CITY OF BURIEN

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MEMORANDUM

October 21, 1996

TO: Honorable Mayor and Members of the City Council

FROM: Frederick C. Stouder, City Manager

SUBJECT: Burien - South King County Airport Impact Assistance and Mitigation Studies

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Attached are elements from the Burien - South King County Impact Assistance and Mitigation Studies Team. During the week of October 20, 1996, the Study Team will be presenting some of the preliminary findings, particularly costs for the environmental and transportation mitigation as a result of the Sea-Tac Airport Expansion. **Preliminary mitigation costs over the twenty year period, are $3.05 billion for environmental and transportation (construction and post construction) impacts alone. Mitigation costs over the period for the City of Burien are approximately $800 million dollars.**

Socio-economic impacts and mitigation costs have yet to be fully analyzed. However, single family property value reductions have been analyzed. **Potential property value loss in the City of Burien is $120,881,357 in the year 2000 expressed in 1995 dollars (please refer to page 38, Table 4-5 of the Draft Sea-Tac Mitigation Study). This number rises to $190,393,350 in the year 2020.** This also translates into an annual $500,000 general fund reduction during a time of increased pressures on the City for services. **Cumulative general property tax revenue loss in the cities studied, just from single family property is $22,520,039 over the twenty year period measured in 1995 dollars for the cities studied (please refer to page 38, Table 4-5 of the Draft Sea-Tac Mitigation Study).**

City of Burien-South King County Cities Mitigation Costs in 1995 Dollars
At Total Buildout (2020 est.)

City	Environment	Transportation	SubTotal
Burien	$ 641.3 million	$ 90.8 million	$ 732.1 million
Des Moines	$1,534.8 million	$ 61.4 million	$1,596.2 million
Federal Way	$ 194.0 million	$108.3 million	$ 302.3 million
Normandy Park	$ 67.5 million	$ 41.9 million	$ 109.4 million
Tukwila	$ 162.5 million	$148.0 million	$ 310.5 million
TOTAL	**$ 2.6 billion**	**$450.4 million**	**$ 3.05 billion**

Average Annual Property Value Reduction In 1995 Dollars at Total Buildout (2020 est.)

City	Property Value Reduction
Burien	$206.5 million
Des Moines	$ 88.8 million
Federal Way	$133.0 million
Normandy Park	$ 32.0 million
Tukwila	$ 39.8 million
TOTAL	**$500.1 million**

Although refinements to the studies are continuing, every single neighborhood is likely to be impacted in one way or another by the proposed third runway and the Airport Master Plan implementation. These estimate are preliminary, and as strategies for mitigation are further analyzed and proposed, reinvestment could occur that would change the property values, tax revenues losses, and quality of life. These strategies are still under study, and proposals are being considered for economic development that could ameliorate the impacts. The final report will be issued in January, 1997.

Enclosed are: (1) Chapter 1 through 4 of the Socio-Economic Impact Studies; (2) the Environmental Issues Technical Papers covering environmental issues and mitigation; (3) Section 1 Draft Introduction of the impact mitigation report itself including a proposed Table Of Contents for the study document that will be released in January; (4) Draft Neighborhood Impact Matrixes with the outline issues and measures on environmental impacts, as well as neighborhood environmental impacts that are being used as part of the presentation materials.

Chapter 1

Equity Issues and the Requirement for Mitigation of Socio-Economic Impacts at Seattle-Tacoma International Airport

DRAFT

1.0 INTRODUCTION

Equity issues related to the geographic distribution of Seattle-Tacoma International Airport's (SEA-TAC's) benefits and costs underpin the requirement for socio-economic impact mitigation. Although a source of contention, it is arguable that socio-economic benefits such as increased economic activity (jobs, income, and output) and social/cultural events (family visits, traveling performance companies and ease of recreational travel) generated by commercial aviation services taking place at SEA-TAC exceed the airport's socio-economic costs (noise, traffic congestion, a degraded environment for human habitat, adversely affected educational and social services, and a reduced tax base). If the benefits generated by the airport however are distributed over western Washington or the Puget Sound region while its costs are localized in a small number of communities immediately surrounding the airport, than there is a need for mitigation that redirects some of the airport's benefits back to the communities that are disproportionately baring its costs.

This chapter looks at the geographic area adversely affected by Sea-Tac's impacts and compares it to the places of origin of persons initiating commercial air service travel at SEA-TAC. The data base for origins of enplaning passengers at SEA-TAC are from a 1991 Origin/Destination (O/D) study conducted by the Evans-McDonough Company (EMC) for the Port of Seattle.[1] Population estimates used to calculate per capita trip generation rates were developed by the Washington State Office of Financial management. Different estimates of the airport's geographic impact area are derived from studies of SEA-TAC noise and related impacts conducted for the Port of Seattle during the past decade.

[1] The O/D survey was conducted between November 4 and 11, 1991. Interviews were conducted between the hours of 7:00 AM and 11:00 PM at SEA-TAC's departure gates. Survey respondents were persons originating the air portion of their trips from SEA-TAC.

1.1 GEOGRAPHIC AREA OF SEA-TAC'S ADVERSE IMPACTS

Numerous communities throughout the central Puget Sound region have perceived themselves adversely impacted by some factor (usually noise) connected with SEA-TAC activity levels, and there is considerable elasticity to the delineation of the geographic area primarily affected. It is widely acknowledged however that the airport's primary adverse impacts occur in the communities immediately surrounding the airport.

A SEA-TAC noise exposure (Part 150) study conducted for the Port of Seattle in 1989 defined the airport's land use impact area as a rectangle extending approximately 6.2 miles north, 7.0 miles south, 1.2 miles west and 1.6 miles east of the ends of runway 16L/34R.[2] The defined area includes all or parts of what are currently the cities of Burien, Des Moines, Federal Way, Normandy Park, SeaTac and Tuckwilla plus parts of South Seattle and parts of unincorporated King County.

A 1994 "Public Building Sound Insulation Project" conducted by the Port of Seattle sent questionnaires to public building that might have been adversely impacted by Sea-Tac's noise. Questionnaires were sent to public buildings located in Bellevue, Burien, Des Moines, Federal Way, Kent, SeaTac and Tuckwilla plus parts of South Seattle and unincorporated King County.[3]

The Port of Seattle's *Final Environmental Impact Statement*, issued February, 1996, defines the "general Study area" for analyzing impacts as a rectangle approximately 7.8 miles north and south and 1.3 miles east and west of the ends of runway 16L/34R[4]. The area includes all or part of the communities of Burien, Des Moines, Federal Way, Kent, Normandy Park, SeaTac and Tuckwilla plus parts of South Seattle and unincorporated King County.

The Airport Communities Coalition (ACC) consists of general and special purpose local governments that have organized in opposition to the proposed SEA-TAC expansion, and they see themselves, collectively, as the primary area affected by the airport's adverse impacts. ACC

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[2] Coffman Associates, Inc., *Noise Exposure Map Documentation/Noise Contour Update* (Prepared for the Port of Seattle, 1989), Exhibit 4C opposite page 4-10.

[3] Port Public Buildings Program documents and correspondence manual, provided by Chester S. Beattie, Policy Analyst, City of Des Moines

[4] Federal Aviation Administration and the Port of Seattle, *Final Environmental Impact Assessment for Proposed Master Plan Update Development Actions* (February, 1996), Exhibit III-2, page III-1B

members include the cities of Burien, Des Moines, Federal Way, Normandy Park and Tuckwilla plus the Highline School District.

In the socio-economic analysis of SEA-TAC's benefits and costs, the five communities plus the City of SeaTac constitute the definition of "Impacted Communities."

1.2 GEOGRAPHIC DISTRIBUTION OF PASSENGERS ORIGINATING TRIPS AT SEA-TAC

The O/D study conducted by EMC is 1991 contains responses from 3,278 originating passengers.[5] Respondents were not required to answer all questions contained in the survey. There were 3,170 responses on the data disk obtained from the Port of Seattle with usable information about trip purposes and trip origins. Respondents were asked the ZIP code of the place where they spent the prior night (the *place of origin* of the trip). The zip code locations were converted to city and town locations using a U.S. Post Office ZIP code manual.[6] Table 1-1 shows the distribution of respondents originating their trips at home, at a hotel/motel or at a business office.

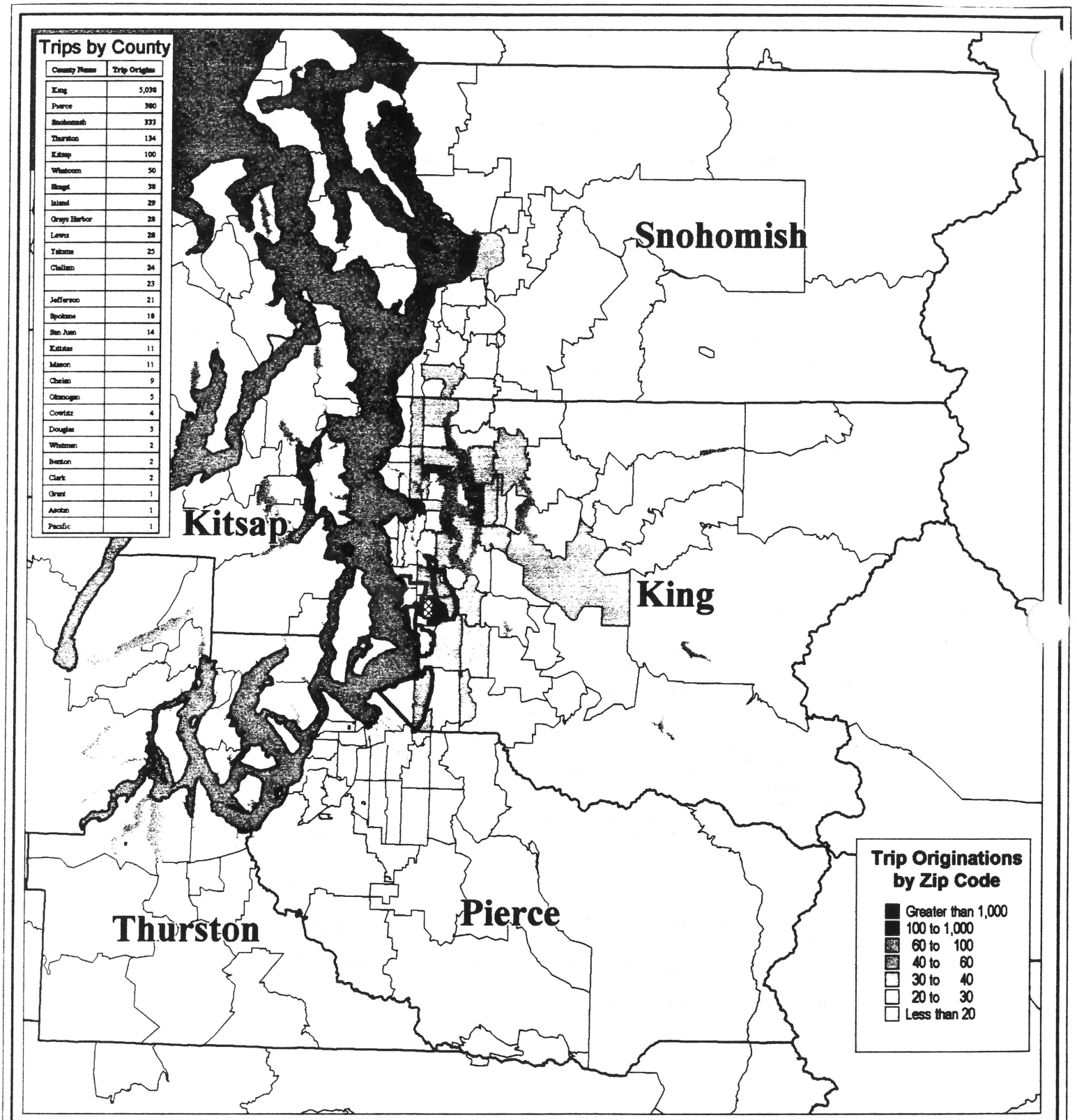
Table 1-1
Trip Origins of Survey Respondents

PLACE OF TRIP ORIGIN	Number	Percent
Home	1,856	58.5%
Hotel/Motel	830	26.2%
Business Office	484	15.3%
Total Respondents	3,170	100.0%

Source: TLA and EMC

Figure 1-1 (page 4) shows the distribution by ZIP code of survey respondents who reported their place of trip origin as the 4-county central Puget Sound Region. The central PSR accounted for almost three quarters (71.9 percent) of all trip respondents in the survey.

