1 Inventory of Existing Facilities and Conditions

The initial step in the master planning process is to develop an inventory of the existing physical conditions and operational characteristics of an airport and its surroundings. The following elements are detailed in this chapter:

- Airside Facilities
- Passenger Terminal Area Facilities
- Support Facilities
- Snow and Ice Control
- Surface Parking
- Other Facilities
- Airspace
- Operations Data
- Socioeconomic and Community Data
- Meteorological Conditions
- Environmental Considerations
- Land Use
- Financial Structure

The information in this chapter provides the basis for evaluating facility requirements for the Nashville International Airport. **Figure 1-1** identifies the existing facilities at the Airport.

1.1 Airside Facilities

An airport's airside facilities generally include those within the airport security fence and typically relate to the landing, takeoff, or taxiing of aircraft. Runway and taxiway systems; aircraft parking aprons and hangars; and airfield lighting, marking, signage and navigational systems; aids characterize the airside of an airport. The design of airside facilities should reflect the standards stated in the FAA's advisory circulars that relate to the type of aircraft operating at an airport. The following sections describe the characteristics and conditions of the Airport's current airside facilities. **Figure 1-2** illustrates the Airport Diagram.

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Nashville International Airport

RW ARMSTRONG

Building List

4103	QUONSET HUT
4106	AIR CARGO TERMINAL I
4107	MOBILE EQUIPMENT
4108	EQ. STOR. SHED #1
4112	INTERNATIONAL PLAZA
4113	Embraer / MNAA STORAGE
4117	AIRFIELD EQUIPMENT STORAGE
4118	VORTAC
4119	FAA EMRG GENERATOR
4121	NEW ORLEANS MANOR
4122	FLEA MRKT
4123	GENESCO OFFICE
4124	GENESCO MANUFACTURING
4125	AUTO CYCLES AND MORE
4126	ARMADA VAN RENTAL
4128	EQ. STOR. SHED #2
4129	WASH RACK
4132	MNAA PROCUREMENT
4133	2L GLIDE SLOPE SHELTER
4134	MATERIALS CONTROL / MNAA SHOPS
4135	EQ. STOR. SHED #3
4138	BNA CORPORATE CTR #100
4139	BNA CORPORATE CTR #200
4140	EMBRAER MAINT
4141	EMBRAER PAINT
4142	EMBRAER HANGAR
4143	AIR CARGO TERMINAL 2
4144	FEDEX
4145	ELECTRICAL VAULT WEST
4149	DELL ASL
4151	2L LOCALIZER SHELTER
4152	2L ALS SUBSTATION
4153	20R LOCALIZER SHELTER
4154	31 LOCALIZER SHELTER
4155	20 R GLIDESLOPE SHELTER
4160	NASHVILLE HANGAR

Building List (Continued)

4162	SATA HANGAR
4201	HANGAR #1
4202	HANGAR #2
4203	HANGAR #3
4205	HANGAR #5
4206	HANGAR #4
4207	HANGAR #7
4208	HANGAR #8
4209	SIGNATURE FS
4210	STATE OF TENNESSEE HANGAR
4215	FLIGHT SERVICE STATION
4216	ATCT and OFFICES
4217	FLAGSHIP AIRLINES OFFICES
4218	SANITARY PUMPING STATION
4219	TN AERONAUTICS
4222	T-HANGAR
4223	T-HANGAR
4224	T-HANGAR
4251	GASSAWAY
4252	MNAA
4253	TDOT AERIAL SURVEYS
4254	SIGNATURE MAIN TERMINAL
4255	SIGNATURE HANGAR #9
4256	SIGNATURE HANGAR #9
4257	SIGNATURE HANGAR #9
4258	FORMER GUN CLUB
4261	T-HANGARS
4262	RUNWAY 31 GLIDESLOPE EQUIPMENT SHELTER
4263	HANGAR #10
4264	HANGAR #11
4265	HANGAR #12
4266	STEVENS AVIATION MAIN TERMINAL
4267	TOMCO
4268	HR
4269	OWL HILL HOLDINGS
4270	GA WATER LINE BUILDING

Building List (Continued)

4271	SANITARY SEWER PUMPING STATION
4272	REMOTE RECEIVER FACILITY
4273	REMOTE TRANSMITTER FACILITY
4274	REAL WORLD
4275	TUNNEL MECH ROOM
4276	TUNNEL MECH ROOM
4277	ATLANTIC
4279	FUEL STORAGE CANOPY
4301	TERMINAL
4302	NORTH CONCOURSES
4303	SOUTH CONCOURSES
4304	PARKING GARAGE – SHORT TERM
4306	TOLL PLAZA OFFICES
4307	IAB
4309	RENTAL CAR FACILITY
4310	RENTAL CAR FACILITY
4311	ELECTRICAL VAULT EAST
4313	TOLL PLAZA
4314	VALET PARKING STATION
4315	TOLL PLAZA
4316	RESTROOM
4317	TOLL PLAZA
4321	AIR FREIGHT
4322	U.S. POST OFFICE
4323	MULTIPURPOSE
4324	DTA
4331	FUEL FARM CONTROL
4332	TRITURATOR
4333	OLYCOL
4334	ARFF
4340	2R GLIDE SLOPE EQUIPMENT SHELTER
4341	20L GLIDE SLOPE EQUIPMENT SHELTER
4342	2R ALSF-2 SUBSTATION/GENERATOR
4343	20L MALSR POWER & CONTROL SHELTER
4344	2R CAT III LOCALIZER/DME SHELTER
4345	20 L LOCALIZER SHELTER

Building List (Continued)

4346	20L MIDDLE MARKER SHELTER
4347	2R INNER MARKER SHELTER
4348	2R MIDDLE MARKER SHELTER
4349	ENTERPRISE
4350	THRIFTY
4351	CSF
4352	ALAMO
4353	BUDGET
4354	DOLLAR
4355	HERTZ
4356	AVIS
4357	NATIONAL
4361	EQ. SHED #4
4364	FIRING RANGE
4365	ASR 9 SITE
4405	2C MALSR POWER & CONTROL SHELTER
4406	2C MALSR POWER & CONTROL SHELTER
4449	SAND STORAGE
4450	SALT STORAGE
4451	SOD FARM
4452	LAB FACILITY
4453	STORAGE BUILDING
5103	BEACON
5104	TRAILER – 32 X 8
209	PICNIC SHELTER
210	ENGINE TEST STAND – RUN-UP AREA
211	RIFLE TESTING TUNNEL
214	MARKSMANSHIP FIRING RANGE
226	VEHICLE STORAGE SHED
702	AGE PAINT SPRAY BOOTH
706	CIVIL ENGINEERING LUMBER STORAGE
708	CIVIL ENGINEERING SHOP
712	SEGREGATED MAGAZINE STORAGE
717	BASE SUPPLY STORAGE SHED
718	BASE SUPPLY STORAGE SHED
720	BASE SUPPLY

Building List (Continued)

721	MAINTENANCE SHOPS & OFFICES 118TH
723	SQUADRON OPERATIONS
730	BASE SUPPLY HAZARD STORAGE
731	BASE SUPPLY PAINT STORAGE
732	FUEL CELL REPAIR
733	WASH RACK/STORAGE
734	CORROSION CONTROL
736	AEROMED/AERIAL PORT/FIRE HALL
738	AERIAL PORT STORAGE
740	ENGINE INSPECTION AND REPAIR
741	FUEL CELL DOCK/HANGAR
742	AIR COMPRESSOR BLDG.
743	WATER DISTRIBUTION METERING BLDG.
744	SHED SUPPLY AND EQUIPMENT BASE
745	(unknown) LIQUID OXYGEN
746	RESERVE FORCES AEROMED
747	NEW SQUADRON OPERATIONS
757	HANGAR MAINTENANCE
801	WING HEADQUARTERS/LIFE SUPPORT
802	UNIT MARKSMANSHIP SUPPORT
803	MEDICAL/FOOD SERVICE FACILITY
804	ENTRY CONTROL POINT
806	CHAPEL
807	VEHICLE MAINTENANCE
808	VEHICLE STORAGE SHED
809	VEHICLE STORAGE SHED
810	BASE CIVIL ENGINEERING – ADMIN
811	BASE CIVIL ENGINEERING – SHED
812	A SHOP
813	EQUIPMENT STORAGE
815	GUARD SHACK

LEGEND

- On-Airport Buildings
- Off-Airport Buildings
- Runway Pavement
- Taxiway Pavement
- Apron Pavement
- Hydrology
- Airport Property Boundary

GRAPHIC SCALE (FEET)
0 750 1500

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Figure 1-1
Existing Facilities

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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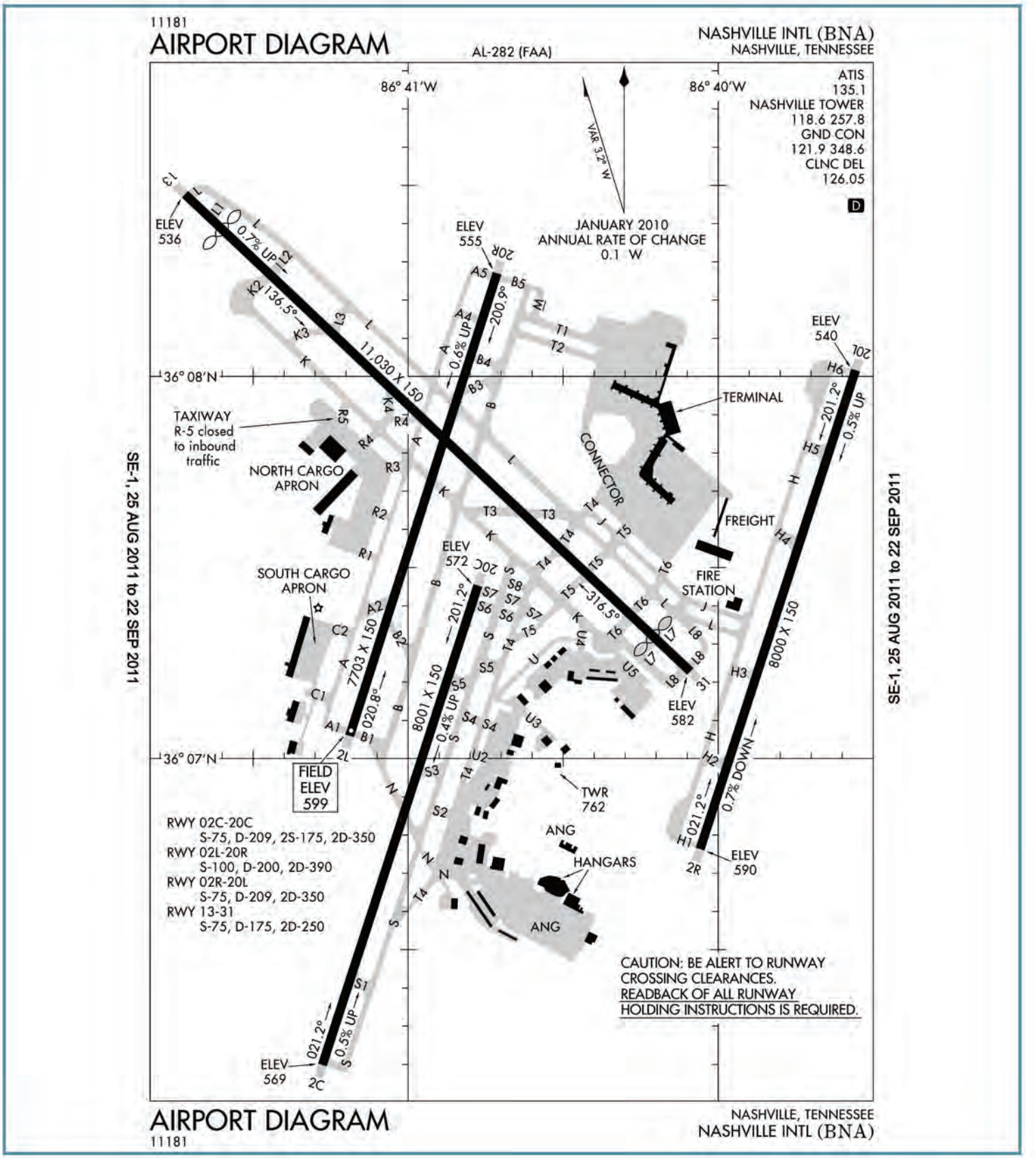

Figure 1-2
Airport Diagram

SOURCE: FAA Airport Facilities Directory (AFD), 2011

1.1.1 Airport Design Criteria

The FAA classifies airports according to the size of aircraft they are designed to accommodate. The system of classification used to relate airport design criteria to the operational and physical characteristics of the operating aircraft is known as an Airport Reference Code (ARC), as described in FAA AC 150/5300-13, *Airport Design*. The characteristics of this system are shown in **Table 1-1**.

The ARC is based on an aircraft's approach speed and wingspan or tail height, whichever is most restrictive. The most demanding aircraft is commonly referred to as the critical, or design, aircraft and must account for a minimum of 500 annual itinerant operations. An itinerant operation is the takeoff or landing of an aircraft going from one airport to another. Local operations are those that remain within 20 nautical miles of the originating airport for the entire flight. The ARC consists of a letter designating the aircraft approach category and a Roman numeral designating the Airplane Design Group (ADG). The Airport is currently designated as an ARC D-V facility.

Table 1-1 – Airport Reference Code

Approach Category		
Approach Category	Airspeed (Knots)	Example Aircraft
A	<91 knots	Cessna 152, Beech Bonanza A36
B	91-<121 knots	Dassault Falcon 900 Gulfstream I
C	121-<141knots	Boeing 737, CRJ
D	141-<166 knots	Boeing 747, MD-11
E	166 knots or more	F-16
Airplane Design Group		
Design Group	Wingspan (Feet)	Example Aircraft
I	<49	Cessna 172, Cirrus SR-22
II	49-<79	ERJ, CRJ
III	79-<118	Boeing 737, Boeing MD 80
IV	118-<171	Boeing 757, MD 11
V	171-<214	Airbus A340, Boeing 747-400
VI	214-<262	Airbus A380, Antonov AN-124

Source: FAA AC 150/5300-13, *Airport Design*, 2011.

1.1.2 Runways

Table 1-2 provides a comparison among the characteristics of runway and taxiway design standards**.**

Table 1-2 – Runway Design Standards

Design Standards	Group III	Group IV	Group V
Runway Width	100 feet	150 feet	150 feet
Runway Shoulder Width	10 feet	20 feet	35 feet
Runway Centerline to:			
Taxiway Holdline	250 feet	250 feet	280 feet
Taxiway Centerline	400 feet	400 feet	400 feet
Aircraft Parking Area	500 feet	500 feet	500 feet

Source: FAA AC 150/5300-13, *Airport Design*, 2011.

There are four active bi-directional runways at BNA, three of which are parallel, oriented in a north/south direction, identified as 2R/20L, 2C/20C, and 2L/20R. Crosswind Runway 13/31 is oriented in a northwest/southeast direction. **Table 1-3** presents the characteristics of each runway.

Runway 2R/20L is 8,000 feet long and 150 feet wide and is situated along the Airport's eastern border. It is constructed of concrete, has a grooved surface, and is supplemented by a 12.5-foot-wide bituminous paved shoulder. The runway's load-bearing capacity is 75,000 pounds for single-wheel landing gear; 209,000 pounds for dual-wheel landing gear, and 350,000 pounds for dual-tandem-wheel landing gear.

Runway 2C/20C is situated between Runway 2R/20L and 2L/20R and south of Runway 13/31. It is 8,000 feet long and 150 feet wide, is constructed of concrete, has a grooved surface and is supplemented by a 12-foot-wide bituminous paved shoulder. The runway's load bearing capacity is 75,000 pounds for single-wheel landing gear; 209,000 pounds for dual-wheel landing gear, and 350,000 pounds for dual-tandem-wheel landing gear. Runways 2C/20C and 2R/20L maintain a centerline separation of 4,655 feet.

Runway 2L/20R lies west of Runway 2C/20C and is 7,703 feet long and 150 feet wide. It is constructed of concrete, has a grooved surface, and is supplemented by a 35-foot-wide bituminous paved shoulder. The runway's load-bearing capacity is 100,000 pounds for single-wheel landing gear; 200,000 pounds for dual-wheel landing gear and 390,000 pounds for dual-tandem-wheel landing gear. Runways 2L/20R and 2C/20C maintain a centerline separation of 1,207 feet.

Runway 13/31 is the Airport's longest runway, measuring 11,029 feet in length and 150 feet in width. It crosses Runway 2L/20R and provides crosswind coverage for the Airport. The runway is constructed of asphalt and concrete, and has a grooved surface. The portion of the runway southeast of its intersection with 2L/20R is supplemented by 35-foot-wide bituminous paved shoulder. Paved shoulders are not provided on the northwest portion of the runway. The runway's load bearing capacity is 75,000 pounds for single-wheel landing gear; 175,000 pounds for dual-wheel landing gear; and 250,000 pounds for dual-tandem-wheel landing gear.

Table 1-3 – Runway Characteristics

	Runway 2L/20R	Runway 2C/20C	Runway 2R/20L	Runway 13/31
Dimensions				
Length (feet)	7,703	8,000	8,000	11,029
Width (feet)	150	150	150	150
Surface Material	Concrete	Concrete	Concrete	Asphalt/Concrete
Surface Treatment	Grooved	Grooved	Grooved	Grooved
Lighting	HIRL	HIRL	HIRL	HIRL
Marking	Precision	Precision	Precision	Precision
Approach Aids	ILS/DME	ILS/GPS	ILS/DME	GPS/VOR-DME
Load Bearing Capacity by Gear Type				
Single-Wheel	100,000 lbs.	75,000 lbs.	75,000 lbs.	75,000 lbs.
Dual-Wheel	200,000 lbs.	209,000 lbs.	209,000 lbs.	175,000 lbs.
Dual-Tandem	390,000 lbs.	350,000 lbs.	350,000 lbs.	250,000 lbs.
Approach Slope	50:1/50:1	50:1/34:1	50:1/50:1	34:1/50:1
Effective Gradient	0.6%	0.0%	0.6%	0.4%
Runway End Coordinates				
Latitude	2L: 36° 7' 3.641"N	2C: 36° 6' 11.991"N	2R: 36° 6' 45.767"N	13: 36° 8' 28.598"N
	20R: 36° 8' 16.230"N	20C:36° 7' 27.24"N	20L: 36° 8' 1.01"N	31: 36° 7' 13.785"N
Longitude	2L: 86° 41' 11.309"W	2C: 86° 41' 16.66"W	2R: 86° 40' 3.516"W	13: 86° 41' 43.278"W
	20R: 86° 40' 42.837"W	20C:86° 40' 46.552"W	20L: 86° 39' 33.398"W	31: 86° 40' 5.441"W

HIRL – High-Intensity Runway Lighting
ILS – Instrument Landing System
DME – Distance Measuring Equipment
LOC – Localizer
GS – Glide Slope
GPS – Global Positioning System
Source: FAA Airport Master Record (Form 5010), 2011.

The FAA requires the publication of declared distances for all runways specified for commercial use, as well as runways with certain operational conditions. Declared distances are published for each of the Airport's runways. Declared distances are a means of alerting pilots to the available runway lengths for various operation types in order to maintain standard runway safety areas (RSAs) and protection zones (RPZs).

Declared distances are defined as follows:

- Takeoff Run Available (TORA) – the runway length declared available and suitable for the ground run of an aircraft taking off.
- Takeoff Distance Available (TODA) – the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA.
- Accelerate Stop Distance Available (ASDA) – the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft aborting takeoff.
- Landing Distance Available (LDA) – the runway length declared available and suitable for an aircraft to land.

Existing runway declared distances are listed in **Table 1-4**.

Table 1-4 – Declared Distances (Feet)

Declared Distance	Runway 2L	Runway 20R	Runway 2C	Runway 20C	Runway 2R	Runway 20L	Runway 13	Runway 31
TORA	7,703	7,703	8,000	8,000	8,000	8,000	10,288	10,228
TODA	7,703	7,703	8,000	8,000	8,000	8,000	11,029	11,029
ASDA	7,703	7,703	8,000	8,000	8,000	8,000	10,288	10,228
LDA	7,703	7,703	8,000	8,000	8,000	8,000	9,487	9,487

Sources: FAA Airport Master Record (Form 5010), 2011.

1.1.3 Taxiways

An airport's taxiway system connects its runways to aircraft parking aprons, storage hangars, and other facilities. The Airport's taxiway characteristics are presented in **Table 1-5** and vary depending on the types of aircraft they are intended to serve.

Table 1-5 – Taxiway Specification

Taxiway/ Taxilane	Purpose	Width (feet)	Construction Type
Alpha (A)	Full-length taxiway serving Runway 2L/20R, the all-cargo apron, Embraer apron, and Taxiways B, C1, C2, K, L, R1, R2, and R3	75	Asphalt/ Concrete
Bravo (B)	Full-length taxiway serving Runway 2L/20R, and Taxiways K, L, N, T1, T2, and Runway 13/31.	75	Asphalt/ Concrete
Charlie (C)	C1 and C2 provide a connection between the South Cargo Apron and Taxiway A	C1: 105 C2: 137	Asphalt/ Concrete
Hotel (H)	Full-length taxiway serving Runway 2R/20L, and Taxiways J and L	75	Asphalt/ Concrete
Juliet (J)	Partial parallel taxiway to southeast portion of Taxiway L and connects to Taxiways H, T4, T5, and T6	75	Asphalt/ Concrete
Kilo (K)	Connects Runway 13 end to Taxiway K2, Embraer apron, and Taxiways K and L	75	Asphalt/ Concrete
Lima (L)	Full-length taxiway serving Runway 13/31, and Taxiways A, B, T3, T4, T5, T6, and Runway 2L/20R	75	Asphalt/ Concrete
Mike (M)	Connects Taxiways T1 and B5	75	Asphalt/ Concrete
November (N)	Connects Runway 2L end to GA area, TANG apron, and Taxiways S and T4 and Runway 2C/20R	75	Asphalt/ Concrete
Romeo (R)	Connects Cargo and Celsius aprons to Taxiways A and K	75	Asphalt/ Concrete
Sierra (S)	Full-length taxiway serving Runway 2C/20C, and provides access to taxiways T4, N, K, and multiple taxiway connectors	100	Asphalt/ Concrete
Tango 1-6 (T)	Connects Runway 13/31 to Taxiways K and L, and provides access to multiple Taxiways, to GA and TANG aprons	75	Asphalt/ Concrete
Uniform (U)	Provides connections between Taxiways T4, and K	75	Asphalt/ Concrete

Source: Atkins North America, Inc., 2011.

1.1.4 Aircraft Storage

The majority of the existing aircraft hangars are on the south side of the Airport. Currently, Nashville's aircraft storage consists primarily of conventional hangars totaling over 503,000 square feet. **Table 1-6** provides details of the existing aircraft storage hangars while **Figure 1-3** illustrates the location of each hangar.

Table 1-6 – Hangar Storage

Hangar	Address	Type	Size (Square Feet)
Hangar No. 1 (#4201)	601 Hangar Lane	Conventional Hangar	23,314
Hangar No. 2 (#4202)	605 Hangar Lane	Conventional Hangar	29,907
Hangar No. 3 (#4203)	609 Hangar Lane	Conventional Hangar	26,000
Hangar No. 4 (#4206)	625 Hangar Lane	Conventional Hangar	23,500
Hangar No. 6 (#4205)	707 Hangar Lane	Conventional Hangar	41,713
Hangar No. 7 (#4207)	745 Hangar Lane	Conventional Hangar	36,440
Hangar No. 8 (#4208)	755, 757, 759 Hangar Lane	Conventional Hangar	21,200
Hangar No. 9 (#4256)	801 Hangar Lane	Conventional Hangar	33,200
Hangar No.10 (#4263)	753 Hangar Lane	Conventional Hangar	14,000
Hangar No. 11 (#4264)	751 Hangar Lane	Conventional Hangar	16,000
Hangar No. 12 (#4265)	733 Hangar Lane	Conventional Hangar	21,000
Hangar No. 14 (#4252)	1480 Murfreesboro Rd	Conventional Hangar	27,130
Hangar No. 15 (#4267)	611 Hangar Lane	Conventional Hangar	12,000
Hangar No. 16 (#4268)	617 Hangar Lane	Conventional Hangar	16,800
Hangar No. 17 (#4269)	600 Hangar Lane	Conventional Hangar	24,000
Hangar No. 18A (#4277)	603 Hangar Lane	Conventional Hangar	12,000
Hangar No. 18B (#4277)	613 Hangar Lane	Conventional Hangar	12,000
Hangar No. 20 (#4274)	749 Hangar Lane	Conventional Hangar	23,000
Hangar No. 41 (#4160)	1362-B Murfreesboro Pike	Conventional Hangar	23,599
Hangar No. 43 (#4162)	400 Air Freight Blvd	Conventional Hangar	44,365
TDOT Hangar (#4210)	716 Hangar Lane	Conventional Hangar	22,111

Source: MNAA, 2011.

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Nashville International Airport®
A Six Sigma Organization

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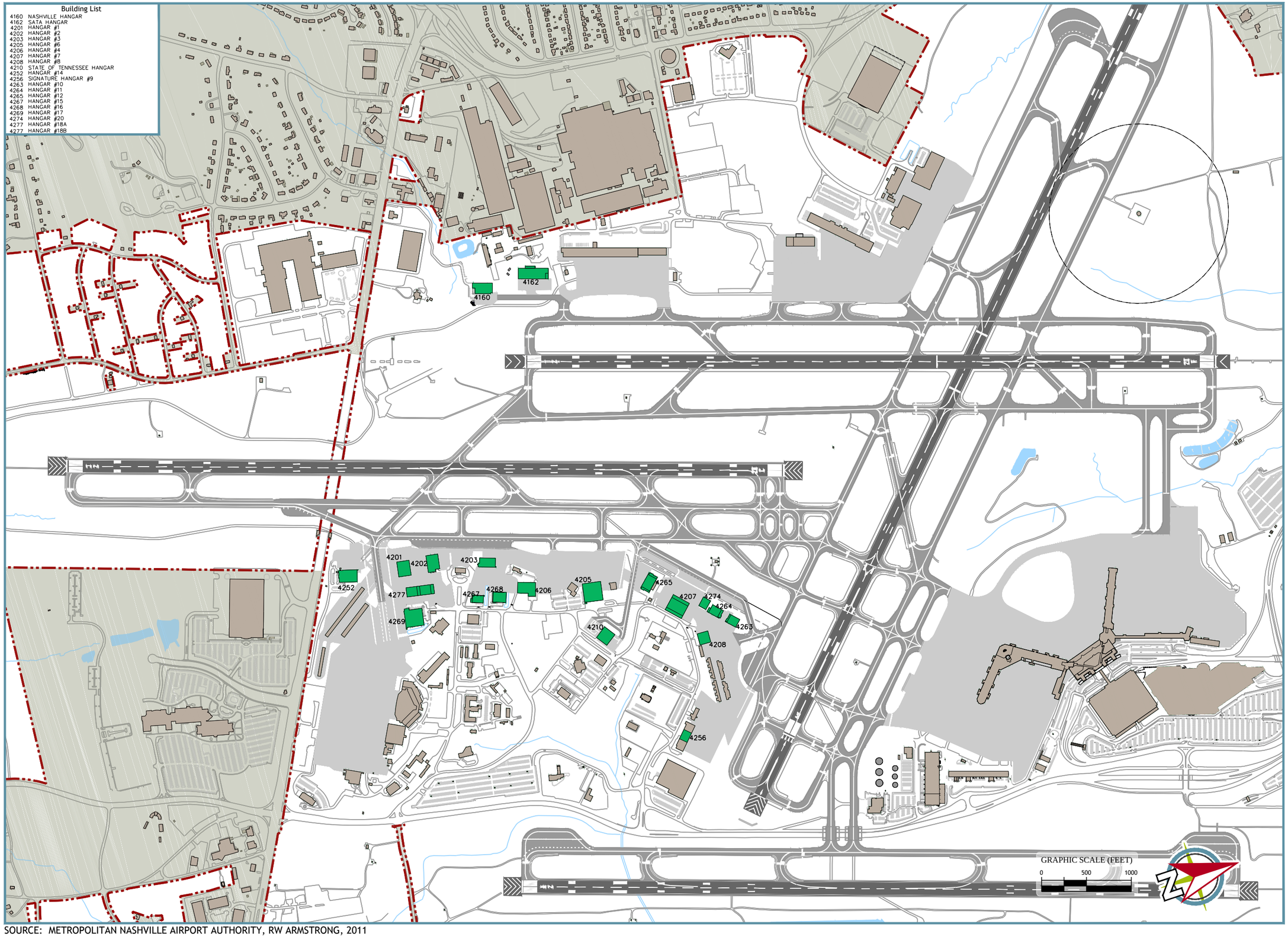
LEGEND

- Aircraft Storage Facilities
- On/Off-Airport Buildings
- Runway Pavement
- Taxiway Pavement
- Apron Pavement
- Hydrology
- Airport Property Boundary

Building List

4160	NASHVILLE HANGAR
4162	SATA HANGAR
4201	HANGAR #1
4202	HANGAR #2
4203	HANGAR #3
4205	HANGAR #6
4206	HANGAR #4
4207	HANGAR #7
4208	HANGAR #8
4210	STATE OF TENNESSEE HANGAR
4252	HANGAR #14
4256	SIGNATURE HANGAR #9
4263	HANGAR #10
4264	HANGAR #11
4265	HANGAR #12
4267	HANGAR #15
4268	HANGAR #16
4269	HANGAR #17
4274	HANGAR #20
4277	HANGAR #18A
4277	HANGAR #18B



SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

Figure 1-3
Aircraft Storage Facilities

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1.1.5 Aircraft Parking Aprons

Aircraft parking aprons or "ramps" provide space for aircraft parking and circulation. There are four categories of aircraft parking aprons:

- Terminal Apron
- Cargo Apron
- General Aviation Apron
- Military Apron

1.1.5.1 Terminal Apron

The Terminal Apron is comprised of approximately 11.47 million square feet of pavement, which provides 46 gate positions for narrow-body equivalent aircraft on the airside of Concourses A, B, and C in the Main Terminal and at least seven designated RON aircraft parking positions for narrow-body aircraft (Note: For discussion purposes, the narrow-body equivalent aircraft index reference aircraft is a B737-700). Apron area is available for four commuter/regional jet (RJ) aircraft parking positions near Concourse D (not in use).

