

sea-tac/communities plan memo
a joint effort of the port of seattle and king county

TO: HOLDERS OF SEA-TAC COMMUNITIES PLAN WORKING DRAFTS

Attached are additional pages to be added to your copy of the Sea-Tac Communities Plan Working Draft. Please insert pages by section (lower left) and page (lower center). Section 4.2.2, page 2-1 replaces an incorrect map and Section 4.2.3, page 3 replaces an incomplete page.

Chapter 6.2, Noise Remedies, and Chapter 6.6, Community Development Programs, are complete revisions. Both should be given priority attention for your review.

COMPLETE REVISION

Feb.4, 1975

4.2.3 ECONOMY AND EMPLOYMENT

INCOME LEVELS:

Median family income varies from a low of \$3,600 in census tract 265 (White Center public housing) to \$18,700 in tract 286 (Normandy Park). In general, highest income levels prevail in the bank of residential development overlooking or close to Puget Sound, where view amenities are abundant, and in the more recently developed areas located south of the airport. Lowest income levels are in the vicinity of White Center and in the northeast portion of the study area, along the slopes facing the Duwamish Valley and on the floor of the valley itself.

As it might be expected, the lower-income areas also have the highest incidence of persons and families receiving public assistance as well as those with a below-poverty level income as reported in the 1970 census. According to the Highline School District, nearly one-fourth of its entire student body who were eating school lunches in the 1972-73 school year received free or reduced price lunches under a program subsidized by the federal government. So, in spite of the fact that, overall, the study area can be rated as a middle-income area as compared with the County as a whole, there are a significant number of low-income families.

WHERE PEOPLE WORK:

Although the Boeing Company and other valley industries and businesses provide the principal source of employment for persons living within southwest King County, jobs generated by the Sea-Tac Airport provide the chief employment opportunities within the Sea-Tac Communities. More than 15,200 jobs accounting for a gross annual payroll of over \$160,000,000 and \$390,000,000

in yearly business activity in King County are related to the commercial traffic of Sea-Tac International Airport. The breakdown of direct and indirect impact is as follows:

	Jobs	Gross Annual Payroll	Sales And/Or Revenues
Direct	11,297	\$131,385,000	#294,918,000
Indirect	<u>3,921</u>	<u>30,047,000</u>	<u>95,500,000</u>
Total Impact	15,218	\$161,432,000	\$390,418,000

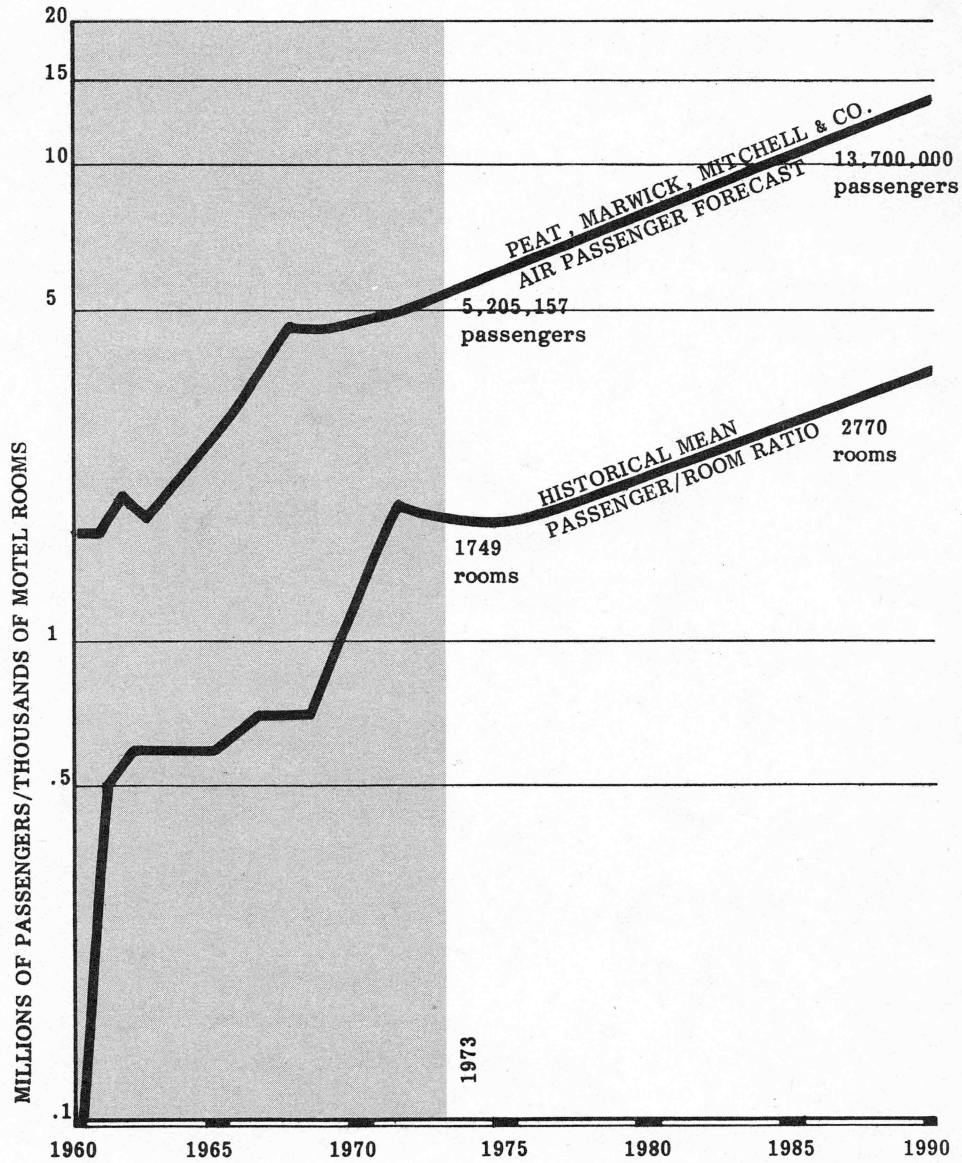
Some 38,000 King County residents and their children presently rely directly or indirectly upon the commercial traffic at Sea-Tac for their livelihood.

In view of further substantial increases in activities of the airport, it is anticipated that its total impact may encompass some 64,000 persons in King County by 1990.

1970 census data reveals that, in all except two tracts, persons employed in the transportation industry (as a % of total employment) is higher than the County figure of 7.0%. In eight census tracts within the study area, over 11% of total employment is in this industry; of these, six tracts are immediately adjacent or close to the airport. This seems to indicate that many people working at or out of the airport wish to live nearby, a fact confirmed by the demand for apartment construction in this area within the last decade.

Sea-Tac's activity also has an impact on the characteristics of commercial development surrounding the airport. This is evident by the motel and passenger-related uses located along Pacific Highway South. Growth in land uses related to airport activity can be expected

to closely follow the growth in air passengers; this assumption can be illustrated by focusing upon the relationship between the number of air passengers and the number of motel rooms available in major motor hotel complexes:



Other major employers are the school districts, with the Highline District alone hiring nearly 2,000 persons in both teaching and non-teaching positions. Highline Community College accounts for another approximately 250 full-time and 200 part-time jobs not including job

opportunities for students. Since relatively few industries are located within the study area boundary, other local employment is limited primarily to local business and service activities.

UNEMPLOYMENT:

Without evidence to the contrary, it seems reasonable to assume that the rate of unemployment in the study area follows that of the Seattle metropolitan area (see table to follow). From a low of 2.9% in 1968, the unemployment rate (unemployment as a percent of total labor force) increased to a high of 13.0% in 1971; it has been dropping since that time and is expected to continue to decline as the business climate in the region continues to improve.

4.3.5 AIR TRAFFIC FORECASTS

The information contained in this section was derived from a report, Aviation Demand Forecast, prepared for the Port of Seattle by Peat, Marwick, Mitchell and Company (See 8.0.1 ref. 4). These forecasts of air traffic activity for Sea-Tac International Airport are based on several general assumptions:

1. The forecasts of population and economic variables set forth in this report are reasonable.
2. The historical trends in the relationships between the population and economic variables and the level of air traffic activity will remain relatively unchanged over the forecast period.
3. The level of airline fares will generally increase at the same rate as the price level of other consumer goods and services.
4. There will be no major technological change during the forecast period of similar magnitude to that which occurred during the 1960's when the jets replaced the less efficient piston aircraft.
5. There will not be a national economic recession in 1974.
6. A sufficient level of service will be provided by the airlines to accommodate forecast demands.
7. No major change in the propensity of tourists to visit the State of Washington will occur throughout the forecast period.

The table on the following page presents air traffic forecasts through the year 1993 for Sea-Tac. The methodology used in developing these forecasts is explained in the Aviation Demand Forecast, Reference. The

following provides explanatory comments on the air traffic forecast presented in the summary table and are numbered to correspond to the same items listed there.

TOTAL PASSENGERS:

Sea-Tac International Airport's total air carrier passengers are expected to increase from the 1972 level of 4,788,962 to 6,900,000 by 1978; 9,600,000 by 1983; and some 15,100,000 by the year 1993. The annual rates of growth during the forecast period are expected to be much reduced from the rampant growth experienced in the 1950's and 1960's when jets replaced the less efficient piston aircraft. It is unlikely that the favorable economic conditions and the same magnitude of technological breakthroughs which accounted for the unparalleled growth of passenger traffic during the 1960's will be repeated during the forecast period.

PASSENGER ENPLANEMENTS:

Representing half of total passengers for each forecast year, passenger enplanements are expected to increase from their 1972 level of 2,394,127 to 3,450,000 by 1978, 4,800,000 by 1983, and some 7,550,000 by 1993.

SCHEDULED AIR CARRIER DEPARTURES:

Forecasts of all-cargo air carrier departures are based upon responses to the "Airport Planning Questionnaire" completed by most air carriers serving the Airport, and also upon the forecast of enplaned cargo tons.

Average day/peak month all-cargo air carrier departures are forecasted to increase as the percentage of total air carrier departures from some 5.6% of the 160 total in 1972 to about 9% of the estimated 275 departures by 1993. Annual air carrier departures are expected to increase from 53,100 in 1972 to some 62,300 in 1978, 70,700 in 1983 and reach a level of approximately 88,800 by 1993.

ENPLANED PASSENGERS PER DEPARTURE:

The volume of enplaned passengers is forecasted to increase from an average of 48 passengers per departure in 1972 to some 60 by 1978, 74 by 1983, and 94 by the year 1993. These estimates were derived from historical and forecast levels of enplaned passengers and annual air carrier departures.

48 - 1972 *62 - 78* *77 - 83*
83 *88* *93*

AVERAGE SEATS PER AIRCRAFT:

The average number of seats per scheduled aircraft departure is expected to increase from 1972 level of some 128 to 150 by 1978, 172 by 1983 and 212 by 1993. The forecast aircraft mix is given in Section 8.0.1 ref. 4.

128 *132-144* *1478* *165 - 83*
202 - 93

BOARDING LOAD FACTOR:

The boarding load factor is the percent of total aircraft seats occupied by enplaning passengers, as opposed to the true load factor which includes onboard, or through passengers. Forecasts of the boarding load factor for Sea-Tac during the planning period derive from estimates of past and future

levels of passengers enplaned per flight during the peak month, and average seats per aircraft. From an estimated 1972 average day/peak month boarding load factor of about 49%, it is expected to rise to some 53% by 1978, 57% by 1983 and reach 59% by 1993.

This rising boarding load factor suggests intensified use of existing service rather than the addition of new service frequencies to accommodate increased demands for air transportation. It is logical to assume that after a certain level of frequency of service is reached, additional flights would provide little or no return to the airlines (theory of marginal diminishing returns).

ANNUAL AIRCRAFT OPERATIONS:

Total aircraft operations are expected to almost double during the forecast period, increasing from 152,344 in 1972 to 179,000 by 1978, 205,000 by 1983, and 258,000 by 1993. This includes air carrier, air taxi, general aviation and military operations. Air carrier operations are forecasted to increase from the 1972 level of 113,631 to 132,000 in 1978, 149,000 in 1983 and reach 186,000 or 72% of total aircraft operations, which consist primarily of training and maintenance test operations, will hold to a level of 4,000 per year through 1993.

General aviation operations accounted for 19,307 of total aircraft operations in 1972 and is expected to increase to 25,000 by 1978, 30,000 by 1983, and 40,000 by 1993.

Difficulties arise in attempting to accurately forecast commuter air-

line aircraft operations. This is due to the fact that (1) the air taxi industry is in a state of flux, and, (2) there is very minimal historical information on which to base a forecast (air taxi operations weren't separated from general aviation operations until 1971). So, the estimates of commuter operations are shown to be a compound annual increase of 3% over the 1972 level throughout the forecast period.

ENPLANED CARGO TONS:

Total enplaned cargo tons are forecasted to increase from the 1972 level of 74,363 tons to 141,000 by 1978, 243,000 by 1983 and 698,000 by 1993.

Volumes of enplaned air freight and express are estimated to increase from 52,020 tons in 1972 to 103,000 by 1978, 187,000 by 1983, and 581,000 tons by the year 1993. Enplaned mail volumes are expected to increase at a relatively slower rate, moving from the 1972 level of 22,343 tons to 38,000 by 1978, 56,000 by 1983 and will be at about the 117,000 ton level by 1993.

GENERAL AVIATION BASED AIRCRAFT

No forecasts were made for general aviation based aircraft at Sea-Tac International Airport. There was only one based aircraft at the Airport in 1972 and at present, there are none. It was assumed by the consultant that future levels of general aviation based aircraft will be determined largely by policy decisions made by the Airport Management.

5.2.0 Noise Exposure

The consultants, Robin M. Towne and Associates (RMTA) in association with Man-Acoustics and Noise, Inc. (MAN), conducted this study. The primary division of study work consisted, in general, of RMTA taking and reducing the actual noise measurements and MAN performing the compilation and analysis of those noise measurements. The objective was to collect all data required for a complete noise analysis relevant, to the Sea-Tac Airport. Comprehensive noise measurements will after detailed study, help to define land use around the Airport and aid in choosing operational alternatives to help curb aircraft-generated noise impacts on the local community.

The aircraft measurement program involved a total of 4,516 measurements at 65 locations throughout the study area.

Several factors were considered in the selection of measurement locations. Locations are evenly distributed throughout the study area but concentrated in noise-sensitive areas (usually residential). The locations were selected to be reasonably free of excessive shielding or reflections from buildings or ground cover. They also were relatively free from background noise (i.e., traffic noise, construction noise, etc.) to obtain the best possible signal-to-noise ratio (aircraft noise compared to background noise). Sightline to the aircraft was also available for photo-ranging; thus many possible locations were eliminated due to heavy foliage or terrain barriers.

Aircraft measurements were performed every week of the year. This was to assure data under a variety of meteorological conditions and times of day. While at the recording locations, the field engineer made weather

measurements noting temperature, relative humidity, cloud cover, wind speed and direction, and barometric pressure. These data were then checked against Sea-Tac weather records for the same period to establish relationship of measurements. At six locations, located 1, 2 and 3 miles north and south of the runway thresholds, full 24-hour measurements were made.

Sources of noise within turbojet or turbofan engines include the jet stream, the internal combustion process, and the rotating machinery parts of the compressor and turbine. The noise producing efficiency of each of these are different as are their relationship to engine power level. Thus, roughly speaking, at very low powers the order of predominance of these three types of sources is: 1) combustion, 2) rotating machinery, and 3) jet exhaust. Conversely, at high powers, the order of predominance is reversed. This is a main reason why exhaust noise is predominant at takeoff and compressor noise is much more noticeable during approach. Note, however, that all three sources produce increased noise with increased thrust level. But, at thrust levels above about 50 percent of the maximum takeoff value the predominant source of noise is jet exhaust.

Although some machinery noise is radiated aft, the greater part is radiated forward of the engine. Jet exhaust noise is, however, radiated predominantly aft of the engine.

The Sea-Tac noise study program also included an investigation of surface noise sources.

While there is a probability that industrial or train noises are predominant at a few locations in the study area, the most pervasive surface noise source in terms of both time and spatial distribution is vehicular traffic. The noise

environment from surface sources, therefore, is structures along the network of streets and highways throughout the area. Based on this consideration, fifteen surface noise measurement locations were chosen to be representative of the full range of possible noise exposure. Six basic location types were selected, each having a different relationship to a vehicular traffic corridor, as follows:

1. Two locations near a highway or freeway
2. Two locations far from a highway or freeway
3. Two locations near an arterial
4. Two locations far from an arterial
5. Five typical neighborhood locations
6. Two rural or park locations.

Sampling from these carefully chosen locations (See Table I next page) enabled us to typify intrinsic noise environments throughout the study area, since any point in the study area relates to a traffic corridor in a manner similar to one of the fifteen measurement locations. All measurement locations were set back from the roadway a distance typical of residences. Curbside or edge of pavement locations would have produced levels significantly higher than the typical residential exposures shown.

Because vehicular traffic volumes vary throughout a typical 24-hour period, three different time periods were selected for obtaining noise data at each location, as follows:

1. Daytime (from 7:00 AM to 7:00 PM)
2. Evening (from 7:00 PM to 10:00 PM)
3. Nighttime (from 10:00 PM to 7:00 AM)

TABLE I. SEA-TAC SURFACE LOCATIONS

POSITION	LOCATION
A	N.E. corner of S. Donovan St. and 8th Ave. S. 100' from W. Marginal Way S.
B	S. 139th and 51st Ave. S. 240' east of I-5
C	S.E. corner of S. 138th St. and 3rd Ave. S. 500' west of SR 509
D	S. 249th St. and 34th Ave. S. 500' west of 1st Ave. S. (SR 509)
E	West side of 1st Ave. S., 500' north of S.W. 197th St., 500' west of 1st Ave. S.
F	N.E. corner of S. 121st Pl. and Military Road South, 150' east of Military Road South
G	South side of S. 216th St. and 21st Ave. S. 80' from S. 216th St.
H	S. 216th and Frager Road 500' south of S. 212th St.
J	South side of S. Donovan St., 100' west of 12th Ave. S., 500' from W. Marginal Way S.
K	West side of 16th Ave. S. and S. 126th St. 600' north of S. 128th St.
L	S.W. corner of 8th Ave. S.W. and S.W. 128th 40' from S.W. 128th St.
M	North side of S. 175th St., halfway between 32nd Ave. and 33rd Ave. S., east of Highway 99
N	S.W. corner of S.W. 162nd St. and 9th Ave. S. 750' south of S.W. 160th St.
P	Saltwater State Park, lower parking lot 50' from Puget Sound
Q	End of 6th Pl. S.W. and S.W. 171st (dead-end road), 3500' west of SR 509

These periods have been shown to represent discrete differences in noise exposure as well as relate to community sensitivity. The recording time period depended on the prevailing traffic conditions. The shorter 20-minute time period was adequate to obtain representative statistical noise data for the two extreme conditions: high-volume, freely flowing traffic (such as on I-5 during the day), and very low traffic volumes at night, where for most of the time the noise level remains at a constant, low background level with only infrequent intrusions from local traffic. Between these conditions, longer recording times were required, with the longest (one hour) recording time used for traffic conditions where the flow is frequently interrupted (such as near traffic signals or stop signs).

Two noise exposure methodologies were used in this study. The Noise Exposure Forecast (NEF) uses a set of generalized noise-distance curves for each aircraft class. However, for the Actual Noise Exposure (ANE) procedure the generalized noise curves were redefined based upon the actual aircraft noise measurements taken in this study. Other than the difference in the sets of noise-distance curves the two methodologies are identical.

Noise Exposure values are determined from aircraft noise levels expressed in terms of the effective perceived noise level (EPNL). In calculating the noise exposure near an airport flight path resulting from the operation of a number of different aircraft types, it is convenient to group the different aircraft types into classes based upon considerations of aircraft noise and performance characteristics. Each class is then characterized by a set of takeoff and landing profiles and a set of noise-distance

curves . Noise exposure values may then be determined from these curves .
At any particular location the noise exposure is determined by the appropriate summation of the noise values from the individual aircraft classes .

NEF & ANE are noise measures that account for the accumulation of noise from many events . As shown in Figure A, NEF and ANE use the EPNL exposure values for individual events combined with the operational factors of number of operations , mix of aircraft, flight paths and schedules . Thus , the NEF or ANE value at a ground position is a calculated estimate based on standard values of single event noise exposure levels resulting from aircraft operations .

