WATERLOO REGIONAL AIRPORT

MASTER PLAN

APRIL 2000

By:
The Regional
Municipality of Waterloo

Executive Summary

In 1996 a Project Team was established to update the 1983 Master Plan for the Waterloo Regional Airport (YKF). The team had representation from the Airport Advisory Committee, the Chamber of Commerce, local elected officials, GRCA, local and Regional planning staff and airport staff. AvGroup Consulting Services Limited was hired to provide technical analysis and airport design expertise to the team. The Team also had workshops and open houses with the general public to provide input to the strategic direction for the future of the airport.

By the end of 1998 the team had prepared a revised strategic plan, five runway development options, and a list of other capital improvements that would be needed to ensure the airport could meet the needs of the Region. Each of the five runway options provided a solution, in varying degrees, to the issues raised through the Master Plan process. In summary the issues that needed to be addressed were:

- identify the role and goals, both short and long term, for the airport with consideration to community objectives
- identify the businesses required on the airport relative to the business goals and economic realities
- identify development/infrastructure needs of the airport
- define processes and procedures required to implement development plans
- review alternative airport management options
- update NEF (Noise Exposure Forecast) contours
- ensure that all federal, provincial and local regulations are considered.

In 1999, a Public Advisory Committee and an Aeronautical Noise Management Committee were established to allow for additional public input into the Master Plan. Both of these committees had representation from citizens selected by local councils in Cambridge, Kitchener and Woolwich, the Chamber of Commerce, local elected officials, the Airport Advisory Committee, airport tenants and Regional staff. These groups met at least seven times starting in May. These groups were very successful at looking at ways the airport could be improved to mitigate any negative impacts the operations would have on the surrounding communities. The Aeronautical Noise Management Committee will continue to meet on a quarterly basis starting in 2000 and the other will be disbanded on the completion of the Master Plan.

Airport Vision

The strategic vision for Waterloo Regional Airport is to operate the facility as a premier regional full-service airport, serving Canada's Technology Triangle (CTT).

Airport Role

The role of the Waterloo Regional Airport is to be a fully equipped, certified airport facility to accommodate scheduled/charter passenger and air cargo facilities and services, business charter services, flight training, recreational flying, and aviation-related industrial /commercial business and service facilities.

The operation and future development of the airport shall balance its role as an aviation service provider and economic development tool with its responsibility to operate in a manner sensitive to the needs of the community.

Goals and Objectives

To meet the strategic vision a set of goals and objectives were developed. These goals and objectives will guide staff, the Airport Advisory Committee, and Regional Council when making decisions about development and operations at the airport:

- Recognize that the planning initiatives from this Master Plan must be comprehensive and long term (20 years);
- Provide long term certainty for businesses, residents, investors and developers in the Region through a commitment to the implementation of the recommendation of the Master Plan;
- Broaden and diversify the airport's business and revenue base with the goal of financial self-sufficiency over the next 5 to 10 years while maintaining a competitive user fee schedule;
- Enhance the business/corporate role for the airport, establishing YKF as a premier corporate airport for the CTT area;
- Attract and sustain a regional air carrier(s) that can provide scheduled (and charter) passenger air services to Ottawa, Montreal and a US hub airport;
- Minimize the effect of aircraft noise through operational improvements;
- Recognize the role of the Airport Advisory Committee in representing the community in planning airport operations and initiatives;
- Implement a noise / operational management committee with stakeholders from the community and business sectors;
- Ensure compatible land use planning around the airport with appropriate amendments to all local and Regional official plans;
- Review the capacity needs and demands of the airport every five years and implement management practices to deal with the effects of any changes to the noise contours (NEF / NEP);
- Develop a 10 year capital budget.

Preferred Development Concept

The preferred development options as presented in Section 10 are:

- Mitigate airport noise through changes to the published noise abatement procedures as recommended by the Aeronautical Noise Management Committee and approved by the Airport Advisory Committee, Regional Council and Transport Canada;

- Implement a noise monitoring and management system;

- Install an Instrument Landing System (ILS) on runway 07 and change the published procedures in Canada Air Pilot to ensure pilots use the ILS. The ILS cannot be installed without lengthening runway 07/25.

- Extend runway 07/25 to 7,000 feet (an 1,800 foot extension);

- Upgrade the existing passenger terminal building to accommodate the needs of regular scheduled passenger service. The Region should pursue a shared funding strategy with all carriers;

- Provide additional airside leased property available to allow businesses and individuals to construct hangars and aviation related operations;

- Undertake the necessary studies to deal with the future infrastructure servicing needs (ie water, sewer, power, storm drainage);

- Maintain the existing airport management structure and administration under the present Regional organization and political governance system;

- Update the Airport Master Plan every five years with the next update in 2005;

- Revise the appropriate clauses of the Regional Official Policies Plan at its next five year review consistent with Section 9.3. Any future changes to the 2000 Airport Master Plan which would result in the development of new runways, significant extension of existing runways, or increases in the pavement load rating or code rating of the airport, will only be implemented following recognition of such change through amendment to the Regional Official Policies Plan;

- Apply for Federal and/or Township of Woolwich zoning to match a 7,000 foot runway 07-25.

- Establish an Airport Capital Financing Plan to implement the Airport Master Plan commencing with the 2001 airport capital program and ten-year forecast.

Environmental Approvals

Airports are a unique entity under provincial and federal regulations. Airports and aviation related projects are not subject to the Ontario Environmental Assessment Act. This position is supported by case law at the Divisional Court level in Ontario. The Region will need to follow the Canadian Environmental Assessment Act for specific projects which receive any funding from the Federal Government.

The Region will continue to follow all federal and provincial regulations concerning all present and future activities at the airport.

Financial Implications

There are limited funds available for safety related, non-expansionary capital projects from Transport Canada through the Airports Capital Assistance Program (ACAP). The Region would be required to have at least 1,000 scheduled passengers per year to be eligible for ACAP. Therefore, the Region will need to fund the majority of the projects from its own reserves or debentures. Section 10 lists all of the projects with estimated capital costs. Appendix H is a draft 10 year capital forecast.

Addendum

The Draft Master Plan was considered by Regional Council on March 22, 2000. The recommendations of the Project Team as listed above were approved. Appendix J contains the minutes of the meeting.

In addition to the Project Team's recommendations, Regional Council approved the following:

> Implement immediately a night time flight restriction between 2300 hours and 0700 hours daily for landings on runway 07, and take-offs on runway 25, except for medical and industrial emergencies with the prior approval of the Airport Manager or designate.
>
> The composition of the Airport Noise Management Committee be considered by the Noise Management Committee, the Airport Advisory Committee and Regional Council.

Staff will be forwarding the nighttime restriction recommendation to Transport Canada and CARAC for approval.

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1.0 Introduction

1.1 Airport History

In June 1948, the Cities of Kitchener, Guelph, Galt and Waterloo, and the Town of Preston established the Waterloo-Wellington Airport Commission with the mandate to develop a new airport that would serve the communities in the regional area. Construction of the airport began in 1950 on a 271 hectare parcel of land that was purchased by the participating municipalities.

Under an agreement between the Federal Government and the Airport Commission, the Department of Transport funded the construction of two paved runways while the municipalities agreed to maintain and operate the property as a public airport. The communities also agreed to develop by-laws to protect the use of lands surrounding the airport.

At the time of its initial construction, the management of the airport was contracted out to the Waterloo-Wellington Flying Club which erected a hangar and clubhouse on the site.

During the 1960's, the airport experienced considerable investment and development. In addition to the construction of a number of private hangars, Transport Canada installed a non-directional beacon (NDB), constructed parallel taxiways associated with the two runways, and provided edge lighting. In 1969, the construction of the air traffic control tower elevated the status of the airport to a "controlled" general aviation airport.

Further investment in the airport occurred in the early 1970's with the construction of the air terminal building, and additional private development. During this same period, the Regional Municipality of Waterloo was created which, along with the City of Guelph, assumed responsibility for the ownership and operation of the airport.

In 1983 a Master Plan was completed for the airport. This report stated that the airport should be a fully equipped, general aviation airport. The main recommendations were to lengthen Runway 07-25 to 5,200 feet and install an instrument landing system.

In 1984, additional lands were purchased for the airport and Runway 07-25 was expanded to the east by 1200 ft. The installation of an instrument landing system was subsequently provided in 1990.

The airport is designed to handle planes that meet Transport Canada's code C rating with a maximum pavement load rating of PLR 9. This allows planes with a maximum wingspan of 117 feet, a gear span up to 29, and a weight of 116,000 pounds.

In 1996, the City of Guelph relinquished its share in the ownership of the airport and the Region of Waterloo became the sole owner. At this time, the airport was renamed the Waterloo Regional Airport.

Recent development at the airport has included the construction of a new airport maintenance garage. The private sector has constructed a number of private and corporate hangars, a restaurant, and is proposing to increase the fixed base operator (FBO) facilities. In 1999, Trillium Airlines started daily scheduled flights to Ottawa.

This update to the Master Plan is required to ensure that the development of the airport is consistent with the long-term needs of the Regional Municipality of Waterloo.

1.2 Airport Setting

The Waterloo Regional Airport is located in the Region of Waterloo, and within the Township of Woolwich. The airport property presently comprises an area of approximately 263.6 hectares.

Illustrated in Figure 1.1, the airport is located across the Grand River and approximately 0.8 km east of the City of Kitchener, 1 km north of the City of Cambridge and 12 km west of the City of Guelph. The closest residential community is Breslau which is located approximately 1.6 km north of the airport. The proposed residential development in the Grand River South area of Kitchener will be less than 1 km off the west end of runway 25.

The airport is ideally situated to serve the surrounding communities and the regional area promoted as Canada's Technology Triangle (CTT). This area is noted for its concentration of high tech manufacturing industries, two universities, and community college. There is a population of approximately 500,000 within a 16 km radius of the airport.

The area immediately surrounding the airport is largely rural in nature, with mixed farming activities, including several sod farms, and rural residences.

The airport is also located within close proximity to industrial development located in the Breslau Settlement, northwest of the airport, and the Cambridge industrial park to the south at the intersection of Regional Road 17 and Maple Grove Road.

To the west of the airport is the Grand River. Lands to the west of the Grand River are within the City of Kitchener.

1.3 Airport Administration

Waterloo Regional Airport is owned and operated by the Regional Municipality of Waterloo. The airport is administered under the Region's Engineering Department, Transportation Division.

At present, the airport has a full time staff of seven (7) employees. This includes the airport manager and two administrative staff plus four (4) operations staff. The airport also draws upon the resources of casual workers who assist in snow removal operations and provide additional support during special events.

In 1998, the operating budget of the airport was $900,000. Of this, approximately 45% was funded through airport revenues including land leases and user fees. The remaining amount was funded through the Region's general tax levy. At present, the airport does not receive any operating or capital subsidies from either the Provincial or Federal governments.

1.4 The New Environment

In recent years, a new environment has emerged with respect to the operation and management of airports throughout Canada. Fundamental changes brought on by a divestment of support from federal and provincial levels of government has far-reaching implications on the future viability of local and regional airports.

Under the National Airports Policy (NAP), introduced in 1994, Transport Canada is divesting itself of local and regional airports; transferring ownership to local and regional municipalities. Transport Canada has eliminated operating and capital subsidies to airports, and has introduced ACAP (Airports Capital Assistance Program) which limits funding only to those airports which have scheduled passenger services. In addition to this, at the provincial level, the Ministry of Transportation has eliminated operating subsidies to local and regional airports.

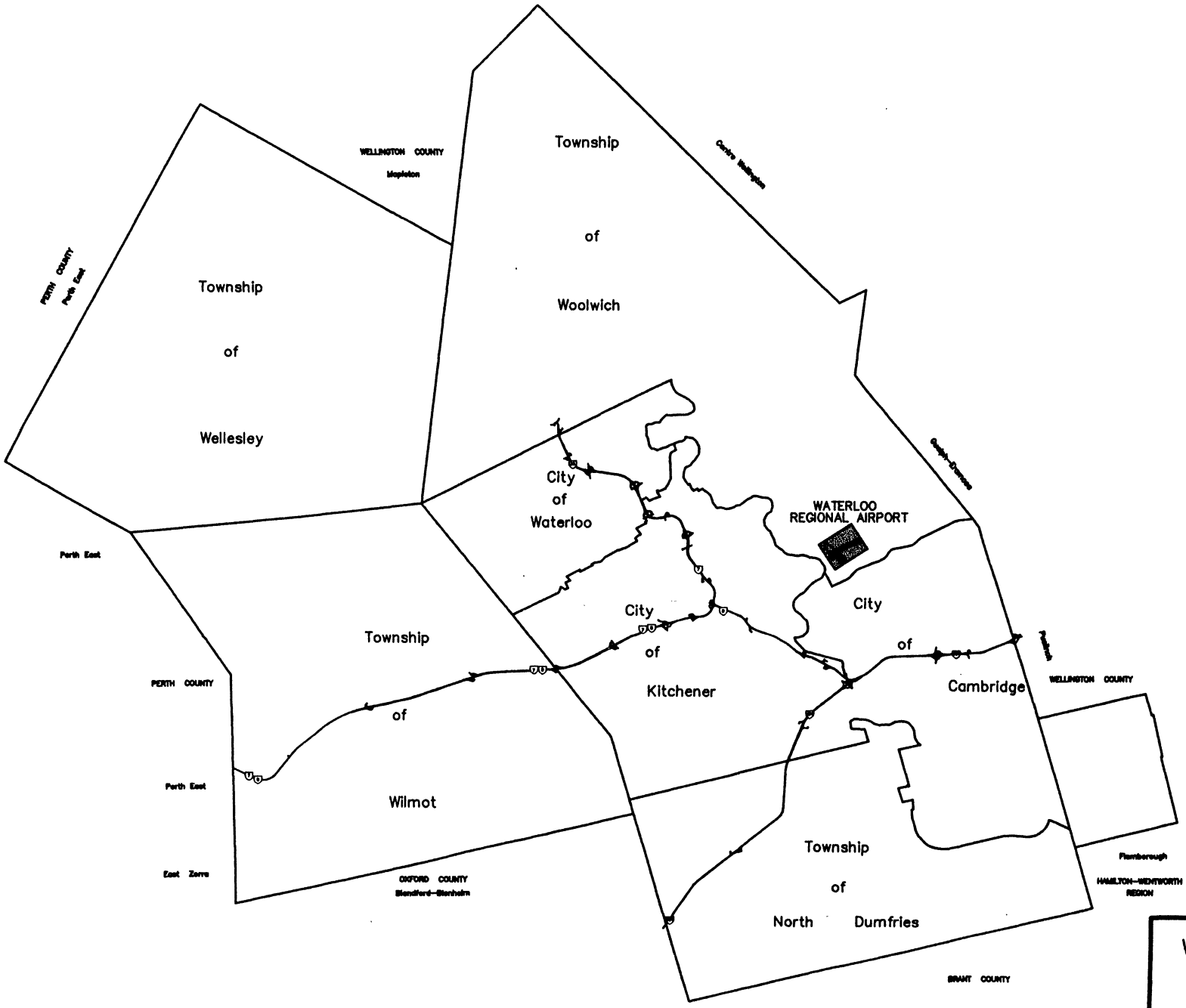
This additional financial burden on local and regional governments comes at a time when municipalities are themselves financially constrained. With reduced funding resources, airports are facing competition for limited tax dollars from other publicly supported activities (police, fire, public health, education) that are being perceived by the community as having a higher value.

Faced with limits on public funding, airports are looking increasingly towards expanded opportunities for revenue generation. At most airports, however, financial self-sufficiency can not be achieved through user-pay solutions without substantial increases in fees to general aviation users. Recent moves by airports to directly charge general aviation users for the use of facilities has been met with strong opposition from the Canadian Owners and Pilots Association and other organizations representing general aviation.

Faced with an increased reliance on government revenues as a source of funding, a new business ethic is emerging within the airport industry. Traditionally, airports were largely viewed as "infrastructure", provided for the general good of the community in much of the same manner as a highway or a utility. Today, airports are increasingly being viewed as "business entities", that are in themselves centres for revenue and profit.

A number of factors have brought about this change in attitude. These include:

- Provincial and federal government's decline in financial and administrative support of airports
- a realization that there is increasing competition between airports for a share of the aviation market
- recognition of the airport as an important economic tool in attracting and sustaining new industry and commerce to a community
- emergence of the airport as a preferred environment to undertake both aviation and non-aviation related businesses.



WATERLOO REGIONAL AIRPORT

FIGURE 1.1

1.5 Master Plan Purpose

The primary purpose of the Airport Master Plan is to update the 1983 Airport Master Plan and provide a comprehensive plan for the airport that will encompass business and development objectives under a single strategy.

With an increased emphasis on financial self-sufficiency and local accountability, it is important that the planning and development process respond to the business interests of the airport, in addition to the traditional elements normally addressed in an Airport Master Plan, and incorporate them under a single strategy. Competitive positioning, revenue generation and financing are all important issues that must also be included in the planning process.

1.6 Master Plan Objectives

Specific objectives for the Airport Master Plan include:

- identify the role and goals, both short and long term, for the airport with consideration to community objectives
- identify the businesses required on the airport relative to the business goals and economic realities
- identify development/infrastructure needs of the airport
- define processes and procedures required to implement development plans
- review alternative airport management options
- identify noise mitigation measures to reduce noise over residential developments
- update NEF (Noise Exposure Forecast) contours
- ensure that all federal, provincial and local regulations are considered.

2.0 Land Use Planning / Noise Contours

The economic viability of the airport is dependent upon a proper balance between business, neighbouring communities and the airport. Defining appropriate land uses surrounding the airport is a key element in achieving this interface.

Two land use components that must be considered include:

- identification and designation of non-conflicting land uses surrounding the airport
- identification of land areas to be protected against the erection of obstacles that could jeopardize the licensing and operation of the airport in its final configuration

With respect to the designation of non-conflicting land uses, regional, city and township official plans should have due regard for recent changes in Provincial Policy regarding the development of residential and other noise sensitive land uses in the vicinity of airports.

2.1 Land Use Planning

On January 22, 1997, an Order in Council was issued which amended the Provincial Policy Statement (PPS) to address land uses and development near airports. Specifically, the following has been added to Policy 1.1.3 g):

To protect airports from incompatible development:

1. *New residential development and other sensitive land uses will not be permitted in areas near airports above 30 NEF/NEP as set out on maps (as revised from time to time) approved by Transport Canada; but*

2. *Redevelopment of existing residential uses and other sensitive land uses of in-filling or residential and other sensitive land uses may be considered above 30 NEF/NEP if it has been demonstrated that there will be no negative impacts on the long term function of the airport.*

The Definition Section of the Policy Statement is amended by adding the following:

"Airports" means <u>all</u> Ontario airports, including designated lands for future airports, with Noise Exposure Forecast (NEF)/Noise Exposure Projection (NEP) mapping."

Waterloo Regional Airport is situated in relatively close proximity to urban residential communities including Kitchener, Breslau, and Cambridge. To ensure the long-term viability of the airport and well-being of the surrounding communities it is important that measures be taken by the Region of Waterloo, City of Kitchener, City of Cambridge, and Township of Woolwich to ensure that lands surrounding the airport are planned and developed in an appropriate manner.

Although the Provincial Policy Statement accommodates residential development in areas at or below NEF 30, the reality is that the public has become very sensitive, not only to noise generated by aircraft, but also to the overflying of low aircraft. This sensitivity is demonstrated by the number of complaints received by airport management from residents

who live well beyond the NEF 30 contour. Many of these complaints are generated from single noise events.

2.2 Airport Neighbours

YKF is in operation 24 hours per day, 365 days per year. Excessive noise generated from airport activities and the over-flight of aircraft is a major concern to the airport management, site operators, and residents surrounding the airport. The airport does not have noise monitoring equipment or a tracking system.

Currently there are residential properties within 1.7 km off the end of runway 32, and 2.5 km off runway 25. The Councils of the City of Kitchener and Regional Municipality of Waterloo have recently approved a new subdivision, an additional 3,000 homes, between the current homes and the west end of runway 25. This new subdivision will be 0.8 km off the end of runway 25. Although the new homes will not be within the 30 NEF/ NEP contours, these homes will be subjected to regular noise from aircraft.

The airport last updated its noise abatement procedures in "Canada Air Pilot" in 1990. The current noise abatement procedures for turbo-jet and turbo-fan aircraft require:

- departures off runway 25 must turn to a heading of 220 degrees once an altitude of 1600 feet above sea level is reached (the runway is 1040 ft ASL)
- departures off runway 32 must maintain the runway heading for four miles before any turns
- use of preferential runways for arrivals and departures between 2300 and 0600 hours
- flight training to approach runway 07 are not permitted between 2300 and 0600 hours.

Detailed complaint logs have been kept since 1998. Tables 2.1 and 2.2 summarize the complaints for 1998 and 1999 respectively. The Region recognizes that operational options must be explored and implemented to minimize traffic over residential areas.

Although the airport generally receives very few noise complaints regarding its daytime operations, the airport's ability to accommodate 24 hour operations results in occasional nighttime movements. These movements can occur with regularity for short periods when local industry must rely on the "just in time" delivery of parts in order to maintain production schedules. The majority of noise complaints received by the airport occur during these short periods when there is sustained nighttime activity.

Aside from noise, some residents voice concern regarding the frequency of aircraft traffic close to their homes. They are worried about privacy and the possibility of an accident. The Master Plan will address operational issues so that the airport can co-exist with the residential communities under its flight paths. To meet this objective the Master Plan was developed through input from the public at workshops, public forums and a formal Public Advisory Committee. An Aeronautical Noise Management Committee was also established to look at operational issues.

2.3 Noise Contours

In Canada, the only officially recognized model used for the analysis of noise impacts associated with aircraft movements is Transport Canada's Noise Exposure Forecast Computer Program (NEFCAL). As part of the Airport Master Plan study, NEFCAL was used to assess both current and projected noise impacts. NEF/NEP analysis was undertaken for both the current and forecasted aircraft movements in order to assess the potential impacts that may be associated with further development of the airport.

2.3.1 Definition of NEF Contours

The Noise Exposure Forecast (NEF, i.e. 5-year forecast) or Noise Exposure Projection (NEP, i.e. 20-year projection) is the officially recognized noise metric in Canada used for airport assessment. The NEF/NEP was designed to encourage compatible land uses in the airport vicinity and to predict human annoyance to airport operations within the noise zones. NEF/NEP are calculated by time-averaging the annual aircraft operations (actual or forecast), considering aircraft mix, flight distances, runway utilization, flight path and time of day. It should be noted that night time operations (i.e. those flights occurring between 10 p.m. and 7 a.m.) are weighted by 16.7 times the daytime level since night time is a much more sensitive period.

Appendix A contains information from the Transport Canada document entitled Land Use in the Vicinity of Airports TP1247E, Seventh Edition, March 1989. Information is provided regarding the definition of NEF/NEP and charts of recommended land uses within various ranges of NEF/NEP values.

Table 2.3 provides typical NEF contour levels and common associations.

The NEF/NEP contours are weighted averages of noise. Airport neighbours though are concerned about the noise levels from single plane events. Land use near the airport is not based on single noise events, but this Master Plan evaluated noise mitigation in determining the long-term alternatives. Appendix B present a few examples of the single noise affects from some typical planes using the airport today as well as the predicted improvement that will occur if the recommendations of the Master Plan are implemented.

Table 2.1 1998 Noise Complaint Summary

Month	*Itinerant Movements*	*Local Movements*	*Total Movements*	*Movements after 11:00 PM*	*Total Number of Complaints*	*Number of Complaint Days*	*Complaints 2300-0700 Hrs*	*Complaints 0700-2300 Hrs*	*Presence*[1]	*Noise*
January	1479	3053	4532	0	10	4	7	3	3	7
February	3478	5813	9291	5	12	7	8	4	0	12
March	2935	4745	7680	29	8	4	8	0	0	8
April	5156	8250	13406	18	11	11	4	3	0	11
May	4569	6983	11552	32	16	9	4	12	4	12
June	4085	6269	10354	48	7	7	1	6	5	2
July	6196	11691	17887	87	7	6	3	3	2	5
August	5044	7015	12059	97	23	12	11	12	7	16
September	5085	8114	13199	79	20	9	15	5	2	18
October	5467	8046	13513	58	5	5	3	2	2	3
November	3546	7069	10615	30	19	7	15	4	2	17
December	3172	5117	8289	37	9	5	2	7	2	7
Totals to Date	50212	82165	132377	520	147	86	81	61	29	118

Note 1 - Presence - the complaint was about an aircraft that the person thought was too close to their home, or that they were concerned about their safety with aircraft overhead

Table 2.2 1999 Noise Complaint Summary

Month	Itinerant Movements	Local Movements	Total Movements	Movements after 11:00 PM	Total Number of Complaints	Number of Planes Causing the Complaint Incident	Number of Households[2]	Complaints 2300-0700 Hrs	Complaints 0700-2300 Hrs	Presence of Aircraft[4]	Noise
January	1956	3964	5920	8	3	3	3	2	1	0	3
February	3357	5950	9307	15	17	16	12	3	14	3	14
March	4663	7182	11845	32	13	12	11	2	11	3	10
April	4516	6553	11069	22	12	8	9	2	10	1	11
May	5357	6958	12315	42	35	14	28	21	14	8	27
June	5105	7700	12805	98	30	18	24	12	18	7	23
July	6196	11691	17887	95	11	11	9	4	7	2	9
August	5928	8101	14029	51	34	16	24	12	22	3	31
September	5296	6957	12253	17	12	12	12	2	10	2	10
October	5124	8256	13380	27	8	8	6	1	7	1	7
November	3873	6674	10547	24	8	7	5	2	6	2	6
December	3304	5102	8406	12	7	7	7	3	4	2	5
Totals to Date	54675	85088	139763	443	190	132	87[3]	66	124	34	156

Notes:

1- Total Number of Complaints represents all complaint calls. The noise events resulting in complaints represent aircraft arriving and departing Waterloo Regional Airport as well as overflights of the area of aircraft not utilizing Waterloo Regional Airport
2- The column titled Number of Households represents the number of different households which have contacted the airport during the month. If a civic address contacts us 4 times during a month, that is one unit in this column.
3- The total of the column labelled Number of Households represents the number of different households which have contacted the airport during the year.
4- Presence -the complaint was about an aircraft that the person thought was too close to their home, or that they were concerned about their safety with aircraft overhead

Table 2.3 NEF Contours and Common Associations

NEF Contour	Common Association
40 NEF	Telephone ringing at 2.7 metres
35 NEF	A person's voice at 1 metre
30 NEF	General Office Environment
25 NEF	Quiet Living Room

2.3.2 NEF/NEP Scenarios

As part of the preparation of the Airport Master Plan, a number of NEF/NEP scenarios were developed. The purpose of these scenarios was to:

- Ascertain the noise impacts generated by current airport activity
- Estimate the potential noise impacts associated with forecasted increases in aircraft movements
- Estimate the potential noise impacts associated with alternative runway developments
- Provide a scenario that can serve as the basis for an updated official Transport Canada approved NEF for the airport.

1985 NEF Contours

Figure 2.1 illustrates the current official noise contours for Waterloo Regional Airport. These contours were prepared by Transport Canada in 1975, with noise contours reflecting estimated growth rates projected to the year 1985.

1998 NEF Modelling Parameters

In the preparation of the 1998 NEF/NEP analysis, a number of underlying parameters were used as a basis of the work. These are identified below.

Data Sources:

- Actual 1998 movement data obtained from Statistics Canada (Aviation Statistics Centre) *local movements* - Appendix C
- Actual 1998 movement data obtained from Nav Canada tower *itinerant movements - Appendix C*
- Noise abatement procedure descriptions obtained from Transport Canada document entitled *Canada Air Pilot* - Appendix D

Summary of Key 1998 Statistical Parameters Developed as Part of the NEF/NEP Analysis:

- Busiest itinerant day, 1998 March 29 - (347 movements)
- Busiest local day, 1998 July 13 - (784 movements)
- For NEF analysis itinerant 1998 Planning Day based on 95th percentile method: - 287 movements/day
- For NEF analysis local 1998 Planning Day based on 95th percentile method: - 595 movements/day
- Actual airport facility and runway utilization (based on itinerant data only) - Table 2.4.
- Summary of 1998 local movements based on aircraft type - Table 2.5

Assumptions for Local Traffic:

Runway utilization will be proportioned as follows (Based on actual annual itinerant 1998 data):

Runway 07 - 12.1%
Runway 25 - 25.7%
Runway 14 - 10.1%
Runway 32 - 52.1%

Table 2.4 Itinerant Runway Utilization

Runway	Utilization (%) Paired Runway Sets	Utilization (%) All Movements, All Runways
7	32	11
25	68	23.4
14	16.2	9.2
32	83.8	47.3
Simulated Approach (Any Runway)		7.4
Helicopter Approach (Any Direction)		0.9
Fly Through Zone (En Route)		0.8
TOTALS		100

Table 2.5 1998 Local Aircraft Type Data

Aircraft Type	% of Total Local Movements	
	Day Time	Night Time
Single Engine	87.9	94.5
Multi Engine	11.8	5.4
Jet	0.2	0
Military	0.1	0.1

General Assumptions:

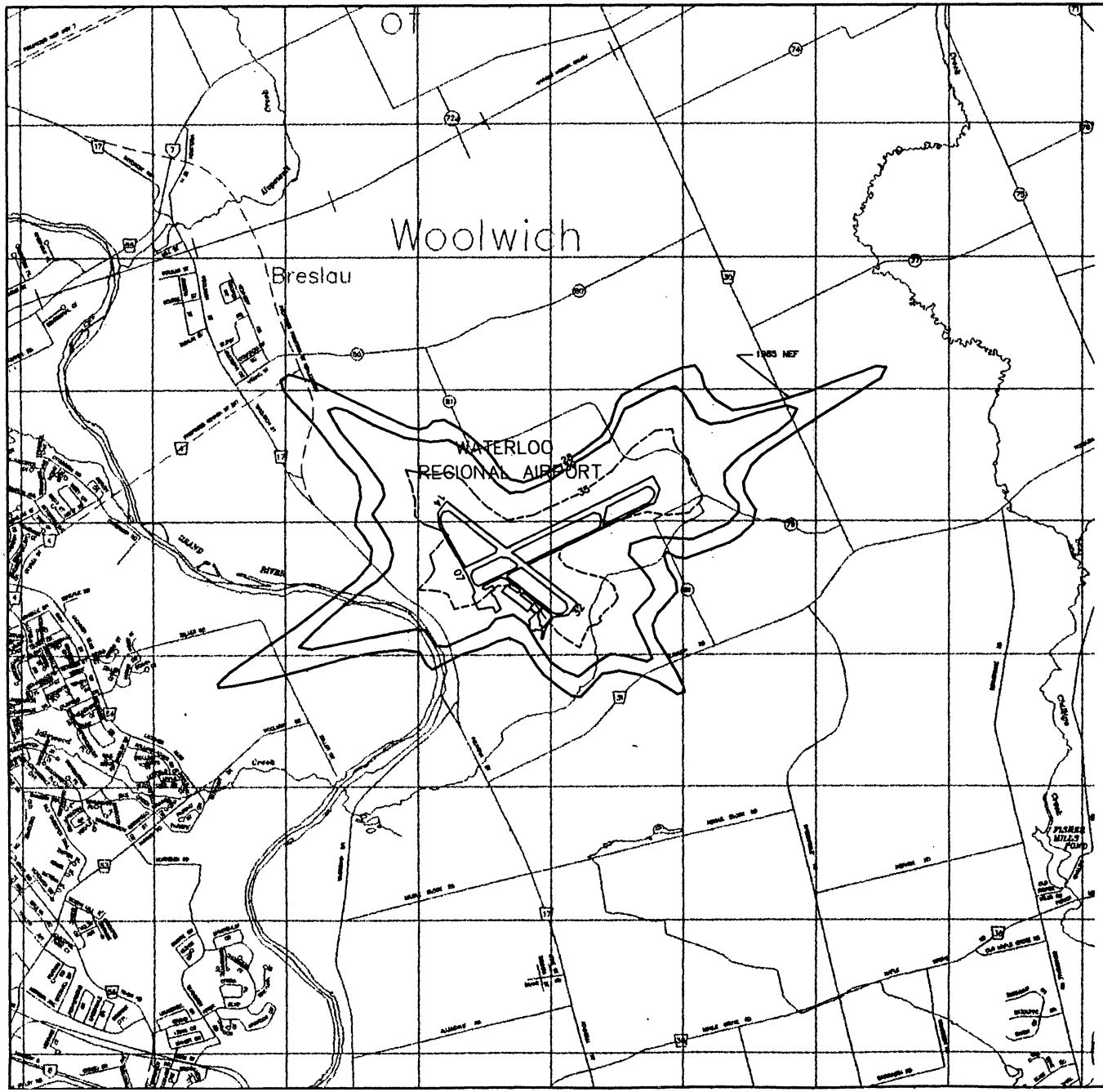
- Simulated approaches were proportioned to Runways 07, 25, 14, and 32. The tower does not log the runway for which the approach is being performed. It will be assumed that the approaches would follow the same distribution as the normal approach traffic
- All home-built aircraft were assumed to be light, single engine piston aircraft.
- Single jet engine military aircraft were assumed to be the equivalent to 3 engine turbofan.
- The existing NEF analysis was based on a maximum departure travel distance of 500 nm.

Illustrated in Figure 2.2, these noise contours were generated based on actual 1998 aircraft movements, aircraft mix and runway utilization. In comparison to the 1985 contours, these contours cover a smaller area. The primary reason for this is that the actual movements that occurred in 1998 are less than the projected movements forecasted by Transport Canada in 1975. The lower number of movements results in a reduced impact on the surrounding community.

The 1998 NEF Contours illustrated in this figure assume that there are no changes to the airport's airside infrastructure, and takes into consideration, the current noise abatement procedures for the airport.

2018 Planning Contours

The 2018 planning contours were developed for the existing runway configuration and for each future viable runway alternative. These planning contours are based on 153,000 movements with a mix of planes that fulfill the role of the airport. Appendix E contains a summary of the plane mix and movements. Figure 2.3 illustrates the 2018 planning contour for the existing runway configuration. The planning contour for the recommended runway configuration will be submitted (once approved by Regional Council) for review to Transport Canada and will then be the official NEP noise contours for YKF.



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REGIONAL MUNICIPALITY OF WATERLOO

LEGEND

1985 NEF FORECAST	———	28 NEF
	———	30 NEF
	- - - - - - -	35 NEF

SCALE 1:15000

BASE MAP : TRICITY MAP (JAN 1999)

AVGROUP

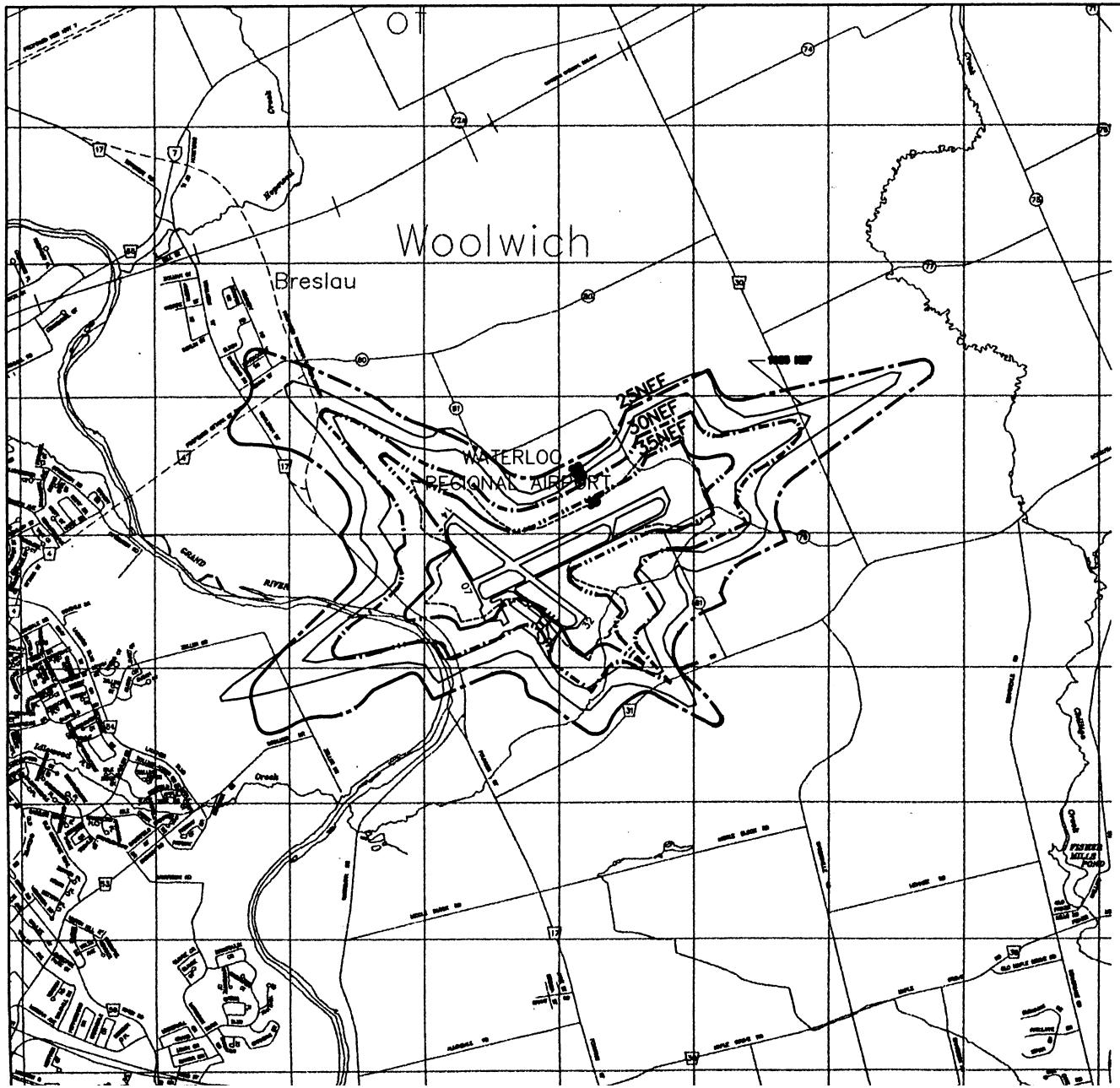
WATERLOO REGIONAL AIRPORT

BUSINESS PLAN UPDATE

1985 NEF CONTOURS WITH EXISTING RUNWAY CONFIGURATION

SCALE: 1:15000 | DATE: NOV. 1999

PROJECT NO. 608-06181 | Figure 2.1



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REGIONAL MUNICIPALITY OF WATERLOO

LEGEND

1998 NEF EXISTING CONDITIONS	— · —	25 NEF
	— · · —	30 NEF
	— — —	35 NEF

NOTE: 28 NEF NOT SHOWN TO MAINTAIN CLARITY

1985 NEF FORECAST	———	28 NEF
	———	30 NEF
	- - - - -	35 NEF

SCALE 1:15000

300 0 100 300 500 1000 1500 METRES

1000 0 500 1000 2000 5000 FEET

BASE MAP : TRICITY MAP (JAN 1999)

AVGROUP

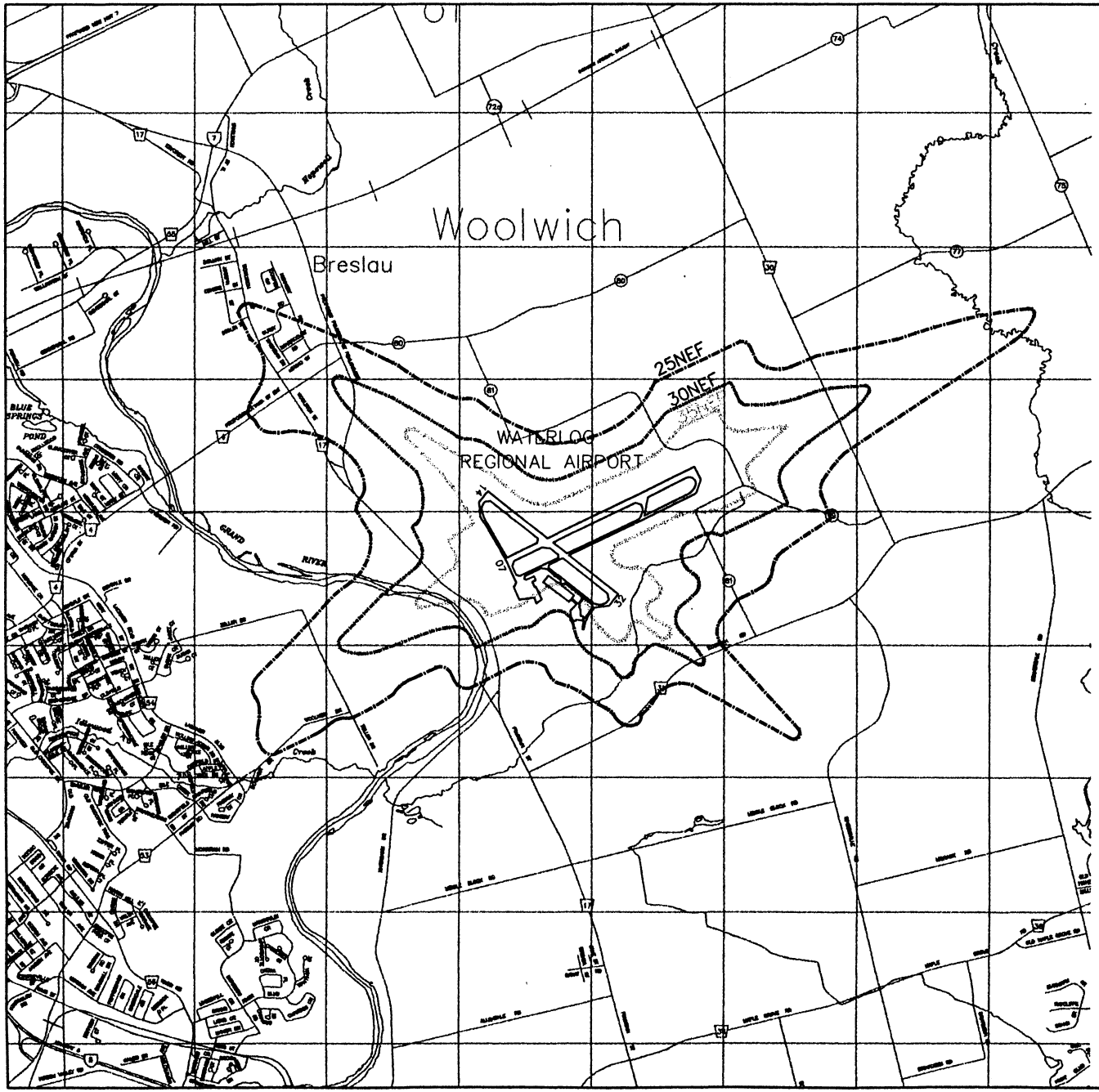
WATERLOO REGIONAL AIRPORT

MASTER PLAN UPDATE

1985 + 1998 NEF CONTOURS WITH EXISTING RUNWAY CONFIGURATION

SCALE: 1:15000 | DATE: JAN. 2000

PROJECT NO. | FIGURE 2.2



WATERLOO
REGIONAL AIRPORT

REGIONAL MUNICIPALITY OF WATERLOO

LEGEND

PLANNING CONTOURS		25 NEF
		30 NEF
		35 NEF

NOTE: 28 NEF NOT SHOWN TO MAINTAIN CLARITY

SCALE 1:15000

200 0 100 300 500 1000 1500 METRES

1000 0 500 1000 2000 5000 FEET

BASE MAP : TRICITY MAP (JAN 1999)

AVGroup

WATERLOO REGIONAL AIRPORT

BUSINESS PLAN UPDATE

ALTERNATIVE A4
PLANNING CONTOURS
FOR THE EXISTING RUNWAYS
WITH 153,000 MOVEMENTS

SCALE: 1:15000	DATE: NOV. 1999
PROJECT NO. 608-06181	Figure 2.3

6181-98-5

3.0 Strategic Plan

3.1 Airport Role

Since its inception in 1951, the primary role of the Waterloo Regional Airport has always been to serve the needs of the surrounding communities. The original agreement, signed in 1948 between the Cities of Kitchener, Guelph, Galt, Waterloo and Preston called for participation in the establishment and funding of a community airport. To further the intent of this agreement, a special Order-in-Council was passed to formally create the first community airport in Canada for general aviation, and to establish the Waterloo-Wellington Airport Commission.

In 1983, the role of the airport, as "a fully equipped general aviation airport", was approved by the Region of Waterloo and the City of Guelph. This role was defined by the Region as:

> *"an airport having the capacity to accommodate scheduled passenger and cargo services, business aviation, flying training, local recreational flying and aviation-related businesses".*

An Airport Master Plan prepared in 1983 acknowledged that at the time, the airport could not fully accommodate this intended role because of inadequate runway length and the lack of an instrument approach system. The 1983 Airport Master Plan recommended that Runway 07-25 be expanded to 5,200 ft., and that the approach to Runway 25 be equipped with an instrument landing system. In 1985 both of these recommendations were implemented, however, full Category I minima were not achieved for the instrument landing system because of obstructions located on properties adjacent to the airport. The maximum size of plane allowed at YKF is limited to Code C with a PLR 9.

With the exception of scheduled passenger and cargo services, the airport presently fulfills much of the role identified in 1983. Today, the Waterloo Regional Airport accommodates a wide variety of activities and services which are directed to the local community.

3.2 Public Input Process

In the preparation of the Airport Master Plan, the role of the airport was reviewed as part of the development of a strategic vision for the airport. As part of the public consultation process, existing and potential roles for the airport were discussed at two separate public workshops.

At the first workshop, the public was asked to identify what they perceived as important roles for the airport and to denote those which were preferred. The preferred roles identified by the participants included the following:

- scheduled passenger services
- corporate/business aviation
- air cargo
- flight training
- medivac

At the second workshop, the planning team presented the public with a number of ultimate development alternatives that were based on various airport role scenarios (Appendix F). These scenarios included:

Reliever Airport

- secondary airport to LBPIA
- potential for 60+ jet movements per day
- potential to accommodate all aircraft types under all weather conditions
- very substantial infrastructure requirements and high development costs
- substantial impact on surrounding community

Charter/Air Cargo Airport

- substantial development of air cargo/terminal facilities
- 15-25 jet movements per day
- additional infrastructure requirements and associated development costs
- moderate additional impacts on community

Regional Airport with Scheduled Air Services

- development of improved terminal facilities with possible extension of runways/taxiways
- regional commuter services using turboprop aircraft with limited jet movements
- minimal additional impacts on community

Corporate/General Aviation Airport

- status quo with natural growth of current activities
- growth of existing flying activities/movements
- possible extension of runways/taxiways
- minimal additional impacts on community

Restricted Airport Role

- restrictions placed on aircraft movements
- no expansion of airside infrastructure (possible constriction)
- reduced impacts on community

At the public presentation of the various development/role scenarios, there was a consensus that both the "reliever" and "charter/air cargo" roles were <u>not</u> appropriate for either the airport or community. It was felt that the community impacts associated with these roles far outweighed any economic benefits, and that these roles went well beyond the definition of a community airport. It was also recognized that it would be very unrealistic to assume that the level of activity associated with these roles could be attained at Waterloo. The type and level of activity suggested by these roles is presently being accommodated at existing airports, including LBPIA and Hamilton International Airport, and it is unlikely there would be the demand for an additional airport to serve these market interests.

There was also a consensus at the public presentation, that the restricted airport role was also not appropriate. Participants agreed that the airport should have the opportunity to meet community needs and market demands as they arise, and this could not be fulfilled if activity and development at the airport were restricted.

During the public workshops, the public also voiced the view that the airport should strive towards self-sufficiency. It was recognized that under the restricted airport role, it is unlikely that the airport could generate sufficient revenues to achieve this position.

The participants at the public workshops agreed that both the "regional airport with scheduled air services" and "corporate/general aviation airport" roles were appropriate for Waterloo Regional Airport. These roles were consistent with the notion that the focus of the airport would be to continue to serve the needs of the surrounding communities.

In 1999, two additional teams were established to comment on the Draft Master Plan and look at operational issues at the airport. Both teams had representation from the local community (selected by the Cities of Kitchener, Cambridge and Guelph), airport operators, local politicians, the Chambers of Commerce and airport staff.

The first team was called the Public Advisory Committee and commented on the Draft Master Plan. This team had nine meetings and held an open house to discuss their issues with the public. This team was disbanded on the completion of the Master Plan. Their recommendations are listed in Appendix G.

The second team was called the Aeronautical Noise Management Committee and had eight meetings. This team looked at operational issues and provided recommendations to staff and the Airport Advisory Committee (a subcommittee of Regional Engineering Committee) on operational issues. This committee will continue to meet on a regular basis after the Master Plan process is completed to ensure there is an open line of communication between airport staff, local neighbours and airport operators. Their initial recommendations are listed in Appendix G.

After consultation by the Master Plan Project Team, the following role description was prepared:

> *"The role of the Waterloo Regional Airport is to be a fully equipped, certified airport facility to accommodate scheduled/charter passenger and air cargo facilities and services, business charter services, flight training, recreational flying, and aviation-related industrial /commercial business and service facilities".*
>
> *"The operation and future development of the airport shall balance its role as an aviation service provider and economic development tool with its responsibility to operate in a manner sensitive to the needs of the community"*

The role differs only slightly from the role approved by Regional Council in 1983 (see Section 3.1).

3.3 Strategic Vision

The strategic vision for Waterloo Regional Airport is to operate the facility as a premier regional full-service airport, serving the Canada's Technology Triangle (CTT).

3.4 Goals and Objectives

To meet the strategic vision a set of goals and objectives were developed. These goals and objectives will guide staff, the Airport Advisory Committee, and Regional Council when making decisions about development and operations at the airport.

- Recognize that the planning initiatives from this Master Plan must be comprehensive and long term (20 years);
- Provide long term certainty for businesses, residents, investors and developers in the region through a commitment to the implementation of the recommendation of the Master Plan;
- Broaden and diversify the airport's business and revenue base with the goal of financial self-sufficiency over the next 5 to 10 years while maintaining a competitive user fee schedule;
- Enhance the business/corporate role for the airport, establishing YKF as a premier corporate airport for the CTT area;
- Attract and sustain a regional air carrier(s) that can provide scheduled (and charter) passenger air services to Ottawa, Montreal and a US hub airport;
- Minimize the effect of aircraft noise through operational improvements;
- Recognize the role of the Airport Advisory Committee in representing the community in planning airport operations and initiatives;
- Implement a noise / operational management committee with stakeholders from the community and business sectors;
- Ensure compatible land use planning around the airport with appropriate amendments to all local and regional official plans;
- Review the capacity needs and demands of the airport every five years and implement management practices to deal with the affects of any changes to the noise contours (NEF / NEP);
- Develop a 10 year capital budget.

3.5 Marketing Strategy

A Marketing Strategy Paper was prepared for Waterloo Regional Airport in May, 1996. The paper proposed that a marketing strategy focus on attracting new scheduled air services including service to Ottawa, Montreal and a US hub airport such as Detroit.

The Paper recommended that these efforts be undertaken without neglecting the existing core aviation business of corporate and general aviation. In particular, attention should be paid to emerging opportunities in the flight training market, a traditional strength of Waterloo Regional Airport.

A coordinated effort is also required with local and regional economic development departments.

Airport staff actively sought an air carrier to service YKF based on the marketing opportunities and approved vision of the airport.

On July 1999, Trillium Air started daily passenger service to Ottawa. The level of customers grew over the summer and by the end of December over 700 passengers were using the airline per month. In late 1999 Trillium Air was considering expanding their routes to Montreal and Pittsburgh.

4.0 Aviation Market

4.1 Aviation Transportation Trends

Since the economic turnaround of the early 1990's, the air transportation industry has sustained continued growth on a world wide basis, with North America continuing to be the dominant market. The growth in all modes of travel is closely correlated with the growth in per capita wealth. Between 1960 and 1993, the GNP per capita grew by 127%. During the same period, travel by all modes increased by 129%.

4.1.1 General Aviation

General Aviation (GA) activity includes private, business/corporate, government and "other" commercial. Other commercial includes activities such as flight training, aerial patrol and inspection, aerial photography, crop spraying, sightseeing and small passenger/cargo charters.

Transport Canada's forecasts for general aviation suggest that over the next ten years, there will be only modest growth and potentially some declines in general aviation activity. Factors contributing to the modest increase in general aviation include increased costs of purchasing and licensing an aircraft, greater share of disposable income spent on housing and other necessities, reduced air fares and increased availability of scheduled services and increased regional airline service to smaller communities.

Forecasts indicate that for the 1994 - 2009 segment, the commercial component of general aviation will only grow 1.5 % per annum, while the private/recreational component may actually decline by 0.1% per annum. The decline of private/recreational activity is a continuation of a tend that began in the early 1980's. Since 1978 the number of private GA aircraft movements has steadily declined. During this period, there has been a loss of 15,000 licensed private pilots and a 7% decrease in the number of registered private aircraft.

Figure 4.1 illustrates historical general aviation movements at all tower and non-tower airports.

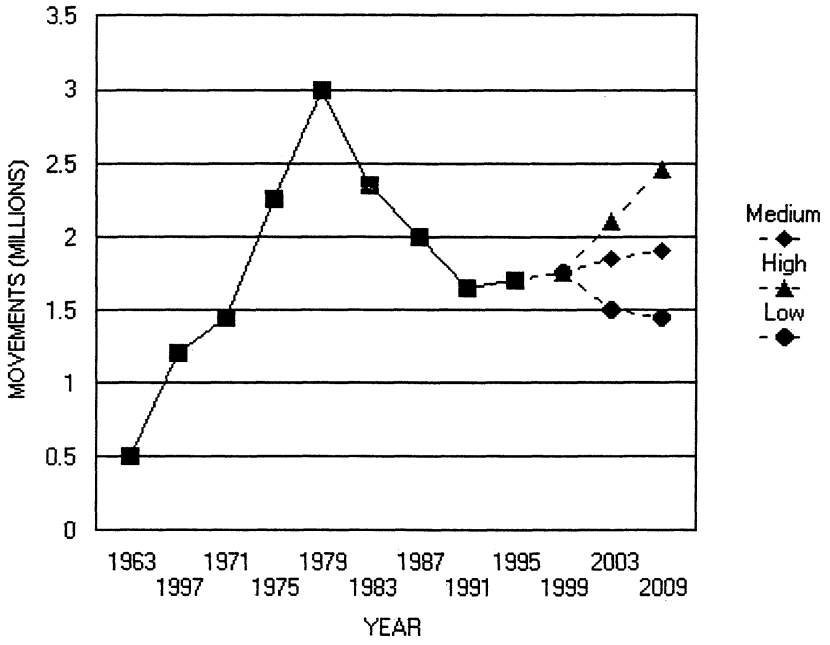


Figure 4.1 Movements - Canada

In the 1994 Southern Ontario Area Airports Study (SOASS), Transport Canada provided the following forecast for general aviation movements (Table 4.1).

Table 4.1 National Aviation Forecasts

Category	Annual Growth Rate	
	1993-2002	2002-2007
Other Commercial	1.06	1.23
Private	-0.26	-0.11
Government	0	0.2
Total Itinerant	0.2	0.38
Total Local	2.02	2.04

4.1.2 Passenger Activity

Since the economic turnaround of the early 1990's, the air transportation industry has sustained continued growth on a world wide basis, with North America continuing to be the dominant market. With only 10% of the world's population, Canada and the US generate over 40% of the passenger traffic. Air transportation accounts for 15% of all intercity trips in North America, but increases to 40% for trips over 800 km and 85% for trips over 1,600 km.

