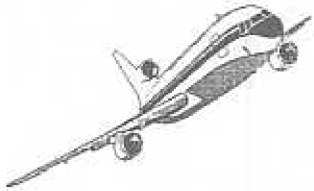
DRAFT ENVIRONMENTAL IMPACT STATEMENT

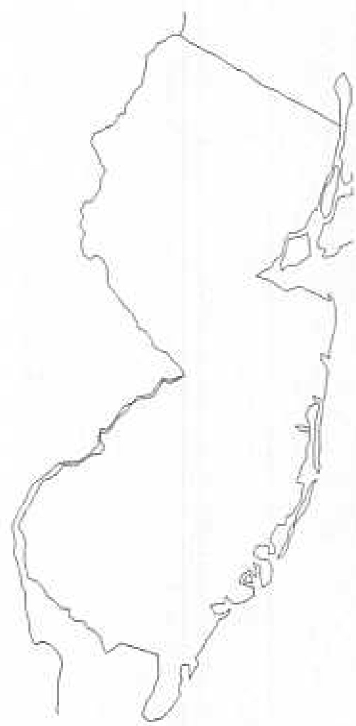
EXPANDED EAST COAST PLAN

Changes in Aircraft Flight Patterns Over the State of New Jersey

Prepared For

U. S. Department of Transportation
Federal Aviation Administration





EXPANDED EAST COAST PLAN (EECP)
Environmental Impact Statement

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

List of Tables

EXPANDED EAST COAST PLAN (EECP)
Environmental Impact Statement

List of Figures

Following Page

Chapter One

Summary

CHAPTER 1. SUMMARY

In the early 1980s, aircraft traffic flows along the East Coast of the United States were saturated and compressed to the extent that they restricted the movement of traffic into and out of the New York-New Jersey area. This congestion caused extensive air traffic delays amounting to 25 percent of the national total of reported delays.

The Federal Aviation Administration (FAA) recognized the increasing complexity of the air traffic control system and the rapidly growing demands on the system, and in 1977 began to discuss plans for improvements. It became apparent that the complexity and interrelationships of different components of the air traffic control system would require adjustments across much of the country to make a major improvement in the New York-New Jersey area. In 1981, the FAA issued policy guidelines and established responsibility for developing better airspace structure in support of national goals to increase controller productivity and improve the system. In 1985, the FAA's Eastern Region established a program office to oversee the development, coordination, and implementation of a series of changes to the Air Traffic Control (ATC) system for the area, designed to reduce congestion and increase capacity.

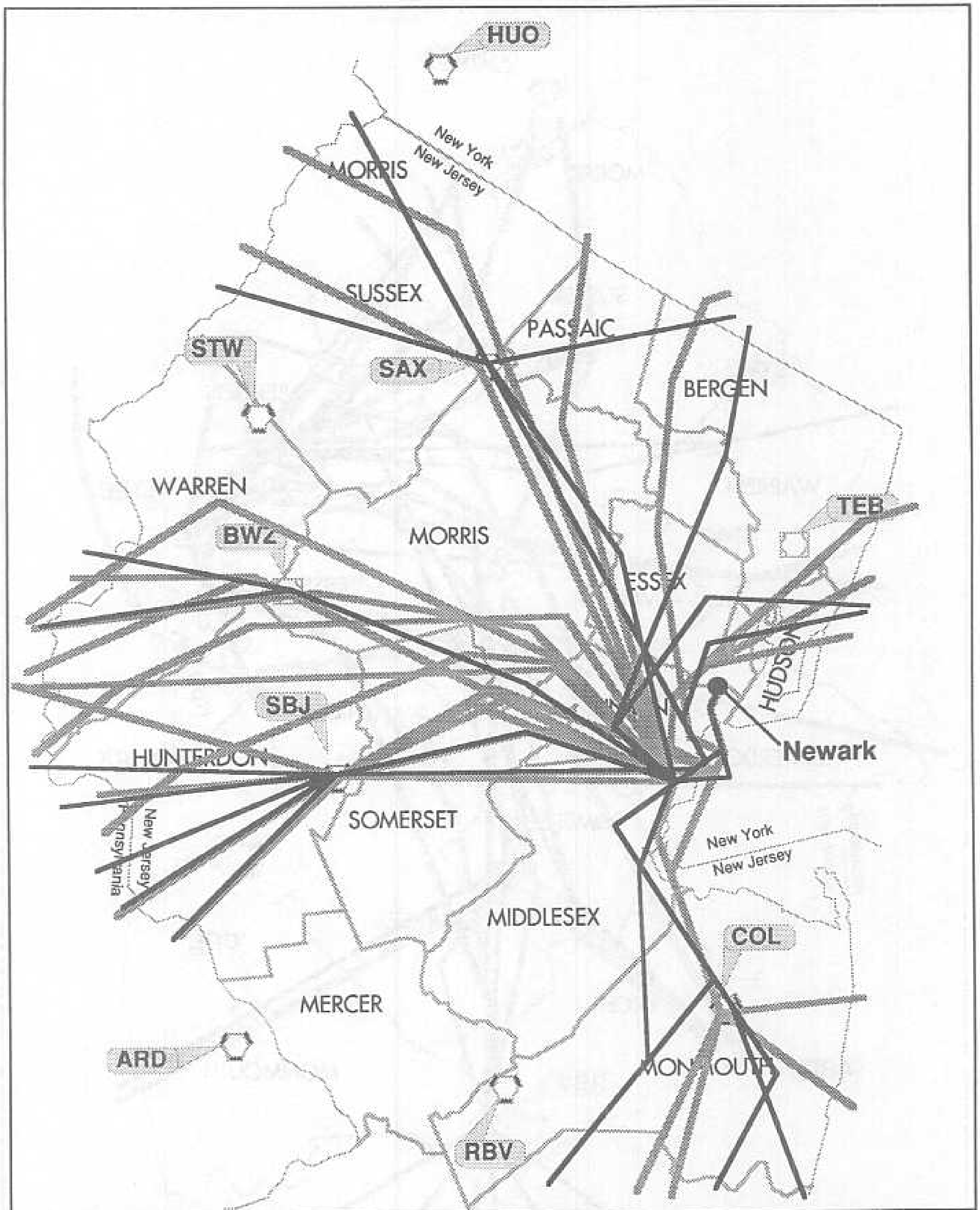
The Expanded East Coast Plan (EECP) defined a comprehensive revision of air route structures and air traffic control procedures that had a broad impact on air operations, air traffic facilities and flight inspection resources in 20 States, 6 FAA Regions, 7 Air Route Traffic Control Centers, and 600 medium to major terminal facilities. The two-phase implementation of the EECP revised standard operating procedures used by the FAA to control air traffic flows above 3,000 feet above ground level(AGL) over the Eastern U.S. Phase I addressed restructuring of airspace in the New York-New Jersey area and was implemented on February 12, 1987. Phase II, restructuring an area stretching from Boston to Miami and westward to Dallas and Denver, was implemented in 1988.

Since the initial implementation of the EECP in 1987, there have been complaints about aircraft noise and overflights, principally from areas in central and northern New Jersey. These concerns largely have focused on the operations by jet aircraft arriving at or departing from the New York-New Jersey airports over areas which, up to the time of the changes, were subject to less overflight. Controversy about the impacts of the EECP on New Jersey has led to a statutory requirement (the Aviation Safety and Capacity Expansion Act of 1990, Section 9119) for the FAA to prepare an Environmental Impact Statement (EIS) on the effects of the changes in aircraft flight patterns over the State of New Jersey caused by implementation of the EECP.

1.1 PURPOSE AND NEED FOR THE ACTION

The proposed action is continued use of the air traffic control routes and procedures that were identified in the EECP as modified to date. The changes made in the system covered a multi-State area, although the changes were initially intended to reduce traffic delays and congestion at the New York-New Jersey metropolitan airports. The objectives of the EECP were:

- Reduce delays by realigning the airspace along the Eastern United States.
- Increase the number of New York-New Jersey area arrival and departure routes.
- Implement a quadrant concept for departures and arrivals at both the New York-New Jersey and Washington metroplex areas, and extend the quadrant concept into the enroute environment to:
    - Provide for unrestricted climbs to the extent possible.
    - Provide for optimum descent to the extent possible.

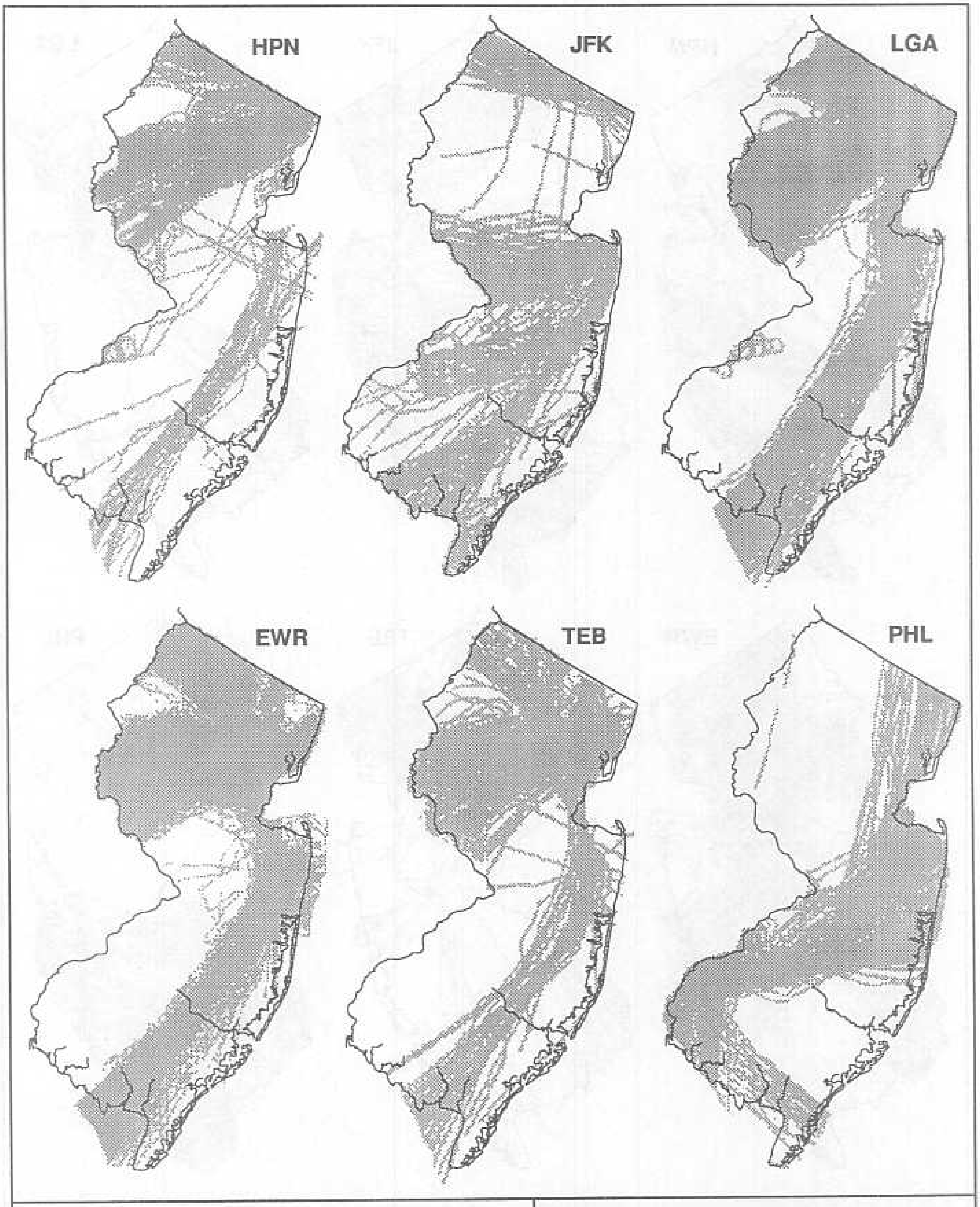


Source: FAA and HNTB Analysis

Alternative A
Alternative B

Newark Runway 22 Departures
Alternative A -1991 Routes
Alternative B -1986 Routes

Figure 1-1



HPN - Westchester
JFK - Kennedy
LGA - Laguardia
EWR - Newark
TEB - Teterboro
PHL - Philadelphia

Sample of Selected Airport Departures

Source: Volpe National Transportation System Center
Analysis of Radar Data, June 25-July 2, 1991

Figure 1-3

which were not previously overflown routinely.

- Routes that headed directly to Solberg now take aircraft departures from Newark's Runways 22L and 22R on a northwesterly heading over Cranford, Summit, Mendham, Long Valley, and Tewksbury before turning southwest and west.

- LaGuardia departures that once crossed exclusively over Solberg now are dispersed over four routes covering a 20-mile-wide corridor from north of Hackettstown to Solberg.

- JFK and LaGuardia arrivals that previously entered the New York-New Jersey airspace by crossing over Long Valley and headed southeasterly over New Providence and Summit are now on parallel routes either 15 miles further north, near Blairstown, then over Denville and Caldwell and into JFK, or they are brought in further south over Solberg where they are split. LaGuardia arrivals remain about 15 miles south of Newark.

- LaGuardia arrivals that once crossed Long Valley at altitudes of 9,000 to 10,000 feet and maintained those altitudes until over Mendham have been replaced by Newark arrivals which now overfly Long Valley at altitudes of 7,000 to 9,000 feet, descending to 6,000 to 7,000 feet over Mendham.

Departures from Newark's Runways 22L and 22R were later revised to delay the turn to the northwest until past Cranford. This change resulted in increased traffic over Scotch Plains.

1.3 AFFECTED ENVIRONMENT

The affected environment that is addressed in this EIS is the State of New Jersey. The State contains nearly 5 million acres of surface area, approximately one-quarter of which is urban or built-up areas concentrated mostly in the northeast part of the State. A continuous urban corridor stretches from Bergen County, close to New York in the northeast, to Camden County, close to Philadelphia in the southwest. In addition, an urbanized strip extends along much of the 120-mile ocean shoreline. The non-urban areas are primarily in the northwest portion of the State, which contains most of New Jersey's 800 lakes and ponds, and the southeast portion of the State.

1.4 ALTERNATIVES

The examination of alternatives is a key element of an EIS. In recognition of the importance of alternatives and the complications associated with a retroactive study, the FAA conducted an extensive scoping process in March and April, 1991, to identify potential impacts and possible alternatives.

Comments received through the scoping process indicated that concerns focus on airport arrivals and departures, rather than on high-altitude operations. Aircraft departing from Newark were a particular concern. The process suggested a number of alternatives to be considered by the FAA, including a return to pre-EECP (1986) routes and procedures (roll back). Significant interest was expressed in having all traffic redirected to over-water routes. Following FAA review of these comments and analyses of operational feasibility, a total of five alternatives were developed for further consideration.

1.4.1 EECP Existing Air Routes, Airways, and Air Traffic Control Procedures.

Implementation of the EECP was largely completed in 1988, but the air traffic procedures since have been continuously modified to further improve the efficiency of air traffic management and reduce environmental impacts. The EECP is defined as the current (1991) FAA operating procedures for routes and routing of aircraft above 3,000 feet AGL over the State of New Jersey.

Given the evolutionary nature of air traffic control procedures, a true "No Action" alternative does not exist. Continuation of the current

They noted that films of fuel-like material were found on the surface of local water bodies.

Noise, air quality and water quality were therefore identified as the primary environmental concerns and have been given the greatest emphasis in the study analyses. Other environmental factors are addressed at appropriate levels of detail.

1.5.1 Aircraft Noise Impacts.

A computer-based noise model was used to compare EECP procedures with the alternatives. The descriptor of aircraft noise used is the Day-Night Sound Level (DNL), which provides an indication of overall noise exposure resulting from an accumulation of individual noise events occurring over a 24-hour period. Although individual reactions to noise vary widely for a given level, the aggregate response to speech interference and sleep disruption and the desire for a quiet environment are predictable. These responses relate well to measures of cumulative noise exposure such as DNL.

The FAA and other Federal and State agencies have used DNL to evaluate community exposure to noise. The exposure level of DNL 65 dB represents the FAA's threshold of significance; all land uses are considered compatible with aircraft noise at exposure levels below DNL 65 dB, although people may be disturbed by aircraft noise at levels lower than DNL 65 dB.

While individuals often have difficulty in judging the absolute magnitude of a noise environment, they can more easily determine the relative difference between two noise exposure levels. An increase in DNL of between 2 and 5 dB is likely to be noticed, and increases of 5 dB or greater are likely to lead to community reaction. In addition, a larger increment of people become annoyed under a given increase in noise level at higher levels of noise.

The highly subjective nature of response to noise and special circumstances can either cause increase or decrease in individuals' tolerance. For example, a high non-aircraft background — or ambient — noise level such as that from vehicular traffic, can mask aircraft noise. Alternatively, residents of areas with unusually low background levels may find relatively low aircraft noise annoying.

Noise measurements of the total noise exposure from all sources, made at several locations in northern and central New Jersey, both verified the reasonableness of the computer-based noise modeling and indicated that the EECP operations account for only a portion of the total noise environment at each of the measurement sites.

Only one alternative examined — the Return to 1986 Air Traffic Routes and Procedures with 1991 Traffic — would generate noise levels in excess of DNL 65 dB. This is a significant adverse impact. Implementation of alternatives to EECP routes and procedures would cause more widespread changes in aircraft noise at less than 65 dB. As discussed earlier, increases of DNL 5 dB or more are likely to lead to community reaction. Figures 1-5 and 1-6 show that returning to 1986 routes and procedures would increase noise levels by DNL 5 dB or more in many areas across the State, while reducing noise levels by similar amounts in four relatively small areas in Monmouth, Union, and Bergen Counties. Implementation of military/oceanic routing (nighttime only) would increase noise levels by DNL 5 dB or more in a small section of northern Monmouth County (Figure 1-7) while not resulting in reductions of DNL 5 dB or more in noise. The spreading alternative would not increase or decrease noise levels by as much as DNL 5 dB. Table 1.1 summarizes population experiencing DNL 5 dB changes resulting from implementation of alternatives to the EECP.

1.5.2 Air Quality Impacts.

There are five major pollutants of concern from aircraft operations: hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO_x), sulfur oxides (SO_x) and particulates. These pollutants are byproducts of fuel combustion.

No_x emissions increase as aircraft power setting and rate of fuelburn increase. SO_x rates are a function

Areas Where DNL Is Expected to Decrease at Least 5 dB with 1991 Traffic on 1986 Routes

Source: Harris Miller Miller & Hanson Inc.

Figure 1-6

Table 1.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Population Exposed to DNL 5 dB or Greater Increase or Decrease in Noise Relative to EECP

Alternative	Population Exposed to Change in DNL of 5 dB or Greater Decrease or Increase Relative to EECP					
	DNL 45-50 dB	DNL 50-55 dB	DNL 55-60 dB	DNL 60-65 dB	DNL 65-70 dB	Net Change
1986 Routes	-40,527	-5,095	-0	-0	-0	-45,622
	+363,577	+421,837	+620,220	+56,227	+58	+1,461,919
Oceanic/Military Routes (Nighttime)	-0	-0	-0	-0	-0	-0
	+4,349	+0	+0	+0	+0	+4,349
Spreading	-0	-0	-0	-0	-0	-0
	+0	+0	+0	+0	+0	+0

Source: VNTSC Analysis

This exceeds the Federal criterion. If it cannot be mitigated by changes in flight procedures, this significant adverse impact may require the consideration of the acquisition of property and the relocation of persons.

Since the actions described in this EIS, except as noted above, do not lead to noise increases of 1.5 dB or greater in areas where the noise level exceeds DNL 65 dB, the FAA does not feel it is necessary or proper to consider any acquisition of properties or relocation of persons, as might have been the case if noise levels were found to exceed the Federal criterion. Adjustment of flight procedures is the most practical means of providing mitigation for noise at levels less than the threshold of significance according to Federal criterion, because these procedures are within Federal control and do not require any physical changes or changes to local land uses. If flight procedures are to be modified, there must be reasonable assurance that there will be a tangible reduction in noise impacts and that noise will not just be moved from one location to another. It is not considered beneficial to increase the impacted population at higher noise levels in order to reduce the affected population subject to noise at lower levels.

Increased noise levels in any area caused by the implementation of the EECP may have resulted from one or more of the following sources.

- Introduction of aircraft operations into areas where no operations had previously occurred.
- Increased numbers of operations.
- Lowered altitude of operations.
- Changes in aircraft types.

Due to the interactive nature and complexity of the air traffic system mitigation measures cannot be considered in isolation, but must be related to the entire New York-New Jersey area's air traffic control system. The FAA will propose a series of operational mitigation strategies as a part of the Record of Decision (ROD). These strategies will include increases in altitudes on some routes, relocation of some routes, and reallocation of some traffic to routes that are currently not fully used and where adverse impacts will be less. Specific mitigation measures will be outlined in the Final EIS, and specific commitments will be included in the ROD.

Chapter Two

Purpose and Need

CHAPTER 2. PURPOSE AND NEED FOR THE ACTION

This chapter includes brief descriptions of the airspace, air traffic control system and enroute system, and a history of the Expanded East Coast Plan (EECP).[1] It discusses the EECP in New Jersey. A description of the purpose and need for the proposed action follows. In Section 9119 of the Aviation Safety and Capacity Act of 1990, Congress directed the FAA to prepare an Environmental Impact Statement (EIS) on the effects of changes in flight patterns over the State of New Jersey caused by implementation of the EECP.

Airspace structure is a complex arrangement. Air traffic control procedures are highly technical and complicated procedures, in part because air traffic does not recognize political boundaries. Traffic into, out of and over New Jersey is associated with one of the most active air traffic areas in the world — the greater New York area. The interconnectedness of air traffic is such that what happens over New York can affect Los Angeles, and vice versa.

2.1 BACKGROUND INFORMATION

This section reviews key airspace and air traffic control concepts relating to the purpose and need for the EECP. Special terms for air traffic are shown in Appendix C.

2.1.1 Airspace and Air Traffic Control

Aircraft flying in the United States are subject to varying degrees of control depending on the flight plan, the type of airspace and meteorological conditions. The airspace within which the aircraft operates is divided into many different blocks of airspace segregated by geography, altitudes, and location. The control of aircraft operating in the airspace is exercised from a system of air traffic control facilities. The air traffic control system operates within a framework of laws and regulations to provide for the safe operation of aircraft. Accuracy of communication and air navigation is required to maintain the air traffic control system and use of Federal airways and routes.

There are two basic types of aircraft flights: those operating under visual flight rules (VFR) and those operating under instrument flight rules (IFR). There are two related weather conditions: instrument meteorological conditions (IMC) and visual meteorological conditions (VMC). Aircraft operating under VFR must operate in VMC. Aircraft operating under IFR may be operating in either VMC or IMC.

The air traffic control system provides guidance and separation for IFR and VFR aircraft. The FAA provides electronic and visual navigation aids for aircraft. It also provides electronic landing systems for approaches to airport runways. The air traffic control system includes radars and communication facilities by which aircraft can be controlled.

<u>Airspace</u>

Airspace is structured into controlled and uncontrolled areas.[2] Figure 2-1 provides an example. All airspace not controlled is uncontrolled. Controlled airspace consists of the following areas.

Continental Control Area. That area at and above 14,500 feet mean sea level (MSL) over the 48 contiguous States, the District of Columbia and Alaska, with a few exceptions.

Control Areas. Consist of airways, airport control areas and control area extensions, but do not include the Continental Control Area.

Positive Control Area. Consists of that airspace over the U.S. from 18,000 feet up to and including 60,000 feet.

Transition Areas. Designated to contain IFR operations in controlled airspace during terminal operations and while transitioning between terminal and enroute areas.

Control Zones. Regulatory in nature and established as controlled airspace.

Terminal Control Area (TCA). Consists of controlled airspace extending from the surface to specified altitudes within which all aircraft are subject to specifically defined operating rules specified in Federal Aviation Regulation (FAR) 91. Each TCA contains at least one primary airport.

Airport Radar Service Area (ARSA). Airport Radar Service Areas consist of controlled airspace extending upward from the surface to specified altitudes with two circles, the inner circle with a five nautical mile (NM) radius and the outer circle with a ten NM radius. The airspace contained in the ARSA extends from the surface to the 4,000 feet above ground level (AGL) within the inner circle, and from 1,200 feet AGL to 4,000 feet AGL in the outer circle.

Special Use Airspace. There are six types of special use airspace defined in the Airman's Information Manual (AIM).

There are also airport traffic areas, airport advisory areas, military training routes and temporary flight restrictions. There are two types of aircraft routes: Federal airways or low altitude airways are designated between 1,200 feet above ground level (AGL) and 18,000 feet MSL; high altitude jet routes exist between 18,000 feet MSL and 45,000 MSL.

Air Traffic Control Facilities

FAA provides air traffic control through a number of facilities and assigned areas of air traffic control responsibility. An Air Route Traffic Control Center (ARTCC) provides air traffic control services to aircraft operating on IFR flight plans within controlled airspace and principally in the enroute system. A terminal radar approach control (TRACON) facility uses radar data and air ground communications equipment to provide approach and departure traffic control services to IFR aircraft within its area of responsibility. Traffic at an airport is controlled by an air traffic control tower (ATCT) at those airports with sufficient operations to require a tower. ARTCC and TRACON air space may be divided into a number of different areas, called sectors, to make the workloads of air traffic controllers manageable.

An aircraft operating on an IFR flight plan will be cleared to taxi by the airport tower and cleared for takeoff by the tower. Prior to taxiing the pilot will have received an air traffic control clearance specifying air routes and altitudes to reach its destination. The aircraft may depart using a standard instrument departure (SID). A SID is an air traffic control (ATC) coded departure procedure which has been established at certain airports to simplify clearance delivery procedures. The SID may be amplified by radar vectors provided by the air traffic controller guiding the aircraft to a hand-off point where it will be directed to change radio frequency and contact the next air traffic controlling facility, normally the ARTCC. Approaching its destination, the aircraft may be directed to a standard terminal arrival route (STAR). A STAR is an ATC coded IFR arrival route established for arriving IFR aircraft destined for certain airports. Its purpose is to simplify clearance and delivery procedures. When the aircraft is handed off from the ARTCC to the terminal area control it will be directed to an approach to the airport. Under instrument conditions, the aircraft will normally execute an instrument approach in accordance with a published instrument approach procedure chart.

The air traffic control system consists of personnel and facilities, laws, rules and regulations controlling operations of aircraft using carefully designed operational procedures and communications and language with their own precise and specific meanings. The purpose of the system is to provide for the safe, orderly and efficient movement of aircraft.

An Air Traffic Control System Command Center (ATCSCC) located at FAA Headquarters provides nationwide air traffic management services to reduce system overloads and ensure the orderly progress of air traffic through the system by balancing air traffic demand with system capacity.

The benefits gained resulted from the reduced aircraft separations which were allowable in the TRACON area. The main features and effects of the Plan in the New York-New Jersey Area were:

1. Kennedy, LaGuardia and Newark Airport departure routes increased by 65% (from 17 to 28).
2. Arrival routes increased 33% (from 9 to 12).
3. In general, higher arrival altitudes and speeds complemented optimum descent profiles to approach courses.
4. Less restrictive departure climbouts led to higher initial altitudes.
5. New routes were created to separate Newark flights from 17 other northern New Jersey airports (i.e. Teterboro, Morristown, Essex County, etc.).
6. Higher altitudes reduced exposure of turbojets to lower performance aircraft operating under Visual Flight Rules within and beyond the Terminal Control Area (TCA).
7. A restructured Tower Enroute Control System, in which departure, enroute and arrival control services were provided to IFR aircraft by one or more approach control facilities.
8. Improved arrival/departure routes for eastern Long Island, southern Connecticut and Westchester County airports.
9. Terminal holding patterns relocated within Air Route Traffic Control Center airspace to:
    a. Allow more area for additional routes.
    b. Elevate holding altitudes to reduce fuel consumption.
    c. Promote improved traffic management.
10. Creation of a "fast-track—slow-track" concept by addition of separate arrival routes for lower performance aircraft.
11. Grouping of arrival/departure flows along parallel lines within quadrants (quadrant concept) to:
    a. Allow more flexibility in balancing traffic loads by moving flights to adjacent airways.
    b. Reduce crossing points, bottlenecks, and complexity by route realignments.
    c. Merge departure routes further from airports and at higher altitudes.
12. Addition of new offshore airway (J174) as a result of military Warning Area modifications.

<u>Initial Implementation</u>

On December 17, 1985, the FAA Administrator was briefed on the program status, purpose, and requirements. The Administrator directed the Associate Administrator of Air Traffic to initiate necessary action to implement the EECP on schedule.

The Expanded East Coast Plan resulted in a comprehensive revision of the air traffic control routes and procedures in the eastern United States. The scope of those revisions resulted in a "domino effect," in which, for the most part, each segment of the plan affected the route flows surrounding it. For this reason, most of the revisions called for in the plan were implemented at the same time to ensure a continued smooth flow of traffic due to the complexity of the required revisions. The target date for plan implementation was early 1987, but portions of the plan were implemented incrementally on an ongoing basis.[6] Early actions involved the following.

April 11, 1985. Arrival routes were restructured to Newark, LaGuardia, and associated satellite airports by segregating jet arrival traffic from "low/slow" aircraft destined for these airports. This action

2.1.4 Expanded East Coast Plan Over New Jersey

Many types of aircraft operations occur in New Jersey airspace. Aircraft may enter New Jersey airspace and travel over New Jersey at some altitude until leaving New Jersey. Aircraft may enter New Jersey airspace and land at a New Jersey airport. Aircraft may take off from a New Jersey airport, climb and leave New Jersey airspace. Aircraft may enter New Jersey airspace and descend to land at an airport adjacent to New Jersey. Aircraft may take off from an adjacent airport and climb over New Jersey. Depending on the type of operation, these aircraft may use high altitude jet routes, lower altitude airways, or arrival and departure routes. The EECP made changes to the high altitude jet routes over New Jersey, the lower altitude airways over New Jersey and the arrivals and departures at airports in the New York-New Jersey area. These changes generally occurred at altitudes above 3,000 feet.

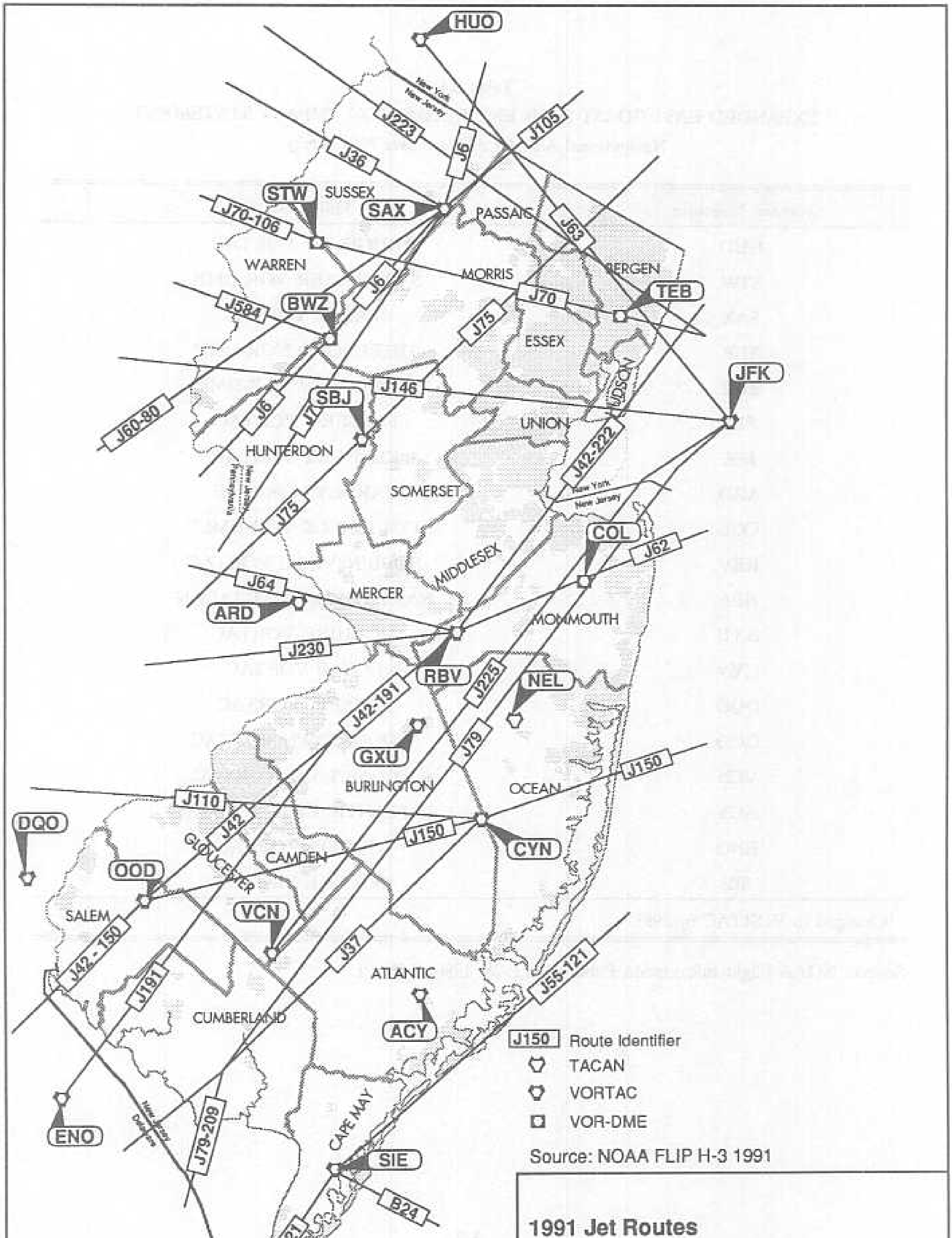
In the early implementation phase of the EECP (1985), a new high altitude jet route, J-174, was created to provide a dual north-south routing. This route removed some traffic that would otherwise have overflown New Jersey. In 1987, when most of the EECP changes were made, most of the high altitude jet routes were modified. Figure 2-2 shows a schematic of the jet routes in 1986 over New Jersey. Figure 2-3 shows a schematic of the jet routes over New Jersey in 1991. These changes involved aircraft flying at 19,000 feet or higher and, based on an analysis of complaints, do not appear to be responsible for community concerns relating to the EECP. Navigation Aids which define airways over New Jersey are shown in Table 2.1.

The airspace between 18,000 and 19,000 feet is not used for enroute traffic. At flight altitudes at or below 18,000 feet, the Federal Airways are known as Victor Airways. Most turboprop aircraft and piston engine aircraft will operate in these altitudes. The Victor Airways were extensively modified in the EECP to provide more efficient enroute air traffic flows on the east coast. Figure 2-4 shows the low altitude Victor Airways in 1986. Figure 2-5 shows the Victor Airways in 1991. Jet aircraft would not normally be operating on these airways but rather would be climbing through the Victor Airways altitudes to the jet routes or descending through the Victor Airways altitudes to an airport for landing. This element of the EECP affected turboprop aircraft and piston powered aircraft cruising on Victor Airways and, based on an analysis of complaints, does not appear to be responsible for community concerns.

The major feature of the EECP affecting New Jersey involved changes in arrivals and departures at Newark and LaGuardia Airports. Although no changes were made in procedures below 3,000 feet AGL, changes in certain procedures above 3,000 feet were noticeable in northern New Jersey after the implementation of Phase I on February 12, 1987.

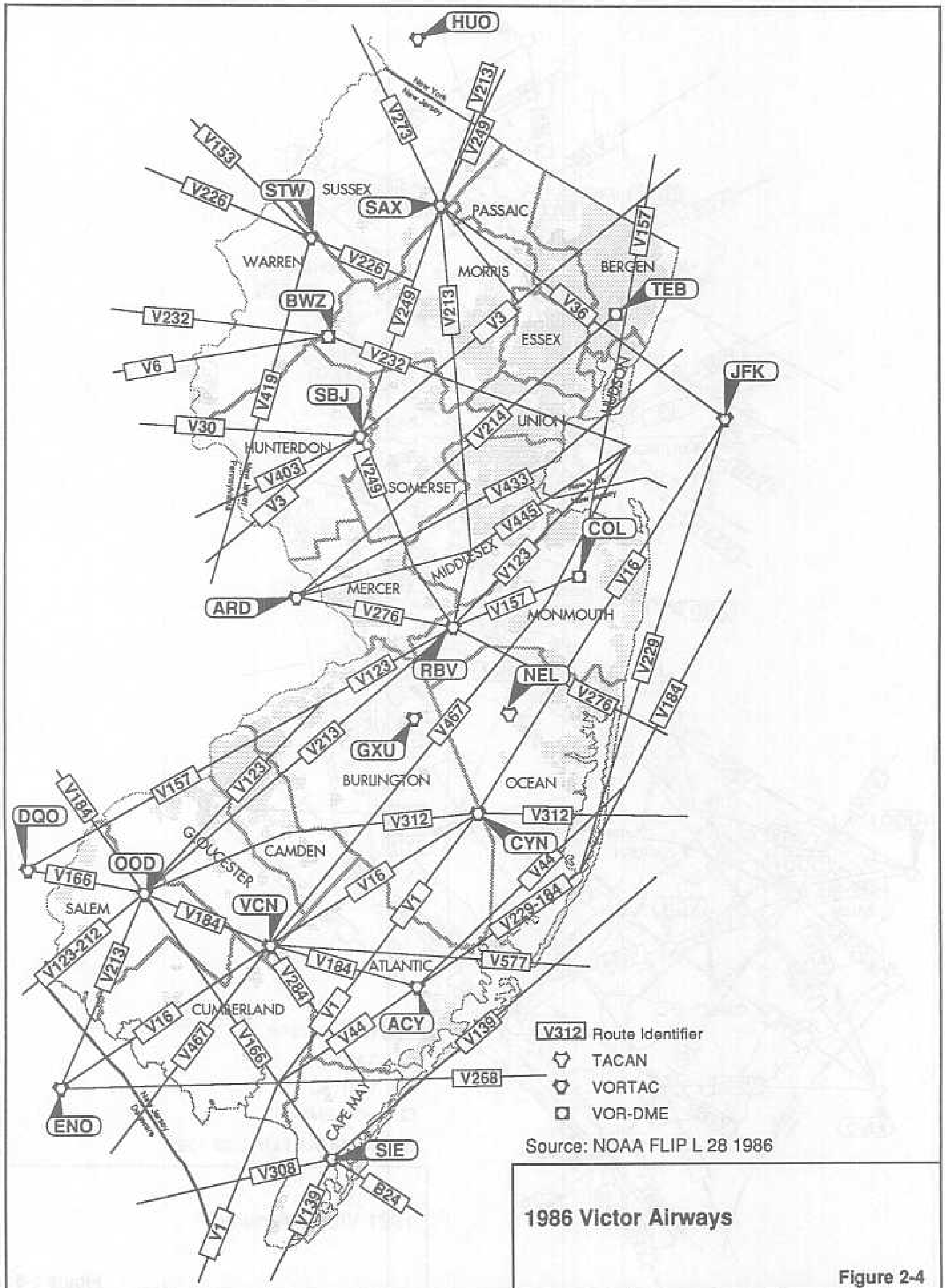
Figures 2-6, 2-7, 2-8 and 2-9 show the general jet aircraft arrival and departure streams over New Jersey before and after the implementation of the EECP for operations to the north and operations to the south. The streams shown were developed from radar tracks of August, September and October, 1986, before the EECP, and April and May, 1988, after the EECP. The lines for arrival and departure streams represent the generalized center of many radar tracks in the stream. The radar tracks were depicted in a report by Harris Miller Miller & Hanson, Inc. in November 1988. Radar tracks were infrequent and ill-defined in some cases. Information was supplemented by air traffic control personnel of the FAA Eastern Region. Key changes as discussed in that document are listed below.[10]

1. The rerouting of Newark departures from Runways 4L and 4R (north flow) that then head toward the SOLBERG VOR (SBJ), a navigational fix located 32 miles west southwest of Newark. Routes that previously took aircraft southwesterly to Solberg over Short Hills and Summit are now dispersed more to the west over a 20-mile wide swath from the BROADWAY VOR (BWZ) near Long Valley south to Solberg. The route changes now take aircraft over the additional communities of Madison, Morristown, Mendham, Tewksbury, and Long Valley.