[5] The survey's margin of error was ± 1.7 percentage points.
[6] The ZIP code 98118 along Pacific Highway South/International Boulevard immediately east of SEA-TAC contains areas lying within both the Cities of Tuckwilla and SeaTac. ZIP code 98118 is allocated to the area identified in the text and tables as "SeaTac-Tuckwilla."



County Name	Trip Origins
King	5,038
Pierce	380
Snohomish	333
Thurston	134
Kitsap	100
Whatcom	50
Skagit	38
Island	29
Grays Harbor	28
Lewis	28
Yakima	25
Clallam	24
	23
Jefferson	21
Spokane	18
San Juan	14
Kittitas	11
Mason	11
Chelan	9
Okanogan	5
Cowlitz	4
Douglas	3
Whitman	2
Benton	2
Clark	2
Grant	1
Asotin	1
Pacific	1

TLA

Thomas/Lane Associates

October, 1996.

SGS Prepared by Schlosser Geographic Systems, Inc. Seattle, WA 98104.

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SEA-TAC IMPACT MITIGATION STUDY

for

CITIES OF BURIEN, DES MOINES, FEDERAL WAY NORMANDY PARK, TUKWILA

1.2.1 Passengers Originating Trips At Home

The majority (58.5 percent) of persons originating the air portion of their trips at SEA-TAC went too the airport directly from home. Almost two-thirds (61.2 percent) of travelers going to the airport directly from home were traveling for pleasure while the remaining one-third (38.8 percent) were traveling for businesses purposes. Table 1-2 presents the geographic distribution of passengers who went to the airport directly from home and who originated the air portion of their trip at SEA-TAC. The impacted communities immediately surrounding the airport accounted for 5.9 percent of these enplanements. King County (excluding the impacted communities) accounted for 57.2 percent. Pierce County and Snohomish County accounted for 10.4 percent and 10.1 percent, respectively. In terms of large aggregates of places, King County (excluding the impacted communities) plus Pierce, Snohomish, Thurston and Kitsap counties accounted for 83.9 percent of home originating enplanements; the rest of Washington State accounted for 10.2 percent and the combined impacted communities accounted for 5.9 percent.

Table 1-2
Counties of Home Originating Travelers

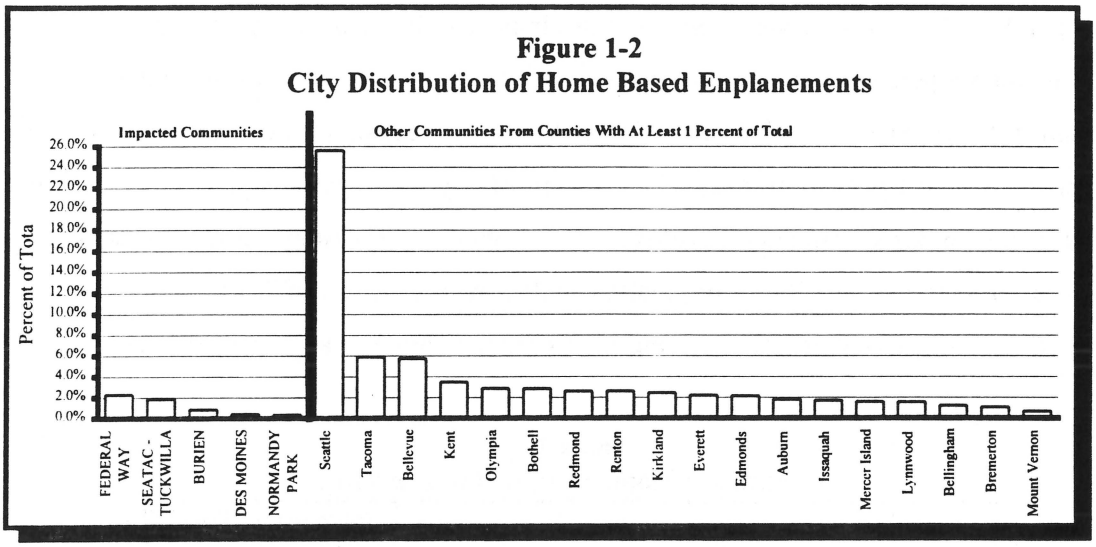
Area	Percent of Total Originating Enplanements
King County (excluding impacted communities)	57.2%
Pierce County	10.4%
Snohomish County	10.1%
Combined Impacted Communities	5.9%
Thurston County	3.1%
Kitsap County	3.1%
Rest of Washington	10.2%

Source: TLA and EMC

Figure 1-2 compares the geographic distribution of home originating enplanements of the impacted communities with other cities and towns located in Washington counties which generated at least 1.5 percent of total home originating enplanements. The cities of Seattle (25.6 percent), Tacoma (5.9 percent), Bellevue (5.8 percent), Kent (3.5 percent), Olympia (2.9 percent), Bothell (2.9 percent), Redmond (2.6 percent), Renton (2.6 percent) and Kirkland (2.5 percent) all account for a larger percentage of total home originating enplanements than do *any*

of the impacted communities. Bellingham, located in Whatcom County and over 100 miles away from the airport generates a larger percentage of home originating enplanements than does Burien. Mount Vernon, located in Skagit County and approximately 75 miles from the airport generates a larger proportion of home based enplanements than do either Des Moines or Normandy Park.

Figure 1-2
City Distribution of Home Based Enplanements



1.2.2 Passengers Originating Trips At Hotels & Motels

Approximately a quarter (26.2 percent) of persons originating the air portion of their trips at SEA-TAC went too the airport directly from a hotel or motel. Just over one-quarter (25.7 percent) of travelers going to the airport directly from a hotel or motel were traveling for pleasure while three-quarter (74.3 percent) were traveling for businesses purposes.

Trip departures from hotels and motels are highly concentrated, reflecting the concentration of hotel and motel rooms in the region. King County (excluding the impacted communities) accounted for over half (55.9 percent) of all persons going to SEA-TAC directly from a hotel or motel. Within King County (excluding the impacted communities), just over three-quarters (75.6 percent) of all trips originating at a hotel or motel were in the City of Seattle; and within Seattle, a single downtown ZIP code area (ZIP 98101) accounted for almost half (49.0 percent) of the city's total hotel/motel originating trips.

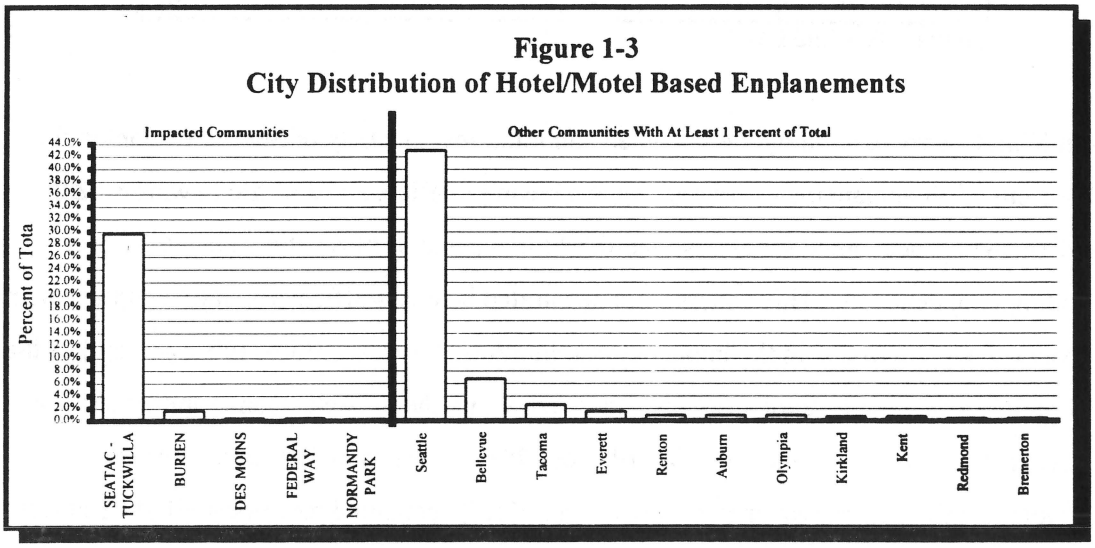
Table 1-3
Counties of Hotel & Motel Originating Travelers

Area	Percent of Total Originating Enplanements
King County (excluding impacted communities)	55.9%
Impacted Communities	32.8%
Pierce	2.9%
Snohomish	2.5%
Kitsap	1.1%
Thurston	1.0%
Rest of Washington	3.9%

Source: TLA and EMC

The impacted communities immediately surrounding the airport accounted for an additional one-third third (32.8 percent) of all persons going to SEA-TAC directly from a hotel or motel. Within the impacted communities, most of the trips to the airport (90.8 percent) originating at a hotel or motel came from the SeaTac-Tuckwilla area; and within the SeaTac-Tuckwilla area, a single ZIP code immediately to the east of the airport along Pacific Highway South/International Boulevard (ZIP 98188) accounted for almost three-quarters (72.5 percent) of the area's total hotel/motel originating trips.

Figure 1-3
City Distribution of Hotel/Motel Based Enplanements



1.2.3 Passengers Originating Trips At Business Offices

Almost one of six persons (15.3 percent) originating the air portion of their trip at SEA-TAC went to the airport directly from a business office. Fewer than one of five travelers (17.5 percent) going to the airport directly from a business office were traveling for pleasure while more than four of five (82.5 percent) were traveling for businesses purposes.

Enplanements originating at business offices are highly concentrated in King County (excluding the impacted communities), which accounts for just under two-thirds (66.1 percent)of the. The impacted communities accounted for an addition 12.4 percent, and no other county accounted for over 10 percent.

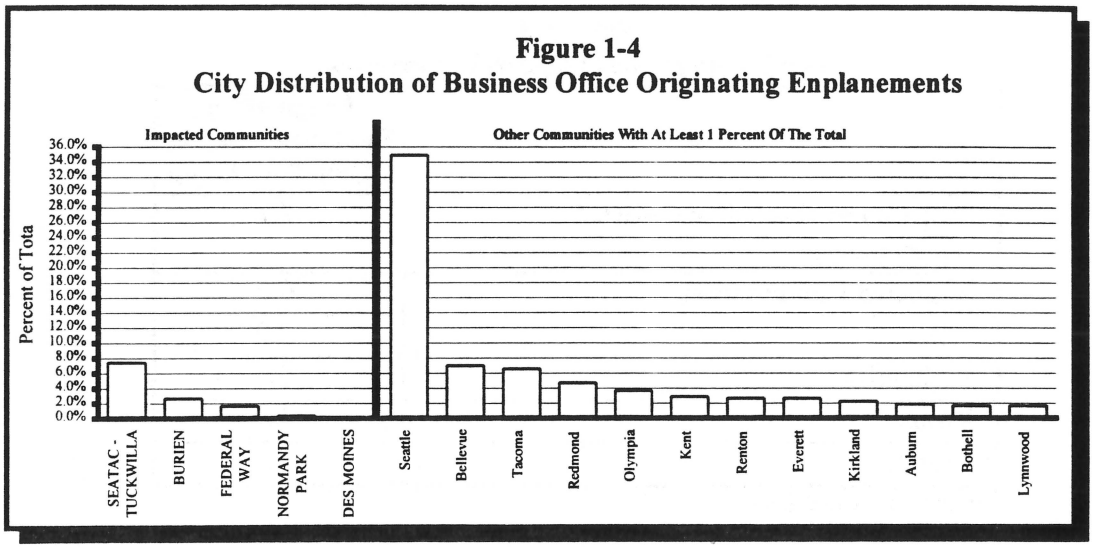
Table 1-4
Counties of Business Office Originating Travelers

Area	Percent of Total Originating Enplanements
King County (excluding impacted communities)	66.1%
Impacted Communities	12.4%
Pierce	7.9%
Snohomish	6.0%
Kitsap	0.6%
Thurston	3.7%
Rest of Washington	3.3%

Source: TLA and EMC

Within King County (excluding the impacted communities), the City of Seattle accounted for 58.0 percent of all enplanements originating at a business office, and a single downtown ZIP code (ZIP 98101) accounted for almost one-third (30.6 percent) of Seattle's business office originating enplanements. This pattern of concentrated business office originating enplanements was even more pronounced in the impacted communities. Over two-thirds (69.2 percent) of the business office originating enplanements generated within the impacted communities occurred in the SeaTac-Tuckwilla area, and a single ZIP code (98188 – the same ZIP code in which hotel/motel originating enplanements were concentrated) accounted for almost all (97.2 percent) of SeaTac-Tuckwilla's business office originating enplanements. The pattern of city concentration of business originating enplanements is shown in Figure 1-4.