1.1.5.2 Cargo Apron

The Airport is home to several cargo processing facilities. Two main aircraft parking aprons are designated for cargo purposes. They are referred to as the North and South Cargo Aprons, and are both located southwest of the intersection of Runways 2L/20R and 13/31.

The North Cargo Apron is shaped similar to the number seven, with its outer edges parallel to Runways 2L/20R and 13/31. It is made up of approximately 1.37 million square feet of full-strength pavement. Taxiways R1 and R2 connect the North Cargo Apron to Taxiway Alpha, Runway 2L/20R's west side full-length parallel taxiway. Taxiways R4 and R5 connect the apron to Taxiway Kilo, Runway 13/31's south side full-length parallel taxiway. Taxiway R3 connects the apron to the intersection of Taxiways Alpha and Kilo. The apron supports scheduled cargo service provided by FedEx.

The South Cargo Apron is rectangular and located west of, and parallel to, the southern end of Runway 2L/20R. The apron is approximately 1,020 feet long and 410 feet wide, consisting of approximately 428,000 square feet of full-strength pavement. Taxiways C1 and C2 connect the apron to Taxiway Alpha. The apron supports cargo service provided by Swissport.

1.1.5.3 General Aviation Apron

There are multiple GA aprons at BNA, which are bordered by Runway 2C/20C to the west, Runway 13/31 to the north, and Donelson Pike to the east. The various GA aprons serve

corporate hangar facilities, fixed-base operator (FBO) offices, aircraft maintenance base hangars, apron area, and fueling facilities. The GA aprons also provide airside access to several T-hangar structures.

1.1.5.4 Tennessee Air National Guard Aviation Apron

The Tennessee Air National Guard (TANG) includes an apron located between the GA area and Murfreesboro Road, which constitutes the Airport's southern border. The TANG Apron is comprised of approximately 1.11 million square feet of pavement, which formerly accommodated C-130s associated with the 118th Airlift Wing. The Air National Guard's mission changed in 2012 to that of Comprehensive Intelligence, Surveillance, and Reconnaissance Wing, at which time the C-130s were reassigned to other military installations. While the apron is currently unused, a proposal is being considered that would relocate Army aviation facilities, currently located at Smyrna/Rutherford County Airport, to Nashville International Airport, which would utilize the apron and occupy limited hangar and office space.

1.1.6 Navigational Aids

Navigational Aids (NAVAIDs) for an airport vary in sophistication. Typically, the degree of sophistication relates to the information provided to an approaching aircraft. The more sophisticated the NAVAID, the lower the landing minimums at an airport. For that reason, instrument approaches and the NAVAIDs that make up the ground-based equipment required to perform the approach procedure are divided into two categories: precision and non-precision. A precision approach provides both horizontal and vertical guidance to pilots as their aircraft descends to land. A non-precision approach provides only horizontal guidance to the runway end.

The types of NAVAIDs available at an airport play an important role in the use of the facility. Typically, pilots of corporate or commercial aircraft anticipate access to an airport in nearly all weather conditions. Therefore, it is incumbent upon an airport to have NAVAIDs and published approaches that allow for approaches to the airport during marginal and instrument flight conditions if it intends to attract or serve corporate or commercial aircraft. **Table 1-7** summarizes the Airport's existing navigational and lighting aids.

The Airport maintains Category II (CAT II) and CAT III Instrument Landing Systems (ILS) for approaches to both Runways 2L and 2R. CAT I ILS approach aids provide precision instrument guidance to pilots on approach to each of the Airport's runways, with the exception of Runways 13 and 20C. An ILS consists of a localizer antenna (LOC) and a glide slope antenna (GS). Those two antennas, located in proximity to the runway, transmit vertical and horizontal information to ensure that the aircraft is on the correct approach path during Instrument Flight Rules (IFR)

conditions. The category of an ILS refers to the accuracy of the system. Higher categories are more accurate and provide lower approach minima. Additionally, a variety of GPS-enabled approaches are available to aircraft approaching BNA. Runways 2L/20R, 2R/20L, 2C/20C, and 31 are all capable of supporting LPV, LNAV/VNAV, and RNP GPS approaches. Runway 13 is capable of supporting LNAV/VNAV GPS approaches as well as approaches using VOR/DME equipment.

1.1.7 Lighting, Markings, and Signage

The Airport contains a variety of lighting, markings, and signage to facilitate identification, approach, landing, and taxiing operations at night and during instrument meteorological conditions (IMC). The systems, categorized by function, are further described in the following paragraphs.

1.1.7.1 Identification Lighting

An airport rotating beacon light universally indicates the location and presence of an airport. The Airport's beacon is equipped with an optical system that projects two beams of light (one green and one white) 180 degrees apart. The Airport's beacon is on the west side of the airfield, north of the South Cargo Apron. The beacon is accessible from Air Freight Boulevard.

Table 1-7 – Navigational Aids

Runway	Runway Markings	Lighting	Minimum Ceiling / Visibility	Approach Types	Approach Aids
2L	Precision	HIRL, TDZ, CL	0 / 600 RVR	ILS-CAT-II, ILS-CAT-IIIb, ILS/LOC, RNAV/GPS	ALSF-2, GS, IM, LOC, GPS, DME
20R	Precision	HIRL, CL	200-ft / ¾ mile	ILS/LOC, RNAV/GPS	MALSF, GS, LOC, GPS, DME, PAPI-4
2C	Precision	HIRL	200-ft / ½ mile	ILS/LOC, RNAV/GPS	MALSR, GS, LOC, GPS, DME
20C	Precision	HIRL	400-ft / 1 mile	RNAV/GPS	GPS, PAPI-4, REIL
2R	Precision	HIRL, TDZ, CL	0 / 600 RVR	ILS-CAT-II, ILS-CAT-IIIb, ILS/LOC, RNAV/GPS	ALSF-2, IM, GS, LOC, GPS, MM, DME,
20L	Precision	HIRL, CL	200-ft / ½ mile	ILS/LOC, RNAV/GPS	MALSR, GS, LOC, GPS,

					DME
13	Precision	HIRL	400-ft /1 ½ mile 513-ft / ½, 1½ mile	RNAV/GPS, VOR/DME	VASI-6, GPS, VORTAC, REIL
31	Precision	HIRL	200-ft / ¾ mile	ILS/LOC, RNAV/GPS	GS, LOC, GPS, DME, REIL

ALSF-2 – High-Intensity Approach Lighting System with Sequenced Flashing Lights
CAT-IIIb – Category Three Instrument Landing System – 600 RVR visibility minima
CL - Centerline
DME – Distance Measuring Equipment
GS- Glide Slope
HIRL – High Intensity Runway Lights
LOC - Localizer
MALSF – Medium Intensity Approach Lighting System with Sequenced Flashing Lights
MALSR – Medium Intensity Approach Lighting System with Runway Alignment Indicator
PAPI-4 – Four-box Precision Approach Path Indicator
REIL – Runway End Identifier Lights
RNAV – Area Navigation
RVR – Runway Visual Range
TDZ – Touchdown Zone
VORTAC – VHF Omnidirectional Range / Tactical Air Navigation
VFR – Visual Flight Rules
Source: FAA Airport Master Record (Form 5010), 2011.

1.1.7.2 Obstruction Lighting

Obstructions in the vicinity of the Airport that cannot be removed are marked or lighted during both daylight hours and at night, to warn pilots of their presence. These obstructions may be identified for pilots on approach charts and on the official Airport Obstruction Chart published by the National Oceanic and Atmospheric Administration (NOAA).

1.1.7.3 Approach Lighting

Approach Lighting Systems provide further assistance to pilots on approaches to the Airport during IMC. There are three types of approach aids: electronic navigational aids, visual approach aids, and approach lighting. Approach lighting systems (ALS) are used in the approaches to runways as adjuncts to electronic NAVAIDs for the final portion of IFR approaches, and as visual guides for nighttime approaches under Visual Flight Rules (VFR) conditions. Approach lighting systems provide pilots with visual cues concerning aircraft alignment, roll angle, height, and position relative to the runway end (threshold).

The Airport's runways are equipped with various approach lighting systems. Runways 2C and 20L are equipped with a Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). Runways 2L and 2R are equipped with a Type 2 Approach Lighting System with Sequenced Flashing Lights (ALSF-2). Runway 20R is equipped with a Medium-Intensity Approach Lighting System with Sequenced Flashing Lights (MALSF). These systems assist pilots transitioning from the cockpit instrument landing segment to the runway

environment. Approach lighting systems provide a lighted approach path along the extended centerline of the runway. Runway alignment indicator lights flash in sequence as a series of white lights moving toward the runway threshold. These lights brilliantly emphasize runway centerline alignment. Roll indication is emphasized by a single row of white lights located on either side and symmetrically along the column of approach lights.

Precision Approach Path Indicator (PAPI) light systems are also used at the Airport. A PAPI is a system of lights located near its respective runway end, which provides pilots with visual descent guidance information during an approach to the runway. PAPIs typically have a visual range of approximately four miles, weather permitting. PAPIs are newer and more efficient systems than their predecessors, Visual Approach Slope Indicator (VASI) systems. Runways 20C and 20R are equipped with PAPI-4 (four-light unit) systems while Runway 13 is equipped with a VASI-6 (six-light unit) system.

1.1.7.4 Runway Threshold Lighting

The identification of runway ends or thresholds assists pilots in much the same manner as other approach aids. The threshold is given special lighting consideration. Threshold identification lights make use of a two-color lens, red and green. The green half of the lens faces the approaching aircraft and indicates the beginning of the usable runway. The red half faces the airplane on the rollout or takeoff, indicating the end of the usable runway. BNA has runway threshold lighting on all usable runway ends.

1.1.7.5 Runway Centerline Lighting

Runway Centerline Lighting Systems (RCLS), which consist of embedded centerline lights spaced at 50-foot intervals beginning 75 feet from the landing threshold, are currently installed on Runways 2R/20L and 2L/20R. The RCLS is required for the Category II and III precision approaches available on the runways as well as CAT I approaches where visibility minimums are less than 2,400 RVR.

1.1.7.6 Runway Touchdown Zone Lighting

Touchdown zone lights illuminate the first 3,000 feet of runways operating Category II and/or Category III approaches. Touchdown zone lighting is also required for Category I airports with landing operations where the Runway Visual Range (RVR) is less than 2,400 feet. A typical touchdown zone lighting array consists of 60 light bars (30 on either side of the runway centerline) with a total of three lights in each bar. These light bars are spaced approximately 100 feet apart across the 3,000-foot length of the lighting array. Touchdown zone lighting systems supplement the ALSF-2 approach lighting systems on both Runways 2L and 2R.

1.1.7.7 Runway Edge Lighting

Runway edge lighting is used to outline the edges of a runway during periods of darkness or restricted visibility. These systems are classified according to their intensity or brightness. All of the Airport's runways are equipped with High-Intensity Runway Light (HIRL) systems. HIRLs are white, visible through 360 degrees of the azimuth, and can be seen several miles from an airport during good visibility conditions.

1.1.7.8 Taxiway Lighting

The first and last segments of flights consist of a taxi operation to or from the terminal gate, parking apron, or hangar. Taxiway lighting delineates the taxiway's edge and provides guidance to pilots during periods of low visibility and at night. The most commonly used type of taxiway lighting is a series of blue fixtures set at 200-foot intervals along the taxiway edges. These lights provide taxiway alignment up to the apron. The Airport's taxiways are equipped with Medium-Intensity Taxiway Lighting (MITL) systems. In addition to the taxiway edge lighting, Taxiway H has centerline lighting, as do portions of Taxiways K and L (between Taxiways T6 and H).

1.1.7.9 Apron Lighting

Apron floodlight systems illuminate the Terminal Apron, the South Cargo Apron, the Air National Guard Apron, and the east portion of the North Cargo Apron.

1.1.7.10 Airfield Markings

The Airport's pavement markings are currently compliant with FAA standards and recommendations. All runways have precision markings. Taxiway markings are more basic. However, recent updates to FAA AC 150/5340, *Standards for Airport Markings,* identify new requirements for Part 139 certificated airports. These new requirements include enhanced taxiway centerline markings, surface-painted hold sign markings, and the extension of the runway holding position markings onto the paved shoulders. BNA has complied with these standards.

1.1.7.11 Airfield Signage

Lighted airfield signage currently found on the airfield consists of all required signage for a Part 139 certificated airport including airfield location signage, mandatory instruction signage, and runway hold position signage. Additional signage may be required to accommodate future improvements or additions to airfield pavements.

1.1.8 Airfield Pavement Condition

The MNAA regularly updates the Pavement Condition Index (PCI) approximately every five years which is a measurement of the structural integrity of the existing pavement. The last PCI study was completed in 2012 by Applied Research Associates, Inc. The results, which are compiled in a report entitled *Phase III Report: Pavement Condition Report,* showed that the overall airside pavement had an average-weighted PCI value of 86 or "Good" condition. A graphical representation of the 2012 findings is depicted on **Figure 1-4**.

The 2012 results were found to have improved slightly from the overall average of 80, obtained in 2007. In general, the Portland Cement Concrete (PCC) areas are performing better (PCI value of 92 or "Good" condition) than the Asphaltic/Concrete (AAC/AC/APC) areas (PCI value of 72 or "Satisfactory" condition). Since the 2007 timeframe, the MNAA has constructed or rehabilitated several pavement sections.

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LEGEND

- Good (86-100)
- Satisfactory (71-85)
- Fair (56-70)
- Poor (41-55)
- Very Poor (26-40)
- Serious (11-25)
- Failed (0-10)

NOTE:
Pavement data depicted in this map is based on airfield pavement inspections from 2007. Several reconstruction, rehabilitation, and repair projects have been executed since that time. In addition, portions of the airfield have changed.

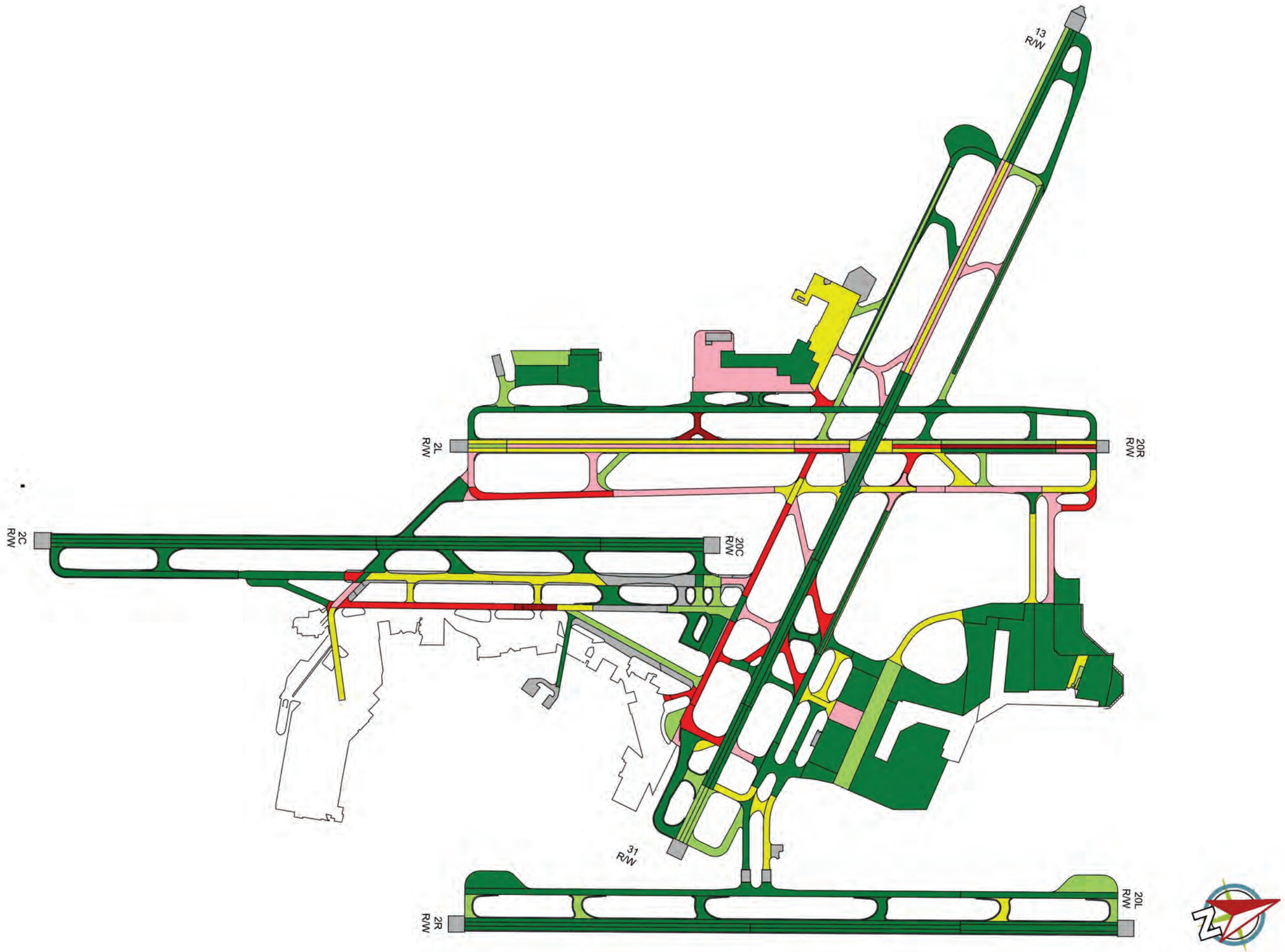

Figure 1-4
Pavement Conditions

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, 2007

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1.1.8.1 Runway Pavement Conditions

Runway 2L/20R was reconstructed in PCC for its full 7,703-foot length in 2010. As in the 2007 report, the pavement is in excellent condition, with an overall PCI value of 99. Various pavement repairs were made in 2010. Runway 2C/20C was constructed with PCC in 1994. The 2012 PCI value was 98, indicating it was in "Good" condition, a slight improvement over the 2007 PCI value of 94. Runway 2R/20L was constructed with PCC in 1989. The 2012 PCI value was 89, indicating it was in "Good" condition, slightly less than the 2007 PCI value of 91. Various pavement and joint repairs were made in 2009.

Runway 13/31 is one of the oldest runways on the airfield, although information on its construction history only dates back to 1978. It has been rehabilitated and extended several times since that date. The runway was originally constructed with ACC. Since the early 2000s, the MNAA has been replacing portions of the existing ACC with PCC so that today, only 1,430 feet of the 11,029-foot-long runway remains in ACC. The runway is designated for heavy cargo users and is capable of accommodating ADG V aircraft. With the most recent PCC construction, 35-foot-wide ACC shoulders were constructed east of the Runway 2L intersection. The 2012 PCI value was 83, indicating it was in "Satisfactory" condition, showing no change from the 2007 PCI value.

1.1.8.2 Taxiway Pavement Conditions

According to the 2012 PCI study, the weighted PCI average of the taxiway system was 82, or "Good" condition. The lowest ratings (below a 55 or "Poor" condition) were generally found in some of the low-use taxiways. Representative samples of the lowest-rated pavements are shown in **Table 1-8**.

Table 1-8 – Select Taxiway 2012 PCI Ratings

Taxiway Segment	2012 PCI Value	Comment
Taxiway K4	49	
Taxiway L2	39	CIP project scheduled 2014/2017
Taxiway L3	29	CIP project scheduled 2014/2017
Taxiway R4	53	Overlaid in 2006. CIP project scheduled 2018
Taxiway R5	45	CIP project scheduled 2015
Taxiway S4	35	CIP project scheduled 2017
Taxiway U4	37	CIP project scheduled 2020

Source: *Phase III Report: Pavement Condition Report*, Applied Research Associates, Inc., 2012.

1.1.8.3 Apron Pavement Conditions

The main passenger terminal apron was constructed of PCC in 1987 when the new terminal facility was completed. Most of the PCC ramp was rehabilitated in 2009. According to the 2012 PCI study, the weighted PCI average of the apron system was 86 or "Good" condition.

The cargo apron consists of both north and south sections west of Runway 2L/20R. The North Cargo Apron portion, which currently serves several large operators including a FedEx facility, consists of PCC pavement dating back to the 1960s when it served as the passenger terminal ramp. Rehabilitation since that time appears to have been limited and the pavement has deteriorated, resulting in a PCI value of 69 or "Fair" condition. The South Cargo Apron portion, which serves several smaller operators in a single facility, consists of PCC pavements dating back to at least the 1960s. This ramp has since undergone fairly extensive PCC rehabilitation. According to the 2012 PCI study, the PCI value was 92, or "Good" condition.

1.2 Passenger Terminal Area Facilities

The original concept was for the passenger terminal (Building 4301) to support two equally proportioned 12-gate concourses. This was radically transformed in 1985 when American Airlines announced its intention to create a secondary hub at BNA. The result was a passenger terminal with four concourses: Concourses A and B designated to accommodate all airlines except American Airlines (Gates A1 to A8 and B1 to B13); Concourse C to serve all American Airlines narrow-body aircraft (Gates C1 to C25), and Concourse D to accommodate ground boarding of American Eagle turbo-prop aircraft (Gates D1 to D15).

Following a fast-track construction process with multiple construction bid packages, the passenger terminal was dedicated to the public on September 14, 1987. During the late 1980s, American Airlines continued to expand their presence, adding international service to London. Terminal modifications and additions included the secure connector between Concourses A/B and Concourses C/D, and the construction of an FIS on Concourse A.

By the early 1990s, American Airlines began downsizing operations at BNA, except for obtaining additional apron space for regional jet parking for American Eagle. American's downsizing was offset by Southwest Airlines' major expansion from Concourse A to Concourse C. This change reduced the number of connecting passengers and increased the number of originating/destination passengers, placing significantly different demands on the terminal. Greater emphasis has been placed on the terminal's landside facilities, directly impacting access roadways, terminal curbsides, parking facilities, rental car facilities, security checkpoints, and ticketing and baggage claim areas.

1.2.1 Passenger Terminal

Unique to the original design, the passenger terminal is organized around three levels: Level 1, Ground Transportation; Level 2, Baggage Claim, and Level 3, Ticketing Hall and Security Screening Checkpoint (SSCP). Level 1 accommodates ground transportation services, including rental car, taxi, limo and shuttle buses. Level 2 functions as the baggage claim hall, shared by a centrally located information counter. Level 3 functions as the ticketing hall with modifications to streamline the self-ticketing process.

Passenger circulation patterns within the main terminal follow a converging "V" plan, connecting the flow to and from the concourses to the center of the terminal and uniting all three levels. This circulation pattern creates straightforward wayfinding for terminal users. The terminal has seen recent interior renovations and modernization.

1.2.2 Terminal Building Functional Areas

The passenger terminal facility is comprised of several areas, each accommodating multiple stakeholder functions, including concessions, airline gates, TSA offices, and administrative support spaces. **Table 1-9** provides an inventory of the terminal facility, listed by location, primary function, and area. **Figures 1-5** through **1-8** illustrate the existing terminal facility.

Table 1-9 – Terminal Functional Areas

Location and Use	Common Use Area (SF)	Functional Area (SF)	Total Area (SF)
Level One - Ground Transportation			
Rental Car		4,683	4,683
Retail		1,599	1,599
Non-Retail (Ground Transportation)		1,861	1,861
Food and Beverage		5,089	5,089
Airport Services		951	951
MNAA		83,688	83,688
Other (Post Office, Valet, Unassigned)		1,150	1,150
Common Use	9,931		9,931
Total	**9,931**	**99,020**	**108,951**
Level Two – Baggage Claim and Air Carrier Ramp			
Airline		136,872	136,872
Non-Retail		3,701	3,701
Retail Storage		1,794	1,794
Food and Beverage		4,563	4,563
Airport Services		273	273
TSA		25,173	25,173
MNAA		45,107	45,107
Common Use	50,062		50,062
Total	**50,062**	**217,483**	**267,546**
Level Three –Ticketing and Concourse			
Airline		115,562	115,562
Retail		22,026	22,026
Retail - Specialty		1,193	1,193
Non-Retail		12,778	12,778
Retail Storage		208	208
Food and Beverage		27,717	27,717
Food and Beverage Common Seating	14,229		14,229
Food and Beverage Storage		152	152
Airport Services		6,050	6,050
TSA – SSCP and Support Space		15,876	15,876
MNAA		41,317	41,317
Storage		73	73
Common Use	189,676		189,676
Total	**203,905**	**242,952**	**446,857**
Level Four – Administrative Offices and Admirals Club			
Airline		646	646
Airport Services		8,135	8,135
MNAA		28,239	28,239
MNAA Roof Level			
Common Use	7,777		7,777
Total	**7,777**	**37,020**	**44,798**

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Location and Use	Common Use Area (SF)	Functional Area (SF)	Total Area (SF)
Ramp Tower – Tower Level			
MNAA		1,134	1,134
Common Use	34		34
Total	**34**	**1,134**	**1,168**
Ramp Tower – Roof Level			
MNAA		2,357	2,357
Common Use	1,032		1,032
Total	**1,032**	**2,357**	**3,389**
Penthouses – Mechanical			
MNAA		9,922	9,922
MNAA Roof Level			
Common Use			
Total		9,922	9,922
Grand Total	**272,742**	**609,889**	**882,631**

Source: MNAA, 2011.

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Nashville International Airport

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UTILITIES

CONCESSION STORAGE & PREP

CONCESSION OFFICES

UTILITIES

DOCK

RENTAL CAR COUNTERS

LOBBY/CIRCULATION

RENTAL CAR COUNTERS

LEGEND

- Airline
- Concessions
- Rental Car
- MNAA
- Utilities
- Security Regulatory
- Other Airport Services
- Circulation Common Use

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

Figure 1-5
Ground Transportation Level One

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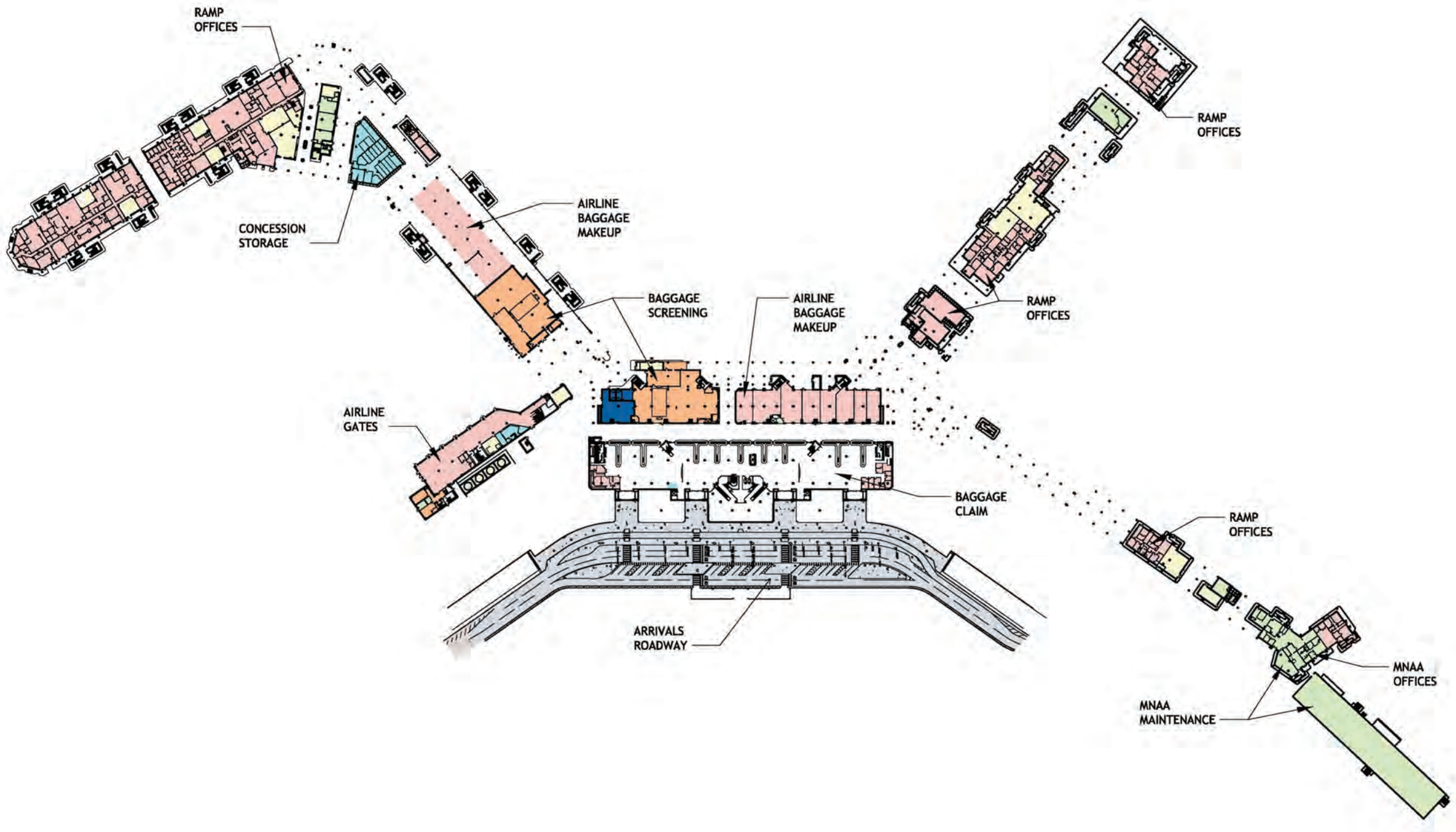

LEGEND

- Airline
- Concessions
- Rental Car
- MNAA
- Utilities
- Security Regulatory
- Other Airport Services
- Circulation Common Use

Figure 1-6
Baggage Claim and Air Carrier Ramp Level Two

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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LEGEND

- Airline
- Concessions
- Rental Car
- MNAA
- Utilities
- Security Regulatory
- Other Airport Services
- Circulation Common Use

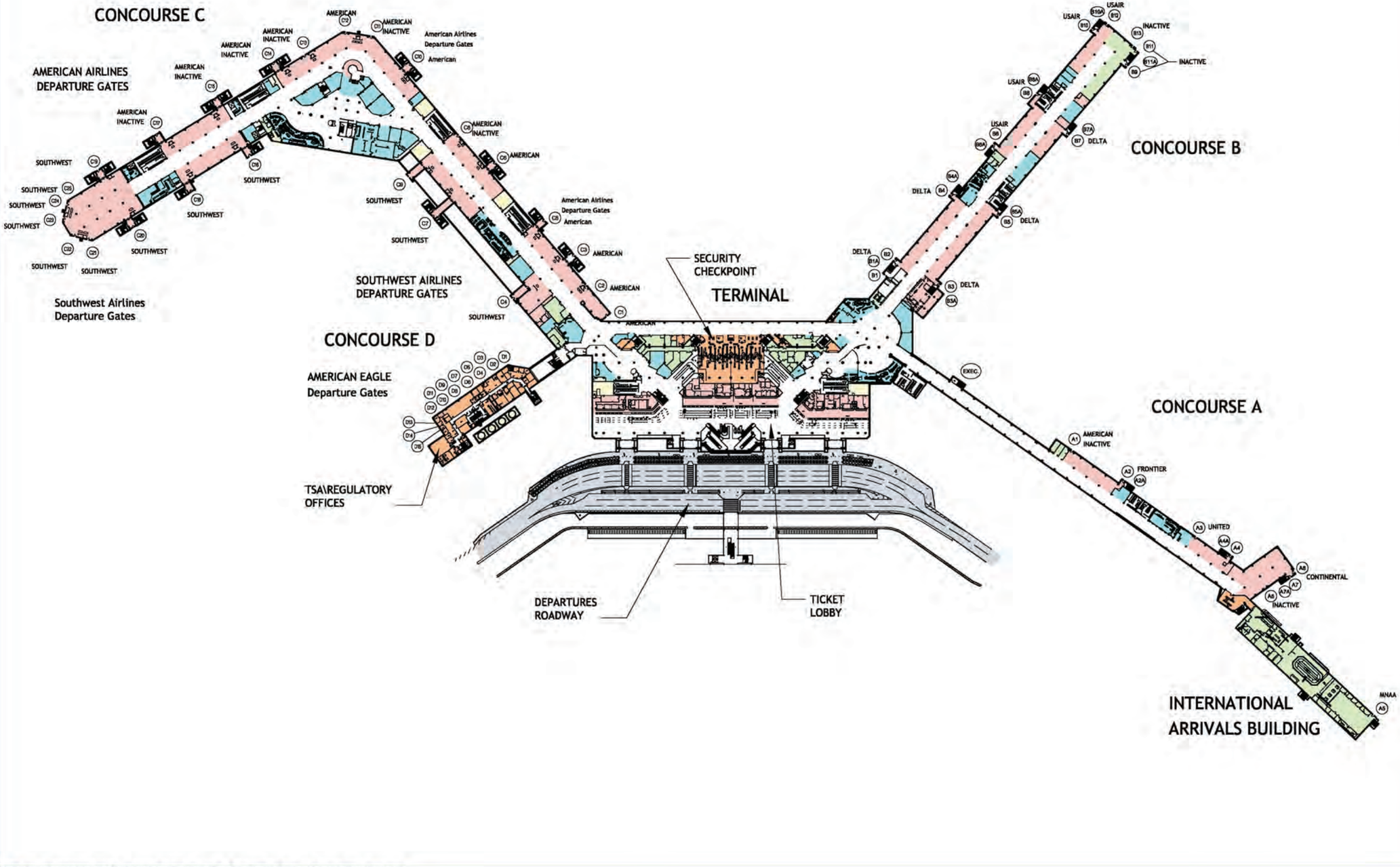

Figure 1-7
Ticketing and Concourse Level Three

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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Nashville International Airport

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LEGEND

- Airline
- Concessions
- Rental Car
- MNAA
- Utilities
- Security Regulatory
- Circulation Common Use

OPEN TO BELOW

MNAA OFFICES

MNAA OFFICES

DEPARTURES LEVEL (BELOW)

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

Figure 1-8
Administrative Offices Level Four

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1.2.3 Airline Gate Assignments

Table 1-10 represents the current year 2011 airline gate assignments based on current lease agreements.