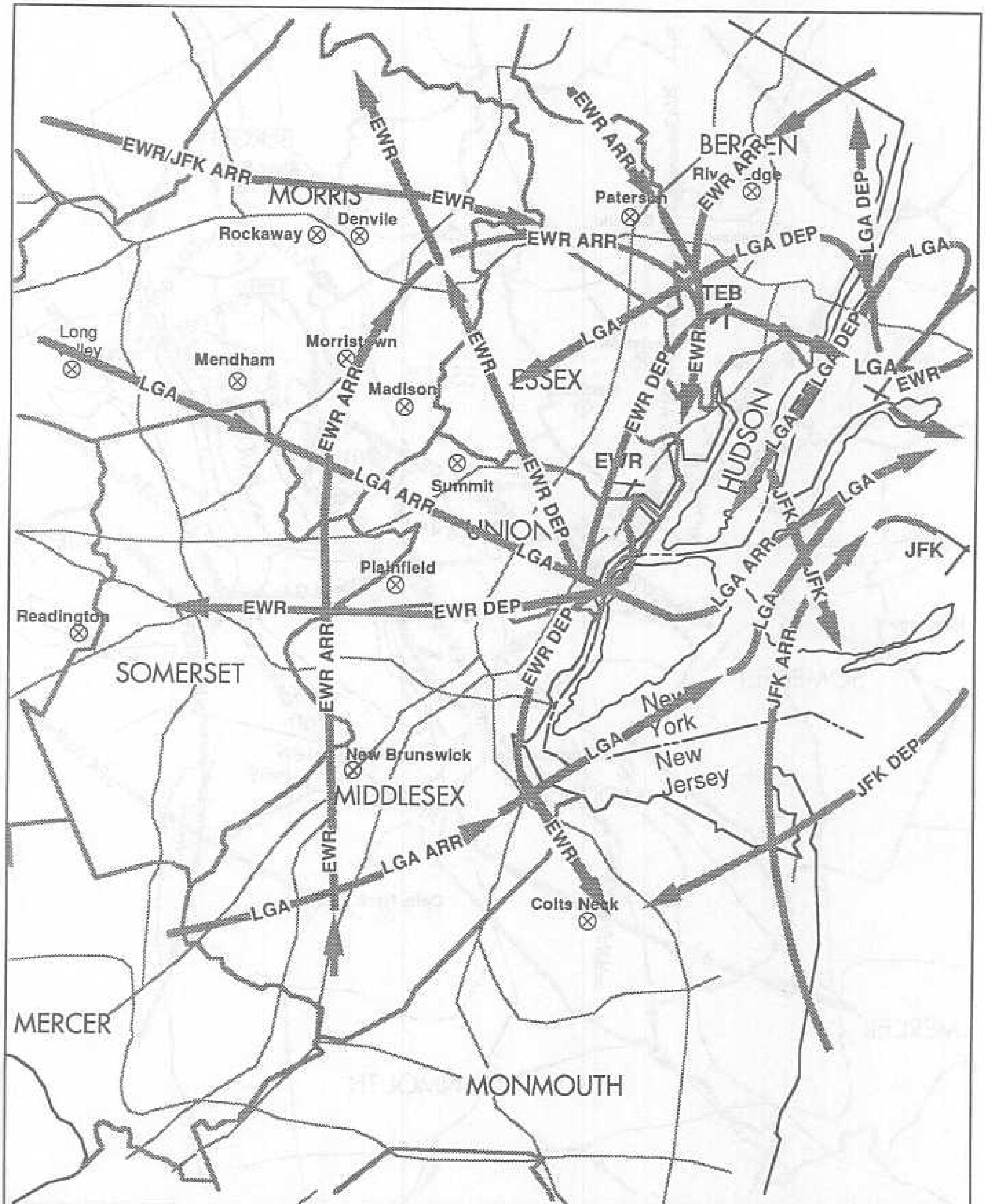
1991 Jet Routes

Figure 2-3



1986 Victor Airways

Figure 2-4

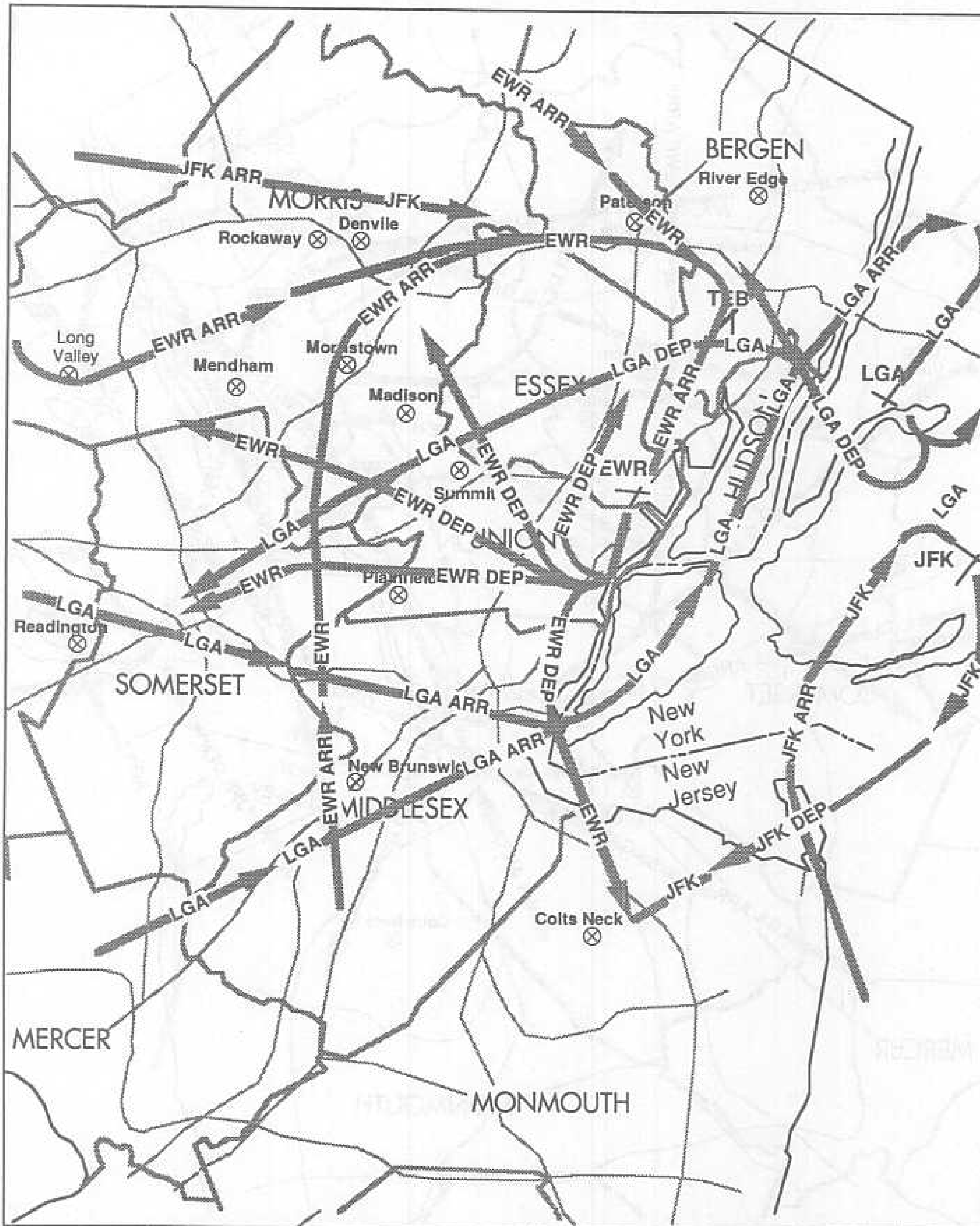


LGA - Laguardia
JFK - John F. Kennedy
EWR - Newark
ARR - Arrivals
DEP - Departures

Source: HNTB adaptation, Fig. 4-3, HMMH Report Nov 1988

Generalized South Flow Operations Over Central New Jersey (Jets Only) Before EECP Implementation

Figure 2-6



LGA - Laguardia
JFK - John F. Kennedy
EWR - Newark
ARR - Arrivals
DEP - Departures

Source: HNTB adaptation, Fig. 4-4, HMMH Report Nov 1988

Generalized South Flow Operations Over Central New Jersey (Jets Only) After EECP Implementation

Figure 2-8

2. A similar rerouting of Newark departures from Runways 22L and 22R (south flow) that head toward the SOLBERG VOR. Routes that headed directly to SOLBERG now take aircraft on a northwesterly heading over Cranford, Summit, Mendham, Long Valley, and Tewksbury before turning southwest and west.

3. The dispersion of LaGuardia departures heading for destinations to the south and southwest. Traffic that once crossed exclusively over the SOLBERG VOR now is subdivided onto four routes covering a 20-mile wide corridor from north of Hackettstown to the SOLBERG VOR.

4. The rerouting of LaGuardia and JFK arrivals from the west and northwest. Aircraft that previously entered the New York airspace by crossing over the BROADWAY VOR (BWZ) in Long Valley and heading southeasterly over the New Providence and Summit areas are now brought into the area on parallel routes either 15 miles further north over the STILLWATER VOR (STW) near Blairstown, then over Denville and Caldwell and into JFK, or they are brought in further south over the SOLBERG VOR where they are split. LaGuardia arrivals remain about 15 miles south of Newark.

5. Replacement of the LaGuardia arrivals that were previously over the BROADWAY VOR with Newark arrivals at lower altitudes. LaGuardia traffic that once crossed the BROADWAY VOR at altitudes of 9,000 to 10,000 feet above mean sea level (MSL) and maintained those altitudes until over Mendham have been replaced by Newark arrivals which now overfly Long Valley at altitudes of 7,000 to 9,000 feet MSL, descending to 6,000 to 7,000 feet over Mendham.

Subsequent to the changes discussed above, Newark departures from Runways 22L and 22R were revised to delay the turn to the northwest until past Cranford. This change resulted in increased traffic over Scotch Plains.

Newark International Airport, where operations doubled from 1975 to 1986, is currently operating at a slightly lower level of traffic than the year prior to the implementation of the EECP, and is forecast to have a substantial increase in air traffic (see Table 2.2). Instrument traffic in the New York/New Jersey area handled by the New York TRACON continued to grow from 1975 to 1990 (see Table 2.3). Since the facilities under New York TRACON jurisdiction have changed from time to time, a better indication of the growth of instrument traffic in the New York/New Jersey area can be obtained by examining the growth of air traffic at selected airports (see Table 2.4). At Newark and Caldwell airports, instrument operations declined after the implementation of the EECP in February 1987. Total instrument traffic declined from 1986 and did not return to its 1986 level until 1990. Total instrument traffic handled by FAA facilities has grown and is forecast to continue to increase (see Table 2.5).

There are several factors that will cause increased awareness on the ground of air traffic changes. These factors are altitude changes, changes in numbers of aircraft, changes in aircraft models, changes in time of day of the traffic and the introduction of additional traffic. A number of studies undertaken shortly after the implementation of the EECP addressed some of these factors.

A study undertaken by the General Accounting Office (GAO) for Congress in 1988 reported on altitude changes at certain locations in New Jersey (see Table 2.6).[11] This report noted that noise complaints were attributed to increased frequency of flights, lower altitudes and late hours of flights, but did not provide any data other than on altitude changes and approach and departure routing changes. Table 2.6 indicates that for arrivals, Chester, Cranford, Long Valley, Mendham, Mountainside, Pottersville and Schooleys Mountain had lower altitudes for aircraft after the implementation of the EECP. On departures a number of locations had increased altitudes, four locations had traffic where no traffic existed before, but no locations had lower altitudes. The GAO report erroneously included altitudes below 3,000 feet which were not part of the EECP changes. Factors other than altitude would seem to be the cause of increased complaints.

Table 2.3

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Instrument Operations Handled by New York TRACON

Year	Number of Operations
1975	969,709
1980	1,084,961
1981	1,054,944
1982	1,028,470
1983	1,276,917
1984	1,440,974
1985	1,495,437
1986	1,614,887
1987	1,637,216
1988	1,709,796
1989	1,739,733
1990	1,782,780

Source: FAA Air Traffic Activity FY 1975-1990, Table 10.

Table 2.5

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Total Instrument Operations at all FAA Facilities
(millions)

Year	Number of Operations
Historical	
1985	38.7
1989	45.0
Forecast	
1992	48.9
2002	61.4

Source: FAA Aviation Forecast, FY 1991-2002, page 9.

A second study undertaken by Harris Miller Miller & Hanson, Inc. for the Port Authority of New York and New Jersey addressed noise issues.[12] Departure and arrival route changes were reported. Appendix E to that study contained a report of air traffic flow altitudes at various air space points (gates) over New Jersey before and after the EECP. The data utilized was information on where and when the aircraft were flying obtained from the FAA's Automated Radar Terminal System. Table 2.7 provides the average flight altitude for the various flight paths for approaches and departures to the three airports under conditions when the airports are operating toward the south (south flow) and when they are operating toward the north (north flow). Not all gates have both arrivals and departures. Departures over Denville are divided into westbound and northbound streams.

Traffic altitudes were lowered at Long Valley and additional traffic streams introduced. At Denville, only a slight reduction in traffic altitudes occurred, but additional traffic streams were introduced. At Solberg traffic altitudes were raised and an additional stream introduced. At Manalapan there was a slight lowering of arrival patterns and one stream was eliminated. At Colts Neck one additional stream was introduced. At Cranford one departure pattern altitude was slightly reduced, one was slightly raised and two new streams were introduced. At Summit all departure pattern altitudes were raised and no new streams introduced. At Short Hills all departure altitudes were raised but one new departure stream was introduced. At Morristown all departure pattern altitudes were raised and one new departure stream was introduced. At Allendale the existing departure stream altitude was raised but one new departure stream was introduced. On the whole it would appear that factors other than altitude changes were responsible for changes in awareness of the traffic pattern change.

A third study prepared by Wyle Research for the State of New Jersey in 1988 reported on route changes and measured noise levels at several New Jersey locations.[13] The study noted that aircraft-only noise levels at the four communities studied (Cranford, Milburn, Denville and Long Valley) were at or below the lowest level identified by the Environmental Protection Agency (EPA) as acceptable for quiet locations: a Day-Night Noise Level (DNL) of 55 decibels (dBA). (See Chapter 5 and Appendix E for a complete description of noise metrics.) The study recommended better guidelines for assessing noise and suggested five possible means of mitigating noise impacts.

Operational data derived from the current analyses of air traffic before and after the implementation of the EECP are contained in Chapter 5.

2.1.5 Air Traffic Data

FAA records air traffic system delays of 15 minutes or more and provides a monthly air traffic activity and delay report.[14] The report provides a breakdown of delays at 55 select airports. The three New York-New Jersey major airports are included in those 55. It does not record the delays by terminal control area. Therefore New York terminal area data are not available. FAA maintains a historical record of total system delays and their causes, but not for individual airports. It assigns delays by cause factor. The causes and their percentages of total delays as reported for the first eight months of 1991 were as follows:

- Weather, 68%
- Terminal volume, 25.8%
- Center volume, less than 1%

Closed runways, taxiways, equipment failures and other causes account for the remainder. The air traffic improvements implemented as a result of the EECP were aimed at center and terminal airspace improvements. These two airspace areas accounted for 25.9% of the delays in 1991.

The air traffic system is a closely interrelated system. What happens in the New York-New Jersey area can influence traffic in Los Angeles or Europe and vice versa. The New York terminal area itself also is a closely interrelated system, where what happens with the air traffic of one airport affects the air traffic of another area airport.

In the U.S. in 1990 there were almost 47 million instrument operations. Of that total, 42.3% took place in the three FAA regions along the east coast of the U.S. Almost 16 percent took place in the Eastern Region which includes New York and New Jersey (see Table 2.8).

Total U.S. instrument operations and total system delays from 1985 through 1990 are shown in Table 2.9. The growth for each year is indicated. The major portion of the improvements of the EECP were implemented on February 12, 1987. In 1987 there was a sharp drop in delays, while the instrument air traffic continued to grow. A similar pattern is shown for Newark Airport (see Table 2.10). Given the large percentage of weather-influenced delays (65-68%), and the fact that the east coast-oriented EECP could only improve that part of the air traffic system which accounts for about 25 percent of the delays, the significant decline in delays in 1987 and 1988 could not be attributed solely to the implementation of the EECP. Given the nature of the delay records and the interdependency of the air traffic system, statistical data supporting the additional efficiency of operations after the EECP improvements were in place are not available. On the other hand, there are no data available to indicate that the EECP objectives were not attained. To individuals knowledgeable of air traffic procedures, the improvements in air traffic operations resulting from the implementation of the EECP are readily recognizable, particularly in the New York-New Jersey area. For example, all southwest-bound traffic from LaGuardia and Newark, as well as their satellite airports, passed over SOLBERG VOR, which became a chokepoint. The EECP replaced the Solberg point with four other points, relieving the chokepoint.

2.2 PURPOSE AND NEED FOR THE ACTION

2.2.1 Proposed Action

FAA desires to continue its existing system of enroute air traffic control and air space structure as it was developed in the Expanded East Coast Plan, implemented in 1987 and 1988, and subsequently modified during the following years. In order to maintain efficiency, reduce delays and accommodate future traffic increases, traffic management systems were improved, permitting the avoidance of airborne holding without undue delays.

There have been increased noise complaints, principally in central and northern New Jersey, since the implementation of Phase I of the EECP. These community concerns apparently focus on the relatively low altitude operations by jet aircraft arriving at or departing from the New York-New Jersey airports. The degree of controversy about the impacts of EECP on New Jersey has led to a statutory requirement (Aviation Safety and Capacity Expansion Act of 1990, Section 9119) for FAA to prepare an Environmental Impact Statement on the effects of the changes in aircraft flight patterns over the State of New Jersey caused by implementation of the EECP.

The proposed action is the continuation of the air traffic control system which was developed over a five-year period to solve air traffic control problems in the enroute system, and which has continued to evolve. The changes made in the system to improve efficiency, reduce delays and maintain safe operations covered an area of 20 States. The complex and costly changes to facilities, procedures, regulations and staffing required extensive planning, coordination and technical definition. The six objectives for which the Expanded East Coast Plan was implemented are restated as follows:

1. Reduce delays by realignment of airspace along the eastern United States.

2. Increase New York metroplex departure routes from 17 to 28.

3. Increase New York metroplex arrival routes from nine to 12.

4. Implement the quadrant concept for departures and arrivals at both the New York and Washington metroplex areas.

5. Extend the quadrant concept into the enroute environment in order to:

    - Provide for unrestricted climbs to the extent possible.
    - Provide for optimum descent to the extent possible.
    - Accomplish all crosses/merges in level flight or low and slow.
    - Reduce the number of multifunction sectors.
    - Enhance enroute metering.

6. Reduce coordination and complexity among facilities.

2.2.2 Geographic Scope

The EIS adheres strictly to the geographic scope that was delineated by Congress for the EIS — environmental effects over the State of New Jersey and adjacent coastal waters. The EECP potentially impacts portions of at least 22 states and tens of thousands of square miles. In addition, given the time constraints on the process, the difficulty of determining a rational basis for including some additional areas and excluding others, and the complexity of an expanded study, it would not have been practicable or feasible to expand the scope of the EIS into other parts of the air traffic system affected by the EECP.

2.3 RELATED STUDIES

2.3.1 New York Metropolitan Area Aircraft Noise Mitigation Review

The FAA has conducted an Aircraft Noise Mitigation Review (ANMR) to examine aircraft noise issues and explore possible alternative operational procedures that might mitigate the effects of aircraft noise in the Greater New York Metropolitan area. The review area encompassed the airspace within a 55 nautical mile radius of LaGuardia Airport overlying the States of New York, Connecticut, and New Jersey. The review area in New Jersey was necessarily limited, both to avoid unnecessary duplication and for consistency with the statutory limits on the scope of the EIS. In accordance with Public Law 101-508, Section 9119(c), the EIS will evaluate and consider possible alternatives to the aircraft flight patterns implemented by the EECP over New Jersey. Since the EECP EIS will evaluate noise impacts and possible operational alternatives in the airspace above 3,000 feet, the ANMR area with respect to New Jersey was limited to airspace below 3,000 feet.

The review was performed by a team of FAA experts drawn from a number of operational areas such as Air Traffic, Airway Facilities, Flight Standards, and Airports. In order to identify specific concerns, the FAA relied heavily on input from the general public, including community organizations. The review team was charged with considering community input, reviewing existing procedures, and investigating viable operational alternatives to possibly mitigate the effects of aircraft noise on the ANMR area.

During the public scoping meetings held in New Jersey as part of the EIS, it became even more evident that the issue of aircraft noise in New York metropolitan area exceeds the boundaries of any one State and the flight patterns attributable to the implementation of the EECP. It is a regional issue, not limited to the effects of the EECP, and therefore must be addressed as such. For these reasons, the FAA conducted the ANMR in the New York Metropolitan area to supplement the EIS on the EECP currently being conducted in New Jersey. It is important to note however, that the difference between the EIS and the ANMR is that the ANMR focused only on aircraft noise issues, not on the all encompassing issues covered in an EIS.

The ANMR team considered all aircraft noise issues raised by the community. The New Jersey portion of the review included noise issues and operational alternatives not related to the EECP that were nonetheless raised during the public scoping meetings held in March and April 1991 as part of the EIS process.

1. "Expanded East Coast Plan," National Implementation Plan FAA DOT, Sept. 17, 1986.

2. Airman's Information Manual, April 4, 1991, FAA DOT.

3. FAA Glossary, 1975.

4. FAA Order 1050.1D. Policies and Procedures for Considering Environmental Impacts.

5. Expanded East Coast Plan Eastern Region Phase I, November 1985. FAA Eastern Region.

6. Expanded East Coast Plan. Tab D, September 17, 1986. FAA

7. FAA Briefing Sheet, undated.

8. FAA Briefing Sheet, 6/21/88.

9. Air Traffic System Management, Air Traffic Activity and Delay Report, March 1991, p. 3.

10. Noise from the Expanded East Coast Plan Operations, Harris Miller Miller & Hanson, Inc., November 1988.

11. Aircraft Noise Implementation of FAA's Expanded East Coast Plan. August 1988, General Accounting Office.

12. Noise from Expanded East Coast Plan Operations. Harris Miller Miller & Hanson, Inc., November 1988.

13. Effects of the Expanded East Coast Air Traffic Plan on Noise Over Northern New Jersey. Wyle Research, March 1989.

14. Air Traffic Activity and Delay Report, Air Traffic System Management, FAA, August 1990.

15. 1990-91 Aviation System Capacity Plan. FAA, September 1990.

Chapter Three

Alternatives

CHAPTER 3. ALTERNATIVES

"This section (alternatives) is the heart of the environmental impact statement."[1] In this case, the development of alternatives is complicated by the fact that this EIS is being conducted well after implementation of the Expanded East Coast Plan (EECP). In recognition of the importance of alternatives and the complications associated with a retroactive study, FAA conducted an extensive public scoping process to identify potential impacts and possible alternatives. This chapter summarizes the scoping process, describes the resultant alternatives, evaluates reasonable alternatives, and summarizes the comparative analysis of alternatives.

Numerous terms are applied to the flight of aircraft. For purposes of clarity, this chapter uses the following terminology. Tracks refer to the passage of aircraft over the ground as observed by radar. Procedures are published directions relating to the flight of aircraft. Routes are published Jet Routes or low altitude (Victor) airways. Routing is the act of assigning aircraft to particular directions and altitudes such as vectoring by air traffic controllers, assignment of arrival and departure procedures, or assignment to routes. Detailed descriptions of the operational assumptions used to evaluate alternatives are contained in Chapter 5.

3.1 ALTERNATIVES DEVELOPMENT PROCESS

"On February 21, 1991, the FAA published notice in the Federal Register of its intention to prepare the EIS (of the EECP) and to conduct three public meetings in March 1991 as part of the scoping process .... The dates and locations of those meetings were advertised in local newspapers and published in the Federal Register on February 26, 1991. The meetings were held in Tinton Falls, Runnemede, and Cranford, N.J., on March 11-12, 20-21, and 26-27, respectively, to cover a cross-section of the entire State."

"Because of the high degree of public interest in the EIS, the FAA decided to hold two additional public scoping meetings on April 17 and 18 in Rochelle Park and Parsippany, N.J., respectively. A total of 260 people testified at, and approximately 1,000 persons attended these meetings."[2]

Comments received through the scoping process indicated that concerns focus on arrivals and departures, not high altitude operations. Aircraft departing from Newark were a particular concern. This process suggested a number of alternatives to be considered by the FAA. Following FAA review of these comments and analyses of operational feasibility, a total of five alternatives were developed for consideration. The following sections outline the development of these alternatives.

3.1.1 The Expanded East Coast Plan (EECP) Existing Air Routes, Airways, and Air Traffic Control Procedures

Proposals subject to environmental review consist of Federal actions including "new and continuing activities, including projects and programs entirely or partly financed, assisted, conducted, regulated, or approved by Federal agencies; new or revised agency rules, regulations, plans, policies or procedures; and legislative proposals."[3] The EECP is a Federal action that falls under the "continuing activity" category. Since the EIS is being conducted following implementation of the EECP, continuation of the air traffic procedures resulting from the implementation should be evaluated as the proposed action.

The implementation of the EECP revised standard operating procedures used by the FAA to control air traffic flows above 3,000 AGL over the Eastern United States. As described in Chapter 2, Phase I of the EECP was initially implemented in 1987 and reorganized the air route network of the Metropolitan New York City area, including much of northern New Jersey.[4] Since the implementation of the EECP, air traffic procedures have been continuously modified to improve the efficiency of air traffic management and to reduce environmental impacts. For instance, HUSH 1 procedures (revising routing for aircraft

Delays would result from the need to increase vertical separation so that all aircraft could follow the same specific route safely. Controllers could not laterally separate the aircraft until they were well offshore. Although it may be possible to tunnel Newark southbound departures east at low altitudes under traffic inbound to LaGuardia and JFK from the south and outbound from JFK to the south, the purpose and need for the EECP would not be met. Sending traffic flows from one airport into the path of flows from other airports increases delays and is neither a safe nor efficient use of the navigable airspace. Tunnelling is costly, because jet aircraft are not fuel efficient when operating at low altitudes. This alternative was not retained for detailed study based on delay and capacity concerns, potential safety concerns, and cost to the users.

The Triangular Offshore Procedure

This procedure would route aircraft south to a point just south of Staten Island, with a left turn over Raritan Bay to intercept Victor Airway 123, then northeast to a point parallel with Newark, then westward overflying Newark at 11,000 or higher and then on course. This procedure would also impose costs to the user. However, it would severely restrict and delay flights into and out of LaGuardia, JFK, White Plains, Islip, Bridgeport, and New Haven airports. It would also require circuitous routes and delay enroute traffic from the northeast destined for Philadelphia, Baltimore, Washington National, and Dulles airports. This procedure was not retained because it would significantly constrain operations at several major airports outside of New Jersey.[6]

The Sandy Hook Offshore Procedure

Under this procedure, traffic departing Newark would proceed southbound over the Arthur Kill Waterway, turning eastbound south of the tip of Staten Island, over Manalapan Bay and the Hudson River to a point over the coast near Sandy Hook, and then make a right turn either to a southerly or a westerly heading. To cross arrivals to Kennedy and LaGuardia and departures from Kennedy safely, this procedure would require use of the potentially unsafe and costly tunnelling approach described above. This procedure raises other potential safety concerns because Newark traffic heading west would have to interact a second time with Kennedy and LaGuardia traffic. This complicated procedure would unduly increase the complexity of the airspace and air traffic controller workload, requiring controllers to track and separate Newark departures constantly. The Sandy Hook procedure was not considered feasible due to concerns about its potential lack of safety and inefficiency.

The Colts Neck Offshore Procedure

This procedure would direct southbound departures towards the Colts Neck navigational aid and then eastward over the coastline with varying routes depending upon destination. Implementation of the Colts Neck procedure would severely restrict operations and cause unacceptable levels of delay at LaGuardia and JFK.

Relocation of LaGuardia and Kennedy Routes

Relocation of the conflicting LaGuardia and Kennedy Routes would require a lengthy planning effort like the EECP. It is not possible to relocate the conflicting arrival and departure routes at LaGuardia and Kennedy in isolation from the system of routes to accommodate any of these alternative procedures. The LaGuardia and Kennedy routes are connected to an entire system of routes in the New York-New Jersey airspace, the busiest airspace in the world. Major changes in routes in this airspace would affect a large portion of the air traffic system in the eastern U.S. For example, the traffic arriving at LaGuardia from the southwest over the Yardley, Pennsylvania (ARD) navigational aid originates on routes and destinations as far west as Denver and as far south as Miami. The traffic arriving at JFK from the east, the southeast, and the south originates on routes and destinations in South and Central America, airports on the East and West Coast, and the Orient. Given these far ranging affects, relocation of conflicting routes at LaGuardia and Kennedy to accommodate over the water routes for Newark departures would require a major study similar to the five year planning effort that led to the Expanded East Coast Plan. Such a

Table 3.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Potential Alternatives Suggested
Through Scoping Process
(1 of 5)

POTENTIAL ALTERNATIVES	SUMMARY OF SCREENING
1. Return to pre-EECP routing.	Incorporated in Alternative B, return to 1986 air routes and procedures using 1991 traffic.
2. Increase use of airspace over the ocean, including military airspace.	Routing all traffic over the ocean is not feasible for numerous reasons. Ultimately, most EECP traffic originates or terminates at airports serving urban centers, thus requiring overflights of populated areas at some point. Alternative C, Oceanic/Military Routing (Nighttime Only) would direct some additional traffic offshore.
3. Accelerate phase-out of Stage 2 aircraft.	Title 14 CFR Part 91.801 establishes an ambitious schedule for eliminating Stage 2 aircraft. Differentiating between EECP and other traffic in terms of Stage 2 phase-out is not feasible.
4. Raise aircraft altitudes.	Raising aircraft altitudes at any point is likely to affect other aircraft operations. The FAA will investigate the feasibility of raising altitudes in those areas where there is a 5 dB or greater increase in noise. This will be addressed as mitigation and implemented if feasible.
5. Impose curfews and/or nighttime restrictions at regional airports.	Restrictions on airport operations fall under the authority of the airport sponsor. Such restrictions must be fair and reasonable, must not be unjustly discriminatory under any Federal grant assurance requirements, may not impose an undue burden on interstate commerce, and must be adopted in compliance with the Airport Noise and Capacity Act of 1990 and 14 CFR Part 161.
6. Establish a coordination process involving the FAA and local communities to resolve aircraft noise problems.	Because of the extensive procedural requirements of the Federal Advisory Committee Act which would apply to coordination on the substantive aspects of the EIS, the FAA elected not to establish such a process for this project beyond the normal NEPA public comment requirements. However, Gov. Florio of New Jersey has established a Newark Airport noise committee which has active FAA participation at the Regional level, and, in addition, in accordance with PL 102-143 the FAA is conducting a regionwide Aircraft Noise Mitigation Review. As a part of the ANMR, the governors of the three states in the region (NY, NJ, and CT) have each appointed three members of a select citizens committee to evaluate aircraft noise issues in the region. In addition, both the FAA and the Port Authority have noise complaint offices, the FAA's is served by a 1-800 number.

Table 3.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Potential Alternatives Suggested Through Scoping Process

(3 of 5)

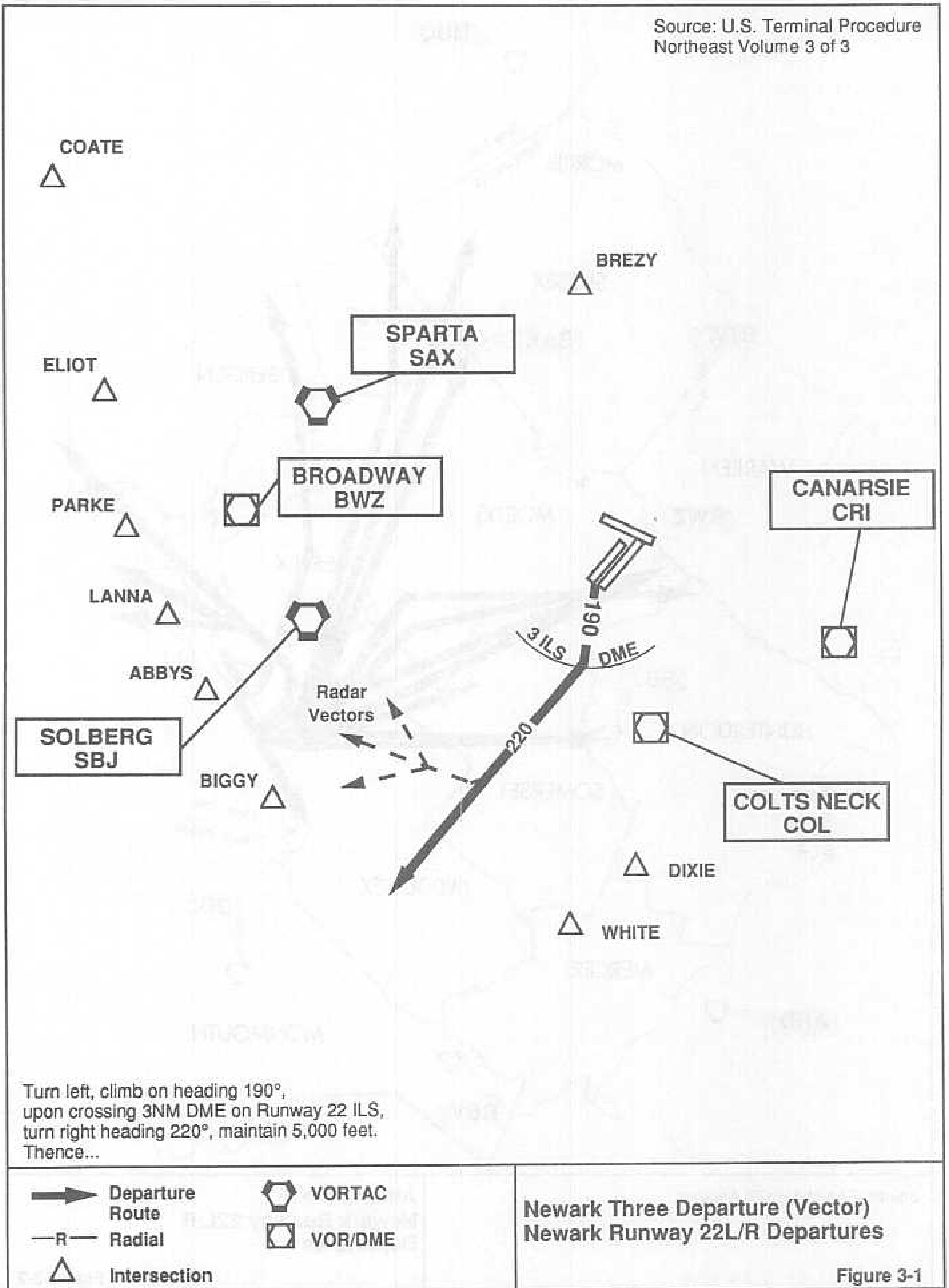
POTENTIAL ALTERNATIVES	SUMMARY OF SCREENING
15. Route noisiest aircraft away from metropolitan areas.	It is not possible to differentiate enroute aircraft by noise characteristics. Furthermore, such regulations would be very disruptive to interstate commerce. Restrictions on aircraft types using metropolitan airports could address this suggestion, but such restrictions fall under the authority of local airport sponsors. (See response to number 5.)
16. Establish noise limits more stringent than FAR Part 36 Stage 3.	Technology does not exist to establish Stage 4 noise standards.
17. Regulate engine run-ups at Newark.	Restrictions on airport operations fall under the authority of the airport sponsor. Insofar as such regulations would limit or restrict aircraft operations, airport operators must establish these regulations in accordance with the Airport Noise and Capacity Act and 14 CFR Part 161.
18. Return to pre-EECP routing at night.	Since EECP routing affects the entire air traffic control system, changing all EECP routing during the course of a day is not feasible. The Ocean/Military Routing (Nighttime Only) alternative partially addresses this suggestion.
19. Develop new airports away from populated areas.	Airport development must be initiated by local sponsors. FAA actively encourages and provides funding assistance for such local initiatives (See also response to number 5.)
20. Change traffic patterns at Philadelphia.	Changing routes to avoid a specific area could adversely affect another area. Any such changes should be planned in a comprehensive manner to balance environmental and operational factors. Such studies may be undertaken as mitigation measures.
21. Limit total activity at Philadelphia.	Restrictions on airport operations fall under the authority of the airport sponsor. Such restrictions must be fair and reasonable, must not be unjustly discriminatory under any Federal grant assurance requirements, may not impose an undue burden on interstate commerce, and must be adopted in compliance with the Airport Noise and Capacity Act of 1990 and 14 CFR Part 161.

Table 3.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Potential Alternatives Suggested Through Scoping Process (5 of 5)

POTENTIAL ALTERNATIVES	SUMMARY OF SCREENING
26. Send cargo traffic from Newark to JFK Airport.	This proposal is an attempt to restrict some nighttime traffic at Newark Airport. Much of the cargo traffic occurs at night. In this respect it is similar to Alternative 5 above. Changes in nighttime activity by relocation of certain types of activities falls under the authority of the airport sponsor. Such restrictions must be fair and reasonable, must not be unjustly discriminatory under any Federal grant assurance requirements, may not impose an undue burden on interstate commerce, and must be adopted in compliance with the Airport Noise and Capacity Act of 1990 and 14 CFR Part 161.
27. Put New York traffic over New York.	At present traffic to and from New York airports passes over New Jersey. Traffic to and from New Jersey airports passes over New York. The geographical proximity of New York and New Jersey and the north, east, west and south-bound nature of the traffic renders this alternative not feasible.
28. Reroute LaGuardia and Kennedy Traffic.	The apparent intent of this alternative is to prevent LaGuardia and Kennedy traffic from overflying New Jersey. This alternative is similar to Item 27. The geographical proximity of New York and New Jersey and the north, east, west and south bound nature of the traffic renders this alternative impractical.



Newark Three Departure (Vector)
Newark Runway 22L/R Departures

Figure 3-1

Eastbound Traffic

Eastbound traffic is vectored with a right turn leading to a course approximately parallel to and three to five miles from Newark Runways 22R and 22L. The aircraft climb to 5,000 feet and make a right turn over the Teterboro Airport before flying approximately east to cross over the LaGuardia Airport at 5,000 feet.

Northbound Traffic

Northbound traffic is vectored with a right turn to intercept a course to cross the SPARTA VOR Tactical Air Navigation (VORTAC) approximately 27 miles northwest of Newark at approximately 14,000 feet (with clearance to climb to 17,000 feet). Aircraft normally climb to 8,000 feet some 12 route miles from the runways.

Westbound Traffic

Westbound traffic is vectored with a right turn to pass through a departure gate approximately 20 miles WNW of Newark at approximately 13,000 feet (with a clearance to climb to 17,000 feet), and thence to cross one of four departure fixes (ELIOT, PARKE, LANNA, or BIGGY, as shown on Figure 3-1) approximately 45 miles west of Newark. Aircraft normally climb to 8,000 feet some 11 route miles from the runways.

This procedure permits reduced separation intervals between aircraft (compared with the pre-EECP procedures) by allowing alternate westbound aircraft to be cleared on different tracks (1) by varying the location (in the range from approximately five to eight miles) of the right turn towards the departure gate, and (2) by routing aircraft to pass over different departure fixes.

During the night, when the number of flights have decreased, westbound departures are cleared to climb to 10,000 feet and are turned to fly directly to SOLBERG (SBJ) when leaving 2,000 feet. This procedure is employed for noise abatement reasons, and is not feasible during other hours due to interaction with LaGuardia arrival traffic (from the LIZZI fix where they are descending from 11,000 feet and through the WARRD fix where they are descending from 8,000 feet). Aircraft are normally climbing through 8,000 feet some 14 route miles from the runways in this nighttime procedure.

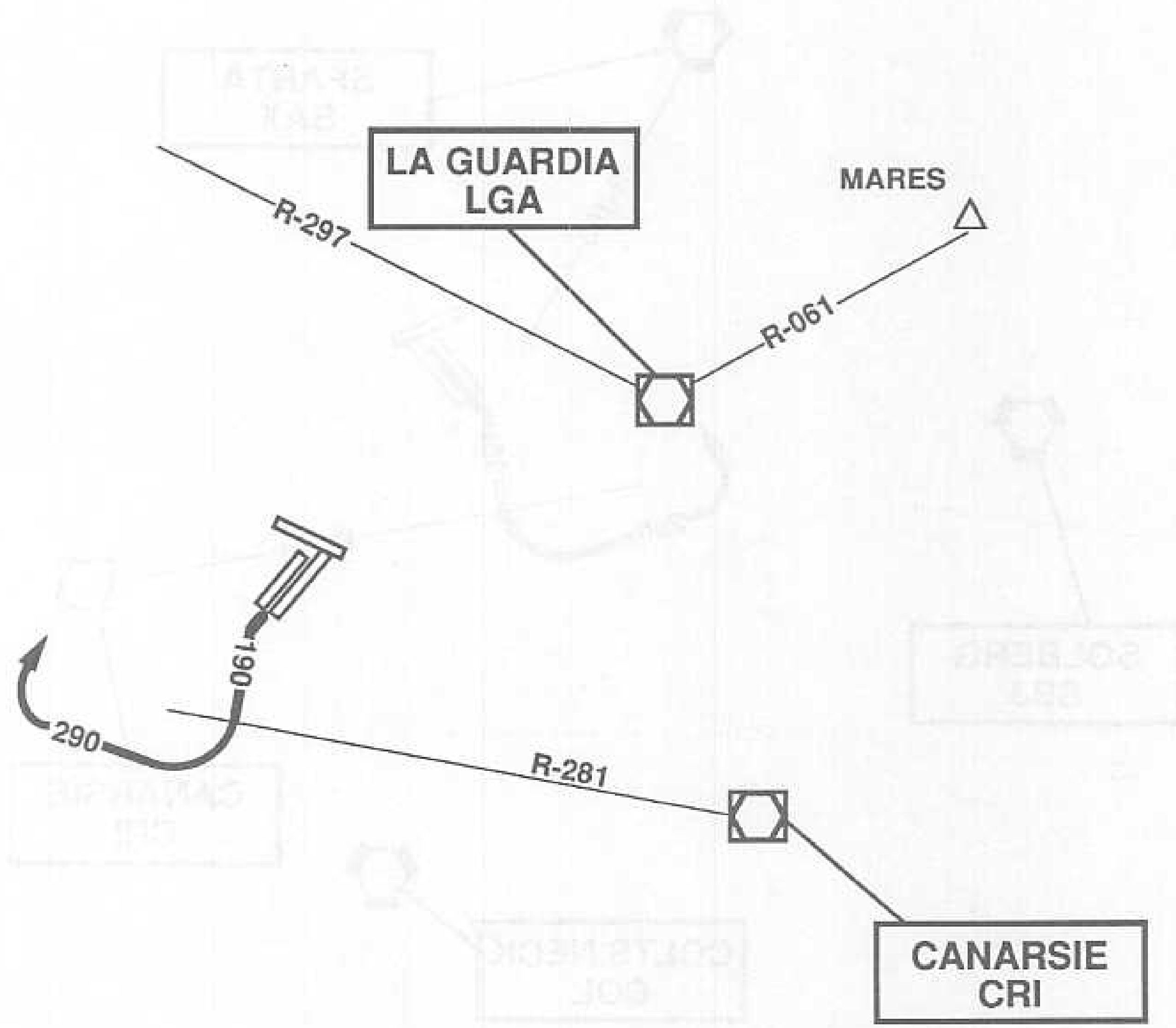
Southbound Traffic

Southbound traffic follows a 220 degree heading to approximately seven miles from Newark and is then vectored with right and then left turns to intercept the COLTS NECK VOR with DME (VOR-DME) 350 degree radial and fly to cross COLTS NECK at approximately 6,000 feet. Aircraft may not climb above 6,000 feet until they are within three miles of COLTS NECK because they must pass under the LaGuardia arrival stream.