Figure 1-4
City Distribution of Business Office Originating Enplanements



1.3 GEOGRAPHIC DISTRIBUTION OF PER CAPITA ORIGINATING ENPLANEMENTS

Dividing the number of originating enplanements in a community by the community's population and multiplying by 10,000 gives the number of home-originating trips per 10,000 population by community. The 1991 survey of originating enplanement data were divided by the State of Washington's 1991 community population estimates for the analysis of per capita originating enplanements[7].

1.3.1 Per Capital Home Originating Enplanements

King County (excluding the impacted communities) generated 7.7 originating enplanements per 10,000 population. The impacted communities (combined) generated 6.8 originating enplanements per 10,000 population. No other place in the state generated over 4.0 originating enplanements per 10,000 population.

[7] Office of Financial Management, Forecasting Division, *Population Trends for Washington State*. The City of Burien's 1993 population was used -- the first year for which Washington State estimated the City's population

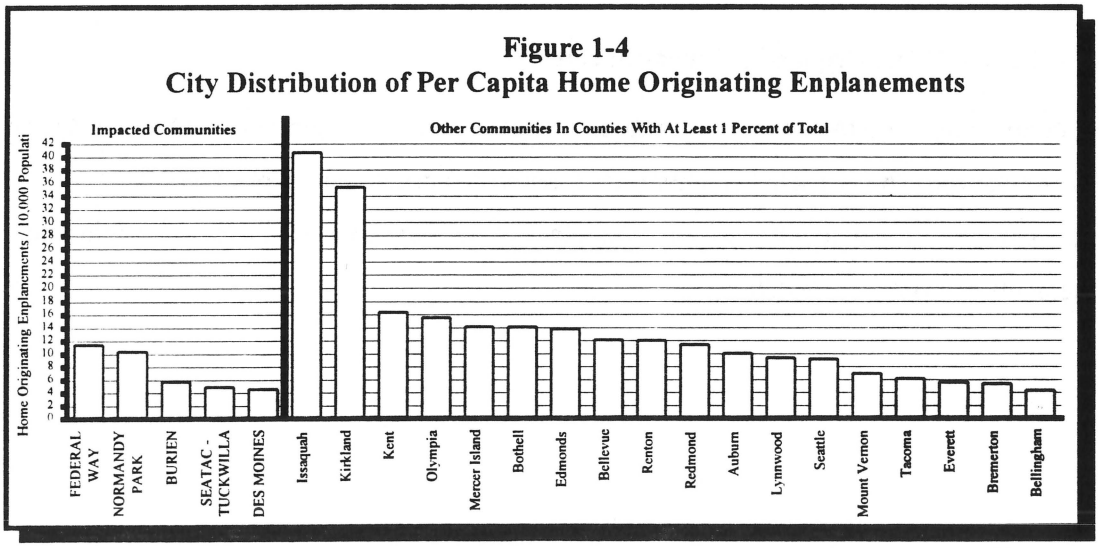
Table 1-5
Per Capita Home Originating Travelers

Area	Originating Enplanements Per 10,000 Population
King County (excluding impacted communities)	7.7
Impacted Communities	6.8
Pierce	3.2
Snohomish	3.9
Kitsap	2.9
Thurston	3.5

Source: TLA and EMC

Figure 1-4 shows the home trips per 10,000 population of cities and towns in counties which accounted for at least 1 percent of total statewide home originating enplanements. Among the impacted communities, the highest rate occurred in Federal Way at 11.5 home originating enplanements per 10,000 population. Higher rates occurred in Issaquah (40.7), Kirkland (35.4), Kent (16.4), Olympia (15.5), Mercer Island (14.2), Bothell(14.1), Edmonds (13.8), Bellevue (12.1) and Renton (12.1). The City of Mount Vernon, approximately 75 north of SEA-TAC, had a higher home originating enplanement rate per 10,000 population (6.9) than three of the five impacted communities.

Figure 1-4
City Distribution of Per Capita Home Originating Enplanements



1.4 DISTRIBUTION OF JOBS CREATED AT AIRPORT

In addition to travelers' time saving benefits, additional benefits are created in the form of airport jobs. Table 1-6 shows the distribution of direct airport jobs in the five impacted cities included in the study, *The Local And Regional Economic Impacts of the Port of Seattle*, prepared by Martin O'Connell Associates for the Port of Seattle[8] and estimated from the PSRC's *Census Transportation Planning Package* (CTPP) data base. The O'Connell study's estimate of the number of jobs at the airport is about 25 percent higher than the number of jobs the CTPP data base shows for Transportation Analysis Zone (TAZ) 355 – which include Sea-Tac Airport plus the area west of the airport to First Avenue SW, so there is a strong likelihood that the O'Connell study's estimate of the number of jobs created is somewhat high. The distribution of airport located jobs among the five impacted cities included in this analysis is similar in both the O'Connell study and the CTPP data base, with about 20 percent of jobs at the airport held by residents of the five impacted cities, of which about half are held by Federal Way residents.

Table 1-6
Estimates of Direct Airport Jobs Held by Residents of Impacted Cities

	PSRC Census Based Estimate		O'Connell Associates Estimate	
	Number	Percent	Number	Percent
Burien	369	3.9%	402	3.4%
Des Moines	566	6.0%	360	3.0%
Federal Way	862	9.1%	1,486	12.5%
Normandy Park	154	1.6%	102	0.9%
Tukwila	115	1.2%	128	1.1%
5-City Airport Jobs	2,065	21.7%	2,479	20.8%
Total Airport Jobs	9,508	100.0%	11,896	100.0%

Source: PSRC, O'Connell Associates

Using the O'Connell study's estimates of all jobs created by activity at Sea-Tac, Table 1-7 shows the percent of different types of job held by residents of the five impacted cities. Among airport created jobs situated at the airport itself, approximately 21 percent are estimated to be held by residents of the five impacted cities. These residents also hold approximately 17 percent of

direct jobs and 3 percent of all airport created jobs. Depending on which definition of job creation is used – airport located, direct or total – between 80 percent and 97 percent of the job related benefits created by the airport go to persons residing outside the five impacted cities.

Table 1-7
Distribution of Jobs to Residents of 5-Impacted Cities, by Type of Jobs

		Percent Jobs Held by Residents of 5-Impacted Cities
Airport Located Jobs	11,896	20.8%
Total Airport Direct Jobs	14,381	17.2%
Total All Airport Jobs	78,711	3.1%

Source: TLA, Martin O'Connell & Associates

1.5 GEOGRAPHIC MISMATCH BETWEEN AIRPORT BENEFITS AND COSTS

Various delineation's of SEA-TAC'S primary adverse impact area exist. However, they all identify the communities and unincorporated areas of southwest King County, immediately surrounding the airport, as the one's which suffer the primary burden of SEA-TAC'S adverse impacts. These communities are impacted by the airport's non-market costs, such as noise pollution, visual degradation, surface traffic congestion and air quality decline. Non-market costs refer to costs resulting from operation of the airport which are not incorporated in the price airport users have to pay for air transportation services. They represent a transfer of value *from* persons living in the immediate vicinity of the airport *to* persons using the air transportation services provided at the airport. If the same persons that suffer the airport's primary non-market adverse impacts were either (a) its primary users or (b) the primary recipients of its job creation related benefits,[9] benefits and costs would be roughly in-line and no equity issue would exist.

However, an analysis of airport users' residential and business locations reveals a "disconnect" between the airport's benefits and costs. The five ACC communities plus the City of SeaTac,

[8] Martin O'Connell & Associates, The Local and Regional Economic Impacts of the Port of Seattle (Port of Seattle, May, 1994) Section III, "The Economic Impacts of Sea-Tac International Airport."
[9] Airport impact studies refer to these non-market benefits as an airport's *indirect* or *induced* impacts.

combined, account for only 5.9 percent of all SEA-TAC enplanements originating at the traveler's home. Cities such as Bellingham – located over 100 miles to the north – generate a larger percentage of home originating enplanements than three of the impacted communities. The City of Seattle accounts for over four times the number of home originating enplanements than do all the impacted communities combined. In terms of per capita rates, the cities of Issaquah, Kirkland, Kent, Olympia, Mercer Island, Bothell, Edmonds , Bellevue and Renton all generated more home originating enplanements per 10,000 population than did any of the impacted communities. The City of Mount Vernon, approximately 75 to the north, had a higher home originating enplanement rate than three of the five impacted communities. The rate of home originating enplanements per 10,000 population for all the impacted communities combined was less than the rate for the rest of King County (6.8 compared to 7.7, respectively).

In terms of persons who live in the region, the impacted communities represent a small fraction of enplanements and they generate a lower rate of participation in flying than does the rest of King County.

Turning to business benefits reflected by enplanements originating from hotels, motels and business offices, the area directly east of SEA-TAC along Pacific Highway South/International Boulevard generates the second largest concentration of hotel/motel originating enplanements in the region – after downtown Seattle. Even a casual inspection of the area immediately shows these hotel/motel originating enplanements to be concentrated directly across from SEA-TAC's terminal.

Enplanements originating from business offices are disproportionately concentrated in King County (excluding the impacted communities) which accounts for almost two-thirds (66.1 percent) of such enplanements. The combined impacted communities account for only 12.4 percent of these types of enplanements. Again, most of the business enplanements originating from the impacted communities come from the area directly east of SEA-TAC along Pacific Highway South/International Boulevard.

In terms of business activity related to the airport, the distribution of originating enplanements shows that the City of SeaTac gets some significant business activity (particularly guests at its motels), but the Cities of Burien, Des Moines, Federal Way, Normandy Park and Tuckwilla receive little business related benefit from the airport.

Finally, an analysis of the job creation benefits generated by the airport shows that between 80 percent and 97 percent of these benefits go to persons wjo do not reside in one of the fiver impacted communities.

Overall, residents of the communities immediately surrounding the airport get disproportionately small benefits (both in total and per capita terms) from their use of the airport while suffering disproportionately large costs. Business activity generated by the airport appear to produce significant benefit for the City of SeaTac but little benefit for the cities of Burien, Des Moines, Federal Way, Normandy Park and Tuckwilla.

Comparing geographic areas which receive the major benefits of Sea-Tac's air transportation services with those that suffer the primary costs (adverse impacts) leads to the inescapable conclusion that a large discrepancy exists between the costs suffered and benefits received by residents of Burien, Des Moines, Federal Way, Normandy Park and Tukwila. The discrepancy results in a lack of equity between residents of the region who primarily benefit from the airport and residents who primarily suffer its socio-economic costs. It causes an imbalance between populations that benefit and that suffer the cost of SEA-TAC as a major aviation center. It is an imbalance that necessitates socio-economic mitigation by the Port of Seattle to redress.

Chapter 2

Overview of Methodological Issues Related to the Mitigation of Socio-Economic Impacts at Seattle-Tacoma International Airport

2.0 INTRODUCTION

The impacts of an airport on a region's socio-economic environment manifest themselves through indirect and induced effects – unlike an airport's physical and biological impacts which impress themselves directly on the natural environment. This is true both for an airport's beneficial and adverse impacts.

In terms of an airport's beneficial impacts, the Federal Aviation Administration (FAA) defines the benefits to a community of an airport as including direct benefits, indirect benefits and induced benefits and it states:[1] "the primary [transportation] benefits of an airport are usually the time saved and cost avoided by travelers who use it over the next best alternative" (page 5); and the resulting "economic activities [measured in terms of employment and income] that would not have occurred in the absence of the airport" (page 15). In both these definitions of airport beneficial impacts, it is not the airport itself but the social and economic consequences of the airport, measured in time savings and business activity, that generate the impact.

In line with the FAA's analysis of how airports generate beneficial impacts, the 1994 report, *The Local and Regional Economic Impacts of the Port of Seattle*[2], measures four types of impacts: jobs, personal earnings, business revenue and taxes paid (page 55). It estimates the direct job benefits to be 38 percent of the total. Equivalent measurement techniques have been used to estimate similar airport beneficial impacts both elsewhere in Washington State[3] and throughout the country.[4]

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[1] Stewart E. Butler & Laurence J. Kiernan, *Estimating the Regional Economic Significance of Airports* (FAA document DOT/FAA/PP-92-6, Department of Transportation, Washington, D.C.), September, 1992.
[2] Martin O'Connell Associates, *The Local and Regional Economic Impacts of the Port of Seattle* (prepared for the Port of Seattle), May 31, 1994
[3] Thomas/Lane Associates, *Airport Economic Benefits* (Aeronautic Division, Washington State Department of Transportation, June, 1991)
[4] Geoffrey J.D. Hewings, et al, *Indirect Impacts of Chicago Airports* (1995)

Similar to beneficial impacts, an airport's adverse impacts have a direct component but are primarily the result of indirect and induced effects. This chapter defines and discusses the different types of adverse impacts produced by airports, and the significance of these impacts for the communities that lie within SEA-TAC's adverse impact area.

