BELFAST MUNICIPAL AIRPORT
BELFAST, MAINE

AIRPORT MASTER PLAN UPDATE

AIP PROJECT NO. 3-23-0007-01

FINAL REPORT

SEPTEMBER 1999

Dufresne-Henry, Inc.
Consulting Engineers

INFORMATION SHEET

Airport Master Plan Update
Technical Documents

FAA AIP Number: 3-23-0007-01
FAA Contract Number: FA-NE-94-45
Final Submission: September, 1999

PREPARED FOR:

City of Belfast
Belfast City Hall
71 Church Street
Belfast, ME 04915

PREPARED BY:

Dufresne-Henry, Inc.
22 Free Street
Portland, ME 04101-3900

The preparation of this document was partially financed by the U.S. Department of Transportation, Federal Aviation Administration (FAA), under the provisions of the Airport and Airway Improvement Act of 1982, as amended by the Airport and Airway Safety and Capacity Expansion Act of 1987, and by a grant administered by the Maine Department of Transportation. The contents of this document do not necessarily reflect official views or policies of the U.S. Department of Transportation or the Maine Department of Transportation. Acceptance of the report by the Federal Aviation Administration does not in any way constitute a commitment on the part of the United States to participate in any development depicted herein, nor does it indicate that the proposed developments are environmentally acceptable in accordance with Public Laws 91-190, 90-495, 94-343 and/or 100-223.

TABLE OF CONTENTS

BELFAST MUNICIPAL AIRPORT
Belfast, Maine

Airport Master Plan Update
AIP # 3-23-0007-0194

CHAPTER ONE - INTRODUCTION

CHAPTER TWO - INVENTORY OF EXISTING CONDITIONS

CHAPTER TWO (CONTINUED)

CHAPTER THREE - FORECASTS

CHAPTER THREE (CONTINUED)

CHAPTER FOUR - DEMAND/CAPACITY ANALYSIS & FACILITY REQUIREMENTS

CHAPTER FIVE - DEVELOPMENT ALTERNATIVES

CHAPTER FIVE (CONTINUED)

CHAPTER SIX - AIRPORT LAYOUT PLAN

CHAPTER SEVEN - ENVIRONMENTAL EVALUATION

CHAPTER SEVEN (CONTINUED)

CHAPTER EIGHT - FINANCING AND DEVELOPMENT PLAN

FIGURES

TABLES

Chapter One
INTRODUCTION

INTRODUCTION

The City of Belfast, Maine contracted with Dufresne-Henry, Inc., consulting engineers and planners, for the purpose of preparing an Airport Master Plan Update (AMPU) for the Belfast Municipal Airport. The Federal Aviation Administration's (FAA) three-letter designation for Belfast Municipal Airport is BST. The airport will be referred to occasionally as BST in this document. The purpose of this study is to define the airport's role within the community and to provide guidance for demand-based aviation growth scenarios at the airport. This study is geared to prepare the City of Belfast for the future by identifying an organized approach for meeting the projected aviation-demand levels at BST.

The AMPU project is financed jointly by the Federal Aviation Administration, the Maine Department of Transportation/Air Transportation Division (MDOT/ATD, now known and the Maine Department of Transportation/Office of Passenger Transportation, MDOT/OPT), and the City of Belfast through a planning grant under the Airport Improvement Program (AIP) of the Federal Aviation Administration Reauthorization Act of 1994 (AIP #3-23-0007-0194).

PLANNING PROCESS

An AMPU is prepared for an airport because the community and/or airport users need to define guidelines for future airport improvements as well as to identify existing airport safety and capacity deficiencies. An AMPU identifies a logical, organized approach for meeting both existing and future airport demands. This approach also considers the financial, environmental, and social constraints of an airport which are sometimes just as important to an airport's viability as the airport's development. Each development recommendation is tied to a quantifiable aviation-demand level. If airport development was a function of time and the demand did not

keep up with the time projections, the result would be faulty recommendation scenarios. This is important because the airport cannot justify to itself, the community, or the various funding agencies development of the airport for the sake of development; development scenarios must be tied to demand levels.

An AMPU report is composed of several chapters. Each chapter provides systematic analyses which lead the reader along a natural progression from inventorying existing conditions to the recommendation of improvement programs. Guidance for the preparation of an AMPU comes from the FAA, specifically Advisory Circular 150/5070-6A, Airport Master Plans. Various other documents will be referenced throughout this report to support the credibility and success of the development recommendations. From Advisory Circular 150/5070-6A, the objectives of an AMPU are as follows:

a. To provide an effective graphic presentation of the future development of the airport and anticipated land uses in the vicinity of the airport.

b. To establish a realistic schedule for the implementation of the development proposed in the plan, particularly for the short-term capital improvement program.

c. To propose an achievable financial plan to support the implementation schedule.

d. To justify the plan technically and procedurally through a thorough investigation of concepts and alternatives on technical, economic, and environmental grounds.

e. To present for public consideration, in a convincing and candid manner, a plan which adequately addresses the issues and satisfies local, state, and federal regulations.

f. To document policies and future aeronautical demands for reference in municipal deliberations on spending and debt incurrence and land use controls, e.g., subdivision regulations and the erection of potential obstructions to air navigation.

g. To set the stage and establish the framework for a continuing planning process. Such a process should monitor key conditions and adjust plan recommendations if required by changed circumstances.

In addition to the AMPU report, a set of drawings called the Airport Layout Plan (ALP) set are developed to graphically detail the improvement recommendations and to show the basic descriptors of the airport.

Public participation is an important function in the development of the AMPU document. Information provided by the public has the benefit of tailoring the planning process specifically to the needs of the airport and local community. A Planning Advisory Committee (PAC) was organized by the City of Belfast. Volunteers, having a variety of perspectives regarding Belfast Municipal Airport or airports in general, have served on this committee providing valuable input into the planning process of the AMPU for Belfast Municipal Airport. The PAC was dissolved following the completion of the AMPU. Figure 1-1 illustrates schematically the process for developing an AMPU.

OVERVIEW OF AIRPORT ISSUES

The previous Airport Master Plan prepared for the Belfast Municipal Airport was prepared in 1977 by E.C. Jordan Co., Inc. Many of the assumptions made in the 1977 document, which precipitated the previous airport development recommendations, are no longer valid or have been completed, prompting the preparation of a new AMPU. Some of these assumptions included a viable operation of the Belfast and Moosehead Lake Railroad, a proposal to construct industrial parks on or abutting airport property, and lack of environmental evaluations to determine the best locations for the proposed airport facilities.

The Belfast Airport Committee, which acts as a liaison between the airport users and the city government, has identified several concerns that it would like to see addressed in this AMPU or in another forum. The following summarizes these issues:

Land Use Concerns Identify land uses in the vicinity of the Belfast Municipal Airport which are impacted by aircraft noise. Recommend land use zoning changes which would protect both aviation and non-aviation users. Present recommendations for compatible development of land adjacent to the airport.

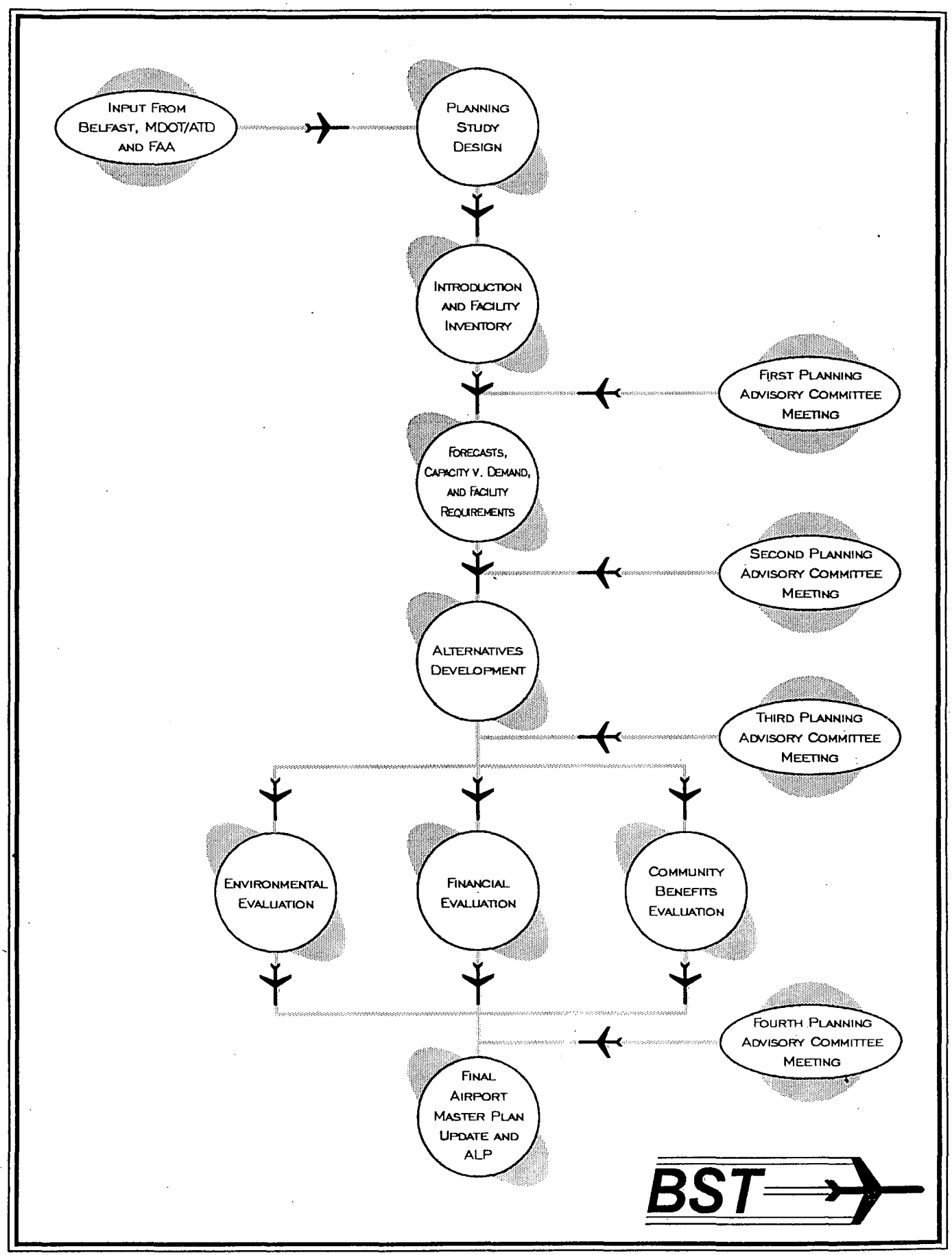


FIGURE 1-1
AIRPORT MASTER PLANNING PROCESS

Taxiway Needs Evaluate the need for and impacts of a parallel taxiway to Runway 15-33. Evaluate the ability of or the need for the disused runway (10-28) to be used as a taxiway.

Runway Safety Areas Determine the requirements and feasibility of obtaining full runway safety areas off both ends of Runway 15-33.

Pavement Maintenance Prepare an airport pavement maintenance program that would consider the age and condition of existing airport pavements, options for maintenance or repair, and approximate costs for these improvements.

Snow-removal Equipment Needs Determine the minimum allowable snow-removal equipment to clear the airport's pavements of snow and ice. In addition, suggest snow/ice removal procedures that can be implemented at the airport.

Terminal Area Development Needs Determine the best location for terminal area growth, building setbacks, number of hangars and tiedowns needed, and square foot area of paved apron needed to satisfy existing and future aviation activity.

Airport Property Boundary Issue Evaluate the need for a boundary survey of the airport property. Identify the uncertain boundaries and what steps need to be undertaken to determine the correct boundaries.

All of these issues will be discussed in later chapters to some degree. Suggestions for reference materials will be offered whenever possible for follow-up work by the City or the Airport Committee.

Chapter Two

INVENTORY OF EXISTING CONDITIONS

Identifying the existing conditions in and around the Belfast Municipal Airport provides the overview necessary to evaluate the airport's role in the local, state, and national aviation systems. All subsequent assumptions, findings, and recommendations are dependent upon accurate and complete data collection during the initial stages of this AMPU. Information was gathered from various sources including on-site visits and discussions with airport personnel, funding agencies, representatives of various city and county offices as well as from existing documents concerning the airport and the Belfast area.

LOCATION AND ACCESS

Belfast Municipal Airport is located approximately one mile west of the downtown business district of Belfast, Maine in Waldo County. Access can be made onto airport property via U.S. Route 1 by-pass to Lower Congress Street then onto Airport Road. The airport is bounded by U.S. Route 1 by-pass to the northeast, Lower Congress Street to the southeast, Little River Drive to the southwest, and Lincolnville Road/Route 52 to the northwest. Figure 2-1 locates the Belfast Municipal Airport in relation to the New England region. Figure 2-2 locates the airport within the boundaries of the City of Belfast, Maine.

AIRPORT HISTORY

The City of Belfast constructed its airport, two paved runways and a runway lighting system, for use as a potential fighter aircraft base supporting Dow Field (a.k.a. Bangor International Airport) in the 1930s with the help of the Work Projects Administration and the Civil Aeronautics Administration. Post-war development, as funded with federal monies, are shown in Table 2-1.

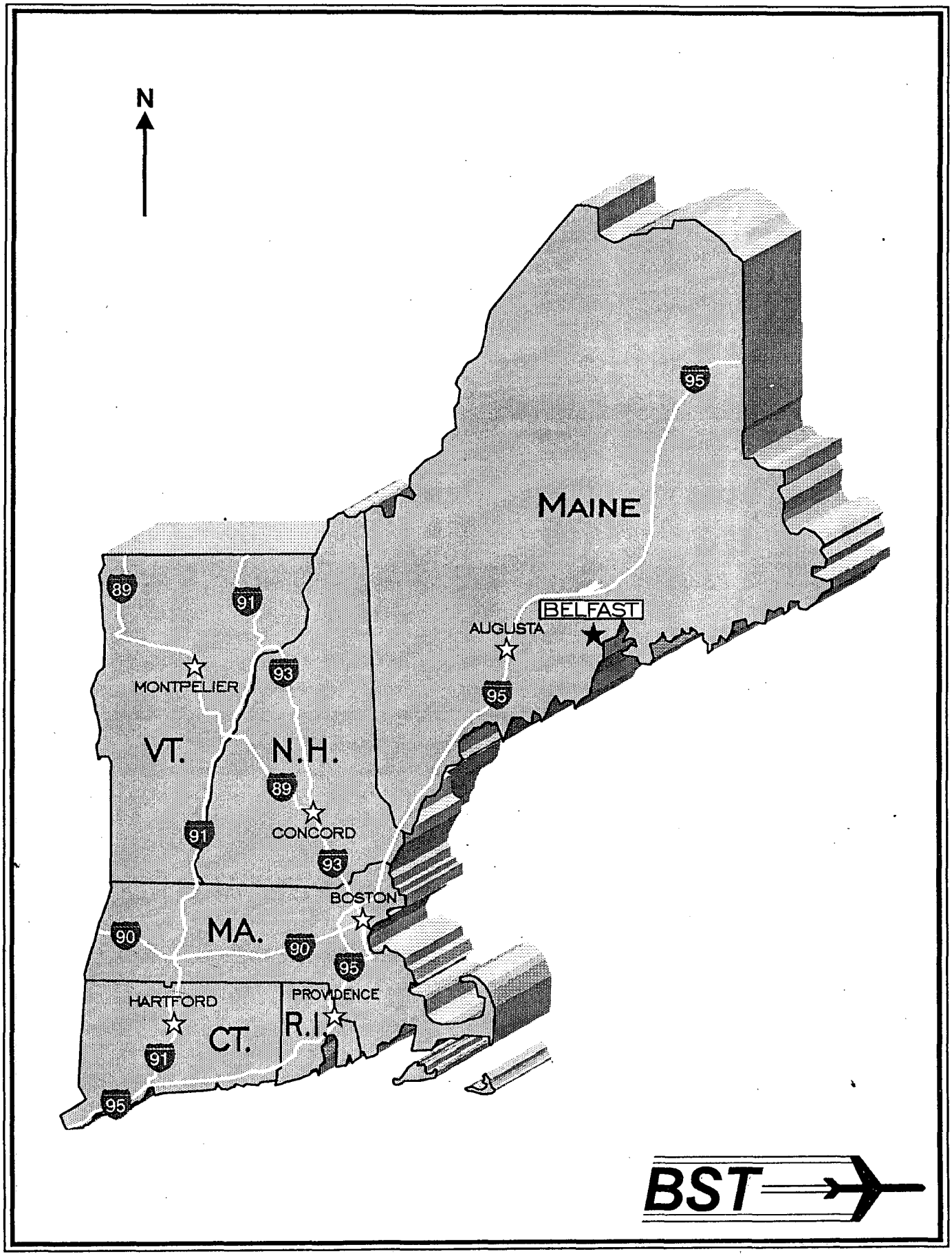


FIGURE 2-1
VICINITY MAP

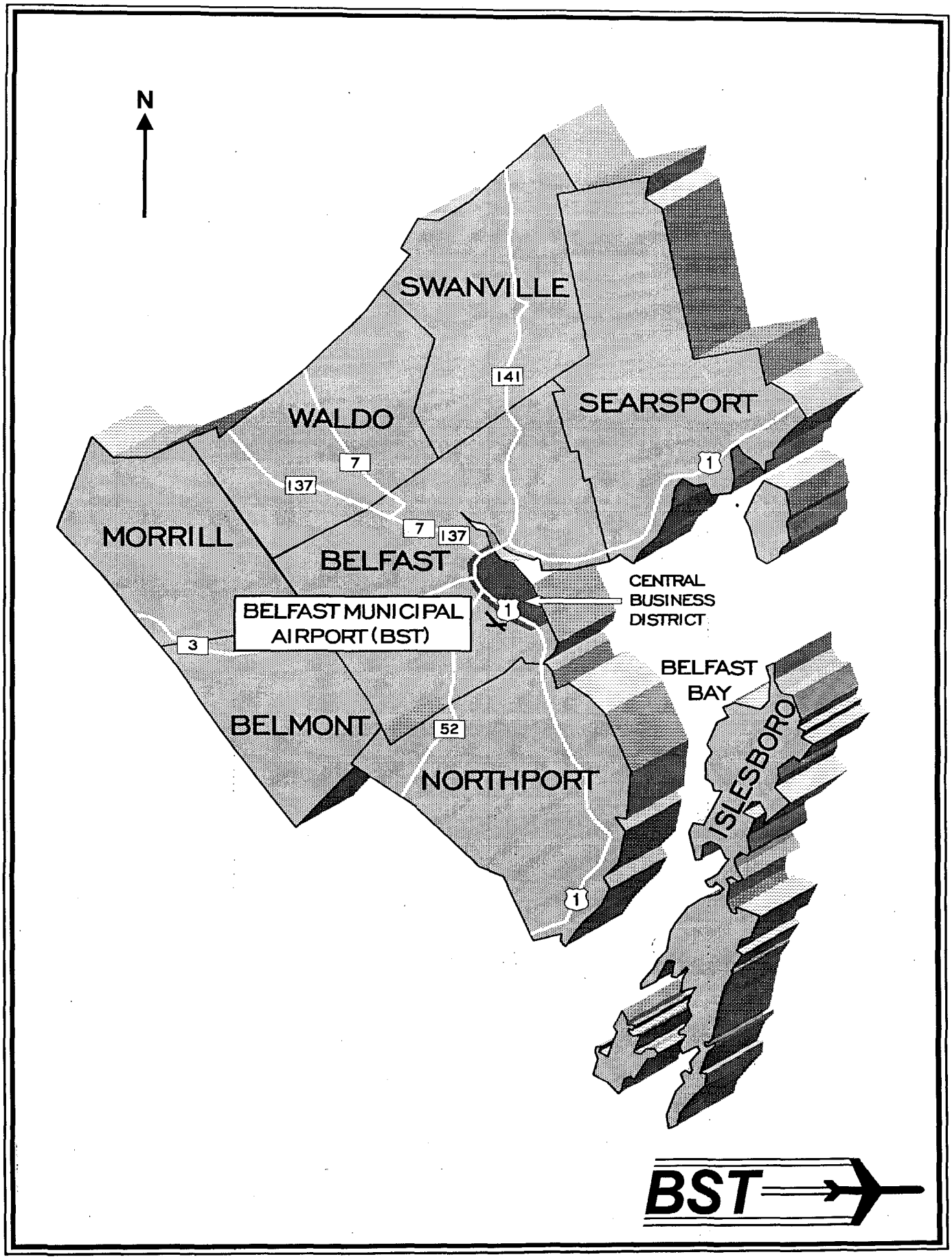


FIGURE 2-2
LOCATION MAP

TABLE 2-1
BELFAST MUNICIPAL AIRPORT
HISTORY OF FEDERALLY FUNDED PROJECTS

Program*	Year	Project Number	Description
FAAP	1969	9-17-023-6001	Land acquisition Clear approaches to Runway 15-33 Construct apron and taxiway
PGP	1976-7	A-09-0007-01	Master Plan Study
ADAP	1978	5-23-0007-01	Clear Part 77 surfaces to Runway 15-33 Install rotating beacon Install obstruction lighting
ADAP	1981	5-23-0007-02	Reconstruct, mark, light Runway 15-33 Install VASI 2-box on Runway 15 Install lighted wind cone/segmented circle Safety area improvements
AIP	1994	3-23-0007-01	Airport Master Plan Update

* FAAP = Federal Aid to Airports Program
PGP = Planning Grant Program
ADAP = Airport Development Aid Program
AIP = Airport Improvement Program
Source: FAA, Burlington, MA.

Recent maintenance projects undertaken with City and/or Maine Department of Transportation/Air Transportation Division (MDOT/ATD) funds included:

- Bush hogging north of Runway 15-33: 1992
- On-site tree clearing under the approach to Runway 33: 1993
- New vinyl siding for the Administration Building: 1993
- Crack filling on Runway 15-33: 1994
- Entrance road and drainage repair: 1994
- Airport beacon repairs: on-going
- Roof repairs to the Administration Building: 1994

- Repainting trim on Administration Building: 1994
- Repainting taxiway lines: 1994

Belfast Municipal Airport was designated as an Economic Development Airport as a result of the *Maine Airport System Plan*, (MDOT/ATD and AirTech, 1991). Factors weighed in making this designation include: location of the airport relative to other modes of transportation, the presence of a state Job Opportunity Zone (JOZ), and the number of airport improvements needed to meet the economic development standards developed by the state. Belfast is limited in its ability to expand, however, the remaining economic development criteria can be met. The state's minimum standards for Economic Development Airports identify the need for both a 5,000-foot-long paved runway and a precision instrument approach.[1]

AIRPORT CLIMATE

Recent wind data for Belfast Municipal Airport was not collected for this study. The 1977 Airport Master Plan compared two nearby weather stations, located at Bangor International Airport and Knox County Regional Airport, for wind data as there was no local weather station. The comparison indicated that the Bangor wind data more closely represented the Belfast Municipal Airport wind conditions than did the Owls Head (Knox County Regional Airport) data. This conclusion was based upon the fact that Knox County Regional Airport is located on a peninsula in the Rockland area which protrudes out into the Atlantic Ocean. The Belfast Municipal Airport is located inland and thus receives more wind protection similar to the Bangor data. Operator input suggests a predominance of northwest-southeast wind patterns which again correlates well with the Bangor data. As questions regarding the addition or abandonment of runways are not anticipated to be issues for this study, further investigation into wind data will not be undertaken. As with the previous *Airport Master Plan*, collection of the current wind conditions at the Belfast Municipal Airport would be "nice to have" data, especially when and if the airport anticipates improved approaches in light of the new Global Positioning System (GPS) availability (refer to Chapter Four for a description of GPS and its applicability to the airport).

[1] Maine Aviation System Plan, 1991, page III-41.

AIRPORT ADMINISTRATION

There is one full-time fixed based operator (FBO), Ace Aviation, Inc., located at the Belfast Municipal Airport. This FBO voluntarily issues and cancels notices to airmen (NOTAM), notifies the City of airport needs, and maintains minor airport facilities (i.e., lights). In addition, this FBO provides aircraft maintenance, aircraft rentals, flight instruction, sightseeing flights, charter flights, and aviation gas (AvGas 100 low lead and MOGAS) to airport users.

The Belfast Airport Committee is composed of six people who are appointed by the City Council to represent the airport to the City for a term of three years. The Airport Committee Chairman acts as a liaison between the airport users, including the FBO, and the Airport Manager.

The City Manager acts as the Airport Manager for the Belfast Municipal Airport. He is responsible for ensuring a viable airport including securing operating and maintenance budgets, airport improvement grants, and fulfilling grant assurances. The City Manager reports to the City Council for all decisions regarding the Belfast Municipal Airport.

AIRPORT FACILITIES

The airport facilities are categorized as either airside or landside. The airside facilities are loosely defined as any area where an aircraft can maneuver, typically the "secure" side of the airport. The landside facilities can be defined as those areas where "passengers" can wander freely (i.e., unescorted). The typical dividing line is the airside face of the terminal building and any security fence line. For the purposes of this study, the airside facilities will include: the runway, taxiways, aprons, fuel facilities, and navigational aids (NAVAIDs). The landside facilities will include: the FBO/Administration Building, hangars, auto parking areas, and access road. Figure 2-3 depicts the existing layout of Belfast Municipal Airport's facilities.

AIRSIDE FACILITIES

Runway The two runways, Runway 15-33 and Runway 10-28, were originally constructed at the airport under the Work Projects Act. Both runways were constructed with bituminous

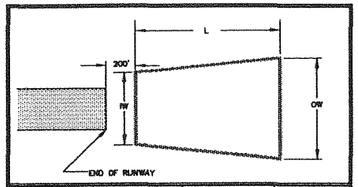
RUNWAY DATA	EXISTING	ULTIMATE
% WIND COVERAGE (ALL WEATHER)	12 MPH 10 MPH R/W 15: 91.7% 83.3% R/W 33: 88.0% 80.3% COMBINED: 91.7% 85.7% CALMS: 38.0% 38.8%	
PAVEMENT STRENGTH	30,000 LBS. SINGLE WHEEL	
APPROACH SURFACES	R/W 15: 20:1 NP R/W 33: 20:1 NP	
RUNWAY MARKINGS	NON-PRECISION	
RUNWAY LIGHTING	MIRL	
RUNWAY NAVAIDS	R/W 15: VASI-2L R/W 33: NONE	
IDEAL RSA DIMENSIONS	120' X 4,482'	
EFFECTIVE GRADIENT	0.67%	
RUNWAY END ELEVATIONS	R/W 15: 196.0' MSL R/W 33: 181.0' MSL	
RUNWAY END COORDINATES	R/W 15: 44°26'48.414"N 69°01'04.105"W R/W 33: 44°24'21.250"N 69°00'24.071"W	

EXISTING	ULTIMATE	BUILDINGS
①		ADMINISTRATION BUILDING
②		STORAGE SHED
③		FBO HANGAR
④		PRIVATE T-HANGAR
⑤		PRIVATE CONVENTIONAL HANGAR
⑥		PRIVATE CONVENTIONAL HANGAR
⑦		PRIVATE CONVENTIONAL HANGAR
⑧		PRIVATE CONVENTIONAL HANGAR
⑨		PRIVATE CONVENTIONAL HANGAR
⑩		PRIVATE CONVENTIONAL HANGAR
⑪		PRIVATE CONVENTIONAL HANGAR
⑫		PRIVATE CONVENTIONAL HANGAR

AIRPORT DATA	EXISTING	ULTIMATE
AIRPORT ELEVATION	196.0' MSL	
AIRPORT REFERENCE POINT	LAT. 44°24'34.873"N LONG. 69°00'44.124"W	
MEAN MAX. TEMP. (HOTTEST MO.)	81°F	
TAXIWAY LIGHTING	NONE	
TAXIWAY MARKING	CENTERLINE, SIGNAGE	
AIRPORT/TERMINAL NAVAIDS	LIGHTED WINDCONE ROTATING BEACON/MDB	
AIRPORT REFERENCE CODE (ARC)	B-II	
ACREAGE OWNED IN FEE SIMPLE	221± ACRES	
ACREAGE OWNED IN EASEMENT	80.2 ACRES	
USE/OWNERSHIP	PUBLIC/PUBLIC	

LEGEND	EXISTING	ULTIMATE
PAVEMENT		
AIRPORT PROPERTY LINE		
AVIGATION EASEMENT		
FENCE LINE		
BUILDING		
TREE LINE		
AIRPORT REFERENCE POINT (ARP)		
WETLANDS (SKETCH-MAP LEVEL DELINEATION)		
LIGHTED WINDCONE		
SEGMENTED CIRCLE		
MAINE STATE GRID TICKS		
UTILITY POLE		
CONTOURS (2-FOOT INTERVALS)	150	
AIRPORT BEACON		
OBJECT FREE AREA (OFA)		
RUNWAY SAFETY AREA (RSA)		
BUILDING RESTRICTION LINE (BRL) (NOTE: 20' BUILDING HEIGHT)		
DIRT ROADWAY		
BRUSH LINE		
RETAINING WALL		
LAND TO BE ACQUIRED IN FEE	N/A	
TREE CLEARING (ASSUME 60' TREES)	N/A	

* REFER TO "EXISTING AIRPORT LAYOUT PLAN" (SHEET 2)



RUNWAY	INNER WIDTH (IW)	OUTER WIDTH (OW)	LENGTH (L)
R/W 15	500'	700'	1000'
R/W 33	500'	700'	1000'

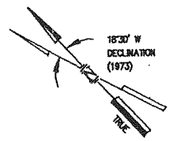
NOTE: INFO SHOWN ON PLAN IS SKETCH LEVEL ONLY. ANY DEVELOPMENT IN THE FUTURE SHOULD REQUIRE ON-SITE WETLAND, DELINEATION, AND COORDINATION WITH ASSOCIATED ENVIRONMENTAL AGENCIES.

GRAPHIC SCALE

300 0 150 300 600

1 Inch = 300 feet

NATIONAL GEODETIC VERTICAL DATUM USED: 1929



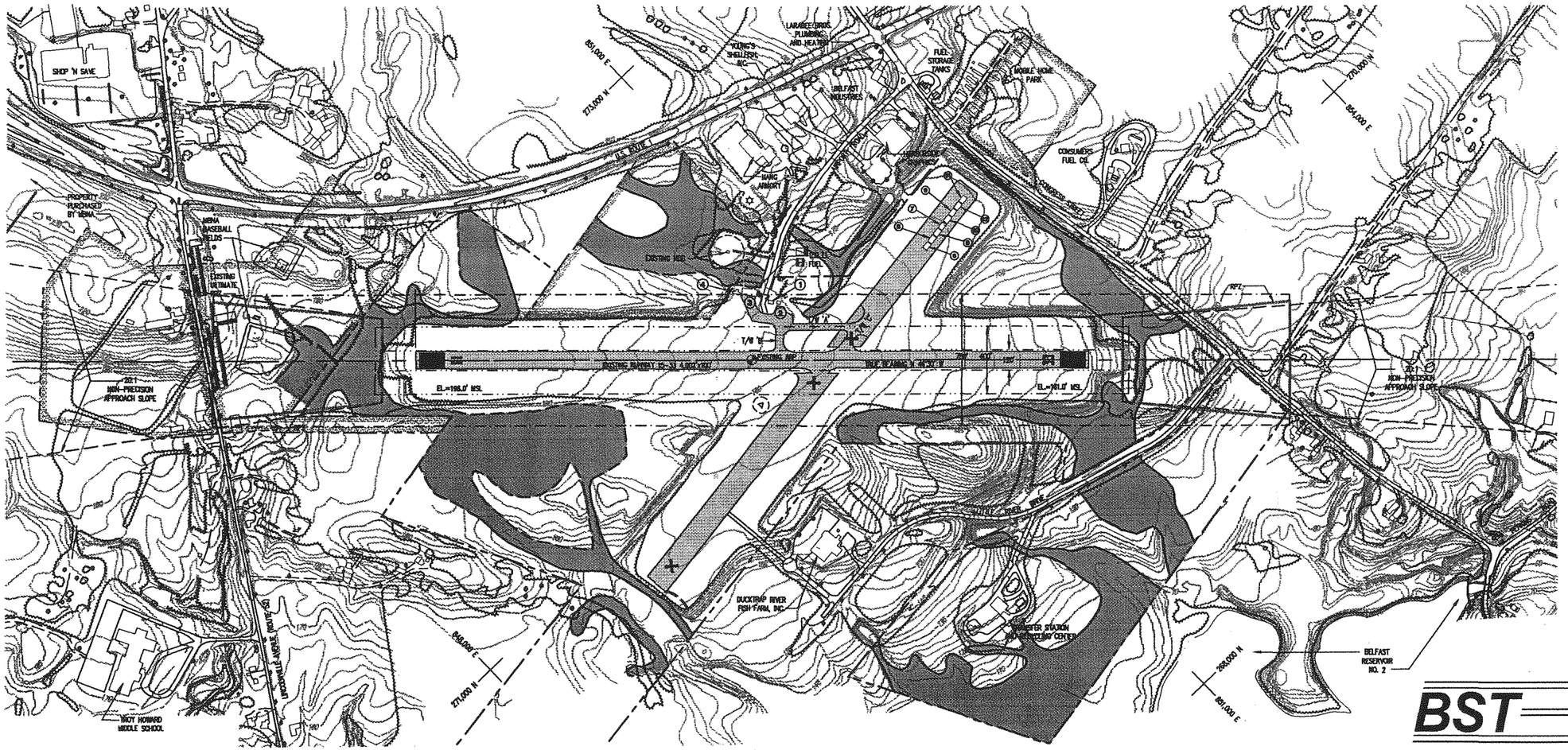


FIGURE 2-3
EXISTING AIRPORT LAYOUT PLAN

concrete surfaces to a width of 150 feet to accommodate military aircraft. In 1982, the crosswind runway, Runway 10-28, was abandoned in place. This action was taken due to the poor condition of the pavement, the high cost of repairing and maintaining a new pavement surface course, and the infrequent use of the runway (the previous *Airport Master Plan* stated that Runway 10-28 was used no more than five to six days per year). It was felt at that time that there was too little justification at that time for keeping Runway 10-28 as an active runway.

In 1981, Runway 15-33 was redesigned and reconstructed, again with a bituminous concrete surface course, to a reduced width of 100 feet. The remaining 25 feet of pavement on either side of the reconstructed runway was removed and the areas seeded. The City recently completed a cracksealing project for the entire length of Runway 15-33. The pavement is now in good condition with no new cracks and no evidence of frost heaving problems. As the topography in Figure 2-3 shows, this runway has a high point near the north end and a low point near the south end. This pavement was designed to accommodate up to a 30,000-pound aircraft with a single-wheel landing-gear configuration. This design is sufficient to support typical snow-removal equipment as well.

Taxiway There are three taxiways at Belfast Municipal Airport: two stubs and one partial parallel. All taxiways have a bituminous concrete surface course in good condition. The first stub taxiway is located approximately mid-field and was reconstructed during the 1982 runway reconstruction project. It connects the terminal area to Runway 15-33. The second stub taxiway makes use of the existing bituminous pavement previously used for Runway 10-28. The runway reconstruction project in 1982 did not include reconstruction of any portion of the abandoned runway, however some pavement striping was carried to a natural conclusion this pavement to indicate direction of travel on this newly designated stub taxiway. This stub taxiway connects Runway 15-33 to an area of eight small conventional hangars. The partial parallel taxiway is approximately 40-feet wide having a centerline to centerline separation distance from Runway 15-33 of 200 feet. The partial parallel taxiway connects the terminal area with the abandoned runway. As no taxiway designations have been adopted to date, for reference sake, this study will refer to the partial parallel taxiway as Taxiway A, the mid-field stub taxiway as Taxiway B and the stub taxiway on the abandoned runway as Taxiway C.

Apron One contiguous, irregularly shaped, aircraft parking apron exists with a bituminous concrete surface area of approximately 33,000 square feet. The generalized dimensions are 110 feet by 300 feet. These are not intended to represent the actual dimensions but only to give a feel for the relative size of the area. This apron was constructed in 1969 under the Federal Aid to Airports Program. This paved aircraft parking apron and the available hangars are not enough to accommodate the existing based and itinerant aircraft parking needs. A make-shift turf aircraft-tiedown area has been created over the years. This area can be loosely defined by extending the centerline of Taxiway A in a northerly direction and using the tree line in the terminal area as the other boundary. Only a few single-engine piston aircraft can be accommodated on this turf apron. With the snowy winters and rainy springs typical of northern New England, this turf apron can be difficult to park aircraft on or to plow snow off of. The airport is in need of a larger paved tiedown area to meet current and future aircraft parking demands.

Navigational Aids There are a limited number of NAVAIDs at Belfast Municipal Airport. There is no air traffic control tower at BST; only an FBO with UNICOM radios. Approach/departure control is provided by Bangor International Airport. Bangor's Flight Service Station (FSS) monitors the common traffic advisory frequency (CTAF) for Belfast Municipal Airport. If emergencies occur, the Bangor FSS has the responsibility of notifying the appropriate parties to summon assistance.

Ground-based electronic NAVAIDs, located on or near the Belfast Municipal Airport, can be functionally classified as: enroute, terminal area, or landing NAVAIDSs. In general, these NAVAIDSs are devices which emit radio frequencies by which pilots can navigate their aircraft.

The enroute NAVAIDs are radio beacons used by a pilot from the time the aircraft is airborne until the pilot begins the initial approach to the destination airport. The Belfast non-directional beacon (NDB) is located adjacent to airport property on land owned by the State of Maine Department of Defense and Veterans' Services (Military Bureau), approximately 250-300 feet north of the FBO/Administration Building. In general, the NDB emits a non-directional radio signal. These signals provide pilots with a bearing by which they can navigate aircraft.

Another enroute NAVAID is a very high frequency omni-directional range (VOR) facility which, in general, provides azimuth readings to aircraft equipped to receive this radio signal. A

VORTAC is a combination of a VOR with a military-use tactical air navigation (TACAN) facility in one location. A VORTAC facility provides VOR azimuth, TACAN azimuth and TACAN distance measuring equipment (DME) to aircraft equipped to receive the signals. Pilots flying into Belfast Municipal Airport may use the following enroute VOR facilities listed in Table 2-2. Refer to the section on Existing Airspace Environment, later in this chapter, for more information on this subject.

TABLE 2-2
BELFAST MUNICIPAL AIRPORT
VOR FACILITIES

Name	Identifier	Frequency	TACAN Channel	Location
Augusta VORTAC	AUG	111.4MHz	51	34.2 NM to the WNW
Bangor VORTAC	BGR	114.8	95	26.5 NM to the NNE

Source: U.S. Terminal Procedures, effective date December 8, 1994.

Landing NAVAIDs are limited to the two-box VASI system located on runway end 15. The VASI system is a visual, rather than electronic, approach guidance system that provides vertical boundaries suitable for a safe approach to the runway. The approach slope is set at 3° with a threshold crossing height (TCH) of 28 feet over runway end 15.

No terminal area NAVAIDs exist currently for BST.

Lighting and Marking The Belfast Municipal Airport installed a 10-inch rotating airport beacon in 1978. The beacon is located adjacent to airport property, on land owned by the State of Maine Department of Defense and Veterans' Services (Military Bureau), approximately 500 feet north of the terminal area. This beacon is equipped with two lenses, one green and one clear set 180 degrees apart. This beacon is used to visually locate the airport during inclement weather or at nighttime. The color of the lenses indicates that it is a civilian airport with runway lighting systems.

A lighted wind cone is located on airport property approximately 550 feet west of the intersection of Runway 15-33 and the abandoned runway. The wind cone is utilized by pilots for apparent wind direction and intensity prior to takeoffs and landings. This wind cone is surrounded by a segmented circle which visually assists in indicating the wind direction.

Runway 15-33 is equipped with medium intensity runway-edge lights (MIRL). These lights were installed at the same time this runway was reconstructed, in 1981. Runway 15-33 is striped for non-precision instrument approaches. The taxiways have only a centerline stripe. The abandoned runway is marked with large "X"s to indicate a closed-runway condition. All runway markings are white and all taxiway markings are yellow. All pavement markings are very faint and will need to be repainted in the near future.

FAR Part 77 Imaginary Surfaces The Federal Aviation Regulations (FAR) *Part 77 Objects Affecting Navigable Airspace* for this airport are based upon a non-precision instrument approach to runway end 15 and a visual approach to runway end 33 for small aircraft (defined as weighing 12,500 pounds or less). The primary surface is an imaginary, planar surface which is centered along the runway centerline and at the elevation of the runway centerline. The total width of the primary surface is 500 feet and extends beyond each runway end by 200 feet. The approach surfaces, also imaginary, are centered on the extended runway centerline and begin 200 feet from the ends of the runways. Both approach surfaces for Runway 15-33 rise outward and upward at a slope of 20 feet (horizontal) to 1 foot (vertical). Along the sides of the primary surface, the transitional surfaces, also imaginary, rise outward and upward at a slope of 7 feet (horizontal) to 1 foot (vertical). At an elevation which is 150 feet above the airport's elevation, there exists an elliptical horizontal surface. Figure 2-4 illustrates the existing imaginary surfaces for the Belfast Municipal Airport. Rough areas of existing penetrations to these surfaces are shown as well.

LANDSIDE FACILITIES

Administration Building This is a one story, wood-framed building approximately 30 feet by 15 feet in size with a small wooden deck on the south side of the building. Inside this building are the FBO's office, a restroom, the electrical vault for the runway lights, and a pilot lounge which doubles as a classroom for student pilots. Due to the small size of this building, the FBO has found it hard to separate functions inside the building. Additional space is needed in the Administration Building to more efficiently separate the student pilots' classroom from the potentially disrupting pilots' lounge and FBO office. The building is heated by a new (installed 1994) monitor heater. The 275-gallon kerosene tank for this heater is located south of the Administration Building near the shed. This building is served by city water lines, overhead electrical and telephone lines, and utilizes a septic tank located northeasterly of the Administration Building. This building was constructed approximately 40 to 45 years ago. It has recently been repainted and is in good condition, however, additional room is needed to serve the increasing numbers of student pilots and charter passengers, and to provide additional space for the FBO office. The Administration Building penetrates the existing FAR Part 77 Imaginary Surfaces and should be relocated farther away from Runway 15-33. A small shed, used for miscellaneous storage, is located southeasterly of the Administration Building.

Auto Parking Automobile parking is limited to two small gravel areas containing approximately nine spaces north of the Administration Building, and approximately six spaces northwest of the Administration Building. The limits of these areas are not well defined. There is no gate to keep automobile traffic from entering the aircraft operations areas, however, it is encouraged that automobiles remain in these gravel parking areas.

Access Road The Belfast Municipal Airport is accessed from Airport Road. This two lane road has a bituminous concrete surface in good condition. This roadway also serves the Belfast Airport Industrial Park - North which currently has four tenants.

Hangars Two areas of hangar development have been constructed over the years: an eight-hangar "condo" has been recently constructed on the easterly end of the abandoned runway, and two hangars, constructed over 20 years ago, are located to the west of the Administration Building. The eight recently constructed conventional hangars are in very good condition. They

are served by no utilities. Of the two older hangars, one is a T-hangar in poor condition and has no utilities. The remaining older hangar is a conventional hangar in good condition which has been divided into two halves, both of which are utilized by the FBO. This hangar is served by water and electric utilities. Two fuel sources provide heat for this hangar: home heating oil stored in 275 gallon fuel tanks, and waste oil stored in 55 gallon drums. One half of this hangar is used for repair of aircraft and the other is used for storage of aircraft. All hangars at the airport are of wood-frame construction with wood siding. The eight-hangar "condo" does not penetrate any existing FAR Part 77 Imaginary Surfaces, however, the two older hangars should be moved farther away from Runway 15-33 so that they do not penetrate the existing FAR Part 77 Imaginary Surfaces.

Figure 2-5 illustrates the layout of the existing facilities in the terminal area.

SUPPORT FACILITIES

The smooth and efficient operation and maintenance of the airport is dependent not only on the airside and landside facilities, but also on the so-called support facilities. These support facilities include safety/emergency services, fuel storage and dispensing equipment, and snow-removal services. These facilities do not necessarily have to be located on airport property, but do have to be available within a reasonable amount of time to serve the airport when needed.

Aircraft Rescue and Fire Fighting (ARFF) The Belfast Municipal Airport has no fire fighting or rescue equipment or personnel on site. Because the airport does not receive scheduled air carrier service, it does not have to meet the requirements of Federal Aviation Regulation (FAR) Part 139, Certification and Operations: Land Airports Serving Certain Air Carriers, (as published in September 1992). This a document which "prescribes rules governing the certification and operation of land airports which serve any scheduled or unscheduled passenger operation of an air carrier that is conducted with an aircraft having a seating capacity of more than 30 passengers." The primary goal of this certification is to promote safe conditions for passengers and the public at airports. Subpart D §139.315 and §139.317 of this Part explain the minimum requirements for ARFF equipment and agents. Each certificated airport is designated with an ARFF Index. This index is based upon the longest aircraft having an average of five or more daily departures. If Belfast Municipal Airport was to become certificated, it

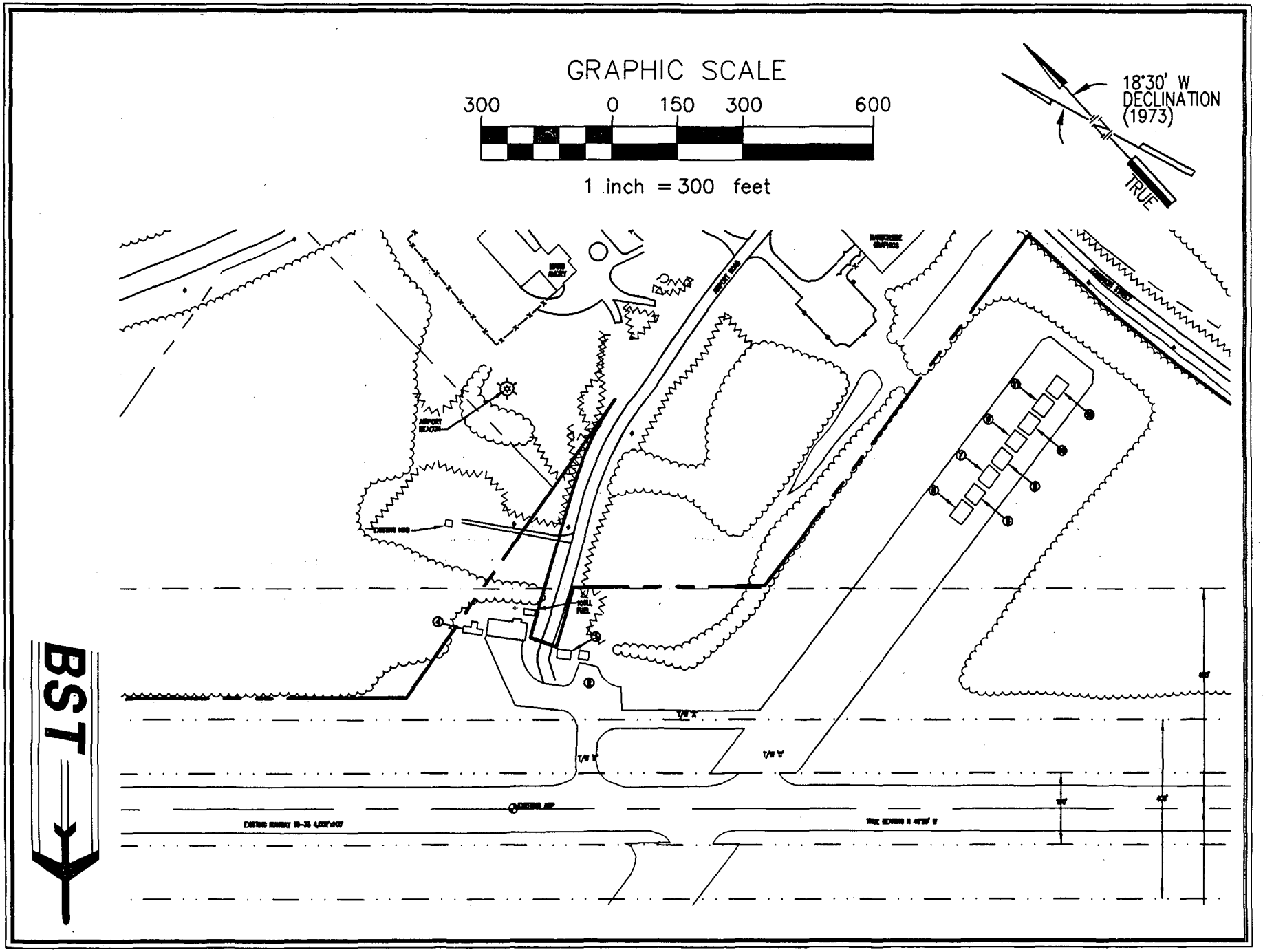


FIGURE 2-5
EXISTING TERMINAL LAYOUT PLAN

would fall into the Index A category which includes aircraft up to 90 feet in length. The minimum ARFF requirements for an Index A airport would include: 500 pounds of sodium-based dry chemical or halon 1211; OR 450 pounds of potassium-based dry chemical and water with a commensurate quantity of aqueous film forming foam (AFFF) to total 100 gallons, for simultaneous dry chemical and AFFF foam application. The Belfast Fire Station is staffed by volunteers and is located at the center of town where Routes 1 and 3 join. This fire station has jurisdiction over the Belfast Municipal Airport in case of an emergency. This fire station appears to have adequate capabilities to serve the airport in an emergency.

Snow-removal Services The airport does not have any of its own snow-removal equipment. Instead, the airport relies on the ability of the City's snow-plow crews to each make a pass along the runway after they have cleared their primary routes. This continues until the snow is cleared from the runway and stub taxiway. This method is not conducive to providing a high degree of reliability for the airport users, and in some cases can effectively close the airport to all users until the situation can be remedied. Using current FAA Advisory Circulars (150/5220-20 and 150/5200-30A), calculations for minimum snow-removal equipment needs under the existing conditions (1994) show that the following are needed:

- one snow blower having a minimum capacity of 224 tons per hour and a casting distance of at least 50 feet
- two displacement plows each having a minimum length of 5.88 feet
- carrier vehicles to support the above equipment

Optional equipment may also be obtained including a truck-mounted hopper/spreader, a small self-propelled, high-speed runway sweeper, and a wheel loader with snow bucket. These minimum and optional equipment purchase costs are reimbursable under FAA's Airport Improvement Program (AIP) fund providing the airport does not already own these types of equipment or that the equipment that it does own is older than the expected life span of the equipment (typically 20 years). In this case, Belfast Municipal Airport does not own any snow-removal equipment and is eligible to request AIP funds for the purchase of such equipment. All

operation, maintenance, and repair of such equipment then becomes the responsibility of the airport as does all funding of the operations, maintenance, and repairs.

In Chapter Four, these calculations will be updated to show how much equipment may be requested if the operational forecasts are realized.

Airport Maintenance A small shed on the easterly side of the Administration Building houses a few implements for upkeeping the airport. The City currently contracts with a local farmer to periodically mow the grassed portions of the airport. The FBO and the Airport Committee Chairman provide recommendations to the City Manager regarding maintenance items for the airport (e.g., replace runway edge lights, replace batteries for NDB, or placement of pavement crack filler). Typically, City crews and/or airport users share the maintenance responsibilities of the airport.

Fuel Facilities Aviation fuel, 100 low lead, is stored in a temporary location to the north of the repair/storage hangar. This fuel is stored in an aboveground tank having a capacity of 5,000 gallons. The tank is of double-walled construction and is placed on a temporary foundation over gravel fill material. From this location, the 750-gallon-capacity mobile fuel truck can pick up the fuel and deliver it to aircraft parked on the apron. The City has requested as part of the Airport Master Plan Update to determine the best location for a permanent fueling facility. This will be undertaken as future chapters are completed.

Other fuel storage areas on airport property include an aboveground kerosene tank capable of holding 275 gallons located on the southeast side of the Administration Building for the monitor heater inside that building, two aboveground fuel tanks located inside the FBO's hangar, both having a capacity of 275 gallons of home heating oil, are used to heat the aircraft storage section of the FBO's hangar, approximately six (the number varies with the season) 55-gallon drums of waste oil located near the entrance of the FBO's hangar are used to heat the aircraft repair section of the FBO's hangar, and two 275-gallon aboveground tanks located on the southeast side of the Administration Building for automobile gas (MOGAS) for the airport vehicles and lawn mower.

Utilities The Belfast Municipal Airport is served by several utilities. Overhead power lines bring both electricity and telephone to the Administration Building; electricity is also

brought to the FBO's hangar. City water lines, via Airport Road, supply the Administration Building and the FBO's hangar with water. The Administration Building and the FBO's hangar utilize a 1,000-gallon septic tank for disposal of waste water; this tank is assumed to be located to the northeast of the Administration Building.

AIRPORT SERVICE AREA

Defining the Belfast Municipal Airport's service area will help to define the potential users of the airport and thus the volume of activity the airport realistically supports. For general aviation airports like Belfast, a 25-mile radius from the airport is a typically accepted boundary defining the estimated area of influence of the airport. This 25 miles approximates 30 minutes of driving time; if it takes any more than 30 minutes to reach the airport by automobile, the user/passenger is likely to utilize an alternate facility.

There are several airports within reasonable driving distance from Belfast. Table 2-3 lists several of these airports and their notable features. Figure 2-6 illustrates the Belfast Municipal Airport service area along with service areas of nearby airports. Just as the Belfast Municipal Airport has a service area, so do the area airports. In fact, many of these area airports' service areas overlap the Belfast service area. Airport users in these overlapped areas have their choice of airports. The airport users' ultimate goals often determine which airport will receive their business. For some, scheduled airline service is a necessity. For this region, Bangor International, Augusta State, Knox County Regional, and Hancock County Airports have scheduled airline service. These airports' service areas cover most of the Belfast Municipal Airport's service area. However, as a result of scheduled airline service, these airports tend to be busier and thus more complicated to student pilots just learning to fly aircraft. The airport in Belfast, as well as many of the other general aviation airports, offers a relatively quiet air traffic environment in which to learn how to fly aircraft. Some business travelers may also choose the relatively uncongested airport in Belfast because it offers them convenient and flexible charter operations. For these reasons, the 25-mile radius limiting Belfast Municipal Airport's service area will remain with the understanding that not everyone inside this boundary will choose to use this airport.

TABLE 2-3
BELFAST MUNICIPAL AIRPORT
VICINITY AIRPORTS

Airport	Runway(s)	Runway ID	Runway Lighting	Fuel Available	Approach Type(s)	# Based Aircraft	Ownership	Distance to Belfast
Belfast Municipal	4,002 x 100	15-33	MIRL	100LL	NDB/GPS-15	26	Public	N/A
Augusta State	5,000 X 150 2,703 X 75	17-35 8-26	HIRL MIRL	100LL Jet-A	ILS-17 VOR/DME-8 VOR/GPS-35	60	Public	34
Waterville Municipal	5,500 X 100 2,300 X 150	5-23 14-32	MIRL MIRL	100LL Jet-A	ILS-5	43	Public	34
Pittsfield Municipal	4,000 X 150	1-19	MIRL	80 100LL Jet-A	NDB-1 GPS-19	25	Public	31
Newport Skypark	3,200 x 150	1-19	None	100LL	Visual	18	Private	30
Bangor International	11,439 x 300	15-33	HIRL	100LL Jet-A	ILS-15 (CAT II) VOR/DME-33	54	Public	28
Brewer Municipal	1,700 x 25	1-19	None	None	Visual	6	Private	28
Hancock County Regional	5,196 x 150	4-22 17-35	MIRL None	100LL Jet-A	ILS-22 LOC/DME-4	47	Public	36
Stonington Municipal	2,100 x 60	7-25	None	None	Visual	8	Public	22
Islesboro Municipal	2,400 x 50	1-19	None	None	Visual	1	Public	9
Knox County Regional	5,000 x 100 4,000 x 100	13-31 3-21	MIRL MIRL	100LL Jet-A	LOC-3 ILS-13	60	Public	24

Sources: U.S. Terminal Procedures, June 18, 1998; Maine Aviation System Plan, Dec. 1991; various FAA Form 5010 c. 1985 to present; and Maine Atlas and Gazetteer, 1989.