3.2.2 Alternative B — Return to 1986 Air Routes and Procedures, using 1991 Traffic

Very little actual radar track data is available for 1986 traffic. Consequently, the routings had to be largely procedural in nature. Where possible, available information was utilized to modify the procedural description of the traffic for input into the noise model.

The aircraft routings and altitudes provided by the FAA for departures from Newark Runways 22R and 22L are shown in Figure 3-3. All Newark 22 jet departures fly an initial 190 degree heading and are cleared to climb to 2,500 feet. When the aircraft pass through 2,000 feet, they receive vectors to course and altitude assignments corresponding with the direction of flight. The standard departure procedures are described in the 1986 Standard Instrument Departure (SID) procedures: the Mares 5 (Eastbound), Port Jervis 7 (Northbound), Somerset 1 (Westbound), and Cranbury 2 (Southbound). Schematics of these SIDs are shown in Figures 3-4, 3-5, 3-6 and 3-7 respectively. The aircraft altitudes described in the following are normal altitude changes in vectoring used for traffic efficiency and differ from the SID.



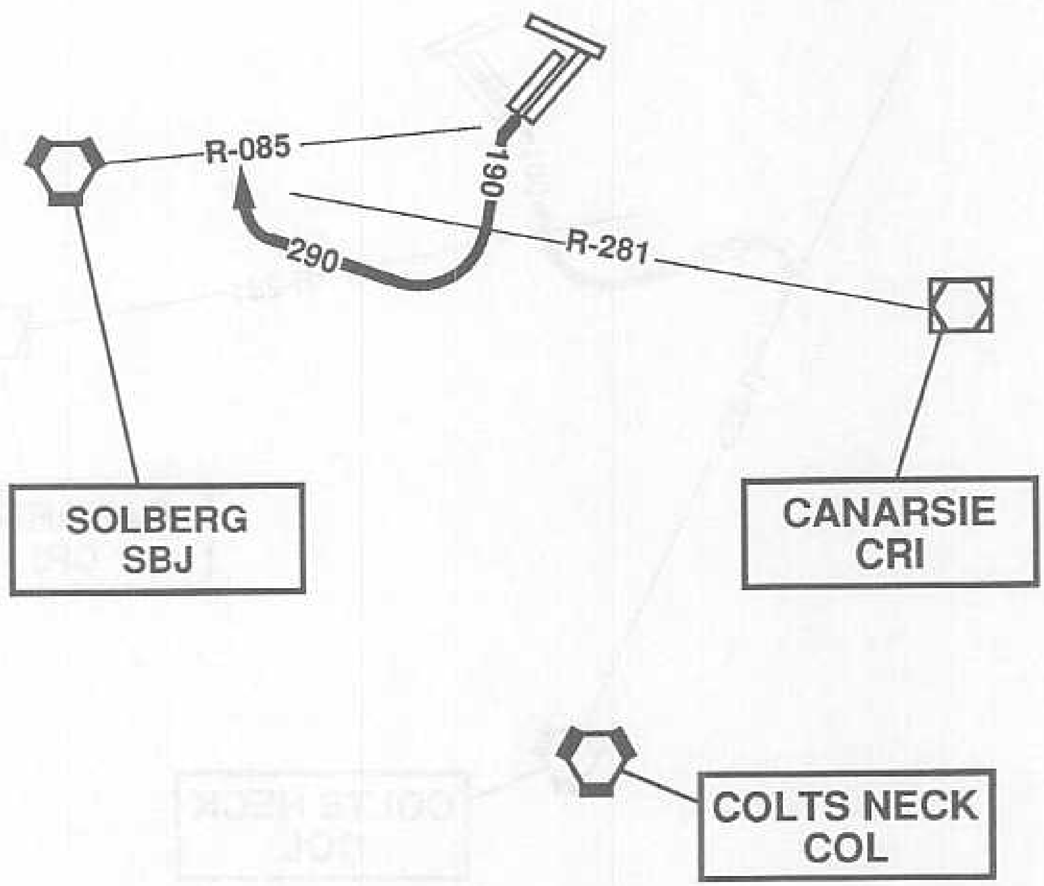
Turn left as soon as feasible, climb on heading 190°, upon crossing CRI R-281 turn right heading 290°, for vector to LGA R-297 to LGA R-061 to Mares intersection, maintain 2,500 feet then via (transition) or (assigned route).

Source: 1986 SID

Departure Route	VORTAC
—R— Radial	VOR/DME
Intersection	

1986 Departure Procedures (Mares 5) Eastbound Newark Runway 22 L/R Departures

Figure 3-4



Turn left as soon as feasible, climb on heading 190°, upon crossing CRI R-281, turn right heading 290°, for vector to SBJ R-085 to SBJ VORTAC, maintain 2,500 feet, then via (transition) or (assigned route).

Source: 1986 SID

Departure Route

—R— Radial

VORTAC

VOR/DME

1986 Departure Procedures (Somerset 1) Westbound Newark Runway 22 L/R Departures

Figure 3-6

Eastbound Traffic

Eastbound traffic is normally vectored with a right turn leading to a course approximately parallel to and three miles from Newark Runways 22R and 22L. The aircraft climb to 5,000 feet and make a right turn over the Teterboro Airport before flying approximately east to cross over the LaGuardia Airport at 5,000 feet (Figure 3-4).

Northbound Traffic

Northbound traffic is vectored with a right turn to a heading of 360 degrees to intercept the SPARTA VORTAC 150 degree radial and fly to SPARTA, climbing to approximately 14,000 feet (with a clearance to climb to 17,000 feet). Aircraft normally climb to 6,000 feet some six route miles from the runways (Figure 3-5).

Westbound Traffic

Westbound traffic is vectored with a right turn to a heading of 290 degrees to intercept the SOLBERG VORTAC 085 degree radial and fly to SOLBERG, climbing to approximately 10,000 feet. Aircraft normally climb to 8,000 feet some 11 route miles from the runways (Figure 3-6).

As all westbound departures from Newark Runways 22R and 22L must cross the single SOLBERG VORTAC, controllers must provide in-trail (single file) separations, resulting in reduced flow rates.

Southbound Traffic

Southbound traffic follows a 290 degree heading to approximately 8 miles from Newark, and is then vectored with left turns to a 160 degree heading to intercept the COLTS NECK VOR-DME 335 degree radial, and cross COLTS NECK at approximately 6,000 feet (Figure 3-7).

The 335 radial used in Alternative B differs from the 350 radial used in Alternative A for two reasons.

- In Alternative B, Newark arrivals cross the YARDLEY VOR and LaGuardia arrivals cross the ROBBINSVILLE VOR.
- In Alternative A, Newark arrivals cross the ROBBINSVILLE VOR and LaGuardia arrivals cross the YARDLEY VOR.

3.2.3 Alternative C — Oceanic/Military Routing (Nighttime Only) — Newark Departures on Runways 22R and 22L Routed Over Raritan Bay at Night Only

Several sub-alternatives were considered before sub-alternative C2 was selected for further consideration. C2 is shown in Figure 3-8, and represents actual modeled tracks. Each sub-alternative contained an initial departure heading of 190 degrees to a three DME point. From this point on, the sub-alternatives differ as follows:

C1. Left turn to heading 140 and intercept COLTS NECK 055 Radial
C2. Right turn to heading 220, intercept SOLBERG 113 Radial and COLTS NECK 065 Radial
C3. Right turn to and continue heading 220, intercept COLTS NECK 350 Radial

C1. Left turn to Heading 140 and intercept COLTS NECK 055 Radial

At three DME, departures in this subalternative turn left to a heading of 140 degrees and climb to an altitude of no more than 5,000 feet in the vicinity of the shoreline. The climb then continues to 6,000 feet at approximately 14 miles, and then a right turn is made to intercept the COLTS NECK 055 radial.

C2. Right turn to 220 Heading, intercept SOLBERG 113 Radial and COLTS NECK 065 Radial

At three DME, departures in this subalternative turn right to a heading of 220 degrees and are cleared to climb to 6,000 feet. At approximately 11 miles, the aircraft then turn left to intercept the SOLBERG

113 Radial. When the aircraft is approximately 33 miles from SOLBERG, the aircraft is cleared to climb to 10,000 feet and turn to the COLTS NECK 065 radial. The aircraft cross the New Jersey shoreline at approximately 8,000 feet.

C3. Continue Heading 220, intercept COLTS NECK 350 Radial

At three DME, departures on this subalternative turn right to a heading of 220 degrees and are cleared to climb to 6,000 feet. The aircraft then turn left to intercept the COLTS NECK 350 Radial. When the aircraft cross COLTS NECK at 6,000 feet, they turn left onto the COLTS NECK 105 Radial and are cleared to climb to 14,000 feet.

When the aircraft reach 10,000 feet, they turn left to intercept the COLTS NECK 094 radial and cross COLTS NECK westbound at 14,000 feet. The aircraft cross the New Jersey shoreline eastbound at approximately 8,000 feet and westbound at approximately 12,000 feet.

Evaluation of Sub-Alternatives

FAA reviewed these subalternatives and selected C2 as the alternative for further consideration.

C1 was not selected, because the routing directly over Staten Island is felt to be impractical due to severe noise concerns in New York.

C3 was not selected because it provides less noise benefits than C2 due to extended low altitude flight over Monmouth County. This option would also involve significant operational disadvantages.

C2 was selected because it should provide some noise abatement benefits without any obvious operational disadvantage.

A subalternative to C2 was also investigated that included a visual departure that followed the "Arthur Kill" waterway instead of using the 220 heading. This sub-alternative was rejected because it would not be available in restricted visibility conditions, may be difficult to fly (especially at night) due to the attitude of the aircraft during climb, and may increase pilot workload, thereby reducing the precision of the turn to intercept the SOLBERG 113 radial.

3.2.4 Alternative D — Spreading Air Traffic: Additional Routes for Newark Departures on Runways 22R and 22L

Several sub-alternatives were considered before this alternative was selected for further consideration of the DEIS. The sub-alternatives are:

- D1. Initial Heading 195 Degrees to 2.5 DME then Turn to Course
- D2. Two Initial Headings to 3 DME, then Turn to Course
- D3. Three Initial Headings to 2,000 feet altitude, then Turn to Course
- D4. Turn to Course at End of Runway

D1. Initial Heading 195 Degrees to 2.5 DME then Turn to Course

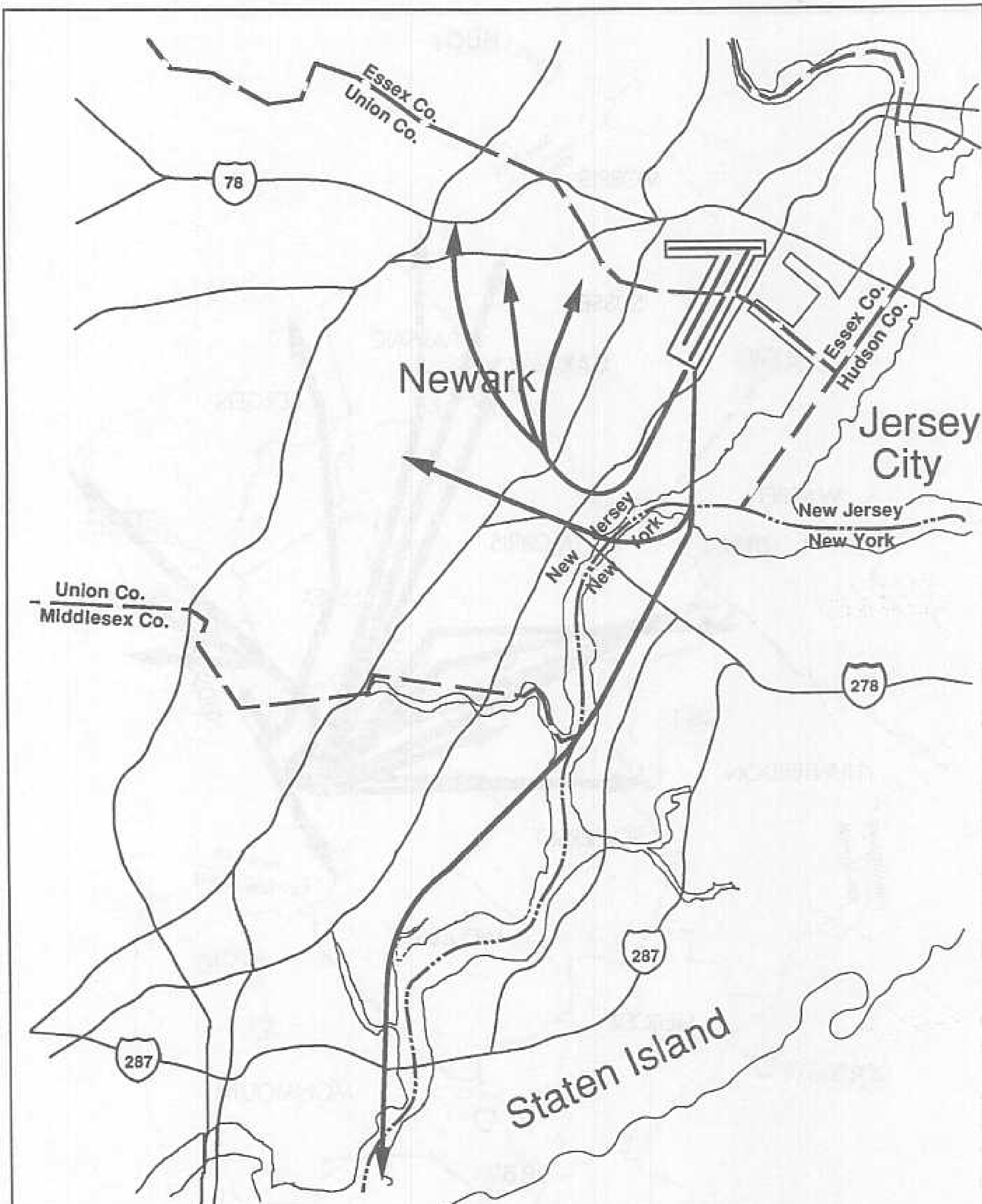
As shown in Figure 3-9, departures follow an initial heading of 195 degrees to 2.5 DME and then turn to the routes identified in Alternative A.

D2. Two Initial Headings to Three DME, then Turn to Course

As shown in Figure 3-10, Westbound and Southbound departures follow an initial heading of 190 degrees to three DME and then turn to the routes identified in Alternative A. Northbound and Eastbound departures follow an initial heading of 220 degrees to three DME and then turn to the routes identified in Alternative A.

D3. Three Initial Headings to 2,000 feet, then Turn to Course

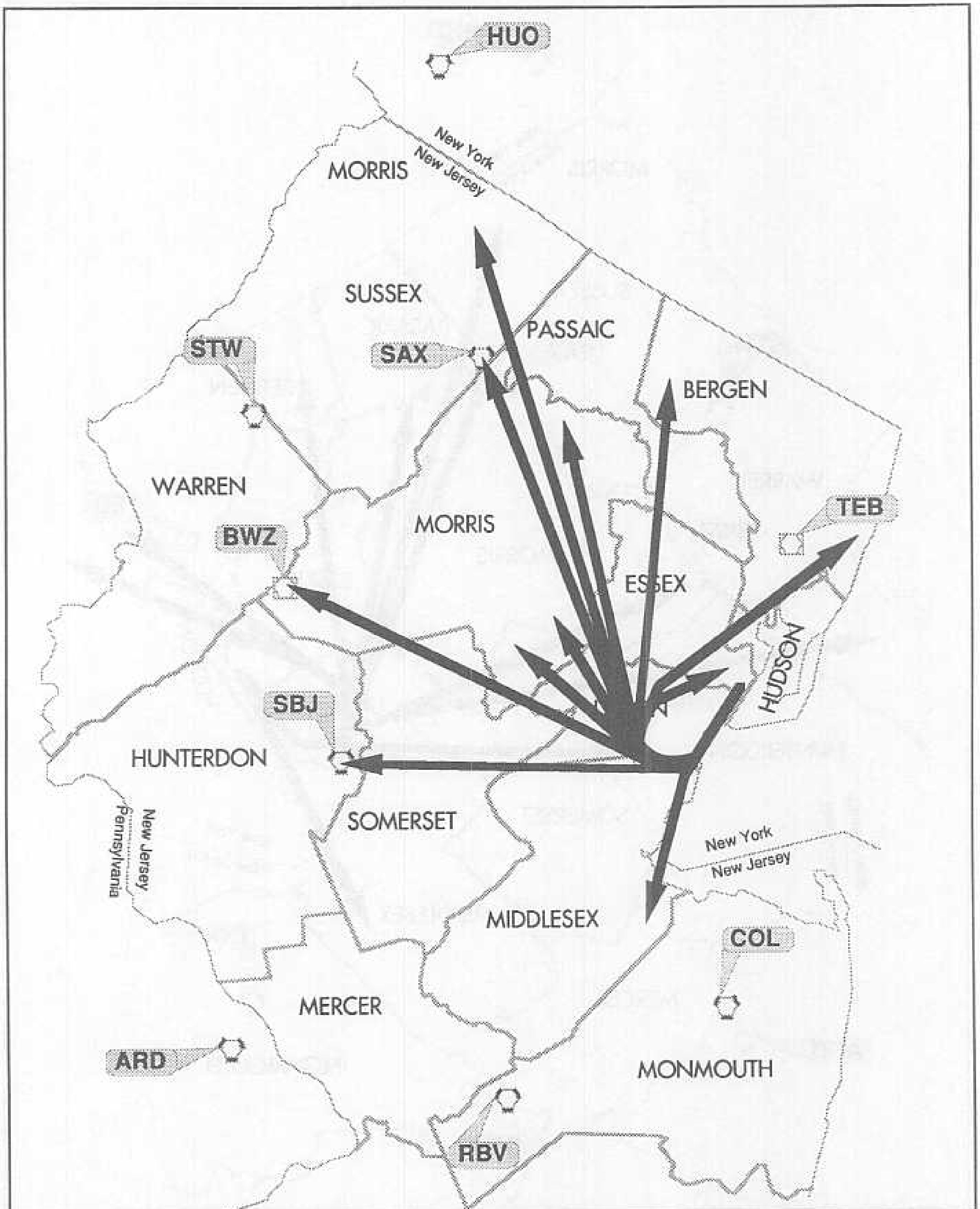
As shown in Figures 3-11, 3-12 and 3-13, departures follow one of three initial headings (190, 205, or 220) to 2,000 feet, and then turn to the routes identified in Alternative A. These figures show the routes as modeled in the noise computer program.



Source: HNTB Analysis

Alternative D2
Spreading Air Traffic
Newark Runway 22 Departures

Figure 3-10



Source: FAA and HNTB Analysis

Alternative D-3
205° Heading

Figure 3-12

The hours of operation of the different initial departure headings for noise analysis will be governed by air traffic control procedures to balance the number of aircraft assigned to each of the three headings over the course of a year.

D4. <u>Turn to Course at End of Runway</u>

As shown in Figure 3-14, departures turn to the routes identified in Alternative A immediately after crossing the runway end.

<u>Evaluation of Sub-Alternatives</u>

FAA reviewed these sub-alternatives and selected D3 as the sub-alternative for further consideration.

D1 was not selected as it does not provide any significant difference from current procedures, and is more difficult to fly because of the shorter time from lift-off to start of turn.

D2 was not selected as it provided no obvious operational advantage nor any apparent noise abatement benefit. The departure sequence would need to be staged carefully to avoid capacity losses.

D4 was not selected as potentially significant new noise impacts were thought to be undesirable.

D3 was selected as it provides some operational advantage by permitting straight-out departures during the departure peaks while also spreading the departures to allow quiet periods at several close-in communities for parts of the day. (This is similar to the technique currently employed at LaGuardia for some departures.)

This alternative would change departure procedures below 3000 feet. Before it could be implemented the effect of other airport related traffic would need to be evaluated. A separate environmental analysis of that procedural change would be required.

3.3 SUMMARY COMPARISON OF REASONABLE ALTERNATIVES

FAA Orders 1050.1D and 5050.4A describe twenty-two environmental factors to be considered in the analysis of potential environmental impacts. The nature of the proposed action determines which of these factors apply. This determination is normally made through the scoping process. In this case, public comments received through the scoping process assisted the FAA in delineating the issues to be addressed in the EIS. Aircraft noise clearly emerged as the issue of greatest community concern. Aircraft emissions and their effects on air and water quality were cited as the second most important concern.

Table 3.2 summarizes the environmental effects of the reasonable alternatives. Analysis of potential environmental impacts indicates that no alternative would generate a significant impact in any of the areas considered, except one census block where the Return to 1986 Routes causes an increase greater than 1.5 dB in an area where the noise level is DNL 65 dB or greater. A brief review of the environmental factors identified through the scoping process follows.

3.3.1 Noise Effects

The primary descriptor of aircraft noise used in noise compatibility planning is the Day-Night Sound Level (DNL), which provides an indication of overall noise exposure resulting from an accumulation of individual noise events occurring over a 24-hour period. Although individual reactions to noise vary widely for a given level, the aggregate response to speech interference and sleep disruption and the desire for a quiet environment are predictable. These responses relate well to measures of cumulative noise exposure such as DNL.

The FAA and other Federal and State agencies have used DNL to evaluate community exposure to noise. The exposure level of DNL 65 dB represents the threshold of significance; all land uses are considered compatible with aircraft noise at exposure levels below DNL 65 dB, although people may be

Table 3.2

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Summary of Environmental Effects by Alternative

ALTERNATIVE	NOISE Population Exposed to DNL 5 dB or Greater Decrease or Increase Relative to EECP						AIR QUALITY Total Emissions (lbs. x 1,000)					FUEL BURN (lbs. x 1,000)
	DNL Range 45-50	DNL Range 50-55	DNL Range 55-60	DNL Range 60-65	DNL Range 65-70	Total Change	HC	CO	NO_x	SO_x	Part.	
A. EECP	N/A	N/A	N/A	N/A	N/A	N/A	3.45	23.18	86.34	2.91	.18	5,421
B. 1986 Routes	-40,527	-5,095	-0	-0	-0	-45,622	3.80	26.20	86.35	2.97	.17	5,492
	+363,577	+421,837	+620,220	+56,227	+58	+1,461,919						
C. Oceanic/Military Routes (Nighttime)	-0	-0	-0	-0	-0	-0	3.45	23.20	86.52	2.91	.18	5,428
	+4,349	+0	+0	+0	+0	+0						
D. Spreading	-0	-0	-0	-0	-0	-0	3.45	23.21	86.45	2.91	.18	5,422
	+0	+0	+0	+0	+0	+0						

1. CEQ 1502.14

2. Federal Register/Vol. 56, No. 124/Thursday, June 27, 1991, p. 29,522.

3. CEQ, 1986.

4. Expanded East Coast Plan, National Implementation Plan, Department of Transportation, Federal Aviation Administration, September 17, 1986.

5. Newark over the Water Department Study Department of Transportation, Federal Aviation Administration Air Traffic Service February 7, 1990.

6. Ibid.

Chapter Four

Affected Environment

CHAPTER 4. AFFECTED ENVIRONMENT

In accordance with the statutory mandate to consider the effects of air traffic over New Jersey, the environment addressed in this EIS is the area within New Jersey. This chapter provides a brief description of the geography of the State; its generalized land use; its population, industry and commerce; its natural resources; and its cultural resources. Expected future development within the State is also described in general terms.

4.1 GEOGRAPHIC DESCRIPTION

New Jersey is a Mid-Atlantic State comprised of 7,787 square miles,[1] of which 319 square miles are water area.[2] The 4,984,000 acres of surface are made up of 145,000 acres of Federal land, 1,163,000 acres of urban or build-up area, and 3,342,000 acres of rural land. The remaining 334,000 acres are water and minor land uses. For the purposes of this analysis, Coastal Waters of New Jersey are considered to be those waters within three nautical miles of the shore, consistent with Coastal Zone Management Rules of New Jersey.[3]

The northwestern part of the State is mountainous, typical of Eastern Highlands. The highest elevation is High Point at 1,803 feet. The lowest part of the terrain is coastal at mean sea level. Between the highlands and the beaches the State is largely Atlantic rolling plains. The coastal area has sand beaches and barrier islands.

New Jersey is bordered on the north by the New York State line and the Hudson River. The Delaware River forms the western boundary with Pennsylvania and Delaware. The Delaware Bay forms the southwestern boundary; the Atlantic Ocean, the eastern boundary; and Lower New York Bay, the northeastern boundary. It is approximately 165 miles from the northwestern corner of the State to the southern tip of Cape May. The narrowest part of the State just south of Trenton is 35 miles in width. The length of the State is oriented slightly east of north.

New Jersey is approximately at the center of the five-State Eastern Region of the FAA (shown in Figure 4-1). New Jersey contains six airports with FAA Air Traffic Control Towers. McGuire Air Force Base provides air traffic control services for a number of civil airports in its vicinity. Newark is the only large hub air carrier airport in New Jersey.[4] Part of the terminal control area (TCA) for New York overlies northern New Jersey. Part of the Philadelphia TCA overlies the Camden area of New Jersey. There is an Airport Radar Service Area (ARSA) at Atlantic City. Fourteen VORs provide enroute navigation aids for the low altitude airways up to 18,000 feet and the high altitude jet routes above.

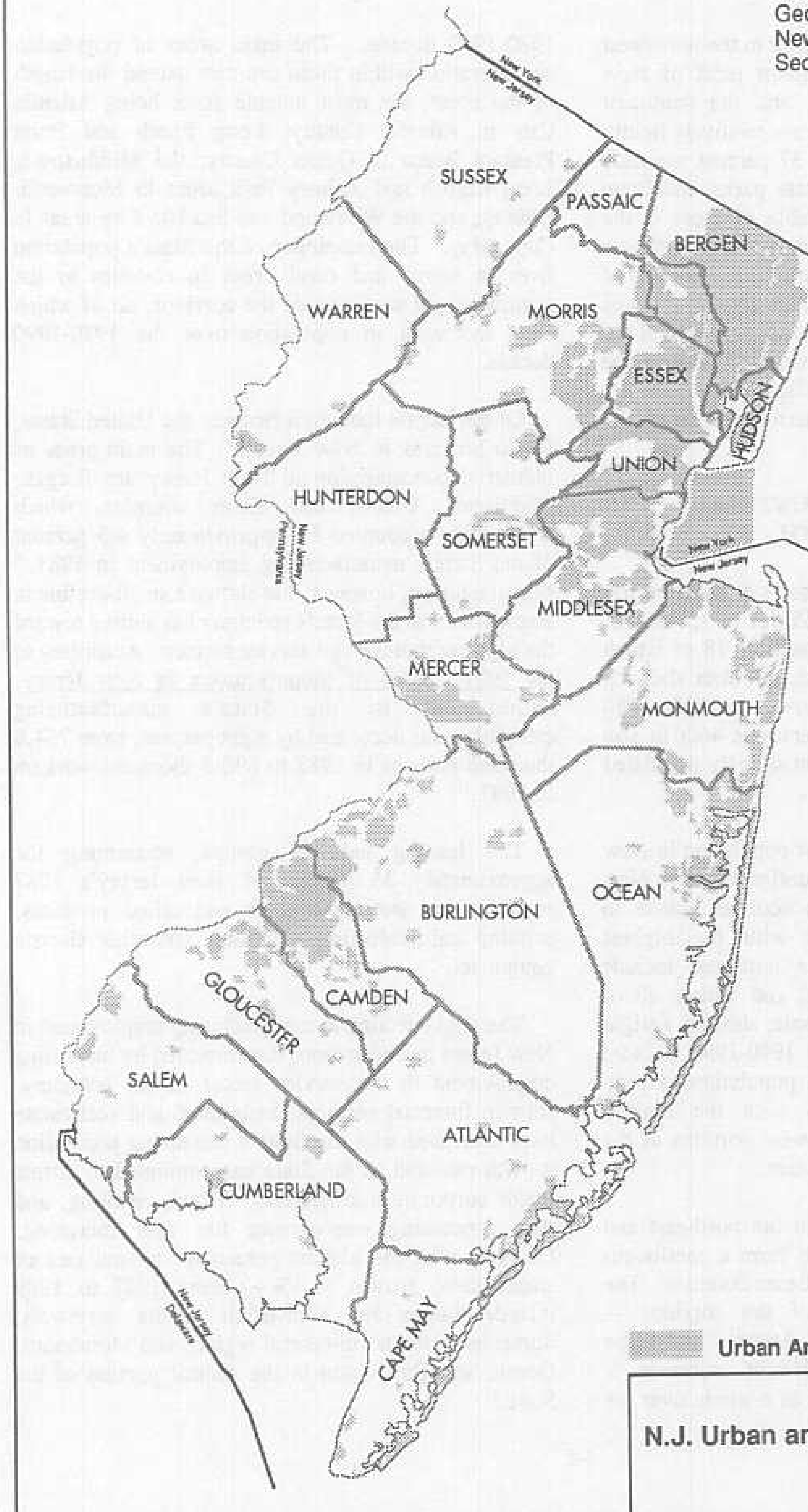
4.2 LAND USE

This section provides a brief general description of land use in New Jersey. Reference is made to urban and non-urban areas as they occur in the State's 21 counties. Figure 4-2 shows built-up areas for towns with a population of over 10,000.

Approximately 23 percent of New Jersey consists of urban or built-up areas.[5] The most concentrated urban area is in the northeast portion of the State, where there are four cities with populations of more than 100,000. These are: Newark in Essex County, Jersey City in Hudson County, Paterson in Bergen County, and Elizabeth in Union County.[6]

Other urban areas in the southwest portion of the State include: Trenton, the State capital, in Mercer County; New Brunswick in Middlesex County; and Camden in Camden County. The small-town aspect of New Jersey's urbanization is evident in the many smaller communities and municipalities which have suburbanized outward from the major urban areas. From Bergen County in the northeast to Camden County in the southwest, a continuous urban corridor is forming. In addition, an urbanized strip extends along much of the 120 mile ocean shoreline where resort towns and, more notably, cities have developed.

Source: U.S. Department of Interior
Geological Survey and
New York and Washington
Sectional Aeronautical Charts



Urban Areas

N.J. Urban and Non-Urban Areas

Figure 4-2

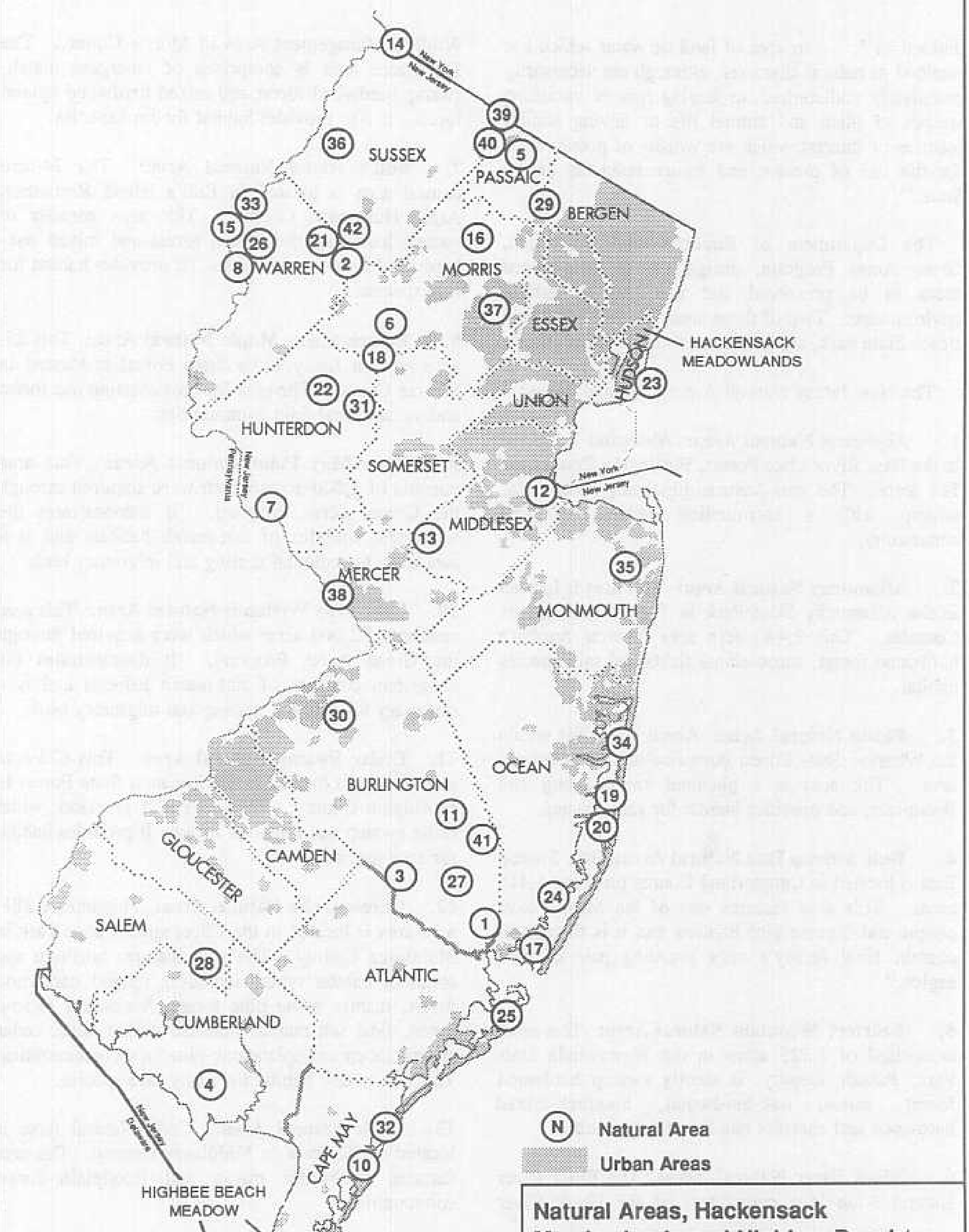
Table 4.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

New Jersey Population Change from 1980-1990 (by County)

County/Year	1980	1990	% Change
Atlantic	194,119	224,327	16
Bergen	845,385	825,380	-2
Burlington	362,542	395,066	9
Camden	471,650	502,824	7
Cape May	82,266	95,089	15
Cumberland	132,866	138,053	4
Essex	851,304	778,206	-9
Gloucester	199,917	230,082	15
Hudson	556,972	553,099	-1
Hunterdon	87,361	107,776	23
Mercer	307,863	325,824	6
Middlesex	595,893	671,780	12
Monmouth	503,173	553,124	18
Morris	407,630	421,353	3
Ocean	346,038	433,203	25
Passaic	447,585	453,060	1
Salem	64,676	65,294	1
Somerset	203,129	240,279	18
Sussex	116,119	130,943	13
Union	504,094	493,819	-2
Warren	84,429	91,607	9
Total	**7,365,011**	**7,730,188**	**5**

Source: U.S. Bureau of the Census Population and Housing Information for New Jersey, 1980 and 1990.



Source: N.J. Dep. of Environ. Protection, Natural Area Systems Directory of Natural Areas 1990

Natural Areas, Hackensack Meadowlands and Highbee Beach/ Pond Creek Meadow Area

Figure 4-3

14. Dryden Kuser Natural Area: This 1,327-acre area in High Point State Park, Sussex County, contains black spruce, Atlantic White Cedar and hemlock with surrounding upland forests. It also provides habitat for rare species.

15. Drumfield Creek Natural Area: This area located in the Worthington State Forest in Warren County is comprised of 1,085 acres of chestnut oak forest and hemlock-mixed hardwood forest communities, and rare species habitat.

16. Farny Natural Area: The Farny Natural Area is comprised of 556 acres in Morris County. The area is mixed oak-hardwood forest and swamp hardwood forest communities and rare species habitat.

17. Great Bay Natural Area: Located on the Bass River in Ocean County, this areas consists of 330 acres, is a salt-marsh habitat and is an excellent example of New Jersey Bay ecosystem. It is a highly productive oyster area and a resting area for coastal birds.

18. Hacklebarney Natural Area: The 465-acre area in Hacklebarney State Park and Morris, Hunterdon and Somerset Counties is a hemlock-mixed hardwood forest, mixed oak-hardwood forest and a successional field community. It also provides habitat for rare species.

19-20. Island Beach State Park: The New Jersey State Legislature has statutorily recognized that Island Beach State Park is one of the few natural expanses of barrier beach remaining along the eastern edge of North America. Island Beach State Park is highly valued for its topography, flora and fauna, and provides a unique recreational and educational resource. There are two natural areas (northern and southern) comprising 931 acres within this State Park in Ocean County.

21. Johnsonburg Natural Area: This small, 11-acre natural area is located in Warren County. It is a chestnut oak forest community.

22. Ken Lockwood Gorge Natural Area: This 311-acre is located within the Ken Lockwood Gorge Wildlife Management Area, Hunterdon County. This area is a hemlock-mixed hardwood forest community and rare species habitat.

23. Liberty Park Natural Area: Liberty Park Natural Area is comprised of 60 acres and is included in the master plan for Liberty Park. It includes salt-marsh habitat for a variety of water fowl and is a valuable study area for tolerance to urban encroachment.

24. Manahawkin Natural Area: Manahawkin is comprised of 64 acres and is designated a National Natural Landmark. The area is a mature bottomland hardwood forest.

25. North Brigantine Natural Area: This area consists of 968 acres which were acquired with Green Acres funds. It adjoins the Brigantine National Wildlife Refuge and contains both sand dune and salt-marsh habitats. The area serves as a refuge for coastal birds.

26. Osmun Forest Natural Area: This area is a 10-acre chestnut oak forest located in Warren County.

27. Oswego River Natural Area: This 635-acre area lies within the Warton State Forest in Burlington County. It features pinelands, white cedar forest, bog, and pine-oak forest communities.

28. Parvin Natural Area: The 400-acre natural area is located in Parvin State Park, Salem County. This area features pinelands, fringe oak-pine forest and swamp hardwood forest communities, and rare species habitat.

29. Ramapo Lake Natural Area: This area is located on 1,417 acres in the Ramapo Mountain State Forest, Passaic and Bergen Counties. This area is a mixed hardwood forest community.

30. Rancocas Natural Area: The Rancocas is a natural area of 80 acres, located in Westhampton Township, Burlington County. It demonstrates freshwater marsh and southern floodplain habitats. The north branch of the Rancocas Creek follows along the southern and eastern boundaries of the area and

Meadowlands District and established a management system which led to the adoption of a Master Plan Zoning Ordinance in 1972 and other management plans defining policies for resource management and development.

The boundary of the Hackensack Meadowlands District extends to the first major road or railroad upland of the tidally influenced meadowlands. The area of the district is 19,730 acres, of which 7,800 acres (40 percent) were developed in 1972. Between 6,200 and 7,500 acres (31-38 percent) were vegetated coastal wetlands and 1,400 acres (seven percent) were tidal waters.

The Hackensack Meadowlands Reclamation and Development Act directed the Hackensack Meadowlands Development Commission (HMDC) to respond to a three-fold mandate:

- Provide jobs, homes, and open spaces with need calculated at a regional scale.
- Protect the delicate balance of nature and protect against air and water pollution.
- Provide for solid waste management in perpetuity for all New Jersey municipalities then dumping in the Meadowlands.