The composition of the passenger market is also changing. Not long ago, the airline market was dominated by the business traveller. Today, only 40% of the market is business related, with the remaining 60% being leisure and personal. The increase in leisure travel has in part been stimulated by substantial decreases in the cost of air fares. Over the past 25 years, the real cost of an air ticket has been reduced by half.

It is anticipated that air travel will experience continued growth within the time frame of the Airport Master Plan. Transport Canada forecasts that to the year 2014, domestic air travel will experience an average growth rate of 2.6% and trans-border air travel a growth rate of 3.9%. The international sector is anticipated to grow at a rate of between 3.8% for travel to Europe to 6% for travel to South America and Asia.

With respect to local and regional airports, the regional airline industry is presently in a fairly volatile state. National carriers are in a process of divesting themselves of regional services and contracting local operators to provide replacement services using smaller turboprop aircraft. An example of this is Air Canada's recent announcement of their intent to contract with Voyageur Airways of Sudbury to operate 19 seat aircraft on behalf of the airline. Similarly, Canadian Airlines International has contracted out much of its services to smaller communities to Georgian Airways.

The recent amalgamation of Air Canada and Canadian Airlines International Limited highlight the turbulence in the aviation industry. Also, Westjet has started a scheduled passenger service out of Hamilton International airport to major centres in western Canada.

4.1.3 Air Cargo

Air cargo is also closely tied to general economic growth. Since 1970, world air cargo volume has expanded at an average annual rate of 8%. Recently, growth in air cargo activity in North America has been expanding at 10% percent. In 1995, this activity represented a shipment of 1.9 million tonnes.

In 1994, approximately 540 million revenue tonne-kilometres of air cargo traffic were moved within Canada. The domestic market peaked in 1990 and after two years of recessionary decline, is growing again. Transborder air cargo shipments have grown sharply in recent years. The 1995 figure of 700 million revenue tonne-kilometres is an increase of 25% over 1994 figures.

4.2 Canada's Technology Triangle Aviation Market

4.2.1 Economic Activity

Waterloo Regional Airport is centrally located within an economic region defined as Canada's Technology Triangle (CTT). The CTT encompasses the municipalities of Kitchener, Waterloo, Cambridge, Guelph, Woolwich, Wellesley, Wilmot and North Dumfries. The approximate population of this area is 500,000.

The area is described as a single socioeconomic entity because its constituent members have similar industrial composition and rates of growth. The area tends to respond economically as a single unit, reflecting the proximity of its members, its shared export orientation and the fact that it draws upon a common pool of resources.

The CTT is one of the most competitive economies in North America. With a Gross Domestic Product almost equal to that of the Province of New Brunswick ($15.8 billion), the CTT area has one of the fastest growing economies in North America.

Between 1988 and 1994, the CTT's economic output rose 12% compared to an increase of only 5% for all of Ontario. During the same period employment rose 8.5% in the CTT, compared to 1.8% for all of Ontario.

The CTT, between 1987 and 1994, outperformed almost every one of Canada's 25 Census Metropolitan Areas with the exception of Vancouver and Victoria. A strong element within this growth has been the rise of "high technology" and automotive manufacturing industries. Major employers include Toyota (2,200 employees), Babcock & Wilcox (1,700 employees), ATS (2,000), Raytheon (640 employees), and Com Dev International (500 employees).

The area is also an important centre for finance and insurance. Clarica, with 2,100 employees, is one example of the major financial institutions with head offices located in the area.

The CTT boasts three universities and a community college within its boundaries, with a combined student population of 96,000 (part-time and full-time). The largest of the institutions, the University of Waterloo, has a worldwide reputation for excellence in science, mathematics, computer science and engineering.

In 1995, the estimated number of employed persons in the CTT was 250,000. The largest employment sectors includes service industry (including health and education) and manufacturing.

Figure 4.2 provides a breakdown of employment by industry. The area's relative prosperity can also be measured by the rate at which new enterprises are created. Between 1981 and 1991, the number of unincorporated enterprises increased by 47.7%, compared to an increase of 27.9% for Ontario.

To try to quantify the growth in the CTT area the "Waterloo Regional Airport Economic Impact Study"[1] was commissioned in 1998. In 1997 the activity at the airport created 194 jobs in the region and $5.6 million in salary. The airport could generate an additional 130 jobs and $10.8 million in wages over the next ten years in an optimistic growth scenario or lose 51 jobs if severe operating constraints were placed on it.

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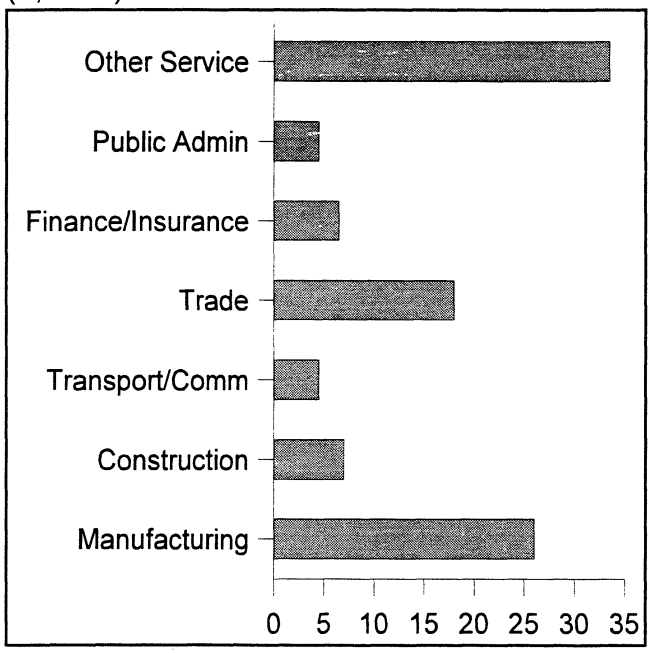
[1] KPMG "Waterloo Regional Airport Economic Impact Study", May 26, 1999

Figure 4.2 1995 Employment by Industry (1,000s)



4.2.2 CTT Aviation Market

Waterloo Regional Airport accommodates a wide range of aviation activities. These activities include flight training, recreational flying, corporate aviation and charter activities, both passenger and air cargo. These activities are briefly described below.

Corporate/Business Aviation

The airport is an important regional transportation facility, providing direct access to businesses and industries located in the CTT region. At present, there are approximately 26 corporate aircraft which visit the airport on a regular basis and numerous others that visit on a less regular basis.

In 1998, there were approximately 1,450 movements by corporate jet aircraft. Many of these aircraft originate in the United States.

Flight Training

There are presently 6 flying schools operating from Waterloo Regional Airport making it one of the busiest flight training airports in Ontario. Flight school operators include: Waterloo Wellington Flight Centre, Adler Aviation, National Flyers Academy, FlyPass, Skyways and Weeks Aviation.

The airport is ideally suited to flight training activities because of the excellent infrastructure provided at the airport, including navaids and instrument landing systems, and because of the presence of an air traffic control tower. These elements provide the

necessary environment to accommodate all levels of private and commercial flight instruction.

In recent years, with the introduction of two new flying schools, training activity at the airport has increased substantially. This increase in activity is evidenced by a 95% increase in local movements for the year 1997.

Despite the declines in recreational flying, the forecasted demand for trained commercial pilots suggests that flight training will continue to be an important activity at the airport.

Air Cargo

In recent years, Waterloo Regional Airport has become increasingly important as an origin/destination for air cargo. The rise in air cargo activity has closely parallelled the growth of high technology industries and auto parts manufacturing in the region. Globalization of the automobile industry, and the emergence of "just in time" delivery methods for many industries, has placed an increased importance on air cargo.

As the CTT Region continues to expand its high tech base, it is likely that air cargo activities will continue to be an important role for the airport.

Air Ambulance

Waterloo Regional Airport provides the community with direct access by medivac aircraft. Every year there are approximately 10 to 30 medivac flights. Without the airport, patients would have to be transported to either LBPIA, London Airport or Hamilton International Airport.

General Aviation Support

Waterloo Regional Airport has a number of successful aviation business establishments on site which serve airport users and thereby make a contribution to the airport's full service reputation.

4.2.3 Passenger Movements

Prior to the commencement of scheduled passenger service, the airport was an important charter passenger airport. Numerous businesses and industries utilize corporate and chartered aircraft to transport employees to and from the community on a regular basis. Many of these firms provide "corporate shuttle" services on a scheduled basis.

Waterloo Regional Airport experienced a short-lived scheduled air service during 1992/93. For a period of approximately four months, air service was provided to Ottawa via Hamilton. During this time, approximately 520 passengers were carried. The demise of the service was not representative of the potential market for air services, but rather, was the result of the cancellation of the air carrier's service at the Hamilton Airport which was part of the service. Also, air services utilized older, inadequate aircraft with flight schedules that were inconvenient and often cancelled.

In June 1999, Trillium Airlines started operating two scheduled flights to Ottawa each week day. Over 1, 750 passengers departed from YKF in 1999.

The CTT area is in fact a very large market for air travel. In a 1985 survey undertaken by the Ministry of Transportation, it was identified that 3.34% of the passenger movements at Lester B Pearson International Airport (LBPIA) originated in the Kitchener-Waterloo area. Today, this percentage represents approximately 850,000 annual passengers. If not for the fact that LBPIA is an hour's drive away, the community would be able to support a thriving air service.

Despite the proximity of Pearson, there exists a strong market potential to develop limited regional and chartered air services from Waterloo Regional Airport. In surveys undertaken as part of the Marketing Strategy Paper for Waterloo Regional Airport (1996) there was an overwhelming (89%) support from both travel agencies and local businesses for a regional air service. Such regional air services would provide direct links from Waterloo to Ottawa, Montreal, and a US hub airport such as Detroit. As highways leading to Pearson become more congested, travel times increase, giving local air service an increased advantage.

The potential to provide regional air service is supported by both available demand analysis and from case examples. The most recent intercity demand study conducted in this region is the Ontario-Quebec High Speed Rail Study prepared in 1993/1994. Extensive origin/destination data was collected for this study on four modes of travel (air, bus, car, and rail). Also collected was socioeconomic and attitudinal information that provided a quantitative analysis of the choices individuals make between various modes.

Table 4.2 provides the flows by different modes to/from the Kitchener-Waterloo-Cambridge area to various destinations.

Using a modal split model similar to that used in the High Speed Rail Study, demand analysis undertaken in the Marketing Strategy Paper derived the relationship and competition between Waterloo Regional Airport and Lester B. Pearson International Airport. The model structure used ensured a realistic assessment of the role of each airport, ensuring that no undue preference was given to either of the airports.

Table 4.3 illustrates the demand that could realistically be diverted to Waterloo from Pearson. From the demand analysis undertaken in the Marketing Strategy Paper, the introduction of scheduled air services at Waterloo Regional Airport would attract approximately 33,000 trips annually. This assumes 17 return flights a week to Montreal, 22 return flights a week to Ottawa, and 22 return flights a week to Detroit.

The potential for scheduled air services is also demonstrated through case examples. Flint Michigan, with a catchment population half that of the CTT, has a regional airport with a thriving passenger activity. Served by 4 regional airlines, Flint's Bishop International Airport has annual passenger movements that exceed 250,000. The airport is also served by jet charters to Las Vegas. The airport has developed strong passenger activities despite the fact that Detroit's international airport is less than 100 km away (a similar distance that Waterloo is from Pearson).

Much of the success of Bishop airport has been attributed to the aggressive marketing efforts undertaken by both the airport and the community to attract regional airlines to the airport.

Table 4.2 Annual Inter-modal Passenger Demand for 1993/94

Origin/ Destination	Flows			
	Air	Car	Bus	Rail
Montreal	50344	128024	2683	11305
Ottawa	24202	256190	6194	9279
Detroit / Cleveland	8787	605362	11149	5847
Eastern Ontario	4493	85050	1341	2856
Quebec	3.41	11395	287	167
Western Canada	2943	11860	264	573
Toronto	1728	12116328	266947	38436
Western Ontario	215	981834	2461	1071
TOTAL	96122	14196043	291326	69534

Another case example is Manchester, New Hampshire. Located less than 70 km from Boston's Logan International Airport, Manchester Airport has developed itself into a thriving scheduled passenger airport with several major carriers providing both regional commuter and jet service.

It is certainly conceivable that similar passenger movements could be generated at Waterloo Regional Airport.

4.2.4 Air Cargo Activity

In the air cargo sector, Waterloo faces formidable competition from, Pearson, Hamilton and London airports. Though the need for facilities to service the air cargo sector is lacking, the greatest constraint to the development of the airport for air cargo/courier activities is the current runway length. The majority of aircraft commonly used by the air cargo operators can not operate from the airport without severe operational and economic penalties.

Despite the runway length, in recent years there has been a significant increase in the amount of air cargo which is moved through the airport. No formal records are kept with respect to the air cargo movements, however, it is estimated that last year approximately 120,000 kg of cargo moved through the airport

Table 4.3 Potential Passenger Demand 1996

Current Market Share

Destination	Air Mode		Other Modes	Waterloo Regional Airport Demand (Annual Trips)
	YYZ	YKF		
Montreal	26.17%	0%	73.83%	0
Ottawa	8.18%	0%	91.82%	0
Detroit / Cleveland	1.39%	0%	98.91%	0

Potential Market Share

Destination	Air Mode		Other Modes	Waterloo Regional Airport Demand (Annual Trips)
	YYZ	YKF		
Montreal	19.96%	8.98%	71.06%	17274
Ottawa	6.37%	2.98%	90.64%	8830
Detroit / Cleveland	0.87%	1.10%	98.03%	6970
			TOTAL	33074

YYZ - Lester B. Pearson International Airport
YKF - Waterloo Regional Airport

Much of this cargo is related to the practice of "just in time deliveries" utilized by the automotive manufacturing industry. Currently, this practice is restricted to the use of medium twin-turbine and corporate jet aircraft. On occasion, smaller code C jet transport aircraft such as the DC-9 and B737 are utilized. However, due to the existing runway length and pavement strength, these aircraft must operate with payloads that are well below the maximum allowable.

It is anticipated that air cargo movements related to local manufacturing/processing activities will continue to expand in the future. It is unlikely that large scale cargo/courier activities would occur unless there is an extension of the current runway to accommodate larger aircraft and runway strengths are increased to accommodate increased payloads.

4.3 YKF Market Opportunities

Currently, Waterloo Regional Airport fulfills its role as a full service community airport, providing facilities and services that meet the needs of a variety of users.

There are a number of market opportunities that can be pursued by the airport administration. These opportunities include both the expansion of existing activities and new businesses.

4.3.1 Scheduled Air Services

There are a number of reasons why scheduled commercial passenger air service is the most attractive market that a proposed marketing program can target. Airline passenger services generate more new revenue streams than any other airport business sector. Also, with a scheduled air service, the airport would become eligible for federal funding under the Airport Capital Assistance Program (ACAP).

Based on the passenger demand identified in Section 4.4, there exists the potential to generate approximately 61 return flights per week. The revenues derived from this scale of activity could be in excess of $350,000 per year based on competitive landing fees and terminal charges. Additional fees could also be generated from car parking, the lease of terminal space, car rental contracts, limousine and taxi licensing, passenger fees and concession fees.

An air service model for Waterloo Regional Airport was generated in the Marketing Strategy Paper prepared in 1996. The Paper identified that because of the proximity to Pearson Airport, the provision of a stable scheduled air service dictates the need for a regional airline that can offer a level of service that will represent a true alternative to the more frequent nonstop jet services at Pearson.

In order to offer an attractive airline service from Waterloo, the airline has to offer frequent service to three or four of the most popular destinations within a short time of startup, and operate a cabin-class airliner of 19 seats or more.

In attracting and sustaining a regional scheduled airline, the most significant liability associated with the current airport is the air terminal building.

It is important to recognize that the airport facilities, including the terminal, are integral components of the total travel experience and therefore have a direct impact on the attractiveness of an airport to both an airline and the travelling public.

4.3.2 Corporate Aviation

Corporate aviation is one of the core activities at Waterloo Regional Airport. This activity is bound to continue to grow at Waterloo as it keeps pace with economic expansion in the CTT area. In addition to serving regional corporate aviation activities, there exists a substantial market opportunity for the airport to expand its service by attracting business from the western Greater Toronto Area.

To date, Pearson International is the only airport in the GTA area that is capable of accommodating the full range of corporate aircraft. Other GTA airports such as Brampton and Buttonville Airports are limited in their capacity to accommodate medium to large corporate jet aircraft because of their restricted runway lengths which are less than 4000 ft. Toronto City Centre Airport does not allow jet traffic.

Pearson International, however, is becoming less desirable as a corporate aviation airport. During peak periods, corporate aircraft must adhere to a slot system which restricts arrival/departure movements. Also, in order to expand the airport's passenger and air cargo activities, less land is being made available for corporate aviation development. The result is that a number of corporate aviation businesses are actively looking at viable alternatives to Pearson.

For those businesses located in western Mississauga and Peel Region, Waterloo Regional Airport is a viable alternative.

Concerns that presently limit the airport's ability to serve the corporate aviation industry include the following:

- The existing runway length limits the operational performance of most medium to large corporate jet aircraft. A minimum runway length of 6000 ft. is required.
- The airport lacks a full service FBO (Fixed Base of Operations) operator that can provide corporate users with the complete range of services and amenities including hangar facilities for larger corporate aircraft, customer lounges and business facilities. Flight crew facilities such as flight planning rooms and rest areas are also lacking.
- The airport presently does not meet full Category I minima for precision approach instrument landings. Full Category I minima is necessary in order to maximize the usability of the airport during poor weather conditions.

4.3.3 Flight Training

Pilot training has been part of the main business of Waterloo Regional Airport since 1950 when the Waterloo-Wellington Flying Club first opened its doors.

Although recreational flying has been in general decline since the early 1980's, the growing demand for commercial pilots both in Canada and worldwide suggests a strong expansion of flight training activities. On a worldwide basis, it is predicted that their will be a need for 45,000 new commercial pilots. In Canada, this demand could exceed 200 pilots per year.

In addition to training domestic pilots, Canada is also gaining a reputation for training foreign commercial and military pilots. Between 1989 and 1995, 3,240 foreign students came to Canada to learn how to fly. This number will steadily increase as foreign students are attracted to Canada because of the high quality of training and favourable exchange rates.

Waterloo Regional Airport provides an ideal environment in which to train both recreational and commercial pilots. Aspects of this environment include:

- proximity to a large urban area
- location adjacent to a major air traffic control centre
- adjacent to IFR and aerobatic training airspace
- provision of an air traffic control tower
- provision of navigational aids including precision and non-precision instrument landing systems
- excellent airside infrastructure including runways and parallel taxiways

This environment provides the airport with an excellent opportunity to encourage the expansion of existing activities and attract new tenants.

Concerns that could limit further expansion of flight training activities include the lack of a full Category I landing system, and insufficient/inappropriate lands on which to accommodate flight training facilities.

4.4 YKF Movement Statistics

4.4.1 Historical Statistics

Table 4.4 and Figure 4.3 illustrate historical movements at Waterloo Regional Airport.

Historically, aircraft movements at Waterloo Regional Airport have been characterized by sharp increases and declines. In that much of the activity included under general aviation is discretionary, the level of activity closely follows the health of the general economy. Movements fell significantly during periods of economic recession in the early 80's and 90's and rebounded in step with economic recovery.

With these fluctuations in traffic it is difficult to forecast growth. Table 4.5 presents the forecast completed in 1977 and compares them to the actual values. The estimate for 1980 was within 2%, while the estimate for 1985 had a 58% error.

Historically, the majority of movements at Waterloo Regional Airport were local in nature. This was representative of the airport's role as a regional centre for recreational flying and flight training. Since 1988, however, itinerant movements have increased. The rise of itinerant movements in recent years is indicative of the airport's expanding role as a commercial airport. Increases in corporate/business activity, air cargo movements, and charter passenger activity.

In the Ontario Airport System Plan prepared in 1989 by the Ontario Ministry of Transportation, a growth rate of 2.9% was forecasted. This short term forecast indicated that by 1996, the airport would experience 103,000 movements. This is slightly less than the actual number of movements that occurred in 1997. By 1998 the actual movements exceeded the projections by 23%. Projections by Transport Canada were similarly incorrect.

In 1994, a forecast of aircraft movements for Waterloo Regional Airport was prepared as part of Transport Canada's SOASS study. This forecast was based on 1993 actual traffic volumes, and was influenced by the fact that prior to 1993 there had been a strong downward trend in movements, the result of the last economic recession (Table 4.6).

This forecast represented an annual growth rate of approximately 1%. Although this growth rate is greater than Transport Canada's national forecast, it is very conservative, given the airport's recent increases in activity. Already, Waterloo's traffic exceeds the 2017 forecast. Transport Canada's model underestimates the actual movements by 37%. These historical examples illustrate how difficult it is to accurately predict movements at YKF. The historical trends do indicate that the rise and fall of itinerant movements closely mirrors local movements and there are severe fluctuations with the economy.

4.4.2 Movement Forecast

The Master Plan forecasts 153,000 movements by 2018 given the historical trends, possible future economic recessions, and market opportunities. This number is well below the 220,000 movements that the airport can handle with its current runway configuration.

In 1998, 82,165 local movements represented 62% of the traffic at YKF. The majority of these movements were training flights. The forecast assumes only a marginal increase in this traffic as it is very sensitive to the economy. As shown in Table 4.2 there were 82, 721 local movements in 1969.

The majority of the itinerant traffic in 1998 was business related but of the 50,212 movements there were only 1,450 jet and 2,485 turboprop plane movements. If a scheduled passenger service is successful it could generate up to ten additional movements per weekday (2,700 movements per year).

The forecast of 153,000 allows for the training capacity experienced over the last thirty years, and twenty thousand additional business movements per year. This allows for a 500% increase in jet/turboprop planes or a 34% increase in piston itinerant aircraft. The percentage increases in economic forecasts for the CTT region do not exceed the allowances given in the movement figures.

Table 4.4 Historical Movements at YKF

Year	Movements (1,000)		
	Total	Local	Itinerant
1969	97	83	14
1970	81	53	28
1971	87	61	26
1972	105	79	26
1973	98	69	30
1974	99	80	19
1975	106	69	36
1976	116	81	34
1980	133	87	46
1981	104	69	35
1982	86	56	30
1983	77	49	28
1984	80	52	28
1985	73	47	26
1986	77	50	27
1987	89	58	31
1988	77	46	31
1989	98	56	38
1990	103	49	54
1991	89	39	50
1992	85	38	47
1993	73	31	42
1994	71	28	43
1995	74	30	44
1996	80	33	47
1997	104	65	39
1998	132	82	50

Table 4.5 1977 Movement Forecasts

Year	Movements (1,000)		
	Total	Local	Itinerant
Estimated 1980 Actual 1980	130.3133	106.287	24.146
Estimated 1985 Actual 1985	158.573	127.847	30.826

Figure 4.3 Local vs Itinerant Movements

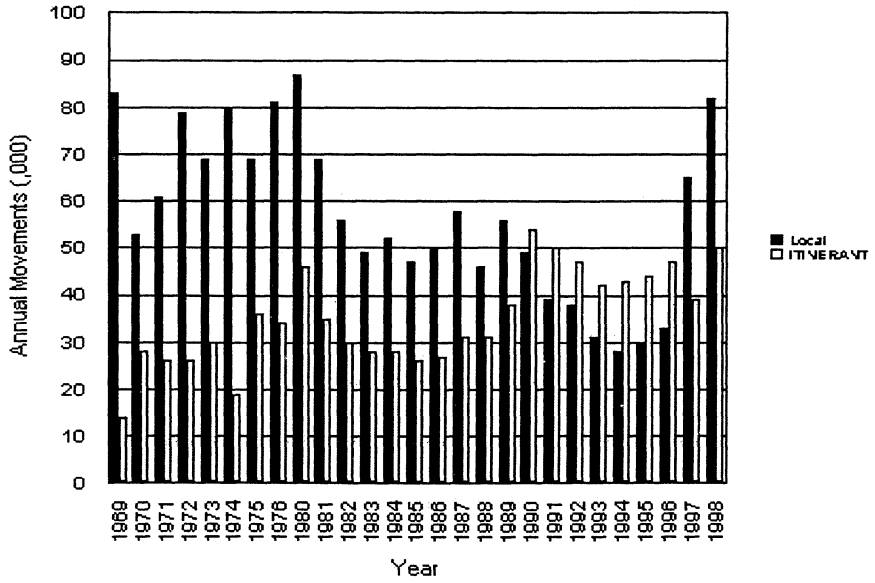


Table 4.6 Projected Aircraft Movements (Transport Canada SOASS Study, 1994)

Year	Movements (1,000)			
	Total	Local	Itinerant	% Increase
2002	98	56	42	
2007	102	60	42	4
2012	106	64	43	4
2017	112	69	43	5.6

5.0 Site Conditions

5.1 Location

Waterloo Regional Airport is located east of the Grand River, near the intersection of Regional Roads 17 and 31.

5.2 Topography

Waterloo Regional Airport is situated on a relatively flat parcel of land. This land generally falls from the northeast to southeast with a slope of approximately 0.05%. The greatest elevation changes occur along the western property line, south of the airport access road. At this point the land falls approximately 6.8 m. The official elevation of the airport is 1,040 ft. above sea level.

The airport is generally surrounded by gently rolling topography. Adjacent lands are used for mixed farming, sod farms and rural residences. To the west, the residential area will eventually extend to the Grand River. In isolated locations, especially to the southeast of the airport, lowland conditions have resulted in wetland environments. These wetlands have been provided with a "provincially significant" designation which restricts their development.

With the exception of the provincially significant wetlands and urban areas, the surrounding topography does not impose any severe constraints with respect to the potential development of the airport beyond its current boundaries.

5.3 Drainage

Surface and subsurface drainage systems on the airport outlet to the Grand River through an open channel system known as the Randall Drain. In addition to the airport properties, the Randall Drain services a watershed of approximately 415 ha. which surrounds the airport property. The drainage system is composed of both man-made and natural watercourses.

One primary branch of the drainage system runs directly through the airport. This branch enters the airport property at its northern property line, moves south, under Runway 14-32 and Taxiway Charlie, and then southeast through the commercial development lands. The Randall Drain, as it moves through the commercial area, is a major constraint to the efficient development of these lands.

A second primary branch of the Randall Drain is located to the south east of the airport, and at one point is located directly southeast of the threshold of Runway 32.

Over the years, there have been numerous problems associated with the Randall Drain. Ineffective drainage of the watershed has resulted in expansion of marshy areas. Improvements have been undertaken to the drainage system in order to improve flows and the problems have been corrected.

5.4 Environmental Constraints

In 1994 an Initial Environmental Evaluation[2] (IEE) document was prepared for Waterloo Regional Airport. Included as part of the document, was an evaluation of the significant impacts on primary environmental components. The findings of the IEE document included the following:

Surface Water

Potential development at the airport will increase the imperviousness of the airport lands, causing an increase in the flow rate and volume of water discharging into the Randall Drain and surrounding wetlands. To counter this impact the IEE recommended the construction of stormwater management facilities. The IEE concluded that "the resulting potential disruption of wetland functions is not significant with the implementation of the SWM measures recommended in the document.

Groundwater

Given the high susceptibility to groundwater contamination (due to a high water table) in the airport area and the existence of an unsafe potable water supply, the 1994 IEE document raised concerns with respect to the expansion of septic sewage disposal systems at the airport. The document recommended that consideration be given to a communal water supply system for the airport, with the well and associated pump house located in a protected area, away from development.

The ability to service future development with individual septic sewage disposal systems will be limited because of the availability of land and because of the relatively high water table. Consideration should also be given to the development of a communal sewage treatment facility for the airport.

Vegetation and Wildlife

The Waterloo Regional Airport is surrounded to the south and north by wetland. These wetlands, which form part of the Breslau and Kossuth Wetland Complexes, were recently upgraded to Provincial Significance status by the Ministry of Natural Resources. Provincial policies for Significant Wetlands prohibits development within the wetland. These policies are supported by both the Grand River Conservation Authority and the Region of Waterloo, through their Official Plan.

The presence of wetland to the north and south of the airport will constrain the development of the airport beyond its current boundaries.

Future development of commercial lands within the existing boundaries is also constrained by the presence of the Randall Drain which bisects the lands available for future development.

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2 Stantec Consulting Ltd."Waterloo-Guelph Regional Airport Initial Environmental Evaluation", November 30 1994.

Realignment of the drainage channel could be subject to Department of Fisheries and Oceans approval due to the possibility of harmful disruption of fish habitat. Relocation of the watercourse may require that acceptable measures be implemented to compensate for potential habitat loss. However, development plans will be explored that do not re-locate the Drain, and thus, minimize any disruption to the fish habitat.

6.0 Existing Facilities

To meet the vision and objectives established in Section 3, the existing facilities need to be maintained and improved. This section provides a basis for the development options presented in Section 7.

6.1 Airside Facilities

The present airside infrastructure at Waterloo Regional Airport is comprised of two runways plus associated taxiways and aprons. These aircraft manoeuvring areas are identified in Figure. 6.1

Under the Southern Ontario Area Airports Study (SOASS) undertaken in 1994, Transport Canada identified that Waterloo Regional Airport has an annual capacity of 220,000 movements. This suggests that within the horizon of the Master Plan, YKF should not have an airside capacity problem.

Waterloo Regional Airport is presently served by two runways. These runways are described in the following text and summarized in Table 6.1. The runway names (07-25) describes the compass direction that the pilot reads when landing or taking off. Runway 07 means flying a compass reading of 70 degrees. Likewise, runway 25 means flying a compass reading of 250 degrees.

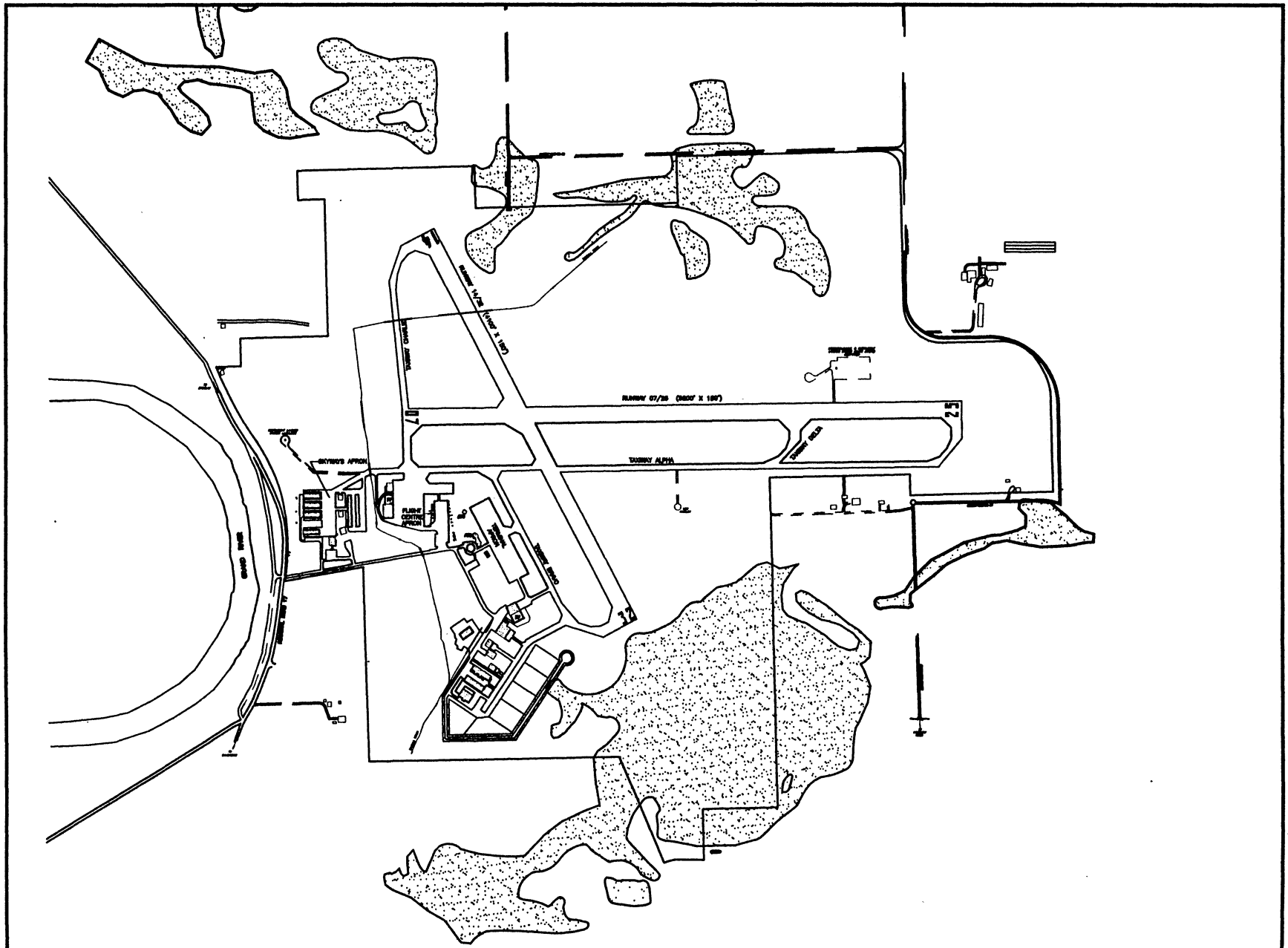
Table 6.1 Summary of Runway Pavements

Description	Size (ft.)	Classification	PLR*	General Comments
07-25	5200 x 150	Code 3C Instrument, Precision	9	Preferred "in-wind" runway
14-32	4100 x 150	Code 3C Instrument, Non-Precision	7	

* TP312E Aerodrome Standards
Pavement Load Rating

Runway 32 has the highest utilization followed by Runway 25. Runway 32's high utilization is not entirely a function of favourable wind direction, but is also the result of operational preferences dictated by the air traffic controllers. This runway is used as a primary runway for flight training activities and local flying, while runway 07-25 is used more for itinerant aircraft, and ILS approaches.

Figure 6.2 provides a breakdown of runway utilization for 1998. The values in this figure do not include simulated approaches, fly throughs or helicopter movements.



WATERLOO REGIONAL AIRPORT

AVGROUP
TELEPHONE: 905-631-7710
FAX: 905-631-7717
550 SHELDON COURT, BURLINGTON, ONTARIO L7L 5K8

LEGEND

	Airport Property Line
	Existing Airside Pavements (1993)
ATB	Airport Terminal Building
ATC	Air Traffic Control Tower
CP	Car Park
GP	ILS Glide Path Antenna
LOC	ILS Localiser Beacon
VOR	VHF Omni-Directional Range Navigation Aid

SCALE

0 100 200 400
Metres

EXISTING AIRPORT SITE PLAN

DRAWING NO. 6.1

April 1998 (Revised)

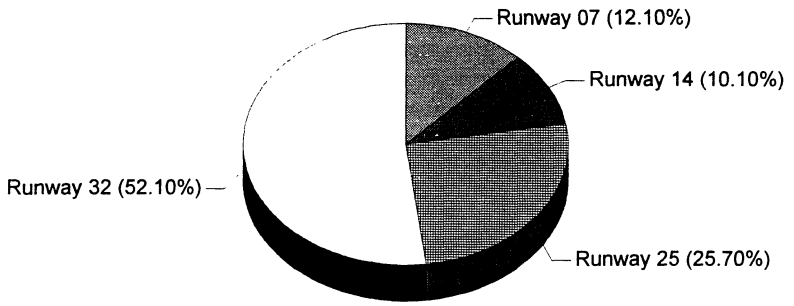


Figure 6.2 1998 Runway Utilization

6.1.1 Runway 07-25

Runway 07-25 is the primary runway at Waterloo Regional Airport and is oriented to favour prevailing winds. During all weather conditions, down to non-precision instrument approach minima, the runway's orientation is favoured 99% of the time, with Runway 25, the favoured direction. Below non-precision instrument approach minima, Runway 07 is the favoured direction.

Runway 07-25 is 5,200 ft. in length and 150 ft. wide. Originally constructed in 1949, the runway was extended in 1984 to accommodate corporate jet aircraft. At its present length, the runway can accommodate most small corporate aircraft. Medium and larger sized corporate aircraft (which currently use the airport) such as the Hawker 700, Canadair Challenger and Gulfstream V are restricted in their gross takeoff weight.

As an example, the Hawker 125-700 (an aircraft of this type is based at the airport) requires 7000 ft. of runway length to take off with full fuel at 20^{O} C air temperature. With the existing runway length, the aircraft is restricted to approximately one half of its fuel capacity which equates to approximately 1,000 nm of range. Restrictions such as these can severely constrain the operation of the aircraft, and would certainly influence the owner's decision to operate from a specific airport.

Runway 07-25 is also capable of accommodating smaller Code C jet transport aircraft (B737, DC-9), again with severe takeoff weight restrictions.

Runway 07-25 is provided with a precision approach landing system that includes a localizer and glidepath. The system was installed in 1990 by Transport Canada to

accommodate IFR (Instrument Flight Rules) flight training. At the time, congestion at Lester B. Pearson International Airport led Transport Canada officials to look at alternate airport sites where the training instrument approaches could be undertaken.

The instrument landing system on Runway 07-25, however cannot provide instrument approaches to Category I minima. This is because of obstacles located adjacent to the airport site. If obstacles were removed, the runway could be brought to full CAT I status.

At present, Runway 07-25 is in very good condition. The original 3700 ft. portion of the runway was reconstructed in 1993. This reconstruction included new drainage systems and upgrading of the runway lighting to high intensity edge lights. The reconstructed portion of the runway remains free of cracks and is in excellent condition. The extended portion of the runway is still the original asphalt surface, and has some longitudinal pavement cracking.

6.1.2 Runway 07-25 Issues

Runway Length

The present maximum runway length of 5,200 ft. is sufficient to accommodate the majority of general aviation aircraft that currently utilize the airport. There are, however, a number of aircraft which are restricted in their gross takeoff weight because of the existing runway length. These restrictions limit both the aircraft's payload and range. The aircraft that presently face operational restrictions include medium to large corporate jet aircraft, such as the Hawker 125 and the Canadair Challenger, and jet transport aircraft that are utilized for air cargo operations. These aircraft include the B737 and DC-9.

Table 6.2 illustrates typical takeoff and landing distances requirements for medium/large corporate aircraft and small Code C jet transport aircraft. It should be noted that when the pavement is wet or has snow patches, the required runway length is considerably longer.

In order to eliminate potential restrictions on corporate aircraft and improve the payload/range capability of larger jet transport aircraft that currently use YKF, a runway length of 7,000 feet with a PLR 9 would be required. This length would allow the appropriate and safe "balanced runway" on takeoff to deal with aircraft performance in all weather conditions.

The Aeronautical Noise Management Committee and the Master Plan Public Advisory Committee investigated whether a longer runway would help mitigate noise issues over the residential areas of Kitchener. A longer runway would:

- Allow the majority of the planes to reach an altitude of 1,600 ft ASL and turn north or south without having to fly over the residential areas in Kitchener.
- If aircraft are able to take a full payload of passengers or cargo it will mean fewer movements with the current aircraft mix that uses YKF. Fewer movements means a more efficient use of aircraft and fewer noise events.

- The installation of an instrument landing system (ILS) on runway 07 requires that the runway be extended by a minimum of 295 feet to maintain a 5,200 ft landing length. The ILS provides significant noise reductions as the planes would have a higher altitude on approach to runway 07.

Category I ILS Capability

Currently, the airport cannot meet Category (CAT) I precision approach minimums because of obstructions (farm silos) that are located on an adjacent property south of Runway 07-25. Provision of a CAT I ILS would improve the all weather capability of the airport to the minimum standards generally accepted by the air transport and corporate aviation industries.

To comply with CAT I requirements, the existing obstacles need to be removed and appropriate approach lighting installed on Runway 25. For comparison, Pearson International Airport has a CAT III ILS.

Instrument Landing System on Runway 07

Runway 07 is often the preferred runway during periods of poor weather. At present, this runway is equipped with a non-precision instrument approach (using the back course localizer for Runway 25). Provision of a full CAT I instrument landing system on Runway 07 would improve the airside utilization during poor weather operations, and would ensure that aircraft on descent to this runway maintain the appropriate altitude. Provision of a CAT I ILS system, would also require the installation of approach lighting.

6.1.3 Runway 14-32

Runway 14-32 is 4100 ft. long and 150 ft. wide. The runway is used extensively for flight training and is used by light general aviation aircraft during crosswind conditions. The runway is not of sufficient length to accommodate large corporate jet or heavy turbine aircraft.

Runway 32 is provided with medium intensity runway edge lighting and complies with Transport Canada's criteria for a Code 3C non-precision approach. VOR/DME and VOR/NDB approaches are published for Runway 32.

Runway 14-32 is in fair condition, with extensive cracking of the pavement surface and some heaving which has resulted in an uneven surface. The runway was last overlaid in 1984. The runway's subdrainage system is prone to silting which has resulted in sink holes developing along the edges of the pavement. This problem is particularly acute near the threshold of Runway 14.

A further concern is that catch basins, located adjacent to the pavement edge, are located several centimetres below the elevation of the pavement and pose a potential safety hazard to aircraft that may stray off of the pavement. Ultimately, these catch basins need to be raised.

Table 6.2 Runway Length Requirements

Aircraft Type	Maximum Takeoff Weight (MTOW) (kg)	Pavement Load Rating (PLR)[1]	Runway Length (ft) at MTOW					Flight Frequency at YKF
			Take-off (ft)		Landing (ft)			
			ISA	Corrected to local Conditions	ISA	Corrected to local Conditions	Snow Patches/Wet Pavement (0.55 CRFI)	
Canadair 604	21600	7.0	6200	7529	2,900	3,115	5593	Infrequent
Gulfstream IV	33,203	7.9	5,280	6,412	3,386	3,636	6339	Daily
Gulfstream V	41051	8.0[8]	6,000	7,286	3,170	3,404	6016	Infrequent
Lear 24	6123	3.6	3,297	4,004	2,620	2,814	5,122	Weekly
Hawker 125	11340	3.9	5,800	7,043	3,076	3304	5534	Daily
Falcon 900	20600	6.6	4,970	6,036	2,300	2470	4,543	Infrequent
B737-200	52,390	9.4	6,200	7,529	4,658	5003	6,800[5]	Once
B737-300	56473	9.9	6,500	7,894	4,659	5,004	5,600[5]	Never
Fokker F28	33110	6.8	4,450	5,404	3,710	3,984	6,799	Never
MD-87	63500	9.7	6,275	7,620	4,760	5,112	8,266	Never
DC 9	54885	9.3	8,041	9,765	4,680	5,026	8,154	Monthly
Dash 8-100	15650	3.6	3,085	3746	2,980	3,200	5,720	Infrequent
Jetstream 31	7350	3.0	4,724	5,738	4,052	4,352	7,278	Daily
Jetstream 41	10886	3.7	5,000	6,072	4,200	4,511	7,484	Never
CRJ	21523	6.6	5,010	6,084	4,670	5,015	8,140	Never
Challenger 601 3A	19578	6.8	5,700	6,922	3,300	3,544	6,212	Infrequent
Global Express	41,300	8.4	5,620	6,825	2,670	2,867	5,207	Infrequent
B757 (A) (Code D)	113389	9.6	8,950	10,869	4,900	5,262	5,600[5]	Not Allowed
B757 (B) (Code D)	163296	10.4	9,000	10,929	5,100	5,477	5,800[5]	Not Allowed
B767 (Code D)	172365	10.4	8,600	10,444	5,400	5,799	6,000[5]	Not Allowed
B727 (Code D)	95,239	11.3	10,600	12,873	4,900	5,262	5,850[5]	Not Allowed

Note:

1. Pavement Load Ratings as obtained from Transport Canada Canadian Airport Pavement Bearing Strengths; AK-67-09-140, November 1997.
2. Take-off and Landing distances (ISA) as obtained from Jane s Encyclopaedia of Aircraft, 1991-92 for the following aircraft: Falcon 900, Canadair RJ, Fokker F28, MD-87, Dash 8-100, Jetstream 31 and 41, and Challenger 601.
3. Take-off and Landing distances (ISA) as obtained from Boeing Aircraft Characteristics Manuals for B737, B757, B767, and B727.
4. Canadair RJ and CRJ are considered to be equivalent aircraft. Data listed for Canadair RJ as obtained from Jane's Encyclopaedia of Aircraft, 1991-92.
5. Wet pavement landing distances for Boeing aircraft taken from charts listed in manuals.
6. Take-off and landing distances (ISA) for Gulfstream V and Global Express as obtained from Bombardier Aerospace, Reference Manual, February 1999.
7. Data listed for Lear 24 as obtained from INM5.a for Lear 25, with exception of take-off distance, obtained from ICAO Aerodrome Design Manual, 1984.
8. Pavement Load Rating (PLR) estimated for Lear 24.
9. Local conditions based on 1,040 ft. ASL and reference temperature of 27.1 °C. Corrections based ICAO Aerodrome Design Manual Part 1)
10. ISA International Standard Atmosphere

6.1.4 Taxiways

Three primary taxiways provide access to the airside aprons and runways. All taxiways are lighted, marked and signed in accordance with Transport Canada standards. Table 6.3 summarizes the properties of the primary taxiways.

Table 6.3 Taxiway Summary Table

Taxiway	Taxiway Classification	Length (feet)	Width (feet)	PLR*
A	Code C Lighted	5420	50	7
B	Code C Lighted	2070	50	7
C	Code C Lighted	2260	50	7
D	Code C Lighted	430	50	7

* Pavement Load Rating

In addition to the primary taxiways, a secondary system of taxiways provides access to the commercial/hangar areas. These taxiways include a 50 ft. wide taxiway to the commercial lots located southeast of the terminal, and a 30 ft. wide taxiway providing access to the west apron area and associated T-hangars. Both of these taxiways have been provided with edge lighting.

Taxiway Alpha

Taxiway Alpha runs parallel to Runway 07-25, providing access from the general aviation/terminal area to the departure thresholds. The taxiway was constructed prior to Transport Canada's present planning standards, and as a result does not meet the minimum setback requirements for a code 3-C precision instrument runway. The existing separation from the runway is 500 ft , whereas the present standard calls for a separation of 550 ft. To meet full Category I ILS operations, special dispensation will be required from Transport Canada, or relocation of the taxiway will be necessary.

The taxiway is in generally good condition, however the pavement surface has numerous cracks, and is uneven in some areas. The present pavement strength is PLR 7 with a tire pressure limitation of 0.43 MPa. This is insufficient for the larger twin turbine and corporate jet aircraft that are presently using the airport. With future increases in this type of traffic, deterioration of the pavement condition can be expected.

Similar to Runway 14-32, the taxiway's subdrainage system is susceptible to silting.

Taxiway Bravo

Taxiway Bravo provides access to the departure threshold of Runway 32. The pavement surface is presently in fair condition with numerous cracks and areas of uneven surface that are the result of inadequate substructure and silting of the subdrainage system.

The taxiway is presently setback 500 feet from Runway 14-32. Under Transport Canada's standards for a Code 3-C non-precision runway, the required taxiway setback is only 300 feet. In the future, the opportunity exists to relocate the taxiway closer to the runway. This would provide an opportunity to expand the depth of the terminal apron.

An existing constraint with the taxiway is the lack of a engine run-up area adjacent to the threshold of Runway 32. Currently, aircraft are often delayed because they cannot taxi past twin engine aircraft that have a lengthy engine run-up period. A run-up pad could be provided at the intersection with Taxiway Echo.

Taxiway Charlie

Taxiway Charlie provides access to the departure threshold of Runway 14. The taxiway is in fair condition with numerous cracks and areas of uneven pavement. Like Taxiway Bravo, this taxiway also suffers from inadequate substructure and silting of the subdrainage system.

Taxiway Delta

Taxiway Delta is located between Runway 07-25 and Taxiway Alpha. Originally, the taxiway provided access to the original departure threshold of Runway 25. However, with the extension for the runway, this taxiway is now used as an intermediate exit from the runway. The taxiway is used as a runway exit primarily by aircraft landing in the 07 direction. The layout of the taxiway, however, does not allow its use as a high speed exit. Taxiway Delta is in fair condition with substantial pavement cracking. The taxiway has inadequate substructure and its subdrainage system is also prone to silting.

6.1.5 Taxiway Issues

Alpha Setback

At present, the separation distance of Taxiway Alpha from Runway 07-25 is only 500 ft., whereas the current standard for a Code 3 precision approach runway is 550 ft.. To meet full Category I requirements in the future, it will be necessary to either relocate the taxiway (or portions of the taxiway adjacent to the thresholds), or obtain a deviation from Transport Canada. Dispensation could result in operational restrictions placed on the operation of the runway and associated taxiway during certain weather conditions.

High Speed Exit

The need for a high speed exit for Runway 07-25 has been expressed by air traffic controllers and identified in previous planning documents. The provision of a high speed exit would reduce the occupancy time of aircraft utilizing the runway and, therefore, improve the efficiency of Runway 25 on busy days. The provision of the exit will also improve the flow of traffic to the terminal area.

Table 6.4 Apron Summary Table

	East (Terminal) Apron	West (Skyways) Apron	Central (Flight Centre) Apron
Function	Provides parking for itinerant aircraft	Provides parking for resident and itinerant aircraft	Provides parking for aircraft operated by the Waterloo Flight Centre and itinerant aircraft
Size	61 m x 241 m	30 m x 107 m	76m x 107 m
Lighting	Area and edge lighting	Area lighting	Area lighting
Surface	Asphalt (poor condition)	Asphalt (poor condition)	Asphalt (good condition
PLR	7	7	7

Engine Run-up Area

The requirement for an engine run-up area has been identified for the threshold of Runway 32. Aircraft departing on Runway 32 are, at times, delayed because of lengthy engine run-ups undertaken by light twin piston engine aircraft. Turbine engine planes do not need an engine run-up area before departing and waste fuel, as they cannot pass the planes performing the engine test. The elimination of this traffic bottle neck would allow for more efficient operations.

A run-up area adjacent to Taxiway Bravo would allow an opportunity for aircraft to bypass other aircraft engaged in engine run-ups.

6.1.6 Aprons

There are three primary aircraft parking aprons at the airport. These aprons are summarized in the Table 6.4.

East (Terminal) Apron

This apron is located immediately east of the air terminal building and is used for itinerant aircraft.

The apron is in poor condition with substantial cracking and deterioration of the pavement surface. The uneven condition of the pavement surface has resulted in ponding occurring in a number of locations. The current pavement strength is PLR 7 with a tire pressure limitation of 0.43 MPa. This is inadequate for many of the corporate and air cargo aircraft which utilize the apron on a frequent basis. The apron pavement has not been resurfaced since the original construction in 1973.

There are a number of operational constraints associated with the apron. The apron is often too small to accommodate the mix of aircraft that visit the airport. Use of the apron by larger corporate and air cargo aircraft also limits the ability for aircraft to taxi by each

other. This problem is further compounded by the lack of access to the apron. Additional points of access need to be provided from Taxiways Alpha and Bravo.

West (Skyways) Apron

The West Apron is used for Skyways operations and by a mix of both resident and itinerant light aircraft. The apron also provides access to the T-hangars located to the west.

The pavement strength of the apron is PLR 7 which is satisfactory given its light duty. The pavement is in fair condition with excessive cracking and drainage problems occurring in some locations.

Central (Flight Centre) Apron

The Central Apron is located west of the terminal building and primarily serves the Waterloo Flight Centre operations. The apron is also utilized by the occasional itinerant aircraft. The apron has a pavement strength of PLR 7 with a tire pressure limit of 1.0 MPa. Used primarily by light aircraft, the apron remains in relatively good condition. Some reflective cracking is occurring in areas where the apron covers the original concrete base.

The apron is often congested with light aircraft. Expansion of the apron, however, would require relocation of the drainage channel that is located to the south of the apron.

6.1.7 East (Terminal) Apron Issues

The existing Terminal Apron is currently constrained in area and lacks appropriate access. The apron is often congested with a mix of corporate/general aviation and air cargo aircraft. The apron has room for 2 Code C and 3 or 4 smaller Code B planes. As the mix of aircraft changes, on occasion, aircraft are forced to manoeuver on the apron with separations that are less than the minimum distances recommended by Transport Canada. Expansion of the Terminal Apron would reduce congestion and allow aircraft to manoeuver safely. An increase in the number of scheduled carrier activities will require the apron to be expanded.

The terminal apron is also currently served by only a single entrance/exit. To improve flows to and from the terminal apron, a second access is required. This access should be provided at the north end of the apron.

6.2 Air Terminal Facilities

The Air Terminal Building was constructed in 1973 and is located at the end of airport road, adjacent to the east (terminal) apron. The facility was originally designed to accommodate airport administrative offices, and a number of aviation-support activities including customs offices, a weather office, and various amenities for visiting pilots and passengers, such as a lounge, flight planning office, pilot's quiet room and shower facilities. With the exception of the lounge, these aviation-support facilities are no longer provided because the space is now utilized for expanded administrative functions and leased office space.

The building is approximately 350 m^2 in area and is relatively unchanged. In 1997 a number of modifications were undertaken to the front entry and washrooms in order to comply with current barrier-free access requirements.

The building has been well maintained and is in generally good condition. Major building components that require replacement in the near future include two roof mounted HVAC units and original single glazed windows, found throughout the building.

6.2.1 Terminal Building Issues

From a functional standpoint, the current facility is inadequate, and fails to meet the requirements demanded by the airport administration and by current corporate and general aviation users. Specific functional constraints of the terminal building include:

- lack of adequate storage space for airport administration
- lack of leasable space to accommodate current and potential tenants
- inadequate facilities to meet the needs of itinerant corporate/business aviation users. Facilities typically provided for corporate aviation would include flight planning/briefing area, pilot's quiet room/lounge, conferencing/ business centre
- inadequate customs facilities

The existing air terminal building is also not capable of properly accommodating a regional scheduled airline. The space requirements associated with passenger ticketing and processing, security screening, hold room and baggage handling can not be accommodated within the existing building. The primary constraints are the lack of space and the narrow configuration of the building. Given the building's construction, major modification and/or expansion to the building is also not viable.

As a temporary measure, a scheduled airline could operate domestic flights from the terminal. However, this would probably necessitate relocation of the administrative offices and the existing tenant to another location. Customs and immigration facilities associated with a scheduled air service could not be provided within the existing terminal.

The current terminal building, although appropriate for light general-aviation needs, does not meet the minimum functional requirements for either scheduled air carrier activities or corporate aviation. Provision must be made in the proposed development concept to accommodate an expanded air terminal facility.

In order to accommodate and sustain a regional airline, terminal facilities must accommodate the following functional elements:

- passenger ticketing and check-in;
- outbound baggage system;
- security screening;
- post security departures lounge;
- inbound baggage systems and baggage claim;
- car rental;

- airline administration/operations areas.
- washroom facilities

To properly accommodate corporate aviation activities the terminal building needs to provide the level facilities and amenities expected by the industry. Facilities that are not presently provided in the terminal include:

- pilots briefing/flight planning area
- pilots lounge
- business centre

These facilities would not be a requirement of the terminal if they could be properly provided by a full service Fixed Base of Operations (FBO) operator. Presently, the FBO operators at the airport do not have the proper facilities.

6.2.2 Landside Parking

The airport is provided with two primary parking lots. The largest lot is located adjacent to the Waterloo Flight Centre and was expanded in 1999. A smaller lot is located immediately south of the air terminal building. There should be adequate parking facilities for the next ten years or more.

6.3 Airport Support Facilities

In addition to the air terminal building, there are a number of other structures located on the airport that are owned and operated by the Region.

