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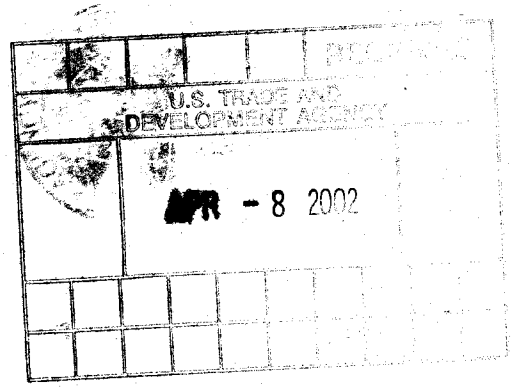

FEASIBILITY STUDY FOR AN AIRPORT IN TEMUCO

FINAL REPORT

The Louis Berger Group, Inc.
Washington, D.C.

In association with

PSC Corp, S.A.
Santiago, Chile

and

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Santiago, Chile

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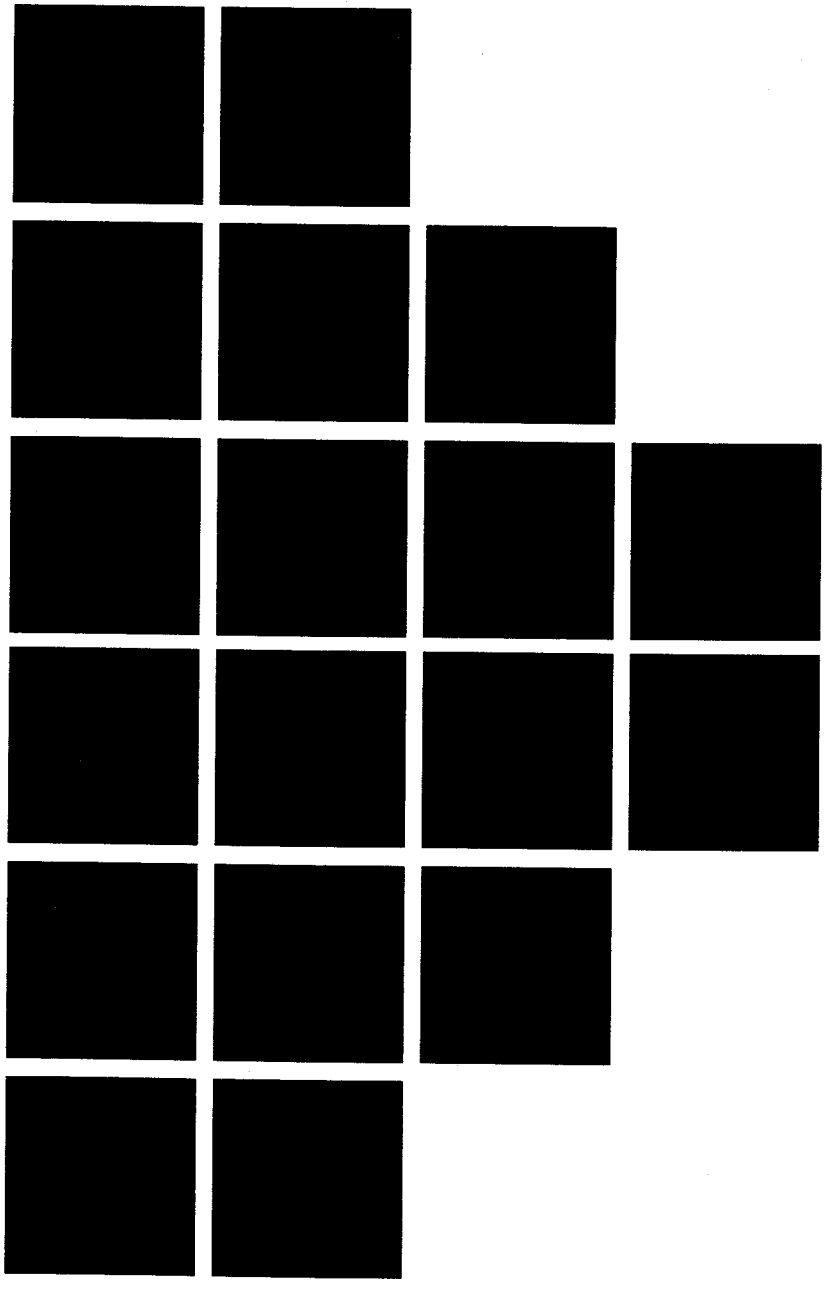


The Louis Berger Group, Inc.

Executive Summary

EXECUTIVE SUMMARY

1. Introduction

The city of Temuco is the capital of Region IX of Araucania (see **Figure ES-1**), which is located 677 kilometers south of Santiago, Chile. This is one of the cities with the greatest increase in growth rates in the country, which is directly related to the high levels of investment in housing construction (INE, 1996). The city of Temuco has a population of 775,000 inhabitants and its principal activities are cattle ranching and tourism, both of which contribute to the region's GDP, by 33.8% and 19.4, respectively. During the 90's, passenger demand at Maquehue airport, which serves the city of Temuco, has experienced one of the biggest growth rates of airports in Latin America. In 1999, passenger activity surpassed 250,000, and the Ministry of Public Works of Chile has estimated that this figure will reach 1,570,000 passengers by the year 2020 (DAP April 12, 2000), although these projections are very optimistic, in comparison with that of business entities.

The government authorities estimate that the present Maquehue Airport has important physical restrictions which does not allow its growth, and which is needed to satisfy the anticipated passenger and aviation activity demand in the region. The Ministry of Public Works (MOP), together with the General Directorate of Civil Aviation (DGAC) carried out superficial first analysis regarding the possible alternative locations for the construction of a new airport, one that would satisfy the required infrastructure demand in the long run (see **Figure ES-2**). The Government of Chile recognizes the importance of the participation of the private sector in the development of the country's infrastructure, therefore they have determined to study the project's feasibility based on a concession system over a determined period of years.

In Chile, air service has evolved into a mixed fleet based on large sized airplanes, such as the A-320. Aside from the decision to expand the present airport, or build a new one, it is necessary to improve and expand the present facilities in order to accommodate the forecasted increase in the flow of passengers, and a longer runway for airplanes and commercial airlines. The improvement of the airport, to serve the city of Temuco and the region, has become a priority for the Ministry of Public Works (MOP) of Chile.

The main objective of this study is a financial feasibility analysis to consider various options on how to structure a concession to the private sector, one that would provide for the necessary improvements through the construction and operation of a new airport.

Figure ES-1: Map of Region IX

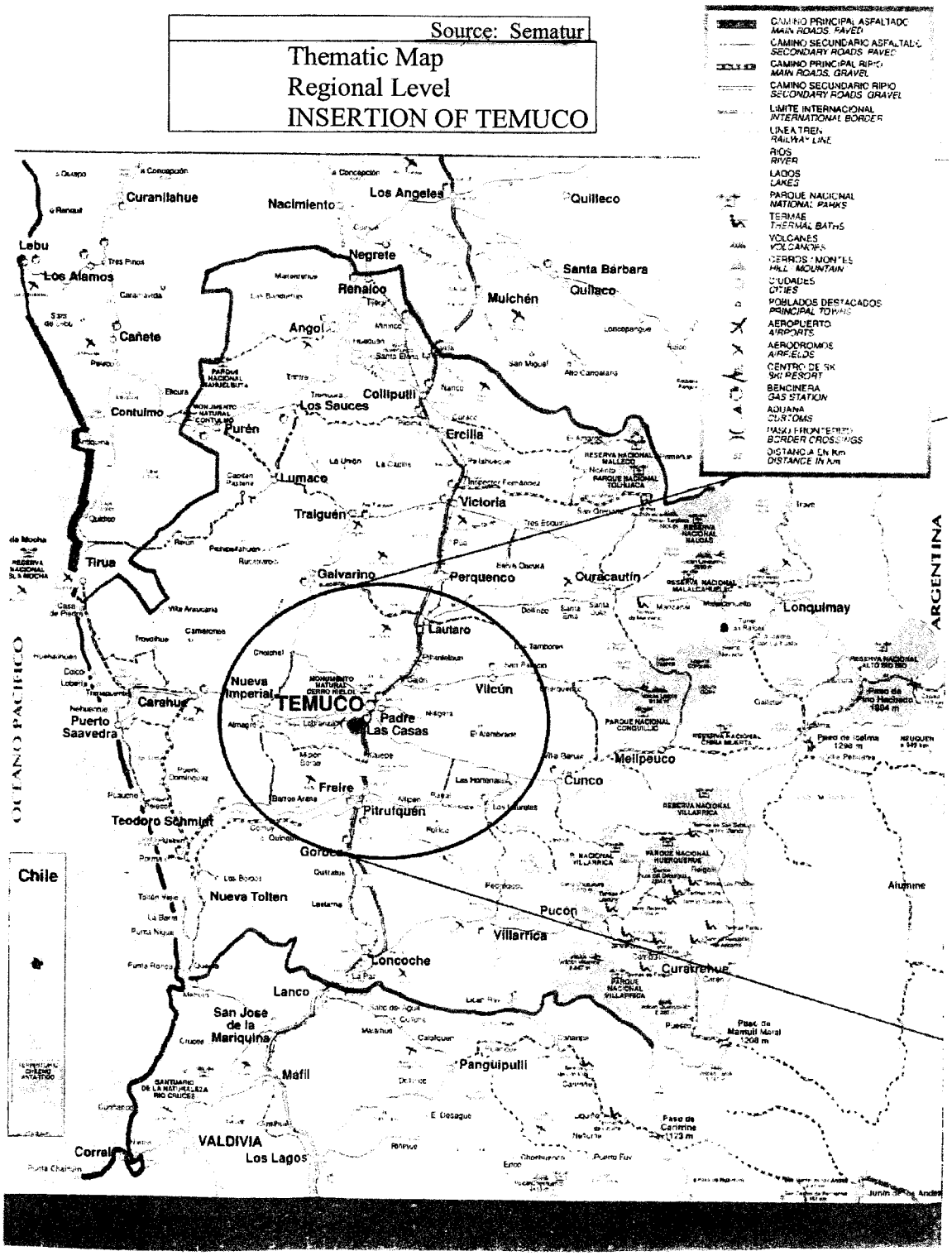
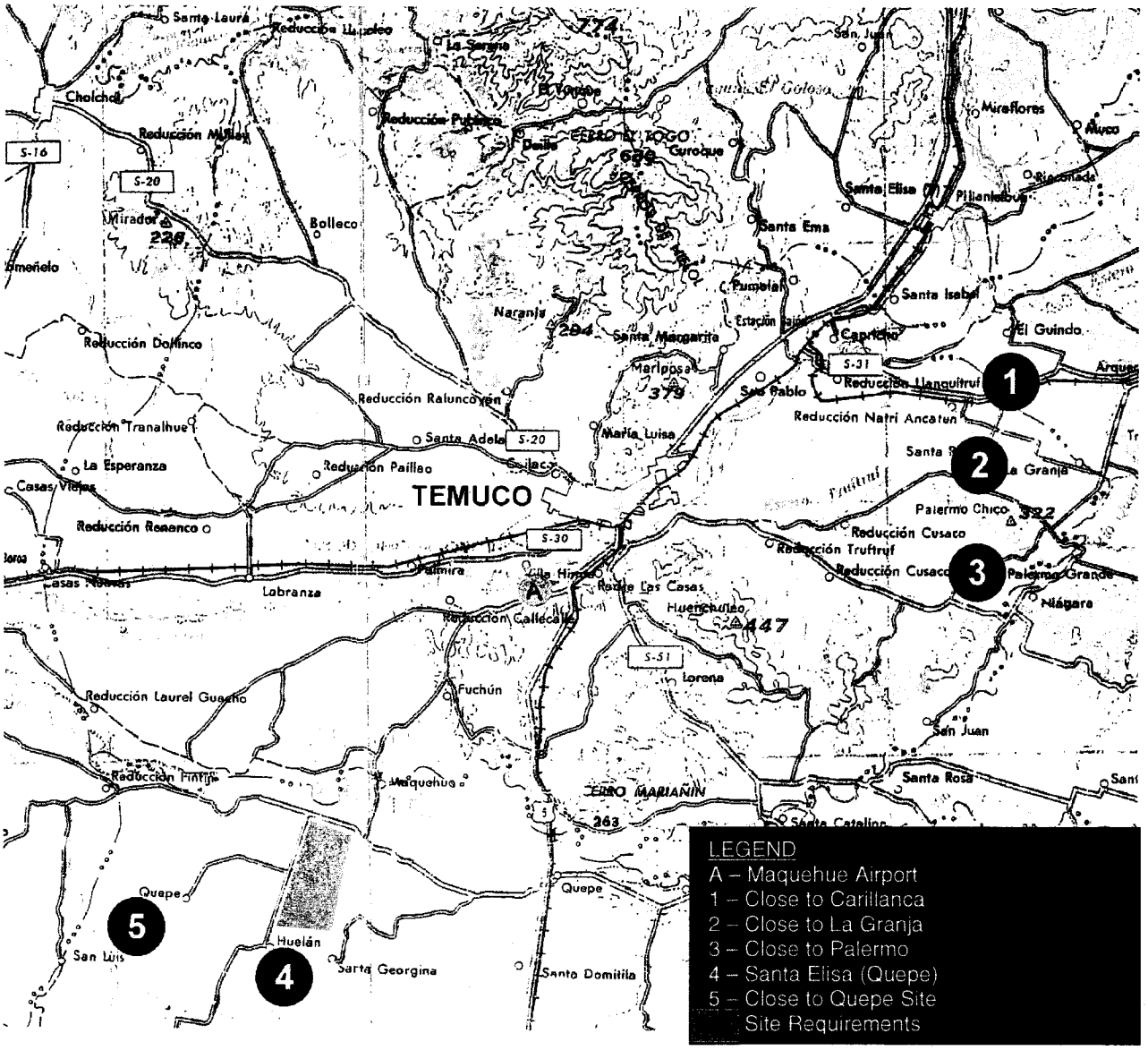


Figure ES-2: Possible Locations for a New Airport near Temuco



For this analysis, it is necessary to analyze the following five principal aspects:

1. Define national and international passenger and cargo demand for Temuco Airport to 2020.

2. Develop a conceptual plan for the necessary facilities, and investment costs to improve the existing airport, or build a new airport, and meet demand and satisfy international design standards, with any of these two options.

3. Appraise the existing airport and its potential for urban development

4. Consider the potential for urban development in the adjacent areas of the new airport, and

5. Consider the project's financial feasibility, under various demand scenarios and airport development, and concession structure options, which will allow for the recuperation of costs, and provide an adequate return to the private investors.

2. Passenger and Cargo Demand for Temuco for 2020

Presently, the Airport in Maquehue handles approximately 250,000 passengers per year. It is projected that the present service standard will change, from a transit city to one of origin or destination from the Santiago-Temuco route. It is expected that during the period considered in the study, there will be no regular direct international flight program to Temuco. International tourism has presented an increase for Region IX, based almost exclusively in land transport service. The forecasts are based on a modal participation model, and regional GDP participation. **Table ES-1** shows air transport passenger, operations and cargo projections for Temuco Airport for the year 2020:

Table ES-1: Summary of Demand Projections for Temuco – 2020

Projection Category	2000 (Pres)	Optimist	Probable	Pessimist
Annual Passengers (Arrivals and Departures)	286.000	815.000	630.000	495.000
Passenger Peak Hour (Departures)	140	369	285	224
Annual Commercial Operations	8.467	12.200	9.400	7.400
Total Annual Operations	17.810	57.300	31.400	19.700
Peak Hour Commercial Operations	4	6	4	3
Total Peak Hour Operations	8	31	17	10
Annual Cargo in Tons	453	1.431	1.105	868

The "Probable" projection represents an increase of 220% over the present service, or equivalent to an average annual growth of 4+/-%. This last projection was used, in order to estimate the size of the required facilities and cost estimates, as well as an airplane capacity utilization factor of 60%.

3. Required Facilities for a New Airport to Meet Demand and Satisfy International Design Standards

In the future, it is expected that the mix of commercial airplanes servicing Temuco will change. Not only will B-737's be used, but also all categories of 4C type planes, such as the A-320.

The Conceptual Plan is presented for the new airport in **Figure ES-3.** The minimum land required for a new airport, based on the demand projections, is 280 hectares, which are divided into approximately 170 hectares for the air-side facilities, and 110 for the land-side activities. In practice, the acquisition of a substantially larger property is recommended, possibly between 480 and 500 hectares, for a location such as the one in Santa Elisa, since it must be taken into consideration other related activities of the airport, and growth in the long-run. The Conceptual Plan includes:

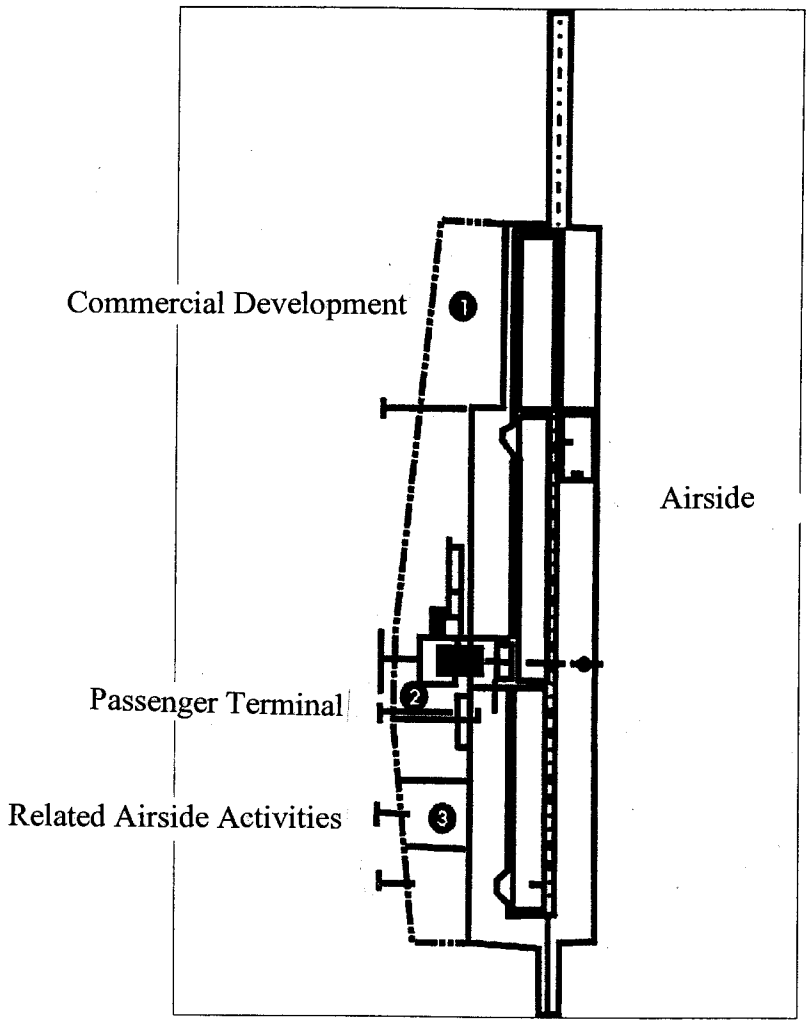
Runways and Taxiways: To satisfy the minimum operations security requirements for projected flights in the future, the runway of Temuco Airport must have a length of at least 2.200 m, with a Category I ILS. The dimensions and the thickness of the runways, taxiways and platforms are designed for Category 4C airplanes.

If it is decided to build a new airport, lands must de acquired, as well as a sufficient area to accommodate Category E airplanes. In other words, the option to expand the runway to 3.000m has been incorporated into the layout of the new airport. For this same reason, the distance between the runway and the taxiway center-lines are designed to allow for simultaneous operations for Category E and D airplanes, as well as smaller sized airplanes. In this manner, additional land will not be required, nor the relocation of a taxiway, if the runway is extended to accommodate airplanes larger than Category 4C.

Given the number of projected peak hour operations, a partial taxiway of 1.000 meters will not be necessary, until 15+/- operations per peak hour are reached, which is considered the "probable" projection for year 2020. When 25+/- operations per peak hour are reached, a taxiway with a length the same as the runway will need to be studied. This improvement would allow approximately between 30 and 35 operations per hour.

Platforms: A new platform to accommodate up to 4 Category 4C airplanes, or other combinations with larger airplanes, is proposed. Three Category 4C airplanes will be serviced through a boarding bridge. For the cost estimates, a rear taxiway and two separate accesses to the middle of the runway are proposed.

Figure ES-3: Layout of the Conceptual Plan



NAVAIDS: Costs in delays and re-routing of flights are difficult to estimate, but nevertheless affect the possible economic development of the region of Temuco. One of the principal objectives of the expansion of the present airport, or the construction of a new one, is to allow for operations under all types of weather conditions.

Aside from the control tower, DGAC offices, related emergency facilities, meteorological equipment and radio communications, a complete NAVAIDS support system will need to be included, including ILS, SALS, precision illumination systems, PAPI, VOR and DME systems, which are considered in the plan and cost estimates.

Auxiliary Services: Support facilities, such as SEI, airport maintenance, storage and distribution of fuels, cargo, and GSE maintenance are included in the Conceptual Plan and in the cost estimates.

General Aviation: A separate area with independent access to the main route is included in the Conceptual Plan.

Military Area (FACH): A separate area with independent access to the main route is included in the Conceptual Plan.

Passenger Terminal: Table ES-2 shows area requirements for the commercial passenger terminal facility, based on a C Level of Service, which is equivalent to a good level of service with stable flows, in accordance with IATA and FAA standards. These standards consist of 10 m2 per peak hour passengers. The number of peak hour passengers was calculated at 1.9 times the forecast for departures.

Table ES-2: Terminal Requirements with a C Level of Service in 2020

Projection Category	Optimist	Probable	Pessimist
Passenger Peak Hour (Departure)	369	285	224
Passenger Peak Hour (Total)	701	542	426
Terminal Area Requirements	7.000 m^2	5.500 m^2	4.000 m^2
Recommended Parking Spaces	185 spaces	143 spaces	112 spaces

Nevertheless initially, the terminal could be smaller (approx. 4.000+/- m2), and could gradually be expanded, according to increases in traffic demand. 10.000 m2 of surface space has been reserved to allow for these future expansions at the terminal. The reserved area for passenger facilities in the Conceptual Plan allows for the expansion of the terminal without affecting other facilities or operations of the airport. There is an ample area to expand passenger parking services, rental vehicles and the construction of a hotel or conference center, if needed.

Commercial Development: The Conceptual Plan includes an ample area to commercial development in airport property. The cost for an independent access way to the main route to Quepe and Temuco has been considered.

Access to Temuco: In order to avoid double tolls when reaching Route 5 and the bypass, it is recommended to improve Route R-500, which connects Santa Elisa with Maquehue and the City of Temuco.

4. Estimates and Investment Costs Programming

Based on the requirements presented in the previous section, total required investment costs were estimated for the construction of a new airport, which has sufficient capacity for the projected demand, according to the medium projections for the year 2020. Only the investments corresponding to the Government and/or the concessionaire of the airport are included. The estimated total is **1.26 million UF.**

Costs related to commercial, military or general aviation facilities are not included, which would be developed by other parties. The total also does not include the access road to the City of Temuco, which is considered fit for a separate concession to be financed through a toll per use.

For the purpose of executing the financial analysis for the concession of a new airport, it is necessary to program the investments, throughout the concussion period. **Table ES-3** shows the required investment sequence to satisfy the forecasted demand in the medium scenario. They have been organized by investment phases. In this table, a fourth phase has been included for 2019, to satisfy demand until the year 2025, as the financial analysis in Chapter 6 considers concession terms of 18 and 24 years. The estimated cost in this fourth phase is estimated at 124,000 UF, increasing the total cost of the project to 1.39 million UF.

Even though a definitive comparative analysis is not included in this study between the alternatives to expand the present Airport in Maquehue, and the construction of a new airport, it is relevant to present a comparison between the different preliminary estimates of the respective costs for each option.

For this purpose, it has been taken into consideration that DGAC determined that the installation of an ILS system is feasible in Maquehue Airport, if the minimum area of land in the air-side is approximately 170 hectares, in order to allow the lengthening of the runway to 2.200m, and place the approach lights. Presently, 100+/- hectares are available for the air-side, which will make necessary the acquisition of at least 70 more hectares, which are indigenous lands.

Table ES-4 shows a comparison of the Ministry of Public Work's (MOP) estimates for Maquehue Airport, including the cost of building a new one in another area, such as the one in Santa Elisa. MOP has provided estimates for the improvement of the present facility to satisfy demand in 2020, including the construction of a 6.000 m2 terminal. An estimate for the construction of a new facility in Santa Elisa has been prepared, with a terminal of 6.000 m2, with the purpose of comparing these estimates.

Table ES-3: Investment Program – Santa Elisa Airport

Concept	Phase 1 2002-03	Phase 2 2009	Phase 3 2014	Phase 4 2019	Total
Land Movement	134.336	0	0	0	134.336
Runways/Ramps/Platforms	130.711	0	18.000	0	148.711
Passenger Terminal	100.000	25.000	0	50.000	175.000
Access and Parking	25.334	623	0	1.246	27.203
Operational Facilities	7.600	0	0	0	7.600
Infrastructure Services	43.500	6.525	0	13.050	63.075
Aeronautical Facilities	156.800	0	0	0	156.800
Engineering and Supervision @ 26%	*155.553*	*8.358*	*4.680*	*16.717*	*185.309*
Terminal Equipment	147.650	22.463	22.463	22.463	215.039
Contingency @ 20%	*180.297*	*12.594*	*9.029*	*20.695*	*222.615*
Land Acquisition	52.272	0	0	0	52.272
Total	**1.134.053**	**75.563**	**54.172**	**124.171**	**1.387.959**

Table ES-4: Estimated Alternative Construction Costs to Improve the Airport (to year 2020)

Airport	6.000m2 Terminal	
	MOP	Consultant
Maquehue	1.052.700	
Santa Elisa without Road		1.288.788

This table shows that the construction of a new airport (to meet the projected demand in 2020) would cost approximately 22% more than the cost of improving the existing airport. This figure would increase to 35% if the reconstruction of an access road to Santa Elisa in included. Obviously one must be careful in reaching conclusions of this comparison, since the costs presented for both alternatives are preliminary estimates prepared without taking into consideration all the necessary studies to determine with certainty the technical feasibility of each one. The construction cost is not the only factor to consider in the final decision. Among other things, the opportunity cost of alternate uses of each property must also be considered.

5. Appraisal of the Existing Airport and Opportunities for Urban Development in the New Site

5.1 Maquehue

According to surveys taken, land costs vary between UF 722 and UF 1.807 per hectare in Maquehue. The existing facility has an estimated value of UF 695.539. The properties of 262 hectares represent approximately UF 235.000. Nevertheless, according to the use of each property, the runways, taxiways, building and platforms may not be appraised by the potential buyer, lowering the commercial value of the present airport to UF 276.000+/-.

On the other hand, it is very likely that that all resources from the alternate land development of Maquehue may not be used for the construction of a new airport. A legal study is needed to determine if the lands will become available once the airport has been moved. The possibility of indigenous complaints exists, as well as confirmation from FACH if it intends to move its operations to Santa Elisa.

Nevertheless, a probable potential demand exists to use the land of the actual airport for the construction of housing, hotel, warehouses, light industry, and commercial business and/or education centers.

In light of these considerations, the financial analysis includes alternatives that appraise the property at UF 235.000, as well as others that do not incorporate the sale of and development of property.

5.2 Santa Elisa

Through surveys, land costs vary between UF 70 and UF 108 in Santa Elisa. It is estimated that the total cost for the acquisition of 484 hectares in Santa Elisa is UF 52,300.

Even though the Santa Elisa location is farther away from the City of Temuco, its distance to regional accesses via the Temuco bypass is approximately equivalent to that of Maquehue. Various land alternatives for urban development in the area of Santa Elisa are the same type as that of those in Maquehue, but are not considered as attractive as the ones found in Maquehue. Therefore, there are more available lands in Santa Elisa, at a substantially lower cost.

Table ES-5 describes the potential different uses for the Maquehue and Santa Elisa locations.

Table ES-5: Potential Uses – Maquehue and Santa Elisa Locations.

	Maquehue	Santa Elisa
1. Airport		
1.1 COMMERCIAL AREAS	375 m^2	375 m^2
1.2 SERVICES	458 m^2	458 m^2
1.3 OFFICES	180 m^2	180 m^2
2. Complimentary Uses		
2.1 HOTEL (ROOMS)	1.308 m^2 (32)	NO
2.2 WAREHOUSES	2.760 m^2	360 m^2
2.3 SERVICES	700 m^2	700 m^2
3. Other Potential Development	POTENTIAL	NO
4. Reuse of Existing Facilities	Potential	NO

6. Financial Analysis and Concession Structure

The analysis was carried out through a formulation of a financial model to simulate the evolution of the project, from the point of view of the private investor. The model also identifies the financial impact of each Civil Aviation General Directorate (DGAC) alternative, in terms of the project's net financial flow.

The analysis focuses on the evaluation of cash flows for the investor or investors, under different alternatives and variables, with the purpose of reaching conclusions and recommendations regarding the structure of private participation in the project.

The main alternatives and variables considered were the following:

1. Two alternatives to define the concession term: 18 years (2002-2019) and 24 years (2002-2025).

2. Seven alternatives or scenarios related to the scope of the concession, which represent different combinations of three variables:

   - The concession of the entire airport or only the land-side.
   - The possible incorporation of the adjacent areas to the airport in the concession
   - The possible allocation to the project (through DGAC) of resources from the alternate development of property at Maquehue Airport, once the new airport is functional.

3. Two alternative payment mechanisms to the concessionaire; one which reflects the existing airport concession structure in Chile, and the second which reflects a proposal for future concessions, coming from the MOP's General Concession Coordination. These are:

   - Under the existing airport concessions in Chile, the concessionaire is allowed to directly collect the operative and commercial terminal concessions. The rest of the concessionaire's income comes from a tariff per passenger, contractually agreed to with DGAC, where a minimum guaranteed income equivalent to a return rate of 12% exists.
   - The future alternate airport concession structure is one in which the Government assumes all risk in demand through the elimination of the tariff per enplaned passenger. Under this structure, the Government guarantees a periodic fixed payment (monthly, quarterly, bi-annually or annually) to the concessionaire, which represents a return of 12% over expenses during the concession term.

4. A sensitivity analysis was carried out to determine the variation impact in demand and investment costs.

The main results of the analysis consist of the identification of specific required incomes by the concessionaire to assure a minimum return over investments, and the project's impact on DGAC's cash flow.

The principal conclusions of this analysis are the following:

1. Under any of the analyzed alternatives, the project will require a net subsidy from the Chilean airport system, through DGAC, as a result of tariff politics adopted by the Government.
2. A term of 24 years was found to result in less net costs to DGAC, and similar potential returns for the concessionaire in comparison to a term of 18 years.
3. The inclusion of adjacent areas to the concession of the airport is recommended. Even though this does not have a significant impact over the project's income for any of the two parts, it allows reducing the administrative responsibilities of DGAC.
4. The allocation of income to the project from the sale of Maquehue Airport property could be particularly important as a mechanism to reduce the project's net cost to DGAC, even though the legal questions regarding the availability of these properties still needs to be defined.
5. Even though the model indicates that the alternative to concession only the land-side of the airport could reduce the project's net cost to DGAC, no other additional costs were considered for the Directorate to build and operate part of the area, particularly in operative costs and an increase in the public debt.

6. The second payment method, in which DGAC transfers a fixed periodic amount, and allows the concessionaire to receive a return of 12%, is preferable for the following reasons:

   - If demand does not vary substantially from its projection, the subsidy required from DGAC is reduced to between 12% and 19%, according to the alternative.
   - This also offers an advantage to the government, in case that demand is superior to that of initial projections. The government receives an increase in income derived from this demand, without having to increase its payments to the concessionaire.
   - In case that demand is significantly lower than expected, there should be no huge difference from the point of view of the government, if it's taken into consideration the fact that the present system generally includes a minimum guaranteed income, estimate using a base of return of 12%.
   - This alternate method does not negatively affect the concessionaire, except in the case when demand exceeds projections, since the concessionaire will not share in the increase of income per passenger.

In case that the second method is chosen, the annual fixed payment amount could be established as one of the award criteria variables, in a similar manner as was utilized in the tariff per enplaned passenger in the previous airport concessions.

7. Environmental and Technical Impacts In Considering a New Airport Alternative

Aside costs, complimentary development potential of the airport, and financial feasibility, other various technical factors and environmental impacts must be considered.

The expansion of the existing facility in Maquehue presents two types of problems:

1. The decision to expand the runway will require the acquisition of lands from Mapuche landowners.
2. Flights will continue to operate over developed zones of the city of Temuco, which continues to expand.

On the other hand, the environmental impact and preventive measures for the expansion of the facilities in Maquehue, or for the construction of a new airport in Santa Elisa, are not significant.

In Maquehue, the expansion of the runway will require the leveling of a portion of a hill, and the expropriation of Mapuche property. Also needed will be defenses against water overflows from the Cautín River.

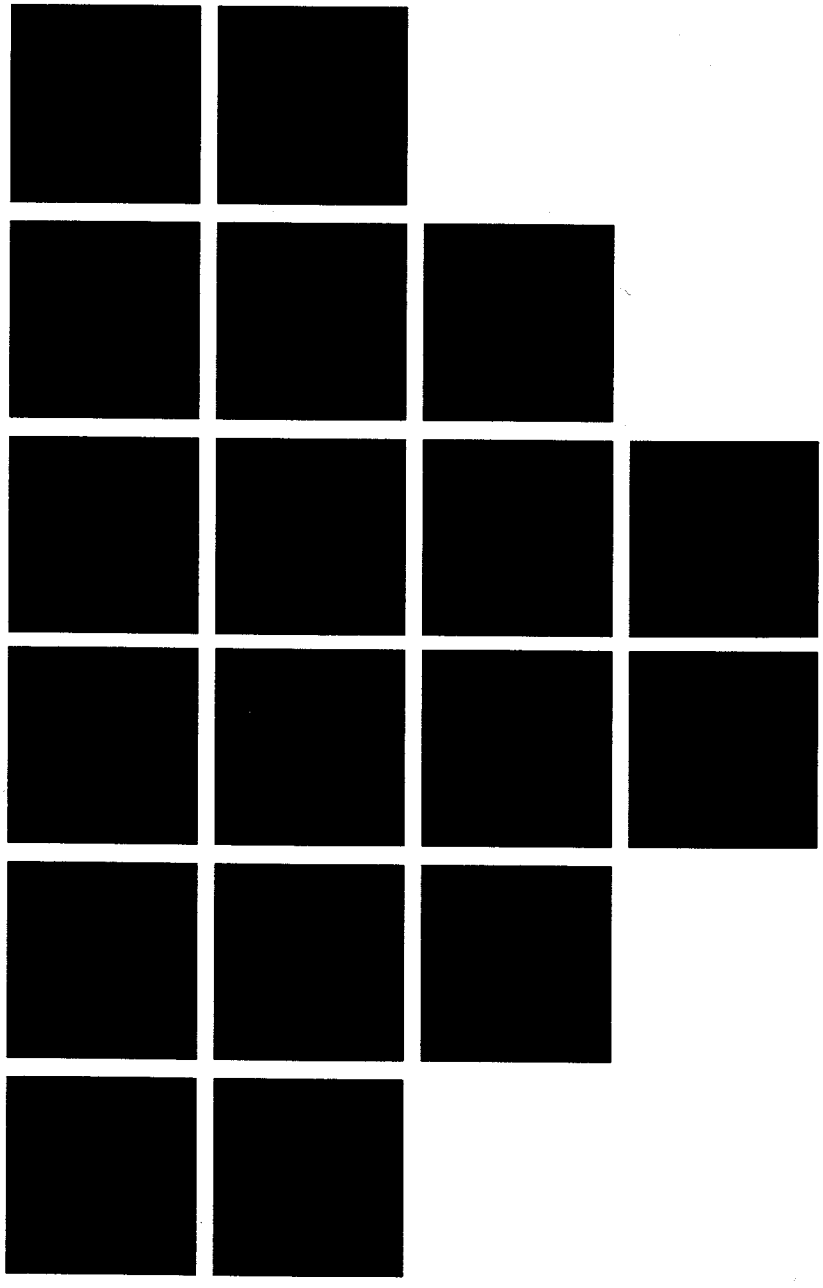
The location at Santa Elisa requires minimal property adjustments, but will not require the construction of a sewer. Mapuche properties will not be needed for the construction of a new airport.

In none of the cases will the waste disposal sites be affected. Solid waste would be deposited in the present waste disposals in Temuco or Freire.

Table ES-6 compares both areas. It is important to note that more detailed studies are needed in order to determine with more precision the capacity of each area, in order to provide good climatic conditions for air navigation.

Table ES-6: Present and New Locations Comparison

	Maquehue	**Santa Elisa**
Satisfies international air navigation standards	Feasible	Feasible
Availability of lands for growth of the airport	Requires hill leveling	Adequate
Acquisition of necessary land	Relatively little, but expensive	Large area, but not cheap
Access to Temuco and other communities	Excellent	Good
Impact to resources and Mapuche land property	Machupe property needed to lengthen runway	None for the airport
Impact to present residential areas	A neighborhood is required for the lengthening of the runway, and all flights will continue to operate over the expanding city	No residential property will be required, nor are there problems with flights over cities.
Impact to waste disposal and solid waste sites	None	None
Potential for urban development	Excellent	Excellent
Access to Route 5 and Temuco bypass	Excellent	Good, requires a road



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CHAPTER I
Introduction

CHAPTER I

INTRODUCTION

1.1 Background

The city of Temuco is the capital of Region IX of Araucania (see **Figures 1-1 and 1-2**), which is located 677 kilometers south of Santiago, Chile. This is one of the cities with the greatest increase in growth rates in the country, which is directly related to the high levels of investment in housing construction (INE, 1996). The city of Temuco has a population of 775,000 inhabitants and its principal activities are game ranching and tourism, both of which contribute to the region's GDP, by 33.8% and 19.4, respectively.

Figure 1-1: Location of the Project

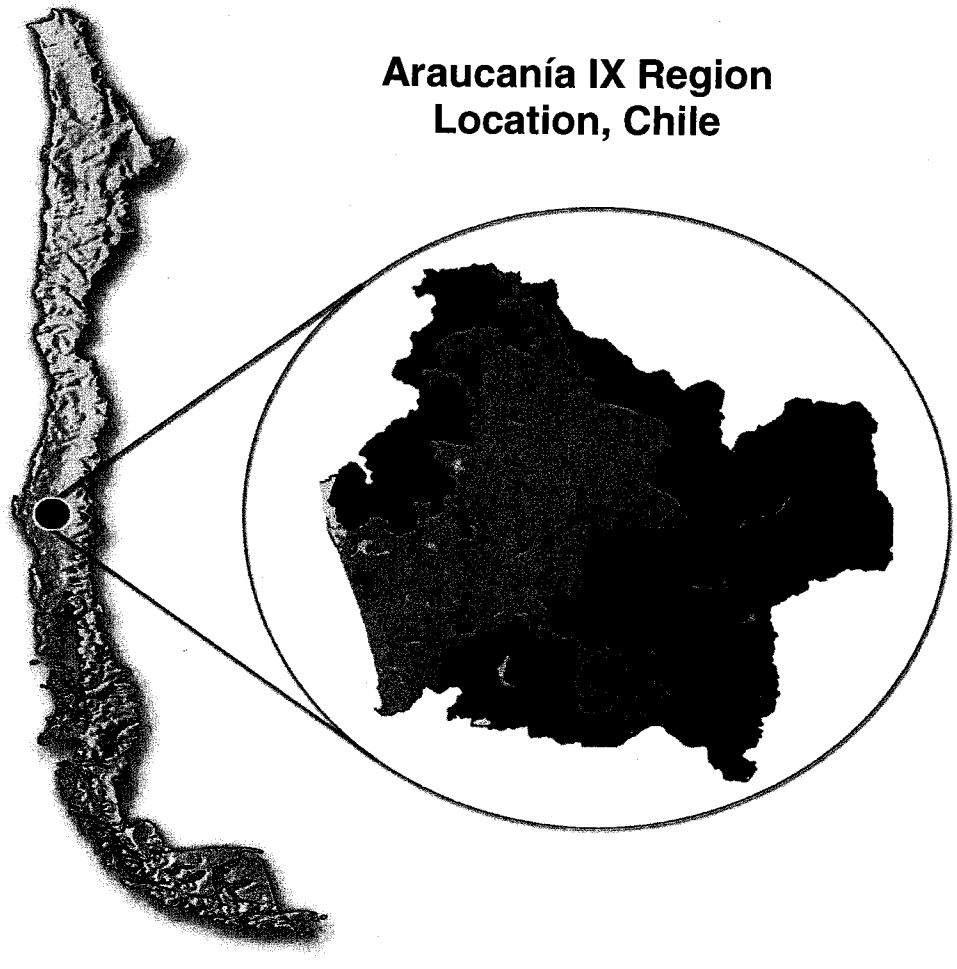
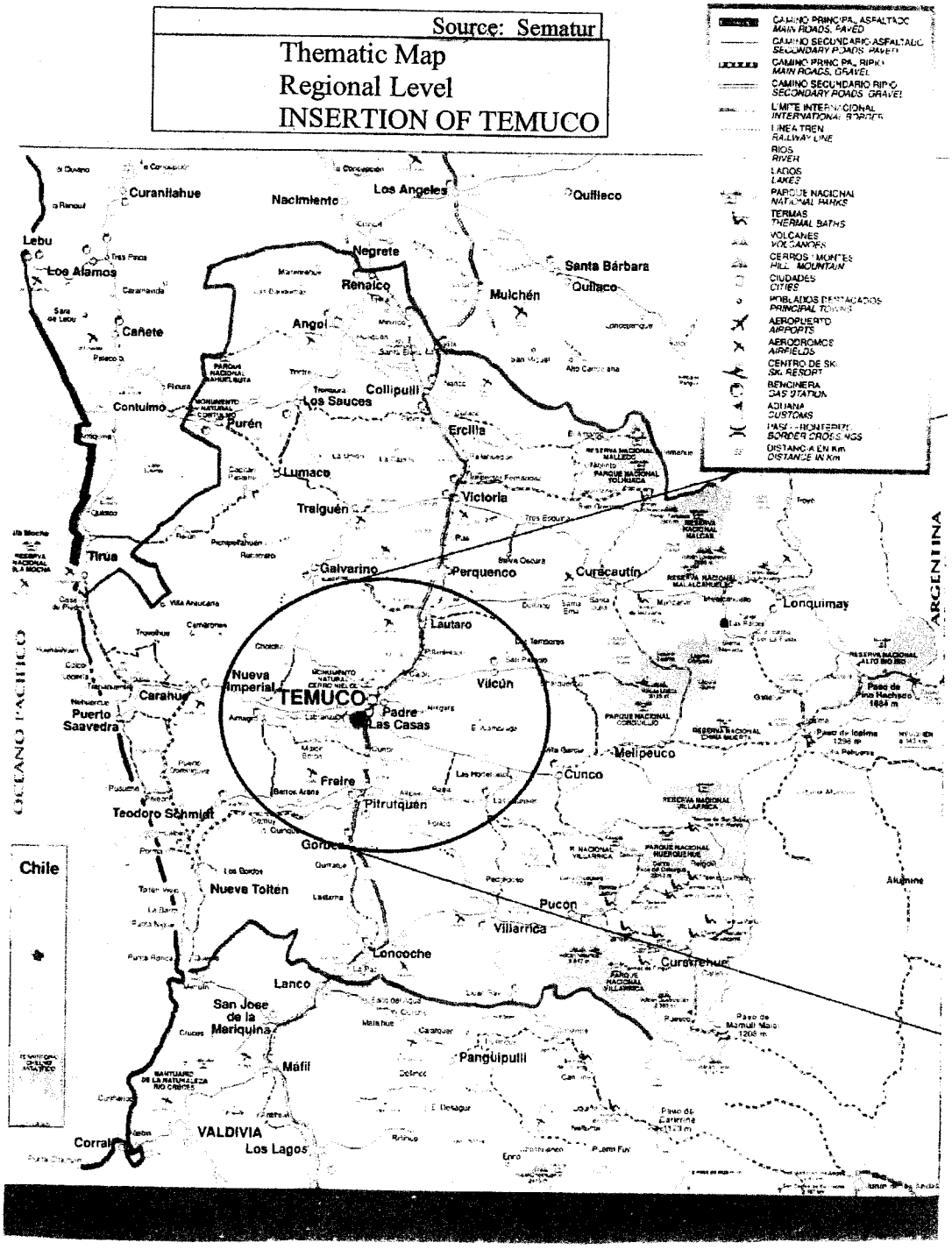


Figure 1-2: Map of Region XI



During the 90's, the passenger demand at Maquehue airport, which serves the city of Temuco, has experienced one of the biggest growth rates of airports in Latin America. In 1999, passenger activity surpassed 250,000, and the Ministry of Public Works of Chile has estimated that this figure will reach 1,570,000 passengers by the year 2020 (DAP April 12, 2000), although these projections are very optimistic, in comparison with that of business entities.

The government authorities estimate that the present Maquehue Airport has important physical restrictions which do not allow its growth, in order to satisfy the anticipated passenger and aviation activity demand in the region. The Ministry of Public Works (MOP), together with the General Directorate of Civil Aviation (DGAC), have carried out a superficial analysis on 5 possible location alternatives for the construction of a new airport, which would satisfy the demand infrastructure in the long-run required by the region near Temuco (See **Figure 1-3**), without reaching a conclusive recommendation.

Various factors, such as topography, land property and regional planning have directed the focus of the studies towards the sun-setting sector and specifically, the area around location No. 4 (see Figure 1-3). The alternative near the Huelan Estate, Santa Elisa, in Quepe, is one that does not contain any indigenous settlements within nor around its property, with the nearest ones being located several kilometers away. [1] In the case of the other four alternatives, all have indigenous settlements along the borders, and also in certain cases there are restrictions on aerial navigation, reason for which they were disregarded.

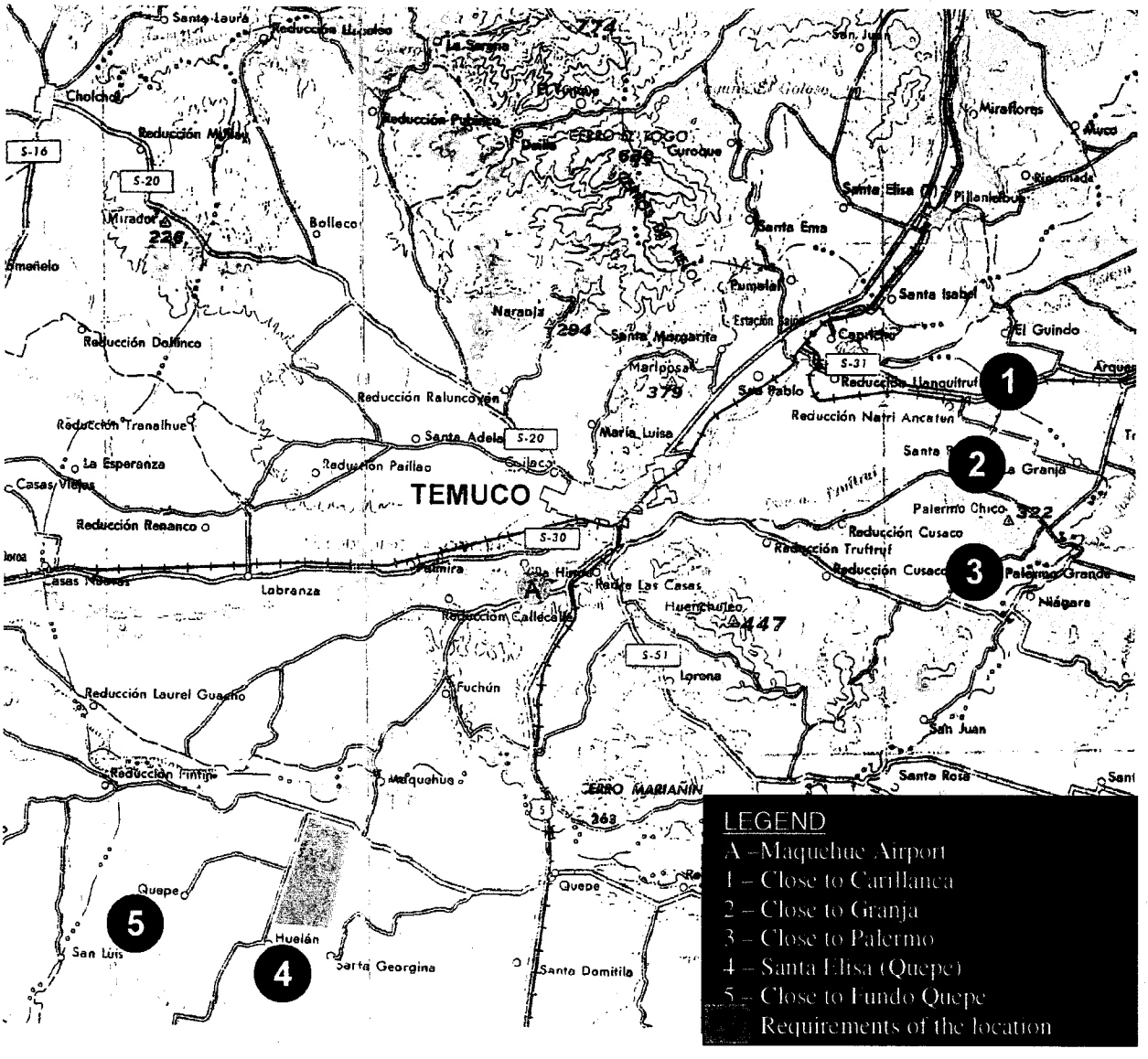
Nevertheless, the site selection for the potential new airport in Temuco is not part of this study. The use of Santa Elisa as a location for a new airport is only for illustrative purposes.

The preliminary costs estimated by MOP for the construction of this new airport was estimated at US$30 million (excluding land costs and taxes).

The Government of Chile recognizes the importance of the participation of the private sector in the development of the country's infrastructure, therefore they have determined to study the project's feasibility based on a concession system over a determined period of years.

[1] According to the MOP Memorandum No. 023/00, dated February 2000.

Figure 1-3: Possible Locations for a New Airport Close to Temuco



(Source: DAP Memorandum 023/00)

1.2 Objectives of the Study

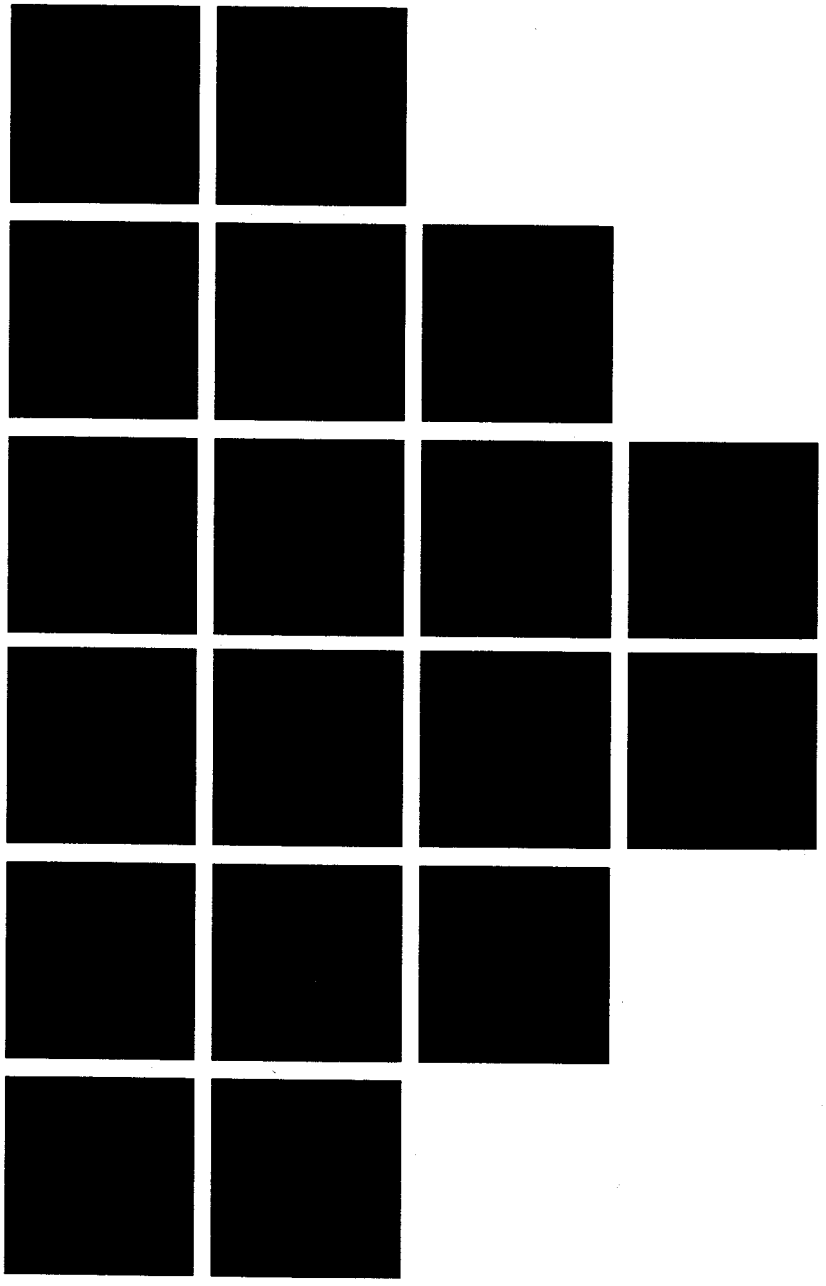
The general objective of this feasibility study is to provide the Ministry of Public Works (MOP) with information regarding the demand projections, market analysis and the corresponding analysis, in order to allow the Ministry to identify the best technical and economic feasibility alternative of the project, and the most appropriate concession structure, taking into consideration a realistic amortization period, and the necessary subsidies for the project to be viable to interested investors.

The technical objective of the study is a financial feasibility analysis of a new airport, under various demand scenarios and under various concession structures, including or excluding the existing airport site and the adjacent areas of the new airport.

The study includes and analyses the construction requirements for a new airport in Temuco; the location requirements, the estimated construction costs and financing alternatives. The projections were prepared in order to mark the position of future demand and operations, and the facilities were designed in order to satisfy these needs.

Even though the Terms of Reference of this study were limited to the feasibility of a new Airport, by request from the MOP, this conceptual plan was applied to the present airport, as well as that of a new one in Santa Elisa, with the objective of comparing the improvement implications of the present airport in the same place versus the construction of a new airport in another place. But the analysis could not be carried out adequately enough so as to reach a definitive conclusion regarding the expansion of the present airport in the same area, or the construction of a new one, since the required level of detail to calculate the specifications of a new location was not available, and the technical and cost feasibility were not sufficiently clear for the expansion of the present airport. Studies on the soil characteristics, fog conditions and the cultural resources in the area of Santa Elisa are needed, as well as the conceptual design of an expanded runway in Maquehue.

The final decision on whether to improve the existing airport or build a new one must be taken by the Government of Chile, taking these variables into consideration.



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CHAPTER II
Demand Projections

CHAPTER II

DEMAND PROJECTIONS

2.1 Introduction

The airport in Temuco has experienced rapid growth in the past few years, reaching the position of fifth largest airport in the country, and generating 10% of domestic enplanements, all after having practically no movements over a prolonged period of time.

The growth of Temuco was achieved in part by a general national air transport development process, which tripled between 1992 and 2000. This growth, which was concentrated on trips of short duration, had its origin in two simultaneous phenomenon: a rapid increase in flights, which is a product of the accelerated economic development, and the deregularization and privatization of national aviation, which derived from strong competition between operators, resulting in lower travel costs. Global traffic also increased rapidly, and furthermore, air transport increased its participation in the market, in detriment of land transport.

The previously mentioned characteristics dictate that the traffic forecasts must take into consideration the fact that the process experienced cannot be repeated. Once air transport has captured a large share of the passenger transport market, future growth must come instead from the growth in global traffic. In other words, once a level of maturity has been reached, it can be expected that future growth will be less.

While a more moderate increase in traffic can be expected, it is also foreseeable that the number of operations will increases less than that of passengers. This is due to more direct flights, since most of the traffic allows fewer stopovers without reducing service frequency, and at the same time, a progressive replacement by larger planes.

This chapter begins with a historical market analysis of the Temuco Airport, followed by a future traffic forecast. Annex A of this report contains the tables and figures to back-up the analysis.

2.2 Historical Market Analysis

2.2.1 Characteristics of the Araucanía Region

a) The Productive Sector

The principal industries in the area have a direct relationship to the natural resources, and depending on the economy, demand and consumer markets are developed with more or less dynamic growth. The principal industrial sectors of the area are:

- **Agriculture,** made up of a large number of small-scale producers, it's generally associated with low use soils. Presently, there is an increase in the amount of irrigated areas, artificial fillings, and improved meadows, which have been changing the traditional farming in natural pastures and meadows for the development of livestock raising. Among the products being grown in the region are "berries", furniture, wood homes, printing materials, salmon and artisan products, such as foods and souvenirs.

- **Livestock,** which is a developing sector, but also affected by the variation in the buying power of the milk producers.

- **Forestry Industry,** an emerging industry hence the existing plantation and soil volumes.

- **The Manufacturing Industry,** has registered in the last few years, a favorable tendency toward gradual industrialization, which, according to national industrial ENIA polls, has increased relatively in the country by more than 100%, demonstrating in the regional industries, an aggregate value of 120% during the period, which is one of the highest among the regions, if compared to a 37% growth rate in the country for said aggregated value.

- **Tourist Resources:** The Araucanía region has diverse and distinct tourist resources, based on a great quantity and variety of natural resources, which have been consolidating tourism in the region as a modern activity and international destination. There exists an orientation program, developed by the regional authorities and leaders in the following document: ERD, Regional Development Strategy. The principal resources include:

  - Scenery: Made up of volcanoes, lakes, slopes, native forests, and mountain ranges.

  - Attractive urban and rural areas with excellent facilities and dining

- Roads to Argentina, which allow travel to beach cities such as San Martín de Los Andes.

- Villarrica, Calafquén, Panguipulli, Colico, Caburgua, Riñigue, Pellaiga and Pirihueico Lakes.

- Budi Lake, which is the only salt lake in South America with bays, ports and a Mapuche population.

- Waterfalls in El Salto del Huilo-Huilo, Bellavista and Los Copihues, Palguin, La China, El León and La Turbina.

- Llaima, Villarrica, Quetrupillan, Choshuenco and Carrán volcanoes, which erupt regularly and are active.

- Ski centers in the Villarica volcano, unique in its characteristics.

- La Morrena glacial, with its glaciers that can be see from all lakes

- The Mapuche scenery, its population, craftsmanship and customs

- The national parks: Villaricca, Conguillio, Huerquehue

- The national reserves of Malalcahuello, Lago Galletué, China Muerta, Villarrica, Mocho-Choshuenco.

- The bathing areas developed around the lakes and hot springs

- Casinos

- Therapeutic visits to the hot springs and spas in Quimey-co, Huife, Los Posones, Palguin, Menetue, San Luis, San Sebastián, Coñaripe, Liquiñe

- Fishing in the rivers, particularly Toltén and Cautín, as well as lake fishing.

- Nautical lake sports: water skiing, wind surfing, boat rides, etc.

- Artisan markets

As the main point of entry to Araucanía, Temuco has a great possibility to increase its tourism through the various natural resources, which surround the area, and its short distances from exceptional scenery, such as lakes, mountains and snow-topped volcanoes.

b) Implications for the Airport

Araucanía's weakness is in its lack of loading ports, customs offices and supporting services, which makes it less attractive to export-oriented investors. This, therefore, drives the necessity to look for ways to develop through communication systems, which will allow the modernization and international integration of the region. This development will generate the growth of the airport infrastructure requirements.

2.2.2 Generation of Traffic

As was mentioned previously in the introduction, the air traffic in Temuco has experienced a great increase in the last few years, reaching a level of 250,000 passengers per year, equivalent to 10% of the national air traffic **(Figure 2-1).**

Also, the international traffic generated by Temuco is practically nonexistent (as is the case in most of the cities of Chile), which is mainly due to the fact that there are no advantages for direct international flights to the South of Chile, while Santiago has the advantage of being located on a route for main international centers, without any advantages in direct international flights.

Historical data indicates that the stationary variations are almost nonexistent. This confirms that not many tourists reach Temuco by air. The analysis does not suggest a change in the future of this situation. National tourism and that of neighboring countries are produced mainly through land. International tourists first land in Santiago.

This increase in air traffic is fundamentally due to the development of the commercial aviation in Chile in the last few years, and is not due to local natural phenomenon; **Figure 2-1** shows that the GDP for Region IX increased less than that of the national GDP (during the period 1991-1995 [1]).

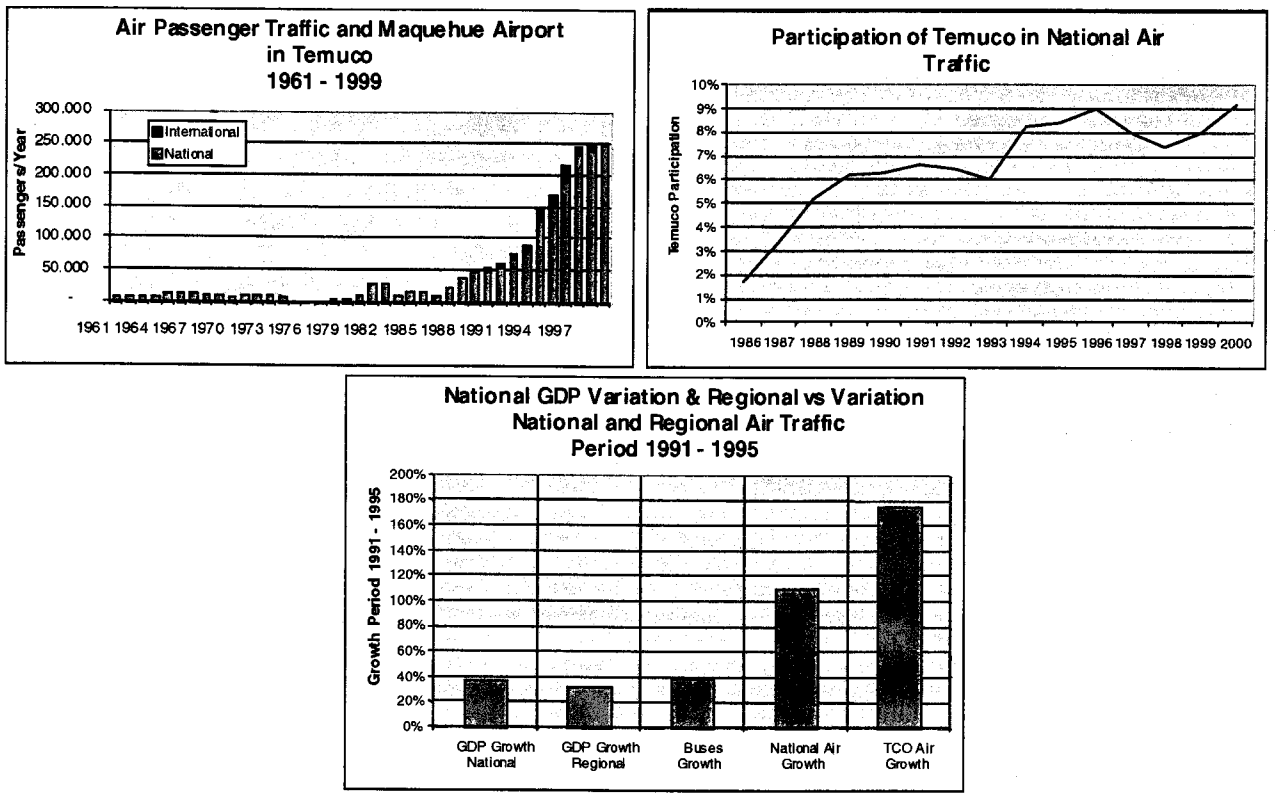
The growth in air transport also cannot be attributed to a growth in massive transport. The growth in inter-urban bus traffic – which is the most relevant mode of transportation nationally – increased by the same amount as that of the national GDP.

In the period 1991-95, nevertheless, the growth in air traffic was significantly higher than the growth of the GDP and land transport, which shows a change in transportation preference and users.

In the case of Temuco, the increase in traffic is much higher than that of national air traffic; this is in part due to this area being a relatively small market before the 90's, not yet having reached a level of maturity.

[1] Regionalized GDP statistics for this period

Figure 2-1 Air Traffic Evolution, in Comparison to National Traffic and GDP Evolution



Sources: Tables 2.1a and 2.1b in Annex A

2.2.3 Air Traffic Distribution by Origin and Destination

a) National

Traditionally, the most intense flows of air traffic were generated in Santiago and at the extreme areas of the country, such as Antofagasta, Iquique and Arica in the north, and Puerto Montt and Punta Arenas in the south. The reason for this was the long distances, which gave air travel practically no competition (see left side of **Figure 2-2**).

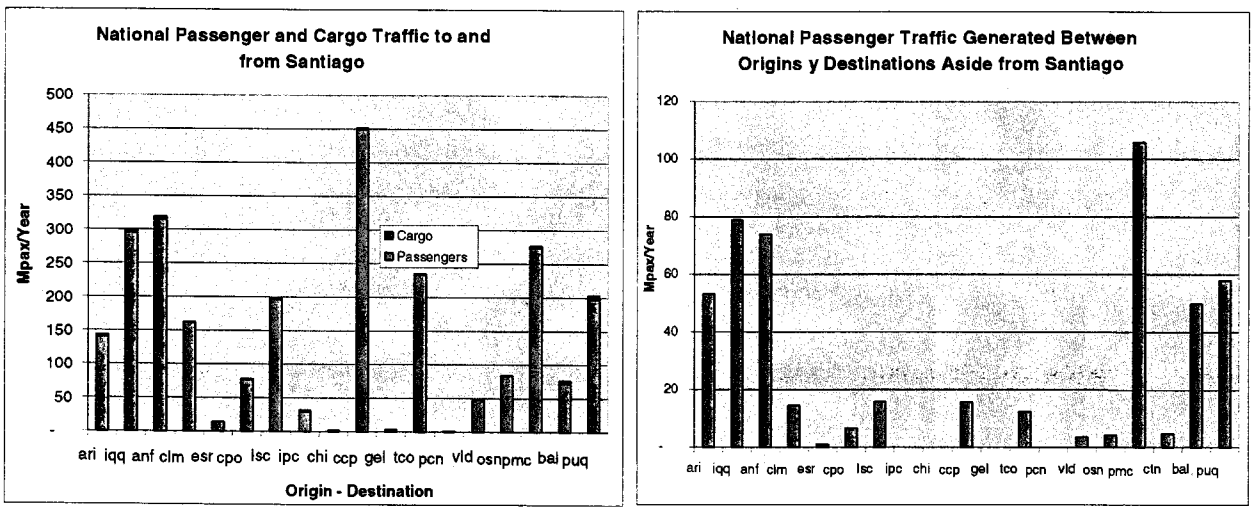
It's important to mention that, within the country, air transport specializes in the transport of passengers; cargo transport is marginal, which is fundamentally due the fact that land transport is less expensive and the trips are much shorter for the majority of cargo.

In the last few years, there has been an important development in national aviation, particularly in some of the shorter routes where there was intense traffic of passengers via land transport, but where aviation had a very small secondary role. For example, Santiago – Concepción has become the most important air route of the country, with a

flow of 450,000 passengers annually. Other short routes have experienced great increases, such as Temuco and La Serena, whose traffic with Santiago has reached a level of 200,000 and 250,000 passengers per year.

The demand for national air transport is eminently radial, in the sense that it develops between Santiago and each one of the major cities. Between different cities aside from Santiago, traffic is practically nonexistent, with the exception of the southern zone, where the absence of land transport connections generate a market for aviation, and in between the large cities of the north, where ground distances are considerable (right half of **Figure 2-2**).

Figure 2-2 National Air Traffic Distribution by Origin-Destination, Year 2000



Source: Tables 2.2.1a and 2.2.1b in Annex A

b) International

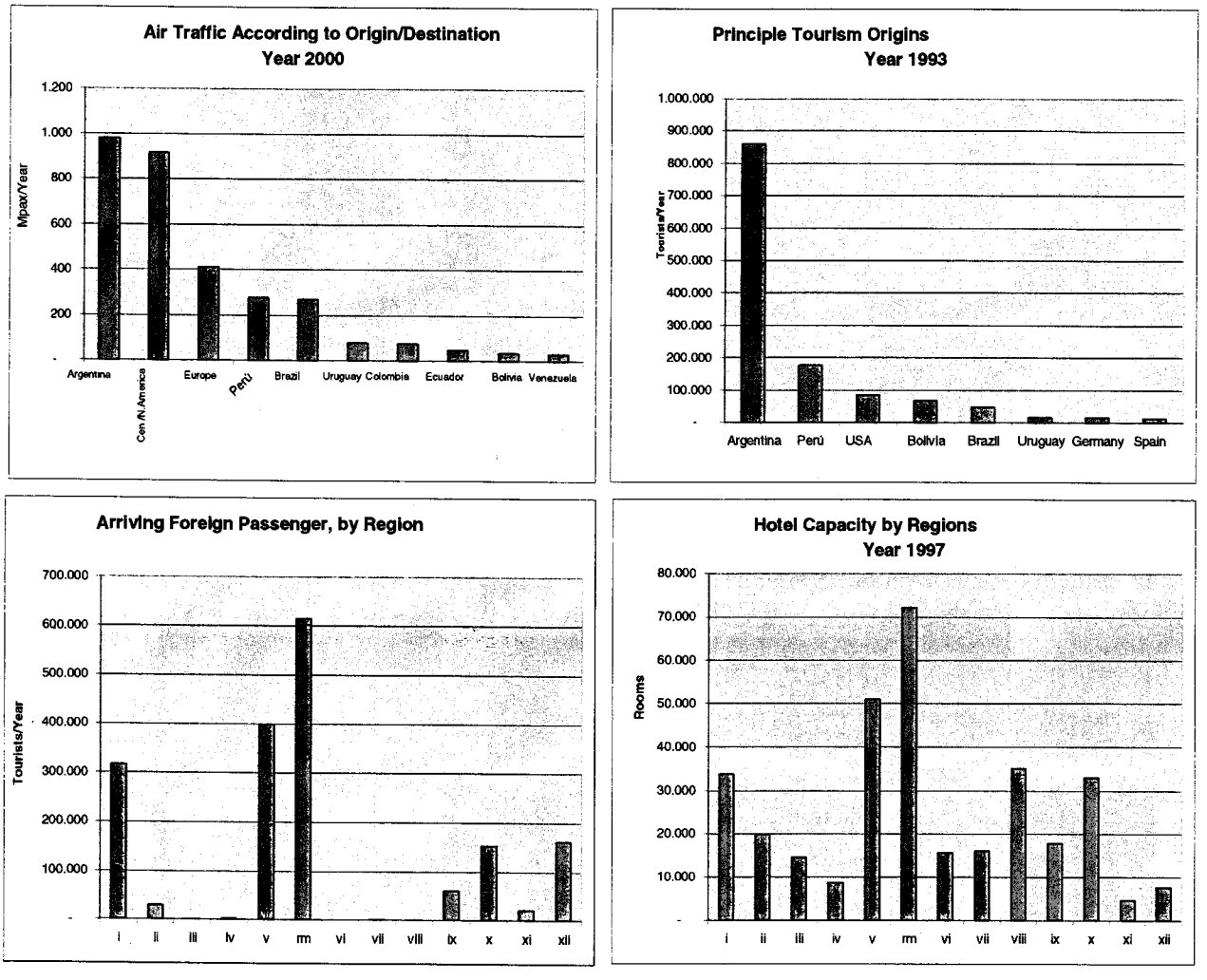
International air traffic generated by Chile is estimated at 3.2 million passengers, this can be further divided into four groups: (**Figure 2-3**, top-left side):

- Chile – Argentina, where traffic reaches almost one million passengers annually.
- Chile – North America, which has a similar flow of passengers.
- Chile – Rest of South America, with 800,000 passengers annually.
- Chile – Europe, with 400,000 passengers annually.

Total tourism in Chile reaches 1.4 million tourist per year, of which more than half (850,000) come from Argentina. Perú comes in second with almost 200,000

passengers per year. All other countries have less than 100,000 tourists per year (**Figure 2-3**, top-right area).

Figure 2-3 International Tourism in Chile



Source: tables 2.3a, 2.3b, and 2.3d in Annex A

The principal gateway to Chile is the International Airport in Santiago (Metropolitan Region), where 600,000 foreigners enter each year. Nevertheless, a great majority of foreigners (750,000) enter the country through land, through routes in Region I (Peru and Bolivia), and in Regions V, IX, X, XI and XII (Argentina).

The total hotel capacity in Chile is 330,000 rooms, 37% of which can be found in the central region (Metropolitan Region and Region V, which are the principal tourist destinations of the country). Outside of the central region, the principal tourist

destinations are located in Regions I, VIII and X. The hotel capacity of each one of these regions is about 30,000 rooms (**Figure 2-3**, bottom-left side).

Region IX has a hotel capacity of less than 20,000 rooms, similar to that of areas considered non-tourist (III, VI and VII).

Practically all air tourism - equivalent to 50% of total tourism – enters the country through AMB, the International Airport in Santiago (**Figure 2-3**, bottom-right side). A very small fraction is claimed by Region I, through airports in Iquique and Arica.

Air tourism as a whole represents less than one fourth of domestic air traffic, while the central area serves as the main area of destination in Chile.

Tourism coming from neighboring countries is generated largely through land. It's logical to assume that internal tourism will behave similarly.

Similarly, changes in tourism activity, even drastic ones, will have little impact on the national air traffic.

2.2.4 Service Offers

a) Operators

Air transport deregulation – which began in 1980 – generated a great proliferation of transport operators. This resulted in strong competition of low tariffs and itineraries, which produced adverse economic results for the majority. The two largest companies, LanChile and Ladeco, merged together, and almost all regional operators disappeared from the market. Presently, the industry has only one big operator (LanChile), whose only competitor (AeroContinente) is a newly established company, with a slim presence in the market. This tendency towards the concentration of the air transport market coincides with what happen at the international level. This can be fundamentally attributed to the great economies of scale, which characterize this activity.

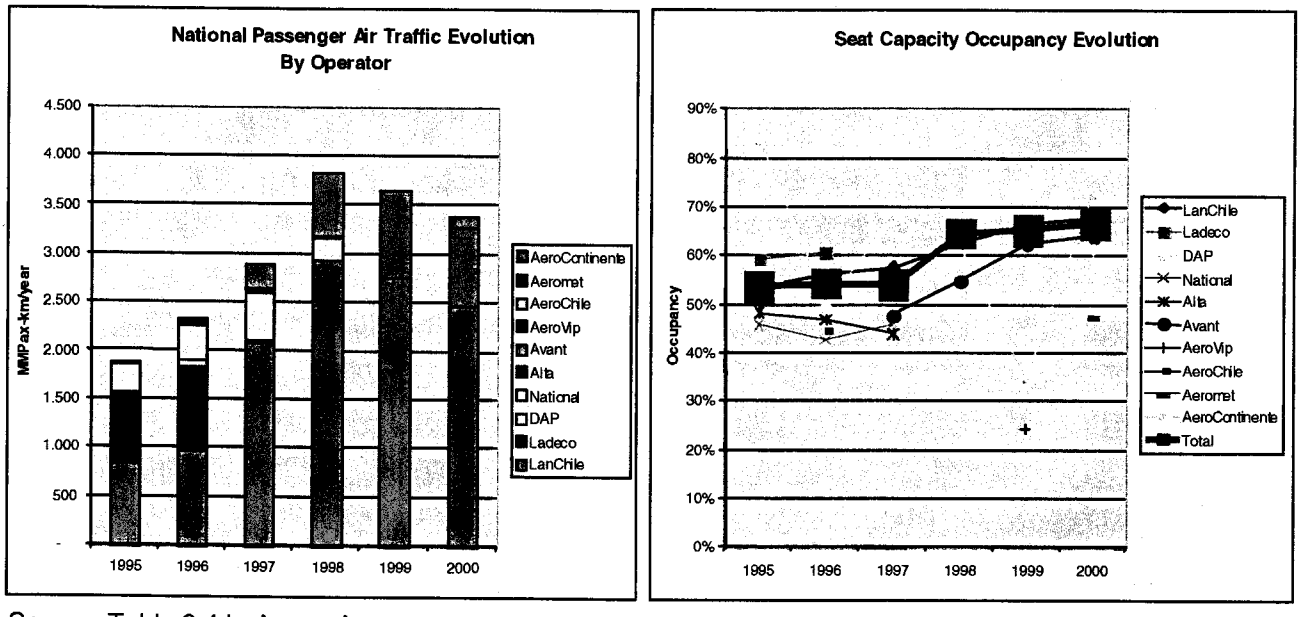
The Chilean air transport market, in the past few years, has also demonstrated a tendency to concentrate. The left side of Graph 2.3.1 shows that in the mid 90's there were three important operators, one of which dominated the market at the end of this period[2]. During 2001, the last significant competitor left the market.