4.4.2 State Parks and Forests

The New Jersey Department of Environmental Protection, through the Division of Parks and Forestry, maintains over 293,000 acres encompassing 36 State parks, four recreation areas, 11 State forests, and 23 Historic Sites.[19] In 1988, the State parks and recreation areas received a total of 10.3 million visitors.[20]

State Parks

The New Jersey State Parks registered by the New Jersey Division of Parks and Forestry (as of July 1, 1991) are listed below.

- Allaire Park, Farmingdale
- Allamuchy Mt. Park, Hackettstown
- Barnegat Lighthouse Park, Barnegat Light
- Cape May Point Park, Cape May Point
- Cheesequake Park, Matawan
- Corson's Inlet Park, Woodbine
- Cranberry Lake Park, Byram Township
- Delaware and Raritan Canal Park, Belle Mead
- Double Trouble Park, Double Trouble
- Edison Park, Edison
- Farny Park, Rockaway
- Finesville Park, Pohatcong
- Fort Mott Park, Salem
- Great Pierce Meadows Park, Fairfield
- Great Sound Park, Swainton
- Greenwood Lake Park, West Melford
- Hacklebarney Park, Long Valley
- Hawk Island Park, Delanco
- High Point Park, Sussex
- Hopatcong Park, Landing
- Island Beach Park, Seaside Park
- Liberty Park, Jersey City
- Long Pond Ironworks Park, Ringwood Park
- Monmouth Battlefield Park, Freehold
- Mount Laurel Park, Mt. Laurel
- Musconetcong Park, Netcong
- Parvin Park, Elmer
- Pigeon Swamp Park, S. Brunswick
- Princeton Battlefield Park, Titusville
- Rancocas Park, New Lisbon
- Ringwood Park, Ringwood
- Swartswood Park, Newton
- Voorhees Park, Glen Gardner
- Washington Crossing Park, Titusville
- Washington Rock Park, Cheesequake Park
- Wawayanda Park, Highland Lakes

State Forests

New Jersey has recognized the national interest in forests through consultation with the U.S. Department of Agriculture (USDA) Forest Service. The State's major forest — the Pine Barrens — is located in the south-central portion of New Jersey. There are no other U. S. forest lands in the State, however the following are State-designated forests:

- Jenny Jump Forest, Hope
- Stokes Forest, Branchville
- Worthington Forest, Columbia

Table 4.2

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Endangered/Threatened Species

(1 of 2)

MUSSELS	
Endangered	**Threatened**
Dwarf Wedge Mussel, *Absmodonta heterodon***	Dwarf Wedge Mussel, *Alasmidonta heteredon***
PLANTS	
Pogonia, Small Whorled, *Isotria medeoloides***	Swamp Pink, *Helonias bullata***
	Orchid, Eastern Prarie Fringed, *Platanthera leucophaea***
BIRDS	
Endangered	**Threatened**
Pied-billed Grebe, *Podilymbus podiceps**	American Bittern, *Botaurun lentiginosos**
Bald Eagle, *Haliaeetus leucocephalus***	Great Blue Heron, *Ardea herodias**
Northern Harrier, *Circus cyaneus**	Little Blue Heron, *Egretta caerulea**
Cooper's Hawk, *Accipiter Cooperii*	Yellow-crowned Night Heron, *Nyctanassa violaceus*
Red-shouldered Hawk, *Buteo lineatus* (Breeding)	Osprey, *Pandion haliaetus*
Peregrine Falcon, *Falco peregrinus***	Northern Goshawk, *Accipiter gentilis*
Piping Plover, *Charadrius melodus***	Red shouldered Hawk, *Buteo lineatus* (Non-breeding)
Upland Sandpiper, *Bartramia longicaude*	Black Rail, *Laterallus jamaicensis*
Roseate Tern, *Sterna dougallii*	Long-eared Owl, *Asio otus*
Least Tern, *Sterna antillarum*	Barred Owl, *Strix varia*
Black Skimmer, *Rynchops niger*	Red-headed Woodpecker, *Melanerpes erythrocephalus*
Short-eared Owl, *Asio flammeus**	Cliff Swallow, *Hirundo pyrrhonota**
Sedge Wren, *Cistothorus platensis*	Savannah Sparrow, *Passerculus sandwichensis*
Loggerhead Shrike,	Ipswich Sparrow, *Passerculus sandwichensis*
Vesper Sparrow, *Pooecetes gramineus*	Grasshopper Sparrow, *Ammodramus savannarum*
Henslow's Sparrow, *Ammodramus henslowii*	Bobolink, *Dolichonyx oryzivorus*
FISH	
Shortnose Sturgeon, *Acipenser brevirostrum***	

* Only breeding population considered endangered or threatened.

** Federally endangered or threatened.

4.4.4 Barrier Islands

The oceanfront barrier islands and spits constitute the Barrier Island region. The Central Barrier Island corridor is that portion of the barrier islands, spits or peninsulas that lies upland of wetlands, beach and dune systems, filled water's edges and existing lagoon edges that line the ocean and bay sides of a barrier island or spit.[21]

The national interest in barrier islands is directly reflected in the Special Areas designated as the Beach and Dune System and the Central Barrier Island Corridor which restrict or prohibit major development, and in the Use Policy on "Coastal Engineering" which gives preference to non-structural instead of structural approaches to shore protection.[22]

4.4.5 Wildlife Refuges

There are six national wildlife refuges managed by the U.S. Fish and Wildlife Service in New Jersey (see Figure 4-4). These refuges are:

- Wallkill River NWR
- Great Swamp NWR
- Edwin B. Forsythe NWR
- Cape May NWR
- Supawna Meadows NWR
- Killcohook NWR

These refuges manage waterfowl, songbirds, raptors and wading birds, as well as many other species.

4.4.6 National Park Service Lands

The National Park Service manages the Edison National Historic Site in West Orange and Morristown National Historical Park in Morristown. Other resources managed by the NPS include the Appalachian National Scenic Trail, the New Jersey Heritage Coastal Trail, the Delaware Water Gap National Recreation Area and the Delaware National Scenic River, the Sandy Hook Unit of the Gateway National Recreation Area and the Statue of Liberty National Monument.

The National Park Service also administers designation of National Natural Landmarks. Under the National Environmental Policy Act, Federal agencies are required to consider the existence and location of National Natural Landmarks when assessing the effects of their actions on the environment.

The National Registry of Natural Landmarks includes 11 sites for New Jersey. These landmarks are:

- Stone Harbor Bird Sanctuary, Cape May County
- Riker Hill Fossil Site, Essex County
- Pigeon Swamp, Middlesex County
- Great Swamp, Morris County
- Troy Meadows, Morris County
- Manahawkin Bottomland Hardwood Forest, Ocean County
- William L. Hutcheson Memorial Forest, Somerset County
- Moggy Hollow Natural Area, Somerset County
- Sunfish Pond, Warren County
- Palisades of the Hudson, Bergen County
- Great Falls of Paterson-Garrett Mountain, Passaic County

4.4.7 Wild and Scenic Rivers

Wild and Scenic River Corridors are components of the New Jersey Wild and Scenic Rivers System designated by the Commissioner of the Department of Environmental Protection. River corridors include the river and adjacent upland to the limit of the Flood Hazard Area or to the limit of State-owned lands, whichever is furthest inland.

The New Jersey State Wild and Scenic Rivers Act of 1977 provides protection of the natural and recreational values of some of the State's most significant river segments. The New Jersey Department of Environmental Protection has published guidelines for designation of the State's rivers, under which both the Lower Delaware River and the Hudson River could be characterized as developed recreational segments.

The Wild and Scenic River Act identifies those rivers eligible for inclusion in the National Wild and Scenic River System. The Delaware River, middle section, flows 41 miles through the Delaware Water Gap National Recreation Area. This is the only section of a river in New Jersey designated as wild and scenic.

Table 4.3 contains a listing of those eligible rivers in New Jersey that meet the criteria for Congressional designation for inclusion into the wild and scenic rivers system, but have not yet been studied or designated.

4.4.8 Wilderness Areas

A wilderness area is defined as "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions ...."[23] Wilderness areas (1) are substantially unaffected by human activities, (2) have outstanding opportunities for solitude, (3) generally are at least 5,000 acres, and (4) generally have features of ecological, geological, scientific, educational, scenic or historic value.

There are three wilderness areas in New Jersey:[24]

- Approximately 3,660 acres of the Great Swamp National Wildlife Refuge, Basking Ridge/Morristown.
- Approximately 6,000 acres of the Brigantine Division of the Edwin B. Forsythe National Wildlife Refuge, Oceanville.
- Approximately 256 acres of the Barnegat Division of the Edwin B. Forsythe National Wildlife Refuge, Barnegat.

4.4.9 Air Quality

The condition of a region's air resources is evaluated relative to the National Ambient Air Quality Standards (NAAQS), which were established as a result of the 1970 Clean Air Act and its subsequent amendments. The NAAQS for the five principal criteria air pollutants are presented in Table 4.4.

New Jersey contains portions of four separate Air Quality Control Regions (AQCR), delineated by the U.S. EPA for purposes of monitoring compliance with the NAAQS. These are shown on Figure 4-5. The results of air quality monitoring are reviewed annually by the State and the EPA to determine the attainment status in each AQCR for the five NAAQS pollutants. The most recent classifications in New Jersey's four AQCRs are summarized in Table 4.5.

New Jersey contains one area, the Brigantine National Wildlife Refuge in Atlantic County, which has been designated Class I for Prevention of Significant Deterioration (PSD) purposes. This means that visibility has been determined to be an important value for this area, and the area must be protected from pollutant concentrations which could degrade visibility.

4.4.10 Water Quality

The Federal Clean Water Act of 1977 (33 USC 466 et seq.) establishes a framework for achieving the national goal of restoring and maintaining the chemical, physical and biological integrity of the nation's waters. This is accomplished by Federal-State partnerships under which the U.S. Environmental Protection Agency establishes water quality standards for rivers, bays and the ocean, and develops a strategy for attainment. The key regulatory element is the National Pollutant Discharge Elimination Systems (NPDES), and the key planning element is the Areawide Water Quality Management (208) Plan. These elements, as well as State wastewater treatment facility requirements, are the programs established for attaining the State's water quality goals.

The maintenance of water quality in New Jersey is the responsibility of DEP's Water Technical Programs. The Division of Coastal Resources also plays a role in water quality enhancement through the enforcement of water quality resource policies under the Coastal Area Facility Review Act, the Wetlands Act and the Waterfront Development Law.

Table 4.3

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Eligible Rivers - New Jersey

(2 of 3)

RIVER NAME	SEGMENT REACH DESCRIPTION
Cedar Creek	Route 9 crossing to the dam above Double Trouble
(including)	
Factory Branch	Confluence with Cedar Creek to headwaters
Cedar Creek	Transmission line above Double Trouble Dam to Bamber Lake
(including)	
Newbolds Branch	Confluence with Cedar Creek to headwaters
Daniels Branch	Confluence with Cedar Creek to headwaters
Cedar Creek	Bamber Lake to headwaters
(including)	
Chamberlain Branch	Bamber Lake to headwaters
Webbs Mill Branch	Confluence with Chamberlain Branch to headwaters
Cohansey River	Delaware Bay to Rogap Run
North Branch of Forked River	Garden State Parkway to the headwaters of Cave Cabin Branch
Great Egg Harbor River	Great Egg Harbor Bay to south of May's Landing
(including)	
Tuckahoe River	Great Egg Harbor Bay to Tuckahoe
Middle River	Great Egg Harbor Bay to north of Corbin City
Great Egg Harbor River	Weymouth to the Atlantic City Expressway
Great Egg Harbor River	New Brooklyn Lake backwater to the PA-Reading R.R. crossing
Mullica River	Great Bay to headwaters
(including)	
Ballanger Creek	Confluence with Mullica to Route 9
Bass River	Confluence with Mullica for 2 miles
Nacota Creek	Confluence with Mullica to confluence with Mattix
Landing Creek	Confluence with Mullica to Indian Cabin Road
Pine Creek	Confluence with Mullica to reservoir below Weekstown
Nescochaque Creek	Confluence with Mullica to Great Swamp Branch and Albertson Brook Branch
Great Swamp Branch	Confluence with Nescochaque Creek to reservoir at Myrtle Ave.
Albertson Brook	Confluence with Nescochaque Creek to PA Railroad
Sleeper Branch	Confluence with Mullica to reservoir below Route 206
Alquatka Branch	Confluence with Mullica to headwaters

Table 4.4

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

National Ambient Air Quality Standards

Pollutant	Averaging Time	Concentration
Sulfur Dioxide (SO^2)	Annual Arithmetic Mean	0.03 ppm
	Twenty-Four Hour*	0.14 ppm
	Three-Hour* Secondary	0.50 ppm
Particulates (PM10)	Annual Arithmetic Mean: Primary & Secondary	50 ug/m^3
	Twenty-Four Hour:** Primary & Secondary	150 ug/m^3
Carbon Monoxide (CO)	One Hour*	35 ppm
	Eight Hour*	9 ppm
Ozone (0^3)	One Hour**	0.12 ppm
Nitrogen Dioxide (NO^2)	Annual Arithmetic Mean	0.053 ppm

* = Not to be exceeded more than once per year.
** = Statistically estimated number of days with exceedances is not to be more than 1 per year.
ppm = Parts of pollutant per million parts of air (by volume) at 25°C.
ug/m^3 = Micrograms of pollutant per cubic meter of air.

Source: Code of Federal Regulations; Title 40 Part 50: Amended July, 1987.

Table 4.5

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

New Jersey — Attainment Status for NAAQS Pollutants
(1 of 2)

	Attainment	Non-Attainment
OZONE		
New Jersey-New York-Connecticut Interstate AQCR		X
Metropolitan Philadelphia Interstate AQCR		X
New Jersey Intrastate AQCR		X
Northeast Pennsylvania-Upper Delaware Valley Interstate AQCR		X
TOTAL SUSPENDED PARTICULATES		
New Jersey-New York-Connecticut Interstate AQCR:		
The City of Jersey City		X
Remainder of Hudson County		X
The City of Newark		X
The City of Elizabeth		X
The City of Linden		X
The Borough of Cartaret		X
The Township of Woodbridge		X
The City of Perth Amboy		X
Remainder of AQCR	X	
Metropolitan Philadelphia Interstate AQCR:		
The City of Camden		X
Remainder of AQCR	X	
New Jersey Intrastate AQCR		X
Northeast Pennsylvania-Upper Delaware Valley Interstate AQCR		X
CARBON MONOXIDE		
New Jersey-New York-Connecticut Interstate AQCR:		
The City of Jersey City		X
The City of Patterson		X
The City of Newark		X
The City Of Elizabeth		X
The City of Hackensack		X
The City of Morristown		X
The City of Perth Amboy		X
The Borough of Somerville		X
The Borough of Freehold		X
Remainder of AQCR	X	

New Jersey has complied with the Clean Water Act, which provides the water resource standards of the Coastal Program. All coastal development must conform with any State-certified, area-wide water quality management (208) plan.

New Jersey water resources potentially affected by the EECP include the State's streams, rivers, lakes, reservoirs, estuaries and coastal zones (see Figure 4-6). Within New Jersey's total land area of 7,468 square miles, approximately 319 square miles are taken up by freshwater bodies. Coastal waters, defined by the New Jersey Coastal Management Plan to include waters out to three (3) nautical miles offshore, add an estimated 750 square miles of water surface to the study area.

Major river basins identified by the U. S. Geological Survey as located in New Jersey or bordering New Jersey include the following:

- Hudson River
- Hackensack River
- Passaic River
- Elizabeth River
- Rahway River
- Raritan River
- Navesink River
- Shark River
- Manasquan River
- Metedeconk River
- Toms River
- Mullica River
- Great Egg Harbor River
- Tuckahoe River
- Maurice River
- Cohansey River
- Delaware River

Delaware River basin is the major basin, with a drainage area comprised of parts of New Jersey, Pennsylvania, New York and Delaware. The drainage area of the Delaware River at Wilmington, DE, is 11,030 square miles. Average discharge of the Delaware River from 1913 to 1990 at Trenton, NJ, was 11,660 ft^3/s (7.5 billion gallons per day).

Major water supply reservoirs consist of 13 reservoirs located primarily in northern New Jersey which serve the metropolitan areas. Combined usable storage for these reservoirs was reported to be 68.6 billion gallons at the end of water year 1990. In addition to the water supply reservoirs, numerous fresh water lakes are located in northern New Jersey.

Ocean bays stretch along the eastern shore of New Jersey with the largest bays being Delaware Bay, Barnegat Bay, Great Bay and Raritan Bay.

4.5 HISTORIC, ARCHITECTURAL, ARCHEOLOGICAL AND CULTURAL RESOURCES

The National Register of Historic Places is the official list of America's historic and cultural resources. Districts, sites, buildings, structures and objects of significance in American history are eligible for the National Register. The New Jersey State Register of Historic Places is the official list of New Jersey's historic and cultural resources. The New Jersey Register contains 23 sites as follows.

- Absecon Lighthouse
- Boxwood Hall
- Carranza Memorial
- Grover Cleveland Birthplace
- Hancock House
- Hermitage House
- Indian King Tavern
- Joyce Kilmer House
- Lawrence House
- Marshall House
- Monocacy Battle Monument
- Monmouth Battle Monument
- Old Dutch Parsonage
- Princeton Battle Monument
- Proprietary House
- Rockingham
- Somers Mansion
- Trenton Battle Monument
- Twin Lights
- Veterans of All War Memorial
- Von Steuben House
- Wallace House
- Walt Whitman House

Table 4.6 represents the number of historic sites recorded per county on the New Jersey State Register and the National Register of Historic Places through 1989.

4.6 NATIVE AMERICANS

Although there are no federally-recognized Indian tribes located in the State of New Jersey, the 1990 Bureau of Census data showed that 14,970 American Indians live in New Jersey, compared to 10,028 which were recorded during the 1980 census. The largest concentrations live in Essex County, followed by Passaic, Bergen, Hudson, Middlesex, Camden, and Cumberland Counties. Of the nearly 15,000 American Indians residing in the State, approximately 5,000 are members of State-recognized tribes. The following provides a brief description of the various tribes in New Jersey.[25]

Delaware Indians. The native Delaware Indians are descendants of the original Lenape or Delaware Indians. The Delaware tribe also includes descendants of the Sand Hill Indians. There are approximately 740 Native Americans listed as Delaware Indians in New Jersey. Although the Delaware tribe does not own tribal land today, members living south of the Raritan River once resided on the Brotherton Indian reservation in Burlington County, which was the only Indian reservation established in the State. This reservation no longer exists. Today, many members of this tribe live in Burlington, Monmouth, and elsewhere in the State.

A reproduction of a Lenape/Delaware village and museum is located at Waterloo Village in Allamuchy State Park, Stanhope, New Jersey.

Ramapough Mountain Indians. The Ramapoughs were recognized as a tribe by the State in February 1980 and have applied for Federal recognition. Approximately 1,800 members of this tribe reside in the Ramapo Mountain region, mostly in Bergen and Passaic Counties. There is no designated tribal land.

Powhattan Renape Nation. The Powhattan Renape Nation was recognized by the State in May 1980. Most of the members reside in the southern New Jersey (Camden and Burlington Counties) and Philadelphia areas. This tribe has a 25-year lease on part of the Rancocas State Park where they maintain a cultural center; this land is not a reservation.

Nanticoke Lenni-Lenape Indians. This tribe was recognized by the State in July 1982. The tribe is comprised of descendants from the Nanticoke and Delaware Indians who migrated from the State of Delaware. Most members of this tribe reside in Cumberland, Salem and Gloucester Counties.

4.7 CONTEMPLATED FUTURE DEVELOPMENT

New Jersey is in the process of producing a State Development and Redevelopment Plan. In 1991 an Interim State Plan was published. This plan states the overall strategy as follows:

> The General Plan Strategy is to achieve all State planning goals by coordinating public and private actions to guide future growth into compact forms of development and redevelopment, located to make the most efficient use of infrastructure systems and to support the maintenance of capacities in infrastructure, environmental, natural resource, fiscal, economic and other systems.[26]

The plan's recommendation to reshape future development into more compact and mixed-use patterns and to direct growth where infrastructure already exists suggests that future development will intensify existing patterns of development rather than contribute to further decentralization. One of the stated policies is to protect and enhance aviation facilities and to maintain State-wide access to the State's airports.

Prudent regulation of land uses immediately surrounding airports is a particular concern.[27]

1. U.S. Bureau of the Census, Statistical Abstract of the United States, 1990.

2. U.S. Bureau of the Census, Statistical Abstract of the United States, 1990. Permanent inland water surface, deeply indented embayments and sounds, and coastal waters sheltered by headlands or islands separated by less than 1 nautical mile of water.

3. "Rules on Coastal Zone Management," New Jersey Administrative Code, Chapter 7E.

4. A large hub is a community enplaning 1.0 percent or more of the total U.S. enplaned passengers.

5. U.S. Bureau of the Census, Statistical Abstract of the United States, 1990.

6. U.S. Bureau of the Census, Population and Housing Information for New Jersey, 1990.

7. "New Jersey," Encyclopedia Americana, Vol. 20, pp. 190-192.

8. "New Jersey," Encyclopedia Americana, Vol. 20, p. 193.

9. Ibid.

10. U.S. Bureau of the Census, 1987 Census of Manufacturers -- New Jersey, Nov. 1990.

11. Ibid.

12. New Jersey Department of Commerce and Economic Development, County Business Growth 1982-1989.

13. U.S. Department of Commerce, New Jersey Coastal Management Program, Final Environmental Impact Statement, p. 263.

14. Ibid, p. 265.

15. Ibid.

16. Ibid.

17. N.J.A.C. 7:2-11.2(A)

18. N.J. Dept. of Environmental Protection, Div. of Parks and Forestry, Bear Swamp East Natural Area Management Plan, pp. 10-11.

19. New Jersey Department of Environmental Protection, Division of Parks and Forestry, State Parks and Forests in New Jersey.

20. U.S. Bureau of the Census, Statistical Abstract of the United States. Also, personal conversation with Chief of Planning and Programs, Branch Division of Parks and Forestry, NJ DEP, Oct. 11, 1991.

21. New Jersey Coastal Management Final EIS, August 1980, p. 45.

22. Ibid, p. 259.

Chapter Five

Environmental Consequences

CHAPTER 5. ENVIRONMENTAL CONSEQUENCES

This chapter reports on the analysis conducted to determine the environmental impacts of the air traffic system as implemented by the EECP and the alternatives to that proposed action. It includes an operational summary to facilitate understanding of the environmental impact analysis. The environmental factors considered are those contained in FAA Orders 1050.1D and 5050.4A.

5.1 OPERATIONS SUMMARY

The mix and number of aircraft operations used to represent the current baseline conditions of this EIS are based on a 7- to 8-day sample of Automatic Radar Terminal System (ARTS) and Air Traffic Management System (ATMS) radar returns for the period from June 25 through July 2, 1991. These radar data provide relevant information on aircraft type, position, speed, altitude, and date/time of occurrence for every IFR aircraft as it progresses on its flight into or out of the State of New Jersey.

Data from ARTS are recorded approximately every 4 seconds from facilities at Newark, Atlantic City, and Philadelphia Airports, each of which provides coverage up to 60 nautical miles from the antenna. While this blankets the large majority of the State, coverage of aircraft outside the ARTS range is provided by the ATMS radar which covers the entire region; however, these returns are refreshed only every 5 minutes and thus provide a less precise record of the aircraft's flight trajectory. ARTS data were used whenever possible.

An initial screening of those aircraft which passed over or near the New Jersey border indicated approximately 31,000 identifiable IFR flights occurred during the sample period. These were sorted by aircraft type and, for commercial flights, by airline to determine the subset of types (available within the Integrated Noise Model database) that would be used to model noise.[1] Table 5.1 lists the resulting 45 aircraft types and the associated number and percentage of flights that comprised this initial fleet.

The process of selecting aircraft for the noise model favored noisier aircraft. In this selection process, a single aircraft was used to represent all series of a given type. For example, the 727 with JT8D-15 engines and quiet nacelles represented all 727s, the Beech 58P represented all general aviation propeller aircraft, the A7D represented military fighters, and the KC-135 represented military jet transports. Helicopters and aircraft having no FAA identification were not modeled. As a result, the first five aircraft listed in the table accounted for more than 50% of the entire fleet of aircraft observed on radar.

Once the correspondence between actual and modeled aircraft types was complete, a separate computerized matching procedure was used to pair radar tracks to the modeled flight track developed by the FAA's Eastern Region to describe the EECP. Each radar track was "jumped" onto the best-fitting modeled route depending on which runway it was using, where it crossed the New Jersey border and which "gates" it passed through on the way. An example of actual flight tracks and the modeled routes with which they were paired is shown in Appendix D, Figure D-1. Tracks which overflew the State at high altitude, never taking off or landing at any of the 14 airports used in the model, were dropped from further consideration at this point. Also dropped were any of the original 31,000 operations that failed to cross into New Jersey to begin with, or that operated from small, infrequently used airports, or other traffic not considered part of the EECP.

Following the assignment of all seven days of radar data to the set of matched routes, the week-long list of operations on each flight track was converted to average daily operations for use in calculating daily noise exposure. This required not only converting the week's activity to a day's activity, but also converting the north and south traffic flows during the sample period to those that exist on an annual average basis. This additional accounting of traffic flows was only conducted for the three major New York Metropolitan Airports where thorough records of runway use are maintained by the Port Authority of New York and New Jersey.

Table 5.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Seven Day Sample of Aircraft Mix Over New Jersey

(2 of 2)

AIRCRAFT TYPES	# Ops.	% Total	Cum. Tot.	Cum. %
DC8QN	178	0.6%	29352	92.2%
DC870	167	0.5%	29519	92.8%
A7D	142	0.4%	29661	93.2%
HS748A	139	0.4%	29800	93.6%
CNA500	130	0.4%	29930	94.1%
L188	115	0.4%	30045	94.4%
SABR80	94	0.3%	30139	94.7%
A310	90	0.3%	30229	95.0%
7373B2	89	0.3%	30318	95.3%
CVR580	87	0.3%	30405	95.5%
C130	92	0.3%	30497	95.8%
707QN	44	0.1%	30541	96.0%
BAE146	13	0.0%	30554	96.0%
CONCRD	13	0.0%	30567	96.1%
DC850	8	0.0%	30575	96.1%
MD83	7	0.0%	30582	96.1%
720	6	0.0%	30588	96.1%
BAC111	4	0.0%	30592	96.1%
DC3	4	0.0%	30596	96.1%
MD82	2	0.0%	30598	96.1%
DC10	1	0.0%	30599	96.1%

Source: VNTSC and ARTS from June 25 through July 2, 1991.

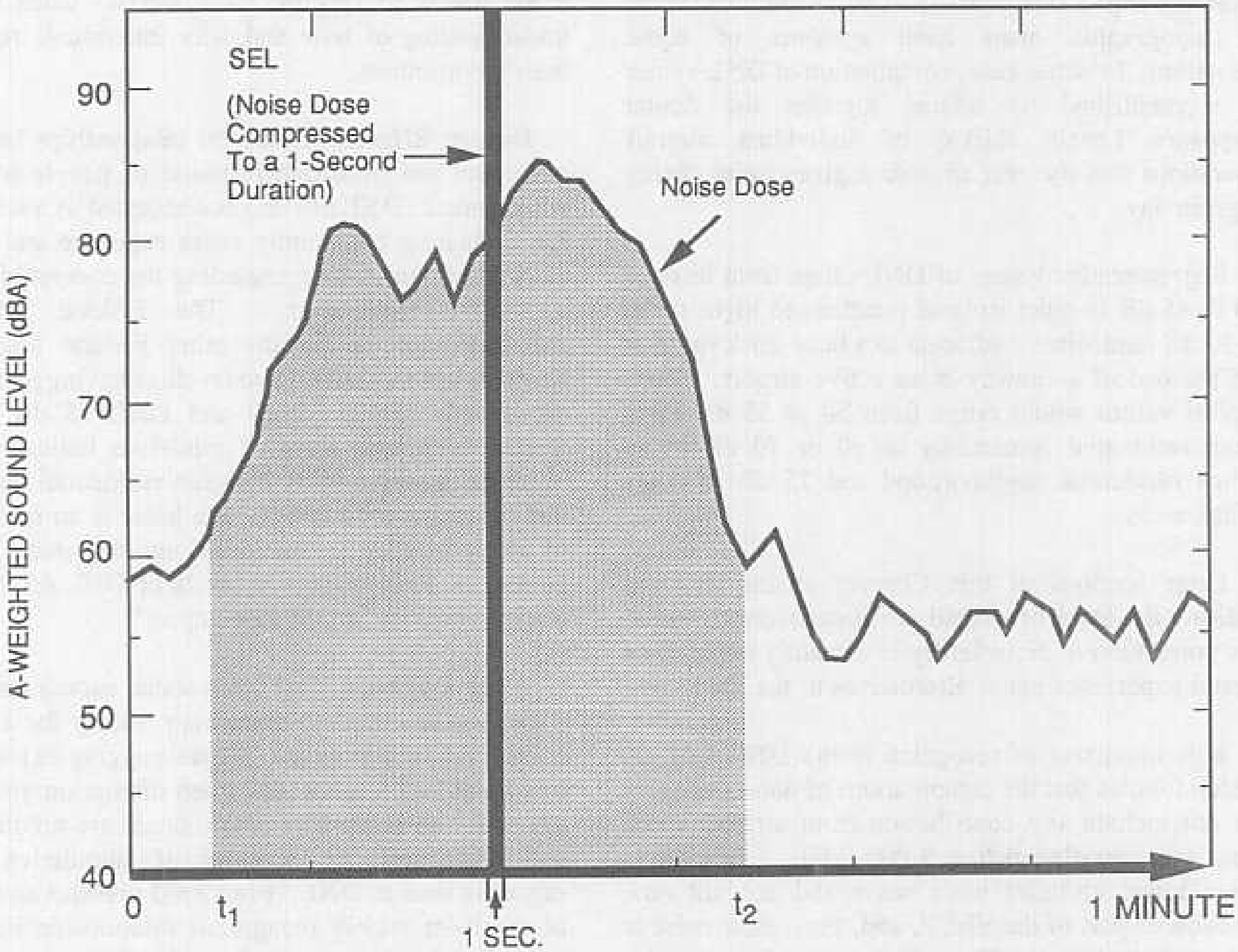
Table 5.2

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Distribution of Average Day Operations by Airport for 1991

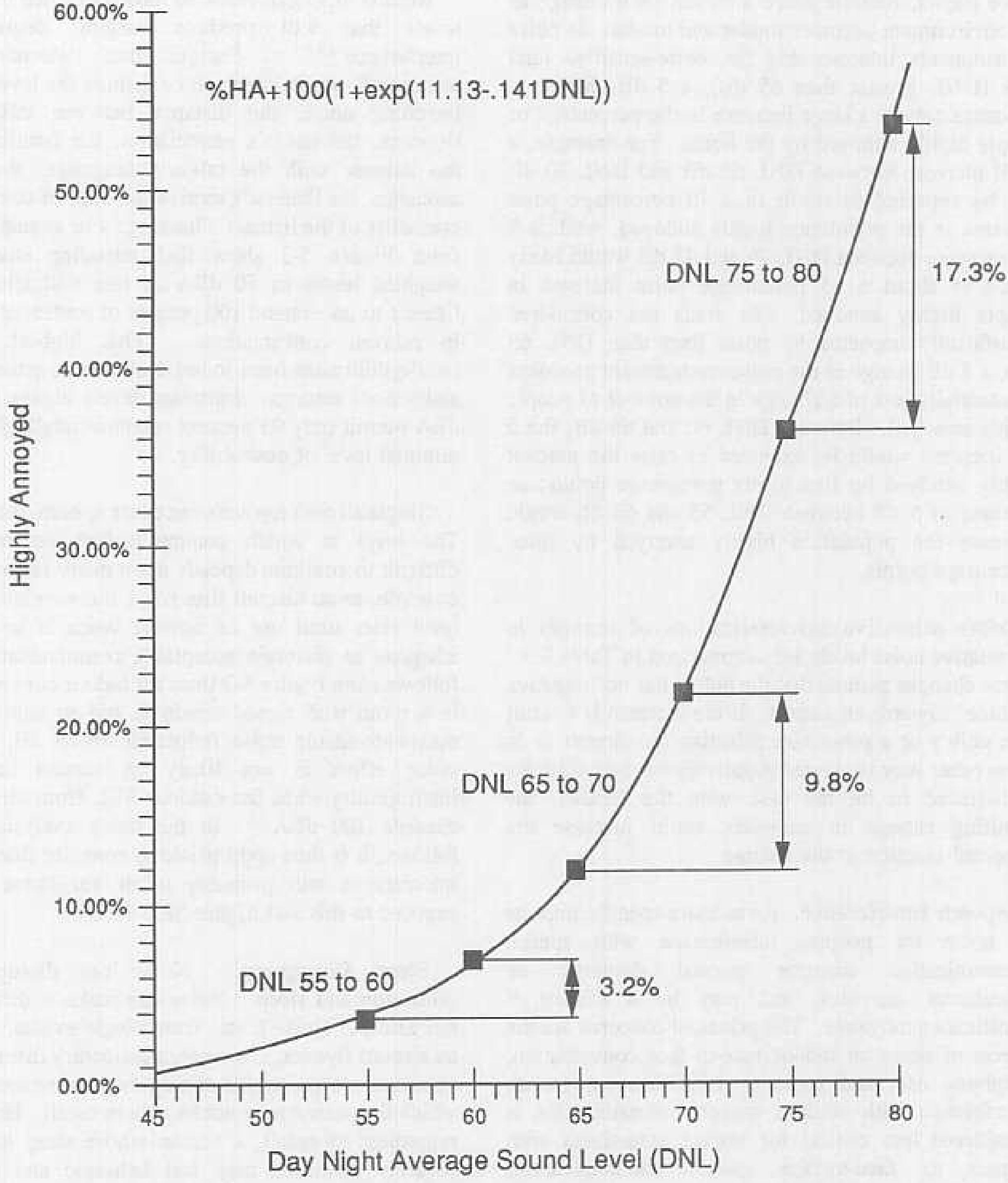
AIRPORT	DEPARTURES		ARRIVALS		TOTAL
	Day	Night	Day	Night	
ATLANTIC CITY	25.13	5.82	23.51	2.22	56.67
CALDWELL	4.46	—	3.65	.42	8.53
JFK	132.54	23.95	157.54	39.27	353.30
LAGUARDIA	297.84	17.40	243.59	36.15	594.98
MORRISTOWN	24.59	1.11	20.54	3.05	49.28
NEWARK	458.25	43.58	436.49	68.38	1006.71
NORTH PHILADELPHIA	2.43	0.14	2.16	0.28	5.01
PHILADELPHIA	125.64	8.17	270.61	38.36	442.79
STEWART	2.03	—	3.78	1.39	7.20
TETERBORO	67.55	13.02	63.36	18.70	162.63
TRENTON	3.11	1.39	1.76	—	6.25
WHITE PLAINS	58.50	3.60	30.40	2.77	15.27
WILLOW GROVE (NAVY)	4.19	—	2.70	—	6.89
WILMINGTON	2.30	.28	2.57	0.14	5.28
TOTAL	**1208.56**	**118.46**	**1262.64**	**211.10**	**2800.76**

Source: Volpe National Transportation Systems Center



The Sound Exposure Level, SEL, for a Representative Aircraft Overflight

Figure 5-1



Impact on Public Health and Welfare Cause-Effect Relationship Between Transportation Noise and Community Reaction

Figure 5-2

Table 5.3

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Characterization of Reaction to Change in Cumulative Noise Exposure

Change in Noise Level	Expected Reaction to Change
0 to less than 2 dB	May be perceived
2 to less than 5 dB	Generally perceived
5 dB or more	A change in community reaction is likely

Source: Miller, N. P., Von Gierke, H. E., and Eldred, K. M., "Impact Assessment Guidelines for the Effects of Noise on People." Harris Miller Miller & Hanson, Inc., Report 291060.01, prepared for Transport Canada, Toronto, Ontario; October 1991.

The limited data on sleep disruption suggest conflicting conclusions. Data collected in people's homes show that much higher levels are needed to awaken a given percentage of people than do data collected in a laboratory setting. For example, an indoor Sound Exposure Level of about 70 dB awakened 28 percent of the people in the laboratory, but only about 2 percent of the people in their homes. This relationship of indoor noise levels, in SEL, to the percent of people awakened is presented in Figure 5-4. The most probable reason for this large difference is that people sleep more soundly at home in their normal surroundings.

Considering that typical residential construction provides on the order of 25 dB of noise reduction from outside to inside when windows are closed, this figure also suggests that there could be approximately 25 percent awakenings to an outdoor SEL of 100 dBA and about 9 percent awakenings to an outdoor SEL of 80 dBA. These relationships, too, can be considered when reviewing the noise analyses which follow.

Noise Impact Criteria

Land Use Compatibility Criteria from Federal Aviation Regulations (FAR) 14 Code of Federal Regulations (CFR) Part 150. Based on the aforementioned relationships between noise and the collective response of people to their environment, DNL has become accepted as a standard for evaluating community noise exposure and as an aid in decision-making regarding the compatibility of alternative land uses.

In their application to airport noise in particular, DNL projections have two principal functions:

(1) To provide a means for comparing existing noise conditions with those that might result from the implementation of alternative operational procedures and/or from forecast changes in airport activity; and

(2) To provide a quantitative basis for identifying and judging potential noise impacts.

Both of these functions require the application of objective criteria. Government agencies dealing with environmental noise have devoted significant attention to this issue, and thus have developed noise/land use compatibility guidelines to help Federal, State, and local officials with this evaluation process.

In FAR Part 150, which defines procedures for developing airport noise compatibility programs, the FAA has established DNL as the official cumulative noise exposure metric for use in airport noise analyses, and has developed recommended guidelines for noise/land use compatibility evaluation. These guidelines are reproduced in Table 5.4.

They represent a compilation of extensive scientific research into noise-related activity interference and attitudinal response. However, reviewers of reports on DNL values should recognize the highly subjective nature of response to noise and the special circumstances that can either increase or decrease individuals' tolerance. For example, a high non-aircraft background or ambient noise level (such as from traffic) can reduce the significance of aircraft noise. Alternatively, residents of areas with unusually low background levels may find relatively low levels of aircraft noise very annoying. Response may also be affected by expectation and experience. People often get used to a level of noise exposure that guidelines suggest may be unacceptable, and similarly, changes in exposure may generate response that is far greater than that which the guidelines might suggest.

Finally, the cumulative nature of DNL means that the same level of noise exposure can be achieved in an essentially infinite number of ways. For example, a reduction in a small number of relatively noisy operations may be counterbalanced by a much greater increase in relatively quiet flights, with no net change in DNL. Residents of the area may become highly aroused by the increased frequency of operations, despite the apparent status quo of the noise. With these cautions in mind, the FAA's guidelines for compatible land use can be combined with DNL calculations to identify the potential types and locations of land uses and the degree of their incompatibility.

Table 5.4

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

FAA Noise/Land Use Compatibility Guidelines
(1 of 2)

	Yearly day-night average sound level, DNL, in decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
Residential Use						
•Residential other than mobile homes and transient lodgings	Y	N	N	N	N	N
•Mobile Home Park	Y	N	N	N	N	N
•Transient Lodgings	Y	N	N	N	N	N
Public Use						
•Schools	Y	N	N	N	N	N
•Hospitals and nursing homes	Y	25	30	N	N	N
•Churches, auditoriums and concert halls	Y	25	30	N	N	N
•Government services	Y	Y	25	30	N	N
•Transportation	Y	Y	Y	Y	Y	Y
•Parking	Y	Y	Y	Y	Y	N
Commercial Use						
•Offices, business and professional	Y	Y	25	30	N	N
•Wholesale & retail building, hardware, and farm equipment	Y	Y	Y	Y	Y	N
•Retail trade — general	Y	Y	25	30	N	N
•Utilities	Y	Y	Y	Y	Y	N
•Communication	Y	Y	25	30	N	N
Manufacturing and Production						
•Manufacturing general	Y	Y	Y	Y	Y	N
•Photographic and optical	Y	Y	25	30	N	N
•Agriculture (except livestock and forestry)	Y	Y	Y	Y	Y	Y
•Livestock farming and breeding	Y	Y	Y	Y	N	N
•Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y

Note that by these guidelines, all land uses are considered compatible with aircraft noise at exposure levels below DNL 65 dB. This does not mean that people will not complain or otherwise be disturbed by aircraft noise at lower levels (as has been shown earlier), nor does it preclude individual communities or other jurisdictions from adopting lower standards to meet local needs.

State or Local Requirements/Guidelines. Neither the State of New Jersey nor any local communities within the State have adopted any noise/land use compatibility guidelines pertaining to aircraft noise. Presently only two States have adopted the FAA's noise/land use compatibility guidelines (or equivalent) for cumulative noise exposure. Maryland has adopted the FAA's DNL 65 dB guideline, while California, which uses the Community Noise Equivalent Level (CNEL), has adopted the equivalent of the FAA's guideline.

Other Federal Agencies. The U.S. Department of Housing and Urban Development (HUD) has promulgated regulations (set forth in Part 51 of the Code of Federal Regulations, 24 CFR) that establish criteria for the eligibility of a site to qualify for Federal funds supporting construction. Like the FAA's, those criteria are defined in terms of DNL and also utilize DNL 65 dB as the threshold of acceptability. They are summarized in Table 5.5. Other agencies use the same threshold of acceptability.