FIGURE A.
FACTORS ACCOUNTED FOR
IN NOISE EXPOSURE EVALUATION UNITS

Human Responses

Noise Characteristics

Level

Spectrum

EPNL

Tones

Duration

NEF and ANE

Operation Considerations

Number of Operations

Mix of Aircraft

Flight Paths

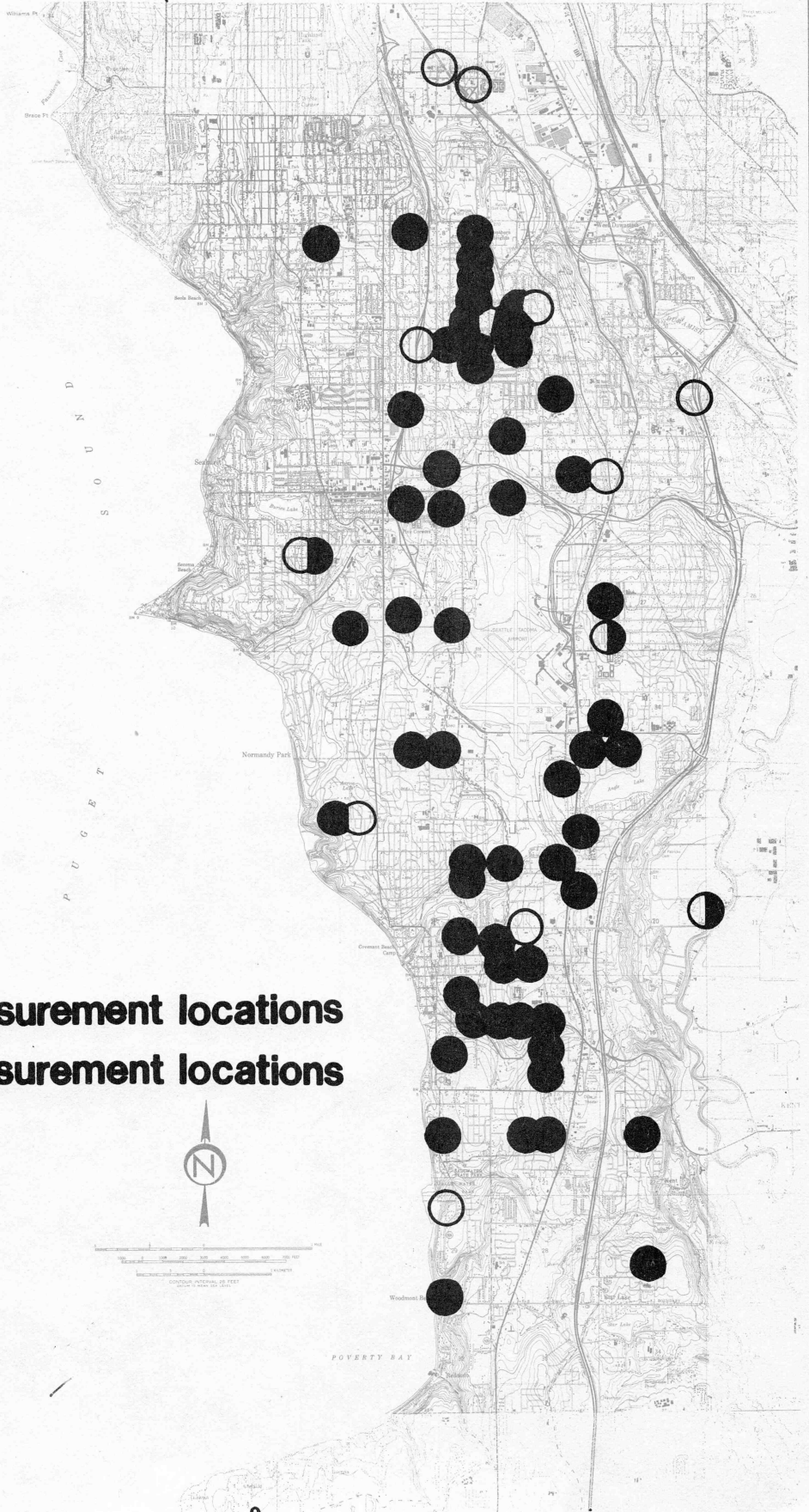
Schedules

Engine maintenance runup is a source of possible noise that is not directly accounted for in the NEF methodology. Current practice at SEA-TAC is to prohibit most engine runups between 2300 - 0600 hours. Further, when being run up, the aircraft are headed into the wind and sited at the airport north boundary for a northerly wind and at the south end for a southerly wind, thus minimizing noise propagation.

There is, of course, a legitimate reason for performing maintenance runups on aircraft at the airport; flight safety regulations require ground running of engines after periodic and repair maintenance. At the same time, ground running of engines can be a significant source of annoyance from the noise produced. Presently, SEA-TAC noise abatement regulations

limit ground runups between the hours of 2300 and 0600. As of this writing only runups of less than two minutes duration or less than 50 percent of maximum takeoff power are permitted during those hours. (Further restrictions are currently being considered.)

sea-tac communities plan



surface measurement locations



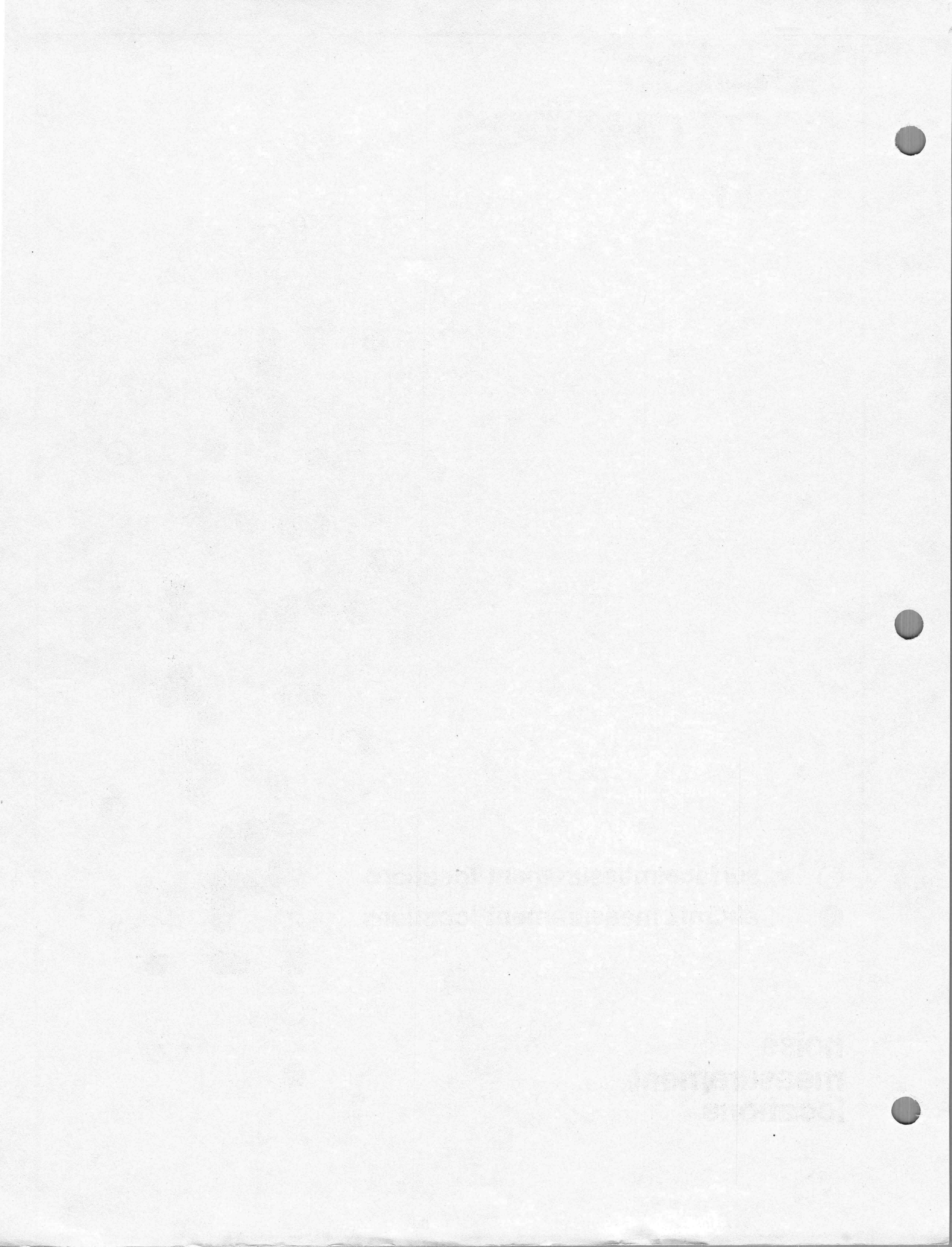
aircraft measurement locations



**noise
measurement
locations**



sponsors
**port of seattle
king county**
5.2.0



5.7.1. SURVEY

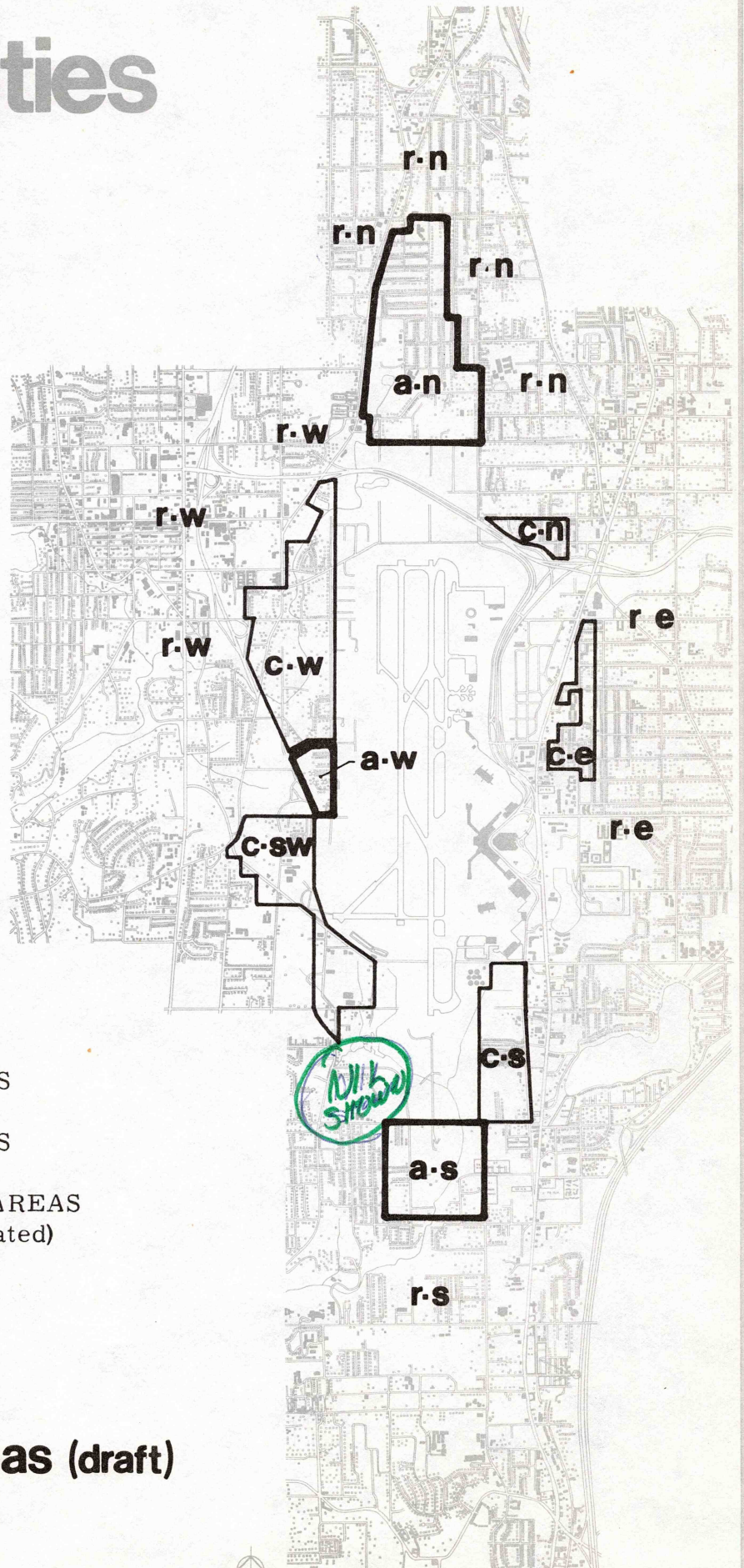
This survey was conducted by the research firm, Battelle Northwest. The objective was to conduct a study of residents' attitudes and opinions related to issues of community concern in the Highline and Shoreline districts of King County, and in other areas of King County.

The survey involved personal interviews of 302 individuals in Highline (including high, medium, and low noise zones), 98 in Shoreline, telephone interview of 316 in other areas of King County.

The survey represented a major effort to identify the social impact of the airport and the attendant ecological problems on the community and its residents. The individual living in the vicinity of the airport, and especially in the zone of highest noise impact, considers noise to be the most serious problem in the community. The effects of the airplane noise appear to be rather localized, although the specific effects on the life style and psychological well-being of the resident are far from clear. A substantial proportion of respondents in the High Noise Zone complain about psychological and physical effects as well as property damage. However, many others who choose to live there seem able to tune out the noise of airplanes or to ignore them in their daily lives.

The residents in the High Noise Zone are obviously affected by airplane noise. Beyond this, there is no marked evidence that the community attitude toward the Port of Seattle, toward local government, or toward the environment, are strongly influenced by living in the general vicinity of the airport. At least insofar as the data from this survey seem to indicate, the airport seems to have relatively little adverse effect on the community lying outside the immediate areas of high noise impact.

sea-tac communities plan



- a** ACQUISITION AREAS
- c** CONVERSION AREAS
- r** REINFORCEMENT AREAS
(to be further delineated)

**acquisition,
conversion and
reinforcement areas (draft)**



sponsors
port of seattle
king county



6.2.3 NOISE REMEDY PROGRAMS

Various ways and means to improve the community-wide noise environment in the vicinity of Sea-Tac International Airport have been identified and analyzed as part of the overall Plan Study. Some fifteen separate noise remedy programs were examined in detail by the Study Team, as well as by numerous citizen and technical groups or interests.

Each potential program covered by this extensive analysis focused on the area experiencing excessive or annoying noise impact as a result of aircraft operations at the Sea-Tac Airport. In general, the noise remedy programs studied fall under one of the following categories of action:

- Outright acquisition of noise-affected properties
- Purchase assurance for impacted property owners
- Acquisition of easements from impacted property owners
- Insulation of noise-affected structures
- Development controls by public agencies
- Property advisory services

Since each of the listed categories can be applied in a variety of ways, brief descriptions of their respective characteristics are in order. These capsule descriptions are presented in the next several subsections of this chapter.

OUTRIGHT ACQUISITION:

Under this program, private or publicly owned properties located in areas subject to specified levels of aircraft generated noise would be acquired by an appropriate unit of government, such as the Port of Seattle or King County. Such acquisition would be accomplished through negotiation to the maximum extent possible; however, condemnation procedures could also be utilized, if necessary.

Following acquisition, and dependent upon the type of land use prescribed by the Sea-Tac Communities Plan, three different actions may be taken:

1. All existing buildings and structures are removed, and new uses involving a minimum concentration of human activity are introduced, such as golf courses, farming or outdoor storage. The resultant low-intensity, open type of pattern is suitable for areas most seriously impacted by aircraft noise.

2. All existing buildings and structures are removed (to the extent necessary) and new uses considered to be compatible with aircraft noise are introduced. The new uses may be of a commercial, industrial or other nature (as appropriate), and the resultant pattern is more intense and less open than the first option.

3. Some or all of the acquired property is maintained in its present use and leased back to prior or new occupants for a specified period of time. The existing land use pattern may not change much under this option, particularly in the short run (up to 10 years).

Key advantage of the outright acquisition process is the fact that lands most subject to intense or prolonged aircraft noise exposure come under public ownership, and thus public control. On the other hand, this process typically costs more than other noise remedy programs that may be employed to resolve or alleviate the problem.

PURCHASE ASSURANCE:

Most (if not all) home owners are concerned from time-to-time about their ability to dispose of their property when they desire and at a price they consider to be equitable. Owners of property near major airports experience such anxieties more often than is otherwise typical. This is usually due to such specialized factors as -

(a) excessive aircraft noise at certain times which results in a less than desirable living or working environment;

(b) uncertainty as to whether (1) the noise problem will grow worse as time passes, (2) the airport will require even more land for operational purposes, or (3) both conditions;

(c) mortgage funding practices of local and federal institutions (such as FHA) which may prohibit or restrict the financing of properties subject to certain levels of airport-oriented noise exposure; and

(d) increased local traffic congestion and thus property access problems as airport workforce and passenger activity grows over time.

In recognition of the above concerns, the Study Team investigated several potential noise remedy programs that can best be classified as "purchase assurance" activities. These activities are so designed and carried out as to assure noise-impacted owners that they can sell their property, if and when desired, with no more than the usual difficulties associated with such transactions. Of the various assurance programs studied by the Team, two were considered to be capable of implementation within the Study Area. They are:

1. Purchase Guarantee. A designated agency of government (such as the Airport sponsor) provides a written guarantee to the owner of residential property subject to specified levels of aircraft noise that his or her holdings will be purchased for fair market value in the event said owner decides to sell. Terms of such an agreement would call for the owner to occupy the premises for a stated period (say 90 days to 6 months), during which time the agency would attempt to market the property through the use of in-house personnel or under contract to private real estate firms.

After a sale is consummated, but prior to occupancy by the new owner, the residence would be sound-insulated to the degree possible and as required to produce an acceptable inside noise environment. An appropriate avigation easement (see later subsection) would be attached to and become part of the property deed acquired by the new owner.

2. HUD/FHA Mortgage Insurance. The Federal Housing Administration (FHA) of the U.S. Department of Housing and Urban Development (HUD) provides federal mortgage insurance for eligible residential properties throughout the United States. In areas subject to unusual noise conditions--such as those often found near a major airport--FHA mortgage commitments may not be available due to an inability to meet published HUD Noise Standards.* In some instances, these commitments are withheld as long as the adverse noise environment prevails. In other cases, there is considerable confusion and misinformation as to where such insurance is or is not available.

A home owner affected by either or both of these conditions may well be nervous and uncertain about the marketability of his or her property. To deal with this situation--which does exist in the vicinity of Sea-Tac International Airport--a second purchase assurance program could be employed. As a minimum, such a program would consist of four components:

*See HUD Circular 1390.2 originally dated August 4, 1971.

1. A clear and comprehensive description of the present and anticipated airport noise environment, based upon recently completed noise measurements and forecasts of future aircraft operational levels and characteristics.

2. Establishment and operation of a permanent aircraft noise monitoring system designed to provide the data needed to update the above description from time-to-time.

3. Periodic modification of FHA practices in the vicinity of Sea-Tac Airport so as to reflect the latest version of current and forecast exposure to aircraft noise.

4. Frequently published and widely distributed information about HUD-FHA mortgage insurance availability within the Sea-Tac Communities area.

Of the two purchase assurance programs described, the second involves fewer initial costs and is capable of being implemented almost as soon as the noise environment picture is clearly portrayed. HUD/FHA cooperation is an obvious necessity if this program is to be effective.

Although the purchase guarantee approach is more costly, it does provide an eligible property owner with the opportunity to move if he or she is truly concerned about the aircraft noise problem. Moreover, since the program does result in the retention and improvement of affected residential structures, prevailing

neighborhood patterns are not disrupted or altered, the local tax base is protected, and property values may be expected to stabilize.

AVIGATION EASEMENTS:

The acquisition of an avigation easement from a private or public property owner provides the party acquiring such easement with the right of flight over the land together with the right to cause noise, vibrations, smoke, glare, dust, and all other effects of aircraft operations. This type of easement differs from an obstruction and hazard easement in that the latter only grants the right to keep the property free from structures, trees, or other hazards to the safe operation of aircraft.

Since a property right or value is involved relative to either type of easement, the owner giving up such right is typically compensated in one form or another. The amount of this compensation is usually negotiated; however, if the easement must be acquired through the process of eminent domain, a court-decreed settlement may be necessary. Of course, easements may also be acquired by gift or they may be leased on a term basis.

Permanent avigation easements "run with the land" and permit aircraft operations to take place over the property in question, including the right to generate noise. Although existing uses may be continued on lands where such easements have been obtained, potential uses that represent a hazard to aircraft flight or are

incompatible with aircraft noise will be prohibited. As a consequence, the existing land use pattern may be expected to slowly change over time.

As implied by their name, long- and short-term aviation easements are effective for a specified amount of time. For purposes of the Sea-Tac Study, long-term was defined as 10 to 20 years, while short-term referred to a 0- to 10-year period.

Among other things, the Study Team concluded that the use of term easements required (1) a good description of the prevailing noise environment near Sea-Tac International Airport; (2) sophisticated forecasts of future aircraft activity; and (3) the establishment of a permanent noise monitoring system. All of these factors are necessary to determine the location and duration of easement that might be called for in a given situation. The location of permanent easements (i.e., where the noise situation is not expected to significantly improve over time) was considered to be dependent on the first two factors only.

While aviation easements are less costly, and owners do receive some compensation in return for contending with the periodic annoyance of aircraft operations, the use of this form of noise remedy does have certain disadvantages. For instance, the occupants of noise-impacted properties are not physically relieved by the problem through the sale and purchase of an easement. Then too, the value of such easements are difficult to determine due to

the dynamic, ever-changing nature of aircraft noise, as well as the wide variation of personal attitudes that usually prevail as to the nature or extent of the "problem."

As a final note, the Study Team also concluded that aviation easements do not represent satisfactory noise remedies in and of themselves--they ought to be used in conjunction with other forms of improvement such as purchase assurance or noise insulation programs.

NOISE INSULATION:

Since the interior environment of residential and other normally quiet uses (such as school classrooms) can be insulated against the transmission of exterior sources of noise, the potential application of "sound attenuation" improvement programs was analyzed by the Study Team. Characteristics of both extensive and moderate insulation measures were investigated, together with costs and the degree of success or failure associated with this form of noise remedy.

Extensive sound insulation for an existing dwelling unit usually consists of the following:

1. Provision of a forced air ventilation system designed to function best when all windows and doors are closed;

2. Replacement of all exterior doors with acoustical doors and seals;

With 'sound insulation' applied will the assessed value for taxing purposes outweigh the benefit of resale value?

6.2.3 ⁹

3. Provision of double glazed windows and seals when and as appropriate;
4. Repair of all cracks and openings;
5. Installation of fireplace dampers (if needed); and
6. Modification of kitchen and bathroom ducts by including a bend and acoustical lining.

