Master Plan

Facility Requirements

Waukegan Regional Airport Master Plan

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Chapter Four: Airport Facility Requirements

4.1 Introduction

Waukegan Regional Airport facility requirements are identified through a comparison of user demand with the operational capabilities or capacities of each existing Airport facility. The improved facility forecasts of aviation activity presented in Section 3 are used in determining demand levels for the various facilities. FAA and other aviation industry criteria/methodologies are used in estimating the capability of each existing Airport facility in meeting predicted demand. Deficiencies identified in this demand/capacity comparison determine specific Airport facility needs. These requirements assist in the preparation of the recommended airport development plan.

Various airport facility components have been grouped under three general categories: airfield, such as runways and navigational aids; terminal area, such as aircraft hangars and auto parking; and airport/terminal access, including area roadways used in accessing the Airport and its facilities. The requirements of each facility category are discussed separately.

4.2 Airfield Requirements

Airfield facilities include runways, taxiways, airfield lighting, runway and terminal navigation aids, and associated support facilities, such as the airport maintenance building. Runways accommodate the landing and takeoff of aircraft. Taxiways provide for the surface movement of aircraft between the runways and other airport areas, such as the terminal area. Airfield lighting and navigation aids enhance the use of runway and taxiway facilities at night and during marginal weather conditions.

4.2.1 Factors Influencing Airfield Requirements

Airfield requirements are influenced by numerous factors including the physical characteristics of the most demanding aircraft (the critical aircraft), areas weather conditions, and the airfield operational capacity. Physical aircraft characteristics dictate runway and taxiway length, width and pavement strength and determine minimum layout design criteria (such as the separation between runways and taxiways). Weather conditions and airfield capacity influence the number and type of runways and taxiways and their orientation, and the extent of necessary navigation aids.

Weather Conditions

Wind speed and direction and visibility and ceiling conditions influence airfield requirements in several ways. The effects of these factors on the runway and navigation aid requirements of Waukegan Regional Airport are discussed below.

Influence of Wind Speed and Direction

Weather conditions at an airport site influence the extent and type of airfield facilities needed to accommodate aircraft operations. Wind speed and direction can influence the number of runways. Periods of low ceiling and/or visibility can influence the extent of electronic and visual navigation aids

required to assure continued use of the airport during marginal weather. Temperature conditions, particularly in warm weather months, can affect runway length requirements. An analysis of weather characteristics in the Waukegan Regional Airport area is contained in the following paragraphs.

Aircraft normally prefer to land and takeoff on runways which result in operations into the wind. When runways with orientations parallel to the wind's direction are not available, operations with acceptable crosswinds are required. Limitations on crosswind operations include the aircraft's crosswind characteristics, pilot proficiency or ability, and insurance or corporate policy. General crosswind limits have been established for planning purposes; a 10 knot (12 mph) crosswind component for small aircraft less than 12,500 pounds; 13 knot (15 mph) crosswind component for large aircraft weighing less than 60,000 pounds, and a 16 knot (18 mph) component for large aircraft weighing more than 60,000 pounds.

The availability of wind and weather observation records for Waukegan Regional Airport was discussed with the National Climatic Center in Asheville, North Carolina. Suitable observations have been taken at the Airport from the ASOS station. The available Waukegan Regional Airport weather observations cover the period January 2000 to December 2009.

All weather and IFR weather wind roses of the Waukegan Regional Airport weather data have been developed and are shown in Figures 4-1 and 4-2. Additional Airport wind roses are shown in Appendix B. Wind roses depict the annual percentage occurrence of various wind direction and speed combinations. All weather data includes all of the weather observations taken, while IFR weather data includes only those observations taken when ceilings are less than 1,000 feet but greater than 200 feet and/or visibility is less than three miles but greater than one-half mile.

Under both all weather and IFR weather conditions, the predominant wind direction is from the southwest (20.4 percent of the time in all weather and 21.7 percent of the time in IFR weather). Average wind speed is 7.4 knots for all weather conditions and 7.5 knots for IFR weather conditions.

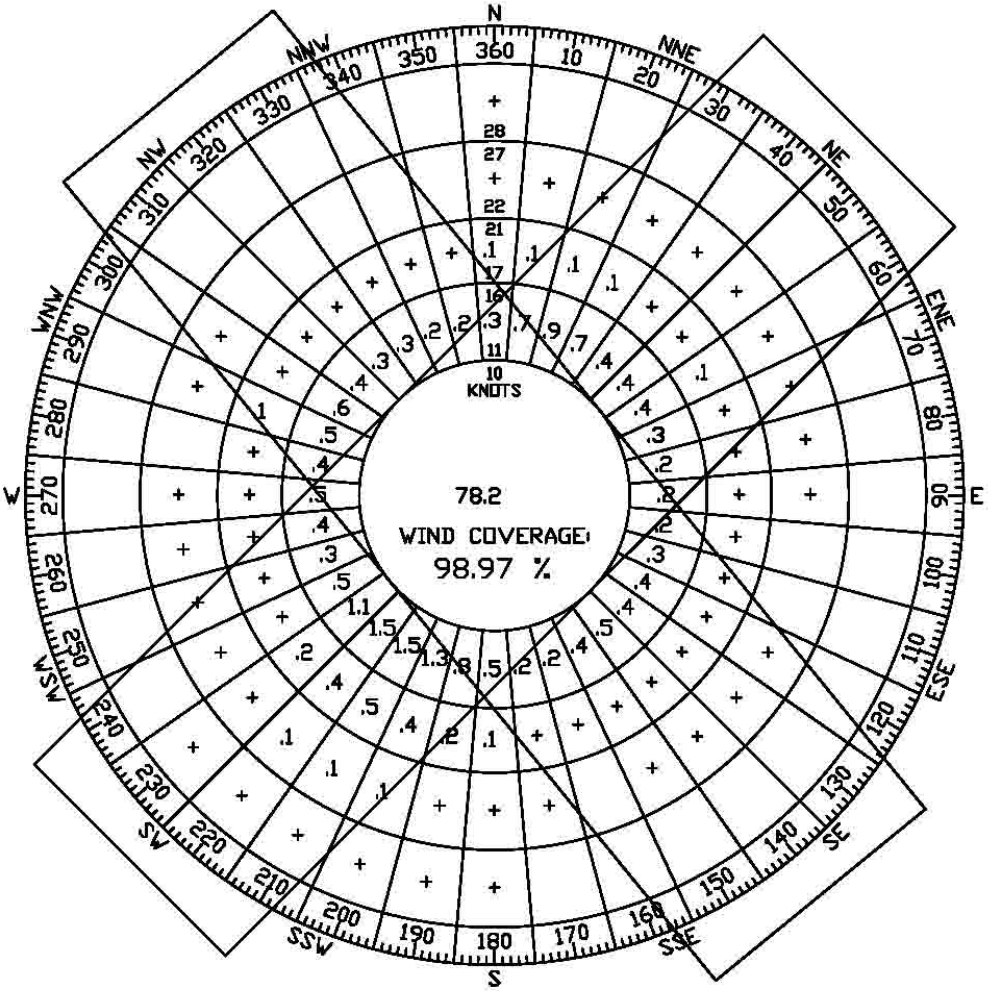
Using the Waukegan wind rose data, wind coverage's have been calculated for each runway and runway combination at the Airport. The runway wind coverage value represents the theoretical percentage of time each runway may potentially be used if only crosswind limits are considered. All weather and IFR wind coverage's for the Airport are listed in Table 4-1. The various IFR ceiling and visibility parameters represent the difference approach minima now available at Waukegan Regional Airport.

Table 4-1 Runway Wind Coverage Tabulation in Percent

Runway and Wind Speed	VFR	IFR				
10.5 Knot Crosswind	All Weather	1000' Ceiling, 3 mile Visibility	500' Ceiling, 1 mile Visibility	300' Ceiling, 1 mile Visibility	300' Ceiling, 0.5 mile Visibility	200' Ceiling, 0.5 mile Visibility
Runway 5-23	93.7%	93.9%	93.8%	93.8%	93.7%	93.8%
Runway 14-32	86.8%	86.6%	86.7%	86.7%	86.7%	86.7%
Both	99.0%	99.0%	99.0%	99.0%	99.0%	99.0%
13 Knot Crosswind						
Runway 5-23	96.9%	97.0%	97.0%	96.9%	96.9%	96.9%
16 Knot Crosswind						
Runway 5-23	99.5%	99.6%	99.6%	99.5%	99.5%	99.5%

Source: National Climatic Center in Asheville, North Carolina, 2000-2009.

Under FAA airport planning criteria, a wind coverage level of at least 95 percent should be provided by an airport's runway facilities to assure that maximum utilization of the airport is realized. The existing Waukegan Regional Airport primary and secondary runway orientation provides the recommended wind coverage for both 10.5 crosswind limit for small aircraft. Therefore, based on wind conditions, both runways are warranted at the Airport, with one runway serving as the primary runway orientation, and the second runway serving as the secondary or "crosswind" orientation. For the 13 knot and 16 knot crosswind conditions, Runway 5-23 alone furnishes the minimum 95% crosswind coverage. Accordingly, the provision of two crossing runways is still required to accommodate small aircraft. Large aircraft are furnished with sufficient wind coverage with only Runway 5-23.



NUMBER OF OBSERVATIONS = 80,371

ALL OBSERVED WHEN CONDITIONS INCLUDE GREATER THAN 1000' CEILING AND GREATER THAN 3 MILE VISIBILITY

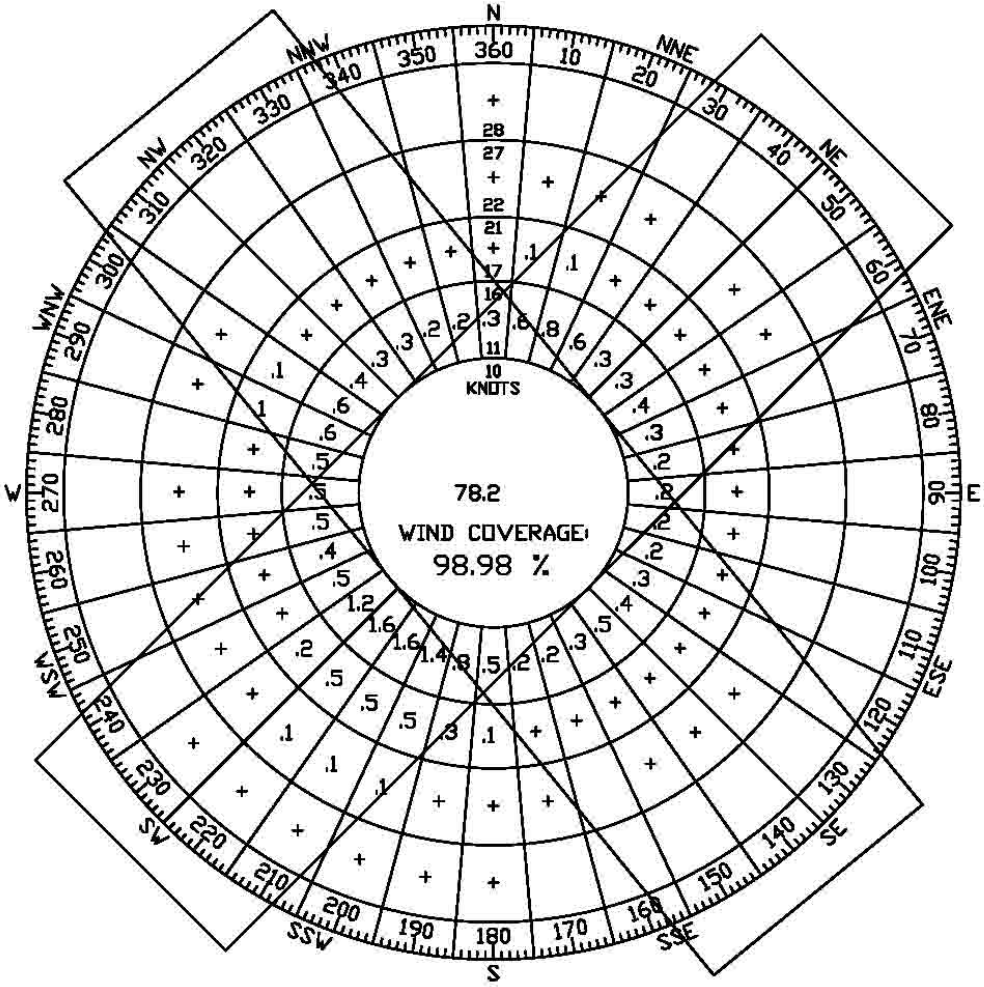
WAUKEGAN PORT DISTRICT

HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: All Weather Wind Rose - 10.5 Knot Wind
Runway 5-23 And Runway 14-32

Exhibit No.: 4-1



NUMBER OF OBSERVATIONS = 71,238

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 1000' CEILING AND 3 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: IFR Weather Wind Rose - 10.5 Knot Wind
Runway 5-23 And Runway 14-32

Exhibit No: 4-2

Influence of Visibility and Ceiling

Conditions of visibility and ceiling have a tremendous influence on flying in general and the need for airport navigation equipment in particular. When visibility (horizontal sight distance) is greater than three miles and ceilings (distance to cloud cover) are higher than 1,000 feet, VFR or visual flight rules conditions exist. During periods of VFR, landings and takeoffs are conducted using visual references with minimal operating restrictions. However, when visibility is less than three miles or the ceilings are lower than 1,000 feet, IFR or instrument flight rules conditions exist. In IFR, landings and takeoffs are partially or entirely conducted through the use of navigation instruments. Different ceiling and visibility operating minima, based on the navigation equipment available, have been established by the FAA. As the ceiling and visibility values get lower, required aircraft instrumentation and pilot proficiency increases.

Percentage occurrences of various weather conditions have been calculated from the ten-year Waukegan Regional Airport weather data and are shown in Table 4-2. The various visibility and ceiling conditions influence the degree of utilization Waukegan Regional Airport can potentially achieve. From the Waukegan weather analysis, VFR flying conditions should occur some 88.6 percent of the time. Flight operations in the remaining 11.4 percent of time would be conducted under approach procedures to the airport, if sufficient facility utilization is to be achieved.

Table 4-2 Annual Weather Condition Occurrences in Percent

Type	Visibility in Miles	Ceiling in Feet	Annual Occurrence
VFR (Visual Flight)	3 miles	1,000 Feet	88.6%
IFR (Instrument Flight)			
Nonprecision	1 to 2-1/2	400 to 900	6.7%
Category I Precision	1/2 to 3/4	200 to 300	2.8%
Category II Precision	1/4 to 3/8	100	Not Covered by Current Aids
Category III Precision	0 to 3/16	0	Not Covered by Current Aids
All Weather Conditions			98.1%

Source: National Climatic Center in Asheville, North Carolina, 2000-2009.

At the Airport, a nonprecision, straight-in approach is available to Runway 5 and a precision, straight in approach is available to Runway 23. Nonprecision or circle-to-land minima are not established for use with the runway ends 14 and 32. If only visibility and ceiling conditions are considered, this existing instrument approach capability raises the theoretical airport utilization potential from 88.6 percent (for visual only) to 98.1 percent. When weather is less than Category 1 minima, the Airport is effectively closed; or some 1.9% of the time.

Site temperatures influence runway length requirements at an airport, particularly in warm weather months. Waukegan weather data also provides pertinent temperature values. The average daily maximum temperature in the warmest month (July) is 88° F.

The improved facility forecasts in Chapter 3 predict significant increases in instrument approach activity. Based on the predicted activity levels, additional terminal navigation and runway approach aids may be warranted at Waukegan Regional Airport. The high percentage of IFR weather in the Airport area and the increasing sophistication of navigation equipment available in general aviation aircraft support this need for improved navigation facilities. Under FAA eligibility criteria, qualification for various terminal navigation equipment is based on the number of annual instrument approaches conducted at the Airport, and the completion and results of a cost benefit analysis, along with other factors. More sophisticated equipment requires a greater level of instrument approach activity. Specific navigation improvements recommended for Waukegan Regional Airport are discussed later in Section 4.2.2.D.

Design Critical Aircraft

One of the many objectives in airport planning is to assure that airport facilities are designed to the standards associated with the critical aircraft, or the most demanding aircraft type expected at the airport. The critical aircraft for runway length may not be the critical aircraft for other facility characteristics, such as layout design criteria or minimum pavement strength.

It is desirable to plan and design all airport elements to the standards of the critical aircraft type(s). This practice assures that airport facilities are available for use by all aircraft in almost all weather conditions and when maintenance and/or snow removal activities close primary (predominant) airfield facilities. However, for many reasons, including unacceptable construction or operation cost or adverse environmental consequences, it is often recommended that some airport facilities, such as a secondary runway, be designed to the standards of lesser demanding aircraft types.

FAA Advisory Circular 150/5300-13, *Airport Design,* should be used in locating and designing primary (5-23) and crosswind (14-32) runways and taxiway facilities. An initial primary runway critical aircraft was identified in the August 2008 *Runway Length Requirements for Airport Design for the Waukegan Regional Airport (KUGN)* (See Appendix A). The two critical aircraft based upon 2008 surveyed activity and five year future activity: (1) 100% of fleet weighing less than 60,000 pounds, and; (2) Gulfstream G450. Subsequent to that report, based upon Chapter 3 Aviation Forecasts, the Boeing Business Jet was identified as the 20 year horizon critical aircraft. In both of these designations, significantly more than 500 annual itinerant operations have been identified.

For the crosswind runway, the recommended critical aircraft is 100% of small airplanes with less than 10 seats. The runway width and strength requirements of those secondary runway facilities needed may be determined using criteria that are Airplane Design Group B-II.

Table 4-3 Critical Aircraft and Runway Data

Current	*Runway 5-23*	Aircraft	*Runway 14-32*	Aircraft
Critical Runway Category	C-II	75% of Fleet @ 60% Maximum Load	B-II	95% small airplanes with less than 10 seats
Critical Runway Length	6,000'	75% of Fleet @ 60% Maximum Load	3,751'	95% small airplanes with less than 10 seats
Critical Runway Width	150'	75% of Fleet @ 60% Maximum Load	75'	95% small airplanes with less than 10 seats
Critical Runway Strength	120,000 lbs DG	75% of Fleet @ 60% Maximum Load	23,000 DG	95% small airplanes with less than 10 seats
Critical Aircraft Wingspan	<119'	75% of Fleet @ 60% Maximum Load	< 79'	95% small airplanes with less than 10 seats
5-Year Plan Horizon				
Critical Runway Category	C-III	Gulfstream G450	B-II	100% small airplanes with less than 10 seats
Critical Runway Length	7,000'	100% of Fleet, Less than 60,000 Pounds	3,900'	100% small airplanes with less than 10 seats
Critical Runway Width	100'	Gulfstream G450	75'	100% small airplanes with less than 10 seats
Critical Runway Strength	74,600 lbs DG	Gulfstream G450	12,500 lbs SG	100% small airplanes with less than 10 seats
Critical Aircraft Wingspan	77'-10"	Gulfstream G450	< 79'	100% small airplanes with less than 10 seats
20-Year Plan Horizon				
Critical Runway Category	C-III	Boeing Business Jet	B-II	100% small airplanes with less than 10 seats
Critical Runway Length	7,000'	Boeing Business Jet	3,900'	100% small airplanes with less than 10 seats
Critical Runway Width	150'[1]	Boeing Business Jet	75'	100% small airplanes with less than 10 seats
Critical Runway Strength	164,000 lbs DG[2]	Boeing Business Jet, 90% Useful Load	12,500 lbs SG	100% small airplanes with less than 10 seats
Critical Aircraft Wingspan	117'-5"	Boeing Business Jet	< 79'	100% small airplanes with less than 10 seats

[1]For Airplane Design Group III serving airplanes with maximum certified takeoff weight greater than 150,000 pounds, the standard runway width is 150 feet.
[2]Represents a value of 90% useful load.

Airfield Capacity

Airfield capacity represents a measure of the ability of the airport runway and taxiway components to accommodate the operational demand imposed on them. As operational demand approaches or exceeds airfield capacity, delays in various phases of operation occur. These delays can be eliminated or reduced to acceptable levels with the provision of additional runway and/or taxiway facilities.

Existing and year 2030 hourly and annual airfield capacity estimates have been prepared for Waukegan Regional Airport using the procedures outlined in FAA Advisory Circular 150/5060-5, Airport Capacity and Delay. The existing capacity estimates are based on the existing Airport runway and taxiway facilities and current, operations levels/characteristics. The year 2030 capacity estimates are based on an assumed runway and taxiway layout and the forecast year 2030 improved facility activity levels/characteristics.

The assumed year 2030 layout is based on the general airfield requirements indentified in the previous discussions of design critical aircraft and weather conditions. Facilities provided in the assumed layout include a primary and a crosswind runway, each served by a parallel taxiway system and a precision instrument approach for the Airport. An intersecting runway configuration, #9 in AC 150/5060-5, (such as the existing runway layout) is also assumed.

The results of the airfield capacity analysis are compared with existing and expected demand levels in Table 4-4. From the demand/capacity comparison, it is seen that the existing Waukegan Regional Airport airfield capacity is more than adequate for existing demand levels. In the year 2030, airfield capacity with the assumed airfield layout is still above the forecast demand level, with demand forecast to be approximately 50 percent of airfield capacity. FAA guidelines recommend that capacity planning begin at the airport when demand reaches 60% of the available capacity. Accordingly, planning for additional runway capacity is not warranted during the master plan period.

Table 4-4 Airfield Demand/Capacity Comparison

	Airfield Operations		Demand as Percent of Capacity	Average Aircraft Delay in Minutes
	Demand	Capacity		
Existing Conditions				
Mix Index % (C+3D) - Runway Config. #9	23.9%			
VFR Weighted Hourly Activity	27	77	34.9%	
IFR Weighted Hourly Activity	(NF)	57	(NF)	
Annual Airport Activity	53,000	200,000	26.5%	0.1 - 0.2
Forecast 2030 (Improved Facility)				
Mix Index % (C+3D) - Runway Config. #9	39.7%			
VFR Weighted Hourly Activity	49	77	63.4%	
IFR Weighted Hourly Activity	(NF)	57	(NF)	
Annual Airport Activity	96,000	200,000	48.0%	0.2 - 0.5

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

Notes: * Maximum peak hour demand, as previously forecast in Section 3.

(NF) Demand not forecast in Section 3, but is less than capacity value.

4.2.2 Recommended Airfield Facilities

Specific airfield facility recommendations for Waukegan Regional Airport are presented below. These recommendations, which consider the factors discussed above, include: runway pavement length, width and strength; runway safety areas and protection zones; taxiway pavement width and strength; airfield lighting systems; and, approach and navigation aid systems. Perimeter fencing needs are also considered.

The forecast Airport activity characteristics, as presented in Section 3, were considered during formulation of the airfield requirements. To assure that potential future changes in facility needs are identified, airfield (and terminal area) requirements should be periodically re-examined throughout the study period, based on actual operations levels and critical aircraft operating characteristics.

A. Runway Facilities

Primary and secondary runway requirements are reviewed separately.

1. Primary Runway

Existing primary Runway 5/23 is 6,000 feet long and 150 feet wide and of asphalt composition. The runway has porous friction course, to improve its operational performance under wet conditions. The runway pavement strength is 95,000 pounds for single wheel, 120,000 pounds for double wheel, and 200,000 pounds for dual tandem. A Pavement Condition Index (PCI) evaluation conducted in 2009 by the Illinois Department of Transportation, Division of Aeronautics determined that the pavement generally is in average condition. A detailed summary of the complete airfield pavement evaluation is included in Appendix C.

Recommended Runway Dimensions

Based on the guidance contained in FAA's AC 150/5324-4B "Runway Length Requirements For Airport Design", specifically Paragraph 403; from the user surveys received from patrons of Waukegan Regional Airport; and from the analysis contained herein, and from the earlier *Runway Length Requirements for Airport Design for the Waukegan Regional Airport (KUGN),* has determined that the current, justified primary runway length at KUGN is 7,000 feet. Accordingly, a primary runway length requirement of 7,000 feet will be the required length to be considered for future airport layout and design, including alternatives evaluations, and NEPA actions.

The runway should be furnished with wet surface treatment, such as grooving or a porous friction course, to accommodate turbojet aircraft.

As noted in Table 3-3, for Airplane Design Group III serving airplanes with maximum certificated takeoff weight MTOW greater than 150,000 pounds, the standard runway width is 150 feet, the shoulder width is 25 feet, and the runway blast pad width is 200 feet. According to the aviation forecast in Section 3, the Boeing BBJ is expected to conduct over 500 operations at UGN by 2030. The Boeing BBJ TOW, at 90% useful load is 164,000 pounds. Therefore, the recommended width for the primary runway is 150 feet.

The primary runway pavement, for a length adequate to accommodate the business jet fleet, may be designed to accommodate 164,000 pound dual wheel gear (DG) aircraft, as a minimum.

It should be noted that these pavement strength recommendations as well as those presented later in circumstances to accommodate loads imposed by snow removal, maintenance or fire and rescue equipment. Further, the pavement section design required to reasonably offset the upheaval effects of frost may result in pavement strengths that are in excess of the normal minimum design recommendations.

2. Secondary Runway

Existing secondary Runway 14/32 is 3,751 feet long and 75 feet wide and of asphalt composition. The runway has no wet surface treatment, such as pavement grooving, to improve its operational performance under wet conditions. The runway pavement strength is 16,000 pounds for single wheel 23,000 pounds for double wheel. A Pavement Condition Index (PCI) evaluation conducted in 2009 by the Illinois Department of Transportation, Division of Aeronautics determined that the pavement generally is in average to poor condition. However, in 2010, the secondary runway was overlayed with asphalt and the pavement is generally in excellent condition.

As a minimum, the recommended secondary runway length should be adequate to accommodate B-II aircraft (including 100% aircraft with ten seats or less.) Based on the runway planning curves within FAA Advisory Circular 150/5300-4B, Figure 2-1 100% *Small Airplanes with Fewer than 10 Passenger Seats,* a minimum secondary runway length of 3,900 feet is recommended for 100% of the fleet. In accordance with Table 3-1 in Advisory Circular 150/5300-13, the recommended minimum secondary runway width is 75 feet. To support operations by 100% *Small Airplanes with Fewer than 10 Passenger Seats* aircraft, secondary runway pavement strength of 12,500 pounds SWG should be provided.

3. Runway Safety Areas

Runway safety area requirements should also be considered in airport facility planning and layout design. The runway safety area is a cleared, drained, graded, and preferably a turf area symmetrically located about a runway. The safety area must be free of objects, surface drainageways, and traverse ways such as roads or railroads. Runway safety areas enhance the safety of aircraft that undershoot, overrun, or veer off a runway, while providing greater accessibility for crash, fire and rescue vehicles and aircraft recovery operations conducted during such incidences. Minimum safety area dimensions for the recommended runways at the Airport are shown in Table 4-5.

4. Runway Protection Zones

Runway protection zones are areas at each runway end that include the innermost portions of the runway's imaginary approach surface. To the extent feasible, protection zones are areas that are cleared of all objects. Traverse ways, such as roads or railroads, should not be located within these zones unless necessary.

The dimensions and approach glide slope for each runway protection zone are based on the category of the runway (B-II or C-III) and the type of approach to the runway end (visual, nonprecision or precision). Standard dimensions for the existing protection zone are shown in Table 4-5.

Table 4-5 Runway Design Standards

Item	Primary Runway 5-23			Secondary Runway 14-32		
		Existing	Forecasted		Existing	Forecasted
Airplane Design Group		C-II	C-III		B-II	B-II
Runway Length		6,000	7,000		3,751	3,900
Runway Width		150	150		75	75
Runway Shoulder Width		20	25		10	10
Runway Blast Pad Width		No Blast Pad	200		No Blast Pad	95
Runway Blast Pad Length		No Blast Pad	200		No Blast Pad	150
Runway Safety Area Width		500	500		150	150
Runway Safety Area Length	5	524*	1,000	14	115*	300
	23	520*	1,000	32	300	300
Runway Object Free Area Width		800*	800		500*	500
Runway Object Free Area Length		1,000*	1,000		300*	300
Runway Protection Zone Dimensions**	5	500' x 1,700' x 1,010'	500' x 1,700' x 1,010'***	14	500' x 1,000' x 700'	500' x 1,000' x 700'
	23	1,000' x 2,500' x 1,750'	1,000' x 2,500' x 1,750'	32	500' x 1,000' x 700'	500' x 1,000' x 700'

* Current Dimension is non-conforming

** Inner Width x Length x Outer Width

***Current; A precision approach RPZ should be considered at such time as an ILS approach is contemplated. Precision RPZ dimensions are for future planning.

Source: FAA AC 150/5300-13.

Sufficient controlling property interest in the existing runway protection zones are not presently provided at the Airport; a portion of the protection zones lay outside of the Airport property boundary. Property interest, through either fee simple ownership or avigation easement, should be secured for all recommended protection zone lands. Fee simple ownership of the protection zones is preferred.

Preliminary analysis also indicates that the existing protection zones are not free of approach surface obstructions; existing obstructions include roads and trees located near each runway end. Obstruction-free Airport protection zones are recommended. Obstruction removal requirements are addressed in detail in the recommended airport development plan.

B. Taxiway Facilities

Taxiways are constructed to facilitate aircraft movements to and from runways and other airport operational areas. The efficiency of an airport, or the volume of traffic that can be handled in a given time period, is directly related to the capability of the taxiway system to expedite the movement of traffic to and from the runways. Various taxiway system components may be classified into one of four groups in accordance with their use: parallel and partial parallel, exit, connecting, and apron/hangar access.

- Parallel or partial parallel taxiways are generally parallel to the runway served and connect one runway end to either the other runway end or an operational area a considerable distance away. These taxiways significantly improve safety and efficiency at the airport.

- Exit taxiways connect the runway with the parallel or partial parallel taxiway serving it. Exit taxiways provided in an effective number and with optimum spacing decrease runway occupancy time and, thus, increase airfield capacity.

- Connecting taxiways generally connect one operational area with another operational area or one runway with another runway. These taxiways improve access to the areas served, reducing travel times and congestion on the parallel taxiway system.

- Apron/hangar access taxiways are used in providing access from the taxiway system to the various apron and hangar areas.

Taxiway recommendations are presented separately for each airfield facility.

1. Primary Runway Taxiway

Existing Runway 5/23 is served by a full-length parallel taxiway 50 feet in width. Two entrance taxiways (one at each runway end) and six exit taxiways (with widths of 50 feet) serve the primary runway/taxiway system, Taxiway A. Taxiway A is not currently furnished with pavement intersection widening as recommended by FAA AC 150/5300-13, Airport Design. Taxiway A was resurfaced in 2008. Based on the 2009 PCI pavement evaluation, Taxiway A is rated as excellent. All of the entrance and exit taxiways are in excellent condition with the exception of the entrance and exit taxiway on the northeast side of the Taxiway. These two taxiways are rated as in good condition. No data are available on the taxiway pavement strength. The existing runway to taxiway centerline separation of 325 feet does not conform to the minimum C-III layout criteria based on Table 2-2 in AC 150/5300-13. The proper separation distance from the runway centerline to the taxiway centerline is 400 feet.

2. Secondary Runway Taxiway

Currently, secondary Runway 14/32 is provided with two full-length parallel taxiways. Taxiway B is on the south side of Runway 14/32 and Taxiway C is located on the north side of Runway 14/32. Taxiway B is 50 feet in width with two entrance and two exit taxiways, which are also 50' wide. Taxiway C is 40 feet wide west of Taxiway A and 50 feet wide east of Taxiway A. Neither Taxiway B or C are equipped with pavement intersection widening as recommended by FAA AC 150/5300-13, Airport Design Taxiway C has two entrance taxiways and one exit taxiway. The entrance taxiway and exit taxiway west of Taxiway A is 40 feet wide and the entrance taxiway east of Taxiway A is 50 feet wide. The 2009 PCI evaluation lists the Taxiway B pavement in generally good condition; no data is available on the pavement strength. Taxiway C is rated between excellent and fair condition.

Taxiways B and C meet B-II standards, 35 feet wide and with a minimum runway to taxiway centerline separation of 240 feet. The current Taxiway B width of 50' accommodates the occasional use of taxiing C-III aircraft. Also to accommodate occasional operations by C-III aircraft taxiing to the primary runway, the taxiway pavement strength of a 164,000 pound DG should be provided.

3. Connecting Taxiways

Depending on the airfield and terminal area layout that will be ultimately selected, the provision of connecting taxiways between runways or between runways and other airport areas may also be recommended. Tremendous reductions in taxiing times and general operational congestion are possible with the inclusion of connecting taxiways in some airfield and terminal layouts. If provided, these taxiways should be designed to the standards of the primary runway's taxiway system (unless the taxiway's use is restricted to B-II, when secondary taxiway standards would be adequate).

4. Apron/Hangar Access Taxiways

Apron and hangar access taxiways are needed to provide access to the various terminal area facilities. Apron access taxiways should be provided in a sufficient number for the apron area served and be constructed to the standards of the primary runway's taxiway system. However, apron taxiways leading to areas not intended for use by C-III aircraft may be designed to B-II pavement width and strength. Hangar access taxiways usually serve T-hangar storage structures. These taxiways, if warranted to meet terminal facility needs, should be 35 feet wide for B-II aircraft use. Pavement strength should correspond with the weight requirements of the particular aircraft type.

Apron and hangar access taxiways now serve both the east and the south ramp Airport hangar areas. These taxiways are of varying widths (35, 25 and 21.5 feet) and, according to the 2009 PCI evaluation, are generally range from excellent to failed condition. The recommended width for these taxiways should be 35 feet, unless access is restricted to smaller aircraft wing spans. Data are not available on pavement strengths.

C. Runway and Taxiway Lighting Systems

Runway and taxiway lighting systems enhance the utility of airfield facilities at night and under reduced weather and visibility conditions. Various lighting systems are often provided in full or in part by the FAA, based on project eligibility criteria. Lighting facilities recommended at Waukegan Regional Airport are described below.

