SD Airports

Airport Master Plan

Brown Field Municipal Airport

Working Paper 3—Facility Requirements

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C&S COMPANIES®

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3.1 Facility Requirements Overview

The Facility Requirements Working Paper (Working Paper 3) identifies the specific types of quantities of infrastructure and facilities needed at Brown Field Municipal Airport (SDM or Airport) to meet the Federal Aviation Administration's (FAA) approved forecast of aviation demand presented in Working Paper 2. The results of a capacity and demand analysis based on the results of the aviation demand forecasts, along with other planning methodologies, determined the facility requirements for the airfield, landside, and support areas of the Airport. In addition to these analyses, considerations included recommendations and feedback from Airport personnel, tenants, Airport businesses, and other stakeholders.

The 20-year planning period for the Airport Master Plan begins with the base year of 2017, and extends through 2037. Development needs usually address short-term (up to five years), mid-term (six-to-10 years), and long-term (11-to-20 years) planning periods. Short-term planning is focused on addressing immediate deficiencies, mid-term planning focuses on a more detailed assessment of needs, while long-term planning primarily focuses on the ultimate role and needs of the Airport. It is important to keep in mind that actual activity at SDM may vary over the 20-year planning period and may be higher or lower than what the aviation demand forecast predicted. However, using the three planning periods (short-, mid-, and long-term), the City of San Diego (City) can make informed decisions regarding the timing of development, which will result in fiscally responsible and demand-based development of SDM. For review, a summary of the FAA approved aviation demand forecast for each planning period for Brown Field Municipal Airport is provided in **Table 3.1**.

Table 3.1 – Brown Field Municipal Airport Demand Forecast Summary

	2017	2022	2027	2032	2037
Based Aircraft	226	242	259	277	296
Annual GA Operations	85,840	86,141	86,443	86,746	87,050

Source: C&S Engineers, Inc., 2017

3.2 Airport Capacity and Delay Analysis

Airspace Capacity

Airspace is defined as the navigable space used by pilots to navigate from one airport to another. Airspace capacity can become constrained when flight paths of air traffic at nearby airports, or local navigational aids (NAVAIDS), interact to add operations to the airspace that surround an individual airport. Also of concern is the need to alter flight paths of arriving and departing aircraft to avoid obstructions.

While numerous public general aviation (GA) and commercial airports were identified within 30-nautical miles of SDM, the largest contributor to airspace capacity is the close proximity to the Border with Mexico. General Abelardo L. Rodriguez International (MMTJ), Tijuana's International Airport is located approximately two miles south of SDM and conducts regular commercial service operations on a daily basis. Flight tracks to the south from SDM are often avoided to stay within U.S. territory. Depending on the volume of operations at MMTJ, there is a potential for airspace congestion. Additionally, SDM's airspace intersects multiple US based airports including Imperial Beach NOLF (NRS) seven nautical miles to the west and the North Island Naval Air Station approximately 14 nautical miles northwest of the Airport.

Airfield Capacity

Airside Capacity calculations represent the capacity of the airside infrastructure such as runways, taxiways, and Instrument Approach Procedures (IAP's). These values are compared to existing and future demand to determine the need for future capacity enhancing infrastructure such as additional runways, or taxiway exits.

Airfield capacity is a measure of the number of aircraft that can operate at an airport in a given timeframe. Capacity is often expressed in hourly or annual measures. Hourly capacities are calculated for visual flight rules (VFR) and instrument flight rules (IFR) in order to identify any peak-period issues. Hourly airport capacity calculations included in the following sections to not include variables attributed to ATC procedures such as procedural spacing. The differentiation between VFR and IFR hourly capacities derive from the lowered minimums required for IFR operations. While under IFR conditions, some aircraft are limited in their ability to handle said conditions and will ultimately reduce the hourly capacity. Annual Service Volume (ASV) is calculated to measure an airport's ability to meet existing and future demand levels. This measurement is discussed in later sections of this working paper.

The major components to be considered when determining an airport's capacity include runway orientation and configuration, runway length, and runway exit locations. Additionally, the capacity of any given airfield system is affected by operational characteristics such as fleet mix, climatology, and IAP's. Each of these components were examined as part of the airside capacity analysis.

The FAA defines total airport capacity as a reasonable estimate of an airport's annual capacity, which accounts for the differences in runway use, aircraft mix, weather conditions that would be encountered over a year's time. The parameters, assumptions, and calculations required for this analysis are included in the following sections.

Airfield Capacity Parameters and Assumptions

The generally accepted methodology for calculating airfield capacity is based on the FAA's Advisory Circular (AC) 150/5060-5, Airport Capacity and Delay. The calculations are based on the runway utilizations that produce the highest sustainable capacity consistent with existing air traffic rules, practices, and guidelines. The criteria and values used in the AC are typical of U.S. airports with similar runway configurations, and are designed to enable calculation of airport capacity as accurately as possible. The parameters and assumptions identified in this section were used to calculate the Airport's airfield capacity.

Runway Orientation, Utilization, and Wind Coverage

The Airport has two bi-directional runways; both (8L/26R, and 8R/26L) with an east-west alignment. The utilization rates and orientation of these runways were evaluated to determine the annual capacity of the Airport, which is the sum of capacities determined for each operation. It is important to note that an operation is defined as either a takeoff or landing. The direction of each operation is highly influenced by wind, available instrument approaches, noise abatement procedures, airspace restrictions, and/or other operating parameters. The runway use configurations used for SDM capacity calculations considered runway orientations for Runways 8L/26R, and 8R/26L in various combinations.

Providing the adequate wind coverage is an important criterion for determining a runway's orientation. Runways should be constructed to maximize the opportunity for aircraft to takeoff and land heading into the wind. When a runway orientation provides less than 95 percent wind coverage for any aircraft using an airport on a regular basis, the FAA requires a crosswind runway. If provisions for a crosswind runway cannot be met, the FAA recommends that the runway be widened to the next largest airport reference code (ARC). According to FAA AC 150/5300-13, *Airport Design*, the 95 percent wind coverage is computed based on the crosswind not exceeding 10.5 knots and 13 knots for smaller aircraft and 16 knots and 20 knots for larger aircraft. The all-weather wind rose and IFR wind rose identified that the existing runway system exceeds the 95 percent combined wind coverage requirement. Furthermore, the wind analysis revealed that each of the two bi-directional runways exceed the 95 percent wind coverage independently for the classes of aircraft that are most regularly accommodated. In conclusion, the construction of an additional runway does not need to be evaluated.

Aircraft Mix Index

The FAA has developed a classification system for grouping aircraft based on size, weight, and performance. **Table 3.2** illustrates the classification categories as they are presented in FAA AC 150/5060-5, *Airport Capacity and Delay*.

Table 3.2 – FAA Aircraft Certifications

Aircraft Class	Max. Cert. Takeoff Weight (lbs.)	Number of Engines	Wake Turbulence Classification
A	12,500 or less	Single	Small (S)
B	12,501 – 41,000	Multi	Small (S)
C	41,000 – 300,000	Multi	Large (L)
D	Over 300,000	Multi	Heavy (H)

Source: FAA AC 150/5060-5, *Airport Capacity and Delay*

This classification system is used to develop an aircraft mix that is the relative percentage of operations conducted by each of the four classes of aircraft (A, B, C, and D). The aircraft mix is used to calculate a mix index that is then used for airfield capacity studies. The FAA defines the mix index as a mathematical expression, representing the percent of Class C aircraft, plus three times the percent of Class D aircraft (C%+3D%). The FAA has established mix index ranges for use in capacity calculations as listed below:

- 0 to 20
- 21 to 50
- 51 to 80
- 51 to 120
- 121 to 180

A review of the aviation demand forecast from Working Paper 2 – *Forecast of Aviation Demand***,** indicates that the Airport experiences most of its traffic from aircraft falling into either A or B weight classifications outlined above. Since the FAA establishes mix index ranges for airport capacity calculations, it is unnecessary to compute the actual mix index value. For the purposes of this analysis, it is assumed that the mix index range for SDM will be between zero and 20 throughout the planning period. This is based on the assumption that the aircraft having maximum certified takeoff weighing between 41,000 pounds and 300,000 pounds will not make up more than 20 percent of the Airport total annual operations, and that there will be no operations by aircraft having maximum certified takeoff weight in excess of 300,000 pounds.

Arrivals Percentage

The percent of arrivals is the ratio of arrivals to total operations. It is typically safe to assume that the total annual arrivals will equal total departures, and that average daily arrivals will equal average daily departures. Therefore, a factor of 50 percent arrivals will be used in the capacity calculations for the Airport. This percentage is based on operational understandings and was derived from the conclusion that aircraft arriving will eventually be departing the airfield. This idea can then be applied to the total operations count to get the 50 percent arrivals compared to 50 percent departures.

Touch-and-Go Percentage

The touch-and-go (TGO) percentage is the ratio of landings with an immediate takeoff to total operations. This type of operation is typically associated with flight training. The number of touch and go operations normally decreases as jet operations increase, the demand for service and number of total operations approach runway capacity, and/or weather conditions deteriorate. Typically, touch-and-go operations are assumed to be between zero and 50 percent of total operations.

Given the flight training presence at SDM, TGO operations are anticipated to account for 48.7 percent of all operations at the Airport.

Taxiway Access Factors

Taxiway entrance and exit locations are an important factor in determining the capacity of an airport's runway system. Runway capacities are highest when there are full-length parallel taxiways, ample runway entrance and exit taxiways, and no active runway crossings required. Each of these components reduce the amount of time an aircraft remains on the runway. FAA AC 150/5060-5, *Airport Capacity and Delay*, identifies the criteria for determining taxiway exit factors at an airport. The criteria for exit factors are generally based on the mix index and the distance the taxiway exits are from the runway threshold and other taxiway connections. Taxiway exits were evaluated for operations in both directions on both runways. **Table 3.3** depicts these findings. All runways have at least one accessible taxiway exit between 2,000 feet and 4,000 feet of the landing threshold.

Table 3.3 – Taxiway Exit Ranges

Runway	Number of Exits within Optimal Range (2,000 ft. to 4,000 ft.)
8L	1
26R	1
8R	1
26L	2

Source: Atkins Analysis, 2017

The taxiway system located at SDM has taxiway geometry that has potential to cause reductions in capacity due to the minimal taxiway access available for the primary runway, Runway 8L/26R. Although Runway 8L/26R does have a full-length parallel taxiway, this is not considered a dedicated taxiway complex as it also serves Runway 8R/26L. This has the potential to create capacity issues as only the only taxiway access to Runway 8L/26R not requiring a runway crossing is located at the runway thresholds.