6.3.1 Airport Maintenance Facility

The Airport Maintenance Facility is a pre-engineered steel building that was constructed in 1993. In excellent condition, the facility is comprised of four service bays, plus associated workshops and storage areas. Administrative offices are located on the second floor.

6.3.2 Airport Maintenance Facility Issues

The operation of the Airport Maintenance Facility is presently constrained because the facility does not have direct airside access. Heavy airside maintenance/snow removal equipment is required to utilize the groundside roadway system and pass through a security gate located some distance from the maintenance facility. If the leased land development is adopted in the Master Plan, the new taxiway should be connected to the maintenance building access roadway. Also, the building may need to be enlarged in the future to handle firefighting equipment as required when planes with more than 19 passengers each regularly use the airport. If an additional runway is constructed the enlargement would be needed to handle additional maintenance vehicles.

6.3.3 Field Electrical Centre

The Field Electrical Centre is located adjacent to the central apron, and accommodates a number of functions. A portion of the building is used as the airport's field electrical centre. The field electrical centre accommodates electrical systems for airfield lighting, and also houses an emergency generator. The centre is constrained for space and would require expansion as part of any new airside development.

A second function of the building is for storage of sand and urea products that are used on airside pavements during winter. These products are probably best stored in a dedicated facility located adjacent to the Maintenance Facility.

The Field Electrical Centre is also the storage area for the airport's crash vehicle.

6.3.4 Sand/Urea Storage Building Issues

A new structure that can accommodate the storage of sand, urea, and other deicing materials is required. This structure should be located adjacent to the Airport Maintenance Building.

6.3.5 Air Traffic Control Tower

Constructed in 1969, the air traffic control tower is a stand alone facility that is owned and operated by Nav Canada, a non-shareholder corporation responsible for the management, operation and maintenance of Canada's air navigation system.

There are no known constraints to the operation of the control tower. Sight lines to all controlled aircraft manoeuvring surfaces, including runways and primary taxiways are free of obstructions. Line of sight to secondary taxiways and portions of the west and central aprons is obstructed because of hangar structures.

6.3.6 Aircraft Refuelling Facilities

Aircraft refuelling services are provided by Flite Line Services (Hammond Fuels) and the Waterloo-Wellington Flight Centre (Esso). All fuels are dispensed using bowsers operating on the aprons. Fuel storage is undertaken in two locations.

Flite Line Services has their fuel farm located adjacent to Hangar 5. The Fuel farm is comprised of above ground storage tanks with the following capacities:

Jet	25,000 L
100 LL	25,000 L
80/87	4,500 L
Mogas	4,500 L

The fuel farm belonging to Imperial Oil Ltd. is located on the west perimeter of the central apron, adjacent to their hangar. This fuel farm has the following storage capacity:

Jet	35,000 L
100 LL	35,000 L

Ideally, a central fuel farm should be provided on the airport in a location that does not impede future aviation related development.

6.3.7 Fire Services

The Woolwich Fire Department (Maryhill) responds to all airside and landside fire emergencies and is able to be on site within 10 to 12 minutes. They have had specific training related to airside response, and are equipped to effectively deal with aviation fuel fires. All water is trucked to the emergency site as there are no on-site fire hydrants.

Regional staff are trained and equipped to use an on-site 350 lb dry chemical fire jeep to deal with an emergency situation until the Fire Department arrives on site.

6.4 Landside Facilities

Landside access to Waterloo Regional Airport is provided by a single two-lane roadway from Regional Road 17. This roadway provides access to the air terminal building, airport maintenance facility, south commercial development and all of the vehicle parking lots. The roadway was resurfaced in 1997 and is in excellent condition. It is noted that the access road lacks street lighting.

6.5 Utilities and Services

Waterloo Regional Airport is provided with only limited central utilities. This section deals with the utility infrastructure inside the property boundary.

6.5.1 Water Supply

Water is supplied from individual wells to a number of buildings on the airport including the Air Terminal Building, Waterloo-Wellington Flight Centre, Air Traffic Control Tower, Maintenance Facility and a number of hangars. The water quality is tested on a regular basis, and in most locations is safe for drinking. At only one location, Hangar 5, the water is unsafe for drinking. The majority of the wells on the airport are drilled wells. The exceptions are the Air Terminal Building, Hangar 5, and Kitchener Aero, which are dug wells.

Due to the surrounding high water table the water supply at the airport is generally reliable.

To ensure supply of potable water in the future, consideration should be given to the installation of a communal water supply system.

6.5.2 Sewage Collection

All sewage collection and treatment is carried out in individual septic tank systems on the airport property. Although the septic systems have functioned well in the past, current and potential development at the airport will place substantial constraints on the septic sewage systems.

The ability to service airport buildings with individual septic systems is at a limit. With the development of the remaining aviation related area, future approval of individual septic systems will become difficult. To accommodate future development it is important that the airport initiate a plan to implement communal sewage collection and disposal facilities.

6.5.3 Stormwater Drainage

Both the surface and subsurface drainage systems on the airport property eventually outlet into the Grand River through an open channel system known as the Randall Drain. This drain is essentially an agricultural drain which services a drainage basin of approximately 415 hectares before entering the northeast quadrant of the airport. Two major branches of the Randall Drain serve the airport property and combine immediately outside the southeast corner.

The drainage area served by the Randall Drain is prone to flooding, and in 1997 work was initiated to improve the flow of water in the drainage channels. This work was completed in 1998.

In order to maximize the development potential of existing and future commercial areas, the need for appropriate stormwater measures has been identified. The provision of stormwater management ponds is a requirement for the development of additional commercial lands.

6.5.4 Power

Electrical power to the airport is provided by a 27,600 volt, 3 phase service from Waterloo North Hydro. Hydro service was upgraded in 1995 after the airport surpassed Hydro's policy limit of 500 KVA of transformation capacity per customer. A bulk meeting unit is provided, and individual tenants and airport facilities are provided with separate metres. Waterloo Regional Airport prorates the monthly hydro costs to individual tenants based on their percentage of the overall consumption.

It is anticipated that the future power needs of the airport can be met with the current service.

Although the airport is provided power from only one source, there is a second electrical grid that the airport can connect into. Provision of power from two sources would improve the reliability of the service.

6.5.5 Gas

In 1997 Union Gas provided a 150 mm gas main to the airport to serve the various airport users. This gas main is of sufficient capacity to meet current and foreseeable demands at the airport.

6.5.6 Data/ Telephone

The airport is currently provided with two telephone/data trunk lines. It is anticipated that this service will meet the needs of the airport for the foreseeable future.

7.0 Airport Development Options

In the evolution of an appropriate development concept for Waterloo Regional Airport, a number of planning issues were identified that need to be addressed as part of the Airport Master Plan. Also, the development must be consistent with the vision and objectives.

Four key issues that must be addressed are:

- The Region is one of Canada's fastest growing economic markets. With this growth there is an increase in aviation demands as companies have a more global perspective.
- The airport has a good base of airside infrastructure/services including runways, taxiways, air traffic control tower and an instrument landing system. A properly maintained and operated airport aids the economic development of the region.
- A growing demand for serviced land adjacent to the runways for aviation related business.
- Engineer solutions to noise mitigation with infrastructure changes.
- An opportunity to decrease the tax levy by tapping new revenue sources.

Constraints to development that must be addressed are:

- The airport is surrounded by large tracts of land that have been designated as Provincially Significant Wetlands.
- The airport is located within close proximity to residential developments.
- The airport lacks municipal services including water and sanitary sewers.

7.1 Airside Development Alternatives

In the preparation of a preferred development plan for the airport, a number of airside alternatives have been considered. These alternatives are described below and summarized in Table 7.1. Due to the concerns related to noise generated by aircraft, noise planning contours are illustrated with the various airside development alternatives.

The 1998 NEF contours for the site are smaller in area than the contours associated with the current approved 1985 NEF for the airport even though the number of movements has increased.

The 2018 noise planning scenarios assume that there will be 153,000 movements per year which is also significantly less than the rated capacity of 220,000 movements per year. The scenarios include growth of existing traffic, 3 daytime arrivals/departures and 1 night arrival/departure of a regional commuter aircraft (Dash 8-100), and 2 daytime arrival/departures of a B737-300 jet transport. Appendix E has a summary of the noise

calculation model's input with a peak planning day of 389 itinerant and 616 local movements.

Alternative A1 - Extend Runway 07-25

Under this alternative (Figure 7.1), Runway 07-25 would be expanded to the east by 1,800 ft. This extension provides a runway length that is required to service the existing customers of YKF in all-weather conditions and allow for the better utilization of the aircraft payloads. This runway is the primary runway at Waterloo Regional Airport and is the favoured choice for extending because of its favoured wind orientation. The extension of Runway 07-25 can be constructed within the existing property boundaries of the airport. The purchase of land or easements would be required for the placement of navigational aids. This extension would necessitate the closure or relocation of a section Township Road 81.

Figure 7.2 indicates the noise planning contours for this option.

The capital cost associated with the extension of Runway 07-25 is approximately $3,300,000.

This extension would result in a shift of the noise contours associated with this runway. The extension of Runway 07-25 would reduce general noise impacts west of the airport and would have a positive impact on residential communities located in Kitchener. Under this alternative, there are three options for development.

The first option would be to retain the glidepath in its present location and allow for a 1,800 ft displacement of the threshold of Runway 25. This would provide a takeoff distance of 7,000 ft in either the 07 or 25 orientation, but would limit the landing distance on Runway 25 to the existing 5,200 ft . As indicated in Table 6.2 the landing requirements of corporate aircraft and small code C jet transport aircraft can still be accommodated with this runway length. This is the most cost effective option in the short term.

Table 7.1 Airport Development Alternative Matrix

OPTION	INFRASTRUCTURE COST (AIRPORT) ($ Millions)	Other Costs	MIN. LAND ACQUISITION ($ Million)	COMMUNITY IMPACT	ENVIRONMENTAL IMPACT	IMPACT ON GRSD	OPERATIONAL IMPACT
A1 - Lengthen Existing Runway 07-25 and Install an ILS on Runway 07	Pavements 3.3 ILS 07 1.0 Navaids .3 TOTAL 4.3	Minor costs associated with partial closure of Township Road 81	19.8 ha. Cost 0.3 (assumes $12,000/ha)	Existing built-up communities would not be impacted by NEF 30	Possible impacts on local drainage systems and Provincially Significant wetlands	NEF 30 would extend into proposed Grand River south Development Area	Operations to remain as is. Possible line-of-sight constraints from control tower
A2 - Construct New Runway Parallel 14-32 or A3 New 02-20	Pavements 9.0 Navaids 1.0 Tower 1.2 TOTAL 11.2	Minor costs associated with partial closure of Township Road 81	108 ha. Cost 1.4	Noise would be directed away from built-up residential areas in Kitchener and Waterloo. Increased noise impacts on rural areas located north and south of airport. Potential impacts on Breslau and Cambridge.	Possible impacts on local drainage systems and Provincially Significant wetlands. Requirement for full environmental review process.	Noise would be directed away from the GRSD area.	Longer taxiing distances. Line of sight constraints with a requirement for a new control tower. Potential requirement to relocate terminal/apron facilities. Potential that Nav Canada would not support new control tower and navaids
A4 - Construct New Airport	Pavements 16.0 Navaids 1.4 Tower 1.0 Terminal 2.0 Support 1.0 TOTAL 21.4	Requirement for new infrastructure to serve airport including access roads, utilities and services. Relocation of existing tenants	280 ha. Cost 3.5	Ideally, noise impacts could be minimized for built-up residential areas, however rural lands adjacent to new airport would be subject to new noise impacts.	Possible impacts on local drainage systems and Provincially Significant wetlands. Requirement for full environmental review process.	Noise would be directed away from the GRSD area.	Assumption that the design of a new airport would accommodate operational requirements. Potential that Nav Canada would not support new control tower and navaids.

The second option would be to relocate the glide path to the new Runway 25 threshold in order to accommodate a full 7,000 ft landing distance on Runway 25. The additional cost associated with the relocation of the glidepath is approximately $450,000.

A third option would be the provision of an ILS approach for Runway 07. This would require the installation of a localizer, glidepath and approach lighting. The provision of a glidepath for Runway 07 would ensure that approaches to Runway 07 are undertaken at the appropriate altitude. The installation of a CAT I ILS system would provide the airport with increased usability during IFR conditions when winds are from the east, and would ensure that aircraft on approach to Runway 07 maintain the appropriate approach altitude, which would raise the current approach path (under IFR conditions).

The Aeronautical Noise Management Committee and Master Plan Public Advisory Committee recommended that an ILS be installed on runway 07. The significant reduction in single event noise on approach to runway 07 is shown in Table 7.2. Without lengthening runway 07, an ILS would reduce the landing length to 4,900 feet. Given the plane mix at YKF, shortening the runway below 5,200 feet is unacceptable so a minimum extension of 300 feet is required. Lengthening 07 requires the relocation of the navigation aids and ILS on runway 25. Relocating the navigation aids with a minimum 300 foot extension requires that Township Road 81 be closed or relocated.

The capital cost for an ILS on runway 07 is $1,000,000. Adding a 300 foot extension and relocating the ILS on runway 25 is $2,900,000. In the future it would cost an additional $2.2 million to extend runway 07-25 an additional 1,500 feet (to make it a total length of 7,000 feet) and relocate the ILS.

The benefits of Alternative A1include:

- Provision of an ILS on runway 07;
- Better service to existing airport operators and users;
- ability for planes to reach 1,600 ft ASL closer to the airport and change flight paths to avoid flying over residential areas;
- Decreased noise to the west of the airport in Kitchener;
- The acquisition of additional property is not required;
- The existing runway is the favoured in-wind runway, providing high reliability (99 % utilization);
- Construction costs associated with this option are substantially lower than either Alternative A2 or A3;
- Maintenance and operating costs would be lower than either alternative A2 or A3;
- Extension of the existing runway would limit additional future impacts to areas currently affected by present activities.

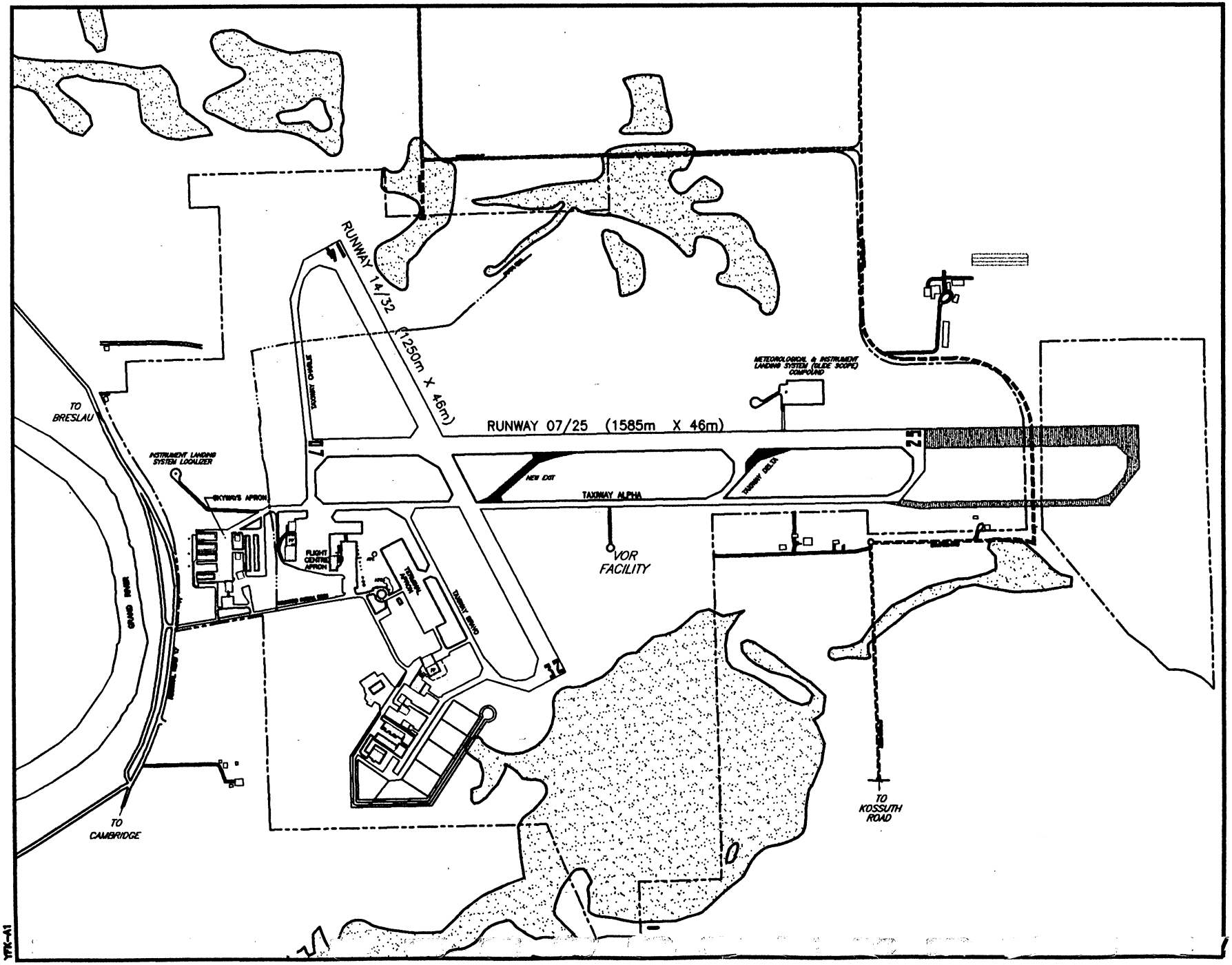
Table 7.2 Single Event Noise Reduction

Plane	Decibel Range	Area Affected (square km)		Percentage Reduction
		Before 1	After 2	
Lear 25	80 and above 75 and above	4361	2233	49% 46%
Hawker 125-700	80 and above 75 and above	1727	39	82% 67%
Boeing 737 - 200 Hushkit	80 and above 75 and above	2944	1322	55% 50%
Boeing 737-300	80 and above 75 and above	2133	1221	42% 37%
Canadair 604	80 and above 75 and above	1323	410	73% 54%

Notes: 1- Assumed existing runway configuration
2- Assumed a minimum 300 foot extension and an ILS on runway 07

The concerns associated with Alternative A1 are:

- A different mix of Code C aircraft could utilize the airport and therefore increase the noise contour. A change in the aircraft mix indicates that other region wide economic changes have occurred. As the economy changes, so do the transportation needs and requirements of the community.



WATERLOO REGIONAL AIRPORT

AIRPORT BUSINESS PLAN

LEGEND:

FUTURE RUNWAY/TAXIWAY PAVEMENTS

PROVINCIALLY SIGNIFICANT WETLANDS

AIRSIDE DEVELOPMENT

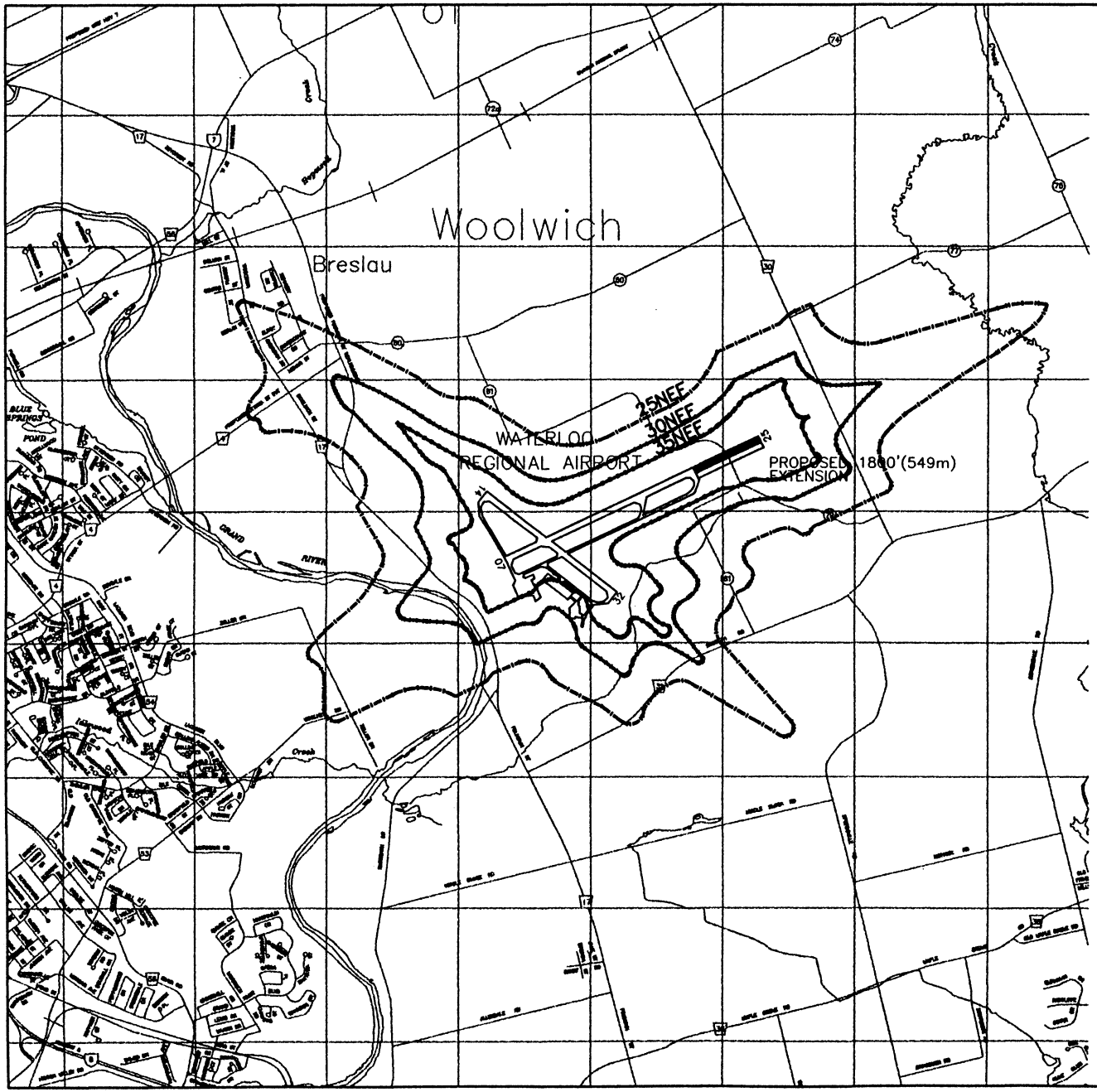
EXTENDED RUNWAY ALTERNATIVE A1

FIGURE 7.1

August 1998

AVGOLD

YFK-A1



WATERLOO
REGIONAL AIRPORT

REGIONAL MUNICIPALITY OF WATERLOO

LEGEND

PLANNING CONTOURS		25 NEF
		30 NEF
		35 NEF

NOISE 25 NEF NOT SHOWN TO MODERN CLARITY

SCALE 1:15000

200 0 100 300 500 1000 1500 METRES

1000 0 500 1000 2000 3000 FEET

BASE MAP : TRICITY MAP (JAN 1999)

AVGROUP

WATERLOO REGIONAL AIRPORT

MASTER PLAN UPDATE

ALTERNATIVE A1 – PLANNING CONTOURS ASSUMING 153,000 MOVEMENTS & 7000 FT RUNWAY 07–25

SCALE: 1:15000 | DATE: JAN. 2000

PROJECT NO. 608–06181 | Figure 7.2

FIGURE 7.2

Alternative A2 - Construct New 14-32 Parallel Runway

Under this alternative (Figure 7.3) a new 7,000 ft runway would be constructed with a 14-32 orientation, parallel to the existing runway. During favourable wind conditions, itinerant aircraft would be directed to use this runway. This would reduce noise impacts on residential communities located west of the airport. However, this would be at the cost of communities such as Breslau and Cambridge which could experience increased noise impacts because of the relocated approach paths. Instrument landing aids would be required in order to provide the runway with an all weather capability, however, under certain wind conditions, operations would remain on Runway 07-25.

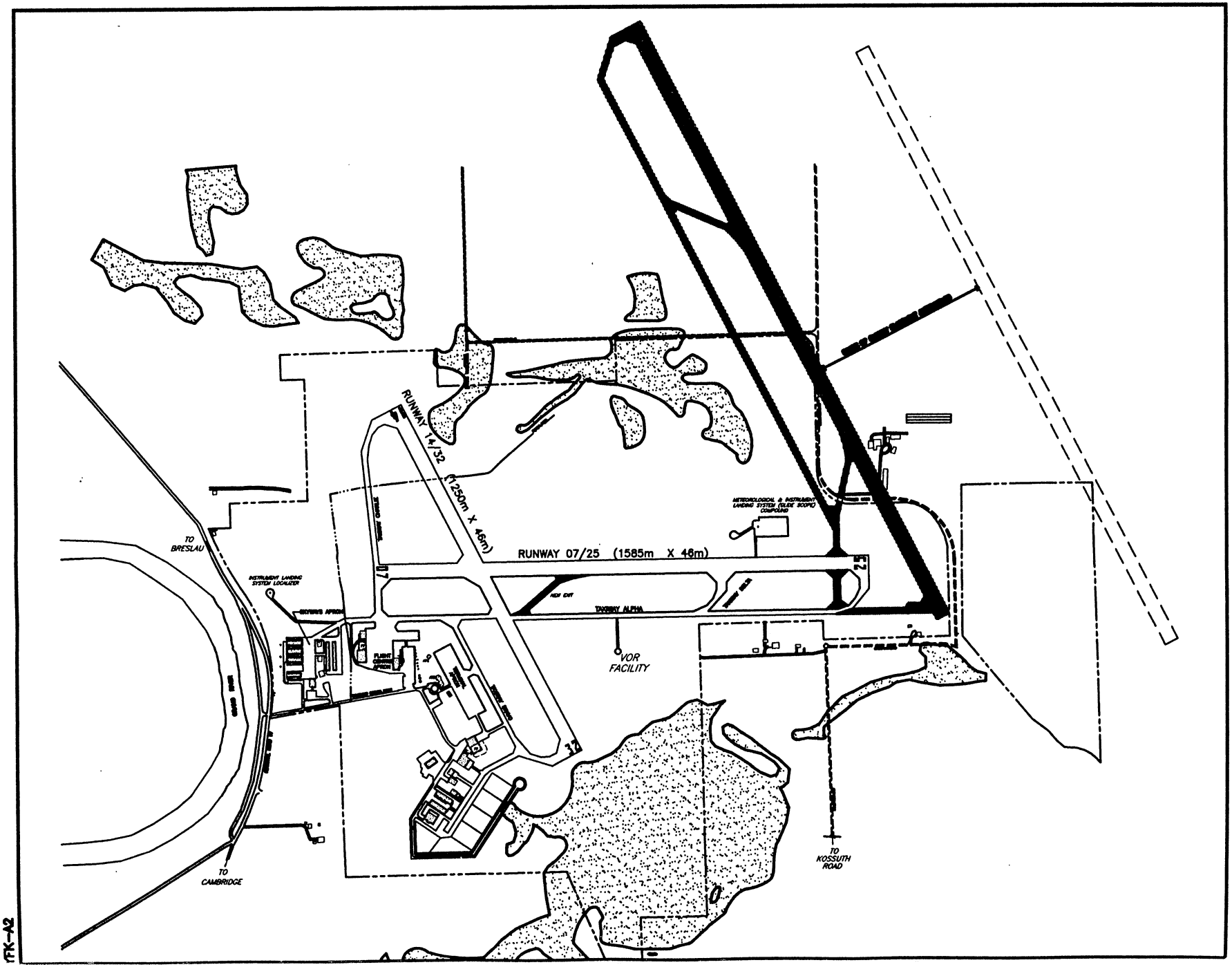
Under this scenario the parallel runway would be constructed east of the existing threshold of Runway 25. This development option allows the greatest flexibility and options for the airport to meet the demands of the Region. It is also the best solution to reducing noise impacts over the established residential communities located west of the airport.

The capital cost associated with this airside alternative is approximately $8 - $10 million. This excludes costs associated with land acquisition.

The NEP contours generated from this scenario (Figure 7.4) indicate that this development option would have only a marginal effect in reducing noise contours to the west of the airport, and would generate additional noise impacts on residents in Breslau and Hespeler.

The benefits associated with Alternative A2 are:

- The parallel runway system offered under this alternative would substantially increase the airport's capacity to accommodate aircraft movements (from approximately 220,000 annual movements to approximately 300,000);
- The parallel runway system would enhance operational safety by allowing air traffic controllers to separate light aircraft/local movements from heavy/itinerant movements;
- The runway would allow for more aviation related business development;
- The runway orientation would reduce noise impacts for residents located north and west of the airport.



WATERLOO REGIONAL AIRPORT

AIRPORT BUSINESS PLAN

LEGEND:

FUTURE RUNWAY/TAXIWAY PAVEMENTS

PROVINCIALLY SIGNIFICANT WETLANDS

SCALE: 0 50 100 150 200 METRES

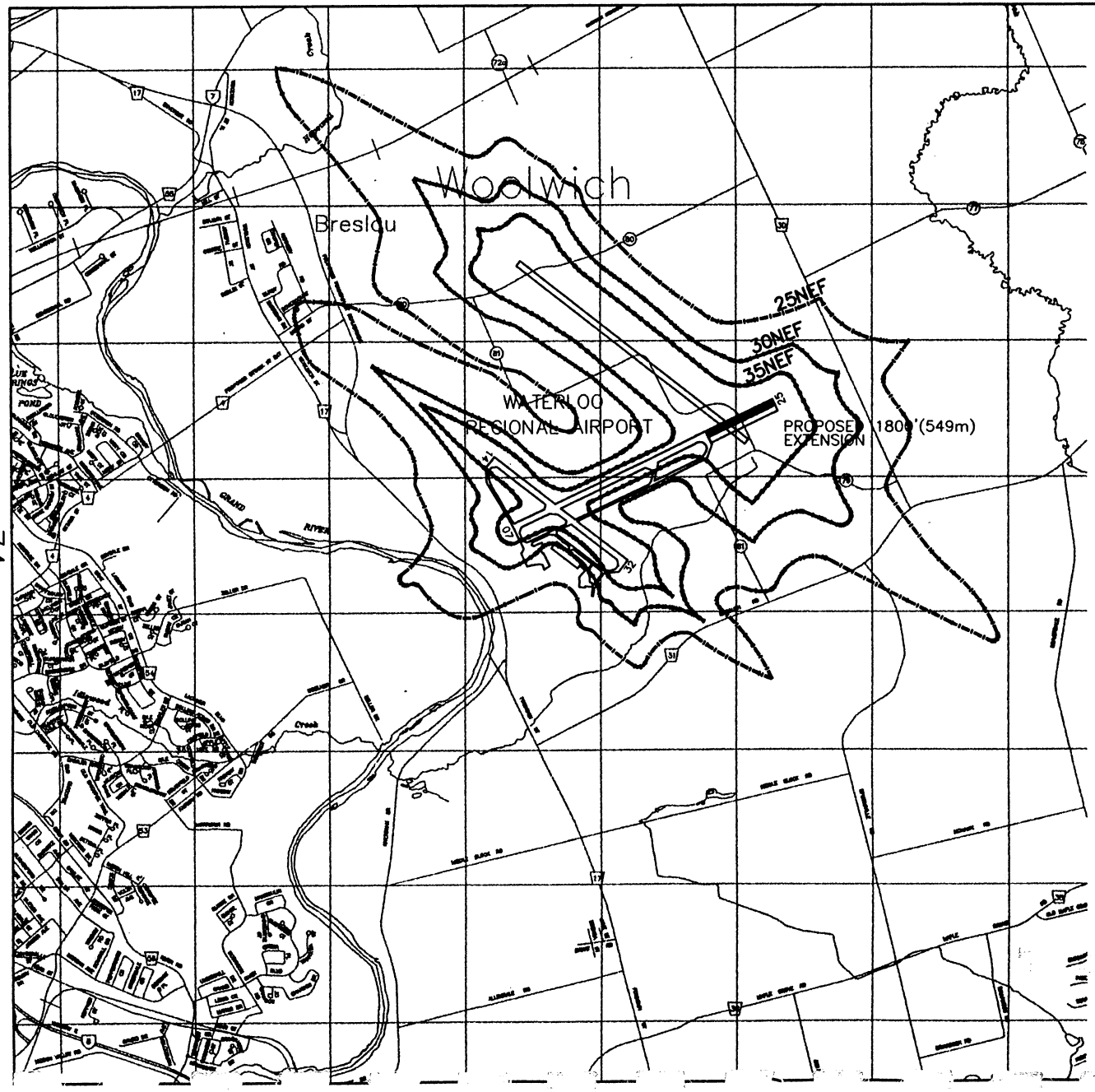
AIRSIDE DEVELOPMENT

NEW RUNWAY 14-32
ALTERNATIVE A2

FIGURE 7.3

August 1998

TRK-A2



WATERLOO
REGIONAL AIRPORT

REGIONAL MUNICIPALITY OF WATERLOO

LEGEND

PLANNING CONTOURS	25 NEF
	30 NEF
	35 NEF

NOTE: 20 NEF NOT SHOWN TO IMPROVE CLARITY

SCALE 1:15000

200 0 100 200 400 600 800 1000 METRES

1000 0 500 1000 2000 3000 FEET

BASE MAP : TRICITY MAP (JAN 1999)

AVGROUP

WATERLOO REGIONAL AIRPORT

MASTER PLAN UPDATE

ALTERNATIVE A2–PLANNING CONTOURS FOR A NEW PARALLEL 14–32 WITH 153,000 & 7000 FT RUNWAY 07–25

SCALE: 1:15000 | DATE: JAN. 2000

PROJECT NO. 608–06181

Figure 7.4

FIGURE

The concerns associated with Alternative A2 are:

- Substantial capital costs associated with runway/taxiway construction and provision of instrument landing aids
- Substantial costs associated with the acquisition of additional property
- Higher operating and maintenance costs;
- Longer taxiing distances and higher operating costs for users;
- Construction of the runway and its associated taxiway could disturb the heronry located to the north of the airport;
- Construction of the new runway would likely require construction of a new air traffic control tower;
- No significant reduction of noise over East Kitchener;
- Flight path would create noise problems in new residential developments in Breslau and Cambridge.

Alternative A3 - Construct New 02-20 Runway

Under this alternative (Figure 7.5), a new 7,000 ft runway would be constructed with an orientation of 02-20.

This orientation was originally identified in the "Report of the Waterloo-Wellington Airport Task Force" prepared in 1974. In the report, the task force recommended that a 5,200 ft., precision approach runway, with an orientation of 02-20, be constructed entirely within the existing airport site.

The primary benefit of this runway orientation is that arrival and departure flight paths would avoid the built-up urban areas surrounding the airport. Another benefit, at the time the study was prepared, was that the runway could be constructed without the need for further land acquisition.

In a subsequent Airport Master Plan update prepared in 1983, the 02-20 runway orientation was not considered and the recommendation was made to extend existing Runway 07-25 to 5200 ft.

In the current evaluation of airside alternatives, the 02-20 orientation remains the preferred alternative with respect to the mitigation of noise impacts. The arrivals/departures flight paths associated with this alternative avoids the major urban areas associated with Kitchener, Waterloo, Breslau and Cambridge.

The primary constraint of this orientation is that it is the least favoured orientation with respect to winds. This runway orientation also has the greatest crosswind component of any of the runway orientations. Crosswinds would meet or exceed the limits established by Transport Canada for light general aviation aircraft approximately 25% of the time. For corporate jets and heavier general aviation aircraft, the crosswind component would be exceeded approximately 11% of the time. In the corporate and commercial aviation industry the reliability of this runway orientation is unacceptable.
A likely consequence of a runway constructed in this orientation is that pilots and air traffic controllers would continue to select the existing runways due to favourable wind conditions. This would ultimately reduce the benefits associated with this runway.

A runway in the 02-20 orientation can no longer be constructed within the existing airport property. Since the Task Force report was prepared, a VOR navaid has been located on the airport. To accommodate a new runway within the airport property, the navaid, which is vital to operations at Lester B. Pearson International Airport, would have to be relocated. Nav Canada has estimated that the cost associated with relocating the VOR would be $750,000 to $1,000,000.

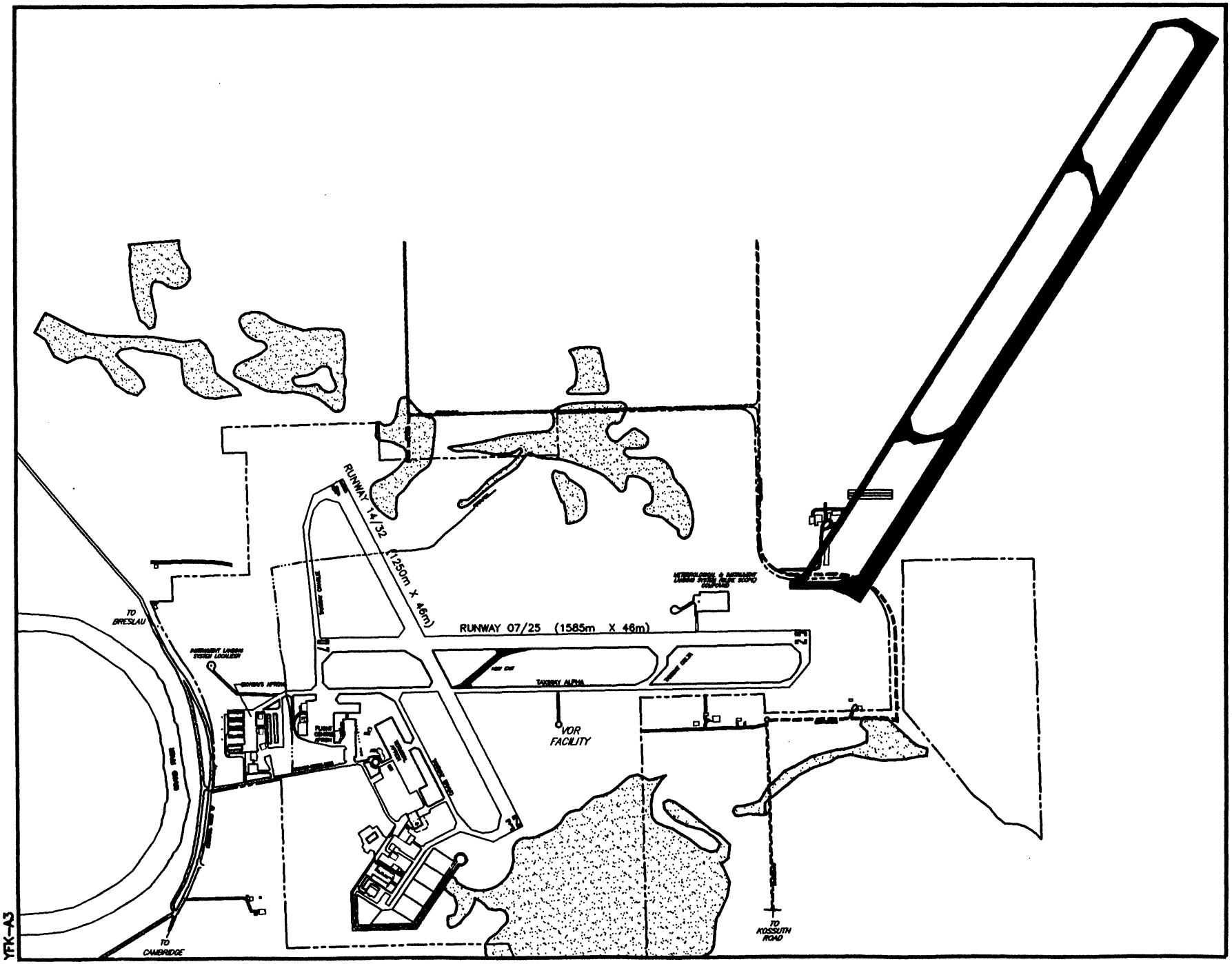
Provision of a runway in the 02-20 orientation would have to be located north of the existing airport. This would require significant acquisition of additional property.

The capital cost associated with this alternative is approximately $8 - $10 million. This excludes the costs associated with land acquisition.

Other concerns associated with 02-20 runway include:

- Construction of the runway and its associated taxiway would require construction on the heronry located to the north of the airport;
- Long taxiing distances from the runway to the terminal/commercial areas would be incurred under this alternative;
- The movement of aircraft to and from the new runway 02-20 would be constrained when Runway 07-25 is also in operation;
- When the new 02-20 runway would be in use, the capacity and utilization of Runway 14-32 would be reduced because of the intersecting approach paths;
- Construction of the new runway would likely require construction of a new air traffic control tower;
- Construction of the new runway would require that a portion of Highway 30 be relocated.

This option was not considered feasible by the Project Team and no NEF contours were developed.



WATERLOO REGIONAL AIRPORT

AIRPORT BUSINESS PLAN

LEGEND:

FUTURE RUNWAY/TAXIWAY PAVEMENTS

PROVINCIALLY SIGNIFICANT WETLANDS

AIRSIDE DEVELOPMENT

NEW RUNWAY 02-20 ALTERNATIVE A3

FIGURE 7.5

August 1998

YFK-A3

Alternative A4 Relocate Airport

The airport at its existing location would be closed and a new facility would be constructed somewhere else in the Region for this alternative. The site should be located so that its operation would not effect existing or future sensitive neighbouring land developments. Also, it should be located so that it has easy access from major roadways and is close to industrial users.

Siting criteria are:

- no net impact on environmentally sensitive lands
- residential developments a minimum of 4 km from the end of runways (ie 5km radius)
- maximum 30 minute drive from major industrial developments
- facilities would include 2-7,000 foot runways, Code C, PLR 9, NAV Canada control tower, Cat I ILS, a terminal building, airside maintenance facility, airside commercial development, leased land for hangars, parking lots

Currently, there are no available parcels of land within the Region to locate a new airport that meets the siting criteria and has the proper zoning. Therefore, prime agricultural lands would have to be used which requires an amendment to the Regional Official Policies Plan and a full Environmental Assessment.

Some locations to the east of line A-A in Figure 7.6 could meet the time / distance but not the 5 km radius requirements. Locations to the north and west of Line A-A would not meet the time / distance criteria however some locations may meet the 5 km radius criteria. No study was completed to determine if one location would be better than another from an environmental perspective.

Currently the Region has approximately 30 long-term leases and 6 short-term leases with its tenants at the airport. The Region leases the land and the tenants own the buildings. As a result, the Region would be liable for significant relocation costs to its tenants if the airport was moved. An estimate of these costs has not been completed as it would include relocation and loss of business expenses.

The purchase of a minimum of 700 acres of agricultural land would cost approximately $3.5 million. If the lands needed to be expropriated the costs would significantly increase. Capital costs for the aviation infrastructure would be $21.4 million. Depending on the location, the costs to improve access roads and provide services (sewer, water, utilities) would be in addition to the noted amounts.

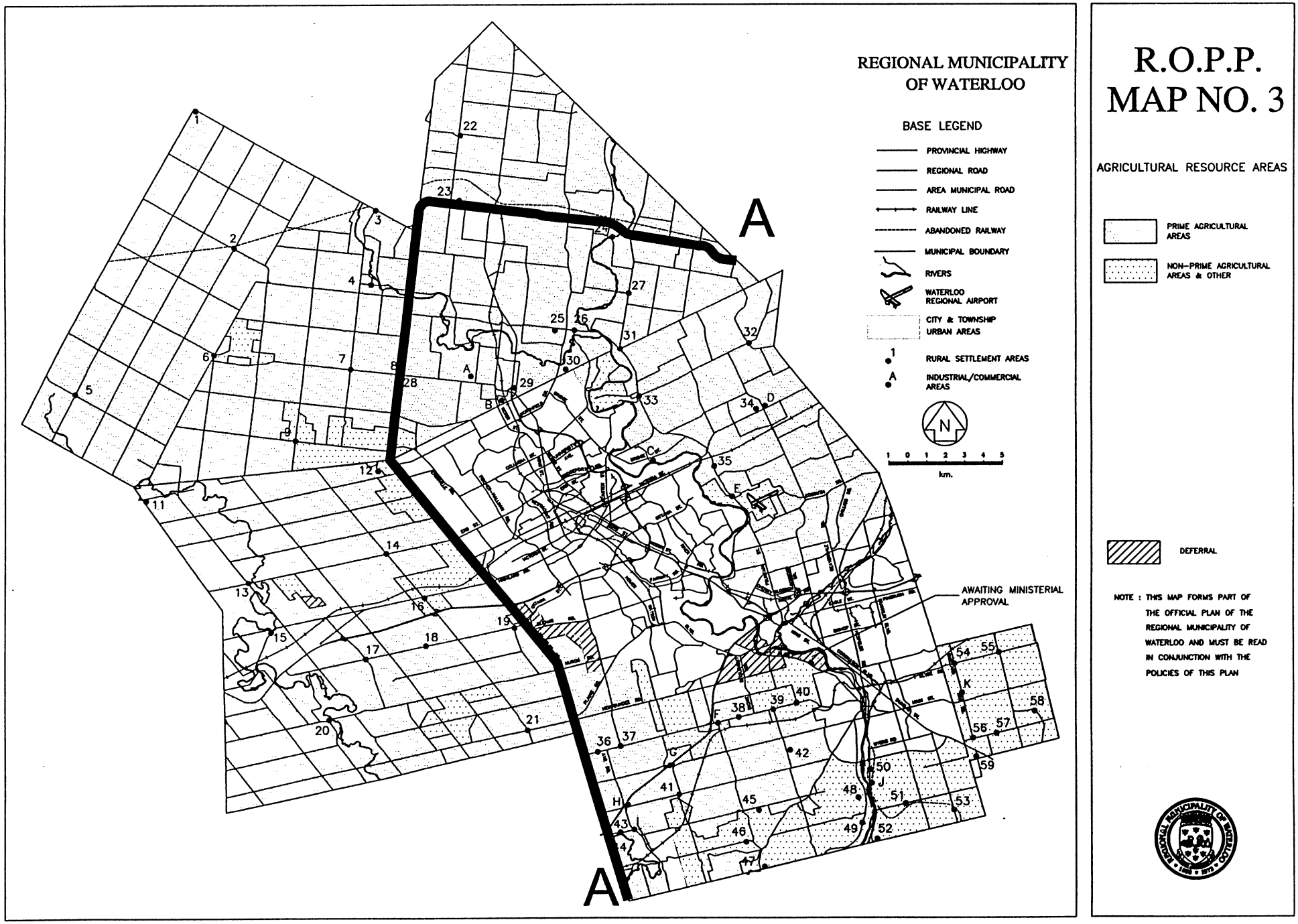
Decommissioning the existing airport including the remove of all buildings, asphalt, site services will be significant. The proceeds from the sale of the land would offset all decommissioning expenses.

The benefits of Alternative A4 are:

- minimal noise impact on residential developments;
- ability for future expansion;
- have 2-7,000 runways;
- avoid the costs for the reconstruction of pavement surfaces at the existing site;
- avoid costs to lengthen runways at the existing site.

The concerns with Alternative A4 are:

- substantial capital costs;
- substantial legal costs with tenants;
- substantial costs associated with the acquisition of property;
- location would not be not central to industrial parks in the CTT area;
- loss of agricultural land;
- noise impacts on new residential areas.



R.O.P.P. MAP NO. 3

AGRICULTURAL RESOURCE AREAS

PRIME AGRICULTURAL AREAS

NON-PRIME AGRICULTURAL AREAS & OTHER

DEFERRAL

NOTE : THIS MAP FORMS PART OF THE OFFICIAL PLAN OF THE REGIONAL MUNICIPALITY OF WATERLOO AND MUST BE READ IN CONJUNCTION WITH THE POLICIES OF THIS PLAN

ALTERNATIVE A4
FIGURE 7-6

7.2 Terminal Development Alternatives

A number of alternatives were examined for the development of a terminal reserve area to accommodate future terminal facilities (Figure 7.7).

Alternative T1 - Status Quo

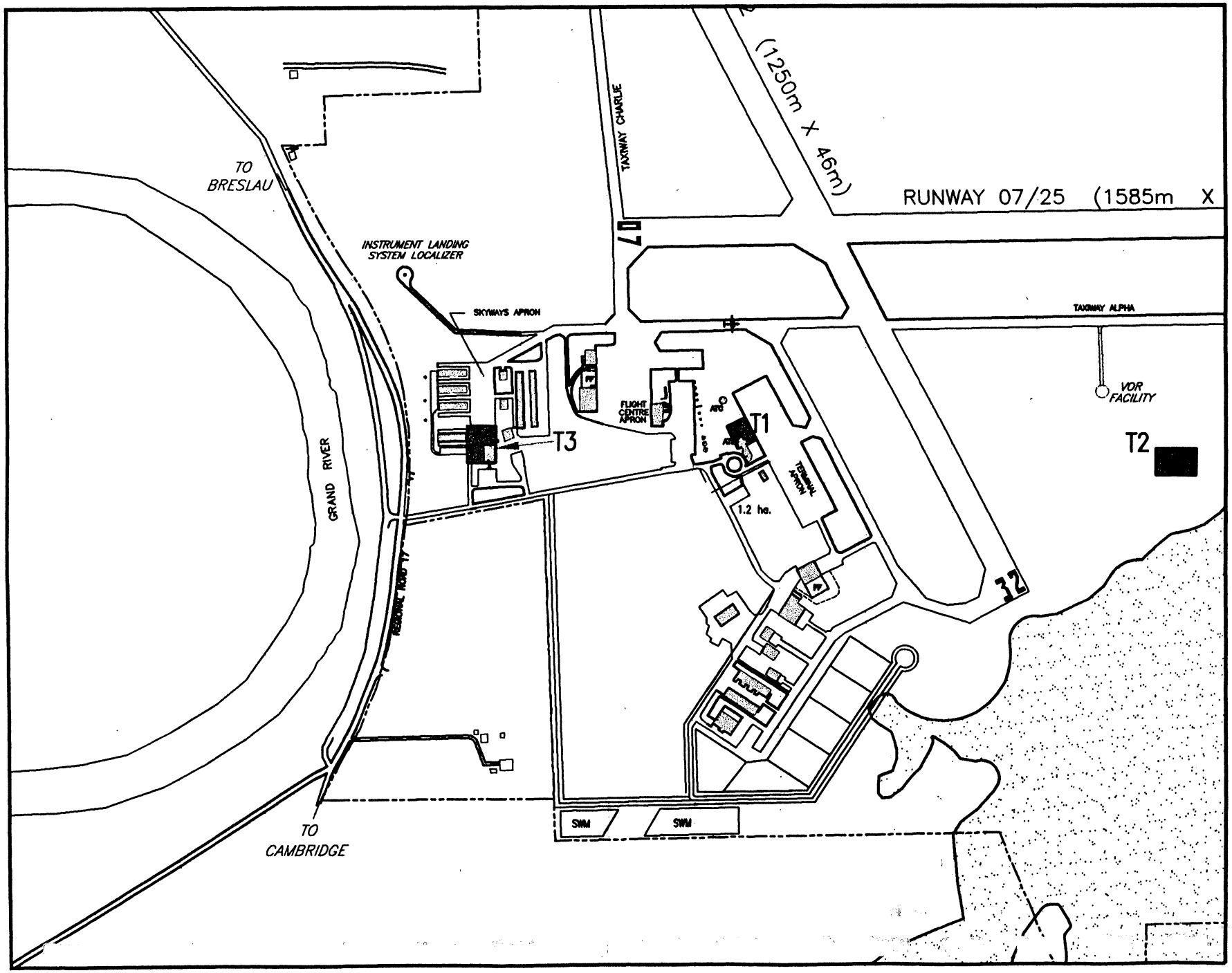
Under this alternative, the terminal reserve area would be located at the site of the present terminal building.

Benefits of this alternative are:

- future terminal facilities can make use of existing terminal apron, vehicle parking, resulting in lower development costs;
- excellent airside/landside access;
- close proximity to other activities.

The concerns associated with this alternative are:

- ultimate development of terminal facilities could be constrained by other surrounding uses including the air traffic control tower and adjacent commercial uses;
- the terminal area has poor exposure from Regional Road 17 .



WATERLOO REGIONAL AIRPORT

AIRPORT BUSINESS PLAN

LEGEND:

FUTURE RUNWAY/TAXIWAY PAVEMENTS

PROVINCIALLY SIGNIFICANT WETLANDS

PROPOSED COMMERCIAL DEVELOPMENT

TERMINAL BUILDING OPTIONS

FIGURE 7.7

May 2000

Alternative T2 - East Location

Under this alternative, a reserve area for future terminal facilities would be located on land located south of Runway 07-25 and east of the VOR. The primary benefit of this option is that the site offers ample land on which to develop future terminal facilities.

Benefits of this alternative are:

- ample land available for terminal facilities;
- site not constrained by adjoining facilities;
- excellent airside access;
- dedicated groundside access.

Concerns associated with this alternative are:

- requirement to acquire additional lands;
- substantial improvements required to landside access;
- site is isolated from airport support and commercial development functions.

Alternative T3 - West Apron

Under this alternative, a terminal reserve area would be located on the West Apron, on lands presently occupied by T-hangars and the Skyways hangar. The primary benefit of this alternative is that future terminal facilities would have excellent access and exposure from Regional Road 17, with good airside access. A terminal facility in this location would provide the airport with a strong visual identity.

Benefits of this alternative are:

- excellent landside access;
- potential to provide a dedicated landside access;
- potential to use the natural slope of the land to develop a 2- story facility.

Concerns associated with this site are:

- requires relocation of T-hangars and other commercial buildings presently located on the site;
- substantial development costs associated with removal/relocation of existing facilities, site grading, new aprons and taxiway improvements.
- loss of commercial land suited to aviation interests

7.3 Airport Support Alternatives

Given the recent construction of the new airport maintenance facility, the only viable alternative considered is to develop the area surrounding the maintenance building as the airport support centre. In the future, other airport support facilities, such as a sand storage structure, should be located adjacent to the maintenance building. Future development should ensure that the maintenance facility is placed airside for direct access.

7.4 Leased Airside Land Alternatives

At present, leased property at the airport is located at three sites; the West (Skyways) Apron, the Flight Centre Apron, and the South Commercial Area. Only two lots remain at the end of 1999.

To accommodate future demand for leased airside properties, the lands south and west of the existing terminal building have been identified. A major constraint in the development of these lands is the Randall Drain which bisects the site. The following alternatives examine development options with the Randall Drain both in its present location and relocated.

In the development of alternatives for additional leased airside land the objectives included:

- provision of large lots with good airside visibility/access that are suitable for FBO facilities;
- maximize leasable development area while minimizing taxiway/roadway development requirements;
- provide airside access to the airport maintenance building.

Alternative LL1

Under this alternative (Figure 7.8), the Randall Drain would be relocated to the western perimeter of the airport property. This would allow for an unencumbered development of the remaining vacant lands. Relocation of the Randall Drain would also allow for the expansion of the Flight Centre Apron and associated development.

This alternative would provide approximately 8.8 ha of additional leasable land. This land could be divided into various parcel sizes appropriate for the range of development that occurs at the airport.

To accommodate the new development, a new access road would have to be constructed around the perimeter of the development. This road would provide access to the South Commercial Area, as well as the new development.

The capital cost for this alternative is $1,600,000.

Alternative LL2

Under this alternative (Figure 7.9), the Randall Drain would remain in its present location. A new taxiway would provide access across Randall Drain connecting the new development area to the existing airside. A new road constructed around the perimeter of the development area would be required in order to access the existing South Commercial area and to provide access to new lots.