<u>Noise Effects at Levels Below Criteria for Significant Impact</u>

Absolute Levels. The FAA compatibility criteria were mentioned earlier in Section 5.2.1. Noise levels greater than DNL 65 dB are considered incompatible with residential land use. Therefore, significant impact can be expected to occur when noise levels are greater than or equal to DNL 65 dB.

Residential land use exposed to noise levels below DNL 65 dB is considered compatible with the noise environment and this is not considered significantly impacted, though there may be adverse effects of noise on residents in these areas.

Incremental Levels. Table 5.3 presented data regarding changes in cumulative noise exposure. The data presented in the table predict that an increase in DNL of between 2 and 5 dB is likely to be noticed, and increases greater than DNL 5 dB are likely to lead to community reaction.

The FAA has for many years used a noise exposure level of DNL 65 dB as an exposure significance threshold. (Federal Interagency Committee on Urban Noise, 1980) Use of this level as a threshold, however, does not mean that impacts cannot be identified at lower levels. The Schultz Curve (Schultz 78) is widely accepted as an indicator of the number of persons highly annoyed by varying levels of aircraft noise. It acknowledges that some people will be highly annoyed by aircraft noise even at relatively low levels (DNL 45 dB).[13] Recent research has indicated that large changes in noise levels (on the order of DNL 3 dB or more in the areas exposed to levels between DNL 60 and 65 dB) may be perceived by people as a degradation of their noise environment. FAA's experience with air traffic actions which occur above 3,000 feet AGL has been that an increase of DNL 5 dB could lead to adverse community reaction.

From a technical standpoint, analysis of noise levels less than DNL 60 dB is subject to some concern based on the reliability of prediction and interpretation of the results. Noise predictions are less reliable at lower levels and increasing distances from the source. There are increased uncertainties associated with variable local atmospheric conditions and large propagation values that occur with increasing aircraft altitude in areas subject to low DNL values. Additionally, it is very difficult to determine the contribution of non-aircraft noise sources at low DNL levels. In the vicinity of an airport, for example, non-aircraft noise sources may begin to mask the aircraft noise sources at background levels of DNL 60 dB or less.

Background (Ambient) Noise. There are indications that ambient noise levels affect the audibility of and resulting annoyance in response to aircraft noise events. This can occur either as masking (in areas of high ambient noise) or enhancement (in areas of low ambient noise). There are no currently acceptable methods available to scientifically evaluate the effects of either masking or enhancement. There are indications, however, that masking begins to occur at ambient levels of about DNL 60 dB, and that enhancement is likely to occur when aircraft noise levels approach 15 dB or more above the ambient.

5.2.2 EECP

Noise Measurements

To supplement the noise modeling of EECP operations, a set of comprehensive noise measurements was conducted at ten representative locations across northern and central New Jersey. The objectives of the program were:

- To determine the extent of aircraft noise on particular New Jersey communities, and
- To perform a check of the reasonableness of the VNTSC-developed Expanded Integrated Noise Model (EINM).

Choice of measurement sites was based on a set of technical criteria that included: (1) the need for sufficient air traffic activity to get reliable noise results, (2) recognition of the different air traffic routings that occur and are dependent on prevailing winds at critical airports such as Newark and LaGuardia, (3) the need for minimal influence of ambient noise sources, and (4) the need for a mix of the different aircraft operations and full range of aircraft noise levels that occur over the State. Site selection was also influenced by the volume of noise complaints received.[14]

The selected locations are shown in Figure 5-5; all are located within a 40 mile radius of Newark Airport. Each is further identified by specific address and latitude/longitude coordinates in Table 5.6. The site in Kearny was repositioned part way through its measurements to a new location around the corner to avoid construction noise.

Measurements at the first nine locations were conducted by VNTSC during the period 25 June through 2 July 1991. Three of these (Denville, Long Valley, and Colts Neck) were located atop school buildings while the remaining six were set up in residential areas with microphones attached to telephone poles approximately 15 feet above ground level for purposes of security. Measurements at the tenth site, representative of neighborhoods in south Scotch Plains, were conducted by Harris Miller Miller & Hanson Inc. (HMMH) over the period 19 through 26 July 1991. In this case, the instrumentation was located directly on residential property with the microphone mounted approximately five feet above ground level. Measurements at this tenth location represented a repeat of an earlier set of measurements conducted by HMMH in June 1990 under a previous study conducted for the Port Authority of New York and New Jersey.[15]

Data collected at all locations included daily DNL values, hourly Equivalent Sound Levels (L_{eq}s), Sound Exposure Levels (SELs) of individual noise events, and a variety of supplementary statistical measures on an hour-by-hour basis. Appendix E provides a full background explanation of each of these noise metrics, supplementing the introduction to noise metrics earlier in this chapter. (At a minimum, the reader is presumed to have an understanding of the meaning of SEL and DNL, for these are used throughout this chapter to explain the noise effects of the EECP).

For sites relatively near Newark Airport, these noise metrics are influenced by the direction of traffic flow in and out of the airport; higher measured values will tend to occur when aircraft are taking off and climbing over a site, while lower values will tend to occur when aircraft are approaching to land. Thus, a site such as Kearny will experience its highest noise levels when Newark is operating to the north; i.e. traffic is taking off and landing on runways 4L and 4R. Sites in Scotch Plains will experience their highest noise levels when Newark is operating to the south; i.e. aircraft are taking off and landing on runways 22L and 22R. These alternative flow conditions are referred to throughout this EIS as "north flow" and "south flow", and the traffic patterns associated with each are very different as aircraft

Table 5.6

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

New Jersey Measurement Sites

Community	Street Address	Utility Pole No.	North Latitude	West Longitude	Gnd&Roof Elevation* (feet MSL)	Mic. Height (feet)	Total Elevation (feet)
1. Scotch Plains (1)	560 Pine Street off Evergreen Avenue	61960SPT	40° 39'19.3"	74° 23'11.7"	175	16	191
2. Denville	Lakeview Elementary School on Cooper Road	N/A	40° 52'13.3"	74° 30'15.4"	717	4	721
3. Kearny	365 Devon Street at corner of King Street	E61127K	40° 45'45.1"	74° 08'44.0"	100	16	116
Kearny after 1200 on 6/29	86 King Street at corner of Hickory Street	E61359K	40° 45'38.5"	74° 08'40.5"	20	15	35
4. Long Valley	Flocktown Road Elementary School	N/A	40° 48'35.7"	74° 48'10.7"	1093	6	1099
5. Colts Neck	Cedar Drive Elementary School	N/A	40° 17'45.2"	74° 12'30.0"	143	4	147
6. River Edge	10 June Court off Kinderkamack Road	E61318RE	40° 55'7.7"	74° 2'11.3"	75	16	91
7. Woodbridge	Corner of Dixon Drive and North Circle	67281WB	40° 33'16.8"	74° 17'13.3"	40	17	57
8. North Brunswick	1250 Stockton Place off Dallas Road	62380NBW	40° 25'56.3"	74° 27'27.6"	100	14	114
9. Mendham	29 Hilltop off Deer Run	BT1494MMT	40° 47'16.4"	74° 34'15.3"	540	16	556
10. Scotch Plains (2)	9 Colonial Drive off Terrill Road	N/A	40° 37'19.4"	74° 22'8"	90	5	95

* Roof elevation applicable for communities of Denville, Long Valley and Colts Neck only.

Source: Volpe National Transportation Systems Center and Harris Miller Miller & Hanson, Inc.

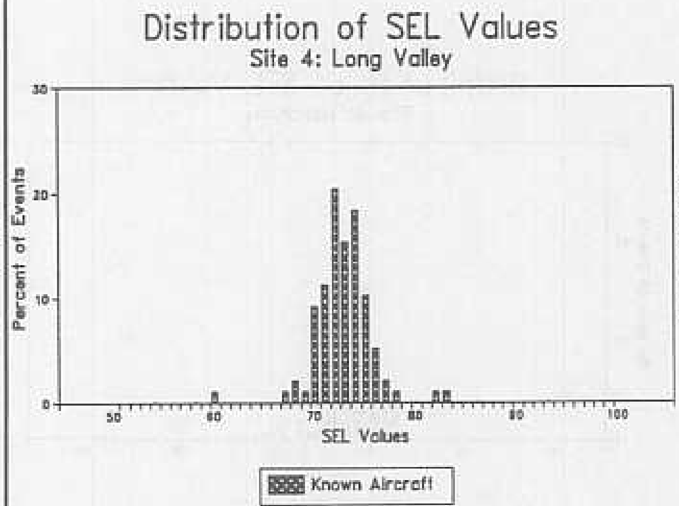
Table 5.7

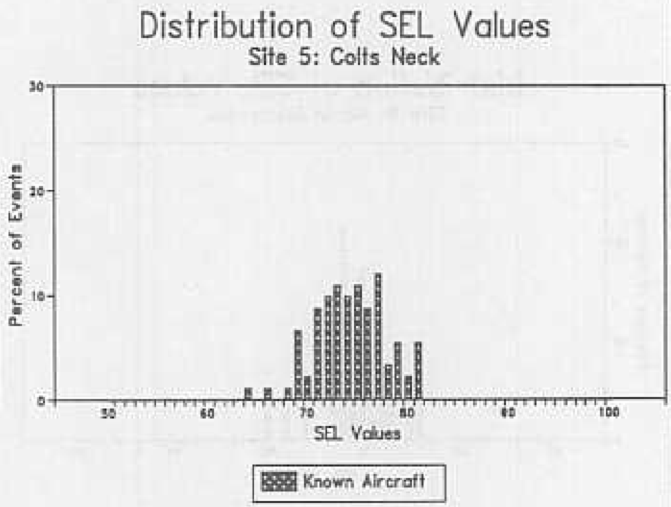
EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

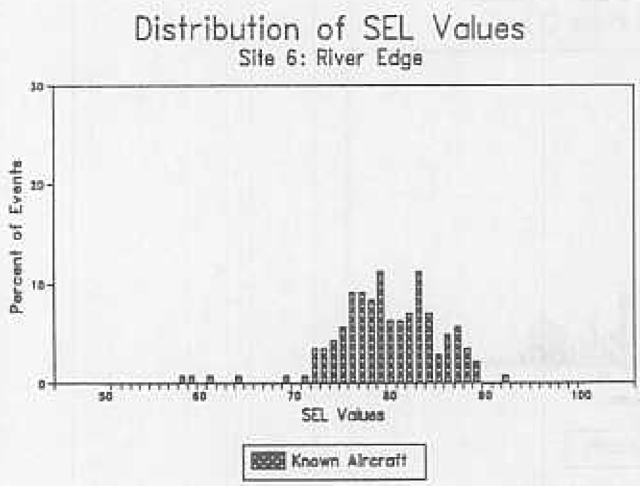
Measured DNL Values and Associated Traffic Flows by Measurement Location

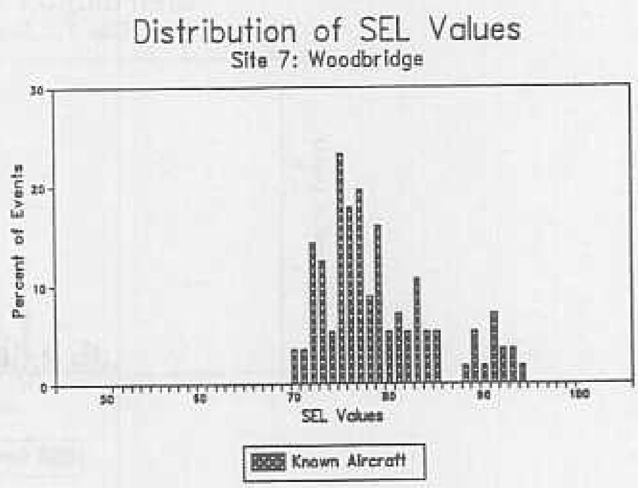
End Date	Primary Traffic Flow	1 Scotch Plains (1)	2 Denville	3 Kearny	4 Long Valley	5 Colts Neck	6 River Edge	7 Woodbridge	8 North Brunswick	9 Mendham	10 Scotch Plains (2)
6/26/91	South	59.5	53.0	64.5	56.7	55.3	59.0	60.6		57.1	
6/27/91	South	61.1	53.7	64.0	57.4	57.0	61.4	59.8	62.4	59.1	
6/28/91	South	57.7	54.0	63.8	55.7	55.5	65.1	63.5	59.1	56.6	
6/29/91	Mostly South	59.3	53.7		54.9	54.1	60.7	61.8	58.6	56.3	
6/30/91	Mostly North	57.4	53.6		53.6	54.6	56.6	57.8	56.1	57.7	
7/01/91	North	55.5	52.9		62.6		55.5	58.7	57.6	57.8	
7/02/91	Mostly North	58.8	52.6	66.7	58.5		58.7	58.8	58.8	57.2	
7/20/91	South										58.3
7/21/91	South										58.4
7/22/91	South										59.3
7/23/91	South										61.5
7/24/91	Undetermined										62.1
7/25/91	Undetermined										61.2
7/26/91	Undetermined										61.6
Average Ldn		58.7	53.4	64.9	55.2	55.4	60.7	60.6	59.2	57.5	60.6

Source: Volpe National Transportation Systems Center and Harris Miller Miller & Hanson, Inc.









Source: Harris Miller Miller & Hanson, Inc.
Volpe National Transportation Systems Center

Distributions of SEL's by Measurement Locations

Figure 5-7

Second, the measured DNL values can be compared directly to the EINM's computed DNL values. This represents a check of the model's "output" — i.e. does the model, with all of its operational and noise-related inputs, do a reasonable job of predicting what is really happening?

In this case, agreement is not expected to be as good for three significant reasons. First (in order of significance), measurements reflect total noise exposure — the effects not only of aircraft, but of local street traffic and other neighborhood sources of noise; the EINM only predicts the noise due to aircraft. Thus, at sites such as Colts Neck, Denville, Long Valley, and Mendham relatively distant from an airport, ambient sources become significant and measured levels will exceed modeled values. This can also happen at sites closer to Newark if they are located in more densely populated suburban communities, particularly with microphones mounted on telephone poles in close proximity to street traffic.

Another factor causing differences between measured and predicted DNL values results from the unique fact that this EIS is only addressing noise from aircraft above 3,000 feet (AGL) and over the State of New Jersey. The EINM does not account for the effects of aircraft when they are below 3,000 feet or beyond the State's coastal waters. Noise monitors, on the other hand, cannot discriminate in this way and thus include this noise. This factor will result in higher-than-predicted DNL values at the measurement sites in Kearny, River Edge and Scotch Plains.

Finally, modeled baseline operations reflect annual average traffic flows in and out of the three New York metropolitan airports. At sites affected by a particular direction of traffic flow (north or south) out of Newark, the measurement period may not have reflected these average conditions.

In combination, these factors suggest that measured DNL values will probably exceed predicted values at every site. In fact, this is the case. Appendix D addresses the comparisons in detail, but in summary, measured DNL values are higher than modeled values by anywhere from 6 to more than 14 dB. Such large differences do not indicate that the model is incorrectly estimating noise as much as they indicate that EECP operations only account for a fraction of each site's total noise environment.

In essence, the modeled results of this EIS are best utilized to evaluate the relative changes in DNL that are predicted to occur as a result of the various alternatives to the EECP, rather than to evaluate the absolute noise levels themselves.

To provide a projection of future noise levels, the EINM was run with 1991 flight tracks and the forecast 2001 fleet mix and operations. This projection provides a comparison with existing noise levels and is included in subsequent tables for comparitive purposes.

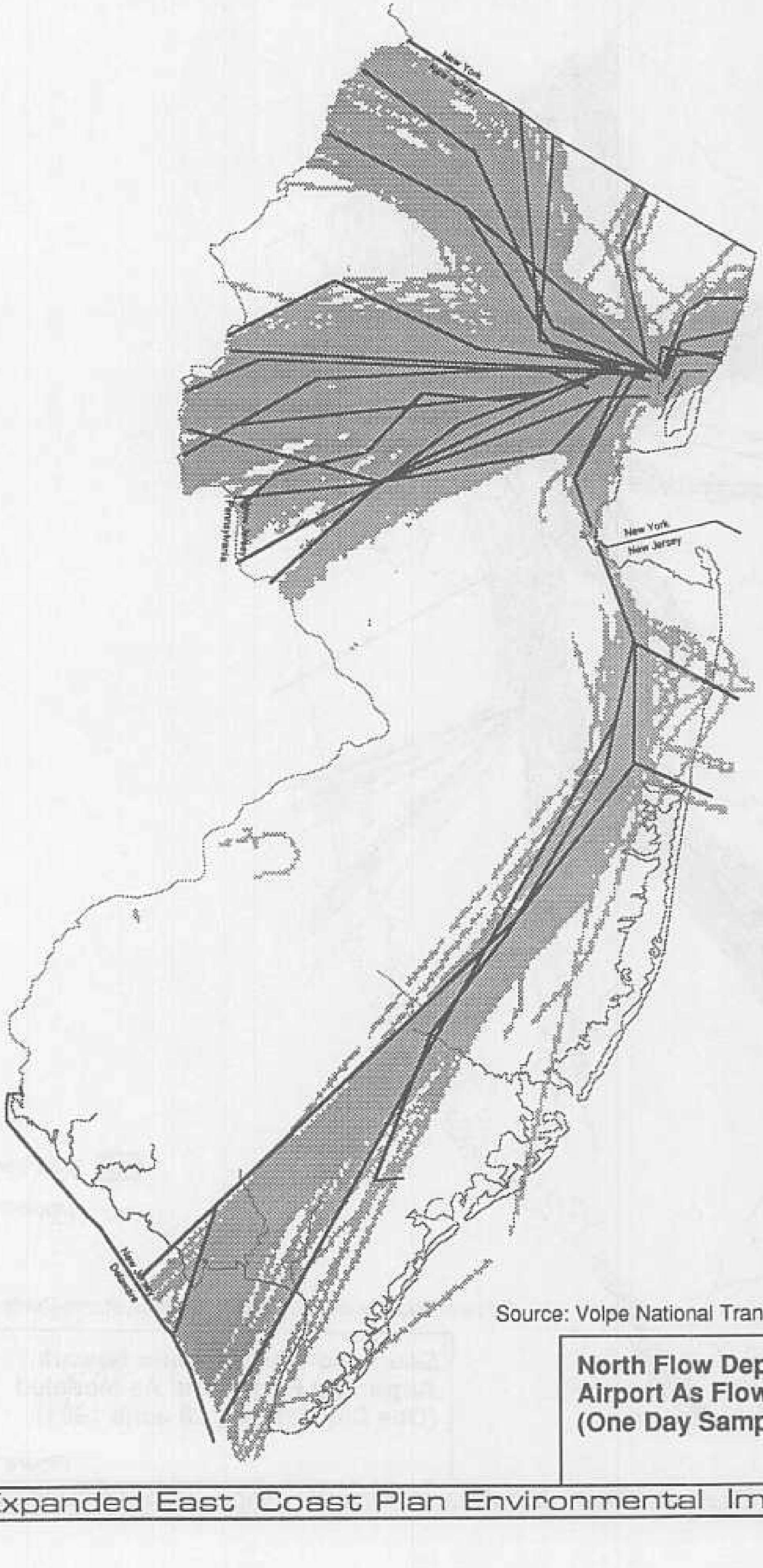
Existing Noise from EECP Operations

General Description of the Environment

Figures 5-9, 5-10, 5-11 and 5-12 show the major traffic flows separately for both arrivals and departures in and out of Newark Airport; superimposed on the radar plots are the modeled flight tracks associated with each flight corridor. Together, these aircraft constitute about one third of the total EECP traffic over New Jersey on an average day, and they contribute substantially to the noise environment in many of the communities from which complaints of the EECP have originated.

Note that these figures show only the central track modeled for each flight corridor and not the fully dispersed tracks described in Appendix D. Dispersion would add up to another 45 flight tracks (one for each aircraft type) to either side of each central track, the degree of dispersion depending on the altitude of each aircraft — the lower the climb or descent, the wider the dispersion.

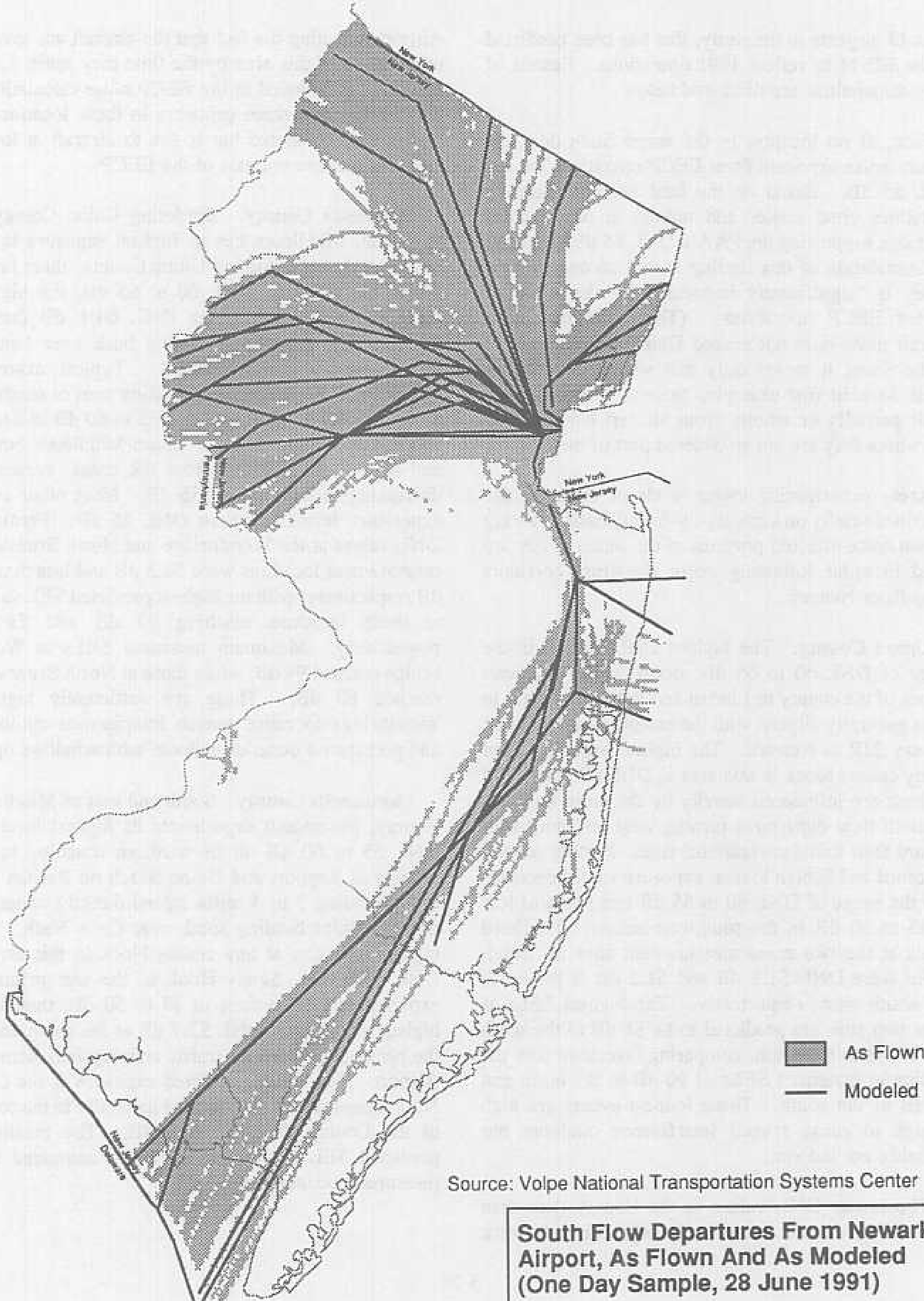
Also note the tracks have been "clipped" at 3,000 feet AGL and again whenever they extend beyond the coastal waterways or the State boundary. This reflects the definition of the EECP and the requirement to predict the impact of EECP operations over New Jersey. It is only the noise from these clipped tracks, as well as from the clipped tracks in and out of the



Source: Volpe National Transportation Systems Center

North Flow Departures From Newark Airport As Flown And As Modeled (One Day Sample, 1 July 1991)

Figure 5-10



Source: Volpe National Transportation Systems Center

South Flow Departures From Newark Airport, As Flown And As Modeled (One Day Sample, 28 June 1991)

Figure 5-12

Ocean County. Further to the south, even the highest exposure levels in Ocean County are less than DNL 45 dB under routes heading southward over the COYLE (CYN) VOR. Exposure along the eastern seaboard is even less.

Atlantic County. Here the highest exposure is found in the vicinity of Atlantic City Airport where the highest DNL value is 55.1 dB, and levels of DNL 50 to 55 dB extend westward for about 8 miles, apparently due to several A-7 departures that occurred during the ARTS radar sample. Levels in most other areas were less than DNL 45 dB, including Cape May, which is well below DNL 45 dB.

Morris County. Moving west away from Newark, areas of Morris County under the primary departure corridors and within three to four miles of the eastern boundary are exposed to DNL 50 to 55 dB, primarily due to aircraft departing runway 22R at Newark and heading northwest toward the SPARTA (SAX) VOR. The highest exposure at any census block in this area is DNL 54.0 dB. Even under flight corridors, these values decrease to DNL 45 to 50 dB and eventually to less than DNL 45 dB heading further west. None of the three measurement locations in the County (Mendham, Denville, or Long Valley) had predicted DNLs above 45 dB, though the value at Denville was 44.7 dB. Predicted maximum SELs at these sites are 89, 79, and 82 dB, respectively, compared to measured maxima of 80, 81 and 84 dB.

Warren County. By the time departures reach the western edge of New Jersey, they are sufficiently high that no area of Warren experiences noise exposure above DNL 45 dB.

Hunterdon County. For those departures heading more to the southwest than to the west, traffic is frequent enough that a very small area in the immediate vicinity of the SOLBERG (SBJ) VOR experiences levels of DNL 45 to 50 dB, the highest being DNL 45.7 dB. However, in all other areas of the County the levels are less than DNL 45 dB.

Hudson and Essex Counties. Both Hudson and Essex Counties are affected most significantly by takeoffs from Runway 4L at Newark. The highest exposure levels, extending five to six miles north of the Airport, are in the range of DNL 60 to 65 dB and are caused by departures turning left to head westbound. Closer to the runways, EECP exposure decreases to less than DNL 45 for the same reason that it decreased in Union County to the south. Westward across Essex County, exposure lowers to DNL 55 to 60 dB following the departure routes to the SOLBERG (SBJ) VOR for a distance of about seven miles, and continues to drop to levels of DNL 50 to 55 dB over essentially all of the remaining portions of the County. The measurement site in Kearny (Hudson County) is estimated to have an average exposure level of DNL 59.3 dB.

Bergen County. To the northeast, exposure levels reach highs in the range of DNL 60 to 65 dB in a small one-and-a-half mile band extending half way along the eastern boundary of the County. They also reach levels of DNL 55 to 60 dB in a two-mile wide, nine-mile long swath extending from the eastern boundary in a northwesterly direction. These are caused by LaGuardia departures heading northwestward across the New Jersey border prior to splitting and either continuing to the northwest or turning west-southwest toward SOLBERG. The very southern portion of the County is also exposed to DNL levels of 60 to 65 dB, but as in Essex and Hudson Counties, these are due to Newark departures from 4L turning westbound after takeoff. Between these highest exposed areas, DNL values decrease to 50 to 55 dB. The measurement site in River Edge is estimated be exposed to DNL 53.7 dB.

<u>Parks, National Wildlife Refuges, and Historic Sites</u>

Table 5.8 presents the DNL noise levels for the 1991 base case at certain county parks and National Wildlife Refuges (NWRs). Noise levels range from less than DNL 45 dB at several locations up to DNL 58.9 dB at the Rahway River Park. Base case 1991 noise levels at historic sites are presented in Table 5.9. Noise levels at the four sites are all less than DNL 45 dB. Since the FAA considers DNL 65 dB the level at which incompatibility exists between outdoor recreational land use and noise, none of the sensitive receptors are considered significantly

Table 5.9

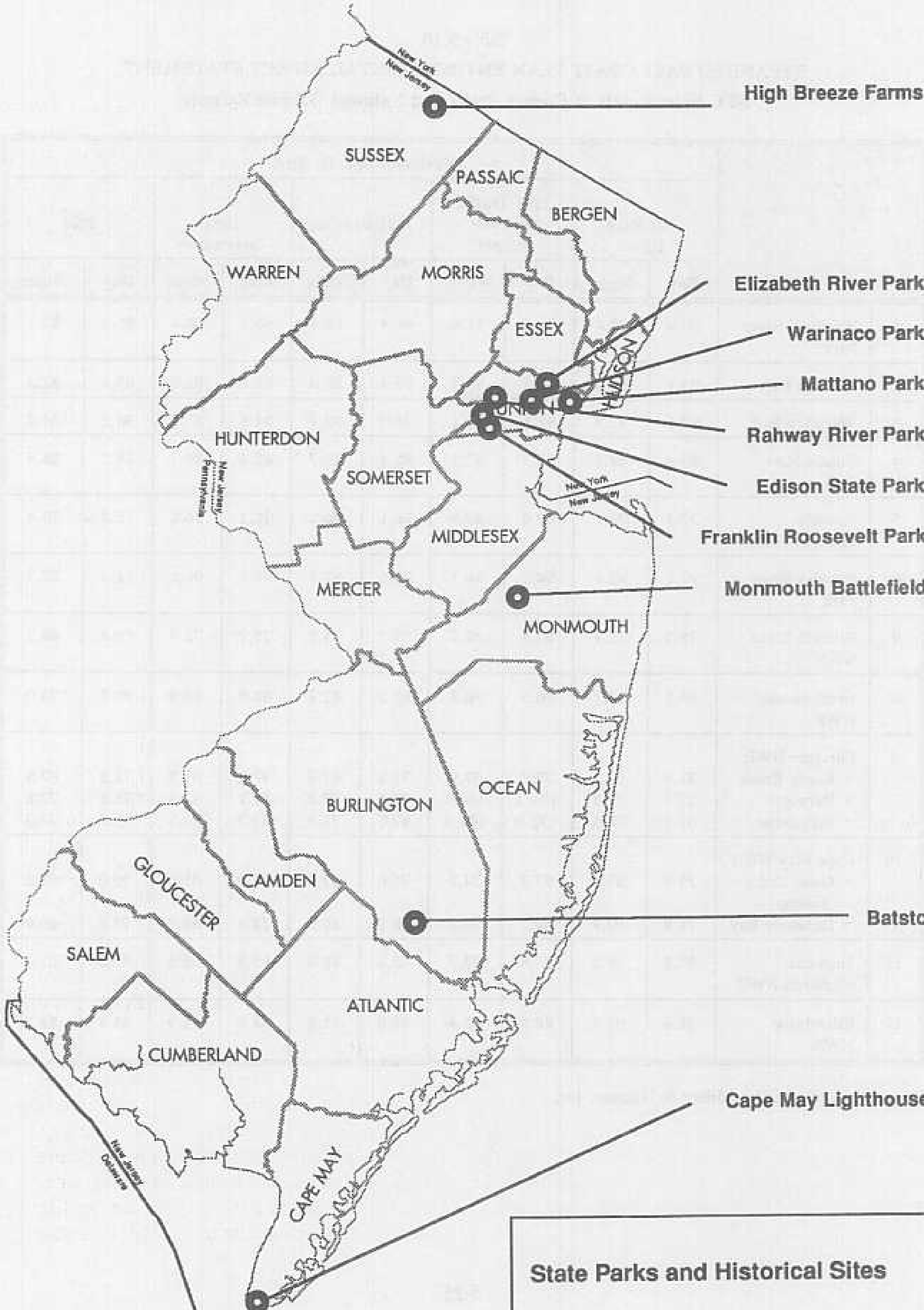
EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

DNL Noise Levels at Historic Sites

		Daily DNL (in dB)								
		1991 Base Case	1991 Traffic on 1986 Routes		1991 Fanning		1991 Overwater		2001	
		DNL	DNL	Δ	DNL	Δ	DNL	Δ	DNL	Δ
1	High Breeze Farms	<45	50.4	> +5.4	<45	NA	<45	NA	<45	NA
2	Monmouth Battlefield	<45	<45	NA	<45	NA	<45	NA	<45	NA
3	Batsto Village	<45	<45	NA	<45	NA	<45	NA	<45	NA
4	Cape May Lighthouse	<45	<45	NA	<45	NA	<45	NA	<45	NA

NA = Not applicable. (Both baseline and alternative DNL values are less than 45 dB.)

Source: Harris Miller Miller & Hanson, Inc.



State Parks and Historical Sites

Figure 5-13

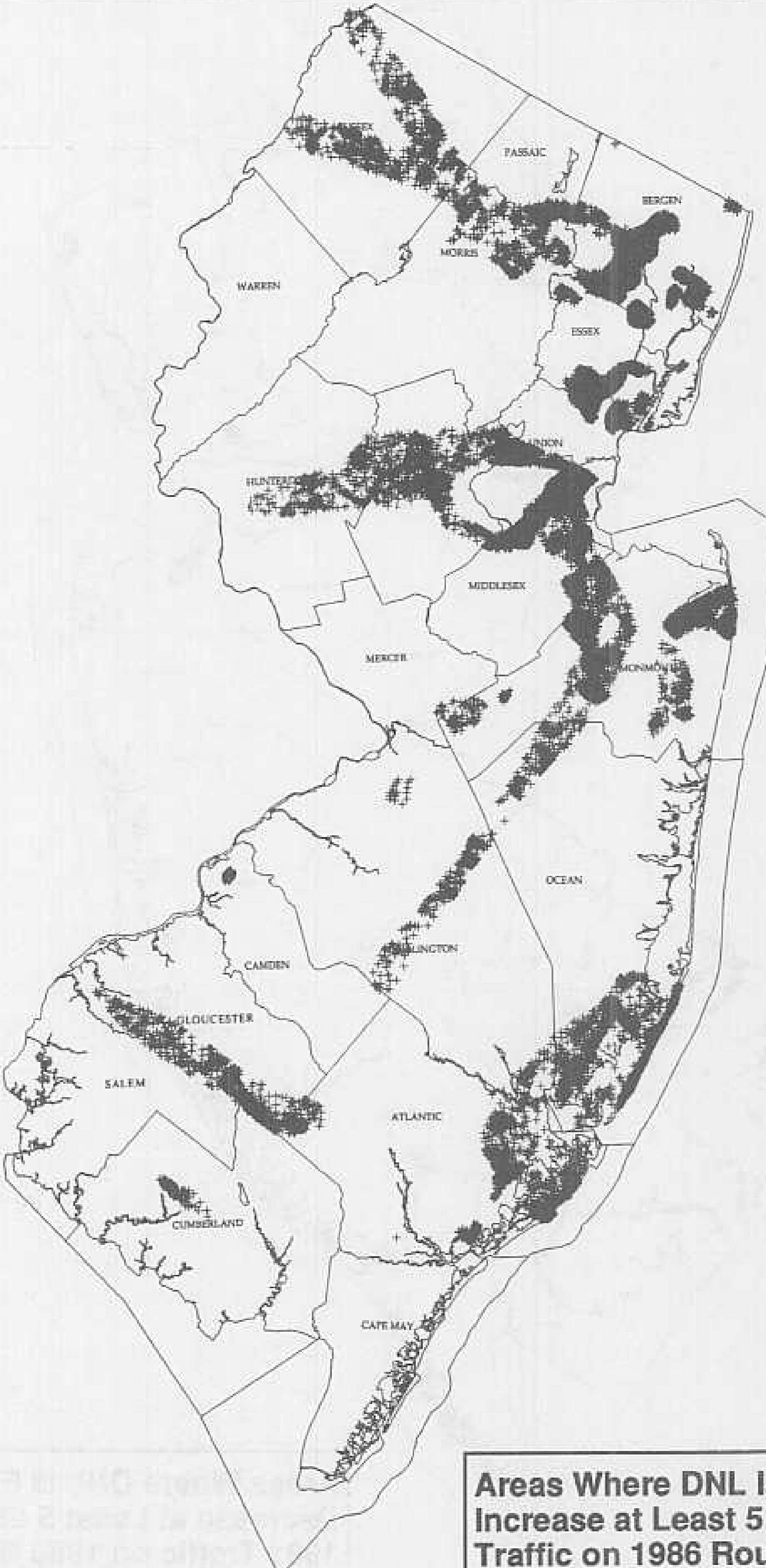
Table 5.11

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

SEL Noise Levels at Historic Sites

		Maximum SEL (in dBA)									
		1991 Base Case		1991 Traffic on 1986 Routes		1991 Fanning		1991 Overwater		2001	
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
1	High Breeze Farms	73.5	71.5	85.2	84.7	73.5	71.5	73.5	71.5	73.5	71.4
2	Monmouth Battlefield	75.0	75.0	75.9	75.9	73.5	71.5	73.5	71.5	73.5	71.4
3	Batsto Village	74.7	73.4	81.4	81.4	74.7	73.3	74.7	73.4	70.6	64.4
4	Cape May Lighthouse	71.7	71.7	75.7	66.5	71.7	71.7	71.7	70.2	64.2	62.7

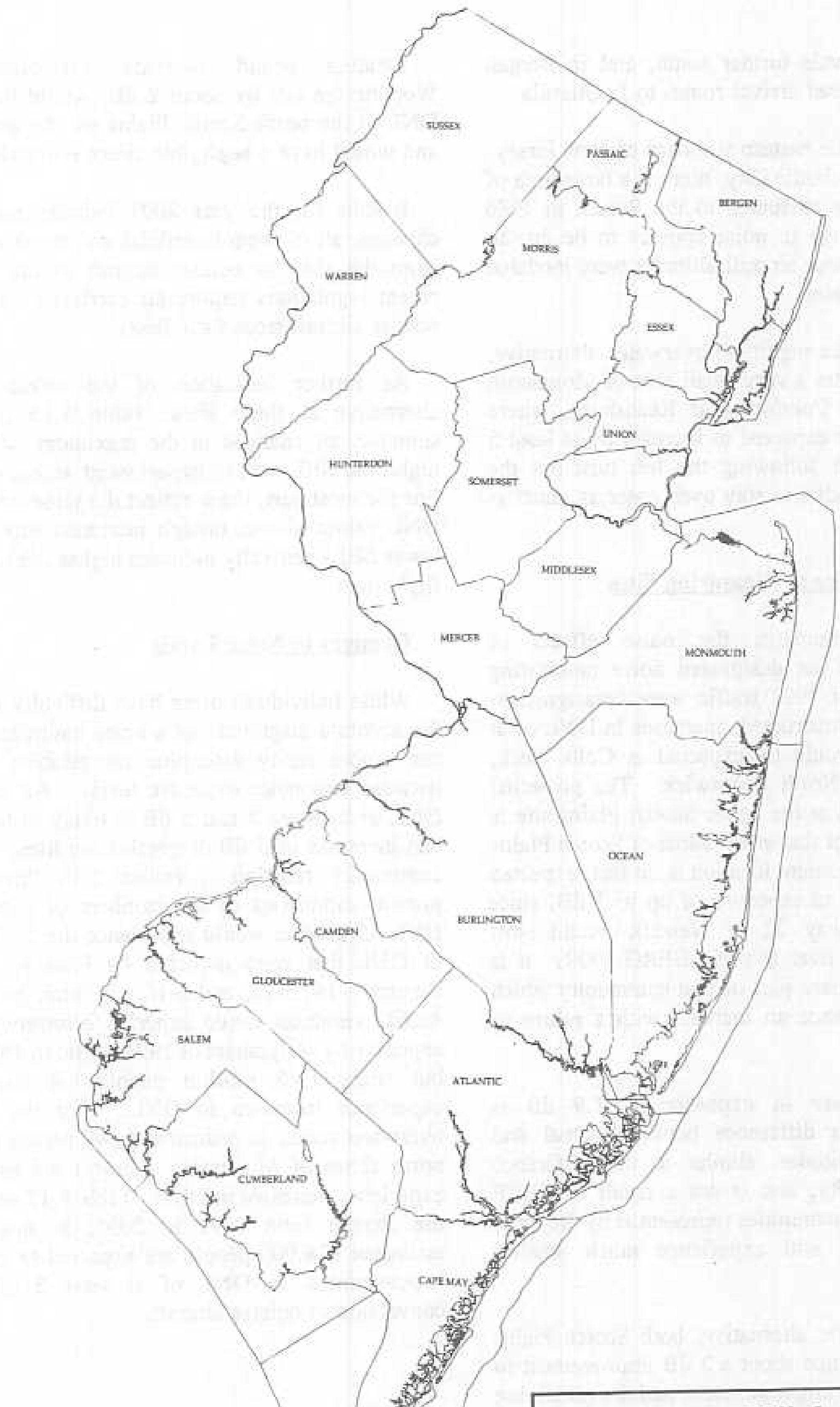
Source: Harris Miller Miller & Hanson, Inc.



Areas Where DNL Is Expected to Increase at Least 5 dB with 1991 Traffic on 1986 Routes

Source: Harris Miller Miller & Hanson Inc.