The degree of success that may be achieved if the above improvements are made (as necessary) will vary widely according to the age, conditions and type of structure that is involved. Based upon one recent study*, modifications that result in noise insulation improvements of 15 dB or total noise attenuation values of 35 to 40 dBA are about the maximum achievable without major reconstruction of the entire house.

Of the various sound insulation programs that were studied by the Team, a system currently in use around London's Heathrow Airport proved to be of special interest. The object of this particular scheme is to give direct help to those residents in certain prescribed areas who are seriously disturbed by aircraft-generated noise. The help takes the form of cash grants from the British Airports Authority toward the cost of sound insulation

*Aircraft Noise Impact - Planning Guidelines For Local Agencies, U.S. Department of Housing and Urban Development, November 1972, p. 214.

of dwellings. Although the program has been devised primarily for houses of standard brick construction, other residential structures are also eligible.

*under
British Airport Challenge*

Under the ^A Heathrow plan, two noise impact districts have been designated--a "Special Area" most seriously affected by aircraft noise, and the "Standard Area" which consists of the remainder of those local governmental jurisdictions covered by the scheme. The owner of a residence located within the Special Area may qualify for a grant amounting to 100% of the cost of prescribed insulation, while his or her counterpart in the Standard Area may receive up to 75% of such costs. A formal application must be submitted and approved in order to obtain a grant. Also, the work may be accomplished by the applicant or by a contractor, but it must conform to the specifications called for by the program.

First established in 1966, results of this British Airports Authority scheme are represented to some extent by an opinion survey taken in 1971. According to the survey, some 64% of the sample of grant recipients interviewed felt that their respective noise modifications were "fairly effective," while 25% of the sample considered the improvements to be "very effective."

Although the exterior noise environment is not changed as a result of sound attenuation, the occupants of insulated homes, offices, schools, and similar uses are less subject to the periodic annoyance of aircraft operations. Other advantages cited by the

Study Team include (a) lower costs than outright acquisition; (b) the improved properties remain on the tax rolls; (c) prevailing neighborhood patterns are neither disrupted or altered by this type of program; (d) owners/occupants of properties are not required to relocate; and (e) heating and cooling costs should prove to be less costly in most cases--an important consideration in this time of energy conservation, inflation, and economic recession.

While not as expensive as outright acquisition, sound attenuation modifications can be very costly if applied over a wide area. Achievement of the previously mentioned 15 dB improvement could run as high as \$7.00 to \$9.00 per square foot of house area.* In general, however, such costs may be expected to approximate those typically associated with the acquisition of avigation easements over residential properties. That is, approximately 20% to 30% of the total appraised value of such properties.

DEVELOPMENT CONTROLS:

Two forms of publicly administered development controls were considered by the Study Team and others participating in the Sea-Tac Communities Plan effort.

The first potential noise remedy program analyzed under this category involved the adoption and enforcement of new or modified

*See HUD report cited on p. 10

construction code requirements by responsible units of local government. These code revisions would be applied in connection with the renovation of existing structures as well as to all new construction after the date of adoption.

The building industry has made some progress in recent years toward resolution of the noise problem (from whatever source) within structures. This is particularly true with regard to interior walls and partitions. A wide variety of construction formats have been tested and given a Sound Transmission Class (STC) rating. Such a rating represents the sound transmission loss performance of walls, doors, floors, ceilings, plumbing, and other materials. The use of STC ratings in building, housing, and plumbing code standards or specifications is growing and certainly seems appropriate for areas impacted by the noise of aircraft operations.

In addition to being less costly than other noise remedy programs previously discussed, the establishment of specialized code requirements for all new or modified construction in the vicinity of Sea-Tac Airport has certain other advantages. Prevailing land use patterns can be retained and even reinforced through code compliance. New administrative costs and machinery associated with this type of program are negligible. Wide-spread acceptance of the construction code form of improvement may be expected. And the establishment of up-to-date code provisions

vis-a-vis sound transmission affords a measure of protection for prospective new residents of the aircraft-oriented noise environment.

As with aviation easements and insulation programs, however, the construction code approach does not improve the out-of-doors noise environment. Moreover, costs are typically borne by property owners and the initiation of extensive new construction requirements may adversely affect the local real estate market. Also, since several units of government are often required to adopt and enforce common code provision, uniform application of such provisions may be difficult (if not impossible) to achieve.

Regulations pertaining to the zoning and subdivision of land represent the second development control program reviewed as part of the Sea-Tac Study. Under this approach, new zoning and/or subdivision regulations would be adopted by responsible governmental entities for those portions of King County most affected by noise attributable to aircraft operations at the subject airport. These new regulations would be designed to foster a land use pattern over time that is more compatible with the Sea-Tac facility.

In order to be both effective and legally defensible, zoning and subdivision regulations must be based upon an acceptable land use plan that has been duly adopted by the implementing public

body. This condition is perhaps of even greater importance in the vicinity of a major airport due to the potential for prolonged and costly litigation, to say nothing of aircraft crash hazard possibilities.

A typical land use plan for an already built-up area around a busy, established commercial airport usually calls for more industrial and business uses in some locations, more open-type uses, and less residential use adjacent to or in close proximity to the facility proper. The speed of actual land use transformation is dependent to a large extent on the location and uses contemplated by the plan--as a consequence, this type of noise remedy must be considered as a long- rather than short-term program of improvement.

Advantages of the land use approach, as identified by the Study Team, include:

1. Public costs are minimal in contrast to most of the programs that received consideration.
2. Properly prepared and administered land use regulations can lead future development (and redevelopment) in such a way as to produce maximum compatibility between the Sea-Tac Airport and the surrounding community.
3. Maximum benefits from public expenditures for capital improvements can be gained through strict adherence to improved land use regulations.

4. Future Airport development can be effectively dovetailed with community change via this program.

5. Although short-term effects are negligible, the number and location of residents who must contend with aircraft noise should substantially reduce over time.

6. Good land use plans and regulations should assist neighborhood change to take place in an orderly fashion, where such change is called for.

Insofar as disadvantages are concerned, the following seem to be of greatest importance:

1. By and of itself, a land use control program provides little relief for occupants of existing structures who must contend with the periodic annoyance of aircraft operations.

2. Meaningful implementation of land use regulations is difficult at best and ineffective at worst. If correct zoning decisions are not made in virtually every instance, such regulations may be expected to produce less improvement than desired or anticipated.

3. To a degree, market conditions govern the success of a given land use plan and attendant regulations. For example, transformation from residential to industrial land use is dependent upon the availability of a market for such a change. If a forecast market condition does not materialize, then very little of consequence can or will take place.

4. The long-term nature of this improvement program requires citizens adversely affected by aircraft operations to exhibit a degree of patience and forbearance that is difficult, if not impossible, to achieve.

As may be derived from the foregoing, development control noise remedy programs are relatively inexpensive, depend upon uniform and coordinated governmental action, are likely to be accepted with a minimum of controversy, result in gradual land use change, and require a long period of time to produce desired results.

PROPERTY ADVISORY SERVICES:

The final category of action evaluated by participants in the Sea-Tac Communities Plan project involves the provision of various advisory services to owners of noise-impacted residential property. These services could be made available by or under the auspices of a designated unit of government, such as King County or the Port of Seattle.

While many activities could be rendered by a comprehensive property advisory program, the following were deemed by the Study Team to be of the greatest potential:

1. Detailed analysis of noise impact characteristics associated with individual property locales.
2. Information about the various noise-remedy programs that have been established for the use and benefit of Sea-Tac Communities property owners.

3. Consultation as to housing-related decisions and options that a given owner or occupant of residential property may encounter.

4. Referrals as to other locations and/or types of housing that may be available in the Seattle area.

The fact that this type of program can be made available to all property owners within the Study Area--regardless of location or status relative to aircraft noise exposure--represents a key advantage. In addition, the proper application of such services should eliminate or certainly reduce uncertainties as to alternative housing decisions that a particular owner might have to cope with. Furthermore, the program offers a means to correct false rumors or misinformation that may circulate from time-to-time within the Sea-Tac Communities.

Only two possible disadvantages were identified. Some property owners may be unhappy with the housing-related options available to them once they are fully informed. Also, certain administrative costs will necessarily be generated by this noise-remedy program. From an overall standpoint, however, the establishment of a carefully structured and administered property advisory service should prove to be of considerable value to all who own or occupy property near Sea-Tac International Airport.

A comprehensive effort to improve the noise environment associated with any busy commercial airport will (or should) include all of the above types of actions to some degree. As discussed later, the Sea-Tac Communities Plan reflects these actions in what is considered to be a logical, feasible and coordinated fashion. However, the post-plan noise monitoring and demonstration projects outlined in Part 7 of this report will need to be carried out in order to confirm or deny this judgment.

6.4.0 AIR QUALITY IMPROVEMENT PROGRAMS

Mitigation measures to improve the future air quality around Sea-Tac are aimed at an airport operational change, modification of access and parking patterns, increased vehicle emission technology and land use change in areas where an annoyance but no detrimental health factor exists.

Although only one part of the vast national air transportation network, Sea-Tac and its surrounding communities must become advocates of strict standards for aircraft emissions. Modifications in engine design and fuel composition can reduce present levels by approximately 50% by 1983.

Ground operational changes must be weighed against safety, noise and capacity alternatives. Considerable reduction of pollutants is observed by use of fewer engines while taxiing, reduced idling time and increased towing of aircraft. Hydrocarbon (HC) losses associated with fuel handling should be minimized. Vapor recovery systems would reduce terminal area levels...

introduction of current pollution prevention equipment and procedures is essential at Sea-Tac.

All fuel and oil spills should receive immediate attention to prevent vaporization.

Mobile source controls again are being regulated from the Federal level. Even though they are less than 10 to 20 percent of the total Sea-Tac emission, localized problems exist. Access roads, terminal drive and parking garage areas especially are susceptible to high concentrations of

Possible locations of new ponds would be south of S. 188th Street or north of the proposed west side perimeter road. These areas would be sufficient to deal with this particular need.

Airport Viewing Park:

policy: *An area on the west side of Sea-Tac Airport, currently used as a viewpoint, should be developed as a park for people interested in observing aircraft operations.*

There is a strong community identification with this section of Sea-Tac Airport and the suggested site at S. 170th and 12th Avenue South has perhaps the best visibility of the airfield of any undeveloped area available for such uses. This area serves well as a buffer zone between Airport operations and the adjacent residential community. It should be made a permanent viewing area with proper landscaping and the possible addition of other amenities.

Development of the site should be accomplished as soon as possible after the adoption of the plan. Its present informal use as a viewing area and orientation to the old Evergreen Tennis Club courts and proposed restaurant facility would let it grow in concert with other activity on the west side of the Airport.

The fact that the general aviation site will be located next to the viewpoint will also add to the enjoyment of this Airport-community interaction point. The scale of the general aviation aircraft as well as their variety will perhaps make it easier for viewers to relate to the Airport operation in general.

In order to respond to structural response alarms it is recommended that there be...

policy: *An increase in the engine company's manning by the end of 1975 from three men to four men to comply with the Washington Survey and Rating Bureau recommendation.*

The purchase of one additional engine and an aerial truck by the end of 1975.

The purchase of a medical aid vehicle within one year.

Fire station locations-- Fire stations should be located so as to provide an average response time of three minutes or less to all parts of the Sea-Tac International Airport. It is recommended that....

policy: *The construction of a new and larger Sea-Tac Airport fire station at the intersection of South 170th St. and the North Perimeter Rd should be completed by the end of 1976, or sooner. This location should include construction of a "burn building" to be used in training for structural fires.*

A second fire station should be located and constructed at the southern end of the Airport when the need arises. This will be determined by construction of the initial phases of the

acreage.

As proposed the Expanded Services Complex would include a wide range of airport-related activities. Passenger services which do not require location within the passenger terminal complex would have priority for space in this development. A relatively compact, well organized pattern of terminal supporting commercial and business uses are planned for this area. Parking is a major component at this site and is discussed in detail under the Terminal Area Parking section (see 6.5.3: p.18). When development of the Expanded Services Complex reaches a point which would justify the investment, a transit link similar to that now servicing the satellites is to be installed. Such a link would provide rapid access between the site and the terminal area, and representation essential addition if the Complex is to reach its full potential.

Present and future areas, under Port of Seattle ownership at Sea-Tac International Airport, should be utilized in accordance with the recommendations of this Plan. Facility demands and financial constraints will dictate the rate at which areas will be developed. Clear Zone or other open spaces should be developed to the fullest possible extent for approach navigation needs, recreation, or other uses compatible with aircraft operation and noise impact. In order to allow maximum use of the areas by the public....

policy: *Airport boundary fences should be located no further from the runways, navigational aids and individual airport facilities than is necessary for safety, security and the general public well being.*

flow; therefore...

policy: *King County, Port of Seattle, and the State Highway Department must coordinate their planning and work programs for the S. 188th St. corridor. Traffic growth should be monitored and improvements made as necessary.*

Parking:

The parking situation at the Sea-Tac Terminal presents problems now and will be of increasing concern over the next few years. Existing or future potential capacity of the Parking Garage is insufficient to handle projected demand throughout the study period. Alternative locations for parking must therefore be developed to meet this anticipated demand. At the same time, more efficient use of space in the Garage must be accomplished to assure full utilization of this facility for Airport patrons, as well as to enable expansion plans to continue on their currently programmed schedule.

The present terminal area is experiencing congestion and overload problems at peak traffic times. The situation needs immediate attention to prevent even more serious problems from developing. Suggested monitoring and surveying of individual carrier and concessionaire needs will provide a reliable means for assuring that these problems are properly handled. Because this complex question has required considerable analysis, a special parking study was conducted concurrently with the overall planning project. The following describes recommendations derived from that study.

The Port of Seattle's Engineering Department has prepared cost estimates

6.5.2 EXISTING AIRPORT FACILITIES

AIRFIELD:

The active runways at Sea-Tac International Airport are:

16L-34R	150' x 11,900'
16R-34L	150' x 9,425'
17-35	75 x 2,875'

Runway 16R-34L, equipped with ILS (Instrument Landing System), has Category II* capability. Located at the north end of the runway are the approach lighting system and 3,000' touchdown lights. The runway, surfaced with concrete, has high intensity runway lighting (HIRL) and all-weather marking.

Runway 16L-34R meets requirements for Category I * weather conditions. It is equipped with an approach lighting system and all-weather marking on an asphalt surface.

Runway 17-35 is utilized for general aviation flights. It has a concrete surface and basic taxiway lighting to serve VFR operations.

*NOTE: CAT I - An instrument approach procedure which provides for approaches to a decision height of not less than 200 feet and visibility not less than 1/2 mile.

CAT II - An instrument approach procedure which provides for approaches to a decision height of not less than 100 feet and visibility not less than 1200 feet.

TERMINAL AREA:

The Sea-Tac terminal expansion program, begun in 1966, included major increases in airline passenger service space, an automated baggage handling system, expanded parking facilities, improved access, increased passenger lounge and concession space as well as the addition of VIP and press facilities. The result is an up-to-date airport which will be a long-term facility for the Puget Sound Region.

The terminal building is the outcome of an innovative approach to dealing with site limitations and the restraints presented by the existing terminal location and its configuration. Two satellite terminals were constructed and connected to the main terminal by an underground rapid transit system. The North Satellite terminal handles domestic flights while the South Satellite terminal handles the international traffic.

Construction of the terminal was completed in 1973, and is designed to accommodate some 20 million passengers per year. The terminal complex provides aircraft gate positions for 65 aircraft; 35 gates in the main terminal building and 24 gates, total, in the two satellite terminals.

AIRCARGO FACILITIES:

Sea-Tac's major existing air cargo facilities are located to the north of the passenger terminal building. Some facilities are also immediately south of the terminal. At present, half of the 70-acre area designated for

air cargo is developed for that use, the rest remains undeveloped. Additional acreage in this "northeast cargo area" and on the west side of the Airport is available for expansion of air cargo facilities.

AIRPORT SUPPORT:

Airport support refers to the many utilities and accessory functions necessary for the efficient and safe operation of the Airport.

Located at the northeast side of Sea-Tac are the elevated water tower and pump house, and within the northeast cargo area are the fire station and airport maintenance area. Straddling the sides of the airfield at the south end, are the industrial waste treatment plant and the fuel storage area. Two electrical substations are located at the lower level of the terminal. Aircraft waste disposal is accomplished by a private contractor who collects and hauls the wastes to King County's Bow Lake Transfer Facility.

The fire station is located in the northeast cargo area south of Air Cargo Building No. 1. Present capacity is:

1. One lightweight fire and rescue truck (unnumbered); one combination foam and dry chemical fire and rescue truck (Truck No. 1; one water tank truck (Truck No. 7); and three water-foam trucks (Trucks Nos. 3,4, and 6).

- ★ 2. Present manpower levels are eight firefighters on duty per shift.

GENERAL AVIATION:

On the northwest side of the Airport, Runway 17-35, rather short in length, is used by both general aviation and commuter (air taxi) aircraft. It is a combined taxiway/general aviation runway. There is one fixed base operator (FBO) offering line services including fueling, tie-downs, and overnight parking for itinerant aircraft. This operation is temporarily located in the northeast cargo area. Other services such as major maintenance, aircraft sales and flight training are not provided. At present, there are no general aviation aircraft based at the Airport.

AIRPORT ACCESS AND PARKING:

Access to the passenger terminal at Sea-Tac International Airport is provided by Pacific Highway South (Highway 99) and the North Approach Drive which link the Airport to the road network of the Puget Sound Region. Highway 99, the old major north-south arterial linking Seattle and Tacoma, is connected with Interstate 5 Freeway (which runs parallel to it) by State Highway 518 north of the Airport and by South 188th Street at the south end of the Airport. The North Terminal Drive provides direct access from Highway 518 to the parking terminal and passenger check-in and pick-up drives which pass in front of the main terminal and loop around the parking terminal. The South Drive plugs into this loop from Highway 99. An interchange at South 188th Street and Highway 99, as well as the

possible completion of the Highline Freeway (SR 509), might improve access to the Airport from the south.

Parking facilities for airline passengers and terminal-related activities at Sea-Tac International Airport include the seven-level parking garage owned by the Port of Seattle, and remote parking in several commercial parking lots near the Airport. The existing Sea-Tac Terminal Garage currently has 4,150 parking spaces available for public and employee parking. In addition, one level of the garage is presently utilized for rental car parking and servicing. An estimate using recent aerial photos of vicinity remote public parking spaces indicated 1,200 spaces were available with some 500 additional spaces available for rental car storage.

6.5.3 EVALUATION OF EXISTING FACILITIES AND REQUIREMENTS

PLANNING GOALS:

In general, a principal goal to be achieved in long-term development of an airport is that...

Sufficient acreage is available to accommodate long-term air traffic requirements.

Another equally important goal is that...

Land surrounding the airport shall be developed under appropriate control to assure compatibility.

The importance of these goals for airport planning reflects the fact that airport facilities represent a tremendous investment and that the operation of any airport will unavoidably have far-reaching impacts on the surrounding land areas.

With reasonable foresight, long-term utilization of the airport site can be achieved without excessive disruption of future land use patterns, and costly land acquisition to accommodate airport expansion requirements can be minimized. This means that adequate consideration must be given to long-term expansion possibilities within the airport boundaries and to the compatibility of future land uses in the neighboring communities.

Planning in this manner strives for flexibility and adaptability necessary to respond to a range of possible demand levels in the future.

Demand may overshoot the forecasts (due, for example, to an unexpected economic boom in the region triggered by Alaska's North Slope activity) or it may be less than the predicted growth rate anticipates.

PLANNING APPROACH:

The Sea-Tac International Airport can be considered a system composed of several major elements which must be analyzed individually and balanced in relation to one another. The major system elements are:

Airfield

Airspace

Terminal Complex

Access and Circulation

Support Facilities

The first two represent "airside" considerations, the last three are "landside" aspect of the airport system.

These elements were analyzed by Peat, Marwick, Mitchell and Company in relation to their capability to satisfy forecast aviation demand. Their report, Demand Capacity Analysis, contributed to the Port of Seattle's effort to refine the requirements for airport facilities to accommodate air traffic activity through 1993.

SUMMARY OF PRELIMINARY REQUIREMENTS:

Based upon the air traffic demand forecasts for Sea-Tac International Airport, preliminary physical facility requirements for the Airport were

developed. Included are requirements for the forecast years 1978, 1983, and 1993. A summary of these overall requirements is presented in Table .

The above Demand Capacity Analysis provides a preliminary evaluation of the existing Airport facility. Generally, in terms of technical requirements...

The existing Airport site has adequate capability to accommodate foreseeable air traffic demand.

AIRFIELD REQUIREMENTS:

The initial phase of study leading to the determination of future airfield requirements at Sea-Tac International Airport include the development of air traffic demand forecasts as well as an analysis of the meteorological conditions affecting aircraft operations. Current and anticipated air traffic volumes, aircraft mix, and usage of the runways and taxiways were taken into consideration in the evaluation process.

Runway Orientation:

FAA criteria specify that at air carrier airports a crosswind runway is required if the primary runway is oriented so that the crosswind on it exceeds 15 miles per hour (13 knots) more than 5% of the time (less than 95% wind coverage). The wind coverage on the Sea-Tac runways is slightly greater than 97%; therefore, crosswind runways are not required.

Runway Lengths:

The consultant found the existing lengths of parallel runways 16-34 (9,425 and 11,900 feet) adequate to accommodate all anticipated aircraft types on expected stage lengths throughout the forecast period. However, Runway 17-35 (2,875 feet) which is presently used for general aviation and commuter airline traffic, falls 725 feet short of FAA planning criteria for accommodating all aircraft less than 12,500 pounds in weight.

