



Federal Environmental
Assessment Review Office

AIR TRAFFIC MANAGEMENT IN SOUTHERN ONTARIO

Interim Report of
the Environmental
Assessment Panel

November, 1992



Published under the authority of the Minister of the Environment.

Cat. No. En105-45/1992E
ISBN 0-660-1 4811-0

To obtain a list of the Panel Reports already published:

Federal Environmental Assessment Review Office
Publications
14th Floor, Fontaine Building
200 Sacré-Cœur Boulevard
Hull, Quebec
K1A 0H3

Printed in Canada

30 November 1992

The Honourable Jean Charest
Minister of the Environment
House of Commons
Ottawa, Ontario

The Honourable Jean Corbeil
Minister of Transport
House of Commons
Ottawa, Ontario

Dear Ministers:

I have the honour to transmit herewith the interim report of the Environmental Assessment Panel appointed to review proposals on air traffic management in southern Ontario, together with an executive summary of it. This interim report, as required by the Panel's terms of reference, examines the Transport Canada proposal to construct three new runways at Lester B. Pearson International Airport.

The report is quite extensive. Much of its technical detail, including a number of tables, figures and appendices, is likely to be of interest to only a relatively small number of parties directly involved.

The executive summary has been prepared as a separate, self-standing document. It is intended to meet the needs of those requiring the Panel's conclusions and recommendations, supported by sufficient background information for these findings to be fully understood and accurately interpreted, but without extensive technical detail.

Yours sincerely,



David Kirkwood
Chairman
Air Traffic Management in Southern Ontario
Environmental Assessment Panel

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1.0 INTRODUCTION

In the late 1980s, Transport Canada concluded that air traffic congestion at Toronto's Lester B. Pearson International Airport (LBPIA) required corrective action. Accordingly, on August 18, 1989 Transport Canada released "Aviation in Southern Ontario: A Strategy for the Future," which broadly addressed the question of appropriate response to the growing demand for air traffic capacity at LBPIA. This strategy called for the development of LBPIA to its "optimum" capacity to the year 2011, as a medium-term measure. For the longer term, the strategy contemplated the development of other airports in the area, in accordance with a system-wide plan for air transportation in southern Ontario. An element of the medium term strategy was the proposed construction of additional runways at LBPIA, a proposal involving potentially significant positive and negative environmental and socio-economic impacts. Accordingly, a full federal environmental assessment was ordered. This report is the first of two that will be issued by the federal Environmental Assessment Review Panel appointed to conduct the review.

1.1 THE REVIEW

1.1.1 Panel Mandate

The Panel's terms of reference were issued by the Minister of the Environment. Those terms require the Panel to investigate implications of both medium-term and long-term proposals to resolve air traffic congestion problems in the Toronto area. The full terms of reference are provided in Appendix 1.

The first phase required the Panel to conduct a public review examining the environmental and socio-economic issues associated with medium-term proposals for construction of additional runways at LBPIA. The Panel was directed to consider noise, air and water emissions, other impacts resulting from construction and operation of additional runways, and economic benefits and disbenefits.

In submitting this first report, the Panel is presenting to federal ministers its conclusions and recommendations on the environmental and socio-economic implications of Transport Canada's medium-term proposals, thus completing the first phase of the Panel's mandate.

The Panel is also mandated to examine the environmental and socio-economic implications of Transport Canada's long-term measures to accommodate the increased demand for air services in southern Ontario. These measures are to be proposed in the Toronto LBPIA Master Plan and the Southern Ontario Area Aviation Master Plan, which are currently being developed for release to the public. The submission of the Panel's final report, setting out its views on those long-term measures, will mark the end of the second phase of the Panel's mandate.

1.1.2 Panel Membership

The Panel was appointed on November 22, 1989, by the Minister of the Environment. On December 10, 1990, there

was a change in the chair of this Panel. The former chairman, Robert Connelly, Director General of Operations at the Federal Environmental Assessment Review Office (FEARO), relinquished the chair to David Kirkwood to conform with the new FEARO policy that environmental review panels be chaired by persons independent from FEARO and other government agencies. The other members of the Panel are Ross Gray, Mel Hagglund, Peter Homenuck and Pamela Welbourn. Appendix 2 provides biographies of the Panel members. The Panel was assisted by Paula Caldwell as Executive Secretary.

1.1.3 Technical Specialists

The Panel employed five Technical Specialists to assist in the review. Their role was to help the Panel, and other review participants, in understanding complex technical issues. They provided factual information, prepared issue analysis reports, and participated in the public hearings. The five technical specialists, their areas of expertise, and their biographies are provided in Appendix 3.

1.1.4 The Review Process

Under the federal Environmental Assessment and Review Process (EARP), projects in which the federal government is involved, that have potentially significant environmental and related socio-economic effects, must be subjected to formal public review. Accordingly, in 1989 Transport Canada referred its proposals to expand airside capacity at LBPIA for public review by an environmental assessment panel. In September, 1989, the Minister of the Environment announced the upcoming review of Transport Canada's proposed medium-term and long-term solutions to aviation congestion problems in southern Ontario.

The Panel held six days of public meetings-termed scoping sessions-between March 23, 1990, and April 2, 1990, to identify the issues and concerns related to the potential environmental and socio-economic effects of Transport Canada's proposal. During the scoping sessions the Panel heard 95 presentations from interested parties. The scoping sessions allowed stakeholders to comment on the boundaries of the review, including the geographical area to be studied, the range and relative importance of issues, and the project phase to be covered.

Based on information gathered during the scoping sessions, the Panel, in August 1990, issued final guidelines for Transport Canada, as the proponent, to use to prepare an Environmental Impact Statement (EIS). The EIS, submitted on May 3, 1991 entitled the "Lester B. Pearson International Airport: Airside Development Project: Environmental Impact Statement", is Transport Canada's detailed, documented assessment of the issues and concerns surrounding the proposed airside expansion at LBPIA. The EIS was released to the public with an invitation to submit comments on its adequacy in responding to the Panel's guidelines.

On August 27, 1991, after detailed review of the EIS and careful consideration of the public comments, the Panel produced a deficiency statement and submitted a request to Transport Canada for additional information.

Transport Canada responded to this request in October and November of 1991 with the release of a series of supplementary documents (Appendix 4). The Panel found the new and additional information sufficient to announce the commencement of public hearings on December 3, 1991.

Between December 3, 1991 and February 7, 1992, the Panel held 30 days of public hearings. Twenty-eight days of hearings were held in Etobicoke, near LBPIA, and two days of hearings were held in Sudbury, to receive comments from interested parties in the northern Ontario "spoke communities" served by LBPIA. During the public hearings, the Panel heard some 255 presentations from participants including individuals; public interest groups; unions; Transport Canada; aviation companies and associations; business interest groups; school boards; regional districts; the cities of Etobicoke, Mississauga, Brampton, North Bay, Thunder Bay, Sault Ste. Marie, and Sudbury; the Northeastern Ontario Municipalities Action Group; and the Ontario Ministry of Transportation representing several provincial government departments. In addition, thousands of written expressions of opinion, including over 400 detailed briefs were reviewed by the Panel. Appendix 5 provides a list of the participants.

At the outset of the review, Transport Canada made available a sum of \$500,000 to assist groups and organizations wishing to participate in the first and second phases of the review process. An independent funding committee, chaired by FEARO, solicited applications for disbursement of these funds and adjudicated the applications. During phase I, a total of \$100,000 was awarded by the Committee to 18 interest groups that participated in the review process up to and including the scoping sessions. A further \$150,000 was awarded to 21 applicants that participated in the public hearings.

During the review, the Panel Secretariat maintained a public file which contained all correspondence and material received by the Panel. The file was available for public scrutiny throughout the review period. It is open to the public at the offices of FEARO in Hull, Quebec. A list identifying key documents produced during the first phase of the environmental assessment review is provided in Appendix 6.

1.2 HISTORICAL DEVELOPMENT OF LBPIA

LBPIA was established as Malton Airport in 1938, with two hard surface runways, a grass strip, and a converted farmhouse for a terminal. Steady increases in passengers and air traffic required various facility improvements through the 1950s and 1960s. By the early 1960s, the airport was serving 200 daily flights and 2.25 million passengers each year. Terminal 1 was completed in 1964 and the initial phase of Terminal 2 opened in 1972. Operations in Terminal 3 began in February 1991. The current three-runway configuration was completed in the early 1970s.

The first master plan for LBPIA, the "Parkin Master Plan", was released in 1967. In August 1968, expansion plans for LBPIA involving additional runways were announced. By December 1968, in response to opposition from area residents and municipalities, the decision to expand LBPIA was reversed. This prompted studies to identify a location for a new international airport for Toronto. A site north of the Town of Pickering was chosen and subsequently supported by the 1974 Airport Inquiry Commission, and extensive lands were acquired in the area. Plans for constructing a new Toronto international airport at Pickering proceeded until 1975, when the Ontario government decided, in response to public opposition, that it would not provide the required roads and services to the new airport. The Pickering project thus came to a halt. The federal government, however, retained ownership of the land, allowing it to be used for other purposes under lease.

On February 25, 1992, the federal government announced that it would sell surplus lands at the Pickering site. It is not clear, at the time of writing this report, whether this applies to all or only part of the federal properties, or whether this proposed action depends on confirmation that the lands need no longer be held for potential airport use.

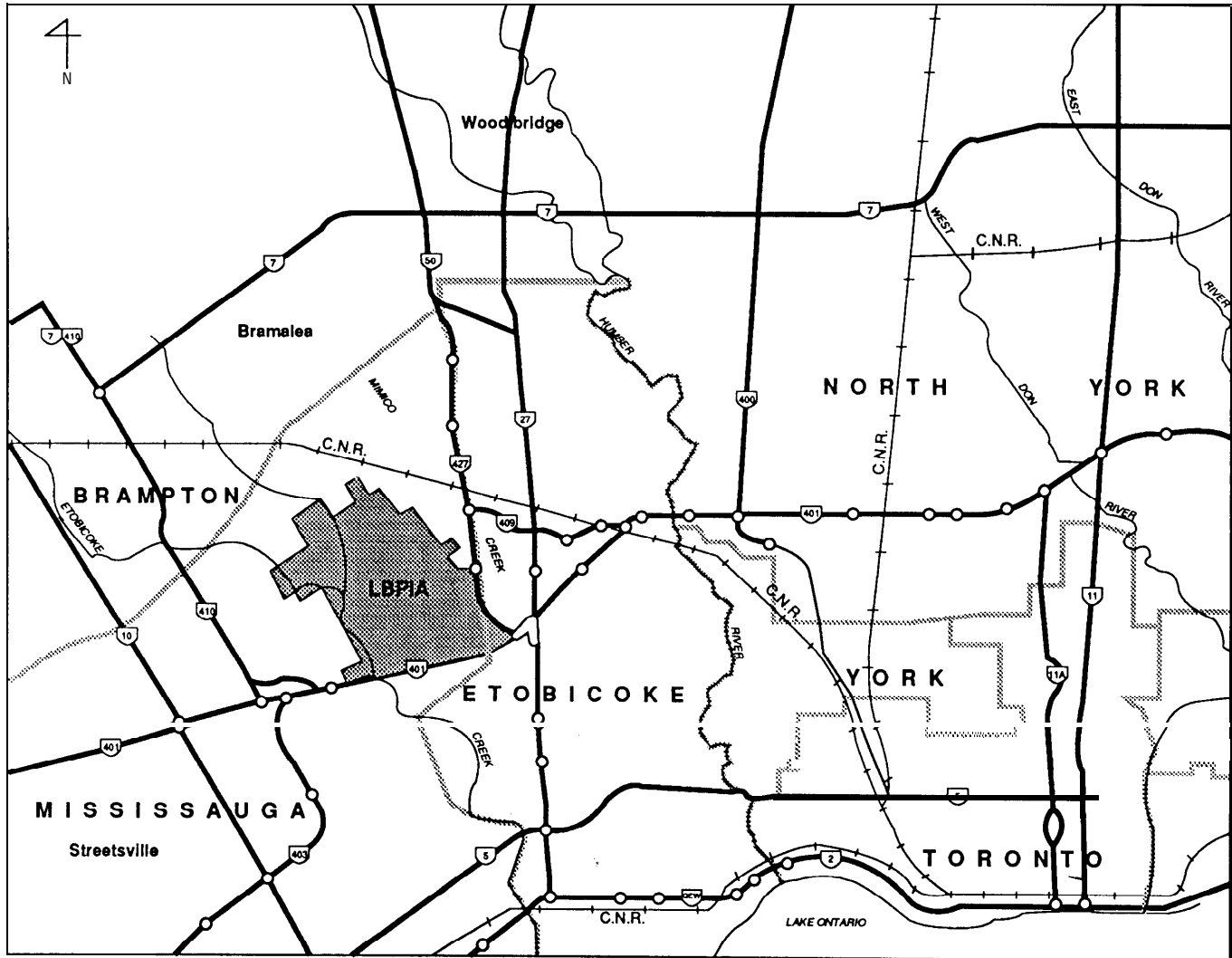
Following the decisions to discontinue development of either LBPIA or the Pickering lands, the Department of Transport produced the Malton Contingency Plan (1975), a second Master Plan (1982), and a Master Plan Update (1986). Each of these plans recommended operational initiatives and physical improvements to the LBPIA airside facilities to increase the capacity and efficiency of the existing three-runway system. Throughout this period, Transport Canada indicated that the demands for more air travel would ultimately require significant increases in airside capacity at LBPIA. During this period, however, announcements were repeatedly made by various Ministers of Transport and other political representatives assuring that no additional runways would be constructed at Lester B. Pearson International Airport.

The federal and provincial governments undertook studies in 1976 to review the potential of alternative modes of transportation to relieve ongoing pressure at LBPIA. It was concluded that rail, bus, and road systems would be too costly and would provide too low a level of service to offer significant relief.

Beginning in 1984, an overhaul of the economic regulatory structure governing national transportation in Canada began with the release of a white paper entitled "Freedom to Move". The policies suggested in the paper were based on principles of less economic regulation, more reliance on competition and market forces, and an open economic regulatory process. These policies were incorporated in the National Transportation Act in 1987. They led to significant changes throughout the transportation industry and, in the aviation sector, to modifications of the types of services provided to passengers. Of particular relevance to LBPIA was the replacement of jet services by more frequent turbo-prop commuter services to regional communities.

Growth in aircraft movements between 1984 and 1988 resulted in increased airside congestion and delay. This gave rise to a growing need to increase the recruitment and training of air traffic controllers in response to the shortfalls in these

FIGURE 1.1
TRANSPORTATION NETWORK



Adapted from Transport Canada, EIS, 1991.

services. As a congestion relief measure, a cap and slot reservation system was introduced at LBPIA in December, 1988. This system puts a cap on the number of aircraft arrivals and departures allowable per hour, reserving slots within each hour for expected movements.

Transport Canada again turned its attention to the provision of additional airside capacity at LBPIA, and the potential use of

other regional airports, new or existing, to relieve congestion at LBPIA. In 1989, Transport Canada requested that the federal Minister of the Environment appoint an independent panel to carry out an assessment of its upcoming proposal to expand the airside capacity of LBPIA. In January 1990, Transport Canada released its document entitled "Aviation in Southern Ontario: A Strategy for the Future".

1.3 THE SETTING

1.3.1 Airport Setting

Lester B. Pearson International Airport is located 25 km from Toronto's business core in the heart of the southern Ontario region. The airport's location is central to the national and North American air transportation networks.

Ground transportation between LBPIA and the business and residential centres of south and central Ontario are provided by nine major highways (**Figure 1.1**), local and regional roadway systems, and public transit.

1.3.2 Local Urban Setting

Communities around LBPIA include the cities of Mississauga and Brampton, and the Town of Caledon in the Regional Municipality of Peel; the cities of Etobicoke and North York and four other municipalities in Metropolitan Toronto; the Town of Vaughan in the Regional Municipality of York; and the towns of Halton Hills and Milton in the Regional Municipality of Halton.

Land use in the neighbourhoods surrounding the airport is highly diversified and includes residential, commercial, and industrial development as well as some remaining agricultural areas. In particular, highly-developed residential areas lie under and adjacent to most of the arrival and departure paths to and from LBPIA.

To assist local communities in land use planning, in 1989 Transport Canada published an operational policy document titled "Land Use in the Vicinity of Airports". Regulations made under the Aeronautics Act provide specific direction to municipalities on building heights, waste management sites and the protection of signals from the airport's electronic equipment. Development in noise-affected areas is governed by a "Land Use Compatibility Table", issued by the Ontario Ministry of Housing.

1.3.3 Local Natural Setting

LBPIA is located in the watersheds of the Mimico and Etobicoke Creeks. Covered by approximately 1200 hectares of uncultivated fields, mowed grassland, and cultivated cropland, the airport lands provide habitat for a diversity of wildlife and plant species. However, the overall quality of natural habitat on and in the vicinity of the airport has become degraded over time—not simply as a result of airport operations, but more directly because of intense urbanization.

Water quality in the local streams has become seriously degraded as more pavement causes increased storm runoff with more erosion, and as industrial discharges are produced during the progressing urbanization of the area. Terrestrial habitats such as meadows and woodlands have been steadily disappearing, and the remaining areas linked by drainage networks become isolated from each other as land development continues.

Whereas the natural resource objective for LBPIA is to sustain the natural environment as much as possible, the objective of ensuring the safety of the airport operations has primary importance over all other objectives. This is particularly true in relation to the need to minimize the danger of bird strikes.

1.3.4 A Major Hub Airport and the Spoke Communities It Serves

The central location of Toronto in Canada, its large local market, and its proximity to the United States market have made LBPIA a principal connection point in Canada for both mainline and feeder services of major Canadian and international airlines. More than 60 air carriers serve LBPIA, providing passenger and air cargo services to over 300 destinations in 60 countries. LBPIA is the busiest airport in Canada, accounting for about one-third of all scheduled domestic flights as well as one-half of all scheduled transborder and international flights.

According to the EIS, about 6 million people, or 60% of the province's and 20% of Canada's population, are concentrated in the southern Ontario region. Within that southern Ontario region, the Greater Toronto Area (GTA) consists of Metropolitan Toronto and the regional municipalities of Durham, York, Peel and Halton. The GTA has a population of about 4 million people, or some 40% of the provincial total.

LBPIA is a major contributor to the regional economy. In 1987, LBPIA operations generated 56,000 jobs, with \$1.8 billion in wages, \$3.8 billion in business revenue, and \$360 million in taxes to various levels of government.

A strong travel market has developed, directly linking LBPIA to countries in continental Europe, the United Kingdom, the Caribbean, and Central and South America. These routes, in turn, provide links to other world markets. There are also indications that Toronto will become increasingly utilized as a gateway to the Pacific Rim as air carriers using new long-haul aircraft fly directly to Toronto, by-passing some of the traditional west coast gateways.

LBPIA plays a key role in the North American air route structure and is the central connection point in the national transcontinental aviation system. Canada's two national air carriers, Air Canada and Canadian Airlines International, connect the airport with all major Canadian cities and provide direct service to many smaller communities throughout Ontario. Transborder air travel to and from the United States is another important air traffic segment at LBPIA, and many of its intercontinental connections are continuing legs of flights that begin or end in the United States. LBPIA is the third largest entry port into North America after New York City's John F. Kennedy Airport and Los Angeles International Airport.

From a regional perspective, many flights from other Ontario and northern U.S. communities are routed to and through LBPIA, a pattern similar to "spokes" routed to or through the "hub" of a wheel. The Canadian regional or commuter airlines use relatively small turboprop aircraft to fly these short-haul and medium-haul routes. Generally, these airlines are affiliated with major air carriers who also use LBPIA as a hub for their operations; all of these regional and national flights also use LBPIA as a connector with transcontinental and international airline flights. Key spoke communities connected through the hub of LBPIA include Ottawa, Kingston, London, Sarnia, Windsor, Sudbury, Timmins, North Bay, Sault St. Marie, and Thunder Bay in Ontario; the Montreal area; and border cities in the northeastern United States.

LBPIA plays a dual role for these communities as origin and destination, and as a connecting point for flights to more distant cities. Specifically, various studies estimate that from 53 to 65% of air passengers travelling on flights on the spoke routes have the Toronto area as their origin or final destination. For the remainder, 35 to 47% of the total, LBPIA serves as an intermediate stop where passengers make flight connections for further destinations.

Although each of the spoke communities is a regional centre, serving its surrounding area, each one is also closely related to the Toronto area. The communities are home to many regional offices which report to headquarters based in Toronto. The decentralization of provincial government departments, which began in the early 1980s, was predicated upon the existence of reliable transportation links between these major communities and Toronto. Transport Canada's EIS states that, perhaps most significantly, the Toronto area is the largest single market for the products and services offered by many firms located in the spoke communities.

In terms of economic development, each of the spoke cities has its own unique aspects which make it attractive to relocating firms. As well, each community has much, although usually not all, of the urban infrastructure required to support such companies. However, a key issue—as stated in the EIS, placing near the top of most recent surveys of industry requirements for new locations—is the availability of good air

service to and from the community. The air service must present a choice of prime departure times, operate safely and reliably, and provide convenient hub connections for ongoing flights to other destinations.

The EIS states that the composition of the spoke air travel markets is relatively consistent and can be divided into two groups, business travellers and leisure travellers.

The document states that 60-70% are business travellers including those who make local business trips to, or out of the Toronto area, often of a same-day nature, and who need peak-period flights that coincide with the beginning and end of a business day; and those who connect with ongoing flights at LBPIA and demand feeder flight schedules that are either very frequent or that are designed to minimize connection time between flights.

According to the EIS the remaining 30-40% are leisure travellers that include those travelling to or from the Toronto area, who typically have considerable flexibility as to their time of departure and, in fact, may prefer to fly outside the busier peak hours. This percentage of travellers also includes those with connecting flights at LBPIA who will revert to the highway—even if driving distance is lengthy—if feeder flights do not offer a high measure of convenience, such as a short waiting time. They will also drive to avoid an overnight stay in Toronto.

TABLE 1.1

SCHEDULED AIR TRAFFIC STATISTICS
AT THE 8 REGIONAL 'SPOKE' AIRPORTS

Airport	AIRCRAFT MOVEMENTS AIRLINE UNIT TOLL			SCHEDULED PASSENGERS ENPLANING & DEPLANING		
	1984	1989	% Change	1984	1989	% Change
Kingston	2,817	4,219	+50%	13,200	40,700	+208%
London	11,340	18,071	+61%	220,800	234,600	-6%
North Bay	8,383	13,033	+55%	78,100	99,600	+28%
Sarnia	2,656	4,520	+70%	48,700	50,900	+5%
Sault Ste. Marie	7,799	13,064	+68%	186,300	199,200	+7%
Sudbury	9,001	18,372	+104%	179,100	220,200	+23%
Timmins	9,324	11,529	+24%	148,000	184,500	+25%
Windsor	3,685	13,279	+260%	197,900	230,600	+17%
TOTAL:	54,915	96,057	+75%	1,072,100	1,260,300	+18%

Adapted from Transport Canada, EIS, 1991.

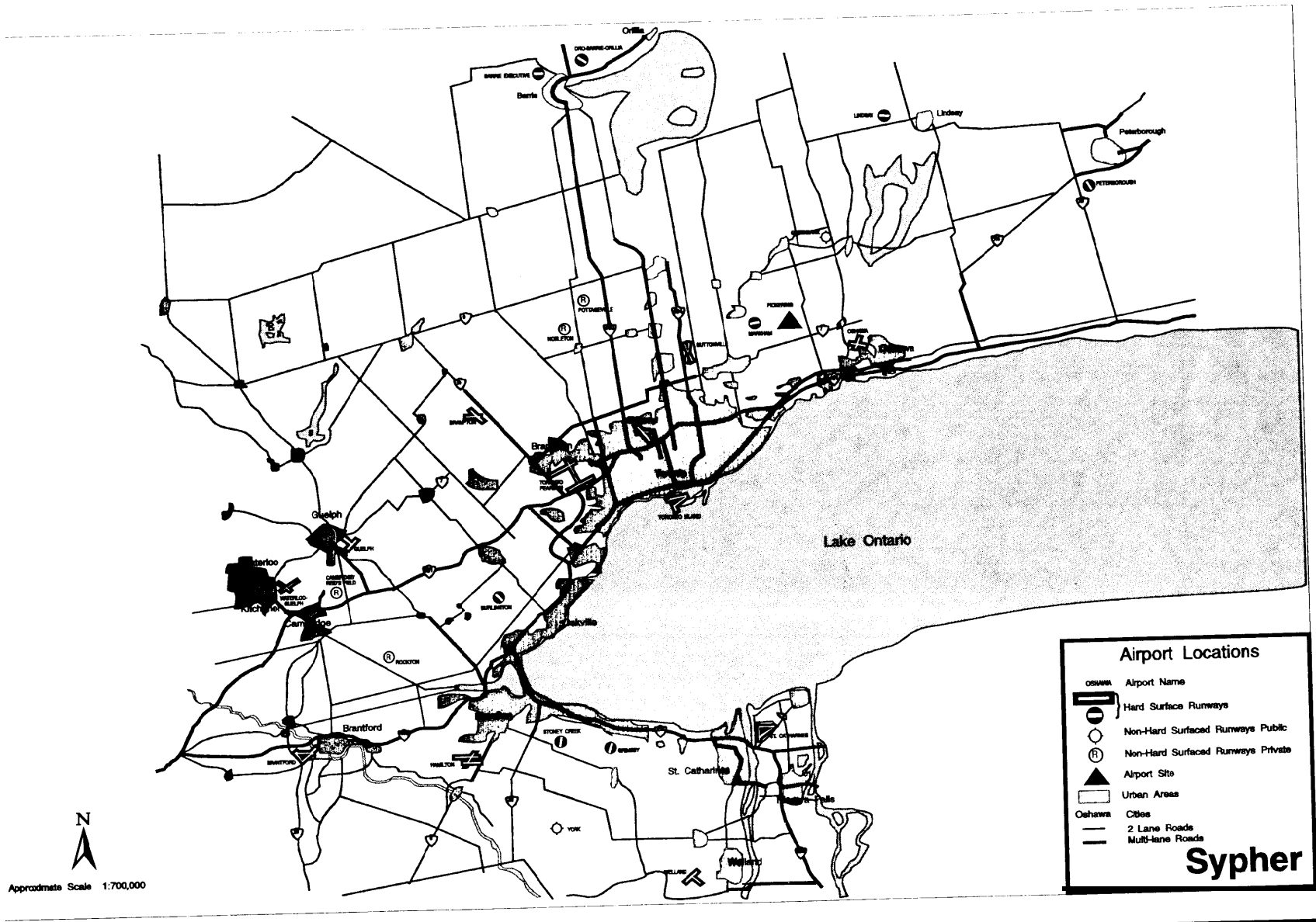


FIGURE 1.2
KEY AIRPORTS IN SOUTH CENTRAL
ONTARIO REGION

Adapted from Transport Canada

The air services currently available to spoke communities have been the subject of various studies. **Table 1.1** shows the growth of air traffic at the spoke airports between 1984 and 1989, fuelled in part by the program of economic regulatory reform. While there is considerable variation by community, the overall picture of the spoke markets shows an 18% growth in passengers and 75% increase in scheduled flight movements. Schedule frequency has been cut in more recent years due to the effects of the recession.

According to the EIS, the air service offered to the spoke communities changed dramatically between the mid-1980s and the beginning of this decade. It found that the number of daily scheduled flights available to all destinations more than doubled and about two-thirds of the increase in the total number of flights available was accounted for by additional flights to Toronto, while the number of flights to Toronto from the spoke communities nearly tripled. The EIS also found that of all scheduled flights offered at the community airports, the percentage that were destined for LBPIA increased from an average of 37% to just over 50%; of all of the seats on scheduled flights offered at the spoke airports, the percentage that were destined for LBPIA increased from an average of 46 to 60%; and compared to the nearly 200% increase in number of flights to Toronto, the number of seats to LBPIA increased by only 38%.

From the above, the EIS concluded that air service at the regional communities concentrates toward hub-and-spoke feeder-type flights focusing around the hub at LBPIA; and that the air carriers on these routes are able to offer much more convenient service by using markedly smaller aircraft—primarily the Dash 8 and the Jetstream 31.

1.3.5 Other Regional Airports

In terms of airports serving the area, some 300 airports have been identified in the central Ontario region. Of these, the EIS states that 21 are publicly-licensed facilities, but only nine are classified as core airports serving the needs of Metropolitan Toronto. Two of the core airports (Maple and King City) have now closed. The core airports still in operation are: LBPIA, Hamilton, Toronto Island, Toronto-Buttonville, Oshawa, Toronto-Markham; and Brampton.

Of all of the airline passengers carried from these airports in 1988, 96% arrived at or departed from LBPIA.

Specific details are provided in Section 2.3.5 for the airports most likely to be regarded as candidates to receive traffic which might be diverted from LBPIA. This information—including airport facilities, Air Traffic Control (ATC) capacity and development, equipment and operations, existing and potential future air traffic, and policy and coordination issues—was provided at the hearings in connection with consideration of the Transport Canada document titled “Alternatives to the Air-side Development Project at Pearson”, published in January, 1992. Figure 1.2 illustrates the locations of the key airports in the south central Ontario Region.

1.4 THE 1989 STRATEGY

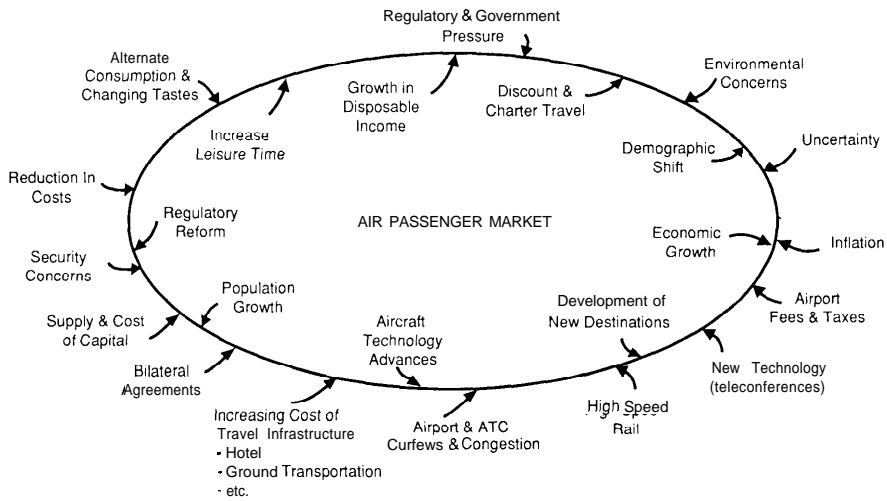
In a press release on August 18, 1989, the Minister of Transport announced initiatives, described in “Aviation in Southern Ontario: A Strategy for the Future.” These initiatives indicate that LBPIA will continue as the major airport for southern Ontario and will be developed to its optimum capacity, and that other airports in southern Ontario will be developed in the long term to fulfil their roles to meet future aviation demands. In order to address this strategy, Transport Canada has said that it will develop a master plan for LBPIA as part of an area plan for southern Ontario. The master plan will incorporate the following features:

- (a) It will be developed to cover at least a twenty (20) year planning horizon.
- (b) It will examine the airport in the context of its ability to be expanded to accommodate the growth in aviation demand expected over the period.
- (c) This growth will be defined in terms of the aviation sectors involved (e.g. commercial scheduled operations, charters, etc.) and of forecast traffic volumes, in order to facilitate the identification of relocation options.
- (d) It will discuss the ability of the existing and future infrastructure (including such new runways and other enhancements as may be approved) to accommodate the various segments of forecast aircraft traffic and increases in passenger activity.
- (e) It will thus allow identification of any potential shortfall in facilities, especially on the airside.
- (f) If the potential for a shortfall in capacity is deemed to exist, then the options for increasing it will be examined.
- (g) The output of these activities will be subject to the federal Environmental Assessment and Review Process.

While the master plan has not yet been released by Transport Canada, all of the features indicated above are reflected in the EIS and supplementary documents which have been the primary subject of the Panel's review activities to date. By presenting to Ministers, in this report, its conclusions and recommendations on the environmental and socio-economic acceptability of the proposals in the EIS, the Panel has put forward views on the main features of the proposals. To the extent that the master plan in fact will seek to identify the optimum capacity at LBPIA, to define its ultimate role, and to identify the types and volumes of traffic that will utilize the facility in the future, the Panel expects that the consideration of the views expressed in this report will be reflected in the plan.

FIGURE 2.1

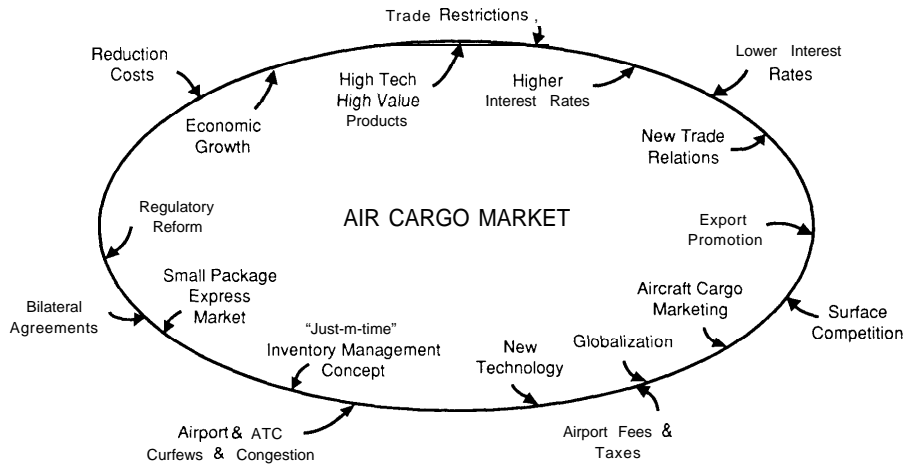
PRESSURES AND CONSTRAINTS FOR AIR TRAVEL GROWTH TORONTO/LBPIA



Adapted from Transport Canada, EIS, 1991.

FIGURE 2.2

PRESSURES AND CONSTRAINTS FOR AIR CARGO GROWTH TORONTO/LBPIA



Adapted from Transport Canada, EIS, 1991.

2.0 THE CURRENT PROPOSAL

This chapter presents “the proponent’s case”: specifically, the Lester B. Pearson International Airport (LBPIA) **Airside** Development Project as presented in Transport Canada’s Environmental Impact Statement (EIS) and supplementary documents (Appendix 4). The topics appearing here, in a version condensed and abridged from thousands of pages of original text, have been selected for presentation because they are the sections of the proponent’s proposals addressed in Chapter 4 of this report, entitled “The Panel’s Analysis”. Details concerning the proponent’s methodology for making forecasts and assessing impacts are provided in Appendices 7 to 11. Chapter 2 does not necessarily reflect the views of the Federal Environmental Assessment Panel reviewing proposals regarding air transportation in the Toronto area.

2.1 DEMAND

2.1.1 Travel Demand

An airport’s need for runway capacity is determined by the frequency of aircraft movements at that airport. In turn, the amount of aircraft movement at an airport is determined by the demand for air passenger travel and cargo transportation to and from that airport. The greater the demand, the greater the number of flights, and therefore the greater required runway capacity.

Forecasting future aviation activity is a complex process, with many forces at work both promoting and constraining the

growth of the aviation market. Figures 2.1 and 2.2 illustrate a number of these forces at work for both the air passenger and cargo markets. The methodology used by Transport Canada to forecast the growth in passenger and cargo traffic at Canadian airports is described in Appendix 7.

Transport Canada’s outlook for passenger growth at LBPIA is presented in **Table 2.1** and **Figure 2.3**. This outlook forecasts a growth in passenger travel at an average rate of 3.5% per year. Thus, the passenger traffic is forecast to grow from 21 million passengers in the base year of 1989, to 30 million by the year 2000 and 40 million by the year 2007.

According to Transport Canada’s forecast, air cargo traffic will also increase. The majority—over 80%—of air cargo is transported in the belly hold of passenger aircraft. The remainder is transported by dedicated cargo aircraft. While dedicated air cargo operations constitute a very small share of total aircraft movements, they are a significant segment because they use older, noisier aircraft and they fly during off-peak hours—often at night. Overall air cargo volume is expected to grow at LBPIA in rough proportion to the increase forecast for passengers. Thus, cargo is forecast to increase from the present level of 300,000 tonnes per year to over 450,000 tonnes per year by 2000, and over 500,000 tonnes by the year 2011. This increased load will be carried primarily in the belly holds of passenger flights, so the anticipated growth is not expected to generate aircraft movement activity far in excess of that predicted for passenger aircraft.

2.1.2 Aircraft Movements

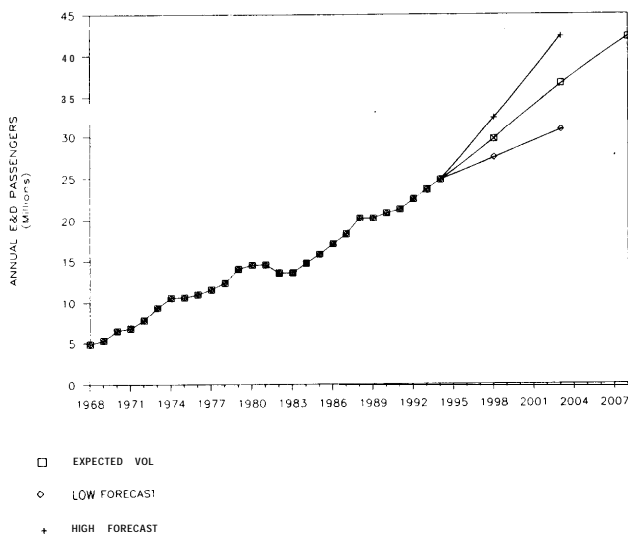
While passenger and cargo forecasts are important in their own right, their primary importance in the EIS is to provide a basis for preparing aircraft movement forecasts. Annual aircraft movement forecasts are prepared for the traffic at LBPIA in two groups: “Air carrier” includes mainline, regional/commuter, and charter traffic; and “general aviation” includes all traffic not using the airport terminal buildings (ATBs) except for the dedicated cargo freighters accessing the cargo terminals. Both of the above groups are considered itinerant traffic, a category that excludes the local movements of aircraft departing and arriving at the same airport and remaining within the local control zone.

According to the EIS, the basic assumptions underlying the conversion from passenger traffic to aircraft movements relate to the average aircraft size and the load factors. These factors, together with key assumptions on routing, permit a conversion from passenger forecasts to aircraft movement forecasts. A summary of Transport Canada’s assumptions is provided in **Table 2.2**.

This process leads to the forecast of total annual aircraft movements shown in **Table 2.3** and in Figure 2.4, with high and low bounds. From the 1989 level of approximately 350,000, aircraft movements are forecast to grow to nearly 470,000 by the year 2000 and to 550,000 by 2011.

FIGURE 2.3

LBPIA ENPLANED AND DEPLANED PASSENGER FORECAST



Adapted from Transport Canada, EIS, 1991.

TABLE 2.1

TORONTO INTERNATIONAL AIRPORT
ENPLANED/DEPLANED PASSENGER FORECASTS
(By Flight Sector)

Year	E/D PASSENGERS (' 000)				SHAREPERCENT		
	DOM	TB	OI	TOTAL	DOM	TB	OI
1977	6151	3465	1930	11545	53	30	17
1978	6597	3832	1933	12363	53	31	16
1979	7642	4366	2033	14041	54	31	15
1980	8096	4569	1858	14523	56	31	13
1981	8291	4547	1701	14537	57	31	12
1982	7580	4217	1753	13549	56	31	13
1983	7542	4139	1896	13577	56	30	14
1984	8172	4469	2082	14722	56	30	14
1985	8667	4700	2471	15838	55	30	16
1986	9286	5109	2727	17122	54	30	16
1987	9540	5484	3328	18352	52	30	18
1988	10660	6019	3589	20267	53	30	18
1989	10400	6390	3880	20670	50	31	19
1996	13196	8616	5572	27384	48	32	20
2001	15869	10579	7158	33606	47	32	21
2006	18584	12391	8832	39807	47	31	22
2011	19935	13266	10541	43742	46	30	24
2016	22254	15158	<i>12520</i>	50232	45	30	25
Average Annual Growth Rate (%)							
1977/178	5.10	5.10	5.80	<i>5.20</i>			
1988/96	2.70	4.60	5.70	<i>3.80</i>			
1988/101	3.10	4.40	5.50	<i>4.00</i>			
1988/106	3.10	4.10	5.10	<i>3.80</i>			
1988/11	<i>2.80</i>	3.50	4.80	<i>3.40</i>			
<i>1988/116</i>	<i>2.70</i>	3.40	4.60	<i>3.30</i>			

Note: DOM = Domestic

TB = Transborder

OI = Other International

Adapted from Transport Canada, EIS. 1991.

TABLE 2.2
AIR CARRIER "SUPPLY" ASSUMPTIONS

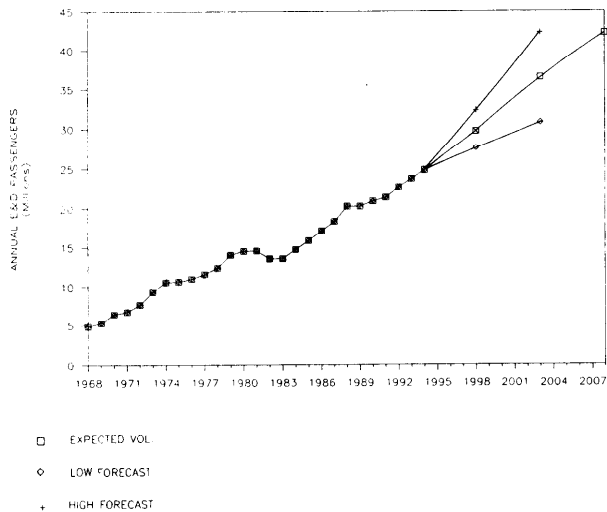
Average Available Seating Capacity		
	Major Carriers (Seats/Aircraft)	Local/Regional Carriers (Seats/Aircraft)
Historical 1987	127	32
Forecast 1998	150	42
Forecast 2003	153	45
	Major Carriers (Load Factors %)	Local/Regional Carriers (Passengers/Aircraft)
Historical 1987	69.3%	13.1
Forecast 1998	72.6%	17.1
Forecast 2003	73.9%	18.0

Adapted from Transport Canada, Aviation Forecasts 1990-2003, 1990.

The annual forecasts serve as a basis for generating traffic volumes on a given day. At LBPIA the "planning day" is defined as the average of the seven busiest days in each of the three busiest months—an average of 21 "busy days". From the planning day volumes, and based on hourly variations in traffic demand, projected peak hour volumes are produced. Such estimates were prepared for each of three "milestone"

FIGURE 2.4

LPBIA AIRCRAFT MOVEMENT FORECASTS



Adapted from Transport Canada, EIS, 1991.

planning years, with the projected number of hourly movements as follows:

	Air Carrier	Cargo	General Aviation	Total
1996	90	2	19	111
2001	108	—	18	126
2011	120	—	19	139

These are role-related forecasts, describing the outlook for LBPIA with limited constraints on air carrier activity.

TABLE 2.3
TORONTO INTERNATIONAL AIRPORT
ITINERANT GENERAL AVIATION MOVEMENTS

ANNUAL MOVEMENTS ('000)				
YEAR	CARRIER	GA	TOTAL	GA PCTG.
1977	136	81	217	37
1978	136	97	233	42
1979	143	94	237	40
1980	161	89	250	36
1981	164	82	246	33
1982	166	72	238	30
1983	165	72	237	30
1984	173	76	249	31
1985	205	84	289	29
1986	217	80	297	27
1987	228	79	307	26
1988	275	75	350	21
1989	304	52	356	15
1996	341	81	422	19
2001	387	83	470	18
2006	440	85	525	16
2011	470	86	556	15
Average Annual Growth Rate (%)				
1977-1988	7.6	0.7	4.4	
1988-1996	2.7	1.0	2.4	
1988/01	2.6	0.8	2.3	
1988/06	2.6	0.7	2.3	
1988-11	2.4	0.6	2.0	

Adapted from Transport Canada, EIS, 1991

Transport Canada uses the term “base case” to describe the expected conditions at LBPIA in 1996, the date that any decision made concerning the present proposals would begin to affect airside congestion. Base case as used by Transport Canada is defined in detail in Section 2.3.1. The base case aircraft movement potential, the balance between demand and capacity as constrained by supply, is given as a maximum of 96 VMC movements per hour. This means that 96 arrivals and departures can move through the system every hour under ideal Visual Meteorological Conditions (VMC).

Transport Canada’s position is that, given these limitations, the present 3-runway system will be inadequate as early as 1996. If construction of the proposed runways is begun immediately, they will come into service in 1996 and will provide the additional runway capacity that will be required by that time.

2.1.3 Preliminary Update of LBPIA Passenger Forecasts

Transport Canada has provided the Panel with a preliminary update, undertaken in April of 1992, of passenger forecasts for LBPIA (Appendix 16). The general forecast update will be available in November, 1992.

FIGURE 2.5

L.P. Pearson International Airport Enplaned and Deplaned Passengers

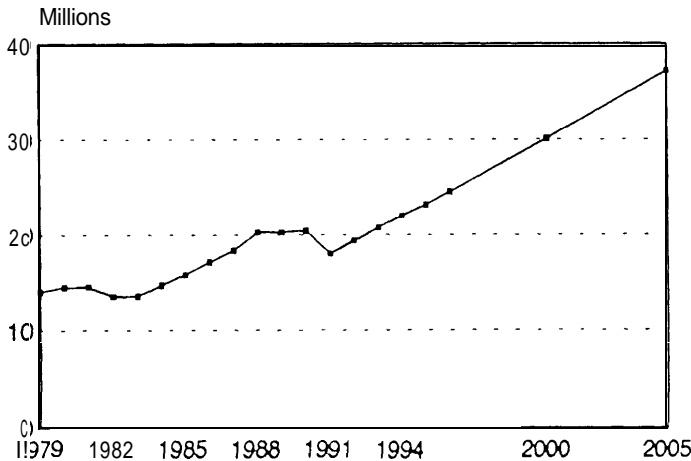


Figure 2.5 illustrates the revised passenger forecast for LBPIA. The revision takes into account the 9.6% decrease from 1990 to 1991 (20.4 million to 18.47 million). For subsequent years the revisions are as follows (compared with totals shown in Table 2.1):

- 1996—decrease from 27.4 to 24.5 million;
- 2001—decrease from 33.6 to 30.0 million, (the medium update forecast for the year 2000);

- 2006—decrease from 39.8 to 37.1 million, (the medium update forecast for 2005);
- 2011—increase from 43.7 to 43.9 million, (the medium update forecast for 2010).

Note that changes for 2001, 2006 and 2011 are approximate as they are compared with the totals for the years 2000, 2005 and 2010 respectively in the preliminary update.

Transport Canada’s preliminary update also describes short-term and long-term effects of the current economic recession.

2.2 RUNWAY CAPACITY-ENGINEERED PERFORMANCE STANDARDS

Transport Canada uses a measure of runway capacity that is termed the “infinite demand capacity”. It represents the aircraft flows that can be achieved with an infinite queue of aircraft or, more practically, in a situation where there is always at least one arriving aircraft and one departing aircraft waiting to be served by a runway system. This is representative of the maximum capacity that could be achieved by a runway system without regard to aircraft routing or the magnitude of queuing delays.

Transport Canada has developed standard methodologies to determine infinite demand hourly aircraft movement capacity for single and multiple runway operations at its airports. These capacity figures are referred to as Engineered Performance Standards (EPS). The computerized EPS calculations take into account aircraft mix, arrival/departure ratios, runway occupancy times, approach path lengths, and speeds.

In as much as the EPS capacities are calculated on the basis of non-zero queues of arriving and departing aircraft, they represent the maximum average hourly capacity attainable on a given runway under a given set of operating conditions. They are calculated for automatic control transfer (ACT) operating conditions, in which visibility is sufficient to enable automatic transfer from radar control to visual control by the control tower; and for sub-ACT operating conditions.

The EPS infinite demand capacities for the base case and the proposed new runways at LBPIA are:

Operating Direction	EPS Infinite Demand Capacity		
	Case	ACT	Sub-ACT
Westbound	Base case	96	80
	Proposed	133	113
Eastbound	Base case	96	80
	Proposed	136	116
Northbound	Base case	48	40
	Proposed	70	68

Transport Canada has also provided capacity estimates for alternative situations in which an infinite queue of aircraft is either not available, such as when routing and airway considerations restrict air traffic control’s ability to balance flows between parallel runway pairs; or is not desirable, such as when acceptable aircraft service and delay standards are

taken into consideration. Although these alternative estimates are generally lower than the infinite demand capacity calculations, Transport Canada notes that they are more representative of the maximum runway capacity that can actually be achieved on a practical basis.

The effects of such considerations on runway capacity may be significant. For example, in the proposed runway system, the engineered performance standards capacity for Visual Meteorological Conditions (VMC) westbound direction, which is the most common operational scenario, is 133 movements per hour. However, the more representative VMC westbound capacity ranges between 117 and 131 movements per hour. In the eastbound direction, the EPS capacity of 136 movements falls to the more representative range of 118 to 132 movements per hour. Transport Canada reports that for the less than ideal instrument meteorological conditions (IMC), the capacity of the proposed runway system can fall to 100 movements per hour or lower—again depending on runway loading conditions.

These wide capacity swings are generic to paired runways, such as those in the proposed quad system, because each runway must be dedicated to a particular usage. This means, in Transport Canada's words, that "...system capacity remains unused when demand for either the arrival or departure runway falls below its maximum capacity".

Transport Canada reports that for the base case, or mixed modes system, "...the exchangeability of arrivals for departures in the mixed modes system permits better retention of system throughput capacity...arrivals may be swapped between the two systems to compensate for the resulting shortfall or excess in available arrival slots on the mixed mode runway." Thus, the base case EPS capacity of close to 96 movements per hour can be maintained under a wide variety of operating conditions.

In the EIS and during the hearings, there was general agreement upon and common usage of 96 and 80 as the base case east/west VMC and IMC capacities, respectively. However, because of the variability in the capacity of the proposed quad system, several different figures appear in the EIS and were used during the hearings to represent its east/west capacity. In Chapter 4 the Panel explains how it proposes to deal with this situation.

Descriptive overviews of runway capacity and theoretical capacity are provided in Appendix 8.

2.3 POTENTIAL SOLUTIONS

2.3.1 Short-Term Capacity Improvements-The Base Case

LBPIA, like all major airports, is a continually changing facility. As a result of the normal development of the airport, improvements are being made in runway and taxiway facilities, equipment, operating procedures, and staff complements and responsibilities. The past decade has seen many modifications at LBPIA, including the addition of taxiway sections, the opening of a new passenger terminal, and the implementation of independent parallel east/west runway operations. These types of modifications enhance the safety and operational

efficiency of the airport, take advantage of technological and procedural advances, and maximize the capacity of the existing runway system.

These progressive changes and improvements occur continuously and will be implemented independently of the ultimate decision concerning the addition of new runways. It is important that all stakeholders understand that change is occurring as this report is being written, and will continue during and after the period of time during which this report's recommendations are being reviewed and considered.

In order to make the most appropriate and fair assessment of the effect of additional runways, the best possible benchmark for comparison must be established. According to Transport Canada, this benchmark is the expected configuration and operation of LBPIA in 1996, rather than that of LBPIA in 1989. During the course of this environmental assessment process, this benchmark has come to be known as the base case. The base case therefore includes several changes and improvements to the 1989 LBPIA physical and operational configuration that has been described. None of these changes would involve the addition of runways or the use of lands outside the present LBPIA boundaries. Specifically, changes and improvements are expected in: (1) air traffic control staffing, (2) air navigation technology, and (3) infrastructure modifications.

(1) Air Traffic Controller Staffing

The Toronto Control Centre has experienced a chronic shortage of air traffic controllers, dating from Transport Canada's decision in 1984 to downsize this function. In 1991, Transport Canada estimated that the Toronto Control Centre was staffed to about 77% of its required complement: Only 23 positions out of the 30 needed were filled. At the hearings, Transport Canada described various measures that had been taken to reduce the training period and improve the flow of controllers to Toronto. Transport Canada indicated that sufficient controllers are now on hand, through the use of overtime, to provide full capacity capability during peak hours. Transport Canada's current expectation is that full air traffic controller staffing will be achieved at LBPIA in June, 1994.

(2) Air Navigation Technology Improvements

- Canadian Automated Air Traffic System (CAATS) is a new computer-based information and display system for air traffic control work stations which will display radar, flight path, weather, and supplementary data. The system will assist controllers in spacing arriving aircraft more consistently at minimum separations, thereby increasing their ability to feed aircraft to runways in a manner that will maximize capacity. This system will be commissioned in two phases at the Toronto Area Control Centre, in 1994 and 1996.
- Microwave Landing System (MLS) will incorporate precision distance measuring equipment and other features which will enable appropriately equipped aircraft to access the glide path from more locations. This will permit the development of more flexible approach procedures.
- Radar Modernization Project (RAMP) will increase radar data processing capability and automatic information transfer. It will also enhance aircraft position information, and may thereby result in more precise spacing of aircraft on final approach, particularly in instrument meteorological

conditions (IMC). The RAMP project will also include improvements in computerized ground-air information transfer which may lead to improved runway utilization. The ability to make use of some of the features of the new ground-based equipment, and therefore the extent of realization of its benefits, will be dependent on the degree to which airlines install compatible equipment on-board aircraft. When the RAMP equipment has been installed, the possibility will exist of reducing minimum approach separation from 3 nautical miles to 2.5 nautical miles. This would occur within four miles of the airport when wake turbulence separation is not a factor. Its effect would be to increase runway capacity.

(3) Physical Infrastructure Modifications

The existing taxiway layout at LBPIA does not permit the most operationally effective use of the east/west runways in independent parallel operation. These taxiway shortcomings restrict, on occasion, the orderly flow of traffic to and from the parallel runways, and can have a constraining effect on capacity. Specifically, there is a requirement for improved departure queue storage and release, for improved separation of arrival and departure flows in the area of Terminals 1 and 2, and for additional runway entrance and exit capabilities. The modifications necessary to realize these requirements are:

- the addition of high speed turnoffs from runways to taxiways to reduce runway occupancy time;
- the improvement in taxiway geometric design, through such means as straightening and addition of fillets, to speed traffic access and egress to and from runways;
- the addition of taxiways to reduce bottlenecks and interference with active runway operations; and
- the expansion of apron manoeuvring areas to reduce the potential of ground traffic conflicts.

These modifications would produce a mature taxiway system for the existing runway layout. They are included in Transport Canada's base case configuration for LBPIA, and are taken as given for the evaluation of the proposed additional new runways.

The changes and improvements indicated above are all expected to proceed and to be in place by 1996. With these improvements, a reliable capacity of 96 movements per hour will be achievable under VMC conditions when using the east/west runways in independent parallel operation. This will drop to 80 movements per hour in IMC conditions, and to approximately 50 movements per hour when wind and/or runway surface conditions preclude use of the east/west runways and thus limit operations to the single north/south runway at LBPIA.

These improvements to the existing LBPIA configuration and operating procedures are considered characteristics of the base case, against which the proposed new runways are compared for purposes of the environmental assessment review.

2.3.2 Additional Runways

The measures outlined in Section 2.3.1 above will serve to improve the efficiency of the existing runway system and thereby increase its east/west capacity to the system's EPS

limit of 96 movements per hour. The cap system currently in effect was originally set at 70 movements per hour; that limit was later increased to 76 movements per hour and then, most recently, increased to 82 movements per hour. Transport Canada forecasts that by 1996 traffic demand will increase to a level that will fully utilize the enhanced capacity. To accommodate any further increase in demand by increasing capacity will necessitate the construction of one or more additional runways.

The following sections, 2.3.3 to 2.3.7, summarize Transport Canada's assessment of measures which might be undertaken to reduce traffic demand at LBPIA. While a number of these are not ruled out for the longer term, Transport Canada has concluded that they do not offer a satisfactory response in the short to medium term. Having already concluded that demand will surpass capacity within this decade, Transport Canada sees a need to increase capacity and therefore to construct additional runways. Its proposals on how this can best be done are set out in detail in Section 2.4.

2.3.3 Use of Pricing Mechanisms

Transport Canada describes how the demand for facilities at LBPIA might be managed through pricing mechanisms. By increasing landing fees or other charges, the growth of airport demand could be slowed or diverted to off-peak periods. According to the EIS, however, international experience shows the effectiveness of these measures is fairly limited. While airport fees constitute only a small share of airline operating costs, business air-travellers, who predominate at LBPIA, are relatively price-inelastic. Pricing measures can be effective in discouraging smaller aircraft. The EIS states, however, that this can harm the regional economy and cause hardship for the outlying spoke communities. Although they have been introduced at LBPIA in the form of a minimum landing fee with a peak period surcharge as a short-term traffic management measure, airport fees are not considered as feasible medium-term or long-term solutions.

2.3.4 Limiting Access to LBPIA

Administrative means can be used to allocate available capacity to some pre-determined upper limit. As a short-term temporary measure, capping traffic is effective in regulating demand and minimizing wasteful delays. A cap of 70 movements per hour-subsequently raised to 76 and more recently to 82-and a slot reservation system were introduced at LBPIA in 1988, as described in Section 2.5.1. The EIS states that as a long-term permanent solution, limiting access produces a negative impact on the local economy. The economies of spoke communities also suffer as a result of restricted access to LBPIA. The EIS states that limiting access is very difficult to administer equitably and would impair the benefits brought by economic regulatory reform. For these reasons limiting access to LBPIA for other than low-productivity traffic, is rejected as a medium-term to long-term solution to the problem.

2.3.5 Diverting Traffic to Other Airports

A number of airports are often mentioned as having the potential to relieve the pressure at LBPIA. Transport Canada considered five possibilities in the document "Aviation in Southern Ontario: A Strategy for the Future" and expanded the list to

seven in the supplementary “Alternatives to the Airside Development Project at Pearson” document. The five considered in the “Strategy” document are Hamilton Airport, Toronto Island Airport, Oshawa Airport, Buttonville Airport, and Downsview Airport. The two added in the “Alternatives” document are the proposed Pickering Airport and the Brampton Airport.

Transport Canada asserts that efforts encouraging air carriers to shift operations away from LBPIA in recent years, including significant investments in infrastructure development at Hamilton and Toronto Island Airports, had little appreciable result. Transport Canada has found that airspace interference with LBPIA, lack of ground transportation to the Toronto market, consumer preference for LBPIA’s wide variety of flight times and destinations, and the inefficiencies of splitting an airline’s operations among airports impair expected advantages offered by increased airside capacity at other sites. Transport Canada cautions that the environmental implications of expanding traffic and facilities at any of the seven considered sites could also be significant and would require a detailed assessment.

“Aviation in Southern Ontario: A Strategy for the Future” assessed the physical limitations such as those imposed by runway numbers and lengths, airspace conflicts, ground transportation, navigational aids, and expansion potentials. “Alternatives to the Airside Development Project at Pearson,”

which was provided at the Panel’s request at the public hearings, furthered the analysis by considering costs, timing, environmental issues, policy and coordination, and the economic and social impact on users and on governments. Implications for aviation markets in the South Central Ontario Region were addressed throughout both documents.

Physical Limitations

- **Runways:** Transport Canada asserts that none of the seven considered airports has sufficient numbers of runways of adequate length to relieve airside pressures on LBPIA. Hamilton has three runways, one of which is 2440 meters (8000 feet) long. All the other sites have up to three runways under 1220 meters (4000 feet) in length.
- **Airspace conflicts:** Hamilton, Brampton, Toronto Island, and Downsview Airports are located in proximity to LBPIA airspace. While Hamilton traffic heading for transoceanic routes or other east-bound flights might compete with LBPIA for airspace, and both Brampton and Toronto Island traffic must coordinate closely with LBPIA traffic, Transport Canada warns that Downsview traffic could actually interfere with access to LBPIA runways 06R/24L and 06L/24R.
- **Ground Transportation:** Transport Canada states that none of the alternative sites are as accessible to Toronto markets by ground transportation as is LBPIA, and that even Toronto

TABLE 2.4

DEVELOPMENT TIMEFRAME FOR ALTERNATIVE AIRPORTS TO SERVE DIVERTED DEMAND (YEARS)

Airport	Planning Assessment, Approvals	Construction	Total
Hamilton	5	4	9
Pickering	6	4	10
Buttonville	5	4	9
Downsview			
Toronto Island	5	4	9
Brampton	5	4	9
Oshawa	4	2	6

— not Achievable

Adapted from Transport Canada, EIS, 1991.

Island is limited by ferry service, The proponent reports that even the business commuters who could adapt to the ferry bottleneck are precluded from use of Toronto Island facilities because of prohibitions against jet-powered aircraft—the type preferred by business passengers using either corporate or privately-owned aircraft.

- Navigational Aids: The Transport Canada document also asserts that in order to relieve airside congestion at LBPIA, all of the proposed alternative sites would require improved navigational aids as well as air traffic control facilities and radar coverage.
- Expansion Potential: It is noted in the Transport Canada document that Oshawa, Buttonville, and Downsview Airports have little expansion potential because of ongoing urban development in surrounding areas. The expansion potential of Hamilton Airport is less affected by urbanization and Brampton Airport is located in a rural area. The proposed Pickering site would be capable of accommodating six or more runways and substantial related development.

Socio-economic Considerations

- Timing: Development at most of the alternative airports requires a lengthy process of planning, environmental review, design, negotiation, financing, construction, equipping and staffing. **Table 2.4** is a summary of the estimated timing for development of each of the sites to meet the requirements of the potentially diverted traffic. Transport Canada states in its “Alternatives” document that none of the seven considered airports could deal with significant diversions for LBPIA by 1997, when additional capacity is forecast to be needed.
- Environmental Issues: One consequence of significant air traffic diversions to other sites is that noise could become an issue at these sites. Transport Canada indicates that the size of the population exposed to aircraft noise at any alternative site would in many cases exceed the population affected by aircraft noise resulting from expansion of LBPIA. If these other airports received more traffic, there would be a local effect on air quality, but the proponent does not anticipate this to be significant in the context of overall regional emissions. Local surface water quality problems could arise from more aircraft de-icing at the alternative airports. Transport Canada states in the “Alternatives” document: “Most significantly, none of the scenarios for diversions of traffic would substantially reduce noise, emissions or other environmental impacts at LBPIA.”
- Policy and Coordination Issues: Transport Canada asserts that diverting a significant amount of activity to alternative sites would require changes to policy, the cooperation of other levels of government, and even substantial capital investment by other levels of government. Key issues at particular sites have been outlined by Transport Canada as follows:
 - Hamilton requires provincial investment in highways to improve access and public investment in facilities in advance of demonstrated markets and in the face of industry opposition and unwillingness to pay, as well as changes to adjacent American ATC sectors.
 - Pickering requires provincial cooperation with development, and provincial investment in access, including

Highway 407 and Highway 401; public investment in facilities in face of industry opposition, and unwillingness to pay.

- Buttonville requires federal and provincial investment in access improvements and infrastructure.
- Toronto Island requires provincial and city willingness to renegotiate sections of the tripartite agreement to permit runway lengthening, provisions of a fixed link, and access by quiet jet aircraft.
- Downsview requires lessor/owner willingness to operate as a public facility, North York cooperation in operating as a public facility, and a decrease in LBPIA capacity.
- Brampton requires owner’s willingness to expand, or to sell airport; and federal and/or provincial investment in new runways.
- Oshawa requires cooperation with lessor (the City of Oshawa) ambitions to improve airport facilities in support of long term industrial development.

- Economic and Social Impacts: Transport Canada asserts that diverting traffic to alternative airports would create new significant risks for users and for governments. It also asserts that for users the risks range from loss of some income to complete business failure resulting from loss of market. All user groups are seeking a single, centrally located airport to serve all their needs. The “Alternatives” document further states that for most users, LBPIA best fulfils their needs, and their options are limited. For jet aircraft users, including most business jet users, the only alternative airport that provides sufficient runway length is Hamilton, which is too remote for consideration by most business jet users. The air carriers want to avoid split operations between two airports, because of higher costs and reduced marketing power. Finally, courier services need reasonably rapid and reliable road access to the Toronto core area.

A further risk associated with diversion involves loss of economic activity to the Canadian economy as a whole. Vulnerable sectors include individuals and commercial interests: Passengers may choose to make international connections through U.S. hubs, or use U.S. points of origin for international or transborder flights. Cargo and courier traffic may be rerouted to U.S. hubs. And finally, Transport Canada asserts that businesses may choose to locate new operations, or to relocate operations, in the U.S. so that management can get to and from their plants quickly.

Market for Aviation

Transport Canada asserts that with adequate investment, with cooperation at all levels of government, and with sufficient time, other airports in the region can provide a limited capacity to handle some of the operations currently at LBPIA. However, according to the proponent, unless dramatic amounts of traffic are diverted, the relief to LBPIA will be short-lived because of the anticipated growth of traffic demand.