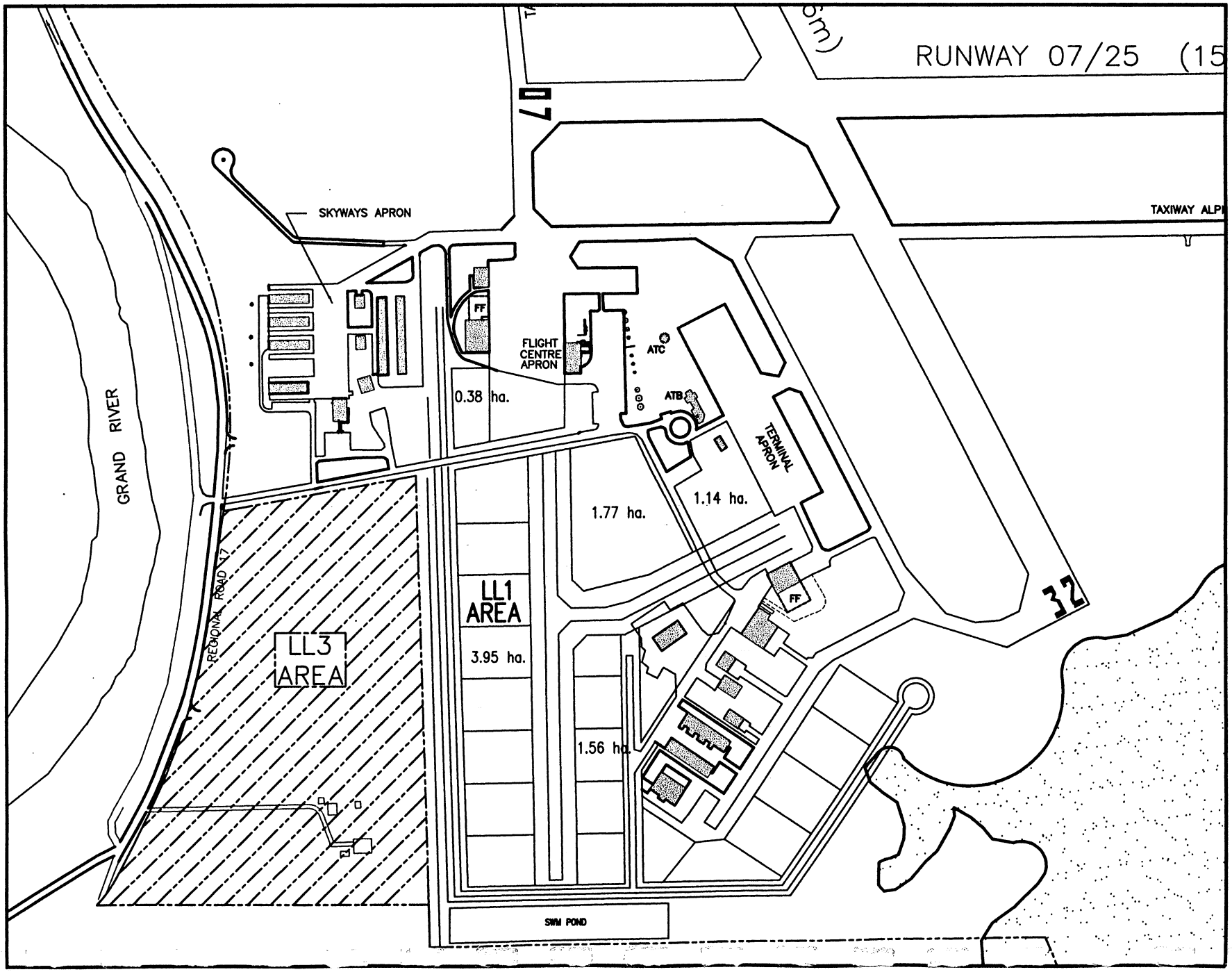
This alternative would provide approximately 8.5 ha. of leasable land.

The primary benefit of this alternative is that the Randall Drain would not require relocation. A constraint of this alternative is that the land is not used to its highest efficiency. There are fewer lots produced in this alternative over the previous alternative. The deeper lot depth provided under this scheme is not required, given the typical hangar development found at the airport. Therefore many of the land parcels would be under utilized.

The capital cost for this alternative is $1,200,000.

Alternative LL3

A third alternative is the purchase the property between the existing airport property and Regional Road 17, south of the entrance road. This area could be used to expand either LL1 or LL2. It is not expected that there would be a need for this amount of leasable property within the time frame of this master plan. This land does need to be evaluated in conjunction with the final design of LL1 or LL2 as there may be some economic benefit to purchase this land and reserve future space instead of moving the Randall Drain.



WATERLOO REGIONAL AIRPORT

AIRPORT BUSINESS PLAN

LEGEND:

FUTURE RUNWAY/TAXIWAY PAVEMENTS

PROVINCIALLY SIGNIFICANT WETLANDS

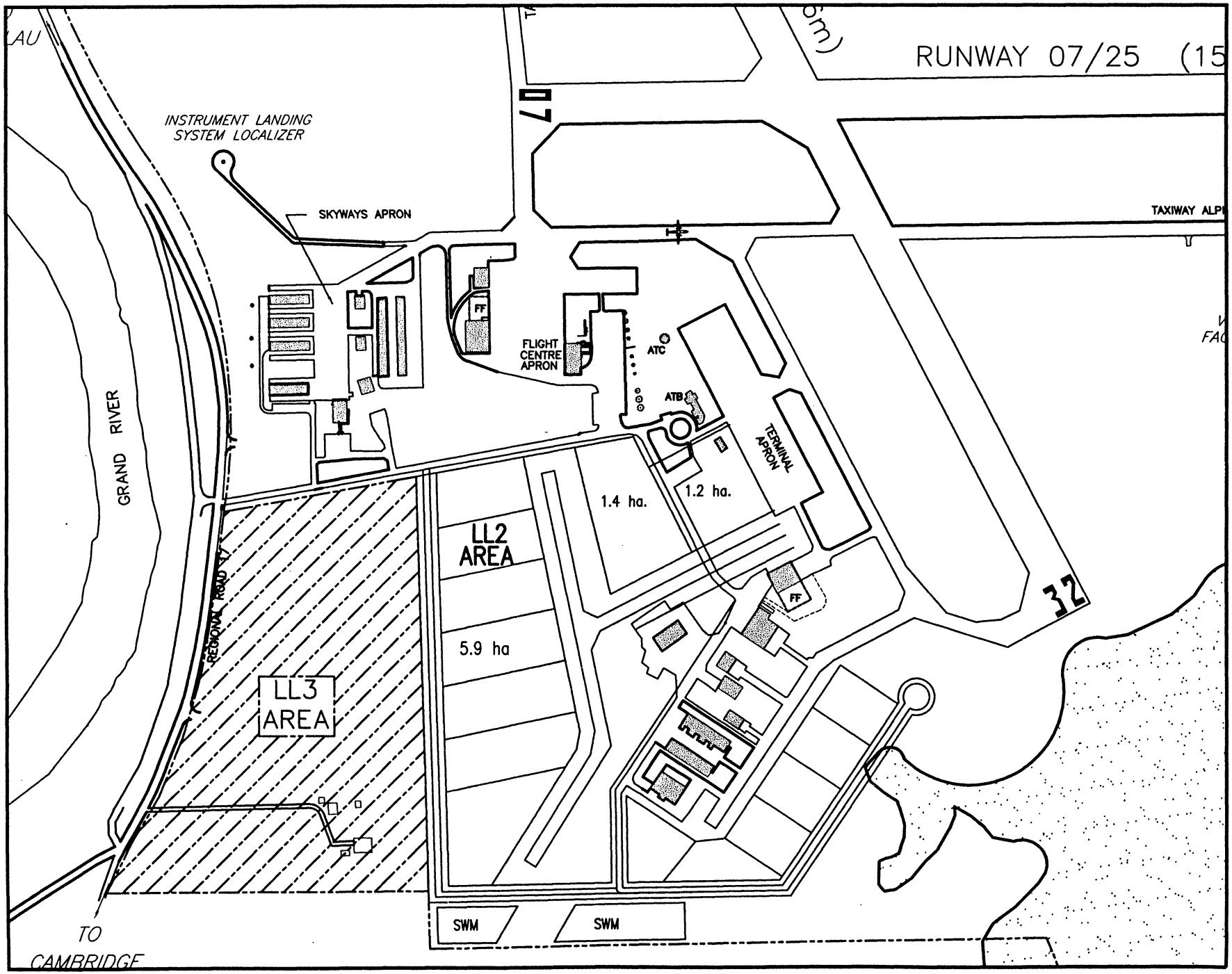
PROPOSED COMMERCIAL DEVELOPMENT

ALTERNATIVE LL1 & LL3

FIGURE 7.8

August 1998

AVGROUP



WATERLOO REGIONAL AIRPORT

AIRPORT BUSINESS PLAN

LEGEND:

FUTURE RUNWAY/TAXIWAY PAVEMENTS

PROVINCIALLY SIGNIFICANT WETLANDS

PROPOSED COMMERCIAL DEVELOPMENT

ALTERNATIVE LL2 & LL3

FIGURE 7.9

August 1998

AVGroup

7.5 Sanitary and Water Services

The provision of appropriate utilities and services is critical to the future development of the airport. The current use of individual septic and water systems could compromise future development of the leased land areas at the airport. Individual septic systems limit the density and placement of development. Future expansion of the existing terminal building or construction of a new facility could also be constrained because of the need to accommodate a septic field. In this regard, it is recommended that the Region initiate the preparation of servicing plans for the airport.

7.6 Power

It is anticipated that the current airport electrical supply system will meet the airport's needs for the foreseeable future. As additional airside field and edge lighting is installed, the Field Electrical Centre will also need to be upgraded.

If there is a significant increase in scheduled passenger service, the maintenance facility and terminal building should have stand-by generators.

7.7 Gas

It is anticipated that the gas supply, recently provided to the airport will adequately meet the needs of the airport for the foreseeable future.

7.8 Regional Transportation

It is important that vehicle access to the airport not impact existing communities. Waterloo Regional Airport is presently well served by the existing regional road and highway system with good access provided to all of the surrounding communities. Access from the west could be further enhanced with the proposed extension of Fairview Rd. across the Grand River and from the north by the proposed Breslau by-pass.

8.0 Airport Management

8.1 Management Alternatives

In recent years a transition has taken place with respect to the management and operation of airports. Once the domain of Transport Canada, airports throughout Canada are now being transferred to local/regional communities. In many respects, the Region of Waterloo and its predecessors were pioneers in the management of a community-based airport.

With the transition of the airports from federal government, there is a strong emphasis on the airport as a business entity and economic generator. For this reason, many communities are opting for airport management frameworks that are based on business principles, rather than infrastructure management practices.

In their acquisition of airports, local and regional municipalities are evaluating a number of management alternatives in an attempt to find an appropriate and cost effective solution.

The following are brief descriptions of some of the alternatives that could be considered as an option to the current management framework established for Waterloo Regional Airport.

Privatization of Airport

Under this scenario, the airport would be sold outright to the private sector. In the National Airports Plan, there are no communities that have opted for this alternative, although there are a number of privately owned airports that contribute significantly to their local community. A notable example is Buttonville Airport, located northeast of Toronto.

It is assumed that the primary benefit associated with the privatization of the airport is that the Region and taxpayer could be released of any financial obligation to support the operation of the airport.

This situation, however is probably unlikely, in that the private owner of the airport would likely turn to the Region for annual subsidies to cover operating deficits incurred by the airport in providing a "service to the community". In the case of Buttonville, the Region of York contributes an annual subsidy of $200,000 to the airport. In recent years the airport has also received Provincial subsidies that are $1,500,000 annually.

With the forthcoming termination of these subsidies, the owners of the airport have suggested publicly that they may have to close the airport if subsidies are not continued.

There are a number of concerns associated with the privatization of a community airport.

These include:

- the community would lose ability to provide input on how the airport is managed or operated;
- to accommodate the annual operating loss it is likely that the operator would have to reduce levels of service and undertake less maintenance, resulting in a loss of benefit to the community;
- community interests could lose out to corporate objectives.

With respect to Waterloo Regional Airport, it is unlikely that the private sector would have interest in airport because revenues are well below operational expenditures, and the existing infrastructure cannot be financially self-sustained with the general aviation activities that presently take place at the airport. To attract private sector ownership, the Region would have to provide some form of compensation to cover operating losses.

Private Sector Management

Under this scenario, the Region would continue to own the airport and the day to day management of the airport would be contracted out to an airport management firm. In Canada, there are a number of private firms and airport authorities that provide third party management services to regional and local airport owners.

Management contracts can vary widely in scope of services, method of remuneration and length of term. Two local airports which have recently contracted out for management services, Hamilton International Airport and Oshawa Airport.

In the case of Hamilton International Airport, the Region of Hamilton-Wentworth entered into a long-term contract with TradePort International Corporation to assume total responsibility for the management, operation and financing of the airport. Under the agreement, TradePort is not paid a management fee from the region, but rather, derives its income from revenues generated from airport and development related activities.

In the case of Oshawa Airport, the City of Oshawa has contracted management services to Serco, an airport management firm. Serco provides management and operations personnel to operate the airport. These personnel are supplemented by additional city staff.

Benefits of private sector management include:

- a potential to lower management/operating costs at airports which have high staffing levels and/or restrictive union agreements;
- private sector management firms can often supplement basic management services with in-house expertise in areas such as marketing, noise management, and airline/tenant negotiations;
- private sector management likely to adhere to business principles and practices;
- potential to undertake financing for capital projects.

Concerns associated with private sector management include:

- the private sector will strive for profitability in its operation. This typically means handling more planes with heavier payloads;
- operating costs may have to be subsidized by the airport owner.

Airport Authority / Commission

Airport authorities are intended to be not for profit corporations that are financially independent business entities. As such, they operate the airport as a business.

An airport authority is comprised of a Board of Directors who are nominated and appointed through a process that is acceptable to the municipality. Board memberships often include representatives from local business and economic development interests, community groups, labour, and consumer interests. The appointment of elected officials is generally avoided.

The day to day operation of the airport would be provided by a management and operations staff who are contracted by the authority and would report directly to the board.

The benefits of an airport authority include:

- with an airport authority, there is greater freedom to make decisions based on business principles;
- the airport authority allows airport administration the ability to tap more directly into the resources of the community;
- the airport authority allows municipalities to insulate themselves from the decision making process and from criticism;
- the airport authority minimizes political interference;
- airport authorities often have the ability to make decisions more quickly, providing a better response to market opportunities as they arise.

Concerns associated with an airport authority are:

- airport authorities are often perceived as another layer of the bureaucratic hierarchy;
- the airport authority is dependent upon the strength and skills of its board members;
- airport authorities are sometimes perceived by the public to serve only the business interests of the community. For this reason it is very important to have a well defined policy with respect to appointee nomination that includes representatives from the community.

Regional Management

In 1996 the airport staff and management were transferred to the Regional Municipality of Waterloo and has been part of the Transportation Division in the Engineering Department. There are no issues regarding the quality or level of service provided by staff since the transition.

The benefits of Regional management are:

- increased involvement and participation from the community in the decision making process
- more accountability and accessible to the public through Regional Councillors
- access to the Region's human resources and financial systems and quality standards

Concerns associated with Regional management are:

- inability to react quickly to new business opportunities

8.2 Marketing/ Business Development Program

The airport is an integral part of the economic development of the Region of Waterloo. It is marketed by local economic development organizations, the Chamber of Commerce, the CTT, and by the Region.

The marketing plan needs to ensure the business community that the airport is a viable operation that will enhance their activities.

The Region needs to ensure that the marketing for the airport is consistent with the short term and long term direction of Regional Council. The airport manager will ensure that the local economic development organizations are informed and kept up-to-date.

Marketing is also required to convince companies to locate their operations at the airport. If the second phase of commercial development proceeds, it is in the best interest of the taxpayers to lease the property as quickly as possible to maximize revenue and reduce the burden on the tax levy. The airport manager must develop a plan, in conjunction with the local economic development agencies to find companies that are compatible with the approved land use.

9.0 Approval Process

Achieving an appropriate and balanced relationship between the airport and the surrounding neighbours is key to both the long-term viability of the airport and the well-being of the business community. The interface between airport and community touches upon a number of key elements. These include: land use planning, vehicular traffic, and noise impacts.

Given the public's increased sensitivity to aircraft noise and the importance to the community of the airport's long-term viability, consideration should be given to adoption of land use policies that go beyond those provided in the Provincial Policy Statement.

9.1 Development Approval

There are a number of processes that any development at the airport must comply with before being granted final approval. Projects are subject to the provisions of the Regional Official Policies Plan (ROPP), Local Official Plans (OP), the Conservation Authority Act and associated regulations, and federal regulations. Table 9.1 lists many of the major projects outlined in the master plan.

9.2 Airside Leased Land Development

The Region currently leases land at the airport to individuals and businesses. Section 7.4 presented the various options for new development. These new developments shall be strictly for aviation-related individuals and businesses that require airside access. Some examples would be aviation repair and maintenance, hangars, FBO, flight training, and aviation related technology. The business would need to have a direct tie to aviation, not just being close to an airport for transportation savings.

Currently, each new tenant must obtain a site plan approval from the Township of Woolwich. The process is complicated because the Region does not have a comprehensive grading and development plan in place. The site plan approval process could be streamlined if the Region received approval for the entire development area. Each leasee would then have to ensure that its plan was consistent with, and approved by the Region before applying for a building permit from the Township.

The Region needs to prepare a site plan consistent with the recommendations of the Master Plan and apply to the GRCA and Woolwich for approval. The Region will need to follow the Canadian Environmental Assessment Act for specific projects which receive any funding from the Federal Government.

Table 9.1 Approval Summary

	Project	Approval Authority [note 1]
On Site (inside airport boundary)	Overall site plan for airside leased land	Regional Council Woolwich & GRCA - site plan
	Individual developments by Leasee	RMOW (lease) RMOW -project site plan approval within the context of the overall site plan approved by Woolwich Woolwich - building permit
	Storm water	Woolwich GRCA MOE RMOW (budget)
	Aprons / taxiways / runways	RMOW (budget/ tender) Federal EA - if Federally funded Environmental impact assessments as required GRCA
	Maintenance items	RMOW (budget / tender) GRCA
	Water & sewer	RMOW (budget / tender) Woolwich - building permit GRCA Health Department / MOE
Off Site (outside airport boundary)	Flight path obstacle clearance	RMOW (budget)
	Obstacle clearance for a runway extension	Federal zoning
	Official plan / zoning by-law change	RMOW - ROPP Kitchener / Cambridge / Woolwich - Local OP

Note 1- Airports are a unique entity under provincial and federal regulations. Aviation related planning and projects are not subject to the Ontario Environmental Assessment Act. This position is supported by case law at the Divisional Court level in Ontario[3].

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[3] Re Woodrow et al and Minister of Environment and Transportation for Ontario [1992] O.J. No. 1847

9.3 Official Plans

Regional and Area Municipality Official Plans establish a policy framework for public and private sector decisions regarding immediate and long-term land use, servicing, transportation, infrastructure investments, and economic matters. These plans should be updated to be more specific on airport land use issues.

Currently the Official Plans only identify the limit of development based on the NEF / NEP contours, the need for warning clauses in purchase agreements, and other noise mitigation measures. It is suggested that the ROPP Policies 11.9.6 and 11.10.1 (Appendix I) be revised to reflect the current role of the airport and changes to Provincial policy. Area Municipality plans should also be revised accordingly.

Operational goals and objectives for the airport are stated in Section 3.4 of this Master Plan and are not recommended for inclusion in any of the Official Plans. Official Plans deal with land use planning, not operational issues. Decisions regarding changes to land use around the airport need to be consistent with the capacity expectations of the airport and meet all provincial and federal regulations and guidelines.

It is recommended that during the next 5 year review of the ROPP scheduled to begin in December 2000, changes consistent with the following be made:

Policy 11.10.1 (revise)
The Region will complete an Airport Master Plan to define the role of the Waterloo Regional Airport and the services it provides to the community. The Master Plan will consider, but not be limited to, the following:

i) changing economic conditions, demand for scheduled or unscheduled commercial air transportation including cargo and charter services, and the need for airport facilities to accommodate pilot training;

ii) improvements to aircraft performance and the availability of new types of aircraft;

iii) mitigation measures to minimize negative impacts associated with the operation of the airport on surrounding residential communities; and

iv) the demand for on-site facilities to accommodate aviation-related commercial and industrial development.

Policy 11.10.2 (add)
To meet long-term needs for aviation related services, the Region will update the Airport Master Plan every five years. The Region will consider amendments to this Plan as required to establish appropriate policies resulting from updates to the Airport Master Plan.

Existing Policies 11.10.2 to 11.10.5 would be renumbered as 11.10.3 to 11.10.6 respectively.

The Airport Master Plan recommendation to bind the Master Plan to the ROPP is:

> Any **future changes to the 2000 Airport Master Plan** which would result in the development of new runways, significant extension of existing runways, or increases in the PLR or Code rating of the airport, will only be implemented following recognition of such changes through amendment to the Regional Official Policies Plan.

These changes will provide the communities surrounding the airport with a framework for public consultation and input if there is ever a need to expand the capacity of the airport in the number of movements, allowable plane size, or to deal with additional runways to cope with noise mitigation.

10.0 Preferred Development Concept

The preferred development concept for the Waterloo Regional Airport requires that the objectives stated in Sections 1.5 and 1.6 be met. The ongoing activities at the airport and its ability to respond to market opportunities must not be compromised. The need for corporate aviation, flight training, air cargo and scheduled air services will increase as the manufacturing, services industries and economic well being of Waterloo Region and Canada's Technology Triangle grow.

The preferred airside development concept is to extend runway 07-25 to 7,000 ft. This extension would improve the operational capability of aircraft currently utilizing the airport, and would support the airport's objective of establishing YKF as a premier corporate airport. The preferred concept also includes the provision of an Instrument Landing System for Runway 07 and relocating the existing system to the new east end of Runway 25. This configuration will significantly mitigate noise over Kitchener. Although the demand for a longer runway is not present today, it is recommended that construction occur as soon as possible for noise mitigation. If noise issues are not resolved today, the future role of the airport could be compromised as a result of political pressure to severely restrict operations.

The preferred development concept proposes that a new terminal building be constructed on lands surrounding the current terminal facility. The current facility will meet the needs of Trillium Airlines in the short-term but will be unacceptable if scheduled flights to the United States start or if a second carrier starts service at YKF.

With respect to aviation related development at the airport, the preferred concept is to expand the available leased land south and west of the existing terminal building. The exact configuration of the leased land will be determined in 2000 when a site grading and stormwater management plan is developed. It is also proposed that future commercial development include an expansion of the Flight Centre and terminal aprons to accommodate growth of flight training, passenger and charter facilities. To meet the very long-term leased land needs of the airport, consideration should be given to the acquisition of the parcel of land located between Taxiway Charlie and Regional Road 17.

Figure 10.1 shows the proposed site plan. These recommendations, and a discussion on the balance of the issues presented in Section 7 follow.

10.1 Airside Development/ Reserve

Airside Development/Reserve applies to those lands that are currently used or required for the movement of aircraft. Uses described under this designation include:

- runways
- taxiways
- aprons
- transitional and approach zoning
- electronic protection areas, i.e. ILS, VOR
- air traffic control line of sight protection areas
- lands held in reserve for future airside development.

At present, the airport has a capacity for approximately 220,000 annual aircraft movements.

Within the 20-year time frame of the Airport Master plan, it is not anticipated that demand will approach the current airfield capacity of 220,000 movements. Therefore, based on operational requirements, construction of an additional runway is not being considered as a component of the master plan.

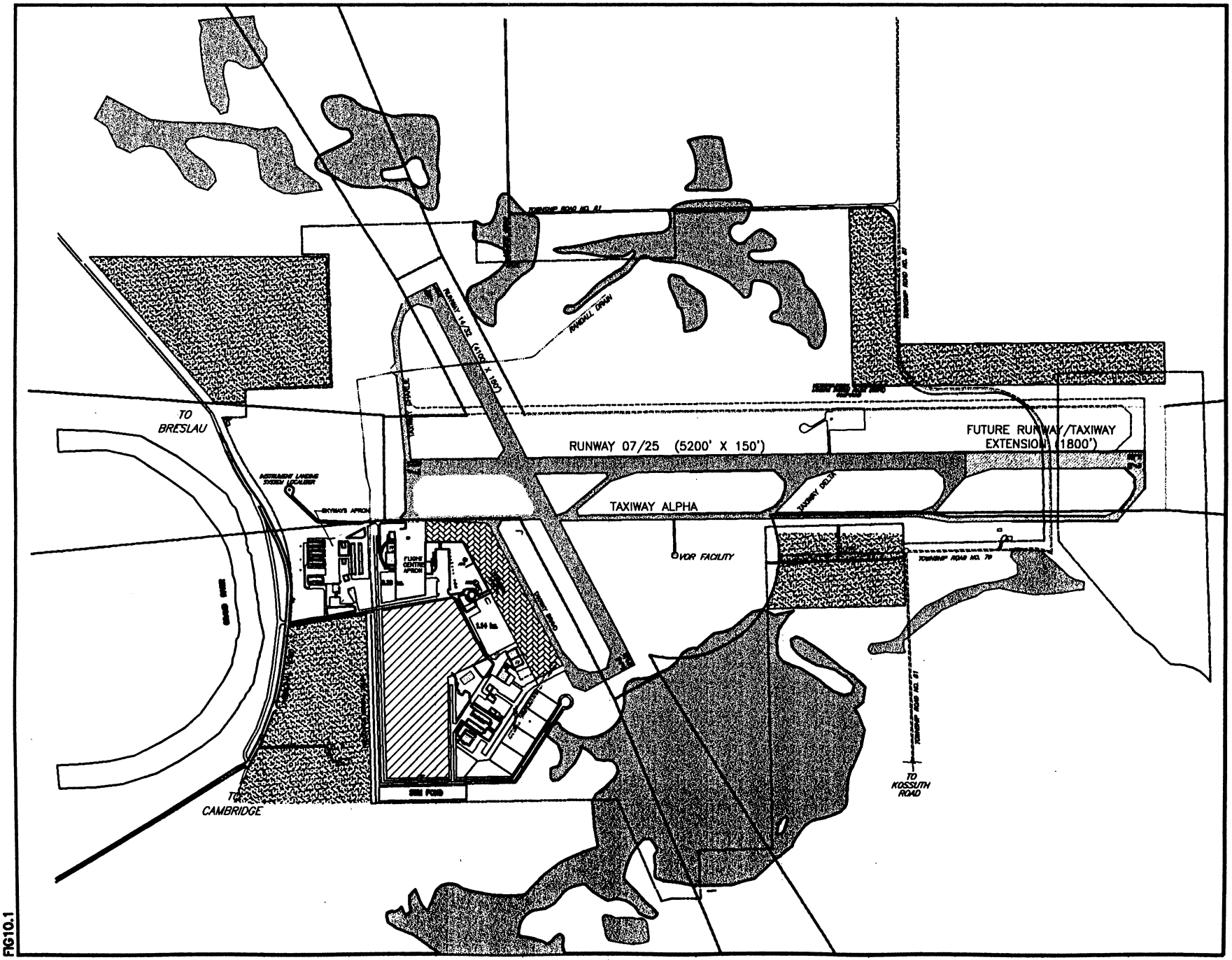
The Master plan does however recognize the need to expand the existing Runway 07-25, and reserves appropriate lands within the current airport property to accommodate this alternative (Alternative A1).

With respect to airside development, the objectives of the Airport Master plan that have been achieved are:

- enhance the operational efficiency and safety of the existing runway and taxiway system;
- provide flexibility for the future expansion of the existing airside infrastructure to provide improved operating efficiencies for existing airport operators and to attract new market opportunities;
- provide airside access to new airside leased lands.

Under the Airport Master plan, the airside reserve accommodates the future extension of Runway 07-25 to 7,000 ft. This extension can be accommodated within the existing airport boundaries, however Township Road 81 would have to be closed or relocated.

In addition to providing a reserve area for the extension of Runway 07-25, the Airside Development Area protects for extension of airside aprons and taxiways.



WATERLOO REGIONAL AIRPORT

AIRPORT BUSINESS PLAN

LEGEND:

- LONG TERM AIRPORT COMMERCIAL
- PROVINCIALLY SIGNIFICANT WETLANDS
- EXISTING AIRPORT PROPERTY LIMITS
- EXPANSION
- SHORT TERM AIRPORT COMMERCIAL

SCALE:

PROPOSED DEVELOPMENT CONCEPT

FIGURE 10.1

October 1998

FIG10.1

10.2 Terminal Reserve Area

The Airport Master plan identifies a reserve area associated with the expansion of the existing terminal or the construction of a new facility (Alternative T1). This area is located adjacent to the existing facilities. Retaining the terminal function in this area will provide the airport with flexibility to either redevelop the existing facilities or provide new infrastructure.

With the introduction of regional airline services, there will be a requirement for terminal facilities that can properly accommodate passenger processing and airline operations functions. These functions cannot be accommodated in the existing terminal.

Given the strong economic growth experienced in the region, the growth of the scheduled passenger services in the near future is a very likely. It is important that the airport is in a position to respond quickly to an air services proposal. A new, permanent terminal facility should be considered to meet the demands of the scheduled passenger services. Preliminary plans should be developed in 2000.

10.3 Airport Support

Airport Support functions are those required to support the operations of the airport. These include airport maintenance, emergency response, and air traffic control. These services are provided by both the airport administration and by outside agencies such as Nav Canada.

With respect to airport support functions, the objectives of the Airport Master plan are:

- reserve sufficient lands for airport support functions and provide appropriate facilities;
- locate and provide airport support services in an efficient and cost effective manner;
- ensure that the provision of airport support facilities does not impede the future development of the airport.

Under the preferred development concept, lands adjacent to the airport maintenance building will be held in reserve for future support functions including a sand storage building.

10.4 Airside Leased Land

The development plan proposed for Waterloo Regional Airport provides for the expansion of the South Commercial Area as the primary area for leased land development. Airside access will be provided via a new taxiway that would be constructed to Code C standards, with a pavement load rating of 9. Landside access would be provided by a new access road located along the west perimeter of the airport property.

The development of the leased land area can be undertaken as a phased development over time, based on demand. A variety of lot sizes can be accommodated. The standard lot size is 60m x 80m. This lot size accommodates an average sized single-bay

corporate/general aviation hangar (30 m x 30 m) plus associated apron and vehicle parking.

Lands adjacent to an expanded terminal apron would be reserved for the development of a high quality, full service FBO facility. Such a facility is necessary if the airport is to seriously compete with other airports for corporate aviation activity.

To accommodate the expansion of leased land development in the long term, it is recommended that the Region give consideration to the acquisition of a parcel of land located between Taxiway Charlie and Regional Road 17. With excellent airside and landside access, this parcel of land is ideal for commercial development. Long term commercial development can also include lands north of Runway 07-25, although these properties are less accessible.

The exact configuration of the leased land will be determined in conjunction with the site grading and storm water management plans for the area.

10.5 Non-Airside Commercial

To date, there has been little demand at the airport for non-airside commercial activities. These activities would include:

- warehousing
- light manufacturing
- offices
- hospitality services
- training facilities

The assumption is that these activities will not be located within the airside leased land areas unless they are aviation related. With respect to office and administrative activities, consideration should be given in the development of any new terminal facility, to provide lease able office space for aviation related businesses as is the practice today.

In the long term, should there be a demonstrated demand for non-airside commercial activities, then consideration by the Township of Woolwich and the Region should be given to the rezoning of lands between Regional Road 17 and the South Commercial Area or other areas near the airport for development by the private sector.

10.6 Sanitary Sewer

It is suggested that Class 4 communal sewage disposal systems could be appropriately constructed at the airport to serve the terminal building and commercial developments. These sewage disposal systems would be located in areas not suitable for airside or commercial development. Potential areas include lands located under the approach to Runway 07 and lands located adjacent to the VOR.

10.7 Water

To ensure the appropriate supply and quality of water to future terminal and commercial development facilities it is suggested that a communal water supply system could be appropriately developed for the airport. Water could be supplied to various airport users from a common well source located on the airport property.

10.8 Stormwater

To meet future stormwater management requirements on the airport, it is proposed that stormwater management ponds be constructed at the southwest corner of the South Commercial Area. These ponds would be designed to accommodate the stormwater flows for the entire commercial development area. Stormwater from the ponds would then be released at a controlled rate into the Randall Drain.

It is recommended that the Randall Drain be considered for relocation to the western perimeter of the airport property, between the airport access road and the southern airport property boundary. This would allow the remaining lands south of the terminal to be developed in an unencumbered manner. In the long term, additional stormwater management facilities will be constructed as an integral part of commercial development.

10.9 Airport Noise

It is in the best interest of the airport to operate in a manner that does not increase the noise impact on the surrounding residential communities. From the noise contour analysis it can be generally concluded that the noise on the surrounding community will not increase beyond the NEF 30 established in 1985. Quieter new jet planes and the retirement of old noisy ones will offset the effects of increased traffic at the airport. It is imperative that the Aeronautical Noise Management Committee continue to meet and resolve operational issues on an ongoing basis.

It is recommended that a noise monitoring and flight tracking system be installed in 2000. The Aeronautical Noise Management Committee has proposed a series of operational improvements that should be implemented immediately and forwarded to Transport Canada for approval. The committee does not recommend nighttime closures as it believes that operational changes, enforcement of noise abatement procedures, an ILS and lengthened runway will significantly mitigate noise in the residential areas. The empirical evidence collected with the noise monitoring equipment will be evaluated by the committee to determine if further restrictions are required.

10.9.1 Noise Management Plan

The most effective way to minimize single event noise occurrences is through the implementation of an appropriate Noise Management Plan.

The primary objective of a noise management plan is to limit noise impacts to their lowest possible level while recognizing legitimate operational and safety requirements. Elements that should be included in a noise management plan include:

Consultation

The noise management plan establishes protocols with respect to consultation with the aviation industry, air traffic control and the public regarding noise matters. The objectives of the consultation process is to monitor the noise abatement measures and provide viable solutions to concerns. To facilitate consultation, the Aeronautical Noise Management Committee was established, with representation from the airport, airport stakeholders and the community. The primary objective is to create a noise management plan (NMP) to mitigate noise impacts to their lowest possible level while recognizing legitimate operational and safety requirements. Elements of the NMP should include:

- noise abatement procedures;
- nighttime operations guidelines/restrictions;
- stakeholder/public consultation process;
- educate current and future residents about coexisting with the airport

In addition to this, the Airport Advisory Committee will be tasked with dispute resolution with respect to noise concerns.

Noise Abatement Procedures

Noise abatement procedures for Waterloo Regional Airport have been implemented for turbojet and turbofan aircraft. These procedures cover preferential runway use during nighttime hours and specific procedures for arrival and departure. There are a number of alternatives proposed by the Aeronautical Noise Management Committee that will have to be approved by Regional Council and Transport Canada.

Noise Monitoring System

The acquisition of noise monitoring equipment would provide real time data regarding noise created by aircraft arrivals and departures. This data can be used to support adjustments to the noise management program. It is recommended that the airport administration implement a noise monitoring system to facilitate noise abatement analysis.

Ground/Maintenance Operations Directives

These directives cover ground servicing and aircraft maintenance operations such as engine runups, and establish protocols with respect to when and how work may be carried out.

10.10 Land Acquisition Requirements

No additional lands are required in order to accommodate the extension of Runway 07-25 to 7000 ft. In order to accommodate approach lighting, land will need to be acquired through a purchase or an easement.

It is recommended that the airport acquire property south of Runway 07-25 to accommodate the removal of obstacles. Acquisition of, or easements on this property can be held in reserve, to be used for commercial development in the future.

To accommodate long-term leased land development, it is recommended that the airport acquire the parcel of land located between Taxiway Charlie and Regional Road 17.

10.11 Phasing of Capital Works

With respect to the phasing of capital projects identified in the Airport Master Plan, priority is based on demand and the requirement to meet market initiatives. Phasing is broken down into short term (1 - 5 years), medium term (6 - 10 years) and long term (11 - 20 years). Table 10.1 summarizes the projected costs for the short, medium and lon-terms respectively. A draft 10 year capital forecast is in Appendix H.

10.12 Airport Management

It is recommended that the airport remain under its present management and political governance system.

10.13 Regional Official Policy Plans

It is recommended that the Regional Official Plans and Local Official Plans be amended with the framework described in Section 9.3 of the Master Plan.

Table 10.1 Capital Project Timing

DESCRIPTION	Short-Term					Medium-Term						Long-Term									TOTAL
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2,010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2000-2019
EXPENDITURES																					
TERMINAL BUILDING																					
Electrical Upgrade	200,000																				200,000
Modifications	250,000	2,500,000																			2,750,000
																					2,950,000
AIRSIDE MAINTENANCE																					
Terminal Apron - Reconst / Expansion	530,000			50,000	775,000				50,000	500,000											1,905,000
Runway 14/32 Reconstruction		50,000	1,500,000																		1,550,000
Flight Centre Apron Expansion-South						30,000	330,000														360,000
Glycol Containment					200,000																200,000
West Apron Hangar Area							125,000														125,000
Taxiway Alpha		100,000	600,000																		700,000
Taxiway Bravo					300,000																300,000
Taxiway Charlie				300,000											120,000						420,000
Taxiway Delta								100,000													100,000
Engine run-up area on 32					120,000																120,000
Terminal Apron Expansion - South					50,000	500,000															550,000
AWOS Sensors		200,000																			200,000
Obstacle Removal & Property				300,000																	300,000
Airport Wildlife Fencing	150,000																				150,000
																					7,580,000
AIRSIDE EXTENSION																					
07/25 Extension	50,000		300,000	2,500,000																	2,850,000
ILS on Runway 07				100,000	900,000																1,000,000
Runway 25 Approach Lighting					350,000																350,000
Runway 07 Approach Lighting					600,000																600,000
High Speed Taxiway Runway 25						50,000	250,000														300,000
Noise & Flight Tracking System	220,000																				220,000
																					5,320,000
LEASED LAND DEVELOPMENT																					
Leased Land Development	50,000	500,000													750,000	400,000				270,000	1,970,000
Pavement	300,000			70,000	500,000	40,000	50,000	50,000				140,000					120,000			330,000	1,600,000
Communal Sanitary Sewer				50,000	150,000				30,000	120,000											350,000
Communal Water				50,000	310,000				30,000	190,000											580,000
Road Access			50,000	200,000	50,000	180,000															480,000
Randell Drain / Stormwater		75,000		450,000																	525,000
																					5,505,000
TOTAL PROPOSED EXPENDITURES	1,750,000	3,425,000	2,450,000	4,670,000	4,395,000	800,000	755,000	150,000	110,000	810,000		140,000			870,000	400,000	120,000			600,000	21,355,000

11.0 Recommendations

The preferred development options as presented in Section 10 are:

- Mitigate airport noise through changes to the published noise abatement procedures as recommended by the Aeronautical Noise Management Team and approved by the Airport Advisory Committee, Regional Council and Transport Canada;

- Implement a noise monitoring and management system;

- Install a Instrument Landing System (ILS) on runway 07 and change the published procedures in Canada Air Pilot to ensure pilots use the ILS. The ILS cannot be installed without lengthening runway 07/25. An addition of 1,800 feet is preferred;

- Upgrade the existing passenger terminal building to accommodate the needs of regular scheduled passenger service. The Region should pursue a shared funding strategy with all carriers;

- Provide additional airside leased property available to allow businesses and individuals to construct hangars and aviation related operations;

- Undertake the necessary studies to deal with the future infrastructure servicing needs (ie water, sewer, power, storm drainage);

- Maintain the existing airport management structure and administration under the present Regional organization and political governance system;

- Update the Airport Master Plan every five years with the next update in 2005;

- Revise the appropriate clauses of the Regional Official Policies Plan at its next five year review consistent with Section 9.9. Any future changes to the 2000 Airport Master Plan which would result in the development of new runways, significant extension of existing runways, or increases in the pavement load rating or code rating of the airport, will only be implemented following recognition of such change through amendment to the Regional Official Policies Plan;

- Apply for Federal and/or Township of Woolwich zoning to match a 7,000 foot runway 07-25.

- Establish an airport capital financing plan to implement the Airport Master Plan commencing with the 2001 airport capital program and ten-year forecast.

Environmental Approvals

Airports are a unique entity under provincial and federal regulations. Airports and aviation related projects are not subject to the Ontario Environmental Assessment Act. This position is supported by case law at the Divisional Court level in Ontario. The Region will need to follow the Canadian Environmental Assessment Act for specific projects which receive any funding from the Federal Government.

The Region will continue to follow all federal and provincial regulations concerning all present and future activities at the airport.

Financial Implications

There are limited funds available for safety related, non-expansionary capital projects from Transport Canada through the Airports Capital Assistance Program (ACAP). The Region would be required to have at least 1,000 scheduled passengers per year to be eligible for ACAP. Therefore the Region will need to fund the majority of the projects from its own reserves or debentures. Section 10 lists all of the projects with estimated capital costs. Appendix H is a draft 10 year capital forecast.

Addendum

The Draft Master Plan was considered by Regional Council on March 22, 2000. The recommendations of the Project Team as listed above were approved. Appendix J contains the minutes of the meeting.

In addition to the Project Team's recommendations, Regional Council approved the following:

> Implement immediately a night time flight restriction between 2300 hours and 0700 hours daily for landings on runway 07, and take-offs on runway 25, except for medical and industrial emergencies with the prior approval of the Airport Manager or designate.
>
> The composition of the Airport Noise Management Committee be considered by the Noise Management Committee, the Airport Advisory Committee and Regional Council.

Staff will be forwarding the nighttime restriction recommendation to Transport Canada and CARAC for approval.

Appendix A
Transport Canada TP1247

PART IV

AIRCRAFT NOISE

4.1 GENERAL

An accurate assessment of the annoyance resulting from exposure to aircraft noise is essential to both aviation planners and those responsible for directing the nature of development of lands adjacent to airports.

This Part will discuss noise measurement, annoyance prediction, the Noise Exposure Forecast and the Noise Exposure Projection. It also contains an assessment of various land uses in terms of their compatibility with aircraft noise.

4.1.1 Noise Measurement

The sound pressure level created by an aircraft (or any other noise source) can be measured by means of a sound level meter. The microphone of the sound level meter senses the pressure fluctuations over a short period of time. The sound pressure is the root mean square value of the difference between atmospheric pressure and the instantaneous pressure of the sound, the mean being read over several periodic cycles. For mathematical convenience, the logarithmic parameter called sound pressure level (SPL) is used. The unit of sound (noise) measurement is the decibel (dB).

A particular sound signal may comprise several different frequencies to which the human ear may respond in various ways. In order that noise measurements may relate more closely to loudness as judged by the average person, sound level meters are equipped with weighting networks which make use of information related to the frequency response characteristics of the human ear. Some sound level meters have the capability of reading on A, B, C, and D weighting scales, and decibel values are correspondingly indicated as dB(A), dB(B), dB(C) or dB(D), according to the weighting network used. However, the dB(A) is the most common. The dB(D) value was designed as the preferred measuring unit for aircraft noise, but dB(A) is widely used since it has been found to have good utility in determining annoyance reactions to a wide variety of noises occurring in communities.

The noise metric known as Perceived Noise Level (PNL), measured in the unit PNdB, provides a frequency weighting system which attempts to more closely approximate the subjective reaction of the human ear to an aircraft noise stimulus. Although weighting networks are available which provide a means of directly measuring approximate PNL values, i.e., dB(D), true PNL values are determined by the analysis and treatment of sound pressure levels in various 1/3 octave bands.

A more sophisticated noise metric, the Effective Perceived Noise Level (EPNL), expressed in the unit EPNdB, was developed specifically for use in the measurement of aircraft noise. This metric is basically similar to the PNL except that corrections have been applied to account for the effects of discrete tones and the duration of the noise event, i.e., factors which contribute to the annoyance of the listener.

4.1.2 Predicting Annoyance

In addition to the annoying characteristics of an individual noise signal, overall subjective reaction to noise is dependent on the number of times the disturbance occurs as well as the daily distribution of these events. These factors must be included in any noise forecasting system if it is to be applicable to the communities located in the vicinity of airports. The Noise Exposure Forecast (NEF) sysem used by Transport Canada takes into consideration all of these factors.

The NEF system provides for the summation of noise from all aircraft types operating at an airport based on actual or forecast aircraft movements by runways and the time of day or night the events occur. The large number of mathematical calculations necessary for the construction of NEF contours requires the use of computer techniques for the practical application of this system.

4.1.3 The Noise Exposure Forecast System (NEF)

Effective Perceived Noise Level is the basis for estimating noise annoyance in the Noise Exposure Forecast system.

The data required for determining NEF contours consist of EPNL (see 4.1.1) vs distance information for various aircraft types, along with generalized aircraft performance data. In calculating NEF at a specific location, the EPNL contribution from each aircraft operating from each runway is assessed by considering the distance from the point in question to the aircraft, and then obtaining EPNL values from the appropriate EPNL vs distance curve. The noise contributions from all aircraft types operating on all runways are summed on an anti-logarithmic basis to obtain the total noise exposure at that one location. Thus, the determination of NEF contours is strictly a numerical calculation procedure. As stated previously, due to the large number of mathematical calculations involved, computer techniques provide the only practical means of constructing NEF countours.[1]

4.2 NOISE EXPOSURE CONTOURS

There are three types of noise exposure contours produced depending on the time element involved. These are Noise Exposure Forecasts (NEFs), Noise Exposure Projections (NEPs) and Planning Contours. Both NEFs and NEPs undergo a rigorous review and approval process within Transport Canada Aviation before public release.

1. Kingston, Beaton and Rohr, *A Description of the CNR and NEF Systems for Estimating Aircraft Noise Annoyance* (R-71-20, Department of Transport, 1971).

TABLE 4

LAND USE TABLES

AIRCRAFT NOISE CONSIDERATIONS ONLY

This land use tabulation should not be considered as an exhaustive listing, but merely as examples of how various land uses would be assessed in the Noise Exposure Forecast zones in terms of community response predictions.

No -Indicates that new construction or development of this nature should not be undertaken.

A -This particular land use may be acceptable in accordance with the appropriate note and subject to the limitations indicated therein.

Yes -The indicated land use is not considered to be adversely affected by aircraft noise and no special noise insulation should be required for new construction or development of this nature.

(a)

NOISE EXPOSURE FORECAST VALUES	>40	40-35	35-30	<30
RESPONSE AREAS	1	2	3	4
RESIDENTIAL				
Detached, Semi-Detached	No	No	B	A
Town Houses, Garden Homes	No	No	B	A
Apartments	No	No	B	A

(b)

NOISE EXPOSURE FORECAST VALUES	>40	40-35	35-30	<30
RESPONSE AREAS	1	2	3	4
RECREATIONAL - OUTDOOR				
Athletic Fields	No	J	K	Yes
Stadiums	No	No	K	Yes
Theatres-Outdoor	No	No	No	H
Racetracks-Horses	No	K	K	Yes
Racetracks-Autos	Yes	Yes	Yes	Yes
Fairgrounds	K	K	Yes	Yes
Golf Courses	Yes	Yes	Yes	Yes
Beaches and Pools	Yes	Yes	Yes	Yes
Tennis Courts	No	K	Yes	Yes
Playgrounds	K	K	Yes	Yes
Marinas	Yes	Yes	Yes	Yes
Camping Grounds	No	No	No	H
Park and Picnic Areas	No	K	Yes	Yes

(c)

NOISE EXPOSURE FORECAST VALUES	>40	40-35	35-30	<30
RESPONSE AREAS	1	2	3	4
COMMERCIAL				
Offices	(F)	(E)	(D)	Yes
Retail Sales	(F)	(D)	Yes	Yes
Restaurants	(F)	(D)	(D)	Yes
Indoor Theatres	No	(G)	(D)	Yes
Hotels and Motels	No	(F)	(G)	Yes
Parking Lots	Yes	Yes	Yes	Yes
Gasoline Stations	Yes	Yes	Yes	Yes
Warehouses	Yes	Yes	Yes	Yes
Outdoor Sales	(E)	(K)	Yes	Yes

(d)

NOISE EXPOSURE FORECAST VALUES	>40	40-35	35-30	<30
RESPONSE AREAS	1	2	3	4
PUBLIC				
Schools	No	No	(D)	(C)
Churches	No	No	(D)	(C)
Hospitals	No	No	(D)	(C)
Nursing Homes	No	No	(D)	(C)
Auditoriums	No	No	(D)	(C)
Libraries	No	No	(D)	(C)
Community Centres	No	No	(D)	(C)
Cemeteries	(N)	(N)	(N)	No

(e)

NOISE EXPOSURE FORECAST VALUES	>40	40-35	35-30	<30
RESPONSE AREAS	1	2	3	4
MUNICIPAL UTILITIES				
Electric Generating Plants	Yes	Yes	Yes	Yes
Gas and Oil Storage	Yes	Yes	Yes	Yes
Garbage Disposal	Yes	Yes	Yes	Yes
Sewage Treatment	Yes	Yes	Yes	Yes
Water Treatment	Yes	Yes	Yes	Yes
Water Storage	Yes	Yes	Yes	Yes

(f)

NOISE EXPOSURE FORECAST VALUES	>40	40-35	35-30	<30
RESPONSE AREAS	1	2	3	4
INDUSTRIAL				
Factories	(I)	(I)	Yes	Yes
Machine Shops	(I)	(I)	Yes	Yes
Rail Yards	Yes	Yes	Yes	Yes
Ship Yards	Yes	Yes	Yes	Yes
Cement Plants	(I)	(I)	Yes	Yes
Quarries	Yes	Yes	Yes	Yes
Refineries	(I)	(I)	Yes	Yes
Laboratories	No	(D)	Yes	Yes
Lumber Yards	Yes	Yes	Yes	Yes
Saw Mills	(I)	(I)	Yes	Yes

(g)

NOISE EXPOSURE FORECAST VALUES	>40	40-35	35-30	<30
RESPONSE AREAS	1	2	3	4
TRANSPORTATION				
Highways	Yes	Yes	Yes	Yes
Railroads	Yes	Yes	Yes	Yes
Shipping Terminals	Yes	Yes	Yes	Yes
Passenger Terminals	(D)	Yes	Yes	Yes

(h)

NOISE EXPOSURE FORECAST VALUES	>40	40-35	35-30	<30
RESPONSE AREAS	1	2	3	4
AGRICULTURAL				
Crop Farms	Yes	Yes	Yes	Yes
Market Gardens	Yes	Yes	Yes	Yes
Plant Nurseries	Yes	Yes	Yes	Yes
Tree Farms	Yes	Yes	Yes	Yes
Livestock Pastures	(M)	Yes	Yes	Yes
Poultry Farms	(L)	(L)	Yes	Yes
Stockyards	(M)	Yes	Yes	Yes
Dairy Farms	(M)	Yes	Yes	Yes
Feed Lots	(M)	Yes	Yes	Yes
Fur Farms	(K)	(K)	(K)	(K)

EXPLANATORY NOTES FOR TABLE 4

The location of the lines between noise zones cannot be fixed exactly. It will therefore be necessary for the responsible public authority to make an appropriate interpretation of what regulations are to apply at a specific location.

In cases where reference is made to a detailed on-site noise analysis, or to peak noise levels, it will be appreciated that the notes are intended to apply specifically at existing airports, where a field assessment is possible. For planning with respect to new airports, such zones should be considered cautionary. Before reaching a final decision with respect to permitting the particular land-use in question, the authority may wish to consider local topographic effects and ambient noise levels, in conjunction with generalized peak noise level "footprints" for the predominant aircraft types to be using the new airport. As an example, the footprints for the DC-9, B-737, BAC-111 have been included in Appendix B.

A. A marginal zone exists near the 30 NEF level where aircraft noise may begin to annoy some residents. It is recommended that developers be made aware of this fact and that they undertake to so inform prospective tenants or purchasers of residential units. In addition, it is suggested that development should not proceed until the responsible authority is satisfied that noise insulation features, if required, have been considered in the building design.[1]

B. The developer should be required to inform prospective tenants or purchasers of residential units that aircraft noise may interfere wth certain activities. Construction should not be permitted to proceed until the responsible authority is satisfied that appropriate noise insulation features have been considered in the building design.[1]

C. These facilities should not be located close to the 30 NEF contour unless the restrictions outlined in Note D are applied.

D. These uses should not be approved unless a detailed analysis is conducted and the required noise insulation features are considered by the architectural consultant responsible for building design.

E. When associated with a permitted land use, an office may be located in this zone provided that all relevant factors are considered and a detailed analysis is conducted to establish the noise reduction features required to provide an indoor environment suited to the specific office function.

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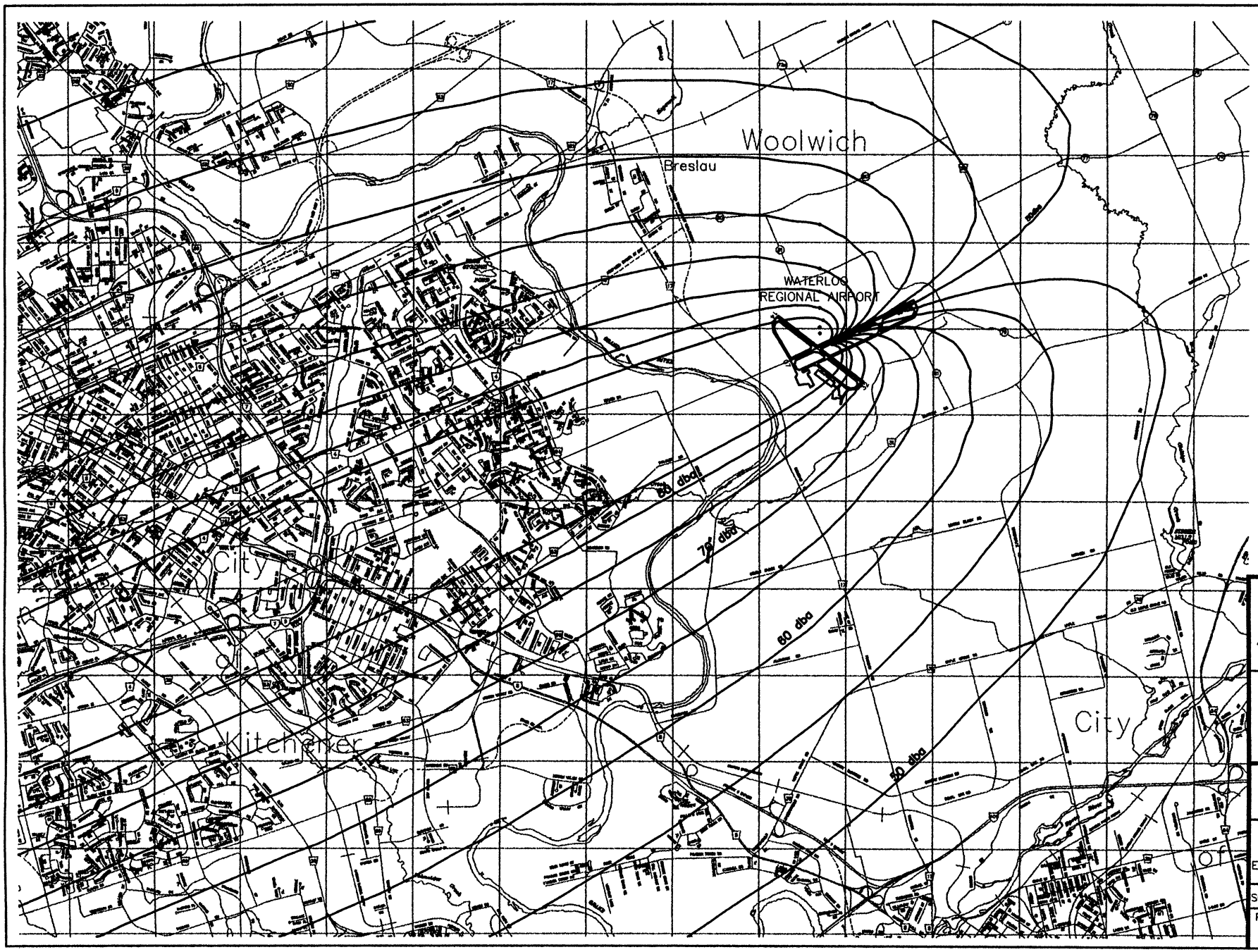
1 The Division of Building Research, National Research Council, working in conjunction with Canada Mortgage and Housing Corporation and the Transport Canada Aviation Group, has developed a technique for selecting residential building components based on NEF values. This information is published in CMHC's New Housing and Airport Noise Handbook. Authorities are referred to this document for assistance in determining appropriate noise insulation features for a particular residential development.