Airfield Capacity:

An analysis was made of the existing airfield capacity at Sea-Tac International Airport. Airfield capacity is related to aircraft delay. Because aircraft can economically tolerate just so much delay, the Airport and airfield must be planned so that aircraft delays do not exceed an acceptable duration; otherwise serious congestion can result.

Factors that affect airfield capacity include aircraft mix, runway and taxiway configuration and use, visibility, runway occupancy times, and the ratio of aircraft arrivals to departures. These factors were evaluated on the basis of data from a recent air traffic survey conducted at Sea-Tac International Airport, available FAA statistics, meteorological conditions, and conversations with FAA air traffic control personnel.

As a result of this evaluation, the hourly capacity of the existing airfield configuration at the Airport in 1973, was determined to be about 63 aircraft operations per hour during Visual Flight Rules (VFR) conditions and approximately 54 operations per hour during Instrument Flight Rules (IFR) conditions. The method used to compute these figures assumes airfield hourly capacity is reached when the average delay to arrivals or departures equals four minutes.

Capacity is expected to decrease between 1973 and 1993, due to an expected increase in "heavy jets" as a percentage of the aircraft mix and to the effects of increased separation rules for this aircraft type on airfield operational capacity. In anticipation of this future situation, the hourly capacity of the existing airfield configuration in 1993, is expected to be

about 55 aircraft operations per hour under VFR conditions and some 46 operations per hour under IFR conditions.

The annual capacity (reached when delays to aircraft exceed the four-minute level for 10% of the annual operations or for 5% of the time) of the existing airfield was 331,000 aircraft operations in 1973. This is expected to decrease to 278,000 operations in 1993 but will still exceed the forecast demand level of 241,000 total aircraft operations for that year.

From the analysis of airfield capacities and aircraft delays in relation to forecast demands, it was concluded that...

The existing runways should provide adequate capacity throughout the planning period.

High-Speed Turnoffs:

The high-speed exit B-5 in the Sea-Tac airfield configuration is not being used as designed and is of particular concern in regard to taxiway egress problems. The large aircraft types such as Boeing 747's and DC-10's are not likely to make this downhill turn even under favorable weather conditions, certainly not when the pavement is wet. It is especially necessary to stop before crossing the runway during times when there is a mix of departures and arrivals. This situation can be remedied by establishing a new exit off 16R-34L between the present high-speed turnoff and the south end of the runway. This would not have to be designed for high-speed egress.

Navigation Aids:

An area which present occasional problems now, and will become of more concern with increased air traffic congestion in the future, is the south end of Runway 16R-34L. The Instrument Landing System (ILS) localizer at this end of the airfield is located such that its "critical area" extends beyond the end of the runway, causing taxing aircraft to penetrate the critical area.

The addition of a new exit south of the existing high-speed exit (B-5) on 16R would create even more difficulties with the reliable operation of the localizer. Shifting the localizer southward would run into topographical limitations constricting relocation possibilities. The runway is on fill and the bank at the end of the runway has a sharp drop off. In the event that the localizer is resituated, it must be at the elevation of the runway.

Other interference problems with navigation aid equipment will arise in this general area of the Airport as the west side is developed. This may necessitate the relocation of the Airport Surveillance Radar (ASR), Airfield Surface Detection Equipment (ASDE) and Very High Frequency (VHR) communications towers. When the need for this move becomes apparent, several locational criteria must apply.

a. ASR--high elevation with a 25-60 mile clear scanning area, and a 1,000 foot radius clear area to act as a safety zone.

b. ASDE -- must be located on the airfield with good visibility of the runways. (Present location is excellent -- should remain there if possible.)

c. VHF -- should be a distance of 1,000 feet between the transmitter and receiver (can be located off the airfield if necessary).

Approaches and Obstruction:

A clear zone is an area at ground level in the runway approaches that provides for unobstructed passage of landing aircraft. This area is dimensioned according to specifications set forth in Federal Aviation Regulations (FAR) Part 77, Objects Affecting Navigable Airspace. All obstructions (which are primarily required navigational facilities) at Sea-Tac are properly marked and lighted.

The obstruction-free approach surface slopes required (according to FAR Part 77 criteria) are tabulated below along with the listing of existing slopes for the various runways.

<u>Runway</u>	<u>Required Slope</u>	<u>Existing Slope</u>
16L	34: 1	50: 1
16R	50: 1	50: 1
17	20: 1	20: 1
34L	34: 1	40: 1
34R	50: 1	50: 1
35	20: 1	20: 1

All of the approaches meet the criteria of FAR Part 77, with the exception of the approach slope to Runway 16L. The existing 50: 1 slope shown above is an operational approach slope related to a 500-foot displaced threshold. However, the approach slope criteria in FAR Part 77 is specifically related to the end of the runway pavement, a localizer

antenna penetrates the approach surface of the FAR Part 77 slope. If the localizer antenna can be relocated, then the threshold could be relocated to the end of the runway and still satisfy FAR Part 77 criteria.

AIRSPACE/AIR TRAFFIC CONTROL:

Airspace and air traffic control conditions in the Seattle-Tacoma area are described in detail in Section 8.0.1 ref. 4.

In general, air traffic control and airspace considerations are presently not limiting aircraft operations at the Airport. In this regard, the consultant estimated that Sea-Tac can accommodate air traffic demands through the planning period and beyond.

Terrain is a somewhat limiting factor for the Sea-Tac Terminal Area airspace. The Cascade Mountain Range to the east and the Olympic Mountain Range to the west create a band of low altitude airspace 40 nautical miles wide which runs from 20 nautical miles south of Puget Sound to the Canadian border.

One factor that is most critical for airspace capacity for Sea-Tac is the potential demand by IFR traffic at surrounding airports -- particularly at nearby Boeing Field International Airport. Under certain weather conditions, this close proximity of two busy airports could cause a bottleneck for traffic using Sea-Tac.

This conflict occurs when weather is less than about 2,000 feet ceiling and/or less than three miles visibility. Under these conditions, all IFR traffic at both airports must use part of the same airspace. There is

significant loss in Sea-Tac's arrival capacity in a south flow and to a lesser extent, there is a loss of departure capacity when traffic flow at Sea-Tac is to the north.

Although these weather conditions occur infrequently on an annual basis, they may persist for relatively long periods when they do occur. Problems caused by the overlapping use of airspace by Boeing Field International Airport and Sea-Tac International Airport during these particular weather conditions will become more critical as traffic volumes increase in the future. The consultant suggests that at some point before 1993, during these conditions, the demand at Sea-Tac will probably exceed the capacity of the final approach/departure airspace in the vicinity of Boeing Field.

TERMINAL COMPLEX REQUIREMENTS:

Passenger Aircraft Gate Positions:

The existing terminal at Sea-Tac provides 59 passenger aircraft gate positions (35 of which are presently in use), with an ultimate design capacity of some 65 aircraft gate positions. The existing terminal facilities and their programmed expansion seem to be more than adequate to meet the needs of air traffic demand through the forecast period. Full gate capacity will not be required until the annual passenger level exceeds 20 million, a fourfold increase over the 1973 level of 5.2 million passengers, (See Table 6.5.3:11).

Of the total aircraft gate positions constructed, 35 are located at the main terminal and the rest are evenly split between the two satellite terminals.

World Government to
11, 12
of 13?

Ticketing/Baggage Check-In:

Based on current arrangements, it is estimated that there is potentially space for 106 check-in positions at Sea-Tac. A total of 72 positions have been constructed to date and 48 of these are in actual use at present. Individual carrier relationships and needs will have to be reviewed periodically to guide future expansion.

Baggage Claim:

Baggage claiming facilities are arranged in three groups with each group containing one major carrier: the north lobby, United Air Lines, the center lobby, Western Airlines; and the south lobby, Northwest Airlines. Within each lobby, all of the claim devices are joint-use to accommodate individual airline peaks; but they are statically signed, designating the normal claim area for each airline in order to facilitate the movement of arriving passengers to the proper area.

The baggage signing system is designed to accommodate the addition of automatic changing signs when the need justifies them in the future so that joint-use of all claim devices can occur irrespective of lobby group. This would allow greater flexibility in joint usage and would enhance the baggage claim capacity at Sea-Tac.

In terms of baggage delivery times for Sea-Tac, it takes 20 to 30 minutes from time of wheel block to last bag delivered for conventional jets, and 30 to 50 minutes for wide-bodies aircraft. Present baggage claim facilities appear to be adequate to handle some 3,200 peak hour passengers.

Terminal Curb Capacity:

Due to site limitations and the resulting central terminal design, passenger terminal curb capacity at Sea-Tac is very limited compared to other large airports. Several additional contributing factors have compounded this situation: the proliferation of courtesy cars; the delay in solving baggage claim problems, particularly in the Parking Terminal; and the additions to curb demand by Metro Transit vehicles without an accompanying reduction in demand for private auto curb space.

Federal Security Investigation:

Compliance with anti-hijacking requirements at Sea-Tac has presented some design problems in adapting the existing terminal complex to accommodate these security provisions. The Concourses in the main terminal building were relatively easy to handle compared to the difficulties incurred in providing acceptable security processing for the Satellite Transit Stations. The limited space, and unique passenger flow and signing at these station areas do not lend themselves to the easy imposition of stringent security features.

FAA security projects no major change in passenger terminal security procedures for the next 5-10 years; but it would like to see preventive measures taken to preclude the success of any organized armed attempts to capture a plane at ground level. This might entail the installation of remotely controlled doors to the aircraft loading bridges and the provision of a manual control device for the main doors leading to

the Concourses. This addition to and improvement in existing control systems can be accomplished fairly simply.

Airport Access and Circulation:

The Airport drive system was designed to provide direct access from the freeway network linking the major urban areas in the Puget Sound Region. The north approach drive connects with Highway 518, the east-west intertie which provides convenient access to Sea-Tac from Interstate 5 and Highway 509. Temporary south access to the Airport is via Highway 99, the old major arterial linking Seattle to Tacoma.

Surface Access Capacity:

Traffic counts taken in November, 1973, and passenger counts taken throughout the year provided the information base for assessment of traffic characteristics for the Sea-Tac Terminal.

The average daily traffic (including employees) for the 5.2 million passenger year in 1973 was 31,000 vehicles. Excluding employee traffic, peak hour entering traffic to Sea-Tac is 1,500 vehicles per hour. For each emplaned and deplaned passenger, approximately 1.4 vehicular trips are generated.

In the maximum traffic hour, the directional split of traffic at Sea-Tac is 88% in one direction. The split of traffic between the north and south is 70/30.

Terminal Drives Capacity:

The terminal drives are designed for non-stop access to the passenger terminal. Optimally, traffic volumes on the drives should not exceed about 1,000 vehicles per hour per lane, but the maximum capacity is around 1,500 v.p.h. per lane.

No real capacity problems on the terminal drives system are anticipated through the 20,000,000 passenger year. However, capacity problems may potentially be posed by two areas: the single lane exit from the garage to the northbound exit lane and the temporary south exit. The forecasted traffic volumes, based on the continuation of existing conditions through the 20,000,000 passenger year, are within the estimated capacity of these potential problem areas.

PEAK DAILY TRAFFIC

(Total Two-Way Volume)

ANNUAL PASSENGERS	PEAK DAILY TRAFFIC WITH EMPLOYEES	PEAK DAILY TRAFFIC WITHOUT EMPLOYEES
6,900,000	41,400	35,700
9,600,000	53,800	46,400
15,100,000	78,500	67,700
20,000,000	98,000	84,500

If the northbound exit to the garage does become a capacity problem, the south exit will have to be made operational. This would

entail dealing with difficulties raised by site restrictions and traffic congestion at the intersection on U.S. 99. It may be necessary to provide the Proposed south entrance/exit and the 188th Interchange prior to opening of the south garage exit.

Automobile Parking Requirements:

Excluding rental car parking and servicing areas, some 4,150 parking spaces are currently available for public and employee parking. The existing parking demand is highly variable but maximum demand levels are reached by accumulated long-term parking during holiday periods.

The maximum parking usage in 1973 occurred in November and December during the holiday peaks. Garage capacity was nearly reached during the Thanksgiving peak period while parking demand exceeded capacity on four different days during the Christmas peak period.

The peak period of employee parking accumulation occurs between 2 and 3 p.m. when shift changes cause an overlap of employees. The maximum parking accumulation recorded in August, 1973 for this time period was 3,300 parking spaces or about 80% of capacity. Without employee cars, the public demand was about 2,200 parking spaces.

Several commercial parking lots near the Airport provide remote public parking. It is estimated that a total of 1,700 parking spaces are provided by five such lots with approximately 1,200 of these spaces available for public parking and the remainder taken up by rental car storage. Currently, about 25% of the total public parking demand at Sea-Tac is served by remote commercial parking facilities.

Table 6.5.3:20 shows the estimated public parking demands for various levels of annual passenger volumes. A 0.036% conversion factor is used to translate Annual Passengers to Peak Hour Passengers. These estimates assume a relationship of 1.5 parking stalls for each Peak Hour Passenger and that all employee parking will be located remote from the garage at an appropriate time. If the peak employee accumulation is removed, the existing Terminal Garage will have adequate capacity to serve the public parking demand until the peak hour reaches about 2,800 passengers.

Several factors which are not reflected in these forecast figures may influence future parking demand. For example, the parking projections assume uninterrupted operation of the remote commercial parking lots. However, should these be eliminated and replaced by some higher land use in the future, parking demand would subsequently be increased at the Terminal Garage for 1,000 to 2,000 additional spaces.

Also, the pricing system could be used to encourage remote parking by long-term parkers at commercial or POS-owned lots as well as to make public transit more economically appealing to Airport patrons. Improved service by alternative modes coupled with higher automobile operating costs may substantially reduce auto traffic and parking demands.

Capacity of Parking Entrances and Exits:

Entrance ticket spitters. A reasonable capacity figure for the parking entrance is 400 cars per hour per lane. With four ticket spitters

available at both the north and south entrances, the hourly garage entrance capacity is:

$$8 \text{ entrance lanes} \times 400 \text{ vehicles/hr/lane} = 3,200 \text{ v.p.h.}$$

It is anticipated that entrance capacity will be sufficient to accommodate the projected peak hour traffic through the 20,000,000 passenger year.

Toll collection facilities. Present toll collection procedures can handle an estimated two cars per minute per toll booth (120 v.p.h.) but with improved techniques and experience, three cars per minute (180 v.p.h.) should be a reasonable capacity to expect.

Currently, there are nine toll booth lanes available for use at the north exit with six in operation. Two toll booths are planned for the future south exit.

$$\text{Exit Capacity - North Only: } 180 \text{ vph} \times 9 = 1,620 \text{ vph}$$

$$\text{Ultimate Capacity: } 180 \text{ vph} \times 11 = 1,980 \text{ vph}$$

It is estimated that at least nine toll booth lanes will be needed for the 15,100,000 passenger year and ten for the 20,000,000 passenger year. If employee parking is excluded from the Terminal Garage, the existing six toll booths now in operation should be sufficient at least to the 9,600,000 passenger year.

Parking Analysis:

Parking needs at Sea-Tac International Airport can be divided into short-term and long-term requirements. The most urgent problem to be faced

is that of employee parking. The recommendations for the short-term parking needs contained in this section focus on ameliorating this problem, concentrating on ensuring adequate facilities to meet total parking demands for roughly the next five years.

A long-term program for parking will require the eventual expansion of the Terminal Garage for additional public parking. A possible alternative to this would be to accommodate public parking overflow at the Expanded Services site through even more extensive development at that location. The long-term approach must recognize that even a fully expanded garage will be inadequate by itself to accommodate the anticipated parking demand through the planning period. Additional remote parking will be required at some point prior to 1993 regardless of any efforts to increase capacity (by expansion and/or more efficient use) for the existing Parking Garage.

Table 6.5.3: 23 shows the forecast demand for parking at Sea_Tac, indicating what additional space for various user categories may be required through the 20-year planning period. To meet the anticipated parking demand through this period of time, a total of 9,000 customer spaces, 3,100 spaces for rental cars and long-term parking, and some 1,600 to 1,700 stalls for employee parking will be required by 1993. It is estimated that by the 15 million passenger year (1987-1993), total parking space demand will be at the 14,000 level.

Appropriate actions must be taken to assure the adequate provision of parking space throughout the planning period. For the short-term, this may mean the relocation of some users (long-term parkers, rental cars, and,

types of locations such benefits would be temporary. Access congestion into the terminal would also in principle be eased by a remote site, but this advantage is offset considerably by the uncertainty as to the ultimate access facility needs of the Expanded Services and remote parking site. These questions relate to the problem of Airport south access --a problem that must be dealt with in more detail in the future. Certainly, some costs for eventual access improvements in the general area south of the terminal will be impart oriented to the need for remote parking accommodations.

AIR CARGO FACILITIES:

All existing air cargo facilities are located in the N.E. Cargo Area. This area is sufficient to accommodate air cargo needs for some time, but future demand will eventually exceed space available and thus require development of other areas. The Auxiliary areas east of the present cargo area, as well as the proposed Westside Air Cargo/Maintenance area, could be developed to handle the overflow.

The N.E. Cargo Area is divided into six separate tracts. Two tracts, comprising a total of 35 acres, are presently vacant. The other four tracts are partially developed with the remaining unused portions already obligated for construction of future facilities. The rest of this section will describe the current state and potential development of each tract.

in particular, employees) from the Parking Garage to a remote lot; or if this is not accomplished, then the early expansion of the Garage will become necessary.

Presently, the only major parking area on the Airport is the garage at the Main Terminal. The choices made as to who may use this facility will in large part determine when it will require expansion. If it is to focus on serving public parking needs, substantial space could be gained for this user category by restriping the areas, removing employee and long-term parking, and reducing rental car space. The existing Parking Garage, thus could satisfy public parking demand until about the 10 million passenger year (about 1983). This would require remote parking for 1,500 employees, plus some 2,000 spaces for rental cars and long-term parking. Fully expended, the Parking Garage could provide as many as 9,800 spaces if the recommended restriping is carried out. However, to meet the anticipated parking space demand of some 14,000 by the 15 million passenger year, some 4,200 to 4,800 remote parking spaces will be required to supplement the fully expanded Garage.

The early expansion of the Garage, as a short-term strategy, could not immediately relieve the parking problem. There would be a time lapse of sixteen months to design and construct a new wing. In the interim, temporary remote parking would be necessary in order to handle the growing parking demand.

It is important to consider the appropriate time frame for various short-term and long-term strategies to operate within in order to minimize phasing or timing problems. One of the main advantages of developing

Tract C:

Existing facilities. POS owns Air Cargo Building #2 which occupies 48,000 square feet of the eastern four acres of the tract. This building is currently leased to the U.S. Postal Service for use as an air mail facility.

Proposed facilities. The present air mail facility will relocate to a new building in Tract A. The then vacant Air Cargo Building #2 will serve as a joint-use air cargo building similar to the manner in which Air Cargo Building #1 is now utilized. In fact, upon removal of Air Cargo Building #1, its remaining tenants will be shifted to Building #2 which will continue to serve their needs.

A two-acre site in the western half of the tract will be developed as an air freight forwarding facility. Future supplemental air carrier service is anticipated, requiring the development of such additional space.

Tract C will also serve as the temporary location of general aviation plane parking. Approximately 24 parking stalls will be provided for this purpose at a site south of the air freight facilities and west of Air Cargo Building #2. When the west side of the Airport is ready for development, this type of use will be transferred to that location.

Tract D:

Existing facilities. Tract D is the site of a 5,000,000 gallon City of Seattle reservoir and the existing POS maintenance facilities, both of which will be relocated outside of the N.E. Cargo Area. The

remote parking to relieve the existing parking problem is that it can be implemented relatively quickly (approximately seven months for a surface lot and 16 months for a structured parking lot).

	<u>Capacity</u>	<u>Estimated Cost ('75 Dollars)</u>
A. Structured Parking Lot	1,640	6,430,000
B. Surface Lot (Full Provisions)	1,500	760,000
C. Surface Lot (Minimal Development)	1,500	498,000
D. Expansion of Parking Garage	2,275	10,916,000

The locational requirements of remote parking include: (1) adequate space (minimum of 1,200-1,500 parking stalls), and (2) proximity to the Main Terminal allowing for a maximum headway time of 15 minutes for shuttle bus service. The Expanded Services site meets all the criteria for remote parking. Incorporated into the initial phases of development of the Expanded Services Area, this parking facility would not only serve to relieve the immediate problem of employee parking, but with expansion would also provide accessory parking for this complex when it becomes operational.

Other considerations include the likelihood that other commercial developments at the Expanded Services site (encouraged at least in part by remote parking developed there) would ultimately support much of a transit connection cost. Construction impact on operations would be less for a remote site. However, since garage expansion in the future would have to occur anyways, the only advantage in going earlier to a

remote site would be to avoid terminal construction impact so quickly on the heels of the recently completed terminal project.

Remote parking will tend to disperse air pollution impact in principle but again, since ultimate development includes both locations such benefits would be temporary. Access congestion into the terminal would in principle be eased by a remote site, but this advantage is offset considerably by the uncertainty as to the ultimate access facility needs of the Expanded Services and remote parking site. These questions relate to the problem of Airport south access which must be dealt with in more detail in the future. Certainly some costs for eventual access improvements in the general area south of the terminal will be partly attributable to remote parking demands.

AIR CARGO FACILITIES:

All existing Air Cargo Facilities are located in the N.E. Cargo Area. This area is sufficient to accommodate air cargo needs for some time, but eventually demand will exceed the space available and other areas will have to be developed. The auxiliary areas east of the present cargo area as well as the proposed Westside Air Cargo/Maintenance area could be developed to handle the overflow.