1. Runway and Taxiway Edge Lighting

Runway and taxiway edge lights are used in defining the lateral limits of the airfield pavement. Primary Runway 5/23 and the associated Taxiway A are presently equipped with High Intensity Lighting (HIRL). HIRL lighting is recommended on Category 1 precision runways. Secondary Runway 14/32 and Taxiway B and C are equipped with Medium Intensity Lighting (MIRL and MITL). The FAA considers Medium Intensity Runway (MIRL) and Taxiway (MITL) Lighting to be fundamental general aviation airport development. Therefore, the Airport is appropriately lighted. Apron access taxiways (and connecting taxiways, if appropriate) should also be provided with MITL lighting.

2. Runway End Identifier Lights

Runway End Identifier Lights, or REIL, are synchronized, flashing lights located at a runway end which assist in identifying the approach end of the runway. Runways 5, 14, and 32 are presently served by REIL systems. Runway 23 is served by a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). Runway 23 does not have REIL lights because it is served by a precision approach ILS.

3. Approach Slope Indicator Lights

This runway lighting provides vertical glide slope guidance to landing aircraft through the use of landing aircraft through the use of visual light patterns. Precision Approach Path Indicator, or PAPI, lights have replaced the earlier VASI (Visual Approach Slope Indicator) lights as the FAA-funded visual approach slope guidance system. Runway ends 5 and 23 and Runway 14 at Waukegan Regional Airport are presently equipped with VASI lights, which should be replaced with newer PAPI-4 lights once they have reached their useful life.

4. Wind Direction Indicators

Although not actually runway lighting facilities, wind direction indicators, including wind cones, wind tees and tetrahedrons, provide the pilot with current wind speed and direction information. A lighted wind cone is presently located southwest of the intersection of Runways 5/23 and 14/3. A segmented wind tee is located southeast of the intersection of Runways 5/23 and 14/32. The segmented circle at the wind tee site aids in the sighting of the wind indicator from the air. To improve the total wind information available to pilots, supplemental lighted wind cones are provided near each primary and secondary runway end, which should be maintained.

D. Terminal NAVAIDS and Air Traffic Control Services

Terminal air navigation (NAVAID) facilities and air traffic control services are provided to assist aircraft in starting and terminating their flights, whether in good or marginal weather conditions. FAA eligibility for these airport facilities are primarily based on air traffic demand levels; eligibility criteria are contained in FAA Order 7031.2, Airway Planning Standard Number One-Terminal Air Navigation Facilities and Air Traffic Control Services. Terminal navigation facilities recommended Waukegan Regional Airport are discussed below.

1. Airport Rotating Beacon

An airport rotating beacon serves as a visual aid for locating an airport at night and during marginal weather conditions. The existing rotating beacon light at Waukegan Regional Airport was replaced in 2010 and should be maintained as needed.

2. Nonprecision Approach Facilities

A nonprecision approach provides only azimuth guidance, meaning that aircraft landings are not possible during a significant segment of IFR weather. Based on the improved facility forecasts of annual instrument approaches, the Airport may not be eligible for more sophisticated electronic navigation and approach lighting systems, as provided for under the FAA's F & E, or Facilities and Equipment, Program. However, forecasts of the Annual Instrument Approaches should be updated periodically and when warranted by FAA guidelines, a Benefit Cost Analysis (BCA) performed if qualification for additional approach improvements is likely. Based upon WAAS implementation, new precision approaches to 14 and 32 appear warranted to improve small aircraft capabilities when wind conditions dictate use of 14-32.

3. Precision Approach Facilities

A precision approach provides both azimuth and elevation guidance to landing aircraft. A Category I approach system includes azimuth guidance equipment and MALSR approach light system (comprised of MALS lights with RAIL, or Runway Alignment Indicator Lights). Waukegan Regional Airport currently has a precision instrument approach system on Runway 23. Runway 23 is served by a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). The typical MALSR installation provides approach minima of 200 foot ceiling and ½ mile visibility. Based on F & E criteria, the Airport is not expected to qualify for multiple precision approach systems during the forecast period.

Forecasts of the Annual Instrument Approaches should be updated periodically and when warranted by FAA guidelines, a Benefit Cost Analysis (BCA) performed if qualification for additional approach improvements is likely. Currently, approach forecasts justify the Runway 23 ILS equipment; approaches are not forecast to justify a second Runway 5, ILS approach.

4. Automated Surface Observing System

An Automated Surface Observing System (ASOS) currently serves Waukegan Regional Airport and provides information to pilots on current wind and weather conditions at an airport. The Automated Surface Observing System, or ASOS, scientific weather station as defined by the Federal Aviation Administration (FAA) and the National Weather Service (NWS), is a suite of weather sensors which measure, collect and disseminate weather data to help meteorologists, pilots and flight dispatchers prepare and monitor weather forecasts, plan flight routes, and provide necessary information for correct takeoffs and landings. ASOS systems are a joint program between the FAA, NWS, and Department of Defense (DOD) to provide a primary network of surface observing scientific weather stations. NWS manages the infrastructure necessary to support all ASOS systems during the life cycle of the program. The NWS-FAA Interagency Agreement describes NWS life support services, which include:

- Identification of ASOS malfunctions and communication network failure.
- Preventative and corrective maintenance.
- Spare parts management, hardware, and software management.
- Configuration and upgrade management.
- Performance reporting.

ASOS systems have an internal processor on its platform, which provides an initial validation of the data. Data from ASOS systems are disseminated to airport towers, FAA systems, and NWS systems every minute, 24 hours a day.

The name ASOS specifically refers to approximately 1000 scientific weather stations in the U.S. and some international locations that were installed in the late 1980's and 1990's. The name ASOS has become synonymous with AWOS. As there are many ASOS scientific weather stations still in use today they are constantly being overhauled and upgraded. In some cases they all receive an upgrade, in other cases only select sites receive certain upgrades.[1]

5. Air Traffic Control Tower

An Air Traffic Control Tower (ATCT) facility provides air traffic services to airborne aircraft operating in the airport vicinity and on the airport operations area itself. Currently, the contract ATCT facility at Waukegan Regional Airport operates between the hours of 6 AM to 8 PM, daily. Based upon the activity forecasts in Section 3, changes in the scope of the ATCT activity is not contemplated within the study period.

6. ATC Communication Facilities

Waukegan Regional Airport is equipped with a remote communications outlet with the Chicago Terminal Radar Approach Control C90 (TRACON). The RCO helps facilitate communication between the Chicago Air Traffic Control system because sometimes communication is difficult to achieve. No changes to the RCO are recommended.

1 http://www.coastalenvironmental.com/scientific-weather-stations-asos.shtml#

E. Airport Perimeter Fencing

Perimeter fencing is provided at an airport to prevent the inadvertent and/or unauthorized entry of persons, vehicles and animals into the airport/airfield operations area. Presently, Waukegan Regional Airport has various types of perimeter fencing, ranging from chain link fence to cattle fence, in various conditions. Complete perimeter fencing, to include the airfield operations area, is recommended and is currently being designed in phases. The new perimeter fence will be adequate in height to prevent the unauthorized movement of people and wildlife onto airport property. The fence will also include a portion of the fence that will be buried to prevent borrowing wildlife from gaining access to the Airport.

4.3 Terminal Area Requirements

Terminal area facilities include the pavement areas, buildings and equipment used by airport based and visiting aircraft for the storage, maintenance and service of aircraft. Facilities used in airport administration (other than the airfield maintenance facility) and in providing desirable user conveniences are also included in the terminal requirements.

Perhaps the most important indicator of terminal area needs is the total number of based and visiting aircraft that must be accommodated at any one time. In establishing relationships of Waukegan Regional Airport terminal requirements to this Airport activity, the improved facility forecasts of based aircraft and peak hour itinerant aircraft operations are selected as the basic planning assumptions. These activity assumptions, as shown in Table 4-6, are combined with accepted FAA and other agency planning guidelines to identify specific terminal requirements.

Individual facility requirements for corporate aviation, general aviation, and Fixed Base Operation (FBO) and areas are shown in Table 4-7. Criteria used in developing these requirements are discussed below.

4.3.1 Airport Administration

The airport administration provides necessary facilities for the management and operation of the airport itself. The terminal area also accommodates embarking and deplaning passengers and visitors and provides pilot conveniences, such as a pilot lounge and flight planning area. Airport user amenities, such as a general concessions area (including vending machines, rental car agencies, etc.), a restaurant or snack bar, rentable office areas and other public conveniences, may also be provided. The administration/terminal area includes the terminal building and associated vehicle parking lot.

A. Administration Office Building

This use includes office areas used exclusively for the administration of the airport. Currently, approximately 2,200 square feet of area is devoted to this purpose. A new snow removal equipment building is under construction to house equipment for airport maintenance and to supplement the administration area. Combined, at the two locations, the available area for airport administration is 3,800 square feet. By the year 2030, an estimated building area of 5,100 square feet will be required at

the Airport. Assume 3,800 square feet is adequate for existing facilities, but significant growth in corporate activity is expected to increase the area needed for the Airport administration. The growth rate of the Airport management-operations are based on the forecasted growth rate of the based aircraft.

B. Maintenance Building

The operation of an airport requires the constant maintenance of airfield facilities. Runway, taxiway and apron pavement, lighting systems and markings must be constantly maintained. Turfed areas must be kept mowed to minimize attraction to birds and other wildlife. In the winter, taxiway and aircraft apron pavement must be kept free and clear of snow and/or ice to assure that aircraft operations are safe. Auto parking pavement maintenance and snow removal must also be performed in the terminal area. These maintenance operations typically require the establishment of an on-airport maintenance facility. The maintenance facility provides an area for the maintenance and storage of vehicles and equipment, and an area for the storage of operating supplies, such as sand and deicing agents used in snow removal operations.

Table 4-6 Basic Planning Assumptions

Planning Assumptions	Existing	Forecast 2015	Forecast 2020	Forecast 2030
Corporate Based Aircraft	76	89	105	144
Single Engine	2	2	2	2
Multi-Engine	14	13	13	12
Helicopters	2	2	3	4
Turboprop	10	11	12	13
Turbojet	48	61	75	114
Small Jet Aircraft	*21*	*18*	*16*	*22*
Medium Jet Aircraft	*17*	*25*	*33*	*41*
Large Jet Aircraft	*10*	*18*	*25*	*49*
Very Large Jet Aircraft	*0*	*0*	*1*	*2*
General Aviation Based Aircraft	125	122	122	128
Single Engine	112	110	110	117
Hangared	*106*	*105*	*105*	*111*
Apron Storage	*6*	*5*	*5*	*6*
Multi-Engine	13	12	12	11
Hangared	*13*	*12*	*12*	*11*
Apron Storage	*0*	*0*	*0*	*0*
Helicopters	0	0	0	0
Turboprop	0	0	0	0
Turbojet	0	0	0	0

Planning Assumptions (Continued)	Existing	Forecast 2015	Forecast 2020	Forecast 2030
FBO Aircraft (Peak Period)	14	24	27	35
Single Engine	8			
Apron Storage	*(NF)*	*13*	*13*	*15*
Multi-Engine	2			
Apron Storage	*(NF)*	*3*	*3*	*3*
Turboprop	1			
Apron Storage	(NF)	*1*	*1*	*2*
Turbojet	3			
Apron Storage	(NF)	7	10	15
Small Jet Aircraft	*(NF)*	*3*	*2*	*2*
Medium Jet Aircraft	*(NF)*	*2*	*4*	*5*
Large Jet Aircraft	*(NF)*	*1*	*2*	*4*
Very Large Jet Aircraft	*(NF)*	*0*	*0*	*1*

Individual Space Needs		Total Hangar Area (sq. ft.)	Total Apron Area (yd^2)	Typical Plane
Single Engine-	*Based*	1,200	300	
	Transient	1,200	360	
Multi-Engine-	*Based*	1,600	300	
	Transient	1,600	360	
Turboprop-	*Based*	1,800	300	
	Transient	1,800	360	
Turbojet			(sq. ft.)	
Small Jet Aircraft		3,750	7,500	Falcon 20 or Citation 2
Medium Jet Aircraft		5,000	10,000	Falcon 900
Large Jet Aircraft		8,500	17,000	Gulfstream IV or Global Express
Very Large Jet Aircraft		15,000	30,000	Boeing Business Jet

Table 4-7 Facility Requirements

Terminal Facility Requirements	Existing	Forecast 2015	Forecast 2020	Forecast 2030
Airport Administration Facilities				
Administration/Office Facilities (SF)	3,800	4,000	4,300	5,100
Maintenance Facilities (SF)	12,350	13,000	13,900	16,700
Corporate Facilities				
Corporate Storage/Hangars				
Enclosed Hangar Area (SF)	319,100	388,500	497,300	779,000
Office Area (SF) (20% of Hangar Area)	70,901	77,700	99,500	155,800
Support Area (SF) (10% of Hangar Area)	41,819	38,900	49,700	77,900
Total Building Area (SF)	431,820	505,100	646,500	1,012,700
Paved Apron Area (SY) (Based on Aircraft Areas in Assumptions)	36,200	84,600	108,700	171,200
Vehicle Parking				
Vehicle Parking Spaces (No.) (1 Space per 1000 ft^2 Hangar Space)	285	389	497	779
Vehicle Parking Area (SY) (No. of Spaces x 35 yd^2)	12,900	13,600	17,400	27,300
General Aviation Facilities				
General Aviation Storage/Hangars				
Enclosed Hangar Area (SF)	194,800	145,000	144,300	150,400
Office and Support Area (SF) (5% of Hangar Area)	7,100	7,300	7,200	7,500
Total Building Area (SF)	201,900	152,300	151,500	157,900
Paved Apron Area (SY) (Assume 360 yd^2 per outdoor aircraft)	37,300	2,000	2,000	2,000
Vehicle Parking				
Vehicle Parking Spaces (No.) (One Space per G.A. Aircraft)	111	122	122	128
Vehicle Parking Area (SY) (No. of Spaces x 35 yd^2)	6,500	4,300	4,300	4,500

Table 4-7 Facility Requirements (Continued)

Terminal Facility Requirements	Existing	Forecast 2015	Forecast 2020	Forecast 2030
FBO Facilities				
FBO Storage/Hangars				
Maintenance Area (SF)	22,900	63,700	92,300	165,200
Office Area (SF) (30% of Maintenance Area)	21,300*	19,100	27,700	49,600
Support Area (SF) (10% of Maintenance Area)	(NF)	6,400	9,200	16,500
Total Building Area (SF)	44,200	89,200	129,200	231,300
Itinerant Paved Apron Area (SY)	23,600	65,600	95,100	170,200
Vehicle Parking				
Vehicle Parking Spaces (No.) (One Space per 500 ft^2 Total Building Area)	120	178	258	463
Vehicle Parking Area (SY) (No. of Spaces x 35 yd^2)	6,800	6,200	9,000	16,200

*Includes Support Areas

Source: Parking Generation Guide 3rd Edition, Institute of Transportation Engineers 2004

Existing Airport maintenance operations are conducted at two locations in a building that is being furnished by the FBO, with area of 2,590 square feet. Also, in 2010, construction of a new snow removal and equipment building began and is expected to finish in summer of 2011. The new 10,700 square foot structure will combine all vehicles and equipment to one building. By the year 2030, an estimated building area of 16,700 square feet will be required at the Airport. Assume 12,350 square feet is adequate for existing facilities, but significant growth in corporate activity is expected to increase the area needed for the Airport maintenance. The growth rate of the Airport maintenance-operations are based on the forecasted growth rate of the based aircraft.

Airport maintenance facilities assure the continuous and proper operation of airport facilities and equipment. Quantifying area requirements for general aviation airport maintenance operations is difficult, due to the varying weather conditions and differing maintenance operations procedures occurring at each airport. The FAA has specific guidance in the appropriate sizing of the airport maintenance facility. For purposes of this study, it has been assumed that the existing area should grow at the same growth rate as aircraft activity.

4.3.2 Corporate Hangar Area

Corporate hangar facilities are those developed by or for the business aircraft owner/operator for their exclusive use. These facilities are used for the storage and maintenance of the corporation's aircraft. Facilities normally provided in corporate areas include aircraft storage hangars, office and administration areas, aircraft parking apron, and vehicle parking areas. (Aircraft fueling facilities may also be provided in the corporate area, although this facility analysis has assumed a central fuel farm area. Fuel farm requirements are discussed later.)

A. Corporate Storage/Office Hangars

Normally, storage and maintenance operations occur in the same corporate aircraft hangar area. Currently, twenty one aircraft hangar spaces with a total of 319,100 square feet is available. This area includes buildings that are owned by the FBO, but corporate aircraft are stored in these hangars. Projected year 2030 corporate requirements are for 779,000 square feet of storage area for 144 aircraft. These space projections are 1,200 square feet of interior space for each single engine aircraft, 1,600 square feet for each multiengine. 1,800 square feet for each turboprop aircraft, and for each business jet aircraft, see Table 4-7 for the projected jet area space requirements.

The corporate offices include provisions for passenger and visitor waiting and convenience, flight department management and administration, and other functions. To support anticipated corporate hangar development, an office and support are of 155,800 square feet may be expected in the year 2030. Corporate office estimates equal approximately 20 percent of the corporate storage area. Year 2030 terminal requirements include a maintenance support hangar area of 77,900 square feet. Forecast maintenance area space needs represent approximately 10 percent of the forecast FBO hangar storage area.

B. Corporate Outdoor Aircraft Parking

Corporate aircraft apron primarily provides access to the hangar itself, but the pavement area may also be used for temporary aircraft parking during passenger loading and unloading and during aircraft positioning prior to and after flights.

Currently, there is 36,200 square yards of designated corporate apron on the Airport. Year 2030 requirements include 171,200 square yards of paved corporate apron. This requirement is based on the area planning assumption of apron area for each corporate aircraft. The corporate apron pavement strength should be designed for the critical corporate aircraft (estimated as high as 164,000 pounds DG). Apron pavement edge lighting and overhead area lighting should be provided in the corporate areas to enhance safe aircraft and passenger movement at night.

C. Corporate Vehicle Parking

In the corporate hangar area, a total of 12,900 square yards of auto parking pavement for 285 vehicles currently exist. By the year 2030, 27,300 square yards of auto parking pavement for 779 vehicles should be required. Corporate parking requirements assume approximately one vehicle space for each

1,000 square feet of corporate hangar/office area. Area requirements include 35 square yards of pavement for each space. Overhead area lighting should be provided for each corporate parking lot.

4.3.3 General Aviation Area

General aviation facilities typically include aircraft and auto parking facilities. Such services may include, but are not necessarily limited to: outdoor aircraft parking; hangared aircraft storage; and, automobile parking. General aviation airport facilities are discussed below.

A. General Aviation Outdoor Aircraft Parking

Outdoor tiedown provides the least expensive method of aircraft storage. Tiedowns are used primarily by visiting aircraft. Numerous existing paved tiedown areas, covering a total area of approximately 37,300 square yards, provide potential parking for 68 aircraft. According to the 2009 airfield pavement evaluation, the paved apron areas are in excellent to poor condition. Data are not available on pavement strengths.

Protected storage is the most popular method of storing based aircraft at Waukegan Regional Airport with over 95% of the based aircraft being hangared. However, adequate aircraft apron area must be available to accommodate all itinerant aircraft visiting in the peak period and all based aircraft regularly stored outside. In determining future aircraft apron requirements, it has been assumed that 95 percent of single engine and 100 percent of multi-engine of the General Aviation based aircraft are to be hangared, with the rest stored outdoors.

Based on these assumptions and the activity forecasts, 3,600 square yards of outdoor parking for 6 aircraft will be needed at the Airport for general aviation use in the year 2030. This parking should be paved. Area projections are based on providing 300 square yards of apron/tiedown space per aircraft, which includes all single engine and light twin engine planes. These allocations include space for the aircraft itself as well as necessary apron circulation. Aircraft parking areas should be provided with overhead area lighting to enhance passenger and personnel movement at night.

For maximum operational flexibility, paved apron in the general aviation area should be of a uniform pavement strength that is adequate to support the runway critical aircraft. In accordance with the airfield requirements analysis, a 164,000 pound DG apron strength should be provided. However, much like runway development, apron strength may be stated, with lower pavement strengths upgraded to support higher aircraft weights as needed. Paved apron areas should include pavement edge lighting.

B. General Aviation Protected Aircraft Storage

Although outdoor storage may be less costly, the indoor storage of general aviation aircraft has become increasingly popular. This increased hangar use may be explained by not only the added convenience provided with a hangar, but also the added protection from extreme weather conditions offered to the more sophisticated and expensive general aviation aircraft now in operation. Currently, 94 protected aircraft storage spaces are available in 194,800 square feet of area.

Based on the assumption of 95% of single engine and 100% of the multi-engine aircraft being hangared, 128 protected general aviation storage spaces, with an area of 150,400 square feet, are needed in the year 2030. Most of this storage will be enclosed, with the remainder providing overhead protection only. Storage area projections assume the provision of 1,200 square feet of interior space for each single engine aircraft and 1,600 square feet for each multi-engine aircraft.

C. General Aviation Maintenance/Office Hangars

General aviation maintenance hangar facilities are included in the FBO maintenance facilities. The general aviation hangars are not typically used for maintenance operations or major repairs. Currently approximately 4% of the general aviation hangar area is used for office area. Future projections assume that 5% of hangar area is used for office purposes.

D. General Aviation Vehicle Parking

Adequate auto parking should be provided in the general aviation areas to accommodate demand by all facility users, visitors and employees during peak activity periods. Current general aviation parking facilities are 111 paved vehicle spaces and 6,500 square yards of pavement are available. Some general aviation parking presently occurs beside and/or inside individual hangars throughout the terminal area, sometimes blocking access for both aircraft and ground vehicles.

Demand in the year 2030 is anticipated to require 128 vehicle spaces, comprising an area of 4,500 square yards. Parking requirements are based on approximately one vehicle space of 35 square yards for each general aviation based aircraft. The projections show a slow growth due to the slow growth of Single Engine Piston (SEP's) and Multi-Engine Piston (MEP's) in the FAA Aerospace Forecasts. These parking areas, which should be paved, can be located adjacent to individual maintenance/office and aircraft storage areas, but should not require ground vehicles to cross aircraft operations areas. Overhead area lighting should be provided for each FBO parking lot.

4.3.4 FBO Aircraft Area

Fixed Base Operators, or FBOs, provide a wide range of services to aircraft owners and operators at an airport. Such services may include, but are not necessarily limited to: outdoor aircraft parking; hangared aircraft storage; aircraft maintenance services, with office and support activities; and, automobile parking. At many airports, individual FBOs also provide aircraft fueling. (This analysis has assumed development of a central airport fuel farm for use by one of more operators, as discussed later.) A single operator currently provides full FBO services at Waukegan Regional Airport. Airport facilities that are intended to support FBO activities for transient aircraft are discussed below.

E. FBO Outdoor Aircraft Parking

Outdoor tie down provides the least expensive method of aircraft storage. Tiedowns are used primarily by visiting aircraft. The FBO has two existing paved tiedown area, covering a total area of approximately 23,600 square yards, provide parking for 18 aircraft. According to the 2009 airfield

pavement evaluation, the paved apron areas are in excellent condition. Data are not available on pavement strengths.

Adequate aircraft apron area must be available to accommodate all itinerant aircraft visiting in the peak period and all based aircraft regularly stored outside. In determining future aircraft apron requirements, it has been assumed that 100 percent of the itinerant aircraft are to use tiedowns.

Based on these assumptions and the activity forecasts, 170,200 square yards of outdoor parking for aircraft will be needed at the Airport in the year 2030. All of this parking should be paved. Area projections are based on providing 360 square yards of apron/tiedown space per aircraft, which includes all single engine and light twin engine planes, and 3,750 – 15,000 square feet depending on the business jet aircraft, as shown in Table 4-7. These allocations include space for the aircraft itself as well as necessary apron circulation. Aircraft parking areas should be provided with overhead area lighting to enhance passenger and personnel movement at night.

For maximum operational flexibility, paved apron in the FBO area should be of a uniform pavement strength that is adequate to support the runway critical aircraft. In accordance with the airfield requirements analysis, 164,000 pound DG apron strength should be provided. However, much like runway development, apron strength may be stated, with lower pavement strengths upgraded to support higher aircraft weights as needed. Paved apron areas should include pavement edge lighting.

F. FBO Maintenance/Office Hangars

FBO maintenance hangar facilities include any covered area used in providing airframe, powerplant and/or avionics maintenance and service for based and transient aircraft. Currently, approximately 22,900 square feet of building area is available for aircraft maintenance. Year 2030 terminal requirements include a maintenance hangar area of 165,200 square feet. Forecast maintenance area space needs represent approximately the same ratio of paved apron area to maintenance area in the existing scenario.

FBO office, administration and support area includes pilot and visitor waiting and convenience areas, pilot training offices, retail aviation sales (including aircraft parts), management offices, and other similar areas. Presently, some 21,300 square feet of building area is used for these purposes. FBO office area demand will be estimated at some 49,600 square feet in the year 2030. This area estimate represents approximately 30 percent of the FBO maintenance hangar area. FBO support area demand is estimated at some 49,600 square feet in the year 2030. This area estimate represents approximately 10 percent of the FBO maintenance hangar area.

G. FBO Vehicle Parking

Adequate auto parking should be provided in the FBO areas to accommodate demand by all facility users, visitors and employees during peak activity periods. Current FBO parking facilities are adequate; 120 paved vehicle spaces and 6,800 square yards of pavement are available. Most FBO parking presently occurs beside the FBO hanger building or inside individual hangars throughout the terminal area.

Demand in the year 2030 is anticipated to require 463 vehicle spaces, comprising an area of 16,200 square yards. Parking requirements are based on approximately one vehicle space for every 500 square feet of total building area. These parking areas, which should be paved, can be located adjacent to individual maintenance/office and aircraft storage areas, but should not require ground vehicles to cross aircraft operations areas. Overhead area lighting should be provided for each FBO parking lot.

4.3.5 Airport Fuel Farm Area

Aircraft fueling activities will be conducted by several parties at the airport, including one FBO, corporate hangar tenants, and by private general aviation tenants. Fueling operations are conducted using fueling trucks and dispenser locations.

The FBO fuel farm is located in the main terminal area; sufficient area exists for any expansion initiated by the FBO.

Private fueling also occurs at several locations at the Airport. As these are tenant facilities, and their size is influenced by operations procedures, relationships with fuel suppliers, and other variables, fuel facility requirements have not been forecast. Both the FBO and the private tenants pay fuel flowage fees to support the airport's operating maintenance and improvements.

4.3.6 Summary of Airport Building and Pavement Area Requirements

The total building and pavement area requirements for the Airport's general aviation, FBO and corporate terminal areas are summarized at the end of Table 4-9.

Table 4-9 Summary of Terminal Facility Requirements

Summary of Terminal Facility Requirements	Existing	Forecast 2015	Forecast 2020	Forecast 2030
Airport Facilities				
Administration/Office Facilities (SF)	3,800	4,000	4,300	5,100
Maintenance Facilities (SF)	12,350	13,000	13,900	16,700
Indoor Aircraft Storage Spaces	114	182	194	232
Apron Tie-Down Spaces	82	30	32	40
Paved Apron Area (SY)	97,100	152,200	205,800	343,400
Storage/Hangars				
Enclosed Hangar Area (SF)	513,900	533,500	641,600	929,400
Office Area (SF)	99,300	104,100	134,400	212,900
Maintenance Area (SF)	64,700	102,600	142,000	243,100
Total Building Area (SF)	677,900	740,200	918,000	1,385,400
Vehicle Parking				
Vehicle Parking Spaces (No.)	516	689	877	1,369
Vehicle Parking Area (SY)	26,200	24,100	30,700	48,000

Airport administration building requirements increase from 3,800 square feet existing to 5,100 square feet in the year 2030. The number of outdoor aircraft parking spaces at the Airport decreases from 82 existing to 41 required in the year 2030; pavement area requirements increase from 97,100 square yards existing to 343,400 square yards. The number of protected aircraft storage space at the Airport increases from 130 existing to 232 required in the year 2030; storage building are requirements increase from 513,800 square feet to 929,400 square feet. Aircraft maintenance and office hangar area requirements increase from the existing 164,000 square feet to 456,000 square feet in the year 2030. Airport vehicle parking needs increase from the existing 516 spaces and 26,200 square yards to 1,369 spaces and 48,000 square yards of pavement area.

4.3.7 Other Terminal Area Requirements

The recommended terminal facility development will require the provision of utility service, including electricity, natural gas, water, and sewerage treatment, in the terminal areas. The existing Airport terminal areas are served by Commonwealth Edison-owned electric distribution, City of Waukegan water and the North Shore Sanitary District wastewater collection and treatment systems. Natural gas service is available from North Shore Gas. Telephone services are provided by AT&T.

Appropriate perimeter fencing, connecting with the recommended airfield fencing, must also be provided in the Airport terminal areas to prevent unauthorized entry to the airport operations area. Necessary personnel and vehicular access to terminal facilities should be accommodated through the provision of pedestrian and driveway gates. Some existing Airport terminal areas are not fenced.

4.4 Airport/Terminal Access Requirements

Waukegan Regional Airport is generally bounded by Green Bay Road to the west, Wadsworth Road on the north, Lewis Avenue to the east, and Yorkhouse Road on the south. The main entrance to the Airport is from McAree Road. McAree Road is a paved, two-lane road that provides access to the Airport terminal facilities, the main ramp and the south ramp. Traffic signalization is provided at the McAree Road and Yorkhouse Road intersection. An additional general aviation entrance to the Airport is located off of Lewis Avenue. Additional corporate facility entrances are located off of Wadsworth Road and Green Bay Road.

Measured 2010 average daily traffic (ADT) volumes and estimated peak hour volumes (based on typical peak hour ratios) for roadways in the Airport area are shown in Table 4-10. The year 2030 traffic projection forecast completed by the Chicago Metropolitan Agency for Planning (CMAP) does not include future traffic volume projections for all Airport area roadways. However, forecasts for the heavier use roadways predict traffic volumes on many roads to increase at varying annual rates of between two and four percent.

Table 4-10 Average Daily Traffic

Road	Existing ADT	2015	2020	2030
Wadsworth Road (West of Green Bay Road)	11,800	11,800	11,800	15,000
Wadsworth Road (Between Green Bay Rd & Lewis Ave)	12,900	12,900	12,900	28,000
Wadsworth Road (East of Lewis Ave)	7,600	7,600	7,600	11,000
Green Bay Road (South of Yorkhouse Road)	21,100	21,100	21,100	43,000
Green Bay Road (Between Yorkhouse Rd & Wadsworth Rd)	16,300	16,300	16,300	35,000
Yorkhouse Road (Between Green Bay and Lewis Ave)	11,400	11,400	11,400	20,000
N Lewis Ave (North of Wadsworth)	22,200	22,200	22,200	29,000
N Lewis Ave (Between Wadsworth Rd. & Beach Rd)	20,500	20,500	20,500	28,000
N Lewis Ave (Between Beach Rd & Yorkhouse Rd)	21,000	21,000	21,000	27,000
N Lewis Ave (South of Yorkhouse Rd)	20,100	20,100	20,100	25,000
N McAree Road (North of Yorkhouse Rd)*	1,800	1,800	1,800	3,000
N McAree Road (South of Yorkhouse Rd)	5,300	5,300	5,300	7,000

*Airport Access Road

Source: IDOT Website, Chicago Metropolitan Agency of Planning 2010.

Forecasts of average daily and peak hour vehicle trip demand at the Airport's entrance are presented in Table 4-10. Average daily volume is anticipated to increase from an estimated 1,800 vehicle trips (both entering and leaving) presently to 3,000 vehicle trips in the year 2030. Peak hour vehicle trips are forecast to be 10% of the Average Daily traffic. So the peak hour vehicles will increase from 180 presently to 300 in the year 2030.

Airport-related traffic growth in and of itself should not require further capacity improvements on the adjoining roadway network. However, to reduce the potential for future roadway congestion, the Illinois Department of Transportation, Division of Highways, should be kept informed of all Airport and Airport area development activities. Green Bay Road is currently a two-lane highway serving as a major north/south arterial route for Lake County. Planning efforts are currently underway to widen the current alignment to four lanes to accommodate existing and future traffic. Coordination with the Airport is ongoing with this improvement.

4.4.1 Other Roads

All-weather service roads should be provided for the airfield maintenance facility, airport fuel farm, air navigation equipment shelters and other potential airport facilities. Actual service road requirements will be dependent on the layout development plan ultimately selected. If the plan recommended includes multiple terminal area locations (such as the existing hangar areas), a paved roadway connecting each area should be considered. The connecting roadway location should not traverse the airport operations area and should not obstruct airport imaginary surfaces.