Instrument Approach Capabilities

Instrument approach capability is determined based upon safety and the ability of an airport to accommodate aircraft operations during periods of inclement weather. Weather, in this regard, is characterized by two measures: local visibility in statute miles, and height of a substantial cloud ceiling above airport elevation. The two measures are termed "approach minima." Currently, Runway

8L has the only published straight in Instrument Approach Procedure (IAP) with a capable RNAV approach with approach minima as low as 3/4 SM and 200ft. All other runways at SDM have no specific IAPs and are considered visual runways for arrival operations, with a circling RNAV approach available for arrivals to these runway ends when approach minima are higher than 1 SM and 500 feet.

Weather Influences

Operational limitations during such times of inclement weather were included in the ASV computation. Weather data obtained from the National Climatic Data Center (NCDC) was broken up into VFR and IFR observations. The data identified that IFR conditions (ceilings greater than 200 feet or less than 1,000 feet above ground level [AGL] and/or visibility greater than a half mile, but less than three miles) occur approximately 20.78 percent of the time at the Airport.

Wind data was obtained and analyzed to depict the most appropriate operational traffic flow during various wind conditions. This wind data was utilized to understand runway utilization scenarios and to better understand the most favorable operational scenario. **Figure 3.1** and **Figure 3.2** depict the VFR and IFR wind observations over the past ten years and corresponding runway traffic flows. **Table 3.4** depicts the airfield operating condition assumptions at SDM based on the NCDC weather data.

Table 3.4 – Airfield Operating Configurations

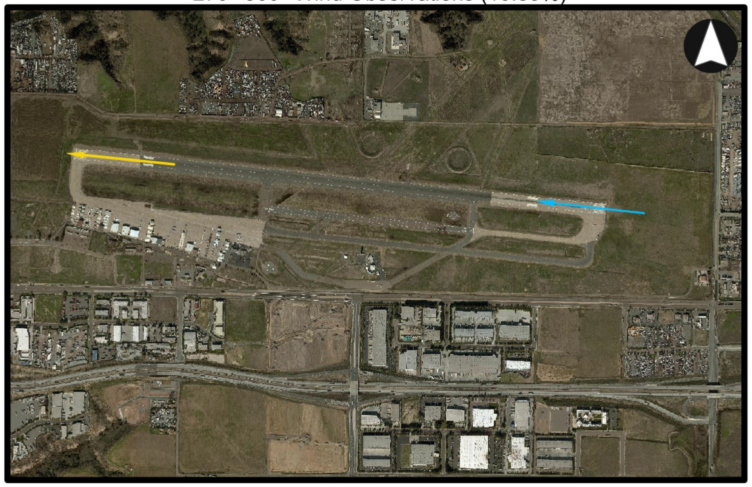
	0° through 180°	**0° through 180°**	**180° through 360°**	**180° through 360°**
Arrivals	8L, 8R	8L	26R, 26L	N/A
Arrival Traffic Flows				N/A
IFR/VFR	VFR	IFR	VFR	IFR
Occurrence	41.16%	15.17%	38.06%	5.61%

Note: [1]Scenario includes calm wind observations

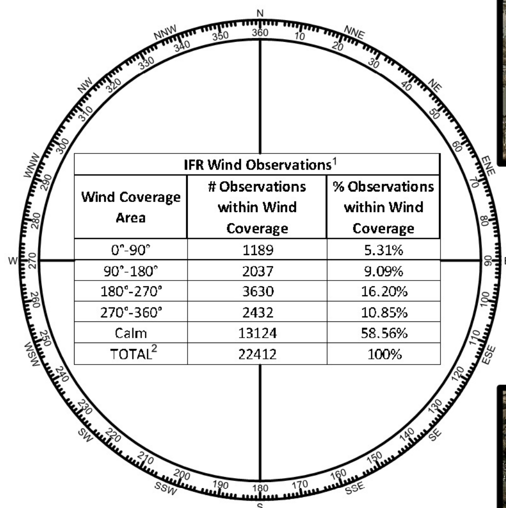
Source: NCDC Wind & Weather Operations, 2017 & Atkins Analysis 2017

The NCDC data analyzed in this process does not identify specific visibility measurements, only that the observation met VFR or IFR criteria. Therefore, it is impossible to determine from the data set the percentage of time that the winds are from 180° and 360° in IFR conditions and meet the circling IAP approach minima of one statute mile and 500 feet for Runways 26L and 26R. A conservative approach was adopted assuming that when these conditions occur, roughly 5.61 percent of the time, zero arrivals occur at SDM.

270°-360° Wind Observations (10.85%)



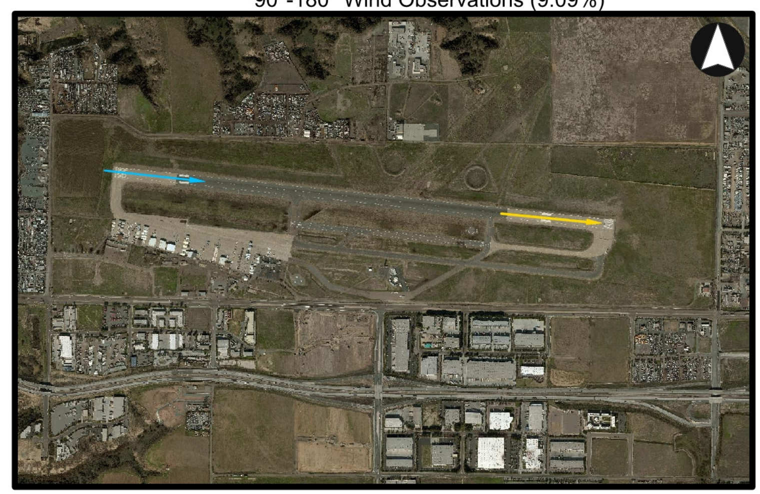
0°-90° Wind Observations (5.31%)



IFR Wind Observations[1]		
Wind Coverage Area	# Observations within Wind Coverage	% Observations within Wind Coverage
0°-90°	1189	5.31%
90°-180°	2037	9.09%
180°-270°	3630	16.20%
270°-360°	2432	10.85%
Calm	13124	58.56%
TOTAL[2]	22412	100%

180°-270° Wind Observations (16.20%)

90°-180° Wind Observations (9.09%)



[1]All wind observations are recorded FROM the listed direction

[2]Calm observations included in total

Source: Data reported at SDM for the period between 2007-2016 and provided by the National Ocean & Atmospheric Administration, National Climatic Data Center

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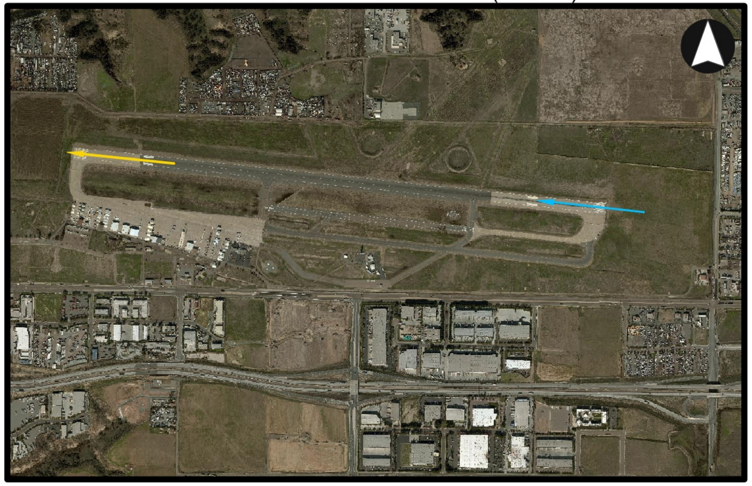
Figure 3.1

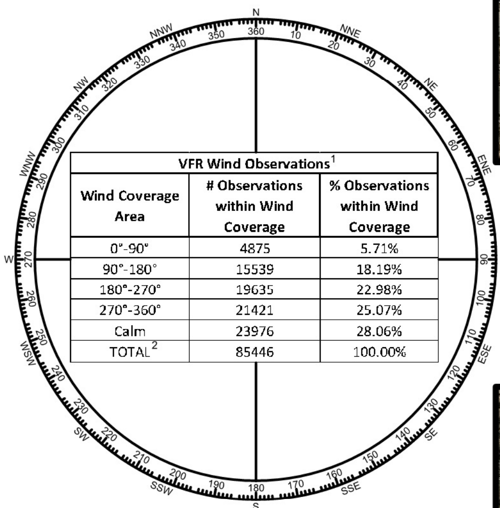
Runway Utilization VFR Wind Observations

ATKINS

270°-360° Wind Observations (25.07%)



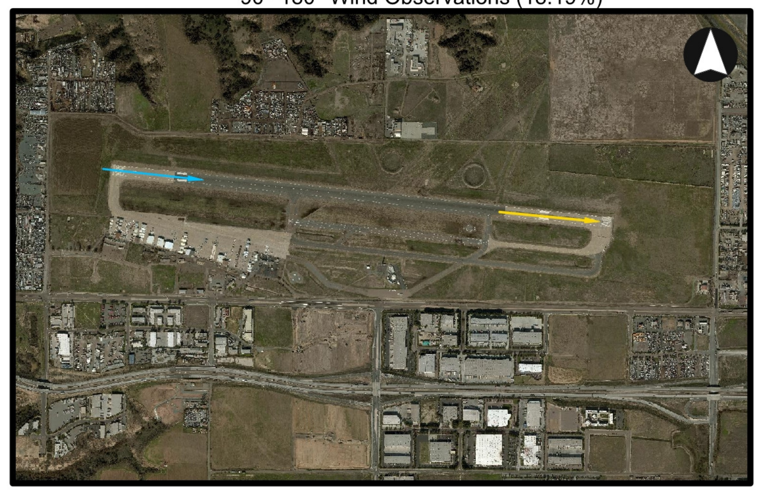
0°-90° Wind Observations (5.71%)



VFR Wind Observations[1]		
Wind Coverage Area	# Observations within Wind Coverage	% Observations within Wind Coverage
0°-90°	4875	5.71%
90°-180°	15539	18.19%
180°-270°	19635	22.98%
270°-360°	21421	25.07%
Calm	23976	28.06%
TOTAL[2]	85446	100.00%

180°-270° Wind Observations (22.98%)

90°-180° Wind Observations (18.19%)



[1] All wind observations are recorded FROM the listed direction

[2] Calm observations included in total

Source: Data reported at SDM for the period between 2007-2016 and provided by the National Ocean & Atmospheric Administration, National Climatic Data Center

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Figure 3.2

Runway Utilization IFR Wind Observations

ATKINS

Airfield Capacity Calculations

The airfield capacity calculations in this section were performed using the parameters and assumptions discussed in the previous sections. These calculations also utilized data from the aviation demand forecast, as presented in Working Paper 2, for portions of the capacity calculations. The following sections outline the hourly capacities in VFR and IFR conditions, as well as the Airport's ASV.