The lessening of competition had, as a consequence, a reduction in the offer and the elevation of occupation factors, as can be seen on the right hand side of **Figure 2-4.**

[2] LanChile acquired Ladeco, its main competitor.

Even when there is no historical information available on tariff averages, it can be assumed that the decrease in traffic beginning in 1999 can not only be attributed to a slowing down of the economy, but also to an increase in tariffs.

Figure 2-4 Operator Offers



Source: Table 2.4 in Annex A

b) Itineraries

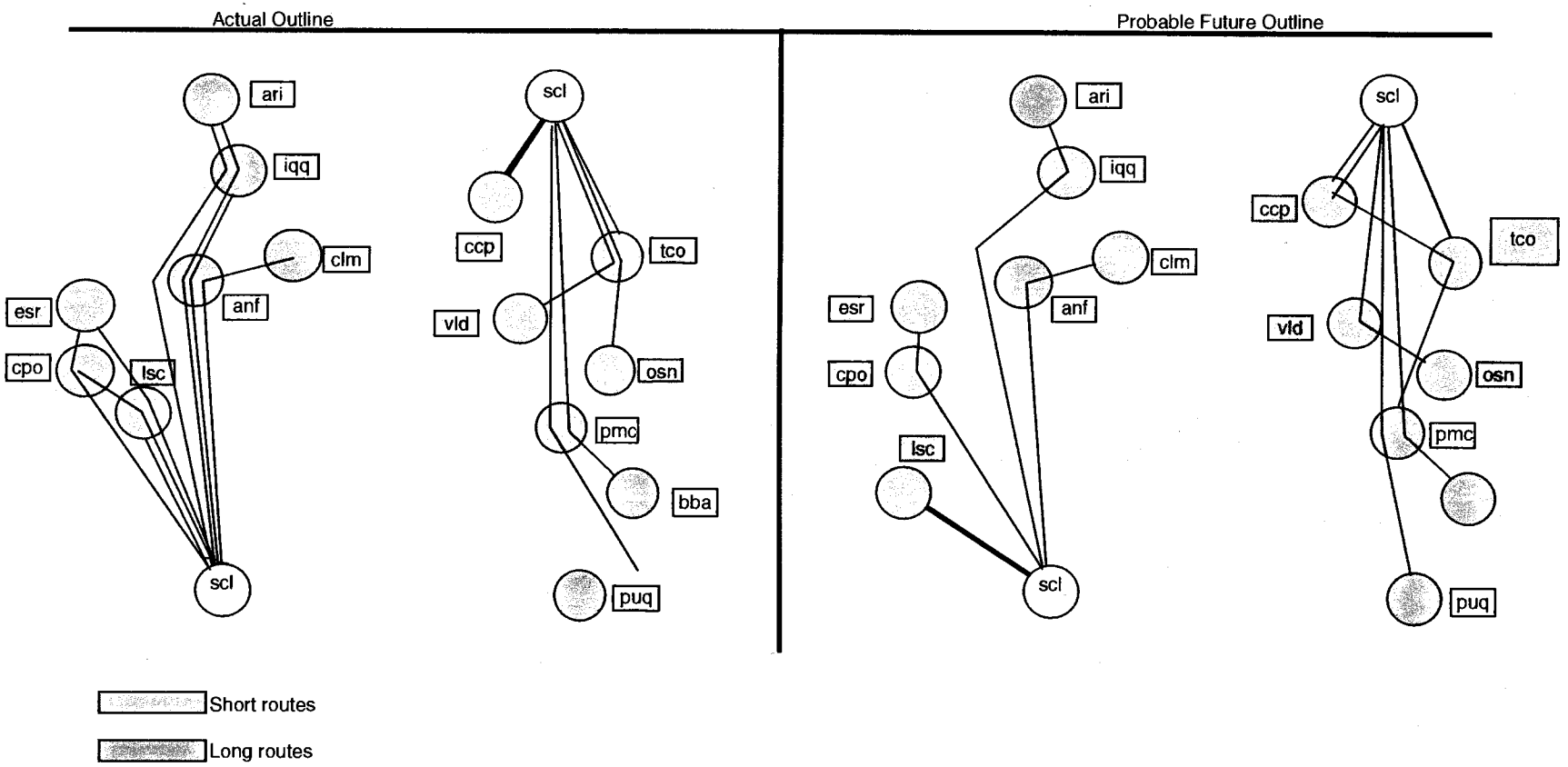
As can be seen in **Figure 2-5,** the majority of national flight itineraries have intermediate connections. Two different routes can be seen: the long routes, which reach the extremes of the country: Arica (through Antofagasta and Iquique), and Balmaceda or Punta Arenas (through Puerto Montt), and short routes, which reach intermediate points, such as Copiapó (through La Serena), and Osorno or Valdivia (through Temuco).

The only case exempt from this tendency is Concepción, whose traffic volume justifies direct flights.

The origins of these services are historical, which come from periods when there were various operators, and air traffic was substantially lower. In those circumstances, each one of the operators wanted to maximize the frequency of services, at the same time as that of service coverage.

The concentration in only one operator, at the same time as the increase in traffic, should revert this process. It can be expected that La Serena and Temuco would have direct services.

Figure 2-5 National Route Service Outline



Source: LanChile and Ladeco itineraries. See itinerary annexes

Figure 2-5 also shows the outline that could be achieved. Flights to Valdivia and Osorno are observed, as to how they could be diverted to flights to Temuco. Nevertheless, it's possible that flights will emerge from Temuco to other large cities, such as Concepción, Puerto Montt and Punta Arenas.

The reduction in flights with intermediate connections would have the effect of reducing – and eventually eliminating – the associated intermediate traffic[3].

2.2.5 Temporary Traffic Distribution

Even though Temuco is a city located in the South of Chile, and where economic activity presents a less than moderate stability[4], air traffic demonstrates a moderate concentration in the summer months, as can be seen in Graph 2.4[5], in the upper-left side.

It can also be seen that there is no significant concentration of operations during the weekend, which is a phenomenon characteristic of the areas where air traffic has an essentially tourist origin (**Figure 2-6**, bottom-left side).

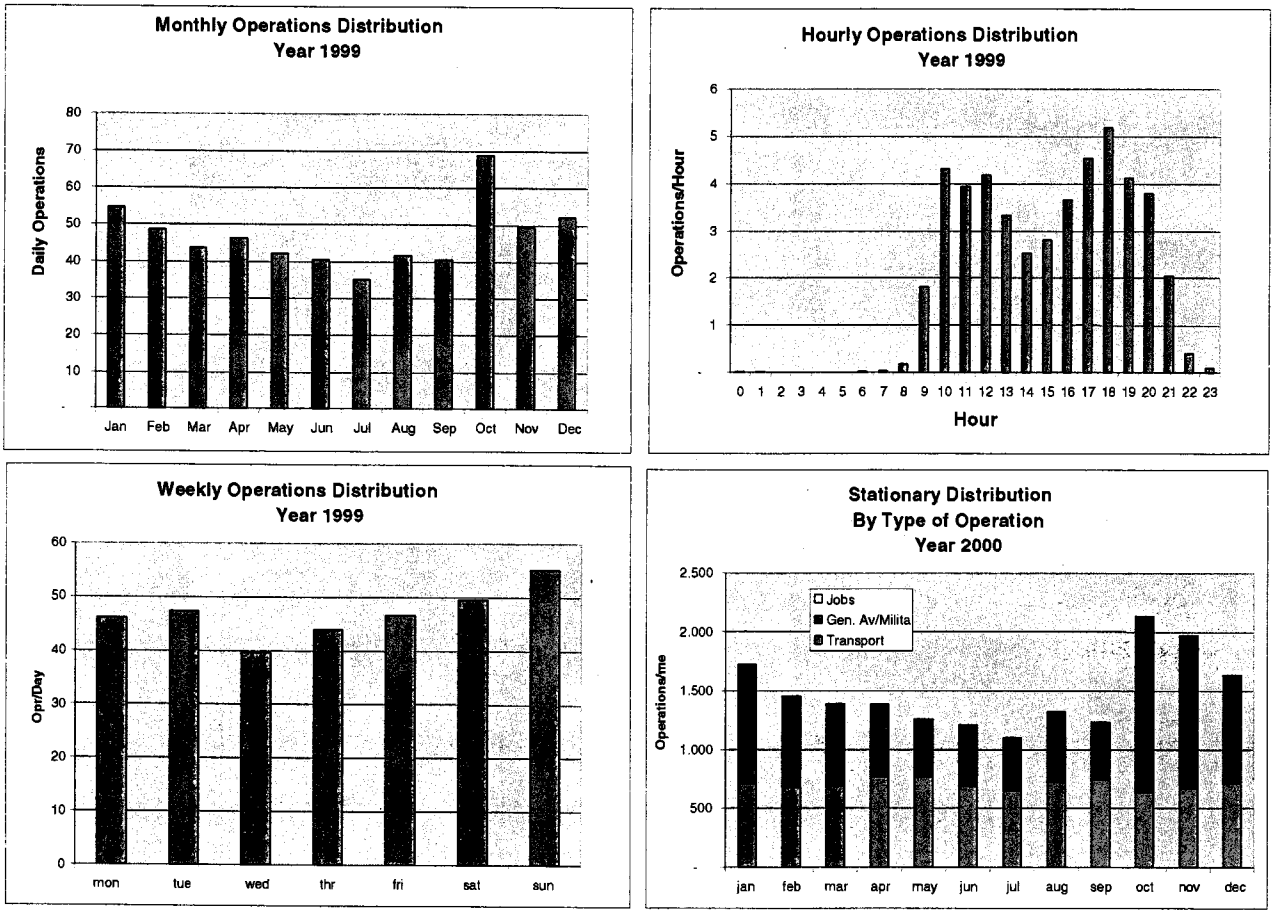
It can be seen that seasonal variations are almost non-existent in commercial air traffic (bottom-right side of **Figure 2-6**), which reaffirms the light tourism influence on air traffic. Likewise, the hourly distribution of flights, which are concentrated in the mornings and afternoons, is primarily for business routes, which are mostly for one-day trips (**Figure 2-6**, top-right side).

The absence of tourist air traffic does not indicate the absence of tourist activity in Temuco. Nevertheless, the majority of the tourist traffic is by land – mainly by automobiles, and by families during vacations for which air transport is irrelevant[6].

The existence of certain stability and the concentration of operations during the weekend, which characterizes general aviation, indicate that in that category, tourism does have an influence. This is about an essentially selective type of traffic, which is hoped to maintain its high level of development.

[3] The plans of the principal operator coincide with this tendency
[4] Given that both tourism and agriculture occupy a very important role in the regional economy.
[5] October figures reflect special, non-recurring events
[6] This characteristic is completely different than those of large international resorts, where international tourists gather and for which no land travel is available.

Figure 2-6 Temporary Distribution of Aerial Operations of the Temuco Airport



Source: Tables 2.6a, 2.6b, 2.6c, and 2.6d in Annex A

2.3 Traffic Projection

2.3.1 Prediction Model

As was mentioned previously, the increase in air transport, which mainly occurred in the last few years, is the consequence of low air tariffs, increased importance of travel time and an increase in the frequency of services.

The accelerated growth of air transport was forecasted by the previous studies[7], based on a modal participation model, which takes into consideration the selected mode of

[7] See "Análisis y Revisión de Estudios de Prefactibilidad de la Red Aeroportuaria Nacional", Mideplán-SECTRA, 1994.

transport as the consequence of the comparison between the passenger's value of time and the cost of saving it, using the airplane (given for reasons between the differences in air and land tariffs and the difference in travel times).

It's assumed that air travelers value their time more than the cost of saving time using an airplane (difference between tariffs/trip length – see **Figure 2-7**). Air transport use increases, then, if the tariff lessens, the value of time increases or if lengths of trips increase.

Figure 2-8 shows that the prediction model gave a precision estimate of national traffic behavior, at an aggregate level. In the case of Temuco, nevertheless, the model, which gave a high growth increase (13.6%), underestimated the growth, which reached 18%.

Opposite to what occurred in Temuco, the model predictions for Valdivia and Osorno were superior to that of the observed traffic[8]. One explanation for the discrepancies between the model predictions and what actually occurred is the manner of service, where the frequency of Temuco was incremented by not only its own traffic, but also by intermediate connections in flights to Valdivia and Osorno, which interrupted services to these cities.

2.3.2 Traffic Projections

Traffic has been projected using the described model, adjusting it to realities of 2000[9].

Figure 2-9 shows the aggregate result of this application. It's observed that after a great increase in the participation of the market, which pushed air traffic to reach 60% of the transport market of Temuco, the projections show a more moderate growth.

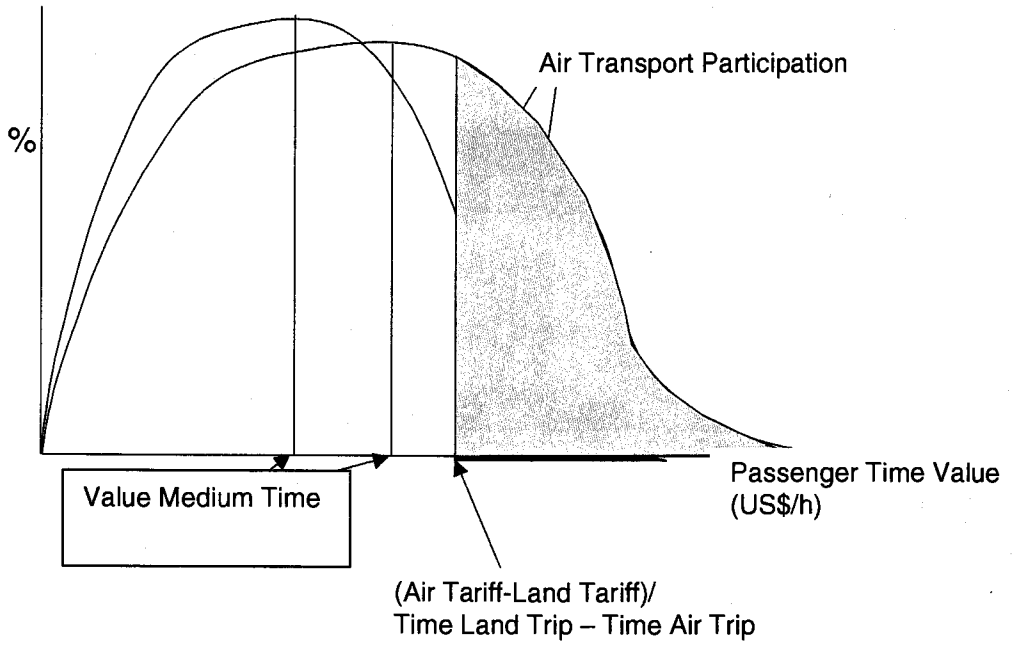
The basis for this projection are:

- A growth in global traffic (air and land), according to the national GDP growth[10], would have annual descending growth rates, starting with 5% annually and 3.5% annually thereafter, until the end of the projected period[11].

[8] In any case, in reality there was substantial change produced in traffic levels, only not at the expected level.
[9] The model has a prediction basis of 1992, due to the fact that there are no statistics for land ground traffic for previous years.
[10] Clearly, in would be more adequate to incorporate predictions on the regional GDP; nevertheless, there are no reliable predictions available in respect to the regional growth, particularly in the present economic juncture, where there exists a great uncertainty regarding the economy at the national level.
[11] These are medium level hypothetical values. High and medium hypothesis will end in 4.5% and 3.0%, respectively.

Figure 2-7 Prediction Model for Air Transport Participation

Effect of the Increase of the Medium Value of Trip Times on Air Transport Participation



Effect of the Decrease of Tariffs on the Air Transport Participation

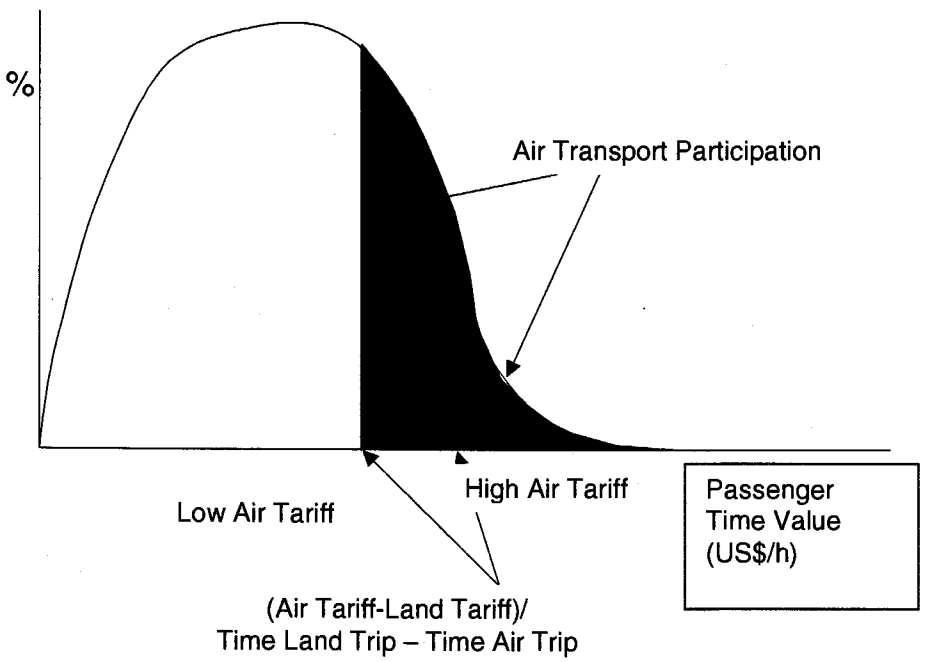
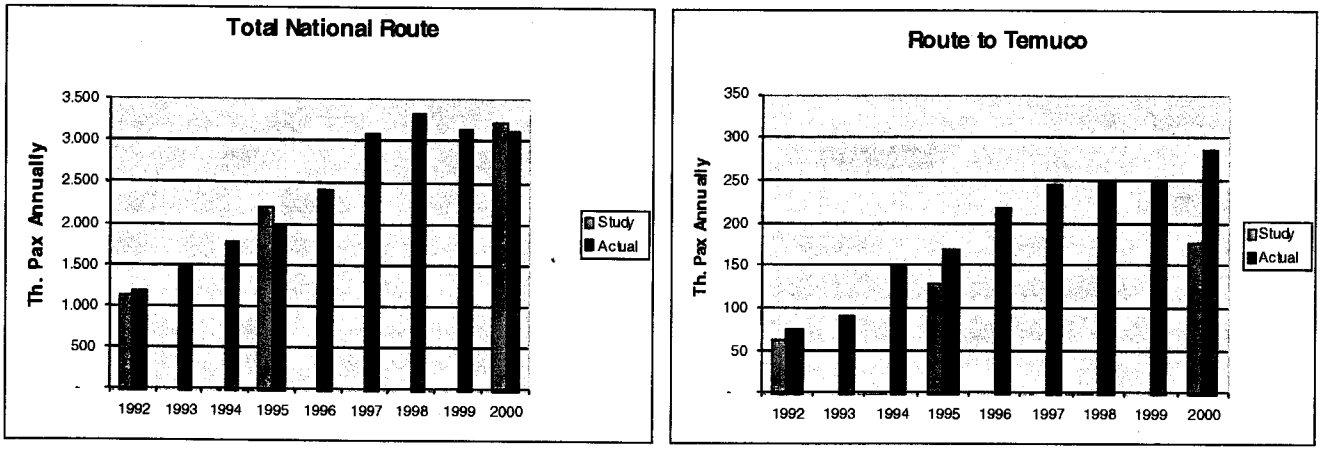


Figure 2.8 Prediction Model for Air Transport Participation



Source: Table 2.7 in Annex A

- An annual population growth rate of 1.8%, similar to that observed in the last intercensal periods.
- The value of time grows at the same productivity rhythm (GDP growth/population growth).
- Tariffs would maintain their actual levels[12].

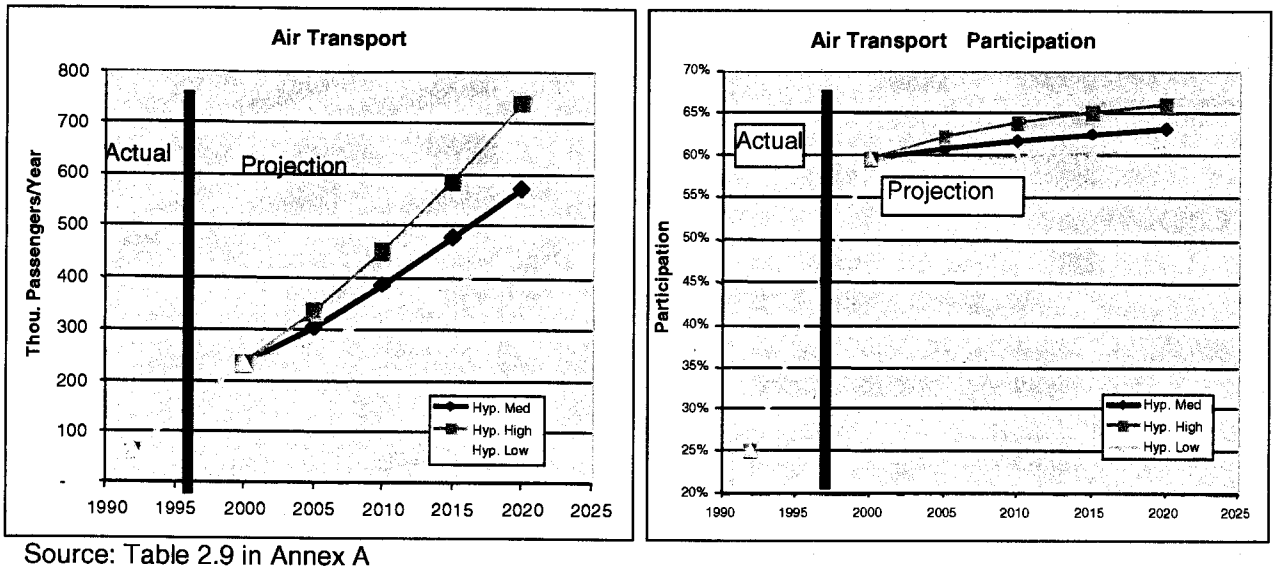
Table 2.9 in Annex A shows how an increase in the value of trip times – from US$9.00 to US$14.48, product of a growth in GDP per capita, elevates the level of air transport use from 59% to 63%. If an average of 4.3% growth in global traffic is added, air traffic would increase annually by an average of 4.6% (medium hypothesis), assuming that tariffs maintain their actual level[13]. In the high hypothesis, traffic would grow to 5.9% annually, and in the low hypothesis to 3.3% annually. Towards the end of the projection period, air traffic is estimated to reach between 450.000 and 570.000 passengers annually.

In respect to inter-city traffic (aside from Santiago), it has been assumed that it will vary proportionally to that of the traffic between Santiago-Temuco. In other words, it will continue to be approximately 10% of the Santiago-Temuco traffic.

The complete absence of international traffic is assumed. If it were to exist, it would probably be that of small aircraft, which would fall under the category of general aviation[14]

[12] Same as previous note.
[13] Table 3.2 shows in detail the evolution of variables, which intervene in the growth of global traffic and in the participation of air transport.
[14] Historically observed traffic fell under this category.

Figure 2- 9 Santiago – Temuco Passenger Traffic Projection



Source: Table 2.9 in Annex A

The resulting projections (Table 3.3a) show a drastic reduction in air traffic growth rates. This is a result of the combination of assuming a decrease in the increase rhythm of global traffic – due to lower economic growth rates – and tariffs having reached a lower level in previous years.

What happened to traffic during 1999 and 2000 validate the suggested hypotheses.

2.3.3 Annual Operation Projections and Fleet Mix

From the traffic projections, the commercial operation projections by year were estimated (**Figure 2-10** and **Tables 2-1** and **2-2**).

a) Fleet Mix

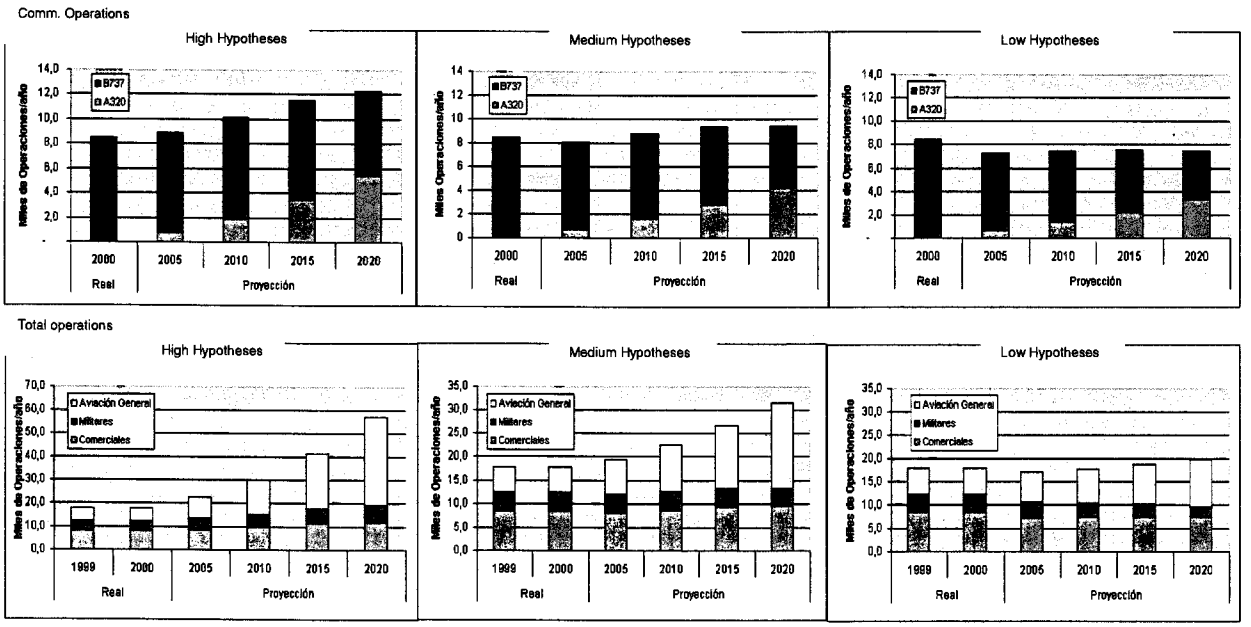
It has been assumed that Boeing 737 – 200 airplanes in use presently (120 seats), will be partially replaced by type A 320 or Boeing 737 – 200/400 airplanes (150 seats). At the end of the period, traffic will be divided up equally among the different aircraft. (**Table 2-1**). **The probability that smaller aircraft will replace the present ones is remote, due to greater operation costs, and frequency of service with B 737 or A 320 airplanes would be high. History coincides with this assumption, since planes of smaller size (C 402, B 200, F27 and Bac 111) have been disappearing from the Chilean market.**

b) Annual Operations

As has been mentioned repeatedly, it has been assumed that flights should be more direct, which consequently increases enplanements per operations. It has been considered that medium enplanements will duplicate, reaching 50% of airplane capacity. The rest of the capacity normally occupied, which is 10%[15], would be destined for passengers in transit.

It has been assumed that military operations, at least in the medium hypotheses, would maintain constant. General aviation could have a significant increase, fundamentally due to a growth in recreational properties in the zone. In the medium hypotheses, a 10% annual rate has been assumed. As a final result, total commercial operations (top part of **Figure 2-10** and **Table 2-1**) will increase slightly (0.5% annual average) in the medium hypotheses.

Figure 2-10 Annual Operation Projections



Source: Tables 2-1 and 2-2

The lower part of **Figure 2-10**, and **Table 2-2** show that the total operations increase at a pace of 2.7% annually, as a result of general aviation and regional commercial aviation operations.

[15] It has been considered that normal occupation is 60%. Occupation of 67% could be considered a product of monopolistic conditions.

Table 2-1 Passenger Projections and Commercial Operations of Temuco Airport

Traffic (Thou. Of Passenger/year)			Actual	Projection				Annual rate
			2000	2005	2010	2015	2020	
Santiago-Temuco		Hyp. Med	234	304	386	476	570	4,6%
		Hyp. High	234	334	449	584	738	5,9%
		Hyp. Low	234	276	327	383	448	3,3%
Other-national		Hyp. Med	24	32	40	50	60	4,6%
		Hyp. High	24	35	47	61	77	5,9%
		Hyp. Low	24	29	34	40	47	3,3%
Other-International		Hyp. Med	1	-	-	-	-	-100,0%
		Hyp. High	1	-	-	-	-	-100,0%
		Hyp. Low	1	-	-	-	-	-100,0%
Total (*)		Hyp. Med	258	336	427	526	630	4,6%
		Hyp. High	258	369	496	646	815	5,9%
		Hyp. Low	258	305	362	423	495	3,3%
Cargo Traffic (t/year) (2)		Hyp. Med	453	590	749	922	1.105	4,6%
		Hyp. High	453	648	871	1.133	1.431	5,9%
		Hyp. Low	453	534	635	743	868	3,3%
Fleet Composition		A320	0%	13%	25%	38%	50%	
		B737	100%	88%	75%	63%	50%	
		Total	100%	100%	100%	100%	100%	
Passengers/Operations		A320		60	65	70	75	
		B737	30	40	45	50	60	3,4%
		Total	30	42	49	56	67	4,0%
Cargo/operation (t)		Total	0,05	0,07	0,07	0,08	0,09	2,7%
MOps/year	Hyp. Med	A320		0,7	1,6	2,8	4,2	
		B737	8,5	7,4	7,1	6,6	5,2	-2,4%
		Total	8,5	8,1	8,8	9,4	9,4	0,5%
	Hyp. High	A320	-	0,8	1,9	3,5	5,4	
		B737	8,5	8,1	8,3	8,1	6,8	-1,1%
		Total	8,5	8,8	10,2	11,5	12,2	1,9%
	Hyp. Low	A320		0,6	1,4	2,3	3,3	
		B737	8,5	6,7	6,0	5,3	4,1	-3,5%
		Total	8,5	7,3	7,4	7,6	7,4	-0,7%

Basis

Seats/Plane	B737	120
	A320	150
	Regional Jet	50
Max. Occupancy		60%
Passang./Planes	B737	72
	A320	90
	Regional Jet	30

(1) Excludes transit passengers, which were 28.000 in 2000
(2) Ilt's assumed that cargo grows parallel to that of passengers

Source: Passenger Traffic Projections: Santiago - Temuco Table 2.9 In Annex A
Rest: Estimate
Operations per plane: Estimate

Table 2-2 Total Operation Projections, by Type of Aircraft

		Actual		Projection				Annual Rate
		1999	2000	2005	2010	2015	2020	
Medium Hypotheses	Commercial	8,5	8,5	8,1	8,8	9,4	9,4	0,5%
	Military	3,7	3,7	3,7	3,7	3,7	3,7	0,0%
	General Aviation	5,7	5,7	7,6	10,2	13,7	18,3	5,7%
	Total	17,9	17,9	19,4	22,7	26,7	31,4	2,7%
High Hypotheses	Commercial	8,5	8,5	8,8	10,2	11,5	12,2	1,8%
	Military	3,7	3,7	4,3	5,0	5,8	6,7	2,9%
	General Aviation	5,7	5,7	9,2	14,8	23,8	38,3	9,5%
	Total	17,9	17,9	22,3	29,9	41,1	57,3	5,7%
Low Hypotheses	Commercial	8,5	8,5	7,3	7,4	7,6	7,4	-0,6%
	Military	3,7	3,7	3,2	2,7	2,3	2,0	-2,9%
	General Aviation	5,7	5,7	6,6	7,7	8,9	10,3	2,9%
	Total	17,9	17,9	17,1	17,8	18,8	19,7	0,5%

Source: Tables 2.6d and 2.10a in Annex A

2.3.4 Peak Hour Operations

Beginning with the annual traffic projections and the temporary distribution of total operations[16], the operations have been projected in peak hour, by type of aircraft. The results are shown in **Table 2-3** and in **Figure 2-11**.

Stationary variations in commercial and military aviation are considered absent, since traffic every month is 8.33% of annual traffic. This percentage reaches up to 15% in the case of general aviation, according to the tendency demonstrated in Graph 2.4. Something similar occurs during the weekdays, in which the distribution of commercial and military flights is homogeneous, so that daily traffic is 3.3% of monthly traffic, while this relation increases to 5% during weekends for general aviation.

In regards to the distribution by hours, commercial traffic has demonstrated that it distributes in bimodal form, with two similar peak hours, in the morning and in the afternoon, in which approximately one-third of the daily traffic is concentrated in and each peak hour represents 16.5% of daily traffic. On the contrary, military and general aviation traffic demonstrate a uniform distribution during diurnal hours (approximately 12 hours per day), and hourly traffic is 8.3% of daily traffic.

In this manner, peak hour traffic would reach 16.5 operations at the end of the projection period, of which only 4.3 would be commercial.

[16] Statistics on the temporary distribution by type of operation is not available.

It is important to mention that in the high hypotheses, peak hour traffic would surpass 30 operations per hour, of which a very small fraction (5.5) would be commercial operations.

The mentioned projections refer to regular operations, and could even include charter or special flights. Nevertheless, given that historically this type of operation has not been of significance, it would be difficult to carry out a forecast in such manner.

Table 2-3 Operation Projections during Peak Periods, by Type of Aircraft

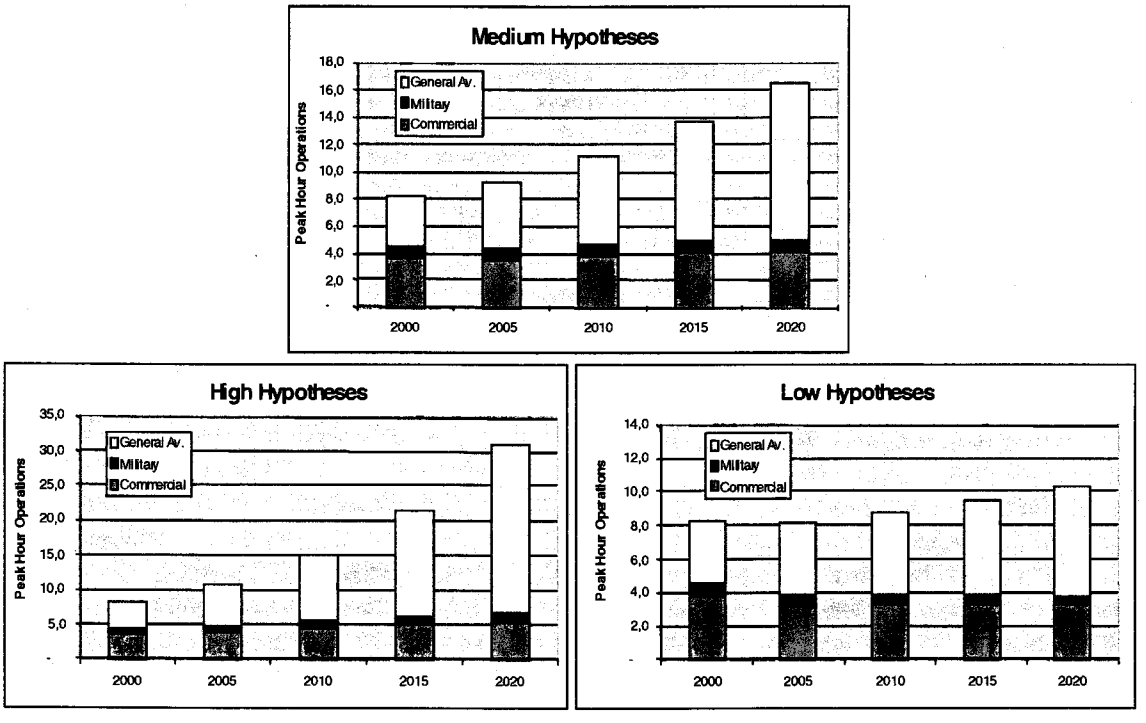
			2000	2005	2010	2015	2020
Annual Operations (Mov/Year)	Hyp Medium	Commercial	8,5	8,1	8,8	9,4	9,4
		Military	3,7	3,7	3,7	3,7	3,7
		GeneralAvia.	5,7	7,6	10,2	13,7	18,3
		Total	17,9	19,4	22,7	26,7	31,4
	Hyp High	Commercial	8,5	8,8	10,2	11,5	12,2
		Military	3,7	4,3	5,0	5,8	6,7
		GeneralAvia	5,7	9,2	14,8	23,8	38,3
		Total	17,9	22,3	29,9	41,1	57,3
	Hyp. Low	Commercial	8,5	7,3	7,4	7,6	7,4
		Military	3,7	3,2	2,7	2,3	2,0
		GeneralAvia	5,7	6,6	7,7	8,9	10,3
		Total	17,9	17,1	17,8	18,8	19,7
Peak Hour Operations (ops/hour)	Hyp Medium	Commercial	3,8	3,6	4,0	4,2	4,3
		Military	0,8	0,8	0,8	0,8	0,8
		GeneralAvia	3,6	4,8	6,4	8,5	11,4
		Total	8,2	9,3	11,2	13,6	16,5
	Hyp High	Commercial	3,8	4,0	4,6	5,2	5,5
		Military	0,8	1,0	1,1	1,3	1,5
		GeneralAvia	3,6	5,7	9,2	14,9	24,0
		Total	8,2	10,7	15,0	21,4	31,0
	Hyp. Low	Commercial	3,8	3,3	3,4	3,4	3,4
		Military	0,8	0,7	0,6	0,5	0,5
		GeneralAvia	3,6	4,1	4,8	5,6	6,4
		Total	8,2	8,2	8,8	9,5	10,2

Basis

	Commercial	Military	GeneralAvia	Total
Traffic 2000 (Thousand of operat/year)	8,5	3,7	5,7	17,9
Traffic peak month/traffic year	8,33%	8,33%	15,0%	10%
Traffic peak month (Mov/month)	0,71	0,31	0,86	1,87
Traffic peak day/traffic month	3,3%	3,3%	5,0%	4,1%
Traffic day peak (operat/day)	23	10	43	76
Traffic peak hour/traffic peak day	16,5%	8,3%	8,3%	10,8%
Traffic peak hour (operat/hour)	3,8	0,8	3,6	8
Traffic peak hour/traffic annual	0,000452	0,000228	0,000625	0,000461

Source: Temporary Distribution of Total Traffic: DGAC
Temporary distribution of Traffic by Type: Estimate

Figure 2-11 Total Operation Projections, by Type of Airplane



Source: Table 2.3

2.3.5 Enplanement of Peak Hour Passengers

Table 2-4 and **Figure 2-12** show that peak hour enplanements would reach 285 passengers at the end of the period under the medium hypotheses, and would surpass 369 under the high hypotheses. Given that 90% of the traffic, and consequently of the flights, are carried out between Santiago and Temuco, at least a similar percentage of de-enplanements are executed simultaneously with enplanements. Also, part of the flights with intermediate connections end in Temuco (Santiago-Conceptión-Temuco, for example), in which case the enplanements and de-enplanements are also simultaneous. Only those flights that continue to the south of Temuco could have a temporary distribution of enplanements different than those of the de-enplanements.

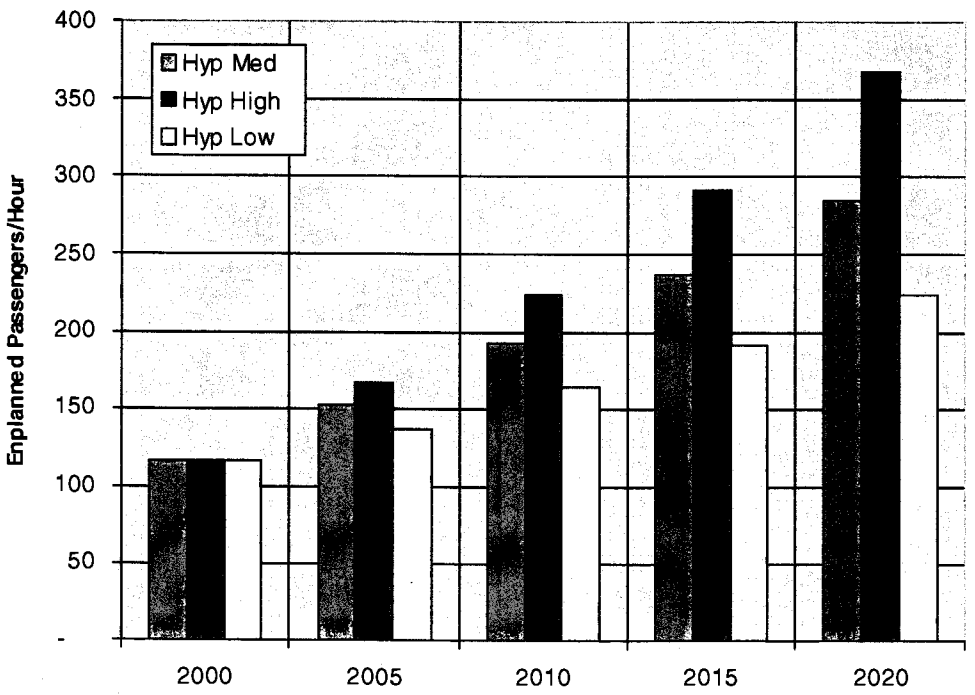
It must be mentioned that, along with the increase in total traffic, a considerable increase in the number of passengers enplaned by operation can be produced. The data suggests that the number of de-enplaned passengers is 0.9 times the number than that of enplaning passengers. Therefore, total passenger demand in the terminal during peak hours is 1.9 times the forecast for enplanements.

Table 2-4 Passenger and Cargo Enplanement Projections during Peak Periods

			2000	2005	2010	2015	2020
Annual Traffic	Passengers (Mpax/year)	Hyp Medium	258	336	427	526	630
		Hyo High	258	369	496	646	815
		Hyp Low	258	305	362	423	495
	Cargo (t/year)	Hyp Medium	453	590	749	922	1.105
		Hyp High	453	648	871	1.133	1.431
		Hyp Low	453	534	635	743	868
Peak hour operations (oper/hour)		Hip Medium	3,8	3,6	4,0	4,2	4,3
		Hyp High	3,8	4,0	4,6	5,2	5,5
		Hyp Low	3,8	3,3	3,4	3,4	3,4
Average enplanement	Passengers/operation		30	42	49	56	67
	Tons per operation		0,05	0,07	0,07	0,08	0,09
Peak hour traffic (Enplaned passengers/hour)	Passengers (Pass./h)	Hyp Medium	117	152	193	238	285
		Hyp High	117	167	224	292	369
		Hyp Low	117	138	164	191	224
	Cargo (t/h)	Hyp Medium	0,20	0,24	0,29	0,34	0,39
		Hyp High	0,20	0,27	0,34	0,42	0,50
		Hyp Low	0,20	0,22	0,25	0,27	0,30

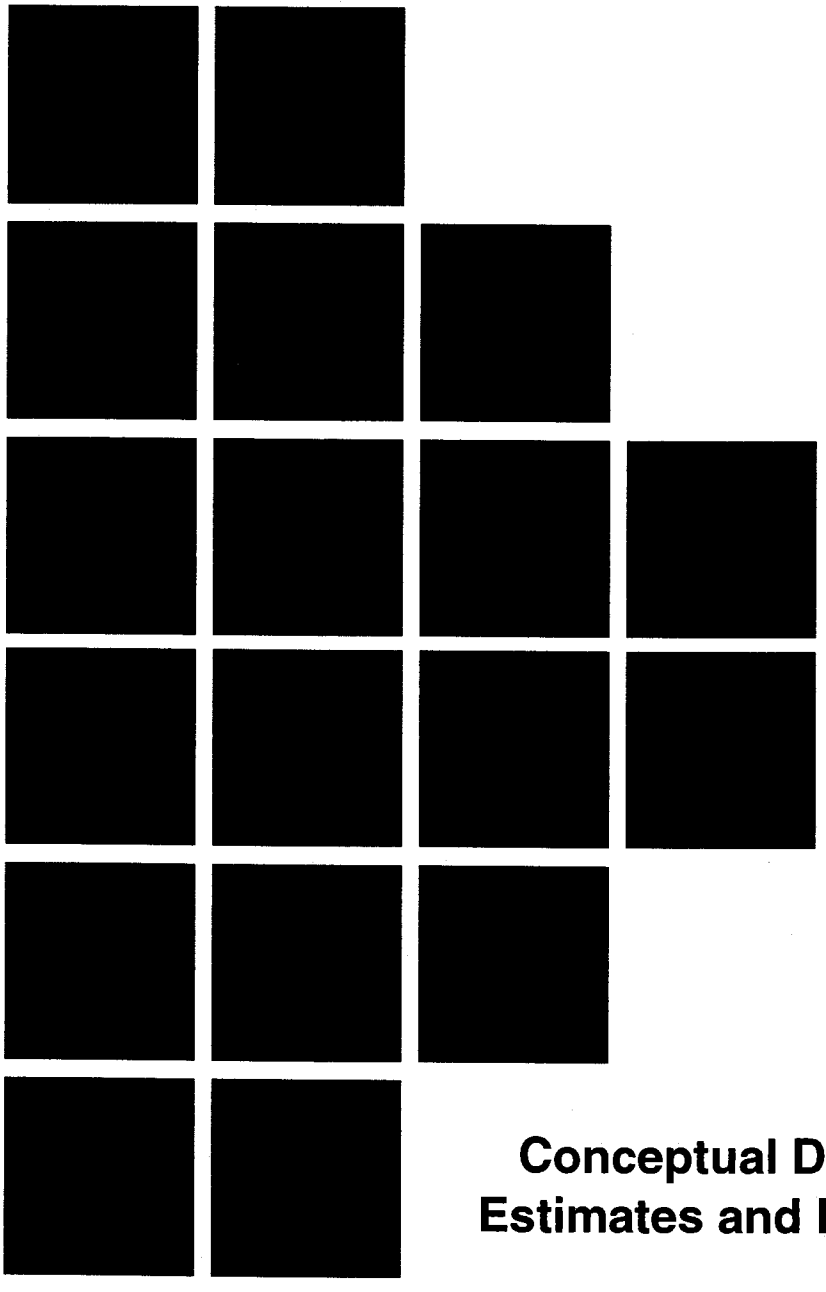
Source: Tables 2-1, 2-2 and 2-3

Figure 2-12 Passenger Enplanement Projections during Peak Hour



Source: Table 2-4

In regards to cargo, the projections indicate that the total flow during peak hour would reach a maximum of less than half a ton, even in the high traffic growth hypotheses. Due to the marginality of cargo traffic, it can be assumed that this is mainly mail cargo.



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CHAPTER III
Conceptual Development Plan, Cost Estimates and Design Standards-New Temuco Airport

CHAPTER III

CONCEPTUAL DEVELOPMENT PLAN, COST ESTIMATES AND DESIGN STANDARDS – NEW TEMUCO AIRPORT

3.1 Introduction

This document explains how the facilities to be included in the conceptual development plan, and their related sizing and design standards, for the new Temuco airport were determined.

Facility determinations were based on:

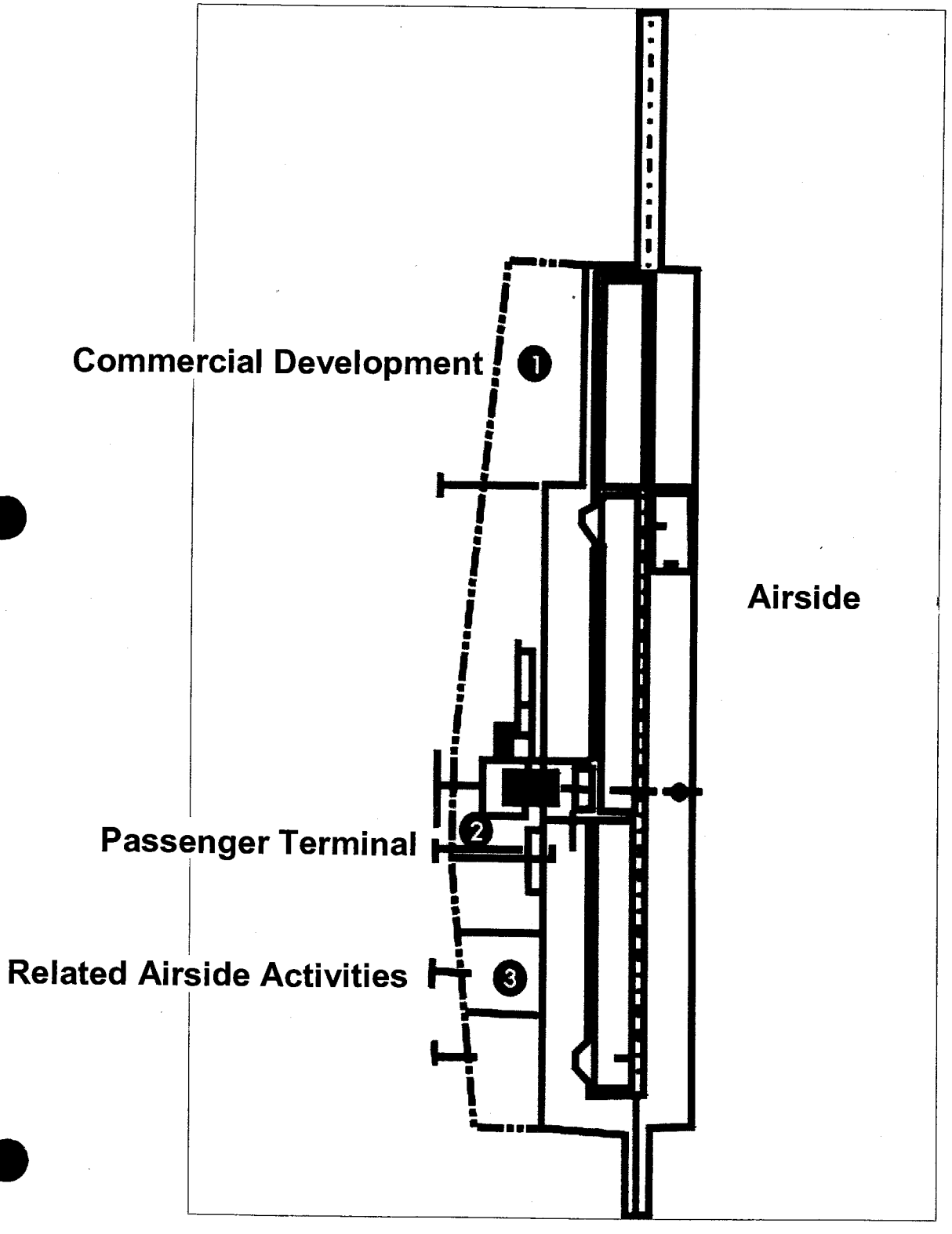
- International Civil Aviation Organization (ICAO) International Standards and Recommended Practices, as described in the Annexes to the Convention on International Civil Aviation
- International Air Transport Association (IATA) recommendations, as described in the Airport Development Reference Manual
- Federal Aviation Administration (FAA) recommendations, as per Advisory Circular 150/5360-13.
- Department of Airports (DAP) directions about type of airport facilities and service requirements
- Airport Compatibility parameters for various commercial aircraft, as published by Boeing and Airbus
- Meteorological data provided by DGAC
- Standard international practice for commercial airline operations

The chapter concludes with a pre-design estimate for the investment costs required to build a new airport.

3.2 Airport Land Use Zoning

As is shown in **Figure 3.1**, land use in airport property was zoned in order to combine similar activities without interfering with the expansion of the terminal or other related activities, within approximately 280 hectares of airport property.

Figure 3-1: Land Zoning



Approximately 180 hectares were set aside for air-side facilities, including the runway, parallel runways, platforms, NAVAIDS, free zones, approach lights, etc. The remaining 100 hectares were assigned for land-side purposes, even though only a small part needs to be developed in the initial phase, as part of a concession. As growth occurs, companies needing space could develop the reserved land next to the areas in use[1].

3.2.1 Commercial Development

58 hectares on the land-side of the airport would be reserved for public area use, which include cargo, fuels and other industrial uses compatible with airport operations.

This area is further subdivided into approximately another 28 hectares, for uses that do not require access to the airport, and another 30 hectares for fuel, cargo, land equipment services and other activities which require access to the airport. A separate 2-way entrance to the Temuco access road is provided.

A secure access towards the air-side is required for the distribution of fuels and cargo. The cargo platform is located next to the terminal platform, and could be expanded without interfering with other activities. This also assures the movement of cargo containers. Cargo airplanes would share the same runways with other airplanes.

Initially the demand for commercial development activities not directly related with airplane services would be very small, less than 1 hectare (see Chapter 4). It would be more than likely that the concessionaire leave the development of these areas to other concessionaires.

3.2.2 Passenger Terminal

An area of approximately 13 hectares would be reserved in the land-side, for passenger-related activities. These include the terminal, administrative offices, airline offices, tourist information and reservations, public parking, taxis, car rentals and hotels, or conference centers.

The terminal could be expandable, with the objective of providing a "C" Level of Service to satisfy the demand projections during peak-hours, according to IATA and FAA recommended standards (see Section 6 of this Chapter). When needed, the terminal could be expanded towards the commercial development area, or towards support services, without interfering with these activities. The 10,000m2 of reserved area would accommodate a two-floor terminal, which would accommodate up to 4 million passengers annually.

[1] In Chapter VI, Financial Analysis, land administration alternatives, either by the Concessionaire or the National Directorate of Civil Aviation (DGAC), are analyzed.

A 4-lane boulevard-type access road to the terminal of would be provided, exclusively for passenger use, and connecting to the road to Temuco.

The necessary air operation facilities, including the platform and related support facilities, are presented below.

3.2.3 Areas for Related Activities

A minimum of approximately 9 hectares would be reserved in the land-side for DGAC facilities, airport support services, general aviation and military areas. This are would be provided with two independent access roads for each one of the three sub-zones.

a) Airport Support:

This sub-zone includes DGAC facilities and airport maintenance facilities. The area occupied by DGAC includes the control tower, related offices and emergency generators. Within the security area is the Airport Rescue and Fire Fighting building. If the terminal were to be expanded, there would be no need to relocate the tower or other related facilities.

b) Airport Maintenance Facilities:

The airport support facilities, including maintenance areas for aerial and non-aerial activities, are located around the security area perimeter. Service plants, including the energy substation, water tanks and residue treatment plants, would be located near the border of the airport property.

c) General Aviation:

The current airport houses general aviation facilities, including flight organizations, hangars and maintenance facilities. There is ample room if new general airport facilities are needed at the new airport, and would also be feasible to jointly use the space for civil and military uses, as is the case now in the present airport. It was assumed that the cost of any of these general aviation facilities would be paid by third parties. These costs are not included in the first-stage estimates.

d) Military Areas:

Currently there are military facilities present in the airport, although their presence in Temuco has been lessening. Nevertheless, if military facilities are required at the new airport, an adequate area could be located, which would also allow for simultaneous civil and military flights. It was assumed that the government would cover any costs related with these military facilities. This cost was not included in the first-phase estimates.

Approximately 11 hectares close to the end of the runway has been reserved for military purposes. The land configuration allows for the doubling or tripling of the dedicated military activity area.

e) Expansions:

Depending on the exact configuration of the airport property, areas assigned to any zone could vary. In using location to calculate airport requirements, there exists a sufficient area to substantially expand each one of these areas. The availability of expansion areas for related activities is very important in choosing the location of the airport.

There is an ample area, in the air-side, between the runway and the security perimeter to provide a platform, and other required areas to support each one of these activities.

3.3 Airport Reference Code

An ICAO Aerodrome Reference Code of 4C is recommended for the new airport. This reference code, as defined in ICAO Annex 14, Chapter 1, is appropriate for airports with runways of over 1,800 meters in length and designed to accommodate aircraft of wingspan up to 40+/- meters (Airbus A-320.) A 4C airport can accommodate all currently operating commercial airliners, and all aircraft currently anticipated flying to the airport in the future.

Even though the forecasts do not require it, large airplanes, such as the B-747 or New Large Aircraft (NLA's), such as Airbus Industrie's proposed A-380 with a wingspan of approximately 80 meters, could operate at the new airport if the runway were to be lengthened. For this reason, in order to meet this potential demand, it is recommended that the runway and platforms be designed in such a way as to allow expansions to accommodate up to size 4E airplanes (Boeing 747-400), in case it is required in the future.

But because of the wider wingspan of such aircraft certain operating restrictions would apply (for example, no aircraft would be allowed on adjacent taxiways when an NLA occupies the runway.) In addition, the runway would have to be widened to accommodate regular NLA flights.

3.4 General Site Development

3.4.1 Road Access

The importance of driving time and access decongestion from the highway to the airport cannot be understated. The potential economic benefit of a better air transport facility will be minimized if highway commutes between the airport and other service areas

become congested, increasing commuting time. At the same time, it must be taken into account that even a difference of a few kilometers or minutes in land travel time would be a critical determinant in the location of the airport, if all other factors were to be equal. In this case, even if transport costs influence transport mode decisions, the Consultant considers that a difference of 10-15 minutes in driving time between Temuco and the airport would not have much of an impact in the decision to whether travel by land or airplane. Land transport between Temuco and Santiago is in the range of 9+/- hours.

In general, travel time of approximately 30 minutes is considered adequate between the airport and downton Temuco. The most important factor is one consistent reliability for passenger and cargo movements.

The present airport in Maquehue is located 5km south of Temuco, by way of Route 5 and R-500. Other possible locations for the new airport outside of Temuco have been discussed. Roads in these areas need to be expanded and improved. For example, there are two feasible options to connect Site No. 4 in Santa Elisa with Temuco:

1. Route S-464: 14 kilometers would have to be reconstructed as a 2-way paved road between Santa Elisa and Quepe. There are 17km between Quepe and Temuco via Route 5. Temuco By-pass users would be required to pay double.

   For commercial users, access between the airport and the region would have to be more reliable, with a direct connection at the Route 5 and Temuco Bypass crossing. This is located between 20 and 30 Km east of Route 5, depending on the alternative considered. The two closest intersections to the city of Temuco are located in Lautaro, 20 Km north of the city of Temuco, and in Quepe, 14 Km south of Temuco. In comparison, both locations are located 14 Km from the Quepe intersection. For destinations outside of Temuco, and for the current airport as well as for the site in Santa Elisa, access to the Temuco By-pass via the interchange in Quepe is more convenient, in terms of travel time and reliability. Other locations to the southeast of Temuco would have similar travel times heading towards Quepe or Freire.

2. Route R-500: 15 Km would need to be reconstructed as a 2-lane paved road between Santa Elisa and the present airport. There are 5 Km between Maquehue and Temuco without tolls.

In general, travel times from or to each location and the region, via Route 5 or the Temuco By-pass, are very similar. The southwest areas are located away from the existing airport in Temuco, as is also the case in Santa Elisa, but still within a travel radius of 30 minutes via Route 5. Given the short difference between each one of the land access alternatives, this would not be a determining factor in the location selection for building a new airport. Since the major flow in Temuco is that of passengers, the

improvement of Route R-500 is recommended. The layout of these routes can be seen in **Figure 3-4.**

3.4.2 Factors Affecting the Location Selection of the Airport

According to the ICAO airport master planning manual, the selection of the site where the new airport would be built must be based on the following factors:

- Air activity
- Surrounding area development
- Atmospheric conditions
- Land transport access
- Land availability
- Topography
- Environment
- Other airports
- Basic services availability

The importance of each one of these criteria varies in each case, depending on the variants of each one, within the region of the new airport. In many cases, the atmospheric conditions could be important factor in the selection of the location.

a) Atmospheric Conditions

Atmospheric conditions could be an important decision factor if weather changes significantly in each site. If the topography of the entire area is relatively flat, then atmospheric conditions, including wind and visibility will more than likely be similar in all the sites. If the regional topography has hills, lakes, rivers, etc., it is probable that there will be an atmospheric variability between the locations.

The presence of climate phenomenon, such as fog or smoke, reduces visibility and can lessen traffic capacity at the airport. Fog has a tendency to exist in areas where there is little wind, and thrives particularly in humid areas. A review of the specific conditions for each site, as well as an analysis of weather records up to the present, must be considered. If there is a variation in topography, weather information from nearby stations may not reflect the exact conditions of the areas, particularly in regards to fog. In these cases, historical data must be backed-up with interviews with local residents.

b) Visibility Conditions in Nearby Candidate Areas to Temuco

Currently in Maquehue, data shows delays due to fog, averaging 100 days per year. Significant topographic variations can be seen between the candidate areas near Temuco, according to the topographic maps and general site investigations. Raised land towards east of Temuco, combined with the hills and river valleys in the immediate

areas close to the city, suggests that there exist various significant weather variations in many of the candidate areas.

There is no detailed meteorological information available for each one of the possible sites. Conditions present at the actual airport, such as wind and visibility, cannot be used for these other sites, as they do not share the same topographic layout.

According to DGAC recommendations, detailed observations must be carried out for each site as part of the selection process. These observations must include wind direction and speed, as well as visibility. This weather information would be used in the site evaluations, as well as in the planning of the runway positioning and NAVAIDS.

For purposes of the conceptual planning of a new airport, it has been assumed that a Landing Instrument System Category I should be provided. Category I ILS allows for landings with reduced visibility conditions, including a "decision altitude" (cloud ceiling) of 200 feet, and a Runway Visual Range (RVR) of 1,800 feet. The complete ILS package includes a localizer, an antenna for measuring descents and a transmitter to measure RVR. DGAC has concluded that the installation of a Category I ILS is feasible in Maquehue (See Annex B).

The installation of a Category II or III ILS allows for flight instrument operations in worse conditions than that of Category I ILS, but requires a greater investment, including the lighting of the runway (central lighting and first contact lighting, or "touchdown" is required for Category II and III ILS). The high costs of Category II and III ILS systems can only be justified for airports with extreme cases of fog and high volume of operations.

3.4.3 Other Considerations for Site Development

a) General Drainage Concepts

The new airport site shall be graded to allow gravity-flow drainage of storm water in open channels, with culverts and underground piping/catch basins as required. Drainage water will be directed to on-site storage ponds, where release to regional watercourses can be controlled to limit discharge surges. The system shall be designed to accommodate a 5-year storm, and so that a 10-year storm will cause only minor flooding without affecting flight operations. Oil separators shall be provided adjacent to potential sources of polluted water run-off, such as the aircraft parking apron and general aviation maintenance areas, if any.

b) Security Perimeter Fence

A fence conforming to ICAO Annex 14, Section 8.4, security standards shall enclose the boundary of the airfield operating area, separating the secure area from the land-side area and from neighboring land uses. Gates will be provided at appropriate intervals for

emergency and operational access. A perimeter road shall be established inside the fence line, for maintenance access and security patrols.

c) Obstacle Limitation Surface

The ICAO obstacle clearance criteria for the airport vicinity, as presented in Annex 14, Section 4.2 for airports with Precision Approach Runways, shall be maintained.

3.5 Air-Side Infrastructure

The new airport conceptual design plan is shown in **Figures 3-2 and 3-3**. Based on the previous chapters, the feasibility study will focus on the construction of a new airport in the Santa Elisa area, Huelan Estate, in Quepe.

Following is a discussion of the main specifications for the design of the runway, taxiways and platforms. Based on previously mentioned design specifications, **Figure 3-4** shows a superimposed design of the Maquehue airport expansion, and the construction of a new airport in Santa Elisa.

3.5.1 Runways

a) Number of Runways

A single air carrier runway has an annual capacity of over 100,000 aircraft movements. The forecast traffic for Temuco airport in the Year 2020 is approximately 15 aircraft movements. Therefore, a single runway will be sufficient to accommodate air traffic at the airport for the foreseeable future, even if military and general aviation operations are also to be accommodated at the new airport.

b) Runway Orientation

The existing airport's runway is oriented at 06/24. Meteorological data provided by DGAC for the Temuco station indicates that winds tend to be out of the south during October-January, out of the north May-August, and calm during March-April and September. Predominant wind speed is indicated to be of less than 10 knots throughout the year. Given these parameters, and the design standard that the crosswind component should be less than 20 knots at least 95% of the time.

It appears that a runway alignment of 03/21 through 06/24 would probably be appropriate for the new runway and would provide a runway usability factor (percentage of time during which crosswind component is no greater than 20 knots).

Figure 3-3:Conceptual Design Plan for the New Airport, Phase 4 (2020-2025)

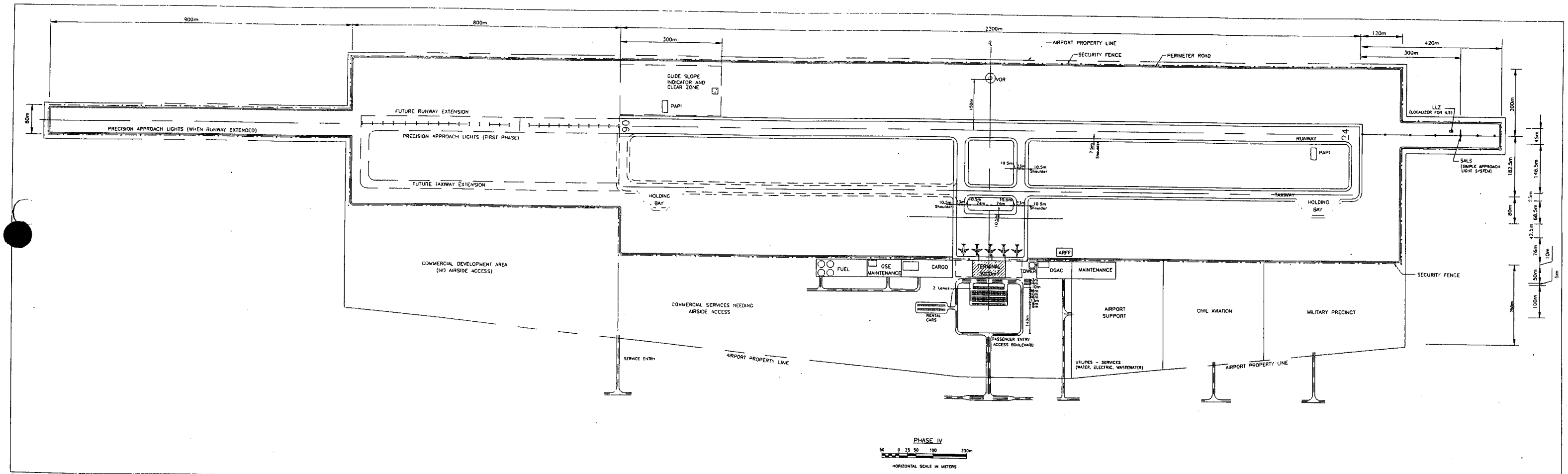


Figure 3-2:Conceptual Design Plan for the New Airport, Phases 1, 2 and 3 (2002-2019)

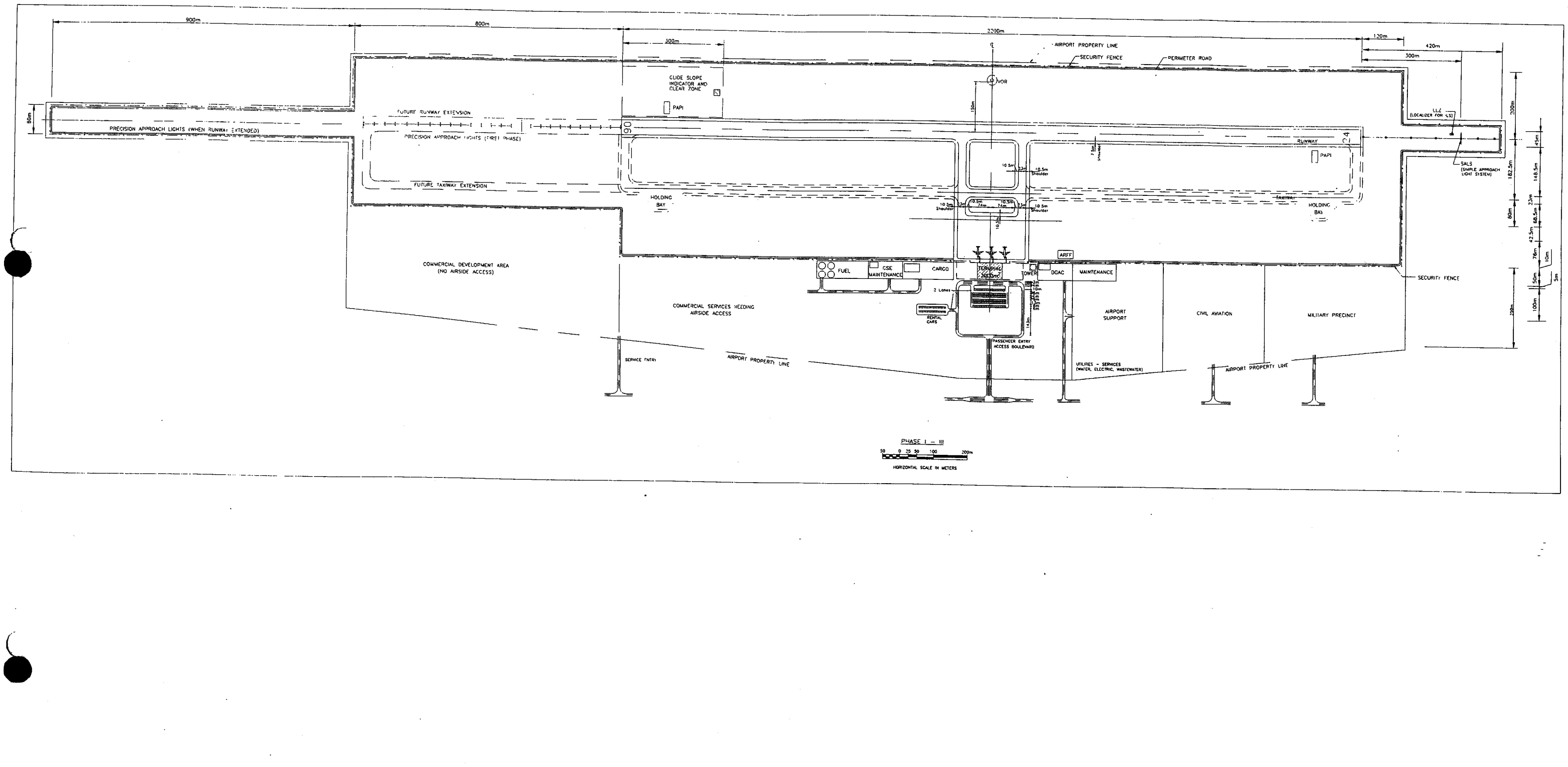
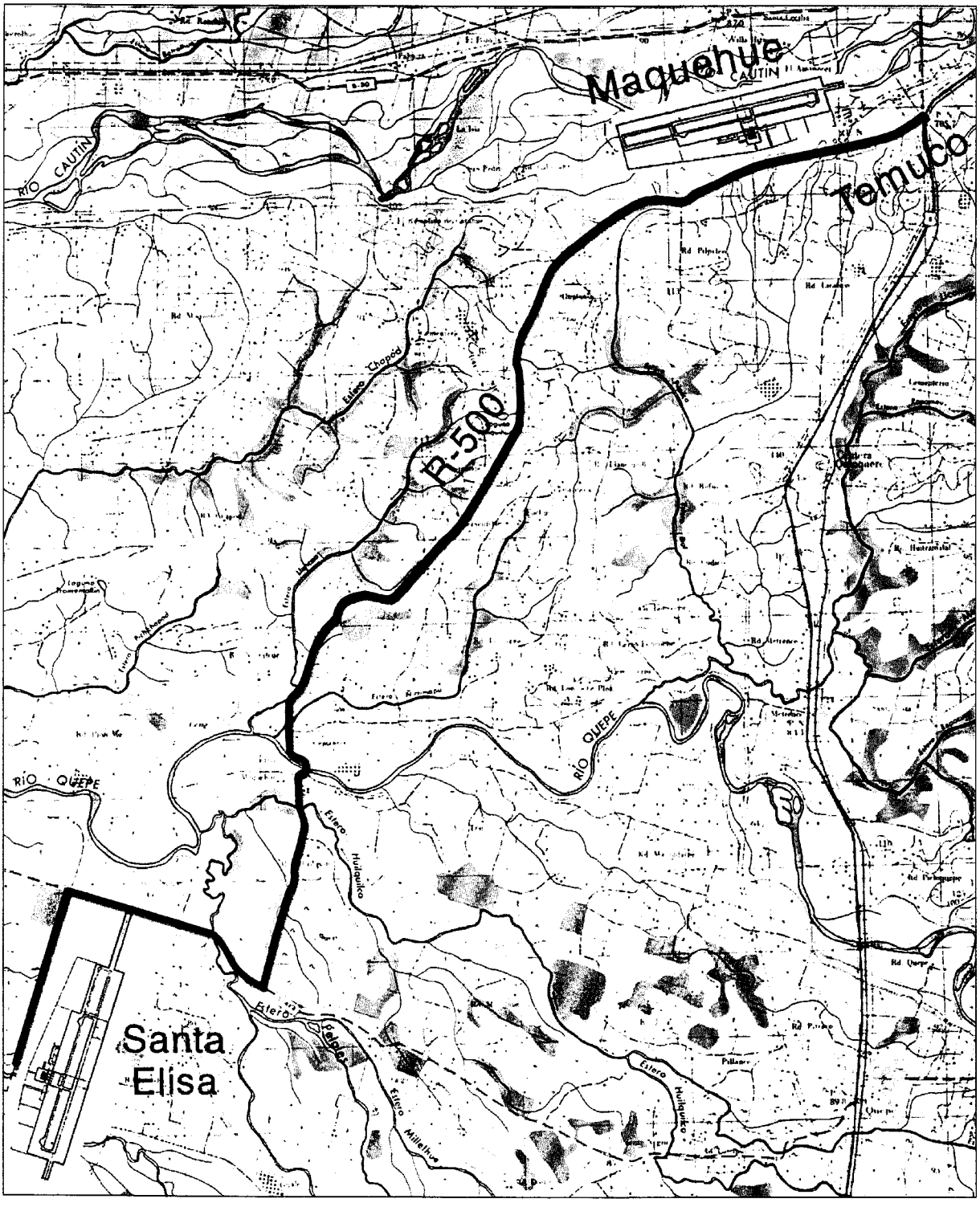


Figure 3-4: Design of a New Airport Superimposition at the Present Maquehue Location and Possible Location in Santa Elisa



As previously suggested by DGAC, a meteorological monitoring station should be set up at the potential new airport site so that wind speed/direction and other parameters can be established for design of the new airport.

c) Runway Length

Type 4C airplanes, such as the A-320, require a runway length at the new airport of 2,200 meters (See details in Annex B). it is recommended in the first phase that the length of the runway measure 2,200 meters. Nevertheless, it is also recommended to allocate space for future expansions of the runway, in order to accommodate large size airplanes, such as the A-330/340, or to accommodate greater operations. Airbus Industrie's airport compatibility information indicates that such future operations could be accommodated on a 3,000-meter runway. (Assuming maximum gross weight operations, reference temperature of 23.8°C, airport elevation of approximately 100 meters, and a level runway.) It is therefore recommended that sufficient land be acquired at the airport site to allow future extension of the runway to 3,000 meters.

d) Runway Width

Runway width for a 4C airport shall be 45 meters, together with 7.5-meter shoulders on each edge (providing a total paved width of 60 meters), in accordance with ICAO Annex 14.

A runway strip, clear of all obstacles, shall be provided along the runway with a total width of 300 meters (150 meters from the runway centerline in each direction), in accordance with ICAO Annex 14. In addition, the inner half of the runway strip shall be graded.

e) Lighting, NAVAID and Approach Lighting Systems

The runway will be a Category I instrument runway (see Aeronautical Facilities below). Runway edge lighting and threshold lighting shall be provided, in accordance with ICAO Annex 14.

Pavement markings shall be provided, in accordance with ICAO Annex 14, and PAPI shall be provided at both runway ends. Guidance signs shall be provided, as recommended in ICAO Annex 14. Obstruction lights and/or markings shall be provided on all obstructions, as defined under ICAO Annex 14, Chapter 6.

Approach lights shall be provided at both ends of the runway. A Precision Approach Category I Lighting System shall be provided for the approach supported by the Instrument Landing System (ILS) and a Simple Approach Lighting System (SALS) shall be provided at the other approach direction. Criteria for design of approach light

systems are provided in ICAO Annex 14 (Chapter 5) and ICAO Aerodrome Design Manual, Part 4 (Visual Aids), Chapter 4.

Criteria for the approach illumination design system is defined in Annex 14, Chapter 5 of ICAO, and in the ICAO Airport Design Manual, Part 4 (Visual Aid), Chapter 4.

f) Construction Material

It is recommended that the runway be constructed of flexible pavement (asphalt concrete), for minimum initial construction cost and for ease of maintenance.

g) Runway Drainage

The runway shall be drained by sheet flow to open channels (lined and unlined) and where necessary conveyed through culverts. A surface treatment, such as grooving or open-graded surface course, shall be provided on the runway pavement to prevent hydroplaning during wet conditions.

h) Design Criteria

The runway shall be designed in accordance with the criteria presented in ICAO Annex 14, Chapter 3, and ICAO Aerodrome Design Manual, Part 1 (Runways) and Part 3 (Pavements). These criteria address surface slopes and gradients, pavement geometry, pavement strength, and preparation of the runway strip. Pavement markings and lights shall be designed in accordance with ICAO Aerodrome Design Manual, Part 4 (Visual Aids).