2.1 DIRECT ADVERSE SOCIO-ECONOMIC IMPACTS

Direct adverse impacts of commercial airports on surrounding communities are measured by the decline in residential property values compared to what they would have been if the airport were located elsewhere in the metropolitan area.

Airports generate noise, visual blight, surface traffic congestion, possible air pollution and other effects which cause most households to consider the areas immediately surrounding them to be less desirable places to live. Some households may have a primary wage earner employed at (or near) the airport and consider the reduction in commuting time a more than off-setting factor too the airport's direct adverse impacts. For others, there may by neighborhood or individual house characteristic that off-set the airport's direct adverse impacts. But for most households, close proximity to an airport reduces a property's residential desirability.[5] As a result, a residential housing unit located close to an airport will normally have a market value less than it would have had if located elsewhere in the region, other things(such as lot size and view) being the same.

Most studies of direct adverse impacts of airports have concentrated on measuring the noise impacts on property values.[6] A recent report by Booz-Allen & Hamilton, Inc., prepared for the FAA, found that the impact on property values of "airport noise varies from negligible [$627 for lower priced housing units around Baltimore International Airport] to significant [$60,873 for moderately priced housing units around Los Angeles International Airport] and appears to be more pronounced in higher priced neighborhoods."[7] A *SEA-TAC Airport Vicinity Land Use Inventory Project* report prepared for the Port of Seattle in 1994 looked at the noise issue by

[5] R.W. Crowly, "A Case Study of the Effects of an Airport on Land Values," *Journal of Transportation Economics*, 1973; J.P Nelson, "Airports and Property Values: A Survey of Recent Evidence," *Journal of Transportation Economics and Policy*, 1980.

[6] J.S. Newman and K.R. Beattie, *Aviation Noise Effects* (FAA Report EE-85-2, 1985); Marvin Frankel, "Aircraft Noise and Residential Property values," *The Appraisal Journal*, 1991; P. Mieszkowski and A.M. Samper, "An Estimate of the Effects of Airport Noise on Property values," *Journal of Urban Economics*, 1978.

comparing the assessed values of 32 residences located within Sea-Tac's "Noise Remedy Area Boundary – 16 residences were within both the airport's 65 L_{DN} and Noise Remedy Area boundaries and 16 residences were outside the airport's 65 L_{DN} boundary but within the its Noise Remedy Area boundary[8]. For a variety of methodological and research procedure issues (the most notable being the lack of comparison between houses near to the airport with comparable units in other parts of the central Puget Sound region), the report concludes, "given the limitation of this study, neither the existence nor the magnitude of any general effect on rates of appreciation of property values from airport noise is demonstrated" page 55).

The airport's direct impacts primarily result in private costs, which are measured as the decline (or reduction in the rate of growth) of privately owned residential property. This cost is borne by the property owner at the time the airport is created or at the time the airport undergoes a significant increase in the magnitude of its adverse impacts – such as occurred when jet airplanes came into wide spread commercial use.

Direct public costs are measured by the decline in the local tax base that results from the reduced (or more slowing growing) property values of residences in close proximity to the airport. These direct public costs are equal to the present value of the annual reduction in an impacted community's tax revenues calculated under "*other things remaining the same*" assumptions.

2.2 INDIRECT ADVERSE SOCIO-ECONOMIC IMPACTS

Indirect adverse impacts of commercial airports on surrounding communities are measured by the change in residential and business land uses that result from the decline in property values (or the decline in the rate of increase of property values) caused by the airport's direct impacts. The importance of indirect effects is that they are the intermediary through which direct impacts lead to induced impacts – and as will be discussed below, there are significant costs associated with induced impacts. Indirect impacts occur only at the community level and generally there are no private indirect costs.

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[7] Booz-Allen & Hamilton, Inc., *The Effect of Airport Noise on Housing Values* (FAA, Office of Environment and Energy, September, 1994)

[8] Shapiro and Associates, *SEA-TAC Airport vicinity Land Use Inventory Project* (Aviation Planning Division, Port of Seattle, April, 1994).

An individual household or business observes the decline in the value of land directly impacted by SEA-TAC and makes rational decisions that will maximize its household welfare or business income. From the perspective of the community however, the result of these individual decision is (a) an increase in single family residential rentals and the development multi-family rental properties; (b) a shift in a community's population from primarily stable home owners to a mix of stable home owners and more transient renters, and (c) the growth of business activity whose market is the more transient rental population. These land use and demographic changes (indirect impacts) produce significant induced impacts and costs for the communities immediately surrounding SEA-TAC.

2.3 INDUCED ADVERSE SOCIO-ECONOMIC IMPACTS

Induced adverse impacts of commercial airports on surrounding communities are measured by the both (a) any costs associated with community service requirements and (b) any declines in a community's property tax base produced by altered demographic and business profiles that result from the airport's indirect (land use) impacts.

The manner in which SEA-TAC's induced impacts can result in a fiscal squeeze (increased service requirement costs and reduced property tax revenues) on local jurisdictions is illustrated by the Highline School District. SEA-TAC's direct and indirect impacts produced lower relative land values, increased rental properties and changed the District's population profile to include more transient (i.e.: renter) households with lower incomes.[9] The children of the lower income renter households, on average, require a higher level of service from the district's schools to achieve the same outcome – whether outcomes are measured in Washington's uniform test scores, percent of high school graduates continuing on to higher education, SAT scores of high school seniors, or any other generally recognized measure of academic performance. At the same time the District experiences these increased service requirements and incurs the cost increases of providing additional service to achieve constant school outcomes, its tax base is reduced because of the decline in relative land values caused by the airport.

[9] The close association between higher/lower income households and owner/renter occupancy status is documented in the report by: Thomas/Lane Associates, Phillips Associates, & Raj Joshi Associates, *Washington Housing Needs Study* (Department of Community Development, 1986).

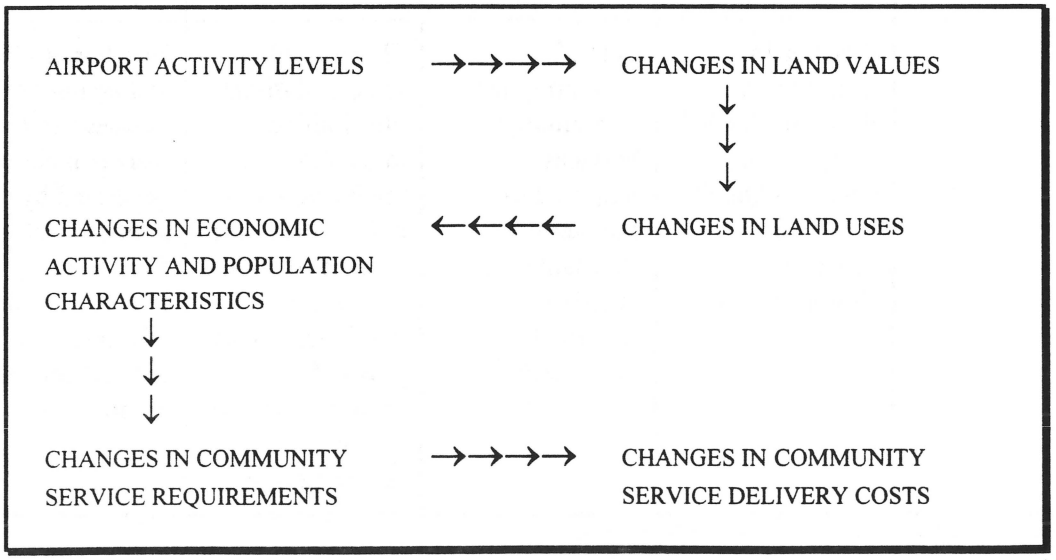
A similar pattern of causality exists between SEA-TAC's direct and indirect impacts and its induced impacts (as measured by their costs) on public safety, child care, senior centers and other types of community services.

2.4 TOTAL SOCIO-ECONOMIC ADVERSE IMPACTS

SEA-TAC's total socio-economic impacts are the sum of it direct, indirect and induced socio-economics. This is true equally for the airport's beneficial and adverse impacts. The requirement for mitigation of adverse socio-economic impacts occurs when the airport's adverse impacts are greater than its beneficial impacts. In a global context, the relationship between SEA-TAC's total socio-economic beneficial impacts and adverse impacts is theoretically analogous to a socio-economic benefit/cost analysis. Analyzing socio-economic mitigation requirements however, involves a partial analysis of socio-economic impacts that is community specific. SEA-TAC's total benefits may exceed its total costs, but (as discussed in Chapter 1) its benefits are widely distributed over the multi-county central Puget Sound region while its adverse impacts are concentrated in communities immediately surrounding the airport. From the perspective of these communities, the SEA-TAC's adverse impacts far exceed its benefits; and the difference between the two represents the appropriate level of socio-economic mitigation required.

The sequence of causally linked steps that generate adverse socio-economic impacts for a community is illustrated in Figure 2-1:

Figure 2-1
Adverse Socio-Economic Causality



The relationship between direct, indirect and induced socio-economic beneficial and adverse impacts is shown in Table 2-1, below.

Table 2-1
Definition & Measurement of Airport Impacts

TYPE OF IMPACT	ADVERSE IMPACT		BENEFICIAL IMPACT	
	DEFINITION	MEASUREMENT	DEFINITION	MEASUREMENT
Direct	Blighting of land in immediate proximity of the airport's approach/ departure tracks	Decreases in value of residential land immediately surrounding airport over what it would have been if there was no airport	Economic activity occurring at the airport that would not have occurred in the absence of the airport and time saving to travelers who use airport	Number of jobs and amount of business and worker income generated at the airport
Indirect	Changes in land uses immediately surrounding airport	Down scaling of socio-economic characteristics of both businesses and population groups in communities immediately surrounding airport	Off-airport economic activity among companies that are users of, or closely linked to, aviation transportation services that would not have occurred in the absence of the airport	Number of jobs and amount of business and worker income generated by companies that are users of or are closely linked to aviation transportation services
Induced	Increase in Community Services Needed to Maintain Constant Quality of Life in Impacted Communities	Cost of Delivering the Community Services Required to Maintain Constant Quality of Life in Impacted Communities	The multiplier effects of direct plus indirect impacts – i.e., the increases in employment and income (over and above the combined direct plus indirect impacts) created by successive spending rounds	Number of jobs and amount of business and worker income generated by multiplier effects from inter-industry linkages of direct and indirect impact companies

Source: TLA & FAA Document DOT/FAA/PP-92-6

2.5 BALANCING SOCIO-ECONOMIC COSTS & BENEFITS

It is widely recognized that airports generate a range of socio-economic impacts[10]. Some adversely impact the quality of life in communities – primarily communities immediately surrounding the airport which suffer the air pollution, visual pollution, noise pollution and surface traffic congestion produced by airport operations. Others beneficially impact the quality of life of communities in the region – primarily communities where jobs, income and business activity are created and where local residents frequently use air transportation services.

As is true with all airports, SEA-TAC's socio-economic impacts are not distributed uniformly over the region, nor are the benefits and costs associated with its impacts distributed proportionately among communities. An analysis of appropriate mitigation consequently requires a community by community assessment of the airport's adverse and beneficial socio-economic impacts, as they were defined and discussed in this chapter.

[10] For example, FAA Advisory Circular AC 150/5020-1, *Noise Control & Compatibility Planning for Airports*, states, " Many [environmental assessments] contain analyses of airport noise, compatible land use, social impacts, and induced socioeconomic impacts" (pg. 6). Section 6 of the document, Analysis of Costs and Benefits and Selection of an Alternative, states, "Evaluation of the social costs and benefits of the alternatives is of equal importance with those of economics and the environment" (pg. 42).

Chapter 3

Analysis of EIS's *No Action* Assumption And The Identification of Airport Activity Levels Likely To Result In Future Land Value Changes

3.0 INTRODUCTION

The *Airport Master Plan Update for Seattle-Tacoma International Airport* was completed in 1996[1], and its findings and forecasts are the basis for Sea-Tac's proposed expansion, including construction of the third runway. The *Airport Master Plan Update* forecasts are also the basis upon which the airport's *Environmental Impact Statement* (EIS) estimated the impact of Sea-Tac's third runway and related capital improvements.

