PART 5 THE ENVIRONMENT

chapter 5.1
air quality

5.1.0 AIR QUALITY

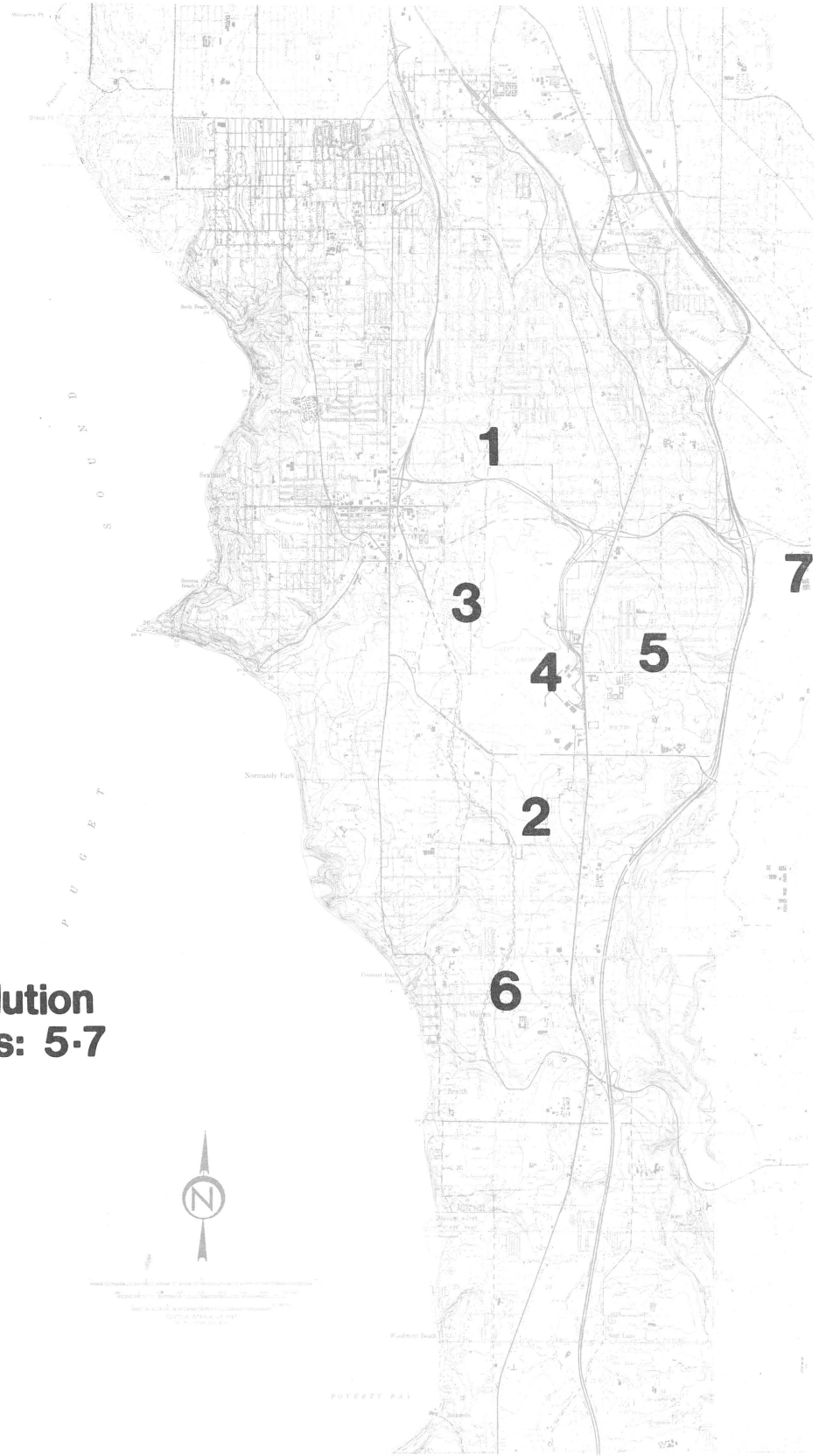
The consulting firm of Environmental Systems Laboratories, Inc. conducted the study to collect, analyze and predict air pollution elements at and around Sea-Tac Airport. Specific operational and land use alternatives were to be recommended to minimize the impact of aircraft operations on air quality.

Existing air quality for the Airport passenger terminal and vicinity was calculated to identify pollutant levels of particulates, carbon monoxide, hydrocarbons, nitrogen oxides and oxidants. Predicted air quality utilized aviation forecasts and community development plans to present the "most probably" and "worst case" conditions.

The Puget Sound Air Pollution Control Agency (PSAPCA) was the only source for historical records for air quality data about the study area. Their three stations are located in Des Moines, Mc Micken Heights, and Tukwila. The data reflected a general high purity of air quality. Because of the predominate wind patterns, it is not expected that significant amount of pollutants would be measured at the PSAPCA monitoring sites.

For this study, the Consultant used an air monitoring van located at sites near the Airport during June and September of 1973, and February 1974. The three sites are shown on the following map as 1,2 and 3. The three PSAPCA sites are 5, 6, and 7. Also, air samples in the terminal area, site 4, and the surrounding community were analyzed for carbon monoxide. Sites 1 and 2 were chosen as areas of major impact based on the north-south prevailing winds, aircraft movements, and areas of population. Pursuant to citizen requests, site 3 was located in the residential area west of the Airport.

sea-tac communities plan



esl sites: 1-4
puget sound air pollution control agency sites: 5-7

air quality measurement sites near sea-tac

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Measurement of pollutants was accomplished as follows:

a. Carbon Monoxide samples were taken 12 times per hour, 24 hours per day during the sampling days in the sampling months of June, September and February.

b. Hydrocarbon analysis utilized air samples taken 12 times per hour, 24 hours per day during the testing periods. Each sample was burned completely to detect all hydrocarbons, including any naturally occurring methane gas.

c. Nitrogen Dioxide measurements were made at sites 1,2 and 3 with air sampling performed on a continuous basis except when test equipment was calibrated or serviced.

d. Oxidant was monitored 24 hours per day during the monitoring periods with extended measurements during the September peak oxidant period.

e. Particulate and Lead samples were collected using a high volume sampler.

The meteorological data taken by the consultant during the sampling periods of June, September and February was compared to data of one year duration taken by PSAPCA. The similarity of the two wind roses would indicate that the consultants sampling periods were representative of the prevailing wind patterns.

Some measurements developed a discernible trend with slight peaking between 6:00-9:00 a.m. associated with higher activity and late evening associated with moderate activity but light wind and stable atmospheric conditions.

Generally, carbon monoxide and nitrogen dioxide were below Federal standards and hydrocarbons and oxidants were above Federal standards. In addition to the pollutant measurements at the seven monitoring stations, carbon monoxide samples were measured about the Sea-Tac terminal and the surrounding community. Higher levels were noted in the proximity of aircraft or automobile operations; however, all measurements were below 1-hour and 8-hour standards.