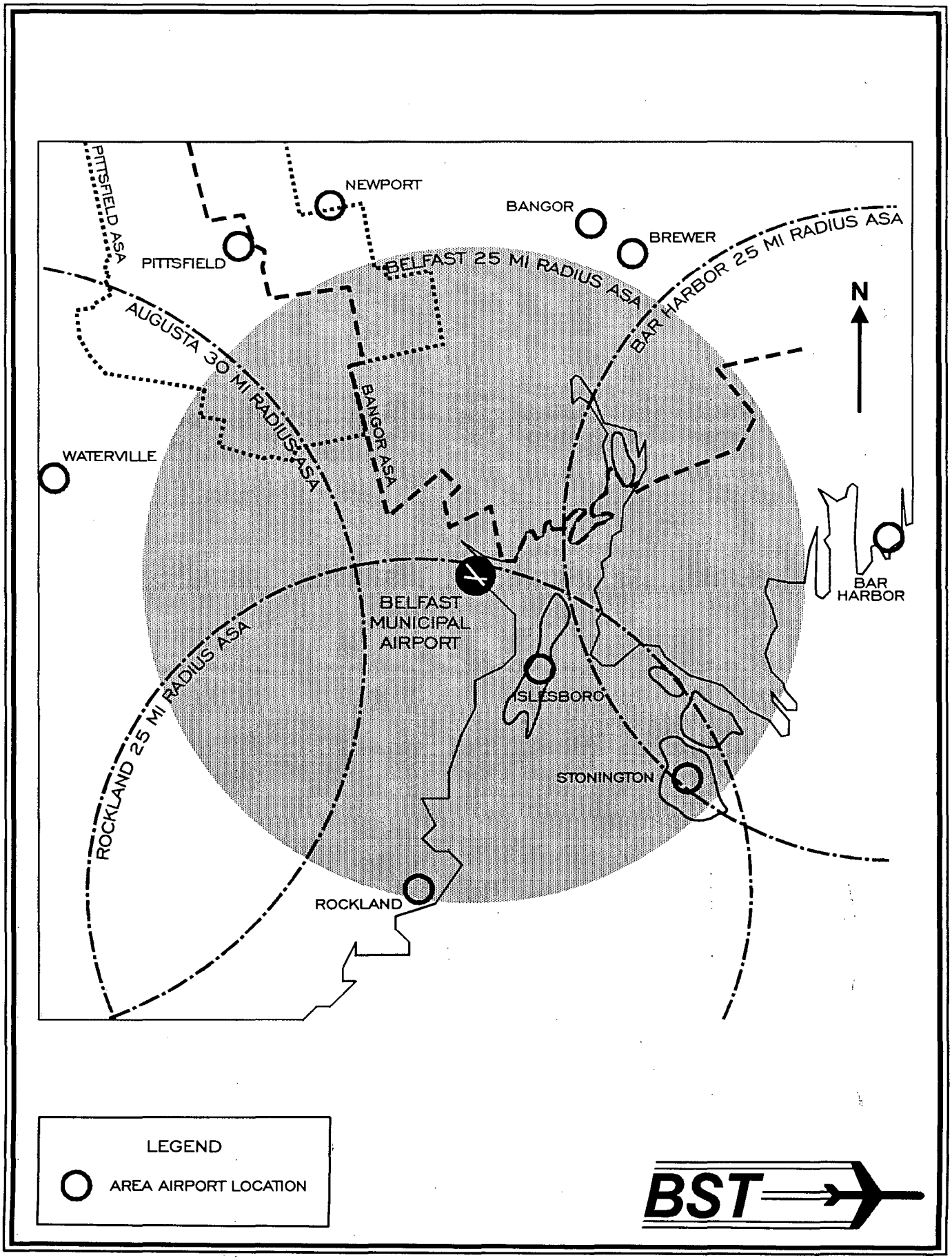


FIGURE 2-6
AIRPORT SERVICE AREA

EXISTING MUNICIPAL LAND USES

According to the City of Belfast Draft Comprehensive Plan, dated November 1992, land uses within the City of Belfast have generally followed the influences of the topography and waterfront. With the advent of city water and sewer lines, development potential has increased. The City has developed along the following lines:

- industrial establishments primarily along the waterfront
- commercial establishments primarily along Main Street and side streets
- residences throughout the downtown and the rural areas of the City

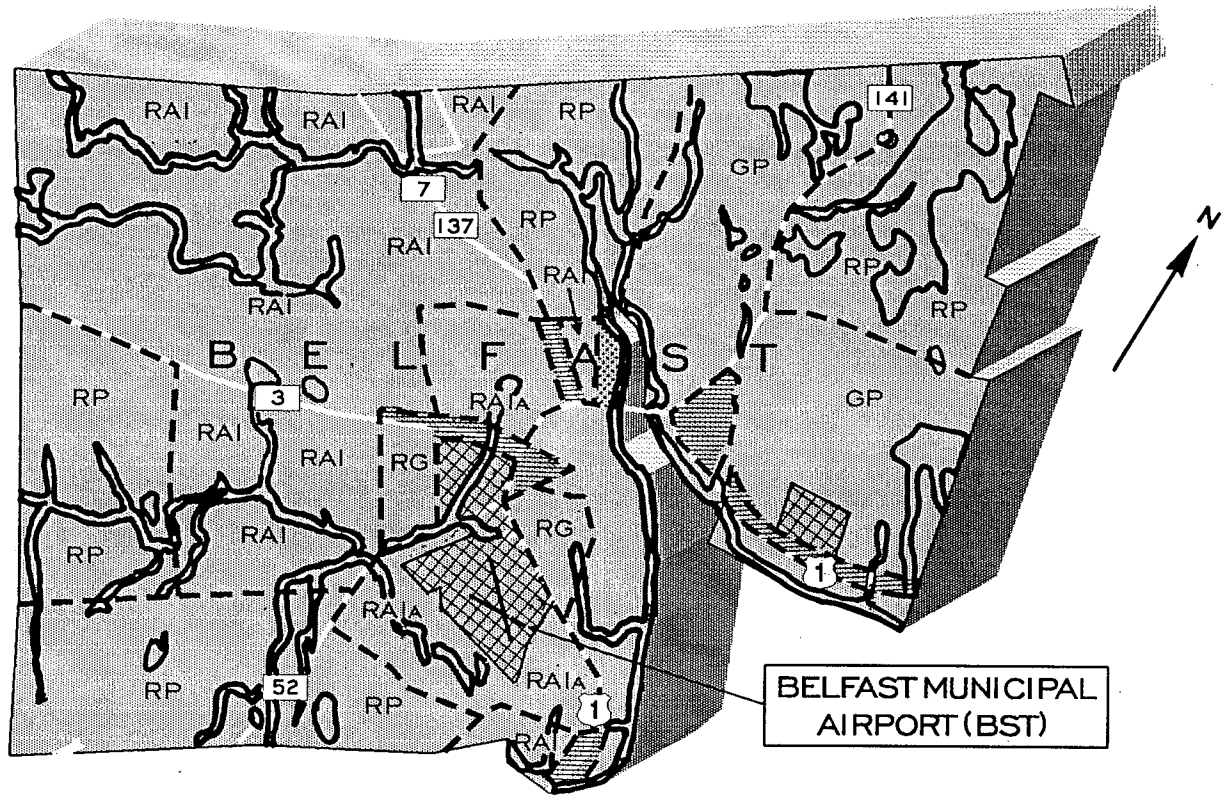
The Belfast Municipal Airport's property is currently zoned as Industrial I - Airport Area. The zoning ordinance states the following for this land use:

> Permitted uses in this area include manufacturing, processing or treatment facilities or other industrial activities which add value to goods produced elsewhere; and accessory commercial outlets for products manufactured or to which value is added at the same site, provided that the accessory use occupies no more than 20 percent of the total floor area. The minimum lot size is 40,000 square feet.

The *1992 Draft Comprehensive Plan* made the following recommendations regarding the airport:

> Amend the Zoning and Subdivision Ordinances to include Standards aimed at ensuring that development in the vicinity of the airport would not interfere with the safe operation of the airport or result in unsafe conditions for surrounding properties. Include in the ordinances Standards to address building height, the use of equipment that might interfere with instrument landing systems, and the modification of subdivision proposals to minimize development in airport approach zones.

The *1992 Draft Comprehensive Plan* developed a draft future land-use plan as a guide to help achieve compatible land uses within the City of Belfast. This future land-use plan has been reproduced as Figure 2-7. Attention should be paid to the final version of this *Comprehensive Plan* as to the impact it will have on the airport community.



LEGEND

	HIGHWAY COMMERCIAL		RESIDENTIAL 2
	INDUSTRIAL A-1		SHORELAND ZONE WETLAND, FLOODPLAIN
RAI	RESIDENTIAL AGRICULTURAL I SUBDISTRICT	RAIA	RESIDENTIAL AGRICULTURAL IA SUBDISTRICT
RG	RESIDENTIAL GROWTH	RP	RURAL PROTECTION
GP	GENERAL PURPOSE		

BST

FIGURE 2-7
DRAFT FUTURE LAND USE PLAN

EXISTING ON-AIRPORT LAND USES

The on-airport land uses can be categorized into functional groups. The interrelationships of these functional groups along with their location on the airport play a large part in the efficiency of the airport. Similar or compatible categories should be grouped together, whereas other categories should be held separate for safety and/or security reasons. Each group should also have the ground access and airfield access appropriate for its needs.

Aircraft Operations Area As this is a small general aviation airport with few facilities, a major portion of the airport can be designated as existing aircraft operational area.

Terminal Area A small terminal area was started mid-field around 40-45 years ago. This area contains several compatible uses: Administration Building, FBO hangar, private hangar, fueling station, and aircraft parking areas.

General Aviation Hangar Area Another area has recently been developed to house aircraft in hangars on the east end of the abandoned runway. This area was developed in general conformance with the previous *Airport Master Plan.*

Other Use Areas No areas for other land uses, such as air cargo, industrial park, or security are currently defined for this airport's property.

Figure 2-8 illustrates the general boundaries of the existing on-airport land uses.

EXISTING NATURAL AND HUMAN ENVIRONMENT

It is important to assess the natural environment in the vicinity of the airport to provide guidance in formulating the most feasible development scenario. In addition, many natural resources are protected by laws which necessitate the acquisition of permits before airport improvement projects can proceed. The natural environment also often dictates the location and layout of development projects at airports. Soil characteristics, surface and subsurface hydrology, waterbodies, wetlands and topography all affect to what degree a parcel of land can be developed.

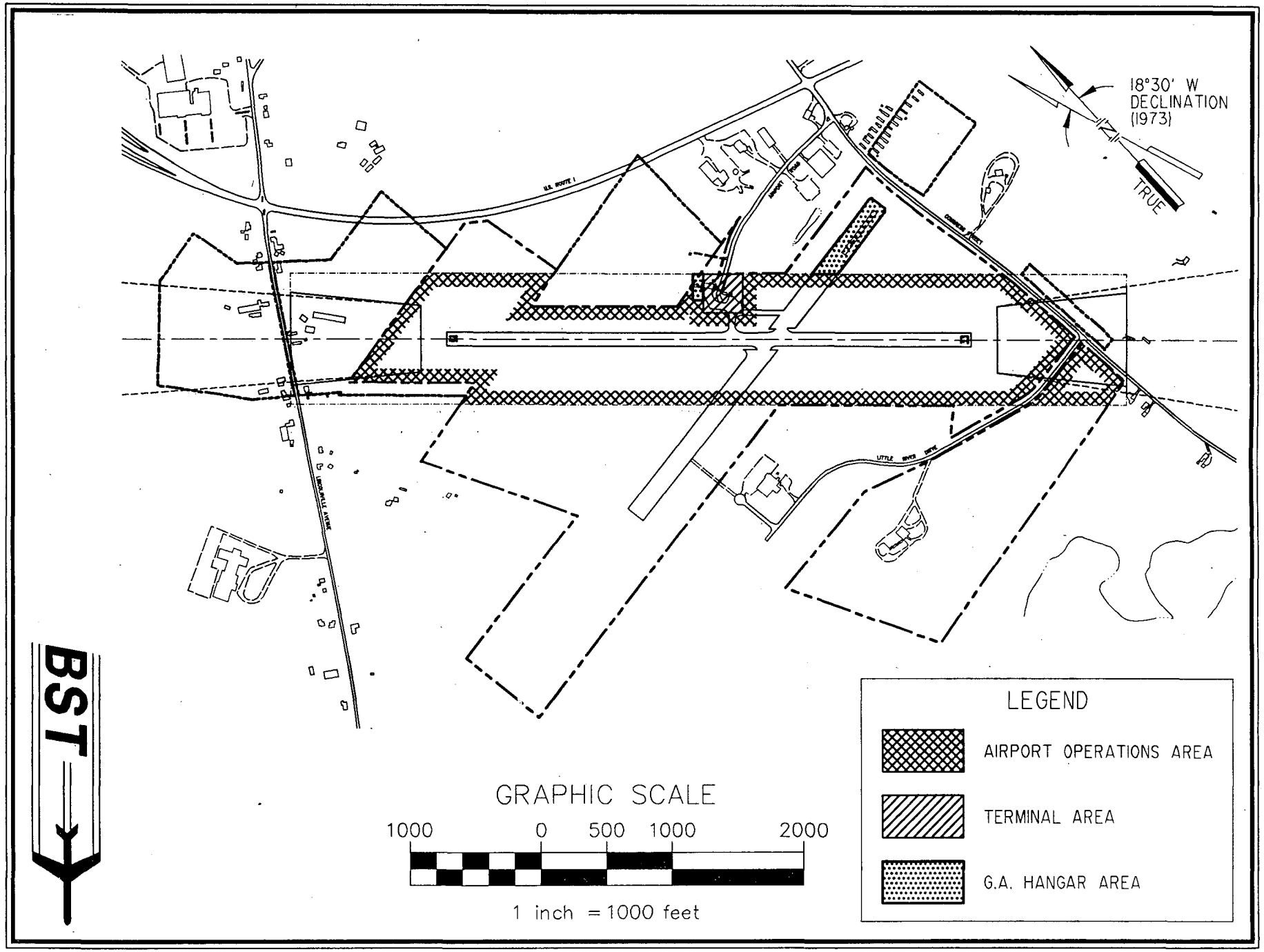


FIGURE 2-8
EXISTING ON-AIRPORT LAND USES

The majority of the airport property is covered by an early successional upland community regenerating from a prior clear cut. It consists of small-diameter mixed hardwood/softwood types that include red maple (*Acer rubrum*) and white pine (*Pinus strobus*) with shrubs and saplings interspersed throughout. Along the runways, grasses and forbs occur. Palustrine forested (PFO) and Palustrine emergent (PEM) wetland areas also occur on airport property.

The soil types at BST are mapped by the Natural Resource Conservation Service (NRCS) in the *Soil Survey of Waldo County, Maine*. These soils are classified as Peru, Swanville, and Brayton (refer to Figure 7-1). The Peru soils formed in compact glacial till derived mainly from mica schist and some granite. They are located on upland drumlin-shaped ridges and on side slopes of bedrock-influenced ridges sloping from three to 15 percent. These soils are moderately well drained. The depth to bedrock is generally more than five feet with a seasonal high-water table of one to two feet below the surface. The Swanville and Brayton soil series are both poorly drained soils with seasonal high-water tables at or near the surface most of the year. The Brayton soil series was formed in compact glacial till derived mainly from schist and gneiss. It is usually found along drainage ways and low-lying areas. The available water capacity of the Brayton soils is low and the depth to bedrock is generally greater than five feet. The Swanville soils consist of water-deposited sediments on low-lying marine plains and lacustrine plains. The available water capacity is high in these soils and the depth to bedrock is generally greater than five feet.

There are many sources of previously documented information that were reviewed regarding environmental and natural resource base data for the airport. These include documents from the following state, federal, and local agencies:

- Maine Department of Economic and Community Development, Natural Areas Program
- Maine Department of Inland Fisheries and Wildlife
- Maine Historic Preservation Commission
- U.S. Department of Agriculture's Natural Resources Conservation Service
- U.S. Department of the Interior's Division of Fish and Wildlife
- City of Belfast municipal officials

From these sources, it has been determined that it is unlikely there are any resources of historic or archeological significance, no known state or federally protected species of plant or animal, and no unique natural areas located in the vicinity of the airport.

Issues that will need to be considered include the presence of freshwater wetlands both on airport property and in the vicinity of airport property based on the U.S. Department of Fish and Wildlife Service's National Wetland Indicator Maps. Additionally, the U.S. Department of Agriculture's Natural Resources Conservation Service's medium intensity soil mapping has many of the soils on airport property mapped as poorly drained or somewhat poorly drained soil series. Many of these soil units are also designated as "hydric" soils in Maine. Hydric soil is one of three parameters necessary for an area to qualify as a jurisdictional wetland by the U.S. Army Corps of Engineers and the State of Maine. The State of Maine also uses what is referred to as the "three parameter approach," which requires the presence of hydric soil, hydrophytic vegetation and evidence of hydrology at or near the surface of the ground for a positive wetland determination.

The *1992 Draft Comprehensive Plan* also identified several factors that could affect development at the airport. These include two sand and gravel aquifers located southerly and westerly of the airport property, an intermediate-value deer-wintering area located westerly of the airport and the presence of Belfast Reservoir No. 2 which is a backup water supply for the City located southerly of the airport. All pumps for this reservoir are currently shut off.

All of these factors will play a part during the alternative developments analyses conducted for this AMPU. The facilities required to meet the projected demand will be sited based on an evaluation of best practical location from aeronautical, engineering, financial, and environmental perspectives.

EXISTING AIRSPACE ENVIRONMENT

The Belfast Municipal Airport has no air traffic control tower now or planned for the future. Belfast's designation as an Economic Development Airport and the interest in precision approaches does not mandate the presence of an on-site control tower. In fact, Maine airports in Sanford, Auburn-Lewiston, Waterville, Bar Harbor, and Presque Isle all have precision approach

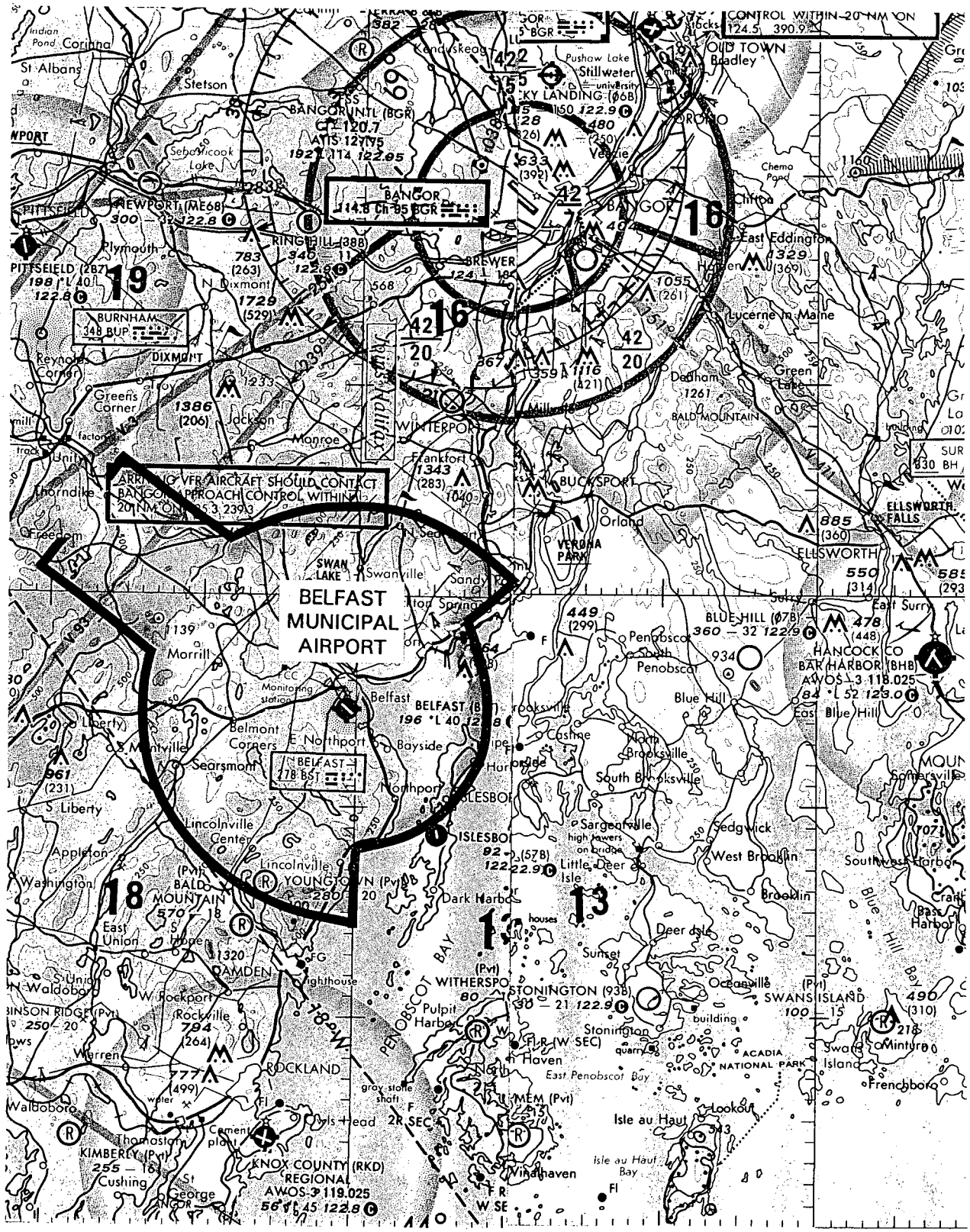
capabilities and no control towers. Instead, other federally-operated air traffic control facilities assume control for instrument approaches to these airports. The Boston Air Route Traffic Control Center (Boston Center) located in Nashua, New Hampshire is responsible for controlling instrument flight rule (IFR) aircraft operation throughout New England and parts of eastern New York and northern Pennsylvania. Pilots flying under visual flight rules (VFR) are expected to contact the airport via the UNICOM frequency to alert operators in the area of impending aircraft operations.

The 1958 Federal Aviation Administration Act designated the FAA as the responsible agency for the control and use of navigable airspace in the United States. This airspace is denoted as the National Airspace System (NAS). The NAS, along with the corresponding charts, regulations, and airport facilities, have been designed to protect people and property on the ground and in the air. The existing airspace boundaries for the Belfast Municipal Airport are shown in Figure 2-9.

There are four types of airspace within the NAS: controlled, uncontrolled, special use, and other. In September of 1993, airspace designations were officially changed from names and types to letter designations. This effort was undertaken to ensure worldwide consistency among airspace nomenclature and requirements. The airspace classes include Classes A through G. Figure 2-10 illustrates the different types of airspace classes. The Belfast Municipal Airport falls within the controlled airspace areas of Classes A, E, and G.

Class A Airspace Class A airspace used to be designated as the Positive Control Areas under the old nomenclature. This area is defined in FAR Part 71.193 for airspace within the contiguous United States from a floor of 18,000 feet above mean sea level (MSL) up to and including a ceiling of 60,000 feet MSL. Class A allows only IFR operations. The aircraft must have special radio and navigation equipment onboard and the pilot must obtain an air traffic control (ATC) clearance to enter this airspace. In addition, the pilot must have at least an instrument rating.

Class E Airspace Class E airspace used to be designated as the Continental Control Area under the old nomenclature. In this case, the floor of the airspace begins at 700 feet above ground level (AGL) and ends at a ceiling of 18,000 feet MSL (floor of Class A airspace). The Class E airspace surrounding the Belfast Municipal Airport is used for transitioning to and from



SOURCE:
BASE MAP FROM MONTREAL AND HALIFAX SECTIONAL AERONAUTICAL CHARTS, NOAA. 51ST EDITION, SEPT. 15, 1994. SCALE 1:500,000.

BST

FIGURE 2-9
BELFAST AIRSPACE

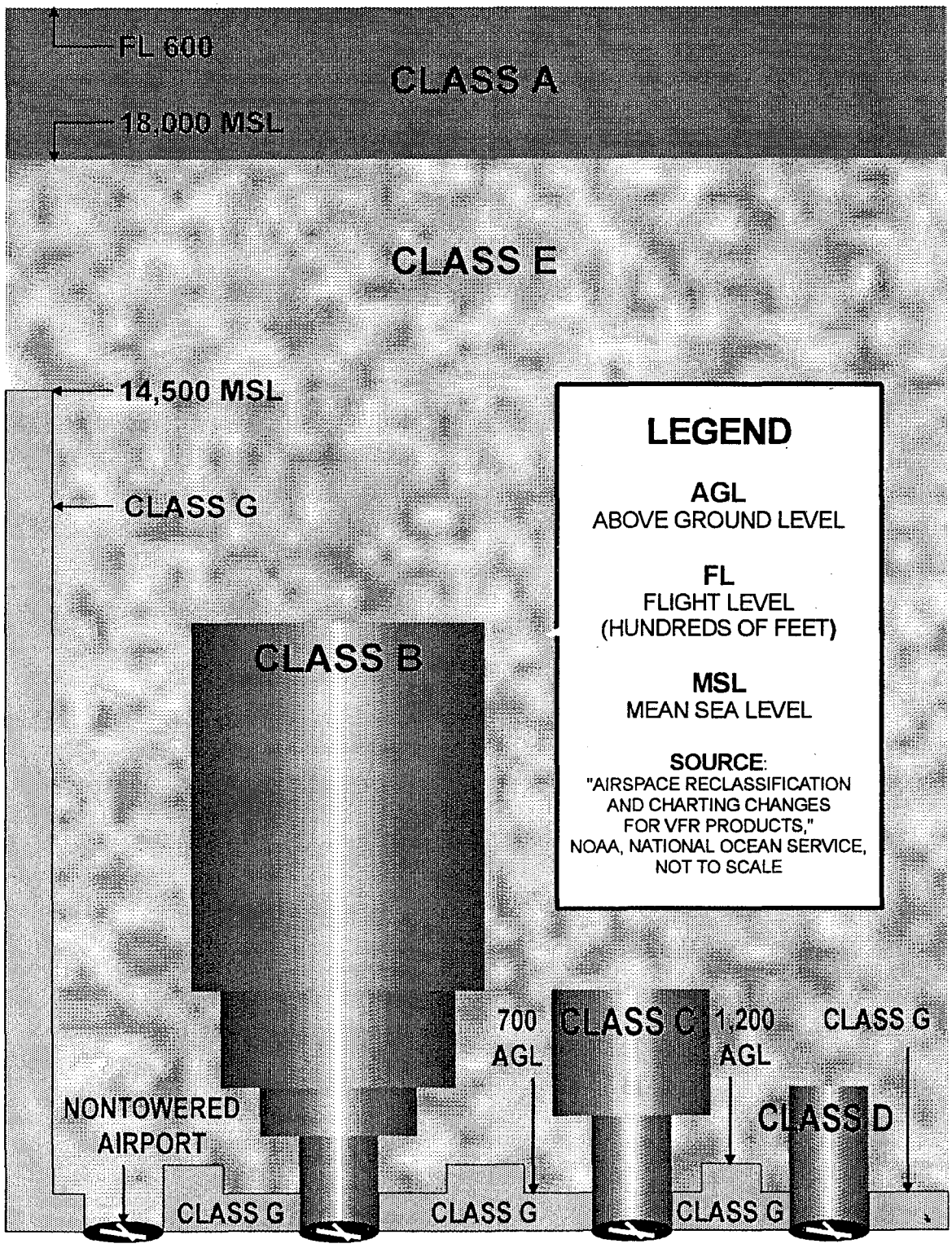


FIGURE 2-10
AIRSPACE CLASSIFICATION

the terminal or enroute air traffic environment. No specific pilot certification, specific equipment, or specific arrival or enroute flight entry requirements are necessary to operate in this airspace.

Class G Airspace Class G airspace is that airspace which is uncontrolled. This airspace generally abuts Belfast Municipal Airport's Class E airspace. Class G airspace begins at the ground surface and rises to a ceiling of 14,500 feet MSL. FAR 91.177 lists the requirements for IFR flight through this airspace.

Aircraft flying VFR, passing through controlled airspace, must ensure that visibility is greater than three miles at altitudes up to, but not including, 10,000 feet MSL. Above 10,000 feet MSL, VFR flight requires greater than five miles of visibility. IFR procedures are required when the visibility is less than three miles.

Victor Airways Victor (V) airways are federal, enroute, low altitude airways which are based upon the locations of the VOR facilities. VORs emit VHF radio signals in a 360 degree radial pattern. This allows aircraft to follow a particular magnetic heading (radial) between successive VORs. These airways are typically eight nautical miles wide and begin at a floor of 1,200 feet MSL and extend up to but not including a ceiling of 18,000 feet MSL. Several Victor airways meet at the Bangor VOR. The closest Victor airway to Belfast is V-93 which runs in a northeasterly-southwesterly direction west of the Belfast Municipal Airport. V-302 is a Victor airway which runs in a northwesterly-southeasterly direction approximately 25 nautical miles to the southwest of the Belfast Municipal Airport.

Special Use Airspace Special use airspace is airspace in which allowable aircraft operations may be restricted or limited. There are no special use airspace designations within the vicinity of Belfast Municipal Airport. However, three military operations areas (MOA) exist to the northwest and northeast of Belfast: the Condor 1 MOA, the Condor 2 MOA and the Deepwoods MOA. A MOA facilitates military training activities. The floor for the two Condor MOAs is 7,000 feet MSL with no ceiling limit. The Deepwoods MOA has a floor of the ground surface up to a ceiling of 3,000 feet MSL. Currently, the Air National Guard is petitioning to have the floor of the Condor MOAs lowered to 300 feet above ground level (AGL). The State of Maine has officially opposed this request based upon safety and environmental reasons. A final

decision has yet to be made in this matter. IFR pilots operating in these areas must obtain air traffic control clearance first; VFR pilots must exercise extreme caution in these areas and should contact the Bangor FSS for current hours of operation of the MOA.

There is one warning area, W-102, over the Atlantic Ocean, approximately 35 nautical miles from Belfast, that pilots operating in the Belfast area should be aware of. Warning area boundaries designate the limits of international waters. Flight through these areas may be hazardous to the aircraft and its occupants.

Other Airspace Other airspace areas can include airport advisory areas, military training routes (MTR), parachute jump aircraft operations areas, and published VFR routes. Contact with the Bangor FSS should be made when these airspace areas are of concern.

Belfast Municipal Airport has the capability of having visual (circling) approaches to both ends of Runway 15-33 as well as a non-precision (straight in) approach to runway 15 via the on-airport NDB or by using global positioning system (GPS) on-board instrumentation. Figure 2-11 illustrates the most recent approach plate for the airport.

EXISTING AIRCRAFT ACTIVITY

Air traffic statistics are estimated annually at the Belfast Municipal Airport by the FAA and MDOT inspectors and are recorded in the Airport Master Record (FAA Form 5010-1). Other estimates of airport activity have been obtained from the airport operator/FBO, the consultant's site visit, the *Maine Aviation System Plan* (MASP), and the previous Airport Master Plan.

Based Aircraft Based aircraft are aircraft which call the Belfast Municipal Airport their permanent "home." The following are the data relevant to based aircraft at Belfast:

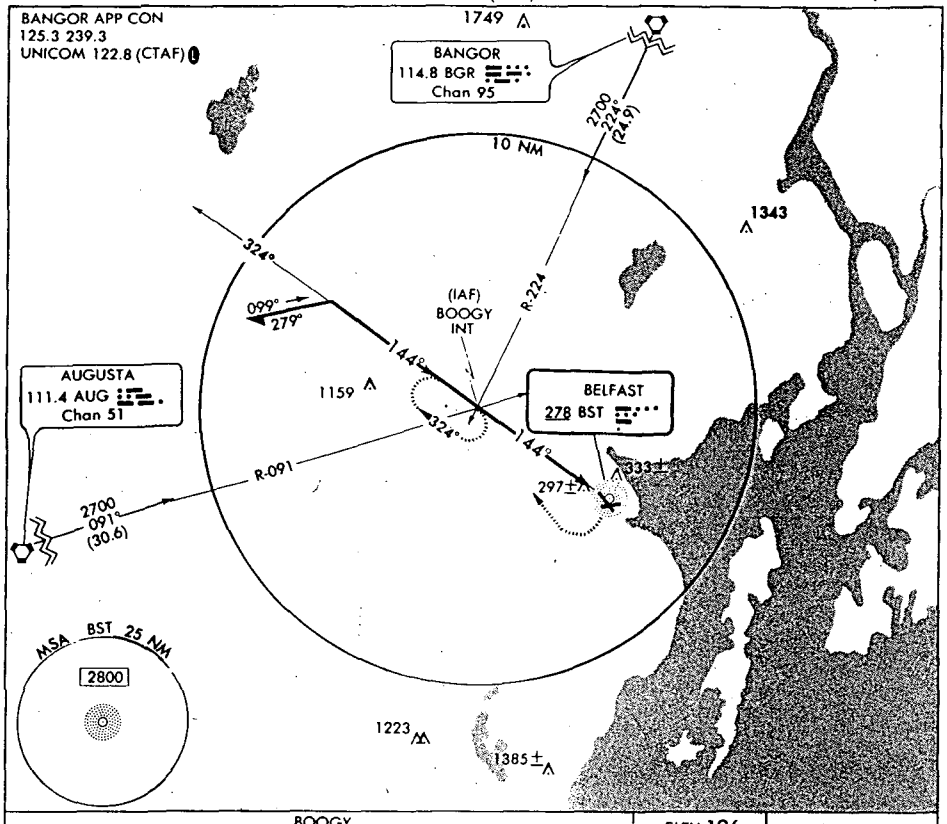
FAA Form 5010-1 (July 11, 1994): 22 total (20 single-engine, 2 multi-engine)
FBO (May 21, 1995): 25 total (actual)
Consultant's visit (November 15, 1994): 17 total
MASP (1989): 20 total (19 single-engine, 1 multi-engine)
1977 Airport Master Plan (1995 forecast): 54 total (50 single-engine, 4 multi-engine)

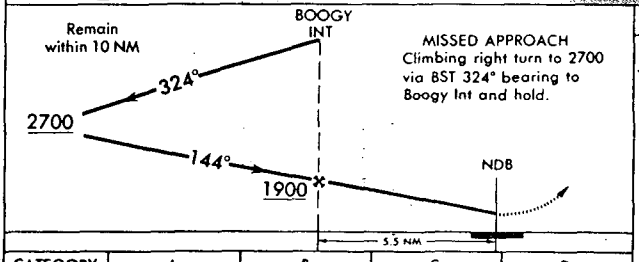
Amdt 1 94118

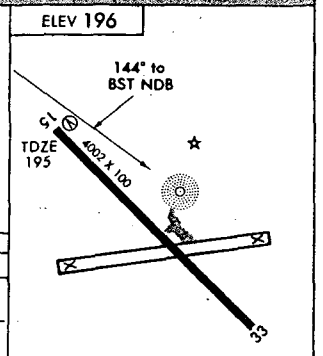
NDB or GPS RWY 15

AL-6448 (FAA)

BELFAST MUNI (BST)
BELFAST, MAINE







CATEGORY	A	B	C	D
S-15	860-1 665 (700-1)		860-1¾ 665 (700-1¾)	NA
CIRCLING	860-1 665 (700-1)		880-2 685 (700-2)	NA

Use Bangor, ME altimeter setting.

▽ NA

Knots	60	90	120	150	180
Min:Sec					

NDB or GPS RWY 15

44°25'N-69°01'W

BELFAST, MAINE
BELFAST MUNI (BST)

SOURCE:
US TERMINAL PROCEDURES, NORTHEAST (NE) VOL. 1 OF 3,
2 FEB 1995 PUBLISHED BY NOAA. NOT TO SCALE.

BST

FIGURE 2-11
BELFAST APPROACH PLATE

There appears to be only one unreasonable based aircraft count: the 1995 forecasted value from the *1977 Airport Master Plan*. This forecast was based upon increasing trends in general aviation aircraft ownership and usage in the late 1970s and early 1980s. This trend did not continue into the late 1980s and early 1990s, and in fact, this trend has decreased. The general influences of these negative trends were due to the purchase and maintenance costs of aircraft as well as aircraft manufacturer liability lawsuits. The range of based aircraft from 17 to 25 seems reasonable, especially when accounting for the seasonal fluctuations in operations and based aircraft at Belfast. The fluctuations can be partly attributed to the fact that the airport has limited aircraft parking facilities (i.e., apron or hangars).

For the purposes of this study, Belfast Municipal Airport will be considered to have an average of 20 based aircraft during the base year of 1994. Following historical trends at the airport, the based aircraft fleet mix is assumed to consist of 19 single-engine piston aircraft and one multi-engine piston aircraft during the 1994 base year. The airport has no based jet aircraft, no based turbo-prop aircraft, and no based helicopters. Therefore, these aircraft types will not be considered as part of the airport's current based aircraft fleet. However, it is recognized in May 1995 there were 25 based aircrafts counted by the FBO.

Aircraft Operations Identifying current operations and passenger enplanements at an airport is an important step in determining the facilities needed now and in the future to increase the efficiency and capacity of the operations at the airport. Aircraft operations can be categorized into two groups: local and itinerant. Local aircraft operations can be defined as, "arrivals and departures of aircraft which operate in the local traffic pattern or within sight of the tower and are known to be departing for or arriving from flights in the local practice areas within a 20-mile radius of the airport and/or control tower; plus simulated instrument approaches or low passes at the airport executed by any aircraft."[2] Itinerant aircraft operations can be defined as, "all aircraft arrivals and departures other than the local operations described above."[3] Typically, itinerant aircraft operations have a specific destination other than the airport of origin. In addition, itinerant aircraft operations are usually performed by non-based aircraft. As business and/or industry use of the airport increases, itinerant aircraft operations will usually increase as well.

[2] FAA Advisory Circular 150/5070-6A, Airport Master Plans, June 1985, page 22.

[3] Ibid.

Other breakdowns of aircraft operations can include air taxi/air charter (for hire), air carrier (major airlines), commuter (regional airlines), and military.

Estimates of current annual aircraft operational activity have been obtained from the previous Airport Master Plan, the FAA Form 5010-1, and in the Maine Aviation System Plan. Refer to Table 2-4.

TABLE 2-4
BELFAST MUNICIPAL AIRPORT
EXISTING ANNUAL AIRCRAFT OPERATIONAL ACTIVITY

Source	Itinerant Operations					Local Operations		Total Operations
	Air Carrier	Air Taxi	Commuter	General Aviation	Military	General Aviation	Military	
FAA Form 5010[1]	0	300	0	5,000	0	12,000	0	17,300
MASP[2]	0	N/A	N/A	16,300	0	0	0	16,300
1977 AMP[3]	N/A	340	N/A	5,100	N/A	16,875	0	22,315

[1] Inspected on July, 11, 1994.
[2] For calendar year 1989. Refer to Table I-3 in Maine Aviation System Plan. General aviation operations not split between itinerant and local.
[3] These are the **forecasted** values for calendar year 1995.

Aircraft operations data from FAA Form 5010-1 (July 11, 1994) will be used as the 1994 base year aircraft operations as this appears to represent more realistic operational data.

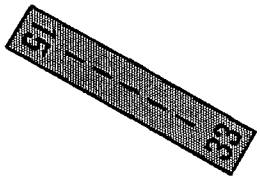
Passenger Demand The Belfast Municipal Airport does not support a large passenger service. According to the previous *Airport Master Plan*, only two passengers per air taxi operation was the average passenger enplanement, and one and one half passengers per itinerant aircraft on business, vacation, or personal travel was the average passenger enplanement.

According to the current FBO, these passenger rates have changed slightly during the recent past due to a change in available air taxi aircraft to an average of three passengers per air taxi operation. The approximate passenger rate of one and one half passengers per itinerant aircraft operation on business, vacation or personal travel was confirmed as still current. The previous Airport Master Plan had forecasted up to 8,330 passenger enplanements for the year 1995. As the airport does not keep accurate records on passenger enplanements at this time, the assumed air taxi and itinerant general aviation activity from the FAA Form 5010-1 combined with the assumed passenger enplanement rates from the FBO leads to the conclusion that there are approximately 8,400 annual passenger enplanements at the present time.

Air Cargo Demand Air cargo demand typically includes package delivery services, U.S. Postal Service delivery services, and bulk freight delivery services. At the present time, none of these air cargo services are provided at the Belfast Municipal Airport. The assumed tonnage of cargo shipped for 1994 is zero.

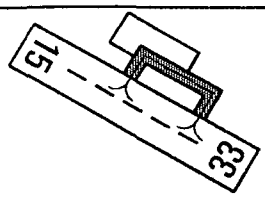
Aircraft Parking Demand Hangars, paved tiedowns, and turf tiedowns are the facilities available at Belfast Municipal Airport for parking and storing aircraft. There are a total of two paved tiedowns, two partially paved tiedowns (of temporary nature and in poor condition), 10 hangar spaces (one of which is in poor condition), and approximately five turf tiedowns. Additional aircraft parking spaces are needed to provide potential tenants with the ability to construct new hangars or to park at paved tiedowns.

Figure 2-12 illustrates a summary of the existing facilities at Belfast Municipal Airport.



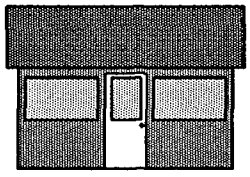
RUNWAY

ID:	15-33
LENGTH:	4,002'
WIDTH:	100'
MARKING:	NON-PRECISION
LIGHTING:	MIRL
LOAD:	30,000 LBS. SW



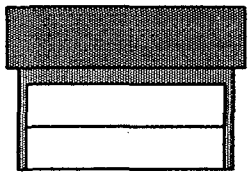
TAXIWAYS

ID:	A	B	C
TYPE:	STUB	PARTIAL PARALLEL	STUB
WIDTH (NOM.):	40'	40'	40'
MARKING:	C/L	C/L	C/L
LIGHTING:	NONE	NONE	NONE



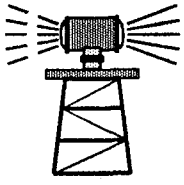
ADMINISTRATION BUILDING

AREA:	30' X 15'
HOUSES:	FBO OFFICE
	PILOT LOUNGE
	RESTROOM
	ELECTRICAL VAULT
AUTO PARKING:	15 SPACES



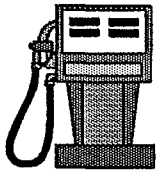
AIRCRAFT PARKING

HANGAR UNITS:	10
PAVED TIEDOWNS:	2
PARTIAL PAVED TIEDOWNS:	2
TURF TIEDOWNS:	5 (MAX.)



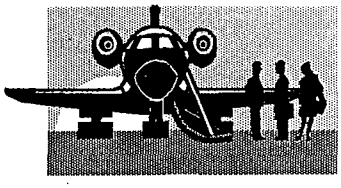
NAVAIDS

TYPES:	
	AIRPORT BEACON
	2-BOX VASI
	NON-DIRECTIONAL BEACON



FUEL

TYPES	TANK CAPACITY (GAL.)
100LL:	5,000
K-1:	275
HOME HEATING OIL:	2 @ 275
WASTE OIL:	6 @ 55
MOGAS:	2 @ 275



ACTIVITY

BASED AIRCRAFT (1995):	25
ITINERANT AIRTAXI OPS (1994):	300
ITINERANT GA OPS (1994):	5,000
BASED GA OPS (1994):	12,000
PASSENGERS (1994):	8,400
AIR CARGO (1994):	0 TONS

BST

FIGURE 2-12
SUMMARY OF EXISTING FACILITIES

Chapter Three

FORECASTS

A logical and orderly development of an airport is the ultimate goal of all airport master plans. In terms of understanding what type of development is needed and when, forecasts of aviation and aviation-related demands must be prepared. This involves reviewing and updating previous forecasts developed by other agencies for the airport's activities. This chapter will concentrate its effort on identifying the forecasts of general aviation's based aircraft numbers and fleet mix, local and itinerant operational split, operational fleet mix, passenger enplanements, and annual instrument approaches. At larger airports, forecasts may be prepared which would estimate future airline passenger enplanements, military activity, and air cargo usage. These forecasts will be omitted from this Airport Master Plan Update as the airport does not support, and does not anticipate supporting, these types of activities during the 20-year planning period.

Forecasts are used to project the magnitude of change (either positive or negative) that can reasonably be expected to occur over time. The projections of activity are to be used as generalizations and not be expected to follow the cyclical ups and downs of the economy with any degree of certainty. Forecasts should serve only as guidelines. The planning efforts to match airport facility requirements to forecasted demand must remain flexible enough to accommodate the actual demand changes which could be due to technological improvements, environmental or safety regulations, or economic policies. Recognizing this, the intent of this document is to prepare a plan for development at the Belfast Municipal Airport that will be based upon the realization of demand levels during the 20-year planning period rather than on timetables.

HISTORICAL PERSPECTIVE

General aviation is an integral part of this nation's transportation system. The *FAA Aviation Forecasts, Fiscal Years 1995-2006*[1] noted the following regarding the importance of general aviation to the national transportation system:

- over 88 percent of all active aircraft in the nation are general aviation aircraft
- over 96 percent of all airports in the nation are dedicated to general aviation
- over 82 percent of all certificated pilots in the nation are general aviation pilots
- over 74 percent of all aircraft operations in the nation are general aviation operations

General aviation includes such activities as crop dusting, passenger and cargo charters, flight instruction, business flights, aerial photography, and pleasure flying. With this widespread availability, one would think that this is a thriving industry. Indeed, from 1955 to 1978, the general aviation industry saw phenomenal growth. One of the best indicators of the health of the general aviation industry is the number of shipments of general aviation aircraft. However, as a result of the Airline Deregulation Act of 1978, several economic recessions, two major fuel crises, and soaring interest rates, the number of general aviation aircraft shipments have dramatically decreased, as has general aviation activity. Two main deterrents that have, until recently, served to depress the once fast growing general aviation industry even further include: general aviation product liability lawsuits and the imposition of a luxury tax.[2]

As a sign of a reversing trend, on August 17, 1994, President Clinton signed into law the General Aviation Revitalization Act which creates an 18-year statute of repose in aircraft accident lawsuits. With this law in place, many general aviation aircraft manufacturers have either increased the production of aircraft or reopened for business. Congress also passed the Omnibus Reconciliation Act of 1993 which repealed the luxury tax on everything except for automobiles as of January 1, 1993. In addition, the recent passage in 1994 of the General Agreement on Tariffs and Trade (GATT) is expected to increase U.S. exports of goods and services which should spin off as increased demand for aviation products and services.

---

[1] *FAA Aviation Forecasts, Fiscal Years 1995-2006*, March 1995, page V-4.

[2] *FAA Aviation Forecasts, FY 1993-2004*, USDOT/FAA, February 1993, page I-3.

Other positive signs for boosting the general aviation industry are the FAA's General Aviation Action Plan, the "No plane. No gain." program sponsored by the General Aviation Manufacturers Association and the National Business Aircraft Association, the "Learn to Fly" program sponsored by the National Air Transportation Association, the Aircraft Owners and Pilots Association's "Project Pilot", and the Experimental Aircraft Association's "Young Eagles" program. All of these programs are geared to increase the public's awareness of the value of the general aviation industry. The hope of all this attention given to the general aviation industry is that the decreasing trends in manufacturing, usage, and ownership of general aviation aircraft will reverse and begin a revitalizing climb again.

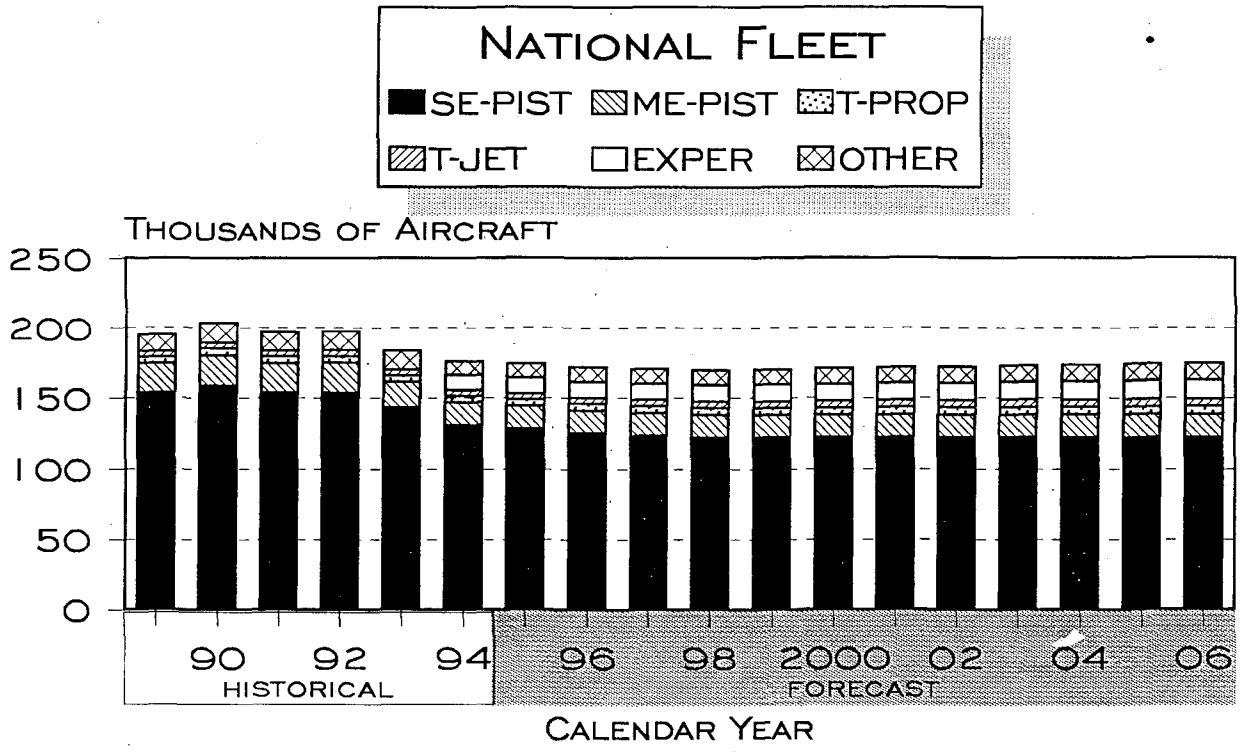
FAA AVIATION INDUSTRY FORECASTS

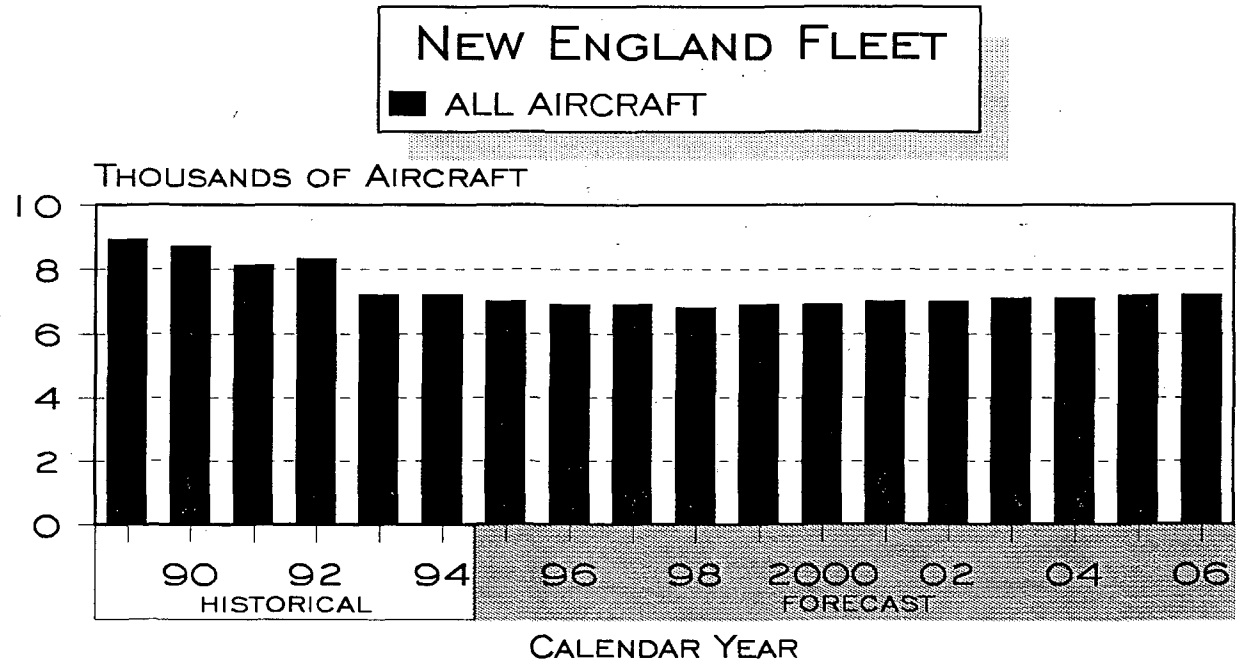
Published forecasts[3] for future active general aviation fleet numbers expect a slowing trend in the decrease of the number of active general aviation aircraft (-0.9 percent annually) from 1994 through 1998 across the nation. In 1998, the number of active general aviation aircraft nationwide is expected to bottom out and begin to climb modestly at 0.36 percent annually until 2006. Figure 3-1 illustrates the combined effects of the FAA's forecasted growth in the national general aviation fleet through the year 2006. These forecasts also expect the number of active aircraft in the general aviation fleet in New England to follow this same trend only with a 1.4 percent decrease in the first four years followed by a 0.7 percent increase for the remaining eight years of the 12-year forecast. The regional general aviation fleet growth is also shown in Figure 3-1.

In general, these forecasts show that the total number of hours flown each year by general aviation aircraft will increase by 0.95 percent annually. Specifically, however, the single-engine piston aircraft hours flown are expected to remain steady at 16.2 million hours through 1998, then increase slightly to 16.3 million hours by 2000, then finally drop to 15.6 million hours by 2006. This fall off is partially due to the fact that many of these aircraft are getting older and parts are becoming scarce and more expensive, as well as the fact that there are fewer new aircraft in this category to replace the retired aircraft. All other

[3] *FAA Aviation Forecasts, FY 1995-2006*, USDOT/FAA, March 1995, page IX-23.

ACTIVE FLEET OF GENERAL AVIATION AND AIR TAXI AIRCRAFT





SOURCE:
FAA. AVIATION FORECASTS, FY 1995-2006, USDOT/FAA, MARCH 1995, PGS. V-14, IX-23, 24.