3.5.2 Taxiways

a) Taxiway Configuration

A taxiway system consisting of only perpendicular connecting taxiway(s) between the parking apron and the runway (as at the existing Temuco airport) provides a runway capacity of approximately 12-15 aircraft movements (landings + takeoffs) per hour. Additional taxiways can significantly increase capacity and operational efficiency; a full-length parallel taxiway, for example, can support runway capacity of approximately 35 movements per hour. Until the projections of 12-15 aircraft movements per peak hour are achieved (medium hypothesis in 2020), an additional taxiway will not be necessary.

When 12 operations per peak hour are reached, the construction of a 1,000+/- parallel taxiway from the platform to the top of the runway, will need to be considered. When 20-25 peak hour operations are reached, the directional use of the runway for commercial or general airplanes, wind direction and other factors will need to be

considered as well, in order to determine the need for a complete parallel taxiway, which would allow for 35 operations per hour.

Construction of an 800 x 15 meter strip would allow for the connection of general aviation with the central platform and the runway. The concessionaire must consider if this investment is profitable. If not, it could be financed by the users. This strip is not included in the cost estimates (see later).

b) Apron-Edge Taxiway

In addition, a parallel taxiway along the edge of the aircraft-parking apron is also recommended for efficient aircraft circulation on the airfield. The taxiway is designed to provide access to aircraft parking stands, and can be somewhat narrower than a full taxiway. Two connecting taxiways between the parallel taxiway and the apron-edge taxiway should also be provided for circulation efficiency.

c) Taxiway Width

Taxiway width for a 4C airport shall be 23 meters, together with 10.5 meter shoulders on each edge (providing a total paved width of 44 meters), in accordance with ICAO Annex 14.

d) Separation Distances

For a 4C airport, the parallel taxiway centerline shall be located at least 168 meters from the runway centerline, and the centerline of the apron-edge taxiway shall be at least 126 meters from the centerline of the parallel taxiway centerline. Nevertheless, a separation of 182.5 m and 80 m is recommended, respectively, to accommodate large airplanes in the future.

In addition, objects on the apron, such as parked aircraft, shall be located at least 42.5 meters from the taxiway centerline. All these separation distances are as specified in ICAO Annex 14.

e) Taxiway Lighting and Visual Aids

Taxiway edge lighting shall be provided, in accordance with ICAO Annex 14.

Pavement markings shall be provided, in accordance with ICAO Annex 14. Guidance signs shall be provided, as indicated in ICAO Annex 14, Appendix 4.

f) Construction Materials

It is recommended that the runways be constructed with flexible pavement. It is recommended that the apron-edge taxiway be constructed of rigid pavement (Portland

cement concrete), for compatibility with the adjacent aircraft-parking apron. Pavement thickness included in the cost estimates is 50 cm: 12 cm of asphalt and 30 cm base.

g) Taxiway Drainage

The taxiways shall be drained by sheet flow to open channels (lined and unlined) and where necessary conveyed through culverts.

h) Design Criteria

The taxiways and taxilane shall be designed in accordance with the criteria presented in ICAO Annex 14, Chapter 3, and ICAO Aerodrome Design Manual, Part 2 (Taxiways, Aprons and Holding Bays) and Part 3 (Pavements). These criteria address surface slopes and gradients, pavement geometry, pavement strength, and preparation of the taxiway strip. Pavement markings and lights shall be designed in accordance with ICAO Aerodrome Design Manual, Part 4 (Visual Aids).

3.5.3 Airplane Parking Apron

Apron dimensions to be based on forecast requirements – assumed values used in description below.

a) Apron Width

Aircraft should be parked perpendicular to the apron-edge taxilane and to the frontage of the passenger terminal, and between these two facilities, so that access to all parking positions is provided from the taxilane. This parking arrangement will minimize the total depth of land area required for the airport site. An apron width of 132 +/- meters is recommended for the airport's first-phase development (width is measured along the terminal frontage.), to accommodate 3 type 4C airplanes.

The apron would need to have a width of 175+/- for the medium forecasts in 2020. This width would allow for parking of 4 A320 aircraft (wingspan = 33.9 meters, and allow 7.5 meters clearance between adjacent aircraft parking positions, as specified in ICAO Annex 14, Chapter 3) or 6 B-737 or 1 B-747, 1 A330/340 and 2 B-737. The apron pavement markings shall be flexible to allow multiple aircraft parking mixes.

b) Apron Depth

The apron depth is measured from the face of the passenger terminal to the inner edge of the apron-edge taxilane. For an ICAO Category 4C airport, sufficient depth of 38 meters should be provided for parking of an A-320 within this area. This area would have to be expanded to 70.6 meters to accommodate larger airplanes, such as the B-747-400.

The apron depth should also accommodate the apron-edge taxilane (width = 54 meters, including clearance to adjacent objects) and a service road along the passenger terminal frontage of 10 meters width. Therefore the total apron depth should be 34 + 38 + 10 = 82 meters for group 4C, or 54 + 70.6 + 10 = 134.6, or approximately 135 meters. For group 4E. An initial depth of 82 meters is recommended.

c) Apron Lighting

Flood lighting shall be provided on the apron, with multiple overhead light standards to minimize shadows in key work areas. General lighting level shall be a minimum of 20 lux, in accordance with ICAO Annex 14. Edge lighting shall also be provided.

d) Construction Material

It is recommended that the apron be constructed of rigid pavement (portland cement concrete), for resistance to static loads (parked aircraft) and resistance to spilled fuel.

e) Apron Drainage

The apron shall be drained by sheet flow to open channels (lined and unlined) along the edges away from the passenger terminal and by concrete gutters with cast iron inlet grates along the passenger terminal frontage. Maximum apron slope shall be 1%, as recommended in the ICAO Aerodrome Design Manual, Part 2 (Taxiways, Aprons and Holding Bays.)

f) Design Criteria

The apron shall be designed in accordance with the criteria presented in ICAO Annex 14, Chapter 3, and ICAO Aerodrome Design Manual, Part 2 (Taxiways, Aprons and Holding Bays) and Part 3 (Pavements). The pavement thickness included in the cost estimates is 38 cm. These criteria address surface slopes and gradients, pavement geometry, and pavement strength. Pavement markings and edge lights shall be designed in accordance with ICAO Aerodrome Design Manual, Part 4 (Visual Aids).

3.6 Passenger Terminal

For planning, terminal conceptual design and the use of airport property, zoning should allow for the expansion of the facilities in the future, without interrupting airport operations. The airport passenger area should accommodate not only the anticipated peak hour demand in 2020, but also for after this year. Even though the terminal and the support facilities would be built in one stage, the estimated cost should reflect unexpected requirements. The estimated costs take into account passenger arrival and departure facilities, airport and airline administration support areas, and all equipment

necessary to efficiently operate the terminal. Each one of these topics is discussed later.

3.6.1 Terminal Expansion Zoning

The terminal has been designed as a simple one and a half level facility, with arrivals at one end, and departures at the other. The zoning plan for airport property, discussed previously, allows for the individual, or simultaneous expansion of either of the two ends of the facility, without interrupting operational activities. These arrival and departure areas can be expanded along with the terminal. A parking lot is provided, through the airport road, which could be expanded if needed. A rental car area is also provided, which is very close to the terminal. This area also has enough space for expansions. The dedicated area for passenger and service activities is sufficiently ample to allow the construction of a hotel/conference center, and related activities, without affecting operational activity.

3.6.2 Terminal Capacity and Dimensions

During this planning stage, it is not appropriate to design a terminal in detail, since there are other passenger requirements factors that would affect the size and services offered at the terminal. The terminal's productivity is defined generally by Service Level scales, which range from A (excellent) to F (unacceptable). IATA offers the following general definitions:

A **Excellent Level of Service:** Open circulation and excellent level of comfort

B **High Level of Service:** Stable circulation, very little delays and high level of comfort

C **Good Level of Service:** Stable circulation, acceptable delays and good level of comfort

D **Adequate Level of Service:** Unstable circulation, acceptable delays for short periods of time and adequate comfort level

E **Inadequate Level of Service:** Unsteady circulation, unacceptable delays and inadequate level of comfort

F **Unacceptable Level of Service:** Crossed circulation, collapsed system, unacceptable delays and unacceptable level of comfort.

A determined number of formulas can be used to estimate facility requirements for a specific Level of Service. These formulas are based on existing airport characteristics, and are generally accepted as normal. The concept is generally applied in two ways:

A) Measuring the time spent by the passenger in between boarding and arrival, baggage claim and terminal exiting stages, or

B) Categorizing total space expected per passenger for each one of these stages, or as a whole for the terminal.

Unfortunately there is no one on one equivalency between these two measurements. Following is an example of space requirements for peak hour passengers (**Table 3-1**):

Table 3-1: IATA Level of Service Standards (m2 per passenger – peak hour)

Function/Category	A	B	C	D	E	F
Check-in waiting line area	1.8	1.6	1.4	1.2	1.0	Collapsed system
Waiting to board area	2.7	2.3	1.9	1.5	1.0	
Waiting area	1.4	1.2	1.0	0.8	0.6	
Baggage claim area (excluding baggage claim equipment)	2.0	1.8	1.6	1.4	1.2	
GIS	1.4	1.2	1.0	0.8	0.6	

Source: Page 105, Airport Development Reference Manual, IATA 1995

Airport terminals are generally designed to provide Level of Service C for forecasted peak-hour demand. An expansion is typically considered when D or E Levels of Service are constantly being surpassed. **Table 3.2** summarizes IATA space allocation for C Level of Service, the two different FAA estimate methods, and the Mexico ASA airport planning guide.

Table 3-2: Space Requirements for a C level of Service (m2 per passenger – peak hour)

Design Standard Categories	IATA[1]	FAA-1[2]	FAA-2[3]	ASA[4]
National Passengers	7.9 m^2	10 m^2	6.2 m^2	10 m^2
International Passengers	Na	15 m^2	na	14 m^2
Terminal Total (Nat. and Intern. Average)	13 m^2	14 m^2	11.2 m^2	12 m^2

Sources:

1. Calculations are based on Chapter 3 from the Reference Manual for the Development of Airports, IATA 1995. The formulas have been adjusted to reflect cargo and passenger factors, versus support space.
2. Based on peak hour passengers, (Chapter 5, FAA Advisory Circular 150/5360-13, 1988)
3. Based on gates, annual enplanements and passengers versus support space (Chapter 5, FAA Advisory Circular 150/5360-13, 1988)
4. ASA numbers reflect airport national averages, for service of 0.5 million to 1 million passengers per year in Mexico (Aeropuertos y Servicios Auxiliares, General Directorate of Civil Aviation, Mexico, 1996)

For planning and financial analysis purposes, and given the fact that there is no significant international passenger forecast, an average of 10m2 for peak hour passengers will be considered. Taking into account Temuco passenger characteristics, it has been estimated that for every passenger flying during peak hours, 0.9 will not.

Considering increases in the size of the terminal to 1000m2 as base, these assumptions are applied for the terminal requirements shown in **Table 3-3**, which shows terminal surface size specifications for passengers in m2.

Table 3-3: Terminal Size Required in m2

Projection Ranges		2000	2005	2010	2015	2020
Low Projection	pax. Peak hour	222	262	312	363	426
	Terminal	2.000m^2	3.000m^2	3.000m^2	4.000m^2	4.000m^2
Medium Projection	pax. Peak hour	222	289	367	452	542
	Terminal	2.000m^2	3.000m^2	4.000m^2	5.000m^2	5.000m^2
High Projection	pax. Peak hour	222	317	426	555	701
	Terminal	2.000m^2	3.000m^2	4.000m^2	6.000m^2	7.000m^2

The first phase of passenger terminal development should accommodate 367+/- passengers per hour in 2010 (medium hypothesis), taking into account peak hour, and based on C Level of Service criteria, as specified by IATA. Post-development phases should increase the size of the terminal so as to allow for up to 540+/- passengers in 2020.

Estimated costs in Section 3.12 are based on a medium projection.

3.6.3 Functional Requirements

The passenger terminal must provide the following functions:

- Facilities for processing of both international and domestic passengers. Facilities for government inspection services (customs, immigration, etc.) will be provided.
- Security screening and security perimeter will be maintained within the building, in accordance with ICAO standards.
- Arriving and departing passengers shall be separated from each other in the secure areas of the terminal.
- Only limited international traffic is projected during the new airport's first-phase development, so international processing areas (check-in counters, hold rooms, baggage claim area, etc.) shall be available for domestic use when no international traffic is present.
- Boarding of passengers shall be by loading bridge for most flights.
- Each functional area of the passenger terminal shall be designed to provide Level-of-Service C, as defined in IATA's Airport Development Reference Manual.
- The passenger terminal shall contain sufficient space to allow for appropriate retail, food and beverage, and other passenger amenities.

a) General Building Configuration

The terminal shall be served by a one and a half levels. Departure hold rooms shall be located at the second level, to allow direct access to the loading bridges. The building will therefore be a one-level building along the road frontage and a two-level building along the airside frontage. The building and adjacent site layouts shall allow for future expansion of the passenger terminal in a lateral direction (parallel to the frontage road and aircraft parking apron.)

Architectural features, landscape and design standards should be followed when building the new airport. Given the fact that zoning must be changed for this use, the design must conform to general construction standards. There is no guideline in respect to architecture and landscape of the airport, as this is a personal decision of the architects and designers. Nevertheless, all designs must make an effort to increase capacity and efficiency, improve airport services for users, and at the same time, create new opportunities for the economic development of the region. The concessionaire is expected to meet international airport design standards.

b) Special Equipment

The following special equipment shall be provided in the passenger terminal:

- Baggage handling equipment. Items shall include conveyor belt(s) from behind the check-in counters to the outbound baggage make-up room, and three baggage claim carrousels, two sized for A320 aircraft loads and one sized for A330 loads.

- Loading bridges. Three loading bridges shall be provided. At least two shall be of the apron-drive type so that they can be arranged to serve either two narrow-body aircraft (such as B-737 or A320) with single bridges or one wide-body aircraft (such as B-767 or A330) with two bridges. It is assumed that Fixed Aircraft Services, such as 400 Hertz electrical power, conditioned air, and potable water, will not be provided at the gates. Instead, these services will be provided by individual airlines utilizing mobile service equipment.
- FIDS/BIDS. A Flight Information Display System (FIDS) and Baggage Information Display System (BIDS) shall be provided, with video monitors located throughout the terminal and a central control/input unit provided in the Airport Operations Center.
- Public Address (PA). A Public Address system shall be provided in the terminal, allowing announcements to be made from the Airport Operations Center.
- Escalators. Escalators shall be provided to convey passengers to/from second level hold rooms and arrival gates.
- Elevator. At least one elevator shall be provided, to transport passengers and goods between the two building levels.
- Security screening equipment. Equipment for screening of departing passengers and hand baggage shall be provided, including magnetometers and x-ray equipment. X-ray systems for checked baggage are not recommended for the first-phase development. It is assumed that this equipment can be moved from the existing airport, so no cost is included in the cost estimate for this item.
- Docking guidance system, for precision direction of parking aircraft, shall be provided at the parking positions where loading bridges are located.

3.7 Aeronautical Facilities

3.7.1 Control Tower

An air traffic control (ATC) tower shall be provided at the new airport. The tower cab, at the top of the building, shall provide a work area for controllers with direct line-of-site view of the entire airfield operating area, including both runway ends. The height of the tower shall be determined by ICAO's recommendation that the runway thresholds must be visible from the tower at an angle of not less than 1%. The tower would therefore be approximately 15-20 meters high (to controller eye level.)

The ATC tower shall include two-way radio equipment for communications with aircraft operating in the air and on the ground.

3.7.2 Navigation Support (NAVAIDS)

The new airport must be equipped with the following NAVAIDS:

- A Doppler VOR (DVOR) shall be provided at the new airport, as a general navigation aid and non-precision approach aid.

- Distance Measuring Equipment (DME) shall be co-located with the DVOR, to allow more precise navigation by aircraft in the airport vicinity.

- A Non-Directional Beacon (NDB) may be deemed appropriate for installation at the new airport, for use by general aviation aircraft. The NDB is not included in the first-phase development cost estimate, because it is not required for air carrier operations.

3.7.3 Precision Instrument Approach Aids

Although detailed meteorological data, and particularly ceiling and visibility information, is not available for the new airport site, it is likely that an ILS would be beneficial for the new airport, for operational reliability and efficiency. The ILS components, including Glide Slope and Localizer antennae, shall be installed in accordance with ICAO recommendations. Obstacle clearance criteria, as described in ICAO Annex 14, Section 4.2, shall be maintained.

Since there is no detailed meteorological information available for the new airport, particularly sky and visibility data, it would be beneficial to have an ILS system, which would also provide security and operational efficiency to the new airport.

Given the lack of meteorological information, there is no way to determine if an ILS system would significantly improve operations at the new airport location. The result of a cost/benefit analysis of an ILS system at the new airport would depend on the frequency of low visibility weather at the site. By the same token, if an ILS system is installed in the new airport, it cannot be determined on which side of the runway it should be installed, until there is sufficient data on direction and wind speed during low visibility conditions.

When there is sufficient meteorological data available, a study can be carried out to determine if 1) an ILS system is justified at the new airport, and 2) where on the runway should the ILS system be located. After these are examined, the location where the precision approach lights and the SALS can be installed would be identified. The configuration of land to be acquired for the new airport can be later defined.

In regards to Maquehue Airport, a DGAC study, dated august 27, 2001, determined that it is feasible to install an ILS system in runway 06.

3.7.4 Meteorological Equipment

a) Weather Station

Meteorological data collection equipment shall be located in the airfield operational area, to support Category I instrument operations. Equipment shall be based on appropriate ICAO standards and recommendations, and shall include:

- Runway visual range (RVR) system
- Ceiling-meter system
- Wind speed and direction sensors
- Atmospheric pressure sensors
- Temperature and dewpoint sensors
- Low level windshear alert system
- Wind cones
- Rain gauge
- Humidity sensor
- Lightning warning sensor.

b) Meteorological Office

An office shall be provided in the ATC tower or airport operations center for meteorological personnel and preparation and issuing of weather reports.

3.7.5 Radar System

The operational requirement for radar installations at the new airport will be determined in the future. No radar installations are assumed to be included in the first-phase development of the new airport.

3.8 Air-Side Support Facilities

3.8.1 Cargo Terminal

A cargo terminal building shall be provided. Based on the medium hypothesis projection of 1.100+/- annual tons, the building shall be of warehouse style design and shall provide truck dock access on the land-side of the building and direct apron access on the airside of the building. No special material handling equipment (conveyor belts, automated stacking systems, etc.) are expected to be required for the new airport's first-phase development. A separate area shall be provided for handling of inbound international cargo, and facilities shall be provided for customs services.

3.8.2 Airport Rescue and Fire Fighting (ARFF) Stations

a) Rescue and Fire Fighting Categories

ICAO Annex 4, Chapter 9, presents recommended categories of rescue and fire fighting protection to be provided at airports, based on "the longest airplanes normally using the aerodrome and their fuselage width."

The existing Temuco airport, where the longest normal aircraft is the B-737, requires Category 6 protection (both the B-737, at 33.4-meter length, and the A320, at 37.6 meters length, are within the same fire protection category.) The protection category specifies the volume and type of extinguishing agent to be provided and the number of vehicles to be provided. If larger aircraft serve the airport in the future, the category of fire protection would increase – for example, the A330 wide-body airliner would require Category 8 protection and the B-747-400 would require Category 9.

b) Fire Station

The fire station should provide covered parking for at least two large fire fighting vehicles and two smaller vehicles, such as an ambulance, together with associated office and storage space and crew accommodation and training facilities. The building should be located so that the vehicles have direct access to the airside area and so that response time to any point on the airfield operating area is no more than three minutes, and preferably less than two minutes, in accordance with ICAO Annex 14, Chapter 9. It is recommended that the Airport Operations Center be located in the station. The fire station shall be designed and sited to allow future expansion to Category 9 capacity.

3.8.3 Aircraft Fueling System

Fuel storage tanks (jet fuel) shall be provided with a capacity of approximately five days of average consumption. It is assumed that fuel will be delivered to the airport by truck. Note that aviation gasoline (AvGas) should also be provided, for general aviation use. AvGas will be stored in separate tanks from the jet fuel and will be delivered to the aircraft apron or general aviation area by tank truck.

A system of underground pipes will deliver jet fuel from the tank farm to underground hydrant pits on the aircraft-parking apron. The distribution system will include pressurization pumps and quality control systems (filters, etc.), and facilities for filling of trucks at the tank farm. It is assumed that all fueling facilities will be installed and operated by third-party contractors, as is currently the case at Maquehue airport. Therefore, no cost for these facilities is included in the first-phase development cost estimate.

3.8.4 Airport Operations Center / Administration Offices

The airport will require office space, including:

- A center for a combined operations control room, security center, systems monitoring, and emergency response coordination center shall be provided. It is recommended that this room be located in the same building as the Rescue and Fire Fighting Station.
- Airport administration offices shall be provided. It is recommended that these offices be provided in the same building as the Airport Operations Center and Rescue and Fire Fighting Station, or in the passenger terminal.
- Offices shall be provided in the passenger terminal for airlines and other tenants of the passenger terminal.

3.8.5 Maintenance Facility

The following airport maintenance facilities will be required, for land and airplane services:

- An airport maintenance building shall be provided, including offices for supervisory personnel, storage of materials and equipment, and crew accommodation and training areas. The facility shall also include covered storage/parking area for vehicles and mobile equipment.
- Appropriate areas on or adjacent to the aircraft parking apron shall be designated for GSE storage/parking. GSE includes aircraft tugs, aircraft service vehicles, baggage carts and tractors, etc.
- It is assumed that airlines or a private-sector operator will provide a GSE maintenance building, when one is needed at the airport. No cost is included in the cost estimate for this item.
- It is assumed that airlines will only perform "line maintenance" tasks on aircraft at the new Temuco airport during its first-phase development, so no maintenance hangar will be required at the airport.

3.9 Land-Side Infrastructure

3.9.1 Airport Roads

a) Main Access Roads

The main access roads on the airport site shall be at-grade. Design shall conform with national highway standards, and may be based on axle load of 80 kN, tire pressure of 0.65 Mpa, and 200,000 load repetitions. The main access roads shall be constructed of flexible pavement (asphalt concrete.) Design speed shall be 80 kph, and 2x2 lanes of 3.5-meter width shall be provided, with breakdown shoulder.

In most cases roadway drainage will be provided by either sufficient grade to allow sheet flow to the nearest ponding canal or will incorporate roadside ditches to convey the run-off to the canals.

b) Internal Roads

The internal roads on the airport site shall be at-grade. Design shall conform with national highway standards, and may be based on axle load of 80 kN, tire pressure of 0.65 Mpa, and 100,000 load repetitions. The main access roads shall be constructed of:

- Flexible pavement (asphalt concrete.)
- Design speed shall be 60 kph
- 2x1 lanes of 3.5 meter width shall be provided, with break-down shoulder
- In most cases roadway drainage will be provided by either sufficient grade to allow sheet flow to the nearest ponding canal or will incorporate roadside ditches to convey the run-off to the canals. Areas where open ditches are not desirable shall be drained by curb and gutter systems with the discharge piped to the nearest open ditch or canal.
- Lighting should have a minimum of 20 lux, with standard lights 6 to meters high.

3.9.2 Vehicle Parking

An area for public parking, with a capacity of 143 vehicles, shall be provided adjacent to the passenger terminal, according to the medium hypothesis (Source ASA). A separate parking area for rental cars shall also be provided in this area.

3.9.3 Landscaping

All trees and large vegetation shall be removed from the aircraft operations area, to allow good visibility for air traffic control and security monitoring purposes and for control of birds. Natural low vegetation and grass shall be maintained in this area, with frequent mowing.

Natural trees and vegetation shall be maintained where feasible, and additional plants shall be introduced in areas along roads and other areas open to the public.

3.10 Utility Infrastructure

3.10.1 Electric Power Supply

The electric energy supply system should have the following components:

- A main electrical substation shall be provided on the airport site, to transform power delivered from the regional grid to the on-airport distribution voltage. At least two main transformers shall be provided, together with associated switchgear to control distribution throughout the airport.
- A power distribution system consisting of one or more loops shall be provided on the airport site, delivering power to all airport facilities. Secondary transformers shall be provided at each facility to transform power from distribution voltage to appropriate voltage for use in respective facilities.

- A main emergency (back-up) power generator shall be provided, to supply power in the event of outage of the main delivery supply from the regional grid. The emergency generator shall be sized to supply critical loads in the passenger terminal and other key airport facilities. Note that critical aeronautical facilities, such as control tower communications equipment, navigation aids, and airfield lighting systems shall be provided with separate dedicated emergency generators.

3.10.2 Water Supply

It is assumed that the new airport's water supply will be provided by on-site wells. Also required include:

- A treatment system for the well water shall be provided, to bring the water to applicable potable water quality standards. Storage capacity for approximately three days average use should be provided.

- A pumping system for water supply pressurization shall be provided, including stand-by pumps for additional pressure when fire hydrants are in use.

- A system of underground pipes shall be provided to deliver water to various airport facilities, from the water supply station. The fire hydrant system shall be connected to the water distribution system.

3.10.3 Wastewater Collection/Treatment

A system of underground pipes shall be provided to conduct domestic wastewater from various airport facilities to a wastewater treatment plant. Flow in the system shall be by gravity, augmented by electric pumps at pump pits if necessary. Storm run-off water shall not be collected by the wastewater collection system (see description of Site Drainage system above.)

A plant for treatment of wastewater shall provide primary and secondary treatment, so that discharge water is of sufficient quality to be placed into the regional surface water drainage system.

3.10.4 Telecommunications Systems

The telecommunications system shall be decentralized, multi-node, electronic type capable of handling ISDN. The nodes shall be located in a number of buildings and/or facilities. A redundant telephone system shall be provided for the control tower, fire station, and operations center. It is assumed that the new airport's telecommunications system will be installed and operated by a private vendor, so no cost for this item is included in the first-phase development cost estimate.

3.10.5 Solid Waste Handling

It is anticipated that solid waste generated at the airport will be collected in containers at locations throughout the airport, and that the containers will be hauled to off-site disposal facilities by truck. If excessive volumes of solid waste are generated, compactor plants can be included at key areas. No cost for this item is included in the first-phase development cost estimate, because it is assumed that the trucks and containers will be provided by private contractors.

An incinerator or other treatment method shall be provided to handle waste from aircraft arriving on international routes. Because no regularly scheduled international service is anticipated at the airport during the first-phase development, no such facility is included in the first-phase development program, or in the related cost estimate.

3.11 Airport External Support Facilities

The following factors have been considered to determine requirements for external support facilities:

- With the exclusive operations between Santiago and Temuco, it is very likely that all prepared foods for passengers will come from Santiago.

- Airport zoning allows for the development of a hotel or conference center near the passenger terminal. This would be a commercial investment, therefore it is not included in cost estimates. The feasibility to build a hotel is analyzed in Chapter 5.

- Car rental facilities may be established at the new airport, depending on the business environment that develops there. It is assumed that any such facilities will be built and operated by the airport's private-sector business partners, and therefore no cost for these items is included in the first-phase development cost estimate.

3.12 Cost and Investment Estimates

Table 3-4 shows an estimate of total investment costs required for the construction of a new airport, with sufficient capacity to meet the projected demand at the end of the analysis period (2020), based on the medium projection. Only investments corresponding to the Government and the concessionaire are included. Estimated total is UF 1.26 million. [2]

Costs related to commercial, military or general aviation facilities are not included, as these facilities could be developed by other entities. This total also does not include costs for road access to the city of Temuco, which would be set for a separate concession, to be financed by tolls. Without carrying out the necessary studies for an exact estimate, the construction cost for the access via Route S0464 alternative is estimated at approximately 84,000 UF, and 90,000 UF for the recommended alternative (Route R0500). This does not include engineering, supervision or unexpected costs.

Unitary costs were estimate based on the following sources: specific prices given to the consultant by MOP, Carriel Sur de Concepcion airport construction costs, and costs identified by the consultant for airports with similar characteristics in other countries in Latin America. An estimate of engineering and supervision expenses of 26% is included, as well as 20% for unexpected costs.

For purposes of carrying out the financial analysis for the concession of a new airport, it is necessary to program the investments throughout the concession period. Table 3-5 shows the required investment sequence to satisfy the forecasted demand under the medium scenario. These are organized in investment phases. Annex B shows the annual investment cost flows and maintenance for the three demand scenarios.

These tables also include a fourth phase in 2019 to satisfy demand up to 2025, since the financial analysis presented in Chapter 6 takes into account concession terms of 18 and 24 years. The estimated cost of this fourth phase is estimated at 124.000 UF, increasing the total project cost to UF 1.39 million.

[2] To convert Chilean pesos and dollars into UF, data from the Central Bank of Chile was used to get an exchange rate of UF into pesos, and during the period in which the unitary costs were observed (June0July 2001). for the peso-dollar exchange These are translated as $15,934 and US$ 26 per UF.

It is also important to note that the initial required investment (Phase 1) for this investment plan for the commencement of airport operations is UF 1.1 million.

Table 3-4: Construction Costs to meet Demand in 2020 (in UF)

Item	Unit	Volume	P. Unit.	Total	Notes and Technical Parameters
1. Site Development				**134.336**	
1,1 Clearing and Leveling (1)	Ha.	213	200	42.600	
1,2 Drainage Site (1)	Ha.	213	250	53.250	
1,3 Air-side Security Fence (1)	ML	8.280	3,2	26.496	
1,4 Proximity to other Properties	ML	3.700	2	7.400	
1,5 Terminal Area Landscape	M^2	34.300	0,1	3.430	
1,6 Chucauco Area Drain	ML	580	2	1.160	
2. Air Sector Paving				**148.711**	*Unitary prices: Using Concepción airport as reference*
2,1 Runway	M^2	120.000	0,75	90.000	Asphalt; 45x2,200m; 12cm asphalt on 38cm base; rising 50%
2,2 Perpendicu. Runway - 18m	M^2	4.320	0,75	3.240	Asphalt; 23x280m; 12cm asphalt on 38cm base; rising 50%
2,3 Parallel Runway - 18m	M^2	24.000	0,75	18.000	Asphalt; 45x2,200m; 12cm asphalt on 38cm base; rising 50%
2,4 Air Sector Perimetral Road	M^2	14.300	0,4	5.720	
2,5 Platforms	M^2	14440	2,2	31.751	Concrete; 215x140m; t=0.38m; includes filling/base and lighting
3. Passenger Terminal				**317.576**	*Unitary prices: terminal (MOP) and equipment (Concepción Airport)*
3,1 Terminal Building	M^2	5.000	25	125.000	2-level building; for medium projection
3,2 Loading Brisges	Ea	3	23.250	69.750	3 units required for medium projection
3,3 Baggage Belt System 70m total	LS	150	185	27.750	
3,4 Other Equipment	LS	1	95.076	95.076	Comm. Systems, elevators, security equipment, etc.
4. Parking Access				**25.957**	
4,1 Terminal Access Road	M^2	25.200	0,6	15.120	Asphalt; 3.5 road meters; 2x1 lanes; incl. drainage and lighting
4,2 Frontis Street Terminal	M^2	2.600	0,6	1.560	Asphalt; 3.5 road lanes; 3 lanes; inl. Drainage and lighting
4,3 Terminal Parking	M^2	7.295	0,6	4.377	Asphalt
4,4 Service Road/ Airport Access	M^2	9.800	0,5	4.900	Asphalt; 3.5 road lanes; 2x1 lanes; incl. drainage and lighting
5. Facility Operations				**7.600**	
5,1 Firefighters	M^2	350	8	2.800	Trucks and equipment to be moved from airport
5,2 DGAC/Airport Oper. Center	M^2	200	15	3.000	
5,3 Maintenance Facilities	M^2	300	6	1.800	
5,4 Cargo Terminal	M^2	300	0	0	
6. Utility Infrastructure Services				**50.025**	Not included – to be developed by third parties
6,1 Energy	LS	1	34.300	34.300	5 substations, distribution, emergency generator
6,2 Water	LS	1	5.125	5.125	3 wells, treatment plant, pipe distribution
6,3 Water Treatment	LS	1	10.600	10.600	Treatment plant; water collection
6,4 Telecommunication Systems	LS	1	0	0	Not included to be developed by third parties
7. Aeronautical Facilities				**156.800**	*Unitary prices: MOP estimates*
7,1 ATC Tower	LS	1	25.000	25.000	Tower + ATC Equipment
7,2 Runway Lighting System	LS	1	49.500	49.500	
7,3 Approach Visual Aid	LS	1	19.000	19.000	Approach lights
7,4 Meteorological Facilities	LS	1	16.000	16.000	
7,5 Navaids	LS	1	47.300	47.300	DVOR/DME; ILS Cat 1
8. Commercial Facilities				**0**	
8,1 Airport Fuel Systems	LS	1	0	0	Not included to be developed by third parties
8,2 GSE Maintenance Facilities	LS	1	0	0	Not included to be developed by third parties
8,3 Car Rental	LS	1	0	0	Not included to be developed by third parties
8,4 Catering	LS	1	0	0	Not included to be developed by third parties
8,5 Airplane Maintenance	LS	1	0	0	Not included to be developed by third parties
8,6 Hotel	LS	1	0	0	Not included to be developed by third parties
9. Other Facilities	LS	1	0	**0**	
9,1 Military Facilities	LS	1	0	0	Not included to be developed by third parties
9,2 General Aviation Facilities				0	Not included to be developed by third parties
10. External Airport Infrastructure	M^2	150000	0	**0**	
10,1 Regional Routes	LS	1	0	0	Not included to be developed by third parties
10,2 Energy				0	Not included to be developed by third parties
Total before Engineering, Gen. Expenses and Utilities			6%	**841.005**	Over Sub-Total (Excluding terminal equip.)
Engineering			20%	38.906	Over Sub-Total (Excluding terminal equip)
General Expenses & Utilities Contract.				129.686	
Total Including Engineering Gen. Expenses and Utilities			20%	**1.009.597**	
Unexpected	Ha.	484	108	201.919	See chapter 5
Land Purchase				52.272	
Construction Total				**1.263.788**	

Table 3-5: Investment Program – Medium Projection (in UF)

PARAMETERS		Phase 1		Phase 2	Phase 3	Phase 4
Multiplier	Proyecciones Operacionales		2010	2015	2020	2025
	Total Ops Peak Hour	-	11	14	17	19
	Comercial Ops Peak Hour	-	4	4	4	4
	Boarding Bridges	-	3	3	3	3
	Departing Pax Peak Hours	-	193	238	285	356
1.9	Total Pax Peak Hours	-	367	452	542	676
10	Size of Terminal @ 10m2/pkhrpax		4,000	5,000	5,000	7,000

INVESTMENT COSTS		Phase 1		Phase 2	Phase 3	Phase 4	
Multiplier	Construction	2002	2003	2009	2014	2019	Totals
	Site Development	67,168	67,168	-	-	-	134,336
							-
	Runway and Taxiways	49,480	49,480	-	-	-	98,960
0.75	1000 m parallel taxiway @ 18 m	-	-	-	18,000	-	18,000
0.75	1000 m complete parallel taxiway	-	-	-	-	-	-
	Apron 4 positions @3610m2 per	-	31,751	-	-	-	31,751
							-
25	Initial Pax Terminal @ 4000m2	-	100,000	-	-	-	100,000
25	Terminal Expansion @ 1000 m2	-	-	25,000	-	50,000	75,000
							-
	Access/Parking	-	25,334	-	-	-	25,334
10.68	Expansion of Parking	-		623	-	1,246	1,869
							-
	Operational Instalations	-	7,600	-	-	-	7,600
							-
	Utility Instalations	-	43,500	-	-	-	43,500
6,525	Expansion of Utilities/1000m2	-	-	6,525	-	13,050	19,575
							-
	Aeronautical Instalations	-	156,800	-	-	-	156,800
							-
	Comercial Instalations	-	-	-	-	-	-
	Military/General Aviation Instalations	-	-	-	-	-	-
	Roads and Power Instalations Outside	-	-	-	-	-	-
	Subtotal only Construction	116,648	481,633	32,148	18,000	64,296	712,725
26%	Engineering and Supervision @ 26%	30,328	125,225	8,358	4,680	16,717	185,309
	Subtotal only Engineering/Superv.	146,976	606,858	40,506	22,680	81,013	898,034
							-
	Initial Terminal Equipment	-	147,650	-	-	-	147,650
23,250	Additional Boarding Bridges	-	-	-	-	-	-
22,463	Other Additional Equipment	-	-	22,463	22,463	22,463	67,389
							-
	Construction + Equipment	146,976	754,508	62,969	45,143	103,476	1,113,073
20%	Contingency @ 20%	29,395	150,902	12,594	9,029	20,695	222,615
	Construction and Equipment Total	176,372	905,409	75,563	54,172	124,171	1,335,687
	Land Cost	52,272	-	-	-	-	52,272
	GRAND TOTAL	**228,644**	**905,409**	**75,563**	**54,172**	**124,171**	**1,387,959**

Even though this study does not provide a definitive comparative analysis between the alternative to expand Maquehue Airport or to build a new airport, it presents a comparison of the different preliminary cost estimates for each option.

Table 3-6 shows a comparison of MOP cost estimates for a terminal at Maquehue airport and the construction of one at the site in Santa Elisa. MOP has provided estimates for the improvement of the present facility, including the construction of a 6.000 m2 terminal. An estimate for the construction of a new facility at Santa Elisa for a terminal of 6.000 m2 has been prepared. For estimate comparison purposes, these should be adjusted to the size of the terminal.

Table 3-6: Estimated Costs for Airport Improvement Construction Alternatives

Airport	6.000m2 Terminal	
	MOP	Consultant
Maquehue	1.052.700	
Santa Elisa w/o road		1.288.788

This table shows that the construction of a new airport (to meet the projected demand in 2020) would costs approximately 22% more than the improvement of the present facility. This amount would increase by 35% if costs to rebuild the Santa Elisa access road were included. One should be careful in reaching conclusions of these comparisons for the following reasons:

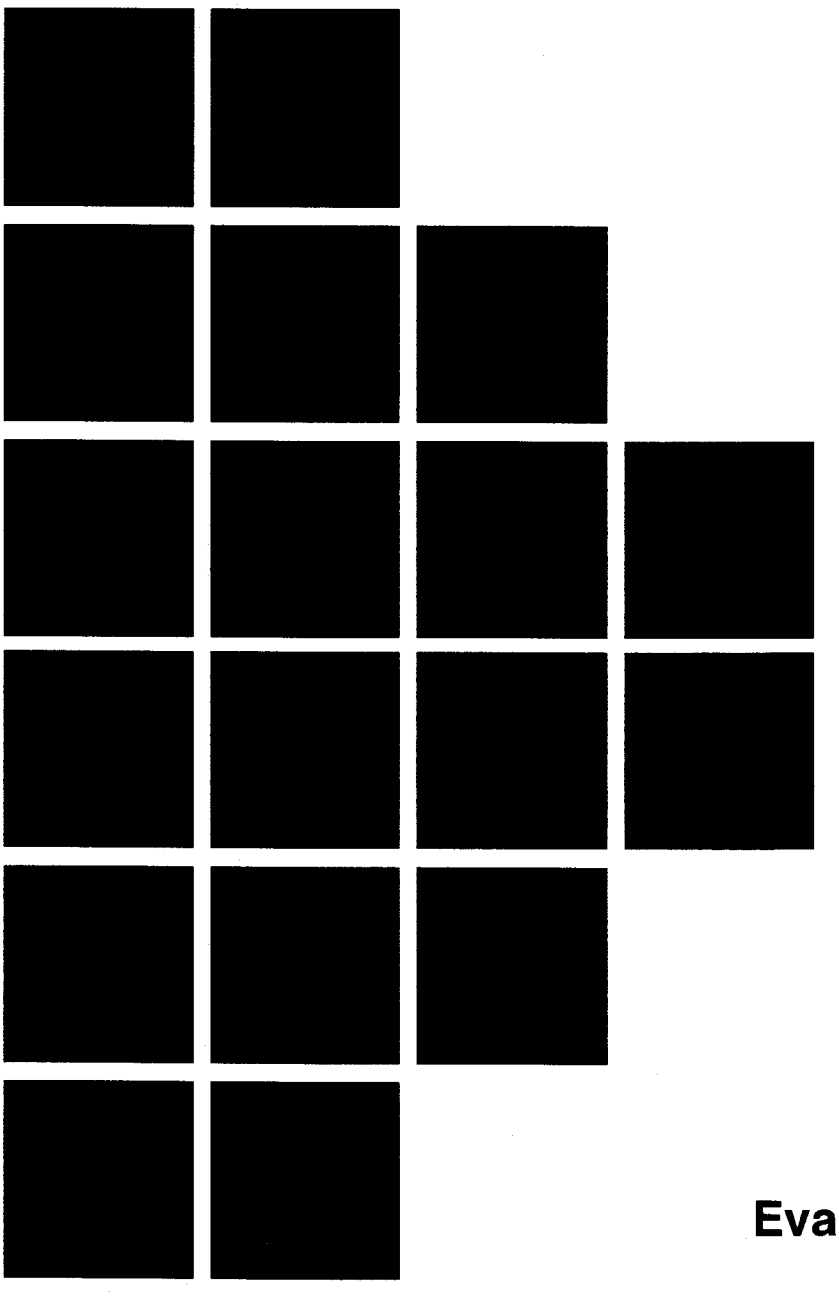
- The costs shown for both alternatives are preliminary estimates, without taking into account all necessary studies to positively determine the feasibility of each one. Among other factors, the location capacity still needs to be determined in order to provide good weather conditions for flying, environmental impact, etc., and the additional necessary investments to resolve these problems.

- Construction cost is not the only deciding factor in reaching a final decision. Among others, the opportunity costs for alternate uses of each property should be considered.

Table 3-7 shows MOP cost estimates for the expansion of Maquehue Airport.

Table 3-7: Cost Estimates for the Expansion of Maquehue Airport (with a 6.000 m2 terminal)

DESIGNATION	UNIT	QUANT.	P. UNIT.	TOTAL	US$ *	U.F. *
1.- Earth Movement						
a) Runway extension	m3	873,400	2,500	2,183,500,000	3,411,719	131,220
b) South area surface	m3	286,080	2,500	715,200,000	1,117,500	42,981
2.- Runway expension pavement (Asphalt).	m2	22,500	10,000	225,000,000	351,563	13,522
3.- Airport platform expansion (reinforced asphalt).	m2	28,000	10,000	280,000,000	437,500	16,827
4.- Parallel Taxiway close to header 06 (Asphalt). L: 1.300	m2	29,900	10,000	299,000,000	467,188	17,969
5.- Recapado asfáltico Pista Actual (e=0.05m)	m2	76,500	3,500	267,750,000	418,359	16,091
6.- New terminal building 6.000 m2. Includ. 3 boarding bridges and equipment	GL	-		2,800,000,000	4,375,000	168,269
7.- Radio support y approach system	GL			698,002,400	1,090,629	41,947
8.- Emergency land and maintenance runway construction.	GL			189,780,000	296,531	11,405
9.- Access crossing, roads, parking.	GL			1,280,000,000	2,000,000	76,923
10.- Taxiway and Air Club platform	GL			127,642,000	199,441	7,671
11.- Expropiations	Há	36	50.000.000	1,800,000,000	2,812,500	108,173
12.- Interior road and fences	GL			101,484,000	158,569	6,099
13.- Control tower	GL	-		320,000,000	500,000	19,231
14.- Interior wire changes	GL		20,000,000	20,000,000	31,250	1,202
15.- Treatment plant	GL	-		128,000,000	200,000	7,692
16.- Runway lighting	GL		150,000,000	150,000,000	234,375	9,014
17.- Flooding defenses	GL			290,000,000	453,125	17,428
			TOTAL $	11,875,358,400	18,555,248	713,663
			25% GG and utility	2,968,839,600	4,638,812	178,416
			TOTAL $	14,844,198,000	23,194,059	892,079
			18% IVA	2,671,965,640	4,174,946	160,575
			TOTAL $	**17,516,163,640**	**27,369,006**	**1,052,654**
			.m.m. US$	27,369,006		



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CHAPTER IV
Evaluation of The Present Airport in Maquehue

CHAPTER IV

EVALUATION OF THE PRESENT AIRPORT IN MAQUEHUE

4.1 Introduction

4.1.1 Objective

This chapter presents a commercial study, which was developed with the purpose of analyzing the achievable value of Maquehue airport, aside from its present use as an actual real physical infrastructure, and the possible uses of these structures and surrounding lands, in order to later analyze different development schemes, and to reach an aggregate value that could be included in the concession value, or make it available for use by third party concessionaires.

Also evaluated within this analysis were urban and road developments for the city of Temuco, as well as demand for urban development and industrial commerce. The possibility exists, that in case the airport is moved, an urban project could be developed in the site of the present airport.

The study also takes into account a first analysis of agricultural and industrial activities in the area, with the purpose of visualizing the activities to be possibly developed, in regards to the airport. These are necessary for the development of the region, as well as the economic development of additional housing.

Also analyzed was the significance of the airport location site, in regards to its tourism development towards the areas of Villarrica, Pucón, Licanray and surrounding areas, as well as the land restitution problem, which affects the Mapuche people in this area, and their impact on the airport.

The object of the analysis is to obtain a sufficient base to allow for demand identification of possible housing businesses, as part of the airport's program, design and post-commercialization, according to needs of an airport like the one in Temuco, taking into account competition and lands near the airport.

The evaluation also takes into account a review of environmental conditions, the situation in the Cautín River, as well as various other conditions and environmental requirements.

4.1.2 Methodology

This chapter's structure is made up of various sections, in which existing information was analyzed, according to the terms of reference of the proposal.

The evaluation of the Maquehue airport must take into account an appraisal of the property and its actual uses, and all structures located within its boundaries. The airport infrastructure accommodates national and international passenger and cargo traffic, FACH activities, and activities of the Air Club of Temuco.

The existing buildings and those annexed to the passenger terminal, within the airport property, and those which are appraised are:

- Passenger Terminal
- Runway
- Taxiway
- Platforms

The following elements have not been considered, due to lack of data for their appraisal:

- Rescue Annex
- Air Club of Temuco Buildings
- FACH Buildings

The methodology and evaluation for the appraisal of the construction and depreciation use and obsolesce, is independent in each case.

The methodology applied to this investigation required information from different sources:

- Data based on **primary sources** of information came from the on-site evaluation, analysis of the Maquehue Airport plans, interviews and meetings with authorities and regional researchers.

- Information which is not identified as a specific parameter or stemming from our direct observation, came from secondary sources, such as publications, catalogs, specialized books, or information obtained from different public and private sources, and particularly from studies carried out by specialists in the region, via the internet, which make up the annexes as web pages from different public institutions.

- Data and registers used in the studies were obtained as analysis, research and measurements from different entities and institutions tasked with the gathering of statistical information. Among these are IATA, the National Institute of Statistics

(INE), Municipality of Temuco, Municipality of Padre Las Casas, Ministry of Public Works (MOP), Regulatory communal and intercommunal plans, Internal Tax Service (SII), Catalogue Plans, PRC, environmental impact studies, Viability Sectra Studies, Hydrologic studies of the Cautín River, New bypass access to Temuco project, Regional Strategy for Development (ERD), Commission for Investment and Infrastructure Planning of Transport, local ordinances, etc., consultant research, statistic analysis, such as the application of parameters, and consultant references.

4.1.3 Plans and Background Information

In order to carry out the appraisal and analysis of the airport, the following official plans were used as base, which were obtained from the Directorate of Airport and the Ministry of Public Works:

TERMINAL BUILDING AND CONTROL TOWER

- Plan scale 1/10.000
- Elevation plan and section cut scale 1/100
- Arrival waiting area plan and general hall scale 1/50
- Structural and foundation plan scale 1/50
- Expansion plan1st floor scale 1/100
- Survey plan of existing building 1/100
- Offices Plan and counters scale 1/50
- Open plant scale 1/100
- Elevation plan scale 1/100
- Pattern plan 1/10
- Partial cut scale 1/50
- Connection details scale 1/5
- Plan, false ceilings scale 1/100

RUNWAYS, TAXIWAYS AND PLATFORMS:

- Horizontal plan for the runway, scale 1/2000
- Regulatory plan of the airport scale 1/1000

Figures 4-1 and 4-2 show the location of Maquehue Airport, in relation to the City of Temuco. **Figure 4-3** presents the Regulatory Plan of the airport at 1/8.000 scale.

Annex C – Part 1 shows photos of Maquehue Airport.

Figure 4-1: Temuco and Surrounding Areas

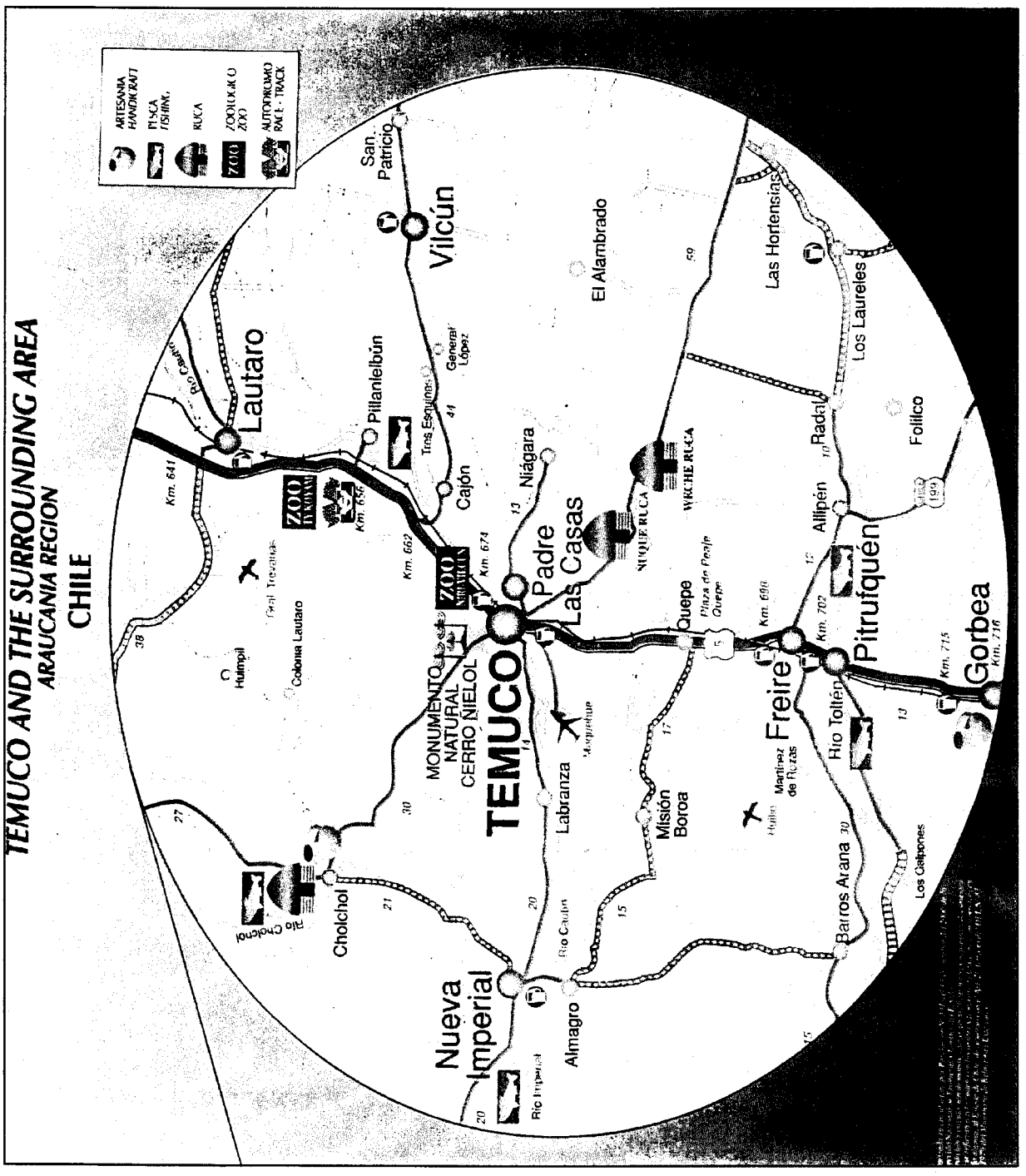


Figure 4-2: Location of Maquehue Airport

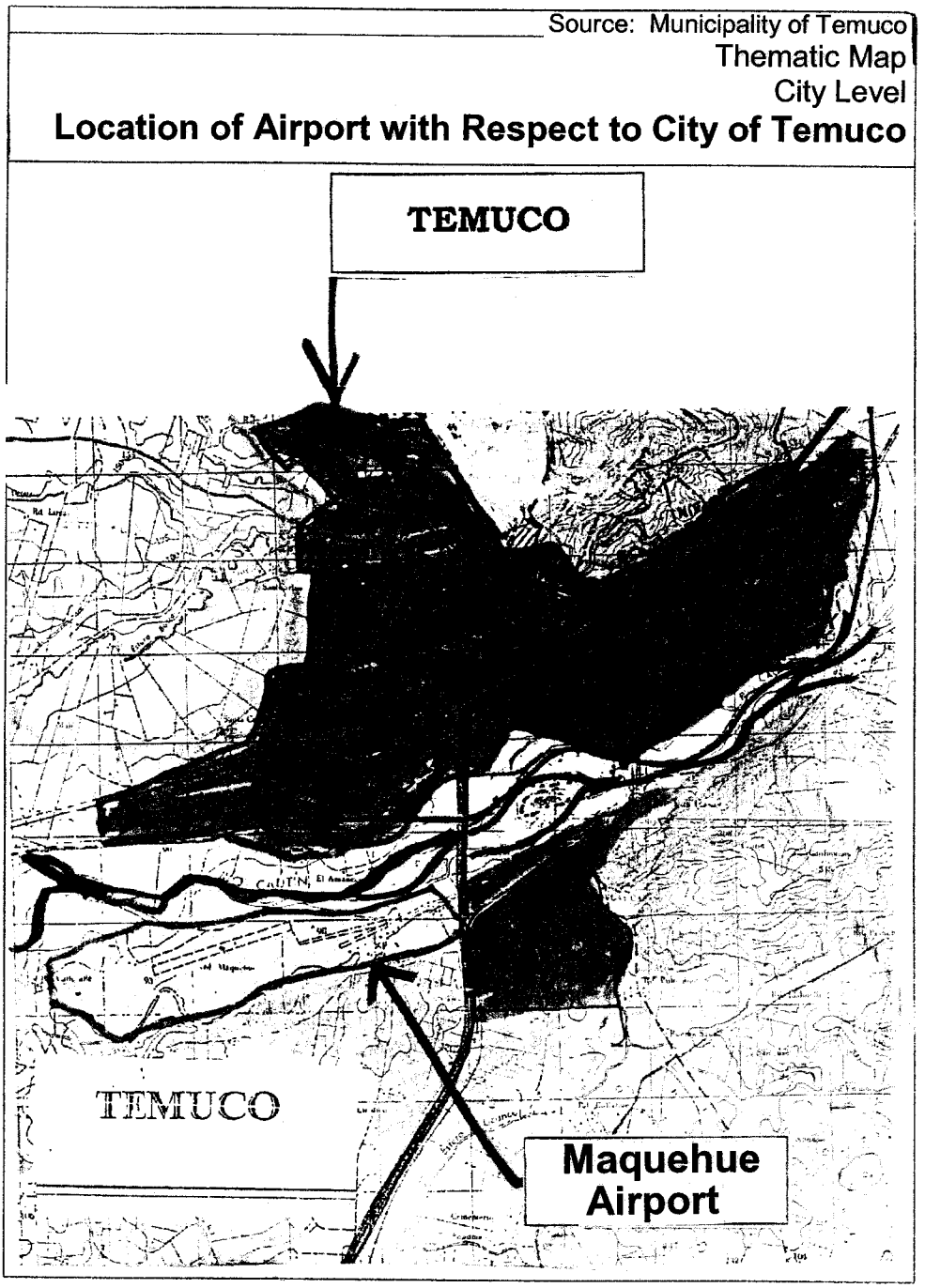
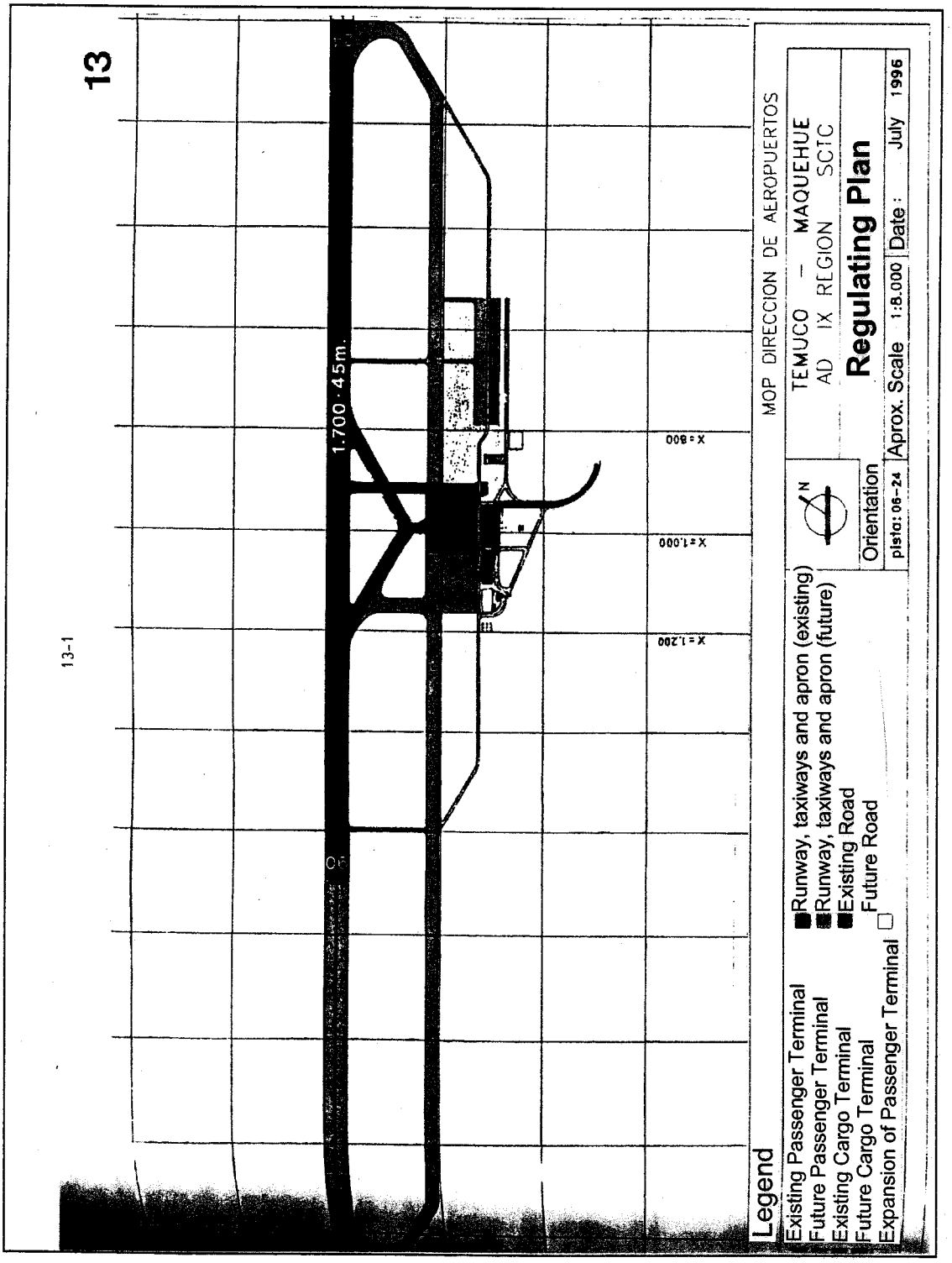


Figure 4-3: Maquehue Airport Plan



4.2 Physical Study of the Present Infrastructure

4.2.1 Description and Technical Specifications

The passenger terminal of Maquehue airport was built in 1962, in the bank south of the Cautín River, with a surface of approximately 266.51 hectares (see **Figures 4-4 and 4-5).**

The project consists of two floors of reinforced masonry, with a surface of 810 m2, and met the needs of airport transportation until 1997, when an expansion of 1490 m2 was made. These expansions was built of a light metallic structure, with a support structure consisting of metal and laminated lining on only one floor, and abut against the existing structure. The remodeling changed the floors in the halls, and provided adequate electrical systems, general painting, refurbishing of bathrooms and change of covers.

a) Technical Specifications

The attached plans (Location, First Floor and Second Level Plans) identify the following by areas

b) Coverings:

The roofing and open areas were covered with a cover type PL Coverpanel PV4 0.5mm. The areas 100%closed a cover Coverpanel L-804.

b) Walls:

- Reinforced masonry
- Partitions and metallic section structures, with an overlap of cardboard plaster on 15 mm, FS 220 panel, and finished gauges of 130, 180 and 250 mm. Exterior vapor barrier insulation, aluminum and 100 mm of expanded polystyrene.
- "Volcometal" partitions, "tabigal" structures, 15 mm/90 mm of finished cardboard plaster.

c) Floors:

- "Microvibrated" floortiles, 30x30
- Enameled tiles, 30x30
- High traffic grade carpet, 1500 grs /m2

Figure 4-4: Maquehue Airport Passenger Terminal Plan

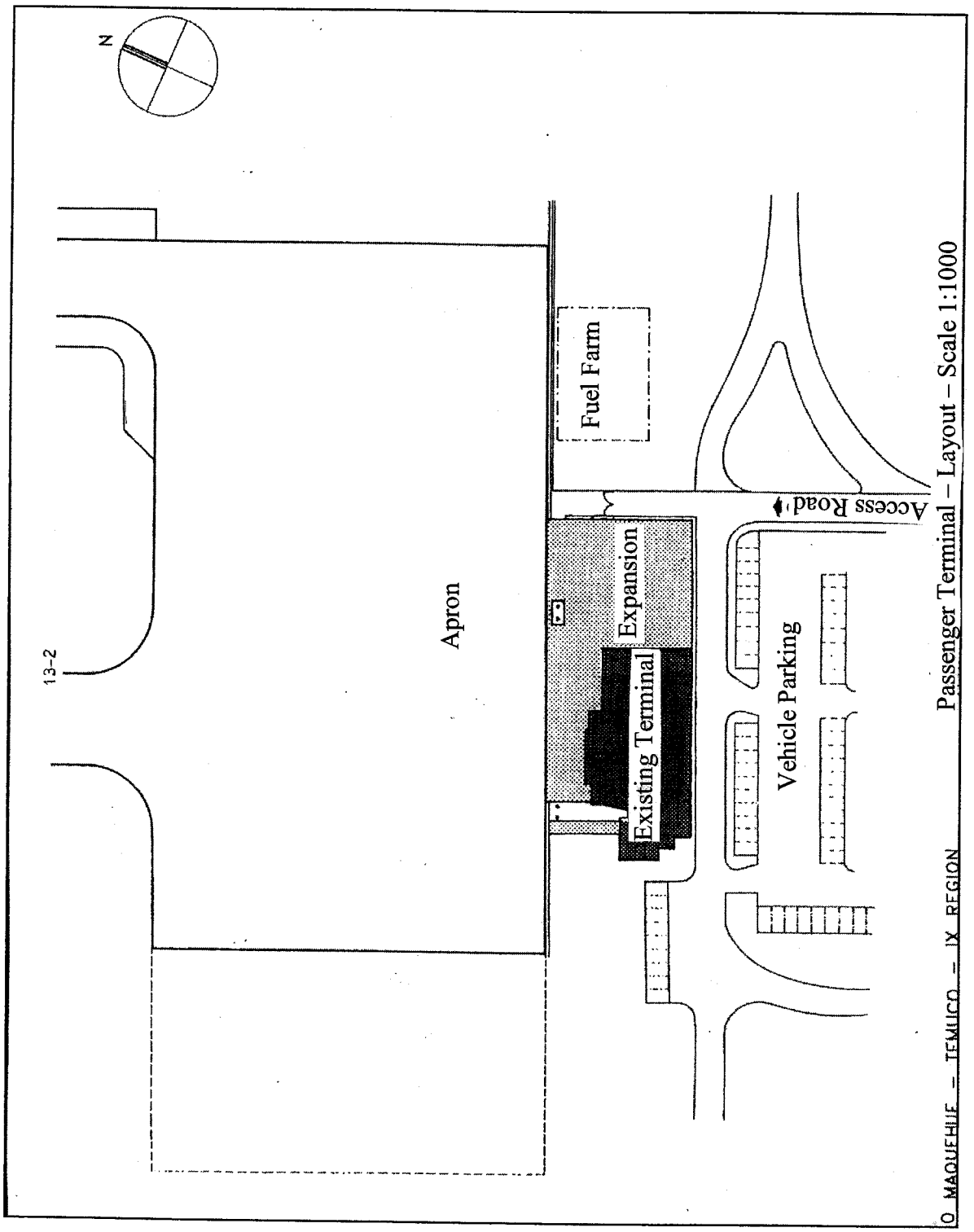
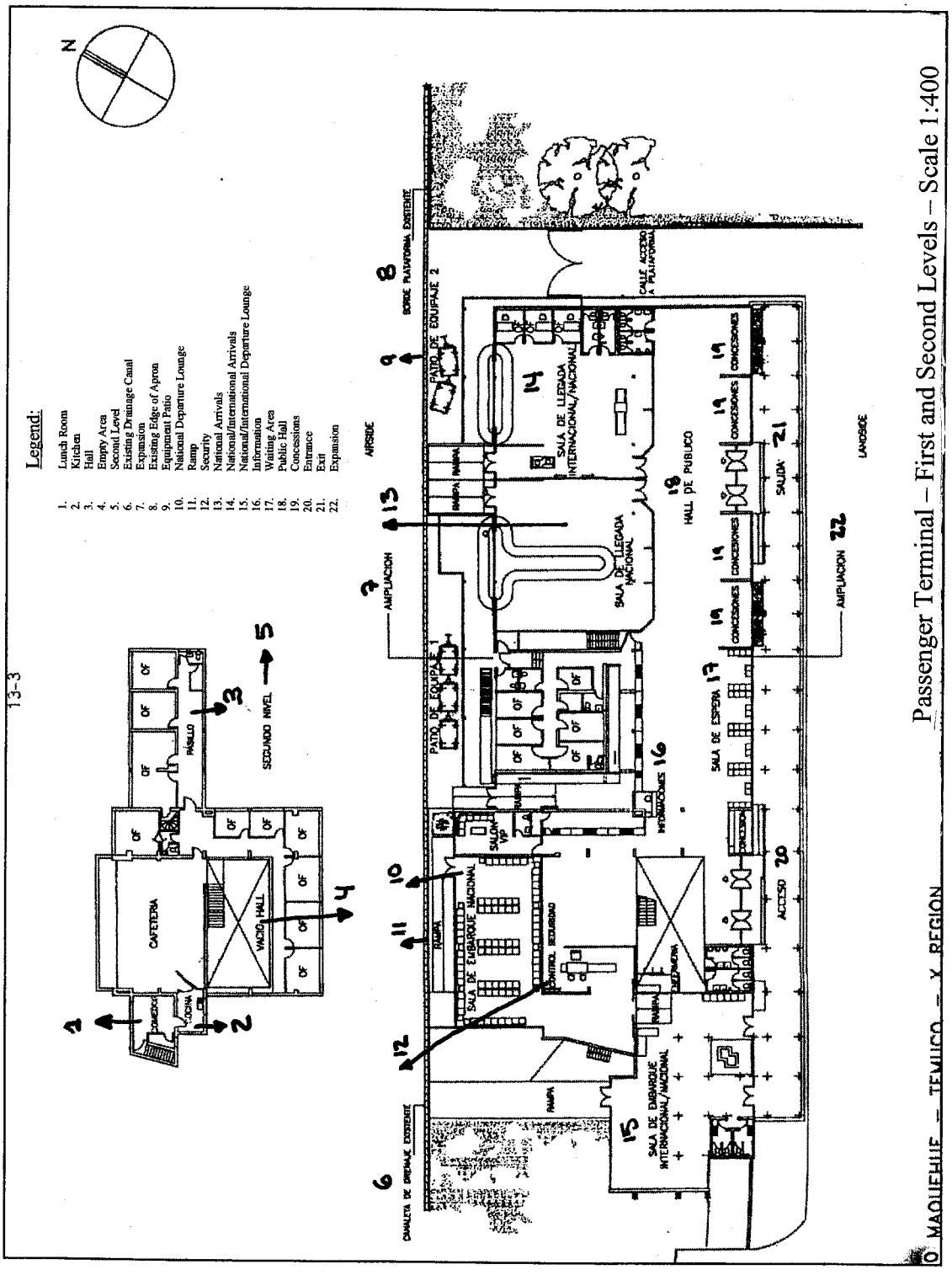


Figure 4-5: Passenger Terminal Plan – First and Second Levels



e) Ceilings:

- Metallic ceilings (covered panel interior)
- American type "false" ceiling", 1220x610 mm ore plates

f) Wall coverings:

- Universal Latex Paint, Color AS 87
- Enameled tile, 20x20
- Wall paper

4.2.2 Appraisal of the Construction of the Passenger Terminal

Table 4-1 was created, based on the analysis of the unitary process for Region IX, in order to obtain a cost evaluation of the construction of the present facility. An annual depreciation rate of 2% will need to be applied to this analysis.

Table 4-1 Passenger Terminal Appraisal – Maquehue Airport

MAQUEHUE TEMUCO AIRPORT			
ZONE A / First Floor	**M2**	**UF/M2**	**TOTAL U.F.**
International Waiting Area	136,23	22,00	2997,06
Men's Restrooms	6,38	24,00	153,12
Lady's Restrooms	6,38	24,00	153,12
VIP Room	24,00	24,00	576,00
VIP Restroom	3,30	24,00	79,20
National Waiting Area	114,00	20,00	2280,00
Enplanement Control	67,24	20,00	1344,80
Electrical Facility Closet	1,75	15,00	26,25
Total Built	**359,28**	**21,18**	**7609,55**

ZONE B /FIRST FLOOR	**M2**	**UF/M2**	**TOTAL U.F.**
Air Line Offices			
Offices	52.04	120,00	1040,8
Halls	12,90	20,00	258,00
Sublevel Access	19,05	18,00	342,90
Men's Restrooms	4,00	22,00	88,00
Lady's Restrooms	4,00	22,00	88,00
Electrical Displays	3,60	15,00	54,00
Counter Area	81,20	20,00	1624,00
Moving Walkway Area	14,00	18,00	252,00
Total Built	**190,79**	**19,64**	**3747,70**

ZONE C / First Floor	M2	UF/M2	TOTAL U.F.
National Arrivals Area	181,90	18,00	3274,20
International Arrivals Area	149,60	18,00	2692,80
Offices	22.59	60,00	451,80
Restrooms	24,80	88,00	545,60
Total Built	**378,89**	**18,38**	**6964,40**
ZONE D / First Floor	**M2**	**UF/M2**	**TOTAL U.F.**
General Public Area	279,40	18,00	5029,20
Concessions	73,40	20,00	1468,00
Waiting Area	38,60	18,00	694,80
Restrooms	16,00	44,00	352,00
Information	3,24	20,00	64,80
First Aid	6,29	22,00	138,38
Total Built	**416,93**	**18,58**	**7747,18**
ZONE E / COVERED MEDIUM AREA SURFACES	**M2**	**UF/M2**	**TOTAL U.F.**
Covered Area Loading and Unloading	315,00	11,00	3465,00
Covered Area frontal access gallery	288,00	11,00	3168,00
Total Covered Medium Area Surfaces	**603,00**	**11,00**	**6633,00**

SECOND FLOOR /	M2	UF/M2	TOTAL U.F.
Restaurant			
Eating Areas	114,00	20,00	2280,00
Kitchen	16,20	22,00	356,40
Personnel Eating Area	9,80	18,00	176,40
Restrooms	2,40	22,00	52,80
Airline Offices, FACH and Air Chief	73,40	80,00	1468,00
Commercial Company Offices	63,20	120,00	1264,00
Total Built Second Floor	**279,00**	**20,06**	**5597,60**
Third floor	**17,20**	**24,00**	**412,80**
Control Tower	**17,20**	**70,00**	**1204,00**
Sublevel	**39,13**	**15,00**	**586,95**

TOTAL BUILT SURFACE	2301,42	17,60	40503,18

NOTE: Equipment is not included in this appraisal.

4.2.3 Appraisal of the Runways, Taxiways and Platforms

The runway has a length of 1.700 meters and is 45 meters wide. Its surface is composed of asphalt, has a resistance of 35 F/A/X/T, and lies at an elevation of 93 msnm. **Table 4-2** shows its appraisal.

Table 4-2: Appraisal of Runway – Maquehue Airport

DESCRIPTION	UNIT	QUANTITY	UNIT VALUE UF/m2	TOTAL VALUE U.F.
1. Earth movement	m3	1.530.000	0,15	229.500
2. Pavement	m2	76.500	0,62	47.430
3. Runway lighting	Global	Global	-	3.187
Sub – Total				**280.117**
Depreciation of 1% annually (w/o earth movement)	38%			19.235
TOTAL RUNWAY APPRAISAL				**260.882**

Taxiways are grouped in three units:

Unit 1	230 x 18	=	4.140 m2
Unit 2	154 x 18	=	2.772 m2
Unit 3	170 x 9	=	1.530 m2
TOTAL			8.442 m2

Two sections in the parking platforms were identified:

Section 1	158 x 100 m	=	15.800 m2
Section 2	200 x 60 m	=	12.000 m2
TOTAL			27.800 m2

Table 4-3 shows the appraisal of the taxiways, and **Table 4-4** shows the appraisal for the platforms. **Table 4-5** shows an appraisal summary of the entire existing infrastructure for the air-side of the airport.

Table 4-3 Appraisal of Taxiways – Maquehue Airport

DESCRIPTION	SURFACE m2	UNIT VALUE UF/m2	TOTAL VALUE U.F.
1. Earth Movement	168.840	0,15	25.326
2. Pavement	8.442	0,62	5.234
Sub – Total			**30.560**
Depreciation of 1% annually (w/o earth movements)	38%		1.989
TOTAL TAXIWAY APPRAISAL			**28,571**

Table 4-4 Platform Appraisal – Maquehue Airport

DESCRIPTION	SURFACE m2	UNIT VALUE UF/m2	TOTAL VALUE U.F.
1. Earth Movement	556.000	0,15	83.400
2. Pavement	27.800	0,62	17.236
Sub – Total			**100.636**
Depreciation of 1% annually	38%		6.550
TOTAL PLATFORM APPRAISAL			**94.086**

Table 4-5 Total Air-Side Appraisal – Maquehue Airport

- Runways	=	260.882	U.F.
- Taxiways	=	28.571	U.F.
- Platforms	=	94.086	U.F.
TOTAL	**=**	**383.539**	**U.F.**

Depending on the type of alternative project developed, the runways, taxiways and platforms are appraised positively, negatively or neutral, depending of the assigned value for each potential purchaser. For purposes of this study, value will not be considered for the potential purchasers.

4.2.4 Land Values

Land values have a direct relation with its proximity to cities, which is why values are higher within the urban limits, and decrease as its proximity moves farther away. Nevertheless, the occupancy of the surrounding lands has an impact on the value of land.

Nevertheless, other parameters or indicators must also be applied, which affect land values. Among them are the number of equipment, sanitary and energy infrastructure, and the natural environment of the area. All these elements combine to increase or decrease the value of the land.

In the case of Maquehue, since these lands are mainly used for agricultural purposes and have no infrastructure facilities, they do maintain an important natural structural pressure to be used for industrial service and housing uses, particularly in the areas near the access routes to the urban centers. This makes the range of estimates values at between UF 0.0722/m2 (12.000.000 of pesos per hectare) and UF .0.1807/m2 (30.000.000 pesos per hectare). This maximum value was paid by the Air Force for a surface area of 4.5 hectares. For purposes of the appraisal of Maquehue Airport, we have considered a value of UF.0.09/m2, which is 25% higher than the minimum value.

The neighboring lands to Maquehue are presently used for agricultural purposes, and are tied to indigenous claims. Its purchase value must correspond to the replacement of these lands in another area with the same characteristics. The fact that the purchased property may later be changed to one of urban development, will require a change in the Regulatory Plan, which will give the property an aggregate value, and will have to be executed by the party acquiring it or the appropriate entity.