Table 1-10 – Airline Gate Assignments

Concourse A		**Concourse C**	
A-1	American (inactive)	C-1	American (inactive)
A-2	Frontier	C-2	American
A-3	United	C-3	American
A-4	United	C-4	Southwest
A-5	International Arrivals	C-5	American
A-6	Continental (inactive)	C-6	American
A-7	Continental	C-7	Southwest
A-8	Continental	C-8	American
Concourse B		C-9	Southwest
B-1	Delta	C-10	American Eagle
B-2	Delta	C-11	American Eagle
B-3	Delta	C-12	American Eagle
B-4	Delta	C-13	American Eagle
B-5	Delta	C-14	American Eagle
B-6	US Airways	C-15	American (inactive)
B-7	Delta	C-16	Southwest
B-8	US Airways	C-17	American (inactive)
B-9	Unassigned	C-18	Southwest
B-10	US Airways	C-19	Southwest
B-11	Unassigned	C-20	Southwest
B-12	US Airways	C-21	Southwest
B-13	Unassigned	C-22	Southwest
Concourse D		C-23	Southwest
Not in Use		C-24	Southwest (inactive)
		C-25	Southwest

Source: MNAA, 2011.

1.2.4 Checked Baggage Screening System

To meet the government-mandated security requirements following the September 11, 2001 terrorist attacks, several Explosive Detection System (EDS) baggage screening machines and Explosive Trace Detection (ETD) devices were installed in the BNA ticket lobby, and a two-step baggage check-in process was introduced. The EDS equipment was placed behind the airline ticket counters, which pushed the ticket counters further into the ticket lobby, reducing public circulation and passenger queuing depth. A new state-of-the-art sort-controlled Checked

Baggage Inspection System (CBIS) was installed at the Airport in 2010. The new system has two four-machine EDS matrices, one beneath Concourse C at the apron Level, and one beneath the Main Terminal. Each EDS matrix has a dedicated Checked Baggage Resolution Area (CBRA) for secondary screening of suspect baggage. Each CBRA has six ETD screening stations for standard-size baggage screening and two for screening oversized, out-of-gauge, or non-conveyable baggage. Upon completion of the CBIS, the existing EDS and ETD machines were removed and the ticket counters restored to their original positions.

1.2.5 Passenger Security Screening Checkpoint

The main passenger SSCP was also modified to accommodate the latest technologies in both passenger and carry-on item screening. The original SSCP used 10 screening lanes with five Walk-Through Metals Detectors (WTMD) for screening passengers and 10 dual energy x-ray devices for screening carry-on items. One screening lane is dedicated to screening Airport employees. The existing SSCP was reconfigured to accommodate five new Advanced Imaging Technology (AIT) scanning portals to be used in tandem with the existing WTMDs, to scan all departing passengers. AIT technology is now used to screen carry-on items, allowing for multiple scanning images and improved efficiency.

1.2.6 Terminal Curbside

Each terminal level is served by an adjacent curbside and access roadway. **Table 1-11** identifies the respective curbside lengths by terminal level and function.

Table 1-11 – Terminal Curbside Length

Location	Linear Feet
Level 1 – Commercial Roadway	
Hotel/Parking Shuttles and Limos	490
Taxi Cab Queue	330
Valet Drop-Off	195
Valet Pick-Up	157
Level 2 – Arrivals Roadway	
Passenger Pick-Up Parking	433
Passenger Pick-Up Curbside	1,286
Level 3 – Departures Roadway	
Parking Shuttles and Taxis	494
Passenger Drop-Off Curbside	788

Source: MNAA, 2011.

The MNAA recently acquired an Automatic Vehicle Identification (AVI) system and began electronically tracking the vehicles using the listed curbside frontages. Each roadway curbside is tracked independently, and distributed between private and commercial vehicles. **Table 1-12** identifies the number of vehicles counted at each level.

Table 1-12 – Terminal Curbside Peak Activity

Curbside Location	2011 Total	2011 Average Day
Ground Transportation (Lane 7)		
Private Vehicle	696,924	2,035
Commercial Vehicle	45,897	741
Total Vehicles	**742,821**	
Baggage Claim (Lanes 4-6)		
Private Vehicle	3,049,188	8,405
Commercial Vehicle	414	7
Total Vehicles	**3,049,602**	
Departures (Lanes 1-3)		
Private Vehicle	2,841,914	7,979
Commercial Vehicle	70,498	1,137
Total Vehicles	**2,912,412**	

Source: MNAA, 2011.

The terminal commercial roadway is at-grade and is the same level as the first level of the public parking garage. A four-lane roadway runs inside the garage along the west end. The far west lane is used as passenger pick-up for hotel and parking shuttles as well as limos. Directly outside the garage are two lanes of through road with a taxi cab pick-up queue at the north side of the pedestrian cross-walk and valet drop-off and pick-up at the south side. A service road runs behind the rental car customer counter building, under the baggage claim level, and connects the two rental car areas on each side of the rental car customer counter area. It also provides through access for employees and service vehicles. **Figure 1-9** depicts the commercial roadway.

The arrivals roadway is at the same level as baggage claim inside the passenger terminal. There are two curbside passenger pick-up lanes, two through lanes, an angled short-term parking space area for passenger pick-up and luggage loading, and two more through lanes. **Figure 1-10** depicts the arrivals level.

The departures roadway is at the same level as the ticketing and airline gates inside the terminal building. In addition to a curbside lane for passenger drop-off, there are three through lanes, a lane for parking/hotel shuttle and taxi cab drop-off, and two more through lanes on the east side of the roadway, as depicted in **Figure 1-11**.

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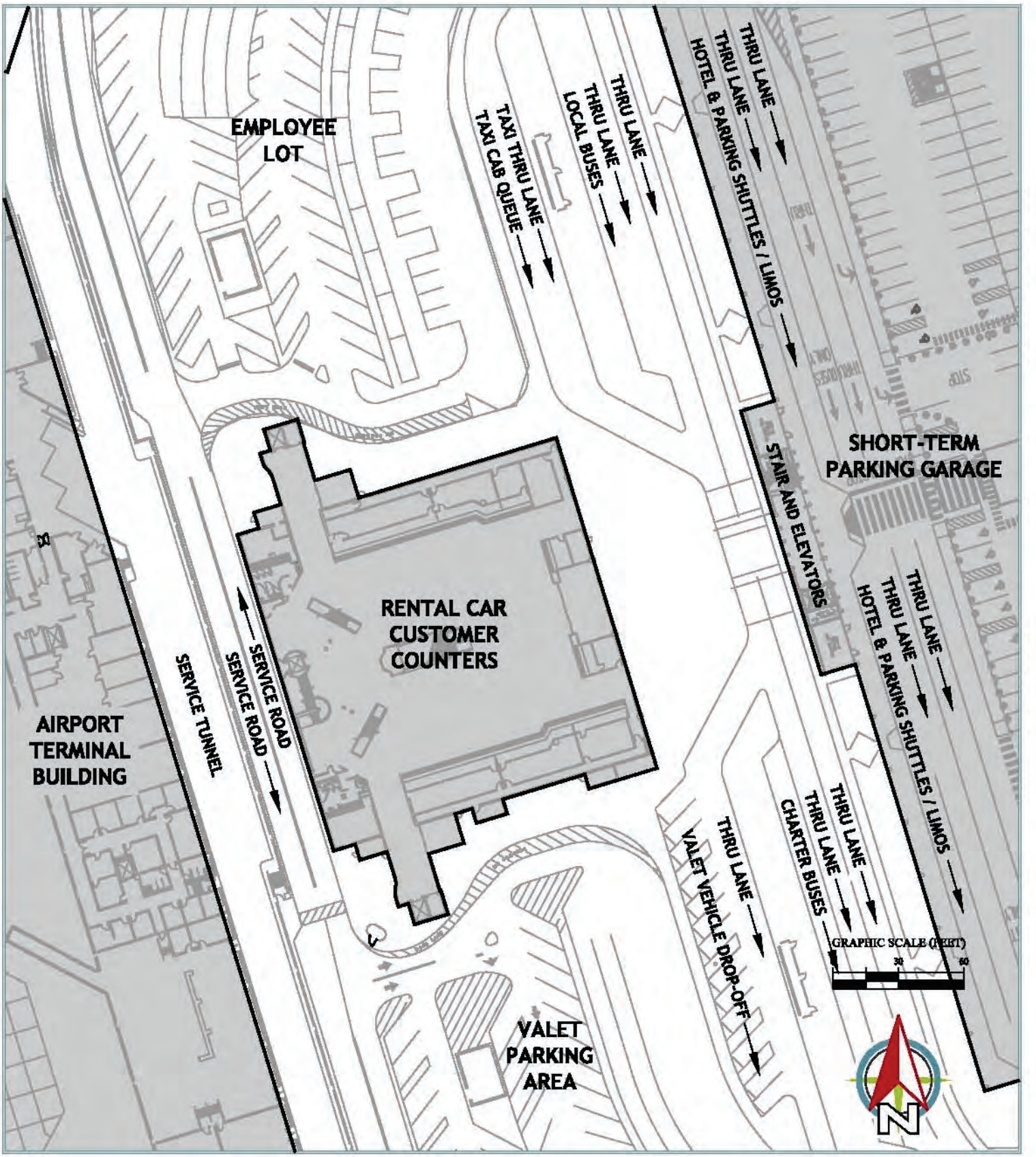

Figure 1-9
Commercial Vehicle Staging
Level 1 - Commercial Roadway

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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Nashville International Airport

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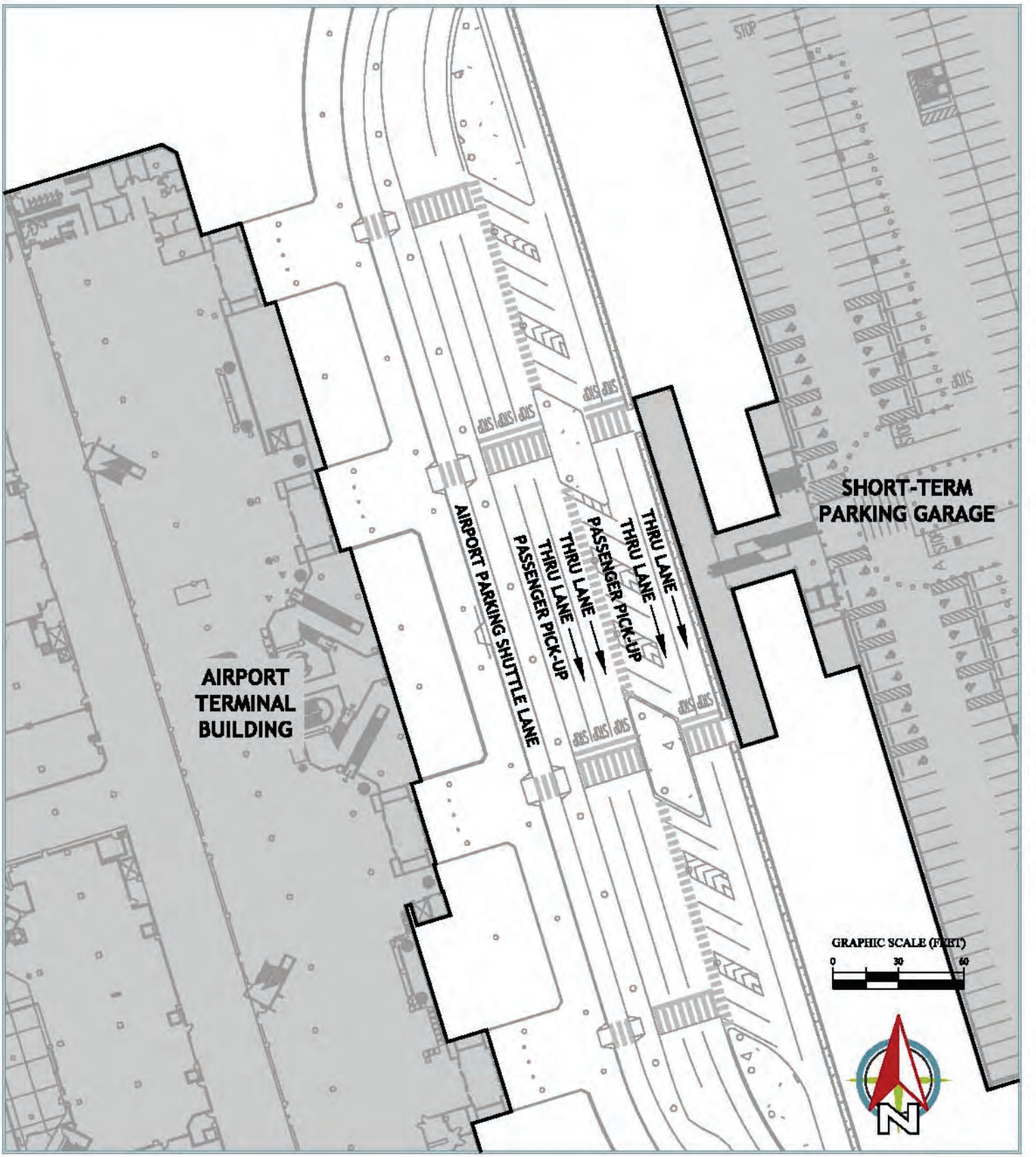

Figure 1-10
Commercial Vehicle Staging
Level 2 - Arrivals Roadway

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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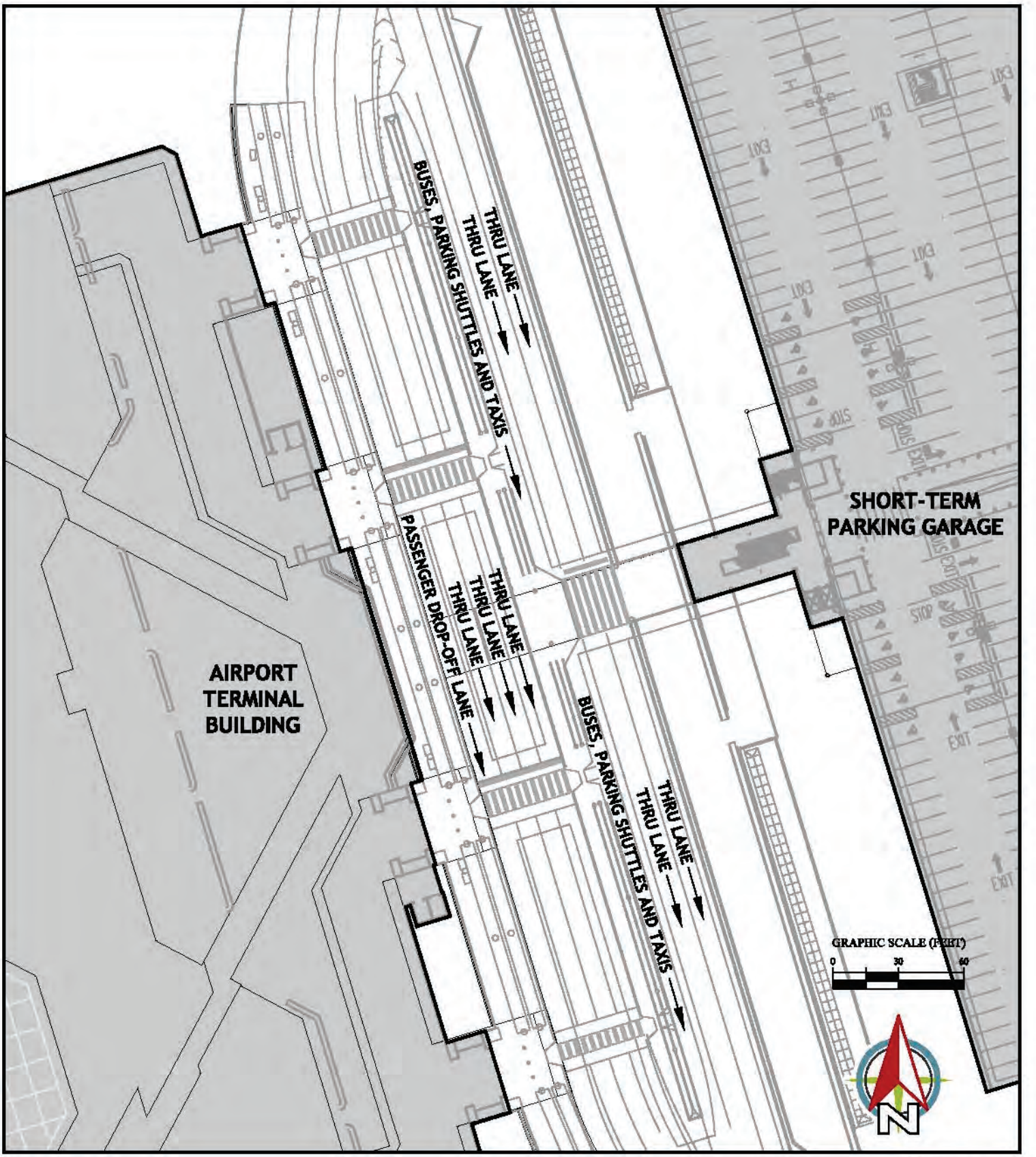

Figure 1-11
Commercial Vehicle Staging
Level 3 - Departures Roadway

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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1.2.7 Terminal Roadways

The passenger terminal complex is accessible via a dedicated roadway from I-40 known as "Discrete Access" and Donelson Pike, a major north/south roadway that connects to the loop roadway in front of the passenger terminal. Approximately 65 percent of the vehicle traffic arrives and departs via “Discrete Access” while the remaining traffic uses Donelson Pike. The outer lane of the entrance loop is for passenger pickup and drop-off. The loop roadway encompasses, and provides access to, the long-term surface lot, the short-term parking garage facility and the new Consolidated Rental Car Facility (CONRAC). Currently, MNAA is planning to realign Donelson Pike and the terminal loop road to the east as well as to expand the long-term surface parking area. **Table 1-13** details the most recent annual (2010) automobile movements for the Airport. These movements are identified by traffic counters located throughout the Airport’s roadway network as identified on **Figure 1-12**.

Table 1-13 – Airport Traffic Counts

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Entering the Airport												
Discrete Access	-	1,028	-	-	-	6,688	6,317	6,340	1,844	-	6,164	5,847
Donelson Pike North	-	1,951	2,260	2,302	2,457	2,675	2,613	2,622	-	-	2,120	1,941
Donelson Pike South	-	2,086	2,232	2,202	2,341	2,508	2,519	2,644	-	-	2,225	2,228
Donelson Pike Long Term B	-	99	125	122	146	144	137	116	-	-	128	411
Economy North	-	1,661	1,892	1,900	1,942	1,956	1,832	1,946	2,101	2,138	1,955	1,845
Economy South	-	1,713	1,941	1,964	1,990	2,161	1,989	2,044	2,140	2,181	1,978	1,898
Exiting the Airport												
Discrete Access	-	702	-	-	-	1,724	1,034	1,208	502	-	1,099	1,136
Donelson Pike North (Lane 4)	-	48	72	61	73	87	104	81	-	-	78	69
Donelson Pike North (Lane 5)	-	-	-	-	-	-	-	-	-	-	-	-
Donelson Pike South	-	143	152	155	143	157	151	156	-	-	161	1,302
Donelson Pike Long Term B	-	2,209	2,508	2,508	2,572	2,817	2,833	2,962	-	-	2,467	2,462
Economy North	-	746	902	922	895	903	785	859	954	951	851	703
Economy South	-	2,878	10,213	6,358	1,072	1,045	941	659	1,013	9,278	5,648	5,971

Note: Dash represents data not contained within AVI report supplied by MNAA. Source: MNAA, 2011.

Nashville International Airport

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- On-Airport Buildings
- Off-Airport Buildings
- Taxiway Pavement
- Apron Pavement
- Entrance and Exit Counter Location
- Airport Property Boundary

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

Figure 1-12
Traffic Counter Locations

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1.3 Support Facilities

This section documents the remaining on-Airport facilities that are not within the terminal facility or do not comprise part of the airfield or ground access infrastructure. They include facilities operated by on-Airport tenants, state government, and the FAA. Other facilities that are either vacant or located off-Airport and have an operational dependency with on-Airport facilities are also discussed. For the purpose of this study, these facilities have been categorized by function to include:

- MNAA Facilities
- General Aviation
- Air Cargo
- Military Facilities
- Aircraft Maintenance Facilities
- Ground Service Equipment Facilities
- ARFF Facilities
- Fuel Storage Facilities

1.3.1 MNAA Facilities

The MNAA Administrative offices are on the fourth floor of the terminal building. The MNAA Operations office is in Concourse C. Other general offices are located in Concourse B. Additional facilities housing MNAA offices include the Airport Rescue and Fire Fighting facility, the Storm Water Treatment facility, and the MNAA Consolidated Service facility (CSF), which will house the Maintenance Department.

1.3.2 General Aviation Area Facilities

General aviation activities are located south of the main terminal complex area between Runway 2C/20C and Hangar Lane. The GA area is a crescent-shaped parcel with 17 major corporate hangar facilities; offices; aircraft maintenance base hangars; fueling facilities; the air traffic control tower; Tennessee Department of Transportation (TDOT) offices; the MNAA's CSF (Building 4351); the Harvey P. Gassaway Building (Building 4251); storage facilities, etc. Major tenants located in the GA area include:

- Atlantic Aviation Terminal (Building 4266)
- Avis-Budget Rental Car Service Center (Building 4352 & 4356)
- Dollar Rental Car Service Center (Building 4354)
- FAA Air Traffic Control Tower (Building 4216)
- FAA Flight Service (Building 4215)

- First Transit (Building 4353)
- Hertz Rental Car Service Center (Building 4355)
- Owl Hill Holdings Hangar (Building 4269)
- Signature Flight Support (Building 4255)
- SkyWest Airlines Hangar 14 (Building 4254)
- Thrifty Rental Car Service Center (Building 4350)
- Tennessee Department of Transportation Aeronautics Division (Building 4219)
- Tennessee Department of Transportation Hangar (Building 4210)

The Airport is served by two full-service FBOs: Signature Flight Support and Atlantic Aviation. The FAA defines an FBO as: "*A commercial business granted the right by the airport sponsor to operate on an airport and provide aeronautical services such as fueling, aircraft storage, tie-down and parking, aircraft rental, aircraft maintenance, flight instruction, etc...*"

The FBOs and aviation support businesses in this area provide a wide range of GA services, including aircraft fueling, airframe and engine repair, ramp parking and tie-downs, ground handling, hangar storage, pilot amenities, and avionics repair. The GA apron area consists of approximately 927,000 square feet of apron for itinerant aircraft parking distributed over six general areas.

1.3.3 Air Cargo Facilities

The cargo facilities include those dedicated to all-cargo aircraft operators, air freight operators, integrated carriers, and the U.S. Postal Service (USPS). All-cargo facilities typically include an aircraft parking apron dedicated to the loading and unloading of aircraft. Air freight represents cargo transported on air carrier passenger aircraft. Integrated carriers are companies such as FedEx, UPS, etc., that transfer cargo via ground as well as air.

Building 4321, Air Freight facility, in the main terminal complex area is for passenger airline freight, and Building 4106 is for all-cargo airlines. Immediately southeast of the passenger terminal apron, the passenger airline air freight facility is conveniently located for transporting air freight to and from passenger aircraft. The facility has approximately 39,961 square feet of enclosed space, although not all of it is currently used for freight-related purposes.

The primary all-cargo facilities are in the western part of the Airport between Briley Parkway and Runway 2L/20R. These facilities have direct access to approximately 400,000 square feet of apron space.. In addition, the Air Cargo Terminal One facility serves four Group III and two Group IV positions. The ramp at the Air Cargo Terminal Two facility accommodates six Group V positions. A 90,000-square-foot primary facility with a 34,500-square-foot secondary building is just north of it. The Air Cargo Terminal Two facility has approximately 31.500 square feet and

the FedEx has approximately 90,000 square feet. The ramp at these facilities accommodates six Group V positions.

1.3.4 Military Facilities

The TANG installation on the south end of the Airport has numerous facilities, including the headquarters and administration building, operations building, civil engineering facility, aircraft maintenance hangars, recreational facilities, and engine shops. However, most transient military aircraft are serviced by the existing Airport FBOs.

1.3.5 Aircraft Maintenance Facilities

Multiple aircraft maintenance facilities are located at the Airport. The FBOs provide maintenance service to GA aircraft, as do several private maintenance providers. Embraer also provides maintenance services. These services are performed at the Embraer hangars (Buildings 4140 and 4141) on the west side of the Airport.

1.3.6 Ground Support Equipment Facilities

Ground Support Equipment (GSE) facilities include all buildings that serve GSE maintenance activities at the Airport. This includes, but is not limited to, vehicles and equipment necessary to serve aircraft operations such as aircraft tugs, baggage tugs/carts, catering trucks, fuel trucks/hose reels, 400-hertz generators, deicers, lavatory service vehicles, pallet loaders, etc.

The airlines currently own and operate all of the GSE equipment used for servicing aircraft. Maintenance is supplied on an as-needed basis and is conducted at numerous locations. GSE equipment is stored in covered areas surrounding the terminal building and in the Multipurpose Building (Building 4323).

1.3.7 ARFF Facilities

Commercial service airports with Airport Operating Certificates under Part 139 are required to provide aircraft rescue and firefighting services. The Airport's ARFF facility (Building 4334) is located at the BNA Department of Public Safety (DPS) south of the terminal area. The DPS employs full-time staff including firefighters, police officers, and emergency medical technicians. The facility includes offices and a four-bay storage garage for the ARFF equipment. This location allows firefighting equipment to access any airfield pavement within the required time. Federal regulations require that one piece of equipment be able to reach the mid-point of the furthest runway or equivalent distance within three minutes. The remainder of ARFF equipment is required to be able to reach these areas within four minutes.