BST

FIGURE 3-1
FAA'S FORECASTED GENERAL AVIATION FLEET

general aviation aircraft types are expected to follow a generally increasing trend. Figure 3-2 illustrates the forecasts of total hours flown for general aviation aircraft nationwide.

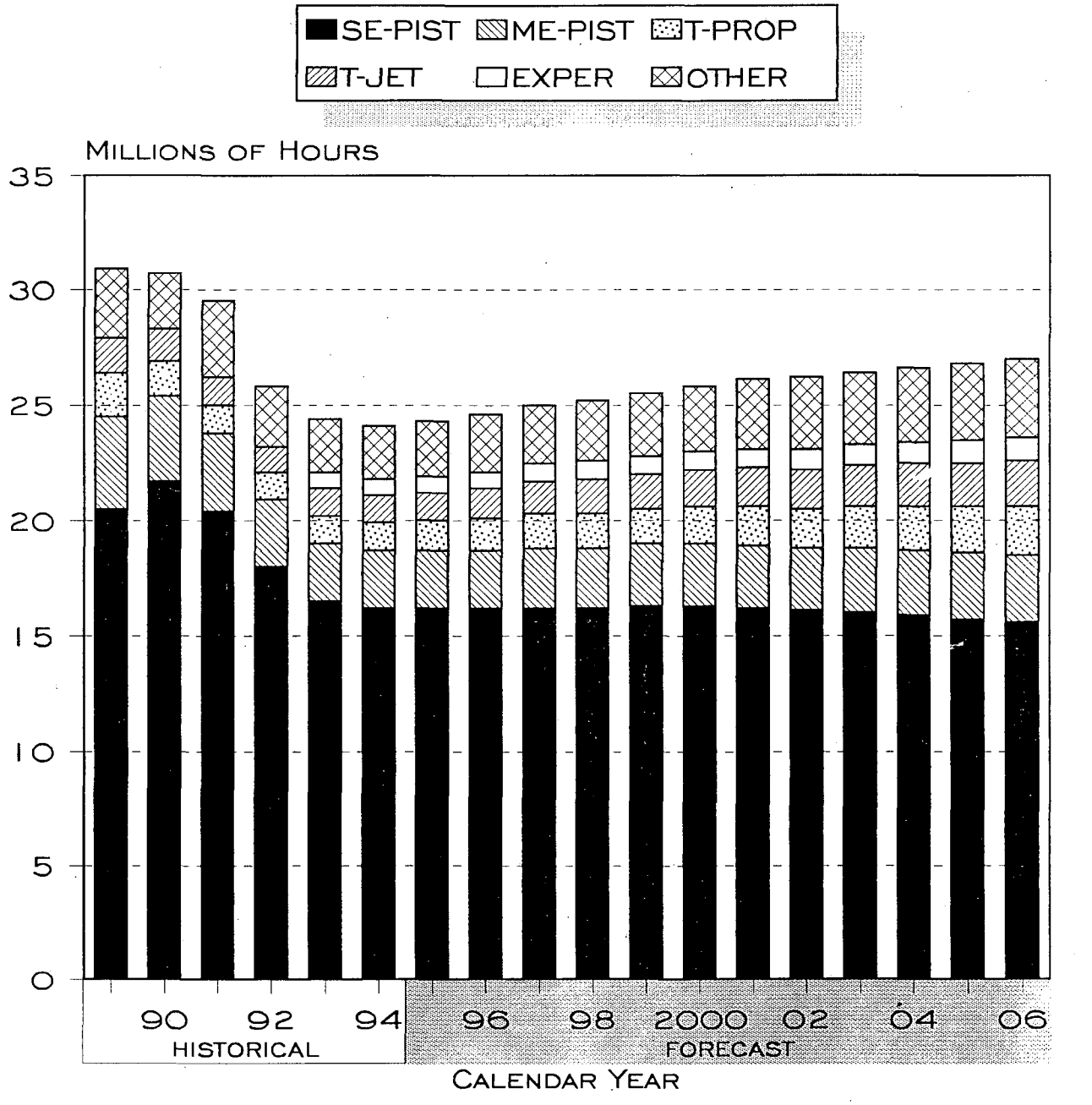
The number of active pilots are, in general, anticipated to increase over the 12 years of these forecasts at a rate of 0.87 percent annually. Specifically, student pilots nationwide are expected to increase by 0.7 percent annually through the planning period. Private pilot certificates are expected to increase by 0.3 percent annually, and glider certificates are expected to increase by 0.77 percent annually across the nation. Figure 3-3 illustrates the number of pilot certificates expected by these forecasts nationwide.

Fuel consumption by the general aviation aircraft fleet is forecasted by the FAA to increase by approximately 2.8 percent annually from 1994 through 2006. Specifically, gasoline-powered, piston-engine aircraft (single and multi-engine piston and experimental aircraft) are expected to increase fuel consumption by 0.27 percent annually while turbine-powered aircraft (turboprop, turbojet, and turbofan aircraft) are expected to increase fuel consumption by 4.1 percent annually. Figure 3-4 illustrates the national fuel consumption forecasts for the period 1994 through 2006 as computed by the FAA.

Pilots of general aviation aircraft are expected to fly their aircraft more often during instrument flight rules (IFR) weather conditions as indicated by the forecasted activity levels for the FAA Air Route Traffic Control Centers. This increase, as forecasted by the FAA, is 1.4 percent annually through the year 2006. The previously-mentioned trends of increasing pilot certifications as well as increasing numbers of IFR certificated pilots, and numbers of multi-engine piston and turbine engine aircraft in the general aviation fleet, are significant when combined with the expectation of increased IFR flights in the nation. The implication is for the continued increase in the sophistication and capabilities of the aircraft and pilots using the National Airspace System (i.e., more business and corporate aviation demand).

Finally, the primary use of aircraft, based upon total hours flown, has been shown in the FAA forecast document that corporate/business use of aircraft has a 25 percent share of all aircraft uses in 1993, the last year data was available. This percentage has increased marginally since the beginning of the decade and is expected to continue to increase in the foreseeable future. Personal use of aircraft held a 33 percent share of all aircraft uses. This

National Active General Aviation and Air Taxi Hours Flown

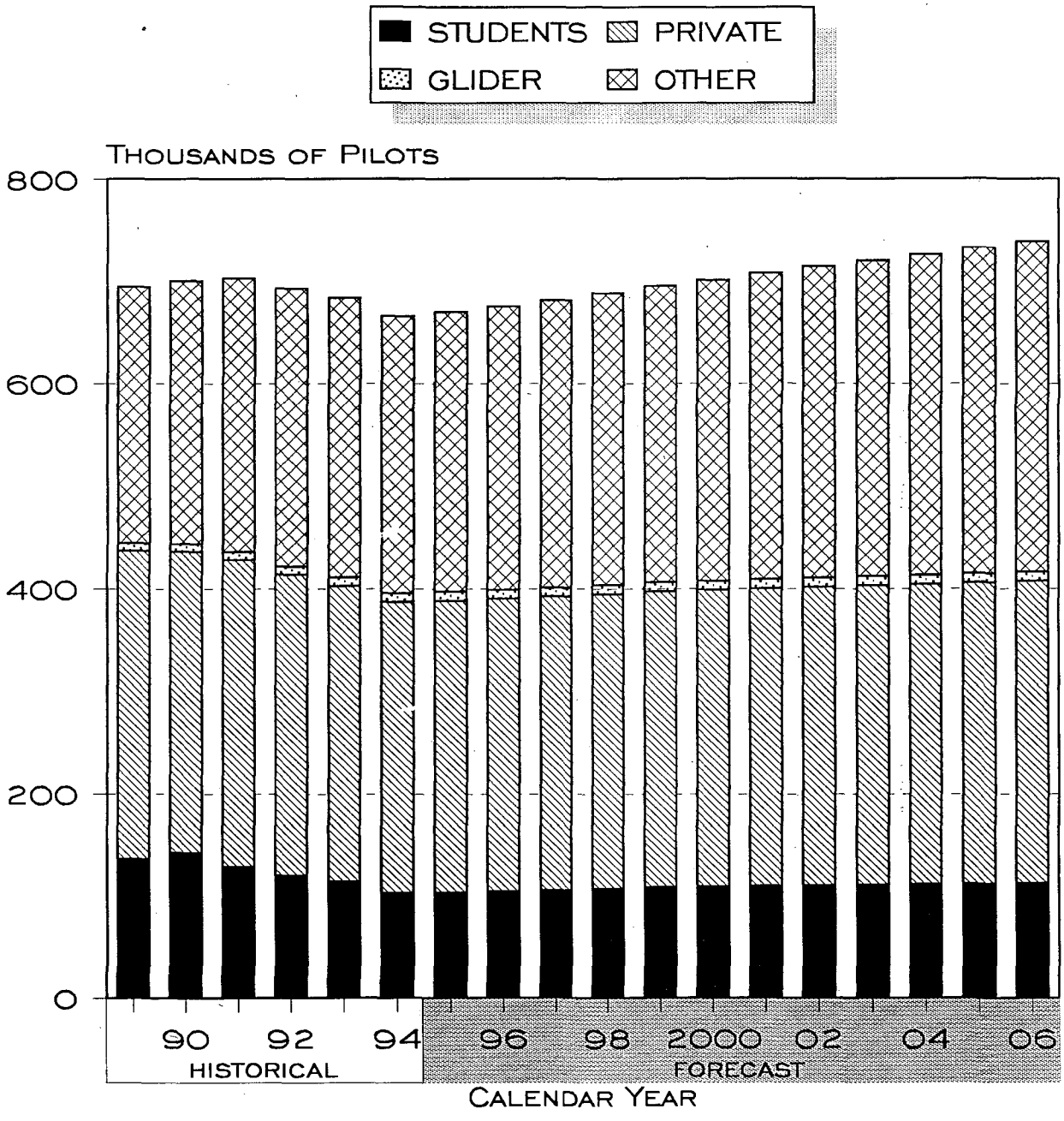


SOURCE:
FAA. AVIATION FORECASTS, FY 1995-2006, USDOT/FAA, MARCH 1995, PGS. V-17 AND IX-25.

BST

FIGURE 3-2
FAA'S FORECASTED GENERAL AVIATION FLIGHT HOURS

ACTIVE PILOT TRENDS AND FORECASTS

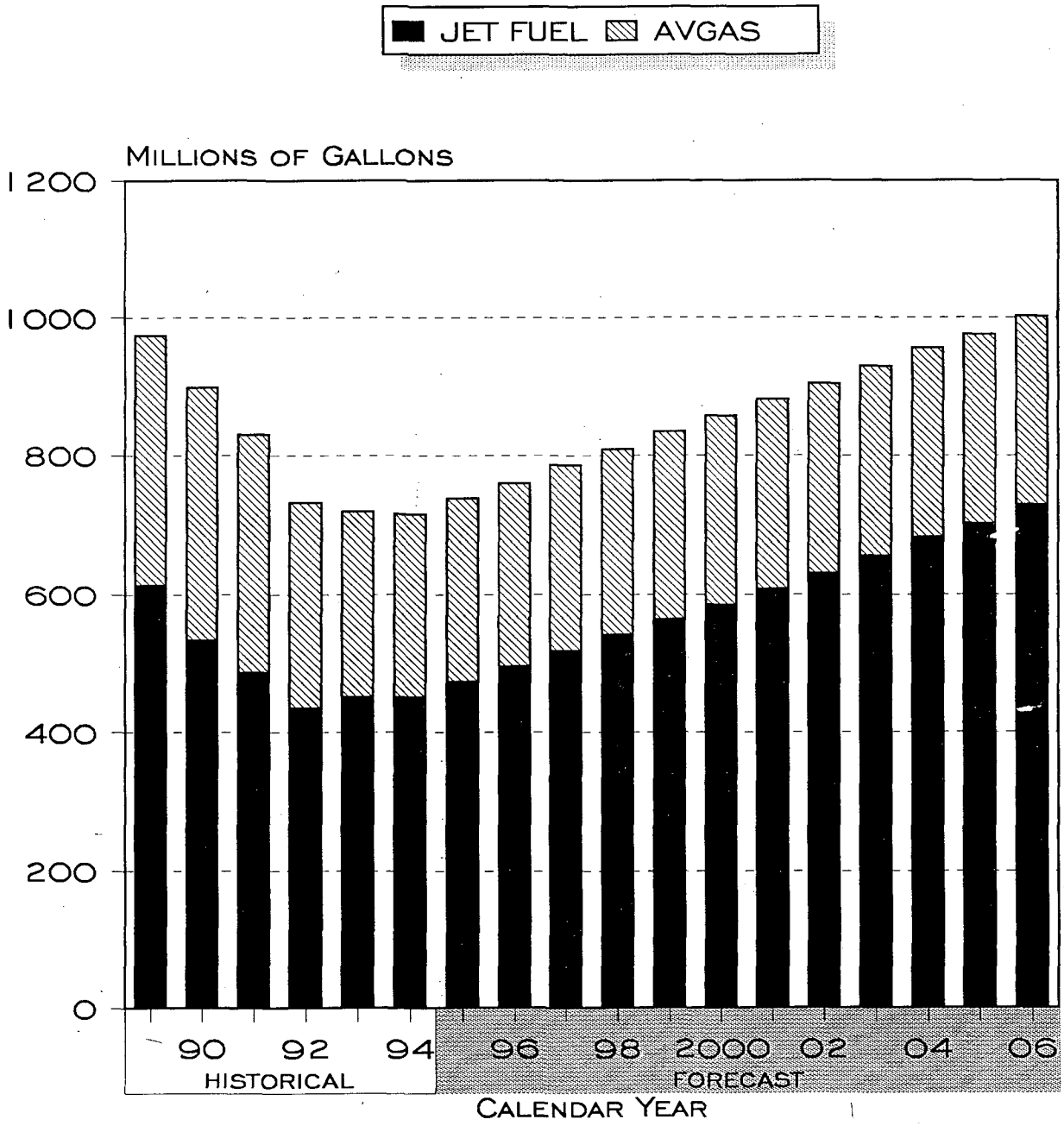


SOURCE:
FAA. AVIATION FORECASTS, FY 1995-2006, USDOT/FAA,
MARCH 1995, PGS. V-18 AND IX-26.

BST

FIGURE 3-3
FAA'S FORECASTED GENERAL AVIATION PILOT CERTIFICATES

GENERAL AVIATION FUEL CONSUMPTION



SOURCE:
FAA. AVIATION FORECASTS, FY 1995-2006, USDOT/FAA, MARCH 1995, PGS. V-19 AND IX-27.

BST

FIGURE 3-4
FAA'S FORECASTED GENERAL AVIATION FUEL CONSUMPTION

share has remained relatively constant since 1990. The same is true for instructional use of aircraft. It has held around a 19-percent share since 1989. Air taxi aircraft uses make up approximately six percent of the aircraft uses. This share has dropped steadily between 1989 and 1993. Other aircraft uses such as aerial applications, aerial observations, sight seeing tours, carrying external loads, and other work types make up the remaining 17 percent share. Figure 3-5 illustrates the 1993 primary use, based upon hours flown nationally, of general aviation aircraft.

The FAA publishes a report entitled National Plan of Integrated Airport Systems (NPIAS) 1990-1999, in which the FAA forecasts airport service levels, airport roles, numbers of based aircraft, annual operations, and estimated federally eligible development project costs for the study period. Airports are chosen to be included in the NPIAS because they are commercial service airports, primary airports, reliever airports, or general aviation airports meeting certain criteria limits. Ten-year forecast data for the Belfast Municipal Airport can be found in the NPIAS. The following list summarizes the FAA's forecast of activity at BST:

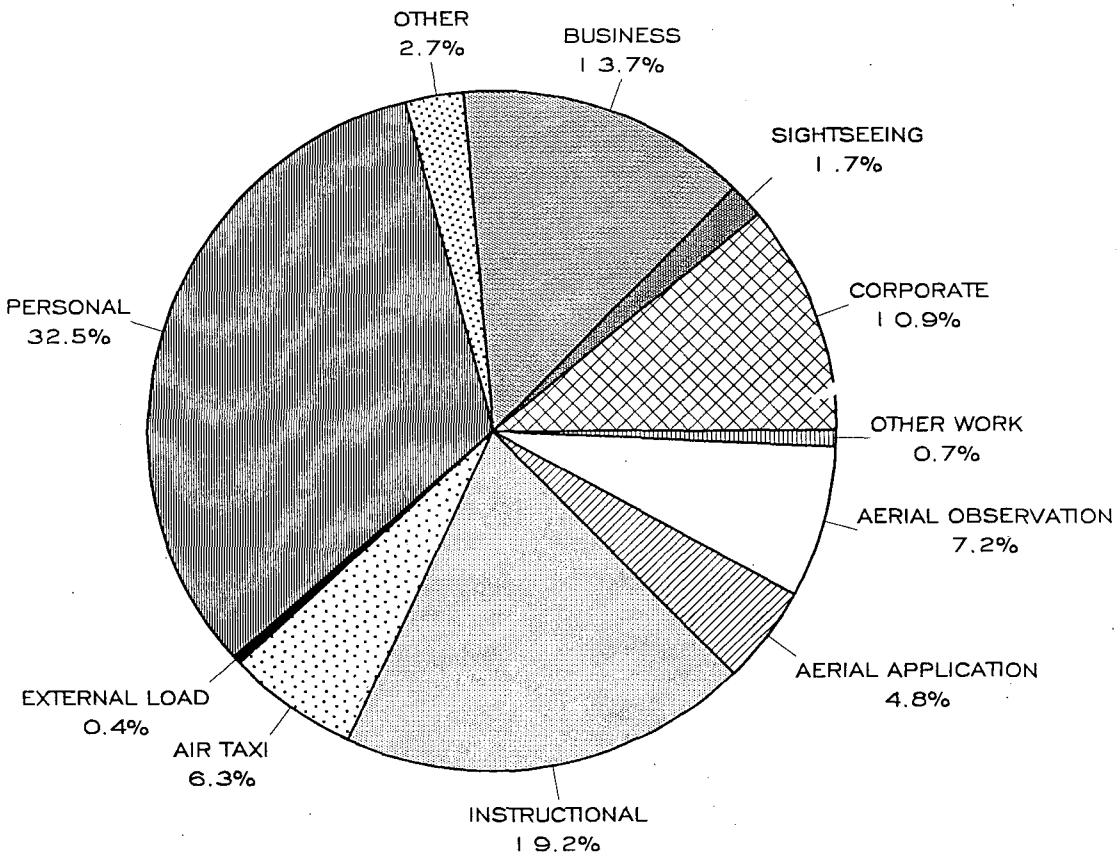
- Service Level: "general aviation" through the planning period
- Airport Role: "basic utility" for the first half of the planning period and "general utility" towards the end of the planning period
- Based Aircraft: 22 (1990); 33 (1995); 42 (2000)
- Annual Itinerant Operations: 4,000 (1990); 5,000 (1995); 6,000 (2000)
- Annual Local or Other Operations: 12,000 (1990); 15,000 (1995); 15,000 (2000)

The NPIAS defines a "basic utility" airport as an airport with the ability to accommodate most single-engine and many small twin-engine aircraft. "General utility" airports are similarly defined to include virtually all general aviation aircraft with maximum gross takeoff weights of less than 12,500 pounds.

STATE AVIATION INDUSTRY FORECASTS

In 1991, MDOT/ATD published the MASP. This document was prepared with the goal to examine the State of Maine's aviation system as it relates to the total transportation network. This document follows the basic guidelines of an airport master plan.

PRIMARY USE OF GENERAL AVIATION AIRCRAFT 1993



SOURCE:
FAA. AVIATION FORECASTS, FY 1995-2006, USDOT/FAA, MARCH 1995, PGS. V-4 AND F-2.

BST

FIGURE 3-5
1993 PRIMARY AIRCRAFT USAGE

Based Aircraft Forecasts

In terms of determining general aviation based aircraft at airports in the State of Maine, the MASP used projected registered aircraft counts and the airport's market share in the region. Because no agency forecasts numbers of registered aircraft, the MASP evaluated two methodologies to forecast these numbers. The first method ("market share") compared the historical relationship between registered aircraft numbers in each of the 11 Regional Transportation Action Committee (RTAC) in Maine with the number of active aircraft in the FAA's entire New England Region. An alternate method ("per capita") compared historical registered aircraft counts in each RTAC region to the historical regional population. The method ultimately used for each region was determined based upon that region's unique characteristics.

The Belfast Municipal Airport, Islesboro Municipal Airport, and Knox County Regional Airport are represented by the same RTAC region. The MASP found that for this region the "per capita" methodology for determining the number of registered aircraft was more representative than the "market share" methodology due to significant historical increases in the per capita ratio methodology. The MASP then projected the historical ratios of the region's based aircraft to the region's registered aircraft throughout the planning period. Next, projections of each airport's market share within its region were prepared. A summary of the MASP's projections for based aircraft at BST through its planning period are shown in Table 3-1.

TABLE 3-1
BELFAST MUNICIPAL AIRPORT
MASP'S FORECASTED BASED AIRCRAFT

Aircraft Type	1989	1994	1999	2004	2009	2014[1]
Single-Engine Piston	18	20	22	23	24	25
Multi-Engine Piston	1	1	2	2	2	2
Rotorcraft	1	1	1	1	1	1
TOTAL	20	22	25	26	27	28

Source: *Maine Aviation Systems Plan*, December 1991, page II-94.

[1] Extrapolated by Dufresne-Henry, Inc.

Review of recent regional population, regional registered aircraft, and Belfast's based aircraft data used in the assumptions to create this based aircraft forecast reveals that the recent actual values are still within reasonable tolerances of the 1991 forecasts except that there are no rotorcraft based at the airport. However, the possibility exists that a rotorcraft operator may locate at or adjacent to BST.

General Aviation Operational Forecasts

The MASP evaluated two methodologies in the projection of general aviation aircraft operations. The first method projected future operational demand based upon historical operational data. The second method reviewed the historical ratios of aircraft operations to based aircraft then assigned future ratios for the study period (1989-2009). The second method of computing historical operations per based aircraft (OPBA) was selected as better suiting this RTAC region because past operational growth rates were too small to accurately project into the future. After the MASP computed the forecasted aircraft operations, it assumed the current split between local and itinerant operations to remain constant throughout the planning period. Itinerant aircraft operations are assumed to be all those operations other than local operations. A local operation was defined by the MASP as:

> Operate in the local traffic pattern or within sight of the airport; are known to be departing for or arriving from flight in local practice areas located within a 20-mile radius of the airport; or are executing simulated instrument approaches in low passes at the airport.

Table 3-2 details the 75 percent local/25 percent itinerant split of operations forecasted by the MASP for Belfast Municipal Airport.

TABLE 3-2
BELFAST MUNICIPAL AIRPORT
MASP'S FORECASTED LOCAL/ITINERANT OPERATIONS

Operations	1989	1994	1999	2004	2009	2014[1]
Itinerant	4,075	4,525	5,125	5,375	5,550	5,750
Local	12,225	13,575	15,375	16,125	16,650	17,250
TOTAL	16,300	18,100	20,500	21,500	22,200	23,000

Source: *Maine Aviation Systems Plan*, December 1991, pages II-119 through II-127.
[1] Extrapolated by Dufresne-Henry, Inc.

The final forecasting effort put forward by the MASP was that of projecting the operating fleet mix of general aviation aircraft. The MASP utilized the general fleet mix stated for the based aircraft fleet and used conservative judgements to modify it to correspond with the FAA's national projections for the general aviation operating fleet mix. Table 3-3 illustrates the MASP's forecasts for the general aviation operating fleet mix.

TABLE 3-3
BELFAST MUNICIPAL AIRPORT
MASP'S GENERAL AVIATION OPERATING FLEET MIX

Aircraft Type	1989	1994	1999	2004	2009	2014[1]
Single-Engine ≤ 12,500 lbs	15,485	17,105	19,373	20,318	20,646	21,390
Multi-Engine ≤ 12,500 lbs	815	996	1,128	1,183	1,554	1,610
TOTAL	16,300	18,100	20,500	21,500	22,200	23,000

Source: *Maine Aviation Systems Plan*, December 1991, pages II-129 through II-137.
[1] Extrapolated by Dufresne-Henry, Inc.

The MDOT/OPT is currently undertaking a program to update the 1991 MASP. This update should reflect the economic downturn that occurred throughout the early 1990s. These forecasts may be revised after the MASP update is complete.

PREFERRED BASED AIRCRAFT FORECASTS

The number of based aircraft forecasted to utilize the airport is important in that airport facilities and sizes are defined by the demand expected of them. In addition, small general aviation airports which do not have air traffic control towers, such as Belfast Municipal Airport, tend not to keep detailed data regarding the aircraft operations at their airports. At the end of this chapter are spreadsheets which may be duplicated or modified by the airport sponsor in starting a record-keeping system for use by the City, the FAA, and the MDOT/OPT. In addition, these records will assist the City in determining when a demand level has been reached that would trigger airport improvement projects.

Historical based aircraft data collected in the previous chapter are shown in Table 3-4. Because of lack of available 1995 data, 1994 will be considered the base year for this Airport Master Plan Update.

TABLE 3-4
BELFAST MUNICIPAL AIRPORT
HISTORICAL BASED AIRCRAFT DATA

	1974	1985	1986	1987	1989	1990	1991	1992	1993	1994	1995
Single Engine Piston	N/A	18	18	20	20	14	14	24	24	20	23
Multi Engine Piston	N/A	2	2	2	1	1	2	2	2	2	2
TOTAL	11	20	20	22	21	15	16	26	26	22	25

Source: FBO supplied actual May 1995 data; FAA Form 5010-1.
Note: No turbine-engine aircraft, jet aircraft, or helicopters are based at BST.

Factors that may have affected the number of based aircraft at BST are the change in the fixed base operator (FBO) in 1993, the construction of the eight-unit hangar "condo" on the abandoned runway in 1990, and the physical limitations in the size of the terminal area for additional aircraft parking and storage needs.

The total number of based aircraft forecasted by the MASP for the Belfast Municipal Airport is relatively conservative compared to the FAA forecasts from 1989 to 2009. In retrospect, the FAA forecasts were developed when the national economy was doing well and the historic based aircraft numbers at the airport were generally showing an increasing trend. However, since that publication, the MASP was completed. The MASP anticipated a slower growth period in the State's economy than did the FAA forecasts. In reality, the economy experienced a declining trend rather than slower growth. With the advent of the new legislative actions regarding general aviation product liability limits and the repeal of the luxury tax on aircraft, and in conjunction with the numerous industry and association public education programs, the MASP forecast rate could still be realized. Consequently, this Airport Master Plan Update will recognize the MASP forecast rate, extrapolated out to 2014 to represent a 20-year planning period, as the preferred forecasts of based aircraft at the Belfast Municipal Airport. Figure 3-6 illustrates the historical and projected numbers of based aircraft for BST.

In order to develop an airport master plan that is demand based rather than time based, three planning horizons for the 20-year planning period have been established that will be utilized throughout this study: short term, intermediate term, and long term. The short term represents those activities or requirements that are expected to happen immediately. The intermediate term represents those activities or requirements that are the most likely to occur at the airport over the 20-year planning period. The long term activities or requirements are those that may come to fruition during the 20-year planning period but should be considered so that another airport master plan will not be needed after 10± years because of failure to consider higher growth potentials. The planning horizons for the based aircraft at BST are as follows:

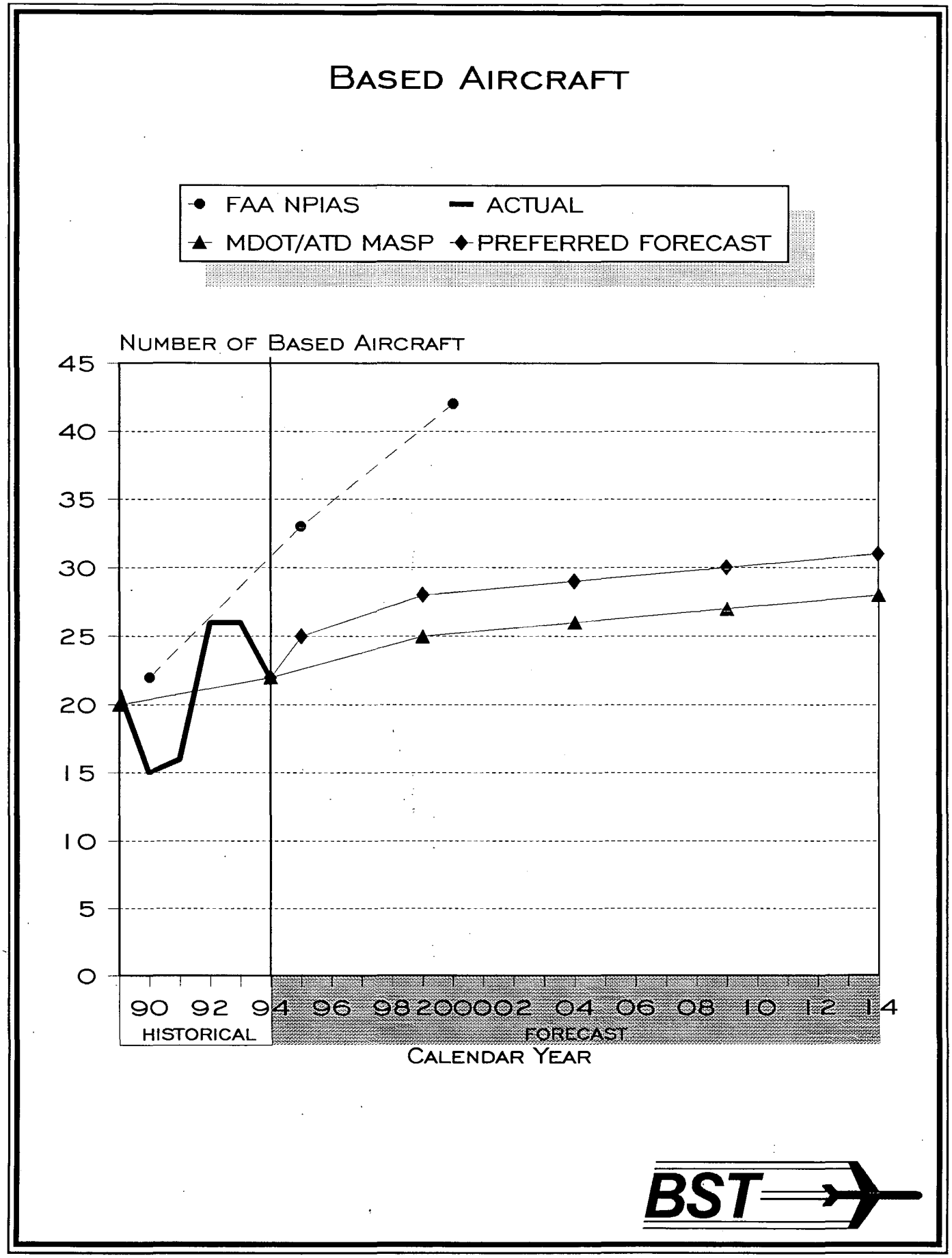


FIGURE 3-6
BASED AIRCRAFT FORECASTS FOR BELFAST

TABLE 3-5
BELFAST MUNICIPAL AIRPORT
PREFERRED BASED AIRCRAFT FORECASTS

Aircraft Type	1994 (actual)	Short Term	Intermediate Term	Long Term
Single-Engine Piston	23	26	26	28
Multi-Engine Piston	2	2	3	3
TOTAL	25	28	29	31

Source: FBO supplied actual May 1995 data and Dufresne-Henry, Inc. analysis.

In May 1995, the City of Belfast was approached by a helicopter operator who has an interest in basing his helicopter business at the Belfast Municipal Airport. If the City is successful in attracting this helicopter operator to this airport, then these forecasts will need to be modified by the operator's projected needs and capabilities. Until that time, the following chapter, Facility Requirements, can be referred to for a discussion of the process of identifying the potential needs of this helicopter operator and the design requirements used to ensure a safe airport for use by both fixed-wing and rotary-wing aircraft.

PREFERRED OPERATIONAL FORECASTS

The number and types of aircraft forecasted to operate at BST will dictate the number and sizes of airside facilities required to meet this demand. The historical aircraft operation data for BST is shown in Table 3-6.

TABLE 3-6
BELFAST MUNICIPAL AIRPORT
HISTORICAL AIRCRAFT OPERATION DATA

Operations	1974	1985	1986	1987	1989	1990	1991	1992	1993	1994
Itinerant/Air Taxi	2,500	4,300	4,300	4,300	5,300	5,300	5,300	5,300	5,300	5,300
Local	4,500	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
TOTAL	7,000	16,300	16,300	16,300	17,300	17,300	17,300	17,300	17,300	17,300

Source: FAA Form 5010-1.

The historical data indicate a fairly constant operational activity level. Operational costs, amount of discretionary time, and the availability of accurate operational data, to name a few, may be factors contributing to the apparently constant activity levels at BST.

Both the FAA and state forecasts for aviation activity at the airport projected healthy annual growth rates (ranging between 2.5 and 4.5 percent annually) for the early and mid 1990s with moderate annual growth rates (approximately one percent annually) for the latter half of the 1990s and beyond. Figure 3-7 illustrates the relationship between these forecasts and the historical counts. This Airport Master Plan Update will not utilize the forecasts of either the FAA (NPIAS) or the MDOT/ATD (MASP). These forecasts don't represent the current aircraft operations at BST. Instead, the relative trends of these forecasts will be retained as the trends follow those of the FAA[4]. These trends indicate a more rapid increase in aviation activity over the short term due to new legislation and industry initiatives, and a more modest increase through the long term representing stable, continued aviation demand. This Airport Master Plan Update prefers to shift the two-percent annual increase for the short term downward from the MASP growth projections to begin at the current operational demand level. A one-percent annual increase will continue through the long term as indicated in the FAA and MDOT/ATD forecasts. This preferred forecast of BST's annual operations is also shown on Figure 3-7 and in Table 3-7.

[4] *FAA Aviation Forecasts, FY 1995-2006.*

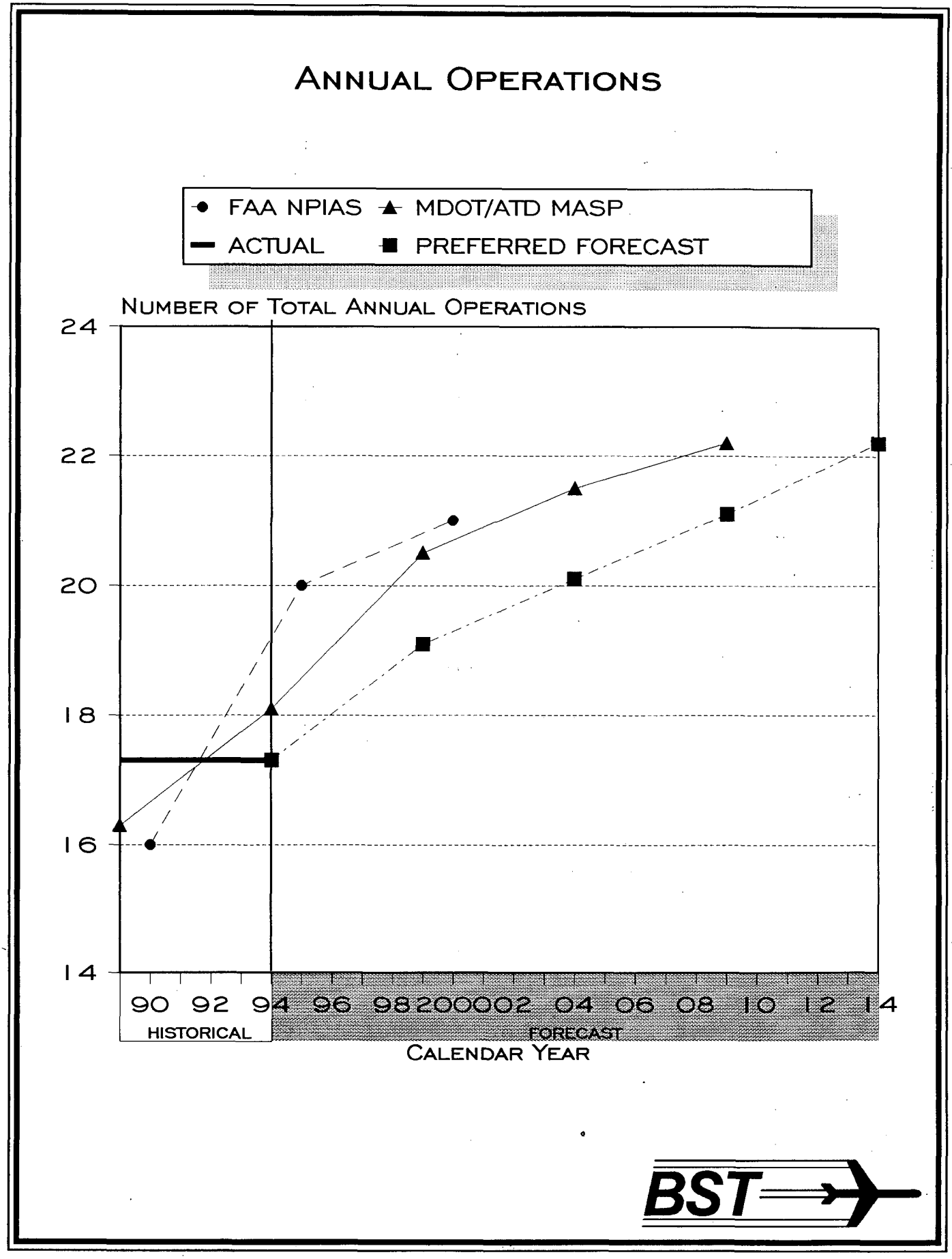


FIGURE 3-7
OPERATIONAL FORECASTS FOR BELFAST

TABLE 3-7
BELFAST MUNICIPAL AIRPORT
PREFERRED ANNUAL OPERATIONAL FORECASTS

Operations	1994 (actual)	Short Term	Intermediate Term	Long Term
Itinerant	5,300	5,730	6,030	6,660
Local	12,000	13,370	14,070	15,540
TOTAL	17,300	19,100	20,100	22,200

Source: Dufresne-Henry, Inc. analysis.

PREFERRED AIRCRAFT FLEET MIX

Following the MASP's lead, this Airport Master Plan Update will continue to split the projected annual operations' fleet mix such that single-engine aircraft weighing less than or equal to 12,500 pounds receives 94 percent of the activity. The remaining six percent will be attributed to multi-engine aircraft weighing less than or equal to 12,500 pounds. Table 3-8 shows this relationship.

TABLE 3-8
BELFAST MUNICIPAL AIRPORT
PREFERRED OPERATING FLEET MIX

Aircraft Type	1994 (actual)	Short Term	Intermediate Term	Long Term
Single-Engine ≤ 12,500 lbs	16,262	17,954	18,894	20,868
Multi-Engine ≤ 12,500 lbs[1]	1,038	1,146	1,206	1,332
TOTAL	17,300	19,100	20,100	22,200

Source: Dufresne-Henry, Inc. analysis.

[1] This category includes piston and some turboprop aircraft (i.e., Beech Super King Air 200 is a turboprop with a maximum gross takeoff weight of 12,500 pounds).

PREFERRED PASSENGER ENPLANEMENT ACTIVITY LEVELS

The previous chapter on airport facility inventory covered the current passenger enplanement rates for itinerant aircraft operations at the Belfast Municipal Airport: three passengers per air taxi operation, and one and one-half passengers per all other itinerant operations. Using data in Table 3-7 and assuming that these enplanement rates will hold true through the long term, the preferred forecasts of annual passenger enplanements are as follows:

TABLE 3-9
BELFAST MUNICIPAL AIRPORT
PREFERRED ANNUAL PASSENGER ENPLANEMENTS

Operation Type	1994 (actual)	Short Term	Intermediate Term	Long Term
Air Taxi (3 pax/op)	900	970	1,000	1,130
Other (1.5 pax/op)	7,500	8,100	8,500	9,400
TOTAL	8,400	9,070	9,500	10,530

Source: Meetings with Fixed Base Operator (November 1994); Dufresne-Henry, Inc. analysis.

PREFERRED FUEL STORAGE FORECASTS

Little to no historical aviation fuel flowage data are available for BST to track fuel flowage trends. In lieu of this, the forecasts for aviation fuel consumption prepared by the FAA and found in the *FAA Aviation Forecasts, FY 1995-2006* document will be applied to the airport's most recent (1994) aviation fuel flowage quantities to estimate aviation fuel requirements for the future.

TABLE 3-10
BELFAST MUNICIPAL AIRPORT
PREFERRED FUEL REQUIREMENTS FORECASTS

Fuel Type	1994 (actual)	Short Term	Intermediate Term	Long Term
MOGAS	4,486 gallons	4,550 gallons	4,625 gallons	4,750 gallons
100 Low Lead	23,418 gallons	23,750 gallons	24,075 gallons	24,725 gallons
Jet-A	0 gallons	0 gallons	1,000 gallons[1]	1,500 gallons
TOTAL	27,904 gallons	28,300 gallons	29,700 gallons	30,975 gallons

Source: FBO supplied actual 1994 data; Dufresne-Henry, Inc. analysis.

[1] Table 3-8 identifies an increasing number of multi-engine aircraft throughout the planning period. These aircraft currently include mostly piston aircraft (uses 100LL) and a few turboprop aircraft (uses Jet-A). This trend is expected to continue in light of recently passed legislation and new industry initiatives. Jet-A is not available at BST but is available at other nearby airports. To attract and maintain the current and forecasted turboprop and eventually turbojet aircraft, Jet-A fuel should be made available at BST. Typical fuel capacities on a turboprop and turbo jet aircraft are 500 and 1,300 gallons respectively. A 1,000 gallon fuel tank for Jet-A should be a starting point for the airport while still relying on area airports to provide full Jet-A fuel services until turboprop/jet activity becomes significant at BST.

ANNUAL INSTRUMENT APPROACHES

An airport's need for additional navigational aid facilities is determined, in part, by the current and forecasted number of annual instrument approaches to that airport. An instrument approach is defined by the FAA as, "an approach to an airport, **with intent to land**, by an aircraft flying in accordance with an instrument flight rules (IFR) flight plan, when the visibility is less than three miles and/or when the ceiling is at or below the minimum initial descent altitude."

An annual publication prepared by the FAA, FAA Air Traffic Activity, supplies one fiscal year's air traffic activity data for listed airports. Instrument approaches to non-towered airports are counted in this document. Historical counts of annual instrument approaches at Belfast Municipal Airport have fluctuated from a low of 12 to a high of 66. Currently, the number of annual instrument approaches at BST is increasing. They appeared to have bottomed out at 12 in 1993 and totaled 25 for 1994. Using the FAA's forecasted growth of instrument operations for airports which are controlled by FAA Air Route Traffic Control Centers (1.4 percent annual growth) and applying it to BST's actual number of annual instrument approaches would result in the data summarized in Table 3-11.

TABLE 3-11
BELFAST MUNICIPAL AIRPORT
PREFERRED ANNUAL INSTRUMENT APPROACH FORECASTS

Annual Instrument Approaches	1994 (actual)	Short Term	Intermediate Term	Long Term
TOTAL	25	27	29	33

Source: 1994 data obtained from the FAA Air Traffic Control Tower, Bangor, ME. Dufresne-Henry, Inc. calculation of forecasted values.

PEAKING CHARACTERISTICS

Evaluating peaking characteristics of aviation demand is a very important step in forecasting demand at high-activity airports. For low-activity airports, the peak activities tend not to happen as often as high-activity airports and can usually be more easily accommodated.

Typically, the process by which peaking characteristics are determined is by researching historical activity levels for the airport. These records are normally kept by air traffic control personnel. At non-towered airports, these records may or may not be kept by the airport manager or airport sponsor. When these records are not readily available, rules-of-thumb can be used to approximate the peak activity levels. Ten percent of the annual operations will be assumed to occur during the peak (highest demand) month (PM) at BST. This peak monthly demand will be divided by 30 days/month to determine the estimated peak month average day (PMAD) operational demand. Ten percent of the PMAD will be assumed to occur during the peak hour (PH) of the PMAD. In the United States, airports are typically not designed to accommodate the busiest hour of the busiest day during the busiest month of the year. The amount of money spent on airport facilities to attain the capacity needed to meet the "busiest" demand levels would be disproportionate to the benefits received. Instead, airports are typically designed such that the design operation level is exceeded only 10 percent of the time (or 36.5 days of the year). This design level is defined as the PMAD. Table 3-12 summarizes the forecasted design operational levels for the Belfast Municipal Airport.

TABLE 3-12
BELFAST MUNICIPAL AIRPORT
PREFERRED FORECASTS OF DESIGN OPERATIONS

	1994 (actual)	Short Term	Intermediate Term	Long Term
Annual Operations	17,300	19,100	20,100	22,200
Peak Month (PM) Operations	1,730	1,910	2,010	2,220
Peak Month Average Day (PMAD) Operations	58	64	67	74
Peak Hour (PH) of PMAD Operations	6	6	7	7

Source: Dufresne-Henry, Inc. analysis.

PREFERRED AIRPORT REFERENCE CODE

The FAA has devised a system called the Airport Reference Code (ARC) which represents the airport's characteristics relative to the operational and physical characteristics of the aircraft used or intended to be used at the airport. This system utilizes a two-part code to identify each airport. The first part of the code represents the aircraft approach category and is represented by a letter: A (approach speeds less than 91 knots) through E (approach speeds greater or equal to 166 knots). The second part of the code represents the airplane design group and is represented by a roman numeral: I (less than 49 foot wingspan) through VI (greater than or equal to 214 feet but not less than 262 feet wingspan). It is this designation that determines many of the airport's design parameters to be used at the airport.

Prior to September 29, 1989, the FAA used a different coding system to determine the design parameters of an airport. Belfast Municipal Airport was coded as a General Utility airport. This classification allowed for the airport to accommodate most small aircraft (less than 12,500 pounds) in the Approach Categories of A and B (less than 121 knots).

As of 1994, the Belfast Municipal Airport accommodated the following makes and models of aircraft:

Aircraft Make/Model	ARC
Cessna 172	AI
Piper Cherokee	AI
Piper Super Cub	AI
Piper Tripacer	AI
Piper Colt	AI
Beech Bonanza	AI
Piper Geronimo	BI
Piper Navajo	BI
Beech Super King Air	BII

A majority of current based aircraft have an Airport Reference Code (ARC) of AI based on actual data supplied by the FBO.

Due to the infrequency of design group II aircraft and the high frequency of design group I aircraft at the airport, BST is currently assumed to have a BI designation. In line with the trends for the increasing numbers of larger, faster business and corporate aircraft types anticipated in the future, BST should have a BII designation for the future scenario.

SUMMARY OF PREFERRED FORECASTS

This chapter has reviewed the national and statewide forecasts of aviation demand for Belfast Municipal Airport. From these forecasts and the inventory of aviation demand collected in the previous chapter, **preferred** forecasts of aviation demand specific to Belfast Municipal Airport were developed. Table 3-13 summarizes each of the preferred forecasts. Again, it must be emphasized that the City of Belfast should be looking to develop the airport only if each demand threshold is met. If any of the demand thresholds are not reached, new development will not be recommended.

TABLE 3-13
BELFAST MUNICIPAL AIRPORT
SUMMARY OF PREFERRED FORECASTS

PREFERRED FORECASTS	1994 (ACTUAL)	SHORT TERM	INTERMEDIATE TERM	LONG TERM
Based Aircraft				
Single-Engine Piston	23	26	26	28
Multi-Engine Piston	2	2	3	3
TOTAL	**25**	**28**	**29**	**31**
Annual Operations				
Itinerant	5,300	5,730	6,030	6,660
Local	12,000	13,370	14,070	15,540
TOTAL	**17,300**	**19,100**	**20,100**	**22,200**
Operating Fleet Mix				
Single-Engine ≤ 12,500 lbs	16,262	17,954	18,894	20,868
Multi-Engine ≤ 12,500 lbs	1,038	1,146	1,206	1,332
TOTAL	**17,300**	**19,100**	**20,100**	**22,200**
Annual Passenger Enplanements				
Air Taxi	900	970	1,000	1,130
Other	7,500	8,100	8,500	9,400
TOTAL	**8,400**	**9,070**	**9,500**	**10,530**
Fuel Requirements				
MOGAS	4,486 gallons	4,550 gallons	4,625 gallons	4,750 gallons
100LL	23,418 gallons	23,750 gallons	24,075 gallons	24,725 gallons
Jet-A	0 gallons	0 gallons	1,000 gallons	1,500 gallons
TOTAL	**27,904 gallons**	**28,300 gallons**	**29,700 gallons**	**30,975 gallons**
Annual Instrument Approaches				
TOTAL	**25**	**27**	**29**	**33**
Design Operations				
Peak Month	1,730	1,910	2,010	2,220
Peak Month Average Day	58	64	67	74
Peak Hour	6	6	7	7
Airport Reference Code	BI	BI	BI	BII

Source: Dufresne-Henry, Inc. analysis.

Instructions: Enter the number of aircraft based at Belfast Municipal Airport.

BASED AIRCRAFT COUNTS Frequency of Counts: 4 times per year **Highlight the Count Representing the Peak Season**							
Count Date	Single-Engine Piston	Multi-Engine Piston	Turbo-Prop	Turbofan or Turbojet	Helicopter	Military or Other	TOTAL

Instructions: Make a tick mark for every operation. Total the counts at the end of the month.

OPERATIONAL ACTIVITY Frequency of Counts: every month **Highlight the Counts Representing the Peak Month** Landing = one operation; Takeoff = one operation; Touch & Go = two operations					
Month	Local*	Air Taxi	Other Itinerant	Military**	TOTAL
JANUARY					
FEBRUARY					
MARCH					
APRIL					
MAY					
JUNE					
JULY					
AUGUST					
SEPTEMBER					
OCTOBER					
NOVEMBER					
DECEMBER					
TOTAL					

* LOCAL: operates in the local traffic pattern OR within sight of the airport OR are flying in local practice area generally within a 20-mile radius of the airport OR executing simulated instrument approaches in low passes at the airport.

** MILITARY: do <u>not</u> include this count with the Other Itinerant Operations.

Instructions: Make a tick mark for every operation. Total the counts at the end of the month.

OPERATIONAL FLEET MIX Frequency of Counts: every month **For Every Operation Identify the Aircraft Type**				
Month	Single Engine Aircraft ≤ 12,500lb	Multi-Engine Aircraft ≤ 12,500 lb	Multi-Engine Aircraft > 12,500 lb	TOTAL
JANUARY				
FEBRUARY				
MARCH				
APRIL				
MAY				
JUNE				
JULY				
AUGUST				
SEPTEMBER				
OCTOBER				
NOVEMBER				
DECEMBER				
TOTAL				

Please write in the space the different makes/models of aircraft that operate at Belfast Municipal Airport (e.g., Beech Super King Air B200, Piper Navajo, Cessna 172...).

Instructions: Make a tick mark for every passenger carried (do not count pilot(s)).

PASSENGER COUNTS Frequency: every month **Highlight the Month Representing the Peak Counts**				
Month	Passengers on Local Flights	Passengers on Air Taxi Flights	Passengers on Other Itinerant Flights	Passenger TOTALS
JANUARY				
FEBRUARY				
MARCH				
APRIL				
MAY				
JUNE				
JULY				
AUGUST				
SEPTEMBER				
OCTOBER				
NOVEMBER				
DECEMBER				
TOTAL				

Have you noticed any trends in the way passengers arrive at Belfast Municipal Airport? Do they share rides with others? Does someone else drop passengers off at the airport?... Please note any trends here.

Instructions: Note the number of gallons sold for each aviation fuel.

FUEL FLOWAGE Frequency of Count: every month **Highlight Months of Peak Usage**				
Month	MOGAS	AvGas (100LL)	Jet-A	Other
JANUARY				
FEBRUARY				
MARCH				
APRIL				
MAY				
JUNE				
JULY				
AUGUST				
SEPTEMBER				
OCTOBER				
NOVEMBER				
DECEMBER				
TOTAL				

Chapter Four

DEMAND/CAPACITY ANALYSIS & FACILITY REQUIREMENTS

With the completion of the aviation demand forecasts and an understanding of the existing features at the Belfast Municipal Airport (BST), the next step in the master planning process is to determine the adequacy of the existing facilities to accommodate the forecasted aviation demands. Evaluation of the runway orientation and length, strengths of the airfield pavements, the extent of airfield marking and lighting systems, the number of aircraft hangars, the size of the aircraft parking apron and tiedown areas, the size of the administration building, as well as the amount of vehicular parking space will all be discussed in this chapter. These evaluations will assume an unconstrained condition. In other words, based on forecasted demand alone, what size and number of airport facilities are needed? The next chapter will apply the constraints of constructability, costs, usage, and environmental compatibility to these proposed facilities to identify a preferred development layout plan.

Some of the facilities recommended may be due to assumed capacity deficiencies (typical of the intermediate and long-term planning periods) or of more immediate safety or capacity deficiencies (typical of the short-term planning period). The recommended facilities or facility improvements are made with the goal of maintaining the Belfast Municipal Airport as a viable and effective airport for its users throughout the planning period.

The following sections address the ability of the existing airport facilities to accommodate existing and future aviation demands and recommends any additional or improved facilities needed to meet those demands.

AIRSIDE CAPACITY

The capacity of an airport is dependent upon a number of variables such as operational fleet mix, air traffic operating rules regarding aircraft separations, runway usage, and weather conditions. As each of these variables change, so does the capacity of the airport. This study will assume these variables to be constants in line with the information collected in Chapter 2 and the forecasts prepared in Chapter 3 of this document.

The FAA utilizes estimates of aircraft delay to characterize airport capacity problems. An increase in demand can translate to an increase in delay experienced by individual aircraft. The FAA encourages evaluation of both the annual and hourly capacities of an airport. Evaluation of annual capacity of an airport may appear to be fine, but during a one-year time frame there will be several peak periods, specifically one-hour time frames, in which capacity of the airport will be exceeded by demand. Especially at small general aviation airports like BST, the volume of aircraft operations will rise and fall with the changing of the seasons. This situation can cause short-lived peaks in operational activity which may create delays among the airport facilities (e.g., runways, taxiways). For this reason, FAA recommends that peak-hour demand during an average day of the busiest month be evaluated to determine the available hourly capacity required for the airport.

Runway Capacity

Runway capacity calculations, originally developed in the 1960s, are based on queuing theories. The more significant factors affecting runway capacity at BST include:

- runway configuration
- exit taxiway locations
- size and mix of the aircraft fleet
- aircraft separation rules related to weather conditions and aircraft mix
- wind conditions
- number and frequency of touch and go aircraft operations
- availability of navigation aids.

FAA Advisory Circular 150/5060-5, *Airport Capacity and Analysis* (including Change 1, 9/23/83) was used to estimate hourly and annual capacity of BST. This Advisory Circular makes several assumptions including: instrument flight rules (IFR) weather conditions exist roughly 10 percent of the time, percent arrivals approximates percent departures, there exists a full-length parallel taxiway for each runway, and the airport has at least one runway equipped with an instrument landing system (ILS). Not all of these assumptions apply to BST, however, an annual service volume (ASV) can be determined that will approximate conditions at BST. Annual service volume is defined as the estimated annual operational capacity of a runway or combination of runways. The approximate ASV for BST is 230,000 operations per year. Current operational counts at BST show that the airport uses only around 7½ percent of its annual capacity at 17,300 operations per year. In the long term, BST's forecasted annual operations are forecasted to be only 22,200 which equates to over 9½ percent of the estimated annual service volume for BST. A general rule of thumb states that when the airport operations approach 60 percent of its estimated annual service volume (or 138,000 operations per year), the airport sponsor should begin taking steps to increase capacity at the airport. This may involve adding exit taxiways, adding a full-length parallel taxiway, increasing the length of the runway, upgrading the navigational aids, or even adding a runway.