Appendix B
Single Event Noise Contours



CONTOURS AT 5dba
INTERVALS

AVGroup

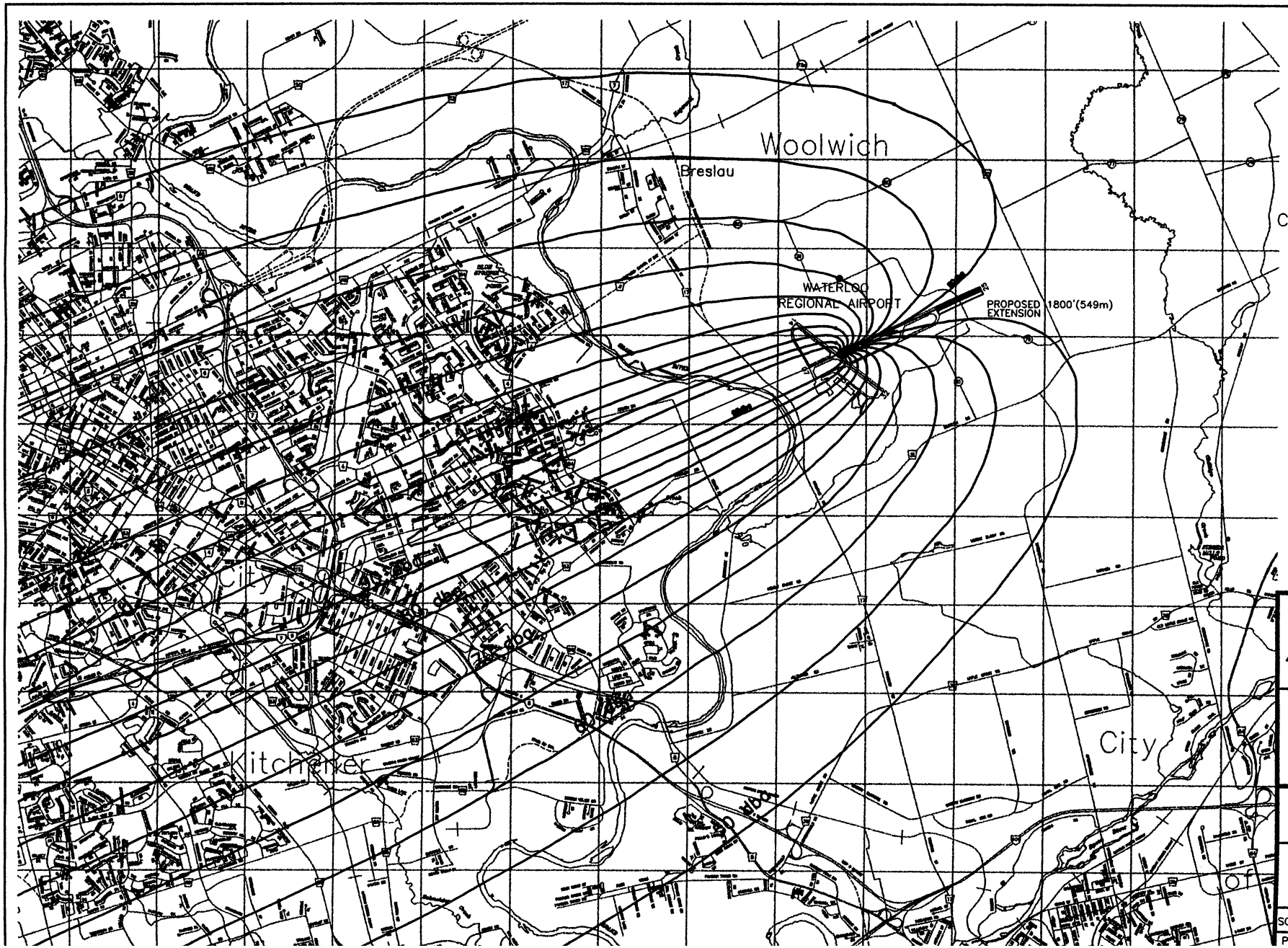
WATERLOO REGIONAL AIRPORT

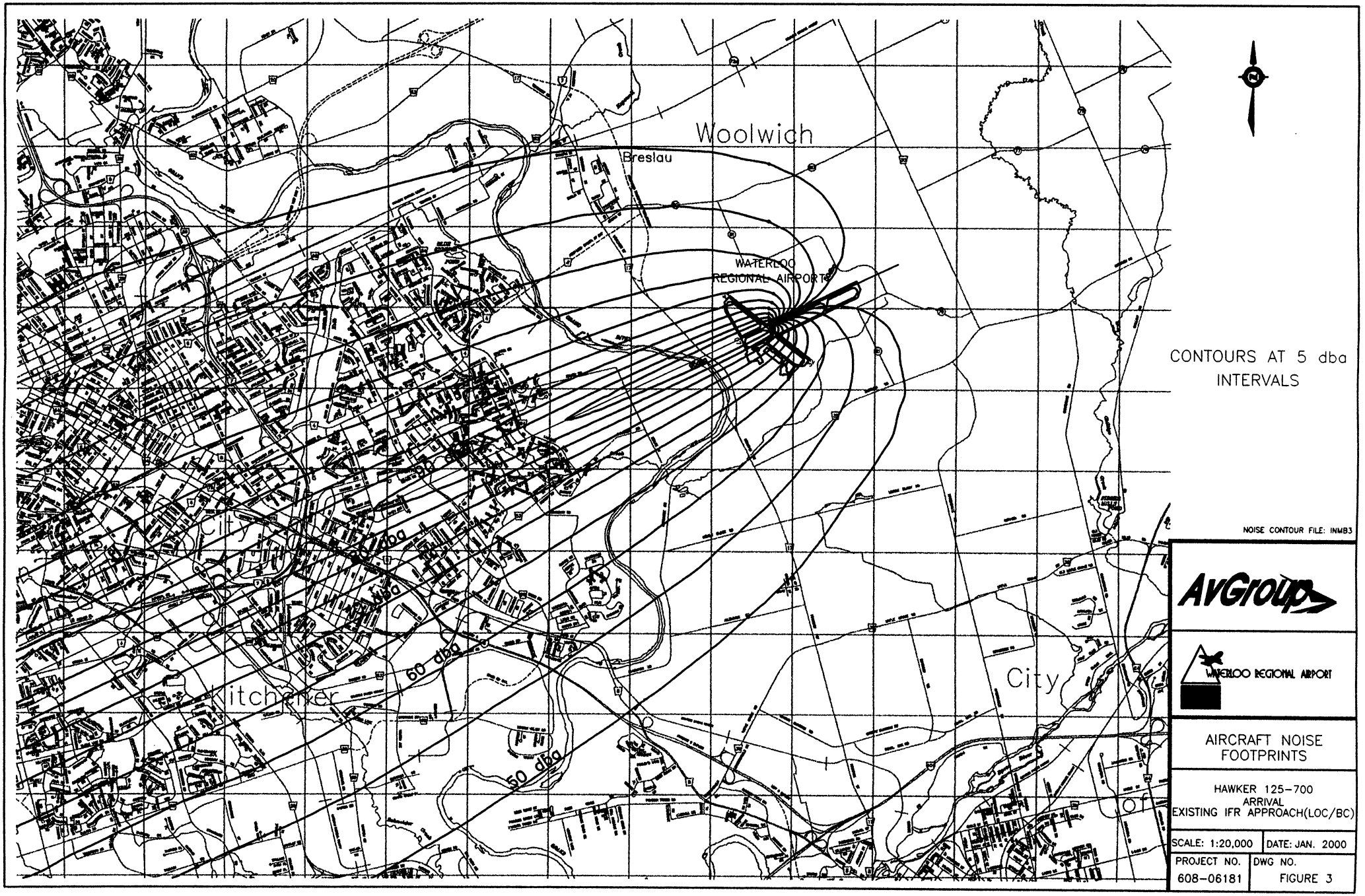
NOISE CONTOUR FILE: INMA1

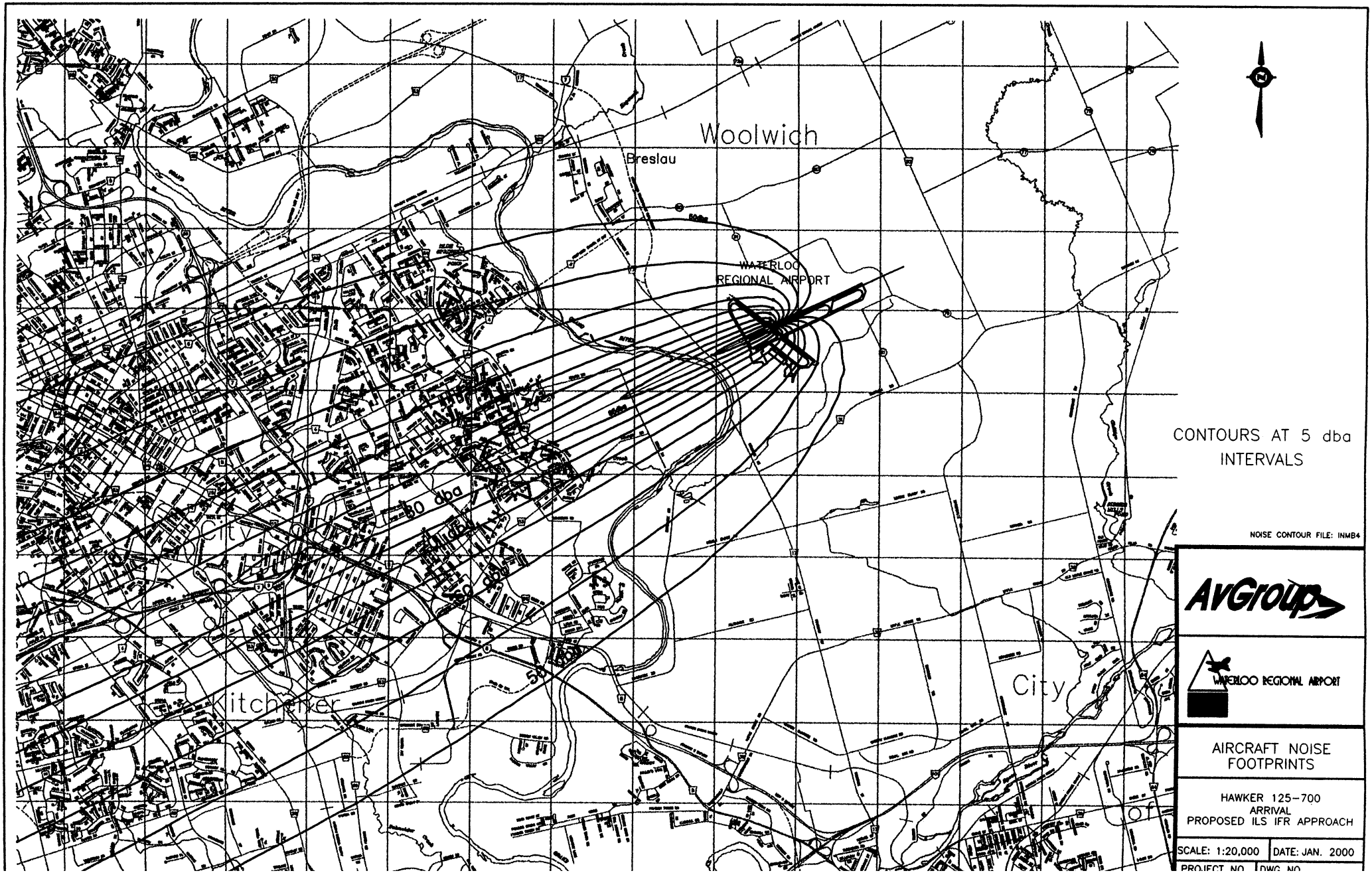
AIRCRAFT NOISE FOOTPRINTS

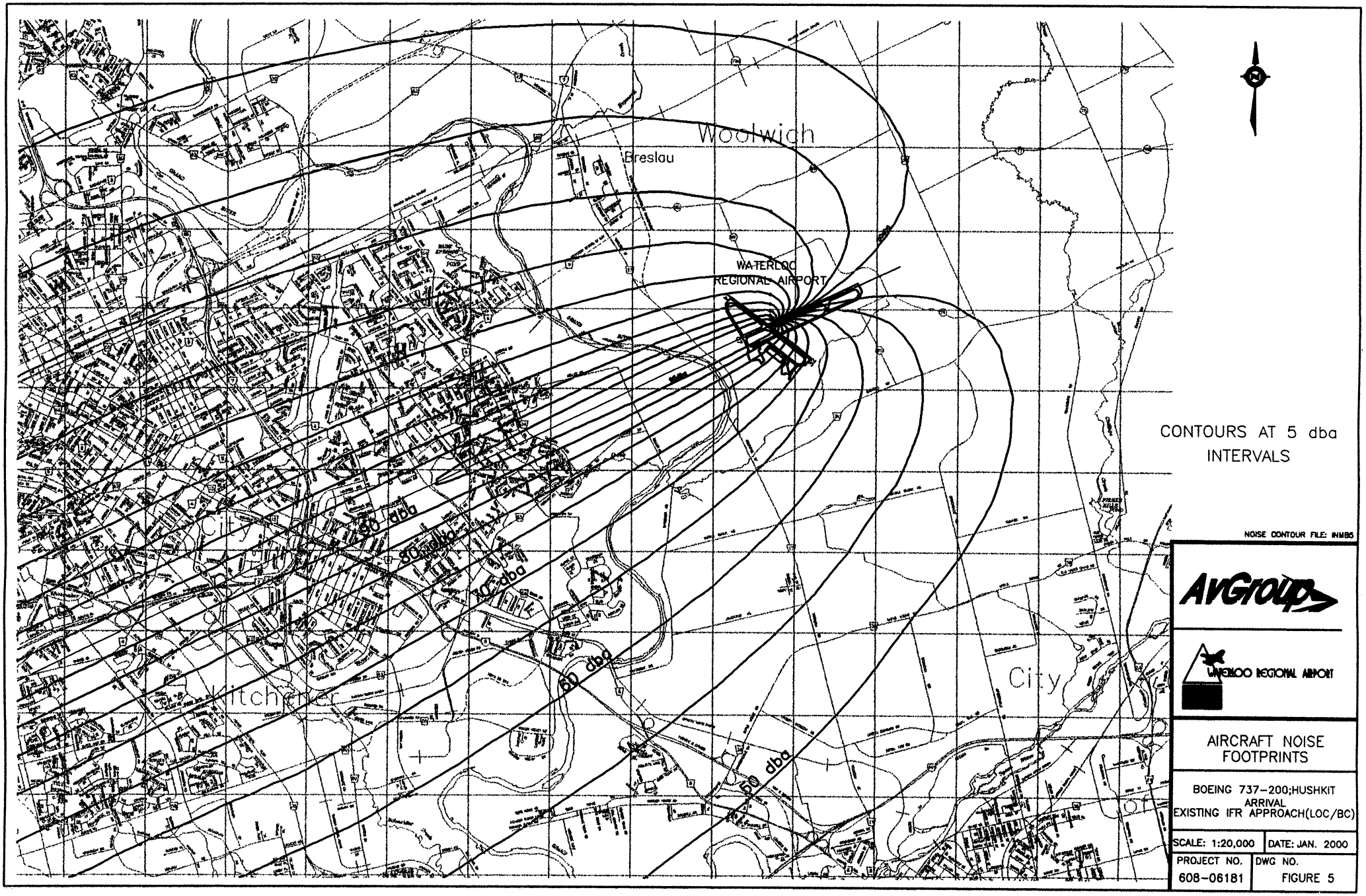
LEARJET 25
ARRIVAL
EXISTING IFR APPROACH(LOC/BC)

SCALE: 1:20,000	DATE: JAN. 2000
PROJECT NO. 608-06181	DWG NO. FIGURE 1


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
PROPOSED 1800'(549m)
EXTENSION
City of
Kitchener
City
of
CONTOURS AT 5 dba
INTERVALS
AVGROUP
WATERLOO REGIONAL AIRPORT
NOISE CONTOUR FILE: INMA2
AIRCRAFT NOISE
FOOTPRINTS
LEARJET 25
ARRIVAL
PROPOSED ILS IFR APPROACH
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
DWG NO.


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
City
Kitchener
City
50 dba
60 dba
50 dba
60 dba
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMB3
AvGroup
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
HAWKER 125-700
ARRIVAL
EXISTING IFR APPROACH(LOC/BC)
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
608-06181
DWG NO.
FIGURE 3


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
80 dba
City
Kitchener
City
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMB4
AVGroup
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
HAWKER 125-700
ARRIVAL
PROPOSED ILS IFR APPROACH
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
DWG. NO.



CONTOURS AT 5 dba INTERVALS

NOISE CONTOUR FILE: INM65

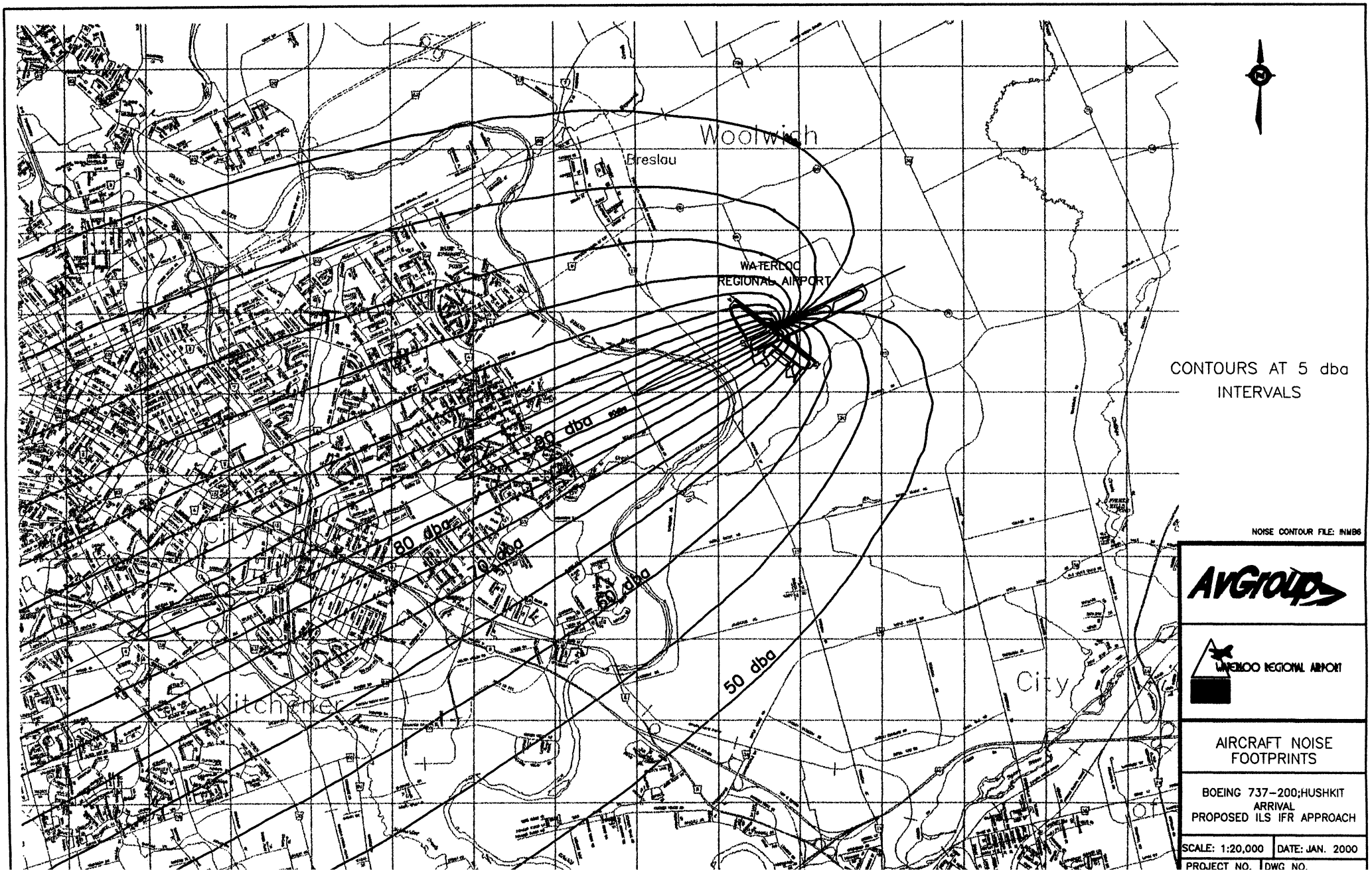
AVGROUP

WATERLOO REGIONAL AIRPORT

AIRCRAFT NOISE FOOTPRINTS

BOEING 737-200;HUSHKIT
ARRIVAL
EXISTING IFR APPROACH(LOC/BC)

SCALE: 1:20,000	DATE: JAN. 2000
PROJECT NO. 608-06181	DWG NO. FIGURE 5



CONTOURS AT 5 dba INTERVALS

NOISE CONTOUR FILE: INMB6

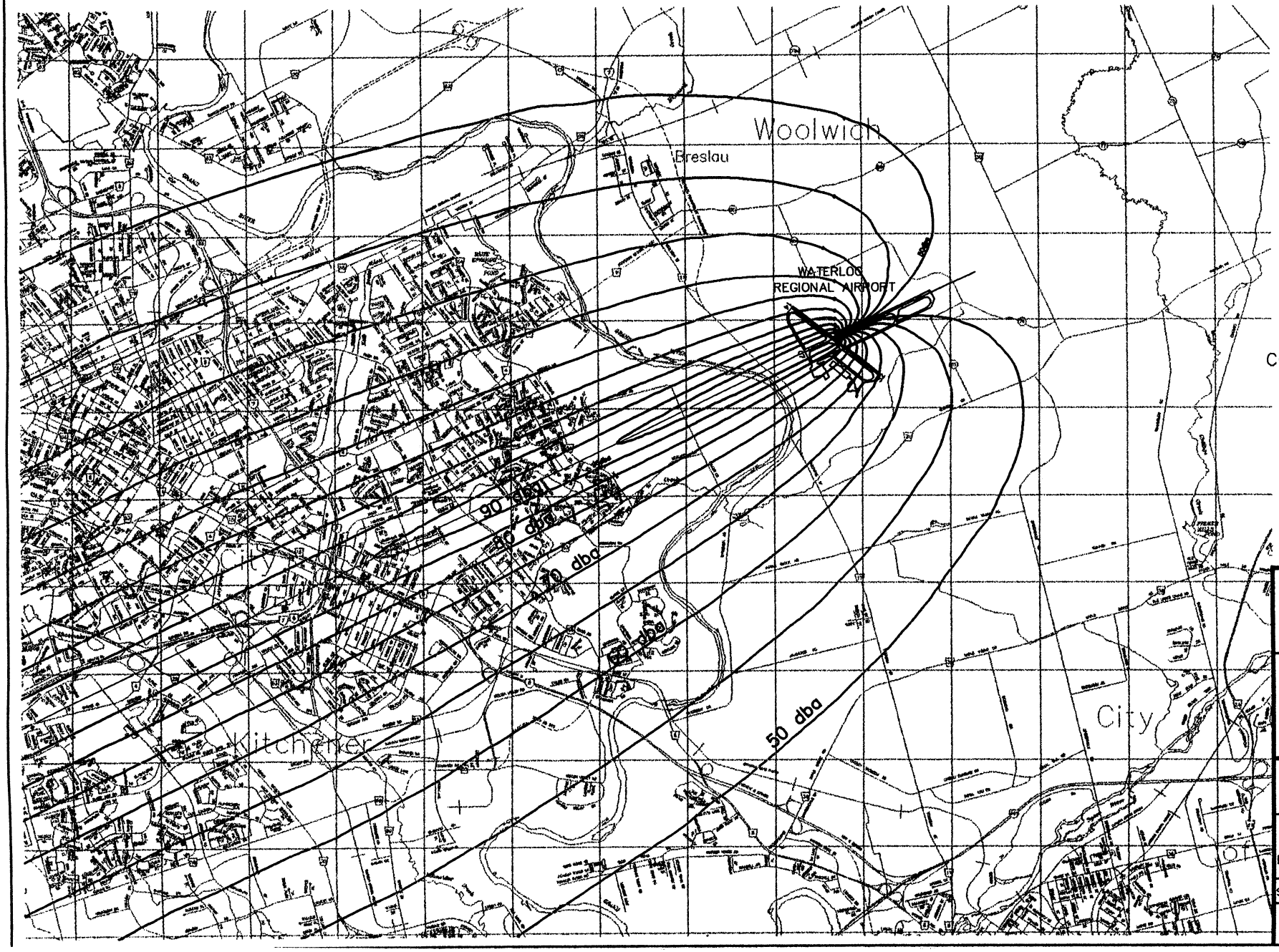
AVGroup

WATERLOO REGIONAL AIRPORT

AIRCRAFT NOISE FOOTPRINTS

BOEING 737-200;HUSHKIT
ARRIVAL
PROPOSED ILS IFR APPROACH

SCALE: 1:20,000	DATE: JAN. 2000
PROJECT NO.	DWG NO.



CONTOURS AT 5 dba INTERVALS

NOISE CONTOUR FILE: INM87

AVGROUP

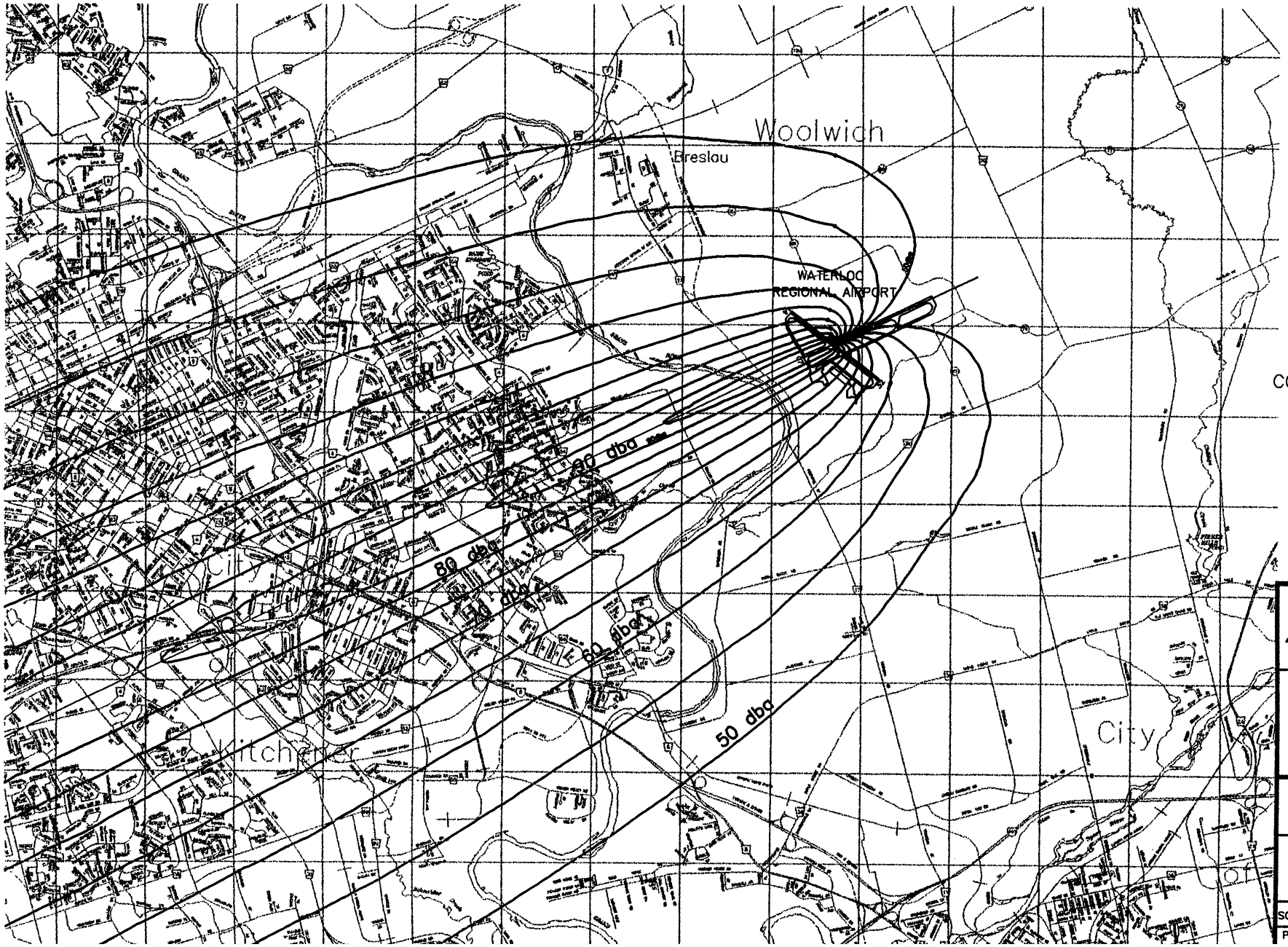
WATERLOO REGIONAL AIRPORT

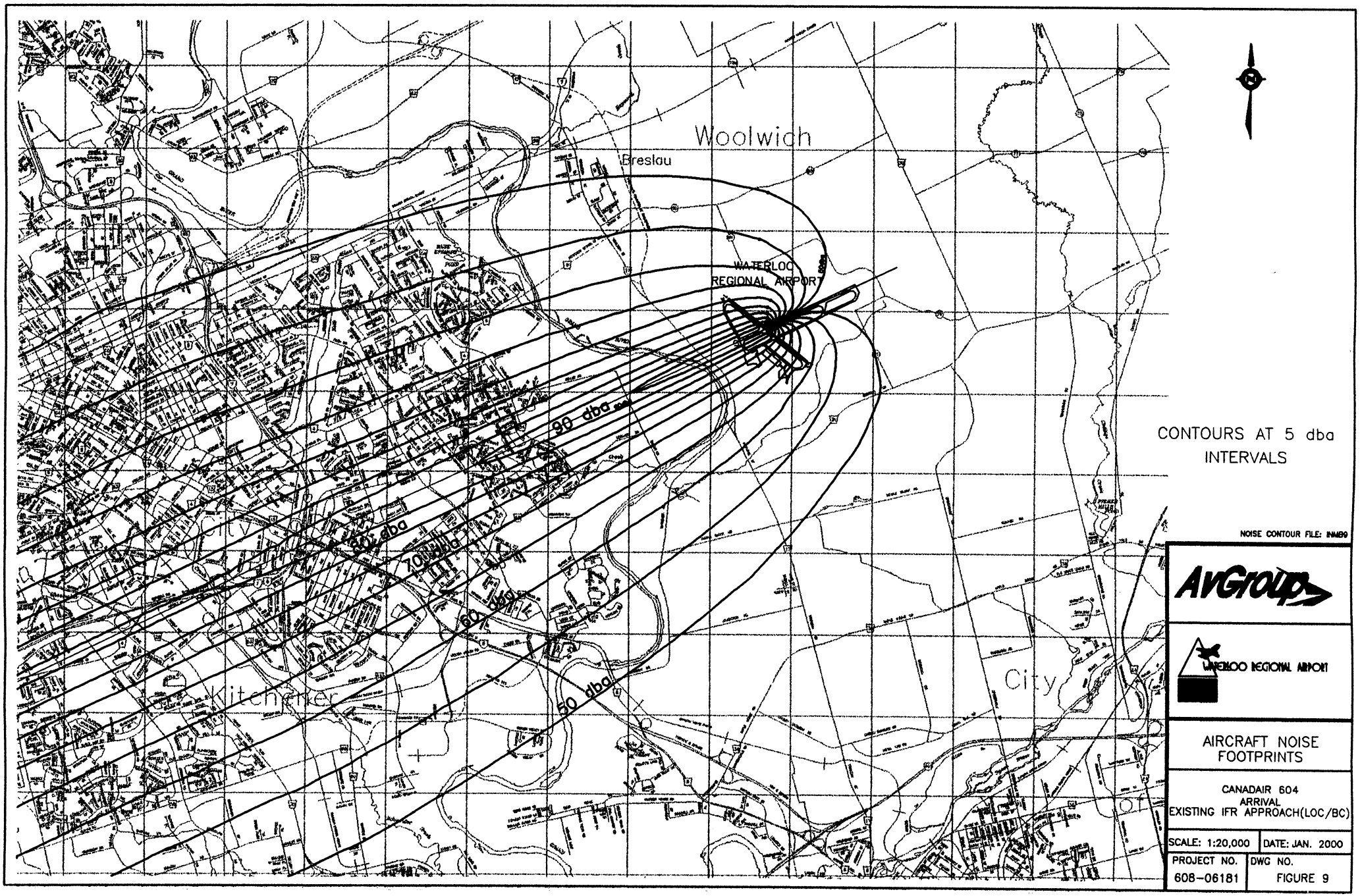
AIRCRAFT NOISE FOOTPRINTS

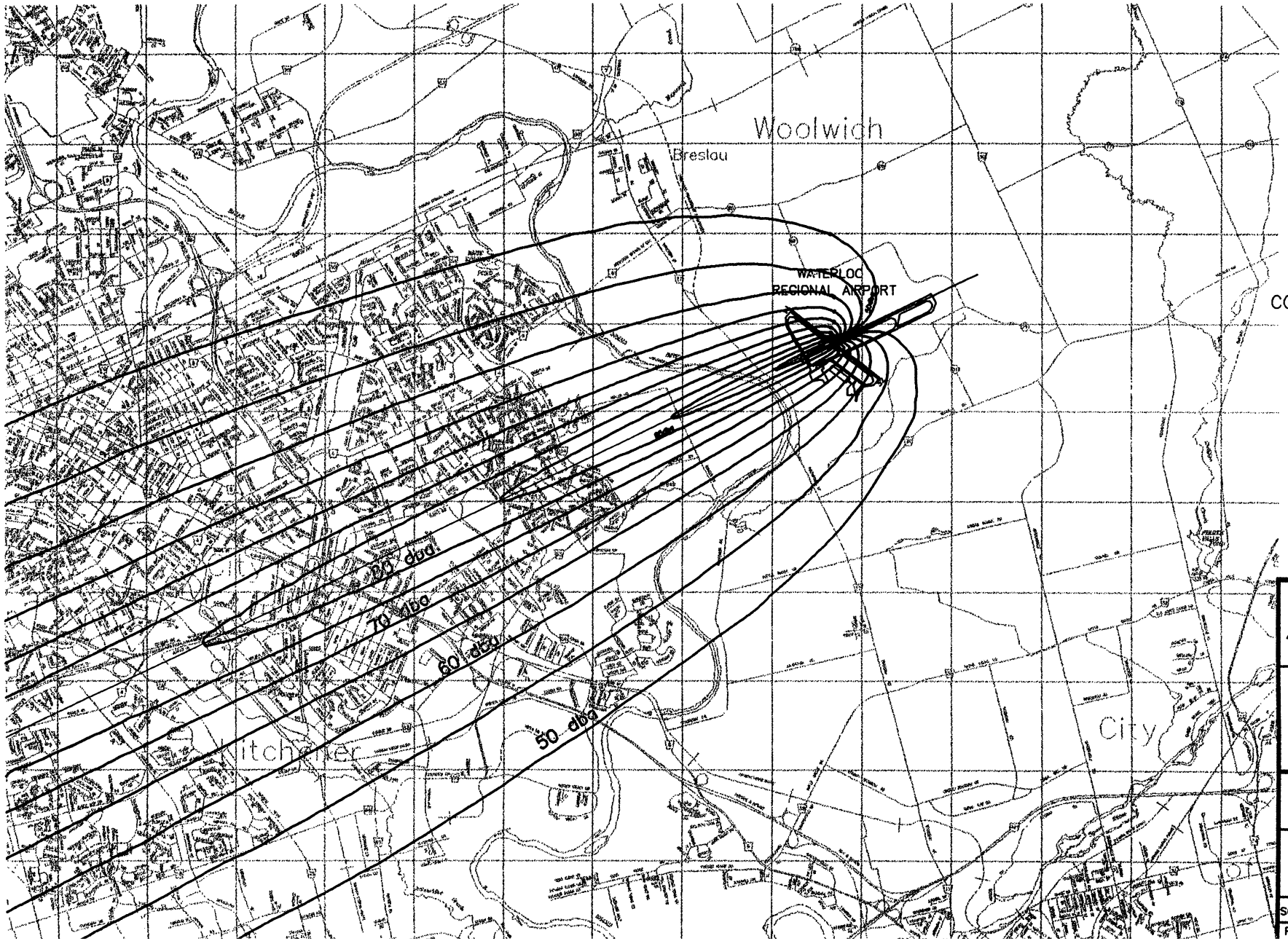
BOEING 737-300
ARRIVAL
EXISTING IFR APPROACH(LOC/BC)

SCALE: 1:20,000	DATE: JAN. 2000
PROJECT NO. 608-06181	DWG NO. FIGURE 7

6181NF_7


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
80 dba
80 dba
80 dba
50 dba
50 dba
Kitchener
City
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMB8
AvGroup
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
BOEING 737-300
ARRIVAL
PROPOSED ILS IFR APPROACH
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
DWG NO.


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
90 dba
80 dba
70 dba
60 dba
50 dba
Kitchener
City
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMB0
AVGroup
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
CANADAIR 604
ARRIVAL
EXISTING IFR APPROACH(LOC/BC)
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
608-06181
DWG NO.
FIGURE 9



CONTOURS AT 5 dba INTERVALS

NOISE CONTOUR FILE: INM810

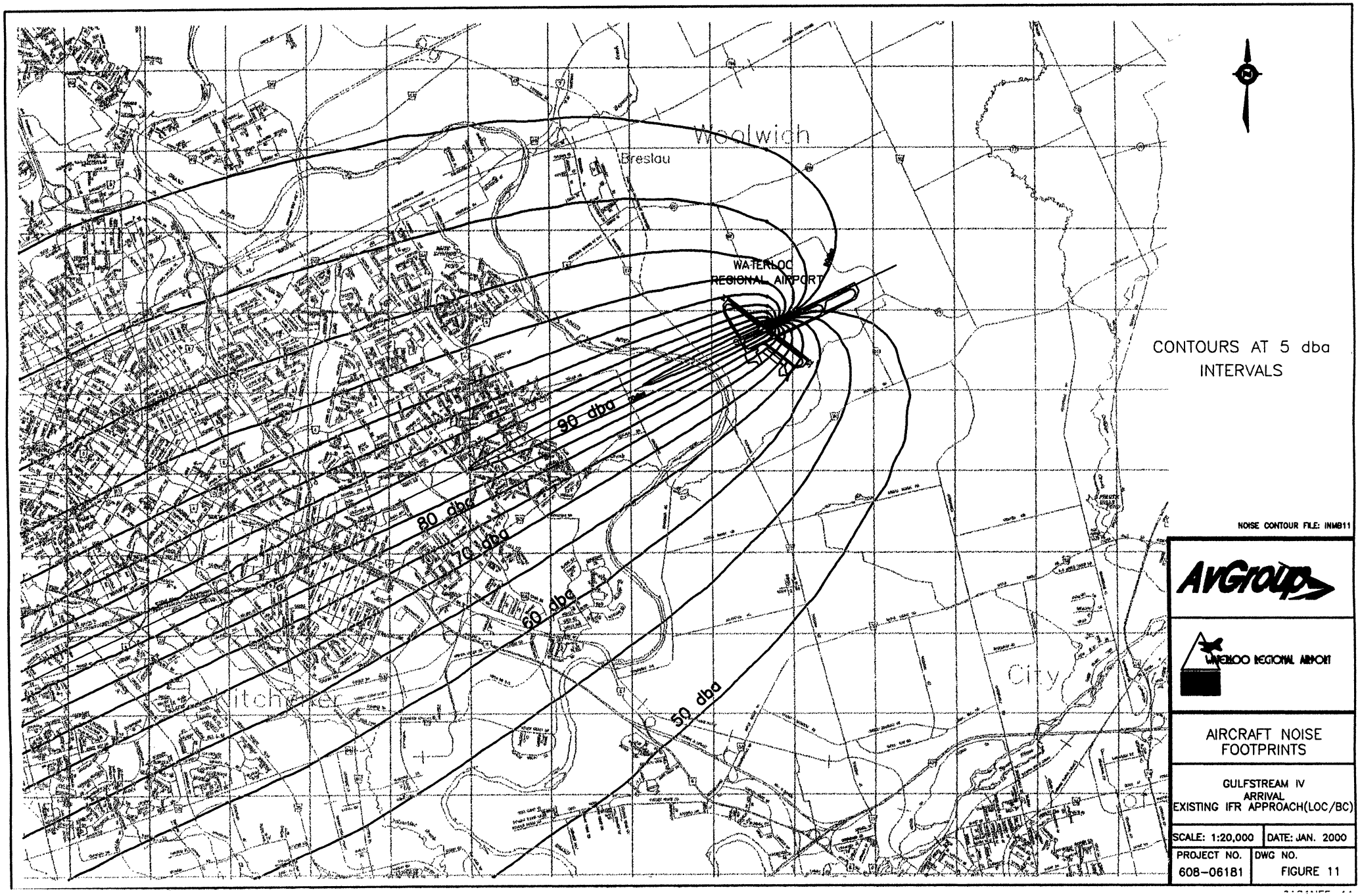
AVGROUP

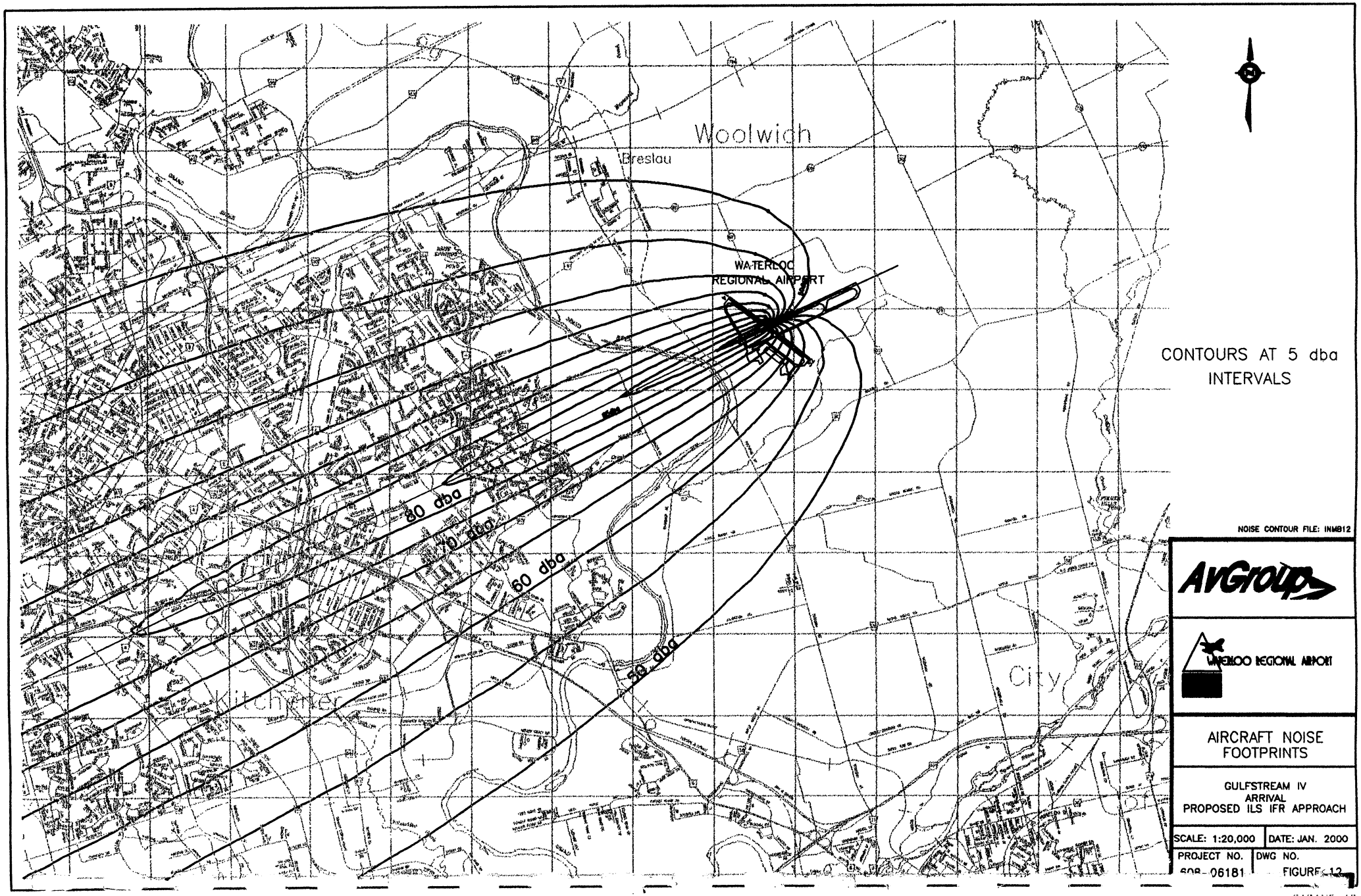
WATERLOO REGIONAL AIRPORT

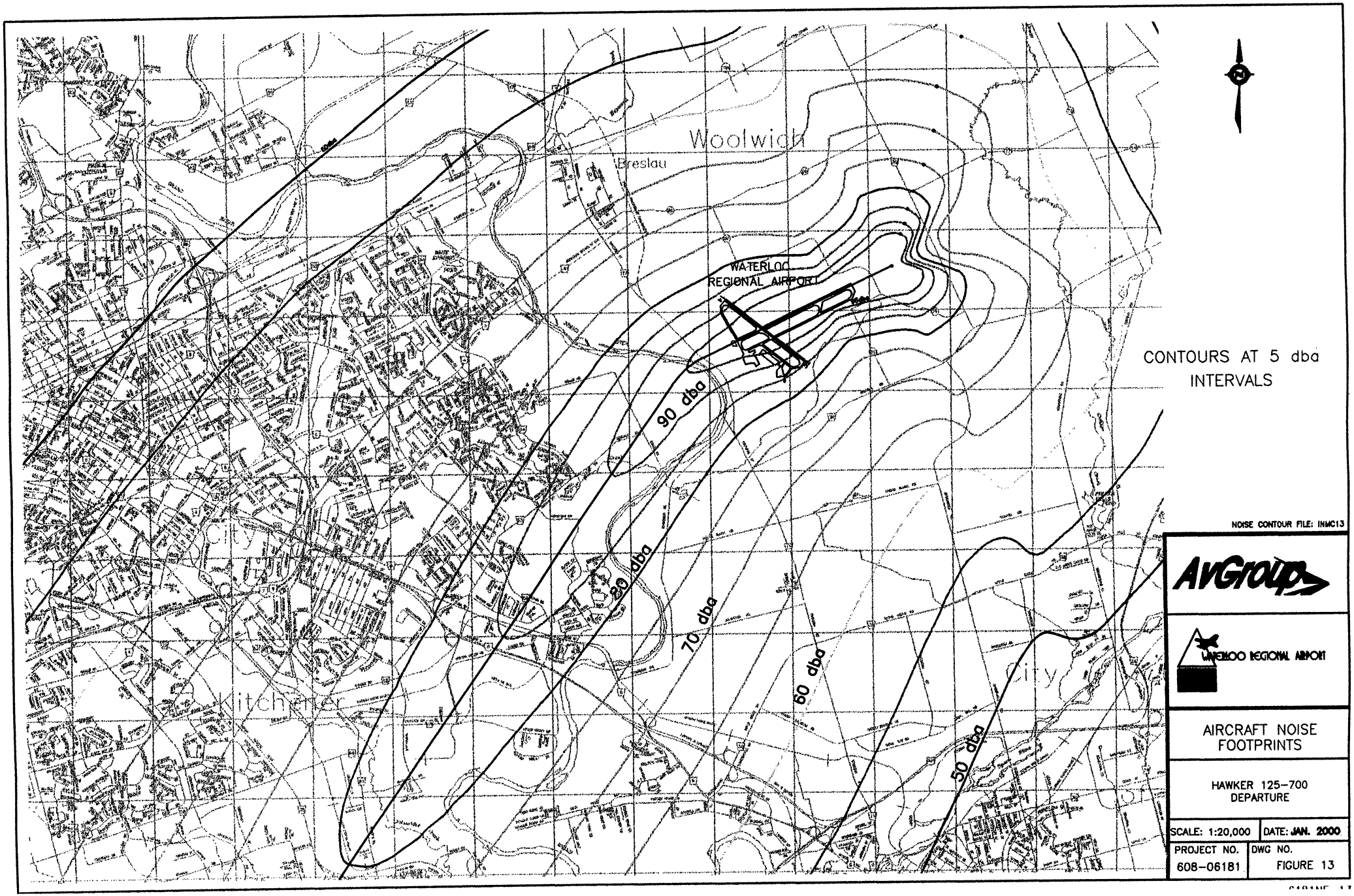
AIRCRAFT NOISE FOOTPRINTS

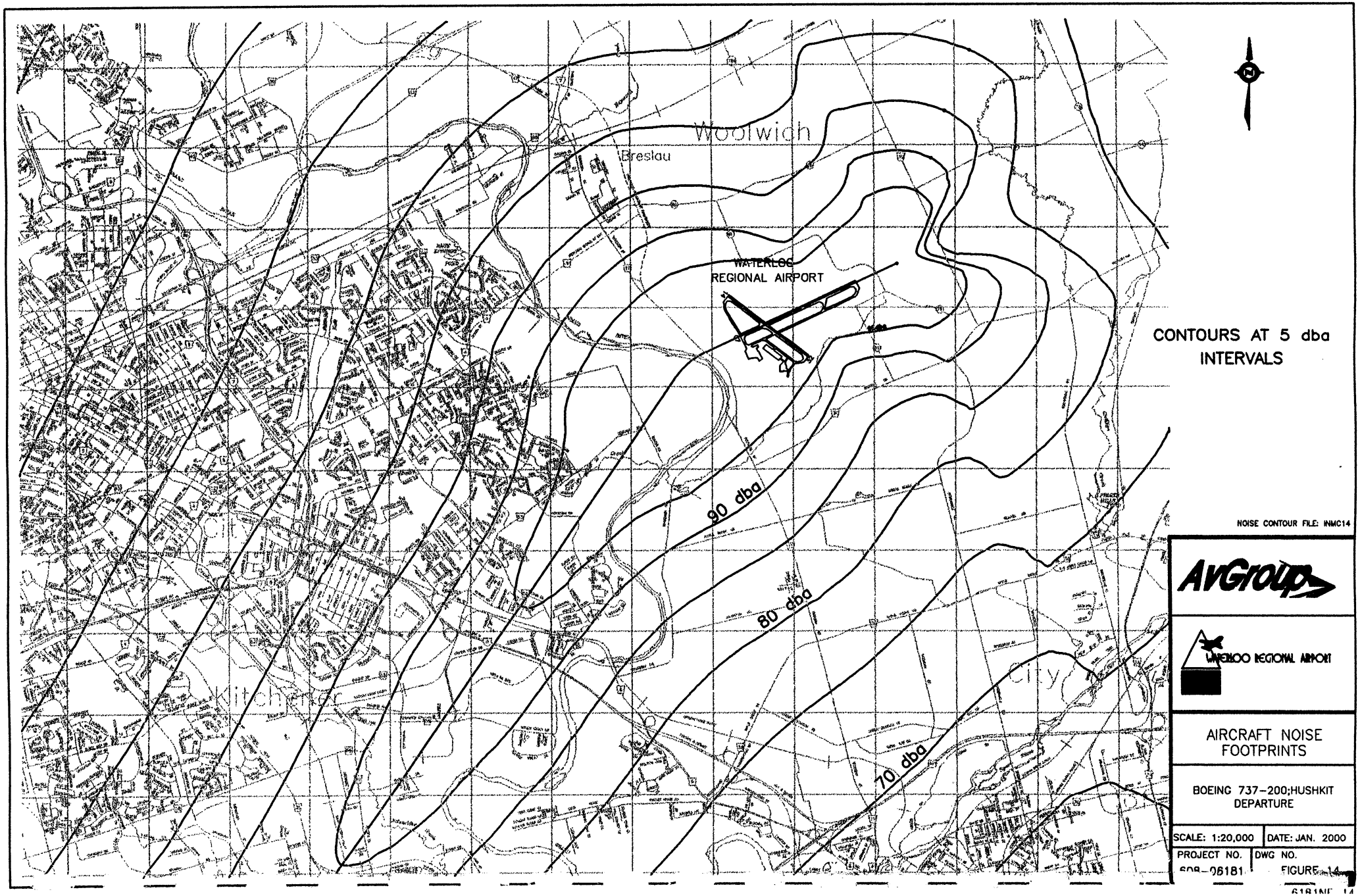
CANADAIR 604
ARRIVAL
PROPOSED ILS IFR APPROACH

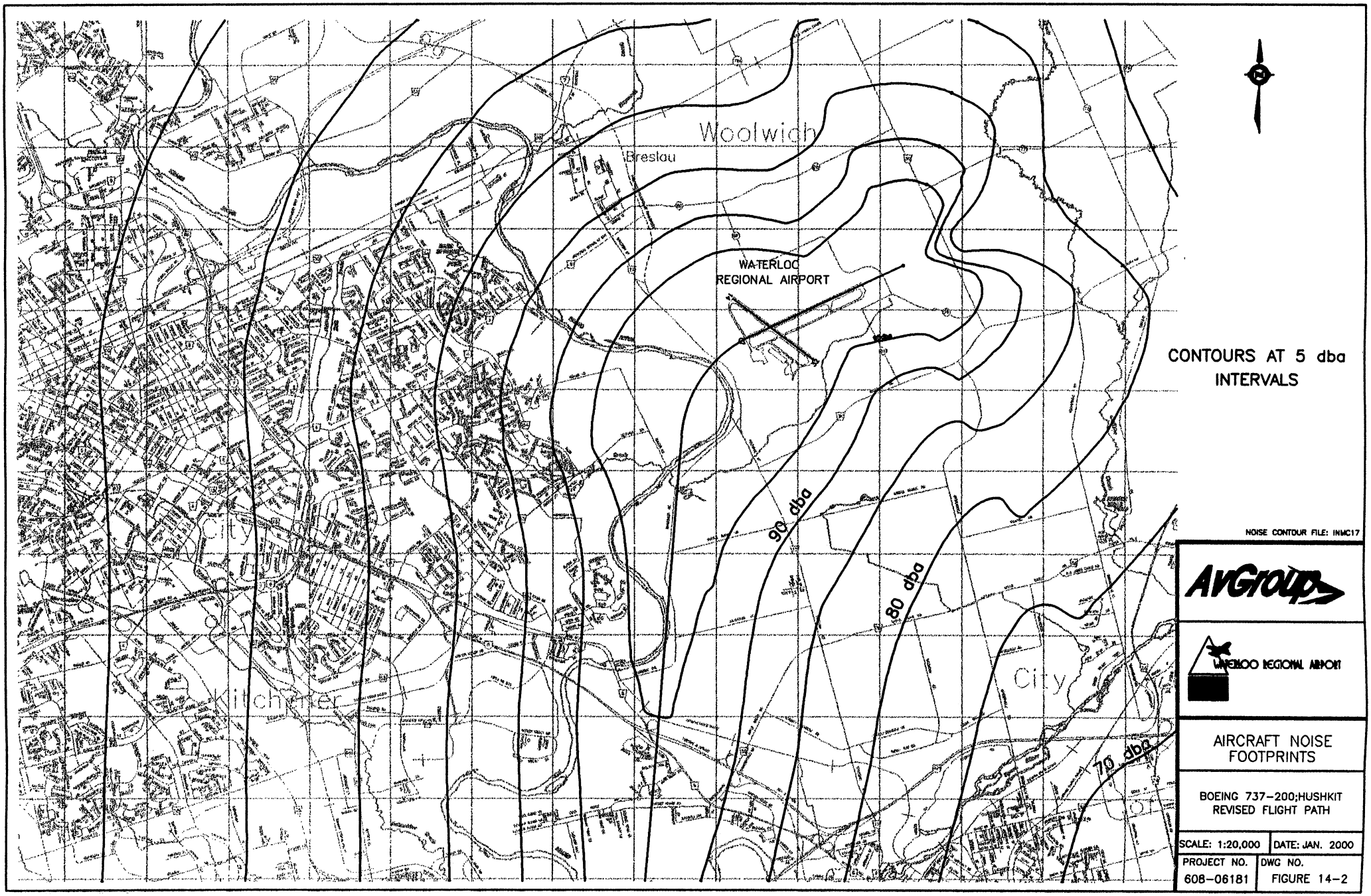
SCALE: 1:20,000	DATE: JAN. 2000
PROJECT NO.	DWG NO.