The N.E. Cargo Area is divided into six separate tracts. Two tracts, comprising a total of 35 acres, are presently vacant. The other four tracts are partially developed with the remaining unused portions already obligated for construction of future facilities. The rest of this

section will describe the current state and potential development of each tract.

Tract A:

Existing facilities. Air Cargo Building #1 occupies 45,000 square feet of Tract A. It provides joint use facilities for the following tenants: Airborne Air Freight, Airport-Drayage Co., Inc., Braniff International Airways, Continental Airlines, Eastern Air lines, Emery Air Freight Corp., Flying Tiger Lines, Inc., REA Express Agency, J.T. Steele & Co, and Wing & Wheels.

It is also the location of the existing Western Airlines Hangar. North of this is the old United Air Lines hardstand area which is now utilized for general aviation parking.

Proposed facilities. The southern 7-1/2 acres of Tract A is the tentative site of the new cargo building for Western and Continental Airlines. This will replace the existing Air Cargo Building #1 and Western Airlines Hangar. The northern 11 acres of the tract will be the site of the new Air Mail Facility which will move there from Air Cargo Building #2, located in Tract C.

Tract B:

Existing facilities. Currently, the sole development of Tract B is the United Air Lines Cargo Building which is located on the western 5 acres.

Proposed facilities. Approximately two acres in the eastern part of the tract will be developed for air freight forwarding, allowing direct servicing by supplemental carriers off a common taxiway.

Tract C:

Existing facilities. POS owns Air Cargo Building #2 which occupies 48,000 square feet of the eastern four acres of the tract. Currently, it is leased to the U. S. Postal Service which operates an Air Mail Facility at this site.

Proposed facilities. The Air Mail Facility will relocate to a new building in Tract A. The then vacant Air Cargo Building #2 will serve as a joint-use air cargo building similar to the way Air Cargo Building #1 is now utilized. In fact, when it comes time to remove Air Cargo Building #1, its remaining tenants will be shifted to Building #2 which will continue to serve their needs.

A two-acre site in the western half of the tract will be developed as an air freight forwarding facility. Future supplemental air carrier service is anticipated, requiring the use of these additional facilities.

Tract C will also serve as the temporary location of general aviation plane parking. Approximately 24 parking stalls will be provided for this purpose at a site south of the air freight facilities and west of Air Cargo Building #2. When the west side of the Airport is ready for development, this use will be transferred there.

Tract D:

Existing facilities. Tract D is the site of a 5,000,000 gallon City of Seattle Reservoir and the existing POS maintenance facilities, both of which will be relocated outside of the N.E. Cargo Area. The reservoir will be re-established in the north clear zone. When air carrier demand requires it, the maintenance facilities will be moved to Auxiliary Area B, (east of the N.E. Cargo Area), thus freeing additional space for air cargo activity.

Proposed facilities. The eastern 10 acres of Tract D are now being developed for Flying Tiger Air Cargo. By the end of 1974, a building covering 40,000 square feet of the site will be ready for their use. South of this is the tentative location for construction of an air freight forwarding building, while the remaining portions of the site are reserved for further development of air carrier cargo activity.

Tract E:

This area encompasses some 25 acres which presently lie idle. When demand materializes, this site has potential for serving air carrier maintenance needs.

Tract F:

This 10-acre tract is currently another vacant portion of the N.E. Cargo Area. Its future use could be as a maintenance site supporting the activities of the air carrier operating out of Tract D.

S.E. Cargo Area:

The S.E. Cargo Area, just south of the passenger terminal, is the location of air carrier hangars for four airlines at Sea-Tac: Northwest, Western, Alaska, and Pan Am. Northwest Airlines, which also operates a flight kitchen in its building, occupies the largest space within this area.

This cargo area encompasses some 22 acres which are currently developed to their fullest extent. There is no room for expansion of existing facilities or addition of new facilities at this location. Other areas must be relied upon to serve the needs of increased air carrier/air cargo activity at Sea-Tac.

GENERAL AVIATION:

Presently, the old United Air Lines hardstand area in the N.E. Cargo Area is used for general aviation purposes. This is strictly a temporary facility for general aviation since this site is part of the proposed lease area for the new Air Mail Facility.

When it comes time to develop the Air Mail Facility, a new interim general aviation site will be established in Tract C, adjacent to Air Cargo Building #2. A permanent site for general aviation on the west side of the airfield will be determined later, as soon as this area is ready for development.

OTHER SUPPORT FACILITIES:

Maintenance:

There are, at present, two separate sites for maintenance activities at Sea-Tac -- one in the northeast and the other at the southwest part of the Airport. The existing maintenance facilities located in Tract D will have to be relocated when this tract is needed for air carrier use. The other maintenance area, located in the existing industrial buildings at the Expanded Services site, will also have to be relocated when this area is developed.

There are higher priorities for the use of these areas other than the maintenance functions now occupying the land. Logically, these areas should be freed for further development and new permanent consolidated maintenance area must be planned.

Industrial Waste Treatment Plant:

The industrial waste treatment area is located on the southwest portion of the Airport. It consists of holding lagoons and a treatment plant which handles all the industrial wastes and runoff from airfield activities. Water from these sources is thoroughly treated before being discharged into Des Moines Creek.

Expansion of these facilities can be provided in two ways. One way would be to increase the capacity of the holding ponds. This would be cheaper than the second option which would be to enlarge the treatment

plant. The latter method of expansion, however, gives flexibility in case of equipment breakdown.

Fuel Tank Farm:

The existing fuel storage area lies just south of the S.E. Cargo Area on the Airport grounds. Presently, this consists of eight tanks with a total capacity of 560,000 barrels. Capacity is sufficient to meet the anticipated demand levels.

It is expected that expansion of this facility will not be necessary in the near future. Capacity conditions of the existing tank farm may even be improved if costs of supplying "bonded fuel" (tax free) continue to approximate that of domestic fuels. It is required that bonded fuel and domestic fuel be stored separately and this imposes certain limitations on the efficient use of existing capacity. However, the costs of shipping and storing bonded fuel is nearing that of domestic fuel and if this situation continues, demand for bonded fuel may subsequently be eliminated. Should this occur, it would mean a substantial improvement in real capacity of the tank farm since the artificial separation of fuel and extra storage would no longer be needed.

Several important factors must be considered when it eventually does become necessary to expand the tank farm facilities. Much thought and care must be exercised when it comes to situating a large and potentially hazardous area such as a fuel tank farm among the other activities at the Airport. While it must be convenient to the servicing areas of the various aircraft, it must not interfere with the operation of other important functions.

The airlines presently have an option on some 6 acres directly south of the existing tank farm for expansion purposes but this may have to be reviewed in light of subsequent development plans for adjacent areas. When the 50-acre site which adjoins this option area is developed for employee parking and the other more intensive uses which will comprise the Expanded Services Complex, a holding pond to handle the runoff from this area will have to be constructed. The option area is the natural choice for a holding pond since it is the lowest land surface in the vicinity.

The present tank farm facilities could remain at their present site with proper screening, but expansion should occur at an alternative location. Use of the option area for further additions to the clustered storage tanks would appear to impede commercial development of the ESC as well as create an undesirable visual effect. Rather than jeopardize the development potential of the ESC, alternative sites to expand fuel storage capacity must be considered. A new site based on the following location parameters should be determined at the appropriate time: minimize the costs of extending the existing pipeline, be compatible with adjacent land uses (especially non-Airport uses, and proximity to pumping stations and cargo areas.

Fire Station:

The existing fire station building is located adjacent to the Northeast Cargo/Maintenance area. When the North Satellite of the Passenger Terminal is expanded, the station will be relocated due to its position in the required aircraft taxiway clearance area. The new location is the southernmost triangle of Tract A of the Northeast Cargo Area.

The relatively poor condition and inadequate capacity of the station suggests that relocation should be accommodated before expansion of the passenger satellite requires it. The fire department is presently operating at approximately 50% below FAA recommended manpower standards. FAA certification requires that the Airport Operator show that there is available, on duty sufficiently qualified firefighting and rescue personnel to ensure at least 85% of the required maximum agent discharge rate of the firefighting equipment. To meet this requirement, the fire department should presently have on duty the manpower minimum of 12 firefighters, plus at least two additional firefighters per duty shift to cover as relief men.

If the manpower requirements are achieved, the existing station does not have adequate space to house them. The fire department will also be acquiring a rescue vehicle which in turn requires additional personnel. This will create additional demand on existing space to house these people. The construction of the building is such that soundproofing is minimal with the number of people working at this location (adjacent to the airfield) on a daily basis, a soundproof structure is almost essential.

Solid Waste Systems:

Solid waste handled by Sea-Tac disposal facilities is generated at several locations: aboard aircraft, in hangars, in flight kitchens, within the terminal, and the Airport grounds area.

Garbage (putrescible solid waste) is ground and flushed into the sanitary sewer system while other solid waste defined as trash is placed in containers and compactors and removed by a private contractor. Wastes

collected from regular sweepings of aircraft aprons and vehicular drive-ways are used to fill in low spots on Airport grounds .

Solid waste removed from international flights arriving at Sea-Tac are disposed of separately from other aircraft wastes in accordance with United States Department of Agriculture requirements. Non-putrescible solid wastes from these flights are incinerated by a private contractor using the POS-owned Airport incinerator. This incinerator meets all air pollution control standards set by Puget Sound Air Pollution Control Agency and has more than adequate capacity to handle international flight wastes through 1993.

Airport wastes have little impact on King County solid waste disposal facilities. The amount of waste generated at the Airport is an insignificant portion (approximately 1%) of total waste handled by King County's disposal system. It is important, however, to maintain a cooperative relationship between the Port of Seattle and King County Solid Waste Utility to continue compatible waste management practices between the Airport and the County .

Solid waste disposal methods and capacities were analyzed in a report prepared for the Master Plan project by Stevens, Thompson, & Runyan, Incorporated, and the Port of Seattle. It was determined that current waste management practices are more than adequate. No adverse impacts created by solid waste disposal at Sea-Tac could be identified. Aesthetic and health problems associated with poor waste management practices such as litter and overflowing waste containers were non-existent and all applicable governmental regulations were met.

6.5.4 RECOMMENDED AIRPORT PROGRAMS

AIRFIELD:

Very few aspects of the airfield configuration at Sea-Tac International Airport need extensive review in regard to meeting the forecasted aviation requirements through the planning period. As indicated, the Airport is well past the point in its development where extensive expansion projects would be needed to adequately serve aviation demand. What is needed at Sea-Tac is some "fine-tuning" to refine the existing airfield conditions. Some significant adjustments to navigation aids could be required in conjunction with conversion of the Airport to a strict "dual-lane" operational mode with all landings confined to the west runway (16R-34L). However, as discussed under Noise Remedies, Chapter 6.2, technological limitations preclude this opportunity in the next 5-10 years. The Demand Capacity Analysis conclusion, referenced earlier, that the existing basic runway system should provide adequate capacity through the 20-year-planning period remains applicable with the following minor refinements.

Runway Exits:

Some additional provision of runway exits is anticipated. Hi-speed Exit B-5 does not allow utilization by many larger aircraft. It appears that the addition of a new exit on 16R, between T/W's B-5 and B-6, would ease this situation. Those aircraft, which are unable now to make the B-5 turnoff, could be better accommodated by this new exit.

The Air Transport Association (ATA) was asked to comment on the need for a new taxiway off 16R. They recognized the advantages of having a hi-speed exit near the south end of the runway and recommended that it be located approximately 7,700' from the threshold of 16R, exiting at a 30 degree angle.

This design would facilitate egress of 4-engine heavy jets as well as eliminate the navigation and interference problems caused by aircraft penetration of the southend ILS critical area.

The addition of an hi-speed exit between Taxiways B-5 and B-6 would make the development of proposed Taxiway B-4 unnecessary. The B-4 exit can thus be deleted from the Airport Layout Plan.

Navigation Aids:

Navigation aid provisions at Sea-Tac need few additions or adjustments (except in terms of the points discussed in conjunction with potential noise remedy programs).

It is recommended that a Category I ILS be installed on Runway 34L. This would increase airport capacity and contribute to the safe operation of the airfield in general. A Category I ILS can be adequately established within the terrain constraints that exist to the southwest of the Airport.

General Aviation Runway:

Provision of supplemental capacity of general aviation activities for general aviation operations requires special attention. The temporary General Aviation Runway 17-35, 2,875 feet in length, falls some 725 feet short of FAA planning criteria for accommodating all aircraft weighing 12,500 pounds or less. As it exists, its clear zone requirement would restrict development of the west side area. Provision of a permanent 17-35 would impose further restriction on west side land use. The development costs associated with this runway would be considerable because of the terrain, and the integrity of the buffer area between it and adjacent residential property would be lessened. In view of this...

- *Proposed Runway 17-35 should be eliminated and that Taxiway C should be extended to serve as a permanent 17-35 for general aviation operations.*

When the Westside Cargo and Maintenance Area is ready for development, Taxiway C can be further extended to service this area both as a taxiway and as a general aviation runway. Moving the runway threshold to the south at that time would further reduce approach area conflicts with cargo/maintenance development.

AIRPORT LAND USE AND SUPPORT FACILITIES:

Recommendation for land use within the Airport will be discussed in terms of geographic sub-areas of the Airport as follows:

S.E. Cargo Area:

This area is currently fully developed and no further expansion can be accommodated here.

N.E. Cargo Area:

Most of this area is already obligated for specific uses. The development pattern is well established in this sector. Only two tracts remain completely vacant at present while the other tracts have some additional undeveloped acreage within them. The following discussion explains how each tract can be handled in the programmed development for this general area.

A new fire station will be relocated in the southernmost triangle of the cargo area. This should occur before the North Satellite undergoes expansion so that adequate maneuvering space will surround the enlarged structure. The southern half of Tract A will be developed for air cargo space. The existing Air Cargo Building No. 1 and the Western Airlines hangar will be removed in this changeover of use. Removal of existing facilities and re-development of the area will also improve the working space around the expanded satellite. The proposed cargo building would be situated with adequate setback for aircraft parking. The new Air Mail Facility is slated for construction on the north half of Tract A. This location will permit the

development of a larger building specifically suited for this function whereas the existing facility is a converted air cargo building.

Proposed Tract B development includes construction of an air freight forwarding building east of the existing United Airlines cargo building. This will be designed for direct servicing of aircraft which should be highly beneficial to future supplemental air carrier service.

Within Tract C, Air Cargo Building No. 2 will be converted back to its original function when Air Mail operations relocate. Air freight forwarding activities will be accommodated here as in Tract B. This will be developed east of Air Cargo No. 2

Flying Tiger Cargo facilities are programmed to be developed in Tract D. The City of Seattle reservoir now located within this tract will be resituated in the North Clear Zone. At the same time, POS maintenance will need to be removed to Auxiliary Area B. These two adjustments will allow Tract D to be more appropriately used for air cargo functions. It is expected that the two undeveloped tracts, E and F, will remain designated as future aircraft maintenance sites. This function will be required as the Northeast Cargo Area becomes more fully developed.

General Aviation Area:

While the main function of Sea-Tac is to accommodate commercial air carrier operations, there is also a need to handle a limited amount of general aviation activity. The present temporary location of general aviation parking and servicing in the N.E. Cargo Area will be needed for air cargo activities as this function expands. As the west side is developed, general aviation

can be given a permanent fixed based support location adjacent to Taxiway C. Extending this taxiway and utilizing it for general aviation operations will be possible as the total west side area becomes developed.

Another factor in the problem of handling general aviation traffic at Sea-Tac is the U.S. Customs situation. If Boeing Field were better prepared to handle the needs for Customs clearance general aviation demands on Sea-Tac would decrease. Sea-Tac's position as the only full-time Customs location in the region necessitates use by many international general aviation arrivals.

If a major Customs clearance demand is still present at Sea-Tac after Fixed Base Operation (FBO) facilities are transferred to the west side, then some difficulties may be experienced in the need to cross the runways to reach the International Satellite Customs location. It may prove feasible to provide Customs service via ground vehicles to the west side, but this question will require further attention as development occurs.

Westside Cargo Maintenance Area:

The southwest portion of the Airport is generally designated as a future cargo-maintenance area. This location represents the only major land area remaining undeveloped with potential runway system access available at Sea-Tac. Airport capacity studies indicate that this area should provide generally a sufficient reserve for cargo and aircraft maintenance demands during the planning period.

Access to the site is a major concern--both from an intra-Airport standpoint and in terms of off-airport connections. Several potential methods exist to connect this area to nearby roads and SR 509. A connection could occur in

the S.W. 188th St./Des Moines Way area to the south end of the site. Another possibility is at 176th St. in the center of the site. A third opportunity exists from the north via 160th St., which connects to SR 509 at an existing intersection. This last method would depend heavily on the vicinity development pattern occurring along 160th St. Access within the Airport proper is important, especially the necessity of passenger terminal access for cargo destined to aircraft belly compartments at gate positions. The most desirable access would be a service road tunnel connection paralleling the 188th St. tunnel. The other service road possibility would connect around the northern perimeter of the Airport along an alignment already established by an unpaved service road.

The exact nature and timing of westside development is critical to eventual intra-Airport access to the west side. Because of the considerable cost represented by a tunnel connection (estimated at \$2.8 million), a very clear indication of tenant demand would have to be established before a cost effectiveness assessment of access could be conducted. It is recommended that...

The majority of the west side should be held as a developmental reserve for cargo and maintenance uses as long as possible so that capital programming for access and utilities can be directly related to established user requirements.

Fixed Base Business Aviation:

Sea-Tac has not provided space for the business aviation segment of general aviation in the form of ground lease operating base locations. As

westside development occurs, it is likely that increasing demand for such uses will be generated. Sea-Tac's location in this region is potentially convenient to many business aviation users. From this standpoint of land use alone, it is recognized that, while future space for direct runway system-related uses is limited, some space on the west side might be safely allocated to business aviation without severely jeopardizing the higher priority air carrier-related uses. However, such allocations would of necessity need to be very restrictive in view of the long-term need to reserve space for the prime air carrier-related functions. In addition, the potential inclusion of some forms of business jet operations to the Airport will add to total community noise exposure. Such exposure would be minimal but could be significant from a policy standpoint unless the leasing policy includes limitations...

Business aviation shall be subject to FAR-36 noise restrictions or equivalent performance restrictions applicable to noise generated by aircraft based or utilized at Sea-Tac.

And the area is limited...

total allocations to business aviation should not exceed 15 acres and must be confined to the peripheral portions of the westside cargo/maintenance land reserve area, i.e., the extreme south or north ends of this site.

Facility Maintenance:

POS maintenance facilities can be consolidated in auxiliary areas A and B. Presently, this function is fragmented and scattered over several locations.

Development of the auxiliary areas for this purpose will necessitate a holding pond to contain runoff water from them since no means of draining the site with existing drainage facilities appears feasible.

It is recognized that the proximity to Highway 99 and Riverton Heights interchange would make some airport-related commercial development of this area possible. Potentially, such development could also occur at this general location along with the maintenance facilities although the total area available is limited.

Tank Farm:

Adjacent area south of the existing tank farm had previously been proposed for expansion of the tank farm if and when needed. It is desirable, however, in view of potential use conflict with the Expanded Services site and because of storm drainage considerations, to examine alternative locations. The area south of the existing tanks has been identified topographically as appropriate for a holding pond.

Alternative expansion sites were assessed in terms of these locational criteria:

- a. Minimize costs of extending the existing pipeline.
- b. Be compatible with adjacent land uses (especially non-Airport uses).
- c. Proximity to pumping stations and cargo areas.

A search for the best expansion site resulted in the selection of an area in the southwestern sector of the Airport next to the ponds on the western ridge of the Tyee Golf Course. This area is convenient to the

existing tank farm, and will fit in with the general development pattern of the west side. It will also be compatible with the surrounding land uses. This area is generally zoned for manufacturing use with some large lot residential uses mixed in. It is a transitional area which will probably become more intensely developed for manufacturing and commercial purposes.

It is possible that, with decreasing reliance on bonded aviation fuel, the need to segregate fuels in the tank complex will decrease in the future and thus increase net capacity. If this occurs, the likelihood of expansion requirements would be lessened.

Industrial Waste Treatment Plant:

The existing treatment plant should be expanded to include additional holding lagoons to adequately handle the anticipated capacity requirements over the study period.

Possible locations of new ponds would be south of S. 188th Street or north of the proposed west side perimeter road. These areas would be sufficient to deal with this need.

Airport Viewing Park:

An area on the west side of the Airport, currently used as a viewpoint, should be developed as a park for people interested in observing airport operations.

015.4. ff 11
Fire Protection
Recommendations

There is strong community identification with this section of the
has perhaps the best visibility of the airfield of any un-
available for such uses. This area serves well as a buffer
Airport operation and the adjacent residential community.

it should be made a permanent viewing area with proper landscaping and
the possibility of other amenities.

The fact that the general aviation site will be located next to the view-
point will also add to the enjoyment of this Airport-community interaction
point. The size of the general aviation aircraft as well as their variety will
perhaps make it easier for viewers to relate to the Airport operation in general.
It will provide a close-up look at the full range of aviation activities including
air cargo and maintenance operations as the west side is developed. Some
commercial development could occur in conjunction with view park/general
use in the form of restaurant services to both users and the general public.

Fire Protection

The Fire Department at Sea-Tac International Airport has written a fire
protection master plan concurrently with the Sea-Tac/Communities Plan
Airport Master Planning effort. The following recommendations have been
derived from that report:

Firepower should be brought up to FAA certification standards:

- Truck No. 1 - three firefighters
- Truck No. 3 - three firefighters
- Truck No. 4 - three firefighters
- Truck No. 5 - two firefighters

Truck No. 6 - three firefighters

Truck No. 7 - two firefighters

16 firefighters (minimum on-duty force)

Aircraft response alarms.