4.2.5 Appraisal Summary of Maquehue Airport

The following is a summary of the analysis made above:

Table 4-6: Appraisal Summary – Maquehue Airport

DESCRIPTION	UNIT	QUANTITY	UNIT VALUE UF.	TOTAL VALUE UF.
LAND	Hectares	261,50	900,00	235.350,00
PASSENGER TERMINAL BLDG.	m2	2.301,42	17,60	40.504,99
RUNWAYS	Global		260.882	0
TAXIWAYS	Global		28.571	0
PLATFORM	Global		94.086	0
GENERAL TOTAL				**275.855**

NOTE 1: For purposes of land appraisal, the price of the land was taken into consideration without the operation of the airport; in other words, for an alternate use. If it's decided to keep the airport and go without some areas, the value would be higher per hectare by the size of the remaining airport.
NOTE 2: In valuing the airport, those areas, which have no use due to their conditions, or are for works to be carried by existing airport, should be discounted.
NOTE 3: The property or concession of the military facilities, air club, or that of other third party users at the airport, must be reviewed.

4.3 Evaluation of Environmental Conditions

The area where the present airport in Temuco lies (Maquehue Airport) is ample and flat, limited by hills at the west sector of the runway. A bank south of the Cautín River borders the area to the north. There is no history of flooding in the airport property.

The approaching airport cone is at 75% over non-populated areas. The noise does affect large populated areas, as the airplanes fly over the city length wise, and given the long length of the shape of the city of Temuco, the impact is of major magnitude. The actual frequencies have not implied any discontent from the population of the city against the airport, but without a doubt an increase in the frequencies would create a negative reaction within the community. (The environmental noise effects are not clear. On one hand, it is confirmed that 75% of the approach cone is located over non-populated areas; on the other hand, it is confirmed that noise affects practically the entire city).

According to DGAC, the meteorological conditions at Maquehue affect operations on an average of 100 days per year. The hills to the west of the runway would need to be leveled, in order to extend the runway and taxiway, but the expropriation of these properties for these improvements would affect Mapuche lands. These conditions will increase the difficulty and cost in expanding the existing airport. These limitations could be overcome by installing a uni-directional ILS system, which would reduce delays caused by fog. Nevertheless, this navigation aid would not change any other present geographic obstacles at the existing airport.

In regards to conservation of the natural environment, without a doubt, the fauna is currently at a scarce level, due to current airplane traffic. In regards to the Native Forest, before any development is made, it would be convenient to conserve the existing trees, which are scarce.

In regards to the existence of waste disposal sites in the surrounding areas of Quepe, where the new airport would be located, it was verified that the landfills serving Temuco, Padre Las Casas and Freire are not close to the Santa Elisa property area.

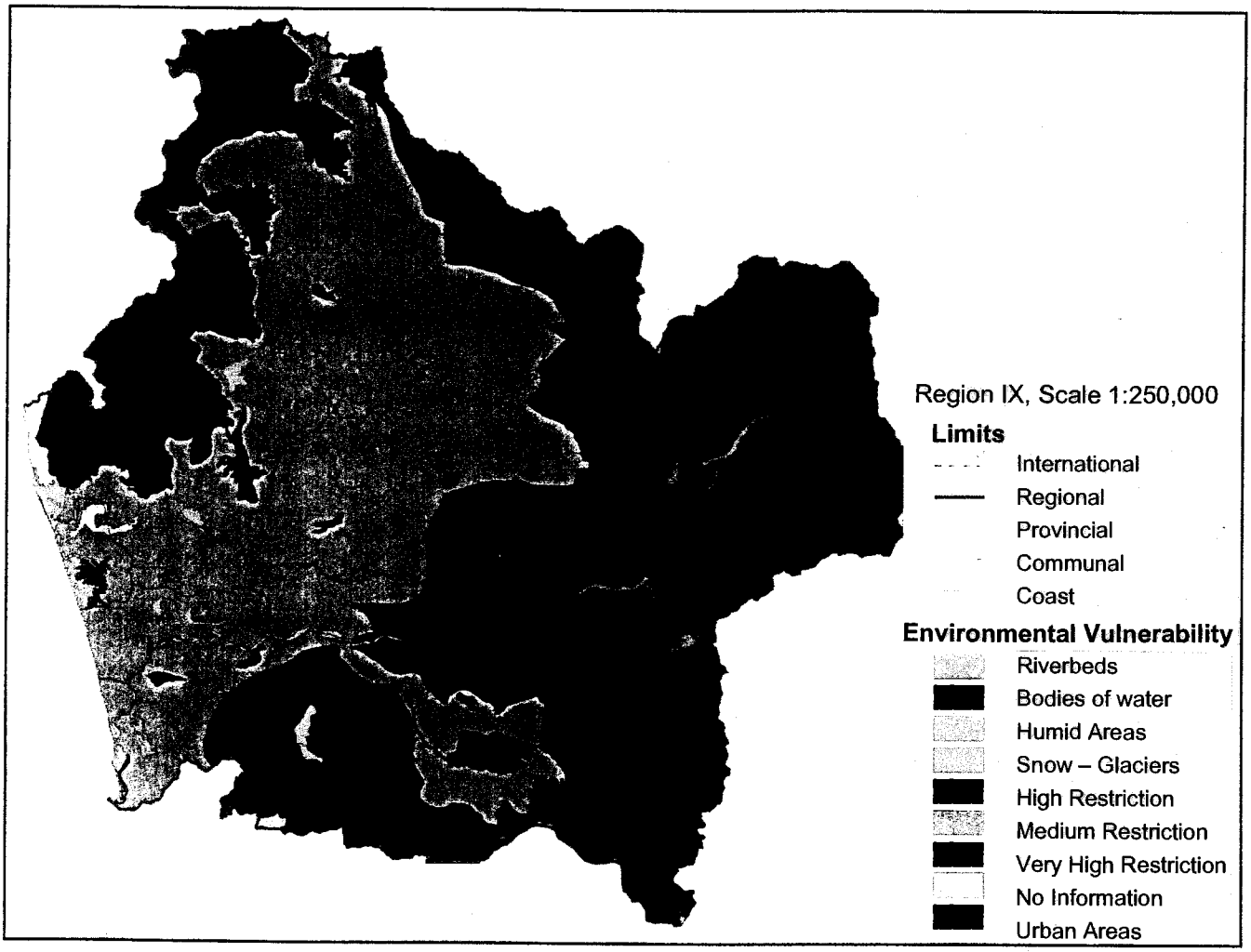
The current waste disposal sites are located in:

- Temuco, heading to Chol-Chol
- Padre Las Casas, heading to Metrenco, on the east side of the highway
- Freire, heading to Villarica, which transports its wastes in the Coipúe area.

Figure 4-6 presents a plan, which defines the environmentally vulnerable areas of Region IX. **Annex C – Part 2** has thematic plans, which show the following specific characteristics for the Region:

- Outstanding Restriction
- Archeological Areas
- Vehicular Flows
- Geo-morphology
- Soil Use
- Indigenous Areas
- Agricultural Soils

Figure 4-6: Environmentally Vulnerable Areas – Region IX



4.3.1 Cautín River

According to the Cautín River Flood Risk Study of the north bank, which was carried out by PRISMA Consultores at the request from the Municipality of Temuco and the Government of Chile in 1997, the retaining walls were built along the north bank of the Cautín River, in order to drain populated areas historically affected by floods. It must be stated that retaining walls were also built in the south bank, across from populated areas.

The Municipality of Temuco, in order to verify the retaining wall designs for periods of 100 and 200 years, and to be assured that the protection would protect large populated areas, requested the study, which was used as reference. The volume design used was 2.552 m3/sec. and 2.795 m3/sec., respectively.

From the reference studies, it can be concluded that the south bank of Cautín River, which borders to the north of the Maquehue Airport property, is not vulnerable to flooding, since its ground level is greater than the highest part of the protections built at the north bank. [1]

Due to deforestation and tangency in the curves, there exist certain risks of the erosion of the property; these have been already observed in the area where the FACH facilities are located. A more detailed study will be needed in order to evaluate the necessary protection.

4.4 Possible Development Alternatives

4.4.1 At the Existing Facilities

The physical facilities of the Maquehue Airport and its dimensions allow for the development of different projects; be it for the development of aeronautical operations in the same area or the construction of an airport in another area. These issues will be discussed, along with the development possibilities in the adjacent areas.

Modern airports nowadays are being transformed into important commercial centers, due to an increase in commercial public use, or an increase in the growth of passengers.

This change has been generating a new commercial center concept, which in turn has been intensifying the demand for new commercial centers and services, or at least generates new opportunities for the development of these concepts.

The greatest asset for a commercial business is its ability to attract foot traffic. All commercial developments always look for an ideal location to allow them to generate this foot traffic. Once generated, it is possible to keep complimenting the business, in accordance with the growth in demand.

Airports have a great advantage in the fact they have their own flow of foot traffic, and is a place of destination; in other words, there is no other traffic alternative for these services, aside from the fact that the foot traffic flow at the airport is stable, and is maintained with the growth of commercial aviation.

[1] There were no specific technical studies for the sector of the airport.

Passengers must arrive at the airport at least one hour ahead of departure, and when they do they must "kill time", which creates the clear opportunity for business.

The normal infrastructure of an airport creates spaces between the departure and arrival operations, which imply distances between the exit doors, which must be "filled", in this case with commercial opportunities.

The separation of the customs and immigration process areas imply a separation of the accompanying party from the traveling party, and this also creates for the development opportunity of specific or mixed commercial areas for each one of these parties.

Connecting flights are not always executed on time, and often the passenger must wait for hours at the airports, with the question of "how to kill time".

Table 4-7 presents a commercial use program; in other words, profitable areas according to the following sections:

a) Commercial Locations

Generally, passengers want to take a gift or souvenir to his or her family of the place where they visited, and sometimes they do not have time to buy these items before reaching the airport.

Newly developed airport statistics show that passengers will spend on average between US$8 and US$10 per trip.

For this purpose, it is important to research, evaluate and define commercial areas taking into consideration the mix of tenants, and what the market mandates.

Statistically, a minimum parameter of 1.4 m2 per 1,000 annual passengers has been assigned, on which the commercial area can be defined.

The Airport in Temuco has traffic of 260,000 passengers annually, which would imply the allocation of 378 m2 for commercial area use.

b) Service Areas

Also envisioned, as basic services are cafeterias, restaurants, telephones, food vending machines, and ATM machines. But aside from these services, and for the globalization and business-related nature of trips, bank services, as well as areas for important passengers and business centers have been incorporated, so as to transform the airport into a true commercial business, along with the complimenting facilities.

It is also common in new projects to place waiting areas, and particularly seating arrangements close to or near to food facilities and other commercial business, in order to induce the passenger to consume these products.

Table 4-7: Commercial Use Program – Maquehue Airport

CONCEPT	N° AREAS	LOCAL SURFACE M2	TOTAL AREA M2
COMMERCIAL AREAS			
Arts and Crafts	3	25	**75**
Newspapers and Magazines	1	20	**20**
Gifts	2	30	**60**
Candies and Sweets	2	20	**40**
Clothing stores	2	30	**60**
Watches and Jewelry	1	30	**30**
Travel Agency	2	20	**40**
Vehicle Rental	2	25	**50**
Sub – total	**15**		**375**
SERVICES			
Cafeteria	1	40	**40**
Restaurant	1	200	**200**
Business centers	1	60	**60**
Bank	1	60	**60**
Telephone	8	2	**16**
Vending Machine	4	4	**16**
ATM Machine	1	6	**6**
VIP Area	1	60	**60**
Sub - total	**18**		**458**
OFFICES			
Public Services	3	30	**90**
Airline Services	3	30	**90**
Sub - total	**6**		**180**
TOTAL	**39**		**1.013**

c) Offices

Commercial airlines, as well as cargo companies, customs and others, require facilities for their administrative purposes, which could be located within the commercial facilities.

4.4.2 In the Property in General

In addition to the commercial areas previously mentioned, we have considered other complementary concepts, under the assumption that the airport stays in the same location. These concepts are summarized in **Table 4-8** and presented below.

Table 4-8: Complimentary Use Program – Maquehue Airport

CONCEPT	N°	LOCAL SURFACE M2	TOTAL AREA M2
Hotel (32 rooms)	1	1.308	**1.308**
Warehouses			
- Refrigerated	6	60	**360**
- Dry products	12	200	**2.400**
Services			
- Customs	1	400	**400**
- Export Certification	1	60	**60**
- Transit Warehouses	2	120	**240**
TOTAL			**2.384**

a) Hotel

A small hotel could be justified, due to its proximity to the airport facilities, so as to: Include the justification of a hotel for the region and areas of interest, such as current hotel capacity, % of utilization, growth in the hotel sector, etc.

- Route 5, which allows the development of a hotel on the way
- Due to its location in an area close to tourist attractions access routes, particularly in the areas of Lakes Villarrica, Licanray, Panguipulli, etc.
- The fact that the airport requires special maintenance which comes from outside
- The fact that due to delays and navigation hours, crew members must be replaced and stay on land
- The fact that the airport is not only used by passengers from Temuco, but also from passengers from other distant areas as well. These latter users benefit from a hotel stay before their flight

- The fact that technical problems could delay flights and passengers must return to the cities.

We have considered that the development of a hotel with these characteristics would have 32 rooms, of which 50% must be occupied at a minimum to stay acceptable and profitable. If the hotel is to be built in airport property, as is the case with food and beverages, its operational costs could be reduced to a minimum.

Table 4-9 shows the main characteristics of a hotel with 32 rooms.

Table 4-9: Hotel Surface Program

DESCRIPTION	No.	Unitary Surface	Total Surface m2	Cost UF/ m2	Total Cost UF
Room + bathroom	32	25	750	22	16.500
Waiting areas	2	104	208	15	3.120
Greeting area and services	1	350	350	20	7.000
TOTAL			**1.308**		**26.620**

The assumed parameter implies the development of a room per 25 passengers/day, and assuming that the number of rooms, for reasons of economy operations, must have a multiplier of 8.

The above implies that it will be necessary to expand the hotel to 48 rooms when the airport reaches 438,000 passengers annually, and 60 rooms when the flow of passengers reaches 547,500 per year.

When the airport reaches 750,000 passengers per year, the hotel must have a capacity equivalent to 80 rooms. Therefore its design must take this increase into consideration.

b) Warehouses

Temuco is a city for transit of goods within the region; therefore the big companies operating there need warehousing and storage facilities. The area also produces many products for export, such as natural products and salmon, which require refrigerated storage. These storage facilities do not need to be located within the city, but rather, to cut costs, in facilities on the way to or near the airport.

It is also important to take into consideration that various manufactured industrial products, such as furniture and wood homes, printing products, paper, seeds, flowers,

various arts and crafts and other products are also exported. These products require storage space, whether it is for air or land transport.

The aggregate value of the regional industry has presented a sustained growth of 120% in the last few years, making this one of the highest of the regions, if it is compared to a growth of 37% for the entire country.

We have considered that in the first stage, the construction of a central warehouse could be considered, with the following specifics:

6 refrigerated warehouses of 60 m2	360 m2
12 dry product warehouses of 200m2	2,400 m2
	2,760 m2

The estimated costs for the development of a warehouse area are presented in **Table 4-10.**

Table 4-10: Warehouse Program – Maquehue Airport

Warehouse	No.	Surface / Unit	Total Surface m2	UF Cost/ m2	Total Cost UF
Refrigerated Warehouses	6	60	360	8	2880
General Warehouses	12	200	2400	4	9600
TOTAL	**18**		**2.760**	**12**	**12.480**

The refrigerated warehouses have a height of 3 meters, and refrigeration equipment for loading platforms measure 1.20 x 1,20x2.25 in height. The warehouses for general storage have a mat, pre-painted covering and electrical system base.

4.5 Adjacent Area Study

4.5.1 Evaluation of Complementary Airport Activities

The possible uses for development in the adjacent area of the airport, which were mentioned previously, could be extended for other uses, if necessary, such as for airport operations purposes that would require indigenous community land in order to extend the runway. This would be subject to indigenous community purchase conditions, and compensation negotiations, under the indigenous law. In this case, the sale of property offer could be extended to other purposes, within which we must consider:

That the work was carried out using the information from the complimenting planimetric studies of Temuco. This corresponds to the Inter-communal Regulatory Plan, which

has not been approved, but without a doubt, before any change is made, measures by the Ministry must be executed in order to change the present proposed use, specifically with the attached plans which correspond to:

1. Schematic survey and existing adjoining uses
2. Territorial planning instruments
3. Commercial use land registry
4. Industrial zones

- According to the survey carried out in the immediate zone of the airport, the existing uses are Warehouses and Cabins, motel type.
- This is followed by industrial and warehousing uses
- The populated areas with housing are distant from the Airport
- According to the Territorial Planning Instrument, the only use that could affect the development of complimenting activities to the New Airport is the zone for the exclusive use of infrastructure.
- According to land registry information for the city of Temuco, the commercial and warehousing activities are scattered in various areas. On the other hand, the industrial activities are located in the three access areas to the city (see land registry)

a) Neutral Industrial Zones

The characteristics of airports, and particularly the limits generated by the aeronautical cones, make the neighboring properties ideal for neutral industries. The major problems generated by these are noise, but are less than what is produced by airplanes.

The previously mentioned assumptions, regarding the proximity to storage areas, distribution and transfers, make this compatible.

A detailed study is needed to measure the size of an industrial park in this sector. For this purpose, the support of regional authorities can be counted on, through their programs. These authorities look for the generation of technology and investments for the production of goods and services, which the area has a comparative advantage in, and to transfer the existing parameters, which the public sector invests 6.2% annually in, and the private sector 2%. For this purpose, various promotion instruments are being executed for the productive diversification and to increase the export nature of the zone.

The Regional Development program promotes the creation of industrial and technological parks and/or urban/industrial zones, with specialized services for PYME.

Among the reasons for an increase in demand for these types of facilities are the consolidation programs of Temuco for the exports of its products, particularly those of

high value, through the new international airport, loading ports, customs and other services, and the development and integration of Pino Hachado, Mamuil Malal and Icalma, for their integration at the land level.

b) Warehouse and Distribution Areas

Depending on land and industry size, the warehouse centers must be expanded in accordance with the demand required of these facilities. In general, the small industrial companies make use of their entire space for production; and the warehouse areas, which are best when they don't occupy industrial areas, and given their flexible or stationary nature, vary permanently in regards to their size, and therefore need the most flexibility.

This proposal favors the fact that La Araucanía does not have loading ports, customs or similar services, which would make possible its installation within the industrial complex and its warehouses, and therefore help to push the region with the incorporation of a support infrastructure, as is the case in Seco Port, which presently is very attractive to export-oriented investors.

Temuco already counts with the presence of the most important commercial retailers from the capital. Sales indicators from these retailers, as well as those of supermarkets and commerce in general are very dynamic, and have generated the expansion and installation of industrial product distribution centers at the highest level, which operate from Temuco and towards the southern part of the country, making the city a principal service center for the southern part of the country.

c) Housing Areas

The city of Temuco has grown to the point of neighboring the existing airport. Any surplus of land could manifest to the development of housing by real estate agencies, similar to the ones built on the County of Padre Las Casas and Camino a Nueva Imperial. These populations have had great success in sales for low-income socio-economic groups, which were also supported by housing and subsidy programs.

If the airport were to be moved, demand for these properties for real estate development would be imminent, and all previous development would be favored by the proximity of labor to the work sites.

Real estate development of this type would create 55 homes per brute hectare, assigning lots of between 120 and 140 m2 for each one, and houses between 40 and 80 m2. The projects carried out in the areas close to the Santiago Airport are important as they have similar characteristics, in particular the development in Renca.

If this type of development is chosen, it should be considered the fact that these projects will be developed on land, which is close to 0.27 UF per m2, so that they may

be profitable. This value is per brute surface; in other words, without urbanization, given the location and housing characteristics that will be or could be developed.

Generally, 70% of the area to be urbanized and 30% for industrial use over brute surface should be considered, for equipment and other uses.

d) Residential Equipment Areas

If new populations are developed, or if neighboring populations with bridges over the Cautín River are included to the existing areas, it could lead to a major commercial development, which could be defined, according to its volume needs for a commercial center of a municipal type, within which a supermarket can be included as base or anchor, as well as accompanying smaller stores.

Therefore, this increase in growth would stimulate the need for other complexes or urban fixtures, such as schools, Servicenters, etc.

e) Recycling of Existing Facilities

Regional Development Strategy (ERD) studies, mandated by authorities and regional leaders for the period between 2000-2010, suggests the need for a change of major activities for the population, which would allow for the poorer sectors to improve, particularly the Mapuche Community, whose economy is affected by the deterioration of the soil and forest resources.

If the aeronautical facilities are moved to another location, we would need to find a new use for the existing facilities, which, due to its characteristics, could support other uses, such as:

Commercial Center, since we assumed that with the move of the airport, this existing property will be used for mixed projects, such as housing and industry, it will also require a large number of commercial spaces.

The size and shape of the airport building allows for its reuse without major difficulties, since it has a width of 32 meters, which is the minimum size required for a supermarket. On the other hand, it could also support the development of a standard-size commercial gallery, with stores on either side.

The existing layout of partitions can be easily removed, and the lights between the structure are apparent for this development.

It is also feasible to leave the existing structure for the use of the commercial gallery, and incorporate the supermarket onto one of its lateral sides. The second floor can be used as administrative areas for the commercial stores, or can be maintained as a cafeteria.

The existing parking areas can facilitate this commercial development.

Housing: As was previously explained, the land is ideal for this type of development, and according to the dimension of the areas to be reused, an adequate program and its equipment necessities will be defined.

Educational Establishments: Average schooling of the regional population averages more than 10 years, which would make necessary the expansion of the local universities.

The development of Temuco as a University City, has been very important in the last yew years, and has helped in the development and growth of the city's population, unlike other cities in the country, which have growth rates of between 1% and 2% annually. Temuco's rates have reached close to 8% in the last few years.

The city and its Universities need to expand and should include a University Campus. Also, the University of Santiago has expressed interest in creating a University in the area, for which large amounts of land will be needed, like the ones that will be left behind by the airport, in which case it too can be reused to house centers of study.

4.6 Evaluation of the Agricultural and Industrial Activities of the Area

According to the regional statistics of the Central Bank of Chile, the most important regional productive activities are the production of Agriculture, Cattle and Tourism.

a) Agriculture and Cattle Ranching

Agriculture farming and cattle ranching are concentrated primarily in grain and game. These sectors are made up of a large number of small-scale producers, generally associated with bad soils. Presently, there has been an increase in watered land, artificial pastureland and improved prairies, which have changed traditional cultivation, for the development of cattle ranching. Cattle ranching is a developing sector, but is affected by the buying power of milk producers.

There is an effort to identify other types of products for the global market. Berries and artisan cheeses are an example of this phenomenon. Fish production does not represent high export figures, due to the fact that the Ninth Region counts with only one Artisan Port in Queule. The fishing center is located in the tenth Region.

b) Forest industry

The forest industry is an emerging sector, given the volume in plantations and existing forest soils

c) Tourism

The manufacturing industry has registered a favorable tendency for gradual industrialization, according to national industrial surveys (ENIA), and has increased its presence in the country by more than 100%. Its aggregate value has grown by more than 120% during the period, which is one of the highest among the regions, if it is compared with a growth of 37% for the same aggregate value for the entire country.

Among the principal products of the sector are berries, furniture, wood homes, printing supplies and products, salmon, and artisan products, including foods and souvenirs.

Tourist Resources

The region of Araucanía has many diverse and distinct tourist resources, which are based on the great quality and variety of natural resources, which have been growing in the region as a modern activity, with an international outlook. There exists a program for this purpose, which is found in a study titled ERD, Regional Development Strategy, developed by the authorities and regional leaders.

The principal resources include:

- Views: made up of volcanoes, lakes, hills, native forests and mountain ranges.
- Attractive urban and rural areas, with excellent equipment and food supply.
- International roads to Argentina, which allows cross-border travel to the health resort city of San Martín de Los Andes.
- Villarrica, Calafquén, Panguipulli, Colico, Caburgua, Riñigue, Pellaiga and Pirihueico lakes.
- Budi Lake, which is the only lake in South America with salt waters, along with its bays, ports and Mapuche towns.
- Waterfalls in El Salto del Huilo-Huilo, Bellavista y Los Copihues, Palguin, la China, El León and La Turbina.
- Llaima, Villarrica, Quetrupillan, Choshuenco and Carrán volcanoes, all of which erupt and are normally active.
- Ski areas in the Villarica volcano, with one of a kind characteristic.
- Morrena Glacial, with its glacial accumulations which can be appreciated in all the lakes
- The Mapuche landscape, its population, arts and crafts and traditions
- National parks, such as: Villarrica, Conguillio and Huerquehue
- National reserves of Malalcahuello, Galletué lake, China Muerta, Villarrica and Mocho-Choshuenco.
- Health spas developed around its lakes and thermals.
- Casinos

- Health related tourism through use of thermals and spas, such as the ones found in Quimey-co, Huife, Los Posones, Palguin, Menetue, San Luis, San Sebastián, Coñaripe and Liquiñe
- Fishing on its navigable rivers, particularly in Toltén and Cautín, as well as shore fishing.
- Water sports, such as: water skiing, wind surfing, jet skiing, etc.
- Artisan markets

As a gateway to Araucanía, Temuco possesses a great opportunity to increase its tourism development through all the natural resources around the city, which are located at short distances, making it easier to enjoy the exceptional views, lakes, mountains and snow-peaked volcanoes.

During the period of 1990 through 1999, the External Investment in the Region was US$72,014 million dollars, of which US$59,841 was allocated to the industrial sector.

4.6.1 Export Products

According to INE, exports from the 9th region are the lowest in the nation. Its average annual participation in total exports from the country does not reach 0.2%, and its amounts fluctuated from a low of US$13.7 million in 1992 to a maximum of US$24.8 million in 1995, stabilizing at US$20 million per year during the last five years.

Main products presently exported from the ninth region include:

Furniture	US$ 7.935 M
Forest products	US$ 7.850 M
Agriculture	US$ 3.137 M
Food Items	US$ 1.105 M
Fruits	US$ 333 M

In analyzing the exports and their destinations at the economic block level, it can be said that in 1999, for exports from the 9th Region of Araucanía, its principal export partners were APEC, with 45.3%, followed by NAFTA countries, with 32.5%, the European Union with 12.9%, MERCOSUR with 8.1%, and the Andean Pact Countries with 1.2%.

The figures are not exact, since many of the exported products from this region are not declared, as there is no customs (there is no land customs, only aerial).

4.6.2 Conversion and Services Products

The manufacturing and financial services sectors occupy the second ranking Internal Brute Product (see INE table in **Annex C**).

The main conversion activity is the production of wood sub-products, such as parts and pieces for furniture, and wood panels for construction.

Fishing and fruit farming production is not included in the aggregate value. There are no frozen products, and products are conserved in only small quantities. In this manner, a gathering center for artisan products would be beneficial to the region, since this initiative is being implemented at the local level, but does not yet exist at the regional level.

Temuco is the financial center of the Region. All the major banks have set-up one or more branches in Temuco. Banco Santander has three branches, Santiago has two, and Sudamericano and others have one branch.

As the region develops, the new Airport in Temuco could contribute to the development of Temuco, with new customs offices and gathering places. These would allow for the processing of exports, which currently is not present in the region. Among them are: furniture, fruits and fresh and frozen products, which can be transported from Temuco to Santiago, and to the rest of the markets.

4.7 Present State of the Lands

4.7.1 Restitution and Occupancy of Lands (attached background)

According to Indigenous Law 19.253, which was approved in 1993, Chile recognizes that the most important cultural manifestation of the original populations is the fact that "The land constitutes the most important fundamental base of its existence, because its base of subsistence is Agriculture".

Law No. 19.253, Article 13

The lands that are hereby referenced to, for the national interest, will enjoy protection by this law and will not be enjoyed by others, nor will they be seized, nor acquired by orders, unless it is between indigenous communities and people for the same ethnicity.

Nonetheless, this shall be authorized by an authorization from the governing entity. This obligation will not include the home-space of the indigenous family, and the necessary land for their subsistence.

Equally, lands whose entitlements are Indigenous Communities will not be rented, given to third parties for use, possessed or administered.

Natural indigenous persons could "serlo" for a period of no more that five years. In any case, the lands, with the authorization of the governing entity, could be exchanged by non-indigenous lands of similar commercial value, dully accredited.

The acts and executed contracts in violation to this article will be annulled.

CONADI is the institution that handles the State resources destined for land restitution, through the Land Funds. They buy around 47,000 hectares annually, of which 36,000 have been in the 9th region. Presently, the conflicts between the original populations and the Chilean State of Region 9, or the Araucanía region, have their origin in forest development and the execution of infrastructure works, (RALCO and MININCO). According to Law 19.253, the Mapuches cannot sell, they can only exchange their properties. CONADI maintains the Land Funds to resolve community demands. The present asking buying price is between $500.000 and $1.500.000 per hectare.

The Mapuche ethnicity is the original population of the 8th, 9th and 10th Regions, and the largest in the country. According to MIDEPLAN, the indigenous population is 635,376 people, of which 80% are Mapuche. Their territory historically lies between the Bío-Bío River and the Island of Chiloé.

Annex C presents the complimenting planimetric information in the plans numbered:

3.- Region
4.- Inter-comunal Area
5.- City of Temuco
6.- Plans of indigenous land locations in the communes of Temuco and Freire
7.- Plan and tables of neighboring communities/favor titles
8.- "Hijuelas" Plans

4.7.2 Impact of the Development of the Expansion of the Airport

The Airport in Temuco (Maquehue) was built over ancestral Mapuche lands, belonging to the communities of Francisco Zenon Melivilu (T.M., No. 960) and Juan Llancanao (T.M.N 1012). Both communities were transferred from the area, under Law 4.332, dated July of 1928, and Decree No. 836, dated October 25, 1973, from the Ministry of National Defense, and others. The expropriation writings are in fs. 17 vta. No. 21, dated 1973.

All lands around the airport are indigenous lands. **Figure 4-7** shows the communities near the airport. The areas marked in brown are indigenous colonies, and as can be seen, they surround the airport on the west and south sides. Taking into consideration the location of the river north of the airport, any expansion would in effect mean the execution of the compensation of lands under the Indigenous Law.

4.8 Urban Development – Maquehue Airport

In the medium term, the Airport in Maquehue has the clear possibility of reusing its air terminal facilities for different uses, such as: Commercial center, supermarket, educational center, warehouses, neutral industry facility, dry port, etc.

The development of an airport in the Quepe area would make these lands available, and allow their integration into the city of Temuco. This is feasible by improving accesses and crossings of the Cautín River, therefore facilitating its connectivity to the city and resolve disarrangement of the road system.

On the other hand, the by-pass project will noticeably improve this sector, as it will place it near the major traffic areas, making its access easier and more direct.

The goal of the Regulatory Plan of Temuco is to look for ways to densify, revitalize and create sub-centers, as part of its long-term strategy. In this case, the area of Maquehue is fit for the development of an urban area of this type[2].

On the other hand, the area of Maquehue has been considered for the expansion of the housing sector, and as an appropriate low-density growth alternative; in other words, as single family homes.

It is also important to consider that to the south of the border of the city of Temuco (south of Cautín River), towards Route 5, an industrial corridor has been developed. This corridor presents a relatively high grade of consolidation, with stable industries. The location of this corridor is a result of high cost of land in urban-industrial areas, which forced industries to look for cheaper land outside the urban limits. From the point of view of the Municipality, this does not present any inconveniences, since it is preferable to keep industries out of the urban areas, and grouped together.

According to the population's tendency projections, the estimated demand for urban land in the area for the period of 1995-2015 would be approximately 2.475 hectares. The area of Maquehue could absorb part of this demand.

[2] As reference to Annex C – Part 3 contains maps, which show the urban growth of Temuco from 1962, to the present.

Figure 4-7: Maquehue Airport Neighboring Communities

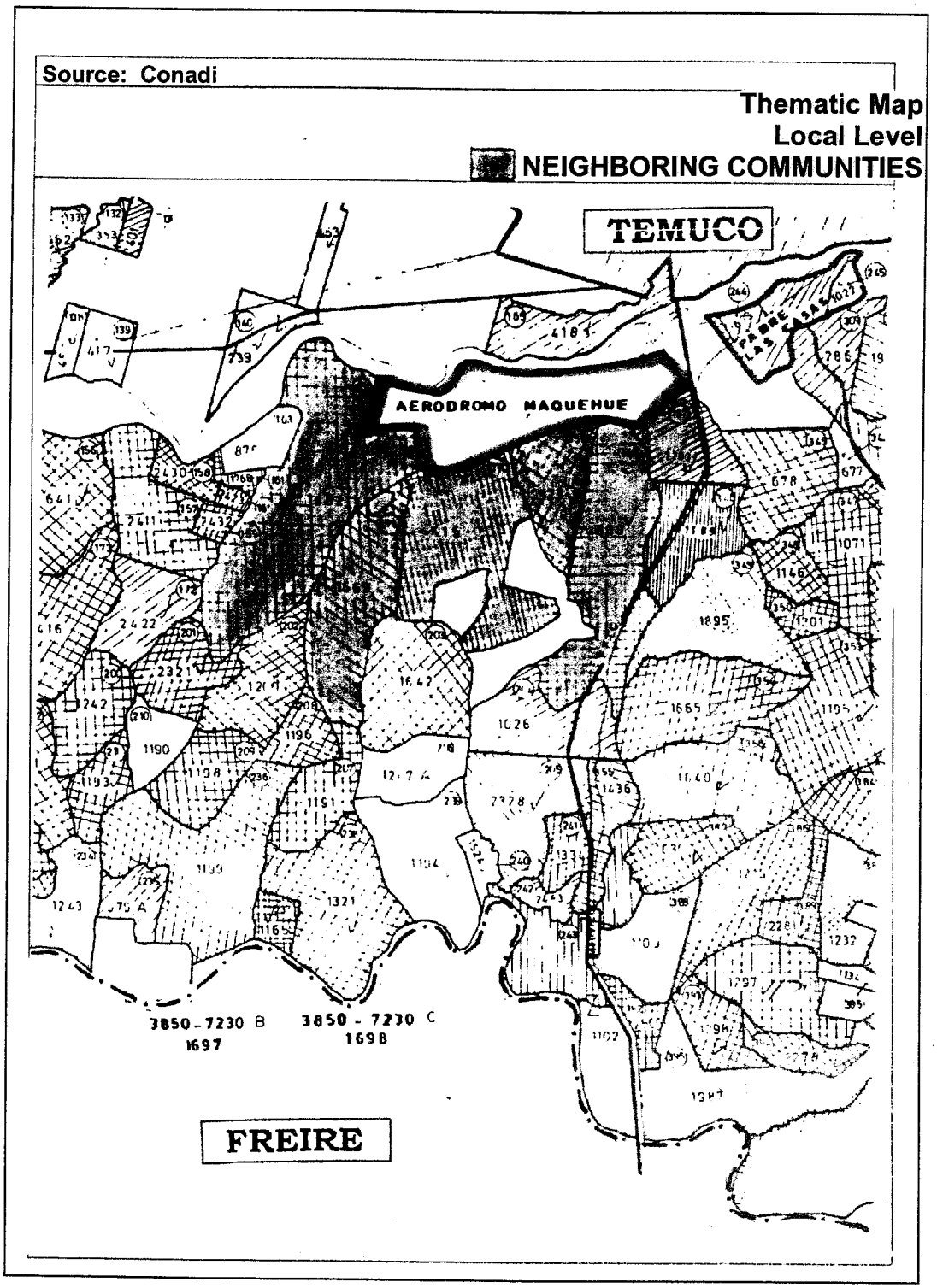


Figure 4-8 shows a possible scenario for the alternate development of the airport property. **Figure 4-9** presents a plan for use of adjacent property to the airport.

4.9 Location Economic Impact for the Development of Tourism

The region has had success, from the tourism point of view. The area offers a variety of activities throughout the year. Other traditional tourist destinations from the area, such as cultural areas, eco-tourism and historical areas, have been adapted. These generate a large number of tourists, both domestic as well as international, which make necessary the improvements of the infrastructures and services.

Temuco is working on expanding its international tourist base, and is also looking for ways to attract more permanent visitors to its diversified tourist destinations. This would require an infrastructure of high quality, such as the one offered by a new airport, which could be the driving force to bring in more passengers at higher frequencies.

Presently, demand for air travel from tourists is not very relevant; therefore an increase in air travel by tourists has not been considered, unless studies carried out by SERANTUR or other agencies show otherwise (see Chapter 2). Without this information, the impact from tourist would not be relevant. With the information taken into account, passenger projection demands would need to be adjusted to reflect an increase, since these were not taken into consideration in the feasibility study.

Figure 4-8: Land Development Scenarios of the Airport

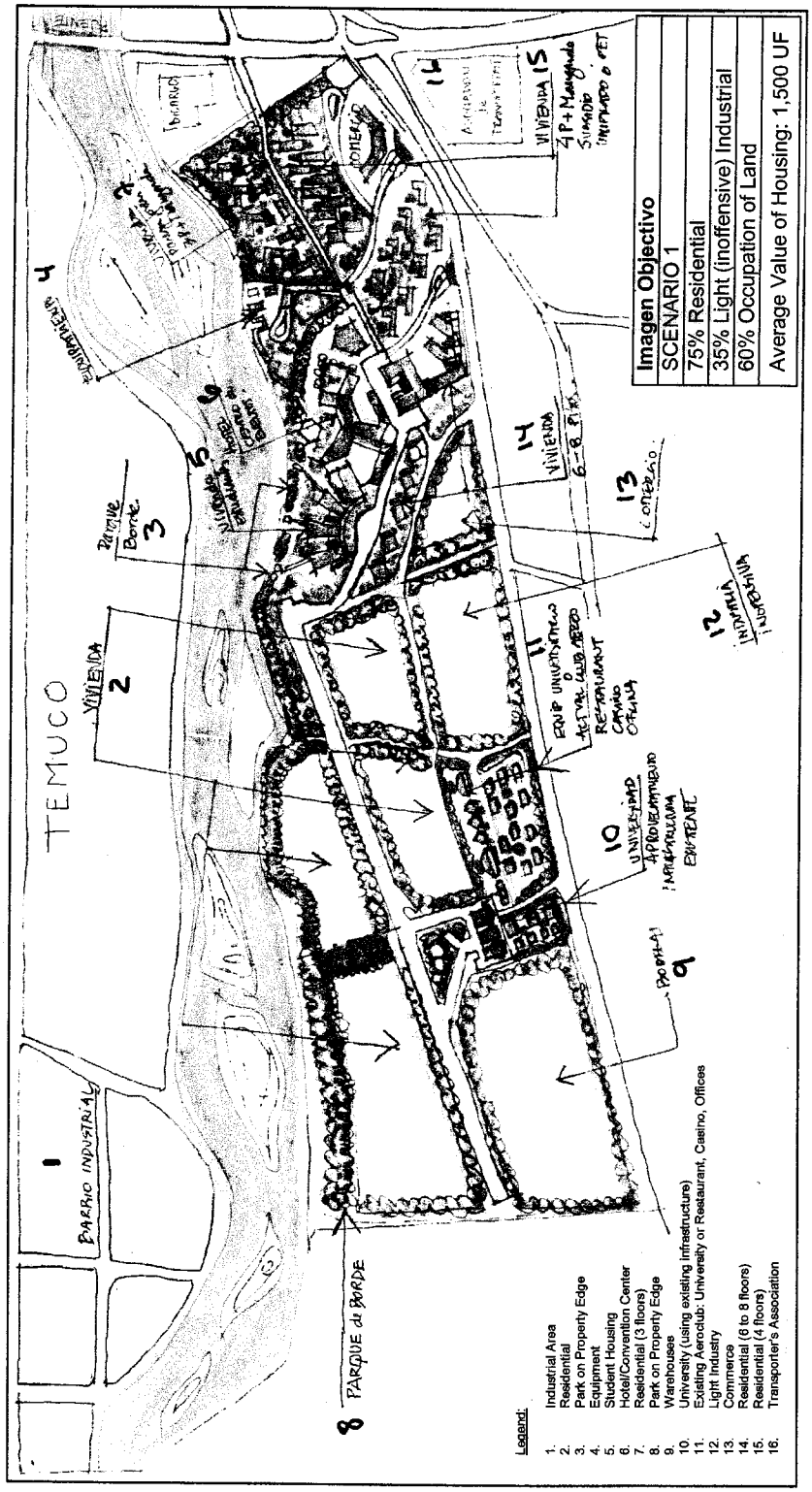


Figure 4-9: Development Scenarios of Adjacent Properties

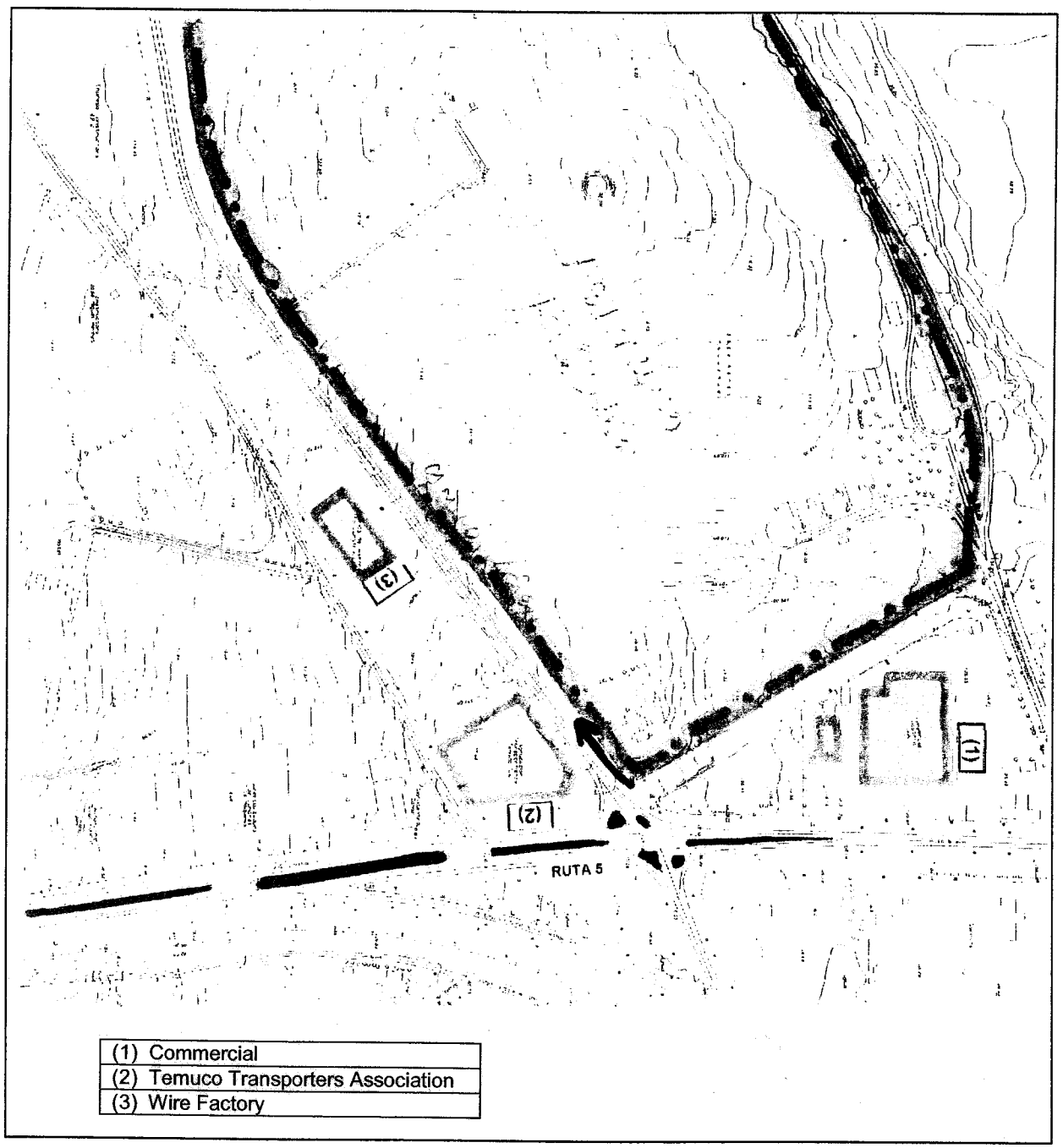


Figure 4-10 shows the location of the main tourist destinations, in relation to Temuco.

4.9.1 Temuco and Outlying Areas

The outlying areas are very attractive for tourism, and are known as Temuco Corridor – Puerto Saavedra. Along this area one can visits the cities of Imperial and Carahue. The salt lake at Budi is a symbol of the Mapuche culture and is unique in the entire country.

There are also several small towns near the coast that are trying to create a historical areas for tourists, while maintaining and displaying their Italian and German ancestry.

The area of Curacautín Lonquimay has a paved road, and is surrounded by volcanoes and snow-peaks, lakes and magnificent views, thermals and ski areas.

4.9.2 Villarrica, Pucón and Licanray

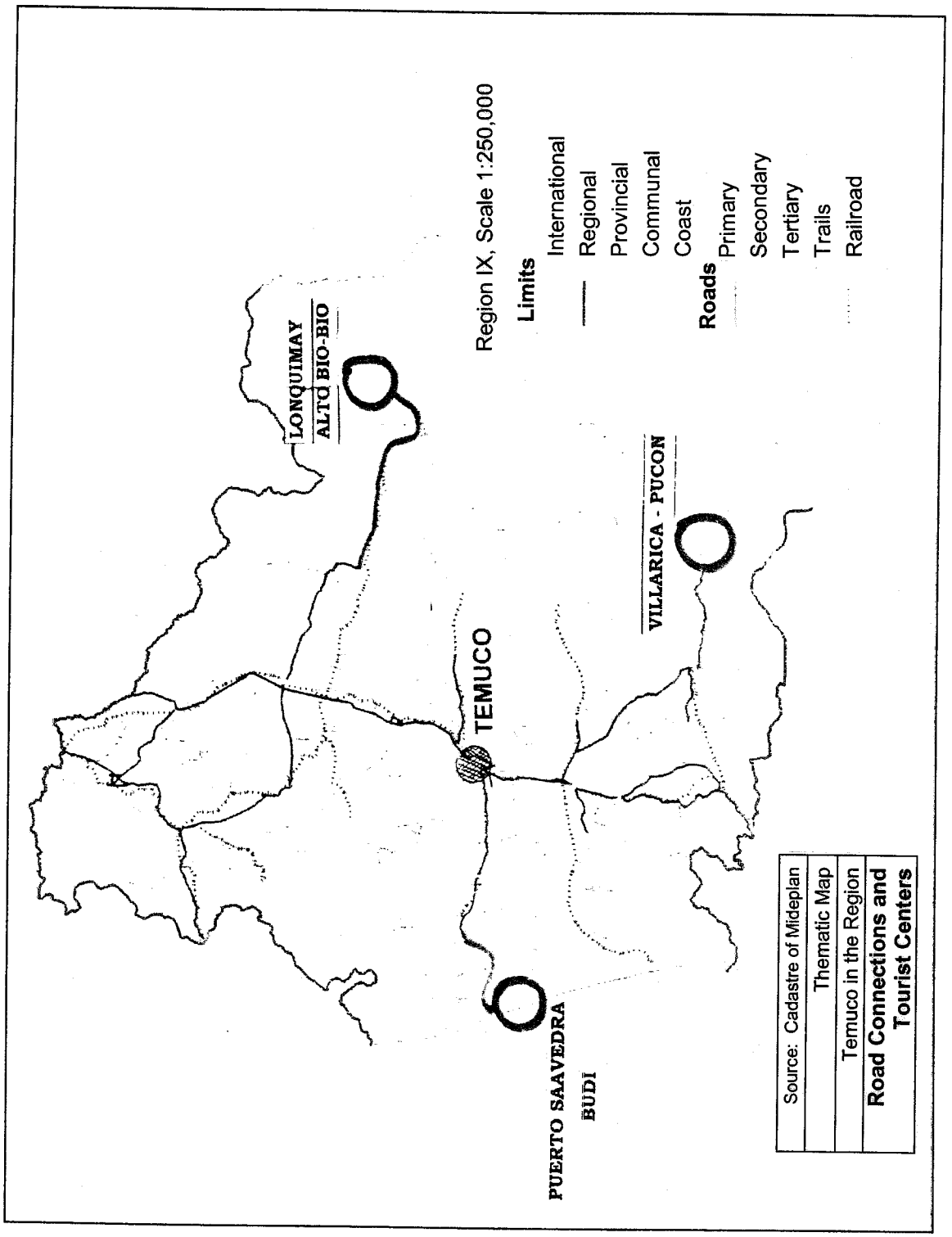
In the past few years, various health resorts have experienced an increase in tourism: for example, Pucón, Villarrica and Licanray, previously bordered by lakes, are now equipped with attractive beaches, casinos, and 5-star hotels, as well as tourist agencies, good restaurants, fishing and sporting events.

Also present are three skiing centers, Lonquimay, Llaima and Pucón, which are surrounded by hotels and various ferry cables. In all cases the location and views are spectacular due to native conifers, known as La Araucanía.

The construction of summerhouses by vacationers from Temuco, Santiago and "Penquistas" is a new developing phenomenon. Sales of these houses, which are built by companies such as Fourcade and Socovesa, have been successful.

Based on the above, it can be concluded that the conditions for a new airport exist, which would increase the development of tourism to the ninth and tenth regions. This would facilitate the access to the rest of the world to this attractive tourist destination, gateway to the south of Chile.

Figure 4-10: Road Connections and Tourist Centers



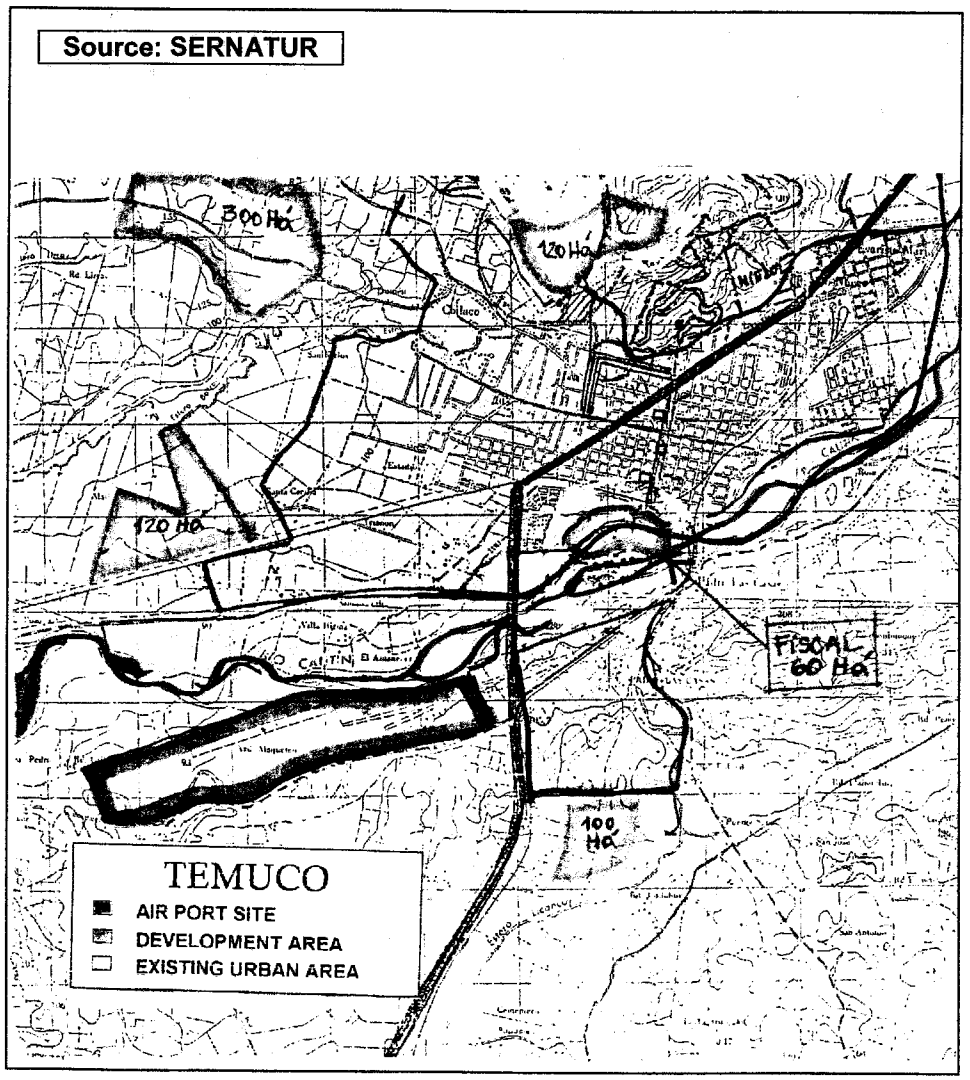
4.10 Demand Identification for Realty Businesses

4.10.1 Existing Competition

The development of realty projects in the city of Temuco has been spearheaded by construction companies, such as Socovesa dn Fourcade. The new neighborhoods have satisfied demand for segments ABC1, C2 and C3, corresponding to the high class, medium high class, medium class and medium low class.

In the next 10 years, the greatest increase will be concentrated in two large lots, both of which have approved municipal and environmental permits. Portal de La Frontera, with 120 hectares, and an area in Carmen, with 300 hectares. **Figure 4-11** shows the location of these lots, in reference to the airport and the city.

Figure 4-11: Areas of Realty Development



4.10.2 Possible Competition from Nearby Property

Traditionally, these communes have been developed as categories C3 and D, corresponding to medium low and low classes. The efforts of the Ministry of Housing are concentrated in the South Area of the commune with a sectoral-style development, where the new Municipal building would be at the center of the neighborhood. This new area of development would also be surrounded with parks and equipment.

4.11 New Transportation Works Impact and Realty Plans

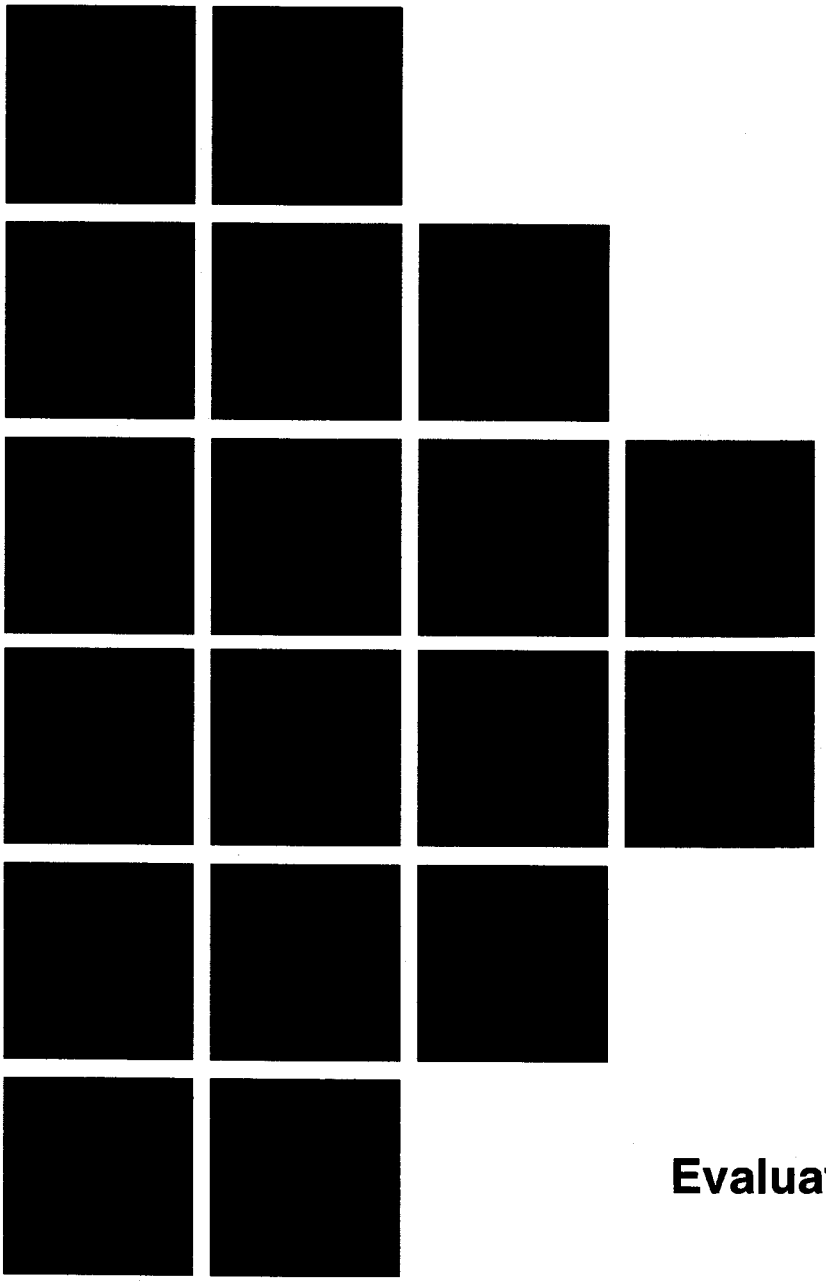
There are two new viable projects that are being carried out, which, without a doubt, will improve accessibility to the Maquehue area.

The most relevant one is the By-Pass, which has a "cajon" split, and exits to the south of the Padre las Casas commune, which is a few kilometers from the access road to the airport.

The second project is the Costanera Avenue in the Isla del Cautín. This project would transform existing military properties into new urban areas and for equipment. This project would change the face of the Cautín River, since old campgrounds populate the present border, and would connect the center with the bank. The development of Isla del Cautín is included within the works to be developed, and is currently at the beginning stages of a study.

This allows for the appraisal of the Maquehue property in a replacement scenario, in terms of a strategic location in regards to the possible scope of realty development. This is the only territory in which a model neighborhood could be developed, in the Padre las Casas commune.

The river, view of the volcanoes and its accessibility make for positive aspects for the development of this area.



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CHAPTER V
Evaluation of the New Airport in Santa Elisa

CHAPTER V

EVALUATION OF THE NEW AIRPORT IN SANTA ELISA

5.1 Introduction

As it was mentioned in Chapter 1, the definitive solution for the location of the airport in Temuco, one that satisfies all air traffic needs, airplane size and the necessary infrastructure, creates the opportunity to evaluate yet another location, if the following are taken into consideration:

- The proximity of the Maquehue Airport to the City of Temuco, and its immediate location to the urban expansion zone.
- The difficulties presented by its geography for a possible runway extension
- Natural risks due to its location in an area classified as slope
- Value and appreciation of properties in the medium term.

The above suggest the evaluation of location alternatives, among which include Santa Elisa, in Quepe.

Quepe is located immediately to the South of the Pan-American Highway or Route 5, approximately 27 Km from the Plaza de Armas in Temuco, which handles daily traffic of more that 10,000 vehicles, according to a 1997 survey. According to investigations and direct consultations, this flow had currently increased by 17%.

The site for an airport in Santa Elisa is located farther away from Temuco, but is closer to the highway beginning at Freire, which has direct access to the Lakes in Villarrica, Caburga, Colico, Calafquén, national parks, volcanoes and thermal springs, and also to the tourist zone of Los Lagos Region, in Region X.

According to MINVU's archeological plans of the area, Santa Elisa does not contain any archeological sites within the area.

5.2 Description of the Environment

Quepe is located to the south of Temuco, within its inter-communal area, and is not located within the slope restriction area, which allows it fewer limitations for the development of a project, such as the airport.

According to the Temuco Regulatory Plan and the "Integrated Study for Resources of Cautín", the area around Santa Elisa and practically all of Quepe possess agricultural lands classified as Class II and III.

Quepe is located near the Quepe River, hence its name, and has a flow of 83 m3/sec. It's less than the Cautín River, which has a 152 m3/sec.

The shape of the land is suitable for an airport at this location, which is secluded from dangers, such as the proximity of the rivers, and also provides clear areas and water supply possibilities.

The area has frost due to its location in an intermediate depression zone, during which periods fluctuate between four and eight months, with an estimate of five for the Santa Elisa sector.

The average maximum temperatures range between 23° and 25°, while the minimum average between 2° and 5°. The vegetative recess period in Quepe reaches a maximum of 150 days, coinciding with rainy seasons in the winter.

The soil is disintegrated and runs risk of natural droughts. The soils are used for cattle ranching and for micro-regional industry-farming.

The fundamental environmental problems of the region are caused by:

- River contamination from unprocessed waters and industrial wastes
- Inadequate disposal systems for urban solid wastes
- Destruction of the native forest
- Contamination of the atmosphere from motor vehicles
- Noise contamination from stationary and moving sources
- Poor quality, degradation and erosion of the soils
- Seasonal flooding

5.3 Dumping Grounds

Currently the Quepe area does not receive any solid waste, nor does it have any sanitary landfills approved by the Health Service of Araucania. Furthermore, the city must dispose of its solid wastes in sanitary landfills or dumping grounds within its own district. Nevertheless, Quepe sends all its wastes to the waste disposal at Freire.

Temuco does not have an adequate solid waste treatment system. The government of Araucania has therefore established a ranking of priorities for solutions to this problem. From a total of 29 locations, Quepe's priority ranked in 14th place.

5.4 Mapuche Ethnicity

The lands of Santa Elisa belong to indigenous areas, according to the indigenous property plan, prepared by Conadi, as part of the Inter-communal Regulatory Plan for Temuco.

Nevertheless, we have reviewed the inventory plans of the indigenous properties prepared by the Ministry of Agriculture, INDAP, Dirección Nacional de Asuntos Indígenas (National Directorate of Indigenous Affairs), which uses the general archive of indigenous affairs as a source of information, as well as the estate of Santa Elisa corresponding to parcels 310,46 and 310,47, which do not belong to indigenous communities, but the access road to Quepe does pass through indigenous property.

Parcel N° 816-46 of Santa Elisa is limited to the East by lot 817, which is an indigenous community.

The conditions of the indigenous lands implies that the lands which must be expropriated or bought for access to the new airport must go through the transfer process as requested by the Indigenous Law, and which mandates legal exchanges, and change in the use of the soil and entitlement. For this purpose, a careful study is needed of the titles, actual inventory of the properties and the search for new alternate lands for delivery to its actual occupants and owners.

If this is a problem, another entrance could be considered from the Pan-American Highway or Route 5 for access to the south of the airport, without entering any indigenous properties.

The indigenous law does not refer to a specific procedure, which must be carried out in case an indigenous property is to be expropriated for the construction of public works. The expropriate procedure in this case must be carried out through common legislation, according to Indigenous Law 19.253, approved in 1993 and summarized in Chapter 4.

5.5 Urban Development: Santa Elisa, Quepe

This area belongs to a sector designated for the towns of "Quepe-Cajón-Labranza", whose localities have not been developed past the urban limit established in 1966, and instead have been settled as dispersments, surrounded by the indigenous population. According to the 1982 census, Quepe had 880 inhabitants, and according to 1992 estimates, it had 1,225 inhabitants, with an annual growth rate of 3.3% per year. This growth caused its category to change from "small village" in 1982 to "town" in 1992.

The projection tendencies for the growth in population, according to the Regulatory Plan for Quepe, are the following:

Year 1995, 1.153 inhabitants
Year 2000, 1.596 inhabitants
Year 2005, 1.883 inhabitants
Year 2010, 2.222 inhabitants
Year 2015, 2.621 inhabitants

Even though Quepe has one of the strongest annual growth rates, this high growth, due to it's low total population, cause its impact to be less appreciative within the urban towns.

These population rankings are perfectly manageable, and do not present any difficulties for a project such as a new airport. As a matter of fact, such a project would greatly increase the population, due to the creation of a new source of jobs.

In the road sector, the concession of Route 5 creates unleveled connections at the interchange with the road to Quepe, which would facilitate access and lower user costs in this access route to the airport. The highway to Quepe would have to be reconstructed. But the tollway in the area of concessioned Route 5 is located in such a way that it will be necessary for users to pay double toll, therefore increasing land costs between the airport and the City of Temuco. For this reason, it is recommended in Chapter 3 to consider an alternate route through Route R-500, which does not go through Quepe.

The growth of Quepe has been limited due to the surrounding indigenous territories. Therefore, indigenous territory is subject to special norms, and may also be substituted for another territory with similar characteristics. An important aspect, which must be mentioned, is the existence of tolls in Quepe, which would limit the development of urban growth towards the South of the highway, if it's location is not modified.

The change in use of land has been more predominant in the inter-communal area of Temuco, at the Temuco-Quepe route.

5.6 Land Values: Santa Elisa

In Chapter 4, land value of Maquehue Airport is estimated at 900 UF per ha. In the case of Quepe, the value is lower due to its distance from urban centers and principal highways.

It's estimated that the minimum value varies between UF 0.007/m2 (1.200.000 pesos per hectare) and UF 0.0108 (1.800.000 pesos per hectare). This range in values depends if the surface is dry land hectares or irrigated hectares. Different agriculture property owners were contacted for their opinion, and helped define the prices. There is no strong real estate market, therefore a price market in this area has been difficult to set. The lower value is due to land quality, its actual use, distance from main highways, access roads and present conditions.

In the case of indigenous property, the transaction value will depend on the existence of properties with similar characteristics and their cost, in order to exchange them with the indigenous communities in the areas where the airport will be developed.

5.7 Commercial Use Program: Santa Elisa

Table 5-1 shows a commercial use program for a new airport in Santa Elisa, based on the conceptual design presented in Chapter 3 of this report. This program is similar to the one recommended for Maquehue Airport in Section 4.4.

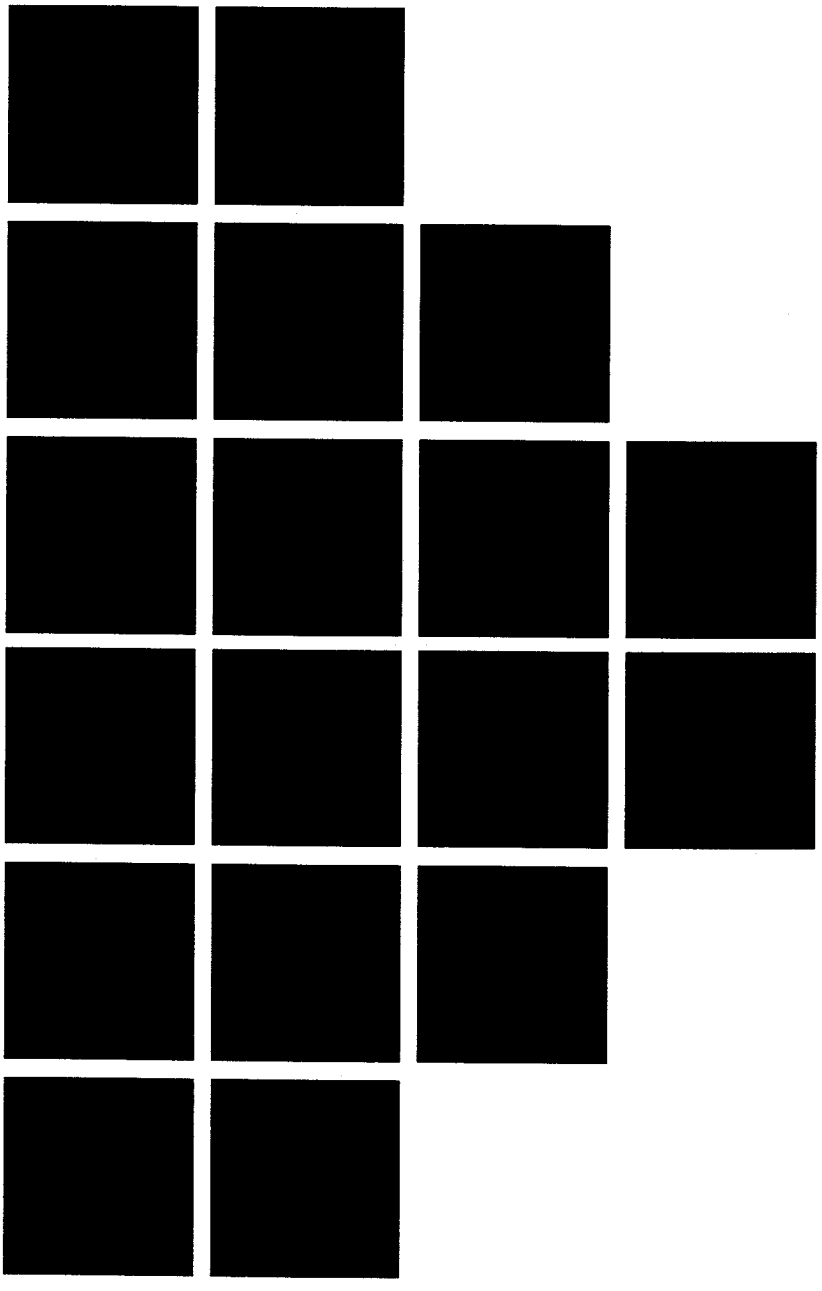
Table 5-2 contains a program for complimentary uses for this airport. The relative site distance in Santa Elisa from the urban centers is translated as a potential limited demand in adjacent areas for complimentary uses.

Table 5-1: Commercial Use Program – Santa Elisa Airport

CONCEPT	NUMBER OF SHOPS	SURFACE LOCAL M2	TOTAL AREA M2
COMMERCIAL SHOPS			
Arts and Crafts	3	25	**75**
Newspapers and Mag.	1	20	**20**
Gifts	2	30	**60**
Candies and Snacks	2	20	**40**
Clothing	2	30	**60**
Jewelry and Watches	1	30	**30**
Travel Agencies	2	20	**40**
Vehicle rentals	2	25	**50**
Sub – total	**15**		**375**
SERVICES			
Cafeteria – Snacks	1	40	**40**
Restaurant	1	200	**200**
Business centers	1	60	**60**
Banks	1	60	**60**
Telephones	8	2	**16**
Vending Machines	4	4	**16**
ATM	1	6	**6**
VIP Room	1	60	**60**
Sub – total	**18**		**458**
OFFICES			
Business Services	3	30	**90**
Airline Services	3	30	**90**
Sub - total	**6**		**180**
TOTAL	**39**		**1.013**

Table 5-2: Complimentary Use Program – Santa Elisa Airport

CONCEPT	NUMBER OF SHOPS	LOCAL SURFACE M2	TOTAL AREA M2
Warehouses			
- Refrigerated	2	60	**360**
- Dry Products	4	60	**240**
Services			
- Customs	1	400	**400**
- Export Certifications	1	60	**60**
- Transit Warehouses	2	120	**240**
TOTAL			**1.300**



The Louis Berger Group, Inc.

CHAPTER VI
Financial Analysis and Concession Structure

CHAPTER VI

FINANCIAL ANALYSIS AND CONCESSION STRUCTURE

6.1 Introduction

This chapter presents an analysis of the financial feasibility for the proposed development of a new Airport for the city of Temuco.

The analysis was carried out through a formulation of a financial model to simulate the evolution of the project from the point of view of the private investor. The analysis focuses on the evaluation of the cash flows of the investor or investors, with the purpose of evaluating different concession alternatives, which would allow for conclusions and recommendations regarding the structure of the private sector participation in the project.

The model also identifies the financial impact of each alternative on the Government, in terms of net financial flow of the project.

The financial analysis is mainly based on the cost estimates of construction, operation and maintenance, as well as the traffic demand projections, which were developed for this study.

This analysis period begins with 2002, when the first investments must take place, and up to the end of the concession. The following two alternatives are considered, in order to define the analysis horizon:

1. A concession of 18 years, which includes 3 investment phases during the years 2002-2003, and 2009 and 2014, sufficient enough to satisfy the projected demand up to 2018.

2. A concession of 24 years. Which would add a fourth investment phase in 2019, to satisfy the projected demand up to 2025.

6.1.1 Analyzed Alternatives

The analysis consists of a comparison of the following seven alternatives or scenarios relating to the concession scope and the possible incorporation of resources coming from other additional sources for the new airport (see **Table 6-1**).

Alternative 1: The concession of a new complete airport, without the adjacent areas and with a reutilization of the existing Airport (sale of land).

Table 6-1: Examined Alternatives of the Financial Analysis

Alternative	New Airport	Reutilization of Maquehue	Adjacent Areas	Only Landside
1	X	X		
2	X	X		X
3	X	X	X	
4	X		X	
5	X		X	X
6	X			
7	X			X

Alternative 2: Concession of the land-side infrastructure of the new airport, without the adjacent areas and with the reuse of the existing Airport (sale of land).

Alternative 3: Concession of a new complete airport and the adjacent areas, with the reuse of the existing Airport (sale of land).

Alternative 4: Concession of a complete new airport and adjacent areas, without the reuseof the existing Airport.

Alternative 5: Concession of the new airport (only the land-side infrastructure) and adjacent areas, without the reuse of the existing Airport.

Alternative 6: Concession of a complete new airport, without the adjacent areas and without the reuse of the existing Airport.

Alternative 7: Concession of the land-side infrastructure of a new airport, without the adjacent areas and without the reuse of the existing Airport.

The alternatives that consider the reuse of Maquehue and the incorporation of the adjacent areas of the new airport reflect established options in the terms of reference for this study.

Alternatives 1, 2 and 3 include the possible utilization of resources stemming from the sale of land of Maquehue airport. But there exists various important considerations, which would reduce the probability that these resources would be utilized.

- It has not been confirmed if FACH will move its base to the new airport, or will keep using Maquehue Airport after it has ended commercial operations.

- Even though Law No. 16.752, which establishes the general dispositions of the General Directorate of Civil Aeronautics (DGAC), [1] allows the sale of fiscal property and specifies that the resources must go directly to the Directorate, it cannot be assumed that the DGAC can sell property in Maquehue. The documents of the original expropriation seem to indicate that it was carried out on behalf of FACH, and that the property must go back to the original owners once its use as an airport is over.

Since a legal determination to define this item is needed, for purposes of this analysis, it will be considered that in case the property can be sold, all revenue would go to DGAC to be used directly or indirectly for the financing of the new airport.

In the case of Alternatives 3, 4 and 5, the concessionaire of the new airport would be allowed to administrate and lease the adjacent properties, according to the development potential identified in Chapter 5 of this report.

The utilization of additional alternatives, which incorporate a limited concession of the "land-side" infrastructure of the airport, reflects the present separation of responsibilities between the concessionaire and DGAC at the other concessioned airports in Chile. Up to now, airport concessions have mainly been limited to the land-side infrastructure.

6.1.2 General Methodology

An integrated model was prepared using Excel software, which allows the development of financial cash flows for the different concession alternatives, under the Build-Operate-Transfer option.

This model includes a projection of project costs associated with the construction and administration of the new airport infrastructure, as well as the estimate of total airport revenues, according to the existing rates.

The main results of the analysis consist of the identification of the specific revenues required by the concessionaire to assure a minimum return investment, and the project impact on the cash flow of the General Directorate of Civil Aeronautics (DGAC).

Two alternate payment mechanisms to the concessionaire were considered in this analysis, one which reflects the structure of the existing airport concessions in Chile, and the second which reflects a proposal for future concessions, which comes from the Division of Development of New Business, from the General Coordination of Concessions.

[1] Law No. 16.752 mandates organization and functions, and establishes general dispositions to the General Directorate of Civil Aeronautics, (Art. 3, paragraph w), published in the Official Diary No. 26.971, from February 17, 1968.

In the existing airport concessions in Chile, the concessionaire is allowed to directly charge the operative and commercial concessions in the terminals, which in average represents 40% of revenues.

The rest of the concessionaire's revenues come from passenger tariffs, contractually agreed to with DGAC. This tariff is not the same as the Loading Fee charged to passengers by DGAC, but rather reflects an amount the moment the works are awarded, and which could be part or not of the award variables. DGAC pays a monthly tariff agreed to the concessionaire.

In the majority of concessioned airports, a joint method for demand and revenue risk has been utilized. This means keeping the monthly revenue per passenger enplaned updated, for each concessioned work and compare these values to a fixed amount defined at the beginning of the concession, with a return rate base of 15%. The next month that the updated revenues are higher than the defined fixed amount, DGAC will proceed to pay the concessionaire only 50% of revenues per enplaned passenger.

Also a minimum guaranteed rate of return of 12% is generally included, and when the revenues are less than this amount, the monthly payment to DGAC should cover the difference.

The alternate structure for future airport concessions is one that the Government assumes the demand risk through the elimination of the tariff per passenger enplaned. Under this structure, the Government guarantees a fixed periodic payment (monthly, quarterly, semi-annually or annually) to the concessionaire who shows a return of 12% over costs during the concession period.

There is no previous experience in Chile of the air-side infrastructure of an airport. For the alternatives that include the concession of the air-side, a second methodology has been used with a fixed amount estimate, which represents a return of 12%.

It is also important to note that the required revenue estimates are made under a total project return projection, without considering possible financing costs, which could be incurred by the concessionaire.

Taking these considerations into account, the main model results for each alternative are the following:

1. The tariff per passenger enplaned and the fixed amount necessary to recuperate the air-side investments, which should be transferred to the concessionaire by DGAC to obtain an Internal Rate of Return (IRR) of 12% (using an actual payment method).

2. The necessary fixed amount to recuperate the land-side as well as the air-side investments, which should be transferred to the concessionaire by DGAC to obtain an IRR of 12% (using an alternate payment method).

3. The Actual Net Value (ANV) and Internal rate of Return (IRR) for the concessionaire with payments from DGAC, if the lending or bond financial impacts are included.