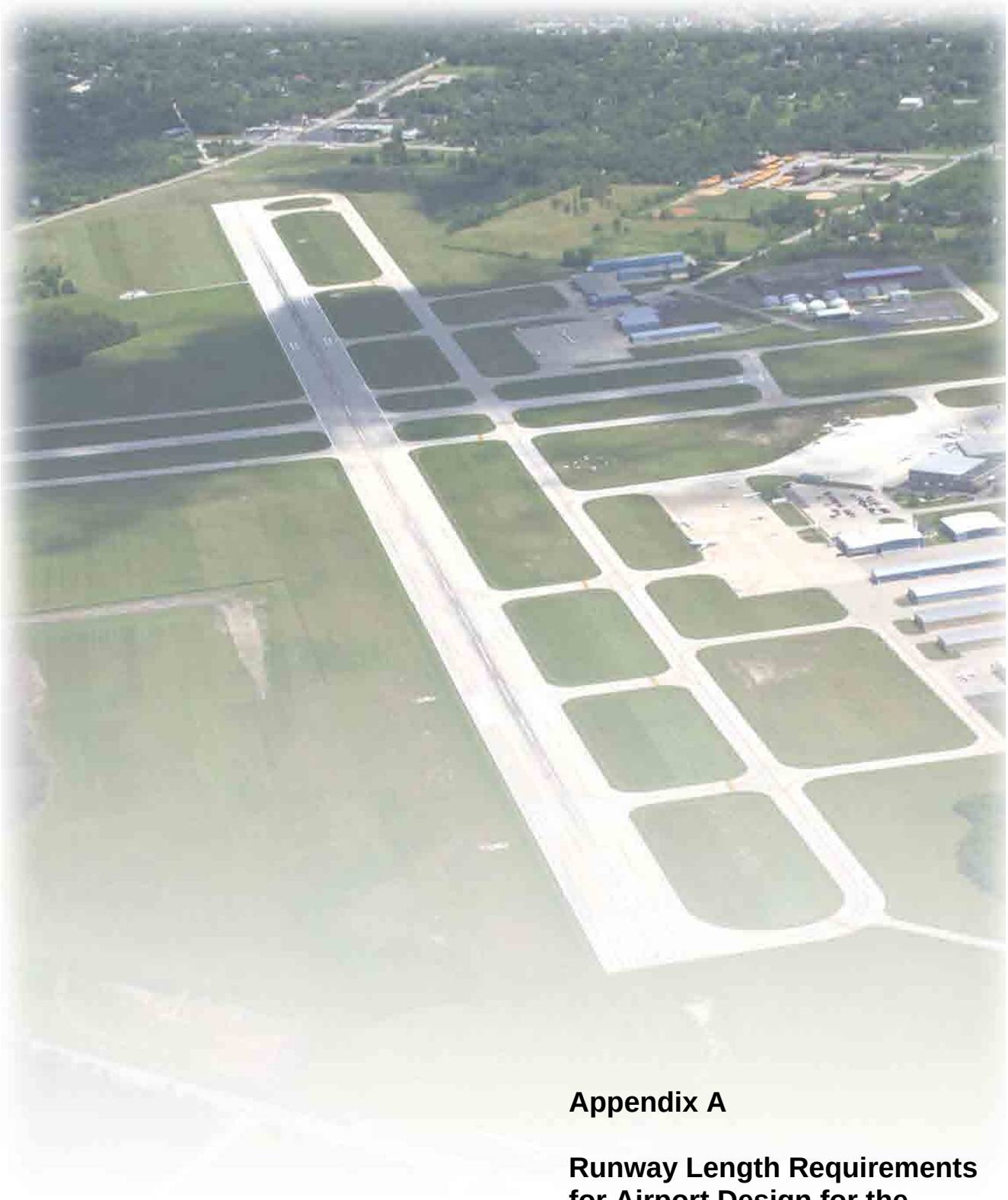
4.5 Airport Land Area Requirements

Airport land area needs are highly dependent on the airfield and terminal layout chosen. However, a reasonable indication of airfield and terminal area land needs is useful in determining the capability of the existing Waukegan Regional Airport site in meeting year 2030 facility requirements.

The majority of the total Airport land area should be controlled through fee simple ownership. However, portions of the airfield protection zones could be controlled through the purchase of avigation easements. With an avigation easement, ownership of the land remains with the present owner, but the Airport secures the right of overflight (including the right to make noise), and the right to remove trees or other objects that obstruct Airport imaginary surfaces.

Fee simple and avigation easement acquisition for the Airport should be conducted in accordance with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), applicable whenever federal or federally assisted programs such as the FAA Airport Improvement Program (AIP) are involved. Guidance for acquisition projects initiated under the AIP is contained in FAA Advisory Circular 150/5100-11, Land Acquisition and Relocation Assistance Under the Airport Development Aid Program.

The entire land area recommended for Airport ownership need not be used solely in support of aviation activities. The airfield land area not directly required by airport operations can be used for compatible uses, such as agriculture. Other land uses, including commercial or industrial areas, may also be accommodated. The extent of lands available for non-aviation use can be determined after selection of the preferred airport development layout.



Appendix A

Runway Length Requirements for Airport Design for the Waukegan Regional Airport

Runway Length Requirements – For Airport Design For The Waukegan Regional Airport (KUGN)

An analysis of the primary runway length needs for the Waukegan Regional Airport, Waukegan, Illinois using FAA's Advisory Circular 150/5325-4B, "Runway Length Requirements for Airport Design".

This report was funded as a part of the Environment Screening Study Project under Federal AIP Project Number 3-17-0105-B33 and Illinois Project Number UGN-3587.

This report was prepared for the:
Waukegan Port District
Federal Aviation Administration
Illinois DOT – Division of Aeronautics
October 17, 2008 Final Issue

HANSON

Runway Length Requirements For Airport Design For the Waukegan Regional Airport (KUGN)

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Introduction

The Waukegan Regional Airport (KUGN) is owned and operated by the Waukegan Port District (Port District) and is located in Waukegan, Lake County, Illinois. KUGN is a general aviation and corporate reliever airport for Chicago O'Hare International Airport and is the only publicly owned airfield in Lake County. Waukegan Regional Airport is home to over 182 based aircraft[1] and the Waukegan Airport Traffic Control Tower (KUGN-ATCT) handles approximately 69,000 aircraft operations[2] during the 14 hours the tower is open. Of the 182 based aircraft at KUGN, there are approximately 54 corporate jets[3] owned by numerous companies and individuals. KUGN is a US Port of Entry and has an on-call customs and immigration service for international flights.

Through regular meetings with airport tenants and users, the Port District has determined that the existing primary runway length at UGN is insufficient to satisfy existing aeronautical demand. In addition, certain prescribed safety areas and surfaces, as defined by the Federal Aviation Administration (FAA) are substandard. In 2005, the FAA and the Illinois Department of Transportation, Division of Aeronautics (Division) provided the Port District with a grant to outline and present to the general public the possible options and alternatives available to satisfy the identified aeronautical deficiencies. As a part of that grant, there is a task to validate, for future National Environmental Policy Act (NEPA) and Airport Design purposes, the critical aircraft for the primary runway. This report satisfies that task.

Methodology

To provide guidance to airport sponsors, the FAA has published Advisory Circular 150/5325-4B. "Runway Length Requirements for Airport Design". This Advisory Circular (AC) provides guiding principles for airport designers and planners to determine recommended runway lengths for new runways or extensions to existing runways. This report is based on the step by step guidelines and requirements of that AC. Steps that are contained in the AC are listed below in *blue*.

Analysis

Step No. 1 - AC 150/5324-4B, Paragraph 102(b)(1). "Identify the list of critical design airplanes that will make regular use of the proposed runway for an established planning period of at least five years. For Federally funded projects, the definition of the term "substantial use" quantifies the term "regular use" (see paragraph 102a(8).)"

[1] IDOT Illinois Airport Inventory Report 2007
[2] UGN ATCT Count 2007
[3] UGN Monthly Survey, May 2008.

Airport Use Surveys. In consultation with the FAA and Division, the Port District submitted an Airport Use Survey on 06 December 2007 to select corporations and businesses having aircraft based at UGN. Survey recipients were those entities now operating small, medium and large business jet aircraft from a Waukegan base. Users and businesses that are not now located at the Airport but may relocate to an improved Waukegan Regional Airport were not surveyed.

Of the twelve (12) surveys provided to users, ten (10) completed surveys were received by the Port District on the requested return date of 10 January 2008 (83% response). The survey results fall into two separate groups, with the first group comprising independent corporate tenants, and the second group representing UGN's full-serve Fixed Base Operator (FBO). Survey results are discussed for each group, and a combined summary is also furnished herein.

Independent Corporate Tenants. Surveys were received from nine (9) independent based corporate tenants reporting twenty-four (24) aircraft. According to the nine surveys, shown in Attachment A, Independent Corporate Tenants estimated they would conduct approximately 3,141 annual operations in 2008. All of these operators report consistent or steady growth in activity to 2012, to approximately 3,378 annual operations.

In this group of nine responses, the three (3) large aircraft over 60,000 pounds, all the Gulfstream G450, are performing an approximate 470 annual operations, increasing to 520 in 2012. Stage lengths reported include Europe (4,000 nautical miles) and West Coast (1,500 nautical miles). Unlike for the FBO activity responses discussed below, the independent corporate tenant respondents did not consistently identify their typical or average stage length. The survey also requested an ideal runway length; lengths listed in the survey were 6,500 to 7,000 by one (1) operator, 7,000 feet by three (3) operators, 7,000 to 7,500 feet by one (1) operator, 7,500 feet by two (2) operators, and 8,000 feet by two (2) operators. Many operators listed contaminated runway conditions (wet, slippery, icy) as a concern requiring additional runway length at UGN.

FBO Activity. The Airport's full-service FBO submitted the tenth survey form. The FBO reported current annual activity by all transient and based corporate aircraft for which he furnishes services to, including aircraft based in hangars owned by the FBO and all transient aircraft using FBO facilities for temporary outside and indoor storage, visiting aircraft purchasing fuel, including non-based charter operations such as Netjets, etc. The FBO's survey does not include the separate corporately owned aircraft reported in the nine surveys discussed previously. Total activity reported by the FBO, shown in Attachment A - FBO Activity, is 51,695 annual operations, increasing to 62,395 operations by 2012. The FBO activity includes substantial operations by aircraft both under and over 60,000 pounds in weight. Aircraft size of this fleet ranges from small business jets through large[4] aircraft weighing over 60,000 pounds. Of the 59 aircraft listed, eleven (11) are large[5] aircraft weighing over 60,000 pounds, accumulating an approximate 825 annual operations currently, growing to an approximate 1,375 operations in 2012. Aircraft models include the Gulfstream G-450, G-550 and G-III, the Global Express, the Global 5000, the Falcon 7X, and Douglas DC-9 and Boeing 737 and 757 aircraft. Stage lengths listed for the FBO activity aircraft were as long as 6,000 nautical miles (number of operations not listed). The ideal runway length for this operator was listed as 8,000 feet. A combined survey analysis of all respondents is discussed in Step No. 2.

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[4] Does not reflect the definition contained in AC 150/5324-4B, Paragraph 102(a)(4).
[5] Ibid.

Step No. 2 – AC 150/5324-4B, Paragraph 102(b)(2). "Identify the airplanes that will require the longest runway lengths at Maximum Certificated Takeoff Weight (MTOW). This will be used to determine the method for establishing the recommended runway length. Except for regional jets, when the MTOW of listed airplanes is 60,000 pounds (27,200 kg) or less, the recommended runway length is determined according to a family grouping of airplanes having similar performance characteristics and operating weights. Although a number of regional jets have an MTOW less than 60,000 pounds (27,200 kg), the exception acknowledges the long range capability of the regional jets and the necessity to offer regional jet operators the flexibility to interchange regional jet models according to passenger demand without suffering operating weight restrictions. When the MTOW of listed airplanes is over 60,000 pounds (27,200 kg), the recommended runway length is determined according to individual airplanes. The recommended runway length in the latter case is a function of the most critical individual airplane's takeoff and landing operating weights, which depend on wing flap settings, airport elevation and temperature, runway surface conditions (dry or wet), and effective runway gradient. The procedure assumes that there are no obstructions that would preclude the use of the full length of the runway."

Combined Survey Results. FAA Advisory Circular 150/5325-4B indicates that runway length should be determined in accordance with the critical (most demanding) aircraft's weight, either below 60,000 pounds or over 60,000 pounds. For aircraft weighing less than 60,000 pounds, a further separation is required as to whether the critical aircraft is within the "75 Percent of the Fleet" grouping, or is within the "100% of Fleet" grouping. In all cases, before an aircraft can be considered the critical aircraft, it must conduct at least 500[6] landings or takeoffs in the current or forecast year. A summary of surveyed operations by FAA aircraft classifications is depicted in Table 1 - FAA Aircraft Classification By MTOW.

Table 1 - FAA Aircraft Classification By MTOW[7]	2008 Annual Operations	2012 Annual Operations
Aircraft Weighing Less Than 60,000 Pounds	48,065	56,250
Comprising 75% of the fleet	*25,384*	*29,372*
Remaining 100% of fleet	*22,681*	*26,878*
Aircraft Weighing More Than 60,000 Pounds	4,100	6,665
Gulfstream G450 (Critical Aircraft by Survey)[8]	*1,627*	*1,868*
All Other Aircraft Over 60,000 Pounds	*2,473*	*4,797*
TOTAL OPERATIONS BY SURVEYED AIRCRAFT	**52,165**	**62,915**

[6] Substantial Use Threshold. Federally funded projects require that critical design airplanes have at least 500 or more annual itinerant operations at the airport (landings and takeoffs are considered as separate operations) for an individual airplane or a family grouping of airplanes.

[7] MTOW – Maximum Certificated Takeoff Weight.

[8] See Table 3 - Aircraft Over 60,000 Pounds.

Step No. 3 – AC 150/5324-4B, Paragraph 102(b)(3). "Use Table 1-1 and the airplanes identified in step No. 2 to determine the method that will be used for establishing the recommended runway length. Table 1-1 categorizes potential design airplanes according to their MTOW. MTOW is used because of the significant role played by airplane operating weights in determining runway lengths. As seen from Table 1-1, the first column separates the various airplanes into one of three weight categories. Small airplanes, defined as airplanes with MTOW of 12,500 pounds (5,670 kg) or less, are further subdivided according to approach speeds and passenger seating as explained in Chapter 2. Regional jets are assigned to the same category as airplanes with a MTOW over 60,000 pounds (27,200 kg). The second column identifies the applicable airport design approach (by airplane family group or by individual airplanes) as noted previously in Step No. 2. The third column directs the airport designer to the appropriate chapter for design guidelines and whether to use the referenced tables contained in the AC or to obtain airplane manufacturers' Airport Planning Manuals (APM) for each individual airplane under evaluation.

In the later case, APMs provide the takeoff and landing runway lengths that an airport designer will in turn apply to the associated guidelines set forth by this AC to obtain runway lengths. The airport designer should be aware that APMs go by a variety of names. For example, Airbus, the Boeing Company, and Bombardier respectively title their APMs as "Airplane Characteristics for Airport Planning," "Airplane Characteristics for Airport Planning," and "Airport Planning Manuals." For the purpose of this AC, the variously titled documents will be referred to as APM. Appendix 1 lists the websites of the various airplane manufacturers to provide individuals a starting point to retrieve an APM or a point of contact for further consultation."

Critical Aircraft. As noted in Step No. 3 guidelines included in FAA Advisory Circular 150/5325-4B require the identification of two separate critical aircraft based upon current surveyed activity: (1) 100% of fleet weighing less than 60,000 pounds, with 22,681 annual operations, and; (2) Gulfstream G450, with 1,627 annual operations. In both of these designations, significantly more than 500 annual itinerant operations have been identified. Operations by FAA Classification are summarized in the following Table 2 - Aircraft Under 60,000 Pounds, But Within the 25% That Comprises 100% of Fleet and Table 3 - Aircraft Over 60,000 Pounds.

Table 2 - Aircraft Under 60,000 Pounds, But Within the 25% That Comprises 100% of Fleet[9]

Fixed Base Operator (FBO)

Aircraft	*Weight*	*2008 Operations*	*2012 Operations*	*Average Stage Length (NM)*	*User*
Astra	23,500	879	1,060		Charter Operator
Learjet 45XR	21,500	1,318	1,484		Charter Operator
Lear 60	23,500	703	890		Charter Operator
Learjet 60SE	23,500	769	954		Charter Operator
Hawker 800XP	28,000	769	954		Charter Operator
Learjet 55	21,500	879	1,060		Charter Operator
Challenger 600	40,000	879	1,060		Charter Operator
Hawker 800	20,000	1,318	1,484		Charter Operator
Falcon 900C	46,500	1,581	1,738	2,500	Charter Operator
Lear 45	21,500	1,318	1,484		Base Tenant
Falcon 900C	46,500	2,306	2,438	2,500	Base Tenant
Lear 45	21,500	593	784		Base Tenant
Challenger 604	47,500	1,647	1,802	2,300	Base Tenant
Challenger 601	45,100	2,087	2,226	2,100	Base Tenant
Falcon 2000	32,000	1,537	1,696		Base Tenant
Falcon 2000	32,000	693	784		Base Tenant
Falcon 900EX	46,500	593	784	2,500	Base Tenant
Citation X	35,300	593	784	1,700	Fractional Operator
Hawker 800XP	28,000	703	890		Fractional Operator
Challenger 604	47,500	110	318	2,300	Fractional Operator
Challenger 604	47,500	110	318	2,300	Transient Aircraft
Lear 60XR	23,000	593	784		Transient Aircraft
Lear 45XR	21,000	593	784		Transient Aircraft
Falcon 900EX	46,500	110	318	2,500	Transient Aircraft
	TOTAL (CHARTER)	**9,095**	**10,684**		
	TOTAL (FRACTIONAL)	**1,406**	**1,992**		
	TOTAL	**22,681**	**26,878**		

Independent Corporate Tenants

Aircraft	*Weight*	*2008 Operations*	*2012 Operations*	*Average Stage Length (NM)*	*User*
Falcon 2000	32,000	200	220		Base Tenant
Falcon 2000	32,000	200	220		Base Tenant
Falcon 2000EX	38,000	200	220		Base Tenant
Challenger 600	40,000	55	70		Base Tenant
Hawker 800XP	28,000	100	100		Base Tenant
Hawker 800XP	28,000	500	600		Base Tenant
Hawker 800XP	28,000	300	300		Base Tenant
Citation 750X	35,300	145	145		Base Tenant
Challenger 601	45,100	30	30		Base Tenant
	TOTAL	**1,730**	**1,905**		

[9] Aircraft referenced in FAA AC 150/5325-4B, "Runway Length Requirements For Airport Design, Tables 3-1 & 3-2.

Table 3 - Aircraft Over 60,000 Pounds					
Fixed Base Operator (FBO)					
Aircraft	*Weight*	*2008 Operations*	*2012 Operations*	*Average Stage Length (NM)*	*User*
Gulfstream 450	73,900	1,157	1348	2400	Base Tenant
Gulfstream 550	91,000	593	784	3800	Base Tenant
Boeing BBJ	174,000	70	318	3400	Fortune 100
Global Express	98,000	110	318	3200	Fortune 100
GIII	69,000	110	318	2100	Transient Aircraft
DC9	110,000	110	318	1600	Military
Boeing 737	110,000	50	318	2300	Military
C130	150,000	110	318		Military
Falcon 7X	69,000	593	784	3300	Transient Aircraft
Global 5000	87,700	593	784	2700	Transient Aircraft
Boeing 757	250,000	24	219	3500	Transient Aircraft
C5	840,000	110	318		Military
	TOTAL	3,630	6,145		
Independent Corporate Tenants					
Aircraft	*Weight*	*2008 Operations*	*2012 Operations*	*Average Stage Length (NM)*	*User*
Gulfstream 450	73,900	150	200		Base Tenant
Gulfstream 450	73,900	320	320		Base Tenant
	TOTAL	470	520		

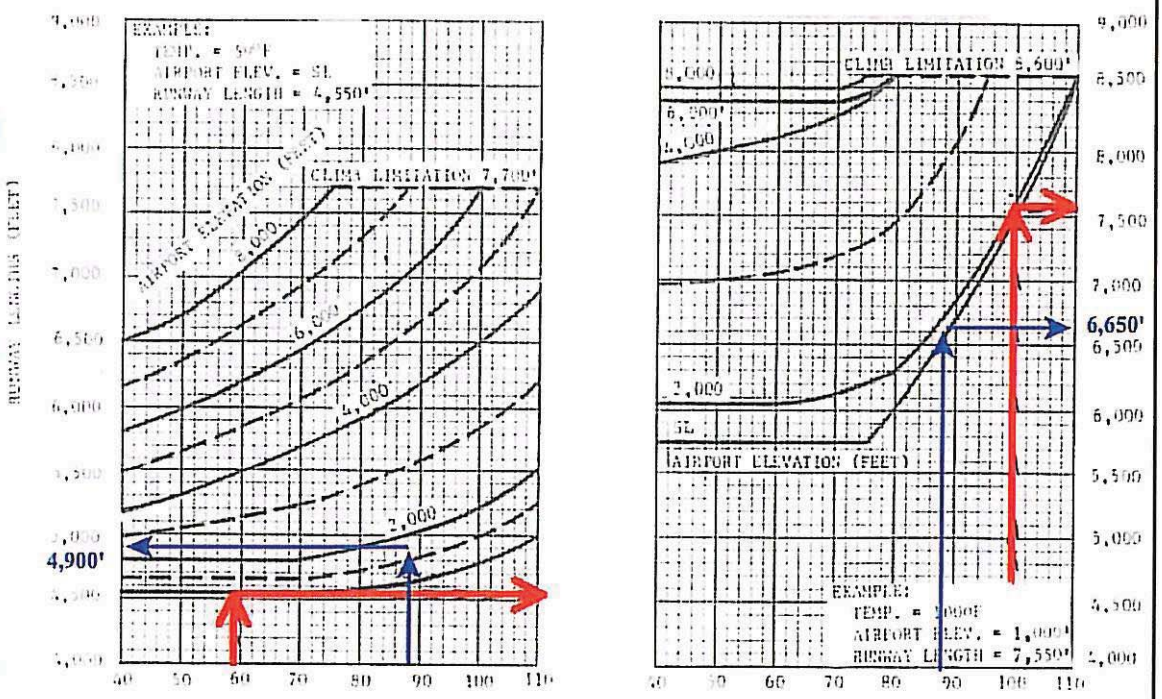
Step No. 4. "Select the recommended runway length from among the various runway lengths generated by Step No. 3 per the process identified in chapters 2, 3, or 4, as applicable."

Runway Length Calculations. The procedures outlined in FAA Advisory Circular 150/5325-4B have been used in determining the runway length required to accommodate the designated critical aircraft. The AC's Table 1-1, "Airplane Weight Categorization for Runway Length Requirements" directs the reviewer to use Figures 3-1 or 3-2 and Tables 3-1 or 3-2 for aircraft under 60,000 pounds and to use individual aircraft manufacturers APM's for aircraft over 60,000 pounds. All calculations are based upon the following assumptions:

- Airport Elevation ..... 725 Feet AMSL
- Mean Maximum Temperature of Hottest Month.....88° Fahrenheit
- Runway Elevation Change..... 15.7 Feet (0.65% Slope)

Aircraft Under 60,000 Pounds, But Within the 25% That Comprises 100% of Fleet. In determining the non-adjusted runway length for the 75% of the fleet category, Figure 3-1 - "75 Percent of Fleet at 60 or 90 Percent Useful Load" of AC 150/5325-4B is used. The graphs read for this report depicts 4,900 feet at 75 Percent of fleet at 60 Percent Useful Load and 6,650 feet at 75 percent of fleet at 90 Percent Useful Load. Figure 3-1 of the AC is shown below. In using the more conservative 100 Percent of Fleet at 60 or 90 Percent Useful Load, graphs contained in Figure 3-2 from the subject FAA Advisory Circular were reviewed. At 100 Percent of Fleet at 60 Percent Useful Load, the runway length need is 5,500 feet. However, at 100 Percent of Fleet at 90 Percent Useful Load, the runway length increases to 8,400 feet. Figure 3-2 of the AC follows.

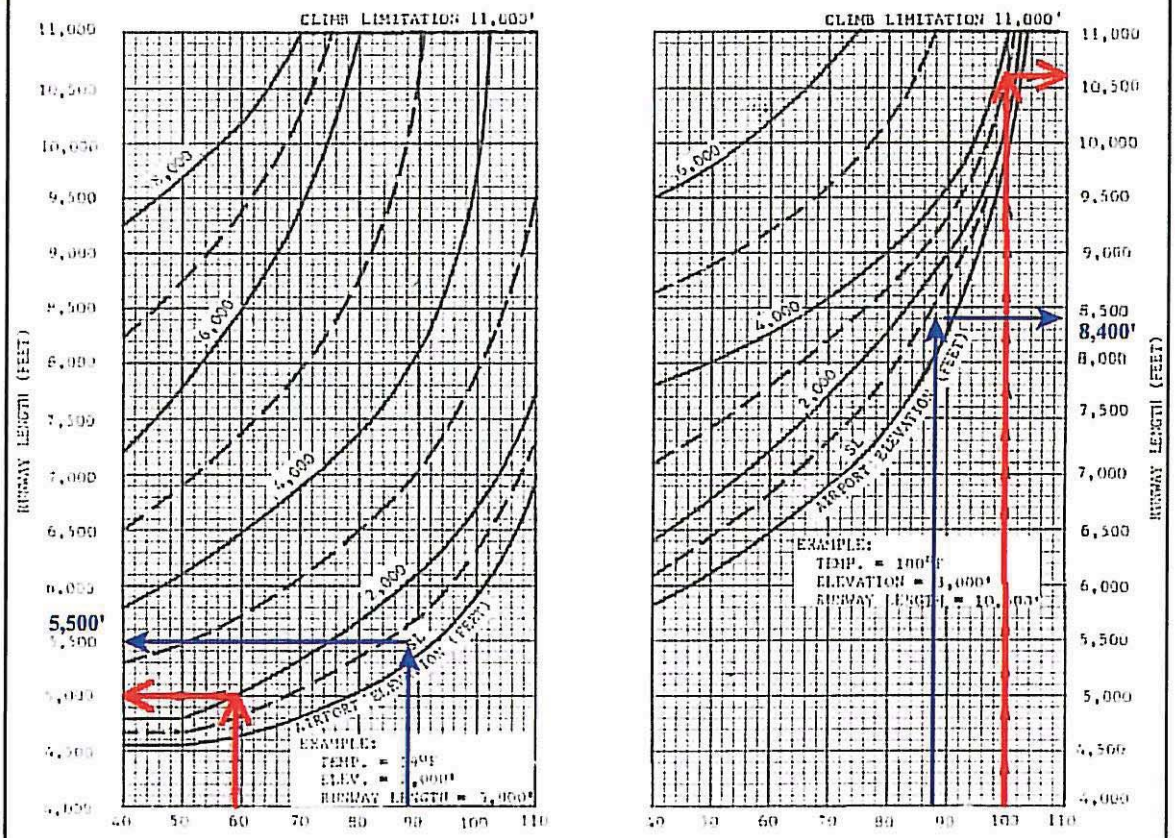
Figure 3-1. 75 Percent of Fleet at 60 or 90 Percent Useful Load



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

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

Figure 3-2. 100 Percent of Fleet at 60 or 90 Percent Useful Load



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

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

Table 4 - AC 150/5324-4B Runway Length Calculations contains a summary of runway length determinations based on Figures 3-1 and 3-2.

Table 4 - AC 150/5324-4B Runway Length Calculations	Runway Length
Aircraft Weighing Less Than 60,000 Pounds	
75 Percent of Fleet at 60 Percent Useful Load	*4,900 ft*
75 Percent of Fleet at 90 Percent Useful Load	*6,650 ft*
100 Percent of Fleet at 60 Percent Useful Load	*5,500 ft*
100 Percent of Fleet at 90 Percent Useful Load	*8,400 ft*

Aircraft Over 60,000 Pounds. As determined under Step No. 3, the Gulfstream 450 presently conducts a "substantial" number of flights from the Waukegan Regional Airport and is considered the "critical" aircraft over 60,000 pounds. In Table 1-1 of AC 150/5324-4B, airport planners and designers analyzing runway length determinations for aircraft over 60,000 pounds MTOW are directed to use Airport Planning Manuals (APM) issued by the specific aircraft manufacturer (i.e. Boeing, Bombardier, etc.). In Chapter 4, Paragraph 403 of the same AC, FAA states that "The longest resulting runway length between the takeoff and landing runway lengths for the critical design airplanes under evaluation becomes the recommended runway length."

The manufacturer's Performance Handbook, Revision 13, dated 24 May 2007, was used in determining runway lengths for the Gulfstream G450. This handbook uses a series of graphs and adjustments to determine the required runway length for various landing and take-off conditions. Interviews were held with a based operator to determine typical operating procedures. As they (based operators) are able to reduce costs because they self-fuel at UGN, the based G450 aircraft typically departs at maximum take-off weight, or 73,900 pounds. Use of the maximum take-off weight is also supported in the surveys by the average stage lengths of as much as 3,800 nautical miles for aircraft weighing greater than 60,000 pounds. The runway length calculations and tables from the APM's are included in Attachment B, and are summarized following:

Maximum Weight

- Take-off - Dry Runway ..... 6,600 Feet
- Landing - Dry Runway ..... 5,000 Feet

Please note that lengths over 30 feet are rounded up to the nearest 100 foot; below 30 feet, rounded down to the nearest 100 foot.

Step No. 5. "Apply any necessary adjustment to the obtained runway length, when instructed by the applicable chapter of this AC, to the runway length generated by Step No. 4 to obtain a final recommended runway length. For instance, an adjustment to the length may be necessary for runways with nonzero effective gradients. Chapter 5 provides the rationale for these length adjustments."

Runway Length Adjustments. As noted in Step No. 5, the Advisory Circular calls for the adjustments to runway lengths based on the following criteria, where applicable: elevation, temperature, wind, runway surface condition and runway gradient. The following analysis adheres to the AC's mandate for runway length adjustments, as required.

100% of Fleet Weighing Less Than 60,000 Pounds. In determining whether 90% useful load curves and adjustments should be used, an analysis of reported stage lengths was made for aircraft weighing less than 60,000 Pounds. Although, the survey results from the independent corporate tenants were inconclusive, useful information was furnished in the FBO activity response. Solely for Falcon 900C aircraft operated by based tenants, the survey identified 4,590 operations for which the average stage length was 2,500 nautical miles. With such stage lengths, with mandatory IFR reserves, and allowing for the high passenger count associated with the "corporate headquarters"-nature of UGN-based aircraft, operations at or near maximum operating weight are normal. Therefore, use of the 90% curve data are warranted.

In determining adjusted runway lengths for this aircraft grouping, a series of conversion factors are applied to the graph results. The adjustments made to the graph for 100% of Fleet Weighing Less than 60,000 Pounds are shown in Attachment B; a summary of the resulting runway lengths are shown below:

- 100% of Fleet at 90% Useful Load - Wet and Slippery Runway ..... 7,000 Feet[10]
- 100% of Fleet at 90% Useful Load - Dry Runway ..... 7,000 Feet[11]

Please note that lengths over 30 feet are rounded up to the nearest 100 foot; below 30 feet, rounded down to the nearest 100 foot.

Based upon the above, the current **MINIMUM** justified runway length for the 100% of fleet weighing less than 60,000 pounds group is **7,000 feet**.

Aircraft Over 60,000 Pounds - Gulfstream G450. In determining adjusted runway lengths for this aircraft grouping, the APM's for the Gulfstream 450 were used. The results of the calculations are included in Attachment C, and are summarized below:

Maximum Weight

- Takeoff - Wet Runway ..... 6,600 Feet[12]
- Landing - Wet Runway ..... 5,700 Feet

Please note that lengths over 30 feet are rounded up to the nearest 100 foot; below 30 feet, rounded down to the nearest 100 foot.

[10] Limited to 7,000 feet per AC 150/5324-4B, Paragraph 304(b).
[11] Limited to 7,000 feet per AC 150/5324-4B, Paragraph 304(b).
[12] No adjustment per AC 150/5324-4B, Paragraph 304(a).

Recommended Runway Length

Based on the guidance contained in FAA's AC 150/5324-4B "Runway Length Requirements For Airport Design", specifically Paragraph 403; from the user surveys received from patrons of Waukegan Regional Airport; and from the analysis contained herein, this report has determined that the current, justified primary runway length at KUGN is **7,000 feet**. Accordingly, a primary runway length requirement of 7,000 feet is the **REQUIRED** length to be considered for future airport layout and design, including alternatives evaluations, and NEPA actions.

Other Considerations

Current FAA airport design criteria incorporate a comprehensive system of runway safety object free areas that extend the clear area around the runway ends to protect aircraft landing and taking-off from the runway itself. These features are prescribed in FAA AC 150/5300-13 "Airport Design". The existing primary runway at UGN does not presently provide these safety features; however, the lengthening of the runway will require that these safety areas be furnished on the improved/replacement runway. Based upon the current and forecast user aircraft (Airplane Design Group III), the safety and object free areas required will extend 1,000 feet beyond the runway pavement end. The runway safety area for the required runway length is 9,000 feet long and 500 feet wide; the runway object free area length is the same 9,000 feet, but a wider 800 feet. Objects, including the existing roads near each runway end, must be located outside of or under these areas.

An alternative to furnishing the full length and width of the runway safety and object free areas is permitted by the FAA. Incorporation of an EMAS (Engineered Material Arresting System) into the runway layout can be used to reduce the required length to 600 feet beyond each runway end. See Attachment D, FAA Fact Sheet, Engineered Material Arresting System. Such measures are typically only considered at severely constrained airport sites, and generally to only maintain an existing useful runway length and not to support a standard runway extension project. EMAS has a high initial installation cost, and requires continuing maintenance attention. Damage from an actual overrun or undershoot event also requires the substantial or complete replacement of the EMAS system. As UGN is not considered to be a severely constrained location, use of EMAS to reduce the clear area beyond the runway is not considered appropriate.

Attachment A

Completed Airport User Surveys

Waukegan Regional Airport
Owned and Operated by the Waukegan Port District

AIRPORT USE SURVEY: Waukegan Regional Airport (UGN)

DATE: 12/13/07

The Waukegan Regional Airport, owned and operated by the Waukegan Port District, will be seeking the assistance of the FAA and the Illinois Department of Transportation, Division of Aeronautics for the improvement of Runway 5-23. In addition to providing important runway safety areas at each end, it is intended that the runway be lengthened to as long as 7,500 feet to more efficiently accommodate larger corporate aircraft. So that we may assess the needs of our users, we request that you, or a qualified representative, please complete the following questionnaire. Information from the completed surveys will be compiled in a summary and individual responses will not be reported in any manner.