Hourly Capacity Calculations

The hourly capacity of the runway facilities is determined by analyzing the appropriate VFR and IFR figures in AC 150/5060, *Airport Capacity and Delay*. The equation used to obtain the hourly capacity was taken from the FAA AC 150/5060-5, *Airport Capacity and Delay,* and is presented below.

Hourly Capacity = (C*) x (T) x (E)

Hourly Capacity Base (C*)

Hourly Capacity Base (C*) is calculated for both VFR conditions and IFR conditions utilizing FAA provided diagrams provided in AC 150/5060, *Airport Capacity and Delay*. By first imputing a combination of mix index, and arrivals percentage, the hourly capacity is determined. At SDM, the following hourly capacity bases were utilized:

- VFR – Operating Runway 26R, 26L (C*) = 197 operations
- VFR – Operating Runway 8L and Runway 8R (C*) = 197 operations
- IFR – Operating Runway 8L (C*) = 59 operations
- IFR – No Arrivals (C*) = Zero operations

Touch & Go Factor (T)

The Touch and Go Factor (T) is an expression of touch and go activity and its effect on capacity. The value is derived using tables within AC 150/5060, *Airport Capacity and Delay*. The factors in calculating (T) include the percent of operations which are touch and go, and the mix index.

- In VFR scenarios at SDM, (T)= 1.15 operations
- For IFR scenarios (T) is always assumed to be 1.00 operations

Exit Factor (E)

Exit Factor (E) is an expression of the availability of taxiway exists within an appropriate range for the mix of aircraft operating at the Airport, derived by selecting the appropriate tables provided within AC 150/5060, *Airport Capacity and Delay*. The primary factors in calculating (E) are the mix index, the number of exists that are within an appropriate exit range for arriving aircraft, and the percent arrivals (50 percent). To calculate capacity at SDM for various scenarios the following exit factors (E) were utilized:

- Operating Runways 26R, 26L (E)= .94 operations
- Operating Runway 26R (E)= .90 operations
- Operating Runway 8L (E)= .94 operations

Hourly VFR Capacity

Hourly VFR capacities at SDM were calculated to be 213 when under VFR conditions at the airfield.

Hourly IFR Capacity

Hourly IFR capacities used similar assumptions to those used in the IFR hourly capacity calculations. However, maintaining greater separation between aircraft is generally required during IFR operations. Given that there are limited instrument approach capabilities at the Airport, the hourly capacity base variable of the equation is lowered. This adjustment reduces the overall hourly capacity during IFR operations.

The Hourly IFR capacity was determined to be 53 operations due to SDM only having one runway available for specific instrument approach capabilities.

Annual Service Volume

An airport's ASV is the maximum number of annual operations that can occur at an airport before an assumed maximum operational delay value is encountered. ASV is calculated based on the existing runway configuration, aircraft fleet mix, and the parameters and assumptions identified herein, and incorporates the hourly VFR and IFR capacities calculated previously. Utilizing this information and the guidance provided in FAA AC 150/5060-5, *Airport Capacity and Delay,* the Airport's existing conditions ASV was calculated to be 262,870 operations. It should be noted that the ASV represents the existing airfield capacity in its present configuration, with two east-west runways, existing taxiway infrastructure, and GPS approach capabilities. The equation used to obtain the ASV were taken from the FAA AC 150/5060-5, *Airport Capacity and Delay,* and is presented below.

Weighted Hourly Capacity (Cw) x Annual/Daily Demand (D) x Daily/Hourly Demand (H) = ASV.

The weighted hourly capacity (Cw) is an expression of hourly capacity that takes into account the percentage of time each runway use configuration is used for both VFR and IFR conditions. The Cw at SDM was calculated to be 123.767 operations. The Annual/Daily Demand (D) represents the ratio of annual demand to average daily demand during the peak month. A typical Annual/Daily demand value for SDM was calculated to be is 228.746. The Daily/Hourly Demand (H) represents the ratio of average daily demand to average peak hour demand during the peak month. The Daily/Hourly Demand SDM was calculated to be 9.285 operations.

- Cw x D x H = ASV → 123.767 x 228.746 x 9.285 = **262,870** operations

According to the FAA, the following guidelines should be used to determine necessary steps as demand reaches designated levels.

- 60 percent of ASV – The threshold at which planning for capacity improvements should begin.
- 80 percent of ASV – The threshold at which planning for improvements should be completed and construction should begin.
- 100 percent of ASV – The airport has reached the total number of annual operations it can accommodate, and capacity-enhancing improvements should be made to avoid extensive delays.

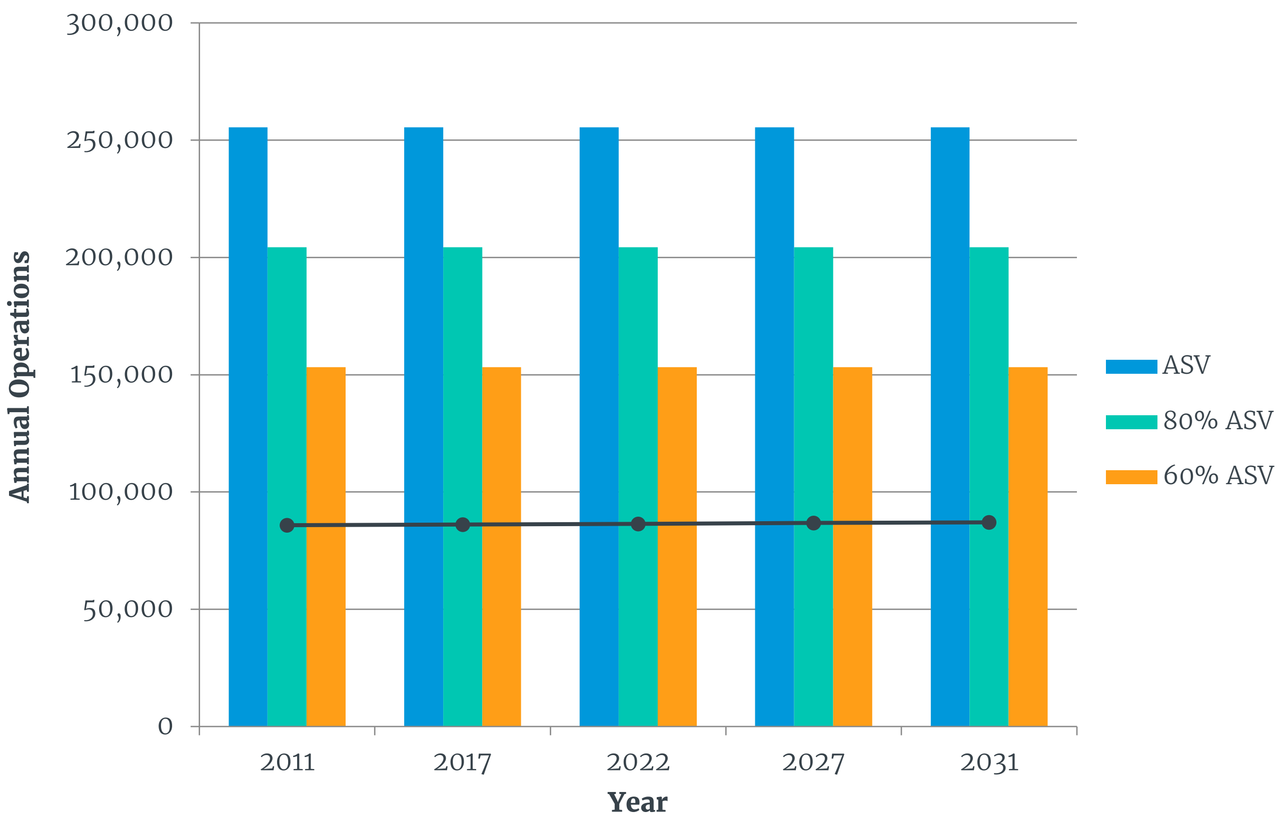
The existing total annual aircraft operations reported for the year 2016 at SDM, as presented in Working Paper 2 – Forecast of Aviation Demand, is 85,780 operations. This equals approximately 33.56 percent of the present ASV. **Table 3.5** illustrates the preferred aviation demand forecast for SDM and its relation to its current ASV, **Figure 3.3** graphically depicts this relationship.

Table 3.5 - Annual Service Volume vs. Annual Demand

Year	Annual Operations	Annual Service Volume	Percent of Annual Service Volume
2016	85,780	262,870	32.63%
2022	85,840	262,870	32.65%
2027	86,443	262,870	32.88%
2032	86,746	262,870	33.00%
2037	87,050	262,870	33.12%

Sources: FAA AC 150/5060-5, Airport Capacity and Delay, and Atkins Analysis, 2017

Figure 3.3 – Annual Service Volume vs. Annual Demand



Source: FAA AC 150/5060-5, *Airport Capacity and Delay*, and Atkins Analysis 2017

Based on the calculated relationship between the Airport's existing ASV and forecast of aviation demand, FAA guidance suggests that the Airport does not have a need for capacity enhancing airfield improvements within the planning period. Yet, at present, there are airfield deficiencies regarding the taxiway geometry that were noted and will be mentioned in later sections of this Working Paper.

Aircraft Delay

Although, the analysis indicated that SDM's current and forecasted level of aeronautical activity is not anticipated to exceed the airfield's calculated capacity, the potential for aircraft delay still exists due to factors such as ATC procedures and weather conditions.

3.3 Critical Aircraft and Design Standards

An initial step in identifying an airport's potential runway and taxiway facility requirements is the establishment of fundamental development guidelines for the largest or most critical aircraft anticipated to make use of the airfield facilities. Airport improvements are planned and developed per the established Airport Reference Code (ARC) for the Airport and then for each runway. The critical aircraft (aircraft with the widest wingspan, tallest tail, and fastest approach speeds) that consistently makes substantial use of the Airport determines its ARC. FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), defines "substantial use" as 500 or more annual aircraft operations or scheduled commercial airline service. An airport operation is classified as either an arrival or departure. An airfield's critical aircraft affects key aspects of airport design, such as the sizing of runways, taxiways/lanes, and the location of aircraft parking areas, hangar facilities, and safety and clearance surfaces.

Currently at SDM, there has been a composite of two aircrafts identified as the critical characteristics for Runway 8L/26R and one critical aircraft identified for Runway 8R/26L. The two aircraft identified as the critical aircrafts for Runway 8L/26R include the Gulfstream 550 and the Lockheed C-130. This determination accommodates for the higher approach speed of the Gulfstream 550 in addition to the critical dimensions of the Lockheed C-130. In respect to Runway 8R/26L, the critical aircraft has been identified as the Beechcraft Baron 58 due to the runway's short length and limited width. These critical aircraft are identified as both current critical aircrafts and future critical aircrafts within the planning period.

