BOIRE FIELD – NASHUA, NH

Boire Field
Nashua, NH

Airport Master Plan
Technical Supplement

Prepared for the
Nashua Airport Authority

Hoyle, Tanner & Associates, Inc.
Manchester, New Hampshire

In conjunction with
DuBois & King, Inc., Nashua, NH

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1. Introduction

Over the last decade, the Nashua Airport Authority has prepared a series of related planning projects for Boire Field[1] in Nashua, NH. In 1989, Hoyle Tanner & Associates, Inc. (HTA) completed the last Airport Master Plan Update (AMPU). In 1990, Coffman Associates, Inc. prepared a noise compatibility study[2] that examined existing and future noise impacts. In 1998, DuBois & King, Inc. finished an Environmental Assessment (EA) for a parallel runway proposed in the 1989 AMPU.

HTA finished the 1989 master plan update prior to the opening of the control tower. Consequently, no accurate data was available on aircraft operations. Since the control tower began operating, data has been collected. These traffic counts turned out to be substantially lower than the estimates used in both the AMPU and the noise compatibility study.

Many of the recommendations in the previous studies are still applicable. Even though it has been ten years since the AMPU, there is no need for a comprehensive update. There is however, a need to update those areas that are directly affected by the inaccurate traffic estimates. For example, we now have a clearer picture of actual noise impacts. At the same time this is also an opportunity to review changes at the airport over the last 10 years.

The Nashua Airport Authority has tasked Hoyle, Tanner & Associates, Inc. and DuBois & King, Inc. with the preparation of a technical supplement to the 1989 master plan update. This report contains the findings of that effort.

A cooperative effort resulted in creating a scope of work for this study. The Nashua Airport Authority, HTA, DuBois & King, Federal Aviation Administration (FAA), and the New Hampshire Department of Transportation developed the scope. The airport authority announced the study in its newsletter and invited the public to provide comments. The scoping team chose the following as the study's main goals:

- Evaluate the role of the airport
- Update the demand-capacity analysis from the 1989 airport master plan update
- Develop a ground access plan for the airport
- Evaluate the current and future noise impact of the airport given the new information on airport activity
- Identify capital projects and evaluate their priorities, costs, and associated environmental study requirements
- Update the airport layout plan (ALP)

The study included a substantial public participation component. We established a Technical Advisory Committee (TAC), which represented a cross-section of interests. We also held two public information meetings open to all interested parties.

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[1] The official name of the airport, as shown on its FAA Airport Master Record, is "Boire Field." More commonly it is referred to as "Nashua Airport" or "Nashua Municipal Airport." This study uses "Boire Field" and "Nashua Airport" interchangeably.

[2] Commonly referred to as a "Part 150 Study" in reference to the applicable part of the Federal Aviation Regulations.

2. Role of airport

A major function of the master plan technical supplement is to provide a plan for the airport's foreseeable future, approximately the next ten years. To do that, we need to know what role the airport is expected to play in the region. We need a reasonable estimate of the future level of aviation activity, assuming the airport will grow. Finally, we need to pick a "critical aircraft" for the future. This is the most demanding aircraft (in terms of wing span, weight, and speed) that we believe will use the airport on a regular basis.

The role of the airport has not changed substantially in the last ten years, nor do we expect it to in the next ten years. The following is a definition of the role of the airport, as used for this study:

> Boire Field is a major ***regional general aviation airport***, serving ***commercial***, ***business***, ***training***, ***personal***, and ***public sector*** uses. The airport has one of the highest aviation activity levels in northern New England; both in terms of based aircraft and operations.
>
> Typical commercial uses include on-demand (i.e., charter) flights, aircraft sales, maintenance, and flight schools. Business use includes corporate aviation, both through aircraft based at the airport and visiting aircraft. The airport is able to serve virtually all types of corporate jets and turbo-prop aircraft. The airport provides an active flight-training role, with several flight schools and a collegiate professional aviation program.
>
> Uses that are not likely to occur, are not planned for, and are not encouraged by the airport authority include scheduled passenger and/or cargo service. Other airports in the region, notably Manchester Airport, adequately serve these uses.

Here are some interesting statistics that further illustrate the role of the airport:

- We estimate that Nashua had 104,311 operations in 1998.[3] This compares with 100,395 reported for Manchester and 503,214 for Logan.
- Nashua houses over a quarter of all aircraft registered in New Hampshire
- Nashua houses over a third of all business jets registered in New Hampshire
- In 1999, the return of aircraft operating fees (a portion of State registration fees for aircraft) from the New Hampshire Department of Transportation to the Nashua Airport Authority was $82,351. This represents 55% of the total aircraft operating fees returned to airports in the entire State.

[3] The exact number is not known, because the air traffic control tower does not operate 24 hours.

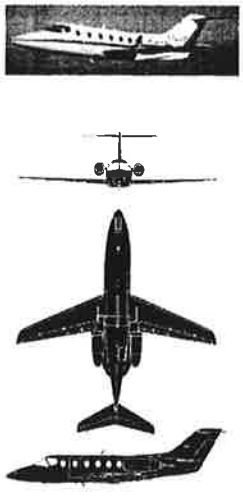
While the airport is one of the busiest in the region, its capacity to grow is limited by surrounding transportation infrastructure, wetlands, as well as residential, commercial and industrial development. Consequently, to the extent the airport is able to grow, it will be at a low rate.

A comment was made at the second public information meeting that Boire Field might be unusually active because it has low rates and charges. We do not believe this to be the case: the high levels of activity seen at Nashua reflect the high level of business activity in the southern New Hampshire region. Some of that activity is due to a favorable tax climate and lower cost of living compared to Massachusetts. Of New Hampshire's airports, Boire Field is probably the airport most affected by this, as it is the closest New Hampshire publicly owned airport to the metropolitan Boston area. This is not an effect of the airport's rates and charges.

The Nashua Airport Authority should, however, review its rates and charges periodically, to ensure they are in line with the industry. In fact, the airport authority did this during the period that this study was conducted (acting independently of this study). The American Association of Airport Executives annual survey of airport rates and charges is a valuable tool for this purpose.

During the development of a scope of work for this project, there was some discussion of including a review of rates and charges at the airport. It is not necessary to do this in an airport master planning process; in fact, one can argue that this is an operational matter best handled by the airport authority. Nonetheless, this is often done as part of master plans, particularly where airports may need a consultant's expertise in reviewing rates and charges at other airports. It was specifically excluded from the scope of this study, and, as noted above, the airport authority conducted its own review and made revisions to the fee schedule during the course of this study.

2.1 Critical aircraft



FAA bases its airport design standards on the concept of a critical aircraft. This is an aircraft that uses the airport regularly and requires the largest safety setbacks due to its wing span, weight, and speed. Based on the inventory of airport activity, discussions with airport users, and the definition of a possible growth scenario, we have selected the Raytheon Beechjet 400A as the critical aircraft. The Beechjet 400A is a medium size corporate jet, seating up to nine people, although most cabin configurations have fewer seats. While there are larger corporate jets that use the airport, they do not generate sufficient operations to count as the critical aircraft. The Beechjet 400A is typical of the small to moderate size corporate jets that most frequently use the airport.

The FAA assigns an airport reference code (ARC) to each airport, which is determined by the critical aircraft. The code consists of a letter that reflects approach speed and a numeral that reflects wingspan. The ARC associated with the Beechjet 400A is C-II. This represents no change from the current ARC at the airport. The ARC drives many of the airport design standards established by the FAA.

The FAA's airport design standards are spread out over several publications. Basic airport design standards are in FAA Advisory Circular 150/5300-13, *Airport Design*, February 14, 1997. Appendix A contains a listing of the basic standards from this document for the ARC applicable to Boire Field (C-II). Note that some of the standards are not applicable to Boire

Field, due to special circumstances. For example, the *Airport Design* advisory circular generally calls for a 700 ft centerline-to-centerline separation between parallel runways. However, at Boire Field the separation can be reduced to 500 ft according to provisions in FAA Order 7110.65L, *Air Traffic Control* – the FAA's air traffic control handbook.

2.2 Effects of airport on the economy

In order to appreciate the effect and contribution of the Nashua Municipal Airport on the local economy, several surveys of on-site businesses, airport users, and businesses providing services to the airport were conducted. This exercise was not completed to determine or estimate the economic contribution of the airport to the City or region. Rather, the intent was to collect data on economic activity and to help put in perspective the relative significance of business activity at the airport.

In addition to the information presented in this report, the Nashua Airport Authority released a much more detailed economic analysis during the course of this study. The airport authority contracted with the American Association of Airport Executives to prepare this study; titled *The Economic Impact of the Boire Field Airport*, October 1999. The report estimated the total annual economic impact of Boire Field to be approximately $21 million, of which $5.6 million was direct spending by the airport authority and its tenants.

2.2.1 Employees on the airport

There are currently approximately 460 full time employees and 80 part-time employees working for businesses on the Nashua Municipal Airport property. This is broken down by aviation and non-aviation employment in the table below:

	Full Time	**Part Time**
Aviation Employment	163	53
Non-Aviation Employment	296	26
Total	**459**	**79**

The above does not include approximately 200 employees and about 1,000 students at Daniel Webster College that is adjacent to the airport.

2.2.2 Outside firms providing services to the airport

According to data from the airport manager and FBOs, approximately 940 businesses have provided temporary or on-going services to the airport over the past several years. This consists of approximately 330 New Hampshire-based businesses, and approximately 610 out-of-state businesses.

2.2.3 Businesses located in Nashua because of the airport

Many small and large businesses rely heavily on the airport. Numerous small-scale businesses use the airport for general aviation travel. Some of these businesses located in the Nashua area solely because of the presence of the airport. Others, located in Nashua for different reasons, merely take advantage of the airport location. Larger businesses typically utilize jet travel; either through based corporate jets or transient corporate jets. Refer to Section 2.3.1 for additional details.

There is a strong relationship between Daniel Webster College and the airport. The college started as the New England Aeronautical Institute in 1965. By 1987 the school had grown and broadened its curriculum and was renamed Daniel Webster College. The college has maintained a strong aviation foundation throughout its growth. It has approximately 30

based aircraft at the airport, and generates a substantial level of training operations. It is clear that the college would not be operating at its current level of activity without its strong ties with the airport. Furthermore, it is unlikely that the proposed parallel runway would be justified without the college-generated aviation activity.

2.2.4 Use of airport in support of charitable organizations

Many aviation programs provide assistance to non-profit organizations at Boire Field. These include:

- Aviation Horizons Program: Provides free flight training to between 20 and 30 disadvantaged local high school students annually.
- Young Eagles: Some 30 pilots have provided free flights to 750 children under the age of 18 over the past four years to introduce them to the world of aviation.
- Special Olympics: The Cessna Citation on the airfield provided free travel to North Carolina for Special Olympic children and their families during 1999. The Cessna Aircraft Company organizes this at the national level as a charitable program.
- Angel Flights: Numerous pilots on Boire Field participate in providing their time and aircraft free to provide transportation for special medical appointments throughout the country.

2.3 Effects of corporate jets on the economy

Corporate jets form a relatively small, but significant, part of the airport and the Nashua economy. Boire Field has developed into a medium-sized business airport, reflecting the economic growth of the Nashua region. Corporate jet activity provides critical transportation connections to many local, regional and national businesses. This creates a need for both based aircraft and transient aircraft service. In addition, corporate jet activity contributes a much higher percentage of operating revenues to the airport, than the remaining general aviation activity. These issues are further discussed below.

2.3.1 Based corporate jets

Many of the corporate based aircraft are owned and operated by businesses that are located in Nashua because of the airport. This includes businesses such as Lowell Paper Box Company, with 105 employees. Discussions with representatives from Lowell Paper Box indicated that they would not have located in the Nashua area without the airport. In the 10 years the company has been in Nashua it has grown from 40 employees and $3 million in sales to 105 employees and about $13 million in sales.

2.3.2 Transient Corporate Jets

In addition to jets based at the airport, many jets from outside of the area use the airport to transport executives to local businesses, and for aircraft fueling and maintenance. The Nashua Control Tower estimates that transient jet activity constitutes approximately 40% of the total jet activity at the airport.

The following area wide businesses are examples of users of transient jet flights:

- Anheuser-Busch, Inc.
- Batesville Casket

- Century Insurance
- Coca Cola
- Ferrofluidics
- Kollsman Instruments
- Lockheed Martin/Sanders
- Nashua Corporation
- Seagram's
- Teradyne
- Wal-Mart

2.3.3 Economic contributions of corporate jets to airport

Corporate jet activity constitutes approximately 3% of the total aviation activity at the airport, yet they contribute about 10% of the total airport general revenue. The major contribution is through fuel flowage fees. General aviation activity, on the other hand, constitutes approximately 97% of the total aviation activity at the airport, but contributes approximately 8% of the total airport general revenue, again mostly through fuel flowage fees. In addition, due to space requirements, corporate jets contribute a much higher percentage (on a per plane basis) to the airport general fund through hangar leases. As a share of total hangar lease revenues, corporate jets account for 56% vs. 44% for all other general aviation aircraft.

3. Airport access: rights and restrictions

Airports that have used federal grants for airport projects are subject to certain obligations. These obligations are outlined in FAA assurances attached to the grant offer. As part of these obligations, the FAA requires that the airport facilities are available for aviation uses on fair and equitable terms without undue discrimination. The standards also prevent exclusive use agreements.

An airport sponsor must work to balance the need to operate a self-sustaining airport with limiting the impacts to the surrounding community. The FAA provides airport sponsors the ability to set standards for aviation businesses that provide services to the public. These standards can help an airport to foster a strong economic foundation. They can also improve the overall safety of the facilities and services at the airport.

Airport sponsors, in concert with the FAA, also have the ability to set standards to minimize noise impacts on the community. These methods, which are reviewed as part of a Federal Aviation Regulation (FAR) Part 150 noise compatibility study, range from flight path modifications to restrictions on the types of aircraft that can use the facility. Nashua completed a Part 150 noise compatibility study in 1990.

This section provides an overview of the FAA's requirements for providing access to an airport for aviation uses. We also describe the methods an airport can use to set standards on the facility to ensure that the airport's goals are met while impacts to the community are minimized.

3.1 Grant assurances

In total there are 36 grant assurances to which a federally funded airport must adhere. Two apply to providing public access to the airport for aeronautical purposes. These are the assurances covering economic nondiscrimination and exclusive rights.

3.2 Economic non-discrimination

The FAA has established standards for providing fair and equitable access to public airport facilities without any undue discrimination. These requirements protect the persons, firms and corporations who provide aeronautical services at an airport, as well as the airport users who purchase these services. This assurance reads:

> The airport will be available for public use without any unjust discrimination to any person, firm, or corporation to conduct or to engage in any aeronautical activity for furnishing services to the public at the airport.
>
> Any person, firm, or corporations conducting aeronautical activities which furnish services to the public are required to furnish services reasonably and fairly to all users, and charge reasonable and nondiscriminatory prices.
>
> All fixed-base operators at the airport making the same or similar use of the airport or utilizing the same or similar facilities will be subject to the same rates, fees, rentals, and charges.

> Air carriers using the airport can service themselves or choose any fixed-base operator authorized to serve air carriers at the airport.
>
> Each air carrier using an airport (whether as a tenant, non-tenant, or subtenant of another air carrier tenant) shall be subject to comparable rules, regulations, conditions, rates, fees, rentals, and other charges for facilities directly and substantially related to providing air transportation as are applicable to all air carriers which make similar use of the airport and utilize similar facilities.
>
> [The airport sponsor] will not exercise or grant any right or privilege which would prevent any person, firm, or corporation operating aircraft on the airport from performing any services on its own aircraft with its own employees (including but not limited to maintenance, repair, and fueling) that it may choose to perform.
>
> If the sponsor exercises any of the rights and privileges referred to in this assurance, the services involved will be provided on the same conditions that apply to the furnishing of such services by commercial aeronautical service providers authorized by the sponsor under these provisions.
>
> The sponsor may establish reasonable and nondiscriminatory conditions to be met by all users of the airport as may be necessary for the safe and efficient operation of the airport.
>
> The sponsor may prohibit or limit any given type, kind or class of aeronautical use of the airport if such action is necessary for the safe operation of the airport or necessary to serve the aviation needs of the public.

3.3 Exclusive Rights

This provision prevents an airport sponsor from giving exclusive rights to any one party to provide a service at the airport. The aeronautical activities include, but are not limited to charter flights, pilot training, aircraft rental and sightseeing, aerial photography, crop dusting, aerial advertising and surveying, air carrier operations, aircraft sales and services, sale of aviation petroleum products whether or not conducted in conjunction with other aeronautical activities which because of their direct relationship to the operation of aircraft can be regarded as an aeronautical activity. Also, the airport sponsor must terminate any existing exclusive right to conduct aeronautical activity prior to the issuance of a federal grant. Essentially this provision provides for a competitive business market for aeronautical services.

The FAA provides one exception to this rule:

> If services at an airport are provided by a single fixed base operator, it would not be considered an exclusive right if the following conditions apply:
>
> It would be unreasonably costly, burdensome, or impractical for more than one fixed-base operator to provide such services, and

If allowing more than one fixed base operator to provide the services would require the reduction of leased space defined within an existing lease.

3.4 Allowable restrictions

The FAA grant assurances severely limit any restrictions the airport can place on aviation activity once federal funds have been used. There are some allowable limitations, however, provided they are justified in accordance with FAA specified methodologies. These fall in the basic categories of minimum standards and noise limitations.

3.4.1 Minimum standards

As discussed above, the FAA maintains provisions for economic non-discrimination and the prohibition of exclusive rights. However, the airports do have the ability to set conditions that must be met prior to initiating operations at the airport. These standards can be used to ensure safe and efficient use of the airport facilities. They ensure that operators serve the aviation needs of the public. The FAA recommends that the airport establish these conditions through the adoption of minimum standards.

Minimum standards are defined as "the qualifications which may be established by an airport owner as the minimum requirements to be met as a condition for the right to conduct an aeronautical activity on the airport."[4] An airport that adopts a carefully prepared set of minimum standards has the means to ensure that any person or businesses conducting business activities at the airport meet adequate requirements for facilities, level of service, financing, and safety.

The FAA prescribes that the minimum standards should require operators to:

- Arrange for suitable spaces, structures, and facilities.
- Provide adequate fixtures and equipment.
- Maintain an adequate staff of employees with skills, licenses and certificates appropriate to the proposed activities.
- Operate during specified hours.
- Conform to safety, health, and sanitary codes.
- Show evidence of financial stability and good credit rating.
- Meet stated indemnity and insurance minimums.

The City of Nashua conservation commission has also recommended that compliance with all local environmental regulations and ordinances be included in minimum standards developed by the Nashua Airport Authority. The commission also recommends that leases with FBOs address environmental regulations and best management practices, especially regarding response plans for fuel spills and/or leaks.

The FAA recommends that airports adopt standards that are "reasonable and relevant". Each type of aviation activity that would be expected to occur at an airport has different

[4] Federal Aviation Administration, Advisory Circular 150/5190-1A, *Minimum Standards for Commercial Aeronautical Activities on Public Airports.*

needs. For example, it would not be reasonable to require an independent charter operator to maintain the same hangar space requirements as a full service fixed base operator (FBO).

Airports also need to be cautious that the standards they establish not conflict with the FAA's grant assurances. Requirements that are too stringent or extensive could cause an exclusive use condition. For example, requiring an independent charter operator to maintain the same hangar space as a full service FBO could be so restrictive, that only a full service FBO could provide charter operations. Conversely, an airport should also be cautious not to develop standards that are too broad. This may inhibit the airport from accomplishing the goals that prompted the development of minimum standards in the first place.

The Nashua Airport Authority has not adopted minimum standards. The Nashua Airport Authority has established a set of standards and procedures for the airport. These were last revised on February 17, 1998. These appear to be a broader set of standards. All commercial and non-aeronautical operators at the airport must abide to these standards in the conduct of their business. They address the following areas: General (purpose, implementation, etc.), buildings and development, non-aeronautical regulations, aeronautical regulations, fixed base operators, and fees.

The standards and procedures do not incorporate all of the elements typically included in minimum standards. They also don't provide individual standards specific to each type of activity. The airport should review the standards in light of the long-term goals for the airport. If this document is so broad that it does not assist the airport in reaching its goals, then minimum standards should be developed and adopted. Without the appropriate standards in place, the airport may not have the grounds to prohibit an aviation use that is not in the best interest of the airport or the community.

If the airport opts to develop minimum standards, coordination between the airport, airport tenants, and the FAA should be an integral part from the initial stages of development. This coordination will insure that once adopted, the standards reflect the best interest of the aviation community as a whole. Also, the FAA review will ensure that the standards do not conflict with the grant assurances.

Once an airport adopts minimum standards, they should be incorporated as a requirement within the airport lease. This will bind all new tenants to the standards. Existing tenants will not be bound to the standards until their lease expires and they renew under the new lease requirements.

Appendix B includes sample minimum standards for a general aviation airport. While the Nashua Airport Authority would want to revise many of the clauses to reflect conditions unique to Boire Field, the language could be used as a beginning for adopting minimum standards.

3.4.2 General noise limitations

The FAA has established procedures for quantifying airport noise and, if necessary, adopting noise controls. This is done as part of a noise compatibility study. These controls can limit impacts of aircraft noise on the surrounding community.

As part of the noise compatibility study, noise exposure maps are developed. These depict the varying levels of noise exposure on the surrounding community. Once the noise

impacts are assessed, methods for reducing noise impacts to the surrounding community are presented for review. These measures range from land use controls and operational standards that could minimize noise, to the more extreme measure of establishing aircraft restrictions at the airport. The objective of such a study is to "find reasonable solutions to noise problems and to present solutions that can be implemented."[5]

In most cases land use measures and operational modifications, such as preferred flight patterns, can minimize community impact without interfering with an aircraft's ability to operate at the airport. However, in some instances the noise is so severe that the airport sponsor may choose to restrict the noisiest aircraft from the airport.

The FAA identifies an aircraft's noise level by noise stages: Stage 1, 2, or 3. The noise limits within each stage are defined by the FAA in FAR Part 36, *Noise Standards: Aircraft Type and Airworthiness Certification*. In general terms, Stage 1 aircraft are the noisiest and Stage 3 aircraft the quietest. Due to federal regulations and improved aircraft technology, Stage 1 aircraft are no longer in wide use (except for military aircraft). They are generally being replaced by newer and quieter Stage 3 aircraft. Therefore, FAA regulations pertaining to an airport's ability to impose restrictions on aircraft are generally applicable to Stages 2 and 3.