In addition to measured data, implementation of a model to predict air quality requires a compilation of an emission inventory. This includes calculation of aircraft operation modes and times (e.g. taxi, approach and ground operations) and emission factors attributed to each type of aircraft engine. Further, aircraft types and fleet mixes are analyzed to predict quantities of pollutants. Other factors to be considered for pollutants are the operation of ground service vehicles, storage and transfer of fuel, heating and other operations of the terminal facilities, and the motor vehicles of both airport employees and passengers.

Development of the emission inventory and inclusion of the meteorological inputs (e.g. wind direction, speed, turbulance and inversion) applicable to Sea-Tac provides the data to develop a mathematical model for predicting the dispersion of the pollutants into the surrounding atmosphere. With the predictions applied to many points on a map, areas can be identified to show the various levels of each of the pollutants. To form a basis for air quality predictions, calculations were developed for "most probably" and "worse case" conditions for year 1973. An analysis of these conditions is:

a. Carbon Monoxide levels are well below Federal Standards and there are no known adverse health effects associated with the predicted levels.

b. Hydrocarbons levels exceed the Federal Standards over large areas. The low standard is not set because of the known adverse health effect but instead is related to the significance of hydrocarbons on oxidant formation and the resultant potential health hazard.

c. Nitrogen Oxide levels should not exceed standards. The only place likely to exceed the standard is in the runway area and personnel are not in this area; therefore, no adverse health effects are expected.

d. Particulate levels were factored to bring predictions in line with observations rather than using recently reduced EPA standards. Even with the increase factor, Federal standards should not be violated at or near Sea-Tac. Aircraft piston engines develop lead compounds in the form of particulate matter. Such aircraft will not generate appreciable amounts of lead and the EPA has not yet set a standard.

e. Oxidant levels have exceeded standards. Analysis indicates these high levels imply that hydrocarbon and nitrogen oxide levels generated by other than aircraft are high. Thus, it is necessary to reduce hydrocarbon emissions about the area to control oxidant formation.

Other than the difference in the sets of noise distance curves, the two methodoligies (NEF and ANE) are identical. Also prepared in the Sea-Tac/Communities Plan is the Aircraft Sound Descriptive System (ASDS) as recommended by the Federal Aviation Administration. This data affords comparison and may be useful in interpreting predicted exposure levels.

Noise exposure values are determined from aircraft noise levels expressed in terms of the effective perceived noise level (EPNL). The different aircraft types flying at Sea-Tac were grouped into classes based on considerations of aircraft noise, performance characteristics and weight. Each class is then characterized by a set of take-off and landing profiles and a set of noise distance curves. The difference between FAA recommended flight paths and the actual flight path, power setting, altitude, weather conditions, and local topography is the difference between the NEF and ANE values. In effect, this "validation" adjustment of NEF calculations tailors the noise picture to Sea-Tac and provides ANE.

Both methodologies, ANE and NEF are composite measurements that reflect noise exposure over a 24-hour period. Each individual event is broken into 24 one-third octave segments (EPNL) by a real time analyzer so the duration and intensity of each segment is recorded. These data are used in calculating the ANE and NEF values. The number of operations, flight schedule, type of plane, load, and flight procedure are all reflected in the noise measurements maps in Volume Three of the Noise Exposure Analysis (8.0.1, ref. 11).

The FAA requires the Aircraft Sound Description System (ASDS) analysis of airports under the PGP Master Plan program. ASDS is measured, like ANE and NEF, over a 24-hour period. It identifies the area on the ground exposed to aircraft generated noise greater than 85 dBA for specific durations from "zero" to "over sixty" minutes daily. Volume Three of the Noise Exposure Analysis presents ASDS contour set for Sea-Tac in 1973, 1978, 1983 and 1993.

Overflight sources of noise emitted by turbo jets or turbo fan engines include the jetstream, the internal combustion process and the rotating machinery parts of the compressor and turbine. The noise produced by each of these are different as is the relationship to engine power setting. Thus, roughly speaking, at low power the order of predominance of the three types of sources is: 1) combustion, 2) rotating machinery, and 3) jet exhaust. Conversely at high power the order of predominance is reversed. This is the main reason why exhaust noises predominant at take off and compressor whine is more noticeable during approach. Note however, that all three sources generally produce increased noise with an increased thrust level. But at high thrust level (above 50% of the maximum take off value) the predominant source of noise is jet exhaust.

Noises generated by engine maintenance run-ups are a major possible source that is not directly accounted for in methodologies used. There are definite requirements for performing maintenance run-ups on the ground at the airport. Flight safety regulations require ground run-ups after periodic maintenance and repair, but at the same time, the run-ups

can be a significant source of annoyance from the noise produced. Presently at Sea-Tac, noise abatement regulations prohibit ground run-ups between the hours of 11 p.m. and 6 a.m. Engine run-up locations have been moved inward from the airport boundaries as a result of preliminary findings of the Sea-Tac/Communities Plan, and further modifications of operating procedures at the airport will be an on-going process at Sea-Tac, as discussed in Part 7.

Results:

Noise contours were developed for Sea-Tac using the ANE, NEF and ASDS methodologies using 1973 "as observed" measurements as a base, and study generated criteria as assumptions for 1978, 1983 and 1993 operations. Element 2.0 of the Sea-Tac/Communities Plan, the Aviation Demand Forecast (8.0.1, ref. 4) determined the operational level and fleet mix of future years. Other variables, such as take-off and landing procedures, "dual-lane runway usage" and retrofit assumptions were tested to characerize changing exposure patterns over time. The ANE contours and the grid system reflect the best estimate available of likely future exposure patterns at Sea-Tac. This forecast includes the following components:

1978, 50% SAM retrofit
ATA take-off;

1983, 100% SAM retrofit

ATA take-off;

1993, 100% SAM retrofit

ATA take-off and

2-segment approach.

The residual noise exposure that remains after aircraft and operational remedies are applied must be dealth with at a local level. In order to express the surface exposure levels the study area was divided into 1/16th section, forty acre grid squares. the Noise data was portrayed through computer print out coordinates for points located in the center of the 1250 grids. This system allows a simple area breakdown for noise/land use comparison. Use of the grid pattern provides correlation with census information, other environmental data generated by the Sea-Tac/Communities Plan, land use patterns, and assessor's data for cost analysis. Also community acceptance of noise remedy program applications applied on a grid related basis has appeared stronger than for the strict contour approach of NEF or ASDS methodologies.