Airside Facility Requirements

Airport Design Standards, established by the FAA, are utilized in this analysis for developing airport facilities capable of meeting existing and forecasted levels of aviation activity. FAA AC 150/5300-13, *Airport Design*, utilizes coding systems to relate airport design criteria to the operational and physical characteristics of the aircraft that operate, or are projected to operate, at an airport. This airport design criteria will further dictate the future need for expanded airfield infrastructure and operational parameters to best plan and meet the forecasted future operations.

Runway Design Code (RDC)

Runway Design Code (RDC) is a code signifying the design standards to which the runway is to be built. Aircraft Approach Category (AAC), Airplane Design Group (ADG), and approach visibility minimums are combined to form the RDC of a specific runway. The AAC is the first component of the RDC. The AAC portion of the RDC relates to the aircraft approach speed, as depicted in **Table 3.6**. A Roman numeral, as depicted in **Table 3.7**, represents the second component or the ADG. The ADG portion of the RDC relates to the aircraft wingspan or tail height. The third and final component of the RDC relates to the visibility minima for the Runway Approach as depicted in **Table 3.8**. The RDC of each runway at SDM differs due to varying critical aircraft and visibility minimums. **Table 3.9** outlines the RDC components for each runway facility.

Table 3.6 – Aircraft Approach Category

Aircraft Approach Category	Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

Source: FAA AC 150/5300-13A, *Airport Design*

Table 3.7 – Airplane Design Group

Group #	Tail Height (FT)	Wingspan (FT)
I	< 20	< 49
II	20 - < 30	49 - < 79
II	30 - < 45	79 - < 118
IV	45 - < 60	118 - < 171
V	60 - < 66	171 - < 214
VI	66 - < 80	214 - < 262

Source: FAA AC 150/5300-13A, *Airport Design*

Table 3.8 – Visibility Minimums

RVR (FT)	Flight Visibility Category (statute mile)
VIS	Visual Approach
5000	Greater than or equal to 1 mile
4000	Lower than 1 mile but not lower than ¾ mile
2400	Lower than 3/4 mile but not lower than 1/2 mile
1600	Lower than 1/2 mile but not lower than 1/4 mile
1200	Lower than 1/4 mile

Source: FAA AC 150/5300-13A, *Airport Design*

Table 3.9 - SDM Runway Design Codes

Runway	Critical Aircraft	AAC	ADG	Visibility Minimums (RVR FT)
8L/26R	Gulfstream 550/ Lockheed C-130	D	IV	4,000
8R/26L	Beech Baron 58	B	I(S)	VIS

Source: Source: FAA AC 150/5300-13A, *Airport Design*, C&S Engineers, Inc., Atkins Analysis, 2017

Airport Reference Code (ARC)

Per FAA AC 150/5300-13A, *Airport Design*, the ARC is a coding system used to relate airport design criteria to the planner or designer and is based on the airport's highest RDC. Airport improvements can be planned and developed per the established ARC for an entire airport. The ARC is based on a combination of AAC, and ADG described in **Table 3.6** and **Table 3.7** respectively. The existing and future ARC for SDM is D-IV.

Runway Requirements

This section of the report will look specifically at SDM's two runways and their future requirements. Specifically, the runways' general characteristics will be analyzed with respect to FAA design and safety requirements and conformance with recommendations. Runway designation and length requirements will also be reviewed.

Runway Width

Runway width standards are established in FAA AC 150/5300-13A, *Airport Design*, and are based on RDC criteria. **Table 3.10** outlines the FAA runway width standards, and the existing runway facilities at SDM. Currently SDM meets the existing and future FAA requirements for runway width on all runways.

Table 3.10 – Runway Width

Runway	RDC	Standard Width (FT)	Existing Width (FT)
8L/26R	D-IV-4,000	150	150
8R/26L	B-I(S)-VIS	60	75

Source: 150/5300-13A, *Airport Design*, C&S Engineers, Inc., Atkins Analysis 2017

Runway Length: Takeoff Distance

Runway length requirements are based on a variety of factors, the most notable of which is the recognition of the critical aircraft operating on the runway as well as the longest nonstop distance being flown by such aircraft. Guidance in FAA AC 150/5325-4B, *Runway Length Requirements of Airport Design*, suggests recommending runway lengths based on a family grouping of aircraft. This criteria involves when the critical aircraft has a maximum takeoff weight (MTOW) less than 60,000 pounds with use of aircraft performance charts specific to the critical aircraft when that aircraft is 60,000 pounds or more when at its MTOW.

Fleet Mix and Critical Aircraft

In accordance with AC 150/5325-4B, *Runway Length Requirements of Airport Design*, the existing fleet mix was analyzed in detail to verify the type of runway length analysis required. **Table 3.11** lists the aircraft fleet mix obtained from an analysis of FAA Traffic Flow Management System Count (TFMSC) data of aircraft operations for the 2016 calendar year by aircraft type, ARC, and MTOW.

Some of the aircraft outlined in **Table 3.11** fall within the range of 60,000 pounds plus. Therefore, it is appropriate to assume the specifications for the specific listed critical aircraft when calculating runway length requirements.

Table 3.11 - Surveyed Jet Fleet Mix

Aircraft	ARC	MTOW	Aircraft Type
Gulfstream 550	D-III	91,000	Jet
Bombardier Learjet 60	C-I	22,750	Jet
Cessna Citation II/Bravo	B-II	13,300	Jet
Cessna Citation V	B-II	16,300	Jet
Bombardier Challenger 600	C-II	41,100	Jet
Gulfstream IV	C-II	74,600	Jet
Bombardier Learjet 35/36	C-I	18,000	Jet

Source: TFMSC data January 2016-December-2016, C&S Engineers, Inc., Atkins Analysis 2017

Table 3.11 identifies the typical surveyed jet fleet mix, as well as their MTOW. As depicted in **Table 3.11**, the critical aircraft that is the most demanding aircraft with substantial use at SDM falls within the 60,000 pounds or more for MTOW.

The Advisory Circular suggests that for aircraft over 60,000 pounds or more in MTOW that the airplane manufactuer's website should be referenced to seek the specific takeoff/landing distance required. The Gulfstream 550, per the manufatuer's website, requies a takeoff distance of 5,190 feet. Currently at SDM, runway 8L-26R has a length of 7,972 feet and is fully capable of accommodating this critical aircraft.

Runway Protective Surfaces

Runway protective surfaces such as the Runway Safety Area, Runway Object Free Area, and Runway Protection Zone aim to protect aircraft, people, and property in the case of an aircraft deviating from its intended course while conducting conventional runway operations. The following sections outline the existing and future criteria for the runway protective surfaces at SDM. At this time, detailed survey information such as pavement, topography and structures has yet to be analyzed to identify deficiencies. An initial visual inspection of the runway protective surfaces revealed no issues. A detailed analysis of protective surfaces utilizing updated survey data is planned as part of the upcoming Alternatives Development Working Paper.

Runway Safety Area

A Runway Safety Area (RSA) is a graded surface centered on a runway, free of any objects, except for objects that are 'fixed by function'. The purpose of the RSA is to protect aircraft in the event of an under-shoot, over-shoot or excursion from a runway during landing or take-off operations. In case of an emergency, the area must be able to support emergency vehicle operations and maintenance vehicles. The width and length of an RSA depend on an airport's RDC and approach visibility minima. The RSA has specific grading requirements to slope away from the runway at 1.5 to 5.0 percent. Meeting RSA requirements is one of the FAA's highest priorities in maintaining safety at the nation's airports. **Table 3.12** lists the Airport's existing and future RSA requirements.

Table 3.12 - Runway RDC Designations & Required Safety Areas

Runway	RDC	RSA Width (FT)	Length Beyond Runway End (FT)
8L/26R	D-IV-4,000	500	1,000
8R/26L	B-I(S)-VIS	120	240

Source: FAA AC 150/5300-13A, *Airport Design*, Atkins Analysis 2017

Runway Object Free Area - ROFA

Similar to the RSA, the Runway Object Free Area (ROFA) must be free of objects except those required to support air navigation and ground maneuvering operations. The function of the ROFA, also centered on the runway, is to enhance the safety of aircraft operating on the runway. It is not permissible to park an airplane within the ROFA. The width and length of the ROFA depend upon an airport's specific RDC and approach visibility minima. The ROFA does not have specific slope requirements, but the terrain within the ROFA must be relatively smooth and graded to be at or below the edge of the RSA. **Table 3.13** notes the ROFA dimensions for SDM:

Table 3.13 - Runway Object Free Area

Runway	RDC	ROFA Width (FT)	Length Beyond Runway End (FT)
8L-26R	D-IV-4,000	800	1,000
8R-26L	B-I(S)-VIS	250	240

Source: FAA AC 150/5300-13A, *Airport Design,* Atkins Analysis 2017

Runway Protection Zones

A Runway Protection Zone (RPZ) is an area centered symmetrically on an extended runway centerline. The RPZ has a trapezoidal shape and extends prior to each runway end. The RPZ is aimed at enhancing the safety of people and property on the ground by limiting and/or restricting the construction of certain structures within its bounds. This area should be free of land uses that create glare, smoke, or other hazards to air navigation. Additionally, the construction of residences, fuel-handling facilities, churches, schools, and offices are not recommended in the RPZ. New roadway construction is also required to remain clear of RPZs.

The dimensions of an RPZ depend on an airport's ARC and approach visibility minima. With no proposed reductions in approach with visibility minima the size and dimensions of the existing RPZ's at SDM are not anticipated to change throughout the planning period. **Table 3.14** illustrates the RPZ requirements for D-IV and B-I(S) ARC's.

Table 3.14 - Runway Protection Zones (RPZ's)

	RDC	Length (FT)	Inner Width (FT)	Outer Width (FT)
Approach RPZ				
8L	D-IV-4,000	1,700	1,000	1,510
26R	D-IV-VIS	1,700	500	1,010
8R-26L	B-I(S)-VIS	1,000	250	450
Departure RPZ				
8L-26R	D-IV	1,700	500	1,010
8R-26L	B-I(S)-VIS	1,000	250	450

Source: FAA AC 150/5300-13A, *Airport Design*, Atkins Analysis 2017

Runway Designations

A runway designation is identified by the whole number nearest the magnetic azimuth of the runway when oriented along the runway centerline as if on approach to that runway end. This number is then rounded off to the nearest unit of 10. Magnetic azimuth is determined by adjusting the geodetic azimuth associated with a runway to compensate for magnetic declination. Magnetic declination is defined as the difference between true north and magnetic north. The value of magnetic declination varies over time and global location. Magnetic declination is a natural process and does periodically require the re-designation of runways. **Table 3.15** shows the runway's true and magnetic bearing, along with the magnetic declinations that is currently occurring.