Figure 5-14



Areas Where DNL Is Expected to Increase at Least 5 dB Due to Nighttime Over-Water Alternative

Figure 5-16

Source: Harris Miller Miller & Hanson Inc.

Table 5.12

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Comparison of DNL Values at Specific Measurement Locations

Site	1991 Baseline	Change in DNL, by Alternative			
		1991 Traffic on 1986 Routes	1991 Overwater	1991 Fanning	2001
1. Scotch Plains (1)	51.8	-0.6	-2.0	+0.9	-5.8
2. Denville	44.7	-8.4	0.0	0.0	-2.8
3. Kearny	59.3	+1.9	0.0	0.0	-7.1
4. Long Valley	42.8	-6.1	-0.6	0.0	-3.0
5. Colts Neck	46.3	+6.6	+1.2	0.0	-6.4
6. River Edge	53.7	+0.5	0.0	0.0	-5.7
7. Woodbridge	50.3	+7.5	-0.2	-2.0	-6.6
8. N. Brunswick	38.3	+3.0	0.0	0.0	-1.7
9. Mendham	42.8	-7.2	-0.1	0.0	-2.6
10. Scotch Plains (2)	51.2	+2.6	-1.9	-0.1	-6.3

Source: Harris Miller Miller & Hanson, Inc.

Table 5.14

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Population Exposed to More Than a 5 dB Change in DNL Due to Assignment of 1991 Traffic to 1986 Routes

Areas Sorted by People Per Sq. Mile	People Exposed to at Least a 5 dB Decrease in DNL Sorted by Projected Exposure Level				
	DNL 45-50	DNL 50-55	DNL 55-60	DNL 60-65	DNL 65-70
Less Than 400	906	3	0	0	0
400 to 1,000	1,910	37	0	0	0
1,000 to 3,000	6,372	117	0	0	0
3,000 to 10,000	20,481	4,137	0	0	0
Greater Than 10,000	10,858	801	0	0	0
Total	**40,527**	**5,095**	**0**	**0**	**0**

Areas Sorted by People Per Sq. Mile	People Exposed to at Least a 5 dB Increase in DNL Sorted by Projected Exposure Level				
	DNL 45-50	DNL 50-55	DNL 55-60	DNL 60-65	DNL 65-70
Less Than 400	37,795	29,637	7,460	109	58
400 to 1,000	34,164	30,899	13,781	617	0
1,000 to 3,000	69,569	74,528	51,577	2,613	0
3,000 to 10,000	133,336	145,190	181,411	12,430	0
Greater Than 10,000	88,713	141,583	365,991	40,458	0
Total	**363,577**	**421,837**	**620,220**	**56,227**	**58**

Source: Harris Miller Miller & Hanson, Inc.

Table 5.16

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Population Exposed to More Than a 5 dB Change in DNL Due to 1991 Fanning Alternative

Areas Sorted by People Per Sq. Mile	People Exposed to at Least a 5 dB Decrease in DNL Sorted by Projected Exposure Level				
	DNL 45-50	DNL 50-55	DNL 55-60	DNL 60-65	DNL 65-70
Less Than 400	0	0	0	0	0
400 to 1,000	0	0	0	0	0
1,000 to 3,000	0	0	0	0	0
3,000 to 10,000	0	0	0	0	0
Greater Than 10,000	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**

Areas Sorted by People Per Sq. Mile	People Exposed to at Least a 5 dB Increase in DNL Sorted by Projected Exposure Level				
	DNL 45-50	DNL 50-55	DNL 55-60	DNL 60-65	DNL 65-70
Less Than 400	0	0	0	0	0
400 to 1,000	0	0	0	0	0
1,000 to 3,000	0	0	0	0	0
3,000 to 10,000	0	0	0	0	0
Greater Than 10,000	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**

Source: Harris Miller Miller & Hanson, Inc.

Changes in Noise in Parks, National Wildlife Refuges, and Historic Sites

Changes to these estimated DNL and SEL values resulting from the various study alternatives are discussed below.

1991 Traffic on 1986 Routes

Noise levels at the county parks, NWRs, and historic sites for 1991 traffic on 1986 routes are also summarized in Tables 5.8 and 5.9. Exposure levels range from less than DNL 45 dB at several locations up to DNL 60.1 dB at the Barnegat area of the Forsythe NWR. At the historic sites noise levels are estimated to be less than DNL 45 dB at all sites except the DNL 50.4 dB at High Breeze Farms.

Park areas expected to experience increases greater than 5 dB include the Franklin Roosevelt Park (10.6 dB), the Barnegat area (15.1 dB), and the Brigantine area of the Forsythe NWR (14.5 dB). An increase of 5.4 dB is expected to occur at the High Breeze Farms historic site.

Maximum daytime single event aircraft noise levels (SELs) at the county parks and NWRs range from 62.8 dBA in Wallkill River NWR to 104.2 dBA at Barnegat while nighttime levels range from 62.7 to 104.2 dBA in the same areas. Maximum SEL values at the historic sites range from 75.7 to 85.2 dBA in the day and 66.5 to 84.7 dBA at night.

SEL noise levels greater than 75 dBA outdoors have the potential to cause speech interference. Therefore, the noisiest aircraft operations at all the sensitive receptors have the potential to disrupt speech. The greatest SEL increases will occur at the Franklin Roosevelt Park (day and night), Great Swamp NWR (day and night), Reedy Creek/Barnegat/Brigantine areas of the Forsythe NWR (day and night), the Great Cedar Swamp of the Cape May NWR (day and night), the Supawna Meadows NWR (night only), and the Killcohook NWR (night only). A substantial decrease in the SEL levels would occur at the Wallkill River NWR (day and night). Large increases in the SEL noise levels at the historic sites would occur at High Breeze Farms, Monmouth Battlefield, and Batsto Village.

1991 Nighttime Overwater

DNL exposure levels in county parks and NWRs due to this alternative range from less than DNL 45 dB, mostly at sites located in southern New Jersey, up to DNL 57.2 dB at the Rahway River Park. At the historic sites exposure levels are all less than DNL 45 dB.

None of the parks, NWRs, or historic sites are expected to experience noise level increases greater than 5 dB.

Maximum single event noise levels (SELs) due to individual aircraft overflights of county parks and NWRs range from 71.8 to 96.4 dBA in the day and 61.9 to 90.6 dBA at night. SEL levels at the historic sites range from 71.7 to 73.5 dBA in the day and 71.5 to 73.3 dBA at night.

Since SEL noise levels greater than 75 dBA outdoors have the potential to cause speech interference, the loudest aircraft operations at all the parks except Reedy Creek have the potential to disrupt speech. Those at historic sites are not expected to be high enough to interfere with speech. Also, comparing these values to the 1991 baseline, minimal changes in noise of single events are expected at all sensitive receptors.

1991 Fanning

Under this alternative, noise exposure levels at the parks and NWRs range from less than DNL 45 dB at numerous locations up to DNL 60.7 dB at the Rahway River Park. At the historic sites exposure levels are all less than DNL 45 dB.

None of the parks, NWRs, or historic sites would experience noise level increases of 5 dB.

Maximum single event levels (SELs) at the county parks, NWRs, and historic sites range from 71.8 to 96.4 dBA in the day and 61.9 to 92.7 dBA at night.

generate noteworthy social impacts. No consultation on this environmental impact category was considered necessary and none was undertaken.

5.5 INDUCED SOCIOECONOMIC IMPACTS

Changes to air traffic patterns above 3,000 feet AGL implemented by the EECP did not cause shifts in patterns of population movement and growth. No changes in public service demands or business and economic activity occurred. Induced socioeconomic impacts normally result only when there are direct social impacts. Neither the retention of the existing air traffic system above 3,000 feet AGL nor any of the alternatives will produce induced socioeconomic impacts. No consultation was undertaken or considered necessary for this environmental impact category.

5.6 AIR QUALITY

5.6.1 Analysis Approach and Assumptions

The analysis procedure used for assessing air quality impacts is based on a methodology and an aircraft emission database jointly prepared by the EPA and the FAA. The emissions inventory utilized a procedure that will be published in EPA's Procedures for Emission Inventory Preparation.[16] The FAA Aircraft Engine Emission Database (FAEED) contains all currently available information on aircraft exhaust emissions.[17] The emission rates presented in the FAEED are based on engine-power settings and the fuel flows at those settings.

EPA's and FAA's procedure and database were developed for operations below 3,000 feet AGL, addressing approach, taxi, takeoff and climbout operations. Only emissions below 3,000 feet relate aircraft emissions to the National Ambient Air Quality Standards (NAAQS). However, because noise was not considered at the airport itself, but rather as a potential annoyance from air traffic above 3,000 feet throughout the State, air quality was considered in a similar context. Emissions were therefore estimated throughout the State above 3,000 feet. To establish cruise power settings, five aircraft types were analyzed using FAA's Fuelburn Model Linkmod 5.0.[18] Two altitudes were analyzed; 7,500 feet MSL for low altitude and 22,500 feet MSL for high altitude. The two altitudes were the averages of block altitudes 5,000 to 10,000 feet MSL and 10,000 to 35,000 feet MSL. The division at 10,000 feet MSL was chosen because FAR 91.117 (a) restricts all aircraft to 250 knots indicated airspeed below 10,000 feet MSL. The five aircraft types were also analyzed at three different operating weights to compare the effects of weight on the rate of fuelburn. Based on this analysis, 50 percent and 85 percent power settings were respectively estimated for low and high altitude cruise operations for all aircraft operating in New Jersey airspace.

The results of the Linkmod analysis were then incorporated into the FAEED. Fuelburn and emission rates were interpolated between the climb and approach power settings to create low altitude and high altitude cruise emission rates. These low altitude and high altitude cruise emission rates along with the climbout emission rates permit comparative analysis of aircraft operations above 3,000 feet AGL.

The aircraft operations from 14 airports in or adjacent to New Jersey were analyzed according to type of aircraft, altitude while over New Jersey and time of operations over New Jersey. These flights included all operations originating in, terminating in or flying over New Jersey.

5.6.2 Aircraft Emissions

There are five major pollutants from piston- and turbo-powered aircraft; hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO_x), sulfur oxides (SO_x), and particulates. All of these pollutants are byproducts of fuel combustion. Depending on the pollutant, the emission rates either increase or decrease based on the amount of fuel burned during any phase of an aircraft's operation. HC and CO emissions decrease as the power setting and rate of fuelburn increase.

NO_x emissions increase as the power setting and rate of fuelburn increase. As more power is used by an aircraft, the higher the NO_x emission rate.

Table 5.18
EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT
Gross Emissions Above 3000'

Alternative	Gross Emissions, lbs. per day				
	HC	CO	NO_x	SO_x	Particulates
1991 EECP	3,448	23,176	86,339	2,907	175
Return To 1986	3,796	26,203	86,346	2,970	171
Percent Change	10.1%	13.1%	0.1%	2.2%	-2.3%
Oceanic/Military	3,453	23,203	86,523	2,914	175
Percent Change	0.1%	0.1%	0.2%	0.2%	0.0%
Spreading	3,454	23,207	86,451	2,912	175
Percent Change	0.2%	0.1%	0.1%	0.2%	0.0%
Source: HNTB Analysis.					
NJ NAPAP All Sources	2,934,641	NA	2,022,049	1,005,195	NA
Comparison of Total Emissions by Alternative & Alternative Emissions as a Percentage of NJ NAPAP					
1991 EECP	2,938,089	-	2,108,388	1,008,102	-
Return To 1986	2,938,437	-	2,108,485	1,008,165	-
Percent Change	0.0118%	-	0.0046%	0.0062%	-
Oceanic/Military	2,938,094	-	2,108,572	1,008,109	-
Percent Change	0.0002%	-	0.0087%	0.0007%	-
Spreading	2,938,095	-	2,108,500	1,008,107	-
Percent Change	0.0002%	-	0.0053%	0.0005%	-

Source: Anthropogenic Emissions Data for the 1985 NAPAP Inventory, EPA-600/7-8-022 and HNTB Analyses.

pollutants would either fall directly into water bodies or get washed into water bodies was also analyzed. Under both types of scenarios, the effect of aircraft emissions of hydrocarbons and particulates was found to be negligible.

More realistically, a portion of the emissions from aircraft flying between 3,000 feet and 45,000 feet AGL above New Jersey would remain airborne until they are rained out or settle into the Atlantic Ocean. For airport approaches and departures over coastal areas, pollutant deposition into the ocean would be insignificant due to the large dilution effect of the ocean.

It is estimated that a majority of the pollutants falling to the ground would remain in the soil and would not be washed off by storm-water runoff. Particulates eventually carried in storm water would be measured as part of the background load of suspended solids in streams and rivers. Typical concentrations of suspended solids in New Jersey rivers and streams are 5 to 50 mg/L with greater concentrations possible during storm events.

Pollutant loading calculations were made for the following scenarios. Since loadings for all alternatives are similar, loads based on existing (1991) conditions were used in the calculations.

- Scenario A — Pollutant loads are dispersed and distributed over the entire State of New Jersey. Water bodies at 4 percent of the total area of the State receive 4 percent of the load. One-half of the pollutants are deposited in the State with the remainder deposited in the ocean or neighboring States.

- Scenario B — Pollutant loads are dispersed and distributed over the entire State. Water bodies at four percent of the total area receive 4 percent of the load. All pollutants are deposited within the State, with no carryover to the ocean.

- Scenario C — Pollutant loads are concentrated in the northeastern one-quarter of the State. Water bodies at 4 percent of the total area receive 4 percent of the load. All pollutants are deposited in the northeastern one-quarter of the State, with no carryover to the ocean.

- Scenario D — Pollutant loads are concentrated in the northeastern one-quarter of the State. Water bodies receive all pollution with no deposition on land or in the ocean.

Runoff flows were calculated based on assumed annual runoff depths of two feet based on annual average precipitation of 40 to 48 inches.[25] Daily pollutant loads from approximately 2,800 overflights were assumed equal for all alternatives. Calculated pollutant loadings for each scenario are given in Table 5.19.

5.7.4 Water Quality Impact

It is not possible to differentiate ground level effects of emissions caused by aircraft flying above 3,000 feet AGL from other air pollutant sources such as power plants, petroleum refineries, fuel storage, motor vehicles, space heating, petrochemical plants, and industrial facilities. In addition to being a minor source of air pollutants, aircraft emissions from above 3,000 feet AGL become widely dispersed, thereby diluting their concentration.

Pollutant calculations made in this study show that water quality impacts caused by emissions from aircraft flying above 3,000 feet AGL should not be discernible and that aircraft emissions pose little water pollution threat for hydrocarbons and particulates. As Table 5.19 shows, most of the calculated pollutant loads are extremely low and in many instances would be below detectable limits.

<u>Water Quality Impact of Fuel Dumping</u>

The impact of fuel dumping was also researched. Due to increased incidences of fuel jettisoning by military aircraft, the U.S. Air Force (USAF) conducted studies on this practice and its effect on the ground.

Fuel dumping, or jettisoning, by aircraft while airborne is occasionally required in emergency situations when the gross weight of an aircraft with fuel exceeds the safe loading weight. Fuel jettisoning usually results from in-flight emergencies such as engine failure. Not all aircraft are capable of dumping fuel. Military aircraft can release fuel from ports in the wingtips specifically designed for jettisoning. Tanker aircraft release fuel through the boom used for refueling aircraft. Aircraft weight can also be reduced by the aircraft remaining airborne until enough fuel has been burned to lower the gross weight sufficiently.

The USAF studied their fuel jettisoning practice and the groundfall effects over a three-year period from January 1975 to June 1978. USAF aircraft worldwide conducted approximately 960 fuel dumps annually. Fuel released totaled 200,000 gallons per month. USAF policy directs fuel dumping to take place at altitudes above 5,000 feet to take advantage of fuel volatilization. At these altitudes, the fuel evaporates and disperses to reduce ground contamination. The study found that 98 percent of jettisoned fuel released above 5,000 feet evaporates before reaching the ground, at ground temperatures above 0°C. In colder air temperatures, a greater percentage of fuel can reach the ground.

Principal fuel jettisoning areas are located over unpopulated or sparsely populated areas such as oceans, deserts, and forests, and are generally in close proximity to military bases. An inventory of dump areas for New Jersey shows no dumping over the populated metropolitan areas. Limited fuel dumping of 1 to 10 metric tons per year is reported for the southern half of New Jersey, centered on Maguire Air Force Base.[26]

The USAF study indicates that fuel jettisoning is a potential source of hydrocarbon contamination, but that under normal circumstances the majority of fuel dumped will vaporize preventing it from reaching the ground. Atmospheric diffusion and dispersion serve to dilute the fuels to low concentrations. The study concluded that no serious consequences are expected at the low concentrations produced by these incidents and that Air Force fuel jettisoning does not appear to entail any serious environmental implications.[27]

Fuel dumping by commercial aircraft are reported nationally in operational reports filed with the FAA. These reports are filed by air carriers but not by region where they occurred. Fuel dumping by commercial aircraft is reported to occur approximately 100 to 200 times annually or once every 3 days.[28] Fuel dumping by commercial flights only occurs during in-flight emergencies. Based on 200 million total air operations annually in the United States with 2,800 operations per day over New Jersey, approximately one fuel dumping incident per year is expected in the study area.

Many commercial aircraft do not have the capability to dump fuel. To lessen gross weight, they would burn fuel while remaining airborne. Representatives from the FAA and the Air Transport Association (ATA) report that dumped fuel volatilizes above 3,000 feet with the majority of fuel vaporized by the time it reaches 2,000 feet below the aircraft.[29,30] The alternatives reviewed in this EIS change potential areas for fuel dumping, but do not increase the likelihood of a fuel dumping event.

5.7.5 Environmental Impacts of Alternatives

All alternatives examined for routing air traffic over the study area showed approximately equal emissions of air pollutants. Air operations were also approximately equal. Table 5.20 shows a summary of the five air pollutants for the alternatives. Concentrations of air contaminants deposited in surface water bodies are below levels that are environmentally significant. Water quality impacts for all alternatives are negligible.

5.8 DEPARTMENT OF TRANSPORTATION ACT, SECTION 4(f)

5.8.1 Summary of Section 4(f) Requirements

Section 4(f) of the Department of Transportation Act states that the Secretary shall not approve any program or project which requires the use of: any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or; land of a historic site of national, State, or local significance as determined by the officials having jurisdiction thereof unless there is no feasible and prudent alternative to the use of such land and such program or project includes all possible planning to minimize harm.

5.8.2 Coordination with Agencies Administering Section 4(f) Properties

Coordination with the U. S. Fish and Wildlife Service and five National Wildlife Refuges was conducted. In addition, coordination with the State Historic Preservation Office, the U. S. Forest Service and the National Park Service was initiated. The Essex County and Union County Parks were also contacted for local park information.

5.8.3 Impacts to Section 4(f) Properties by Alternative

Sections 4.4 and 4.5 describe the Federal and State properties that are included under the designation of Section 4(f) lands. New Jersey has 42 specifically designated State-owned natural areas, which include parks, refuges, wilderness areas and recreation areas. The NJDEP-owned areas include 36 State parks, 4 recreation areas, 23 State historic sites and 11 State forests. There are also 6 National Wildlife Refuges in the State.

There are several county and city parks of interest located south of Newark International Airport in Middlesex and Union Counties. These are also considered Section 4(f) lands and include the following:

- Elizabeth River Park, Union County
- Mattano Park, Union County
- Warinaco Park, Union County
- Edison State Park, Middlesex County
- Franklin Roosevelt Park, Middlesex County
- Rahway River Park, Union County

Implementation of the EECP involved flight regimes where aircraft are operating on an instrument flight plan at 3,000 feet above ground level (AGL) or higher. Flight procedures lower than 3,000 feet AGL were not changed. Alternative D, Spreading Air Traffic, changes Newark departure routes below 3,000 feet AGL.

There will be no taking (actual or constructive) or other use of Section 4(f) land under any alternative. The proposed action would not affect the normal activity or aesthetic value of a public park, recreation area, refuge or historic site.

The following describes the noise level changes on certain public parks and refuges by alternative. Historic sites are discussed in Section 5.9.

No park, wildlife refuge, or recreation area will experience DNL 65 dB or greater noise levels resulting from any alternative. Changes in noise levels of DNL 5 dB or greater were analyzed for each of the six wildlife refugees and the six local interest parks, south of Newark Airport. The changes in noise levels are shown in Table 5.8. Table 5.10 shows changes in single event noise levels in terms of SEL. The degree of change is related to the 1991 procedures and traffic. See Sections 5.2.2 and 5.2.3 for a discussion of noise at National Wildlife Refuges and Parks.

5.9 HISTORIC, ARCHITECTURAL, ARCHEOLOGICAL AND CULTURAL RESOURCES

5.9.1 Summary of Laws Pertaining to Historic, Archeological and Cultural Resources

Compliance with two Federal laws that protect historic and cultural resources must be observed. The National Historic Preservation Act of 1966, as amended, and its regulations established under 36 CFR 800 establish measures to coordinate Federal actions affecting properties included in or eligible for the National Register of Historic Places. The Archeological and Historic Preservation Act of 1974 provides for the survey and preservation of significant cultural resources that may be lost due to a Federal project.

Under the requirements of the National Historic Preservation Act, an initial review is made of those

5.9.4 Impacts to Native Americans

There are no Federally recognized Indian tribes in the State of New Jersey. However, as described in Chapter 4, there are approximately 5,000 members of State-recognized tribes in New Jersey. None of these tribes will be adversely affected by any of the alternatives under consideration in this study.

5.10 BIOTIC COMMUNITIES

The EECP is based on a definition that involves flights at altitudes 3,000 feet AGL and higher. This altitude does not conflict with the criteria set forth in FAA Advisory Circular 91-36C, which advises pilots not to fly lower than 2,000 feet AGL over noise-sensitive areas, nor with 50 CFR 27.34, which prohibits aircraft at altitudes that result in harassment to wildlife. In most circumstances, the flights within the parameters of the EECP are much higher than 3,000 feet AGL. Because the nature of this project involves only aircraft operations at 3,000 feet AGL and higher, the focus of this analysis is on avian species rather than terrestrial or marine species.

5.10.1 Coordination with U.S. Fish and Wildlife Service and New Jersey Department of Environmental Protection

Initial coordination with the U.S. Fish and Wildlife Service Region V Refuges Office, the Enhancement Office in Pleasantville, the Endangered Species Office and the National Wildlife Refuges was conducted. Coordination with the New Jersey Department of Environmental Protection's Division of Fish, Game and Wildlife and Non-Game and Endangered Species Program was conducted throughout the study. In addition to coordination with Federal and State resource agencies, coordination with the New Jersey Audubon Society and several independent researchers was conducted.

In response to the FAA's request for scoping comments on the EECP, the U.S. Fish and Wildlife Service (FWS) noted that flight pattern changes implemented as a result of the EECP between February 1987 and March 1988 should not be confined to the State of New Jersey, and that the analysis in this EIS should be expanded to include the New York metropolitan area which is also affected. As discussed in Section 2.2.2, the scope of the EIS is limited, in accordance with the congressional mandate, to New Jersey and its adjacent coastal waters. Congress provided in Section 9119 of the Aviation Safety and Capacity Expansion Act of 1990 that the EIS would address the impact of the implementation of the EECP within the State of New Jersey. In addition, studying effects of other portions of the air traffic system affected by the EECP would have been neither practicable nor feasible given time constraits on the process, the complexity of an expanded study, and the lack of a reasonable basis for including, for example, the entire New York metropolitan area while excluding other geographic areas from Maine to Florida that may have been affected.

New Jersey is an important part of an avian migration system, habitat area, and wintering and breeding area within the Middle-Upper Atlantic Coast range. The Middle-Upper Atlantic Coast area, defined in the North American Waterfowl Management Plan, is considered one of the five priority habitat ranges in North America.[35] New Jersey is host to a wide variety of migratory birds, including passerines, waterfowl, shorebirds and raptors. Although spring and fall migration seasons bring countless birds into New Jersey's coastal areas, mountains, and rivers, creeks and lakes, birds are abundant year-round throughout the State.

It is important to understand the timing, altitudes, and routes of birds in flight. Although migration usually occurs during the fall and spring for most avian species, researchers have found that at almost all periods of the year there are some latitudinal movements of birds. Each species or group of species migrates at a particular time of year, and some at a particular time of day. Some species, such as shorebirds, begin their fall migrations early in July, and others migrate southward late in the winter months due to severe weather and lack of food. While some migrants are still traveling south, some early spring migrants have been observed returning north through the same region.[36]

Table 5.21

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Summary of Altitude and Visibility of Hawks at Cape May Point, New Jersey, During Autumn 1982 as Determined by Vertical Fixed-Beam Radar

Species[1]	Sample Size[2]	Mean Altitude±SD(m)	Critical Altitude (m)[3]
Turkey Vulture	6	655 ± 285	700
Northern Harrier	7	626 ± 132	550
Cooper's Hawk	5	406 ± 269	560
Broad-winged Hawk	12	476 ± 187	625
Red-tailed Hawk	1	499	---
Osprey	11	470 ± 256	700
American Kestrel	21	314 ± 206	400
Merlin	1	257	---
Peregrine Falcon	2	483	560

Note: Samples represent days when soaring conditions were good.

[1]Data for Sharp-shinned Hawks are given elsewhere.
[2]Number of days of observation.
[3]Critical altitude is the altitude at which the species was judged to be "difficult" to see with the naked eye when directly overhead against a cloudless sky.

Source: Kerlinger, Paul. Flight Strategies of Migrating Hawks, 1989.

larger the bird and the faster its airspeed, the higher it flies during the migration (Tucker, 1975).[46]

According to radar studies, the distribution of nocturnal migrants in airspace is strongly skewed to the lower altitudes. Based on data collected in the spring of 1967 at New Orleans, 70 percent of the migrants at night were most frequently between 241m (800 ft.) AGL and 1,127m (3,700 ft. AGL). Within this zone, about 75 percent were between 241m (800 ft.) and 482m (1,580 ft. AGL). Table 5.23 shows altitudes of peak densities of migrants aloft on 70 spring nights and 35 fall nights at New Orleans and Lake Charles, Louisiana; Athens, Georgia; and Charleston, South Carolina.[47]

Of the 79 altitude measurements taken on 70 spring nights, 73 percent showed the altitudes of peak densities of migrants to be at 1,000 feet or lower. In the fall, 56 percent of the 39 measurements on 35 nights indicated that the greatest concentrations of migrants aloft were at 1,000 feet. Only about 13 percent of the migrants were aloft at 3,000 feet or higher during spring migration and 28 percent were at 3,000 feet or higher during fall migration. The altitude of migrants changes throughout the night. Usually the maximum mean altitude of migration is reached about 2 hours after the initiation of flight and slowly declines thereafter as birds begin to terminate their nightly migration (Able, 1970).[48]

Studies have also shown that the variance in altitudinal distributions was significantly affected by wind speed and patterns. The densest migration altitude correlated with the altitude of most favorable wind conditions. Observations showed that the birds often fly higher if favorable winds can be found at higher altitudes.[49]

Migrating birds appear to fly at altitudes where winds will minimize the cost of transport and assist movements in seasonally appropriate directions. Where bird flights occur at higher altitudes, a significant correlation exists between the altitude of densest migration and the altitude of most favorable wind. Lower altitudes may be favored over slightly more favorable winds at much higher altitudes.[50]

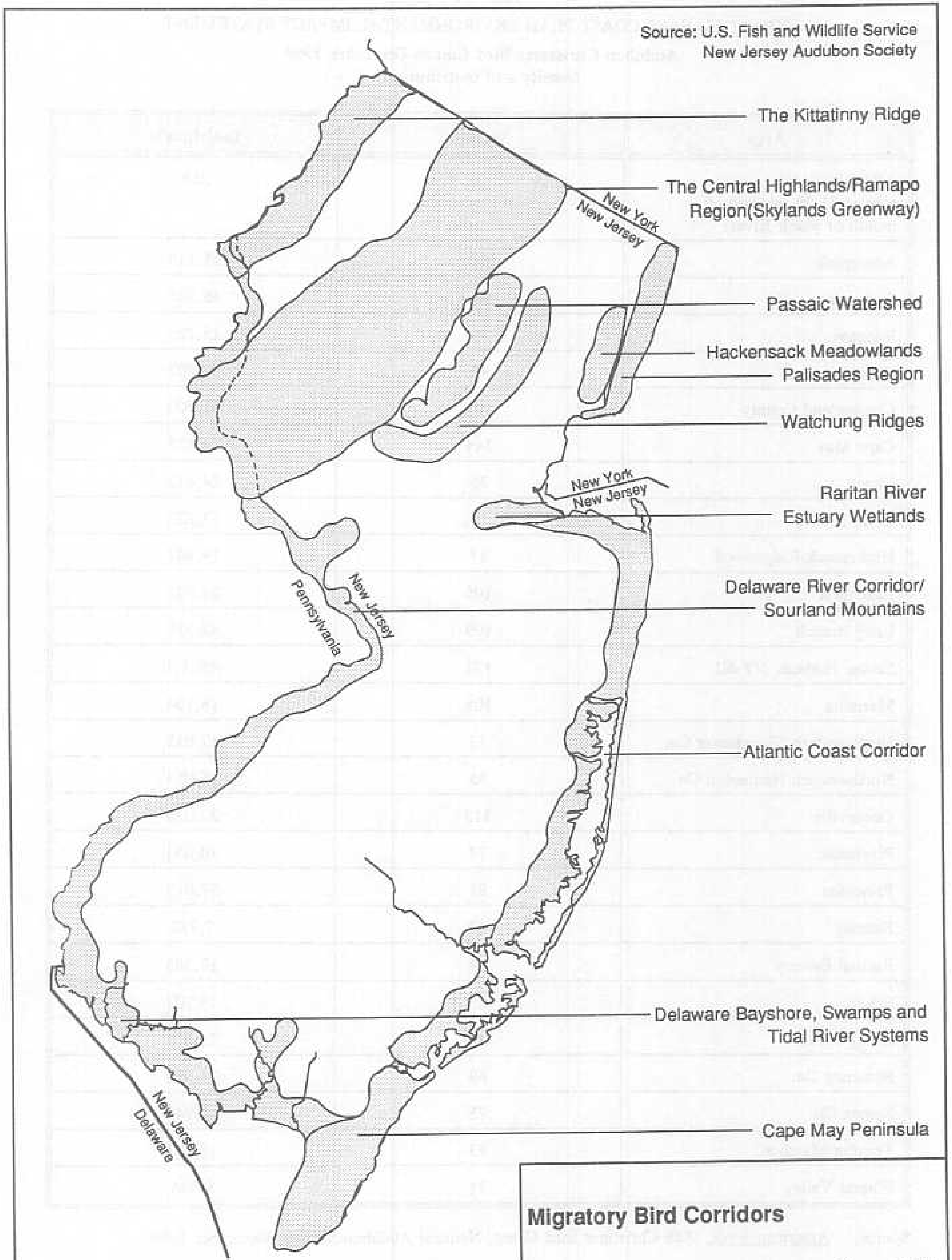
Migration Routes and Distribution Patterns

The New Jersey Audubon Society has identified certain key portions of New Jersey as designated Migratory Bird Corridors. These areas encompass the Kittatinny Ridge, Pequannock Watershed, Wawayanda Plateau, Hunterdon Plateau, Sourland Mountains, Delaware River Corridor, Palisades Region, Hackensack Meadowlands, all Passaic wetlands, Rockaway Valley, Watchung Ridge, Raritan River Estuary Wetlands, Ramapo Mountain Region, Black River Wetlands, Garden State Parkway Corridor, Atlantic barrier beach and bays and estuaries, Delaware Bayshore and marshes, Cape May Peninsula, Cumberland County swamps and rivers, Atlantic coastal waters to three miles, and Delaware Bay.[51] Figure 5-17 illustrates these general corridors. Certain researchers believe that there are two principal migration flyways in New Jersey: the coastal flyway across the Delaware Bay, and along the eastern edge of the Kittatinny Mountains. Raptor migration patterns, as in the case of migrants, differ depending on weather, topography and possibly photoperiodism.[52]

The Atlantic coast wintering area receives accretions of waterfowl from three or four interior migration routes. This area is used by land birds, as well as by large flocks of canvas backs, redheads, scaup, Canada geese and many black ducks that winter in the coastal regions south of Delaware Bay.[53]

The New Jersey Audubon Society's 90th Christmas Bird Count, conducted in 1990, provides useful information on density and distribution of birds throughout the State. Table 5.24 gives a distribution of the birds counted during December 1990. As can be seen from the distribution, the Lower Hudson Bay area shows the greatest number of wintering birds, followed by Cape May Point and Cumberland County.

The Great Swamp National Wildlife Refuge, located in Morris County, approximately 13 miles west of Newark International Airport, contains over 6,793 acres of hardwood swamp, upland timber, marsh and water, and pasture and cropland. This diverse habitat attracts a wide variety of both migratory and residential birds. Spring migration is



Migratory Bird Corridors

Figure 5-17

a prime season for waterfowl. A total of 222 species of birds were identified on this refuge from 1960-1985.[54] Table 5.25 illustrates those species found in abundance on the refuge by season.

Based on conversations with the refuge manager, helicopters and low-flying general aviation aircraft are incompatible with birds and the objectives of the refuge.[55] However, the refuge manager did not feel that aircraft flying at higher altitudes were a problem at this time.

An Interagency Agreement among National Park Service, Fish and Wildlife Service and the FAA was signed in 1984 in which FAA established a 2,000-foot AGL altitude as the minimum altitude for aircraft flying in airspace over lands administered by the National Park Service or the U. S. Fish and Wildlife Service. In addition, Federal regulations under 50 CFR 27.34 prohibit the unauthorized operation of aircraft at altitudes resulting in the harassment of wildlife.

5.10.2 Environmental Impacts by Alternative

The following discussion focuses on the potential impacts associated with the various alternatives under consideration.

Alternative A — EECP Existing Air Routes, Airways and Air Traffic Control Procedures. The implementation of the EECP in 1987 changed operating procedures used by the FAA to control air traffic above 3,000 feet AGL over the eastern United States. This alternative also constitutes the No Action alternative, or existing condition, as well as the proposed action.

Operations affected by the implementation of the EECP are those on instrument flight plan, under the control of the FAA and at altitudes of 3,000 feet and higher. Aircraft affected by the EECP implementation will be flying across the State of New Jersey at altitudes between 3,000 and 40,000 feet — mainly at 10,000 feet AGL and higher. Aircraft have been flying in this area for decades and disturbance to birds or other wildlife at higher altitudes has been minimal, unknown or unreported. The analysis presented in this section indicates that birds often do fly at altitudes of 3,000 feet and higher. However, the majority of birds fly below 2,000 feet during migration. The study recognizes that hawks, falcons, eagles, and some other birds can fly 10,000 to 20,000 feet and higher. Experts in the field of bird migration and literature studies suggest that there's a remote chance of an adverse effect of aircraft on birds at altitudes greater than 3,000 feet AGL.

Alternative B — Return to 1986 Air Routes and Procedures, Using 1991 Traffic. Disturbance to birds or other wildlife under this alternative is also considered minimal. In the airspace above 3,000 feet, the chances of impacting birds are remote.

Alternative C — Oceanic/Military Routing (Night Only) — Newark Departures on Runways 22R and 22L Routed Over Raritan Bay. There are no wildlife refuges or natural areas that would be affected by aircraft under this alternative. Cheesequake State Park lies just south of Raritan Bay, but flights across the bay would be well above 3,000 feet. Previous studies of migrating hawks showed that these birds often fly lower over water than over land; some will even avoid crossing water. Although waterfowl and shorebirds exist in this area, flights above 3,000 feet are believed to have minimal effects on avian species. Under this alternative, aircraft are cleared to climb to 10,000 feet and turn to intercept the Colts Neck 065 radial. Aircraft cross the New Jersey shoreline at about 8,000 feet. Although many birds, mostly passerines, migrate at night, the altitudes of night movement are believed to be much lower than the aircraft altitudes for this alternative. Based on the altitude for nighttime flights, no significant impacts to wildlife are expected to occur under this alternative.

Alternative D — Spreading Air Traffic — Additional Routes for Newark Departures on Runways 22R and 22L. A subalternative described in Chapter 3 was selected for further evaluation. This alternative provides straight-out departures during peak periods, while spreading the departures to allow quiet periods at several communities during parts of the day. Because this alternative involves departures at Newark International Airport, it is conceivable that aircraft could encounter birds enroute to the Kearny marshlands, Sawmill Wildlife Management Area or Great Swamp National Wildlife Refuge. However, disturbance to these birds or to their habitat in the area is considered unlikely due to the altitudes that aircraft will reach over these areas.

5.11 ENDANGERED AND THREATENED SPECIES OF FLORA AND FAUNA

As noted in Section 5.10, Biotic Communities, this analysis focuses on avian species.

5.11.1 Summary of Section 7 of the Endangered Species Act

Section 7 of the Endangered Species Act of 1973, as amended, requires Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

5.11.2 Coordination with Agencies under Section 7

Section 7(a)(3) of the Act, amended in 1982, provides for early consultation between Federal agencies and the U. S. Fish and Wildlife Service and the National Marine Fisheries Service to discover and attempt to resolve potential conflicts early in the planning stage of a proposed action.

On February 21, 1991, the Federal Aviation Administration (FAA) published a Notice of Intent (NOI) to prepare an EIS in the Federal Register. The U.S. Fish and Wildlife Service (FWS) provided comments on the NOI in a letter dated April 3, 1991. Coordination with the National Wildlife Refuge managers was requested in this response. Letters informing the refuge managers of the proposed action and its alternatives were sent to the National Wildlife Refuges in New Jersey: Great Swamp NWR, Supawna Meadows NWR, Edwin B. Forsythe NWR, Cape May NWR and Wallkill NWR. Information on the various refuges was received from Supawna Meadows, Great Swamp, Wallkill, and Cape May.

Comments from the Supawna Meadows NWR were received concerning wildlife resources in the area. In addition, reference to 50 CFR 27.34 was made which concerns the unauthorized operation of aircraft at altitudes resulting in the harassment of wildlife.

A conversation was conducted with the Refuge Manager of the Great Swamp NWR. The Great Swamp NWR manages waterfowl songbirds, raptors and wading and shore birds. A raptor rehabilitation center also exists at Great Swamp. The manager expressed concerns about helicopter operations. In addition, low-altitude general aviation operations also presented problems. The manager stated that commercial air traffic at higher altitudes was not a problem at this refuge.[56]

In a coordination letter, dated October 7, 1991, the U.S. Fish and Wildlife Service (FWS) Enhancement Office reported that five avian species currently listed as federally endangered or threatened occur in New Jersey. An additional species, the migrant loggerhead shrike (*Lanius Ludovicianus migrans*), is a Category 2 candidate species for listing.

Other Federally and State listed endangered and threatened species of flora and fauna in New Jersey are listed in Table 4.2 of Chapter 4. Many of these species are residents at the National Wildlife Refuges, the Sandy Hook Unit of the Gateway National Recreation Area located offshore to the east of Raritan Bay, and various State Wildlife Management Areas. The following Federal or State listed species are breeding birds found at Sandy Hook: Osprey (*Pandioin haliaetus*); least tern (*Sterna antillarum*); piping plover (*Charadriuis melodus*); and black skimmer (*Rynchops niger*).[57]

Coordination was also conducted with staff members of the Hackensack Meadowlands District and the Pinelands Commission. There are two federally threatened species that are known to breed within the Hackensack Meadowlands: the pied-billed grebe (*podilymbus podiceps*) and the Northern harrier (*Circus cyaneus*). Further, there are two federally endangered species and nine State threatened species known to use the district.[58] The bald eagle (*haliaeetus leucocephalus*) and peregrine falcon (*Falco*

5.11.3 Impacts to Endangered and Threatened Species by Alternative

Alternative A — EECP Existing Air Routes, Airways and Air Traffic Control Procedures. Hawks, eagles and falcons have the ability to climb as high as 10,000 to 20,000 feet and even up to heights of 25,000 feet AGL. However, conversations with experts who have observed these birds for years show that these species are: 1) not flocking by nature and 2) often migrate at altitudes much lower than 3,000 feet. The actual numbers of these species are quite low, which coupled with the remote chance of these birds soaring to the altitude of an aircraft at the same point and time, make the probability of an impact unlikely. It should also be noted that in the State of Alaska, where the numbers of bald eagles are many times that in the State of New Jersey, and where the range of aircraft altitudes is very broad, only one eagle strike is known to have occurred in the 1970s. That strike occurred at Anchorage International Airport when the aircraft was on take-off.

The implementation of the EECP in 1987 involved changes in aircraft procedures above 3,000 feet AGL. Most flights within this airspace are well above 10,000 feet. Therefore, aircraft at higher altitudes are not expected to endanger the continued survival of the species nor are they expected to impair the existence of their habitat.

Alternative B — 1986 Air Traffic Routes and Procedures with 1991 Traffic. The explanation provided for Alternative A applies to this alternative. Aircraft flying at altitudes 3,000 feet or higher are not expected to affect the continued existence of the species or its critical habitat.