4. The project ANV for DGAC, taking into consideration its investments, payments to the concessionaire, and revenues from the airport. This estimate includes infrastructure maintenance costs, which correspond to DGAC under each alternative, but does not include operative costs in the airport (mainly related to the function of ATC).

All flows are expressed in UF.

A complete model for each alternative is presented in **Annex D**, showing details and calculations of the financial analysis. Once the results are established for each alternative, sensibility tests are executed to examine the project's susceptibility to changes in the important variable values, which affect the costs and demand of the project.

6.2 Cost Analysis

6.2.1 Project Investment Costs

The investments in infrastructure equipment for the new airport are presented in detail in Chapter 3 of this report. Likewise, the proposed investment plan is presented, to satisfy demand under the Medium Scenario. The total cost of the project if the four phases are included was estimated at US$26.1 million, or 1.4 million UF, of which an initial investment is required of US$29.5 million, or 1.1 million UF[2].

For purposes of this analysis, it was necessary to separate the investment program between those that are required for the development of the air-side and land-side, respectively.

It was also necessary to separate the investments between the ones the concessionaire would carry out, and the ones to be carried by the Government under each alternative.

The total estimated capital costs for each group of alternatives and its programming are shown in **Table 6-2.**

[2] To convert Chilean pesos and US dollars to UF, data from the Central Bank of Chile was used of the price quote of UF in pesos and exchange rate of the peso-dollar observed during the period that unitary costs were estimated (June-July, 2001). This translates to $15.934 and US$ 26 per UF.

Table 6-2 Investment Programming (UF)

Concept	Total	Phase 1 2002-2003	Phase 2 2009	Phase 3 2014	Phase 4* 2019	Percent. of Total
Landside Investments- Concesionnaire (All Altenatives)						
Ground Movements - Landside	37.629	37.629	0	0	0	3%
Passenger Terminal	264.600	151.200	37.800	0	75.600	19%
Access and Parking	41.131	38.305	942	0	1.884	3%
Operations Facilities	11.491	11.491	0	0	0	1%
Infrastructure Services - Landside	63.583	43.850	6.578	0	13.155	5%
Terminal Equipm.	258.047	177.180	26.956	26.956	26.956	19%
Sub-Total - Landside	***676.481***	***459.655***	***72.275***	***26.956***	***117.595***	***49%***
Airside Investments - Concessionaire (Alternatives 1, 3, 4 y 6) or DGAC (Alternatives 2, 5 y 7)						
Ground Movement - Airside	165.487	165.487	0	0	0	12%
Platforms/Ramps	224.851	197.635	0	27.216	0	16%
Infrastructure Services - Airside	31.787	21.922	3.288	0	6.577	2%
ATC Tower and Lighting System	112.644	112.644	0	0	0	8%
Sub-Total - Airside	***534.769***	***497.688***	***3.288***	***27.216***	***6.577***	***39%***
Government Functions - DGAC (All Alternatives)						
ILS Systems/Metereolog./Navaids.	124.438	124.438	0	0	0	9%
Land Purchasing	52.272	52.272	0	0	0	4%
Sub-Total – Govern.	***176.710***	***176.710***	***0***	***0***	***0***	***13%***
Total Project	**1.387.959**	**1.134.053**	**75.563**	**54.172**	**124.171**	100%

Note: Costs include engineering and supervision (26%) and unforeseen expenses (20%).

As this table shows, the initial investment corresponding to the concessionaire in the majority of the alternatives is 0.96 million UF, or 85% of the total initial investment. The investment by the concessionaire for the four phases under these alternatives reaches 1.2 million UF (88% of the total).

The exceptions are Alternatives 2, 5 and 7, where the concessionaire is only responsible for the land-side sector of the airport, and the initial investment lowers to 0.46 million UF (39% of the required initial investment), with a total investment for the four phases of 0.68 million UF (47%).

The ***Infra*** sheet in the financial model in ***Annex D*** details these investments by item, along with the detailed assumptions.

6.2.2 Operative Costs

The costs required to operate a new airport have been estimated, taking into consideration the specific infrastructure and the equipment to be installed, and using the experiences of other concessioned airports in Chile and in Latin America, with similar characteristics.

The key assumptions are presented in this section, along with the resulting cost estimates for each phase of development.

The model contains electronic sheets for the estimation of each one of the following annual operative cost categories for the concessionaire:

a) Personnel
b) Maintenance
c) General and Administrative Expenses
d) Third Party Services
e) Basic Services
f) Depreciation

Table 6-3 presents a comparison between the operational cost estimate alternatives (minus depreciation) for each development phase, and **Figure 6-1** presents the behavior of the operative costs during the analysis period for Alternatives 1, 3, 4 and 6, which include the concession of the air-side as well as the land-side of the airport. The key assumptions used to estimate each one of these categories are presented in the rest of this section.

The model also includes a sheet containing an estimate of maintenance and security costs for DGAC.

a) Personnel

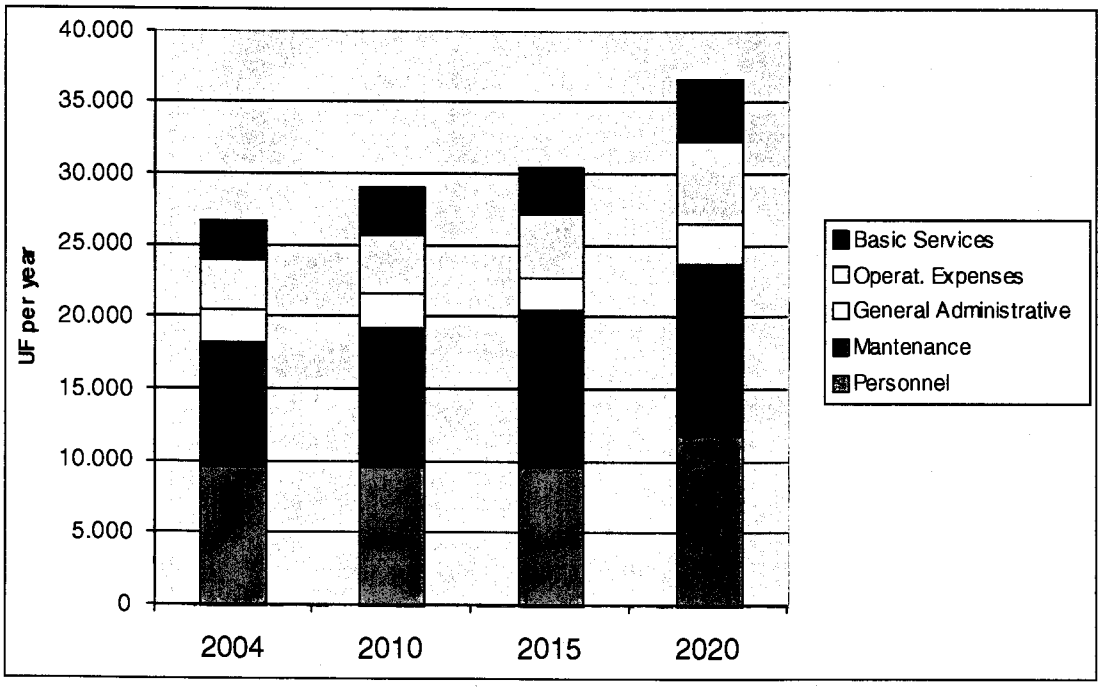
Total personnel requirements have been estimated for the Concessionaire for administrative functions of the airport, based on standard industry norm operations, and the specific requirements for each alternative. The awardee will require personnel in the following areas:

- Management
- Operations
- Routine Maintenance
- Accounting/Financing

Table 6-3: Operative Costs Projection (UF)

Concept	*Phase 1 2004*	*Phase 2 2010*	*Phase 3 2015*	*Phase 4 2020*
Alternatives 1, 3, 4, y 6 (Airside and Landside)				
Personnel	9.696	9.696	9.696	12.008
Maintenance	8.653	9.684	10.871	11.856
General and Adminstrative	2.327	2.327	2.327	2.882
Operat. Expenses	3.477	4.184	4.392	5.600
Basic Services	2.464	3.080	3.080	4.312
Total	**26.616**	**28.972**	**30.365**	**36.657**
Alternatives 2, 5, y 7 (Only Landside)				
Persnnel	8.611	8.611	8.611	10.097
Maintenance	6.135	7.153	8.231	9.191
General and Adminstrative	2.067	2.067	2.067	2.423
Operat. Expenses	3.044	3.751	3.959	5.166
Basic Services	2.464	3.080	3.080	4.312
Total	**22.319**	**24.662**	**25.947**	**31.189**

Figure 6-1 Operative Costs Projection – Alt. 1, 3, 4, y 6



Taking into consideration the standard of other concessioned airports in Chile, it is probable that various additional functions will be carried out by third party contracts. For this reason, the Concessionaire will not require cleaning, security or infrastructure maintenance personnel. The costs for these contracts are quantified ahead.

In order to simplify the calculations for the costs related with labor, five (5) categories have been defined. For each category, a monthly salary is estimated, based mainly on actual salaries of the present Concessionaire of the airport in Santiago. Assumed figures are added for indirect costs as a function of direct salaries. These were estimated. **Table 6-4** presents the five categories and assumed salary levels.

It is assumed that the salary level for each category represents an average, allowing for a certain variation in rates between the salaries of the specific positions.

Table 6-4: Summary of Salary Levels by Worker Category

		Salaries and Benefits			
Description	**Category**	**Direct**		**Indirect**	**Total**
		('000 $/month)	(UF / year)	(UF / year)	(UF / year)
Manager/Directors	1	3.350	2.529	632	3.161
Management/Professionals	2	1.075	812	203	1.014
Supervisors	3	475	359	90	448
Technical/Secretaries	4	350	264	66	330
Workers	5	200	151	38	189

Table 6-5 shows estimated personnel requirements for the alternatives included in the concession of the entire airport, as well as those that include only the land-side. For each role, the personnel required for the first three phases (to 2020), and the estimated total cost, are indicated.

As is shown in the table, annual personnel costs do not change substantially if the concession is limited to the land-side sector of the airport. Even though the number of personnel is reduced from 19 to 14, the positions eliminated generally are of lower income.

In case that the concession is extended for a period of 24 years and includes a fourth phase, an increase in personnel would be necessary to reflect terminal expansion and other required land-side infrastructures, beginning in 2020. For the alternatives that include the concession of the entire airport, it is estimated that the payroll would increase from 19 to 27 employees, and total annual costs would increase from 9.696 UF to 12.000 UF.

Table 6-5: Requirements and Labor Costs – Awardee

Description	Number of Personnel		Cost of Personnel (UF)	
	Total	Landside	Total	Landside
Management				
General Manager	1	1	3.161	3.161
Commercial Director	1	1	448	448
Secretary	1	1	330	330
Operations Management				
Operations Manager	1	1	1.014	1.014
Assistant	1	1	330	330
Workers	4	2	755	377
Maintenance Management				
Maintenance Supervisors	1	1	448	448
Electromechanics	1	0	330	0
Technitians	1	1	330	330
Workers	4	2	755	377
Accounting/Finance Management				
CFO	1	1	1.014	1.014
Accountant	1	1	448	448
Assistants	1	1	330	330
Total	**19**	**14**	**9.696**	**8.611**

b) Maintenance

Maintenance costs have been estimated separately for the team, as well as the land-side and air-side infrastructure. These estimates have been made based on the respective investment costs.

Taking into consideration the experiences of other concessioned airports, it is estimated that the routine and periodic land-side infrastructure maintenance costs represent approximately 1.6% of the investment costs.

In the air-side case, it is estimated that the annual maintenance costs represent only 0.6% of the investment, but also requires more surface maintenance after 10 years of operations, at an approximate cost of 10% of the initial investment. In the model, the latter is incorporated in the ***Infra*** sheet, along with the non-recurrent investment costs. Annual equipment maintenance costs are estimated at 2% of the investment cost.

c) General and Administrative Expenses

This category includes general administrative costs, legal costs, accounting, sales and commercialization costs, among others.

These costs were derived as percentages for the total personnel costs, using data from Santiago and other concessioned airports in Chile.

- Administrative expenses represent 12% of Personnel Expenses.
- Third Party administrative services (legal, auditing, computers costs, etc.) represent 4% of Personnel Expenses.
- Insurance expenses are estimated at 7% of Personnel Expenses.
- Sales and Commercialization expenses represent approximately 1% of Personnel Expenses.

d) Third Party Operative Expenses

This includes the contracting of services such as cleaning, security and maintenance parking in the part of the airport operated by the concessionaire, according to each alternative.

These contract costs were estimated in relation to the area in m2 to be covered for each service.

e) Basic Services

Also considered were public service expenses, such as electricity, potable water, gas and communications. These expenses were estimated based on an estimate of m2 costs of the terminal, and referring to Santiago airport data for the period between January 2000 and July 2001.

6.3 Income Analysis

The rates that can be charged by DGAC to airport facility users were established in Exempt Resolution No. 0359 of Ruling DAR-50, enacted on January 16, 1996.

Based on this law, DGAC may charge the following rates at the new airport in Temuco:

<u>Aeronautical Income:</u>

- Landing Duties
- Airplane Parking
- Lighting
- ILS Services

Airport Income:

- Enplanement Duties
- Boarding bridge duties

Non-Aeronautical Commercial Income

- Terminal Operative Services Concession (counters, offices)
- Terminal Commercial Services Concession
- Airplane Operative Services Concession

As was previously mentioned about rates and duties, the concessionaire is only permitted to charge directly the operative and commercial concessions in the terminals. The remaining income is estimated as the result of the model, which are presented in Section 6.4.

Table 6-2 presents a projection of the obtained income through rates and duties charged to users, for DGAC as well as for the Concessionaire. **Figure 6-2** presents an income flow projection for DGAC. In the latter, incomes for terminal concessions are not included, which would be charged by the concessionaire.

Aside from these airport incomes, potential rental income from adjacent areas to the new airport, and the sale of property at the existing airport are also quantified.

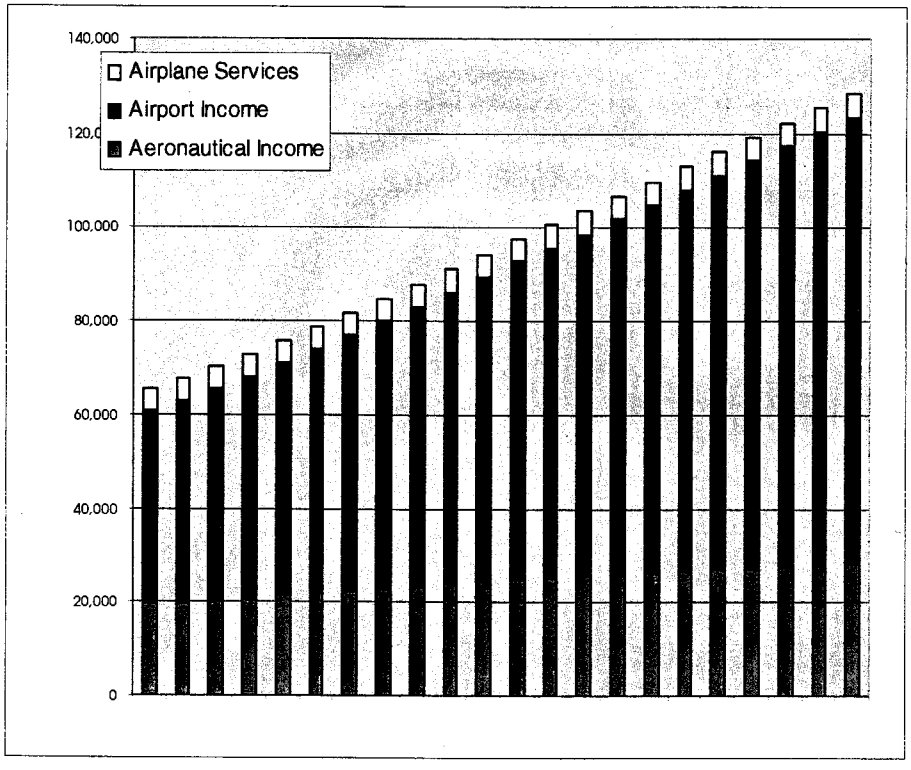
Following is a summary of the assumptions used for future income projections for each category mentioned above. In general, tariffs were maintained at their established actual levels in the regulations, including indexed adjustments to the IPC of July, 2001.

The assumptions and detailed results are presented in the income estimates in the ***Ingreso*** sheet, in the financial model presented as Annex XII.

Table 6-6 Annual Income Projection by Rate and Duties (UF)

Concept	*2004*	*2010*	*2015*	*2020*
Concessionaire Income				
Commercial Income	10.547	14.215	17.690	22.159
Sub-Total	**10.547**	**14.215**	**17.690**	**22.159**
DGAC Income				
Aeronautical Income	19.680	22.233	24.938	26.512
Landing	11.053	12.526	14.087	15.022
Parking	67	76	85	91
Lighting	486	551	620	661
ILS	8.073	9.080	10.146	10.738
Airport Income	41.310	54.833	67.769	81.402
Enplanement Duties	38.798	52.132	64.873	78.487
Boarding Bridges	2.512	2.701	2.896	2.915
Airplane Servicing Income	4.504	4.699	4.900	4.919
Sub-Total	**63.242**	**79.415**	**95.157**	**110.373**

Figure 6-2: DGAC Income Flow Projections



6.3.1 Aeronautical Income

This income was estimated based on commercial operations projections presented in Chapter 2 of this report. The specific methodologies that were used were the following:

a) Landing Rate

Commercial operations projections were applied for airplanes such as B737 and A320, and the maximum take-off weight (PMD) of these airplanes, to the actual tariff, by ton.

b) Parking Rate

The parking rate is charged by ton, according to the airplane PMD, for each 4-hour period or permanence fraction at the airport, after the first two hours.

Historical data at the Maquehue Airport for the period between 1996 and 2000 indicates that on average, an equivalent of 6% of the commercial landings paid for a period of four hours. Future income for this rate was projected, under the assumption that the percentage would not be changed.

c) Lighting Rate

This rate represents 20% of the landing rate, and is paid by the airplanes that use the airport's lighting system.

Based on the flight programming of Maquehue Airport, it is estimated that on average approximately 22% of landings require the use of the lighting system.

d) ILS Service Rate

The investment program includes the installation of a Category 1 ILS system. This would allow the DGAC to charge a respective rate per airplane.

6.3.2 Airport Income

The incomes were estimated based on the passenger projection presented in Chapter 2 of this report. The following specific methodologies were used:

a) Enplanement Duties

Passengers using the country's airports pay a duty for the use of the facilities, services and other services of the terminals.
This duty was recently modified (October 2001) and set rates of $4.406 for domestic passenger and US$25 for international passengers. These new amounts were used for the projections of the model.

b) Dutiy for the use of boarding bridges

The project includes 3 boarding bridges. Each airplane must pay an amount of 0.26 UF for the first 45 minutes that the airplane is connected to the bridge, and 0/52 for each additional 30 minutes. Each airplane that uses electricity from the bridge must also pay 0.25 UF.

To prepare the income projection for this duty, the following assumptions were used:

- 70% of commercial landings use the bridge, taking into consideration that 4 commercial operations are projected per peak hour.
- 30% of commercial landings use the bridge for more than 45 minutes.
- 20% of commercial landings use the bridge for more than 75 minutes.

6.3.3 Income from Non-Aeronautical Services

This category includes income from terminal operative and commercial income, as well as income from airplane concession services. The first may be charged directly by the concessionaire.

a) Commercial Income (to the Concessionaire)

This includes the rental of counter space and offices to the airlines, as well as commercial space in the terminals and parking of private vehicles. The rates to be applied must be incorporated into the terminal concession contract, and may or may not vary in respect to the duty by square meters, as established in the DGAC ruling.

For purposes of this analysis, commercial income averages were used per passenger of the concessioned airports in La Serena and Calama, for the period between January 2000 and August 2001. These two specific airports were chosen, because they are comparable to Temuco, in terms of number of passengers, and the similarity of concessioned services to the ones projected for Temuco.

b) Income by Airplane Services Concessions

The DGAC ruling contains a specific duty for the concession of airplane fuel and lubricant supplying services. The provider of this service must pay an equivalent of US$ 5.75 per metric cube sold. To project the quantity of M3 sold in Temuco in the future, historical income data was used for this concept in Maquehue during the past five years, estimating an supply average of 2,891 m3 per commercial landing. This quantity is relatively small, but it is expected that the majority of the commercial airplanes will not refuel in the airport.

Aside from the specific fuel service duty, DGAC could also charge other providers for ramp services. This fee could be per m2 of utilized space by these providers, as support to their ramp equipment.

Ruling 50 states a specific rental for land in airport property that is outside of the passenger terminals. In this case, it is assumed that the development of these lands will come from the service provider, and will be rented as untilled land, equivalent to US 0.04 per month per m2. It is estimated that approximately 4.000 m2 will be required for this purpose.

6.3.4 Income from Adjacent Areas

A conclusion was reached in Chapter 5, which says that the potential for the development of complementary projects adjacent to the new airport in Santa Elisa are very limited, due to its distance from the city. Several warehouses and services were identified which could be installed in the areas adjacent during the analysis period, with a requirement of only 1.300 m2 of land.

Since this amount of space falls easily within the property recommended for purchase, it is not necessary to consider the purchase of additional land. For this reason,

Alternatives 3, 4 and 5 have been interpreted so as to permit the concessionaire of the new airport to manage and rent these adjacent properties.

For the remaining alternatives, it is assumed that DGAC would administer these properties.

In both cases, it is assumed that the lands would be rented as untilled land to third parties, for its development, depending on their needs.

To identify possible income, the same assumptions were used as the ones in land rentals to the airplane service concessionaires. The possible annual incomes are estimated at only 621 UF per year.

6.3.5 Income from the Maquehue Airport Property Sale

As was mentioned in Section 6.1, there exist important doubts regarding the possibility that the Maquehue property could be sold, and the income used for the construction of the new airport.

In the case of Alternatives 1 to 3, where possible, it is assumed that the income from this sale would be transferred indirectly to the concessionaire, through a payment from DGAC, which would imply that the principal impact of these alternatives would be over the project flow for the Directorate.

To estimate the possible income, it is assumed that the property would be sold to housing developers during the first two years of operation of the new airport (2004-2005), at a cost estimated at 900 UF per hectare (see Chapter 4). This is translated to a total income of 235.350 UF.

6.4 Financial Flow Analysis

6.4.1 Methodology

The recommended financial feasibility option decision is based on the traditional analysis of cash flow from the perspective of the entity that will be carrying out the required investments, and the operation of the airport. An estimate of the impact of the project on DGAC has also been added.

For comparative purposes, results that permit the measurement of the feasibility of the project under the following conditions have been produced:

1. Private investors without loans
2. Private investors with loans
3. Government (DGAC) without loans

The minimum conditions for the feasibility from the point of view of the concessionaire is that the project must offer a nominal rate of return over networth of at least 12%.

The case for DGAC is more complicated, since this would require a financial analysis of the entire airport system of Chile. For this reason, the emphasis of the study is to evaluate the alternatives presented, with the objective of minimizing project net costs for the Government.

6.4.2 Main Assumptions

a) Depreciation

For income purposes, the concessionaire entities can depreciate their assets in a linear or accelerated form, according to present legislation. Technical Bulletin No. 67 of the School of Accountants specifies that the investments originating in the construction of works must be considered as fixed income, and the adopted method for its depreciation must be applied consistently during the exploitation period. The same bulletin points out three possible ways to depreciate:

a.- Unit flow method
b.- Income method
c.- Lineal depreciation method

The current concessioned airports under development use the unit flow method. The following is the depreciation quote calculation:

$$\frac{\text{Cost of works under concession}}{\text{Total estimated flow}} \times \text{Actual period flow}$$

This method is particularly applicable when cost recuperation is by incomes, which depend of the future flow of passengers.

As was mentioned in Section 6.1, the financial model considers two alternate payment methods by DGAC to the concessionaire. The first method maintains tariff use by enplaned passenger. Since the unit flow depreciation method is particularly applicable when the recuperation of costs depends of the future flow of passengers, in this case this method is utilized.

In case that the payment of a fixed periodic amount method is used, the income depreciation method is more appropriate. The fixed payment is equivalent to a subsidy from the State. As in this case, since these payments will only be effective once the project is in operation, after the concessionaire made all the investments, it is correct to carry out the depreciation in which the subsidy quotes are subtracted as soon as they are made.

The following formula is used with this payment alternative:

$$\frac{\text{Cost of works under concession}}{\text{Total estimated income}} \times \text{Period income}$$

b) Working Capital

Aside from the required infrastructure investment, it is necessary to keep working capital for the administration and maintenance of the airport facilities. The used assumptions to estimate this amount are the following:

- Accounts Receivable: It is assumed that the average period for billing of commercial income and payments from DGAC will be 30 days.
- Accounts Payable: It is assumed that operations expenses payments will be made on average within 30 days.
- Cash: A cash balance equivalent to 10% of operation expenses must be maintained.

Detailed calculations of work capital net balance and the annual changes coming from the increase in expenses and incomes are presented in sheet ***G&A,*** in the financial model in **Annex D.**

c) Financing

In the case where debt finance has been incorporated, the following average terms have been considered, derived from the loan conditions or bonds obtained by the present airport concessionaires in Chile:

- % of financed investment 70%
- Annual interest rate 8%
- Term/Period 20 years for Phase 1 investment
  10 years for later investments
- Grace period 0 years
- Initial commission 2%

d) Taxes

The taxes that were considered and included in the model correspond to a tax of 15% over the resources of the company. Since it is estimated that operative expenses are greater than direct commercial incomes of the concessionaire, and the subsidies by DGAC are discounted through a depreciation calculation, taxes are only one factor when external financing is incorporated.

6.4.3 Financial Analysis Results

a) Initial Results

Table 6-7 presents a comparative summary of the initial results of the analysis for each alternative with the traditional DGAC payment method to the concessionaire, including a tariff per passenger enplaned to recuperate land-side airport expenses, and a fixed periodic payment for the air-side costs. These results are for a concession of 24 years.

Table 6-7 Results Summary – Traditional Payment Method

Traditional Payment Method(w/Tariff per Passenger)								
Altern.	Characteristics			Concessionaire				DGAC
				Projedt Without Loan		With Loan		
	Reuti Maqu	Adja. Area	Only Land	Tariff p Pax ($ Ch)	Fixed Pay (UF/year)	TIR	VAN (UF/year)	VAN (al 12%) (UF/year)
1	X			7.536	73.654	21,4%	200.465	(505.858)
2	X		X	7.536	0	20,6%	102.282	(430.208)
3	X	X		7.488	73.653	21,4%	200.501	(505.856)
4		X		7.488	73.653	21,4%	200.501	(664.399)
5		X	X	7.488	0	20,6%	102.282	(588.750)
6				7.536	73.654	21,4%	200.465	(664.401)
7			X	7.536	0	20,6%	102.282	(588.751)

Table 6-8 presents a comparative summary of the results with the alternate payment method, with a fixed periodic payment to recuperate all expenses.

Table 6-8 Results Summary – Alternate Payment Method

Alternate Payment Meth. (Without Tariff per Pax)								
Altern.	Characteristics			Concessionaire				DGAC
				Project Without Loan		With Loan		
	Reuti Maqu	Adja. Area	Only Land	TIR	Fix Payment (UF/year)	TIR	VAN (UF/year)	VAN (12%) (UF/year)
1	X			12,0%	152.847	20,7%	141.084	(429.132)
2	X		X	12,0%	78.532	21,7%	67.365	(349.445)
3	X	X		12,0%	152.270	20,7%	141.084	(429.165)
4		X		12,0%	152.270	20,7%	141.084	(587.708)
5		X	X	12,0%	77.955	21,7%	67.365	(508.022)
6				12,0%	152.847	20,7%	141.084	(587.675)
7			X	12,0%	78.532	21,7%	67.365	(507.989)

The status of the results and concessionaire's cash flow with each alternative can be found in sheet ***FlujoConces*** in **Annex D.** The project's cash flow, from DGAC's point of view, can be found in sheet ***FlujoGob***, in the same Annex. This Annex also includes some of the principal indicators related to the flow expenses and projected income for each alternative.

b) Initial Analysis of the Results

A first general conclusion is that with all the alternatives, the project will require a net subsidy from DGAC, which is indicated by the negative VAN shown in the last column of every table. Therefore, this result must not be seen as a negation to the project's financial feasibility, given that the rates and duties charged by DGAC are fixed in order to maintain the sustainability of the Chilean airport system as a whole. A new airport, like the one proposed for Temuco, must be financed in part by income from the existing airports, which do not require large amounts of investment.

What is more relevant is that an initial analysis of these results allows the selection of the most attractive alternatives to consider. For example, it can be noted that there is little difference in regards to which entity will administer the adjacent areas. Since the incorporation of these areas during the concession slightly reduces payments from DGAC, and also reduces the administrative charges, it can be concluded that Alternatives 3, 4 and 5 are the most attractive.

The comparison of the alternatives to concession the entire airport (Alternatives 3 and 4), or to keep the traditional structure to concession only the land-side (Alternative 5) is more complex. Even though the results indicate that this last structure represents a net cost of between 11% and 14% less for DGAC, the presented estimates do not include various additional costs for the Directorate to build and operate the air-side. These include the operative costs and an increase in public debt.

The alternative to concession the entire airport is more attractive if the additional operative costs for DGAC to assume the construction and operation of the air-side has a present value of 12% over 75,000 UF, which is equivalent to an average of 10.000 UF annually.

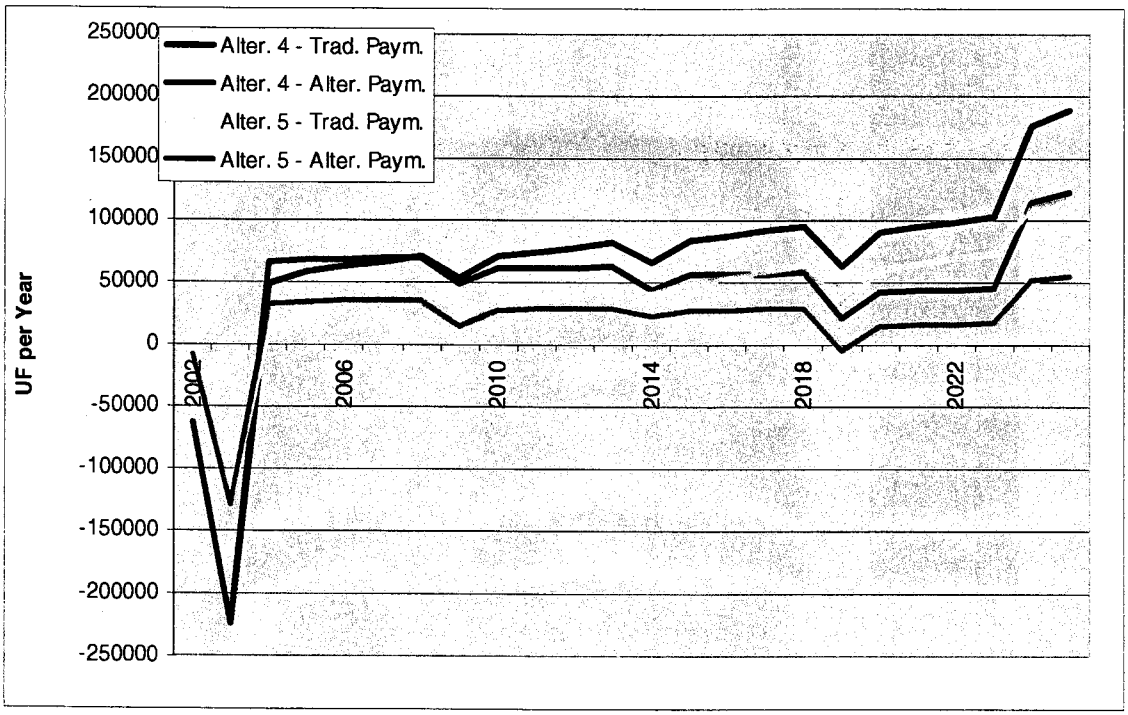
The suggested payment method for the General Coordination of Concessions, in which the payment from the concessionaire is eliminated through a tariff per enplaned passenger, clearly reduces DGAC's required subsidy, between 12% and 19%, according to the alternative, if demand does not vary substantially.

This alternate method also offers the Government an advantage in case demand is superior to the initial projections. The government receives an increase in income derived from this demand, without having to increase its payments to the concessionaire.

In case that demand is significantly lower than expected, there should be no big difference from the point of view of the Government, if it's taken into consideration that the present system generally includes a guaranteed minimum income, which is estimated based on a return rate of 12%.
The comparison is not very clear from the point of view of the concessionaire. Even though the Concessionaire's Rate of Return in the debt scenario does not vary substantially with a change in the payment method, its VAN is superior if an enplanement tariff is included. Also, when demand exceeds the projections, the benefit to the concessionaire is limited to an increase in commercial income, since it won't share the increase in the income per passenger.

Figure 6-3 shows the concessionaire's annual flows for Alternatives 4 and 5, if external financing is included[3]. This figure indicates that even though the TIR is similar with both methods of payment, the traditional method offers less net income for the concessionaire during the first years, but results in significantly higher margins over the medium and long terms.

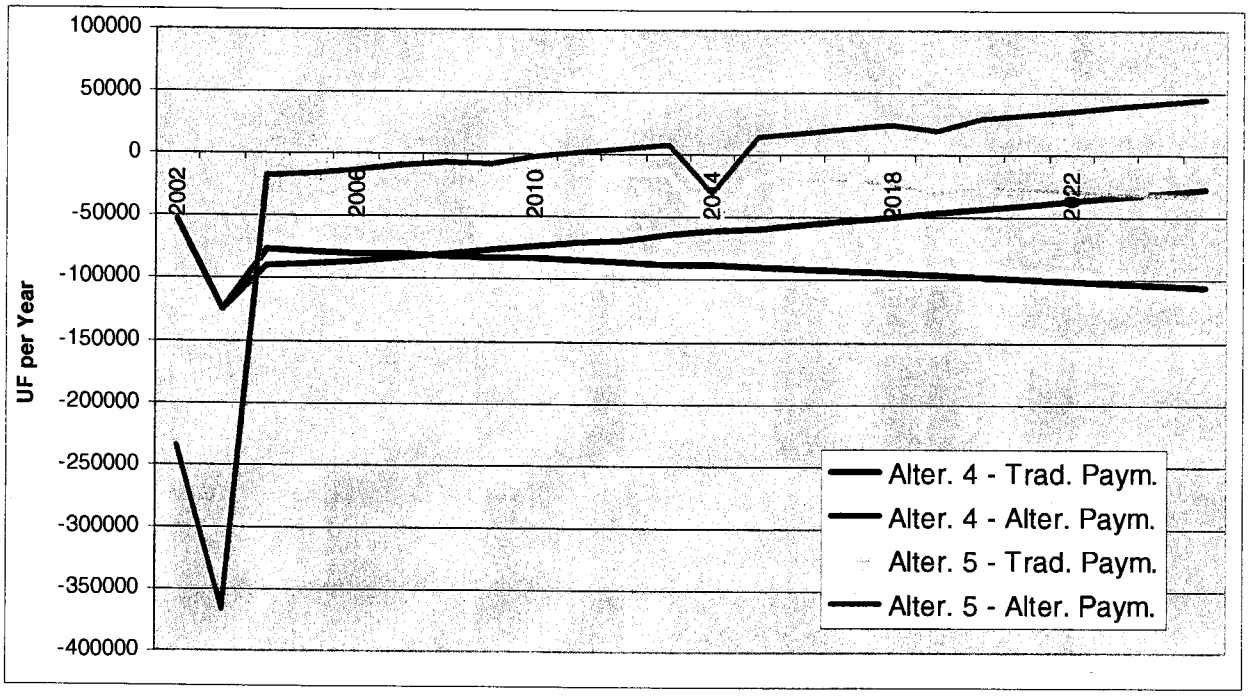
Figure 6-3: Concessionaire's Annual Flow Projection – Alternatives 4 and 5



[3] From the point of view of the concessionaire, Alternative 3 is equal to Alternative 4, since the income from the sale of Maquehue only affect DGAC.

Figure 6-4 presents a similar comparison, but from DGAC's point of view. In this case, a substantially different behavior is observed over the long run, in which the payment method through a tariff per passenger implies an increase in annual deficits, while the alternate method implies a constant reduction in these deficits, offering a net surplus starting in 2015 for Alternative 5.

Figure 6-4: DGAC Annual Projection Flow – Alternatives 4 and 5



6.4.4 Sensibility Analysis

The results of the financial analysis are evaluated through a sensibility analysis to determine the impact of changes in the main variables. The variation range of these variables is established to explore the extreme risk limits of the project, even though a low probability occurrence could be assigned to the majority of these tests.

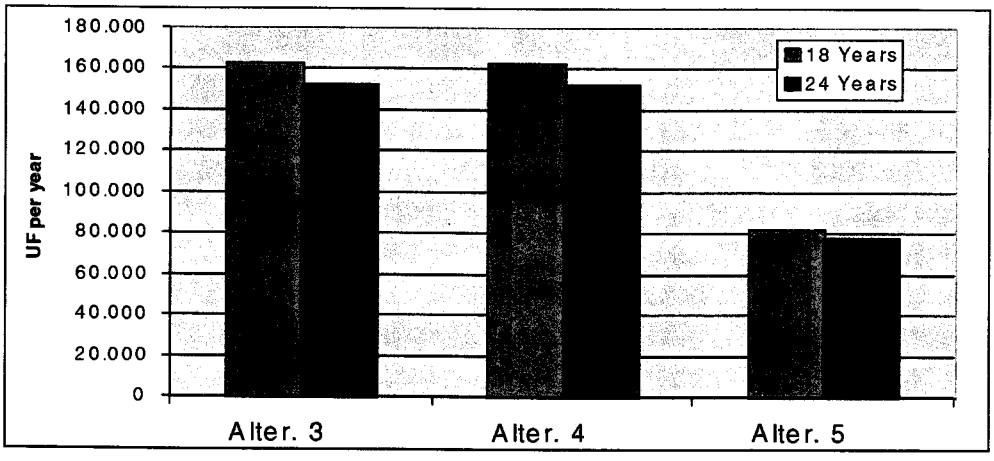
Following is the impact of changes to the other following factors over profit of the main alternatives (3, 4 and 5), with an alternate payment method, from the point of view of the concessionaire as well as that of DGAC.

- Concession Terms
- Investment costs
- Demand Scenario

a) Concession Terms

The previously presented results correspond to a concession of 24 years, which includes four phases of investment. Also executed were model runs for the concession with terms of 18 years (2002-2019), which only includes the first three phases.

Figure 6-5: Impact of the Variation of the Concession Terms over Annual Payment



As this figure demonstrates, a reduction in the concession term increases the annual payment amount required for the concessionaire to obtain a return of 12%.

As a result of this increase, a lower term of 18 years also results in an increase in the net cost for DGAC between 6% and 8%, depending on the alternative.

b) Variation in Investment Costs

Figure 6-6 presents a summary of the effect on the annual fixed payment of each variation alternative on the investment costs. Alternatives 3 and 4, which include the complete concession of the airport, are slightly more sensitive to cost variations than Alternative 5.

Figure 6-6: Investment Cost Variation Impact over Annual Payment

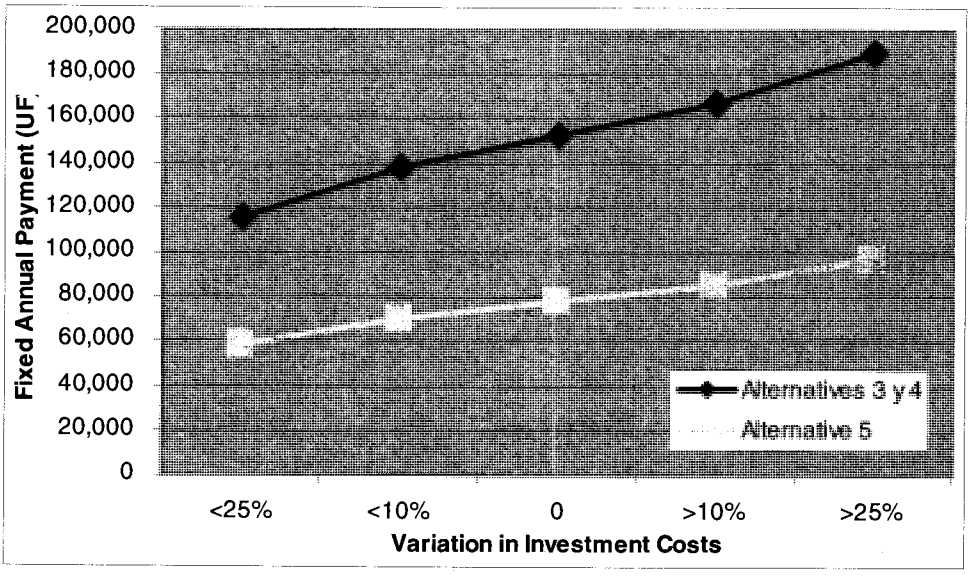
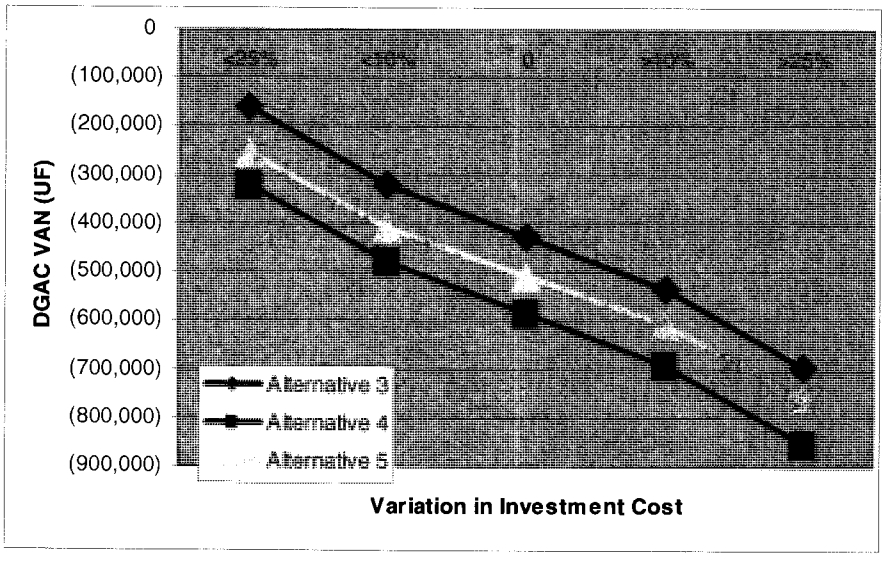


Figure 6-7 presents a summary of the effects over VAN to DGAC for each variation alternative of investment costs. As can be seen in the figure, the project represents a net charge for DGAC's finances, even in the case of a reduction of 25% of investment costs.

Figure 6-7: Variation Impact of Investment Costs over DGCA's VAN



In order for the project to stop receiving subsidies from the national airport system, the following reductions in investment costs would be necessary:

Alternative 3	<40,1%
Alternative 4	<54,9%
Alternative 5	<50,7%

Logically, the reduction in the required costs of Alternative 3 is less, since this scenario also includes income coming from the sale of Maquehue property. Nevertheless, the required reduction is substantial.

c) Variation in Demand

Three demand scenarios were presented in Chapter 2: medium, high and low. The medium scenario was used for the base analysis. But the model also allows obtaining results with the other two scenarios.

To estimate the results of the other demand scenarios, the investment in Phases 2, 3 and 4 were varied to adjust an increase or decrease in demand, in comparison to the projection base. The initial investment is kept at no variation, under the assumption that the demand tendencies in the medium and long terms will not be apparent before the beginning of the project.

Figure 6-8 presents the demand variation impacts over annual fixed payment to the concessionaire, while **Figure 6-9** shows this impact over VAN for DGAC.

Figure 6-8: Demand Variations Impact over Fixed Annual Payment

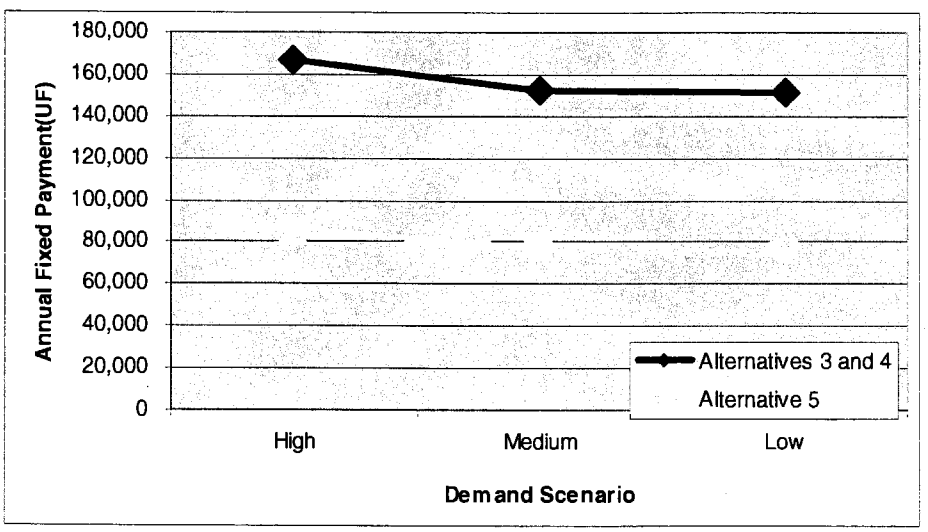
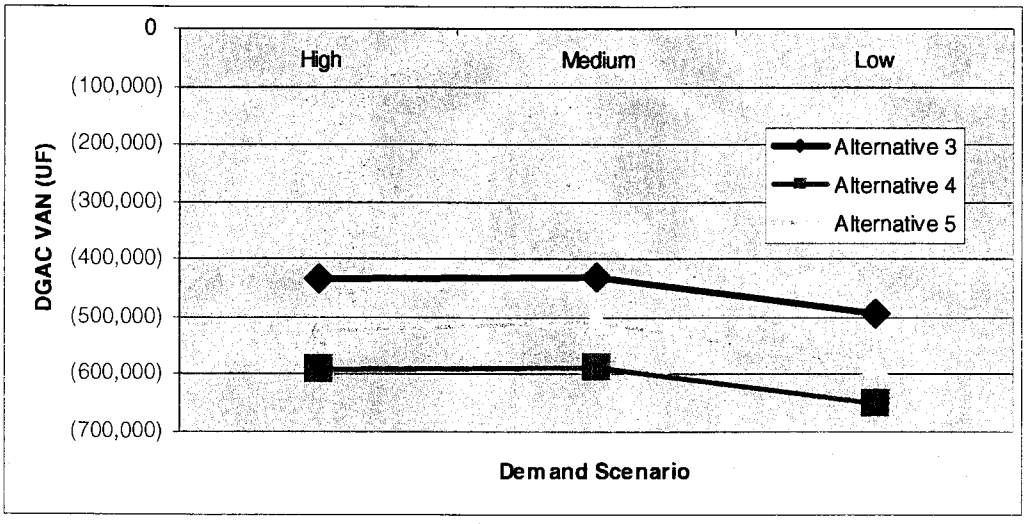


Figure 6-9: Demand Variation Impact over DGAC VAN



These two figures present an interesting demand variation effect. Under the Low Scenario, the annual fixed payment is reduced mirroring a reduction in cost for the concessionaire. But the income for DGAC coming from the airport experienced an even greater reduction, which would lead to a more negative VAN for the Directorate.

In the case of the High Scenario, an important increase of 9% of the annual fixed payment amount is compensated by a similar increase in DGAC income, which is translated to a VAN similar to the Medium Scenario.

The reason why the results are more sensitive to a reduction, in comparison to an increase in the demand, is that the initial investment is maintained with no change, which carries with it a grade over the project during the first 10 years, in the case of the Low Scenario.

It is also important to note that the Project's TIR for the concessionaire, when debt is incorporated into the model, increases by 1% under the High Scenario, and is reduced by the same proportion under the Low Scenario.

6.5 Conclusions and Recommendations

Taking into account that the project, under any of the analyzed alternatives, will require a net subsidy from the Chilean airport system through DGAC, and as an expected result from the political tariff adopted by the Government, the importance of the financial analysis is that it allows to reach some preliminary conclusions related to the concession structure, which could minimize this subsidy.

The impact on project revenue for the concessionaire and DGAC was analyzed, establishing concession terms of 18 and 24 years, respectively. It was found that a

term of 24 years would result in less net costs for DGAC, and similar potential returns for the concessionaire.

6.5.1 Concession Scope

Different alternatives to establish terms and scopes for the concession were analyzed. The main conclusions were the following:

- The impact on project revenue for the concessionaire and DGAC was analyzed, establishing concession terms of 18 and 24 years, respectively. It was found that a term of 24 years would result in less net costs for DGAC, and similar potential returns for the concessionaire.
- The inclusion of adjacent areas to be included in the concession of the airport is recommended. Even though this does not have a significant impact on the income of the project for either of the two parts, it does allow for the reduction of administrative oversight over DGAC.
  The possibility of greater demand exists in the long run, with the growth of areas, such as Temuco and Quepe, which is translated to larger income.
- The turning over of income to the project from the sale of property at Maquehue airport could be particularly important as a mechanism to DGAC to reduce the net cost of the project, even though the legal situation regarding the availability of these lands needs to be clarified.
- Adding the development of the existing airport property to the concession of the new airport could complicate even more the legal uncertainties. It seems to be more simple that DGAC sell these properties (if it is made available to them) and use these resources to finance part of the payment that it must make to the concessionaire.
- Even though the model indicates that the alternative to concession only the land-side of the airport could reduce the net costs of the project for DGAC, other various additional costs to the Directorate were not considered to build and operate the air-side, particularly the operative costs and an increase in public debt.

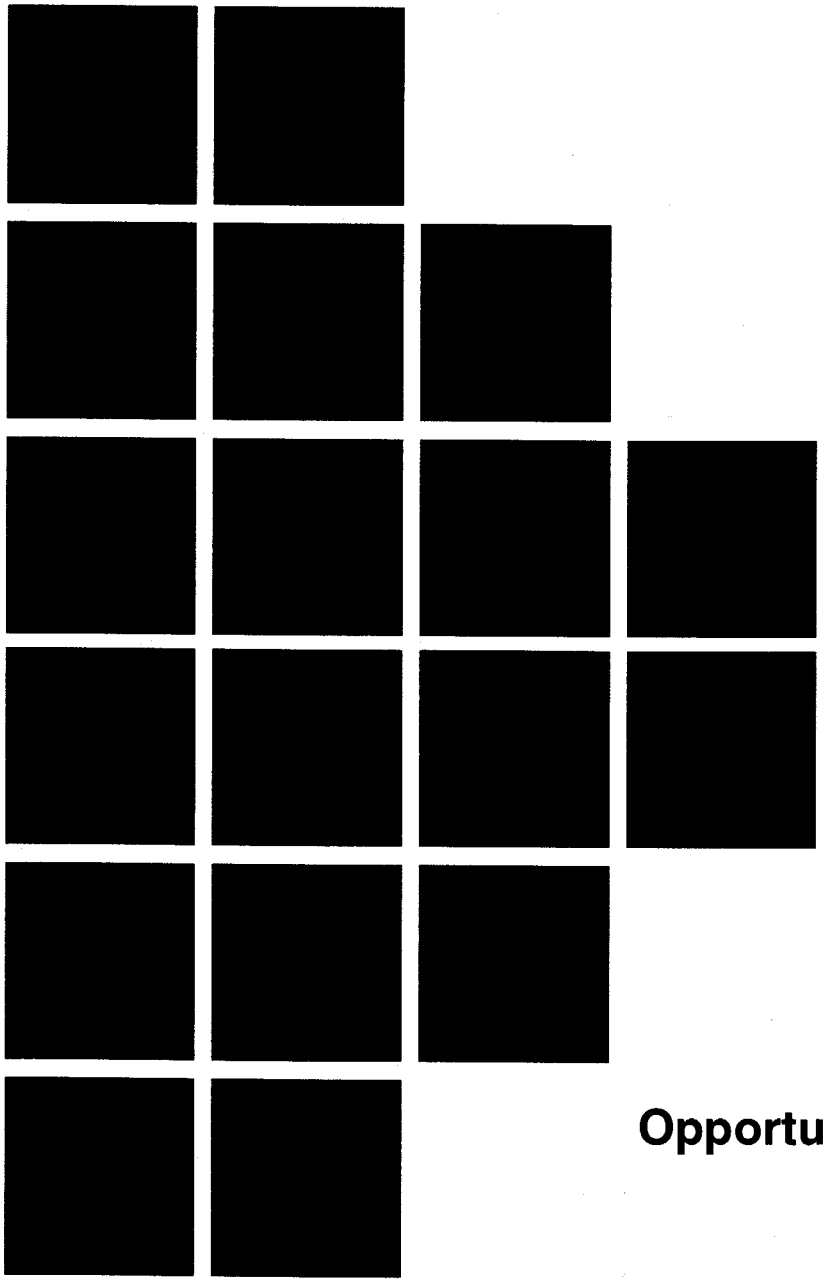
6.5.2 Payment Method

Two alternate methods for the transfer of resources from DGAC to the concessionaire were analyzed. The first method maintains the present system of charging a tariff per passenger enplaned, as part of the works bid. A second method was also considered, in which DGAC makes a periodic fixed payment, which would allow the concessionaire to obtain a return of 12%.

The conclusion that this second method was preferable was reached, for the following reasons:

- If demand does not vary substantially than projected, the required subsidy from DGAC is reduced to between 12% and 19%, according to the alternative.
- An advantage is also presented to the Government, in case demand is superior to that of the initial projections. The government receives an increase in income coming from this demand, without having to increase its payments to the concessionaire.
- In case that demand is significantly lower than expected, it should not make a significant difference from the point of view of the Government, if it's taken into consideration that the present system generally includes a guaranteed minimum income, with the estimate based on a return of 12%.

This alternate method does not negatively affect the concessionaire, except in the case that demand exceeds the projections, since the concessionaire would not share the increase in the income per passenger.
In case that it is decided to pursue the second method, the annual fixed payment amount could be established as one of the award criteria variables, in a similar manner as to that used in the tariff per enplaned passenger in previous airport concessions.



The Louis Berger Group, Inc.

CHAPTER VII
Opportunities for US Suppliers of Goods and Services

CHAPTER VII

OPPORTUNITIES FOR US SUPPLIERS OF GOODS AND SERVICES

7.1 Introduction

According to TDA requirements and the Terms of Reference, a preliminary list has been carried out of US suppliers, operators, construction companies and investors for the construction and operation of the facilities at the new Temuco Airport.

7.2 List of U.S. Equipment Suppliers

a) ARFF Equipment

ENVIROFUEL INC/"E III" ENVIROFLUID
1613 Kennedy Avenue
Blacksburg, VA 24060-5731
Mr. Ted DeBruyn, Chairman/CEO
Phone: (540) 5520001
Fax: (540) 552-0002
Website: **WWW.CPCHEM.COM/SPECIALTYCHEM**

OSHKOSH TRUCK CORPORATION
2307 Oregon St
Oshkosh, WI 54901
Mr. David Laurent
Phone: (920) 233-9442
Fax: (920) 233-9607
Website: **WWW.OSHKOSHTRUCK.COM**
E-mail: **DLAURENT@OSHTRUCK.COM**

PRO-TEC FIRE SERVICES LTD
2129 South Oneida Street
Green Bay, WI 54304
Mr. Richard L. Watermolen, Vice President
Phone: (920) 494-8851
Fax: (920) 494-5384
Website: **WWW.PROTECFIRE.COM**
E-mail: **INFO@PROTECFIRE.COM**

b) Airfield Equipment

HI-LITE MARKINGS, INC
18249 Hi-Lite Drive
P.O. Box 350
Adams Center, NY 13606-0350
Ms. Rhonda M. McNeely
Phone: (315) 583-6111
Fax: (315) 583-5807

TIGER CORPORATION
3301 North Louise Avenue
Sioux Falls, SD 57107
Mr. Randy Jensen, Marketing Manager
Phone: (605) 336-7900
Fax: (605) 338-9702
Website: WWW.TIGER-MOWERS.COM
E-mail: RJENSEN@TIGER-MOWERS.COM

c) Airfield Marking and Stripping

HI-LITE MARKINGS, INC
18249 Hi-Lite Drive
P.O. Box 350
Adams Center, NY 13606-0350
Ms. Rhonda M. McNeely
Phone: (315) 583-6111
Fax: (315) 583-5807

ROADS & RUNWAYS STRIPING SERVICE INCORPORATED
P.O. Box 6514
Daytona Beach, FL 32118
Mr. Donald F. Boatner, CEO
Phone: (904) 255-4521
Fax: (904) 238-1438

SPEIDEL CONSTRUCTION INC
58 Le-Way Dr
Fredericksburg, VA 22406
Ms. Donna J. Speidel, President
Phone: (540) 371-5326
Fax: (540) 899-3653
Website: WWW.CLEANRUNWAYS.COM
E-mail: DONNA@CLEANRUNWAYS.COM

d) Baggage Handling Equipment

BAE AUTOMATED SYSTEMS
2525 Carter Drive
Carrollton, TX 75006
Mr. John Gude, Director of Marketing & Business Development
Phone: (972) 245-9411
Fax: (972) 389-6490
Website: WWW.BAE-INC.COM
E-mail: PURCHASING@BAE-INC.COM

BURNS & MCDONNELL
4800 East 63rd Street
Kansas City, MO 64130
Mr. Randy D. Pope, P.E., Associate Vice President
Phone: (816) 822-3231
Fax: (816) 822-3517
Website: WWW.BURNSMCD.COM
E-mail: RPOPE@BURNSMCD.COM

CAGE INC.
1303 Walnut Hill Lane, Suite 140
Irving, TX 75038
Ms. Susan Prediger, Director of Business Development
Phone: (972) 550-1001
Fax: (972) 550-9221
Website: WWW.CAGE-INC.COM
E-mail: SPREDIGER@CAGE-INC.COM

DIVISION SYSTEMS
3957 East Raines Road
Memphis, TN 38118
Mr. Steven R. Muccillo, President
Phone: (901) 366-4220
Fax: (901) 365-3934
Website: WWW.DIVISIONSYSTEMS.COM
E-mail: MUCCILLO@DIVISIONSYSTEMS.COM

G & T CONVEYOR COMPANY INC.
476 South Ridge Industrial Dr
Tavares, FL 32778
Mr. Ted Majewski, Vice President
Phone: (352) 343-1500
Fax: (352) 343-2040
E-mail: GTCONVEYOR@EARTHLINK.COM

IDmicro, LLC
1019 Pacific Avenue, 13th Floor
Tacoma, WA 98402
Roger C. Douglas, Vice President, Investor Relations
Phone: (253) 396-1479
Fax: (253) 396-1478
Toll Free: (877) 395-1479
Website: WWW.IDMICRO.COM
E-mail: RDOUGLAS@IDMICRO.COM

JERVIS B. WEBB
34375 West Twelve Mile Road
Farmington Hills, MI 48331
Mr. Michael Loux, Director of Marketing Research
Phone: (810) 553-1000
Fax: (810) 553-1228
Website: WWW.JERVISBWEBB.COM
E-mail: INFO@JERVISBWEBB.COM

PROFESSIONAL CONVEYOR SERVICE
P.O. Box 1118
Bristol, CT 06011-1118
Mr. Richard Bugryn, Director of Maintenance/Service
Phone: (860) 582-9816
Fax: (860) 589-9157

VIC THOMPSON COMPANY
2738 SE Loop 820
Ft. Worth, TX 76140
Mr. Vic Thompson, President
Phone: (817) 293-7600
Fax: (817) 293-8856

e) Display Systems

AEROGROUP, LTD.
P.O. Box 14013
Research Triangle Park, NC 27709
David L. Rigsbee, President
Phone: (800) 672-8536
Fax: (919) 544-9224

ALPINE SYSTEMS
RR 1 Box 3109
Killington, VT 05751

Mr. George Cone, Director of Sales
Phone: (802) 422-3008
Fax: (802) 422-7166
E-mail:alpinesy@vermontel.com

f) Fencing

SAFEGUARDS TECHNOLOGY INC.
75 Atlantic St.
Hackensack, NJ 07601
Mr. Baruch Koren, V.P. Marketing
Phone: (201) 488-1022
Fax: (201) 488-1244
Website: WWW.SAFEGUARDS.COM
E-mail: MARKETING@SAFEGUARDS.COM

g) Fire Detection, Fire Extinguishing, and Control Systems

COSERV SECURITY
3501 FM 2181
Denton, TX 76205
Ray Coppock, VP/General Manager
Phone: (214) 747-6500
Fax: (214) 747-6555
Website: WWW.COSERV.COM

HALOTRON INC
3770 Howard Hughes Parkway, Suite 300
Las Vegas, NV 89109
Mr. Jeff Gibson, Director, Support Operations
Phone: (702) 735-2200
Fax: (702) 735-4876
Website: WWW.HALOTRON-INC.COM
E-mail: JEGIBSON@APFC.COM

h) Floor Covering

INTERFACE FLOORING SYSTEMS INC
Orchard Hill Rd
P.O. Box 1503
LaGrange, GA 30241
Ms. Tracy Cook, Public Relations Manager
Phone: (706) 882-1891

Fax: (706) 882-0500
Email: ifsai.com

MILLIKEN AND COMPANY
201 Lukken Industrial Dr West
LaGrange, GA 30240
Mr. Edward P. Waltemath, Contract Carpet Consultant
Phone: (706) 880-5415
Fax: (706) 880-5906
Website: WWW.MILLIKEN.COM

i) Ground Maintenance Equipment

TIGER CORPORATION
3301 North Louise Avenue
Sioux Falls, SD 57107
Mr. Randy Jensen, Marketing Manager
Phone: (605) 336-7900
Fax: (605) 338-9702
Website: WWW.TIGER-MOWERS.COM
E-mail: RJENSEN@TIGER-MOWERS.COM

j) Ground Support Equipment

CAGE INC.
1303 Walnut Hill Lane, Suite 140
Irving, TX 75038
Ms. Susan Prediger, Director of Business Development
Phone: (972) 550-1001
Fax: (972) 550-9221
Website: WWW.CAGE-INC.COM
E-mail: SPREDIGER@CAGE-INC.COM

FORTBRAND SERVICES INC.
One Ames Court, Suite 200
Plainview, NY 11803
Mr. Rich Boily, Vice President Sales
Phone: (516) 576-3200
Fax: (516) 576-3221
Website: WWW.FORTBRAND.COM
E-mail: RBOILY@FORTBRAND.COM

NMC-WOLLARD
2021 Truax Blvd.
Eau Claire, WI 54703
Mr. Bruce Steingart, Vice President
Phone: (715) 835-3151
Fax: (715) 833-8707
Website: WWW.NMC-WOLLARD.COM
E-mail: BSTEINGART@NMC-WOLLARD.COM

k) Lighting, Airfield

ADB, A Siemens Company
977 Gahanna Parkway
Columbus, OH 43230
Mr. Elvis Jimenez, International Sales Manager
Phone: (614) 573-8225
Fax: (614) 573-8325
Website: WWW.SAS.SIEMENS.COM
E-mail: ELVIS.JIMENEZ@SAS.SIEMENS.COM

AIRPORT LIGHTING SYSTEMS
10661 Shady Trail
Dallas, TX 75220
Mr. Steve Denny
Phone: (800) 962-6574
Fax: (214) 366-0922
Website: WWW.AIRPORTLIGHTING.COM
E-mail: QUESTIONS@AIRPORTLIGHTING.COM

CH2M HILL
4350 W Cypress Street
Suite 600
Tampa, FL 33607-4155
Mr. Philip C. Becker, Senior Airport Engineer
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HONEYWELL AIRPORT SYSTEMS
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I) Lighting, Terminal

WIDE-LITE
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m) Navigational Aids

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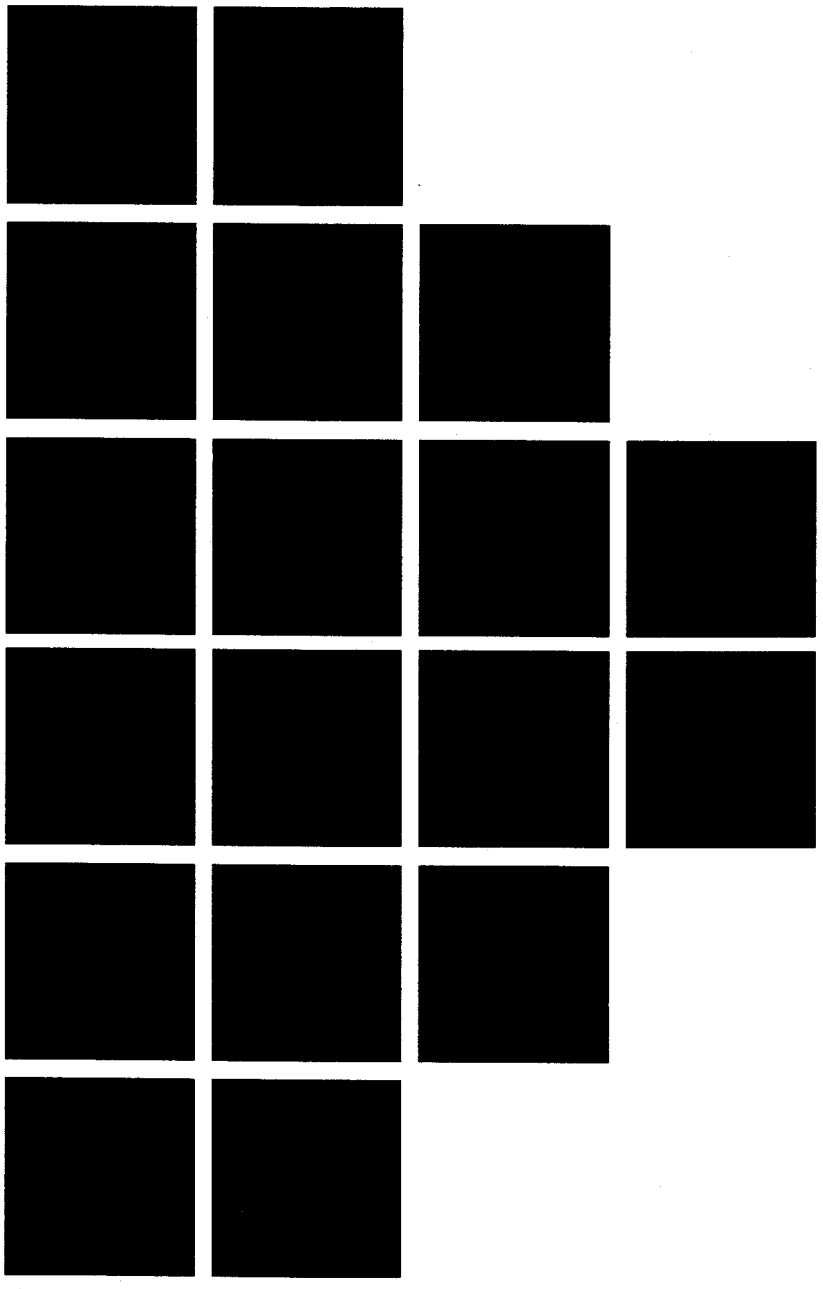
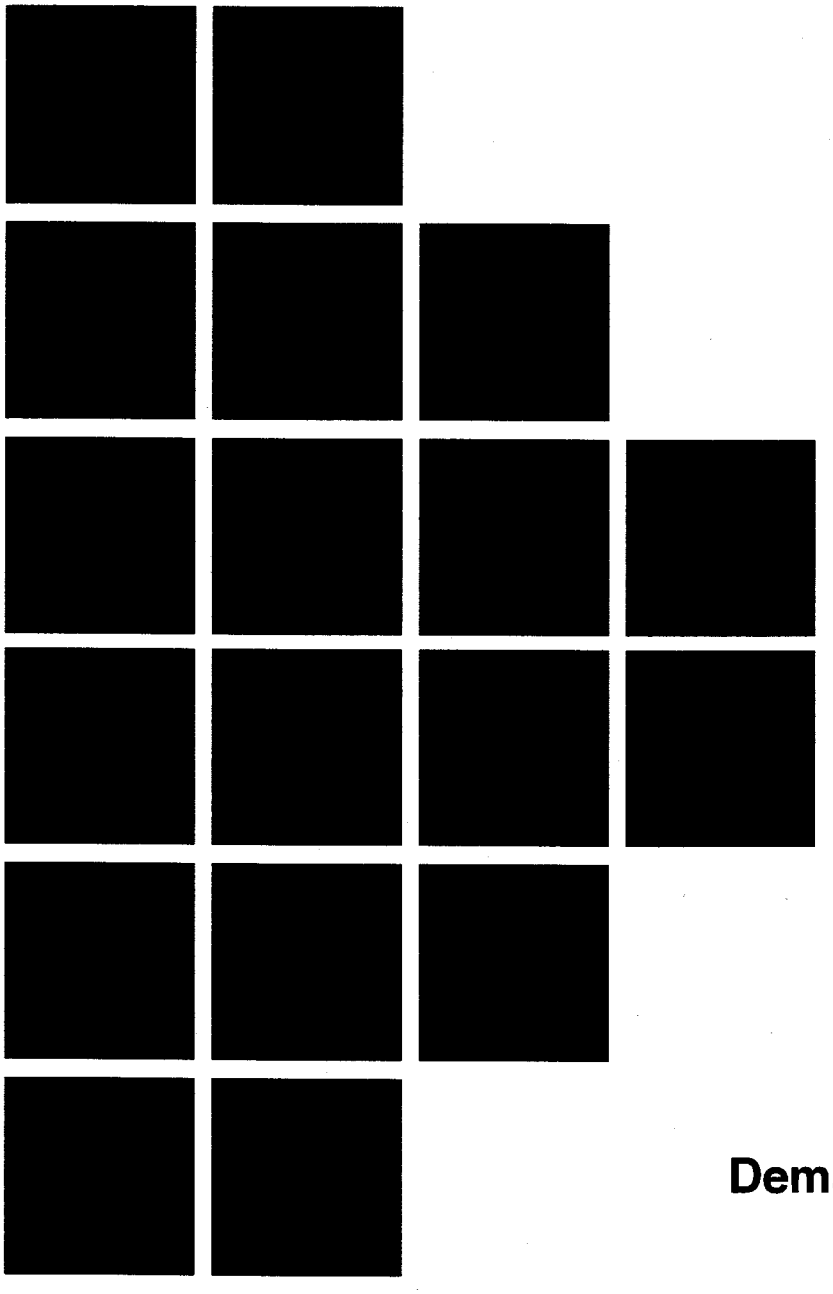


The Louis Berger Group, Inc.

ANNEXES



The Louis Berger Group, Inc.

ANNEX A
Demand Projections/Tables

Table 2.1a
Passenger Traffic Generated in Temuco. 1961-99
('000 Annual Pax)

	Passengers		
	National	International	Total
1961	6,365	-	6,365
1962	6,186	-	6,186
1963	4,132	-	4,132
1964	6,121	-	6,121
1965	10,754	-	10,754
1966	12,146	-	12,146
1967	12,215	-	12,215
1968	8,279	-	8,279
1969	7,951	-	7,951
1970	6,782	-	6,782
1971	10,063	-	10,063
1972	9,796	-	9,796
1973	8,651	-	8,651
1974	4,175	-	4,175
1975	726	-	726
1976	88	-	88
1977	300	-	300
1978	841	-	841
1979	2,672	-	2,672
1980	8,338	-	8,338
1981	29,283	-	29,283
1982	27,077	-	27,077
1983	10,326	-	10,326
1984	15,831	-	15,831
1985	16,730	-	16,730
1986	9,627	-	9,627
1987	21,873	-	21,873
1988	38,290	-	38,290
1989	48,961	975	49,936
1990	51,217	2,340	53,557
1991	55,270	3,762	59,032
1992	69,561	6,135	75,696
1993	80,542	9,035	89,577
1994	129,714	17,529	147,243
1995	151,318	16,179	167,497
1996	194,095	22,555	216,650
1997	236,278	8,795	245,073
1998	242,287	5,199	247,486
1999	247,285	3,219	250,504

Source: Dirección General de Aeronáutica Civil (DGAC)

Table 2.1b
Tendencies of GDP and Terrestrial and Air Passenger Traffic

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Variation National GDP	5.6	6.6	7.3	12.3	3.7	8	12.3	7	5.7	10.6	7.4	7.6	3.4	-1.1	5.5
Variation Region IX GDP					1%	3%	14%	10%	2%	11%	3%				
National Bus Traffic ('000 Tollbooth Passes)						1140	1244	1380	1566	1659					
Variation Bus Traffic							9.1%	10.9%	13.5%	5.9%					
National Air Traffic (Pax '000)	566	646	736	808	856	890	1171	1486	1790	1,997	2,410	3,080	3,327	3,132	3,117
Variation National Air Traffic		14%	14%	10%	6%	4%	32%	27%	20%	12%	21%	28%	8%	-6%	0%
Temuco Air Traffic (Pax '000)	10	22	38	50	54	59	76	90	147	167	217	245	247	251	286
Variation Temuco Traffic					7%	10%	28%	18%	64%	14%	29%	13%	1%	1%	14%
Participation Temuco Air Traffic/ National Air Traffic	2%	3%	5%	6%	6%	7%	6%	6%	8%	8%	9%	8%	7%	8%	9%

	Period 1991-95
Growth National GDP	37%
Growth Regional GDP	32%
Growth Bus Traffic	37%
Growth National Air Traffic	109%
Growth Temuco Air Traffic	175%

1.11836864

Source: Instituto Nacional de Estadística
Junta de Aeronáutica Civil

Table C2.2a
National Passenger and Cargo Traffic to/from Santiago
2000

	To/From Santiago			
	Passengers	Cargo	Pax Equivalents (1)	
	('000 Pax/Year	000 Tons/Yea	Passengers	Cargo
ari	140	3.02	140	3.02
iqq	295	4.80	295	4.80
anf	314	4.65	314	4.65
clm	162	0.81	162	0.81
esr	14	0.02	14	0.02
cpo	77	0.35	77	0.35
lsc	196	0.89	196	0.89
ipc	30	1.75	30	1.75
chi	2	-	2	-
ccp	448	2.37	448	2.37
gel	3	0.00	3	0.00
tco	234	0.45	234	0.45
pcn	1	-	1	-
vld	47	0.16	47	0.16
osn	83	0.32	83	0.32
pmc	274	3.31	274	3.31
bal	73	2.77	73	2.77
puq	198	5.39	198	5.39

Source: Junta de Aeronáutica Civil.

Table 2.2b
National Passenger Traffic with Origins/Destinations Other than Santiago
('000 Annual Passengers)

	ari	iqq	anf	clm	esr	cpo	lsc	ipc	chi	ccp	gel	tco	pcn	vld	osn	pmc	cth	bal	puq	Total
ari		39	14	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	53
iqq	39		33	0	-	0	6	-	-	-	-	-	-	-	-	-	-	-	-	79
anf	14	33		13	-	5	9	-	-	-	-	-	-	-	-	-	-	-	-	74
clm	-	0	13		-	1	0	-	-	-	-	-	-	-	-	-	-	-	-	15
esr	-	-	-	-		-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
cpo	0	0	5	1	0		-	-	-	-	-	-	-	-	-	-	-	-	-	7
lsc	-	6	9	0	1	-		-	-	-	-	-	-	-	-	-	-	-	-	16
ipc	-	-	-	-	-	-	-													-
chi	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-
ccp	-	-	-	-	-	-	-	-	-		0	2	0	3	2	2	-	0	7	16
gel	-	-	-	-	-	-	-	-	-	0		-	-	-	-	-	-	-	-	0
tco	-	-	-	-	-	-	-	-	-	2	-		0	0	3	3	-	0	4	12
pcn	-	-	-	-	-	-	-	-	-	0	-	0		-	-	-	-	-	-	0
vld	-	-	-	-	-	-	-	-	-	3	-	0	-		-	0	-	-	-	3
osn	-	-	-	-	-	-	-	-	-	2	-	3	-	-		0	-	-	-	4
pmc	-	-	-	-	-	-	-	-	-	2	-	3	-	0	0		5	49	46	106
ctn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5		-	-	5
bal	-	-	-	-	-	-	-	-	-	0	-	0	-	-	-	49	-		0	50
puq	-	-	-	-	-	-	-	-	-	7	-	4	-	-	-	46	-	0		58

Source: Junta de Aeronáutica Civil

Table 2.3a
International Air Traffic, 2000.

Airport	Origin/Destination	000 Annual Pax
Santiago	Argentina	981
	North-Central America	918
	Europe	412
	Perú	276
	Brazil	271
	Uruguay	78
	Colombia	75
	Ecuador	48
	Bolivia	34
	Venezuela	30
Iquique	Bolivia	19
	Paraguay	18
Arica	Bolivia	10
Others		85
Total		3,254

Source: Junta de Aeronáutica Civil

Table 2.3b
Hotel Capacity 1992-1997

Region	('000 Rooms)		
	1995	1996	1997
i	32,413	36,154	33,727
ii	17,423	17,869	19,758
iii	14,116	13,796	14,515
iv	8,534	8,401	8,681
v	50,605	50,846	51,024
rm	63,091	69,363	72,179
vi	13,341	12,652	15,583
vii	14,801	15,241	15,991
viii	27,871	30,998	35,052
ix	16,224	17,796	17,692
x	33,888	36,273	32,906
xi	4,019	4,308	4,691
xii	7,601	7,896	7,571
Total	303,927	321,593	329,370

Source: INE. Panorama Regional 1990-98.