When finished, please return this survey by **January 10, 2008** to the following address:
Waukegan Regional Airport
Attn: Mr. James Stanczak
3580 North McAree Road
Waukegan, Illinois 60087 . . . . . **or fax to: 847.244.3813**

Questions concerning this survey can be directed to:
Mr. James Stanczak at 847.244.0055

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1. What aircraft makes(s) and model(s) are currently used, or would be used, if the runway was extended (please be specific):

Current Aircraft: CL-601-3R
CR-680

Desired Aircraft: G-450 To Be Delivered 4/01/08

2. What aircraft make(s) and model(s), and number of operations for each, do you estimate your firm would be using at this airport in the next five years if the proposed runway length (total of 7,500 feet) was in place? An operation equals one takeoff or landing.

Aircraft Model	Number of Operations				
	2008	2009	2010	2011	2012
CL-601	30				
CR-680	185	200			
G-450	150	200			
Yearly Totals:		400			

3. Expected destination and/or length of flight and takeoff weight, by aircraft model.

Aircraft Model	Destination / Length of Flight	Takeoff Weight (lbs.)
CL-601	Avg Length 695	37,000
CR-680	Avg Length 410	26,000

4. What are the Accelerate/Stop distance requirements of your aircraft with 90% useful load on a 90° day?

Aircraft Model	Accelerate / Stop Distance (feet)
CL-601	5800
CR-680	4000

5. What runway length does your insurance company require?

Aircraft Model	Insurance Requirements (feet)
W/A	

Related comments: _____

6. Do you have a company policy that specifies a minimum runway length? If so, what is the minimum length required?

Aircraft Model	Company Policy (feet)
CL-601	5000
CR-680	4000

Related comments: _____

Baseline Field may be no more than 90% of Available Runway and of UGW 5400 ft Max takeoff Distance NOW

7. What runway length would be ideal for your needs? Please be specific for each model of aircraft.

Aircraft Model	Ideal Length (feet)
CE-680	Present Runway Serves
	us Fine
CL-601	7,000 would be g
G-450	7,000

Related Comments: _____

8. Are you currently operating with less than the desired amount of payload or fuel (takeoff weight) in order to use the current runway(s)? Please be Specific for each model of aircraft.

Aircraft Model	Less Than Desired Operation?			Explanation
	Yes	No	Cannot Currently Use	
CL-601	☒	☐	☐	Some Information this
	☐	☐	☐	we are not able
	☐	☐	☐	to Depart YCW with
	☐	☐	☐	all up Fuel
	☐	☐	☐	

9. Please list any other information or comments that you feel would benefit the airport:

_____

Thank you very much for your time and input.

Waukegan Regional Airport
Owned and Operated by the Waukegan Port District

AIRPORT USE SURVEY: Waukegan Regional Airport (UGN)

DATE: 12/13/2007

The Waukegan Regional Airport, owned and operated by the Waukegan Port District, will be seeking the assistance of the FAA and the Illinois Department of Transportation, Division of Aeronautics for the improvement of Runway 5-23. In addition to providing important runway safety areas at each end, it is intended that the runway be lengthened to as long as 7,500 feet to more efficiently accommodate larger corporate aircraft. So that we may assess the needs of our users, we request that you, or a qualified representative, please complete the following questionnaire. Information from the completed surveys will be compiled in a summary and individual responses will not be reported in any manner.

When finished, please return this survey by **January 10, 2008** to the following address:
Waukegan Regional Airport
Attn: Mr. James Stanczak
3560 North McAree Road
Waukegan, Illinois 60087 . . . . . **or fax to: 847.244.3813**

Questions concerning this survey can be directed to:
Mr. James Stanczak at 847.244.0055

---

1. What aircraft makes(s) and model(s) are currently used, or would be used, if the runway was extended (please be specific):

   Current Aircraft:

   Desired Aircraft:

2. What aircraft make(s) and model(s), and number of operations for each, do you estimate your firm would be using at this airport in the next five years if the proposed runway length (total of 7,500 feet) was in place? An operation equals one takeoff or landing.

Aircraft Model	Number of Operations				
	2008	2009	2010	2011	2012
FALCON 900 (2)	246	257	268	268	268
Yearly Totals:					

3. Expected destination and/or length of flight and takeoff weight, by aircraft model.

Aircraft Model	Destination / Length of Flight	Takeoff Weight (lbs.)
FALCON 900	AVG 5 6 HRS	46.5 K

4. What are the Accelerate/Stop distance requirements of your aircraft with 90% useful load on a 90° day?

Aircraft Model	Accelerate / Stop Distance (feet)
FALCON 900	4900

5. What runway length does your insurance company require?

Aircraft Model	Insurance Requirements (feet)
FALCON 900	4000

Related comments: _____

6. Do you have a company policy that specifies a minimum runway length? If so, what is the minimum length required?

Aircraft Model	Company Policy (feet)
FALCON 900	4000

Related comments: _____

7. What runway length would be ideal for your needs? Please be specific for each model of aircraft.

Aircraft Model	Ideal Length (feet)
FALCON 900	7000

Related Comments: ____

8. Are you currently operating with less than the desired amount of payload or fuel (takeoff weight) in order to use the current runway(s)? Please be Specific for each model of aircraft

Aircraft Model	Less Than Desired Operation?			Explanation
	Yes	No	Cannot Currently Use	
FALCON 900	☐	☒	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

9. Please list any other information or comments that you feel would benefit the airport:

____

Thank you very much for your time and input.

Waukegan Regional Airport
Owned and Operated by the Waukegan Port District

AIRPORT USE SURVEY: Waukegan Regional Airport (UGN)

DATE: 12/14/2007

The Waukegan Regional Airport, owned and operated by the Waukegan Port District, will be seeking the assistance of the FAA and the Illinois Department of Transportation, Division of Aeronautics for the improvement of Runway 5-23. In addition to providing important runway safety areas at each end, it is intended that the runway be lengthened to as long as 7,500 feet to more efficiently accommodate larger corporate aircraft. So that we may assess the needs of our users, we request that you, or a qualified representative, please complete the following questionnaire. Information from the completed surveys will be compiled in a summary and individual responses will not be reported in any manner.

When finished, please return this survey by **January 10, 2008** to the following address:
Waukegan Regional Airport
Attn: Mr. James Stanczak
3560 North McAree Road
Waukegan, Illinois 60087 . . . . . **or fax to: 847.244.3613**

Questions concerning this survey can be directed to:
Mr. James Stanczak at 847.244.0055

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1. What aircraft makes(s) and model(s) are currently used, or would be used, if the runway was extended (please be specific):

   Current Aircraft:

   Desired Aircraft:

2. What aircraft make(s) and model(s), and number of operations for each, do you estimate your firm would be using at this airport in the next five years if the proposed runway length (total of 7,500 feet) was in place? An operation equals one takeoff or landing.

Aircraft Model	Number of Operations				
	2008	2009	2010	2011	2012
Falcon 2000	200	205	210	215	220
Falcon 2000	200	205	210	215	220
Falcon 2000EX EASY	200	205	210	215	220
Yearly Totals:	600	615	630	645	660

3. Expected destination and/or length of flight and takeoff weight, by aircraft model.

Aircraft Model	Destination / Length of Flight	Takeoff Weight (lbs.)
falcon 2000	630 miles	32,000
Falcon 2000EX	721	38,000

4. What are the Accelerate/Stop distance requirements of your aircraft with 90% useful load on a 90° day?

Aircraft Model	Accelerate / Stop Distance (feet)
F 2000	BFL 5050
F2000 EX	BFL 5707

5. What runway length does your insurance company require?

Aircraft Model	Insurance Requirements (feet)
F 2000	
F 2000 EX	

Related comments: No specific requirement.

6. Do you have a company policy that specifies a minimum runway length? If so, what is the minimum length required?

Aircraft Model	Company Policy (feet)
F 2000	4,500
F 2000 EX	4,500

Related comments: _____

7. What runway length would be ideal for your needs? Please be specific for each model of aircraft.

Aircraft Model	Ideal Length (feet)
Both	7,500'

Related Comments: of course.

8. Are you currently operating with less than the desired amount of payload or fuel (takeoff weight) in order to use the current runway(s)? Please be Specific for each model of aircraft.

Aircraft Model	Less Than Desired Operation?			Explanation
	Yes	No	Cannot Currently Use	
Both	☐	☒	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

9. Please list any other information or comments that you feel would benefit the airport:

Thank you very much for your time and input.

Waukegan Regional Airport
Owned and Operated by the Waukegan Port District

AIRPORT USE SURVEY: Waukegan Regional Airport (UGN)

DATE: Dec 18. 2007

The Waukegan Regional Airport, owned and operated by the Waukegan Port District, will be seeking the assistance of the FAA and the Illinois Department of Transportation, Division of Aeronautics for the improvement of Runway 5-23. In addition to providing important runway safety areas at each end, it is intended that the runway be lengthened to as long as 7,500 feet to more efficiently accommodate larger corporate aircraft. So that we may assess the needs of our users, we request that you, or a qualified representative, please complete the following questionnaire. Information from the completed surveys will be compiled in a summary and individual responses will not be reported in any manner.

When finished, please return this survey by **January 10, 2008** to the following address:
Waukegan Regional Airport
Attn: Mr. James Stanczak
3580 North McAree Road
Waukegan, Illinois 60087 . . . . . **or fax to: 847.244.3813**

Questions concerning this survey can be directed to:
Mr. James Stanczak at 847.244.0055

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1. What aircraft makes(s) and model(s) are currently used, or would be used, if the runway was extended (please be specific):

   Current Aircraft: Challenger 600 NETTR

   Desired Aircraft:

2. What aircraft make(s) and model(s), and number of operations for each, do you estimate your firm would be using at this airport in the next five years if the proposed runway length (total of 7,500 feet) was in place? An operation equals one takeoff or landing.

Aircraft Model	Number of Operations				
	2008	2009	2010	2011	2012
Challenger 600	55	65	70	—	—
Yearly Totals:					

3. Expected destination and/or length of flight and takeoff weight, by aircraft model.

Aircraft Model	Destination / Length of Flight	Takeoff Weight (lbs.)
Challenger 600	Arkansas, 2:30	40 000

4. What are the Accelerate/Stop distance requirements of your aircraft with 90% useful load on a 90° day?

Aircraft Model	Accelerate / Stop Distance (feet)
Challenger	7000 feet

5. What runway length does your insurance company require?

Aircraft Model	Insurance Requirements (feet)
Challenger 600	Minimum of 6000 feet

Related comments: _____

6. Do you have a company policy that specifies a minimum runway length? If so, what is the minimum length required?

Aircraft Model	Company Policy (feet)
Challenger 600	5000 feet

Related comments: _____

7. What runway length would be ideal for your needs? Please be specific for each model of aircraft.

Aircraft Model	Ideal Length (feet)
Challenger 600	7500 feet

Related Comments: _____

8. Are you currently operating with less than the desired amount of payload or fuel (takeoff weight) in order to use the current runway(s)? Please be Specific for each model of aircraft.

Aircraft Model	Less Than Desired Operation?			Explanation
	Yes	No	Cannot Currently Use	
Challenger 600	X			Runway is too short for additional fuel

9. Please list any other information or comments that you feel would benefit the airport:

I would buy and take-off with more fuel if the runway was longer. 7500 feet would be ideal!

10. Please provide your contact information:

Waukegan Regional Airport
Owned and Operated by the Waukegan Port District

AIRPORT USE SURVEY: Waukegan Regional Airport (UGN)

DATE: JAN 3, 2008

The Waukegan Regional Airport, owned and operated by the Waukegan Port District, will be seeking the assistance of the FAA and the Illinois Department of Transportation, Division of Aeronautics for the improvement of Runway 5-23. In addition to providing important runway safety areas at each end, it is intended that the runway be lengthened to as long as 7,500 feet to more efficiently accommodate larger corporate aircraft. So that we may assess the needs of our users, we request that you, or a qualified representative, please complete the following questionnaire. Information from the completed surveys will be compiled in a summary and individual responses will not be reported in any manner.

When finished, please return this survey by **January 10, 2008** to the following address:
Waukegan Regional Airport
Attn: Mr. James Stanczak
3560 North McAree Road
Waukegan, Illinois 60087 ..... or fax to: 847.244.3813

Questions concerning this survey can be directed to:
Mr. James Stanczak at 847.244.0055

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1. What aircraft makes(s) and model(s) are currently used, or would be used, if the runway was extended (please be specific):

   Current Aircraft: CE750 Citation X

   Desired Aircraft: FAlcon 2000EX

2. What aircraft make(s) and model(s), and number of operations for each, do you estimate your firm would be using at this airport in the next five years if the proposed runway length (total of 7,500 feet) was in place? An operation equals one takeoff or landing.

Aircraft Model	Number of Operations				
	2008	2009	2010	2011	2012
CE750	145	145	145	145	145
Yearly Totals:	145	145	145	145	145

3. Expected destination and/or length of flight and takeoff weight, by aircraft model.

Aircraft Model	Destination / Length of Flight	Takeoff Weight (lbs.)
CE750	CYQX - 3430	35,300

4. What are the Accelerate/Stop distance requirements of your aircraft with 90% useful load on a 90° day?

Aircraft Model	Accelerate / Stop Distance (feet)
CE750	5970' DRY

5. What runway length does your insurance company require?

Aircraft Model	Insurance Requirements (feet)
CE750	PERFORMANCE REQUIREMENT

Related comments: _____

6. Do you have a company policy that specifies a minimum runway length? If so, what is the minimum length required?

Aircraft Model	Company Policy (feet)
CE750	4500'

Related comments: _____

7. What runway length would be ideal for your needs? Please be specific for each model of aircraft.

Aircraft Model	Ideal Length (feet)
CE750	7000'

Related Comments: _____

8. Are you currently operating with less than the desired amount of payload or fuel (takeoff weight) in order to use the current runway(s)? Please be Specific for each model of aircraft.

Aircraft Model	Less Than Desired Operation?			Explanation
	Yes	No	Cannot Currently Use	
CE750	☒	☐	☐	Wet Runway
CE750	☒	☐	☐	Reduce Fuel Weight
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

9. Please list any other information or comments that you feel would benefit the airport:

Runway Extension will assist our needs when Runway is Contaminated. ie: Fuel Purchase/ Increase operations from larger aircraft.

Thank you very much for your time and input.

Waukegan Regional Airport
Owned and Operated by the Waukegan Port District

AIRPORT USE SURVEY: Waukegan Regional Airport (UGN)

DATE: Jan 3 2008

The Waukegan Regional Airport, owned and operated by the Waukegan Port District, will be seeking the assistance of the FAA and the Illinois Department of Transportation, Division of Aeronautics for the improvement of Runway 5-23. In addition to providing important runway safety areas at each end, it is intended that the runway be lengthened to as long as 7,500 feet to more efficiently accommodate larger corporate aircraft. So that we may assess the needs of our users, we request that you, or a qualified representative, please complete the following questionnaire. Information from the completed surveys will be compiled in a summary and individual responses will not be reported in any manner.

When finished, please return this survey by **January 10, 2008** to the following address:
Waukegan Regional Airport
Attn: Mr. James Stanczak
3580 North McAree Road
Waukegan, Illinois 60087 . . . . . **or fax to: 847.244.3813**

Questions concerning this survey can be directed to:
Mr. James Stanczak at 847.244.0055

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1. What aircraft makes(s) and model(s) are currently used, or would be used, if the runway was extended (please be specific):

   Current Aircraft: Falcon 900 C

   Desired Aircraft: Falcon 7X

2. What aircraft make(s) and model(s), and number of operations for each, do you estimate your firm would be using at this airport in the next five years if the proposed runway length (total of 7,500 feet) was in place? An operation equals one takeoff or landing.

Aircraft Model	Number of Operations				
	2008	2009	2010	2011	2012
Falcon 900	70	70	70	70	70
Yearly Totals:	70	70	70	70	70

3. Expected destination and/or length of flight and takeoff weight, by aircraft model.

Aircraft Model	Destination / Length of Flight	Takeoff Weight (lbs.)
Falcon 900C	Rome, Italy 8.5 hrs.	46,500

4. What are the Accelerate/Stop distance requirements of your aircraft with 90% useful load on a 90° day?

Aircraft Model	Accelerate / Stop Distance (feet)
Falcon 900C	5600

5. What runway length does your insurance company require?

Aircraft Model	Insurance Requirements (feet)
Falcon 900C	No "feet" requirement only with Aircraft Flight Manual data

Related comments: _____

6. Do you have a company policy that specifies a minimum runway length? If so, what is the minimum length required?

Aircraft Model	Company Policy (feet)
Falcon 900C	5,000

Related comments: _____

7. What runway length would be ideal for your needs? Please be specific for each model of aircraft.

Aircraft Model	Ideal Length (feet)
Falcon 900C	8,000

Related Comments: ____

8. Are you currently operating with less than the desired amount of payload or fuel (takeoff weight) in order to use the current runway(s)? Please be Specific for each model of aircraft.

Aircraft Model	Less Than Desired Operation?			Explanation
	Yes	No	Cannot Currently Use	
Falcon 900 C	☒	☐	☐	International Trips on hot days
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

9. Please list any other information or comments that you feel would benefit the airport:

Snow removal has been excellent thru out the past 10 years I have been operating here!

10. Please provide your contact information

Thank you very much for your time and input.

Waukegan Regional Airport
Owned and Operated by the Waukegan Port District

RECEIVED
JAN 10 2008
HANSON PROFESSIONAL SVS INC
OAK BROOK, ILLINOIS

AIRPORT USE SURVEY: Waukegan Regional Airport (UGN)

DATE: JANUARY 3, 2008

The Waukegan Regional Airport, owned and operated by the Waukegan Port District, will be seeking the assistance of the FAA and the Illinois Department of Transportation, Division of Aeronautics for the improvement of Runway 5-23. In addition to providing important runway safety areas at each end, it is intended that the runway be lengthened to as long as 7,500 feet to more efficiently accommodate larger corporate aircraft. So that we may assess the needs of our users, we request that you, or a qualified representative, please complete the following questionnaire. Information from the completed surveys will be compiled in a summary and individual responses will not be reported in any manner.

When finished, please return this survey by **January 10, 2008** to the following address:
Waukegan Regional Airport
Attn: Mr. James Stanczak
3580 North McAree Road
Waukegan, Illinois 60087 . . . . . or fax to: 847.244.3813

Questions concerning this survey can be directed to:
Mr. James Stanczak at 847.244.0055

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1. What aircraft makes(s) and model(s) are currently used, or would be used, if the runway was extended (please be specific):

Current Aircraft: 2 GULFSTREAM G450
2 BOMBARDIER CHALLENGER 300
1 BEECHCRAFT KINGAIR 350
Desired Aircraft: 1 RAYTHEON HAWKER 800XP

GULFSTREAM G550 AIRCRAFT OR EQUIVALENT

2. What aircraft make(s) and model(s), and number of operations for each, do you estimate your firm would be using at this airport in the next five years if the proposed runway length (total of 7,500 feet) was in place? An operation equals one takeoff or landing.

Aircraft Model	Number of Operations				
	2008	2009	2010	2011	2012
GULFSTREAM G450 (2)	300	→	→	→	→
BOMBARDIER CL 300	150	→	→	→	→
RAYTHEON HAWKER 800XP	100	→	→	→	→
BEECHCRAFT KINGAIR 350	150	→	→	→	→
Yearly Totals:	720				

3. Expected destination and/or length of flight and takeoff weight, by aircraft model.

Aircraft Model	Destination / Length of Flight	Takeoff Weight (lbs.)
G450	EUROPE 8.0 hrs.	74,600
CHALLENGER 300	WEST COAST 4.0 hrs.	38,850

4. What are the Accelerate/Stop distance requirements of your aircraft with 90% useful load on a 90° day?

Aircraft Model	Accelerate / Stop Distance (feet)
G450	6,382
CHALLENGER 300	5,267
GULFSTREAM 350	4,114

5. What runway length does your insurance company require?

Aircraft Model	Insurance Requirements (feet)
ALL JETS	
ALL AIRCRAFT	MINIMUM REQUIRED BY
	AIRCRAFT FLIGHT
	MANUAL

Related comments: _____

6. Do you have a company policy that specifies a minimum runway length? If so, what is the minimum length required?

Aircraft Model	Company Policy (feet)
G450	5000
CHALLENGER 300	5000
HAWKER 800XP	5000
GULFSTREAM 350	3750

Related comments: _____

7. What runway length would be ideal for your needs? Please be specific for each model of aircraft.

Aircraft Model	Ideal Length (feet)
G450	7,000 TO 7,500'
CHALLENGER 300	7,000

Related Comments: _____

8. Are you currently operating with less than the desired amount of payload or fuel (takeoff weight) in order to use the current runway(s)? Please be Specific for each model of aircraft.

Aircraft Model	Less Than Desired Operation?			Explanation
	Yes	No	Cannot Currently Use	
G450	☒	☐	☐	HOT TEMPS - RWY LIMITED, WET OR SLOPPY RWY LIMITED.
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

9. Please list any other information or comments that you feel would benefit the airport:

HOT TEMPS — WEAKE LIMITED ON TAKEOFF
WET/CONTAMINATED RWYS — LIMITED ON TAKEOFF + LANDING.

Thank you very much for your time and input.

Waukegan Regional Airport
Owned and Operated by the Waukegan Port District

AIRPORT USE SURVEY: Waukegan Regional Airport (UGN)

DATE: 1-7-08

The Waukegan Regional Airport, owned and operated by the Waukegan Port District, will be seeking the assistance of the FAA and the Illinois Department of Transportation, Division of Aeronautics for the improvement of Runway 5-23. In addition to providing important runway safety areas at each end, it is intended that the runway be lengthened to as long as 7,500 feet to more efficiently accommodate larger corporate aircraft. So that we may assess the needs of our users, we request that you, or a qualified representative, please complete the following questionnaire. Information from the completed surveys will be compiled in a summary and individual responses will not be reported in any manner.

When finished, please return this survey by **January 10, 2008** to the following address:
Waukegan Regional Airport
Attn: Mr. James Stanczak
3580 North McAree Road
Waukegan, Illinois 60087 . . . . . **or fax to: 847.244.3813**

Questions concerning this survey can be directed to:
Mr. James Stanczak at 847.244.0055

1. What aircraft makes(s) and model(s) are currently used, or would be used, if the runway was extended (please be specific):

   Current Aircraft:

   3 HAWKER 800XP's, 1 FALCON 20

   Desired Aircraft:

   GULFSTREAM IV

2. What aircraft make(s) and model(s), and number of operations for each, do you estimate your firm would be using at this airport in the next five years if the proposed runway length (total of 7,500 feet) was in place? An operation equals one takeoff or landing.

Aircraft Model	Number of Operations				
	2008	2009	2010	2011	2012
HAWKER	300	300	300	300	300
FALCON	15	15	15	15	15
Yearly Totals:	315	315	315	315	315

3. Expected destination and/or length of flight and takeoff weight, by aircraft model.

Aircraft Model	Destination / Length of Flight	Takeoff Weight (lbs.)
HAWKER	CALIFORNIA	28,000
FALCON	"	32,000

4. What are the Accelerate/Stop distance requirements of your aircraft with 90% useful load on a 90^0 day?

Aircraft Model	Accelerate / Stop Distance (feet)
HAWKER	6,800'
FALCON	6,600'

5. What runway length does your insurance company require?

Aircraft Model	Insurance Requirements (feet)
HAWKER	4500'
FALCON	4500'

Related comments: _____

6. Do you have a company policy that specifies a minimum runway length? If so, what is the minimum length required?

Aircraft Model	Company Policy (feet)
HAWKER	4500'
FALCON	4500'

Related comments: _____

7. What runway length would be ideal for your needs? Please be specific for each model of aircraft.

Aircraft Model	Ideal Length (feet)
HAWKER	8,000'
FALCON	8,000'

Related Comments: _____

8. Are you currently operating with less than the desired amount of payload or fuel (takeoff weight) in order to use the current runway(s)? Please be Specific for each model of aircraft.

Aircraft Model	Less Than Desired Operation?			Explanation
	Yes	No	Cannot Currently Use	
HAWKER	✓			CONTAMINATED RWY'S
FALCON	✓			" "

9. Please list any other information or comments that you feel would benefit the airport:

_____

Thank you very much for your time and input.

Waukegan Regional Airport
Owned and Operated by the Waukegan Port District

AIRPORT USE SURVEY: Waukegan Regional Airport (UGN)

DATE: JAN 9, 2008

The Waukegan Regional Airport, owned and operated by the Waukegan Port District, will be seeking the assistance of the FAA and the Illinois Department of Transportation, Division of Aeronautics for the improvement of Runway 5-23. In addition to providing important runway safety areas at each end, it is intended that the runway be lengthened to as long as 7,500 feet to more efficiently accommodate larger corporate aircraft. So that we may assess the needs of our users, we request that you, or a qualified representative, please complete the following questionnaire. Information from the completed surveys will be compiled in a summary and individual responses will not be reported in any manner.

When finished, please return this survey by January 10, 2008 to the following address:
Waukegan Regional Airport
Attn: Mr. James Stanczak
3580 North McAree Road
Waukegan, Illinois 60087 . . . . . or fax to: 847.244.3813

Questions concerning this survey can be directed to:
Mr. James Stanczak at 847.244.0055

RECEIVED
JAN 9 2008
SAMSON PROFESSIONAL INC NO

1. What aircraft makes(s) and model(s) are currently used, or would be used, if the runway was extended (please be specific):

   Current Aircraft: HAWKER 800XP, BEECHJET 400A, KING AIR 350

   Desired Aircraft:

2. What aircraft make(s) and model(s), and number of operations for each, do you estimate your firm would be using at this airport in the next five years if the proposed runway length (total of 7,500 feet) was in place? An operation equals one takeoff or landing.

Aircraft Model	Number of Operations				
	2008	2009	2010	2011	2012
HAWKER 800XP	500	550	600	600	600
BEECHJET 400A	100	100	100	100	100
KING AIR 350	25	30	30	30	30
Yearly Totals:	625	680	730	730	730

3. Expected destination and/or length of flight and takeoff weight, by aircraft model.

Aircraft Model	Destination / Length of Flight	Takeoff Weight (lbs.)

4. What are the Accelerate/Stop distance requirements of your aircraft with 90% useful load on a 90° day?

Aircraft Model	Accelerate / Stop Distance (feet)
HAWKER 800XP	APP 6000

5. What runway length does your insurance company require?

Aircraft Model	Insurance Requirements (feet)

Related comments: CHIEF PILOT APPROVAL

6. Do you have a company policy that specifies a minimum runway length? If so, what is the minimum length required?

Aircraft Model	Company Policy (feet)
HAWKER 800XP	5000 OR CHIEF PILOT APPROVAL
BEECHJET 400A	5000 OR CHIEF PILOT APPROVAL
KING AIR 350	4200 OR CHIEF PILOT APPROVAL

Related comments: _____

7. What runway length would be ideal for your needs? Please be specific for each model of aircraft.

Aircraft Model	Ideal Length (feet)

Related Comments: LONGER RUNWAYS ARE ALWAYS DESIRABLE. 6000 FEET CURRENTLY MEETS OUR NEEDS. THAT BEING SAID 6500-7000 WOULD BE IDEAL.

8. Are you currently operating with less than the desired amount of payload or fuel (takeoff weight) in order to use the current runway(s)? Please be specific for each model of aircraft.

Aircraft Model	Less Than Desired Operation?			Explanation
	Yes	No	Cannot Currently Use	
HAWKER 800XP	☐	☒	☐	
BEECHJET 400A	☐	☒	☐	
KINGAIR 350	☐	☒	☐	
	☐	☐	☐	
	☐	☐	☐	

9. Please list any other information or comments that you feel would benefit the airport:

Thank you very much for your time and input.

Attachment B

Adjustments for 100% of Fleet Weighing Less Than 60,000 Pounds

ADJUSTMENT FACTORS

Effective Gradient of Runway - The runway length from Figure 3-1 and 3-2 is increased at a rate of 10 feet for every one foot of elevation difference between high and low points of the runway. The current elevation difference is 16 feet (0.65% slope). Anticipated runway layout alternatives may be expected to result in changes to this slope to meet existing grade contours and runway design criteria. Accordingly, the runway slope used in this analysis is an elevation change of 8 feet (0.33%), as this provides for appropriate final grade slopes and allows for drainage culvert piping and associated structures to be placed at acceptable depths and with efficient pipe slopes.

Runway End ' Elevation Change; Use 8'

∴ Increase Runway Length by 80 feet.

Figure 3-1:

75% of fleet @ 60% Useful Load
Length from Figure: 4,900'
+ 80'
4,980'
Say 5,000'

75% of fleet @ 90% Useful Load
Length from Figure: 6,650'
+ 80'
6,730'
Say 6,800

Figure 3-2:

100% of fleet @ 60% Useful Load
Length from Figure: 5,500'
+ 80'
5,580'
Say 5,600'

100% of fleet @ 90% Useful Load
Length from Figure: 8,400'
+ 80'
8,480'
Say 8,500'

Wet and Slippery Runways - By regulation, the runway length for a turbojet-powered airplanes obtained from the "60% useful load" curves increased by 15% or up to 5,500 feet, whichever is less. By regulation, the runway lengths for turbojet powered airplanes obtained from the "90% useful load" curves are also increased by 15% or up to 7,000 feet, whichever is less. No adjustment is necessary by regulation for turboprop-powered airplanes.

Figure 3-1:

75% of fleet @ 60% Useful Load
Length from Figure: 4,900'
+(4,900*0.15)'
5,635'
Say 5,700'

Figure 3-2:

100% of fleet @ 60% Useful Load
Length from Figure: 5,500'
+(5,500*0.15)'
6,325'
Say 6,300'

∴ Use 5,500' Runway Length for both scenarios @ 60% Useful Load.

Figure 3-1:

75% of fleet @ 90% Useful Load
Length from Figure: 6,650'
+(6650*0.15)'
7,648'
Say 7,700'

Figure 3-2:

100% of fleet @ 90% Useful Load
Length from Figure: 8,560'
+(8560*0.15)'
9,844'
Say 9,900'

∴ Use 7,000' Runway Length for both scenarios @ 90% Useful Load.

Attachment C

Adjustments for Gulfstream G450

Maximum Takeoff Weight - Dry Runway

Weight 73,900 lbs (Max Weight)
Temp 88°F
20° Flaps
Airport Elevation 725 APA

Initial Field Length for UGN at Elevation 725 APA

Airport Elevation Field Length (725 APA, 88°F)		6,168 feet
Based on interpolation of following data:		
500 Feet APA		
	Field Length (86°F)*	5,970 feet
	Field Length (95°F)*	6,400 feet
	Field Length (88°F)*	6,066 feet
1000 Feet APA		
	Field Length (86°F)**	6,190 feet
	Field Length (95°F)**	6,650 feet
	Field Length (88°F)	6,292 feet

* Taken from the Gulfstream 450 Performance Handbook, page PA-17
** Taken from the Gulfstream 450 Performance Handbook, page PA-19

Field Length Adjustments (based on notes on page PA-19)

1 5 knot Tailwind		124 feet
(2% Increase in Field Length for every 5 knots)		
	Resulting Field Length	6,292 feet
2 Runway Slope @ UGN 0.33% uphill for Takeoff		407 feet
Increase Length 20% for every 1% Slope Uphill		
	Resulting Field Length	6,575 feet
	Final Required Field Length	**6,600 feet**

Maximum Landing Weight - Dry & Wet Runway

Weight 55,000 lbs (Maximum Load)
Temp 88°F
20° Flaps
Airport Elevation 725 APA

Dry Field Length for UGN at Elevation 725 APA

Airport Elevation Field Length (725 APA, 88°F, 70,770 lbs)		4,953 feet
Based on interpolation of following data:		
	Say	5,000 feet
0 Feet APA - Sea Level		
	Field Length *	4,830 feet
2000 Feet APA		
	Field Length *	5,000 feet

* Taken from the Gulfstream 450 Performance Handbook, page PC-1

Wet Field Length for UGN at Elevation 725 APA

Airport Elevation Field Length (725 APA, 88°F, 70,770 lbs)		5,696 feet
Based on interpolation of following data:		
Multiply Dry Length by 1.15		5,696 feet
	Say	5,700 feet

G450 Takeoff Planning: Dry Runway, Flaps 20° - APA 500 Feet

AFM APP. A

TAKEOFF PLANNING CHART

DRY RUNWAY	AIRPORT PRESSURE ALTITUDE = 500 FEET											TAKEOFF FLAP 20°
73,900 LB MTOGW	OAT (°C)	49	45	40	35	30	25	20	15	5	-5	-15
	OAT (°F)	120	113	104	95	86	77	68	59	41	23	5
	RATED EPR	1.55	1.57	1.60	1.63	1.66	1.66	1.66	1.66	1.66	1.66	1.66
-- 73,900 LB --												
	FLD LNGTH	7,930	7,430	6,880	6,400	5,970	5,820	5,730	5,630	5,480	5,290	5,120
V_{SE} = 174 KCAS	V_1 KCAS	144	142	140	139	137	137	137	137	137	137	137
V_{REF} = 154 KCAS	V_R KCAS	145	145	145	145	145	144	144	144	144	144	144
MAX TEMP = 49°C	V_2 KCAS	149	149	149	149	149	149	149	149	149	149	149
-- 72,000 LB --												
	FLD LNGTH	7,460	7,010	6,500	6,060	5,670	5,520	5,440	5,350	5,200	5,030	4,860
V_{SE} = 172 KCAS	V_1 KCAS	141	140	138	136	135	134	134	134	135	135	135
V_{REF} = 152 KCAS	V_R KCAS	143	143	143	143	142	142	142	142	142	142	142
MAX TEMP = 49°C	V_2 KCAS	147	147	147	147	147	147	147	147	147	147	147
-- 70,000 LB --												
	FLD LNGTH	7,010	6,600	6,130	5,730	5,360	5,220	5,140	5,060	4,920	4,760	4,600
V_{SE} = 169 KCAS	V_1 KCAS	138	137	135	133	132	132	132	132	132	132	132
V_{REF} = 150 KCAS	V_R KCAS	141	141	141	141	140	140	140	140	140	140	140
MAX TEMP = 49°C	V_2 KCAS	145	145	145	145	145	145	145	145	145	145	145
-- 68,000 LB --												
	FLD LNGTH	6,570	6,200	5,770	5,400	5,060	4,930	4,850	4,780	4,650	4,490	4,340
V_{SE} = 167 KCAS	V_1 KCAS	135	134	132	131	129	129	129	129	129	129	129
V_{REF} = 147 KCAS	V_R KCAS	139	139	139	138	138	137	137	137	137	137	137
MAX TEMP = 49°C	V_2 KCAS	143	143	143	143	143	143	143	143	143	143	143
-- 66,000 LB --												
	FLD LNGTH	6,160	5,820	5,430	5,090	4,770	4,650	4,580	4,510	4,390	4,240	4,100
V_{SE} = 164 KCAS	V_1 KCAS	132	131	129	128	126	126	126	126	126	126	126
V_{REF} = 145 KCAS	V_R KCAS	137	137	136	136	135	135	135	135	135	135	135
MAX TEMP = 49°C	V_2 KCAS	141	141	141	141	141	141	141	141	141	141	141
-- 64,000 LB --												
	FLD LNGTH	5,780	5,460	5,110	4,790	4,500	4,380	4,320	4,250	4,130	4,000	3,860
V_{SE} = 162 KCAS	V_1 KCAS	129	128	127	125	123	123	123	123	124	124	124
V_{REF} = 143 KCAS	V_R KCAS	135	134	134	133	133	132	132	132	132	132	132
MAX TEMP = 49°C	V_2 KCAS	139	139	139	139	139	139	139	139	139	139	139
-- 62,000 LB --												
	FLD LNGTH	5,420	5,130	4,810	4,510	4,240	4,130	4,070	4,000	3,890	3,760	3,640
V_{SE} = 159 KCAS	V_1 KCAS	127	125	124	122	121	120	120	120	121	121	121
V_{REF} = 141 KCAS	V_R KCAS	132	132	131	131	130	130	130	130	130	130	130
MAX TEMP = 49°C	V_2 KCAS	137	137	137	137	137	137	137	137	137	137	137
-- 60,000 LB --												
	FLD LNGTH	5,070	4,820	4,520	4,240	3,980	3,890	3,830	3,770	3,660	3,540	3,430
V_{SE} = 157 KCAS	V_1 KCAS	124	122	121	119	118	118	118	118	118	118	118
V_{REF} = 139 KCAS	V_R KCAS	130	130	129	128	128	127	127	127	127	127	127
MAX TEMP = 49°C	V_2 KCAS	135	135	135	135	135	135	135	135	135	135	135

NOTES:
1. Increase available field length 2% for each 5 knots of headwind (up to 40 knots).
2. Decrease available field length 20% for each 1% of uphill slope (up to 2%).
3. Decrease available field length 500 feet if ground spoilers are inoperative.