Transport Canada categorizes the air traffic utilizing LBPIA as scheduled domestic air carriers, scheduled foreign carriers, other commercial operators, non-commercial activity, and

charter traffic. The potential for transferring these traffic segments is discussed in the EIS and "Aviation in Southern Ontario: A Strategy for the Future":

- Scheduled Domestic Carriers are Canadian-owned airlines offering scheduled services that account for 64% of the traffic at LBPIA. The central issue underlying traffic initiatives for these airlines is their continuing freedom to provide service on routes between domestic airports of their choice. Any transfer of scheduled feeder traffic to other airports would operate to the competitive disadvantage of the major Canadian carriers by inhibiting their ability to "feed" onward-bound longer-haul passengers to their own flights.
- Scheduled Foreign Carriers are flights by scheduled foreign airlines and constitute approximately 14% of LBPIA's total aircraft movement activity. Such scheduled flights are normally operated in accordance with specific bilateral agreements which identify the airports of call in both countries. Any attempt to abrogate or alter such agreements by relocating a foreign airline to a less favourable airport would, in all likelihood, be met with punitive retaliatory measures to the bilateral Canadian airline by the host country of the affected airline. The costs, in terms of reduced market share for Canadian airlines flying to secondary airports with inconvenient connections and in terms of inconvenience to Canadian passengers, would be higher than any benefits derived.
- Other Commercial Operators make up approximately 7% of commercial aircraft activity at LBPIA conducted by a mix of small carriers providing passenger, courier, and small cargo services, and LBPIA-based aircraft operators offering special charter and other services. A large proportion of this traffic owes its viability to interaction with the larger air carrier operations such as cargo transfers and specialized charter services for passengers, and to available services from brokers, forwarders, trucking companies, and Customs—all of which are based at LBPIA. LBPIA has become the focus of a large multi-modal goods transportation capability for the region. Operators of these services argue that relocation would have serious financial impacts for them. Many of the other commercial operators are Fixed Base Operators (FBOs) or other airport tenants such as aircraft maintenance companies, who have invested heavily in plant and equipment on-site and in the vicinity of LBPIA.
- Non-Commercial Activity describes most of the 11% of the aviation activity at LBPIA that is not a commercial enterprise. It includes private and corporate aircraft and may directly or indirectly support commercial or business pursuits. 60% of the non-commercial activity is carried out by jet-powered or high performance turbo-prop aircraft owned by business corporations or by operators providing such services to them.
- Charter Traffic includes three categories to consider when discussing diversions: Charter-type seats on regularly scheduled flights, charter flights by regularly scheduled airlines, and pure charter operations. These latter two categories represent 4% of the aircraft traffic at LBPIA,

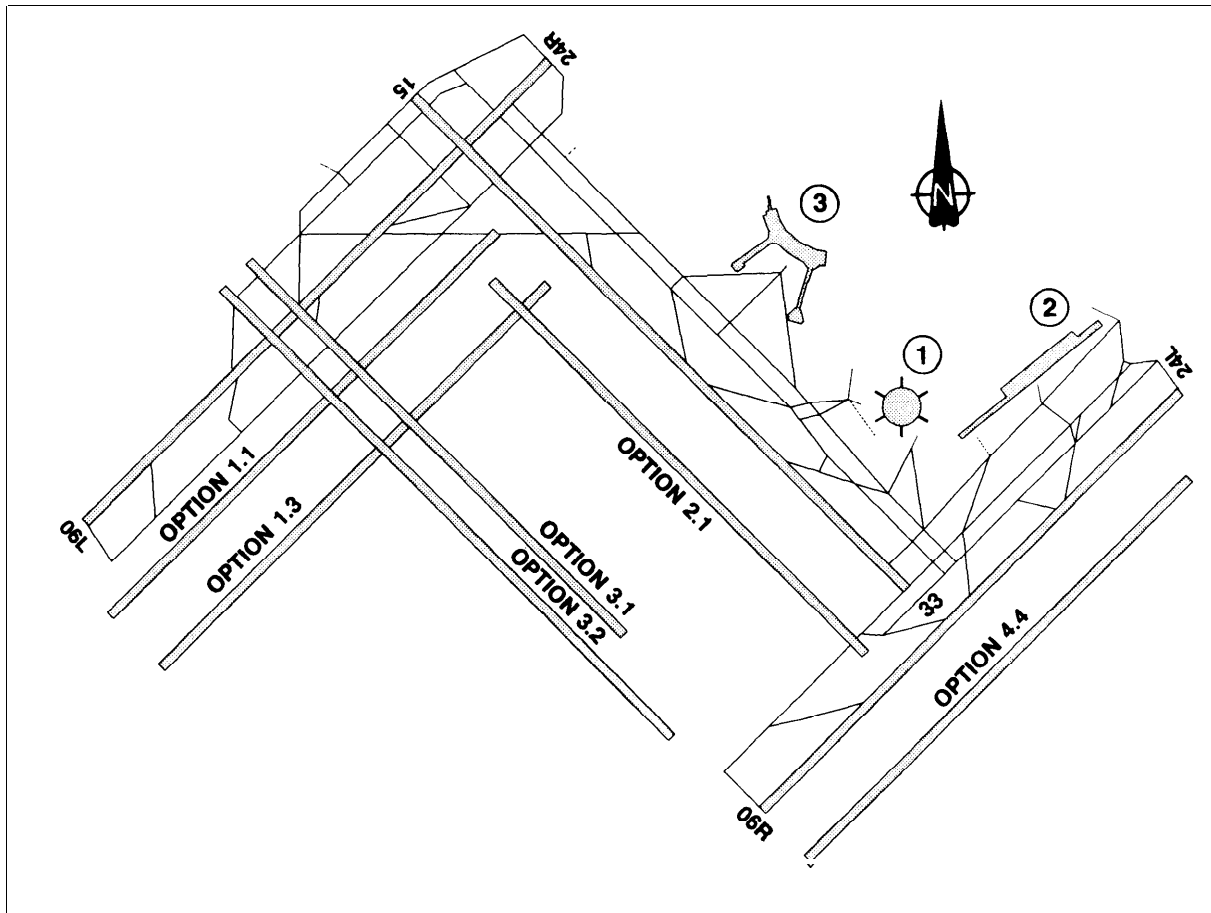
and they are presently not allowed to operate in the peak hours. Charter-type seats on regularly scheduled flights are offered to increase load factors during off-peak travel times. Significant volumes of these discount-fare passengers travel on the same flights as full fare passengers using a variety of tickets whose terms and conditions span the spectrum between scheduled and charter. Charter-like operations of regularly scheduled airlines would increase if charter traffic was diverted to serve passengers who want service from LBPIA. Canadian pure charter operators, which carry 75% of the pure charter passenger traffic, have made clear their reluctance to move from LBPIA. They have two concerns: Any relocation would increase ground travel time for the majority of their potential clientele who come from the Toronto market. This would place them at a serious competitive disadvantage with the charter-type fares or the charter-like operations offered by the scheduled airlines based at LBPIA. The second concern is the potential loss of the small, but marginally significant, proportion of connecting passengers which they capture because of the frequency of flights and magnitude of the passenger traffic at LBPIA.

The EIS states that over the last three years, pure charter flights have not been permitted between the hours of 1500 and 2000, which are the hours of peak airport activity. Consequently, pure charter flights have minimal effect on airport facilities, particularly runways, during those periods subject to capacity overload. Therefore, the proponent argues, the diversion of such traffic would provide no significant relief to the runways and other facilities at LBPIA.

Transport Canada further asserts that the transfer of scheduled airline charter traffic may tend to defeat the purpose of the transfer, because there would be a requirement to reposition aircraft from LBPIA to another site. Virtually all the transborder and international charter flights by scheduled airlines utilize aircraft which are primarily dedicated to scheduled service. Thus, many charter flights by scheduled airlines which originated out of LBPIA would have previously landed as a scheduled flight. Consequently, Transport Canada concludes, if charter activity were transferred, aircraft of scheduled airlines would depart LBPIA empty to pick-up charter passengers at another site. Thus, the objective of minimizing the number of aircraft movements would be lost.

In general, Transport Canada concludes that LBPIA has strong market dynamics that make it attractive to users. The Toronto area has had a multi-airport system for years, but the passenger traffic at Hamilton, Buttonville, Toronto Island, and Oshawa combined is less than 2.5% of the traffic at LBPIA. It may be possible to require that classes of aviation use facilities other than LBPIA, but Transport Canada asserts that legally it is not possible to require customers and goods to follow the relocated classes of aviation to such other sites. For example, if cargo services and charter traffic were diverted to Hamilton, Transport Canada estimates that an investment of \$192 million would be needed to provide adequate capacity. If moving charters to Hamilton resulted in a shift of charter passengers to scheduled flights out of LBPIA, charter operations would fail. Hamilton would be left, as in the past, with little new

FIGURE 2.6
RUNWAY OPTIONS



Adapted from Transport Canada, EIS, 1991.

traffic-and the government that financed the large capital investment would be left with a deficit. Transport Canada notes that directive mechanisms have been unsuccessful in many other jurisdictions and would likely be equally unsuccessful in efforts to relieve congestion at LBPIA, particularly as such mechanisms contradict the spirit of the National Transportation Act.

2.3.6 Constructing a New Airport in the Toronto Area

A new airport could either complement LBPIA or replace it entirely. A replacement airport would eliminate the problems faced by airlines and other airports users when required to split operations between two sites. The EIS states however that this alternative would be more costly than constructing a less substantial new airport to augment the capacity offered by LBPIA.

The alternative of a new international airport for the Toronto area, to be located in the Pickering area, was the subject of intense study two decades ago. Transport Canada does not regard construction at this site as a solution to the region's medium-term airport capacity problem. Transport Canada's proposal emphasizes that modern aircraft technology has now made it possible to expand LBPIA with less environmental impact than was previously possible. A new airport is a long-term alternative that will be considered, together with other airports, in the Southern Ontario Area Aviation Master Plan being prepared to address the long-term aviation needs of the region.

2.3.7 Conclusions Concerning Potential Solutions

Transport Canada concluded in its EIS that the solutions presented in Sections 2.3.3 to 2.3.6 are not capable, either separately or in any combination, of resolving the current capacity shortage in southern Ontario during the medium-term. Therefore they conclude that adding runways at LBPIA is the only solution that would ensure adequate capacity in the short-term and medium-term.

Transport Canada states that even though the other airports in the Toronto area may have a limited role in meeting the current capacity problem at LBPIA and do not offer solutions to the medium-term capacity problem, they may have a role in meeting the region's long-term aviation needs. It will be the task of the Southern Ontario Area Aviation Study to evaluate these issues and to develop a full set of recommendations on the roles of the surrounding airports and the Pickering lands to meet southern Ontario's long-term aviation needs.

2.4 PROPOSED NEW RUNWAYS

2.4.1 The Options

Transport Canada states in its airside expansion proposal that additional runways are required to increase airside capacity, which should relieve current congestion and accommodate the forecast growth in aircraft movements. A wide range of

development options were examined that would solve the two distinct capacity problems with the existing runway system: On the one hand, development options under consideration must provide additional runway capacity in the primary east/west wind direction to accommodate growth in aircraft movements for at least the period 1996-2007; and, on the other hand, additional runway capacity in the north/south crosswind direction to reduce the traffic disruption and delays which occur when the primary runways cannot be used because of adverse weather conditions.

Initially all possible runway alignments which were substantially within or adjacent to the existing airport property were considered. A preliminary feasibility screening reduced the number of individual potential candidates to six; three in each direction and parallel to the existing east/west and north/south runways. These were, in the east/west direction:

- Option 1.1 : offset 408 metres (1338 ft) southeast of existing Runway 06L-24R;
- Option 1.3: offset 762 metres (2500 ft) southeast of existing Runway 06L-24R;
- Option 4.4: offset 335 metres (1100 ft) southeast of existing Runway 06R-24L;

and in the north/south direction:

- Option 2.1: offset 365 metres (1200 ft) southwest of existing Runway 15-33;
- Option 3.1: offset 1067 metres (3500 ft) southwest of existing Runway 15-33; and
- Option 3.2: offset 1311 metres (4300 ft) southwest of existing Runway 15-33.

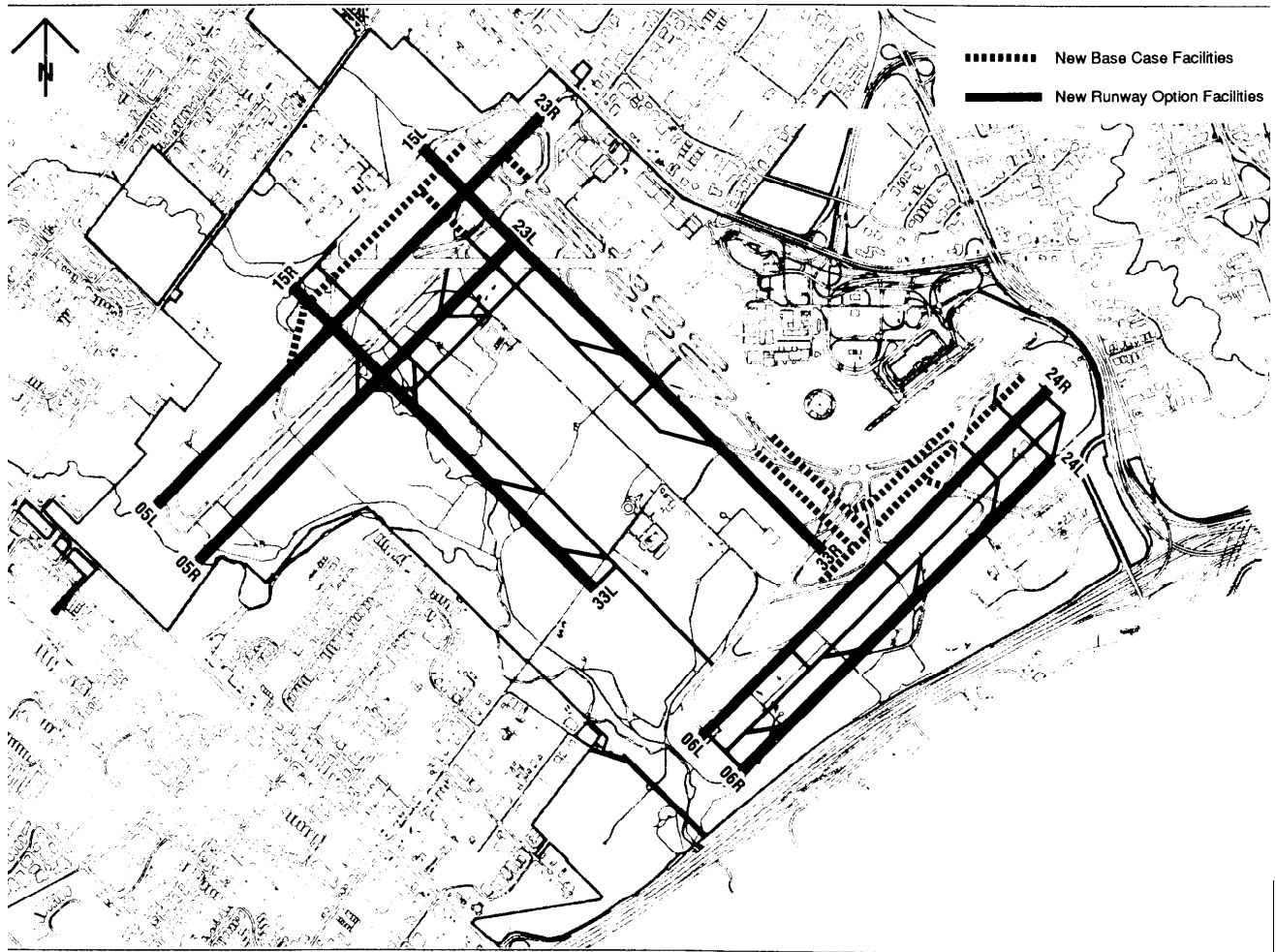
These alignments are shown in Figure 2.6.

Additional capacities resulting from either Option 1.1 or Option 4.4 alone were found to be small. However, studies indicated that a more significant increase could be achieved by a combination of both options. Construction of these two runways in combination and in conjunction with the existing east/west runways would provide two pairs of parallel runways. One pair would be located in the northern part of the airport and a second pair would be located in the southern part. This is known as the "quad" configuration. Although one pair could operate independently of the other pair, the use of each runway within a pair would be dependent on the activities of the other.

An analysis was conducted to determine the most appropriate runway lengths. Transport Canada concluded that acceptable lengths would be in the range of 2591 to 2743 metres (8500-9000 ft). The potential of short runways aimed at serving primarily turbo-prop aircraft was considered in the course of the runway-length analysis. However, the EIS states that this short runway option was rejected because of the very limited capacity increase that it would provide. There were also safety concerns posed by the need to weave traffic when departures are segregated by aircraft size rather than destination.

FIGURE 2.7

PROPOSED RUNWAY CONFIGURATION



Adapted from Transport Canada, EIS, 1991.

**TABLE 2.5
RUNWAY OPTIONS EVALUATION CRITERIA**

Criteria	
TECHNICAL	1.0 Technical-Operation 1.1 Capacity/Thru-Put 1.2 Runway System/Demand Balance 1.3 Delays or Schedule Disruption 1.4 Ground Manouvering Simplicity 1.5 Efficiency 1.6 Operations and Maintenance Cost
	2.0 Technical - Implementation 2.1 Capital Costs 2.2 Implementation Time 2.3 Land Acquisition 2.4 Operational Interference 2.5 Potential for Future Development
ENVIRONMENTAL	3.0 Environment - Noise 3.1 Noise Exposure Profile Net Changes 3.2 Noise Impact on Suseptable Institutions
	4.0 Environment - Air Quality 4.1 Air Quality Changes
	5.0 Environment - Water Quality/Quantity 5.1 Compliance to Standards and Water Quality Objectives 5.2 Impact on Flood Plain 5.3 Quantity and Quality Control Requirement 5.4 Groundwater
	6.0 Environment - Natural 6.1 Terestrial Habitat 6.2 Aquatic Habitat 6.3 Changes in Wildlife Corridors 6.4 Rare Species 6.5 Potential for Bird Strikes
	7.0 Socio-economic - Economic Considerations 7.1 Net-User Benefits
SOCIO-ECONOMIC	8.0 Socio-economic - Social Impact 8.1 Land Use 8.2 Residential Property Value 8.3 Commercial Property Value 8.4 Quality of Life (Community Well-Being) 8.5 Quality of Life (Individual Well-Being) 8.6 Level of Passenger Service 8.7 Waste Management 8.8 Utiditites and Community Services
	9.0 Socio-economic - Historical Considerations 9.1 Heritage and Archaeological Potential

Adapted from Transport Canada, EIS, Summary, 1991.

2.4.2 The Selection

The runway development options were then subjected to a detailed analysis and screening to select the optimal solutions to the two capacity problems at LBPIA. Because of the different nature of the two capacity problems, the analysis and comparison of options in each direction were carried out separately.

Options were first ranked in terms of their technical performance -their ability to resolve the capacity problems in a safe, efficient, and cost effective manner-and then were examined for environmental or socio-economic factors which might result in changes to that ranking. A detailed set of criteria was developed to provide the basis for comparison of the options. These criteria are shown in **Table 2.5**.

The Preferred East/West Option

The quad configuration including runway Options 1.1 and 4.4 was selected as the preferred development in the east/west direction. The new runway 05R-23L would be 2591 metres (8500 ft) in length and offset 408 metres southeast of existing 06L-24R, which would be redesignated as 05L-23R; and new runway 06R-24L would also be 2591 metres (8500 ft) in length, but offset 335 metres southeast of existing 06R-24L, which would be redesignated as 06L-24R.

Transport Canada states in the EIS that although this option represents neither the highest capacity nor the lowest capital cost solution, it did rank among the top alternatives from all perspectives, and is considered the best balance between achieving technical effectiveness and limiting environmental and socio-economic impacts.

The Preferred North/South Option

In the north/south direction, Transport Canada concluded that option 3.1 best balances all factors-although it provides less capacity than Option 3.2, the noise and natural environment impacts are less severe.

The configuration of the proposed runway system and associated taxiways is shown in **Figure 2.7**.

2.4.3 Capacity Improvements

Transport Canada emphasizes that because of their lateral spacing in relation to the existing runways, the proposed three runways cannot be used independently. This explains why the addition of three new runways to the three existing runways would not result in a doubling of aircraft movements. Nonetheless, Transport Canada asserts in its EIS that these new runways would provide significant improvements in operating capacity. During normal wind conditions, when the airport is operating in the east/west direction, the two new runways could increase the capacity to 126 movements per hour. This represents an improvement over the base case estimate of 96 movements per hour of almost 31%.

During adverse wind conditions when the airport is operating in the north/south direction (5% of the time), the hourly capacity would be approximately 70 movements per hour, an improvement of about 40%.

2.4.4 Runway Operations

Under the airside expansion proposal, runways in the east/west direction would be operated as a quad system with two dependent parallel runways operating on the southeast side of the airport, runways 06R-24L and 06L-24R, and two dependent parallel runways operating on the northwest side, runways 05L-23R and 05R-23L. Within each pair, one runway would be used primarily for takeoffs and the other primarily for landings.

The lateral spacing of more than 2743 metres (9000 ft) between the southeast and the northwest runway complexes would allow each pair to operate fully independently of the other pair. However, because of the close lateral spacing within each pair, operations on one runway would be dependent on operations of the other. Thus, each runway within a pair could be used for either takeoffs or landings but the two runways in a pair could not be used for simultaneous arrivals or simultaneous departures.

Transport Canada states that the proposed runway operating in the north/south direction would be used during the 5% of the year when wind conditions prevent airport operations on the higher capacity east/west parallels, or when operational contingencies force its use.

Because the lateral spacing between the two north/south runways spans 1067 metres (3500 ft), they could operate semi-independently, with the proposed runway dedicated primarily to arrivals from either direction, and the existing runway used primarily for departures.

2.4.5 Road Adjustments

The addition of new runways, and the reconfiguration of the airport infield would result in the need to alter several roads. The sections of Britannia Road on airport property would be redesigned and tunnelled under the new north/south runway. As well, lighting adjustments would be required on Highway 401 and on new flight approaches over Dixie Road, Derry Road, and Renforth Drive; and a minor realignment of Renforth Drive would be necessary near Highway 427.

improvements to other off-site roadways and transit systems may be necessary in the future. These will be examined during the preparation of the Southern Ontario Area Aviation Master Plan. Specific plans would not be prepared until the on-going federal/provincial transportation study for LBPIA and the surrounding area is complete.

2.4.6 Construction Programme and Phasing

Subject to decisions made following this environmental assessment, Transport Canada's EIS proposed that implementation begin in 1992. Detailed design, site preparation,

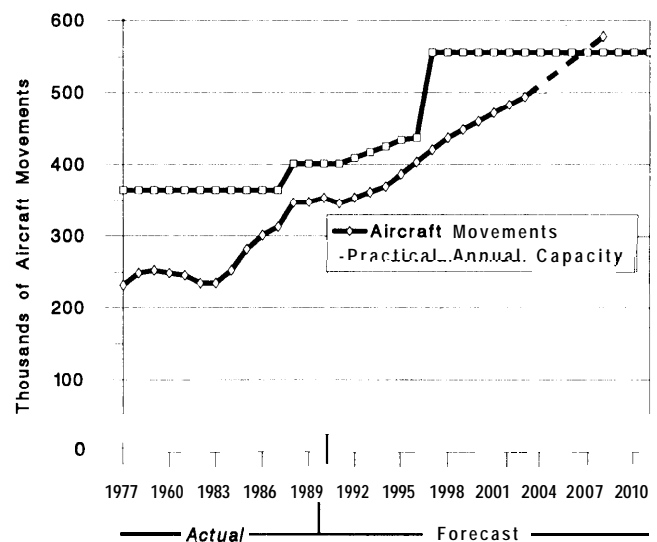
and construction of runways, roads, and other facilities could be completed within approximately four years. The total cost of constructing the three runways -including taxiways, lighting, facility relocation, real estate costs and navigational aids-is estimated to be \$666 million in 1990 present-value dollars.

2.4.7 Net Benefits of Additional Runways

The EIS states that the addition of the two east/west runways would result in a more efficient use of the resources employed in providing transportation services and a productivity gain for the economy at large. The additional runways would yield benefits in two ways: First, the passengers and aircraft currently using LBPIA would experience less delay; and secondly, the increased capacity could accommodate additional users.

FIGURE 2.8

CAPACITY VS FORECAST AIR CARRIER MOVEMENTS



Adapted from Transport Canada, EIS, 1991.

Figure 2.8 compares the annual capacity with additional east/west runways to forecast annual movements. The estimated cost of delay without additional east/west runways was compared to that with additional runways to determine the benefits of additional east/west runways.

TABLE 2.6**BENEFIT COST ANALYSIS RESULTS
(PRESENT VALUE \$1990 MILLIONS)**

	06-24	15-33
BENEFITS		
Delay Savings to Existing Users	1,327.2	—
Consumer Surplus for New Users	15.1	—
Disruption Savings	—	279.4
Total Benefits	1,344.3	279.4
COSTS		
Capital Expenditures	326.7	157.2
Operating and Maintenance Costs	26.8	11.7
Social Costs-Noise	5.1	0
Total Costs	358.6	168.5
NET BENEFITS		
(Benefits Less Costs)	985.6	110.5
BENEFIT-COST RATIO		
	3.8	1.7
INTERNAL RATE OF RETURN		
	29.3%	16.4%

Adapted from Transport Canada, EIS, 1991.

The value of the reduction of delay is compared to the costs of providing these runways—capital, operating, maintenance, and noise—to yield a net benefit of \$985 million in 1990 dollars (Table 2.6).

The addition of a second north/south runway would increase capacity in that direction from 50 to 70 movements per hour and some current disruption costs could be averted. The estimated cost of disruption without an additional north/south runway was compared to that with an additional runway in order to determine the benefits of this element of the proposed airside development project. The value of the reduction in disruption when compared to the costs of providing the additional runway yields a net benefit of \$110 million in 1990 dollars.

2.5 AIRPORT OPERATIONS

2.5.1 Air Traffic Control Services

The principal functions of the air traffic control system (ATC) are to manage air traffic flow and to provide separation between aircraft under all weather conditions. The LBPIA ATC Centre provides control and other services not only at LBPIA

but over a large area, extending generally from Windsor to Ottawa and from the U.S.-Canada boundary north to Hudson Bay.

In recent years the air traffic control system at LBPIA has received much attention from the media and the public because of shortages of qualified controllers in the control tower, as well as shortages in the larger ATC Centre. With a poor annual success rate in training during the 1980s—sometimes as low as 2 and 5 qualified controllers out of a class of 22 students—Transport Canada stated that it anticipated critical staff shortage problems.

According to Transport Canada, several measures were undertaken to relieve air traffic congestion at LBPIA in December of 1988. These measures included a cap, initially of 70 hourly aircraft movements and a supporting slot reservation system to regulate the availability of slots. Without a full complement of air traffic controllers, allowable movements were in sharp contrast to the theoretical maximum capacity of the existing three-runway system or the base case. The base case includes a maximum capacity of 96 movements per hour under visual weather conditions and 80 movements per hour in inclement weather, when instruments are required, in the east/west direction at LBPIA. The cap was increased to 76 movements per hour in September, 1990 and again to 82 movements in 1992. The cross-wind capacity of the north/south runway, independent of the cap, remained unchanged at 50 movements per hour.

At the hearings, Transport Canada reported that air traffic congestion at LBPIA was severe and steadily increasing in the late 1980s. Accordingly, measures were undertaken in late 1988 to increase substantially the recruitment and training of air traffic controllers with the objective of alleviating the shortfall in this area.

During the hearings, Transport Canada presented a commitment to have full ATC staffing in critical areas by June, 1994. Transport Canada's initiatives toward this commitment included such measures as increasing the number of trainees in the on-the-job training phase, reducing training time, increasing the success rate of the training programmes, improving the quality of students entering the programmes, upgrading flight control simulators, restructuring air space, changing traffic flows, and revising departure and arrival procedures—all with the clear goal of simplifying the work of the air traffic controller. Training programmes aimed specifically at staffing ATC Toronto were also expected to eliminate loss of controllers to other regional and national airports.

As discussed at the hearings, the national training programme is targeted to deliver an additional 20 controllers each year. This represents an annual growth of about 10%. Under the proposal to expand airside capacity, LBPIA has a projected requirement for an additional 10 person-years to handle the increase volume of traffic. As stated at the hearings, Transport Canada officials are confident that they can achieve 100 per cent staffing under the proposed airside expansion at LBPIA, and satisfy the projected 3.5% growth in air traffic to the year 2001.

2.5.2 Airspace Structure

Canadian airspace is divided in plan and elevation into a hierarchy of categories, areas, and zones for the purposes of Air Traffic Control. Within Canada's Southern Domestic Airspace, the Toronto Flight Information Region corresponds roughly to the province of Ontario. Within that region, the area generally bounded by Trenton, Lake Simcoe, Georgian Bay, Lake Huron, Sarnia, and the Canada-U.S. boundary is designated as the "Toronto Control Area Extension". The Toronto Control Area Extension is further sub-divided into various airspace classes based on the rules governing air traffic controllers and pilots within each class.

The area within 22 nautical miles of LBPIA, the Toronto Terminal Area, is separately identified and assigned a different class, as is the Toronto Control Zone, the area within 7 nautical miles of LBPIA. Special provisions are made within these latter areas in the vicinity of Downsview, Toronto Island, Buttonville, and Brampton airports for the control of local flight operations

Passing through, around, above, and below these various airspace areas is a two-tiered, both low-level and high-level, system of enroute airways. Equivalent to highway and ramp systems in the sky, the airways are generally defined as paths or tracks, four nautical miles wide, linking Very High Frequency Omni-directional Range beacons. These beacons are strategically located throughout Canada with one at LBPIA. There are 15 low-level and 15 high-level airways that converge on or pass in close proximity to LBPIA.

These airways serve not only flights to and from LBPIA, but also flights to nearby airports such as Hamilton and flights between distant airports that merely overfly LBPIA such as those connecting Europe and the North American west coast. The latter two types of flights comprise approximately 65% of all Instrument Flight Rule (IFR) flights in the regional airspace.

Detailed descriptions of airspace structure and flow control methods are presented in Appendix 9.

2.5.3 Planning Day Schedule

Transport Canada, as part of the assessment of the positive and negative effects of its proposed new runways at LBPIA, developed operating scenarios for the years 1996, 2001 and 2011. These operating scenarios were then used to predict aircraft and traveller delays, and community effects—primarily noise. Preparation of the scenarios involved the synthesis of an operating schedule for the planning day for each of the three years, for operations with and without the proposed runways.

In each of the three years for which an operating scenario was developed, Transport Canada predicted that virtually the same number of aircraft would use LBPIA on the planning day whether or not the proposed new runways were constructed. This would be accomplished by spreading throughout the day the movements of aircraft in the scenarios representing operations without the proposed runways.

Essentially, some aircraft that would have been scheduled to arrive or depart during peak periods of aircraft movement, when demand exceeded capacity, would be rescheduled into earlier or later, less busy, time slots. The effect is to flatten and broaden the peak periods, and to increase the number of flights during off-peak, particularly shoulder, periods. Under these scenarios it is clear that a significant number of passengers would be forced to travel at times other than their first preference.

2.5.4 Waste Management and Disposal

Various waste materials requiring disposal are generated on-site and from aircraft at LBPIA. According to the EIS, LBPIA produces approximately 950 tonnes of solid waste per month from all sources. It also produces an unspecified volume of liquid waste, including sanitary sewage and storm water runoff, the latter containing de-icing agents, fuel and oil, and other chemicals used on runways, taxiways, and aprons. A separate document from Transport Canada, issued in March 1991 and entitled "Lester B. Pearson International Airport Environmental Management Plan" outlines the airport management's continuing efforts to satisfy increasingly complex environmental regulations. The document includes reference to waste management and spills management.

In any consideration of waste management and disposal, wastes can be categorized in three major ways: according to the physical state—liquid waste or solid waste; according to the source—waste generated on-site or in planes respectively; or by the degree of danger, and thus by category of disposal needs—municipal waste and toxic or hazardous waste. The disposal of garbage from international flights—those from neither Canada nor the U.S.—is regulated under the Canadian federal Animal Disease and Protection Act, which requires that "all international garbage be immediately sterilised or incinerated." Therefore this international waste category should be treated as a separate stream, regardless of its physical or chemical nature. It amounts to approximately 300-350 tonnes per month. According to the EIS this international garbage was being "shredded and compressed at the airport" and then being shipped by truck across the Canada-U.S. border to a hazardous waste facility, Occidental Chemical, in Niagara Falls, New York, rather than being "...immediately sterilised or incinerated."

Other domestic, commercial, and non-hazardous industrial wastes, estimated as approximately 600 tonnes per month, are collected by private contractors and delivered to Peel Regional landfill facilities. All aircraft sanitary sewage is delivered to a dedicated sewage transfer station. From there it flows by gravity to the main sewage station, then it is pumped to a forcing main and conveyed to the Humber Sewage Treatment Plant. Domestic sanitary sewage is fed through two separate municipal sewage sub-trunks.

At the time Transport Canada produced its EIS all of the disposal methods described above were under review for possible modification. Thus for disposal of international garbage, the Airline Consultative Committee (ACC) is "...actively reviewing alternative technologies for the longer term treatment of this and other waste streams and recognise that any new

major waste disposal system will require a specific evaluation under the Environmental Assessment Review Process," according to the LBPIA Environmental Management Plan. In the case of non-hazardous waste, the Transport Canada 1991 study entitled "Recyclable Materials Recovery Report" estimated that "...recyclable material accounts for 180 tonnes per month", while the EIS states that for domestic sanitary sewage the peak "...ultimate development...sanitary sewage flow (140 l/s) was within the available capacity of the Region of Peel sub-trunk sewer on the west side of Highway 427."

The EIS also refers to a Technical Working Group consisting of representatives from Environment Canada, Transport Canada, and Agriculture Canada whose function is to "develop a strategy for international transportation wastes". More specific details about waste management at LBPIA are presented in Appendix 10.

2.5.5 Noise Management

The Noise Management Programme at LBPIA began in the 1960's as heavy jet traffic began to grow. The programme has evolved in response to community concerns, tempered by operational requirements. Over the years, measures to reduce noise exposure levels have involved regulations and procedures, noise monitoring methods and restrictions. Control measures are continuing to evolve.

The proponent, in the EIS and at the hearings, identified the following guidelines for the programme:

- * no compromise to safety;
- * equitable balance between community and airline operating concerns;
- . encourage quieter aircraft-increase restrictions on noisier aircraft;
- . base restrictions on actual noise.

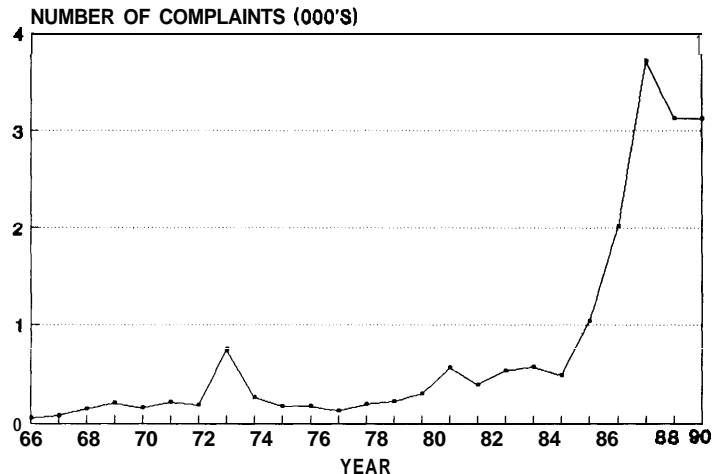
The Noise Management Office

The Noise Management Office at LBPIA currently has a full time staff of three. The responsibilities of this office include: monitoring, complaint follow up, procedure development and statistical reporting.

The Complaint Report System is described in the EIS as "the main vehicle to register complaints about airport activities at LBPIA." The first telephone line was installed in 1980 when complaint activity was in the range of 200 to 300 complaints per year. In 1990 over 3,000 complaints were registered. According to the EIS, complaints are analyzed in terms of "relationships between specific aircraft or airport activities and the location of complainants.... The Noise Management Office then investigates each complaint with the tools at hand (interim radar tracking system, noise monitoring system and runway utilization data) and completes a complaint record on the incident and enters it onto Noise Management Office complaint database system."

FIGURE 2.9

NOISE COMPLAINT HISTORY LBPIA



Adapted from Transport Canada, EIS, 1991.

The EIS provides data for 1990, in terms of the nature of complaints under the existing conditions: Disturbed sleep caused 34% of the complaints, speech interference caused 6%, television or radio interference caused 3%, outdoor recreation problems caused 2%, "quality of life" interference caused 40%, and "other" caused 15% of the complaints. **Figure 2.9** indicates a rapid increase in complaints during the mid 1980's, with some decline after 1988. According to the proponent, if the same person made several complaints in a "short time period" (subject to Transport Canada's judgement), this would be counted as one complaint. In 1990, there were 3,124 complaints by 1,200 individuals, 40 to 50% of the complaints were made by the three most frequent callers.

The recent decline in complaints, as seen in Figure 2.9 was cited by Transport Canada as an indication of a recent decrease in noise. However, a number of residents expressed the opinion that this decline in complaints was a result of many people "giving up" on the system, because they felt it was ineffective. On the other hand, some residents continued to complain when noise became bothersome and there were some residents who still felt that it was worthwhile to use the complaints line.

Noise Management Committee.

A committee consisting of representation from airlines, pilot associations, Air Traffic Services, Air Navigation Services and from Noise Management and Senior Management at the airport has been in existence since 1989. The public, i.e., the local resident community, is not represented on this Noise Management Committee.

The panel was informed that the Committee "is reviewing options involving reduced power settings, maximum speeds,

arrival and departure profiles, reduced night activity, and accelerated retirement of noisier aircraft, all with the objective of providing maximum noise relief to the surrounding communities.”

Amendment to the Aeronautics Act.

On June 3, 1992, an amendment to the Aeronautics Act provided for an increase in fines for violation to the provisions in the Canada Air Pilot, from a current maximum of \$1,000.00, to a maximum of \$25,000 for corporations and \$5,000 for private owners.

Noise Monitoring and Measurement.

The first fixed noise monitoring system for LBPIA was installed in 1979, (i.e., a year before the first noise complaints line was installed). Between 1982 and 1985 the permanent monitoring system was upgraded and additional monitors were added. The existing monitoring systems cannot unambiguously identify noise violators. The upgrading and addition of monitors however was an attempt to “facilitate the identification of pilots violating the noise abatement procedures published . . . While effective, the procedure is tedious requiring manual matching of the data sources to be compared.” In effect, as the Panel heard at the hearings, current fines are not related to the amount of noise produced, rather they are related to non-compliance with flight slots, night restrictions, or designated departure and arrival flight paths.

On January 10, 1992, at the hearings, Mr. Chern Heed, General Manager of LBPIA, described that between April and October, 1992, there were 149 violators of the noise abatement procedures of the Canada Air Pilot. Mr. Heed noted at the public forum that 88 of the violators were pending judgement, 32 were investigated with no further action, 13 received letters of counselling, and 9 received monetary penalties amounting to \$7,000.

The New Noise Monitoring System

A state-of-the-art system is being installed in the near future. There will be twelve fixed monitoring stations and one portable monitor; the system is expandable to 26 monitors. According to the EIS, the system was expected to be completed in 1991, but at the time of the hearings it was not complete. At a cost of \$2.2 million, the system will permit accurate noise measurement and accurate flight tracking. With the full installation of RAMP (see section 2.3.1), the software permitting immediate electronic matching of noise level and aircraft location at a given instant, can be finalized to “instantaneously identify violations.”

Regulations and Procedures for Noise Management.

Historical accounts of the methods used in noise management since the 1960s are provided in the EIS. The present section addresses the most current mechanisms and procedures.

The complaints line described above represents part of the noise management programme. The other measures are more directly technical in nature.

The current programme consists of night flight restrictions, with *no* scheduled arrival *or* departures between 0100 hrs. and 0600 hrs., and limited (Stage 3 aircraft only) scheduled arrivals and departures between midnight and 0100 hrs. AM. In spite of the attempts to limit flights during the quiet hours of

the night, both scheduled and unscheduled flights do occur over nighttime hours. Some of these result from emergencies, and as stated in the guidelines, safety can never be compromised. Since some runways and directions are less sensitive than others, LBPIA practices preferential runway use during the midnight to 0600 hrs. period, with arrivals and departures to and from the west and the north. There is a special noise abatement departure flight track to minimize impact on Malton and Bramalea.

Noise abatement departure procedures, consistent with International Civil Aviation Organization (ICAO) guidelines, are in use for all runways and there are restrictions of engine run-ups between midnight and 0700 hrs. Training flights are restricted during quiet hours.

2.6 NOISE

2.6.1 Noise Measurements

Measures of noise intensity and magnitude are called noise metrics. They measure instantaneous sound level, the cumulative sound energy of a single noise event, and the cumulative sound energy of a number of events averaged over time. The metrics most commonly used are decibels, maximum sound levels, and sound exposure levels.

The human ear is sensitive to an enormous range of sound intensities. To render this range more manageable, a logarithmic scale of sound intensity, the total sound energy related to an event, has been developed that is analogous to the Richter Scale of earthquake intensity. This measure of sound intensity is called the “decibel (dB) scale.” The basic metric of sound on the decibel scale is called Sound Pressure Level. It is directly measurable with a sound level meter.

(dBA) Decibels, A-weighted

There are several decibel scales. The most commonly used is the A-weighted scale which most accurately mimics the characteristic human ear response to the range of sound intensity most frequently encountered. The EIS and the present report use the dBA scale. On this scale, everyday sounds normally range from very quiet 30 dBA to very loud 100 dBA. Normal speech between two people about 2 meters apart creates a sound level of about 65 dBA.

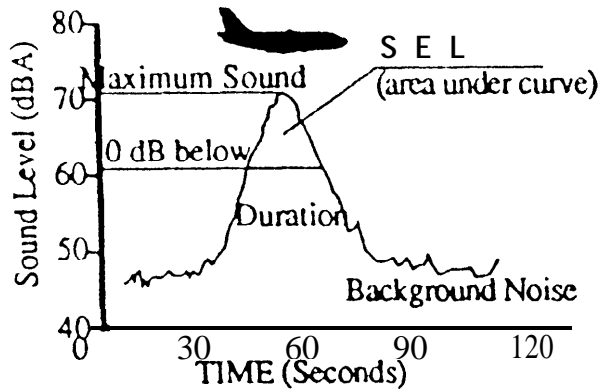
The subjective loudness or noisiness of a sound depends on both its intensity and duration. A sound that is 3 dBA louder than another sound of the same duration actually contains twice as much sound energy, and the increase is generally noticeable. The human subjective response is, however, not doubled. It would normally require a 10 dBA increase to double the perceived noise loudness, while a corresponding 10 dBA decrease would halve the perceived loudness. On the other hand, a sound that lasts twice as long as another sound of the same intensity also contains twice as much sound energy and would typically be subjectively judged to be twice as noisy, for durations of up to a minute or so.

L_{max} — Maximum Sound Level

The point at which the noise associated with an event reaches its maximum intensity is known as the L_{max}. For example, in a typical aircraft flyover, L_{max} would occur when the aircraft was very nearly directly overhead or at its nearest point of approach for sideline noise. Technically, L_{max} is the instantaneous maximum sound level in dBA.

FIGURE 2.10

SINGLE EVENT SOUND EXPOSURE LEVEL (SEL)



Adapted from Mestre Greve Associates, 1992

SEL, or Sound Exposure Level

SEL is more often referred to as the Single Event Level. It is a cumulative measure of the noise or acoustic energy associated with a single noise event (Figure 2.10). SEL is measured in dBA from the time the noise reaches a level within 10 dBA of L_{max} until the noise falls again to a level of 10 dBA below L_{max} . For a typical aircraft flyover, this might be 20 to 30 seconds.

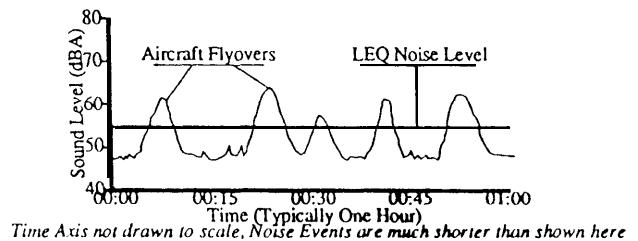
SEL is a function of both intensity and duration, in contrast to L_{max} which is an expression of intensity only. As a result, the SEL of a given noise event is greater than its L_{max} . For a

typical commercial aircraft flyover, SEL is generally taken to be 10 dBA more than the L_{max} .

Included in the Panel's list of additional data requirements, following release of the EIS, was a request for more information on the role of single event noise levels (SELs) and SEL contours in the noise impact assessment for LBPIA. Transport Canada responded in October 1991 with an expanded SEL analysis intended to replace all previous SEL data in the EIS and its supporting documents. This SEL analysis is summarized in Appendix 11.

FIGURE 2.11

ONE HOUR OF EVENTS (LEQ)



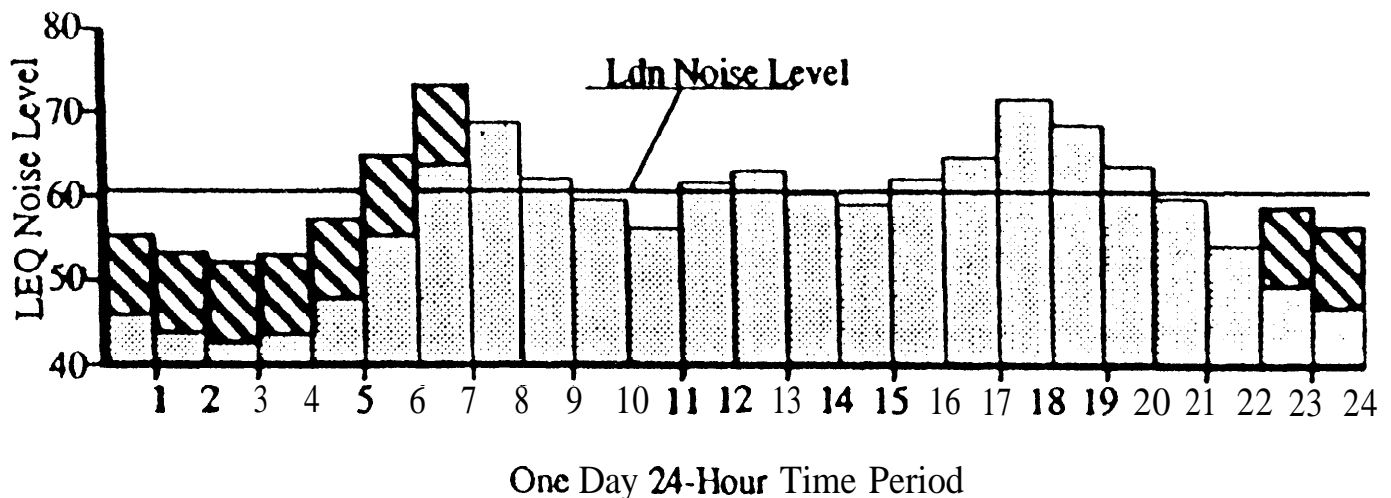
Adapted from Mestre Greve Associates, 1992

L_{eq} , or Equivalent Sound Level

L_{eq} is that level of continuous, steady noise that would, over a given time period, contain the same acoustic energy as a series of SELs plus the background noise. It can be expressed for any period of time such as 15 minutes, 1 hour or 24 hours (Figure 2.11).

FIGURE 2.12

24-HOUR NOISE LEVEL (L_{dn})



Adapted from Mestre Greve Associates, 1992

L_{dn}, Day-Night Noise Level

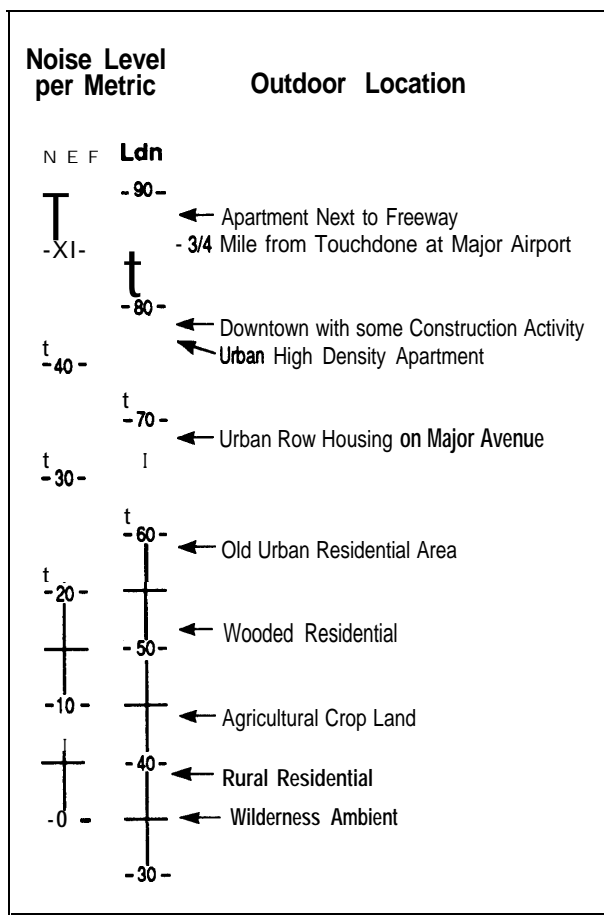
L_{dn} is a cumulative noise metric commonly used for plotting “noise contours” around an airport. It is derived by averaging the equivalent noise levels (L_{eq}) for each hour over a **24-hour** period (see Figure 2.12). The L_{dn} metric includes a weighting factor that penalizes night-time noise in the calculations. This **recognizes** that night-time noise is perceived as more annoying.

NEF, Noise Exposure Forecast

NEF is another commonly-used cumulative noise metric. It is the summation of all noise that takes place in a **24-hour** period based on the Effective Perceived Noise Level (EPNL). It considers some tonal qualities of sound and is intended to rate the “noisiness” or annoyance level of a sound rather than its loudness. Like the L_{dn} metric, the NEF metric includes a weighting factor that penalizes night-time noise.

FIGURE 2.13

TYPICAL NOISE LEVELS IN THE ENVIRONMENT



Adapted from Transport Canada, EIS, 1991.

The Use of Noise Metrics

Noise metrics are measures of instantaneous noise level or noise energy exposure level over time. In impact assessment, they are used to predict human response to airport noise. This section compares the value of different noise metrics for various noise measurement purposes.

Comparison of Cumulative Noise Metrics

Noise around airports is most often quantified in terms of the cumulative noise metrics, L_{dn} or NEF. In addition to their use in land-use planning, these cumulative measures are accepted worldwide for relating community reaction or annoyance to aircraft noise. Of course, metrics which measure single events, such as L_{max} and SEL, are also important; it is often the noise of an individual overflight that is sufficiently annoying to elicit a complaint.

The relationship between L_{dn} and NEF metrics as illustrated in Figure 2.13 follows the formula: NEF + 35 dBA = L_{dn}. The main difference between the two metrics is that L_{dn}—and the SELs, L_{eqs}, and L_{maxs} from which it is developed—can be measured directly at the LBPIA noise monitoring sites, whereas NEF contours can be produced only by computer modelling. L_{dn} is used by the U.S. Federal Aviation Administration (FAA) and the U.S. Environmental Protection Agency (EPA) and also by many municipalities in Canada. However, the NEF is the most widely used metric in Canada. Transport Canada guidelines provide that no residential development should take place inside the NEF 30 contour, although with appropriate noise insulation this can be expanded to the NEF 35 contour. The Canadian Mortgage and Housing Corporation (CMHC) uses NEF 25 as a contour-value guideline for mortgage approval purposes.

Aircraft Noise

There are several sources of noise which are inherent in the design and operation of aircraft. Appendix 12 gives a brief description of these noise sources: overflights; landings and take-offs; reverse thrust; run-ups; taxiing; and use of auxiliary power units.

2.6.2 Noise Sensitivity

The EIS provides a detailed section on methods of noise measurement and analysis "...to aid in the process of estimating the impact of airport noise." However, this statement is made in the context of decision making, and:

...it must be remembered that noise is only one of the many factors that need balanced assessment in the decision-making process. The safe, efficient functioning of the airport and the feasibility of noise mitigation are two of the most obvious factors. While it is desirable to eliminate any adverse effects of noise on surrounding populations, and to prevent any new adverse effects, to do so completely may not be possible within the context of running an acceptable efficient international airport. Such inevitable balancing should be kept in mind when assessing incremental noise impacts.

The EIS addresses the application of noise analysis to decision-making and develops tables of noise levels for single aircraft overflights as well as for total noise exposure for future runway locations. Very small changes in noise exposure are not detected by the human ear, therefore it is necessary to interpret increments of changes in noise level with respect to their effects on people. The interpretation of the effect on people of changes in noise for both single events and for cumulative noise exposure is as follows:

***Single Event Noise Levels (SEL or L_{max}):**

<u>Change in Level</u>	<u>Interpretation of Change</u>
0-2 dBA	Generally not noticeable
2-5 dBA	May be noticeable
Over 5 dBA	Generally noticeable

***Cumulative Noise Exposure (NEF or L_{dn}):**

<u>Change in Level</u>	<u>Interpretation of Change</u>
0-2 dBA	Generally not noticeable
2-5 dBA	May be noticeable
Over 5 dBA	A change in community reaction is likely

In the EIS the proponent notes that these changes in levels can be used to judge impacts "...if aircraft noise levels are sufficiently higher than levels from other sources . . ." and that

they can also be used to "...quantify the benefits of noise abatement measures." In the latter context, noise abatement effects are based on the criteria shown as follows:

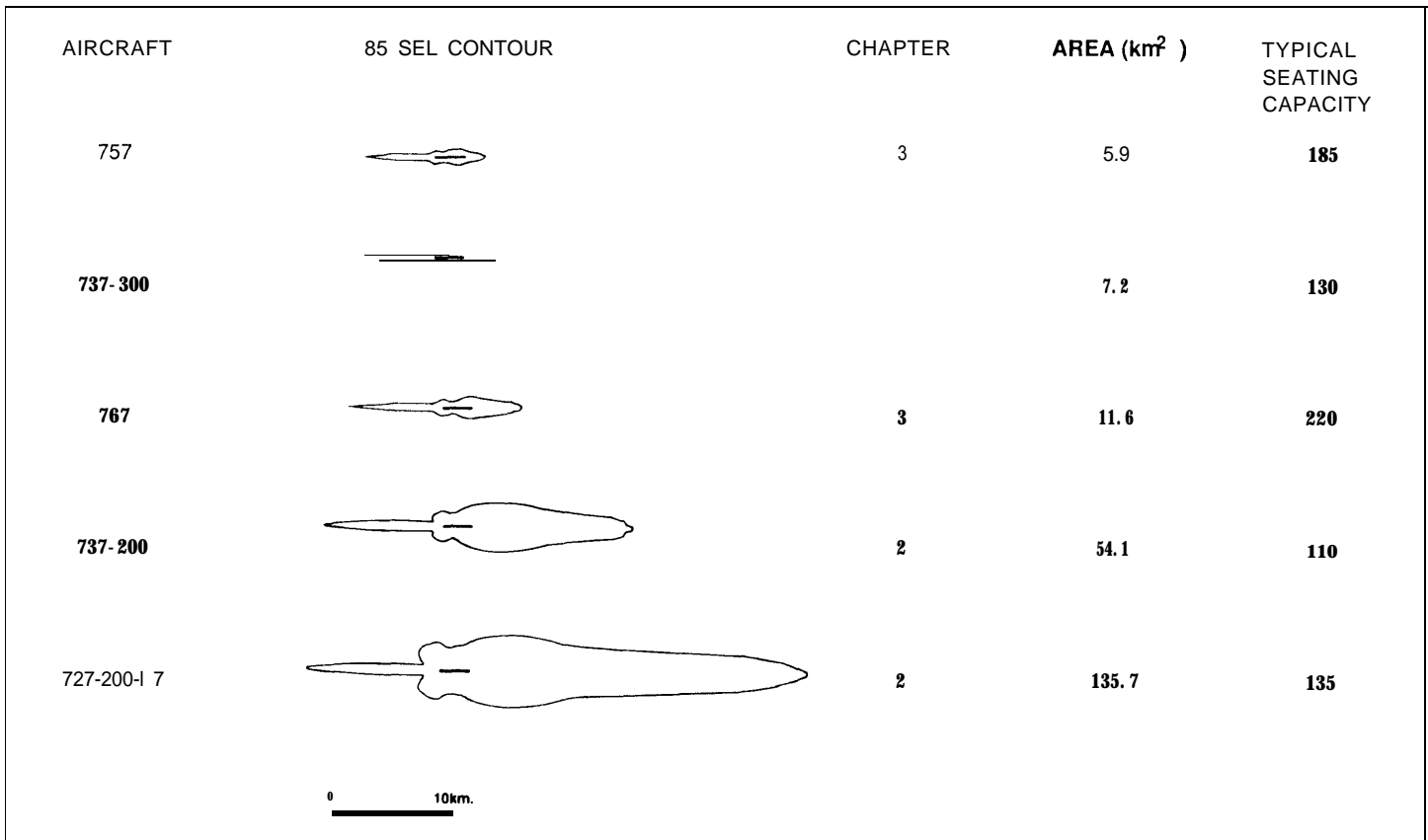
<u>Decrease in Level</u>	<u>Interpretation of Change</u>
0-2 dBA	Abatement may be beneficial
2-5 dBA	Abatement should be beneficial
Over 5 dBA	Abatement definitely beneficial

The techniques used to assess noise impacts on people and to plan abatement measures are based on a review of the known health effects-including behavioural effects-of noise on people. In the context of individual health effects, a scientifically established dose-response relationship is required to use these effects in assessment. In the context of assessing noise impacts on an identified population, the effects must be quantified in terms of a statistically measurable fraction of the population.

The effects of noise on people include direct and measurable auditory health effects; certain controversial, and less well-established, non-auditory health effects; behavioural effects, such as interference with communication and sleep disturbance; and social effects, described as general quality of life. Details of commonly cited behavioural effects are described in Appendix 13.

FIGURE 2.14

SOUND EXPOSURE LEVEL (85 DBA CONTOUR)



Adapted from Transport Canada, EIS, 1991.

2.6.3 Conversion from Stage 2 to Stage 3 Aircraft

Transport Canada stated at the hearings that the newer, quieter, Stage 3 aircraft employing state-of-art noise suppression technology show a dramatic difference in noise level—about 10 to 15 dBA—particularly on take-offs, when compared with the older Stage 2 aircraft (Figure 2.14). Advances in engine design have resulted in an evolution of aircraft technology, and these advances are expected to continue into the next century. However, Transport Canada presented a chart depicting the aircraft noise trend over the last 40 years showing that progress in noise reduction is slowing; the industry does not have the knowledge or the technology which could be used to build a quieter aircraft than it is producing now in the form of Stage 3 aircraft.

In the United States, the Airport Noise Capacity Act of November, 1990, requires that there be only Stage 3 aircraft at all airports by the year 2000, with limited exemptions to the year 2003. The International Civil Aviation Organization (ICAO) passed a similar rule in October, 1990, requiring that Stage 2 aircraft be phased out starting in 1995 if they are 25 years of age. The phase-out is to be complete by April 1, 2002.

Evidence presented by Transport Canada and major carriers suggested that fleet conversion in Canada would probably follow a similar schedule to that of the United States. While there is no current legislated requirement for phasing out Stage 2 aircraft in Canada, the phase-out should occur for economic reasons: Stage 3 aircraft are more fuel-efficient, and require less maintenance as well as fewer crew members per passenger.

2.6.4 Noise Profiles (NEF Contours)

Noise Exposure Forecasts (NEFs) predict future noise produced by the traffic and activities that characterize airports. NEFs are computations based on the perceived noise level of each type of aircraft and of each flight profile, on the number of flights, and on the time of day runways are used, among other variables. The computations are used to plot contours around airports that predict the distribution of noise levels. NEF contours around LBPIA are shown in Figures 2.15 to 2.18.

2.6.4.1 Current (1990 and 1991)

Based on 1988 and 1990 planning days, the current noise profiles generated by Transport Canada are plotted in 5 dBA increments from NEF 25 to NEF 40, consistent with most of the planning policy guidelines for land use capability. The total area within the 25 NEF contour for 1988 and 1990 was 200 and 180 square kilometres respectively.

Transport Canada estimates that 45,000 and 38,000 people were residing within the NEF 30 zone in 1988 and 1990 respectively. According to the proponent, the reduction in the number of people affected was due to a 10% increase in the use of quieter Stage 3 aircraft between 1988 and 1990, from 30% to about 40%. Diverging turns after takeoff, which were implemented with the initial introduction of simultaneous parallel instrument departure (SPID) operations, had the effect of

broadening the 1988 noise contours—indicated by increased noise exposure to the sides of the parallel runway configurations. The problems of divergent turns on departure have since been corrected.

2.6.4.2 Base Case (1990, 1996, 2001 and 2011)

Observed changes in NEF planning contours for the years 1990, 1996, 2001, and 2011 result from forecast changes in air traffic levels, fleet mix, and changing proportions of night movements. The NEF analysis by Transport Canada of forecast traffic levels shows that the noise contours will initially increase in size until about 1996, after which they will contract in response to increasing proportions of Stage 3 aircraft. Although Transport Canada forecasts a relative increase in the area within noise contours between 2001 and 2011, the virtual completion of Stage 2 phase-out and the growth in traffic volumes of Stage 3 aircraft still result in NEF contours that are significantly smaller than those forecast for 1996. Despite that slight increase, the forecasted contours for 2001 and 2011 are no larger than those for 1990.

The 1996 planning contours are predicted to be noticeably larger in some areas than the 1990 historical contours and smaller in other areas. For 1996, approximately 25,000 additional people are forecast to be located within the 25-30 NEF contour, 5,000 more within the 30-35 NEF, and 2,000 fewer in the 35-40 NEF. The 2001 planning contours are forecast to be contained within the 1996 contours. The increase in Stage 3 passenger jet percentages, from 61% to 96% in the planning day schedule, is expected to more than compensate for the increase in number of movements by 2001. The reduction in affected population is predicted to be almost 50% within the 25-30 and 35-40 NEF exposure bands and greater than 50% in the 30-35 and 40+ NEF bands.

The 2011 contours are forecast to be somewhat larger than the 2001 contours. Transport Canada attributes this increase to two factors: Reduction in Stage 2 aircraft after 2001 does not compensate for the increase in traffic, and the increased movements in 2011 would force operations into the night hours for which the NEF model imposes a penalty. Transport Canada concludes therefore that the number of people affected increases within each contour. Within the 25-30 NEF band, approximately 9,000 more people would be affected. Above the 30 NEF contour, the increase in the number of people affected would be less than 500 people.

Comparisons with the 1996 Noise Exposure Projection (NEP) contours, the NEF contours for 1996 which were produced in 1984 and on which the municipal land use guidelines are based, are also relevant. For 1996, the population forecast to be within the 30 NEF (40,000) is 18% greater than that originally forecast to be within the 30 NEF contour of the 1996 NEP. This increase has been attributed to contour excursions beyond the contours of the 1996 NEP along with the centre-lines of the runways in the 06 and 24 directions. Even though the new 1996 contours recede well within those of the 1996 NEP in the 15-33 direction, the sparser population densities below these less-affected areas were forecast to not have the same magnitude as the increase in population affected in the other areas.

This situation is forecast to be short-lived. By 2001, population volumes within the 30 NEF will be approximately half of those within the 30 NEF of the 1996 NEP. By 2011, these volumes will continue at approximately one half the 1996 level.

2.6.4.3 Proposed New Runways (1990, 1996, 2001 and 2011)

The actual 1990 NEF contours are shown in Figure 2.15. Figures 2.15 to 2.18 show the noise contours for the preferred option for the years 1990, 1996, 2001 and 2011 superimposed on the contours for the base case. Two conclusions were drawn by Transport Canada: The similarity between the contours of the base case and those of the preferred option indicates that the NEF (and L_{dn}) values are not expected to differ by more than 3 dBA for any location affected by airport operations. Thus, the addition of three runways would have little incremental effect on noise impact. And after an initial increase between 1990 and 1996, the contours for 2001 and 2011 are expected to shrink to less than those for 1990.

The EIS indicates that the reasoning for the similarity in the shape or size of the noise contours between the proposed development option and those for the existing three-runway layout is twofold: First, in both scenarios the number of large jet aircraft which dominate the noise environment remain the same. Second, by primarily confining the noisier operations to the runways closest to the centre of the airport, the affected areas would remain largely unchanged.

The reduction in overall noise levels predicted over the period 1996 to 2001, for both the preferred option and the base case, is attributable to the expected increased percentage of quieter Stage 3 aircraft in the future. Between 2001 and 2011, the noise impacts of the preferred option are forecast to become progressively smaller than those of the base case. Transport Canada concludes that this decrease results from a decrease in sensitive night operations, a scenario assumed by Transport Canada under the base case that would also occur under the preferred option.

From **Figures 2.17 and 2.18** it is evident that the contours of the base case and the proposed development option are of the same shape, except that the major lobes are shifted somewhat in response to reallocation of arrivals and departures to the proposed runways. The most significant movement in the contours is related to departures on the proposed Runway 23L which would begin their takeoff roll closer to the centre of the airport and thus farther away from Malton Village. The area within the NEF contours in both development scenarios remains essentially the same.

Noise levels resulting from operation of the east/west quad runway system would be marginally higher for residents located in north central Mississauga, along the 06R-24L runway, particularly in the initial years of operation. These increases, attributed to the traffic gain made possible in the east/west direction, would be less than 3 dBA.

When compared to the official 1996 NEP prepared in 1984, the new 1996 contours prepared for the base case and the preferred option are larger in the east/west directions but smaller in the north/south direction. In the EIS, the proponent

explains that this variance is primarily due to a greater use of the east/west runways, which Transport Canada has promised to continue to 1996 and beyond. It is expected that all areas affected by operations in the north/south direction would experience lower noise levels.

By 2001, the number of residents affected by noise under the preferred option is forecast to reduce within each NEF contour band. This is attributed in part to the increased ability to accommodate traffic during day-time hours. Without additional runways, Transport Canada assumes that this traffic would progressively flow into the night hours. By 2011, Transport Canada forecasts that continued traffic increases would cause minor growth in the 2001 contours; they would however remain largely contained within the envelope of the 1996 NEP.

2.6.4.4 Noise Impact of Proposed North/South Runway

In its EIS Transport Canada produced NEF contours around LBPIA for a planning day. As the proposed 33L-15R runway would be used about 1% of the time in the southerly direction and 5% in the northerly, such infrequent usage was not included in the planning day, and therefore effects of that runway did not distort the computer-derived NEF contours in either the north or the south direction.

The Panel, noting that there was apparently no normal NEF effect depicted in the EIS, particularly south of the 33L threshold, requested Transport Canada to produce NEF contours representing the 4% usage of Runway 33L—its forecast weather-determined use. In response to the Panel request, Transport Canada produced a report on the subject on Nov. 29, 1991, followed by a revised report on January 23, 1992.

Transport Canada recognized the Panel's concern, but indicated that deriving 4% NEFs would be a flawed usage of NEFs, for three reasons. According to that argument, the NEF system is based on the concept of a long-term representative day; unlike L_{dn} or Leq cumulative metrics which provide a direct appreciation of noise levels, the NEF is more directly associated with long-term annoyance and land use planning standards. Finally, intrinsic to any representation of the differential noise impact, there must be an appreciation of the difference in long-term exposure of residents under the 06-24 runways for 95% of the time, compared to residents under the proposed new approach path on 33L for 5% of the time.

For the above reasons, Transport Canada concluded that an alternative approach based on the one hour $L_{eq(1)}$ cumulative metric should be used to satisfy the Panel's objective of fully identifying the noise impact of the proposed north/south runway, considering that typical usage of the 33 direction lasts for an average 5.4 hour interval, occurring approximately 70 times a year.

Accordingly, hourly Leq values were computed and compared at a series of grid points on, or close to, the aircraft approach and departure paths for both the single runway 15-33, and the proposed dedicated two runway operation in both the 15 and 33 directions. This method of describing the noise impact of the proposed north/south runway is described fully in Appendix 14.