Table 2.3c
Entry and Exit of Tourists by Country of Origin/Destination, 1993
(tourists/years)

Continent	Country	Entry Foreigners by Origin	Exit Chileans by Destination	Entry/ Exit
América	Argentina	860,502	504,897	1.70
	Bolivia	67,856	16,483	4.12
	Brazil	47,676	27,097	1.76
	Canada	4,566	2,439	1.87
	Colombia	8,474	5,897	1.44
	Ecuador	7,160	5,539	1.29
	USA	84,798	112,790	0.75
	Mexico	6,293	13,677	0.46
	Paraguay	7,561	9,300	0.81
	Peru	175,579	28,139	6.24
	Uruguay	15,225	8,577	1.78
	Venezuela	8,760	8,423	1.04
	Other	10,164	10,626	0.96
	Total	1,304,614	753,884	1.73
Europa	Germany	14,749	7,659	1.93
	Spain	12,948	13,014	0.99
	France	6,882	4,727	1.46
	England	4,370	2,248	1.94
	Italy	4,616	5,597	0.82
	Holland	3,397	2,647	1.28
	Russia	2,001	939	2.13
	Sweeden	4,131	4,791	0.86
	Others	7,797	5,777	1.35
	Total	60,891	47,399	1.28
Asia	Korea	678	26	26.08
	Israel	463	567	0.82
	Japon	1,935	312	6.20
	Others	1,146	248	4.62
	Total	4,222	1,153	3.66
África	South Africa	366	228	1.61
	Others	191	246	0.78
	Total	557	474	1.18
Oceanía	Australia	2,783	1,785	1.56
	Tahiti	6,197	2,582	2.40
	Others	448	331	1.35
	Total	9,428	4,698	2.01

Source: INE. Compendio Estadístico 1996.

Table 2.3d
Entry of Tourists, by Nationality and Region of Entry
(Pax per Year)

Entry Passengers	Region	1993	1992	1995	1996	1997	1998
Chileans and Residents	i	35,184	50,462	74,786	114,270	153,230	185,387
	ii	2,643	7,672	11,898	11,904	12,764	13,101
	iii	177	581	1,298	2,033	1,486	1,525
	iv	252	324	1,738	1,403	12,362	4,406
	v	216,233	235,993	261,978	249,125	270,396	277,853
	rm	396,763	406,503	566,489	610,493	698,938	745,412
	vi	-	-	-	-	-	-
	vii	704	1,127	1,162	1,370	1,022	1,433
	viii	460	515	582	654	663	2,141
	ix	12,329	74,853	41,290	38,078	42,064	56,784
	x	84,238	88,942	92,760	92,761	111,575	121,024
	xi	22,997	29,395	13,652	8,890	18,346	32,260
	xii	75,058	134,244	120,228	106,481	113,996	130,661
	Total	847,038	1,030,611	1,187,861	1,237,462	1,436,842	1,571,987
Foreigners	i	206,221	260,650	284,902	253,758	304,662	316,649
	ii	10,773	29,328	23,576	19,917	20,360	29,913
	iii	865	626	870	652	1,290	587
	iv	2,592	5,176	4,160	8,132	9,772	2,945
	v	480,875	493,859	391,390	358,239	444,044	398,630
	rm	413,624	427,976	485,208	512,101	592,713	615,170
	vi	-	-	-	-	-	-
	vii	1,155	1,455	951	1,117	1,616	1,515
	viii	658	1,830	307	449	372	444
	ix	14,377	62,781	33,563	31,612	41,876	60,324
	x	108,106	121,975	135,755	114,327	130,875	152,347
	xi	17,562	19,710	9,392	6,200	38,134	21,594
	xii	74,769	189,499	133,221	119,752	137,527	161,161
	Total	1,331,577	1,614,865	1,503,295	1,426,256	1,723,241	1,761,279

Source: INE

Table 2.4
National Air Transport. Evolution of Occupation and Capacity
(millions of annual pax - km and annual seats - km)

		1995	1996	1997	1998	1999	2000
Pax-km	LanChile	860	987	2,100	2,952	2,758	2,481
	Ladeco	723	857				
	DAP	3	64	22	3	0	4
	National	284	365	490	212		
	Alta	15	45	41	18		
	Avant			229	635	875	786
	AeroVip					0	
	AeroChile		12				
	Aeromet						2
	AeroContinente						100
Total		1,885	2,330	2,882	3,820	3,634	3,271
Seats-km	LanChile	1,611	1,755	3,643	4,734	4,162	3,673
	Ladeco	1,224	1,418				
	DAP	3	127	33	5	1	6
	National	622	857	1,068			
	Alta	32	96	94			
	Avant			477	1,159	1,400	1,228
	AeroVip					2	
	AeroChile		28				
	Aeromet						3
	AeroContinente						163
Total		3,492	4,281	5,315	5,898	5,566	4,907
Occupation	LanChile	53%	56%	58%	62%	66%	68%
	Ladeco	59%	60%				
	DAP	83%	50%	68%	63%	35%	73%
	National	46%	43%	46%			
	Alta	48%	47%	44%			
	Avant			48%	55%	62%	64%
	AeroVip					24%	
	AeroChile		45%				
	Aeromet						48%
	AeroContinente						61%
	Total	54%	54%	54%	65%	65%	67%

Source: Junta de Aeronáutica Civil

Table 2.6a
Monthly Distribution of Operations at Temuco Airport. 1999.

Hour	Monthly Operations												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
0	1	0	0	2	0	0	0	0	0	0	1	0	0
1	0	0	0	2	0	0	0	0	0	2	0	0	0
2	0	0	0	1	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	-
4	0	0	0	0	0	0	0	0	0	1	0	0	0
5	0	0	0	0	0	0	0	0	0	0	1	0	0
6	3	0	0	0	0	0	0	0	0	1	1	0	0
7	8	0	1	0	0	0	0	0	0	0	0	1	1
8	10	5	17	7	1	0	5	7	1	2	2	8	5
9	82	49	98	51	28	49	22	34	62	48	47	89	55
10	180	137	113	147	109	110	86	146	132	132	135	145	131
11	167	133	122	121	113	101	65	117	117	120	118	141	120
12	157	139	100	136	123	111	80	135	103	159	129	149	127
13	93	70	74	90	118	101	89	96	78	186	100	126	102
14	81	58	68	89	69	59	72	81	50	157	73	67	77
15	84	70	98	70	76	89	76	71	68	158	103	66	86
16	95	90	148	107	101	83	89	106	80	214	133	92	112
17	130	111	177	117	145	120	142	110	110	243	147	109	138
18	193	150	144	153	139	120	131	134	144	230	178	174	158
19	138	119	99	111	119	95	83	73	87	287	141	149	125
20	166	132	69	90	77	87	77	100	104	171	157	153	115
21	69	58	18	76	86	82	59	74	77	15	15	115	62
22	33	35	3	13	2	6	10	7	1	5	2	29	12
23	5	5	2	9	1	1	1	0	0	7	0	3	3
Total	1695	1361	1351	1392	1307	1214	1087	1291	1214	2138	1483	1616	1,429
Days/month	31	28	31	30	31	30	31	31	30	31	30	31	30.4
Average ops/day	55	49	44	46	42	40	35	42	40	69	49	52	47

Source: Dirección General de Aeronáutica

Table 2.6b
Hourly Distribution of Operations at Temuco Airport. 1999.

Hour	Operations per Hour												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	-
4	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	1	0	0	0	0	0	0	0	0	0	0
9	3	2	3	2	1	2	1	1	2	2	2	3	2
10	6	5	4	5	4	4	3	5	4	4	5	5	4
11	5	5	4	4	4	3	2	4	4	4	4	5	4
12	5	5	3	5	4	4	3	4	3	5	4	5	4
13	3	3	2	3	4	3	3	3	3	6	3	4	3
14	3	2	2	3	2	2	2	3	2	5	2	2	3
15	3	3	3	2	2	3	2	2	2	5	3	2	3
16	3	3	5	4	3	3	3	3	3	7	4	3	4
17	4	4	6	4	5	4	5	4	4	8	5	4	5
18	6	5	5	5	4	4	4	4	5	7	6	6	5
19	4	4	3	4	4	3	3	2	3	9	5	5	4
20	5	5	2	3	2	3	2	3	3	6	5	5	4
21	2	2	1	3	3	3	2	2	3	0	1	4	2
22	1	1	0	0	0	0	0	0	0	0	0	1	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	55	49	44	46	42	40	35	42	40	69	49	52	47
Days/month	11%	11%	13%	11%	11%	10%	13%	11%	12%	13%	12%	11%	11%
Average ops/day	9.7%	8.6%	7.7%	8.2%	7.5%	7.2%	6.2%	7.4%	7.2%	12.2%	8.8%	9.2%	8.3%

Source: Dirección General de Aeronáutica

Table 2.6c
Weekly Distribution of Traffic at Maquehue Airport
(Daily Operations)

Week	Mon	Tue	Wed	Thurs	Fri	Sat	Sun
1	38	53	46	45	50	84	115
2	95	47	42	43	79	81	65
3	55	57	3	1	54	75	56
4	44	56	56	46	82	70	56
5	34	84	4	3	75	91	52
6	37	84	14	4	68	56	49
7	61	52	6	25	80	61	83
8	54	72	14	21	50	67	62
9	40	47	40	53	47	36	27
10	30	46	68	65	53	41	29
11	27	49	32	51	43	50	41
12	34	39	32	41	53	42	47
13	30	43	59	55	59	41	25
14	37	49	70	80	60	42	31
15	30	62	40	47	50	65	35
16	26	43	31	46	59	58	44
17	31	32	48	49	40	46	40
18	22	49	42	35	30	35	38
19	19	34	64	47	35	36	34
20	22	37	59	41	67	40	44
21	60	64	40	32	39	42	42
22	50	68	44	49	44	43	39
23	31	27	47	52	51	58	26
24	22	52	65	68	36	52	21
25	20	51	46	53	23	24	24
26	25	43	32	48	31	40	37
27	20	33	21	34	27	32	27
28	26	37	43	45	39	48	41
29	32	26	28	37	29	43	46
30	34	35	41	36	25	48	46
31	29	62	54	29	39	41	37
32	25	40	38	50	53	65	50
33	44	48	32	26	39	33	49
34	41	50	33	51	34	31	55
35	21	43	50	26	33	29	36
36	18	26	38	35	41	28	57
37	25	70	27	50	45	42	48
38	38	52	30	59	15	51	46
39	41	35	37	64	56	53	47
40	37	36	55	50	41	90	198
41	35	33	40	55	38	53	207
42	361	40	23	54	35	45	192
43	62	25	20	39	46	40	48
44	29	57	38	48	36	50	57
45	56	45	39	42	54	47	49
46	28	25	49	39	23	52	33
47	62	48	54	31	53	54	74
48	123	33	34	40	47	50	71
49	70	53	55	72	52	48	52
50	51	39	38	58	36	26	49
51	52	61	49	50	57	47	34
52	60	66	51	62	71	49	
Average	46	47	40	44	47	49	55
Day/month	3.2%	3.3%	2.8%	3.1%	3.3%	3.5%	3.9%

Source: DGAC

Table 2.6d
Seasonal Distribution of Operations, Temuco Airport
by Type of Aviation, 1999.

	Transport	GenAv/Milit.	Work	Total
ene	710	1,004	4	1,718
feb	685	766	4	1,455
mar	689	689	11	1,389
abr	773	607	5	1,385
may	767	473	16	1,256
jun	687	518	9	1,214
jul	653	444	1	1,098
ago	725	594	2	1,321
sep	747	484	4	1,235
oct	638	1,483	12	2,133
nov	675	1,294	0	1,969
dic	718	903	16	1,637
Total	8,467	9,259	84	17,810
Average/day	23	25	0	49

Source: DGAC

Table 2.8
Comparison between Study of National Airport Network and the Real Tendency

		1992	1993	1994	1995	1996	1997	1998	1999	2000
National	Study	1,125			2,185					3,223
	Real	1,171	1,486	1,790	1,997	2,410	3,080	3,327	3,132	3,117
Temuco	Study	63			128					175
	Real	76	90	147	167	217	245	247	251	286

Sources: Table 2.1b
Analisys and Review of Prefeasibility Studies of the National Airport Network, SECTRA. 1994.

Table 2.9
Projection of Passangers for Temuco-Santiago

		1992	2000	2005	2010	2015	2020
Total Traffic ('000 Pax/year)	Medium Hyp.	252	393	502	625	760	903
	High Hyp	252	393	538	704	898	1,119
	Low Hyp	252	393	467	548	635	736
Annual Variation	Medium Hyp.		5.71%	5.00%	4.50%	4.00%	3.50%
	High Hyp		5.71%	6.50%	5.50%	5.00%	4.50%
	Low Hyp		5.71%	3.50%	3.25%	3.00%	3.00%
Air Traffic	Medium Hyp.	63	234	304	386	476	570
	High Hyp	63	234	334	449	584	738
	Low Hyp	63	234	276	327	383	448
Participation Air Traffic	Medium Hyp.	25%	59%	61%	62%	63%	63%
	High Hyp	25%	59%	62%	64%	65%	66%
	Low Hyp	25%	59%	59%	60%	60%	61%
Average Time Value (US$/h)	Medium Hyp.	3.75	9.00	10.51	11.98	13.33	14.48
	High Hyp	3.75	9.00	11.28	13.48	15.74	17.94
	Low Hyp	3.75	9.00	9.78	10.49	11.13	11.80
Standard Deviation (US$/h)	Medium Hyp.	7.50	18.00	21.01	23.95	26.65	28.95
	High Hyp	7.50	18.00	22.56	26.97	31.48	35.88
	Low Hyp	7.50	18.00	19.55	20.99	22.25	23.60
Cost of Time Savings (US$/h)(1)	Medium Hyp.	8.75	4.80	4.80	4.80	4.80	4.80
	High Hyp	8.75	4.80	4.34	3.92	3.55	3.20
	Low Hyp	8.75	4.80	5.30	5.30	5.30	5.30
Cost of Time Savings standardized (US$/h)	Medium Hyp.	0.67	- 0.23	- 0.27	- 0.30	- 0.32	- 0.33
	High Hyp	0.67	- 0.23	- 0.31	- 0.35	- 0.39	- 0.41
	Low Hyp	0.67	- 0.23	- 0.23	- 0.25	- 0.26	- 0.28

Assumptions:			2000	2005	2010	2015	2020
Increase in GDP	Hypothesis	Medium	5.71%	5.00%	4.50%	4.00%	3.50%
		High	5.71%	6.50%	5.50%	5.00%	4.50%
		Low	5.71%	3.50%	3.25%	3.00%	3.00%
Increase in Population			1.80%	1.80%	1.80%	1.80%	1.80%
Variation in Tariffs	Hypothesis	Medium	5%	0%	0%	0%	0%
		High	0%	-2%	-2%	-2%	-2%
		Low	10%	2%	0%	0%	0%

(1) Difference between air and land tariffs, divided by difference in air and land travel times.

Source: Table 2.1b
Analisys and Review of Prefeasibility Studies of the National Airport Network, SECTRA. 1994.

Table 2.10a
Projection of Comercial Operations for Maquehue Airport

Traffic ('000 pax/year)			Real	Projection			
			2000	2005	2010	2015	2020
Santiago-Temuco		Medium Hyp.	234	304	386	476	570
		High Hyp	234	334	449	584	738
		Low Hyp	234	276	327	383	448
Others National		Medium Hyp.	24	32	40	50	60
		High Hyp	24	35	47	61	77
		Low Hyp	24	29	34	40	47
Others International		Medium Hyp.	1	-	-	-	-
		High Hyp	1	-	-	-	-
		Low Hyp	1	-	-	-	-
Total (*)		Medium Hyp.	258	336	427	526	630
		High Hyp	258	369	496	646	815
		Low Hyp	258	305	362	423	495
Cargo Traffic (t/year) (2)		Medium Hyp.	453	590	749	922	1,105
		High Hyp	453	648	871	1,133	1,431
		Low Hyp	453	534	635	743	868
Fleet Mix		A320	0%	13%	25%	38%	50%
		B737	100%	88%	75%	63%	50%
		Total	100%	100%	100%	100%	100%
Passengers per Operation		A320		60	65	70	75
		B737	30	40	45	50	60
		Total	30	42	49	56	67
Cargo/Operation (t)		Total	0.05	0.07	0.07	0.08	0.09
000 Ops/year	Medium Hyp.	A320		0.7	1.6	2.8	4.2
		B737	8.5	7.4	7.1	6.6	5.2
		Total	8.5	8.1	8.8	9.4	9.4
	High Hyp	A320	-	0.8	1.9	3.5	5.4
		B737	8.5	8.1	8.3	8.1	6.8
		Total	8.5	8.8	10.2	11.5	12.2
	Low Hyp	A320		0.6	1.4	2.3	3.3
		B737	8.5	6.7	6.0	5.3	4.1
		Total	8.5	7.3	7.4	7.6	7.4

Parameters:

Seats/Aircraft	B737	120
	A320	150
	Regional Jet	50
Maximum Occupation		60%
Pax/Aircraft	B737	72
	A320	90
	Regional Jet	30

(1) Excludes transit passengers, which totaled 28,000 in 2000.
(2) Cargo is assumed to grow at the same rate as passengers.

Source: Passenger Traffic Projections = Santiago - Temuco (Table 2.9 in Annex A); Other Routes Estimate
Aircraft Operations = Estimate

Table 2.10b
Projection of Total Operations, by Type of Aviation
('000 Ops/Year)

		Real		Projection				Annual
		1999	2000	2005	2010	2015	2020	Growth
Medium Hypothesi	Comercial	8.5	8.5	8.1	8.8	9.4	9.4	0.5%
	Military	3.7	3.7	3.7	3.7	3.7	3.7	0.0%
	General Aviation	5.7	5.7	7.6	10.2	13.7	18.3	5.7%
	Total	17.9	17.9	19.4	22.7	26.7	31.4	2.7%
High Hypothesis	Comercial	8.5	8.5	8.8	10.2	11.5	12.2	1.8%
	Military	3.7	3.7	4.3	5.0	5.8	6.7	2.9%
	General Aviation	5.7	5.7	9.2	14.8	23.8	38.3	9.5%
	Total	17.9	17.9	22.3	29.9	41.1	57.3	5.7%
Low Hypothesis	Comercial	8.5	8.5	7.3	7.4	7.6	7.4	-0.6%
	Military	3.7	3.7	3.2	2.7	2.3	2.0	-2.9%
	General Aviation	5.7	5.7	6.6	7.7	8.9	10.3	2.9%
	Total	17.9	17.9	17.1	17.8	18.8	19.7	0.5%

Source: Table 2.6d
Table 2.10a

Table 2.11
Projection of Operations During Peak Periods, by Types of Aviation

			2000	2005	2010	2015	2020
Annual Operations ('000 Ops/Year)	Medium Hyp.	Comercial	8.5	8.1	8.8	9.4	9.4
		Military	3.7	3.7	3.7	3.7	3.7
		General Aviat	5.7	7.6	10.2	13.7	18.3
		Total	17.9	19.4	22.7	26.7	31.4
	High Hyp	Comercial	8.5	8.8	10.2	11.5	12.2
		Military	3.7	4.3	5.0	5.8	6.7
		General Aviat	5.7	9.2	14.8	23.8	38.3
		Total	17.9	22.3	29.9	41.1	57.3
	Low Hyp	Comercial	8.5	7.3	7.4	7.6	7.4
		Military	3.7	3.2	2.7	2.3	2.0
		General Aviat	5.7	6.6	7.7	8.9	10.3
		Total	17.9	17.1	17.8	18.8	19.7
Annual Operations (Ops/Hours)	Medium Hyp.	Comercial	3.8	3.6	4.0	4.2	4.3
		Military	0.8	0.8	0.8	0.8	0.8
		General Aviat	3.6	4.8	6.4	8.5	11.4
		Total	8.2	9.3	11.2	13.6	16.5
	High Hyp	Comercial	3.8	4.0	4.6	5.2	5.5
		Military	0.8	1.0	1.1	1.3	1.5
		General Aviat	3.6	5.7	9.2	14.9	24.0
		Total	8.2	10.7	15.0	21.4	31.0
	Low Hyp	Comercial	3.8	3.3	3.4	3.4	3.4
		Military	0.8	0.7	0.6	0.5	0.5
		General Aviat	3.6	4.1	4.8	5.6	6.4
		Total	8.2	8.2	8.8	9.5	10.2

Parameters:

	Comercial	Military	General Av.	Total
Traffic 2000 ('000 de operations/year)	8.5	3.7	5.7	17.9
Traffic Peak Month/Annual Traffic	8.33%	8.33%	15.0%	10%
Traffic Peak Month ('000 Ops/Month)	0.71	0.31	0.86	1.87
Traffic Peak Day/Monthly Traffic	3.3%	3.3%	5.0%	4.1%
Traffic Peak Day (ops/day)	23	10	43	76
Traffic Peak Hour/Traffic Peak Day	16.5%	8.3%	8.3%	10.8%
Traffic Peak Hour (ops/hour)	3.8	0.8	3.6	8
Traffic Peak Hour/Annual Traffic	0.000452	0.000228	0.000625	0.000461

Sources:

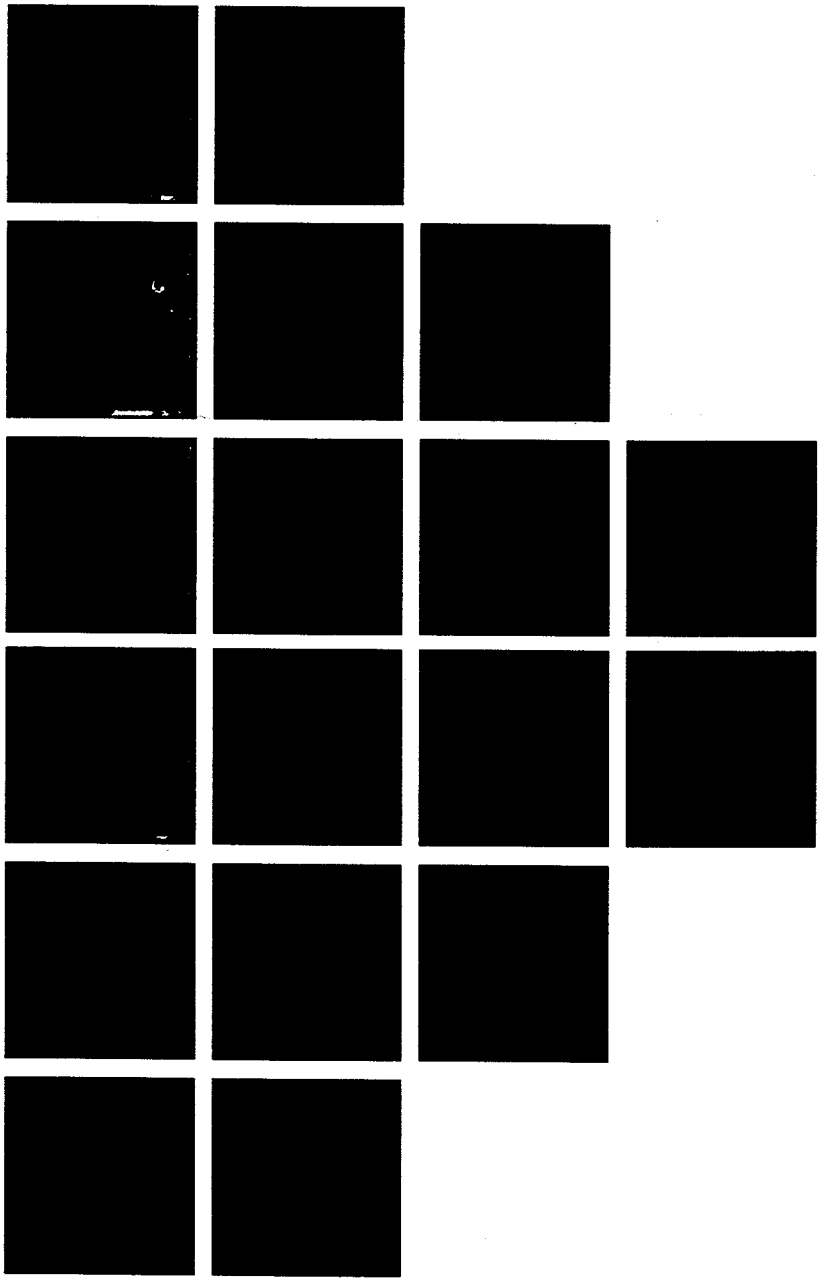
Distribution of total traffic: DGAC
Distribution of traffic by types of aviation. Consultant's Estimate

Table 2.12
Projection of Embarking Passengers and Cargo During Peak Periods

			2000	2005	2010	2015	2020
Annual Traffic	Pasajeros ('000 pax/ year)	Medium Hyp.	258	336	427	526	630
		High Hyp	258	369	496	646	815
		Low Hyp	258	305	362	423	495
	Carga (t/year)	Medium Hyp.	453	590	749	922	1,105
		High Hyp	453	648	871	1,133	1,431
		Low Hyp	453	534	635	743	868
Peak Hour Operations (Ops/Hour)		Medium Hyp.	3.8	3.6	4.0	4.2	4.3
		High Hyp	3.8	4.0	4.6	5.2	5.5
		Low Hyp	3.8	3.3	3.4	3.4	3.4
Average Embarking	Pax/Operation		30	42	49	56	67
	Tons/Operation		0.05	0.07	0.07	0.08	0.09
Peak Hour Traffic (departing pax/hour)	Pax (Pax/h)	Medium Hyp.	117	152	193	238	285
		High Hyp	117	167	224	292	369
		Low Hyp	117	138	164	191	224
	Cargo (t/h)	Medium Hyp.	0.20	0.24	0.29	0.34	0.39
		High Hyp	0.20	0.27	0.34	0.42	0.50
		Low Hyp	0.20	0.22	0.25	0.27	0.30

Sources:

Table 2.10a
Table 2.10b
Table 2.11



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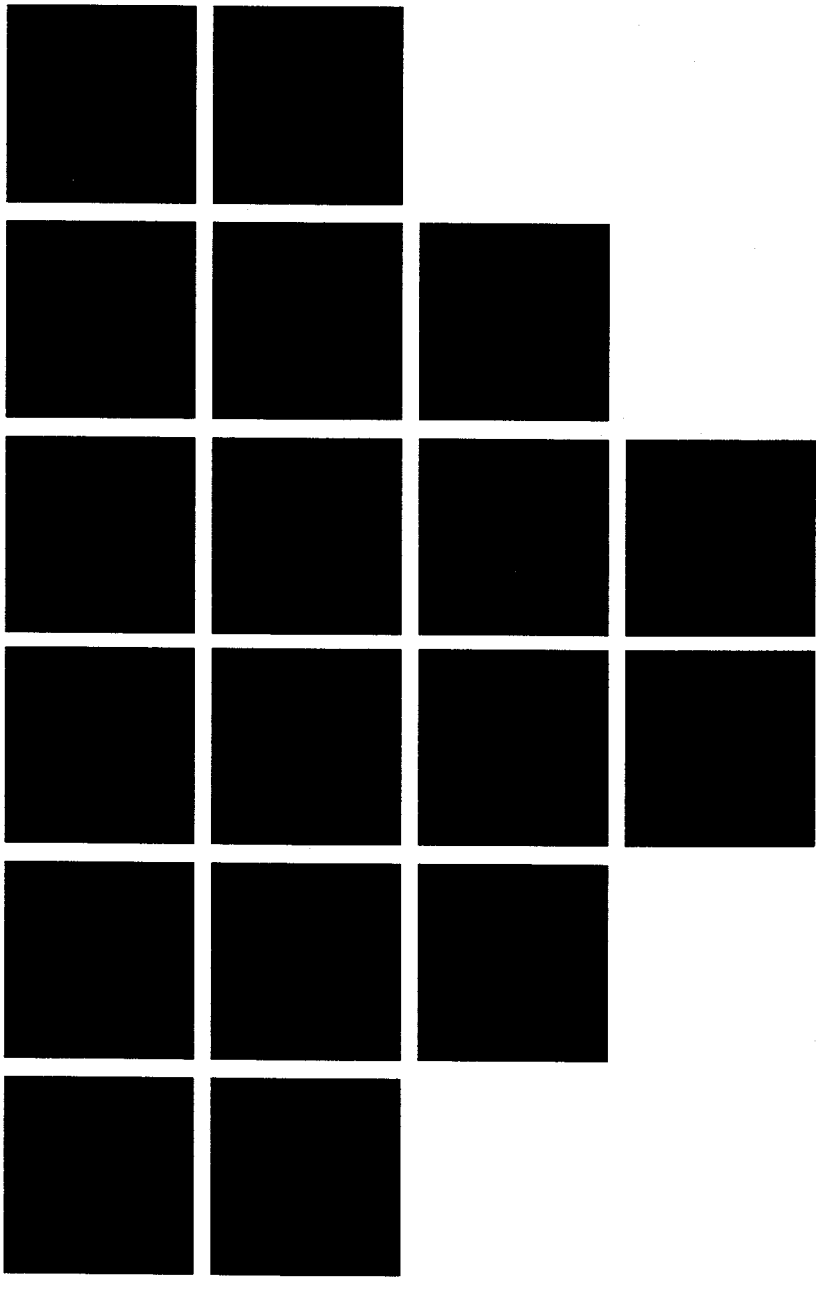
ANNEX B



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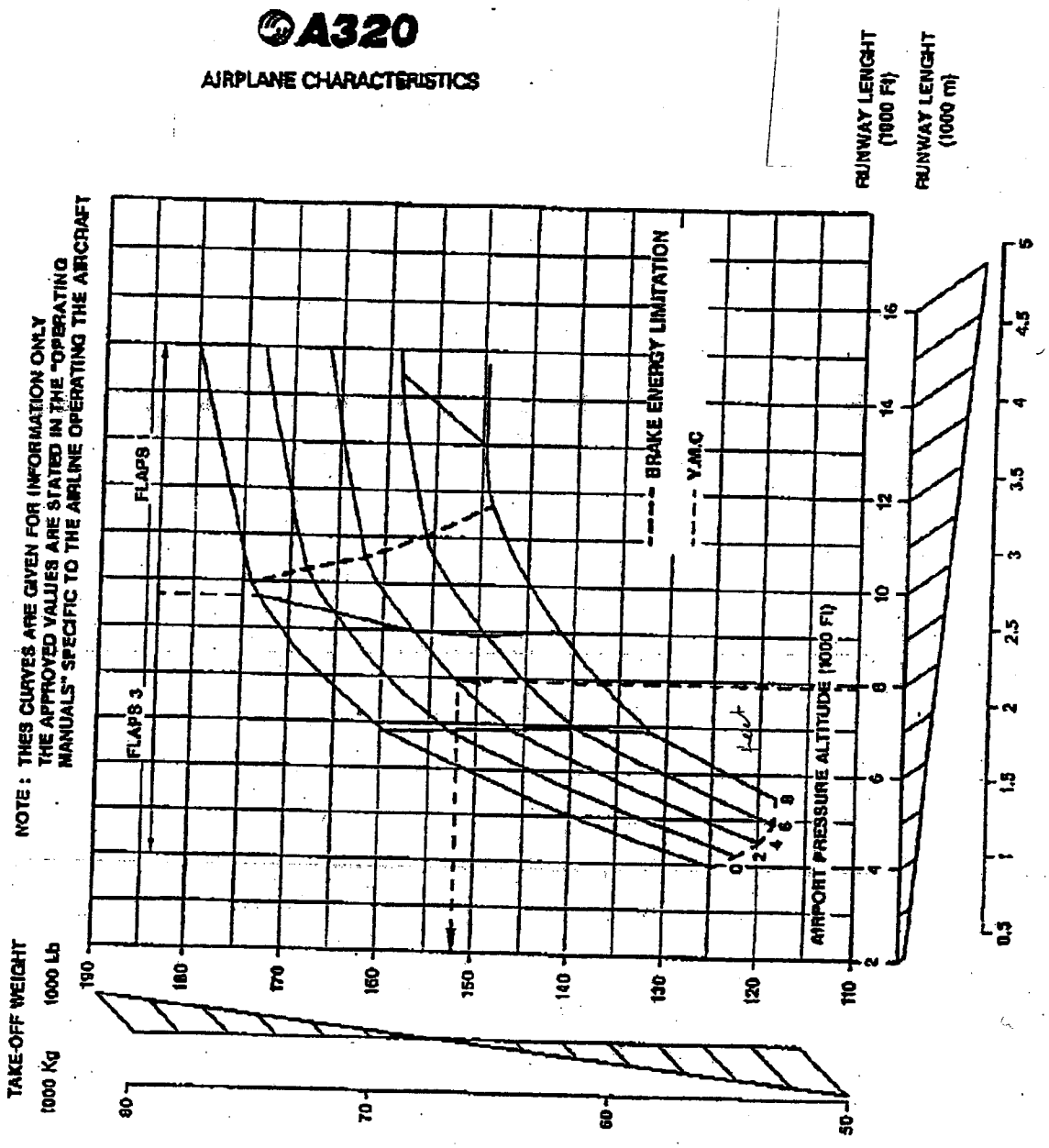
ANNEX B - Part 1
Takeoff Graphics



MAC5 03 03 01 0 AAMD 00

3.3 F.A.R./J.A.R.TAKE-OFF WEIGHT LIMITATION
3.3.1 ISA CONDITIONS
MODEL 200-CFM56-5A1 ENGINE

Chapter 3.3.1
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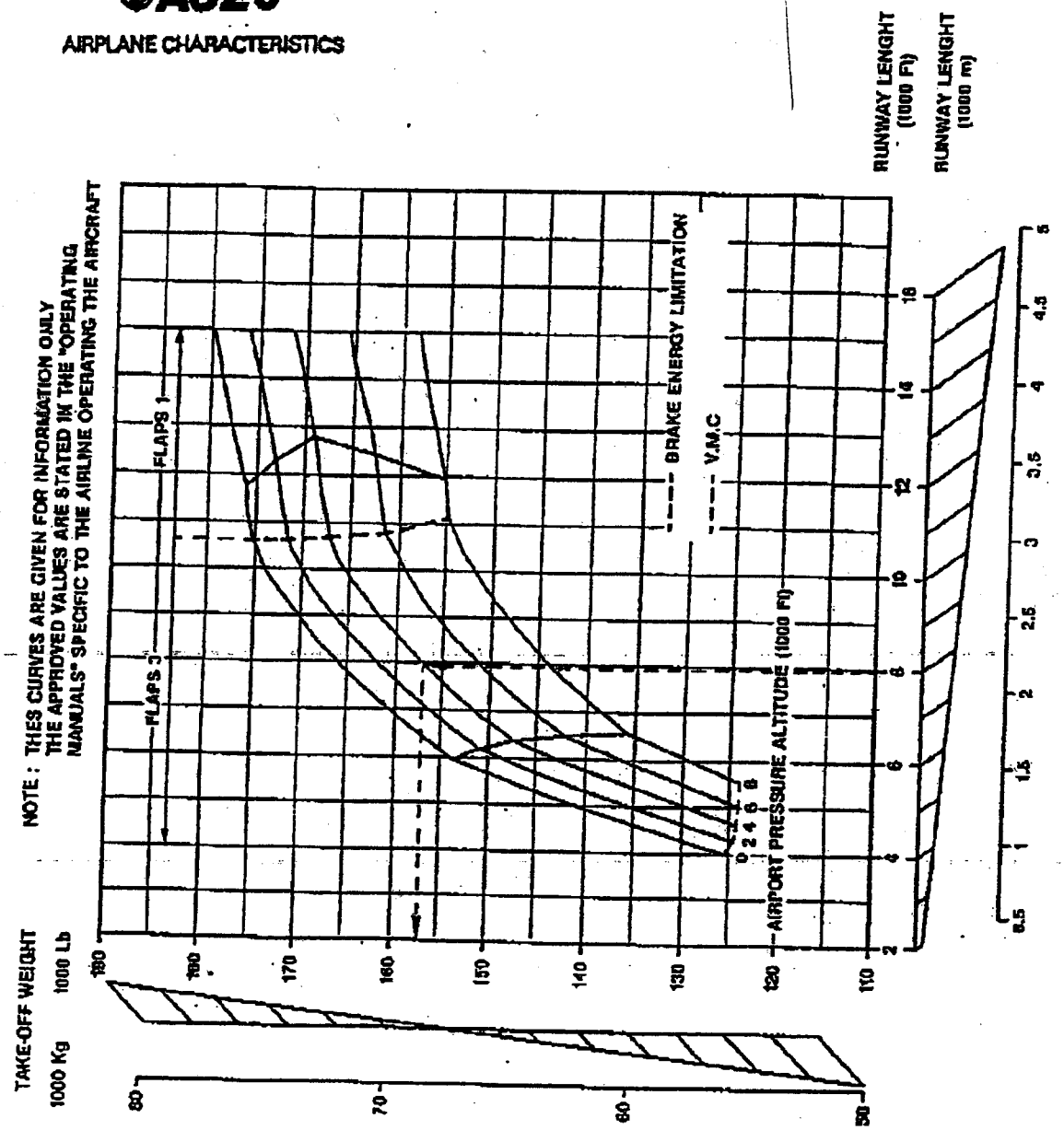
A320

AIRPLANE CHARACTERISTICS



NAC5 03 03 01 B ABMO 00

3.3 F.A.R./J.A.R.TAKE-OFF WEIGHT LIMITATION
3.3.1 ISA CONDITIONS
MODEL 200-V2500-A1 ENGINE

Chapter 3.3.1
Page 2
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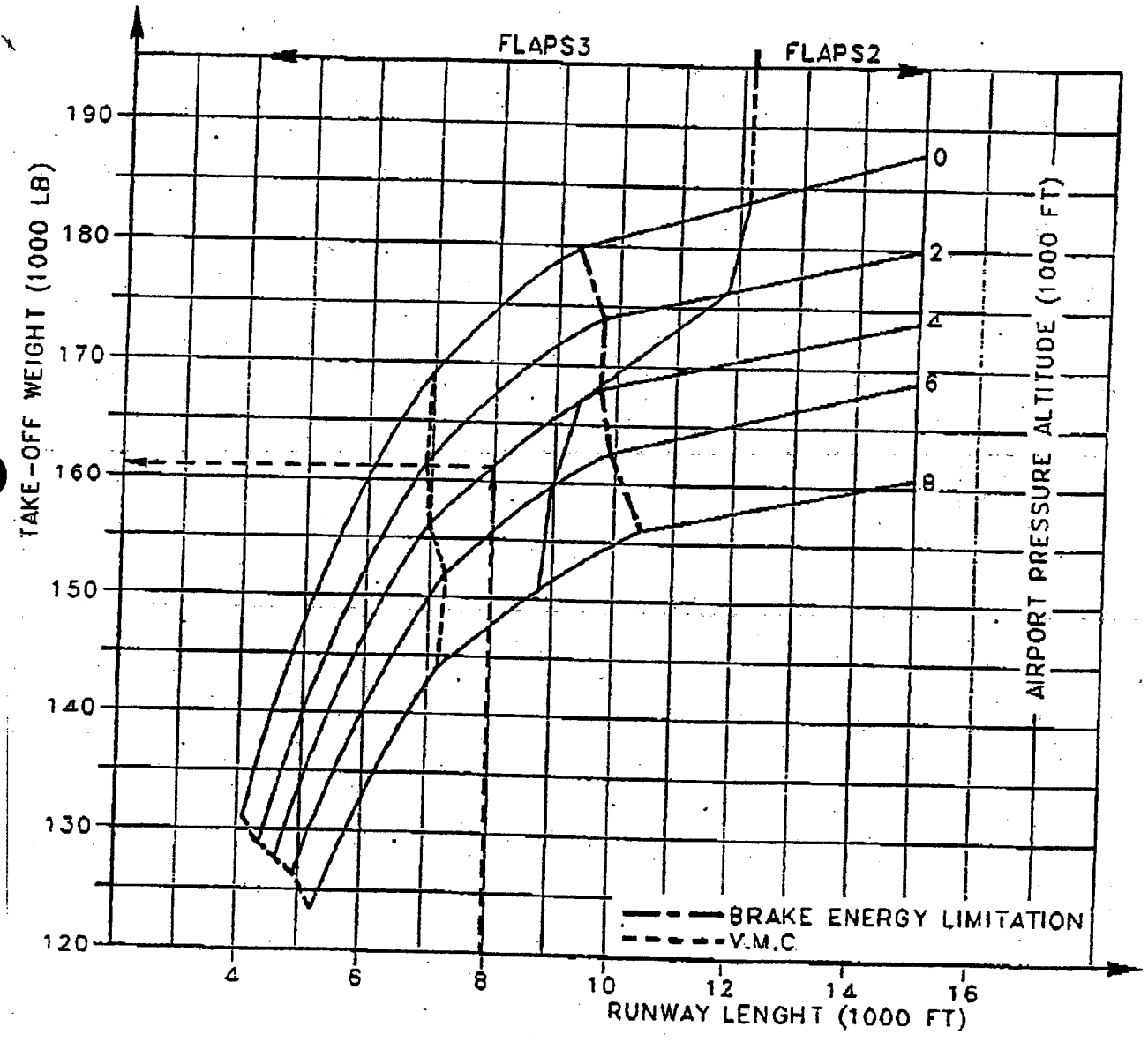
A320

AIRPLANE CHARACTERISTICS

NOTE : THESE CURVES ARE GIVEN FOR INFORMATION ONLY
THE APPROVED VALUES ARE STATED IN THE "OPERATING MANUALS" SPECIFIC TO THE AIRLINE OPERATING THE AIRCRAFT.

MAX FUEL CAPACITY = 42210 LB



3.3 F.A.R./J.A.R.TAKE-OFF WEIGHT LIMITATION
3.3.1 ISA CONDITIONS
MODEL 200-CFM56-5A3 ENGINE

Chapter 3.3.1
Page 3
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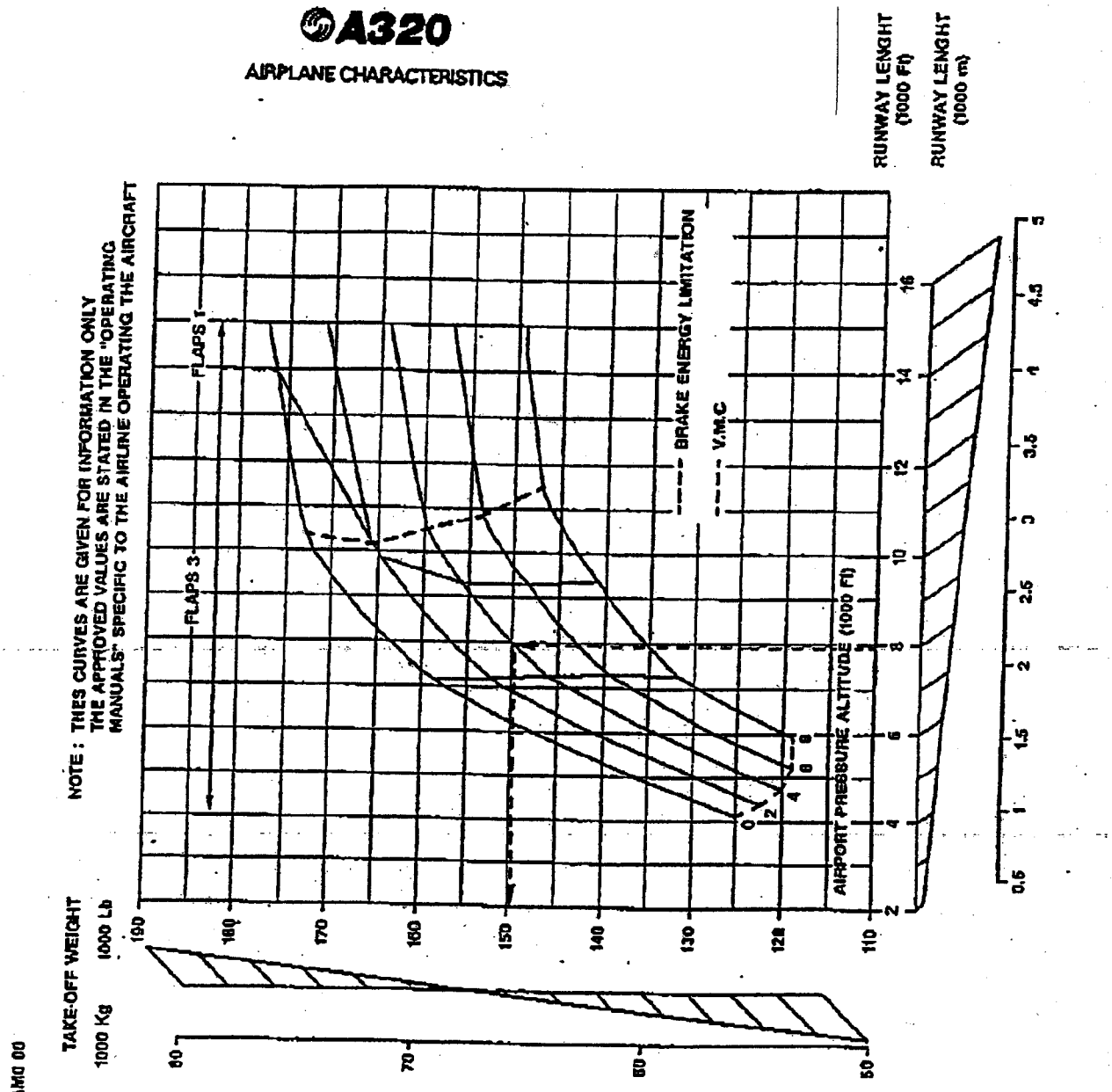

3.3 F.A.R./J.A.R. TAKE-OFF WEIGHT LIMITATION
3.3.2 ISA +15°C (27°F) CONDITIONS
MODEL 200-CFM56-5A1 ENGINE

Chapter 3.3.2
Page 1
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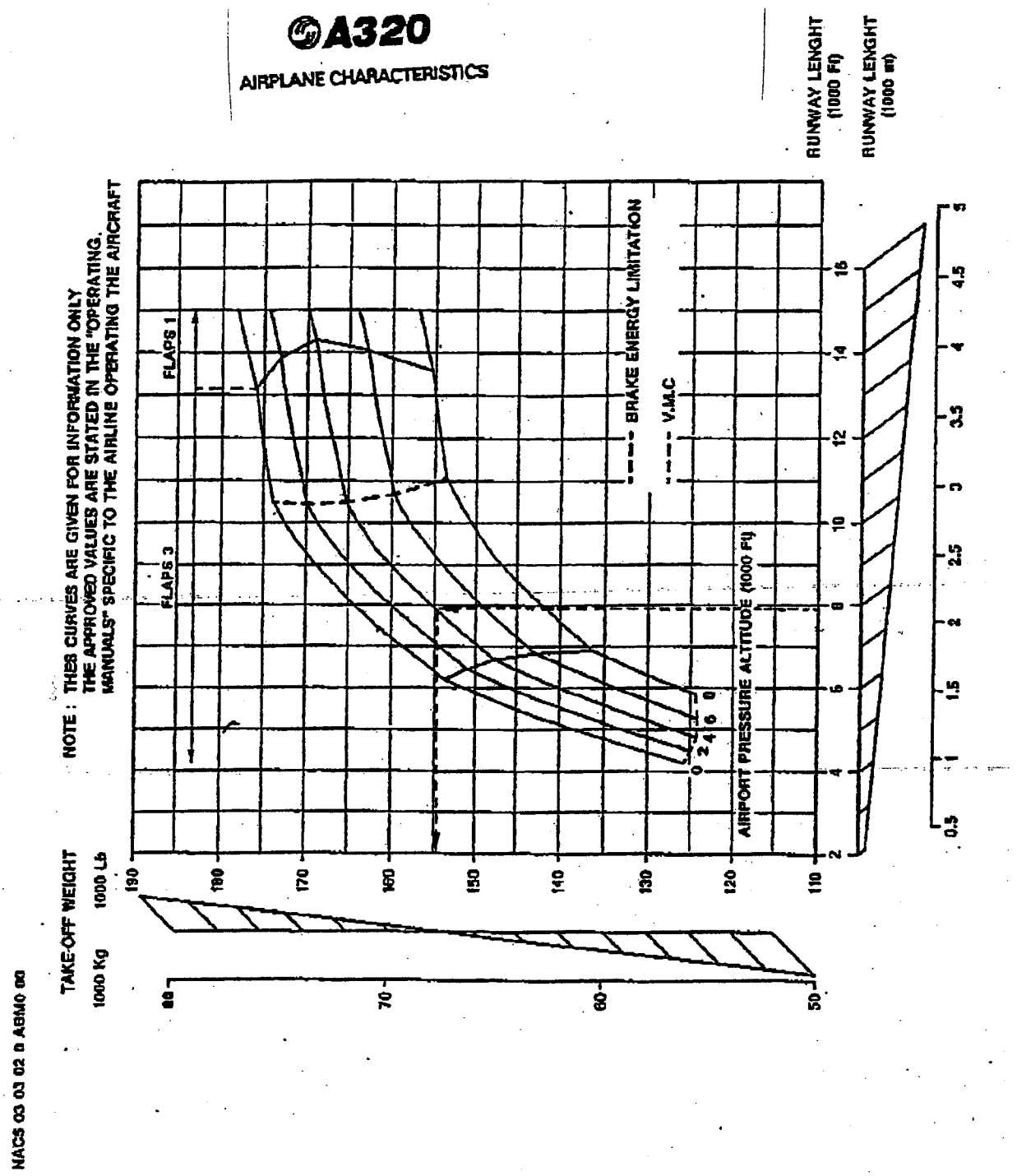

3.3 F.A.R./J.A.R. TAKE-OFF WEIGHT LIMITATION
3.3.2 ISA +15°C (27°F) CONDITIONS
MODEL 200-V2500-A1 ENGINE

Chapter 3.3.2
Page 2
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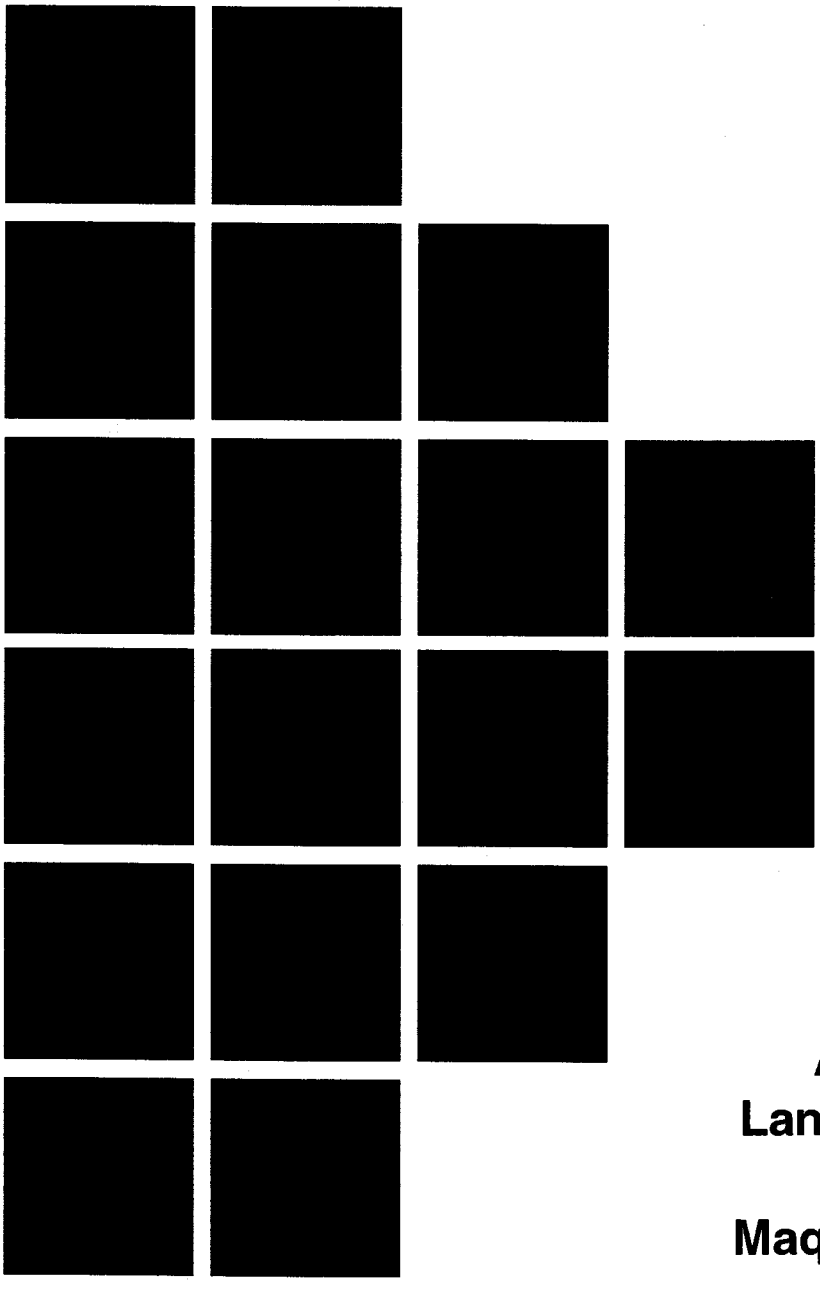
Airplane Versions	Maximum Take-Off Weight (MTOW)	Take-Off Runway Length Requirements Std. Temperature (59 deg. F or 15 deg. C)	Take-Off Runway Length Requirements Std. Temperature + 27 F (86 deg. F or 30 deg. C)
Airbus 320-200 (CFM56-5A1 Engine)	162,037 lbs 73,500 kg	7,150 feet 2,179 m	7,400 feet 2,256 m
Airbus 320-200 (V2500-A1 Engine)	162,037 lbs 73,500 kg	7,100 feet 2,164 m	7,350 feet 2,240 m
Airbus 320-200 (CFM56-5A3 Engine)	162,037 lbs 73,500 kg	6,200 feet 1,890 m	6,600 feet 2,012 m

Source: A320 Airplane Characteristics, 1995.

Note 1: Airport Elevation at Sea Level

Note 2: The Temperature in Temuco, Chile varies between 45 deg. F to 60 deg. F throughout the year. Therefore, the runway requirements should be based upon the standard temperature.



The Louis Berger Group, Inc.

ANNEX B - Part 2
Air Space Analysis and Landing Approach with an Extended Rynway at Maquehue-Temuco Airport

Aerodrome and Aeronautical Service Bureau
Air Space Sub-Office

Santiago, August 27, 2001

(REVIEWED FINAL REPORT)

AIR SPACE ANALYSIS AND APPROACH PROCEDURES IN MAQUEHUE – TEMUCO AERODROME EXPANDED RUNWAY

I.- INTRODUCTION

As requested by the Planning Office through Official Communication Nª 4/B/680 dated July 03, 2001 in relation to the operation feasibility of the existing Temuco runway expansion of 500 meters, the following final report has been prepared from the air space viewpoint.

It is important to note that early this year, a preliminary evaluation was submitted to construct the new aerodrome South to the existing one. Later, DGAC Planning Office requested the evaluation of the existing runway expansion of 500 meters to Southwest, in order to enhance the aerodrome operability at a lower cost as discussed in this report.

II.- EVALUATION

A.- GENERAL CONSIDERATIONS

The evaluation contained in this Final Report is based on the following considerations:

1. - Runway expansion of 500 meters to southwest;
2. - Cat I ILS system installation for RWY 06, consisting of a Glide Slope, Localizer and associated DME;
3. - Implementation of full ALSF-1 type approach lighting system (900 meters) to get the best operation minimums possible;
4. - Obstacle definition and identification;
5. - VOR/DME relocation and alignment (optional) with current runway axis at 700/1.000 m. to Southwest of existing threshold 06 expanded in 500 meters.

B.- BACKGROUND REQUESTED BY PLANNING OFFICE

The air space analysis conducted in this final report in based on the possibility of implementing a Cat 1 ILS precision instrument approach system to allow executing air operations with a visibility and ceiling less than those currently used for VOR/DME approaches.

Based on the theoretical and practical analysis, it is feasible to implement an ILS procedure on the new expanded RWY 06 as detailed below.

In the event of relocating that navaid (optional), the VOR/DME operation minimums will basically remain the same, but better operational precision and safety would be accomplished in case this navaid is realigned along the runway, at the runway axis, about 700/1.000 m to Southwest of the new threshold 06.

The current ATS routing system does not represent any objection to join the aforementioned instrument procedures with the domestic routing network currently in force.

1.- Feasibility analysis on the ILS approach system in existing RWY 24

Based on the land evaluation, it is not operationally nor physically viable to implement an ILS approach system on RWY 24, this option was rejected according to the following aspects:

a) There is a natural obstacle, Conimueno Hill, which cannot be moved and is practically aligned with the runway axis and located 4.780 meters from threshold 24. In addition, there are other man made obstacles, such as antennas located on such hillside and very close to the hilltop, and even exceeding the top in one case. These antennas are exactly in the area of the final approach segment.

b) The approach light system (ALS) associated with the ILS system would have to be installed inside Cautin River. This situation is certainly very complex and implies a very high cost, as such; its installation would be almost unviable.

c) Based on operational experience, this runway is affected by bad meteorological conditions by the prevalent North wind; therefore approach and departure procedures should be executed on RWY 06, and it would be unreasonable to install this type of approach system on RWY 24.

2. - Feasibility analysis on the ILS approach system in future RWY 06 (2.200-meter runway)

Based on the land evaluation, it is operationally viable to implement a Cat 1 ILS system to serve RWY 06 with 500-meter expansion to Southwest.

Considering the earth moving to define the different approach-departure surface determined by the aerodrome area in the corresponding report, it is absolutely viable to construct a Cat 1 ILS instrument procedure on RWY, based on the following analysis and characteristics:

a) Basic ILS surface for missed approach is obstructed by Cautin and Conimueno Hills, therefore 2° method available, Obstacle Assessment Surfaces (OAS), was used to calculate the ILS surfaces.

b) A 90-meter elevation was considered in the new threshold 06 (03 meters above existing threshold) to calculate the OAS surfaces.
In the final approach analysis, a new contour line was found before the new threshold 06 and a 23-meter tableland 130 meters to South of the existing threshold 06, which are obstacles in the evaluation surfaces. The solution is to modify the land to have an obstacle-free area, as determined in the aerodrome report, the minimum air space requirement being as follows:

   i) A 50-meter horizontal plane on both sides of the runway axis from threshold 06 to 281 meters to Southwest.
   ii) A graded plane from 281 meters, with the same with and a 2.85% upgrading slope, until the land is cleaned up, by removing or relocating the obstacles.
   iii) From 50 meters, obstacle should not laterally obstruct a 18% upgrading slope until reaching 300 meters on the runway threshold (elimination of natural trees should be considered in this sector; this is a recurrent situation because of the rapid and constant vegetation growth)

c) Based on the analysis, Conimueno and Cautin Hills obstruct a missed approach surface with a regular 200-feet decision height (DH), Conimueno being the most critical. Consequently, the DH should be increased to 325 feet over threshold 06 elevation in order to clear such surface, as indicated in the preliminary procedure chart attached.

d) The glide path angle was established in 3°, which is an optimum value for this type of procedures.

e) The minimum visibility for this approach was established in 1200 meters, considering the installation of an ALSF-1 Approach Light System with a 900-meter length.

f) To install glide path antennas to the Northeast side of the new threshold 06 and the ILS localizer to the Northeast of threshold 24,

the area available should be evaluated to have a proper land and sufficient room to install and locate such systems and prevent obstacles that might affect the signal. The technical area is responsible for this issue as determined in D.L & T. documents attached in this report.

3. - Analysis to readjust the current VOR/DME approach on RWY 24 and 06, considering the VOR/DME relocation (optional) to Southeast of threshold 06, at the runway axis.

These types of approach are completely viable by relocating the VOR/DME at the runway axis, which would be located 700/1.000 meters to the Southeast of the new threshold 06.

The approach minimums would not be benefited because of Conimueno Hill and the telephone antennas located next and on top of it, obstructing the protection surfaces.

The advantage is the approach alignment with the runway axis, getting more safety and operability for users.

MDA's remain according to the approaches currently issued. Preliminary charts with VOR/DME relocation are attached in this report.

4.- En route air space analysis in relation to ILS and VOR/DME instrument procedures.

The current domestic routing system to the different sectors that connect Temuco with other areas in the country does not have any operational inconveniences and ILS and VOR/DME procedures would be properly connected to the established routing network.

III. - CONCLUSION

In line with the aforementioned background, we conclude that the project presented by the Planning Office in respect to the runway expansion is completely viable from the air space viewpoint, and it is operationally feasible to implement a Cat 1 ILS system in the new threshold 06 and optionally relocate VOR/DME aligned with the runway axis nearby the current "R" location radio range, which would be eliminated.

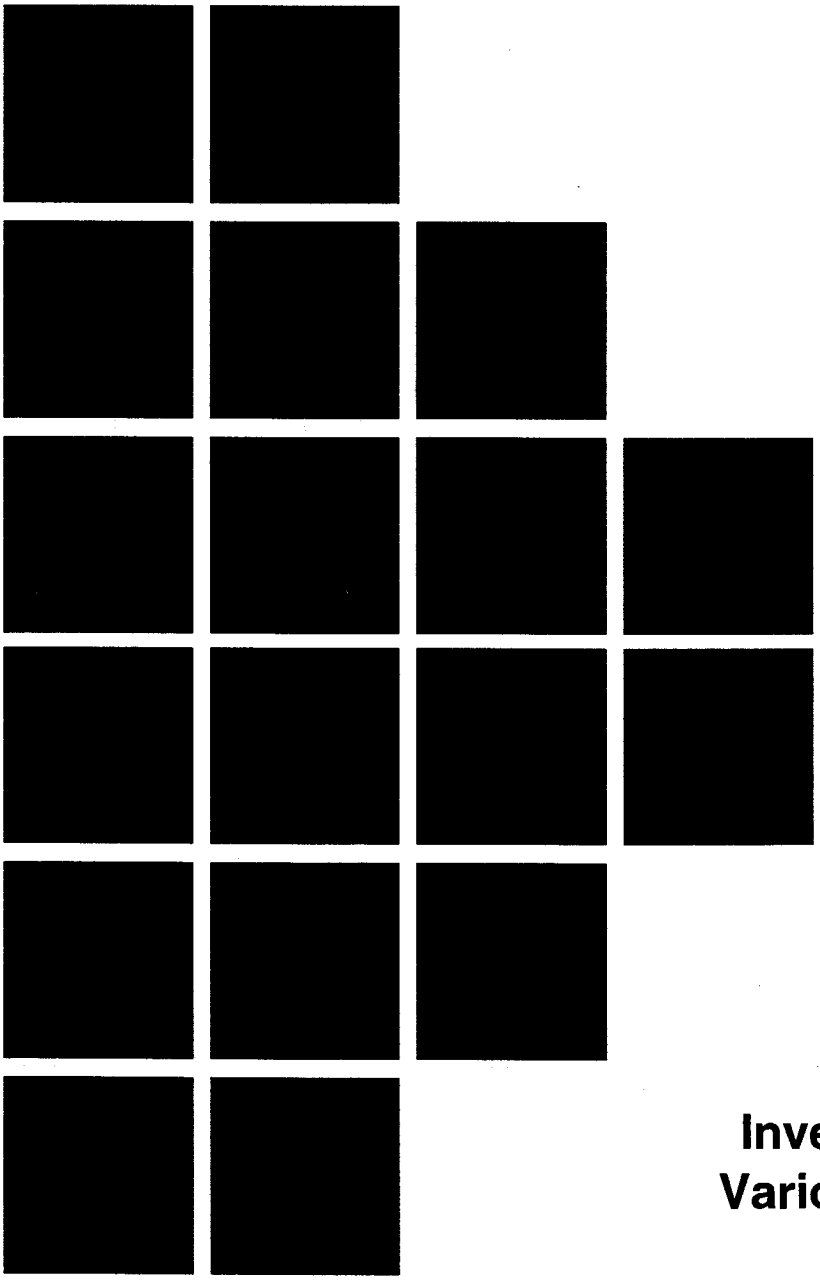
In regard to the construction of a Cat 1 ILS IFR procedure, we conclude that the best operational option is to implement an ILS procedure in the new RWY 06, with some Decision Height (DH) and visibility restrictions higher

than the regular parameters, because of the natural and man made obstacles along the missed approach path.

The VOR/DME could remain in their current location or be optionally relocated nearby the existing "R", as such, operations would be safer, since after cleaning up the land prior to threshold 06, there would not be obstacles affecting such approach in the final section. Consequently, this approach would be aligned with and in a favorable situation in case of stronger frontal winds mainly from the North and Northeast.

MARCO ABARCA DAZA
Air Space Department

JULIO SANTOS PRIETO
Air Space Sub Office



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ANNEX B - Part 3
Investment Programs with Various Demand Scenarios

INVESTMENT PHASING FOR DEVELOPMENT OF NEW AIRPORT AT SANTA ELISA - HIGH

(all costs in UF)

Factors	Operational Forecasts	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	Peak Hour Ops	8	-	-	-	-	11	-		-	-	15	-	-	-	-	21	-	-	-	-	31	-	-	-	-	41
	Peak Hour Commercial Ops	4	-	-	-	-	4	-		-	-	5	-	-	-	-	5	-	-	-	-	6	-	-	-	-	6
	Loading Bridges	3	-	-	-	-	3	-		-	-	4	-	-	-	-	4	-	-	-	-	4	-	-	-	-	4
	PeakHour Passengers Departing	117	-	-	-	-	167	-		-	-	224	-	-	-	-	292	-	-	-	-	369	-	-	-	-	491
1.9	PeakHour Passengers Total	222	-	-	-	-	317	-		-	-	426	-	-	-	-	555	-	-	-	-	701	-	-	-	-	933
10	Terminal Size @ 10m2/pkhrpax	2,000					3,000					4,000					6,000					7,000					9,000

Factors	Construction	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Totals
	Site Development	-	-	67,168	67,168	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	134,336
	Airfield, perpendicular taxiways	-	-	49,480	49,480	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98,960
0.75	1000 m parallel taxiway	-	-	-		-	-	-		-	18,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,000
0.75	1000 m to complete taxiway	-	-	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	18,000	-	-	-	-	-	-	18,000
	Apron 4 positions @3610m2 per	-	-	-	31,751	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31,751
2.20	Apron expansion @ 3610m2	-	-	-		-	-	-		-	7,942	-	-	-	-	7,942	-	-	-	-	-	-	-	-	-	-	-	15,884
												-																-
25	Passenger Terminal @ 4000m2	-	-	-	100,000	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100,000
25	Terminal Expansion @ 1000 m2	-	-	-	-	-	-	-		-	50,000	-	-	-	-	25,000	-	-	-	-	50,000	-	-	-	-	-	-	125,000
												-																-
	Access and Parking	-	-	-	24,088	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24,088
10.68	Pass Parking Expansion	-	-	-	1,246	-	-	-		-	1,246	-	-	-	-	623	-	-	-	-	1,246	-	-	-	-	-	-	4,361
												-																-
	Operations Facilities	-	-	-	7,600	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,600
												-																-
	Utilities Infrastructure	-	-	-	43,500	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43,500
6,525	Utilities expansion/1000m2	-	-	-	-	-	-	-		-	13,050	-	-	-	-	6,525	-	-	-	-	13,050	-	-	-	-	-	-	32,625
												-																-
	Aeronautical Support Facilities	-	-	-	156,800	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156,800
												-																-
	Commercial Facilities	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GenAviation/Military Facilities	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Off-Airport Roads & Power	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Construction only Subtotal	-	-	116,648	481,633	-	-	-		-	90,238	-	-	-	-	40,090	-	-	-	-	82,296	-	-	-	-	-	-	810,905
26%	Engng and Contractor @ 26%	-	-	30,328	125,225	-	-	-		-	23,462	-	-	-	-	10,423	-	-	-	-	21,397	-	-	-	-	-	-	210,835
	Construction & Fees Subtotal	-	-	146,976	606,858	-	-	-		-	113,700	-	-	-	-	50,513	-	-	-	-	103,693	-	-	-	-	-	-	1,021,740
																												-
	Equipment,3 bridges,2esc,1elev	-	-	-	147,650	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	147,650
23,250	Additional Loading Bridges	-	-	-	-	-	-	-		-	23,250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23,250
22,463	Other Equipment Additions	-	-	-	-	-	-	-		-	22,463	-	-	-	-	22,463	-	-	-	-	22,463	-	-	-	-	-	-	67,389
	Total for Equipment	-	-	-	147,650	-	-	-		-	45,713	-	-	-	-	22,463	-	-	-	-	22,463	-	-	-	-	-	-	238,289
	Construction + Equipment	-	-	146,976	754,508	-	-	-		-	159,413	-	-	-	-	72,976	-	-	-	-	126,156	-	-	-	-	-	-	1,260,029
20%	Contingency @ 20%	-	-	29,395	150,902	-	-	-		-	31,883	-	-	-	-	14,595	-	-	-	-	25,231	-	-	-	-	-	-	252,006
	Construction and Equipment Total	-	-	176,372	905,409	-	-	-		-	191,295	-	-	-	-	87,572	-	-	-	-	151,387	-	-	-	-	-	-	1,512,035
	Land Cost	-	-	52,272	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52,272
	GRAND TOTAL	**-**	**-**	**228,644**	**905,409**	**-**	**-**	**-**		**-**	**191,295**	**-**	**-**	**-**	**-**	**87,572**	**-**	**-**	**-**	**-**	**151,387**	**-**	**-**	**-**	**-**	**-**	**-**	**1,564,307**

Factors	Maintenance	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Totals
	Invested capital landside only	-	-	126,892	824,178	-	-	-		-	165,353	-	-	-	-	79,630	-	-	-	-	133,387	-	-	-	-	-	-	1,329,440
	Cumulative investment landside	-	-	126,892	951,070	951,070	951,070	951,070	951,070	951,070	1,116,423	1,116,423	1,116,423	1,116,423	1,116,423	1,196,053	1,196,053	1,196,053	1,196,053	1,196,053	1,329,440	1,329,440	1,329,440	1,329,440	1,329,440	1,329,440	1,329,440	
1.6%	Maintenance landside only	-	-	2,030	15,217	15,217	15,217	15,217	15,217	15,217	17,863	17,863	17,863	17,863	17,863	19,137	19,137	19,137	19,137	19,137	21,271	21,271	21,271	21,271	21,271	21,271	21,271	
	Invested airside capital	-	-	49,480	81,231	-	-	-		-	25,942	-	-	-	-	7,942	-	-	-	-	18,000	-	-	-	-	-	-	182,595
	Cumulative airside investment	-	-	49,480	130,711	130,711	130,711	130,711	130,711	130,711	156,653	156,653	156,653	156,653	156,653	164,595	164,595	164,595	164,595	164,595	182,595	182,595	182,595	182,595	182,595	182,595	182,595	
0.6%	General Airside Maintenance	-	-	297	784	784	784	784	784	784	940	940	940	940	940	988	988	988	988	988	1,096	1,096	1,096	1,096	1,096	1,096	1,096	
10.0%	Scheduled Airside R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16,460	-	-	-	-	-	-	-	-	-	-	-	

INVESTMENT PHASING FOR DEVELOPMENT OF NEW AIRPORT AT SANTA ELISA
MID
(all costs in UF)

Factors	Operational Forecasts	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	Peak Hour Ops	8	-	-	-	-	9	-		-	-	11	-	-	-	-	14	-	-	-	-	17	-	-	-	-	19
	Peak Hour Commercial Ops	4	-	-	-	-	4	-		-	-	4	-	-	-	-	4	-	-	-	-	4	-	-	-	-	4
	Loading Bridges	3	-	-	-	-	3	-		-	-	3	-	-	-	-	3	-	-	-	-	3	-	-	-	-	3
	PeakHour Passengers Departing	117	-	-	-	-	152	-		-	-	193	-	-	-	-	238	-	-	-	-	285	-	-	-	-	356
1.9	PeakHour Passengers Total	222	-	-	-	-	289	-		-	-	367	-	-	-	-	452	-	-	-	-	542	-	-	-	-	676
10	Terminal Size @ 10m2/pkhrpax	2,000					3,000					4,000					5,000					5,000					7,000

Factors	Construction	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Totals
	Site Development	-	-	67,168	67,168	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	134,336
	Airfield, perpendicular taxiways	-	-	49,480	49,480	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98,960
0.75	1000 m parallel taxiway @ 18 m	-	-	-	-	-	-	-		-	-	-	-	-	-	18,000	-	-	-	-	-	-	-	-	-	-	-	18,000
0.75	1000 m to full taxiway @ 18 m	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Apron 4 positions @3610m2 per	-	-	-	31,751	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31,751
2.20	Apron expansion @ 3610m2	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
												-																-
25	Passenger Terminal @ 4000m2	-	-	-	100,000	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100,000
25	Terminal Expansion @ 1000 m2	-	-	-	-	-	-	-		-	25,000	-	-	-	-	-	-	-	-	-	50,000	-	-	-	-	-	-	75,000
												-																-
	Access and Parking	-	-	-	24,088	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24,088
10.68	Pass Parking Expansion	-	-	-	1,246	-	-	-		-	623	-	-	-	-	-	-	-	-	-	1,246	-	-	-	-	-	-	3,115
												-																-
	Operations Facilities	-	-	-	7,600	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,600
												-																-
	Utilities Infrastructure	-	-	-	43,500	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43,500
6,525	Utilities expansion/1000m2	-	-	-	-	-	-	-		-	6,525	-	-	-	-	-	-	-	-	-	13,050	-	-	-	-	-	-	19,575
												-																-
	Aeronautical Support Facilities	-	-	-	156,800	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156,800
												-																-
	Commercial Facilities	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GenAviation/Military Facilities	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Off-Airport Roads & Power	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Construction only Subtotal	-	-	116,648	481,633	-	-	-		-	32,148	-	-	-	-	18,000	-	-	-	-	64,296	-	-	-	-	-	-	712,725
26%	Engng and Contractor @ 26%	-	-	30,328	125,225	-	-	-		-	8,358	-	-	-	-	4,680	-	-	-	-	16,717	-	-	-	-	-	-	185,309
	Construction & Fees Subtotal	-	-	146,976	606,858	-	-	-		-	40,506	-	-	-	-	22,680	-	-	-	-	81,013	-	-	-	-	-	-	898,034
																												-
	Equipment,3 bridges,2esc,1elev	-	-	-	147,650	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	147,650
23,250	Additional Loading Bridges	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22,463	Other Equipment Additions	-	-	-	-	-	-	-		-	22,463	-	-	-	-	22,463	-	-	-	-	22,463	-	-	-	-	-	-	67,389
	Total for Equipment	-	-	-	147,650	-	-	-		-	22,463	-	-	-	-	22,463	-	-	-	-	22,463	-	-	-	-	-	-	215,039
																												-
	Construction + Equipment	-	-	146,976	754,508	-	-	-		-	62,969	-	-	-	-	45,143	-	-	-	-	103,476	-	-	-	-	-	-	1,113,073
20%	Contingency @ 20%	-	-	29,395	150,902	-	-	-		-	12,594	-	-	-	-	9,029	-	-	-	-	20,695	-	-	-	-	-	-	222,615
	Construction and Equipment Total	-	-	176,372	905,409	-	-	-		-	75,563	-	-	-	-	54,172	-	-	-	-	124,171	-	-	-	-	-	-	1,335,687
	Land Cost	-	-	52,272	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52,272
	GRAND TOTAL	**-**	**-**	**228,644**	**905,409**	**-**	**-**	**-**		**-**	**75,563**	**-**	**-**	**-**	**-**	**54,172**	**-**	**-**	**-**	**-**	**124,171**	**-**	**-**	**-**	**-**	**-**	**-**	**1,387,959**