For airports supporting larger and heavier aircraft (e.g., Boeing 727, DC 9, Airbus A320) than those normally found at airports used exclusively by small general aviation aircraft, capacities of taxiways and aprons can and should be evaluated for capacity deficiencies as part of the airports' overall capacity calculations. The small general aviation airports typically do not have complex layouts of taxiways and aprons; thus the single most constraining component of these airports is their runway(s). For this reason, the runway at BST will be the only airside airport component evaluated for capacity in this document.

FAA Advisory Circular 150/5060-5 includes instructions for calculating the hourly capacity of an airport which serves small general aviation aircraft and has no radar coverage or an ILS but does have an approved instrument approach procedure. Utilizing the airport layout configuration which most closely represents the layout at BST and an assumed percent of touch and go aircraft operations leads to an assumed hourly capacity range of 71 to 85 operations per hour for both the existing and future airport configurations. When the airport reaches 60 percent of its hourly capacity (i.e., 43-51 operations during the busiest hour of the average day in the busiest month),

the airport sponsor should consider making airport capacity improvements. This will not be needed during the 20-year planning period of this study.

AIRSIDE FACILITY REQUIREMENTS

This section establishes recommended facility requirements for the three planning periods (short, intermediate and long terms). The basis for these determinations comes from a combination of the results of the forecast chapter, existing safety deficiencies, and existing needs as determined by the consultant and airport users' input on the condition of the airport facilities. Guidelines for meeting the requirements of the State of Maine for Economic Development Airports (refer to page 2-5 of this Airport Master Plan Update) will also be considered. The next chapter will utilize these facility requirements to prepare schematic airport facility layouts of the proposed facilities. These layouts will be constrained by economic, environmental, and construction factors. Ultimately, some of these layouts will be rejected and a preferred development scenario recommended.

Runway Requirements

Runway 15-33 at BST is currently designated with an airport reference code of BI, meaning this airport serves aircraft which predominantly have wingspans less than 49 feet and approach speeds greater than or equal to 91 knots but less than 121 knots. This is not to say that larger or faster aircraft cannot use the airport, it's just that they would need to take more care when using the facility. By the long term, the airport should plan to accommodate, on a regular basis, aircraft in the BII group (same approach speed, wingspans greater than or equal to 49 feet but less than 79 feet).

The capacity analysis performed in an earlier section of this chapter identified that the airport currently operates at approximately seven percent of its capacity. In the future, the airport is expected to operate at approximately nine percent of its capacity. No additional runways or parallel taxiways are needed to provide additional capacity through the planning period. However, the following discussion evaluates the need for maintaining the existing 100-foot runway width and for a partial or a full-length parallel taxiway to Runway 15-33 for safety reasons rather than for added capacity.

A runway reconstruction project in 1982 (ADAP #5-23-0007-02) reduced this width from 150 feet, as it was originally constructed, to 100 feet, as it stands today. By today's design standards, a 100-foot wide runway is suitable for accommodating aircraft with wingspans less than 118 feet under the current approved visibility minimum (1¼ miles). During this same ADAP project, Runway 10-28 was officially closed to aircraft arrivals and departures. This runway supplied additional wind coverage which improved the reliability of BST.

The FAA recommends that runways be oriented such that aircraft can operate at the airport at least 95 percent of the time. This can be accomplished with a better runway orientation or additional runways. Sometimes a wider runway may be all that is needed to alleviate airplane "crabbing" during strong crosswinds. Some slower design group I aircraft (wingspans less than 49 feet) can tolerate up to a 12 mph crosswind component, above which the aircraft starts to "crab" or be pushed sideways down the runway. This situation is unsafe for the pilot and the aircraft. Similarly, some slower design group II aircraft (wingspans greater than or equal to 49 feet but less than 79 feet) can tolerate a 15 mph crosswind component. Currently at BST, design group I aircraft can theoretically operate at the airport 91.7 percent of the time whereas design group II aircraft can theoretically land at the airport 95.7 percent of the time. To increase the amount of time design group I aircraft can operate at BST to the preferred 95 percent, would require improved navigational aids or an additional runway. Since most pilots of design group I aircraft are typically pleasure flyers and usually rated for visual meteorological conditions, the addition of expensive navigational aids would not improve the situation for these pilots. The other alternative to increase the time design group I aircraft can operate at the airport is to add another runway. Even though the pavement to the closed Runway 10-28 still exist (albeit in poor condition), the expense required to add and maintain a second runway would not justify the incremental benefit of increasing the time that design group I aircraft can operate at BST. Instead, this study will recommend maintaining the runway width at 100 feet to counteract the "crabbing" effect that strong crosswinds have on these smaller aircraft as well as in anticipation of accommodating design group II aircraft on a regular basis during the planning period.

The length of Runway 15-33 is currently 4,002 feet. The capacity analysis, previously described, does not support a longer runway. The aircraft types which currently operate, on a regular basis, do not require a longer runway length. Two factors may develop that may require a longer runway length: increased business/corporate use of the airport spurring the use of larger and

faster aircraft, and/or the implementation of the Economic Development Airport objectives for BST. The MASP concluded that a longer runway at BST would not provide enough benefit to breakeven with the costs required to acquire the land and to design and construct the runway extension.

The pavement strength of Runway 15-33, which was reconstructed in 1982, meets a 30,000-pound single-wheel load. This loading is also used to represent the typical snow removal equipment loading on the pavement. The on-going crack repair/sealing program at the airport sponsored by the City of Belfast has been able to maintain a viable runway pavement surface upon which aircraft can traverse. However, the pavement cracks are growing in number as the pavement is now 13± years old. The airport sponsor will need to prepare a cost/benefit analysis in the near term to determine whether it is more cost effective to continue to maintain the existing pavement or to reconstruct the pavement. Most airfield pavements are designed to have a normal life expectancy of 20 years before major reconstruction is needed. In the meantime, the airport sponsor may want to add runway reconstruction to the MDOT/OPT's capital improvement program (CIP) list for the timeframe when the pavement will be 20 years old (e.g., 2002).

Taxiway Requirements

BST has three designated taxiways: A, B, and C. The partial parallel taxiway, Taxiway A, is used to access the aircraft parking apron and the remote conventional hangars located on the closed runway. A full-length parallel taxiway is not required to satisfy capacity deficiencies or line-of-sight deficiencies on the runway at BST. A clear line of sight from a point 5 feet above the runway threshold to the other runway threshold is required to ensure the safety of the aircraft operators preparing for takeoffs or landings if no full-length parallel taxiway is available. The existing runway is sloped such that it has a short, level plateau at the north end and then slopes downward at a 0.87 percent grade towards the south end of the runway. During peak activity periods at BST, congestion on the aircraft parking apron and the stub taxiways exists such that minor delays are experienced by aircraft operators waiting their turn to utilize the runway. As this congestion becomes more prevalent and the concern for safe maneuvering at the airport increases, a full length, or at least a longer parallel taxiway may be required to ensure that there is enough storage area between the aircraft parking apron and the taxiways to hold the operating

aircraft with a minimum of confusion. A longer partial parallel taxiway will also provide aircraft access to additional aircraft parking areas. The use of "turnarounds," short stub taxiways that are located at the ends of a runway, may be better suited to the BST situation as it minimizes design and construction costs, less impervious surface is created, it serves to effectively remove waiting aircraft from the active runway while the runway is in use by another aircraft. This adds additional capacity at little cost. The parallel taxiway can be extended to meet the turnaround(s) at a later date if capacity, safety, or access to additional hangar or apron areas becomes an issue. This study will recommend that two bituminous concrete turnarounds be constructed, one at either end of Runway 15-33, in the intermediate term because of the lack of exit taxiways.

There are two existing stub taxiways; Taxiway B joins the aircraft parking apron with Runway 15-33 and Taxiway C joins the remote conventional hangar area to the southerly portion of Runway 15-33. The addition of two turnarounds effectively adds two exit taxiways to the runway system such that it opens the runway up for use by other aircraft. Beyond that, additional exit taxiways are not needed to meet the existing aviation demand. However, if during the planning period, additional terminal areas are developed, appropriately located exit taxiways would prove beneficial in processing aircraft to and from the active runway.

All three taxiways have a nominal width of 40± feet; pavement tapers and fillets have increased the nominal widths of these taxiways. Table 4-1 provides taxiway design criteria based upon FAA's airplane design groups (categorized by wingspan lengths). By FAA's design criteria, these taxiways have been designed to include paved shoulders. The existing nominal width of the taxiways is sufficient to support the airport's aviation activities during the planning period providing the wheel track (i.e., the distance between the outermost wheels) of the largest, most prevalent aircraft is no larger than 20 feet. In the future, proposed taxiway widths should be designed to have at least a nominal width of 35 feet. Most general aviation aircraft will have a wheel track less than 20 feet; some sample general aviation aircraft and their associated wheel tracks are listed below:

- Cessna 180 (Skywagon) 8± feet
- Beechcraft F-33 (Bonanza) 10± feet
- Piper PA-31 (Navajo) 14± feet
- Beechcraft A-100 (King Air) 13± feet

- Cessna Citation I 13± feet

If aircraft with wider wheel tracks become the predominant aircraft in the future at BST, the FAA design manual will have to be consulted to improve the taxiways to accommodate these aircraft. It is not expected that this situation will occur during the 20-year planning period.

TABLE 4-1
BELFAST MUNICIPAL AIRPORT
FAA TAXIWAY AND TAXILANE DESIGN CRITERIA

Item	Airplane Design Group	
	I	II
Taxiway Width	25 ft.	35 ft.
Taxiway Edge Safety Margin	5 ft.	7½ ft.
Taxiway Shoulder Width	10 ft.	10 ft.
Taxiway Safety Area Width	49 ft.	79 ft.
Taxiway Object Free Area Width	89 ft.	131 ft.
Taxiway Turn Radius	75 ft.	75 ft.
Taxiway Lead-In Fillet Length	50 ft.	50 ft.
Fillet Radius:		
Centerline Tracking	60 ft.	55 ft.
Judgmental Oversteering	62½ ft.	57½ ft.
Taxiway Wingtip Clearance	20 ft.	26 ft.
Taxilane Wingtip Clearance	15 ft.	18 ft.
Taxilane Object Free Area Width	79 ft.	115 ft.

Source: FAA Advisory Circular 150/5300-13, *Airport Design*, (including Change 4, November 10, 1994).

Taxiway pavement strengths should be maintained at the 30,000-pound single-wheel loading throughout the planning period as neither aircraft nor maintenance equipment are expected to exceed this loading during the planning period.

Apron Requirements

The existing, irregularly shaped, aircraft parking apron currently accommodates approximately four aircraft while still allowing room to maneuver to and from the hangars, administration building and the runway for a total of approximately 33,000 square feet. Computations based on the procedures for sizing aircraft parking aprons in the FAA Advisory Circular 150/5300-13 (including Change 4, Appendix 5, 11-10-94) were utilized to determine approximate aircraft parking apron size requirements for current and future conditions. These computations are based upon existing and projected PMAD aircraft operations as forecast in the previous chapter.

The itinerant aircraft parking apron is based upon the existing and projected PMAD itinerant aircraft operations. From the analysis in Chapter Three, itinerant aircraft operations are assumed to be 30 percent of all operations at BST. Table 3-13 listed the PMAD for all aircraft operations under existing and projected future conditions as 58 and 74 respectively; the assumed itinerant numbers are 17 and 22 respectively. The FAA Advisory Circular recommends increasing these itinerant PMAD operations by 10 percent to represent the busiest day scenario, then assume that 50 percent of these operations will need to park on the apron at the same time. These computations identify a need for 32,400 square feet of itinerant apron space currently and 38,880 square feet by the end of the planning period.

The based aircraft parking apron size requirements are computed using the number of based aircraft now and projected for the future and applying a hangared versus non-hangared factor. Currently at BST, approximately 40 percent, or 10 based aircraft, are hangared; applying this percentage to the hangared based aircraft expected in the future presumes 12 based aircraft will be hangared in the future, providing current usage trends continue. The based aircraft remaining to be parked or tied down on the apron in the existing and future scenarios are 15 and 19 respectively. Computations based upon values provided by the Advisory Circular suggest that 40,500 square feet and 51,300 square feet are needed to satisfy existing and future based aircraft parking needs at BST respectively.

Combining the aircraft parking apron size requirements, these computations presume that 72,900 square feet of apron are needed to satisfy existing aircraft parking needs and 91,180 square feet of apron are needed to satisfy aircraft parking needs by the end of the planning period.

Comparing these requirements to the existing available apron shows a significant deficit in apron space. An existing deficit of 39,900± square feet of apron space should be made up in the near term to accommodate current aircraft parking needs. By the end of the planning period if no additional apron space has been constructed, a deficit of 57,180± square feet will exist.

Providing the composition of based versus itinerant aircraft does not change drastically over the planning period, Table 4-2 illustrates the computations which can be used as a starting point in assessing the aircraft parking apron needs at anytime (hint: use of the Operational Activity sheet at the back of Chapter Three is helpful).

TABLE 4-2
BELFAST MUNICIPAL AIRPORT
AIRCRAFT PARKING APRON COMPUTATIONS

Current Aircraft Parking Apron Size	33,000 SF
Year of Analysis	1995
ITINERANT AIRCRAFT	
Operations in Peak Month (A)	530
Calculate Peak Month Average Day (PMAD) Operations (3% to 5%) x (A)	17
Compute Assumed Busy Day Operations (1.10) x (PMAD)	19
Assume Apron Usage (50%) x (Busy Day)	10
Compute Assumed Itinerant Aircraft Parking Apron Needs (Apron Usage) x (3,240 SF)	32,400 SF
BASED AIRCRAFT	
Number of Based Aircraft	25
Number of Based Aircraft in Hangars	10
Remaining Based Aircraft using Apron (B)	15
Compute Assumed Based Aircraft Parking Apron Needs (B) X (2,700 SF)	40,500 SF
TOTAL AIRCRAFT PARKING APRON **NEEDS**	72,900 SF
APRON DEFICIT/SURPLUS	-39,900 SF

Source: FAA Advisory Circular 150/53001-13, *Airport Design*, including Change 4, Appendix 5, 11-10-94. Dufresne-Henry, Inc. analysis.

Airfield Pavement Marking Requirements

Pavement markings are required on the runway and taxiways at BST to help guide moving aircraft on the ground to maneuver to and from locations on the airport pavements, and in the air to recognize the airport and the types of approaches that are available. Through the various weather events, operation of aircraft, and scraping caused by snow plows, these markings have

become very faint and difficult to notice. As was noted in a recent FAA inspection of the airport, these markings will need to repainted in the near future and then periodically maintained afterwards. The future repainting of these markings may be timed to coincide with future pavement rehabilitation or extension work efforts.

Airfield Lighting and Navigational Aid (NAVAID) Requirements

Currently, BST is served by medium-intensity runway edge lights (MIRLs) and no taxiway lights. The runway lights should be adequate for the airport, but the taxiways should be lit. The installation of lights should be incorporated into the construction of the parallel taxiway.

Pilots at the airport have indicated that better visual guidance to the airport and the runway ends is necessary during IFR conditions. Runway end identifier lights (REILs) are strobe lights located at the ends of the runway which provide pilots with a reference point to locate these ends. REILs should be installed on both ends of the runway at BST to provide better visual reference.

Currently, a visual approach slope indicator (VASI) isin operation for Runway 15. This device provides visual guidance through a series of lights to pilots indicating the optimum descent angle to the runway. A precision approach path indicator (PAPI) provides the same function with less equipment and is the current technology for visual guidance. In order to improve the reliability of the airport, the VASI on Runway 15 should be replaced with a PAPI and another PAPI should also be installed for Runway 33.

Pilots using the airport have also requested some form of weather reporting at the airport. FAA regulations require pilots operating charter flights into the airport under IFR conditions to receive weather information from that airport in order to make an instrument approach to the facility. Since there is no control tower at BST, an automated system can be used. An automated surface observing system (ASOS) can provide information on wind speed and direction, barometric pressure, cloud height, visibility, temperature, and precipitation to the pilots through an computer-generated message over the radio. The installation of an ASOS at BST will allow IFR operations by charter aircraft at the airport as well as provide current weather information to all pilots using the airport.

Aircraft Tiedown and Parking Apron Requirements

Most aircraft that will be tied down when not in use will be the based aircraft not housed in hangars. For the most part, itinerant aircraft will park on the apron but will not be tied down as the itinerant aircraft are usually larger and heavier than the based aircraft and less likely to be affected by the wind. Aircraft which utilize the tiedowns are usually in design group I (less than 49 foot wingspans) and can be parked in a compact nested configuration. From the analysis above regarding aircraft parking apron space, 15 based aircraft will need tiedown spaces under existing conditions and 19 based aircraft are expected to need tiedown spaces by the end of the planning period. Two make-shift tiedowns on the existing aircraft parking apron are in use. Approximately five turf tiedowns are utilized for the existing based aircraft for a total of seven existing tiedowns. During the PMAD, there are not enough tiedowns to go around. An additional eight tiedown spaces are needed to meet the existing demand. However, the Airport Sponsor may want to consider the ease of maneuvering aircraft and airport maintenance equipment on a paved aircraft tiedown surface rather than turf. There are tradeoffs, for example, less pavement means less stormwater runoff however the pavement can contain chemical spills so that they may be cleaned up rather than let soak into the ground. If the tied down based aircraft are to be parked on a paved apron, then 13 new paved tiedowns are needed to meet the existing demand and 17 new paved tiedowns may be needed beyond those currently available to meet the demand expected to occur at the end of the planning period. Existing demand computation says that approximately nine itinerant aircraft will need to park on the apron on the busiest day; in the long term, that number may increase to 12. In addition to these evaluations, the Airport Sponsor may want to consider rehabilitating the existing apron as well as expanding it to improve the quality of the pavement and to facilitate more efficient maneuvering of aircraft.

Aircraft Hangar Requirements

Aircraft hangars are used for many purposes such as aircraft storage, snow removal/airport equipment storage, airport materials (sand, urea, etc.) storage, and aircraft/avionics repairs. Currently, one large conventional hangar is used by the FBO for storage of one of his aircraft and the repair of aircraft and avionics. An old T-hangar is located adjacent to the FBO's hangar. This T-hangar is abandoned and in poor shape. Eight new conventional hangars were constructed in 1990 and are currently in very good condition. These hangars are all occupied.

These hangars made use of the closed runway pavement for their development thereby avoiding constructing additional impervious surfaces which would increase stormwater runoff and possibly soil erosion. Additional room is available in this area to continue this hangar concept. No additional new hangars are needed to meet current demand, the only exception being the possible replacement of the old, abandoned T-hangar in the terminal area. In the future, it is anticipated that approximately two more hangars will need to be constructed to accommodate projected hangar demand. The layout for these additional hangars should take into consideration the development of hangar space beyond the current planning horizons. It should be noted that "hangar space" as used herein refers to housing one aircraft. "Hangars," on the other hand, may house more than one aircraft.

Helicopter Facility Requirements

Recently the City of Belfast was been approached by the owner of a helicopter operation who is looking to base his company out of the Belfast Municipal Airport. As this option for the airport had never taken shape before, it was somewhat unexpected however enthusiastically received. The following chapter will identify at least three potential sites that could be used to support helicopter operations at BST. Further discussions with the operator, the airport sponsor, the FAA and the MDOT/OPT are required before finalizing the evaluation and recommending a preferred site.

LANDSIDE FACILITY REQUIREMENTS

Administration Building Requirements

ith interest in aviation in the Belfast area on the upswing again, the FBO has been instrumental in providing the facilities to keep this interest alive. A larger administration building with the thought towards future expansions should be developed. A larger building would be able to supply the FBO with an office space separate from the student classroom and pilot lounge. In addition, a small room dedicated to the electrical vault hardware could be created improving the safety of the building's occupants and protecting the expensive and necessary electrical hardware for the airport. Currently, the electrical vault is inside a small closet inside the administration building. A somewhat larger space could be made available for this equipment. A separate

pilot's lounge should be planned for sometime in the future as more students become certified pilots in their own right and aircraft ownership becomes more accepted with the reduced costs due to a reduction in aircraft manufacturers' liabilities. The following is a sample of the building square footage requirements that would accommodate the growth anticipated to occur at BST through the planning period.:

♦	FBO Office/Sales Area:	(12'x12')	= 144 SF
♦	Student Pilot Classroom Area:	(12'x12')	= 144 SF
♦	Pilot Lounge Area:	(12'x20')	= 240 SF
♦	Restrooms:	2@(4'x6')	= 48 SF
♦	Electrical Vault Area:	(6'x8')	= 48 SF
♦	Utility Area:	(6'x8')	= 48 SF
♦	TOTAL SQUARE FOOTAGE:		= 672 SF
♦	Existing Square Footage:		= 450 SF
♦	Surplus/Deficit of Square Footage:		= 222 SF

The above list only considers one FBO on the airport, if in the future, another FBO offers services out of BST, then additional office/sales space should be allocated for the new FBO in the Administration Building or a separate facility. Knowing that the existing Administration Building already penetrates the existing FAR Part 77 transitional surface and will have to be relocated or torn down and rebuilt, the size of the terminal building should be expanded at the time of the move/reconstruction. In the short term, the Administration Building needs a separate room for the student pilot classroom, a larger electrical vault room, a utility room added, and a second restroom. By the end of the 20-year planning period, the FBO office/sales room should be expanded and an additional pilot lounge space added.

Ancillary Services Requirements

Aircraft rescue and fire-fighting services should continue to be provided by the City's volunteer fire department throughout the planning period. An instance when an on-site facility may be needed would be when an airport begins scheduled passenger airline service or obtains Part 139 certification to have scheduled passenger airline service. The City and its fire department should continue to monitor BST's aircraft rescue and fire-fighting needs throughout the planning period.

Snow-removal equipment and storage facilities should be considered for BST as the City begins to find itself short of available plow drivers for the City's streets. If BST had its own snow-removal equipment, the airport would not have to depend upon the availability of the City's crews to remove snow at the airport. Less down time at the airport would take place if the airport had its own equipment. Below are computations for the existing and proposed snow removal requirements and the equipment eligible for federal and state reimbursement to meet these requirements.

TABLE 4-3
BELFAST MUNICIPAL AIRPORT
SNOW REMOVAL EQUIPMENT NEEDS

	EXISTING	FUTURE
Primary Surface Area to be Kept Clear	400,000 SF	460,100 SF
Annual Operations	17,300	22,200
Depth of Snow to Plow	1"	1"
Required Time to Clear 1" of Snow	3 hours	3 hours
Assumed Air Temperature	25°F	25°F
Assumed Snow Density	25 LB/CF	25 LB/CF
Assumed Equipment Efficiency	70%	70%
Snow Removal Requirements	**225 TONS/HOUR**	**230 TONS/HOUR**
SNOW REMOVAL EQUIPMENT NEEDS	ELIGIBLE EQUIPMENT	ELIGIBLE EQUIPMENT
	1 small Class I snowblower	1 small Class I snowblower
	1 carrier vehicle for blower	1 carrier vehicle for blower
	2 displacement snow plows	2 displacement snow plows
	2 carrier vehicles for plows	2 carrier vehicles for plows
	OPTIONAL EQUIPMENT	OPTIONAL EQUIPMENT
	1 truck w/ hopper-spreader	1 truck w/ hopper-spreader
	1 small runway sweeper	1 small runway sweeper
	1 wheel loader w/ bucket	1 wheel loader w/ bucket

Source: Dufresne-Henry, Inc. analysis.

Snow removal can be a very time consuming time. It requires at least one, if not more, people to be available to operate the equipment during snow/ice events. Even if as little as one inch of

snow or ice accumulates on paved surfaces at the airport it must be removed so that aircraft can safely operate. This requires dedication and a commitment by the equipment operators to be available each time a winter weather event is predicted to occur in the vicinity of the airport, whether it materializes or not, and to stick it out for whatever duration it takes to clear the airport pavements. In addition to the operational responsibilities of the snow-removal equipment, ownership of this equipment requires continual maintenance. Part of the agreement that the FAA makes with an airport sponsor during the acquisition of snow-removal equipment for an airport is that the airport sponsor becomes responsible for all maintenance efforts. The FAA expects that the airport sponsor will maintain the equipment for the anticipated lifetime of that equipment, typically 20 years, before they will consider funding replacement equipment.

Considering the previous issues, this study will recommend pursuing acquisition of at least the "eligible" snow-removal equipment for the specific use of the Belfast Municipal Airport during winter weather events in the near term as a supplement to the City's crews.

Storage facilities for this new equipment should be available at the time the equipment is purchased. Storage facilities serve to prolong the life of the equipment as they are not exposed to the elements as often, and also as a place to do minor services or repairs to the equipment to ensure that the equipment is operating properly. Therefore, a snow-removal equipment building or hangar should be made available or constructed in the near term.

Fuel Storage Requirements

The existing demand for aircraft fuel at BST is 4,486 gallons of MOGAS (automobile gas used for automobiles, lawnmowers, and some aircraft) and 23,418 gallons of 100 low lead (aviation fuel used by many types of general aviation aircraft). No Jet-A (jet fuel) is sold at BST; at this time other nearby airports provide this fuel type to turboprops and jet-powered aircraft that may utilize BST. The airport currently has one 5,000-gallon tank for 100 low lead aviation fuel and two 275-gallon tanks for MOGAS. Using the forecasted fuel sales projected in the previous chapter would lead to continuing to use a 5,000-gallon tank for 100 low lead in the future. The amount of MOGAS that is sold at the airport can easily justify installing a 1,000- gallon tank in the short term and utilizing it throughout the planning period. A Jet-A fuel tank should be

considered for installation in the long term when the demand for this fuel at BST justifies storing this fuel on site.

Auto Parking Requirements

The automobile parking demand is a function of the general aviation and charter activity occurring at BST through the 20-year planning period. Automobile parking generated by itinerant pilots and passengers is typically due to the requirements of meeters/greeters. During the PMAD, approximately 17 itinerant aircraft operations occur presently and 22 itinerant aircraft operations are expected to occur by the end of the planning period. Since not all of these operations will occur at the same time and would be spread out throughout the day, a peak-hour operations level will be used to indicate the number of automobile parking spaces are needed to meet this type of demand. During the peak hour of the PMAD, approximately 10 percent of the daily operations are expected to occur; this study will use two operations for the existing and future cases. Assuming 1.5 automobiles per itinerant operation during the peak hour results in a total of three automobile parking spaces will be needed now and in the future to meet the demand caused by itinerant aircraft operations.

Based aircraft owners also need places to park their automobiles. At some airports, aircraft owners are allowed to park their vehicles near their aircraft or hangars. At BST, the general practice is to park the automobiles in the parking lot next to the Administration Building. There are currently 25 based aircraft at BST, in the future there are expected to be 31. Again, not every based aircraft owner will be at the BST at the same time, unless there is a special event in which case alternate parking arrangements will be made. A percentage, say 50 percent, of the total of based aircraft owners will be used as the guidelines for determining automobile parking demand for based aircraft owners. Under existing conditions, this determines the needs to be approximately 13 automobile parking spaces, and in the future 16 spaces.

Employee automobile parking spaces are needed throughout the year no matter the operational demands. The FBO staffs at least two full time employees year round. For planning sake, this study will assume that three spaces are needed for employees now and four spaces will be needed in the future.

SUMMARY OF AIRPORT FACILITY REQUIREMENTS

Table 4-4 presents a summary of the facility needs as identified for Belfast Municipal Airport in this chapter. In most instances, the projected airport facility requirements are a direct function of the forecasted aviation demand. Therefore, if demand is realized at a faster or slower rate, the development of the recommended facilities will change accordingly. Other factors that will likely impact future facility needs in addition to the timing of the development will be constraints imposed by funding availability, environmental issues, and engineering considerations. Chapter Seven will review the environmental constraints imposed upon the development of these facility recommendations. Chapter Eight will review the financial considerations on the implementation of these projects.

TABLE 4-4
BELFAST MUNICIPAL AIRPORT
SUMMARY FACILITY IMPROVEMENT RECOMMENDATIONS

	Short Term	Intermediate Term	Long Term
Airport Reference Code	BI	BI	BII
Runway Dimensions	4,002' x 100'	4,002' x 100'	4,002' x 100'
Airport Pavement Strength*	30,000 LB SWL	30,000 LB SWL	30,000 LB SWL
Taxiway Development	None	Construct 2 Turn-arounds	Extend Partial Parallel
Taxiway Width	25'	25'	35'
Apron Space			
Itinerant Aircraft	32,400 SF	35,640 SF	38,880 SF
Based Aircraft	45,900 SF	45,900 SF	51,300 SF
TOTAL SPACE	78,300 SF	81,540 SF	90,180 SF
Airport Pavement Markings	Repaint	No action	Repaint
Runway Lighting and NAVAIDs	MIRL, REILs, PAPI for Runway 33, ASOS	same	same
Aircraft Tiedowns (Total)	17	17	19
Aircraft Hangars (Total)	11	12	12
Helicopter Facility	Yes	Yes	Yes
Size of Administration Building	450 SF	550 SF	672 SF
Snow Removal Equipment & Building	Purchase and store eligible equipment		
Fuel Storage	5,000 gal. 100 LL 2,000 gal. MOGAS	5,000 gal 100 LL 2,000 gal. MOGAS	5,000 gal. 100 LL 2,000 gal. MOGAS 1,000 gal. Jet-A
Auto Parking Spaces	17	19	21

Source: Dufresne-Henry, Inc. analysis.

* SWL indicates an aircraft's single-wheel loading configuration.

Chapter Five
DEVELOPMENT ALTERNATIVES

Using the information from the previous chapters, this Airport Master Plan Update chapter develops and evaluates conceptual airport facility layouts from a constrained perspective. The previous chapters developed projections of aviation demand and facility requirements from an unconstrained point of view. They did not consider environmental issues, operational conflicts, construction feasibility, user convenience, or costs associated with the design, construction, permitting, operation, and/or maintenance of the facility. In addition to these constraints, consideration must be given to the interrelationships between the airport facilities when phasing the development of the recommended improvements. This chapter will provide alternatives showing realistic choices for implementing the anticipated facility improvements along with an analysis of a "no-build" scenario. Each alternative includes a discussion of both its advantages and disadvantages to the community, the airport itself, and aviation users.

Recommendations for implementing airport development are the result of engineering analysis and public input. Chapter Seven will identify the environmental impacts associated with the preferred development alternative. Chapter Eight will identify potential project costs and funding sources associated with the preferred development alternative as well as an implementation plan.

PREVIOUS PLANNING STUDIES

A review of previous planning studies related to the Belfast Municipal Airport is prudent in understanding the past issues of concern and resolutions found to be acceptable to the

community. Several studies are known to exist that refer to the needs of BST. A summary of these studies are as follows:

1977 *Airport Master Plan* The base year (1975) for this document identified aviation activity at 26 based aircraft and 7,000 total annual operations. Forecasted aviation-demand levels have proven to be significantly higher than those actually realized; 54 based aircraft and 22,315 annual operations were forecasted to occur in 1995. As a result, the 1977 *Airport Master Plan* had recommended several airport improvements to coincide with forecasted demand at the airport including:

Airside	Landside
Close Runway 10-28	Relocate airport access road
Improve NAVAIDs	Relocate administration building
Add 500 feet to south end of runway	Construct additional T-hangars
Add 200 feet to north end of runway	Relocate fuel tanks
Improve runway approaches	
Construct full-length parallel taxiway	

The present levels of aviation activity are lower than previously anticipated, consequently some of the recommended airport improvement projects (i.e., runway extension and development of the terminal facilities) have not been undertaken.

1992 *City of Belfast Draft Comprehensive Plan* This *Comprehensive Plan* reviewed the airport uses and abutting land uses to identify compatibility issues. The recommendations from this document include amending the Zoning and Subdivision Ordinances to ensure the safe and continued operation of the airport.

To date none of the Zoning and Subdivision Ordinances regarding compatibility with the airport have been amended. This issue should still be considered, especially in light of the potential for improved approaches to the airport using GPS.

1991 *Maine Aviation Systems Plan* The 1991 MASP had identified forecasted aviation activity levels in the same range as that of the current activity levels for BST; a more realistic forecast. Recommendations from the 1991 MASP did not include a runway extension, but did suggest improved approach capabilities and terminal-area improvements. BST was also designated as an Economic Development Airport in this document. This designation was due in part because of BST's proximity to other transportation resources, the community's ability to support increased business and industry activity, and the airport's ability to accommodate increased corporate aviation demand and improved runway approach capabilities.

AIRSIDE FACILITY RECOMMENDATIONS

Airside facility improvements to the runway, taxiways, aircraft parking aprons, and NAVAIDs from Chapter Four were evaluated to identify the best physical layout which would satisfy the following: (1) minimize impacts to the neighboring community and the natural environment and, (2) minimize project design, permitting and construction costs. The following subtopics list the assumptions, evaluations and decisions made regarding each of the airside facilities at BST.

Runway Improvements Chapter Four recommended several attributes for Runway 15-33 in the long term. These are listed as follows in Table 5-1.

TABLE 5-1
BELFAST MUNICIPAL AIRPORT
RUNWAY IMPROVEMENT RECOMMENDATIONS

	Existing		Recommended	
	Runway 15	**Runway 33**	**Runway 15**	**Runway 33**
Runway Length	4,002 feet		4,002 feet	
Runway Width	100 feet		100 feet	
Runway Pavement Strength	20,000-pound single-wheel load		30,000-pound single-wheel load	
Runway Approaches	non-precision	non-precision	non-precision	non-precision
Runway Markings	non-precision	visual	non-precision	
Runway Safety Area Beyond Runway Ends	240 feet		300 feet	
Runway Protection Zones				
inner width	500 feet	500 feet	500 feet	500 feet
outer width	700 feet	700 feet	700 feet	700 feet
length	1,000 feet	1,000 feet	1,000 feet	1,000 feet

Source: Dufresne-Henry, Inc., analysis.

Should a larger class of aircraft (i.e., greater than 12,500 pounds) exceed 250 operations annually at BST, the length of the runway should be revisited.

A runway width of 100 feet is anticipated to be needed through the long term, due to the absence of the former crosswind runway and the remaining runway's ability to handle strong crosswinds. Also, the City's reliance on City snow-removal crews to remove snow and ice from the runway means that snow and ice tend to build up in windrows along the edge of the runway pavement, obscuring the runway edge lights and, as the winter season progresses, diminishing the usable runway width. Unless adequate snow-removal equipment and personnel are utilized at BST during winter weather events, the historic practice of windrowing the snow and ice without blowing the windrow off the pavement will continue. For these reasons, a 100 foot width is critical and strongly recommended.

A runway pavement strength of 30,000-pounds single-wheel load should continue to be the goal for pavement strengths at BST. The 30,000 pounds reference refers to the total vehicle weight; the single-wheel loading refers to how this total weight is distributed (i.e., over three points of contact with the ground). This loading capability will accommodate all the 12,500- pound aircraft anticipated to utilize BST. However, it is generally accepted in the aviation industry, that most snow-removal equipment weighs in the vicinity of 30,000 pounds in gross weight. Most snow-removal equipment distributes their weight (i.e., load) in the same manner as an aircraft with a single-wheel load configuration. Therefore, recommendation that an airfield pavement be designed to accommodate 30,000-pound single-wheel loading should be sufficient for the anticipated aircraft and snow-removal equipment.

The approaches to Runways 15 and 33 are anticipated to continue as non-precision, straight-in approaches. As this airport is located in an area historically popular with tourists and more recently with corporate businesses, the airport should keep an eye toward the future and the potential for a 5,000-foot runway to accommodate larger aircraft.

Taxiway Improvements Chapter Four recommended the following regarding taxiways at BST:

TABLE 5-2
BELFAST MUNICIPAL AIRPORT
TAXIWAY IMPROVEMENT RECOMMENDATIONS

Full-length parallel taxiway	Yes
Taxiway Widths	35 feet
Taxiway Markings	Basic
Taxiway Pavement Strength	30,000-pound single-wheel load
Taxiway-Runway Centerline Separation	300 feet

Source: Dufresne-Henry, Inc., analysis.

The previous taxiway design requirements accommodate design group II aircraft (wingspans up to 79 feet). Options for connecting a full-length parallel taxiway to Runway 15-33 include right-angle exits and "dog leg" exits. "Dog-leg" exits are used to minimize impacts to nearby wetlands but still qualifies as a full-length parallel taxiway when FAA evaluates airport facilities for improved approach minimums.

Development of the full-length parallel taxiway at BST will assume a 35-foot nominal taxiway pavement width located 300 feet off the centerline of Runway 15-33. All taxiway options assume basic pavement markings and 30,000-pound single-wheel load pavement strength. All stub taxiways connecting the runway to the parallel taxiway will also conform to this criteria.

The advantages of constructing the proposed parallel taxiway on one side of the runway or the other is dependent upon the location of the terminal-area facilities selected. As an aside, impacts to wetlands by a parallel taxiway on the west side of the runway would be slightly higher than if located to the east of the runway.

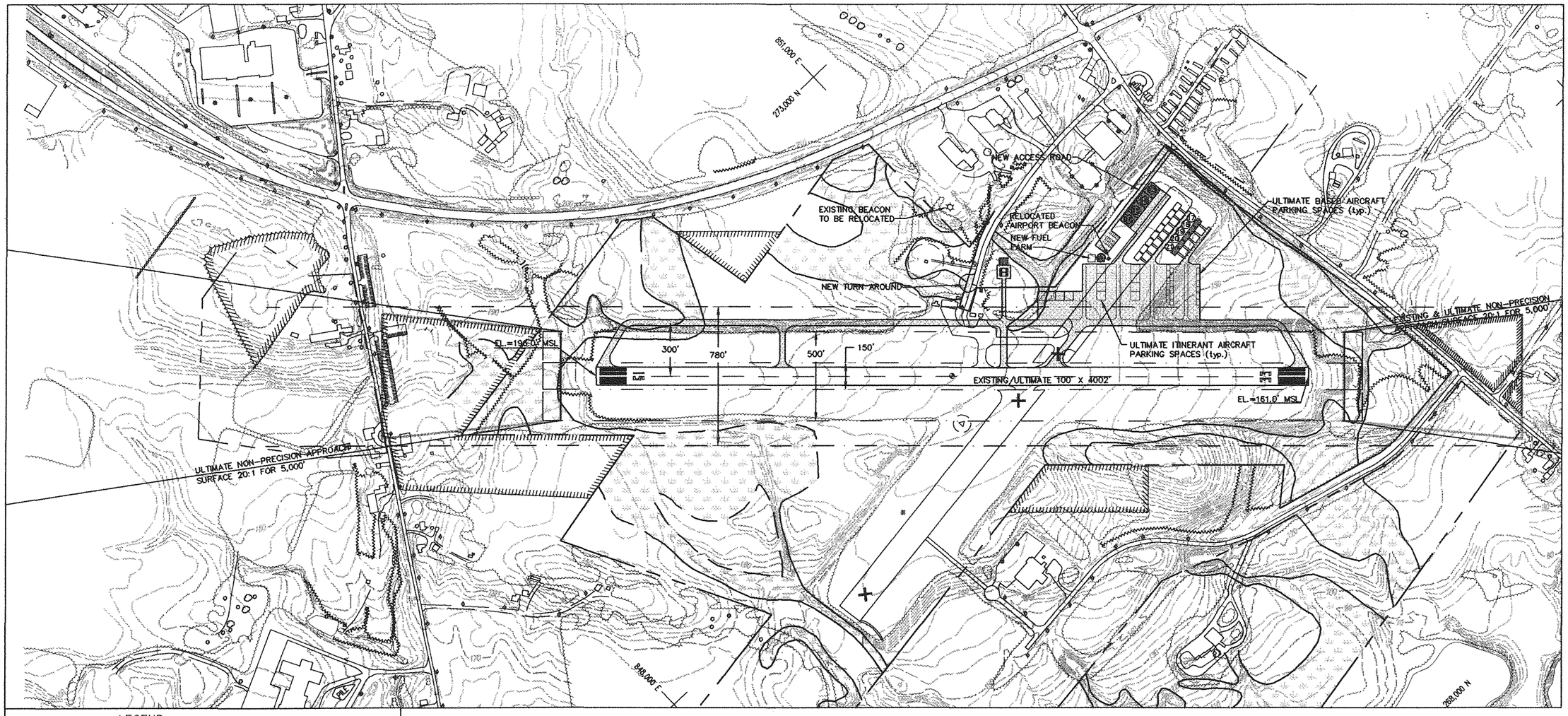
Apron and Terminal-area Facilities Chapter Four recommended relocating the current terminal-area facilities so that they are not, or will not be, penetrations to the FAR Part 77 imaginary surfaces. Several alternatives were evaluated for their potentials for success. As part of this chapter, several alternative development scenarios were prepared which identified locations for accommodating the recommended facility improvements. Three alternatives have been selected to receive further analysis in this chapter (Figures 5-1, 5-2 and 5-3). Other alternatives were discarded because viable and less costly alternatives do exist. Some of these discarded alternatives included:

- locating the terminal-area facilities midway along and to the east of Runway 15-33 on land now or formerly owned by the State of Maine
- splitting the fixed-wing and rotary-wing aircraft uses to opposite ends of the closed runway
- locating the fixed-wing aircraft operations area on the east end of the closed runway and the rotary-wing aircraft on a parcel of airport land to the north of the runway

Extensive development in wetlands, significant land-acquisition requirements, and the separation of aviation uses contributed to the dismissal of these alternatives.

Alternative 1 (see Figure 5-1) maintains all terminal-area facilities on the east side of the runway but relocates them so that they will not penetrate the FAR Part 77 imaginary surfaces. At this time, the helicopter operator has selected an off-airport site that meets his needs. Alternative 1 has identified the hangar and apron locations for this operation; one option for accessing the runway has been shown.

In order to keep a cohesive airport terminal area without need for land acquisition and to make use of the closed runway, these facilities were located on the east end of the closed runway. Allowing for access to the off-airport helicopter site from the runway negates safe passage of automobile traffic from Airport Road to the new terminal-area facilities. Therefore, a new access drive from Congress Street was considered. Creating a cul-de-sac at the end of Airport Road with a security fence between the cul-de-sac and the airport will prevent unauthorized access into the airport. Perhaps this area could be turned into an airport viewing area for the local citizens. The new terminal area can accommodate more than the recommended number of hangars and tiedown spaces which will help to prevent restrictions for growth beyond the current 20-year planning period. The aircraft parking apron allows for both itinerant and based aircraft parking spaces. Itinerant aircraft spaces are located in the vicinity of the administration building and fuel pumps. This location provides a direct route from their parking spaces to the taxiway, thereby minimizing conflicting movements. All aircraft parking spaces, both based and itinerant, are located perpendicular to the proposed parallel taxiway to efficiently maximize space. The proposed hangars are located perpendicular to Congress Street and parallel to the closed runway to conform to the layout previously started with the eight T-hangars. The administration building should have an unrestricted view of both ends of Runway 15-33. This alternative minimizes wetland impacts to 0.7± acres and tree clearing for development to 4.4± acres for the terminal-area facilities. However, considerable amounts of fill material will be needed to construct the southern-most portion of the proposed aircraft parking apron.



LEGEND

- PROPOSED BRL (20' OBJECT)
- PROPOSED OFA
- PROPOSED RSA
- PROPOSED BUILDING
- PROPOSED PAVEMENT
- PROPOSED LAND ACQUISITION (AVIGATION EASEMENT)

GRAPHIC SCALE

600 0 300 600 1200

1 inch = 600 feet

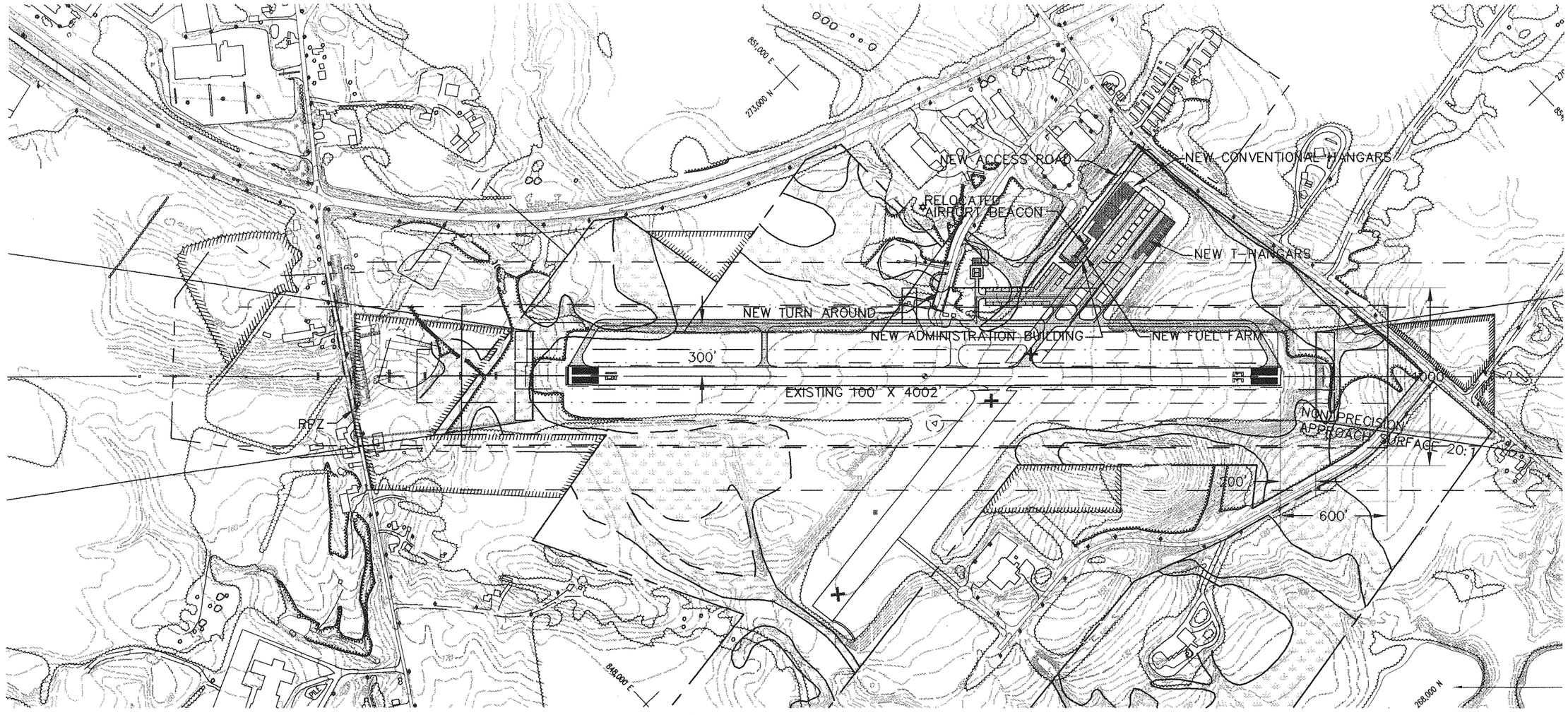
Dufresne-Henry, Inc.
22 Free Street
Portland, ME
04101-3900

BELFAST MUNICIPAL AIRPORT

FIGURE 5-1
DEVELOPMENT ALTERNATIVE 1

BELFAST MAINE

Client No. 811005	Proj. Mgr. CLN	Date 8/13/98	B	ALT-1



LEGEND

- PROPOSED BRL (20' OBJECT)
- PROPOSED OFA
- PROPOSED RSA
- PROPOSED BUILDING
- PROPOSED PAVEMENT
- PROPOSED LAND ACQUISITION (AVIGATION EASEMENT)

GRAPHIC SCALE

600 0 300 600 1200

1 inch = 600 feet

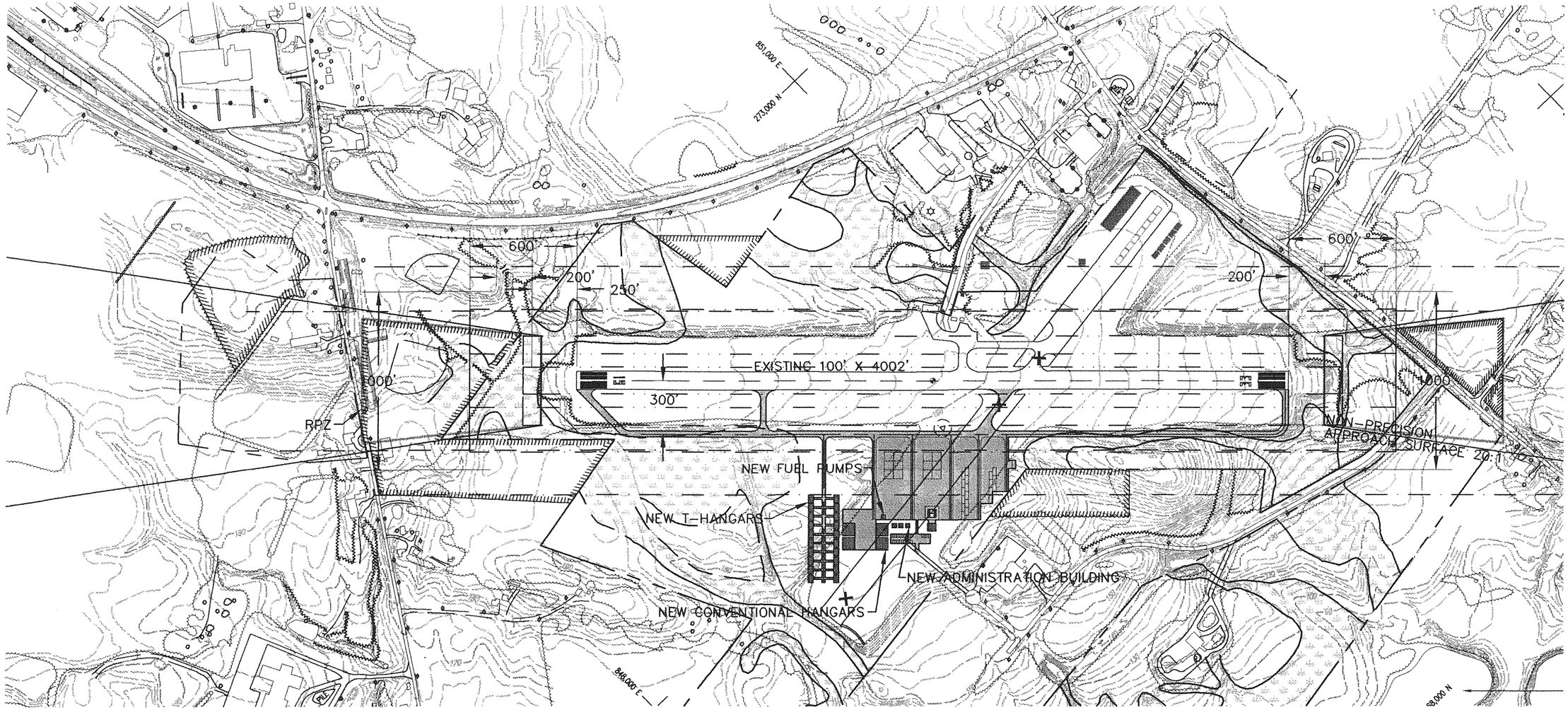
Dufresne-Henry, Inc.
22 Free Street
Portland, ME
04101-3900

BELFAST MUNICIPAL AIRPORT

FIGURE 5-2
DEVELOPMENT ALTERNATIVE 2

BELFAST MAINE

Client No. 811005	Proj. Mgr. CLN	Date 8/13/98	B	ALT-2



LEGEND

- PROPOSED BRL (20' OBJECT)
- PROPOSED OFA
- PROPOSED RSA
- PROPOSED BUILDING
- PROPOSED PAVEMENT
- PROPOSED LAND ACQUISITION (AVIGATION EASEMENT)

GRAPHIC SCALE

600 0 300 600 1200

1 inch = 600 feet

Dufresne-Henry, Inc.
22 Free Street
Portland, ME
04101-3900

BELFAST MUNICIPAL AIRPORT

FIGURE 5-3
DEVELOPMENT ALTERNATIVE 3

BELFAST MAINE

Client No. 811005	Proj. Mgr. CLN	Date 8/13/98	B	ALT-3

Alternative 2 is similar to Alternative 1. Whereas the impacts to wetlands are on the same order of magnitude as Alternative 1, the proposed aircraft parking apron can be wholly contained on the graded plateau at the east end of the closed runway. This alternative, however, limits future growth beyond the 20-year planning period, unless the apron is expanded in a southerly direction. In this case, considerable amounts of fill material would be needed, just as with Alternative 1.

Alternative 3 is radically different than the previous alternatives. The difference lies in the location of the terminal-area facilities on the west end of the closed runway and significant hangar and apron space is available for future developments. This alternative assumes that the existing eight T-hangars would be relocated, removed, or abandoned so as not to separate the terminal-area facilities and to keep people and aircraft from crossing the active runway to receive services from the FBO and/or access these remote hangars. There is considerable potential for expansion beyond the 20-year planning period for the terminal-area facilities in this scenario.

The final physical location and implementation of the recommended alternative development plan will be dictated by: (1) airport design criteria, (2) airport tenants' adaptability to the location, (3) airport tenants' preferences (e.g., hangar size), and (4) environmental regulations and other specific site-related data (e.g., soils or wetlands data) at that time. This Airport Master Plan Update should be utilized as a guide to future planning efforts, not as construction documents. Capabilities for future airport growth should be accommodated within the ultimate development plan.

LANDSIDE FACILITY RECOMMENDATIONS

Landside facilities include the aircraft hangars, terminal building, automobile parking area, and access road. Some of these facilities have already been referenced in previous sections of this chapter.

Access Road For all three development alternatives, a new access road will be needed to access the airport facilities. This is due primarily to the importance of relocating the administration building so that it will not penetrate the FAR Part 77 imaginary surfaces. This requirement

places the administration building approximately 640 feet from Runway 15-33's centerline. In order to use the existing Airport Road to access the proposed terminal-area facilities as shown in Alternatives 1 and 2, the proposed driveway would have to be extended into the FAR Part 77 primary surface and cross active aircraft movement areas before reaching the automobile parking area. This is not a safe condition as activity from both aircraft and automobiles are not monitored at BST. Alternatives 1 and 2 place a new, paved airport access road entirely on airport property along the southerly edge of the northern Airport Industrial Park and outside the primary surface, away from aircraft movement areas. Access to the terminal facilities in Alternative 3 could use one of two routes: via Little River Drive, or acquire private property to extend a driveway from Route 52/Lincolnville Avenue to the site. This second route is not necessary as a viable alternative already exists: Little River Drive. In all three alternatives, new roadside signage will increase the visibility and recognition of the airport entrance.