FAR Part 161, *Notice and Approval of Airport Noise and Access Restrictions*, outlines the steps that an airport must take to impose curfews or restrictions on Stage 2 and Stage 3 aircraft. The Part 161 process is quite extensive, and is realistically a last resort measure if all other methods fail to reach an airport's noise reduction goals.

For both Stage 2 and Stage 3 restrictions, an airport must develop a detailed analysis of the proposed restriction at least 180 days prior to the establishment of the restriction. Public notice and opportunity for comment must also be provided. The following sections outline the basic requirements for imposing Stage 2 and Stage 3 restrictions:

3.4.3 Stage 2 restrictions

The following information must be provided:

- Analysis of the anticipated or actual costs and benefits of the proposed noise or access restriction;
- Description of alternate restrictions; and
- Description of alternative measures considered that do not involve aircraft restrictions and a comparison of the costs and benefits of the proposed noise or access restriction.

3.4.4 Stage 3 Restrictions

The requirements for Stage 3 restrictions are substantially more demanding. The following is a brief overview of what is required:

- The complete text of the proposed restriction and any submitted alternatives;

[5] Federal Aviation Administration, Advisory Circular 150/5020-1, *Noise Control and Compatibility Planning for Airports*.

- Map denoting the airport boundary and the boundaries and names of jurisdictions that control the land uses within the airport noise study area;
- An environmental assessment of the proposed restriction or adequate information supporting a categorical exclusion in accordance with the national Environmental Policy Act of 1969; and
- A detailed summary of extensive evidence supporting the six statutory conditions, described as:
- The restriction is reasonable, nonarbitrary, and nondiscriminatory;
- The restriction does not create an undue burden on interstate or foreign commerce;
- The restriction maintains a safe and efficient use of navigable airspace;
- The restriction does not conflict with any existing Federal statute or regulation;
- Adequate opportunity is provided for public comment on the proposed restriction; and
- The restriction does not create an undue burden on the national aviation system.

After the sponsor has completed the application, it is submitted to the applicable regional office of the FAA for review. The regional office only verifies that the application is complete. Once the regional office finishes its review, it is forwarded to FAA Headquarters. The FAA Administrator makes the final determination for the purposes of judicial review. It should be noted that due to the implications that restrictions have on interstate commerce, approvals of Part 161 requests are exceedingly rare.

A written comment received after the second public information meeting expressed concern that FAR Part 161 is biased in favor of the airport users. The author objected to defining the impacts of Stage 2 and/or 3 restrictions as "costs" to the airport users and "benefits" to the residents impacted by the airport. He argued that the process should instead consider the "costs" to the impacted residents prior to any restrictions. These costs would "include the detrimental effects on the health of people surrounding the airport who cannot get an uninterrupted night's sleep..." There may be room for improvement in the semantics of FAR Part 161; however, the method places equal weight on the effects, whether called "costs" or "benefits." The essence of the regulations is to provide guidelines for quantifying the impacts of noise regulations. The regulations appear comprehensive in this regard. Among other requirements are estimates for the following:

> ...Anticipated increase in real estate values and future construction cost (such as sound insulation) savings; anticipated increase in airport revenues; quantification of the noise benefits, such as number of people removed from noise contours and improved work force and/or educational productivity, if any; valuation of positive safety effects, if any; and/or other qualitative benefits, including improvements in quality of life.

In February 1990, Coffman Associates, Inc completed a Part 150 noise compatibility study for Boire Field. As part of this study alternatives were presented and reviewed for their ability to minimize noise impacts on the community. The recommendations within this report fell into the following categories:

- Runway use and flight routing changes
- Airport regulation changes and facility restrictions
- Aircraft operational procedure changes
- Airport facility changes

All options including changes in airport regulations or airport restrictions were excluded from further consideration for one of the following reasons: they were in contradiction with the airport's policy of improving air service to the community; they were potentially discriminatory; they had the potential for causing unsafe conditions (e.g., pilots attempting potentially unsafe maneuvers to reduce noise); or they were unnecessary given the level and type of operations at Boire Field.

The 1990 noise compatibility study found that the airport's existing noise abatement techniques were already successful in reducing the airport impacts to the community. The study recommended the construction of a parallel runway coupled with minor modifications to existing procedures. The noise impact analysis showed that these recommendations had the best potential to reduce noise impacts to the community. The study concluded that noise compatibility could be maintained without imposing restrictions on airport use.

4. Future level of aviation activity

One of the reasons for this supplement is that the activity projections in the 1989 AMPU were too high. This was primarily the result of the lack of information on actual levels of activity at the time.

Aviation activity is measured in a number of different ways. Two key measures are operations and based aircraft. Both are difficult to measure accurately.

An operation is a take-off or a landing. The level of operations at an airport affects the recommended runway and taxiway layout. It also has impacts on airspace congestion, noise, and air quality. Measuring operations at an airport is nearly impossible, *unless* there is a control tower present. Controllers are required to count each operation and report the data to the FAA. At airports where there are no control towers, alternate methods include acoustical counters, statistical sampling, or estimates through interviews with airport staff. None of these methods have the reliability of control tower counts.

When control tower counts are not available, operations estimates have usually been overstated. This is partly due to the perception that FAA and/or State funding is based on aircraft operations. There is also a pervasive history in the airport planning field of providing optimistic forecasts. Consequently, the estimates of current activity in the 1989 AMPU were high. A comparison of base line estimates and predictions from past studies illustrate this problem:

Comparisons of annual level of operations

	AMPTS '99	EA '98	Part 150 '90	AMPU '89	AMP '79
-10 years	110,000	-	195,000	195,000	190,500
today	104,311	107,000	272,000	272,000	282,000
+10 years	129,985	130,000	-	-	-

Notes:

AMPTS	*Airport Master Plan Technical Supplement*, Hoyle, Tanner & Associates, Inc. [this study]
EA	*Parallel Runway Evironmental Assessment*, DuBois & King, Inc.
Part 150	*Noise Compatibility Study*, Coffman Associates, Inc.
AMPU	*Airport Master Plan Update*, Hoyle, Tanner & Associates, Inc.
AMP	*Airport Master Plan*, Hoyle, Tanner & Associates, Inc.

Of particular note is the prediction of jet operations, since jets have a disproportionately high impact on noise. Not all of the above referenced studies included breakouts for jet activity. Those that did are compared below:

Comparisons of annual levels of jet operations

	AMPTS '99	Part 150 '90	1989 AMPU
-10 years	1,650	1,500	1,800
today	1,415	6,300	6,000
+10 years	2,582	-	-

These findings warrant a look at the activity levels used for *this* study. Our first goal was to avoid making inaccurate estimates of current base line conditions. Consequently, we used actual traffic counts provided by the control tower. These were increased by 10% to estimate the operations that occur when the control tower is closed.

We also asked the control tower staff to do a special count for this study during May 1999. For the first time, this provided an actual count of jet operations. During this month, turbo-props and jets conducted 2.5% of all operations. Since it is not particularly wise to use a single month to make annual predictions, we only used this count as anecdotal evidence to check if our predictions appeared to be in the right range.

Other fleet mix forecasts were based on aircraft registration data obtained from the New Hampshire Department of Transportation, Division of Aeronautics (NHDOT). We assumed that the operations fleet mix is the same as the based aircraft fleet mix. Past experience shows that this is a reasonable assumption, given that there is no other source of data. Using this methodology results in a turboprop and jet share of 2.2%, growing to 2.9% in the future. This seems consistent with the 2.5% count for May of 1999.

For the estimate of based aircraft, we relied on data presented in the 1998 EA and information collected by NHDOT during its airport inspections. Ideally, one should be able to use the NHDOT database of registered aircraft both for fleet mix information and for the total number of based aircraft. In reality, there are a number of aircraft at the airport that are not registered. Based on the EA and NHDOT airport inspection data, we estimate that there are approximately 40 unregistered aircraft at the airport. The registration database was used for determining the fleet mix of based aircraft, however.

Decades of experience in aviation forecasting have resulted in one single conclusion: It is impossible to accurately forecast aviation activity. We have already seen that simply determining the *current* levels of activity is a challenge. Predicting how the current level is going to grow (or decline) in the future, is frustratingly difficult. Still, we need some estimates to use for long term planning of the airport's facilities.

The solution to this dilemma is to use a flexible planning approach, also referred to as a scenario-based approach. This method accepts that the future is uncertain. Aviation activity is tightly connected to economic activity. We know the economy is cyclical – it has generally been growing throughout the century, but with significant ups and downs. It is the timing of these ups and downs that makes prediction so difficult.

A flexible plan assumes that the airport may grow, stay at its current level, or decline. The role of our future activity estimates is to provide a reasonable set of assumptions, *should the airport grow*. We accept that we cannot forecast when or if growth will happen. We do believe, given growth in activity, that we can reasonably predict the magnitude of the growth. That is fundamentally what is needed to lay out future development at the airport.

We derived our future activity levels from national forecasts prepared by the FAA in its *Aerospace Forecasts: Fiscal Years 1999-2010*. The FAA publishes its forecasts annually and constantly refines their models to reflect past prediction errors. They appear compatible with the predicted role of Boire Field, since the FAA assumes low growth rates for general aviation, especially for piston engine aircraft. This represents the bulk of the fleet used for recreational and personal use. This segment of aviation has been hard hit by increased

costs, leading to declines in sales of new piston engine aircraft and student pilot starts. Overall, an annual growth rate of only 1.5% was used for the forecast.

Jets, however, are expected to grow at an annual rate closer to 5%. At the same time jets will become more quiet. This has historically proven to be the case, as improvements in engine technology and aerodynamics have decreased noise levels, increased fuel efficiency, and reduced emissions. For example, the two jets based at the airport that are thought to generate the highest noise levels were manufactured in the early 1970s. Operating economics make it likely that they will be retired within the planning horizon of this study, although that cannot be guaranteed.

The tables below represent our estimates of future activity levels for the purpose of planning for the airport.

Operations	*Local*	*Itinerant*							
	Local	GASEPF	GASEPV	MEP	Rotor	Turboprop	Jet	Subtotal	Total
1998	49,270	36,398	9,587	6,226	566	849	1,415	55,041	104,311
1999	56,209	41,630	10,937	6,997	646	969	1,614	62,793	119,002
2000	53,715	39,735	10,454	6,653	614	921	1,601	59,978	113,693
2001	54,713	40,474	10,649	6,693	624	933	1,684	61,058	115,771
2002	55,727	41,224	10,848	6,737	633	945	1,765	62,152	117,879
2003	56,367	41,698	10,967	6,778	642	957	1,845	62,886	119,253
2004	57,067	42,215	11,099	6,819	651	969	1,926	63,679	120,746
2005	57,774	42,738	11,232	6,860	660	980	2,022	64,493	122,267
2006	58,484	43,264	11,365	6,901	669	992	2,124	65,315	123,799
2007	59,191	43,787	11,497	6,942	679	1,004	2,230	66,139	125,330
2008	59,901	44,312	11,630	6,983	689	1,016	2,341	66,970	126,872
2009	60,614	44,839	11,763	7,024	698	1,027	2,459	67,810	128,424
2010	61,326	45,366	11,896	7,067	709	1,039	2,582	68,659	129,985
Average growth	1.9%	1.9%	1.9%	1.1%	1.9%	1.8%	5.2%	1.9%	1.9%

Notes: GASEPF General aviation, single engine piston/propeller, fixed pitch

GASEPV General aviation, single engine piston/propeller, variable pitch

MEP Multi-engine piston/propeller

We assumed that all local operations are touch-and-gos and that the number of local operations that are not GASEPF is negligible.

The growth rates are applied to the average of 1998 and 1999, which represent actual figures based on control tower counts. This explains the slight reduction in projected activity from 1999 to 2000. This is not meant to imply that a reduction in traffic is expected in the immediate future, simply that actual traffic levels will oscillate around a slowly growing trend line.

Based Aircraft	GASEPF	GASEPV	MEP	Rotor	Turboprop	Jet	Total
1998	257	68	44	4	6	10	389
1999	261	69	44	4	6	11	395
2000	266	70	44	4	6	11	402
2001	271	71	45	4	6	12	409
2002	276	73	45	4	6	12	417
2003	279	73	45	4	6	13	422
2004	283	74	46	4	6	13	427
2005	286	75	46	4	7	14	432
2006	290	76	46	4	7	15	438
2007	293	77	46	5	7	16	443
2008	297	78	47	5	7	16	449
2009	300	79	47	5	7	17	455
2010	304	80	47	5	7	18	460
Average growth	1.4%	1.4%	0.6%	1.4%	1.2%	5.1%	1.4%

Additionally, for planning purposes, we need estimates of peak activity. Peak variations are both seasonal (i.e., monthly peaks), daily, and hourly. The table below shows our estimate of peak activity:

Peak operations	Month	Day	Hour
1998	11,763	392	59
1999	13,420	447	68
2000	12,821	427	64
2001	13,056	435	66
2002	13,294	443	67
2003	13,449	448	68
2004	13,617	454	68
2005	13,788	460	69
2006	13,961	465	70
2007	14,134	471	71
2008	14,308	477	72
2009	14,483	483	73
2010	14,659	489	74
Average growth	1.9%	1.9%	1.9%

Notes: Peak month is based on the average ratio of peak month (October, historically) to total annual operations for the ten-year period 1989-1998. We assumed this ratio will stay constant in the future.

Peak day is based on peak month divided by 30 days.

Peak hour is based on the ratio of the 90 percentile busiest hour in September 1998 and the average daily count for the same month. We assumed this ratio will stay constant in the future.

5. Capacity of existing facilities

The purpose of the demand/capacity analysis is to determine the airport's existing capacity and compare that to projected demand. The anticipated demand is based upon the forecasts developed as part of this study.

Boire Field is one of the busiest airports in the region. However, due to surrounding development and wetlands the development potential for the airport is limited to within the existing property boundary. Therefore, the 1989 Airport Master Plan Update (AMPU) and this technical supplement represent a maximum development scenario for the Airport. This scenario was developed to make the best use of available land. The main goals are to maintain safety standards and to maximize aircraft parking capacity.

This demand/capacity analysis is an update of the analysis conducted in the 1989 AMPU. It addresses both airside facilities (i.e., runways, taxiways, aprons) and landside facilities (i.e., terminal building, car parking). This analysis determines if the build-out scenario can accommodate projected demand. Using the results of this analysis an implementation plan can be developed.

5.1 Runways and taxiways

Runway 14/32 is the only runway at the airport. It is 5,500 ft long and 100 feet wide. There is a parallel taxiway that extends along the entire length of the runway. The taxiway provides access to both runway ends. There are four exit taxiways ("A", "B", "C", and "D") that connect to the runway at right angles.

We reviewed the runway and taxiway capacity analysis conducted in the 1989 study, based on current conditions. The FAA provides guidelines for determining runway capacity in Advisory Circular (AC) 150/5060-5 CHG 2, *Airport Capacity and Delay*, December 12, 1995.

In that AC, the FAA defines the method for determining an airport's hourly operational capacity under visual flight rules (VFR)[6] and instrument flight rules (IFR)[7]. It also defines an airport's annual service volume (ASV)[8]. However, the method to determine IFR capacity assumes the airport has an approach control radar facility. This is not the case at Nashua, and consequently we only review the hourly capacity for VFR conditions. It is in VFR conditions that demand peaks at Nashua, due to the high level of VFR-only flight training operations.

We used this method to determine the hourly and annual capacity according to Boire Field's runway configuration and aircraft fleet mix. An airport's fleet mix is measured by an index calculated based on the percentage of aircraft at the airport that are heavier than

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[6] In AC 150/5060-5, the FAA defines that visual flight rules (VFR) apply when the cloud ceiling is at least 1,000 feet above ground level and the visibility is at least three statute miles.

[7] In AC 150/5060-5, the FAA defines that instrument flight rules (IFR) apply whenever the reported cloud ceiling is at least 500 feet but less than 1,000 feet above ground level and/or the visibility is at least one statute mile but less than three statute miles.

[8] In AC 150/5060-5, the FAA defines annual service volume as a reasonable estimate of an airport's annual capacity.

12,500 pounds. We found that all assumptions regarding the airport used in the 1989 study are still applicable:

- The airport has a single runway configuration with arrivals and departures at both runway ends
- Touch-and-go training operations equal approximately one-half of the annual aircraft operations
- The runway exit factor (based on the number of exit taxiways) equals 1.0 (the highest factor)
- The mix index is 0 to 20 (the lowest index)

Based on this set of conditions we found that the current hourly and annual capacity are the same as reported in the 1989 Airport Master Plan Update (AMPU) study: A theoretical VFR capacity of 98 operations per hour and an annual service volume of 230,000 annual operations.

The design peak hour for 1999 was determined to be 68 operations. This was based on the 1999 annual activity level of approximately 119,000 annual operations. This peak hour activity is 30 operations less than the airport's VFR hourly capacity. Also, the 1999 annual operations level is only approximately 52% of the ASV.

Annual operations are projected to grow to approximately 130,000 annual operations by 2010. This level of projected aircraft activity is only 57% of the ASV. Design peak hour operations are projected to grow from 68 operations in 1999 to 74 operations in 2010. This is 24 operations below the VFR hourly capacity. Consequently, according to the FAA methodology, the airport's capacity is sufficient.

The FAA methodology is a theoretical ideal. In practice, the capacity of the airport is constrained by interactions with the Manchester Class C airspace, lack of radar, controller workload, etc. In the 1998 EA, the peak hour capacity was found to be in the 50-80 range and the ASV approximately 140,000 operations. Based on this, the capacity numbers adopted for this study are:

- **VFR practical hourly capacity (PHOCAP):** 50-80 operations/hour
- **Annual service volume (ASV):** 140,000 operations

The design peak hour is not the absolute peak of the year. In this study, we are using the 90th percentile busiest hour. Consequently, there are occasions when demand exceeds the hourly capacity of the airport. This results in delays at the airport or periods of time when the air traffic control staff is unable to accommodate touch-and-go traffic.

5.2 Airspace

Boire Field is surrounded by Class D airspace from the surface to 2,500 ft above the airport elevation. Any aircraft operating within this airspace must be in radio communication with the Air Traffic Control Tower (ATCT). The northern portion of Nashua's Class D airspace is within the outer area of Manchester Airport's Class C airspace, which extends from 1,200 ft. to 4,000 ft. above airport elevation.

We contacted the Boire Field ATCT staff to determine if the location of the Class D airspace within Manchester's Class C airspace causes any special issues. They indicated that this is more of an issue for Manchester. The Manchester approach control facility has to route some aircraft around Boire Field's airspace or request clearance from the Boire Field ATCT to route aircraft through the airspace.

The airport manager indicated that there is skydiving activity at Pepperell Airport, which is located south of the airport. Boire Field ATCT is notified prior to skydiving activity at Pepperell.

5.3 Radio navigation aids

Radio navigation aids (navaids) provide guidance information or position data for aircraft in flight. The navaids serving Boire Field include:

- Instrument Landing System (ILS) approach to Runway 14
- Very High Frequency Omni-directional Range (VOR) and a Global Positioning System (GPS-A) circling approach to the airport
- VOR approach to Runway 32
- Non-directional beacon (NDB) or GPS approach to Runway 14
- GPS approach to Runway 32

The FAA publishes the procedures for each of these approaches in the U.S. Terminal Procedures. The ILS approach to Runway 14 is the only precision instrument approach. This means that the navaid provides both vertical and horizontal guidance to the runway end. The remaining approaches are non-precision, as they only provide horizontal guidance.

At the time of this study, the FAA was still in the process of developing precision GPS approaches. We contacted the FAA to determine the status of the program. At this time, the FAA plans to begin charting the new precision GPS approaches in February 2000. They have selected the first 50 airports nationwide to receive this new GPS approach. They were not able to provide a list of the 50 airports; however, it is highly unlikely that Boire Field is on that list. Once the FAA has established approaches at the initial 50 airports, the following priority system will be used for scheduling the establishment of the approaches in each FAA region:

- Part 139 certificated airports (this does not include Boire Field)
- Airport's with runways measuring 5,000 feet or greater (this includes Boire Field)
- All remaining airports based on priority.

5.4 Aircraft parking

This section compares aircraft parking demand with current and planned aircraft parking capacity. The existing aircraft parking facilities are described as follows:

Paved tie-downs:	278 aircraft (87,220 SY of apron)
T-hangar:	106 aircraft (106 T-hangar units)
Corporate hangar:	26 aircraft (12 hangars)
Total:	**410 aircraft**

Of the 278 paved aircraft tie-downs, seven are dedicated for transient aircraft use, Daniel Webster College leases 22, GFW leases 12, and Keyson Airways leases 24. This leaves 213 tie-down spaces available for the airport to lease to individual aircraft. At the time of this report, the Airport was leasing 195 tie-down spots, with the remaining 18 tie-downs available for lease or for temporary transient use.

The T-hangars and corporate hangars are all privately owned and operated, therefore the airport authority does not track the hangar vacancy rate. However, anecdotal evidence indicates hangar demand is strong and that as hangars become available they are filled relatively quickly.

The size of aircraft being stored and the other uses of the hangar determine the aircraft parking capacity in corporate and other multi-aircraft hangars. Consequently, it is difficult to identify an exact capacity figure. For instance, some of the corporate hangars are used for both aircraft parking and maintenance. The reported capacity for corporate hangars is the actual number of aircraft that are currently stored in them.

The following is the maximum build-out capacity for aircraft parking[9]:

Paved tie-downs:	329
T-hangar:	199
Corporate hangar:	41
Total:	**569**

This build-out scenario shows that 51 additional tie-downs, 93 additional T-hangar spaces, and 15 additional corporate hangar spaces can be constructed. In total there is development potential for 159 additional storage spaces on existing airport property. This development includes the construction of aircraft parking on the Holden property. Depending on how much hangar space is used for maintenance and other non-parking uses, this number will be lower in practice. Also, additional parking will have to be provided for transient aircraft as activity grows. In practice, the actual parking capacity of the airport is probably closer to 500. Compare this to the growth scenario used for this study, in which we project based aircraft to grow from 389 in 1998 to 460 in 2020. This leaves an approximate buffer of 40 spaces available for additional based aircraft growth beyond this study, higher demand for transient aircraft parking, and for hangar uses other than parking aircraft.

[9] Reported by DuBois & King, Inc., October 1999.

5.5 Airport buildings

The greatest development need at the airport is for additional aircraft parking, especially hangars. Other than corporate and T-hangars, the only other building development proposed is a terminal building and office space for the airport management staff.