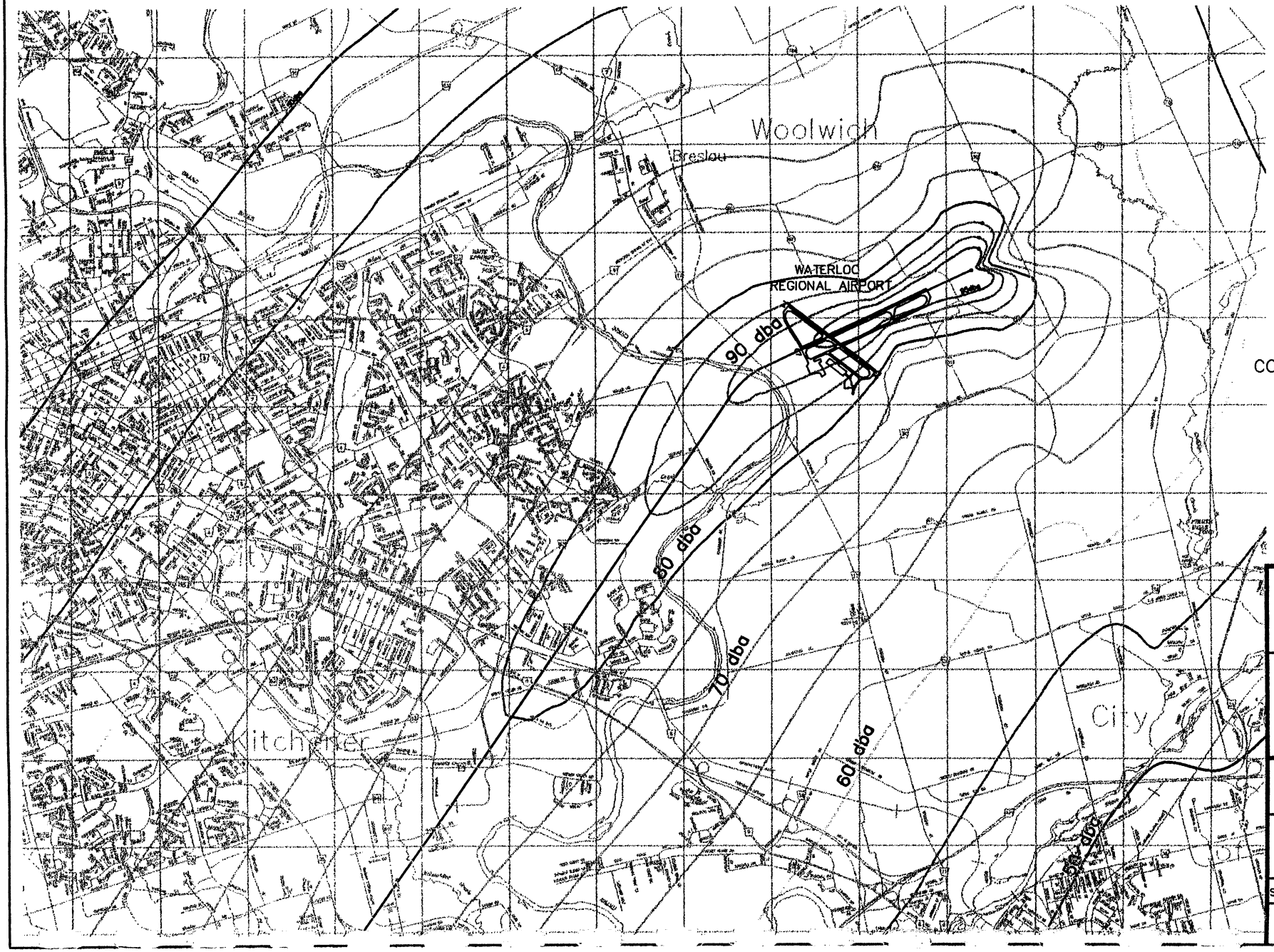

Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
90 dbq
80 dbq
70 dbq
60 dbq
50 dbq
Kitchener
City
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMB11
AVGroup
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
GULFSTREAM IV
ARRIVAL
EXISTING IFR APPROACH(LOC/BC)
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
608-06181
DWG NO.
FIGURE 11


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
80 dba
70 dba
60 dba
50 dba
Kitchener
City
City
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMB12
AVGroup
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
GULFSTREAM IV
ARRIVAL
PROPOSED ILS IFR APPROACH
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
608-06181
DWG NO.
FIGURE 12


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
90 dba
80 dba
70 dba
60 dba
50 dba
City
Kitchener
City
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMC13
AVGroup
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
HAWKER 125-700
DEPARTURE
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
608-06181
DWG NO.
FIGURE 13


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
90 dba
80 dba
70 dba
Kitchener
City
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMC14
AVGroup
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
BOEING 737-200;HUSHKIT
DEPARTURE
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
608-06181
DWG NO.
FIGURE 14


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
90 dba
80 dba
70 dba
City
Kitchener
City
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMC17
AVGROUP
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
BOEING 737-200;HUSHKIT
REVISED FLIGHT PATH
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
608-06181
DWG NO.
FIGURE 14-2



CONTOURS AT 5 dba INTERVALS

NOISE CONTOUR FILE: INMC15

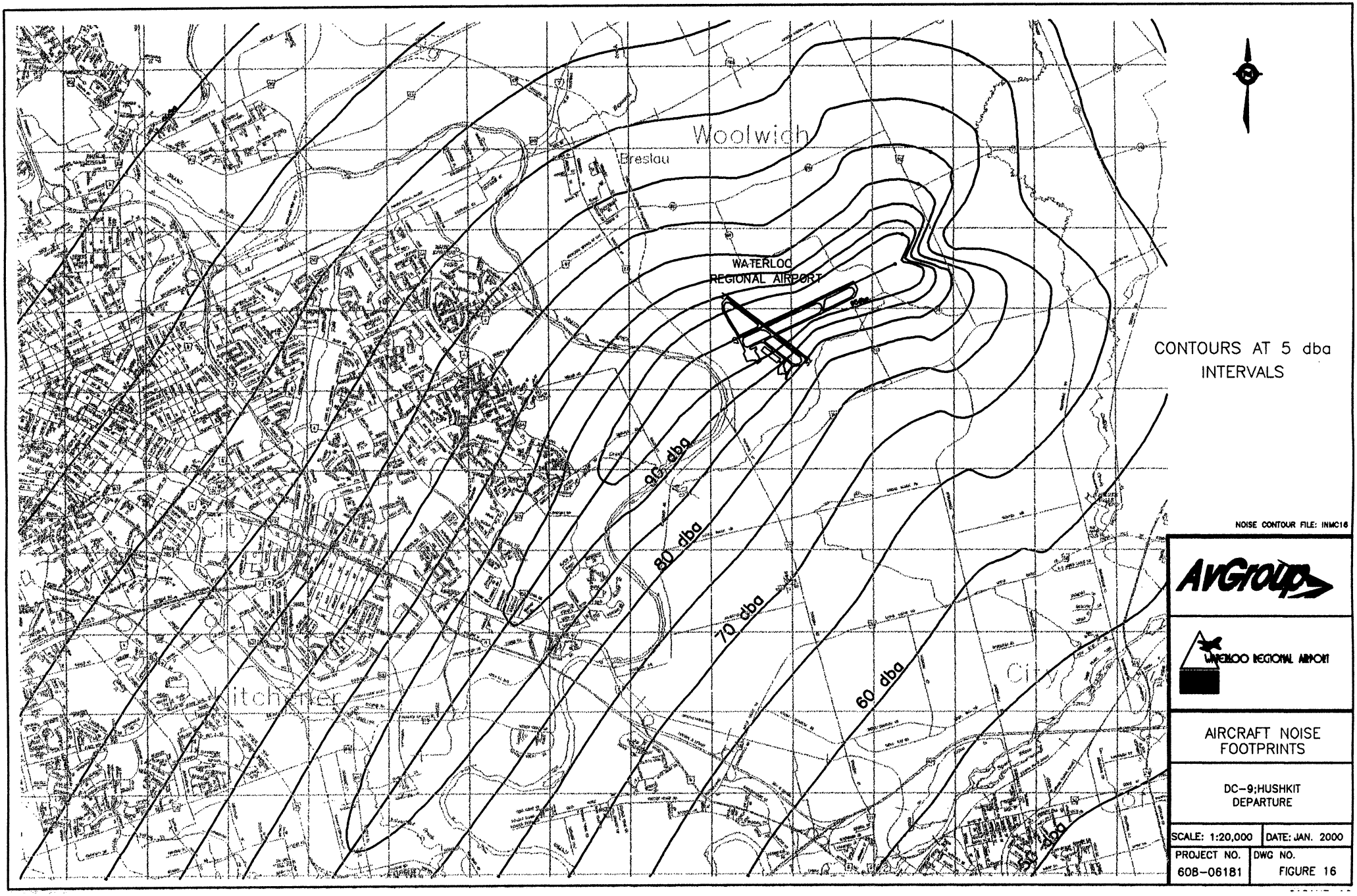
AVGROUP

WATERLOO REGIONAL AIRPORT

AIRCRAFT NOISE FOOTPRINTS

BOEING 737-300 DEPARTURE

SCALE: 1:20,000	DATE: JAN. 2000
PROJECT NO. 06181	DWG NO. FIGURE 4.5


Woolwich
Breslau
WATERLOO
REGIONAL AIRPORT
95 dba
80 dba
70 dba
60 dba
CONTOURS AT 5 dba
INTERVALS
NOISE CONTOUR FILE: INMC16
AVGroup
WATERLOO REGIONAL AIRPORT
AIRCRAFT NOISE
FOOTPRINTS
DC-9;HUSHKIT
DEPARTURE
SCALE: 1:20,000
DATE: JAN. 2000
PROJECT NO.
608-06181
DWG NO.
FIGURE 16

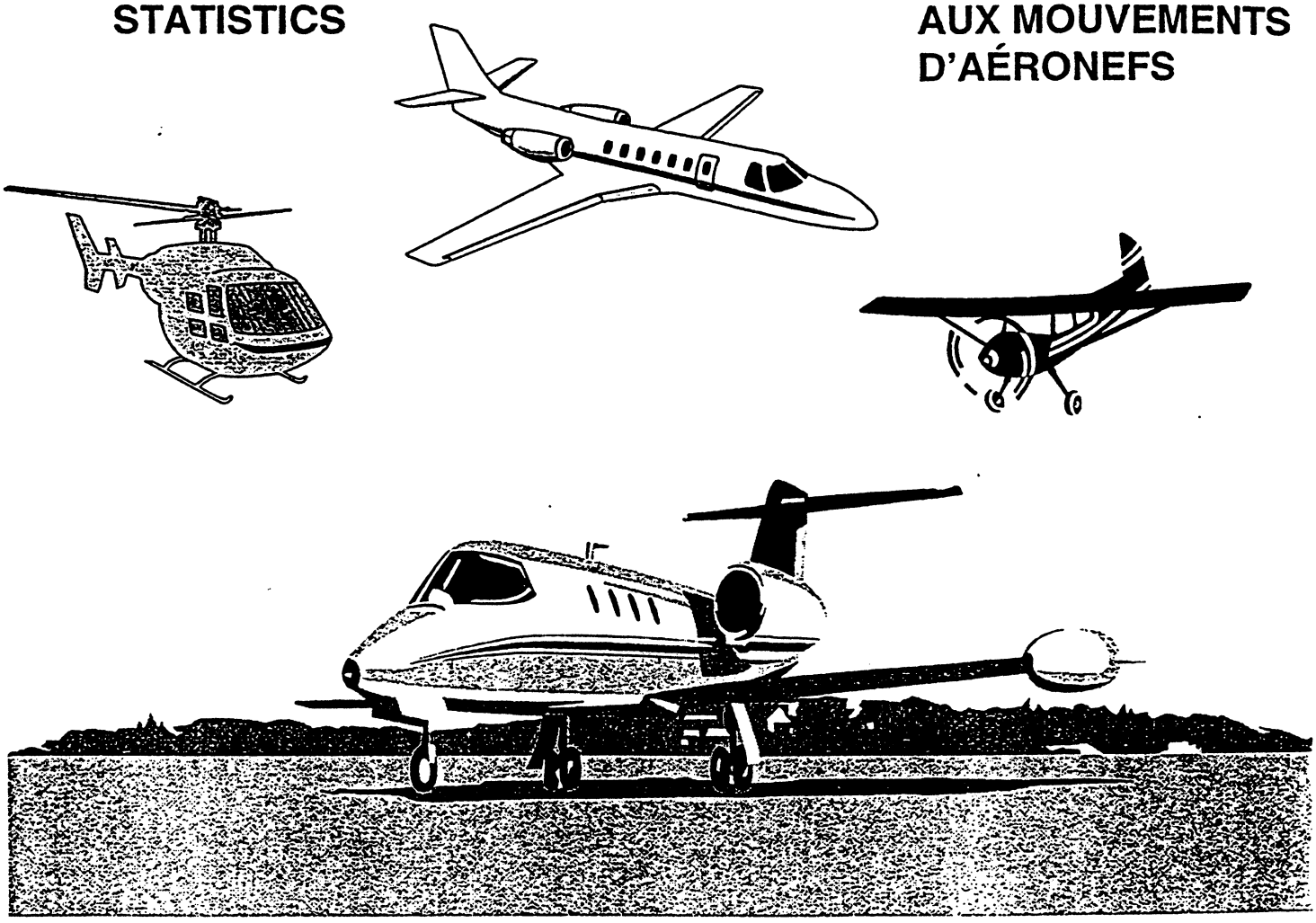
Appendix C
1998 Aircraft Movement Statistics

Transport Canada Transports Canada

TP 577

AIRCRAFT MOVEMENT STATISTICS

STATISTIQUES RELATIVES AUX MOUVEMENTS D'AÉRONEFS



Aviation Statistics Centre
Statistics Canada

Centre des statistiques de l'aviation
Statistique Canada

Annual Report 1998 Rapport annuel

Table 1 | **Total Aircraft Movements by Class of Operation** | **Annual 1998 Annuel**
Tableau 1 | **Total des mouvements d'appareils par classe de vol**

NAV CANADA Towers Tours de NAV CANADA		Rank Rang	Total	Rank Rang	Itinerant Vols itinérants	Rank Rang	Local Vols locaux
Vancouver Intl	1998	2	368,388	2	368,388	44	-
	1997	2	342,552	2	342,552	43	-
	1996	2	329,960	2	329,960	44	-
	1995	2	311,450	2	311,450	45	-
	1994	2	301,163	2	301,163	54	-
Victoria Intl	1998	6	183,104	7	116,247	9	66,857
	1997	7	174,513	7	110,558	10	63,955
	1996	8	159,781	7	106,779	9	53,002
	1995	7	163,474	7	106,676	8	56,798
	1994	6	163,770	8	109,562	9	54,208
Waterloo Regional	1998	15	132,377	23	50,212	5	82,165
	1997	19	103,653	29	39,093	9	64,560
	1996	25	80,339	34	33,266	14	47,073
	1995	27	74,153	26	44,401	23	29,752
	1994	26	71,554	26	43,032	25	28,522
Whitehorse	1998	43	32,233	42	21,333	36	10,900
	1997	42	40,197	42	20,595	32	19,602
	1996	42	42,575	41	22,536	28	20,039
	1995	41	50,933	42	21,987	24	28,946
	1994	41	51,496	50	22,227	24	29,269
Windsor	1998	38	60,000	33	34,310	26	25,690
	1997	36	56,140	38	29,726	24	26,414
	1996	38	56,000	39	28,394	24	27,606
	1995	32	63,226	38	29,236	17	33,990
	1994	34	60,495	40	28,471	21	32,024
Winnipeg Intl	1998	10	150,085	6	126,893	30	23,192
	1997	11	155,193	5	130,172	25	25,021
	1996	9	155,065	5	126,233	23	28,832
	1995	9	156,002	6	122,049	18	33,953
	1994	7	154,868	6	114,313	13	40,555
Winnipeg/St Andrews	1998	20	106,599	41	27,059	7	79,540
	1997	20	101,029	41	25,053	6	75,976
	1996	24	83,554	42	22,229	7	61,325
	1995	20	89,053	41	24,094	7	64,959
	1994	23	82,683	48	22,980	7	59,703
Yellowknife	1998	39	55,598	34	34,039	31	21,559
	1997	37	55,058	32	35,123	31	19,935
	1996	31	62,881	27	38,801	27	24,080
	1995	30	65,340	32	36,493	25	28,847
	1994	22	83,281	29	40,844	11	42,437
Total (44)	1998		5,256,550		3,508,294		1,748,256
(44)	1997		4,996,850		3,313,762		1,683,088
(44)	1996		4,794,698		3,245,876		1,548,822
(45)	1995		4,729,817		3,206,937		1,522,880
(54)	1994		4,917,805		3,329,238		1,588,567

Table 2 Total Aircraft Movements - Civil and Military Annual 1998 Annuel
Tableau 2 Total des mouvements d'appareils, civils et militaires

NAV CANADA Towers Tours de NAV CANADA		Civil - Civils				Military - Militaires		
		Total	Itinerant - Itinérants		Local Locaux	Total	Itinerant Itinérants	Local Locaux
			Commercial Commerciaux	Private and Govt Privés et officiels				
Toronto/Buttonville	1998	170,204	58,325	22,617	89,262	40	32	8
	1997	161,122	55,019	21,997	84,106	88	76	12
	1996	149,513	49,699	21,918	77,896	70	66	4
	1995	140,110	43,669	23,170	73,271	326	288	38
	1994	141,012	42,102	27,033	71,877	335	311	24
Toronto/LB Pearson Intl	1998	420,734	399,020	21,532	182	294	294	-
	1997	394,760	373,344	21,299	117	995	994	1
	1996	371,924	351,222	20,592	110	494	494	-
	1995	341,066	319,991	21,055	20	910	910	-
	1994	306,320	284,684	21,636	-	703	703	-
Vancouver Harbour	1998	62,914	49,749	3,555	9,610	86	62	24
	1997	62,071	43,734	3,796	14,541	3,832	3,808	24
	1996	56,977	42,643	5,990	8,344	4,617	4,523	94
	1995	61,054	45,240	6,332	9,482	128	96	32
	1994	59,448	46,408	6,610	6,430	97	89	8
Vancouver Intl	1998	367,079	340,229	26,850	-	1,309	1,309	-
	1997	341,929	314,232	27,697	-	623	623	-
	1996	329,293	299,022	30,271	-	667	667	-
	1995	310,730	279,050	31,680	-	720	720	-
	1994	300,518	262,787	37,731	-	645	645	-
Victoria Intl	1998	179,529	87,168	27,513	64,848	3,575	1,566	2,009
	1997	170,286	80,885	27,660	61,741	4,227	2,013	2,214
	1996	156,204	78,310	26,864	51,030	3,577	1,605	1,972
	1995	159,765	75,290	29,292	55,183	3,709	2,094	1,615
	1994	160,009	74,283	33,258	52,468	3,761	2,021	1,740
Waterloo Regional	1998	132,006	33,824	16,107	82,075	371	281	90
	1997	103,185	25,178	13,532	64,475	468	383	85
	1996	80,145	18,892	14,242	47,011	194	132	62
	1995	74,086	23,702	20,642	29,742	67	57	10
	1994	71,364	20,576	22,310	28,478	190	146	44
Whitehorse	1998	31,682	14,952	6,012	10,718	551	369	182
	1997	39,234	14,185	5,909	19,140	963	501	462
	1996	41,859	16,068	6,172	19,619	716	296	420
	1995	50,601	14,243	7,550	28,808	332	194	138
	1994	50,522	12,967	8,872	28,683	974	388	586
Windsor	1998	59,815	26,338	7,817	25,660	185	155	30
	1997	55,709	22,893	6,526	26,290	431	307	124
	1996	55,719	22,261	5,978	27,480	281	155	126
	1995	62,860	22,199	6,825	33,836	366	212	154
	1994	60,160	20,425	7,883	31,852	335	163	172
Winnipeg Intl	1998	129,447	107,057	10,407	11,983	20,638	9,429	11,209
	1997	128,859	107,139	10,886	10,834	26,334	12,147	14,187
	1996	130,746	105,936	10,299	14,511	24,319	9,998	14,321
	1995	129,560	100,656	10,885	18,019	26,442	10,508	15,934
	1994	127,085	90,921	12,011	24,153	27,783	11,381	16,402
Winnipeg/St Andrews	1998	106,255	21,540	5,313	79,402	344	206	138
	1997	100,404	20,331	4,425	75,648	625	297	328
	1996	82,902	17,783	4,142	60,977	652	304	348
	1995	88,208	19,134	4,599	64,475	845	361	484
	1994	82,062	16,923	5,914	59,225	621	143	478
Yellowknife	1998	52,739	30,398	3,429	18,912	2,859	212	2,647
	1997	52,001	31,410	3,056	17,535	3,057	657	2,400
	1996	59,906	34,530	3,398	21,978	2,975	873	2,102
	1995	62,446	31,794	3,985	26,667	2,894	714	2,180
	1994	80,650	35,714	4,289	40,647	2,631	841	1,790
Total (44)	1998	5,181,984	2,936,123	525,249	1,720,612	74,566	46,922	27,644
(44)	1997	4,907,270	2,744,288	512,158	1,650,824	89,580	57,316	32,264
(44)	1996	4,701,379	2,669,927	518,848	1,512,604	93,319	57,101	36,218
(45)	1995	4,626,231	2,565,207	583,103	1,477,921	103,586	58,627	44,959
(54)	1994	4,792,146	2,591,877	668,463	1,531,806	125,659	68,898	56,761

Table 3
Tableau 3

Number of Itinerant Movements by Type of Operation
Nombre de mouvements itinérants par type d'exploitation

Annual 1998 Annuel

NAV CANADA Towers Tours de NAV CANADA		Total	Air Carriers Transporteurs aériens		Other Commercial	Private	Government Officiels	
			Level I-III and Foreign Niv. I-III et étranger	Level IV-VI Niv. IV-VI	Autres vols commerciaux	Privés	Civil Civils	Military Militaires
Toronto/Buttonville	1998	80,974	1,883	45,027	11,415	21,761	856	3
	1997	77,092	2,303	35,503	17,213	21,206	791	7
	1996	71,683	1,513	32,757	15,429	21,249	669	6
	1995	67,127	1,659	33,983	8,027	22,609	561	28
	1994	69,446	3,806	29,713	8,583	26,405	628	31
Toronto/LB Pearson Intl	1998	420,846	385,736	11,082	2,202	20,720	812	29
	1997	395,637	349,864	21,045	2,435	20,481	818	99
	1996	372,308	328,497	18,383	4,342	19,288	1,304	49
	1995	341,956	293,150	21,681	5,160	19,612	1,443	91
	1994	307,023	266,086	14,740	3,858	19,652	1,984	70
Vancouver Harbour	1998	53,366	39,228	6,657	3,864	3,470	85	6
	1997	51,338	33,445	4,906	5,383	3,692	104	3,80
	1996	53,156	34,811	3,503	4,329	5,881	109	4,52
	1995	51,668	37,585	3,847	3,808	6,198	134	9
	1994	53,107	30,745	13,922	1,741	6,464	146	8
Vancouver Intl	1998	368,388	295,214	30,880	14,135	22,866	3,984	1,30
	1997	342,552	264,296	37,245	12,691	23,632	4,065	62
	1996	329,960	249,273	34,247	15,502	25,397	4,874	66
	1995	311,450	212,697	50,435	15,918	26,898	4,782	72
	1994	301,163	222,379	30,563	9,845	30,314	7,417	64
Victoria Intl	1998	116,247	45,811	18,600	22,757	26,431	1,082	1,56
	1997	110,558	42,535	18,674	19,676	26,708	952	2,01
	1996	106,779	41,656	17,867	18,787	25,884	980	1,60
	1995	106,676	33,211	24,391	17,688	28,296	996	2,09
	1994	109,562	38,683	18,584	17,016	30,190	3,068	2,02
Waterloo Regional	1998	50,212	789	24,039	8,996	15,978	129	28
	1997	39,093	722	19,159	5,297	13,361	171	38
	1996	33,266	250	15,003	3,639	14,044	198	1
	1995	44,401	253	20,428	3,021	20,393	249	5
	1994	43,032	167	17,627	2,782	22,020	290	14
Whitehorse	1998	21,333	5,604	7,377	1,971	5,295	717	36
	1997	20,595	5,805	5,707	2,673	5,293	616	50
	1996	22,536	6,841	4,460	4,767	5,451	721	29
	1995	21,987	6,255	3,602	4,386	6,930	620	19
	1994	22,227	6,416	3,048	3,503	8,132	740	38
Windsor	1998	34,310	13,836	12,004	498	7,687	130	15
	1997	29,726	8,060	14,407	426	6,341	185	30
	1996	28,394	9,555	11,817	889	5,669	309	15
	1995	29,236	7,217	14,277	705	6,556	269	21
	1994	28,471	7,766	12,098	561	7,632	251	16
Winnipeg Intl	1998	126,893	78,737	25,352	2,968	6,753	3,654	9,42
	1997	130,172	80,129	23,714	3,296	6,639	4,247	12,14
	1996	126,233	76,446	24,838	4,652	6,107	4,192	9,99
	1995	122,049	68,843	27,139	4,674	6,637	4,248	10,50
	1994	114,313	64,766	23,335	2,820	7,577	4,434	11,38
Winnipeg/St Andrews	1998	27,059	654	14,121	6,765	5,120	193	20
	1997	25,053	545	13,139	6,647	4,153	272	29
	1996	22,229	468	12,798	4,517	3,897	245	30
	1995	24,094	197	13,561	5,376	4,464	135	36
	1994	22,980	126	11,407	5,390	5,840	74	14
Yellowknife	1998	34,039	24,667	3,936	1,795	2,053	1,376	21
	1997	35,123	26,152	3,928	1,330	2,252	804	65
	1996	38,801	27,038	2,606	4,886	2,659	739	87
	1995	36,493	25,374	1,917	4,503	3,110	875	71
	1994	40,844	19,341	9,497	6,876	3,339	950	84
Total (44)	1998	3,508,294	1,882,015	627,505	426,603	465,003	60,246	46,92
(44)	1997	3,313,762	1,704,892	630,394	409,002	452,031	60,127	57,3
(44)	1996	3,245,876	1,680,853	557,845	431,229	455,892	62,956	57,1
(45)	1995	3,206,937	1,555,353	613,494	396,360	514,034	69,069	58,62
(54)	1994	3,329,238	1,607,882	606,582	377,413	584,220	84,243	68,89

Table 4 — Itinerant Movements by I.F.R. and V.F.R. and Runway 88 Movements — Annual 1998 Annuel
Tableau 4 — Mouvements itinérants par I.F.R. et V.F.R et mouvements de piste 88

NAV CANADA Towers / Tours de NAV CANADA		Itinerant Aircraft Movements - Mouvements itinérants d'appareils					Runway 88 / Piste 88
		Total	I.F.R.	Percentage I.F.R. Pourcentage	V.F.R.	Percentage V.F.R. Pourcentage	
Vancouver Intl	1998	368,388	287,340	77.9	81,048	22.0	35,513
	1997	342,552	275,007	80.2	67,545	19.7	20,014
	1996	329,960	239,593	72.6	90,367	27.3	31,219
	1995	311,450	210,433	67.5	101,017	32.4	41,734
	1994	301,163	192,420	63.8	108,743	36.1	41,109
Victoria Intl	1998	116,247	47,425	40.7	68,822	59.2	32,398
	1997	110,558	45,165	40.8	65,393	59.1	16,076
	1996	106,779	31,087	29.1	75,692	70.8	16,537
	1995	106,676	26,225	24.5	80,451	75.4	14,935
	1994	109,562	27,054	24.6	82,508	75.3	15,068
Waterloo Regional	1998	50,212	7,780	15.4	42,432	84.5	7,153
	1997	39,093	7,071	18.0	32,022	81.9	6,186
	1996	33,266	6,133	18.4	27,133	81.5	6,031
	1995	44,401	5,779	13.0	38,622	86.9	5,242
	1994	43,032	4,862	11.2	38,170	88.7	5,233
Whitehorse	1998	21,333	5,218	24.4	16,115	75.5	14,786
	1997	20,595	4,813	23.3	15,782	76.6	22,719
	1996	22,536	4,803	21.3	17,733	78.6	19,358
	1995	21,987	4,119	18.7	17,868	81.2	9,276
	1994	22,227	3,898	17.5	18,329	82.4	14,459
Windsor	1998	34,310	18,079	52.6	16,231	47.3	2,221
	1997	29,726	14,870	50.0	14,856	49.9	1,964
	1996	28,394	14,202	50.0	14,192	49.9	1,788
	1995	29,236	12,993	44.4	16,243	55.5	1,819
	1994	28,471	11,271	39.5	17,200	60.4	2,585
Winnipeg Intl	1998	126,893	106,706	84.0	20,187	15.9	11,442
	1997	130,172	107,349	82.4	22,823	17.5	7,759
	1996	126,233	104,845	83.0	21,388	16.9	3,216
	1995	122,049	99,660	81.6	22,389	18.3	1,320
	1994	114,313	91,040	79.6	23,273	20.3	1,693
Winnipeg/St Andrews	1998	27,059	803	2.9	26,256	97.0	3,547
	1997	25,053	840	3.3	24,213	96.6	3,341
	1996	22,229	748	3.3	21,481	96.6	2,082
	1995	24,094	580	2.4	23,514	97.5	1,878
	1994	22,980	290	1.2	22,690	98.7	1,911
Yellowknife	1998	34,039	16,973	49.8	17,066	50.1	20,786
	1997	35,123	18,467	52.5	16,656	47.4	23,258
	1996	38,801	17,020	43.8	21,781	56.1	21,454
	1995	36,493	15,632	42.8	20,861	57.1	12,878
	1994	40,844	15,095	36.9	25,749	63.0	16,264
Total (44)	1998	3,508,294	2,163,692	61.6	1,344,602	38.3	495,251
(44)	1997	3,313,762	2,047,762	61.7	1,266,000	38.2	443,268
(44)	1996	3,245,876	1,979,575	60.9	1,266,301	39.0	457,125
(45)	1995	3,206,937	1,879,115	58.5	1,327,822	41.4	388,900
(54)	1994	3,329,238	1,855,302	55.7	1,473,936	44.2	415,747

Table 5
Tableau 5

Itinerant Movements by Type of Power Plant
Mouvements itinérants par groupe motopropulseur

Annual 1998 Annuel

NAV CANADA Towers Tours de NAV CANADA		Total	Aircraft - Aéronefs			Other Aircraft Autres appareils	
			Jet À réaction	Turboprop Turbo-propulseurs	Piston À pistons	Helicopters Hélicoptères	Gliders Planeur
Toronto/Buttonville	1998	80,974	1,657	3,198	69,451	6,641	27
	1997	77,092	1,818	2,821	66,363	5,922	168
	1996	71,683	1,465	2,431	62,177	5,593	17
	1995	67,127	1,572	2,678	57,517	5,344	16
	1994	69,446	1,225	4,910	59,205	4,099	7
Toronto/LB Pearson Intl	1998	420,846	317,121	96,840	5,761	1,062	62
	1997	395,637	303,841	84,330	6,417	1,038	11
	1996	372,308	276,132	89,991	5,378	802	5
	1995	341,956	245,481	89,939	5,841	693	2
	1994	307,023	219,181	80,513	6,141	1,157	31
Vancouver Harbour	1998	53,366	4	11,545	22,176	19,609	32
	1997	51,338	-	10,116	22,257	18,940	25
	1996	53,156	5	9,700	24,735	18,702	14
	1995	51,668	5	7,779	24,854	19,003	27
	1994	53,107	2	5,629	25,925	21,527	24
Vancouver Intl	1998	368,388	150,749	142,759	56,991	17,790	99
	1997	342,552	141,434	128,459	54,077	18,479	103
	1996	329,960	134,649	126,280	49,593	19,282	156
	1995	311,450	111,870	124,026	54,791	20,494	269
	1994	301,163	101,556	119,608	58,853	20,927	219
Victoria Intl	1998	116,247	7,365	39,619	61,505	7,705	53
	1997	110,558	6,275	35,702	61,725	6,835	21
	1996	106,779	6,709	35,758	58,148	6,141	23
	1995	106,676	5,185	33,726	60,762	6,969	34
	1994	109,562	6,659	33,496	63,259	6,104	44
Waterloo Regional	1998	50,212	1,450	2,485	44,992	850	435
	1997	39,093	1,263	2,113	34,661	898	158
	1996	33,266	2,245	1,464	28,859	560	138
	1995	44,401	1,940	1,386	40,243	631	201
	1994	43,032	1,370	1,278	39,241	889	254
Whitehorse	1998	21,333	2,139	4,413	12,237	2,531	13
	1997	20,595	2,179	4,052	11,843	2,521	-
	1996	22,536	2,788	2,747	14,691	2,306	4
	1995	21,987	1,908	2,182	15,755	2,141	1
	1994	22,227	1,962	2,280	15,709	2,268	8
Windsor	1998	34,310	1,362	16,282	15,979	526	161
	1997	29,726	1,563	12,946	14,597	425	195
	1996	28,394	813	13,163	14,114	301	3
	1995	29,236	779	11,809	16,226	413	9
	1994	28,471	549	10,439	16,954	526	3
Winnipeg Intl	1998	126,893	57,949	45,405	21,364	2,114	61
	1997	130,172	61,386	43,347	20,150	5,271	18
	1996	126,233	58,193	46,124	19,388	2,490	38
	1995	122,049	53,881	45,697	19,909	2,499	63
	1994	114,313	49,313	42,093	20,502	2,380	25
Winnipeg/St Andrews	1998	27,059	19	1,720	23,768	1,541	11
	1997	25,053	28	1,717	20,932	2,366	10
	1996	22,229	44	650	19,767	1,757	11
	1995	24,094	77	377	21,884	1,748	8
	1994	22,980	16	282	21,359	1,304	19
Yellowknife	1998	34,039	7,224	17,289	6,056	3,453	17
	1997	35,123	7,934	17,720	6,441	3,024	4
	1996	38,801	7,823	17,681	9,034	4,249	14
	1995	36,493	8,179	15,439	9,381	3,494	-
	1994	40,844	8,527	15,413	12,667	4,224	13
Total (44)	1998	3,508,294	1,105,649	990,712	1,233,040	169,653	9,240
(44)	1997	3,313,762	1,069,320	893,011	1,173,811	169,777	7,843
(44)	1996	3,245,876	1,034,529	918,528	1,121,145	159,884	11,790
(45)	1995	3,206,937	940,689	919,823	1,165,505	167,029	13,891
(54)	1994	3,329,238	876,250	976,006	1,267,906	195,612	13,464

Table 6
Tableau 6

Itinerant Movements by Weight Group
Mouvements itinérants par groupe de poids

Annual 1998 Annuel

NAV CANADA Towers Tours de NAV CANADA		Gross Take-Off Weight (kg.) - Poids brut au décollage (kg.)									
		2 000 & under et moins	2 001 4 000	4 001 5 670	5 671 9 000	9 001 18 000	18 001 35 000	35 001 70 000	70 001 90 000	90 001 136 000	136 001 and Over Et plus
Vancouver Intl	1998	30,336	38,762	26,432	39,823	87,511	21,818	54,983	30,246	6,912	31,476
	1997	30,614	35,712	32,608	27,279	53,185	41,647	60,682	27,807	6,711	26,307
	1996	29,025	33,147	34,701	12,642	53,039	50,321	55,421	27,760	8,439	25,465
	1995	31,557	35,765	39,719	15,623	48,619	42,619	44,340	24,320	5,280	23,608
	1994	31,912	39,266	41,908	20,763	43,046	37,786	40,752	22,012	2,902	20,816
Victoria Intl	1998	51,206	17,470	5,841	1,530	33,303	1,893	4,150	294	87	457
	1997	49,969	17,477	4,029	2,913	17,039	14,748	3,275	931	140	37
	1996	46,437	17,568	4,113	3,279	14,081	17,057	3,495	597	117	35
	1995	49,026	17,939	4,293	4,234	15,206	13,360	1,989	513	80	36
	1994	49,292	20,395	3,849	6,369	15,660	11,541	1,953	374	71	58
Waterloo Regional	1998	42,384	3,786	2,107	914	845	109	9	42	2	2
	1997	32,286	3,138	2,047	842	570	140	48	20	-	2
	1996	26,389	3,057	1,404	1,227	1,046	105	28	10	-	-
	1995	37,054	4,035	1,281	939	972	111	2	6	-	1
	1994	36,241	3,878	1,276	529	932	139	17	8	-	12
Whitehorse	1998	11,797	1,580	2,495	754	1,442	1,428	1,638	149	-	50
	1997	12,055	1,797	2,685	227	866	1,016	1,805	135	3	6
	1996	13,052	2,772	2,127	235	1,403	397	2,411	129	4	6
	1995	13,119	3,189	1,758	172	1,793	225	1,658	69	-	4
	1994	13,098	3,280	1,677	317	1,817	386	1,594	52	1	5
Windsor	1998	15,272	2,799	1,383	6,581	8,034	123	35	67	5	11
	1997	14,000	2,516	1,869	3,273	3,561	4,180	246	72	-	9
	1996	13,450	2,042	1,770	1,271	5,474	4,294	27	65	-	1
	1995	14,668	2,677	1,955	430	5,922	3,492	11	66	-	15
	1994	15,372	2,759	1,894	696	4,610	3,008	14	102	2	14
Winnipeg Intl	1998	11,758	15,403	22,861	9,473	11,054	15,390	18,197	19,641	946	2,147
	1997	12,764	13,787	25,176	8,187	9,552	17,315	20,916	21,325	527	623
	1996	11,021	13,400	25,778	5,960	11,755	14,883	24,606	18,099	315	416
	1995	11,441	13,317	28,282	4,562	9,018	11,770	27,360	15,297	366	636
	1994	11,182	14,837	24,489	4,633	8,203	11,337	23,810	14,353	471	998
Winnipeg/St Andrews	1998	21,221	5,155	396	124	67	91	3	2	-	-
	1997	19,497	3,625	595	1,194	94	34	10	4	-	-
	1996	17,332	4,101	572	121	36	15	8	17	-	27
	1995	19,496	4,041	409	15	45	9	7	12	3	57
	1994	18,947	3,674	316	6	20	9	6	2	-	-
Yellowknife	1998	5,369	5,460	5,971	2,073	2,503	5,568	5,537	653	1	886
	1997	5,564	3,709	7,897	1,811	2,616	4,719	6,651	2,149	-	7
	1996	7,614	3,858	9,386	1,920	3,742	4,433	6,585	1,261	-	2
	1995	7,475	3,102	9,158	2,021	4,526	3,154	6,374	671	-	12
	1994	9,068	4,242	9,977	2,063	5,697	2,842	6,310	620	-	25
Total (44)	1998	1,099,421	296,802	274,386	242,205	500,932	314,252	319,113	279,526	29,741	150,581
(44)	1997	1,037,394	290,863	283,915	201,751	367,326	363,709	360,969	250,608	32,188	125,037
(44)	1996	990,676	282,076	276,303	153,689	422,624	340,307	394,099	225,099	38,632	122,371
(45)	1995	1,020,839	300,141	285,376	151,742	432,133	273,552	366,767	217,490	39,768	119,127
(54)	1994	1,099,202	348,592	310,465	167,751	476,504	225,026	347,820	212,082	33,099	108,697

GLOSSARY OF TERMS

AIR CARRIER - Aircraft Operators, Licensed by the Canadian Transportation Agency to transport persons, mail and/or goods by air.

Level I-III air carriers consist of Canadian air carriers which, in each of the two years preceding the reporting year, carried five thousand or more revenue passengers, one thousand or more tonnes of revenue goods or both.

Canadian air carriers not meeting the definition for Levels I-III have been assigned to Levels IV-VI.

AIRCRAFT MOVEMENT - A take off, a landing, or a simulated approach by an aircraft. ATC MANOPS Amendment 8-8-83. NC-703.

CLASS OF OPERATION- Aircraft movements are classified as either "Itinerant" or "Local".

COMMERCIAL- Flights by aircraft operators licensed by the Canadian Transportation Agency to perform commercial air services. Commercial operations are divided into two categories: AIR CARRIER and OTHER COMMERCIAL.

DOMESTIC ITINERANT MOVEMENTS- Movements, at a Canadian airport, of aircraft departing to or arriving from another point in Canada.

FSS- Flight Service Station.

GOVERNMENT-CIVIL- Aircraft owned by federal, provincial and municipal bodies as well as foreign states, but excluding those owned by crown corporations, boards and commissions. Such aircraft are coded "3" under "Purpose" in the Canadian Civil Aircraft Register.

GOVERNMENT-MILITARY- Aircraft of any branch of the armed forces of any nation.

GROSS TAKE-OFF WEIGHT- The maximum weight for which the aircraft is licensed to operate. For operational purposes, all weights are rounded upwards to the next 1 000 kilograms. Thus 3 200 kilograms becomes 4 000 kilograms.

I.F.R. FLIGHT- A flight conducted in accordance with Instrument Flight Rules.

INTERNATIONAL MOVEMENTS- Movements, at a Canadian airport, of aircraft arriving from or departing to a point outside Canada. International movements are subclassified into "transborder" (to or from a point in the United States including Alaska but excluding Hawaii), and "other international" (to or from points in countries other than Canada and the United States).

Since aircraft movements are reported on the basis of place "arrived from" or "departed to", an arrival at Mirabel airport from London, England would appear under "other international". If the same aircraft moved on to Toronto, both the departure at Mirabel and the arrival at Toronto would be shown as "domestic".

ITINERANT MOVEMENTS- At Airports With Control Towers and/or Flight Service Stations. For the purpose of completing air traffic records, itinerant movements are considered as movements in which aircraft proceed to or arrive from another location; or where aircraft leave the circuit but return without landing at another airport.

ITINERANT MOVEMENTS- At Airports Without Control Towers. An aircraft movement in which the aircraft arrives from or departs to a point other than the reporting airport; or a movement by an aircraft that leaves the close proximity of an airport and returns without landing at another airport.

LOCAL MOVEMENTS- At Airports With Control Towers and/or Flight Service Stations. For the purpose of completing air traffic records, local movements are considered as movements in which the aircraft remains in the circuit.

LOCAL MOVEMENTS- At Airports Without Control Towers. An aircraft movement in which the aircraft remains in the close proximity of the airport. Local movements are often carried out during training flights (touch-and-go), equipment tests etc.

Mandatory Frequency (MF) Area- An area established at selected uncontrolled aerodromes within which aircraft are required to comply with mandatory frequency reporting procedures.

OTHER COMMERCIAL- Flights performed by COMMERCIAL aircraft operators not included in the AIR CARRIER categories.

POWER PLANT- The source of propulsion. For example, piston engines, turbo-propellers and jet engines. "Helicopters", in this report, include both piston and turboshaft-driven engines.

PRIVATE AIRCRAFT- Aircraft used solely for private purposes, not for hire and compensation, which are classified as "Private" or "Private Restricted" in the Canadian Civil Aircraft Register or similar registries of other countries. Owners include individuals, groups and business firms.

RUNWAY 88- Through control zone flights, i.e. flights which communicate with the tower while transiting the tower control zone to another destination without landing at the reporting airport.

Data for these runways are not included in the grand total.

SIMULATED APPROACHES- Movements that are either missed instrument or practice instrument approaches without landing.

TC - Transport Canada.

TOWER CONTROL ZONE- A controlled airspace within the proximity of an air traffic control tower, usually within a radius of less than 24 kilometres of the tower.

V.F.R. FLIGHT- A flight conducted in accordance with Visual Flight Rules.

WEIGHT GROUP- The classification of weight classes in groups for statistical purposes.

Appendix D
YKF Noise Abatement Procedures

NOISE ABATEMENT PROCEDURES

GENERAL

The following procedures apply to turbo-jet and turbo-fan aircraft operating at Waterloo-Guelph Regional Airport.

DEPARTURES

RWY	VNAP
ALL RWYS	A or B

Rwy 25 - Runway heading to 1600. Left turn heading 220°. Heading 220° to YWT 4 DME BPOC.

Rwy 32 - Rwy heading to YWT 4 DME BPOC.

ARRIVALS

CONTACT AND VISUAL APPROACHES (Rwys 07, 14 and 32):

1. Remain on or above assumed 3° glide path.
2. Maintain 2000 or last assigned altitude until established on final.

PREFERENTIAL RUNWAYS

Between 2300 and 0600 hours local time, consistant with safety of operations, pilots should select runways in the following order of priority:

DEPARTURES	ARRIVALS
1. Rwy 07	1. Rwy 25
2. Rwy 14	2. Rwy 32
3. Rwy 32	3. Rwy 14
4. Rwy 25	4. Rwy 07

TRAINING FLIGHTS

Training approaches to Rwy 07 not permitted between 2300 and 0600 hours local time.

INQUIRIES

Contact the Airport General Manager at (519) 648-2256 between 0900 and 1700 hours local time.

Appendix E
NEF Model Input Summary

INPUT DATA FILE:

```
LINES**    NOVALUES
TITLE       0
YKF(B) AIRPORT 1998 NEF - EXISTING CONDITIONS - REM
RUNWY       5
 07S     1        .0000      .0000     5.2000      .0000     1.0000      .0000
      3.0000     3.0000      .0000  DIST      15.0000
 14S     2        .2500     1.7100     2.0900    -1.9600     1.0000      .0000
      3.0000     3.0000      .0000  DIST      15.0000
 25S     3       5.2000      .0000      .0000      .0000     1.0000      .0000
      3.0000     3.0000      .0000  DIST      15.0000
 25L     4       5.2000      .0000      .0000      .0000      .0000     1.0000
  LEFT    30.0000  HGHT      .5600  RATE**     1.0000
 32S     5       2.0900    -1.9500      .2500     1.7100     1.0000      .0000
      3.0000     3.0000      .0000  DIST      15.0000
AIRCF      10
            1     1   GASEPF     1       12.0400      .1700
            1     1   GASEPF     2       11.7300      .1100
            1     1   GASEPF     3        2.3500      .0200
            1     1   GASEPF     4       22.0900      .1700
            1     1   GASEPF     5       57.6900      .6600
            2     1   GASEPV     1         .1400      .0000
            2     1   GASEPV     2         .1000      .0000
            2     1   GASEPV     3         .0200      .0000
            2     1   GASEPV     4         .1900      .0100
            2     1   GASEPV     5         .3600      .0300
            3     1   CNA500     1         .0800      .0000
            3     1   CNA500     2         .0000      .0000
            3     1   CNA500     3         .0200      .0000
            3     1   CNA500     4         .1700      .0000
            3     1   CNA500     5         .0300      .0000
            4     1   BEC58P     1        3.6900      .1600
            4     1   BEC58P     2        3.0000      .0300
            4     1   BEC58P     3         .4500      .0200
            4     1   BEC58P     4        5.3800      .1900
            4     1   BEC58P     5       10.3700      .3000
            5     1   CNA441     1        1.1900      .1100
            5     1   CNA441     2         .4700      .0100
            5     1   CNA441     3         .1500      .0100
            5     1   CNA441     4        1.4900      .0900
            5     1   CNA441     5        2.4400      .1200
            6     1   COMJET     1         .9600      .1900
            6     1   COMJET     2         .0500      .0000
            6     1   COMJET     3         .1900      .0200
            6     1   COMJET     4        1.6900      .1300
            6     1   COMJET     5         .3700      .0100
            7     1      DC3     1         .0600      .0300
            7     1      DC3     2         .0200      .0100
            7     1      DC3     3         .0100      .0000
            7     1      DC3     4         .1100      .0300
            7     1      DC3     5         .1100      .0500
            8     1     DHC8     1         .3400      .0900
            8     1     DHC8     2         .0800      .0100
            8     1     DHC8     3         .0300      .0100
            8     1     DHC8     4         .2900      .0600
            8     1     DHC8     5         .3200      .0500
            9     1   COMJET     1         .0600      .0100
            9     1   COMJET     2         .0100      .0000
            9     1   COMJET     3         .0100      .0000
            9     1   COMJET     4         .0500      .0000
```

	9	1	COMJET	5	.0200	.0000
	10	1	C130	1	.0200	.0000
	10	1	C130	2	.0000	.0000
	10	1	C130	3	.0100	.0100
	10	1	C130	4	.0400	.0000
	10	1	C130	5	.0300	.0000
	1	0	GASEPF	1	11.0600	.2600
	1	0	GASEPF	2	12.6200	.1300
	1	0	GASEPF	3	25.5000	.3800
	1	0	GASEPF	5	55.6600	1.0800
	2	0	GASEPV	1	.1400	.0100
	2	0	GASEPV	2	.1100	.0000
	2	0	GASEPV	3	.2100	.0200
	2	0	GASEPV	5	.3400	.0100
	3	0	CNA500	1	.1100	.0100
	3	0	CNA500	2	.0100	.0000
	3	0	CNA500	3	.1000	.0100
	3	0	CNA500	5	.0500	.0000
	4	0	BEC58P	1	3.5100	.1400
	4	0	BEC58P	2	2.9500	.0100
	4	0	BEC58P	3	6.6500	.1800
	4	0	BEC58P	5	10.0400	.2200
	5	0	CNA441	1	1.0600	.0500
	5	0	CNA441	2	.5800	.0100
	5	0	CNA441	3	1.9900	.1300
	5	0	CNA441	5	2.2600	.0900
	6	0	COMJET	1	1.0400	.1100
	6	0	COMJET	2	.0500	.0000
	6	0	COMJET	3	2.0000	.2300
	6	0	COMJET	5	.2400	.0100
	7	0	DC3	1	.0600	.0400
	7	0	DC3	2	.0200	.0000
	7	0	DC3	3	.1000	.0300
	7	0	DC3	5	.1200	.0400
	8	0	DHC8	1	.2800	.0800
	8	0	DHC8	2	.0700	.0000
	8	0	DHC8	3	.3600	.1000
	8	0	DHC8	5	.3900	.0400
	9	0	COMJET	1	.0400	.0000
	9	0	COMJET	2	.0000	.0000
	9	0	COMJET	3	.1000	.0000
	9	0	COMJET	5	.0100	.0000
	10	0	C130	1	.0200	.0000
	10	0	C130	2	.0000	.0000
	10	0	C130	3	.0700	.0000
	10	0	C130	5	.0300	.0000
END**	0	0	0	0	.0000	.0000

YKF(B) AIRPORT 1998 NEF - EXISTING CONDITIONS - REM
****

ALL DISTANCES MEASURED IN THOUSANDS OF FEET
AND ALL ANGLES MEASURED IN DEGREES

RUNWAY/FLIGHT PATH DEFINITIONS:

RUNWAY 07S NUMBER 1 (.000, .000) TO (5.200, .000)
FLIGHTPATH CONFIGURATION: STRAIGHT OUT DEPARTURE

APPROACH INFORMATION:
GS1: 3.00 GS2: 3.00 DGS: .00

RUNWAY 14S NUMBER 2 (.250, 1.710) TO (2.090, -1.960)
FLIGHTPATH CONFIGURATION: STRAIGHT OUT DEPARTURE
APPROACH INFORMATION:
GS1: 3.00 GS2: 3.00 DGS: .00

RUNWAY 25S NUMBER 3 (5.200, .000) TO (.000, .000)
FLIGHTPATH CONFIGURATION: STRAIGHT OUT DEPARTURE
APPROACH INFORMATION:
GS1: 3.00 GS2: 3.00 DGS: .00

RUNWAY 25L NUMBER 4 (5.200, .000) TO (.000, .000)
FLIGHTPATH CONFIGURATION: SINGLE TURN DEPARTURE
FIRST TURN: LEFT ANGLE: 30.00 WHEN: HGHT H/S: .56
NO APPROACH INFORMATION GIVEN

RUNWAY 32S NUMBER 5 (2.090, -1.950) TO (.250, 1.710)
FLIGHTPATH CONFIGURATION: STRAIGHT OUT DEPARTURE
APPROACH INFORMATION:
GS1: 3.00 GS2: 3.00 DGS: .00

RANGE NO.	STAGE LENGTH (NM)
1	UNDER 500
2	500-1000
3	1000-1500
4	1500-2500
5	2500-3500
6	3500-4500
7	OVER 4500

AIRCRAFT NO. 1: GASEPF
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:
SPEED: 77.0 KNOTS
TAKEOFF ROLL: 1.85 TAN CLIMB ANGLE: .0935
DIST TO NEW CLIMB ANGLE: 12.32 TAN CLIMB ANGLE: .0980

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	94.6	85.4	94.6
400.	90.4	80.1	90.4
1000.	84.2	72.4	83.8
2000.	78.6	65.9	77.4
4000.	72.3	58.1	68.1

6000.	68.1	51.8	61.5
10000.	62.4	43.3	52.3
20000.	52.2	26.2	36.7

AIRCRAFT NO. 2: GASEPV
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	76.0 KNOTS		
TAKEOFF ROLL:	1.21	TAN CLIMB ANGLE:	.0839
DIST TO NEW CLIMB ANGLE:	7.50	TAN CLIMB ANGLE:	.1440

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	102.1	91.0	102.1
400.	97.9	85.7	97.9
1000.	91.7	78.0	91.3
2000.	86.1	71.5	84.9
4000.	79.8	63.7	75.6
6000.	75.6	57.4	69.0
10000.	69.9	48.9	59.8
20000.	59.7	31.8	44.2

AIRCRAFT NO. 3: CNA500
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	190.0 KNOTS		
TAKEOFF ROLL:	3.03	TAN CLIMB ANGLE:	.1472
DIST TO NEW CLIMB ANGLE:	9.82	TAN CLIMB ANGLE:	.0765
DIST TO POWER CUTBACK:	22.21	TAN ANGLE:	.1090