Table 3.15 - Runway Magnetic Bearing

Runway	True Bearing	Magnetic Declination	Magnetic Bearing	Runway Designation Required
8L	96° 0'	11° 28' E	84° 32'	8
26R	276° 0'	11° 28' E	264° 32'	26
8R	96° 0'	11° 28' E	84° 32'	8
26R	276° 0'	11° 28' E	264° 32'	26

Source: NOAA National Centers for Environmental Information (NECI), Atkins Analysis 2017

The current rate of change is 0° 5' W per year according to the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NECI). By utilizing this current rate of change, the runway designations will not need to be adjusted throughout the planning period. It is important to note that magnetic declination can vary over time due to fluctuations in the earth's magnetic fields. It is critical that the declination be reviewed on a semi-annual basis and before any runway work requiring marking modifications.

Runway Strength

The gross weight bearing capacity for Runway 8L/26R is published in the Airport 5010 as Single Wheel (S) 80,000 pounds and Dual Wheel (D) 110,000 pounds. Runway 8R/26L is single-wheel 14,000 pounds. A Pavement Maintenance Management Plan study is currently underway, with an anticipated completion date of December 2017. Upon completion of this study, a Runway Strength analysis will be revisited with updated runway pavement data.

Taxiway Requirements

The FAA introduced Taxiway Design Group (TDG) in 2012. Taxiway systems should provide safe and efficient routes for aircraft ground movement to and from the runways and apron areas that serve an airport's facilities. The type and location of taxiways in relation to a runway system have a significant impact on the capacity of an airfield. As traffic increases, the taxiway system can limit an airport's overall capacity, especially if the configuration results in frequent runway crossings by taxiing aircraft or does not provide sufficient access to airport facilities or bypass capability.

FAA guidance found in FAA AC 150/5300-13-A, *Airport Design*, recommends that a taxiway system should:

- Provide each runway with a full-length parallel taxiway
- Have as many bypasses, multiple accesses, or connector taxiways as possible to each runway end
- Provide taxiway run-up / holding bay areas for each runway end
- Have the most direct routes possible
- Have adequate curve and fillet radii
- Avoid areas where ground congestion may occur

The existing SDM taxiway system meets width and spacing requirements, yet all fillets found at taxiway/runway and taxiway/taxiway intersections do not meet the current FAA design standard. Historically, the FAA has permitted a few methodologies for designing and constructing taxiway fillets. However, with the most recent release of FAA 150/5300-13A, *Airport Design*, the options were reduced to a single standard that ensures all wheels of an aircraft tracking on the taxiway centerline remain on taxiway pavement. This standard is more conservative than other fillet design methods previously used, and thus requires more pavement. All the taxiway/runway and taxiway/taxiway intersections at SDM have pavement deficiencies considering this new standard. As a result, all airfield fillets should comply with current FAA design standards regarding taxiway fillets.

Furthermore, the additional pavement that extends from the Runway 26L end and ultimately connects to Taxiway A at the Runway 26R end has been identified as non-standard. This pavement can cause pilot confusion and is recommended for removal.

Full Length Parallel Taxiway

Currently on the SDM airfield, neither runway has a dedicated full-length parallel taxiway. As Runway 8L/26R is the primary runway due to its length and width, unrestricted runway exits are only available at the runway ends. All other taxiway connectors require crossing Runway 8R/26L in order to access or exit the primary runway. This configuration can reduce capacity due to the necessary holding before crossing Runway 8R/26L, or due to the additional taxi time to access or exit the primary Runway 8L/26R at the runway ends.

Taxiway Holding Bay Requirements

At SDM, there are currently four holding bays. The first two hold bays are located on Taxiway B between the Runway 8R threshold and Runway 8L/26R. The third holding bay is located on the west side of Taxiway C between the Runway 26L threshold and Runway 8L/26R. The fourth holding bay is located on Taxiway A, adjacent to the Runway 26R threshold.

Holding bays can replace bypass taxiways to overall increase the capacity at an airport. These bays are designed to take waiting aircraft from inhibiting the possible traffic flow on taxiways. Ideally, Hold Bays are located at the runway ends directly off the respective taxiways. Yet aircraft in holding bays should not be within any OFZ, RSA, or interfere with present Instrument Landing Systems (ILS). General design of holding bays include assured wingtip clearance of established critical aircraft, and proper markings to guide pilots safely into run up positions. Markings should be labeled to have a specified area where aircraft can turn within the holding bays to not line up nose to tail with other aircraft. This will allow for aircraft to easily enter and exit the holding bay without interfering with other aircraft in the same holding bay.

The existing holding bays at SDM have deficiencies including lack of markings, likely insufficient taxiway wingtip clearance, insufficient depth, and insufficient safety area clearance. **Table 3.16** outlines the existing run up area design deficiencies.

Table 3.16 - Run Up Area Design Compliance

Run Up Area Location	Sufficient Markings	Sufficient Wing-Tip Clearance	RSA Compliance	TSA Compliance
Runway 26R End	×	×	✓	×
North of Runway 26L End	×	×	✓	×
North of Runway 8L end (1/2)	×	×	✓	×
North of Runway 8L end (1/2)	×	×	✓	×

Source: Atkins Analysis, 2017

During the upcoming alternatives analysis phase of the Master Planning process any proposed hold bay modifications aim to meet the following criteria:

- Markings should direct aircraft to turn perpendicular or angled to the taxiway, which will create independent standing areas so aircraft can enter and exit at ease and avoid prop wash during run up, and ensure proper wingtip clearance.
- Pavement area should be increased to address capacity issues and ensure proper hold bay depth.
- Identify Additional hold bay locations to maximize run up area availability for each runway end.

Airfield Pavement

An airfield pavement condition analysis is being conducted as part of the Pavement Maintenance Management Plan currently underway at SDM. The intent of this study is to present comprehensive classifications for airfield pavement by utilizing the industry standard Pavement Condition Index (PCI) metric. In this method, pavement sections are inspected for distress type and severity. The inspection data is evaluated to determine the PCI of the pavement. Pavement is then classified using its PCI in categories of good, fair, or poor according. Given that the Pavement Maintenance Management Plan is currently underway, only preliminary PCI information is available for SDM. The following pavement condition findings depicted in **Figure 3.4** are preliminary in nature, and will potentially be updated and refined as the Pavement Maintenance Management Plan is finalized. It is recommended during capital improvement program development efforts that pavement condition be utilized as a factor in prioritizing future pavement rehabilitation projects. **Table 3.14** lists the pavement sections that have been classified as having a "fair" or "poor" condition in the preliminary Pavement Investigation Study findings.

Runway Pavement

From the initial data for the on-going pavement condition analysis, portions of Runway 8L/26R and

Runway 8R/26L have been classified as having a "poor" PCI rating. The sections include:

- Runway 8L/26R: From Taxiway C to approximately 975 feet from the Runway 8L end, the pavement is split into three sections horizontally on the runway.
- The southern two sections in this specified area has been classified as having a "poor" PCI rating. (R8L26R-02)
- Runway 8R-26L: At Taxiway A1, a section of approximately 400 feet has been classified as having a "poor" PCI rating. (R8R26L-03)

Taxiway Pavement

The initial data for the on-going pavement condition analysis shows that the taxiway pavement at SDM is currently in need of rehabilitation. The taxiways are listed as either being in "fair" or "poor" conditions. The specific sections of taxiway pavement classified as "poor" condition is as follows:

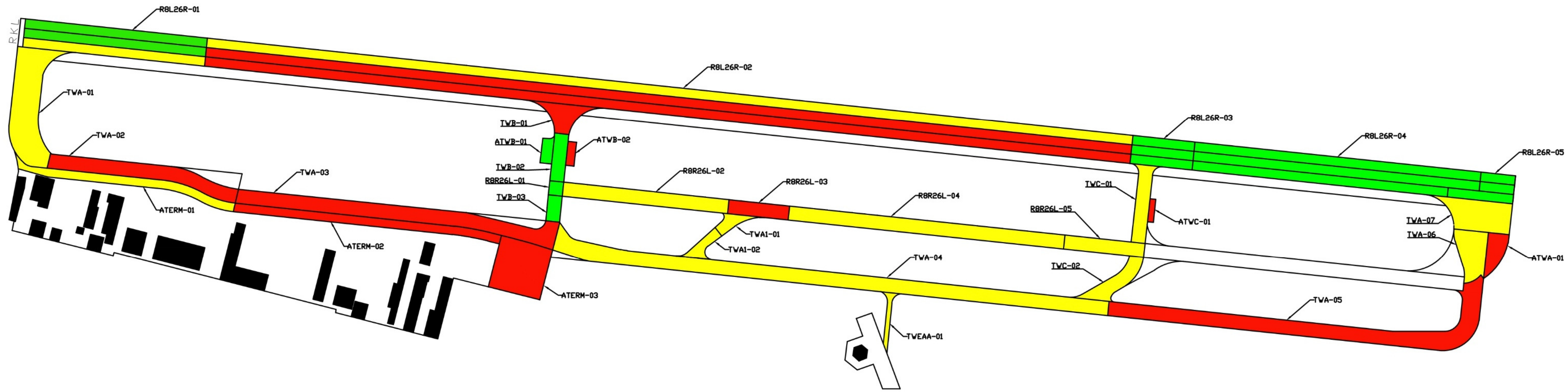
- Taxiway A: From the Runway 26R end's run-up area extending down and around to Taxiway C. (TWA-05, ATWA-01)
- Taxiway A: Starting from the intersection at Taxiway B extending until Taxiway B begins its turn towards the Runway 8L end. (TWA-02, TWA-03)

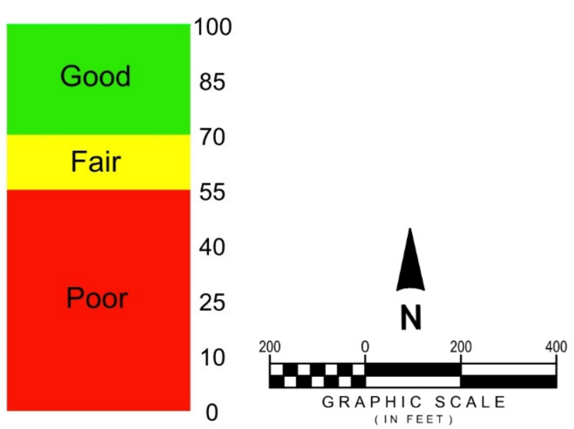
Apron Pavement

The initial data from the ongoing pavement condition analysis, surveyed SDM's apron area pavement as having a "poor" PCI rating. These sections include:

- All apron sections from the five conventional hangars that mark the midpoint of the apron area to the east where the apron pavement finishes. (ATERM-02, ATERM-03)
- All apron run-up areas located directly off the taxiway pavement at their respective runway ends. (ATWB-02, ATWC-01, ATWA-01)

Notes
1. The preliminary rating of existing pavement condition index (PCI) is based on limited visual survey performed on August 21-24, 2017 and the available As-Built information. Assumptions were made as necessary when an exact construction completion date and/or maintenance treatment date are unknown.
2. The current PCI may change as pavement coring information and/or additional As-Built information are received.