The *Airport Master Plan Update* forecasts were, "prepared as an element of the Airport Master Plan Update to be used to develop airport facilities requirements and to estimate the timeframes when future improvements are needed."[2] The objective of the *Master Plan Update* forecasts was:

> "to develop updated master plan forecasts which can account for a range of potential future airport scenarios and provide a sound basis for guiding the development of future facility improvements at the airport. Accordingly, the forecasts ... are planning level estimates and are not intended to be exact predictions."[3]

The approach to, and purpose of, forecasting contained in the Master Plan Update is consistent with FAA guidelines, which state:

> "The purpose of aviation forecasts is to indicate the relative timing for airport investments in a manner that minimizes forecast error costs. The idea is to forecast the different elements of aviation demand, compare that demand over

[1] P&D Aviation, *Technical Report No. 8, Master Plan Update Final Report* (Port of Seattle, January, 1996)
[2] P&D Aviation, *Technical Report No. 5, Final Forecast Report (Port of Seattle, August 30, 1994) page 5-1.*
[3] Op. Cit.

> time with the *capacity* [emphasis added] of an airport's various facilities, and to identify the time when new or expanded airport facilities may be necessary."[4]

However, when using the *Airport Master Plan Update* forecasts that were the basis for recommended facilities expansions at the airport, the *Sea-Tac Master Plan Update Final EIS* states:

> "if the proposed *new runway and other facility improvements* [emphasis added] are not constructed, the growth in demand for air travel would continue to occur as would the number of aircraft operations, because it is expected that the Region will continue to experience growth in population and income" ... and that "*it is reasonable to assume for purposes of this environmental analysis* [emphasis added] that the same number of operations would occur with and without the proposed new runway."[5]

A disjunction exists consequently between the objective for which the Sea-Tac forecast was made and purpose to which it was put in the EIS. The *Master Plan Update* generated a forecast, compared it with Sea-Tac's existing facilities and determined the airport's facilities needed expansion. The EIS used the same forecast and assumed it would occur without any facilities being expanded at the airport. The result of the EIS's *assumption* is that the third runway causes no socio-economic impacts since the same level of passenger enplanements, aircraft operations and cargo movements occurs whether or not facilities at the airport are expanded.

This chapter evaluates the reasonableness of the EIS's assumption that passenger enplanements, aircraft operations and cargo movements at Sea-Tac will be unaffected by whether or not any facilities – including the third runway – are expanded/constructed over the twenty-five year period, 1995 and 2020. It also proposes a more likely scenario of the relationship between facilities expansion and aviation activity at the airport.

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[4] Federal Aviation Administration, Airport Master Plans (Advisory Circular No. 150/5070-6A, U.S. DOT, FAA), page 22.
[5] Volume 4, Appendix R, page R-5

3.1 THE MASTER PLAN UPDATE FORECAST

The final Sea-Tac *Airport Master Plan Update* forecast report (vol. 5) projects the demand for aircraft operations (landings and take-offs) to grow as follows (estimated in thousands of operations):

Table 3-1
Aircraft Operations Forecast

	1993 [actual]	2000	2010	2020	Change 1993-2020
Air Carriers	188	223	255	287	99
Air Taxis/Commuters	127	127	118	117	- 10
All-Cargo Carriers	16	20	23	27	11
GA & Military	8	9	10	11	3
TOTAL	**339**	**379**	**406**	**442**	**103**

Airport Master Plan Update Volume 5, Table 5-15

The *Airport Master Plan Update* report also forecasts the mix of aircraft flying into Sea-Tac will contain larger aircraft than are in use today, as shown in the following table:

Table 3-2
Forecast of Aircraft Mix Flying Into Sea-Tac

	1993 [actual]	2000	2010	2020	Change 1993-2020
Average Seats Per Air Carrier Aircraft	155	169	189	209	54
Average Seats Per Air Taxi/Commuter Aircraft	28	31	36	36	8
% of All-Cargo Carriers Over 60 Thousand Pounds	64%	69%	75%	80%	16%

Airport Master Plan Update Volume 5, Table 5-18

The demand forecast for carrier/commuter operations and for the use of larger aircraft results from the following forecast of passenger enplanement demand, 96 percent of which comes from persons enplaning domestic air carriers flying in and out of Sea-Tac.:

Table 3-3
Forecast of Enplaning Passengers
(000s)

	1993 [actual]	2000	2010	2020	Change 1993-2020
Domestic Air Carriers	8,100	10,100	13,000	16,300	8,200
Domestic Air Taxis/Commuters	600	700	800	900	300
Enplanements To Canada	400	600	900	1,100	700
Other International Enplanements	300	500	600	800	500
TOTAL	**9,400**	**11,900**	**15,300**	**19,100**	**9,700**

Airport Master Plan Update Volume 5, Table 5-8

Based on the above forecasts, the *Airport Master Plan Update* report proposes numerous facilities improvements, including the following:

- a new 8,500 foot runway (the so-called third runway, or runway 16X-34X)
- a mid-field overnight parking apron between runways 16R-34L and 16X-34X
- limited expansion of 4-6 gates on Concourse A and the Main Terminal, including expansion of the Central Parking Garage
- development of a [new] north unit terminal
- development of a cargo warehouse
- construction of a new Air Traffic Control Tower and TRACON
- installation of a CAT III ILS on runway 16L
- extension of duel parallel taxiways A and B the full length of runway 16L-34R and a taxiway bridge over 188th Avenue South
- extension of runway 34R by 600 feet and relocation of the glideslope

The *Airport Master Plan Update* report finds operations levels to reach the airport's capacity about the year 2000, and therefore recommends that the third runway and the expansion of the Main Terminal at Concourse A be completed between the years 2001 and 2005, with additional facilities expansions occurring between 2005 and 2020.

3.2 OTHER AVIATION FORECASTS OF SEA-TAC'S CAPACITY

A report titled, *Air Transportation Demand, Aviation Industry Trends, and Air Capacity in Washington Through 2020*, was prepared for the Washington State Air Transportation Commission (AIRTRACT) in 1992. It calculated the service capacity (or Annual Service Volume [ASV]) of Washington airports and reported, "With 1991 operations at 365,000, Sea-Tac is close to capacity. According to the base forecasts, the ASV calculation of 380,000 operations will be reached between 1992 and 1993."[6]

The Final Report of the Puget Sound Council of Government's (jointly with the Port of Seattle) Puget Sound Air Transportation Committee also placed Sea-Tac's annual operating capacity at 380,000 operations.[7]

A study titled, *Phase I Forecasts: Flight Plan Study*, conducted by KPMG Peat Marwick for the Port of Seattle and the Puget Sound Conference of Governments in 1990 found that its forecast of 427,000 operations for the year 2000, assuming no changes in Sea-Tac's runways and facilities, would mean that, "annual average aircraft delays would approximate 10 minutes per aircraft operation. .... Average delays on the order of 10 minutes are experienced at the most congested airports in the United States, such as Chicago O'Hare International Airport, LaGuardia Airport, and Washington National Airport."[8] All three of which are so-called "slot controlled" airports where the FAA prohibits any increase in total operations.

In 1992, P&D Aviation (the same consulting organization that prepared the *Airport Master Plan Update* for Sea-Tac) wrote a "Working Paper" for the Port of Seattle titled, *Analysis of Maximum Passenger Limits at Sea-Tac Airport Under the No New Runway Alternative*. The report "estimated that the maximum acceptable delay would be an average of 22 minutes per aircraft operation,"[9] and it analyzed both non-structural methods by which the airport could increase

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[6] TRA Consulting, Air Transportation Demand, Aviation Industry Trends, and Air Capacity in Washington Through 2020 (AIRTRAC, October, 1992), page 5-11.

[7] Puget Sound Air Transportation Committee, *The Flight Plan Project: Draft Final Report and Technical Appendices* (Puget Sound Council of Governments & the Port of Seattle, January, 1992).

[8] KPMG, Peat Marwick, Phase I Forecasts: Flight Plan Study (Port of Seattle and Puget Sound Council of Governments, July, 1990), page ES-17.

[9] P&D Aviation, *Analysis of Maximum Passenger Limits at Sea-Tac Airport Under the No New Runway Alternative* (Draft Working Paper prepared for the Port of Seattle, May 19, 1992) page 1.

capacity and the likely airline response to increased delays. It concluded that the airport would reach capacity somewhere between 2010 and 2012, but also concluded, "obviously an average delay of 22 minutes per operation would be a significant increase in delay and would have a large impact on airport operations as well as overall passenger service."[10]

Finally, the *Final EIS for the Proposed Master Plan Development Actions* discusses Port of Seattle studies about Sea-Tac's capacity limits and reports that,

> "The inability of existing airfield facilities to accommodate traffic into the 21st century was first recognized in the mid-1980s when the Port completed the Comprehensive Planning Review & Airspace Update Study. The purpose of the study was to assess the validity of previous plans developed for Sea-Tac in light of air travel growth and other changing conditions at the Airport. While previous plans had not indicated a need for new runway capacity, this new study showed that the existing runway system would not be capable of serving the increased demand past the year 2000."[11]

All past studies, including the *Master Plan Update* study, conclude Sea-Tac's existing facilities cannot accommodate the operations, enplanements and cargo demands forecast for the year 2020. Construction of the third runway, and related airport improvements, are a necessary condition for expansion of airport activity to the 2020 forecast levels.

In the absence of the third runway, and related airport improvements, the number of annual operations contained in the forecast will not be reached. Airlines will raise fares for flights originating/departing Sea-Tac, shift flights to other airports in the region, discontinue short haul commuter operations and concentrate on long haul flights into/out-of Sea-Tac, or take other actions compatible with delay reduction and higher profit margins. If the average time delay per arriving flight forecast if the third runway, and its related facilities improvements, are not built occurs, there will be some reduction in use initiated by airlines flying into Sea-Tac, passengers using the airport, or both.

[10] Op. Cit., page 5.
[11] Port of Seattle, et al, *Final Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport* (February, 1996), page I-2.

While a full, detailed investigation of the relationship between airport expansions and the growth of airport activity is beyond the scope of the current work effort, a review of available data on major airports in the United States indicates that there are no cases of a major airport more than doubling its number of operations and enplanements and growing continuously over a period of 45 years without having major expansions in its "airside" and "landside" facilities. Yet this is scenario assumed in the EIS since the last major facility expansion at Sea-Tac was completed in 1975.

Whether looked at analytically or empirically, consequently, the probability that there will be no reduction in Sea-Tac activity levels whether or not the third runway, and related facilities, are built is so low that it cannot be taken seriously.

3.3 SEA-TAC'S LIKELY CAPACITY LIMITS

Airport capacity and airport delay are closely related concepts. As discussed by the FAA in its Advisory Circular, *Airport Capacity and Delay*,

> "As demand approaches capacity, individual aircraft delay is increased. Successive hourly demands exceeding the hourly capacity result in unacceptable delays. When the hourly demand is less than the hourly capacity, aircraft delays will still occur if the demand within a portion of the time interval exceeds the capacity during that interval. Because the magnitude and scheduling of user demand is relatively unconstrained, reductions in aircraft delay can best be achieved through asirport improvements which increase capacity."[12]

The concept of Airport Capacity is usually defined in technical literature to be the maximum number of aircraft operations that can be accommodated on an airport in an hour. An airport's Annual Service Volume (ASV) is an estimate of the airport's annual service volume. At any airport, the ASV is a function of the runway-use configuration, percent arrivals, percent touch-and go's, taxiways, airspace limitations, runway instrumentation, and weather conditions. Most of the analyses referred to earlier in this chapter, and using standard, FAA recommended modeling procedures estimate the Sea-Tac's ASV at approximately 380 thousand operations.

Annual operation levels will be effected by year-o-year weather fluctuation, changes in air traffic control (ATC) procedures that affect airspace limitations, and other factors. As the ASV level after which airport improvements are required if future demand levels are to be accommodated, 380 thousand operations is Sea-Tac's consensus threshold. As shown in Table 3-4, Sea-Tac is forecast to reach 379.2 thousand operations in the year 2000, effectively bumping up against its threshold ASV of 380 thousand operations.