G450 Takeoff Planning: Dry Runway, Flaps 20° - APA 1000 Feet

AFM APP. A

TAKEOFF PLANNING CHART

DRY RUNWAY	AIRPORT PRESSURE ALTITUDE = 1,000 FEET											TAKEOFF FLAP 20°
73,900 LB MTOGW	OAT (°C)	48	45	40	35	30	25	20	15	5	-5	-15
	OAT (°F)	118	113	104	95	86	77	68	59	41	23	5
	RATED EPR	1.55	1.57	1.60	1.63	1.66	1.67	1.67	1.67	1.67	1.67	1.67
-- 73,900 LB --												
	FLD LNGTH	8,150	7,760	7,160	6,650	6,190	5,960	5,870	5,770	5,610	5,420	5,240
V_{SE} = 174 KCAS	V_1 KCAS	144	143	141	139	138	137	137	137	137	137	137
V_{REF} = 154 KCAS	V_R KCAS	145	145	145	145	145	145	144	144	144	144	144
MAX TEMP = 48°C	V_2 KCAS	149	149	149	149	149	149	149	149	149	149	149
-- 72,000 LB --												
	FLD LNGTH	7,670	7,310	6,770	6,290	5,870	5,660	5,570	5,480	5,330	5,140	4,970
V_{SE} = 172 KCAS	V_1 KCAS	141	140	138	137	135	134	135	135	135	135	135
V_{REF} = 152 KCAS	V_R KCAS	143	143	143	143	143	142	142	142	142	142	142
MAX TEMP = 48°C	V_2 KCAS	147	147	147	147	147	147	147	147	147	147	147
-- 70,000 LB --												
	FLD LNGTH	7,200	6,880	6,380	5,940	5,550	5,350	5,270	5,190	5,040	4,870	4,710
V_{SE} = 169 KCAS	V_1 KCAS	138	137	136	134	132	132	132	132	132	132	132
V_{REF} = 150 KCAS	V_R KCAS	141	141	141	141	140	140	140	140	140	140	140
MAX TEMP = 48°C	V_2 KCAS	145	145	145	145	145	145	145	145	145	145	145
-- 68,000 LB --												
	FLD LNGTH	6,750	6,450	6,000	5,600	5,240	5,050	4,970	4,900	4,760	4,600	4,440
V_{SE} = 167 KCAS	V_1 KCAS	136	134	133	131	130	129	129	129	129	129	129
V_{REF} = 147 KCAS	V_R KCAS	139	139	139	138	138	138	137	137	137	137	137
MAX TEMP = 48°C	V_2 KCAS	143	143	143	143	143	143	143	143	143	143	143
-- 66,000 LB --												
	FLD LNGTH	6,330	6,060	5,640	5,270	4,940	4,760	4,690	4,620	4,490	4,340	4,190
V_{SE} = 164 KCAS	V_1 KCAS	133	132	130	128	127	126	126	126	127	127	127
V_{REF} = 145 KCAS	V_R KCAS	137	137	137	136	135	135	135	135	135	135	135
MAX TEMP = 48°C	V_2 KCAS	141	141	141	141	141	141	141	141	141	141	141
-- 64,000 LB --												
	FLD LNGTH	5,930	5,680	5,300	4,960	4,650	4,490	4,420	4,350	4,230	4,090	3,950
V_{SE} = 162 KCAS	V_1 KCAS	130	129	127	126	124	123	124	124	124	124	124
V_{REF} = 143 KCAS	V_R KCAS	135	135	134	134	133	133	133	133	133	133	133
MAX TEMP = 48°C	V_2 KCAS	139	139	139	139	139	139	139	139	139	139	139
-- 62,000 LB --												
	FLD LNGTH	5,560	5,330	4,990	4,670	4,380	4,230	4,160	4,100	3,980	3,850	3,720
V_{SE} = 159 KCAS	V_1 KCAS	127	126	124	123	121	121	121	121	121	121	121
V_{REF} = 141 KCAS	V_R KCAS	132	132	132	131	130	130	130	130	130	130	130
MAX TEMP = 48°C	V_2 KCAS	137	137	137	137	137	137	137	137	137	137	137
-- 60,000 LB --												
	FLD LNGTH	5,200	5,000	4,680	4,390	4,120	3,980	3,920	3,860	3,750	3,620	3,500
V_{SE} = 157 KCAS	V_1 KCAS	124	123	121	120	118	118	118	118	118	118	118
V_{REF} = 139 KCAS	V_R KCAS	130	130	129	129	128	128	128	128	128	128	128
MAX TEMP = 48°C	V_2 KCAS	135	135	135	135	135	135	135	135	135	135	135

NOTES:
1. Increase available field length 2% for each 5 knots of headwind (up to 40 knots).
2. Decrease available field length 20% for each 1% of uphill slope (up to 2%).
3. Decrease available field length 500 feet if ground spoilers are inoperative.

G450 Takeoff Planning: Wet Runway, Flaps 20° - APA 500 Feet

AFM APP. A

TAKEOFF PLANNING CHART

WET RUNWAY	AIRPORT PRESSURE ALTITUDE = 500 FEET											TAKEOFF FLAP 20°
73,900 LB MTOGW	OAT (°C)	49	45	40	35	30	25	20	15	5	-5	-15
	OAT (°F)	120	113	104	95	86	77	68	59	41	23	5
	RATED EPR	1.55	1.57	1.60	1.63	1.66	1.66	1.66	1.66	1.66	1.66	1.66
-- 73,900 LB --												
	FLD LNGTH	8,740	8,200	7,590	7,050	6,570	6,390	6,280	6,170	5,990	5,760	5,550
V_{SE} = 174 KCAS	V_1 KCAS	134	132	130	127	125	125	125	125	125	126	126
V_{REF} = 154 KCAS	V_R KCAS	145	145	145	145	145	144	144	144	144	144	144
MAX TEMP = 49°C	V_2 KCAS	149	149	149	149	149	149	149	149	149	149	149
-- 72,000 LB --												
	FLD LNGTH	8,230	7,730	7,160	6,670	6,230	6,060	5,950	5,850	5,670	5,460	5,260
V_{SE} = 172 KCAS	V_1 KCAS	131	129	127	125	123	122	122	122	123	123	123
V_{REF} = 152 KCAS	V_R KCAS	143	143	143	143	142	142	142	142	142	142	142
MAX TEMP = 49°C	V_2 KCAS	147	147	147	147	147	147	147	147	147	147	147
-- 70,000 LB --												
	FLD LNGTH	7,720	7,260	6,740	6,290	5,880	5,720	5,620	5,530	5,360	5,160	4,970
V_{SE} = 169 KCAS	V_1 KCAS	128	126	124	122	120	119	120	120	120	120	120
V_{REF} = 150 KCAS	V_R KCAS	141	141	141	141	140	140	140	140	140	140	140
MAX TEMP = 49°C	V_2 KCAS	145	145	145	145	145	145	145	145	145	145	145
-- 68,000 LB --												
	FLD LNGTH	7,230	6,810	6,330	5,920	5,530	5,380	5,300	5,200	5,050	4,860	4,680
V_{SE} = 167 KCAS	V_1 KCAS	125	123	121	119	117	117	117	117	117	117	117
V_{REF} = 147 KCAS	V_R KCAS	139	139	139	138	138	137	137	137	137	137	137
MAX TEMP = 49°C	V_2 KCAS	143	143	143	143	143	143	143	143	143	143	143
-- 66,000 LB --												
	FLD LNGTH	6,770	6,380	5,950	5,560	5,210	5,070	4,980	4,900	4,750	4,580	4,410
V_{SE} = 164 KCAS	V_1 KCAS	122	120	118	116	114	114	114	114	114	114	115
V_{REF} = 145 KCAS	V_R KCAS	137	137	136	136	135	135	135	135	135	135	135
MAX TEMP = 49°C	V_2 KCAS	141	141	141	141	141	141	141	141	141	141	141
-- 64,000 LB --												
	FLD LNGTH	6,330	5,980	5,580	5,230	5,010	4,900	4,810	4,730	4,560	4,400	4,230
V_{SE} = 162 KCAS	V_1 KCAS	119	117	115	113	112	112	112	112	113	113	113
V_{REF} = 143 KCAS	V_R KCAS	135	134	134	133	133	132	132	132	132	132	132
MAX TEMP = 49°C	V_2 KCAS	139	139	139	139	139	139	139	139	139	139	139
-- 62,000 LB --												
	FLD LNGTH	5,920	5,600	5,250	5,070	4,940	4,850	4,770	4,680	4,520	4,350	4,190
V_{SE} = 159 KCAS	V_1 KCAS	116	114	112	112	112	113	113	113	113	113	113
V_{REF} = 141 KCAS	V_R KCAS	132	132	131	131	130	130	130	130	130	130	130
MAX TEMP = 49°C	V_2 KCAS	137	137	137	137	137	137	137	137	137	137	137
-- 60,000 LB --												
	FLD LNGTH	5,530	5,320	5,150	5,020	4,890	4,800	4,720	4,640	4,470	4,310	4,150
V_{SE} = 157 KCAS	V_1 KCAS	113	112	112	112	113	113	113	113	113	113	113
V_{REF} = 139 KCAS	V_R KCAS	130	130	129	128	128	127	127	127	127	127	127
MAX TEMP = 49°C	V_2 KCAS	135	135	135	135	135	135	135	135	135	135	135

NOTES:
1. Increase available field length 2% for each 5 knots of headwind (up to 40 knots).
2. Decrease available field length 20% for each 1% of uphill slope (up to 2%).
3. Decrease available field length 1600 feet if ground spoilers are inoperative.

G450 Takeoff Planning: Wet Runway, Flaps 20° - APA 1000 Feet

AFM APP. A

TAKEOFF PLANNING CHART

WET RUNWAY — AIRPORT PRESSURE ALTITUDE = 1,000 FEET — TAKEOFF FLAP 20°

73,900 LB MTOGW	OAT (°C)	48	45	40	35	30	25	20	15	5	-5	-15
	OAT (°F)	118	113	104	95	86	77	68	59	41	23	5
	RATED EPR	1.55	1.57	1.60	1.63	1.66	1.67	1.67	1.67	1.67	1.67	1.67
-- 73,900 LB --												
	FLD LNGTH	8,990	8,570	7,920	7,330	6,820	6,560	6,450	6,340	6,140	5,910	5,690
V_{SE} = 174 KCAS	V_1 KCAS	135	133	131	128	126	125	125	125	126	126	126
V_{REF} = 154 KCAS	V_R KCAS	145	145	145	145	145	145	144	144	144	144	144
MAX TEMP = 48°C	V_2 KCAS	149	149	149	149	149	149	149	149	149	149	149
-- 72,000 LB --												
	FLD LNGTH	8,460	8,070	7,470	6,930	6,460	6,210	6,110	6,000	5,820	5,600	5,400
V_{SE} = 172 KCAS	V_1 KCAS	132	130	128	125	123	123	123	123	123	123	123
V_{REF} = 152 KCAS	V_R KCAS	143	143	143	143	143	142	142	142	142	142	142
MAX TEMP = 48°C	V_2 KCAS	147	147	147	147	147	147	147	147	147	147	147
-- 70,000 LB --												
	FLD LNGTH	7,940	7,580	7,020	6,530	6,100	5,870	5,770	5,670	5,490	5,290	5,100
V_{SE} = 169 KCAS	V_1 KCAS	129	127	125	123	121	120	120	120	120	120	121
V_{REF} = 150 KCAS	V_R KCAS	141	141	141	141	140	140	140	140	140	140	140
MAX TEMP = 48°C	V_2 KCAS	145	145	145	145	145	145	145	145	145	145	145
-- 68,000 LB --												
	FLD LNGTH	7,430	7,100	6,590	6,140	5,740	5,530	5,430	5,340	5,180	4,980	4,800
V_{SE} = 167 KCAS	V_1 KCAS	125	124	122	120	118	117	117	117	117	117	118
V_{REF} = 147 KCAS	V_R KCAS	139	139	139	138	138	138	137	137	137	137	137
MAX TEMP = 48°C	V_2 KCAS	143	143	143	143	143	143	143	143	143	143	143
-- 66,000 LB --												
	FLD LNGTH	6,950	6,650	6,190	5,770	5,400	5,200	5,110	5,030	4,870	4,690	4,520
V_{SE} = 164 KCAS	V_1 KCAS	122	121	119	117	115	114	114	114	114	114	115
V_{REF} = 145 KCAS	V_R KCAS	137	137	137	136	135	135	135	135	135	135	135
MAX TEMP = 48°C	V_2 KCAS	141	141	141	141	141	141	141	141	141	141	141
-- 64,000 LB --												
	FLD LNGTH	6,500	6,230	5,800	5,420	5,110	4,950	4,860	4,770	4,610	4,440	4,270
V_{SE} = 162 KCAS	V_1 KCAS	119	118	116	114	112	112	112	112	112	112	112
V_{REF} = 143 KCAS	V_R KCAS	135	135	134	134	133	133	133	133	133	133	133
MAX TEMP = 48°C	V_2 KCAS	139	139	139	139	139	139	139	139	139	139	139
-- 62,000 LB --												
	FLD LNGTH	6,080	5,830	5,440	5,160	5,000	4,900	4,810	4,730	4,560	4,390	4,230
V_{SE} = 159 KCAS	V_1 KCAS	116	115	113	112	112	112	112	112	112	112	112
V_{REF} = 141 KCAS	V_R KCAS	132	132	132	131	130	130	130	130	130	130	130
MAX TEMP = 48°C	V_2 KCAS	137	137	137	137	137	137	137	137	137	137	137
-- 60,000 LB --												
	FLD LNGTH	5,680	5,450	5,210	5,070	4,950	4,850	4,760	4,680	4,520	4,350	4,180
V_{SE} = 157 KCAS	V_1 KCAS	113	112	111	111	112	112	112	112	112	112	112
V_{REF} = 139 KCAS	V_R KCAS	130	130	129	129	128	128	128	128	128	128	128
MAX TEMP = 48°C	V_2 KCAS	135	135	135	135	135	135	135	135	135	135	135

NOTES:
1. Increase available field length 2% for each 5 knots of headwind (up to 40 knots).
2. Decrease available field length 20% for each 1% of uphill slope (up to 2%).
3. Decrease available field length 1600 feet if ground spoilers are inoperative.

G450 Landing Speed Schedule

AFM 5.11

The following guidance is provided to assist in the use of the charts in this section:

Tire speed limits occur when touchdown speeds exceeds 195.5 knots (225 mph). **Tire fuseplug release limits** occur when Brake Kinetic Energy (BKE) for a maximum effort landing (full brake application at touchdown) exceeds 75 MFP, making fuseplug release possible.

Limits shown in the charts that follow are conservative in nature and represent a combination of worst-case conditions, i.e., maximum temperature at a given altitude plus a 2% downhill runway slope. These limits apply to a nil or headwind condition only.

NOTE: All speeds shown are KCAS.

Weight = 45,000 LB			Normal Flaps 39°		Abnormal Flaps 20°		Abnormal Flaps 10°		Abnormal Flaps UP	
Altitude	F39° Shake	F39° Push	V_{APP}	V_{REF}	V_{APP}	V_{REF}	V_{APP}	V_{REF}	V_{APP}	V_{REF}
0	99	92	125	120	128	123	133	128	141	136
2000	99	92	125	120	128	123	133	128	141	136
4000	99	92	125	120	129	124	134	129	141	136
6000	99	93	125	120	130	125	135	130	143	138
8000	100	93	127	122	131	126	137	132	144	139
10,000	101	94	128	123	132	127	138	133	146	141
12,000	102	95	129	124	133	128	139	134	147	142
14,000	103	96	130	125	134	129	141	136	149	144
15,000	103	97	131	126	135	130	142	137	**150**	**145**
***CAUTION:** Fuseplug Release Possible With Max. Braking*							***CAUTION:** Tire Speed Limit*			

Weight = 50,000 LB			Normal Flaps 39°		Abnormal Flaps 20°		Abnormal Flaps 10°		Abnormal Flaps UP	
Altitude	F39° Shake	F39° Push	V_{APP}	V_{REF}	V_{APP}	V_{REF}	V_{APP}	V_{REF}	V_{APP}	V_{REF}
0	104	97	131	126	135	130	140	135	148	143
2000	104	97	131	126	135	130	140	135	148	143
4000	104	97	131	126	136	131	141	136	149	144
6000	105	98	132	127	137	132	143	138	151	146
8000	106	99	133	128	138	133	144	139	152	147
10,000	106	100	135	130	139	134	145	140	**154**	**149**
12,000	108	101	136	131	140	135	147	142	**155**	**150**
14,000	109	102	137	132	141	136	**149**	**144**	**157**	**152**
15,000	109	102	138	133	**142**	**137**	**149**	**144**	**158**	**153**
***CAUTION:** Fuseplug Release Possible With Max. Braking*							***CAUTION:** Tire Speed Limit*			

Attachment D

FAA Fact Sheet, Engineered Material Arresting System

Federal Aviation Administration

Fact Sheet

For Immediate Release
August 11, 2008
Contact: Marcia Adams
Phone: (202) 267-3488

Engineered Material Arresting System (EMAS)

Background

The Federal Aviation Administration (FAA) requires that commercial airports, regulated under Part 139 safety rules, have a standard Runway Safety Area (RSA) where possible. At most commercial airports the RSA is 500 feet wide and extends 1000 feet beyond each end of the runway. The FAA has this requirement in the event that an aircraft overruns, undershoots, or veers off the side of the runway. The most dangerous of these incidents are overruns, but since many airports were built before the 1000-foot RSA length was adopted some 20 years ago, the area beyond the end of the runway is where many airports cannot achieve the full standard RSA. This is due to obstacles such as bodies of water, highways, railroads and populated areas or severe drop-off of terrain.

The FAA has a high-priority program to enhance safety by upgrading the RSAs at commercial airports and provide federal funding to support those upgrades. However, it still may not be practical for some airports to achieve the standard RSA. The FAA, knowing that it would be difficult to achieve a standard RSA at every airport, began conducting research in the 1990s to determine how to ensure maximum safety at airports where the full RSA cannot be obtained. Working in concert with the University of Dayton, the Port Authority of New York and New Jersey, and the Engineered Arresting Systems Corporation (ESCO) of Logan Township, NJ, a new technology emerged to provide an added measure of safety. An Engineered Materials Arresting System (EMAS) uses materials of closely controlled strength and density placed at the end of a runway to stop or greatly slow an aircraft that overruns the runway. The best material found to date is a lightweight, crushable concrete. When an aircraft rolls into an EMAS arrestor bed, the tires of the aircraft sink into the lightweight concrete and the aircraft is decelerated by having to roll through the material.

Benefits of the EMAS Technology

The EMAS technology provides safety benefits in cases where land is not available, where it would be very expensive for the airport sponsor to buy the land off the end of the runway, or where it is otherwise not possible to have the standard 1,000-foot overrun. A standard EMAS installation extends 600 feet from the end of the runway. An EMAS arrestor bed can still be installed to help slow or stop an aircraft that overruns the runway, even if less than 600 feet of land is available.

Current FAA Initiatives

The Office of Airports prepared an RSA improvement plan for the runways at approximately 575 commercial airports in 2005. This plan allows the agency to track the progress and to direct federal funds for making all practicable improvements, including the use of EMAS technology.

Presently, the EMAS system developed by ESCO using crushable concrete is the only system that meets the FAA standard. However, FAA is conducting research through the Airport Cooperative Research Program (project number 07-03) that will examine alternatives to the existing approved system. The results of this effort are expected in 2009. More information on the project can be found at the Transportation Research Board web site at http://www.trb.org/CRP/ACRP/ACRP.asp.

Many of the EMAS beds installed prior to 2006 need periodic re-painting to maintain the integrity and functionality of the bed. FAA is working with ESCO to develop a retrofit of the older beds with plastic lids that are used on newer installations. This lid should eliminate the need for the periodic re-painting.

EMAS Arrestments

To date, there have been four incidents where the technology has worked successfully to arrest aircraft which overrun the runway and in several cases has prevented injury to passengers and damage to the aircraft.

- May 1999: A Saab 340 commuter aircraft overran the runway at JFK
- May 2003: Gemini Cargo MD-11 overran the runway at JFK
- January 2005: A Boeing 747 overran the runway at JFK
- July 2006: Mystere Falcon 900 airplane overran the runway at the Greenville Downtown Airport in South Carolina

EMAS Installations

Currently, EMAS is installed at 35 runway ends at 24 airports in the United Stated, with plans to install 15 EMAS systems at 11 additional U.S. airports.

Airport	Location	No. of Systems	Installation Date
JFK International	Jamaica, NY	2	1996/2007
Minneapolis St. Paul	Minneapolis, MN	1	1999
Little Rock	Little Rock, AR	2	2000/2003
Rochester International	Rochester, NY	1	2001
Burbank	Burbank, CA	1	2002
Baton Rouge Metropolitan	Baton Rouge, LA	1	2002
Greater Binghamton	Binghamton, NY	2	2002
Greenville Downtown	Greensville, SC	1	2003*
Barnstable Municipal	Hyannis, MA	1	2003
Roanoke Regional	Roanoke, VA	1	2004
Fort Lauderdale International	Fort Lauderdale, FL	2	2004
Dutchess County	Poughkeepsie, NY	1	2004
LaGuardia	Flushing, NY	2	2005
Boston Logan	Boston, MA	2	2005/2006
Laredo International	Laredo, TX	1	2006
San Diego International	San Diego, CA	1	2006
Teterboro	Teterboro , NJ	1	2006
Chicago Midway	Chicago, IL	4	2006/2007
Merle K. (Mudhole) Smith	Cordova, AK	1	2007
Charleston Yeager	Charleston , WV	1	2007
Manchester	Manchester, NH	1	2007
Wilkes-Barre/Scranton Intl.	Wilkes-Barre, PA	1	2008
San Luis Obispo	San Luis Obispo, CA	2	2008
Chicago-O'Hare	Chicago, IL	2	2008

* General aviation airport

Additional Projects Currently Under Contract

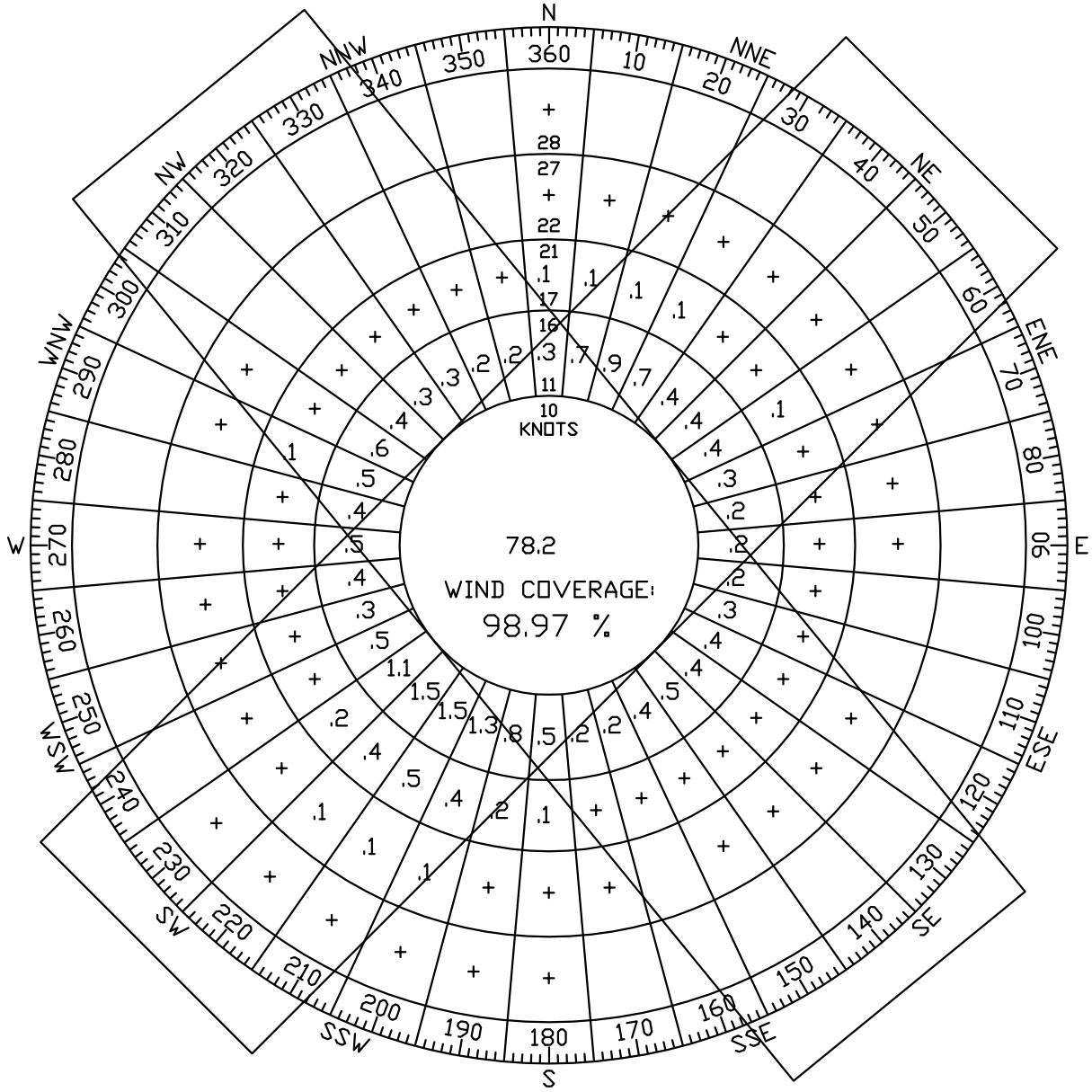
Worcester, MA	1	Fall 2008
Minneapolis St. Paul, MN	2	Fall 2008
Burbank, CA	1	Fall 2008
Key West, FL	1	2009
Winston-Salem, NC	1	2009
Lafayette , LA	2	TBD
Telluride, CO	2	TBD
Groton-New London, CT	2	TBD

###

Hanson Professional Service Inc
815 Commerce Drive, Suite 200
Oak Brook, IL 60523
630.990.3800

Appendix B

Waukegan Regional Airport
Wind Roses



NUMBER OF OBSERVATIONS = 80,371

ALL OBSERVED WHEN CONDITIONS INCLUDE GREATER THAN 1000' CEILING AND GREATER THAN 3 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

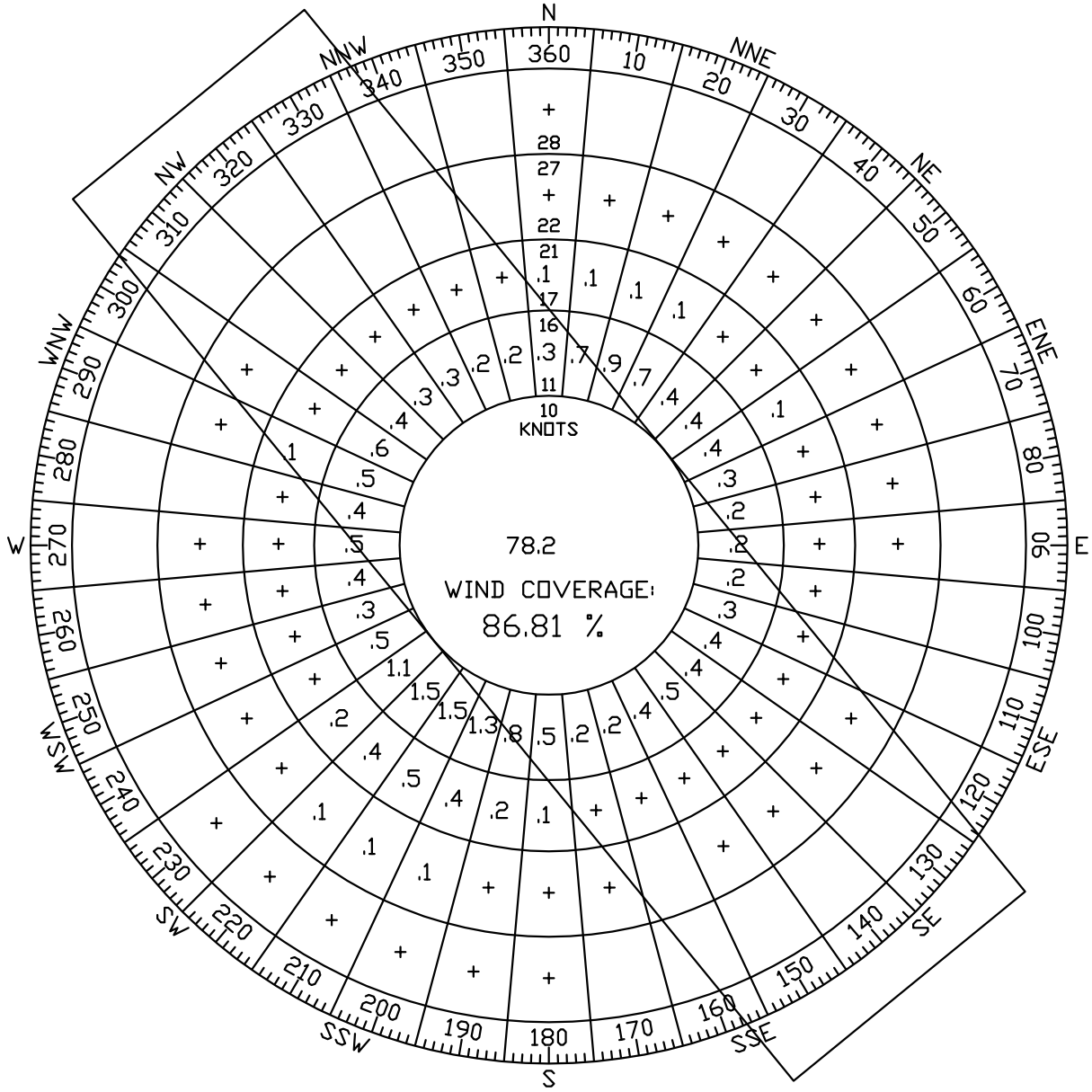
HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

All Weather Wind Rose - 10.5 Knot Wind
Runway 5-23 And Runway 14-32

Sheet Title:

Exhibit No.: B-1



NUMBER OF OBSERVATIONS = 80,371

ALL OBSERVED WHEN CONDITIONS INCLUDE GREATER THAN 1000' CEILING AND GREATER THAN 3 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