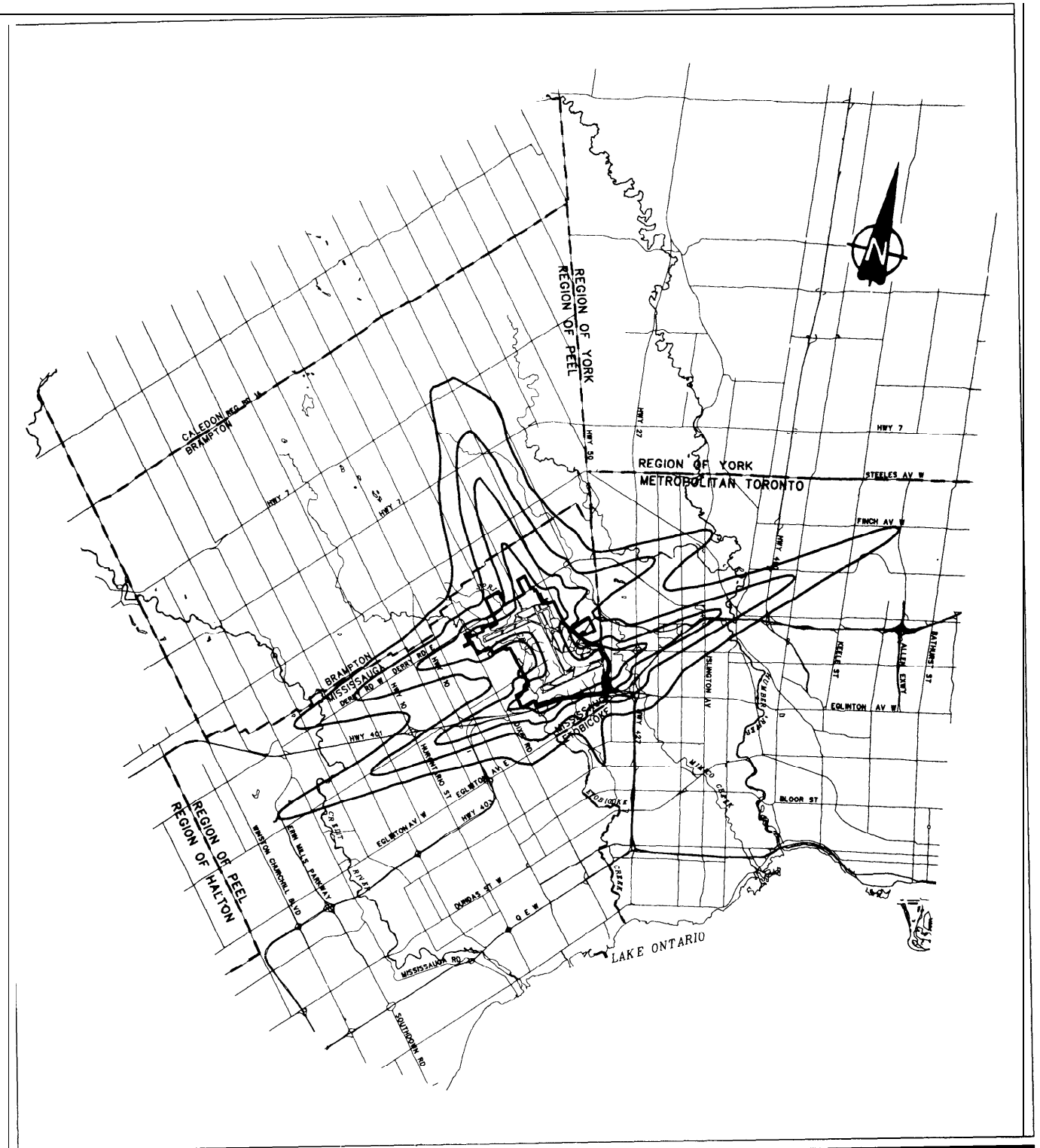


FIGURE 2.15

1990 ACTUAL NEF CONTOURS

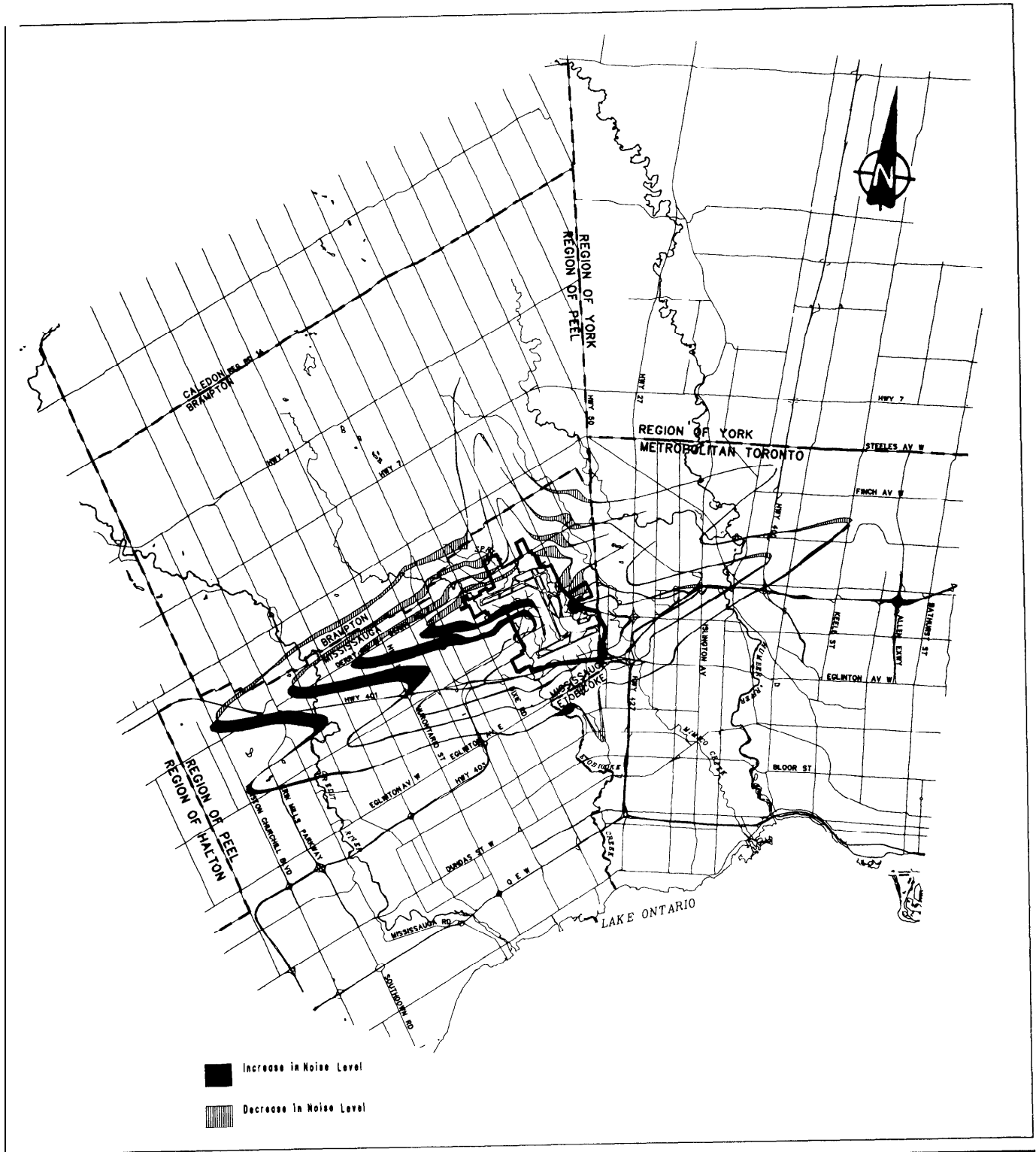


FIGURE 2.16

1996 NOISE LEVEL CHANGES BETWEEN THE BASE CASE AND PROPOSED OPTION

Adapted from Transport Canada, EIS, 1991.



FIGURE 2.17

2001 NOISE LEVEL CHANGES BETWEEN THE BASE CASE AND PROPOSED OPTION

Adapted from Transport Canada, EIS, 1991.



FIGURE 2.18

2011 NOISE LEVEL CHANGES BETWEEN THE BASE CASE AND PROPOSED OPTION

Adapted from Transport Canada, EIS, 1991.

In response to a Panel request for an indication of expected approach noise levels, in residential areas south of the proposed runway 15L/33R, Transport Canada provided a report on January 23, 1992. The report illustrates the location of the remote Noise Monitoring Terminals (NMT), and provides typical recorded single event noise levels at those sites. In the case of two terminals, NMT6 and NMT4, the noise levels recorded for existing runways can give an indication of expected noise levels for operations on the proposed runway.

Figure 2.19 provides a geographic indication of the relative locations of NMT sites 4 and 6 in relation to the proposed runway 33R. By "relocating" the two sites to the approach path to 33L, at distances from the threshold of the proposed 33L equal to their distances from existing runway thresholds (06R and 33R), current noise measurements can simulate what would occur south of the proposed 33L.

TABLE 2.7

ENERGY AVERAGED **L_{max}** AND SEL MEASUREMENTS, SEPTEMBER 12, 1991

ARRIVALS		NMT 6 4011403	
Runway		06R	
Date		Sept. 12/91	
Time Period		1400-2300 Local	
Wind (Deg/Knots)		130/7 - 160/8	
Temperature (°C)		18-20	
Aircraft Types	No.	LMAX	SEL
Airbus A320	8	76.9	85.8
Boeing 757	11	77.5	87.2
Boeing 767	20	79.0	88.2
Boeing 737	23	77.8	87.4
McDonnell	21	84.7	93.3
Douglas DC9			
Boeing 727	26	83.7	92.3
Boeing 747-200	12	86.1	95.0
Total	121	82.4	91.3

Adapted from Transport Canada, LBPIA Noise Monitoring System, Response to Environmental Assessment Panel Request.

Table 2.7 shows the actual energy averaged Lmax and SEL measurements for NMT 6 on Sept. 12/91. Similarly Table 2.8 shows the same information for NMT4 on May 21/91. Table 2.7 and Table 2.8 also show the number and type of aircraft whose noise levels were recorded. By relocating NWT6 and 4

as shown on Figure 2.19, Site 6 would be located approximately at the eastern intersection of Garnetwood Chase and Marblethorne Court in Rockwood. Site 4 would be located approximately at the northern intersection of Markland Drive and Silverthorne Bush Drive in Markland Woods. Site 6 would be exposed to average peak noise levels of 76 to 86 dBA, and Site 4 would have average peak noise levels of 75 to 83 dBA.

TABLE 2.8

ENERGY AVERAGED **L_{max}** AND SEL MEASUREMENTS, MAY 21, 1991

ARRIVALS		NMT 4 Markland	
Runway		33	
Date		May 21/91	
Time Period		1300-2300 Local	
Wind (Deg./Knots)		260/4 - 320/3	
Temperature (°C)		22-27	
Aircraft Types	No.	LMAX	SEL
Airbus A320	8	75.1	85.2
Boeing 757	6	74.8	85.5
Boeing 767	18	78.3	88.1
Boeing 737	24	76.4	86.4
McDonnell	20	80.9	90.6
Douglas DC9			
Boeing 727	22	80.4	90
Boeing 747-200	6	82.3	92.2
Total	104	79.2	88.9

Adapted from Transport Canada, NBPIA Noise Monitoring System, Response to Environmental Assessment Panel Request.

2.6.5 Noise and Health

Descriptions and discussions of effects of noise on people are usually considered as physiological effects-both auditory and non-auditory; or as behavioural effects -such as interference with speech communication, sleep disturbance, annoyance-as discussed in Appendix 13. However, all of these potential effects of noise on people can be considered within the broad definition of health, according to the World Health Organization, which includes "the total social, physiological and psychological well-being of the individual" according to Transport Canada consultant Henning Von Gierke.

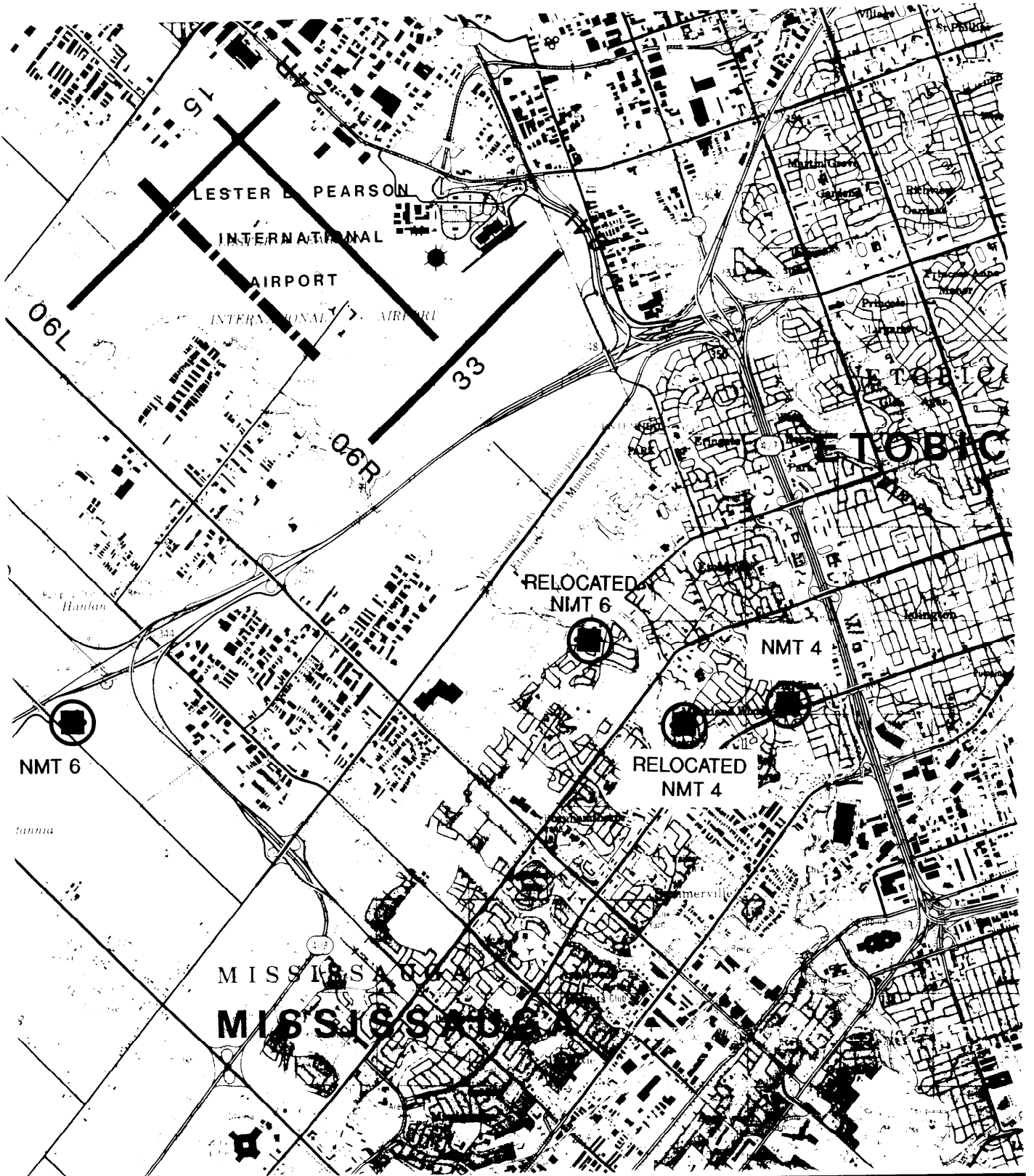


FIGURE 2.19

EXISTING AND RELOCATED NMT 4 AND 6

Adapted from Transport Canada,
Expected Reported Noise Levels

Physiological Effects

The physiological effects of noise are considered in two categories: auditory and non-auditory. At extremely high noise levels, clinically measurable noise-related auditory health effects can be demonstrated, with strong causal relationships. These occur at rather high levels of sound, as evidenced by research over the past 40 years, on industrial and military populations. Detailed international criteria have been developed that identify maximum permissible noise exposures to protect any particular exposed population. The Canadian Occupational Safety and Health Regulations, in line with other Canadian and US bodies, identify the maximum permissible exposure as 90 dBA for eight hours. Studies in the United States, Japan, and the United Kingdom have confirmed the predictions that the possibility for permanent hearing loss in communities exposed to aircraft noise, even under the most intense commercial take-off and landing patterns, is remote. Therefore Transport Canada dismisses the probability of any risk to hearing from LBPIA.

At noise levels below those causing damage to hearing, there is less certainty about health effects. The so-called non-auditory physiological effects that have been described for noise include cardiovascular disease, gastric ulcers, mental illness, and fetal abnormalities. Research on these subjects has included experimental as well as epidemiological studies. These non-auditory effects are documented to be related to lower levels of noise exposure than those affecting hearing. However, the most rigorous scientific studies have not provided consistent evidence of non-auditory effects such as those listed above. According to Transport Canada's EIS:

...[T]he claim is frequently made that noise affects human physical and mental health in the workplace as well as in communities. In spite of considerable research on the problem worldwide, there is little solid evidence supporting many of these claims, and our scientific understanding is far from being able to demonstrate a cause-effect relationship.

In "The Effect of Noise on People," an October 1991 document supporting Transport Canada's EIS, the non-auditory health effects of noise are discussed:

...[T]here is no unambiguous scientific evidence to relate quantitatively any noise environment with the origin of or contribution to any clinical non-auditory disease. Even the most recent research (reported at the fifth International Congress on Noise as a Public Health Problem) conducted at levels above the limits for the conservation of hearing failed to give consistent results.

In other words, in order to assess the specific effect of a given noise exposure on people, one needs either some specific dose that is related to a clinical effect, or alternatively, some kind of statistical dose-response relationship. Transport Canada claims that there is no unequivocal evidence of this type for the non-auditory health effects of noise.

Behavioural Effects

In the EIS, behavioural effects of noise are assessed through three indicators, which can be referred to as primary indicators: interference with speech communication such as live conversation, telephone conversation, radio, and television; interference with sleep; and annoyance. The two former are objective criteria and the third is subjective. For each of these, further discussed in Appendix 13, there are established dose-response relationships based on fairly numerous studies.

Noise has effects on other activities including listening and reading, but these and other activities are less sensitive to noise than the three used for primary assessment. It has also been shown that noise may affect cognitive development and academic performance, particularly for certain subgroups of the student population. The criteria of interference with speech communication, sleep disruption, and annoyance are more conservative and more consistently related to specific noise exposures than any other behavioural criteria. Therefore, it is not necessary to address the details of the uncertainty surrounding effects of noise on cognitive performance itself because students will be protected if the three primary criteria are used.

Noise Descriptors for Health Effects

Noise is defined as "unwanted sound." Noise, or more objectively sound, is measured as a level, the magnitude of a sound in its physical sense; but, for assessing people's response to sound one needs to consider the exposure—those sound levels that are transmitted to the human ear, and the dose—the cumulative exposure over a stated period of time.

There is general agreement that the L_{dn} is a reliable descriptor of noise in the context of overall community reaction, and according to Transport Canada, "...its magnitude has been related to most of the effects of noise on people to an extent unmatched by any other descriptor." As such it is used by the United States' federal government in regulations and guidelines, including their Federal Aviation Administration (FAA) and the Environmental Protection Agency (EPA). The NEF is the most widely used metric in Canada, and, as shown in Figure 2.13, there is a relationship between the NEF and L_{dn} values.

For more fine tuning of noise assessment, or for specific direct health effects, other descriptors have been used, but it is clear that cumulative noise metrics provide the most consistent correlation with community response to noise. Even though complaints frequently refer to single overflights, the single event level (SEL) metric does not take into account the frequency of flights, and according to the EIS, reported community response has never been correlated with single event noise.

2.6.6 Quality of Residential Life

At the hearings, an entire session was devoted to social impact. This session attracted one of the largest audiences in the entire hearings process. In many of the general sessions as well, reference was made by residents to the impact of the airport, both now and in the future, on their quality of life.

	MUNICIPALITY						
	Brampton	Mississauga	Etobicoke	North York	York	Primary Study Area TOTAL	Secondary Study Area TOTAL
Households Concerned About Airside	32%	42%	43%	2 1%	52%	33%	20%
MEASURES SEEN TO BE NEEDED							
Night Curfew	1 3%	14%	22%	14%	7%	17%	19%
Higher Fines for Noise Violations	1 2%	4%	3%	4%	7%	5%	2%
Landscaping and other Noise Barriers	3%	5 %	2%	5%	0%	3%	5%
Compensation/Move People	4%	2%	4%	2%	0%	3%	0.4%
Upgrade houses to improve Insulation	1 %	5%	2%	3%	0%	3%	1%
Restrict Noisier Planes	8 %	20%	19%	1 0%	33%	16%	8%
Change flight path/re-distribute flights	13%	1 1%	7%	10%	7%	9%	9%
Restrict Number/Hours/Older Planes	0%	2%	5%	2%	0%	3%	1%
Move Airport--Relocate Runways	5%	5 %	5%	5%	0%	5%	8%
Legislate Chapt.3 Airplanes	4%	1%	1%	1%	0%	1%	1%
Provide Info/Hold Public Meeting	2%	2%	6%	7%	7%	5%	6%
Monitor Noise	6%	3%	4%	0%	0%	3%	0%
Control Air Pollution	3%	4%	2%	2%	7%	2%	2%
Add staff/controllers	1 %	1%	1%	1%	7%	1%	1%
Increase safety	3%	1%	0.3%	6%	0%	2%	0%
Set up Public Committee/Complaint Board	2%	0%	1%	2%	7%	1%	0%
Does not matter--Moving	2%	2%	2%	1%	0%	1%	0%
Nothing	7%	1%	7%	2%	7%	5%	1 1%

Percentages greater than 1 .0 have been rounded to nearest whole number.

Adapted from Transport Canada, An Assessment of Impact on Quality of Life in the Surrounding Neighbourhoods.

TABLE 2.9

**PRIMARY AND SECONDARY STUDY
AREAS – AIRSIDE DEVELOPMENT PROJECT:
MEASURES SEEN TO BE IMPORTANT TO DEAL
WITH CONCERNS**

Noise was a primary concern, and air pollution an additional one.

In the EIS, Transport Canada presented information on the effects noise has on people. On reviewing this, the Panel found the information deficient, and suggested additional studies. In October of 1991 the proponent provided a separate study entitled "An Assessment of Impact on Quality of Life in the Surrounding Neighbourhoods", referred to as the Social Impact Assessment (SIA), which was not incorporated into the main EIS.

For the SIA, Transport Canada identified three objectives in assessing the potential social impact of the proposed runway expansion: The first objective is determination of what adverse social effects the runway expansion will have on the quality of life of those living in neighbouring communities. The second objective is determination of how significant these effects will be given the characteristics of the households and neighbourhoods that may be affected, the current quality of life in the area, and the attitudes and perceptions of those who may be affected. The final objective is determination of what can and should be done to alleviate the potential problems given what is known about potential social impacts, residents' attitudes and concerns, and the ways and means of possibly avoiding, minimizing, or offsetting potential effects. The methodology followed by the SIA is described in Appendix 15.

The major findings presented in the SIA and at the hearings show:

- One in ten households in the primary study area is now dissatisfied with its neighbourhood as a place to live. There are many factors that contribute to this dissatisfaction but noise is a key one, with at least three in ten households in the primary area finding the airport a bothersome source of noise.
- One in ten households in the secondary area is dissatisfied with their neighbourhood, although fewer would choose to move out, if they had to move, than for the primary area. 12 % of households in this area are bothered by airport noise.
- One in ten households in the primary area finds that airport noise interferes with the ability to hear television, to relax, to study or concentrate, and in particular, noise interferes with the ability to sleep, to carry on conversations in the homes, and to entertain in back yards.
- One third of households in the primary area are concerned about the airside development project, about noise and air pollution, with a higher percentage in parts of Mississauga and Etobicoke. The percentage of concerned households does not vary much by household characteristic, but rises from 33 to 58% for households that are already bothered by LBPIA, and up to 89% for those who have made formal complaints about the current situation.

The SIA provides a list of measures to manage the noise impacts based on residents' views resulting from the household survey. This part of the survey is shown in **Table 2.9**. To highlight some of the most frequently suggested measures,

17% of households in the primary area and 18% in the secondary area identified night curfews. The second most frequent, 16% in primary and 8% in secondary, were restrictions for noisier planes; and 9% of concerned households suggested that flight paths be changed so that they are redistributed—a suggestion which seemed to reflect an underlying concern with equity.

Given the extent of concern among households in neighbourhoods surrounding LBPIA, the SIA emphasises that it will be important for the residents to have some direct involvement in developing a noise mitigation programme. The SIA states that this is not just a matter of good community relations, it is a matter of effective social impact management. The effects of airport operations, now and in future, are likely to be perceived and felt as significant if those affected feel they have no measure of control over factors influencing their quality of life—other than to bear the effects in silence, complain about them, or move away.

2.6.7 Schools

There are six school boards—four public school boards and two separate school boards—which administer 571 elementary and 127 secondary schools in the vicinity of LBPIA. The chief concerns shown by some of the school boards have been the disruption caused by the constant and excessive noise levels by over-flying aircraft and the problem of air quality and resulting health hazards, particularly on those schools directly under the flight paths.

Some school boards have also shown concerns about air quality and the resulting effects on health. Transport Canada points out that LBPIA is situated in a highly concentrated and urbanized area of the region. It is surrounded by a network of major highways and arterial roads which are most often very busy and the heavy traffic on them is constantly emitting pollutants. Air quality monitoring has shown that large major international airports like LBPIA are a complex source of air emissions. Emissions inventory information indicates that LBPIA is presently responsible for between 1.3% and 10% of the annual pollutant emissions within a seven kilometre radius of the airport. According to the Emission Dispersion Modelling System (EDMS) developed for the Ontario Ministry of the Environment's gas model and for the United States' Federal Aviation Administration FAA, emissions from the airport under the proposed six-runway options would be less than those for the base case in 1996 and 2001. Air traffic congestion and the need to queue aircrafts are major contributors to air pollution as engines are most inefficient during idling. The proposed expansion would provide greater capacity and help reduce queuing and therefore a considerable reduction in air emissions.

The above facts demonstrate that aircraft activity in general does have both noise and air pollution impacts on the local schools surrounding LBPIA. To mitigate these impacts so that both noise and air emissions are minimized, several steps may be taken such as centralized air conditioning with double glazed windows, sound absorbent material in retrofitting schools, and better fabricated portables which would significantly reduce the noise effects. Air pollution may be reduced

by a change in operational procedures to reduce queuing and by the introduction of more efficient aircraft at LBPIA.

2.6.8 Businesses

The airport contributes directly and indirectly to the local and regional economy and business of Ontario in a significant way. The economic activity at LBPIA is a function of the number of passengers and aircraft movements processed in a year. Business-related air travel should expand with the economy and growth in market can be expected from the recreational air travel sector as well. Users assume that adequate airport capacity—both flight capacity and passenger-handling capacity—will be available to serve the growing demand. The direct contribution of LBPIA to the economy and business may be divided into four categories: Airport-related contributions include airlines services, freight and transportation, ground transportation, construction and maintenance. Cargo-related contributions include freight forwarding, Customs clearance, and consulting. Visitor services contributions include retail business, restaurant and catering, tourism and rental businesses, and banking and foreign exchange. Thus, the airport itself contributes indirectly through the purchases of goods and services by the airlines, businesses, and government agencies that generate the direct economic activity.

In 1987, LBPIA was responsible for direct employment of approximately 33,800 people resulting in personal income level of \$760 million. The direct business revenue due to LBPIA activity was about \$3.8 billion. These activities generated a total direct tax revenue of approximately \$380 million in that year. At the same time, it provided indirect employment to about 7900 people, contributing \$200 million to personal income and government tax revenues of about \$90 million. It is clear from these income and employment levels that the economic contribution of LBPIA is undoubtedly significant to the local and regional economy as a whole. LBPIA's contribution will continue to increase with increased activity at the airport in the future. Almost 90% of airline employees and 95% of other employees live within the regions of Metro Toronto, Peel, Halton and York. With almost 14,000 on-site employees, the airport is one of the largest local employers.

According to Transport Canada estimates, in the base case scenario between 1987-2006, the direct average annual employment will approximate 66,000 people providing a personal income level of about \$29.5 billion. The base case in the Transport Canada Economic Impact Study assumes a phased relaxation of the cap of 76 movements per hour, recently raised to 82 (see Section 2.5.1), to approximately 92 movements per hour by 1994, and continuing at this level until 2006. The employment and income levels for the proposed six-runway scenario will be even higher. It is estimated that the direct average annual employment will be increased by about 3000 to approximately 69,000 people. This will lead to an additional personal income of \$1.7 billion which will provide an additional tax revenue of \$830 million.

Besides the direct and indirect economic impacts, Transport Canada estimates that a substantial economic spin-off would result due to the induced economic impacts of these activities. Induced economic impacts result from the purchases of goods

and services by the employees of businesses and government agencies which generate the direct economic impacts. In 1987, estimated induced economic impacts have produced over 14,000 jobs, a personal income level of \$910 million, and a tax revenue of \$160 million to the various levels of government. In the base case scenario, induced activity is expected to generate average annual employment of 87,000 with personal income of \$44.4 billion. The six-runway scenario is expected to induce approximately 90,000 jobs, \$46.3 billion of personal income, a total tax revenue of \$51 .0 billion, and a total output of over \$120 billion.

The economic contribution of the airport is undoubtedly significant to the local and provincial economies as it generates substantial amount of tax revenues for all levels of the government and a considerable level of employment opportunity for the people of the region

2.6.9 Property Values

Transport Canada notes that the intensification of activities and growth in the air traffic over the past decades does not appear to have had any negative impact upon residential development, nor on new and resale housing prices in the relatively higher NEF areas. It is assumed that further increase in air traffic and airport activity, including the addition of runways, will not have any unfavourable impact on the pace of development or on property values in the established neighbourhoods around LBPIA. This stems from the observation that the on-going growth and intensification of operation at LBPIA over the past 40 years does not appear to have adversely affected the community characteristics and desirability. It is also important to note that there is no apparent evidence of stigma attached to living near the airport or in a high NEF area. Although, aircraft noise is the most frequently mentioned and single reason for leaving the neighbourhood, it is still mentioned by less than one in ten residents. Due to the weak cause/effect relationship between airport activity and the property values, it is assumed that the expected noise levels from the additional runways would not have any greater effect on the property values within the vicinity of LBPIA than that expected in the base case.

The cost/benefit analysis by Transport Canada included four categories of noise costs that are related to property value and individuals leaving the community. These categories are:

- **Property depreciation:** for those who move out of the neighbourhood naturally or induced by the airport noise;
- **Transaction costs:** costs associated with moving such as legal and real estate fees, removal costs, etc., for those who decide to move due to noise;
- **Lost consumer surplus:** loss in utility from their attachment to the community or their own home; and
- **Noise annoyance costs:** those who remain in the area with increased noise exposure experience and increased noise annoyance; these costs were estimated based on the imputed property depreciation.

Accordingly, the present value of the noise costs within NEF 30 contours between 1996-2011, in 1990 dollars, is estimated to be \$5.1 million for the proposed additional east/west runways. There are no costs assumed for the proposed additional north/south runway.

2.7 ECOLOGICAL AND HISTORICAL RESOURCES

2.7.1 Air Quality

The composition of the atmosphere is normally fairly constant with major components of nitrogen, oxygen, and carbon dioxide; and with traces of other gases. Biological and geochemical processes produce gases such as oxides of nitrogen, sulphur, and carbon as well as methane and some trace organics. Aircraft produce gases which can be considered as pollutants, including carbon monoxide (CO), oxides of nitrogen (NO_x), oxides of sulphur (SO_x), particulates, and volatile organic compounds (VOCs). Ozone (O₃) concentrations are also elevated as a result of the oxidants emitted by aircraft, and aircraft also produce high concentrations of carbon dioxide (CO₂). None of these is unique to aircraft emissions.

Air pollutants have the potential to damage, temporarily or permanently, the health of all living organisms-including humans. Provincial or federal objectives for air quality are based upon levels which will not be harmful to the most sensitive organisms, be they human, other animals, or plant life. There is normally a wide margin of safety between objectives and thresholds for damage.

The SIA found that air pollution, although of less concern than noise, emerged as a major issue in the context of residents' perception of the impact of LBPIA on their quality of life. Air pollution, odours, dirt, and "soiling" of surfaces were frequently mentioned by residents in general presentations at the hearings.

Airport emissions include, in addition to aircraft emissions, those emissions originating from parking lots, airport heating and power facilities, fuel storage tanks, training fires and on-site access roadways. Airports are a complex source of air emissions, as most of the emission sources are mobile, and their activity and emissions characteristics vary considerably with diurnal, weekly, seasonal and weather-related factors.

The data and conclusions for air quality in the EIS are based on a combination of direct measurements, with some recent and fairly detailed monitoring for CO, and simulation modelling. For CO, model results were compared with results from direct monitoring.

Emission inventory information was also used to assess the contribution of LBPIA to the annual pollutant emissions from all sources within an approximately 7.5 km radius of the airport. The model results were compared with measured results, but the EIS points out that the model "...includes contributions from offsite sources within 7.5 km, it does not include sources further afield which will contribute to the 'background' or regional level of each contaminant."

The proponent's assessment of air quality uses Canadian federal air quality objectives, Ontario criteria, and air emissions standards which exist for both agencies to assess present and future local air quality related to airport operations.

The EIS concludes that air quality in 1990 was defined by certain parameters: Maximum measured CO did not exceed half of the 1-hour acceptable objective. Concentrations of NO₂ were always below 70% of the objective. Ozone levels were consistently high related to objectives, with summer concentrations being higher than winter, but the primary sources of ozone were off-airport. LBPIA is currently responsible for between 1.3% and 10% of the present annual air emissions within approximately 7.5 km of the airport.

On the ground, aircraft that are queuing will emit gaseous pollutants, and clearly the longer the queuing time, the greater the contribution per aircraft to local air pollution. This contribution will be lessened if queuing times are shortened, thus the proponent predicts that additional runways will result in decreased air pollution.

In Transport Canada's EIS, the air quality models analyze scenarios defining only the two new east/west runways and not the new north/south runway. The proponent explains, "The contribution of emissions from parallel north/south runways to the local pollution burden is expected to be minimal since they are intended for only occasional operation."

The EIS air quality models that compare the base case with the current situation predict that in some instances for 1996 and for all instances in 2001 there would be "...an increase in LBPIA emissions and concentrations of all pollutants." Describing the proposed new east/west runways the EIS states:

With the exception of NO_x, the proposed new runways would result in significant decreases in concentrations due to LBPIA sources in 1996 as compared to 1990. These decreases would be due to reduced unit emissions for the newer aircraft, reduced delays and changes in the use of runways...Comparison of the 2001 preferred option with the base case shows dramatic improvements in air quality for all pollutants. These improvements are due to significant reduction in delays and queuing.

The EIS summary concludes: "Airport expansion would provide greater capacity thus reducing queuing. In addition, the introduction of the much cleaner Stage 3 aircraft will reduce airport-generated emissions."

2.7.2 Hydrology and Water Quality

Surface water on the LBPIA property includes sections of Etobicoke Creek, Spring Creek and parts of their watersheds. Mimico Creek, although not on the property, drains the eastern portion of the site. The surface waters from these creeks eventually flow into Lake Ontario.

Concern for these surface waters relates to effects mainly from fluctuations in the quantity of water passing through the watersheds that can result in flooding and erosion, and inhibit use by wildlife and by nature-lovers. Concern also relates to effects resulting from changes in the quality of water.

LBPIA is a network of paved runways, taxiways, and aprons. All the pavement prevents water from infiltrating the underlying soil so it runs along the surface and collects in conduits, transporting various sediments and chemicals that collect upon the pavement. So not only do large quantities of water enter the drainage system when snow melts or rain falls, but the quality of the runoff is questionable.

Assessment of the impact of the proposal for three new runways includes the evaluation of stormwater runoff from new runways, taxiways, aprons and graded areas as well as maximum development of associated aviation support services. Based on the results of stormwater modelling, there is expected to be a slight increase in stormwater runoff volume from the airport due to airside development; however, the residual impact of runoff volumes in the watercourse, after implementing mitigative measures, would be insignificant.

Furthermore, on other physical impacts resulting from the proposed development, no significant change is expected in stream erosion hazard in Etobicoke Creek, no significant change in upstream or downstream flooding, provided that proposed culverts and conveyance channels are provided, and no increase in ponding which could attract birds (see Section 2.7.3).

According to the EIS there are monitoring stations at LBPIA equipped for stormwater flow measurement-measurement of runoff quantities-but the equipment is not currently in use. At the same time, the EIS reports that eleven chemical parameters are monitored-to measure run-off quality-at four stations at frequent intervals, varying with the time of year.

The contaminants in question result from spills of fuel and lubricants, from the use of chemical and sand used to de-ice

planes and runways, and from materials released during firefighting exercises. Runways have to be de-iced, and to a lesser extent taxiways and aprons have de-icing materials applied to them. The de-icing material is mainly urea, of which 250 tonnes are applied per year. Sand is also applied to runways. These materials are allowed to run into the soil and they are also carried by surface runoff. There are no procedures in place to collect and treat the urea-contaminated water. Current practice addressing the potential problem of water pollution by these materials consists of applying urea to aprons and taxiways on a "very limited basis."

The EIS states that aircraft de-icing fluids will be handled by the new dedicated de-icing facilities being planned close to the runways. These will include glycol collection and recycling facilities thus eliminating most glycol contaminated runoff at the airport. Further, if monitoring indicates that the pavement de-icing increases the ammonia that comes from urea to unacceptably high concentrations in the stormwater, then some type of treatment process would be required to remove the ammonia.

Sediment wash-off from airport lands would increase with increased airside development. Sediment control techniques would be implemented to meet the Ontario Ministry of Natural Resources' requirements for the protection of fish in the habitat of Etobicoke Creek. Specific chemicals including phosphorus and heavy metals, identified as already above objectives in many parts of Etobicoke Creek, would need to be addressed in the water from ground support and de-icing activities on the apron areas. There is currently little data on these contaminants. Further monitoring will be required to determine the sources of such contamination and determine if additional treatment is required.

TABLE 2.10
FREQUENCY OF EXCEEDANCE OF PWQO IN ETOBICOKE CREEK (%)

Parameter	Spring			Summer			Winter			Autumn		
	Derry Road	Burnhamthorpe Rd	Hwy #2	Derry Road	Burnhamthorpe Rd	Hwy #2	Derry Road	Burnhamthorpe Rd	Hwy #2	Derry Road	Burnhamthorpe Rd	Hwy #2
Total phosphorus	61	69	79	56	60	89	80	87	94	75	80	81
Lead	14	14	38	13	10	20	9	26	31	27	19	27
Zinc	14	14	23	13	15	7	26	30	38	18	9	26
Cadmium	—	—	72	—	—	62	—	—	87	—	—	75
Chromium	—	—	0	—	—	0	—	—	5	—	—	7
Phenol			39	—	—	36	—	—	44	—	—	42

Note: (—) No data available.

Adapted from Transport Canada, EIS, 1991.

Transport Canada says that the action for stormwater management includes bringing on-line in 1991 the flow monitoring stations as well as increasing the frequency and total number of water quality measurements. The former data will be used to develop estimates of pollutant loading and the latter will permit the LBPIA management to “more closely monitor the impact of de-icing materials.” The action plan for mitigation of glycol pollution looks at the feasibility of constructing one remote aircraft de-icing centre in the infield area. The target date for this was fall of 1992, according to the LBPIA Environmental Management Plan. Meanwhile, LBPIA will operate a vacuum sweeper to collect de-icing fluids around the Terminal 1 and 2 perimeter de-icing areas beginning in the 1991/92 de-icing season.

Transport Canada states that since the area draining from LBPIA to Etobicoke Creek is now largely undeveloped and less than 8% of the watershed area, it is expected that the airport lands contribute less than 5% to peak flows at the creek mouth. As far as Mimico Creek is concerned, Transport Canada points out that the airport property is not within the Mimico Creek floodplain.

Transport Canada notes that the quality of Etobicoke Creek is poor before it enters the airport property. An Ontario provincial water sampling station at Derry Road for which data were available from 1978 to 1989 conveniently represents the quality of Etobicoke Creek water before it enters LBPIA. As shown in Table 2.10, total phosphorus, lead, and zinc at the Derry Road site frequently exceeded the Provincial Water Quality Objectives (PWQO). As noted in the EIS, the number of exceedences of total phosphorus increase consistently further downstream indicating phosphorus sources throughout the entire creek drainage basin. ●

The EIS noted that according to field surveys performed during wet weather conditions, the water in Etobicoke Creek was very turbid due to large amounts of suspended solids. It was concluded that upstream processes were responsible for the high suspended solid loading.

No values were given for the present contribution of LBPIA to suspended solids, but additional loads from LBPIA will increase the suspended solid levels; thus sediment control practices should be implemented both during construction and post construction.

The impact of the base case on water quantity and quality was discussed in the EIS. The LBPIA Environmental Management Plan will apparently go into effect regardless of the degree of development that occurs.

The proponent concludes with respect to hydrological effects:

Although the infrastructure modifications and additions identified to improve airport operations in the base case will add slightly to the paved surface on the airport, run-off control features will be incorporated into the design of all these facilities to ensure that the hydrologic response is not altered significantly.

A number of initiatives are presented by Transport Canada to manage water quality, which apparently will be implemented

in the base case. These initiatives include centralised de-icing facilities, changes in methods and materials for pavement de-icing, and changes in procedures and possibly even locations of fire-fighting training. Therefore the base case infrastructure development is in fact expected to result in significant improvements over the current water quality.

2.7.3 The Natural Environment: Aquatic and Terrestrial Resources

Baseline studies of the so-called natural environment provided in the EIS address aquatic and terrestrial resources of the airport site. Surveys of aquatic habitats identified “highly urbanized” sections of the watersheds of Etobicoke and Mimico Creeks. Terrestrial surveys identified four major types of vegetation: agricultural land, mowed grass, inactive fields, and forests. Over-all, the ecological significance of the LBPIA property is, at best, moderate given the urbanization occurring throughout the local area.

According to the proponent the aquatic resources of the area are minimal, as expected from the physical and chemical condition of the creeks. The significance of fisheries is slight, with the Etobicoke and Mimico creeks identified by the Ontario Ministry of Natural Resources (OMNR) as capable of supporting warmwater fishery. No rare species, migratory salmonid, warmwater spawning runs, or coldwater fish habitats have been identified in the vicinity of the airport.

Riparian vegetation on the streambanks and stream beds is used as fish, invertebrate, and bird habitat, being intermediate between wholly aquatic and wholly terrestrial habitat. This vegetation also provides physical support for bank structures. This marginal vegetation type will be affected by any construction as excavation and filling will temporarily disrupt this type of habitat.

Results of inventories of the wildlife that use the various types of terrestrial habitat on the airport lands, as provided in the EIS, were fairly typical of highly urbanized land. They showed 96 species of birds, including three regionally-rare bird nesting species, 11 species of mammals including several that were “unexpected” in urban areas, three amphibian, and two reptile species.

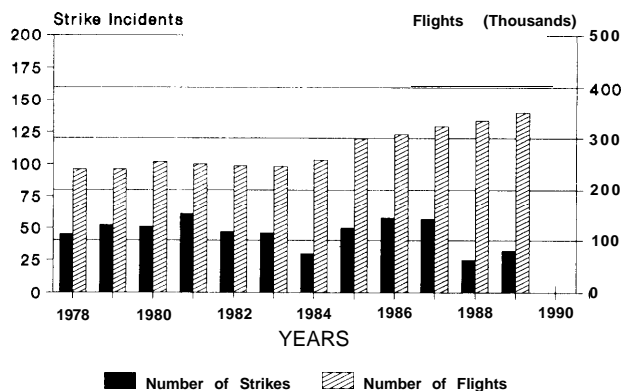
The proponent recognises that the major impacts and disruptions by the project on the aquatic and terrestrial resources would occur during construction. For the most part, these would be temporary. Mitigation and ongoing monitoring to determine the quality of the environment is planned. Consultation with agencies including the Metro Toronto Regional Conservation Authority, the Ontario Ministry of Natural Resources, the Department of Fisheries and Oceans, as well as the federal and Ontario Ministries of Environment, have led to satisfactory and mutually acceptable programmes to guard against further degradation of the LBPIA site from the point of view of aquatic and terrestrial natural resources.

The most significant effect on wildlife of both present and future airport activities relates to safety. Transport Canada regards all wildlife on airports as potential hazards to airport operation and passenger safety. Even with the objective to sustain the natural environment as much as possible, this

objective must be secondary to the objective of ensuring the safety of airport operations. This is particularly true for the need to minimize bird strikes.

FIGURE 2.20

**NUMBER OF BIRD STRIKES AT TORONTO LBPIA
FOR THE YEARS 1978 TO 1990**



Adapted from Transport Canada, EIS, 1991.

Collisions between aircraft and birds are addressed in Transport Canada's EIS which outlines present bird control programmes as well as recommendations for bird control related to the proposed airport expansion project. Figure 2.20 indicates the number of bird strikes compared with the number of flights at LBPIA from 1978-1989. Clearly the numbers of strikes are decreasing over time, and at the hearings the Panel was told that for 1991 there were under a dozen bird strikes.

The methods currently employed to minimize strikes include habitat manipulation, falconry, auditory deterrents, dogs, and raptor control. The EIS states that "captured uninjured birds are released into the wild while sick or injured raptors are taken to Guelph University."

2.7.4 Historical Resources: The Fifth Line Cemetery

The EIS identifies archaeological and heritage resources from an inventory prepared in 1990. The primary objective of this inventory was to identify known and potential heritage and archaeological resources at LBPIA and was limited to a 5 km radius of the airport boundary.

Of the two historic parish cemeteries referred to in the EIS, the Fifth Line, or Elmbank, Cemetery was addressed at the scoping sessions and in the Public hearings in January 1992. In contrast to the Moore's Cemetery, which is on Deny Road West and adjacent to airport property, the Fifth Line Cemetery is completely surrounded by airport property. It consists of 300 graves, with the earliest recorded burial dating to 1833. It was officially established in 1837 as part of a land grant to the

Roman Catholic church. The cemetery is private property although it is enclosed by the government-owned airport. At present, it is open to the public on request.

The EIS states that construction of the base case facilities will not disturb the Fifth Line Cemetery. However, construction of the preferred option would require removal of the Fifth Line Cemetery since it is in the middle of the proposed 15R/23L runway infield. Details of the means by which this would be done were not specified in the EIS.

At the hearings, the Panel heard a presentation by Michael Harrison, representing the descendants of the persons buried in the cemetery. The conditions set out by Mr. Harrison for the removal were meant to ensure that the excavations are carried out in a dignified manner and in consultation with qualified archaeologists. The remains-along with all gravestones-are to be placed in a designated section of Assumption Cemetery, which is the Roman Catholic cemetery closest to the site. It was requested that the descendants be kept informed of the procedures at all stages.

At the hearings, questions were asked about the position of the Archdiocese of Toronto in the context of the cemetery. Transport Canada indicated that they had been in discussion with the Roman Catholic Cemeteries Board, but had received no specific indication of the position of the Archdiocese. Despite this, Transport Canada gave assurances that "the removal of the cemetery will be carried out in a very sensitive manner... and that it will be done to meet all-within reason-the requirements of the Archdiocese or of the Cemeteries Board."

2.8 COST/BENEFIT ANALYSIS

Transport Canada has prepared a cost/benefit analysis that is designed to combine the primary costs and benefits of its proposal to build three new runways at LBPIA, all expressed in terms of 1990 dollars. Among other items, the analysis considers construction costs, property values, aircraft operating costs and the value of passenger time. Sensitivity analyses are provided that show the potential effects of changes in some of the assumed values and important variables used to prepare the analysis.

The cost/benefit analysis presents data for several runway development options that were rejected by Transport Canada, as well as for the proposed option. Two separate analyses are presented, one for the east/west operating direction, where delay minimization drives the benefit stream, and a separate analysis for the north/south operating direction, where disruption reduction drives the benefit stream.

2.8.1 Cost/Benefit Methodology and Assumptions

The basic method used in the cost/benefit analysis is very straightforward: Cost and benefit streams are calculated over a 20-year period and summed to produce a net value. The specific benefits included in the analysis consist of operating-cost savings to airlines and travel-time savings to passengers.

Costs include capital expenditures, operating and maintenance costs, and noise costs as they relate to property values.

To calculate the value of the benefits, both the amount and value of the time saved by relief of congestion had to be determined. The amount of time saved was considered as the difference in total delay between each construction option and the base case. A complex interpolation and extrapolation process was used to obtain total delay for each scenario, based on delays calculated for planning days for the years 1996 and 2001.

A generic weighted airline operating cost was calculated based on aircraft type and mix, airline policies, projected operating costs, and assumed fuel costs and consumptions. Passenger travel time costs were based on the value of time as

indicated by the average hourly wage of business travellers, and discounted by 60% for leisure travellers.

Capital costs were taken directly from the construction cost estimates prepared for the various options, and maintenance costs were determined using standardized Transport Canada data. Noise costs were based on estimated depreciation in residential property values, relative to the base case, and on moving costs.

In addition to an underpinning of economic theory, the cost/benefit analysis is dependent on a myriad of qualitative and quantitative assumptions. In response to Panel encouragement, Transport Canada tested the sensitivity of the results of the analysis to changes in some of the more significant arithmetic assumptions.

FIGURE 2.21

BENEFIT-COST ANALYSIS: RESULTS SUMMARY

Option	VMC Hourly Capacities	NPV 1990 \$'s (\$000,000)	B/C Ratio	IRR (%)
06-24 Runways	(24 Direction)			
Base Case	96	0.0		
4.4	110	666.2	4.41	33.60
1.1.1(a)	108	556.7	4.50	32.50
1.3.3(a)	119	728.7	4.35	30.70
1.1.1(a) + 4.4	126	990.6	3.80	29.80
1.3.3(a) + 4.4	130	849.1	3.07	24.60
15-33 Runways	(33 Direction)			
Base Case	50	0.0		
With Existing 06-24 Runways				
2.1.4	60	(2.6)	0.98	9.80
3.1.2	70	110.6	1.66	16.40
3.2.1	84	118.4	1.43	14.60
With Expanded 06-24 Runways				
2.1.4	60	1.6	1.01	10.10
3.1.2	70	105.6	1.63	16.10
3.2.1	84	133.3	1.48	15.30

Adapted from Transport Canada,
Benefit-Cost Analysis of Airside Development Project
at LBPIA, 1991.

2.8.2 Results of Cost/Benefit Analysis

The results of the cost/benefit analysis are quite uniform: With the exception of a closely-spaced north/south parallel runway constructed by itself, every additional runway option that was considered produced a positive net present value relative to the base case, a cost/benefit ratio greater than one, and an internal rate of return greater than 10%. The results are shown in **Figure 2.21**.

The sensitivity analysis investigated changes such as increased capital costs, higher and lower discount rates, project implementation delays, traffic growth stagnation, reductions in the value of passenger time, reduced aircraft operating costs, and fixed and declining fuel prices. The essential conclusion drawn by Transport Canada from the examination of the effects of changes in these, and other, assumptions is that their preferred option survives as a viable and attractive option under all reasonable changes in the above variables.

2.8.3 “The Balanced Solution”

Any addition of new runways at LBPIA which would result in significant benefits to air travellers and to businesses associated directly or indirectly with the airport would have some adverse impact on the communities surrounding the airport. The task for Transport Canada in preparing its proposals was to find a solution which in its judgement best balances the need for additional capacity with the need to minimize social and environmental impacts.

Transport Canada states in its EIS that with the two additional east/west runways, the air industry and the travelling public would gain some much-needed **airside** capacity—a 30% increase. However, they would forego a potentially greater increase which could be gained by constructing a single, more widely-spaced east/west runway. In the north/south direction a more widely-spaced runway operated independently could provide significantly more crosswind capacity than the one proposed.

The EIS states that surrounding communities would benefit from the proposed runways. The close spacing and constrained operation of these runways would, according to the proponent, confine the noise impacts of additional operations close to pre-development levels much more effectively than the higher capacity options.

Transport Canada contends that the impacts of the project on the natural environment within the airport site would also be significantly reduced, while still achieving a viable increase in airside capacity, by keeping the proposed runways as close to the existing ones as possible.

Transport Canada in its airside expansion proposal at LBPIA concludes that the location and operating limitations of the recommended runways represent the best compromise between the needs of the industry and travelling public, and the concerns of the surrounding communities.

3.0 STAKEHOLDER POSITIONS

The Panel heard over 250 presentations at the public hearings (see Appendix 5 for a complete list of participants). The hearings were the longest held to date under the auspices of the Federal Environmental Assessment and Review Office (FEARO). Chapter 3 provides a general overview of the range of issues and concerns raised during the public review process. The following sections, intended as a representative selection rather than a complete compendium, outline positions taken by stakeholders; in some cases they are supported by direct quotations, either from written submissions or from the verbatim transcripts of oral presentations.

3.1 PUBLIC INTEREST GROUPS

Several public interest groups opposed expansion of LBPIA. The Panel welcomed the information they provided, as in a number of cases this constituted a valuable supplement to information provided in the EIS and other material from Transport Canada. For the most part the concerns of these groups were reflected in their recommendations, and thus are indicated in the summaries of the latter which appear below. The Panel noted that the issue of noise commanded far more attention than any other environmental concern.

All intervenors emphasized that everything possible must be done to minimize noise increases including those expected under the base case as well as those resulting from the proposed expansion—if it is approved. Most of these presentations also addressed in detail the past and present noise problems. Most of these groups acknowledged that the base case involved certain improvements over the present situation, and that the accompanying noise increments were probably inevitable in any circumstance. However, they used their perception of past and present noise problems as the basis for strongly opposing the proposed runway expansion. While the Panel's mandate concerns specifically the incremental impact of runway expansion, information and projections relating to the operation of the present runway system were considered relevant as a basis for comparison.

The Council of Concerned Residents (CCR)

The CCR opposed additional runways at LBPIA. They contended that Transport Canada had presented an "alleged" solution to the problems of aviation in Southern Ontario before conducting a comprehensive study of all the options and before developing a system of reliever and regional airports.

Members of the CCR felt that the proponent did not adequately address the social and environmental impacts of the project. This interest group also contended that there are many residents who reside outside the present NEF contours and who are adversely affected by aircraft noise.

The CCR, in common with a number of other public interest groups and individuals, underlined their discontent over the history of LBPIA, which involved promises and reassurances made since 1968 by various Ministers of Transport that LBPIA would not be expanded. In a public release dated August 18,

1989 they described as a 'a breach of faith' the announcement by the then federal Minister of Transport, the Honourable Benoit Bouchard, that two new runways would be built at LBPIA.

They also were concerned with the direct influence these promises had on the official Plans of the various municipalities. Further to this, CCR recommended that the official plans of Brampton, Etobicoke and Mississauga be recognized as the pre-eminent instruments used for controlling land use and development, and that changes be prohibited which would affect lands that have been developed for residential use on the basis of Transport Canada's NEF contour maps.

As a general overview, the CCR accepted the base case scenario with the following conditions:

1. that the base case be used as a short to medium-term solution in order to give Transport Canada sufficient time to seek a long-term solution;
2. that Transport Canada recognize the present noise problems and implement measures to alleviate the problems;
3. that a compensation program be developed to address the current noise problems;
4. that daytime level of noise not exceed 55 dBA and that the authorities legislate this noise standard for land use planning;
5. that with respect to compensation, a committee be formed which includes a resident from each of Brampton, Etobicoke and Mississauga to develop a fair distribution policy, with the suggestion that the distribution of these monies would be to all individuals whose homes do not conform with the provincial guidelines for homes within the 30 NEF in order to bring these residences up to "acceptable standards". With respect to mitigation, the 30 NEF noise threshold be lowered to 20 NEF or 55 dBA for the simple reason that the 30 NEF level does not accurately reflect the reality of living with aircraft noise;
6. the official plans of Brampton, Etobicoke and Mississauga be recognized as the pre-eminent instrument used for controlling land use and development and that wherever lands have been residentially developed based on Transport Canada's NEF contour maps, changes cannot be made;
7. that the responsibility for the management of the noise complaints unit and enforcement be given to a separate organizational unit under the direction of the Minister of the Environment and that an ombudsman be appointed to act as an arbitrator between this unit and the residents;
8. that a system be developed whereby a complaint would be followed-up to the point that the enforcement action would be reported back to the complainer; and

9. that a residents' advisory council be established comprised of two residents each from Brampton, Etobicoke and Mississauga appointed by the CCR. The role of this council would be as a go-between for the communities and airport management.

The Etobicoke Federation for Ratepayers' and Residents' Association (EFRRA)

The EFRRA participated throughout the review process; their involvement included a submission at the scoping sessions, review of and comment on the Panel's draft guidelines for the EIS, comment on the adequacy of Transport Canada's response to the requirements of the Panel's guidelines, and presentation at the public hearings of a submission with the following three parts:

- (a) a definitive "planning" program;
- (b) a demonstrated "need" for the development of LBPIA to maintain its mainline/international status; and
- (c) a concern for the welfare and health of the adjacent urban communities which will be called upon to bear an unfair proportion of the social and other adverse effects of airport operations.

EFRRA's position can be summarized as follows:

1. that LBPIA continue as a mainline/international airport dedicated to the service of the long-distance travel market;
 2. that reasonable expansion (i.e. the base case: existing three-runway system with improved ATC staffing, high-speed exits, traffic management, etc.) at LBPIA is acceptable provided that all environmental implications are and will be addressed;
 3. that Transport Canada move now to define a "System of Airports" for the Greater Toronto Area, and move to manage that "System" so that the local/commuter air activity may be effectively and efficiently absorbed, eliminating the need for new runways at LBPIA;
 4. that all development action, at LBPIA or elsewhere, be subject to a proper recognition of the existing noise problems associated with the operation of passenger aircraft, and a program be developed to deal expressly with such problems;
 5. that all reasonable alternatives be examined to address capacity shortfalls of aviation in southern Ontario and their advantages and disadvantages be compared with the environmental impact of three additional runways at LBPIA, and assurance be given that no decision will be made prior to full consideration and evaluation of those findings;
6. that in pursuit of a "satisfactory solution" to residential and environmental concerns, there be implemented a program of compensation, mitigation and relocation for residents, businesses, institutions, schools, etc. that are impacted by noise due to :
 - (a) current increasing airport operations;
 - (b) change in operational procedures since May 7, 1988; and
 - (c) construction of three additional runways, if approved;
 7. that the 20 NEF be used as a benchmark for providing detailed information concerning changes to the noise environment affecting areas surrounding LBPIA that would result from the current increasing airport operations and the addition of three runways if approved;
 8. that Transport Canada be required to undertake a study of the non-auditory physiological effects of noise and to take these factors into account;
 9. that the forecast presented by Transport Canada fails to recognize:
 - (a) the unfavourable negative economic conditions that have existed since the forecast was prepared;
 - (b) the possible impact of further deregulation on transborder traffic; and
 - (c) the potential distribution of the short-haul commuter traffic to other airports;

The forecast should be reviewed and adjusted accordingly. At best "forecasting" is "a big guess" and should be treated as such in the decision making process. For example, the inaccurate forecast for Terminal 3 is resulting in a massive claim of \$75 million for compensation,
 10. that the recommendations of the cost/benefit analysis be set aside, because the input involving comprehensive project costs including social costs, and time and delay caused by traffic congestion, is seriously flawed. In the case of "delay" information Transport Canada has to rely on the airlines. This information, as supplied, is usually unreliable and unacceptable for objective planning purposes. For example, self-induced delays caused by the airlines are not identified in the information provided;
 11. (a) that a communication program be implemented to deal with and agree on issues such as:
 - (i) current increasing airport operations at LBPIA;
 - (ii) the application of additional noise reduction and mitigation measures;
 - (iii) noise abatement enforcement; and
 - (iv) the introduction of operational and capacity improvements based on the current three-runway system at LBPIA;

11. (b) that an independent ombudsman be appointed to arbitrate disputes between stakeholders related to impacts of airport operations, changes in operational procedures, noise abatement enforcement, noise complaints, etc.;
 12. that the City of Etobicoke's Official Plan be recognized as the pre-eminent instrument used for controlling land use and development, providing an assurance of stability to the citizens of the city, and be not subject to amendment without due process of public consultation;
 13. that Transport Canada document the comments, affirmations, and re-affirmations made by governments (including references to the recommendations in the 1973 Royal Commission Report, Hansard, House of Commons and master plans) that no additional runways would be built. The time frame for this documentation is 1968 to August 1989; and
 14. that consideration be given to transfer the functions of the monitoring of noise complaints department to another department such as the Department the Environment.
4. that a neighbourhood committee should be formed which would become a part of the present LBPIA communication network;
 5. that Transport Canada should provide two forums per year, where noise abatement officials, and operational representatives would be present to listen to and fully respond to concerns and suggestions;
 6. that Transport Canada should provide central libraries in each municipality surrounding LBPIA with past and future copies of press releases, announcements, quarterly reports on reported noise incidences, enforcement action taken and fines collected;
 7. that an independent enforcement branch must be established preferably within the Department of the Environment; and
 8. that in the future, FEARO should not permit public hearings to begin until all the information requested by the panel has been presented, and not until all the information base has been printed and made available to the public for a minimum 60 day review period.

The Mississauga East Citizens Against Airport Noise (MECAAN)

The MECAAN was formed in 1989 in response to increased aircraft noise in the Mississauga community. The committee was seeking a fair balance between the operation of LBPIA and the social and physical environment of the communities surrounding the airport. While concerned about the noise impacts of airport operations, they stressed that they were not "anti-LBPIA" and accepted the economic and social value of the airport to both the GTA and to Canada as a whole.

The MECAAN discussed several issues including what they described as an "intimidating and frustrating" process in getting information on the airport and argued the need for a communication link between the "powers-that-be" and the people. With the various issues in mind, the MECAAN stated its four major goals of encouraging night flight restrictions, encouraging operational changes to improve noise abatement, improving communication with local residents on airport related events and limiting the capacity of LBPIA with no additional runways.

Further to this, the MECAAN presented several recommendations to the Panel:

1. that no additional runways should ever be constructed at LBPIA;
2. that Transport Canada should immediately re-focus on development of the long-term plan for the future transportation needs of the region;
3. that a capacity with the present three-runway configuration should be determined which would be balanced equally on need and impacts;

Rockwood Community, Mississauga

Although no single committee participated on behalf of the residents of the Rockwood community at the hearings, residents had broad-ranging concerns about expansion of the airport, especially about noise related to the possibility of aircraft approaching on the proposed north south runway. As an on-going activity at the hearings, the Panel added a red dot (sticker) on a large wall map (showing LBPIA and the surrounding communities) marking the approximate locations of the residences of concerned individuals who participated. At the end of the forum, a significant concentration of red dots covered the Rockwood area of the map.

Some of the Rockwood resident concerns are illustrated by the following quotation :

I am opposed to it [the addition of runways] as a resident. Our home is on the first residential street south of Eglinton over which a new flight path will take planes. I am opposed as a parent. My children attend St. Martha and Mary School and the soon to be occupied Philip Pocock High School. Both schools would be severely affected by any new flight paths. I am opposed as a teacher. I am a teacher in a portable classroom at St. Alfred's School, another school which would suffer as a result of the new flight paths. I am also opposed as a citizen concerned with the environment. The damage already done to Etobicoke Creek can on/y be worsened by additional runways. None of the above reasons is more significant than the others, but if one would stand out it is the effect that this expansion would have on the children and teachers in portable and portapac classrooms.

Yvonne Mitoff, resident of Rockwood, December 19, 1991 (pg. 169).

In 1980 I made the conscious decision to remain in the Rockwood community, but to change residences. My reason for moving was the increasing air traffic of the north south runway over Centennial Hill, and the accompanying air and noise pollution that were spoiling my enjoyment of my backyard and Garnetwood Park. I examined the city plan, a municipal, provincial and federal government agreement that there would be no additional runways constructed, and consulted with the Mayor, who assured me of her opposition to airport expansion . . . An increase in the number of runways will irreparably damage quality of life, my quality of life and my family's, and enjoyment of our home . . . My concern, and that of my wife is: In our local schools, what will the effect be upon learning? . . . The prospect of disrupting . . . the schooling of two young children [Samantha and Amanda Perrin] is not one I take lightly . . . I don't know how intolerable the conditions will be in the future. I just know that they are going to provide quite a disruption to my lifestyle.

Douglas Perrin, resident of Rockwood, December 14, 1991 (pg. 187)

The Malton Airport Safety Committee

The Malton Airport Safety Committee raised several safety concerns at the hearings. They stated their opposition to the airside expansion of LBPIA on the basis that more runways would mean more air traffic, and argued that this would lead to increased probability of an accident related to the activities at LBPIA.

Their position also included expanding Hamilton Airport as a viable solution. The committee concluded by encouraging the Panel to strive towards the best solution to the noise, safety, and environmental issues as they relate to the project.

The Community Advisory Committee (CAC)

In the course of the hearings, the panel received material from the CAC which was formed in March 1988 as a result of "public outrage at the possibility of constructing an incinerator on the airport site for the disposal of international waste."

(Additional concerns and positions of public interest groups are provided in Chapter 4).

3.2 SCHOOLS AND EDUCATION BOARDS

The Dufferin-Peel Roman Catholic Separate School Board

At the October 29, 1991 meeting of the Board of Trustees, the Dufferin-Peel Roman Catholic Separate School Board adopted a position to oppose the expansion of the LBPIA. This position was taken to protect the learning environment and the safety and well-being of the board's students and teachers, and was also taken with respect to the cemetery within the bounds of the LBPIA.

The school board stated that due to the expertise required for assessing noise and pollution impacts inherent in the airport, funding must be made available to assist school boards in this

endeavour. They requested that the panel consider compensation to those affected by the increased levels of traffic at the airport. They requested as a minimum, that schools which are located in areas where noise levels will exceed 28 NEF during regular school hours be eligible for upgrading, and that the cost of such upgrading be borne by Transport Canada. They further recommended that the degree of upgrading must be such that noise levels would be brought to an acceptable level, i.e. lower than 28 NEF during regular school hours to ensure that a child's learning capability is not negatively affected by undesirable noise levels.

The board further requested that all existing schools which are located in areas where noise levels will exceed 28 NEF during regular school hours not have portable classrooms on-site and that Transport Canada must commit funds to provide alternate suitable classroom space to the satisfaction of the board.

They expressed concern about future noise levels at various separate schools if the runways were to be built. The board also stated that if noise levels increase slowly over an extended period of time and the school board deems it necessary for an acoustic sound study to be performed, these costs must be the responsibility of Transport Canada.

The board was also concerned about the air quality in areas located in close proximity to the airport. They stated that children and staff spend a portion of their school day outdoors, and if pollution increases as a result of the expansion, the overall general health of students and staff will be affected. With this in mind, the board asserted that the degree of air pollution, as a result of the operations of LBPIA, must be carefully monitored by Transport Canada and that equipment and methods which minimize air pollution must be utilized continuously by Transport Canada.

Metropolitan Separate School Board (MSSB)

The Metropolitan Separate School Board (MSSB) presented an overview of the noise and air quality of the MSSB school environment and a summary of the noise effects. The following are the conclusions and recommended mitigative measures, based partly on independent studies, that the MSSB presented before the panel at the hearings:

1. The review of noise levels at MSSB schools has identified schools which will experience noise levels (NEF) in 1996 that are greater than current (1990) levels. The schools most affected include some that use portable classrooms whose sound insulation is such that they do not provide an adequate learning environment due to the disruption that will occur even with closed windows. The noise levels in portables with open windows will be even more intolerable.
2. In the case of permanent school buildings in those areas with NEF levels of 30 or over, adverse noise levels are likely since the schools are not specially insulated to reduce noise. Such levels will be worse when windows are open, a condition that is typically the case in pleasant weather.

3. All schools will suffer from intolerable conditions during outdoor recreational activities to the extent that such activities are compromised.
4. Since there are unacceptable noise impacts that severely affect MSSB school activities, even after mitigative measures indicated in the EIS are implemented, it is incumbent upon Transport Canada to make a commitment to implement additional measures to provide acceptable noise levels. In the event that residual impacts still remain, as indicated in Transport Canada's quality of life study, it may be possible to offset the unavoidable adverse effect through some form of compensation.

The MSSB expressed serious concerns and objections regarding the proposed airport expansion unless there is firm commitment to implement mitigation measures that address the following:

1. In view of the uncertainty in determining indoor noise levels in MSSB schools that are in a 25 or greater NEF zone, suitable noise measurements should be made in each such school (at no cost to the board) to verify that sound levels are less than 55 dBA when noisiest aircraft are flying over the area.
2. In addition with respect to portable classrooms, Transport Canada bear the cost of upgrading the sound insulation and also the mechanical system for air conditioning and ventilation in these facilities at MSSB schools to limit indoor sound levels to L_{max} of 55 dBA.
3. Physical mitigation measures for portable and permanent school buildings indicated above will still mean that outdoor noise levels will remain unacceptable for educational activities. Physical or more likely operational noise abatement measures are required to ensure that outdoor educational programs can be conducted in the least disruptive manner.
4. The Metropolitan Separate School Board must be represented on any Noise Management Committees established to deal with community noise due to airport activities.