In addition to providing the 1973 ANE for each grid square, the 1978, 1983, and 1993 values were added to depict future change in exposure values. The calculated data was augmented further by computation of a form of weighted average exposure value for each cell designated as a "sustained" exposure value. The sustained value reflects a level of

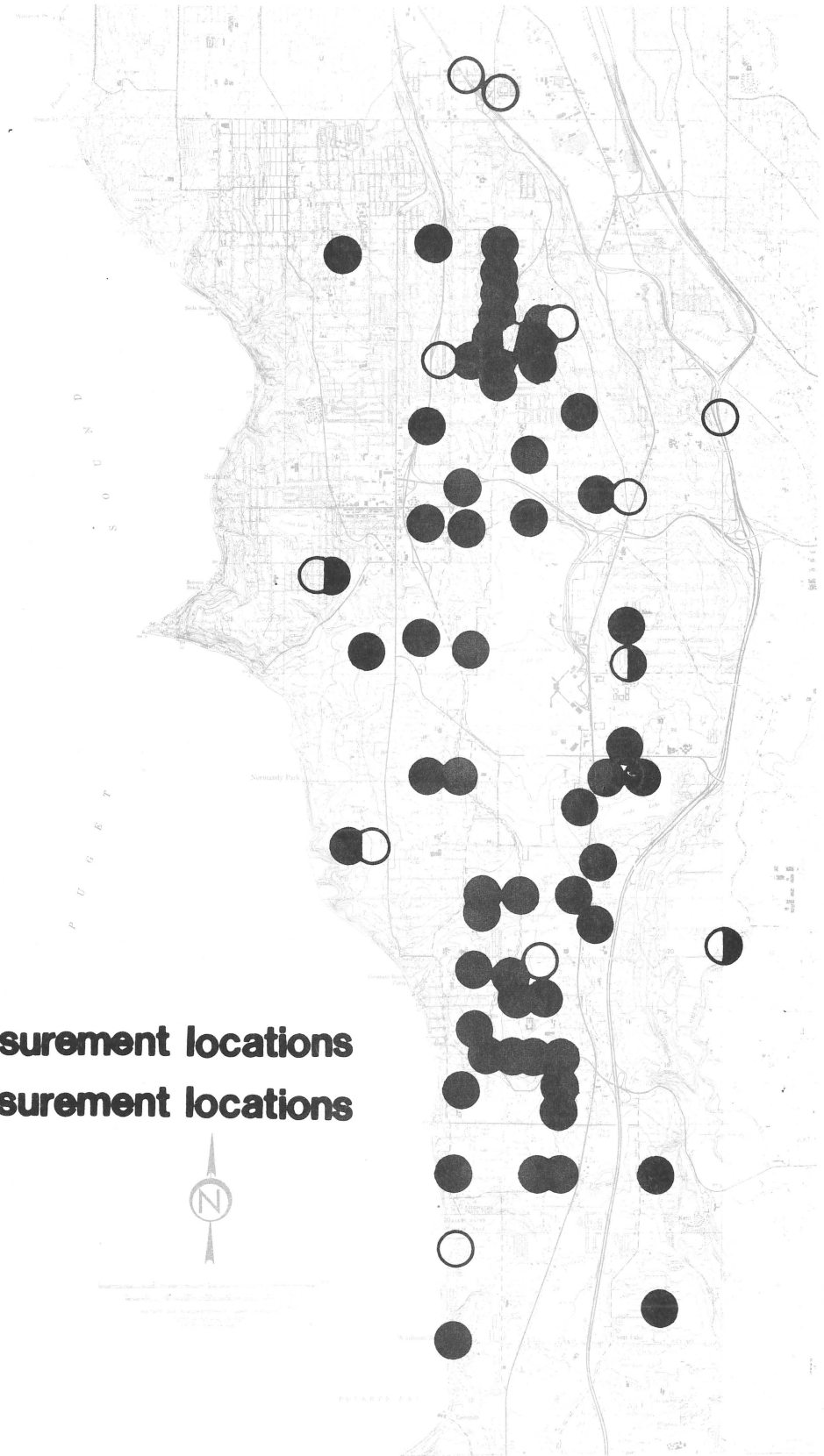
noise exposure for a specific area over an extended period of time and is used in the noise program application process developed in Section 6.2.

CONCLUSIONS/RECOMMENDATIONS:

The noise consultants recommend that land exposed to more than 45 ANE should be prohibited from single family, multi-family or apartment use, and that remedial actions relieving those persons now exposed should be implemented using the data provided. On land exposed to levels between 35 and 45 ANE, programs as described in Section 6.2.3 of this document are recommended. An application of those recommended programs is found in Section 6.2.4.

In order to evaluate the progress of noise improvement programs at Sea-Tac, a monitoring system was also recommended. Adherence to designed flight patterns and procedures could be better enforced. Monitoring would also aid in measuring the general noise environment to evaluate programs on a ongoing basis.

sea-tac communities plan



○ surface measurement locations

● aircraft measurement locations

N

noise measurement locations

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5.2.0

1973 ANE

Adjusted Noise Exposure Values For Each 1/16 Section Within The Study Area

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1											32	34	36	37	39	35	31	27						
2											33	34	36	38	40	35	31	28	25					
3			17	19	20	22	23	25	28	31	32	34	36	38	40	36	31	28	25					
4			17	19	20	22	23	25	28	30	30	34	36	38	41	36	32	28	25	24				
5			17	19	20	21	23	25	27	30	32	34	36	39	42	36	32	29	26	24				
6			18	19	20	21	23	25	27	30	32	34	36	39	43	37	32	29	26	24	23			
7			18	19	20	21	23	24	26	29	32	34	36	39	43	37	33	29	27	25	23	22		
8			18	19	20	21	23	24	26	29	31	34	36	40	44	37	33	30	27	25	24	22		
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48												31	33	35	37	37	35	34	32	32	31	30		
49												32	33	35	36	36	35	34	33	32	31	31		
50												32	33	35	36	36	35	34	33	32	32	31		

Airport Boundary Outlined

1978 ANE

Adjusted Noise Exposure Values For Each 1/16 Section Within The Study Area

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1											31	33	35	36	38	34	30	26						
2											31	33	35	37	39	34	30	26	23					
3			16	17	18	20	22	24	27	29	31	33	35	37	39	35	30	27	24					
4			16	17	18	20	22	24	26	29	31	33	35	37	40	35	30	27	24	22				
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49												30	32	34	35	35	34	32	31	30	30	29		
50												31	32	34	35	35	34	32	31	30	30	30		

Airport Boundary Outlined

1983 ANE

Adjusted Noise Exposure Values For Each 1/16 Section Within The Study Area

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1										30	33	34	33	33	31	29	25						
2										31	32	34	34	34	21	29	26	23					
3		15	17	18	20	21	24	27	29	31	32	34	34	34	32	30	26	23					
4		15	17	18	20	21	23	26	29	30	32	34	35	35	32	30	27	24	22				
5		16	17	18	19	21	23	26	28	30	32	34	35	36	33	30	27	24	22				
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33										28	31	34	36	39	39	36	34	31	28	25	23		
34										28	31	34	36	39	39	36	34	31	28	25	23		
35											31	34	36	38	38	36	34	31	28	25	23		
36											31	33	35	38	38	35	33	31	28	25	23		
37											31	33	35	38	38	35	33	31	28	25	23		
38											31	33	35	37	37	35	33	31	28	25	23		
39											31	33	35	37	37	35	33	31	28	25	23		
40											31	33	35	36	36	35	33	31	28	25	23		
41											31	33	34	36	36	34	33	31	28	26	23		
42											31	32	34	36	36	34	33	31	29	26	24		
43											31	32	34	35	35	34	33	31	29	27	24		
44											30	32	34	35	35	34	33	31	29	27	25		
45											30	32	33	35	35	34	33	31	30	27	26		
46											30	32	33	34	34	34	32	31	29	28	27		
47											30	31	33	34	34	33	32	31	30	29	28		
48											30	31	33	34	34	33	32	31	30	29	28		
49											30	31	32	33	33	33	32	31	30	29	29		
50											30	31	32	33	33	32	31	31	30	29	29		