Increase the manning of all crash trucks from the present one man to three men on each truck by the end of 1975.

The purchase of large-capacity AFFF crash trucks as replacements for Trucks Nos. 3 and 6 by the end of 1976.

Structural response alarms.

(1) Increase the engine company's manning by the end of 1975 from three men to four men to comply with the Washington Survey and Rating Bureau recommendation.

(2) The purchase of one additional engine and an aerial truck by the end of 1975.

(3) The purchase of a medical aid vehicle within one year.

Fire station locations. Fire stations should be located so as to provide an average response time of three minutes or less to all parts of the Sea-Tac International Airport.

The construction of a new, larger fire station at the intersection of South 170th Street and the North Perimeter Road should be completed by the end of 1976, or sooner. This location should include construction of a "burn building" to be used in training for structural fires.

A second fire station should be located and constructed at the southern end of the Airport when the need arises. This will be determined by construction of the initial phases of the Expanded Services Complex. A rough breakdown of the equipment types and personnel requirements for each station is described below.

North Station

Apparatus and Full Manning

Truck No. 1 -- (light rescue-combination engine)

Truck No. 3 -- (3,000 AFFF crash truck) --three men

*Truck No. 4 -- (1,500 AFFF reserve crash truck) - one man
late response*

Truck No. 5 -- (multi-purpose vehicle) - two men

Truck No. 8 -- (medical aid vehicle) -- two men

Truck No. 10 -- (3,000 AFFF crash truck) -- three men

South Station

Apparatus and Full Manning

*Truck No. 2 -- (combination engine/telesquirt/hose) --
four men*

Truck No. 6 -- (3,000 AFFF crash truck) -- three men

Truck No. 7 -- (tanker) -- two men

Truck No. 9 -- (heavy-duty rescue truck) - two men

Undeveloped/Reserved Areas:

Expanded services complex. A 50-acre site directly south of the S.E. Cargo Area has been identified for several years as an Expanded Services Complex. Construction of the remote parking garage in the northernmost part of the site will be the forerunner of more intensive use of the available Acreage.

The Expanded Services Complex as proposed, would include a wide range of airport-related activities. Passenger services which do not require location within the passenger terminal complex would have priority for space in this development. A relatively compact, well organized pattern of terminal supporting commercial and business uses are planned for this area. Parking is a major component at this site and is discussed in detail under Terminal Area Parking. When development of the Expanded Service Complex reaches a point which would justify the investment, a transit link similar to that now servicing the satellites will be installed. This would provide rapid access between this site and the terminal area. This will be an essential addition if this development is to reach its full potential.

TERMINAL COMPLEX:

Passenger Terminal:

Sea-Tac's Passenger Terminal facilities as presently constructed and programmed for expansion appear to be adequate to meet the forecasted demand through and beyond the 20-year planning period. Careful management practices and periodic review of individual airline needs will provide a check on any unanticipated fluctuations in passenger levels at Sea-Tac and their subsequent impact on Terminal Area operations.

In terms of passenger check-in, waiting areas, baggage handling and baggage claim facilities, the existing space designated for these purposes is sufficient to meet the expected demand levels. Full gate capacity will not be required until the annual passenger level exceeds 20 million, a fourfold increase over the 1973 level of 5.2 million passengers. No significant problems are anticipated in expanding these facilities as passenger levels rise over the forecast period.

Existing and planned concessionaire and passenger service facilities, likewise, are generally adequate to meet anticipated demand. These facilities should also be regularly reviewed, however, to assure that there is an orderly coordinated effort to expand.

It has become apparent that serious parking problems and difficulties with south access to the Airport will require careful attention. The Airport drives have adequate capacity for the forecast period but congestion problems at the S. 188th St. intersection will increase over the next five years and may

necessitate construction of a major interchange to adequately handle the traffic flow; therefore...

King County, Port of Seattle, and the State Highway Department must coordinate their planning and work programs for the S. 188th St. corridor. Traffic growth should be monitored and improvements made as necessary.

Parking:

The parking situation at the Terminal presents problems now and will be of increasing concern over the next few years. Existing or future potential capacity of the Garage is insufficient to handle the projected parking demand throughout the study period. Alternative locations for parking must be developed to meet forecasted demand. At the same time, more efficient use of space in the Parking Garage must be accomplished to assure full utilization of this facility for Airport patrons and to enable expansion plans to continue on their programmed schedule.

The present terminal area is experiencing congestion and overload problems at peak traffic times. The situation needs immediate attention to prevent even more serious problems from developing. The suggested monitoring and surveying of individual carrier and concessionaire needs will provide a reliable way of assuring that these are properly provided for. Because this complex question has required considerable analysis, a special parking study was conducted concurrently with the overall planning project. The following describes the recommendations derived from that study.

The Port of Seattle's Engineering Department has prepared cost estimates for three alternative ways of developing remote parking at the Expanded Services Complex site. They range in nature from intensive to very minimal development. Alternative A is structured parking lot (garage), while Alternative B and C offer varying degrees of surface lot development.

Alternative B provides for a surface lot fulfilling the following design parameters: Parking spaces for approximately 1,500 cars, paving on both the parking areas and the drive lanes, several shuttle bus stations (including lighting and telephone connections), security guard stations, security fencing, storm drainage facilities (this will necessitate a detention pond), parking area lighting, bus turnaround south of the existing Parking Garage (in the vicinity of the cooling towers). This fully paved and equipped lot would cost some \$760,000.

Alternative C is a surface lot which has the same capacity as Alternative B, but offers certain economies. Reducing the level of construction (fewer pick-up stations, and minimum surfacing) provides the means for achieving lower cost of development. The cost estimates for this lot (some \$498,000) represent about a 50 percent reduction of costs from that of Alternative B. Further cost reductions could be achieved by reducing the size of the lot in its initial phase to 900 or so cars (approximately \$288,000 total cost).

Alternative A, though more expensive at the outset than Alternatives B or C, offers important advantages which justify its preferred selection over the other two. Its design is more feasible in that it calls for more intensive use of the very costly and limited acreage available. Whereas the surface

lots require some 10 acres (approximately one-fifth of the ESC area), construction of the garage requires only four to five acres. The garage fits the long-term development pattern of the Expanded Services Complex in this regard. The surface lots, however, would be inconsistent with the development potential of the land. When the ESC site reaches a point in its development that requires full utilization of the land, space consuming surface lots would have to be eliminated. Another consideration must be the aesthetic appeal of a well designed, relatively compact garage over that of acre-upon-acre of car-studded blacktop.

The alternative to providing for employee parking at a remote site would be early expansion of the passenger Parking Terminal. This would mean the addition of at least one wing to the Garage to relieve the overload problem which will become of increasing concern in the next few years.

Costs were analyzed in two different ways. The first analysis looks only at the comparative costs of the four different alternatives, A through D. A comparison of annual capital costs indicates that expansion of the Parking Garage would represent a greater financial liability than that of any of the three development alternatives for remote parking.

The annual operating costs used in this analysis only take into consideration the shuttle bus service to the terminal area until such time as a permanent transit connection is provided. While it is realized that the costs of the transit system might exceed shuttle bus costs, it is assumed that the major portion, if not all of the operational maintenance expenses, would be supported by the commercial aspects of the Expanded Services Complex.

	Annual Capital <u>Cost*</u>	Annual Operating <u>Cost</u>	Total Annual <u>Cost</u>
Remote Parking Alternative A	\$544,436	\$185,322	\$729,758
Remote Parking Alternative B	64,350	185,322	249,672
Remote Parking Alternative C	42,166	185,322	227,488
Expansion of Parking Garage	924,270	185,322	924,270

*Alternative D based on annual payments

The second analysis examines two plan strategies. Plan I is based on initial construction of the remote parking garage with expansion of the main Parking Garage in 1980.

Annual Costs:

(1975-1980, 30 yrs. @ 7-1/2% -
quarterly payments)

Remote Garage	\$ 540,404
Operational Cost	<u>185,322</u>
1975-1980	\$ 725,726

(1980-2005, @8-1/2%)

Term Garage Exp.	\$1,008,768
Remote Garage	<u>540,404</u>
1980-2005	\$1,549,172

(2005-2010, @ 8-1/2%)

Term. Garage Exp.	\$1,008,768
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Total Outlay - Plan I = \$47,401,770

Ave. Annual Cost - Plan I \$ 1,354,336

Plan II is based on initial expansion of the main Parking Garage with construction of the remote garage taking place in 1980.

Annual Costs:

(1975-1980, 30 yrs. @ 7-1/2% -
quarterly payments)

Term. Garage Exp. \$ 917,424

1975-1980 \$ 917,424

(1980-2005 @ 8-1/2%)

Term. Garage Exp. \$ 917,424

Remote Garage 594,208

1980-2005 \$1,511,632

(2005-2010 @ 8-1/2%)

Remote Garage \$ 594,208

2005-2010 \$ 594,208

Total Outlay - Plan II \$45,348,960

Ave. Annual Cost - Plan II \$ 1,295,685

Upon reviewing these two analyses, one may conclude that, while initial construction of the remote garage and delayed expansion of the main parking terminal (Plan I) is the lesser total outlay cost, the short-term annual cost of the remote garage is less than that of expansion of the main parking

terminal. In view of present burdens in retiring construction bonds for recent passenger terminal expansion, it may be prudent to construct remote parking now at the lower annual cost.

Public parking. Priority for space within the main parking facility should be given to Airport patrons. Their need for convenient direct access to the Main Terminal, facilitating the smooth flow of passengers to and from their air carrier connection points, should be of primary concern. In order to meet public parking needs in the existing facility, such things as restricting the garage and elimination or reduction of long-term parking, employee parking and rental car space must be accomplished.

Complete removal from the Parking Terminal of employee parking is necessary in order to adequately serve the public parking demand. One parking space can accommodate 4.5 customers for every employee parker, so the deletion and relocation of employee parking would significantly improve public parking capacity. If employees were moved out of the Parking Terminal, there would be adequate capacity to handle total passenger traffic peaks until about 1979.

Long-term parkers are tying up a considerable portion of garage capacity. Limiting maximum length of stay to three days for public parking would enable the Garage to accommodate an additional passenger flow of over one million. This would achieve about two extra years of below capacity operation for the Parking Terminal.

Another step can be taken to extend the useful life of the existing parking facility by restriping the Parking Garage. Approximately 340 additional parking spaces may be created by restriping two floors for exclusive

use by compact cars utilizing straight-in (90degree) parking and by eliminating pass-through lanes.

The relocation of half of the rental car space at the main garage to remote lots would free some 170 parking slots for public use. Rental car companies would still have adequate space at the Parking Garage to keep a sufficient ready-supply of cars to serve customer demand at the Terminal. Utilizing half of the present rental car spaces for public parking would help extend the life of the existing garage by approximately one year.

If all the above actions were undertaken, the existing garage would be adequate to serve public parking demand until about 1982 or 1983. At that time, excess demand could be accommodated by the addition of one wing to the Parking Terminal or the overflow could be handled by further development of Expanded Services Complex parking facilities.

Employee parking. Employee parking presents significant problems at the Parking Terminal, particularly at times of capacity overload of this facility during the holiday peak periods. In order to reduce this overload, employee cars are diverted to remote parking (e.g., the NE Cargo Area) during the holidays. As a general practice, employees are encouraged to use public transit or park at sites other than the Terminal Garage.

Several alternative sites have been assessed for relocation of employee parking at Sea-Tac. A study entitled, "Inquiry into the 'Expanded Services' Complex at Sea-Tac," was completed in November, 1969 by the Port of Seattle Planning and Research Department. It explored several locational

scenarios and proffered one site near the south end of the airport as the most likely choice for other future development of an expanded services complex. This area, which would be an organized montage of commercial, business, residential and recreational uses, could help solve problems at the Airport by providing remote lots connected by the Satellite Transit to the Terminal.

One of the Port of Seattle's most recent efforts at evaluating alternative sites for employee parking was in April, 1974. Five sites were assessed in a brief report entitled "Airport Employee Parking Location Analysis." It was determined that the proposed site of the Expanded Services Complex best meets the criteria for a remote parking site of space, distance to the terminal, shuttle bus headway time, and possibilities for being a long-term solution to the parking problem.

Conclusions. Total parking demand at Sea-Tac has reached a level which now presents over-load conditions at peak traffic periods and this will become even more serious within the next few years. Appropriate actions must be taken to alleviate the immediate problem, as well as to assure adequate provision for future parking requirements...

★ Remote parking must be eventually developed to supplement the existing Parking Garage.

Depending on the phasing program adopted this can help meet short-term as well as long-term parking needs at the Airport. In between phasing programs, all methods to extend the useful life of the Garage should be considered in order to maximize its capacity to serve parking demand. Therefore...

Action must be taken soon to alleviate an immediate problem.

Some temporary remote parking may be needed.

Additional new structural parking is recommended.

Other measures to extend capacity of the existing garage should be used.

Both the existing garage and the remote Expanded Services Site will be required for structural parking in the long run.

Analysis of which location to emphasize first in a phased development program resulted in a relatively equal comparison technically and financially.

Final selection should be based on a review of all developmental policy considerations that apply to this program.

6.6.1 COMMUNITY DEVELOPMENT GOALS

The ability of the Airport and the communities to exist together in a balanced relationship depends not only on noise remedy programs (Chapter 6.2), water quality and drainage programs (Chapter 6.3), air quality programs (Chapter 6.4), and airport improvement programs (Chapter 6.5), but depends on the application of such programs as part of a carefully planned community development concept. In this concept the above programs are coordinated with a range of land use policies and programs in order to assure that all concerned are most effectively and efficiently working toward the fundamental goals of the Sea-Tac Communities Plan.

LAND USE COMPATIBILITY:

The Airport, a regional asset, makes a substantial contribution to the economy of the Pacific Northwest. Locally, however, its relationship has been less than satisfactory. Although the Sea-Tac Communities face a variety of problems including stream flooding and pollution, airport expansion, and commercial land use encroachment, the effect of aircraft noise has been the most significant. Therefore one fundamental goal is:

Goal:



Make the Airport and the community better neighbors.

An effort will be made on Airport property to properly locate uses and buffer adjoining land. North and south of the Airport noise remedy

programs are the primary effort for achieving compatibility. On the east side of the Airport commercial and hotel uses are well established, adaptable to noise, and certainly compatible with the terminal activities. The land on the west side is isolated between the Airport and the freeway, SR 509. The west side includes substantial amounts of undeveloped land, and few homes remain after freeway and Airport expansion. In this case a substantial change is possible with the land providing growth for both Burien and airport related uses.

On all four sides not only will noise problems be addressed and hopefully solved, but all land use decisions will be based on the following policy objective:

policy: ★ *Blend the Airport and its surroundings.*

LAND USE CONSIDERATION IN THE IMPACT AREAS:

Clearly, purchasing all land receiving some impact from the Airport is neither an economical nor desirable solution. Equally obvious, the existing single family residences cannot continue to endure the high noise levels. What land uses are then compatible?

Residential Considerations:

The criteria presented in Chapter 6.2 can be used to delineate the area which should be removed from residential use. Beyond those boundaries single family residential neighborhoods should be made livable through

a combination of noise remedy programs and other community development actions geared to improve local conditions. There are many established neighborhoods in the less impacted areas where the residents have demonstrated the desire to reside. Also there is a significant public investment in urban services.

In some instances multi-family usage can be compatible with the Airport, since apartment structures can better insulate against noise. As it would be shown with other land uses, questions of compatibility with remaining single family uses and questions of the availability of urban services must be answered before extensive apartment areas are established.

Commercial Considerations:

An early assumption by many was that impacted lands would be best put to industrial or commercial use, the type of development that could be compatible with the aircraft noise situation. However, it soon became apparent that such an ingeniously simple solution was plagued by questions of suitability and compatibility. Was the land actually suitable for such uses? Would there actually be a market for such uses? Would we merely be compounding the problem for the remaining residential uses by imposing something else incompatible besides noise?

The existing assortment of commercial center in the vicinity is important when considering new commercial growth in noise impacted areas. Southcenter, Burien, Des Moines, and Pacific Highway South are all existing commercial areas with considerable growth potential. Burien is located at the center of a network of arterials serving the surrounding resident

population in excess of 100,000 persons. Southcenter with its location at the intersection of two interstate freeways, I-5 and SR 405 can draw from a regional population in excess of 1,000,000. The lack of adequate access to any market effectively eliminates the noise impact areas for commercial development.

Industrial Considerations:

The use of noise impacted lands for industry on the surface appears more logical than for business or trade, for two primary reasons. The airport is itself an industrial type use, especially considering those activities such as cargo and fuel transfer, maintenance buildings, etc. Secondly, airport activity, air cargo in particular, is often thought to require support of warehouses and freight terminals. However, industrial use must be proven economical and feasible.

The Duwamish and Green River Valleys contain industrial development that is significant, not only to south King County, but to the entire region. These industrial areas have evolved and grown due principally to some distinctive advantages they possess. Rail access, navigable waterways, adequate power, and large level sites are basic to the evolution of industrial centers. In addition they are convenient to a major airport, Sea-Tac. The influence of the Duwamish and Green River Valley industrial belt on the Sea-Tac Communities is unmistakable. Very little non-airport industry exists in the Highline area. Over 200 acres of land within the Airport vicinity are currently zoned for manufacturing or industry and approximately 15 acres are presently developed with industrial uses. In short, the noise

impacted areas do not contain the necessary economic factors to attract industry, plus intensive noise is a detrinant to many industrial uses.

The market for air cargo related warehousing does not really exist. The nature of air freight is one involving little lay-over in storage; to warehouse goods for long periods would defeat the purpose of rapid air shipping. The limited storage and warehousing needs, along with the more extensive maintenance facility requirements of air cargo and commercial air carriers, are presently being met by facilities located on the airport itself.

Last, to convert extensive areas north and south of the airport to industrial use would impose totally incompatible uses on the surrounding residential neighborhood.

Open Space Considerations:

Various forms of open space are compatible with aircraft noise exposure. Those which involve large assemblages of people, of course, are not logical, both because of noise and safety.

Extensive open space and recreation uses, although not problem free, can provide substantial opportunities. Such uses are compatible with residential use, in fact, can work toward uplifting the quality of adjoining neighborhoods. In developed residential areas which may be presently deficient in park land, such as north of the Airport, open space created because of the noise impact can provide needed park land without further disrupting the residential neighborhoods from within.

Open space use can take various forms ranging from improved recreation, such as golf courses, to natural areas meeting suburban equestrial

needs. Agricultural open space is compatible with noise and can provide an economical return, though often modest. Agriculture however, is usually highly dependent on proper soils, a scarce resource in the Sea-Tac vicinity.

Conclusion:

While a number of land uses appear to be compatible with noise, that is, can exist in noisy environments, all must also be evaluated in terms of suitability, market, and compatibility. Unfortunately those which would normally be the most profitable are also the least likely to occur and most disruptive to the remaining community. The selected open space uses carefully planned to meet local needs will be cost effective and support other Sea-Tac Community Plan policies and programs.

COMMUNITY AND ECONOMIC DEVELOPMENT:

The growth of the Sea-Tac Communities prior to 1960 was largely in the form of single-family development accompanied by commercial development which was geared largely for the provision of household goods and services. In the early sixties, the first hotel was built which catered solely to Sea-Tac passengers. Numerous hotels followed in response to the jet-age boom. Multi-family development began in the sixties like in many other suburban areas. Commercial development, however, remained largely dedicated to serving the needs of the areas's households except for the airport-related growth on the Hwy 99 strip.

Many citizens within the Sea-Tac Communities have expressed a need for a greater sense of community identity. Unfortunately, growth and development has produced a variety of unrelated features which either do not warrant, or do not allow, community identity. Because new development has been inhibited by noise, uncertainty and the economy, efforts to foster a feeling of belonging or identity have been ineffective. Therefore a fundamental goal of the plan is:

Goal: ★ Provide a focus for community identity.

Identity is generally far more easily obtained through the focus of activities. There are options yet available as to ways this may be accomplished. Clustering a variety of community service uses, such as cultural, governmental and recreational, is one approach. The improvement and beautification of existing business centers to strengthen them as community focal points is also an option. Scattered historical preservation is another, although effective approach, toward creating community identity. Community identity can be improved by the above measures whether change in the overall development pattern occurs or not.

It is not expected that any other facet of the Sea-Tac Communities will display such growth dynamics as those land uses which are related to the Airport. Although, the Airport itself will not substantially expand since its present runway system and terminal facilities are designed to handle a 20 million passenger year, there will be continuous, substantial increases in air passenger traffic. It is reasonable to assume that growth of airport-related and air trade related activities would follow. Therefore, opportunities

for change within the communities occur relative to the growth of those activities related to the Airport.

The graphs shown in Section 4.2.3, page 3 illustrates the trends since 1960 and the forecasts to 1990 of Sea-Tac passengers and corresponding motel rooms. Motel rooms are used here as an indicator of the expected growth of the airport-related activities, since rooms relate most directly to passengers and because the trend of room growth since 1970 could be accurately obtained and plotted. The trend from 1960 to 1973 shows a strong correlation between rooms and passengers. The lag of rooms growth indicates the time it has taken for the hotel market to respond to spurts of air passenger growth. The forecast number of air passengers by 1993 is 17,500,000. The corresponding forecast for motel rooms is 3,770, a 2,021 room increase. This is tantamount to the addition of eight more Holiday Inns, which has 260 rooms, to serve future Sea-Tac passengers. In varying proportions other airport-related activities such as rental car, entertainment, car, personal services etc. can also be expected to increase.