There may be a future need for a terminal building, which would essentially provide a "front door" to the airport. Currently, the fixed base operators (FBOs) provide the equivalent of a terminal to the airport users. For example, the FBOs provide flight planning areas, pilot lounge facilities, telephones, and meeting points on the airport for passenger pick-up and drop-off. However, there may be a future need to provide a terminal with facilities such as phones, restrooms, lounge areas, and a central meeting point for pilots to pick-up and drop off passengers. The need may partially be driven by any future restrictions of vehicle access to the airside. It would also be a suitable location for the Airport's administrative offices. The current offices are located in the snow removal and maintenance equipment storage facility, not a central area on the airport.

Land on the west side of the ATCT has been reserved for a terminal building, should the need for one materialize. Terminal buildings at general aviation airports are not eligible for federal funding. However, the airport terminal would be a public facility and the airport authority should investigate eligibility under other government funding programs, such as economic development grants.

The airport also needs additional storage for its snow removal equipment (SRE), especially with additional equipment purchases in the future. We recommend that the existing airport SRE storage building be expanded to provide the necessary storage space. This expansion could include the expansion of office space for the airport management staff, as an interim solution. The most desirable location for the Airport Manager's office would be at a central airport terminal. However, until the need arises for the construction of a terminal and a funding source can be identified, the current location will suffice.

The airport's non-aviation property holdings are nearly fully developed. Space is available on the south side of Perimeter Road for one additional office building only. A private developer subject to airport authority approval would construct this facility.

5.6 Aircraft fuel

There are three underground and two above ground fuel tanks at the airport. They are described as follows:

- One 20,000 gallon above ground tank for 100LL
- One 20,000 gallon above ground tanks for Jet-A
- Two 10,000 gallon underground tank for 100LL
- One 20,000 gallon underground tank for Jet-A
- One 12,000 gallon underground tank for Jet-A

Both the Jet A and 100LL fuels are delivered to aircraft by fuel trucks. The airport owns the fuel tanks and equipment, and in turn leases them to the FBOs. Should demand warrant it, the fuel farm can be expanded with the installation of two additional 20,000 gallon tanks.

6. Ground access

The three major considerations concerning access to the airport are associated with the level of service provided to users of the airport, truck/service deliveries, and emergency vehicles. General user access to the airport is relatively convenient at the present time; signing has been recently improved. Truck/service vehicle access is restricted, both in terms of the routes available to the airport and time of day restrictions. There is currently a Nashua Fire Station located adjacent to the airport. There is one primary access route (i.e., Perimeter Road), and a second access available for emergency vehicles only along the extension of Perimeter Road to the discontinued portion of Deerwood Drive leading to the B&M Railroad and Amherst Street.

6.1 Current access

Current general vehicle access to the airport is provided via:

- The Route 101A/Everett Turnpike Exit 7 area, to Charron Avenue, to Pine Hill Road, to Perimeter Road
- The Route 130/Everett Turnpike Exit 6 area, to Blue Hill Avenue to Pine Hill Road, to Perimeter Road

An additional emergency vehicle access is provided via Deerwood Drive off Amherst Street, although gates prohibit access for the general public.

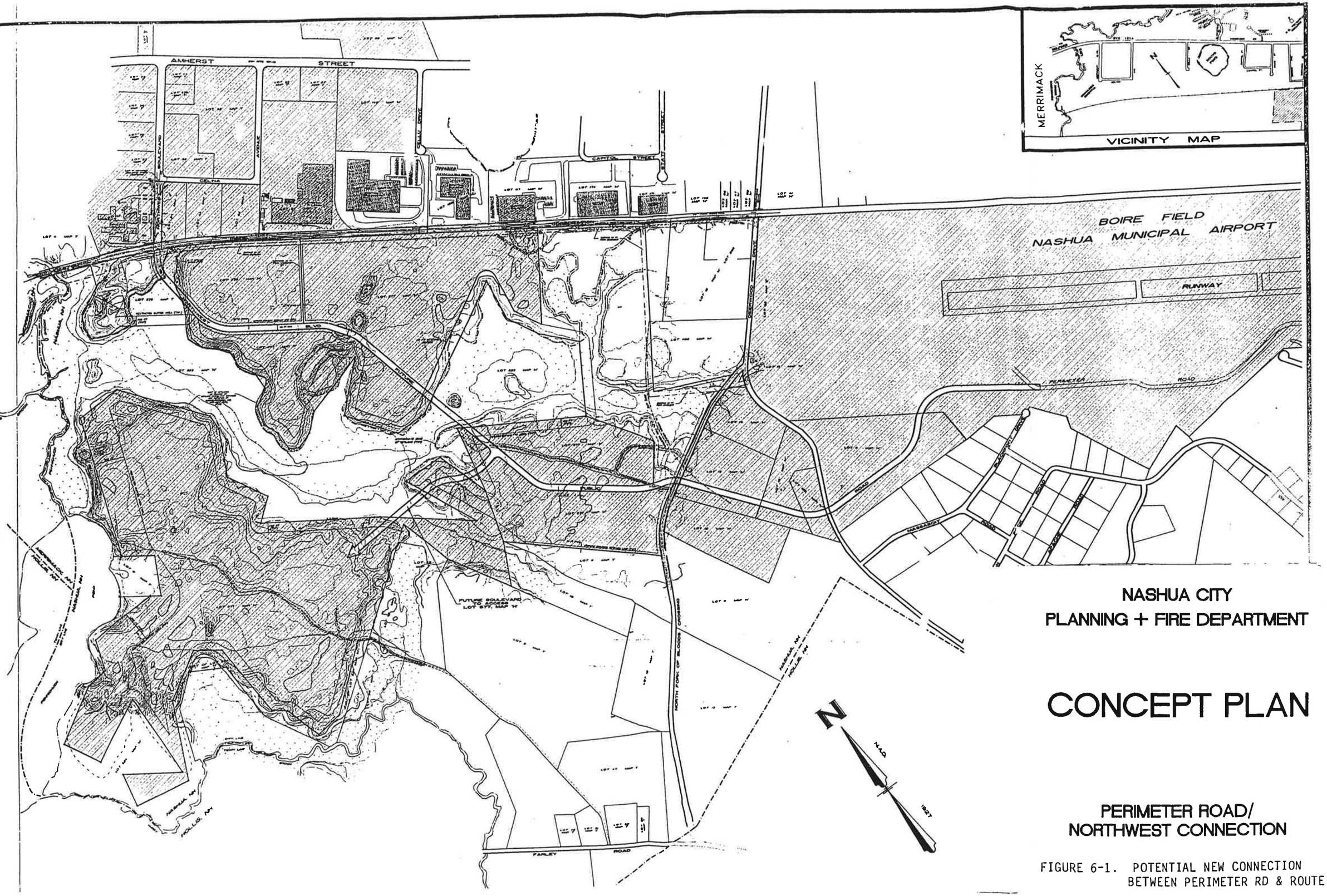
6.2 Current truck restrictions

There is currently a full time truck-ban on Pine Hill Road, from Charron Avenue to Route 130 (Broad Street) that was instituted by the City in 1977. Another ban adopted in 1987 prohibits truck traffic from Dublin Avenue between Route 130 (Broad Street) and Pine Hill Road. There is also a nighttime ban (11 PM to 7 AM) on trucks along Pine Hill Road, west of Charron Avenue to Dublin Avenue, which was adopted by the Nashua Alderman in 1998. This essentially prohibits nighttime access by trucks to the airport. All indications from the City at the present time are that these truck bans will remain in effect in the future.

6.3 Conceptual City plan to improve emergency access, circulation, and economic development

The City has prepared a conceptual plan to connect Amherst Street (Rt. 101A) to Pine Hill Road. To implement this connection, Northwest Boulevard would be extended to Perimeter Road. The purpose of the connection is to improve emergency access and, if made into a public street, to provide an alternative route from northwest Nashua to the Birch Hill neighborhood and open up land for economic development. The latter is in response to the recent extension of Northwest Boulevard to its current terminus and the development of the first major industrial building along the road. The conceptual plan is shown in Figure 6-1.

The proposal is only in an initial discussion phase. To go forward with the project, the City would need to address political and neighborhood support, final road layout, wetland permits, traffic and fiscal analyses, engineering/design, environmental review, and public participation. The implications of this proposal on the development of Boire Field are discussed in detail in Section 6.5.



NASHUA CITY
PLANNING + FIRE DEPARTMENT

CONCEPT PLAN

PERIMETER ROAD/ NORTHWEST CONNECTION

FIGURE 6-1. POTENTIAL NEW CONNECTION BETWEEN PERIMETER RD & ROUTE 101A

6.4 Tenant parking and airside access

Boire Field has gradually evolved over the past decade to become a large general aviation/small business airport. The aspect of vehicle access to aviation operation areas has been gradually controlled and restricted by the Airport Authority via fencing, gates, and signage. There is still a significant mixing of vehicles and aircraft creating more incidents of conflict needing attention by management and the Authority.

In anticipation of the need at some future time to more fully restrict access to aircraft operation areas, we evaluated tenant parking and airside access. Current practice is to park vehicles in hangar stalls or on grass areas adjacent to aircraft tie-downs. If access to the field were to be curtailed, parking in locations outside the fence would become necessary.

We conducted a survey of existing conditions and areas for additional parking expansion. The results are presented in the table below. This shows there are currently 255 parking spaces outside the fence available for aviation support. The two areas currently without parking areas are the old T-hangars just south of the old grass tie down area and the fuel farm/Keyson area near the end of Perimeter Road. Providing parking in these areas, expanding the area behind the control tower, and adding a new parking area on the Holden property to serve future T-hangars would add another 310 parking spaces. A total of 565 spaces should be adequate to serve airside activity. The distribution may not be optimal and could likely require some fine-tuning in the future. The greatest challenges for good parking access appear to be the area of the old grass tie downs and the T-hangar area.

Parking area location	Existing capacity	Future Capacity
Brick Hangar	25	
Citrus Hills	26	
OIA Hangar #3	10	
Old T-Hangar Area		10
Control Tower	120	200
GFW/MacAir	48	
NAA Building	26	
Fuel Farm/Keyson Area		44
Holden Property		56
Total	255	310

6.5 Future Access Alternatives

Future airport access alternatives include the following:

- Current access to remain, with current truck restrictions
- Current access remains, with the elimination of one or both of the current truck restrictions
- New roadway link from the north, connecting Perimeter Road to Northwest Drive, and Route 101A (see Section 6.3)

Based on comments from the technical advisory committee (TAC) and the public information meetings, the following general conclusions appear valid:

7. Noise impact

Noise is generally defined as any unwanted sound. When the sounds generated from aircraft using an airport become too loud or frequent and begin to interfere with various activities, such as conversation and sleep, they are referred to as noise. Aircraft approaching or departing the airport, and aircraft taxiing on the ground cause these sounds. They are also produced by aircraft conducting stationary engine run-ups, whether for maintenance or as a requirement of the pre-departure checklist.

Airport noise is a serious concern with airport neighbors. Over the years, airport operators have had to find ways to encourage airport growth while limiting impacts, such as noise, on surrounding communities. However, before measures can be taken to impose limits, we need to measure the extent of the impacts. Aircraft sound levels are measured using decibels on the A-weighted decibel noise scale (dBA). The dBA sound levels are based on the human threshold for hearing. They are closely correlated to the perceived loudness of a sound event.

The FAA standard cumulative noise exposure scale is the day-night equivalent sound level (DNL). In simple terms, the DNL is the average annual sound level. In calculating the DNL, a 10 dBA penalty is applied to any sound occurring at night, which is defined as 10 p.m. to 7 a.m. This has the effect of counting each nighttime aircraft operation as ten daytime operations. The nighttime penalty is based on the premise that there is a greater sensitivity to noise events occurring at night, when it is generally quieter, and people are either resting or sleeping.

Aircraft noise impacts are assessed through use of the FAA's Integrated Noise Model (INM). For this study, we used INM Version 5.1, the version available at the time. This computer model quantifies airport noise and its impact on surrounding communities. The INM produces noise impact areas based on the airport's activity level, fleet mix, flight patterns, and aircraft operational characteristics. These so-called noise contours are then overlaid on a land use plan showing the airport and the area immediately adjacent to it. The noise contours depict lines of equal sound pressure.

7.1 Scenarios selected for noise modeling

Airport noise levels can increase due to activity growth, change in aircraft fleet mix operating at the airport, traffic pattern changes, airport expansion, etc. Therefore, as part of the study, we used a number of scenarios to evaluate a range of noise impacts:

- Scenario 1: Future activity level from 1990 Part 150 Noise Impact Study
- Scenario 2: Existing activity levels
- Scenario 3: Growth scenario with existing runway configuration
- Scenario 4: Growth scenario including the proposed parallel runway

The first scenario incorporates the existing runway configuration with the forecasted fleet mix and activity levels reported in the 1990 Part 150 Study. This allows for a comparison between the noise modeling conducted for this study and the 1990 Part 150 Study.

The second scenario models existing conditions. It is based on the 1998 runway configuration, fleet mix and activity levels. It represents the base case against which we can compare future noise impacts.

The third scenario incorporates the projected fleet mix and activity levels from the growth scenario prepared for this study. It assumes that the airport will maintain the existing runway configuration. The fourth scenario is identical to this one, but assumes the construction of a parallel runway, which would be used for training activity by small aircraft.

7.1.1 Flight paths

We used the flight paths from the 1990 Part 150 study for this noise impact analysis. For the fourth scenario, we added additional tracks for the proposed parallel runway. Figure 7.1 depicts the existing flight paths. Figure 7.2 shows the flights paths with the proposed parallel runway.

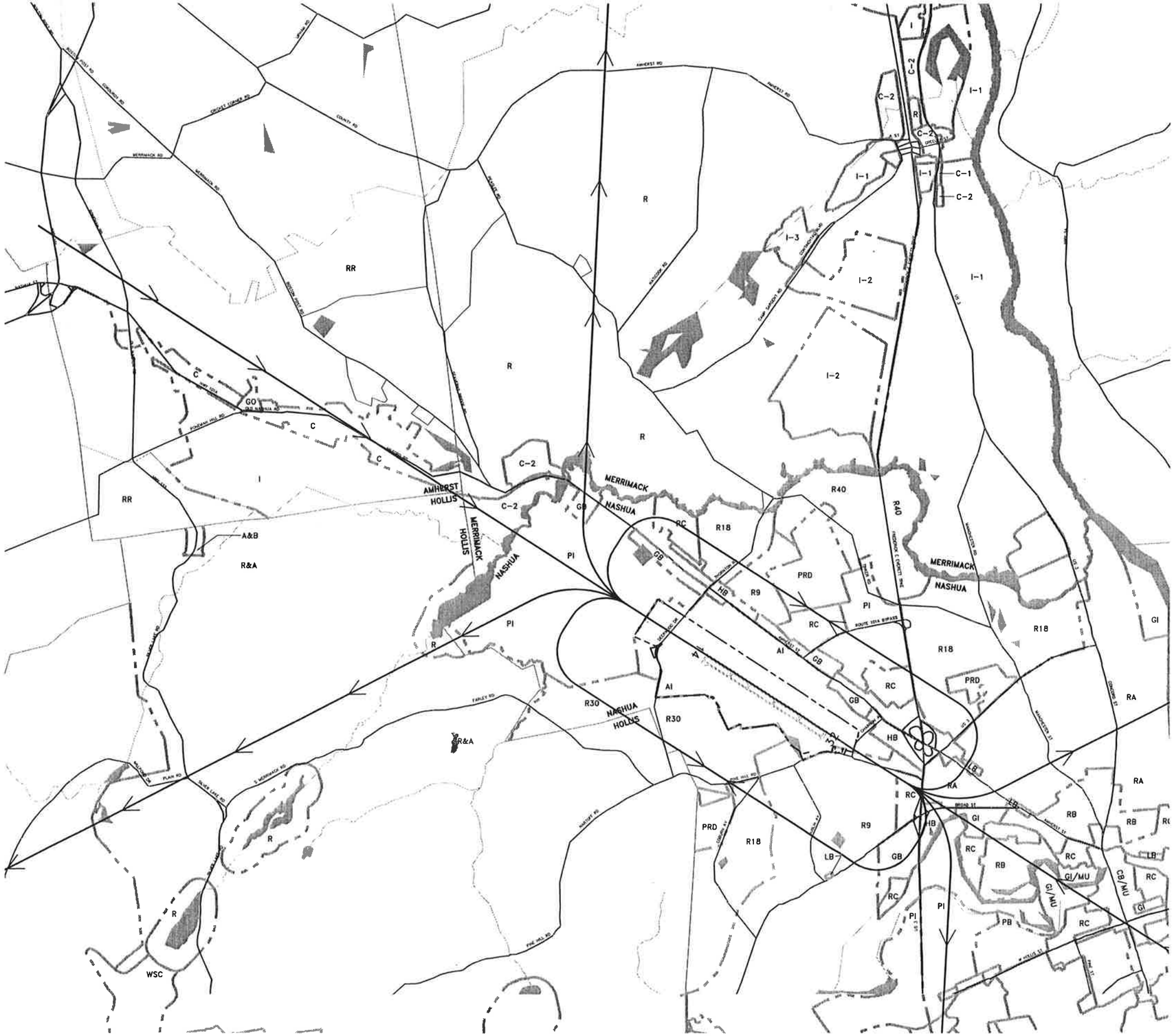
7.1.2 Aircraft operations

The noise analysis breaks down aircraft into several categories: single engine (SE), multi-engine piston (ME), multi-engine turbo prop (TP) and jet. Helicopter activity is not included in the analysis because they are not included in the INM, Version 5.1 database. The FAA has developed a Helicopter Noise Model (HNM) to study helicopter noise. However, HNM is not compatible with the INM. Consequently, the results from the two models cannot be integrated. This should not affect the overall results at Nashua, as over 98% of aircraft operations involve fixed wing aircraft. Helicopter noise is masked by the fixed wing activity, especially jets.

We used standard INM SE and ME aircraft types to represent all aircraft in those categories. Note that the aircraft used in INM do not necessarily represent actual aircraft types operating at the airport. To a large extent, INM relies on approved substitutions of aircraft with similar noise characteristics when modeling general aviation aircraft. All the aircraft types that we used for this study are based on guidelines in the documentation for the INM software.

In the 1998 and 2010 analyses, the Twin Commander and the Mitsubishi MU2 were selected to represent turbo props. For the scenario replicating the Part 150 Study, the Piper Cheyenne, Mitsubishi MU2, and the King Air were used. We based this on findings from the 1989 Master Plan Update by Hoyle, Tanner and Associates, Inc. The following table lists the jets used in each analysis:

1998	Forecasted 2010	Part 150 Study
Beech Jet	Beech Jet	Sabreliner 40
Citation II	Challenger 600	Citation I
Citation V	Citation II	
Falcon 50	Citation III	
Gulfstream IV	Citation V	
Lear 24	Lear 35	
Sabreliner 40		
Sabreliner 60		



LAND USE LEGEND

NASHUA ZONING

R40	RURAL RESIDENCE
R30	SUBURBAN RESIDENCE
R18	SUBURBAN RESIDENCE
R9	SUBURBAN RESIDENCE
RA	URBAN RESIDENCE
RB	URBAN RESIDENCE
RC	URBAN RESIDENCE
PRD	PLANNED RESIDENTIAL DEVELOPMENT
GB	GENERAL BUSINESS
CB	CENTRAL BUSINESS
HB	HIGHWAY BUSINESS
LB	LOCAL BUSINESS
PI	PARK INDUSTRIAL
GI	GENERAL INDUSTRIAL
AI	AIRPORT INDUSTRIAL
HD	HISTORIC DISTRICT
MU	MIXED USE DISTRICT
FU	FLEXIBLE USE DISTRICT

MERRIMACK ZONING

R	RESIDENTIAL
C-1	LIMITED COMMERCIAL
C-2	GENERAL COMMERCIAL
I-1	INDUSTRIAL
I-2	INDUSTRIAL
I-3	INDUSTRIAL

HOLLIS ZONING

A&B	AGRICULTURE AND BUSINESS
R&A	RESIDENTIAL AND AGRICULTURE
R	RECREATION
WSC	WATER SUPPLY CONSERVATION

AMHERST ZONING

C	COMMERCIAL
GO	GENERAL OFFICE
I	INDUSTRIAL
RR	RESIDENTIAL RURAL

LEGEND

SYMBOL	DESCRIPTION
	AIRPORT PROPERTY LINE
	TOWN / CITY BOUNDARY LINE
	ZONING BOUNDARY LINE
PRD	ZONING DESIGNATION
14	NOISE CONTOUR RUNWAY DESIGNATION

N

4000 0 4000

PROJECT NO.	301601
FILE NAME	ASHPL06
DO NOT SCALE DRAWINGS	
REV.	DESCRIPTION
DATE	
DESIGNED BY	AO
DRAWN BY	BBH
CHECKED BY	JK
DATE:	1/06/00
SCALE:	1"=4000'

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BOIRE FIELD
NASHUA AIRPORT AUTHORITY
AIRPORT MASTER PLAN TECHNICAL SUPPLEMENT

FLIGHT TRACKS WITH EXISTING RUNWAY CONFIGURATION

FIGURE NO. 7.1

SHEET 1 OF 6

LAND USE LEGEND

NASHUA ZONING

R40	RURAL RESIDENCE
R30	SUBURBAN RESIDENCE
R18	SUBURBAN RESIDENCE
R9	SUBURBAN RESIDENCE
RA	URBAN RESIDENCE
RB	URBAN RESIDENCE
RC	URBAN RESIDENCE
PRD	PLANNED RESIDENTIAL DEVELOPMENT
GB	GENERAL BUSINESS
CB	CENTRAL BUSINESS
HB	HIGHWAY BUSINESS
LB	LOCAL BUSINESS
PI	PARK INDUSTRIAL
GI	GENERAL INDUSTRIAL
AI	AIRPORT INDUSTRIAL
HD	HISTORIC DISTRICT
MU	MIXED USE DISTRICT
FU	FLEXIBLE USE DISTRICT

MERRIMACK ZONING

R	RESIDENTIAL
C-1	LIMITED COMMERCIAL
C-2	GENERAL COMMERCIAL
I-1	INDUSTRIAL
I-2	INDUSTRIAL
I-3	INDUSTRIAL

HOLLIS ZONING

A&B	AGRICULTURE AND BUSINESS
R&A	RESIDENTIAL AND AGRICULTURE
R	RECREATION
WSC	WATER SUPPLY CONSERVATION

AMHERST ZONING

C	COMMERCIAL
GO	GENERAL OFFICE
I	INDUSTRIAL
RR	RESIDENTIAL RURAL

LEGEND

SYMBOL	DESCRIPTION
	AIRPORT PROPERTY LINE
	TOWN / CITY BOUNDARY LINE
	ZONING BOUNDARY LINE
PRD	ZONING DESIGNATION
	DIRECTION OF AIR TRAFFIC
14	RUNWAY DESIGNATION

N

4000 0 4000

BOIRE FIELD

NASHUA AIRPORT AUTHORITY

AIRPORT MASTER PLAN TECHNICAL SUPPLEMENT

FLIGHT TRACKS WITH PROPOSED PARALLEL RUNWAY

Hoyle, Tanner & Associates, Inc.
150 Dow Street, Manchester, NH 03101

HTA Companies engineers planners

PROJECT NO.	301601
FILE NAME	ASHPL07
SCALE:	1"=4000'
DATE:	1/06/00
DESIGNED BY	AO
DRAWN BY	BBH
CHECKED BY	JK

DO NOT SCALE DRAWINGS

REV. DESCRIPTION

FIGURE NO. 7.2

SHEET 2 OF 6

The jets selected for the 1998 analysis represent the types of jets that are reported to currently use the facility.[10] Over the next ten years we expect the national jet fleet mix to change. Newer and quieter jets will replace older and louder ones, as they become uneconomical to operate and maintain. Therefore, we assumed that the older Stage 2 jets currently operating at Boire Field will be phased out within the ten-year planning period and replaced by newer and quieter Stage 3 jets. The jets selected for the future scenarios in our analysis reflect this transition.

