOS A representing excellent traffic flow with minimal delays. LOS E represents conditions approaching the capacity of the intersection, and LOS F is over capacity.

Please note that traffic counts were not available for the recently constructed multi-lane roundabout at the intersection of Airport Road / Columbus Drive and Southbound Cline Avenue Frontage Road. This intersection was not analyzed in this study; however, highway facilities are typically designed to accommodate expected traffic volumes for 20 years after construction, so it is assumed that this intersection was designed and constructed to reasonably handle expected traffic volumes in the horizon year of this study, 2035.

4.9.3.1 Analysis of Existing Traffic Conditions

A summary of the results of the traffic analysis for existing conditions (based on 2016 counts) are shown in Table 4-46. As shown, there are very few level-of-service or traffic delay issues for the existing conditions. The most significant delays are found at the all-way stop-controlled intersection of Gary Avenue with the Southbound Cline Avenue Frontage Road, but LOS C is still generally considered acceptable operations.

Table 4-46 - Level of Service at Key Intersections, 2016 Traffic

Existing Conditions (2016 Counts)		AM Peak		PM Peak	
Intersection	Control Type	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Airport Rd & Airport Entrance	Signal	A	5	A	4
Airport Rd & Chicago Ave	Side-Street Stop [a]	B	12	A	10
Airport Rd & NB Cline Ave Frontage	Signal	B	11	B	11
Chicago Ave & NB Cline Ave Frontage	Signal	B	11	A	10
Chicago Ave & SB Cline Ave Frontage	Signal	A	7	B	12
Gary Ave & NB Cline Ave Frontage	Signal	A	9	A	9
Gary Ave & SB Cline Ave Frontage	All-Way Stop	A	10	C [b]	21[b]

a) LOS and delay shown for side-street stop-control intersections are only for the approach(es) that stop, which in this case is Chicago Ave.

b) Heavy WB and SB left-turns are causes of delay. RR crossing may also cause additional delays that are not modeled.

Source: AES, May 2018.

4.9.3.2 Analysis of Projected Year 2035 Traffic Conditions

A summary of the results of the traffic analysis for projected year 2035 conditions (including PAL 3 and PAL 5 airport passenger forecasts) are shown in **Table 4-47** and **Table 4-48**.

With the forecasted 2035 traffic volumes, most of the intersections would still be expected to operate at acceptable levels-of-service without significant additional improvements, for both PAL 3 and PAL 5 activity levels. The intersections of Gary Avenue with the southbound and northbound Cline Avenue frontage roads, however, would experience significant delays for some or all traffic.

Table 4-47 - Projected Level of Service at Key Intersections, PAL 3, 2035 Background Traffic

2035 Conditions (PAL 3 passenger volumes)		AM Peak		PM Peak	
Intersection	Control Type	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Airport Rd & Airport Entrance	Signal	B	13	B	12
Airport Rd & Chicago Ave	Side-Street Stop [a]	C	18	C	16
Airport Rd & NB Cline Ave Frontage	Signal	B	14	B	11
Chicago Ave & NB Cline Ave Frontage	Signal	B	13	B	10
Chicago Ave & SB Cline Ave Frontage	Signal	B	10	B	15
Gary Ave & NB Cline Ave Frontage	Signal	C [b]	23 [b]	B	11
Gary Ave & SB Cline Ave Frontage	All-Way Stop	B	12	F [3]	144 [c]

a) LOS and delay shown for side-street stop-control intersections are only for the approach(es) that stop, which in this case is Chicago Ave.

b) High delays and LOS D/E for southbound and eastbound left-turns.

c) Very heavy WB and SB left-turns are causes of delay. RR crossing on south leg may also cause additional delays that are not modeled.

Source: AES, May 2018.

Table 4-48 - Projected Level of Service at Key Intersections, PAL 5, 2035 Background Traffic

2035 Conditions (PAL 5 passenger volumes)		AM Peak		PM Peak	
Intersection	Control Type	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Airport Rd & Airport Entrance	Signal	B	16	B	15
Airport Rd & Chicago Ave	Side-Street Stop [a]	C	25	C	21
Airport Rd & NB Cline Ave Frontage	Signal	B	16	B	11
Chicago Ave & NB Cline Ave Frontage	Signal	B	13	B	10
Chicago Ave & SB Cline Ave Frontage	Signal	B	11	B	16
Gary Ave & NB Cline Ave Frontage	Signal	C [b]	25 [b]	B	11
Gary Ave & SB Cline Ave Frontage	All-Way Stop	B	12	F [3]	151 [c]

a) LOS and delay shown for side-street stop-control intersections are only for the approach(es) that stop, which in this case is Chicago Ave.

b) High delays and LOS D/E for southbound and eastbound left-turns.

c) Very heavy WB and SB left-turns are causes of delay. RR crossing on south leg may also cause additional delays that are not modeled.

Source: AES, May 2018.

In the AM peak, the heavy volume of traffic exiting northbound Cline Avenue (US 12 / SR 912) and turning left onto Gary Avenue towards the Indiana Toll Road contribute to larger delays and longer queues. One option to mitigate these delays would be to explore restriping the off-ramp so that the right lane, which is currently for right-turns only, becomes a shared left-and-right-turn lane, in addition to the existing exclusive left-turn lane. The geometrics of the intersection would need to be checked for truck turning radii and other factors to know if this solution is feasible.

In the PM peak, very heavy left-turn volumes for the southbound and westbound approaches to the intersection of Gary Avenue with Southbound Cline Avenue Frontage Road would cause significant delays and queues at the all-way stop. In addition, railroad tracks cross the south leg of the intersection, so delays would be even more significant during times when the crossing is blocked. A potential solution would be to reconstruct the intersection with traffic signals, integrated with the railroad crossing warning system and coordinated with the traffic signal to the east at Northbound Cline Avenue Frontage Road.