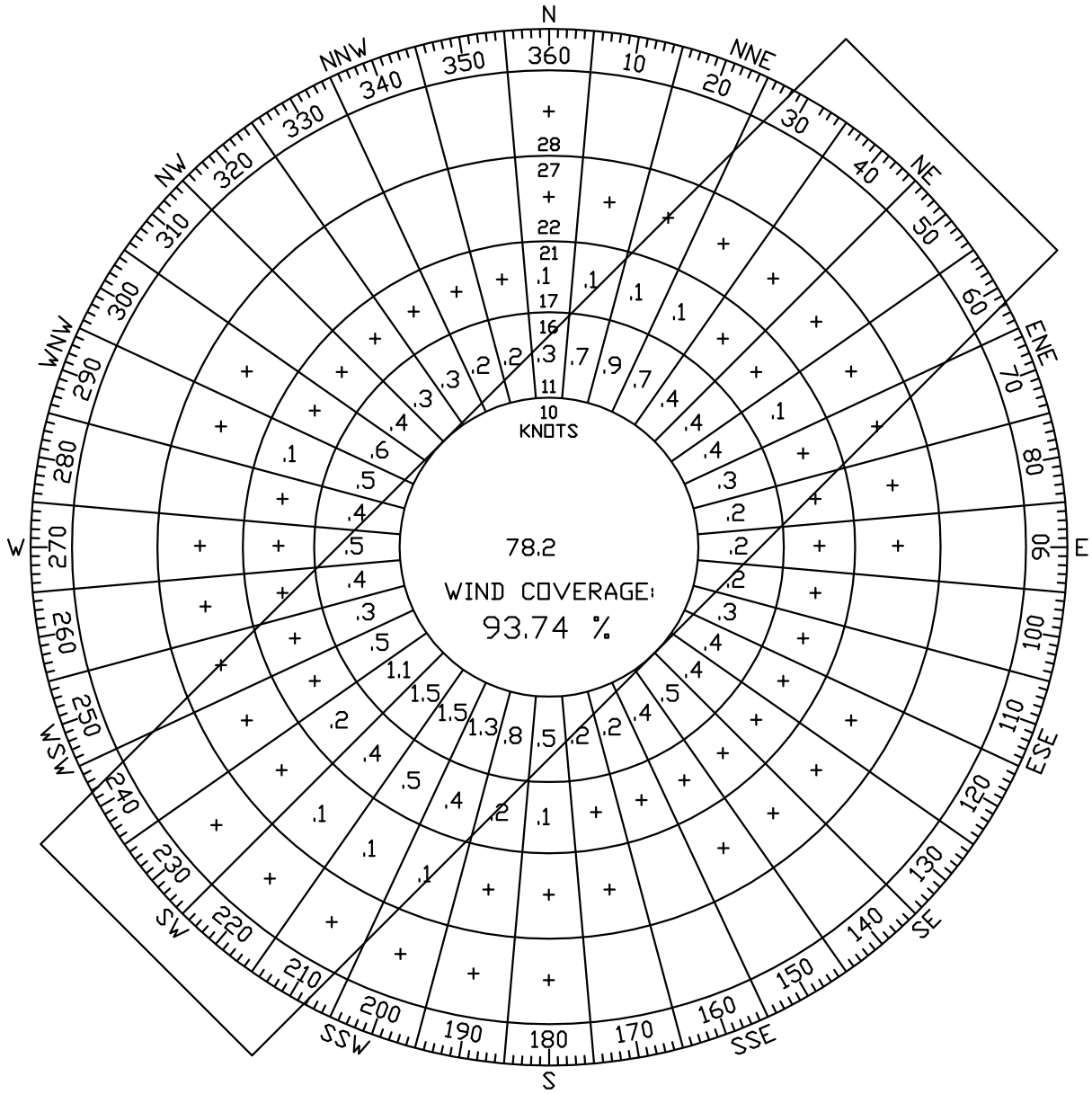
HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

All Weather Wind Rose - 10.5 Knot Wind
Runway 14-32

Sheet Title:

Exhibit No.: B-2



NUMBER OF OBSERVATIONS = 80,371

ALL OBSERVED WHEN CONDITIONS INCLUDE GREATER THAN 1000' CEILING AND GREATER THAN 3 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

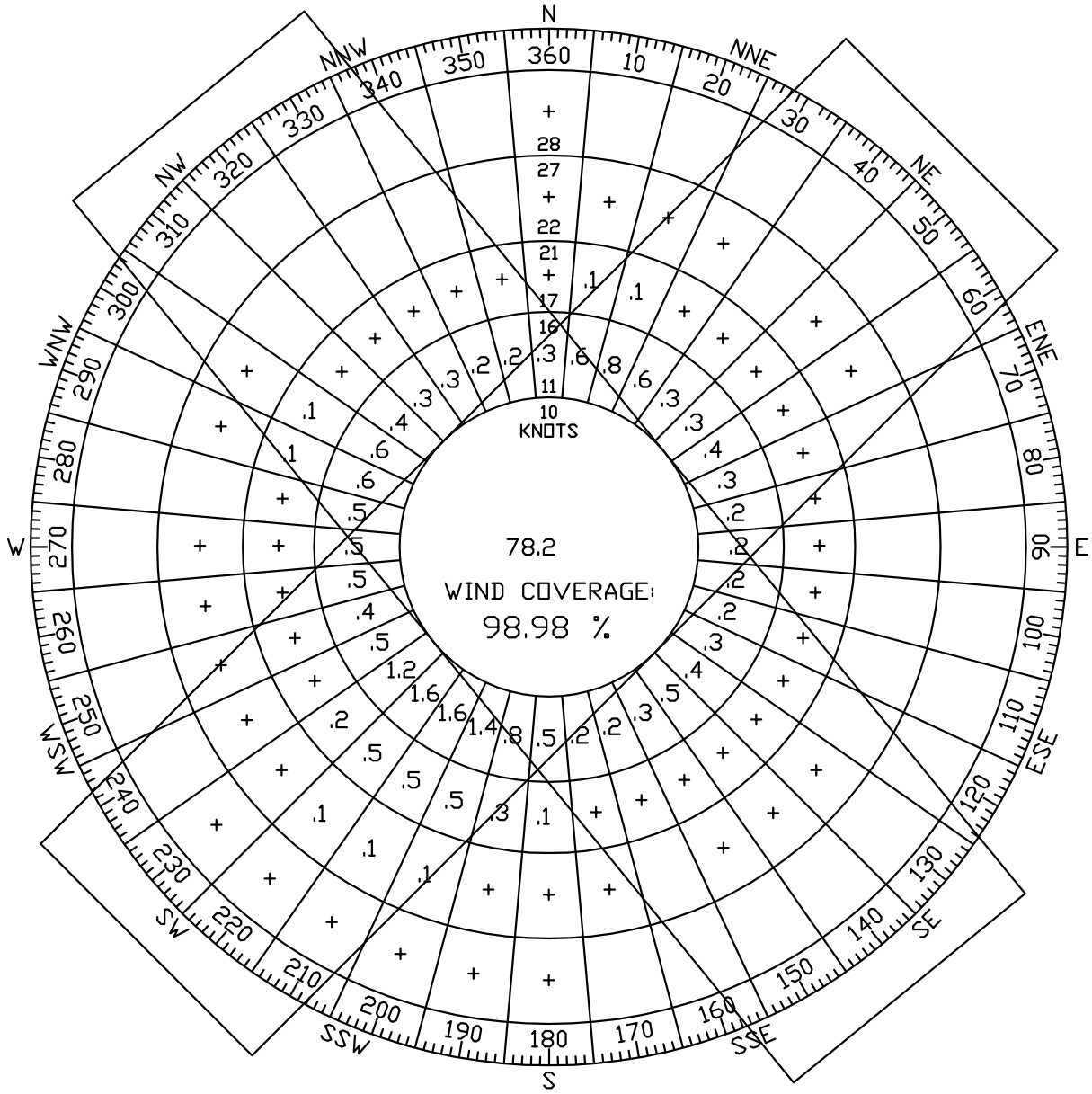
HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

All Weather Wind Rose - 10.5 Knot Wind
Runway 5-23

Sheet Title:

Exhibit No.: B-3



NUMBER OF OBSERVATIONS = 71,238

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 1000' CEILING AND 3 MILE VISIBILITY

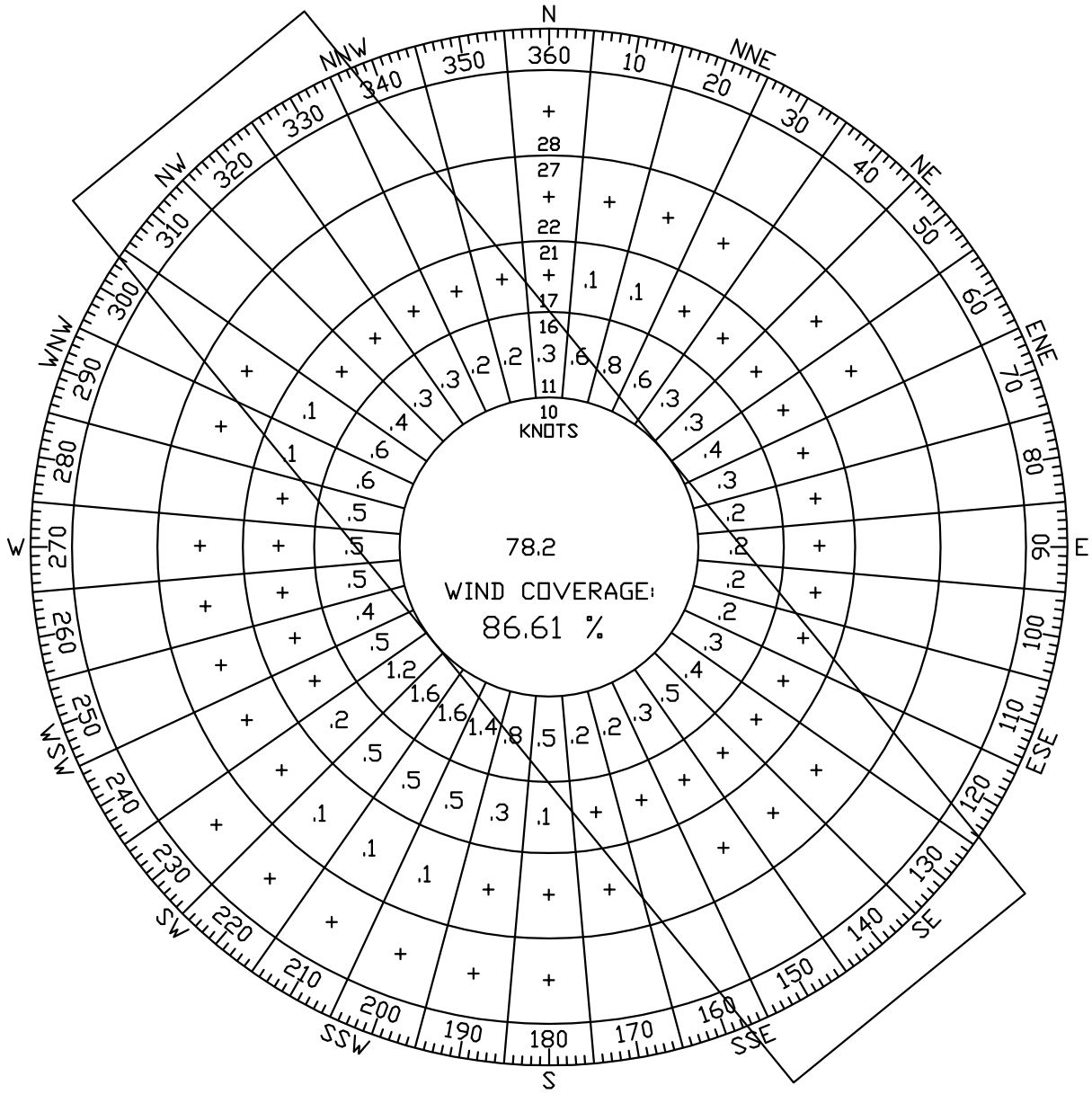
WAUKEGAN PORT DISTRICT

HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: IFR Weather Wind Rose - 10.5 Knot Wind
Runway 5-23 And Runway 14-32

Exhibit No.: B-4



NUMBER OF OBSERVATIONS = 71,238

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 1000' CEILING AND LESS THAN 3 MILE VISIBILITY

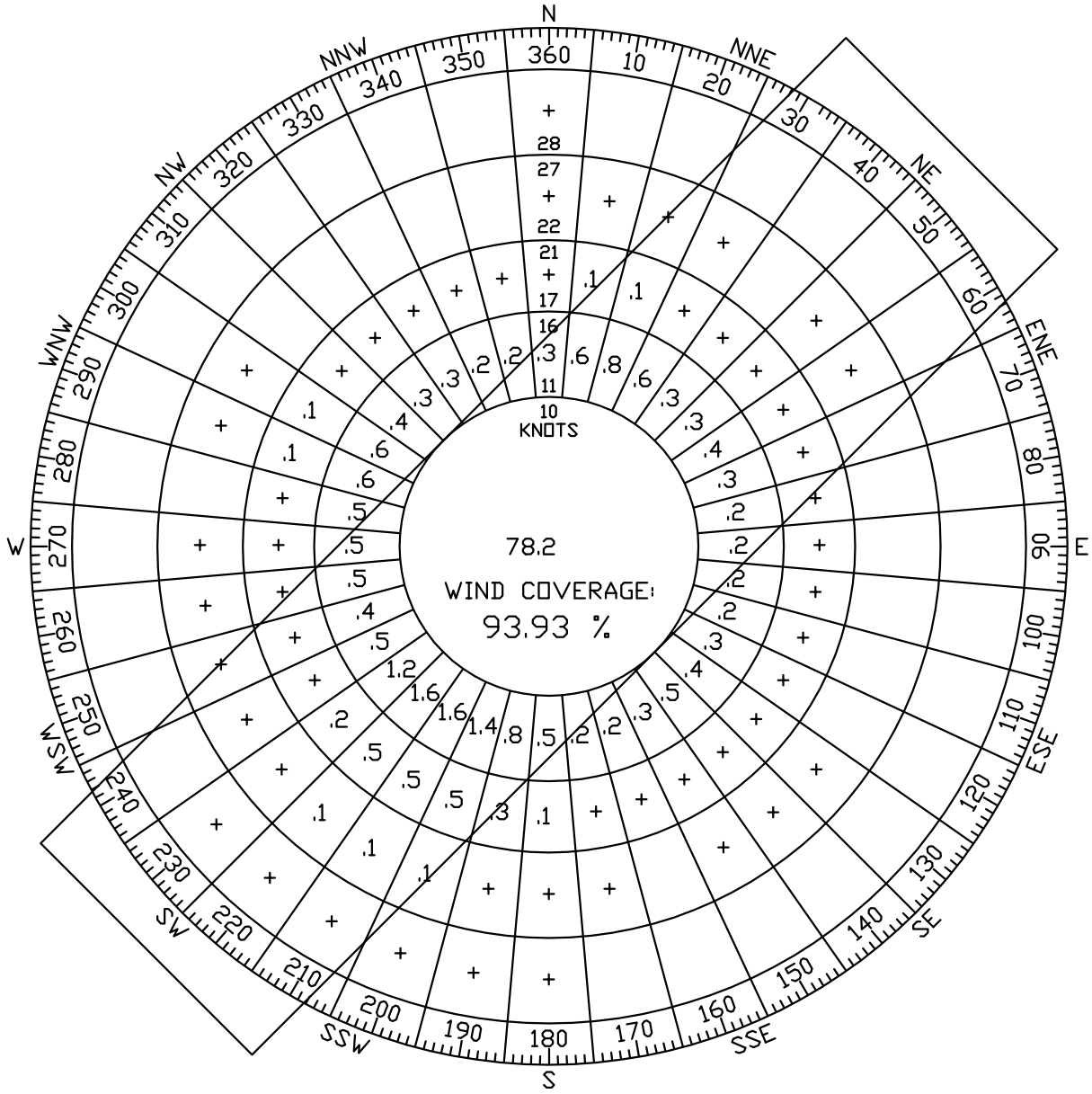
WAUKEGAN PORT DISTRICT

HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: IFR Weather Wind Rose - 10.5 Knot Wind
Runway 14-32

Exhibit No.: B-5



NUMBER OF OBSERVATIONS = 71,238

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 1000' CEILING AND LESS THAN 3 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

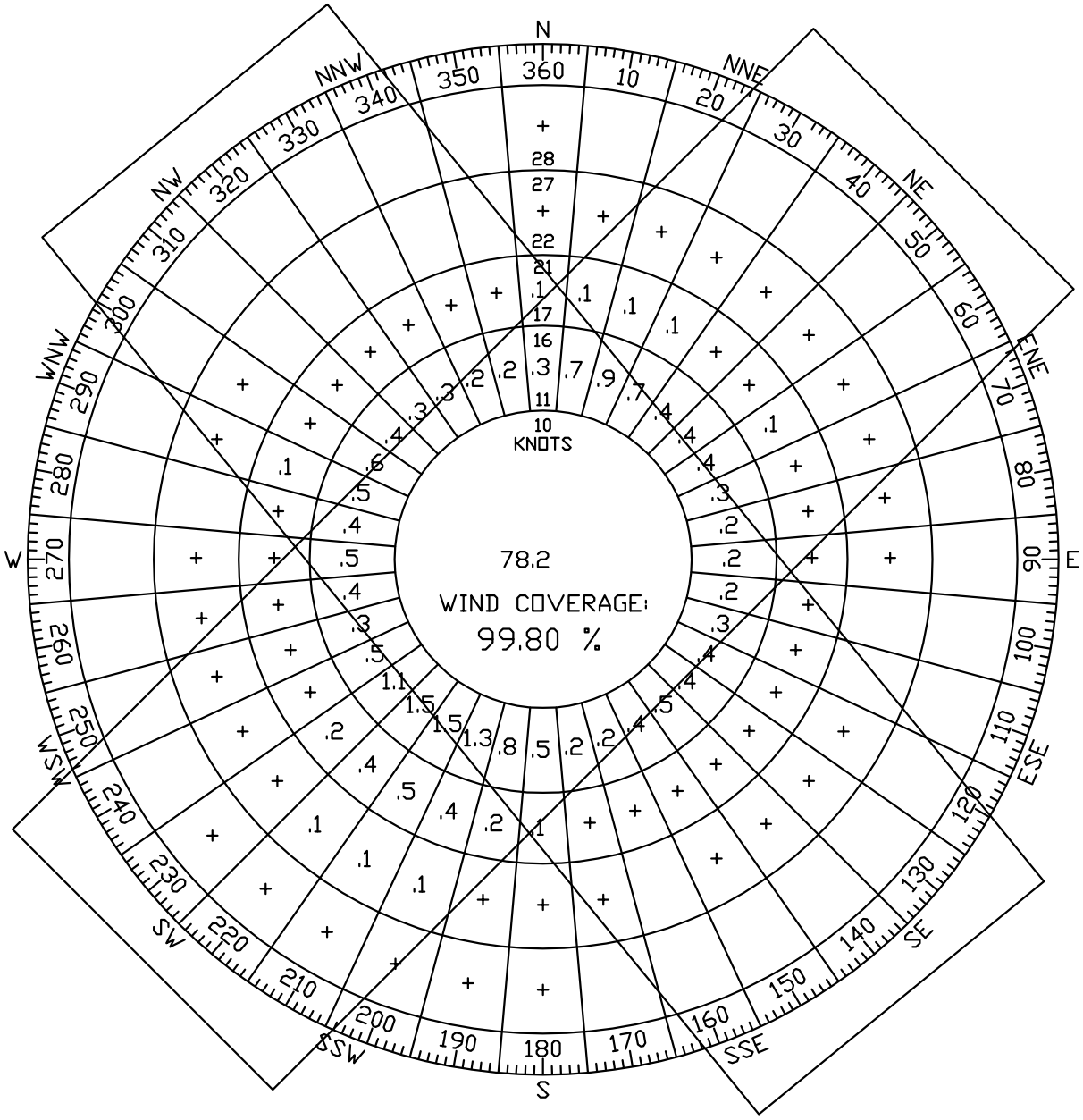
HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

IFR Weather Wind Rose - 10.5 Knot Wind
Runway 5-23

Sheet Title:

Exhibit No.: B-6



NUMBER OF OBSERVATIONS = 80,371

ALL OBSERVED WHEN CONDITIONS INCLUDE GREATER THAN 1000' CEILING AND GREATER THAN 3 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

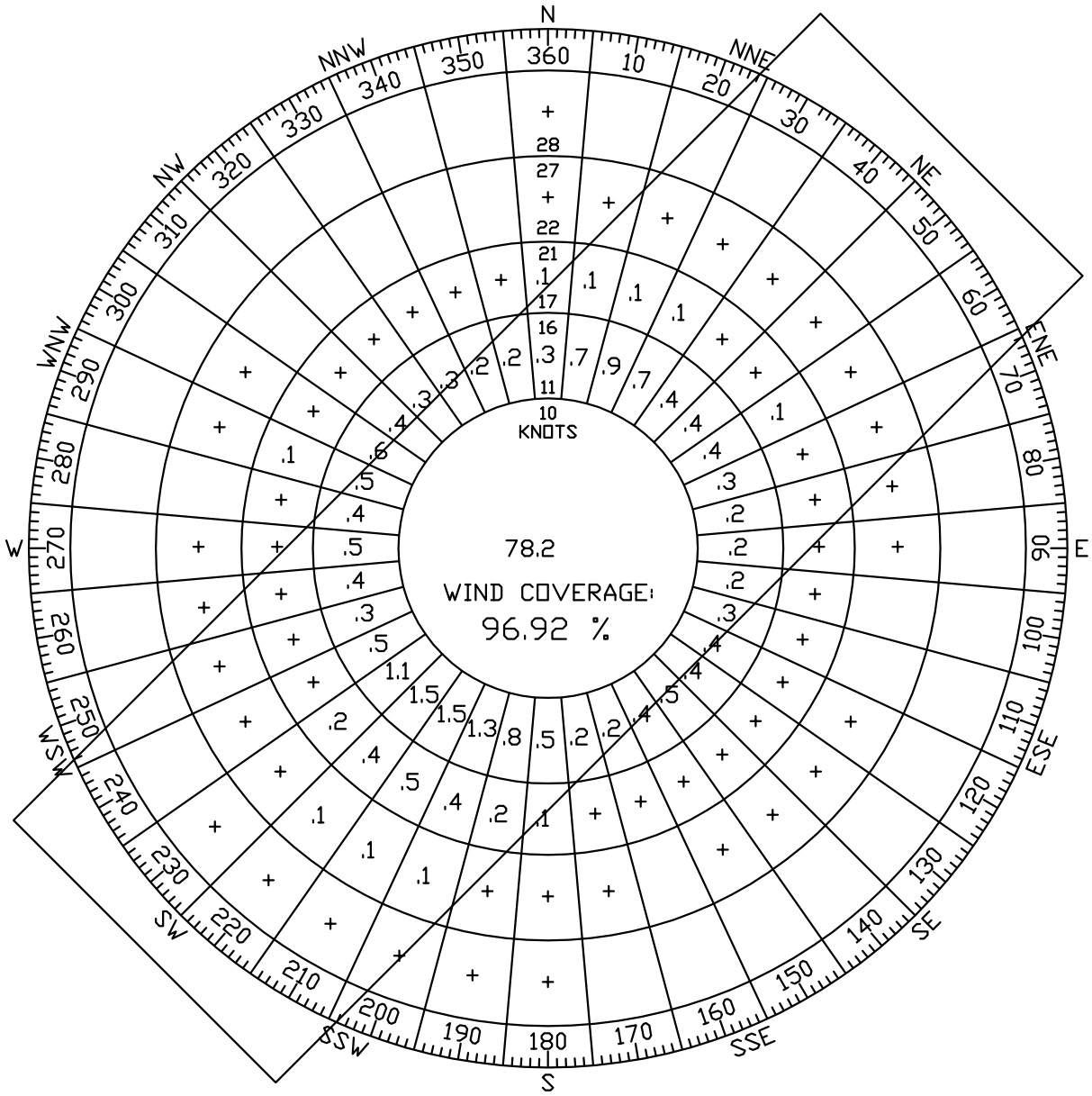
HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

All Weather Wind Rose - 13 Knot Wind
Runway 5-23 And Runway 14-32

Sheet Title:

Exhibit No.: B-7



NUMBER OF OBSERVATIONS = 80,371

ALL OBSERVED WHEN CONDITIONS INCLUDE GREATER THAN 1000' CEILING AND GREATER THAN 3 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

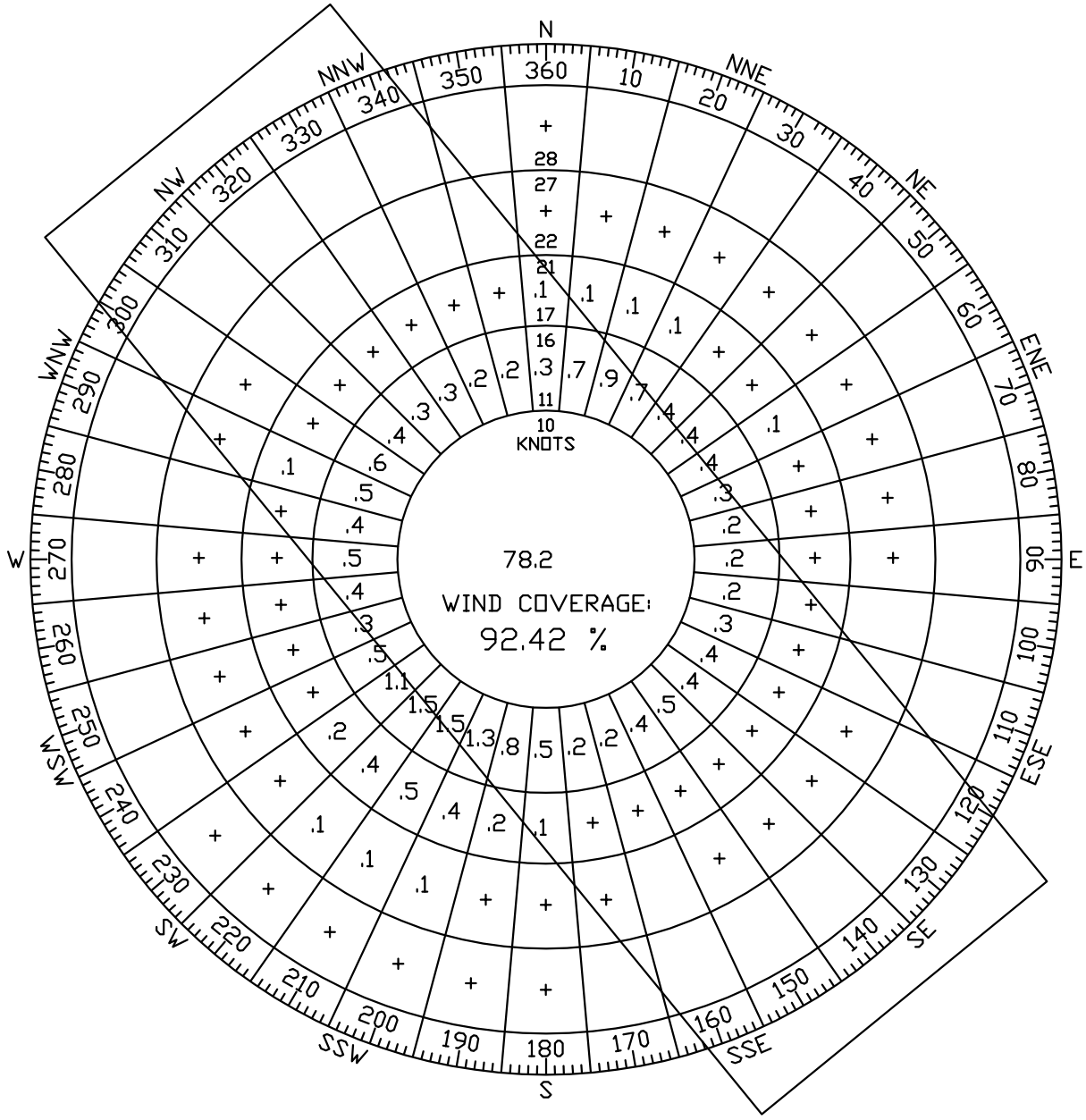
HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

All Weather Wind Rose - 13 Knot Wind
Runway 5-23

Sheet Title:

Exhibit No.: B-8



NUMBER OF OBSERVATIONS = 80,371

ALL OBSERVED WHEN CONDITIONS INCLUDE GREATER THAN 1000' CEILING AND GREATER THAN 3 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

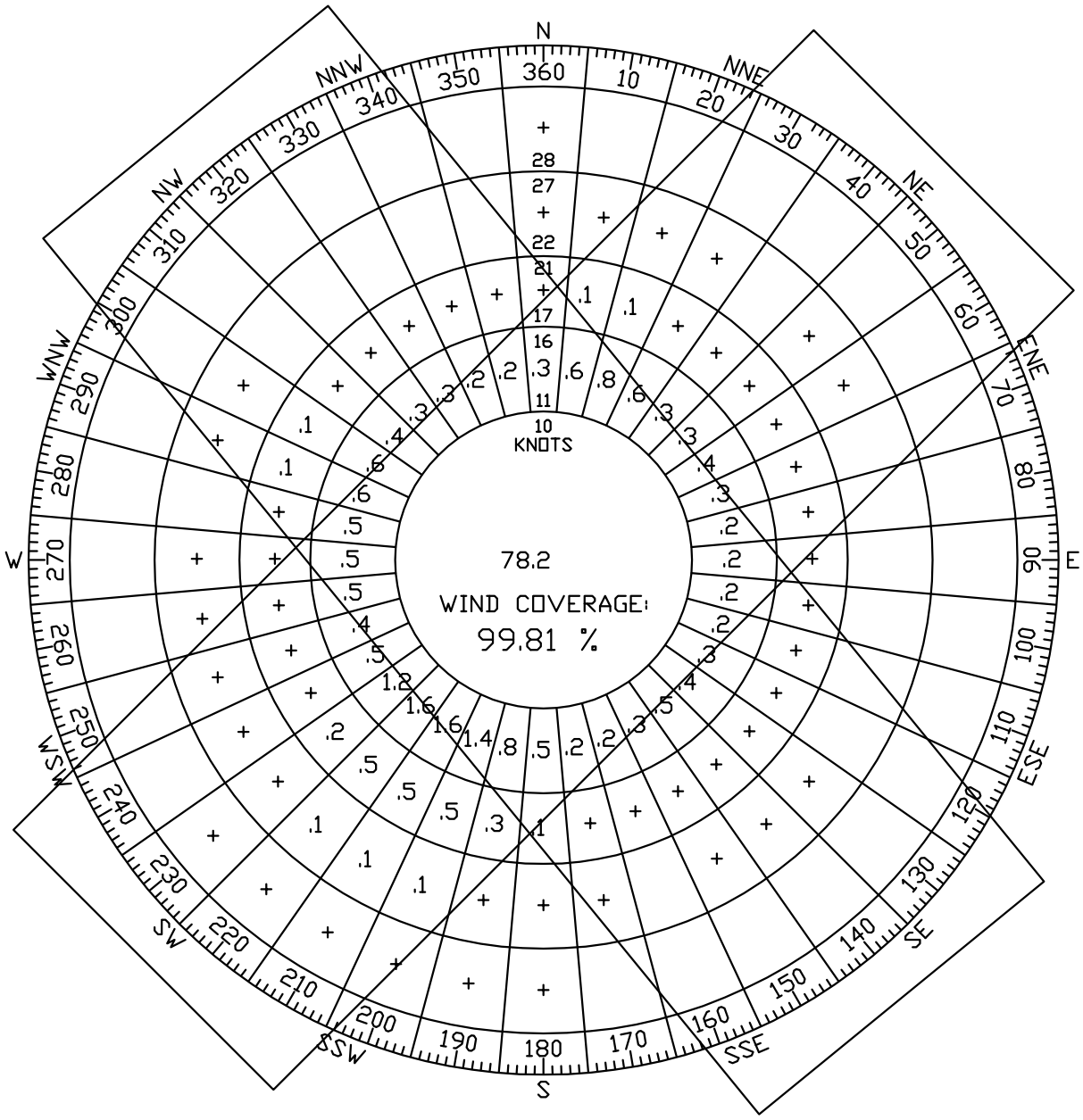
HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

All Weather Wind Rose - 13 Knot Wind
Runway 14-32

Sheet Title:

Exhibit No.: B-9



NUMBER OF OBSERVATIONS = 71,238

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 1000' CEILING AND 3 MILE VISIBILITY