The level of service, or index, is determined by the longest scheduled passenger aircraft with at least five daily departures. The Airport operates with an ARFF Index of C, with the MD-80 as the longest scheduled passenger aircraft with five daily departures (i.e., MD-80). **Table 1-14** identifies the ARFF Index requirements mandated by the FAA.

Table 1-14 – ARFF Index Requirements

Index	Aircraft length (Feet)	Vehicles	Extinguishing Agents
A	<90	1	Either 500 pounds of sodium-based dry chemical, Halon 1211, or clean agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF to total 100 gallons for simultaneous dry chemical and AFFF application
B	90 to <126	1	500 pounds of sodium-based dry chemical, Halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF for foam production
		2	One vehicle carrying the extinguishing agents as specified for Index A; and one vehicle carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons
C	126 to <159	2	One vehicle carrying the extinguishing agents as specified for Index A; and one vehicle carrying water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 3,000 gallons
		3	One vehicle carrying the extinguishing agents as specified for Index A; and two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 3,000 gallons
D	159 to <200	3	One vehicle carrying the extinguishing agents as specified for Index A; and two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 4,000 gallons
E	>200	3	One vehicle carrying the extinguishing agents as specified for Index A; and two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 6,000 gallons

Source: 14 CFR Part 139, Aircraft Rescue and Firefighting, 2011.

1.3.8 Aircraft Fuel Storage Facilities

Aviation and non-aviation fuel at BNA is stored in several in-ground and above-ground fuel tanks. AC 150/5230-4, *Aircraft Fuel Storage, Handling and Dispensing on Airports,* identifies the best practices regarding aviation fueling activities.

The terminal apron is equipped with an in-ground fuel hydrant system. This system consists of hydrant pit valves that are located within the apron and directly connect the fuel servicing vehicle or cart to the hydrant system. The fueling vehicle/cart provides the interface between the system and the fueling point on the aircraft. This system receives fuel from the American Airlines Fuel Control Building (Building 4331) and feeds it directly to the terminal apron. There are several fuel farms on the Airport with the capacity to hold over 8 million gallons of Jet-A and over 25,000 gallons of low lead aviation gasoline (AvGas). **Table 1-15** identifies the existing aircraft fuel storage capacity at BNA.

Table 1-15 – Aircraft Fuel Storage

Owner/Operator	Capacity (Gallons)	Contents	Location
American Airlines	2,016,000	Jet A	American Airlines Fuel Farm
American Airlines	2,016,000	Jet A	American Airlines Fuel Farm
American Airlines	1,654,338	Jet A	American Airlines Fuel Farm
American Airlines	1,008,000	Jet A	American Airlines Fuel Farm
American Airlines	1,008,000	Jet A	American Airlines Fuel Farm
American Airlines	1,008,000	Jet A	American Airlines Fuel Farm
Owl Hill Holdings	10,000	Jet A	Hangar Lane
Owl Hill Holdings	10,000	Jet A	Hangar Lane
Atlantic Aviation	12,000	AvGas	Hangar Lane
Atlantic Aviation	12,000	Jet A	Hangar Lane
Atlantic Aviation	12,000	Jet A	Hangar Lane
Signature	550	AvGas	Hangar Lane
Signature	1,000	AvGas	Hangar Lane
Signature	12,000	AvGas	Hangar Lane
Signature	12,000	Jet A	Hangar Lane
Signature	12,000	Jet A	Hangar Lane
Signature	2,000	AvGas	Hangar Lane
Embraer	2,000	Jet A	West Side
Embraer	2,000	Jet A	West Side
Nashville Hangar	12,000	Jet A	West Side
SATA Hangar	12,000	Jet A	West Side

Sources: MNAA SPCC, November 2010.

1.4 Snow and Ice Control

During the winter, the MNAA Maintenance and Operations Department uses weather forecasts obtained from the DTN MxVision Weather Sentry to determine the implementation level of snow/ice clearing and prevention operations and the need to hold over or place snow and ice clearing and prevention crews on standby.

Based on the forecast, the Airport determines the size and composition of the standby workforce to remain on duty and determines the deployment of personnel and equipment for actual snow and ice clearing and prevention operations.

Snow and ice clearing and prevention operations normally commence prior to the accumulation of one-half inch of wet or two inches of dry snow. These operations are performed in accordance with FAA AC 150/5200-30C, *Airport Winter Safety and Operations*. This section documents the MNAA procedures and equipment used to improve safety and operational capacity during these winter events.

1.4.1 Pavement Snow and Ice Control

The MNAA operates a pavement condition detection system called *Surface Scan System,* which is installed on the airfield. This system includes a series of in-pavement sensors and weather equipment, which detail actual conditions of the airfield pavement. The weather information includes air temperature, wind speed/direction, and relative humidity. The pavement information includes wet or dry status, presence of chemicals or ice, and the pavement temperature. Additionally, historical data can be retrieved from the airfield to analyze current/forecast conditions against previous weather patterns. Weather Sentry uses information provided by a sensor located on the airfield at the intersection of Runway 2L/20R and Runway 13/31 to forecast runway surface temperatures. Typical equipment used to prevent snow/ice on the runways and taxiways consists of:

- 3 – Oshkosh Trucks with 18-foot brooms
- 4 – Mack Trucks with 16-foot plows
- 1 – Oshkosh Truck with a 20-foot plow
- 1 – Fuel Truck
- 1 – John Deere Road Grader

The terminal apron snow/ice clearing and prevention process is normally conducted by members of the MNAA's various Building Maintenance Teams. However, airlines electing to conduct their own snow/ice clearing and prevention, either directly or through a contractor, are responsible for their own activities or by conducting such activities agree to hold the Authority harmless for any damage that may occur to any persons or property. It is the airlines' responsibility to select contractors that are in compliance with federal, state, and MNAA requirements. Typical equipment used to prevent snow/ice on the aircraft parking aprons consists of:

- 1 – 10-foot John Deer broom
- 1 – 750 gallons John Deere deicer

- 1 – 1600 boomless deicer sprayer
- 1 – Trackless dry deicer chemical distributer with a 7-foot plow
- 2 – Volvo trucks with a 16-foot plow
- 2 – GMC trucks with a 16-foot plow
- 4 – Salt spreaders
- 2 – Truck spreaders
- 1 – Small spreader
- 1 – Bobcat 8-foot snow pusher
- 1 – Front-end loader
- 1 – John Deere tractor cyclone/dry chemical spreader

Snow and ice clearing and prevention on the North Cargo Apron, South Cargo Apron, and public GA aprons are directly controlled by the MNAA and are performed by the MNAA's runway and taxiway snow and ice clearing and prevention crew. The FBOs are responsible for snow and ice control on their leasehold areas. The MNAA currently uses Potassium Acetate E-36 as a runway deicing fluid. The MNAA's pavement deicing storage capacity is shown in **Table 1-16.**

Table 1-16 – Pavement Deicing Storage

Operator	Capacity (Gallons)	Contents	Location
MNAA	10,000	Potassium Acetate	Terminal Area
MNAA	10,000	Potassium Acetate	MNAA Westside Maintenance
MNAA	10,000	Potassium Acetate	MNAA Westside Maintenance
MNAA	20,000	Potassium Acetate	MNAA Westside Maintenance
MNAA	20,000	Potassium Acetate	MNAA Westside Maintenance

Source: MNAA SPCC, 2010.

1.4.2 Aircraft Deicing

Aircraft deicing operations are confined to the terminal ramp, the north side of the terminal ramp, and east of runway 2L/20R before taxiway T1. These trenched concrete pads drain directly to BNA's Storm Water Treatment Facility for treatment prior to discharge. The 80,000-square-foot area north of the terminal apron is available for deicing fluid application prior to takeoff. **Table 1-17** identifies the existing aircraft deicing agent capacity at the Airport.

Table 1-17 – Aircraft Deicing Storage

Operator	Capacity (Gallons)	Contents	Location
American Airlines	30,000	Glycol	Multipurpose Building (Out of Service)
American Airlines	30,000	Glycol	Multipurpose Building (Out of Service)
Signature	1,000	Glycol	Hangar Lane
Delta Air Lines	5,000	Glycol	Terminal Area
US Airways	6,000	Glycol	Terminal Area
Southwest Airlines	5,000	Glycol	GSE Facility
All Airlines	10,000	Glycol	GSE Facility

Source: MNAA SPCC, 2010.

In March 2010, TDEC issued a Notice of Violation (NOV) to MNAA for the discharge of deicing chemicals to the receiving stream (Sims Branch) in January and February 2010 in violation of the NPDES permit. MNAA determined that the discharge resulted from the application of deicing chemicals on areas of pavement that were not routed to the facility treatment plant. Subsequent investigation by MNAA identified that, while the treatment facility was properly operating and MNAA's self-monitoring was satisfactory, there were locations along Sims Branch where untreated deicing chemical was leaking from the retention ponds and treatment lagoon.

On October 12, 2012, TDEC and MNAA entered into a Consent Order related to this discharge. The Order included a Civil Penalty and Damages totaling $26,524.03 and a Natural Resources Damage Assessment (NRDA) in the amount of $218,520.00. The NRDA was waived in lieu of upgrades to the deicing system and treatment plant scheduled to be completed before the beginning of the 2014-2015 deicing season. These improvements are intended to improve system efficiency and improve water quality in the receiving stream and include the following:

- In-stream monitors to evaluate water quality in collection pipe systems conveying stormwater from the terminal apron areas to the North and South Ponds.
- Install new slide gates will be installed to divert clean water away from the North and South Ponds.
- Install a gate at the low-flow pipe discharging into the South Pond from the non-deicing collection pipe.
- Improve the system managing groundwater beneath South Pond.
- Inspect and repair of stormwater piping conveying deicing stormwater to the Ponds.
- Install a Programmable Logic Controller to manage flow rates to the treatment lagoon based upon a near constant mass loading rate using online monitoring for Total Organic Carbon (TOC) and flow monitoring.

- Install and implement new nutrient mixing and controlled nutrient loading to the treatment lagoon to match the mass load.
- Install a clarifier for solids separation of effluent.
- Replace aeration equipment to aerated treatment.
- Improve treatment lagoon control by monitoring TOC, temperature and dissolved oxygen and improving the program for manual sampling and analysis.

The cost of these improvements is expected to exceed $7 million.

1.5 Parking

Currently the Airport provides approximately 12,838 public parking spaces in six public parking facilities. The Airport's parking facilities are detailed in **Table 1-18** and illustrated on **Figures 1-13** and **1-14**.

Table 1-18 – On-Airport Parking Inventory

Public Lots	Spaces	Acres [1]
Long-Term A	2,060	17.0
Long-Term B	2,124	15.5
Economy	3,690	30.0
Overflow	1,416	9.6
Short-Term	2,396	14.6
Valet	1,152	7.3
Total	**12,838**	**94.0**

1 – Approximate Size
Source: MNAA Parking Space Chronology, 2011.

Short-Term parking occupies all three levels of the parking garage on the east side of the Airport terminal building. It contains 2,396 short-term parking spaces within walking distance of the terminal building.

Long-Term Lot A is within walking distance of the Airport terminal building just east of the short-term parking garage and along Terminal Drive. It provides 2,060 spaces of long-term parking (including the frequent parker area). Shuttle service to and from the Airport terminal building is also provided. This lot was formerly called the "Long-Term" lot and was renamed to "Long-Term Lot A" in November of 2009 when Long-Term Lot B opened.

Long-Term Lot A also reserves about 250 spaces at its south end for the Frequent Parker Program. Patrons purchase a pass for $20.00 then pay $15.00 per day for parking. This earns

the patron 11 points per dollar spent, which can then be redeemed for free parking in any of the Airport's public parking lots, except Valet.

Long-Term Lot B is northeast of the Airport terminal building just east of Donelson Pike. It contains 2,124 parking spaces with shuttle service to and from the Airport Terminal Building. This lot was formerly the "overflow" lot and was renamed "Long-Term Lot B" in November of 2009.

The Economy Lot is north of the Airport terminal building between the Terminal Road and Interstate 40. The largest of the six on-Airport public parking lots, it provides 3,690 parking spaces and has shuttle service to and from the Airport terminal building.

Valet parking pick-up and drop-off occurs on the lower roadway level in front of the Airport terminal building. There is also a larger valet storage lot just west of the Economy lot that contains 1,152 stalls. The Valet Lot also offers optional car wash services.

The overflow lot contains 1,416 spaces and is south of the Airport passenger terminal along Donelson Pike. This lot was previously the employee lot and was renamed the Overflow Lot after the new employee lot near the intersection of Murfreesboro Road and McCrory Creek Drive opened in 2009. This lot was not in service during 2010.

The Cell Phone Lot is just east of the Economy Lot and contains 51 spaces. Since this lot serves as space for motorists to wait for arriving passengers, it is not included in the parking inventory.

1.5.1 Off-Airport Parking Supply

In addition to the on-Airport public parking, four private off-Airport operators shuttle patrons to and from the terminal building. These facilities are detailed in **Table 1-19** and **Figure 1-14**.

Table 1-19 – Off-Airport Parking Inventory

Off-Airport Facilities	Covered Spaces	Uncovered Spaces	Total Spaces	Acres
Fly Away (1671 Murfreesboro Road)	70	660	730	4.5
The Parking Spot (560 Donelson Pike)	170	1,130	1,300	8.1
Flight Park (534 Donelson Pike)	70	420	490	3.0
Executive Travel and Parking (616 Royal Parkway)	3	497	500	3.3
Total	**313**	**2,707**	**3,020**	**18.9**

Source: RW Armstrong and estimates from Google Earth Pro, 2011.

Fly Away is just south of the Airport's employee lot at the intersection of Murfreesboro Road and McCrory Creek Road, about 3.3 miles from the Airport passenger terminal. The secured lot with fencing provides approximately 730 covered and uncovered parking spaces. They also

offer self-parking or valet services, car wash and detailing, baggage assistance, and a free bottle of water upon trip return.

The Parking Spot is just north of Interstate 40 along Donelson Pike about one mile from the Airport passenger terminal. It is the largest of the four off-Airport lots, with approximately 1,300 spaces. It is secured with fencing and provides both covered and uncovered parking. They also provide self-parking or valet services, baggage assistance, complimentary newspaper, and chilled water.

Flight Park is north of Interstate 40 at the northwest intersection of Royal Parkway and Donelson Pike, about 1.2 miles from the Airport terminal building. It provides approximately 490 covered and uncovered parking spaces. Except for the indoor climate-controlled parking, it is not secured with fencing, but is monitored via security cameras. They provide self-parking or valet services, car wash and detailing, and full auto maintenance services.

Executive Travel and Parking is just south of Flight Park on the south side of Royal Parkway, about 1.2 miles from the terminal building. There are approximately 500 uncovered parking spaces (and only three covered spaces) secured with fencing. They provide valet parking, wash, detailing, and oil changes. Based on aerial imagery dated April 12, 2010, a count of occupied spaces at all off-Airport parking facilities determined that 2,090 of the 3,020 available parking spaces were occupied, an occupancy rate of 76 percent.

1.5.2 Parking Demand

Parking demand is the number of spaces required during peak parking periods and is a direct function of airline passenger activity. Since 2006, the month of October consistently had the highest number of occupied parking spaces. Saturday, October 9, had the highest peak occupancy for 2010 from which a parking demand ratio has been developed. Although this day is not the absolute peak parking demand, it does represent the number of occupied spaces on all but a few abnormal peak parking days.

Figure 1-16 illustrates the total number of occupied spaces on October 9, 2010 (excluding valet parking). The peak parking demand occurred at noon with 7,228 occupied self-park spaces. When valet parking demand is included, the total public parking demand is 8,228 spaces on the design day. In 2010 there were over 4 million enplaned passengers. Based on the Airport parking demand of 8,228 spaces, the parking demand ratio is approximately 1.81 spaces per thousand annual enplanements. If private off-Airport parking demand is factored in, the public parking demand ratio is 2.27 spaces per thousand annual enplanements.

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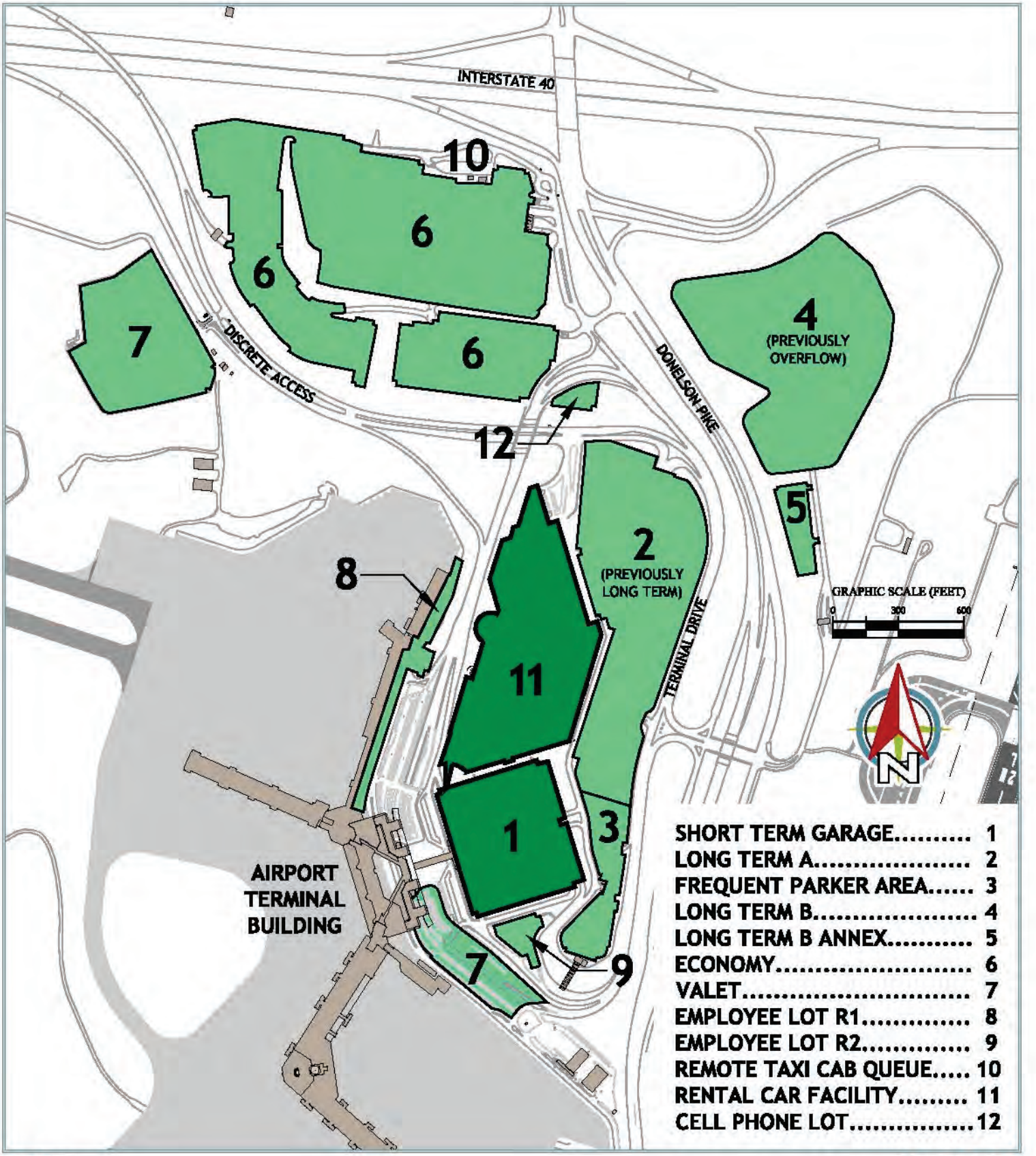

LEGEND

SURFACE LOT PARKING

STRUCTURED PARKING

Figure 1-13
On-Airport Public Parking Supply
North of Airport Terminal

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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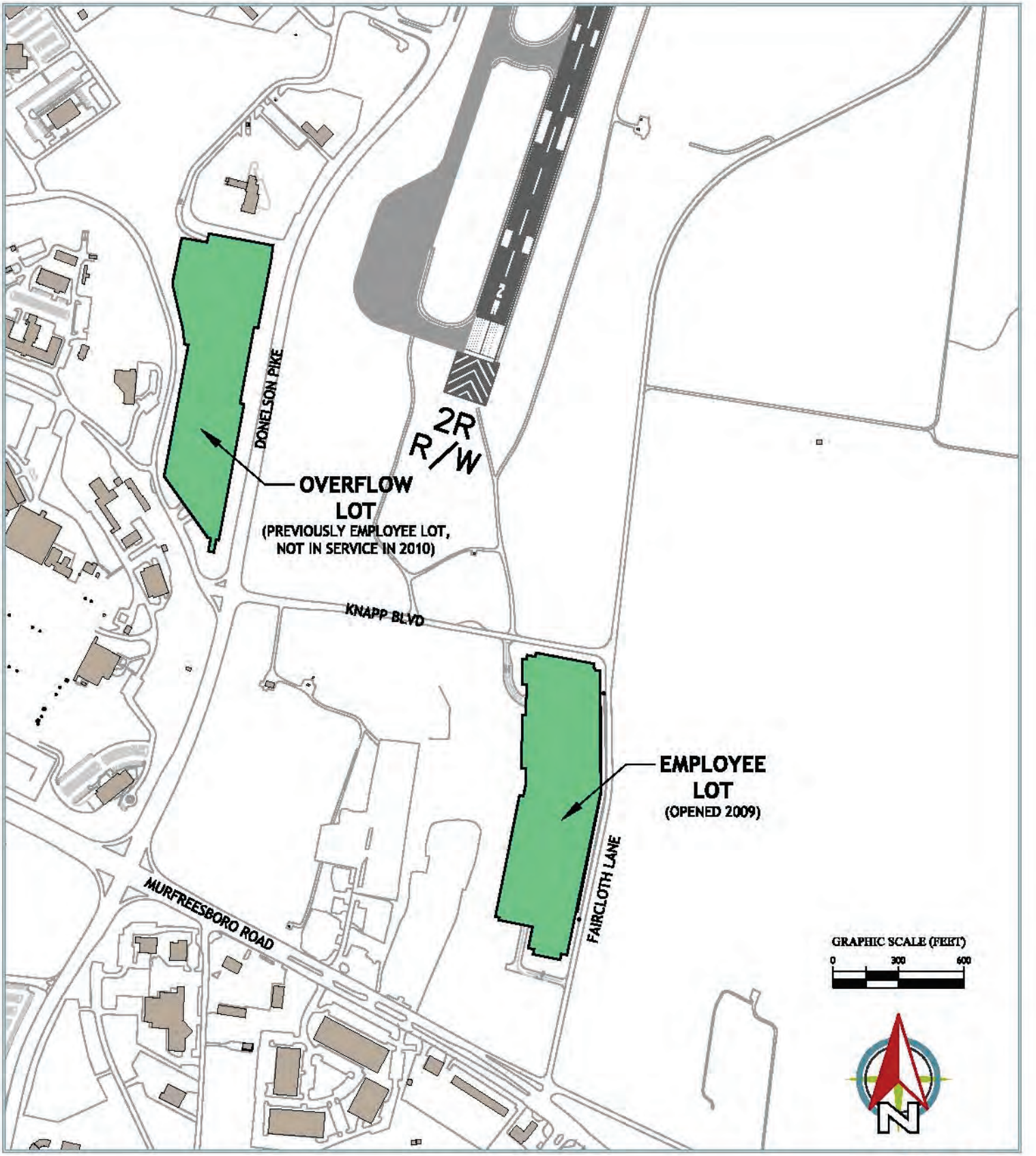

LEGEND

SURFACE LOT PARKING

Figure 1-14
On-Airport Public Parking Supply
South of Airport Terminal

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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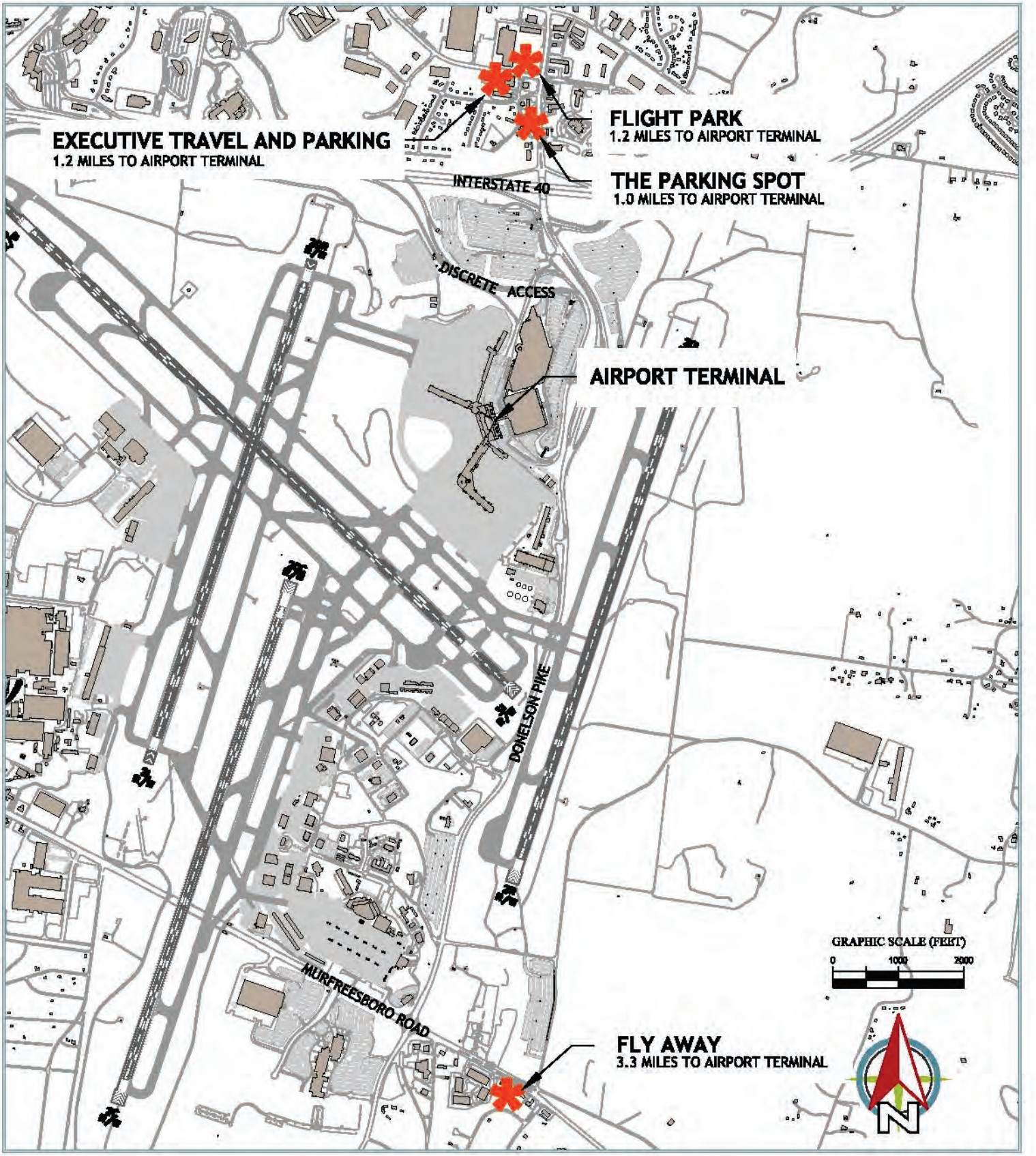
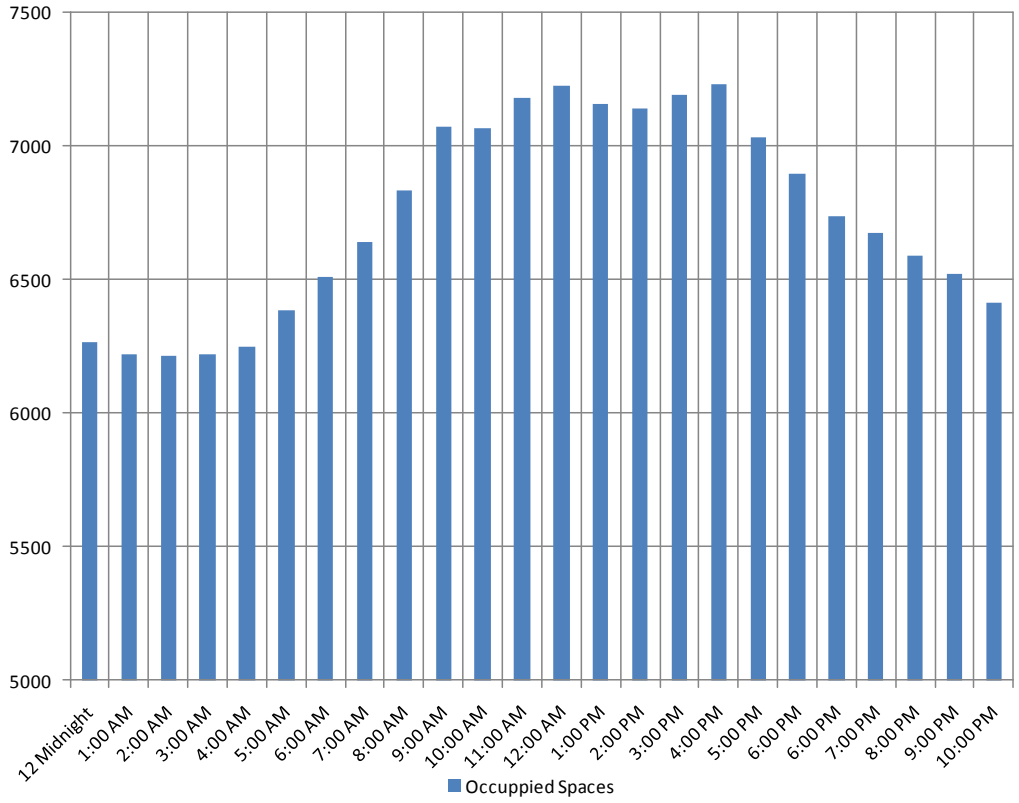


Figure 1-15
Off-Airport Public Parking Supply
Off-Airport Parking Locations

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

Figure 1-16 – Occupied Spaces (October 9, 2010)



Source: MNAA, 2011

Parking utilization refers to the parkers' number and length of stay. Parking utilization numbers are used for revenue-generation calculations and sizing facilities such as cashiering plazas, vertical circulation systems and entry plazas. In 2010, there were approximately 1,601,952 on-Airport public parkers. **Table 1-20** shows that the parkers per enplanement had declined since 2007, but were up again in 2010.