Fuel Facilities Both Alternatives 1 and 2 offer a fuel farm/fuel pumps adjacent to the administration building. Alternative 3 offers fuel pumps located adjacent to the aircraft parking apron, and a remote fuel farm. Self-serve fuel pumps can offer 24-hour convenience to its users, automatic record keeping, all in a self-contained unit. The current method relies on contacting the FBO to alert him as to the need for fuel, the fuel truck is dispatched to the aircraft in question, and fuel is dispensed. Late at night when the airport is not attended, fuel is dispensed into aircraft by contacting the FBO at home and requesting him to come to the airport to service an aircraft. The proximity of the fuel pumps to the administration building allows the FBO to monitor the fuel dispensing operation. In addition, this proximity also allows fuel delivery trucks onto airport property to fill the tank(s) in the fuel farm without entering into the aircraft operation area. By locating the fuel pumps at the edge of the apron, aircraft can travel to the fuel pumps, thereby negating the need for a fuel truck to dispense fuel into the aircraft. This would eliminate the need to maintain and/or purchase newer fuel trucks for the airport in the future. Relocation of the existing tanks must follow current local, state, and federal regulations, but could occur as soon as the new apron is constructed. Care should be taken when allowing fuel supply trucks into any aircraft operation area until a new access road can be constructed.

Administration Building The previous chapter outlined the recommended administration building footprints for each of the demand thresholds through the planning period. In addition to

the requirement to relocate (or demolish and reconstruct) the administration building, a new administration building will provide passengers, student pilots, pilots, and the FBO with the potential for a more efficient layout by separating competing functions within the building. This efficiency will allow a smoother processing of passengers from landside to airside.

Automobile Parking Facilities This Airport Master Plan Update recommends a total of 21 automobile parking spaces in by the long term of this planning period. Considerations were given to the potential for growth beyond the current 20-year planning period. As such, open space buffers have been planned around each alternative's automobile parking areas to allow for room to expand in the future. The current automobile parking areas are unpaved gravel lots. The recommendation made in this evaluation for the new automobile parking area is for a paved surface graded to minimize ponding of water. However, as the airport already has a considerable amount of planned impervious surfaces, it is not critical that this lot be paved.

Aircraft Maintenance/FBO Hangar Facilities This Airport Master Plan Update continues to separate the administration building's functions from those of the FBO's repair, maintenance, and storage facility as is currently the case. Each of the evaluated alternatives have planned space for conventional hangars, any one of which can be adapted to fit the needs of the FBO.

Snow-removal Equipment Storage Facility As the airport does not currently have any snow-removal equipment of its own, there is no existing need for such a storage/maintenance facility. At the time the airport considers purchasing its own snow-removal equipment, or other airport maintenance equipment, the airport should consider utilizing one of the remote conventional hangars to fill these needs. By choosing a remote hangar to house and maintain this equipment, the preferred hangars closer to the terminal facilities can be offered to aircraft operators who will pay hangar or land rental fees to the airport. Until a hangar can be made available, maintenance of the snow-removal equipment can be performed at the town's Public Works' garage.

Land Acquisition The runway protection zone for Runway 33 covers 14± acres of land of which the airport owns approximately 10.3± in fee simple. It is recommended that the airport purchase the remaining approximately 3.7± acres of land in fee simple or with an avigation easement to protect the runway protection zone.

At the north end of the runway, the runway protection zone covers 14± acres of land of which the airport owns approximately one acre in fee simple and 13± acres in avigation easement. This Airport Master Plan Update recommends converting five acres of avigation easements to fee simple ownership within this runway protection zone to ensure that the future runway safety area is under the complete control of the airport. Should the opportunity present itself to the City for the fee simple conversion of the remaining eight acres within the runway protection zone, the City should consider the acquisition. However, the City is not required to do this as the avigation easement fulfills FAA's requirements for protection within the runway protection zone. Currently, the avigation easements that already exist allow for the removal of penetrating trees to the existing approach surface of Runway 15. Consideration should be given to updating these easements when the runway extension is implemented to reflect the new elevation of the easement surface.

Should the City of Belfast pursue a longer runway in the long term or beyond the current 20-year planning period, additional land acquisition will be required to support the runway protection zone and runway safety area. Other items that will need to be addressed before pursuing a longer runway include roads and MBNA's ballfield.

RECOMMENDATION OF DEVELOPMENT ALTERNATIVE

Based on comments from the 3rd Planning Advisory Committee meeting, Alternatives 1 and 3 received favorable comments from committee members; however, because of the benefits outlined below, it is recommended that the Belfast Municipal Airport pursue the development layout presented in Alternative 1. The following summarizes the favorable benefits of each of the three alternative plans as well as a "Do-nothing" Alternative:

Do-nothing Alternative The "Do-nothing" Alternative means BST would not implement a runway extension, terminal-area relocation, parallel taxiway, or new hangars. BST would continue to maintain the airport in a status quo condition. This philosophy limits the City's ability to market its airport to potentially new airport users in that the airport reliability (i.e., amount of time the airport is considered open for use) will not improve, airport facilities will not be modernized, and the terminal-area buildings will continue to present safety concerns to those

using the airspace above the airport. However, no runway extension means that the existing NAVAIDs won't have to be relocated and the possibility for small jet aircraft operations at the airport won't occur, thereby, negating any need to sell Jet-A fuel. All these items represent considerable cost savings, minimize environmental impacts, and reduce capital investment needs into the airport. Fulfilling the "do-nothing" alternative guarantees that the forecasted aviation demand levels cannot be accommodated.

Alternative 1 Alternative 1 is the preferred alternative based on the simplicity and efficiency of the layout, as well as its expandability along with its development phasing capabilities. This location provides convenient aircraft parking with a direct access route from the taxiway to the parking area and the terminal-area facilities. Other favorable advantages of this alternative are: (1) the unique access road to the airport which is distinctive from the industrial park road, (2) efficient space utilization, and (3) helicopter operation is on the same side of the runway as the terminal-area. However, costs associated with this alternative will be slightly more in terms of the amount of fill material required to construct the apron extension that would be required to meet the forecasted long-term aviation demand.

Alternative 2 Alternative 2 is similar to Alternative 1. Location of aircraft parking areas and terminal facilities are more compact on airport land which utilizes this area more efficiently than the other two alternatives. This alternative lacks the potential to accommodate demand beyond the 20-year planning period. The favorable attributes of this alternative are: (1) More compact with efficient use of space, (2) maximizes existing closed runway pavement to the east of Runway 15-33, (3) least expensive to construct, and (4) unique access road to the airport which is distinctive from the industrial park road.

Alternative 3 Alternative 3 is quite different from the other alternatives. This alternative changes the location of the terminal-area facilities on the west end of the closed runway with significant hangar and apron space that allows for any future airport developments. Other favorable attributes to Alternative 3 are: (1) greatest room for expansion capabilities, (2) less fill will be required, (3) efficient layout, maximizes its use on airport property, (4) less noise for neighboring community, and (5) ability to expand terminal-area facility to meet the demand

anticipated to occur beyond the current 20-year planning period. A significant disadvantage of this alternative is its lack of ability to phase the developments.

With consideration of costs, favorable benefits and development disadvantages, Alternative 1 is the recommended development alternative for the Belfast Municipal Airport.

PHASING OF THE PREFERRED DEVELOPMENT ALTERNATIVE

Airport improvements are recommended to be phased in over the course of the planning period as aviation-demand levels are approached. The intention is to accommodate the demand as needed rather than to build with the hopes that the demand will arrive.

Short Term

During the short term, those airport improvement projects which are needed to satisfy existing safety or capacity issues should be undertaken. Such projects should include:

- overlay runway
- purchase snow removal equipment
- upgrade runway safety areas at both ends of the runways
- construct the aircraft parking apron to accommodate 10 parked itinerant aircraft and 17 parked based aircraft
- construct sheltered aircraft parking (T-hangars and/or conventional hangars) to house at least three additional based aircraft
- construct a partial parallel taxiway to provide access to the new aircraft parking apron from runway end 33 to the existing apron
- relocate the rotating airport beacon to airport property, with the authorization and final site location to come from FAA's New England regional office
- install REILs, PAPI, and ASOS

No other airside improvements are needed at this time. However, it would also be appropriate to consider relocating (or demolishing and reconstructing) the administration building, the FBO

hangar, and the fuel farm to their recommended positions, if funds are available. As the FBO plans to make improvements to keep pace with his clients' demands, it may be prudent to invest in a permanent solution to the administration building's size and location issues during the short term. If funds are not available for at least four to five years, small-scale investing in the existing administration building to meet the immediate user demands should be undertaken with the knowledge that this will be a temporary fix. If the administration building is not relocated in the short term, it is recommended that the existing apron pavement remain in place until such time as the administration building, FBO hangar, and fuel farm can be relocated to their recommended positions.

In addition to the previously stated short-term airport improvements, it is likely that the proposed helicopter facility will be constructed on an adjacent parcel in this same time frame. Conversations between the City and the helicopter owner should begin immediately to reconcile the helicopter operator's access to airport property and facilities (including the potential construction of a connecting taxilane).

Intermediate Term

Consideration should be given to the following as an intermediate term development plan:

- acquire avigation easements over 3.7± acres of land off the south end of runway 15-33 to protect the proposed RPZ.
- add additional apron space as demand dictates
- relocate the administration building and FBO hangar (if not already completed)
- remove the former aircraft parking apron and adjacent vacant T-hangar
- construct additional hangars as demand dictates
- relocate automobile parking area
- relocate and obtain permits for fuel tanks
- construct new airport access road and a new cul-de-sac on old airport access road

Consideration should be given at this time to rehabilitate Runway 15-33 at 100-feet wide to ensure the longevity and usefulness of this landing surface.

Long Term

By the long term, full realization of forecasted aviation demand will dictate the:

- extension of the partial parallel taxiway to the full length
- addition of new hangars (T-hangars or conventional hangars) as demand dictates
- expansion of the aircraft parking apron as demand dictates
- installation of a Jet-A fuel system

Additionally, preventative maintenance to the apron pavement and partial parallel taxiway constructed during the short term will need to be undertaken.

UNUSED AIRPORT PROPERTY

There are a few large areas of airport property that are, as yet, not designated for a specific purpose. The west end of the closed runway contains an area 20± acres in size of usable land. It has access via Little River Drive and is in a relatively inactive part of the airport. One suggested use would be to utilize this area as an overflow aircraft parking area. Parking positions could be marked on the existing pavement and shuttles could be provided which could transport pilots and passengers to the airport's terminal-area facilities and back again. Because demand for this overflow area is not anticipated to be very high or frequent, the existing condition of the pavement should not be upgraded nor should snow-plowing operations be required during the winter months. The potential for a shuttle service from the overflow parking area to the terminal area would only be necessary during times of high aircraft parking demands (e.g., fly-ins, an airport open house, or local conventions) to prevent the necessary runway crossings by pedestrians that this overflow parking area necessitates.

A second unused area that has development potential is airport land to the north of the existing terminal-area facilities. This unused, wooded airport land has direct access to Route 1 bypass

and has 20± acres of apparently developable land. Ideally, this land could be developed as a corporate aircraft parking or hangar area. Considerations for fuel facilities or fuel accessibility, aircraft parking apron, and taxiway to the north end of the runway still need to be made.

A third area of reportedly airport land is located to the south of the South Airport Industrial Park. Currently, this land is mostly wooded with a transfer station/recycling center located towards one end of the parcel. Clarification from a licensed surveyor is required to verify whether this parcel was indeed sold as part of the South Airport Industrial Park as intended or whether it remains as airport property. Should this parcel be airport land, consideration should be made to sell or lease this land for non-airport uses. As this property is no longer contiguous with the remaining airport property and non-airport uses are already present in the area, there is little chance that the airport will be able to use this parcel for airport purposes. In addition, this land is not needed to protect existing or future airport surfaces, zones, or areas.

A fourth area of airport land is approximately 23± acres in size and is located to the west of the closed Runway 10 pavement. The previous *Airport Master Plan* recommended that this land be utilized for industrial purposes. As this area is a considerable distance from the active runway, it is not likely that it will ever be used for airport purposes; aviation demand can be accommodated easily without this piece of land. This evaluation concurs with the previous *Airport Master Plan's* recommendation, except that the use of this area should not be limited to industrial uses. The area should be able to be leased or sold to a non-aeronautical user with the concurrence of the FAA and MDOT/OPT.

AIRPORT MAINTENANCE PROGRAMS

As appendices to the final *Airport Master Plan Update,* suggestions are given for developing minimum airport standards and snow-removal action plans for BST. Table 5-3 summarizes the recommendations for each phase of development as warranted by aviation demand levels.

TABLE 5-3
BELFAST MUNICIPAL AIRPORT
SUMMARY OF DEVELOPMENT PHASES

SHORT TERM DEVELOPMENTS
Overlay Runway 15-33
Upgrade runway safety areas at both ends of the runways
Purchase snow removal equipment
Construct new aircraft parking apron
Construct additional hangars
Construct partial parallel taxiway
Relocate rotating airport beacon
Install REILs, PAPI (Runway 33) and ASOS
INTERMEDIATE TERM DEVELOPMENTS
Rehabilitate Runway 15-33
Acquire land in easement off both runway ends
Add additional apron space as demand dictates
Relocate the administration building and FBO hangar
Remove the former aircraft parking apron and adjacent vacant T-hangar
Construct additional hangars as demand dictates
Upgrade to HIRLs and MITLs
Replace VASI with PAPI on Runway 15
Relocate automobile parking area
Relocate and obtain permits for fuel tanks
Construct new airport access road and a new turn around

LONG TERM DEVELOPMENTS
Extend of the partial parallel taxiway
Construct addition hangars
Expand aircraft parking apron
Install a Jet-A fuel system

Source: Dufresne-Henry, Inc. analysis.

Chapter Six

AIRPORT LAYOUT PLAN

INTRODUCTION

A product of this AMPU is the graphical presentation of the recommended airport improvement projects for Belfast Municipal Airport. The ALP set presents these data. The following subsections briefly describe the contents of each sheet in the ALP set, which has been reduced in size and is included in this chapter. All recommended airport improvements shown on these sheets are representational in nature and may be modified as necessary to meet the needs of the town and airport users or the future design requirements of the FAA or MDOT/OPT.

TITLE SHEET

This sheet identifies the airport location, wind data, and provides a table of contents for the ALP set.

EXISTING AIRPORT FACILITIES PLAN

This sheet identifies details of existing airport facilities, as well as surrounding land uses. Also shown are FAA surfaces and design setbacks. Tables provide additional data about the usage and dimensions of the airport and its facilities.

ULTIMATE AIRPORT LAYOUT PLAN

This sheet identifies details of the recommended airport facility improvements and their likely impact on surrounding land uses. Tables provide additional data about the likely ultimate usage and dimensions of the airport and its facilities.

TERMINAL AREA PLAN

This sheet provides a close-up view of the recommended airport facility improvements. For easy reference, tables are provided that duplicate those of the Ultimate ALP.

APPROACH PLAN AND PROFILE

This sheet highlights the ground topography and object heights relative to FAR Part 77 approach surfaces for existing and ultimate conditions.

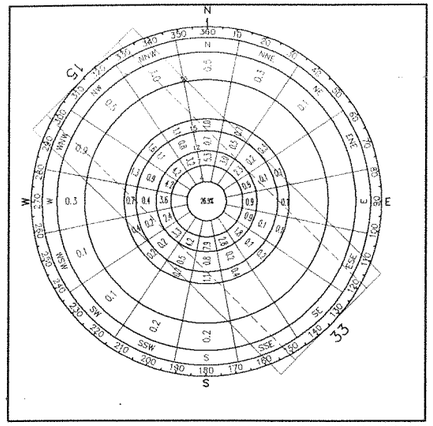
FAR PART 77 IMAGINARY SURFACES PLAN

This sheet identifies all FAR Part 77 imaginary surfaces for the airport, representing ultimate conditions. Likely ground and tree penetrations are highlighted.

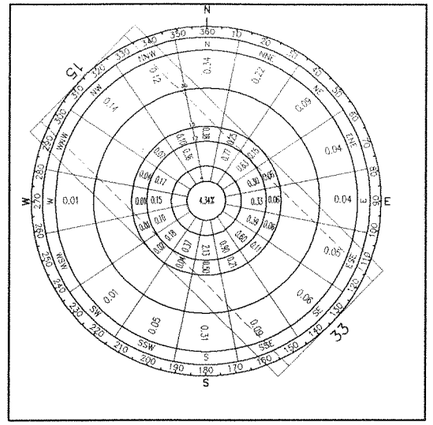
LAND-USE PLAN

This sheet shows the airport and its surrounding structures superimposed with the estimated aircraft-noise contours.

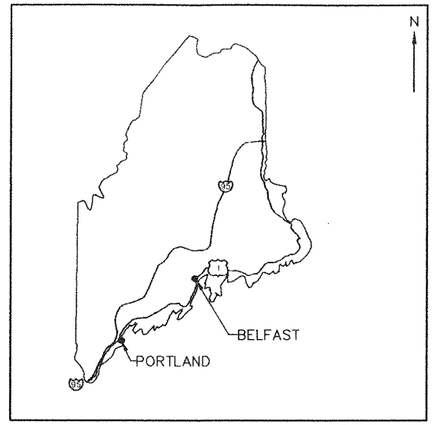
Insert Sheets 1-7



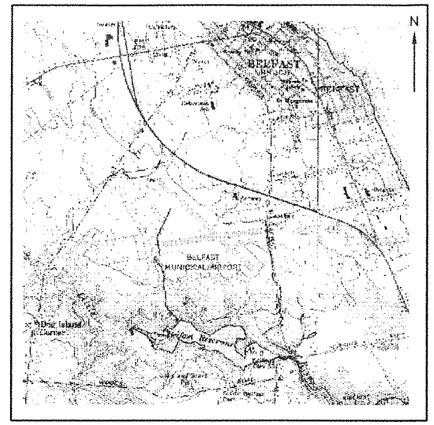
ALL WEATHER WINDROSE



IFR WINDROSE



LOCATION MAP



VICINITY MAP

SHEET DESCRIPTION

1	TITLE SHEET
2	EXISTING AIRPORT LAYOUT PLAN
3	ULTIMATE AIRPORT LAYOUT PLAN
4	TERMINAL AREA PLAN
5	APPROACH PLAN AND PROFILE RUNWAY 15–33
6	FAR PART 77 IMAGINARY SURFACES PLAN
7	LAND–USE PLAN

INDEX OF SHEETS

ALL WEATHER WINDROSE

RUNWAYS	12 MPH	15 MPH
15	51.7%	53.3%
33	66.9%	69.3%
COMBINED	91.7%	95.7%
CALMS	26.9%	

IFR WINDROSE

RUNWAYS	12 MPH	15 MPH
15	62.7%	64.2%
33	50.5%	52.3%
COMBINED	88.0%	91.3%
CALMS	25.2%	

PERIOD : DECEMBER 1941 – MARCH 1965
LOCATION : BANGOR INTERNATIONAL AIRPORT
BANGOR, MAINE
SOURCE : NATIONAL CLIMATIC DATA CENTER
ASHEVILLE, NORTH CAROLINA

AIRPORT LAYOUT PLAN 1994 – 2014

BELFAST MUNICIPAL AIRPORT
BELFAST, MAINE

AIP NO. 3–23–0007–0194

Dufresne-Henry, Inc.
A DVI Company
22 Free Street
Portland,
Maine 04101–3900

Consulting Engineers

OFFICES
No. Springfield, Vermont 05150
Montpelier, Vermont 05602
Manchester, New Hampshire 03101
Portland, Maine 04101–3900
Westford, Massachusetts 01886
Greenfield, Massachusetts 01301
Naples, Florida 33942
Port Charlotte, Florida 33954
Sarasota, Florida 34236

ENGINEERING DISCIPLINES
Civil
Electrical
Environmental
Industrial
Mechanical
Solid Waste
Structural
Transportation
Wastewater
Water

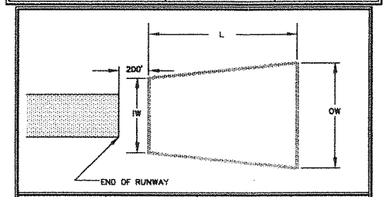
ASSOCIATED DISCIPLINES
Construction Management
Site Assessments
Surveying

APPLIED SCIENCES
Geologic
Hydrologic
Water Quality

RUNWAY DATA	EXISTING	ULTIMATE
% WIND COVERAGE (ALL WEATHER)	12 MPH 15 MPH R/W 15: 51.7% 53.3% R/W 33: 66.9% 89.3% COMBINED: 91.7% 95.7% CALMS: 26.9% 26.9%	
PAVEMENT STRENGTH	30,000 LBS. SINGLE WHEEL	
APPROACH SURFACES	R/W 15: 20:1 NP R/W 33: 20:1 NP	
RUNWAY MARKINGS	NON-PRECISION	
RUNWAY LIGHTING	MIRL	
RUNWAY NAVAIDS	R/W 15: VASI-2L R/W 33: NONE	
IDEAL RSA DIMENSIONS	120' X 4,482'	
EFFECTIVE GRADIENT	0.87%	
RUNWAY END ELEVATIONS	R/W 15: 196.0' MSL R/W 33: 161.0' MSL	
RUNWAY END COORDINATES	R/W 15: 44°24'48.414"N 69°01'04.105"W R/W 33: 44°24'21.250"N 69°00'24.071"W	

EXISTING	ULTIMATE	BUILDINGS
①		ADMINISTRATION BUILDING
②		STORAGE SHED
③		FBO HANGAR
④		PRIVATE T-HANGAR
⑤		PRIVATE CONVENTIONAL HANGAR
⑥		PRIVATE CONVENTIONAL HANGAR
⑦		PRIVATE CONVENTIONAL HANGAR
⑧		PRIVATE CONVENTIONAL HANGAR
⑨		PRIVATE CONVENTIONAL HANGAR
⑩		PRIVATE CONVENTIONAL HANGAR
⑪		PRIVATE CONVENTIONAL HANGAR
⑫		PRIVATE CONVENTIONAL HANGAR

AIRPORT DATA	EXISTING	ULTIMATE
AIRPORT ELEVATION	196.0' MSL	
AIRPORT REFERENCE POINT	LAT. 44°24'34.873"N LONG. 69°00'44.124"W	
MEAN MAX. TEMP. (HOTTEST MO.)	81°F	
TAXIWAY LIGHTING	NONE	
TAXIWAY MARKING	CENTERLINE, SIGNAGE	
AIRPORT/TERMINAL NAVAIDS	LIGHTED WINDCONE ROTATING BEACON/NDB	
AIRPORT REFERENCE CODE (ARC)	B-I	
ACREAGE OWNED IN FEE SIMPLE	221± ACRES	
ACREAGE OWNED IN EASEMENT	80± ACRES	
USE/OWNERSHIP	PUBLIC/PUBLIC	

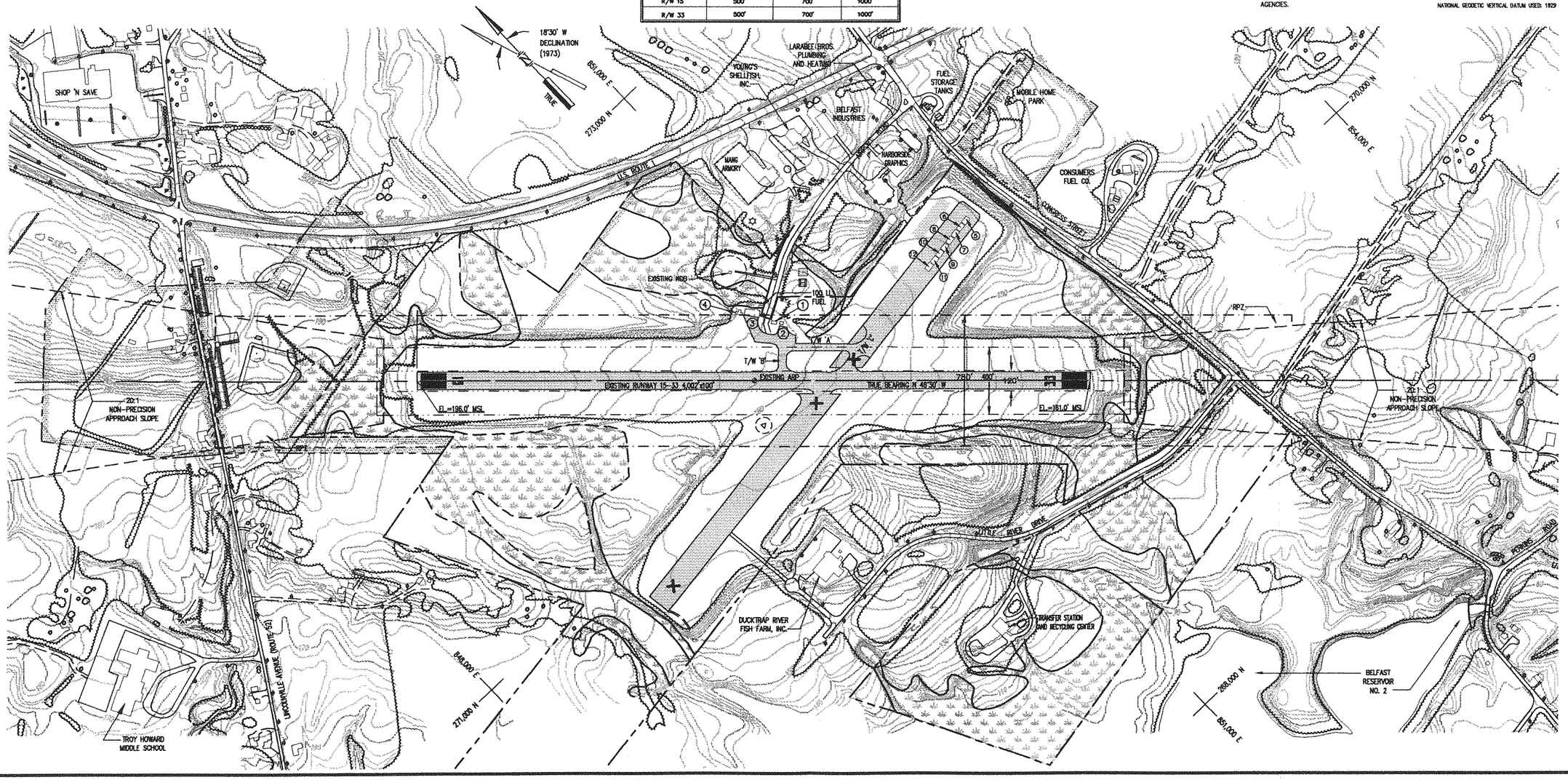


RUNWAY	INNER WIDTH (IW)	OUTER WIDTH (OW)	LENGTH (L)
R/W 15	500'	700'	1000'
R/W 33	500'	700'	1000'

LEGEND	EXISTING	ULTIMATE
PAVEMENT		
AIRPORT PROPERTY LINE		
AVIGATION EASEMENT		
FENCE LINE		
BUILDING		
TREE LINE		
AIRPORT REFERENCE POINT (ARP)		
WETLANDS (SKETCH-MAP LEVEL DELINEATION) **		
LIGHTED WINDCONE		
SEGMENTED CIRCLE		
MAINE STATE GRID TICKS		
UTILITY POLE		
CONTOURS (2-FOOT INTERVALS)	100	
AIRPORT BEACON		
OBJECT FREE AREA (OFA)		
RUNWAY SAFETY AREA (RSA)		
BUILDING RESTRICTION LINE (BRL) (NOTE: 20' BUILDING HEIGHT)		
DIRT ROADWAY		
BRUSH LINE		
RETAINING WALL		
LAND TO BE ACQUIRED IN FEE	N/A	
TREE CLEARING (ASSUME 60' TREES)	N/A	

** NOTE: INFO SHOWN ON PLAN IS SKETCH LEVEL ONLY AND DEPICTS POTENTIAL WETLANDS ON ARP PROPERTY. ANY DEVELOPMENT IN THE FUTURE SHOULD REQUIRE ON-SITE WETLAND DELINEATION, AND COORDINATION WITH ASSOCIATED ENVIRONMEN AGENCIES.

GRAPHIC SCALE
300 0 150 300 600
1 inch = 300 feet
NATIONAL GEODETIC VERTICAL DATUM USED: 1929



Dufresne-Henry, Inc.
22 Free Street
Portland
Maine 04101-3900
TEL. (207) 775-3211
FAX (207) 775-4434

Rev.	Description	By	Date

MAINE

BELFAST MUNICIPAL AIRPORT
AIP# 3-23-0007-01

EXISTING AIRPORT LAYOUT PLAN

BELFAST

Client No.	811005
Proj. Manager	C.L. NIEWOLA
Proj. Designer	C.L. NIEWOLA
Drawn By	M.R. STACEY
Checked By	C.L. NIEWOLA
Scale	1"=300'
Approved	D. C. DARGIE
Date	05-26-99

BST

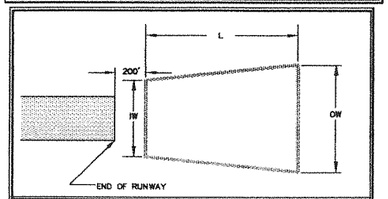
Sheet 2 of 7
D AS TITLED

RUNWAY DATA	EXISTING	ULTIMATE
% WIND COVERAGE (ALL WEATHER)	12 MPH 15 MPH R/W 15: 91.7% 53.3% R/W 33: 66.9% 89.3% COMBINED: 91.7% 95.7% CALMS: 28.9% 28.9%	SAME
PAVEMENT STRENGTH	30,000 LBS. SINGLE WHEEL	SAME
APPROACH SURFACES	R/W 15: 20:1 NP R/W 33: 20:1 NP	R/W 15: 20:1 NP R/W 33: 20:1 NP
RUNWAY MARKINGS	NON-PRECISION	NON-PRECISION
RUNWAY LIGHTING	MIRL	SAME
RUNWAY NAVAIDS	R/W 15: VASI-2L R/W 33: NONE	R/W 15: PAPI, REIL R/W 33: PAPI, REIL
RSA DIMENSIONS	120' X 240' BEYOND RUNWAY END	150' X 300' BEYOND RUNWAY END
EFFECTIVE GRADIENT	0.87%	SAME
RUNWAY END ELEVATIONS	R/W 15: 196.0' MSL R/W 33: 161.0' MSL	SAME
RUNWAY END COORDINATES	R/W 15: 44°24'48.414"N 69°01'04.105"W R/W 33: 44°24'21.250"N 69°00'24.071"W	SAME

EXISTING	ULTIMATE	BUILDINGS
①	Ⓐ	ADMINISTRATION BUILDING
②		STORAGE SHED
③		FBO HANGAR
④		PRIVATE T-HANGAR
⑤		PRIVATE CONVENTIONAL HANGAR
⑥		PRIVATE CONVENTIONAL HANGAR
⑦		PRIVATE CONVENTIONAL HANGAR
⑧		PRIVATE CONVENTIONAL HANGAR
⑨		PRIVATE CONVENTIONAL HANGAR
⑩		PRIVATE CONVENTIONAL HANGAR
⑪		PRIVATE CONVENTIONAL HANGAR
⑫		PRIVATE CONVENTIONAL HANGAR
	⑬	PRIVATE CONVENTIONAL HANGAR
	⑭	PRIVATE CONVENTIONAL HANGAR
	⑮	PRIVATE CONVENTIONAL HANGAR
	⑯	PRIVATE CONVENTIONAL HANGAR
	⑰ - ㉑	PRIVATE T-HANGARS

NOTE: EXISTING BUILDINGS 1-4 ARE TO BE REMOVED OR REPLACED WITH NEW BUILDINGS IN THE RELOCATED TERMINAL AREA.

AIRPORT DATA	EXISTING	ULTIMATE
AIRPORT ELEVATION	196.0' MSL	SAME
AIRPORT REFERENCE POINT	LAT. 44°24'34.873"N LONG. 69°00'44.124"W	LAT. 44°24'34.020"N LONG. 69°00'45.370"W
MEAN MAX. TEMP. (HOTTEST MO.)	81°F	SAME
TAXIWAY LIGHTING	NONE	MITL
TAXIWAY MARKING	CENTERLINE, SIGNAGE	SAME
AIRPORT/TERMINAL NAVAIDS	LIGHTED WINDCONE ROTATING BEACON/NDB	SAME
AIRPORT REFERENCE CODE (ARC)	BII	BII
ACREAGE OWNED IN FEE SIMPLE	221± ACRES	SAME
ACREAGE OWNED IN EASEMENT	80± ACRES	107± ACRES
USE/OWNERSHIP	PUBLIC/PUBLIC	SAME



RUNWAY	INNER WIDTH (IW)	OUTER WIDTH (OW)	LENGTH (L)
R/W 15	500'	700'	1000'
R/W 33	500'	700'	1000'

LEGEND	EXISTING	ULTIMATE
PAVEMENT		
AIRPORT PROPERTY LINE		SAME
AVIGATION EASEMENT		
FENCE LINE		
BUILDING		
TREE LINE		
AIRPORT REFERENCE POINT (ARP)		SAME
WETLANDS (SKETCH-MAP LEVEL DELINEATION) **		SAME
LIGHTED WINDCONE		SAME
SEGMENTED CIRCLE		SAME
MAINE STATE GRID TICKS		SAME
UTILITY POLE		SAME
CONTOURS (2-FOOT INTERVALS)		SAME
AIRPORT BEACON		
OBJECT FREE AREA (OFA)	NOT SHOWN *	
RUNWAY SAFETY AREA (RSA)	NOT SHOWN *	
BUILDING RESTRICTION LINE (BRL) (NOTE: 20' BUILDING HEIGHT)	NOT SHOWN *	
DIRT ROADWAY		SAME
BRUSH LINE		SAME
RETAINING WALL		SAME
TREE CLEARING(ASSUME 60' TREES)	N/A	

* REFER TO "EXISTING AIRPORT LAYOUT PLAN" (SHEET 2)

** NOTE: INFO SHOWN ON PLAN IS SKETCH LEVEL ONLY AND DEPICTS POTENTIAL WETLANDS ON AIRPORT PROPERTY. ANY DEVELOPMENT IN THE FUTURE SHOULD REQUIRE ON-SITE WETLAND DELINEATION, AND COORDINATION WITH ASSOCIATED ENVIRONMENTAL AGENCIES.

FOR APPROVAL BY FEDERAL AVIATION ADMINISTRATION

APPROVED BY: _____
MANAGER, AIRPORTS DIVISION

DATE: _____

FOR APPROVAL BY MAINE DEPARTMENT OF TRANSPORTATION/ OFFICE OF PASSENGER TRANSPORTATION

APPROVED BY: _____
DIRECTOR

DATE: _____

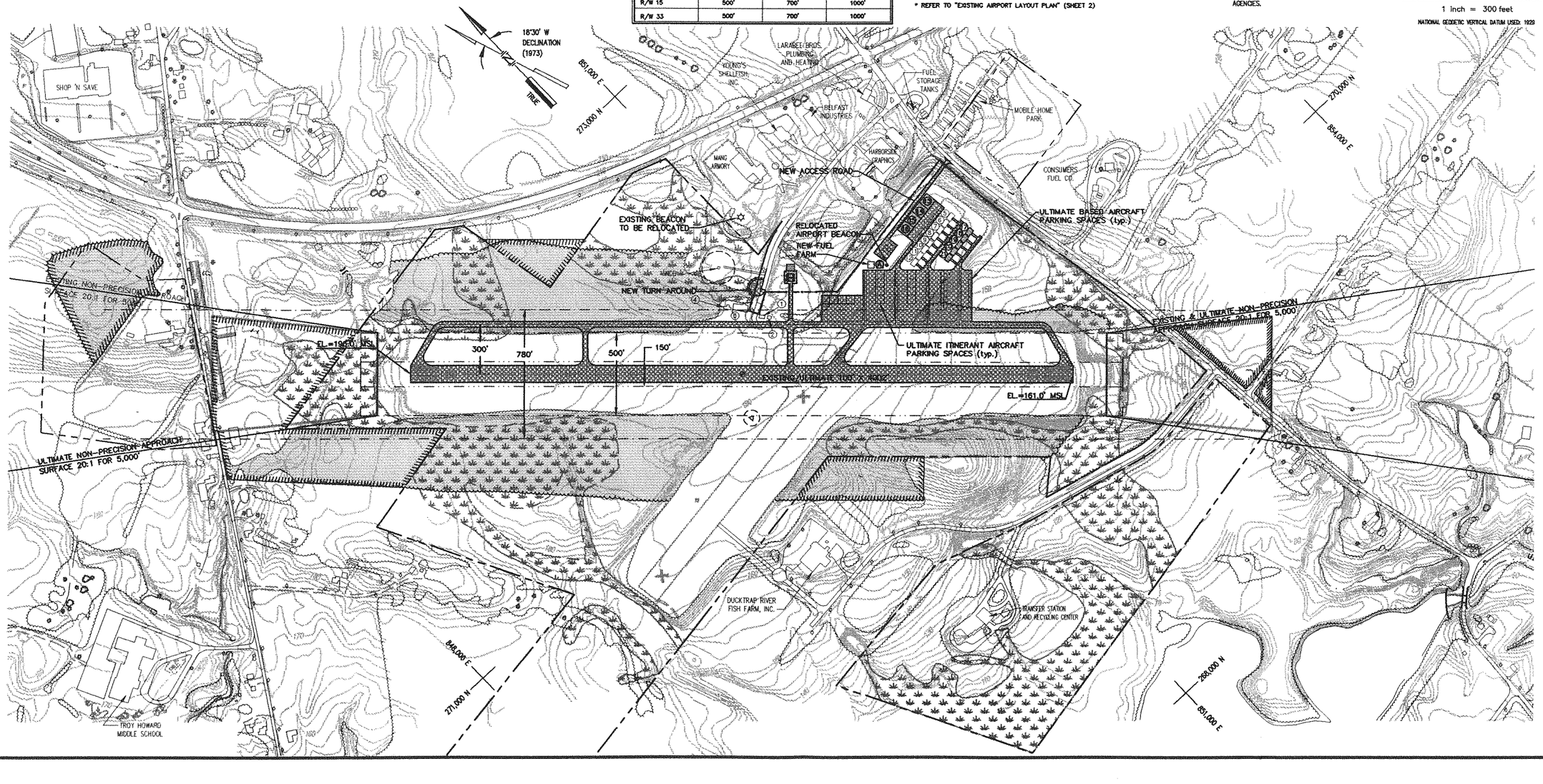
FOR APPROVAL BY CITY OF BELFAST, MAINE

APPROVED BY: _____
CITY MANAGER

DATE: _____

GRAPHIC SCALE
300 0 150 300 600
1 inch = 300 feet

NATIONAL GEODETIC VERTICAL DATUM USED: 1929



Dufresne-Henry, Inc.
22 Free Street
Portland, Maine 04101-3800
TEL. (207) 775-3311 FAX (207) 775-4434

Rev.	Description	By	Date

MAINE

BELFAST MUNICIPAL AIRPORT
AIP# 3-23-0007-01

ULTIMATE AIRPORT LAYOUT PLAN

BELFAST

Client No.	811005
Proj. Manager	C.L. NIEWOLA
Proj. Designer	C.L. NIEWOLA
Drawn By	M.R. STACEY
Checked By	C.L. NIEWOLA
Scale	1"=300'
Approved	D. C. DARGIE
Date	05-26-99

BST

Sheet 3 of 7
D AS TITLED

EXISTING	ULTIMATE	BUILDINGS
①	Ⓐ	ADMINISTRATION BUILDING
②		STORAGE SHED
③		FBO HANGAR
④		PRIVATE T-HANGAR
⑤		PRIVATE CONVENTIONAL HANGAR
⑥		PRIVATE CONVENTIONAL HANGAR
⑦		PRIVATE CONVENTIONAL HANGAR
⑧		PRIVATE CONVENTIONAL HANGAR
⑨		PRIVATE CONVENTIONAL HANGAR
⑩		PRIVATE CONVENTIONAL HANGAR
⑪		PRIVATE CONVENTIONAL HANGAR
⑫		PRIVATE CONVENTIONAL HANGAR
	⑬	PRIVATE CONVENTIONAL HANGAR
	⑭	PRIVATE CONVENTIONAL HANGAR
	⑮	PRIVATE CONVENTIONAL HANGAR
	⑯	PRIVATE CONVENTIONAL HANGAR
	⑰–㉑	PRIVATE T-HANGARS

AIRPORT DATA	EXISTING	ULTIMATE
AIRPORT ELEVATION	198.0' MSL	SAME
AIRPORT REFERENCE POINT	LAT. 44°26'34.873"N LONG. 89°00'44.124"W	LAT. 44°24'34.020"N LONG. 89°00'45.370"W
MEAN MAX. TEMP. (HOTTEST MO.)	81°F	SAME
TAXIWAY LIGHTING	NONE	MITL
TAXIWAY MARKING	CENTERLINE, SIGNAGE	SAME
AIRPORT/TERMINAL NAVAIDS	LIGHTED WINDCONE ROTATING BEACON/NDB	LIGHTED WINDCONE ROTATING BEACON
AIRPORT REFERENCE CODE (ARC)	BII	BII
ACREAGE OWNED IN FEE SIMPLE	221± ACRES	SAME
ACREAGE OWNED IN EASEMENT	80± ACRES	107 ± ACRES
USE / OWNERSHIP	PUBLIC/PUBLIC	SAME

NOTE: SPACING BETWEEN ULTIMATE CONVENTIONAL HANGARS MAY BE ALTERED AT THE TIME OF DESIGN/CONSTRUCTION TO MEET USER NEEDS.

LEGEND	EXISTING	ULTIMATE
PAVEMENT		
AIRPORT PROPERTY LINE		SAME
AVIGATION EASEMENT		
FENCE LINE		
BUILDING		
TREE LINE		
AIRPORT REFERENCE POINT (ARP)		SAME
WETLANDS (SKETCH-MAP LEVEL DELINEATION) **		SAME
LIGHTED WINDCONE	△	SAME
SEGMENTED CIRCLE		SAME
MAINE STATE GRID TICKS		SAME
UTILITY POLE	◇	SAME
CONTOURS (2-FOOT INTERVALS)	150	SAME
AIRPORT BEACON	☼	●
OBJECT FREE AREA (OFA)	NOT SHOWN *	
RUNWAY SAFETY AREA (RSA)	NOT SHOWN *	
BUILDING RESTRICTION LINE (BRL) (NOTE: 20' BUILDING HEIGHT)	NOT SHOWN *	
DIRT ROADWAY		SAME
BRUSH LINE		SAME
RETAINING WALL		SAME
TREE CLEARING(ASSUME 60' TREES)	N/A	

18°30' W
DECLINATION
(1973)

TRUE

** NOTE: INFO SHOWN ON PLAN IS SKETCH LEVEL ONLY AND DEPICTS POTENTIAL WETLANDS ON AIRPORT PROPERTY. ANY DEVELOPMENT IN THE FUTURE SHOULD REQUIRE ON-SITE WETLAND DELINEATION, AND COORDINATION WITH ASSOCIATED ENVIRONMENTAL AGENCIES.

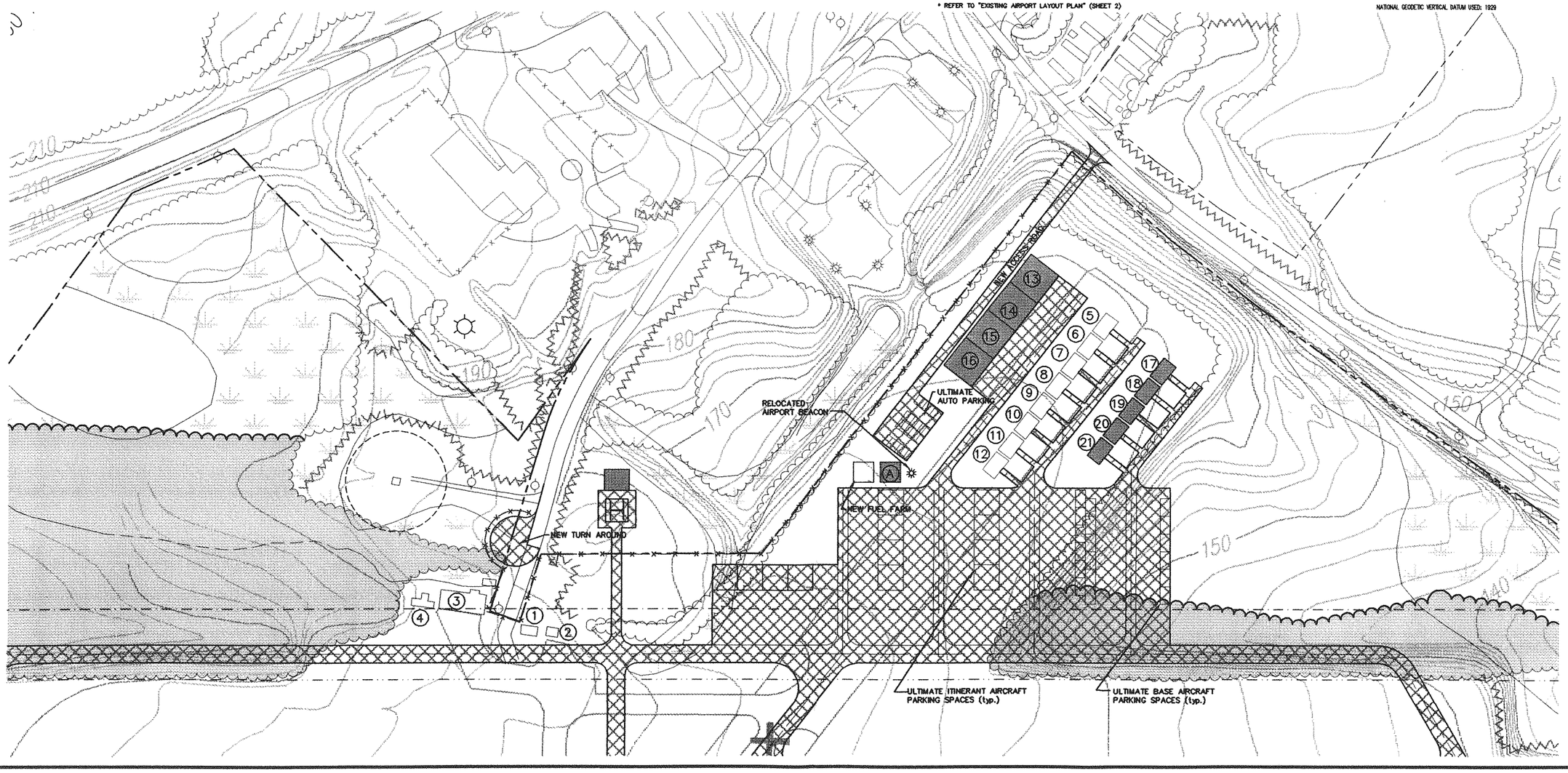
GRAPHIC SCALE

100 0 50 100 200

1 inch = 100 feet

* REFER TO "EXISTING AIRPORT LAYOUT PLAN" (SHEET 2)

NATIONAL GEODETIC VERTICAL DATUM USED: 1929



Dufresne-Henry, Inc.
22 Free Street
Portland
Maine 04101-3900
TEL. (207) 775-3311
FAX (207) 775-4434

MAINE	Rev.	Description	By	Date

BELFAST MUNICIPAL AIRPORT
AIP# 3-23-0007-01

TERMINAL AREA PLAN

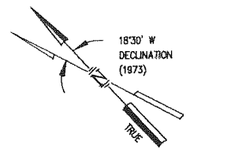
Client No.	811005
Proj. Manager	C.L. NIEWOLA
Proj. Designer	C.L. NIEWOLA
Drawn By	M.R. STACEY
Checked By	C.L. NIEWOLA
Scale	1"=100'
Approved	D. C. DARGIE
Date	05-26-99

BST

Sheet 4 of 7

D AS TITLED

BELFAST



	DESCRIPTION	PART 77 PENETRATION
A	TREES	YES
B	TREES	YES
C	TREES	YES
D	TREES	NO
E	TREES	NO
F	TREES	YES
G	TREES	NO
H	TREES	NO
I	TREES	NO
J	TREES	NO
K	TREES	NO
L	TREES	NO
M	TREES	NO
N	TREES	NO
O	TREES	NO
P	TREES	NO
1	FENCE	NO
2	BUILDING	NO
3	BUILDING	NO
4	BUILDING	NO
5	BUILDING	NO
6	BUILDING	NO
7	BUILDING	NO

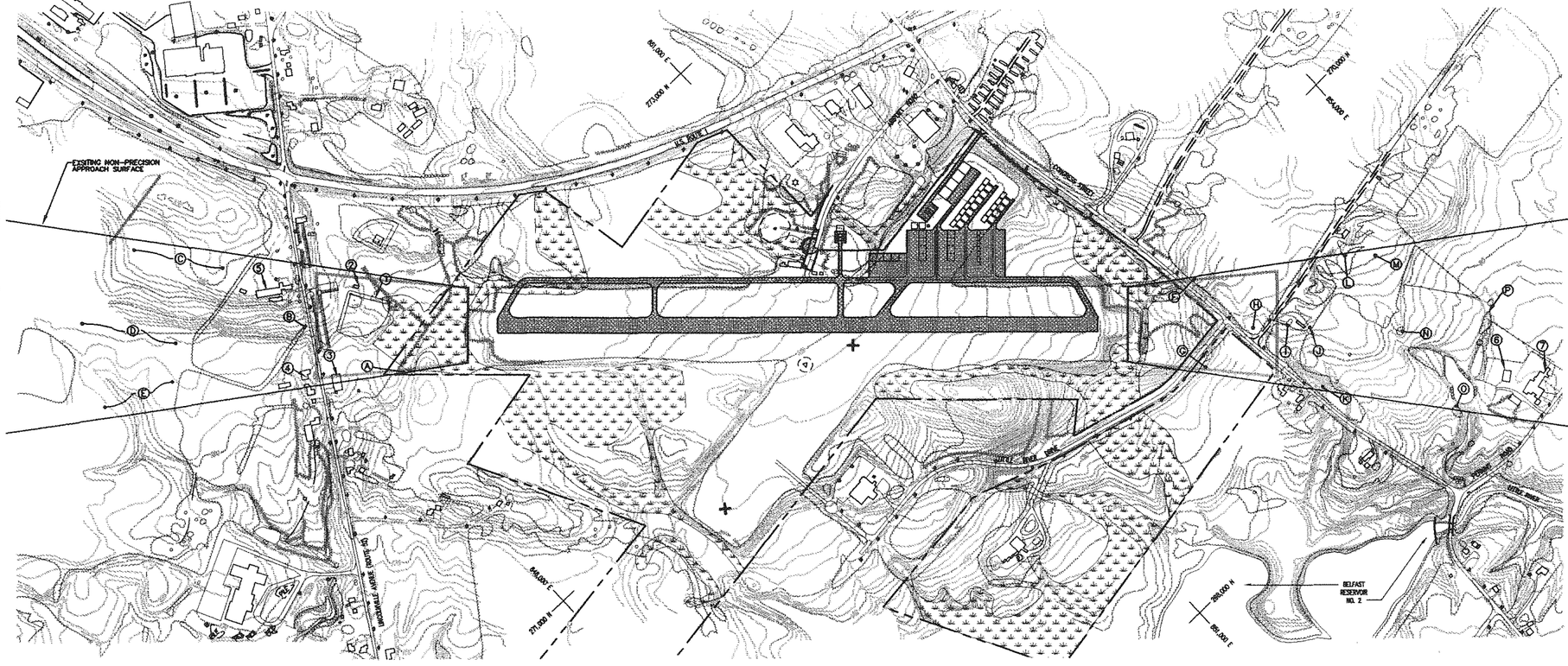
NOTE: INFO SHOWN ON PLAN IS SKETCH LEVEL ONLY AND DEPICTS POTENTIAL WETLANDS ON AIRPORT PROPERTY. ANY DEVELOPMENT IN THE FUTURE SHOULD REQUIRE ON-SITE WETLAND DELINEATION, AND COORDINATION WITH ASSOCIATED ENVIRONMENTAL AGENCIES.