Alternative C — Oceanic/Military Routing (Nighttime Only) Newark Departures Runways 22R and 22L Routed over Raritan Bay. The Forsythe NWR commented that "offshore flight patterns shown on the EECP map are often moved inland such that low altitude flights occur all year over impoundments heavily used by brant (*Branta bernicla*) and snow geese (*Chen caerulesceus*). Nesting piping plovers and colonial nesting birds also experience low-altitude aircraft disturbance on the refuge."[64] The EECP map to which the U.S. Fish and Wildlife Service refers was provided to them by the FAA. It appears that there was some misunderstanding of the map and aircraft operations along the coast of New Jersey. Low altitude flights — i.e., below 3,000 feet — were not included in the EECP. Routes V229-184 and V44, both in the general vicinity of Barnegat where Forsythe NWR is located, were relocated slightly in the implementation of the EECP. Patterns on these airways are not moved. It is apparent that the low altitude flights observed by Forsythe NWR are not associated with the EECP.

Passerines and some waterfowl are nocturnal migratory species. The buteos, falcons and eagles are diurnal species and do not often move at night. The altitude of nocturnal migrants and migrants over water appears through studies to be lower than those altitudes recorded during the day. Under Alternative C, departing aircraft turn right to a heading of 220 degrees and climb to 6,000 feet and then left to the Solberg 113 radial and the COLTS NECK VOR. The aircraft cross the New Jersey shoreline at approximately 8,000 feet. Therefore, if aircraft within the EECP are at these altitudes, the continued existence of threatened and endangered species and their habitat is not expected to be affected by this alternative.

Alternative D — Spreading Out Air Traffic — Additional Tracks for Newark Runways 22L and 22R. This alternative provides three alternative headings for aircraft after take off from Newark Runway 22; the existing heading 190, a heading of 205 and a straight out heading of 220. Aircraft are assigned to these departures in equal proportions over the course of a year. On each departure heading, after reaching 2,000 feet, the aircraft will return to the routings used in Alternative A. Therefore the impacts noted for Alternative A are valid for this alternative.

Conclusion

Little research is available to determine the exact altitudes of the listed federally and State threatened and endangered avian species. Most data are based on

Order 5650.2, Floodplain Management and Protection, contains DOT's policies and procedures for implementing the Executive Order.

5.13.2 Impacts to Floodplains by Alternative

The implementation of the EECP did not involve any construction-related activity nor did it affect floodplains. None of the alternatives impacts floodplains.

5.14 COASTAL ZONE MANAGEMENT

5.14.1 Summary of New Jersey Coastal Management Program

The New Jersey Coastal Management Program (NJCMP) is administered by the Division of Coastal Resources (DCR) in the Department of Environmental Protection. The following laws form the basis for regulatory control: the Coastal Area Facility Review Act (CAFRA), the Wetlands Act of 1970, the Waterfront Development Law, and the Riparian statutes. The NJCMP couples regulatory responsibilities with a coastal land-use planning function. Through time, the DCR's overall mission has expanded to include the regulation of inland freshwater wetlands and construction in floodplain areas of State tributaries, placing it in a unique position to protect watershed systems and ultimately the coastal zone.

The coastal boundary extends: (1) from the New York border to the Raritan Bay landward up to the first road or property line from mean high water; (2) from the Raritan Bay south along the Atlantic shoreline up to the Delaware Memorial Bridge varying from one-half to 24 miles inland (1,376 square miles of land area); (3) north along the Delaware River to Trenton landward to the first road inclusive of all coastal wetlands; and (4) around a 31-square mile area in the northeast corner of the State bordering the Hudson River under the jurisdiction of the Hackensack Meadowlands Development Commission, the State's designated body responsible for implementing the NJCMP in the Meadowlands.[65]

5.14.2 Coordination with Coastal Zone Management Agencies

Coordination with the New Jersey Division of Coastal Resources and the Office of Coastal Zone Management was initiated on August 5, 1991. Information was received concerning New Jersey's Coastal Zone Management Plan.

The New Jersey Coastal Zone Management Plan addresses the regulatory responsibilities involving a coastal land use planning function. The Division of Coastal Resources' functions have expanded to include regulation of freshwater wetlands and construction in floodplain areas of State tributaries.[66]

5.14.3 Impacts to Coastal Zone by Alternative

Based on a review of the New Jersey Coastal Zone Management Plan and the final environmental impact statement (August 1980) prepared for the New Jersey Coastal Management Program, the implementation of the EECP and the alternatives do not appear to be inconsistent with the New Jersey Coastal Management Plan. Areas of particular concern within the coastal zone have been identified in Chapter 4.

Special Federal requirements, which must be a part of the State's coastal management program under the Federal Coastal Zone Management Act, address certain activities that are subject to State review. Those activities specified for the FAA involve permits and licenses for the construction, operation or alteration of airports.[67] The implementation of the EECP and its alternatives do not involve construction, operation or alteration to any airport. The action only involves the restructuring of airspace from 3,000 feet AGL and higher. The New Jersey CZM Plan states that New Jersey will consider an activity consistent if it does not conflict with the Coastal Resources and Development Policies. There are no impacts to the coastal zone.

administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland." The Act required the Department of Agriculture to develop criteria to identify the effects of Federal programs on the conversion of farmland to non-agricultural uses.

5.17.2 Coordination with the Soil Conservation Service

The proposed action will not involve the taking or conversion of farmland to non-agricultural use. Therefore, coordination with the Soil Conservation Service in Somerset was initiated in August 1991, but was not continued.

5.17.3 Impacts to Farmland by Alternative

The proposed action and the alternatives under consideration will not involve conversion of any farmland to non-agricultural use. Therefore, no impacts resulting from the implementation of the EECP or any alternative will occur.

5.18 ENERGY SUPPLY AND NATURAL RESOURCES

This category of impact involves changes in demand for fuel at stationary facilities, changes in demand for fuel for mobile facilities, and use of natural resources other than fuel which are in short supply. The EECP involved neither stationary facilities nor use of any natural resources other than fuel. The difference in air miles traveled by aircraft within the boundaries of the State of New Jersey could account for a difference in fuel use for each alternative. The aircraft fuel burn, shown in Table 5.26, was calculated by a computer program using data for each model of aircraft during four flight modes: climb, low level cruise, high level cruise, and approach. Changes in flight track geometry affect the number of operations above 3,000 feet AGL over New Jersey for each alternative. Therefore, to permit alternative comparisons, the total fuel burn was converted to an average fuel burn by dividing by the number of aircraft operations. This methodology assumes that there is no effective difference in aircraft fleet mix between the alternatives. The results of this analysis are shown in Table 5-26.

5.19 LIGHT EMISSIONS

Changes in air traffic patterns caused by the implementation of the EECP would cause the location of lights from some night flying aircraft to change. No change in the intensity of aircraft lights has occurred. There were no changes to the location or intensity of any lights located on the ground. Aircraft in flight at night will have navigation lights and an anticollision strobe light visible. The introduction of air traffic into areas where no air traffic has been located previously, or a significant increase in the number of aircraft in these areas, may cause an increased awareness of the light emissions of aircraft in flight. Aircraft light emissions at altitudes of 3,000 feet or greater do not in themselves constitute significant impacts, therefore the retention of the air traffic system above 3,000 feet as implemented by the EECP or any of the alternatives will not cause significant light emission impacts. No coordination on this category of impact was considered necessary nor undertaken.

5.20 SOLID WASTE

Changes to aircraft flight patterns above 3,000 feet as implemented cannot affect solid waste collection, control or disposal. Therefore neither the continuation of the existing air traffic patterns resulting from the implementation of the EECP nor any of the alternatives will cause solid waste impacts. No coordination was deemed necessary nor undertaken for this impact category.

5.21 CONSTRUCTION

The implementation of the EECP caused changes to air traffic patterns at 3,000 feet AGL and above but did not result in any construction activity. None of the alternatives to the retention of the existing air traffic system above 3,000 feet will involve construction. No coordination in this environmental category was undertaken nor required.

5.22 VISUAL QUALITY

This impact category is normally related to considerations of the aesthetic integrity of an area in relation to proposed development in residential and recreational areas or disruption of scenic vistas. Since neither the proposed action nor any of its alternatives involves development, construction, earth moving, or stream relocation the normal considerations in this impact category do not apply. Changes in air traffic patterns above 3,000 feet AGL as introduced by the implementation of the EECP and proposed by the alternatives to the retention of the existing air traffic system may introduce air traffic into areas with pleasing vistas where no such air traffic or less air traffic existed before.

Air traffic may be visible during the day or as a source of lights at night. At higher altitudes under certain atmospheric conditions aircraft may produce "contrails." A contrail, or condensation trail, is a trail of water droplets or ice particles produced by aircraft engine exhaust when the humidifying effect of the water vapor exceeds the opposed heating effect of the exhaust.[69] A contrail appears as a long very narrow high altitude cloud. A contrail may be seen developing behind an aircraft. The aircraft itself will normally be so high as to appear to be no more than a speck. While contrails will be noticeable, as would any peculiar cloud formation, they are not likely to be considered a visual intrusion of significance. The difference in spatial distribution of contrails (because the high altitude jet routes differ between Alternatives A and B as shown in Figures 2-2 and 2-3) is not likely to be discernible to an observer on the ground.

The amount of visual intrusion because an aircraft is flying at lower altitudes is a function of the size of the aircraft and the distance of the aircraft from the observer. Since the aircraft flights related to the EECP implementation are at 3,000 feet AGL or above, the closest an aircraft could be to an observer is 3,000 feet.

The Forest Service of the U.S. Department of Agriculture has produced a volume addressing the preservation of visual quality of National Forests.[70] This volume provides a useful frame of reference for addressing the possible impact of aircraft flights on the visual aesthetics.

Aesthetics is defined by Webster as a branch of philosophy dealing with the nature of the beautiful and judgments concerning beauty.[71]

The aesthetic quality of an area to a large degree is a function of the frame of reference of the viewer.[72] The visual landscape is established as a basic resource to be treated as an essential consideration with other basic resources of the land. Most of the Forest Service Landscape Management guidelines address mitigation of the visual intrusion of structures, roads, bridges, etc. in the National Forests.

Residential areas or other land uses where aesthetically pleasing vistas are important in New Jersey are presumed to be limited to the rural or semirural areas of the State. Even in these areas there already exist a large number of structures, roads, bridges, powerlines etc. which, depending upon the point of view of the observer, constitute visual intrusion to varying degrees. The ambient visual intrusion in an area would be difficult to quantify. Furthermore, as the Forest Service indicates, individuals have an image of what they expect to see: "the image produced represents the knowledgeability, expectedness, romanticism and emotionalism associated with features within an area."[73] The introduction of aircraft into these areas or increasing the numbers of aircraft overflights can best be discussed in terms of relative intrusion.

The area within which the human range of vision is in focus is a 45° to 60° cone.[74] Using a value of 55° for the cone, the distance from the viewer that an aircraft will span the horizontal plane of this cone may be determined. Using the largest commercial aircraft operating over New Jersey — the 747, with a length of 231 feet — the distance from the viewer at which the length of the aircraft spans the cone of focused vision is 222 feet. At 3,000 feet distance — the lowest altitude of aircraft operations associated with the EECP implementation — a 747 would occupy only about 7.3 percent of the horizontal plane of the cone of focused vision. A vista covering 180 degrees can be scanned by a viewer moving his head through 3.3

Improvements in individual airport capacity are connected to the continuation of the improvements in air traffic control introduced by the EECP. Individual airport improvements which are likely to cause environmental impacts are the subject of individual environmental assessments for those airport actions.

The continued introduction of Stage III aircraft and the removal of Stage II aircraft from the national fleet is an action not dependent upon the continuation of the 1991 air traffic routings and procedures but is an action with cumulatively significant impacts. The improvement in noise levels in the Year 2001 because of the introduction of Stage III aircraft is discussed in 5.2.4.

5.23.2 Alternative B — Return to 1986 Aircraft Routings with 1991 Traffic.

The implementation of the EECP with its many changes to: routes, airways, arrival and departure procedures, frequencies, boundaries of responsibility, navigation aids, Federal Aviation Regulations and publications required about five years of planning and many detailed operational instructions. The magnitude of the planning and implementation of a return to 1986 air traffic routings and procedures would approach if not exceed the magnitude of the effort required to implement the EECP. The detailed study and effort required to return to 1986 air traffic routings and procedures could reveal deterioration of air traffic system efficiency. Quantification of the degree to which returning to 1986 air traffic routings and procedures over New Jersey would adversely impact air traffic flows in the remaining New York and other east coast areas would require a major air space study.

5.23.3 Alternative C — Oceanic/Military Routing (Nighttime Only) Newark Departures on Runways 22R and 22L Routed Over Raritan Bay at Night Only.

In this alternative some of the nighttime departures from Newark are turned eastward and pass over the New Jersey Coast prior to turning to the routing toward their destination. Related actions are the adjustments in other air traffic flows necessary to provide safe separation between the new routings and other New York area air traffic streams. Such actions are minor and are not likely to produce environmental impacts.

5.23.4 Alternative D — Spreading Air Traffic, Additional Departure Headings for Newark Runways 22L and 22R Departures.

This alternative provides two initial departure headings besides 190 degrees to follow until reaching 2,000 feet and then turning to routing. No significant related air traffic actions are required. There are no cumulative impacts related to the traffic at or above 3,000 feet. Noise impacts resulting from changes in traffic patterns below 3,000 feet should be considered in relation to all of the air traffic at Newark airport. Implementation of this alternative would require an environmental assessment of Newark Airport.

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60. Ibid.

61. Telephone conversation with Michael Kochert, BLM Birds of Prey Research Center, Boise, ID., October 16, 1991.

62. Telephone conversation with Kathy Clark, Tuckahoe Wildlife Management Area, Oct. 16, 1991.

63. Telephone conversation with Jim Brett, Hawk Mountain Sanctuary, Oct. 17, 1991.

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Chapter Six

Mitigation

CHAPTER 6. MITIGATION

The return to 1986 routes would result in an increase of 1.5 dB or greater in an area where the noise level is DNL 65 dB or greater at Holgate, N.J. This exceeds the FAA criterion. If it cannot be mitigated by changes in flight procedures, this significant adverse impact may require the consideration of the acquisition of property and the relocation of persons.

In general, there are only limited mitigation measures available for activities which generate noise at lower levels. Since the actions described in this EIS, except as noted above, do not lead to noise impacts exceeding DNL 65 dB (the established Federal guideline for compatible residential land uses), the FAA does not propose any acquisition of properties or relocation of persons, as may be the case if noise levels were found to be higher. Adjustment to flight procedures is the most likely means of providing mitigation for noise at less than significant levels, because these procedures are within Federal control and do not require any physical changes or changes to local land uses. Modification of flight procedures does have limitations, however. For example, if flight procedures are to be modified, there must be a reasonable assurance that there will be a tangible reduction in noise impacts and that noise will not just be moved from one location to another equally sensitive location. In particular, it is not considered useful to increase the impacted population at higher noise levels in order to reduce the impact of noise at lower levels. Additionally, modification to flight procedures must be "doable" within the constraints of safety, capacity, and controller and pilot workload.

The FAA will propose a series of operational mitigation strategies as a part of the Record of Decision (ROD). These strategies will include increases in altitudes on some routes, relocation of some routes, and reallocation of some traffic to routes that are currently not fully used. Specific mitigation measures will be outlined in the Final EIS, and specific commitments will be included in the ROD.

<u>Noise Concerns</u>

Increased noise levels in any area caused by the implementation of the EECP may have resulted from one or more of the following sources.

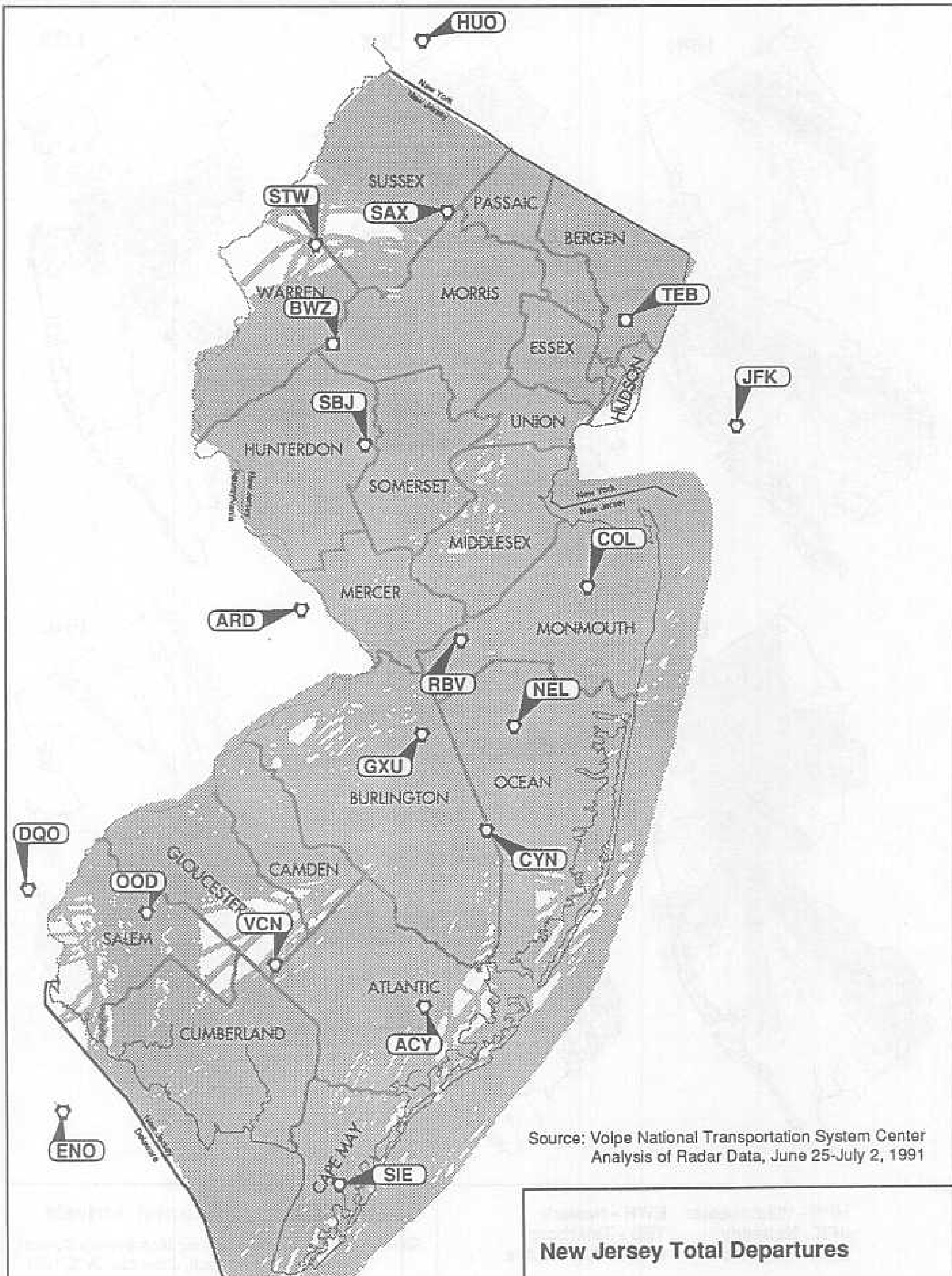
(a) Introduction of aircraft operations into areas where no or few operations had been previously.
(b) Increased numbers of operations.
(c) Lowered altitude of operations.
(d) Changes in fleet mix (aircraft types).

In addition, it is apparent that some of the annoyance expressed about the EECP resulted from aircraft flying below 3,000 feet. Such aircraft operations are not related to the EECP.

Introduction of Aircraft. The nature of aircraft operations over New Jersey is such that the whole state is subject to over-flight. Figures 6-1 and 6-2 show radar plots of arrivals and departures at New Jersey and adjacent airports. Figures 6-3 and 6-4 show radar plots of arrivals and departures for six of the 14 airports included in the data. An illustration of the airspace surrounding New Jersey would show similar concentrations of activity. These figures illustrate the difficulty of relocating aircraft operations from one area to another. Any such relocation affects other traffic. Consequently, the relocation of traffic to mitigate noise would require extensive air traffic control and air space analysis.

Increased Operations. Increased numbers of aircraft overhead could also increase noise levels. An increase in numbers could result either from a shift in air traffic patterns or an increase in total air traffic over time.

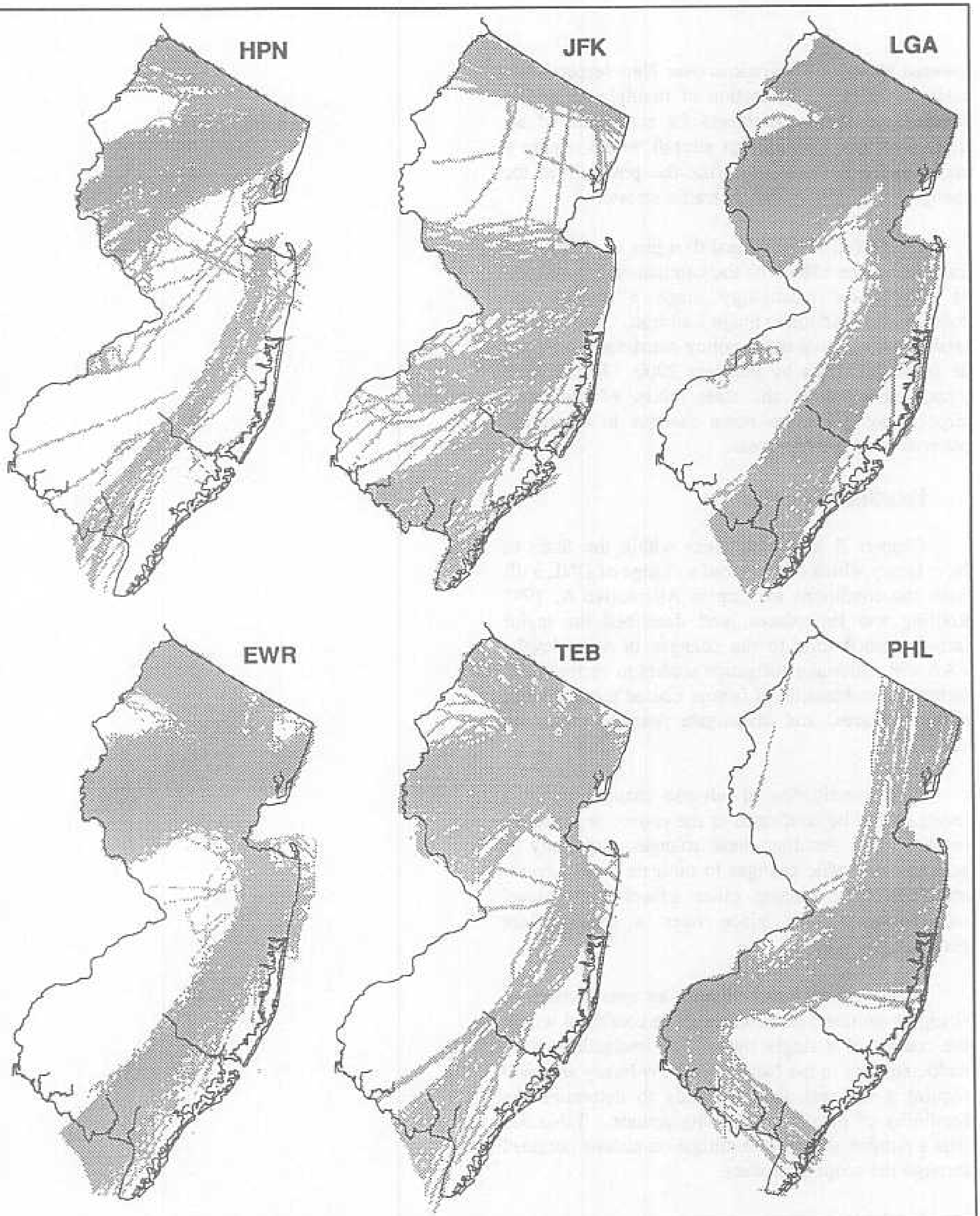
Lowered Altitudes. Lowered altitudes of operations over a particular area can result from shifts in traffic patterns. For example, the lowered air traffic over Long Valley resulted from shifting arrivals at LaGuardia to a different area and replacing that traffic with arrivals at Newark which pass over Long Valley at a lower altitude. Mitigation of the effect of



Source: Volpe National Transportation System Center
Analysis of Radar Data, June 25-July 2, 1991

New Jersey Total Departures

Figure 6-2



HPN - Westchester **EWR - Newark**
JFK - Kennedy **TEB - Teterboro**
LGA - Laguardia **PHL - Philadelphia**

Sample of Selected Airport Departures

Source: Volpe National Transportation System Center Analysis of Radar Data, June 25-July 2, 1991

Figure 6-4

Chapter Seven

List of Preparers

CHAPTER 7. LIST OF PREPARERS

Listed below are employees of the Federal Aviation Administration (FAA) who are responsible for the preparation of the Draft Environmental Impact Statement (DEIS). Supporting the FAA in this effort are individuals from the Department of Transportation (DOT) Volpe National Transportation Systems Center (VNTSC); PRC, Inc.; Harris, Miller, Miller and Hanson (HMMH); Howard, Needles, Tammen and Bergendoff (HNTB); and SRI International. It should be noted that, in accordance with Section 1502.6 of the CEQ regulations, the efforts of an interdisciplinary team, consisting of technicians and experts in various fields was required to accomplish this study. Specialists involved in this DEIS included those in such fields as air traffic, airports, logistics, environmental, government and industry, and public affairs; and other disciplines. While an interdisciplinary approach has been used, all decisions made leading to the development of this DEIS/FEIS are those of the FAA.

FEDERAL AVIATION ADMINISTRATION

FAA Headquarters

Charles R. Reavis

Program Manager for Environmental Issues, Office of Air Traffic System Management. B. S., B. A., Southeastern University. United States Air Force. FAA Air Traffic Controller in Texas and Virginia. Since 1976, Air Traffic Management positions at Chicago's O'Hare Tower; Honolulu Tower/TRACON, Honolulu, Hawaii; Washington ARTCC, Leesburg, Virginia; and FAA Headquarters. FEIS responsibilities: Special Project Manager to oversee the completion of the FEIS.

Tom Bennett

Environmental Protection Specialist (Airports, APP-600), B.A. in History, 17 years NEPA compliance experience. Responsible for technical review of the document for compliance with FAA, DOT, and CEQ regulations.

Daphne Fuller

B. A., Sociology, Princeton University, 1977; J. D., Howard University School of Law, 1980.

Prior experience: Four years as Assistant Attorney General New York State Attorney General's Office, Litigation Bureau, seven months as Principal Law Clerk, Supreme Court of the State of New York, over four years as Attorney/Advisor in FAA Office of Chief Counsel, Airports and Environmental Law Branch, Washington D. C.

Richard W. Danforth

B.A., Johns-Hopkins University, 1960; J.D. Georgetown University, 1964.

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Walter Messcher

M.S., Mechanical Engineering, Northeastern University, MA
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Mr. Messcher has 19 years of experience in noise simulation and analysis. He is the co-developer of the Integrated Noise Model (INM), and is also responsible for developing the Expanded INM (EINM) and the conduct of the noise simulation.

Edward J. Rickley

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Mr. Rickley has over 30 years of experience in instrumentation systems and over 20 years experience in transportation-related noise measurement, analysis, and assessment. As manager of the Noise Measurement and Assessment Facility, he is responsible for obtaining noise measurement data and providing analysis support to the EECP EIS.

Kevin W. Yearwood

M.B.A., Babson College, MA
B.S., Mechanical Engineering, Northeastern University, MA

Mr. Yearwood has over 20 years of experience in transportation systems engineering and application, with six years experience managing the on-going development of the INM. He is responsible for providing technical management and administrative coordination for the preparation of the EECP EIS.

Gregg G. Fleming

B.S., Electrical Engineering, University of Lowell, MA

Mr. Fleming has over five years experience in transportation-related noise measurement, analysis and assessment. As a member of the Noise Measurement and Assessment Facility, he is responsible for obtaining noise measurement data and providing analysis support to the EECP EIS.

William J. Willkie

M.C.P., Georgia Institute of Technology, GA
B.A., Architecture, University of New Mexico, NM

Mr. Willkie, an active pilot with 16 years of aviation and planning experience, serves as Manager of Aviation Environmental Studies at HNTB. His work has focused on the evaluation of environmental impacts, urban development, and land use controls as they relate to airport development. He has been involved in the land use/environmental component of studies at numerous large airports, including: FAR Part 150 Noise Studies at Washington National Airport, DC; Baton Rouge Metropolitan Airport, LA; Tampa International Airport, FL; and Charlotte/Douglas International Airport, NC. Mr. Willkie was also project manager and principal author of the recently published update of the FAA's Community Involvement Manual. He is currently project manager for the comprehensive assessment of the Navy's Air Installation Compatible Use Zone (AICUZ) Program.

Robert A. Sweatt

M.B.A., George Washington University, DC
B.A., Political Science, University of New Hampshire, NH

Mr. Sweatt is an active pilot with extensive experience in jet aircraft and flight operations. He has completed numerous master plans including supervising ten consultants on the Miami International Airport Master Plan. He has participated in Air Installations Compatible Use Zones (AICUZ) studies for Naval Air Stations. He was involved in the environmental impact assessment of a new major hub airport in South Florida and the environmental impact assessment of a runway extension at Austin Straubel Field, Green Bay, WI. Mr. Sweatt also was Project Manager for the Environmental Assessment for the United Parcel Service (UPS) air package sorting facility at Philadelphia International Airport. He is currently managing an evaluation of airspace, airport capacity, noise, passenger, terminal and surface access impacts resulting from possible changes in restrictions at Dallas Love Field.

Victor A. HoSang

B.S. Civil Engineering, Rensselaer Polytechnic Institute

Mr. Hosang has over 30 years of extensive airport project experience, including the development of airport master plans and aircraft noise abatement plans for airports throughout the United States. These include: Greater Rochester International, NY; Greater Buffalo International, NY; Miami International Airport, FL; Atlanta Hartsfield International, GA; Washington National Airport, DC; Minneapolis-St. Paul International Airport, MN; Des Moines International Airport, IA; Westchester County Airport, NY; Philadelphia International Airport, PA; Tulsa International Airport, OK; Kansas City International Airport, MO.

Dr. Stephen L. M. Hockaday

Ph.D. Transportation Engineering, University of California, Berkeley
M.Sc Transportation Engineering, University of California, Berkeley
B.S. (Hons.) Engineering, Royal Military College of Science

Dr. Hockaday has more than 20 years of experience in many aspects of air and surface transportation research, planning, design, and operations for government, industry and universities. Dr. Hockaday is Professor and Chair of the Civil and Environmental Engineering Department at California Polytechnical State University, San Luis Obispo (Cal Poly), where his responsibilities include teaching and research in air and surface transportation. He is also Interim Director of the School of Engineering's Research and Development facilities and activities. Descriptions of representative projects follow:

As part of the Puget Sound Flight project, Dr. Hockaday was responsible for examination of airspace operation and procedures for the Port of Seattle, and the Puget Sound Governmental Conference. The analysis assessed three types of airspace procedures: those in existence previously, those resulting from recent revisions implemented by FAA, and those that might occur in the future (with the implementation of improvements at existing airports, the construction of a new airport, and/or the redistribution of demand among airports in the region). The environmental assessment report associated with the ATC Procedure changes was also reviewed, and increases in the capacity of the Seattle-Tacoma International Airport that might result from physical improvements and revised air traffic control procedures were also investigated.

For the cities adjacent to Dallas/Ft. Worth International Airport, Dr. Hockaday was responsible for the review of the Draft Environmental Impact Statement for the addition of new runways and airspace procedures. He reviewed the FAA Metroplex Airspace Plan, proposed new ATC rules and procedures, and innovative operations at Dallas Love Field, Navy Dallas, and other airports in the region.

Dr. Hockaday has practical experience and knowledge of the East Coast Airspace, based on his work for FAA on the airport improvement task forces for LaGuardia, Kennedy, and Logan Airports (1977-79). He has developed and applied airspace models and developed ATC procedures for USAF and FAA (1979-1983). His most recent work has included airspace analysis for Hanscom Field, Boston (1990-1991), for the Seattle Region (1990-1991), and as a part of the Minneapolis-St. Paul Airport Studies (1989-1991). He has chaired two recent FAA-sponsored international workshops on the application of advanced software technologies to air traffic control.

Eileen M. Carlton

B.A. English, Campbell College
Graduate Studies, American University

Ms. Carlton has over 15 years of experience as an environmental planner with six years of experience in aviation related environmental studies. Ms. Carlton has had considerable experience in conducting environmental assessments, most recently for Douglas County Airport, GA; Stone Mountain Airport, GA; and Greater Buffalo International Airport, NY. Other recent project involvement has been as an assistant in the environmental analyses of master plan updates for Greensboro, NC, and Raleigh-Durham, NC. Ms. Carlton has also been involved in the environmental analyses for a General Aviation Reliever Site Selection Study in Orange County, FL, and for R.I. Bong Airport, Superior, WI.

Alan G. Hass

B.S. Engineering Science, University of Wisconsin, Milwaukee

Mr. Hass has over 13 years of experience in projects dealing with the analysis and control of noise in a variety of areas, including highways, airports and communities. He has participated in noise impact assessment and analyses of noise abatement procedures for surface transportation, and airport and community noise problems. He has been the principal investigator/author on over 120 projects nationwide.

Mr. Hass also has consultant experience with industry and commercial establishments. Specifically, he was responsible for the identification and evaluation of employee noise exposure, and the recommendation and implementation of appropriate noise control measures.

Richard D. Horonjeff

M.S. Transportation Engineering, University of California, Berkeley.
B.S. Mechanical Engineering, University of California, Berkeley.

Mr. Horonjeff has over twenty years of research and application experience in the fields of aircraft and airport noise control, psychoacoustics, and acoustic data acquisition systems. In the field of airport noise he has planned and directed numerous civil and military airport noise studies involving interaction with pilots and FAA, noise modeling and noise monitoring. In these, he has developed specific monitoring procedures for augmenting the model data base as well as for validating noise contours. Mr. Horonjeff is also a coauthor of NOISEMAP, the United States Air Force airport noise prediction computer model. In addition, he authored BOOMMAP, the SAF sonic boom prediction model.

In the area of psychoacoustics, Mr. Horonjeff has conducted laboratory experiments and field surveys of the effects of noise on people. Examples include community attitudinal aircraft noise surveys (adaptation to exposure change, and time-of-day sensitivity) and in-situ studies of the effects of noise on sleep. He has also conducted laboratory investigations of annoyance of pure tone components in aircraft passerby noise, helicopter rotor blade slap, and noise duration. Additional psychoacoustics work includes modeling of human auditory signal detection processes for steady state and impulsive signals.

In the area of data acquisition systems, Mr. Horonjeff has developed hardware and software specifications for portable and permanent noise monitoring systems. He also developed instrument calibration and data acquisition procedures, instrument control software, and computational algorithms for an FAA-approved FAR Part 36 aircraft noise data acquisition system. In addition, he has designed and implemented a variety of computer-based, high speed data acquisition systems. He also developed hardware specifications and computer software for control of time-critical laboratory and field experiments. Mr. Horonjeff has prepared journal articles, papers and oral presentations on each of these subjects.

and economic analysis, environmental planning, and water and natural resource management. Prior to ICF, Mr. Harper served as a Regulatory Impact Analyst on the staff of the Office of Air and Radiation, U.S. Environmental Protection Agency. In addition, he has held staff positions in environmental and legislative agencies in California, New Jersey, and Colorado.

Appendix A

Comments and Responses

APPENDIX A. COMMENTS AND RESPONSES

A-1. Post-Scoping Comments

On November 5, 1990, the U.S. Congress passed the Aviation Safety and Capacity Expansion Act of 1990 (P.L. 101-508) which directed the FAA to "issue an environmental impact statement pursuant to the National Environmental Policy Act of 1969 on the effects of changes in aircraft flight patterns over the State of New Jersey caused by implementation of the Expanded East Coast Plan." In response to this congressional mandate, the FAA published a Notice of Intent to prepare an environmental impact statement (EIS) in the Federal Register on February 21, 1991. In conjunction with this notice, the FAA announced its intention to conduct a series of three public scoping meetings in March 1991 as part of the scoping process. The meetings were held in Tinton Falls, Runnemede and Cranford, New Jersey on March 11-12, 20-21 and 26-27, respectively. Subsequently, two additional meetings were held in Rochelle Park and Parsippany, New Jersey on April 17 and 18 to respond to the high degree of public interest in the project. A post-scoping document was prepared by FAA.

A Notice of Availability of the Post-Scoping Document was published in the Federal Register on June 27 and July 12, 1991. This notice summarized the range of alternatives, the environmental concerns and the potentially significant issues to be addressed in the EIS. This notice provided a list of libraries where the document was available and a statement on how to obtain the document, and invited public comments on the post-scoping document.

The FAA received 39 written comments from the public concerning changes in aircraft flight patterns over the State of New Jersey. The purpose of this document is to provide responses to the public comments received during the post-scoping comment period. Some of the comments received reflect opinions of the individual commenters. Comments contained herein are those relating to issues germane to the EECP.

Table A.1 provides a summary of these comments, the responses to these comments and a listing of the respective individuals, groups or agencies making the comment.

Table A.2 provides a listing of respondents who submitted written comments in response to the Notice of Availability of the Post-Scoping Document. This table includes 1) a respondent identifier number; 2) the name of the commenter, group or agency submitting the comment; and 3) the corresponding number of the response to their comments.

All written comments received are attached. These comments can be divided into six major areas, which are: 1) effects of aircraft noise on residents; 2) effects of aircraft noise on human health, behavior and quality of life; 3) impacts of nighttime aircraft operations; 4) validity of the existing noise methodology and approach to modeling; 5) aircraft departure and arrival routes; and 6) increases in aircraft operations.