INM requires input of the number of average daily operations for each aircraft type. We calculated this by converting the annual operations from Section 4, *Future level of aviation activity*, to average daily operations.

The operations were further broken out in to type of operations per aircraft type. The types of operations include local and itinerant operations. Local operations are generally those that remain in the traffic pattern. Itinerant operations are aircraft that depart to and arrive from outside the airport's local airspace.

Operations are also classified as take-offs, landings, or touch-and-go operations. For the 1998 and 2010 scenarios, 100% of local general aviation single-engine piston fixed-pitch propeller (GASEPF) operations were assumed to be touch-and-go operations. All remaining (i.e., itinerant) operations were evenly distributed between take-off and landing operations. For the 1990 Part 150 study, 100% of the local single-engine operations were assumed to be touch-and-go operations. All remaining (i.e., itinerant) operations were evenly distributed between take-off and landings.

The operations were then apportioned to each runway end. The runway use information reported in the 1990 Part 150 study was applied to all scenarios: 74% of operations use Runway 32 and 26% of operations use Runway 14. Training operations predominantly occur on the north side of the airfield, with 80% of all training flights on the north side. The predominant departure is a left turn from Runway 32, with 65% of all departures heading south.

Finally, the operations were distributed between daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.). The 1990 Part 150 Study reported that the share of nighttime operations was 4% of the itinerant operations. All training operations were assumed to occur during the day.

7.2 Noise impact evaluations

The FAA has identified certain land uses, such as residential development, as incompatible with noise levels at or above 65 DNL. Other activities, such as commercial and industrial uses, are not as sensitive to noise and are compatible land uses above 65 DNL. Airports need to take measures to mitigate noise and to limit or eliminate interference with incompatible land uses, such as residential development within the 65 DNL noise contour.

We included the 55, 65 and 75 DNL noise contours in the noise analysis completed for this study. The 55 LDN contour *is* compatible with residential land uses. We show it only as an

[10] Determined through review of the State of New Hampshire's aircraft registration database and discussions with the airport manager.

additional illustration of the airport's general noise impact. Figure 7-3 shows the noise contours generated based on the activity levels reported in the forecasts generated for the 1990 Part 150 study (Scenario 1). Figure 7-4 shows the noise contours based on existing activity levels (Scenario 2). Figure 7-5 shows the noise contours based on projected activity levels (Scenario 3), and Figure 7-6 depicts the same levels of activity but including the construction of the parallel runway (Scenario 4).

7.2.1 Scenario 1: Future activity level from 1990 Part 150 Noise Impact Study

These are the results of the INM analysis for the comparison case from the 1990 Part 150 study:

- The entire 75 DNL contour is within the airport property boundary.
- The 65 DNL contour extends over land zoned for industrial park use northwest of the approach end of Runway 14. Along the north side of Runway 14/32 it extends primarily over land designated for airport use. However, north of the approach end of Runway 32 it extends over land zoned for general business use. It also extends over residentially zoned land located southeast and south of the approach end of Runway 32. On the south side of Runway 14/32 it remains within the airport boundary and over land zoned for airport use.

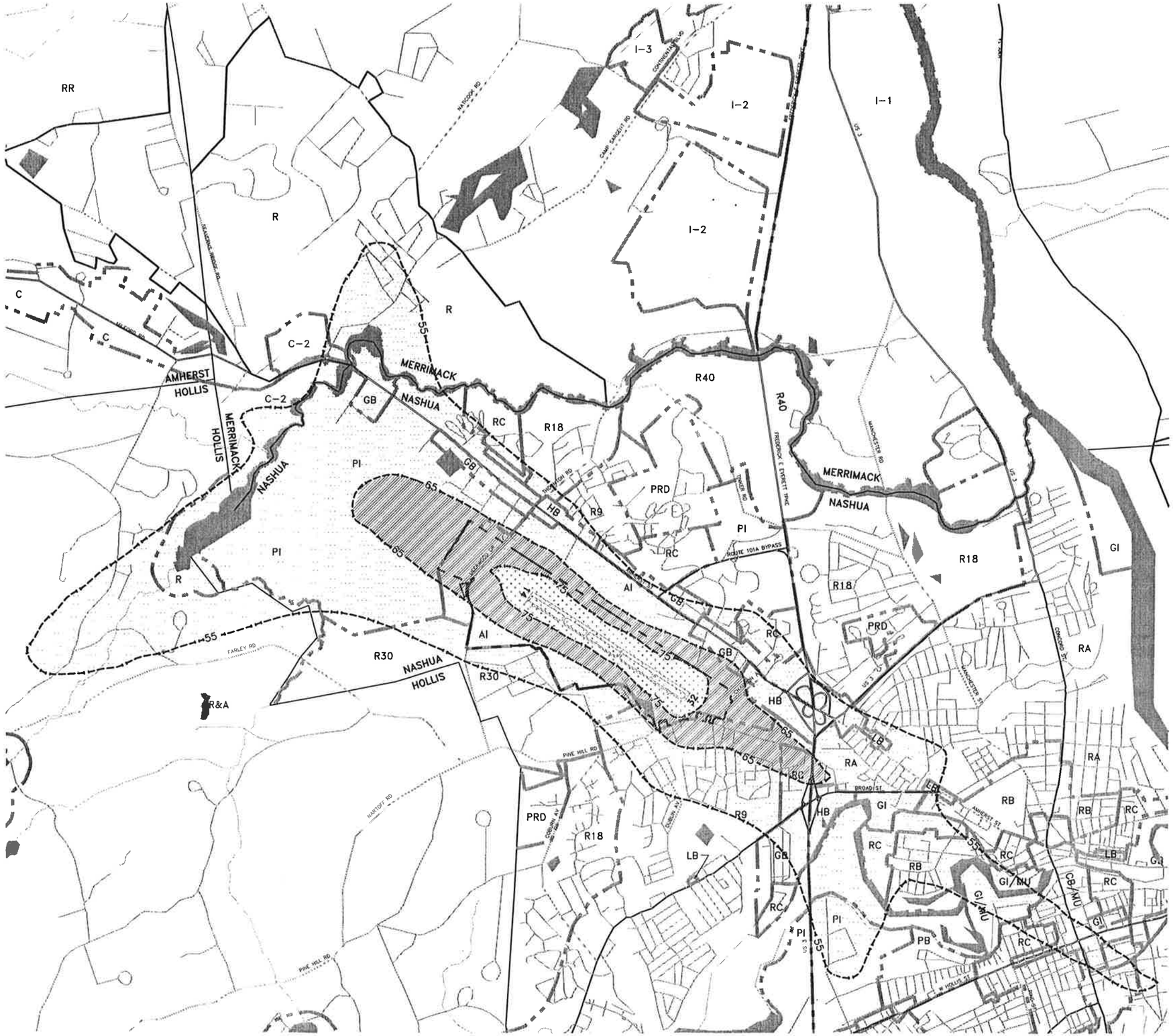
Any differences in the size and shape of the noise contours generated as part of this study from the ones originally generated as part of the Part 150 study can be attributed to the following factors:

- The Part 150 Study used INM Version 3.9. Since that time, there have been several updated versions of the INM. Each version has refined how the model calculates noise. This analysis used INM Version 5.1.
- The 1990 Part 150 study INM input report was not available. Therefore, several assumptions had to be made regarding the selection of aircraft from the INM database, and the actual operations attributed to each aircraft and flight track. These assumptions were based on statements made within the report and the 1989 Airport Master Plan Update.

7.2.2 Scenario 2: Existing activity levels

These are the results of the INM analysis for the current conditions at the airport:

- The entire 75 DNL contour remains within the airport property boundary.
- The majority of the 65 DNL is also within the airport boundary. It extends off airport property northeast of the Runway 14 approach end over land designated as industrial park, and outside of the airport property boundary on the north side of the runway over land zoned for airport use. A small portion of the noise contour southeast of the Runway 32 approach end extends over land zoned for residential use.



LAND USE LEGEND

NASHUA ZONING

R40	RURAL RESIDENCE
R30	SUBURBAN RESIDENCE
R18	SUBURBAN RESIDENCE
R9	SUBURBAN RESIDENCE
RA	URBAN RESIDENCE
RB	URBAN RESIDENCE
RC	URBAN RESIDENCE
PRD	PLANNED RESIDENTIAL DEVELOPMENT
GB	GENERAL BUSINESS
CB	CENTRAL BUSINESS
HB	HIGHWAY BUSINESS
LB	LOCAL BUSINESS
PI	PARK INDUSTRIAL
GI	GENERAL INDUSTRIAL
AI	AIRPORT INDUSTRIAL
HD	HISTORIC DISTRICT
MU	MIXED USE DISTRICT
FU	FLEXIBLE USE DISTRICT

MERRIMACK ZONING

R	RESIDENTIAL
C-1	LIMITED COMMERCIAL
C-2	GENERAL COMMERCIAL
I-1	INDUSTRIAL
I-2	INDUSTRIAL
I-3	INDUSTRIAL

HOLLIS ZONING

A&B	AGRICULTURE AND BUSINESS
R&A	RESIDENTIAL AND AGRICULTURE
R	RECREATION
WSC	WATER SUPPLY CONSERVATION

AMHERST ZONING

C	COMMERCIAL
GO	GENERAL OFFICE
I	INDUSTRIAL
RR	RESIDENTIAL RURAL

LEGEND

SYMBOL	DESCRIPTION
	AIRPORT PROPERTY LINE
	TOWN / CITY BOUNDARY LINE
	ZONING BOUNDARY LINE
PRD	ZONING DESIGNATION
65	NOISE CONTOUR
14	RUNWAY DESIGNATION

N

3000 0 3000

		DESCRIPTION
PROJECT NO. 301601	FILE NAME ASHPL02	DO NOT SCALE DRAWINGS
		CHECKED BY JK
		DRAWN BY BBH
		DESIGNED BY AO
		DATE: 1/06/00
		SCALE: 1"=3000'

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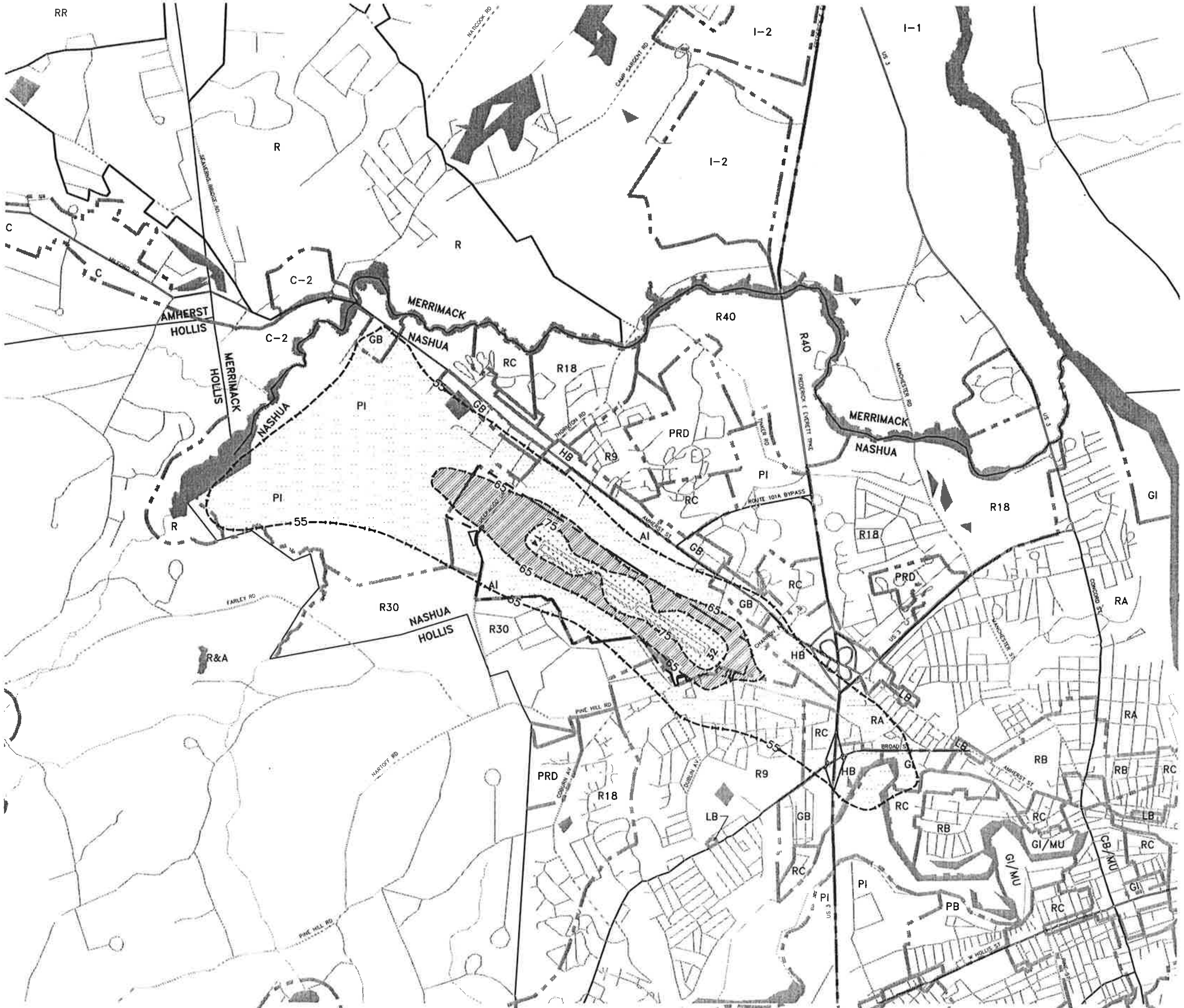
BOIRE FIELD
NASHUA AIRPORT AUTHORITY
AIRPORT MASTER PLAN TECHNICAL SUPPLEMENT

1990 PART 150 STUDY
FORCASTED ACTIVITY LEVELS
EXISTING RUNWAY CONFIGURATION

FIGURE NO. 7.3

SHEET 3 OF 6



LAND USE LEGEND

NASHUA ZONING

R40	RURAL RESIDENCE
R30	SUBURBAN RESIDENCE
R18	SUBURBAN RESIDENCE
R9	SUBURBAN RESIDENCE
RA	URBAN RESIDENCE
RB	URBAN RESIDENCE
RC	URBAN RESIDENCE
PRD	PLANNED RESIDENTIAL DEVELOPMENT
GB	GENERAL BUSINESS
CB	CENTRAL BUSINESS
HB	HIGHWAY BUSINESS
LB	LOCAL BUSINESS
PI	PARK INDUSTRIAL
GI	GENERAL INDUSTRIAL
AI	AIRPORT INDUSTRIAL
HD	HISTORIC DISTRICT
MU	MIXED USE DISTRICT
FU	FLEXIBLE USE DISTRICT

MERRIMACK ZONING

R	RESIDENTIAL
C-1	LIMITED COMMERCIAL
C-2	GENERAL COMMERCIAL
I-1	INDUSTRIAL
I-2	INDUSTRIAL
I-3	INDUSTRIAL

HOLLIS ZONING

A&B	AGRICULTURE AND BUSINESS
R&A	RESIDENTIAL AND AGRICULTURE
R	RECREATION
WSC	WATER SUPPLY CONSERVATION

AMHERST ZONING

C	COMMERCIAL
GO	GENERAL OFFICE
I	INDUSTRIAL
RR	RESIDENTIAL RURAL

LEGEND

SYMBOL	DESCRIPTION
— - —	AIRPORT PROPERTY LINE
———	TOWN / CITY BOUNDARY LINE
— · —	ZONING BOUNDARY LINE
PRD	ZONING DESIGNATION
---65---	NOISE CONTOUR
14	RUNWAY DESIGNATION

N

3000 0 3000

BOIRE FIELD
NASHUA AIRPORT AUTHORITY
AIRPORT MASTER PLAN TECHNICAL SUPPLEMENT

1998 ACTIVITY LEVEL WITH EXISTING RUNWAY CONFIGURATION

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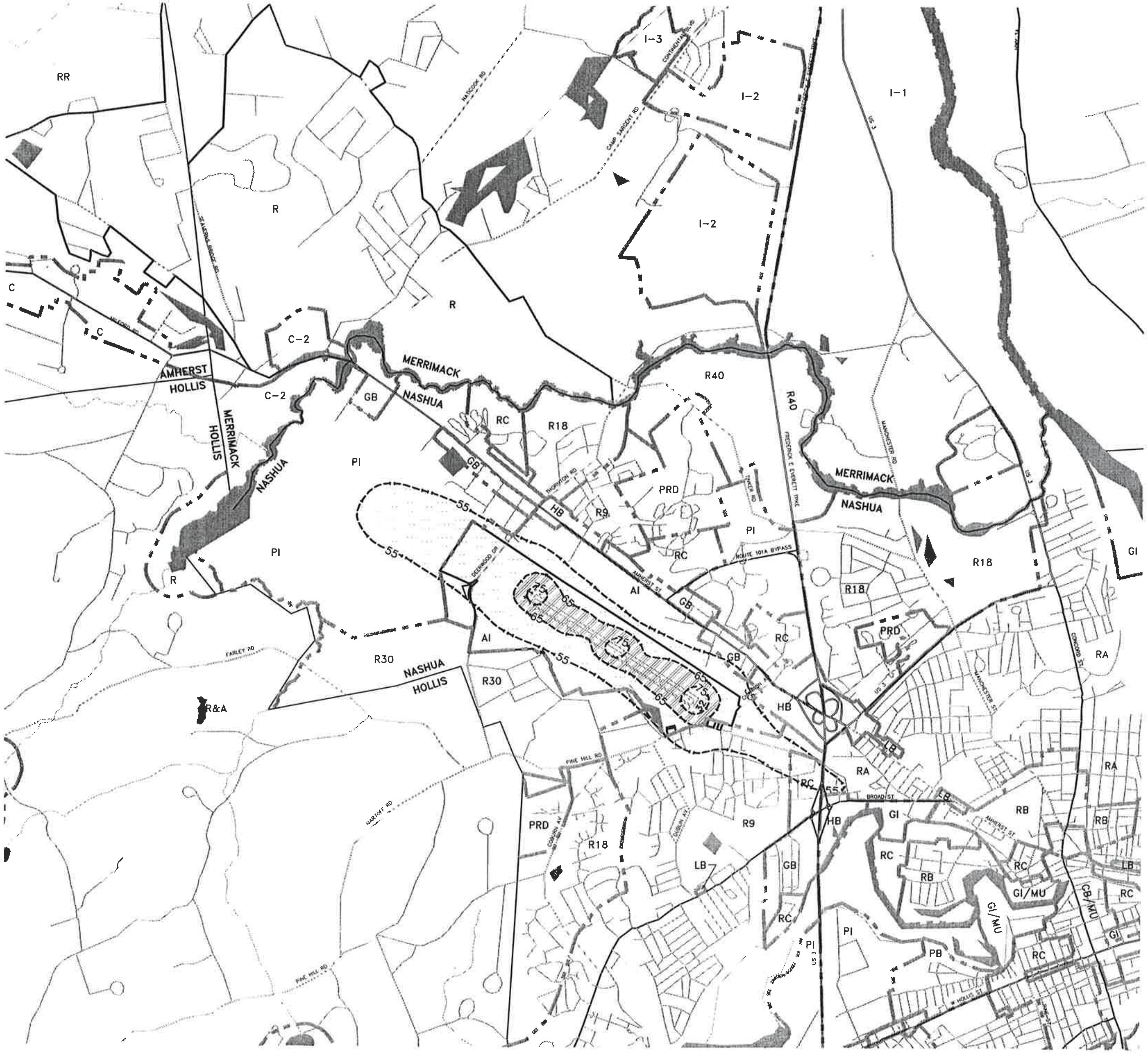
PROJECT NO. 301601 | FILE NAME ASHPL01 | DO NOT SCALE DRAWINGS

REV. | DESCRIPTION | DATE

FIGURE NO. 7.4

SHEET 4 OF 6



LAND USE LEGEND

NASHUA ZONING

R40	RURAL RESIDENCE
R30	SUBURBAN RESIDENCE
R18	SUBURBAN RESIDENCE
R9	SUBURBAN RESIDENCE
RA	URBAN RESIDENCE
RB	URBAN RESIDENCE
RC	URBAN RESIDENCE
PRD	PLANNED RESIDENTIAL DEVELOPMENT
GB	GENERAL BUSINESS
CB	CENTRAL BUSINESS
HB	HIGHWAY BUSINESS
LB	LOCAL BUSINESS
PI	PARK INDUSTRIAL
GI	GENERAL INDUSTRIAL
AI	AIRPORT INDUSTRIAL
HD	HISTORIC DISTRICT
MU	MIXED USE DISTRICT
FU	FLEXIBLE USE DISTRICT