Table 1-20 – Annual Parkers per Enplaned Passengers

Year[1]	Enplanements[2]	Parkers	Parkers/Enplanement
2006	4,735,910	1,843,114	0.38
2007	4,938,191	1,907,098	0.39
2008	4,880,360	1,575,685	0.34
2009	4,460,962	1,465,714	0.33
2010	4,487,336	1,541,459	0.35

1 – Calendar Year
2 – All Passengers
Source: MNAA, 2011.

Typically, the majority of parkers at an airport have a length of stay of less than one day. At BNA, approximately 63 percent of parkers have a length of stay of less than one day. The year 2009 was used for calculating length of stay and identified in **Table 1-21**.

Table 1-21 – On-Airport Parkers - Historical

Duration	2006	2007	2008	2009	2010
0-1 Day	1,178,167	1,198,113	947,968	925,728	1,011,147
1 - 2 Days	145,800	152,075	127,819	108,364	108,884
2 - 3 Days	169,350	180,280	157,828	136,420	133,973
3 - 4 Days	139,798	150,339	138,986	123,126	120,131
4 - 5 Days	87,396	91,181	83,773	72,722	71,056
5 - 6 Days	42,161	44,215	40,675	34,488	34,386
6 - 7 Days	21,573	22,999	21,181	17,444	16,608
7 - 8 Days	22,678	25,338	22,222	18,699	17,554
8 - 9 Days	10,223	11,055	10,233	8,372	8,178
9 - 10 Days	6,489	7,143	6,543	5,431	5,117
10 - 11 Days	4,538	5,063	4,575	3,745	3,726
11 - 12 Days	5,030	5,622	5,082	4,116	3,983
12 - 13 Days	2,142	3,218	2,083	1,678	1,594
13 - 14 Days	1,387	1,736	1,299	1,159	1,032
> 14 Days	6,382	8,721	5,418	4,222	4,090
Total	**1,843,114**	**1,907,098**	**1,575,685**	**1,465,714**	**1,541,459**

Source: MNAA Operations

1.5.3 Parking Economics

In 2010, the total gross parking revenue was $28,991,188. In recent years, parking revenue has declined from a high of $30,213,230 in 2008, as identified in **Table 1-22**. This could be attributed to a number of factors including the decline in enplaned passengers, change in passenger behavior due to the changing economy (i.e., passengers getting dropped-off instead of paying to park), the addition of private off-Airport parking operators, and disruption at the Airport due to the construction of the new CONRAC facility.

Table 1-22 – Annual Gross Revenue to Parker

Year	Parkers	Revenue	Revenue per Parker
2006	1,843,114	$27,614,933	$14.98
2007	1,907,098	$29,620,724	$15.53
2008	1,575,685	$30,213,230	$19.17
2009	1,465,714	$26,180,602	$17.86
2010	1,601,952[1]	$28,991,188	$18.10

1 – Tickets Issued (from 5 year history - vehicles parked per lot)

Source: MNAA, 2011.

The last parking rate change was made on July 1, 2010. The short-term daily rate was increased from $22 to $24, the valet daily rate from $20 to $22 and the long-term daily rate from $10 to $13. Rates for Long-Term Lot B, economy, and overflow remained the same at $10 and $8 per day, respectively. **Table 1-23** and **Table 1-24** summarize parking rates for Long-Term Lots A and B. **Table 1-25** summarizes parking rates for the Frequent Parker Section, which is designated for members of the Frequent Parker Program. The Frequent Parker Program allows members to earn points for each stay. When enough points have been accumulated, they are automatically applied to free parking in any of the Airport's parking lots (excluding valet).

Table 1-23 – Long-Term Lot A Rates

Length of Stay	Long-Term A
0 - 10 Minutes	Free
10 - 30 Minutes	$1.50
.5 - 1.5 Hours	$3.00
1.5 - 2 Hours	$6.00
2 - 3 Hours	$9.00
3 - 24 Hours	$13.00
Maximum Per Day	$13.00

Source: MNAA, 2011.

Table 1-24 – Long-Term Lot B Rates

Length of Stay	Long-Term B
0 - 60 Minutes	$1.50
1 – 1.5 Hours	$3.00
1.5 - 2 Hours	$6.00
2 - 3 Hours	$9.00
3 - 24 Hours	$10.00
Maximum Per Day	$10.00

Source: MNAA, 2011.

Table 1-25 – Frequent Parker Section Rates

Length of Stay	Frequent Parker Section
0 - 10 Minutes	Free
10 - 30 Minutes	$1.50
.5 - 1.5 Hours	$3.00
1.5 - 2 Hours	$6.00
2 - 3 Hours	$9.00
3 - 4 Hours	$12.00
4 – 24 Hours	$15.00
Maximum Per Day	$15.00

Source: MNAA, 2011.

Table 1-26 summarizes the short-term parking rates.

Table 1-26 – Short-Term Parking Rates

Stay	Fee
0 - 20 Minutes	Free
20 - 40 Minutes	$2.00
Each Additional 20 Minutes	$1.00
Maximum Per Day	$24.00

Source: MNAA, 2011.

Table 1-27 summarizes the economy and overflow parking rates.

Table 1-27 – Economy and Overflow Rates

Stay	Fee
0 - 1 Hour	$3.00
1 - 24 Hours	$8.00
Maximum Per Day	$8.00

Source: MNAA, 2011.

Table 1-28 summarizes the valet parking rates.

Table 1-28 – Valet Rates

Stay	Fee
0 - 4 Hours	$10.00
Max 24 Hours	$22.00
Maximum Per Day	$22.00

Source: MNAA, 2011.

Table 1-29 summarizes the off-Airport parking rates.

Table 1-29 – Off-Airport Parking Rates

Location	Fee	Airport Fee
Fly Away		
Daily - Self Park	$8.95	included
Daily - Valet	$10.95	included
Weekly - Self Park	$62.95	included
Weekly - Valet	$76.65	included
The Parking Spot		
Daily - Open Air	$10.95	included
Daily - Covered	$12.95	included
Weekly - Open Air	$76.65	included
Weekly - Covered	$90.65	included
Flight Park		
Daily - Open Air	$10.50	included
Daily - Climate Controlled	$15.00	included
Weekly - Open Air	$73.50	included
Weekly - Climate Controlled	$105.00	included
Executive Travel and Parking		
Daily	$8.75	$1.50[1]
Weekly	$61.25	$10.50[1]

1 – In addition to daily and weekly fee

Source: Off-Airport websites

The Airport contracts with Central Parking to operate the Airport parking system under a management agreement. The parking operating expenses for 2010 were $7,985,883, as identified in **Table 1-30**.

Table 1-30 – Annual Parking Operating Expense

Location	Operating Expense (Less Shuttle)	Shuttle Expenses[1]	Total Operating Expenses
Short-Term	$1,456,209	$0	$1,456,209
Long-Term A	$911,001	$769,174	$1,680,175
Long-Term B	$420,594	$925,137	$1,345,731
Economy	$716,455	$963,913	$1,680,367
Valet	$1,700,911	$0	$1,700,911
Overflow	$122,489	$0	$122,489
Total	**$5,327,659**	**$2,658,224**	**$7,985,883**

1 – First Transit shuttle operations and passenger assistance

Source: MNAA Parking Revenue/Expense Report, 2010.

1.5.4 Employee Parking

There are approximately 1,474 employee parking spaces in three parking lots. These lots are detailed in **Table 1-31**.

Table 1-31 – Employee Parking Inventory

Employee	Spaces	Acres
Employee Lot	1,189	10.5
R1	212	1.6
R2[1]	73	0.6
Total	**1,474**	**12.7**

1 – Currently used as valet staging, but will revert back to employee in spring of 2012

Source: MNAA, 2011.

The largest employee lot is along Faircloth Lane just north of Murfreesboro Road. It has approximately 1,189 spaces and provides shuttle service to the Airport passenger terminal. Lot R1, adjacent to the north concourse along the east side, has about 212 parking spaces, and Lot R2, just south of the public parking garage, has about 73 spaces.

1.5.5 Rental Car Facilities

On November 1, 2011, the MNAA opened a new rental car facility (CONRAC) at the Airport just north of the short-term parking garage. There are three levels of ready and return car parking for a total of 2,400 stalls. The quick-turnaround (QTA) facility is at grade level adjacent to and north of the ready and return parking. The QTA consists of 10 car wash bays, 54 fueling positions and queuing for about 240 vehicles. There is one supported level over the QTA area that is used for storage of about 600 rental cars.

Figure 1-16 depicts the existing rental car service sites, and **Figures 1-18, 1-19** and **1-20** depict the various rental facilities located at the CONRAC. The rental car customer service counters are in the passenger terminal building at the ground transportation level just east of the short-term parking garage.

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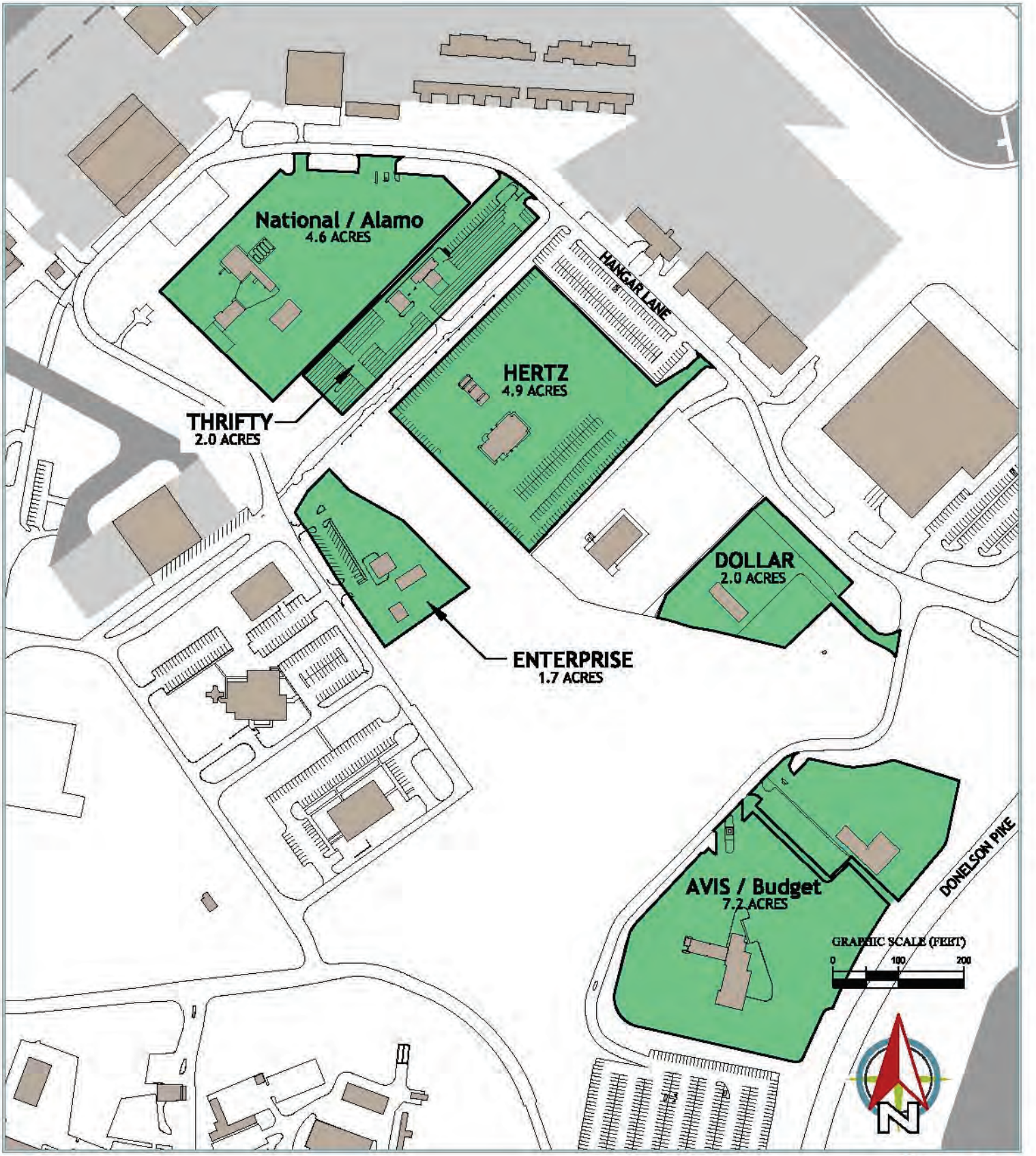

Figure 1-17
Existing Rental Car Service Center Sites
Storage & Maintenance Facility Site Locations

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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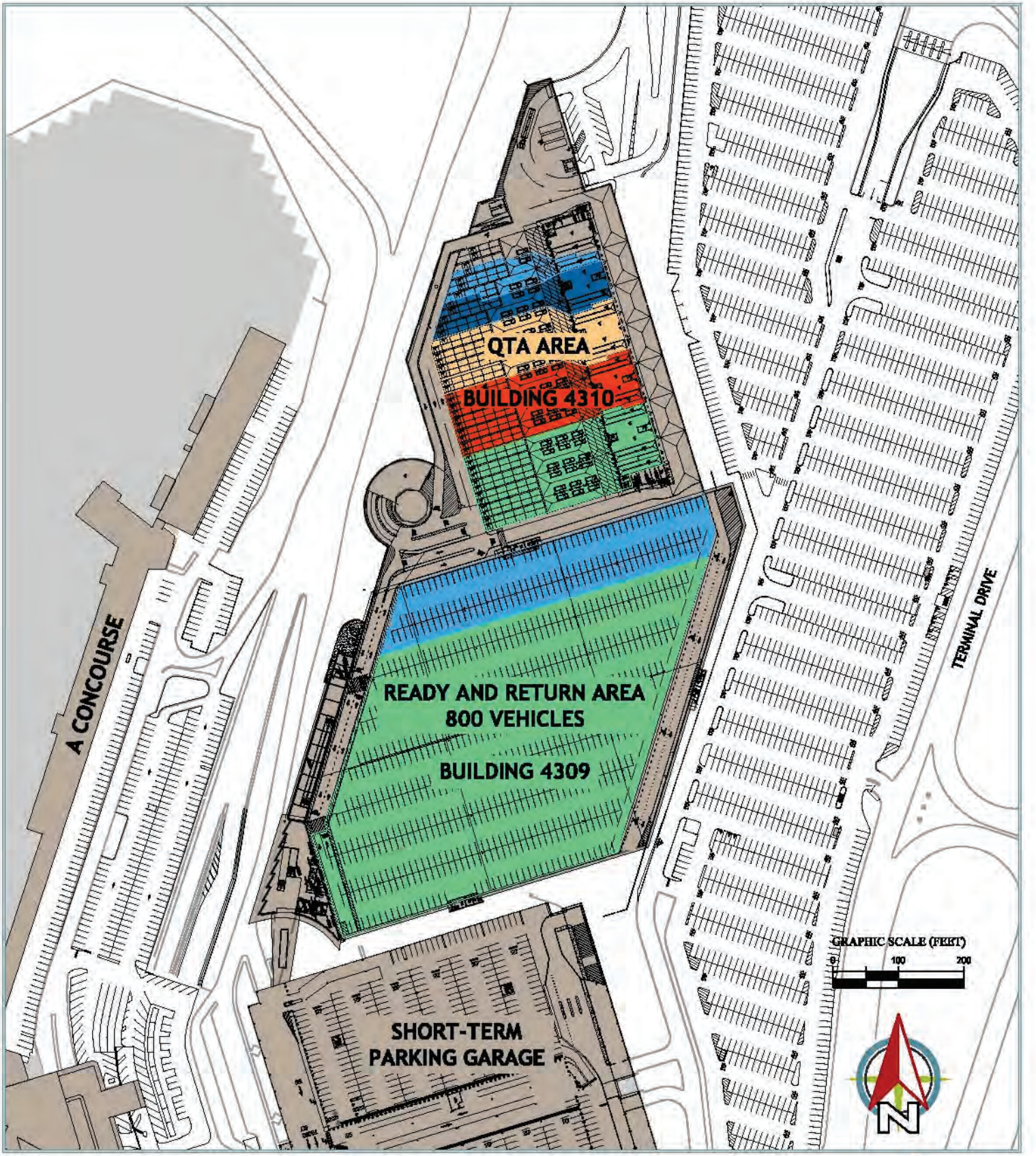

LEGEND

- ALAMO & NATIONAL
- HERTZ
- THRIFTY
- AVIS & BUDGET
- DOLLAR

Figure 1-18
New Rental Car Facility
Level 1 - CONRAC

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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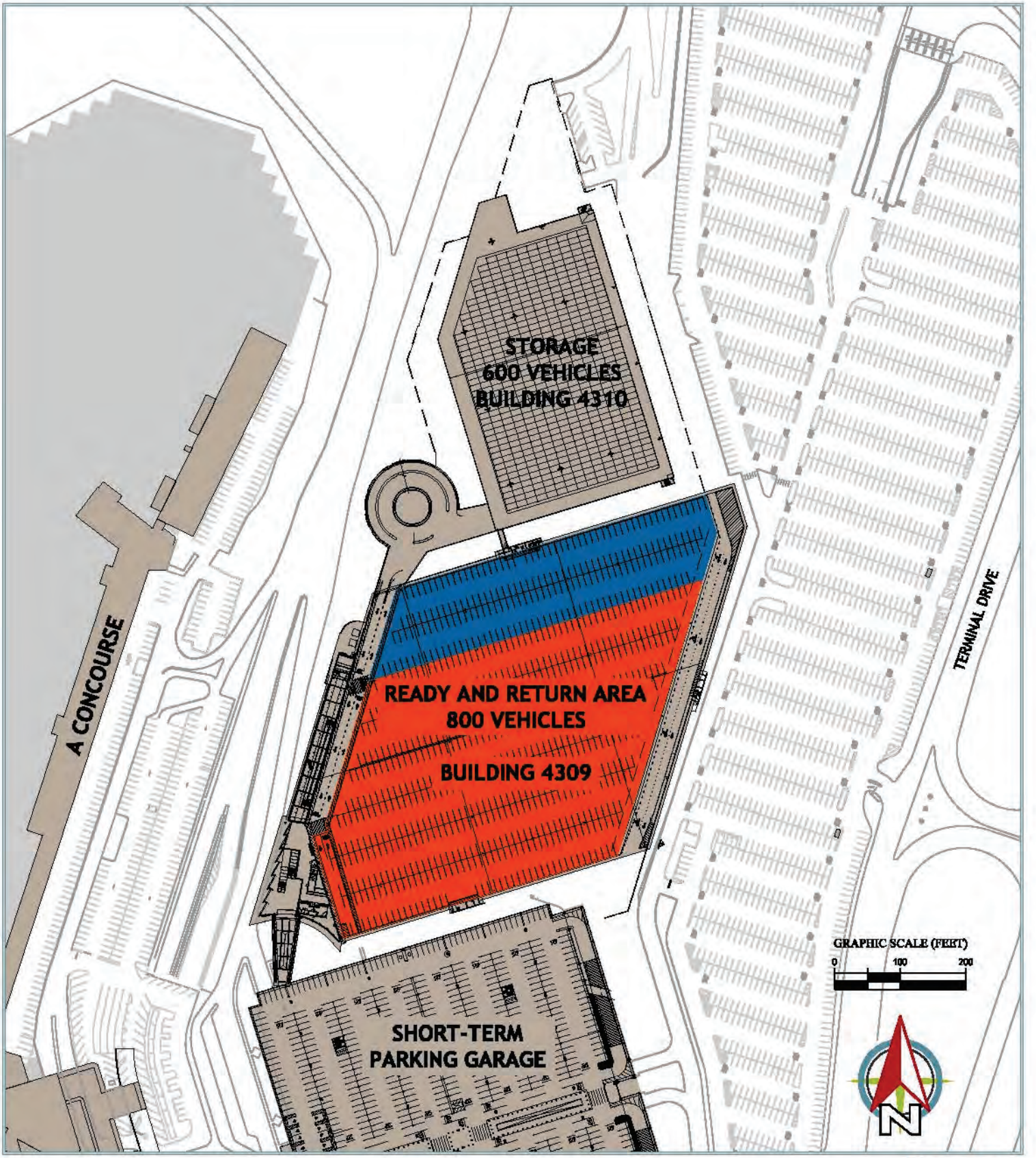

LEGEND

- ALAMO & NATIONAL
- HERTZ
- THRIFTY
- AVIS & BUDGET
- DOLLAR

Figure 1-19
New Rental Car Facility
Level 2 - CONRAC

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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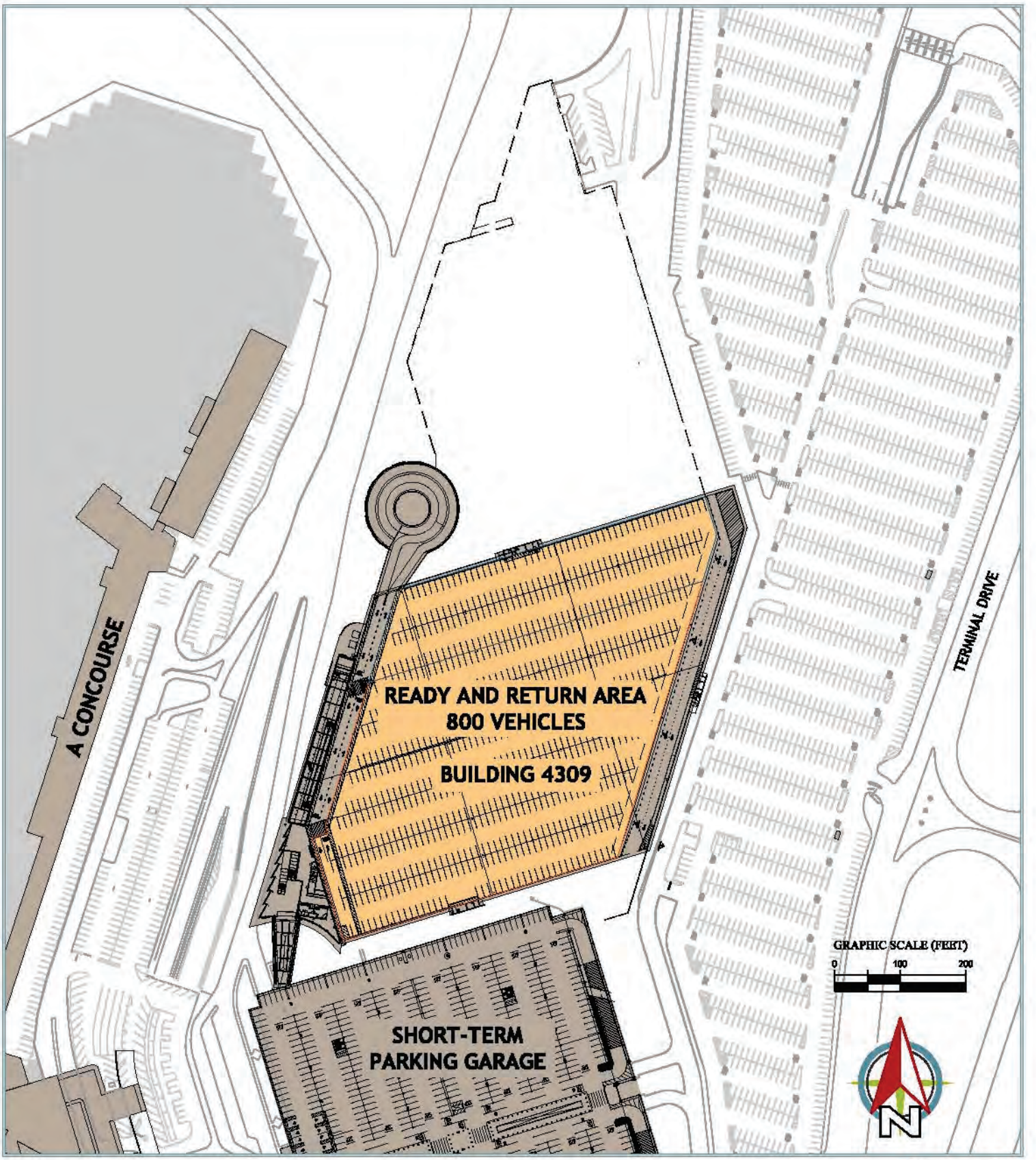

LEGEND

- ALAMO & NATIONAL
- AVIS & BUDGET
- HERTZ
- DOLLAR
- THRIFTY

Figure 1-20
New Rental Car Facility
Level 3 - CONRAC

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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Table 1-32 describes the major components of the CONRAC facility.

Table 1-32 – CONRAC Facility

Location	Spaces
Terminal Counter Capacity (workstations)	70
Ready / Return Spaces	
Level One	800
Level Two	800
Level Three	800
Total	**2,400**
Storage Spaces	
Level Two (Over QTA)	600
QTA Area	
Fueling Positions	54
Car Wash Bays	10
Queue Capacity (Spaces)	240

Source: MNAA, 2011.

The rental car agencies pay a concession fee based on a percentage of gross rental car revenue. Additionally, customers are charged a customer facility charge (CFC) of $4.50 per transaction day. The CFC revenue is used to pay the capital cost associated with the CONRAC facility.

1.6 Other Facilities

A number of non-aviation-related businesses are within and immediately outside of Airport property. One of the largest non-aviation properties outside of the Airport is the Dell Computer Corporation campus south of Murfreesboro Road. Dell also leases a training facility (Building 4401) on Airport property directly south of the Runway 2C RPZ.

Other non-aviation facilities on Airport property include the Luton building, which houses the Metro 911 emergency call center (Building BNA911), Monell's Restaurant (Building 4121), the U-Haul Service Center (Building 4125), a bank (Building 4126), the Genesco Office Building (Building 4123), the Johnston & Murphy plant (Building 4124), a restaurant (Building 4121), office buildings (Buildings 4112, 4138, and 4139), and apartment buildings (Buildings MBP1 through MBP17 and MBP100).

1.6.1 Airfield Fencing

The airfield is currently protected by a chain-link fence that encloses the runways, taxiways, and aircraft movement areas. Approximately 95 percent of the airfield fence is six feet high and topped with three strands of barbed wire. The remaining five percent is eight feet tall, as required by TSA to protect vitally important areas on the airfield.

1.6.2 Utilities

The Airport is currently supplied with electricity, telecommunications, natural gas, water, and sewer. **Figures 1-21**, **1-22**, and **1-23** identify the locations of these utility lines. These service lines vary in capacity.

1.7 Airspace

The U.S. National Airspace System (NAS) is the most complex aviation system in the world. It is an integrated collection of controls, procedures, and policies put in place and regulated by the FAA to ensure safe and efficient air operations. The NAS has been divided into airspace classes to designate the level of service and operating rules for a given area.

BNA's airspace is classified as "Class C"airspace. Class C airspace is defined as an airspace consisting of inner and outer rings centered on the airport reference point with radii of 5 and 10 nautical miles, respectively. The ceiling of the inner ring extends from the ground to 4000 feet above the airport elevation, 4,600 feet above Mean Sea Level (MSL) for BNA. The ceiling of the outer ring must extend no lower than 1,200 feet above the airport elevation. For BNA, the established lower ceiling for the outer ring is 2,100 feet to the east of the airport or 2,400 feet to the west. Communication with ATC must be established prior to entering the Class C airspace. In addition, BNA is located within the Memphis Air Route Traffic Control Center (ARTCC) boundary. The Memphis ARTCC is one of 22 FAA Centers responsible for controlling en route IFR traffic within the U.S.