SD Airports

Brown Field Municipal
Airport Master Plan

Figure 3.4
Preliminary Pavement Condition Index (PCI)

ATKINS

Table 3.17 - Fair and Poor Pavement Sections

Type of Area	Section Code	PCI Rating
Runway 8L-26R	R8L26R-02	1/3 Fair 1/3 Poor
Runway 8R-26L	R8R26L-02	Fair
Runway 8R-26L	R8R26L-03	Poor
Runway 8R-26L	R8R26L-04	Fair
Runway 8R-26L	R8R26L-05	Fair
Taxiway A	TWA-01	Fair
Taxiway A	TWA-02	Poor
Taxiway A	TWA-03	Poor
Taxiway A	TWA-04	Fair
Taxiway A	TWA-05	Poor
Taxiway A	TWA-06	Fair
Taxiway A	TWA-07	Fair
Taxiway B	TWB-01	Poor
Taxiway A1	TWA1-01	Fair
Taxiway A1	TWA1-02	Fair
Taxiway C	TWC-01	Fair
Taxiway C	TWC-02	Fair
Taxiway EAA	TWEAA-01	Fair
Apron	ATERM-01	Fair
Apron	ATERM-02	Poor
Apron	ATERM-03	Poor
Apron (Run-up)	ATWB-02	Poor
Apron (Run-up)	ATWC-01	Poor
Apron (Run-up)	ATWA-01	Poor

Source: Atkins Analysis 2017

Airfield Lighting

Working Paper 1 – *Inventory, Surveys, & Data Collection*, describes existing conditions of airfield lighting equipment at SDM. Currently, SDM has appropriate lighting equipment including Precision Approach Path Indicators (PAPI), Runway End Identifier Lights (REIL), and Runway and Taxiway Edge Lighting where required. Therefore, no major lighting deficiencies currently exist at SDM. However, lighting will be analyzed in the upcoming alternatives analysis when making any proposed improvements to instrument approach minima. Finally, future any improvements to or implementation of lighting equipment should feature LED technologies where able and when practical.

Signage

Working Paper 1 – *Inventory, Surveys, & Data Collection*, describes existing conditions of airfield signage at SDM. While no specific recommendations for signage improvement are identified, airfield signage should be expanded and updated as necessary in conjunction with any airfield improvement projects.

Airfield Marking

Working Paper 1 – *Inventory, Surveys, & Data Collection*, describes existing conditions of airfield markings at SDM. While no specific recommendations for marking improvements are identified, airfield markings should be expanded and updated as necessary in conjunction with any airfield improvement projects.

3.4 Landside Facility Requirements

The planning of landside facilities is based on both airside and landside capacity. The requirements for terminal and support area facilities has been determined for the 20-year planning period. The principal operating elements covered under these analyses for general aviation requirements include:

- Aircraft Hangars
- Aircraft Parking Apron
- Fueling Facilities
- Terminal/Airport Administration Building
- Support Facilities
- Perimeter/Security Fencing and Access Gates
- Utilities
- Vehicle Access and Parking
- Land Use

Aircraft Hangars

Hangar requirements for a general aviation facility are a function of the number of based aircraft, the type of aircraft to be accommodated, owner preferences, and area climate. Furthermore, it is common when calculating the hangar size needs of a facility to use an average size requirement for the various types of aircraft, meaning that each type of aircraft will require a different amount of space (usually measured in square-feet) within a specific type of storage facility, e.g. T-hangar, single-aircraft box hangar, or large multi-aircraft conventional hangar. **Table 3.18** illustrates the average aircraft space requirements based on aircraft type for the Airport.

Table 3.18 – Average Aircraft Space Requirements

Aircraft Storage Type	Space Required (SF)
Conventional/Box Hangar	
SE piston	1,200
ME piston	1,400
Turboprop/jet	1,800
Rotorcraft	800
T-hangar	
SE/ME (piston/turboprop)	1,400

Acronyms: Square feet (SF), single-engine (SE), multi-engine (ME)
Source: C&S Engineers, Inc.

The average space requirements for the various aircraft in the Airport's based aircraft fleet mix was applied to the based aircraft forecasts to estimate hangar area requirements for each hangar type. **Table 3.19** includes the assumptions that were made regarding the type of storage needed for each type of based aircraft at the Airport. The existing based aircraft data provided by Airport management, along with the current aircraft storage conditions, as they exist on the airfield today, were used to develop these assumptions. Finally, using these averages and assumptions, combined with the forecasted fleet mix, **Table 3.20** depicts the calculated demand requirements for hangar space at Brown Field for each planning period.

Table 3.19 – Aircraft Storage Assumptions

Aircraft & Storage Type	% of Based Aircraft Fleet Using Storage[1]
SE Piston	
T-hangar	45%
Parking apron	30%
Conventional/box hangar	25%
ME Piston	
Conventional/box hangar	45%
Parking apron	30%
T-hangar	25%
Turboprop/jet	
Conventional/box hangar	85%
Parking apron	15%
Rotorcraft	
Conventional/box hangar	100%

Acronyms: Single-engine (SE), multi-engine (ME)

Note: [1] Assumes the percentage of the based aircraft fleet using each type of storage remains constant over the planning period. Source: City of San Diego Airports Division, 2017; C&S Engineers, Inc., 2017

Table 3.20 – Hangar Demand Summary

	2017 (Existing)	2022	2027	2032	2037
Conventional/ Box Hangar[1] (SF)	130,000[1]	53,400	55,800	58,200	63,200
T-Hangar/Single-aircraft box hangar (SF)	105,00	155,400	165,200	177,800	190,400
Total Hangar Area (SF)	235,000	208,800	221,000	236,000	253,600

Acronyms: Square feet (SF) Notes: 1) Excludes single-aircraft box hangars.

Source: City of San Diego Airports Division, 2017, C&S Engineers, Inc.

The results of the hangar demand analysis indicate that the Airport has substantially enough conventional box hangar storage space available over the 20-year planning period, but lacks T-hangar storage space. At the time of writing, Airport management indicates the demand for T-hangars is not critical. Likewise, the MAP development may include potential areas for private T-hangars, thus potentially alleviating some of the demand without the need for the City's investment. Hangars of all types are not normally eligible for FAA Airport Improvement Plan (AIP) funding, and therefore may be funded by the sponsor, private investor, or a combination thereof. Because the hangar space demand analysis shows a shortage of T-hangars in the 20-year planning period, potential locations to construct additional structures will be further explored during the Alternatives

Development Working Paper. It is recommended that the City continue to monitor the actual demand for hangars at the Airport, and make adjustments in the types and amount of hangars as needed over the course of the planning horizon.

Aircraft Parking Apron

The multiple aircraft parking areas found at the Airport were assessed in order to identify the required parking space needed for based aircraft not stored in a hangar, as well as transient aircraft requiring temporary parking. Transient aircraft are those that are visiting the Airport on a temporary basis and do not remain at the Airport for an extended period. Areas designated for the parking of transient (visiting) aircraft are called "itinerant aprons." There are currently 94 paved parking spaces available for based and transient aircraft and approximately 50,000 square yards of parking apron at the Airport, the majority of which is reserved for based aircraft. This amount excludes approximately 1,800 square yards of apron designated exclusively for the U.S. Customs and the transient aircraft utilizing their services. Since this apron parking area is off limits to both based and transient aircraft not utilizing the services of the U.S. Customs, it was not included in the needs assessment. The assumption is that the U.S. Customs service will continue to utilize this apron for the near future. Should they at some point leave the Airport, the small amount of apron they occupy should not have a significant effect on the overall apron demand determined within this report for the 20-year planning period.

The paved parking area requirements were calculated using an average of 300 square yards per based aircraft and 400 square yards per itinerant aircraft. The assumptions made for calculating the based aircraft that require apron parking, or tie-down space, included 30 percent of single- and multi-engine piston aircraft and 15 percent of turboprop and jet aircraft (see **Table 3.19**). **Table 3.21** summarizes the based and transient aircraft apron needs for the 20-year planning period. See **Figure 3.5** for a depiction of the itinerant and based aircraft aprons on the airfield.