Airport Boundary Outlined

1993 ANE

Adjusted Noise Exposure Values For Each 1/16 Section Within The Study Area

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1											29	31	33	32	32	30	28	25						
2											29	31	33	33	33	30	28	25	22					
3			15	16	17	19	21	23	26	28	29	31	33	33	33	31	29	25	22					
4			15	16	17	19	20	22	25	28	29	31	33	34	34	31	29	26	23	21				
5			15	16	17	19	20	22	25	27	29	31	33	34	35	32	29	26	23	21				
6			15	16	17	19	20	22	24	27	29	31	33	35	36	32	29	26	23	22	20			
7			15	16	17	19	20	22	24	27	29	31	33	35	37	32	29	27	24	22	20	19		
8			15	16	17	19	20	22	23	26	29	31	33	36	37	33	30	27	24	22	21	20		
9				16	17	19	20	22	23	26	28	31	33	36	38	33	30	27	25	23	21	20	19	
10				16	18	19	20	22	23	25	28	31	33	36	39	34	30	28	25	23	22	21	19	
11					18	19	20	22	23	25	28	31	33	36	40	34	31	28	26	24	23	21	20	
12					18	19	21	22	24	26	28	31	33	37	41	34	31	28	26	25	23	22		
13					18	19	21	22	24	26	28	31	33	37	42	35	32	29	27	25	24	23		
14					18	20	21	23	24	26	28	31	34	37	43	36	32	30	28	26	25	23		
15				17	19	20	21	23	25	26	28	31	34	38	45	37	33	31	29	27	25	24	22	
16				17	19	20	22	23	25	27	29	31	34	39	47	39	35	32	29	28	26	24	22	
17				17	19	20	22	23	25	27	29	31	34	40	49	45	37	33	30	28	26	24	23	21
18				13	14	16	17	19	20	22	25	27	31	38	49	43	32	28	25	23	21	19	18	16
19			11	13	14	15	17	18	20	22	24	27	30	37	49	43	32	28	25	23	21	19	17	16
20			11	12	13	15	16	18	20	22	24	26	30	37	50	42	32	27	25	23	20	19	17	15
21	9	10	11	12	13	15	16	18	20	21	24	26	29	36	51	43	32	28	25	23	21	19	17	
22			11	12	14	15	17	18	20	22	24	26	30	36	51	44	33	28	26	23	21	19	18	
23						16	17	19	21	22	25	27	30	36	51	44	34	29	26	24	22	20	18	
24							18	19	21	23	25	27	31	37	51	43	35	30	27	25	22	20	19	
25							21	22	24	26	28	30	34	40	51	43	36	32	29	27	25	23	21	
26							21	22	24	26	28	30	33	38	46	42	36	32	29	27	25	23		
27								22	24	26	28	30	33	37	42	42	36	32	29	27	25	23		
28								22	24	25	27	30	32	36	41	41	36	32	29	27	25	23		
29								22	23	25	27	29	32	36	40	40	36	32	29	27	25	23		
30								22	23	25	27	29	32	36	40	40	35	32	29	27	24	23		
31									23	25	27	29	32	35	39	39	35	32	29	27	24	23		
32										24	27	29	32	35	39	39	35	32	29	27	24	22		
33											27	29	32	35	38	38	35	32	29	27	24	22		
34											27	30	32	35	38	38	35	32	30	27	24	22		
35												30	32	34	38	38	34	32	30	27	24	22		
36												30	32	34	37	37	34	32	30	27	24	22		
37												30	32	34	37	37	34	32	30	27	24	22		
38												30	32	34	36	36	34	32	30	27	24	22		
39												30	32	34	36	36	34	32	30	27	24	22		
40												30	32	33	35	35	33	32	30	27	24	22		
41												30	31	33	35	35	33	31	30	27	25	22		
42												30	31	33	35	35	33	31	30	28	25	23		
43												30	31	33	34	34	33	32	30	28	26	24		
44												29	31	32	34	34	33	32	30	28	26	24		
45												29	31	32	33	34	33	32	30	29	26	25		
46												29	31	32	33	33	32	31	30	29	27	26		
47												29	30	32	33	33	32	31	30	29	28	27		
48												28	30	31	32	33	32	31	30	29	28	28		
49												28	30	31	32	32	31	30	30	29	28	28		
50												28	30	31	32	32	31	30	29	29	28	28		

Airport Boundary Outlined

Based on this consideration 15 surface noise measurement locations were chosen to be representative of a 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 a arterial.
4. Two locations far from a arterial.
5. Five typical neighborhood locations.
6. Two rural or park locations.

Sampling from these carefully chosen locations make it possible to typify intrinsic noise environment throughout the study area. Any point is the study area will relate to a traffic corridor in a manner similar to one of the 15 measurement locations. All locations were set back from roadways a distance typical of residences. Curb side locations would have produced significantly higher level than the typical residential exposures shown. Because vehicular traffic volume is varied throughout a typical 24-hour period three different time periods were selected for obtaining these noise data for each location as follows:

1. Daytime (from 7:00 a.m. to 7:00 p.m.)
2. Evening (from 7:00 p.m. to 10:00 p.m.)
3. Night time (from 10:00 p.m. to 7:00 a.m.)

These periods have been shown to represent 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, free flowing traffic and very low traffic volumes at night, where 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 (1 hour) recording time used for traffic conditions where the flow is frequently interrupted, such as near traffic signals and stop signs.

ANALYSIS OF AIRCRAFT NOISE EXPOSURE:

Methods:

Three noise exposure analysis methodologies were used in this study. The Noise Exposure Forecase (NEF) utilizes a set of generalize noise distance curves for each aircraft class. However, for the Adjusted Noise Exposure (ANE) procedure, the generalized noise curves were refined based on the actual aircraft noise measurements taken in this study. In the Element Report (Volume II) on Noise Exposure Analysis, (8.0.1, ref. 10) ANE is referred to as "Actual Noise Exposure", but in view of the emphasis on forecast data, the terminology Adjusted Noise Exposure has been adopted as more representative of measurement or adjusted NEF noise curves.

5.2.0. NOISE EXPOSURE

Consultants Robin M. Towne and Associates (RMTA) and Man-Acoustics and Noise Inc. (MAN) conducted the Noise Exposure Analysis. The primary division of work consisted, in general, of RMTA recording and formulizing the actual noise measurements and MAN performing the computation and analysis of those noise measurements. The objective was to collect all data required for a complete noise analysis revelant to the Sea-Tac Airport. Comprehensive noise measurement and analysis can help define areas affected by noise around the Airport, assist in choosing operational alternatives to help curb aircraft generated noise impact on the community.