The potential of these activities to make a contribution to the orderly growth of the surrounding area depends largely upon their ability to properly relate to the community, not only by minimizing their impact on surrounding neighborhoods; but by also supporting local commerce and enhancing area image. The real opportunity to make the Airport compatible with the community and foster a renewed identity may well rest with how effectively airport-related uses can be intergrated within the community.

A special opportunity exists, then, when major local governments coordinate their plans. New improvements and investments can be examined

and chosen to serve a new purpose often without additional cost. For instance, a new road necessary for airport purposes also may be located and designed to serve a community purpose, thereby stimulating renewed community and economic development. Therefore...

policy: ★ *The Port and King County should assume an active, positive role in stimulating local community and economic development.*

ENVIRONMENTAL MANAGEMENT:

Many people give credit for their enjoyment and appreciation of the Sea-Tac Communities to the beauty and natural character of the area. In order to maintain that character, deliberate community and governmental action will be necessary to obtain the fundamental goal:

goal: ★ *Safeguard the abundant natural features of view, water, and vegetation.*

Responsible Development Will Protect The Environment:

Public as well as private projects must be based upon an environmental conscious which will...

policy: *Preserve and protect the natural environment.*

Saving as many trees, ponds, and green belts as possible; taking advantage of view potentials; using natural features to separate different

land uses; and using open space as a visual focus should be part of responsible development. Therefore, in order to retain natural qualities that presently exist such measures should be used in both public and private projects.

Control measures would further assure that construction is sensitive to its natural surroundings. The height of buildings in areas which have views or the potential of views should be controlled. Additional development controls in areas containing bogs, marshes, wetlands, and steep slopes should be imposed.

Open Space Can Solve Problems:

The establishment of open space provides a solution to major problems, especially in noise areas whether other land uses, such as industry, may not be feasible. Different development characteristics found in the north and south of the airport demand flexibility geared to compliment the surrounding neighborhood and to...

policy: *★ Promote a diversified and extensive open space systems.*

A natural approach to drainage such as holding ponds may be applied. Open space can also be used to separate residential neighborhoods from incompatible land uses. The Creeks, therefore, provide the backbone of the open space network.

policy: *Use the drainage holding ponds, water courses, and wetlands of Miller and Des Moines Creeks for recreation incorporated into a network of open space.*

RESIDENTIAL NEIGHBORHOODS:

The condition of residential neighborhoods is a fundamental concern of all communities. Action which can strengthen the identity or enhance the character of existing neighborhoods should be encouraged.

goal: *△ Enhance and protect residential neighborhoods.*

Bring About Stability:

The removal of uncertainty associated with airport expansion, future noise levels, and home marketability is a major step in achieving stability. Many of the noise remedy programs will be aimed at promoting stability in the residential neighborhoods.

policy: *★ Resolve the uncertainty connected with noise impact.*

A major step toward removing such uncertainty should be assured by determining once and for all the extent of airport expansion, by removing the financial restrictions which have inhibited home sales, by providing noise remedy programs (from purchase guarantee to sound insulation) to the remaining neighborhoods, and, of course, reducing the noise generated by the aircraft. With those uncertainties other programs to improve neighborhoods where needed and to change neighborhoods where appropriate can then be effective.

most important to the majority of the people within the airport vicinity are the financial restrictions in the resale of homes and the values placed on them -

by the assessment office to 2004 by the actual market value for the vicinity.

Improve Neighborhood Quality:

A major step toward enhancing and protecting residential neighborhoods would be through road improvements fulfilling their potential as community assets. Roads can do more than providing automobile traffic routes by including street tree planting, view points, underground wiring, and bicycle and pedestrian paths.

Parks can also be a major factor in fulfilling the neighborhood identity. In some areas, a park development might be the start toward improving neighborhood quality and cohesiveness by bringing people together in its planning and by providing a common and shared place.

Schools presently serve as the focal point for many neighborhoods. Although declining enrollment and possible changes in service areas due to noise remedy programs may somewhat alter this relationship, neighborhoods can be enhanced by maximum use of school facilities as activity centers for all ages.

Assure Orderly Conversion:

Zoning, as a tool for neighborhood protection, can help provide adequate buffering or transition between residential and non-residential uses. In neighborhoods where some non-residential uses may be planned, developments that provide buffering and open space would be the most compatible with adjacent homes. Commercial planned unit developments and industrial parks are examples of this approach.

In some instances compatibility will result only through substantial change within a neighborhood. Since such a change may occur over a number of years, the manner in which the conversion of land uses occurs

is critical throughout the process. Conversion of single-family areas, especially those more densely developed, can obviously bring about a number of problems. During the period of transition, existing residents may feel threatened by new uses being developed nearby, or by unordered acquisition of land. To minimize the problems, it is necessary that...

policy: *Conversion of land uses within or near single-family residential areas should be accomplished through orderly transition programs.*

AIRPORT ACQUISITION AREAS DEFINED:

A The most significant, long lasting action resulting from the Sea-Tac Communities Plan will be the determination of the extent of land acquisition for airport environmental purposes. Once that boundary is determined and the process begun to purchase the properties, there will be hope for the remaining communities. In addition to looking forward to a gradual improvement in noise conditions themselves, priority in other programs can be given to those remaining areas adjoining the acquisition area.

policy: *Generally, community development programs should have priority in those areas adjoining the Airport acquisition area. Within those adjoining areas priority shall be given to the most environmentally sensitive uses.*

7. The determination of the Airport acquisition area is based on the application of all policies and criteria delineated in previous chapters on Noise (Chapter 6.2), Water Quality and Drainage (Chapter 6.3), Air Quality (Chapter 6.4), and Airport (Chapter 6.5), as well as this Chapter 6.6 on Community Development, to existing land use, topographic and geologic conditions, and road patterns. The following map depicts the acquisition boundary which may vary in detail as final engineering studies and property negotiations are undertaken.

The determination of the Airport acquisition is not solely based on the above. — Whatever happened to the "extended clear zone" — a safety area for the airport? That face of the acquisition is for safety not noise. Considering the fact that 1250' laterally from the runway centerline & 5200 ft beyond each end of the runway are to be considered "desirable minimums" — it should be so stated. (Whether it is mandatory or not!)

6.6.2 ACHIEVING COMPATIBILITY

Three basic methods can be identified as means to achieve compatibility between the airport and the communities: outright acquisition of an area by a public authority, private redevelopment or land use conversion, and reinforcement of existing land use uses or neighborhoods. While each is not mutually exclusive, an understanding of the three approaches gives greater meaning to the detailed development guidelines which will ultimately follow.

PUBLIC ACQUISITION:

Acquisition of land by a public authority is a most direct and complete form of land use change. It is complete because public agencies possess the power of eminent domain and thereby have the right to take, or condemn, private land at fair market value, provided that the land will be for the "public use or necessity". Although the term "condemnation" has somewhat a negative connotation, the power is generally only used when normal negotiations are unsuccessful.

Additional factors considered in large public acquisitions include cost, source of funds, effect on the tax base, relocation of existing uses or residents, effects of abandoning utilities should future uses have no need for them, environmental impact, and the future cost of operating and maintaining the property. These factors, and certainly more, complicate the

public decision of whether to add real property for the public's use or necessity .

PRIVATE CONVERSION:

The second general method of land use change is through private initiative. As opposed to public acquisition, the private sector is at a disadvantage because of the lack legal means, such as condemnation, to assemble small parcels, e.g. when dealing with single family land use changing to other uses, small parcels of land usually must be assembled to form larger tracts. Since it is a significant feature of this plan to rely on the private sector to bring about land use change, it is important to review the factors influencing private development or redevelopment of urban land:

Economic Return:

Foremost of course, is the probability of an economic return on the development investment. In addition to their own effect on the suitability of a contemplated use, each of the following factors has a dollar dimension.

Ownership:

Because private developers do not have the power of eminent domain, single family areas which become logical for redevelopment are usually rejected. Private developers and their financial supporters instead have preferred large vacant tracts further from present urbanization.

Cost of Redevelopment:

The intensity of existing use, in this case the density of single family use, poses the most significant constraint to redevelopment in the vicinity of the Sea-Tac Airport. Platted or subdivided residential land not only presents the problem of high clearing costs, but also the problem of vacating additional streets.

Physical Site Suitability:

In some cases clearing a developed site maybe more economically feasible than dealing with a difficult vacant site should the alternative vacant site possess soil, geologic, drainage or other natural problems.

Transportation:

Proximity, or competitive position, of the property to its intended market makes transportation a significant factor whether the use be an apartment, business, industry or hotel. And, of course, each use has its own transportation requirements.

Availability of Utilities and Facilities:

While sewers and streets are the primary necessities their actual existence is not always the total consideration. Included as considerations are the cost and timing of the improvement and the possibility to share the cost.

Development of Surrounding Properties:

The market position of a site is enhanced should an intended use

become a part of an area where other uses possibly supportive of each other exist or might arise. If a major anchor-type development is pending the area in the near vicinity may well experience change in anticipation.

Local Character, Quality and Potential:

Some private development interests are concerned with the overall character or quality of the community in which their development is to be located. Also some more far-sighted interests are involved with creating character and are therefore concerned with the potential of an area more than its existing state.

Local Attitude:

Increased public awareness supported by environmental legislation has made the consideration of local attitudes a serious factor in evaluating private development alternatives.

Government Support and Assistance:

Larger scale developments often consider the degree to which government support and assistance is available. Towns are occasionally found competing for new uses to boast their local economy. Zoning, utilities, taxes all become bargaining points. At a different level government can give financial support or guarantee private development. Degrees of government assistance can be provided through various forms of economic development programs, coordination of local capital improvements, and planning coordination at all levels of government.

Market Suitability:

While all of the above factors are in a sense measures of market suitability, there exists the separate and distinct question, "Is there a market for the use in this general area?"

Redevelopment Potential:

The question remains, "why should private developers be interested in redeveloping urban land when thousands of acres of vacant land exist out and away from the urban areas?"

The first consideration must be whether there is or isn't a desire to return to the urban area or a desire to be within a closer time and distance proximity to not only urban places of employment, but also urban activities. The continued rise in the popularity of condominium living somewhat expresses this as well as the desire to be rid of the upkeep of the large suburban house and yard. An incentive to developers to redevelop urban areas would be the desire of people -- the developer's market -- to live, shop and work in urban developments rather than move to new growth areas in rural King County.

General planning directions at the County, Regional and State levels are pointing toward defining some sort of outer limits for suburban development in order to curtail urban sprawl, retain sensitive environmental and agricultural areas, conserve energy, and limit costs of new freeways and utilities.

It is not fully known to what extent this kind of urban redevelopment or life style exists or what trends are prevailing. However, recent action, such

as the court ordered delay of the third Lake Washington Floating Bridge, make those once certain high return suburban developments much more speculative. The trend in state and federal legislation makes unrestricted growth less assured and is more supportive of in-city living. The factors are there. The Sea-Tac Communitites Plan should recognize this new force and be prepared.

INCREASED STABILITY THROUGH REINFORCEMENT:

In the majority of cases actually changing land use or ownership does not solve a community's problem. The community may be well established, but suffering from undesirable forces. The more desirable and economical solution is to apply programs to reinforce what is already there. These programs can be remedial, remove a problem or correct a situation created by a problem. The programs can be preventative. In the long run the most effective programs may be those which are designed to stimulate renewed community interest and confidence in itself. Whatever the type of program, reinforcement means the Port of Seattle and King County taking the initiative in carrying out a combined set of programs.

Chapter 6.2 lists a number of noise remedy programs. Their effect should be twofold. The uncertainty associated with home ownership should be alleviated because of the purchase guarantee and assistance programs. Second, physical improvements for sound insulation should make homes more liveable.

Various forms of economic development programs have been sponsored by local, state and federal governments. The Housing and Community Development Act of 1974, which replaces older programs like urban renewal, is far reaching and innovative. Much of the Act is oriented to reclaiming our already developed areas. The Act encourages coordination and greater partnership between local governments, existing property and homeowners, and interested developers.

Local and state governments can effectively time Capital Improvements in a concerted manner to compliment the private development process. Especially important are the timely provision of sewer and water utilities, local access roads and freeway interchanges, and drainage facilities.

Although much of the result of planning for communities in general is to "reinforce", the concept is given special attention and areas actually delineated in the Sea-Tac Communities Plan. This is to show the concentration, rationale and expected benefits of various programs in the vicinity of the Airport.

THE ECONOMICS OF ACHIEVING COMPATIBILITY:

(to be written)

This section will contain an analysis of the types of "gains" and "losses" in acquisition, conversion, and reinforcement areas, to include housing units, population, school enrollment, tax base, commercial markets, etc. Part 7 will contain the actual detailed cost effective analysis.

One principle to be illustrated here will be that the net result in all areas combined should be an equal or greater tax base resulting from proposed programs.

6.6.3

07.13

Designated Recreation Uses -

line 3- "within the noise acquisition
area _____

6.6.3 - any reference to sunset of

07.14

High school should recog-
nize the fact it is located
within the extended clear
zone - a safety area for
the airport - not a noise
acquisition. As such FAA

guidelines say it is not com-
patible to schools - places
of public assembly.

4.3.5 07.5 -

Annual Aircraft Operations

Total aircraft operations are ex-
pected to almost double during the
forecast period. - - -

6.6.3 DEVELOPMENT GUIDELINES

Development guidelines are intended to direct urban development to appropriate areas, guide the conversion of land use, and to reinforce and protect remaining areas. It is recognized that compatibility between the Airport and the community can only be achieved by encouraging and properly directing land use changes in the vicinity of the Airport. Development guidelines are presented here by three basic types of areas: acquisition, conversion and reinforcement.

The primary intent in guiding development in the vicinity of the Airport is to redirect airport-related growth and other urban development away from permanent and stable areas to areas capable of receiving new development or to share new development would have a positive effect on growth and change.

policy: ★ *Direct the economic and land use development of airport-related activities, general urban development, and public projects toward deliberate improvement of the local community.*

Neighborhoods remaining which previously had been threatened by the encroachment of airport-related commercial development, excessive airport-generated traffic volumes, etc. would now be effectively protected and their stability reinforced.

ACQUISITION, CONVERSION AND REINFORCEMENT AREAS DEFINED:

The following map identifies the three types of areas. Land use changes are proposed for the acquisition and conversion areas. Transportation and land use encroachment concerns are addressed for the future growth and stability of the reinforcement areas.

By delineating the areas, application of programs can be clearly defined and, most important, properly evaluated. This table summarizes the residential characteristics of the acquisition, conversion areas.

Table: ACQUISITION, CONVERSION AND REINFORCEMENT AREAS

MAP AREA	NUMBER UNITS	GROSS AREA	DENSITY (UNITS/ACRE)	NUMBER PARCELS
A-N	616	250 (less Sunset Pk)	2.46	
C-N	77	36	2.14	(to be computed)
C-E	177	65	2.72	
C-S	132	63	2.10	
A-S	110	130 (less freeway R/W)	.85	
C-SW	*	*	*	
A-W	72	38	1.89	
C-W	410	250	1.64	

Total A

Total C

TOTAL

* to be computed

Notes: All residences in change areas are single-family residences.

Gross area is total area including streets which may consist of 15%-20% of the total area.

S.R. 509 CORRIDOR DEFINED:

SR 509 is a freeway facility which will ultimately be the key transportation link between the total Sea-Tac/Highline Community and the rest of the Seattle-Metropolitan area. It presently ends in Seattle near the 1st Avenue South bridge and will ultimately connect to the Seattle central business district. The extension south beyond its existing terminus at Des Moines Way South has been the subject of discussion and controversy. Its ultimate location has the greatest impact on the Sea-Tac communities, but unfortunately it is beyond the scope and authority of this Plan to finally select such a route.

The posture of the State Highway Department and the present status of SR 509 was summarized in August, 1974, by the State Highway Department District #1 engineer:

"The Department does have an established corridor for SR 509 between S. 160th Street and SR 516. Right-of-way is presently being purchased within this corridor. Although the department is committed to this route, a study plan has been set up to evaluate the environmental impact and consider design alternatives for SR 509 from S. 160th Street to SR 516 within this corridor."

Although the planning responsibility lies with the State Highway Department, the Sea-Tac Communities Plan process sought to examine local factors as route considerations. Specifically future developments near Sea-Tac's west

side, including industry, air cargo and maintenance facilities, offices, and apartments; plans for development of an expanded passenger services complex and an airport employee parking near the intersection of Highway 99 and S. 188th Street; potential south airport access problems encompassing the adequacy of existing airport drives and congestion at the intersection of Highway 99 and S. 188th Street will all be affected by the location and design of SR 509.

After careful review and consideration of route alternatives, the Sea-Tac Communities Plan concluded that for planning purposes SR 509 will continue to the south and ultimately connect to I-5. It is also concluded that a major south access to the airport must be incorporated as part of this freeway facility. Both of these issues must be the subject of additional technical studies. Should the final location and design be significantly different, some revision to the Sea-Tac Communities Plan may be necessary.

ACQUISITION DEVELOPMENT GUIDELINES:

Consideration of suitable uses, compatible with noise and the adjoining residential neighborhoods, has prescribed a direction for utilization of noise impact acquisition areas. In order to buttress the intent of the noise remedies and further promote neighborhood amenities...

policy: *The noise impact acquisition areas should be primarily open space, put to community multiple use.*

A variety of open space and recreation needs, desires and requirements have been analyzed throughout plan development. Recreation groups, as well as individuals and staff members, have expressed views on recreation and open space needs.

The following uses and activities, along with requirements peculiar to each, are competing for a share of noise impact area use: soccer, 15 to 20 acres plus a meeting room; rugby, 5 acres; tennis, 2 to 5 acres for indoor courts and a clubhouse; field archery, 10 to 20 acres plus a clubhouse; watersports, encompassing swimming, boating and fishing; horse-back riding, including trails, 40 or more acres for semi-public riding, and 2 to 5 acres for corrals; nature walks, primarily trails along Miller and Des Moines Creeks; landscaped buffer areas intended only for visual, aesthetic improvement; golf, over 120 acres to include a clubhouse and, possibly, "pitch-n-putt" areas; motorcycling, + 200 acres for motorcross, scrambles, and flat track areas.

in which zoning regulations permit market demand to select from a variety of permitted uses within a particular zoning classification.

To the north of Sea-Tac, three community use reserves contain roughly 7, 8-1/2, and 50 acres; over 60 all together. South of the airport there is one 25 acre reserve. Theoretically, 7 acres would absorb rugby and tennis acreage demands; 50 acres should more than suffice for soccer and archery. Thus, the expressed needs of various recreation groups could be met, with approximately 30 acres left for future use.

The purpose of the community use reserve designation is to promote development of open space and recreation uses consistent with demonstrated needs, in terms of current demands and future requirements.

policy: *Post-Plan Coordination procedures should provide for determining the appropriateness of any proposed activity with a community use reserve; the compatibility of the use with the particular development theme and specific location; the adequacy of provision for off-street parking and maintenance.*

policy: *Multiple use of community use reserves should be encouraged, provided that the uses are compatible and adequate area is provided for each specific activity.*

policy: *Areas designated as community use reserves should be held inviolate against diversion to non-open space/recreation uses, and should not be considered as reserves for such uses.*

IMPORTANT

The Maywood and Madraona neighborhoods are characterized by less dense, more rural qualities; many people chose the area to live in principally because of its pastoral aura. Open space uses here should complement that image.

policy: *Development of the south acquisition area should stress open space and recreational uses that contribute to the dominance of a natural, rural, and greenbelt character.*

Horseback Riding Facilities. Consistent with the more pastoral development theme of the south end, roughly 45 acres are designated for equestrian use.

policy: *The equestrian use area should allow the range of development associated with horseback riding, such as, pastures, corrals, stables, trails, and an arena.*

To assure compatibility with nearby residential uses, the corral, stable, and arena uses, as well as the off-street parking areas needed for riders and spectators, should be located away from the boundary common with residential uses, and nearer to S.R. 509. In order to provide buffering...

policy: *Within the equestrian use section, pastures and grazing areas should, to the greatest extent possible, adjoin the nearby single family residential properties.*

Des Moines Creek Park Addition. Application of the noise remedy criteria for acquisition justifies procurement of additional lands for incorporation into Des Moines Creek Park. Nearby uses, however, also justify a modification to the rural, pastoral development theme.

In the area west of Pacific Highway South, east of 24th Avenue S., between S. 200th and S. 208th Streets there are 230 mobile homes, which represents a deviation from the otherwise low-density, large lot, scattered residential development that generally characterizes the area south of Sea-Tac. In order to respond effectively to the needs of a somewhat higher density living area...

policy: *Within the south acquisition area play facilities should be developed which are accessible to the medium density population adjacent on the east.*

West Acquisition Area Guidelines:

An area with airport-related development potential is between the Sea-Tac's west side and Burien. The relatively sparsely developed single family area (about 1 1/2-2 units per acre) will be further impacted by the extension of S.R. 509, probably within the next 10 years. Upon S.R. 509's completion the area will be between the Airport and the freeway with little opportunity remaining for the neighborhood to maintain itself as a unified and stable residential environment. The development of air cargo, aircraft maintenance, general and corporate aviation uses on the Airport's west side

would provide the primary impetus for redevelopment of the area. The southern portion of the area south of S. 170th Street, between 12th Av. S. and the freeway route, is largely at an high enough elevation to make its future use directly compatible with the airport facilities on-grade with the runways and taxiways. For this reason this site becomes a scarce resource, since it is the only remaining area of such elevation not already designated for airport use, (see Chapter 6.5). Acquisition of this area for future Airport development related to air cargo and airport activities provides the initial redevelopment of the west side.

policy: ★ *Areas on the Sea-Tac west-side on or near elevation similar to those of runway grade should be for future Airport use directed toward improvement and redevelopment of the west acquisition and conversion areas.*

This area differs from the other acquisition areas in that it relates directly to a conversion area. The timing and manner in which this area is redeveloped greatly affects the success of the west conversion area.