Table A.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Summary of Public Comment Responses

Summary of Comment	Response	Commenter Number
6. Is Scotch Plains/Fanwood considered enroute or terminal airspace?	This seemingly simple question does not have a simple answer. Airspace structure and air traffic control procedures are very complicated matters. Northern New Jersey is included in the area assigned to the New York Air Route Traffic Control Center (ARTCC). Normally the ARTCC controls enroute IFR traffic. In the New York area in order to improve the flow of air traffic, certain air traffic control functions have been delegated to the New York Terminal Radar Approach Control (TRACON). Approaches and departures for instrument traffic are normally executed in accordance with Standard Instrument Departures (SID) and Standard Terminal Approach Routes (STAR). STARs commence far outside anything normally considered a terminal area: for example, the Ward Three Arrival for Newark commences over Patuxent, Maryland. Thus, the New York TRACON controls air traffic well outside the New York Terminal Control Area. Consequently, Scotch Plains could be affected by both "enroute" and "terminal" activity. Because of the complications of air space structure and air traffic control procedures, this EIS has adopted a simplifying definition which states that everything above 3,000 feet AGL is enroute airspace. Thus the EECP was concerned with air traffic operating on instrument flight plans at or above 3,000 feet AGL. According to this definition, Scotch Plains would be under both enroute and terminal airspace, as well as uncontrolled airspace which is neither "enroute" nor "terminal."	003
7. Why wasn't "SID 3" completely implemented?	Standard Instrument Departure SID-3 is understood to be the Newark Three Departure (Vector) which was published in the United States Government Flight Information, U.S. Terminal Procedures, Northeast, Volume 3 of 3. It provided for Runway 22L/R departures to turn left, and climb on a heading of 190 degrees and upon crossing the three Nautical Mile DME on Runway 22 ILS turn right to heading 220°, and maintain 5,000 feet thence — (via vectors). There is no indication that this departure has not been fully implemented. There was no specified route for vectors after aircraft reached 5,000 feet and having turned to 220 degrees heading. The actual vector given would depend on the ultimate route of the aircraft, existing air traffic and the controllers discretion. In the November 14, 1991, issue, Newark Three Departure has been replaced by Newark Four Departure. Runway 22L/R departures in that procedure were not changed.	003

Table A.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Summary of Public Comment Responses

Summary of Comment	Response	Commenter Number
10. (continued)	Although reductions in flight delays reduce the fuel consumption of taxiing aircraft, the scope of the EECP environmental analysis will be restricted to the effects of the aircraft operations at or above an altitude of 3,000 feet above ground level (AGL).	
11. Several commenters recommended that the EECP be "rolled back."	Comment noted. The EIS will specifically address this issue as an alternative.	001, 004, 006, 007, 013, 036, 039
12. Several commenters stated that the 3,000-foot AGL benchmark was unacceptable since many flights occur below 3,000 feet.	The implementation of the EECP changed instrument departure, arrival and enroute procedures above 3,000 feet. Therefore, air traffic related to the implementation of the EECP only operate on an instrument flight plan at 3,000 feet AGL and above. There is a significant amount of air traffic below 3,000 feet which is not related to the implementation of the EECP. This air traffic will be addressed in a separate study currently being undertaken by the FAA.	006, 009, 017, 019, 021, 025
13. A comment was made that aircraft should only be permitted to fly over residential areas when they have achieved maximum altitude.	Such a restriction would not permit many airports to operate and therefore is deemed infeasible.	004, 006
14. One week period of noise monitoring provides insufficient time sampling according to the commenters.	Noise monitoring is designed to determine if annual noise level calculations are based on reasonable assumptions. The results of the study's noise monitoring were largely consistent with the noise levels developed using annual noise averages. During any specific period, it is unlikely that traffic patterns could duplicate the annual average conditions used for impact analysis. In recognition of this normal variation, noise monitoring was conducted along arrival and departure routes. During the monitoring program, radar tracks were monitored to enable the study team to correlate monitored noise levels with the EINM computer model. This tracking also indicated that, while flight tracks can vary substantially, such variations were within the range assumed for noise modeling.	006, 011, 014, 018, 022, 023, 027, 028, 032
15. A commenter stated that regulations should be promulgated to restrict unlimited additional flights by the airlines.	Such restrictions are beyond the preview of the EIS for the EECP since they are not related to changes in air routes.	006
16. Oceanic route is the preferred alternative according to some commenters.	Routing all traffic over the ocean is not feasible for numerous reasons. Ultimately, most EECP traffic originates or terminates at airports serving urban centers, thus requiring overflights of populated areas at some point. Increased use of oceanic routing is addressed in the EIS.	007, 011, 014, 018, 023, 029

Table A.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Summary of Public Comment Responses

Summary of Comment	Response	Commenter Number
23. How is reduction in altitude of aircraft over Long Valley consistent with the objective of allowing arriving aircraft to remain at higher altitudes?	The general objective of allowing arriving aircraft to maintain higher altitudes longer is not inconsistent with lowered altitudes over a specific location. In the case of Long Valley, arriving LaGuardia and Kennedy traffic that crossed Broadway VOR at altitudes of 9,000 to 10,000 mean sea level (MSL) prior to implementation of the EECP was replaced by Newark arrivals which overfly Long Valley at 7,000 to 9,000 MSL descending to 6,000 to 7,000 feet over Mendham.	035
24. A request was made to include the original technical analyses upon which the categorical exclusion of "instrument approach procedures, departure procedures, and enroute procedures conducted at 3,000 feet or more above ground level" are based.	Categorical exclusions are established: (1) for categories of Federal actions which have been shown historically to have no significant environmental impact under NEPA (see 40 CFR 1508.4); (2) because they will be widely utilized; and (3) that can be concisely stated to cover a particular group of Federal actions. The categorical exclusion for changes to instrument approach procedures, departure procedures and enroute procedures is contained in FAA Order 1050.1D, Appendix 4 dated 12-5-86. The categorical exclusion resulted from examination of previous noise studies, individual noise estimates and the best professional judgement at the time. No formal technical analysis report was completed at that time.	035
25. A description of "Traffic Management Strategy" was requested.	Traffic management is the process of balancing safety requirements with the capacity and demand for services that result from air traffic. Strategy is the art of preparing plans to use available means to attain a goal. Air traffic management strategy is the strategic management of traffic flow to minimize delays and congestion and maximizing the overall throughput of the national airspace system.	035

Table A.2

EXPANDED EAST COAST ENVIRONMENTAL IMPACT STATEMENT

Listing of Commenters

Commenter Number	Individual, Group or Agency	Response Number
027	Richard Vedvik-Lillis	5, 14
028	Edward M. Burstein, D.C.	5, 14
029	Ingrid O. Geygan	16
030	Will Berson, Office of the Governor, State of New Jersey	No response
031	Pauline Arkoulakis	4, 20, 21
032	Honorable Elizabeth L. Jaeger, Mayor, Township of Randolph	5, 14, 18
033	Honorable Maureen Ogden, New Jersey Assemblywoman	5
034	Honorable Jim Florio, Governor, State of New Jersey	5, 18
035	Angel M. Garcia, People Against Newark Noise	5, 22, 23, 24, 25
036	Jack Kelly, People Against Newark Noise	11
037	John P. Amatetti, Aerospace Industries Association	No response
038	Mary Jeanne White	4, 5
039	Rodney Ruth, Citizens Air Rights, Inc.	5, 11

Appendix B

List of Parties to Whom EIS Was Sent

APPENDIX B. LIST OF PARTIES TO WHOM DEIS WAS SENT

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Honorable Bill Bradley
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Honorable John H. Day
United States Senate
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Honorable Christopher Dodd
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Honorable Wendell H. Ford
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Honorable Frank R. Lautenberg
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Honorable Joseph Lieberman
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Honorable John McCain
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Free Public Library of Woodbridge
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Appendix C

Glossary

APPENDIX C. GLOSSARY

AGL — Above Ground Level.

Air Route Traffic Control Center (ARTCC) — An FAA facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace during the enroute portion of a flight.

Air Traffic Control (ATC) — A service operated by appropriate authority to promote the safe, orderly, and expeditious flow of air traffic.

Airman's Information Manual — A publication containing basic flight information and ATC procedures designed primarily as a pilot's information and instructional manual for use in the National Airspace System.

Airport Radar Service Area (ARSA) — Controlled airspace surrounding an airport or airports consisting of an inner circle (usually having a 5 nautical mile radius) which includes airspace from the surface to 4,000 feet, and an outer circle (usually having a 10 nautical mile radius) which includes airspace from 1,200 feet above the ground to 4,000 feet.

Airport Traffic Area — Controlled airspace surrounding an airport with an operating control tower. Airport traffic areas generally consist of the airspace within a 5 statute mile radius of the airport and from the surface up to but not including 3,000 feet above the surface. Aircraft within this area must be in communication with the ATCT.

Airport Traffic Control Tower (ATCT) — The air traffic control facility located on an airport and responsible for traffic separation within an airport traffic area.

Airway — A corridor of controlled airspace whose centerline is established by radio navaids. Low altitude airways (between 3,000 and 18,000 feet AGL) are identified by the letter V. High altitude airways (above 18,000 feet MSL) are known as Jet airways and are identified with the letter J.

Continental Control Area — Consists of controlled airspace above the contiguous 48 states, the District of Colombia, and a portion of Alaska at and above 14,500 feet (MSL). It does not include any airspace less than 1,500 feet above the earth's surface or prohibited and restricted areas other than those listed in 14 CFR Part 71, Subpart D.

Controlled Airspace — Airspace, which under certain specified conditions may not be used, without a clearance from FAA Air Traffic Control.

Control Zones — Controlled airspace surrounding an airport. (See also Airport Traffic Area)

Distance Measuring Equipment (DME) — A flight instrument which measures the distance from a navigational radio station in nautical miles.

Enroute System — That part of the National Airspace System located between terminal areas.

Quadrant — A quarter part of a circle, centered on a NAVAID oriented clockwise from magnetic north.

Radial — A magnetic bearing extending from a VOR, VORTAC, or TACAN facility.

RAMP Study — FAA Eastern Region Airspace and Metering Procedures study. A predecessor to the Expanded East Coast Air Traffic Plan (EECP).

Special Use Airspace — Six types of airspace designated for special uses and defined in the AIM.

Standard Instrument Departure Procedure (SID) — A published IFR departure procedure describing specific criteria for climb, routing, and communications for a specific runway from the terminal environment.

Standard Terminal Arrival Routes (STARs) — A published IFR arrival procedure describing specific criteria for descent, routing, and communications for a specific runway from the enroute environment.

Statute Mile — A measure of distance equal to 5,280 feet.

TACAN — Tactical Air Navigation. A navigational system used by the military. TACAN provides both azimuth and distance information to a receiver on board an aircraft.

Terminal Control Area (TCA) — Controlled airspace surrounding one or more airports and extending from the surface or some higher altitude within which all aircraft (regardless of the type of flight rules in effect either VFR or IFR) are subject to specified operation, communication, minimum equipment and pilot qualification regulations as specified in 14 CFR Part 91.

Terminal Radar Approach Control (TRACON) — An FAA Air Traffic Control Facility which uses radar and two way communication to provide separation of air traffic within a specified geographic area in the vicinity of one or more airports.

Tower Enroute Control — The control of IFR enroute traffic within designated airspace between two or more adjacent approach control facilities.

Transition Area — Areas of controlled airspace designed to contain aircraft flying IFR during portions of the terminal operation and while transiting from the terminal to the enroute portion of a flight.

Turboprop Aircraft — An aircraft whose main propulsive force is provided by a propeller driven by a gas turbine. Additional propulsive force may be provided by gas discharged from the turbine exhaust.

Vector — Heading Instructions issued by ATC to provide navigational guidance by Radar.

Visual Meteorological Conditions (VMC) — Weather conditions equal to or greater than those specified in 14 CFR 91.155 for aircraft operations under Visual Flight Rules (VFR).

Visual Flight Rules (VFR) — Rules and procedures specified in 14 CFR 91 for aircraft operations under visual conditions. Aircraft operating under VFR are not generally under positive control by ATC.

Appendix D

Integrated Noise Model (Expanded)

APPENDIX D. EXPANDED INTEGRATED NOISE MODEL

The core of the EECP noise prediction model is the Expanded Integrated Noise Model, or EINM. Developed by the Volpe National Transportation Systems Center, the model utilizes all of the basic noise prediction algorithms of the INM, but with the following additional features:

- The EINM has been restructured to permit modeling of unlimited airports and flight paths. For this study, approximately 1,300 corridors in and out of 14 airports are included in the analysis. Of the airports, Newark, LaGuardia, and Kennedy account for 70 percent of the total modeled operations. Philadelphia adds another 16 percent.

- Radar data now can be incorporated directly into the modeling process.

- The noise and performance data base for each aircraft type was modified in several significant ways:

  1) Noise data for individual aircraft types were updated to reflect a new data base just published by FAA.[1]

  2) Climb performance was modified to incorporate direct input from ARTS-IIIA radar systems.

- The ability to compute noise at large numbers of points has been added, along with the ability to incorporate site elevation of each point in noise computations. Calculations of noise from the EECP were made at approximately 125,000 locations representing population centroids of every census block in New Jersey.

Several aspects of these features are discussed briefly below.

D.1 FLIGHT CORRIDORS

FAA's Eastern Region provided definitions of existing flight corridors for use in modeling noise from the EECP. Examples of these are shown in Figures 1-3 and 1-4 and also in Chapter 5. Route definitions that had been part of the original planning behind the EECP were supplemented with designated "short-cut" routes that were added after reviewing plots of radar data to account for traffic vectored or cleared direct to a fix.

Figure D-1 shows a plot of four departure routes from runway 22R at Newark and the associated radar tracks of aircraft following the designated EECP procedures. A total of 30 departure routes were used to model the complete set of takeoffs from 22R.

In addition to each primary flight track, dispersed tracks were added to either side of the designated route to spread noise more realistically across the full corridor. The distance (d) between the dispersed track and the centered route is considered to be a function of the aircraft altitude (h) and is defined by the relationship:

$$d = (9000 - h) / 1.5 \text{ (in feet)}$$

When the aircraft is at 3,000 feet on the floor of the EECP, the dispersed tracks are 4,000 feet to either side of center; as the aircraft climbs to 9,000 feet, the dispersed tracks converge to the center. Operations are distributed 25% to each side and 50% on the middle. These relationships are shown in Figure D-2.

Note in the figure that actually there are multiple dispersed tracks about the center; this reflects the varying climb profiles of the 45 different aircraft types assigned to the route. Faster climbing aircraft reach 9,000 feet earlier and converge on the center sooner; slower climbing aircraft converge later.

D.2 AIRCRAFT ALTITUDE PROFILES

Aircraft altitudes in the 1991 baseline period are determined directly from the 25 June to 2 July 1991 sample of ARTS radar data assumed to comprise current operations. The average altitude for each aircraft type is computed at points along each modeled route using the radar returns of all similar aircraft assigned to the route. Thus, all 727s following a specific departure procedure will create an altitude profile different from the collection of DC-10s on the same route, but they also will create a profile different from the set of 727s following some other departure corridor. This approach to modeling the baseline condition means that altitude hold-downs, heavy aircraft, and other climb-related factors are all accounted for in the noise predictions. It also provides a means of generating profiles at higher altitude when aircraft climb above 10,000 feet — the normal cut-off altitude in most airport noise studies.

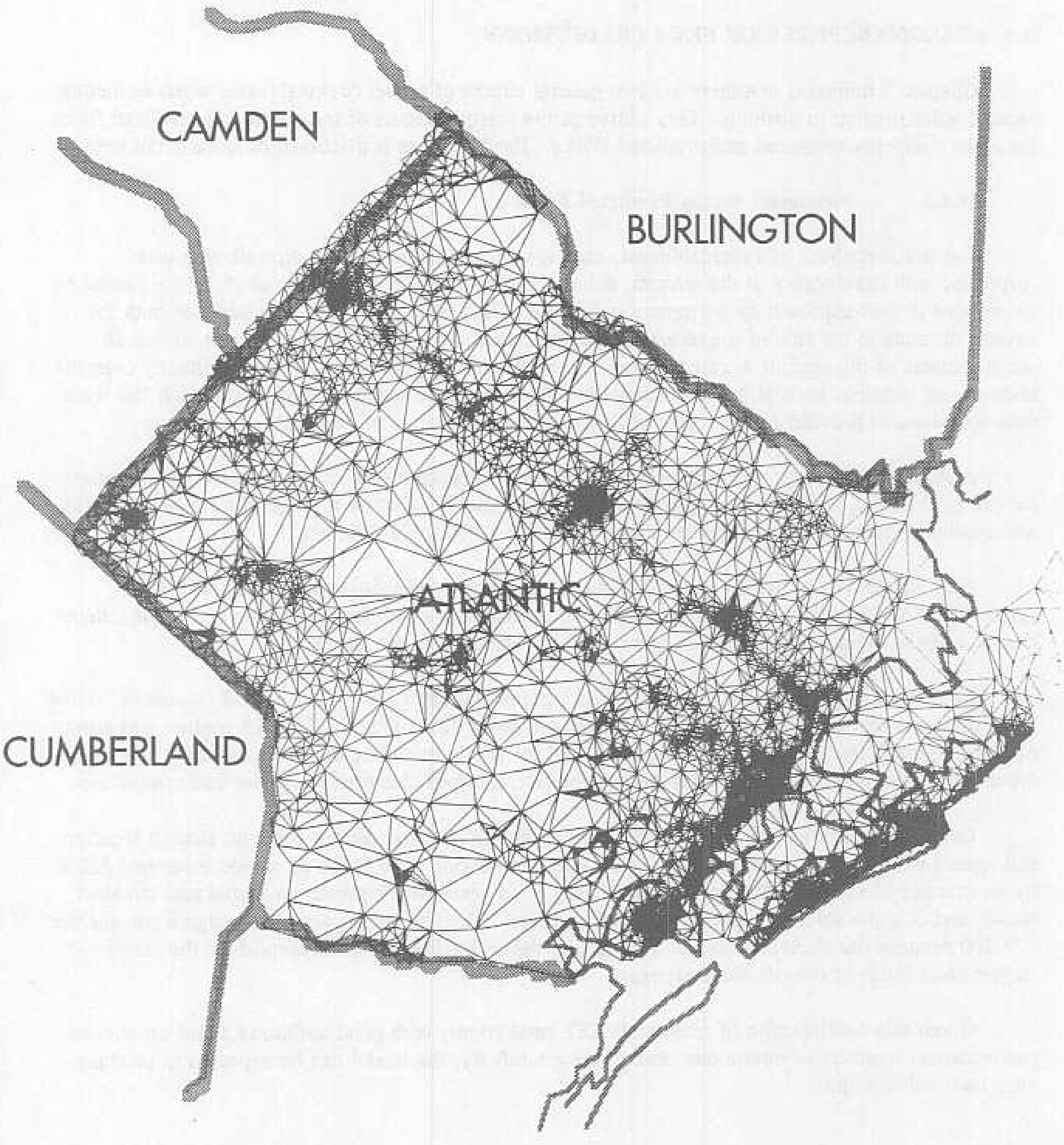
In modeling alternatives to the 1991 baseline case, however, this same "as flown" approach to aircraft performance cannot be replicated. For example, if an alternative incorporates a revised climb restriction to avoid conflicting traffic, the "as flown" profile will ignore it. As a result, all alternatives to the 1991 baseline case incorporate a different vertical dispersion.

Each approach and departure route of the alternatives to the baseline has been given FAA-assigned altitudes at each node of each route. A mid-performance aircraft, the 737-300, is assumed to follow these altitudes, while higher and lower performance aircraft follow their same relative profiles as determined from the radar data. Thus, vertical dispersion exists, but the technique has the potential effect of generating a conservative set of climb profiles, resulting in noise levels higher than what are likely to be experienced on the ground.

D.3 CALCULATIONS AT POPULATION CENTROIDS

The U.S. Census Bureau divides areas into small blocks, each designed to have no more than a few hundred people living in it. The population-weighted centers of these blocks are referred to as centroids, and each is defined by a latitude and longitude to identify its location.

Figure D-3 illustrates the set of centroids for Atlantic County, New Jersey, the densely packed area on the southeastern coast representing Atlantic City. The figure gives the sense of the massive numbers of points at which the EINM computed noise exposure and SEL values for the EECP and its alternatives.



Source: Harris Miller Miller & Hanson Inc.

Population Centroids for All Census Blocks in Atlantic County

Figure D-3

Expanded East Coast Plan Environmental Impact Statement

Table D.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Sample Results of Noise Calculations

census					density		maximum SEL	
trak	blk	longitude	latitude	people	/sq mi	DNL	day	night
0382	210	74.442892	40.663400	36	2590.67	51.13	86.73	86.73
0382	211	74.440682	40.661900	42	2472.92	51.10	86.84	86.84
0382	215	74.446999	40.656600	26	2322.67	50.43	86.80	86.80
0382	216	74.449429	40.656843	78	2245.25	50.30	86.63	86.63
0382	217	74.452025	40.665450	74	6810.68	49.87	86.28	86.24
0382	224	74.442627·	40.661400	68	2348.88	51.04	86.81	86.81
0382	225	74.441488	40.660369	7	1394.98	51.00	86.87	86.87
0382	226	74.450485	40.658794	81	1907.68	50.51	86.59	86.57
0382	232	74.447042	40.658450	55	1370.07	50.64	86.77	86.77
0382	233	74.445159	40.660133	3	863.56	50.87	86.71	86.71
0382	234	74.438830	40.663050	56	2378.32	51.17	86.90	86.90
0382	235	74.436285	40.664500	39	2149.71	51.19	86.91	86.91
0382	601	74.434768	40.681798	0	0.00	50.63	87.02	94.46
0382	602	74.439704	40.681967	209	3426.90	50.70	86.66	94.13
0382	609	74.438924	40.676400	67	2018.32	50.77	86.92	93.20
0382	610	74.436695	40.677567	2	575.71	50.69	87.04	93.49
0382	611	74.434350	40.579300	4	63.19	50.63	87.14	93.98
0382	628	74.429980	40.671033	50	3012.41	50.84	87.32	89.07
0382	635	74.434598	40.675233	484	2176.89	50.73	87.14	92.37
0382	636	74.434547	40.673667	60	5978.48	50.80	87.14	91.41
0382	637	74.432279	40.674250	67	4036.63	50.76	87.29	91.50
0382	633	74.431340	40.673200	25	2233.34	50.77	87.31	90.67
0382	639	74.430899	40.671950	55	4071.06	50.82	87.33	89.80
0382	640	74.433800	40.671533	83	3413.11	50.90	87.20	89.96
0382	641	74.431560	40.670000	56	2737.32	50.94	87.22	88.67
038101505A		74.413729	40.679908	1	1295.34	50.80	88.05	92.56
0382	517	74.417546	40.682250	313	1634.84	50.94	87.85	94.90
0382	519	74.429972	40.680600	0	0.00	50.59	87.31	94.40
0382	524	74.414111	40.679750	16	4605.64	50.77	88.03	92.52
0382	525	74.418699	40.679400	62	4490.50	50.64	87.90	93.16
0382	526	74.419924	40.678800	32	2858.67	50.59	87.86	92.91
0382	527	74.419035	40.677600	221	3145.82	50.54	87.84	91.88
0382	528	74.421085	40.681367	70	4029.94	50.79	87.77	94.93
0382	529	74.423358	40.679800	41	3933.99	50.64	87.68	94.11

D.4.2 Measured versus Predicted DNLs

The second test of the reasonableness of the EINM is a basic comparison of measured and predicted DNL values for existing operations. This comparison of levels is presented in Table D.2.

In this case, agreement is not expected to be as good for three significant reasons. First, measurements reflect total noise exposure — the effects not only of aircraft, but of local street traffic and other neighborhood sources of noise; the EINM only predicts the noise due to aircraft. Thus, at sites such as Colts Neck, Denville, Long Valley, and Mendham relatively distant from an airport, ambient sources become significant and measured levels will exceed modeled values. This can also happen at sites closer to Newark located in more densely populated suburban communities, even when microphone locations are selected to minimize the effects of background noise.

A second factor causing differences between measured and predicted DNL values results from the unique fact that this EIS is only addressing noise from aircraft above 3,000 feet AGL and over the state of New Jersey. The EINM does not account for the effects of aircraft when they are below 3,000 feet or beyond the state's coastal waterways. Noise monitors, on the other hand, cannot discriminate in this way and thus include this noise. This factor will result in higher-than-predicted DNL values at the measurement sites in Kearny, River Edge and Scotch Plains.

Thirdly, modeled baseline operations reflect annual average traffic flows in and out of the three New York metropolitan airports. At sites affected by a particular direction of traffic flow (north or south) out of Newark, the measurement period may not have reflected these average conditions.

In combination, these factors suggest that measured DNL values will probably exceed predicted values at every site. In fact, this is the case. Measured DNL values are higher than modeled values by anywhere from 6 to more than 14 dB. Such large differences do not indicate that the model is incorrectly estimating noise as much as they indicate that EECP operations only account for a portion of each site's total noise environment.

1. Bishop, D.E., and Mills, J.F., "Update of Aircraft Profile Data for the Integrated Noise Model Computer Program", prepared for Volpe National Transportation Systems Center, FAA Report No. FAA-EE-91-02, Vols. 1 and 2, March 1992.

Appendix E

Noise Metrics

APPENDIX E. NOISE METRICS

Most airport-related noise analyses are based largely on a description of the airport noise environment using a measure of exposure referred to as the Day-Night Sound Level (abbreviated DNL). These exposure levels are typically reported as equal-level noise contours or, as reported in this document, individual noise values at specific points of interest. In this study, DNL values are computed for approximately 125,000 points representing every census block in the State of New Jersey. But the EIS also includes discussion of several other noise metrics which help to further define the noise environment and describe its effects.

The sections which follow are presented to assist reviewers in understanding and interpreting all of the noise metrics used in this EIS.

E.1 INTRODUCTION TO ACOUSTICS AND NOISE TERMINOLOGY

Five interrelated acoustical descriptors of noise are introduced here in increasing degree of complexity. They are the:

- Decibel, dB;
- A-Weighted Decibel, dBA;
- Sound Exposure Level, SEL;
- Equivalent Sound Level, L_{eq}; and
- Day-Night Sound Level, DNL.

Of these, the SEL (representing an individual noise event) and the DNL (representing overall noise exposure from many events) form the basis for the majority of discussions on noise impacts from the EECP.

E.1.1 Decibel, dB

All sounds come from a sound source — a musical instrument, a voice speaking, an airplane passing overhead. It takes energy to produce sound. The sound energy produced by any sound source is transmitted through the air in sound waves — tiny, quick oscillations of pressure just above and just below atmospheric pressure. These oscillations, or sound pressures, impinge on the ear, creating the sound we hear.

Our ears are sensitive to a wide range of sound pressures. The loudest sounds that we hear without pain have about one million times more energy than the quietest sounds we hear. But our ears are incapable of detecting small differences in these pressures. Thus, to better match how we hear this sound energy, we compress the total range of sound pressures to a more meaningful range by introducing the concept of sound pressure level.

Sound pressure level is a measure of the sound pressure of a given noise source relative to a standard reference pressure: either 0.0002 microbars, 0.00002 Newtons/square meter, or 20 micropascals — all ways to express the same basic quantity. This reference pressure is typical of the quietest sound that a young person with good hearing is able to detect.

Table E.1

EXPANDED EAST COAST PLAN ENVIRONMENTAL IMPACT STATEMENT

Decibel Addition

When two decibel values differ by:	Add the following amount to the higher value:
0 to 1 dB	3 dB
2 or 3 dB	2 dB
4 to 8 dB	1 dB
9 dB or more	0 dB

Source: Harris Miller Miller & Hanson Inc.

E.1.2 A-Weighted Decibel, dBA

Another important characteristic of sound is its frequency, or "pitch". This is the rate of repetition of the sound pressure oscillations as they reach our ear. Formerly expressed in cycles per second, frequency is now expressed in units known as Hertz (Hz).

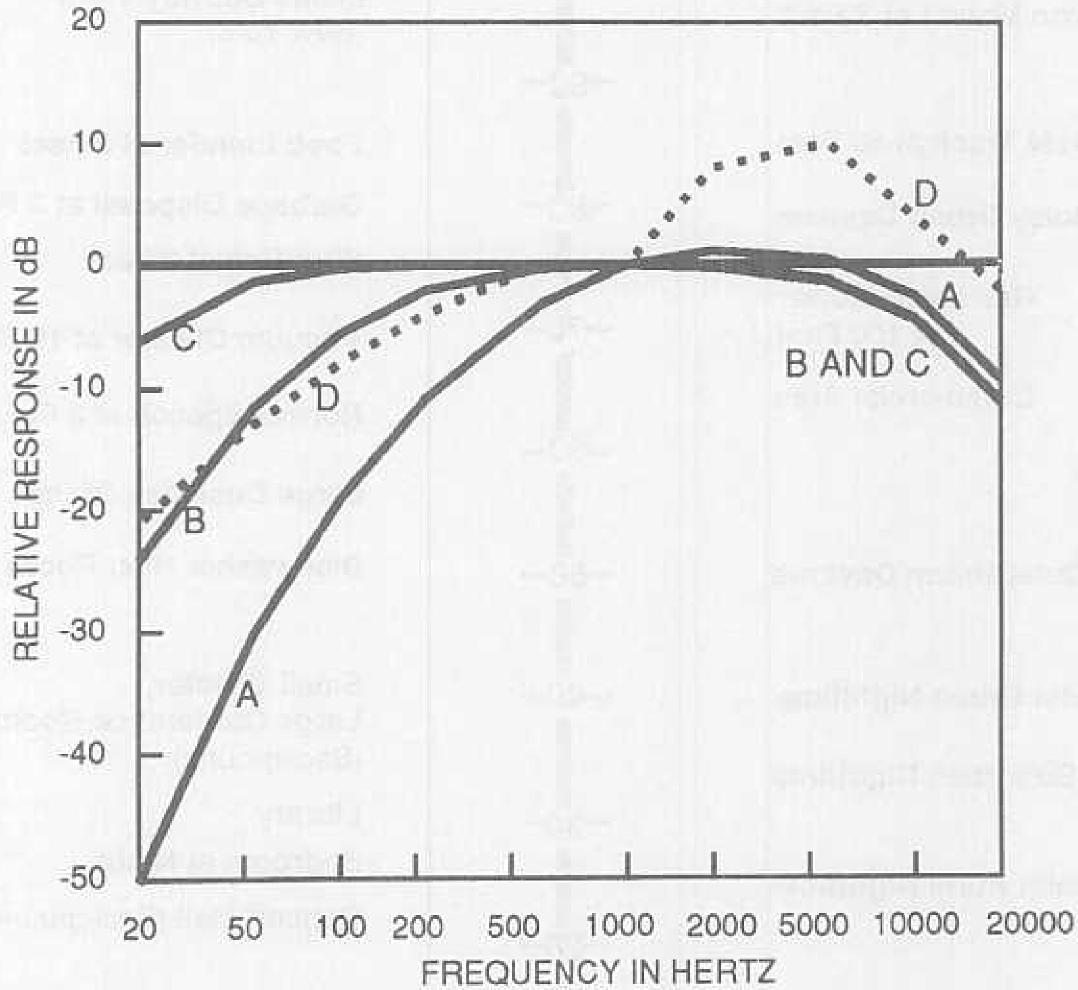
When analyzing the total noise of any source, acousticians often break the noise into frequency components (or bands) to determine how much is low-frequency noise, how much is middle-frequency noise, and how much is high-frequency noise. This breakdown is important for two reasons:

(1) Our ears are better equipped to hear mid and high frequencies, but are quite insensitive to low and to very high frequencies. Thus, we find mid- and high-frequency noise to be more annoying. High frequency noise is also more capable of producing hearing loss.

(2) Engineering solutions to a noise problem are different for different frequency ranges. Low-frequency noise is generally harder to control.

The normal frequency range of hearing for most people extends from a low frequency of about 20 Hz to a high frequency of about 10,000 to 15,000 Hz. People respond to sound most readily when the predominant frequency is in the range of normal conversation, typically around 1,000 to 2,000 Hz. Psycho-acousticians have developed several filters which match this sensitivity of our ear and thus, help us to judge the relative loudness of various sounds made up of many different frequencies. The so-called "A" filter does this best for most environmental noise sources. Sound pressure levels measured through this filter are referred to as A-weighted levels (measured in A-weighted decibels, or dBA).

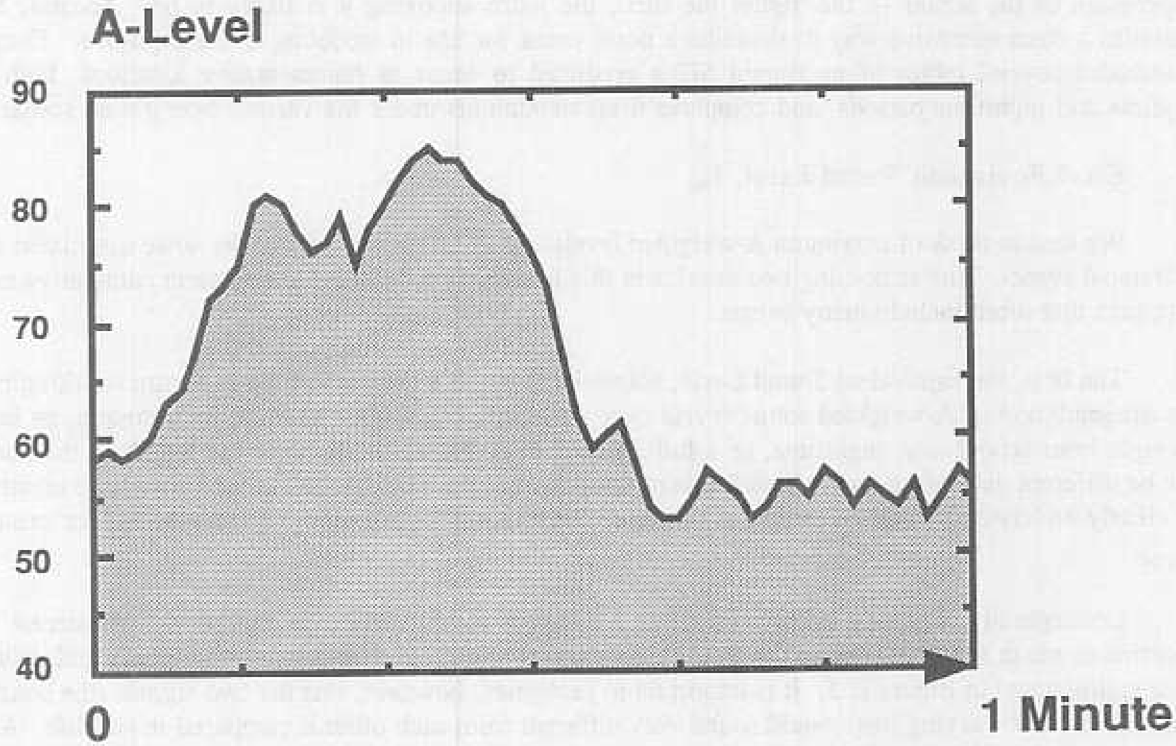
The A-weighted filter significantly de-emphasizes those parts of the total noise that occur at lower and lower frequencies (those below about 500 Hz) and also at very high frequencies above 10,000 Hz where we do not hear as well. The filter has very little effect, or is nearly "flat", in the middle range of frequencies between 500 and 10,000 Hz where we hear just fine. Because this filter generally matches



Source: Harris Miller Miller & Hanson Inc.

Frequency-response Characteristics of Various Weighting Networks

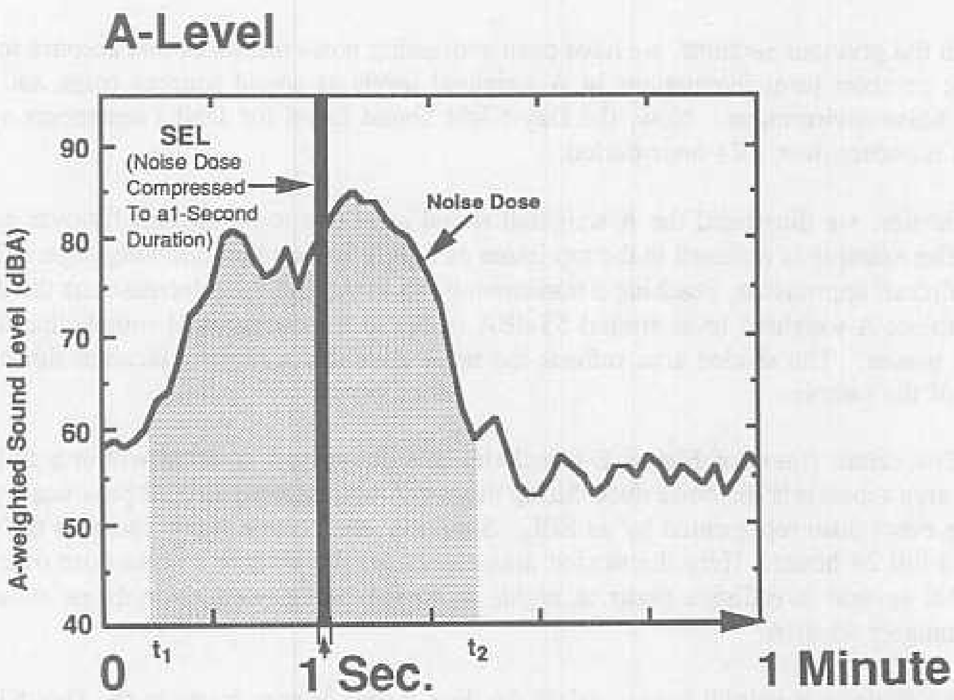
Figure E-1



Source: Harris Miller Miller & Hanson Inc.

Variation in the A-Weighted Sound Level over Time

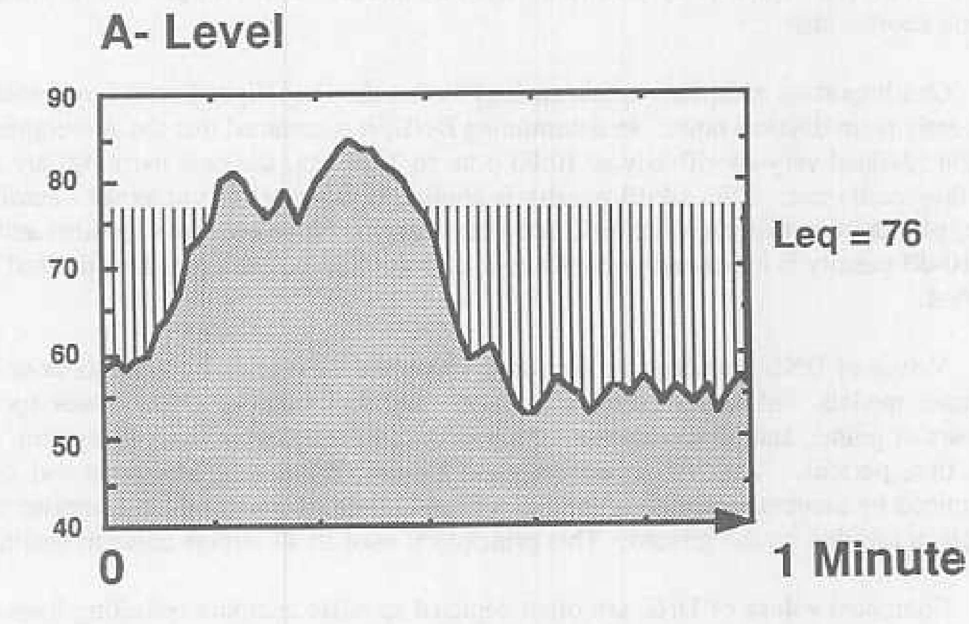
Figure E-3



Source: Harris Miller Miller & Hanson Inc.

Sound Exposure Level

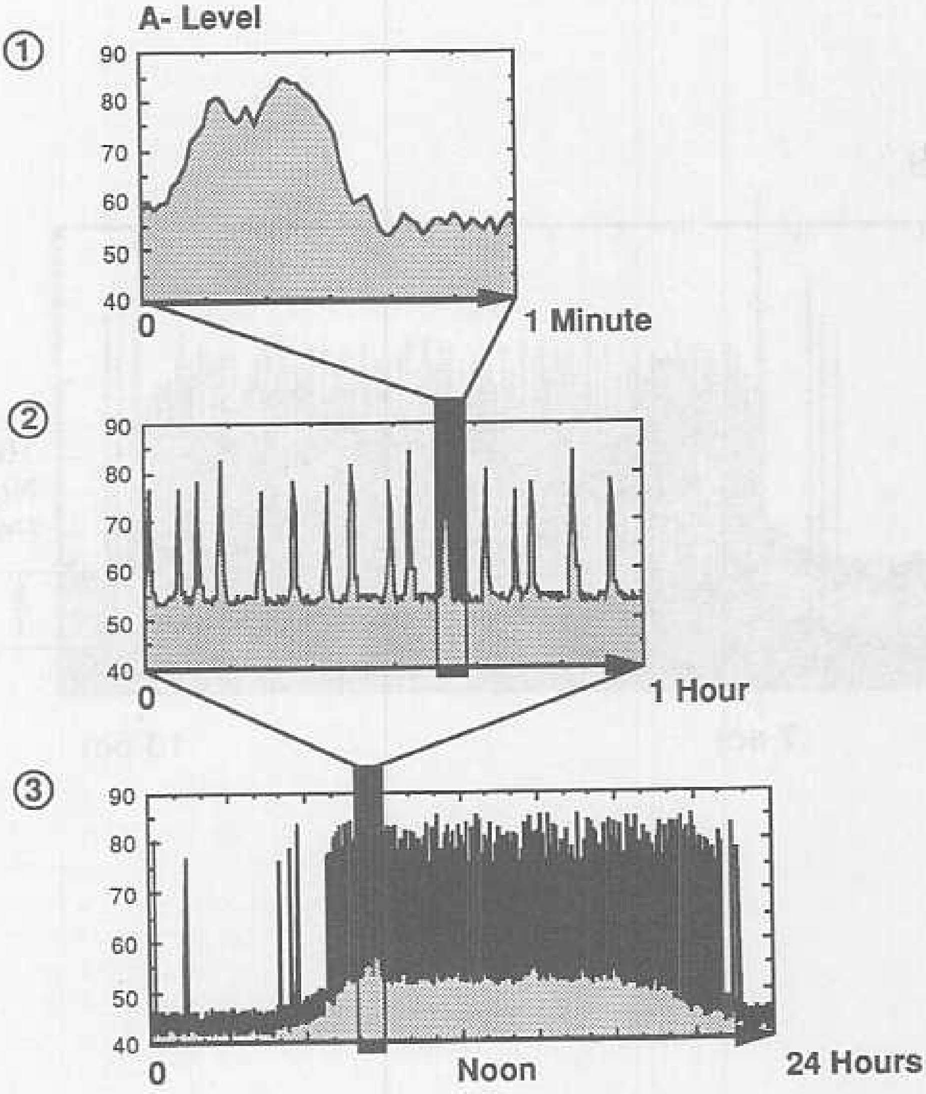
Figure E-4



Source: Harris Miller Miller & Hanson Inc.

Example of a 1-Minute Equivalent Sound Level

Figure E-5



Source: Harris Miller Miller & Hanson Inc.

A-Weighted Level Fluctuations and Noise Dose

Figure E-6

how often each runway is used throughout the year, and where over the surrounding communities the aircraft normally fly. Alternative time frames representing a single day or a typical seasonal day may also be helpful in understanding shorter term aspects of a noise environment.

Representative values of DNL in our environment range from a low of 40 to 45 decibels in extremely quiet, isolated locations, to highs of 80 or 85 decibels immediately adjacent to a busy truck route or off the end of a runway at an active Air Force base. More typical values would be in the range of 50 or 55 decibels for a quiet residential community to 60 or 65 decibels in an urban residential neighborhood. Figure E-8 gives some examples of DNL values measured in different areas across the U.S.

Why is DNL used to describe noise around airports? The U.S. Environmental Protection Agency identified the measure as the most appropriate means of evaluating airport noise based on the following considerations:

(1) The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods of time.

(2) The measure should correlate well with known effects of the noise environment and on individuals.

(3) The measure should be simple, practical and accurate. In principal, it should be useful for planning as well as for enforcement or monitoring purposes.

(4) The required measurement equipment, with standard characteristics, should be commercially available.

(5) The measure should be closely related to existing methods currently in use.

(6) The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.

(7) The measure should lend itself to small, simple monitors which can be left unattended in public areas for long periods of time.[1]

Now, most other public agencies dealing with noise exposure, including the Federal Aviation Administration (FAA), the Department of Defense, and the Department of Housing and Urban Development (HUD), also have adopted DNL in their guidelines and regulations.

[1] "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety", EPA Report No. 550/9-74-004, March 1974.