As shown in Table 3-4, Sea-Tac is forecast to increase aircraft operations by 62.4 thousand (16.5 percent) after the year 2000. Passenger enplanements are forecast to increase by 7.7 million (67.5 percent) after the year 2000. Cargo movements are forecast to increase by 370.0 metric tons (72.5 percent) after the year 2000. These increases occur after Sea-Tac reaches its current ASV, and they occur because the airport accommodates its forecasted demand levels by building the third runway, and related airport improvements. These activity levels will not occur at Sea-Tac without construction of the third runway, and related improvements. The consequences of the growth of operations, enplanements and cargo movements after Sea-Tac reaches its threshold ASV of 380 thousand in the year 2020, are the socio-economic impacts that require mitigation.

Table 3-4
Forecast of Operations, Enplanements and Cargo

	1993 (actual)	2000	2010	2020
Aircraft Operations (000s)	339.5	379.2	405.8	441.6
Change in Aircraft Operations		39.7	26.6	35.8
Cumulative Change		39.7	66.3	102.1
Cumulative Change After Year 2020			26.6	62.4
Enplaned Passengers (000s)	9,400.0	11,400.0	15,300.0	19,100.0
Change in Enplaned Passengers		2,000.0	3,900.0	3,800.0
Cumulative Change		2,000.0	5,900.0	9,700.0
Cumulative Change After Year 2020			3,900.0	7,700.0
Air Cargo Tons (000s metric tons)	381.0	510.0	680.0	880.0
Change in Air Cargo Tons		129.0	170.0	200.0
Cumulative Change		129.0	299.0	499.0
Cumulative Change After Year 2020			170.0	370.0

Source: Tables 5-8, 5-11 and 5-15, *Final Forecast Report: Airport Master Plan Update*

[12] FAA, Airport capacity and Delay (Departmnet of Transportation, FAA AC 150/5060-5, September 23, 1983), page 4.

Chapter 4
Expected Changes in Land Values, Land Uses, Home Ownership Tenure, Local Government Revenue & Social Service Needs Resulting from Construction of the Third Runway, and Related Facilities

4.0 INTRODUCTION

Aircraft operations at Seattle-Tacoma International Airport impact the value of close-by properties in two ways. First, the airport's operations depress property values below the level that real estate markets would produce if the airport did not exist. If a single family residential house located in, for example, Burien could be physically transported to an identical location on an identical lot in another part of King County, its value would be increased, and the amount of its increase is the depression in value caused by proximity to the airport. The first section of this Chapter estimates the average loss in value of real estate locate in close proximity to Sea-Tac by comparing a large sample of comparable single family housing units in Northwest and Southwest King County holding constant the non-airport factors that also influence real estate values.

A second way in which Sea-Tac operations impact the value of real estate is in the variation in value among properties caused by their proximity to the flight paths of arriving and departing aircraft. Such changes are the "shadow" affects (noise pollution, visual pollution, possible air quality pollution, and a generally degraded environment for human habitat) caused by living under low flying aircraft. The second section of this chapter uses a statistical technique known as *regression analysis* to estimate Sea-Tac's shadow affects by measuring the difference in value of a property, holding other things the same, when it is located at different distances from directly under one of Sea-Tac's arrival/departure flight paths.

The final two sections of the Chapter estimate the changes in land use produced by the airport-induced depression in adjacent land values, and the alteration in the demographic profile of persons living in jurisdictions where depressed land values result in altered land uses.

It is important to remember that the following analysis addresses the issue of depressed but not declining land values. All parts of the Puget Sound Region (PSR) have experience population growth in the recent past. The entire PSR is expected to experience rates of population growth

above the national average in the foreseeable future. This means the PSR is expected to have significant net in-migration. As a result, average real estate values in the region will undoubtedly rise. Real estate located in close proximity to the airport will participate in these growth trends and will also experience rising land values. Because of the airport, however, the rate of appreciation in the value of close-by real estate will be less than it otherwise would have been. The correct measure of the airport induced depression in land values, consequently, is the price difference between comparable properties located close too and distant from the airport – neither a simple calculation of whether or not property values have increased nor a comparison of properties inside or outside any specific L_{dn} contour line provides an appropriate basis for comparison. The balance of this chapter addresses methods by which Sea-Tac's socio-economic impacts can be quantitatively estimated.

4.1 AIRPORT IMPACTS ON AVERAGE PROPERTY VALUES

The impact of proximity to the airport was evaluated using average property values for comparable housing units in ten Census Tracts in SW King County immediately around Sea-Tac and ten Census Tracts in NW King County – the area that generally conforms to the City of Shoreline.

NW King County was chosen for comparison based on the following criteria:

- The Census Tracts are all located in King County and are equally affected by county and state land use and development policies;
- The Census Tracts are all bordered by Puget Sound to the west and Lake Washington to the east;
- Both clusters of Census Tracts contain commercial areas bordering Highway 99, and both have a mix of residential areas ranging from low/moderate income to high/upper income;
- Both clusters of Census Tracts contain racially and ethnically diverse populations.

The cluster of ten Census Tracts around the airport contained 17,046 housing units in 1990,of which 11,526 (67.6 percent) were single family. The cluster of ten Census Tracts in NW King

County contained 19,523 housing units in 1990, of which 12,683 (65.0 percent) were single family.

The following parameters were used to screen housing units in the two clusters of Census Tracts for comparability:

- Only units rated as being in "Very Good" condition by the King County Assessors office were included;
- All units with a "View" were excluded;
- All Units were in "Single Family" zoned areas and were classified as single family land uses
- All units had an above ground structure of 1,000 square feet or more;
- All units were located on lots of between 10,000 and 14,999 square feet;
- All units had three or more bedrooms;
- All units had two or more bathrooms.

These screening criteria excluded the top and the bottom of the distribution of housing units in both areas and resulted in a total of 739 of the 11, 526 single family properties (6.4 percent) in the ten Census Tracts around the airport (SW King County) and 760 of the 12,683 single family properties (6.0 percent) in ten Census Tracts in NW King County being used for comparison of real estate values. Summary statistics from the King County Assessors Office for these units are contained in Table 4-1.

The two groups of properties compared closely in terms of their physical attributes. The difference in average lot size between the SW and NW King County properties was 3.3 percent. The difference in size of structure was 2.0 percent, in number of bedrooms 1.4 percent, and in number of baths 0.6 percent. In terms of values however the differences were more pronounced. Average assessed value of land was 14.1 percent lower in NW King County than it was in areas immediately surrounding the airport, and assessed value of structures was 7.7 percent lower. The assessed value of land and structures combined was 10.1 percent lower.

Table 4-1
Comparison of Housing Units in NW and SW King County

	SW Mean Values	NW Mean Values	Difference [SW-NW]	Percent Difference
Lot Size (sq. ft.)	11,914	11,522	392	3.3%
Above Ground Structure Size (sq. ft.)	1,538	1,507	(31)	-2.0%
Number Bedrooms	3.6	3.6	(0)	-1.4%
Number Bathrooms	2.0	2.0	0	0.6%
Assessed Value of Land	$ 52,734	$ 60,181	$ (7,447)	-14.1%
Assessed Value of Structure	$ 88,703	$ 95,550	$ (6,847)	-7.7%
Total Assessed Value	$ 141,438	$ 155,731	$ (14,294)	-10.1%

Source: TLA and King County Assessors Office

Standardized for view, condition of structure, size of structure, lot size, number of bedrooms, number of baths, zoning, land use, County/State development policies, and similarity of neighborhoods, a housing unit selling for $141,400 in the immediate vicinity of the airport would sell for $155,700 – or $14,300 (10.1 percent) more – if it were located elsewhere. The average difference of 10.1 percent in the assessed value of real estate (property plus structure) when all other factors are adjusted for is attributable to the impact of low flying aircraft in the immediate vicinity of Sea-Tac. The resulting depression of property values as of 1993, taking account of community differences is shown in Table 4-2.

Table 4-2
Estimated Average Depression in Single family Residential Property Values, by Community, 1993

	Actual Average Assessed Value of Housing Unit	Estimated Assessed Value Without Airport	Difference
Burien	$ 129,900	$ 143,000	$ (13,100)
Des Moines	$ 136,100	$ 149,800	$ (13,700)
Federal Way	$ 142,900	$ 157,300	$ (14,400)
Normandy Park	$ 173,600	$ 191,100	$ (17,500)
Tukwila	$ 122,400	$ 134,800	$ (12,400)

Source: TLA

Between 1993 and the year 2000, operations at Sea-Tac are forecast to increase by 39.7 thousand, or 11.7 percent. Between the years 2000 and 2020, operations are forecast to increase by an additional 62.4 thousand, or 16.5 percent. Applying these same rates of change to the estimated 1993 difference in single family residential property values caused by aircraft operation at Sea-Tac produces the depressed values shown in Table 4-2. The next to the last column of Table 4-2 contains the expected loss of value for the average single family residential housing unit between the years 2000 and 2020. The last column shows the average yearly loss of value experienced over the entire 10-year period 2000 through 2020. This loss of value occurs after Sea-Tac would have reached its ASV capacity limit had the third runway, and related facility improvements, not been built. It consequently represents the loss of value per single family residential housing unit attributable the third runway's, and related facility improvement's, construction.

Table 4-3
Forecast of Average Depression in Single Family Residential Property Values Caused by Aircraft Operations at Sea-Tac

	1993	2000	2020	Change 2000 - 2020	Average Change Per Year 2000 - 2020
Burien	$ (13,100)	$ (29,822)	$ (43,913)	$ (14,091)	$ (6,951)
Des Moines	$ (13,700)	$ (31,217)	$ (45,978)	$ (14,761)	$ (7,282)
Federal Way	$ (14,400)	$ (32,794)	$ (48,294)	$ (15,500)	$ (7,646)
Normandy Park	$ (17,500)	$ (39,847)	$ (58,677)	$ (18,830)	$ (9,289)
Tukwila	$ (12,400)	$ (28,163)	$ (41,446)	$ (13,283)	$ (6,553)

SOURCE: TLA

4.2 FLIGHT TRACT IMPACTS ON AVERAGE PROPERTY VALUES

The impact on a parcel's value of its location under, or in close proximity to, the approach/departure flight track of aircraft operating at Sea-Tac was estimated using the linear regression model:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10}$$

where:

y = assessed value of land and structures
X_1 = lot size (sq. ft.)
X_2 = structure size (sq. ft.)
X_3 = number of bedrooms
X_4 = number of baths
X_5 = distance from center of a jet flight track (east of runway 16/34R or west of runway 16/34L), measured in tenths of a mile.
X_6 = a binary variable representing the City of Des Moines
X_7 = a binary variable representing the City of Normandy Park
X_8 = a binary variable representing the City of Seatac
X_9 = a binary variable representing Unincorporated King County
X_{10} = a binary variable representing the City of Tukwila

The model[1] used to calculate the relative decline in property values caused by proximity to a jet aircraft flight track was estimated from Assessors data on 3,026 properties in ten Census Tracts[2] in the immediate vicinity of the airport. The regression coefficient (adjusted R^2) was 0.65.[3] All of the independent variables in the model were statistically significant at the 90 percent level and seven were statistically significant at the 99 percent level. The variable measuring a property's distance from a flight track was significant at the 99 percent level.

The coefficient on the variable for distance from a jet aircraft flight track was 17,784, meaning that, all other things remaining equal, the value of a house and lot increases by about 3.4 percent ($4,450 on the average valued house of $129,900) for every quarter of a mile the house is farther away from being directly underneath the flight track of departing/approaching jet aircraft. This relationship is shown in Table 4-3 and illustrated in Figure 4-1.

[1] The model initially contained variables for the Cities of Federal Way and Kent, but these places had too few cases to be meaningful and were dropped from the final model. The distance from each parcel to the center of the airport was also initially used as a variable but its coefficient was not statistically significant and it was also dropped from the final model.