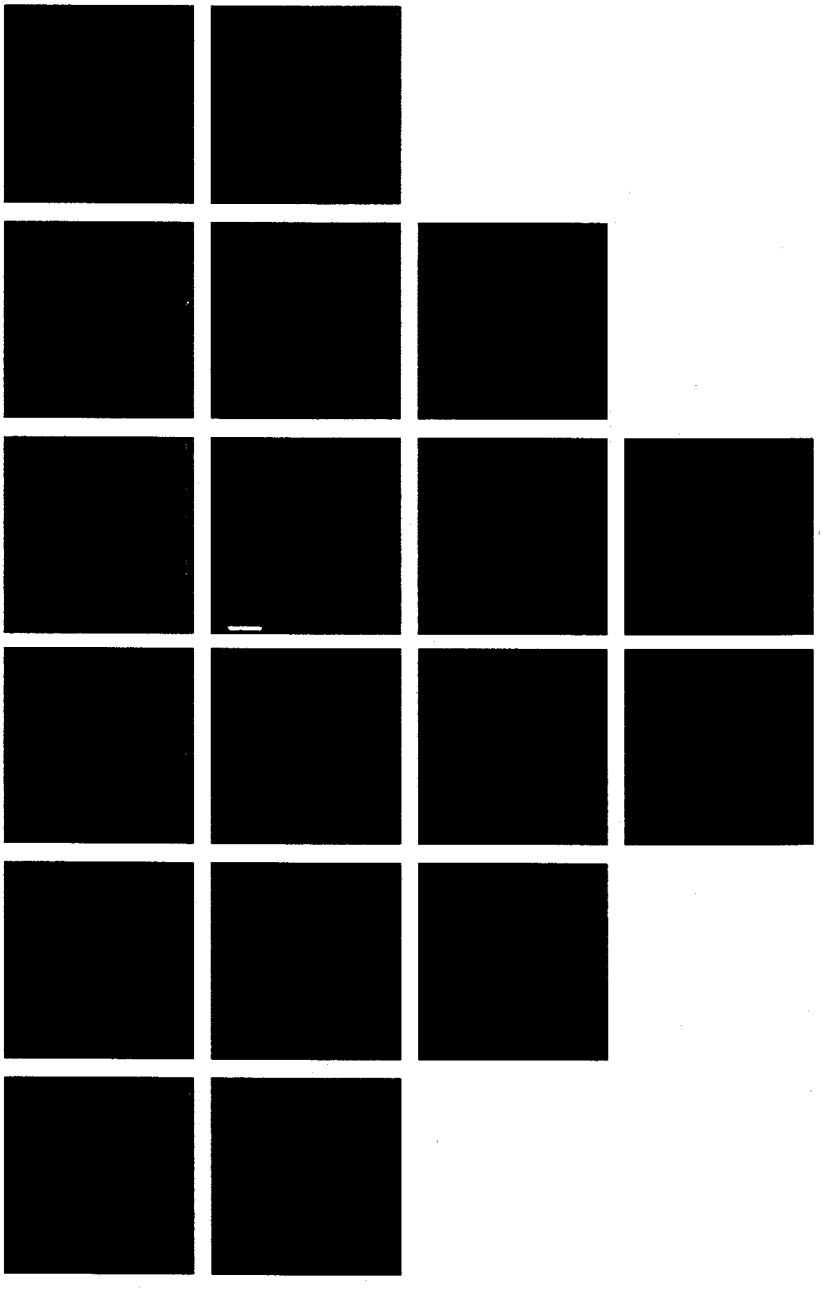
Factors	Maintenance	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Totals
	Invested capital landside only	-	-	126,892	824,178	-	-	-	-	-	75,563	-	-	-	-	36,172	-	-	-	-	124,171	-	-	-	-	-	-	1,186,976
	Cumulative investment landside	-	-	126,892	951,070	951,070	951,070	951,070	951,070	951,070	1,026,633	1,026,633	1,026,633	1,026,633	1,026,633	1,062,805	1,062,805	1,062,805	1,062,805	1,062,805	1,186,976	1,186,976	1,186,976	1,186,976	1,186,976	1,186,976	1,186,976	
1.6%	Maintenance landside only	-	-	2,030	15,217	15,217	15,217	15,217	15,217	15,217	16,426	16,426	16,426	16,426	16,426	17,005	17,005	17,005	17,005	17,005	18,992	18,992	18,992	18,992	18,992	18,992	18,992	
	Invested airside capital	-	-	49,480	81,231	-	-	-	-	-	-	-	-	-	-	18,000	-	-	-	-	-	-	-	-	-	-	-	148,711
	Cumulative airside investment	-	-	49,480	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	148,711	148,711	148,711	148,711	148,711	148,711	148,711	148,711	148,711	148,711	148,711	148,711	
0.6%	General Airside Maintenance	-	-	297	784	784	784	784	784	784	784	784	784	784	784	892	892	892	892	892	892	892	892	892	892	892	892	
10.0%	Scheduled Airside R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14,871	-	-	-	-	-	-	-	-	-	-	-	

INVESTMENT PHASING FOR DEVELOPMENT OF NEW AIRPORT AT SANTA ELISA
LOW FORECAST
(all costs in UF)

Factors	Operational Forecasts	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	Peak Hour Ops	8	-	-	-	-	8	-		-	-	9	-	-	-	-	10	-	-	-	-	10	-	-	-	-	11
	Peak Hour Commercial Ops	4	-	-	-	-	3	-		-	-	3	-	-	-	-	3	-	-	-	-	3	-	-	-	-	3
	Loading Bridges	2	-	-	-	-	2	-		-	-	2	-	-	-	-	2	-	-	-	-	2	-	-	-	-	2
	PeakHour Passengers Departing	117	-	-	-	-	138	-		-	-	164	-	-	-	-	191	-	-	-	-	224	-	-	-	-	263
1.9	PeakHour Passengers Total	222	-	-	-	-	262	-		-	-	312	-	-	-	-	363	-	-	-	-	426	-	-	-	-	500
10	Terminal Size @ 10m2/pkhrpax	2,000					3,000					3,000					4,000					4,000					5,000

Factors	Construction	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Totals
	Site Development	-	-	67,168	67,168	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	134,336
	Airfield, perpendicular taxiways	-	-	49,480	49,480	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98,960
0.75	1000 m parallel taxiway @ 18 m	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.75	1000 m to full taxiway @ 18 m	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Apron 4 positions @3610m2 per	-	-	-	31,751	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31,751
2.20	Apron expansion @ 3610m2	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
												-																-
25	Passenger Terminal @ 4000m2	-	-	-	100,000	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100,000
25	Terminal Expansion @ 1000 m2	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	25,000	-	-	-	-	-	-	25,000
												-																-
	Access and Parking	-	-	-	24,088	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24,088
10.68	Pass Parking Expansion	-	-	-	-	-	-	-		-	623	-	-	-	-	-	-	-	-	-	623	-	-	-	-	-	-	1,246
												-																-
	Operations Facilities	-	-	-	7,600	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,600
												-																-
	Utilities Infrastructure	-	-	-	43,500	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43,500
6,525	Utilities expansion/1000m2	-	-	-	-	-	-	-		-	6,525	-	-	-	-	-	-	-	-	-	6,525	-	-	-	-	-	-	13,050
												-																-
	Aeronautical Support Facilities	-	-	-	156,800	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156,800
												-																-
	Commercial Facilities	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GenAviation/Military Facilities	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Off-Airport Roads & Power	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Construction only Subtotal	-	-	116,648	480,387	-	-	-		-	7,148	-	-	-	-	-	-	-	-	-	32,148	-	-	-	-	-	-	636,331
0.26	Engng and Contractor @ 26%	-	-	30,328	124,901	-	-	-		-	1,858	-	-	-	-	-	-	-	-	-	8,358	-	-	-	-	-	-	165,446
	Construction & Fees Subtotal	-	-	146,976	605,288	-	-	-		-	9,006	-	-	-	-	-	-	-	-	-	40,506	-	-	-	-	-	-	801,777
	Equipment,3 bridges,2esc,1elev	-	-	-	147,650	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	147,650
23,250	Additional Loading Bridges	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22,463	Other Equipment Additions	-	-	-	-	-	-	-		-	11,232	-	-	-	-	11,232	-	-	-	-	11,232	-	-	-	-	-	-	33,695
	Total for Equipment	-	-	-	147,650	-	-	-		-	11,232	-	-	-	-	11,232	-	-	-	-	11,232	-	-	-	-	-	-	181,345
																												-
	Construction + Equipment	-	-	146,976	752,938	-	-	-		-	20,238	-	-	-	-	11,232	-	-	-	-	51,738	-	-	-	-	-	-	983,122
20%	Contingency @ 20%	-	-	29,395	150,588	-	-	-		-	4,048	-	-	-	-	2,246	-	-	-	-	10,348	-	-	-	-	-	-	196,624
	Construction and Equipment Total	-	-	176,372	903,525	-	-	-		-	24,286	-	-	-	-	13,478	-	-	-	-	62,086	-	-	-	-	-	-	1,179,746
	Land Cost	-	-	52,272	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52,272
	GRAND TOTAL	**-**	**-**	**228,644**	**903,525**	**-**	**-**	**-**		**-**	**24,286**	**-**	**-**	**-**	**-**	**13,478**	**-**	**-**	**-**	**-**	**62,086**	**-**	**-**	**-**	**-**	**-**	**-**	**1,232,018**

Factors	Maintenance	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Totals
	Invested capital landside only	-	-	126,892	822,294	-	-	-		-	24,286	-	-	-	-	13,478	-	-	-	-	62,086	-	-	-	-	-	-	1,049,035
	Cumulative investment landside	-	-	126,892	949,186	949,186	949,186	949,186	949,186	949,186	973,471	973,471	973,471	973,471	973,471	986,949	986,949	986,949	986,949	986,949	1,049,035	########	########	########	########	########	########	
1.6%	Maintenance landside only	-	-	2,030	15,187	15,187	15,187	15,187	15,187	15,187	15,576	15,576	15,576	15,576	15,576	15,791	15,791	15,791	15,791	15,791	16,785	16,785	16,785	16,785	16,785	16,785	16,785	
	Invested airside capital	-	-	49,480	81,231	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	130,711
	Cumulative airside investment	-	-	49,480	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	130,711	
0.6%	General Airside Maintenance	-	-	297	784	784	784	784	784	784	784	784	784	784	784	784	784	784	784	784	784	784	784	784	784	784	784	
10.0%	Scheduled Airside R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13,071	-	-	-	-	-	-	-	-	-	-	-	



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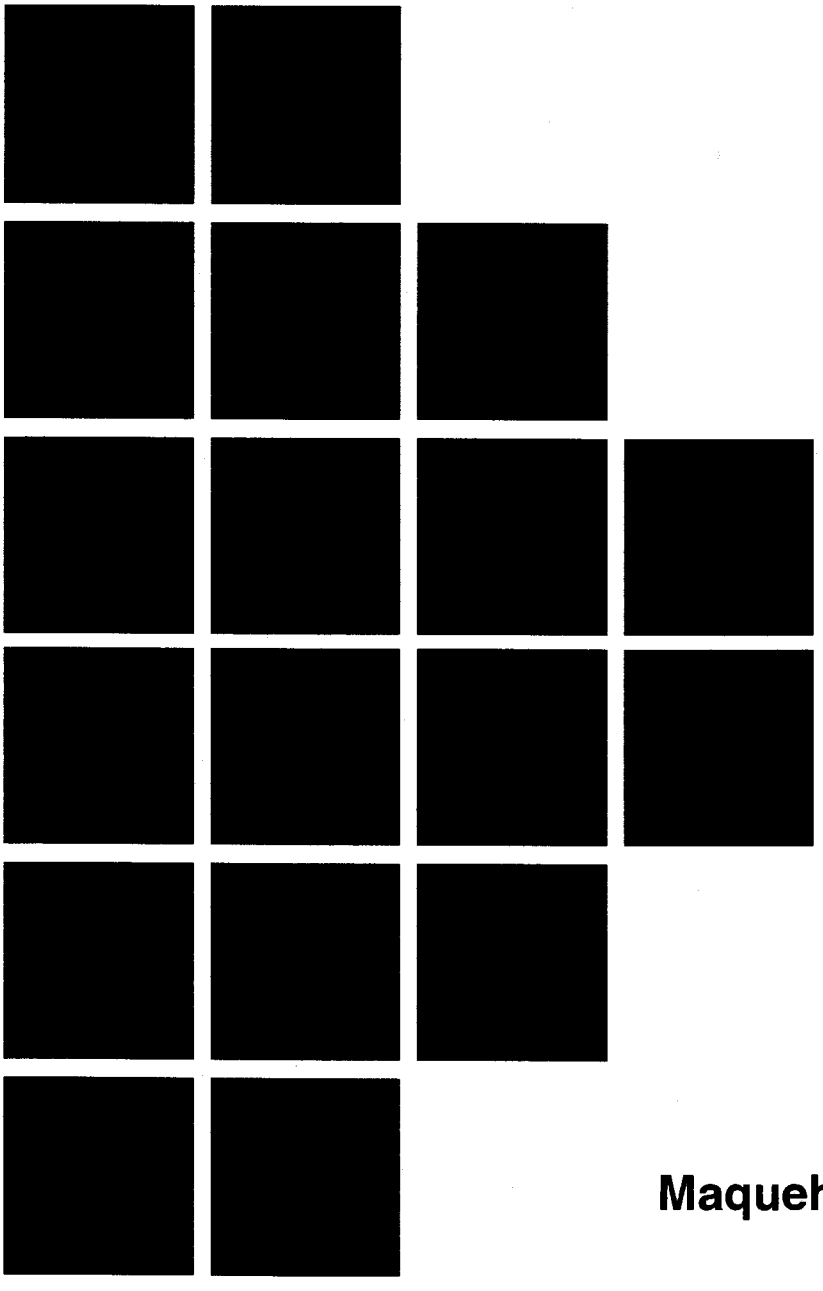
ANNEX C



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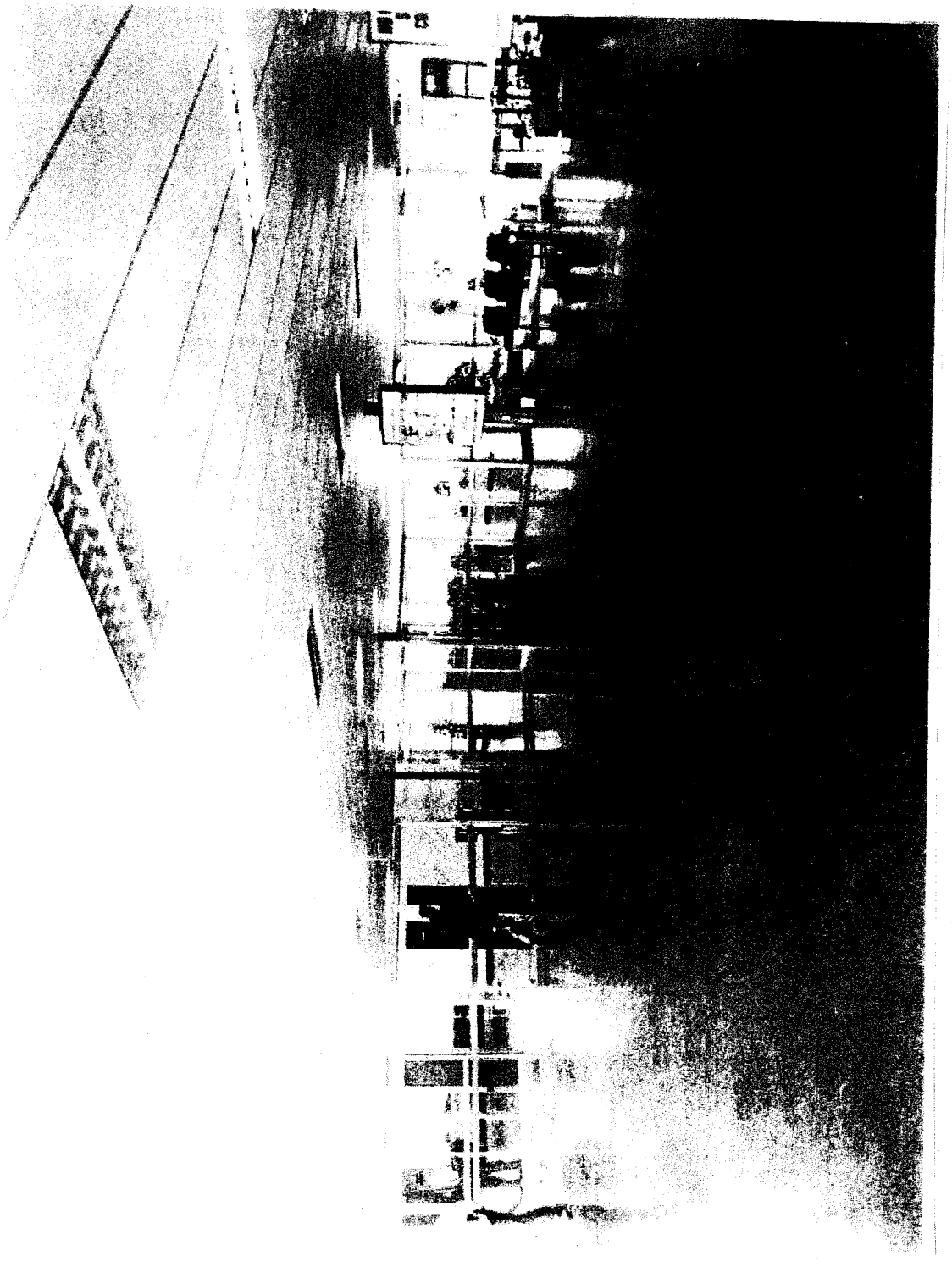
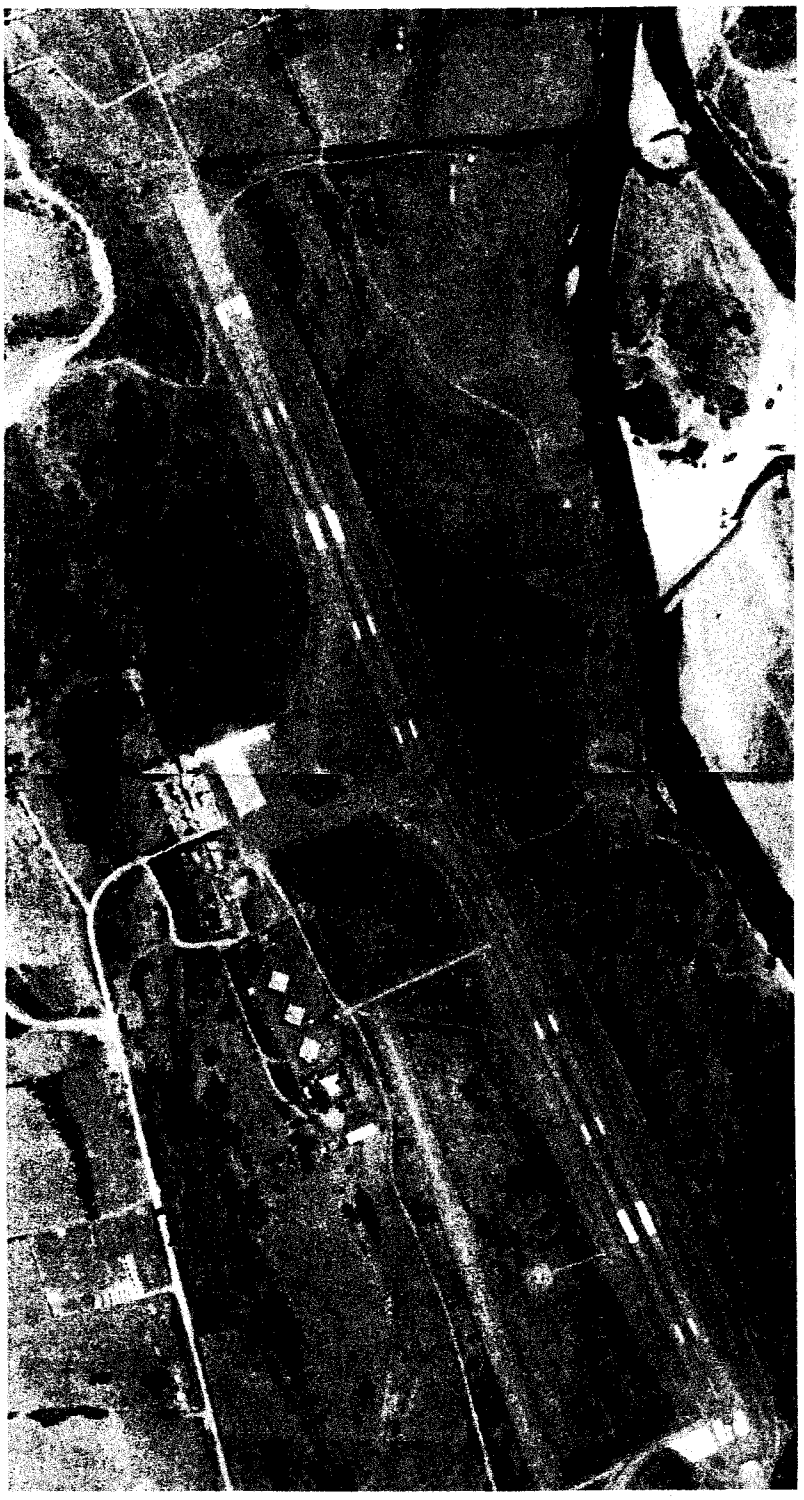
ANNEX C - Part 1
Maquehue Airport Photos and Santa Elisa Area



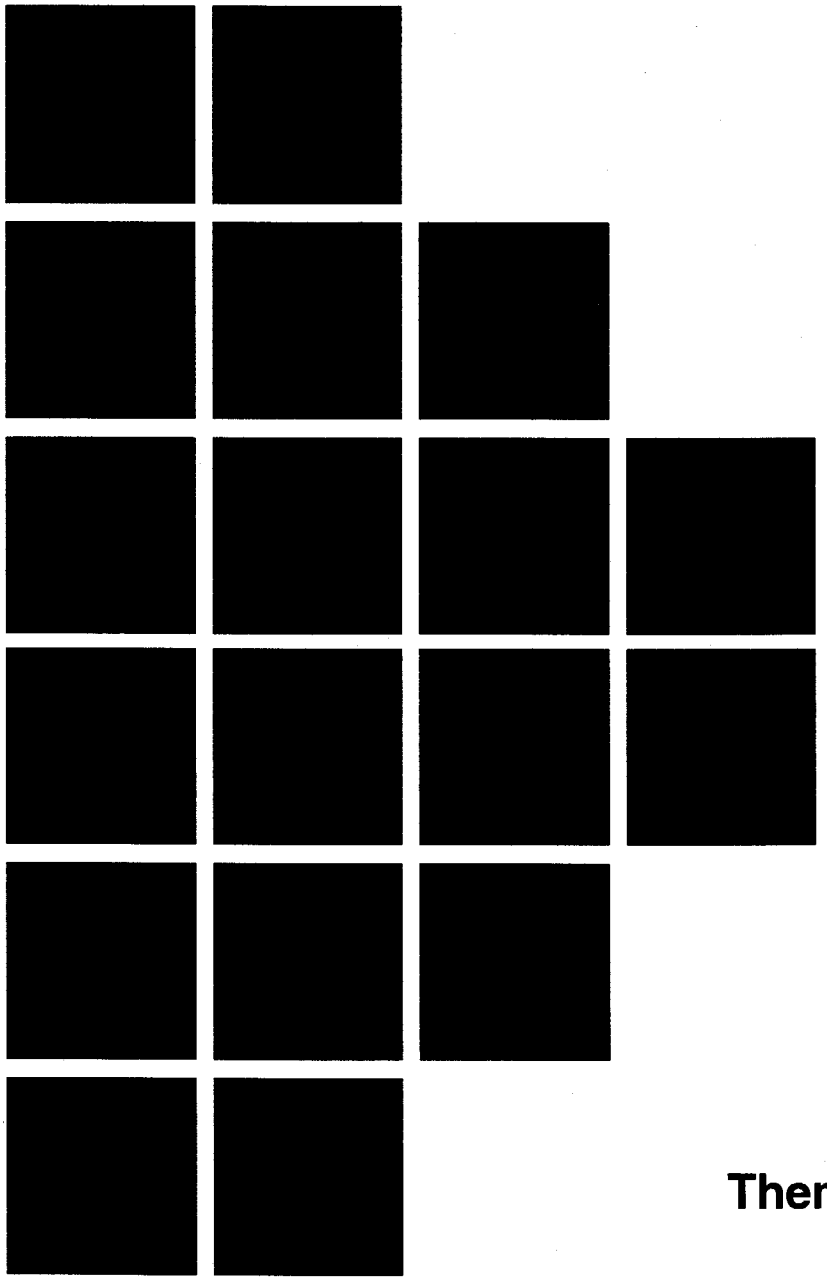
New Arrival Lounge

AERODROMO MAQUEHUE - TEMUCO

AERODROMO MAQUEHUE - TEMUCO



Background View of Santa Elisa, Quepe



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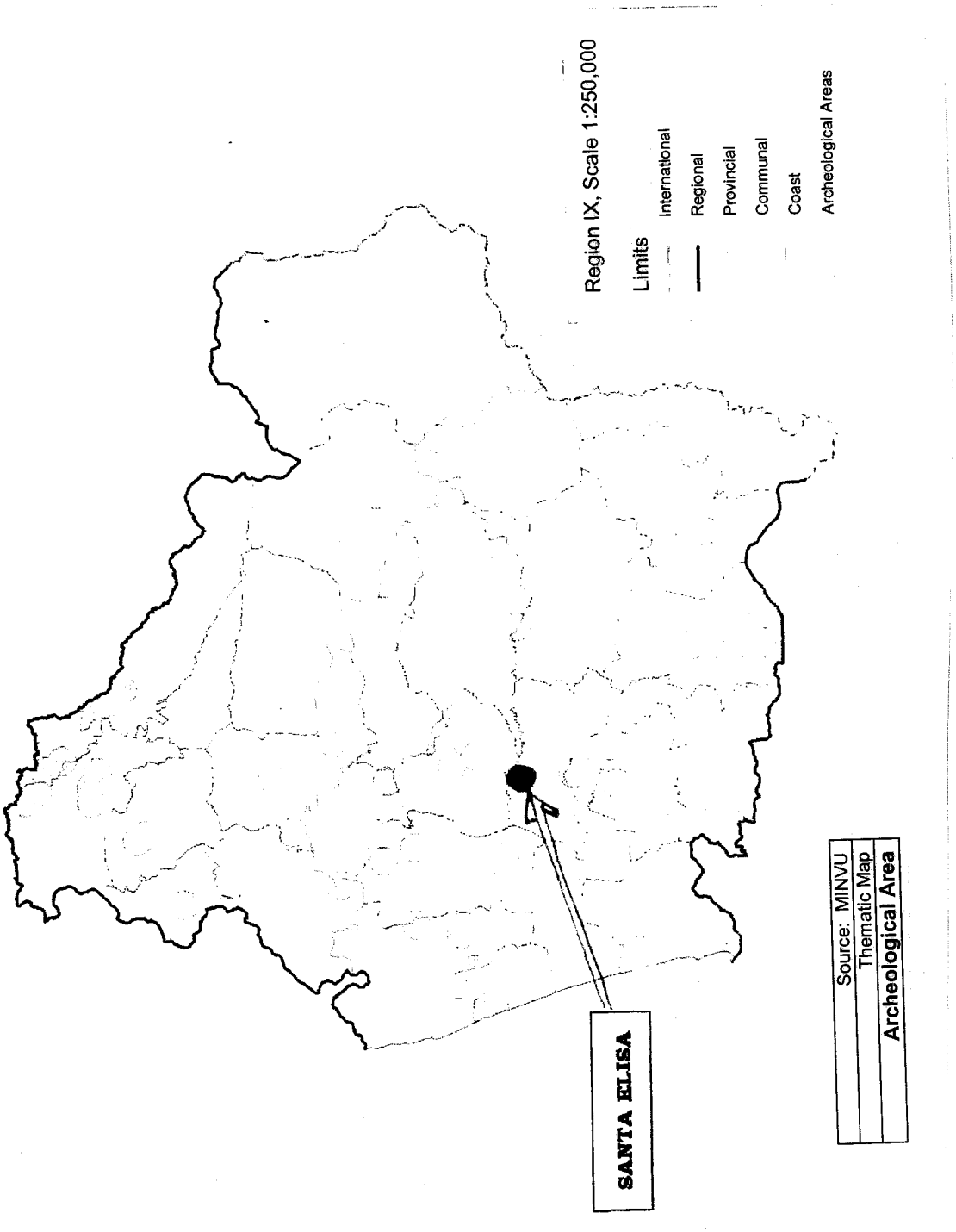
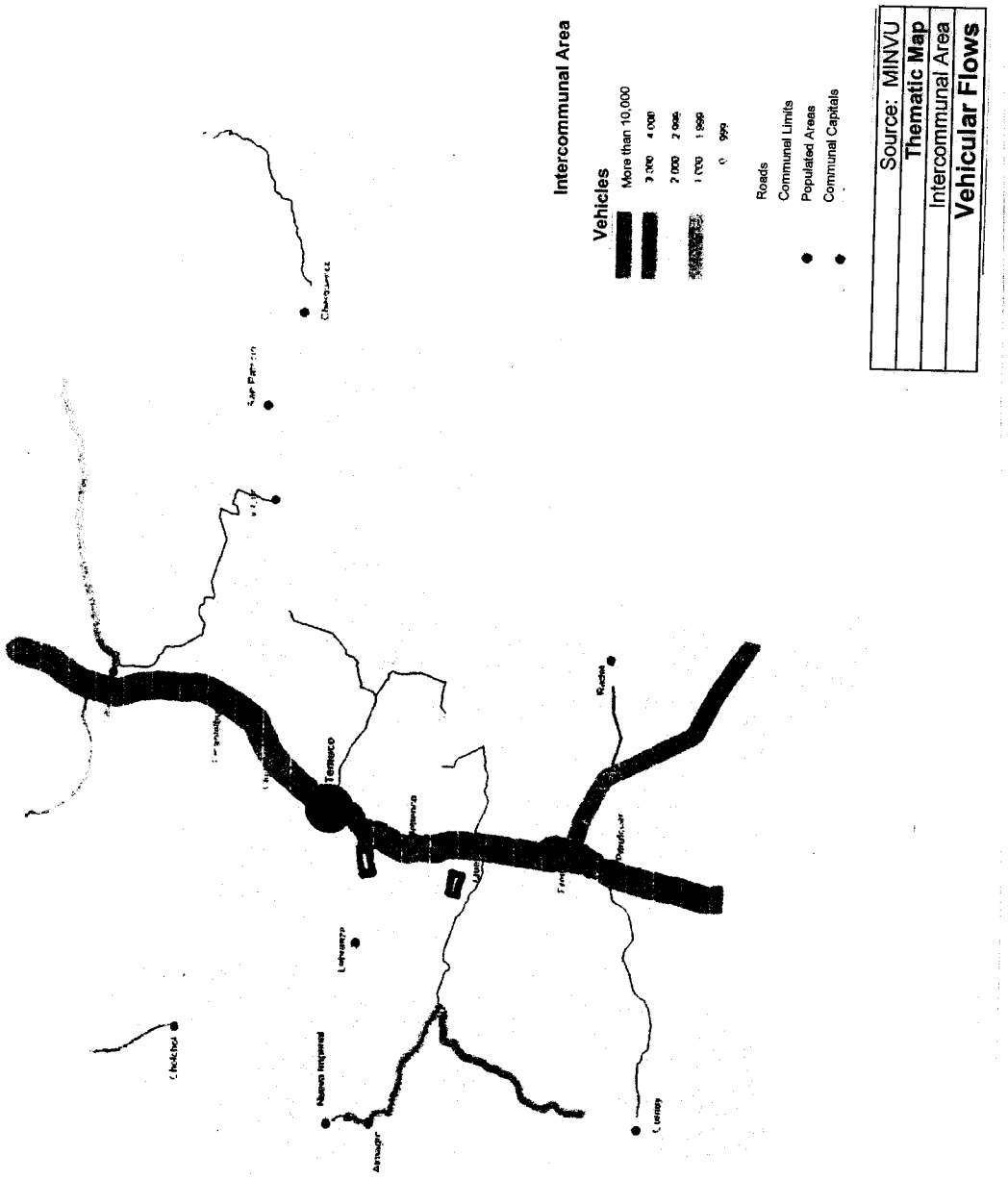
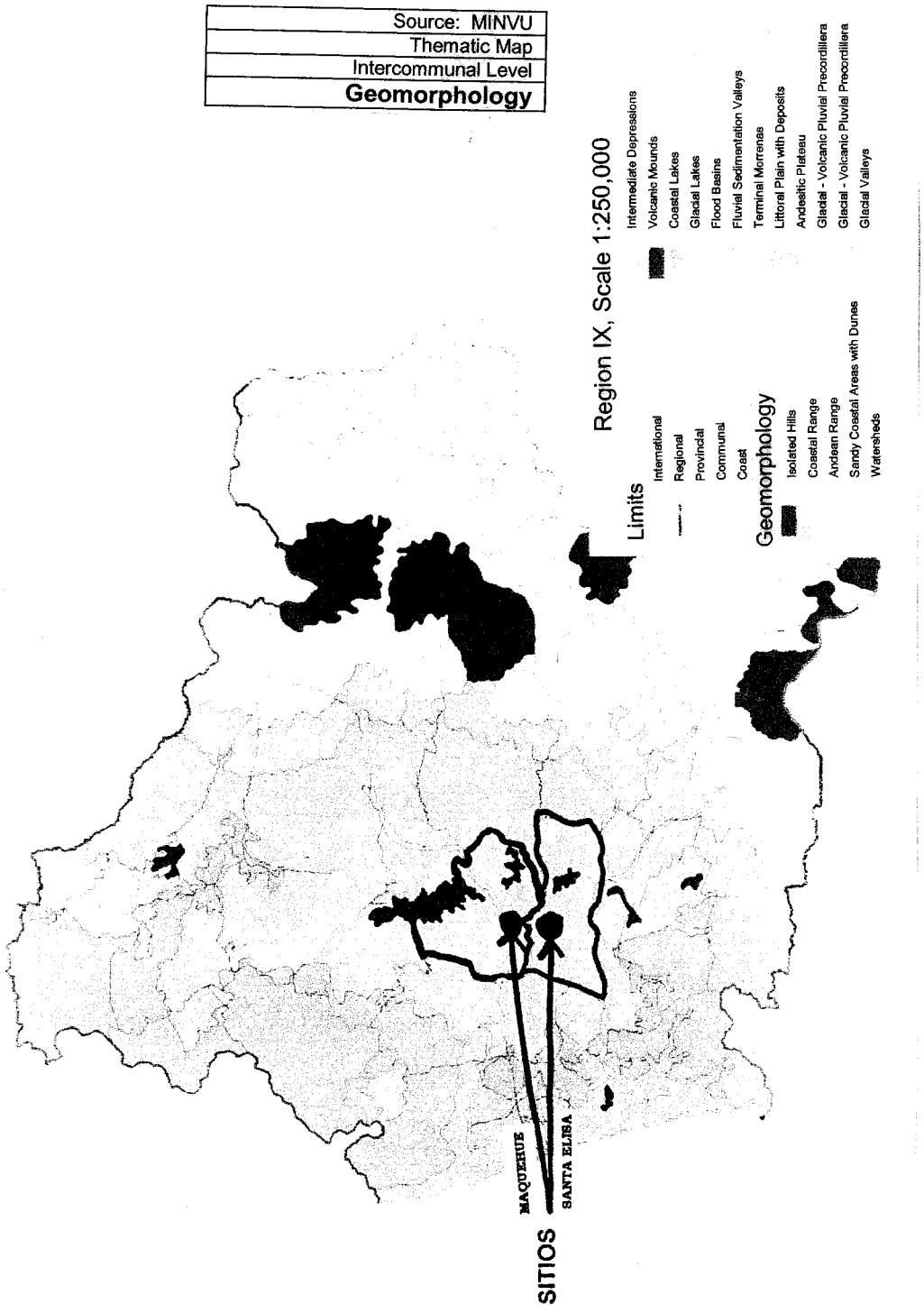
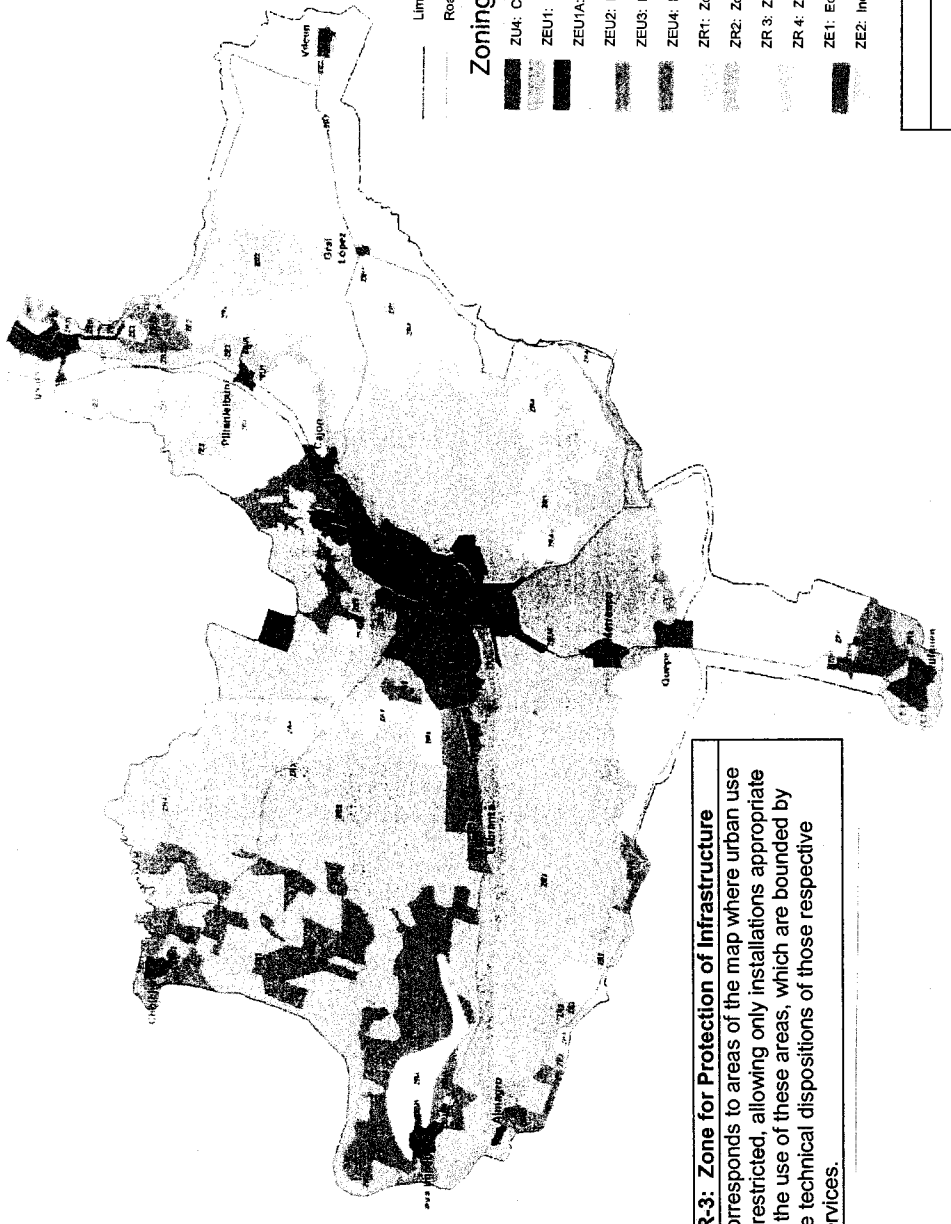
ANNEX C - Part 2
Thematic Plans - Region IX

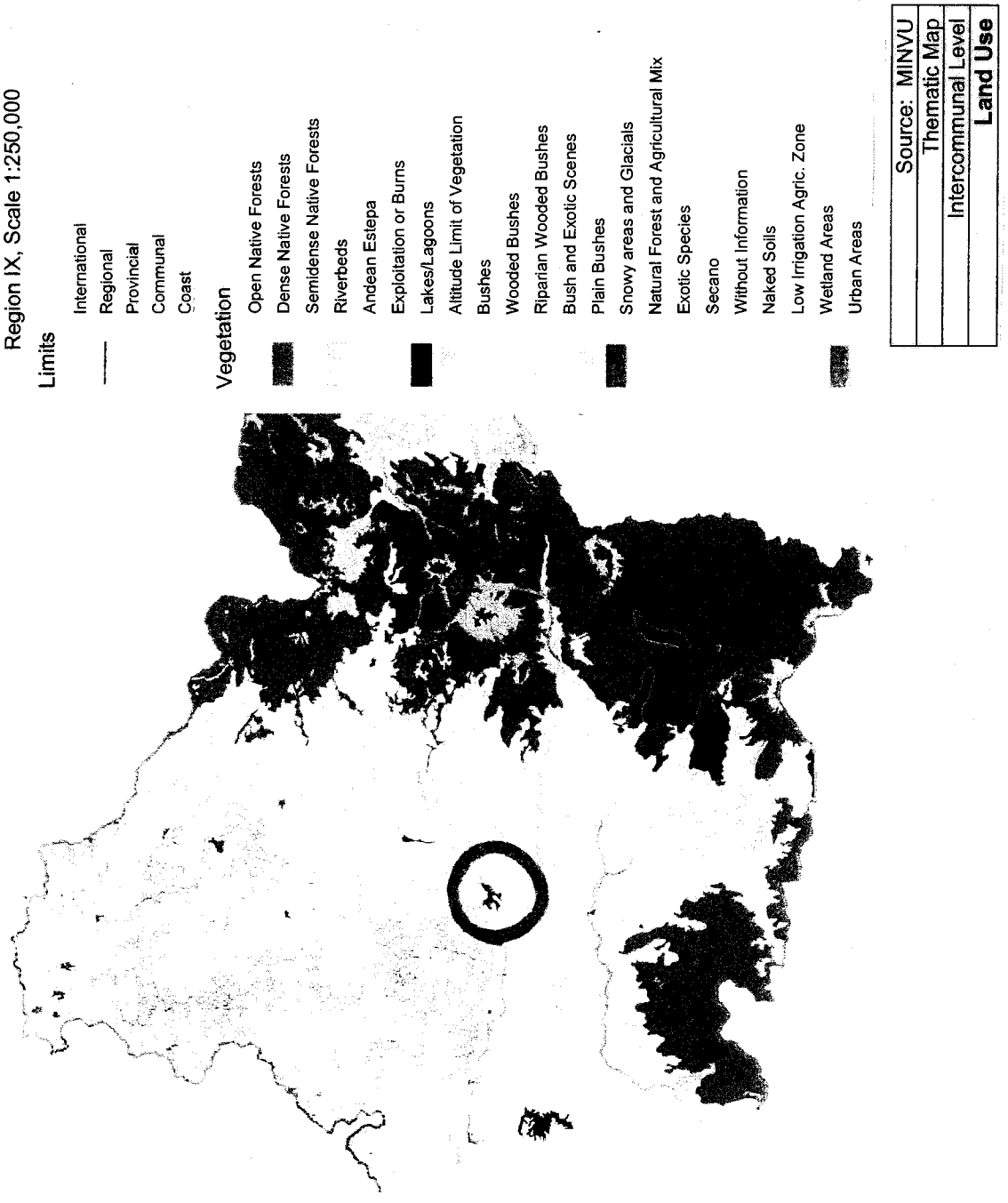
Intercommunal Area
Areas with Slope Restrictions
Drainage for intercommunal area
Communal Limits
Populated Areas
Communal Capitals
Temuco
Source: MINVU
Thematic Map
Intercommunal Area
SLOPE RESTRICTIONS


Region IX, Scale 1:250,000
Limits
International
Regional
Provincial
Communal
Coast
Archeological Areas
SANTA ELISA
Source: MINVU
Thematic Map
Archeological Area

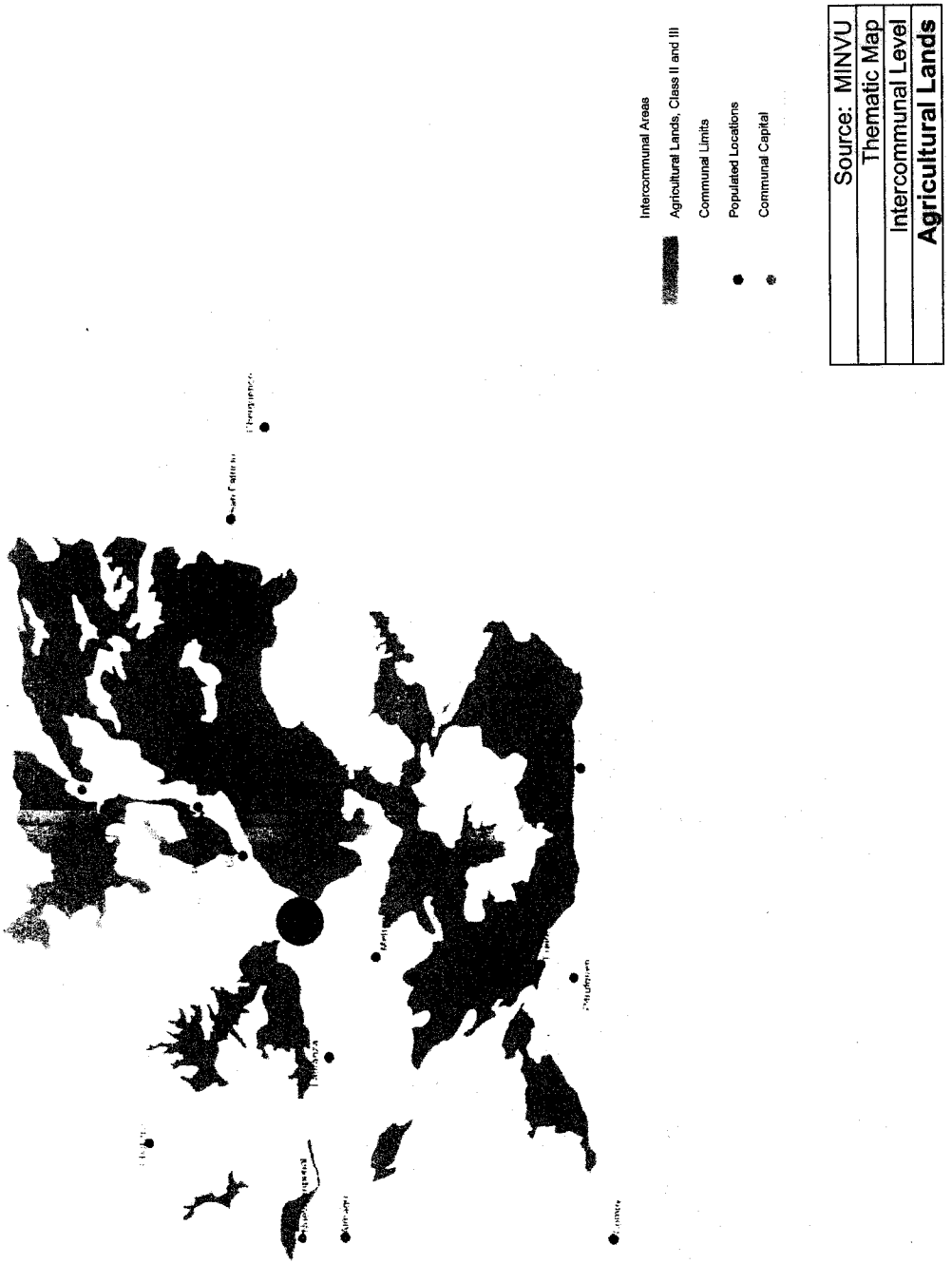

Intercommunal Area
Vehicles
More than 10,000
Roads
Communal Limits
Populated Areas
Communal Capitals
Source: MINVU
Thematic Map
Intercommunal Area
Vehicular Flows
Temuco

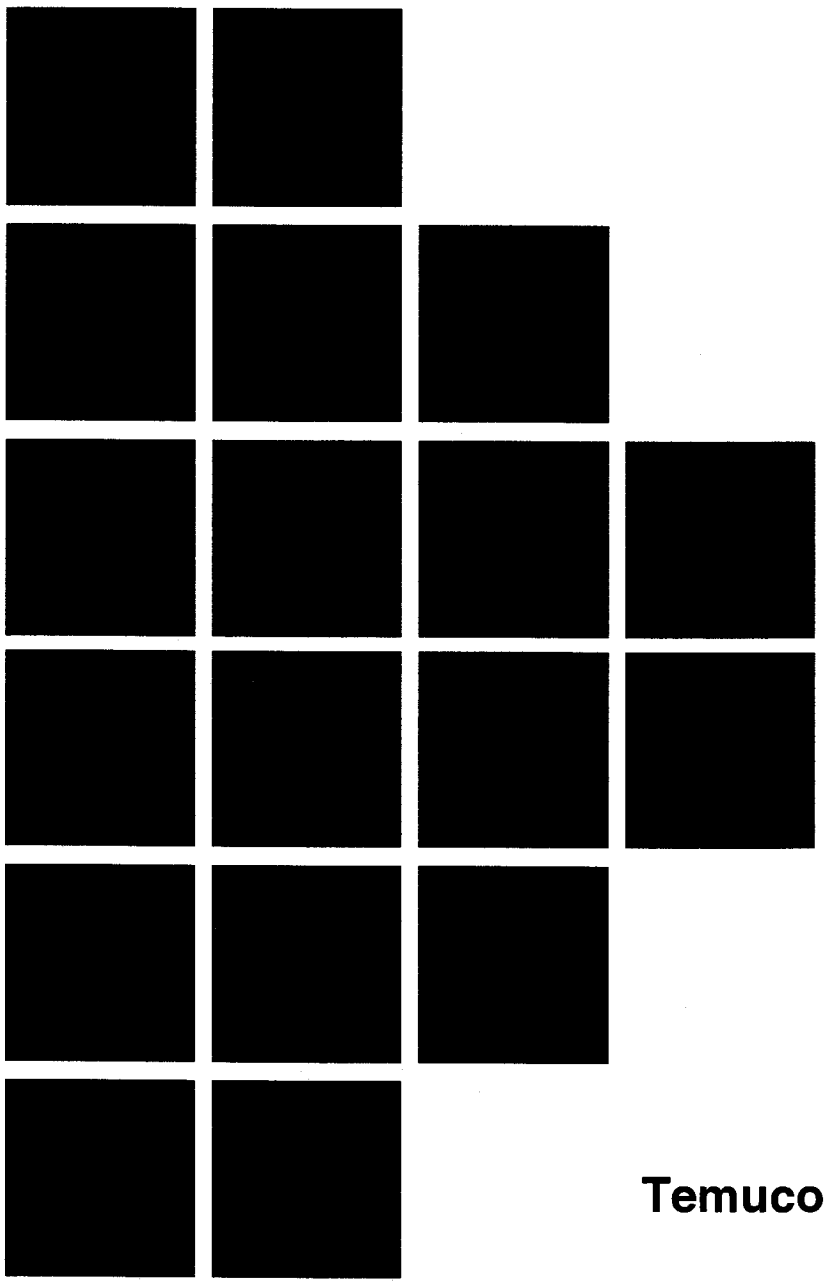

Source: MINVU
Thematic Map
Intercommunal Level
Geomorphology
Region IX, Scale 1:250,000
Limits
International
Regional
Provincial
Communal
Coast
Geomorphology
Isolated Hills
Coastal Range
Andean Range
Sandy Coastal Areas with Dunes
Watersheds
Intermediate Depressions
Volcanic Mounds
Coastal Lakes
Glacial Lakes
Flood Basins
Fluvial Sedimentation Valleys
Terminal Morrenas
Littoral Plain with Deposits
Andesitic Plateau
Glacial - Volcanic Pluvial Precordillera
Glacial - Volcanic Pluvial Precordillera
Glacial Valleys
SITIOS
MAQUEHUE
SANTA ELISA


Limit of Regulated Areas
Road System
Zoning
ZU4: Consolidated Urban Zone
ZEU1: High Density Expansion Zone
ZEU1A: High Density Expansion Zone Equipped to Support Transport
ZEU2: Low Density Expansion Zone with Conditional Growth
ZEU3: Expansion Zone with Conditional Growth
ZEU4: Industrial Expansion Zone
ZR1: Zone Restricted by Slopes
ZR2: Zone Restricted by Rivers and Streams
ZR 3: Zone for Protection of Infrastructure
ZR 4: Zone with Natural Value or Agricultural Uses
ZE1: Ecological Protection Zone
ZE2: Indigenous Lands
Source: MINVU
Thematic Map
Intercommunal Level
Land Use
XR-3: Zone for Protection of Infrastructure
Corresponds to areas of the map where urban use is restricted, allowing only installations appropriate to the use of these areas, which are bounded by the technical dispositions of those respective services.


Region IX, Scale 1:250,000
Limits
International
Regional
Provincial
Communal
Coast
Vegetation
Open Native Forests
Dense Native Forests
Semidense Native Forests
Riverbeds
Andean Estepa
Exploitation or Burns
Lakes/Lagoons
Altitude Limit of Vegetation
Bushes
Wooded Bushes
Riparian Wooded Bushes
Bush and Exotic Scenes
Plain Bushes
Snowy areas and Glacials
Natural Forest and Agricultural Mix
Exotic Species
Secano
Without Information
Naked Soils
Low Irrigation Agric. Zone
Wetland Areas
Urban Areas
Source: MINVU
Thematic Map
Intercommunal Level
Land Use

The Indigenous Law does not specify the procedure to be followed in case of the need to expropriate indigenous lands for the construction of public works. It's assumed that the expropriation procedure in this case would require ordinary legislation.


Intercommunal Areas
Agricultural Lands, Class II and III
Communal Limits
Populated Locations
Communal Capital
Source: MINVU
Thematic Map
Intercommunal Level
Agricultural Lands



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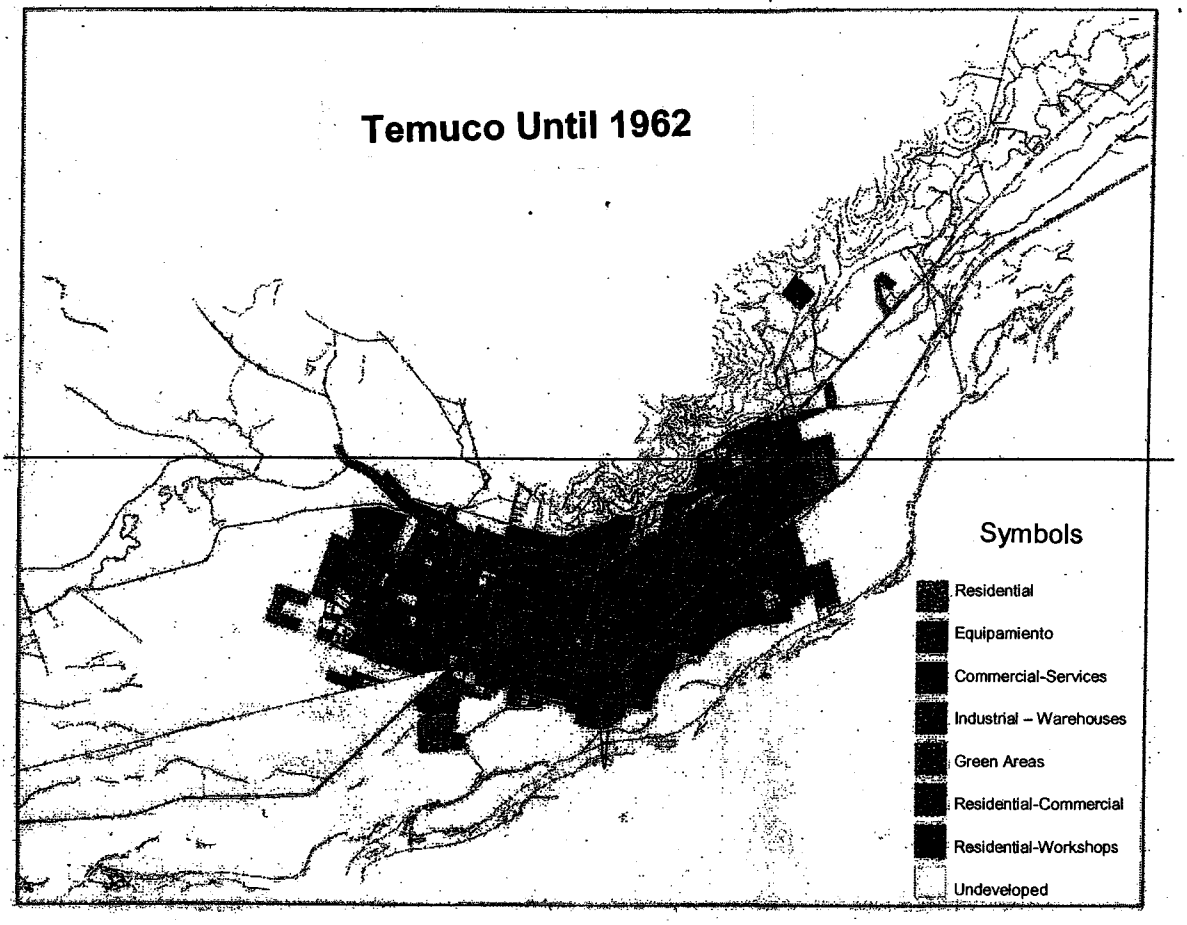
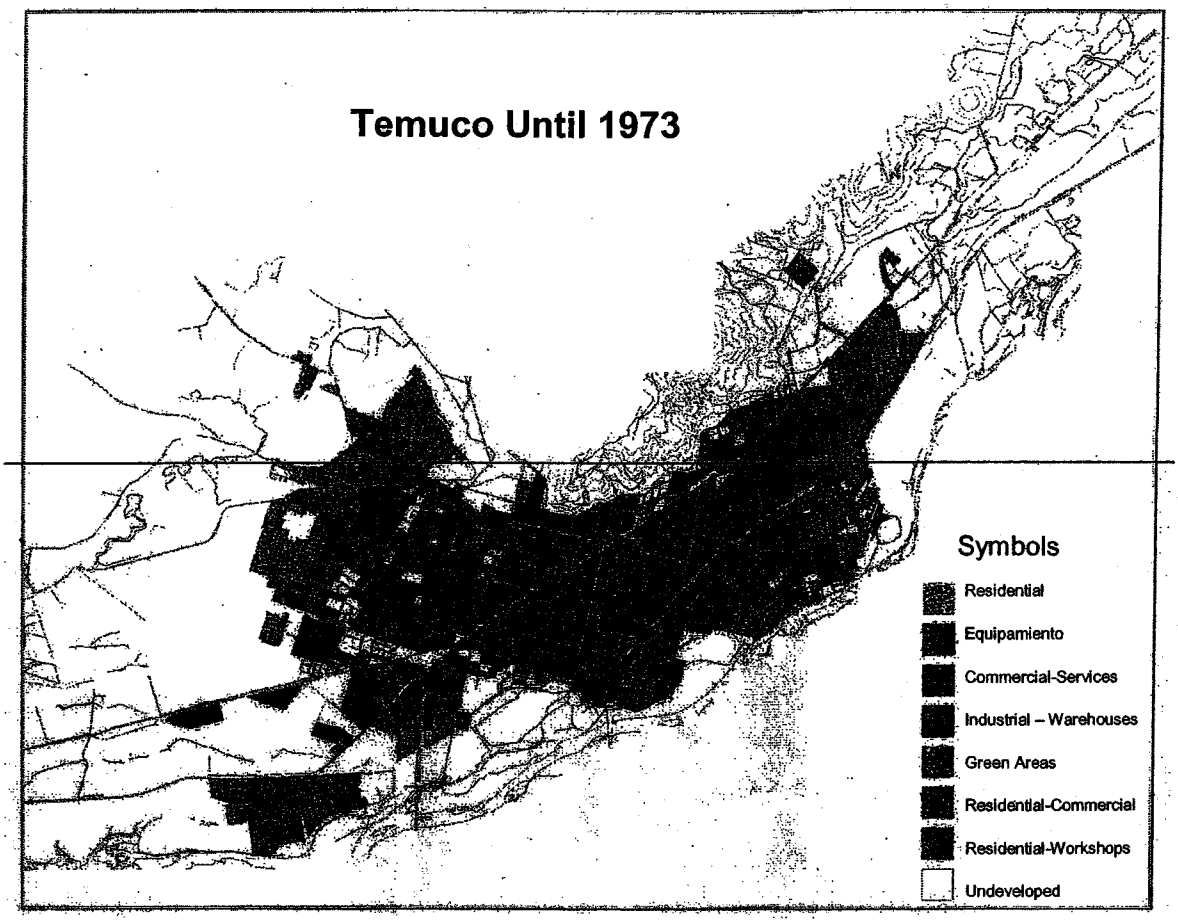
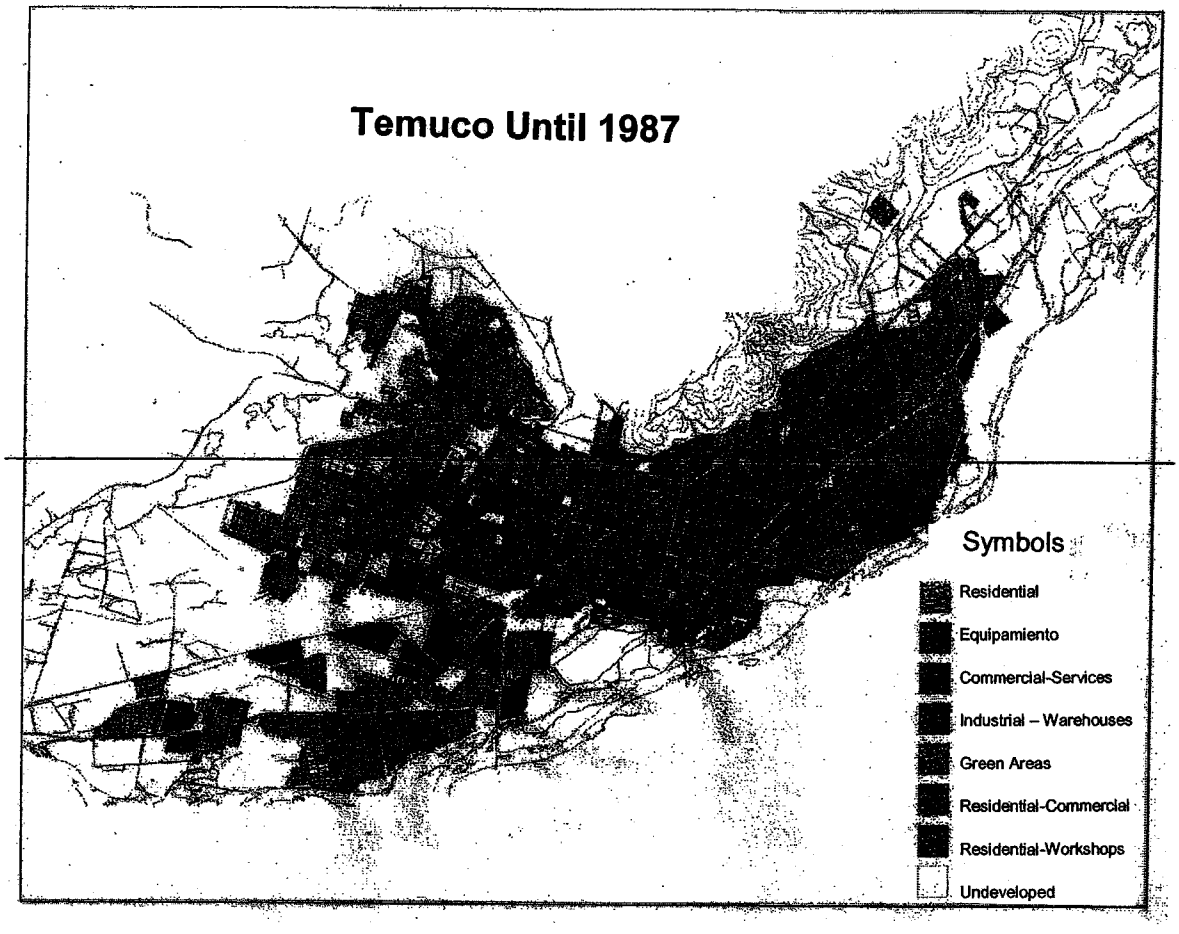
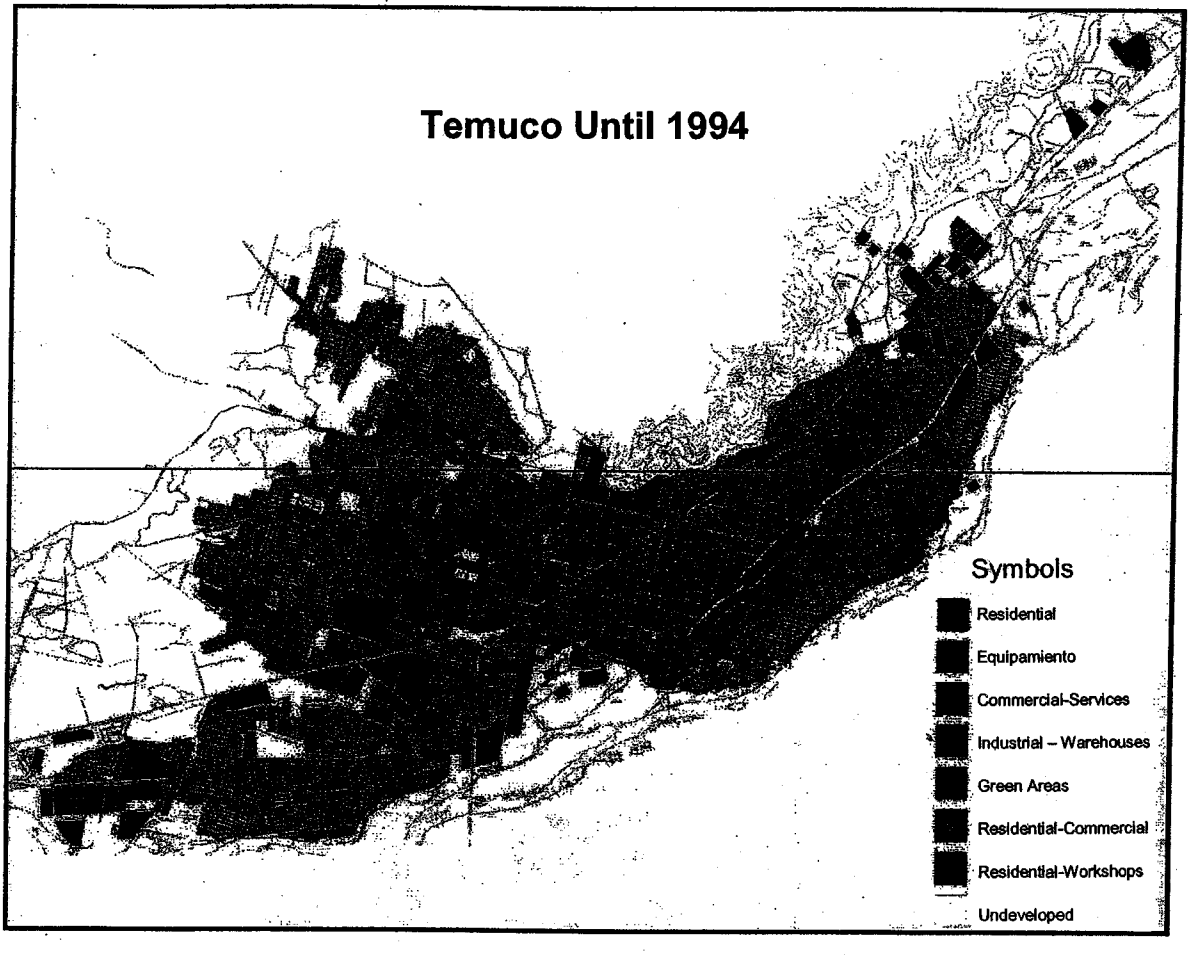
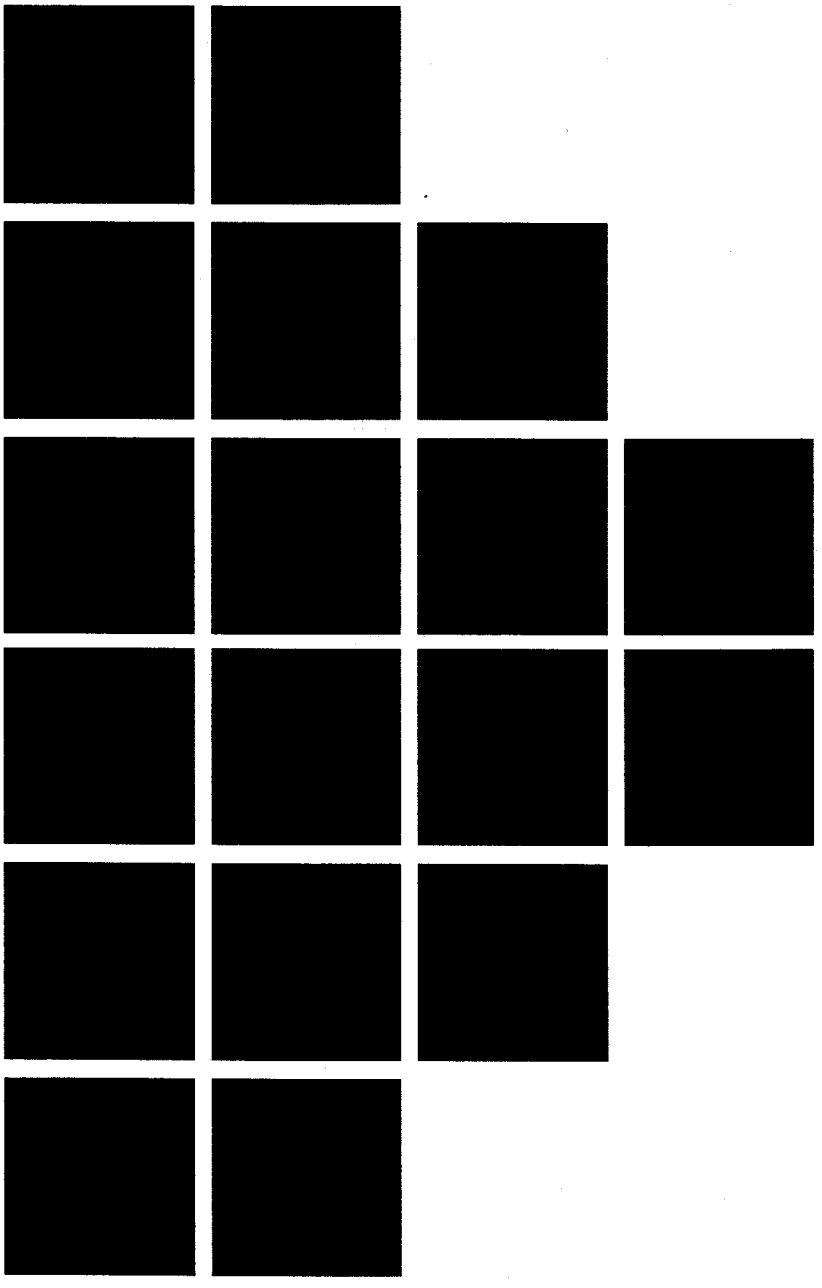
ANNEX C - Part 3
Temuco Historic Growth Plans


Temuco Until 1962
Symbols
Residential
Equipamiento
Commercial-Services
Industrial – Warehouses
Green Areas
Residential-Commercial
Residential-Workshops
Undeveloped


Temuco Until 1973
Symbols
Residential
Equipamiento
Commercial-Services
Industrial – Warehouses
Green Areas
Residential-Commercial
Residential-Workshops
Undeveloped


Temuco Until 1987
Symbols
Residential
Equipamiento
Commercial-Services
Industrial – Warehouses
Green Areas
Residential-Commercial
Residential-Workshops
Undeveloped


Temuco Until 1994
Symbols
Residential
Equipamiento
Commercial-Services
Industrial – Warehouses
Green Areas
Residential-Commercial
Residential-Workshops
Undeveloped



The Louis Berger Group, Inc.

ANNEX D

Feasibility Study for the Temuco Airport
Financial Analysis Model

Principal Parameters

Analysis Alternative	6	
Demand Scenario	M	(B=Low; M=Medium; A=High)
Coverage of Concession	3	(1=only airside, 2=only landside, 3= both)
Payment Method	2	(1=does not include departure tariff, 2=includes departure tariff)
Duration of Concession	24	years

Development Phases

	First Year Investment	First Year Operation	Construction Period	Terminals New (m2)	Terminals Total Accum (m2)	Apron New (m2)	Apron Total Accum (m2)
Phase 1	2002	2004	2	4000	4000	14440	14440
Phase 2	2009	2010	1	1000	5000		14440
Phase 3	2014	2015	1		5000		14440
Phase 4	2019	2020	1	2000	7000		14440

Infration rate	0%		
Exchange rate	15,934	$/UF	(Banco Central de Chile - average for Junio-Julio 2001)
Exchange rate	26.10	US$/UF	(Banco Central de Chile - average for Junio-Julio 2001)
Base year for prices	2001		

Price Increments	Inflation factor	Growth rate
Tariffs	1.00	0.0%
Operational Costs	1.00	0.0%
Depreciation Costs	1.00	0.0%

Variations in Tariffs (Concessionaire vrs. DGAC):

Increment/Reduction National Landing Fee	1.00
Increment/Reduction National Departure Tariff	1.71

Tariffs Concessionaire (2001)

326 pesos/ton (MTOW<=49 ton.
839 pesos/ton (MTOW > 49 ton.
7,536 pesos per pax.