AIRCRAFT NOISE MEASUREMENT PROGRAM:

The aircraft measurement program was designed to produce generalized noise contour maps, such as the previously used Zone 3 Map, as well as, values for a symmetrical and more precise grid system. Values by grid are represented on tables, pages 11-14. These values, by grid, are the primary tool for analyzing the geographic distribution of noise and for the application of noise remedy programs (see 6.2.4 and 6.6.5).

The aircraft noise measurement program involves a total of 4,516 measurements at 60 locations throughout the study area. A map depicting these locations is included on page 10.

Several factors were considered in the selection of measurement locations. Locations were 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 building or ground cover, they also were relatively free from background noise, (i.e. traffic noise, construction noise, etc.) to obtain the best signal-to-noise ratio (aircraft noise compared to background noise). Sightline to the aircraft was also necessary for photo ranging in several cases; many possible locations were eliminated due to heavy foliage or terrain barriers.

Aircraft measurements were performed every week between March, 1973 to March, 1974, to assure that data was collected under a variety of meteorological conditions and times of day. At the recording location the field engineer documented weather conditions noting temperature, relative humidity, cloud cover, with speed and direction and barometric pressure. The data was then checked against Sea-Tac weather records for the same period to establish measurement relationships.

SURFACE NOISE MEASUREMENT PROGRAM:

The Sea-Tac Noise Study Program included in addition to the aircraft measurements an investigation of surface noise sources. While it is possible that industrial or other transportation noises are dominate at a few locations in the study area, the most prevasive surface noise source in terms of both time and spatial distribution is vehicular traffic. The noise environment from surface sources is structured along the network of streets and highways throughout the area.

chapter 5.2
noise exposure

chapter 5.3
water quality and drainage

5.3.0 WATER QUALITY AND DRAINAGE

The study was conducted by the consulting firm of Stevens, Thompson and Runyan, Inc. with the objective to quantify and characterize the water quality and drainage and define the environmental impact of Sea-Tac on the surrounding vicinity. Operational and land use alternatives will be recommended in both the Miller Creek and Des Moines Creek basins.

The field study focused on chemical, biological and hydrological properties of the creeks. Water chemistry was measured to determine the basic makeup of the streams, and to check for compliance with Washington State water quality standards for Class A streams. Where the standards were not met the consultants used the collected chemical data to identify and locate sources of contaminants. As part of the water quality study, the consultants also measured the creeks' biological makeup. The biological investigation complements the water quality analysis, in that the types, numbers and variety of organisms living in a stream indicate the general pollution level of the water. Also, certain chemical sampling, manifest themselves through the biological composition of the creeks. The final part of the study, the hydrological measurements, identified major areas contributing to runoff and noted the levels and frequency of flooding.

To measure the chemical, biological and hydrological data, a one-year field sampling program was conducted. The program extended over a full year to account for various seasonal fluctuations. Several sampling stations

were selected along both creeks to represent different characteristics of the water bodies. Eight water quality sampling stations were established on both Miller and Des Moines Creeks to test for physical and chemical properties, including heavy metals and pesticides. These are shown on the following maps for each creek. The consultants located six biological sampling stations on both creeks and conducted three types of tests to determine the nature of the biological community. Finally, staff gauges were placed at four stations on Miller and Des Moines Creeks to measure stream discharges and to correlate these discharges with the permanent stream gauging station established by King County.

While conducting these sampling programs, meetings with various committees were held to gain a fuller perspective of the creeks' problems. The Citizen Water Quality and Drainage Task Force reviewed the consultant's progress reports throughout the study, pointed out important problem areas, and recommended specific solution ideas. General citizen comments were also received by the community attitude survey.

The consultants, the County and the Port, sorted the community input and found that the citizens' suggested solutions naturally fell into three approaches for solving water quality and drainage problems. These approaches were categorized as on-site measures, where rainwater is treated before it becomes runoff; in-passage measures, where stormwater runoff is controlled on its way to the stream; and in-stream measures, where runoff problems are corrected in the stream itself. All of these methods preserve or will restore the natural conditions of the creeks.

Major problems were found in all three areas. Department of Ecology standards for Class A streams were violated at most of the chemical sampling stations; violations included temperature, dissolved oxygen and coliform levels. In general, the high nutrient content of the creeks contributes to the relatively large algal growth which in turn produces large daily dissolved oxygen fluctuations. Also, potentially chronic concentrations of pesticides and herbicides exist in both streams and temperatures occasionally exceed maximum for fish propagation.

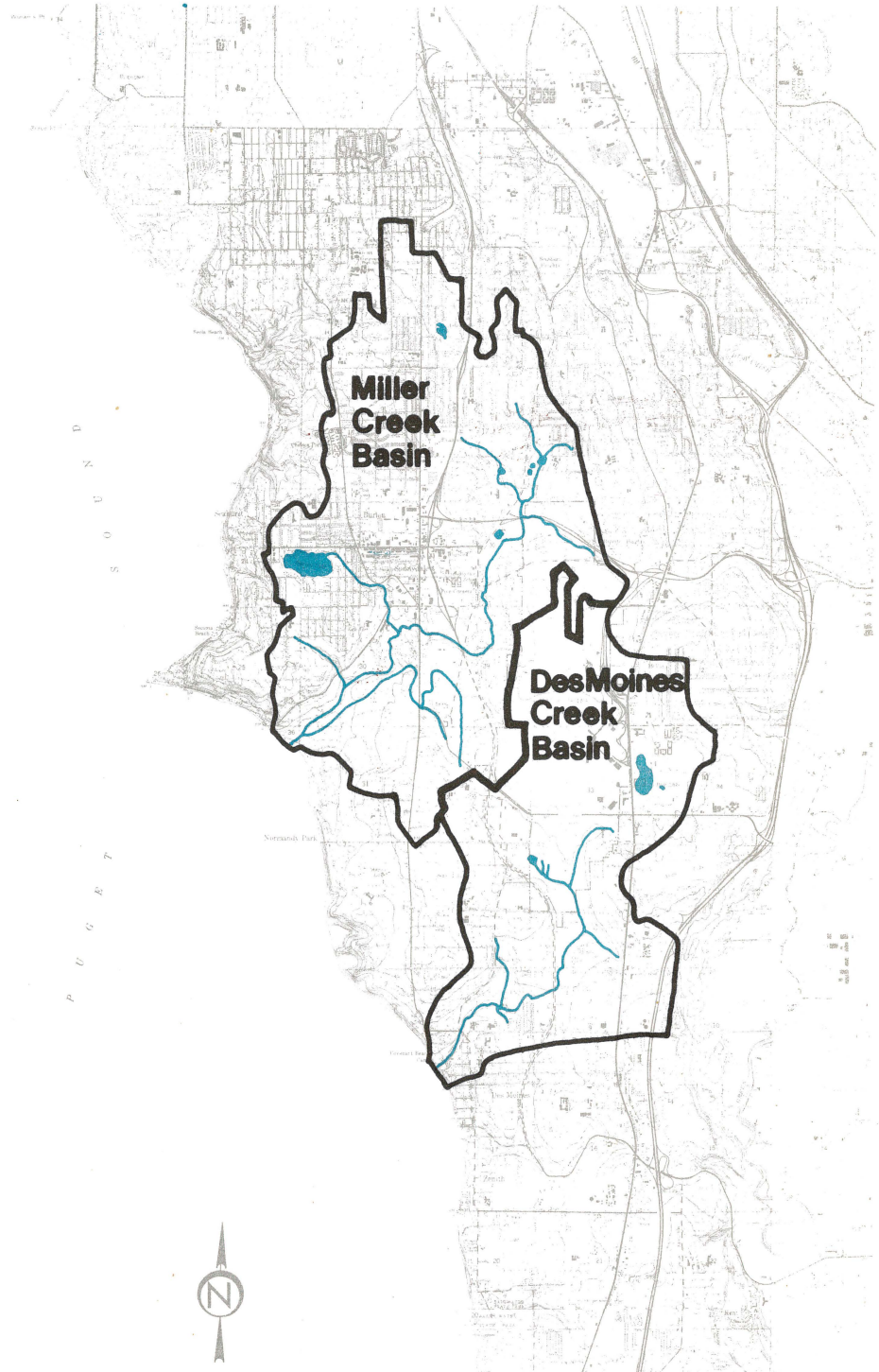
The biological data indicated large populations of organisms tolerant of stiltation and degraded water quality conditions in both creeks. Heavy siltation is detrimental because it eliminates salmon spawning beds by blocking the flow of water which carries dissolved oxygen. Futhermore, the consultants found very few pollutant intolerant organisms in either Miller or Des Moines Creeks, demonstrating an unbalanced polluted ecosystem throughout the length of the streams.