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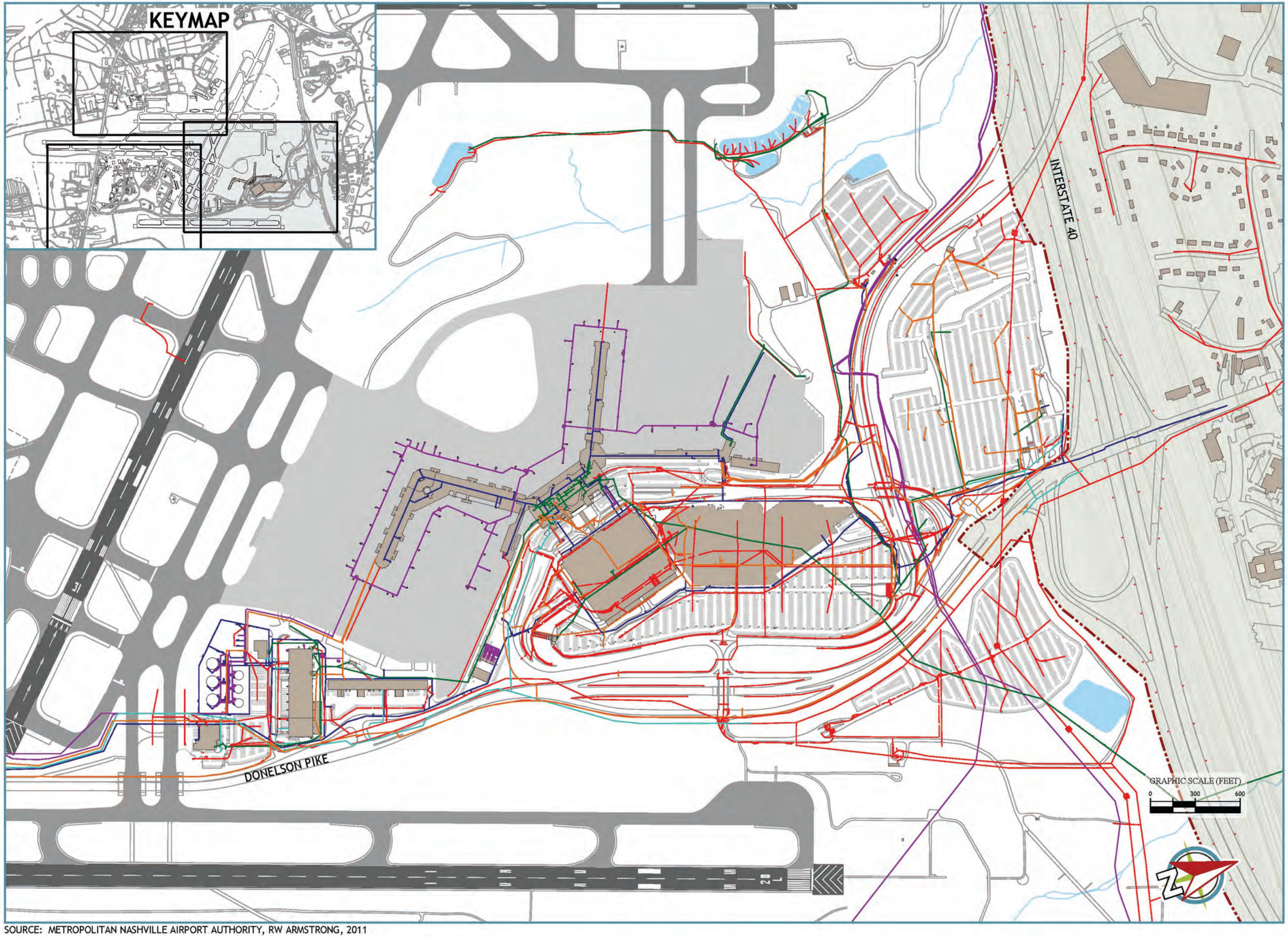

Nashville International Airport

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Figure 1-21
Airport Utilities
Terminal Area

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

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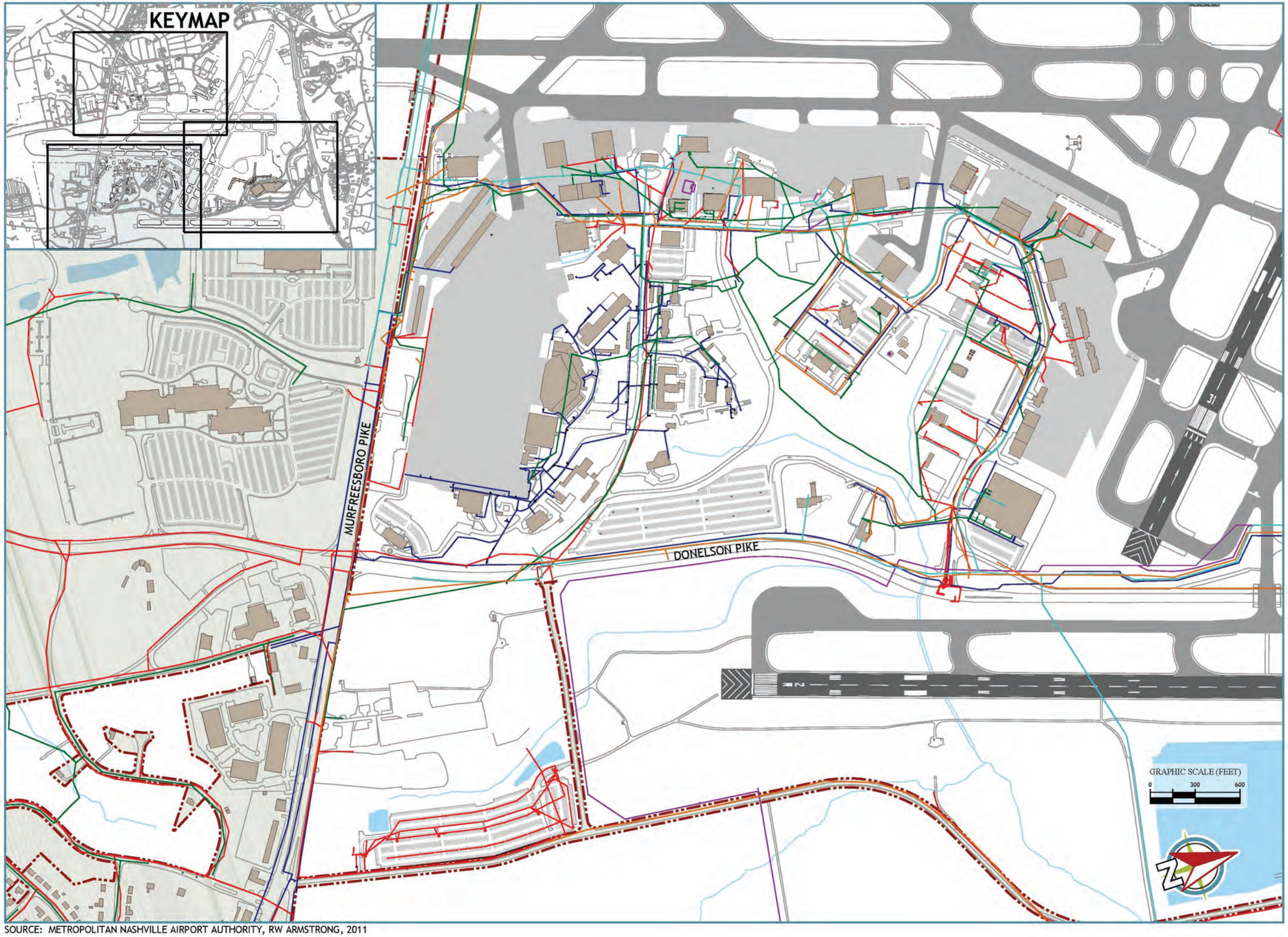

Nashville International Airport

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LEGEND

- Buildings
- Runway Pavement
- Taxiway Pavement
- Apron Pavement
- Hydrology
- Electric
- Telecommunication
- Natural Gas
- Water
- Sewer
- Fuel
- Airport Property Boundary

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

Figure 1-22
Airport Utilities (East)

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Nashville International Airport

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LEGEND

- Buildings
- Runway Pavement
- Taxiway Pavement
- Apron Pavement
- Hydrology
- Electric
- Telecommunication
- Natural Gas
- Water
- Sewer
- Fuel
- Airport Property Boundary

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

Figure 1-23
Airport Utilities (West)

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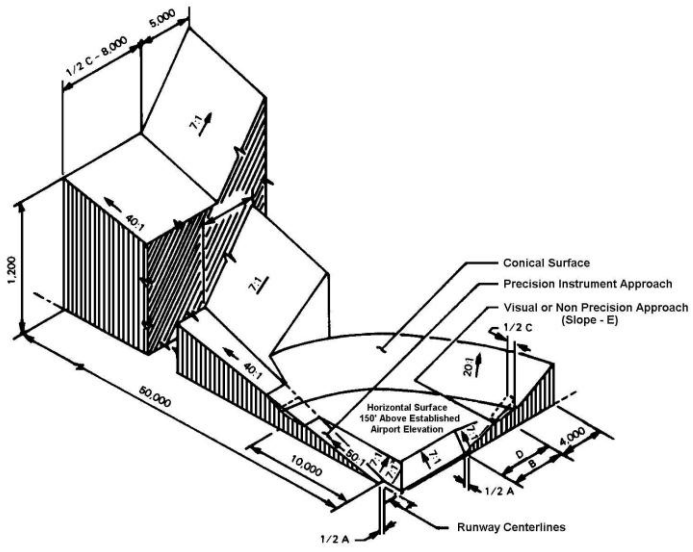
1.7.1 Federal Aviation Regulations (FAR) Part 77

Federal Aviation Regulation (FAR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, defines an obstruction to air navigation as any existing object, whether fixed or mobile, that penetrates the imaginary approach or transitional surfaces for a given airport or heliport. This regulation establishes imaginary surfaces to govern the vertical height of obstacles within the vicinity of airports. **Figure 1-24** illustrates standard Part 77 surfaces. These surfaces vary in size and slope depending on the available approaches at each runway end, as indicated in **Table 1-33**. Once objects have been identified as obstructions, the FAA must evaluate them to determine if they present a hazard to air navigation. If determined to be a hazard, the obstacle must be removed or altered to eliminate the penetration. Current penetrations will be identified in the ALP.

1.7.2 Air Traffic Facilities

The Air Traffic Control Tower (ATCT) (Building 4216) is located at 515 Olen Taylor Boulevard. The building was constructed in 1982, is used for Air Traffic Control, and contains administrative support offices and the Terminal Radar Approach Control Facilities (TRACON) facility. The land is leased from MNAA, but the FAA owns the 191-foot-tall (above ground level or AGL) building. Approximately 40 automobile parking spaces serve the ATCT. The tower is attended 24 hours a day throughout the year, during which time staff controls air traffic in accordance with federal regulations.

Figure 1-24 – Part 77 Surfaces



Source: 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, 2011.

Table 1-33 – Part 77 Surface Criteria

Item	Dimensional Standards (Feet)					
	Visual Runway		Non – Precision Instrument Runway			Precision Instrument Runway
	A	B	A	B		
				C	D	
Width of Primary Surface and Approach Surface Width	250	500	500	500	1,000	1,000
Radius of Horizontal Surface	5,000	5,000	5,000	10,000	10,000	10,000
	Visual Approach		Non – Precision Instrument Approach			Precision Instrument Approach
	A	B	A	B		
				C	D	
Approach Surface Width at End	1,250	1,500	2,000	3,500	4,000	16,000
Approach Surface Length	5,000	5,000	5,000	10,000	10,000	50,000*
Approach Slope	20:1	20:1	20:1	34:1	34:1	50:1 / 40:1*

A – Utility runways (Aircraft < 12,500 pounds)
B – Runways larger than utility
C – Visibility minimums greater than ¾ mile
D – Visibility minimums lower than ¾ mile
* Precision instrument approach slope is 50:1 for inner 10,000 feet and 40:1 for an additional 40,000 feet
Source: 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, 2011.

1.7.3 Airspace Procedures

BNA currently has eight Standard Terminal Arrival Routes (STARs), which bring arrivals into the BNA airspace from each of the four corners. Area Navigation STARs are being developed that will follow a similar flight pattern and should be in place within the next few years. These STARs may also allow for Optimized Profile Descents (OPDs), which will allow aircraft to arrive into the terminal airspace flying an optimal descent pattern for that aircraft, thereby reducing fuel burn, air pollutants and noise. BNA currently has published arrival procedures for most runways, including instrument approach procedures (IAPs), aRea NAVigation (RNAV) procedures and Required Navigational Performance (RNP) procedures.

BNA currently has thirteen Departure Procedures (DP) for departing IFR aircraft. These Standard Instrument Departures (SIDS) are in order to comply with FAA ATCT Order 7400.2G, *Procedures for Handling Airspace Matters,* which identifies specific turns off each runway end to avoid residential areas. The FAA has developed RNAV DPs for all runway ends and for all flight directions and anticipates it has implemented these DPs in 2013.

Table 1-34 lists both the current arrival and departure procedures.

Table 1-34 – BNA Airspace Procedures

Procedure Type	Runway	Current Procedure
STARS	N/A	CHSNE ONE
STARS	N/A	GRAHAM FIVE
STARS	N/A	GUITR FOUR
STARS	N/A	HEHAW FIVE
STARS	N/A	PASLY TWO
STARS	N/A	RYYMAN ONE
STARS	N/A	SWFFT ONE
STARS	N/A	VOLLS EIGHT
DP	ALL	CHADM ONE
DP	ALL	DANLS ONE
DP	ALL	DRURY ONE
DP	ALL	EVVAN ONE
DP	ALL	FLAME ONE
DP	ALL	GDOGG ONE
DP	ALL	HGGRD ONE
DP	ALL	KRSTA ONE
DP	ALL	NASHVILLE ONE
DP	ALL	PARDN ONE
DP	ALL	PREDS ONE
DP	ALL	TAZMO ONE
DP	ALL	TIPPN ONE

Source: FAA, 2013.

1.8 Inventory of Operations Data

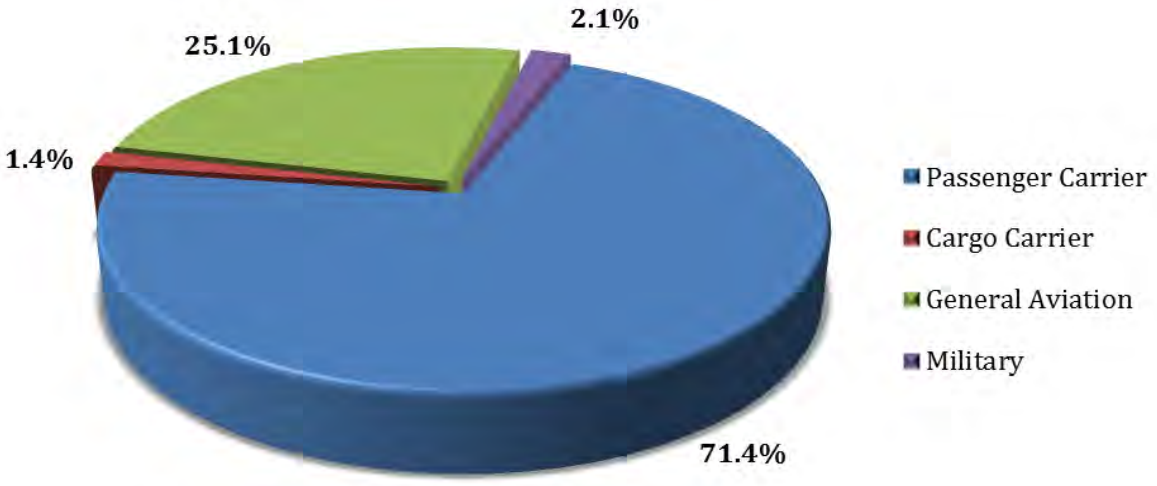
Aircraft operations (arrivals and departures) at the Airport totaled just over 174,598 in Fiscal Year (FY) 2011 (July 1, 2010 through June 30, 2011). As detailed in **Table 1-35** and **Figure 1-25**, the majority of BNA aviation activity consists of commercial passenger carrier operations, which account for 71 percent of total FY2011 Airport operations. Commercial passenger activity is followed by GA activity at approximately 25 percent of total operations, while military and air cargo activity account for 2.1 percent and 1.4 percent of total operations, respectively.

Table 1-35 – FY2011 BNA Operations by Type

Aircraft Category	Operations	Percent of Total
Passenger Carrier	124,590[1]	71.4%
Cargo Carrier	2,526	1.4%
General Aviation	43,870	25.1%
Military	3,612	2.1%
Total	**174,598**	**100%**

1 – Estimated TAF air carrier operations based on MNAA 2011 actuals
Source: MNAA, 2011.

Figure 1-25 – FY2011 BNA Operations by Type



Source: MNAA, 2011.

The following subsections provide a detailed overview of current aviation operations at BNA by activity type (i.e., commercial carrier, cargo carrier, general aviation, and military) based on FY2011 operations data reported by the MNAA.

1.8.1 Commercial Passenger Carrier Activity

Commercial passenger service at the Airport was provided by the following airlines and their associated regional airline affiliates during FY2011:

- Air Canada Jazz
- American/American Eagle
- Continental Express (In 2012, Continental Express merged with United Express to form one entity.)
- Delta/Delta Connection
- Frontier Airlines/Frontier Express
- Southwest Airlines
- United Express
- US Airways/US Airways Express

In total, these airlines conducted nearly 125,000 operations, and enplaned over 4 million passengers at BNA in FY2011. These carriers provide an average of 190 daily departures to the following top 50 passenger enplanement destinations:

1. Chicago - Midway
2. New York - La Guardia
3. Baltimore
4. Orlando
5. Denver
6. Los Angeles
7. Las Vegas
8. Philadelphia
9. Tampa
10. Dallas/Fort Worth
11. Detroit
12. Phoenix
13. Fort Lauderdale
14. Raleigh/Durham
15. Chicago - O'Hare
16. Houston - Hobby
17. Kansas City
18. New Orleans
19. Seattle/Tacoma
20. Jacksonville
21. Minneapolis
22. San Antonio
23. San Diego
24. Washington – National
25. Austin
26. Cleveland
27. Boston
28. New York – Newark
29. San Francisco
30. Charlotte
31. Windsor Locks
32. Houston - Intercontinental
33. Atlanta
34. Dallas - Love
35. Columbus
36. Providence
37. Norfolk
38. Panama City, FL
39. Salt Lake City
40. Sacramento
41. Portland
42. St. Louis
43. Pittsburgh
44. Milwaukee
45. Miami
46. Oakland
47. Fort Myers
48. Ontario, CA
49. Manchester
50. Santa Ana

Table 1-36 details the number of departures and departure seats (i.e., annual available seats based on an airline's number of departures and aircraft capacity) for each airline operating at the Airport during FY2011. In total, there were 62,295 scheduled departures with over 6.3 million available seats in FY2011.

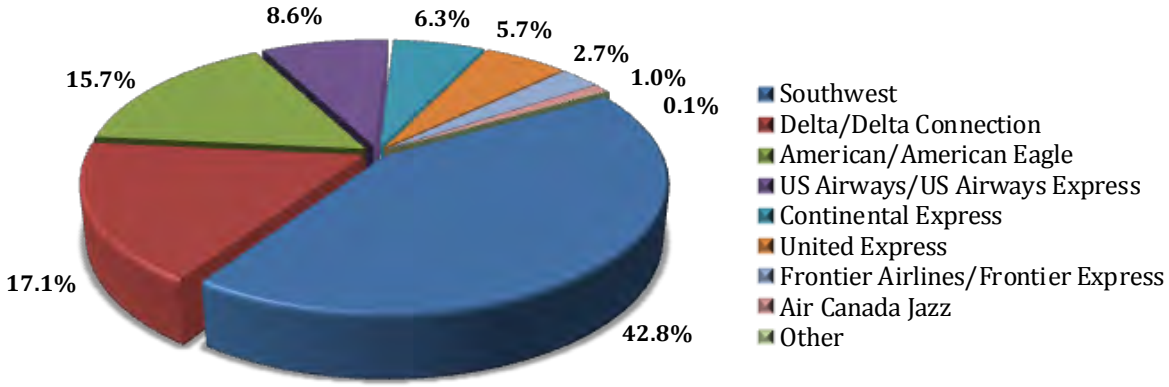
Table 1-36 – FY2011 BNA Departures and Seats by Airline

Airline	Annual Departures	Departure Seats	Total Operations
Southwest	26,660	3,640,090	53,320
Delta/Delta Connection	10,648	884,942	21,296
American/American Eagle	9,790	835,580	19,580
US Airways/US Airways Express	5,382	400,254	10,764
Continental Express	3,895	195,620	7,790
United Express	3,578	187,728	7,156
Frontier Airlines/Frontier Express	1,686	141,264	3,372
Air Canada Jazz	612	30,600	1,224
Other	44	2,200	88
Total	**62,295**	**6,318,278**	**124,590**

NOTE: United Express RJs are separated from other United/Continental narrow-body operations
Source: MNAA, 2011.

As illustrated in **Figure 1-26**, Southwest Airlines accounts for nearly 43 percent of the commercial passenger carrier operations at the Airport, followed by Delta, American, and US Airways at 17.1, 15.7, and 8.6 percent, respectively. As a result of the United and Continental Airlines merger, the anticipated reduction in total operations, if any, due to network redundancies is unknown at this time.

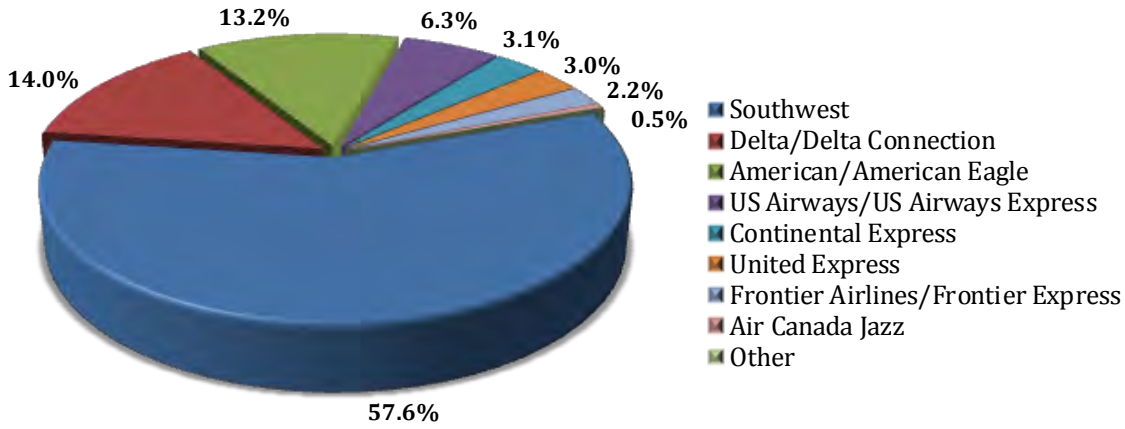
Figure 1-26 – FY2011 BNA Operations by Airline



Source: MNAA, 2011.

Figure 1-27 details the FY2011 total available seats by airline, a function of total departures and an airline's fleet mix (i.e., capacity of aircraft used on BNA routes). Due to Southwest Airlines' high share of BNA commercial carrier departures, coupled with their high average seats per departure (they do not operate regional jets), Southwest Airlines accounts for nearly 58 percent of BNA's annual departure seats. Southwest is followed by Delta, American, and US Airways at 14.0, 13.2, and 6.3 percent, respectively.

Figure 1-27 – FY2011 BNA Seats by Airline



Source: MNAA,2011.

Table 1-37 and the associated **Figure 1-28** detail the annual operations by aircraft type grouping (narrowbody, widebody, regional jet 50 seats and under, regional jet over 50 seats).

Nearly 58 percent of FY2011 BNA commercial service operations were conducted by narrowbody aircraft, accounting for 77 percent of all available seats; the majority of these operations and seats are Southwest Boeing 737 series aircraft. Regional jets account for just over 42.3 percent of BNA commercial service operations and 22.9 percent of available seats.

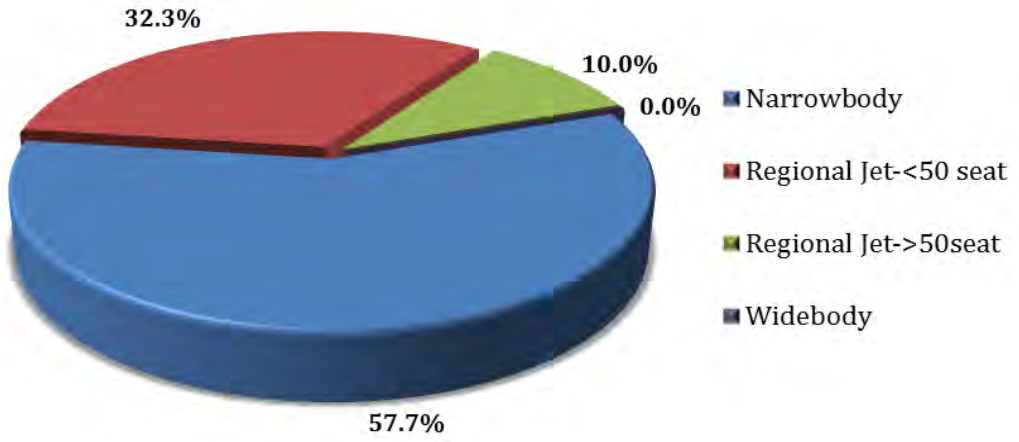
Table 1-37 – FY2011 BNA Departures and Seats by Aircraft Type

Airline	Annual Departures	Departure Seats	Total Operations
Narrowbody	35,939	4,871,106	71,878
Regional Jet-<50 seat	20,137	976,279	40,274
Regional Jet->50seat	6,208	468,161	12,416
Widebody	11	2,732	22
Total	**62,295**	**6,318,278**	**124,590**

Source: MNAA, 2011.

Note that there are no regularly scheduled widebody flights into BNA; those listed in FY2011 were likely either charters, diversions due to weather, or replacement aircraft for canceled flights due to mechanical issues.

Figure 1-28 – FY2011 BNA Seats by Aircraft Type



Source: MNAA, 2011.

1.8.2 Cargo Carrier Activity

In FY2011, there were 2,526 all-cargo carrier operations at the Airport. These all-cargo carrier operations, in conjunction with passenger carrier belly-freight, moved 43,995 tons of cargo for the year (36,592 tons for the all-cargo carriers and 7,364 tons of belly-freight for the passenger carriers). Scheduled all-cargo carrier air cargo service at the Airport is provided by FedEx (and feeder carriers operating on their behalf), BAX Global, and ASTAR Airlines (DHL) using the following aircraft for weekday operations:

- FedEx: Airbus A-300 or A-310, Boeing 727-200 and 757
- BAX Global: Boeing 727 or DC-8
- ASTAR (DHL): Boeing 727

In addition to the scheduled all-cargo carriers, charter all-cargo carriers also operate at the Airport to supplement the scheduled all-cargo carriers. These charter freight carriers have included the following:

- AirNet System
- Ameristar Jet Charters
- Cherry Air Inc.
- IFL Group
- McNeely Charter Service
- Royal Cargo
- Special Aviation Services
- USA Jet

1.8.3 General Aviation Activity

According to the MNAA, GA operations at the Airport totaled approximately 43,870 in FY2011, equating to 25.1 percent of total BNA operations. GA activity includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled cargo, and military operations. Although this is not the case for BNA, GA operations represent the majority of operations handled by towered and non-towered airports, as well as for the majority of certificated pilots in the United States. GA activities include air taxi, business and corporate aviation, the training of new pilots, sightseeing, aerial photography, law enforcement, and medical flights. General aviation aircraft encompass a broad range of aircraft types, from small, one-passenger piston aircraft to large corporate jets, as well as helicopters, gliders, and amateur-built aircraft.

As detailed in **Table 1-38** and **Figure 1-29**, 101 GA aircraft are based at BNA, in addition to 10 military aircraft.

Table 1-38 – BNA Based Aircraft by Type

Aircraft Category	Aircraft Count
Single Engine	18
Multi-Engine Piston	25
Turbo-Prop	15
Jet	41
Rotorcraft	2
Military	10
Total	**111**

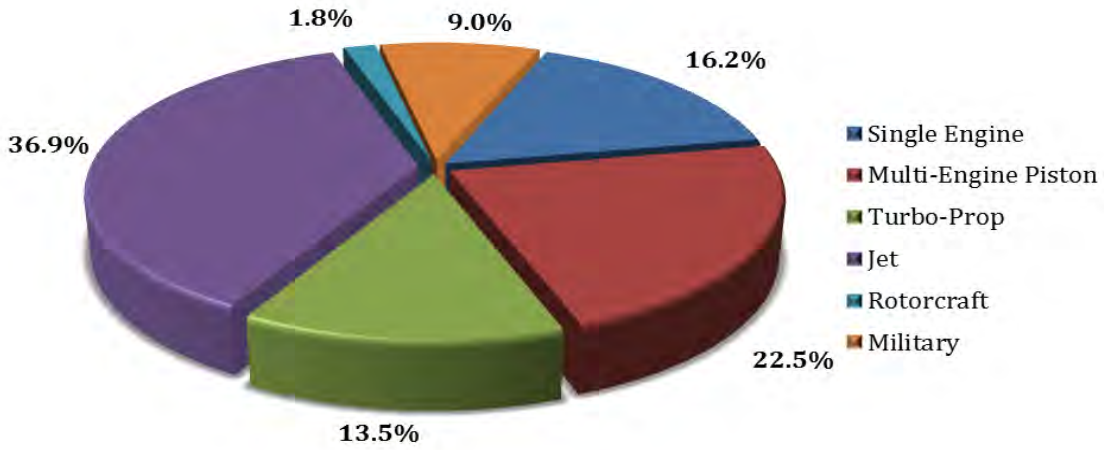
Source: MNAA, 2011.

Jet and turbo-prop aircraft account for over 50 percent of total based aircraft (including military), or over 55 percent of based GA aircraft. This is a much higher percentage than is seen at typical commercial service airports and is indicative of a high level of corporate, business, and air taxi activity at BNA.

1.8.4 Military Activity

Military operations accounted for 3,612, or 2.1 percent, of total BNA operations in FY2011. The military operations include those conducted by the TANG and their 10 C-130 aircraft based at the Airport, as well as other transient military aircraft that use BNA for training or refueling.

Figure 1-29 – Based Aircraft by Type



Source: MNAA, 2011.

1.8.5 Airfield Use

BNA has an "Informal Runway Use Program." The program identifies the priority of runway combinations to be used during the day and night. As stated, the program is designed to provide noise abatement to surrounding communities without unreasonably inhibiting air commerce or diminishing the prime function of the ATCT to promote the safe, orderly, and expeditious flow of air traffic. The program applies to all jet aircraft and all four-engine aircraft with a gross weight of 12,500 pounds or more, except for the DeHavilland Dash-7. The parallel runways should be the first choice for daytime arrivals and departures. Runway 13/31 is the second choice when conditions dictate. Military fighter/attack/trainer jet aircraft must always use Runway 13/31. Runway combination priorities are provided for nighttime arrival and departures as shown in **Table 1-39.**

Table 1-39 – Runway Use Priority

Runway	Arrive	Depart
1[1]	Runway 31	Runway 13
2	Runway 31	Runway 31
3	Runway 2R	Runway 31
4	Runway 20R	Runway 13
5	Runway 20R	Runway 20L
6	Runway 20R	Runway 20R
7	Runway 2R	Runway 2L

1 - This may be omitted during 2200-2300L and 0600-0700L

Source: ATCT Tower Order, April 2011.