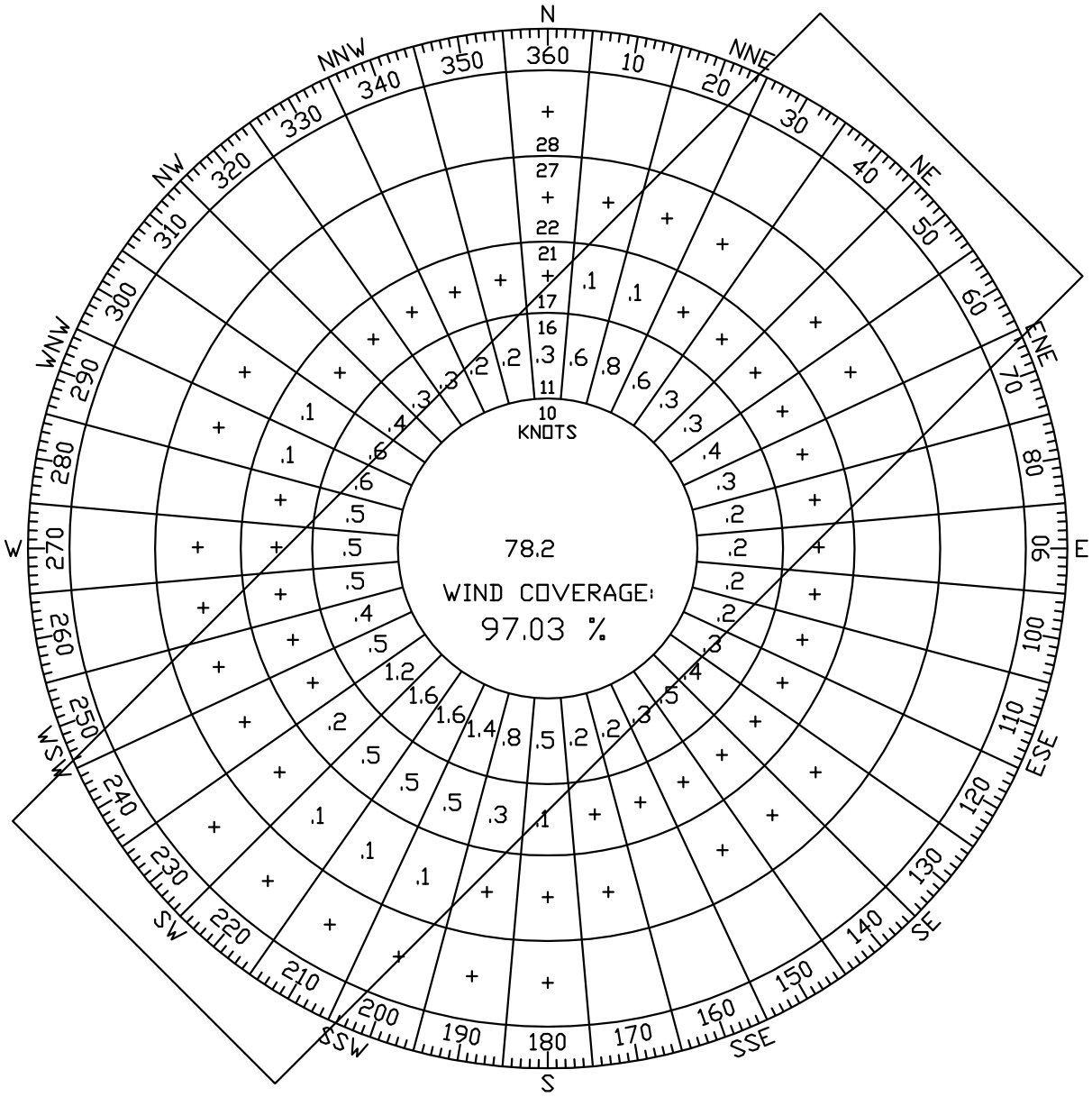
WAUKEGAN PORT DISTRICT

HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: IFR Weather Wind Rose - 13 Knot Wind
Runway 5-23 And Runway 14-32

Exhibit No.: B-10



NUMBER OF OBSERVATIONS = 71,238

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 1000' CEILING AND 3 MILE VISIBILITY

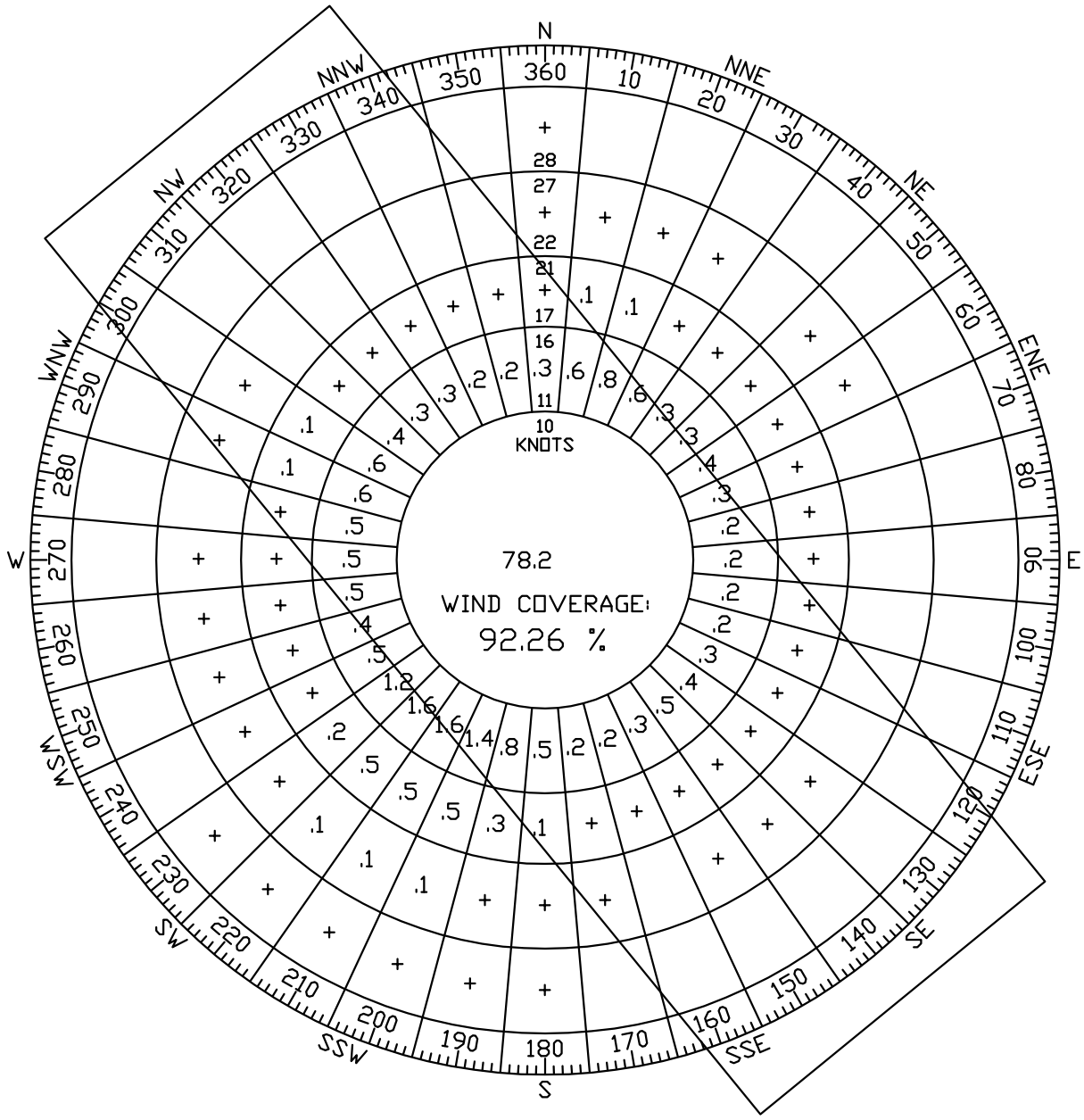
WAUKEGAN PORT DISTRICT

HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: IFR Weather Wind Rose - 13 Knot Wind
Runway 5-23

Exhibit No.: B-11



NUMBER OF OBSERVATIONS = 71,238

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 1000' CEILING AND 3 MILE VISIBILITY

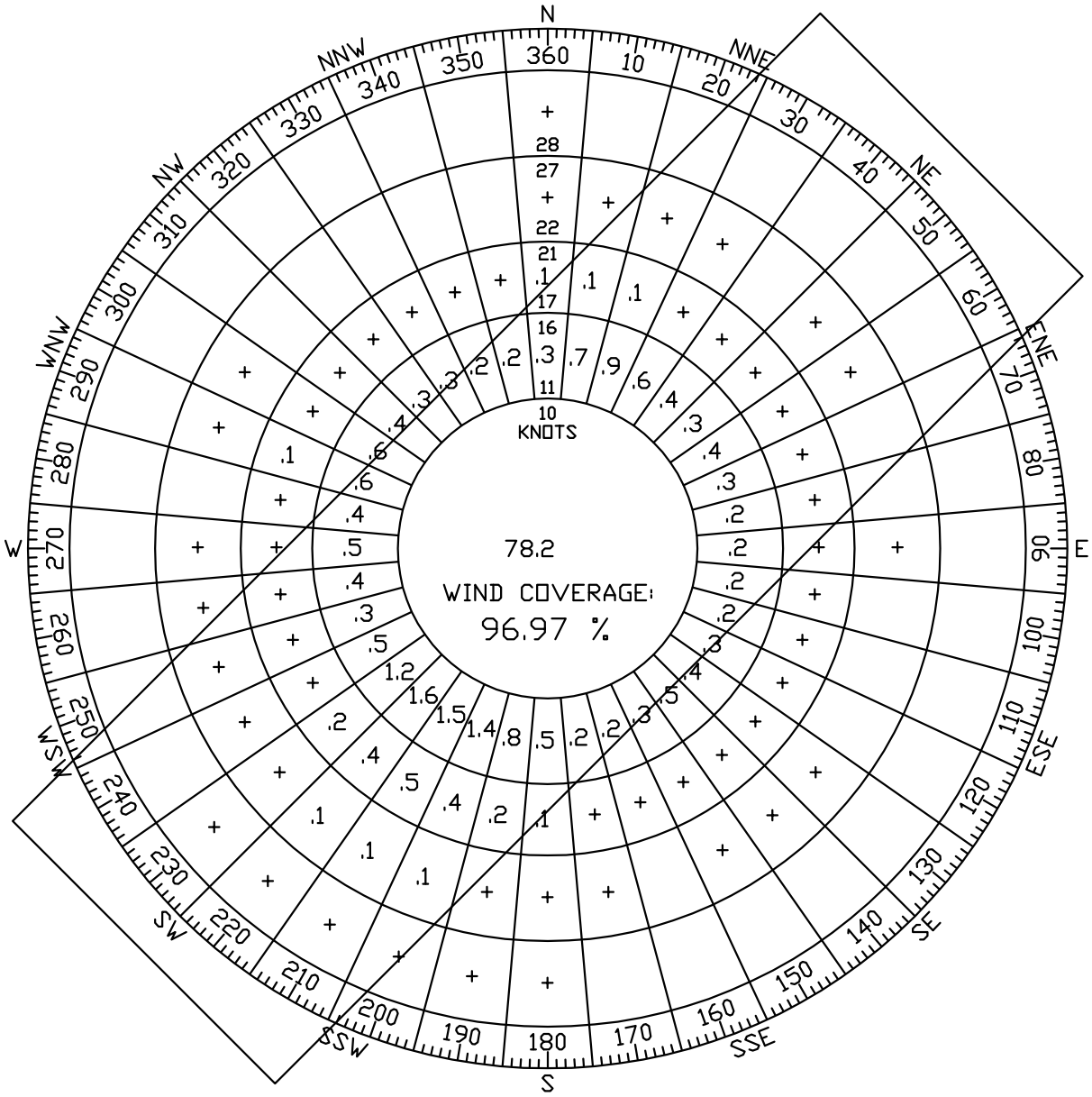
WAUKEGAN PORT DISTRICT

HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: IFR Weather Wind Rose - 13 Knot Wind
Runway 14-32

Exhibit No.: B-12



NUMBER OF OBSERVATIONS = 76,588

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 500' CEILING AND 1 MILE VISIBILITY

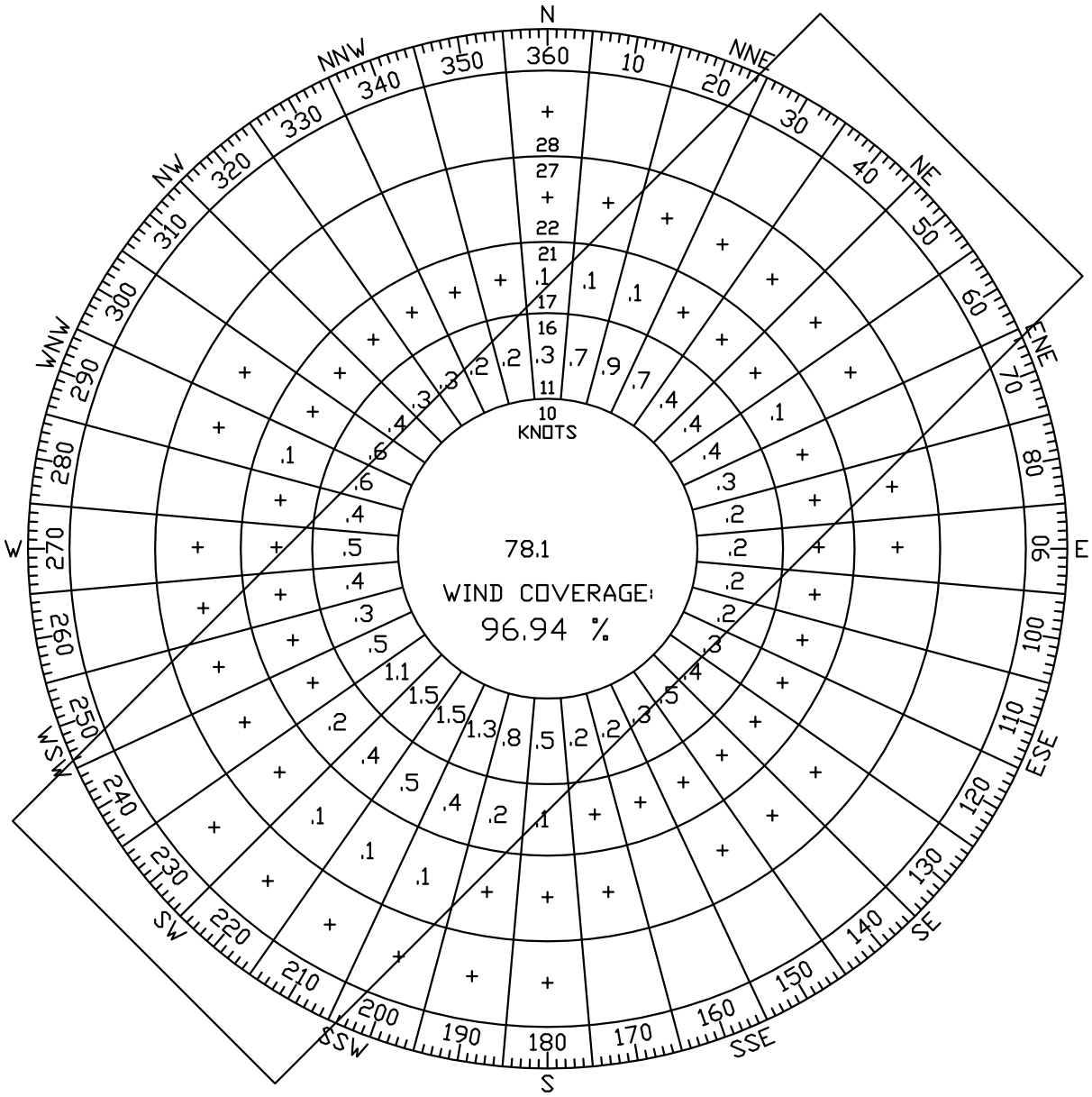
WAUKEGAN PORT DISTRICT

HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: 500' Ceiling; 1 Mile Visibility
Wind Rose - 13 Knot Wind Runway 5-23

Exhibit No.: B-13



NUMBER OF OBSERVATIONS = 77,868

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 300' CEILING AND 1 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

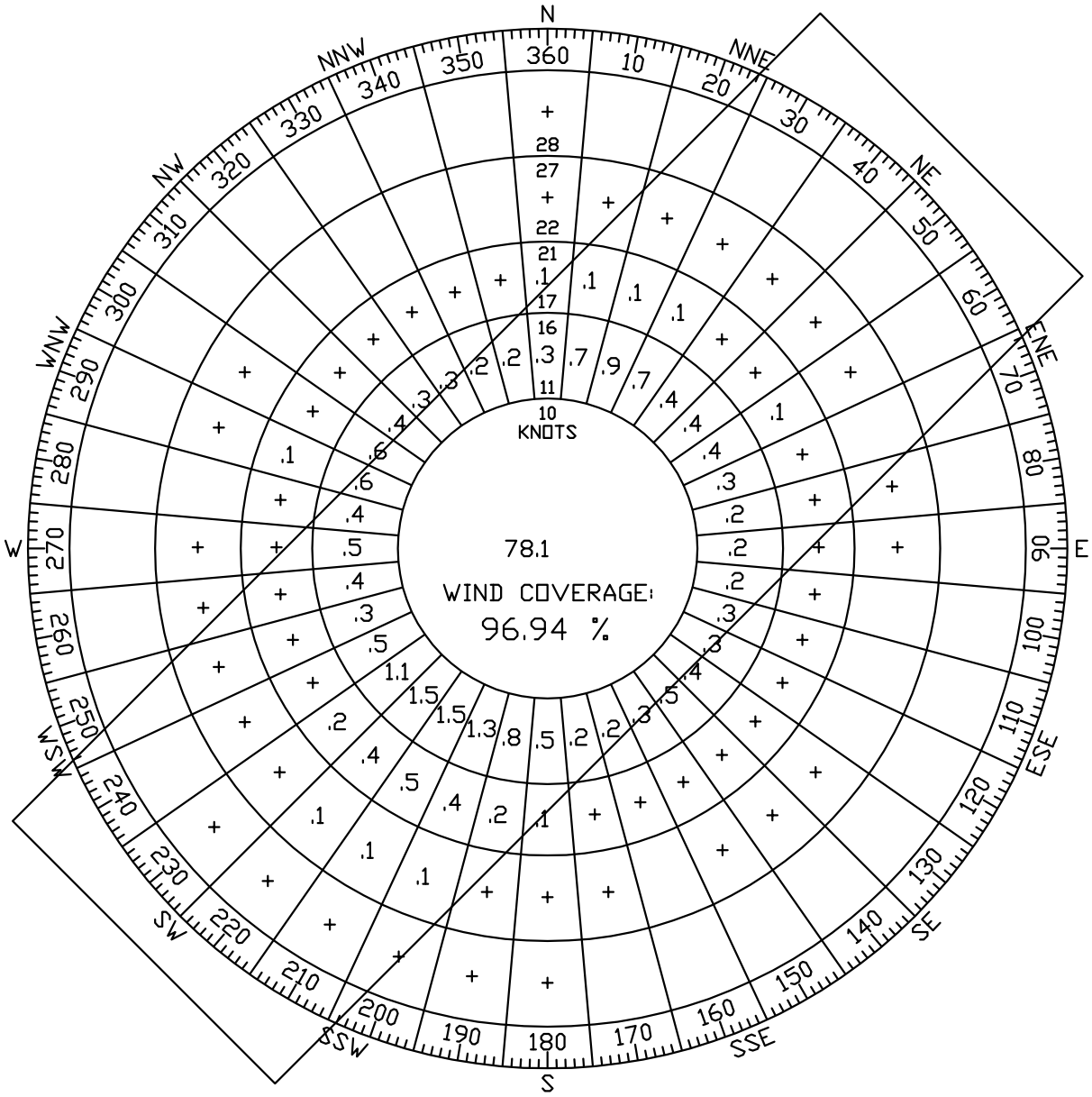
HANSON

MASTER PLAN

WAUKEGAN REGIONAL AIRPORT

Sheet Title: 300' Ceiling; 1 Mile Visibility
Wind Rose - 13 Knot Wind Runway 5-23

Exhibit No.: B-14



NUMBER OF OBSERVATIONS = 78,282

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 300' CEILING AND ½ MILE VISIBILITY

WAUKEGAN PORT DISTRICT

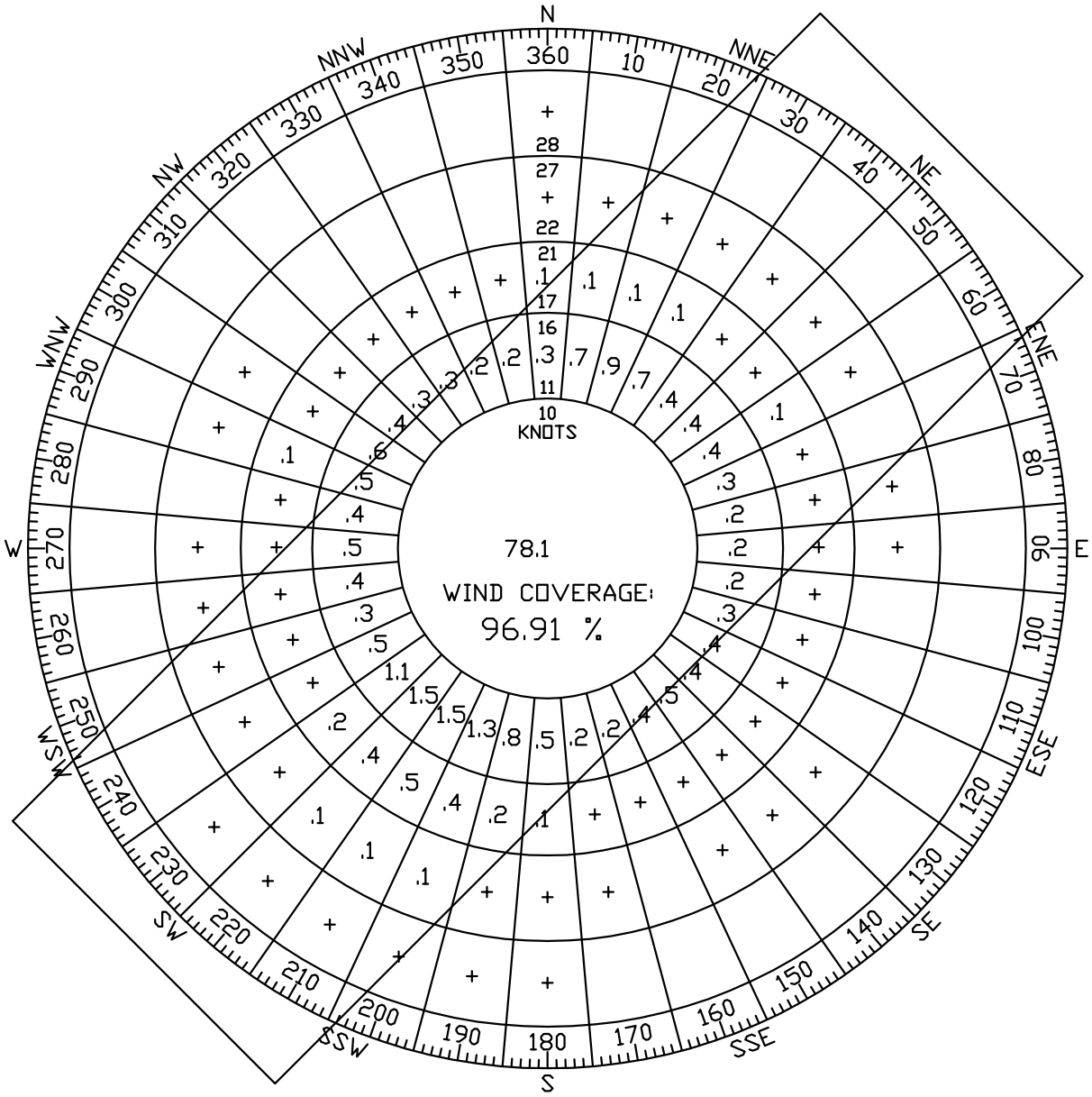
HANSON

MASTER PLAN

WAUKEGAN REGIONAL AIRPORT

Sheet Title: 300' Ceiling; ½ Mile Visibility
Wind Rose - 13 Knot Wind Runway 5-23

Exhibit No.: B-15



NUMBER OF OBSERVATIONS = 78,821

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 200' CEILING AND ½ MILE VISIBILITY

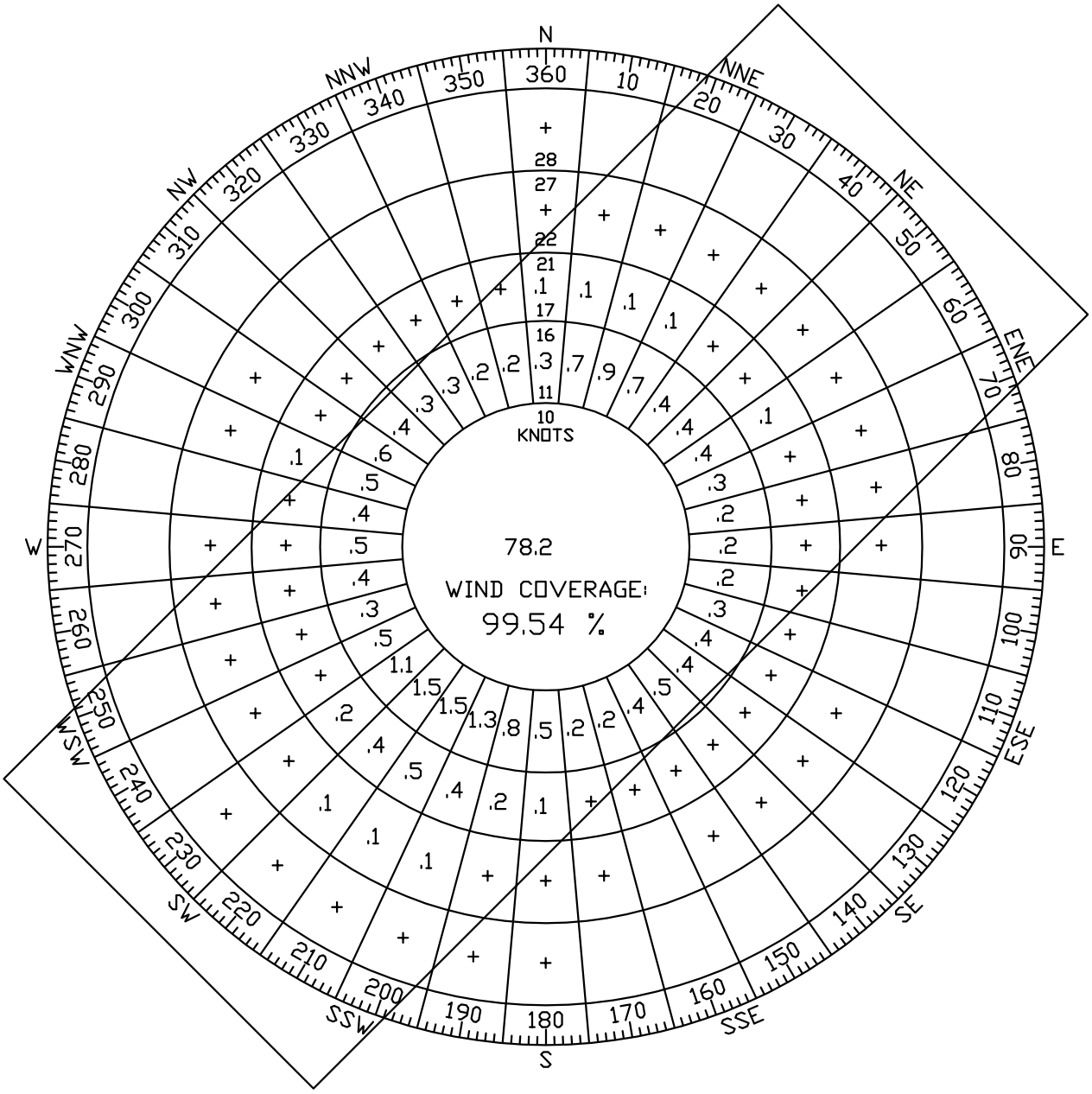
WAUKEGAN PORT DISTRICT

HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: 200' Ceiling; ½ Mile Visibility
Wind Rose - 13 Knot Wind Runway 5-23

Exhibit No.: B-16



NUMBER OF OBSERVATIONS = 80,371

ALL OBSERVED WHEN CONDITIONS INCLUDE GREATER THAN 1000' CEILING AND GREATER THAN 3 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

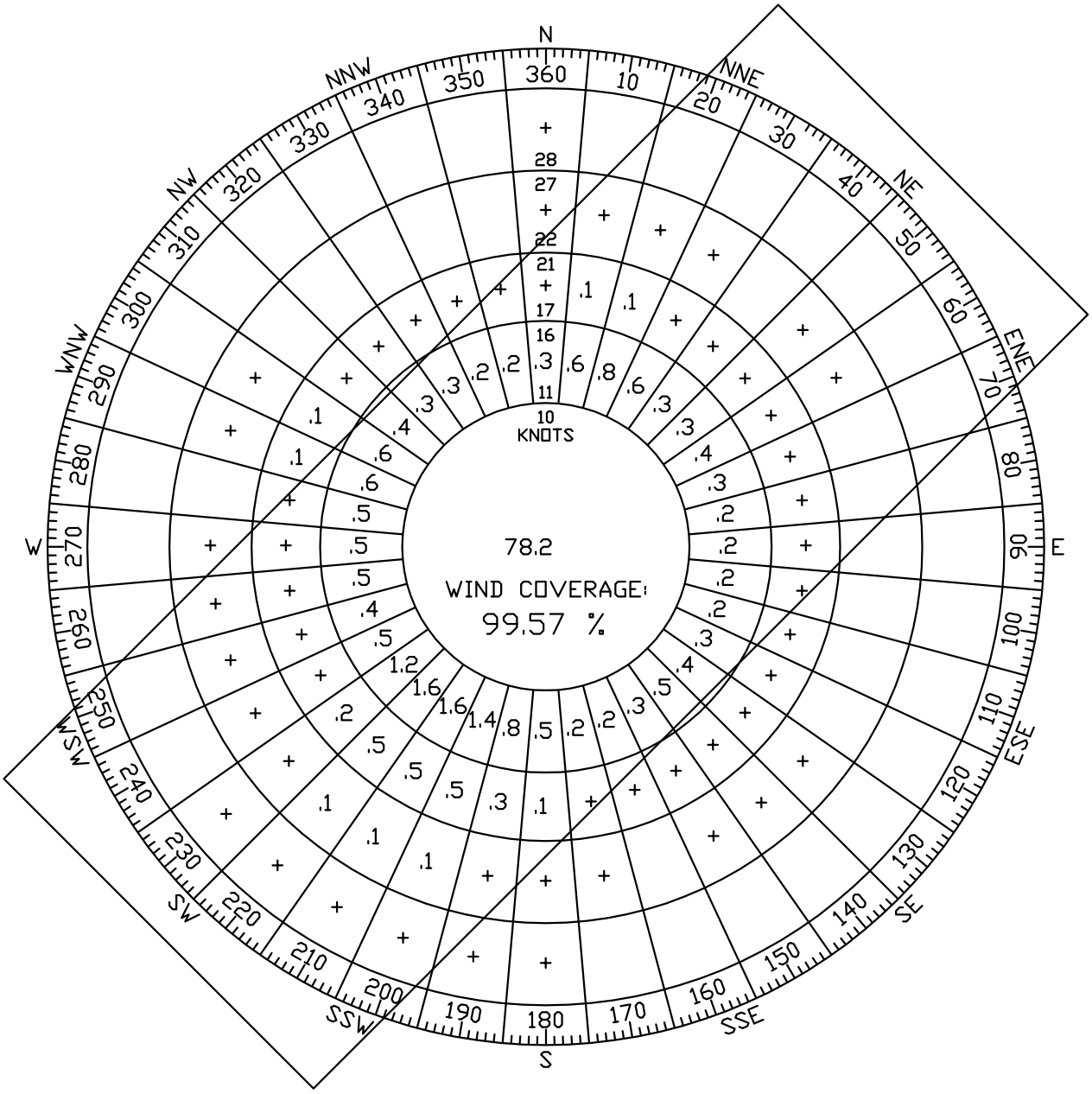
HANSON

MASTER PLAN

WAUKEGAN REGIONAL AIRPORT

Sheet Title: All Weather Wind Rose - 16 Knot Wind
Runway 5-23

Exhibit No.: B-17



NUMBER OF OBSERVATIONS = 71,238

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 1000' CEILING AND 3 MILE VISIBILITY

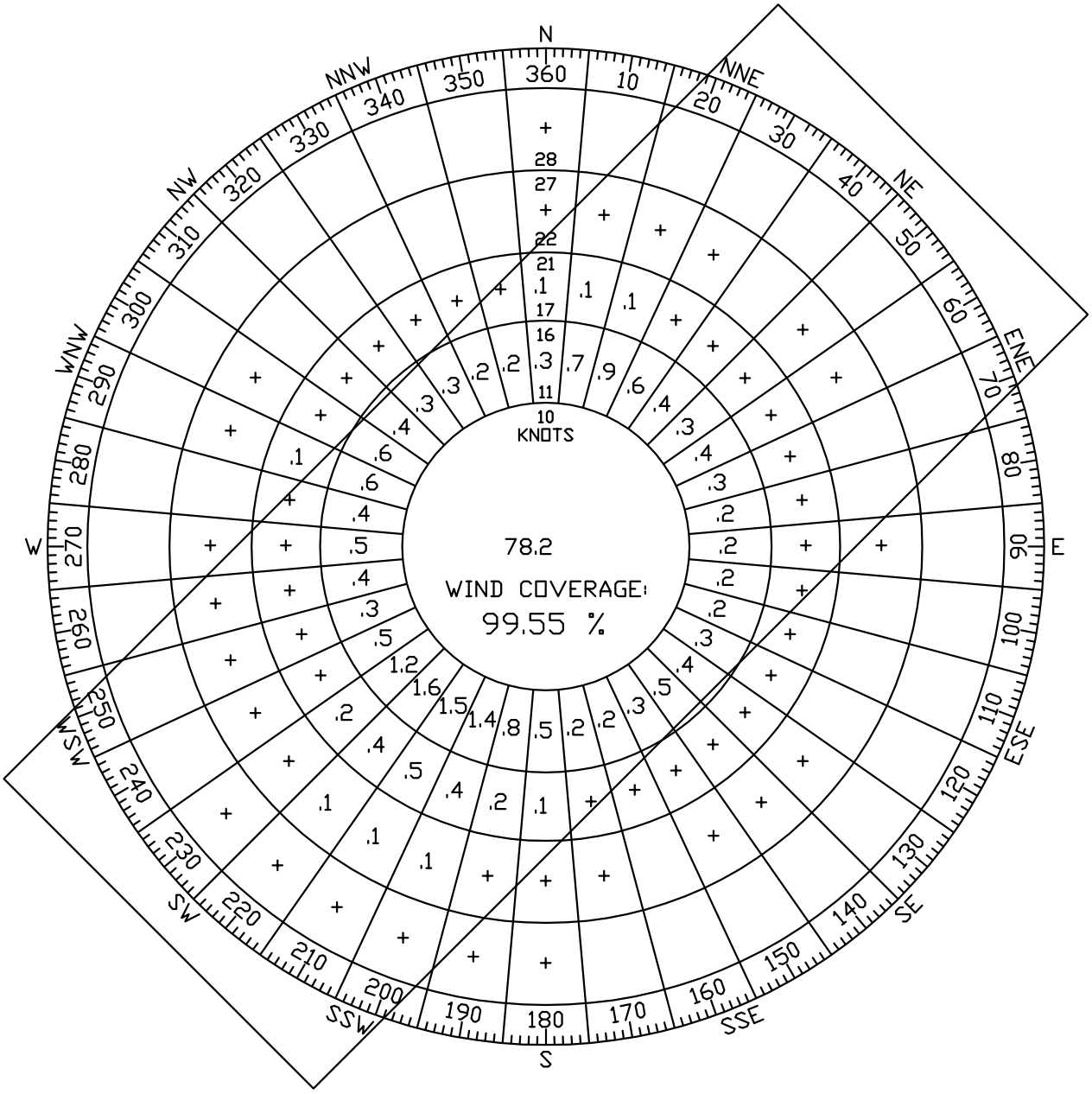
WAUKEGAN PORT DISTRICT

HANSON

MASTER PLAN
WAUKEGAN REGIONAL AIRPORT

Sheet Title: IFR Weather Wind Rose - 16 Knot Wind
Runway 5-23

Exhibit No.: B-18



NUMBER OF OBSERVATIONS = 76,588

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 500' CEILING AND 1 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