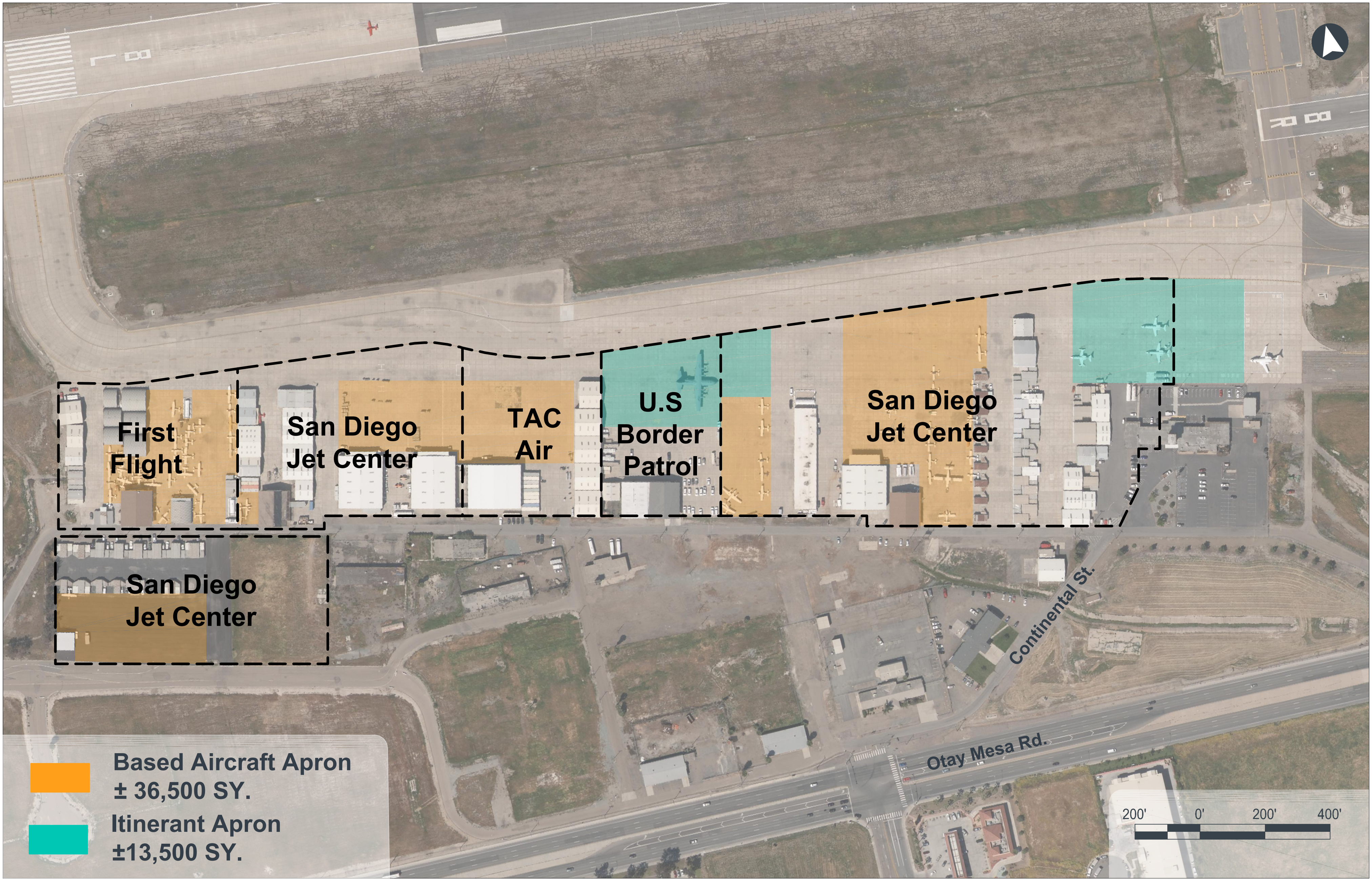
Table 3.21 – Apron Area Demand Summary

	Existing Area (SY)[1]	Estimate of Apron Area Needed (SY)			
		2022	2027	2032	2037
Itinerant Apron	13,500	11,200	11,200	11,200	11,600
Based Apron	36,500	20,100	21,600	23,400	24,900
Total Apron	50,000	31,300	32,800	34,600	36,500

Acronyms: Square yards (SY)

Notes: 1.) Existing apron areas were measured using aerial imagery and are approximate.

Source: City of San Diego Airports Division, 2017; C&S Engineers, Inc., 2017; Google Earth, 2017



SD Airports

Brown Field Municipal Airport Master Plan

Figure 3.5

Apron Area Measurements

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Based on the apron area demand forecast, the existing apron space for based and transient aircraft not needing the services of the U.S. Customs at the Airport is adequate to accommodate the 20-year planning period. However, this is not the case for the U.S. Customs aircraft parking apron that was left out of the calculations. According to the Airport, the existing 1,800 square yards of aircraft parking apron designated for U.S. Customs services is currently not large enough to handle the parking demand during peak activity. Often, aircraft waiting to be cleared by Customs must wait on nearby taxiways and/or other portions of the airfield far removed from the designated area. This creates issues with the airfield capacity and efficiency, as well as poses potential safety and security risks to the airfield. Therefore, it is recommended that the existing apron should be either reconfigured to include more parking space by absorbing more of the adjacent itinerant apron in the short-term, or construction of additional apron be proposed in the long-term. The latter ultimately depends on if the U.S. Customs' operations remains in the same location over the course of the planning period. It is important to note that the need for apron space ultimately depends on demand, particularly for transient aircraft. Since the Airport appears to have sufficient apron space for the existing and forecasted based aircraft, one solution may be to reconfigure the existing based aircraft apron parking and redistribute the "excess" space as transient parking. This recommendation would most likely involve the fixed base operators' (FBOs) input, and the ability to work with Airport personnel on developing new based aircraft parking aprons which maximize the use of the apron space as much as possible. Ultimately, the City should continue to monitor the use of the apron and make adjustments if necessary within the planning period. Reconfiguration of existing apron space may be reviewed during the alternatives development stage in order to ensure the current space is utilized efficiently.

Fueling Facilities

As previously discussed in Working Paper 1 – *Inventory, Surveys, & Data Collection*, between the two FBOs at the Airport, a total of 84,000 gallons of Jet A and 100LL fuel are stored within six above ground tanks. Furthermore, an additional total of 20,000 gallons of Jet A and 750 gallons of 100LL contained within four fuel trucks is available for fueling aircraft. This totals 84,000 gallons of Jet A and 20,750 gallons of 100LL Avgas fuel available at the Airport at full capacity.

A review of the fuel sales data from 2011-2016 indicates that the FBOs sell on average approximately 568 gallons of Avgas and 7,460 gallons of Jet A on a weekly basis. Thus, the existing aircraft fueling facility capacities at the Airport appear to be adequate for existing demand.

Terminal/Airport Administration Building

The terminal/Airport administration building is located on the southwestern portion of the airfield on Continental Street. Besides housing the Airport management offices, it is also includes the San Diego Jet Center offices, the U.S. Customs office, and a restaurant (The Landing Strip). The former ATCT is located in the middle of the building, serving as a historical landmark and focal point of the structure. The structure is approximately 12,600-square feet, not including the old tower.

The methodology used to determine the terminal building facility requirements for general aviation airports is based on the number of airport users anticipated to use the facility during the design hour operations. The design hour is defined as the peak hour of an average day of the peak month. The design hour can be used to determine the number of passengers and pilots departing or arriving on an aircraft in an elapsed hour of a typical busy day (design day). Furthermore, conventional planning practices use a factor of 2.5 people (passengers and pilots) per peak-hour (design hour) and an area of 100- to 150-square feet of space per person to determine the building size requirements in order to accommodate the peak-hour traffic. Due to SDM's size and current activity, 100-square feet of space was used. **Table 3.22** illustrates the results of these calculations.

Table 3.22 – General Aviation Terminal Space Requirements

Year	Design Hour Operations	Peak-Hour Pilots and Passengers	Terminal Size Required (approx. SF)
2017	46	115	11,500
2022	47	118	11,800
2027	47	118	11,800
2032	47	118	11,800
2037	47	118	11,800

Source: C&S Engineers, Inc., 2017

Although the results of the terminal space analysis indicates that the existing size of the facility is adequate over the 20-year planning period, this analysis does not take into account the existing condition of the facility. During the onsite inventory of the existing terminal facility, observations concluded that the structure is old, outdated, and contains unmitigated environmental concerns that conflict with general maintenance and the option of realistically renovating the structure; this is also the opinion of Airport management. Besides the known environmental concerns such as lead paint, hazardous materials in the ceiling and floors, and pest infestation, cracks in the foundation are present in some areas and the administrative offices and conference rooms are inadequate in size to handle the day-to-day operations by Airport personnel. The alternatives development portion of the Master Plan will consider various options that include the construction of a new general aviation and Airport administration joint facility adequate in size to meet the demand over the course of the 20-year planning period as determined from the analysis above.

Support Facilities

ARFF & Other Emergency Services

Although the Airport is not required to provide aircraft rescue and firefighting (ARFF) services as it is not a 14 CFR Part 139 certificated airport (airports which serve scheduled and unscheduled air carriers), as previously mentioned, San Diego Fire Department, Station 43, is located on the southeast portion of the airfield and provides assistance to the Airport if available. FAA AC 150/5210-6D, *Aircraft Fire and Rescue Facilities and Extinguisher Agents* recommends GA airports have 190-gallons of aqueous film forming foam (AFFF) supplemented with 300-pounds of dry chemical, in addition to aviation rated fire extinguishers, immediately available in the vicinity of the aircraft apron and fueling facilities. Thus, it is recommended that the City continue its agreement with the local Station 43 as long as they are able to provide the recommend minimum protection as outlined above.

City Equipment and Maintenance Building

The City does occupy several small structures located in various locations on the airfield for equipment, supplies, and maintenance activity; the combined total space of these facilities equates to approximately 3,200 square feet. Airport management indicates that additional equipment would be helpful to daily operations. Likewise, management indicates that the current storage space is adequate, but the multiple locations of each building on the airfield is inefficient and inconvenient. Thus, better location for a combined, single-structure maintenance building on the airfield will be analyzed during the various development alternatives.

Airfield Electrical Vault

The airfield electrical vault is located just west of the ATCT and is in overall good condition; it is approximately seven years old. The current size of the building (approximately 1,200-square feet) and the equipment inside are adequate to meet the Airport's current demand. However, the City should continue to monitor and maintain the equipment and replace as needed.

Airport Traffic Control Tower
The FAA ATCT is located just south of Runway 8R/26L at about mid-field of Airport property. The structure itself is in good condition. The ATCT is currently 593 feet mean sea level (MSL); verification of line-of-sight requirements as outlined in FAA Order 6480.4A, *Airport Traffic Control Tower Siting Criteria* will occur once the aerial survey is complete. The ATCT sits on approximately 2,500-square yards of pavement that is in fair to good condition, and chain-link fencing with one access-controlled vehicle gate for entry and exit encloses the entire paved area. There are 12 designated vehicle parking spaces at the base of the ATCT. At this time, there are no plans to relocate the ATCT from its current location on the airfield, and it is anticipated to remain in its current location over the course of the planning period.

U.S. Customs Office
The existing office and processing space used by U.S. Customs officials at the Airport is inadequate to handle the current activity. Airport management indicates that more space is needed to accommodate the agents and their equipment, as well as the customers waiting to be processed. Possible solutions to solve the constraints include constructing a larger, stand-alone facility, or possibly combining it into the proposed new terminal/administration building. The alternatives development stage of this report will further explore the options available for this facility.

Perimeter/Security Fencing and Access Gates

The primary function of airport fencing is to restrict the inadvertent entry to the Airport by unauthorized individuals or wildlife. As mentioned above, SDM is not a 14 CFR Part 139 certificated airport, and therefore does not require any security measures; however, most GA airports at a minimum usually possess some type of perimeter fencing, especially when located in busy urban areas. The Airport currently has perimeter fencing and access control measures in place that provides a layer of security and safety for its users. Nevertheless, improvements to the existing measures could be improved. For example, the current fencing varies in age, height, and condition in several locations. In order to provide better protection, it is recommended that the fencing in all areas be eight-feet in height with three strands of barbed wire at the top. Breeches to the fencing by coyotes is a known problem at the Airport. Some wildlife fencing exists in certain locations, but more may be needed in other areas currently not protected. The Airport is currently undergoing a Wildlife Hazard Assessment (WHA) in which the entire airport property is being evaluated for wildlife hazards. The report ultimately will recommend mitigation and other measures to help make the airfield safer from potential dangers posed by wildlife. A more in depth discussion of the WHA is contained in later sections of this report. It is recommended that the City follow the guidelines provided within the WHA to address the issues pertaining to wildlife and the perimeter fencing.