The Board of Education for the City of Etobicoke

The Board of Education for the City of Etobicoke opposed the project unless its concerns were adequately addressed. In general, the board was concerned on several points: that the proposed airport expansion will result in increased aircraft noise and additional adverse impact on some Etobicoke schools; that the high level intrusions due to aircraft have the potential for serious disruption to normal activities both within the schools and outside; that the disruptions are in the form of speech interference, distractions, interruption of concentration, and interference with quiet activities and relaxation; and that air emissions from airport expansion will have an adverse effect on the health of children, staff and other users of the board's facilities.

Consultants who conducted studies for the board found that all 25 portables, and 18 masonry buildings would not meet the

indoor speech intelligibility guidelines (suggested by Transport Canada) now or in the future, that seven schools would experience a noticeable increase in aircraft noise and five of these would exceed Transport Canada guidelines in 1996 for outdoor communication, and that twelve schools would exceed the 1996 design contours, if the expansion went ahead. The board stated that the effect on learning based on the analysis conducted is considered significant and detrimental.

On the issue of air quality, measurements of air pollutants both on airport property and off-site show that acceptable federal and provincial air quality criteria are exceeded from time to time. On-site measurements were taken by Transport Canada and off-site measurements were taken by the Department of the Environment monitoring stations. Monitoring at requested school locations in 1989 and in a March 1990 submission to the environmental Panel by the Etobicoke Board of Education had not been carried out.

Estimates of air pollutant concentrations at nine selected schools had been made using the predicted concentrations contained in the Airside Development Project Environmental Impact Statement (EIS). The estimates showed that:

- the 1990 base case hourly nitrogen dioxide concentrations exceeded the provincial criterion at all nine schools under poor dispersion conditions;
- the hourly nitrogen dioxide concentrations under poor dispersion conditions increase in the 1996 base case at all schools with levels five times higher than those considered acceptable at some school locations; and
- with the new runways, the estimated improvement in nitrogen dioxide concentrations under poor dispersion conditions at the schools is negligible.

Considering airport sources only, nitrogen dioxide concentrations were estimated to be unacceptable at Kipling Collegiate in both 1996 and 2001 for both base case and best option scenarios. Hollycrest was estimated to receive unacceptable levels in the 1996 base case due to airport sources.

Based on the predicted potential for unacceptable air pollution levels under poor dispersion conditions now and in the future for 10 % or more of the time at a number of schools in Etobicoke, the board requested that actual measurements be obtained to determine the air quality at schools that may be adversely impacted.

The predicted deterioration of air quality led the board to assert a need, in addition to access to air quality data, to know what mitigation measures will be taken, and by whom, to establish acceptable air quality. The board stated its eagerness to participate in an air quality control plan that will limit exposure of students to excessive pollutant concentrations in the air they breath.

3.3 THE NORTHERN COMMUNITIES

The panel held two days of public hearing sessions in Sudbury to receive comments from interested parties in the spoke communities of Northern Ontario. The panel heard 17

presentations from groups that included the Regional Municipality of Sudbury, the North Bay and District Chamber of Commerce, Falconbridge Limited, the Sudbury Area Tourism Council, Placer Dome incorporated, the City of Sault Ste. Marie, the Ontario Lottery Corporation, the Sudbury Business and Professional Women's Association, and the Canadian Cancer Society. As well, many Northern Ontario representatives made presentations at the hearings in Etobicoke.

All participants from northern communities supported airside expansion at LBPIA. Presenters favoured the hub-and-spoke system as a positive response to the deregulation of the aviation industry. Use of LBPIA as a major hub airport was thereby seen as a vital component of a healthy air transportation system that offers frequent services and good fares. Many representatives of the northern communities emphasized that air traffic flow through LBPIA is a critical link between northern communities and regional, national and international business opportunities.

LBPIA is a fundamental component of our regional transportation network. Efficient and reliable commuter air service is vital to the economic health of the communities along the corridor and essential to the quality of life for the residents living in these communities. Continued and enhanced access to LBPIA is critical to the future economic health of the communities located along the Highway 11 corridor... The Panel must therefore consider "quality of life" issues for people everywhere who depend on the services of LBPIA, and not just simply focus on the effects of the expansion proposal on the residents in the immediate vicinity of LBPIA... air transportation is the most important and fastest growing mode of transport that links these areas to southern Ontario, the rest of Canada and other countries... our economic development strategies rely heavily on an efficient air transportation system that is part of a national and international network based on LBPIA.

Victor Power, Mayor of the City of Timmins, member of the Northeastern Ontario Municipalities Action Group, February 7, 1992 (pg. 85-98)

LBPIA is very important to our company and our community [South Porcupine, located in the City of Timmins]. Due to the large distance between Timmins and Toronto, air service is the only viable mode of transportation available to us. The other services such as rail and bus are time consuming, averaging 10 to 12 hours per trip. Air service allows us to get to Toronto in about one and a half hours. We can leave in the morning, conduct our business and be back home at night with ease and little time wasted. It also allows us to make connecting flights to our head office in Vancouver with relative ease and no extra costs.

Bob Perry, Placer Dome Inc., December 11, 1991 (pg. 61)

Representatives of the northern communities voiced much concern about the effects that the status quo option would have on their quality of life.

New industries competing in the international marketplace in environmental engineering, health care, electrical co-generation, mining engineering, and forestry research are

currently being established in the north attracted by the well trained labour force, lifestyle, and comparative communications costs. The success or failure of such efforts is fully dependent upon the operation of reliable air service to the major population base of the province and through the major airport to international markets elsewhere. These Hearings have heard from northern residents expressing concern about government travel, health care, education, and tourism and the serious impact all these would feel by increased costs of air travel through LBPA... we ask the Panel to recognize the impact of increased costs of doing business in the Province if the proposed expansion is not supported.

Dave Thomas, Representative, Economic Development Group of Northern Ontario, February 7, 1992 (pg. 70)

Typical of the public hearing participants in Sudbury, Mr. Thomas went on to express his support for measures to reduce congestion at LBPIA, and for this reason encouraged the Panel to recommend expansion of the existing runways system at the airport.

3.4 BUSINESS INTEREST GROUPS

Several business interest groups appeared before the panel during the hearings and brought with them the underlying message that LBPIA is of great and growing economic importance. A constant theme throughout submissions to the Panel on behalf of business interests was the serious adverse effect on industry's ability to compete, if it was forced to incur the additional costs caused by travel delays, lack of direct connections for onward flights, and other such deficiencies in air travel service, to which lack of adequate capacity at LBPIA would give rise.

We, as a community need to build on this emerging role and enhance LBPIA's hub status. Simply put, this means equipping LBPIA with the proper facilities to meet present needs and future growth. The ability to attract new investment and jobs to the GTA will be seriously jeopardized if operations are split or if another airport is proposed... We believe that LBPIA has room for growth and that this region and province cannot afford a second international airport that will not come on stream for at least ten to twenty years. Passengers prefer to use LBPIA and with the advent of a deregulated marketplace forcing airlines and travellers to use another airport is simply a step backwards. Finally, a second major international airport for Toronto is not warranted and not affordable.

Mr. Jim Murphy, Representative, Board of Trade of Metropolitan Toronto, February 7, 1992 (pg. 76-77)

Organizations such as the Metropolitan Toronto Board of Trade, the Mississauga Board of Trade, the Brampton Board of Trade, and the Etobicoke Chamber of Commerce supported the project. The organizations represent hundreds of local businesses, employing thousands of people.

Support was also provided by national business organizations such as the Canadian Chamber of Commerce, the Canadian

Manufacturer's Association, the Canadian Freight Forwarders Association, the Canadian Professional Sales Association, and the Canadian Industrial Transportation League.

Many business representatives emphasized their view that decisions on where best to invest are heavily influenced by judgements on the adequacy of existing and prospective air transport services at the various locations being considered. A number went on to suggest that the Toronto area was already experiencing some loss of potential business and investment, because of a perception that air travel to and from Toronto was subject to undue delay and disruption at LBPIA.

A decision to freeze LBPIA at its current capacity is a decision to move the airport to Pickering or some other location. It would be a strong signal to stop investing in LBPIA and the businesses that are located in Brampton, Mississauga, and Etobicoke because of their proximity to the airport . . . There is no status quo. If the airport cannot grow with growing demand, then demand will go elsewhere, taking with it jobs, opportunity, and investment.

Gordon Sinclair, Air Transportation Association of Canada, February 7, 1992 (pg. 174-175)

Particular concerns were expressed by those whose business interests depend, in whole or in part, on air travel by means other than regular scheduled passenger flights, i.e. cargo flights, charter flights, corporate or other private aircraft, etc. Such flights often have difficulty in booking slots at LBPIA, and, even if successful, may at periods of congestion be diverted to other less convenient airports. A number of those affected said that, if this situation were to continue, they would be likely to transfer their operations to alternative "hub" airports such as Buffalo or Detroit, and a few said they had already done so.

A number of individual companies—both small businesses and multinational Northern Telecom—in expressing their concern, described how they rely on LBPIA and why they would be drawn to U.S. airports in the event LBPIA continues to be unreliable.

Several major unions, including the International Association of Machinists, the Canadian Auto Workers (Airline Division), the Canadian Union of Public Employees and the Canadian Air Line Dispatchers Association expressed their support for airside expansion of LBPIA. It was emphasized that a great majority of the 14,000 workers represented by those unions live in the communities around the airport.

Overall, the presentations made to the Panel based on economic considerations did not appear to reflect an actual current problem so much as an apprehension that, unless the proposal to expand runway capacity is approved, future congestion at LBPIA is likely to inhibit or prevent the exploitation of the business opportunities expected to accompany a recovery, so eagerly awaited, from the current recession.

3.5 AVIATION COMPANIES AND ASSOCIATIONS

The vast majority of aviation companies and associations supported expanding the airside capacity of LBPIA. The airlines that appeared before the panel stressed the importance of LBPIA not only to the travelling public, but also to the well being of the aviation industry.

Participants such as Ron Chafe of the Canadian Business Aircraft Association stressed that the economic viability of the aviation industry, as typified by CBAA member companies, is directly related to timely access to a major airport.

He added that failure to provide adequate capacity at LBPIA would probably result in significant disruptions of support industries that maintain the viability of the aviation industry.

Fixed base operators will not be able to sustain their operation, nor will the technical support services, if the quantity of aircraft starts to disappear . . . We are going to look at a loss of 568 direct jobs and a loss of aviation department annual budgets of \$41 million and \$9 million of payroll. If the runway expansion proceeds and provides business aviation with a closer historical share of capacity, then the 20 year economic value is \$1.7 billion and 734 direct jobs . . . It also, if the expansion proceeds, is a clear signal for the business community, that Toronto, and indeed Canada, is open and anxious for business.

Ron Chafe, January 22, 1992 (pg. 203)

Aviation companies also voiced concerns over the issue of disrupting the hub-and-spoke system of LBPIA. Several airlines found that partial alternatives involving forced diversion of spoke community traffic to a second airport were fundamentally unreasonable.

... it is discriminatory to regional travellers ... [that] their communities would suffer significant social and economic penalties. Deliberately building new inefficiency and higher costs into spoke communities routes will jeopardize service to many communities. Diversions run counter to the laws of Canada which specify the right of "freedom to move," where consumers, not federal bureaucrats, determine when and how and to where they will fly. Any splitting of spoke traffic would gut the regional carriers, which have based their fleets and schedules around turboprop aircraft feeding the LBPIA hub. Disruption of the spoke "feeder" system would undercut the competitiveness of the major Canadian carriers . . . We would be competing against U.S. carriers without the efficiency generated by a functioning hub airport. Mr. Chairman, we would be shooting ourselves in the foot. We would deliberately set up a process, the first signs of which we are seeing now, where Canadian passengers will be fed into an American hub for travel not only in the U.S. but internationally.

Gordon Sinclair, Air Transport Association of Canada, February 7, 1992 (pg. 167-168)

The Canadian Air Line Pilots Association and the Canadian Air Traffic Control Association stated the airport would be safer as a result of the additional runways.

The twinning of the existing runways will allow one runway in each pair to be dedicated to landing and one to take-off, which will enhance safety by reducing delays and the . . . associated potential hazards such as icing, pilot fatigue and fuel consumption problems, and by lowering the chances of runway incursions, and by further separating arriving and departing traffic.

Of particular importance to the reduction of delay and other hazards, such as wake turbulence, is a second north-south runway 15/33, which must be at least 8500 feet in length. Although use of the north-south runway is weather-dedicated only some 5 % of the time, the single runway 15/33 is a major contributor to delays and their associated hazards.

Further, with the additional capacity and resultant fewer delays . . . afforded by another 15/33, Transport Canada and pilots would be less reluctant to change the runways in use when winds are adverse, thus increasing the margin of safety that must presently be accepted in using the east-west runways at or near the crosswind capability of aircraft, particularly when these runways are wet or otherwise contaminated.

Pilots are committed to being good neighbours in the reduction of noise from aircraft operations, both as noise-affected members of communities surrounding LBPIA and in the realization that it will bring greater acceptance of our industry . . . We have been and will continue to be involved in procedural changes to reduce the impact of noise on the community and are pledged to operate our aircraft in the quietest possible way consistent with the overriding dictates of safety.

Captain Al Ails, Canadian Air Line Pilot Association, Canadian Air Line Pilot Association, February 7, 1992 (pg. 57, 58, 60)

Gordon Sinclair, of the Air Transport Association of Canada, summed up the support of the project given by the majority of participating aviation companies and associations.

Through the course of the hearings-despite constant scrutiny by experts and opponents-there has been no evidence submitted which disproves the basic planning assertions of the proposed development. Compared to the status quo or base case, this project will result in less noise, less air pollution, greater efficiencies, higher standards of safety, while ensuring that LBPIA remains Canada's hub airport and the region's primary engine of economic growth.

Gordon Sinclair, February 7, 1992 (pg. 155)

Other participants from the aviation industry stated a need to enhance other regional airports to improve their attractiveness as alternate airports to LBPIA.

Mike Sifton, Sr., of Toronto Airways, described Buttonville Airport as home to over 250 light aircraft which are largely corporately registered. It has been the port of entry to the

Metropolitan area for large numbers of corporate aircraft from all over North America. He concluded that Buttonville Airport, the fourth busiest in Canada, is therefore important to the economic well-being of the Greater Toronto Area (GTA). Further to this, he indicated that Buttonville has much potential to accept traffic from LBPIA, "over 90% of business jets are capable of making use of the Toronto Buttonville Airport and do so on a regular basis".

Mr. Sifton made a number of comments regarding Buttonville Airport including the fact that Canadian Partner found their experience at Buttonville profitable and desirable and that the infrastructure, in support of the airport, is excellent with direct connection to Highway 404 and the metropolitan Toronto expressway system. He asked that the federal government participate in the leasing arrangement in a minor partnership way so that all levels of government are in a partnership with private enterprise. This was seen as important to maintain partnership arrangements with the federal government as negotiated and to keep all runways in full operation. He noted that maintenance of operation of all Buttonville runways is important in not adding stress on the rest of the system and on LBPIA.

Comparing the GTA to other major cities in the world, Mr. Sifton concluded that the GTA is vastly under-served by the air industry. He concluded that ultimate construction of the Pickering Airport must occur-at the appropriate time-and that all existing airports should be saved and maximized to serve the needs of future generations. He raised the point that the other airports should be improved so that they are attractive to the travelling public as a viable alternative to LBPIA, "Let them attract business that is suitable rather than direct the traffic to their court".

Peter Ainsworth, manager of Hamilton Airport for eight years and general manager of a private company that will build a cargo and maintenance complex at Hamilton Airport, expressed his belief that:

... there is a very viable and publicly desirable niche for Hamilton Airport to fill, a niche that will facilitate LBPIA's growth, yet create new activity and jobs in an area whose traditional industries are under siege in the changing commercial environment of today. Hamilton [airport] is the ideal location for the new cargo airport, one where cargo and courier are not subordinate to passenger traffic, where long haul intercontinental freighters could operate without concern for slots or time constraints . . . an airport where annual freight growth can be accommodated as time demands and one to which shippers will send their freight confident that neither A TC nor ground delays will interfere with its delivery ... and when the [cargo] component has grown passenger traffic will follow.

Peter Ainsworth, January 17, 1992 (pg. 112)

Mr. Ainsworth asked for 2,000 feet to be added to Hamilton's main 8,000 foot runway to maintain the airport's attractiveness to intercontinental non-stop flights. He contended that new highway access and the runway extension would contribute to relieving some of Toronto's problems, and "at a fraction of the cost".

3.6 MUNICIPAL, REGIONAL AND PROVINCIAL GOVERNMENTS

The Councils of the City of Mississauga, the City of Brampton, the Regional Municipality of Peel and Metropolitan Toronto either voted to accept airside expansion of LBPIA or to conditionally support the project. The City of Etobicoke concluded either to reject the project, for reasons described below, or to defer the decision on the proposed expansion.

The City of Mississauga

Hazel McCallion, Mayor of the City of Mississauga, stated that the city "will oppose the proposed airside development project, including the addition of three new runways, unless certain conditions are included and implemented by Transport Canada". Key conditions included:

- a) allowing use of the new north/south runway only during unsafe crosswind conditions and emergencies (with the understanding that all emergencies must be reported to and vetted by the noise management authority as outlined in condition (e) below); entrenching no takeoffs from this runway to the south as an operational requirement; and entrenching no arrivals or departures between 2300 hrs. and 0700 hrs., as an operational requirement;
- b) the entrenchment of 100 per cent conversion of Stage 2 to Stage 3 aircraft by 2003;
- c) the commitment to impose a complete prohibition of night flights by Stage 2 aircraft;
- d) the emplacement and activation of a fully operational noise management monitoring system by September 1, 1992;
- e) the creation of a fully functional "noise management authority" by December 31, 1992, created by and reporting through the federal Minister of Transport, with community and municipal staff representation to play a major role in the conduct of its business;
- f) other GTA/Southern Ontario airports must play a role in responding to future airport capacity requirements; options which encourage specific alternative solutions professing a "market enticement" approach must be actively sought; and
- h) the Minister of Transport must enter into an agreement with the City of Mississauga which clearly outlines the processes and procedures that must be followed, including public consultation with the noise management authority and city council, prior to any operational or policy changes being introduced in the future.

Ward 3 in the City of Mississauga

Maja Prentice, councillor for Ward 3 in the City of Mississauga, supported the motion passed by the Council of the City of Mississauga on January 22, 1992, with regard to the proposed east/west runways as long as all conditions in the resolution are passed. She recognized the tremendous economic benefit that the airport has brought to Mississauga and Peel.

She opposed however the north/south runway, to protect her community. Pursuant to this, she noted that the federal government had promised that there would be no new north/south runway and that the area in Ward 3 north of Burnhamthorpe Road was allowed to develop based on that commitment. Maja Prentice believed that the area east of Dixie Road and north of Burnhamthorpe Road would not have been opened for residential development by any Council of Mississauga if they had known a runway would be built in the proposed location. She also presented statistics leading to her conclusion that the residential area from Dundas Street to Burnhamthorpe Road would have no relief when landings are occurring on the proposed north/south runways, i.e. 5% of the time.

As quoted from the transcripts of the hearings, her presentation to the panel raised the following points:

There are seven primary and secondary schools east of Dixie Road from Dundas Street to Eglinton Avenue. They range from primary to secondary with an enrolment of 4,906 students. Even west of Dixie Road the schools will be impacted to a degree. There are 12 schools in this area with an enrolment of 8,755 students. Every one of these schools has portables.

At present, there is no compensation package offered by Transport Canada or the federal government to retrofit these schools or portable classrooms to protect the children and teachers. The taxpayer cannot afford these increased costs and our children cannot learn in an interrupted environment.

Maja Prentice, January 23, 1992 (pg. 169)

The councillor raised many issues in support of her position including: (1) that the residents of Mississauga East had been told for many years that the city's official plan protected them from runway expansion at LBPIA; (2) that the NEF noise contours do not reflect the impact of the new flights that will occur over Mississauga East, as the decibel reading of a landing aircraft 1280 to 600 feet above ground is a significant disturbance and annoyance; the NEF measurement, because of the limited use of the north/south runway, does not clearly reflect the intrusion of the noise of aircraft on the quality of life; (3) that LBPIA has impacts at all four levels of government-and that is a direct impact to the taxpayer, and (4) that should the proposed 33L runway be used for takeoffs, it would add 15 dBA to the 66 dBA to 80 dBA from arriving aircraft. She also stated that the Federal Government should be responsible for all compensation and raised the question of how one compensates for loss of use of outside enjoyments-parks, schoolyards, backyards, and decrease in value of residential property for owners that find themselves under a new flight path.

Maja Prentice concluded that every airport in southern Ontario should have been assessed with a view to expansion and additional usage to relieve LBPIA prior to addressing additional runways, in the councillor's words, "it appears to me that the cart had been placed before the horse".

The City of Brampton

The City of Brampton generally supported the proposed expansion of the airport, in principle, provided that recommendations as presented at the hearings are met. The recommendations were broad ranging and included issues such as takeoff corridor tracking and regulations, ground transportation, fleet mix conversion, air traffic control staffing, noise monitoring, enforcement, and compensation, air quality, technical adequacy and conditions, and economic benefits. Their final recommendation to the Panel was that it consider the merits of using a performance contract between Transport Canada (LBPIA office) and the surrounding communities to enhance the prospects of adhering to forecasts and actually achieving the noise levels indicated in the EIS report.

The City of Etobicoke

Dr. Claude Davis, a representative of the City of Etobicoke, provided insights on the technical aspects of air quality, water quality, and noise and social impact issues, and concluded that there were sufficient serious limitations to the presentation by Transport Canada that the panel should either reject the application or defer the decision on the proposed expansion. Identified items that needed elucidation included sensitivity analysis of the assumptions that Transport Canada used for projected demand of air traffic; consideration of alternatives to the project; recognition of the limitations of the use of noise metrics, especially the NEF system; underestimation of the number of people affected by the six-runway option; and monitoring of health impacts on residents in the surrounding communities.

Dr. Davis concluded that “the panel should either reject the application or defer the decision on the proposed expansion, unless, . . . Transport Canada provides additional options which would effectively address the outstanding social impacts, and undertake to implement compensation measures for the residual impacts.

The Regional Council of Peel

The Regional Council of Peel made several recommendations to the Panel proposing that:

1. the Panel require Transport Canada (a) to incorporate in the airport master plan an adequate ground transportation system including a direct rapid transit connection to mitigate the impact of the airport growth on the surrounding transportation network and, (b) to address the costs and financing of this system;
2. the Panel require as a condition of approval of the project that a railway spur line be constructed to provide access to the airport property for importing the bulk materials to the construction sites for the northerly proposed east/west runway and the proposed north/south runway; and

3. in accordance with the Region of Peel’s Road Width and Setbacks By-law, the Panel make provision in the EIS for the gratuitous dedication of all required road widenings from Transport Canada lands to the Region of Peel as a condition of approval of this project.

The Regional Municipality of Metropolitan Toronto

Alan Tonks, Chairman of the Regional Municipality Council, spoke at the hearings of the importance of “LBPIA in terms of the inter-relationship and linkage with the economic infrastructure of Metropolitan Toronto”. He asserted that without the increased airside capacity access, the regional municipality will be constrained and alternative locations for business and tourism, etc. will be sought out, probably in the United States. It was his position that LBPIA must be expanded to ensure continued economic growth and well-being of the Metropolitan Toronto region. He also recognized that “with these proposals must go the needed noise and environmental mitigation measures required to limit as far as possible the impacts on the adjoining communities that could result from additional aircraft [movements].”

The Government of Ontario

On February 6, 1992, the Government of Ontario announced its support for plans to build three additional runways at LBPIA. LBPIA and the ground transport systems associated with it represent an enormous investment in infrastructure that has a significant economic impact on the entire province. The Ontario Ministry of Transportation news release, February 6, 1992, stated:

The future of the airport is of major provincial interest because the airport is an integral component of the provincial transportation system. LBPIA is the key hub of the provincial and national air transportation systems, and is Canada’s major point of entry for visitors from other countries. The airport expansion would ensure Ontario’s continued role as a dynamic and enterprising province. An expanded LBPIA would generate 69,000 direct jobs, and approximately 120,000 indirect jobs. As well, during the next 15 years, the airport would generate \$110 billion in business revenue, \$31 billion in direct personal earnings, and \$20 billion in taxes.

At the hearings, a senior official of the Ontario Ministry of Transportation, speaking on behalf of several provincial ministries, expressed their support for a local airport authority for LBPIA, especially as a forum to allow interest groups, including local residents and the business community, to participate in decision-making for topics such as operational procedures and international issues.

4.0 THE PANEL'S ANALYSIS

4.1 INTRODUCTION

A very large volume of information and opinion was put before the Panel in the Environmental Impact Statement (EIS) and other documentation provided by Transport Canada, in written submissions from other stakeholders, and in the extensive oral presentations and dialogue during the hearings. Much of this material is essentially factual. While the Panel has carefully reviewed the full range of material before it, it does not intend to comment in any detail on material which, even if relevant, was not the subject of contention or of disputed interpretation. The various sections of this chapter are therefore limited for the most part to the examination of matters -relevant to the Panel's mandate -on which significant differences emerged on points either of fact or of interpretation.

4.2 BACKGROUND

Before addressing these matters, however, the Panel wishes to comment on several factors of a rather general nature which constituted a background for its consideration of the more specific issues. These had to do with the nature of the proposal, the underlying causes of the opposition to it on the part of many local residents, and the circumstances of the preparation of Transport Canada's EIS.

4.2.1 The Incremental Nature of the Proposal

The proposal that the Panel was mandated to review, unlike many others subject to environmental impact assessment, is not for the construction of a new independent, self-standing project to be undertaken where no project now exists. On the contrary, the project calls for the addition of facilities similar to those which have been a vital component of a complex for several years. In this sense the project under review is essentially incremental.

Consequently, most opinions on the anticipated effect of the additional facilities reflect, consciously or otherwise, attitudes about the existing complex. Therefore there are two matters that must be assessed: the effect of the existing facilities and the incremental consequences of the proposal.

4.2.2 The Attitude of Local Residents

It was evident from early in the review process that there is a substantial body of opposition to the proposal among the residents of communities adjacent to the airport, especially among those whose homes lie under or close to the flight paths of the existing or proposed runways. This opposition was expressed in vigorous and often emotional terms by many individuals who appeared before the Panel, and also by the great majority of those speaking on behalf of associations representing local residents. There were clearly very strong feelings involved. The attitude of many of these intervenors could be described as frustrated, mistrustful, hostile, angry, and bitter.

These opponents of the proposal presented themselves as representing a great many others who, for a variety of reasons, had not come forward in person. Supporters of the project tended to depict this vehement opposition as a fringe group, not representative of the majority of the local population. However, in the Panel's view a substantial percentage, but probably not a majority, of those who live close to LBPIA and along the centrelines of existing and proposed runways oppose construction of the proposed runways. Among those residents most directly affected, opponents probably constitute a majority.

4.2.3 Underlying Causes

There are two underlying causes for the extent and the intensity of opposition to the expansion; neither cause is related directly to the content of the proposal. The first is the irritating-or what some term intolerable -effect of current aircraft noise levels on the lives of area residents. Concern about aircraft noise far outweighs all other issues in shaping the attitudes of proposal opponents. This concern is attributable to distress caused by the noise of current airport operations, probably even more than to an anticipated increase in noise to which the proposal may give rise.

The second underlying factor is the public perception that over the past twenty or thirty years, while the noise affecting the lives of area residents has been relentlessly increasing, the airport authorities and all three levels of government have developed a consistent record of insincerity, of broken promises, and of failure to recognize, or callous disregard for, the hardships caused by their decisions. The sense of grievance flowing from this perception is the primary cause of the mistrust, anger and bitterness which were so evident to the Panel.

This considerable opposition to runway expansion should not be taken lightly, nor should the fact that it involves such deep-seated mistrust of and hostility towards government's past role. Against this background, the Panel considers that approval should not be given for any project perceived to increase noise levels near LBPIA unless the necessity is very clearly established.

4.2.4 The Environmental Assessment Process

In considering the presentation by Transport Canada of the EIS and other material, the Panel identified an apparent contradiction in the current environmental review process. Ostensibly an EIS, supplemented by such additional material as may be provided by the proponent, constitutes a detached presentation of the relevant facts and an objective analysis of them. In other words, the procedure is formally expected to produce a neutral and open-minded presentation.

However, at the time an EIS is prepared, several relevant developments have already taken place. On the basis of an internal examination, the agency or department sponsoring the proposal has already come to a conclusion about the

nature of the problem and has already decided upon a preferred solution. That preferred solution has already been publicly announced, and has thus to some degree become a political commitment. At that point in the process, a review panel has been appointed and has held scoping sessions revealing the significance of opposition to the proposal; the guidance document is so structured as to ensure that the basis for that opposition is fully explored.

While the review process is not formally an adversarial one, it seems to the Panel almost inevitable that it will in fact be quasi-adversarial. The presentation by the proponent's representatives will be in the form of advocacy; the arguments supporting the project are presented in a favourable light and those of the opponents are downplayed.

When the ultimate sponsor is the government, represented by a minister, officials responsible for making the proponent's case are placed in a particularly difficult position. The Panel believes such difficulty could be detected from time to time in the course of its review, despite the best efforts of Transport Canada representatives to be candid, objective, and open-minded. For example, the case for construction of additional runways at this time, or at least for additional east/west runways, is based essentially on the forecast that traffic demand will increase sufficiently rapidly that a serious capacity shortfall will occur by about 1996. It became evident early in the hearings that this forecast, based on pre-recession statistics, was seriously flawed, but Transport Canada was not prepared to provide an update, which would presumably have decreased the urgency of the case for new runways. However, it has produced revised traffic forecasts since the hearings concluded.

This situation, in turn, puts the Panel in the difficult position of attempting to elicit information, or interpretation of information, that the proponent has not provided. This is compounded by the fact that opponents to the proposal are generally at a disadvantage in having neither the technical expertise nor the resources to present an analysis comparable in depth and complexity to that provided by the proponent. In such situations, the Panel is left to its own devices to explore the strength of the proponent's arguments and interpretations.

4.2.5 The Content of the Proposal

In summary, Transport Canada presents its proposal as the construction of three additional runways at LBPIA, in order to raise the airport's runway capacity to a level judged sufficient to serve anticipated demand until the year 2011. In fact, Transport Canada has made two proposals; each is designed to address a different problem, each is capable of independent implementation; and, as a pair, they are not entirely compatible.

One of the two proposals is to build two additional runways in the east/west direction, the designated primary operating direction at LBPIA. The purpose of this proposal is to increase runway capacity in the east/west direction.

LBPIA currently has an east/west hourly capacity of 82 movements per hour, as compared with a potential of 96; thus, about 14% of the potential is unusable because of Air Traffic

Control (ATC) shortages and, to a lesser extent, limitations in taxiways and other infrastructure. Only after the planned correction of these deficiencies would the adequacy of the runways themselves become the effective limit on east/west capacity. In fact, without further improvement in ATC staffing and taxiways, the addition of new runways would not result in any significant increase in capacity. Thus, expansion of east/west runway capacity can be justified only as a response to a problem expected to arise in the future, and not as a strategy to meet an existing need.

The second Transport Canada proposal is to build one additional north/south runway. The purpose of this proposal is to reduce the existing directional imbalance in runway capacity which now gives rise to traffic disruptions when weather or other factors do not permit use of the two east/west runways and require all traffic to use the one north/south runway.

The optimum north/south capacity is 50 hourly movements, only about 54% of the potential east/west capacity of 96 and 61% of the current effective capacity of 82 movements per hour. Transport Canada's proposed new runway would increase north/south capacity to 70 movements per hour, still only about 73% of east/west potential. Therefore, this would not eliminate the imbalance. But this would reduce the imbalance and would thereby partially alleviate an ongoing problem which has existed for some time. This problem is not attributable to future traffic growth, although it is likely to be exacerbated by such growth.

This latter proposal thus differs from the first in several significant ways: in fact, implementation of the first would directly conflict with the objective of the second—the reduction of directional imbalance in runway capacity. If both proposals were to be implemented, the imbalance in capacity would remain virtually constant; the north/south capacity at 70 would be 56% of the east/west capacity of 125 movements per hour.

On the strength of the distinctions between the proposals, and their dichotomy of purpose, the Panel has chosen to review each independently of the other.

4.3 THE BASE CASE

4.3.1 The Present Situation

At the present time, there is no general problem of traffic congestion at LBPIA. This is in sharp contrast to the situation in the late 1980s, when congestion was a major problem giving rise to delays of hours rather than minutes, and to cancellations. That congestion was the result of an excess of demand over capacity; but at the time, restrictions on capacity resulted from a shortage of ATC staff, rather than from insufficient runway or other physical capacity.

The easing of traffic congestion has come about primarily because of two factors. The first was the introduction in 1988 of the cap on hourly air movements, with the accompanying system of traffic flow control. These measures have served to restrict demand, and to space it out, so that under normal operating conditions, demand can be managed without major problems, despite under-staffing. The cap was first set at 70

movements per hour; later this figure was increased to 76. Since the hearings ended, it has been increased once again to 82 movements per hour.

The other factor-fortuitous in terms of airport operations -was the sharp decline in demand caused by the recession. The total number of passengers dropped from 20.42 million in 1990 to 18.47 million in 1991, or almost 10%.

This does not mean that the present situation is entirely satisfactory; indeed it is not. In the first place, while the measures to keep demand matched to capacity are effective in controlling congestion, they have unwanted effects. These include the inability to accommodate traffic that would be desirable to serve, and the reduction of schedule flexibility for the traffic which can be accommodated. In the second place, recovery from the recession will bring about a resumption of demand growth, with a consequent increase in the pressures on the system; hence the present relative lack of demand pressure offers only temporary relief.

Three other aspects of the present situation should be mentioned here. One is the directional imbalance in runway capacity which, as noted above, gives rise to disruption when weather or other conditions preclude east/west operations. This situation arises about 70 times a year, for an average duration of about five hours. Although this affects only a relatively small percentage of the total operating time, when it does occur it can cause serious disruptions -not only at LBPIA, but throughout the national air transport system.

Another relevant aspect of the present situation is that the potential capacity of the three existing runways cannot be fully exploited. A shortage of air traffic controllers imposes a major restriction on operating capacity. Early resolution of this problem is among a package of improvements, already undertaken or planned, whose implementation should increase effective capacity to 96 movements per hour. Achievement of this package of improvements is termed the "base case". It appears to the Panel that implementation of these improvements may not be currently receiving the urgent attention it clearly deserves.

Transport Canada does not predict that in the base case the pressures of increasing aircraft movements would cause the functioning of LBPIA to collapse. On the contrary, Transport Canada forecasts that the system would continue to service demand, but with a gradual increase in delays, cancellations, and costs.

Before the base case is addressed, there is a final aspect of the present situation that deserves attention. In Section 4.1.2, there was reference to the widespread distress in surrounding communities about the effect of current operations and also to the perception that inadequate attention had been given to the concerns of residents. It is very evident that efforts to inform local communities affected by airport operations, to consult them concerning proposed changes in operations, to take account of their views and suggestions, and to minimize adverse impacts have been seriously inadequate. The Panel has noted, however, that the present airport manager appears to have recognized this problem and has undertaken corrective action to the extent it is within his authority.

Hopefully, this will help to lessen the anxieties of local residents. However, there remains a long way to go in this regard.

4.3.2 Improvements to the Existing Airside System

In Section 2.3.1 the continuing process of incremental improvement was described, and the package of specific improvements now proposed or being implemented by Transport Canada was outlined. As indicated in Section 2.3.1, these improvements include measures designed to resolve the shortage of ATC staff. Since the conclusion of the Panel's hearings, it has been announced that adjustments in air traffic controller staffing have permitted an increase in the cap on hourly movements from the previous figure of 76 to 82.

Transport Canada has proposed improvements to the airport ground infrastructure, such as turn-offs, taxiways, and manoeuvring areas, which will permit more effective exploitation of the present runways. Installation of advanced electronic equipment expected to enhance air navigation and air traffic tracking and control capabilities is also proposed. These measures, combined with planned improvements in operating procedures, will increase effective capacity; they will also enhance safety and efficiency, and improve the ability to monitor compliance with noise control and abatement procedures. In conjunction with further ATC staffing improvements, these measures should raise the capacity of the present runway system to its limit of 96 hourly movements, while enhancing airport management's ability to address some of the current noise problems.

These various improvements are clearly desirable: They are measures designed to increase efficiency in the utilization of LBPIA's present facilities, to enhance safety, to increase the effectiveness of noise abatement and control procedures, and to help in offsetting a prospective capacity shortfall. These benefits were not contested during the Panel's hearings. Instead, the proposed measures were supported by the local resident associations which led opposition to the construction of new runways, despite the resulting increase in traffic volumes and hence in cumulative noise.

4.4 POSSIBLE IMPROVEMENTS TO THE BASE CASE

4.4.1 General

Leaving aside, for the moment, matters relating to runway capacity, the Panel believes there are a number of measures open to, but not currently planned by, Transport Canada which would constitute valuable improvements. These relate to problems of noise, safety, waste management, air pollution, and health concerns. The first three of these matters are examined later in this section, the other two later in this chapter.

Special mention should be made at this point of the interrelated issues of adequacy of noise abatement regulations and the effectiveness of their enforcement, mitigation of noise

impacts, and compensation for injury, in a legal sense, caused by noise which cannot be adequately mitigated. These three areas are of great interest to those exposed to aircraft noise resulting from current operations at LBPIA, as well as to those who expect to be exposed to noise or to have their present exposure increased, if the proposed new runways are built.

The concepts of mitigation and compensation raise important policy issues, which are examined later in this report. They are mentioned here because of their logical connection with noise abatement measures. The Panel believes that present measures at LBPIA relating to noise abatement can and should be improved, and examines below what might be done in this respect, regardless of whether the proposed runways are constructed.

Even with abatement, some noise exposure is inevitable. It is clearly incumbent on Transport Canada to participate in efforts to minimize the effect of resulting noise by active mitigation measures. In the Panel's view, it is a logical consequence of this obligation, that if such mitigation measures are not sufficient to prevent significant injury caused by aircraft noise, then Transport Canada has some degree of responsibility with regard to that injury.

4.4.2 Noise Abatement

The Panel uses the term "noise abatement" to cover those measures, in the general area of aircraft operations and control, designed to minimize the noise in residential and other noise-sensitive areas resulting from those operations. Included are restrictions on night flights, assignment of runways, and designation of prescribed flight paths, rates of climb and descent, and power settings. The term "noise mitigation", on the other hand, refers to measures that reduce noise levels in sensitive areas through direct intervention, such as increasing building insulation.

Despite considerable efforts at noise abatement, sometimes at a significant cost in operational convenience, LBPIA has not been successful in persuading local residents that it is doing everything possible to limit aircraft noise. The most important contributing factor is management's failure to provide sufficient information and consultation. For example, many residents continue to believe that there is a curfew on night flights, whereas in fact there is in force only a program of restriction. Furthermore, the restriction program is sufficiently flexible that in fact the average number of authorized flights per week night is about 17; it is scarcely surprising, even though these are relatively quiet aircraft, that residents regard night flight restrictions as inadequate.

Since the most annoying and stressful effect on the quality of life-and possibly on the health -of residents appears to arise from nighttime noise, the Panel suggests a curfew imposed on all night flights except for operational and medical emergencies. A very restrictive exception procedure should be developed to be available when a substantial number of scheduled flights have been significantly delayed by extreme weather conditions at LBPIA. These restraints are proposed in part because of the observation, detailed in Section 4.4.5, that even Stage 3 aircraft can create sufficient noise to interfere

with sleep. And limiting the absolute number of night flights is not a satisfactory solution: only one airplane in the night hours is enough to disturb sleep. In addition to an overnight curfew, the Panel believes that special noise abatement procedures should apply to flights in the late evening and early morning periods i.e. the so-called "shoulder periods". This is discussed further in Section 4.15.

A second concern regarding noise abatement relates to the system for registering noise complaints. Many residents believe that airport management is content to merely record the fact that a complaint has been made. They believe that very little effort is made to investigate it; to determine if in fact an infraction was involved and, if so, to impose a penalty; or to report back to the complainant. Indeed, Transport Canada officials have been hampered in their efforts to prosecute, or even identify, violators by a lack of equipment and of significant legislative authority: So, to some extent the residents' perceptions have been accurate. A much more active program of monitoring the observance of noise abatement procedures, investigating complaints of infractions, penalizing confirmed infractions, and informing complainants of the results will be necessary to restore any measure of confidence in the noise abatement program.

Another potential element of the noise abatement program is rotational runway use, a procedure that distributes noise more equitably among a number of areas. A number of residents supported this concept. The equity aspects of this matter are complex; in addition they must be related to considerations of operational efficiency, which are also complex.

4.4.3 De-icing and Other Safety Issues

Air safety, in Canada's climate, requires completely effective de-icing facilities and procedures. The de-icing facilities in use and the de-icing procedures followed at LBPIA in 1989 were severely criticized in the Second Interim Report of the Commission of Inquiry into the Air Ontario Crash at Dtyden, Ontario. The Commissioner, the Honourable Virgil P. Moshansky, in that report set out thirteen interim recommendations, of which five related specifically to the improvement of facilities or procedures at LBPIA and the remaining eight apply to airports and air carriers across Canada. The Panel was surprised that Transport Canada did not outline these recommendations and describe what action Transport Canada had taken or was planning to take in response to them, particularly those specific to LBPIA.

The Commissioner proposed that "interim runway-end de-icing/anti-icing facilities" should be in place at LBPIA during the 1990-91 icing season, and that a number of other "interim measures should be put in place immediately" at LBPIA. These include ATC gate-hold procedures and peripheral expansion of existing taxiways; expansion of existing ramp space "should be given high priority".

The Panel strongly supports Justice Moshansky's recommendations on the improvement of facilities and procedures at LBPIA, "the use by Canadian air carriers of type II anti-icing fluids", and the clean-up and disposal of used de-icing/anti-

icing fluids. These measures are desirable, not only to address safety hazards but to enhance environmental protection. They should be undertaken promptly as aspects of the base case improvements, unrelated to the question of additional runways.

The Panel has further concerns about safety at LBPIA because of the hazards represented by birds and other wildlife. The Panel urges LBPIA management to deal immediately and effectively with the safety hazard of deer on runways. Management should ensure that deer, or any significant mammals, present no further menace to the travelling public. The Panel also supports the continuation of the various approaches to prevent or control the incidence of bird strikes. Transport Canada should address the effects on bird behaviour of any changes in land use within or outside LBPIA. An example of threatening land use changes beyond LBPIA property involves a new landfill site to the north of the airport. This may attract increasing numbers of seagulls that will fly to and from Lake Ontario over the airport. This will increase the potential risk to aircraft from bird strikes. If necessary, Transport Canada should be actively involved in any decisions about land uses that are known to attract birds.

4.4.4 Waste Management

Transport Canada's plans for waste management related to the major issues for the current situation, for the base case, and for the preferred option are described in Section 2.5.3.

The Panel accepts the proposals and action plans outlined by the Transport Canada in the EIS and in the Environmental Management Plan concerning waste management and disposal. In particular, the Panel wishes to emphasize the importance of waste reduction and recycling, for both international and domestic wastes. The Panel considers that none of the proposed actions for improved waste management, with the exception of those actions related to construction, is related to increased traffic or other developments at LBPIA. The measures are necessary in order to raise the standards of waste management at LBPIA and should proceed in addition to the base case and independent of any proposed expansion.

Furthermore, the Panel suggests that the components of the Waste Management Plan adhere to a more formal, realistic, and binding timetable. Apparently, a number of items recommended for 1991 or early 1992 had not yet been accomplished at the time of the 1991/92 hearings.

Also, some proposals in the Environmental Management Plan of March 1991 are general and vague; as they stand, they are not binding commitments at all. For example: "LBPIA will participate in Airports Safety and Technical Services programs to identify more environmentally acceptable anti-icing/de-icing agents." Such proposals must be more focused and more specific in describing activity and timing. The Panel suggests a target date of June 1993 for the decision on these anti-icing/de-icing materials, so they will be available and in use by the winter of 1993-4.

The Panel also recognises that a number of aspects of waste management are regulated under federal, provincial, or municipal statutes or by-laws, and that others are addressed by

recommendations and guidelines. These provide some reassurance that humans and ecosystems are being protected from the health threats of waste materials. However, regulations are only effective if compliance is accomplished, so inspection and monitoring is needed.

Ongoing monitoring of water, air, and other materials of concern, and if necessary corrections through mitigation, should proceed as proposed, for all aspects of waste management.

Co-ordination of all of the waste management at LBPIA involves some complex procedures, and the over-all responsibility for this is unclear, at present. The Panel agrees with the suggestion of the Community Advisory Committee (CAC) that the Airport General Manager's office should be the authority for this function.

The Panel recognizes the concerns of local citizens, and endorses the suggestion put forward by the CAC that "... [P]rovision be made for public representation in whatever guidelines/procedures including waste audits that are developed for the Airport General Manager's responsibilities in the matter of international/domestic waste disposal." This is in keeping with recommendations for openness and public participation in other aspects of airport environment. It will also help to remedy the perceived lack of communication and accompanying frustration that residents have expressed in the past, concerning this and other environmental issues at LBPIA.

A special situation exists with regard to the disposal of international garbage. Under federal regulations, this has to be sterilised or burned. At the hearings, however, Canadian Airlines indicated that in the course of implementing their recycling programme, they obtained some exemption from the regulation in order to recycle beverage cans from service on international flights. Both Canadian Airlines and Air Canada have implemented waste reduction and recycling programmes for international waste, and this is commendable. It can also have financial benefits for the company that takes such an initiative. Nevertheless, a certain amount of waste from international flights still has to be treated.

The present practice of shipping waste from international flights into New York state for disposal is far from ideal. The Panel considers that a solution for the disposal of international waste should be given high priority. The Panel recognises the public concern over incineration on the LBPIA site, given the adverse publicity that such waste disposal methods have received in the media, and given the Ontario Ministry of the Environment's present policy against incineration. Yet incineration appears to be safe and acceptable in other jurisdictions of the developed world. The Panel therefore believes that technical considerations, as well as public interest, should be taken into account in deciding on the solution for international waste disposal, and that the decision-making should be communicated to the public at all stages.

4.4.5 Stage 2/Stage 3 Aircraft Noise

The Panel wishes to comment here on the assertion by supporters of the runway expansion proposal that the noise situation will be substantially improved when Stage 2 aircraft have

all been replaced by stage 3 aircraft. A number of intervenors suggested this change-over would permit a considerable increase in air movements without causing a corresponding increase in noise.

The Panel recognizes that, other things being equal, Stage 3 aircraft are quieter than Stage 2 aircraft. However, the Panel does not agree that the change-over to be complete by the turn of the century, according to industry representatives -will produce as substantial a noise reduction as predicted by many supporters of runway expansion. The reduction in noise is relative; a large, heavy Stage 3 aircraft still generates a lot of noise, often more noise than a smaller and lighter Stage 2 aircraft. Even though the more efficient and more powerful Stage 3's climb faster and reach a greater altitude by the time they pass over residential areas, the steady trend towards larger and heavier aircraft may result in unchanged, or increased, noise levels.

Furthermore, the difference in noise level is much greater in connection with take-off than landing; the change-over will not make a great deal of difference for landing aircraft. Thus, the fact remains that large Stage 3 aircraft will produce noise levels not very different from those produced by Stage 2's, if they pass over residential areas at low altitudes.

Despite the likelihood that it will not significantly offset the increased noise of more and larger aircraft, the Panel recognizes that completion of the conversion to Stage 3 is desirable. However, the Panel is less optimistic than industry representatives about the completion date for the change-over, in the absence of regulatory intervention. The Panel notes that a mandatory timetable for conversion has been established by regulation in the United States. The absence of similar regulations in Canada could lead to dumping of noisy Stage 2 aircraft on domestic users here. In light of these various considerations, the Panel sees a persuasive case for the adoption by Canada of a regulated timetable for conversion.

Furthermore, the Panel is not persuaded that the benefits of whatever noise reductions do occur as a result of the Stage 2/Stage 3 conversion should be used automatically and as justification for an increase in aircraft movements. As noted, the existing noise levels in communities surrounding LBPIA are already intolerable for some individuals; a reasonable argument can readily be made that the community should be afforded at least a portion of the benefits of reduced noise levels.

4.5 DIRECTIONAL IMBALANCE AND NORTH/SOUTH CAPACITY

In this section the Panel's analysis of considerations relating to the balance between east/west and north/south runway capacity at LBPIA is summarized.

4.5.1 Directional Imbalance

Transport Canada has designated the primary operating direction at LBPIA as east/west. Consequently, an estimated

95% of arrivals are assigned to the east/west runway system, depending on wind and surface conditions. Conditions dictate use of the north/south runway only 5% of the time, but it is used considerably more often for northbound departures. Transport Canada expects this practice to continue.

Based on the distribution of wind direction and strength in the vicinity of LBPIA, north/south could just as readily be designated as the primary operating direction and be used most of the time. But the east/west direction is currently served by two runways, while the north/south direction is served by only one. Thus, the designation of east/west as the primary operating direction results from the orientation of the existing runways, not from the distribution of wind direction and strength. There are certainly no local weather conditions that require use of the east/west runway system 95% of the time.

The potential capacity under visual meteorological conditions (VMC) in the east/west direction is about 96 movements per hour, while the potential VMC capacity in the north/south direction is approximately 50 movements per hour. Given the high percentage of time that the east/west runway system is used, its effective VMC capacity determines both the hourly movement cap and the number of slots in the reservation system.

When conditions require that the north/south direction must be used, a backlog of arriving and departing aircraft can develop, and delays will occur. For instance, even if weather conditions are excellent, a strong northwest wind could dictate use of the north/south runway. This would limit usable LBPIA runway capacity to 50 movements per hour, significantly less than either the potential 96 movements per hour or the current cap of 82 movements per hour available from use of the east/west runways.

Airline schedules are not written on the basis of expected wind direction; they are planned according to the capacity available in the east/west direction as reflected by the cap. When the east/west runways are used in independent parallel operation, there is sufficient capacity at LBPIA to accommodate all scheduled flights. However, when the north/south runway must be used, many scheduled flights cannot be accommodated.

Under normal conditions, Air Traffic Control cannot safely operate arrivals simultaneously from both the east/west and the north/south directions. Thus, when wind and surface conditions are marginal for east/west operations or when the wind is shifting towards a direction that favours use of the north/south system, Air Traffic Control must switch all operations to the north/south runway. Conversely, as conditions change in the other direction all operations may switch back from north/south to east/west.

In general, the heavier the aircraft, the less affected it is by wind and runway surface conditions. Similarly, jet aircraft are less affected by wind and runway surface conditions than non-jet aircraft. Thus, the performance and handling characteristics of heavy jet aircraft allow them to operate safely under conditions of higher crosswinds and poorer runway surface conditions that cannot be tolerated by other aircraft. This

means that selection of LBPIA operational direction is controlled by -and consequently, runway capacity is determined by-the aircraft with the lowest performance capabilities.

Thus, there is a directional imbalance in capacity at the airport at this time. The imbalance will become more pronounced as enhancement of east/west runway capacity permits the cap on movements per hour to be increased, because this will lead to increased amounts of traffic disruption when conditions require a switch to the north/south runway system.

4.5.2 Flow Control

Capacity shortfalls at LBPIA, including those caused by the imbalance in capacity between the two runway systems, are managed by adopting procedures termed "flow control". These procedures are designed to limit the number of aircraft that actually arrive at or depart from LBPIA according to prevailing conditions. Flow control operates by prioritizing flights within a multi-level hierarchy. Flights already in the air and arriving from the most distant airports are given the highest priority. Those still on the ground and arriving from airports closest to LBPIA are given the lowest priority. By virtue of their proximity to LBPIA, flights serving the spoke communities receive the lowest priority-they are the most frequently delayed and cancelled flights.

Thus, effects of the runway capacity imbalance fall unequally on different airlines and travellers. Commuter and regional airlines that serve businesses and travellers associated with spoke communities suffer the most frequent and severe disruption under flow control. Conversely, flights and passengers on international flights-excluding short-range transborder flights -are the least disrupted.

The effect that delays and cancellations have on individual passengers depend on personal itineraries and agendas, but benefits are clearly negligible. The effects on airlines are easier to assess: Costs compound as aircraft end up in the wrong place at the wrong time. Subsequent flights and passengers are delayed until aircraft catch up to their assigned schedule. Often the schedules of delayed flights do not become rectified until the next day. Implementation of flow control disrupts airlines and passengers for a significant time, even if these procedures are in effect only briefly. Furthermore, any disruption to flight schedules at LBPIA results in a cascade of missed connections and delayed deliveries throughout the country, because LBPIA is the hub of Canada's airline industry.

4.5.3 A New North/South Runway

Transport Canada argues, and the Panel agrees, that the capacity imbalance between the two runway systems is a significant problem that can be resolved only through an increase in north/south runway capacity at LBPIA.

In an attempt to determine a fair resolution, the Panel considered several alternatives -such as diversion of some flights to Downsview Airport when use of the north/south runway system restricts access to LBPIA. Combinations of ATC

difficulties, airline operational problems, aircraft routing interference, and inconvenience to passengers rendered each alternative solution unacceptable.

The Panel also recognizes a safety issue that favours additional north/south runway capacity. Operating conditions produce some incentive for both air traffic control services and individual controllers to use the east/west parallel runways to the maximum extent possible. The Panel does not suggest that this is attributable to specific Transport Canada directives or to the actions or instructions of supervisory personnel. It is attributable to the obvious fact that an operational switch from the east/west parallel runways to the single north/south runway automatically entails a host of significant problems.

While the Panel remains confident that ATC will not hesitate to switch when it is clearly required for safety reasons and that individual pilots will not hesitate to request a switch when they believe conditions warrant, the working environment creates pressures to delay a switch for as long as possible. Thus, the addition of north/south runway capacity would enhance safety by reducing the current incentives to avoid north/south operations.

Transport Canada has not identified the specific amount of additional north/south capacity that is required, the potential costs and benefits of matching north/south capacity to east/west capacity, nor the possible effects construction of the proposed north/south runway would have on flow control procedures. However, the Panel considers that east/west and north/south capacity should be made as nearly equal as possible, and that this consideration should be given substantial weight in the selection of the design and location of a north/south runway.

Transport Canada and its supporters argue that additional runway capacity is required immediately. The Panel agrees that as demand increases the need to correct the directional capacity imbalance becomes more pressing. The Panel further suggests that once the directional capacity imbalance is minimized, any re-establishment of such imbalance resulting from future development of LBPIA would be undesirable.

4.5.4 The Options

The three north/south parallel runway options that were considered by Transport Canada included a closely-spaced medium-length runway, a semi-independent medium-length runway, and a more widely-spaced independent full-length runway. Transport Canada settled on the semi-independent medium-length runway, detailed in Section 2.4.2.

In an early stage of developing runway options, Transport Canada evaluated short runways in a generic sense, but rejected them from further consideration except perhaps in an east/west direction. The Panel suggests, for reasons indicated below, that such rejection was premature; that a short north/south runway option should have been developed and analyzed. During the course of the hearings and in response to a request from the panel, Transport Canada provided information -to the extent feasible in the limited amount of time available -on a short north/south runway. The Panel's review

of north/south runway options therefore included a total of four possibilities.

In its review of the north/south runway options, the Panel agrees with Transport Canada's conclusion that the closely-spaced parallel runway is not an attractive alternative; it would not provide an increase in capacity sufficient to justify the cost. The Panel also agrees with the proponent's rejection of the independent full-length option: Despite the potential alleviation of capacity imbalance, the Panel concluded that the associated noise impact in the surrounding neighbourhoods would be unacceptable.

The option proposed by Transport Canada, the semi-independent medium-length runway, requires a more detailed consideration. Its improvement in capacity from 50 to 70 hourly movements falls between the capacity of the closely-spaced parallels and the capacity of the more widely-spaced independent parallels. This increase of 20 movements would produce a reduction in prospective directional imbalance, represented by the difference between 96 east/west and 50 north/south movements -about 45%. This figure appears relatively encouraging.

Upon examination, however, its contribution to resolving the problem of potential traffic disruption is less satisfactory. This potential is at present represented by the difference between the east/west capacity of 82 hourly movements and the north/south capacity of 50 movements, meaning that 32 scheduled flights cannot be accommodated when operations must switch to the north/south direction during peak periods. Transport Canada's proposal would increase the north/south figure to 70, but by then (approximately 1996), assuming all key elements of the base case have been implemented, the enhanced east/west capacity would provide for 96 scheduled hourly movements in peak periods. Thus, if no new north/south capacity is provided, up to 46 scheduled movements would be disrupted. The Transport Canada proposal would reduce this figure of 46 to 26, a reduction of 20 movements, or 43% in the number of movements, subject to disruption. However, in terms of increased capacity, from 50 to 70, comparing these two capacity figures with the east/west capacity of 96, the additional 20 movements per hour provided by the Transport Canada proposal represents a mere 21% improvement in the directional imbalance. Furthermore the unaccommodated flights would still be lowest priority under flow control procedures, i.e., those serving spoke communities.

Rockwood Village, Orchard Park and Markland Woods residential communities lying on the southward extension of Transport Canada's proposed north/south runway, are not now exposed to high levels of aircraft noise. Because of the infrequent use foreseen for it, the proposed new runway would not create a high Noise Exposure Forecast (NEF) contour for this area; but when used, the resulting noise impact expressed in Sound Exposure Level (SEL) units would be significant. Understandably, Transport Canada's proposal is vigorously opposed by a substantial proportion of the local residents affected, indignant because governments at all levels have promised repeatedly that their area would be safeguarded from major noise increases.

Considering this community opposition to the project, its considerable cost, and its modest reduction in traffic disruption potential, the Panel does not regard the Transport Canada north/south runway proposal as an acceptable solution to the problem of directional imbalance. In the Panel's view, this option should not be pursued further.

Before a possible alternative is discussed, it should be noted that on the basis of current experiments in the United States, it may become acceptable to operate Transport Canada's proposed north/south runway in a fully independent mode. This could significantly increase its capacity, especially if its length were extended by 300 or 450 metres (1000 or 1500 feet). These capacity improvements, however, would be accompanied by corresponding increases in noise generation. In the extreme case, if the capacity of Transport Canada's proposed north/south runway matched the capacity of the present north/south runway, it would produce the same noise levels as those which originally precluded consideration of Transport Canada's fully independent north/south runway option.

The Panel expects that, if the proposed north/south runway is constructed, pressures to expand its capacity will eventually prevail, with the accompanying unacceptable consequences for surrounding communities. This is a further argument against the semi-independent north/south parallel runway option.

4.5.5 A Possible Improvement

The Panel's objection to Transport Canada's north/south preferred option leaves the matter unresolved. If no new north/south runway capacity is added, the disruptive conditions that characterize use of flow control at LBPIA will not only continue, but will increase. This would be an unacceptable situation.

Two possible solutions present themselves. The first is to proceed immediately to the second phase of this environmental assessment review -the phase intended to address long term strategies for Southern Ontario's air transportation requirements. The schedule for longer-term Southern Ontario airport Initiatives could and should be accelerated. This would not solve the north/south runway capacity problem in the immediate future, but it would establish a limit on its duration.

An alternative solution may lie in the fourth north/south runway option mentioned above, the short fully-independent parallel runway used for both arrivals and departures. This option considers a parallel runway located **1310** metres (4300 feet) west of the existing runway 15-33. Other things being equal, the two runways could operate independently, as the existing east/west runways do now. Setting aside for the moment qualifications relating to the length of the new runway which are discussed below, such an option would provide a north/south runway pair with the same combined capacity as the east/west pair and the directional capacity imbalance would be eliminated.

Transport Canada's primary reason for rejecting short runways as an option for LBPIA is that they are, by virtue of their

restricted length, capable of serving only a portion of the aircraft that use the airport -the smaller aircraft. This is a significant limitation. In the absence of special considerations, the Panel could accept Transport Canada's rejection of short runways for an airport such as LBPIA. However, after close study the Panel realized that those same limitations that Transport Canada judged as prohibitive features would not necessarily be unfavourable in the particular circumstances of additional north/south runway capacity needs at LBPIA. They could, in fact, have off-setting benefits.

The two primary limiting criteria, runway capacity and community reaction, that have been applied to those north/south runway options originally considered by Transport Canada must be applied to a short fully-independent runway option. The capacity considerations will be addressed first.

The nominal hourly VMC capacity of a pair of independent parallel runways is 96 movements. In the case of the particular north/south runway pair in question, however, there are two significant restrictions on this capacity that must be considered. The first restriction involves the aircraft mix at LBPIA, and in particular the inability of the short runway to accommodate all aircraft. But the potential advantage of the short runway lies in precisely this limitation -its use is restricted to the smaller commuter and general aviation aircraft, which are also the quieter planes. In this scenario, all large aircraft would be assigned to the existing runway 15-33. To maximize capacity, all suitable smaller aircraft would be directed to the short runway.

Transport Canada estimates the number of smaller aircraft that would be able to use a short runway as approximately 35-40% of the total hourly movements at LBPIA, or approximately 36 movements per hour during peak hours. The peak period usage pattern of this north/south pair would thus include 50 movements of the larger aircraft on the existing runway and 36 movements of the smaller aircraft on the new short runway -a total of 86 movements per hour. Under these circumstances, some excess capacity would remain unused on the short runway.

However, there is an additional restriction: Aircraft would be assigned to either the left or right of the two parallel runways based on size rather than on origin or destination. During periods when traffic volume required use of both parallel runways, aircraft would have to cross in the air prior to approach and after takeoff. Assuming that safe crossings are feasible, virtually all of the additional capacity afforded by the short runway would be achieved.

In the EIS, Transport Canada did not consider this option. Therefore, the Panel cannot assess the operational implications of directing aircraft to specific runways according to size or of crossing aircraft when they are aloft. However, the discussion provided in the supporting documents to the EIS indicates that crossing aircraft on arrival is not difficult and does not limit capacity. The potential problem, therefore, appears to be present only with respect to departures. The key question is whether crossings on departure can be accomplished without compromising safety.

Finally, if crossing has to occur outside the Toronto Terminal Area in order to be accomplished safely, this will force extra air miles on aircraft that must cross. While the Panel recognizes that extra air miles involve extra costs, it anticipates that the cost of the extra miles to both airlines and passengers would be less than the cost of flight delays, diversions, and cancellations.

Above all other considerations, aviation safety is the highest priority. All crossings must be accomplished without the slightest compromise in safety. This might require crossings at some distance from LBPIA and modification of airways in the vicinity of the airport. It may also require additional ATC positions.

These issues would have to be analyzed in detail through simulation and safety review prior to proceeding with construction of a short parallel north/south runway. However, if safe and effective solutions can be found, the additional capacity benefit relative to the only acceptable alternative-continuing north/south operations with only the existing runway -would be well worth the increased cost of staffing and flying miles.

Even with the short independent parallel runway, total north/south capacity would not match total east/west capacity. Therefore, some disruptions during periods when operations were relegated to the north/south runway system would continue. However, only 10 movements per hour would be curtailed-the difference between the potential east/west capacity of 96 and a projected north/south capacity of 86. This is a manageable level that compares very favourably with the 26 curtailed movements under the Transport Canada proposal.

Moreover, any residual disruption would be of a different nature. Fewer aircraft would be affected, meaning that the cascading disruption would be dampened; and only larger aircraft would be disrupted, because there would be extra capacity to accommodate smaller aircraft. This means that disruptions would affect larger cities such as Ottawa and Montreal. These disruptions would be more tolerable because these centres are served by larger aircraft, more frequent flights, and more choice of routes than the spoke communities. No flights served by smaller aircraft would be affected: service to the spoke communities would continue uninterrupted throughout periods of north/south runway operation.

In summary, when the base case improvements have been implemented and the LBPIA hourly cap has been raised to 96 movements per hour, the comparison from a capacity perspective is simple and compelling: with no new north/south runway, the VMC capacity during periods when wind and runway surface conditions require use of the north/south direction would fall from 96 to 50 movements -46 flights per hour would be subject to disruption. With Transport Canada's proposed north/south runway which the panel considers environmentally unacceptable, the VMC capacity would fall from 96 to 70 movements -26 flights per hour would be subject to disruption. With a short independent north/south runway, and the assumption that 35-40% of all aircraft in the LBPIA fleet mix could use it, the VMC capacity would fall from 96 to 86

movements -only 10 flights per hour would be subject to disruption.

Given that other potential north/south solutions are not acceptable, the short runway option therefore recommends itself, provided that the crossing problem can be safely and satisfactorily solved and that effects on surrounding communities are acceptable.

The question of effects on surrounding communities is primarily one of aircraft noise. The parameters of the noise issue have already been discussed in previous sections and various appendices. To be considered as a resolution to LBPIA's runway capacity problem, a short north/south parallel, located 1310 metres (4300 feet) west of the existing runway 15-33, must be acceptable within these parameters.

A short north/south runway would be used just as frequently-approximately 5% of the operating hours -as a medium-length north/south runway. However, the frequency of flights over individual locations would differ significantly because of differences in location and in capacity of the two runways; and because one would be used for arrivals only, the other for both arrivals and departures.

As north/south operations occur for such a small proportion of the time, these differences are less important than the fact that overflights using the short runway would be by small commuter and general aviation aircraft. The noise produced by such aircraft, whether turbo-prop or jet-powered, is significantly less than that produced by larger jet aircraft, either Stage 2 or Stage 3, particularly on departure. The Panel considers that, while these smaller aircraft would certainly be audible in residential areas during their overflights, their noise levels would not cause problems as serious as those associated with the larger aircraft.

An additional consideration is the effect of independent parallel north/south runway operations on the "noise abatement jog" that has been built into the current standard departure routing for 33R runway. The first phase of this jog requires departing aircraft to initially turn left to avoid the Malton community. This would put aircraft departing from the existing 33R in conflict with aircraft departing from the 33L. The jog would therefore have to be discontinued, and departing aircraft would have to take a straight-out path until intercepting, and turning right along, the 337 radial of the Toronto Visual Omni Range (VOR). These aircraft would therefore fly closer to Malton than is currently the case. The noise abatement component of this procedure in so far as it affects eastern Brampton would continue unaffected.

In essence, the elimination of the noise abatement jog would route departing aircraft closer to Malton than they are at present. This would result in an increase in the noise created by each Runway 33R departure in a community already affected by operations on the existing Runway 06L-24R. The Panel believes that this relative impact would be significantly less than that which would be experienced by communities to the north and south of LBPIA if the Transport Canada proposal were implemented. However, if possible, any such noise increase should be avoided.

On balance, the Panel finds that the noise level increase due to a short north/south parallel runway, although affecting some communities, would not be severe or widespread. This short runway option appears to be the most acceptable method of adding essential north/south capacity to LBPIA. The Panel is agreed that Transport Canada should pursue a detailed examination of its operational and safety characteristics.

A critical requirement of this option is that the runway length be strictly limited, so that only those aircraft that create a low and narrowly-defined noise level would be capable of using the runway. To this end, the runway should be located to the north end of the field, so that its north and south thresholds are approximately equidistant from the residential communities located along its centreline in Brampton and Mississauga.

Its length would ensure that its use would be limited to commuter and lighter general aviation aircraft, and to aircraft meeting restrictive noise standards based on their SEL noise footprint.