A detailed forecast developed for the ongoing NEM Update includes a full breakdown of operations by type and time of day. Radar data were collected from the BNA Flight Track

Monitoring System (FTMS) as part of the Noise Exposure Map (NEM) Update. Data was collected and evaluated for the periods from January 2009 through June 2010 and for January 2011. Operation levels and types were determined from this data set. The operations database was provided to the Consultant Team and this was used along with several other sources to develop the forecast for the NEM Update. The detailed forecast included operations for both 2011 and 2016, which were needed for the NEM Update. The total annual operations and the annual average day operations for the past five years are shown in **Table 1-40.**

Table 1-40 – Historical Average Annual Day Operations

Year	Annual Total	Annual Average Day
2005	231,227	617.5
2006	212,284	583.0
2007	213,966	581.4
2008	198,792	523.9
2009	175,107	476.9
2010	174,566	477.3

Source: FAA TAF, 2011.

The radar flight data collected for the NEM Update contained the necessary information to determine the actual runway end used for each arrival and departure. The NEM runway use, by aircraft type and time of day, was developed from this dataset. There are no anticipated runway use changes between the two forecast years. The summarized runway use percentages projecting both the existing (2011) and forecast (2016) years, as presented in **Table 1-41**, were based on actual annual average runway use for both arrivals and departures during the periods in calendar year 2009 when all runways were open.

Table 1-41 – Summary of FAR Part 150 Runway Use

Runway	Departures	Arrivals
2C	5.6%	15.0%
2L	5.7%	7.7%
2R	3.1%	3.6%
13	1.0%	3.5%
20C	22.2%	10.0%
20L	2.5%	15.4%
20R	7.9%	10.2%
31	52.0%	34.8%
Total	**100%**	**100%**

Source: HMMH, BNA FAR Part 150 Update, 2011.

Table 1-42 and **Table 1-43** provide additional details, including runway use percentages by the time period (daytime and nighttime) and aircraft group.

General aviation jet and non-jet activity tends to favor the center runway due to its proximity to the GA facilities. Air carrier jets primarily use Runway 13-31 at night for noise abatement purposes

Table 1-42 – Summary of FAR Part 150 Runway Use (Commercial Jet)

	Air Carrier Jet				Regional Jet			
	Departures		Arrivals		Departures		Arrivals	
Runway	Day	Night	Day	Night	Day	Night	Day	Night
2C	0.4%	0.3%	20.7%	9.6%	0.6%	30.6%	10.4%	6.7%
2L	10.4%	5.7%	8.4%	7.7%	12.2%	0.2%	26.6%	15.9%
2R	17.1%	0.9%	16.5%	1.2%	16.5%	4.8%	8.9%	0.5%
13	0.1%	2.5%	0.5%	3.4%	0.0%	5.3%	0.2%	1.3%
20C	34.7%	8.6%	0.3%	0.1%	17.5%	6.4%	0.4%	0.3%
20L	8.9%	5.0%	39.9%	17.6%	7.5%	17.0%	30.5%	18.3%
20R	6.2%	12.2%	10.5%	18.1%	25.2%	9.0%	20.4%	20.6%
31	22.2%	64.7%	3.3%	42.3%	20.6%	26.7%	2.7%	36.2%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: HMMH, BNA FAR Part 150 Update, 2011.

Table 1-43 – Summary of FAR Part 150 Runway Use (GA and Non-Jet)

	General Aviation Jet				Non-Jet			
	Departures		Arrivals		Departures		Arrivals	
Runway	Day	Night	Day	Night	Day	Night	Day	Night
2C	18.1%	6.2%	38.3%	22.1%	22.2%	10.2%	32.4%	34.0%
2L	3.3%	1.1%	1.1%	0.0%	1.0%	0.8%	1.8%	0.5%
2R	11.3%	0.6%	6.4%	1.3%	4.0%	0.6%	12.3%	2.3%
13	0.1%	1.1%	0.2%	5.8%	0.4%	0.0%	0.3%	2.8%
20C	42.5%	27.5%	27.6%	15.5%	50.4%	64.3%	29.3%	16.3%
20L	7.0%	2.5%	19.7%	14.5%	0.6%	0.0%	15.7%	15.1%
20R	1.5%	0.6%	3.5%	4.7%	1.3%	0.6%	4.1%	1.6%
31	16.2%	60.5%	3.1%	36.1%	20.3%	23.4%	4.1%	27.5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: HMMH, BNA FAR Part 150 Update, 2011.

1.8.6 Run-up Operations

Four areas are designated for run-ups. Run-ups are usually performed after aircraft maintenance to ensure engines are operating as intended. **Figure 1-30** identifies these locations. **Table 1-44** details the run-up locations operations by aircraft type.

Table 1-44 – Run-up Operations

	Southeast Heading			Southwest Heading			Northeast Heading			Northwest Heading		
Area	**King Air**	**C-130**	**E-175**	**King Air**	**C-130**	**E-175**	**King Air**	**C-130**	**E-175**	**King Air**	**C-130**	**E-175**
H-1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H-6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
K-2	**Limit**[1]	**Limit**[1]	**Limit**[1]	Yes	**Limit**[1]	Yes	**No**[2]	**No**[2]	**No**[2]	**Limit**[1]	**Limit**[1]	Yes
N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1 - No nighttime run-ups due to 70 dBA over residential areas.
2 - No run-ups anytime due to airfield fence.
Source: HMMH BNA Run-up Evaluation, December 2010.

1.9 Historical Socioeconomic and Community Data

The Nashville International Airport primarily serves the population of the Metro Nashville area (inclusive of Davidson County) and, by extension, the surrounding counties that compose the Nashville Metropolitan Statistical Area. The Nashville MSA consists of the following 13 counties:

- Cannon County
- Cheatham County
- Davidson County
- Dickson County
- Hickman County
- Macon County
- Robertson County
- Rutherford County
- Smith County
- Sumner County
- Trousdale County
- Williamson County
- Wilson County

For planning purposes, the Nashville MSA will act as the proxy for the Nashville International Airport market area. Its projected demographic and economic characteristics will be detailed in greater detail in Chapter 2. The following subsections provide an overview of the current Nashville metropolitan area (i.e., City) and the Nashville MSA as depicted on **Figure 1-1**.

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Nashville International Airport

RW ARMSTRONG

LEGEND

- On-Airport Buildings
- Off-Airport Buildings
- Taxiway Pavement
- Apron Pavement
- Run-up Location
- Airport Property Boundary

BRILEY PKWY

K2

N

INTERSTATE 40

AIRPORT TERMINAL BUILDING

MURFREESBORO PIKE

DONELSON PIKE

H1

H6

GRAPHIC SCALE (FEET)

0 750 1500

SOURCE: METROPOLITAN NASHVILLE AIRPORT AUTHORITY, RW ARMSTRONG, 2011

Figure 1-30
Run-up Locations

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1.9.1 Metro Nashville Area

The population of the Metro Nashville area in 2010 was 626,681, reflecting population growth of 10 percent between 2000 and 2010. According to Nashville's 2010 Comprehensive Annual Financial Report, the top employers in the City, and the associated number of employees, are as follows:

- Vanderbilt University and Medical Center: 20,968
- Nashville-Davidson County Government and Public Schools: 20,162
- State of Tennessee: 20,000
- U.S. Government: 11,496
- Saint Thomas Health Services: 6,500
- Nissan North America: 5,850
- Hospital Corporation of America: 5,447
- Wal-Mart: 4,500
- Gaylord Entertainment: 4,500
- Cracker Barrel Old Country Store: 4,189
- Dell: 3,200

In the 2008 Milken Institute/Greenstreet Partners Best-Performing Cities Index, which ranks metropolitan area economic performance, Nashville placed 22nd out of 200 large U.S. metro areas. The study examined factors such as job creation, technology, and wages to determine how well cities are creating and sustaining economic growth.

1.9.2 Nashville MSA

With a 2010 population of 1,613,300 persons, the Nashville MSA is an extension of the Metro Nashville area, a 13-county group that surrounds the City and Airport and will act as a proxy for the BNA catchment area (market area), which extends beyond the MSA and includes parts of northern Alabama and southern Kentucky. The MSA's population growth, income, and employment characteristics will have an often direct, sometimes indirect, impact on the utilization and growth prospects of BNA. In order to examine these characteristics, Woods and Poole Economics demographic data is used to provide comparisons between the Nashville MSA and the benchmarks of the State of Tennessee and the United States.

1.9.3 MSA Population Growth

The historic population and associated growth rates for the Nashville MSA, Tennessee, and the United States for years 2000 to 2010 are shown in **Table 1-45.** The populations for the United

States, Tennessee, and the Nashville MSA from 2000-2010, grew at an average annual growth rate (AAGR) of approximately 0.9 percent, 1.1 percent, and 2.0 percent respectively. These trends show that Nashville MSA population growth outpaced the U.S. population by a factor of two. Strong population growth in the BNA market is a significant driver of growth at the Airport.

Table 1-45 – Population Growth (Historic)

Year	Nashville MSA (000)	Average Annual Growth	Tennessee (000)	Average Annual Growth	United States (000)	Average Annual Growth
2000	1,317.6	-	5,703	-	282,172	-
2005	1,450.5	1.9%	5,996	1.0%	295,753	0.9%
2010	1,613.3	2.1%	6,368	1.2%	310,009	0.9%
AAGR 2000-2010		**2.0%**		**1.1%**		**0.9%**

AAGR - Average Annual Growth Rate
Source: Woods and Poole Economics, 2011.

1.9.4 MSA per Capita Income

The historic per capita income and associated growth rates for the Nashville MSA, Tennessee, and the United States for years 2000 to 2010 are shown in **Table 1-46**. From 2000-2010, the per capita income for the Nashville MSA, the state, and the United States grew at an AAGR of 1.8 percent, 2.5 percent, and 2.6 percent, respectively. Though the Nashville per capita income grew at a rate slightly less than that of the State and the United States as a whole, in absolute terms, Nashville's 2010 per capita income of $37,954 is 11.6 percent above the State and only 2.9 percent below the national average.

Table 1-46 – Per Capita Income (Historic)

Year	Nashville MSA ($)	Average Annual Growth	Tennessee ($)	Average Annual Growth	United States ($)	Average Annual Growth
2000	31,662	-	26,691	-	30,318	-
2005	36,052	2.6%	31,294	3.2%	35,424	3.2%
2010	37,954	1.0%	34,022	1.7%	39,063	2.0%
AAGR 2000-2010		**1.8%**		**2.5%**		**2.6%**

AAGR - Average Annual Growth Rate
Source: Woods and Poole Economics, 2011.

Chapter 2 of this document will examine projected per capita income growth in the Nashville MSA, state, and nation to determine how forecast income growth in the MSA relates to that of the State and Nation. Higher rates of income growth equate to higher disposable income and potentially higher travel demand.

1.9.5 MSA Employment Levels

The historic number of people employed and percent of population group employed (i.e., persons employed divided by total population) for the Nashville MSA, Tennessee, and the United States for years 2000 to 2010 are shown in **Table 1-47**. From 2000-2010, the employment levels (number of people employed within the population group) for the Nashville MSA, were above that of the state and the nation. The rate at which employment grew also outpaced the state and nation; employment for the MSA grew 0.8 percent annually, while the state and United States grew at an AAGR of 0.2 percent and 0.5 percent, respectively.

Table 1-47 – Employment Levels (Historic)

Year	Nashville MSA (000)	Percent Employed	Tennessee (000)	Percent Employed	United States (000)	Percent Employed
2000	913.0	69.3%	3,471	60.9%	165,371	58.6%
2005	977.9	67.4%	3,597	60.0%	172,551	58.3%
2010	986.0	61.1%	3,557	55.9%	174,063	56.1%
AAGR 2000-2010	**0.8%**		**0.2%**		**0.5%**	

AAGR - Average Annual Growth Rate
Source: Woods and Poole Economics, 2011.

As with the other demographic factors examined, Chapter 2 will look at projected employment levels in the Nashville MSA in order to benchmark the levels compared to Tennessee and the United States. These levels will be used as another indicator of future Airport demand.

1.10 Meteorological Conditions

Meteorological conditions affect operations at an airport in many ways. Winds, precipitation and temperature influence decisions pertaining to NAVAIDs, runway orientation and required runway length. BNA is equipped with an Automated Surface Observing System (ASOS), a highly sophisticated weather data sensing, processing, and dissemination system. It was designed to support weather forecast activities and aviation operations. Controlled and operated by the FAA and the National Weather Service (NWS), the ASOS automatically takes weather observations at 20-minute intervals, which are transmitted to pilots and airports throughout the region.

The State of Tennessee and the Nashville metropolitan areas experience a variety of precipitation throughout the year. Rainfall is heaviest during the winter and spring months. Average annual rainfall is approximately 50 inches, and average annual snowfall is approximately nine inches. **Figure 1-31** depicts annual weather averages for the Nashville area.

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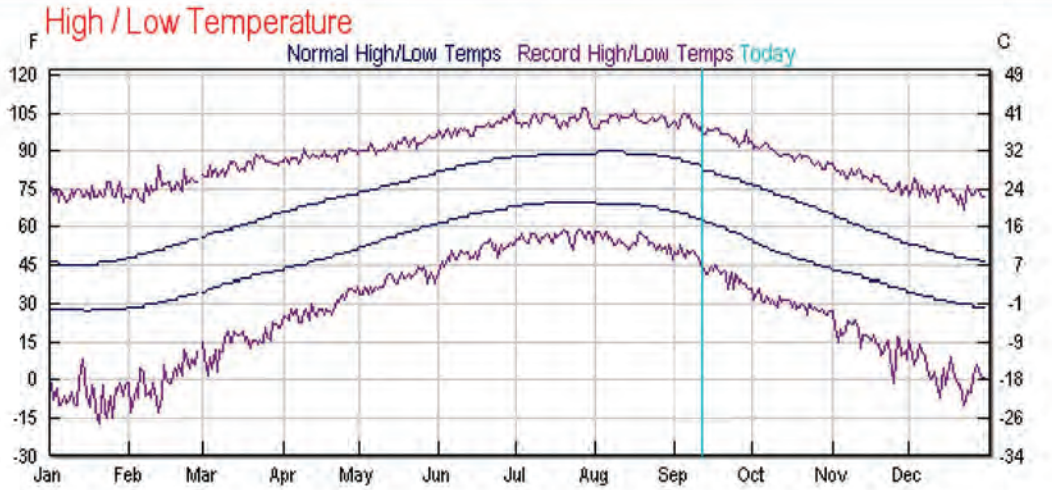
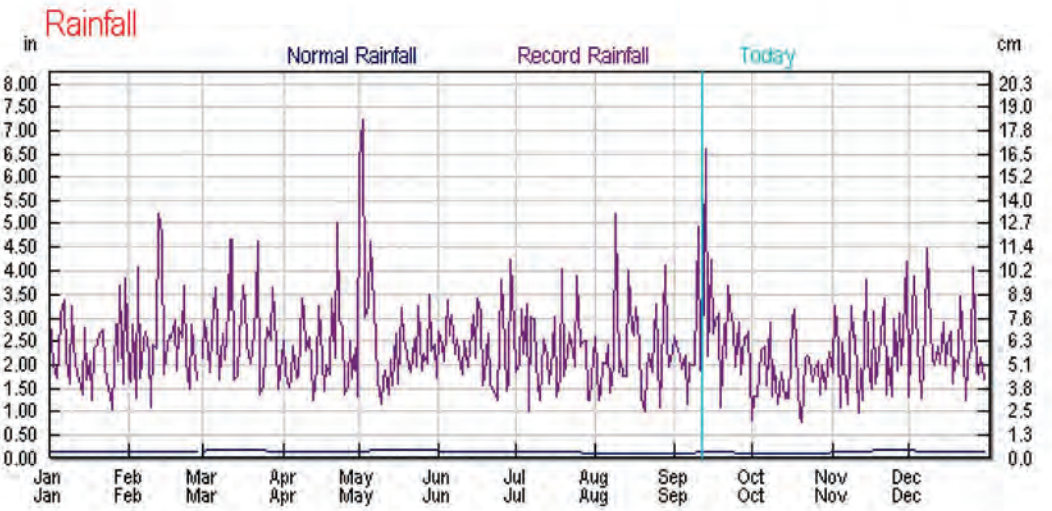




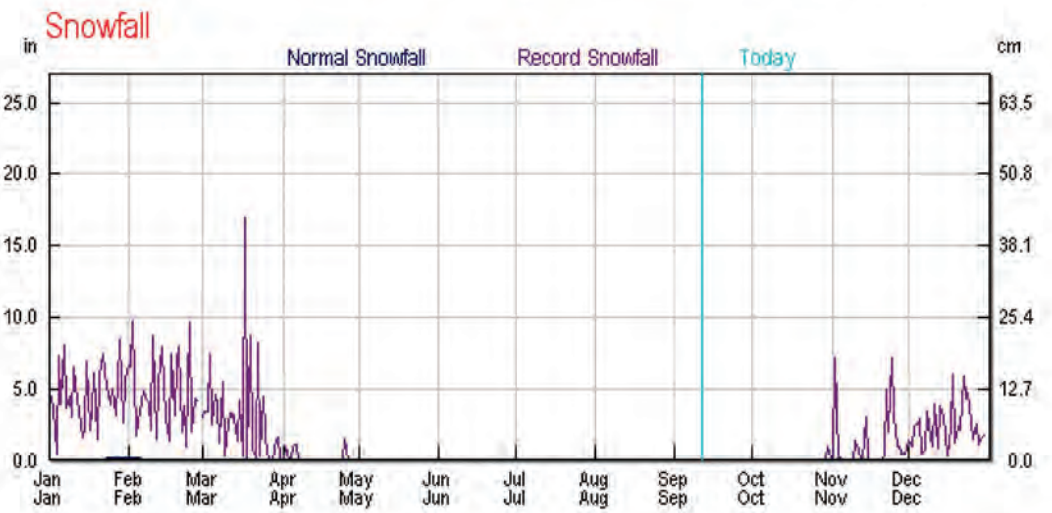


Figure 1-31
Seasonal Weather Averages

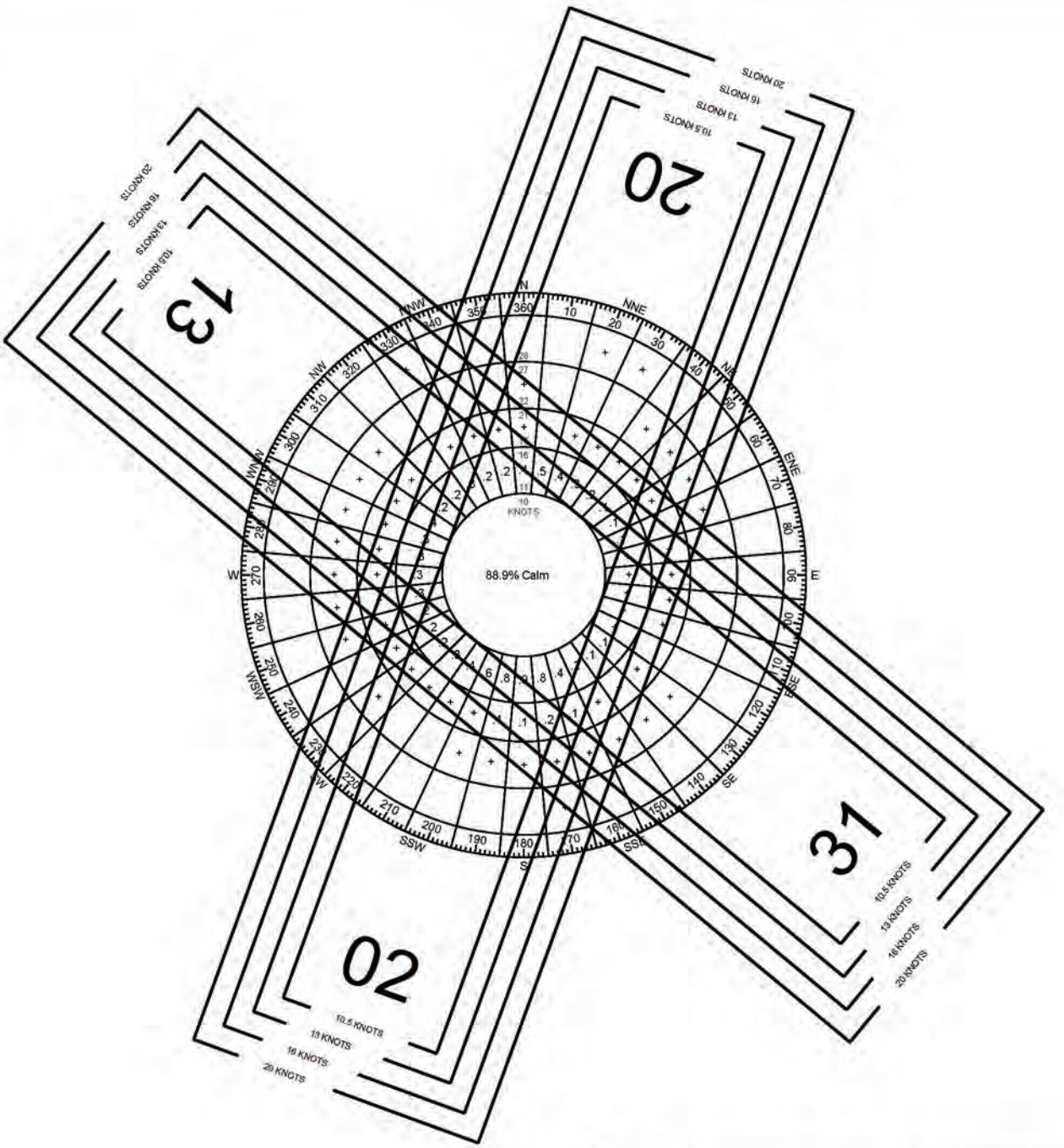
SOURCE: Weather Underground, 2011; BNA ASOS.

The Nashville area has a generally subtropical climate, typical of the Southeastern United States, while still enjoying the benefits of all four seasons. The region is characterized by mild to cool winters and hot, humid summers. January is typically the coldest month, with average low temperatures of approximately 28 degrees Fahrenheit. July is often the hottest month, with average high temperatures of approximately 89 degrees Fahrenheit.

It is essential to consider weather conditions during the planning and development stages of an airport master plan. Temperature is a critical factor in determining runway lengths, and wind direction determines runway orientation. Additionally, the need for NAVAIDS and approach lighting is directly impacted by the frequency of cloud cover and low visibility conditions that reduce operating minimums to IFR levels.

Local wind conditions at an airport play a large role in runway use, as aircraft operate most efficiently when landing and departing into the wind. Runways not oriented to take full advantage of the prevailing wind patterns are typically not used as frequently. Aircraft can operate on a runway when the crosswind component, or wind component perpendicular to the direction of travel, is not excessive or beyond the limits of the aircraft. Crosswind components differ slightly depending on the size of aircraft and the associated ARC for the runway. According to FAA criteria, a runway should provide at least 95 percent wind coverage for any aircraft forecast to use the airport regularly. The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5 knots for ARC A-I and B-I; 13 knots for ARC A-II and B-II; 16 knots for ARC A-III, B-III, and C-I through D-III, and 20 knots for ARC A-IV through D-VI.

The calculated wind coverage for BNA facilities shows that all runways exceed the 95 percent wind coverage threshold individually and combined in all modeled weather conditions (all weather, VFR-only, and IFR-only) for crosswind coverage of 13 knots or higher. Furthermore, all runways with the 2/20 alignment (2L/20R, 2C/20C, and 2R/20L) meet the 95 percent wind coverage requirement for the smallest crosswind component of 10.5 knots. Only Runway 13/31 at BNA fails to obtain 95 percent wind coverage in all weather and IFR weather conditions. The appropriate crosswind components for BNA's four runways were determined based on the type of aircraft typically operating on those runways. **Figures 1-32, 1-33,** and **1-34** depict the all-weather, VFR weather, and IFR weather wind roses when considering a 10.5-, 13-, 16-, and 20-knot crosswind for all runways.



All Weather	10.5 Knots	13 Knots	16 Knots	20 Knots
2/20	97.01%	98.56%	99.76%	99.96%
13/31	94.51%	97.48%	99.67%	99.96%
All Combined	**99.45%**	**99.91%**	**99.98%**	**100.00%**

Figure 1-32
All Weather Wind Rose

SOURCE: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), 2011

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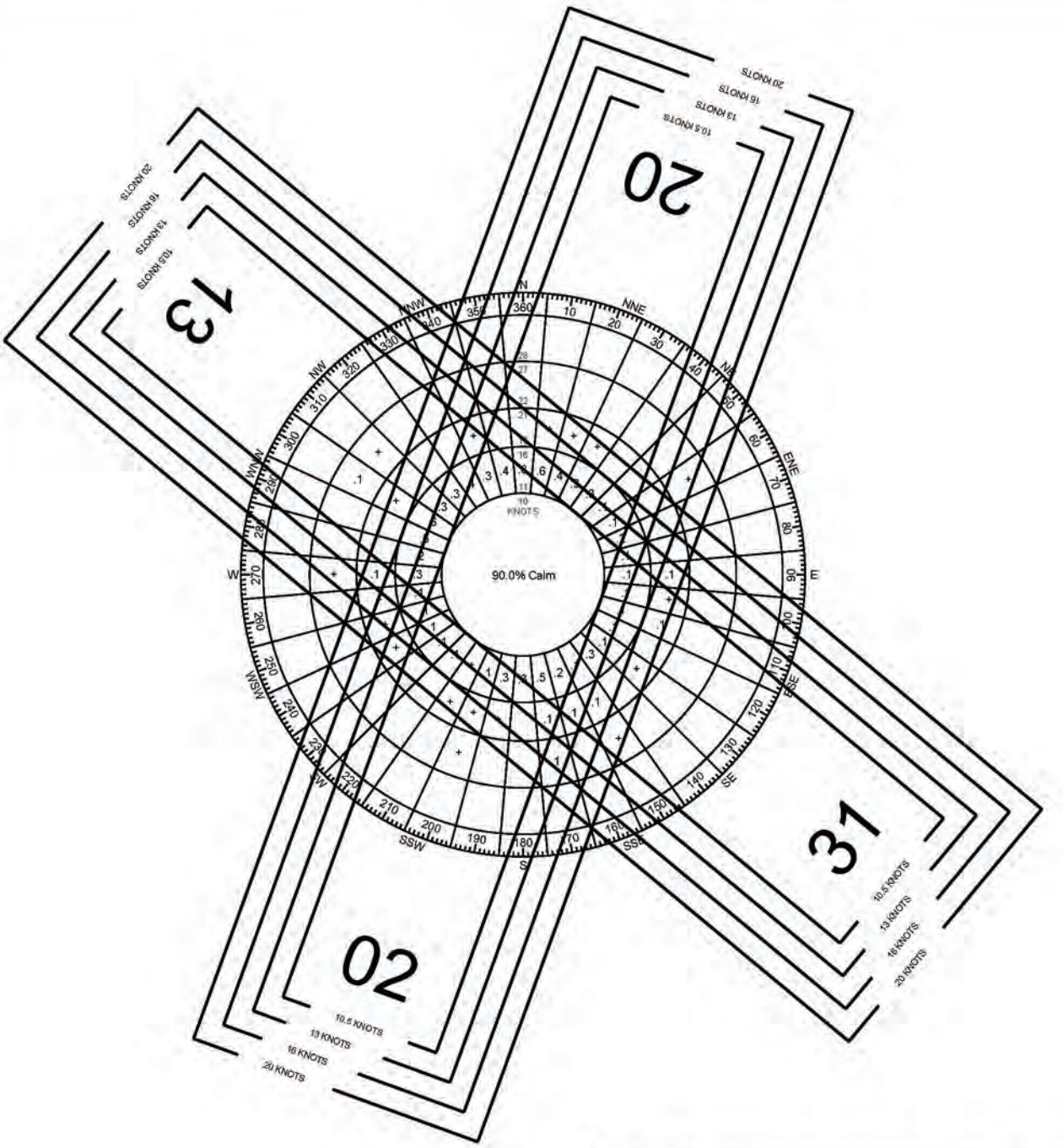

VFR Weather	10.5 Knots	13 Knots	16 Knots	20 Knots
2/20	95.80%	97.71%	99.45%	99.84%
13/31	96.18%	98.26%	99.63%	99.92%
VFR Combined	**99.31%**	**99.80%**	**99.96%**	**100.00%**

Figure 1-33
VFR Weather Wind Rose

SOURCE: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), 2011

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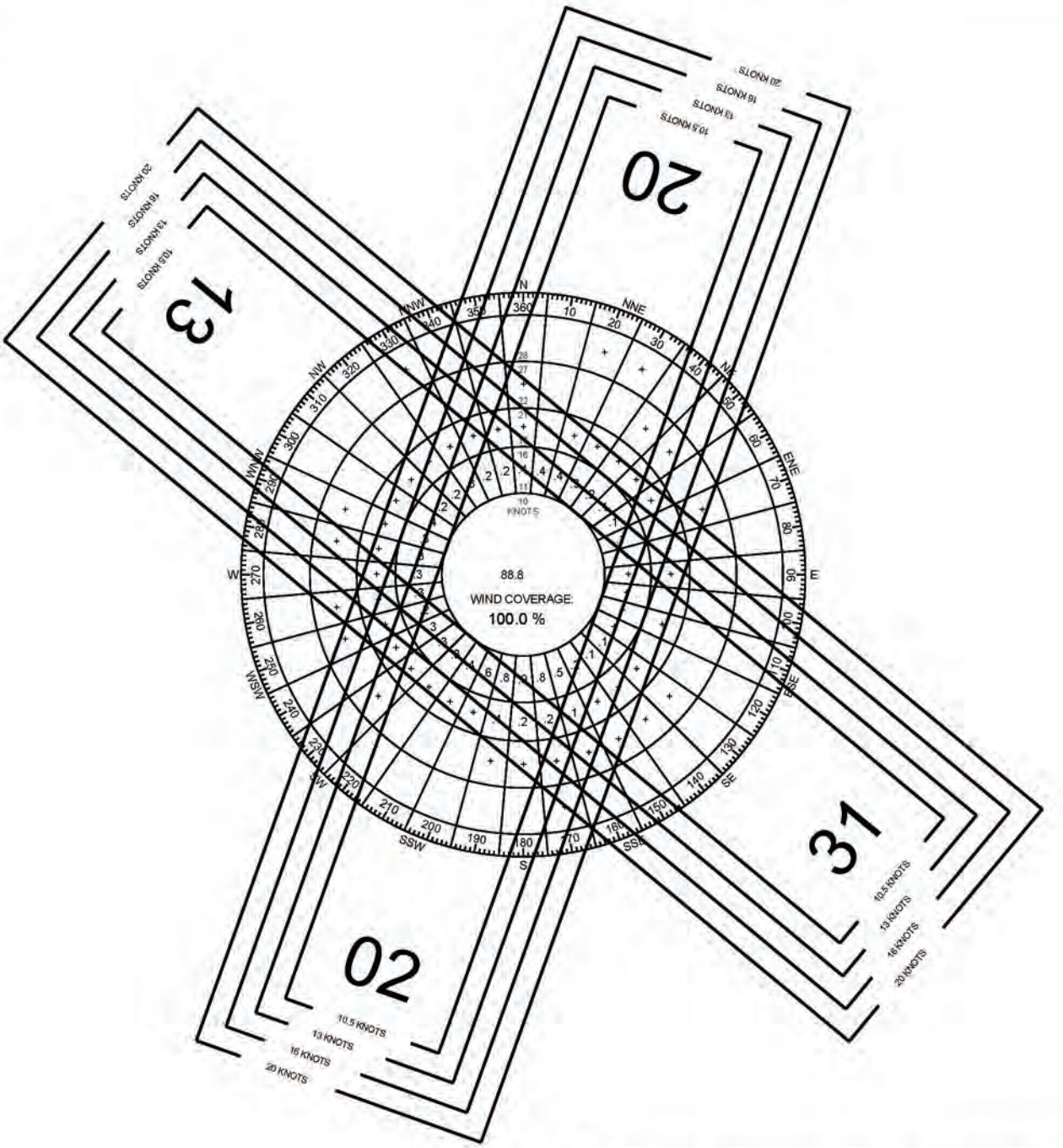

IFR Weather	10.5 Knots	13 Knots	16 Knots	20 Knots
2/20	97.05%	98.59%	99.77%	99.97%
13/31	94.42%	97.44%	99.67%	99.96%
IFR Combined	**99.45%**	**99.92%**	**99.98%**	**100.00%**

Figure 1-34
IFR Weather Wind Rose

SOURCE: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), 2011

1.11 Environmental Considerations

As stated in FAA AC 150/5060-6B, "The purpose of considering environmental factors in airport master planning is to help the sponsor thoroughly evaluate airport development alternatives and to provide information that will help expedite subsequent environmental processing." Although a detailed environmental analysis will be completed in a subsequent chapter, early review of potential environmental impacts to future development is considered prudent during the planning process. This section serves to identify existing environmental concerns that should be documented prior to analyzing future improvements.