MERRIMACK ZONING

R	RESIDENTIAL
C-1	LIMITED COMMERCIAL
C-2	GENERAL COMMERCIAL
I-1	INDUSTRIAL
I-2	INDUSTRIAL
I-3	INDUSTRIAL

HOLLIS ZONING

A&B	AGRICULTURE AND BUSINESS
R&A	RESIDENTIAL AND AGRICULTURE
R	RECREATION
WSC	WATER SUPPLY CONSERVATION

AMHERST ZONING

C	COMMERCIAL
GO	GENERAL OFFICE
I	INDUSTRIAL
RR	RESIDENTIAL RURAL

LEGEND

SYMBOL	DESCRIPTION
— - —	AIRPORT PROPERTY LINE
———	TOWN / CITY BOUNDARY LINE
- - -	ZONING BOUNDARY LINE
PRD	ZONING DESIGNATION
--65--	NOISE CONTOUR
14	RUNWAY DESIGNATION

N

3000 0 3000

BOIRE FIELD
NASHUA AIRPORT AUTHORITY
AIRPORT MASTER PLAN TECHNICAL SUPPLEMENT

HIGH GROWTH SCENARIO WITH EXISTING RUNWAY CONFIGURATION

Hoyle, Tanner & Associates, Inc.
150 Dow Street, Manchester, NH 03101

HTA engineers planners Companies

PROJECT NO. 301601
FILE NAME ASHPL03
DO NOT SCALE DRAWINGS
SCALE: 1"=3000'
DATE: 1/06/00
DESIGNED BY AO
DRAWN BY BBH
CHECKED BY JK

REV. | DESCRIPTION | DR BY | CHKD BY | APPD BY | DATE

FIGURE NO. 7.5

SHEET 5 OF 6

LAND USE LEGEND

NASHUA ZONING

R40	RURAL RESIDENCE
R30	SUBURBAN RESIDENCE
R18	SUBURBAN RESIDENCE
R9	SUBURBAN RESIDENCE
RA	URBAN RESIDENCE
RB	URBAN RESIDENCE
RC	URBAN RESIDENCE
PRD	PLANNED RESIDENTIAL DEVELOPMENT
GB	GENERAL BUSINESS
CB	CENTRAL BUSINESS
HB	HIGHWAY BUSINESS
LB	LOCAL BUSINESS
PI	PARK INDUSTRIAL
GI	GENERAL INDUSTRIAL
AI	AIRPORT INDUSTRIAL
HD	HISTORIC DISTRICT
MU	MIXED USE DISTRICT
FU	FLEXIBLE USE DISTRICT

MERRIMACK ZONING

R	RESIDENTIAL
C-1	LIMITED COMMERCIAL
C-2	GENERAL COMMERCIAL
I-1	INDUSTRIAL
I-2	INDUSTRIAL
I-3	INDUSTRIAL

HOLLIS ZONING

A&B	AGRICULTURE AND BUSINESS
R&A	RESIDENTIAL AND AGRICULTURE
R	RECREATION
WSC	WATER SUPPLY CONSERVATION

AMHERST ZONING

C	COMMERCIAL
GO	GENERAL OFFICE
I	INDUSTRIAL
RR	RESIDENTIAL RURAL

LEGEND

SYMBOL	DESCRIPTION
	AIRPORT PROPERTY LINE
	TOWN / CITY BOUNDARY LINE
	ZONING BOUNDARY LINE
PRD	ZONING DESIGNATION
65	NOISE CONTOUR
14	RUNWAY DESIGNATION

N

3000 0 3000

PROJECT NO.	301601
FILE NAME	ASHPL04
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CHECKED BY	JK
DRAWN BY	BBH
DESIGNED BY	AO
DATE:	1/06/00
SCALE:	1"=3000'

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150 Dow Street, Manchester, NH 03101

BOIRE FIELD
NASHUA AIRPORT AUTHORITY
AIRPORT MASTER PLAN TECHNICAL SUPPLEMENT

HIGH GROWTH SCENARIO WITH PROPOSED PARALLEL RUNWAY

FIGURE NO. 7.6

SHEET 6 OF 6

7.2.3 Scenario 3: Growth scenario with existing runway configuration

These are the results of the INM analysis for the growth scenario, retaining the existing runway configuration:

- The entire 65 and 75 DNL contours remain within the airport property boundary.

7.2.4 Scenario 4: Growth scenario including the proposed parallel runway

These are the results of the INM analysis for the growth scenario, assuming the construction of a parallel runway for training activity:

- There is no 75 DNL contour.
- The entire 65 DNL contour remains entirely within the airport property boundary.

7.3 Noise complaints

In addition to analyzing noise using INM, we reviewed one year's worth of noise complaints, from July 1998 through June 1999. Complaints are filed by telephone. An airport management staff member fills a form that includes two major sections: The first describes the nature of the complaint, the second the follow-up action taken.

7.3.1 Findings

Here are some basic findings regarding the complaint forms:

A total of 10 reports were filed:

- 5 were noise complaints
  - 4 were from the same person
  - 3 flights were confirmed to be from other airports or could not be correlated to Nashua operations
  - 2 reports list specific aircraft registration numbers, both of them Sabreliner jets (however, one could not be correlated with an actual operation at the time indicated by the caller)
  - 3 had missing or unclear reports on action taken
  - 2 callers did not return messages requesting additional information or an opportunity to provide a follow-up
- 3 were safety concerns sparked by low flying aircraft
  - 1 flight was confirmed to be from another airport
  - 2 had missing or unclear reports on action taken
- 1 was a general comment regarding high levels of aircraft traffic above the caller's house
  - Caller did not return message asking for more information

- 1 form does not contain enough detail to determine the nature of the complaint

The format of the report changed in 1999. The new form asks for less information than the earlier one. However, the additional detail information requested on the earlier form was rarely filled out. This included information on weather conditions, runway used (if known), and phase of flight.

7.3.2 Recommendations

With only five or six noise complaints it is difficult to make broad conclusions, especially since one person generated four of them. With that disclaimer, here are our findings:

- Noise problems do not motivate many neighbors to complain through the existing complaint system *or* neighbors are not complaining through the airport manager's office, but through other channels (e.g., Ward 1 and 2 aldermen, City Hall, the press).
- Additionally, the low number of complaints may indicate a lack of public awareness of the airport's noise complaint program.
- The two Sabreliner jets currently based at the airport were the only two specifically identified in the noise complaint forms.
- Manchester Airport and other jet flights not related to Boire Field cause some noise problems.
- The complaint system is adequate, except that many reports lack much detail information or complete action reports.

It is possible that the low number of complaints is due to factors other than the level of the noise problem. As stated, one reason could be lack of publicity regarding the availability of a noise complaint program. Also, potential callers may feel that complaining is not worth it because nothing will change and may be feeling a sense of futility. We recommend that the Nashua Airport Authority continue the noise complaint program and promote its role as a means for airport neighbors to be heard. Conversely, we also recommend that those who file complaints be as specific as possible and return calls asking for more information.

We commend the airport management for having instituted a formal noise complaint process. Allowing neighbors to voice their concerns, and receiving follow-up reports describing the actions taken, helps build a constructive relationship between the airport and those impacted by it.

When analyzing noise complaints, the more detail that is available, the higher the potential for constructive change. We do not know why the form was changed in 1999, but on the surface it appears that the earlier form had useful information that is not on the new one. We recommend that the detailed form be re-adopted and that the airport staff fills out as much of the form as possible. Action should be taken promptly, and the action report should document all available details. It may be worthwhile to study noise complaint programs developed at other airports. A suitable example may be the Massachusetts Port Authority's program at Hanscom Field in Bedford, MA.

7.4 Traffic generated by Manchester Airport

As part of the scope of work for this study, HTA was asked to investigate whether some of the noise complaints at Nashua were in fact due to passenger jet aircraft flying into Manchester Airport. We visited the Manchester Terminal Radar Approach Control (TRACON) facility on April 20, 1999 to review this issue.

7.4.1 Manchester Airport flight tracks

The table below summarizes the flight tracks for jets and turboprops approaching and departing Manchester Airport:

Jets		
Runway	Arrivals	Departures
17	Routed over Keene VOR, 10 miles north of Nashua. Normally no impact on Nashua.	Heading of 220°, then turn to the west 4-5 miles north of Nashua. Normally no impact on Nashua.
35	Routed over Keene VOR, then right over Nashua at 3,000-4,000 ft for a 5 mile intercept of the ILS.	Runway heading until 3,000 ft. Normally no impact on Nashua.
Turboprops		
17	Routed over Gardner VOR at 3,000-5,000 ft, 7-8 miles northwest of Nashua. Normally no impact on Nashua.	Heading of 220°, then turn to the west 4-5 miles north of Nashua. Normally no impact on Nashua.
35	Routed over Gardner VOR, then right over Nashua at 3,000-4,000 ft for a 5 mile intercept of the ILS.	Runway heading until 3,000 ft. Normally no impact on Nashua.

These are only general guidelines. Aircraft may fly over Nashua even when landing Runway 17. Overflights may also occur with turboprops landing on Runway 6, which is not used by jets. The rule of thumb is that if aircraft over Nashua are headed east, they are on a noise abatement route to intercept a 5-mile final to Runway 35. If they are traveling north, they are either landing on Runway 17 (jets) or Runway 6 (turboprops).

Runway 17 is the designated calm wind runway at Manchester Airport. They estimate that it is used 60% of the time. Consequently, the impact over Nashua is relatively low.

When Runway 17-35 closes for reconstruction, aircraft vectored into an ILS approach for Runway 6 may interfere with the Class D airspace at Nashua. There may be a temporary increase in jet and turboprop activity over the Nashua area.

7.4.2 Additional information

In the evenings, around 7-8 p.m., a cargo arrival rush occurs at Manchester. This consists mostly of feeder aircraft from the north. Generally speaking, this does not affect Nashua. There are no other nighttime operations that would affect Nashua negatively.

The Manchester TRACON is scheduled to move into the Boston Consolidated TRACON in late 2002. The facility will be located in Merrimack, NH. No operational impacts are expected.

7.4.3 Summary

The TRACON staff has not received any noise complaints from the Nashua area. Our review of noise complaints at Boire Field reveals very little impact from Manchester. While the information above does document that jets using Manchester overfly Nashua at relatively low altitudes, it does not appear to be a significant problem. There also isn't much evidence that Nashua residents are confusing Manchester and Nashua traffic. However, the Boire Field airport management staff members who process noise complaints should be aware of the Manchester Airport flight tracks and how they potentially relate to noise complaints at Nashua.

7.5 Summary of noise impacts

The following table shows the total area encompassed within each noise contour for each scenario in square miles:

DNL Contour	Part 150 High growth scenario	1998 (existing conditions)	Growth (existing runway configuration)	Growth (with parallel runway)
65	1.2	0.6	0.2	0.2
75	0.3	0.2	0.04	0.0

The size of the Part 150 noise contours, as compared to the 1998 contours, is due to the inflated forecast for annual operations, especially for jet operations. The inflated forecast was a result of the lack of historical information from which projections of future activity were made. While this case is retained for comparison purposes, it has little bearing on actual noise impacts experienced in the communities surrounding the airport.

The contours generated using the 1998 activity levels and the existing runway configuration constitute the base case for this study. We compared the two future scenarios with this case to determine the effects the airport may have on its surroundings in the future.

As noted in the previous section, the entire 1998 75 DNL contour and the majority of the 65 DNL contour remain over land that is either airport property or zoned for airport use. On the northwest side of the airport, the 65 DNL contour extends over industrial land. This is primarily undeveloped land and a land use compatible with the aviation activity. A small portion of the 65 DNL contour does extend over residentially zoned land southeast of the Runway 32 approach end. This is not a compatible land use within this noise contour.

Annual aircraft activity is projected to increase over the planning period. In particular, jet activity is expected to grow from 1,415 annual operations to 2,556 operations. Nonetheless, our results show that the total area impacted by the operation of the airport is expected to shrink. This is due to the expected phase-out of the older and noisier jets. This study shows that the increased use of the quieter jets will have a significant impact on the noise levels generated by the airport. This will especially benefit the residential area southeast of the approach end of Runway 32, which will be removed from the 65 DNL contour.

The construction of the parallel Runway 14L/32R would further reduce the size of the noise contours. The 75 DNL contour will be completely eliminated. However, this finding is not of great significance to the airport's neighbors, since the 75 DNL contour does not extend beyond the airport property. The 65 DNL contour will have a slight reduction in size, with some benefit to residences.

In summary, there are only a few incompatible land uses within the existing 65 DNL contour. The reduction in the size of the contours, as shown in the future scenarios, shows the significance that jet activity has on the extent of noise generated by operations at Boire Field. This is especially true of the older and noisier Stage 2 jets. As these jets are replaced with quieter jets, the noise levels experienced by the airport community will be reduced, even as overall jet activity increases at the airport. In fact, during the course of this project, a Stage 3 aircraft replaced one of the Stage 2 aircraft based at the airport.

7.6 Review of recommendations in 1990 Part 150 Noise Impact Study

In the 1990 Part 150 Study, alternatives were developed and reviewed for their ability to minimize noise impacts to the surrounding community. These methods fell within the following categories:

- Runway use and flight routing changes
- Airport regulation changes and facility restrictions
- Aircraft operational changes
- Airport facility changes

The study found that the noise impacts did not warrant the more drastic measures of placing restriction on airport use. The study further concluded that the airport's existing noise abatement procedures were successful in minimizing the airport's noise impacts to the community. It recommended the construction of the parallel runway with some minor modifications to existing procedures as a means of further reducing airport noise impacts.

This study supports the recommendation of the Part 150 Study not to implement airport restrictions. As aging jets are removed from the active fleet mix, and the use of newer and quieter jets increases, the noise impacts at airports such as Boire Field will be reduced, without any additional operational modifications. We believe that the combination of the existing noise abatement procedures and the phase-out of the older jet fleet will minimize the impacts to the community to the point that there will be no incompatible land uses within the 65 and 75 DNL contours. The construction of the parallel runway would somewhat further reduce the noise impact.

Note that the elimination of incompatible land uses does not mean the airport will not have an adverse noise impact on its neighbors. Comments at the public information meetings and data from noise complaints show that the quality of life of some neighbors is affected negatively by the airport. The fact that their properties are outside the 65 DNL contour only takes into account noise impacts averaged over a yearly basis. Even with a reduction of the 65 DNL impact area, these residents would still be experiencing frequent disruptive single noise events. It should be noted that the weather conditions on a specific day can alter the noise impacts of an aircraft, making what would normally be an acceptable level of noise

one day unacceptable another day. The airport should continue its noise complaint program and remain sensitive to the concerns of these residents.

At the second public information meeting, a member of the audience commented that the most intrusive noise impacts were business jet operations on weekend mornings. This is a typical example of noise impacts that may not be sufficiently large to affect the 65 DNL contour, but affect the quality of life of residents. These impacts cannot be entirely eliminated – they are part of the side effects of modern transportation systems. It does point out a continuing need for impacted airport neighbors and the airport authority to engage in constructive dialog, as well as for continuing education of the pilot community.

Also, as discussed within the 1990 Part 150 Study, the airport should continue to work with the governing agencies of the surrounding communities, especially the City of Nashua, to monitor the land uses within the 55 DNL contour. Although residential land uses are compatible in areas that experience noise levels below 65 DNL, efforts should be taken to minimize additional residential development within the 55 DNL contour to provide an additional margin of error. This will also serve to control the number of residents subjected to disruptive single noise events.

8. Planned airport improvements

The Nashua Airport Authority has managed a Capital Improvements Program (CIP) for over 20 years as part of the City, State, and Federal planning for future improvements to Boire Field. The general planning horizon is a 6-year program to match the Nashua planning guidelines. The projects shown on the 6-year plan have been coordinated with the FAA and NHDOT, Division of Aeronautics and are included in their comprehensive airport capital improvement plans. While this does not guarantee funding participation by these agencies, this is the first step in securing such funds.

Each year the airport management staff reviews the previous plan, reevaluates current requirements, and modifies the plan to reflect revised needs. This year, with this technical supplement, a more thorough review was conducted to take a detailed overview of the airport future. This information is tabulated below:

Project	Cost	Funding source	Priority
1. Taxiway lights & signage upgrade	$263,000	AIP (FAA/State/NAA)	1
2. Land acquisition (Flynn)	$50,000	AIP (FAA/State/NAA)	2
3. Parallel runway	$1,058,000	AIP (FAA/State/NAA)	3
4. Taxiway & apron (Holden property)	$563,000	AIP (FAA/State/NAA)	4
5. Road relocation (Holden property)	$100,000	AIP (FAA/State/NAA)	4
6. Security fence	$175,000	AIP (FAA/State/NAA)	4
7. SRE building addition (30 by 104 ft)	$240,000	AIP (FAA/State/NAA)	5
8. Reconstruct old apron	$820,000	AIP (FAA/State/NAA)	6
9. Land acquisition (Runway 32 RPZ)	$150,000	AIP (FAA/State/NAA)	6
10. Obstruction clearing (Runway 14)	$250,000	AIP (FAA/State/NAA)	7
11. Terminal apron reconstruction	$744,000	AIP (FAA/State/NAA)	8
12. Land acquisition (Runway 32 RPZ)	$150,000	AIP (FAA/State/NAA)	9
13. Obstruction clearing (Runway 32)	$200,000	AIP (FAA/State/NAA)	10
14. Terminal building	$522,500	See text	
15. Auto parking (fuel farm area)	$50,000	Local/private	A
16. Auto parking (old hangar area)	$70,000	Local/private	B
17. Auto parking (terminal/tower)	$150,000	Local/private	C
18. T-Hangars (Holden property)	$360,000	Bonding	D
19. Auto parking (Holden property)	$150,000	Local/private	E

DuBois & King, Inc. engineers reviewed the projects listed above to prepare preliminary budget estimates. We estimated costs based on basic construction components. Actual construction costs can vary significantly. The construction costs were escalated by a 25% engineering and contingency amount to determine total project costs in 1999 dollars.

The funding source column identifies potential funding sources. Projects 1-13 should be eligible for airport improvement program (AIP) funding. Under the AIP, the FAA usually provides 90% of total project cost, NHDOT provides 5% funding participation, and the Nashua Airport Authority is responsible for the remaining 5%. In the past, the airport has usually participated in the City of Nashua City capital improvement plan to obtain the local 5% share.

The last column identifies the relative priority the projects have been assigned by the Nashua Airport Authority through the airport manager. These priorities were developed in conjunction with the airport's consultant engineer, DuBois & King, Inc.

We asked the TAC committee members to provide input on these priorities, but only three members provided input. Of those, one stated that the list of priorities was "OK as is." The other two had revisions, both of which listed the Holden property taxiway and apron as the number one priority. The Holden property projects were subsequently listed in a separate group of priorities, since the do not compete for AIP funding. This is how they are presented in the table above. One way the proposals differed was regarding the parallel runway. The original version listed the parallel runway with a priority score 1. One of the proposals gave it a priority score 6. The other gave it a priority of zero, with the comment that it "should not be built." As shown above, the final version assigns the parallel runway the priority score 3.

The first thirteen projects, all AIP eligible, have an assigned priority from 1 to 10. Projects 15 to 19 are not AIP eligible and will be totally funded by local/private sources. The local funding source might be city capital improvements program, or as part of private development of some hangar sites. Project 14, the terminal building, is unique in respect to the relative size of funding required and unknown potential source of funding.

The projects are described in more detail below:

1. **Taxiway lights and signage upgrade:** This involves complete lighting of parallel taxiway system and upgrading signage with taxiway indicators to conform to current FAA advisory circulars. At the present time, night taxiing from the lighted runway to apron parking or hangar areas is difficult. This is particularly true for transient aircraft operated by crew unfamiliar with the airport.

2. **Property Acquisition (Flynn).** This is one of four remaining properties in the runway protection zone (RPZ) for Runway 32. This is a ½ acre vacant lot. It is the property closest to the Runway 32 threshold. All four properties are on the airport side of the Charron Avenue/Pine Hill Road intersection and within the RPZ for Runway 32. Previous master planning efforts have recommended that the Nashua Airport Authority acquire all four properties, as they become available on the market.

3. **Parallel Runway:** This two-year project involves design and construction of a 3,200 by 60 ft parallel runway. The new runway would be designated 14L/32R (for left/right) and the existing runway would be renamed and remarked as 14R/32L. This runway would be used primarily for training operations. Unless required for emergency, safety, or back-up reasons, aircraft would only use the new runway during daytime visual conditions. Further, it could only be used while small aircraft are using the primary runway.

   The airport has completed all environmental assessment requirements for this project. The Nashua Airport Authority recognizes that there is an ongoing need to educate the public and officials on what the proposed parallel runway will provide and more clearly communicate how it will, or will not, impact surrounding residential areas.

4. **Taxiway and Apron (Holden property):** This is for design, possible environmental update, permits and construction of a 1,200 by 35 ft taxiway to service a new 240 by 600 ft apron for 51 aircraft tie down and 84 stalls of T-hangars. This is the last expansion area for based aircraft tie-downs and the only remaining sites for small aircraft T-hangars. The conceptual land plan was prepared and assessed during the acquisition process in 1991.

   The EA for the Holden parcel is still current as it relates to the wetland ordinances and will require a dredge and fill permit as noted in that document. The new watershed protection ordinance may require certain roof material treatments and additional drainage computations to validate a slow rate of run-off to enable ground water recharge. These are minor requirements that are usually a part of the site plan review process. All other environmental considerations remain the same as identified in the environmental assessment (EA).

5. **Road Relocation (Holden property):** As part of the environmental mitigation on the Holden Property and to maintain adequate emergency access, Perimeter Road needs to be relocated to the southern side of the proposed aviation development. Currently Perimeter Road bisects the proposed taxiway system servicing this new T-hangar area. To maintain the integrity of the gravel Perimeter Road for emergency access from Pine Hill Road to Route 101A (Amherst Street), the relocation of Perimeter Road is important. This was a part of the land planning and EA completed in 1991.

6. **Security Fence:** This will extend the security fence in the northwest sector of the airport property from the current end of Perimeter Road for a distance of 8,000 ft around the Holden Property, along Deerwood Drive and former Pennichuck land to close the entire airport perimeter. As the Pennichuck industrial land to the northwest has begun to develop, animal intrusions into active aviation areas is becoming a greater concern. Also, as this area to the northwest develops it will create a greater potential for unauthorized people to gain greater access to aviation operations areas.