For the proposed short runway, as for the semi-independent parallel, a similar possibility would exist of increasing capacity in future by increasing its length and the frequency with which it was used. Scepticism about assurances that it would not at some future time be lengthened to accommodate larger and therefore noisier aircraft might make it more difficult to persuade neighbouring communities that the concept is acceptable. Such suspicions might be eased if a device could be found which would make it impossible, or at least extremely difficult, to consider possible future runway extension. For example, the "barrier strip" scheme was used to stop the Spadina Expressway Extension in Toronto.

In the event that Transport Canada finds that it would not be possible to safely operate the Panel's suggested north/south short runway as an independent parallel, then the Panel reiterates that no other north/south runway option is acceptable. The Panel would, under these circumstances, conclude that no new north/south runway should be built at LBPIA, and that efforts should be made to accelerate the Phase II long-range planning process.

4.6 EAST/WEST CAPACITY

4.6.1 The Demand Prospect

As previously noted, demand management procedures restrict traffic to LBPIA's current effective east/west capacity of 82 hourly movements. Implementation of base case improvements, especially those planned for ATC, will no doubt lead to further increases in effective capacity over the next few years. The maximum east/west capacity of 96 movements per hour accompanied by corresponding gains in efficiency will be attained, according to the EIS, by 1996; to meet this target will require that the various projects are vigorously pressed forward.

Although current demand management procedures do restrict traffic movement, the Panel perceived that these are tacitly considered, except by general aviation representatives, to be

no more than a minor issue. Essentially, supporters of runway expansion are concerned about future problems, which would be caused by anticipated increases in demand. Perhaps the most fundamental task facing this Panel is assessment of how soon LBPIA traffic demand will reach a level that cannot be accommodated by the present east/west runway system, resulting in serious congestion problems. The critical comparison is between the hourly demand for aircraft movements and the hourly runway capacity.

The forecasts of future demand presented in the EIS reflect data collected up to 1989, and do not represent the effects of the ongoing recession. In April of 1992, Transport Canada released new estimates, based on more recent data, which significantly lower the forecast for traffic levels. A more definitive update will become available by November of 1992. As no clear evidence of economic recovery has emerged since the April release, it will not be surprising if the November forecast projects an even longer delay before traffic growth reaches levels projected in the EIS.

Capacity figures in the EIS for the base case and the proposed quad system of four east/west runways, and respective dates at which anticipated traffic growth could be adequately accommodated by each of these two scenarios, appear to the Panel to involve certain discrepancies. These points are not significant, however, in the context of ongoing revisions of traffic demand forecasts.

On the basis of Transport Canada's April forecast, the level of passenger travel demand at LBPIA originally predicted in the EIS for the year 1996 and beyond will not be achieved until several years later. If the low forecasts in the April update are adopted as more likely than the medium forecasts-considering the duration of the recession and the apparently very slow recovery -the deferral in demand is extended even more. Translating these passenger demand estimates into aircraft movements reveals that the existing runways, assuming full implementation of the base case improvements, should have sufficient capacity to serve aircraft movement demand until 2001 or later.

By definition these estimates involve some degree of uncertainty; and the longer the time scale, the greater the uncertainty. However, the foregoing analysis should not substantially overestimate the interval before a real need for additional east/west capacity arises. On this assumption, the Panel believes that a decision on the construction of any new east/west runways can safely be deferred. The reasons for deferral are outlined below in Section 4.6.3.

The Panel is confident that speedy implementation of the planned base case improvements to the present runway system will provide adequate service into the next decade. However, if the economy recovers more rapidly than now anticipated, resulting in increased traffic demand at LBPIA, that will surely become evident by the mid-1990s. There would still be sufficient time to initiate suitable measures before the problem became acute. There might be a period of inconvenience before those measures came into full effect, but this would scarcely be of major proportions.

Furthermore, the Panel regards the EIS projection of the extent of congestion resulting from the continuation of the base case as unduly pessimistic -at least over the short-run. If demand put growing pressure on the base case capacity of 96 movements per hour, adjustments resulting from market forces would probably offset the more severe consequences. For example, rather than accept chronic delays or the dispersion of flight schedules to inconvenient time slots, airlines would probably reduce demand for runway slots by scheduling fewer flights but with larger aircraft. This process would discourage diversion to late night hours of scheduled passenger flights because the practice is unpopular with passengers as well as residents -at such hours, seats would be difficult to market. A trend towards larger aircraft, permitting the movement of more passengers by the same number of flights, is already apparent for other reasons. It would certainly be encouraged by the possible re-emergence of congestion problems.

In the background documents to the EIS, Transport Canada expresses similar views regarding probable airline and passenger reaction to any recurrence of congestion difficulties. Apparently, the Panel and Transport Canada agree that the effects of growing traffic pressure on LBPIA's runway capacity would not be as severe or as sudden as suggested in the EIS. As noted elsewhere, this has relevance for the cost/benefit analysis cited by Transport Canada.

Finally, several intervenors attest to a perception by business travellers of chronic and severe congestion at LPBIA. The Panel does not believe that current conditions support such a perception. It may reflect memories of the severe congestion of the late 1980s, kept alive by occasional current disruptions. Current disruptions are frequently caused by restrictions on runway use owing to crosswind or other weather conditions, problems of maintenance or equipment serviceability, difficulties in ATC labour relations, or other factors that have nothing to do with the normal operating capacity of the runway system.

4.6.2 Alternatives

In the EIS and its supplements, Transport Canada produced a comprehensive analysis of possible alternatives to runway expansion at LBPIA, described in Section 2.3. These alternatives include using price mechanisms to reduce traffic demand, limiting access to LBPIA, diverting traffic to other airports, and constructing a new airport in the Toronto area.

Transport Canada concludes that none of these alternatives, either individually or in combination, are capable of providing additional capacity soon enough to meet the shortage that might emerge as early as 1996, according to the EIS. It does however acknowledge that several of these alternatives might be considered subsequently, if additional capacity is required at a later date.

The Panel agrees that the construction of additional runway capacity at LBPIA would be the only way of meeting the requirement, if it was necessary to provide capacity beyond that of the base case by 1996. However, current demand forecasts show no need for such additional capacity until a

number of years later. Therefore, the Panel is satisfied that the further development of LBPIA's overall capacity, together with the alternatives mentioned and perhaps others, should be considered within the broader context of an airport Master Plan for Southern Ontario.

4.6.3 Reasons for Deferral

The Panel accepted three persuasive reasons for deferring a decision on the construction of additional east/west runway capacity at LBPIA at this time.

First, deferral would permit any such decision to be made in the context of Transport Canada's long term plan for the development of aviation facilities in Southern Ontario. The framework provided by a broad, long-term plan would clearly offer a more solid basis for this decision than is available at present. That plan must consider a number of possible ways to provide the additional capacity that will be needed in the longer term to satisfactorily serve the Toronto market. One or more of those options, seen in that broader context, could well prove preferable to the proposed creation of a quad runway configuration at LBPIA.

Secondly, any increase of east/west runway capacity at LBPIA would certainly perpetuate, if not increase, the present directional imbalance in the airport's runway capacity. This imbalance causes real problems which will increase as traffic grows. Therefore, any provision for future traffic growth should aim to reduce, or at least not increase, the present problems. This is a cogent reason for careful consideration of all possible alternatives.

Finally, while the construction of additional east/west runway capacity at LBPIA may become necessary eventually, it is clearly not necessary now. To proceed with construction now, despite the vigorous opposition by many local residents, would confirm their opinion that their legitimate interests and concerns will continue to be ignored. Thus it would further aggravate an already serious social problem.

These important considerations suggest that it would be irresponsible to dismiss this opportunity. Deferment of an immediate decision on construction of additional east/west runways will allow time for determination of the best balance among the various objectives while providing the necessary traffic capacity at LBPIA. It is within this context that the proposed quad configuration for the provision of additional east/west capacity should be addressed. As the Panel found no necessity for a decision at this time with regard to such additional capacity, it has not reached any conclusion on the merits of that particular proposal for increasing east/west capacity.

4.7 NOISE IMPACTS

4.7.1 Noise Metrics (NEF and SEL Contours)

Throughout the hearings there was frequent reference to the NEF metric, defined in Section 2.6, and to its advantages and shortcomings in fulfilling its twofold function of relating noise levels to community annoyance and to compatible land use planning. Likewise, there were many references to SELs and

their frequency of occurrence, in relation to the LBPIA noise regime. From the discussions on relevant aspects of these two metrics, involving technical specialists and stakeholders, a number of features of the two emerged. A summary of the Panel's perception of these features is provided in Appendix 17.

Noise Metrics — The Panel's Analysis

The Panel concludes that the NEF metric, despite its shortcomings, has no suitable replacement as a single measure of the noise regime around LBPIA. An exception may be the L_{dn} ("Day-Night Noise Level") metric. The L_{dn} might be an adequate means of direct measurement at noise monitoring terminals around LBPIA, but it would be an unfamiliar metric to the municipalities around LBPIA that now use the NEF for compatible land use planning.

The Panel also notes that the NEF metric does have its own shortcomings. Specifically, NEF contours calculated for communities experiencing infrequent overflights cannot be interpreted for municipal planning purposes in the same way as NEF contours calculated for communities that experience frequent overflights. Because NEF contours are representative of a "total dose" of noise, their normal application to the north/south runway situation at LBPIA will result in an underestimate of the effects of infrequent overflights. The best evidence of this tendency is Transport Canada's NEF contours for the proposed LBPIA expansion indicating that the midpoint of the proposed new north/south runway would be a suitable and acceptable location for a residential development, from an NEF noise perspective.

The Panel finds that the SEL analysis provided by Transport Canada leads to three distinct conclusions about the present and the future noise regime around LBPIA:

- (1) There is little difference-of the order of 5 dBA ("Decibels, A-weighted") in L_{max} ("Maximum Sound Level") or SEL -between approach noise produced by Stage 2 and by Stage 3 aircraft. Thus, residents now affected by noise produced during approach will not greatly benefit by the gradual change over from Stage 2 to Stage 3 aircraft in the LBPIA fleet if it is accompanied by an increase in the number of aircraft approach movements.
- (2) An examination of the SEL departure noise footprints reveals that, except for the larger Stage 3 aircraft such as the 8747, changing the fleet mix from Stage 2 to Stage 3 will lead to dramatic reductions in aircraft departure noise, which is likely to more than offset the impact on NEF values of increased frequency of departure movements. This will be to the greater benefit of communities to the west of LBPIA because the majority of departures are westbound.
- (3) Aircraft take-off noise intrusions are experienced by residents of areas outside the 25 NEF contour. They will perceive no significant reduction in the frequency of such intrusions until the noisier Stage 2 aircraft, such as the 8727 or the DC9, are replaced by the quieter Stage 3 aircraft now entering the airline fleets.

4.7.2 Noise profiles (NEF Contours)

The Panel's first realization of the LBPIA noise problem occurred at the scoping sessions, held in April 1990 to assist the preparation of the EIS guidelines. At that time it became clear that aircraft noise around LBPIA had reached a level that was now intolerable for many area residents. The views expressed by many area residents at that time were expressed even more forcefully at the hearings.

Despite a full appreciation of residents' perception of the noise problem, the Panel believes that the NEF profiles presented by the proponent and detailed in Section 2.6.4.2 represent the most likely future noise regime around LBPIA along the east/west runway centrelines. This is because the profiles reflect the accepted basic data for aircraft movement forecasts and related operational scenarios and runway usage. The Panel therefore accepts the analysis as one valid description of the future LBPIA noise regime for both the base case and the proposed project, subject to the previous caution concerning the interpretation of the contours in the north/south direction and on Transport Canada's assumption concerning the timing of the conversion to Stage 3. It appears that any incremental noise changes in areas around LBPIA, whether increases or decreases, will probably be less than significant. However, this cannot be actually confirmed until the actual event-5 10, or 20 years in the future.

In other words, unless no increase in aircraft movements is allowed, the future noise regime -as depicted by the NEF contours produced by Transport Canada for 1996, 2001 and 2011 -will be essentially the same for both the base case and the proposed six-runway scenario. Changes in NEF contours will be relatively insignificant, with conversion to stage 3 aircraft being more or less offset, in terms of noise generated, by the gradual increase in the frequency in aircraft movements. Thus, it appears inevitable that, regardless of whether the proposed new runways are built, a noise regime which many residents already describe as intolerable will continue unabated. For some areas, it will actually become more intrusive.

The above discussion of the LBPIA noise environment, and the Panel's conclusions therein, relate only to the NEF contours associated with the east/west runways-base case or quad -together with those contours resulting from runway 33R usage. No NEF contours were developed by Transport Canada for aircraft usage and noise associated with the proposed runway 33L.

4.7.3 Noise Impact of a New North/South Runway

Prior to the Panel's request for additional information following release of the EIS, it was clear that Transport Canada considered the 5% north/south impact so small compared with the east/west 95% impact that it could be dismissed entirely. The two Transport Canada reports that followed on January 23, 1992 were designed to illustrate the magnitude of the noise impact, albeit for only 5% of the time.

Before January 23, 1992, a detailed report was publicly available, describing the extent of weather-mandated use of the north/south runway. This is the report on which the 5%

probability of north/south weather-mandated usage is based. Its intent was not for consideration of noise impacts, but rather for justification of the cost benefit analysis of constructing a north/south runway.

As the 5% probability did not receive any scrutiny at the hearings, the Panel decided to explore possible variations in the probability of north/south runway usage, and to suggest how any such variation could affect the noise and consequent community annoyance.

The Panel's analysis of these variations is outlined in Appendix 18: "Probability of variation in north/south runway usage and the effect on noise impacts". From this analysis, conclusions on noise impacts south of the proposed 33L can be drawn:

1. The 5% annual probability of weather-mandated use of the north/south runway system varies by season, from near 0% in the summer months to a high of 8% in the colder winter and spring months. Noise impact for the proposed 33L would therefore exhibit the same seasonal variations.
2. Diurnal variations and consequent noise variations would reflect the policy of no usage during the night hours of 2300 hrs. to 0700 hrs., while actual daytime usage would be greatest between 0900 hrs. and 1500 hrs. and lowest in the evening hours.
3. With the present LBPIA fleet mix of Stage 2 and Stage 3 aircraft using the proposed 33L for landings, there would be about 35 noise intrusions per hour, creating average L_{max} outdoor noise ranging from 82.4 dBA at homes nearest the 33L threshold to 74.8 dBA at Lakeshore Blvd. Indoors, these average L_{max} values would be reduced by 20 dBA, with closed windows, or by 10 dBA, with open windows. These values would be further reduced by about 5 dBA if only quieter aircraft such as the Dash 8 used the runway. This reduction could well be the case, as a minimum, if the recommended short runway discussed in Section 4.5.5 above is implemented.
4. The expected noise regime south of Transport Canada's proposed 33L would be better than that now experienced by residents south of 33R, for two reasons: First, there would be no night-time usage-weather-mandated use would be confined to 33R, as is the case now-and with usage restricted to landings, roll-back noise -confined to take-offs on 33R—would be no worse south of the proposed 33L than it is now.
5. The noise impact of the Panel's suggested short runway would be less than that of Transport Canada's proposed 33L due to the threshold location and its use by quieter aircraft.

It appears, overall, that:

- a) the areas affected by either of the proposed new north/south runways are exposed now to LBPIA aircraft

noise, albeit at a relatively low NEF level, and thus the noise introduced would be incremental in nature; and

- b) in light of commitments by Transport Canada regarding night-time use, and the reduced probability-well below the accepted 5%—of any new noise impacts at times of the year, and of the day, when most outdoor activities take place, the noise impact of Transport Canada's proposed new north/south runway would at those times be only a relatively minor increment to the existing noise regime in the area of its southern projection. This would probably also be the case for the Panel's proposed runway-but, with the aforementioned minor increment, would be reduced even more.

4.8 NOISE AND HEALTH

As stated in Section 2.65, the World Health Organization broadly defines health as "the total social, physiological and psychological well-being of the individual." Under such a definition, all categories of the effects of noise on people -from clinically measured physiological effects to behavioral changes -can be considered health effects. In order to assess the particular effect of exposure to a given noise, a relationship between the dose and the response must be established. Isolated observations or subjective opinions concerning the effects of noise, even though they may represent real events, cannot be used to establish dose-response relationships. And without dose-response relationships, reliable criteria for determining acceptable exposure levels cannot be set.

4.8.1 The Effects of Noise on Health

Auditory Health Effects

Measurable noise-related auditory damage occurs at rather high levels of sound. The Panel agrees with statements in the EIS and report #26- *The Effects of Noise on People*, and those submitted by independent experts, that the risk of hearing loss to the general public due to normal airport activities is extremely remote. Therefore no more reference will be made to this specific health effect.

Non-auditory Health Effects

The Panel heard a psychologist, an audiologist, medical doctors, medical researchers, and community workers during presentations regarding non-auditory health effects. In contrast to Transport Canada's position, most of these presenters considered aircraft noise as a potential cause of such conditions as fetal abnormalities, cardiovascular disease, gastric ulcers, and mental illness at levels of noise exposure lower than those which affect hearing. While these presenters stressed that evidence for noise related non-auditory effects should be regarded as sufficiently strong to require consideration by the Panel, none could provide a quantitative method for assessing such effects. The proponent's conclusion concerning non-auditory health effects is stated in Section 2.6.5.

The Panel affirms that despite the absence of unequivocal evidence that illness of the types described above can be

caused by noise, this possibility cannot be dismissed. As report #26 acknowledges, these types of illnesses are often stress-related syndromes and can be caused by a complex interaction of many factors. The Panel notes however, that, as Dr. S. Martin Taylor, the Panel's consultant, stated in his assessment of the EIS: "Using behavioral effects as primary assessment criteria is a more conservative approach which can be assumed to be protective of any possible non-auditory effects." The Panel therefore sees no need to discuss any further the evidence for or against the potential for non-auditory health effects related to LBPIA.

Behavioral Effects

The Panel concludes that protection of the public from health effects-that is, health in the broadest sense -can be accomplished by addressing three primary indicators of behavioral effects of noise: Interference with speech, interference with sleep, and annoyance. This can be accomplished because the criteria selected are not only the most reliable, but also the most conservative, or cautious, measures of the effects of noise on people. These effects have been examined in experimental and in survey studies.

4.8.2 Noise sensitivity

There are well-established standards and guidelines for health protection from noise in the workplace, and many local by-laws restrict noise produced within neighbourhoods. But there are no Canadian standards or regulations to protect people-or any other organisms, for that matter -from the effects of involuntary exposure to aircraft noise. The Panel is unaware of regulations addressing this issue in other countries. Therefore assessment is normally made on a case-by-case basis.

The March 1989 publication, *National guidelines for Environmental Noise Control: Procedures and concepts for the drafting of environmental noise regulations/by-laws in Canada*, stated that:

The experience of...many Canadian cities and municipalities is that unwanted sound, or noise, is one of North America's most widespread nuisances. Noise is more than just a nuisance since it constitutes a real and present danger to people's health.... People appear to adjust to noise by ignoring it but the ear, in fact, never closes....Jet aircraft are probably the noisiest single sources of noise in the environment.

These statements from Health and Welfare Canada indicate the federal government's recognition of the need to protect human populations from adverse effects of aircraft noise as well as other noise.

But the public should also be protected from unnecessary regulation and from irresponsible litigation. In order to meet all of these requirements, specific adverse effects need to be directly related to measurable amounts of noise. Assessment of such effects on humans may begin with relevant information found in standards and guidelines for noise in the workplace, both Canadian and those of other countries.

Use of Criteria for Noise Effects and Factors which Relate to Assessment of Effects.

Once a clear dose-response relationship between noise exposure and behavioral effect has been demonstrated, a threshold or level must be established above which protection is required. For example, once a certain percentage of the population is affected, then the criterion for implementation of protective measures has been met.

Transport Canada acknowledges complexities in the possible human reactions to living in a noise environment that changes from day to day, from day to night, and from one location to another during the day. Transport Canada also acknowledges that there are particularly sensitive subgroups of the population who are objectively and subjectively more likely to suffer from exposure to noise. Therefore, in addition to identifying the threshold for average people, or the statistical relationship between a population and a noise exposure, special groups of people are considered and means for their protection are addressed.

Transport Canada's own consultants consider that noise assessment criteria should respond to the lowest valid levels,

...so that the public will be protected from all adverse effects. In the case of airport operations, this approach concludes that the assessment guidelines are to be based primarily on activity interference, namely protecting speech communication and sleep, and on the minimising of adverse community reaction.

Interference with Speech and Interference with Sleep

Transport Canada has stated that speech intelligibility of close to 100% would be desirable in home and school settings, but points out that:

...application of such a severe criterion would imply that measures should be in place to also control noise from alternative noise sources...[I]t was found in school measurement surveys in the vicinity of LBPIA that ambient levels (excluding aircraft noise) inside several schools, with windows open, were close to or higher than an $L_{eq(1)}$ of 45 dBA.

The proponent identified an L_{dn} limit of 45 dBA for indoor communication and suggested a 44 dBA limit for sleep interference with a 2% probability of waking as detailed in Appendix 13. With greater certainty of the threshold for speech interference than for sleep interference, the Panel is in agreement that the more reliable criteria are for speech protection.

Annoyance

The EIS proposes the use of the modified Schultz curve, described in detail in Appendix 13. This relationship between noise and annoyance shows that 5% of the people in a given community are highly annoyed at L_{dn} 50 dBA, and allowing for confidence limits around 5 dBA, the threshold for annoyance is set at L_{dn} 45 dBA. The Panel supports the use of the shifted Schultz curve and is satisfied that the threshold for "highly annoyed" furthermore provides a criterion sufficient to protect against speech interference.

However the Schultz curve was based on surveys, while the proponent is using it to predict the effect of changes in the noise regime on the percentage of annoyed people and on increased annoyance in various exposed neighbourhoods. The Panel's consultant Martin Taylor pointed out a problem with this use: "What we are forced to do is to draw inferences about the impacts of noise from those response relationships which are based on studies that have nothing to do with change."

In addition to this reservation, the Panel cautions that confidence in the calculation of the number of people annoyed by a sound regime depends upon two other factors as well, the dependability of the shifted Schultz curve as a predictor of annoyance and the dependability of Transport Canada's noise exposure estimates. At the present time, no better methods are available for assessing the numbers of affected people, and therefore, as stated above, the Panel supports this approach. For the future however, Transport Canada should responsibly review new scientific information as well as scientific reviews on noise and health. If new evidence indicates that a more conservative threshold is required, Transport Canada should modify its criteria accordingly.

Vulnerable Populations and Individuals

Certain institutions including schools, nursing homes, and hospitals have been identified as sensitive by the proponent. In the Panel's opinion, it is more straightforward to protect these special populations than to identify and protect vulnerable individuals, since the institutions are geographically identifiable. Among these institutions, there is a potential noise problem for inadequately insulated buildings that already exist, such as older structures or portable classrooms.

The proponent assumes that unusually vulnerable or noise-sensitive individuals are included in the social surveys that made up the Schultz relationship. Therefore, their needs would be accounted for in the assessment of annoyance. The Panel is in general agreement with this conclusion. However, in agreeing, the Panel does not preclude giving special consideration to extremely vulnerable individuals.

The Panel agrees that the criterion of L_{dn} 45 dBA, for indoor noise based upon 100% speech communication, is conservative and sufficient to protect the very young schoolchild from speech interference. The Panel agrees with Transport Canada that when only a few operations contribute to L_{dn} the maximum sound level within most schools for a typical overflight should not exceed the hourly L_{eq} by more than 15 dBA.

When speech communication is part of structured outdoor school activity, the same criteria apply as for indoor sound levels in schools. Clearly some existing schools already fall short of this requirement.

Considerable evidence was brought before the Panel by various school boards, students and parents, to document the current situation, which is far from acceptable in some locations.

The Panel agrees with Transport Canada's suggestion for hospitals and nursing homes of a 2% awakening from sleep

criterion, with an indoor-outdoor reduction 10 dBA greater than for other types of structures. The Panel notes that, contrary to the situation of the schools, little comment was made or evidence presented that airport operations were affecting residents of hospitals and nursing homes.

It is clear to the Panel that, in planning for new facilities, some combination of specialized structural properties and choice of location with respect to noise levels can address the noise environment for the special institutions. Where existing situations are unsatisfactory according to these criteria, sound insulation or other measures will be necessary.

4.9 SOCIAL ISSUES

4.9.1 Quality of Residential Life

The development of a major project, whether the expansion of an existing facility or the construction of a new facility, may affect the way people in a community live, work, entertain, and interact with one another on a daily basis. Such development has a bearing on the quality of life of those people. In this report, the Panel uses the term "quality of life" to mean the ability of people in the vicinity of the airport to conduct their everyday activities without undue external interference and to utilise and enjoy the comforts of their homes and their community.

Noise Impact and Annoyance

Many of the residents in the immediate vicinity of LBPIA—particularly those in Etobicoke, Mississauga, and Brampton—are concerned about the diminished quality of life in their communities due to the effects of noise and air pollution. They are critical of the existing noise levels and are apprehensive about increased noise due to the proposed addition of runways.

The Panel heard considerable evidence, sometimes expressed in very emotional terms, about persistent noise from airport activity adversely affecting the quality of life in the area surrounding LBPIA. The general fear is of more noise from the increased traffic resulting from expansion that will bring further harm to already disturbed neighbourhoods. The Transport Canada SIA recognises that noise is significant among many factors common to urban areas that cause dissatisfaction on the part of residents. Many residents are concerned that the noise level has increased over the years. Their annoyance has increased even more because their complaints seem to be ignored—resulting in a sense of frustration and bitterness among the residents of the affected communities. Some residents fear that if nothing is done to improve the situation more residents will move, adversely affecting community cohesion and ultimately, the quality of life.

Effect on Behaviour and Attitudes

During the hearings, it became quite evident that airplane noise is most annoying when it interferes with personal conversation, telephone use, television watching, reading, thinking, relaxing, and sleeping. This annoyance causes additional stress to some individuals, and has the potential to affect their behaviour and attitudes. The quality-of-life survey conducted

by Dr. Audrey Armour, referred to in this report as Transport Canada's SIA, indicates that about 43% of households polled in Etobicoke and Mississauga expressed concern about noise and air quality effects of the proposed Airside Development Project.

A substantial proportion of those surveyed settled in their homes as long ago as 20 years or more, when airport activities were not so hectic and disrupting. Many people bought their properties because politicians promised—and local municipalities planned—that the airport would not be expanded. And many houses were not designed to dampen the effects of noise produced by modern aircraft. Some residents are especially disturbed by the intensity of vibrations—periodic eruptions of rattling windows and shaking doors—while others find the frequency of aircraft noise intrusion more disturbing.

Residents, citizens groups, local politicians, and area school boards fear that an increase in air traffic volume will make the current situation worse. Residents from certain areas claim that current noise levels are already unbearable when airplanes pass. Some students cannot study at home due to the constant aircraft noise—the only recourse is to make arrangements to study away from their own homes.

Impact on Sleep and Relaxation

Many sleeping individuals are disturbed by departures and arrivals during the night and the early morning hours. The disruption of sleep not only affects individual comforts but can have broader ramifications such as decreased work productivity and reduction in alertness. Testimony during the hearing asserted that both the frequency and the intensity of noise during the night damage the quality of life of the people living in the vicinity of LBPIA. Individuals are much more sensitive to noise during the night than in the day when background noise levels are higher.

Efforts to reduce the effect of aircraft noise include the installation of air conditioners. Constant operation of air conditioners to block aircraft noise means that residents keep their windows closed and increase their consumption of and expenditures on energy.

Impact on Outdoor Activities

Residents expressed concern about the influence of aircraft noise on social events at their homes. Some complained that they were unable to use their property for socialising during the summer months. They are very annoyed and frustrated that they cannot enjoy their backyards with family and friends due to the high level and frequently disrupting noise. The Panel agrees that such concerns are legitimate; however, by their nature, noise impacts on outdoor activities cannot be readily mitigated. Steps taken by airport operations to abate airport noise may reduce such effects to a small degree.

Transport Canada's studies assumed that in residential areas L_{dn} values above 65 dBA (30 NEF) are likely to cause speech interference inside homes and may result in sleep disruption. L_{max} values above 65 dBA will cause interference with outdoor spoken communication and would require raised voices. Also,

according to the EIS, change in the cumulative noise exposure of 2-5 dBA is generally noticeable by exposed populations and any change over 5 dBA will result in some sort of community reaction such as protests or formal complaints from residents. Transport Canada predicts that for all locations in the vicinity of LBPIA, the differences between the base case and the proposed development would be less than 3 dBA.

The Panel agrees that airport noise does influence the quality of life of the people who live near LBPIA. Both Transport Canada's EIS and the many presentations by the residents and citizens groups concur that aircraft noise does cause a significant disturbance to speech communication, to sound sleep patterns, and to outdoor activities in general resulting in a high degree of annoyance for a substantial fraction of the population.

It is also evident from the various presentations and studies available to the Panel that the present NEF metrics have some serious limitations. While the NEF contours show a generalised, average noise exposure, they do not represent the effects of single noise events. However, NEF measures do provide a useful starting point. The Schultz curves clearly show the individual nature of noise sensitivity: the same noise may completely distract one person while another person may remain completely oblivious to it.

To improve the environment around LBPIA, the Panel has considered a number of mitigation and impact management measures. The Panel attaches high priority to the establishment of a Community Liaison Committee with representatives from the affected communities. This Committee would have a role in identifying operational procedures to facilitate noise abatement, and monitor environmental conditions in the airport vicinity. Issues of local restrictions, establishment of curfews and curfew modifications and changes in operational procedures, such as queuing time, are all significant agenda items to be dealt with by this committee. Meaningful community participation, in and of itself, would ameliorate the problem of mistrust of airport officials and lessen the frustration of the residents regarding their complaints. The Committee should also make specific suggestions towards better understanding of and appropriate response to public complaints.

The Panel believes that the airport must take some responsibility for the deterioration of quality of life in neighbourhoods surrounding LBPIA that is caused by high levels of aircraft noise. The Panel feels that Transport Canada should consider development of a policy for retrofitting buildings to provide for more noise attenuation in areas that exceed 30 NEF.

Air Quality as a Social Issue

According to Transport Canada's SIA one out of every five residents is dissatisfied with air quality in their neighbourhood. A technical analysis of the issue of air quality is provided in Section 4.10.1 In that section, concerns about odours and suspended particles are also addressed. Beyond the technical concerns, however, the Panel recognizes air quality as a social issue.

The Panel is of the opinion that implementation of changes in operational procedures that can improve air quality should be addressed by a community liaison committee. The Panel also believes that implementation of regular air quality monitoring from several stations located in surrounding neighbourhoods -with the results made public on a regular and consistent basis -will contribute to a greater public understanding of the relationship between air quality and airport operations.

4.9.2 Schools

There are approximately 700 public and separate schools in the municipalities surrounding LBPIA, administered by six different school boards. Considerable evidence—presented by boards of education, school teachers, and parents—**emphasized** the impediments to day-to-day learning and teaching that are caused by noise and air pollution.

Noise Impacts

Speech communication and mental processes are the major school activities affected by noise interference. Learning requires smooth communication, uninterrupted attention, and performance of various mental tasks -all are processes that may be severely disrupted by noise. Some boards of education provided evidence that noise affects the overall learning abilities of children.

When aircraft pass over schools in the immediate vicinity of LBPIA, the noise disrupts the classroom activity for a brief interval of time -teaching must stop and start again. The cumulative effects of such interruptions include constant repetition of words, use of raised voices in normal speech communication, and overall lack of attention in the classroom. Authorities are concerned that serious disruption to normal activities go beyond the obvious interference with voice communication and interruption of concentration during teaching sessions. Distractions due to aircraft noise may interfere with students' abilities to concentrate on in-class assignments that require reading, quiet activity, and relaxed contemplation.

The Panel observes that many of these schools have portable classrooms. Most portables are not adequately sound-insulated and aircraft noise can disrupt classroom activity even when the windows are closed. According to Transport Canada, all portable classrooms measured during flypasts had sound levels which would interfere with and disrupt teaching activities. In fact, any school of standard construction, located in an area where L_{max} sound levels exceed 80 dBA, would not provide sufficient sound insulation to protect against aircraft noise.

Data from the EIS indicates that perfect intelligibility requires noise levels no higher than Ldn 45 dBA. According to the Transport Canada survey of schools, of the total 698 public and separate schools around LBPIA, only 56 are located within the 1990 25-40 NEF contours. The EIS shows that the number of schools within the various 25-40 NEF ranges will decrease after 1996, regardless of whether the proposed development goes forward.

The Panel agrees that the effect of noise greater than 30 NEF on the learning environments at the exposed schools will be

detrimental. The Panel is concerned that a good number of schools may be disturbed by the noise levels; however, many of the concerns of the Boards, parents, and teachers can be reasonably addressed through the adequate mitigation of the noise levels. The Panel attributes a certain proportion of these noise levels directly to airport activities and finds that as such, the noise levels should be mitigated to some degree by Transport Canada.

At the same time, the use of portables and the recent construction of some schools in the affected areas have been conscious decisions of the respective boards of education with full knowledge and awareness of the airport activity and consequent noise. In such cases Transport Canada should not be held fully responsible for the effects of noise on the learning environment.

Impact on Air Quality

There was also strong concern among the school boards and residents regarding the air quality of the schools located in close proximity to the airport. Children spend a part of the school time outdoors, especially during spring and autumn months.

The survey of schools indicated that odours detected at two schools nearest to the airport were locally assumed to be airport-related. However, many residents and school boards do admit that with the high volume of ground traffic near LBPIA a great deal of the pollution problem can be attributed to the highway traffic sources.

The Panel agrees that air quality problems in the LBPIA area are not specific to the schools alone, but affect the community as a whole. The Panel understands that the air quality problems are also caused by sources other than the airport, such as highway traffic and nearby industrial operations. The Panel believes that improved efficiency of operations to reduce queuing will improve the air quality around the airport and mitigate the effect on the larger community as a whole. This should adequately address the air quality concerns of the school boards around LBPIA.

4.9.3 Property Values

Comparisons between increased noise levels and decreased property values were presented to the Panel and concerns were raised that property values would depreciate considerably as a result of the increased air traffic. This would result in a loss of equity to a large number of home owners and may represent a potential loss of tax revenue to the municipality. The Rockwood Ratepayers Association presented excerpts from the Mississauga Official Plan in which that municipality assumes a direct association of noise with property values by requiring that prospective tenants and purchasers be informed of aircraft noise problems by a notice registered on the property title.

The potential loss in property value is a particular concern for people whose homes are their most significant life-time investment, considered as part of their retirement fund. Nevertheless, intensification of activities and growth in the air traffic over the past decade appear to have no detrimental effect on

residential development nor on new or resale housing prices in the higher NEF areas surrounding LBPIA.

The Panel assumes that those in the most direct flight paths and those within the 35 NEF will find that the property value for a similar residence in a quieter setting would attract a higher selling price. At the same time, the Panel assumes that when property near the airport is bought, the buyer would either perceive an opportunity or pay a price reflecting the presence of the airport. In other words, such buyers benefit by purchasing the property at a lower price than would be charged in unaffected neighbourhoods. The Panel understands, however, the perspective of those residents who will experience noise for the first time due to the proposed expansion, and accepts that the properties exposed to noise for the first time may experience some reduction in property value.

Overall the Panel is not persuaded that there will be widespread and significant adverse financial consequences from increased airport activity. The Panel believes that, if there are property value reductions, the most reasonable mitigation strategy would be to seek a reduction in the assessment of the affected property. This reduction would then be reflected in the annual property tax payments.

4.10 ECOLOGICAL AND HISTORICAL RESOURCES

4.10.1 Air Quality

LBPIA is situated in a highly urbanized region. Therefore air emissions from airport operations are in a sense diluted or masked by the already elevated concentrations of air pollutants from other sources, both stationary and mobile. This background of air pollutants also makes it difficult to measure the specific contribution of airport operations.

The EIS has addressed, through direct measurement and through modelling exercises, the major components of air pollution that are known to be related to airport operations. These studies are summarized in Section 2.7.1 The Panel considers that these approaches are appropriate, but that the assumptions and limitations of the approaches have to be acknowledged, even if they cannot be improved upon or remedied with the best available methods at the present time.

The Panel is satisfied that Transport Canada has demonstrated to the best of its ability, and satisfactorily under the inherent limitations of the approaches, that the present contribution of LBPIA to the major common air pollutants listed in the EIS is normally between 1.3 and 10%. The Panel is also satisfied, since none of the pollutants except ozone is exceeding the provincial or federal objectives, that the airport operations are not endangering the health of people or biota through airborne emissions. Ozone pollution needs to be addressed by all emitters of oxidants, including LBPIA, since it is a regional problem.

The Panel is satisfied that, with the exception of oxides of nitrogen, pollutant emissions from individual aircraft should decrease as the more efficient Stage 3 aircraft replace the present fleet. This will occur independently of new runway

construction. Clearly the over-all impact of this replacement is dependent upon the numbers of movements and the extent of delays on the ground.

The Panel notes that the assessment of air quality related to airport operations under the present conditions leaves a number of issues unresolved. Residents, as well as other presenters at the hearings, frequently mentioned the general problem of air pollution from the airport. More specific references were made to problems of air quality, including the odour of exhaust or fuel, the soiling of outdoor surfaces and clothes, and the appearance of material on the edges or surfaces of swimming pools. In no instances, however, were there any objective or scientific demonstrations that these problems were caused specifically by airport operations.

The Panel recognizes that, with the exception of jet fuel odours, all of these phenomena are common to industrialized areas. The Panel is satisfied that the airport is not now, and will not be in the future, a major contributor to these aspects of nuisance. The exception is jet fuel odour, which Transport Canada and the Air Transport Association of Canada (ATAC) say is believed to be caused by aldehydes produced during combustion and that the odour is considered to be a nuisance rather than a health concern. The Panel concurs with this opinion.

For the base case, the proponent's claim concerning increased emissions is based on the assumption that congestion will increase, resulting in more delays on the ground and, consequently, an increase of air pollutants. The Panel points out that the timing and extent of this congestion is dependant upon the accuracy of the forecasts for traffic.

The comparison of air quality between the base case and the preferred option shows some advantages of the preferred option. Fewer delays and reduced queuing on the ground, in combination with the phasing-in of more Stage 3 aircraft, are expected to result in a significant decrease of emissions and atmospheric concentrations of most air pollutants.

The Panel believes that the increased emissions projected for the base case might not actually occur because of uncertain projections of traffic volume and operational adjustments. Indeed, improvement in air quality could result from decreased emissions of air pollutants as the more fuel-efficient Stage 3 aircraft are phased-in, regardless of future development.

Continued monitoring and assessment of air quality is essential, in order to ensure that air quality objectives continue to be met, regardless of future developments.

Ozone Depletion and Greenhouse Gases

At the hearings, some intervenors sought to relate runway expansion to the thinning of stratospheric ozone and the increased emission of carbon dioxide, a greenhouse gas, into the atmosphere. The operation of high-performance aircraft does contribute to both of these processes, and both processes are generally recognized as environmentally damaging on a global scale.

However, aircraft are by no means the only cause of this environmental damage. Furthermore, operations at LPBIA

constitute only a tiny fraction of world-wide aviation activity. Finally, almost the same number of aircraft movements will take place at LPBIA in the foreseeable future, whether or not the runway system is expanded. Thus, any change, positive or negative, which the addition of new runways at LPBIA might make to the environmental degradation associated with these processes, clearly would be quite negligible.

However, the Panel does endorse the objective of preventing atmospheric damage resulting from ozone depletion or the emission of greenhouse gases. While the matter is outside the Panel's mandate, it would favour any reasonable and realistic policy directed to this objective.

4.10.2 Hydrology and Water Quality

In the Panel's view the quality and quantity of surface water affected by LPBIA operations do not represent major issues at present. The material presented in the EIS and supporting documents, together with presentations at the hearings, show that concern for damage to local hydrology and to surface water quality resulting from activities at LPBIA is far less than concern for certain other environmental impacts. This does not suggest that surface water hydrology and quality can be entirely discounted.

There are three reasons why the problem is relatively simple. First, the aquatic systems and the effects of LPBIA are well described and understood. Secondly, provincial water quality objectives are in place. Finally, the condition of the surface water before it enters the LPBIA site is already poor, as described in Section 2.7.2.

None of these should lead to complacency concerning the need for Transport Canada to take full responsibility to monitor water quality and to provide remedial or mitigative measures to prevent further deterioration.

The Panel is satisfied that, providing all the conditions laid out by the proponent for ongoing monitoring of water quality, and for ameliorative measures to prevent further deterioration are met, then the aquatic systems and their related ecological resources will not undergo further negative impact.

The Panel wishes to draw attention to the discussion of water quality in the EIS. Transport Canada claims that under the base case as well as under the preferred option, there will be an improvement in water quality. This improvement in water quality appears to have nothing to do with improved efficiency of operations or decreased delays resulting from additional runways. In fact, all the water quality improvements that are cited result from initiatives which could and should be taken as part of good environmental management. They were referred to in the EIS as part of the airport Environmental Management Plan. They should proceed immediately, regardless of any structural or organizational changes at the airport.

In other words, it may be misleading to tie the management of water quality and hydrology to future scenarios. Scenarios that involve construction will certainly have impacts of themselves, but the mitigative measures that are described to control contaminants in run-off, and especially those related to

control of de-icing and fire exercise operations, can and should be implemented independently of other developments.

4.10.3 The Natural Environment: Aquatic and Terrestrial Resources

As described in Section 2.7.3, inventories of wildlife on the LBPIA property are rather typical of highly urbanized land and for practical reasons, little improvement can be expected. However, further deterioration should be guarded against. The involvement of environmental, conservation, and provincial and regional natural resource authorities should continue according to the proponent's plans set out in the EIS.

The Panel is satisfied that existing habitat and other conditions affecting wildlife will be maintained as far as possible, so long as any damage or change resulting from construction will be repaired and mitigated, as described in the EIS. The Panel concurs with the principle of addressing safety above all other concerns in the operation of LBPIA.

4.10.4 Historical Resources: The Fifth Line Cemetery

In its analysis, the Panel found no immediate reason why the Fifth Line Cemetery should be moved, nor why the present arrangements that Transport Canada has made for the public to visit the cemetery should not continue. If the cemetery has to be relocated due to the north/south taxiways, Transport Canada should honour their promise to pay for the relocation.

4.11 ECONOMIC CONSIDERATIONS

4.11 .1 General

The Panel fully recognizes the major role which LBPIA plays in the Canadian economy, and shares the view expressed by so many intervenors that its effective functioning must be protected and supported. At the same time, the Panel does not believe that this concern, in itself and without careful and detailed analysis, automatically justifies the proposal to construct three new runways at this time.

Various economic considerations relating to the proposed runway expansion are examined in Section 4.11.3. Such economic considerations are undoubtedly important. Nonetheless in the assessment of projects such as this, having major social as well as economic implications, important issues of public policy, often not quantifiable in economic terms, may also be involved and must be given consideration. Questions involving ethical judgements or issues of social justice, for example, do not lend themselves to economic analysis.

Overall, the representations made to the Panel based on economic considerations did not appear to reflect an actual current problem. Rather they revealed an apprehension that, unless the proposal to expand runway capacity is approved, congestion at LBPIA is likely to inhibit or prevent the exploitation of the business opportunities expected to accompany the eagerly awaited recovery from the recession.

4.11.2 Financing the Costs of Expanding Runway Capacity

At this stage it is, not surprisingly, very difficult to determine the precise costs of undertaking and carrying out the construction of the proposed three new runways, and estimates put before the Panel vary considerably. Generally speaking, however, they fall in the range of 750 to 1000 million dollars.

Transport Canada proposes that this substantial amount will be covered by user charges, and that there will be no charge to the taxpayer. The airlines have endorsed the concept that costs will be met through user charges, which will presumably be reflected in passenger and freight charges collected by the operators.

The Panel was, however, unable to obtain information on any precise mechanism which might be put in place in order to implement this concept. More particularly, there was no indication of how the actual costs might be paid in the first instance, pending eventual recovery through user charges. ATAC made it clear that the airlines were not in a position to assume this responsibility, which thus would appear to remain with the federal government. The latter, no doubt, would find it difficult to undertake financing on the scale involved within the budgetary framework, but no alternative was suggested. The Panel was told that certain options were being discussed between the government and the airlines; there was, however, no indication of their content nor any suggestion that an early resolution of the matter is to be expected. This lack of clarity with regard to arrangements for funding a runway expansion project raises a question in the Panel's view as to whether it could in fact be covered by user charges.

4.11.3 Cost/Benefit Considerations

Transport Canada's cost/benefit analysis, as described in sections 2.8.1 and 2.8.2, projects in 1990 dollars net benefits of \$985 million and \$110 million respectively for the construction of the two proposed east/west runways and of the one proposed north/south runway. These projections, pointing to a total net benefit of almost \$1 .1 billion for the proposal as a whole, are based on a number of assumptions of which two should be mentioned here.

The first assumption concerns traffic forecasts. In a supplementary report, Transport Canada's consultants stated that "[T]he analysis is of course dependent on traffic forecasts for LBPIA....Without the traffic growth anticipated in these forecasts, the benefits associated with new runways could be substantially reduced". Their analysis was based on the traffic forecasts in the EIS; it is apparent that a recalculation of the net benefit, using the recently updated forecast, would yield a lower figure -possibly one substantially lower.

The second assumption concerns the congestion forecasts, likewise appearing in the EIS, used to calculate delay costs which could be incurred in future as a result of a failure to expand runway capacity. As reported in Section 4.6.1, the projected extent of congestion, and consequent delays, appears unduly high. Transport Canada and the Panel believe

that there would be offsetting market forces to diminish such delays below the forecast levels.

Sensitivity analyses, designed to test these and other assumptions, were carried out. Reportedly these analyses confirmed that the total net benefit of the proposal remained positive, even in the face of the most radical assumptions. The Panel accepts this conclusion. At the same time, it does not attach undue weight to the quantitative value of the net benefit projected by the analysis, since it is too dependent on assumptions about future developments which are not susceptible to precise estimation, still less to verification.

The Panel also notes that there are other considerations, not reflected in the particular cost and benefit streams of the analysis discussed above, which have a bearing on the economic merits of the proposal. For example, the three-runway and six-runway scenarios probably would have a differential effect on LBPIA's contribution to the economy at large. In any case, this effect would be only marginal provided that an adequate level of service to clients was maintained.

A second example relates to the opportunity cost of this particular commitment of capital resources, as opposed to other potential social or economic investments of possibly higher priority. The Panel does not believe that decisions on major projects of this nature should be based only on a calculus of economic costs and benefits; such a calculus is simply too dependent on hypotheses of which the validity cannot be adequately established.

4.12 THE SPOKE COMMUNITIES

The Panel recognizes and understands the sense of dependency these communities -particularly the more isolated and distant northern ones -have on the air services which link them with LBPIA. Their economic programs require efficient and reliable links with their markets in the Greater Toronto Area and in the more distant centres reached by connecting flights at LBPIA. In social terms, the air link provides access to facilities which their small populations and fragile economic bases cannot support locally. Air links are essential to health care and other specialized professional services in spoke communities. These outlying regions also depend on air travel for access to many cultural, educational and recreational facilities.

Prior to de-regulation, air service to spoke communities consisted of relatively infrequent flights to and from LBPIA using small or medium jet aircraft; the communities' small populations did not generate sufficient traffic to support more frequent service. With the market competition resulting from de-regulation, the airlines have found it more satisfactory to replace this type of service with more frequent flights of smaller, turbo-prop aircraft. While this may be sound policy in terms of competition for seat sales, it results in a much higher than average ratio of air movements to passengers carried -a situation enhanced by the fact that turbo-prop aircraft can be operated economically at lower load factors than larger jet aircraft. When air movements at LBPIA are rationed, as they are at present by the slot and cap system, the residents of these spoke communities thus enjoy preferential access to

this limited facility. However, when flow control is necessary, these communities experience the opposite treatment -resulting in severe disruptions.

Generally speaking, these communities are satisfied with their present air services. A majority of their residents appearing before the Panel attached importance to the more frequent service now available, while a minority expressed some preference for the greater comfort and convenience of their former jet service.

There is, however, one problem for the spoke communities at present, which arises from the operation of the flow control system described in Appendix 9. As explained in the final paragraph of that appendix, the first level of flow control involves the assignment of delayed departure times to aircraft operating to or from airports within 302 nautical miles of LBPIA. This means that whenever actual or anticipated traffic disruption leads to a decision to apply flow control, the first effect falls upon the spoke communities as they all lie within the indicated radius.

Against this background, there is widespread support throughout the spoke communities, and especially in the northern tier, for the proposal to expand runway capacity at LBPIA. Their concern is that, unless the project goes forward, the resumption of demand growth will give rise once again to severe congestion at LBPIA, and that, sooner or later, their commuter flights will be diverted to alternate airports such as Hamilton. They fear that the resulting increase in travel time and costs, particularly through the loss of connections to onward destinations, would have an extremely damaging effect on their ability to compete economically.

If congestion increases, there is another possible development, which would be unwelcome to the spoke communities but less so than diversion of their commuter flights from LBPIA. This would be a restriction of the access to LBPIA for scheduled turbo-prop flights, with their low passenger loadings per flight. Should that occur, some flights might indeed be diverted, but it is likely that others would be replaced, in reduced numbers, by jet flights-in effect, a reversion to the pre-deregulation situation.

Spoke community traffic is mixed. Some of this traffic is destined to or from Toronto, while some uses LBPIA for flight connections with other destinations. At present the total volume is generally not enough to support separate services. But as their traffic grows, the situation of these communities may come to resemble that of Ottawa. Ottawa, much larger than the other spoke communities and a national capital, generates a much greater volume of traffic; it is thus able to support turbo-prop commuter flights to Buttonville and the Toronto Island Airport, in addition to its jet service to LBPIA.

The spoke communities are at present uneasy about any suggestion of diverting some of their commuter flights from LBPIA, for fear of losing that service. However, if and when their traffic reaches levels sufficient to support flights to more than one Toronto destination, direct flights to, for example, the Toronto Island Airport could offer more convenient service than is now available for those passengers destined to or from Toronto. In that situation, diversion of some flights from LBPIA

would in fact become a benefit. The Panel believes that, in time, normal market forces will lead to the provision of such additional services; this evolution should be encouraged.

4.13 POLICY TURBULENCE

LBPIA is not an airport that operates in isolation from national or international trends and events in the aviation industry. When major changes occur in the provision of air transportation services and new directions and initiatives are pursued at the national and international level, operations at LBPIA are usually affected. To the extent that operations at LBPIA are affected, the need for various facilities at LBPIA may also be affected. Therefore, industry trends and events must be considered in any review of the need for future facilities at LBPIA.

At any given time, a particular industry may be in a relatively stable period, or it may be undergoing change. Change may be the result of economic pressures, the introduction of new technology, maturation of the industry, government policy initiatives, or modifications in user expectations regarding the nature and quality of services. It is apparent to the Panel that the airline industry, particularly in Canada, is in the midst of a period of significant structural change brought on by industry economics and government policy initiatives.

During the course of the hearings and in various other submissions received by the Panel, three specific on-going industry adjustments were raised that some felt might increase or decrease the future volume of aircraft operations at LBPIA, and therefore affect the need for additional runway capacity at LBPIA. None of these issues is specific to LBPIA, in as much as they are all related to events and activities that are broader in scale than just one airport. However, because they have to do with approaches being taken by governments and the aviation industry to supply air transport services on a national and international basis, and because LBPIA is a major airport in the world context, the Panel gave each of the issues consideration.

4.13.1 Privatization

Transport Canada has announced that it wishes to privatize certain elements of the LBPIA infrastructure. Its current and medium term priority appears to be privatization of the ownership and operation of terminal buildings at the airport, and proposals have been requested and submitted in this regard. The Panel was asked by several participants to consider the potential effects of such privatization on the need for additional runway capacity at LBPIA.

The Panel finds that privatization of terminal buildings is likely to have very little or no effect on the need for additional runway capacity at LBPIA. The reason for this is very simple: Privatization of terminals, in and of itself, will have virtually no impact on the demand for air transportation services at or through LBPIA. There is no reason to believe that either travellers or airlines are likely to select or reject LBPIA for their routing on the basis of who owns and operates the terminals.

Certainly, the 75% of LBPIA traffic that has the Toronto region as either its origin or destination will not be affected in any

way. Connecting traffic-one passenger in four -could be affected, but only if the cost of using privatized terminals changed radically, relative to the current cost of using the terminals. This is unlikely to occur to such a degree that airlines would be encouraged to either expand or contract the use of LBPIA as a hub. The Panel therefore finds that privatization of terminals need not be considered a factor in determining the need for additional runway capacity at LBPIA.

4.13.2 Airline Amalgamation

The airline industry is in the midst of a major re-structuring on a world-wide basis. The clear trend is toward fewer, larger airlines and airline groups, that operate extensive route structures without particular regard for national boundaries. Increasingly, airlines are forming commercial groups, or are being amalgamated into larger units, resulting in fewer competitors in individual markets and more coordinated schedules within individual airline groups.

As a major international airport, LBPIA is already served by most of the North American, European and Pacific airlines that have been and will be affected by restructuring. At the time this report was written, Air Canada had formed alliances with United Airlines and Air France, and continued to pursue other opportunities; while Canadian Airlines International appeared destined to form at least a commercial alliance with another major airline.

The several processes and results of airline restructuring must be considered in assessing its impact on an airport such as LBPIA. Very often, as a part of the lead-up to restructuring, airlines seek to make themselves more attractive to potential partners or investors. One technique for doing this is to capture market share on key routes, primarily by offering more and better service at lower cost. This can lead to over-capacity on key routes as extra flights and lower fares are offered.

The Panel has been advised that significant over-capacity is currently present in the Canadian domestic market, as the Canadian industry participates in the restructuring process. The Panel accepts this argument. The media has quoted airline officials' estimates of the amount of overcapacity on major Canadian routes in the range of 25-35%. The Panel has no basis on which to verify these percentages, but also has no reason to doubt that they represent the current situation.

By its very nature, over-capacity is a short-term phenomenon. Financially, airlines can simply not sustain non-profitable or loss-leader operations over a lengthy period of time. Eventually, schedules have to be brought in line with demand and fares have to reflect costs. This process will result in fewer flights to serve a given demand level, with more passengers per flight, higher load factors, and a more satisfactory yield.

Similarly, the airlines that remain after restructuring have the opportunity, and financial incentive, to coordinate and consolidate flight schedules and services within their route networks. Even if over-capacity has not previously occurred, operational rationalization normally leads to some reduction in the number of flights offered to serve a given demand level, again with more passengers per flight and higher load factors. If over-capacity has occurred, this reduction will be more dramatic.

The Panel is of the view that service reductions brought on by amalgamation-induced rationalization and by overcapacity correction will occur at LBPIA in the near future, and will jointly have a negative impact on the demand for runway capacity at LBPIA. Since the load factors estimated by Transport Canada to determine the number of future flights corresponding to future levels of demand are based in part on existing load factors, they are at the low end of the likely future range. While the Panel is not able to predict or suggest specific alternative higher load factors, it is able to determine that load factors in the short to medium-term are unlikely to be below Transport Canada's estimates.

Therefore, Transport Canada's estimates of the number of flights that will be scheduled in the future to serve a given level of demand must be regarded as being on the high side. Given this, the estimates of the number of aircraft wishing to use LBPIA that arise out of any given demand level must also be on the high side, as must the resulting estimate of the future need for runway capacity. In the Panel's view, this weakens the case for the need for additional east/west capacity at LBPIA.

The Panel has therefore concluded that airline restructuring is likely to have a significant effect on the need for runway capacity at LBPIA, and that its effect will be to reduce the need for additional runway capacity.

4.13.3 "Open Skies"

During the course of the first phase of this environmental assessment review process, Canada and the United States entered into so-called "Open Skies" negotiations. The purpose of these negotiations was to review and amend the existing bilateral agreement regarding air services between the two countries. These negotiations continued during and after the hearings, and at the time of the Panel's review of the proposed additional runways at LBPIA, had not yet been concluded.

It is clear that the outcome of these negotiations may radically alter the provision of trans-border air transportation services between Canada and the U.S. Based on third-party evidence given by aviation industry representatives during the hearings and on media reports, the subjects being negotiated include more than specific routes and gateways for new trans-border services. Also under consideration are the relative timing of implementation of new services, access to new foreign airports by carriers of the respective countries, and possibly even cabotage operations.

The fact that these negotiations were underway was brought to the Panel's attention during the hearings on several occasions by several different individuals and organizations. Various arguments concerning the effects of these negotiations on LBPIA were suggested to the Panel. By definition, these arguments were speculative at best, as the negotiations had not been concluded. There was no notable pattern to the arguments presented, suggesting that the arguments will continue to be speculative until the negotiations have been concluded and adequate time for review has passed.

Two effects of the agreement that results from the negotiations are likely to affect LPBIA. The first is that additional non-stop services will become available to and from traditional Canadian "gateway" city pairs. As a major Canadian airport and the primary Canadian gateway to the United States, LBPIA will surely be a candidate for some of these additional services. This is evidenced by the attention being given during the negotiations to the appropriate delay that should be imposed on the implementation of new services to LBPIA by U.S. carriers. Probably the effect of the agreement, particularly the advent of new services to LBPIA by U.S. carriers, will be tempered by timing restrictions that will be placed on the inauguration of such new services.

Regardless of timing considerations, it is reasonable to conclude that, in the context of the medium-term being considered in this environmental assessment, there will be flights between LBPIA and more US cities than there are at the current time. This is not to say that there will necessarily be more flights in total at LBPIA, as there are now approximately 20 US cities that already receive non-stop service to and from LBPIA, and a similar additional number with direct service. Given this significant level of service already offered, the number of additional flights, if any, will be determined primarily by the total demand for transborder air service, rather than by the routing of the air services.

It is the Panel's view, as speculative as those of others, that one effect of expanded access between US cities and LBPIA will be a small increase in the total number of transborder flights operating to and from LBPIA. This increase will result from a dispersion of existing transborder flights among a larger set of available routes, a substitution of smaller aircraft as some passengers switch from mainline routes with connections in the US to less dense non-stop routings, and a small increase in demand arising out of the availability and promotion of new non-stop services.

A second effect of the agreement foreseen by the Panel will be the provision of some non-stop trans-border services to inland Canadian centres, such as Chicago-Ottawa. To the extent that such services develop, they will off-load passengers who previously had to connect in Toronto to make their transborder trip. This will create a corresponding reduction in the passenger load on existing LBPIA flights, and may lead to a slight reduction in the number of flights using LBPIA.

It is the Panel's view that these two effects will roughly cancel each other, and the net impact on the demand for runway capacity at LBPIA arising out of an "Open Skies" agreement will be negligible. In reaching this conclusion, the Panel has been mindful of the fact that 75% of LBPIA traffic is local, originating in or destined for the Toronto region, and is therefore unaffected by any agreement that permits services to other cities. Thus, the provision of new transborder services will be affected more by the underlying demand for such services than by the mere ability to provide such services.

The Panel, therefore, believes that the potential effect of an "Open Skies" agreement on the demand for runway capacity at LBPIA is not a determining, or even significant, factor, and has therefore chosen to disregard this development in its review of the need for additional runway capacity at LBPIA.

4.13.4 Local Airport Authorities (LAAs)

Local Airport Authorities (LAAs) are now being implemented by Transport Canada and local groups at the major Transport Canada airports of Vancouver, Calgary, Edmonton, and Montreal. Others, including LBPIA, are expected to follow in due course.

To the Panel's knowledge, the necessary negotiations -involving municipal, provincial, and federal officials -have not begun for LBPIA. However, at the hearings, strong support for the concept came from the Province of Ontario. The LAA concept is also well known to the Greater Toronto Area (GTA) Heads of Council, who are aware of the steps that must be followed to create a LBPIA LAA.

The Province endorses the approach of having a LAA manage and operate all airports serving the GTA, now and in future. The Province believes that a LAA replacing Transport Canada's role at LBPIA would serve to alleviate the frustrations of LBPIA's neighbours; the LAA would be more responsive to local interests and would ensure that local concerns about airport operations and effects, such as noise pollution and air quality degradation, are addressed promptly and adequately. The same arguments would apply to other regional airports which could be included in an LBPIA LAA.

Concerns were expressed by other stakeholders about the likely adverse impact on an LAA of the privatization action underway at LBPIA regarding Terminals 1 and 2, with Terminal 3 already privately owned and operated. This should not, however be an obstacle to the creation of an LAA, as the latter would simply assume the role now played by Transport Canada at LBPIA terminals. Transport Canada would retain complete responsibility for air navigation and air traffic control facilities and services.

In the light of comments on airport community relations made to the Panel at the scoping sessions and the hearings, the Panel supports the provincial government's views that creation of an LAA would lead to better relations between the airport and the community. The Panel therefore urges the GTA Heads of Council to take the necessary steps to form a local body, and to commence negotiations with Transport Canada's Air Transfer Task Force at an early date. This Panel view should not be construed as a criticism of the present LBPIA management, but rather as a support for a development likely to improve the system within which LBPIA management must now operate.

4.14 GENERAL AVIATION

For the purposes of its review, the Panel has chosen to define "general aviation" as all aircraft that do not operate out of the passenger terminal buildings. This group would include, therefore, pure cargo flights, courier operations, business aviation, recreational flying, flights related to aircraft servicing, flights arriving solely to obtain Customs clearance, government flights, military operations, training flights, and Transport Canada navigation-aids calibration flights. Of this group, the first three types are the most predominant at LBPIA.

General aviation has long been a significant component of the LBPIA fleet mix, and many general aviation representatives have argued that they must continue to use LBPIA, if their operations are to be commercially viable. Despite this, Transport Canada has, over the past decade, implemented several policies that have increasingly restricted or banned general aviation from LBPIA. As a result, the level of general aviation activity at LBPIA has gradually declined to the point where some operators, and several of those whose business is dependent on the presence of general aviation, are no longer found at LBPIA.

It is not surprising, therefore, that the general aviation community presented many grievances concerning its status at LBPIA to the Panel. In this report, the Panel will address those concerns which, in its view, are most relevant to the issues raised before it.

The Panel reached two general conclusions regarding general aviation. The first is that the current restrictions on general aviation do not arise primarily out of a shortage of runway capacity. Rather, the restrictions arise out of air traffic control considerations, particularly the chronic shortage of air traffic controllers. It is the Panel's view that, if a full complement of air traffic controllers were today on staff at LBPIA, adequate capacity would exist to serve almost all the reasonable needs of the general aviation group.

The use of the word "reasonable" is intentional, and must be explored. The Panel concurs with Transport Canada's restrictive general aviation policies in so far as they apply to activities such as recreational flying, training flights, aircraft servicing flights, and military operations. There is no specific feature of LBPIA, or of these flights, that presents a compelling reason that they must use LBPIA as opposed to some other airport. There are adequate alternative airport facilities in the Toronto region for such flights and activities. And, because such flights often involve above-average use of resources such as runway time and air traffic control services, there is no valid reason to supply or justify the services and facilities they require at LBPIA.

However, the argument is much less strong in the case of the other types of general aviation which are essentially commercial. In fact, the Panel is of the view that the other types of general aviation make a valid and compelling argument for their continued presence, in numbers greater than currently found, at LBPIA. Because of their requirements to integrate with scheduled airline services and their use of state-of-the-art operating techniques, cargo, courier, and business aviation are legitimate elements of the aviation mix at a major airport. Transport Canada should make the same effort to serve these enterprises at LBPIA as it does to serve airline passenger operations. This is particularly true in light of the fact that no alternative airport facilities have been developed in the Toronto area that are capable of meeting the needs of these enterprises.

In particular, the Panel finds the operation of the cap and slot reservation system at LBPIA to be strongly and unfairly biased against general aviation. While the Panel is unaware of the calculations originally used to determine the number of slots

within the cap that would be made available to general aviation, it is clear to the Panel that the number of general aviation slots that resulted from those calculations was disproportionately low relative to the number that were made available for airline operations.

Moreover, the slot assignment process is designed to allow airlines to plan well in advance to be assured that they can operate their planned schedules, whereas it militates against forward planning or any degree of certainty on the part of much of general aviation. As a result, the effect of the introduction of the slot system was much more severe on general aviation than on airline operations, and the extent of general aviation at LBPIA has dropped sharply while the number of airline operations has simultaneously grown.

It is also apparent to the Panel that the on-going management of the slot system is inappropriate, and has resulted in needless disruption of general aviation. In particular, the Panel believes that airlines have been allowed to protect unused slots for possible future operations, and to bank and transfer slots between flights, without any discipline being exercised by Transport Canada. This mismanagement has served to further restrict general aviation activity at LBPIA when no such restriction was warranted.

The Panel suggests that Transport Canada overhaul the slot assignment and reservation system by reviewing the proportion of slots available to general aviation with a view to making significantly more slots available. This could be accomplished through implementation of a "use-it-or-lose-it" policy regarding slots assigned to airlines, elimination of slot banking and transferring by airlines, and establishment of criteria to determine the legitimacy of individual users' claims that they must use LBPIA. To the extent that the use of runway facilities at LBPIA is restricted, the restrictions should be imposed equally on all legitimate users.

Representatives of the business aviation group argued during the hearings that their members are unfairly treated by the night flight restrictions in place at LBPIA. In essence, their argument was based on their contention that the Stage 2/Stage 3 distinction used to permit or restrict flights during the late evening and early morning hours is not appropriate to their type of operation. Their thesis is that business aircraft are sufficiently light and climb out sufficiently quickly on departure that their noise footprints create a much lower community noise level than that of airline transport aircraft. They therefore argue that they should be subject to only the most liberal restriction regime.

While the Panel is somewhat sympathetic to the position advanced by the business aviation group, it finds it to be inconsistent with the arguments presented regarding their inability to use other Toronto-area airports, specifically Buttonville. If one accepts that business jets must use LBPIA because they are often heavy enough to require LBPIA's long runways, then one cannot accept that they are normally light enough to be sufficiently quiet to be granted special privileges regarding noise abatement.

4.15 IMPACT MANAGEMENT

Any major development project will produce effects having both positive and negative effects. From the various deliberations presented before the Panel, it was clear that residents are not opposed to air transport as such and they fully realize its importance in the Canadian national economy. Nevertheless, members of the communities in the vicinity of LBPIA and spoke communities believe that their social and economic well-being should not be sacrificed to any sectoral interest.

Many residents suggested they deserve compensation for their permanent noise and pollution burden attributable to airport operations. The schools were also emphatic when it came to mitigation. They insisted that mitigation should apply to both permanent buildings and portable classrooms.

Another factor that emerged in the hearing was that of equity, the fairness of a project. It is therefore not surprising that much opposition to the proposed development at LBPIA has been set in the context of seeking fair treatment. Many presentations heard by this Panel indicated profound defects in the relationship between Transport Canada and the residents of communities in the vicinity of LBPIA. Past issues have been badly handled by the government and by airport authorities. Based on this precedent of broken promises, residents fear that the proponent had been highlighting only the economic or technical aspects of the proposed development and downplaying the social impact - the consequences of which will be born by those same residents. The need to reduce or eliminate negative environmental and social impacts of major development projects is becoming more apparent and effective means to minimize these adverse effects are continually sought. However, despite the best of intentions, in some cases effective mitigation measure may not be feasible.

The Panel also understands that it is seldom possible to equitably distribute benefits and costs of a project to the satisfaction of all people concerned. Similarly, it is also difficult to prioritize among competing, and often conflicting, interests between the environment and economics; or between efficiency and equity. Dealing with the negative effects leads to the identification of an impact management strategy.