Through staff gauge data, hydrological measurements and computer model runs, the creeks were found to be grossly inadequate to handle even a relatively small storm, having a duration of four hours and expected to occur an average of once every ten years. Surcharging, where the capacity of the creek to carry water is exceeded, starts approximately one hour after the storm begins, reaches a maximum at the end of the storm and continues for approximately five hours after the storm at the mouth of the creek. Surcharging occurs at thirteen points on Miller Creek and at three on Des Moines Creek.

A series of solutions has been recommended by this study to resolve the existing water quality and flooding problems. The community has been involved throughout the entire study and has expressed its desire to have the problems resolved. The details have not been discussed on sources of funding the solutions or on the relationships between existing agencies which must be developed to carry out the recommendations. It is clear, however, that effective solutions do exist and that King County presently appears to be the central agency in directing the implementation of these solutions.

The Water Quality and Drainage Element of the program specifically covers the Miller Creek and Des Moines Creek drainage basins. Following in a southwesterly direction from the north end of the Sea-Tac Airport to its estuary in Puget Sound, Miller Creek drains approximately 5,230 acres. Des Moines Creek, with its headwaters near the south end of Sea-Tac, flows nearly parallel to Miller Creek. Des Moines Creek drains 3,730 acres (see map next page).

sea-tac communities plan



miller and des moines creek drainage basins

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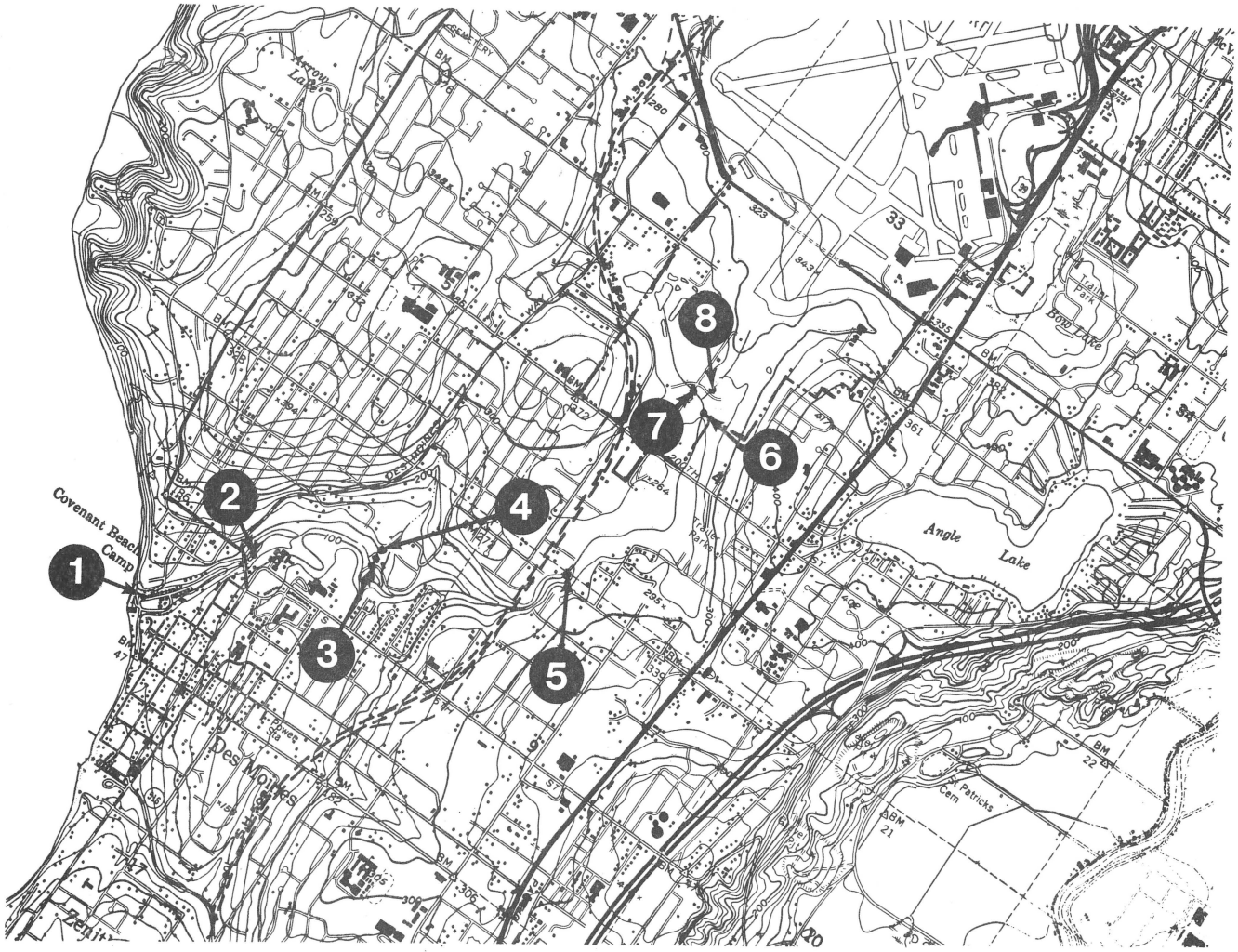
5.30

Miller Creek Station Location Map

Station	Type Survey	Intervals
1	CHEMICAL & BIOLOGICAL AND STAFF GAGE	MONTHLY
2	CHEMICAL & BIOLOGICAL AND PESTICIDE & HEAVY METALS	MONTHLY
3	CHEMICAL & BIOLOGICAL AND STAFF GAGE	MONTHLY
4	CHEMICAL ONLY	OCCASIONAL GRAB
5	CHEMICAL & BIOLOGICAL	MONTHLY
6	CHEMICAL & BIOLOGICAL AND STAFF GAGE	MONTHLY
7	CHEMICAL & BIOLOGICAL AND STAFF GAGE	MONTHLY
8	CHEMICAL ONLY	OCCASIONAL GRAB