While the specific impact categories outlined in FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects*, and FAA Order 1050.1E, *Policies and Procedures for Considering Environmental Impacts,* do not need to be followed directly, they were consulted as a guide to assist in identifying potential environmental impacts.

1.11.1 BNA Sustainability Study

The Airports Council International-North America (ACI-NA) defines airport sustainability as a holistic approach to managing an airport to ensure:

- Economic viability
- Operational efficiency
- Natural resource conservation
- Social responsibility

The FAA recently introduced the Sustainability Master Plan Pilot Program. This program evaluates ways to make sustainability a core objective at every airport by funding long-range planning documents. These documents, called Sustainable Master Plans and Sustainable Management Plans, include initiatives for reducing environmental impacts and achieving economic benefits while increasing integration with local communities. The Airport was part of the 10-airport pilot program and completed a Sustainability Study in 2012. Recommendations identified as part of this Master Plan Update will be paralleled wherever possible with the ongoing Sustainability Study. The draft sustainability goals and associated draft objectives for consideration by the MNAA in sustainability categories most applicable to the Airport will be reviewed once available. Examples of sustainability categories that will be considered by the MNAA include:

- Air quality enhancement and climate change
- Noise abatement

- Water quality protection and conservation (including stormwater)
- Energy conservation and renewable energy
- Solid waste reduction and recycling
- Hazardous material and waste management
- Spill prevention, control, and countermeasures (SPCC)
- Materials and resource use
- Natural resources management (wetlands)
- Surface transportation management
- Multi-modal transportation management
- Sustainable site and land use planning
- Socioeconomic enhancement
- Buildings and facilities
- Public outreach/involvement

The full BNA Sustainability Study Report is available in Appendix D.

1.11.2 Noise

Noise is generally the most apparent impact an airport has on the environment, with the majority of complaints received from nearby residents. The FAA recommends the average day-night sound level (DNL) in decibels as the national standard for measuring airport noise. It has determined that a sound level of 65 DNL or less is compatible with residential land uses. Therefore, compatible land uses should be contained within the 65 DNL contour to the greatest extent possible. For areas around the Airport where noise levels exceed 65 DNL, other methods of mitigation, such as land acquisition in noise-sensitive land use areas (typically within the 70 DNL contour), zoning requirements, and the purchase of easements, may be possible remedies.

The most recent noise exposure map developed by the Airport reveals that the vast majority of land within the 65 DNL contour is owned or controlled by the Airport. However, some areas of the 65 DNL contour do extend off BNA property. BNA's noise program closed in the mid-1990s with all eligible properties mitigated. Furthermore, the Airport employs multiple operational strategies, such as the "Informal Runway Use Program" discussed in Section 1.8.5, aimed at reallocating the noise exposure from aircraft operations to less densely populated areas surrounding the airfield. These noise abatement procedures include:

- Modification of daytime runway use to balance airfield operations, resulting in a 50/50 north/south runway split. This measure has led to more departures to the east, south, or southwest, reducing the impact to the residential population near the Airport.

- Use of Runway 13/31 for over 96 percent of operations between 10:00 p.m. and 7:00 a.m. with an emphasis on departing to the east and arriving from the southeast whenever conditions allow (i.e., low-traffic periods, wind and weather conditions, etc.).
- Changing the following nighttime (10:00 p.m. to 7:00 a.m.) flight corridors: Runway 13 departures turn to a heading of 095 degrees until reaching 3,600 feet MSL; Runway 31 departures to a heading of 280 degrees until reaching 3,600 feet MSL. Turn to be initiated at 2 DME; Runway 20R departures turn to a heading of 180 degrees until reaching an altitude of 3,600 feet MSL.
- Change the following daytime flight corridors: Runway 31 departures follow runway heading then turn to 50 degrees or 280 degrees at 2 DME; Runway 20R eastbound departures turn to the southeast (140 or 180 degrees), Runway 20L westbound departures turn to the southwest (220 degrees).

1.11.3 Air Quality

Guidelines for regulating air quality have been established by the Federal Clean Air Act, and most Environmental Protection Agency (EPA) implementation and enforcement of these guidelines has been delegated to the Tennessee Department of Environment and Conservation (TDEC). Section 110 of the Act requires that states develop a State Implementation Plan (SIP) in an effort to comply with federal air quality standards. National ambient air quality standards have been established Under Section 109 of the Act to protect Public Health. The FAA must ensure that all federal airport actions, such as financial awards and grants, conform to the state plan for controlling air pollution impacts.

Furthermore, the FAA states that an air quality analysis is required only if the forecast aircraft levels of GA and air taxi activities are above 180,000 annual operations or the Airport accommodates 1.3 million annual enplanements. As will be presented in the forecasts of aviation demand chapter of this report, the current and forecast levels of GA operations and passenger enplanements at BNA exceed these thresholds.

At present, the MNAA is required to submit to the Air Pollution Control Division of the Metropolitan Nashville and Davidson County Health Department a report summarizing the air emissions coming from BNA resulting from Airport activity. Multiple sources of emissions are considered during this annual analysis, including: aircraft emissions, auxiliary power unit (APU) emissions, ground support equipment emissions, roadways, parking areas, and stationary sources such as HVAC systems, emergency generators, and aircraft deicing equipment. Future Airport improvement projects that could impact regional air quality will require a thorough air quality analysis as part of an EA or EIS.

The BNA Sustainability Study team is currently conducting an operational air emissions inventory for BNA to account in detail for the emissions associated with the Airport. The overall approach for preparing the operational air emissions inventory conforms to FAA guidelines contained in the in the FAA publication *Air Quality Procedures for Civilian Airports and Air Force Bases*, and uses the most current version of the FAA's Emissions Dispersion and Modeling System (EDMS Version 5.1). The BNA Sustainability Study team is also conducting a greenhouse gas (GHG) emissions inventory for BNA following guidelines recently published by the Transportation Research Board (TRB), Airport Cooperative Research Panel (ACRP). The GHG emissions inventory is building on the work completed by Metro as part of its Baseline Inventory of Greenhouse Gas Emissions for the Metropolitan Government of Nashville and Davidson County, which did not include GHG contributions from the Airport. Both emissions inventories will be completed by the end of 2011.

1.11.4 Soils and Geology

The United States Department of Agriculture (USDA) Natural Resource Conservation Council (NRCC) provides information on local soil types through data collected through the National Cooperative Soil Survey (NCSS). Using the USDA Web Soil Survey GIS platform, an Area of Interest (AOI) was created which encompassed 8,792 acres centered about BNA's property boundary. Calculations from within the developed AOI revealed that the Airport property is largely composed of Stiversville-Urban land complex, Stiversville loam, Talbott-Urban land complex, Talbott-Rock outcrop complex, Maury-Urban land complex, and Hampshire silt loam. **Figure 1-35** depicts the soil type information derived from the NCSS for areas within the defined AOI surrounding BNA.

1.11.5 Wetland and Water Bodies

Two important Federal laws regulating wetlands are the River and Harbors Act (RHA) of 1899 (the earliest environmental law in the U.S.) and the Clean Water Act (CWA) of 1972. The focus of the RHA is to protect water navigation, while the focus of the CWA is to prevent water pollution. Additionally, the North American Wetlands Conservation Act of 1989 assigns preservation responsibilities to all Federal agencies whose jurisdiction may involve the management or disposal of lands and waters under their control.

Under EO 11990, *Protection of Wetlands* (1977), federal agencies are prohibited from undertaking or providing assistance for activities, including new construction, located in wetlands unless there are no practicable alternatives and all practicable measures to minimize harm to wetlands have been implemented.

The U.S. Army Corps of Engineers (USACE) and the EPA share responsibility for wetland protection and permitting under the CWA. Both define a wetland as, "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Such areas typically include swamps, marshes, and bogs. However, a recent Supreme Court decision, Solid Waste Agency of Northern Cook County vs. U.S. Army Corps of Engineers, No. 99-1178 (January 9, 2001), involved the scope of regulatory authority under Section 404 for the CWA. The court held that assertion of jurisdiction over "non-navigable, isolated, intrastate" waters, based solely on the use of such waters by migratory birds, was invalid; therefore, these areas were not considered waters of the United States and therefore do not require a Department of the Army permit for alteration, relocation, or removal.

Other agencies with non-regulatory responsibilities to create or protect wetlands include the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service, and the Soil Conservation Service (NRCS). In Tennessee, TDEC is tasked with the preservation and maintenance of the state's water resources.

Information regarding existing wetlands located on BNA property was derived from the USFWS database, which identifies a variety of wetland areas on BNA property. As a result of recent airport development initiatives at BNA, however, some of the USFWS-identified wetlands no longer exist. Furthermore, the wetland areas delineated by USFWS fail to include all the bodies of water found on BNA property. As a result, information received from MNAA with respect to on-Airport bodies of water was used to obtain a clearer picture of BNA's hydrologic condition. **Figure 1-36** illustrates the size and location of USFWS-identified wetland areas as well as bodies of water identified by the MNAA and the surface water drainage basins and sub-basins on Airport property.

1.11.6 Floodplains

Floodplains are defined in the U.S. Environmental Protection Agency's Executive Order (EO) 11988, *Floodplain Management*, 1977. They include lowland areas adjoining inland and coastal waters, especially those areas subject to a one percent or greater chance of flooding in any given year. Under the EO, the Federal Emergency Management Agency (FEMA) has produced flood insurance rate maps for communities participating in the National Flood Insurance Program. Detailed maps illustrate the 100- and 500-year base flood elevations. Descriptions of zones delineated on these maps include: Zone VE – coastal flood with velocity hazard; Zone A and AE – areas of 100-year flood; Zone X500 – areas in the 500-year floodplain, and Zone X – areas outside the 500-year floodplain.

FEMA maintains a computer database that contains the flood hazard map information from FEMA's Flood Map Modernization Program. Through the program, FEMA has developed the National Flood Hazard Layer (NFHL), which represents mapped data from the digital federal insurance rate maps (DFIRMs) and letters of map revisions (LOMRs). **Figure 1-37** depicts the DFIRM data for BNA and its surrounding properties. As shown on the figure, airfield pavements are not located within a floodplain boundary.

1.11.7 Manmade Environmental Considerations

A primary concern that should be documented is the Hoover Quarry east of the Airport. Opened in 1959, the quarry was constructed to extract limestone. Mining operations continued until 1988 when it was shut down in order to expand the Airport and construct Runway 2R/20L. Since the completion of the runway, water has been entering Hoover Quarry both from groundwater infiltration and stormwater runoff. Currently, the Airport uses the quarry as a stormwater retention pond. Water depth in the 43-acre quarry averages about 205 feet, with a maximum of 250 feet.

Based on background research and investigations conducted during the *Feasibility Study to Fill the Former Hoover Quarry* (2009) and the knowledge and extent of the required construction, the quarry could be successfully filled. However, the construction timetable, total project cost and potential impacts to airfield operations make the project highly unfeasible. Other possible uses of the quarry center on the valuable resource within the quarry, its water (1.8 billion gallons). Possible options include: water for irrigation, water for cooling of HVAC, water for on-site drinking and water access to be sold to a public or private utility, among others. The "Do Nothing" option inhibits future development and has the potential to attract waterfowl. Compressed air guns have been placed near the edge of the quarry to mitigate wildlife hazards. Additional uses and safety concerns regarding this environmental condition will be documented in subsequent chapters.

1.12 Land Use and Zoning

The Airport is surrounded by diverse land uses. Land use maps are a graphic representation of physical uses of land, while a zoning map is a graphic depiction of the boundaries for which a certain set of standards or regulations have been adopted by a governmental entity. Off-Airport zoning information is portrayed in **Figure 1-38**. **Figure 1-39** depicts the on-Airport land use. Land use strategies assist in defining the overall development plan of an Airport by consolidating similar functional areas and ensuring a safe and efficient operating environment. Future on-Airport land use maps will be developed in subsequent chapters.

1.13 Financial Structure

The MNAA is a quasi-governmental agency responsible for developing, financing and operating BNA and JWN. This section presents the financial conditions, provisions and restrictions under which MNAA operates.

The MNAA also owns MNAA Properties Corporation (MPC), a Tennessee nonprofit corporation whose purpose is to support and facilitate the operations of MNAA and to promote the economic development of the surrounding area. In late 2009, MNAA and MPC established CONRAC LLC as a Tennessee nonprofit limited liability company in connection with the special facilities financing for the CONRAC Facility. MPC is the sole member of CONRAC LLC.

The MNAA has the legal authority to accomplish its purpose, such as acquiring land and constructing airport facilities, issuing revenue bonds and other tax-exempt indebtedness, maintaining its own police and ARFF, and setting rates, charges, and rentals for activities on Airport properties. Based on the criteria set forth in Governmental Accounting Standards Board Statement No. 14, The Financial Reporting Entity, it has been determined that MNAA is a component unit of the Metropolitan Government of Nashville and Davidson County, Tennessee.

The MNAA operating and capital budgets are legally adopted by the full Board of Commissioners. In the case of BNA, the annual capital and operating budgets are additionally reviewed and approved by the seven signatory airlines which have committed to the residual lease agreement. This agreement expires September 30, 2017. Although budget programs are approved by the Board, individual expenditures, whether for capital or operating purposes, must comply with MNAA's bylaws and policies and procedures for competitive acquisition.

The MNAA distinguishes between operating and non-operating revenues and expenses. Operating revenues and expenses generally result from providing services in connection with principal ongoing operations. Revenues from space rental and fees, landing fees, parking, and other miscellaneous income are reported as operating revenues. Expenses from employee wages and benefits, purchases of services, materials and supplies, and other miscellaneous expenses are reported as operating expenses. Transactions that are capital-, financing-, or investing-related are reported as non-operating revenues or expenses. This includes items such as passenger facility charges (PFCs), CFCs, interest revenue and expense, and financing costs. MNAA has a five-year capital improvement program (CIP) that details the projects needed to maintain and efficiently operate BNA and JWN. Federal and State grants are recorded on financial statements as capital contributions (i.e., not as non-operating revenue). The funding sources of the CIP include federal entitlement and discretionary grants, State of Tennessee grants, PFCs, CFCs, revenue bond funds, and MNAA funds.

In general, the financial operations of MNAA are governed by the following guidelines:

- The Airport Improvement Revenue Bond Resolution adopted by the Authority in 1991, as supplemented and amended
- Operating leases with passenger and cargo airlines
- Concession agreements and other leases with other tenants at the Airport (including food and beverage, merchandise, car rental, automobile parking, ground transportation, and other services)
- FAA approvals to collect and use PFC collections
- The authorizing resolution for the collection of CFCs adopted on November 26, 2007, as amended and restated during 2008 and amended and restated again on November 18, 2009
- Federal statutory and constitutional provisions, the Airport and Airways Improvement Act, the TSA, and the PFC Act of 1990
- Generally accepted accounting principles
- Various policies adopted by MNAA

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Davidson County, Tennessee (TN037)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AmB	Armour silt loam, 2 to 5 percent slopes	251.8	2.9%
AmC	Armour silt loam, 5 to 12 percent slopes	32.2	0.4%
AmC3	Armour silt loam, 5 to 15 percent slopes, severely eroded	114.7	1.3%
Ar	Arrington silt loam	268.4	3.1%
BbD	Barfield-Rock outcrop complex, 5 to 20 percent slopes	51.5	0.6%
BvB	Bradyville silt loam, 2 to 5 percent slopes	17.7	0.2%
CaB	Capshaw silt loam, 2 to 5 percent slopes	2.5	0.0%
HmC	Hampshire silt loam, 5 to 12 percent slopes	319.6	3.6%
HmD	Hampshire silt loam, 12 to 20 percent slopes	611.7	7.0%
Ld	Lindell silt loam	307.3	3.5%
Ln	Lindell-Urban land complex	192.0	2.2%
MaB	Maury silt loam, 2 to 7 percent slopes	108.3	1.2%
McB	Maury-Urban land complex, 2 to 7 percent slopes	620.4	7.1%
Ne	Newark silt loam	10.4	0.1%
Pt	Pits	77.5	0.9%
RtC	Rock outcrop-Talbott complex, 5 to 15 percent slopes	214.2	2.4%
Se	Sequatchie fine sandy loam	3.1	0.0%
StC	Stiversville loam, 3 to 12 percent slopes	731.4	8.3%
StD	Stiversville loam, 12 to 25 percent slopes	777.1	8.8%
SvD	Stiversville-Urban land complex, 3 to 25 percent slopes	2,623.7	29.8%
TbC	Talbott silt loam, 2 to 10 percent slopes	94.4	1.1%
TrC	Talbott-Rock outcrop complex, 5 to 15 percent slopes	630.3	7.2%
TuC	Talbott-Urban land complex, 3 to 12 percent slopes	655.2	7.5%
W	Water	76.8	0.9%
Totals for Area of Interest		8,792.1	100.0%

Nashville International Airport

RW ARMSTRONG.

LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Water Features
- Streams and Canals

Transportation
- Rails
- US Routes
- Major Roads
- Local Roads

Figure 1-35
Soils Map

SOURCE: National Resources Conservation Service, Web Soils Survey, 2011.

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Nashville International Airport

ARMSTRONG.

LEGEND

- U.S. Fish & Wildlife Service Identified Wetlands
- Previously Mitigated U.S. Fish & Wildlife Service Identified Wetlands
- Nashville International Airport Identified Water Bodies
- Stream
- Drainage Basins
- Property Line

Basin 6
Basin 5
Basin 7
Basin 8
Basin 9
Basin 4
Mill Creek
Basin 12
Basin 11
Basin 10
Basin 13
Basin 3
Unnamed tributary to Sims Branch
Sims Branch
Lagoon
South Pond
Basin 15
Basin 14
North Pond
Basin 2
Basin 16
Basin 17
Basin 20
Basin 19
McCrory Creek
GRAPHIC SCALE (FEET)
0 750 1500
HORIZONTAL
Basin 21
Basin 18
Former Quarry
Basin 1
Basin 22

SOURCE: U.S. FISH AND WILDLIFE SERVICE, 2011; MNAA, 2011.

Figure 1-36
On Airport Wetlands and Water Bodies

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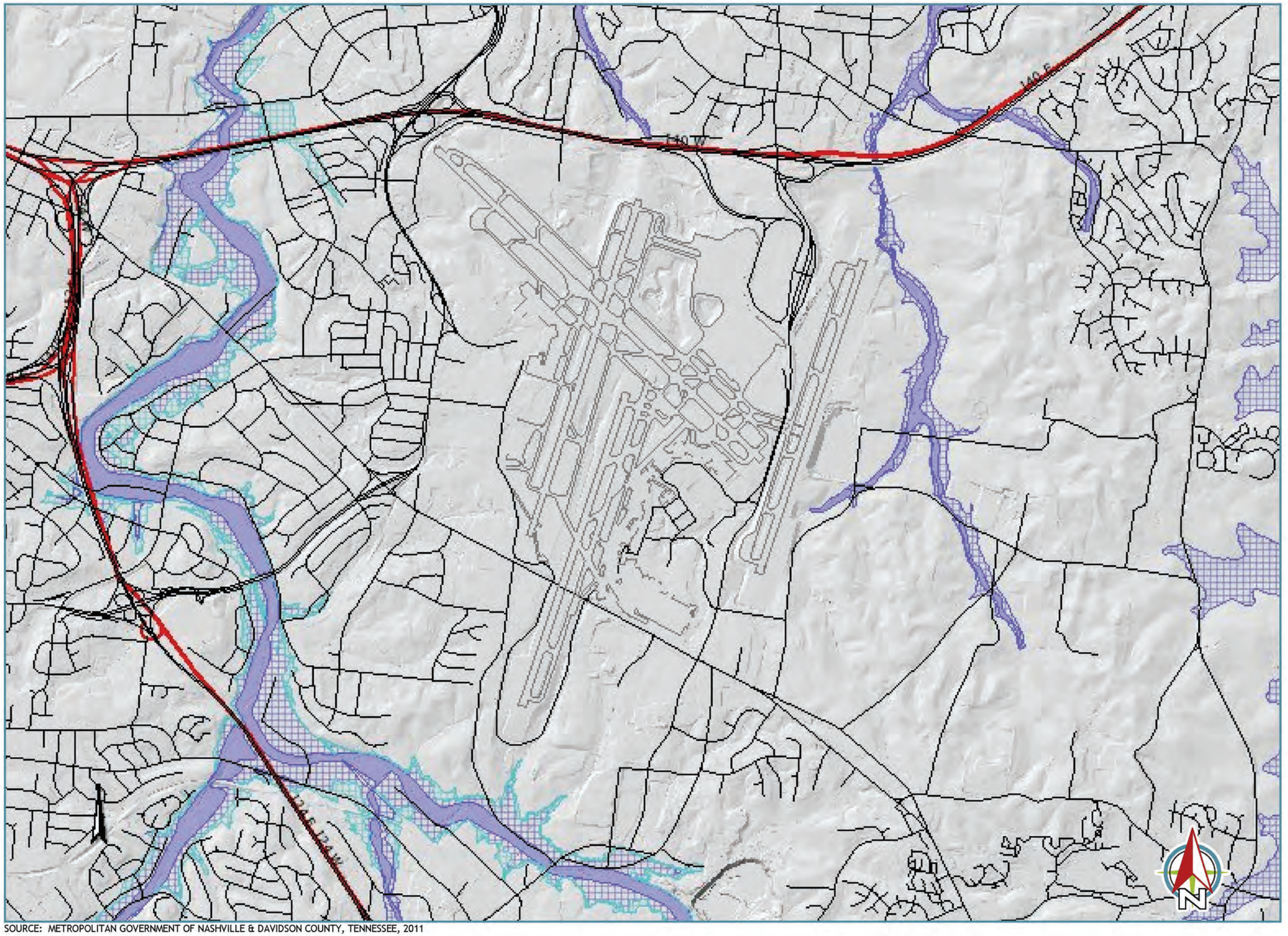

SOURCE: METROPOLITAN GOVERNMENT OF NASHVILLE & DAVIDSON COUNTY, TENNESSEE, 2011

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LEGEND

- 100 Year Floodplain
- 500 Year Floodplain
- Floodway
- Interstate
- Roadway
- Airport

Figure 1-37
FEMA Flood Zones

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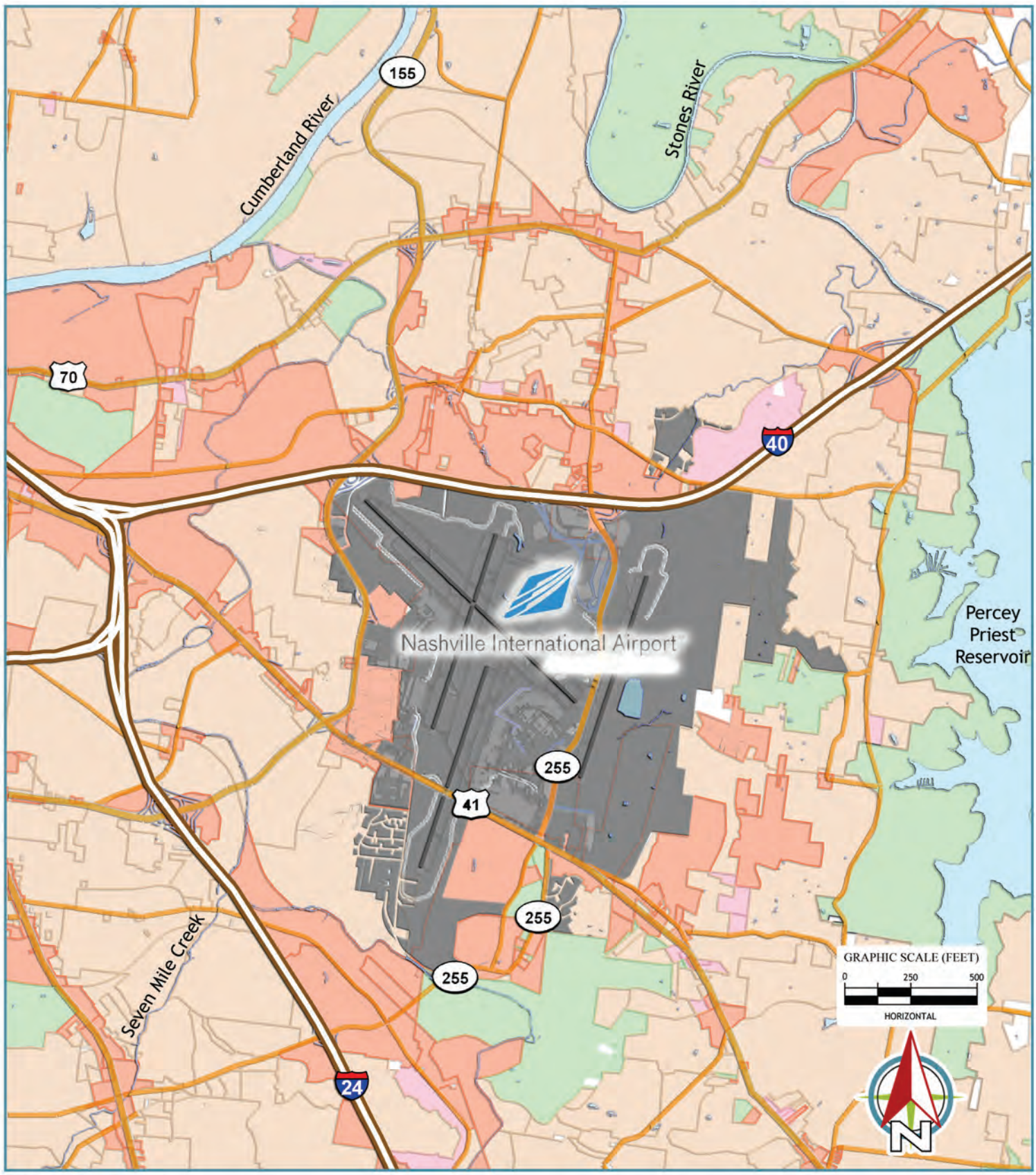

LEGEND

- Residential
- Agricultural
- Airport Property
- Commercial / Industrial / Warehouse / Distribution
- Mixed Use

Figure 1-38
Zoning Map

SOURCE: http://maps.nashville.gov/mcsp/
http://maps.nashville.gov/propertykiva/site/main.htm

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LEGEND

- BUILDING
- RUNWAY PAVEMENT
- FUTURE AIRFIELD PAVEMENT
- TAXIWAY PAVEMENT
- APRON PAVEMENT
- WATER
- AIRPORT PROPERTY LINE
- F–RPZ– RUNWAY PROTECTION ZONE
- F–BRL– BUILDING RESTRICTION LINE
- RVZ / RVZ RUNWAY VISIBILITY ZONE
- RPZ EX. RUNWAY PROTECTION ZONE
- BRL EX. BUILDING RESTRICTION LINE
- RVZ / RVZ EX. RUNWAY VISIBILITY ZONE
- AIRFIELD
- TERMINAL AREA
- GENERAL AVIATION
- MRO / CARGO DEVELOPMENT
- MILITARY
- AIR SUPPORT
- AIRPORT PARKING
- AVIATION RELATED
- POTENTIAL AIRFIELD
- NAVAID
- PLANNED ROADWAY IMPROVEMENTS
- COMMERCIAL DEVELOPMENT
- OFFICE DEVELOPMENT
- RENTAL CAR
- OPEN SPACE
- ACQUISITION FOR AVIATION DEVELOPMENT
- FUTURE TERMINAL / CONRAC AREA
- NOISE CONTOURS

Figure 1-39
On-Airport
Land Use Map

SOURCE: Metropolitan Nashville Airport Authority

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