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	103.5	91.3	103.5	101.7
400.	98.5	86.2	98.5	96.7
1000.	90.6	77.8	90.2	88.8
2000.	84.1	71.3	82.9	82.3
4000.	76.5	63.7	72.3	74.7
6000.	71.2	58.0	64.6	69.3
10000.	63.4	49.7	53.3	61.6
20000.	49.8	30.4	34.3	48.0

AIRCRAFT NO. 4: BEC58P
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	120.0 KNOTS		
TAKEOFF ROLL:	1.95	TAN CLIMB ANGLE:	.1094
DIST TO NEW CLIMB ANGLE:	11.09	TAN CLIMB ANGLE:	.0690
DIST TO POWER CUTBACK:	13.94	TAN ANGLE:	.1218

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	104.0	92.8	104.0	103.6
400.	99.8	88.5	99.8	99.4
1000.	93.6	82.3	93.2	93.2
2000.	88.0	76.6	86.8	87.6
4000.	81.7	70.3	77.5	81.3
6000.	77.5	66.2	70.9	77.2
10000.	71.8	59.8	61.7	71.4
20000.	61.6	50.1	46.1	61.2

AIRCRAFT NO. 5: CNA441
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	115.0 KNOTS		
TAKEOFF ROLL:	2.34	TAN CLIMB ANGLE:	.1023
DIST TO NEW CLIMB ANGLE:	7.50	TAN CLIMB ANGLE:	.1760

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	93.6	89.0	93.6
400.	89.5	84.6	89.5
1000.	83.7	78.1	83.3
2000.	78.9	72.6	77.7
4000.	72.9	66.2	68.7
6000.	68.9	61.9	62.3
10000.	63.5	55.6	53.4
20000.	54.2	43.6	38.7

AIRCRAFT NO. 6: COMJET
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	230.0 KNOTS		
TAKEOFF ROLL:	4.42	TAN CLIMB ANGLE:	.1693
DIST TO NEW CLIMB ANGLE:	10.33	TAN CLIMB ANGLE:	.0955
DIST TO POWER CUTBACK:	14.02	TAN ANGLE:	.0846

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	122.0	95.5	122.0	119.3
400.	116.3	90.4	116.3	113.8
1000.	107.1	82.5	106.7	104.9
2000.	98.6	75.3	97.4	96.7
4000.	90.3	66.9	86.1	88.5
6000.	84.8	61.6	78.2	83.0
10000.	76.9	53.8	66.8	75.2
20000.	63.4	40.7	47.9	61.8

AIRCRAFT NO. 7: DC3
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	140.0 KNOTS

TAKEOFF ROLL:	6.00	TAN CLIMB ANGLE:	.1009
DIST TO NEW CLIMB ANGLE:	15.92	TAN CLIMB ANGLE:	.1040
DIST TO POWER CUTBACK:	16.92	TAN ANGLE:	.0955

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	113.5	100.8	111.2	111.6
400.	108.9	96.4	104.6	107.0
1000.	102.1	90.0	93.5	100.3
2000.	96.4	84.4	84.1	94.6
4000.	89.5	77.6	75.6	87.7
6000.	84.5	72.8	70.6	82.7
10000.	77.8	66.2	63.9	76.0
20000.	68.1	55.6	54.3	66.3

AIRCRAFT NO. 8: DHC8
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	110.0 KNOTS		
TAKEOFF ROLL:	2.25	TAN CLIMB ANGLE:	.1510
DIST TO NEW CLIMB ANGLE:	8.87	TAN CLIMB ANGLE:	.1360
DIST TO POWER CUTBACK:	9.87	TAN ANGLE:	.1200

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	96.1	99.1	96.1	92.5
400.	92.7	95.0	92.7	89.0
1000.	87.5	88.5	87.1	83.5
2000.	82.9	82.8	81.7	78.6
4000.	78.0	76.3	73.8	73.0
6000.	74.6	72.1	68.0	69.3
10000.	70.0	66.1	59.9	63.8
20000.	63.1	57.0	47.6	55.3

AIRCRAFT NO. 9: COMJET
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	230.0 KNOTS		
TAKEOFF ROLL:	4.42	TAN CLIMB ANGLE:	.1693
DIST TO NEW CLIMB ANGLE:	10.33	TAN CLIMB ANGLE:	.0955
DIST TO POWER CUTBACK:	14.02	TAN ANGLE:	.0846

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	122.0	95.5	122.0	119.3
400.	116.3	90.4	116.3	113.8
1000.	107.1	82.5	106.7	104.9
2000.	98.6	75.3	97.4	96.7
4000.	90.3	66.9	86.1	88.5
6000.	84.8	61.6	78.2	83.0

10000.	76.9	53.8	66.8	75.2
20000.	63.4	40.7	47.9	61.8

AIRCRAFT NO.10: C130
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	150.0 KNOTS		
TAKEOFF ROLL:	4.70	TAN CLIMB ANGLE:	.1087
DIST TO NEW CLIMB ANGLE:	13.90	TAN CLIMB ANGLE:	.1317
DIST TO POWER CUTBACK:	29.08	TAN ANGLE:	.1151

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	113.0	104.6	113.0	113.0
400.	108.4	99.7	108.4	108.4
1000.	101.6	92.1	101.2	101.6
2000.	95.9	85.7	94.7	95.9
4000.	89.3	78.5	85.1	89.3
6000.	84.2	73.5	77.6	84.2
10000.	77.4	66.6	67.3	77.4
20000.	68.0	55.6	52.5	68.0

AIRPORT MOVEMENTS SUMMARY:
****

AIRCRAFT/RUNWAY	DAY TIME OPERATION (0700-2200 HRS) TAKE-OFFS	LANDINGS	NIGHT TIME OPERATION (2200-0700 HRS) TAKEOFFS	LANDINGS
1 / 1	12.0400	11.0600	.1700	.2600
2 / 1	.1400	.1400	.0000	.0100
3 / 1	.0800	.1100	.0000	.0100
4 / 1	3.6900	3.5100	.1600	.1400
5 / 1	1.1900	1.0600	.1100	.0500
6 / 1	.9600	1.0400	.1900	.1100
7 / 1	.0600	.0600	.0300	.0400
8 / 1	.3400	.2800	.0900	.0800
9 / 1	.0600	.0400	.0100	.0000
10 / 1	.0200	.0200	.0000	.0000
TOTALS-RUNWAY NO. 1:	18.5800	17.3200	.7600	

.7000

1 / 2	11.7300	12.6200	.1100	.1300
2 / 2	.1000	.1100	.0000	.0000
3 / 2	.0000	.0100	.0000	.0000
4 / 2	3.0000	2.9500	.0300	.0100
5 / 2	.4700	.5800	.0100	.0100
6 / 2	.0500	.0500	.0000	.0000
7 / 2	.0200	.0200	.0100	.0000
8 / 2	.0800	.0700	.0100	.0000
9 / 2	.0100	.0000	.0000	.0000
10 / 2	.0000	.0000	.0000	.0000

TOTALS-RUNWAY NO. 2:	15.4600	16.4100	.1700	.1500
1 / 3	2.3500	25.5000	.0200	.3800
2 / 3	.0200	.2100	.0000	.0200
3 / 3	.0200	.1000	.0000	.0100
4 / 3	.4500	6.6500	.0200	.1800
5 / 3	.1500	1.9900	.0100	.1300
6 / 3	.1900	2.0000	.0200	.2300
7 / 3	.0100	.1000	.0000	.0300
8 / 3	.0300	.3600	.0100	.1000
9 / 3	.0100	.1000	.0000	.0000
10 / 3	.0100	.0700	.0100	.0000

TOTALS-RUNWAY NO. 3:	3.2400	37.0800	.0900	1.0800
1 / 4	22.0900	.0000	.1700	.0000
2 / 4	.1900	.0000	.0100	.0000

3 / 4	.1700	.0000	.0000	.0000
4 / 4	5.3800	.0000	.1900	.0000
5 / 4	1.4900	.0000	.0900	.0000
6 / 4	1.6900	.0000	.1300	.0000
7 / 4	.1100	.0000	.0300	.0000
8 / 4	.2900	.0000	.0600	.0000
9 / 4	.0500	.0000	.0000	.0000
10 / 4	.0400	.0000	.0000	.0000
TOTALS-RUNWAY NO. 4:	31.5000	.0000	.6800	.0000
1 / 5	57.6900	55.6600	.6600	1.0800
2 / 5	.3600	.3400	.0300	.0100
3 / 5	.0300	.0500	.0000	.0000
4 / 5	10.3700	10.0400	.3000	.2200
5 / 5	2.4400	2.2600	.1200	.0900
6 / 5	.3700	.2400	.0100	.0100
7 / 5	.1100	.1200	.0500	.0400
8 / 5	.3200	.3900	.0500	.0400
9 / 5	.0200	.0100	.0000	.0000
10 / 5	.0300	.0300	.0000	.0000
TOTALS-RUNWAY NO. 5:	71.7400	69.1400	1.2200	1.4900
AIRPORT TOTALS	140.5200	139.9500	2.9200	3.4200

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INPUT DATA FILE:

```
LINES**   NOVALUES
TITLE       0
YKF (13) AIRPORT - 1998 LOCAL NEF - REM
RUNWY       4
 07C    1        .0000      .0000     5.2000      .0000     1.0000     2.0000
  LEFT   -1.0000  HGHT       .5000  RATE**     1.0000
      5.0000     5.0000      .5000  HGHT       1.0000
 25C    2       5.2000      .0000      .0000      .0000     1.0000     2.0000
  LEFT   -1.0000  HGHT       .5000  RATE**     1.0000
      5.0000     5.0000      .5000  HGHT       1.0000
 14C    3        .2500     1.7100     2.0900    -1.9500     1.0000     2.0000
  LEFT   -1.0000  HGHT       .5000  RATE**     1.0000
      5.0000     5.0000      .5000  HGHT       1.0000
 32C    4       2.0900    -1.9500      .2500     1.7100     1.0000     2.0000
  LEFT   -1.0000  HGHT       .5000  RATE**     1.0000
      5.0000     5.0000      .5000  HGHT       1.0000
AIRCF       4
            1     1   GASEPF     1       24.5500      .7200
            1     1   GASEPF     2       52.4000     1.5300
            1     1   GASEPF     3       20.5800      .6000
            1     1   GASEPF     4      106.0100     3.1000
            2     1   GASEPV     1        6.1400      .1800
            2     1   GASEPV     2       13.1000      .3800
            2     1   GASEPV     3        5.1500      .1500
            2     1   GASEPV     4       26.5000      .7800
            3     1   BEC58P     1        4.1500      .0500
            3     1   BEC58P     2        8.8700      .1100
            3     1   BEC58P     3        3.4800      .0400
            3     1   BEC58P     4       17.9400      .2200
            4     1   CNA500     1         .0900      .0000
            4     1   CNA500     2         .2000      .0000
            4     1   CNA500     3         .0800      .0000
            4     1   CNA500     4         .4000      .0000
  END**     0     0        0     0         .0000      .0000
```

YKF (13) AIRPORT - 1998 LOCAL NEF - REM

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ALL DISTANCES MEASURED IN THOUSANDS OF FEET
AND ALL ANGLES MEASURED IN DEGREES

RUNWAY/FLIGHT PATH DEFINITIONS:

```
 RUNWAY 07C   NUMBER  1  (   .000,    .000) TO (  5.200,    .000)
  FLIGHT PATH CONFIGURATION:   CIRCUIT
         TURN: LEFT      WHEN: HGHT        H/S:    .50
  APPROACH INFORMATION:
          GS1:  5.00      GS2:  5.00       DGS:  5.20


 RUNWAY 25C   NUMBER  2  (  5.200,    .000) TO (   .000,    .000)
  FLIGHT PATH CONFIGURATION:   CIRCUIT
         TURN: LEFT      WHEN: HGHT        H/S:    .50
  APPROACH INFORMATION:
          GS1:  5.00      GS2:  5.00       DGS:  5.20
```

RUNWAY 14C NUMBER 3 (.250, 1.710) TO (2.090, -1.950)
FLIGHT PATH CONFIGURATION: CIRCUIT
TURN: LEFT WHEN: HGHT H/S: .50
APPROACH INFORMATION:
GS1: 5.00 GS2: 5.00 DGS: 5.31

RUNWAY 32C NUMBER 4 (2.090, -1.950) TO (.250, 1.710)
FLIGHT PATH CONFIGURATION: CIRCUIT
TURN: LEFT WHEN: HGHT H/S: .50
APPROACH INFORMATION:
GS1: 5.00 GS2: 5.00 DGS: 5.31

RANGE NO.	STAGE LENGTH (NM)
1	UNDER 500
2	500-1000
3	1000-1500
4	1500-2500
5	2500-3500
6	3500-4500
7	OVER 4500

AIRCRAFT NO. 1: GASEPF
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:
SPEED: 77.0 KNOTS
TAKEOFF ROLL: 1.85 TAN CLIMB ANGLE: .0935
DIST TO NEW CLIMB ANGLE: 12.32 TAN CLIMB ANGLE: .0980

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	94.6	85.4	94.6
400.	90.4	80.1	90.4
1000.	84.2	72.4	83.8
2000.	78.6	65.9	77.4
4000.	72.3	58.1	68.1
6000.	68.1	51.8	61.5
10000.	62.4	43.3	52.3
20000.	52.2	26.2	36.7

AIRCRAFT NO. 2: GASEPV
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:
SPEED: 76.0 KNOTS
TAKEOFF ROLL: 1.21 TAN CLIMB ANGLE: .0839
DIST TO NEW CLIMB ANGLE: 7.50 TAN CLIMB ANGLE: .1440

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	102.1	91.0	102.1
400.	97.9	85.7	97.9
1000.	91.7	78.0	91.3
2000.	86.1	71.5	84.9
4000.	79.8	63.7	75.6
6000.	75.6	57.4	69.0
10000.	69.9	48.9	59.8
20000.	59.7	31.8	44.2

AIRCRAFT NO. 3: BEC58P
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	120.0 KNOTS		
TAKEOFF ROLL:	1.95	TAN CLIMB ANGLE:	.1094
DIST TO NEW CLIMB ANGLE:	11.09	TAN CLIMB ANGLE:	.0690
DIST TO POWER CUTBACK:	13.94	TAN ANGLE:	.1218

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	104.0	92.8	104.0	103.6
400.	99.8	88.5	99.8	99.4
1000.	93.6	82.3	93.2	93.2
2000.	88.0	76.6	86.8	87.6
4000.	81.7	70.3	77.5	81.3
6000.	77.5	66.2	70.9	77.2
10000.	71.8	59.8	61.7	71.4
20000.	61.6	50.1	46.1	61.2

AIRCRAFT NO. 4: CNA500
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	190.0 KNOTS		
TAKEOFF ROLL:	3.03	TAN CLIMB ANGLE:	.1472
DIST TO NEW CLIMB ANGLE:	9.82	TAN CLIMB ANGLE:	.0765
DIST TO POWER CUTBACK:	22.21	TAN ANGLE:	.1090

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	103.5	91.3	103.5	101.7
400.	98.5	86.2	98.5	96.7
1000.	90.6	77.8	90.2	88.8
2000.	84.1	71.3	82.9	82.3
4000.	76.5	63.7	72.3	74.7
6000.	71.2	58.0	64.6	69.3
10000.	63.4	49.7	53.3	61.6
20000.	49.8	30.4	34.3	48.0

AIRPORT MOVEMENTS SUMMARY:
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AIRCRAFT/RUNWAY	DAY TIME OPERATION (0700-2200 HRS) TAKE-OFFS	LANDINGS	NIGHT TIME OPERATION (2200-0700 HRS) TAKEOFFS	LANDINGS
1 / 1	24.5500	24.5500	.7200	.7200
2 / 1	6.1400	6.1400	.1800	.1800
3 / 1	4.1500	4.1500	.0500	.0500
4 / 1	.0900	.0900	.0000	.0000
TOTALS-RUNWAY NO. 1:	34.9300	34.9300	.9500	.9500
1 / 2	52.4000	52.4000	1.5300	1.5300
2 / 2	13.1000	13.1000	.3800	.3800
3 / 2	8.8700	8.8700	.1100	.1100
4 / 2	.2000	.2000	.0000	.0000
TOTALS-RUNWAY NO. 2:	74.5700	74.5700	2.0200	2.0200
1 / 3	20.5800	20.5800	.6000	.6000
2 / 3	5.1500	5.1500	.1500	.1500
3 / 3	3.4800	3.4800	.0400	.0400
4 / 3	.0800	.0800	.0000	.0000
TOTALS-RUNWAY NO. 3:	29.2900	29.2900	.7900	.7900
1 / 4	106.0100	106.0100	3.1000	3.1000
2 / 4	26.5000	26.5000	.7800	.7800
3 / 4	17.9400	17.9400	.2200	.2200
4 / 4	.4000	.4000	.0000	

.0000

TOTALS-RUNWAY NO. 4: 150.8500 150.8500 4.1000
4.1000

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AIRPORT TOTALS 289.6400 289.6400 7.8600
7.8600

YKF (13) AIRPORT - 1998 LOCAL NEF - REM

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INPUT DATA FILE:

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LINES**   NOVALUES
TITLE       0
YKF AIRPORT PLANNING DAY (INCL. 16 COMMUTER + 4 B737-300) - 7000 ft.
RWY
 RUNWY       5
  07S     1        .0000      .0000     7.0000      .0000     1.0000      .0000
        3.0000     3.0000      .0000   DIST      15.0000
  14S     2        .2500     1.7100     2.0900    -1.9600     1.0000      .0000
        3.0000     3.0000      .0000   DIST      15.0000
  25S     3       7.0000      .0000      .0000      .0000     1.0000      .0000
        3.0000     3.0000      .0000   DIST      15.0000
  25L     4       7.0000      .0000      .0000      .0000      .0000     1.0000
    LEFT    30.0000  HGHT       .5600   RATE**     1.0000
  32S     5       2.0900    -1.9500      .2500     1.7100     1.0000      .0000
        3.0000     3.0000      .0000   DIST      15.0000
 AIRCF      13
             1     1    GASEPF     1       16.3000      .2300
             1     1    GASEPF     2       15.8800      .1500
             1     1    GASEPF     3        3.1800      .0300
             1     1    GASEPF     4       29.9100      .2300
             1     1    GASEPF     5       68.1100      .8900
             2     1    GASEPV     1         .1900      .0000
             2     1    GASEPV     2         .1400      .0000
             2     1    GASEPV     3         .0300      .0000
             2     1    GASEPV     4         .2600      .0100
             2     1    GASEPV     5         .4900      .0400
             3     1    CNA500     1         .1100      .0000
             3     1    CNA500     2         .0000      .0000
             3     1    CNA500     3         .0300      .0000
             3     1    CNA500     4         .2300      .0000
             3     1    CNA500     5         .0400      .0000
             4     1    BEC58P     1        5.0000      .2200
             4     1    BEC58P     2        4.0600      .0400
             4     1    BEC58P     3         .6100      .0300
             4     1    BEC58P     4        7.2800      .2600
             4     1    BEC58P     5       14.0400      .4100
             5     1    CNA441     1        1.6100      .1500
             5     1    CNA441     2         .6400      .0100
             5     1    CNA441     3         .2000      .0100
             5     1    CNA441     4        2.0200      .1200
             5     1    CNA441     5        3.3000      .1600
             6     1    COMJET     1        1.3000      .2600
             6     1    COMJET     2         .0700      .0000
             6     1    COMJET     3         .2600      .0300
             6     1    COMJET     4        2.2900      .1800
             6     1    COMJET     5         .5000      .0100
             7     1       DC3     1         .0800      .0400
             7     1       DC3     2         .0300      .0100
             7     1       DC3     3         .0100      .0000
             7     1       DC3     4         .1500      .0400
             7     1       DC3     5         .1500      .0700
             8     1      DHC8     1         .4600      .1200
             8     1      DHC8     2         .1100      .0100
             8     1      DHC8     3         .0400      .0100
             8     1      DHC8     4         .3900      .0800
             8     1      DHC8     5         .4300      .0700
             9     1    COMJET     1         .0800      .0100
             9     1    COMJET     2         .0100      .0000
             9     1    COMJET     3         .0100      .0000
```

9	1	COMJET	4	.0700	.0000
9	1	COMJET	5	.0300	.0000
10	1	C130	1	.0300	.0000
10	1	C130	2	.0000	.0000
10	1	C130	3	.0100	.0100
10	1	C130	4	.0500	.0000
10	1	C130	5	.0400	.0000
11	2	737300	1	.6800	.0000
11	2	737300	4	1.3200	.0000
12	1	DHC8	1	.3900	.1300
12	1	DHC8	2	.3300	.1100
12	1	DHC8	4	.7500	.2500
12	1	DHC8	5	1.5300	.5100
13	1	SF340	1	.3900	.1300
13	1	SF340	2	.3300	.1100
13	1	SF340	4	.7500	.2500
13	1	SF340	5	1.5300	.5100
1	0	GASEPF	1	14.9800	.3500
1	0	GASEPF	2	17.0900	.1800
1	0	GASEPF	3	34.5300	.5100
1	0	GASEPF	5	65.3600	1.4600
2	0	GASEPV	1	.1900	.0100
2	0	GASEPV	2	.1500	.0000
2	0	GASEPV	3	.2800	.0300
2	0	GASEPV	5	.4600	.0100
3	0	CNA500	1	.1500	.0100
3	0	CNA500	2	.0100	.0000
3	0	CNA500	3	.1400	.0100
3	0	CNA500	5	.0700	.0000
4	0	BEC58P	1	4.7500	.1900
4	0	BEC58P	2	3.9900	.0100
4	0	BEC58P	3	9.0000	.2400
4	0	BEC58P	5	13.5900	.3000
5	0	CNA441	1	1.4400	.0700
5	0	CNA441	2	.7900	.0100
5	0	CNA441	3	2.6900	.1800
5	0	CNA441	5	3.0600	.1200
6	0	COMJET	1	1.4100	.1500
6	0	COMJET	2	.0700	.0000
6	0	COMJET	3	2.7100	.3100
6	0	COMJET	5	.3200	.0100
7	0	DC3	1	.0800	.0500
7	0	DC3	2	.0300	.0000
7	0	DC3	3	.1400	.0400
7	0	DC3	5	.1600	.0500
8	0	DHC8	1	.3800	.1100
8	0	DHC8	2	.0900	.0000
8	0	DHC8	3	.4900	.1400
8	0	DHC8	5	.5300	.0500
9	0	COMJET	1	.0500	.0000
9	0	COMJET	2	.0000	.0000
9	0	COMJET	3	.1400	.0000
9	0	COMJET	5	.0100	.0000
10	0	C130	1	.0300	.0000
10	0	C130	2	.0000	.0000
10	0	C130	3	.0900	.0000
10	0	C130	5	.0400	.0000
11	0	737300	1	.6800	.0000
11	0	737300	3	1.3200	.0000
12	0	DHC8	1	.3900	.1300
12	0	DHC8	2	.3300	.1100

	12	0	DHC8	3	.7500	.2500
	12	0	DHC8	5	1.5300	.5100
	13	0	SF340	1	.3900	.1300
	13	0	SF340	2	.3300	.1100
	13	0	SF340	3	.7500	.2500
	13	0	SF340	5	1.5300	.5100
END**	0	0	0	0	.0000	.0000

YKF AIRPORT PLANNING DAY (INCL. 16 COMMUTER + 4 B737-300) - 7000 ft. RWY

****

ALL DISTANCES MEASURED IN THOUSANDS OF FEET
AND ALL ANGLES MEASURED IN DEGREES

RUNWAY/FLIGHT PATH DEFINITIONS:

RUNWAY 07S NUMBER 1 (.000, .000) TO (7.000, .000)
FLIGHTPATH CONFIGURATION: STRAIGHT OUT DEPARTURE
APPROACH INFORMATION:
GS1: 3.00 GS2: 3.00 DGS: .00

RUNWAY 14S NUMBER 2 (.250, 1.710) TO (2.090, -1.960)
FLIGHTPATH CONFIGURATION: STRAIGHT OUT DEPARTURE
APPROACH INFORMATION:
GS1: 3.00 GS2: 3.00 DGS: .00

RUNWAY 25S NUMBER 3 (7.000, .000) TO (.000, .000)
FLIGHTPATH CONFIGURATION: STRAIGHT OUT DEPARTURE
APPROACH INFORMATION:
GS1: 3.00 GS2: 3.00 DGS: .00

RUNWAY 25L NUMBER 4 (7.000, .000) TO (.000, .000)
FLIGHTPATH CONFIGURATION: SINGLE TURN DEPARTURE
FIRST TURN: LEFT ANGLE: 30.00 WHEN: HGHT H/S: .56
NO APPROACH INFORMATION GIVEN

RUNWAY 32S NUMBER 5 (2.090, -1.950) TO (.250, 1.710)
FLIGHTPATH CONFIGURATION: STRAIGHT OUT DEPARTURE
APPROACH INFORMATION:
GS1: 3.00 GS2: 3.00 DGS: .00

RANGE NO.	STAGE LENGTH (NM)
1	UNDER 500
2	500-1000
3	1000-1500
4	1500-2500
5	2500-3500
6	3500-4500
7	OVER 4500

AIRCRAFT NO. 1: GASEPF
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	77.0 KNOTS		
TAKEOFF ROLL:	1.85	TAN CLIMB ANGLE:	.0935
DIST TO NEW CLIMB ANGLE:	12.32	TAN CLIMB ANGLE:	.0980

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	94.6	85.4	94.6
400.	90.4	80.1	90.4
1000.	84.2	72.4	83.8
2000.	78.6	65.9	77.4
4000.	72.3	58.1	68.1
6000.	68.1	51.8	61.5
10000.	62.4	43.3	52.3
20000.	52.2	26.2	36.7

AIRCRAFT NO. 2: GASEPV
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	76.0 KNOTS		
TAKEOFF ROLL:	1.21	TAN CLIMB ANGLE:	.0839
DIST TO NEW CLIMB ANGLE:	7.50	TAN CLIMB ANGLE:	.1440

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	102.1	91.0	102.1
400.	97.9	85.7	97.9
1000.	91.7	78.0	91.3
2000.	86.1	71.5	84.9
4000.	79.8	63.7	75.6
6000.	75.6	57.4	69.0
10000.	69.9	48.9	59.8
20000.	59.7	31.8	44.2

AIRCRAFT NO. 3: CNA500
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	190.0 KNOTS		
TAKEOFF ROLL:	3.03	TAN CLIMB ANGLE:	.1472
DIST TO NEW CLIMB ANGLE:	9.82	TAN CLIMB ANGLE:	.0765
DIST TO POWER CUTBACK:	22.21	TAN ANGLE:	.1090

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK

200.	103.5	91.3	103.5	101.7
400.	98.5	86.2	98.5	96.7
1000.	90.6	77.8	90.2	88.8
2000.	84.1	71.3	82.9	82.3
4000.	76.5	63.7	72.3	74.7
6000.	71.2	58.0	64.6	69.3
10000.	63.4	49.7	53.3	61.6
20000.	49.8	30.4	34.3	48.0

AIRCRAFT NO. 4: BEC58P
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	120.0 KNOTS		
TAKEOFF ROLL:	1.95	TAN CLIMB ANGLE:	.1094
DIST TO NEW CLIMB ANGLE:	11.09	TAN CLIMB ANGLE:	.0690
DIST TO POWER CUTBACK:	13.94	TAN ANGLE:	.1218

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	104.0	92.8	104.0	103.6
400.	99.8	88.5	99.8	99.4
1000.	93.6	82.3	93.2	93.2
2000.	88.0	76.6	86.8	87.6
4000.	81.7	70.3	77.5	81.3
6000.	77.5	66.2	70.9	77.2
10000.	71.8	59.8	61.7	71.4
20000.	61.6	50.1	46.1	61.2

AIRCRAFT NO. 5: CNA441
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	115.0 KNOTS		
TAKEOFF ROLL:	2.34	TAN CLIMB ANGLE:	.1023
DIST TO NEW CLIMB ANGLE:	7.50	TAN CLIMB ANGLE:	.1760

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	93.6	89.0	93.6
400.	89.5	84.6	89.5
1000.	83.7	78.1	83.3
2000.	78.9	72.6	77.7
4000.	72.9	66.2	68.7
6000.	68.9	61.9	62.3
10000.	63.5	55.6	53.4
20000.	54.2	43.6	38.7

AIRCRAFT NO. 6: COMJET
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	230.0 KNOTS		
TAKEOFF ROLL:	4.42	TAN CLIMB ANGLE:	.1693

DIST TO NEW CLIMB ANGLE: 10.33 TAN CLIMB ANGLE: .0955
DIST TO POWER CUTBACK: 14.02 TAN ANGLE: .0846

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	122.0	95.5	122.0	119.3
400.	116.3	90.4	116.3	113.8
1000.	107.1	82.5	106.7	104.9
2000.	98.6	75.3	97.4	96.7
4000.	90.3	66.9	86.1	88.5
6000.	84.8	61.6	78.2	83.0
10000.	76.9	53.8	66.8	75.2
20000.	63.4	40.7	47.9	61.8

AIRCRAFT NO. 7: DC3
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:
SPEED: 140.0 KNOTS
TAKEOFF ROLL: 6.00 TAN CLIMB ANGLE: .1009
DIST TO NEW CLIMB ANGLE: 15.92 TAN CLIMB ANGLE: .1040
DIST TO POWER CUTBACK: 16.92 TAN ANGLE: .0955

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	113.5	100.8	111.2	111.6
400.	108.9	96.4	104.6	107.0
1000.	102.1	90.0	93.5	100.3
2000.	96.4	84.4	84.1	94.6
4000.	89.5	77.6	75.6	87.7
6000.	84.5	72.8	70.6	82.7
10000.	77.8	66.2	63.9	76.0
20000.	68.1	55.6	54.3	66.3

AIRCRAFT NO. 8: DHC8
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:
SPEED: 110.0 KNOTS
TAKEOFF ROLL: 2.25 TAN CLIMB ANGLE: .1510
DIST TO NEW CLIMB ANGLE: 8.87 TAN CLIMB ANGLE: .1360
DIST TO POWER CUTBACK: 9.87 TAN ANGLE: .1200

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	96.1	99.1	96.1	92.5
400.	92.7	95.0	92.7	89.0
1000.	87.5	88.5	87.1	83.5
2000.	82.9	82.8	81.7	78.6
4000.	78.0	76.3	73.8	73.0
6000.	74.6	72.1	68.0	69.3
10000.	70.0	66.1	59.9	63.8

20000.	63.1	57.0	47.6	55.3

AIRCRAFT NO. 9: COMJET
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	230.0 KNOTS		
TAKEOFF ROLL:	4.42	TAN CLIMB ANGLE:	.1693
DIST TO NEW CLIMB ANGLE:	10.33	TAN CLIMB ANGLE:	.0955
DIST TO POWER CUTBACK:	14.02	TAN ANGLE:	.0846

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	122.0	95.5	122.0	119.3
400.	116.3	90.4	116.3	113.8
1000.	107.1	82.5	106.7	104.9
2000.	98.6	75.3	97.4	96.7
4000.	90.3	66.9	86.1	88.5
6000.	84.8	61.6	78.2	83.0
10000.	76.9	53.8	66.8	75.2
20000.	63.4	40.7	47.9	61.8

AIRCRAFT NO.10: C130
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	150.0 KNOTS		
TAKEOFF ROLL:	4.70	TAN CLIMB ANGLE:	.1087
DIST TO NEW CLIMB ANGLE:	13.90	TAN CLIMB ANGLE:	.1317
DIST TO POWER CUTBACK:	29.08	TAN ANGLE:	.1151

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	113.0	104.6	113.0	113.0
400.	108.4	99.7	108.4	108.4
1000.	101.6	92.1	101.2	101.6
2000.	95.9	85.7	94.7	95.9
4000.	89.3	78.5	85.1	89.3
6000.	84.2	73.5	77.6	84.2
10000.	77.4	66.6	67.3	77.4
20000.	68.0	55.6	52.5	68.0

AIRCRAFT NO.11: 737300
RANGE NO. 2

TAKEOFF PROFILE PARAMETERS:

SPEED:	220.0 KNOTS		
TAKEOFF ROLL:	3.65	TAN CLIMB ANGLE:	.2232
DIST TO NEW CLIMB ANGLE:	8.13	TAN CLIMB ANGLE:	.2040
DIST TO POWER CUTBACK:	9.13	TAN ANGLE:	.0957

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK

200.	104.3	101.7	104.3	104.0
400.	100.3	96.9	100.3	100.0
1000.	94.4	89.1	94.0	93.9
2000.	89.4	81.7	88.2	88.7
4000.	83.0	73.6	78.8	82.2
6000.	78.4	68.1	71.8	77.6
10000.	72.0	60.3	61.9	71.1
20000.	61.6	48.1	46.1	60.6

AIRCRAFT NO.12: DHC8
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	110.0 KNOTS		
TAKEOFF ROLL:	2.25	TAN CLIMB ANGLE:	.1510
DIST TO NEW CLIMB ANGLE:	8.87	TAN CLIMB ANGLE:	.1360
DIST TO POWER CUTBACK:	9.87	TAN ANGLE:	.1200

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	96.1	99.1	96.1	92.5
400.	92.7	95.0	92.7	89.0
1000.	87.5	88.5	87.1	83.5
2000.	82.9	82.8	81.7	78.6
4000.	78.0	76.3	73.8	73.0
6000.	74.6	72.1	68.0	69.3
10000.	70.0	66.1	59.9	63.8
20000.	63.1	57.0	47.6	55.3

AIRCRAFT NO.13: SF340
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	126.0 KNOTS		
TAKEOFF ROLL:	3.00	TAN CLIMB ANGLE:	.1173
DIST TO NEW CLIMB ANGLE:	7.50	TAN CLIMB ANGLE:	.1507
DIST TO POWER CUTBACK:	11.57	TAN ANGLE:	.1280

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	103.8	95.4	103.8	100.6
400.	99.4	91.0	99.4	96.3
1000.	93.0	84.4	92.6	90.0
2000.	87.4	78.7	86.2	84.4
4000.	81.1	72.1	76.9	78.1
6000.	76.9	67.7	70.3	73.9
10000.	71.0	61.5	60.9	68.0
20000.	59.5	48.7	44.0	56.5

AIRPORT MOVEMENTS SUMMARY:
****

AIRCRAFT/RUNWAY	DAY TIME OPERATION (0700-2200 HRS) TAKE-OFFS	LANDINGS	NIGHT TIME OPERATION (2200-0700 HRS) TAKEOFFS	LANDINGS
1 / 1	16.3000	14.9800	.2300	.3500
2 / 1	.1900	.1900	.0000	.0100
3 / 1	.1100	.1500	.0000	.0100
4 / 1	5.0000	4.7500	.2200	.1900
5 / 1	1.6100	1.4400	.1500	.0700
6 / 1	1.3000	1.4100	.2600	.1500
7 / 1	.0800	.0800	.0400	.0500
8 / 1	.4600	.3800	.1200	.1100
9 / 1	.0800	.0500	.0100	.0000
10 / 1	.0300	.0300	.0000	.0000
11 / 1	.6800	.6800	.0000	.0000
12 / 1	.3900	.3900	.1300	.1300
13 / 1	.3900	.3900	.1300	.1300
TOTALS-RUNWAY NO. 1:	26.6200	24.9200	1.2900	1.2000
1 / 2	15.8800	17.0900	.1500	.1800
2 / 2	.1400	.1500	.0000	.0000
3 / 2	.0000	.0100	.0000	.0000
4 / 2	4.0600	3.9900	.0400	.0100
5 / 2	.6400	.7900	.0100	.0100
6 / 2	.0700	.0700	.0000	.0000
7 / 2	.0300	.0300	.0100	.0000
8 / 2	.1100	.0900	.0100	.0000
9 / 2	.0100	.0000	.0000	.0000
10 / 2	.0000	.0000	.0000	.0000
11 / 2	.0000	.0000	.0000	.0000

12 / 2	.3300	.3300	.1100	.1100
13 / 2	.3300	.3300	.1100	.1100
TOTALS-RUNWAY NO. 2:	21.6000	22.8800	.4400	.4200
1 / 3	3.1800	34.5300	.0300	.5100
2 / 3	.0300	.2800	.0000	.0300
3 / 3	.0300	.1400	.0000	.0100
4 / 3	.6100	9.0000	.0300	.2400
5 / 3	.2000	2.6900	.0100	.1800
6 / 3	.2600	2.7100	.0300	.3100
7 / 3	.0100	.1400	.0000	.0400
8 / 3	.0400	.4900	.0100	.1400
9 / 3	.0100	.1400	.0000	.0000
10 / 3	.0100	.0900	.0100	.0000
11 / 3	.0000	1.3200	.0000	.0000
12 / 3	.0000	.7500	.0000	.2500
13 / 3	.0000	.7500	.0000	.2500
TOTALS-RUNWAY NO. 3:	4.3800	53.0300	.1200	1.9600
1 / 4	29.9100	.0000	.2300	.0000
2 / 4	.2600	.0000	.0100	.0000
3 / 4	.2300	.0000	.0000	.0000
4 / 4	7.2800	.0000	.2600	.0000
5 / 4	2.0200	.0000	.1200	.0000
6 / 4	2.2900	.0000	.1800	.0000
7 / 4	.1500	.0000	.0400	.0000
8 / 4	.3900	.0000	.0800	.0000
9 / 4	.0700	.0000	.0000	

.0000				
	10 / 4	.0500	.0000	.0000
.0000				
	11 / 4	1.3200	.0000	.0000
.0000				
	12 / 4	.7500	.0000	.2500
.0000				
	13 / 4	.7500	.0000	.2500
.0000				
TOTALS-RUNWAY NO. 4:		45.4700	.0000	1.4200
.0000				
	1 / 5	68.1100	65.3600	.8900
1.4600				
	2 / 5	.4900	.4600	.0400
.0100				
	3 / 5	.0400	.0700	.0000
.0000				
	4 / 5	14.0400	13.5900	.4100
.3000				
	5 / 5	3.3000	3.0600	.1600
.1200				
	6 / 5	.5000	.3200	.0100
.0100				
	7 / 5	.1500	.1600	.0700
.0500				
	8 / 5	.4300	.5300	.0700
.0500				
	9 / 5	.0300	.0100	.0000
.0000				
	10 / 5	.0400	.0400	.0000
.0000				
	11 / 5	.0000	.0000	.0000
.0000				
	12 / 5	1.5300	1.5300	.5100
.5100				
	13 / 5	1.5300	1.5300	.5100
.5100				
TOTALS-RUNWAY NO. 5:		90.1900	86.6600	2.6700
3.0200				
AIRPORT TOTALS		188.2600	187.4900	5.9400
6.6000				

YKF AIRPORT PLANNING DAY (INCL. 16 COMMUTER + 4 B737-300) - 7000 ft. RWY

INPUT DATA FILE:

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LINES**    NOVALUES
TITLE       0
YKF AIRPORT - PLANNING LOCAL NEF with 7000 ft. Rwy 25
RUNWY       4
 07C    1        .0000      .0000     7.0000      .0000     1.0000     2.0000
  LEFT   -1.0000  HGHT       .5000   RATE**      1.0000
      5.0000     5.0000      .5000   HGHT        1.0000
 25C    2       7.0000      .0000      .0000      .0000     1.0000     2.0000
  LEFT   -1.0000  HGHT       .5000   RATE**      1.0000
      5.0000     5.0000      .5000   HGHT        1.0000
 14C    3        .2500     1.7100     2.0800    -1.9600     1.0000     2.0000
  LEFT   -1.0000  HGHT       .5000   RATE**      1.0000
      5.0000     5.0000      .5000   HGHT        1.0000
 32C    4       2.0800    -1.9600      .2500     1.7100     1.0000     2.0000
  LEFT   -1.0000  HGHT       .5000   RATE**      1.0000
      5.0000     5.0000      .5000   HGHT        1.0000
AIRCF       4
            1     1   GASEPF     1       25.4100      .7500
            1     1   GASEPF     2       54.2300     1.5800
            1     1   GASEPF     3       21.3000      .6200
            1     1   GASEPF     4      109.7200     3.2100
            2     1   GASEPV     1        6.3500      .1900
            2     1   GASEPV     2       13.5600      .3900
            2     1   GASEPV     3        5.3300      .1600
            2     1   GASEPV     4       27.4300      .8100
            3     1   BEC58P     1        4.3000      .0500
            3     1   BEC58P     2        9.1800      .1100
            3     1   BEC58P     3        3.6000      .0400
            3     1   BEC58P     4       18.5700      .2300
            4     1   CNA500     1         .0900      .0000
            4     1   CNA500     2         .2100      .0000
            4     1   CNA500     3         .0800      .0000
            4     1   CNA500     4         .4100      .0000
  END**     0     0        0     0         .0000      .0000
```

YKF AIRPORT - PLANNING LOCAL NEF with 7000 ft. Rwy 25

****

ALL DISTANCES MEASURED IN THOUSANDS OF FEET
AND ALL ANGLES MEASURED IN DEGREES

RUNWAY/FLIGHT PATH DEFINITIONS:

```
 RUNWAY 07C   NUMBER  1  (   .000,    .000) TO (  7.000,    .000)
  FLIGHT PATH CONFIGURATION:   CIRCUIT
         TURN: LEFT      WHEN: HGHT        H/S:    .50
  APPROACH INFORMATION:
          GS1:  5.00      GS2:  5.00       DGS:  5.02


 RUNWAY 25C   NUMBER  2  (  7.000,    .000) TO (   .000,    .000)
  FLIGHT PATH CONFIGURATION:   CIRCUIT
         TURN: LEFT      WHEN: HGHT        H/S:    .50
  APPROACH INFORMATION:
          GS1:  5.00      GS2:  5.00       DGS:  5.02
```

RUNWAY 14C NUMBER 3 (.250, 1.710) TO (2.080, -1.960)
FLIGHT PATH CONFIGURATION: CIRCUIT
TURN: LEFT WHEN: HGHT H/S: .50
APPROACH INFORMATION:
GS1: 5.00 GS2: 5.00 DGS: 5.30

RUNWAY 32C NUMBER 4 (2.080, -1.960) TO (.250, 1.710)
FLIGHT PATH CONFIGURATION: CIRCUIT
TURN: LEFT WHEN: HGHT H/S: .50
APPROACH INFORMATION:
GS1: 5.00 GS2: 5.00 DGS: 5.30

RANGE NO.	STAGE LENGTH (NM)
1	UNDER 500
2	500-1000
3	1000-1500
4	1500-2500
5	2500-3500
6	3500-4500
7	OVER 4500

AIRCRAFT NO. 1: GASEPF
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:
SPEED: 77.0 KNOTS
TAKEOFF ROLL: 1.85 TAN CLIMB ANGLE: .0935
DIST TO NEW CLIMB ANGLE: 12.32 TAN CLIMB ANGLE: .0980

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	94.6	85.4	94.6
400.	90.4	80.1	90.4
1000.	84.2	72.4	83.8
2000.	78.6	65.9	77.4
4000.	72.3	58.1	68.1
6000.	68.1	51.8	61.5
10000.	62.4	43.3	52.3
20000.	52.2	26.2	36.7

AIRCRAFT NO. 2: GASEPV
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:
SPEED: 76.0 KNOTS
TAKEOFF ROLL: 1.21 TAN CLIMB ANGLE: .0839
DIST TO NEW CLIMB ANGLE: 7.50 TAN CLIMB ANGLE: .1440

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE
200.	102.1	91.0	102.1
400.	97.9	85.7	97.9
1000.	91.7	78.0	91.3
2000.	86.1	71.5	84.9
4000.	79.8	63.7	75.6
6000.	75.6	57.4	69.0
10000.	69.9	48.9	59.8
20000.	59.7	31.8	44.2

AIRCRAFT NO. 3: BEC58P
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	120.0 KNOTS		
TAKEOFF ROLL:	1.95	TAN CLIMB ANGLE:	.1094
DIST TO NEW CLIMB ANGLE:	11.09	TAN CLIMB ANGLE:	.0690
DIST TO POWER CUTBACK:	13.94	TAN ANGLE:	.1218

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	104.0	92.8	104.0	103.6
400.	99.8	88.5	99.8	99.4
1000.	93.6	82.3	93.2	93.2
2000.	88.0	76.6	86.8	87.6
4000.	81.7	70.3	77.5	81.3
6000.	77.5	66.2	70.9	77.2
10000.	71.8	59.8	61.7	71.4
20000.	61.6	50.1	46.1	61.2

AIRCRAFT NO. 4: CNA500
RANGE NO. 1

TAKEOFF PROFILE PARAMETERS:

SPEED:	190.0 KNOTS		
TAKEOFF ROLL:	3.03	TAN CLIMB ANGLE:	.1472
DIST TO NEW CLIMB ANGLE:	9.82	TAN CLIMB ANGLE:	.0765
DIST TO POWER CUTBACK:	22.21	TAN ANGLE:	.1090

NOISE CHARACTERISTICS:

REF. DISTANCES	TAKEOFF	LANDING	SIDELINE	PWR BACK
200.	103.5	91.3	103.5	101.7
400.	98.5	86.2	98.5	96.7
1000.	90.6	77.8	90.2	88.8
2000.	84.1	71.3	82.9	82.3
4000.	76.5	63.7	72.3	74.7
6000.	71.2	58.0	64.6	69.3
10000.	63.4	49.7	53.3	61.6
20000.	49.8	30.4	34.3	48.0

AIRPORT MOVEMENTS SUMMARY:
****

AIRCRAFT/RUNWAY	DAY TIME OPERATION (0700-2200 HRS) TAKE-OFFS	DAY TIME OPERATION (0700-2200 HRS) LANDINGS	NIGHT TIME OPERATION (2200-0700 HRS) TAKEOFFS	NIGHT TIME OPERATION (2200-0700 HRS) LANDINGS
1 / 1	25.4100	25.4100	.7500	.7500
2 / 1	6.3500	6.3500	.1900	.1900
3 / 1	4.3000	4.3000	.0500	.0500
4 / 1	.0900	.0900	.0000	.0000
TOTALS-RUNWAY NO. 1:	36.1500	36.1500	.9900	.9900
1 / 2	54.2300	54.2300	1.5800	1.5800
2 / 2	13.5600	13.5600	.3900	.3900
3 / 2	9.1800	9.1800	.1100	.1100
4 / 2	.2100	.2100	.0000	.0000
TOTALS-RUNWAY NO. 2:	77.1800	77.1800	2.0800	2.0800
1 / 3	21.3000	21.3000	.6200	.6200
2 / 3	5.3300	5.3300	.1600	.1600
3 / 3	3.6000	3.6000	.0400	.0400
4 / 3	.0800	.0800	.0000	.0000
TOTALS-RUNWAY NO. 3:	30.3100	30.3100	.8200	.8200
1 / 4	109.7200	109.7200	3.2100	3.2100
2 / 4	27.4300	27.4300	.8100	.8100
3 / 4	18.5700	18.5700	.2300	.2300
4 / 4	.4100	.4100	.0000	

.0000

TOTALS-RUNWAY NO. 4: 156.1300 156.1300 4.2500
4.2500

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AIRPORT TOTALS 299.7700 299.7700 8.1400
8.1400

YKF AIRPORT - PLANNING LOCAL NEF with 7000 ft. Rwy 25

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Appendix F
Airport Role Matrix Public Workshops

Waterloo Regional Airport - Public Workshop
May 15, 1997

AIRPORT ROLE	COMMUNITY/ SOCIAL IMPACT	LAND USE DEVELOPMENT IMPACT	ENVIRONMENTAL IMPACT	REGIONAL IMPACTS	AIRPORT COST IMPLICATIONS	AIRPORT REVENUE IMPLICATION	MARKET DEMAND
RELIEVER AIRPORT							
• secondary airport to LBPIA • 60+ jet movements/ day • accommodate all types of aircraft under all weather conditions • facilities designed to accommodate Code E aircraft • 9,500 - 10,000 ft. runway requirement	• significantly expanded NEF contours would impact a large area • existing residential communities in Kitchener and Breslau impacted by noise • potential for existing residential areas to be located within 30 NEF contour • significant increase in vehicle traffic • increased community awareness of airport activity because of overflights of large jet aircraft and vehicle traffic	• expanded NEF contours would restrict residential development in areas located on approaches to Runway 07-25 • airport activity would enhance the potential for commercial/ industrial development on adjacent lands • value of adjacent lands would increase	• potential for development to expand into wetland areas • potential for development to have an impact on surface/ drainage water quality	• airport could be a major employment generator (+3000 full time positions) • airport activity would generate additional employment in service and hospitality industry (+800 full time positions) • community would have direct access from domestic, transborder and international centres • requirement for upgrading of regional road systems with direct access to 401 and provision of new Grand River crossing	• substantial costs ($50 - 150 million) associated with runway/taxiway development and new terminal • additional costs associated with the acquisition of additional land required for expansion	• potential revenues associated with this level of airport activity could provide for a self-sufficient airport • substantial revenues are required to service major capital and operating expenses • flexibility to respond to various market opportunities would be maximized	• competition from Hamilton International Airport and reluctance of airlines to locate away from LBPIA make this scenario unlikely • requirement for 2nd Toronto airport not required for 25-35 years • low market demand for this role within the business plan planning horizon

Waterloo Regional Airport - Public Workshop
May 15, 1997

AIRPORT ROLE	COMMUNITY/ SOCIAL IMPACT	LAND USE DEVELOPMENT IMPACT	ENVIRONMENTAL IMPACT	REGIONAL IMPACTS	AIRPORT COST IMPLICATIONS	AIRPORT REVENUE IMPLICATION	MARKET DEMAND
CHARTER/AIR CARGO							
• moderate (15-25 flights/day) Code C jet movements associated with passenger/cargo services • potential for increased night flights • 7000-8000 ft runway requirement	• existing residential communities would be impacted by increased aircraft noise • existing residential areas could be impacted by NEF 30 contour • increased community awareness of airport because of overflights of medium sized jet aircraft • adjacent communities could be impacted by increased traffic on roads	• expanded NEF contours associated with activity would restrict potential residential development on lands adjacent to airport • airport activity could enhance the potential for commercial/ industrial development on adjacent lands • value of adjacent lands would increase	• possible impact of adjacent wetlands	• additional employment generated at airport (+600 full-time positions) • potential for additional employment in service and hospitality (+160 full time positions) • direct access from domestic and transborder centres	• $15-25 million capital cost required for new infrastructure • additional costs associated with acquisition of additional lands	• strong potential for self-sustaining airport • stable passenger/ cargo activities required to generate required revenues	• existing and potential demand has been identified for this role • medium sized jet aircraft currently used for "just in time" delivery of auto parts • airport administration has received an inquiry from a potential charter operator who is interested in utilizing the airport • role provides flexibility to respond to market opportunities

Waterloo Regional Airport - Public Workshop
May 15, 1997

AIRPORT ROLE	COMMUNITY/ SOCIAL IMPACT	LAND USE DEVELOPMENT IMPACT	ENVIRONMENTAL IMPACT	REGIONAL IMPACTS	AIRPORT COST IMPLICATIONS	AIRPORT REVENUE IMPLICATION	MARKET DEMAND
REGIONAL SCHEDULED AIR SERVICES							
• regional commuter services (-16 flights/day) with commuter sized aircraft and limited (2-4 flights/day) Code C jet aircraft • 5,000-7000 ft. runway	• existing community could be impacted by increased noise • existing residential areas not impacted by 30 NEF contour • increased community awareness of airport because of increased overflights of larger aircraft	• potential residential development in areas adjacent to airport restricted by 30 NEF • airport activity may enhance the potential for commercial/industrial development on adjacent lands	• environmental impact on adjacent wetland areas can be mitigated	• additional employment generated at airport (+100 full time positions with ± 26 positions off airport	• $3-5 million capital required for new infrastructure	• potential for self-sustaining airport	• strong market potential for this role demonstrated in recent marketing surveys and airline/operator interest

Waterloo Regional Airport - Public Workshop
May 15, 1997

AIRPORT ROLE	COMMUNITY/ SOCIAL IMPACT	LAND USE DEVELOPMENT IMPACT	ENVIRONMENTAL IMPACT	REGIONAL IMPACTS	AIRPORT COST IMPLICATIONS	AIRPORT REVENUE IMPLICATION	MARKET DEMAND
CORPORATE/GENERAL AVIATION (NATURAL GROWTH)							
• corporate/ business aircraft • aviation industry • flight training • recreation/ sport flying • 5000-6000 ft. runway requirement	• existing community could be impacted by increased noise • existing residential community not impacted by NEF 30	• potential residential development areas adjacent to airport may be impacted by NEF 30	• environmental impacts on wetlands could be mitigated	• modest employment generator at airport (+50 full time positions) • locational incentive for business/ industry	• $1.5-3 million capital cost for runway expansion and provision of services	• limited potential for self sustaining airport if corporate/business role expanded and well developed • airport will most likely require continued public subsidy in order to operate with existing or expanded infrastructure	• existing demand for this role clearly demonstrated - strong potential for increased corporate activity

Waterloo Regional Airport - Public Workshop
May 15, 1997

AIRPORT ROLE	COMMUNITY/ SOCIAL IMPACT	LAND USE DEVELOPMENT IMPACT	ENVIRONMENTAL IMPACT	REGIONAL IMPACTS	AIRPORT COST IMPLICATIONS	AIRPORT REVENUE IMPLICATION	MARKET DEMAND
RESTRICTED DEVELOPMENT							
• airport restricted to current activities/ infrastructure with restrictions imposed on aircraft movements to minimize NEF impact on adjacent lands	• existing residential community not impacted by NEF 30	• caps placed on aircraft movements would maintain 1996 NEF contours with no impact on potential residential development on adjacent lands	• no additional environmental impacts	• if future activities/ movements at airport are restricted, future benefit to region will be constrained • potential for disbenefits to region	• capital maintenance program required to support existing infrastructure	• continued deficit operation • minimal flexibility to respond to market opportunities • operational restrictions would encourage operators to locate/relocate to other airports	• market potential limited • role may not meet identified potential market demand

Appendix G
Public Advisory Committee Recommendations
Aeronautical Noise Management Committee

Recommendations of the Aeronautical Noise Management Committee

The Noise Management Committee has met on seven occasions. These meetings have included the dissemination of some fourteen position papers, numerous letters, question periods and several learning sessions. Members are now familiar with the needs and desires of all the concerned parties and reviews operational processes to allow the communities involved to co-habitat.

Through a consensus process, members have developed the following pro-active list of proposals to alleviate some noise discomfort to residents and still allow for the airport to flourish within a highly competitive market.

Change Frontier Departure

Presently there are departures from the airport which are called Frontier Departures. These are straight out departures from the end of each runway. The pilot departs the runway, climbs to 4000 feet Above Sea level (ASL). The committee proposes to change the Frontier Departure on runway 25 and force all aircraft to take the present departure route referred to as Waterloo One. When departing Runway 25 pilots will ascend to 1600 feet Above Sea Level (ASL) and turn to a compass heading of 220 degrees, taking the aircraft away from the more heavily populated areas.

Change Waterloo One to a Waterloo Two

Presently, Jet and Turbofan aircraft, departing Runway 25, climb to 1600 ASL and then turn left to a compass reading of 220 degrees. The committee proposes to change the angle of departure from 220 degrees compass to 190 degrees compass. This will direct aircraft over less residentially populated areas.

Ban IFR Night Approach training flights between 1900 and 0800

Eliminate night IFR (Instrument Flight Rules) training approaches on Runway 07 after 1900 hours, reducing the frequency of night flights over residential areas in the vicinity of the airport.