7. **SRE Building Addition:** This is for a 30 by 104 ft (3000 SF) addition to the rear of the existing building constructed in 1983. In the subsequent years the pavement to be maintained has increased with three apron expansions, numerous new hangars and another proposed taxiway and apron expansion. Snow equipment acquisitions have doubled the equipment available to take care of this airport expansion. The current building is inadequate to store and repair this equipment.

8. **Reconstruct Old Apron:** This is the oldest apron (1,050 x 240 ft) originally constructed with local funds only. This apron is immediately south of the terminal apron at the control tower. This apron requires significant fill, complete closed drainage, and an all-new structural section.

9. **Land Acquisition (Runway 32 RPZ):** This is for property acquisition of one of the three remaining single family lots at the corner of Pine Hill Road and Charron Avenue in the runway protection zone. At the time of writing, we have no knowledge of any plans by the property owners to sell the properties. They are all aware of the airport's interest to acquire their properties should they desire to leave. It is anticipated that at least one of these owners may wish to sell within the first half of the planning period.

10. **Obstruction Removal (Runway 14):** This involves clearing approximately 35 acres of treed area in the primary surface of the Runway 14 approach and the westerly transition surface. This is the area between current Perimeter Road and the approach lighting system. All previous obstruction removal has been with local funds only. Future clearings of this area should involve methods to control re-growth. Existing re-growth has created a denser vegetation cover than previously existed. Large parts of this area are within identified wetlands.

11. **Terminal Apron Construction:** This apron was originally constructed with FAA funds in 1976. The pavement is currently 24 years old and showing its age. There are numerous 1-1/2 inch wide cracks. The pavement has dried out. Pavement deterioration in this area is accelerating. In the next 5 to 6 years, the need for reconstruction will increase, as maintenance costs become increasingly higher.

12. **Land Acquisition (Runway 32 RPZ):** In the second half of the planning period, it is anticipated a second of the three property owners at the corner of Charron Avenue/Pine Hill road will be prepared to sell. The airport authority needs to plan for funding this property acquisition when it comes on the market.

13. **Obstruction Removal (Runway 32):** This is for the removal of trees in the Runway 32 approach surface. Most of these are currently penetrations to the 34:1 surface, but not to the 20:1 surface. In some areas, tree removal and replacement with other species maybe necessary to satisfy neighboring property owners. At the time of writing, an updated obstruction chart is being prepared for Boire Field. When completed, the need for clearing in the Runway 32 approach should be evaluated in more detail.

14. **Terminal Building (6,000 SF):** Present airport operations are administered from the snow removal equipment storage facility. This location is not easily identifiable by visitors from either airside or landside. A terminal building has been on the Airport Layout Plan for over 20 years; located adjacent to the control tower. This central location is highly visible from both airside and landside, and has adequate potential for parking capacity. If the airport authority were to limit public vehicle access to the airfield, the terminal building could become a focal location for boarding or off-landing air charter passengers. The additional space requirements for airport operations, conference rooms, pilot lounge, charter passenger waiting area, rental car space, and possible additional restaurant space would require a 60 by 100 ft terminal building.

    Terminal buildings are usually not AIP funded: Project financing through other grants or low interest loans will be necessary to fund a terminal building. It is not practical for the Nashua Airport Authority to fund this project alone. The ability to obtain this level of funding through other City sources for capital funding is limited by high competition for capital funds. Other sources of federal/state grants and low interest loans are possible sources for funding of this project.

15. **Auto Parking (fuel farm area):** As discussed in Section 6.4, the Nashua Airport Authority may need to restrict access to aircraft operational areas by private vehicles. The section identified several areas where additional vehicle parking would be needed to provide adequate parking space. The first and easiest area to improve is a parking area just north of the fuel farm. This location could accommodate about 44 vehicles.

16. **Auto Parking (old hangar area):** The second location needing additional parking space is the old hangar area (building nos. 9-19). There is limited space available on either side of Perimeter Road for a parking area. The size of this parking space needs to accommodate about 10 spaces to adequately handle this area.

17. **Tower Auto Parking:** The third area is behind the control tower. Currently 120 spaces are available at this central location. The rough site work to expand parking in this area is complete. Improving this area will provide an additional 200-car capacity at this central airport location.

18. **T-Hangars:** To date, all T-hangars on the airport have been developed with private investment funds on land leased from the Nashua Airport Authority. At various times, the airport authority has weighed the merits of developing a T-hangar complex. This project is planned to enable the airport authority to exercise this option, if it so chooses. We estimate that with favorable bond financing, T-hangars could be developed for about $30,000 per unit.

19. **Auto Parking (Holden Property):** As part of the aviation improvements for this area, a 56 car parking area would be necessary, if vehicle access to the aircraft areas were to be restricted. This could be provided on the southwest side of the relocated Perimeter Road.

8.1 Review of environmental requirements for CIP items.

This section reviews each proposed project to identify potential environmental constraints or permits that may be necessary for the project to proceed with construction. This is just an initial review, to assist proper planning of proposed improvements.

Several of the proposed projects are categorically excluded from a formal environmental assessment per FAA Order 5050.4A, *Environmental Handbook*. They include:

Project(s):	Description:
1	Taxiway lights & signage upgrade
2, 9, 12	Runway protection zone land acquisition
6	Security fencing
8	Reconstruct old apron
11	Terminal apron reconstruction

Three proposed projects have had a full environmental assessment and FAA has issued a "finding of no significant impact". These projects are:

3	Parallel runway
4	Taxiway and apron (Holden property)
5	Road relocation (Holden property)

The remaining projects have been reviewed against National Environmental Policy Act criteria:

The Snow Removal Equipment Building Addition (project no. 7) is in a location where no known environmentally sensitive parameters exist and this project should require no further review.

Both obstruction removal projects, obstruction clearing for Runway 14 (project no. 10) and for Runway 32 (project no. 13), may need additional environmental review and documentation prior to project initiation. There are definite wetland considerations at the Runway 14 end of the airport. The new City of Nashua watershed protection act might have some bearing. Coordination with the local Conservation Commission would be an initial step.

The terminal building project is in a location on the airport where no known environmentally sensitive issues exist. Of the auto parking areas, only the old hangar area site might have environmental sensitive issues associated with siting and construction. Auto parking at the fuel farm and tower building locations do not have environmentally sensitive issues. The Holden property parking was part of the EA for the land use of the property.

The T-hangar projects would only be on the Holden property and the prior EA has covered them for that property. There could be minor issues relating to the recently adopted City of Nashua watershed protection ordinance. These usually are addressed as part of the local planning review process.

In addition to the environmental review requirements listed above, the Nashua Airport Authority should conduct a Storm Water Pollution Prevention Plan (SWPPP). This would cover issues related to the discharge of storm water run-off from the airport. It would cover all activities at the airport, both those conducted by the airport authority and those of its tenants. Issues to be addressed include the relationship between airport drainage and its surroundings, especially environmentally sensitive areas such as wetlands and aquifers; deicing operations; use of herbicides; use of foam based aircraft fire fighting agents; and response to fuel spills/leaks. It would be prepared in accordance with current Environmental Protection Agency (EPA) guidelines and would include best management practices for the discharge of storm water. The preparation of a SWPPP is normally eligible for AIP funding. For the sake of efficiency, we recommend that the airport authority prepare the SWPPP in conjunction with the design effort for its next construction project.

8.2 On-airport helipad

During the completion of this study, a member of the Technical Advisory Committee (TAC) and a member of the public requested that a possible location for an on-airport helipad be identified. In 1992 a helipad siting study was conducted by Hamilton Engineering. We conducted a review of the report and found that overall, the results of the study are still valid. However, since the completion of the 1992 study there have been some minor changes in the FAA's helipad requirements, as outlined in Advisory Circular 150/5390-2A, *Heliport Design*. The following is a discussion of the FAA's changes and any modifications that we made to the calculations or findings from the 1992 study.

The 1992 study found that the helipad should be located on Taxiway "J". The report described the location of the center of the helipad as approximately 150 ft. from the

centerline of the taxiway parallel with Runway 14/32 and approximately 150 ft. from Hangar #7. The report indicated that this site was selected because it does not impact on revenue producing tie-down areas and most closely meets the FAA's design and clearance standards.

We did not conduct a detailed study of each possible site. However based on a review of each proposed site identified in the 1992 study, we generally agree with this finding. It is most beneficial to locate a helipad in close proximity to the terminal area, so that the passengers and crew can be loaded and unloaded without the need to hover-taxi the helicopter to and from the terminal area. However at Boire Field, the recommended location on the terminal apron, referred to as "A1" in the 1992 report, would impact an area of aircraft tie-downs. At an airport that already has limited aircraft parking, this would adversely impact the airport. Also, at Boire Field vehicles are permitted to drive on the apron areas. The presence of vehicles and pedestrians in close proximity to an operating helipad poses safety considerations. The remaining alternative sites were located closer to the runway centerline, providing even less separation than the selected site. Other alternatives were impacted by obstructions. Therefore, we conducted our review using the 1992 report's selected site for the helipad on Taxiway 'J".

The required takeoff and landing areas for an on-airport helipad consist of a Final Approach and Takeoff Area (FATO), Touchdown and Liftoff Area (TLOF), and a safety area. These areas are calculated based on the dimensions of the design helicopter, which was determined in the 1992 study to be the Bell 206-L[11]. They are defined in more detail below:

> **FATO:** An area over which the final phase of the approach to a hover, or a landing, is completed and from which the takeoff is initiated. The FATO shall not be less than 1.5 times the overall length of the design helicopter. The length of the Bell 206-L is 42.5 ft.; therefore the FATO needs to be at least 63.8 ft.
>
> **TLOF:** A paved or other hard surface centered in the FATO, on which the helicopter lands or takes off. The FAA recommends that the dimensions of the TLOF be at least the rotor diameter of the design helicopter. The required dimension for the TLOF is 37 ft. diameter.
>
> **Safety Area:** An area surrounding the FATO that is free of objects, other than those required for air navigation purposes, and intended to reduce the risk of damage to helicopters accidentally diverging from the FATO. The safety area is required to be equal to 1/3 the rotor diameter of the design helicopter, but it shall not be less than 20 feet in width. The calculated safety area (1/3 the rotor diameter) is only 12.3 ft.; therefore a 20 ft. wide safety area is required.

Based on these dimensions, the existing width of Taxiway "J" (40 ft.) is adequate for the TLOF. The FATO and Safety Area will extend over the graded turf areas on the easterly

[11] The specification of the Bell 206L-4 was obtained from the Bell Helicopter internet site, http:www.bellhelicopter.Textron.com

and westerly sides of the helipad and on the taxiway pavement on the northerly and southerly sides of the helipad.

Although not discussed in detail in the 1992 report, the FAA has identified specific surfaces that must be maintained clear of obstructions for the operation of a helipad. These surfaces, outlined in Federal Aviation Regulation (FAR), Part 77, Objects that Effect Navigable Airspace, are discussed below.

Primary surface: The primary surface is the TLOF.

Approach surface: The approach surface begins at the end of the primary surface (TLOF) with the same width as the primary surface, and extends outward and upward at a slope of 8 to 1 for a horizontal distance of 4,000 feet where its width is 500 ft.

Transitional Surface: The transitional surface extends outward and upward from the lateral boundaries of the primary surface (TLOF) at a slope of 2 to 1 for a distance of 250 feet measured from the centerline of the primary and approach surfaces.

The airport needs to provide at least one helicopter approach and departure path that is clear of obstructions in the Part 77 surfaces noted above. The 1992 study did not provide information on the approach and departure paths used in the analysis. For this review, we assumed one approach and departure path extending parallel to the extended runway centerline to the approach end of Runway 14 (on the southeast side of the helipad). We also assumed that the helipad would only be used in visual weather conditions only.

The 1992 study found that hangars 7 and 11 were penetrations to the transitional surface. Our analysis found that neither hangar penetrates the Part 77 surfaces.

The FAA also requires that certain distances be provided between the center of the helipad and the runway centerline. For helipads serving small helicopters the required separation is 300 ft. from runways serving small airplanes and 500 ft. from runways serving large airplanes. Runway 14/32 does serve large aircraft; however, small airplanes weighing 12,500 lbs or less conduct the overwhelming majority of operations. The proposed site of the helipad is between 350 to 400 ft. from the runway centerline. Although this is less than the 500 ft. required for separation from runways serving large airplanes, it does meet the requirements for runways serving small airplanes. It is recommended that the FAA issue a modification to standards for the proposed site of the helipad based on the premise that a restriction will be placed on the use of the helipad that would prohibit helicopter operations from being conducted simultaneously with a large aircraft operation. This is similar to the concept envisioned for the proposed parallel runway. Based on the low level of existing and projected helicopter activity at the airport, this restriction would not significantly interfere with the use of the helipad, but would delay a helicopter operation from being conducted until a takeoff or landing of a large aircraft is completed.

The 1992 study also calculated the design loads for the heliport using guidance provided by the FAA. Since that study was completed the FAA modified the calculation for static load. Also, based on information obtained from the Bell Helicopters we found a slight difference

in the maximum takeoff weight for the Bell 206-L than was applied in the 1992 study. Therefore, we recalculated the design loads for the helipad.

There are three design loads that must be considered when designing the paved surface of a helipad, consisting of Static Load, Dynamic Load, and Rotor Load. The following is a description of each design load and the revised calculation for each based on a maximum takeoff weight of 4,550 pounds:

> **Static Load:** equal to the helicopters maximum takeoff weight applied through total contact area of the wheels or skids. The result is 4,550 lbs.
>
> **Dynamic Load:** Short duration (1/5 of a second or less) loads occur during hard landings. For design purposes this dynamic load is assumed to be 150 percent of the design helicopters takeoff weight. The result is 6,825 lbs.
>
> **Rotor Load (Downwash Load):** Rotor load is approximately equal to the weight of the helicopter distributed over the disk area of the rotor. The result is 4,550 lbs.

Runway 14/32 is designed for a maximum dual wheel loading of 65,000 pounds. We can assume that the taxiways providing access to the runway have the same design weight. Therefore, the existing taxiway loading will be adequate for the helipad.

Our analysis shows that the selected location on Taxiway "J" is suitable for the establishment of the helipad. An additional benefit to this site is that emergency vehicles arriving from Pine Hill Road can readily access it, for uses such as medical transport. An emergency access gate is located in this area that provides access to the Fire Station located on Pine Hill Road.

Since the proposed helipad is located in a location remote from the terminal area, a parking area and taxi route will need to be designated. The 1992 report does not discuss the requirements for providing taxiways or taxilanes from the helipad to the terminal area, and short term parking areas on the apron for passenger loading and unloading.

A taxi route that provides at least 20 ft. of rotor tip clearance to objects and parked helicopters for hover taxiing and 10 ft. of clearance for ground taxi. The Bell 206-L is equipped with skids, not wheels; therefore the hover taxi requirements will apply. The rotor diameter is 37 ft. The taxiway parallel to Runway 14-32 is 40 ft. wide and is required to maintain a safety area of 79 ft. (39.5 ft either side of centerline). The helicopter would require 38.5 ft. on either side of centerline (½ rotor diameter + 20 ft.), therefore adequate clearance is provided on the taxiway.

The parking area should be readily accessible from the taxiway and require minimal maneuvering from and to the taxiway. The FAA requires that a clearance of at least 1/3 the rotor diameter, but not less than 10 ft. be provided. Since the helicopter will be maneuvering to and from the parking position, the full length of both rotors (top and rear) will be used to determine the required separation. This length is 42.52 ft, so a clearance of 14 ft. is required. The airport will need to designate an area on the apron that meets this requirement.

The current level of helicopter operations represent less than 3% of total operations. Given the other capital improvement needs of the airport, it would not be cost effective to construct a helipad. However, if capital needs change and/or helicopter operations increase, the above analysis provides the best suitable location for the construction of a helipad. Consequently, we recommend that the Nashua Airport Authority reserve this location on the ALP for potential use as a helipad. Reserving this location does negatively impact any other potential use of this site.

8.3 Airport Layout Plan

The airport layout plan (ALP) depicts the location of the proposed improvements. It shows both current conditions, and the future layout of the airport, assuming all recommended improvements are constructed. It is reviewed and approved by the Nashua Airport Authority, FAA, and NHDOT, Division of Aeronautics. The inclusion on the airport layout plan of a proposed development does not represent a commitment by the airport sponsor to implement the indicated development. It shows that under the current planning assumptions, the improvements are recommended and that they fit in with the airport layout as planned for the future.

Approval of the ALP does not constitute a commitment to funding of the improvements by any of the approval agencies. It simply means that the layout meets federal and State guidelines and that the agencies are in general agreement on the future development of the airport. As conditions change, minor revisions to the ALP are allowed to reflect minor updates to the planning process. While the ALP is to scale, it is not intended as a construction or engineering drawings and does not require the same level of positional accuracy that such drawings would. The base map (i.e., topography, geographical features, streets, and property lines) for the current ALP is based on a much-revised hand drawing. Consequently, there are a number of small discrepancies between the ALP and actual conditions, none of which are thought to affect the real purpose of the ALP. We recommend that the next time the Nashua Airport Authority prepares an ALP, a new base map be prepared based on digital photography.

9. Public participation

This study was funded entirely by public funds, primarily from the federal Airport Improvement Program (AIP). Use of AIP funds is supervised by the Federal Aviation Administration (FAA), which requires that AIP funded projects have an opportunity for public participation. Minimally, this requires one public information meeting (PIM). In reality, the actual public participation program varies from project to project depending on the nature of the work, the size of the community, and the concerns involved.

Since a number of the issues covered by this study relate to the airport's impact on its surroundings, the study team decided from the outset to have a relatively extensive public participation process. It consisted of the following components:

- A Technical Advisory Committee (TAC) representing various community and airport user groups
- A mailing list for interested members of the public not on the TAC
- Two public information meetings

In addition, the study team actively solicited comments and input from the public. We used this public input as one of several sources of data in making our findings. We regularly made changes to the report and our thinking based on this input. We also set aside time for public comment on both the scope of work and the draft version of the final report.

9.1 Technical advisory committee

We established the TAC as a means to meet regularly with representatives of both communities affected by the airport and aviation users. The TAC consisted of 20 members that the study team nominated and the Nashua Airport Authority approved. They represented the following categories:

- Nashua Airport Authority
- Airport neighbors
- Airport users
- Airport tenants
- Conservation groups
- City of Nashua
- Federal Aviation Administration, Airports Division
- New Hampshire Department of Transportation, Division of Aeronautics
- Daniel Webster College
- Boire Field control tower (Midwest Air Traffic Control)

We held a total of five TAC meetings, all of which were also open to the public. The TAC meetings essentially covered 1-3 sections of this report at a time. The final TAC meeting served to review the draft of this report.

9.2 Project mailing list

At each TAC meeting, a mailing list was circulated for members of the public attending the TAC meeting. On a voluntary basis, members of the public could add themselves to the project mailing list. Everyone on the mailing list received the same review copies of study materials that we provided to the TAC prior to each meeting. We also made the mailing list sign-up sheet available at the first public information meeting. By the end of the study, the mailing list had approximately 20 recipients.

9.3 Public information meetings

We held two public information meetings. These were advertised in the Nashua Telegraph and by posters in City Hall, Nashua Public Library, Fixed Based Operators, Daniel Webster College, and Nashua Airport Authority offices.

9.3.1 Public information meeting no. 1

The first public information meeting was held on September 20, 1999 at the Daniel Webster College Aviation Center. The format was a three hour long open house, with three rooms set aside as "stations". Each station covered a specific part of the work completed to date:

- Role of airport and airport operations (existing and growth scenario)
- Noise impacts
- Ground access

A member of the consultant team attended each station. A central location provided sign-up sheets, comment forms, and copies of all material that we had provided to the TAC at the time. Members of the Nashua Airport Authority, including the airport manager, were available for questions and comments at this central location.

Approximately 50 people attended the first public information meeting. While concerns were varied, the main topic of discussion appeared to be noise impacts, especially single noise events. Refer to Section 7.6 for additional discussion of single noise events and the concerns raised at the public information meeting. Three filled-out comment forms were received at or after the first public information meeting.

9.3.2 Public information meeting no. 2

The second public information meeting was held in Nashua City Hall on March 1. The project manager gave a presentation of the main findings of each section of the study. Questions were answered throughout the presentation. A central location provided a review copy of the report, as well as sheets for written comments. Prior to the meeting, the City of Nashua Planning Department, Public Library, and the Nashua Airport Authority had received copies of the report and the airport layout plan to be made available for public review.

Approximately 50 people attended the second public information meeting. While a number of audience members expressed support for the airport, there were also concerns about impacts and the growth of the facility. Two items addressed in particular were the impact of business jets on weekend mornings and the assertion that the airport has unusually low rates and charges, and therefore carries a disproportionate burden of the area's general

aviation activity. The draft technical supplement was amended to include additional discussion of these issues, in Sections 2 and 7.6, respectively.

The second public information meeting was followed by a fifteen-day period for written comments. Eight sets of written comments were received. All comments were reviewed and, if applicable, revisions were made throughout the final draft of the report. The Nashua Airport Authority subsequently reviewed the final draft for approval.

10. Conclusions

The future role of Boire Field is not expected to change significantly from the function it serves today: An active general aviation airport serving commercial, business, training, personal, and public sector uses. The nature of Nashua's airport makes its growth inextricably tied to that of the economy. At the time of writing, the national economy is strong, and the local and regional economies even more so. Consequently, the airport is currently experiencing growth. History teaches us that the economy is cyclical, however; future growth at the airport will be dampened if the economy goes through a period of recession. Consequently, the long-term growth rate at Boire Field, averaged out over several economic cycles, should remain gradual.

The most rapidly growing sector of the aviation market served by Nashua is corporate aviation. The main benefit of this is that the access provided to corporate aviation has a positive impact on the local economy. Boire Field is by far the most active corporate aviation center in New Hampshire, and a major one in all of New England. The disadvantage is that jets are the largest contributors to airport noise impacts. However, older, louder jets dominate the current noise impact. As these jets become replaced with modern, quieter, and more cost efficient equipment, as is the national trend, we expect the overall noise impact to decrease. This should be the case even with the 5% average annual growth rate in jet activity that was used for this study's findings. Nonetheless, some neighbors will continue to be impacted by noise at the airport. The airport authority should continue its ongoing noise complaint program and noise abatement procedures. An ongoing dialog between the airport, public, and aircraft users appears to be the best way to find solutions to future noise problems.