Des Moines Creek Station Location Map

Station	Type Survey	Intervals
1	CHEMICAL & BIOLOGICAL AND STAFF GAGE	MONTHLY
2	CHEMICAL & BIOLOGICAL	MONTHLY
3	CHEMICAL & BIOLOGICAL STAFF GAGE AND PESTICIDE & HEAVY METALS	MONTHLY
4	CHEMICAL ONLY	OCCASIONAL GRAB
5	CHEMICAL & BIOLOGICAL AND STAFF GAGE	MONTHLY
6	CHEMICAL & BIOLOGICAL AND STAFF GAGE	MONTHLY
7	CHEMICAL ONLY	OCCASIONAL GRAB
8	CHEMICAL ONLY	OCCASIONAL GRAB



chapter 5.4
natural determinants

5.4.1 GEOLOGY & SOIL

The natural determinants result from a complex interaction of all the natural geologic processes operating throughout geologic time. However, nearly all of the present surface sculpture within the study area took place during the last 40,000 years. The primary geologic processes responsible for the surface relief, including several hundred feet of subsurface formation was the prehistoric glaciation.

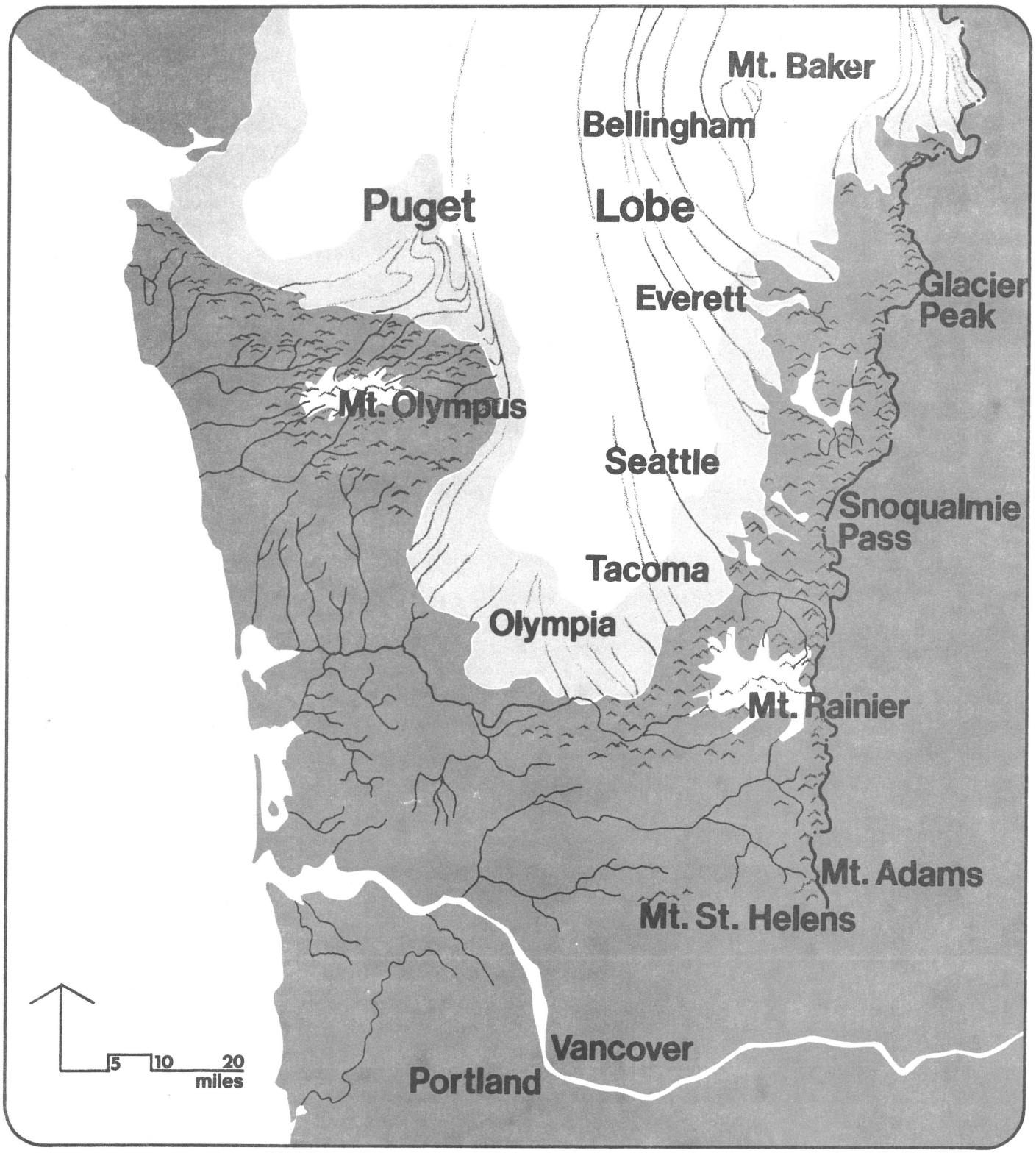
This glacial period began about 40,000 years ago and ended approximately 10,000 years ago in the greater Seattle portion of the Puget Lowlands.

The last two glacial cycles, the Vashon and Salmon Springs are recorded in the Sea-Tac Study Area by their characteristic debris left by the advancing or retreating ice and melt water. Two older glacial cycles have been recognized by the United States Geological Survey in areas south and east of the study area. Figure 2 shows a simplified illustration of the sedimentation that characterizes the advance and retreat of the ice of the Salmon Springs and the Vashon Glacial Cycles. Each of these units, called formations, and their relative position of deposition with respect to the advance or retreat of the ice is shown by map symbols.

The glacial and post-glacial formations shown on this map were deposited in different climactic and physical environments, made up of greatly varying materials from different source areas, transported and winnowed by varying water velocities. Some were compacted by thousands

of feet of overriding ice. The older glacial formations have been oxidized and weathered and the youngest were not compacted by ice of thick overburden. All of these factors affect in some manner the physical, chemical and the hydrological characteristics of each formation. The different formational characteristics influence the quality of the soil that is produced by weathering and biological activity. The combination of soil and formational characteristics influence the foundation strength, seismic stability, surface utilization, distribution of sand and gravel resources and the ground water distribution and flow.

The distribution of soil types and the physical characteristics of the units recognized in the study area have been published by the United States Department of Agriculture, Soil Conservation Service, entitled "Soil Survey" King County Area, Washington, 1973.