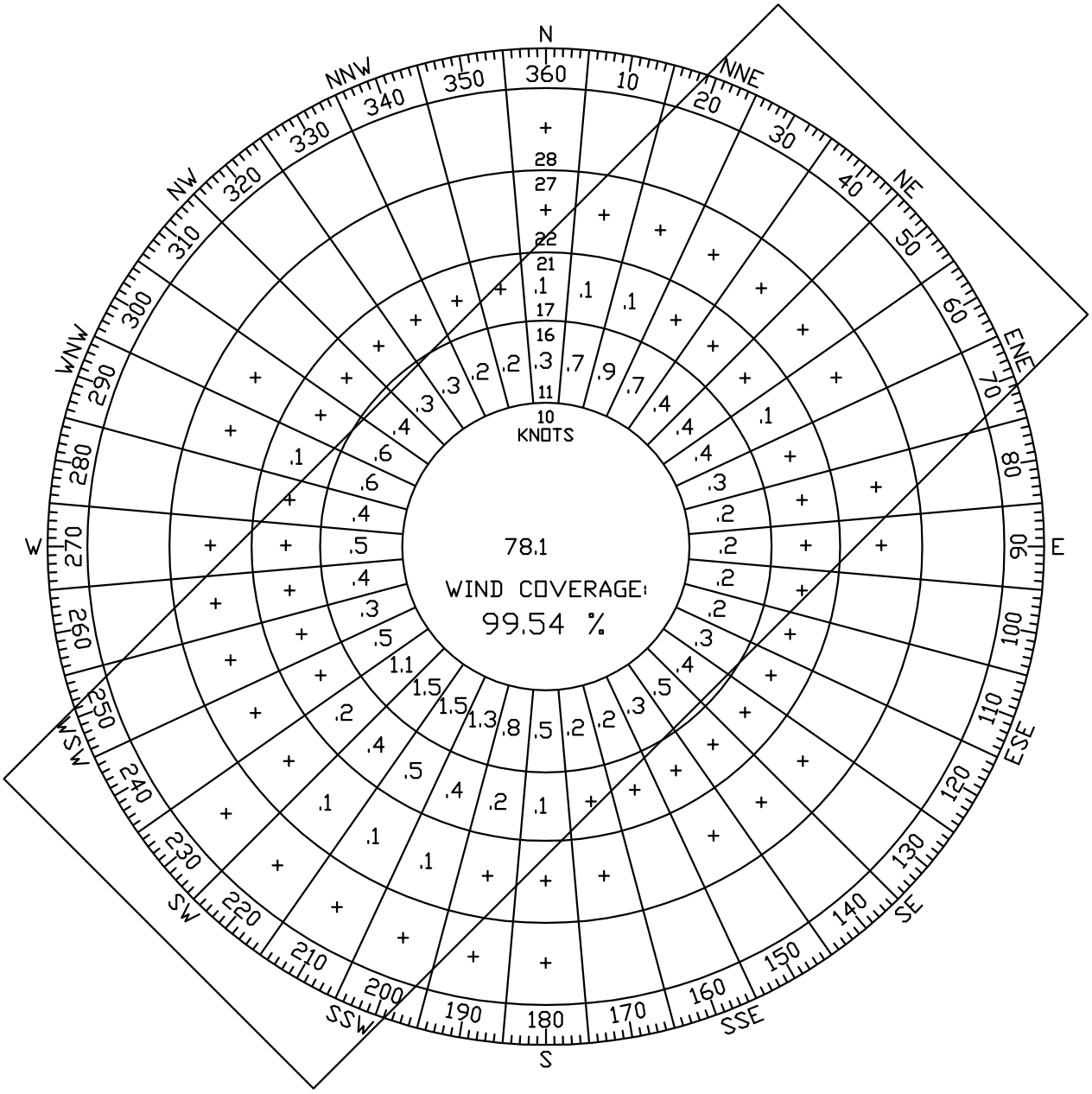
HANSON

MASTER PLAN

WAUKEGAN REGIONAL AIRPORT

Sheet Title: 500' Ceiling; 1 Mile Visibility
Wind Rose - 16 Knot Wind Runway 5-23

Exhibit No.: B-19



NUMBER OF OBSERVATIONS = 77,868

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 300' CEILING AND 1 MILE VISIBILITY

WAUKEGAN PORT DISTRICT

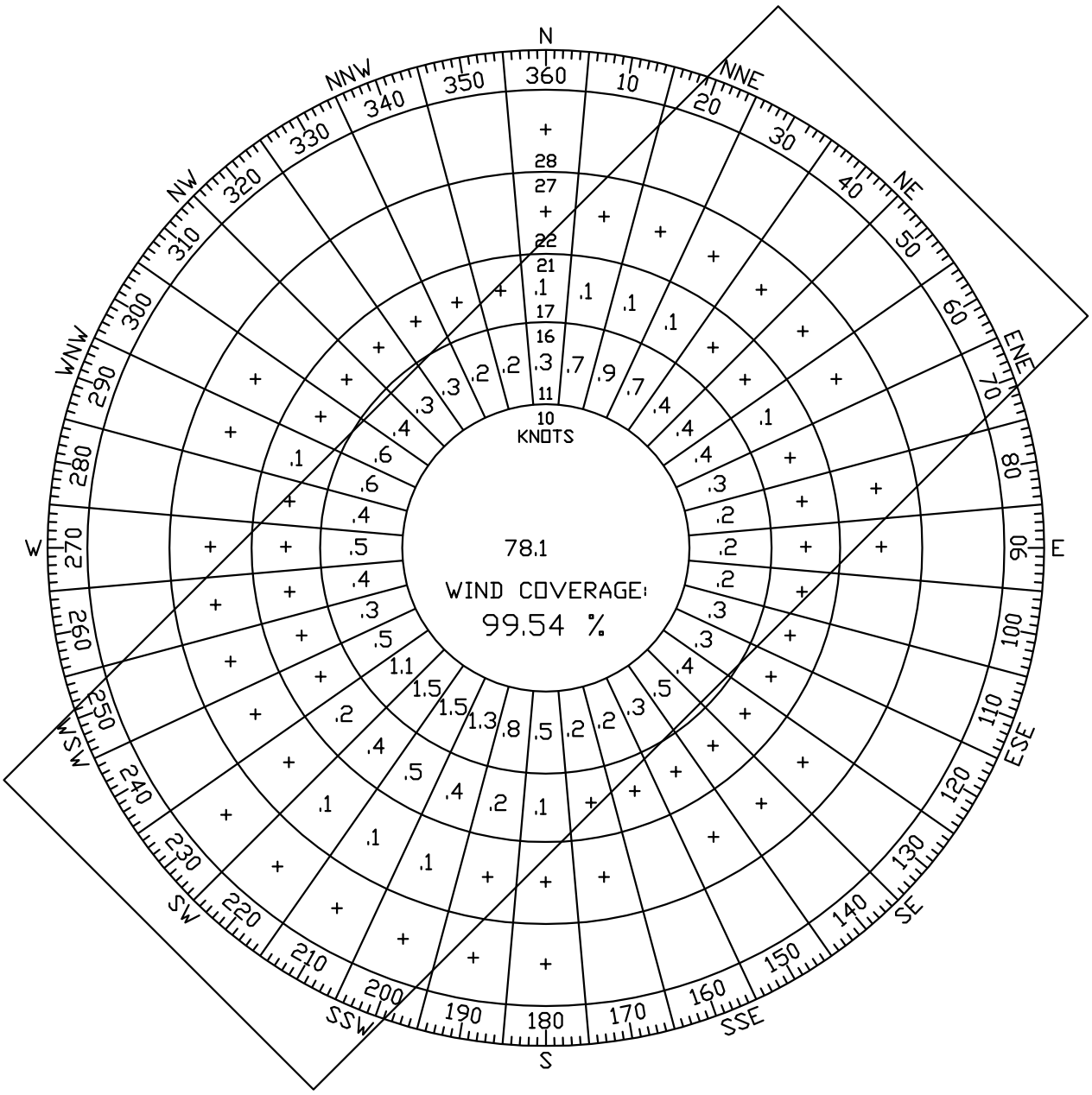
HANSON

MASTER PLAN

WAUKEGAN REGIONAL AIRPORT

Sheet Title: 300' Ceiling; 1 Mile Visibility
Wind Rose - 16 Knot Wind Runway 5-23

Exhibit No.: B-20



NUMBER OF OBSERVATIONS = 78,282

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 300' CEILING AND ½ MILE VISIBILITY

WAUKEGAN PORT DISTRICT

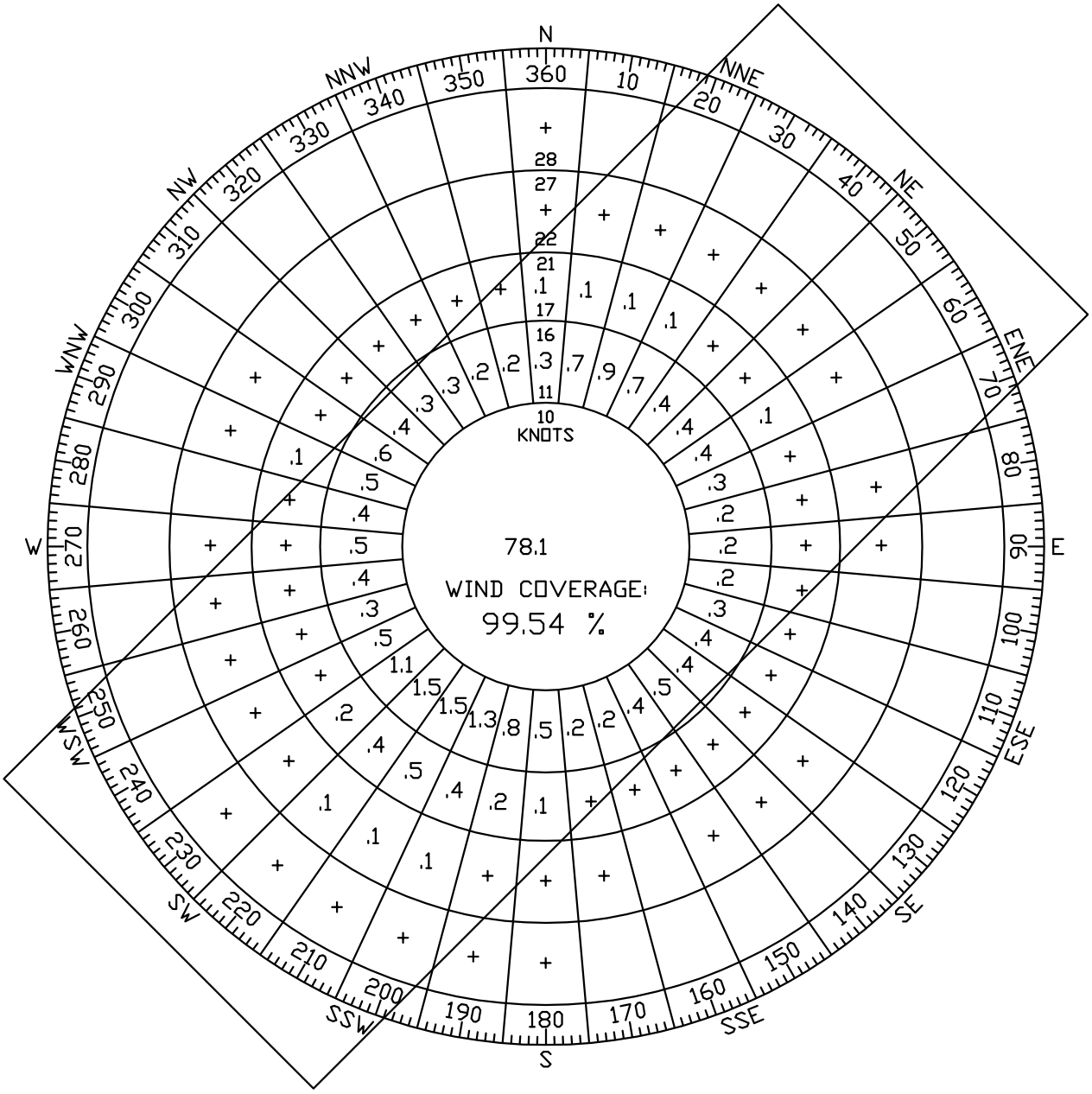
HANSON

MASTER PLAN

WAUKEGAN REGIONAL AIRPORT

Sheet Title: 300' Ceiling; ½ Mile Visibility
Wind Rose - 16 Knot Wind Runway 5-23

Exhibit No.: B-21



NUMBER OF OBSERVATIONS = 78,821

ALL OBSERVED WHEN CONDITIONS INCLUDE LESS THAN 200' CEILING AND ½ MILE VISIBILITY

WAUKEGAN PORT DISTRICT

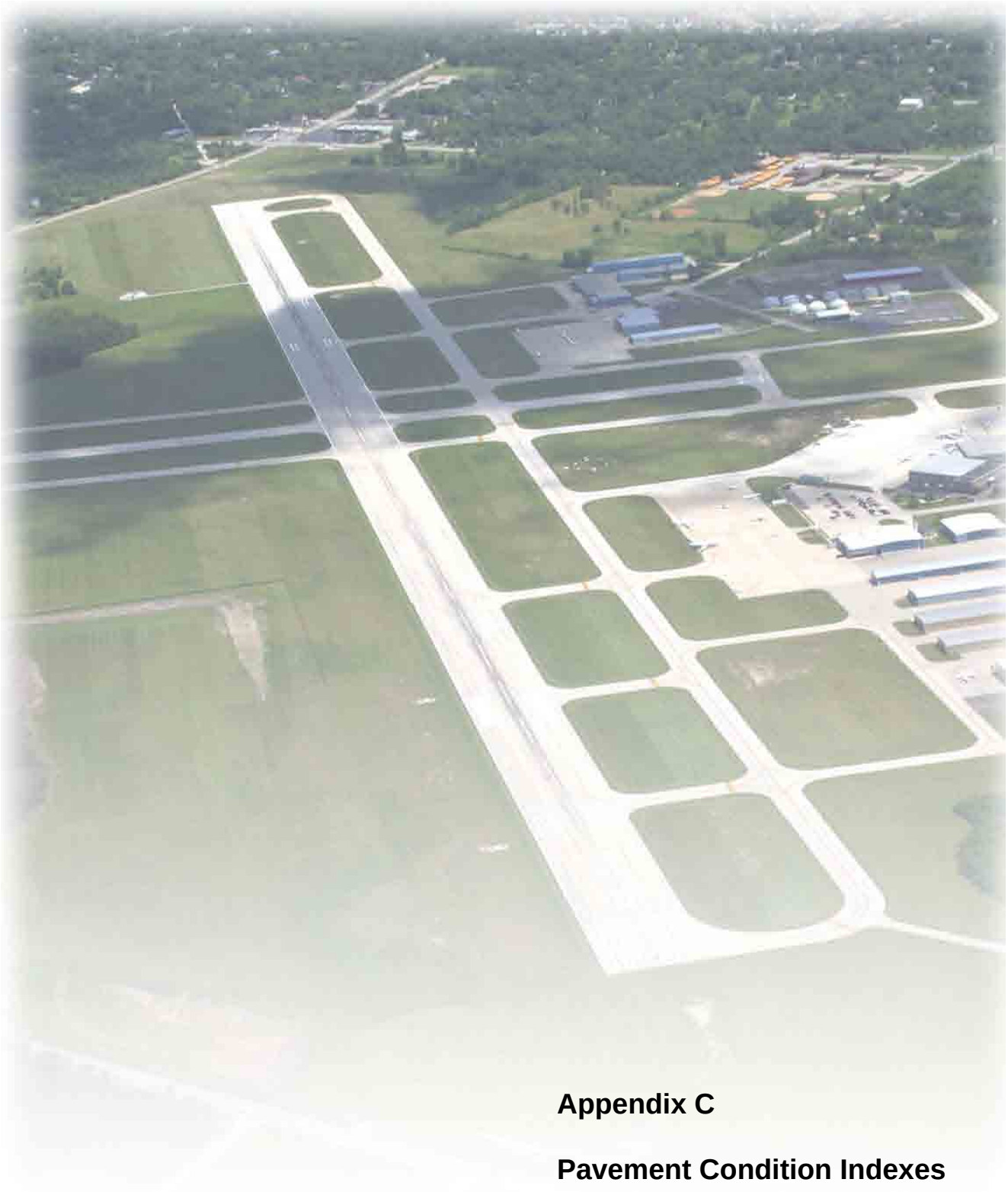
HANSON

MASTER PLAN

WAUKEGAN REGIONAL AIRPORT

Sheet Title: 200' Ceiling; ½ Mile Visibility
Wind Rose - 16 Knot Wind Runway 5-23

Exhibit No.: B-22



Appendix C

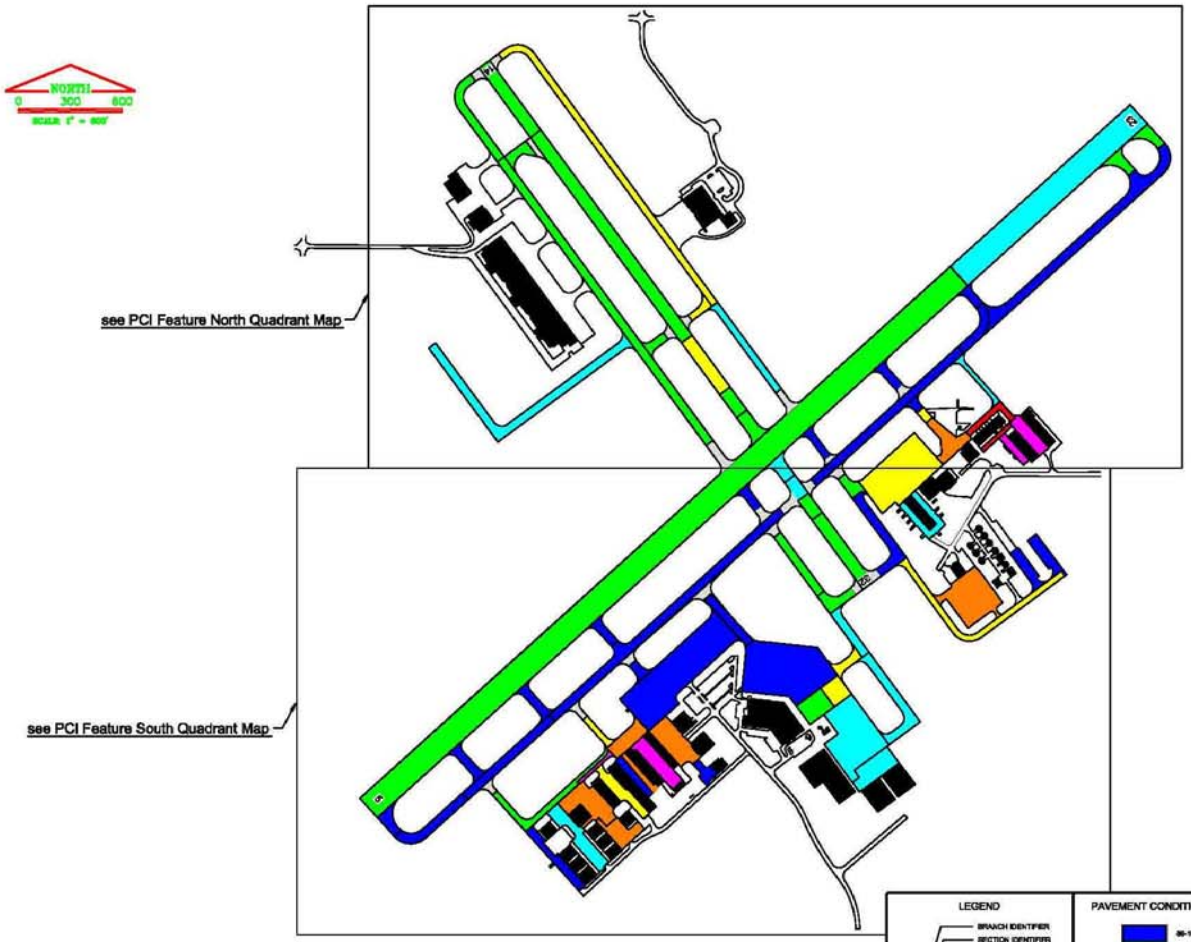
Pavement Condition Indexes

The Airport Pavement Evaluation procedure was developed at the Construction Engineering Research Laboratory in Champaign, Illinois. In 1980, the Illinois Department of Transportation (IDOT) began using this procedure to inspect and evaluate airfield pavements at every public-use airport in Illinois. These evaluations, conducted at each airport every other year, do not purport to identify or rate existing pavement strengths, but rater are intended to identify the present pavement surface condition.

With the evaluation procedure, each runway, taxiway, and apron at an airport is divided into various pavement features possessing consistent thickness and materials that were constructed at the same time. A sample survey is then performed for each feature, the number of samples being dependent upon the variation of the distresses over the extent of the feature. The actual survey measures the quantity and severity of each distress type; these measurements are then passed through a computer program to determine the Pavement Condition Index (PCI). The PCI scores are values of from 0 to 100 and are categorized as follows:

PCI Value	Rating
86-100	Excellent
71-85	Very Good
56-70	Good
41-55	Fair
26-40	Poor
11-25	Very Poor
0-10	Failed

The existing airfield pavement conditions at Waukegan Regional Airport are shown in the following Figures. The evaluation results are based on a 2009 inspection of the Airport.



LEGEND

BRANCH IDENTIFIER
SECTION IDENTIFIER
PCI
8/1 (87)
SECTION BREAK LINE

PAVEMENT CONDITION INDEX

86-100
71-85
56-70
41-55
26-40
11-25
0-10

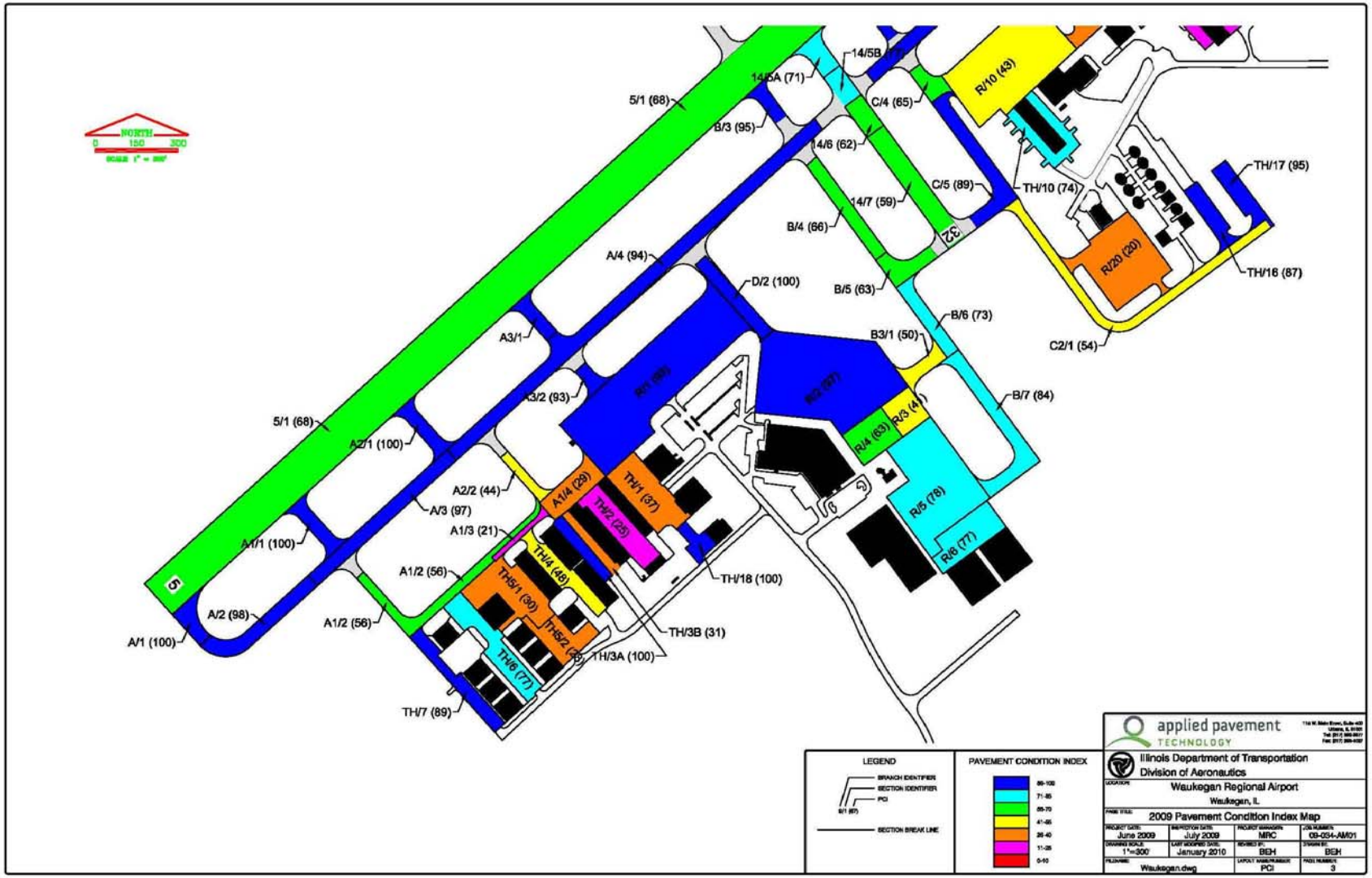
applied pavement TECHNOLOGY

Illinois Department of Transportation
Division of Aeronautics

LOCATION: Waukegan Regional Airport
Waukegan, IL

PAGE TITLE: 2009 Pavement Condition Index Map

PROJECT DATE: June 2009	INSPECTION DATE: July 2009	PROJECT MANAGER: MRC	JOB NUMBER: 09-034-AM01
DRAWING SCALE: 1"=600'	LAST REVISED DATE: January 2010	REVISED BY: BEH	DRAWN BY: BEH
FILENAME: Waukegan.dwg		LAYOUT NAME/NUMBER: PCI	PAGE NUMBER: 1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0 150 300
5/1 (68)
14/5A (71)
14/5B
C/4 (65)
R/10 (43)
B/3 (95)
14/6 (62)
C/5 (89)
TH/10 (74)
TH/17 (95)
14/7 (59)
B/4 (66)
32
R/20 (20)
TH/16 (87)
A/4 (94)
D/2 (100)
B/5 (63)
B/6 (73)
B3/1 (50)
C2/1 (54)
A3/1
A3/2 (93)
B/7 (84)
5/1 (68)
A2/1 (100)
R/4 (63)
R/3 (4)
A2/2 (44)
A1/4 (29)
TH/1 (37)
A/3 (97)
TH/2 (25)
R/5 (78)
A1/3 (21)
A1/1 (100)
TH/4 (48)
R/6 (77)
A1/2 (56)
TH/5/1 (30)
TH/18 (100)
5
A/2 (98)
TH/5/2 (25)
TH/3B (31)
A/1 (100)
A1/2 (56)
TH/3A (100)
TH/6 (77)
TH/7 (89)
LEGEND
BRANCH IDENTIFIER
SECTION IDENTIFIER
PCI
5/1 (67)
SECTION BREAK LINE
PAVEMENT CONDITION INDEX
86-100
71-85
55-70
41-55
26-40
11-25
0-10
applied pavement TECHNOLOGY
Illinois Department of Transportation
Division of Aeronautics
LOCATION: Waukegan Regional Airport
Waukegan, IL
FIGURE TITLE: 2009 Pavement Condition Index Map
PROJECT DATE: June 2009
INSPECTION DATE: July 2009
PROJECT MANAGER: MRC
JOB NUMBER: 09-034-AM01
DRAWING SCALE: 1"=300'
LAST MODIFIED DATE: January 2010
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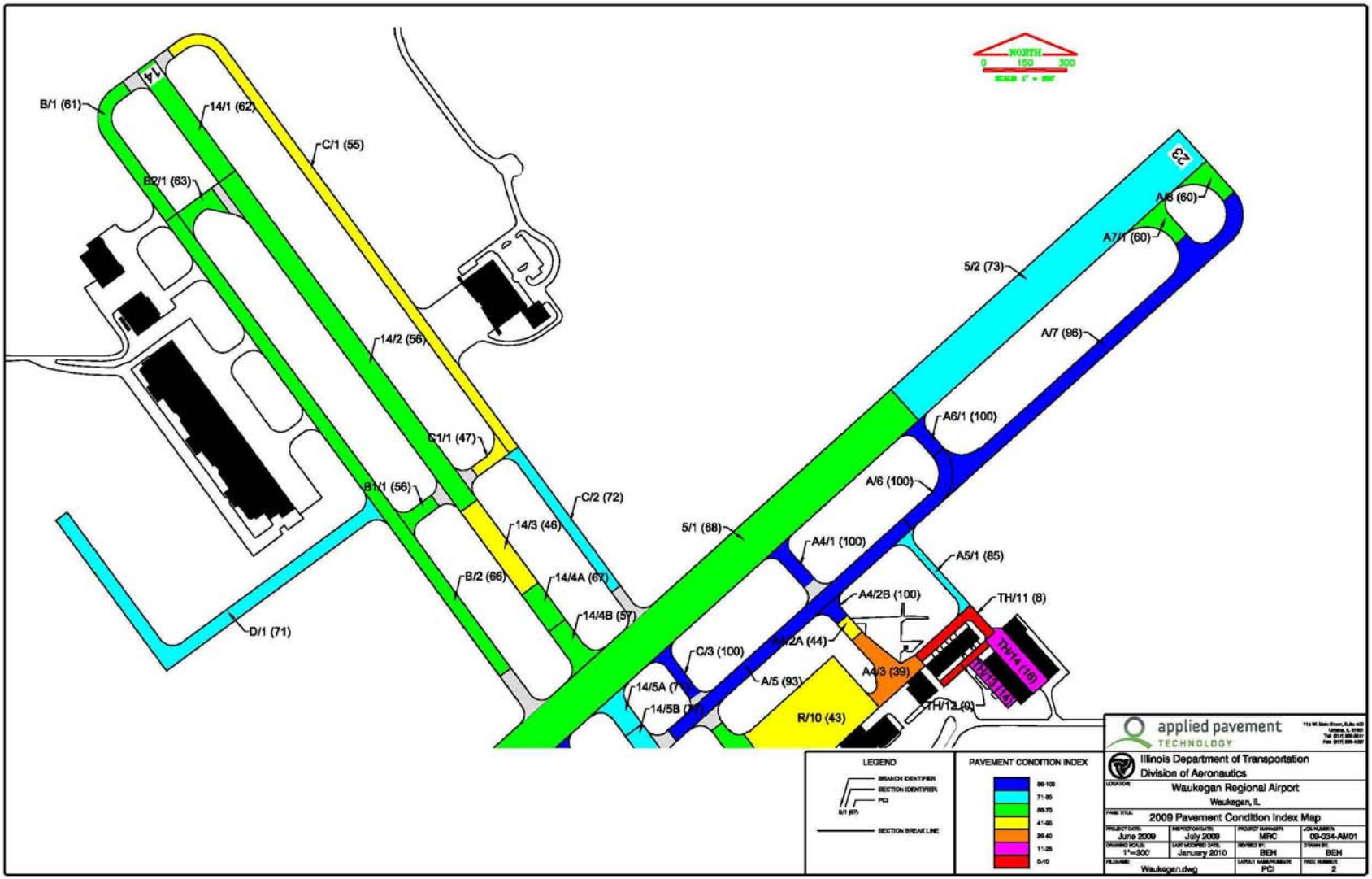
FILENAME: Waukegan.dwg
LAYOUT NAME/PLANSHEET: PCI
PAGE NUMBER: 3


NORTH
0 150 300
14
23
B/1 (61)
14/1 (62)
C/1 (55)
B2/1 (63)
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C1/1 (47)
B1/1 (56)
C/2 (72)
14/3 (46)
B/2 (66)
14/4A (67)
14/4B (57)
D/1 (71)
5/1 (68)
C/3 (100)
14/5A (7
14/5B (
A/5 (93)
R/10 (43)
A4/1 (100)
A4/2A (44)
A4/2B (100)
A4/3 (39)
A6 (100)
A6/1 (100)
A7 (96)
A7/1 (60)
A/8 (60)
5/2 (73)
A5/1 (85)
TH/11 (8)
TH/12 (0)
TH/14 (16)
LEGEND
BRANCH IDENTIFIER
SECTION IDENTIFIER
PCI
8/1 (67)
SECTION BREAK LINE
PAVEMENT CONDITION INDEX
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LAYOUT MASTER/MAKER: PCI
PAGE NUMBER: 2

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