Regardless of projected growth in activity, the airport is geographically unable to expand significantly beyond its current property line. One area remains available for development, the so-called Holden property. This property has already been purchased by the airport and has undergone an environmental assessment. Development on the property is limited to aircraft parking, both tie-down spaces and T-hangars. To provide access, the airport authority will also need to relocate Perimeter Road. The development plan for this property was developed in conjunction with representatives of neighboring residents, and is subject to a community agreement. This agreement places restrictions on uses of this area that would negatively impact neighbors, while allowing the airport to obtain the additional aircraft parking it needs.

The airport's priorities for capital improvements focus on the following:

- Safety and efficiency improvements such as taxiway lights, signage upgrade, security fencing, snow removal equipment storage, reconstruction of existing pavement areas, and obstruction clearing
- Parallel runway to separate small aircraft primarily used for flight training from the main runway
- Additional aircraft parking
- Additional vehicle parking, in the event that the Nashua Airport Authority restricts private vehicle access to the airfield.

- A terminal building in a central location of the airport

No additional land acquisition is recommended, except for three properties in the runway protection zone. These are part of an ongoing long-term plan to remove houses and trees from the approach to Runway 32. The process has been gradual, because the airport authority has elected to rely on voluntary property acquisitions instead of eminent domain takings. This policy appears to have been successful, and the acquisition of the final properties within this program is likely to occur during the planning period of this study.

As the airport continues its gradual development, it should continue to work with its neighbors, the City, environmental interest groups, and regulatory agencies to minimize adverse economic impacts. In addition to the noise issues addressed above, water quality is the greatest area of concern. Development of a Storm Water Pollution Prevention Plan and adoption of best management practices within minimum standards for the airport's tenants would address the majority of these concerns. As each project requiring environmental review is initiated, coordination with the public and other interested parties will be needed to find solutions that address the airport users' needs while meeting environmental protection guidelines.

The recommendations in this study for Boire Field paint a picture of an active regional airport that is reaching maturity. Growth is expected to be gradual; consequently, the improvements at Boire Field are evolutionary in nature. First and foremost they address the safety of aviation users and the public, increased efficiency of a constrained airport, and the best use of the airport's assets. The airport's goal is to continue to serve the air transportation needs of the public and local economy, while keeping adverse impacts to a minimum.

Appendix A: Basic FAA airport design standards for Boire Field

Aircraft Approach Category C
Airplane Design Group II
Airplane wingspan . . . . . 78.99 feet
Primary runway end approach visibility minimums are not lower than CAT I
Other runway end approach visibility minimums are not lower than 1 mile
Airplane undercarriage width (1.15 x main gear track) . . . 15.00 feet
Airport elevation . . . . . 200 feet
Airplane tail height . . . . . 9.10 feet

RUNWAY AND TAXIWAY WIDTH AND CLEARANCE STANDARD DIMENSIONS

	Airplane	Group/ARC
Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is not treated as a factor:		
VFR operations with no intervening taxiway		700 feet
VFR operations with one intervening taxiway		800 feet
VFR operations with two intervening taxiways		905 feet
IFR approach and departure with approach to near threshold		2500 feet less 100 ft for each 500 ft of threshold stagger to a minimum of 1000 feet.
Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is treated as a factor:		
VFR operations		2500 feet
IFR departures		2500 feet
IFR approach and departure with approach to near threshold		2500 feet
IFR approach and departure with approach to far threshold		2500 feet plus 100 feet for each 500 feet of threshold stagger.
IFR approaches		3400 feet
Runway centerline to parallel taxiway/taxilane centerline	239.5	400 feet
Runway centerline to edge of aircraft parking	400.0	500 feet
Runway width		100 feet
Runway shoulder width		10 feet
Runway blast pad width		120 feet
Runway blast pad length		150 feet
Runway safety area width		400 feet
Runway safety area length beyond each runway end or stopway end, whichever is greater		1000 feet
Runway object free area width		800 feet
Runway object free area length beyond each runway end or stopway end, whichever is greater		1000 feet
Clearway width		500 feet
Stopway width		100 feet
Obstacle free zone (OFZ):		
Runway OFZ width		400 feet
Runway OFZ length beyond each runway end		200 feet
Inner-approach OFZ width		400 feet

Inner-approach OFZ length beyond approach light system		200 feet
Inner-approach OFZ slope from 200 feet beyond threshold		50:1
Inner-transitional OFZ height H	53.0	53 feet
Inner-transitional OFZ slope		6:1
Runway protection zone at the primary runway end:		
Width 200 feet from runway end		1000 feet
Width 2700 feet from runway end		1750 feet
Length		2500 feet
Runway protection zone at other runway end:		
Width 200 feet from runway end		500 feet
Width 1900 feet from runway end		1010 feet
Length		1700 feet
Departure runway protection zone:		
Width 200 feet from the far end of TORA		500 feet
Width 1900 feet from the far end of TORA		1010 feet
Length		1700 feet
Threshold surface at primary runway end:		
Distance out from threshold to start of surface		200 feet
Width of surface at start of trapezoidal section		1000 feet
Width of surface at end of trapezoidal section		4000 feet
Length of trapezoidal section		10000 feet
Length of rectangular section		0 feet
Slope of surface		34:1
Threshold surface at other runway end:		
Distance out from threshold to start of surface		0 feet
Width of surface at start of trapezoidal section		400 feet
Width of surface at end of trapezoidal section		1000 feet
Length of trapezoidal section		1500 feet
Length of rectangular section		8500 feet
Slope of surface		20:1
Taxiway centerline to parallel taxiway/taxilane centerline	104.8	105 feet
Taxiway centerline to fixed or movable object	65.3	65.5 feet
Taxilane centerline to parallel taxilane centerline	96.9	97 feet
Taxilane centerline to fixed or movable object	57.4	57.5 feet
Taxiway width	30.0	35 feet
Taxiway shoulder width		10 feet
Taxiway safety area width	79.0	79 feet
Taxiway object free area width	130.6	131 feet
Taxilane object free area width	114.8	115 feet
Taxiway edge safety margin		7.5 feet
Taxiway wingtip clearance	25.8	26 feet
Taxilane wingtip clearance	17.9	18 feet

Appendix B: Sample minimum standards

SECTION I. PURPOSE, INTENT AND REQUIREMENTS

1.1 The purpose herein is to allow for the establishment and orderly development of a sound economic base upon which the Airport will thrive, and experience a stable growth pattern.

1.2. The intent herein is to categorically identify these minimum standards and procedures by which all persons and firms involved in aeronautical activities on the Airport shall conduct their respective operations.

1.3 The requirements, as set forth in these standards and procedures, are intended to ultimately protect the public health, safety and interests; and, to foster and promote the continued development of the Airport.

SECTION II. IMPLEMENTATION AND APPLICATION[12]

2.1 It is intended that the implementation and application of these Standards and Procedures shall be so accomplished by the Nashua Airport Authority (NAA), its duly elected Chairman, its appointed Airport Manager and/or its appointed agent.

2.2 These Standards and Procedures shall be published and appended to all current lease agreements and shall be considered a part of all lease/operating and/or purchase/ sale agreements, which the NAA may, heretofore, enter into.

2.3 Application for permission to establish, acquire and/or use Airport land or any facilities thereon shall be accomplished in a manner and form as may be published by the Owner; however, in no case, unless otherwise excepted herein, shall an applicant submit anything less than the following information:

a. Applicant's legal name and address;
b. Applicant's primary business;
c. Applicant's express purpose in applying for lease/ operating rights on the Airport;
d. Applicant's express intent for utilization of the land and/or facilities to be occupied, and the services which are intended to be provided to the public;
e. Applicant's estimate of costs which he will incur for the development and improvement of such leasehold or fee position applied for.

[12] Note: Within this section the Nashua Airport Authority can also require the submission of a business plan.

other hazards by the Owner, the FAA, and the appropriate State and local fire agency. The NAA and the FBO shall meet all applicable fire codes; federal, state, and local laws, statues, ordinances, rules and regulations pertaining to fire safety.

f. Fuel delivered shall be bright, clean, pure and free of microscopic organisms, water or other contaminants. Quality control of the fuel is the responsibility of the FBO. The FBO shall maintain current fuel reports on file and available for auditing at any time by the Owner, the Federal Aviation Administration or other applicable agencies. The FBO shall forward a copy of its monthly fuel report to the Owner. Fueling service and record keeping by the FBO shall be in full compliance with the FAA's current Advisory Circular on aircraft fueling and procedures describing proper fire protection and electrical grounding of aircraft during fueling operations in NFPA-467.

g. The FBO shall provide proper equipment for inflating aircraft tires, servicing oleo struts, changing engine oil, washing aircraft and aircraft windows, and recharging or energizing discharged aircraft batteries and starters.

h. Airport security fencing and other barricades restricting access to any aircraft operating areas shall be maintained at all times.

i. Insurance Coverage shall be provided and paid for by the FBO in the amounts identified in Section 10.0, as a minimum with the Owner, its officers, agents and employees as additional insured. A Certificate of Insurance or a copy of the insurance policies involved will be furnished to the Owner and ten (10) days advance written notice of any change to any policy or cancellation of any policy shall be given to the Airport.

j. The FBO shall have his premises open and services available a minimum of eight (8) hours daily, seven (7) days a week, except as authorized by the Owner.

k. The FBO shall have in its employ or under contract, and on duty on a full-time basis, sufficient line service personnel (never less than one during operating hours) to provide services requested.

5.2 Category "B", Flight Instruction

5.2.1 Statement of Concept

A Flight Training Lessee is an FBO engaged in instructing pilots in dual and solo flight training, in fixed and/or rotary wing aircraft, in land or sea 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' certificates and ratings involved.

5.2.2 Minimum Standards

a. The FBO shall lease an area of ground space, on which shall be leased or constructed a building providing floor space meeting NFPA minimum standards for fire protection for office, classroom, rest rooms, and telephone facilities for customer use. Restrooms may be commonly provided if within the same building as approved by the Owner. Adequate, Owner-approved automobile parking space and a paved aircraft apron all within the leased area sufficient to accommodate the FBO's activities and operations shall also be provided or made available by the FBO. The minimum areas of ground and building shall be as approved by the Owner, shall be commensurate with other operations of the same category at the Airport and will be consistent with the current Airport Layout Plan.

b. The FBO shall have available for use in flight training, either owned or under written lease to FBO, a sufficient number of aircraft, properly certified, for the proposed scope of his student operation, but not less than one (1) properly certificated aircraft.

c. The FBO performing the services under this category will be required to carry the types of insurance identified in Section 10.0.

d. The FBO shall have his premises open and services available a minimum of eight (8) hours daily, seven (7) days a week, except as authorized by Owner.

e. The FBO shall have in its employ or under contract, and on duty on a full-time basis, currently certificated pilots and instructors in sufficient numbers (never less than one) to meet the demands of the number of students reasonably expected to be engaged in flight instruction.

5.3 Category "C", Aircraft Charter and Air Taxi Service

5.3.1 Statement of Concept

An Aircraft Charter (Commercial Lessee) and/or an Air Taxi Lessee is an FBO engaged in the business of providing air transportation (persons or property) to the public for hire on a charter basis, as currently defined and regulated by Federal Aviation Regulation (FAR) Part 135.

5.3.2 Minimum Standards

a. The FBO shall lease from the Owner an area of ground space on which shall be leased or constructed a building providing floor space for aircraft storage and space meeting NFPA minimum standards for fire protection for offices, rest rooms, customer lounge and telephone facilities for customer use. On-site customer and employee auto parking and paved aircraft parking shall be provided within the leased area sufficient to accommodate the FBO's activities and operations. Parking of customer automobiles over an extended period (over three days) shall be the subject of specific agreements between the FBO and the Owner. The minimum areas of ground and building shall be as approved by the Airport and commensurate with other operations of the category at the Owner and consistent with the current Airport Layout Plan.

b. An FBO shall have and maintain an FAA Part 135 Air Taxi Certificate during the term of the tenancy at the Airport and shall operate in conformance with all applicable Federal Aviation Regulations.

c. The FBO shall provide not less than one (1) four-place aircraft equipped for and capable of use under instrument conditions, either owned or under written lease to FBO, in accordance with the requirements of the FAR Part 135 Air Taxi Commercial Operator Certificate held by the FBO.

d. An FBO will demonstrate that he will hold out for hire, to provide aircraft charter service, as defined in Part 135 of the Federal Aviation Regulations.

e. The FBO shall provide at least one FAA certified commercial pilot rated for the air taxi service.

f. The FBO performing the service under this category will be required to carry the types of insurance identified in Section 10.0.

g. The FBO shall have his premises open and services available a minimum of eight (8) hours daily, five (5) days a week, except as authorized by Owner; and shall provide on-call service after normal business hours.

h. The FBO shall have in his employ (and on duty during the operating hours) trained personnel in such numbers as to meet the minimum standards set forth in this category in an efficient manner, but never less than one (1) Federal Aviation Administration currently certificated commercial pilot appropriately rated to permit the flight activity offered by the FBO. The FBO shall have available sufficient qualified operating crews for checking in passengers, handling of luggage, ticketing and for furnishing or arranging for suitable ground transportation. The FBO shall provide reasonable assurance of the availability for hire of qualified operating crews and of approved aircraft within a specified maximum notice period.

5.4 Category "D", Aircraft Sales (New and/or Used)

5.4.1 Statement of Concept

An Aircraft Sales FBO is engaged in the sale of new and/or used aircraft through a franchise, licensed dealership or distributorship (either on a retail or wholesale basis) from an aircraft manufacturer or otherwise and provides such repair, services, and parts as necessary to meet any guarantee or warranty on new and/or used aircraft sold by him.

5.4.2 Minimum Standards

a. The FBO shall lease from the Owner an area of ground space to provide for outside display and storage of aircraft on which shall be a leased or constructed building providing floor space meeting NFPA minimum standards for fire protection for office, customer lounge, rest rooms, and telephone facilities for customer use. Provision of auto parking space and paved aircraft apron within the leased area sufficient to accommodate the FBO's activities and operations shall be provided. The minimum areas of ground and building shall be as approved by the Owner and be commensurate with other operations of the category at the Airport and be consistent with the current Airport Layout Plan.

b. The FBO shall provide necessary and satisfactory arrangements for the repair and servicing of aircraft, but only for the duration of any sales guaranty or warranty period. Servicing facilities may be provided through written agreement with a repair shop operation at the Airport. The FBO shall provide an adequate inventory of spare parts for the type of new aircraft for which sales privileges are granted. An FBO in the business of selling new aircraft shall have available at least one fully-assembled and certificated airworthy demonstrator aircraft for each category or class of aircraft sold.

c. The FBO performing the services under this category will be required to carry the types of insurance identified in Section 10.0.

d. The FBO shall have his premises open and services available a minimum of eight (8) hours daily, five (5) days a week, unless authorized by Owner.

e. The FBO shall have in his employ (and on duty during the operating hours) trained personnel in such numbers as to meet the requirements of its business in an efficient manner, but never less than one (1) person having a current commercial pilot certificate with at least single-engine rating .

5.5 Category "E", Aircraft Rental

5.5.1 Statement of Concept

An aircraft rental FBO is engaged in the rental of fixed and/or rotary wing aircraft to the public.

5.5.2 Minimum Standards

a. The FBO shall lease from the Owner an area of ground space, on which shall be leased or constructed a building providing floor space meeting NFPA minimum standards for fire protection for aircraft storage, offices, rest rooms, customer lounge and telephone facilities for customer use. Provision shall be made for auto parking space and paved aircraft parking within the leased area sufficient to accommodate the FBO's activities and operations. The minimum areas of ground and building shall be as approved by the Owner and commensurate with other operations of the category at the Airport and consistent with the current Airport Layout Plan.

b. The FBO shall offer for hire a certified and currently airworthy aircraft commensurate with the scope of their operation, and shall have at least one commercial pilot with current instruction ratings for the check-out, as necessary, of those leasing the aircraft. The FBO shall specify to the Owner the pilot qualifications that will be required for aircraft rental as well as the number and type of aircraft to be made available for rental.

c. The FBO performing the services under this category will be required to carry the types of insurance identified in Section 10.0.

d. The FBO shall have his premises open and services available a minimum of eight (8) hours daily, five (5) days a week, except as authorized by Owner.

e. The FBO shall have in his employ (and on duty during the operating hours) trained personnel in such numbers as to meet the minimum standards in an efficient manner, but never less than one (1) person currently certified by the Federal Aviation Administration with commercial and instructor ratings for the type of aircraft being rented.

5.6 Category "F", Airframe and Powerplant Repair

5.6.1 Statement of Concept

An Aircraft Airframe and Engine Repair FBO is an FBO providing one (or a combination of) airframe and power plant overhaul and repair services, with at least one (1) person currently certified by the Federal Aviation Administration with ratings appropriate to the work being performed. This category of aeronautical services shall also include the sale of aircraft parts and accessories.

5.6.2 Minimum Standards

a. The FBO shall lease from the Owner an area of ground space on which he shall lease or construct a building providing floor space for airframe and power plant overhaul and repair services, and including, if necessary, a segregated painting area (meeting all local and State industrial code requirements) and space for office, rest rooms, and shops. Provision of on-site, hard surface auto parking and a paved aircraft apron within the leased area sufficient to accommodate the FBO's activities shall also be provided. The minimum areas of ground and building shall be as approved by the Owner and commensurate with other facilities operations of this category on the Airport and consistent with the current Airport Layout Plan.

b. The FBO shall provide sufficient equipment, supplies and availability of parts equivalent to that required for certification as an FAA-approved repair station.

c. The FBO performing the services under this category will be required to carry the types of insurance identified in Section 10.0.

d. The FBO shall have his premises open and services available a minimum of eight (8) hours daily, five (5) days a week, except as authorized by Owner.

e. The FBO shall have in his employ (and on duty during the required operating hours) trained personnel in such numbers as are required to meet the requirements in an efficient manner, but never less than one (1) person currently certified by the Federal Aviation Administration with ratings appropriate to the work being performed and who holds an airframe, power plant, or aircraft inspector rating.

5.7 Category "G" - Aircraft Painting and/or Repair of Interiors

and

Category "H" - Avionics, Instrument and/or Propeller Repair Service

5.7.1 Statement of Concept

These specialized aircraft repair services FBO's are engaged in the business of providing a highly specialized shop, or a combination of Federal Aviation Administration certified shops, for the repair of aircraft radios, propellers, instruments and/or accessories for general aviation aircraft. This category shall include those operations engaged in the sale of new and/or used aircraft radios, propellers, instruments and/or accessories.

5.7.2 Minimum Standards

a. The FBO shall lease from the Owner an area of ground to construct or will lease office and shop space to house all equipment and to provide an office, shop, and rest rooms. Provision of auto parking space, and a paved aircraft apron within the leased area sufficient to accommodate the FBO's activities shall be provided. The minimum areas of ground and building shall be as approved by the Owner and commensurate with other operations of these categories on the Airport and consistent with the current Airport Layout Plan.

b. The FBO shall obtain and maintain, as a minimum, the repair station certificates required by the Federal Aviation Administration which are applicable to the operation or operations contemplated. The FBO may furnish only one of the specialized repair services categories unless classified as a category "K", multiple Services FBO.

c. The FBO shall apply for, obtain and comply with all State and Federal Environmental Regulations pertaining to the ownership and operation of an Aircraft Painting station.

d. The FBO performing the services under this category will be required to carry the types of insurance identified in Section 10.0.

e. The FBO shall have his premises open and services available a minimum of eight (8) hours daily, five (5) days a week, except as authorized by Owner.

f. The FBO shall have in his employ, (and on duty during operating 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 (1) person currently certified as a Federal Aviation Administration rated repairman as appropriate to the service to be offered.

g. The FBO will be responsible for the condition of its leased premises, and will clean-up and repair any spill or damage that occurs as a result of their operation.

5.8 Category "I", Ramp Parking and Tie Down

5.8.1 Statement of Concept

A Ramp Parking and Tie Down FBO shall provide FBO Ramp Assistance, including the parking, tie-down and storage of only functional aircraft within the FBO's leased area. This category of service shall include the provision of adequate tie-down facilities and equipment, including ropes or other types of restraining devices and wheel chocks for a minimum of 5 typical aircraft. This type of FBO shall provide properly trained line personnel on duty during a minimum of 8 hours of each required calendar day unless otherwise provided. The FBO shall provide adequate towing equipment to safely and efficiently move aircraft.

The FBO shall provide a waiting room which is conveniently located in proximity to public rest rooms. At least one working telephone will be provided for 24 hour public use.

5.8.2 Minimum Standards

a. The minimum land to be leased for a Category "I" operation shall be sufficient for the unobstructed tie-down of at least five (5) single-engine aircraft and will be satisfactory to the Owner and commensurate with other operations of this category on the Airport as well as consistent with the current Airport Layout Plan.

b. On-site auto parking space shall be provided to accommodate a minimum of five (5) automobiles, or the number required by the applicable Town code.

c. All paving and any construction of buildings shall be of permanent construction. Use of mobile-type structures requires special authority from the Owner.

d. Insurance coverage shall be provided and paid for by the FBO in the amounts identified in Section 10.0, as a minimum with the Airport, its offices, agents and employees as additional insured. A Certificate of Insurance or a copy of the insurance policies involved will be furnished to the Airport and 10 days advance written notice of any change to any policy or cancellation of any policy shall be given to the Airport.

e. The FBO shall prominently post, in the vicinity of the tie-downs, a 24 hour phone number by which the FBO can be contacted.

5.9 Category "J", Specialized Commercial Flight Services

5.9.1 Statement of Concept

A Specialized Commercial Flying Services FBO is engaged in air transportation for hire for the purpose of providing the use of aircraft for any one of the activities including, but not limited to, those listed below:

a. Nonstop sightseeing flights that begin and end at the same airport within a 24-mile radius of the airport.

b. Crop-dusting, seeding, spraying, wildlife management

c. Banner towing and aerial advertising.

d. Aerial photography or survey.

e. Fire Fighting.

f. Power line or pipeline patrol.

g. Scheduled airline service (passenger and/or cargo).

h. Any other operations specifically excluded from Part 135 of the Federal Aviation Regulations.