Summary of Results

Total investment costs (for Concessionaire)

(UF)	Phase 1	Phase 2	Phase 3	Phase 4	Total
Infrastructure	705,319	48,608	42,087	97,216	893,230
Equipment	252,024	26,956	26,956	26,956	332,891
Total	957,343	75,563	69,043	124,171	1,226,121

Financial Results

For Concessionaire		No Debt	With Debt	
Net Present Value at	12%	(0)	200,467	UF
Internal Rate of Return		12%	21%	

Annual Fixed Payment from DGAC to Concessionare 73,648 UF

For DGAC		No Debt	
Net Present Value at	12%	(664,407)	UF
Internal Rate of Return		0%	

Infrastructure

Alternativa 6

Key Parameters

Analysis Alternative	3

	Phase 1	Phase 2	Phase 3	Phase 4	
First Year of Investment	2004	2010	2015	2020	
Construction Period (years)	2	1	1	1	
% Last Year of Period - Alt. 1	57.0%	100.0%	100.0%	100.0%	airside vrs landside
% Previous Year of Period - Alt 1	43.0%	0.0%	0.0%	0.0%	
% Last Year of Periodo - Alt. 2	90.2%	100.0%	100.0%	100.0%	
% Previous Year of Period - Alt 2	9.8%	0.0%	0.0%	0.0%	

% Engineering and Supervision	26.0%
% Contingencies	20.0%
% Mainten. Annual Airside	0.8%
% Mainten. Annual Landside	1.6%
Growth Rate Expenses	0.0%
Base year:	2001

Summary of Periodic Expenses in Infrastructure

Alt	Item	Investment Requirements (UF) Phase 1	Phase 2	Phase 3	Phase 4	Total	Annual Maintenance Costs Percent of Investment	(UF/year) Phase 1	Phase 2	Phase 3	Phase 4	NOTE = ESTIMATED SEPERATELY - SHEET "G&A" Annual Insurance Costs Percent of Investment	(UF/year) Phase 1	Phase 2	Phase 3	Phase 4
1	Purchase Land - airside	0	0	0	0	0	0.0%	0.0	0.0	0.0	0.0	0.0%	0.0	0.0	0.0	0.0
2	Purchase Land - Landside	0	0	0	0	0	0.0%	0.0	0.0	0.0	0.0	0.0%	0.0	0.0	0.0	0.0
1	Earth Movements - airside	109,449	0	0	0	109,449	0.0%	0.0	0.0	0.0	0.0	0.0%	0.0	0.0	0.0	0.0
2	Earth Movements - Landside	24,887	0	0	0	24,887	0.0%	0.0	0.0	0.0	0.0	0.0%	0.0	0.0	0.0	0.0
1	Runways/Taxiways/Aprons	130,711	0	18,000	0	148,711	0.6%	784.3	784.3	892.3	892.3	0.0%	0.0	0.0	0.0	0.0
2	Passenger Terminal	100,000	25,000	0	50,000	175,000	1.6%	1,600.0	2,000.0	2,000.0	2,800.0	0.0%	0.0	0.0	0.0	0.0
2	Access and Parking	25,334	623	0	1,246	27,203	1.6%	405.3	415.3	415.3	435.2	0.0%	0.0	0.0	0.0	0.0
2	Operational Instalations	7,600	0	0	0	7,600	1.6%	121.6	121.6	121.6	121.6	0.0%	0.0	0.0	0.0	0.0
1	Service Infrastructure - airside	14,499	2,175	0	4,350	21,023	0.6%	87.0	100.0	100.0	126.1	0.0%	0.0	0.0	0.0	0.0
2	Service Infrastructure - landside	29,001	4,350	0	8,700	42,052	1.6%	464.0	533.6	533.6	672.8	0.0%	0.0	0.0	0.0	0.0
1	Aeronautical Instalations	25,000	0	0	0	25,000	0.6%	150.0	150.0	150.0	150.0	0.0%	0.0	0.0	0.0	0.0
1	Rehabilitation Runway/Taxiways	0	0	14,871	0	14,871	0.0%	0.0	0.0	0.0	0.0	0.0%	0.0	0.0	0.0	0.0
1	Engineering and Supervision	72,711	565	4,680	1,131	79,088	0.0%	0.0	0.0	0.0	0.0	0.0%	0.0	0.0	0.0	0.0
2	Engineering and Supervision	48,574	7,793	0	15,586	71,953	0.0%	0.0	0.0	0.0	0.0	0.0%	0.0	0.0	0.0	0.0
1	Contingencies	70,474	548	4,536	1,096	76,654										
2	Contingencies	47,079	7,553	0	15,107	69,739										
	Total Airside - Alt.1	**422,844**	**3,288**	**42,087**	**6,577**	474,796		**1,021**	**1,034**	**1,142**	**1,168**		**0**	**0**	**0**	**0**
	Landside - Alt.2	**282,475**	**45,320**	**0**	**90,639**	418,434		**2,591**	**3,071**	**3,071**	**4,030**		**0**	**0**	**0**	**0**
	Total-Alt.3	**705,319**	**48,608**	**42,087**	**97,216**	893,230		**3,612**	**4,105**	**4,213**	**5,198**		**0**	**0**	**0**	**0**

Annual Costs
(UF)

Phase of operation:	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4	4
Investment Airside (Alternative 1)																									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capital Investments	181,832	241,012	0	0	0	0	0	3,288	0	0	0	0	42,087	0	0	0	0	6,577	0	0	0	0	0	0
Maintenance	0	0	1,021	1,021	1,021	1,021	1,021	1,021	1,034	1,034	1,034	1,034	1,034	1,142	1,142	1,142	1,142	1,142	1,168	1,168	1,168	1,168	1,168	1,168
Insurance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	181,832	241,012	1,021	1,021	1,021	1,021	1,021	4,310	1,034	1,034	1,034	1,034	43,121	1,142	1,142	1,142	1,142	7,719	1,168	1,168	1,168	1,168	1,168	1,168
Investment Landside (Alternative 2)																								
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capital Investments	27,554	254,922	0	0	0	0	0	45,320	0	0	0	0	0	0	0	0	0	90,639	0	0	0	0	0	0
Maintenance	0	0	2,591	2,591	2,591	2,591	2,591	2,591	3,071	3,071	3,071	3,071	3,071	3,071	3,071	3,071	3,071	3,071	4,030	4,030	4,030	4,030	4,030	4,030
Insurance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	27,554	254,922	2,591	2,591	2,591	2,591	2,591	47,910	3,071	3,071	3,071	3,071	3,071	3,071	3,071	3,071	3,071	93,710	4,030	4,030	4,030	4,030	4,030	4,030
Total Project (Alternative 3)																								
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capital Investments	209,385	495,934	0	0	0	0	0	48,608	0	0	0	0	42,087	0	0	0	0	97,216	0	0	0	0	0	0
Maintenance	0	0	3,612	3,612	3,612	3,612	3,612	3,612	4,105	4,105	4,105	4,105	4,105	4,213	4,213	4,213	4,213	4,213	5,198	5,198	5,198	5,198	5,198	5,198
Insurance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	209,385	495,934	3,612	3,612	3,612	3,612	3,612	52,220	4,105	4,105	4,105	4,105	46,192	4,213	4,213	4,213	4,213	101,428	5,198	5,198	5,198	5,198	5,198	5,198
Inflation factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Costs of Selected Alternative																								
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capital Investments	**209,385**	**495,934**	**0**	**0**	**0**	**0**	**0**	**48,608**	**0**	**0**	**0**	**0**	**42,087**	**0**	**0**	**0**	**0**	**97,216**	**0**	**0**	**0**	**0**	**0**	**0**
Maintenance	**0**	**0**	**3,612**	**3,612**	**3,612**	**3,612**	**3,612**	**3,612**	**4,105**	**4,105**	**4,105**	**4,105**	**4,105**	**4,213**	**4,213**	**4,213**	**4,213**	**4,213**	**5,198**	**5,198**	**5,198**	**5,198**	**5,198**	**5,198**
Insurance	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total	**209,385**	**495,934**	**3,612**	**3,612**	**3,612**	**3,612**	**3,612**	**52,220**	**4,105**	**4,105**	**4,105**	**4,105**	**46,192**	**4,213**	**4,213**	**4,213**	**4,213**	**101,428**	**5,198**	**5,198**	**5,198**	**5,198**	**5,198**	**5,198**

Investment by Phases	Phase 1	Phase 2	Phase 3	Phase 4
	705,319	48,608	42,087	97,216

Traffic Projections and Demand

Alternativa 6

Key Parameters

Analysis Alternative	6
Demand Scenario	M
Coverage of Concession	3
First Year of Concession	2002
Category MTOW B737	2 (1 = <= 49 tons, 2= >49 tons)

Tráfico	Unidad	Año 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Passengers																											
Scenario=	M																										
International	000 pax	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
National - Santiago	000 pax	234	248	262	276	290	304	321	337	353	370	386	404	422	440	458	476	495	513	532	551	570	589	608	626	645	664
National - Others	000 pax	24	26	27	29	30	32	34	35	37	39	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70
Scenario=	A																										
International	000 pax	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
National - Santiago	000 pax	234	254	274	294	314	334	357	380	403	426	449	476	503	530	557	584	615	646	677	707	738	769	799	830	861	891
National - Others	000 pax	24	27	29	31	33	35	37	40	42	45	47	50	53	56	58	61	65	68	71	74	77	81	84	87	90	93
Scenario=	B																										
International	000 pax	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
National - Santiago	000 pax	234	242	250	259	267	276	286	296	307	317	327	339	350	361	372	383	396	409	422	435	448	461	474	487	500	513
National - Others	000 pax	24	25	26	27	28	29	30	31	32	33	34	35	37	38	39	40	42	43	44	46	47	48	50	51	52	54
Pasajeros Embarcados Escenario Seleccionada																											
Scenario=	M																										
International	pax	285	228	171	114	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
National - Santiago	pax	116,805	123,891	130,978	138,064	145,151	152,237	160,404	168,570	176,737	184,903	193,070	202,023	210,977	219,930	228,884	237,837	247,254	256,670	266,087	275,503	284,920	294,337	303,753	313,170	322,586	332,003
National - Others	pax	12,249	12,992	13,735	14,478	15,221	15,964	16,820	17,677	18,533	19,389	20,246	21,185	22,124	23,062	24,001	24,940	25,928	26,915	27,903	28,890	29,878	30,865	31,852	32,840	33,827	34,815
Total	pax	129,338	137,111	144,883	152,656	160,429	168,201	177,224	186,247	195,270	204,293	213,316	223,208	233,100	242,993	252,885	262,777	273,181	283,585	293,989	304,393	314,797	325,202	335,606	346,010	356,414	366,818
Comercial Operations																											
Scenario=	M																										
A320	000 oper.	0.0	0.1	0.3	0.4	0.6	0.7	0.9	1.1	1.3	1.5	1.6	1.9	2.1	2.3	2.6	2.8	3.1	3.4	3.6	3.9	4.2	4.5	4.8	5.0	5.3	5.6
B737	000 oper.	8.5	8.2	8.0	7.8	7.6	7.4	7.3	7.3	7.2	7.2	7.1	7.0	6.9	6.8	6.7	6.6	6.3	6.0	5.8	5.5	5.2	5.0	4.7	4.5	4.2	3.9
Regional Jet	000 oper.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenario=	A																										
A320	000 oper.	0.0	0.2	0.3	0.5	0.6	0.8	1.0	1.2	1.5	1.7	1.9	2.2	2.5	2.8	3.1	3.5	3.9	4.3	4.6	5.0	5.4	5.8	6.2	6.6	7.0	7.4
B737	000 oper.	8.5	8.4	8.3	8.2	8.2	8.1	8.1	8.2	8.2	8.2	8.3	8.2	8.2	8.2	8.1	8.1	7.8	7.6	7.3	7.1	6.8	6.5	6.3	6.0	5.8	5.5
Regional Jet	000 oper.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenario=	B																										
A320	000 oper.	0.0	0.1	0.3	0.4	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.6	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3
B737	000 oper.	8.5	8.1	7.7	7.4	7.0	6.7	6.5	6.4	6.3	6.2	6.0	5.9	5.7	5.6	5.4	5.3	5.1	4.8	4.6	4.4	4.1	3.9	3.7	3.4	3.2	3.0
Regional Jet	000 oper.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Landings Selected Scenario																											
Scenario=	M																										
A320	Landings	0	70	140	210	280	350	444	538	632	726	820	938	1,055	1,173	1,290	1,408	1,546	1,684	1,822	1,960	2,099	2,237	2,375	2,513	2,651	2,790
B737	Landings	4,234	4,123	4,012	3,901	3,790	3,679	3,655	3,630	3,605	3,580	3,555	3,501	3,447	3,393	3,339	3,285	3,152	3,020	2,888	2,756	2,623	2,491	2,359	2,226	2,094	1,962
Regional Jet	Landings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	Landings	4,234	4,193	4,152	4,111	4,071	4,030	4,099	4,168	4,237	4,307	4,376	4,439	4,502	4,566	4,629	4,692	4,698	4,704	4,710	4,716	4,722	4,728	4,734	4,740	4,746	4,751
Demand for Space (m2)																											
Terminal Concessions																											
Offices	m2	0	0	0	0	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Counters	m2	0	0	0	0	49	49	49	49	49	49	63	63	63	63	63	77	77	77	77	77	98	98	98	98	98	98
Comercials Spaces	m2	0	0	0	0	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375	375
Services	m2	0	0	0	0	458	458	458	458	458	458	458	458	458	458	458	458	458	458	458	458	458	458	458	458	458	458
Vehicle Parking	m2	0	0	0	0	5218	5218	5218	5218	5218	5218	6256	6256	6256	6256	6256	7294	7294	7294	7294	7294	8332	8332	8332	8332	8332	8332
Airside Concessions																											
Fuel	m2	0	0	0	0	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Other Services to Aircraft	m2	0	0	0	0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Adjacent Areas																											
Lots for Warehouses	m2	0	0	0	0	300	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Lots for Services	m2	0	0	0	0	300	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700
Total	m2	0	0	0	0	600	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300

Projections of Income

Alternativa 6

Key Parameters

Analysis Alternative	**6**
~~Coverage of Concession~~	~~3~~
First Year of Concession	2002
First Year of Operation	2004

	1996	Current
Value Ch$/UF	12,865	15,934
Value US$/UF	31.20	26.10

MTOW		
A-320	73.50	metric tons
B737-200	49.94	metric tons
Regionales	21.00	metric tons
Category PMD B737	2	(1 = <= 49 tons, 2= >49 tons)
% parking/landings	6.0%	of landings (Maquehue - average 1996-2000)
% use bridges/landings	70.0%	of landings
% use bridges more than 45 mi	30.0%	of landings
% use bridges more than 1 h 1	20.0%	of landings
% Nocturnal Landings	22.0%	of landings (Maquehue - average 1996-2000)
Sale of Fuel & Lubricants	2.891	m3 per Commercial Landing (Maquehue - average 1996-2000)
% of Other Pax with O/D < 27(	60.0%	
Sales from Commerical Locale:	0.080	UF per pax
Income Vehicle Parking	0.011	UF per pax.

Unitary Tariffs

Terminal Commercial Income	UF - 2001	
Total	0.036	per pax

Adiacent Areas	Ch$ of 199(	UF - 2001	
Hangers	3,893	0.314	per m2/month
Warehouses	1,949	0.157	per m2/month
Paved Areas	957	0.077	per m2/month
Undeveloped Land	494	0.040	per m2/month

Fuel Rights	US$/m3	UF/m3	
	$5.75	0.220	per m3 of sales

ILS Service Trariff 2001

	1996 ($ / aircraft)	2001 (UF / aircraft)
minimum	12,386	0.999
<= 60 Ton	23,933	1.930
> 60 Ton	33,528	2.704

	$ de 1996	UF - 2001	
Use of Boarding Bridges	3,226	0.260	first 45 minutes
Use of Boarding Bridges	6,451	0.520	every additional 30 min.
Power to Aircraft		0.25	per aircraft

Sale of Maquhue Airport Prope: 900.00 UF per hectare

Increment/Reduction National Departure Tariff 1.0
Increment/Reduction National Departure Tariff 1.7

Average Landing Fees 1996 / DGAC ($ of 2001) / Conces. ($ of 2001) / Tasas Aterrizaje (UF/Ton)

	National (Ch$ / Ton)	Intern. (US$/Ton)	National (Ch$ / Ton)	Intern. (US$/Ton)	National (Ch$ / Ton)	Intern. (US$/Ton)	National	Intern.
mimimum	1,251	$15.11	1,608	$15.11	1,608	$15.11	0.101	0.579
<= 49 Ton	254	$2.65	326	$2.65	326	$2.65	0.020	0.102
> 49 Ton	653	$3.96	839	$3.96	839	$3.96	0.053	0.152

Aircraft Parking Fees 2001 / Aircraft Parking Fees (UF/Ton)

	National (Ch$ / Ton)	Intern. (US$/Ton)	National	Intern.
minimo	125.08	$1.511	0.010	0.058
<= 49 Ton	25.44	$0.265	0.002	0.010
> 49 Ton	65.35	$0.396	0.005	0.015

Illumination Tariff 2001 / Illumination Tariff (UF/Ton)

	National (Ch$ / Ton)	Intern. (US$/Ton)	National	Intern.
minimum	$159.59	$1.511	0.010	0.058
<= 49 Ton	$32.41	$0.265	0.002	0.010
> 49 Ton	$83.25	$0.396	0.005	0.015

Departure Tariff	US$	UF - 2001	
International	$25.00	0.958	per departing pax

	DGAC	Conces.	DGAC	Conces.	
	Ch$ of 199(	Ch$ of 200	Ch$ of 200	UF - 2001	UF - 2001	
National > 270km	3,023	4,406	7,536	0.277	0.473	per departing pax
National < 270km	1,143	1,736	2,969	0.109	0.186	per departing pax

Income (UF of 2001)

	Year 2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Aeronautical Income																								
Landing Fees																								
A320	0	0	1,085	1,356	1,720	2,084	2,448	2,812	3,176	3,630	4,085	4,540	4,994	5,449	5,984	6,518	7,053	7,588	8,123	8,658	9,193	9,728	10,262	10,797
B737	0	0	9,968	9,676	9,611	9,546	9,481	9,415	9,350	9,208	9,065	8,923	8,781	8,638	8,291	7,943	7,595	7,247	6,899	6,551	6,203	5,855	5,508	5,160
Regional Jet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	11,053	11,033	11,331	11,630	11,929	12,227	12,526	12,838	13,150	13,463	13,775	14,087	14,274	14,461	14,648	14,835	15,022	15,209	15,396	15,583	15,770	15,957
Parking Fees																								
A320	0	0	7	8	10	13	15	17	19	22	25	27	30	33	36	39	43	46	49	52	56	59	62	65
B737	0	0	60	58	58	58	57	57	57	56	55	54	53	52	50	48	46	44	42	40	37	35	33	31
Regional Jet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	67	67	68	70	72	74	76	78	79	81	83	85	86	87	89	90	91	92	93	94	95	96
Illumination Fee																								
Total	0	0	486	485	499	512	525	538	551	565	579	592	606	620	628	636	645	653	661	669	677	686	694	702
ILS Service Tariff																								
Total	0	0	8,073	8,049	8,255	8,462	8,668	8,874	9,080	9,293	9,507	9,720	9,933	10,146	10,264	10,383	10,501	10,619	10,738	10,856	10,974	11,093	11,211	11,329

Total Aeronautical Income	**0**	**0**	**19,680**	**19,634**	**20,154**	**20,674**	**21,193**	**21,713**	**22,233**	**22,774**	**23,315**	**23,856**	**24,397**	**24,938**	**25,253**	**25,568**	**25,882**	**26,197**	**26,512**	**26,826**	**27,141**	**27,455**	**27,770**	**28,085**
Aerodom Income																								
Departure Tariff																								
International	0	0	164	109	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
National > 270km	0	0	37,737	39,778	41,820	43,862	46,215	48,568	50,920	53,273	55,626	58,206	60,785	63,365	65,945	68,524	71,237	73,950	76,663	79,376	82,089	84,803	87,516	90,229
National < 270km	0	0	898	946	995	1,044	1,100	1,156	1,212	1,267	1,323	1,385	1,446	1,508	1,569	1,630	1,695	1,759	1,824	1,889	1,953	2,018	2,082	2,147
Total	0	0	38,798	40,834	42,870	44,905	47,314	49,723	52,132	54,541	56,950	59,591	62,232	64,873	67,514	70,155	72,932	75,710	78,487	81,265	84,043	86,820	89,598	92,375
Boarding Bridges																								
Use of Bridges	0	0	1,800	1,782	1,813	1,843	1,874	1,904	1,935	1,963	1,991	2,019	2,047	2,075	2,078	2,080	2,083	2,086	2,088	2,091	2,093	2,096	2,099	2,101
Power to Aircraft	0	0	712	705	717	729	742	754	766	777	788	799	810	821	822	823	824	825	826	827	828	829	830	832
Total	0	0	2,512	2,487	2,530	2,573	2,615	2,658	2,701	2,740	2,779	2,818	2,857	2,896	2,900	2,904	2,907	2,911	2,915	2,918	2,922	2,925	2,929	2,933
Total Aerodom Income	**0**	**0**	**41,310**	**43,321**	**45,400**	**47,478**	**49,930**	**52,381**	**54,833**	**57,281**	**59,729**	**62,409**	**65,089**	**67,769**	**70,414**	**73,058**	**75,839**	**78,621**	**81,402**	**84,183**	**86,964**	**89,746**	**92,527**	**95,308**
Terminal Commercial Income																								
Total	**0**	**0**	**10,547**	**11,113**	**11,679**	**12,245**	**12,902**	**13,559**	**14,215**	**14,872**	**15,529**	**16,249**	**16,969**	**17,690**	**18,410**	**19,130**	**19,887**	**20,645**	**21,402**	**22,159**	**22,917**	**23,674**	**24,432**	**25,189**
Operating Services to Aircraft																								
Fuel (volume)	0	0	2,592	2,566	2,610	2,654	2,698	2,742	2,786	2,827	2,867	2,907	2,948	2,988	2,992	2,996	2,999	3,003	3,007	3,011	3,014	3,018	3,022	3,026
Fuel (rent of space)	0	0	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434	1,434
Other Services	0	0	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478
Total	**0**	**0**	**4,504**	**4,478**	**4,523**	**4,567**	**4,611**	**4,655**	**4,699**	**4,739**	**4,779**	**4,820**	**4,860**	**4,900**	**4,904**	**4,908**	**4,912**	**4,915**	**4,919**	**4,923**	**4,927**	**4,930**	**4,934**	**4,938**
Income Adjacent Areas																								
Rent Undeveloped Land	**0**	**0**	**287**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**	**621**
Income Reutilization Maquehue																								
Sale of Land	**0**	**0**	**117,675**	**117,675**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Summary of Income of Selected Alternative (UF)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Aeronautical Income	0	0	19,680	19,634	20,154	20,674	21,193	21,713	22,233	22,774	23,315	23,856	24,397	24,938	25,253	25,568	25,882	26,197	26,512	26,826	27,141	27,455	27,770	28,085
Landing Fees	0	0	11,053	11,033	11,331	11,630	11,929	12,227	12,526	12,838	13,150	13,463	13,775	14,087	14,274	14,461	14,648	14,835	15,022	15,209	15,396	15,583	15,770	15,957
Parking Fees	0	0	67	67	68	70	72	74	76	78	79	81	83	85	86	87	89	90	91	92	93	94	95	96
Illumination Fee	0	0	486	485	499	512	525	538	551	565	579	592	606	620	628	636	645	653	661	669	677	686	694	702
ILS Service Tariff	0	0	8,073	8,049	8,255	8,462	8,668	8,874	9,080	9,293	9,507	9,720	9,933	10,146	10,264	10,383	10,501	10,619	10,738	10,856	10,974	11,093	11,211	11,329
Aerodom Income	0	0	41,310	43,321	45,400	47,478	49,930	52,381	54,833	57,281	59,729	62,409	65,089	67,769	70,414	73,058	75,839	78,621	81,402	84,183	86,964	89,746	92,527	95,308
Departure Tariff	0	0	38,798	40,834	42,870	44,905	47,314	49,723	52,132	54,541	56,950	59,591	62,232	64,873	67,514	70,155	72,932	75,710	78,487	81,265	84,043	86,820	89,598	92,375
Boarding Bridges	0	0	2,512	2,487	2,530	2,573	2,615	2,658	2,701	2,740	2,779	2,818	2,857	2,896	2,900	2,904	2,907	2,911	2,915	2,918	2,922	2,925	2,929	2,933
Terminal Commercial Income	0	0	10,547	11,113	11,679	12,245	12,902	13,559	14,215	14,872	15,529	16,249	16,969	17,690	18,410	19,130	19,887	20,645	21,402	22,159	22,917	23,674	24,432	25,189
Operating Services to Aircraft	0	0	4,504	4,478	4,523	4,567	4,611	4,655	4,699	4,739	4,779	4,820	4,860	4,900	4,904	4,908	4,912	4,915	4,919	4,923	4,927	4,930	4,934	4,938
Income Adjacent Areas	0	0	287	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621
Income Reutilization Maquehue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**76,329**	**79,168**	**82,376**	**85,584**	**89,257**	**92,929**	**96,601**	**100,287**	**103,974**	**107,955**	**111,937**	**115,919**	**119,602**	**123,285**	**127,142**	**130,999**	**134,856**	**138,713**	**142,570**	**146,427**	**150,284**	**154,141**

Income from Departure Tariff with Payment Mehtod 2

Income to Concessionaire																								
International	0	0	164	109	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
National > 270km	0	0	64,548	68,041	71,533	75,025	79,050	83,075	87,099	91,124	95,149	99,561	103,973	108,386	112,798	117,211	121,851	126,492	131,133	135,773	140,414	145,055	149,695	154,336
National < 270km	0	0	1,536	1,619	1,702	1,785	1,881	1,977	2,072	2,168	2,264	2,369	2,474	2,579	2,684	2,789	2,899	3,010	3,120	3,230	3,341	3,451	3,562	3,672
Total	0	0	66,248	69,769	73,290	76,810	80,931	85,051	89,172	93,292	97,412	101,930	106,447	110,965	115,482	119,999	124,750	129,502	134,253	139,004	143,755	148,506	153,257	158,008

General, Administrative and Operational Costs

Alternativa 6

Key Parameters

Coverage of Concession	3
First Year of Concession	2002

	1996	Current
Value Ch$/UF	12,865	15,934
Value US$/UF	31.20	$26.10

General and Administrative Costs		
Direct Administrative Costs	12.0%	of Personnel Expenditures
Contracted Admin. Serv. (Legal, €	4.0%	of Personnel Expenditures
Insurance	7.0%	of Personnel Expenditures
Comercialization	1.0%	of Personnel Expenditures
Contrated Services		
1 Airside (cleaning, security, etc.)	0.030	per m2 apron
2 Landside (cleaning, security, etc.)	0.500	per m2 terminals
2 Vehicle Parking	0.200	per m2 parking
Utilities		
Water	0.150	per m2 terminals
Electricity	0.400	per m2 terminals
Gas	0.060	per m2 terminals
Others (phone/gasoline)	0.016	per m2 terminals
Working Capital		
Accounts Recievalbe	8%	of gross revenues (assumes average of 30 days for payment)
Accounts Payable	8%	of O&M expenditures (assumes average of 30 days for payment)
Cash Balance	10%	of operational expenditures

Base for Estimates (UF)

Phase of Operations	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4
Item	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Personnel Expenditures	0	0	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	11,979	11,979	11,979	11,979	11,979	11,979
Gross Income	0	0	76,795	80,882	84,969	89,055	93,833	98,610	103,387	108,164	112,941	118,179	123,417	128,654	133,892	139,129	144,638	150,146	155,655	161,163	166,672	172,180	177,689	183,197

	Phase 1	Phase 2	Phase 3	Phase 4
Cummulative Terminal Area	4000	5000	5000	7000
Cummulative Apron Area	14440	14440	14440	14440
Year of Operation	2004	2010	2015	2020

Annual O&M Costs
(UF)

Item	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
General and Administrative Costs																								
Direct Administrative Costs	0	0	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,437	1,437	1,437	1,437	1,437	1,437
Contracted Admin. Serv. (Legal, €	0	0	387	387	387	387	387	387	387	387	387	387	387	387	387	387	387	387	479	479	479	479	479	479
Insurance	0	0	677	677	677	677	677	677	677	677	677	677	677	677	677	677	677	677	839	839	839	839	839	839
Comercialization	0	0	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	120	120	120	120	120	120
Total	0	0	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,875	2,875	2,875	2,875	2,875	2,875
Contrated Services																								
1 Airside (cleaning, security, etc.)	0	0	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433
2 Landside (cleaning, security, etc.)	0	0	2,000	2,000	2,000	2,000	2,000	2,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	3,500	3,500	3,500	3,500	3,500	3,500
2 Vehicle Parking	0	0	1,044	1,044	1,044	1,044	1,044	1,044	1,251	1,251	1,251	1,251	1,251	1,459	1,459	1,459	1,459	1,459	1,666	1,666	1,666	1,666	1,666	1,666
Total	0	0	3,477	3,477	3,477	3,477	3,477	3,477	4,184	4,184	4,184	4,184	4,184	4,392	4,392	4,392	4,392	4,392	5,600	5,600	5,600	5,600	5,600	5,600
Utilities																								
Water	0	0	600	600	600	600	600	600	750	750	750	750	750	750	750	750	750	750	1,050	1,050	1,050	1,050	1,050	1,050
Electricity	0	0	1,600	1,600	1,600	1,600	1,600	1,600	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,800	2,800	2,800	2,800	2,800	2,800
Gas	0	0	200	200	200	200	200	200	250	250	250	250	250	250	250	250	250	250	350	350	350	350	350	350
Others (phone/gasoline)	0	0	64	64	64	64	64	64	80	80	80	80	80	80	80	80	80	80	112	112	112	112	112	112
Total	0	0	2,464	2,464	2,464	2,464	2,464	2,464	3,080	3,080	3,080	3,080	3,080	3,080	3,080	3,080	3,080	3,080	4,312	4,312	4,312	4,312	4,312	4,312
Working Capital																								
Accounts Recievalbe	0	0	6,144	6,471	6,797	7,124	7,507	7,889	8,271	8,653	9,035	9,454	9,873	10,292	10,711	11,130	11,571	12,012	12,452	12,893	13,334	13,774	14,215	14,656
Accounts Payable	0	0	(661)	(661)	(661)	(661)	(661)	(661)	(767)	(767)	(767)	(767)	(767)	(783)	(783)	(783)	(783)	(783)	(1,023)	(1,023)	(1,023)	(1,023)	(1,023)	(1,023)
Cash Balance	0	0	826	826	826	826	826	826	959	959	959	959	959	979	979	979	979	979	1,279	1,279	1,279	1,279	1,279	1,279
Net Working Capital Balance	0	0	6,309	6,636	6,963	7,290	7,672	8,054	8,463	8,845	9,227	9,646	10,065	10,488	10,907	11,326	11,767	12,208	12,708	13,149	13,589	14,030	14,471	14,912
Change in Working Capital	0	0	(6,309)	(327)	(327)	(327)	(382)	(382)	(409)	(382)	(382)	(419)	(419)	(423)	(419)	(419)	(441)	(441)	(501)	(441)	(441)	(441)	(441)	(441)

Equipment

Alternativa 6

Key Parameters

Coverage of Concession	3	
Duration of Concession	24	years
First Year of Concession	2002	

	Phase 1	Phase 2	Phase 3	Phase 4	End
First Year of Operation	2004	2010	2015	2020	2025
Implementation Period Infra.	2	1	1	1	
% Last Year of Period - Alt. 1	100.0%	100.0%	100.0%	100.0%	
% Previous Year of Period - Alt 1	0.0%	0.0%	0.0%	0.0%	
Implementation Period Equipment	1	1	1	1	

% Engineering and Supervision	26.0%
% Contingencies	20.0%
% Mainten. Annual Equipment	2.0%
Inflation rate	0.0%
Base year:	2001

Summary of Equipment

NOTE = ESTIMATED SEPERATELY - SHEET "G&A"

Item	Purchase Price (UF)	Quantity Required per Phase				Total Investment by Phase (UF)					Annual Mainten. Costs	Insurance	Use-Life	Salvage	Depreciaiton		Annual Maintenance Costs (UF)				Annual Insurance Costs (UF)			
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 1	Phase 2	Phase 3	Phase 4	Total	(% purchase)	(% purchase)	(years)	(% purchase)	(UF)		Phase 1	Phase 2	Phase 3	Phase 4	Phase 1	Phase 2	Phase 3	Phase 4
2 Boarding Bridges	27,900	3	0	0	0	83,700	0	0	0	83,700	2.0%	0.00%	25	10.0%	1,004		1,674.0	1,674.0	1,674.0	1,674.0	0.0	0.0	0.0	0.0
2 Others (terminal)	93,480	1	0.2884	0.2884	0.2884	93,480	26,956	26,956	26,956	174,347	2.0%	0.00%	25	10.0%	3,365		1,869.6	2,408.7	3,486.9	3,486.9	0.0	0.0	0.0	0.0
1 Illumination System	74,844	1	0	0	0	74,844	0	0	0	74,844	2.0%	0.00%	25	10.0%	2,694		1,496.9	1,496.9	1,496.9	1,496.9	0.0	0.0	0.0	0.0
2						0	0	0	0	0	2.0%	0.00%	25	10.0%	0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Airside - Alt.1						74,844	0	0	0	74,844						Alter. 1	1,496.9	1,496.9	1,496.9	1,496.9	0.0	0.0	0.0	0.0
Landside - Alt.2						177,180	26,956	26,956	26,956	258,047						Alter. 2	3,543.6	4,082.7	5,160.9	5,160.9	0.0	0.0	0.0	0.0
Total-Alt.3						252,024	26,956	26,956	26,956	332,891						Alter. 3	5,040.5	5,579.6	6,657.8	6,657.8	0.0	0.0	0.0	0.0

Phase of Operations	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4	

Purchase New Equipment (UF)

Initial Investment + Replacement	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2 Boarding Bridges	0	83,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Others (terminal)	0	93,480	0	0	0	0	0	26,956	0	0	0	0	26,956	0	0	0	0	26,956	0	0	0	0	0	0
1 Illumination System	0	74,844	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub- Airside - Alt.1	0	74,844	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Landside - Alt.2	0	177,180	0	0	0	0	0	26,956	0	0	0	0	26,956	0	0	0	0	26,956	0	0	0	0	0	0
Total-Alt.3	0	252,024	0	0	0	0	0	26,956	0	0	0	0	26,956	0	0	0	0	26,956	0	0	0	0	0	0

Equipment Maintenance

Airside - Alt.1	0	0	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497	1,497
Landside - Alt.2	0	0	3,544	3,544	3,544	3,544	3,544	3,544	4,083	4,083	4,083	4,083	4,083	5,161	5,161	5,161	5,161	5,161	5,161	5,161	5,161	5,161	5,161	5,161
Total-Alt.3	0	0	5,040	5,040	5,040	5,040	5,040	5,040	5,580	5,580	5,580	5,580	5,580	6,658	6,658	6,658	6,658	6,658	6,658	6,658	6,658	6,658	6,658	6,658

Insurance

Airside - Alt.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landside - Alt.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total-Alt.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Infaltionary factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Equipment Costs Selected Alternative

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Purchase of Equipment	0	252,024	0	0	0	0	0	26,956	0	0	0	0	26,956	0	0	0	0	26,956	0	0	0	0	0	0
Maintenance	0	0	5,040	5,040	5,040	5,040	5,040	5,040	5,580	5,580	5,580	5,580	5,580	6,658	6,658	6,658	6,658	6,658	6,658	6,658	6,658	6,658	6,658	6,658
Insurance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	252,024	5,040	5,040	5,040	5,040	5,040	31,996	5,580	5,580	5,580	5,580	32,535	6,658	6,658	6,658	6,658	33,613	6,658	6,658	6,658	6,658	6,658	6,658

Personnel

Alternativa **6**

Key Paramentrs

Coverage of Concession	3	
Demand Scenario	M	
Indicrect Costs (Benefits)	25%	of direct costs
Backup labor multiplier	1.00	total labor as a function of direct labor
Annual inflation Personnel	0.0%	
Value $ch / UF	15,934	

	Phase 1	Phase 2	Phase 3	Phase 4	
First Year of Operation	2004	2010	2015	2020	2025

	Incio	Fase 2	Fase 3	Fase 4
Pax Selected Scenario	321	427	526	630
Increment over Beg.		106	205	309
Personnel Multiplier		0	0	1

Wages by Category Personnel

		1	2	3	4	
		000 Ch$/	Salaries and Benefits (UF/year)			
Item	Categoria	month	Direct	Indirect	Total	
Managers/Directors	1	3,350	2,523	631	3,154	
Chiefs/Professionals	2	1,075	810	202	1,012	
Supervisors	3	475	358	89	447	
Technicians/Secretaries	4	350	264	66	329	
Laborers	5	200	151	38	188	

Personnel Requirements by Phase

Description	Category	Alternative 2	No. Pax / Additional Personnel	Personnel by Phase Phase 1	Phase 2	Phase 3	Phase 4	Annual Costs (UF)	Personnel Costs per Phase (UF) Phase 1	Phase 2	Phase 3	Phase 4
Direction												
General Manager	1	1		1	1	1	1	3,154	3,154	3,154	3,154	3,154
Comercial Director	3	1		1	1	1	1	447	447	447	447	447
Secretary	4	1		1	1	1	1	329	329	329	329	329
Operations Division												
Chief of Operations	2	1		1	1	1	1	1,012	1,012	1,012	1,012	1,012
Operations Supervisor	3	0	1	0	0	0	1	447	0	0	0	447
Assistant	4	1		1	1	1	1	329	329	329	329	329
Technicians	4	0		0	0	0	0	329	0	0	0	0
Laborers	5	0.5	2	4	4	4	6	188	753	753	753	1,130
Maintenance Division												
Maintenance Supervisors	3	1	1	1	1	1	2	447	447	447	447	894
Electricians	4	0		1	1	1	1	329	329	329	329	329
Technicians	4	1	1	1	1	1	2	329	329	329	329	659
Laborers	5	0.5	2	4	4	4	6	188	753	753	753	1,130
Financial Division												
CFO	2	1		1	1	1	1	1,012	1,012	1,012	1,012	1,012
Accountants	3	1		1	1	1	1	447	447	447	447	447
Assistants	4	1	1	1	1	1	2	329	329	329	329	659
Clerks	5	0		0	0	0	0	188	0	0	0	0
Total	**sum(32:94) >>**			19	19	19	27		9,673	9,673	9,673	11,979

Annual Personnel Costs

Phase of Operations	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4
Labor costs (UF)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
At Base Year Prices	0	0	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	11,979	11,979	11,979	11,979	11,979	11,979

Fixed Assets and Depreciation

Alternativa 6

Key Parameters

Alternative	3	
~~Duration of Concession~~	~~24~~	~~años~~
First Year of Concession	2002	
Depreciaiton Method	2	(1=income method, 2= unit flow method)

	Phase 1	Phase 2	Phase 3	Phase 4	End
First Year of Operation	2004	2010	2015	2020	2025

Annual Inflation	0.0%
Base year	2001

Estimate of Fixed Assets

New Infrastructure — Investment by Phase (UF)

Item		Phase 1	Phase 2	Phase 3	Phase 4	Use-Life (years)
1	Purchase Land - airside	0	0	0	0	0
2	Purchase Land - Landside	0	0	0	0	0
1	Earth Movements - airside	0	0	0	0	0
2	Earth Movements - Landside	0	0	0	0	0
1	Runways/Taxiways/Aprons	130,711	0	18,000	0	25
2	Passenger Terminal	100,000	25,000	0	50,000	25
2	Access and Parking	25,334	623	0	1,246	25
2	Operational Instalations	7,600	0	0	0	25
1	Service Infrastructure - airside	14,499	2,175	0	4,350	25
2	Service Infrastructure - landside	29,001	4,350	0	8,700	25
1	Aeronautical Instalations	25,000	0	0	0	25
1	Rehabilitation Runway/Taxiways	0	0	0	0	0
Sub-Total	Concessionaire Aprons - Alt.1	**170,210**	**2,175**	**18,000**	**4,350**	**194,734**
	Concesionaire Terminals - Alt.2	**161,935**	**29,973**	**0**	**59,946**	**251,855**
	Total-Alt.3	**332,145**	**32,148**	**18,000**	**64,296**	**446,589**

Equipment — Investment in Phases (UF)

			Phase 1	Phase 2	Phase 3	Phase 4	Use-Life (years)
2	Boarding Bridges		83,700	0	0	0	25
2	Others (terminal)		93,480	26,956	26,956	26,956	25
1	Illumination System		74,844	0	0	0	25
2		0	0	0	0	0	25
Sub-Total	Concessionaire Aprons - Alt.1		**74,844**	**0**	**0**	**0**	
	Concesionaire Terminals - Alt.2		**177,180**	**26,956**	**26,956**	**26,956**	
	Total-Alt.3		**252,024**	**26,956**	**26,956**	**26,956**	**332,891**

Phase of Operations	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4

Cummulative Fixed Assets (UF)

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1	Infrastructure - Airside			170,210	170,210	170,210	170,210	170,210	170,210	172,384	172,384	172,384	172,384	172,384	190,384	190,384	190,384	190,384	190,384	194,734	194,734	194,734	194,734	194,734	194,734
2	Infrastructure - Landside			161,935	161,935	161,935	161,935	161,935	161,935	191,909	191,909	191,909	191,909	191,909	191,909	191,909	191,909	191,909	191,909	251,855	251,855	251,855	251,855	251,855	251,855
1	Equipment - Airside			74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844	74,844
2	Equipment - Landside			177,180	177,180	177,180	177,180	177,180	177,180	204,136	204,136	204,136	204,136	204,136	231,091	231,091	231,091	231,091	231,091	258,047	258,047	258,047	258,047	258,047	258,047
	Total (for Alternative)			584,169	584,169	584,169	584,169	584,169	584,169	643,273	643,273	643,273	643,273	643,273	688,228	688,228	688,228	688,228	688,228	779,480	779,480	779,480	779,480	779,480	779,480

Depreciation Estimate

Flow of Income (to Concessionaire)

	Total	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Phase 1	4423504	0	150443	154530	158617	162703	167481	172258	177035	181812	186590	191827	197065	202302	207540	212777	218286	223794	229303	234811	240320	245828	251337	256845
Phase 2	3457472	0	0	0	0	0	0	0	177035	181812	186590	191827	197065	202302	207540	212777	218286	223794	229303	234811	240320	245828	251337	256845
Phase 3	2523143	0	0	0	0	0	0	0	0	0	0	0	0	202302	207540	212777	218286	223794	229303	234811	240320	245828	251337	256845
Phase 4	1458444	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	229303	234811	240320	245828	251337	256845

Flow of Departing Pax

	Total	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Phase 1	5719939	0	160429	168201	177224	186247	195270	204293	213316	223208	233100	242993	252885	262777	273181	283585	293989	304393	314797	325202	335606	346010	356414	366818
Phase 2	4628274	0	0	0	0	0	0	0	213316	223208	233100	242993	252885	262777	273181	283585	293989	304393	314797	325202	335606	346010	356414	366818
Phase 3	3462772	0	0	0	0	0	0	0	0	0	0	0	0	262777	273181	283585	293989	304393	314797	325202	335606	346010	356414	366818
Phase 4	2044846	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	314797	325202	335606	346010	356414	366818

Annual Depreciation Expense by Phase

(UF)

		Total	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	Phase 1																								
1	Infrastructure - Airside	170,210	0	4774	5005	5274	5542	5811	6079	6348	6642	6936	7231	7525	7820	8129	8439	8748	9058	9368	9677	9987	10296	10606	10915
2	Infrastructure - Landside	161,935	0	4542	4762	5017	5273	5528	5784	6039	6319	6599	6879	7159	7439	7734	8028	8323	8618	8912	9207	9501	9796	10090	10385
1	Equipment - Airside	74,844	0	2099	2201	2319	2437	2555	2673	2791	2921	3050	3179	3309	3438	3575	3711	3847	3983	4119	4255	4391	4527	4664	4800
2	Equipment - Landside	177,180	0	4969	5210	5490	5769	6049	6328	6608	6914	7220	7527	7833	8140	8462	8784	9107	9429	9751	10073	10396	10718	11040	11362
	Total (for Alternative)	584,169	0	16,384	17,178	18,100	19,021	19,943	20,864	21,786	22,796	23,806	24,816	25,827	26,837	27,900	28,962	30,025	31,087	32,150	33,212	34,275	35,337	36,400	37,463
	Phase 2																								
1	Infrastructure - Airside	2,175	0	0	0	0	0	0	0	100	105	110	114	119	123	128	133	138	143	148	153	158	163	167	172
2	Infrastructure - Landside	29,973	0	0	0	0	0	0	0	1381	1446	1510	1574	1638	1702	1769	1837	1904	1971	2039	2106	2173	2241	2308	2376
1	Equipment - Airside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Equipment - Landside	26,956	0	0	0	0	0	0	0	1242	1300	1358	1415	1473	1530	1591	1652	1712	1773	1833	1894	1955	2015	2076	2136
	Total (for Alternative)	59,104	0	0	0	0	0	0	0	2,724	2,850	2,977	3,103	3,229	3,356	3,489	3,621	3,754	3,887	4,020	4,153	4,286	4,419	4,551	4,684
	Phase 3																								
1	Infrastructure - Airside	18,000	0	0	0	0	0	0	0	0	0	0	0	0	1366	1420	1474	1528	1582	1636	1690	1745	1799	1853	1907
2	Infrastructure - Landside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	Equipment - Airside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Equipment - Landside	26,956	0	0	0	0	0	0	0	0	0	0	0	0	2046	2127	2208	2289	2370	2451	2531	2612	2693	2774	2855
	Total (for Alternative)	44,956	0	0	0	0	0	0	0	0	0	0	0	0	3,412	3,547	3,682	3,817	3,952	4,087	4,222	4,357	4,492	4,627	4,762
	Phase 4																								
1	Infrastructure - Airside	4,350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	670	692	714	736	758	780
2	Infrastructure - Landside	59,946	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9229	9534	9839	10144	10449	10754
1	Equipment - Airside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Equipment - Landside	26,956	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4150	4287	4424	4561	4698	4835
	Total (for Alternative)	91,252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14,048	14,512	14,976	15,441	15,905	16,369
	Total (Según Alternativa)																								
1	Infrastructure - Airside	194,734	0	4,774	5,005	5,274	5,542	5,811	6,079	6,448	6,747	7,046	7,345	7,644	9,309	9,678	10,046	10,415	10,783	11,821	12,212	12,603	12,993	13,384	13,775
2	Infrastructure - Landside	251,855	0	4,542	4,762	5,017	5,273	5,528	5,784	7,421	7,765	8,109	8,453	8,797	9,141	9,503	9,865	10,227	10,589	20,179	20,846	21,513	22,180	22,847	23,514
1	Equipment - Airside	74,844	0	2,099	2,201	2,319	2,437	2,555	2,673	2,791	2,921	3,050	3,179	3,309	3,438	3,575	3,711	3,847	3,983	4,119	4,255	4,391	4,527	4,664	4,800
2	Equipment - Landside	258,047	0	4,969	5,210	5,490	5,769	6,049	6,328	7,850	8,214	8,578	8,942	9,306	11,716	12,180	12,643	13,107	13,571	18,185	18,786	19,387	19,988	20,589	21,190
	Total	779,480	0	16,384	17,178	18,100	19,021	19,943	20,864	24,510	25,646	26,783	27,920	29,056	33,604	34,935	36,265	37,596	38,926	54,305	56,099	57,894	59,689	61,484	63,278
	Inflation factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Annual Depreciation Expense Selected Alternative (nominal)

	Total	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total	**0**	**0**	**16,384**	**17,178**	**18,100**	**19,021**	**19,943**	**20,864**	**24,510**	**25,646**	**26,783**	**27,920**	**29,056**	**33,604**	**34,935**	**36,265**	**37,596**	**38,926**	**54,305**	**56,099**	**57,894**	**59,689**	**61,484**	**63,278**

Financing Program

Alternativa 6

Key Parameters

	Fase 1	Fase 2	Fase 3	Fase 4
Investment (UF)				
At base-year price level	957,343	75,563	69,043	124,171
At price level of first year disbursement	957,343	75,563	69,043	124,171
Debt as % of investment	70%	70%	70%	70%
Loan disbursement (US$ thousands)	670,140	52,894	48,330	86,920
Interest rate (%)	8%	8%	8%	8%
Loan term (years)	20	10	10	6
Grace period (years)	0	0	0	0
Initial Commission (%)	2%	2%	2%	2%
Loan disbursement period	2	1	1	1
% Last Year of Period	78%	100%	100%	100%
First Year of Operation	2004	2010	2015	2020
Year of Disbursement Loan	2002	2009	2014	2019
Total Loan (UF)	681,866	52,894	48,330	86,920

Debt Payment Schedule

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Phase 1 - Loan Schedule																								
Loan disbursement	146,570	523,571	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitalized interest	0	11,726	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Principle balance - begini	146,570	670,140	681,866	666,966	650,873	633,494	614,724	594,452	572,559	548,914	523,377	495,798	466,012	433,844	399,101	361,580	321,057	277,292	230,026	178,978	123,847	64,305	0	0
Interest payment	0	0	(54,549)	(53,357)	(52,070)	(50,679)	(49,178)	(47,556)	(45,805)	(43,913)	(41,870)	(39,664)	(37,281)	(34,707)	(31,928)	(28,926)	(25,685)	(22,183)	(18,402)	(14,318)	(9,908)	(5,144)	(0)	(0)
Principal payment	0	0	(14,900)	(16,092)	(17,380)	(18,770)	(20,272)	(21,893)	(23,645)	(25,536)	(27,579)	(29,786)	(32,169)	(34,742)	(37,521)	(40,523)	(43,765)	(47,266)	(51,047)	(55,131)	(59,542)	(64,305)	0	0
Total payment	0	0	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	0	0
Principle balance - end	146,570	681,866	666,966	650,873	633,494	614,724	594,452	572,559	548,914	523,377	495,798	466,012	433,844	399,101	361,580	321,057	277,292	230,026	178,978	123,847	64,305	0	0	0
Phase 2 - Loan Schedule																								
Loan disbursement	0	0	0	0	0	0	0	52,894	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitalized interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Principle balance - begini	0	0	0	0	0	0	0	52,894	52,894	49,243	45,300	41,041	36,441	31,474	26,109	20,315	14,057	7,299	0	0	0	0	0	0
Interest payment	0	0	0	0	0	0	0	0	(4,232)	(3,939)	(3,624)	(3,283)	(2,915)	(2,518)	(2,089)	(1,625)	(1,125)	(584)	(0)	(0)	(0)	(0)	(0)	(0)
Principal payment	0	0	0	0	0	0	0	0	(3,651)	(3,943)	(4,259)	(4,600)	(4,968)	(5,365)	(5,794)	(6,258)	(6,758)	(7,299)	0	0	0	0	0	0
Total payment	0	0	0	0	0	0	0	0	(7,883)	(7,883)	(7,883)	(7,883)	(7,883)	(7,883)	(7,883)	(7,883)	(7,883)	(7,883)	0	0	0	0	0	0
Principle balance - end	0	0	0	0	0	0	0	52,894	49,243	45,300	41,041	36,441	31,474	26,109	20,315	14,057	7,299	0	0	0	0	0	0	0
Phase 3 - Loan Schedule																								
Loan disbursement	0	0	0	0	0	0	0	0	0	0	0	0	48,330	0	0	0	0	0	0	0	0	0	0	0
Capitalized interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Principle balance - begini	0	0	0	0	0	0	0	0	0	0	0	0	48,330	48,330	44,994	41,391	37,499	33,297	28,758	23,856	18,562	12,844	6,669	0
Interest payment	0	0	0	0	0	0	0	0	0	0	0	0	0	(3,866)	(3,599)	(3,311)	(3,000)	(2,664)	(2,301)	(1,908)	(1,485)	(1,028)	(534)	(0)
Principal payment	0	0	0	0	0	0	0	0	0	0	0	0	0	(3,336)	(3,603)	(3,891)	(4,203)	(4,539)	(4,902)	(5,294)	(5,718)	(6,175)	(6,669)	0
Total payment	0	0	0	0	0	0	0	0	0	0	0	0	0	(7,203)	(7,203)	(7,203)	(7,203)	(7,203)	(7,203)	(7,203)	(7,203)	(7,203)	(7,203)	0
Principle balance - end	0	0	0	0	0	0	0	0	0	0	0	0	48,330	44,994	41,391	37,499	33,297	28,758	23,856	18,562	12,844	6,669	0	0
Phase 4 - Loan Schedule																								
Loan disbursement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86,920	0	0	0	0	0	0
Capitalized interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Principle balance - begini	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86,920	86,920	75,071	62,275	48,455	33,529	17,409
Interest payment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(6,954)	(6,006)	(4,982)	(3,876)	(2,682)	(1,393)
Principal payment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(11,849)	(12,796)	(13,820)	(14,926)	(16,120)	(17,409)
Total payment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(18,802)	(18,802)	(18,802)	(18,802)	(18,802)	(18,802)
Principle balance - end	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86,920	75,071	62,275	48,455	33,529	17,409	0
Total																								
Loan disbursement	146,570	523,571	0	0	0	0	0	52,894	0	0	0	0	48,330	0	0	0	0	86,920	0	0	0	0	0	0
Capitalized interest	0	11,726	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Principle balance - begini	146,570	670,140	681,866	666,966	650,873	633,494	614,724	647,346	625,453	598,157	568,677	536,839	550,783	513,647	470,204	423,285	372,613	404,807	345,703	277,905	204,684	125,604	40,198	17,409
Interest payment	0	0	(54,549)	(53,357)	(52,070)	(50,679)	(49,178)	(47,556)	(50,036)	(47,853)	(45,494)	(42,947)	(40,196)	(41,092)	(37,616)	(33,863)	(29,809)	(25,431)	(27,656)	(22,232)	(16,375)	(10,048)	(3,216)	(1,393)
Principal payment	0	0	(14,900)	(16,092)	(17,380)	(18,770)	(20,272)	(21,893)	(27,296)	(29,480)	(31,838)	(34,385)	(37,136)	(43,443)	(46,919)	(50,672)	(54,726)	(59,104)	(67,798)	(73,222)	(79,080)	(85,406)	(22,789)	(17,409)
Total payment	0	0	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(69,450)	(77,332)	(77,332)	(77,332)	(77,332)	(77,332)	(84,535)	(84,535)	(84,535)	(84,535)	(84,535)	(95,454)	(95,454)	(95,454)	(95,454)	(26,005)	(18,802)
Principle balance - end	146,570	681,866	666,966	650,873	633,494	614,724	594,452	625,453	598,157	568,677	536,839	502,453	513,647	470,204	423,285	372,613	317,887	345,703	277,905	204,684	125,604	40,198	17,409	0

Financial Results (Concessionaire)

Alternativa **6**

Key Paremeters

Alternative	**6**	
Coverage	3	
Taxes	15%	on income before taxes
Annual Inflation	0%	
Payment Method	2	(1=does not include departure tariff, 2=includes departure tariff)
Duration of Concession	24	years

Profit/Loss Statement (UF)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Operational Revenues																								
Aerodom Income	0	0	66,248	69,769	73,290	76,810	80,931	85,051	89,172	93,292	97,412	101,930	106,447	110,965	115,482	119,999	124,750	129,502	134,253	139,004	143,755	148,506	153,257	158,008
Commercial Income	0	0	10,547	11,113	11,679	12,245	12,902	13,559	14,215	14,872	15,529	16,249	16,969	17,690	18,410	19,130	19,887	20,645	21,402	22,159	22,917	23,674	24,432	25,189
Income Adjacent Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	0	0	76,795	80,882	84,969	89,055	93,833	98,610	103,387	108,164	112,941	118,179	123,417	128,654	133,892	139,129	144,638	150,146	155,655	161,163	166,672	172,180	177,689	183,197
Expenditures																								
Personnel	0	0	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	9,673	11,979	11,979	11,979	11,979	11,979	11,979
Maintenance	0	0	8,653	8,653	8,653	8,653	8,653	8,653	9,684	9,684	9,684	9,684	9,684	10,871	10,871	10,871	10,871	10,871	11,856	11,856	11,856	11,856	11,856	11,856
General and Administrative	0	0	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,875	2,875	2,875	2,875	2,875	2,875
Contracted Services	0	0	3,477	3,477	3,477	3,477	3,477	3,477	4,184	4,184	4,184	4,184	4,184	4,392	4,392	4,392	4,392	4,392	5,600	5,600	5,600	5,600	5,600	5,600
Utilities	0	0	2,464	2,464	2,464	2,464	2,464	2,464	3,080	3,080	3,080	3,080	3,080	3,080	3,080	3,080	3,080	3,080	4,312	4,312	4,312	4,312	4,312	4,312
Total Operational Expenditures	0	0	26,588	26,588	26,588	26,588	26,588	26,588	28,943	28,943	28,943	28,943	28,943	30,337	30,337	30,337	30,337	30,337	36,622	36,622	36,622	36,622	36,622	36,622
Earnings before Interest, taxes, depreciati	0	0	50,207	54,294	58,381	62,468	67,245	72,022	74,444	79,221	83,998	89,236	94,474	98,317	103,555	108,792	114,301	119,809	119,033	124,542	130,050	135,559	141,067	146,576
Depreciation	0	0	16,384	17,178	18,100	19,021	19,943	20,864	24,510	25,646	26,783	27,920	29,056	33,604	34,935	36,265	37,596	38,926	54,305	56,099	57,894	59,689	61,484	63,278
Interest Payments	0	0	54,549	53,357	52,070	50,679	49,178	47,556	50,036	47,853	45,494	42,947	40,196	41,092	37,616	33,863	29,809	25,431	27,656	22,232	16,375	10,048	3,216	1,393
Total Gastos	0	0	70,934	70,535	70,170	69,701	69,121	68,420	74,546	73,499	72,277	70,867	69,252	74,696	72,551	70,128	67,405	64,357	81,961	78,332	74,269	69,737	64,699	64,671
Earnings before Taxes	0	0	(20,726)	(16,241)	(11,789)	(7,233)	(1,876)	3,602	(102)	5,722	11,721	18,369	25,221	23,621	31,004	38,664	46,896	55,452	37,072	46,210	55,781	65,821	76,368	81,904
Taxes	0	0	0	0	0	0	0	540	0	858	1,758	2,755	3,783	3,543	4,651	5,800	7,034	8,318	5,561	6,931	8,367	9,873	11,455	12,286
Net Operating Margin	0	0	(20,726)	(16,241)	(11,789)	(7,233)	(1,876)	3,062	(102)	4,864	9,963	15,614	21,438	20,078	26,353	32,865	39,862	47,134	31,511	39,278	47,414	55,948	64,912	69,619

Cash Flow Statement (UF)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Net Income	0	0	(20,726)	(16,241)	(11,789)	(7,233)	(1,876)	3,062	(102)	4,864	9,963	15,614	21,438	20,078	26,353	32,865	39,862	47,134	31,511	39,278	47,414	55,948	64,912	69,619
Adjustments for Cash Flow																								
Add Depreciation	0	0	16,384	17,178	18,100	19,021	19,943	20,864	24,510	25,646	26,783	27,920	29,056	33,604	34,935	36,265	37,596	38,926	54,305	56,099	57,894	59,689	61,484	63,278
Change in net working capital	0	0	(6,309)	(327)	(327)	(327)	(382)	(382)	(409)	(382)	(382)	(419)	(419)	(423)	(419)	(419)	(441)	(441)	(501)	(441)	(441)	(441)	(441)	(441)
Add loan and grant disbursements	146,570	523,571	0	0	0	0	0	52,894	0	0	0	0	48,330	0	0	0	0	86,920	0	0	0	0	0	0
Subtract principal payments	0	0	(14,900)	(16,092)	(17,380)	(18,770)	(20,272)	(21,893)	(27,296)	(29,480)	(31,838)	(34,385)	(37,136)	(43,443)	(46,919)	(50,672)	(54,726)	(59,104)	(67,798)	(73,222)	(79,080)	(85,406)	(22,789)	(17,409)
Subtract capital expenditures	(209,385)	(747,958)	0	0	0	0	0	(75,563)	0	0	0	0	(69,043)	0	0	0	0	(124,171)	0	0	0	0	0	0
Total Adjustments	(62,816)	(224,387)	(4,825)	759	393	(76)	(711)	(24,080)	(3,195)	(4,216)	(5,437)	(6,885)	(29,212)	(10,262)	(12,403)	(14,826)	(17,571)	(57,870)	(13,994)	(17,563)	(21,626)	(26,158)	38,254	45,428
Initial Financial Return (no loans)																								
Annual Cash Flow	(209,385)	(747,958)	36,367	45,823	49,297	52,771	56,776	(14,727)	62,869	66,956	71,017	75,432	10,841	83,147	87,603	92,055	96,715	(22,774)	100,678	105,420	110,102	114,784	119,466	124,149
Net Present Value 12%	(448,831)																							
Transfers from Government **73,648**			73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648	73,648
Earnings before Taxes	0	0	52,922	57,407	61,859	66,415	71,772	76,710	73,546	78,512	83,611	89,262	95,086	93,726	100,001	106,513	113,510	120,782	105,160	112,926	121,062	129,596	138,561	143,267
Financial Return (with loans)																								
Annual Cash Flow	(62,816)	(224,387)	48,097	58,166	62,253	66,339	71,061	52,629	70,351	74,296	78,174	82,377	65,874	83,464	87,598	91,687	95,939	62,913	91,166	95,363	99,436	103,439	176,815	188,695
Internal Rate of Return	**21%**																							
Net Present Value 12%	**200,467**																							
Net Present Value 15%	**107,757**																							
Financial Return (no loans)																								
Annual Cash Flow	(209,385)	(747,958)	110,016	119,471	122,945	126,419	130,424	58,921	136,517	140,604	144,665	149,080	84,489	156,795	161,251	165,703	170,363	50,874	174,326	179,068	183,750	188,432	193,114	197,797
Internal Rate of Return	**12%**																							
Net Present Value 12%	**(0)**																							
Net Present Value 15%	**(140,715)**																							

Investment, Maintenance and Depreciation for DGAC

Alternative **6**

Key Parameters

Analysis Alternative	**6**	
~~Coverage of Concession~~	~~3~~	
Duration of Concession	24	years
First Year of Concession	2002	

	Phase 1	Phase 2	Phase 3	Phase 4	End
First Year of Operation	2004	2010	2015	2020	2025
Implementation Period Infra.	2	1	1	1	
% Last Year of Period - Alt. 1	91.3%	100.0%	100.0%	100.0%	
% Previous Year of Period - Alt 1	8.7%	0.0%	0.0%	0.0%	
Implementation Period Equipment	1	1	1	1	

% Engineering and Supervision	26.0%
% Contingencies	20.0%
% Mainten. Annual Equipment	2.0%
% Mainten. Annual Airside	0.6%
Inflation rate	0.0%
Base year:	2001

Summary of Investments and Maintenence (DGAC)

NOTE = ESTIMATED SEPERATELY - SHEET "G&A"

Item	Purchase Price (UF)	Quantity Required by Phase				Total Investment by Phase (UF)					Annual Mainte. Costs (% purchase)	Insurance (% purchase)	Use-Life (years)	Salvage (% purchase)	Depreciation (UF)		Annual Maintenece Costs (UF)				Annual Insurance Costs (UF)			
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 1	Phase 2	Phase 3	Phase 4	Total							Phase 1	Phase 2	Phase 3	Phase 4	Phase 1	Phase 2	Phase 3	Phase 4
2 Purchase Land	52,272	1				52,272	0	0	0	52,272	2.0%	0.00%	25	10.0%	1,882		1,045.4	1,045.4	1,045.4	1,045.4	0.0	0.0	0.0	0.0
2 ILS	28,728	1				28,728	0	0	0	28,728	2.0%	0.00%	25	10.0%	1,034		574.6	574.6	574.6	574.6	0.0	0.0	0.0	0.0
2 Meterological Instalations	24,192	1				24,192	0	0	0	24,192	2.0%	0.00%	25	10.0%	871		483.8	483.8	483.8	483.8	0.0	0.0	0.0	0.0
2 Navaides	71,518	1				71,518	0	0	0	71,518	2.0%	0.00%	25	10.0%	2,575		1,430.4	1,430.4	1,430.4	1,430.4	0.0	0.0	0.0	0.0
1 Airside Infrastructure						422,844	3,288	42,087	6,577	474,796	0.6%	0.00%	25	10.0%	0		1,021.3	1,034.3	1,142.3	1,168.4	0.0	0.0	0.0	0.0
Alt.1						422,844	3,288	42,087	6,577	474,796						Alter. 1	**1,021.3**	**1,034.3**	**1,142.3**	**1,168.4**	**0.0**	**0.0**	**0.0**	**0.0**
Alt.2						176,710	0	0	0	176,710						Alter. 2	**3,534.2**	**3,534.2**	**3,534.2**	**3,534.2**	**0.0**	**0.0**	**0.0**	**0.0**
Total-Alt.3						599,554	3,288	42,087	6,577	651,505						Alter. 3	**4,555.4**	**4,568.5**	**4,676.5**	**4,702.6**	**0.0**	**0.0**	**0.0**	**0.0**

Phase of Operations	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4
Purchase New Equipment (UF)																								
Initial Investment + Replacement	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2 Purchase Land	52,272	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 ILS	0	28,728	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Meterological Instalations	0	24,192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Navaides	0	71,518	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 Airside Infrastructure	181,832	241,012	0	0	0	0	0	3,288	0	0	0	0	42,087	0	0	0	0	6,577	0	0	0	0	0	0
Sub- Alt.1	**181,832**	**241,012**	**0**	**0**	**0**	**0**	**0**	**3,288**	**0**	**0**	**0**	**0**	**42,087**	**0**	**0**	**0**	**0**	**6,577**	**0**	**0**	**0**	**0**	**0**	**0**
Total Alt.2	**52,272**	**124,438**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total-Alt.3	**234,104**	**365,450**	**0**	**0**	**0**	**0**	**0**	**3,288**	**0**	**0**	**0**	**0**	**42,087**	**0**	**0**	**0**	**0**	**6,577**	**0**	**0**	**0**	**0**	**0**	**0**
Equipment Maintenance																								
Airside - Alt.1	0	0	1,021	1,021	1,021	1,021	1,021	1,021	1,034	1,034	1,034	1,034	1,034	1,142	1,142	1,142	1,142	1,142	1,142	1,142	1,142	1,142	1,142	1,142
Landside - Alt.2	0	0	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534
Total-Alt.3	0	0	4,555	4,555	4,555	4,555	4,555	4,555	4,568	4,568	4,568	4,568	4,568	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676	4,676
Insurance																								
Total with Alt 3	0	0	727	727	727	727	727	727	727	727	727	727	727	904	904	904	904	904	904	904	904	904	904	904
Amount Concessionaire	0	0	677	677	677	677	677	677	677	677	677	677	677	677	677	677	677	677	839	839	839	839	839	839
Total DGAC	0	0	50	50	50	50	50	50	50	50	50	50	50	227	227	227	227	227	65	65	65	65	65	65
Inflation factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Expenses in Infrastructure and Equipment for Selected Alternative

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capital Costs	**52,272**	**124,438**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Equipment Maintenance	**0**	**0**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**	**3,534**
Insurance	**0**	**0**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**227**	**227**	**227**	**227**	**227**	**65**	**65**	**65**	**65**	**65**	**65**
Total	**52,272**	**124,438**	**3,584**	**3,584**	**3,584**	**3,584**	**3,584**	**3,584**	**3,584**	**3,584**	**3,584**	**3,584**	**3,584**	**3,761**	**3,761**	**3,761**	**3,761**	**3,761**	**3,599**	**3,599**	**3,599**	**3,599**	**3,599**	**3,599**

Investment by Phases	Phase 1	Phase 2	Phase 3	Phase 4
	599,554	**3,288**	**42,087**	**6,577**

Depreciation Estimate (unit flow method)

	Phase of Operations	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4
Cummulative Fixed Assets	(UF)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1	Alt 1			422,844	422,844	422,844	422,844	422,844	422,844	426,132	426,132	426,132	426,132	426,132	468,219	468,219	468,219	468,219	468,219	474,796	474,796	474,796	474,796	474,796	474,796
2	Alt 2			176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710
	Total (for Alternative)			176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710	176,710

Depreciation Estimate (Unit-Flow Method)

Flow of Departing Pax

	Total	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Phase 1	5719939	0	160429	168201	177224	186247	195270	204293	213316	223208	233100	242993	252885	262777	273181	283585	293989	304393	314797	325202	335606	346010	356414	366818
Phase 2	4628274	0	0	0	0	0	0	0	213316	223208	233100	242993	252885	262777	273181	283585	293989	304393	314797	325202	335606	346010	356414	366818
Phase 3	3462772	0	0	0	0	0	0	0	0	0	0	0	0	262777	273181	283585	293989	304393	314797	325202	335606	346010	356414	366818
Phase 4	2044846	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	314797	325202	335606	346010	356414	366818

Annual Depreciation Expense by Phase (UF)

	Total	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Phase 1																								
1 Alt 1	422,844	0	11860	12434	13101	13768	14435	15102	15769	16501	17232	17963	18694	19426	20195	20964	21733	22502	23271	24040	24809	25579	26348	27117
2 Alt 2	176,710	0	4956	5196	5475	5754	6033	6311	6590	6896	7201	7507	7813	8118	8440	8761	9082	9404	9725	10047	10368	10689	11011	11332
Total (for Alternative)	599,554	0	4,956	5,196	5,475	5,754	6,033	6,311	6,590	6,896	7,201	7,507	7,813	8,118	8,440	8,761	9,082	9,404	9,725	10,047	10,368	10,689	11,011	11,332
Phase 2																								
1 Alt 1	3,288	0	0	0	0	0	0	0	152	159	166	173	180	187	194	201	209	216	224	231	238	246	253	261
2 Alt 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (for Alternative)	3,288	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phase 3																								
1 Alt 1	42,087	0	0	0	0	0	0	0	0	0	0	0	0	3194	3320	3447	3573	3700	3826	3953	4079	4205	4332	4458
2 Alt 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (for Alternative)	42,087	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phase 4																								
1 Alt 1	6,577	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1012	1046	1079	1113	1146	1180
2 Alt 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (for Alternative)	6,577	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (for Alternative)																								
1 Alt 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Alt 2	176,710	0	4,956	5,196	5,475	5,754	6,033	6,311	6,590	6,896	7,201	7,507	7,813	8,118	8,440	8,761	9,082	9,404	9,725	10,047	10,368	10,689	11,011	11,332
Total	176,710	0	4,956	5,196	5,475	5,754	6,033	6,311	6,590	6,896	7,201	7,507	7,813	8,118	8,440	8,761	9,082	9,404	9,725	10,047	10,368	10,689	11,011	11,332
Inflation factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Depreciation Expense Selected Alternative (Nominal)																								
Total	**0**	**0**	**4,956**	**5,196**	**5,475**	**5,754**	**6,033**	**6,311**	**6,590**	**6,896**	**7,201**	**7,507**	**7,813**	**8,118**	**8,440**	**8,761**	**9,082**	**9,404**	**9,725**	**10,047**	**10,368**	**10,689**	**11,011**	**11,332**

Financial Results (DGAC)

Alternativa **6**

Key Paramenters

Alternative	**6**	
Coverage	3	
Annual Infaltion	0%	
Payment method	2	(1=does not include departure tariff, 2=includes departure tariff)

Profit/Loss Statement (UF)

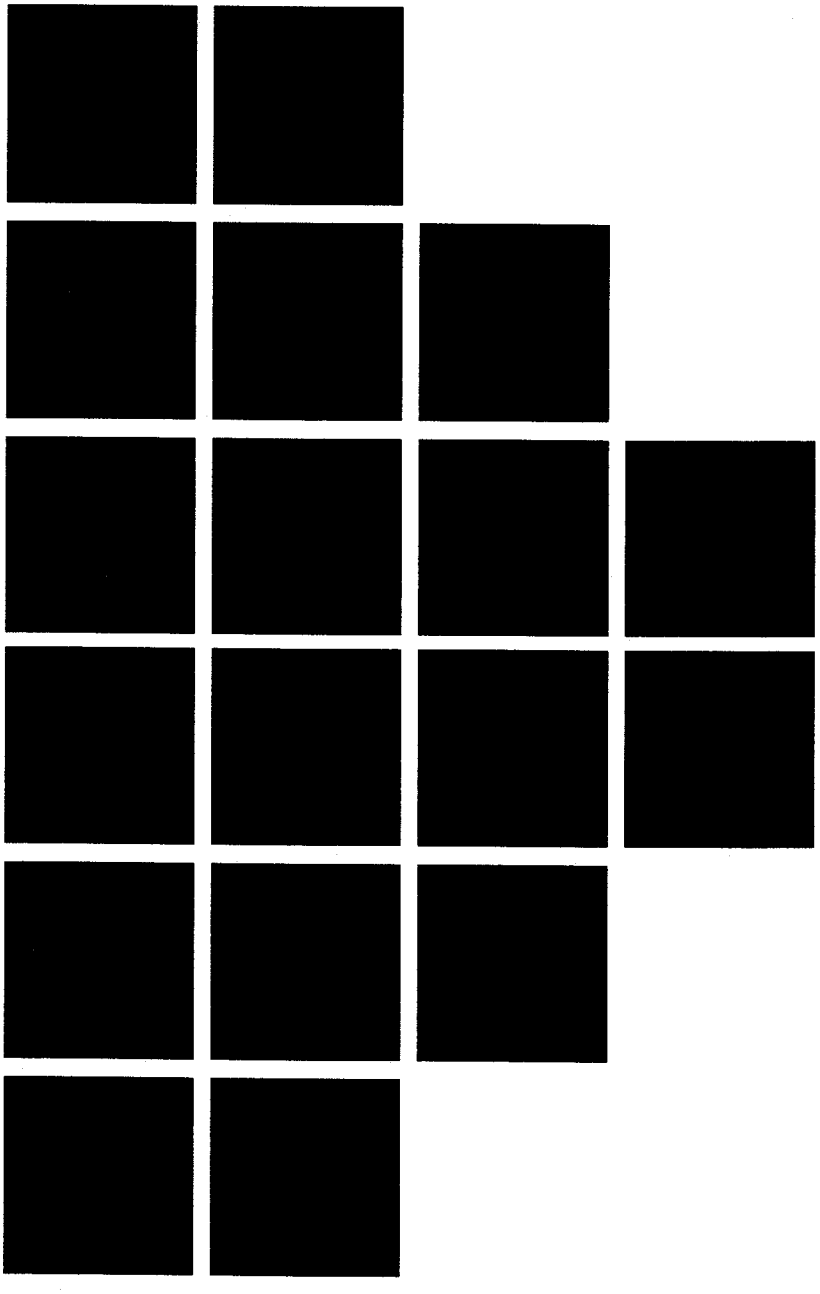
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Operational Revenues																								
Aeronautical Revenues	0	0	19,680	19,634	20,154	20,674	21,193	21,713	22,233	22,774	23,315	23,856	24,397	24,938	25,253	25,568	25,882	26,197	26,512	26,826	27,141	27,455	27,770	28,085
Aerodom Income	0	0	41,310	43,321	45,400	47,478	49,930	52,381	54,833	57,281	59,729	62,409	65,089	67,769	70,414	73,058	75,839	78,621	81,402	84,183	86,964	89,746	92,527	95,308
Service to Aircraft	0	0	4,504	4,478	4,523	4,567	4,611	4,655	4,699	4,739	4,779	4,820	4,860	4,900	4,904	4,908	4,912	4,915	4,919	4,923	4,927	4,930	4,934	4,938
Adjacent Areas	0	0	287	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621
Reutilization Maquehue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	65,781	68,055	70,697	73,340	76,355	79,370	82,386	85,415	88,445	91,706	94,968	98,229	101,192	104,155	107,255	110,355	113,454	116,554	119,653	122,753	125,853	128,952
Expenses (without Operational Expenditures)																								
Maintenance	0	0	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534	3,534
Insurance	0	0	50	50	50	50	50	50	50	50	50	50	50	227	227	227	227	227	65	65	65	65	65	65
Transfers to Concessionaire	0	0	139,896	143,417	146,938	150,459	154,579	158,699	162,820	166,940	171,060	175,578	180,095	184,613	189,130	193,647	198,399	203,150	207,901	212,652	217,403	222,154	226,905	231,656
Total Expenses	0	0	143,480	147,001	150,522	154,043	158,163	162,283	166,404	170,524	174,644	179,162	183,679	188,374	192,891	197,408	202,159	206,911	211,500	216,251	221,002	225,753	230,505	235,256
Depreciation	0	0	4,956	5,196	5,475	5,754	6,033	6,311	6,590	6,896	7,201	7,507	7,813	8,118	8,440	8,761	9,082	9,404	9,725	10,047	10,368	10,689	11,011	11,332
Net Operating Margin	0	0	(82,655)	(84,142)	(85,300)	(86,457)	(87,841)	(89,224)	(90,608)	(92,005)	(93,401)	(94,963)	(96,524)	(98,263)	(100,138)	(102,014)	(103,987)	(105,960)	(107,771)	(109,744)	(111,717)	(113,690)	(115,663)	(117,636)

Cash Flow Statement (UF)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Net Income	0	0	(82,655)	(84,142)	(85,300)	(86,457)	(87,841)	(89,224)	(90,608)	(92,005)	(93,401)	(94,963)	(96,524)	(98,263)	(100,138)	(102,014)	(103,987)	(105,960)	(107,771)	(109,744)	(111,717)	(113,690)	(115,663)	(117,636)
Adjustments for Cash Flow																								
Add Depreciation	0	0	4,956	5,196	5,475	5,754	6,033	6,311	6,590	6,896	7,201	7,507	7,813	8,118	8,440	8,761	9,082	9,404	9,725	10,047	10,368	10,689	11,011	11,332
Change in net working capital	(52,272)	(124,438)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Adjustments	(52,272)	(124,438)	4,956	5,196	5,475	5,754	6,033	6,311	6,590	6,896	7,201	7,507	7,813	8,118	8,440	8,761	9,082	9,404	9,725	10,047	10,368	10,689	11,011	11,332

Financial Returns

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Annual Cash Flow		(52,272)	(124,438)	(77,699)	(78,946)	(79,824)	(80,703)	(81,808)	(82,913)	(84,018)	(85,109)	(86,200)	(87,456)	(88,712)	(90,144)	(91,699)	(93,253)	(94,905)	(96,556)	(98,046)	(99,697)	(101,349)	(103,000)	(104,652)	(106,303)
Internal Rate of Return		**#DIV/0!**																							
Net Present Value	12%	**(664,407)**																							



The Louis Berger Group, Inc.

ANNEX E
Reference Documents

ANNEX E

REFERENCE DOCUMENTS

The following is a partial list of the documents used as reference in this study. Copies of these documents can be obtained from the Consultant.

1. Manual para la Evaluación de Proyectos Aeroportuarios en la Etapa de Preinversión, Ministerio de Planificación y Cooperación, Junio de 1998. (*Manual for the Evaluation of Airport Projects in the Preinvestment Phase*).

2. ICAO Aerodom Codes.

3. Tasas y Derechos Aeronáuticos, Dirección General de Aeronáutica Civil, Reglamento DAR-50, Exenta No. 0359, 26 Febrero 1996. (*Airport Tariffs and Rates*).

4. Ley No. 16.752 – Fija Organización y Funciones y Establece Disposiciones Generales de la Dirección General de Aeronáutica Civil. (*Law No. 16.752*)

5. Contabilización de los Contratos de Concesiones de Obras Públicas, Boletín Técnico No. 67, Colegio de Contadores, Santiago. (*Accounting for Public Works Concession Contracts*)

6. Estrategia Regional de Desarrollo – IX Región de Araucanía (*Regional Development Strategy*)

7. Plan de Desarrollo del Sistema de Transporte Urbano de Temuco, Comisión de Planificación de Inversiones en Infraestructura de Transporte, 1999. (*Development Plan for the Urban Transport System of Temuco*)

8. Plan Regulador Intercomunal de Temuco, CEC Ltda. Consultores, Septiembre 1997. (*Regulating Intercomunal Plan for Temuco*)

9. Ordenanza Local, Plan Regulador Intercomunal de Temuco, CEC Ltda. Consultores, Septiembre 1997. (*Local Ordinance for the Regulating Intercomunal Plan for Temuco)*

10. Modificación al Plan Regulador de Temuco, Plan Seccional Chivilcan, Arquitectos Carolina Solar S. y Paz Serra F, Temuco, Abril 1998. (*Modification to the Regulating Intercomunal Plan for Temuco)*

11. Sistema Socio Económico de la Comunidades Indígenas y Sistema Socio-Cultural, Instituto de Estudios Indígenas URFO-Temuco. (*Socio-Economic System of the Indigenous Communities y Socio-Cultural System*)

12. Plano de Ubicación de Reservas Indígenas (*Location Plan for Indigenous Reserves*)

13. Ley Indígena N° 19.253 (*Indigenous Law*)

FEASIBILITY STUDY FOR AN AIRPORT IN TEMUCO

FINAL REPORT

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