Although the overall levels-of-service at the other area intersections are forecast to remain at LOS C or better, the analysis does indicate a few other minor issues, especially for the PAL 5 activity level. In the AM peak hour analysis for PAL 5, the queue of traffic waiting to leave the Airport and turn left on Airport Road is estimated to approach or slightly exceed the available storage length of the left-turn bay, which is approximately 125 feet. However, a significant unknown factor is the type and intensity of potential development across Airport Road (to the northeast) from the entrance. The analysis assumes a total of 30 vehicles leaving that property during the peak hour. If development results in more intense activity and greater traffic volumes, additional geometric and/or traffic signal improvements may be required. For example, protected green left-turn arrows could be provided to traffic exiting the airport (and possibly the other property) to mitigate queue lengths and/or delays.

At the intersection of Airport Road and Chicago Avenue, eastbound vehicles waiting at the stop sign to turn left from Chicago Avenue onto Airport Road may experience delays exceeding 25 seconds (LOS D) during both the AM and PM peak periods for the PAL 5 activity level (although they would be expected to remain LOS C for PAL 3). This also assumes only general growth in background traffic on Chicago Avenue due to redevelopment. If more intensive redevelopment of properties on Chicago Avenue resulted in significantly higher volumes, delays would be expected to increase further, which may require additional improvements such as installation of traffic signals.

Finally, the analyses also show that there would be relatively long queues of traffic during the AM peak period for traffic on the northbound Cline Avenue Frontage Road at the intersection with Airport Road. The 95% queue length, which is typically used to look at storage length requirements for turn bays, would be approximately 275 feet for the PAL 3 activity level and 330 feet for the PAL 5 activity level. Most of this traffic is waiting to turn left (west) onto Airport Road, and thus is not headed to or from the Airport itself. However, vehicles turning right towards the Airport would also contribute to these queues, and they would be blocked from entering the channelized right-turn lane to go towards the airport until the queues dissipated as the approach receives a green traffic signal. There is approximately 500 feet of storage space on the northbound frontage road from Airport Road back to the point where traffic merges from the Cline

Avenue freeway off-ramp. So, while the queues would not be expected to reach this point, there may still be some potential weaving conflicts between frontage road traffic and off-ramp traffic as they approach the intersection with Airport Road during the periods of heaviest traffic.

4.9.4 Access to and from Major Highways

For the Airport to effectively serve the region, it should have relatively direct access to major highways. In the Gary region, those highways include I-90 (Indiana Toll Road) and I-294. I-90 connects to the Chicago Skyway giving access to the Chicago area. East of Gary it ties into I-65 south, a major north-south corridor in the state. I-294 also ties into I-65 southeast of Gary and I-94, a major north/south Illinois corridor into Chicago and south into more rural parts of Illinois.

4.9.4.1 Access to Highways from GYY

Access to these highways from the Airport has historically been via Airport Road and Cline Avenue (US 12/ SR 912). Northbound Airport Road had a northbound direct exit onto Cline Avenue. However, this was removed with roadway modifications to serve Buffington Harbor. Without this on-ramp, traffic bound for northbound/westbound Cline Avenue and I-90 must continue on Airport Road under Cline Avenue, turning right on the Cline Avenue frontage road then turn right again at Guthrie Road, heading back under Cline Avenue to pick up the new Cline Avenue access ramp. The I-90 interchange is approximately 5.5 miles from that point. This maneuver adds travel time and will create additional congestion in PALs 3 and 5. Restoring direct access should be considered, particularly as activity (passenger, vendor and cargo traffic) at the Airport increases.

Southbound Cline Avenue provides access from the Airport to both I-90 and, further south, I-294. Vehicles traveling to I-90 must take the toll road access lanes at Gary Avenue. As described in the previous section, while traffic LOS is adequate now, it is expected to degrade significantly over the planning period. Traffic bound for I-294 would use the on-ramp from the Cline Avenue southbound frontage road and travel approximately 3.5 miles south to the grade-separated interchange.

Airport Road southbound becomes W. 4th Avenue after crossing under I-90 and over the North Shore Rail line. Approximately 0.6 miles after the underpass, Bigger Street connects to W. 5th Avenue, an east/west urban arterial. Just after the underpass, Clark Road branches to the right from Airport Road and provides direct access to W. 5th Avenue, however, it has an at-grade crossing of the South Shore Line, so is subject to delays due blocked crossings. Improving access to W. 5th Avenue would improve the Airport's connectivity with the nearby metro areas.

4.9.4.2 Access to GYY from Highways

Access from regional highways back to the Airport is more direct. Westbound I-90 has an overhead exit signed for Gary/Cline Avenue, with airplane icon indicating the Airport. An intermediate sign before the exit is labeled Gary/Chi Airport. One of the eastbound overhead exit signs for the Gary/Cline Avenue was missing the airplane icon, however there is an intermediate roadside sign before the exit for Gary/Chicago

Int'l Airport. Both exits have unimpeded flow through the toll plaza to Cline Avenue exits, with the eastbound exit having no toll. The north exit for Cline Ave/Chicago Ave does not include an airplane icon but there is a small roadside sign for Gary/Chicago Airport before the exit. On northbound Cline Avenue, coming from I-90 or I-294, there is no airplane icon on the overhead exit sign for Columbus Dr./Airport Rd.

Southbound on Cline Avenue, coming from I-90 and West Chicago, there is an overhead sign for Airport Road with an airplane icon as well as a smaller intermediate roadside sign for Gary/Chicago Airport. This exit, 6B is an overpass onto Airport Road.