Perimeter fencing is just one layer of security for general aviation airports, and although not required to have any specific security measures in place, it is common for general aviation airports to have several other forms of security measures in place other than fencing. Due to SDM's close proximity to the International border, it is recommended that the City explore additional security measures in order to enhance the overall safety of the airfield for its users.

There are several programs designed to increase general aviation airport security. For example, the Aircraft Owners and Pilots Association (AOPA) Airport Watch program created an around the clock telephone hotline answered by federal authorities for pilots and other airport users to report suspicious activity at GA airports. In addition, the Transportation Security Administration's (TSA) *Security Guidelines for General Aviation Airports* provides a set of federally endorsed recommendations to enhance security for municipalities, owners, operators, sponsors, and other entities charged with oversight of GA airports. The TSA's guidance provides nationwide consistency with regard to security at GA facilities, as well as a rational method for determining when and where these enhancements may be appropriate based upon the operational profile of differing airports. The guidelines offer an extensive list of options, ideas, suggestions, and proven best practices for the Airport operator, sponsor, tenant, and/or user to choose from when considering security enhancements. It is recommended the City review the latest version of the TSA's *Security Guidelines for General Aviation Airports* in order to assess the suggested security enhancements needed at the Airport.

Utilities

Significant concerns with the age and condition of the majority of the utilities serving the Airport and surrounding areas exists. For example, due to the antiquity (50 plus years) of the plumbing and pipes providing water to the area, often times leaks and ruptures occur causing major damage to the roads and buildings. Furthermore, some areas to the north of the Airport are only serviced by hydrants and PVC piping that in some areas run on the surface of the airfield; oftentimes these lines are ruptured during the mowing process, which in turn also causes interruption in service and repair issues. Furthermore, many of the electrical and telephone supply lines and panels are outdated, which present a continual challenge to maintain. Overall, the utilities serving the Airport and the immediate area are in need of upgrading and/or replacement. This is a concern to the Airport, as future development may require additional electrical or water capacity to meet the power needs of the operation or to meet fire codes (usually for new hangar developments). As such, during the planning phase of all proposed development, coordination with the local utility providers should occur to insure sufficient capacity exists. Furthermore, to determine the adequacy of the existing infrastructure at SDM, it is recommended that a general utility study be performed to gauge the Airport's current systems, which in turn should assist in estimating the future utility demands needed to support the proposed future development contained in this master plan update.

Vehicle Access and Parking

Vehicle Access

As mentioned in Working Paper 1 – *Inventory, Surveys, & Data Collection*, the Airport is bound by Otay Mesa Rd. to the south, Heritage Rd. to the west, La Media Rd. to the east, and open space to the north. Otay Mesa Rd. is the main road providing access to the Airport, and the main entrance is located at Curran St. At this time, the existing entrance road is expected to be adequate to accommodate the current and future activity for the planning period, although routine pavement maintenance for the roadway itself should be considered in the short-term. Furthermore, should the proposed Metropolitan Airpark (MAP) development move forward, it might be likely that additional airport entrance points could be added depending on the overall plan of that development. Any new airport access points proposed as a part of the MAP development will be discussed and evaluated at that juncture.

Vehicle Parking

Two main public vehicle public parking lots are located adjacent to the terminal building (one to the north and one to the south of the building) off Curran St. Both lots have a combined 100 vehicle parking spaces currently available. Normally, an airport's vehicle parking area should be able to satisfy the forecasted peak-hour (design hour) general aviation pilot and passenger demand. Typically, this involves determining two-thirds of the design hour, and then multiplying that figure by the standard 2.5 peak hour pilots and passenger factor. **Table 3.23** depicts the public vehicle space requirements for the 20-year planning period determined by these calculations.

Table 3.23 – Public Vehicle Parking Requirements

Year	Design Hour Operations	Parking Spaces Required[1]
2017	46	77
2022	47	79
2027	47	79
2032	47	79
2037	47	79

Note: [1] Parking space requirements were determined using 2/3 of the design hour operations multiplied by the standard 2.5 peak hour pilots and passengers factor and rounded to the nearest whole number.

Source: C&S Engineers, Inc.

Based on the existing public parking spaces currently available at SDM and the calculations above, no additional spaces should be needed to accommodate visiting and other transient users of the airport. However, parking spaces will ultimately depend on actual demand; therefore, the City should continue to monitor the public vehicle parking needs throughout the planning horizon and consider expansion as the need arises.

Land Use

Designating land use and zoning on, adjacent to, and in the close proximity of an airport is an important task for municipal airport sponsors. Typical land use compatibility considerations include safety, height hazards, and noise exposure, all of which the sponsor should address when designating land use and zoning ordinances on and around airports within their jurisdiction. In the state of California, these types of measures are contained within the Airport Land Use Compatibility Plan (ALUCP), which ensures that incompatible development does not occur on land surrounding an airport (non-airport property). To meet these objectives, the ALUCP addresses potential airport compatibility impacts related to four specific airport-related factors; these include:

1. Noise – Exposure to aircraft noise
2. Safety – Land use that affects safety both for people on the ground and in aircraft
3. Airspace protection – Protection of airport airspace
4. Overflight – Annoyance and other general concerns related to aircraft overflights

The Airport's current ALCUP was published in January 2010. Any proposed development, such as the MAP, surrounding the Airport (i.e. not on Airport property) must conform to the guidelines as outlined within the 2010 ALUCP. It is imperative that the Airport continue to work in conjunction with other City departments and the MAP developers on controlling the types of development and land uses surrounding the Airport via zoning and other measures, such as avigation easements and airport overlay zones, in order to meet the requirements found within the ALUCP.

The MAP, as discussed in the Background section of Working Paper 1 – *Inventory, Surveys, & Data Collection*, includes proposed development that addresses almost all of the undeveloped land to the north and south of the airfield. The MAP, as proposed, will cover a 331-acre portion of the Brown Field Municipal Airport. The MAP is divided into 16 Development Areas that will be developed in four phases. Design Guidelines have been established, including a Master Site Plan, shown on Figure 1.9 in Working Paper 1 – *Inventory, Surveys, & Data Collection*. An Environmental Impact Report was completed in 2013, and an Aviation Activity Forecast, for use in the Environmental Assessment, was also developed and then approved by the FAA in 2016. A Biological Assessment also followed in 2016. The potential degree of environmental impact of the project requires additional assessment and documentation, and is currently under FAA review. Once the project moves forward, development is planned for a 20-year time period and is currently estimated to be completed in 2038. Thus, as the MAP addresses almost the entirety of the unused land available on the airfield, additional consideration of non-aeronautical land use at the Airport outside of what the MAP proposes is unlikely to occur at this time.

The MAP proposed land uses are identified by development area in **Table 3.24**. Some elements of the proposed development have changed since the completion of the MAP Design Guidelines in 2013, and are reflected in the table.

Table 3.24 – Proposed MAP Development Areas

Development Area Description	Gross Acres	Principal Land Use	Total Gross Floor Area (SF)
Jet Aviation Fixed Base Operation (FBO) to include: large hangars; jet fuel; aircraft maintenance; offices; restaurant; wind turbines; solar roof panels	30.09	Aviation	295,651
General aviation for small aircraft to include: small hangars; aircraft maintenance; Avgas; nested and standard T-hangars; solar roof panels	28.06	Aviation	275,114
Vehicular parking	2.31	Aviation	-
Open space with informational marker on the old Alta Loma School District site – NOT PART OF DEVELOPMENT (1.17 acres)	-	Public Space	-
Large hangars; offices; solar roof panels	9.10	Aviation	109,370
Large aircraft hangars; offices; Helicopter FBO to include: hangars; offices; San Diego Fire Department aviation hub (office, sleeping quarters, hangar) or other user; solar roof panels	17.58	Aviation	130,065
Aircraft apron	12.87	Aviation	-
Solar photovoltaic energy generation facility	25.72	Utility	-
Potential aircraft apron	29.51	Aviation	-
Solar photovoltaic energy generation facility; outdoor equipment and materials storage area	38.89	Utility, Storage	-
Access road	11.74	Roadway	-
Industrial park with an emphasis on light Industrial aviation and non-aviation (research and development) uses	62.69	Industrial	1,355,000
N/A	24.65	N/A	-
Commercial	18.20	Commercial	151,500
Commercial,120-room hotel, alternative fuels station, public transit station TRANSIT STATION NOT PART OF LEASE AREA (0.74 acre)	14.47	Commercial, Transit Facility	113,425
Commercial, 150-room hotel	5.32	Commercial	75,000

Source: MAP Design Guidelines, 2013

3.5 Advisory Committee Input

As with the previous two Working Papers, the Montgomery-Gibbs Executive Airport Public Advisory Committee (PAC) had the opportunity to review Working Paper No. 3 and provide comments to the project team during the third scheduled committee meeting held on October 17, 2017. Committee members provided several comments regarding both the airside and landside facility requirements presented within Working Paper No. 3. The more notable comments include the following:

Airside Facility Requirements Feedback

The PAC agreed that the Airport lacks adequate run-up areas for the mix of aircraft currently using the facility and suggested looking for ways to expand existing areas. Additionally, one PAC member suggested the project team evaluate the possibility of extending Runway 8R/26L 1,500 feet in length. The capacity of the airfield is a key focus of the airside alternatives, and will be thoroughly examined within Working Paper 5.

Landside Facility Requirements Feedback

The PAC agreed on several items regarding the landside facility requirements at the Airport. First, all seemed to agree that close coordination with the Metropolitan Airpark's (MAP) proposed future development is a necessity for the proper outcome of the Airport Master Plan. A PAC member shared the Experimental Aircraft Association's plans to also build an additional 10 to 15 hangars on their current leasehold, which would be in addition to the approximately 61 T-hangars recommended to meet the future aviation demand. Furthermore, the PAC concluded that access and perimeter roads are in need of improvements and possible re-alignment pending coordination with MAP development. Another common suggestion involved the U.S. Customs existing aircraft parking apron and facility. PAC members agreed that more space is needed for both the aircraft designated parking area and for their building. Finally, the PAC also believes that the terminal building is in need of updating, but agreed that the historic old tower should remain as a part of the redevelopment. Thus, all landside alternatives proposed in the subsequent Working Paper 5 will include recommended additions and improvements in these areas, and ultimately will be incorporated into the preferred alternative for the Airport Master Plan.

Summary

This phase of the AMP captured the required facility requirements as a result of the Airport's existing conditions and its projected aviation demand over the course of the 20-year planning period. Input from the FAA, AMP Advisory Committee, and the public is a vital component in this process. Under Working Paper 5 - Alternatives Development, Evaluation and Selection; various airside, airfield, and landside improvements will be presented for evaluation. After further review and input from airport stakeholders and the surrounding community, a recommended preferred alternative for the Airport's airside and landside improvements will be proposed for further evaluation.