[2] The following housing units were excluded in estimating the regression model: [a] units with fewer than three bedrooms, [b] units whose condition was less than "good" or "very good"; [c] units with a view; [d] units not in single family residential zoned areas

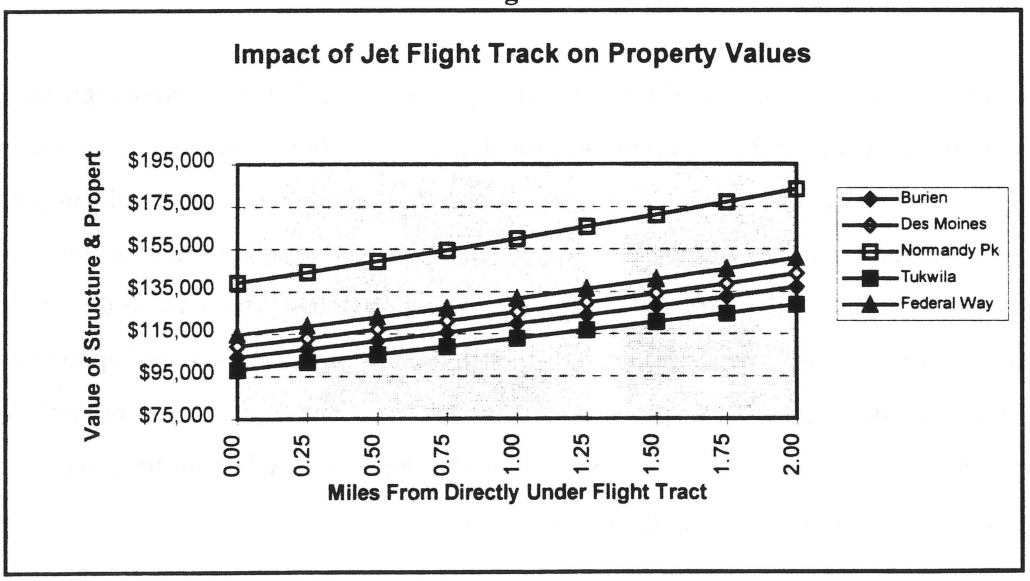
[3] The ratio of the regression's standard error to the standard deviation of the dependent variable was 0.59. The log likelihood ratio was -35,379; and the F Statistic was 566. The Durbin-Watson statistic was 1.44.

Table 4-3
Model Estimated Impact of Jet Flight Track on Average Property Values

	Average Value Structure & Property, By Community				
Miles From Center of Flight Track	Burien	Des Moines	Federal Way	Normandy Park	Tukwila
0.00	$104,151	$109,122	$114,574	$139,189	$ 98,138
0.25	$107,843	$112,990	$118,636	$144,123	$101,617
0.50	$111,666	$116,996	$122,841	$149,232	$105,219
0.75	$115,625	$121,143	$127,196	$154,522	$108,949
1.00	$119,724	$125,438	$131,705	$160,000	$112,811
1.25	$123,822	$129,732	$136,214	$165,478	$116,673
1.50	$128,062	$134,174	$140,878	$171,143	$120,668
1.75	$132,446	$138,767	$145,701	$177,002	$124,799
2.00	$136,980	$143,518	$150,689	$183,062	$129,072

Source: TLA

Figure 4-1



4.3 OPERATIONS IMPACTS ON RESIDENTIAL PROPERTY TAX REVENUES

The *Sea-Tac Master Plan Update Final EIS*'s estimate of reduced residential property tax revenues caused by construction of the third runway, and related facility improvements, is shown in Table 4-4. The only cause of reduced revenues identified in the *Final EIS* is the acquisition of property now on the tax tolls of the Cities of Burien and Seat-Tac. The EIS assumes there will be no impact on land located in the immediate vicinity of the airport or under the flight tract of the airport's increased traffic volumes. In other words, the *Final EIS* assumes that unless land is acquired, it will not be affected.

Table 4-4
EIS Estimate of Third Runway Induced Decline in Residential Property Tax Revenues

Jurisdiction	Property Tax Rate Per $1,000 Assessed Value	Reduction in Residential Property Tax Revenues
City of Burien	$ 3.00838	$ 45,867
City of Sea-Tac	$ 3.02811	$ 181,687
TOTAL		$ 227,554

Source: Sea-Tac Master Plan Update Final EIS, page IV.8-12.

As discussed earlier, construction of the third runway, and related facilities improvements, will allow aircraft operations at the airport to increase after the year 2000 – when it reaches its ASV capacity limit – by 62,400, or over 16 percent. A statistical analysis of comparable properties in King County demonstrates that these increased operations will (a) on average, depress all property values around the airport below levels they would have had if the aircraft didn't expand, and (b) specifically, cause a depression of value for properties directly under, and up to two miles on either side of, jet aircraft approach/departures tracks. The depression of property values below the market levels that would otherwise occur also depresses the flow of property tax revenues to local, county, special purpose, and state governments.

The methodology used to estimate the reduction in single family residential property tax revenues resulting from airport impacts that l depress property values is as follows. The number

of single family residential housing units in each impacted community was multiplied by the average loss

Table 4-5
Single Family Residential Property Tax Revenue Losses by Housing Units in Immediate Proximity of the Airport

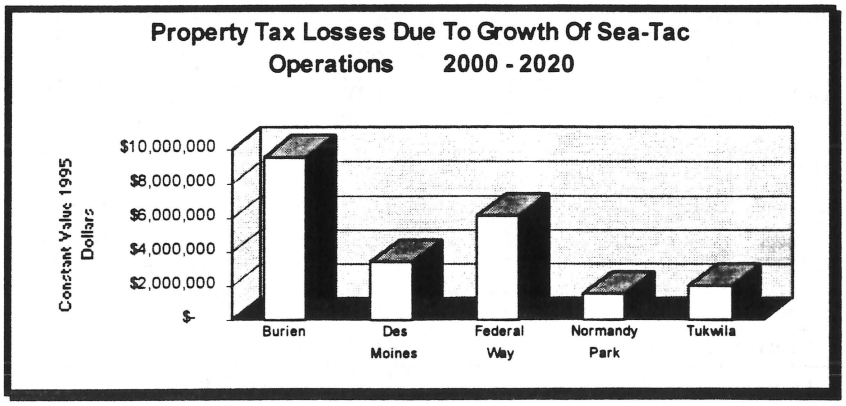
	Forecast Year		
	2000	**2010**	**2020**
Burien			
Number of Housing Units (HUs)	15,890	17,890	19,890
Average Loss of Value Per HU	$ (6,951)	$ (6,951)	$ (6,951)
Estimated Total Loss of Value	$ (120,881,357)	$ (155,637,354)	$ (190,393,350)
City Property Tax Levy Rate	0.00300969	0.00300969	0.00300969
Yearly Revenue Loss	$ (363,815)	$ (468,420)	$ (573,025)
Cumulative Revenue Loss	$ (363,815)	$ (4,213,480)	$ (9,473,009)
Des Moines			-
Number of Housing Units (HUs)	5,179	6,179	7,179
Average Loss of Value Per HU	$ (7,282)	$ (7,282)	$ (7,282)
Estimated Total Loss of Value	$ (37,712,162)	$ (44,993,908)	$ (52,275,654)
Property Tax Levy Rate	$ 0.00374534	$ 0.00374534	$ 0.00374534
Yearly Revenue Loss	$ (141,245)	$ (154,881)	$ (195,790)
Cumulative Revenue Loss	$ (141,245)	$ (747,133)	$ (3,397,622)
Federal Way			-
Number of Housing Units (HUs)	10,992	12,392	13,792
Average Loss of Value Per HU	$ (7,646)	$ (7,646)	$ (7,646)
Estimated Total Loss of Value	$ (84,048,585)	$ (94,753,432)	$ (105,458,279)
Property Tax Levy Rate	0.00323195	0.00323195	0.00323195
Yearly Revenue Loss	$ (271,641)	$ (306,238)	$ (340,836)
Cumulative Revenue Loss	$ (271,641)	$ (2,906,695)	$ (6,159,365)
Normandy Park			-
Number of Housing Units (HUs)	2,417	2,577	2,737
Average Loss of Value Per HU	$ (9,289)	$ (9,289)	$ (9,289)
Estimated Total Loss of Value	$ (22,452,311)	$ (23,938,604)	$ (25,424,896)
Property Tax Levy Rate	0.00310000	0.00310000	0.00310000
Yearly Revenue Loss	$ (69,602)	$ (74,210)	$ (78,817)
Cumulative Revenue Loss	$ (69,602)	$ (721,363)	$ (1,488,801)
Tukwila			-
Number of Housing Units (HUs)	3,666	4,866	6,066
Average Loss of Value Per HU	$ (6,553)	$ (6,553)	$ (6,553)
Estimated Total Loss of Value	$ (24,021,828)	$ (31,884,947)	$ (39,748,066)
Property Tax Levy Rate	0.00310000	0.00310000	0.00310000
Yearly Revenue Loss	$ (74,468)	$ (98,843)	$ (123,219)
Cumulative Revenue Loss	$ (74,468)	$ (878,743)	$ (2,001,242)
Yearly Revenue Loss - All Cities	**$ (920,771)**	**$ (1,116,229)**	**$ (1,311,687)**
Cum. Revenue Loss - All Cities	**$ (920,771)**	**$ (10,282,729)**	**$ (22,520,039)**

Source: OFM, King County Assessor's Office, TLA

(depression) of value per unit for each community between the years 2000 and 2020 to estimate the aggregate loss of property value. Each city's total levy rate (regular, including) was than multiplied by its aggregate loss of property value to estimate its loss of single family residential property taxes. The number of single family housing units in each city was obtained from OFM's Forecasting Division. The average yearly increase in each city's single family residential housing units between 1990 and 1995 was used to trend forward its stock of single family housing. Levy rates for each city were obtained from the King County Assessors Office's Accounting Division. The estimated property value loss by community for the years 2000, 2010 and 2020 and the cumulative property losses between 2000 and 2020 are shown in Table 4-5.

In the year 2000, when the number of aircraft operations at Sea-Tac will increase as a result of construction of the third runway, and related facilities improvements, the five impacted cities will experience depressed property values for single family residential housing units estimated at approximately $0.9 million dollars. As Sea-Tac operations increase, the depression of property values in the impacted communities will grow each year, reaching $1.3 million dollars in the year 2020. Over the 20-year period, 2000 through 2020, the cumulative loss of property tax revenues in the five impacted cities is estimated at approximately $22.5 million (expressed in constant value 1995 dollars), distributed among the cities as follows: Burien - $9.47 million; Des Moines - $3.40 million; Federal Way - $6.16 million; Normandy Park - $1.49 million; and Tukwila - $2.00 million. Cumulative single family residential property tax revenue losses, by city, are illustrated in Figure 4-2.

Figure 4-2



4.4 FLIGHT TRACK IMPACTS ON RESIDENTIAL PROPERTY TAX REVENUES

In addition to the loss of value resulting from aircraft operations that will be suffered by all single housing units in immediate proximity to the airport, single family housing units that will be under the flight tack of approaching/departing aircraft using the proposed third runway will suffer additional value losses from having low flying aircraft pass directly overhead. The magnitude of these types of impacts were described and analyzed in Section 4-2, above. The methodology used to estimate the flight track impacts on the property tax revenues of the affected cities was as follows.

Approaches/departures using the third runway will create a flight track approximately half a mile (2,500 feet) to the west of the flight track on existing runway 16/34L. A new set of single family housing units will lie directly under the flight tract (defined as $1/8^{th}$ of a mile on either side) and a new set of units will fall within the quarter mile and half mile bands to the west of the third runway's new flight track. To the south, the affected single family housing units will be in Des Moines, Federal Way and Normandy Park (only the half mile band will impact Normandy Park). To the North, the new third runway flight tract will pass over the City of Burien. The City of Tukwila lies entirely to the east of the airport and will not be impacted by the flight track generated by the third runway.

The linear north-south distance of the new flight track for the third runway was calculated for each of the impacted cities. Each flight tract "impact band" used in the regression model (Section 4-2) was a quarter mile wide. The linear distance of the third runway flight tract over each impacted city multiplied by a quarter mile therefore generated an estimate of the area of each impact band within each city. The average lot size of single family residential housing units used to calibrate the regression model was 12,950 square feet. Using this average lot size produces an estimate of 538 single family housing units for each linear mile of the new flight tract.

Multiplying this estimate times the dollar value of the average annual depression in single family housing units for each city produced the estimated total value reduction in single family residential housing units as a result of the third runway's value loss gradient. Multiplying the loss of value by each city's property tax levy rate produced the estimate of annual property tax revenue loss for each city. The results are summarized in Table 4-6.

Table 4-6
Average Annual Single Family Property Tax Revenue Losses Resulting from the Third Runway's Flight Track Gradient.