5.9.2 Minimum Standards

a. The FBO shall lease adequate space and/or land area to meet the requirements of the operation at the Airport subject to the approval of the Owner. In the case of crop-dusting or aerial application, the FBO shall demonstrate that he will make suitable arrangements and have such space available in his leased area for safe loading and unloading, storage and containment of noxious chemical materials and that he is properly licensed for aerial application.

b. The FBO shall have ready access to sufficient aircraft to provide the service offered and/or meet the schedule set. Such aircraft shall meet all the requirements of the Federal Aviation Administration and applicable regulations of the Owner with respect to the type of operations to be performed.

c. The FBO performing the services under this category will be required to carry the types of insurance identified in Section 10.0.

d. The FBO must provide, by means of an office and a telephone on the Airport, a point of contact for the public desiring to utilize FBO's services. In the case of scheduled

passenger service, FBO shall lease sufficient space from the Owner for a passenger waiting area, ticket counter and offices in proximity to public rest rooms and auto parking.

e. The FBO shall have in his employ, and on duty during operating hours, trained personnel in such numbers as to meet the minimum standards herein set forth in an efficient manner, but never less than one (1) person capable of assisting the public in securing FBO's services.

f. Any itinerant Specialized Commercial Flying Services FBO desiring to utilize the airport for a period less than 30 days will operate in accordance with the Airport's direction. Minimum requirements will include proof of insurance in the amounts given in "c" above and agreement to payments of compensation to the NAA as set by the NAA.

5.10 Category "K", Multiple Services

A multiple service FBO is one that engages in two (2) or more of the categories of services described above. The most stringent of all applicable minimum standards will apply to such an FBO but commonly required facilities need not be duplicated.

SECTION VI. CAR & TRUCK RENTAL

6.1 Minimum Standards - Car and Truck Rental

6.1.1 Statement of Concept

A car and truck rental lessee is engaged in providing car and truck rental services to users of the Airport.

6.1.2 Minimum Standards

a. No person shall engage in the business of renting "drive-it-yourself" automobiles, trucks or trailers, or advertise for or solicit customers therefore on the Airport except pursuant to the terms of a written contract entered into with the Owner.

b. Solicitation of airport users for car and truck rentals by companies located off-airport will require an agreement with the Owner providing for compensation to the Owner.

SECTION VII. FLYING CLUBS

7.1 Minimum Standards - Flying Clubs

7.1.1 Statement of Concept

In an effort to promote flying for pleasure, develop skills in pilotage and navigation and foster an awareness of aviation requirements, Flying Clubs are encouraged by the Owner. They are included in the Minimum Standards to clarify the differences between the non-commercial Flying Club activities and other, commercial activities to insure there is no competition between the two.

7.2 Minimum Standards

All flying clubs desiring to base their aircraft and operate on the Airport must comply with the applicable provisions of these Standards and Requirements. However, they shall be exempt from FBO requirements upon satisfactory fulfillment of the conditions contained herein.

a. The club shall be either a non-profit entity or a not-for-profit entity (corporation, association or partnership) organized for the express purpose of providing its members with one or more aircraft for their personal use and enjoyment only. The ownership of any aircraft must be vested in the name of the flying club (or owned equally by all of its members). The property rights of the members of the club shall be equal and no part of the net earnings of the club will inure to the benefit of any member in any form (salaries, bonuses, etc.). The club may not derive greater revenue from the use of its aircraft than the amount necessary for the operations, maintenance, and replacement of its aircraft.

b. All flying clubs and their members are prohibited from leasing or selling any goods or services whatsoever to any person or firm other than a member of such club at the Airport except that said flying club may sell or exchange its capital equipment.

c. The flying club, along with its permit request, shall furnish the Owner a copy of its charter and by-laws, articles of association, partnership agreement or other documentation supporting its existence; a roster, or list of members, including names of officers and directors, to be revised on a semiannual basis; evidence of insurance in the form of a certificate of insurance in the amounts identified in Section 10.0

The Flying Club shall provide: an indemnity and hold harmless clause in favor of the Owner and its employees (thirty (30) days prior notice of cancellation shall be filed with the Airport); number and type of aircraft; evidence that aircraft are properly certified; evidence that ownership is vested in the club; and operating rules of the club. The books and other records of the club shall be available for review at any reasonable time by the Airport or its authorized agent.

d. A flying club at the Airport shall abide by and comply with all federal, state and local laws.

e. The operations of a flying club at the Airport which violates any of the foregoing, or permits one or more members to do so, may be terminated by the Owner.

SECTION VIII. HANGAR/TIE-DOWN

8.1 Minimum Standards - Hangar/Tie-down

8.1.1 Statement of Concept

A Hangar/Tie-down lessee is a corporate or personal aircraft operator engaged in operating aircraft for their own business or for their own use in a not-for-hire fashion.

8.2 Minimum Standards

Any individual or any firm desiring to base their aircraft and operate on the Airport must comply with the applicable provision of these minimum standards. However, they shall be exempt from the regular FBO requirements upon satisfactory fulfillment of the conditions contained herein.

a. In order to operate on the Airport, owners of aircraft in this category must have a valid lease agreement with Owner.

b. The FBO/lessee may install a privately owned aircraft fuel system for its personal use with prior written approval from the Airport. Such fuel may not be sold to outside parties and all fueling operators shall comply with the safety practices described for Category A FBO's.

c. Lessee may perform maintenance on aircraft owned by himself or his firm without restriction of any kind. No commercial maintenance may be performed at any time, such performance requiring certification as a Fixed Base Operator. The Lessee shall comply with the safety practices described for Category A FBOs.

d. No commercial activity of any type is permitted on the premises without the express written permission of the Owner. The Airport may withhold such permission at its discretion.

e. The FBO performing the services under this category is required to carry the types of insurance identified in Section 10.0.

SECTION IX. AIRCRAFT SELF-FUELING OPS

9.1 Minimum Standards - Aircraft Self-Fueling Operations

The following requirements pertain to standard aircraft fuel, self-fueling operations, and to all airport users desiring to use automotive gasoline (mogas) in lieu of aviation gasoline (avgas) in their aircraft.

9.1.1 Permit

All self-fueling operations, whether private use or commercially available, will be governed by a permit issued by the Owner at a cost of $_____ per year per aircraft.

9.1.2 Standards for Fuel other than 100LL and Jet A

Fuel to be used for aviation purposes, typically mogas, must meet ASTM D-439-58 standards at the time of delivery into the aircraft. Mogas may be substituted for avgas in only those aircraft for which an individual Supplemental Type Certificate (STC) has been approved by the Federal Aviation Administration. A copy of the individually held STC must be on file with the Owner.

9.1.3 Refueling Operations

Airport users conducting self-fueling must refuel only in areas designated for that purpose. Refueling of aircraft in a hangar or building is strictly prohibited.

The maximum container size used for the transport and storage of mogas shall be such as to allow portability to and from the fueling station and must be approved by the Fire Marshall or other appropriate authority.

Pumps, either hand or power operated, shall be used to transfer fuel from either a portable or fixed storage vessel into the aircraft. Pouring or gravity flow transfer of fuel is not permitted. The transfer of fuel from the storage tank of a ground based vehicle (e.g., automobile gas tank) is not permitted.

The storage of any fuel in any amount in a hangar, building, or tie-down area is not permitted. All such stores shall be off-airport.

The transportation of mogas onto or off the airport must be done in accordance with the regulations established by the Fire Marshal or other appropriate authority.

9.1.4 Personnel

Aircraft owners and FBOs engaged in any refueling operations shall be properly trained in fuel handling and associated safety procedures and shall adhere to standard industry practices for aircraft refueling operations, federal statutes and regulations, state regulations and local regulations. The fueling standards described for Category A FBO's shall be the basis for any self-fueling activity.

9.1.5 Environmental Requirements

The aircraft owners and FBO shall comply with all applicable local, state, and federal environmental statutes and regulations, for the refueling of all aircraft.

9.1.6 Responsibility

Any individual or FBO will be responsible for any clean-up costs or other costs caused by their self-fueling activity.

9.1.7 Insurance Coverage

The types of insurance coverage to be provided by any FBO involved in self-fueling activity is identified in Section 10.0. Private self-fueling users will be required to demonstrate they have applicable liability insurance associated with their aircraft which will cover self-fueling incidents.

SECTION X. GENERAL INSURANCE PROVISIONS

10.0 General Insurance Provisions

The following provisions pertain to Indemnity and apply to all classifications identified above. The "Owner" is the Owner.

1. The LESSEE shall indemnify, defend and save Owner and its authorized agents, officers, representatives and employees harmless from and against any and all actions, penalties, liabilities, claims, demands, damages or losses resulting from any civil or criminal court actions, and/or administrative actions, arising directly or indirectly out of acts or omissions of the LESSEE, its agents, employees, servants, guests, members, business visitors, tenants, sublessees, partners or affiliates.

2. Notwithstanding the above, with respect to all operations performed under this lease, the LESSEE shall carry general liability insurance having all major divisions of coverage including, but not limited to:

Premises - Operations

Independent Contractors' Protective
Products and Completed Operations
Personal Injury Liability
Contractual Liability

The policy shall be on an occurrence form and limits shall not be less than:

$_____ Per Occurrence
$_____ General Aggregate
$_____ Products/Completed Products Aggregate
$ _____ Fire Legal Liability

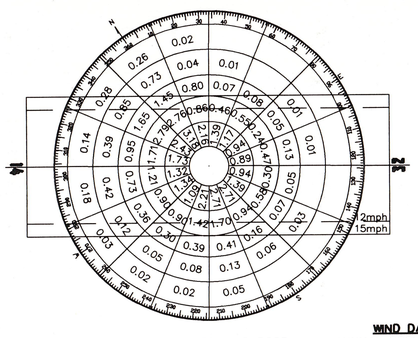
The Owner reserves the right, upon thirty (30) days written notice, to require reasonable increases in the foregoing required insurance.

3. In addition to the insurance required in Paragraph 2. above, LESSEE shall secure hangar keepers legal liability insurance in the amount of not less than $_____ per occurrence for any and all aircraft.

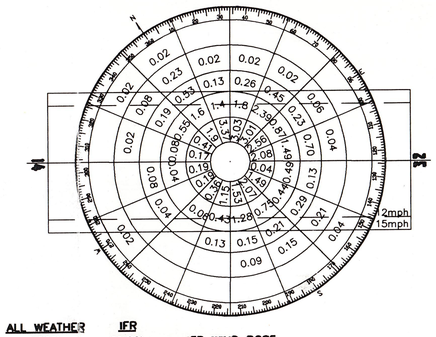
4. The insurance in Paragraphs 2 and 3 above, shall be placed with a reputable insurance company authorized to do business in the State of Maine. A binder or certificate of insurance, naming the Owner as an additional insured, shall be delivered to the Owner as proof of compliance with Paragraphs 2 and 3 of this Article within ten (10) days of execution of this lease. Said policy shall provide that said insurance shall not be terminated or canceled without thirty (30) days notice to the Owner. Renewal certificates shall be forwarded to Owner within ten (10) days of renewal. The amounts of said insurance shall not be deemed as limitation of the liability of the LESSEE to indemnify, defend and save harmless the Owner as provided in Paragraph 1. of this Article and if the Owner or any of its authorized agents, officers, representatives or employees become liable for an amount in excess of such insurance, the LESSEE shall save and hold them harmless for such excess.

EXISTING AIRPORT BUILDINGS	
A	CORPORATE HANGAR
B	CORPORATE HANGARS
1,3,5	CORPORATE HANGARS
7	T-HANGAR
9	CORPORATE HANGAR
11	CORPORATE HANGAR
13	T-HANGAR
15	T-HANGAR
17	T-HANGAR
19	T-HANGAR
79	CONTROL TOWER & DWC OFFICES
83	FIXED BASE OPERATOR
85	CORPORATE HANGAR
87	CORPORATE HANGAR
89	CORPORATE HANGAR
91	CONVENTIONAL HANGAR
93	SRE BUILDING
95	CORPORATE HANGAR
97	CONVENTIONAL HANGAR
99	CORPORATE HANGAR
100	OFFICE BUILDING
101	CORPORATE HANGAR
102	OFFICE BUILDING
103	FUEL FARM
104	LIGHT INDUSTRIAL BUILDING
105	T-HANGAR
106	LIGHT INDUSTRIAL BUILDING
107	T-HANGAR
109	T-HANGAR
110	LIGHT INDUSTRIAL BUILDING
111	CORPORATE HANGAR
113	CORPORATE HANGAR
114	OFFICE/R AND D BUILDING
115	CORPORATE HANGAR
117	CORPORATE HANGAR
119	CONVENTIONAL HANGAR
121	T-HANGAR
122	OFFICE BUILDING
123	T-HANGAR
125	T-HANGAR
127	T-HANGAR
129	T-HANGAR

FUTURE AIRPORT BUILDINGS	
73	CONVENTIONAL HANGAR
75	CONVENTIONAL HANGAR
81	TERMINAL BUILDING
93	SRE BUILDING ADDITION
108	OFFICE BUILDING
C	CONVENTIONAL HANGAR
D	T-HANGAR
E	T-HANGAR
F	T-HANGAR
G	T-HANGAR
H	T-HANGAR
I	T-HANGAR
J	T-HANGAR



ALL WEATHER WIND ROSE

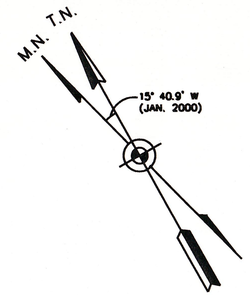


IFR WIND ROSE
200 FT 1/2 MI TO
1,000 FT 3 MI

WIND DATA	ALL WEATHER	IFR
ANNUAL OCCURRENCE	100%	11.9%
MAXIMUM COVERAGE (12 mph X-WIND)	92.3%	93.8%
TOTAL OBSERVATIONS	38,749	

LOCATION: GRENIER FIELD, MANCHESTER, NH

LEGEND		
ITEM	EXISTING	ULTIMATE
AIRPORT PROPERTY LINE		
AIRPORT REFERENCE POINT (A.R.P.)		
BUILDING RESTRICTION LINE (B.R.L.)		SAME
RUNWAYS/TAXIWAYS		
APRON		SAME
TREELINE/BRUSH		
SAFETY AREA		
AIRPORT BUILDINGS		SAME
WETLANDS		
LEACHING CATCH BASIN (PRELIMINARY)		
FENCE		
RUNWAY PROTECTION ZONE	RPZ	RPZ
PRECISION INSTRUMENT APPROACH SURFACE	34:1P	34:1P
NON-PRECISION INSTRUMENT APPROACH SURFACE	34:1NP	34:1NP



ENGINEER/ARCHITECT

NO.	DESCRIPTION	DR. BY	APPD. BY	DATE

PROJECT NO. 301601.04
FILE NAME ALP2000
REV.

DES. BY SB | DR. BY HW/PA | CHKD. BY JK

DATE: MAY, 2000

SCALE: 1" = 400'

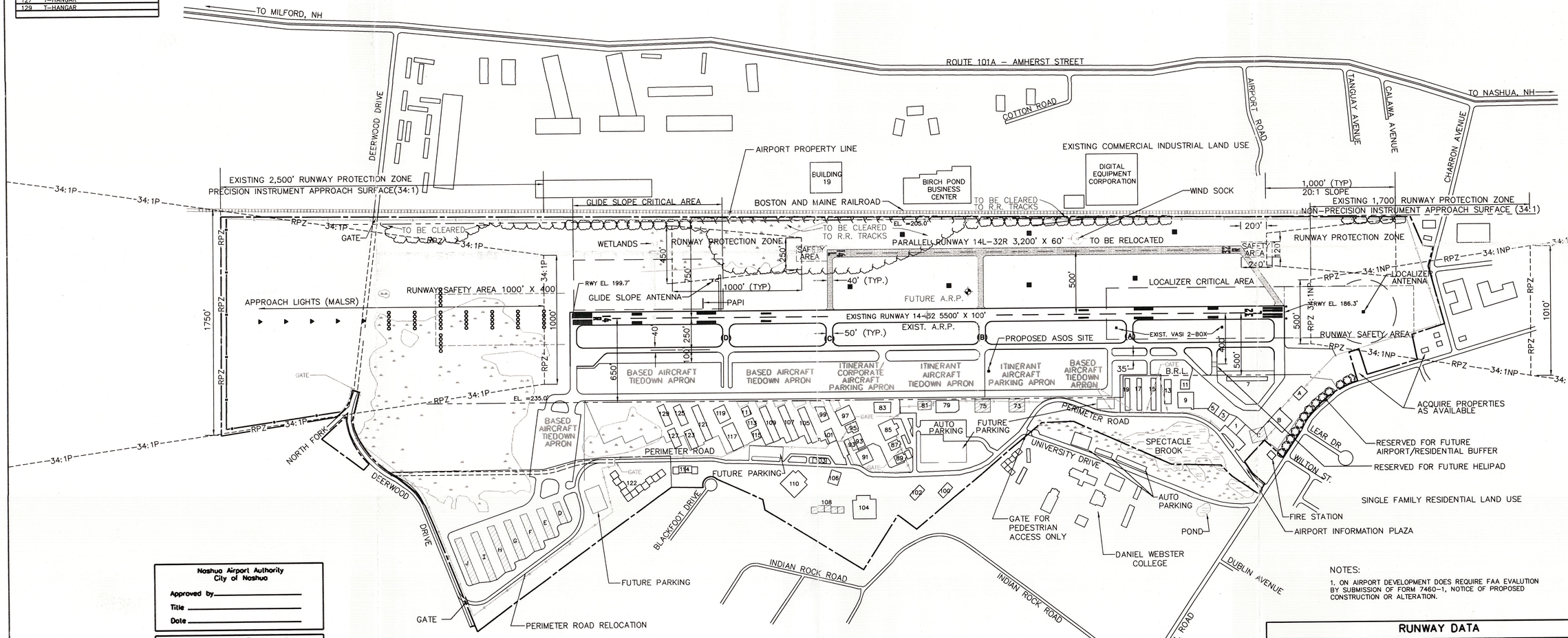
Hoyle, Tanner & Associates, Inc.
150 Dow Street Manchester New Hampshire 03101

BOIRE FIELD
NASHUA, NEW HAMPSHIRE

AIRPORT LAYOUT PLAN

DRAWING NO. 2

SHEET 2 OF 6



NOTES:

1. ON AIRPORT DEVELOPMENT DOES REQUIRE FAA EVALUTION BY SUBMISSION OF FORM 7460-1, NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION.

Nashua Airport Authority
City of Nashua
Approved by _____
Title _____
Date _____

N.H. Department of Transportation
Division of Aeronautics
Approved by _____
Title _____
Date _____

U.S. Department of Transportation
Federal Aviation Administration
New England Region
Approved by _____
Title _____
Date _____
Approved subject to comments and recommendations in letter dated

NON CONFORMING CONDITIONS

DESCRIPTION	EXISTING/PLANNED	STANDARD	REMARKS	DATE APPROVED
OBJECT FREE ZONE	RUNWAY 14-32 ℄ TO BRL 650' RUNWAY 14 END 500' RUNWAY 32 END	OBJECT FREE AREA WIDTH IS 800 FT.		
OBJECT FREE ZONE	RUNWAY 14-32 ℄ TO PARKING LINE = 350 FT.	OBJECT FREE AREA WIDTH IS 800 FT.		
OBJECT FREE ZONE	RUNWAY 14-32 ℄ TO PARALLEL TAXIWAY = 250 FT	OBJECT FREE AREA WIDTH IS 800 FT.		
RUNWAY 14 APPROACH SURFACE	RUNWAY 14 APPROACH SURFACE IS 34:1	RUNWAY APPROACH SURFACE IS 50:1		
PARALLEL RUNWAY SEPARATION	RUNWAY 14-32 ℄ TO PARALLEL RUNWAY = 500'	PARALLEL RUNWAY SEPARATION IS 700 FT.	PARALLEL RWY FOR DAYLIGHT, VFR SMALL PLANES ONLY	
CERTIFICATION	CERTIFIES THAT ALL AIRPORT ELEMENTS SHOWN ON THIS ALP ARE IN ACCORDANCE WITH CRITERIA CONTAINED IN THE CURRENT EDITION OF THE FAA ADVISORY CIRCULAR 150/5300-13, CHANGE 5, EXCEPT AS NOTED IN THE ABOVE TABLE ENTITLED "NON CONFORMING CONDITIONS".			

NASHUA AIRPORT AUTHORITY — ELIZABETH CEPASTIS — DATE

AIRPORT DATA

ITEM	EXISTING	FUTURE
AIRPORT ELEVATION (U.S.G.S.-M.S.L.)	200'	200'
AIRPORT REFERENCE POINT (ARP)	42°-46'-54" N 71°-30'-53" W	42°-46'-55.5" N 71°-30'-53.8" W
MEAN MAX. TEMP HOTTEST MONTH	84° F	84° F
TERMINAL NAVAIDS	VOR LOC NDB GS GPS	VOR LOC NDB GS GPS
COMBINED WIND COVERAGE (A/W)	SEE WIND ROSES	
DIST. & DIRECT. TO CITY	NASHUA 3 SE	
LAND OWNED IN FEE (ACRES)	392	394
OWNER	CITY OF NASHUA	
MAGNETIC DECLINATION (2000)	15° 40.9'W	
CRITICAL AIRCRAFT	BEECH JET 400A	BEECH JET 400A
AIRCRAFT DESIGN GROUP	II	II
AIRCRAFT APPROACH SPEED CLASS	C	C
SERVICE LEVEL	RL	RL

RUNWAY DATA

ITEM	RUNWAY 14-32 EXISTING	RUNWAY 14-32 FUTURE	R/W 14L-32R FUTURE		
PHYSICAL LENGTH	5,500'	5,500'	3,200'		
PHYSICAL WIDTH	100'	100'	60'		
SAFETY AREA (-)W	1000'x400'	1000'x400'	240'x120'		
TAXIWAY WIDTH	40'/50'	40'/50'	40'		
SURFACE COMPOSITION	PAVED	PAVED	PAVED		
PVMT. STRENGTH (x1000#)	65 (DW)	65 (DW)	12.5		
PAVEMENT TYPE	BIT. CONC.	BIT. CONC.	BIT. CONC		
RUNWAY LIGHTING	HIRLS	HIRLS	NONE		
RUNWAY MARKING	PREC.	PREC.	BASIC		
EFFECTIVE GRADIENT (%)	0.19%	0.19%	TBD		
NAVAIDS	ILS(14)RNAV(32) VOR-A NDB(14)	ILS(14)RNAV(32) NDB(14) GPS	NONE		
BEARING (TRUE)					
CONTROLLING OBSTR.	TREES(14) TREES/POLE(32)	CLEAR	CLEAR		
AIRPORT REFERENCE CODE	C - II	C - II	A - I		
VISUAL AIDS	VASI(32) REILS(32) PAPI(14)	VASI(32) REILS(32) PAPI(14)	NONE		