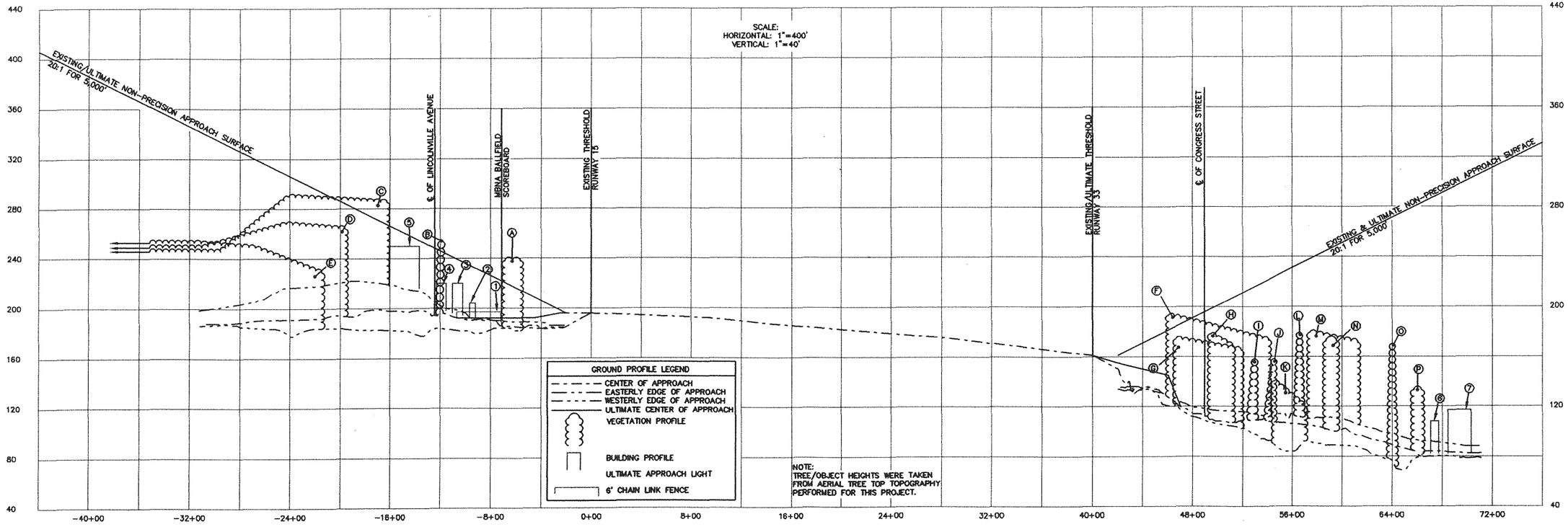
GRAPHIC SCALE

400 0 200 400 800

1 Inch = 400 feet

NATIONAL GEODETIC VERTICAL DATUM USED: 1929





Dufresne-Henry, Inc.
22 Free Street
Portland
Maine 04101-3900
TEL. (207) 775-3211
FAX (207) 775-4434

Rev.	Description	By	Date

MAINE

BELFAST MUNICIPAL AIRPORT
AIP# 3-23-0007-01

RUNWAY 15-33
APPROACH PLAN AND PROFILE

BELFAST

Client No.	811005
Proj. Manager	C.L. NIEWOLA
Proj. Designer	C.L. NIEWOLA
Drawn By	M.R. STACEY
Checked By	C.L. NIEWOLA
Scale	1"=400'
Approved	D. C. DARGIE
Date	05-26-99

BST

Sheet 5 of 7

D AS TITLED

LEGEND

TREE PENETRATION AREA
(ASSUMED 60' TREE HEIGHT)

GRAPHIC SCALE
2000 0 1000 2000 4000
1 inch = 2000 feet

Client No.	811005	
Proj. Manager	CLN	
Proj. Designer	DC	
Drawn By	CWM	
Checked By	JEG	
Scale	1"=2000'	
Approved	DCD	
Date	08-21-98	

BELFAST MUNICIPAL AIRPORT
AIP# 3-23-0007-01

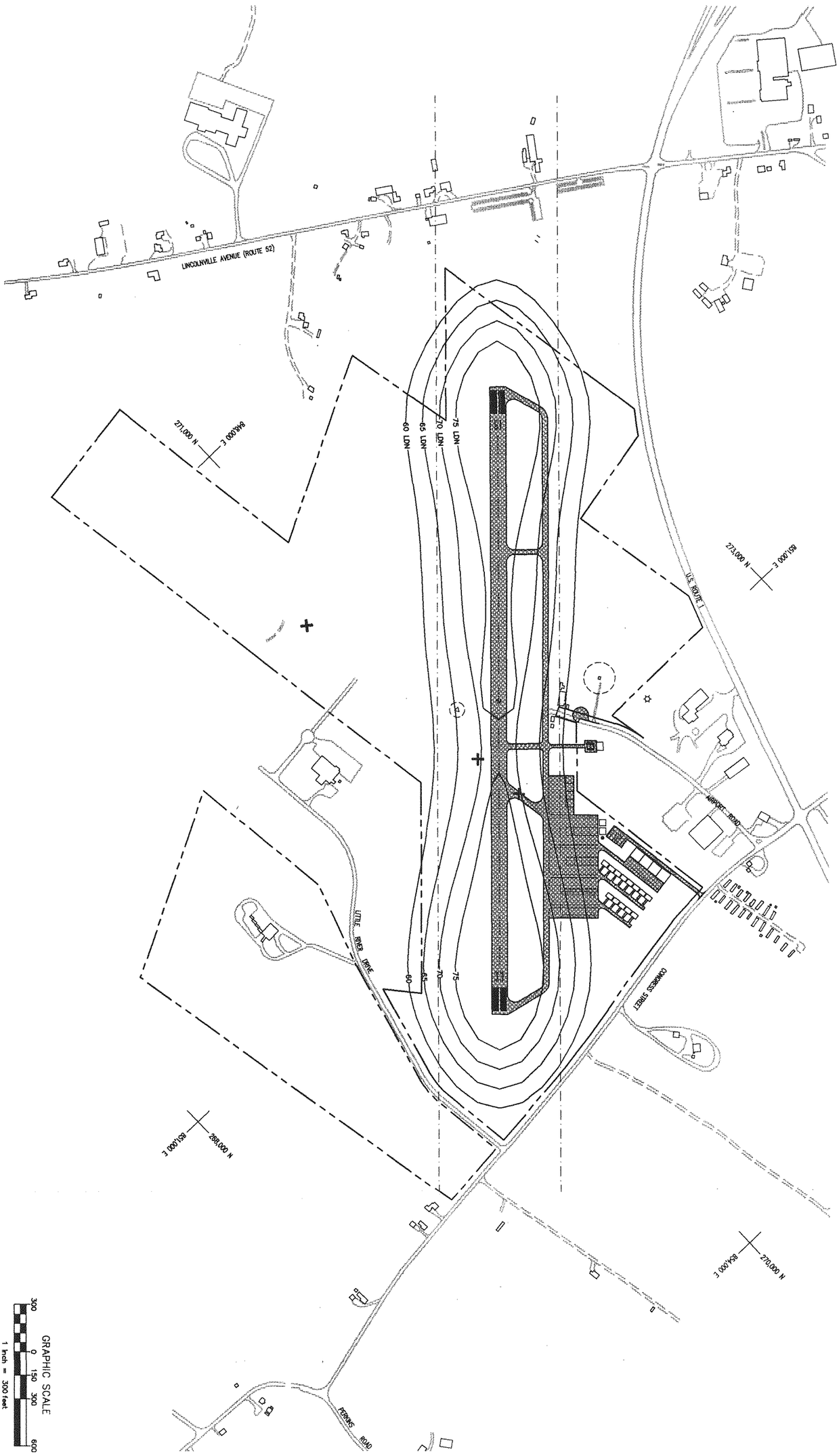
FAR PART 77
IMAGINARY SURFACES PLAN

BELFAST MAINE

Rev.	Description	By	Date

Dufresne-Henry, Inc.
22 Free Street
Portland, Maine
04101-3900
TEL. (207) 775-3211
FAX (207) 775-6434

Sheet 6 of 7



Sheet 7 of 7 DJAS TITLED	BST	Client No. B11005 Proj. Manager C.L. NIEWOLA Proj. Designer C.L. NIEWOLA Drawn By C.W. MILLS Checked By C.L. NIEWOLA Scale 1"=300' Approved D. C. DARGIE Date 05-26-99		BELFAST MUNICIPAL AIRPORT AIP# 3-23-0007-01 LAND-USE PLAN BELFAST MAINE	Rev.	Description	By	Date	Dufresne-Henry, Inc. 22 Free Street Portland, Maine 04101-3900 TEL. (207) 775-3211 FAX (207) 775-6434

Chapter Seven

ENVIRONMENTAL EVALUATION

PURPOSE AND INTENT

The intent of this chapter is to evaluate impacts associated with airport improvement projects recommended for Belfast Municipal Airport. This analysis is conducted pursuant to the guidelines presented in FAA Order 5050.4A, *Airport Environmental Handbook*, and FAA Order 1050.1D, *Policies and Procedures For Considering Environmental Impacts*. These FAA documents are based on the general requirements for compliance with the National Environmental Protection Act (NEPA).

The environment, which includes soils, wetlands, historic structures, topographic features, and hydrology, can dictate the location and layout of development projects at airports. This environmental analysis provides guidance and information regarding the extent of environmental permitting required for those recommended improvement projects.

The following environmental analysis evaluates 20 impact categories identified in FAA Order 5050. 4A that are required for FAA review of the recommended airport improvement projects.

EXISTING CONDITIONS

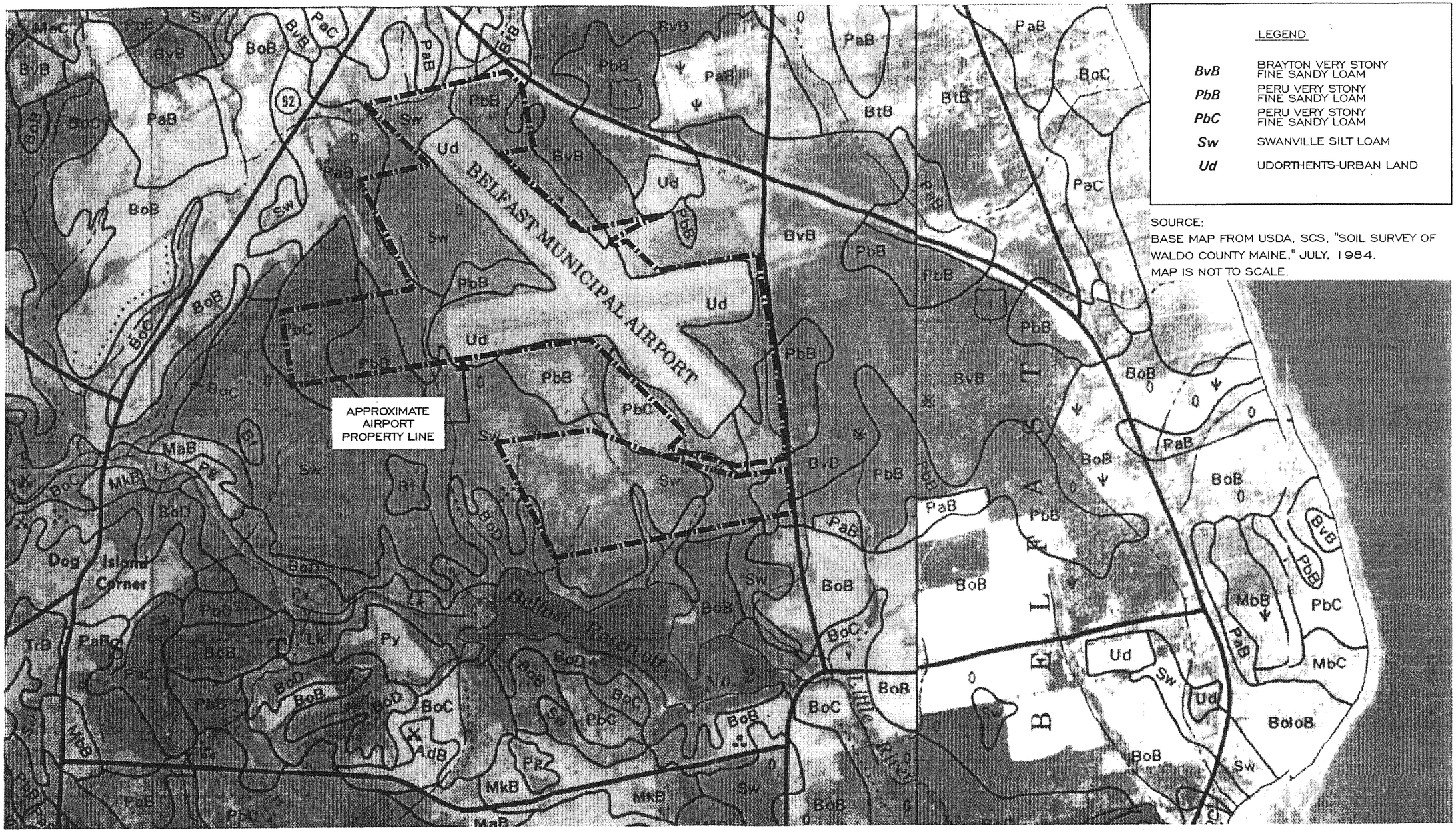
The City of Belfast, is located at the mouth of the Passagassawakeag River, which flows into Belfast Bay near the mouth of the Penobscot River. The Penobscot Bay region is rich in historical and cultural heritage that is similar to many traditional Maine-coast communities. Belfast also provides a variety of outdoor-recreational opportunities associated with its proximity to the Atlantic Ocean.

Belfast Municipal Airport is located approximately one mile southwest of the downtown business district of Belfast and just east of the U.S. Route 1 bypass, Maine's scenic coastal route. It also has easy access to Route 3, which provides a valuable link to Interstate 95 (i.e., Maine Turnpike).

BST consists of approximately 318 acres of land owned in fee simple by the City of Belfast. The airport is zoned Industrial I (IND I) based on the local zoning ordinance #614.0 (dated 1997). The IND I and Airport Growth (AG) zones surround BST to the south, north, and west. However, located to the east, the adjacent land is zoned General Purpose B (GP B).

The majority of the airport property is covered by an early successional upland community regenerating from a prior clear cut. It consists of small-diameter mixed hardwood/softwood types that include red maple (*Acer rubrum*) and white pine (*Pinus strobus*) with shrubs and saplings interspersed throughout. Along the runways, grasses and forbs occur. Palustrine forested (PFO) and Palustrine emergent (PEM) wetland areas also occur on airport property.

The soil types at BST are mapped by the Natural Resource Conservation Service (NRCS) in the *Soil Survey of Waldo County, Maine*. These soils are classified as Peru, Swanville, and Brayton (Figure 7-1). The Peru soils formed in compact glacial till derived mainly from mica schist and some granite. They are located on upland drumlin-shaped ridges and on side slopes of bedrock-influenced ridges sloping from three to 15 percent. These soils are moderately well drained. The depth to bedrock is generally more than five feet with a seasonal high-water table of one to two feet below the surface. The Swanville and Brayton soil series are both poorly drained soils with seasonal high-water tables at or near the surface most of the year. The Brayton soil series was formed in compact glacial till derived mainly from schist and gneiss. It is usually found along drainage ways and low-lying areas. The available water capacity of the Brayton soils is low and the depth to bedrock is generally greater than five feet. The Swanville soils consist of water-deposited sediments on low-lying marine plains and lacustrine plains. The available water capacity is high in these soils and the depth to bedrock is generally greater than five feet.



BST

FIGURE 7-1
BELFAST SOILS MAP

There are only a few water resources located on or in the vicinity of the airport property. Belfast Reservoir, a back-up drinking water supply, and Little River, a state-designated Class B waterbody, are located south of the airport within the same watershed.

ENVIRONMENTAL IMPACTS REVIEW

The following subsections evaluate each of the 20 impact categories identified in NEPA as they relate to the recommended airport improvement projects.

Noise. FAA Order 5050.4A does not require an analysis of aircraft noise at airports that serve aircraft with wingspans less than 79 feet and annual adjusted propeller-aircraft operations of less than 90,000 or jet operations of less than 700. This is because studies[1] have shown that the significant aircraft noise levels (i.e., 65 day-night average A-weighted sound level [Ldn]) can generally remain within the landing surface area of the airport. However, for the sake of identifying the approximate location of these contours, two aircraft noise modeling methods have been utilized. The first method, the Area Equivalent Method (AEM) is a computerized model that computes the approximate area of the 65 Ldn. The Ldn noise metric is commonly accepted for measuring aircraft noise. It is a measure of the average A-weighted sound levels (measured in decibels) over a 24-hour period; a 10-decibel penalty is normally applied to aircraft noise events occurring between 10:00 p.m. and 7:00 a.m. which correlates to the perceived increase in the level of noise events during those hours (i.e., less background noise to compare it to). Table 7-1 lists different "single-event" noise activities and their associated Ldns for comparison purposes (note that a comparison of average noise levels to single-noise event levels cannot be directly compared).

[1] FAA Report No. FAA-AS-71-1, *Developing Noise Exposure Contours for General Aviation Airports*

TABLE 7-1
BELFAST MUNICIPAL AIRPORT
SINGLE-NOISE EVENTS

NOISE EVENT	NOISE LEVEL (dBA)
Rustle of Leaves	10
Watch Ticking	30
Ordinary Conversation	60
Vacuum Cleaner	70
Garbage Disposal	80
Boeing 727 on Take-off From ¼ Mile	100
Rock-music Concert	110
Air-raid Siren	130

Source: Dufresne-Henry, Inc., research.

The 65 Ldn has been used as the threshold for significant aircraft noise levels because it is at this level that noise will interfere with normal conversation levels. The AEM is a planning tool used to identify the relative changes in the noise-contour area. A 17-percent increase in this area is defined as statistically significant and requires further evaluation using a more sophisticated modeling procedure (i.e., FAA's Integrated Noise Model [INM]). Because daily operations are anticipated to grow during the planning period from 58 to 74 operations and the runway length to increase by 250 feet, the area of the 65 Ldn grew as well; almost a 30-percent increase (keep in mind that the area of the 65-Ldn contour was estimated by the AEM at 0.07 square miles under existing conditions and it grew to an estimated 0.09 square miles by the end of the planning period).

The second method of noise analysis employed is the FAA's INM (version 4.11). The INM uses mathematical models to predict noise levels for numerous aircraft types. Specific data is required by this model to properly determine the associated aircraft noise contours for BST. Obtaining accurate data is difficult particularly at small, general-aviation airports because there is

no record of the aircraft types, flight tracks, or operational frequency. Using estimates of this data, approximate aircraft noise contours can be developed for both existing and future activity levels. Because of the uncertain accuracy of these operational estimates, the actual noise contours may vary from those computed by the INM. Results of this analysis under existing activity levels indicate that the 65-Ldn noise contour lies roughly 410 feet to the south of Runway 33, wholly within airport property. The existing 65-Ldn noise contour extends approximately 460 feet to the north of Runway 15, just cropping the edge of the airport property line. Under the proposed conditions, the 65-Ldn noise contour is expected to extend to the south of Runway 33 by approximately 450 feet and to the north of the Runway 15 threshold by approximately 550 feet. This noise contour can be wholly contained in the long term on airport property at the south end of the runway, but extends slightly beyond the property boundary on the north end.

Because the 65-Ldn noise contour extends beyond the airport property boundaries in the long term, the potential exists for noise impacts on the south side of Lincolnville Avenue. Further coordination with MBNA would help the city ensure that only compatible development continues to be proposed for this area.

Even though the area to the east of the runway and north of the terminal area has not yet been developed, it does fall within the 65-Ldn noise contours for both the existing and proposed conditions. To prevent potential noise impacts on this parcel, the city should ensure that only compatible land uses are allowed to develop there. An even better option would be to acquire, at a minimum, an avigation easement over that portion of the parcel that falls within the 65-Ldn noise contour; it may also be prudent to acquire enough of this parcel in fee simple, if not all of it, to protect for potential noise imipacts as well as to meet the airport improvement needs of the future.

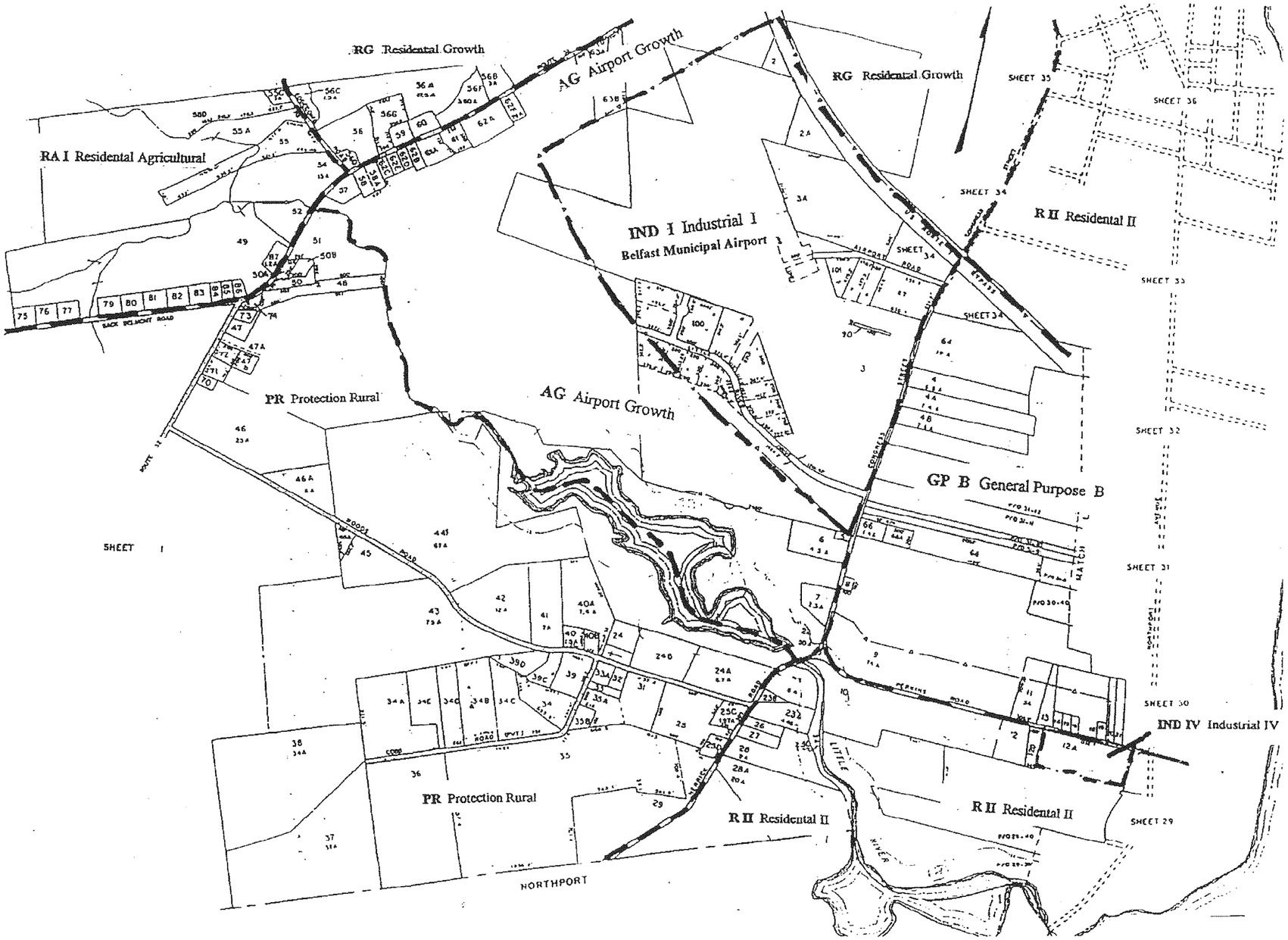
Compatible Land Uses. According to FAA Order 5050. 4A, the compatibility of existing and planned land uses in the vicinity of an airport are usually associated with the extent of potential noise impacts from aircraft at the airport. The noise analysis previously described found potential aircraft-noise impacts in the long-term period that resulted from increased operations anticipated to occur in the future. The impacts occur near the south side of Lincolnville Avenue;

however, as previously mentioned, the developer (MBNA) has already removed these residences, the only concern is then on proposed land uses for this area and the area to the east of the runway. The city should consider acquiring, at a minimum, an avigation easement in each of the off-airport areas impacted by the 65-Ldn noise contour or provide appropriate zoning language that would discourage incompatible development in these areas.

FAA Order 5050. 4A, also states, "The land-use section of an environmental assessment shall include documentation to support the required sponsor's assurance under Section 511 (a)(5) of the 1982 Airport Improvement Act that appropriate action, including the adoption of zoning laws, has been or will be taken, to the extent reasonable to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations including landing and takeoff of aircraft. The assurance must be related to existing and planned land uses."

The City of Belfast Zoning Map of 1997 for the airport vicinity, presented as Figure 7-2, indicates several land-use designations adjacent to and in the vicinity of the airport. The IND I and AG zones permit manufacturing, processing, and industrial activities which are considered compatible land uses with the airport. The GP B zone includes a small residential cluster development on the east boundary of the airport. This zone permits manufactured housing, nonprofit recreational activities, agriculture, educational institutions, and health care facilities. This zone does allow uses that could be incompatible with the airport.

The GP B zone allows incompatible land uses with the airport and needs to be addressed. The City of Belfast should consider amending the GP B zone to prevent further development of residential housing or the encroachment of any other land uses considered incompatible with the airport.



LEGEND

———	PROPERTY BOUNDARY
- - - -	ZONE BOUNDARY
AG	AIRPORT GROWTH
IND I	INDUSTRIAL I
IND IV	INDUSTRIAL IV
R II	RESIDENTIAL II
RG	RESIDENTIAL GROWTH
GP B	GENERAL PURPOSE B
PR	PROTECTION RURAL

SOURCE:
BASE MAP PREPARED FOR CITY OF BELFAST, ME. BY EASTERN MAPPING SERVICES, NEWBURGH, ME., UPDATED APRIL 1, 1996. MAP NOT TO SCALE.

BST

FIGURE 7-2
BELFAST ZONING MAP

Social Impacts. Social impacts are typically associated with large projects that cause community disruption. In accordance with FAA Order 5050.4A, community disruptions include projects that relocate any residence or business; alter surface transportation patterns; divide or disrupt established communities; disrupt orderly, planned development; or create an appreciable change in employment. Acquisition of avigation easements in the runway protection zone to Runway 33 will affect approximately 3.7± acres of land. The acquisition of land, which already contains an avigation easement, to protect the ultimate object free area for Runway 15 will likely impact one property. This property used to be residential in nature with several outbuildings. Since the aerial photogrammetry was obtained for this AMPU, MBNA has purchased this land and removed the existing structures.

Induced Socioeconomic Impacts. Induced socioeconomic impacts are usually associated with large, airport-improvement projects. They are considered actions that would have secondary impacts on the surrounding community by causing shifts in population patterns and changes in public service demand and in businesses. Induced socioeconomic impacts will normally not be significant except where there are also significant impacts in other categories, especially noise, land use, or direct social impacts.

The projects recommended for BST are not anticipated to result in any adverse socioeconomic impacts. However, beneficial socioeconomic impacts to the community may occur over time as tourism and business opportunities increase with the implementation of recommended airport improvements.

Air Quality. Section 176 (c) of the Clean Air Act Amendments of 1977 states, in part, that no federal agency shall engage in, support in any way, provide financial assistance for, license, permit, or approve, any activity which does not conform to a state implementation plan for meeting air quality standards after it has been approved or promulgated under Section 110 of that Act. It is FAA's responsibility to assure that federally funded airport actions conform to state plans for controlling area-wide air-pollution impacts.

FAA Order 5050. 4A also indicates that any general-aviation airport projecting less than 180,000 aircraft operations annually does not require an air-quality analysis as part of an environmental

assessment. The projected number of aircraft operations at Belfast Municipal Airport is 22,200 in the year 2014. This is significantly below the 180,000 aircraft operations threshold for an air-quality review. Therefore, no significant impacts to air quality are anticipated.

Water Quality. There are no significant surface-water resources located on airport property. There are also no known significant sand and gravel aquifers mapped by the Maine Geological Survey Department in the vicinity of the airport. There are two intermittent streams located along the east and west airport property lines. These streams drain south, toward the Belfast Reservoir and Little River.

The Swanville soil type located at BST is poorly drained and considered a hydric, wetland soil. Wetlands can provide flood storage for storm water and have the potential to improve water quality by filtering out contaminants that may enter into the surface water.

The potential threat to water quality is present at BST as a result of aviation activities. The Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act of 1977, provides the authority to establish water quality standards and control discharges into surface and subsurface waters bodies. Section 402 of the Clean Water Act (33 U.S.C. 1344) gave the Environmental Protection Agency (EPA) authority to regulate certain high priority stormwater discharges. On September 29, 1995 the EPA published the *Final National Pollution Discharge Elimination System (NPDES) Multi-Sector General Permit for Industrial Activities* (FR Vol. 60 No. 189). Under this regulation, all airports are required to file a Notice of Intent (NOI) to the EPA and prepare a Storm Water Pollution Prevention Plan (SWPPP). This plan should describe management techniques and practices used at the airport that minimize pollutants in storm water.

The projects recommended for BST have the potential to impact water quality. The recommended airport improvement projects will relocate the fueling facilities and the majority of aviation activities closer to the intermittent stream that parallels Congress Street and flows into the Little River. The construction phase of any project also has the potential to impact water quality. These impacts can be minimized by the proper use of Best Management Practices (BMP) for construction including the implementation of erosion and sedimentation controls measures.

Department of Transportation Act, Section 4(f). Section 4(f) of the Department of Transportation Act requires that the Secretary of Transportation investigate all alternatives before impacting any publicly owned lands designated as public parks, recreation areas, wildlife or waterfowl refuges of national, state, or local significance, or land having national, state, or local historical significance. There are no properties that qualify under Section 4(f) of the Department of Transportation Act at the Belfast Municipal Airport. Therefore, no impact on Section 4(f) lands are anticipated.

Historic, Architectural, Archeological, and Cultural Resource. The Maine Historic Preservation Commission was contacted to determine if there are any resources of historic, architectural, archeological, or cultural significance located adjacent to or in the vicinity of BST. The State Historic Preservation Officer (SHPO) reviewed the project area and found no properties with the above characteristics to be located within the project area. Therefore, no impacts upon these resources are anticipated.

Biotic Communities of Flora and Fauna. The majority of the airport property is covered by a forest community regenerating from a prior clear cut. It consist of small, mixed hardwood/softwood types that include red maple and white pine with shrubs and saplings interspersed throughout. Along the runways, grasses and forbs occur. Palustrine forested (PFO) wetland and palustrine emergent (PEM) wetland areas have also been identified and located on airport property.

According to Maine Department of Inland Fisheries and Wildlife (MDIFW) records, a mapped indeterminate-value deer-wintering area was associated with the Belfast Airport Industrial Park. A cursory survey conducted by the MDIFW in 1989 indicated that this area did not represent quality winter shelter for deer. However, it is likely that deer presently winter along the north shore of the Belfast Reservoir just at the edge of the Belfast Airport Industrial Park boundary. The U.S. Fish and Wildlife Service, the MDIFW, and the Maine Natural Areas Program have determined that there are no essential or significant wildlife habitats or exemplary natural communities known to be associated with this site.

Endangered and Threatened Species of Flora and Fauna. The Natural Areas Program, MDIFW, and the U.S. Fish and Wildlife Service were contacted to identify rare, threatened, and endangered species and exemplary natural communities on and in the vicinity of the airport. All three agencies indicated that their current files show no record of occurrences for any listed species within the vicinity of the airport. Therefore, no significant impact is anticipated.

Wetlands. A review of the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) map, the Waldo County Soil Survey, and a wetlands sketch map by Jones Associates, of Poland Springs Maine, identifies PFO and PEM wetlands on the airport property (Figure 7-3).

Wetlands are regulated at many levels of government. The federal regulations, implemented by the Army Corps of Engineers are based on Section 404 of the Clean Water Act. The State of Maine regulates wetlands through the Natural Resource Protection Act. The City of Belfast regulates wetlands through the Mandatory Shoreland Act, Title 38 M.R.S.A. Section 435-448. The Department of Environmental Protection's Shoreland Zoning guidelines stipulate that the resource protection district must be applied to moderate to high-value wetlands identified by the MDIFW.

MDIFW has identified no moderate- to high-value wetlands near any of the recommended improvement projects.

The recommended projects for BST have been prioritized and separated into development phases (see Table 5-3). The projects recommended in the short-term that will impact wetlands and may require permitting are the construction of a new aircraft apron and a partial parallel taxiway. Because wetland impacts are anticipated to result from some of the recommended airport improvement projects, an environmental assessment must be prepared. An environmental assessment is required in accordance with NEPA when a "federal action" (i.e., use of federal funds to implement an airport

NOTE:

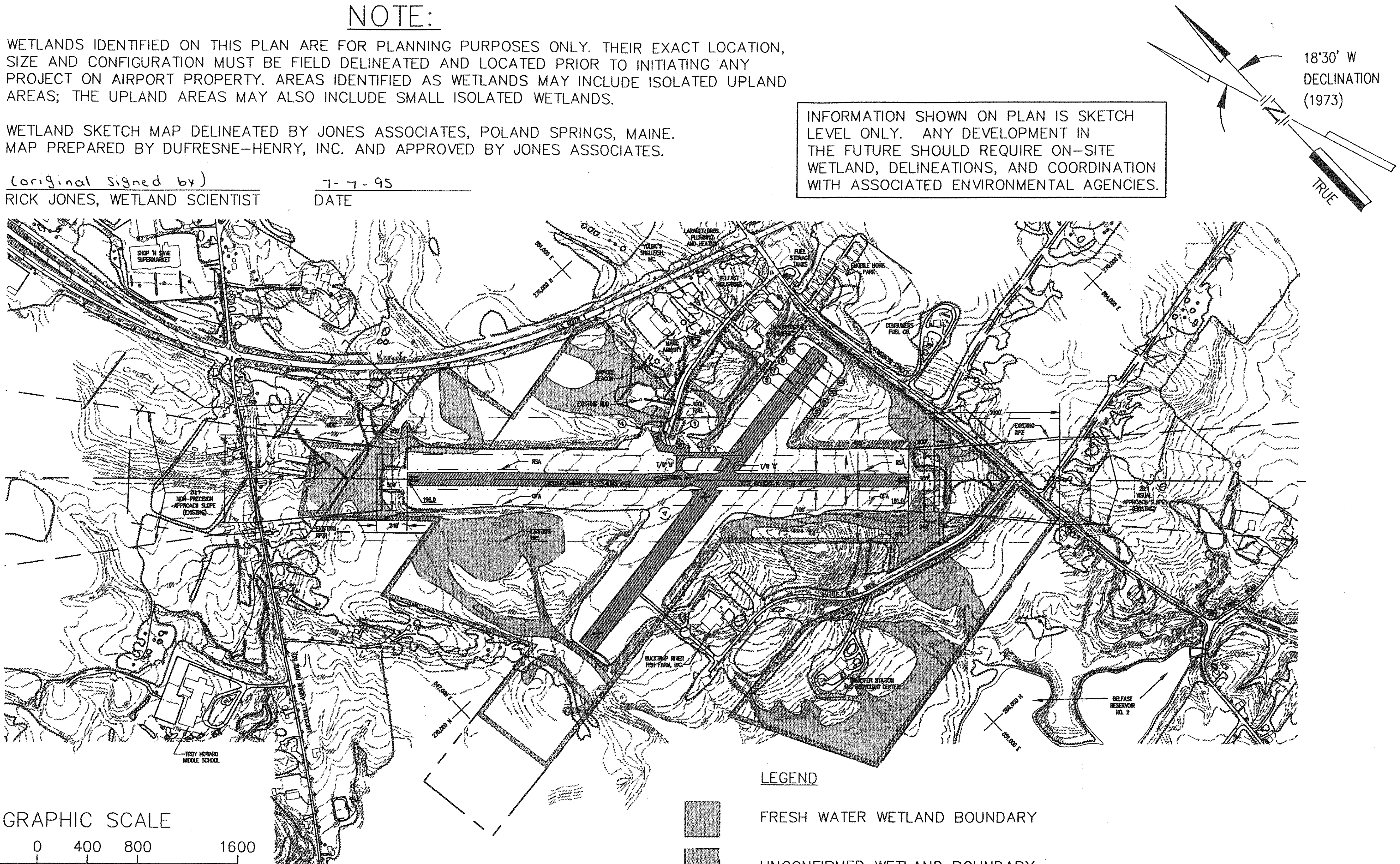
WETLANDS IDENTIFIED ON THIS PLAN ARE FOR PLANNING PURPOSES ONLY. THEIR EXACT LOCATION, SIZE AND CONFIGURATION MUST BE FIELD DELINEATED AND LOCATED PRIOR TO INITIATING ANY PROJECT ON AIRPORT PROPERTY. AREAS IDENTIFIED AS WETLANDS MAY INCLUDE ISOLATED UPLAND AREAS; THE UPLAND AREAS MAY ALSO INCLUDE SMALL ISOLATED WETLANDS.

WETLAND SKETCH MAP DELINEATED BY JONES ASSOCIATES, POLAND SPRINGS, MAINE.
MAP PREPARED BY DUFRESNE-HENRY, INC. AND APPROVED BY JONES ASSOCIATES.

(original signed by) — RICK JONES, WETLAND SCIENTIST

7-7-95 — DATE

INFORMATION SHOWN ON PLAN IS SKETCH LEVEL ONLY. ANY DEVELOPMENT IN THE FUTURE SHOULD REQUIRE ON-SITE WETLAND, DELINEATIONS, AND COORDINATION WITH ASSOCIATED ENVIRONMENTAL AGENCIES.



LEGEND

- FRESH WATER WETLAND BOUNDARY
- UNCONFIRMED WETLAND BOUNDARY
- LIMIT OF WETLAND SKETCH MAP DELINEATION

GRAPHIC SCALE

800 0 400 800 1600

1 inch = 800 feet

BST

FIGURE 7-3
WETLAND SKETCH MAP

improvement project) has the potential to impact the environment. Because of the dynamic nature of environmental regulations and the difficulty in realistically predicting development on and in the vicinity of the airport, an environmental assessment will most likely be required during each planning term. If the projects are delayed or prioritized differently, then it may be possible to delay the preparation of an environmental assessment as well.

The wetlands identified for the AMPU were conducted at a sketch level of delineation. Prior to initiating any of the recommended airport improvement projects, the wetlands need to be fully delineated to determine the exact extent of wetland impact. Of the three development alternatives evaluated in the previous chapter, the recommended alternative will impact the least amount of wetland area.

Floodplains. The National Flood Insurance Program is administered by the Federal Emergency Management Agency (FEMA). The program is designed to provide flood insurance for existing properties and to discourage additional development within the 100-year flood plain.

FEMA has conducted a detailed flood study of the 100-year floodplain within the City of Belfast. The Flood Insurance Rate Map for Belfast indicates that none of the recommended development projects will impact the 100-year floodplain.

Coastal Zone Management. The Maine Coastal Zone Management Program (Maine Coastal Program) was created by the state and approved by the National Oceanic and Atmospheric Administration in 1978, pursuant to the Federal Coastal Zone Management Act of 1972. The program is administered by the State Planning Office (SPO). A letter of concurrence with the federal consistency requirements (15 CFR Part 930), or a waiver, is required for activities using federal funds in a municipality located within the coastal zone.

The City of Belfast is within the coastal zone and a letter of concurrence is necessary for all federally funded airport improvement projects.

Coastal Barriers. Under Title 38 M.R.S.A. Section 1904, Maine Coastal Barrier System, there are no coastal barriers identified in the vicinity of BST. Therefore, no potential coastal barriers impacts are anticipated.

Wild and Scenic Rivers. There are no water resources in the vicinity of the airport which are designated as a "wild or scenic river" by the U.S. Department of the Interior's National Park Service.

Farmland. According to the Farmland Protection Policy Act (FPPA), P.L. 97-98, "prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops." The NRCS of Waldo County, Maine, has determined that there is no prime or unique farmland located on BST.

Energy and Natural Resources. None of the airport improvement projects recommended for Belfast Municipal Airport will have a significant demand on the existing available energy supply nor will there be any significant demand on any natural resource.

Light Emissions. Light emissions refer to the potential for creating an annoyance to residents in the vicinity of the lighting installation. The recommended development projects include the addition of MITLs along the taxiway. It is not expected that these lights will create significant additional light emission off airport property.

Solid Waste. BST currently produces minimal amounts of solid waste. Solid waste is collected in receptacles placed at various locations in the airport terminal area and disposed of by the City of Belfast. The anticipated increase in solid waste will be proportional to the increase in use of the airport and will be addressed during the state-level environmental permitting process.

Construction Impacts. Construction impacts have the potential to create temporary environmental impacts at the airport. These impacts typically are associated with noise of construction equipment, dust associated with earth moving, air pollution from burning debris or engine exhaust, and water pollution from soil disturbance and erosion.

All of the evaluated alternatives will have some degree of temporary construction impact. The recommended projects would have greater impacts because of their proximity to Congress Street and the residential development along Congress Street.

Construction impacts can, however, be mitigated by using responsible design practices, appropriate project scheduling, and erosion and sedimentation control plans. It is recommended that the proposed project specifications include the provisions of FAA Advisory Circular 150/5370, *Standards for Specifying Construction of Airports*.

ENVIRONMENTAL IMPACT SUMMARY

Environmental rules and regulations change frequently. As a result, a thorough investigation of all current rules and regulations is necessary prior to initiating any recommended airport improvement project.

The U.S. Fish and Wildlife Service, the MDIFW, and the Maine Natural Areas Program have indicated that there are no known rare, threatened, or endangered species or exemplary natural communities located on or in the vicinity of the airport property. The SHPO has also indicated that there are no known historic, archeological, or cultural resources located on or in the vicinity of the airport.

There are no significant water bodies located on Belfast Municipal Airport property. However, the recommended airport improvement projects pose the potential to adversely impact water quality. The Belfast Reservoir and Little River receive runoff and stream flow from BST. These valuable municipal water resources may be threatened by the recommended improvement projects. Protection of these water resources should be considered during the design phase of each project.

BST has a Site Location of Development Permit for the existing airport facility. Prior to conducting any recommended improvement projects an "Application for Project Modification" or an "Amendment to the Existing Site Location Permit" will be required.

The zoning designation GP B includes a small residential cluster on the northeast boundary of the airport and permits manufactured housing, nonprofit recreational activities, agriculture, educational institutions, and health care facilities. This zone allows land uses that are considered incompatible with the airport as defined by FAA Order 5050. 4A. It is recommended that the City of Belfast amend its zoning ordinance to prevent further residential development and other incompatible land uses within the GP B zone.

Prior to initiating any of the recommended projects, a full wetland delineation will need to be conducted to determine the actual wetland boundaries and the extent of the impacts associated with the recommended projects. Once the wetland impacts have been identified, the required level of permitting to meet the state and federal criteria can be determined. This AMPU is proposing the preparation of environmental assessment(s) that will address the impacts associated with the recommended acquisitions.

The recommended improvement projects at BST have been prioritized into development phases (see Table 5-3). The recommended projects that will impact wetlands and may require permitting in the short-term are the construction of a new aircraft parking apron and a partial parallel taxiway. The recommended improvement projects have the least amount of wetland impact area of the alternatives evaluated in Chapter Five.

NEPA, implemented through FAA on airport projects, encompasses all environmental regulations at the federal level. NEPA requires all major actions that utilize federal funds and impact environmental resources prepare an environmental assessment. The recommended projects in the short term that will impact environmental resources are the construction of a new aircraft parking apron and a partial parallel taxiway. These projects will require an environmental assessment, if federal funds are used.

Beyond the 20-year planning period, the community asked that the AMPU consider the addition of a runway extension to accommodate larger aircraft on Runway 15-33. If demand for this extension comes to fruition, the airport will need to prepare a thorough alternatives analysis and environmental investigation. A project of this magnitude would impact many of the 20 impact categories listed previously. Impacts to wetlands, the potential relocation of roads, residents,

and an intermittent stream, and the proximity of the Residential II zone are just a few of the issues that will need to be addressed should this project become a reality.

Chapter Eight

FINANCING AND DEVELOPMENT PLAN

AIRPORT PROJECT FINANCING

Schedules of proposed development at BST resulting from recommendations proposed previously in this AMPU and estimates of development costs are presented in this chapter. Development projects are listed by three time periods: short term (zero to five years), intermediate term (six to 10 years), and long term (11 to 20 years). It is more appropriate, however, to think of these time periods in terms of safety needs and demand levels; those projects needed to correct safety deficiencies (short term), those needed to correct capacity issues (intermediate term), and those needed to meet future demand levels (long term). Through the development of these schedules, the goal is to produce a realistic plan for implementing improvements at BST. The schedule for short-term improvements will be utilized by the MDOT/OPT to create a capital improvement plan (CIP) for the airport. The CIP will serve as a guide to the MDOT/OPT and FAA in making decisions regarding funding future projects at the airport.

At the end of this chapter are tables that list detailed cost estimates for the schedule of recommended airport improvements during each term. The tables identify the anticipated financial responsibility for each of the airport improvements as being from the FAA, MDOT/OPT, airport sponsor, and/or private sources.

Project cost estimates developed herein are based on construction costs of airport-improvement projects that were identified in Chapter Four and further refined in Chapter Five. In addition to estimated construction costs, an estimate of planning, design, and environmental permitting efforts, as well as other construction items and contingencies not specifically enumerated previously, have also been provided.

After total project cost estimates were calculated, the respective amounts funded by federal, state, and local or private enterprises were determined. Under current federal legislation, the FAA can reimburse up to 90 percent of the project costs eligible for consideration through the Airport Improvement Program (AIP). The remaining 10 percent of the eligible project costs is divided evenly between the MDOT/OPT and the airport sponsor. AIP-eligible projects generally include airfield components (i.e., runway reconstruction, taxiway construction, new aircraft parking aprons), land and equipment acquisition, as well as airport-planning and environmental documents. Projects typically not eligible for AIP funds include hangars, automobile parking lots, and FBO facilities because these are viewed as potential revenue generators. Maintenance activities, such as mowing and annual pavement striping, are also considered ineligible for AIP funds at this time, however, this may be changing. Some ineligible projects, such as taxilane construction or pavement overlay work, can be funded by the MDOT/OPT at an 80/20-percent split for state/local funds, while others are 100-percent locally or privately funded, or some combination of the two. Other funding sources that are typically available to the larger hub airports, such as passenger facility charges (PFCs) and airline funds, are not available to most small, general-aviation airports due to the low numbers of passengers and lack of scheduled air service by airlines.

Construction cost estimates listed in Tables 8-2 through 8-5 are based on 1997 dollar values. These costs could undoubtedly rise in the future, possibly by 2 to 4 percent per year as a result of inflation. To compute up-to-date cost estimates, refer to the Construction Cost Index (CCI) of *Engineering News Record*, a weekly, nationwide civil engineering and construction magazine published by The McGraw-Hill Companies. The CCI is revised every week, and averaged every year, to reflect changes in typical labor rates and construction-material costs. Based on an index of 100 for the year 1913, recent CCI annual averages are listed in the following table.

TABLE 8-1
BELFAST MUNICIPAL AIRPORT
CONSTRUCTION COST INDEX

YEAR	CCI
1985	4,195
1990	4,732
1991	4,835
1992	4,985
1993	5,210
1994	5,408
1995	5,471
1996	5,701
1997	5,825

Source: *Engineering News Record*, McGraw-Hill Co., March 31 and May 26, 1997.

The average construction-cost rate rose by 2.4 percent annually between 1985 and 1990. In the most recent five-year period (1992 to 1997), the rate increased by 3.16 percent annually. By applying future CCI numbers as they are determined, cost estimates in this chapter can be updated to more accurately reflect ongoing inflationary factors. An example of computing future project costs using this information is as follows:

$$\frac{\text{(1997 project costs) x (future CCI)}}{\text{(1997 CCI = 5,825)}} = \text{future project costs}$$

Project Scheduling. This subsection discusses factors relative to each component of the scheduling and capital cost tables. Included are comments and exceptions to the percentage of funding participation by the FAA, MDOT/OPT, and airport sponsor, including any ineligible airport-improvement projects.

As discussed previously, construction scheduling of facility improvements at BST is divided into three development terms. It is not recommended that facilities in the intermediate and long terms be designed or constructed until the anticipated demand levels develop that would justify the developments. In all probability, intermediate- and long-term demands will not occur exactly as the schedule indicates, which may affect the development timetable. In addition, any noticeable interruptions in the review and approval process of proposed projects or associated environmental permits may delay the proposed implementation schedule accordingly. It should be noted that the intermediate term may need to act as a "catch-all" for necessary short-term projects that were not implemented due to a shortage of funds.

Although intermediate- and long-term improvements are tied directly to projected demand, there is no guarantee that the improvements will be required. Therefore, the airport sponsor should closely monitor aviation demand as it develops and be prepared to initiate steps to bring these recommended developments on-line as needed. Sample charts for tracking aviation activities at the airport can be found at the end of Chapter Three. The airport sponsor should begin implementing short-term recommendations now, because these improvements are a direct result of existing safety deficiencies at the airport.

Short-term Improvements. The following paragraphs outline the projects anticipated for the short term. References are made to Figure 5-1.

The airport has an immediate need for an improved and expanded, paved, aircraft-parking apron. This improvement is necessary to provide a stable, uniform area to tiedown or park aircraft at the airport. Chapter Four anticipated a need for a total of 17 based aircraft tiedowns and 10 itinerant aircraft parking spaces in the short term. The preferred development alternative will utilize the easterly end of the closed runway for terminal area development. These projects will consist of rehabilitating that portion of the closed runway between Runway 15-33 and the existing T-hangars, and adding new paved apron areas to the south and north of the rehabilitated pavement for contiguous, new aircraft-parking spaces. The new pavement in the vicinity of the off-site helicopter pad will likely cross or fill a wetland that appears to be part of a man-made ditch system. Because of this anticipated wetland impact, current federal regulations dictate the preparation of an environmental assessment prior to the new apron development project to

determine the impacts of this and subsequent projects on the environment. The necessary environmental permits will also need to be obtained subsequent to the design of the apron project.

Incidental to this apron project will be the construction of a portion of the parallel taxiway. Based on demand, the limits of the partial parallel taxiway may only extend from the intersection with the taxilane from the off-site helicopter pad and end to the south at the last apron taxilane, or it may extend all the way to the threshold of Runway 33. The decision for the taxiway construction to the Runway 33 threshold would be made if excess demand on the new apron creates "bottlenecks" for aircraft attempting to access the runway or if bottlenecks occur for aircraft attempting to enter the apron from the runway. Medium-intensity taxiway lights (MITLs) and pavement markings are incidental to this project. A portion of this taxiway in the vicinity of the taxilane to the helicopter pad will also need to cross a wetland that appears to be part of a man-made ditch system. The preparation of the environmental assessment previously described will also cover this project. The taxilane to the helicopter pad is assumed to be privately constructed.

Because of the shift in the use of the terminal area during the short term, additional T- and conventional hangar construction are anticipated to replace obsolete hangars from the old terminal area. Funding for this type of project is typically by the private sector or airport sponsor. Incentives can be awarded by the airport sponsor to private entities as a way to encourage the capital investment at the airport. These incentives may be in the form of a long-term lease or favorable revenue-sharing terms on lease payments received as well as other forms found acceptable to the airport sponsor. These hangars should be built to conform to Belfast Airport Committee's construction standards. The T-hangars should be constructed parallel to and south of the existing T-hangars; the conventional hangars should be constructed parallel to, and to the north of, the existing T-hangars. Figure 5-1 illustrates sample conventional hangar sizes and locations. The hangar size and space between hangars should be adjusted to fit the construction standards or those dimensions proposed by the hangar tenant. For instance, in an arrangement of smaller conventional hangars with less space between each hangar, it is possible to fit approximately five conventional hangars where the figure has suggested only three. Depending on the demand level at the time of development, the airport may want to plan to

accommodate more of the smaller conventional hangars rather than a fewer number of larger conventional hangars. Incidental construction costs would include the pavement from the taxilanes to the hangars and any utilities required. In this case, both the pavement and utility extensions are considered ineligible for AIP funds.

The airport's rotating beacon is currently located off airport. To better control the condition and maintenance of the beacon, Chapter Five recommended relocated the beacon to a new site just north of the new aircraft-parking apron. During the design of this project, the airport must ensure that the tower will not be a penetration to the existing or proposed FAR Part 77 transitional surfaces. This project is eligible for AIP funding. Incidental costs associated with this project include extending new power cables to the site.

The airport should acquire land interests through avigation easement to protect the runway protection zones. Recent land acquisitions by private entities in the vicinity of the airport are beginning to limit the airport's control of FAR Part 77 penetrations. Due to the time involved in a federally assisted land acquisition project, the efforts to acquire the recommended easement interests should be initiated in the short term. All work efforts and land costs associated with an eligible land acquisition project are eligible for reimbursement by the FAA and MDOT/OPT.

As discussed in Chapters 2 and 4, the airport is eligible to purchase snow removal equipment in order to enhance the safety of winter operations at the airport. If funding permits, this equipment should be purchased in the short-term period.

The runway safety areas off each runway end need to meet specific criteria for grading. This grading may impact wetlands on the airport; however, the environmental assessment previously mentioned should address these potential impacts. Once the EA is completed, this grading work should be accomplished.

Intermediate-term Improvements. The following paragraphs outline the projects anticipated for the intermediate term. References are made to Figure 5-1.

With the completion of the new aircraft-storage areas in the short term, the old terminal area can be phased out by relocating the existing administration building/FBO office and the fuel tanks. Prior to relocating the administration building, a new access road must be constructed from Congress Street and a cul-de-sac constructed at the westerly end of Airport Road to prevent unauthorized access to the airport (emergency-vehicle access would be acceptable). Along with the new access road, a new automobile parking lot needs to be constructed. As shown in Figure 5-1, the placement of the fuel tank would be adjacent to the relocated administration building and new aircraft-parking apron. Following the administration building and fuel tank relocation, the former aircraft-parking apron and hangars should be removed to eliminate potential vandalism problems or insurance concerns.

An airport-security fence should be installed along a portion of the airport property line near Airport Road and continue to the new administration building to prevent unauthorized access to the airside facilities. The airport sponsor may wish at this time to continue the security fence along the back side of the new hangars for the same reason. A crash-gate should be installed at the end of Airport Road to be used by emergency vehicles to enter airport property when responding to airport emergencies.

A pavement overlay has been programmed for the short-term period; however the useful life of the pavement will only be extended for five to seven years by this overlay. As a result, a rehabilitation of the runway may be necessary in the intermediate term.

If demand dictates additional hangar and/or aircraft-parking apron space may need to be constructed.

Several areas of obstructions to the FAR Part 77 surfaces have been identified, and the necessary easements to remove these obstructions should have been obtained in the short-term period. Both the tree and ground obstructions should be removed.

Long-term Improvements. The following paragraphs outline the projects anticipated for the long term. References are made to Figure 5-1.

During the long term, the remainder of the parallel taxiway is anticipated to be constructed along with the associated exit taxiways. This taxiway extension will, again, impact wetlands and trigger the need for a second environmental assessment in order to incorporate the latest environmental regulations. Incidental project efforts will include pavement striping, MITL installation, new airport signage, drainage systems, tree clearing, and grading.

If demand dictates additional hangar and/or aircraft-parking apron space may need to be constructed.

If the anticipated growth in turboprop or small jet aircraft is realized in the long term, the airport may want to consider offering Jet-A fuel to its customers or may opt to allow the FBO to handle this facility. Funding for this type of facility is solely by the airport sponsor or private entity.

Annual Maintenance. Projects such as crack sealing and mowing are considered standard annual operation and maintenance (O&M) budget items and are not typically eligible for AIP funds. However, a pilot program currently being initiated within the AIP allows certain states the option of selecting a small number of airports to receive AIP funds for O&M pavement projects. The hope is that by spending a little bit of money now to preserve pavements, the pavements may last longer thereby delaying the next major pavement reconstruction project. If the pilot program is deemed successful and implemented nationwide, it is hoped that all airports throughout the country will be eligible to receive these funds and somewhat alleviate the financial burden placed on the airport sponsor for funding these projects.

The pavement of Runway 15-33 is in fair shape with a significant amount of new cracks visible each year. This pavement was last reconstructed in 1982 with an expected life span of 20 years. This pavement will be eligible for reconstruction again at the end of the 20 years, in 2001. This places a reasonable projection for runway reconstruction in the beginning of the intermediate term. This reconstruction project will necessitate upgrading the runway safety areas where necessary as well as removing all obstructions (or lighting the hazards) to FAR Part 77 approach and transitional surfaces. Funds for this project are AIP-eligible. This project should follow the completion of the necessary land interests already discussed under the short term.

The existing aircraft-parking apron is in fair to poor shape. Because of the urgency for additional aircraft-parking apron space, only minor crack sealing maintenance is envisioned to maintain the existing pavement in usable condition until the new apron can be constructed.

Mowing efforts will increase incrementally during the planning period with the upgrade of the runway safety areas and tree clearing efforts. Airport utility costs will rise as additional lighting systems are added to the airport. Snow-removal efforts will increase with the addition of new aircraft-parking apron and taxiway areas.

Summary. Although the need for the projects mentioned for the short term is evident, funds typically available from the FAA and MDOT/OPT are inadequate to complete all these projects as well as fund airport improvement projects at other airports throughout the state. As a result, only the highest priority projects will receive funding. Tables 8-2 through 8-5 have tried to illustrate not only the estimated project costs but also the priority of each project. These tables should be re-evaluated from time to time by the airport sponsor and funding agencies to re-establish the project priorities.

COMMUNITY BENEFITS EVALUATION

This section of Chapter Eight identifies the airport's existing and anticipated benefits to the community. Resources for this evaluation include results of the business and industry poll and various industry documents. Appendix 8-1 contains a copy of the poll and a summary of the results for each question.

Business and Industry Poll. The poll was conducted to determine the value of the Belfast Municipal Airport to the local business community. The poll was mailed to 188 businesses currently registered with the Belfast Area Chamber of Commerce. Sixty-seven responses were received for this poll; a 36-percent response rate which is high for this type of survey. Responses to this survey should be used for informational purposes only and are not intended to be used as a precursor for airport expansion. In general, the majority of the respondents are in the retail or service industries and have been in the area for at least five years. Only 4 percent of the respondents identified the proximity to an airport (i.e., Belfast Municipal Airport or another) as a

reason why they located their businesses in the area. Many of the respondents indicated that they do not currently utilize aircraft to transport people and/or cargo for business purposes. Approximately 21 and 31 percent of the respondents identified time and reliability, respectively, as important factors in transporting people and/or cargo for their business. Most of the respondents did not have an opinion as to whether air transportation would improve their business (i.e., easier, more efficient, more cost effective). There appears to be an even split between respondents who felt that air transportation would benefit their business, would not benefit their business, or had no opinion.