	Burien	Des Moines	Federal Way	Normandy Park	Tukwila
Track Miles by Noise Gradient					
0.00 mi	1.28	2.77	1.99	0.00	0.00
0.25 mi	1.28	2.77	1.99	0.00	0.00
0.50 mi	1.28	2.77	1.99	1.14	0.00
SF Housing Units/Track Mile	538	538	538	538	538
New Noise Gradient Affected HU					
0.00 mi	688	1,491	1,070	-	-
0.25 mi	688	1,491	1,070	-	-
0.50 mi	688	1,491	1,070	612	-
Average Prop Value Loss/HU					
0.00 mi	$ 7,515	$ 7,874	$ 8,267	$ 10,043	$ 7,081
0.25 mi	$ 7,782	$ 8,153	$ 8,560	$ 10,399	$ 7,332
0.50 mi	$ 8,057	$ 8,442	$ 8,864	$ 10,768	$ 7,592
Total Value Loss From Gradient					
0.00 mi	$ 5,170,645	$11,737,775	$ 8,848,167	$ -	$ -
0.25 mi	$ 5,353,943	$12,153,876	$ 9,161,832	$ -	$ -
0.50 mi	$ 5,543,738	$12,584,727	$ 9,486,616	$6,585,531	$ -
Total	$16,068,326	$36,476,378	$27,496,615	$6,585,531	$ -
Property Tax Levy Rate	0.00300969	0.00225795	0.00155887	0.0017	0.00321043
Annual Loss of Property Tax Revenues					
0.00 mi	$ 15,562	$ 43,962	$ 28,597	$ 0	$ 0
0.25 mi	$ 16,114	$ 45,520	$ 29,611	$ 0	$ 0
0.50 mi	$ 16,685	$ 47,134	$ 30,660	$ 20,415	$ 0
Total	$ 48,361	$136,616	$ 88,868	$ 11,195	$ 0

Source: TLA

In the five impacted cities combined, tax collections from single family residential units lying directly under or close to the third runway's jet flight tracks will be reduced by $294,260 a year, or $5.89 million over the twenty year period 2000 - 2020 (expressed in constant value 1995 dollars) as a result of depressed property values. The distribution of these cumulative 20-year revenue losses by city are as follows: Burien - $0.97; Des Moines - $2.73; Federal Way - $1.78; Normandy Park - $0.41; Tukwila - $0.00.

4.5 SUMMARY OF IMPACTS ON SINGLE FAMILY RESIDENTIAL PROPERTY TAX REVENUES

The total cumulative reduction in single family property tax revenues during the years 2000 through 2020 caused by construction and operation of the proposed third runway, and related facilities, in the five impacted cities is shown in Table 4-7.

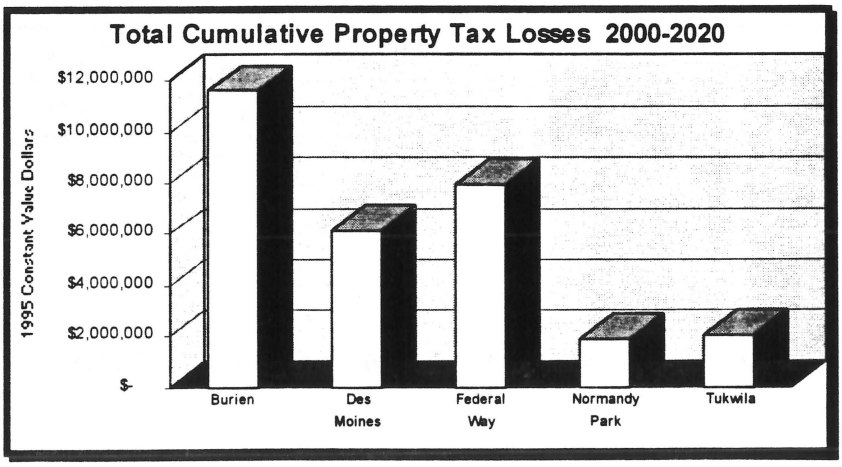
Table 4-7
Total Loss of Single Family Residential Housing Property Tax Revenue Caused by Construction and Operation of the Third Runway, Years 2000 through 2020

	Total Revenue Losses	Land Acquisition Induced Losses	Aircraft Operations Induced Losses	Flight Track Gradient Induced Losses
Burien	$11,586,898	$ 1,146,675	$ 9,473,009	$ 967,214
Des Moines	$ 6,129,951	$ 0	$ 3,397,622	$ 2,732,329
Federal Way	$ 7,936,719	$ 0	$ 6,159,365	$ 1,777,354
Normandy Park	$ 1,897,104	$ 0	$ 1,488,801	$ 408,303
Tukwila	$ 2,001,242	$ 0	$ 2,001,242	$ 0
Combined Total Losses	$29,551,910	$ 1,146,675	$22,520,039	$ 5,885,196

Source: TLA

Over the 20-year period 2000 through 2020, the five impacted communities will suffer a reduction in property tax revenues from single family residential units of $29.55 million, an average annual revenue reduction of $1.48 million (expressed in constant value 1995 dollars), as a result of construction of the third runway, and related facility improvements.

Figure 4-3



The largest source of property tax losses (76.2 percent) will be depressions in property values caused by the increase in Sea-Tac's aircraft operations after the year 2000 made possible by construction of the third runway, and related facilities improvements. They will cause a loss of $22.5 million in local government revenues over the 20-year period. The second largest source of property tax losses (19.9 percent) will come from the decline in single family residential property values of units that will be beneath the flight tract of aircraft using the proposed third runway. These property value reductions will cause a loss of an additional $5.9 million in local government revenues over the 20-year period (again expressed in constant value 1995 dollars). The smallest cause of local government property tax revenue losses will result from the acquisition of properties required for expansion of the airport. These reduction will cause a cumulative loss of $1.1 million.[4]

Looked at in terms of the impacted communities, Table 4-8 contains the percentage distribution of total property tax revenue losses among the impacted cities.

Table 4-8
Distribution of Property Tax Revenue Losses Among Impacted Cities

	Cumulative Loss of Property Tax Revenues	Percent of Total
Burien	$11,586,897	39.2 %
Des Moines	$ 6,129,951	20.7 %
Federal Way	$ 7,936,719	26.9 %
Normandy Park	$ 1,897,104	6.4 %
Tukwila	$ 2,001,242	6.8 %
5-City Total	$29,551,910	100.0 %

Source: TLA

4.6 IMPACTS ON OWNERSHIP OF SINGLE FAMILY RESIDENTIAL HOUSING UNITS

[4] The acquisition of properties as part of Sea-Tac's third runway related expansion will begin in 1996. Cumulative revenue losses are for a fifteen year period 1996 through 2020, inclusive.

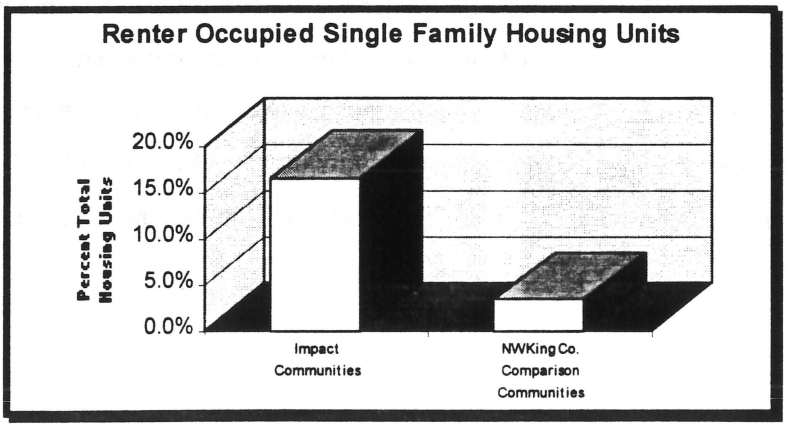
Economic theory argues that the relative change (reduction) in single family residential land values discussed above will lead to tenure changes in the affected single family housing units. The major expected tenure change is a shift from owner occupied to renter occupied housing as relative housing prices fall. Table 4-9 and Figure 4-3 compare housing tenure in the Sea-Tac impacted communities with housing tenure in the comparison census tracts in NW King County. As the data show, the expectations from economic theory hold true. Renter occupied units in areas immediately surrounding the airport were 16.6 percent of total single family housing. In the comparison areas in NW King County, they were only 3.4 percent.

Table 4-9
Owner & Renter Occupied Single Family Housing Units
Sea-Tac Impacted & NW King County Comparison Communities

	Number	Percent
NW King County Comparison Communities		
Total Single Family Housing Units	12,683	100.0%
Owner Occupied Units	12,254	96.6%
Renter Occupied Units	429	3.4%
Sea-Tac Impacted Communities		
Total Single Family Housing Units	11,526	100.0%
Owner Occupied Units	9,618	83.4%
Renter Occupied Units	1,908	16.6%

Source: TLA, & 1990 Census, STF-3

Figure 4-4



If past trends continue, the percent of single family housing units in the impacted communities occupied by renters will rise to 20.6 percent in the year 2020. About two-thirds of the increase in renter's housing tenure percentage will occur after the year 2000, and is attributable to construction of the proposed third runway, and related facilities improvement's at Sea-Tac.

4.7 IMPACTS ON COMMUNITY DEMOGRAPHIC PROFILES

The Washington State Housing Needs study in 1989 reported, "Most low income households are renters. ... Sixty percent of all Washington households with annual incomes below [75 percent of state median income] were renters. ... The average renter is generally younger, more mobile, and has an income half that of the average homeowner."[5] Table 4-10 compares the income distribution of owner and renter households.

Table 4-10
Income Distribution of Household Owners & Renters
Washington State

Household Income Status	Total	Owner	Renter
Below 50% State Median Income	26.3%	17.9%	42.4%
50% tp-100% State Median Income	28.4%	25.1%	34.6%
100% to 165% State Median Income	23.5%	27.6%	15.7%
Over 165% State Median Income	21.8%	29.4%	7.3%
Total	100.0%	100.0%	100.0%

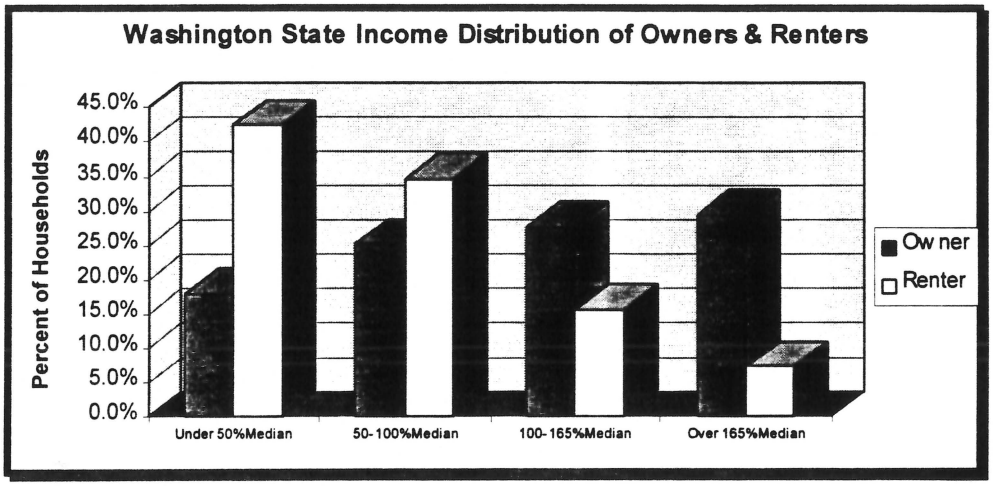
Source: *Washington State Housing Needs and Market Trends*

Among households that own their own home, 43 percent are below state median income and 18 percent are below half of the state's median income. Among households that rent their home, 76 percent are below state median income and 42 percent are below half the state's median income. Looked at from another perspective, renter households make up 34 percent of all households in the state but they account for only 17 percent of households with income over the state median.

[5] Joshi, Thomas, Lane & Phillips, *Washington State Housing Needs and Market Trends: An Overview* (Washington State Department of Community Development, 1989), page 44.

In turn, a regression model developed by TLA that explains Washington State Department of Social and Health Services' (DSHS') "county use rates"[6] by county per capita personal income levels for 1994 indicates that the relationship between income levels and need for public services is statistically significant and has a negative sign – meaning that the need for public services goes up as household incomes (and hence, the percent of owners) fall.[7]

Figure 4-5



Although a detailed analysis of the relationship between different types of public service needs and the growth of aircraft operations at Sea-Tac is beyond the work scope of the current socio-economic study, it appears from the preliminary analysis and data developed so far that such a relationship exists; and that it is statistically meaningful.

[6] Use rates are derived by dividing a county's total DSHS clients, for all types of DSHS services, by the county's total population. Counties where a high percentage of seasonal or transient resident receive DSHS services will have overstated use rates. *DSHS County Data Report, Fiscal Year 1994* (Office of Research & Data Analysis, DSHS, April, 1996).

[7] The regression model's R^2 was 0.15785, the t-statistic for the per capita personal income variable was -2.6335, the regression's F-statistic was 6.9361.