Impact management strategies are now becoming common and expected adjuncts to environmental assessment studies of major developments. An impact management strategy normally consists of five components:

1. Proper Design
2. Proper Operations
3. Monitoring
4. Mitigation
5. Compensation

Each of these five components contributes in different ways to controlling the effects of the proposed development. This Panel believes that these components could be usefully applied to the proposed expansion of LBPIA.

The Panel further believes that a comprehensive impact management strategy must be put in place to deal with the effects of the airport. The following elements should form the minimum components of the strategy:

Airport Design

The design and construction of taxiways, turn-offs and runways must minimize queuing, ground travel, and idling of aircraft.

Airport Operations

1. Transport Canada and the airlines must expedite the introduction of quieter aircraft.
2. A curfew should be imposed on all flights between midnight and 0600 hrs., with appropriate restrictions during the "shoulder" periods (2300 hrs.-midnight, 0600-0700 hrs.).
3. Flight take-off and departure procedures should be reviewed at frequent intervals with the view to minimising noise impacts while maintaining air safety.
4. Effective enforcement of noise abatement procedures should be given priority and the results should be publicized.

Monitoring

1. An extensive noise monitoring program must be carried out in all areas within the 25 NEF and higher contours.
2. Air and water quality monitoring should be continued in the immediate vicinity of the airport.
3. All monitoring information should be made available publicly, in clear and understandable form for the lay public, on a quarterly basis.
4. The monitoring information should be basic data used by the Community Liaison Committee in reviewing conditions and developing recommendations for design and operations modifications.

Mitigation

After proper design and operations, there may be some impacts that can be further reduced or eliminated through mitigative actions. The Panel feels that priority should be given to mitigation in the form of specific preventive measures.

- 1 Transport Canada, in conjunction with the various boards of education, should explore ways of mitigating noise in schools through retrofitting existing facilities and developing construction standards and guidelines for new facilities.
- 2 Retrofitting the most severely affected residential dwellings to reduce noise effects is a reasonable mitigation measure that Transport Canada should examine.
- 3 The Panel acknowledges that noise can contribute to stress and believes that in rare cases it can affect the health of some people. In such cases, where it can be medically proven to be so, the Panel urges that a policy to assist with relocation be considered. Such a policy is not seen as specific compensation, but rather a form of mitigation. It might involve purchasing the residence of any such

individual and then putting the residence back on the market for fair market value to be purchased by someone who is not bothered by noise.

The Panel wishes to stress that all parties — Transport Canada, the municipalities, the school boards and the residential property owners — bear some responsibility for taking appropriate actions to mitigate the impacts of airport operations. Review and discussion of appropriate actions might be a significant agenda item for the Community Liaison Committee.

Compensation

Compensation is a tool to complement mitigative efforts, used to address residual effects that mitigation cannot resolve.

Evaluation and quantification of environmental loss and loss of resource value to a person or community is more than complicated—it may be impossible because they are not amenable to precise measurement. This inadequacy may especially flaw attempts to address social impacts. Nevertheless, the lack of precision in assessing effects cannot be taken as an excuse to ignore a project's consequences for individuals or for communities.

The Panel had the opportunity to review compensation measures being applied at or planned for several other airports. In one interesting case the following was put forth:

a) Sales Guarantee Program

In this program, multi-family dwellings within L_{dn} 75 dBA or single family dwellings within L_{dn} 70 dBA or next to the runway extension are purchased by the airport at an "unaffected fair market price" which is evaluated through independent appraisers. The airport authority will sell these houses at 90% of its "affected fair market value" within 30 days.

b) Aviation Easement Program

This is an alternative to the sales guarantee program and is applicable only to single family dwellings in L_{dn} 70 dBA contours. Here the house owner is paid 25% of the value of the house in exchange for a nuisance-easement agreement. The house owner cannot make any future claims against the airport.

In either case—Sales Guarantee or Aviation Easement -an agreement is attached to the property deed so that future owners cannot claim compensation from the airport but are aware of the airport operations and potential noise problems.

The Panel feels that the measures identified above have merit in responding to residents' concerns. Transport Canada in conjunction with the Community Liaison Committee should examine such programs at other airports. It may be that in discussion with the relevant stakeholders, other appropriate measures will be identified. Regardless of the details of specific measures, the Panel believes that a comprehensive impact management program, consisting of the five components noted, is fair and appropriate.

5.0 CONCLUSIONS AND RECOMMENDATIONS

I. INTRODUCTION

Two general considerations regarding the nature of the proposal before the Panel, namely the construction of three additional runways at Lester 5. Pearson International Airport (LBPIA), substantially influenced its views on the more specific issues. These considerations are identified in this introduction to provide a background and a frame of reference for the more detailed conclusions and recommendations which follow. Additional detail underlying these conclusions and recommendations can be found in Chapter Four.

As a first consideration, the proposal clearly consists of two components: respectively the construction of two new east/west runways and the construction of one new north/south runway. These two components involve significantly different considerations, and the Panel has therefore addressed them separately.

The second consideration is the fact that the proposal is incremental. In other words, the proposed construction of one or more new runways at LBPIA would not create an entirely new facility, but rather would transform the airport's existing three runway system into a new system involving four, five or six runways. The assessment of the proposal's environmental impact must therefore involve the cumulative effect of adding the impact of the proposal to that of the existing operations at LBPIA, rather than an assessment of the impact of the proposed new runways in isolation.

The proposal calls for a major commitment of capital resources; it is strongly supported by some, strongly opposed by others. It was therefore incumbent on the Panel to assess the strength of the case for proceeding at this time with either or both of the proposal's two components, together with the environmental impacts (including the economic, social and ecological impacts) of doing so. Since opposition to the proposal on the part of many local residents is very intense, the Panel felt a responsibility to focus on the causes of this opposition and to assess the weight which should be given to it.

The Panel's conclusions on these matters are set out in Part II of this chapter. Its recommendations follow in Part III.

II. CONCLUSIONS

A. Demand Prospects

1. The passenger demand forecasts presented in the EIS were based on data up to 1989, that did not take account of the effects of the recession. The interim update of demand forecasts, which was released in April of 1992, projects a delay until 2001 in reaching the demand level projected in the EIS for 1996.
2. The April 1992 update, while taking account of the fall-off in demand in 1990 and 1991 caused by the recession,

assumed an early economic recovery. The intervening months, however, have provided little or no supporting evidence for this assumption. If the demand forecast scheduled for release in November, 1992, shows any change from the April forecasts, it seems likely that the change will be in the direction of further delay in reaching demand levels forecast in the EIS.

3. The only current policy development likely to significantly affect future aircraft movement demand is the extensive restructuring now taking place in the airline industry, and in particular in the relationship between Canada's two mainline carriers. While the precise outcome is not clear at the time of writing, it is likely to involve a decline in the recent intense competition for market share. This reduction in turn is likely to lead to a further reduction in demand for aircraft movements at LBPIA from levels previously forecast.
4. Regardless of the changing relationships among carriers, the Canadian airline industry clearly is experiencing considerable over-capacity at present. It is inevitable that sooner or later the market will correct this situation in some way that involves a reduction in the number of flights.
5. In summary, there is now no likelihood that passenger or aircraft movement demand will reach the levels projected in the EIS for 1996 before the year 2001; it may be even later.

B. Capacity Considerations

1. There is no serious and continuing problem of traffic congestion at LBPIA at present. There was such a problem in the late 1980s, but as a result of two developments it has virtually disappeared. The first was the introduction of the cap and slot reservation system of demand management in 1988, and the second was the decline in demand caused by the recession.
2. Even in 1988 when congestion was a serious problem, the primary cause was the shortage of air traffic control staff, rather than a shortage of runways. This led to the inability to utilize fully and on a sustained basis the potential capacity of the existing runway system.
3. Measures already taken to enhance the efficient utilization of the existing runway system have made it possible to raise the cap on aircraft movements from the 1988 figure of 70 per hour to the 1992 figure of 82 per hour, and related measures being introduced or contemplated should increase the east/west capacity to some 96 movements per hour by 1996. This enhanced system, with an hourly capacity some 37% higher than the 1988 capacity, is called the base case.

4. These measures, together with the lower demand for air movements now foreseen, should permit the present runway system to respond adequately to traffic demand into the next decade. The Panel fully expects that the emergence of a requirement for additional capacity will not occur until at least five years after the year 1996, identified in the EIS as the date by which such additional capacity might become necessary.
5. Transport Canada argued that the proposal to construct three new runways was the only way to provide additional capacity in time to meet the prospective need; other options, while perhaps suitable for future consideration, could not be developed and implemented soon enough. In light of point II.B.4 above, the Panel is satisfied that there is in fact adequate time to consider other options.
6. Taking account of these considerations, it is possible and desirable without significant risk to defer, for at least two or three years, a decision on increasing the capacity of LBPIA by the construction of additional east/west runways. This would allow time for the completion and environmental review of Transport Canada's longer term proposals for aviation in southern Ontario. Consequently, the Panel has not reached any conclusion concerning the merits of the specific Transport Canada proposal regarding east/west runways.
7. Deferral is desirable for three main reasons:
 - (a) It would permit the detailed consideration of several possible ways to accommodate larger traffic volumes, rather than limiting consideration only to the single option now proposed of expanding east/west runway capacity at LBPIA. One or more of these possible alternatives might, for various reasons, be found preferable.
 - (b) The construction of additional east/west runways at LBPIA would perpetuate, and perhaps increase, the present directional imbalance in runway capacity. Because this imbalance is the cause of infrequent but nonetheless real, and probably growing, disruptions, it is important that alternatives should be seriously considered.
 - (c) To proceed at this time with construction of additional east/west runways, when there is clearly no present necessity to do so, would seriously increase the already difficult problems in community relations, arising from the adverse social impacts of LBPIA operations, which are identified in Part II.E below. To defer the provision of additional east/west capacity until the need for it can be clearly demonstrated would, in contrast, serve to reduce community opposition in two ways. It would avoid imposing a burden on local residents in the absence of a demonstrated need to do so. Furthermore, if east/west capacity at LBPIA is eventually found to be desirable, the local residents would at least know that all other options had been fully and fairly examined and found to be unsatisfactory.
8. While it ~~has at present no serious and continuing problem~~ of traffic congestion, LBPIA, like other airports, from time to time experiences temporary periods of traffic disruption. These are attributable to a variety of causes, including equipment malfunctions, labour disputes, and shutdowns mandated by weather.
9. In particular, traffic disruption is caused at LBPIA when strong crosswinds, in conjunction with heavy traffic volumes, preclude operation of the two east/west runways and thus restrict all movements to the lower capacity single north/south runway. This situation arises only during a small fraction of annual operating time, but when it does occur the resulting disruption can have significant impacts not only on traffic at LBPIA but also at many other airports. Directional capacity imbalance is a significant inherent defect in LBPIA's existing runway system, not caused by traffic growth although exacerbated by it.
10. Action to reduce the directional imbalance will respond to a significant current problem, one which will become steadily more serious with future traffic growth. At present, flow control procedures must be invoked to deal with the problem, with particularly adverse consequences for the spoke communities and general aviation. Corrective action should be initiated without delay.
11. At present the two east/west runways can accommodate 82 hourly movements, and this figure governs current flight scheduling. When peak period operations must be transferred to the single north/south runway, with a capacity of only 50 hourly movements, there are up to 32 scheduled flights which must be subjected to the disruptions resulting from flow control. By approximately 1996, when all key elements of the base case are implemented and the east/west capacity has risen to 96 movements per hour, the number of scheduled flights that might be subject to disruption will rise to 46 if no new north/south capacity is provided. The Transport Canada proposal would increase the north/south capacity to 70, and thereby reduce the figure of 46 to 26, a reduction of 20 movements, or 43%, in the disruption index. However, there would still be 26 flights per hour subject to disruption.
12. The Transport Canada proposal would also expose residential areas, such as Rockwood and Orchard Park, to significant incremental aircraft noise, albeit for only 5% of the time. The community perception of this noise increment, occurring 5% of the time in the form of 30 to 35 noise intrusions per hour, is one of environmental unacceptability, and has led to intense community opposition to the proposal. This perception and opposition are considered by the Panel to be reasonable. These factors, in combination with the relatively modest reduction in potential flight disruptions, render unacceptable the Transport Canada north/south runway proposal for resolving the directional imbalance problem.
13. A fully independent parallel north/south runway, suitably located and no more than 4500 feet in length, offers a more satisfactory solution. If feasible on operational and

safety grounds, it would provide a much greater reduction in potential traffic disruption. This reduction might well be as much as 78% (from 46 to 10 disrupted flights per hour) where the Transport Canada proposal offers only a 43% reduction. At the same time, this short runway would be limited to smaller, quieter aircraft, with a resulting reduction in the size of its SEL noise footprint: this fact, together with its location, would lead to a significantly smaller noise impact on residential areas.

C. Airport Operations

1. The Panel believes that commercial general aviation, as opposed to recreational flying, plays an important role at LBPIA and has valid reasons to be accorded full access to LBPIA runways. For most general aviation users in this category, there is no viable alternative to LBPIA. Full access is not now being provided to this group, primarily because of the design and operation of the cap and slot reservation system, even though the runways are not currently operating at their full capacity.
 2. The slot management system is not being well-managed at LBPIA. The underlying distribution of slots is unduly biased in favour of the airlines, at the expense of general aviation. Furthermore, a measure of discipline is absent from the slot management process. The result is that airlines are able to keep unused slots, and to use and abuse the slot system to their advantage, while other potential users are turned away.
 3. The Panel has concluded that a lack of true public involvement in, or even understanding of, LBPIA operations contributes significantly to the difficult relationship that LBPIA experiences with its neighbours. While this would be partially reduced through the creation and operation of the Community Liaison Committee, proposed later in this report (III.E.2), the Panel believes the situation would be further ameliorated by the implementation of a Local Airport Authority (LAA). Under an LAA, decisions affecting LBPIA's neighbours would be made by a local entity that should be more responsive to the interests of those neighbours than is the present Transport Canada management.
 4. Present arrangements for management of domestic and international waste at LBPIA and improvements in these areas are addressed in very general terms in the LBPIA Environmental Management Plan. The intentions are admirable, but there are not clear commitments concerning the timing of their implementation. The present situation is unsatisfactory with respect to the handling of international garbage, for which responsibility is shared by various governmental authorities.
2. In the course of its review, however, the Panel became concerned that the application of this policy appeared at times to be ineffective.
 3. For example, the Panel was surprised that Transport Canada provided no information on action taken in response to the urgent recommendations, by the commissioner on the inquiry into the Air Ontario crash at Dryden, with regard to defects in the de-icing facilities and procedures at LBPIA.
 4. As a further example, it became publicly known after the close of the hearings that intrusions of white-tailed deer into the LBPIA runway area are the cause of a serious safety hazard. The Panel was concerned by reports of failure to deal promptly and effectively with this situation.
 5. As a final example, the various base case improvements, in addition to increasing effective capacity and improving operational efficiency, are expected to enhance the safety of operations. The Panel was not satisfied that these improvements are being implemented as vigorously as they deserve. The systematic and planned use of overtime by ATC staff is not a satisfactory means, except to deal with very temporary situations, of alleviating the shortage of air traffic controllers.
 6. The Panel regards it as unacceptable that effective actions to deal with safety hazards and enhance the safety of operations are delayed, impeded or compromised by administrative indecision, inadequate budgetary provisions, political pressures or other such extraneous factors.

D. Safety Considerations

1. The Panel fully endorses Transport Canada's stated policy that safety requirements must take precedence over all other considerations.

E. Social Impact

1. The important economic role of LBPIA gives rise to widespread but indirect and, for the most part, diffuse social benefits. These indirect benefits are enjoyed wherever the airport contributes significantly to personal or governmental revenues, and also in localities (such as the spoke communities) where the services it provides give access to otherwise unavailable social facilities and resources.
2. In contrast, the direct social costs of LBPIA fall almost exclusively on residential areas in close proximity to the airport. In these affected areas, many people suffer severe distress, attributable mainly to aircraft noise. In addition, there are special considerations applicable to certain institutions with sensitive populations such as schools, nursing homes and hospitals.
3. Future traffic growth at LBPIA, whether confined to the present three runways or alternatively accommodated through an expanded runway system, will result in a gradual increase in aircraft noise in surrounding residential areas. In the short- to medium-term, the rate of noise increase is likely to be somewhat less than the rate of traffic increase, because of the progressive introduction of quieter aircraft.

4. Upon implementation of base case improvements, the overall number of flights at LBPIA and hence the cumulative noise impacts are likely to be very much the same, whether the three runway scenario or the expanded runway system scenario prevails. In general terms, the incremental noise effects of the proposed new runways would be quite minor in relation to the substantial social impacts of LBPIA's current operations.
 5. These minor increments are not sufficient to explain the extent and intensity of the opposition to the expansion proposal which was expressed to the Panel. However, to some extent this discrepancy may be attributable to a perception that doubling the number of runways must inevitably lead to a major increase in noise levels. The Panel does not share this perception.
 6. The cumulative distress, anger and frustration which has built up over the years as a result of steady growth in LBPIA operations, coupled with the absence of response to subsequent complaints, was evident in the hearings. The establishment of an environmental review panel offered, for the first time, a recognized forum for expression of the concerns of local residents.
 7. These deep seated feelings, and the accompanying hostility and mistrust towards both government and airport management, constitute a serious social problem which should not be ignored. The present relationship between LBPIA and many residents of the adjacent communities will remain unsatisfactory unless and until effective measures are put in place to address the causes.
 8. This conclusion is independent of any decision about the construction of new runways. However, any decision to proceed with construction of currently unnecessary runways will be perceived as a signal that the concerns expressed before the Panel, like previous efforts to mitigate the adverse social impacts of LBPIA, have fallen on deaf ears. If this happens, the existing social problems would be exacerbated.
 9. The cumulative noise metrics, NEF or L_{dn} , are in common use, worldwide, to relate aircraft noise levels to community annoyance and compatible land use planning. For these two specific purposes, the cumulative metrics do not now, despite their shortcomings, have a suitable replacement as a single measure of the noise regime around LBPIA. When the cumulative NEF metric is combined with the frequency and magnitude of single event noise intrusions, particularly in areas with infrequent overflights, measured as SELs occurring over a given area, residents affected will be able to determine how realistic are the contentions about their future noise regimes.
 10. The increase in noise due to the increase in flight frequencies will be offset by the changeover from Stage 2 to Stage 3 aircraft. From an examination of SELs for various aircraft, it is apparent that the conversion from Stage 2 to Stage 3 will provide little relief from the noise impact of aircraft in the approach mode, but there will be a dramatic reduction in noise from comparable individual aircraft on takeoff. Overall, the two offsetting features of increased flight frequency and reduced noise from Stage 3 aircraft appear to have little incremental effect, when combined, on the future NEF values around LBPIA.
 11. A satisfactory criterion to assess the effects of noise on people through the behavioural response known as annoyance is provided by the shifted Schultz curve (shifted by 5 dBA), as described by Transport Canada. The use of this assessment criterion represents a very conservative approach. It will provide protection against other behavioural impacts such as speech or sleep interference, as well as any possible non-auditory health effects. The possibility of hearing loss caused by LBPIA aircraft noise is remote.
 12. There is a need for a blanket overnight curfew on airport operations between the hours of midnight and 0600 hrs. In addition, there is a need to continue to restrict operations of noisier aircraft, as Transport Canada now does, during the so-called "shoulder periods" of 2300 hrs. to midnight and 0600 hrs. to 0700 hrs.
- ## F. Economic Impact
1. In economic terms, LBPIA is the source of major and widespread benefits. These accrue to the three municipalities immediately adjacent to LBPIA, to the Greater Toronto Area, to a number of other Ontario communities directly dependent on LBPIA's air services, to the economy of Ontario and more generally to that of Canada.
 2. Adverse economic effects, such as depreciation of real estate values in the more immediately surrounding area, are not clearly demonstrable and, if they exist, are relatively minor.
 3. The Panel shares the view of supporters of the proposal, which was endorsed as well by many of the opponents, that for compelling economic reasons the effective functioning of LBPIA must be protected and supported. Nevertheless, the Panel does not believe, for reasons set out in Section II.B above, that this effective functioning is currently threatened by any general shortage of runway capacity. This view is however qualified, as previously explained, with regard to runway capacity in the north/south direction.
 4. The cost/benefit analysis cited in the EIS projects a substantial net economic benefit resulting from the proposed increase in east/west runway capacity. This is based on the assumption that traffic growth will lead, in the absence of that increase, to serious congestion and resulting large delay costs. The prospect that such growth will be significantly delayed means that the congestion and delays will also be delayed, and that the net benefit of early east/west construction will not be realized. Moreover, the delay provides an opportunity to more fully assess the merits, including the cost/benefit ratios, of other possible means of accommodating future traffic growth taking account of market and operational adjustments.

5. The Panel is not aware of any specific plans for funding the initial construction costs of the proposal.
6. The economic aspects of the proposal are clearly important. Any conclusions to which they might point, however, must be tempered by a recognition of other relevant factors, relating for example to considerations of social justice, which cannot so readily be expressed in quantitative terms.

G. Ecological Impact

1. The presentations to the Panel, both in written submissions and in oral statements during the hearings, for the most part constituted a vigorous debate between committed supporters and fervent opponents of the proposed runway expansion. Most presenters based their case on the perceived economic benefits, or on the anticipated adverse social impact. Few presentations gave much attention to matters concerning the natural environment.
2. Undoubtedly the existence of LBPIA, through the air operations and other activities conducted there, contributes to some degree to the degradation of the natural environment in the area. The extent of this contribution, in an area already heavily impacted by widespread and intensive urbanization and industrialization, while not easy to measure, is clearly relatively minor.
3. The Panel accepts the proposition of Transport Canada that, provided the proposed protective measures are vigorously pursued, the adverse impact of the proposal on the natural environment would be at most marginal and mainly temporary; the longer term effect might in fact prove to be less harmful than the present situation.
4. Regulations exist for emissions which come from airplanes and from other airport operations. In a relative sense, the contribution of the airport in the urban area in which LBPIA is situated, is not great, and currently no harmful effects can be attributed to LBPIA. Nevertheless air pollutants are potentially harmful and all the major ones should be monitored.
5. The quality and quantity of surface water affected by LBPIA under the base case and under the preferred option do not represent serious concerns. A major issue, however, is the potential pollution of soil and surface water by runway and airplane de-icing materials. For other pollutants, the fact that the local surface water quality is already degraded means that LBPIA operators need to be conscientious in monitoring water quality as a routine procedure and addressing exceedances of water quality objectives.
6. The Fifth Line Cemetery will not be affected by the base case improvements or by the short north/south runway proposed by the Panel; it is therefore expected to remain undisturbed.

H. The Environmental Review Process

1. The decision to undertake a project subject to environmental review is, formally speaking, a provisional one only, until the outcome of the review is available. The review's findings, however, are advisory only, are not binding on the proponent, and the latter is not legally required to await them.
2. The initial announcement of the intention to undertake the project is widely regarded as a substantial political commitment.
3. Three significant consequences flow from the fact of this degree of commitment:
 - (a) It is difficult for the proponent's officials to reconcile objectivity in their preparation and presentation of the EIS and supporting material with the pressures to be supportive of a proposal publicly endorsed by their organization.
 - (b) It is almost inevitable that the relationship between those officials on the one hand, and intervenors seeking the withdrawal or amendment of the proposal on the other, will become to a greater or lesser degree adversarial, even through the review process is not intended to proceed adversarially.
 - (c) Some members of the public believe that the review process is largely *pro forma* and that the proposal is unlikely to be significantly altered regardless of the review's findings. There is thus understandable public scepticism about the effectiveness and relevance of the review process.
4. The resources available to the proponent for the preparation and presentation of the case for the proposal are usually far greater than those available to its critics and opponents.
5. With these considerations in mind, the Panel tried to:
 - (a) provide ample opportunity for intervenors, through a process of questioning, to seek clarification, amplification and, if appropriate, correction of information and arguments presented in support of the proposal;
 - (b) give broad latitude for the expression of a wide range of views, and not to inhibit this by overly rigorous insistence on relevance or avoidance of repetition; and
 - (c) examine most carefully the material put before it, and to seek any necessary clarification or amplification, in order to ensure that the Panel fully understood all perspectives on the issues involved and that its findings were soundly based.
6. The Panel believes that it achieved these goals to a degree that will satisfy at least the great majority of those participating in the review, despite the aforementioned

elements of asymmetry and conflict inherent in the review process. It is confident that the government will share this view, and will accordingly find acceptable the conclusions and recommendations set out in this report.

7. The Panel also believes that the foregoing observations on the current review process will be helpful to those preparing regulations to govern reviews to be conducted under the new environmental review legislation.

III. RECOMMENDATIONS

A. Capacity Improvements

1. Measures to increase ATC staffing must be vigorously pursued, with additional resources committed, if necessary, to ensure that the necessary staffing level is achieved not later than the end of 1994. The necessary level is that required to utilize fully and on a continuing basis, without the use of planned overtime, LBPIA's existing potential capacity of 96 movements per hour.
2. Transport Canada must take the necessary measures to ensure the implementation of proposed improvements in air navigation technology at LBPIA.

Specifically, this calls for:

- (a) the commissioning of the two phases of the Canadian Automated Air Traffic System (CAATS) by the target dates of 1994 and 1996 respectively;
- (b) the installation at LBPIA of the Microwave Landing System (MLS) capability by 1996; and
- (c) the immediate implementation at LBPIA, of the Radar Modernization Project (RAMP) already behind schedule.
3. Construction of proposed improvements to the air side physical infrastructure such as high speed turnoffs, taxiway system capacity and geometry, and manoeuvring areas, should be accelerated, to ensure their completion not later than 1996.

B. Runways

1. No decision should be taken at this time with regard to the construction of one or more additional east/west runways at LBPIA. The possible future need for such runways, together with other options for the accommodation of traffic growth, should be examined in the context of Transport Canada's long term plan for aviation in Southern Ontario.
2. The proposal to construct the runway 15R-33L as described in the EIS, should not be further pursued, as the adverse social impact which it would create would outweigh the modest increase in north/south capacity it would provide.

3. Transport Canada should immediately undertake detailed studies to determine the safety and operational feasibility, as well as the capacity, noise profile and cost/benefit implications, of a new 4500 foot north/south runway. This runway would be located parallel to and 4300 feet southwest of the existing north/south runway and would be displaced toward the northwest airport boundary, so that its northerly and southerly thresholds are equidistant from the closest residential areas of Brampton and Mississauga respectively. The runway would be operated simultaneously with, but fully independently of, the existing north/south runway, and would serve all arriving and departing aircraft that are capable of safe operation to and from its limited length.

4. The Panel believes that such studies will demonstrate that such a runway would:

- (a) be operationally feasible without compromise of safety standards;
- (b) increase north/south capacity from the present 50 hourly movements to approximately 86, thus reducing the existing directional imbalance very substantially;
- (c) have a positive net present value; and
- (d) have a noise impact in residential areas, expressed in SEL terms, approximately 5 dBA below that of the runway 15R-33L proposed in the EIS.

The Panel therefore recommends that such a runway be constructed promptly provided that studies (a) to (d) above confirm the Panel's belief that this runway is a satisfactory solution to the problem of directional imbalance in capacity at LBPIA.

5. If these studies prove conclusively that such a runway is not feasible, this would make it more urgent to proceed with the consideration of Transport Canada's long-term plan referred to in B.I above.

C. Airport Operations

1. Transport Canada should recognize commercial general aviation as a legitimate user of LBPIA, and should take the steps and introduce the measures necessary to ensure that this sector of the aviation community is guaranteed the same degree of freedom of access to LBPIA as is now afforded to other users, particularly the airlines. The distribution of slots within the cap system should more equitably reflect demand from legitimate users.
2. In particular, Transport Canada should completely overhaul the management of the slot reservation system. Slot reservations at present are assigned in hourly blocks. This is not nearly precise enough to avoid "bunching"; a much shorter period should be used. Reservations should not be allocated unless the need for them is fully established, and should be monitored to ensure they are

used. Slot allocations not currently needed or not used should be withdrawn.

3. Transport Canada should immediately commence the process leading to the establishment of a Local Airport Authority (LAA) that would be given responsibility not only for LBPIA, but also as a minimum for all airports serving the GTA now and in future.
4. Measures to improve the standard and coordinate the practices of waste management at LBPIA should proceed, regardless of any expansion at the airport. This should be handled through a subcommittee of the Community Liaison Committee working with the Airport General Manager's Office. Re-use and recycling should be required formally of all tenants as well as of government operations.

D. Safety Considerations

1. The measures recommended in III.A.1, 2 and 3 above are important, not only because they will increase the operating efficiency and effective capacity of the existing three runway system, but also because they will significantly enhance operational safety.
2. Transport Canada should review its various programs affecting air operations at LBPIA, to identify all situations which may not be fully satisfactory from a safety point of view. In its conclusions relating to safety, as set out in Section III.B of this chapter, the Panel has identified several examples which it believes fall in this category; there may well be others.
3. Transport Canada should immediately determine and implement the corrective action necessary in all such cases.
4. If Transport Canada's existing authority and resources are not sufficient for such implementation, the government should immediately make whatever adjustments are necessary.
5. It is essential that the policy of giving precedence to safety over all other considerations be made totally effective in practice.

E. Community Relations

1. Transport Canada should immediately develop and implement a comprehensive program to improve LBPIA's relationship with neighbouring residential communities.
2. The keystone of this program should be the early establishment of the "LBPIA Community Liaison Committee". Its general mandate should be to consider all matters relating to LBPIA development and operations which might impinge in an adverse sense on the quality of life in neighbouring residential areas.

3. The Committee should be chaired by an independent person, neither a local community representative nor a current employee of any government, nominated by the Minister of Transport and confirmed by the Minister of the Environment.
4. Given the mandate to deal with the quality of life in neighbouring residential areas, the composition of this committee should be the following: (1) the airport manager; (2) the air traffic control manager; (3) one representative from the airline companies; (4) one representative from the Canadian Airline Pilots Association; (5) one representative from senior staff in each of Mississauga, Brampton and Etobicoke; and (6) one representative of local residents in each of Mississauga, Brampton and Etobicoke who have concerns about the impact of LBPIA on their quality of life. The latter should be designated by community groups, such as those which appeared before the Panel to express the environmental concerns of local residents, rather than by municipal governments.
5. The Committee should meet at least quarterly, and more frequently as necessary. It should have sufficient financial and staff resources, provided by Transport Canada, to enable it to function effectively.
6. A budget should be proposed by the chairperson for approval by Transport Canada.
7. The Committee should have the power to appoint subcommittees.
8. No proposed changes in LBPIA airside equipment, facilities or operational procedures which might appreciably alter aircraft noise impacts should be authorized, until such changes and their probable consequences have been discussed in the committee.
9. The meetings should normally be open to the public and each meeting should provide an appropriate opportunity for questions and answers from the public. All reports and financial statements of the committee should be publicly available and the committee should operate using the principles of consensus decision-making.
10. In conjunction with the establishment of the Community Liaison Committee, LBPIA should develop an enhanced and substantially more effective program for informing local residents of developments or proposals likely to be of interest or concern to them. To be effective, this program must be allocated sufficient resources.
11. Activity reports from the noise complaints office should be given regularly to the committee.
12. At an early meeting of the Community Liaison Committee, LBPIA management should present a review of current noise abatement procedures required in connection with arrivals and departures, to include an outline of optional changes which might further reduce noise impacts.

13. With the assistance of the improved navigational aids to be introduced shortly, the observance of noise abatement procedures should be monitored on a continuing basis and periodic reports on infractions, with full information on follow-up action, should be submitted to the Community Liaison Committee.
14. Transport Canada should intensify its current efforts to abate aircraft noise during the shoulder periods, between 2300 hrs. and midnight and between 0600 hrs. and 0700 hrs. During these periods runway allocations should be governed by noise abatement considerations, and all operations by Stage 2 aircraft should be prohibited except in declared emergencies.
15. An overnight curfew should be introduced by April 1, 1993 prohibiting all departures and all arrivals between midnight and 0600 hrs. except for declared emergencies in the same period.
16. Transport Canada should seek to expedite the conversion from Stage 2 to Stage 3 aircraft; in this connection it should introduce a regulatory requirement to parallel that being introduced by the United States.
17. Continuous noise monitoring should be mandatory. This should be done in all areas within a 10 mile radius of LBPIA perimeter, or which are within an SEL 75 contour for areas that are subjected to noise only 5% of the time, using a network of permanent stations concentrated in known noisy areas and supplemented as needed by portable monitors. The results should be provided to the public, and reviewed periodically in the Community Liaison Committee.
18. Regular air quality monitoring at several stations in different neighbourhoods should be undertaken; the results should likewise be made public, and reviewed periodically in the Committee.

F. Mitigation of Noise Effects

1. Transport Canada should, on request, contribute to the cost of appropriate retrofitting with sound insulation of residences and schools, including portables, exposed to high levels of aircraft noise, with an independent investigation on a case-by-case basis to determine what retrofitting is appropriate, as follows:

(a) above 30 NEF, Transport Canada to pay 25% of cost of retrofitting;

(b) above 35 NEF, Transport Canada to pay 50% of cost of retrofitting.

2. Municipalities should endorse and support property tax adjustments for residential properties exposed to levels of aircraft noise of 30 NEF and above.
3. The owners of residences located at or within the 40 NEF contour should have the option of selling their property to Transport Canada, at an "unaffected fair market price".
4. Residents living within the 30 NEF contour, of whom it has been medically certified that their health is being damaged by aircraft noise, should have the option of relocating, with the full costs of relocation being recoverable from Transport Canada.
5. When a resident or school board has benefited from a mitigation program as recommended in 1 and 3 above, a notation must be added to the deed or property assessment roll information with a provision that no future claim can be made against Transport Canada.
6. In the event of a disagreement that cannot be resolved by the parties, either party can require binding arbitration, the costs of which will be shared jointly by the parties.

G. Ecological Measures

1. A decision should be made by 1995 and implemented by 1999 concerning the best practicable means for incineration of garbage from international flights.
2. The measures relating to air and water quality, including arrangements for ongoing monitoring and for ameliorative action to prevent further deterioration, which were referred to in the EIS as elements of the airport's Environmental Management Plan, should proceed forthwith.
3. Collection of **airplane** and runway de-icing materials to prevent their run-off, onto and beyond airport property, and contaminating soil, surface or ground water should be implemented by winter 1993-94.
4. Transport Canada should take whatever measures may be found necessary to control safety hazards attributable to birds, deer or other wildlife.

AIR TRAFFIC MANAGEMENT IN SOUTHERN ONTARIO

ENVIRONMENTAL ASSESSMENT PANEL



ROSS GRAY



MEL HAGGLUND



PETER HOMENUCK



PAMELA WELBOURN



DAVID KIRKWOOD

Appendices

APPENDIX 1

PANEL TERMS OF REFERENCE

Introduction

The Lester B. Pearson International Airport has the highest volume of air traffic of any airport in Canada, and it is anticipated that this traffic will continue to increase. The growth of air traffic at this airport has been stimulated by the strength of the economy in southern Ontario as well as the impact of economic regulatory reform on the domestic air carrier industry. This unexpected growth has resulted in congestion at the airport, especially on the runways and in the air terminals.

The federal Minister of Transport referred Transport Canada proposals to resolve the problems of increased air traffic at Lester B. Pearson International Airport, to the Minister of the Environment for public review by an independent environmental assessment panel.

Transport Canada has proposed medium- and long-term measures to resolve air traffic congestion problems in the Toronto area. The medium-term measures address means to expand runway capacity at the airport to resolve the present aviation congestion and to ensure the efficiency of airport use until the end of this century. The long-term measures involve determining the ultimate capacity of the airport and identifying the role that other airports in southern Ontario could fulfil in order to accommodate the aviation needs in the Toronto area.

Mandate and Responsibilities

The Panel is to undertake a public review of the environmental and socio-economic effects of Transport Canada's medium- and long-term proposals to address the problem of increased air traffic at the Lester B. Pearson International Airport.

To address the problem of aviation congestion in the medium-term, the Panel shall examine the environmental and socio-economic issues associated with proposals for construction of additional runways. The Panel shall include in its review consideration of noise, air and water emissions, any other impacts resulting from construction and operation of additional runways, and economic benefits and disbenefits.

The Panel shall present its conclusions and recommendations on the environmental and socio-economic acceptability of Transport Canada's proposals to expand runway capacity at the airport, to the federal Ministers of Environment and Transport in an interim report.

In addition, the Panel will also examine the environmental and socio-economic implications of Transport Canada's announced proposals to accommodate the increased demand for air services in southern Ontario. The Panel shall consider how Lester B. Pearson Airport, as well as other airports in this region, may be able to accommodate future demands for aviation services.

The Panel's representatives shall also include the investigation of mitigating action which would reduce any negative environmental or socio-economic aspects which may result from the medium- or long-term proposals.

Transport Canada proposals regarding the regulatory reform of the transport industry are outside the Panel's mandate as they are of a national scope and are not unique to Pearson International Airport.

Review Process

The main components of the process will be:

- 1) formulation of an environmental assessment panel, and release of the Panel's terms of reference;
- 2) development by the Panel of the operational procedures for the review;
- 3) preliminary public meetings to identify the priority issues and concerns to be addressed in the review;
- 4) release of Panel draft guidelines for the preparation of an Environmental Impact Statement (EIS) to the public, government agencies and the proponent for review and comment;
- 5) finalization of EIS guidelines and issuance to the proponent;
- 6) completion of the proponent's documentation in response to the guidelines and submission of the EIS to the Panel;
- 7) distribution of the EIS by the Panel to the public and government agencies for review and comment;
- 8) review by the Panel and the public of the available information to determine whether any additional information is required;

- 9) identification by the Panel of any additional information requirements;
- 10) completion of the proponent's response to deficiencies and submission to the Panel;
- 11) convening of final public meetings once the Panel is satisfied with the availability and quality of information;
- 12) preparation of an interim report by the Panel to the Ministers of Environment and Transport addressing the medium-term measures proposed to deal with the expansion of runway capacity at the airport, in approximately one year from its appointment; and
- 13) preparation of a final report by the panel to the Ministers of Environment and Transport which will address the long-term measures proposed in the Toronto Lester B. Pearson International Airport Master Plan and in the Southern Ontario Area Aviation Master Plan to provide solutions to aviation congestion problems in southern Ontario, in approximately two years from the Panel's appointment.

APPENDIX 2

PANEL MEMBER BIOGRAPHIES

David Kirkwood is a former Deputy Minister of Health and Welfare Canada and past Chairman of the Anti-Dumping Tribunal. After receiving his M.A. from the University of Toronto, Mr. Kirkwood held several positions in Ottawa and overseas with the Department of External Affairs from 1950 to 1969. He then was appointed Assistant Secretary to the Cabinet. From 1972 until 1986, Mr. Kirkwood served as a senior public servant in various government departments, and finally as Deputy Minister of Health and Welfare. From the time he retired until recently, he has served as President of the Canadian Mediterranean Institute, a non-profit cultural organization. He well understands the need for public consultation and has extensive experience in chairing public hearings.

Dr. Ross Gray is president of Carrierworks Corporation, a transportation consulting firm in Mississauga. He has a B.Sc. in Engineering from the University of Toronto. He has extensive experience in transportation projects including the design of parking, hotel, and airport access facilities. He prepared a noise impact analysis study for urban transportation in Toronto and directed environmental assessment and public participation programs on urban transport for Hamilton. From 1975 to 1984 he held various positions with the Urban Transportation Development Corporation.

Dr. Pamela Welbourn recently retired from the University of Toronto where she was Professor of Botany and Environmental Studies for 20 years. She was Director of Toronto's Institute for Environmental Studies from 1984-1989. She is currently the McLean Visiting Professor of Environmental Studies at Trent University in Peterborough. She obtained her B.Sc. and Ph.D. degrees from the University of Bristol, England, in Biology and Chemistry and taught in London University prior to coming to Canada. She was vice-chairman of the Royal Society of Canada's Commission on Lead in the Environment, a member of the Ontario Pesticides Advisory Committee from 1986-1990 and chaired that committee from 1989-

1990. She served on Ontario's Round Table on the Environment and Economy and on the Ontario Environmental Assessment Public Review Committee. She consults for US EPA surface water assessment panels, Ontario's water quality guidelines and has recently reviewed EIS's for proposals by Ontario Hydro.

Dr. Peter Homenuck is a senior partner of the Institute of Environmental Research in Toronto. He has an M.A. and Ph.D. in Geography and an M.C.P. in Community Planning from the University of Cincinnati. He taught at the University of Calgary and has held various positions at York University where he is a professor in the Faculty of Environmental Studies and in the Geography Graduate Program. A former Vice-Chairman of the Urban Affairs Association of North America, he is now a member of the Ontario Society for Environmental Management. He has been involved in studies on hazardous waste management and social impact assessment, as well as the Pickering Airport Impact Study.

Mr. Melvin Hagglund is a retired meteorologist with extensive experience in airport planning. He has a B.A. in Mathematics and Physics from the University of British Columbia and an M.A. in Physics (Meteorology) from the University of Toronto. He joined Transport Canada in 1949. From 1964 to 1970 he was Chairman for Air Services of the departmental Financial Management Implementation Team; Assistant Superintendent for Strategic Planning and Policies in the Meteorological Branch, and Chief of Airports Planning and Research. From 1970 to 1972 he was Regional Director of Air Administration in Winnipeg. He became Administrator of the Arctic Transportation Agency in 1972 and Director of the Task Force on Airport Management in 1979. Since his retirement in 1981 he has been a transportation Consultant and is a member of the federal environmental assessment panel reviewing the proposal for a new runway at Vancouver International Airport.

APPENDIX 3

TECHNICAL SPECIALISTS BIOGRAPHIES

Dr. S. Martin Taylor, professor of geography at McMaster University and Director of the Institute of Environment and Health, is an expert on issues related to health aspects of noise. He has a Ph.D., M.A., and an Honours B.A. in Geography. Dr. Taylor's ten-year programme between 1975 and 1985 was on effects of transportation noise on communities. The focus of research of his current ten-year is psycho-social effects of environmental contaminants.

Peter Marshall, a principle in the consulting firm of Marshall, Koenig and Associates, has undertaken economic impact studies on a number of facilities and reviewed the relevant technical documents associated with the potential loss or benefit in property values (eg. real estate) due to air traffic and the Cost-Benefit analysis document tabled by Transport Canada at the Public Hearings. He was Treasurer and Commissioner of Finance for the Regional Municipality of Peel between 1978 and 1986 and has a Honours B.A. in economics.

Murray Daigle of B.P. Aeronautique Incorporated is an expert in the areas of air traffic control services operations and procedures, electronic navigation aids analysis, airport capacity and related fields which affect airport capacity. After working as an air traffic controller for Transport Canada from 1955 to 1972, he became chief of the Montreal Air Control Centre between 1957 and 1978. He retired as Regional Director of the Air Traffic Control Service in the Quebec region in 1986. Mr. Daigle's work with the International Civil Aviation Organisation as a civil aviation consultant included postings in Zaire, Singapore, South Africa, Vietnam, and Ruwanda. In 1983, he wrote the Operational Procedures for arriving and departing

aircraft on the parallel runway operations at Changi International Airport, Singapore. Mr. Daigle has also been involved in numerous National Air Space studies including the North Atlantic Airspace Study which developed the procedures current used in the region.

John C. **Swallow**, a partner in Barman Swallow Associates, Consulting Engineers, **Rexdale**, Ontario, provided expertise on issues related to the physical aspects of noise. In April 1980, Mr. Swallow was one of the founding members of Barman Swallow Associates. Since then he had been involved in Environmental Noise Projects, Vibration Analysis of Structures, Seismic Analysis of Heavy Equipment, and Room and Theatre Acoustics. He is the Chairman of the International Standards Organization (ISO) Editing Committee for the revision of ISO 2631, a proposed standard on the effects of vibration on the human body. He received a **B.A.Sc.** and a **M.A.Sc.** in Mechanical Engineering in 1971 and 1974 from the University of Toronto.

Vince Gambino, of Barman Swallow Associates, provided expertise on issues related to the physical aspects of noise. Upon graduated from Mechanical Engineering in 1984, Mr. Gambino worked as a Structures and Dynamics engineer with Pratt and Whitney Canada. In this position, he conducted both the vibration analysis and testing of rotating gas turbine engine components. In July of 1987, he joined Barman Swallow Associates as an associate. Since then he has worked on a number of projects primarily dealing with environmental noise and vibration as well as structural vibration and architectural acoustics.

APPENDIX d

SUPPLEMENTARY INFORMATION TO THE ENVIRONMENTAL IMPACT STATEMENT (in order of distribution from Transport Canada to the Panel)

1. Response to Panel request for clarification of EIS: figure 2.3-6; Response to Panel request for additional information: section 4.7; Information on transiting passengers; and section 4.9.
2. High speed rail transportation as an alternative to *airside* development at LBPIA, FEAR0 request section 4.1.

Coordinating Consultants Summary Report. January 1991. Prepared for the Ontario-Quebec Rapid Train Task Force, by KPMG Peat Marwick Stevenson and Kellog.
3. Dillon, M.M., North-South Arterial Interchange Study: Working Paper #2: Future Traffic Conditions. August, 1990.

Phase I Overview: LBPIA Transportation Study. Transport Canada and the Ontario MOT, 1991.
4. LBPIA Area Transportation Study, Summary of the First Public Information Centres, 1991.
5. Transit Access to LBPIA: Final Report. July, 1989. Submitted to Toronto Area Coordinating Office, Ontario Ministry of Transportation by Transmode Consultants Inc.
6. Response to the FEAR0 Panel for Additional Information on Air Quality. September 30, 1991. Submitted to Public Works Canada, Ontario Region, by Rowan Williams Davies and Irwin Inc., Guelph, Ontario. Report 90-180C-66.
7. Supplementary to Report #21 Air Quality Modelling (Taxiing, Climbout, and Approach). June 4, 1991. Submitted to Public Works Canada, Ontario Region, by Rowan Williams Davies and Irwin Inc., Guelph, Ontario. Report 90-180F-64.
8. Response to Section 4.3 of the Panel request. Discussion of the impacts of diverging parallel departures on NEF contours.
9. Transport Canada: LBPIA, Air Traffic Controller Staffing. August, 1991.
10. Final Report No. 3, Preliminary Cost Estimates to Air Traffic Services. March, 1991. Appendix 'A' LBPIA Air Traffic Control Staffing.
11. Changes to the EIS summary. Response to Section 4.11 of the FEAR0 request.
12. Response to Panel Request for Additional Information Related to the Cost-Benefit Analysis for *Airside* Development. October, 1991. Prepared for Transport Canada, Major Crown Projects, by Transmode Consultants, Inc..
13. Section 4.10 Relationship Between Annoyance and Noise. 1991. *Airside* Development Project — LBPIA Response to EA Panel.

Section 4.8 Runway Utilization. 1991. *Airside* Development Project — LBPIA Response to EA Panel.
14. Miller, N.P., Henning, E.v.G., and Eldred, K.M.. March, 1991, Final Report No. 26 (Updated October 1991) Impact Assessment Guidelines for the Effects of Noise on People. Report No. 291060.01.
15. Single Event Noise Analysis: LBPIA Panel Response.

Airside Development Project — LBPIA Response to EA Panel Review.
16. *Airside* Development Project — LBPIA Response to EA Panel Review of the EIS Section 4.3 — Impacts of the Proposed North-South Runway.
17. *Airside* Development Project — LBPIA, Response to the EA Panel Section 4.8 Runway Utilization.
18. Comparison of LBPIA Traffic Forecasts and Fleet Mix with Other Recent Projections. October 1991.
19. Armour, A., An Assessment of Impact on Quality of Life in the Surrounding Neighborhoods. October 1991.
20. Reponse to Panel Request of Additional Information — Section 3.0 (Social Impact Assessment) and Section 4.11 (Effects of Noise on Schools);
21. Item 5: Noise Mitigation at LBPIA. November, 1991.
22. Consideration of Alternatives for the *Airside* Development Project, LBPIA, 1991.
23. The Short Runway: A Qualitative Operational Review for Increased Capacity, LBPIA, 1991.
24. Comparative Evaluation of Hourly *Airside* System Efficiency, LBPIA. 1991.
25. Passenger Survey: Level of Service at Spoke Communities, LBPIA. 1991.

26. Measuring the Noise "Benefits" of Runway Expansion at LBPIA Using Residential Housing Markets. October, 1991. Prepared for Public Works Canada by Valcoustics Canada Ltd., Consulting Acoustical Engineers.
27. Erratum to the EIS: Tables 6.13-34 are incorrect and should be as follows...
28. Measuring the Noise Costs of Alternative Runway Expansion Plans at LBPIA Using Residential Housing Markets.
29. Sound Insulation and Aircraft Noise in Schools Near LBPIA: In response to the request for further information.
30. Alternatives to the Airside Development Project at Pearson. January, 1992. Sypher and Mueller International Inc..
31. Environics Pearson International Airport Public Opinion Research. November, 1991. Phase IV Report, Phase III. Focus Group Report.

APPENDIX 5

PUBLIC HEARINGS PARTICIPANTS

December 3, 1991 — afternoon

Transport Canada

— Chern Heed
— Dr. Lloyd
— McCoomb
— Gordon Sinclair
— Mark L. Jacques
— Charles Wunder

Air Transportation Association of Canada
Windsor District Chamber of Commerce
Fairhaven Golfwood Heights

City of Timmins

Canada 3000

Andrew Elek

— Mayor Victor M. Power
— Captain Dusty Thompson

December 3, 1991 — evening

Transport Canada

— Dr. Lloyd
— McCoomb
— Tom Syme
— Larry Pope
— Ken Lajambe

Air Ontario
Brampton Board of Trade
Sault Ste. Marie Chamber of Commerce
Adrian Burtussi

December 5, 1991 — afternoon

Transport Canada
Field Aviation-Fixed Base Operators
American Airlines
Canadian Airline Pilots Association

— Peter Tidd
— Joar Gronland
— Tony Pliska
— Captain Rob McInnes

December 4, 1991 — afternoon

Transport Canada

— Dr. Lloyd
— McCoomb
— Robert Duclos
— Naren Dosi
— Captain Ron Dennis
— Jim Tennant

Air Canada

Metro Toronto Visitors and
Convention Bureau
National Freight Forwarders Association

December 5, 1991 — evening

City of Thunder Bay

Transport Canada

City of North Bay

— Mayor David Hamilton
— Dr. Lloyd McCoomb
— Donald Finlay
— Mark Nowicky
— Mayor Stan Lawlor

December 4, 1991 — evening

Transport Canada

— Dr. Lloyd
— McCoomb
— John Desmarais

December 7, 1991 — morning

Transport Canada
Toronto Limousine Association and the Air
Limousine Association
Wheel and Rim
Sandalwood Estate Association

— John Kaldeway
— John Kirkwood
— Barry A. Howard
— Nunzio Carnovale

December 7, 1991 — afternoon

Transport Canada

— Dr. Lloyd
McCoomb

Cecilia Timlin

London Economic Development Corporation
O'hare Citizens Coalition National and the
Airport Watch Group, Chicago
Ann Elchuk— Howard Atkinson
— Matthew
RosenbergMalette Incorporated
Hospitality and Travel Sault Ste. Marie
Harold Beaudry, Q.C.
Ontario Cancer Society— Gerald Brousseau
— Colin Malcolm
— Helen Ghent**December 9, 1991 — afternoon**

Transport Canada

— Dr. Mara-Lee
McLaren
— Adil Cubukgil
— Peter Tidd**December 9, 1991 — evening**

Transport Canada

— Donald Finlay
— David Washington
— Frank DeCarlo
— Richard Wigston

Pem-Air

Dr. Franco Vaccarino

December 10, 1991 — afternoon

Transport Canada

Accor North America Corporation
Canadian Airline Dispatchers Association— Michael Flaxman
— Mike McLeod**December 10, 1991 — evening**

Transport Canada

— Peter Tidd
— Donald Finlay
— Brian Lackey
— George Nowak**December 11, 1991 — afternoon**

Transport Canada

— Dr. Lloyd
McCoomb
— Dr. Mara Lee
McLaren
— Paul McKnight

Diane Marleau, M.P.

Placer Dome Incorporated, Dome Mine
The City of Sault Ste. Marie
Ontario Lottery Corporation
Mr. Gerry Loughheed, Jr.
Sudbury and District Chamber of
Commerce— Bob Perry
— Ken Lajambe
— Patrick MacDougall

-Jeanne E. Warwick

December 11, 1991 — evening

Transport Canada

— Dr. Lloyd
McCoomb
— Howard Johnson**December 12, 1991 — morning**Transport Canada
Regional Municipality of Sudbury
North Bay and District Chamber of
Commerce— Yves Lemieux
— Stan Hayduk
— Barry Spilchuk**December 12, 1991 — afternoon**Laurentian University
Falconbridge Limited— Dr. Oiva Saarinen
— Mike Humphries**December 14, 1991 — morning**

Transport Canada

Malton Airport Safety Committee

Sophie Bioleck
Brad Green
Roy McLaren, M.P.— Dr. Lloyd
McCoomb
— Rolly Graham
— Roy Willis**December 14, 1991 — afternoon**Robin Pereira
Douglas Perrin
Vista Property Management
Elms Rexdale Resident's Association
Ross Beattie
Tim Healy— Nicola Bongiovanni
— Marilyn Whibbs**December 16, 1991 — afternoon**Wedgewood-Bloorlea Association
Etobicoke Chamber of Commerce
See-Mat Equipment Company
Mission Air Transportation Network
Jim Lee— James Biss
— Marjory Overholt
— Thomas Parker
— Terri Barr**December 16, 1991 — evening**

Transport Canada

Evie Pike
Canadian Professional Sales AssociationCarlo Dalgas
Howard Johnson Hotels— Peter Tidd
— John Kaldeway— Stan Lithwick
— Terry Ruffell

— Michael Brake

December 17, 1991 — afternoon

Transport Canada

— Dr. Lloyd
McCoomb
— C. Leonard Taylor
— Dr. Keith Heidorn

Alan Sproule
Transport 2000 Canada

— Gordon
Woodmansey
— Dr. Judith
Patterson
— Clare Etock

Air Transport Association of Canada and
the Canadian Business Aircraft Association

December 17, 1991 — evening

City of Etobicoke
Transport Canada

— Dr. Claude Davis
— Randy McGill

December 18, 1991 — afternoon

Air Canada

— Captain Ron
Dennis

John Lenhoff
Municipality of Metro Toronto
Council of Concerned Residents
Betty McGregor
Frank Guglietti

— Alan Tonks
— Hap Pareti

December 18, 1991 — evening

Canadian Manufacturer's Association
Corinne Gelley
Erika Kiss
International Air Transport Association

— Don Weirsma

Joan Chlebus
Dusan Jovanovic
Ward 5, Etobicoke

-John Meredith
— Kevin Dobby

Ward 10, Etobicoke

— Councillor Brian
Flynn
— Councillor Brian
Ineson

December 19, 1991 — afternoon

Transport Canada

— Donald Finlay
— Yves Lemieux
— Dick Dolphin

Thunder Bay Chamber of Commerce
Amrit Punhani
Peter Kell
Northwestern Municipal Association

— Gary Norris

December 19, 1991 — evening

Yvonne and Lawrence Mitoff
Brick and other Construction Materials
Group, Jannock Limited
Gordon Dunning

— Vic Hepburn

Connie Neto
Bob Cacelli
Toronto Airport Hotel Association

— Fred Fernandez

January 9, 1992 — morning

Transport Canada

— Dr. Lloyd
McCoomb

Canadian Industrial
Transportation League
Peter Chan
Jetall Holdings Corporation
Ward 5, City of Mississauga

— Maria Rehner

— Arie Tall
— Councillor Frank
McKechnie

January 9, 1992 — afternoon

Luciano Martin
Canadian Air Traffic Control Association

— John Redmond

January 10, 1992 — afternoon

Vilma Munch
Andrew M. Sanders
Robert Horning
Siggy Maier

January 10, 1992 — evening

Transport Canada
John Loria
Du Vernet, Stewart, and Fenn
Geoffrey Baker
John Anga
Alfred Zawadzki
Peel Condominium Corporation
Peel Condominium Corporation No. 231

-John Kaldeway

— Robert Fenn

— Ian Stewart
— Dean Bradley
— Paula Lytwyn

January 11, 1992 — morning

Etobicoke Federation for Ratepayers' and
Residents Association

— Ken Lopez

— Ted Livingston

Canadian Association of
Speech-Language Pathologists

— Marshall Chasin

January 11, 1992 — afternoon

Dot-thy Merrill
Rosette Kertesz
Harry Chadwick, M.P.
Albina Guarnieri, M.P.
Jim Williams
Michael Harrison
Canadian Owners and Pilots Associations

— Michael Stairs

January 13, 1992 — afternoon

George Shaw
Ontario Hotel and Motel Association
Malton Neighbourhood Services
Canadian Auto Workers and the
International Association of Machinists and
Aerospace Workers

Rexdale-Thistletown

Mississauga Board of Trade
Roman Vilkas

— Diane Karabinos
— Carole Berry
— Cheryl Kryzaniwsky
— Bill Shipman
— Metro Councillor
Lois Griffin
— Sid Valow

January 13, 1992 — evening

Thistletown Ratepayers Association
Craig Emick
York Hanover Developments
Polaris Realty (Canada) Limited
Dante Crispino
George Weiss
Cottrell Air Freight Limited

-Joanna Twitchin
— Margaret Knowles
— Dieter Lueloff
— Paul Publow

January 14, 1992 — afternoon

Transport Canada
Olaf Nigol

— Dr. Lloyd McCoom
— Vincent Mestre

January 14, 1992 — evening

Transport Canada
Air Transport Association of Canada
Health and Welfare Canada

— Peter Tidd
— Dr. Henning Von Gierke
— Gordon Sinclair
— Curtis Holsclaw
— Bob Cuthbertson
— Dr. Stephen Bly

January 15, 1992 — afternoon

Canadian Business Aircraft Association
Dufferin-Peel Roman Catholic School Board
Transportation Information Centre
Tarbuck Electric

-John David Lyon
— David Hamilton
— Sally Fallon
— John Howe
— David Tarbuck

January 15, 1992 — evening

Transport Canada

— Dr. Audrey Armour
— Peter Tidd

January 16, 1992 — morning

City of Etobicoke
City of Etobicoke

— Hazam Gidamy
— Dr. Michael Picard

January 17, 1992 — afternoon

John Coop
Churchville Residents Association
Peter Ainsworth
Mitch Speigel
Craig Gammie

— Carole Miles
— Claude Laffoley

January 17, 1992 — evening

City of Brampton

Ray Desjardins
Ron Searle
Dianna Cromarty
Stanley Locke
William Kelly

— Mayor Peter Robinson
— Councillor Roda Begley
— Councillor Gael Miles
— Bill Winterhalt

January 18, 1992 — morning

Kingsway Park Ratepayers Association
William Campbell
Think Rail Group
Malcolm Engering
Standard Trust

— David Warrick
— Jan Van Den Anel
— Don Hiel
— Dan Gold

January 18, 1992 — afternoon

Martin Fuchs
Susan Doolittle
Mississauga East Federal Progressive
Conservative Association
John Baron
Donald Scott
Bitove Corporation

— Stephen McCrory
— Charles S. Cutts

January 21, 1992 — afternoon

Canadian Automobile Association
Anne Methot
Aercoustics Engineering Limited

— Sylvia Foreman
— Dr. Werner Richarz

January 21, 1992 — evening

Francine Cross
Mississauga East Citizens
Against Airport Noise
Rockwood Ratepayers Association
Charles Boon
John Boots
Violetta Sobiech

— David Wiesenthal
-Joanne Scharf

January 22, 1992 — morning

Metropolitan Toronto Separate
School Board
City of Etobicoke

— Dr. Claude Davis
— Dave Hardy

January 22, 1992 — afternoon

Canadian Chamber of Commerce
Canadian Business Aircraft Association

-Tim Reid
— John Lyon
— Ron Chafe
— Deborah Boots

Mississauga East Citizens Against Airport
Noise
The Board of Trade of
Metropolitan Toronto

— Gerry Meinzer
-Jim Murphy
— Trevor Carnahof
-Judy Langer

January 22, 1992, — evening

Canadian Association of Tour Operators
Regional Municipality of City of Hamilton/
Wentworth
Bob Wood, M.P.P. (Nipissing)
Markland Homes Association
Timmins Chamber of Commerce

— Bill Clark
— Don Ross

— Martin Ross
— Bob McBean

January 23, 1992 — morning

Dennis Prigoda
Alfred Huard
City of Mississauga
Ward 3, Mississauga

— Marc Neeb
— Councillor Maja
Prentice

January 23, 1992 — afternoon

John Turner
Etobicoke Board of Education
Federation of Northern Ontario
Municipalities
Walter Besnoski
Vista Cargo Terminals
Eli Ophek

— Debra Smith
— Robert Gray
— Roy Ackroyd

January 30, 1992 — morning

Northern Telecom
Ontario Express Limited
Ward 2, Etobicoke

— Glen Rainbird
— Duncan Fischer
— Councillor Alex
Faulkner

January 30, 1992 — afternoon

Gail Hanna
Toronto Airways
Mel Mitchell
Dr. Jim Henderson, M.P.P. (Etobicoke-
Humber)

— Mike Sifton Sr.

Erin Mills Residents' Association

— Donna Howard

January 31, 1992 — morning

Mr. E. Tom Sternig
Policy and Planning Analysis,
University of Toronto

— Tom Wilson

January 31, 1992 — afternoon

Transport Canada

— Lloyd McCoomb
— Chern Heed

January 31, 1992 — evening

John Wooller
Pickering Rural Association
Donna Rendell
Rosemary Powell
Municipality of the Region of Peel

— Brian Buckles

Council of Concerned Residents/MECAAN

— Doug Billett
— Doug Thwaites
-John Doherty

February 1, 1992 — morning

Canadian Airlines International

— Harry Hargadon
— Nick Portman
— Bob Palmer
— Malcolm Metcalfe

February 1, 1992 — afternoon

Mrs. Gerry Simpson
Canadian Union of Public Employees

— Paul Juttner
— Stefan Saganski

February 6, 1992 — afternoon

Transport Canada

— Gordon Hamilton

February 6, 1992 — evening

Province of Ontario

— David Guscott

February 7, 1992 — afternoon

City of Mississauga

— Mayor Hazel
McCallion

Canadian Business Aircraft Association
City of Etobicoke
Canadian Airline Pilots Association
Economic Development Groups of
Northern Ontario
The Board of Trade of
Metropolitan Toronto

-John Lyon
— Dr. Claude Davis
-Captain Al Aills
— Dave Thomas

-Jim Murphy

February 7, 1992 — evening

Northeastern Ontario Municipalities
Action Group

— Mayor Victor Power
— Ken Russell
— Bob Gray
— Mayor Charles **Caldwell**
— Mayor Joe Mavrinac

— David Hughes
— Mayor James Brown
— **Reg Beldaire**, M.P.
— Mayor Stan Lawlor

Council of Concerned Residents and
Mississauga East Citizens Against Airport
Noise
Air Transport Association of Canada
Transport Canada

— Peter Pickfield

— Gordon Sinclair
— Chern Heed

APPENDIX 6**PEARSON INTERNATIONAL AIRPORT REVIEW PANEL DOCUMENTS**

FEARO, May, 1990. Briefs Submitted to the Panel after Public Meetings in Toronto in March — April 1990. Air Transportation Proposals for the Toronto Area Environmental Assessment Panel.

FEARO, August, 1990. Compendium of Comments Received on Draft EIS Guidelines. Air Transportation Proposals for the Toronto Area Environmental Assessment Panel.

FEARO, July, 1991. Compendium of Comments on the Adequacy of the Environmental Impact Statement on the Lester B. Pearson International Airport **Airside** Development Project.

FEARO, July, 1991. Compendium of Submissions from Technical Experts on the Lester B. Pearson International Airport **Airside** Development Project Environmental Impact Statement.

FEARO, February, 1992. Compendium of Submissions Received by the Pearson International Airport Environmental Assessment Panel.

FEARO, February, 1992. Compilation of Submissions Received from Participants in Public Hearings on the Lester B. Pearson International Airport **Airside** Development Project.

APPENDIX 7

Forecasting Passenger and Cargo Traffic Growth

Transport Canada states that possibly the most difficult aspect of forecasting the future of air transportation is that the demand for this service is not direct-the demand depends on enough variables that it is considered a derived demand: "...it is therefore not possible to directly estimate the future demand for air travel by, for example, simply projecting past trends".

Air travel demand can be divided into two basic components: non-discretionary or business travel, and discretionary or recreational travel. While nationally the air transportation market is roughly divided evenly between these two types of travel, at LBPIA business travel dominates the market, constituting over 70% of total trips. The basis for the proponent's forecasting methodology is summed up in the following two paragraphs from the EIS:

By understanding the relationship between aviation activity and economic activity and the price of air travel, it is possible to predict the future of aviation travel based on the outlook for these real "drivers" of aviation activity. Historical data is used to develop this relationship. Research and judgement are used to predict the outlook for the explanatory variables. The actual forecasting technique proceeds as follows. Forecasts of the flow of air passengers between major population centres are first prepared using econometric models relating passenger flows to projections of economic activity, air fares, and disposable income. These flows are then assigned to the air transportation network using a linear programming model which simulates the process travellers use to select their routings. Finally, the passenger forecasts are converted to aircraft movements based on knowledge of aircraft load factors, aircraft size, routing patterns, and other factors.

Once the historical relationship between aviation activity and economic activity and price are established, the future course of these explanatory factors must be predicted. Forecasts of future economic activity by region of the country are prepared from a comprehensive economic forecasting model developed by INFORMETRICA, a nationally recognized economic research firm. These

projections are verified against those of other institutions performing similar economic research such as the major banks, the Conference Board of Canada, and the Economic Council. Similarly, projections are made for the price of air travel by forecasting the outlook of the major factors influencing the price of air travel such as fuel prices, labour costs, government fees and airline profits. Projections are then cross-checked with numerous sources to ensure a reasonable consensus with the best professional judgement available. Finally the air carriers are polled to determine their fleet procurement plans, operating strategies and other plans. Based on all these inputs, preliminary forecasts are prepared and consultations held with key stakeholders to review the reasonableness of the forecast assumptions and results.

Transport Canada points out that for the most part, their forecasts have enjoyed an excellent track record, with the mean absolute percent errors of the forecasts ranging from 3 to 15%. In this regard, Transport Canada states that "...a particular strength of the Department's approach to forecasting is that traffic at all major Canadian airports is predicted simultaneously, thus ensuring that there is no double-counting of traffic, and that there is consistency of results."

Passenger volumes carried on air carrier aircraft are made up of three components:

- Origin and Destination (O-D) passengers are those beginning or ending their trip at the airport;
- Emplaned and Deplaned (E-D) passengers are the sum of O-D passengers plus connecting passengers; and
- Arriving and Departing (A-D) passengers are the sum of E-D passengers plus transiting passengers (those who pass through the airport on same-plane service, and who never exit the aircraft).

For the purposes of the EIS study, E-D passengers constitute the most critical component of the passenger traffic. It is the E-D total that is normally quoted to describe passenger demand growth.

APPENDIX 8

Runway Capacity-A Descriptive Overview

The capacity rating of a given runway is not an absolute value. It is dependent on a variety of factors having to do with air traffic control standards and procedures, physical runway and taxiway layout, nearby airspace layout, traffic mix, wind and weather, and aircraft operations. On occasion, a runway can handle more movements than indicated by its rated capacity, and on other occasions queues of aircraft can develop even though the total number of aircraft movements in a given period of time is well below the nominal runway capacity.