The responses from the poll indicate a need for an education or marketing program targeted to increase the community's awareness of the benefits to be derived by the use of air transportation. This program could be implemented by the airport sponsor, airport operators, airport funding agencies, and/or community development agencies.

Community Benefits. In the 1950s and 1960s, industrial and manufacturing businesses were the latest business trends. By manufacturing a better product, these businesses found that they could become more successful. Airports served a very important role during those decades in that excess airport land or vacant land abutting airports was suitable for supporting industrial and manufacturing land uses. The airports at that time were seen as part of the overall community transportation system that acted as a catalyst for new economic growth. The way to ensure the continuation of new economic development in the community was by modernizing airport and other transportation facilities. Air transportation offered the ability to transport people and goods from one place to another with both a cost and time savings to the business.

Today, airports continue to be an important link in the national transportation system. Airports, whether served by airlines (i.e., commercial airports) or not (i.e., general aviation airports), serve to connect people and goods with other parts of the state and the world. In addition to the transportation functions that airports serve, airports support direct employment of people as pilots, mechanics, and maintenance crews. Other economic benefits show up in the form of:

- increased industrial or commercial development within the community

- development of aviation-related businesses such as ground transportation and meal catering
- increased tourist spending
- increased employment
- improved access to the national airport system
- increased recreational opportunities

Airports continue to provide a strong presence within their communities during emergencies. The Civil Air Patrol may utilize several airports during its search-and-rescue missions; emergency medical transportation can be provided from airports; and military-reserve units utilize airports to fulfill their missions. These are all situations that show the vital role airports continue to play within their communities.

Many corporate entities invest in aircraft ownership as a way to save time, increase productivity, and expand the "bottom line." In fact, according to a study prepared for the General Aviation Manufacturers Association (GAMA) and the National Business Aircraft Association (NBAA), the companies in the Fortune 500 with the largest return to investors from 1982 to 1992 owned and utilized aircraft. To look a step further, 92 percent of the most successful 50 of these companies own and utilize aircraft. Successful corporations rely on air transportation to enhance their businesses. Lastly, airports, whether large or small, commercial or general aviation, bring visitors to the area who spend money in local shops, restaurants, and motels.

So even though industrial development is not growing at the rate it once did, other industries are developing that are a direct result of improvements in technology. Information transfer and personal services are the latest business trends. Air transportation is modernizing to keep pace with today's air-traveler needs by implementing GPS navigation procedures and other time-saving improvements. Communities do benefit both directly and indirectly from the modern operation of Belfast Municipal Airport as well as other airports throughout the world.

MANAGEMENT PROGRAMS

To assist the airport sponsor in complying with various airport grant assurances, this section provides a sample "Minimum Standards of Operation for Airport Tenants" and ideal winter pavement-maintenance operation procedures.

Minimum Standards of Operation for Airport Tenants. Minimum standard requirements are the qualifications established by an airport sponsor as a condition of conducting aeronautical activities or leasing space at the airport. They are not the result of a federal or state requirement. In October of 1996, the American Association of Airport Executives (AAAE) and National Air Transportation Association (NATA) produced a guide for use by airport sponsors in preparing local minimum standard requirements for airport service providers (refer to Appendix 8-2). Airport tenants that do not provide any services to the public should also be provided with their own minimum standard requirements. These standards, as modified to meet specific airport needs, are then enforced by the airport sponsor.

Most minimum standard requirements are categorized by land use to help make it easier to identify allowable activities, necessary requirements, and potential fees. The following are some typical land-use categories used in minimum standard requirements prepared by other airports in the region:

- flight instruction
- aircraft charter or air taxi
- aircraft sales
- aircraft rentals
- aircraft airframe/power plant repair and/or maintenance
- aircraft painting or interior repairs
- fuel and oil sales/ramp services
- flying clubs
- airport tenants (those not serving the public)
- restaurants
- other concessionaires (i.e., rental cars, newsstands, telephones, advertises)

Typically each of these land-use categories will have identified within the minimum standard requirements a brief description of the "concept" or definition of the land use, allowable condition of property and equipment, requirement for insurance, and user-fee structure (if any). If sample requirements are used, they must be modified to meet the needs of the airport sponsor. In addition, the airport sponsor must be sure that only those requirements that they feel are necessary are included in the minimum standard requirements as the airport sponsor will be the one to enforce the requirements. Appendix 8-2 also includes a sample of the requirements for the average, non-service-providing airport tenant.

Winter Pavement-Maintenance Operations. Chapter Two identified the airport's lack of airport-owned snow-removal equipment and the fact that the snow-removal crews employed by the City are responsible for clearing airport pavements of snow and ice. The current operation utilizes only snow plows; no snow blowers or sweepers are currently utilized. Under existing condition, Chapter Two identified that the airport is qualified for several pieces of equipment including a snow blower capable of removing at least 225 tons of snow per hour, two small displacement-plow blades, one truck-mounted hopper/spreader, one small high-speed runway sweeper, carrier vehicle(s) for this equipment including buckets for general-purpose and snow. In the future, the amount of pavement to be cleared will increase slightly, however, because of the capacities of the equipment already identified to meet the existing conditions, no new or larger equipment beyond that identified in Chapter 2 should be necessary.

The airport sponsor will be responsible for operating and maintaining the equipment. Purchase of the equipment is eligible for AIP funding (i.e., 90 percent by FAA, 5 percent by MDOT/OPT, and 5 percent by City). Once purchased, the equipment will not be eligible for replacement with federal funds until 20 years have passed. In addition, any equipment purchased for use at the airport must be used at the airport and not for other municipal activities.

Snow-removal procedures typically used at airports in the United States are recommended in FAA Advisory Circular 150/5200-30A (including changes 1 and 2), *Airport Winter Safety and Operations*. The purpose of clearing snow and ice from airport pavements is to reduce the hazards to aircraft operating at the airport, thereby reducing aircraft accidents, incidents, delays, diversions, and flight cancellations. An effective winter pavement-maintenance program is

crucial to improving the reliability of the airport. If possible, runway-pavement braking conditions should be determined to enhance the safety and reliability of the airport.

Airports the size of Belfast Municipal Airport are allowed three hours to clear snow and ice from its priority pavement areas. In general, these areas should include the primary runway, a taxiway between the runway and aircraft parking apron, the portion of the apron needed to remain open during a storm event, and any aircraft fire and rescue vehicle roadways on airport property. The goal of the snow-removal procedures is clear the pavement of snow and ice. It would be prudent for the airport to develop a snow and ice removal plan and to practice it prior to the arrival of winter to identify any difficulties in executing the plan. This plan should include not only the procedures for removing snow and ice from airport pavements, but also in and around navigational or visual aids as well as preseason maintenance. Obstructions, such as snow banks and snow drifts, will also need to be removed during snow-removal operations. Typical elements of this plan include the following:

- identify equipment and airfield maintenance objectives
- list material storage requirements
- establish and define personnel responsibility including the development of a snow committee
- identify airport user operational requirements during a storm event
- define relationships with contractors, if any are used
- address environmental, climatic, and physical conditions impacting snow-removal operations
- preseason efforts

A snow-removal plan for BST does not necessarily have to be an extensive document as the complexity of snow-removal operations at Belfast Municipal Airport is low.

Besides equipment, the airport sponsor can utilize sand and/or urea to improve pavement friction or melt snow/ice, respectively. Salt is never used for the airside pavements as it will corrode the aircraft making them less flight worthy. Sand and urea (pelletized or liquid) is usually stored in a storage building, separated from the equipment bay(s).

As with any activity on airport property, communication is an important tool in efficiently removing snow and ice from airfield pavements. This communication not only involves the other snow-removal crew members, but also aircraft pilots. The ground crews need to be aware of flight activities so they can react accordingly.

Preseason training is important to the smooth implementation of the snow- and ice-removal procedures during a storm event. These preseason efforts ensure that all worn parts and equipment have been replaced to reduce potential down time; personnel are comfortable operating the equipment and can do so properly; communication terminology is understood; and snow-disposal areas (and back-up areas) are identified. Another preseason activity is the installation of snow fences that, once strategically placed, will trap blowing snow from drifting onto airfield pavements.

Airports that serve turbojet aircraft operations (e.g., Hawker 1000, CitationJet, and Gulfstream 4 or larger) are recommended to have trained personnel and approved equipment to adequately monitor runway friction. This AMPU does not anticipate this level of activity at BST and is, therefore, not recommending implementation of these efforts at this time. Should the fleet mix shift significantly towards turbojets, runway friction testing needs should be re-evaluated.

Airport control of drifting and plowed snow can be carried out by utilizing snow fences. Placement of snow fences will reduce potential for snow drifts if they are placed perpendicular to the prevailing winds and located upwind from the runway surface. Plowing snow to the downwind side of the runway will also help to reduce snow drifts on the runway. Of particular interest when erecting snow fences and creating snow banks is that they are kept clear of the NAVAID critical areas.

Snow trenches, if used properly, can be effective in storing blown or plowed snow; snow trenches can be no closer than 50 feet from the runway.

Appendix 8-3 identifies the recommended snow removal procedures for both large and small airports. These guidelines are part of FAA Advisory Circular 150/5200-30A and should be

modified by the airport sponsor to meet the needs of the airport and correspond to the level of personnel/equipment being used to control snow and ice accumulations on airport pavements.

SUMMARY

This chapter identifies a recommended airport improvement implementation plan for Belfast Municipal Airport. Each major improvement, because of financial and environmental considerations, should be phased-in over time. Representative planning-level project costs have been computed to provide the airport sponsor and funding agencies with the future funding-level needs anticipated for the airport. This chapter has also reviewed the importance of airports to the local community. The results of the business and industry poll, conducted as part of this AMPU, can be used by the airport sponsor to target future education and marketing efforts within the community. Samples of the minimum standard procedures for all kinds of airport tenants were reviewed and included as part of this chapter. Lastly, this chapter identified the principle winter pavement maintenance procedures implemented at cold-climate airports.

The improvement-project phasing plan should be reviewed on an annual basis to identify aviation demand levels that could trigger additional airport improvements. As necessary, the project cost estimates that follow should be updated to reflect current design, permitting, and construction prices prior to project initiation.

TABLE 8-2
BELFAST MUNICIPAL AIRPORT
SHORT-TERM (0-5 YEARS) CAPITAL IMPROVEMENT COST ESTIMATES

ITEM DESCRIPTION	CONSTRUCTION OR LAND COSTS	ENGINEERING, PERMITTING & CONTINGENCIES	PROJECT TOTAL	FAA SHARE	MDOT/OPT SHARE	CITY SHARE	PRIVATE SHARE
Overlay Runway 15-33	$150,000	$30,000	$180,000	$0	$144,000	$36,000	$0
Prepare environmental assessment	N/A	$100,000	$100,000	$90,000	$5,000	$5,000	$0
* Upgrade runway safety areas	$45,000	$5,000	$50,000	$45,000	$2,500	$2,500	$0
Construct new aircraft parking apron w/ partial parallel taxiway (assume to R/W 33)	$1,347,000	$370,000	$1,717,000	$1,545,300	$85,850	$85,850	$0
Install REILs, PAPI, and ASOS	$120,000	$30,000	$150,000	$135,000	$7,500	$7,500	$0
Purchase snow-removal equipment (plow & blower)	$160,000	$10,000	$170,000	$153,000	$8,500	$8,500	$0
Acquire avigation easements (30± acres)	$180,000	$30,000	$210,000	$189,000	$10,500	$10,500	$0
Relocate airport rotating beacon	$44,500	$20,000	$64,500	$58,050	$3,225	$3,225	$0
Construct T-hangars (approx. 3 hangars)	$56,250	$30,000	$86,250	$0	$0	$0	$86,250
Construct conventional hangars (approx. 1 hangar)	$165,000	$50,000	$215,000	$0	$0	$0	$215,000
SHORT-TERM TOTALS	**$2,267,750**	**$675,000**	**$2,942,750**	**$2,215,350**	**$267,075**	**$159,075**	**$301,250**

Land cost estimates should be rechecked against current tax records to determine a more accurate value at the time these projects are initiated.

* Construction costs include estimated wetland mitigation costs at $100,000 per acre of impact.

TABLE 8-3
BELFAST MUNICIPAL AIRPORT
INTERMEDIATE-TERM (6-10 YEARS) CAPITAL IMPROVEMENT COST ESTIMATES

	ITEM DESCRIPTION	CONSTRUCTION COSTS	ENGINEERING, PERMITTING & CONTINGENCIES	PROJECT TOTAL	FAA SHARE	MDOT/OPT SHARE	CITY SHARE	PRIVATE SHARE
*	Construct new access road; block old access road	$95,000	$50,000	$145,000	$130,500	$7,250	$7,250	$0
	Clear tree penerations (78± ac)	$429,000	$100,000	$529,000	$476,100	$26,450	$26,450	$0
*	Clear ground penetrations (10± acres)	$2,600,000	$80,000	$2,680,000	$2,412,000	$134,000	$134,000	$0
	Construct new automobile parking lot	$31,500	$12,000	$43,500	$0	$0	$0	$43,500
	Relocate administratation building	$68,000	$17,000	$85,000	$38,250	$2,125	$2,125	$42,500
	Relocate fuel tank	$22,000	$12,000	$34,000	$0	$0	$0	$34,000
*	Install airport security fence (1,900± linear feet)	$72,000	$48,000	$120,000	$108,000	$6,000	$6,000	$0
	Remove old apron pavement and structures	$45,000	$10,000	$55,000	$49,500	$2,750	$2,750	$0
	Rehabilitate Runway 15-33	$670,000	$100,000	$770,000	$693,000	$38,500	$38,500	$0
	INTERMEDIATE-TERM TOTALS	**$4,032,500**	**$429,000**	**$4,461,500**	**$3,907,350**	**$217,075**	**$217,075**	**$120,000**

* Construction costs include estimated wetland mitigation costs at $100,000 per acre of impact.

TABLE 8-4
BELFAST MUNICIPAL AIRPORT
LONG-TERM (11-20 YEARS) CAPITAL IMPROVEMENT COST ESTIMATES

ITEM DESCRIPTION	CONSTRUCTION COSTS	ENGINEERING, PERMITTING & CONTINGENCIES	PROJECT TOTAL	FAA SHARE	MDOT/OPT SHARE	CITY SHARE	PRIVATE SHARE
Prepare environmental assessment	N/A	$75,000	$75,000	$67,500	$3,750	$3,750	$0
* Construct remainder of parallel taxiway and exit taxiways	$1,227,000	$310,000	$1,537,000	$1,383,300	$76,850	$76,850	$0
Construct conventional hangars (2 each)	$330,000	$65,000	$395,000	$0	$0	$0	$395,000
Construct T-hangars (3 each)	$56,250	$30,000	$86,250	$0	$0	$0	$86,250
Install Jet-A fuel tank (5,000 gallons)	$24,000	$12,000	$36,000	$0	$0	$0	$36,000
LONG-TERM TOTALS	**$1,637,250**	**$492,000**	**$2,129,250**	**$1,450,800**	**$80,600**	**$80,600**	**$517,250**

* Construction costs include estimated wetland mitigation costs at $100,000 per acre of impact.

TABLE 8-5
BELFAST MUNICIPAL AIRPORT
SUMMARY OF CAPITAL IMPROVEMENT COST ESTIMATES

ITEM DESCRIPTION	CONSTRUCTION COSTS	ENGINEERING, PERMITTING & CONTINGENCIES	PROJECT TOTAL	FAA SHARE	MDOT/ATD SHARE	CITY SHARE	PRIVATE SHARE
SHORT-TERM AIRPORT IMPROVEMENTS	$2,267,750	$675,000	$2,942,750	$2,215,350	$267,075	$159,075	$301,250
INTERMEDIATE-TERM AIRPORT IMPROVEMENTS	$4,032,500	$429,000	$4,461,500	$3,907,350	$217,075	$217,075	$120,000
LONG-TERM AIRPORT IMPROVEMENTS	$1,637,250	$492,000	$2,129,250	$1,450,800	$80,600	$80,600	$517,250
TOTALS	**$7,937,500**	**$1,596,000**	**$9,533,500**	**$7,573,500**	**$564,750**	**$456,750**	**$938,500**

BELFAST MUNICIPAL AIRPORT
BELFAST, MAINE

APPENDIX 8-1
BUSINESS AND INDUSTRY POLL

BELFAST MUNICIPAL AIRPORT SURVEY

On behalf of the City of Belfast, Maine, the City's airport consultant, Dufresne-Henry, is conducting a survey to determine the value of the Belfast Municipal Airport to the local business community. Responses to this survey are for informational purposes only and are not intended to be a precursor for airport expansion. We are requesting your help to fill in the following survey questions regarding your use of the Belfast Municipal Airport.

1. Please indicate your type of business:
   - ☐ agriculture, forestry, fishing
   - ☐ construction
   - ☐ transportation, public utilities
   - ☐ manufacturing
   - ☐ wholesale trade
   - ☐ retail trade
   - ☐ finance, insurance, real estate
   - ☐ services
   - ☐ other _____

2. How long have you been operating your business in the Belfast/Searsport area:
   _____ years

3. Was one of the reasons you located your business in the Belfast/Searsport area because there was an airport nearby? ☐ yes ☐ no

If yes to #3, please indicate which airport(s) influenced your decision to locate your business in the Belfast/ Searsport area.
☐ Bangor ☐ Rockland ☐ Belfast ☐ Bar Harbor
☐ Other_____

4. Does your business currently utilize an aircraft to transport passengers and/or cargo? ☐ yes ☐ no

If yes to #4, is the aircraft based at the Belfast Municipal Airport?
☐ yes ☐ no ☐ based elsewhere, but uses the Belfast airport

If yes to #4, please indicate your business' aircraft usage levels:
_____ # of flights, monthly
_____ type of cargo
_____ average # of passengers, monthly

5. Please list your current means of transportation that your employees or customers use to access your business, with #1 being the most common:
   1._____
   2._____
   3._____

6. Please list your current means of transporting cargo (goods, mail supplies, etc.) that your business produces or uses, with #1 being the most common:
   1._____
   2._____
   3._____

7. Is time of day an important factor in utilizing air transportation for your business?
   ☐ yes ☐ no

8. Is reliability an important factor in utilizing air transportation for your business?
   ☐ yes ☐ no

9. Do you feel that air transportation makes your job or your employees' jobs:
   - easier ☐ yes ☐ no
   - more efficient ☐ yes ☐ no
   - more cost effective ☐ yes ☐ no
   - no opinion ☐

10. Would air travel create more jobs and increase revenues for your business?
    - more jobs ☐ yes ☐ no
    - increase revenues ☐ yes ☐ no
    - no opinion ☐

11. Do you typically consider the cost of air transportation for passengers or cargo to be:

    passengers: ☐ good bargain ☐ fair value ☐ too costly ☐ no opinion

    cargo: ☐ good bargain ☐ fair value ☐ too costly ☐ no opinion

12. When was the last time you used air transportation for business purposes?
    ☐ within the last month ☐ 6-12 months ago
    ☐ over one year ago ☐ never

13. Have you, your employees, or customers (without researching) ever used the facilities at Belfast Municipal Airport for business purposes?
    ☐ yes ☐ no

14. Are you aware that Belfast Municipal Airport provides the following services and capabilities to the community?
    - full-time fixed base operator ☐ yes ☐ no
    - 4,002' runway ☐ yes ☐ no
    - aircraft rentals and maintenance service ☐ yes ☐ no
    - passenger amenities ☐ yes ☐ no
    - aircraft flight instructions ☐ yes ☐ no
    - shuttle services ☐ yes ☐ no
    - charter flights ☐ yes ☐ no

If you've had the opportunity to use charter services at Belfast Municipal Airport, please rate the following regarding this service with the following rating:

(1) DOES NOT MEET MY NEEDS
(2) MEETS MY NEEDS
(3) EXCEEDS MY NEEDS
(4) NO OPINION

	(1)	(2)	(3)	(4)
• pilot personality	☐	☐	☐	☐
• passenger amenities	☐	☐	☐	☐
• baggage handling	☐	☐	☐	☐
• reservation assistance	☐	☐	☐	☐
• available aircraft size	☐	☐	☐	☐
• flight availability	☐	☐	☐	☐
• flight schedule flexibility	☐	☐	☐	☐
• available destinations	☐	☐	☐	☐

15. Would you consider using Belfast Municipal Airport for your business if delivery services were available to transport your goods/cargo from your business to the airport?
    ☐ yes ☐ no

Would you like more information about the services offered at Belfast Municipal Airport sent to you? (please leave address information on the comment line on the reverse side of this survey)

Please use the reverse side for any additional comments you may wish to add to this survey. Thank you for your participation in this survey. Results will be posted at the Airport on or about the week of December 4, 1995. If you have any questions please feel free to call Carol Niewola at (207) 775-3211. Please fold this survey, tape the edges, and mail to Dufresne-Henry, Inc.

Surveys Sent out	Surveys Received	% of Return
188	67	36%

BELFAST MUNICIPAL AIRPORT SURVEY
USER POLL SURVEY RESULTS

Below is a summary of the results of the Belfast Municipal Airport Survey. This survey was conducted to determine the value of the Belfast Municipal Airport to the local business community. Reponses to this survey are for informational purposes only and are not intended to be a precursor for airport expansion. We have received valuable comments and information from everyone who participated with this survey. Thank you very much for your cooperation.

1. Please indicate your type of business:

Business	No. of Respondents
Agriculture, forestry, fishing	1
Construction	2
Transportation, public utilities	0
Manufacturing	3
Wholesale trade	0
Retail trade	17
Finance, insurance, real estate	2
Services	8
Agriculture, forestry, fishing & wholesale trade	1
Wholesale trade & retail trade	2
Retail trade & finance, insurance, real estate	2
Retail trade & services	4
Finance, insurance, real estate & services	1

Other Businesses	No. of Respondents
Legal	1
Real estate brokerage	2
Researcher/publisher	1
Restaurant	1
Resort, Bed & Breakfast, Hotel	6
Physician/healthcare/veterinarian	5
Software development	1
Car rental	1
Telecommunications	1
Newspaper	2
Museum	1
Education	1
Community theatre	1

2. How long have you been operating your business in the Belfast/Searsport area:

Less than 1 yr.	2 – 5 yrs.	6–10 yrs	11–15 yrs	16–20 yrs	21–25 yrs	26–30 yrs	31–40 yrs	41–100 yrs.	101+ yrs
1	10	22	7	10	6	4	1	4	2

3. Was one of the reasons you located your business in the Belfast/Searsport area because there was an airport nearby?

Yes	No
3	64

If yes to #3, please indicate which airport(s) influenced your decision to locate your business in the Belfast/Searsport area.

Belfast	Other
2	1

4. Does your business currently utillize an aircraft to transport passengers and/or cargo?

Yes	No	No Answer
4	62	1

If yes to #4, is the aircraft based at the Belfast Municipal Airport?

Yes	No
3	1

If yes to #4, please indicate your business' aircraft usage levels:

Average # of flights, Monthly	Type of Cargo	Average # of passengers, monthly
3, 2, 2	Books, other	1.3

5. Please list the current means of transportation that your employees or customers use to access your business, with #1 being the most common:

1st Most Common Means –	2nd Most Common Means –	3rd Most Common Means –
Number of Respondents	Number of Respondents	Number of Respondents
Auto/truck – 62	(No response – 30)	(No response – 54)
Airlines – 2	Auto/truck – 13	Bus – 5
(No response – 2)	Airlines – 7	Airlines – 2
Walking – 1	Bus – 6	Bike – 2
	Walking – 5	Auto/truck – 2
	Boats – 4	Motorcycle – 1
	Bike – 1 Telephone – 1	Walking – 1

6. Please list the current means of transporting cargo (goods, mail supplies, etc.) that your business produces or uses, with #1 being the most common:

1st Most Common Means –	2nd Most Common Means –	3rd Most Common Means –
Number of Respondents	Number of Respondents	Number of Respondents
Mail delivery vehicles – 45	(No response – 48)	(No response – 53)
(No response – 12)	Mail delivery vehicles – 12	Mail delivery vehicles – 10
Automobiles/trucks – 9	Automobiles/trucks – 6	Walking – 2
Walking – 1	Bus – 1	Automobiles/trucks – 1
		Ambulance – 1

7. Is time of day an important factor in utilizing air transportation for your business?

Yes	No	No Answer
14	48	5

8. Is reliability an important factor in utilizing air transportation for your business?

Yes	No	No Answer
21	31	15

9. Do you feel that air transportation makes your job or your employees' jobs:

	Yes	No	No Opinion
Easier	14	19	34
More efficient	15	18	34
More cost effective	14	19	34

10. Would air travel create more jobs and increase revenues for your business?

	Yes	No	No Opinion
More jobs	13	33	21
Increase revenues	19	26	22

Additional Comments to #10:

(1) "I am a beginning Flight Surgeon for the FAA to increase services to pilots".

(2) "If it helps others, the spinoff will help us".

BELFAST MUNICIPAL AIRPORT SURVEY
USER POLL SURVEY RESULTS

11. Do you typically consider the cost of air transportation for passengers or cargo to be:

	Good Bargain	Fair Value	Too Costly	No Opinion
Passengers	4	21	13	29
Cargo	4	14	10	39

12. When was the last time you used air transportation for business purposes?

Within the Last Month	6–12 Months Ago	Over One Year Ago	Never	No Answer
13	16	14	20	4

13. Have you, your employees, or customers (without researching) ever used the facilities at Belfast Airport for business purposes?

Yes	No	No Answer
22	41	4

14. Are you aware that Belfast Municipal Airport provides the following services and capabilities to the community?

	Yes	No	No Answer
Full–time fixed base operator	42	22	3
4,002' runway	35	26	6
Aircraft rentals and maintenance service	50	13	4
Passenger amenities	27	34	6
Aircraft flight instructions	50	12	5
Shuttle services	38	26	3
Charter flights	52	12	3

If you've had the opportunity to use charter services at Belfast Municipal Airport, please rate the following regarding this service with the following rating:
(1) DOES NOT MEET MY NEEDS, (2) MEETS MY NEEDS, (3) EXCEEDS MY NEEDS, (4) NO OPINION

	(1)	(2)	(3)	(4)
Pilot personality	7	6	6	48
Passenger amenities	8	3	8	48
Baggage handling	8	1	8	50
Reservation assistance	9	2	6	50
Available aircraft size	7	3	8	49
Flight availability	7	3	7	50
Flight schedule flexibility	7	3	7	50
Available destinations	9	3	6	49

Note: Some respondents have not used the charter service but responded to this question anyway.

15. Would you consider using Belfast Municipal Airport for your business if delivery services were available to transport your goods/cargo from your business to the airport?

Yes	No	No Answer	Doubtful
25	25	16	1

Additional Comments to Question #15:

(1) "Emergency transport to specialized healthcare possibly". (2) "We deal primarily in medical service but rely on transport service for drugs and supplies".

1. Belfast Airport is Belfast's hidden gem!

2. We have used this service for aerial photography for real estate business. Doug Low is excellent! Knows his stuff and is very helpful.

3. I feel that expansion of the Belfast Airport facility would greatly enhance the development and growth of Waldo County and the surrounding area.

4. I feel that the Airport is a great asset to the area, particularly with the future growth that we expect. The Airport and its use just isn't applicable to our business.

5. Keep up the good work. Your improvement in services can only improve our county's economy.

6. Having this Airport in Belfast is very important for the use of private planes as well as business.

7. Having an active Airport is a definite asset to the Belfast area.

8. I consider the services offered at the Belfast Airport to be vital to the economy of the area. While my business doesn't use the services offered at their fullest, I base my personal aircraft there which I do use for business purposes. This provides my business with a clear cost advantage for short haul transport as compared with scheduled airlines out of Bangor.

9. We previously owned a company based in Belfast from 1937 to 1981. Over a 10-year period from 1970 to 1980 our company used the Airport daily. It was a great convenience and benefit for a company our size. This Airport is a great asset to Belfast and the mid-coast of Maine which should be expanded upon.

10. Can any grant or help be obtained to lengthen the runway?

11. Being a pilot, I use Belfast Airport for pleasure.

12. My brochure lists your Airport.

13. The use of the Airport for our institution would be primarily travel to a major airport.

14. We only use air service by Fed-Ex or UPS for quick delivery of parts, and only on rare occasions.

15. Occasionally, I could foresee the need to transport, from out of the immediate area, a client who needs skilled or long-term care to our facility when family members are not available to assist.

16. Our business is hardware retail, so we don't use the Airport. We would if our company needs it.

17. We often use the airport in Owls Head to connect to flights in Boston. It would be great if Colgan or a comparable airline would offer similar services at Belfast that they do at Owls Head. The pilots, reservation people, and ground crew are all pleasant, relaxed, and personable. Belfast is certainly ready to expand.

18. I am sorry, but our business currently has little use of air transportation, but I feel an adequate airport is vital to the growth of this community. As the community grows, so do we.

19. Our business is a small, completely volunteer museum. We do not have employees or visitors to use airport facilities. We ship nothing out and actually order very little in the way of supplies. The fact that the Airport is here and keeps getting better is a big plus for Belfast and we are enthusiastic about that. Our need to use the Airport is a long way off and may never occur.

20. We are a bed and breakfast inn within 1½ miles of the Belfast Airport. If there were club "fly ins" we could put these folks up in our inn.

21. Given that we are less than 1 hour from three (Augusta, Bangor, Owls Head) airports that are quite sophisticated (ILS, etc.), it seems that Belfast is at an ideal state of development as a simple, low cost facility.

    The current charter operation's revenue base is flying summer visitors to the islands. As such, this service could be based anywhere, and since their destinations are foggy (non-ILS fields), upgrading Belfast will not enhance service.

    Upgrading Belfast will not only impose capital expense. An increase in capacity will increase cost. Only an increase in volume will increase revenues. Let's have this development be pushed by demand instead of pulled by speculative enthusiasm.

BELFAST MUNICIPAL AIRPORT
BELFAST, MAINE

APPENDIX 8-2
MINIMUM STANDARD PROCEDURES

SAMPLE DOCUMENT

MINIMUM STANDARD REQUIREMENTS FOR AIRPORT AERONAUTICAL SERVICES

APPENDIX A

TABLE OF CONTENTS

Section

Section

Section 1Preamble and Policy

The _____ Airport Authority being the Owner and in a position of responsibility for the administration of the _____ Airport does hereby establish the following Policy for the Minimum Standards:

The Minimum Standards are intended to be the threshold entry requirements for those wishing to provide aeronautical services to the public and to insure that those who have undertaken to provide commodities and services as approved are not exposed to unfair or irresponsible competition. These Minimum Standards were developed taking into consideration the aviation role of the _____ Airport, facilities that currently exist at the Airport, services being offered at the Airport, the future development planned for the Airport and to promote fair competition at _____ Airport. The uniform application of these Minimum Standards, containing the minimum levels of service that must be offered by the prospective service provider, relates primarily to the public interest and discourages substandard entrepreneurs, thereby protecting both the established aeronautical activity and the _____ _____ Airport patrons.

Section 2 - Definitions

Aeronautical Activity - means any activity conducted at airports which involves, makes possible or is required for the operation of aircraft, or which contributes to or is required for the safety of such operations. These activities include, but are not limited to, air taxi and charter operations, pilot training, aircraft renting, sightseeing, aerial photography, crop dusting, aerial advertising, aerial surveying, air carrier operations, skydiving, ultralight operations, aircraft sales and services, sale of aviation petroleum products, repair and maintenance of aircraft, or sale of aircraft parts and aircraft storage.

Aeronautical Service means any service which involves, makes possible or is required for the operation of aircraft, or which contributes to or is required for the safety of aircraft operations commonly conducted on the airport by a person who has a lease from the airport owner to provide such service.

Airport means the (airport name) airport, and all of the property, buildings, facilities and improvements within the exterior boundaries of such airport as it now exists on the Airport Layout Plan or Exhibit A or as it may hereinafter be extended, enlarged or modified.

FAA means the Federal Aviation Administration.

FAR means Federal Aviation Regulation.

FBO means any aviation business or Fixed Base Operator duly licensed and authorized by written agreement with the airport owner to provide aeronautical activities at the airport under strict compliance with such agreement and pursuant to these regulations and standards.

Flying Club means a non-commercial organization established to promote flying, develop skills in aeronautics, including pilotage, navigation, and awareness and appreciation of aviation requirements and techniques. See the Airport Rules and Regulations for requirements.

Fuel: As defined in an operator's lease agreement.

Fueling Operations means the dispensing of aviation fuel into aircraft.

Fuel Vendor means an entity engaged in selling or dispensing aviation fuel to aircraft other than that owned or leased by the entity.

Fueling Operations Permit means a permit issued by the airport manager to a person or entity who dispenses aviation fuel at _____ Airport (see Airport Rules and Regulations for requirements and procedure). There are two types: (1) Fuel Vendor's Permit; and (2) Self-fueling Permit.

Landside means all buildings and surfaces on the airport used by surface vehicular and pedestrian traffic.

Large Aircraft is an aircraft of more than 12,500 pounds maximum certified takeoff weight or turboprop and turbojet aircraft.

Lease (pertaining to the lease of aircraft by an aeronautical activity) means a long-term written agreement established on a minimum basis of six (6) months wherein the lessee shall have full control over the scheduling and use of aircraft and the aircraft is insured as required by these Minimum Standards for the use of the aircraft by Lessee. (Also referred to as aircraft lease-back.)

Manager means the Airport Manager or his/her designee.

Minimum Standards means the standards which are established by the airport owner as the minimum requirements to be met as a condition for the right to conduct an aeronautical activity on the airport.

NFPA means the National Fire Protection Association.

NOTAM means a Notice to Airmen published by the FAA.

Owner - means the _____ Airport Authority, airport sponsor, or group providing anyone or a combination of aeronautical services to or for aviation users at the Airport.

Person means an individual, corporation, government or governmental subdivision, partnership, association, or any other legal entity.

Ramp Privilege means the driving of a vehicle upon an aircraft parking ramp on the airside of the airport to deliver persons, cargo or equipment to an aircraft as a matter of convenience or

necessity. See Airport Rules and Regulations for requirements and procedure.

Self-fueling operator means a person who dispenses aviation fuel to aircraft owned by such person, or leased from others and operated by such person. See Airport Rules and Regulations for requirements and procedure.

Small Aircraft is an aircraft of 12,500 pounds or less maximum certified take-off weight.

UNICOM means a non-governmental communication facility which provides airport advisory information.

Section 3 - Minimum Standards for All FBO's

The following shall apply to all prospective aeronautical service providers wishing to become FBO's at the _____ Airport:

1. Leases shall be for a term to be mutually agreed upon between the parties with due consideration for the financial investment and the need to amortize improvements to the leasehold.

2. A person shall have such business background and shall have demonstrated his business capability to the satisfaction of, and in such manner as to meet with the approval of the Airport authority.

3. Any prospective FBO seeking to conduct aeronautical activity at the airport should demonstrate that they have adequate resources to realize the business objectives agreed to by the Anytown Airport Authority and the applicant.

4. The prospective FBO shall lease from the Owner an area of not less than _____ square feet of ground space to provide for outside display and storage of aircraft and on which shall be erected a building to provide or is an existing building that provides at least _____ square feet of floor space for aircraft storage and at least _____

square feet of floor space for office, customer lounge and rest rooms, which shall be properly heated and lighted, and shall provide public telephone facilities for customer use. The FBO shall also provide, on the leased area, paved parking for the FBO's customers and employees.

5. The prospective FBO shall have his premises open and services available _____ hours,_____ days a week, and shall make provision for someone to be in attendance in the office at all times during the required operating hours.

6. All prospective FBO's shall demonstrate to the _____ Airport authority's satisfaction evidence of its ability to acquire insurance coverage as stipulated for each particular type of operation. An FBO should make its own analysis to determine if more is needed. However, such policies of insurance shall be maintained in full force and effect during all terms of existing leases, agreements or business licenses or renewals or extensions thereof with a 30-calendar day notice of cancellation to _____ Airport Authority. Such policies shall not be for less than the amounts listed at **APPENDIX 1**; however, in all cases, amounts of policies must meet the statutory requirements of applicable governmental agencies and be approved in writing by the _____ Airport authority.

Section 4 - Application and Qualifications

Demonstration of intent to conduct a business operation at the Airport shall be by application to the Anytown Airport Authority. The written application shall contain at the minimum:

1. The proposed nature of the business. A business plan may be used to express the proposed nature of the business. (See a business plan outline at **APPENDIX 2** .)

2. The signatures of all parties whose names are being submitted as owning an interest in the business or will appear on leases or other documents as being a partner, director or corporate officer and those who will be managing the business.

3. The current financial statement prepared or certified by a Certified Public Accountant.

4. A listing of assets owned, or being purchased, or leased which will be used in the business on the Airport.

5. A current credit report for each party owning or having a financial interest in the business and a credit report on the business itself covering all geographical areas in which it has done business in the ten-year period immediately prior to such application.

6. An agreement to provide a bond or suitable guarantee of adequate funds to the _____ _____ Airport Authority to be used to defray any expenses and fees normally paid by the Lessee between the estimated time the Lessee may default and a new lease is executed and another Lessee takes over.

7. A written authorization for the FAA, any aviation or aeronautics commissions, administrators, and departments of all states in which the applicant has engaged in aviation business to release information in their files relating to the applicant or its operation. The applicant will execute such forms, releases, or discharges as may be required by those agencies.

8. Preliminary plans, specifications and dates for any improvements which the applicant intends to make on the Airport as part of the activity for which approval is sought. Applicant must comply with appropriate Review Procedures and the _____ Airport Authority requirements.

9. Proof (copy or insurance company letter of intent) of liability coverage for the business operation, flight operations, itinerant aircraft and operators and premises insurance.

10. Such other information as the _____ Airport Authority may require.

Section 5 - Action on Application

All applications will be reviewed and acted upon by the _____ Airport Authority within 90 days from the receipt of the application. Applications may be denied for one or more of the following reasons:

1. The applicant does not meet qualifications, standards and requirements established by these Minimum Standards.

2. The applicant's proposed operations or construction will create a safety hazard on the Airport.

3. The granting of the application will require the expenditure of local funds, labor or materials on the facilities described in or related to the application, or the operation will result in a financial loss to _____ Airport Authority.

4. There is no appropriate or adequate available space or building on the Airport to accommodate the entire activity of the applicant.

5. The proposed operation, Airport development or construction does not comply with the approved Airport Layout Plan.

6. The development or use of the area requested will result in a congestion of aircraft or buildings, or will result in unduly interfering with the operations of any present fixed base operator on the Airport, such as problems in connection with aircraft traffic or service, or preventing free access and egress to the existing fixed base operator area, or will result in depriving, without the proper economic study, an existing fixed base operator of portions of its leased area in which it is operating.

7. Any party applying, or interested in the business, has supplied false information, or has misrepresented any material fact in the application or in supporting documents, or has failed to make full disclosure on the application.

8. Any party applying, or having an interest in the business, has a record of violating the Rules, or the Rules and Regulations of any other Airport, Civil Air Regulations, Federal Aviation Regulations, or any other Rules and Regulations applicable to this or any other Airport.

9. Any party applying, or having an interest in the business, has defaulted in the performance of any lease or other agreement with the _____ Airport Authority or any lease or other agreement at any other airport.

10. Any party applying, or having an interest in the business, is not sufficiently credit worthy and responsible in the judgment of the _____ Airport Authority to provide and maintain the business to which the application relates and to promptly pay amounts due under the FBO lease.

11. The applicant does not have the finances necessary to conduct the proposed operation for a minimum period of six months.

12. The applicant has committed any crime, or violated any local ordinance rule or regulation, which adversely reflects on its ability to conduct the FBO operation applied for.

Section 6 - Aircraft Sales

Statement of Concept

1. New Aircraft Sales: An aircraft sales FBO engages in the sale of new aircraft through franchises or licensed dealerships (if required by local, county or state authority) or distributorship (either on a retail or wholesale basis) of an aircraft manufacturer or used aircraft;

and provides such repair, services, and parts as necessary to meet any guarantee or warranty on aircraft sold.

2. Used Aircraft Sales: Many companies engage in the purchasing and selling of used aircraft. This is accomplished through various methods including matching potential purchasers with an aircraft (brokering), assisting a customer in the purchase or sale of an aircraft, or purchasing used aircraft and marketing them to potential purchasers. In many cases these FBO's also provides such repair, services, and parts as necessary to support the operation of aircraft sold. Some of the requirements may not be appropriate to the sale of used aircraft because of each aircraft's unique operational history.

Minimum Standards

1. The FBO shall provide necessary and satisfactory arrangements for repair and servicing of aircraft, but only for the duration of any sales guarantee or warranty period. The FBO shall provide an adequate inventory of spare parts for the type of new aircraft for which sales privileges are granted. The FBO who is engaged in the business of selling new aircraft shall have available a representative example of the product.

2. The FBO shall have in his employ, and on duty during the appropriate business hours, trained personnel in such numbers as are required to meet the Minimum Standards set forth in an efficient manner. The FBO shall also maintain, during all business hours, a responsible person in charge to supervise the operations in the leased area with the authorization to represent and act for and on behalf of the FBO, and provide check ride pilots for aircraft sold.

Section 7 - Aircraft Airframe, Engine and Accessory Maintenance and Repair

Statement of Concept

An aircraft airframe, engine and accessory maintenance and repair FBO provides one or a combination of airframe, engine and accessory overhauls and repair services on aircraft up to and

may include business jet aircraft and helicopters. This category shall also include the sale of aircraft parts and accessories.

Minimum Standards

1. The FBO shall provide sufficient equipment, supplies, manuals and availability of parts equivalent to that required for certification by the FAA.

2. The FBO shall have in his employ, and on duty during the appropriate business hours, trained personnel in such numbers as are required to meet the Minimum Standards set forth in this category of services in an efficient manner, but never less than one person currently certificated by the FAA with ratings appropriate to the work being performed and who holds an airframe, power plant or an aircraft inspector rating.

Section 8 - Aircraft and/or Ultralight Vehicle Lease and Rental

Statement of Concept

An aircraft and/or ultralight vehicle lease or rental FBO engages in the rental or lease of aircraft and/or ultralight vehicle to the public.

Minimum Standards

Aircraft:

1. The FBO shall have available for rental, either owned or under written lease to FBO, _____ certified and currently airworthy aircraft, _____ of which must be a four-place aircraft, and _____ of which must be equipped for and capable of flight under instrument weather conditions.

2. The FBO shall have in his employ and on duty during the appropriate business

hours, a minimum of one person having a current FAA commercial pilot certificate with appropriate ratings, including instructor rating.

Ultralight Vehicles:

1. The FBO shall have available for rental, either owned or under written lease to the FBO, one approved two-place ultralight vehicle.

2. The FBO shall have in his employ and on duty during appropriate business hours, a minimum of one person having a current FAA commercial pilot certificate or an Advanced Flight Instructor's (AFI) rating from the United States Ultralight Association (USUA).

Section 9 - Flight Training

Statement of Concept

A flight training FBO engages in instructing pilots in dual and solo flight training, in fixed and/or rotary wing aircraft, and provides such related ground school instruction as is necessary preparatory to taking a written examination and flight check ride for the category or categories of pilots' licenses and ratings involved.

Minimum Standards

1. The FBO shall have available for use in flight training, either owned or under written lease to FBO, properly certificated aircraft, _____of which must be a four-place aircraft, and _____of which must be equipped for and capable of use in instrument flight instruction.

2. The FBO shall have on a full-time basis at least one flight instructor who has been properly certificated by the FAA to provide the type of training offered.

Section 10 - Commercial Skydiving

Statement of Concept

A Skydiving FBO engages in the transportation of persons for skydiving, instruction in skydiving, and rental and sales of skydiving equipment.

Minimum Standard

1. The FBO shall have available for skydiving, either owned or under written lease to the FBO, at least one property certificated aircraft.

2. The FBO operation shall meet or exceed the Basic Safety Requirements (BSR) of the United States Parachute Association (USPA), FAR 105, and related FAA Advisory Circulars. The jump plane pilot must hold a FAA commercial pilot certificate and approximately rated for the aircraft being operated.

3. The skydiving FBO shall carry the same insurance coverage and limits as any other FBO on the airport.

Section 11 - Aircraft Fuels and Oil Service

Statement of Concept

An aircraft fuels and oil service FBO provides aviation fuels, lubricants and other services supporting itinerant aircraft operations and operations of aircraft based on the airport.

Minimum Standards

Except as otherwise provided in any agreement between the FBO and the Authority, an FBO conducting aviation fuel and oil sales or service to the public on the Airport shall be required to provide the following services and equipment:

1. Appropriate grades of aviation fuel.
   a. _____
   b. _____
   c. _____

2. An adequate inventory of generally accepted grades of aviation engine oil and lubricants.

3. Fuel dispensing equipment, meeting all applicable Federal, State, and Authority requirements for each type of fuel dispensed.

4. Proper equipment for aircraft towing, inflating aircraft tires, washing aircraft windscreens, and recharging aircraft batteries.

5. The safe storage and handling of fuel in conformance with all Federal, State, County requirements and fire codes pertaining to safe storage and handling of fuel.

6. The lawful and sanitary handling and timely disposal, away from the Airport, of all solid waste, regulated waste, and other materials including, but not limited to, used oil, solvents, and other regulated waste. The piling and storage of crates, boxes, barrels, and other containers will not be permitted within the leased premises.

7. Permanent restroom facilities for personnel and customers.

8. Auto parking for customers and employees.

9. A flight planning area with appropriate seating, work areas, communication

facilities, directories and all items necessary for complete flight planning separate from other public areas.

10. A pilot lounge and waiting area for transition of air passengers to ground transportation and vice versa.

11. Adequate bonding wires will be installed, continuously inspected and maintained on all fueling equipment, to reduce the hazards of static electricity.

12. An adequate supply of properly located fire extinguishers and other precautions and/or equipment required by applicable fire codes.

13. Unless provided by the airport owner, the FBO shall have a fixed fuel storage system which shall contain safety fixtures and filtration systems to ensure airline-type quality. The system shall be required to have at least _____ gallons of storage for each type of fuel the FBO is required to provide. The storage system must include adequate fuel spill prevention features and containment capabilities, together with an approved fuel Spill Prevention Countermeasures and Control Plan (SPCC), as applicable.

Section 12 - Avionics, Instruments or Propeller Repair Station

Statement of Concept

An avionics, instrument, or propeller repair station FBO engages in the business of and provides a shop for the repair of aircraft avionics, propellers, instruments, and accessories for general aviation aircraft. This category may include the sale of new or used aircraft avionics, propellers, instruments, and accessories. The FBO shall hold the appropriate repair station certificates issued by FAA for the types of equipment he plans to service and/or install.

Minimum Standards

The FBO shall have in his employ and on duty during the appropriate business hours trained personnel in such numbers as are required to meet the Minimum Standards set forth in this category in an efficient manner but never less than one person who is an FAA rated radio, instrument or propeller repairman.

Section 13 - Aircraft Charter and Air Taxi

Statement of Concept

An unscheduled, or scheduled air charter or air taxi FBO engages in the business of providing air transportation (persons or property) to the general public for hire, on an unscheduled or scheduled basis under Code of Federal Regulations CFR 14 Part 135 of the Federal Aviation Regulations.

Minimum Standards

1. The FBO shall provide, either owned or under written lease type, class, size and number of aircraft intended to be used by the FBO, not less than _____ _____single-engine four-place aircraft and _____ multi-engine aircraft, both of which must meet the requirements of the air taxi commercial FBO certificate held by the FBO. The multi-engine aircraft shall be certified for instrument operations.

2. The FBO shall have in his employ and on duty during the appropriate business hours trained personnel in such numbers as are required to meet the Minimum Standards set forth in this category in an efficient manner but never less than one person who is an FAA certified commercial pilot and otherwise appropriately rated to permit the flight activity offered by FBO.

Section 14 - Aircraft Storage

Statement of Concept

An aircraft storage FBO engages in the rental of conventional hangars or multiple T-hangars.

Minimum Standards

1. The conventional hangar FBO shall have his facilities available for the tenant's aircraft removal and storage on a continuous basis.

2. The FBO shall demonstrate that it can provide sufficient personnel trained to meet all requirements for the storage of aircraft with appropriate equipment.

Section 15 - Specialized Commercial Flying Services

Statement of Concept

1. A specialized commercial flying services FBO engages in air transportation for hire for the purpose of providing the use of aircraft for the following activities:

   a. Non-stop sightseeing flights that begin and end at the same airport.
   b. Crop dusting, seeding, spraying, and bird chasing.
   c. Banner towing and aerial advertising.
   d. Aerial photography or survey.
   e. Power line or pipe line patrol.
   f. Fire fighting.
   g. Any other operations specifically excluded from Part 135 of the Federal Aviation Regulations.

Minimum Standards

1. The FBO shall lease from the Owner and the lease shall include a building sufficient to accommodate all activities and operations proposed by the FBO. The minimum areas in each instance shall be subject to the approval of the Owner. In the case of crop dusting or aerial application, the FBO shall make suitable arrangements and have such space available in his leased area for safe loading and unloading and storage and containment of chemical materials. All FBO's shall demonstrate that they have the availability of aircraft suitably equipped for the particular type of operation they intend to perform.

2. The Owner shall set the minimum insurance requirements as they pertain to the particular type of operation to be performed. These minimum requirements shall be applicable to all operations of a similar nature. All FBO's will, however, be required to maintain the Aircraft Liability Coverage as set forth for all FBO's.

3. The FBO shall have in his employ, and on duty during appropriate business hours, trained personnel in such numbers as may be required to meet the Minimum Standards herein set forth in an efficient manner.

4. The FBO must provide, by means of an office or a telephone, a point of contact for the public desiring to utilize FBO's services.

Section 16 - Multiple Services

Statement of Concept

A multiple services FBO engages in any two or more of the aeronautical services for which Minimum Standards have been herein provided.

Minimum Standards

1. The FBO shall comply with the aircraft requirements, including the equipment thereon for each aeronautical service to be performed except that multiple uses can be made of all aircraft owned or under lease by FBO except aircraft used for crop dusting, aerial application, or other commercial use of chemicals.

2. The FBO shall provide the facilities, equipment and services required to meet the Minimum Standards as herein provided for all aeronautical service the FBO is performing.

3. The FBO shall obtain, as a minimum, that insurance coverage which is equal to individual insurance requirements of all aeronautical services being performed by FBO.

4. The FBO shall have in his employ, and on duty during the appropriate business hours, trained personnel in such numbers as are required to meet the Minimum Standards for each aeronautical service the FBO is performing as herein provided. Multiple responsibilities may be assigned to meet the personnel requirements for each aeronautical service being performed by the FBO.

Section 17 - Flying Clubs

See requirements for Flying Clubs in Airport Rules and Regulations.

Section 18 - FBO's Subleasing From Another Commercial FBO

Prior to finalizing an agreement, the lessee and sublessee shall obtain the written approval of the Owner for the business proposed. Said sublease shall define the type of business and service to be offered by the sublessee FBO.

The sublessee FBO shall meet all of the Minimum Standards established by the Owner for the categories of services to be furnished by the FBO. The Minimum Standards may be met in combination between lessee and sublessee. The sublease agreement shall specifically define those services to be provided by the lessee to the sublessee that shall be used to meet the standards.

Section 19 - Environmental

Any FBO, person, party, firm or corporation operating on this airport must comply with all federal, state and local environmental requirements.

APPENDIX 1

Minimum Insurance Policy Limits

Type of Insurance	Minimum Limits	When Needed
- Workman's Compensation	Statutory	Statutory
- Aircraft Liability	Risk Analysis	Owned or leased aircraft
- Non-owned Aircraft Liability	Risk Analysis	Flying non-owned aircraft (such as dual to owner, maintenance test & ferry flights, pilot service, sales demonstrations)
- Airport Premises Liability	Risk Analysis	Airport premises are owned or leased by tenant.
- Products & Completed Ops.	Risk Analysis	Aircraft repair or service, fuel and oil sales, aircraft sales, avionics repair, aircraft parts sales, and manufacturing.
- Builders Risk	Risk Analysis	Construction projects.
- Contractual Liability	Risk Analysis	Hold harmless and indemnification agreement is included in a lease.

APPENDIX 1

Type of Insurance	Minimum Limits	When Needed
- Hangar Keepers Liability	Risk Analysis	Non-owned aircraft are in the care, custody or control of the tenant while on the ground.
- Property Insurance for	Replacement value	Covers physical damage of lease hold premises damage to premises leased from the airport.
- Automobile Liability	Statutory minimum	Owned and non-owned licensed vehicles are driven on the airport premises.
- Chemical Liability	Usually statutory	Aerial applicators and fire bombers.
- Environmental	Risk Analysis	(Investigate state and federal limits and financial assistance.)

APPENDIX 2

Minimum Requirements for a Business Plan

1. All services that will be offered.
2. Amount of land desired to lease.
3. Building space that will be constructed or leased.
4. Number of aircraft that will be provided.
5. Equipment and special tooling to be provided.
6. Number of persons to be employed.
7. Short resume for each of the owners and financial backers.
8. Short resume of the manager of the business (if different from "g" above) including this person's experience and background in managing a business of this nature.
9. Periods (days and hours) of proposed operation.
10. Amounts and types of insurance coverage to be maintained.
11. Evidence of the projections for the first year and the succeeding 4 years.
12. Methods to be used to attract new business (advertising and incentives).
13. Amenities to be provided to attract business.
14. Plans for physical expansion, if business should warrant such expansion.

SAMPLE
AIRPORT TENANT MINIMUM STANDARD REQUIREMENTS

Definition: a person(s), firm(s), or corporation(s) conducting an aeronautical or non-aeronautical activity occupying building(s), land space, and/or aircraft apron space on airport property but who is not a fixed base operator.

Minimum Standards: An airport tenant shall be prohibited from engaging in any of the activities of fixed based operators [as defined herein].

An airport tenant shall provide that any and all aircraft owned by him and/or operated from the property leased or occupied by him are FAA certified, currently airworthy, and currently registered with the Maine Department of Transportation/Office of Passenger Transportation.

An airport tenant shall lease from the [airport sponsor] or provide under terms agreeable to the [airport sponsor], a building or portion thereof, owned by the [airport sponsor] and/or an area of ground space which shall be improved as may be required by the [airport sponsor].

An airport tenant shall be required to carry the following types of insurance in the limits specified:

Comprehensive General Liability including Completed Operations: $_____ to $_____ each person, each occurrence.

Aircraft Liability (if applicable): $_____ each person bodily injury; $_____ each accident bodily injury; $_____ each accident property damage.

Products Liability (if applicable): $_____ each occurrence.

Motor Vehicle Liability (if applicable): $_____ each person bodily injury; $_____ each accident bodily injury; $_____ each accident property damage.

The [airport sponsor] reserves the right to further develop or improve the landing area of the airport as it sees fit, regardless of the desires or view of the airport tenant, and without interference or hindrance.

The [airport sponsor] reserves the right to take any action it considers necessary to protect the aerial approaches of the airport against obstruction, together with the right to prevent airport tenants from erecting, or permitting to be erected, any building or other structure on the airport which, in the opinion of the [airport sponsor], would limit the usefulness of the airport or constitute a hazard to aircraft.

Any lease/operating rights agreement shall be subordinate to the provisions of any existing or future agreement between [airport sponsor] and the United States, relative to the operation or maintenance of the airport, the execution of which has been or may be required as a condition precedent to the expenditure of federal funds for the development of the airport.