After 2300 hours, NAV Canada, Toronto Centre to highlight runway preference and noise abatement.

After 2300 hours, Air Traffic Control is closed at Waterloo Regional Airport and handed from the Waterloo Regional Airport tower to Toronto Centre; both operations are maintained by NAV Canada. The committee wishes to encourage Toronto Centre to highlight the preferred runways to be used for take-off and landing and to verify pilots are aware of the noise abatement procedures that are in place at Waterloo Regional Airport.

VFR (Visual Flight Rules) maintain 3100 Feet

Turbo Prop and Jet aircraft will maintain an altitude no less than 3100 ft above populated areas until they are established in the circuit.

Signs

The committee recommends the installation of signs at the commencement of each runway to highlight noise abatement procedures in place. Though the rules are published, pilots unfamiliar with the airport will therefore get one last reminder concerning departure procedures and the existence of a noise monitoring system.

Split Training Traffic on Runways 32 and 25

Whenever weather and wind conditions permit, the committee would encourage NAV Canada Control Tower personnel to split training traffic between the two runways so the impact of training flights is shared between the areas surrounding the airport.

Purchase Noise Monitoring Equipment

The committee concludes that until a system is installed to verify exactly the level and frequency of noise, there can be no further decisions than the seven issues previously discussed. A noise monitoring system will qualify and quantify the noise produced by specific flights departing, arriving and overflying the area. Microphones in residential areas will pick up the noise generated, relay the information to a computer system. The computer will interface with radar and NAV Canada information systems. Each aircraft will be identified and their trip plotted on an area map with data such as the aircraft's height, direction and speed.

ILS Runway 07

An ILS (Instrument Landing System) on runway 07 will result in less missed approaches on the runway and will also allow the aircraft to proceed toward the airport at a higher approach angle when coming in to land. The benefits are:

- aircraft will land more frequently on their first attempt, resulting in less frequency of aircraft over populated areas and the noise associated with a missed approach
- aircraft will proceed toward the airport at a steeper angle of approach, they will be higher above residential areas and therefore cause less noise.
- presently landing on Runway 25 is a stepped approach with pilots achieving specific heights at different distances from the airport. Maintaining this stepped approach is noisier than an ILS approach.

Lengthen Runway 07/25

Lengthening the runway will only allow for the same aircraft presently utilizing the airport services today. This is based on keeping the airport at the present code "C" rating and the pavement load rating at the present designation of "9". The advantage will be that aircraft will be able to carry a full payload of fuel, passengers and cargo and they will be able to lift off runway 25 earlier, allowing them to gain a higher altitude before crossing residential areas.

The benefits are:

- better service to our customers
- less noise impact on the residential areas due to height gained after take off
- potential for less frequent flights, heavier payloads result in a potential for less trips by an operator.

Issues Requiring Further Debate

There are several issues that the Noise Management Committee has acknowledged as unresolvable at the present time. These issues include closures, aircraft type restrictions and restrictions on training hours. These issues need to be addressed over the coming years and in conjunction with the qualifying and quantifying information attainable with a noise monitoring system.

Recommendations from the Public Advisory Committee

Extend Runway 07-25

Some committee members believe that from a long-term perspective, it is not sound to restrict the runway at a PLR 9 and a Code C rating. If noise is the concern, these ratings are not relevant as many larger aircraft are quieter.

Questions were raised if the best option for the long-term is the parallel 14-32 runway and/or if the timing of construction of the extension to runway 07/25 in 2009 is appropriate.

The consensus of the committee is to support the 07-25 extension as recommended in the draft Master Plan. The committee believes that it should be constructed as soon as possible. A maximum delay would be three years.

Change Waterloo One Departure to Waterloo Two Departure

The committee agrees with the Waterloo Two departure as recommended by the Noise Committee. The committee emphasized that the Waterloo Two redirects noise and does not reduce it. The Region should emphasis that approval must be given by CARAC and that could delay implementation up to 18 months after Regional Council approval. The committee also wants to highlight that the actual path that planes will take before turning to 190 degrees will vary for each aircraft. Planes will not turn until they are at 1,600 ft above sea level (ASL) and this point will vary based on the aircraft, load, performance and atmospheric conditions.

Visual Flight Rule Change to Maintain 3,100 feet ASL

The committee agrees with the Noise Management Committee recommendation. Emphasis that this process will raise the planes and therefore reduce the noise. Staff must be clarify with the public that the 3,100 ft height is Above Sea Level (ASL) and not above a particular landfall. The airport has an elevation of 1,040 ft ASL.

Eliminate Frontier One Departure

The committee supports the recommendation of the Noise Committee to eliminate the straight out departures on runway 25 over Kitchener. This change must be approved by CARAC.

Ban Training IFR Night Approaches on Runway 07 between 1900 and 0800

The committee supports the recommendation of the Noise Committee to ban training IFR night approaches on runway 07 between the hours of 1900 and 0800.

Signs

The committee supports the placement of signs at the runway thresholds to notify pilots of noise abatement rules. Transport Canada approval of these signs is required.

NAV Canada, Toronto Centre

The committee recommends that Regional staff train NAV Canada's staff at Toronto Centre (Pearson Airport) to properly instruct pilots on noise abatement procedures for use at YKF between 2300 and 0600.

Split Traffic

The committee agrees with the Noise Management Committee recommendation to split / share the traffic between runways 32 and 25 on departures. In 1998, 52% of the traffic was on runway 32. Traffic can be split but the decision is at the discretion of each air traffic controller. Council must be made aware that reducing noise in Breslau will increase noise in Kitchener. Staff should discuss with NAV Canada and Transport Canada if there is a possibility for redesigning the training circuits. Regional Council does not have the ability to redesign the airspace or training circuits..

The radar that was recently installed will facilitate the sharing of traffic between runways. The committee recommends that rules be established to require transponder equipped aircraft to turn on their transponder whenever they are in the airport's airspace. Council can implement this procedure with airport tenants through the tenant leases. To make it mandatory for all pilots to comply, Transport Canada would have to change the airspace designation.

Noise Monitoring Equipment.

The committee fully supports the installation of a noise monitoring and flight tracking system. It is recommended that a system be budgeted for 2000 and made operational in 2000.

Instrument Landing System (ILS) on Runway 07

The committee supports the lengthening of the runway by 295 feet to allow for its installation and recommends that discussions with Nav Canada be initiated in 2000. The timing of the project in the draft Master Plan is unacceptable. The committee wants staff to clarify the process followed by NAV Canada and to ensure that YKF is on the priority list (if one exists). Funding arrangements between the Region and NAV Canada should be considered to ensure a speedy installation of the ILS.

Nighttime Restrictions

A recommendation was tabled to initiate management control practices on arrivals and departures of aircraft on runway 07 and departing on 25. Aircraft should have the prior approval of the Airport Manager. It is believed these are rare events and they are manageable by both industry and the airport. In emergency cases, either industrial or medical, the aircraft would be allowed to land and depart. There are other operational restraints at other airports and Waterloo Regional should review the potential.

B. Vrbanovic supports a restriction that only allows Stage 3 planes at night and that all Stage 2 aircraft need the approval of the Airport Manager before landing.

After a lengthy discussion, no consensus could be reached on the proposal. Some committee members believe restrictions will send the wrong message to potential customers.

Some committee members believe that the committee should wait for the installation of a noise monitoring system to quantify noise issues, evaluate the effects of the other changes that were recommended, and verify a problem actually exists. The restrictions at Pearson Airport were highlighted as a way to manage capacity. Waterloo Regional though does not have a capacity problem to manage at this time and restrictions could harm the revenue generation potential of the airport.

Airport Newsletter

The Committee recommends that the airport publish a quarterly newsletter to keep the public aware of issues at the airport and the progress made in the area of noise abatement.

Environmental Impact Studies

The committee recommends that the Region follow a process consistent with the Class Environmental Act, Schedule "C" to ensure that there is adequate public input on the runway extension.

Appendix H
10-Year Capital Budget Projections

THE REGIONAL MUNICIPALITY OF WATERLOO
TEN YEAR CAPITAL FORECAST
2000 - 2009

DEPARTMENT: ENGINEERING
DIVISION/FUNCTION: REGIONAL AIRPORT

PROJECT		DESCRIPTION	EXPENSES BEFORE 2000	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	TOTAL 2000-2009	PROJECT TOTAL
		EXPENDITURES													
		TERMINAL BUILDING													
		Electrical Upgrade		200,000										200,000	200,000
3509		Modifications		250,000	2,500,000									2,750,000	2,750,000
		AIRPORT BUILDINGS													
3507		Airport Parking Lot Expansion	194,000												194,000
3505		Hangar 5 Roof Repairs	50,700												50,700
		Heated Urea / Sand Storage						180,000						180,000	180,000
		Maintenance Building Standby Power								150,000				150,000	150,000
		Field Electric Centre Building Upgrade					75,000							75,000	75,000
		F E C Standby Power-Upgrade					125,000							125,000	125,000
		F E C Roof Replacement							75,000					75,000	75,000
		T Hangar - 4 Replace Doors					50,000				50,000			100,000	100,000
		T Hangar - 4 Interior Painting						30,000						30,000	30,000
		Hangar 5 - Replace Hangar Doors					80,000							80,000	80,000
		Hangar 5 - Replace Water System					25,000							25,000	25,000
		Maintenance				20,000	30,000	30,000	50,000	50,000	50,000	50,000	50,000	330,000	330,000
		AIRSIDE MAINTENANCE													
3510		Terminal Apron - Reconst / Expansion		530,000			50,000	775,000				50,000	500,000	1,905,000	1,905,000
	2	Runway 14/32 Reconstruction			50,000	1,500,000								1,550,000	1,550,000
		Flight Centre Apron Expansion-South							30,000	330,000				360,000	360,000
		Glycol Containment						200,000						200,000	200,000
		West Apron Hangar Area								125,000				125,000	125,000
		Taxiway Alpha			100,000	600,000								700,000	700,000
		Taxiway Bravo						300,000						300,000	300,000
		Taxiway Charlie					300,000							300,000	300,000
		Taxiway Delta									100,000			100,000	100,000
		Engine run-up area on 32						120,000						120,000	120,000
		Terminal Apron Expansion - South						50,000	500,000					550,000	550,000
		AWOS Sensors			200,000									200,000	200,000
		Obstacle Removal & Property					900,000							900,000	900,000
3512	1	Airport Wildlife Fencing		150,000										150,000	150,000
		AIRSIDE EXTENSION													
		07/25 Extension		50,000		300,000	2,500,000							2,850,000	2,850,000
	3	ILS on Runway 07					100,000	900,000						1,000,000	1,000,000
		Runway 25 Approach Lighting						350,000						350,000	350,000
		Runway 07 Approach Lighting						600,000						600,000	600,000
		High Speed Taxiway Runway 25							50,000	250,000				300,000	300,000
3513		Noise & Flight Tracking System		220,000										220,000	220,000
		LEASED LAND DEVELOPMENT													
3511		Leased Land Development		50,000	500,000									550,000	550,000
		Pavement		300,000			70,000	500,000	40,000	50,000	50,000			1,010,000	1,010,000
		Communal Sanitary Sewer					50,000	150,000				30,000	120,000	350,000	350,000
		Communal Water					50,000	310,000				30,000	190,000	580,000	580,000
		Road Access				50,000	200,000	50,000	180,000					480,000	480,000
		Randell Drain / Stormwater			75,000		450,000							525,000	525,000
3506		Randall Drainage Works	125,000												125,000
		MISCELLANEOUS													
3502		Airport Business Plan	121,769												121,769
3504		Airport Economic Impact Study	55,243												55,243
		VEHICLES & EQUIPMENT													
	2	Vehicle & Equipment Replacements				200,000	435,000		110,000			174,000	42,000	961,000	961,000
		TOTAL PROPOSED EXPENDITURES	546,712	1,750,000	3,425,000	2,670,000	5,490,000	4,545,000	1,035,000	955,000	250,000	334,000	902,000	21,356,000	21,902,712
		SOURCES OF FINANCING (4)													
		Grants & Subsidies		160,000		1,425,000	480,000	900,000						2,965,000	
		Reserves & Reserve Funds													
		- Vehicles & Equipment				200,000	55,000		110,000			174,000	42,000	581,000	
		- Capital Levy		1,070,000	425,000	445,000	1,805,000	1,310,000	245,000	375,000	250,000	160,000	50,000	6,135,000	
		Revenue (Taxation)													
		Developer Contribution			125,000			240,000					77,500	442,500	
		Debentures		530,000	2,875,000	600,000	3,150,000	2,095,000	680,000	580,000			732,500	11,242,500	
		TOTAL PROPOSED SOURCES OF FINANCING		1,750,000	3,425,000	2,670,000	5,490,000	4,545,000	1,035,000	955,000	250,000	334,000	902,000	21,356,000	21,356,000

BUDGET ISSUES:

1) Project added in 2000 to address wildlife incidents with aircraft. Project to be funded from MTO grant.
2) Runway reconstruction in 2002 and equipment purchase in 2003 subject to 95% ACAP funding.
3) Assumes 100% funded from Nav Canada
4) Capital financing plan, including role of reserve funds, debentures, short-term borrowing, other, to be developed further for 2001 budget process.

THE REGIONAL MUNICIPALITY OF WATERLOO

Waterloo Regional Airport Model Projection

OPERATING BUDGET PROJECTION (DRAFT)												
No. of Departing Passengers:			4,500	6,000	8,650	21,000	25,450	26,000	26,000	26,000	26,000	26,000
Passenger Fee:				$5.00	$5.00	$5.00	$7.50	$10.00	$10.00	$10.00	$10.00	$10.00
	Budget	Actual										
	1999	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
EXPENDITURES												
Staff Costs	338,174	340,249	404,895	410,968	417,133	423,390	429,741	436,187	442,730	449,371	456,111	462,953
Existing Debenture Service	66,465	66,465	66,375	66,240	66,106	65,958	44,377	44,224	0	0	0	0
New Debenture Service (1)	0	0	0	72,010	468,490	552,474	1,000,008	1,302,118	1,401,649	1,487,816	1,487,816	1,487,816
Other Operating	500,476	516,127	510,258	522,912	535,755	548,792	562,024	575,454	589,086	602,922	616,966	631,220
Reserve Contribution re: Capital (1)				650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000
	905,115	922,841	981,528	1,722,130	2,137,485	2,240,615	2,686,150	3,007,983	3,083,464	3,190,108	3,210,893	3,231,989
REVENUES												
Ground Rents	62,344	62,779	77,344	83,504	89,757	96,103	102,545	109,083	115,719	122,455	129,292	136,231
Landing Fees	35,000	39,761	48,000	48,720	49,451	50,193	157,145	159,503	161,895	164,324	166,788	169,290
Fuel Surcharge	28,000	49,248	38,000	38,570	39,149	39,736	40,332	40,937	41,551	42,174	42,807	43,449
Passenger Fees (New in 2000)			53,000	30,000	43,250	105,000	190,875	260,000	260,000	260,000	260,000	260,000
Other(Tax & Hydro Recoveries, etc.)	216,358	255,953	220,698	224,008	227,369	230,779	234,241	237,754	241,321	244,941	248,615	252,344
	341,702	407,741	437,042	424,803	448,975	521,811	725,138	807,277	820,486	833,893	847,501	861,314
Net Levy Impact (Including Reserve Contribution)	563,413	515,100	544,486	1,297,327	1,688,510	1,718,804	1,961,012	2,200,706	2,262,978	2,356,215	2,363,391	2,370,675
Cost per Household (2):	$2.63		$2.49	$5.84	$7.47	$7.47	$8.38	$9.24	$9.34	$9.56	$9.42	$9.29
RESERVE FUND PROJECTIONS (1)												
Opening Balance (3)			1,400,000	381,900	629,998	865,094	(357,573)	(1,141,626)	(812,476)	(614,067)	(267,196)	200,626
Reserve Contribution			0	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000
Capital Levy Financing (Inflated $)			1,070,000	431,375	458,450	1,887,449	1,390,386	263,935	410,041	277,461	180,239	57,169
Net Balance			330,000	600,525	821,548	(372,355)	(1,097,960)	(755,560)	(572,517)	(241,528)	202,565	793,457
Interest (6%) Earned/(Paid)			51,900	29,473	43,546	14,782	(43,666)	(56,916)	(41,550)	(25,668)	(1,939)	29,823
Closing Reserve Fund Balance/(Short-term borrowing)			381,900	629,998	865,094	(357,573)	(1,141,626)	(812,476)	(614,067)	(267,196)	200,626	823,279

NOTES:

(1) Capital financing plan, including role of reserve funds, debentures, short-term borrowing, other, to be developed further for 2001 budget process. To be considered in conjunction with other projected Regional capital financing requirements.

(2) Existing cost per household levels are based on previously approved capital forecasts which extended only to 2002, and which relied primarily on capital funding from existing Regional reserve fund balances, pending the development of the Airport Master Plan.

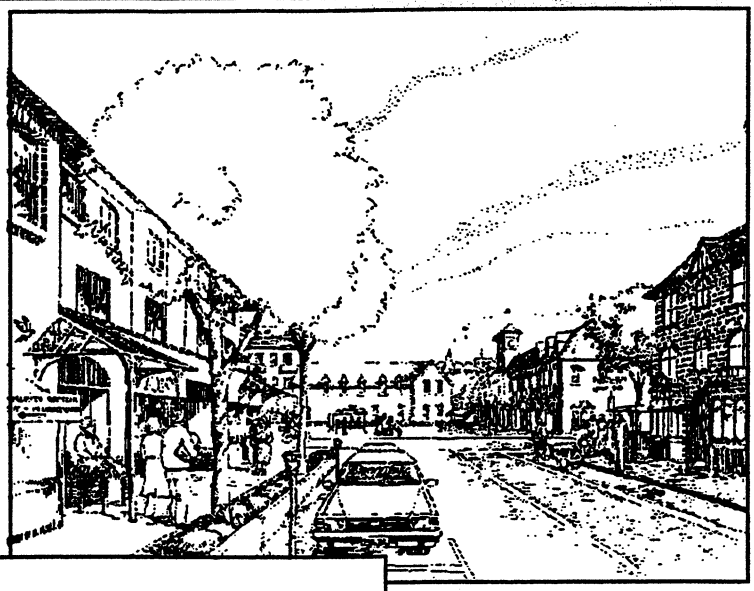
(3) Opening balance represents approximate portion of Regional Capital Levy Reserve Fund required for Airport capital financing based on previously approved capital forecasts. Those capital forecasts extended only to 2002, pending the development of the Airport Master Plan.

Assumption in the Ten Year Capital Forecast

- projected inflation rate of 1.5%
- debentures are 10 years in duration at 6% interest
- the number of emplaning (departing) passengers, passenger fees and landing fees increased in 2003/2004 due to the upgrading of the terminal building and scheduled flights to other cities

Appendix I
Regional Official Policies Plan

PLANNING FOR A SUSTAINABLE COMMUNITY



REGIONAL OFFICIAL POLICIES PLAN

DECEMBER 1998 CONSOLIDATION

As approved by the Minister of Municipal Affairs and Housing , December 19, 1995

11.9.3 The Region will require consideration of passive noise mitigation measures during the preparation of development applications as a means of reducing the use of structural mitigation measures such as noise barriers.

11.9.4 The impact of noise generated by increased traffic volumes that result from proposed Regional Road system expansions will be considered prior to approval of the project, where such projects are located adjacent to existing noise sensitive land uses. During the review of these projects, consideration will be given to implementing noise attenuation measures in accordance with the Regional Implementation Guideline relating to noise mitigation.

11.9.5 In preparing Official Plan policies and Zoning By-laws for lands in the vicinity of the Waterloo Regional Airport, Area Municipalities will be required to apply Noise Exposure Forecast (NEF) contours, and comply with all Federal, Provincial and Regional legislation and by-laws.

11.9.6 Appropriate warning and/or noise attenuation measures will be required as a condition of approval for residential development applications located between the NEF 25 and 35 contours. New residential development within the NEF 35 contour will be prohibited. Such contours are established by Transport Canada based on input from the Region.

11.10 Inter-Regional Transportation Services

11.10.1 The role of the Waterloo Regional Airport and the services it provides to the community will be regularly reviewed giving consideration to the following:

a) changing economic conditions, demand for scheduled or unscheduled commercial air transportation including cargo and charter services, and the need for airport facilities to accommodate pilot training;

b) improvements to aircraft performance and the availability of new types of aircraft; and

c) the demand for on-site facilities to accommodate aviation-related commercial and industrial development.

Appendix J
Regional Council Minutes March 22, 2000

REGIONAL COUNCIL MINUTES
March 22, 2000

The following are the minutes of the Regular Council meeting held at 7:00 p.m. in the Regional Council Chamber, 150 Frederick Street, Kitchener, Ontario.

All members were present except T. Fairless, M. Yantzi** and C. Weylie.

Regrets: T. Fairless and C. Weylie

DECLARATIONS OF PECUNIARY INTEREST UNDER THE MUNICIPAL CONFLICT OF INTEREST ACT

K. Seiling declared a pecuniary Conflict of Interest relative to Finance Report FIN-00-018 relative to the Elmira Wastewater Treatment Plant as his mother-in-law owns property adjacent to the said Plant, which property has been declared a potential development area.

T. Galloway declared a pecuniary Conflict of Interest relative to Item 1 of AF-00-003/S, Summary of Recommendations of the Administration & Finance Committee, relative to the approval of one-time funding for the Residential Energy Efficiency Program, as he is employed by the University of Waterloo.

Prior to hearing Delegations, Chair Seiling announced that Councillor Ziegler's Notice of Motion relative to amending the Smoking By-law had been deferred to the April 12, 2000 Council meeting, and no delegations would be heard on that matter at this meeting.

He stated that the Delegations would be grouped according to the subject they wished to address and that given the very large number of persons present wishing to address Council, that a motion reducing the time limits for speaking and suspending the rules for speaking would be considered.

MOVED by J. Ziegler
SECONDED by J. Martens

THAT Regional Council suspend time limitations as described in Section 24. (1) a), b) and c) of By-law No. 98-001, being Council's Procedural By-law, and prescribe the following with respect to Delegations at it's meeting of March 29, 2000:

- Delegations will be limited to a maximum of five (5) minutes;

- Delegations of three (3) or more persons (presenting themselves as a particular group) be limited to a total maximum of ten (10) minutes;
- Citizens, organizations or their representatives who are present at the meeting but have not notified the Clerk of their desire to address Council be limited to a total maximum of three (3) minutes.

CARRIED

DELEGATIONS

a) Sandra Millar, Manager, K-W Tourism and Doug McKenzie commented briefly on the Millennium Project "Cherish the Past ... Celebrate the Future" planned for this summer when the Mennonite settlers' trek from Lancaster County, Pennsylvania to this area is re-enacted using the Conestoga Wagon from Doon Heritage Crossroads.

T. Galloway, Chair, Administration and Finance Committee, presented the recommendation.

MOVED by T. Galloway
SECONDED by L. Woolstencroft

THAT the Regional Municipality of Waterloo approve one-time finding in the amount of $10,000 from the 2000 Contingency Provision for K-W Tourism for the "Cherish the Past...Celebrate the Future" millennium project.

CARRIED

(Refer Item 2 of AF-00-003/S)

Prior to hearing Delegations relative to the **Waterloo Regional Airport Master Plan**, J. Hammer, Director of Transportation, provided some background, explaining that the Airport Master Plan had not been up-dated since 1983. He described the actions which had been taken to date with respect to the establishment of Committees and holding of Public Meetings to obtain input. He explained that the recommendations tabled at the Engineering Committee had been approved by the Airport Advisory Committee.

J. Hammer talked about the extension of runway 07-25 (compass headings) which is required for safety and reliability reasons, and about landing requirements for normal and inclement weather conditions. The longer runway will also provide noise mitigation as it will allow aircraft to exit the airport and gain higher altitude more quickly. He explained that the extension of the runway does not mean expansion, because the existing load limit will not permit larger planes to land. As to timing, J. Hammer explained that a study must be undertaken and approvals obtained from Transport Canada. The Project Team supports the extension and it is most cost effective to construct it all at one time.

Night time flight restrictions would require Federal approval and the Noise Management Committee, which includes a wide variety of people, has recommended no restrictions at this time as they would rather wait for data from the noise monitoring equipment.

In response to questions about the proposed lengthening of runway 07-25, J. Hammer explained that in good weather all of the planes can take off easily, but the take off distance required increases with inclement weather. The industry norm is 7,000 feet. He acknowledged that 97% of the movements are small aircraft, but noted that corporate flights are increasing and these are the kinds of aircraft which require the extra length.

In response to the suggestion that additional landing fees be charged for planes landing at night, such as is done at Pearson International, J. Hammer commented that the restriction was on the number of flights into the airport at night. Scheduled aircraft are allowed to land but unscheduled flights are charged extra. Regional Council could pass on such a recommendation to Transport Canada.

Airport Delegations

b) Sheila Hultquist, a resident of the Stanley Park area of Kitchener, addressed Council with respect to her concerns about the noise generated by planes, particularly at night. She expressed concern that expanding the airport would encourage more and larger planes and questioned whether the benefit to the community would be great enough to justify the sacrifice of the residents. She asked Council to ban night flights between 10 p.m. and 7 a.m. except for medical emergencies; not to expand the airport and to encourage links to Pearson International for passenger and cargo service.

c) David Leis, General Manager of the Chamber of Commerce of Kitchener and Waterloo, stated that the Chamber is supportive of the staff recommendations relative to the Airport Master Plan. The Chamber believes that extending the runway and installing the ILS (Instrument Landing System) is a positive step in improving safety at the Airport. He also stressed the importance of having a good local airport for the development of the local economy. The Region needs to send the message that it is "Open for Business". He then introduced the Delegations who accompanied him.

Vince Schiralli, President of Communitech, stated that the company represents over 180 businesses employing over 20,000 people, providing a great deal of fast growing industry, which need the infrastructure if they are to continue to grow and compete in such places as Ottawa/Kanata and Boston.

Greg Barrett, Vice-President of Communitech, added that the technical community wants a safe, accessible airport and questioned why the 3rd largest technical community has the smallest airport.

Bud Weir, President of Skyway Services and a pilot, explained what happens when an aircraft takes off and the added safety benefits of a 7,000 foot runway. He observed that with a longer runway, aircraft would be able to reach higher altitudes more quickly, thereby reducing noise. He also spoke in support of the other noise mitigation measures.

David Leis concluded their presentation by stating that the Chamber of Commerce had placed an advertisement in the local paper stating that the "Airport Means Business" because business leaders in the community have indicated the importance of the Airport to their businesses. He also read excerpts of letters of support from Kuntz Electroplating, Kitchener

and ATS, Cambridge.

D. Leis also commented that at the Engineering Committee it had been stated that the Chamber of Commerce supports the development of Grand River South, whereas the Chamber does not support this development because of its concern that such development could impede operation of the Airport. He compared the Airport to the Expressway, which is an important part of the community.

As a result of questions to the Delegation, Bud Weir explained that currently an aircraft such as the Falcon 20 could not land at the Waterloo Regional Airport during inclement weather, whereas with a longer runway and the ILS system, inclement weather would not pose a problem.

d) Bill Thomson, Chair of the Waterloo Regional Airport Advisory Committee addressed Council and stated that the Advisory Committee had approved all of the recommendations. Noise problems have been discussed since 1975 when the first Airport Master Plan was developed. Most people don't mind the daytime noise but will continue to ask for night time restrictions. He provided some examples of the kinds of restrictions which are in place at other Airports in Ontario, notably Hamilton and Oshawa. In conclusion, he stated that although he was in favour of the installation of the ILS, that there was new microwave technology emerging in the United States which would probably be available in Canada within the next ten years.

e) Alexis Marsden, a resident of the Chicopee/Idlewood area, commented on the number of movements forecast for the Airport in 2018, which is well below the number of movements the Airport can accommodate in its present configuration, questioning the need for expansion. With respect to safety in poor weather, she suggested that the information in the report was incorrect and that the safety requirements were overstated, although she would support valid safety measures. She stated that extension of the runway would not reduce noise - increased traffic would increase noise levels - and 190 degree diversions would take care of the noise issue, there was no need to spend $20 million for equipment. The residents support a 300 foot extension of the runway and installation of the ILS.

f) Ev McGuffin, a resident of the Idlewood area, expressed her concerns relative to the noise, stating that her home in on the flight path, and the potential for increased traffic if the runway is extended. A major concern relates to the cargo planes using the Airport. She also asked for restriction of night time flights. While recognizing the importance of noise monitoring and ILS, she stated that it was also important to implement stiff penalties. She urged Council to "do the right thing" for the residents of the area.

g) Kevin Bechard, a resident of the Idlewood area stated that he also serves on a Committee as a Kitchener resident, relative to the Airport Master Plan. While prepared to support the 300 foot runway extension, he commented on the failure of Regional staff to identify the need for expansion of the airport and failure to consider the impact on the residents of east Kitchener. He noted that the Residents' Association has asked that capacity limitations be placed on the Airport and suggested that a capacity limitation be included in the Regional Official Policies Plan (ROPP). He also commented that acceptance of the recommendations of the Airport Master Plan would lead to an Environmental Assessment.

In conclusion he stated that he supported a more modest expansion of the airport.

h) Wilf Park, Riverbank Drive, Cambridge stated that he is a member of the Noise Management Committee as a resident of Cambridge. He commented that his knowledge of aircraft, etc. had increased considerably as a result of the presentations made by experts in the field. He spoke of the importance of the noise monitoring system and recommended that the runway be extended to further mitigate noise from aircraft taking off. He stated that the Committee members had reached consensus and did not recommend limiting night flights until there were results from the ILS. In conclusion he urged Council to approve in full, the recommendations of the Noise Management Committee.

i) David Heil, a resident of the Lackner Woods area, stated that a group of citizens had worked diligently to provide an unbiased report. He noted that there are no restrictions at Waterloo Regional Airport, which is similar to Oshawa, in that it serves a strong industrial base. He also spoke of the differences in landing fees and about the benefits of Just In Time deliveries and how this eliminates waste in the manufacturing process. However, it is his belief that businesses locate here because of the skills of the people and not just because of the Airport. In closing he noted that residents should be able to enjoy a particular quality of life.

j) Stewart Thomas, 11 Corfield Drive, Kitchener, questioned whether the expenditure of $20 million on the Airport was critical to the economic growth of the Region. He observed that the Region's growth is due to its ideal geographic location and not the Airport. In response to comments by the Chamber of Commerce, he suggested that it was the Universities which promote technology and not the Airport. He suggested that the airport tenants are the prime benefactors of the $20 million expenditure and questioned whether they had offered to pay anything towards the cost of expansion. He also observed that losses would accrue should the anticipated growth in passenger service not materialize. In conclusion he questioned whether this expenditure was more important than others in the Region and reiterated his comments that it was geographic location and the Universities which promote growth and not the Airport.

k) Bob Kowtaluk, Airview Acres Farms, stated that his land abuts the Airport and that he operates an intensive poultry operation virtually at the end of the runway. He commented that extension of the runway would increase traffic which would have a negative impact on his operation. While in favour of the Airport and acknowledging the Region's responsibility to maintain the Airport, he questioned the impact the proposed road closure would have on his property.

l) Eleanor Maxwell, a resident of the Stanley Park area, addressed the issue of night time flights. She expressed confusion about who decides the rules of operation for the Airport. She stated that she had contacted Transport Canada for clarification and was told that its approval was not required but that it must be notified so that NavCanada can up-date its publications on a quarterly basis. She asked that noise abatement and night time flight restrictions be implemented. In response to her questions to Transport Canada about restrictions at other airports, she was advised that the restrictions had been implemented as a result of the lobbying of citizen groups.

m) Barry Aylward, a Woolwich Township resident and representative of the Airport Business Association stated that the Association believes the best approach is to defer the issue of night time restrictions until data can be collected. As concerns the runway extension, he felt it would effectively mitigate noise problems as it would allow departing aircraft to make their turns over the river. He acknowledged that departing aircraft create noise and questioned the continuing approval of subdivisions closer to the Airport. He commented that Kitchener, Cambridge and Woolwich had endorsed the draft Master Plan.

n) Berry Vrbanovic, a Kitchener Councillor representing residents of Chicopee Ward, stated that he has been dealing with complaints about aircraft noise between 11 p.m. and 7 a.m., since 1997. While supporting many of the recommendations, he asked that the extension of the runway be limited to an additional 300 feet because this and the ILS system would achieve most of the noise mitigation. He also asked for night time restrictions between 11 p.m. and 7 a.m. except for medical emergencies

o) Jake Smola, a Kitchener Councillor representing the Grand River South Ward, commented that while he could basically support the recommendations including the installation of the ILS, he had concerns about the extension of the runway beyond the 300 feet required for the ILS. He too expressed concerns regarding night flights between 11 p.m. and 7 a.m. and requested a restriction on runway 07-25 with the exception of medical and industrial emergencies with the approval of the Airport Manager. He expressed appreciation to Regional staff for their professionalism throughout.

p) Jim Tait, 330 Eden Bridge Place, stated that he lives directly in the path of runway 07-25 and has observed an increase in high noise aircraft over the past few years. He stated that there were no noise warning clauses in the Deeds for the properties in the area. He indicated support for the implementation of a Noise Monitoring system and installation of the ILS, however, he did not support the extension of runway 07-25 except to accommodate the ILS. He agreed with the exception for medical emergencies, but felt industrial emeregencies should be re-routed to Hamilton or Toronto.

** M. Yantzi entered the meeting at approximately 9:00 p.m. while Delegations were being heard.

F. Kent, Chair of the Engineering Committee presented Item 7 of E-00-003/S, paragraphs a) through j) inclusive.

MOVED by F. Kent
SECONDED by J. McKinnon

THAT the Regional Municipality of Waterloo approve the following actions with respect to the Waterloo Regional Airport Master Plan:

a) Mitigate airport noise through changes to the published noise abatement procedures as recommended by the Public Advisory Committee and Aeronautical Noise Management Committee as noted in Appendix C of Report E-WRAAC-00-001.1, dated March 8, 2000 and forward the changes to Transport Canada for approval;

b) Purchase and install a noise monitoring and flight tracking system and that the Region waive its purchasing by-law as necessary to expedite this work;

c) Upgrade the existing passenger terminal building to accommodate the needs of regular scheduled passenger service;

d) Provide additional airside leased property available to allow businesses and individuals to construct hangars and aviation related operations;

e) Undertake the necessary studies to determine the future infrastructure servicing needs (ie water, sewer, power, storm drainage);

f) Maintain the existing Airport management and administration structure;

g) Update the Airport Master Plan every five years with the next update in 2005;

h) Revise the appropriate clauses of the Regional Official Policies Plan at its next five year review consistent with Section 9.3 of the Master Plan. Any future changes to the 2000 Airport Master Plan which would result in the development of new runways, significant extension of existing runways, or increases in the pavement load rating or code rating of the airport, will only be implemented following recognition of such change through amendment to the Regional Official Policies Plan;

i) Forward the NEF/NEP 2018 planning contours to Transport Canada for review and approval; and

j) Direct staff to establish an airport capital financing plan to implement the Airport Master Plan commencing with the 2001 airport capital program and the ten-year forecast.

CARRIED
(Refer to Item 7 of E-00-003/S)

Discussion ensued with respect to item k) dealing with the composition of the Airport Noise Management Committee, with L. Woolstencroft indicating that she would like more discussion around the Terms of Reference.

G. Sudden explained that the Noise Management Committee operates on a consensus basis and J. Hammer advised that the Committee's Terms of Reference had been approved by the Engineering Committee.

MOVED by G. Sudden
SECONDED by J. Martens

THAT the Regional Municipality of Waterloo take no action at this time relative to the composition of the Airport Noise Management Advisory Committee, but that the Terms of Reference and composition be brought back to the Engineering Committee for review and consideration.

CARRIED

Discussion ensued with respect to item 7 l) dealing with night time flight restrictions.

C. Zehr stated that the Airport was an extremely valuable and important part of the Region's infrastructure, and that there should be some reasonable compromise around night time flights and provision for medical emergencies. He also commented on the importance of reducing the disturbance for residents.

S. Strickland suggested that "industrial emergency" be defined and a protocol developed.

G. Sudden explained that the Noise Monitoring System would not only monitor noise but identify the planes which are causing the problems.

MOVED by C. Zehr
SECONDED by S. Strickland

THAT the Regional Municipality of Waterloo implement immediately a night time flight restriction between 2300 hours and 0700 hours daily for landings on runway 07, and take-offs on runway 25, except for medical and industrial emergencies with the prior approval of the Airport Manager or designate.

CARRIED

YEAS: S. Strickland, J. McKinnon, D. Craig, M. Connolly, J. Ziegler, L. Woolstencroft, J. Brewer, T. Galloway, G. Lorentz, F. Kent, W. Roth, M. Yantzi, J. Smola, F. Friedmann, C. Zehr, J. Martens and R. Shantz.

NAYS: G. Sudden
ABSENT: T. Fairless, C. Weylie and W. Strauss

F. Kent brought forward the recommendation contained in Engineering Report E-00-030 dealing with the extension of runway 07-25 and considerable discussion ensued. K. Seiling pointed out that extending the length of the runway would not attract larger planes because the runway load capacity is not being increased, based on a Council decision in the early 1980's.

MOVED by F. Kent
SECONDED by G. Lorentz

THAT the Regional Municipality of Waterloo approve the following actions with respect to the Waterloo Regional Airport Master Plan:

a) Approve in principle a 7,000 foot Runway 07-25 to best serve the needs of the community.

b) Request that Transport Canada and the Township of Woolwich amend their zoning regulations to accommodate a 7,000 foot Runway 07-25.

c) Install an Instrument Landing System and lengthen Runway 07-25 to 7,000 feet in 2003, to mitigate noise over residential areas in Kitchener, and to improve the safety and availability of the runway.

CARRIED

(Refer E-00-030)

* * *

The Chair called a brief recess at 10:55 p.m.

MOVED by M. Yantzi
SECONDED by L. Woolstencroft

THAT the continuation of the Council Meeting beyond 11 o'clock p.m. be approved.

CARRIED

Prior to hearing **Delegations relative to Ambulance Service**, J. Prno, Director of Ambulance Services for the Region, made a presentation setting out the background of the matter, the research which has resulted in the report presented to the Health & Social Services Committee. J. Prno advised that 10 out of 16 upper tier municipalities have opted for "direct delivery" of ambulance service as opposed to "contracting out", and the benefits were reviewed.

Discussion ensued and J. Prno explained that the "direct delivery" model was being recommended for a number of reasons, in particular the cost savings; the requirement to notify employees by May 3, 2000; and the access to "critical call" information. He also explained that the RFP (request for proposal) process would require at least seven months to complete. L. Parent, Manager, Financial Services, responded to questions about cost sharing.

** J. McKinnon left the meeting at approximately 11:25 p.m.

a) Wayne Morriss, President and Manager, Kitchener-Waterloo Regional Ambulance (1987) Inc. explained that his company has operated the Ambulance Service for the past 12 years. He responded to comments in the presentation relative to WSIB claims and agreed that the Region had an advantage as a Schedule 2 employer. As concerns OMERS, be observed that the contribution holiday would not continue indefinitely. He further observed that 10 of the 16 upper tier municipalities did not represent the whole of the Province and that in reality only 10 out of 44 had opted for direct delivery of Ambulance Service.

Chair Seiling commented that virtually all of the urban regions had opted for direct delivery of the service, representing approximately 80% of the population of the Province.

b) Diane Wilkinson, Program Manager, Critical Care, Cambridge Memorial Hospital, spoke in support of direct delivery Ambulance Service stating that the Hospital is committed to a collaborative transition process to ensure the provision of service to the community and to protect the well being of the paramedics.

C06-60, T18-01/MP
E-00-030

REGIONAL MUNICIPALITY OF WATERLOO

COUNCIL REPORT

TO: Regional Chair Ken Seiling and Members of Regional Council

DATE: March 22, 2000

SUBJECT: WATERLOO REGIONAL AIRPORT MASTER PLAN

RECOMMENDATION:

THAT the Regional Municipality of Waterloo approve the following actions with respect to the Waterloo Regional Airport Master Plan:

a) Approve in principle a 7,000 foot Runway 07-25 to best serve the needs of the community.

b) Request that Transport Canada and the Township of Woolwich amend their zoning regulations to accommodate a 7,000 foot Runway 07-25.

c) Install an Instrument Landing System and lengthen Runway 07-25 to 7,000 feet in 2003, to mitigate noise over residential areas in Kitchener, and to improve the safety and availability of the runway.

SUMMARY:

At the March 8, 2000 Engineering Committee meeting, recommendations with respect to the Waterloo Regional Airport Master Plan were tabled. The Committee approved the majority of recommendations but deferred three topics. The extension of Runway 07-25 was deferred to Regional Council, with the request that staff provide further information regarding the pros and cons of an extension. The issues of night restrictions and Noise Management Committee membership were referred to the Noise Management Committee and Airport Advisory Committee for further review.

During the development of the Airport Master Plan, a need was identified to extend Runway 07-25 from 5,200 to 7,000 feet within the twenty year planning horizon to: mitigate noise; improve safety in poor weather; and better serve current and future airport customers by improving runway reliability.

It is important that the Region take steps now to protect for the eventual extension of the runway (e.g. requesting changes to Township and Federal zoning). Staff and the Project Team recommend that the entire runway extension be constructed in 2003 in conjunction with the installation of the proposed Instrument Landing System. This will provide the benefits of the runway extension (e.g. noise mitigation, improved safety and reliability) in the near term, and result in $1 million less costs than extending the runway in two phases.

REPORT:

In 1996, a Project Team was established to update the 1983 Master Plan for the Waterloo Regional Airport (WRA). The Project Team, which included representatives from many groups, consulted broadly with the community during the development of the Master Plan recommendations. The recommendations were endorsed by the Project Team and the Airport Advisory Committee, and were presented to Engineering Committee on March 8, 2000 (Report E-WRAAC-00-001.1).

At that meeting, Engineering Committee approved most of the Master Plan recommendations, as noted in Appendix A. However, Engineering Committee requested additional information be provided to Regional Council on March 22 regarding the lengthening of Runway 07-25. Engineering Committee also referred the issues of night-time restrictions and the membership of the Noise Management Committee to the Airport Advisory Committee and the Noise Management Committee, and requested further information on possible timing of these Committee meetings. The following information is provided on these items.

EXTENSION OF RUNWAY 07-25

Two of the key recommendations of the Airport Master Plan are the installation of an Instrument Landing System (ILS) on Runway 07 and the lengthening of Runway 07-25 to 7,000 feet.

The ILS will reduce noise impacts by enabling aircraft to make a gradual descent into the airport over the populated areas of East Kitchener. With the installation of an ILS, there is a requirement to extend Runway 07-25 a minimum of 300 feet. This extension is required to properly locate the ILS instruments within the field configuration.

There are two important issues for Council to consider regarding Runway 07-25. The first relates to the eventual need for the runway to be extended from 5,200 feet to 7,000 feet. The second relates to the timing of the extension to 7,000 feet.

Need for 7,000 Foot Runway 07-25

In the Master Plan process, an extension of 1,800 feet to Runway 07-25 was identified as desirable within the twenty year planning horizon. The extension would serve three purposes:

- mitigate noise
- improve safety in poor weather
- better serve current and future customers by improving runway reliability.

In 1998, 97.8% of the traffic at the WRA was small aircraft such as Cessna 172 and Piper Seminole which only need a runway length of 5,200 feet regardless of weather conditions. The scheduled and corporate aircraft, such as the JetStream 31 and Dash 8 turboprops, and GulfStream and Hawker jets, are a growing sector of aviation at the airport. In the twenty year forecast, it is projected that there will be 50 movements per day of this type of aircraft. These aircraft require 5,500 to 7,300 feet of runway for landing in inclement weather. A 7,000 foot runway is an industry norm for this class of aircraft. The extension would make the airfield safer for landing, more reliable and available during inclement weather conditions, and it will enable our customers to utilize heavier payloads. Staff and the Project Team believe that an extension of Runway 07-25 to 7,000 feet will be needed within the next twenty years to adequately serve the projected traffic at the airport.

It is important to note the following points regarding the runway extension to 7,000 feet:

- The extension is not an "expansion" to the airport. It does not increase the current Code C rating or Pavement Load Rating (PLR). The extension does not provide for additional capacity, either in number of movements or larger aircraft, at the airport.

- The number of aircraft movements is projected to increase over the next 20 years. This increase will occur even if the extension is not constructed. The extension will provide added noise mitigation for current and future residents related to the increased movements.

- The extension will not attract larger aircraft to the facility. Research by staff has confirmed there is no demand for larger aircraft. Also, Dr. Gillen's report prepared for R.E.A.S.O.N. confirms staff research by stating, "There is not congestion, nor is there a pent up demand for larger aircraft to use the facility". Furthermore, the Region has mechanisms to control increased services which would be resident at the airport, in the form of lease and operating agreements. For example, in negotiating the recent agreement with the scheduled passenger service operator at the airport, the Region was able to impose hours of operation and the type of aircraft used in the service to mitigate potential noise problems.

The Project Team emphasized that if a decision was to be made to proceed with the construction of a 300 foot extension only in the short term, it is imperative that the proper planning controls (i.e. Federal zoning and Township zoning) be put in place now to protect for the long term construction of a 7,000 foot runway.

Timing of Runway Extension

The Aeronautical Noise Management Committee, the Public Advisory Committee and the Project Team all recognize the value of an 1,800 foot extension as a noise mitigation measure. The extension will provide noise mitigation by allowing aircraft, taking off on Runway 25, to attain a higher altitude when flying over the adjacent residential areas. The extension also allows aircraft to change their course direction earlier to avoid flying directly over residential areas (i.e. turn south over the Grand River). It is projected that there will be over 240 departures daily, mostly small piston aircraft, on Runway 25 (towards Kitchener) by 2018. The extension will allow 99% of these aircraft to avoid flying over the new residential areas in Grand River South. The reduction in single event aircraft noise levels on the adjacent residential areas will vary for each type of aircraft, however it is expected that the level would be reduced on an average between 5 and 20 decibels. As a result, the recommendation for an 1,800 foot extension is proposed for implementation as soon as possible. The Committees and Project Team have targeted 2003 as a reasonable date for construction.

In addition to noise mitigation, the additional 1,500 foot extension provides the following advantages:

- It provides additional safety and reliability to customers in poor weather conditions (e.g. wet or snow covered runway). An example of this would be the aircraft that provides the scheduled passenger service to Ottawa. This aircraft normally can land using the existing Runway 07-25, however during certain weather conditions it requires up to 7,000 feet to land. If these conditions occur now, the flight has to either be cancelled or diverted to another airport.

- It is cost effective to lengthen the runway all at once instead of in stages. The costs of the different approaches to extending Runway 07-25 can be summarized as follows:

<u>One Phase Project</u>	
1,800 foot runway extension (to coincide with ILS installation)	$4,100,000
<u>Two Phase Project</u>	
a) 300 foot runway extension (to coincide with ILS installation)	$2,900,000
b) Additional 1,500 foot runway extension	<u>$2,200,000</u>
Two Phase Total	$5,100,000

Therefore, the two phase approach results in approximately $1 million in "throw-away costs", primarily due to moving the ILS ($500,000), realigning drainage systems, modifying pavement and moving lighting systems ($500,000).

- The extension allows some airport customers to more efficiently use their aircraft through fully loaded aircraft. Loads are a combination of fuel, passengers and cargo. The number of flights that would be able to take advantage of this is minimal and is estimated currently to be in the range of 25 to 50 per year. Even for the aircraft that would now be fully loaded, the extension provides noise mitigation since they would still be taking off further away from residential areas (somewhere in the range of 1,700 feet to 1,300 feet, depending on the aircraft type).

For these reasons, the Project Team recommends that the entire 1,800 foot extension be constructed in 2003, in conjunction with the installation of an ILS. This will provide the benefits of the runway extension (e.g. noise mitigation, improved safety and reliability) in the near term, and result in $1 million less costs than extending the runway in two phases.

OTHER ISSUES

Any night-time restrictions must be approved by Transport Canada through the CARAC process. This process is outlined in Appendix B. A key element of the process is that all stakeholders must be included in the preparation of noise abatement procedures. Transport Canada may not accept the recommendations from Regional Council if the airport operators and surrounding communities including Guelph, have not been sufficiently included in the analysis, or if the procedures do not significantly reduce the noise problem. Transport Canada's process is designed to ensure that the aviation regulations at each airport are safe, cost effective to the operators, and consistent with international standards.

At the most recent Aeronautical Noise Management Committee meeting, a discussion on night-time restrictions resulted in no consensus on the implementation of restrictions, with a vast majority of members voicing the opinion that restrictions should only be implemented if the proposed engineered solutions prove to be ineffective. As requested by Engineering Committee, the group will reconvene and further discuss the issue and report back to Committee and Council by June.

The next meetings for the AAC and NMC have been set for April 13, 2000 and May 4, 2000, respectively. The composition of the NMC and the question of night flight restrictions will be included on the agenda for both these meetings. Staff expect to report back to Engineering Committee and Council on these two issues in June, 2000.

CORPORATE STRATEGIC PLAN:

The airport encourages economic prosperity in the Region. The Master Plan establishes a long-term direction for the airport to provide aviation services in a manner sensitive to the needs of the community.

FINANCIAL IMPLICATIONS:

The costs of the different approaches to extending Runway 07-25 can be summarized as follows:

One Phase Project	
1,800 foot runway extension (to coincide with ILS installation)	$4,100,000
Two Phase Project	
a) 300 foot runway extension (to coincide with ILS installation)	$2,900,000
b) Additional 1,500 foot runway extension	$2,200,000
Two Phase Total	$5,100,000

Therefore, the two phase approach results in approximately $1 million in "throw-away costs", primarily due to moving the ILS ($500,000), realigning drainage systems, modifying pavement and moving lighting systems ($500,000).

OTHER DEPARTMENT CONSIDERATIONS:

The Planning and Culture, Finance and Corporate Resources (Legal Services Division) Departments have been involved in the development of the Airport Master Plan recommendations.

PREPARED BY: *D. Hunter*, AAE, Manager, Waterloo Regional Airport

APPROVED BY: *M.L. Murray*, M. Eng., P. Eng., Commissioner of Engineering and Public Works

C06-60, T18-01/MP
E-00-030

APPENDIX A

RECOMMENDATIONS APPROVED BY ENGINEERING COMMITTEE - MARCH 8, 2000

MOVED by K. Seiling
SECONDED by J. Martens

THAT the Regional Municipality of Waterloo recommends the following actions with respect to the Waterloo Regional Airport Master Plan:

a) Mitigate airport noise through changes to the published noise abatement procedures as recommended by the Public Advisory Committee and Aeronautical Noise Management Committee as noted in Appendix C of Report E-WRAAC-00-001.1, dated March 8, 2000 and forward the changes to Transport Canada for approval;

b) Purchase and install a noise monitoring and flight tracking system and that the Region waive its purchasing by-law as necessary to expedite this work;

c) Upgrade the existing passenger terminal building to accommodate the needs of regular scheduled passenger service;

d) Provide additional airside leased property available to allow businesses and individuals to construct hangars and aviation related operations;

e) Undertake the necessary studies to determine the future infrastructure servicing needs (ie water, sewer, power, storm drainage);

f) Maintain the existing Airport management and administration structure;

g) Update the Airport Master Plan every five years with the next update in 2005;

h) Revise the appropriate clauses of the Regional Official Policies Plan at its next five year review consistent with Section 9.3 of the Master Plan. Any future changes to the 2000 Airport Master Plan which would result in the development of new runways, significant extension of existing runways, or increases in the pavement load rating or code rating of the airport, will only be implemented following recognition of such change through amendment to the Regional Official Policies Plan;

i) Forward the NEF/NEP 2018 planning contours to Transport Canada for review and approval;

j) Direct staff to establish an airport capital financing plan to implement the Airport Master Plan commencing with the 2001 airport capital program and the ten-year forecast;

k) And that the composition of the Airport Noise Management Committee be considered by the Noise Management Committee, the Airport Advisory Committee and Regional Council;

l) And further that the question of night time flight restrictions be further considered by the Waterloo Regional Airport Noise Management Committee, the Waterloo Regional Airport Advisory Committee and Regional Council.

CARRIED As Amended

MOVED by K. Seiling
SECONDED by J. Martens

That Engineering Committee recommends the following action to be taken with respect to the Waterloo Airport Master Plan:

a) Install an Instrument Landing System (ILS) on Runway 07, and that additional information with respect to the two options of lengthening Runway 07-25 by 300 feet and 1800 feet be provided to Regional Council on March 22nd for a decision, and that the work be advanced in the capital program; and

b) Revise the Federal zoning and Township of Woolwich zoning to reflect a runway length approved by Regional Council on March 22nd, 2000;

CARRIED as Amended

Transport Canada Air
Transports Canada Air

TP 2300

C06-60, T18-01/MP
E-00-030

APPENDIX B

A.I.P. Canada

AERONAUTICAL INFORMATION PUBLICATION

Canada

A pilot-initiated waiver indicates to the controller that the pilot accepts responsibility for wake turbulence separation. The controller will still issue a wake turbulence cautionary with the takeoff clearance. More information on Wake Turbulence can be found in AIR 2.9.

4.1.2 Noise Abatement

Pilots and operators must conform to the applicable provisions of CAR 602.105 – *Noise Operating Criteria*, and CAR 602.106 – *Noise Restricted Runways* (see RAC Annex) and the applicable noise abatement procedures published in CAP.

Noise operating restrictions may be applied at any aerodrome where there is an identified requirement. When applied at an aerodrome, the procedures and restrictions will be set out in the CFS, and shall include procedures and requirements relating to:

(a) preferential runways;

(b) minimum noise routes;

(c) hours when aircraft operations are prohibited or restricted:

(d) arrival procedures;

(e) departure procedures;

(f) duration of flights;

(g) the prohibition or restriction of training flights:

(h) VFR or visual approaches;

(i) simulated approach procedures; and

(j) the minimum altitude for the operation of aircraft in the vicinity of the aerodrome.

Transport Canada recognizes the need for proper consultation and has instituted a procedure that will allow aircraft operators to challenge all proposed changes to noise rules at aerodromes. This procedure includes a check list which requires consultation with all concerned parties before new noise restrictions can be published in CAP or the CFS. When the following check list has been completed for proposed noise restrictions at an aerodrome, and approved by Transport Canada, the noise restrictions will be published in the appropriate aeronautical publications.

Check List

1. A description of the problem;
2. Parties consulted. This list shall include all regular owners and operators using the airport, as well as the Air Transport Association of Canada;
3. Alternatives; procedures/restrictions considered;
4. Proposed action and justification;
5. Estimated cost and revenue impairment to all regular owners and operators. This information will be requested from all regular owners and operators using the airport, owners and operators who have indicated their intention to use the airport, and any other owner or operator who may be affected by the proposal. Costs must be submitted within 90 days of being requested;
6. Estimated cost to the airport operators of the proposed action;
7. Forecast noise exposure impact of the proposed action;
8. Decision reported to the public and to the affected owners and operators, as well as the Air Transport Association of Canada.

4.1.3 Preferential Runway Assignments

At controlled airports, when selecting preferential runways for noise abatement or for other reasons, air traffic controllers consider the runway condition, the effective crosswind component and the effective tailwind component.

The maximum effective crosswind component considered in determining runway selection is 25 KT for arrivals and departures. The maximum effective tailwind component is 5 KT.

Although air traffic controllers may select a preferential runway in accordance with the foregoing criteria, pilots are not obligated to accept the runway for taking off or landing. It remains the pilot's responsibility to decide if the assigned runway is operationally acceptable.