Runway capacity is typically expressed in terms of the number of aircraft movements per hour that the runway can handle. This number is normally based on calculations and simulations that mimic a specific set of circumstances that is common for that runway or, for comparative purposes, that are common among several runways.

Air traffic control standards and procedures are important when determining runway capacity. The maximum rate at which a runway is able to serve aircraft is the rate at which aircraft can be delivered to and accepted from the runway. To the extent that air traffic control procedures require certain minimum airborne distance separation between aircraft, runway capacity is limited. A shortage of air traffic controllers can also limit the rate at which aircraft can be brought to the runway, and this will also limit the effective runway capacity.

The physical layout of a runway and the taxiway system that serves the runway can have a significant effect on capacity. In general, the more highly developed the taxiway system, particularly the extent to which it includes multiple high-speed exit and entrance points, the lower the average aircraft runway occupancy time. If aircraft are able to achieve a lower runway occupancy time, are able to spend less time on the runway, then following aircraft are able to use the runway sooner, and the resultant total capacity is higher.

Runway capacity can also be affected by the location of the runway, and the location of other active runways at the airport, in relation to terminal buildings and other sites around the airport where aircraft originate or are destined. The most desirable design is one that minimizes the number of times that taxiing aircraft have to cross an active runway, thereby reducing the total time available during which the runway can be used to land or depart aircraft, and maximizing capacity. Normally, a layout with centrally-located terminal and other aircraft-related buildings and with runways at the perimeter of the airport is the most efficient in terms of maximizing runway capacity.

The minimum time permissible between successive arrivals can also influence runway capacity. The more widely-spaced the stream of arriving aircraft, the longer the time between each arrival, and the lower the resulting runway capacity.

However, if arriving aircraft are separated sufficiently to insert one or more departures between each pair of arrivals, the total runway capacity can be increased beyond what it would be if the runway were to be used for arrivals only.

Aircraft arriving at and departing from a runway need airspace through which to fly. If the airspace surrounding the runway is congested to the point where required airspace is not available at all times for arrivals or departures, then some arrivals and departures will not be able to use the runway, and its effective capacity will be reduced.

Aircraft performance and mix is an important factor when considering runway capacity. The better the performance characteristics of the aircraft and the faster its operating speed when on final approach or departure climb-out the sooner the next aircraft can use the runway and the higher the runway capacity. Similarly, the more uniform the mix of aircraft using a runway, the easier it is for air traffic controllers to select and to achieve consistent minimum spacing between aircraft, and the higher the runway capacity.

Similarly, runway capacity can be diminished by the presence of large high-performance aircraft that produce wake turbulence on arrival approach. Because of the dangers inherent in wake turbulence, aircraft following large aircraft must be assigned a greater spacing to permit wake turbulence to dissipate. In turn, this can reduce runway capacity.

Wind has an effect on runway capacity. Not only does the wind direction and strength determine which runways can be used at any given time, it also affects aircraft ground speed. The stronger the headwinds, the greater the intervals between successive aircraft established at a given distance separation. Thus, the longer the time between runway use by successive aircraft, the lower the runway capacity.

Weather, particularly visibility, affects the ability of air traffic controllers in the tower to make positive contact with aircraft. If weather is sufficiently good to permit the tower controller to make visual contact with aircraft, then shorter spacings can be used between arriving and departing aircraft, and the effective runway capacity is higher. If weather restricts visibility or inhibits use of the runway surface, then runway capacity will be reduced.

The final consideration that can affect runway capacity is the imposition of constraints on aircraft operations. Usually, such constraints are established as an element of noise abatement procedures, and take the form of routing and of speed restrictions. Constraints that require aircraft to follow specific routes have the effect of limiting the available airspace. Constraints that restrict aircraft speed have the effect of limiting aircraft performance. Both effects result in increased aircraft time-

based separation, which eventually results in reduced runway capacity.

As each of the above conditions can vary between different airports and between different runways at the same airport, the rated capacity of two runways that are otherwise substantially the same can be different. Furthermore, as some of the above conditions will vary over time for any given runway, the effective capacity of an individual runway will vary over time.

Transport Canada has prepared generic nominal runway capacities reflecting the traffic mix and other conditions at LBPIA that can be used as rules-of-thumb. A single runway handling arrivals and departures has a capacity of 48 movements per hour in Automatic Control Transfer (ACT) conditions-when visibility is sufficient to enable automatic transfer from radar control to visual control by the control tower-and 40 movements per hour in sub-ACT conditions. The capacity of a set of two fully independent parallel runways, both handling both arrivals and departures, is double that of a single runway, or 96 and 80 in ACT and sub-ACT conditions, respectively.

Two parallel runways spaced between 765 metres (2500 feet) and 1310 metres (4300 feet) apart, so that they are "partially dependent," have a combined capacity of 78 in ACT conditions and 73 in sub-ACT conditions. If the runways are spaced more closely than 765 metres (2500 feet), with an intervening taxiway system, they form a dual-lane dependent system, and would have a capacity of 66 in ACT conditions and 56 in sub-ACT conditions.

These nominal rule-of-thumb runway capacities are the highest that can be reasonably expected to be achieved, and may not be representative of the actual capacities that would be achieved under day-to-day operating conditions. In particular, they are calculated assuming at least one arrival and one departure waiting to use the runway. By definition, this condition implies delays that may or may not exceed acceptable levels. Furthermore, in the cases where more than one runway is being rated in the capacity calculation, it may or may not be possible, depending on airspace and aircraft routing considerations, to maintain a non-zero queue of aircraft-to always have aircraft waiting.

The following sections provide further information on each of the two remaining runway capacity calculations as they apply to LBPIA.

Theoretical Capacity

This measure of capacity presented by Transport Canada takes into account the undesirability of serious delays. Specifically, this "Capacity-Based Demand Capacity" measure assumes that average delay should be limited to four minutes. In practice, an operation limited in this manner would feature some aircraft delayed by more than four minutes, and others that would not be delayed at all. There would therefore be some times when arriving and departing aircraft would be

queued, and other times when space and time would be available on the runway to serve an aircraft, but no aircraft would be awaiting service.

This capacity is representative of the aircraft flow that would be achieved at an airport suffering from a runway capacity shortfall, and operating under flow control conditions that were designed to limit average delays to the established level, provided that the flow control procedures had been finely tuned to take into account aircraft routing direction.

The capacity-based demand capacities for the base case and the proposed new runways at LBPIA are:

Capacity-Based Demand Capacity

<u>Direction</u>	<u>Case</u>	<u>ACT</u>	<u>Sub-ACT</u>
Westbound	Base case	•*	**
	Proposed	126	107
Eastbound	Base case	**	**
	Proposed	128	109
Northbound	Base case	**	•*
	Proposed	65	63

The third measure of capacity presented by Transport Canada takes into account not only the above restriction on delays, but also the distribution of directions to which aircraft depart and from which they arrive at LBPIA. This then results in the degree of balance that can be achieved in the operation and loading of parallel runways. This is called the "Constrained System Throughput Capacity". To the extent that aircraft direction favours one of the two parallel runways, the other will be under-utilized, and the resulting effective capacity of the parallel pair will be reduced.

While this last of the three capacity measures is helpful as a planning tool, it must be carefully applied and interpreted. Inherent in its definition is the assumption that it would be possible for an aircraft wishing to arrive at LBPIA from Montreal would be denied a landing clearance on Runway 24L at times when the demand on Runway 24R from aircraft arriving from Winnipeg exceeded the capacity of Runway 24R. Operationally of course, the Montreal aircraft would not be denied, so the use and applicability of a capacity calculation that assumes it would be is somewhat uncertain.

The constrained system throughput capacities for the base case and the proposed new runways at LBPIA are:

Constrained System Throughput Capacity

<u>Direction</u>	<u>Case</u>	<u>ACT</u>	<u>Sub-ACT</u>
Westbound	Base case	**	**
	Proposed	126	106
Eastbound	Base case	**	•*
	Proposed	127	109
Northbound	Base case	**	•*
	Proposed	65	63

APPENDIX 9

Airspace Structure and Flow Control

Flights arriving at and departing from LBPIA must be meshed with those that use nearby airports and those that overfly the region, while adhering to international air traffic control standards and ensuring flight safety. As a result, the capacity of the airway-airspace system can restrict the capacity of LBPIA: If airspace in the vicinity of LBPIA is filled by traffic between other airports, then LBPIA departures are grounded.

These high volumes of transient aircraft overflying the LBPIA area, of aircraft using nearby regional airports, and of LBPIA arrivals and departures require a very complex air traffic control system. To facilitate the flow of LBPIA traffic and to increase separation between LBPIA traffic and transient traffic, Air Traffic Control (ATC) uses four navigational fixes located 26 to 39 nautical miles northeast, southeast, west-southwest and northwest of LBPIA. This layout has been nicknamed the "bedpost" system. All aircraft arriving at LBPIA will be routed over one of these four bedposts, and from there to the appropriate landing runway.

Air traffic control service responsibilities are divided generally along the same boundaries as are used for airspace, with additional sub-division of responsibilities within individual areas as required. The Toronto Area Control Centre provides air traffic control services within the Toronto Flight Information Region. The Centre is divided geographically into five areas, each of which is further divided into a low-level and a high-level sector.

One of the five areas, Terminal Control, is responsible for routing arriving aircraft along their final approach paths to assigned runways, and for routing departing aircraft from their runways to their enroute airways. The arrival and departure functions are divided between teams of controllers, and may often be further subdivided depending on volume of traffic, runway use, and controller availability.

Once arriving aircraft are routed toward LBPIA over one of the four bedposts, they proceed to the perimeter of the Terminal Control sector by means of a published profile descent. The profile descents establish routings and altitude and airspeed restrictions. On arriving at the perimeter of the Terminal Control area, aircraft are individually assigned further routings, altitudes, and airspeeds by terminal controllers.

Departing aircraft are assigned a published Standard Instrument Departure procedure specific to their runway prior to

being given take-off clearance. These procedures establish flight routing, obstacle clearance, and noise abatement requirements for pilots to follow until air traffic controllers assign the particular routing to the flight's enroute airway.

Aircraft within the seven nautical mile range of the Toronto Control Zone are under the control of Toronto Tower. Using a combination of radar and visual monitoring, the tower assigns landing and take-off clearances, and moves aircraft on and off active runways. The Toronto Ground Control position is also located in the tower. This position is responsible for the movement of aircraft between the active runways and the ramp areas at LBPIA, and for the movement of ground vehicles along taxiways. A separate control function has been established to monitor Visual Flight Rule (VFR) aircraft not destined to or departing from LBPIA but operating along assigned routes within the Toronto Control Zone.

An essential, but often unpopular, element of air traffic control at LBPIA is flow control. A traffic management procedure, flow control is implemented by air traffic control when demand exceeds capacity at any point in the airway-airport system. Its intention is twofold: To reduce airborne holding, taxiway holding, and controller workload; and to meter the flow of arriving aircraft into the Toronto Terminal area during the busiest and most congested periods of operation.

Flow Control at LBPIA involves the review of planned flights and expected operating conditions to predict occasions when demand will overload capacity. At LBPIA, this most often occurs when there are insufficient air traffic controllers to operate the existing runway system at full capacity, or when wind or runway surface conditions dictate the use of the single north/south runway.

When an overload is predicted, a hierarchical system of planned delays is imposed-redistributing demand in time to match available operational capacity. At its first level, flow control assigns delayed departure times to aircraft operating to or from airports within 302 nautical miles of LBPIA. Often, delays to these aircraft may be sufficient to re-establish demand-capacity balance. If this first level of delays are not sufficient, then additional levels of flow control are imposed, affecting aircraft operating to and from progressively more distant airports, until the air traffic demand-capacity ratio reaches a balance.

APPENDIX 10

Waste Management at LBPIA

Transport Canada's EIS addresses the management of various types of waste ranging from polychlorinated biphenyls (PCBs) and accidental fuel spills to international sewage and contaminated soil.

PCBs that have been taken out of service are held in a storage area where conditions conform to the appropriate section of the Canadian Environmental Protection Act. For hazardous chemicals other than PCBs, the EIS states that tenants and authorities are responsible for the storage and disposal of their hazardous wastes other than PCBs. The LBPIA Fuelling Sub-committee meets approximately every two months to review spill records, propose improvements to reduce frequency and severity, and monitor all aspects of fuel spill prevention and response.

According to Transport Canada, the base case projects increased passenger traffic of 3.5% per year. No values are provided in the EIS for concomitant increases in all kinds of waste generation, but a certain amount of increase in all waste streams can be anticipated. In the EIS base case scenario, the major emphasis for waste management relates to reduction and recycling of waste.

For international waste, the EIS base case anticipates increases in volume since quantities of waste vary in proportion to the level of passenger activity at the airport. As indicated above, incineration is required for this type of waste, and it will continue to be treated as a separate waste stream. The Airline Consultative Committee (ACC) assumes that Transport Canada's LBPIA Environmental Management Plan, "...would consider permitting an environmentally acceptable on-site waste management system if that system has obtain [sic] all the necessary environmental approvals, including an evaluation under the federal Environmental Assessment Review Process (EARP). The existing position of Transport Canada is that on-site incineration will only be considered if no other alternatives exist."

For non-hazardous waste, currently being landfilled, the EIS base case scenario indicates that these materials can continue to be disposed of at local landfill facilities. However, in recognition of the increased environmental consciousness of passengers and changes in packaging, the proponent expects a decrease in the volume of waste produced, as well as the adoption by Transport Canada of all practical suggestions in order to reduce waste and increase recycling. An estimated 60% of the non-hazardous waste is recyclable, and the proponent proposes a recycling plan and educational programme which will be airport-wide and which will include all tenants.

An additional factor which may force the airport management to change its current management of non-hazardous wastes

relates to policies in effect at the landfill site in which such waste from LBPIA is disposed. The Region of Peel already requires mandatory diversion of certain wastes and further restrictions were expected for 1992 at the time of writing of the LBPIA Environmental Management Plan.

Contaminated soil, which can be considered as waste material requiring disposal, is known to be present in a number of locations covered by the runway options. The types of soil contamination include two abandoned sewage fields, an abandoned septic tank system and the Fort Knox area—the airport storage area for equipment, supplies, office furniture, etc. Other areas of contaminated soil may be exposed and discovered if and when construction proceeds.

When contaminated soil is disturbed, as for example during construction, a number of potential hazards occur. Dust arising from the disturbed soil may present a risk to workers on the site and may also blow into existing water bodies. Furthermore, placement of contaminated soil in previously uncontaminated sites may pose a risk to humans or other biota exposed to soil and water in the area receiving the contaminated debris.

Provincial guidelines exist concerning the disposal of contaminated soil on the owner's site, although this is still a rather new area of environmental management. Essentially, the owner is responsible for on-site disposal, rather than allowing export of the material to other sites. Bearing this in mind, the proponent has provided two main on-site disposal options, and has conceded that "...the solutions would require careful staging of the excavation work."

Construction of the three proposed runways will not affect any municipal sewers, but construction of the runway and taxiway strips of Option 1 . 1 affects portions of the sanitary trunk sewer which crosses the airport property. The trunk sewer passes through airport property under an agreement between the Ontario Water Resources Commission (OWRC) and Transport Canada. Under that agreement OWRC is responsible for all the necessary works associated with the strengthening including environmental protection.

Regarding other aspects of waste management under the preferred option for the proposed runway expansion project, the EIS makes only very brief reference to the subject: "Increases in wastes generation would be proportional to the increases in passenger traffic as accommodated by the new runways." Another reference states: "Since passenger volumes are forecast to be only marginally higher (5 — 10%) for the proposed new runways than with the base case in the medium term, the incremental increase in waste generation would be similarly marginal."

APPENDIX 11

Single Event Noise Analysis

Role of SEL Data: In the introduction to the SEL analysis for LBPIA, the proponent made a number of observations aimed at clarifying misconceptions regarding the use to be made of SELs in the analysis of noise regimes around airports. These observations can be summarized as follows:

- It is a common error to assume that cumulative noise metrics do not account for single event noise. Quite the opposite is true. The single event component of the cumulative metric is the most important component.
- SEL contours are developed to better understand the extent of the change in cumulative noise levels associated with changes in single event noise occurring as a result of changing fleet mix, number of operations, new or revised flight tracks or changes in flight profiles.
- Today, SEL contours are the single most used tool to illustrate the impacts of the world-wide changeover to Stage 3 aircraft.
- One of the critical deficiencies of the single event contour is that it does not address the frequency of occurrence of similar movements by the same aircraft type.
- In all cases of study of annoyance due to aircraft noise, a cumulative noise metric was the tool for measuring the level of noise. Reported community annoyance has never been significantly correlated with single event noise.
- Noise has the capacity to interfere with speech communication and can cause sleep disturbance. The basis for evaluating single event noise is often related to these known effects of noise on people.
- Even for a given aircraft on a given flight track, there is substantial variation in noise level from flight to flight. This variation is due to differences in aircraft weight, meteorological effects on sound propagation and pilot technique. The variation can be as high as 10 dBA or more. The point is that the noise level represented by a SEL contour is in fact merely an estimate of the noise level created by a typical aircraft of the type designated on the selected flight track.

Development of SEL Contours for LBPIA: For illustrative purposes of individual SEL contours for individual aircraft on one track for one operation, the 8727, (a common Stage 2 aircraft operating at LBPIA) and the Airbus A320 (a popular Stage 3 aircraft operating at LBPIA and forecast to become a dominant aircraft in the future fleets of both Air Canada and Canadian Airlines International) were chosen. A simultaneous arrival on the proposed new 24L and departure on the renamed 24R was selected for both aircraft. A departure profile similar to that included in the NEF model was used, along

with a trip length of less than 950 km. Figures 2.22 and 2.23 illustrate the resulting SEL contours in increments of 5 dBA, from 75 to 95 dBA. Note that the 75, 80 and 85 dBA SEL contours for the B727 extend beyond the study area (Figure 2.22). Note also that in Figure 2.23 the SEL contours for the A320 are not shown for levels above 85 dBA as these higher values do not extend beyond airport property or the highway infrastructure East of the 24L threshold. These Figures together with Table 2.11 (Areas in km² within SEL contours) reveal the dramatic difference in sound energy generated by comparable Stage 2 and Stage 3 aircraft. Tables 2.12 and 2.13 illustrate the change in areas within SEL contours for various stage lengths for the two aircraft. Departure profiles also change the areas within given SEL contours. At LBPIA the optimum profile is used in the Vertical Noise Abatement (VNA) procedure to reduce overall noise exposure on the ground while ensuring that the necessary safety of flight operations is maintained.

Representative SEL Contours Selected for LBPIA: In response to the Panel request for SEL contours to replace the overlays (SEL contours) presented in the EIS, "representative" SEL contours were produced for two Stage 2 aircraft and two Stage 3. These contours were constructed by superimposing separate composite contours of combined parallel runway use in each of the 24, 06, 33 and 15 directions, with arrival and departure tracks assumed to be straight in-straight out, except for departures on 33R and 15L, where specific departure turns are required. Figures 2.24 to 2.27 illustrate the representative contours for the four aircraft.

Complementing similar information already provided in Tables 2.12 and 2.13 for the B727 and the A320, Tables 2.14 to 2.18 present SEL footprint areas, for various stage lengths for each of the DC9 (Stage 2), B737-200 (Stage 2) B737-300 (Stage 3), 8767 (Stage 3) and the B747-200 (Stage 3). Note that the footprint for the Stage 3 747-200 at its longest stage length is virtually the same as the Stage 2 737-200 at its longest stage length.

Use of SEL Contours for Airport Impact Assessment: Transport Canada points out that, while SEL contours are quite useful in understanding the incremental change in noise level that occurs as a result of the proposed runways and the difference in aircraft noise levels by type of aircraft, there is no clear way to utilize the SEL contours to assess the noise impact of airport operations at any geographical location.

The primary reason for this fact is that SEL contours ignore frequency of operation. Thus, while they give a visual indication of the different noise characteristics of different aircraft types, they provide no indication of net impact, e.g., a population impacted by 5 8727 operations per day would be described as having the same SEL impact as a population

impacted by 500 8727 operations per day; and a review of Figures 2.24 to 2.27 provides no clue to the fact that many more operations are experienced by residents under the approach to Runway 24L than by those under the approach to Runway 33.

Furthermore, while it is possible to generate many SEL contours for an airport, there is no clear way to determine of many possible contour sets to use in noise assessment or regulatory schemes. The "worst case" might be an obvious choice, but it will probably change with time. For example, while the 8727 now provides a common worst case noise footprint at LBPIA, by the turn of the century the common aircraft noise footprint will probably be about the size of that of the A320.

Use of SEL Data at Other Airports: There are two common types of use of SEL data, and these are at present primarily in the U.S. The most common is not in the form of SEL contour thresholds, but in terms of fleet mix control. Several airports set noise limits in terms of published SEL data for aircraft at Stage 2 and Stage 3 measurement sites, with a view to restricting access altogether, or at night.

A second use of SEL data is the adoption of noise budgets for the airlines, again based on published SEL data. The budget

allows the airline to compose its fleet in such a way that the combination of single event noise level and number of operations does not exceed the budgeted amount.

Of the airports that have published SEL contours as part of environmental studies, none have used these contours in developing assessment or regulatory schemes. Rather they have been used to better understand the effects of changes in fleet mix or flight tracks.

Conclusions on Use of SELs in the LBPIA Environmental Review: Transport Canada concludes that SEL contours can be very helpful in aiding the understanding of how the proposed runway development at LBPIA will affect the airport environs. SEL is a simple concept, easily understood, and SEL contours clearly show the effect of quieter aircraft and new tracks. When combined with frequency of occurrence and time of day of operations, SEL data becomes the cornerstone of the methodology for calculating cumulative noise metrics such as L_{dn} or NEF. For the purposes of identifying impacted areas for any noise assessment or regulatory action, both in regards to total and incremental noise, Transport Canada recommends that a cumulative noise metric such as NEF or L_{dn} be used.

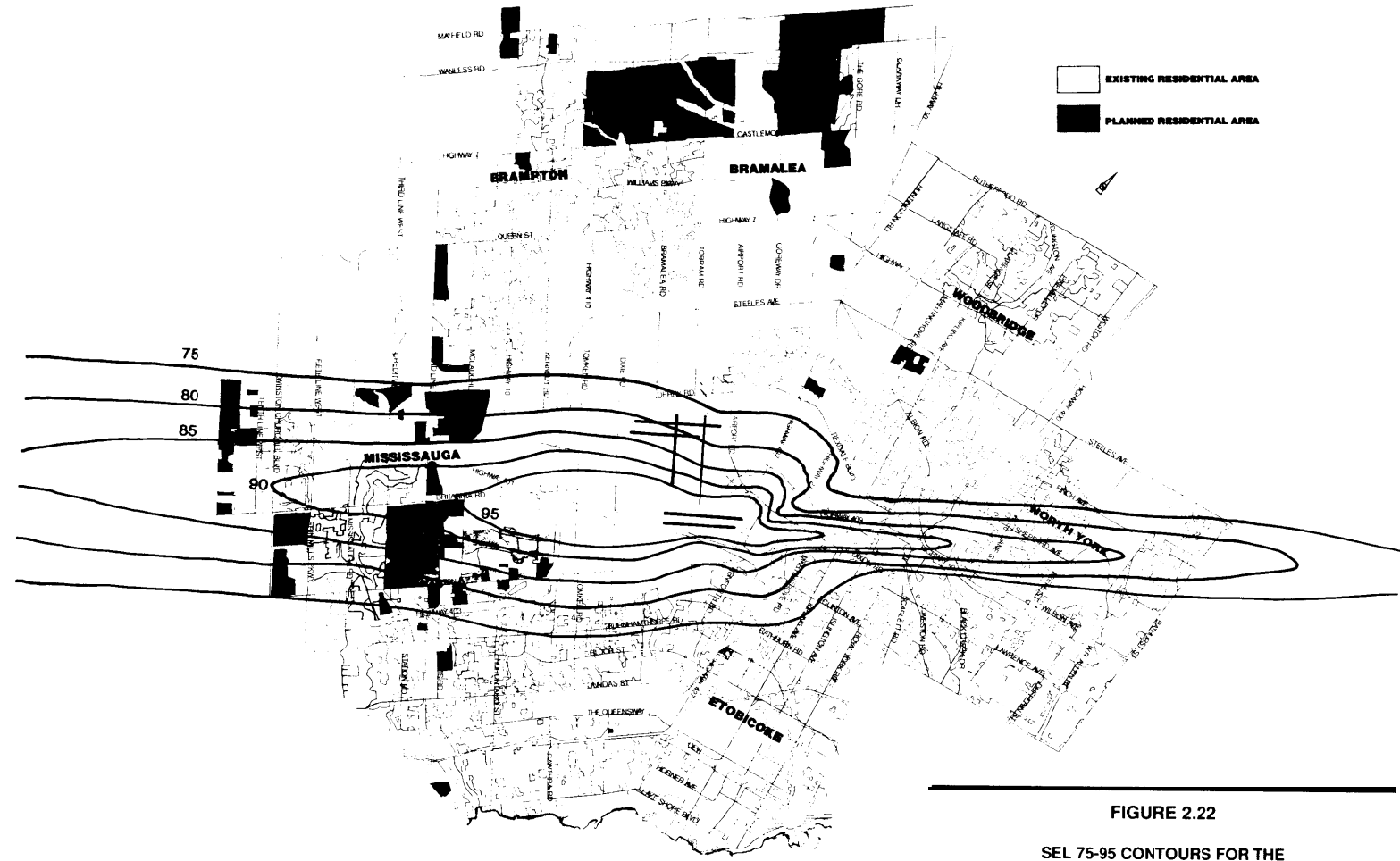


FIGURE 2.22
SEL 75-95 CONTOURS FOR THE
BOEING 727 (TRIP LENGTH 0-950 KM), LBPIA

Adapted from Transport Canada,
Single Event Noise Analysis, 1992.



5 km

Adapted from Transport Canada Single Event Noise Analysis, 1992.

TABLE 2.11

AREA (SQ. KM.) WITHIN SEL CONTOURS
FOR B727-D15 AND A320 BASED ON TRIP
LENGTH OF 0-950 KM

A/C TYPE	SEL 75	SEL 80	SEL 85	SEL 90	SEL 95
B727	545.7	265.1	116.2	50.0	22.3
A320	24.3	9.6	3.6	1.0	0.3

Adapted from Transport Canada,
Single Event Noise Analysis, 1992.

TABLE 2.13

AREA (SQ. KM.) WITHIN SEL CONTOURS
FOR A320

STAGE LENGTH	SEL 75	SEL 80	SEL 85	SEL 90	SEL 95
0-950km	24.3	9.6	3.6	1.0	0.3
950- 1850km	25.9	10.4	3.9	1.0	0.3
2775km 1850-	27.7	10.9	4.1	1.0	0.3
4625km 2775-	28.7	11.6	4.4	1.3	0.5

Adapted from Transport Canada,
Single Event Noise Analysis, 1992.

TABLE 2.12

AREA (SQ. KM.) WITHIN SEL CONTOURS
FOR B727-D15

STAGE LENGTH	SEL 75	SEL 80	SEL 85	SEL 90	SEL 95
0-950km	545.7	265.1	116.2	50.0	22.3
950- 1850km	600.1	287.6	127.4	54.9	24.6
1850- 2775km	675.7	323.1	142.4	60.6	27.2
2775- 4625km	810.1	372.8	162.3	67.6	29.8

Adapted from Transport Canada,
Single Event Noise Analysis, 1992.

TABLE 2.14

AREA (SQ. KM.) WITHIN SEL CONTOURS
FOR **DC9-30** CHAPTER 2 AIRCRAFT

STAGE LENGTH	SEL 75	SEL 80	SEL 85	SEL 90	SEL 95
0-950km	281.2	128.4	54.4	22.3	10.1
950-1850km	301.6	141.6	60.3	24.6	10.9
1850-2775km	323.4	152.0	63.9	26.1	11.6

Adapted from Transport Canada, Single Event Noise Analysis, 1992.

TABLE 2.15

AREA (SQ. KM.) WITHIN SEL CONTOURS
FOR **B737-200** STAGE 2 AIRCRAFT

STAGE LENGTH	SEL 75	SEL 80	SEL 85	SEL 90	SEL 95
0-950km	255.5	117.0	52.6	24.1	11.4
950-1850km	263.0	121.7	53.6	24.3	11.6
1850-2775km	281.4	134.1	59.8	26.4	12.4
2775-4625km	317.4	149.4	64.7	28.5	13.5

Adapted from Transport Canada, Single Event Noise Analysis, 1992.

TABLE 2.16

AREA (SQ. KM.) WITHIN SEL CONTOURS
FOR **B737-300** STAGE 3 AIRCRAFT

STAGE LENGTH	SEL 75	SEL 80	SEL 85	SEL 90	SEL 95
0-950km	53.1	21.0	7.5	2.3	0.8
950-1850km	54.9	21.7	7.8	2.3	0.8
1850-2775km	57.2	22.8	8.0	2.6	0.8
2775-4625km	61.4	24.1	8.8	2.6	0.8

Adapted from Transport Canada, Single Event Noise Analysis, 1992.

TABLE 2.17

AREA (SQ. KM.) WITHIN SEL CONTOURS
FOR **B767** STAGE 3 AIRCRAFT

STAGE LENGTH	SEL 75	SEL 80	SEL 85	SEL 90	SEL 95
0-950km	74.6	29.3	10.6	3.6	1.6
950-1850km	76.4	30.0	10.9	3.9	1.6
1850-2775km	78.4	30.1	11.4	3.9	1.6
2775-4628km	82.1	32.4	11.9	4.1	1.8
4625-6475km	87.0	34.2	12.7	4.9	2.1
6475-8350km	92.7	36.5	13.7	4.9	2.1

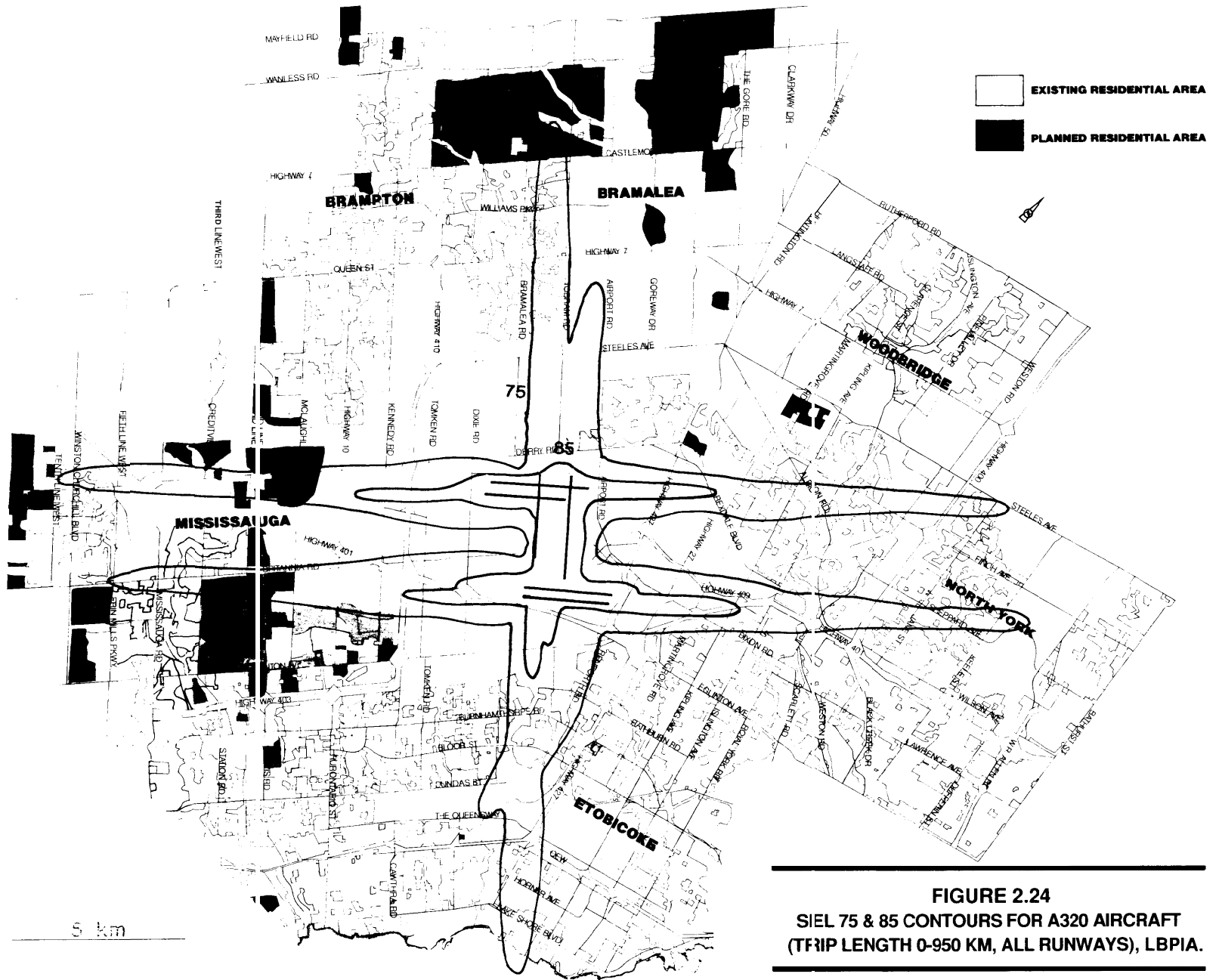
Adapted from Transport Canada, Single Event Noise Analysis, 1992.

TABLE 2.18

AREA (SQ. KM.) WITHIN SEL CONTOURS
FOR **B747-200** STAGE 3 AIRCRAFT

STAGE LENGTH	SEL 75	SEL 80	SEL 85	SEL 90	SEL 95
2775-2465km	276.0	120.6	50.2	20.5	9.6
4625-6475km	295.9	128.7	54.4	22.5	11.1
6475-8350km	324.6	141.9	59.3	25.1	12.7
8350 +km	344.3	149.6	63.7	27.7	14.2

Adapted from Transport Canada, Single Event Noise Analysis, 1992.



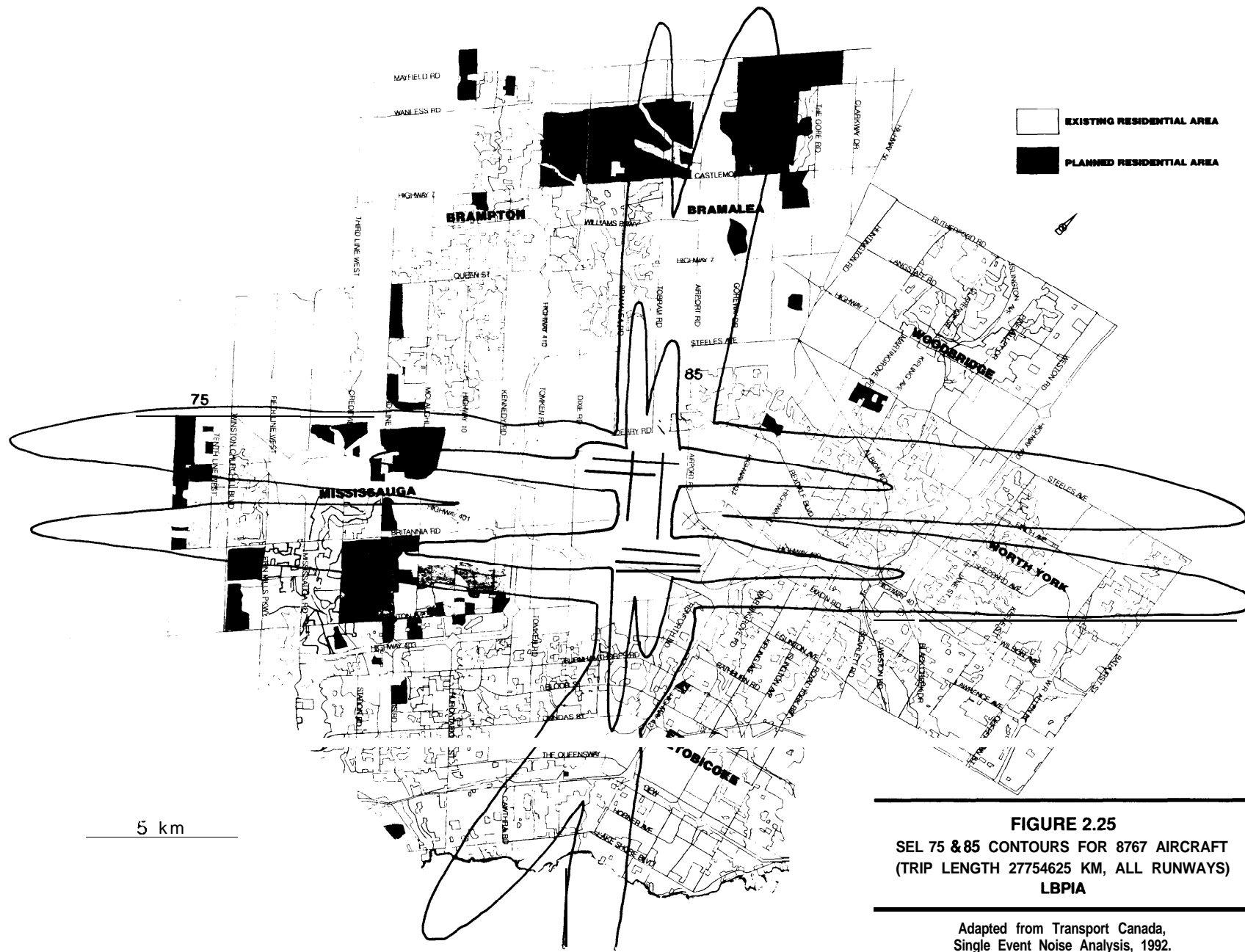


FIGURE 2.25
SEL 75 & 85 CONTOURS FOR 8767 AIRCRAFT
(TRIP LENGTH 27754625 KM, ALL RUNWAYS)
LBPIA

Adapted from Transport Canada,
 Single Event Noise Analysis, 1992.



FIGURE 2.26
SEL 85 CONTOURS FOR B737-200 AIRCRAFT
(TRIP LENGTH 0-950 KM, ALL RUNWAYS), LBPIA.

Adapted from Transport Canada,
 Single Event Noise Analysis, 1992.



FIGURE 2.27
SEL 85 CONTOURS FOR DC 930 AIRCRAFT
(TRIP LENGTH 0-950 KM, ALL RUNWAYS), LBPIA.

Adapted from Transport Canada,
 Single Event Noise Analysis, 1992.

APPENDIX 12

Sources of Aircraft Noise

Overflights: This refers to the passage of aircraft not involved in landing or departing over areas near airports. Full power is generally not being applied-people on the ground are exposed to noise at a level depending on the characteristics of the aircraft, its distance and altitude, and other factors such as meteorological conditions.

Landings and Takeoffs: Aircraft approaching and departing from the runways are the dominant sources of noise at any airport, with departures creating the highest levels. It was primarily for this aircraft activity that the noise exposure measures were developed. Sophisticated instrumentation and modelling techniques also exist for measuring and predicting the associated noise levels. Not surprisingly, these aircraft movements also create the bulk of the noise complaints at LBPIA.

Reverse Thrust: The noisiest part of a landing occurs when reverse thrust is used. This term refers to the application of engine thrust opposite the direction of travel as a braking aid. It can involve an abrupt application of engine power and a sudden increase in noise which can be startling.

Run-Ups: There are two types of engine run-up. The first type of ground run-up occurs as a departing aircraft begins its take-off roll, and is included in noise models used to draw noise contours around the airport. The second type of run-up is termed maintenance run-up and involves the running of aircraft engines at idle and above-idle power settings for either

scheduled or unscheduled maintenance purposes. Maintenance run-ups are common at a major international airport and can be quite frequent where major aircraft maintenance facilities are located. Maintenance run-ups are not included in development of noise contours in the EIS but were discussed at the hearings. Residents from areas surrounding the airport were particularly concerned about such activities being undertaken at night.

Taxiing: Taxiing and other ground traffic noise is generally less intense than landing or take-off noise.

Use of Auxiliary Power Units: Auxiliary Power Units (APUs) are small turbine engines that are either mounted in the aircraft or are contained in separate ground-based units, and which provide power to aircraft while they are parked and not connected to the airport electrical system. These engines produce noise, but are considerably smaller and quieter than main jet engines on an aircraft. APU noise can be of some concern because aircraft may be running on these units for extensive periods of time while parking on the ramp or other areas where electrical power is not available. APU noise does not appear to travel beyond the airport boundary, and complaints have not been received by the LBPIA Noise Management Office that could be associated with APU operation.

APPENDIX 13

Behavioural Effects of Noise

Assessments of the behaviour effects of noise concentrate on levels of interference with speech, interference with sleep, and annoyance; as well as on particularly vulnerable populations and individuals.

Interference with speech: Speech interference by noise—measured during relaxed conversation in a typical living room or in a classroom—is zero at 45 decibels (dBA). At levels above 50 dBA, people will have to raise their voices in order to communicate. Thus for indoor communication in residential buildings, the day-night average sound level (L_{dn}) should not be above 45 dBA, while in buildings that are not used during nighttime hours, all other things being equal, the equivalent sound level over 24 hours—or $L_{eq(24)}$ 45 dBA—should not be exceeded. Depending upon the type of building construction, the corresponding outdoor levels can be calculated to provide the most conservative value of outdoor L_{dn} or $L_{eq(24)}$ for protection.

Interference with sleep: For rest and sleep, properties of the noise in addition to the level of sound may be important. Interferences with sleep result primarily from intermittent rather than steady noise, and are often associated with single events. Published data on sleep disruption are limited. Assessment of effects on sleep made from a laboratory study, suggests a 5% probability of being awakened by a maximum of 40 dBA near the ear and a 30% probability at 70 dBA. Interpretation is confounded by major differences between laboratory and field studies, with values for increased percent-awakening ranging from 1% per 10 dBA in the field compared to almost 10% per 10 dBA in the laboratory. Although criteria have been proposed for protection from sleep interruption, none of them has been adopted by any government or international body (Henning Von Gierke, Representative for Transport Canada, 1992). The criteria that have been proposed recently vary quite widely: The Dutch Health Council cites thresholds of 61 dBA at the ear, a German proposal places the maximum level (L_{max}) at less than 54 dBA, and a French proposal draws the line at less than 48 dBA. Transport Canada suggests—based on North American studies and a 2% probability of being awakened—an L_{max} during overflight of 60 dBA, leading to an indoor L_{dn} of 44 dBA. If these are compared with the speech criteria, it is clear that they are in the same range.

Annoyance: Interference with speech communication and sleep interruption are both quantifiable in objective tests, even though the variability in methods and results for the second parameter result in difficulties of interpretation. A more subjective measure of interference by noise comes from the use of annoyance. When people are asked in sociological surveys about being annoyed by noise, their response will be influenced by many factors, not the least of which are real individual differences in noise sensitivity. Previous experience of

noise and attitude to the noise itself have also been shown to affect response. Even with all of these sources of variability to individual sounds, or categories of sounds, there emerges a rather consistent statistical relationship between annoyance and sound exposure in a community.

The relationship most frequently quoted and used in this context is the “Schultz curve” which is a dose-response relationship between noise exposure in L_{dn} and percent annoyed in the population (**Figure 2.28**). The original curve was based on 12 surveys from different parts of the world. For a number of reasons, the original Schultz curve has been modified, mainly to reflect the potentially greater impact of aircraft noise compared with other types of noise; this shifted Schultz curve is also shown in **Figure 2.28**. The modification results in an increased sensitivity of 5 dBA.

With the shifted curve, 5% are highly annoyed at L_{dn} 50 dBA, and allowing for confidence limits on the curve, the threshold for annoyance is L_{dn} 45 dBA. This threshold for “highly annoyed” provides a criterion consistent with the values considered sufficient to protect from speech interference.

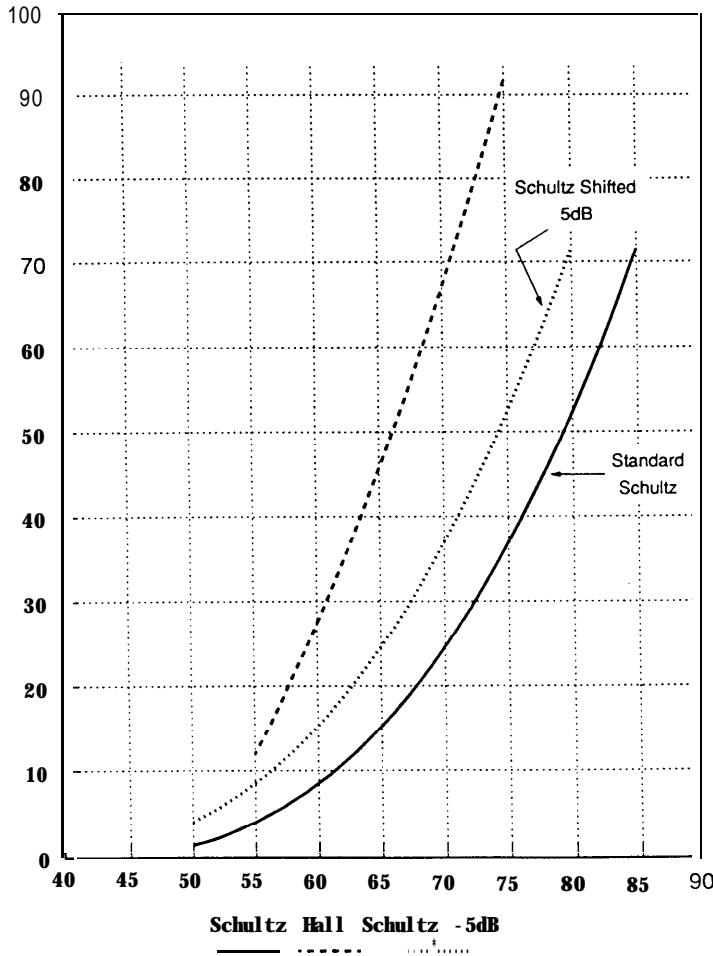
Use of the modified Schultz curve has been proposed in the EIS as a means to predict the effect of changes in the noise regime, resulting from the project, on the percentage of annoyed people and on changes in annoyance in various exposed neighbourhoods.

Populations and individuals that are especially vulnerable: The very young and the elderly are, for various well-recognized reasons, more sensitive to noise than young or middle-aged people, and may need additional protection. In addition, members of the general population who have pre-existing conditions, clinical or emotional, may be more sensitive to noise than the average person. The proponent has considered that in terms of the residential populations, these vulnerable or “noise-sensitive” people are included in the social surveys that made up the Schultz relationship, and that therefore their needs would be accounted for in the assessment of annoyance.

Certain institutions have also been identified as “sensitive”. These include schools, nursing homes and hospitals. The criterion for indoor noise level in the immediate environment of schools is based upon 100% speech communication, which at 45 dBA is conservative and sufficient to protect the very young schoolchild from speech interference. For older children, the hourly L_{eq} can be permitted up to 50 dBA. The proponent states that when only a few operations contribute to L_{dn} , the maximum sound level indoors for a typical overflight should not exceed the hourly L_{eq} by more than 15 dBA. Outdoor activities are part of the school curriculum, and where speech communication is part of the activity, the same criteria apply

FIGURE 2.28

**SCHULTZ AND SCHULTZ SHIFTED 5 dB
COMPARED WITH HALL PER CENT HIGHLY
ANNOYED**



Adapted from Transport Canada, Impact Assessment Guidelines for the Effects of Noise on People, 1991.

as for indoor sound levels in schools. Some existing schools fall short of this requirement.

For hospitals and nursing homes, speech communication and sleep are the most important criteria, and the proponent states: "Occupants of hospitals and nursing homes, however, may very well need more protection from noise intrusions than do average residential dwellers." For such populations, the Transport Canada proposes the use of a 2% **awakening-from-sleep** criterion, with an indoor-outdoor reduction 10 dBA greater than for other types of structures.

The proponent has used information from the literature, consultation with experts in the field of noise and health, as well as experts in noise measurement and interpretation, along with studies specific to LBPIA, to identify specific impact assessment criteria for four different populations. These populations are residents of communities that surround LBPIA, children in schools and day-care centres near LBPIA, occupants of hospitals and nursing homes, and employees who work at and around LBPIA.

Concerning behavioural effects in general, no significant noise interference with speech and sleep, or adverse community reaction to noise, is expected for a "sensitive population", if indoor noise does not exceed 45 dBA L_{dn} . With adequate home insulation and closed windows, which are expected to provide attenuation of 20-25 dBA, this would translate into outdoor noise levels of approximately 65 dBA L_{dn} .

In terms of Noise Exposure Forecast (NEF), exceedence of the 45 L_{dn} indoor threshold would normally begin to be observed at around 30 NEF. For older homes with inadequate insulation or with open windows, attenuation could drop to below 15 dBA resulting in outdoor threshold noise levels below 60 dBA. In these situations, speech and sleep interference for the most sensitive residential populations could begin to occur below the 25 NEF.

Noise assessment criteria should not be confused with present or future land use compatibility standards or guidelines. For example, the Canada Mortgage and Housing Corporation (CMHC) recommends that areas between the NEF 25-30 (60-65 dBA L_{cd}) are acceptable for housing, but sound insulation is recommended. The Ontario Minister of Municipal Affairs identifies the NEF 28-35 range as a discretionary range where all buildings must conform to acoustic design criteria. The proponent and consultants have pointed out that NEF is a calculated value, employed principally for land use planning.

APPENDIX 14

Noise Impact Of Proposed North/South Runway

In response to the Panel's request for closer examination of the noise impact resulting from the proposed north/south runway, Transport Canada produced specific details.

Analytical Approach: The impact areas north and south of the airport were superimposed with a grid network of 875' grid squares, as shown in Figure 2.29.

Runway Operations Analyzed: For residential areas to the north (i.e. Bramalea and Malton Village), the noise impact was calculated using the FAA Integrated Noise Model (INM) computer programme for three operational scenarios:

- 1) Existing mandatory single runway usage of existing Runway 15L due to wind, with 25 arrivals per hour which would impact the area and 25 departures per hour to the south.
- 2) Existing swing usage (for example, with 30 arrivals per hour on either Runway 24L or Runway 06R) and 40 departures per hour on existing Runway 33R, which would impact the area.
- 3) Proposed mandatory usage due to wind with 30 landings per hour on the proposed new Runway 15R, which would impact the area and 40 departures per hour on the existing Runway 15L.

For residential areas to the south (i.e. Markland Wood, Rockwood etc) the noise impact was also calculated for three operational scenarios:

- 1) Existing mandatory single usage of existing Runway 33R due to wind, with 25 arrivals per hour which would impact the area and 25 departures to the north.
- 2) Existing swing usage (for example, with 30 arrivals per hour on either Runway 06L or Runway 24R) and 40 departures per hour on existing Runway 15L.
- 3) Proposed mandatory usage due to wind with 30 landings per hour on the proposed new Runway 33L, which would impact the area and 40 departures per hour on the existing Runway 33R.

Use of these three operating scenarios permits a thorough comparison of the short term noise impacts of proposed usage of the new Runway 15R/33L with similar impacts resulting from current or historical methods of usage of the existing Runway 15L/33R.

Traffic Demand to be Processed: Air traffic demands from the six busiest hours of the 1996 planning day were processed for the runway scenarios identified. **Table 2.19** summarizes the forecast hourly volumes.

TABLE 2.19
FORECAST AIRCRAFT MOVEMENTS

	Arrivals	Departures	Total
15:00-15:59	58	29	87
16:00-16:59	67	29	96
17:00-17:59	46	49	95
18:00-18:59	55	41	96
19:00-19:59	50	45	95
20:00-20:59	47	46	93

Adapted from Transport Canada Impacts of the Proposed North-South Runway.

When the hourly traffic demand exceeded the capacities of the runway configurations, smaller aircraft types were excluded. Conversely, the first aircraft to be included in the selected group would be those capable of carrying the largest passenger loads. Table 2.20 shows the traffic selections by aircraft type, first for the single runway configurations offering a capacity of 50 movements per hour and secondly for the other "dedicated use" configurations offering 70 movements per hour.

Noise Metrics Calculated: For each point in the grid and for each of the three impacting runway scenarios, the equivalent steady state noise level was calculated for each of the six hours and the maximum value selected. The equivalent steady state noise level for an hour ($L_{eq(1)}$), would represent the constant noise level in dBA, which would need to be maintained, to equal the total noise energy generated by varying noise levels resulting from aircraft overflights over the same period, superimposed on some background level. Based on the results of Transport Canada's 1990 airport noise survey, a background ambient noise level of 50 dBA was assumed.

In addition, an estimated range of the maximum instantaneous noise level (L_{max}) over the hour, was also provided. Based on theoretical calculations and observations, the L_{max} value was assumed to be 15 to 20 dBA higher than the $L_{eq(1)}$ value.

Results of Analysis

-Area to the North: Figures 2.30 to 2.32 provide the calculated $L_{eq(1)}$ values for each of the three operational scenarios, and for each grid point within the affected residential portions of Bramalea and Malton Village.

Figure 2.33 shows the grid network superimposed on a map of the area. This is intended to facilitate reconciliation of the grid coordinates with specific points on the ground.

Figure 2.30 summarizes the results of the analysis for the first of the two current noise situations. It shows that arrivals on existing Runway 15L cause the $L_{eq(1)}$ value to rise 11 dBA above the background ambient level, to 61 dBA at points in Bramalea closest to the flight track. Increases in noise level in Malton Village are attributable not only to the arrivals but also to the rollback noise created by departures on the same runway. At the closest point, the $L_{eq(1)}$ value was calculated to be 68 dBA.

Figure 2.31 summarizes the results for the second current noise situation. Departures off existing Runway 33R have significant impacts on both residential communities. The closest points in Malton and Bramalea experience $L_{eq(1)}$ levels of 80 dBA and 71 dBA respectively. The residual impact of aircraft turning left around the north of Bramalea is evidenced by the marginally higher values (60 dBA) at the top of grid Column A.

Figure 2.32 summarizes the results for the proposed noise situation resulting from the usage of proposed Runway 15R for arrivals. Under the new approach path, the maximum $L_{eq(1)}$ value calculated was 71 dBA at the south boundary of the residential development in Bramalea. In Malton Village, the impact mainly of rollback noise would have been experienced resulting in a maximum level of 69 dBA. Such operations will occur less than 1% of the time.

Comparison of the relative impacts of the three operational runway uses, is effectively done by comparing the impacts on 30 schools in the area. Table 2.21 lists the $L_{eq(1)}$ and L_{max} levels for all three runway configurations for the schools. In Bramalea, it is clear that compared to arrival operations on the existing Rwy 15L, arrivals on the proposed runway 15R would for all schools increase the dBA level within a range of 0 to 15. However, when current departures at 40 or more movements per hour off Rwy 33R are also considered, departure noise is seen to be just as likely to dominate the noise environment as the proposed usage of new Rwy 15R over the schools in Bramalea. It is obvious that current departure operations will also continue to dominate the noise environment at Malton.

— Area to the South: Figures 2.34 to 2.36 provide the calculated $L_{eq(1)}$ values for each of the three operational scenarios, and for each grid point within the impacted residential areas south of the airport. Figure 2.37 shows the grid network superimposed on a map of the area.

Figure 2.34 summarizes the results of the analysis for the first of the two current noise situations. It shows that arrivals on existing Rwy 33R coupled with some rollback departure noise cause the $L_{eq(1)}$ value to rise 22 dBA over the ambient background level to 72 dBA, at a residential point closest to the airport. By consulting Figure 2.37, one can determine that at Lakeshore Blvd under the arrival flight track, the $L_{eq(1)}$ level would be 63 dBA.

Figure 2.35 summarizes the results of the second current noise situation. While usage of Rwy 15 for departures has lapsed over the last few years, in the early and mid eighties it was more frequently used in a swing runway configuration with arrivals on either Rwy 06L or Rwy 24R. During February 1987 for example, it was used in this manner for 50 hours. Because of the need for a 34 degree turn to the right at 3.5 DME to avoid operations at Toronto Island Airport, many of the flights overfly the Rockwood community before making their turn at 3600' above sea level. At the closest point to the airport, the calculated $L_{eq(1)}$ value was 75 dBA.

Figure 2.36 summarizes the results for the proposed noise situation resulting from the usage of proposed Rwy 33L for arrivals. The results approximate a translation of the results in Figure 2.34 by four columns. Such operations will occur less than 5% of the time.

Comparison of the relative impact of the three operational scenarios is accomplished by comparing the impacts on 20 schools and 4 institutions in the area, as shown in **Tables 2.21 and 2.22**. Comparing the arrival scenarios, it is clear that benefits which accrue to Etobicoke are at the expense of Mississauga. Thus, for the 7 schools in Mississauga, 3 are significantly impacted and 3 marginally impacted.

When departure noise is considered however, the noise environment in these areas is dominated by it. At the schools significantly impacted by arrivals on the new Rwy 33L, the noise levels due to current departures off existing Rwy 15L would be 6 dBA to 10 dBA higher. This is tempered somewhat by the estimate that mandatory and offpeak swing usage of Rwy 15 for departures is not expected to occur for more than 2% of the time compared to the mandatory usage of proposed Rwy 33L for up to 5% of the time.

Conclusions: Transport Canada states that the usage of the proposed new runway 15/33 will generate significant annoyance within these communities when they are used. This will be particularly true for outdoor usage. However, the maximum noise levels generated by the new runway will not, in the view of the proponent, generally be greater than those currently experienced in these areas due to departures on existing runways. This factor is of some importance in reviewing the justification of need for increased building insulation due to arrivals on the new runway.

TABLE 2.20
AIRCRAFT FLEET MIX FOR THE LBPIA
LEQ ANALYSIS

Aircraft Type	Constrained Capacity												Expanded Capacity											
	HR1		HR2		HR3		HR4		HR5		HR6		HR1		HR2		HR3		HR4		HR5		HR6	
	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep
747100	1	-	1	-	-	1	-	-	-	-	-	4	1	-	1	-	-	1	-	-	-	-	4	
747200	2	1	4	-	2	4	-	-	-	2	2	3	2	1	4	-	2	4	-	-	-	2	3	
L1011	2	-	3	-	3	-	1	2	-	1	1	2	2	-	3	-	3	-	1	2	-	1	2	
A300	-	-	-	-	1	-	1	1	1	1	-	-	-	-	-	-	1	-	1	1	1	1	-	
DC10	2	-	2	3	2	2	-	1	3	1	-	2	2	-	2	3	2	2	-	1	3	1	2	
MD11	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	
767	5	6	7	2	3	9	5	5	5	9	1	3	5	6	7	2	3	9	5	5	5	9	3	
A310	2	-	2	1	3	1	4	1	2	4	-	3	2	-	2	1	3	1	4	1	2	4	3	
757	1	1	3	-	2	-	-	1	1	1	1	3	1	1	3	-	2	-	-	1	1	1	3	
DC8	2	-	1	1	-	-	1	1	2	2	2	-	2	-	1	1	-	-	1	1	2	2	-	
707	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	
727	3	1	1	2	-	3	-	1	1	-	3	1	3	1	3	2	-	3	-	1	1	-	3	
A320	3	3	-	2	6	4	8	6	5	3	4	1	3	3	3	2	6	8	8	6	5	6	6	
737200	-	1	-	2	-	-	-	1	-	-	3	-	3	1	-	2	5	6	3	6	2	2	1	
737300	1	4	-	3	1	-	4	3	2	-	3	-	3	4	-	3	1	1	6	4	3	4	3	
737400	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	
DC9	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	
MD81/82	-	2	1	-	1	1	1	1	2	1	-	2	-	2	1	-	1	1	1	1	2	1	2	
Turbo Prop	-	6	-	8	-	-	-	-	-	-	5	-	-	10	-	12	-	4	-	9	2	6	6	
Total	25	25	25	25	25	25	25	25	25	25	25	25	30	29	30	29	30	40	30	40	30	40	40	

Adapted from Transport Canada Impacts of the Proposed North-South Runway.

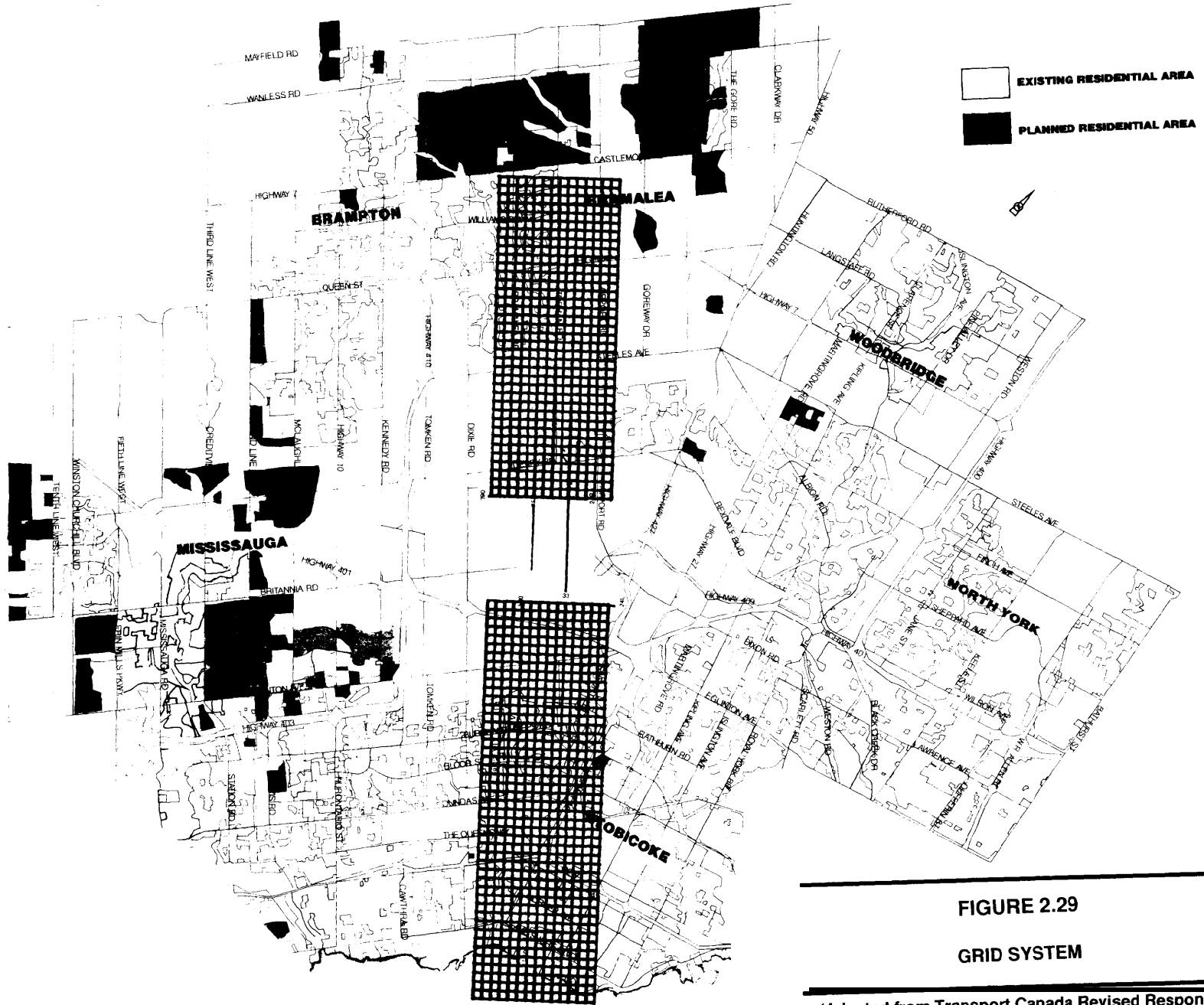


FIGURE 2.29

GRID SYSTEM

(Adapted from Transport Canada Revised Response to Panel Review of the EIS Section 4.3).