It is clearly understood by the airport tenant that no right or privilege has been granted which would operate to prevent any person, firm, or corporation operating aircraft on the airport from performing any services on its own aircraft with its own regular employees (including, but not limited to, maintenance and repair) that it may choose to perform outside of leasehold area of the airport tenant.

Landscaping of facilities is required. Each airport tenant will be required to provide a plan for landscaping his area, to be approved by the [airport sponsor] and maintained by the airport tenant in a neat, clean, and aesthetically pleasing manner.

Each airport tenant shall provide for the adequate and sanitary handling and disposal, away from the airport, of all trash, waste, and other materials, including, but not limited to, used oil, solvents, and other waste. The piling or storage of crates, boxes, barrels, and other containers will not be permitted within the leased premises.

All leasehold improvements by the airport tenant shall be made in strict conformance with all standard construction specifications promulgated by the [airport sponsor]. Prior to the construction or display of any exterior signing, written approval must be obtained from the [airport sponsor]. In recognition of the need for positive and tasteful appearance of new development and exterior signage at the airport, the [airport sponsor] is hereby delegated the final responsibility for reviewing all airport development and extension signage plans to ensure that aesthetic quality is properly maintained in airport development and that the plan meets applicable safety standards subject to appeal to the City/Town Council.

Each airport tenant shall protect the general public, the customers or clients and the [airport sponsor] from any and all lawful damages, claims, or liability, and they shall provide the types of insurance required in the applicable category(s) and written in such amounts designated on the previous schedule, as amended from time to time by City/Town Council, but in no event less than the amounts required by the Maine Department of Transportation/Office of Passenger Transportation. The [airport sponsor] shall be an additional named insured in any such policy, and a certificate of insurance evidencing the same and the required coverage shall be delivered to the [airport sponsor] prior to or at the time of any lease of airport property. The certificate of insurance shall also provide that the [airport sponsor] will be notified by the insurance company, in writing, thirty (30) days in advance of any cancellation of such insurance. Such insurance policies shall remain in full force and effect during the term of the lease/contract between the airport tenant and [airport sponsor], and any renewal policies shall be filed with the [airport

sponsor] not less than thirty (30) days before the expiration date of such policies.

All airport tenants shall conform with and abide by all rules and regulations of the Federal Aviation Administration, the Maine Department of Transportation/Office of Passenger Transportation, and [airport sponsor]. In this regard, airport tenants shall require that aircraft which they own and operate, or make available for hire, be operated by personnel who hold appropriate and current Federal Aviation Administration Pilot and Medical certificates.

No construction of any kind shall be done at the airport without the prior written approval of the Federal Aviation Administration, or its successor governmental agency, and the [airport sponsor], and no such approval shall be granted unless such construction and design is consistent with the latest approved airport master plan or airport layout plan for the development of said airport. Construction shall be completed within one year of the date of such written approval.

Aircraft parking apron space other than apron space specifically leased to airport tenants shall be for use by the general public only. No airport tenant shall be permitted to use any portion of public apron space for his use exclusively or to use any of such apron space as parking or tiedown area.

Rental rates to be paid by any airport tenant to the [airport sponsor] for the lease of land, building space and/or other improvements owned by [airport sponsor], under a duly executed agreement between the airport tenant and [airport sponsor], shall be increased or decreased on the [frequency] anniversary of the agreement and on each subsequent [frequency]-year anniversary, in accordance with the fluctuations of the U.S. Department of Commerce, "Consumer Price Index" (hereinafter the CPI), Northeast Division. The adjusted rental rates shall be computed on each [frequency]-year anniversary, to be effective for the next [frequency] years, by multiplying the rental rates set forth in the agreement by a fraction, the numerator of said fraction being the most recently published CPI prior to the applicable anniversary date and the denominator of said fraction being the CPI published for the month of the effective date of the agreement. In no event shall such adjustment of rental rates result in a reduction of said rates below the rates set forth in the agreement.

In recognition of the need for positive and tasteful appearance of new development at the airport, the [airport sponsor] is hereby delegated the final responsibility for reviewing all airport development plans to ensure that aesthetic quality is properly maintained in airport development and that the plan meets applicable safety standards subject to appeal to the City/Town Council.

All non-airworthy aircraft not in an enclosed structure shall be removed from the airport on thirty (30) day written notice from the [airport sponsor] to airport tenant at airport tenant's expense unless a waiver is requested and granted by the [airport sponsor] for insurance purposes.

In the event of any conflict between the terms of these "Minimum Standards and Procedures at [name of airport]," and the provisions of any lease of a portion of the airport property, the terms of the lease shall be controlling, providing they are not less stringent than these standards.

Nothing in these "Minimum Standards and Procedures for [name of airport]" shall be construed as the conferring of a positive privilege and/or exclusive right to do business on the airport, irrespective of any existing agreement between the [airport sponsor] and an airport tenant. Any subsequent grant of federal funds, administered by the Federal Aviation Administration, requires the [airport sponsor] to agree not to permit the establishment of an exclusive right to engage in any aeronautical activities in the future and to terminate any existing agreement which permits such an exclusive right as soon as possible.

All airport tenants who have fuel storage tanks or wish to install them shall maintain or install them in complete accordance with Title 40 Code of Federal Regulations Part 280 and submit application/recordation form with the Maine Department of Environmental Protection. In addition, all airport tenants shall register any existing above ground or below ground fuel tanks that are on the leased premises with the [airport sponsor] indicating the size, the contents, the date of installation and the exact location and proof of insurance satisfactory to the [airport sponsor] thereon. All airport tenants shall have such facilities inspected at least annually by an independent qualified fuel tank inspector and the report of the inspection shall be made available to the [airport sponsor] within fifteen (15) days of inspection. Recommendations from the inspectors shall be carried out forthwith by the airport tenant. Inventory control and records must be kept as approved by the [airport sponsor]. If the inspection report of any tank indicates that there may be a leakage problem with the tank, the airport tenant shall, at the airport tenant's expense, cause the tank to be properly removed. The airport tenant, by virtue of owning and using such tank facility, takes complete and total responsibility for any leakages or pollution that may occur as a result of the use of the tank, and by continuing to use such tanks or installing new ones acknowledges this complete responsibility and liability and indemnifies and holds the [airport sponsor] harmless from any responsibility or liability whatsoever therefore. No new tanks shall be installed at the airport by airport tenants except fixed base operators and only then with the express written consent of the [airport sponsor].

BELFAST MUNICIPAL AIRPORT
BELFAST, MAINE

APPENDIX 8-3
SNOW-REMOVAL PROCEDURES

CHAPTER 3. SNOW AND ICE REMOVAL PROCEDURES

21. **SNOW CONTROL PROCEDURES.** Close coordination should be maintained between the snow control center, air traffic control facility, FSS or UNICOM, and airport management to ensure a prompt response to snow and ice control urgencies. Alternate access to the runway by snow and ice control equipment, friction measuring equipment, and aircraft is necessary to keep movement areas operational to the extent practical.

a. **Control of Snow Drifting.** Preventing drifting snow from reaching operational areas will reduce the clearance effort.

(1) **Operational Procedures.** If possible, move the snow to the prevailing downwind side of the runway to reduce drifting. Plan on the prevailing winds and the likelihood that they will change with frontal passage. Another aid to help reduce drifting snow early in the season is to have all vegetation on the pavement edges mowed as short as possible.

(2) **Snow Fences.** Snow fences, if properly designed and located, can reduce the drifting of windblown snow. Snow fences should not be placed so that they penetrate any critical surfaces, and they should be outside of the runway safety area. Studies with snow fences have shown that optimum retention is obtained with a fence having 50 percent porosity, and the fence should be located upwind of the area to be protected a distance of at least thirty times the height of the fence. Studies by the United States Department of Agriculture, Forest Service aided in the development of the "Wyoming" snow fence which has proven very effective. It has horizontal slats with 50 percent porosity, a gap of 12-18 inches (30-46 cm) at the bottom, an angle of 15 degrees toward the leeward side, and is set perpendicular to the prevailing wind. A 12-foot (3.7 m) height was generally most effective in their studies, though a shorter height can be used and is usually necessary on airports.

(3) **Snow Trenches.** An expedient involves cutting a trench in the snow which has been cleared off the edges of the runway to act as a trap (see figure 3-1). Care must be taken in digging the trenches to ensure that the surface of the safety area is not damaged (i.e., ruts, humps, or bumps are created). Multiple trenches spaced about 10 feet (3 m) apart can store more snow. The closest to the runway that a trench should be excavated is 50 feet (15 m).

b. **Snow Removal Principles.** While conditions at individual airports vary widely and may require special removal methods or techniques, there is general criteria that should be followed as closely as possible. In general, airport users should be promptly notified, and a NOTAM should be issued immediately, advising of unusual airport conditions.

(1) Start snow and ice control operations on priority 1 areas as defined in paragraph 16, beginning with the primary instrument runway or active runway, as soon as snow or frozen precipitation begins to fall. Sweepers, if available, should be used to keep the center bare. As soon as snow has accumulated to a depth that cannot efficiently be handled by the sweepers, displacement plows and rotary plows should be dispatched to remove the windrows. If the pavement is warm enough for snow to compact and bond or if freezing rain is forecast, anti-icing chemicals should be applied prior to the start of precipitation or as soon after its start as possible. When snow has melted or begins to accumulate, or any ice that has formed has been disbonded from the pavement by the chemical, sweepers should remove this residue.

(2) The severity of a snowstorm will determine the extent of the area to be cleared initially. The objective should be to clear the entire priority 1 area; but should snowfall be too heavy to accomplish this, operations should be reduced to keeping the center of the priority 1 runway and its taxiways open. If the full width of the runway cannot be cleared, this situation should be reported in a NOTAM giving details of the cleared width to allow each operator to judge the suitability of conducting operations since aircraft requirements differ. If this width will not meet minimum operational requirements, operations should be reduced further or curtailed, and efforts should be concentrated on satisfying those requirements.

(3) Clearance of snow from the runway is accomplished most effectively by operating a plow team in echelon, figures 3-2 and 3-3, using a number of displacement plows to move the snow with a minimum of rehandling into a windrow which can then be cast beyond the edge lights by a rotary plow.

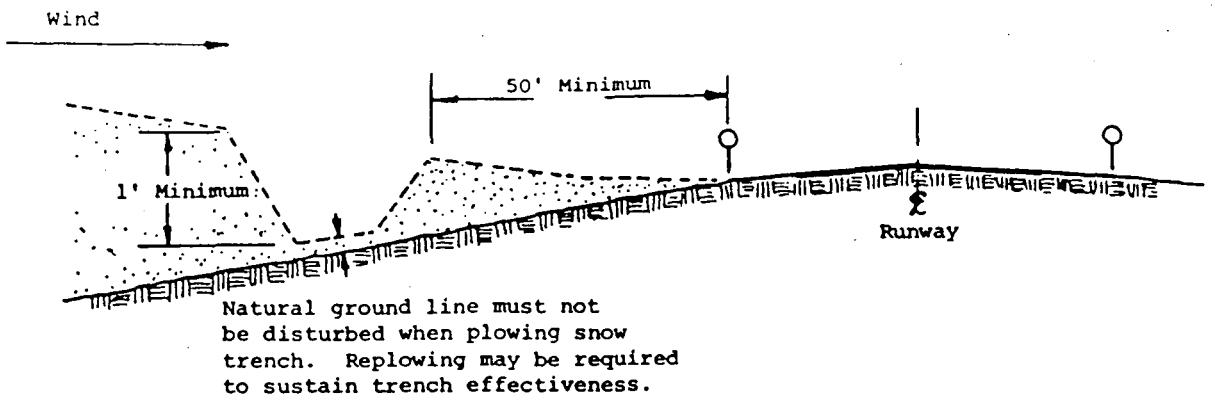


Figure 3-1. Typical Snow Trench.

The number of displacement plows to be used should be based on the volume of snow handled and the capacity of the rotary plow. Blades should not be dropped onto the pavement until the equipment is in motion in order to avoid damage to pavement and equipment. A safe distance should be maintained between vehicles operating in a team to avoid accidents resulting from loss of visibility. If visibility suddenly drops to near zero while plowing operations are in progress, equipment should stop immediately and radio its position to the supervisor or snow desk. No further movement should be attempted until visibility improves.

(4) If no wind is blowing, snow can be cleared to either side of the runway. Selection of casting direction can then be based on storage capacity of the field adjacent to the runway; visibility considerations, avoidance of structures, NAVAID's or other devices; and least effort clearance. If a wind is blowing, however, free choice of clearance direction may not be possible because movement of snow into the wind will result in considerable drifting back onto the cleared areas and will reduce the operator's visibility. In the case of a cross wind, clearance is best accomplished by plowing and casting with the wind, figure 3-4, regardless of the situation on the side of the runway where the snow will be deposited (except make sure clearances are in tolerance with figures 3-5, 3-6a, and 3-6b).

(5) Equipment movements must be carefully timed and coordinated to ensure an orderly turnaround and safe reentry at the start of the return pass. Close liaison must be maintained between the control tower, snow control center, and supervisory personnel. The control tower should be in contact with the snow control monitoring network whenever equipment is operating on movement areas.

(6) The height of a snowbank on an area adjacent to a runway, taxiway, or apron should be reduced to provide wing overhang clearance and preclude operational problems caused by ingestion of ice into turbine engines or propellers striking the banks prior to the area being reopened to aircraft operations. Figure 3-5 shows the desired maximum snow height profile which generally should be obtained. This profile should be checked for the most demanding airplanes used at the airport to ensure that props, wing tips, etc., do not touch the snow with a wheel at the edge of the full-strength pavement. When conditions permit, the profile height should be reduced to facilitate future removal operations and to reduce the possibility of snow ingestion into jet engines. Figures 3-6a and 3-6b provides a graphic presentation of the glide slope (ground plane) area to be kept clear. Snowbanks should not be allowed between this area and the runway.

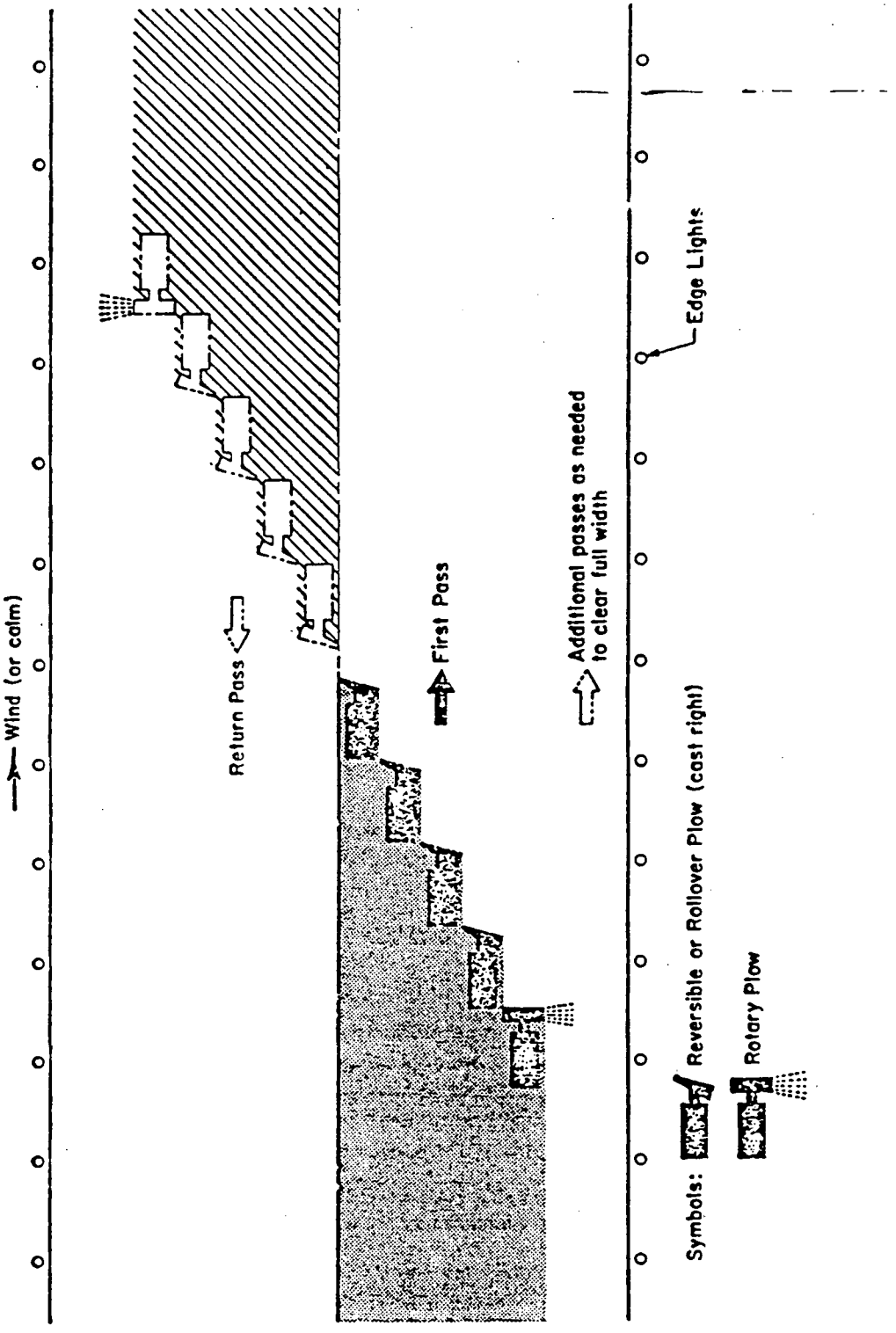


Figure 3-2 Possible Team Configuration During Light Snowfall with Parallel or Calm Wind Situations

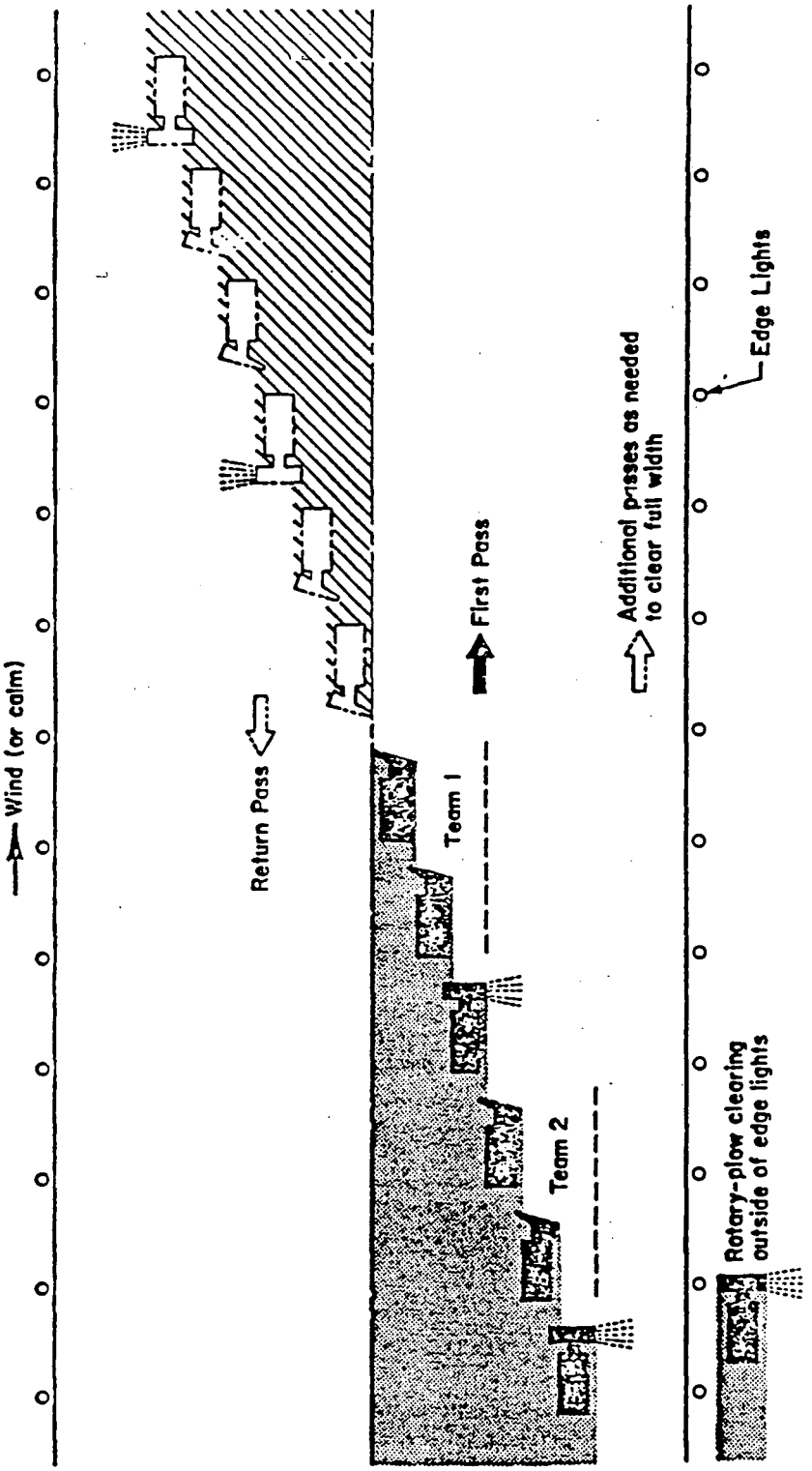


Figure 3-3 Possible Team Configuration with Parrallel or Calm Wind. Rotary Plow Can be Used Outside of Edge Lights if Suitable Paved Shoulder is Available.

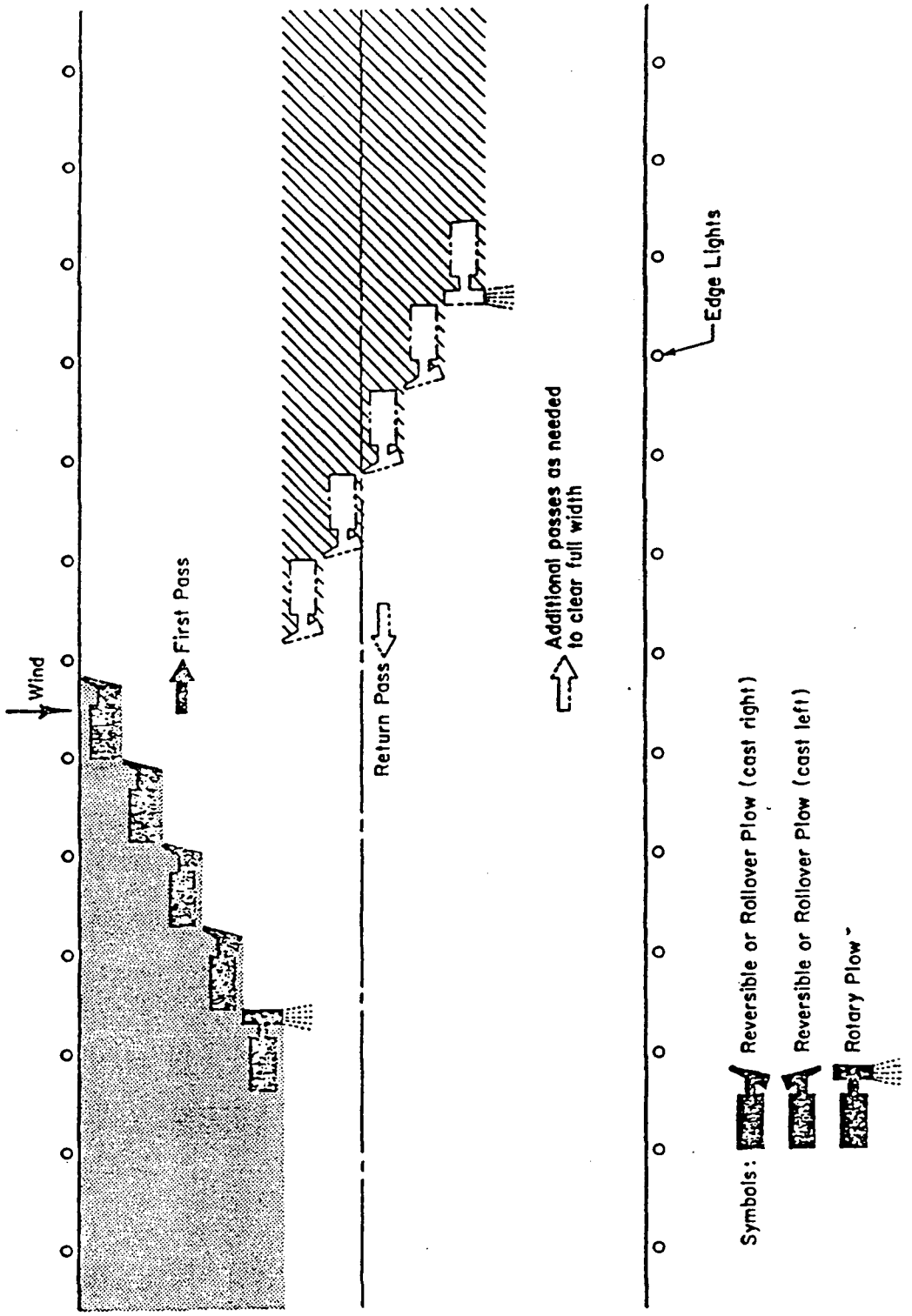
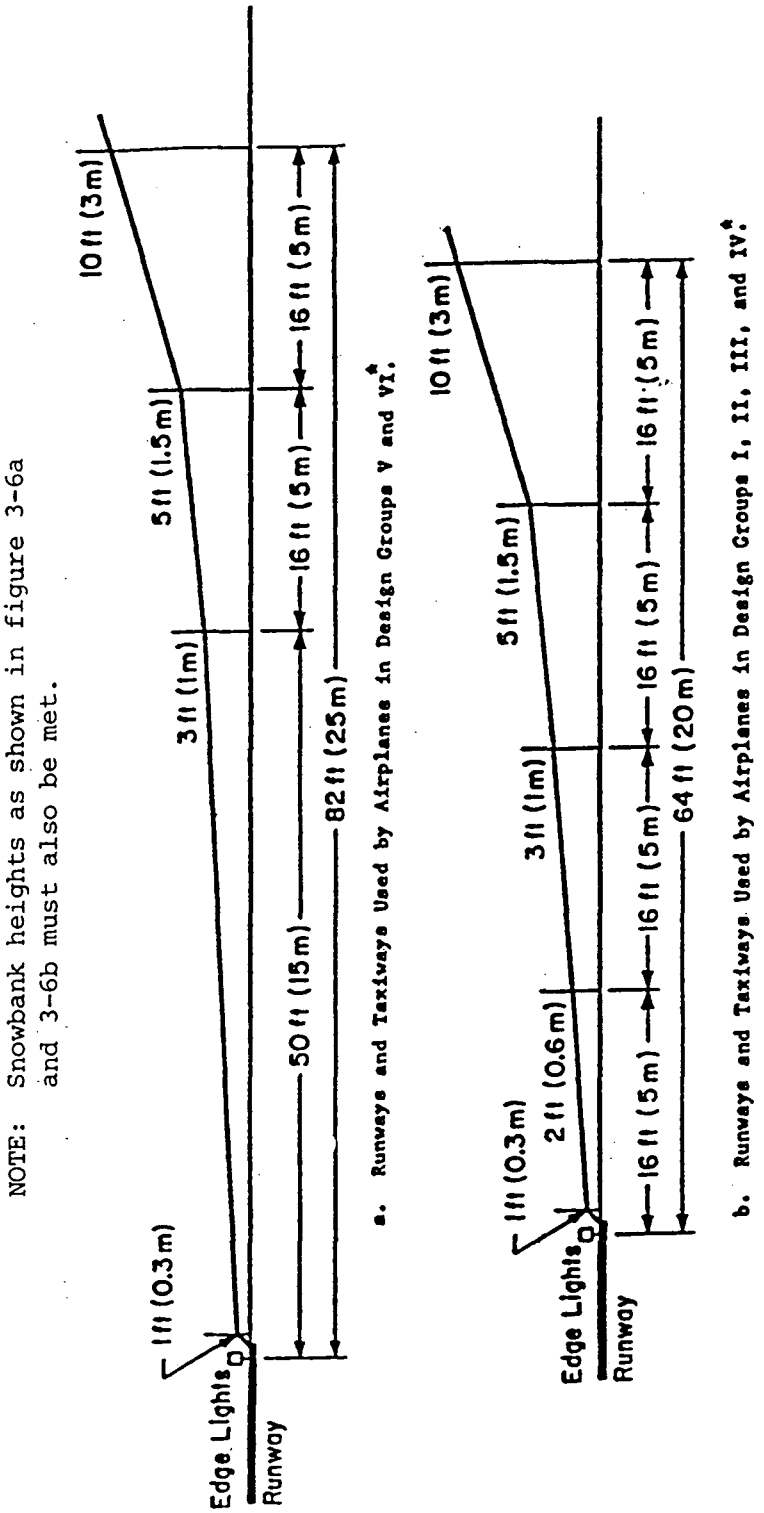


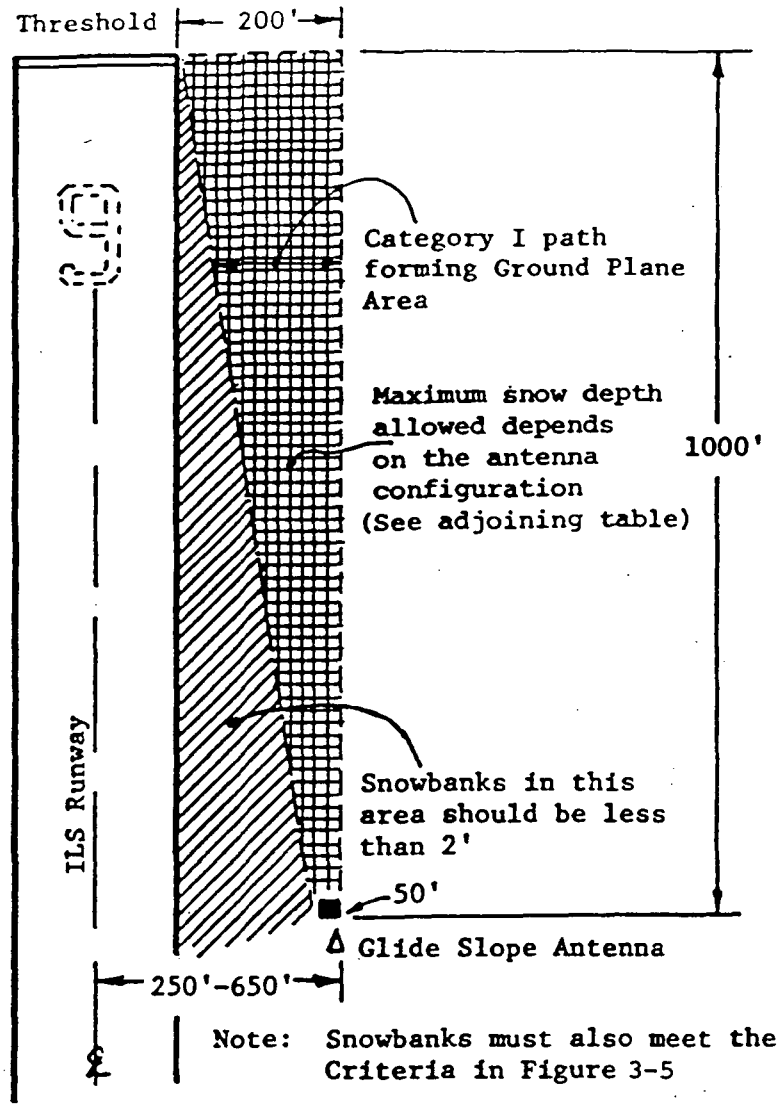
Figure 3-4 Possible Team Configuration with Perpendicular Wind. (Dependent upon Capacity of the Rotary Plow)



NOTE: Snowbank heights as shown in figure 3-6a and 3-6b must also be met.

* As defined in AC 150/5300 13

Figure 3-5 Snowbank Heights Generally Acceptable to Clear Engines and Wingtips With the Airplane Wheels on Full Strength Pavement

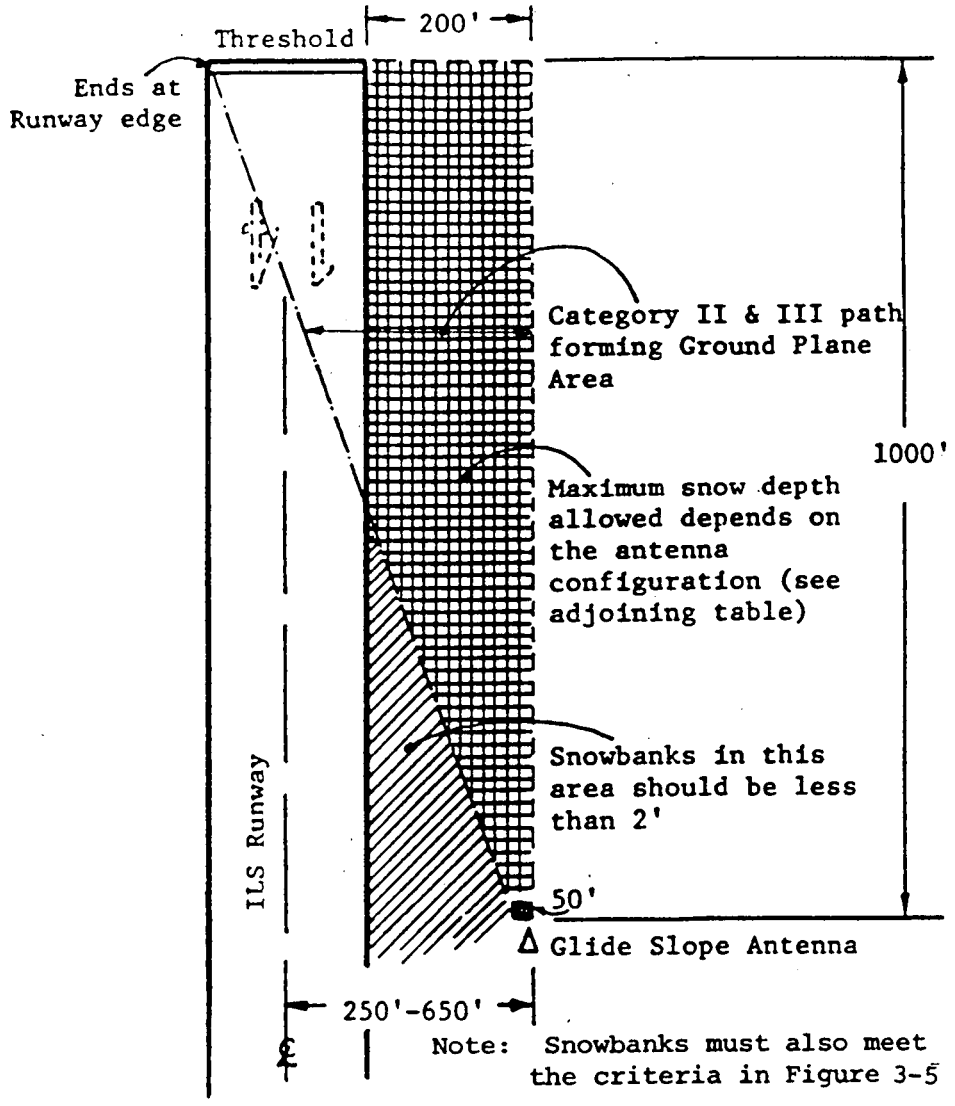


SNOW DEPTH

ACTION TAKEN	SBR < 6 in MR,CEGS < 18 in	SBR 6 - 8 in MR,CEGS 18 - 24 in	SBR > 8 in MR,CEGS > 24 in
Snow is removed	Removal not required. Full CAT I service.	Remove snow 50 ft wide at mast widening to 200 ft wide at 1000 ft towards middle marker.	
Snow is not removed	Full CAT I service.	Category D aircraft minima raised to localizer only.	CAT I approach restricted to localizer only minima.

Antenna configurations: SBR sideband reference
MR mull reference
CEGS capture-effect glide slope

Figure 3-6a CAT I Snow Critical Areas to be Kept Clear of Snow Accumulation



SNOW DEPTH

ACTION TAKEN	SBR < 6 in MR,CEGS < 18 in	SBR 6 - 8 in MR,CEGS 18 - 24 in	SBR > 8 in MR,CEGS > 24 in
Snow is removed	Removal not required. Full CAT II & III services.	Remove snow 50 ft wide at mast widening to 200 ft wide at 1000 ft towards middle marker plus widen the area to include the line from the mast to the far edge of the runway threshold.	
Snow is not removed	Full CAT II & III services.	Both CAT II & III restore to CAT I service. Category D aircraft minima raised to localizer only.	Landing minima raised to localizer only minima.

Antenna configurations: SBR sideband reference
MR null reference
CEGS capture-effect glide slope

Figure 3-6b CAT II & III Snow Critical Areas to be Kept Clear of Snow Accumulation

(7) Movement areas where aircraft will operate at high speeds such as turnoffs should receive the same snow and ice control attention as runways. Areas of low speed operation such as taxiways and ramps can also be critical under some conditions. Directional control and braking action should be maintained under all conditions.

(8) Airports with joint military operations may have arresting barriers located near the end of the active runway or the beginning of the overrun area. Great care should be taken in clearing snow from the barriers. Barriers located on the runway should be deactivated and pendants removed prior to snow removal operations. Snow should be removed to the distance required for effective runout of the arresting system. Snow removal involving arresting barriers should be coordinated with the military tenant prior to the snow removal season.

(9) In heavy snow areas, it is helpful to mark edge lights by placing flexible markers adjacent to the lights. Markers should be securely fastened in place to avoid creating a foreign object damage (FOD) hazard. They should be of a high-contrast color such as international orange to enhance visibility. The height of these units should be 6 inches (14 cm) outside of the propeller arc of the most critical airplane using the airport. Although the units are primarily used to assist snow removal equipment operators in maneuvering around the lights, pilots also find them to be useful as visual taxiing aids. Time and effort in clearing snow from around the lights is minimized by plowing as close as possible to them. The remaining snow can be blown away using an airblast unit mounted on a truck or broom or by spraying with liquid deicing chemical. In some cases, edge lights may be raised. As a last resort, hand shoveling may be necessary.

(10) The face of all signs and all lights should be kept clear of snow and in good repair at all times with priority given to lights and signs associated with holdlines and ILS.

(11) Centerline and touchdown zone (TDZ) lights inset in the pavement tend to form "igloos" of ice or compacted snow surrounding them. Heat from the lamps will melt even cold dry snow which will refreeze and adhere to the pavement and then accumulate around the lights. One method of control or removal is described in paragraph 24. To prevent damage to these lights, use rubber or plastic cutting edges or shoes and casters on plow moldboards and the front of rotary plows.

(12) Striated pavement markings are useful in reducing ice buildup.

22. SNOW DISPOSAL. Some means of disposing of snow must be provided when there is insufficient space for storage adjacent to cleared areas. This will entail loading trucks and hauling to a disposal site, pushing the snow into melting pits sited near the areas being cleared, or portable melting pits set up over catch basins. Although melting pits eliminate long hauls and may reduce truck traffic in the ramp area, an economic analysis should be made to determine the benefit of constructing and operating them. Calculation of the thermal energy required is based on the heat of fusion of ice, 144 Btu/lb (335 kJ/kg) and the specific heat of ice, 0.5 Btu/lb (2.1 kJ/kg). Submerged combustion burners have been developed and are commercially available. A typical 10 x 8 x 8 ft (3 x 2.4 x 2.4 m) deep melting pit containing two burners can melt 120 tons of snow per hour (30 kg/s) consuming 60 gal. (227 liters) of No. 2 fuel oil per burner.

23. MECHANICAL METHODS FOR CONTROLLING ICE. Ice near the freezing point is soft and may be scraped off the pavement. Cold, hard ice bonds much more tenaciously and is difficult to remove by mechanical means. Scraping is not very effective, and attempts to lift the ice from the pavement by penetration with a wedge parallel to the pavement, have only been partially successful. Cutting edges attached to plow moldboards can be operated in contact with the pavement in the attempt to remove ice. At plowing speeds above about 10 mph (16 km/hr), front-mounted plows tend to bounce and leave ice on the pavement. Slower speeds, heavier plows, or plows which can be downloaded can reduce this "porpoising" or bouncing. Application of downward force also helps to penetrate and scrape the ice. Although down pressure can be applied by hydraulic cylinders on front-mounted plows, underbody blades can apply greater pressure without reducing steering control. All blades or cutting edges or the moldboards to which they are attached should have trip mechanisms to release the blade upon striking an obstacle in order to prevent damage to the blade, truck, pavement insert, or pavement. Carbon steel cutting edges run in contact with the pavement wear rapidly and require frequent replacement. Tungsten carbide cutting edges are extremely tough and can last for thousands of miles. They are brittle, however, and can chip upon striking metal or other very hard projections. Serrated cutting edges which cut grooves in hard ice are sometimes used and will facilitate retention of chemicals and abrasives which might otherwise be blown off. Centerline or flush lights should not be plowed with metal cutting edges contacting the pavement; rubber or polymer cutting edges will help prevent damage to the lights. Slush or very soft ice can also be removed effectively by rubber cutting edges which squeegee the pavement.

24. ANTI-ICING VS. DEICING. The most difficult task in winter maintenance occurs when snow or ice bond to the pavement. Thus the primary effort should be directed at bond prevention. Though dry

snow will not readily form a strong bond even under heavy and frequent wheel passes, wet snow and ice will develop such a strong bond that mechanical removal is either difficult, slow, or damaging to the pavement. Ice removal after formation is called deicing; preventing the bond from forming is called anti-icing or bond prevention. Anti-icing, which is recommended over deicing whenever possible, is accomplished by concentrating either thermal or chemical energy at the pavement surface. Because of the high cost of installing pavement heating systems and the large amounts of energy required to maintain the surface above freezing prior to the onset of precipitation, anti-icing/deicing with approved airside chemicals is generally more economical. Chemical application is in either solid (includes pre-wetted) or liquid form. Chemicals in liquid form are most effective for uniform anti-icing treatment of pavements. All deicing/anti- icing chemicals should be applied based on pavement temperature rather than air temperature (see AC 150/5220-13A, Runway Surface Condition Sensor-Specification Guide).

a. **Deicing Chemicals.** Deicing chemicals should be applied on ice 1/16 inch (1.5 mm) or less in thickness. Thicker layers of ice require an extended period of time to obtain ice-free pavement. However, solar radiation from even a cloudy sky enhances melting action to such an extent that elimination of ice thickness greater than 1/16 inch (1.5 mm) are possible.

b. **Anti-icing Chemicals.** The recommended chemical form for anti-icing is liquid, although solid chemicals can also be effective in this application. A dry solid chemical has the disadvantages that if applied to a cold dry surface it may not adhere and therefore, may be windblown or scattered by aricraft movements. However, certain physical properties of a solid, such as its bulk density, particale shape, etc., may reduce these tendencies. Regardless, wetting a dry anti-icing chemical, either during distribution or before or after loading into the application vehicle, improves the ability to achieve uniform distribution and improved adhesion.

25. CHEMICALS. Any water-soluble substance will lower the freezing point of water and thus promote the melting of ice. Theoretically, the lower the molecular weight and the more individual particles (ions) the substance disassociates into, the more effective the product is as an ice control chemical, assuming its solubility still remains high at the freezing temperature. For the purpose of shared information, airport operators should advise the airlines before introducing a new chemical on the airside.

a. **Approved Airside Chemicals.** The FAA either establishes approval specifications or, upon recognition, references the specifications of professional associations such as the Society of Automotive Engineers (SAE) through Aerospace Material Specifications (AMS) and the United States military (MIL-SPEC). The approved airside chemicals for nonaircraft applications are fluid and solid products meeting a generic SAE specification or MIL specification. These specifications require vendors to provide the airport operator with a material safety data sheet (MSDS) and certification that the chemical conforms to the applicable specification. With the increased accountability placed on airport operators to manage deicing/anti-icing chemical runoff, they should request vendors to provide certain environmental data. These data consist of pollutants that the Environmental Protection Agency and the State Department of Natural Resources require of the airport operator in their discharge reporting. Typical information includes: percent product biodegradability, biochemical oxygen demand (BOD5), chemical oxygen demand (COD), pH, presence of toxic or hazardous components, if any, and remaining inert elements after application. Related to the environment, MSDSs provide measures on how to secure large product spills and a 24-hour 800 emergency phone number. While these fluid and solid specifications cover technical requirements for deicing/anti-icing compounds, they do not address the compatibility issue of combining products during operations. Airport operators should query manufacturers about the safe and proper use of concurrently applying multiple deicers/anti-icers.. The FAA-approved airside chemical specifications are as follows:

(1) **Fluid Deicer/Anti-icer.** The approved specification is SAE AMS 1435, Fluid, Generic Deicing/Anti-icing, Runways and Taxiways. Approved products include glycol base fluids and potassium acetate base fluids.

(i) **Glycol Base Fluids.** Composition of proprietary solutions meeting this specification varies with the manufacturer, though the glycol-base content is approximately 50 percent. Application rates range from 1-2 gal/1000 ft^2 for deicing and from 0.2-0.5 gal/1000 ft^2 for anti-icing. While the specification only requires a eutectic temperature of -10 F (-23 C) or less, proprietary products are available with eutectic temperatures as low as -75 F (-59 C). Ethylene glycol, $(CH_2)(OH)(CH_2)(OH)$, has a eutectic temperature of approximately -58 F (-50 C) for an aqueous solution of 58-78 weight percent of ethylene glycol and a freezing point of approximately 8.6 F (-13 C) for the pure fluid. Propylene glycol, $(CH_2)(OH)(CH)(OH)(CH_3)$, has a eutectic temperature of approximately -75 F (-59 C) for an aqueous solution of 60 weight percent of propylene glycol. Propylene glycol in its pure form does not have a freezing point per se, but sets to glass below -60 F (-51 C).

(ii) **Potassium Acetate Base Fluids.** Application rates range from 1-2 gal/1000 ft^2 for deicing and from 0.3-0.5 gal/1000 ft^2 for anti-icing. While the specification requires a eutectic temperature of -10 F (-23 C) or less, proprietary products are available with eutectic temperatures as low as -76 F (-60 C).

(2) **Solid Compound Deicer/Anti-icer.**

(i) **Generic Solid.** The approved specification is SAE AMS 1431A, Compound, Solid Runway and Taxiway Deicing/Anti-icing. Approved solid compounds include airside urea, calcium magnesium acetate (CMA), sodium formate, and sodium acetate. The specification requires a phase diagram relating product dilution to freeze point. The delivered product is effective within +7 F (+4 C) of the preproduction temperature value established by the manufacturer. Application rates for a specific product are based on manufacturer recommendations.

(ii) **Airside Urea (also called carbamide).** The approved specifications are SAE AMS 1431A, Compound, Solid Runway and Taxiway Deicing/Anti-icing and MIL SPEC DOD-U-10866D, Urea-Technical. Agricultural grade urea that meets any of these specifications, termed airside urea, is acceptable. Production of this nontoxic solid white chemical, chemical formula $(NH_2)_2CO$, is in either powder or "shotted" ("prilled") form. The latter form's shape is small spheres of about 1/16 inch (1.5 mm) diameter. Both forms are primarily for deicing where powdered urea is frequently mixed with sand. Hot mixtures of powder or "shotted" urea and sand serve two purposes: (1) immediate increase in braking action and; (2) retention of chemical over the pavement area until it initially dissolves some of the ice and then melts the remainder. The urea deicing function is practical only at temperatures above approximately 15 F (-10 C) because of the decreasing

Application Rate of Airside Urea (lb/ft^2) [kg/m^2]

Ice Thickness inch (cm)	Temperature Deg. F (C)		
	30 (-1.1)	25 (-3.9)	20 (-6.7)
less than 1/32 (.08)	.016 (.078)	.023 (0.11)	.06 (0.29)
1/32 (.08) up to but not including 1/8 (.32)	.03 (0.15)	.06 (0.29)	.125 (0.61)
1/8 - 1/4 (.32-.64)	.125 (0.61)	.175 (0.86)	.275 (1.34)

melting rates below this temperature value. The decreasing melting rate is a result of urea's eutectic temperature, defined in paragraph 2(f), which is approximately 11.3 F (-11.5 C). However, the presence of solar radiation assists urea in the melting action. Pavement surface temperature and ice thickness determine the urea application rate.

b. **Landside Chemicals.** The most effective landside chemicals used for deicing/anti-icing based on both cost and freezing point depression are from the chloride family, e.g., sodium chloride (rock salt), calcium chloride, and lithium chloride. Unfortunately, these chemicals are known to be corrosive to aircraft and therefore are prohibited from use on aircraft operational areas. Although classified as salts, CMA, sodium formate, and potassium acetate are approved for airside use because they comply with an SAE specification. When any corrosive chemical is used, precautions should be taken to ensure that vehicles do not track these products onto the aircraft operational areas.

26. **ENVIRONMENTAL ASPECTS OF DEICING CHEMICALS.** All freezing point depressants may cause scaling of portland cement concrete (PCC) by physical action related to the chemical concentration gradient in the pavement. Deleterious effects on PCC can be reduced by ensuring sufficient cover over reinforcing steel (minimum of 2 inches (5 cm)), using air-entraining additives, and avoiding applications of chemicals for a year after placement. Concrete meeting the compressive strength outlined in ASTM C 672, Scale Resistance of Concrete Surfaces Exposed to Deicing Chemicals, will perform well when subjected to chemical deicers. No surface degradation of asphalt concrete has been observed due to approved chemicals.Deicing/anti-icing chemicals commonly used on airfields, e.g., airside urea, CMA, sodium formate, glycols, and potassium acetate, rapidly biodegrade in the environment although biological oxygen demand for some products may be high under certain cases. Low temperatures and dilution from heavy runoff during periods of use tend to minimize this. Urea decomposes to ammonia which may be quickly dissipated.

27. **RUNWAY FRICTION IMPROVEMENT.** Since snow and ice degrade the coefficient of friction between rubber tires and pavement and could pose an unsafe condition for aircraft, it is important to clear to bare pavement whenever possible. There are situations where complete removal is difficult or impossible to achieve within a required span of time; at temperatures approaching the eutectic temperature of a deicing chemical, for instance, it may require an hour or more for the chemical to go into solution and melt the ice. There are two techniques for modifying the frictional coefficient of a pavement covered with ice or compacted snow, one by building in a texture on the surface and the other by surface treatment of the ice or snow. It should be emphasized, however, that an abrasive is not a deicing chemical and will not remove ice or compacted snow--in fact, heavy applications of abrasives can insulate the ice and prolong its presence.

a. **Pavement Surface Modification.** Surface texture and surface treatment modifications by themselves will not increase the coefficient of friction of ice formed on the surface but both will enhance the response of chemical treatment.

(1) **Pavement Grooving.** Grooves cut into the pavement will trap deicing chemical, reduce loss, and prolong its action. Grooves also assist in draining melt water and avoiding its refreezing. There is empirical evidence that grooves and porous friction courses modify the thermal characteristics of a pavement surface, probably by reducing the radiant heat loss, and delay the formation of ice. There do not appear to be any negative effects from grooved pavements.

(2) **Porous Friction Course (PFC).** PFC has generally the same benefits as grooving. Open graded asphalt concrete is less effective in improving coefficient of friction under icing conditions because the open spaces will fill with compacted snow, and to a lesser extent with ice in the case of freezing rain. Most maintenance personnel have found that chemical treatment rates may need to be increased on this type of pavement compared to dense graded asphalt concrete because of drainage of the chemical. The drainage characteristics also change as abrasives accumulate in the voids and plug them.

b. **Surface Treatment.** This is the approach taken to rapidly increase the frictional coefficient of an ice surface. Two methods are available: application of coarse granular material ("abrasives") and scarifying the ice surface with a serrated blade. A friction value measured below 27 (MU equivalent), as discussed in paragraph 13, indicates that surface treatment should be initiated.

(1) **Abrasives.** Granular material provides a roughened surface on ice and thereby improves aircraft directional control and braking performance. Use of abrasives should be controlled carefully on

turbojet movement areas to reduce engine erosion. If the granules do not embed or adhere to the ice, not only are they likely to be ingested in engines but they can be blown away by wind or scattered by traffic action and serve no useful function. This is particularly the case when ice or compacted snow is at temperatures below about 20° F (-6.7° C) since no water film exists on the surface to act as an adhesive. There are three approaches to reducing loss of abrasives: (a) they can be heated to enhance embedding into the cold surface; (b) the granules can be coated with an approved deicing chemical in the stockpile or in the distributing truck hopper; or (c) dilute deicing chemical can be sprayed on the granules or the pavement at the time of spreading. If stockpiles are kept in a heated enclosure and spread promptly after truck loading, sufficient heat may remain for embedding without the necessity for any further treatment. One method of setting the sand, though difficult to implement, is to apply heat after the sand has been spread by using weed burners or other open flame sources. Maintenance personnel should make a test on an unused pavement covered with ice or compacted snow to determine if bonding is adequate to prevent loss. When the slippery condition giving rise to the requirement for abrasives has passed, treated pavements should be swept to remove the residue to prevent engine damage. Abrasives should be used when the friction measurement, as discussed in paragraph 13, is below 27 (MU equivalent). Other factors to consider when deciding to apply abrasives are pavement and air temperatures and frequency of operations.

(2) **Ice Scarifying.** Directional control of vehicles on an ice or compacted snow surface can be improved dramatically by cutting longitudinal grooves in the ice. However, no improvement in braking effectiveness results from grooving, so this approach is only an expedient to be employed when very low temperatures prevent rapid chemical action or mechanical removal. The grooves trap abrasives or chemicals and hence contribute to improving the surface friction characteristics and melting action.

28. **ABRASIVES.**

a. **Materials.** The airlines should be consulted about the material used on the runways. *The following is the standard for abrasives.* Friction improving materials applied to airport movement surfaces shall consist of washed granular particles free of stones, clay, debris, and chloride salts or other corrosive substances. The pH of the water solution containing the material shall be approximately neutral (pH 7). Material shall meet the following gradation using U.S.A. Standard Sieves conforming to ASTM E 11-81.

Sieve Designation	Percent by Weight Passing
4	100
8	97-100
16	30-60
50	0-10
80	0-2

b. **Application.** Sharp, hard silica sand provides the greatest increase in traction and remains effective the longest when compared to softer materials because of its resistance to fracturing and rounding. It is also very abrasive. Limestone is softer and may be used where available if abrasion needs to be reduced. Tests have shown that application rates of 0.1-0.2 lb/ft^2 (0.49-0.98 kg/m^2) of sand will substantially increase friction coefficient. The greater amount is required at temperatures approaching 32°F (0°C), the amount decreasing as the temperature drops.

c. **Chemically-treated Abrasives.** Granular particles are treated with approved chemicals or heated to make them adhere to ice thereby preventing loss of material. At temperatures above 15°F (-9.4°C) a solution of airside urea may be used; below this temperature glycol or potassium acetate will be more effective. Approximately 8-10 gallons (30-38 liters) of fluid chemical are required to coat one ton of sand. The most effective method of applying the chemical is to spray it on granules as they drop onto the spinner mechanism of a material spreader since wetting is more thorough than when the chemical is poured onto the stockpile or the hopper load. Below 0°F (-17.8°C), heated sand can be more effective because of more rapid adhesion of the granules to ice.