This area is somewhat more densely developed than other areas on the west side, since residential subdivisions exist here. Other residential areas are more sparse with single homes on large tracts. A major obstacle to private land development - the assemblage of small platted parcels - would therefore be partly eliminated through acquisition. The area is also wedged between the Airport and the proposed freeway with approximately 1200 feet

between the two at So. 170th Street and only about 600 feet between them at So. 176th Street. For this reason acquisition of this area should occur in a manner timely to the residents of that area.

policy: *Acquisition of the initial west side cargo auxiliary area should occur prior to the development of S.R. 509 and prior to extensive use of the west side for Airport purposes.*

CONVERSION DEVELOPMENT GUIDELINES:

A primary problem in parcel-by-parcel changes in land use is that a single house, or a small residential enclave, may be caught in amidst redevelopment. In some cases this is considered to be desirable from the property owners standpoint since increased development raises the property value and its eventual scale will be more appreciated, or inflated, than if it had been included in the initial development. However, many desire to avoid the transition of their neighborhood, especially if they are owner-occupants. During the period of transition, existing residents may feel threatened by new uses being developed nearby, or by unorderly acquisition of land, and probably most felt are the effects of nearby homes being removed or demolished. To minimize these problems, it is necessary that programs of conversion are undertaken to assume a orderly conversion of land uses within or near single-family residential areas.

Transition Control:

Timing, coordination and the manner in which land uses are converted are major considerations in programming an orderly transition. To a certain extent existing development controls, such as zoning, planned unit developments, subdivision controls, etc. can be relied on. However, due to the redevelopment nature involving small parcels and existing residences, variations to these controls or the development of new controls must be considered.

The Tract PUD concept is merely introduced here. It appears to have some potential and goes considerably further than existing control measures in assuring orderly transition of single-family areas. For that reason....

policy: ★ *The Tract PUD should be further developed as an official means to encourage orderly transition of single-family areas where necessary and desirable.*

The mechanics of the Tract PUD are not nearly as difficult to overcome as the ways in which to encourage its use. Since additional costs and energies will be required to assemble parcels to form tracts, gain approvals, prepare more detailed plans; new incentives also need to be developed. Currently developers are permitted additional densities should they go over and above what the code requires to accomplish a quality development.

Existing land or home owners can also undertake measures to facilitate the conversion of their area. Assuming there is a fair amount of agreement amongst the owners, legal development corporations could be formed where advertising, negotiations and sale of the properties is done as a unit. While there are obvious pit falls to this approach it comes most closely to addressing the problem of assembling parcels to create unified ownership.

Zoning can be applied in three basic ways. The zoning classification which most closely represents the plan can be applied "outright". Developers would be permitted the range of uses allowed by the code and subject only to the general provisions of the code. Zoning can also be applied which indicates a potential use. Conversion to out-right, or actual, zoning requires the preparation and approval of a Planned Unit Development (PUD). The third application would be to retain existing zoning or zoning which reflected current uses. Change of zoning would require the approval of an application for rezoning subject to the plan's use and conditions. Change of current zoning could also be initiated on a sub-area or area basis by the local zoning authority (King County). Zoning controlled in this manner might better assure coordinated timing of land use change as opposed to a parcel-by-parcel rezone and development. Orderly transition of land use in conversion areas cannot occur under outright zoning. Measures which utilize planned unit development provisions therefore must be heavily relied on.

policy: ★ *Land use changes in identified conversion areas shall be subject to the approval of planned unit developments.*

Through preparation, review and approval of the PUD, can be made for the development's relationship to surrounding properties, as well as for access, landscaping and architectural provisions. More specific provisions can be placed on actual development of the site in the review of a PUD than a rezone.

A PUD of a new type is necessary which would combine a number of parcels into logical development tracts. Such a "Tract PUD" could be under a single or multiple ownerships. Current owners could join together to form a tract. Preparation and approval of a Tract PUD could make their properties more marketable for prospective developers. A major hurdle of assembling small parcels, site planning, and official approval would be accomplished.

A further refinement to this approach would be to divide the process into two phases. The first phase would consist of establishing the tract and setting the general nature of the future uses. This would require little, if any, actual site planning. The tract would be reviewed to determine whether it was a logical developable unit, to outline its constraints for development, to determine whether the general uses intended met the direction of this plan, and most importantly whether the tract could be developed without undue hardship to or degradation of surrounding single-family areas. Upon approval of the first phase, the tract would be considered a developable unit. At this point current owners could market the tract, or its development rights, to prospective developers who would prepare and submit detailed second phase plans. It is essential that the tract stay as one unit and any reduction in its area would require an additional first phase review and approval. Second phase Tract PUD plans would include specific uses, architectural design, access and circulation plans, landscaping plans, drainage plans, plans for public and open space, and other plans and designs which would assure that the considerations and conditions are met of the phase one approval relative to the tract's harmony with the remaining single-family area.

An additional commitment and impetus could be added to this approach by actually forming a 'single' ownership under a corporation. While some legal questions remain, a subdivision could conceivably be vacated forming one single tract with ownership by a single corporation with numerous shareholders. The existing homes would be similar to detached condominiums. The corporation itself might be synonymous with a condominium owners association. The land unit could then be sold or other official actions taken, as approved by the board of directors and the shareholders.

An additional way of assisting redevelopment is through public acquisition of parcels and their eventual resale. While such purchase/sellback could not be practiced indiscriminately, in many cases it could be an effective way in which to assemble small parcels to form larger tracts, especially where public acquisition programs are likely to be in effect, such as in "purchase assurance-guarantee" noise, program areas (see Chapter 6.2).

North Conversion Area Guidelines:

This triangular areas lies outside areas eligible for noise remedy programs except for its western 1250 feet where 26 of the area's 77 houses are located. That section is within a purchase assistance noise program area. The area is bordered on the south by freeway S.R. 518. As traffic volumes increase on that facility, vehicular noise impacts will undoubtedly increase on this area. Airport and freeway generated air pollution, especially hydrocarbons and particulate, also affect this area.

Conversion from single-family use to multi-family use in this area

seems logical. Apartment structures can be more adequately constructed to eliminate these impacts from the indoor environment through sound proofing during construction and by providing air conditioning. Outdoor areas, such as yards and gardens, which are currently soiled by air pollution particulate, are also not as prevalent in multi-family use areas. Conversion to multi-family use would also be an expansion of an existing multi-family area immediately east of the area.

policy: *The area identified as the North Conversion Area*
 ? *should be encouraged to convert to medium density multi-family use with proper sound insulation.*

Much of this area is 29 to 30 feet above the freeway's elevation providing the area with good unobstructed views of the north portion of the airport and clear zone. Although now a constant reminder of the airport's negative impact, the spectacular views of aircraft taxiing to their take-off position could be captured as a real amenity for apartment dwellers. Additional height achieved by multi-story apartment structures would also open up views to the west of the Olympic mountains and the north acquisition area open spaces, as well as the airport operations.

Traditional PUD requirements may be all that is required for orderly conversion of this area. However, property owners may find it to their advantage to form more developable units.

East Conversion Area Guidelines:

Conversion of this area would result as the ultimate "filling out" of the airport/passenger commercial growth area. It would contain a variety of commercial uses related to the airport, possibly hotels, and multi-family uses. It's proper development is critical to the reinforcement of the McMicken Heights neighborhood and careful site planning and design must assure that a proper transition is achieved between the commercial uses fronting Highway 99 and the single-family residential neighborhood of McMicken Heights. The Tract PUD for conversion would be appropriately applied here to single-family areas converting to non-residential uses.

South Conversion Area Guidelines:

This area includes the 35 acre area owned by the Port and designated as a future Expanded Services Complex (see Chapter 6.5). A small, but densely developed, 98 house subdivision is also included in this area. The Port owned Tyee golf course is adjacent west of the area. Only the narrow western edge of this area containing one row of houses (13 of 98) is identified for noise acquisition. The remainder is within a purchase assistance noise remedy area. In addition to the impacts of aircraft operation, this area will eventually be further affected by development of the expanded passenger complex, south airport access roads and possibly encroachment of expanded Highway 99 commercial use. The area will lose, if it hasn't already lost, its neighborhood cohesiveness. This will be further heightened if Angle Lake School[?] is acquired and its area incorporated into the expanded complex.

The Expanded Services Complex needs to be defined to include private land area which can be converted to uses complementary to the entire conversion area. Such uses may well be high and medium density apartments and offices.

policy: *Site planning and design for the Expanded Services Complex should include, whenever possible, the private areas of the South Conversion Area to encourage proper land use integration and to facilitate orderly conversion of the area.*

Under application of noise remedy program criteria only, the "purchase assistance" noise remedy program would apply here. In order to assist conversion, the "purchase guarantee" will be applied instead. Those homes which are acquired could be retained, or "land banked", and re-sold once a significant number of parcels were assembled. Development could be contingent on legal covenants that describe uses and conformity to certain plans. Planning and design for the Expanded Services Complex could thereby be effectively controlled for both the public and private owned portions.

Southwest Conversion Area Guidelines:

Privately owned land immediately southwest of the Airport presently supports the only significant non airport-related industrial uses within the entire Sea-Tac Communities. Uses are primarily those of the light manufacturing or heavy commercial type, such as commercial storage,

vehicle storage, some office and limited light fabrication. Few single-family residences (less than 30) are currently within the defined conversion area. The Highline School District's bus storage/dispatch and industrial/vocational education facilities are the only major public uses in the area.

Two future actions will substantially affect this area. The extension of S.R. 509 will bisect this area forming a full diamond interchange at So. 188th St. and will provide the eastern boundary of the area north of 188th and its western boundary south of 188th. This action will greatly improve this area's ability to gain access to the regional transportation system. Another action is the development of Sea-Tac's west side to airport industrial uses (see Chapter 6.5). Both of these actions can be expected to influence the type, timing and extent of development in this area. Orderly conversion of this area with careful site planning can positively add to the community's industrial and employment base.

policy: ✚ *Manufacturing and industry uses within the Sea-Tac Communities should be directed to locate within the southwest conversion area.*

The primary concern in this area's conversion, much like the other areas, is compatibility with surrounding single-family residential areas. Upon completion of S.R. 509, the southern portion of this area will be effectively separated from single-family areas since it will be confined by S.R. 509 on the west and southwest, S. 188th on the north, and airport clear zone and open space to the east and south. The northern section will also be effectively

surrounded by compatible transition uses to the east, north and west. However, the portion of this area south of S. 188th does abut a single-family area. While changes in topography aid in the transition, special considerations should be made to control the type of uses and to assure proper buffering and set-back. Planned Unit Developments are essential here regardless of the size of the parcels.

The potential for a totally planned business or industrial park approach to this area is restricted by a number of existing uses and the unfortunate existence of a number of small parcels. However, a few vacant parcels of five acres or more could be planned to include the addition of surrounding lesser developed properties for their eventual redevelopment. Hopefully, the new developments would serve as anchor-type developments and influence the character and future redevelopment of the entire area. This type approach should be encouraged and assisted whenever possible.

West Conversion Area Guidelines:

This area involves the second largest number of single-family residences-410. Except for its northern portion, the area does not fall under any direct noise remedy program as presented in Chapter 6.2. However, as a result of past Airport expansion, its cohesiveness as a residential neighborhood has diminished. Future extension of freeway S.R. 509 from Des Moines Way to S. 188th street will perpetuate its instability. Therefore, conversion to more urban uses related both to the airport and to Burien seems a logical direction.

Fundamental to its conversion are timing and coordination. As mentioned its relationship to the west acquisition area is a key. Other factors are extension of S.R. 509, interest by major developers, provision of utilities, etc. While a substantial number of houses are ultimately involved, it is apparent that a number of small residential enclaves could coexist with the redevelopment for a considerable length of time. An example is the small 26 home subdivision of Burien Estates, which presently coexists with major apartment developments and a freeway.

A community and economic development approach would be particularly appropriate for the West Conversion Area. Coordinated timing of such improvements as the extension of S.R. 509, local capital improvements of roads (especially 160 and 12th Ave. So.), and sewers, as well as Port improvements of the west acquisition area alone would constitute a significant community development program. Control measures such as the Tract PUD should be vigorously pursued. Existing property owners may find particular opportunity here to coordinate their efforts and time property sales in concert with improvements to the west side, extension of S.R. 509, etc.

Public Improvements. A number of public capital projects, primarily surface transportation facilities, will have dramatic effects on this area's conversion. The extension of S.R. 509 is an integral part of land use change in the west side growth district. It will on the one hand, further degrade some single family areas currently impacted by the Airports presence. The freeway's extension, on the other hand, can play a valuable role in defining a new direction for the area. The extension of S.R. 509 from its

present terminus at Des Moines Way to S. 188th Street would provide the western boundary of this district. Further Airport growth (cargo and maintenance facilities) will require convenient surface access. In part, that requirement can also be met by the S. 188th St./S.R. 509 interchange. Land use change stimulated by the combination of freeway and interchange construction, development of air cargo and maintenance facilities, and Burien's urban growth consequences for other significant west side roads, primarily S. 160th St., 12th Ave. S. and Des Moines Way South.

South 160th Street presently serves as the major link between Burien and the residential areas on Sea-Tac's west side. In addition, a full interchange exists now at S.R. 509 and S. 160th St. The importance of these two features increases as the amount of commercial, apartment, and air cargo development in the west side growth district increases. In order to adequately serve apartment, commercial, and office traffic; to strengthen the present tendencies of Burien's urban growth; and to provide for flexibility in access to west side airport development....

policy: *S. 160th St. should serve as the major east-west road from Burien through the west side growth district.*

Des Moines Way South is a significant north-south road with interchange connection to S.R. 518, as well as receiving S.R. 509 traffic. Des Moines Way South was recently slated for improvement to four lanes between S. 128th St. and Ambaum Blvd. This action would not only

have removed the remaining WWI commemorative elm trees, it would have increased the traffic bearing capacity of the road and consequently, encouraged more traffic. Because of the historic value and the "country road" character of Des Moines Way S., citizens forestalled the planned construction claiming it to be untimely if not altogether inappropriate.

The completion of S.R. 509 from S. 176th St. to S. 188th St. and beyond will further relieve through-traffic demand on Des Moines Way South. The use of S. 160th St. and 12th Ave. S. as major west-side routes, the proximity of 1st Ave. S., S.R. 518, Ambaum Blvd. S., and S. 188th St., together with the extension of S.R. 509, point toward the plausibility of less intensive usage of Des Moines Way S. and allowing retention of only two travel lanes. Therefore, in order to be consistent with the role of an historical community collector

policy: *Public improvement of Des Moines Way., between S. 128th and Ambaum Blvd., should focus upon preservation and appropriate replacement of memorial elm trees, landscaping treatment, historical designation, and provision for pedestrian and bicycle travel.*

12th Avenue South is dramatically affected by development of Sea-Tac's west side. A facility that presently serves as single family residential access, 12th Ave. S. will eventually bisect air cargo and maintenance development and be fronted upon by offices and apartments. In order to facilitate access to west side airport development, while at the

same time providing for the surface access needs of other urban center uses,

policy: *★ 12th Ave. S. should serve as the major north-south road within the west side conversion area.*

In order to further emphasize 12th Ave. S. as the major north-south route and allow retention of Des Moines Way S. as an historical community collector

policy: *An extended 12th Ave. S. should connect with S.R. 518 in order to serve traffic destined for the eastbound lanes of the freeway, replacing the existing on-ramp from Des Moines Way South.*

REINFORCEMENT AREA GUIDELINES:

(to be written)

This section, similar to the previous two, will contain general reinforcement guidelines and specific guidelines for each delineated reinforcement area.

nitrogen oxides (NO_x). A reduction in vehicular traffic and elimination of congestion by structured parking rates, hourly traffic limits, development of mass transportation and remote parking facilities would improve conditions.

Most areas at Sea-Tac adversely affected by air quality in present and future years lay within proposed Port of Seattle boundaries. Those areas exposed to Federally non-regulated irritants and odor will be diminished during future years, however, action must be taken for further improvement by land use programs as proposed by the Port, King County and citizens. In particular, uses that generate pollutants already found in quantity around the Airport (HC, NO_x particulates) should be avoided. This would eliminate gas stations, firms dealing in the manufacture of solvents or chemicals, and firms consuming vast amounts of carbon fuels. Too, uses that attract crowds (and traffic) should also be discouraged... stadium complexes, shopping centers, and regional educational centers. These uses will also be addressed by FAA safety regulations if they fall within the clear zones of the Airport.

To monitor air quality around the Airport, the Puget Sound Air Pollution Control Agency should add hydrocarbon (HC) detection equipment to their McMicken Heights monitoring station.

During September, the worse month for air pollution, the agency's mobile van should be utilized for sampling more specific readings at either end of the runways. Coordination between the Port and control agency will be required to implement this recommendation. Continued planning and implementation of measures like this should prevent future air quality problems from increasing.

WEST REINFORCEMENT AREA GUIDELINES:

The West Reinforcement Area recognizes the relationship of the Burien Business Center to surrounding single-family neighborhoods and to the West Acquisition and Conversion Areas. Burien's business economy should be reinforced in a positive manner directed at not only achieving physical compatibility with the community, but also at achieving renewed economic and physical compatibility with the Airport.

Delineation of the Area:

The west reinforcement area refers to the Burien Business Center, the single family residential neighborhoods surrounding Burien, and the area of mixed land uses found between S.R. 518, S.R. 509, and the West Conversion Area (Map, 6.6.5: 31)

Future Use Potential :

Burien is presently well confined by single-family residential areas to the north, west and southwest. Any encroachment into those areas would seriously degrade their residential character. Those areas are stable living environments and no actions should be taken which would jeopardize them.

policy: *Expansion of the Burien Business District and facilities serving that District should not jeopardize the cohesiveness of surrounding permanent residential neighborhoods.*

Expansion of Burien commercial uses southerly is considered to be highly undesirable since it would result in a strip form of development which

July 20th

6.2 Noise Remedies (850/14/10)

Last restriction--The people are not asking for blood--"except for emergency situations" should be sufficient.

6.2.3 pg 5

It is important that HUD noise standards be updated to comply, in the Sea Tac area, to the noise measurements as set forth in the "study". FAA should be able to influence their decision!

6.2.3 pg 9 and on

With sound insulation applied--will the assessed value for taxing purposes ~~out-~~ weigh the benefit and resale value?

6.6.2 pg 5

Thanks for the sentence- "Those which involve large assemblages of people, of course, are not logical, both noise and safety (because of)

6.6.1 pg 9 1st policy

How about talking to Representative Gerealding McCormick and use some of the "noise impacted" land for a gambling bazaar? Who needs it most-Spokane or us? We could use the revenue for our noise remedy programs, etc. Only kidding!!!

6.6.1 pg 11

Most important to the majority of the people within the airport vicinity are the financial restrictions in the resale of homes--and the value placed on them-- 1st by the assessors office and 2nd by the actual market value of the vicinity.

6.6.1 pg 12 3rd paragraph

If again you are including Sunset Jr High as a school facility for the use of the public as a community center--I caution to mention that that particular school is no more of a place for the senior citizen--the preschooler or the junior high age that is now attending it. It is not a compatible place -safety or noise wise for an activity center.

6.6.1 pg 13 1st policy

A strong statement and probably accurate--but it will not help, particularly the older resident who doesn't have time to WAIT.

6.6.1 pg 13 1st sentence under airport acquisition areas defined.

Should all be in capital letters--it is that important.

6.6.1 pg 14

The determination of the Airport acquisition is not solely based on the application of all policies and criteria delineated in previous chapters. Whatever happened to the "extended clear zone" a safety area for the airport? That area of the acquisition is for safety not noise. Considering the fact that 1250 ft. laterally from the runway centerline and 5200 ft. beyond each end of the runway are to be considered "desirable minimums"--it should be so stated. (Whether mandatory or not)

6.6.3 pg 13 last policy

What happens to responsibility and liability?

6.6.3 pg 14 Community Uses

Because of its location Sunset Jr. High should not be used for recreation groups. If it were either east or west of its location it might make a difference. It is directly under the flight of aircraft/with the future projection for aircraft--we should not offer it for group usage of any kind.

6.6.3 pg 15 1st policy

Sunset should not be a community facility

6.6.3 pg 15 2nd policy

What does FAA have to say?

6.6.3 pg 16 2nd policy

So. 142nd-144th Why? Is this for the manufacturing and office type thing? Would it not have to go thru to 24th--or will it be only a westerly entrance and exit route?

6.6.3 pg 25 North Conversion Areas

In theory it sounds great but what happens to the people who reside there now. Will they wait--CAN they?

Although the buildings and location (minus aircraft) make this a most desirable location for community use — its not a compatible area for PEOPLE.

now — and with ~~any~~ aircraft operations expected to double during the forecast period it makes the location even less desirable for "community use."

6.5.3 - pg. 35 - line 15 - The construction of the building is such that soundproofing is minimal with the number of people working at this location (adjacent to the ~~airport~~ ^{field}) on a daily basis, a soundproof

structure is essential.

If the Port fails strongly enough about soundproofing for the fire department —

The Senat Junior High faculty should not support office type uses either. The planes go right over the top. **THEY** are NOISY!

Sets face it — it's a good location for nothing — but maybe storage.