MAXIMUM Leq(1) FROM 15:00-20:59 in 1996 FORECAST SCHEDULE - AMBIENT BACKGROUND NOISE LEVEL of 50 dBA
 CURRENT SINGLE RUNWAY OPERATION ON EXISTING RWY 15 - 25 ARRIVALS (25 DEPARTURES)
 EXISTING MANDATORY OPERATION OCCURRING 1% OF THE TIME

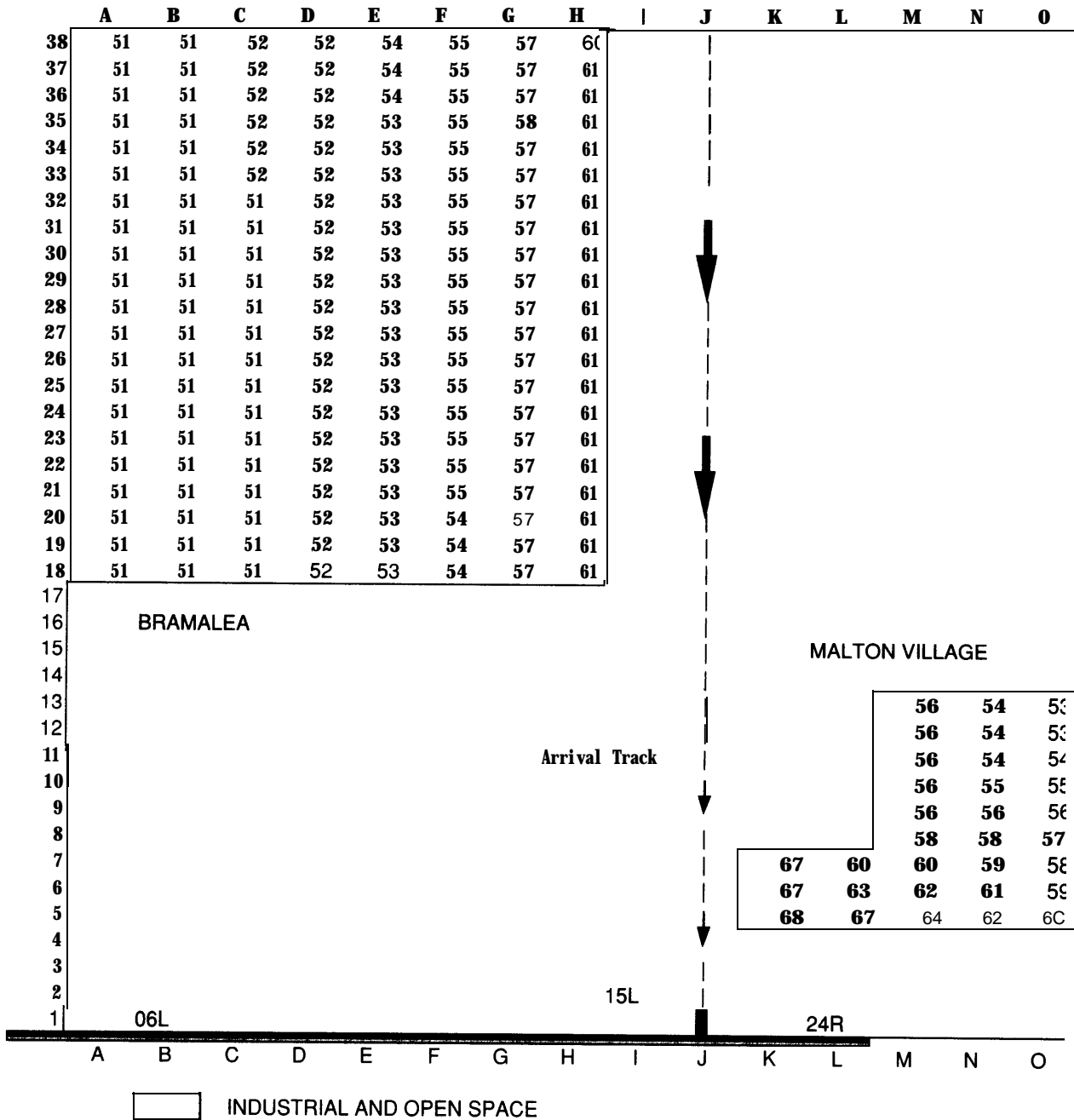
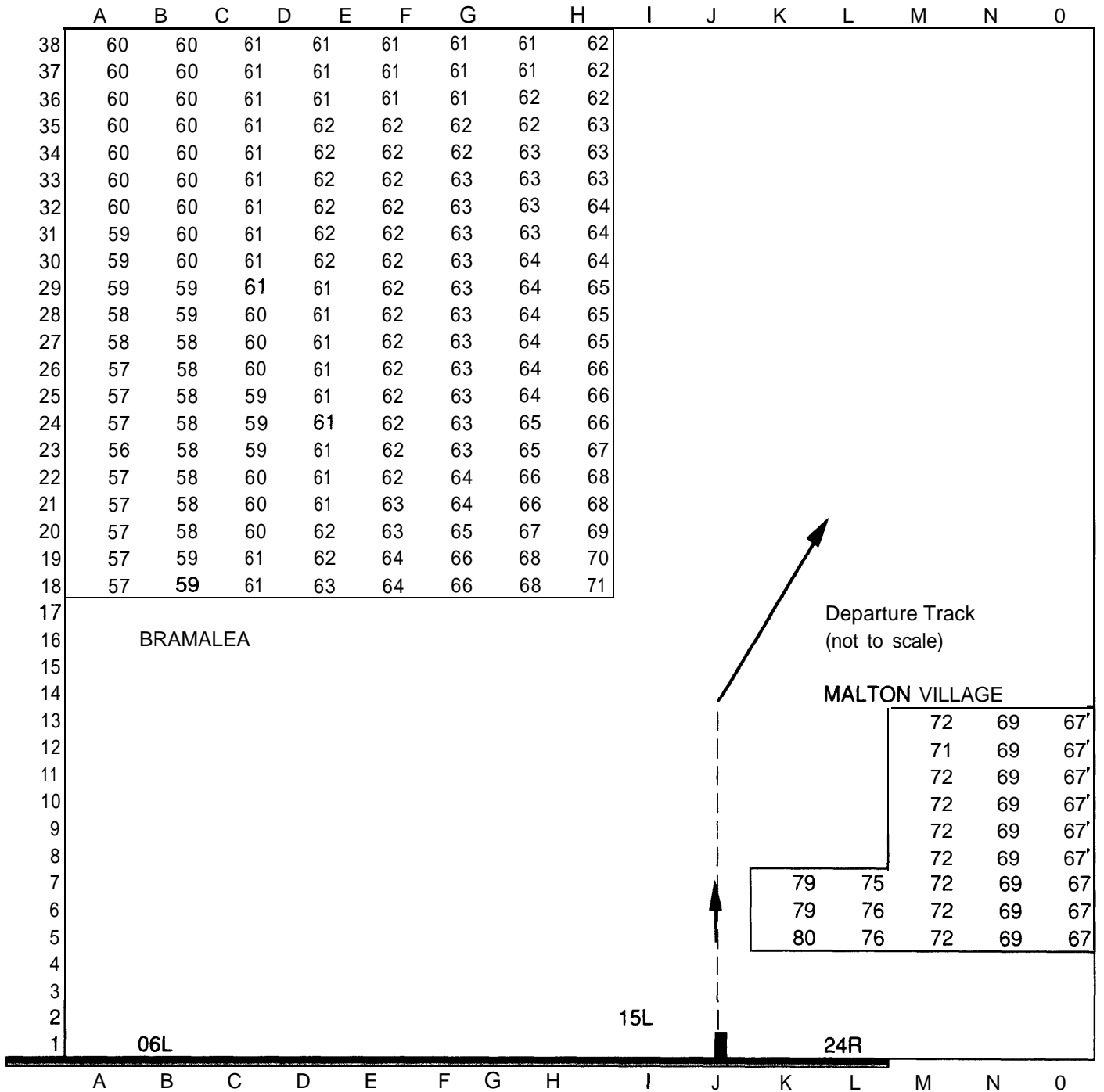


FIGURE 2.30
 EQUIVALENT HOURLY STEADY STATE
 NOISE LEVELS (dBA)
 Adapted from Transport Canada, Revised Response
 to Panel Review of the EIS, Section 4.3, 1992

MAXIMUM Leq(1) FROM 15:00-20:59 IN 1996 FORECAST SCHEDULE - AMBIENT BACKGROUND NOISE LEVEL OF 50dBA
 40 DEDICATED HOURLY DEPARTURES ON EXISTING RWY 33R
 CURRENT OPERATION - SWING CONFIGURATION



INDUSTRIAL AND OPEN SPACE

FIGURE 2.31

EQUIVALENT HOURLY STEADY STATE NOISE LEVELS (DBA)

Adapted from Transport Canada, Revised Response to Panel Review of the EIS, Section 4.3, 1992

MAXIMUM Leq(1) FROM 15:00-20:59 in 1996 FORECAST SCHEDULE - AMBIENT BACKGROUND NOISE LEVEL of 50 dBA
 30 DEDICATED HOURLY ARRIVALS ON PROPOSED RWY 15R- 40 DEPARTURES ON EXISTING 15L
 PROPOSED MANDATORY OPERATION OCCURING 1% OF THE TIME

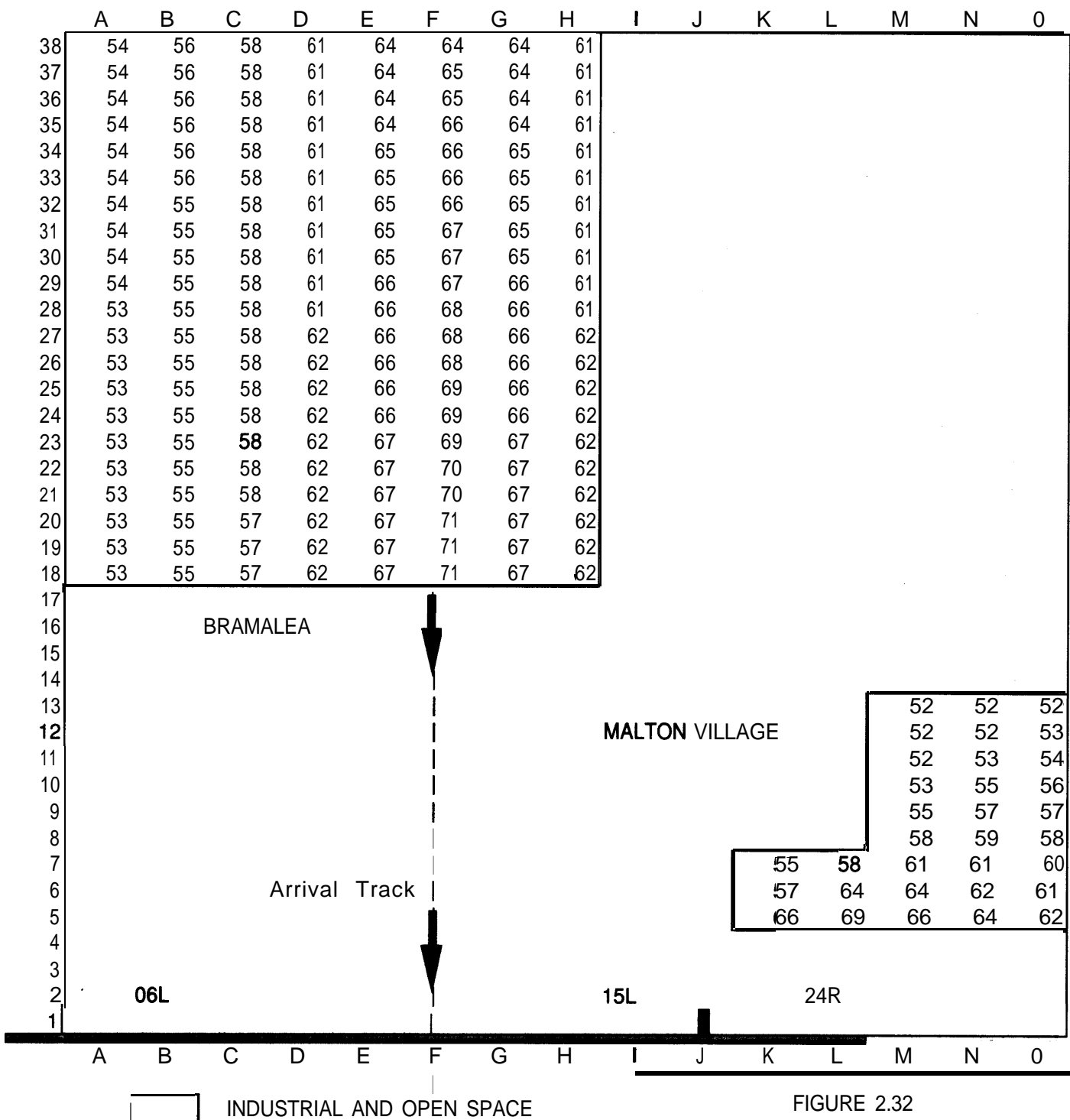


FIGURE 2.32

EQUIVALENT HOURLY STEADY STATE NOISE LEVELS (DBA)

Adapted from Transport Canada, Revised Response to Panel Review of the EIS, Section 4.3, 1992

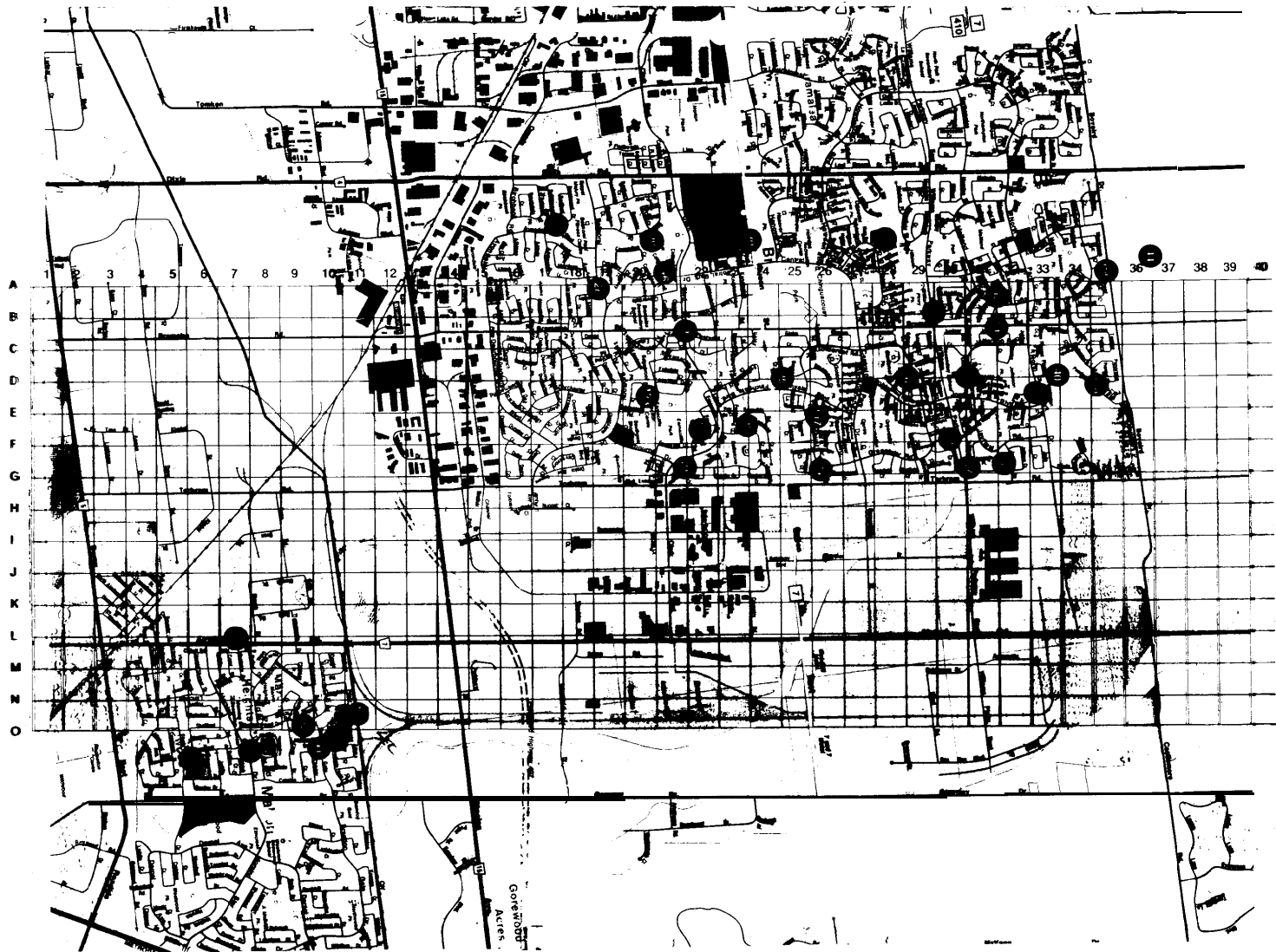
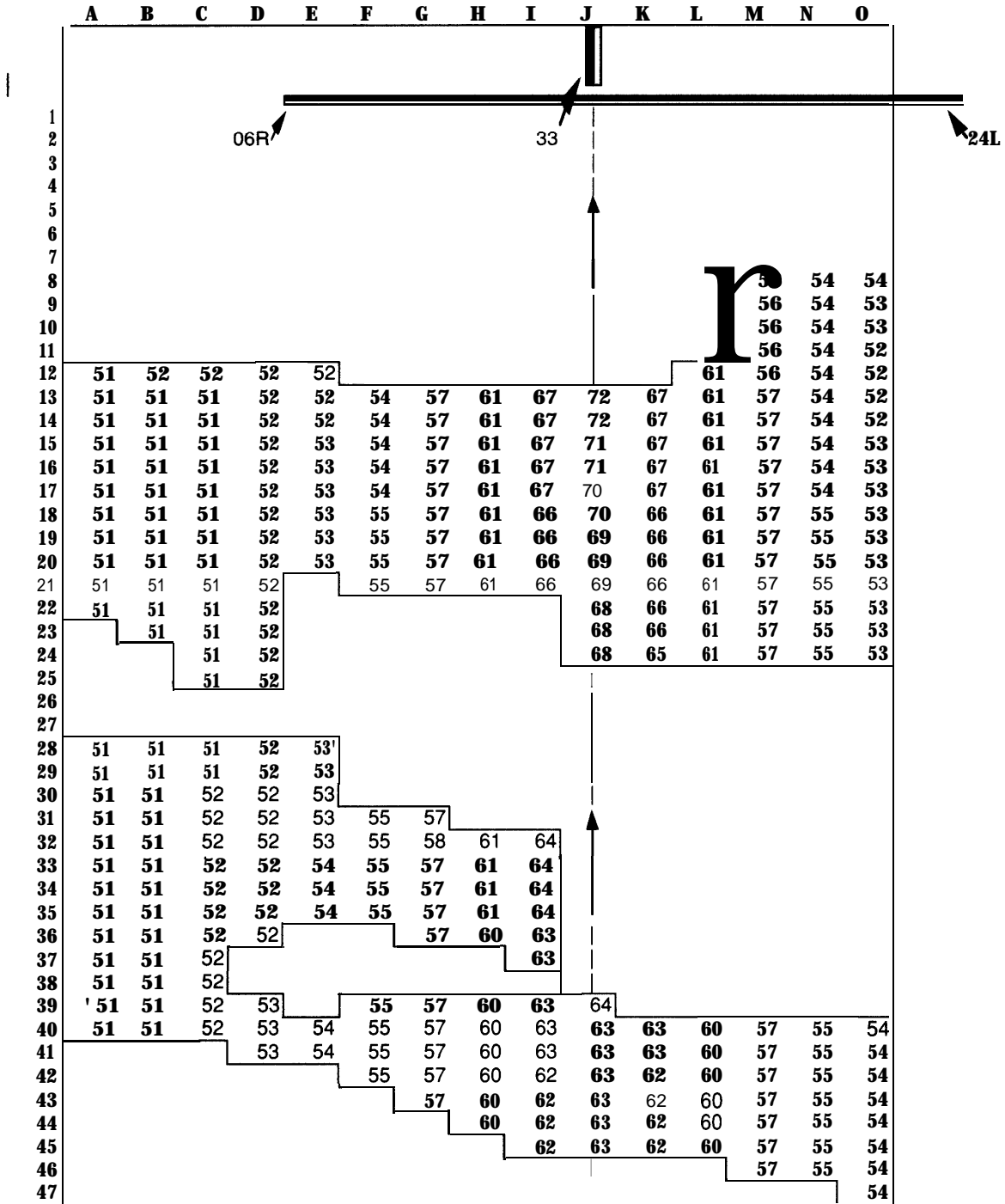


FIGURE 2.33

GRID SYSTEM SUPERIMPOSED ONTO A
MAP OF THE NORTHERN AREA

Adapted from Transport Canada, Revised Response
to Panel Review of the EIS, Section 4.3, 1992.

Maximum Leq(1) from 15:00-20:59 in 1996 Forecast Schedule
 CURRENT SINGLE RUNWAY OPERATION ON EXISTING RWY 33 - 25 ARRIVALS AND 25 DEPARTURES



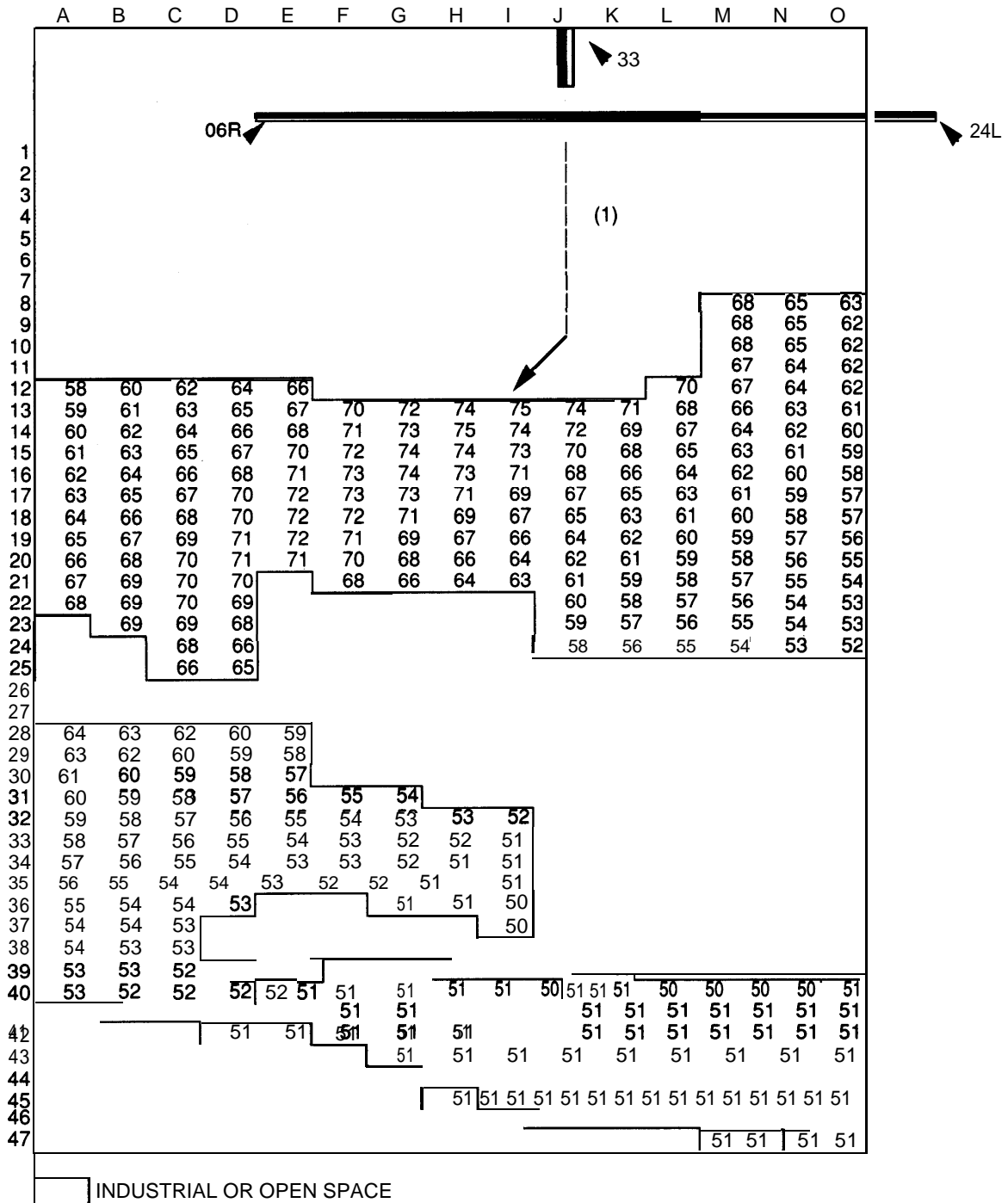
INDUSTRIAL OR OPEN SPACE

FIGURE 2.34

EQUIVALENT STEADY STATE NOISE LEVELS (DBA)

Adapted from Transport Canada, Revised Response to Panel Review of the EIS, Section 4.3, 1992

ONE HOUR Leq (17:00-17:59) IN 1996 FORECAST SCHEDULE - AMBIENT BACKGROUND NOISE LEVEL OF 50 dBA
 40 DEDICATED DEPARTURES ON THE EXISTING RWY 15 IN A SWING RWY OPERATION



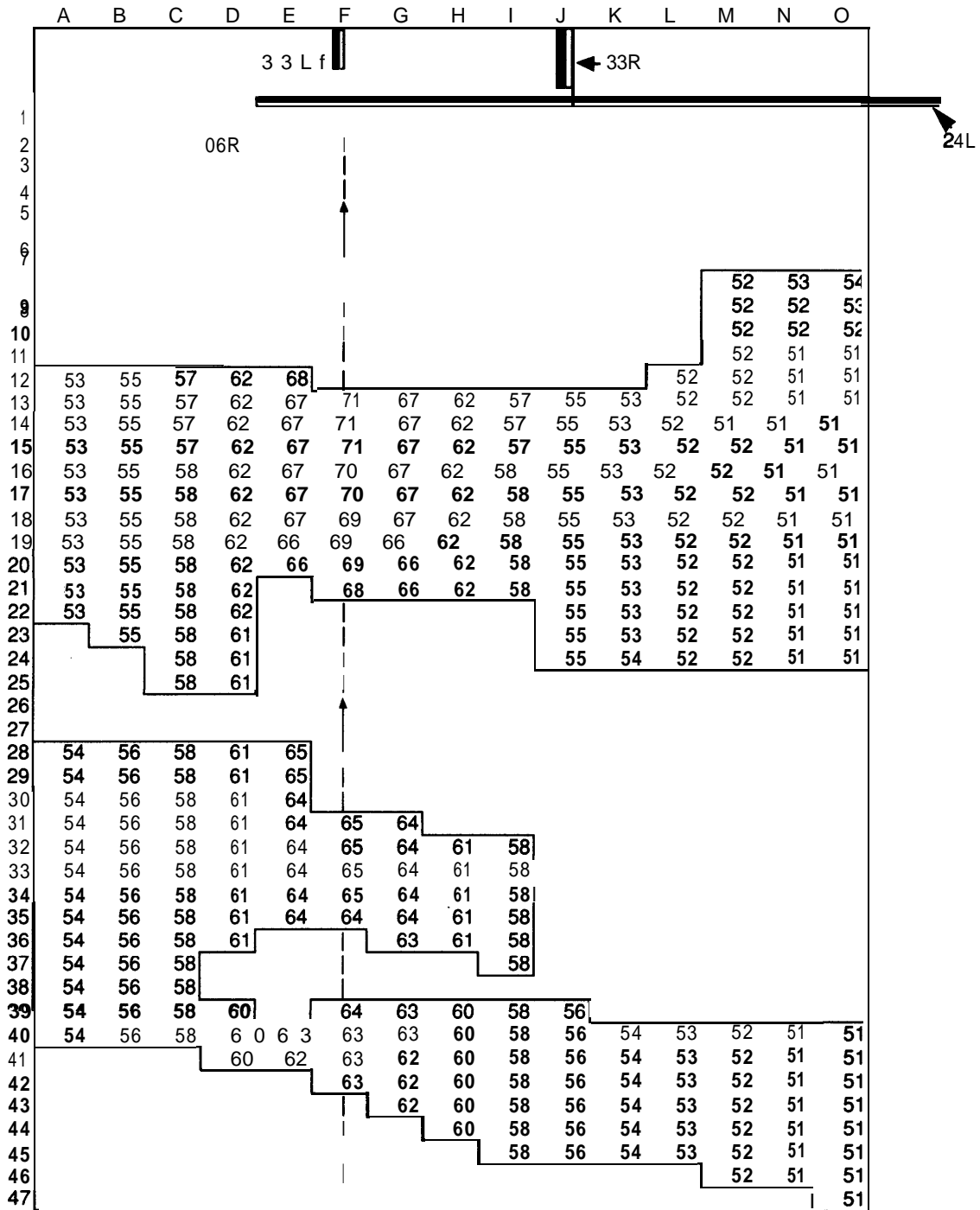
(1) -- Standard instrument departure turn at 3.5 DME.
 See Figure 2.3 - 19 of EIS Document (p 2-55) and attached Figure 1.

FIGURE 2.35

EQUIVALENT STEADY STATE NOISE LEVELS (DBA)

Adapted from Transport Canada, Revised Response to Panel Review of the EIS, Section 4.3, 1992

Maximum Leq(1) from 15:00-20:59 in 1996 Forecast Schedule - Ambient Background noise level of 50 dBA
 30 DEDICATED HOURLY ARRIVALS ON PROPOSED RWY 33L - 40 DEPARTURES ON EXISTING 33R



INDUSTRIAL OR OPEN SPACE

Adapted from Transport Canada, Revised Response to Panel Review of the EIS, Section 4.3, 1992

FIGURE 2.36

EQUIVALENT STEADY STATE NOISE LEVELS (DBA)

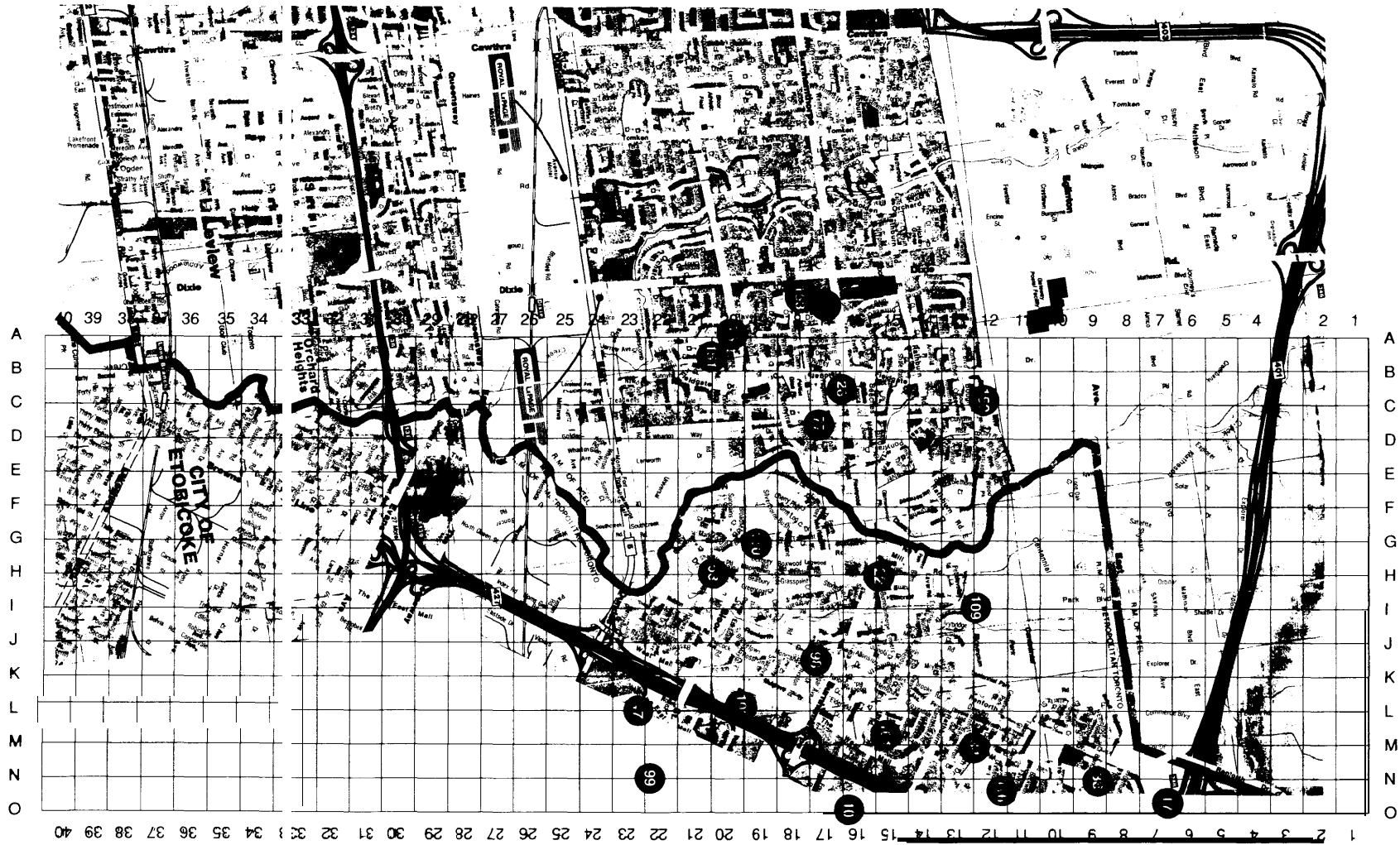


FIGURE 2.37

**GRID SYSTEM SUPERIMPOSED ONTO A MAP
OF THE AREA (SOUTHERN AREA)**

**(ADAPTED FROM TRANSPORT CANADA REVISED
RESPONSE TO PANEL REVIEW OF THE EIS SECTION 4.3)**

TABLE 2.21

SCHOOLS IN BRAMALEA AND MALTON
IMPACTED BY EXISTING AND PROPOSED
RUNWAY USAGE

SCHOOL NAME	SCHOOL No.	GRID REFERENC	SCHOOL BOARD	GRADE LEVEL	1996 NEP	1996 NEF RWY	MAXIMUM L _{eq} (1)			L _{max}			Closest Grid Point
							EXISTING		PROPOSED	EXISTING		PROPOSED	
							ARR 15L	DEP 33R	ARR 15R	ARR 15L	DEP 33R	ARR 15R	
OUR LADY OF THE AIRWAYS	161	L7	D-P	ELEM	35-40	30-35	60	75	58	75-80	90-9E	73-78	L7
MORNING STAR		N9	PEEL	SEC.	30-35	25-30	55	67	56	70-75	a2-87	71-76	010
RIDGEWOOD		OFF GRID	PEEL	ELEM	30-35	30-35	55	65	56	* 70-75	. 80-8E	. 71-76	OFF GRID
LANCASTER SR.		OFF GRID	PEEL	ELEM	25-30	25-30	53	65	54	. 68-73	. 80-8E	. 69-74	OFF GRID
MARVIN HEIGHTS	125	N11	PEEL	ELEM	30-35	25-30	54	69	53	69-74	a4-8E	68-73	N11
CANADIAN MARTYRS	166	013	D-P	ELEM	<25	<25	53	67	52	68-73	a2-87	67-72	P13
ASCENSION OF OUR LORD	41	OFF GRID	D-P	SEC.	25-30	25-30	52	65	52	. 67-72	* 80-8E	* 67-72	OFF GRID
EASTBOURNE	21	F21	PEEL	ELEM	30-35	25-30	57	66	67	72-77	81-8E	a2-a7	G22
CARDINAL NEWMAN	145	E22	D-P	ELEM	30-35	25-30	55	64	70	70-75	79-a4	a5-90	F22
DORSET DRIVE	123	D20	PEEL	ELEM	25-30	25-30	53	63	67	68-73	78-8E	a2-87	E21
ALOMA	2E	A19	PEEL	ELEM	<25	<25	51	57	53	66-71	72-77	68-73	A19
ST. JOHN FISHER	14E	OFF GRID	D-P	ELEM	<25	<25	51	56	51	. 66-71	* 71-7E	. 66-71	OFF GRID
BRAMALEA	2	B22	PEEL	SEC.	25-30	<25	51	60	58	66-71	75-8C	73-78	c22
EARNSCLIFFE SR.	23	E23	PEEL	ELEM	25-30	25-30	53	62	66	68-73	77-8E	81-86	E24
FALLINGDALE	25	D25	PEEL	ELEM	<25	<25	52	61	62	67-72	76-al	77-a2	D25
GEORGES VANIER	147	E26	D-P	ELEM	25-30	<25	53	62	66	68-73	77-8E	81-86	E26
FOLKSTONE	24	F26	PEEL	ELEM	30-35	25-30	57	64	66	72-77	79-a4	81-a6	G26
GOLDCREST	2E	D29	PEEL	ELEM	25-30	<25	52	61	61	67-72	76-al	76-al	D29
ST. THOMAS AQUINAS	37	E29	D-P	SEC.	25-30	<25	55	63	67	70-75	78-8E	a2-a7	F29
GREENBRIAR	37	F30	PEEL	ELEM	25-30	<25	57	64	65	72-77	79-a4	80-85	G30
GRENOBLE	3E	F31	PEEL	ELEM	25-30	<25	57	63	65	72-77	78-8E	80-a5	G31
ST. JEAN BREBEUF	39	C30	D-P	ELEM	25-30	<25	52	62	61	67-72	77-8E	76-al	D31
HILLDALE	36	A30	PEEL	ELEM	<25	<25	51	60	55	66-71	75-8C	70-75	B30
NORTH PEEL	31	B31	PEEL	SEC.	<25	<25	51	61	58	66-71	76-81	73-78	C32
WILLIAMS PARKWAY SR.	42	A31	PEEL	ELEM	<25	<25	51	60	55	66-71	75-8C	70-75	B32
CHINGUACOUSY		D32	PEEL	SEC.	25-30	<25	52	62	61	67-72	77-8E	76-al	D33
JEFFERSON	40	D33	PEEL	ELEM	25-30	<25	52	62	61	67-72	77-8E	76-al	D34
ST. JOHN BOSCO	148	D35	D-P	ELEM	25-30	<25	53	62	64	68-73	77-8E	79-a4	E35
ST. ANTHONY	166	OFF GRID	D-P	ELEM	<25	<25	51	60	54	. 66-71	* 75-8C	* 69-74	OFF GRID
MASSEY	44	OFF GRID	PEEL	ELEM	<25	<25	51	60	54	. 66-71	. 75-8C	. 69-74	OFF GRID

NOTE: * POINTS OFF THE GRID ARE EXTRAPOLATED VALUES FOR REFERENCE ONLY

Adapted from Transport Canada, Revised Response to Panel Review of the EIS, Section 4.3, 1992

TABLE 2.22

**SCHOOLS IN SOUTH MISSISSAUGA IMPACTED
BY EXISTING AND PROPOSED RUNWAY USAGE**

SCHOOL NAME	SCHOOL No.	GRID REFERENCE	SCHOOL BOARD	LEVEL	1996 NEP	1996 NEF (6 RWY)	MAXIMUM Leq(1)			Lmax			Closest Grid Point
							EXISTING		PROPOSED	EXISTING		PROPOSED	
							ARR 33R	DEP 15	ARR 33L	ARR 33R	DEP 15	ARR 33L	
STS. MARTHA AND MARIE	152	C13	D-P	PRIM	<25	<25	51	63	57	66 -71	78 -83	72 -77	C13
GLEN FOREST SEC.	26	B18	PEEL	SEC.	<25	<25	51	68	58	66 -71	83 -88	73 -78	C 17-18
FOREST GLEN PUBLIC	77	C18	PEEL	PRIM	<25	<25	52	69	60	67 -72	84 -89	75 -80	C-D 18
ST. ALFRED	151	A21	D-P	PRIM	<25	<25	51	67	53	66 -71	82 -87	68 -73	A-B 21
HAVENWOOD	75	A21	PEEL	PRIM	<25	<25	51	66	53	66 -71	81 -86	68 -73	A 20
MOTHER CABRINI	17	N8	M.S.S.B.	PRIM	25-30	25-30	55	63	56	70 -75	78 -83	71 -76	07
PHILIP POCOCK	38	N10	D-P	SEC.	25-30	25-30	54	65	52	69 -74	80 -85	67 -72	N9
HOLLYCREST	106	L12	ETOBICOKE	PRIM	25-30	<25	61	70	52	76 -81	85 -90	67 -72	L12
WELLSWORTH	116	N12	ETOBICOKE	PRIM	25-30	<25	54	64	51	69 -74	79 -84	66 -71	N12
NATIVITY OF OUR LORD	34	M13	M.S.S.B.	PRIM	25-30	<25	57	66	52	72 -77	81 -86	67 -72	M13
MILL VALLEY	109	I13	ETOBICOKE	PRIM	30-35	25-30	67	75	57	82 -87	90 -95	72 -77	I13
BROAD ACRES	101	M16	ETOBICOKE	PRIM	25-30	<25	57	62	52	72 -77	77 -82	67 -72	M16
BURNHAMTHORPE	10	O17	ETOBICOKE	SEC.	<25	<25	53	57	51	68 -73	72 -77	66 -71	O17
EATONVILLE	102	L19	ETOBICOKE	PRIM	25-30	<25	61	60	52	76 -81	75 -80	67 -72	L19
ST. ELIZABETH	47	L22	M.S.S.B.	PRIM	25-30	<25	61	57	52	76 -81	72 -77	67 -72	L22
BLOORLEA	99	N22	ETOBICOKE	PRIM	25-30	<25	55	54	51	70 -75	69 -74	66 -71	N22
SILVERTHORNE	22	H16	ETOBICOKE	SEC.	25-30	<25	61	73	62	76 -81	88 -93	77 -82	H16
BLOODALE	98	J18	ETOBICOKE	PRIM	30-35	<25	70	65	55	85 -90	80 -85	70 -75	J18
ST. CLEMENT	63	H20	M.S.S.B.	PRIM	25-30	<25	61	66	62	76 -81	81 -86	77 -82	H20
MILLWOOD	110	G19	ETOBICOKE	PRIM	25-30	<25	57	69	66	72 - 77	84 -89	81 -86	G19

Adapted from Transport Canada, Revised Response to Panel Review of the EIS, Section 4.3, 1992

APPENDIX 15

Social Impact Assessment Methodology

The guidelines for the SIA—"Impact on the Quality of Life in the Surrounding Neighbourhoods"—based on the Panel's guidelines to Transport Canada, focused on effects the airside expansion project would have on residents' day-to-day activities, on their enjoyment of their home and property, and on their satisfaction with their neighbourhood. The SIA took four factors into account—the current effects of airport operations; the changes that would occur with the base case; the difference in anticipated effects between the proposed expansion and the base case; and the residents' attitudes and tolerance toward airport operations, noise, and airside development. The SIA attempted to identify sub-populations that are considered noise sensitive—seniors, children, shift workers, people in hospitals; and household characteristics such as air-conditioning and glazing standards.

The SIA used four methods—telephone surveys of 2200 households, stratified by location relative to the 20 NEF contour into primary study areas and a secondary study area, from September 5 to October 15, 1991; analysis of public submissions; analysis of the 1990 complaint data and a review of the EIS for noise, air pollution, and traffic. This review included reference to Transport Canada's measurement survey of noise levels at 33 locations around the airport, many in residents' back yards.

According to the SIA, there are many factors common to urban life that may cause community dissatisfaction, and noise is a key one. Transport Canada has provided information supporting the conclusion that in residential areas, L_{dn} 65

dBA—equivalent to 30 NEF—is likely to result in speech interference and may result in sleep disruption for 2% of people. Such a noise regime would translate into L_{dn} of 45 dBA indoors, on average, although the quality of buildings and windows influences the difference between indoor and outdoor noise. Social surveys normally define these population sectors as "percentage of highly annoyed", with a threshold at about 45 dBA.

Current airport operations already affect the quality of life of many neighbourhoods surrounding LBPIA, particularly in Etobicoke and Mississauga. Thirty eight % of the households in the primary study area and 20% of those in the secondary area are bothered by operations at LBPIA. At least 20% in the primary and 6% in the secondary area have difficulty tolerating the effects of airport operations; these include some households that stated they want to complain but have not done so, as well as some that have complained.

According to the SIA an increase in NEF from runway expansion is likely to produce a shift of households in both categories, with more households becoming less tolerant of the disruptive effects of airport operations. This decline in tolerance is likely to be reinforced if "current attitudes and concerns" toward the airside development project persist.

The over-all conclusions of the SIA state that although the effects of the airside development project are relatively small, their social implications are significant. This is because the incremental changes are not likely to be seen or to be felt as small.

APPENDIX 16**April Update of Traffic Forecast**

Received on Transport Canada letterhead

Toronto - Lester B. Pearson
International Airport
P.O. Box 6003
Toronto AMF, Ontario
L5P 1B5

Mr. D. Kirkwood, Chairman
Federal Environmental Assessment
Review Office, Fontaine Building
200 **Sacré-Coeur** Boulevard
13th Floor
Hull, Quebec
K1A OH3

Dear Mr. Kirkwood:

As per the request from Mr. Greg Shaw to obtain an update on the status of activity forecasts for LBPIA, the following is provided:

1. Activity forecasts for top 77 airports in Canada are updated every 2 years and are presented at the Canadian Aviation Forecasts Conference in Ottawa. Results of the 1992 General Forecasts Update are to be presented at the conference in November '92.
2. In view of the 8.5% decline in activity in 1992 over 1990, a preliminary update of the forecasts for LBPIA was undertaken in April 1992. The attached documentation provides a summary of the enplaned/deplaned passenger forecasts. Please note that subsequent to the preparation of these forecasts, estimates of 1991 traffic have been revised to 18.47 million enplaned/deplaned passengers, a decrease of 9.6% over 1990.

I trust this information is of assistance.

Yours truly,

C.S. Head
Airport General Manager

DRAFT

**L.B. Pearson International Airport
Preliminary Forecasts
Enplaned and Deplaned Passengers**

**Economic Analysis
Statistics and Forecasts
Policy and Coordination
April 1992**

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1. Introduction	1
2. Economic Outlook	2
3. Enplaned and Deplaned Passengers	2

1. Introduction

This report presents a preliminary update of the short and long term forecasts for enplaned and deplaned passengers by sector for L.B. Pearson International Airport. Please note that the update is based on a review of the origin and destination passengers and does not incorporate factors that could stimulate or impair the level of connecting passengers. Short term forecasts cover the period from 1992 to 1996 and long term forecasts are presented for the year 2000, 2005 and 2010. All forecasts are preliminary and the official version will be presented this Fall.

Short term forecasts are based on recent (March 1992) Ontario Gross Domestic Product forecasts and long term forecasts are based on the general assumptions of the General Update Forecasts which will be completed in November 1992.

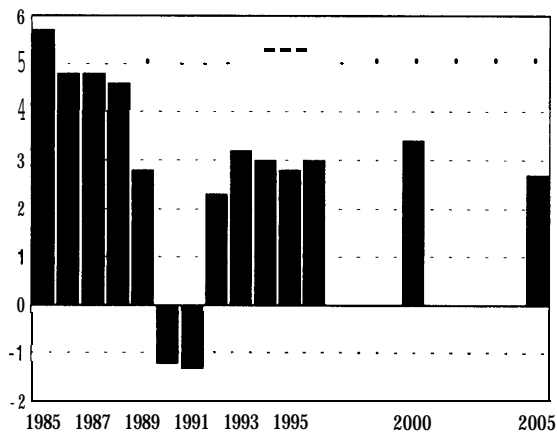
This report contains two sections: the economic outlook for the short and long term for the province of Ontario and a summary of enplaned and deplaned passengers forecasts.

2. ECONOMIC OUTLOOK

This section presents average annual percentage changes Gross Domestic Product (GDP) of Ontario between 1985 and 2010. Figure 1 shows the variation in constant 1981 dollars.

Figure 1

Gross Domestic Product (1981\$)
Ontario (Annual Percentage Changes)



Between 1985 and 1989, Ontario GDP increased strongly with an average annual growth rate of 4.5% per year. This growth was supported by consumer expenditures on durable goods along with business investments in machinery and equipment Ontario's economic situation has been greatly affected by the recession. Between 1990 and 1991 the unemployment rate increased by 3.3%, from 0.3% to 9.6%; consumers reduced their purchases and business failures accelerated. However, in 1992 it is expected that Ontario

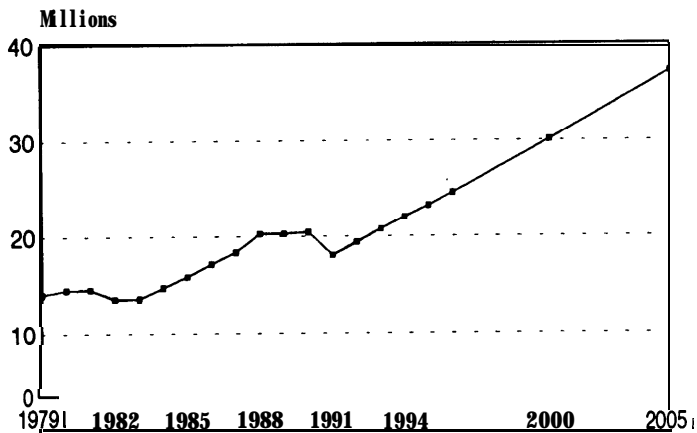
economic situation will recover and that the GDP will maintain an average annual growth rate around 3.0% until 1996. A lower Canadian dollar will stimulate exportations and lower interest rates will stimulate consumer expenditures and business investments.

3. ENPLANED AND DEPLANED PASSENGERS

Figure 2 and Table 1 show preliminary short and long term forecasts for **enplaned** and **deplaned** passengers for L.B. International airport. Figure 2 illustrates total traffic, while Table 1 presents traffic by sector.

Figure 2

L.P. Pearson International Airport Enplaned and Deplaned Passengers



In 1991, **enplaned** and deplaned passengers have dropped by **11.7%**. The key factors affecting the trend in 1991 were the Gulf war, introduction of the GST and the recession. For 1992, 1992 and 1994 a strong recovery is expected producing growth rates averaging at about 7% per year. Recovery from the effects of the Gulf war and the GST are expected combined with a moderate economic recovery. Between 1995 and 2000, it is expected that the average annual growth rate will be around 5% per year.

The domestic sector (Major Carriers and Regional/Local Carriers) is expected to recover in the short term; from one effects of the recession growth rate is expected to be around 5% in 1992 and 7% in 1993.' In the long term (after **1996**), the average annual growth rate for this sector is expected to be below 4%.

In 1992, the transborder sector is believed to have a strong rate of growth over **8%**, and to remain at about 5% per year for the rest of the short term. In the long term (after **1996**), this sector will be stronger than the domestic sector with an average annual growth rate of around 5.7%. This sector should be stimulated by free-trade agreement.

In the short term, the other international sector is expected to have a strong growth of **13.1%** in 1992 and 8.4% in 1993. This sector has been affected by the Gulf war in 1991 and only marginally by the GST. In the long term (after **1996**), this sector is also expected to have a strong rate of growth with an average annual rate of around **6.8%**, supported by one globalization of the world economy.

Table 1

L. B. Pearson International Airport
 Enplaned and Deplaned Passengers
 Major Carriers, Regional/Local Carriers and Charter

MAJOR CARRIERS											
	DOMESTIC	TRANSBORDER	OTHER INTL	TOTAL	CHARTER	R/L	TOTAL	TOTAL			
1979	7308900	3931300	1237500	12477700	1275600		287200	14040500			
1980	7743100	4043600	1165900	12952600	1303500		266600	14522700			
1981	7856100	3978900	1026800	12861800	1399400		277300	14538500			
1982	7117600	3647900	923800	11689300	1610200		249800	13549300			
1983	7008300	3539300	929900	11477500	1877900		221900	13577300			
1984	7614281	3819784	1101165	12535230	1931475		255403	14722108			
1985	7967284	3826465	1317979	13111728	2267500		459131	15838359			
1986	8796826	4275845	1499702	14572373	2056200		493181	17121754			
1987	8953589	4553931	1883960	15391480	2304700		655294	18351474			
1988	9940318	4736744	2082546	16759608	2564887		944685	20269180			
1989	8975426	4676915	2248226	15900567	3094260		1268973	20263800			
1990	8543610	4907363	2356314	15807287	3013830		1602700	20423817			
1991	7749045	4451012	1972223	14172280	2411776		1451944	18036000			
1992	8139400	5.0% 4812600	8.1% 2230100	13.1% 15182100	7.1% 2682400	11.2%	1523500	4.9% 19388000	7.5%		
1993	8716600	7.1% 5035100	4.6% 2416700	8.4% 16168400	6.5% 2953000	10.1%	1623380	6.6% 20744780	7.0%		
1994	9188700	5.4% 5285000	5.0% 2588900	7.1% 17062600	5.5% 3219800	9.0%	1711300	5.4% 21993700	6.0%		
1995	9568100	4.1% 5548200	5.0% 2766800	6.9% 17883100	4.8% 3508900	9.0%	1781950	4.1% 23173950	5.4%		
1996	10013200	4.7% 5856000	5.5% 2966800	7.2% 18836000	5.3% 3809000	8.6%	1864800	4.6% 24509800	5.8%		
LOU 2000	10447000	6179800	3443800	20070600	4430100		1945600	26446300			
2000	11655100	7317900	3872900	22845900	5048900		2170700	30065500			
HIGH 2000	13361200	8742400	4601700	26705300	5951900		2488400	35145600			
LOU 2005	11771000	7216100	4367600	23354700	5538900		2192200	31085800			
2005	13829200	8972300	5156000	27957500	6617800		2575500	37150800			
HIGH 2005	16587000	11502100	6316200	34405300	8179000		3089200	45673500			
LOW 2010	12669200	7838500	5374100	25881800	6356000		235900	32473700			
2010	15814100	10392300	6742100	32948500	8076600		2945200	43970300			
HIGH 2010	19758000	13842100	8596300	42196400	10385800		3679700	56261900			
AAGR 89-00	2.4%	4.2%	5.1%	3.3%	4.6%		5.0%	3.7%			
MGR 89-05	2.7%	4.2%	5.3%	3.6%	4.9%		4.5%	3.9%			
AAGR 89-10	2.7%	3.9%	5.4%	3.5%	4.7%		4.1%	3.8%			

NOTES: (5) Total Regional/Local (DOM + TB + 01)
 (6) Total Charter (DOM + TB + 01)
 (7) Total may not equal the sum of components (1) to (6) due to conceptual differences.

SOURCES: (1), (2), (3), (4) Air Carrier traffic at Canadian Airports
 (5) Other Unit Toll Survey (St. 4, Report 2)
 (6) Charter Survey (Table 22F)
 (7) + (8) AMS (Aircraft Movement Survey)
 (9) Total of columns (7) + (8)

APPENDIX 17

Noise Metrics — The Panel's Analysis

1. Noise Exposure Forecast (NEF)

The NEF metric is cumulative in nature, based on the noise “dose” from a number of discrete noise events, each generated by aircraft in either the departing or landing modes events which may be created by different or identical types of aircraft, on different flight tracks and with different flight profiles.

- It is based on the Effective Perceived Noise Level (EPNL) which is similar to the more commonly used metric, the Sound Exposure Level (SEL), often referred to as the Single Event Noise Level, in dBA.
- It can be related to a more commonly used cumulative metric, the L_{dn} , by the (approximate) formula $NEF + 35 = L_{dn}$, in dBA.
- Both the NEF and L_{dn} noise contours around airports are produced by similar computer programs. Explanation of the basis for the L_{dn} therefore enables an understanding of the derivation of the NEF. A series of aircraft flyovers, each with its own SEL, creates a noise dose over a given period of time, the equivalent noise level, L_{eq} . Thus $L_{eq(1)}$ is the noise dose over 1 hour, $L_{eq(6)}$ is the noise dose over 6 hours, and $L_{eq(24)}$ the noise dose over 24 hours. L_{dn} is the $L_{eq(24)}$ with a night-time penalty for flights between 10 p.m. and 7 a.m.
- Comparable NEF and L_{dn} noise contours, e.g. NEF 25 and L_{dn} 60, cover approximately the same areas around an airport.
- The L_{dn} metric (in dBA) is widely used at airports in the U.S.A. and elsewhere. Criticism of the NEF is therefore a criticism of a much more widely used metric (the L_{dn}) accepted by acoustic experts worldwide (with slight variations), as the best available for land use planning around airports, and for correlation with community annoyance, or other effects of noise on people.
- Unlike the L_{dn} , and the SEL, on which it is based (and which can be measured directly at noise monitoring terminals), to quote Mr. Miller, (consultant to Transport Canada):

“It is very difficult to answer to the accuracy of an NEF contour where in fact you can’t measure it” i.e. the NEF can only be produced by computer modelling.
- The most commonly accepted weakness of the cumulative metrics, NEF and L_{dn} , is that they do not, except indirectly, provide dBA values of the discrete noise events on which they are based. Thus, around LBPIA, a typical average SEL at a given geographic point subjected to regular aircraft noise, is equal to the L_{dn} (at that point) plus 26 dBA. Hence at a point on the NEF 25 contour for example, the L_{dn} would be $25 + 35 = 60$ dBA, the average SEL would be $60 + 26 = 86$ dBA, and the average L_{max} would be 76 dBA.

- The severest criticism of the use of the NEF metric to describe the LBPIA noise regime (and hence a criticism of the L_{dn} and L_{eq} metrics) came from the MECCAN consultant, Dr. Richarz, and the City of Etobicoke consultant, Dr. Hazam Gidamy. While Dr. Richarz criticized other aspects of the proponent’s description of the noise regime around LBPIA one of his main thrusts related to the appropriate level of NEF at which the assessment process should begin—commonly accepted in Canada as the NEF 25 contour, and in the U.S.A. as the L_{dn} 60 contour. His opinion was that NEF 15 (L_{dn} 50 dBA) would be ideal, something higher, NEF 17 or 20 could be more practical, and eventually agreed that NEF 22 could suffice. The Panel supports his view that a NEF value lower than 25 would be more suitable. At the same time, for a busy, established airport such as LBPIA, the cut-off value of NEF 25 (L_{dn} 60), is in the Panel’s view not unacceptable provided it is recognized that at the NEF 25 level (with average typical L_{max} s of 76 dBA for aircraft flyovers) there will be a significant percentage of people highly annoyed.

One of Dr. Gidamy’s main criticisms of the NEF metric (and hence, again, of the L_{dn} metric) related to the inability of the NEF to reflect area residents’ perception of the noise effects created by changes in the number of discrete events: specifically, the fact that doubling the number of discrete events results in only a 3 dBA increase in the NEF, where as most area residents would perceive this change as twice as much noise. The Panel accepts this as a valid weakness in the NEF, and other cumulative metrics, and supports Dr. Gidamy’s argument that the NEF system “does not accommodate or have sensitivity to predict the negative reaction and impact of single event problems”.

- In this regard, the Panel finds that the following summation made by Mestre Greve Associates (in their 1989 Workplan prepared for Transport Canada) can receive the Panel’s full support:

“The public will often be sceptical of the cumulative noise contours because of the small area they encompass, when in fact the noise complaints are distributed over a much larger area. This does not mean the cumulative contours do not have value in assessing human response to noise. It is more related to the fact the airport noise complaint is a very unique and complex phenomenon. Cumulative noise contours have been shown to be very

good at measuring overall community response. When communities are surveyed and asked to rate various characteristics of the community, including noise, people's rating of noise correlates well with the NEF or L_{dn} values. Said another way, while the total noise exposure as described by the cumulative noise metric serves as the basis for a person's judgement of the noise environment, it is a single event interference with some activity task that people will use to express their concern over noise."

- In another wide-ranging discussion (at the hearings) involving the Transport Canada planning day, on which the NEF contours are based (the average of the 21 days derived from the 7 busiest days in each of the 3 busiest months) and runway usage, leading to the NEF noise contours for a given runway, a clarification of any confusion that might exist regarding runway usage and resulting NEF contours came from a highly acceptable source. Mr. Neil Standon, Consultant to ATAC, and responsible for development for the NEF system when employed with Transport Canada, offered the following, found by the Panel to be both timely and acceptable:

"The NEF is an amalgam and represents an entire year's experience of noise. It is generated on the basis of an extreme value, a 95th percentile level of aircraft operations and the noise due to those aircraft operations, but it represents the annual usage of the runway spread over the entire year.

I hope that answers the question from the gentleman over here to the effect that the noise from a particular runway will, in fact, represent the annual usage of the runway."

- The Panel also noted that field measurements of SELs and $L_{dn's}$, (and their conversion to NEF) by Mr. Miller and Dr. Richarz, in 1991, confirmed the overall validity of Transport Canada's 1990 NEF contours.

2. Single Level Event (SEL) Noise Analysis

The SEL analysis as presented by the proponent, clarified the utility of this additional metric, (in contour form) in illustrating the noise regime around LBPIA. It is the Panel's view that virtually all the arguments, pro and con, regarding use of SEL contours, as presented by the proponent are valid. The SEL analysis should be most useful to affected area residents to enable a better understanding of how changes in cumulative noise levels can occur. It will also be clear to area residents that take-off noise intrusions are experienced outside the NEF 25 contour, and that no significant reduction in the frequency of such intrusions will take place until the noisier Stage 2 aircraft, such as the B727 or the DC9, are replaced by quieter Stage 3 aircraft. On the other hand, the SEL analysis shows that the odd (heavy) Stage 3 aircraft is as noisy as some Stage 2 aircraft, even on takeoff.

It is also evident that the differences in noise levels between Stage 2 and Stage 3 aircraft on approach are not nearly so dramatic as are differences on departure. This is quite clear from the SEL analysis wherein, on approach, the SEL 75 contour for the A320 extends as far from the runway threshold as does the SEL 85 for the B727, a difference of only 10 dBA. On the other hand, for departures, the difference at comparable distances from the airport is 25 dBA or more for the two aircraft. In the case of actual measurements at the relocated NMT 6 and NMT 4 as the difference in the L_{max} of typical Stage 2, Stage 3 aircraft, varies from 0 dBA to 8 or 10 dBA, on approach. On average the measured difference in the L_{max} or SEL between Stage 2 and Stage 3 aircraft, appears to be no more than 5 dBA. The conclusions to be drawn from the above discussions on SELs are two fold: first for aircraft on approach, there will be little relief for residents on or near the flight track occasioned by full fleet conversion from Stage 2 to Stage 3; and secondly, the changing fleet mix (Stage 2 to Stage 3) will result in dramatic reductions in the departure noise, which in turn will help to offset the increase in NEF values due to increased frequency in aircraft movements.

APPENDIX 18

Probability of Variations in N-S Runway Usage and the Effect on Noise Impacts

1. Analysis of the 5% Usage Criterion

1.1 The study of weather-mandated use of runway 15-33 (Final Report #20) consists of two phases. Phase 1 deals with actual occurrences of weather-mandated use of 15-33 over a 27 month period: (Only the use of 33 will be dealt with here, as the weather-mandated use of 15 in the same period was too infrequent to be statistically significant).

In Phase 1, over a period of 27 months (Feb. 88 — Apr. 90) there were 56 occurrences of runway 33 **weather-mandated** use, for a total of 302 hours; an average occurrence would appear to be from 2 to 3 times per month, for an average of 11 hours per month. Occurrences typically are much more likely in winter than in either spring or fall.

Summer occurrences are few. In fact, in the 27 month period, there were 5 months (4 in summer June-August) when no use of runway 33 was mandated by weather. Phase 1 ignored the time between 0100 hrs. and 0600 hrs., i.e., only a 19 hour “operating” day, or 15,600 operating hours at LBPIA were analyzed. As a total of only 302 hours of weather-mandated use of runway 33 were identified in the 27 month period, this yields a 1.93% likelihood that weather will force use of runway 33. Phase 1 did not include “wet” runways (precipitation data was not available) and as shown in Phase 2, this factor adds from 1 to 1.4% to the frequency. On that basis Phase 1 results, for use of runway 33, would range between 2.93% and 3.33%, or to use one figure, an average of 3.13%.

With respect to diurnal variation in runway 33 usage, the hours between 0900 hrs. and 1500 hrs. appear to be twice as likely as the hours after 1800 hrs.. For example, considering the 4 hours from 1700 hrs. to 2100 hrs., runway 33 usage was weather-mandated for 41 of the 302 hours total, or 13.5%. The probability of runway 33 usage for these hours of the day is therefore 13.5% of 3.13% or 0.42%.

The primary shortcoming of Phase 1 of the study is the size of the sample — only 27 months. Phase 2 therefore examines a 10 year period of wind and precipitation data. Four different runway use scenarios were also examined. Taking the “worst case” scenario, Runway 33 was weather-mandated 4.9% of the time. The seasonal variations were again similar to Phase 1, with wind and precipitation patterns throughout the year resulting in greater need for runway 33 at certain times than others, namely:

(a) occurrences in the peak months of **Mar/Apr.** are 4 to 6 times as frequent as in lowest months;

(b) depending on the scenario selected, from 70 to 80% of weather-mandated usage is in the cold **weather** months, Nov. through April;

(c) the ranges of seasonal variations in occurrence frequency are significant, regardless of scenario selected:

Summer — from 1 to 3% of the time

Fall — from 2 to 5%

Winter — from 4 to 7%

Spring — from 4 to 8.8%

Thus, in August, for example, weather-mandated use of runway 33 ranges from 0.6% to 2.3%, over the 4 scenarios **analyzed**. Combining these frequencies with the diurnal variations uncovered in Phase 1, the probability of weather-mandated use of 33, from 1700 to 2100 hrs. (when outdoor activities such as barbecuing frequently takes place) ranges from 0.08% to 0.31% (very close to the Phase 1 results).

Applying the frequency of occurrence analysis to probable noise impacts (analyzed in more detail below) there is a relatively low probability in the warm weather months, June through September, that there will be interference with outdoor activities, i.e., 1 to 3% of the time, whereas in winter and spring there is a much higher probability, 4 to 8.8% that outdoor activities will be impacted. There can also be a monthly variation in the generation of aircraft noise intrusions ranging from a low of 0% to a high of 8.8%.

2. Probability of Variation in Noise Impact:

Because of its particular relevance to the assessment of the noise impacts resulting from weather-mandated use of the proposed 33L, the relationship to one another, of on the one hand, the noise metrics discussed in the EIS and at the hearings, and on the other hand noise attenuation, outdoors to indoors, windows open and windows closed, should be reviewed.

The Panel will use the following relationships, as being approximate values for the average operational scenarios at LBPIA, leading to average $L_{max's}$ and SELs:

- (a) $L_{dn} = NEF + 35$ (dBA)
- (b) $L_{eq(1)}, L_{eq(8)},$ or $L_{eq(24)} = L_{dn} + 2$ (dBA)
- (c) $L_{dn} + 26 = SEL$ (dBA)
- (d) $L_{max} = SEL - 10$ (dBA)
- (e) With respect to outdoor to indoor attenuation, the Panel accepts 20 dBA attenuation with windows closed, and 10 dBA with windows open.

(The Panel is not certain how maximum $L_{eq(1)}$ related to the other metrics, as it does not refer to average, as is the case for the other metrics.)

The Panel also believes that, particularly for departures, SELs for a given type of aircraft tend to vary depending on meteorological conditions, variations in flight tracks, flight profiles, and pilot techniques. However, on approach to the airport, following the 3 degree ILS glide slope and tracking along the extended runway centreline, aircraft follow closely the same flight track on each approach, and therefore generate SELs along the flight track that vary little flight to flight; and, from research in Sweden (discussed in the EIS, Annex 2, Page A-15) there is no correlation between wind speeds up to 18km/hour and noise level, for aircraft heights above the measurement site up 300 to 500 m.

Turning to the January 23, 1992, Transport Canada report on the noise impact of 33L, (discussed in Annex 2B) and the depiction of the noise impact using the max $L_{eq(1)}$ metric, on 875 ft. grid squares, it is clear that the noise regime now existing south of 33R in Etobicoke would be transposed, within 1 DBA, to Mississauga residents south of the proposed 33L. An examination of the max $L_{eq(1)}$ values proceeding south along the flight track shows that the decrease from max $L_{eq(1)}$ of 71 dBA at row 13 (nearest to the airport) to 63 dBA at Lakeshore Blvd., some 4 1/2 miles south, is only 8 dBA. This is, of course due to the 3 degree glide path slope, with the aircraft at 2000 ft. altitude at Lakeshore and 760 ft. altitude at residences closest to the runway threshold (2.75 miles from touchdown).

In terms of actual dBA values near the flight path (and in order to relate actual and discrete noise intrusions to annoyance factors such as speech or sleep interference), the Panel will use SEL and L_{max} data from the two January 23, 1992, Transport Canada reports. The max $L_{eq(1)}$ values produced for 875 grid squares south of 33L and 33R will be used to illustrate only relative changes in the noise regime, as the max $L_{eq(1)}$

values shown appear to be about 8 dBA higher than those that would be obtained using the measured values from the "relocated" NMT 6 and NMT 4, and converting such measured L_{max} (or SEL) values to (normal) $L_{eq(1)}$ values.

Considering now the noise regime at the "relocated" NMT 6 which is coincident with residences nearest the threshold of the proposed 33L, (approximately 14,000 ft. from the threshold) the measured (and average of 121 Stage 3 and Stage 2 aircraft) approach SEL is 91.3 dBA, and L_{max} is 82.4, i.e., $L_{max} = SEL - 9$ (dBA), (very close to the 10 dBA difference assumed earlier). An L_{max} of 82.4 outdoors would correspond to L_{max} 62.4 indoors, windows closed, and 72.4 dBA with windows open. These values can be related to degrees of annoyance, for example, for speech or sleep interference. Further south, at Lakeshore Blvd. these L_{max} values would decrease to 54.8 dBA (windows closed) and 64.8 dBA (windows open). Note that in Fig. G-1 (which illustrates the 80 and 85 SEL contours for one simultaneous arrival and departure of a Dash-8 aircraft on Runway 33, with resultant contours virtually identical to those of the A320) if only Dash 8 aircraft were used, the SEL and L_{max} would be about 5 dBA less.

When the noise intrusions as just described, at 30 per hour, are combined with the probability of occurrence as outlined in the "5% occurrence analysis" above, the following features emerge:

- (a) Outdoor activities would be impacted by L_{max} ranging from 82.4 dBA nearest the airport to 74.4 at Lakeshore Blvd. However, in the warm months of the year the frequency of occurrence of these impacts would range from near zero to 2.3% (rather than the assumed 5%);
- (b) The greatest frequency of noise intrusions would be in cold weather, from 4 to 8%, but as this is the time of year when windows would normally be closed, a 20 dBA attenuation would bring the indoor L_{max} to levels near those causing speech interference at residences nearest the airport, and below that level further south;
- (c) With regard to sleep interference, in as much as the runway would not be used from 11 p.m. to 7 a.m., normal interference with sleep would not occur. Such would not be the case for shift workers.

The noise "picture" is therefore not nearly as bleak, or as onerous as first (and probably still) feared by the residents of Rockland.