MAXIMUM EXTENT OF THE VASHON ICE SHEET

At the time of the maximum extent of the glaciers, the ice was about 5,000 feet thick at Seattle, and 2,000 feet at Tacoma. The direction of the ice movement is indicated by lines of medial moraines on the ice surface. (Modified after E.R. Atrium; Washington State Department of Natural Resources, I.C. 47)

5.4.2 TOPOGRAPHY AND SLOPE

Topographic relief characteristics are due largely to glacial processes already discussed and to subsequent erosion along the beaches, streams and river banks. In these areas slope of the soil surface increases rapidly and slopes greater than 20 percent require special engineering consideration when development is undertaken. Rarely are slopes over 40 percent built on, and most sources recommend against any development on slopes greater than 25 percent unless it is highly regulated and engineered and of low density. The Soil Conservation Service of the U.S. Department of Agriculture reports that: in King County most soils located on 25 to 40 percent slopes have both a severe soil erosion and a landslide hazard. Kitsap soil types are locally known to have severe hazard at slopes of 15 percent or greater.

5.4.3 NATURAL HAZARDS

The soils, slope and geologic maps are useful devices for determining landslide, erosion and seismic hazard potential for relatively large areas that can be generalized on the map scale of 1" = 1 mile. Smaller areas, i.e., lots and platted areas that cannot be generalized at this scale require site study and perhaps laboratory testing of the soil to determine the soil, slope and geologic character of the particular area planned for development.

The natural hazards maps, contained in the map supplement, shows areas of very severe, severe and moderately severe landslide potential. Also shown are areas thought to have relatively poor seismic stability due to settling of the subsurface material, following an earthquake shock.

The landslide component of the hazards map was delineated using three parameters: percent of slope, geologic formations and soil types, and the presence of ground water. The following table defines "moderate", "severe" and "very severe" in terms of these three factors. Slopes greater than 20 percent were mapped and unless these slopes were found in bedrock they were given a minimum classification of "moderate".

The areas outlined are areas where slippage is likely to occur and does not include downslope area of lower slope that might become inundated or a similar upslope area that might be affected by slumping due to development.

SLOPE	GEOLOGIC UNITS	CLASSIFICATION (SLIDE HAZARD)	
		NO SEEPAGE	WATER SEEPAGE
20 to 40 %	Qva-Vashon Advance Qss-Salmon Springs Qpy- Puyallup Qsc-Lacustrine (Lake) Sediments	Severe	Very Severe
	Qvr-Vashon Recessional Qvt-Vashon Till	Moderate	Severe
More than 40 %	Qva-Vashon Advance Qss-Salmon Springs Qpy-Puyallup Qsc-Lacustrine Sediments	Very Severe	Very Severe
	Qvr-Vashon Recessional Qvt-Vashon Till	Severe	Very Severe
	Bedrock	Moderate to Severe	----------
0 to Vertical	Qm-Fill material	Severe to Very Severe	Very Severe

CLASSIFICATION OF SLIDE HAZARDS

5.4.4 HYDROLOGY

The hydrologic study of the Sea-Tac area includes determination of surface stream flow, water quality, drainage basin definition and the sub-surface or ground water distribution.

The drainage basins, stream systems, topographic depressions and lakes are shown on the drainage basins map, located in the map supplement. There are three major drainage basins within the study area. These are Miller Creek, Des Moines Creek and Salmon Creek drainage basins. Detailed water quality and quantitative studies are being undertaken utilizing the results of this study, which will provide typical water quality and runoff data that can be applied to other stream systems undergoing urbanization.

chapter 5.5
land use and circulation

5.5.1 LAND USE

INTRODUCTION:

The land uses found in the Sea-Tac Communities area reflect the full range of general land uses found in a typical urban area. However, because the area lies just outside the corporate limits of the City of Seattle, the residents turn to the central city for some of the urban facilities, i.e., cultural, social and economic, that might otherwise be found in an urban area of comparable size (137,000 persons) located in a remote area of the county.

Within the Sea-Tac area can be found commercial truck gardens, greenhouses, horticultural nurseries, small scattered pastures for horses and cattle, trailer parks, multi-story apartment houses, low income "housing projects", luxurious mansions, large retirement home developments, apartments, lovely houses, ugly houses, a community college, public and private schools, playgrounds, parks, shopping centers, three large discount department stores, gaudy strip commercial developments, an outstanding library, cemeteries, golf courses, and a major international airport to name a few of the land uses characterizing the area.

A series of 1"=1 mile land use maps is found in the map supplement to the six month report: Environmental Assessment (See Part 8 References). A detailed survey and tabulation of the type and number of land uses and land area devoted to major categories of land use has been made by 40-acre cells and is available through the Land Use Management Division of King County.

The following description of land uses found in the Sea-Tac communities is in no way all-inclusive but is intended to provide a generalized picture of the area.

RESIDENTIAL LAND USE:

Although the Sea-Tac area is developed on a predominately grid street pattern, the community has avoided a monotonous uniformity of appearance. This is in a large part due to the hilly terrain but is also because of a wide variety of housing styles, densities, age and quality.

The community is predominately a single family residential area with pockets of apartment development occurring in Burien, north along Ambaum Blvd., in White Center, in spots along 1st Ave. S., along the west side of Glen Acres golf course, along Des Moines Way from Seattle to Burien, in Riverton Heights along Pacific Hwy. S., around Bow Lake east of the airport, around Midway and in Des Moines. Nowhere are there extensive apartment complexes dominating a neighborhood environment as, for example, in the city of Seattle.

Two large public housing developments are located in the eastern half of the White Center Community. Retirement housing developments are found in Burien, in and around White Center, in Des Moines and in Zenith.

The single family residential areas vary from somewhat rural appearing areas found in isolated spots to the urban tract housing found in scattered groupings throughout most of the community. The residential areas of Normandy Park have the leisure estate character of an upper-class neighbor-

sea-tac communities plan

residential land use

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5.5.1

hood. The homes in this area are located on large lots served by curvilinear streets. The residential neighborhoods of Seahurst, Seola Beach and Three Tree Point are also served by curvilinear streets and, because of their rugged hillside character, are low density development areas. The rest of the Sea-Tac area is developed around a grid street system. In at least three areas, Riverton Heights, Southern Heights and Mountain View, the grid system was designed to serve narrow but very deep lots, i.e., 60' x 200'. This has resulted in the inefficient use of land and lower density development.

Large areas of vacant land for development of subdivisions are scarce. Single-family development has slowed in recent years especially compared to the boom in this area in apartment development. Of approximately 10,167 housing units added in the Highline Study area between 1960 and 1968, 6,298 units were either in duplex or apartment units, almost double the number of single-family units.

In sum, there are 10,600 acres of land developed for single-family residential use at an overall average density of 3.02 units per acre.

BUSINESS/COMMERCIAL LAND USE:

The predominate business/commercial development in the Sea-Tac community is at Burien. The two large discount department/general merchandise stores located here contain over 250,000 sq. ft. of combined floor area. In addition, a junior department store is located close by on the main east/west street of Burien. The Burien complex contains over 450 retail stores serving

various needs. The center also contains three major line car dealerships, several used car lots and numerous businesses providing automotive care services.

Located in the area are two indoor movie theatres. A number of first line restaurants serve the area and provide evening entertainment facilities. Several taverns also provide their principal function and serve as local entertainment centers.

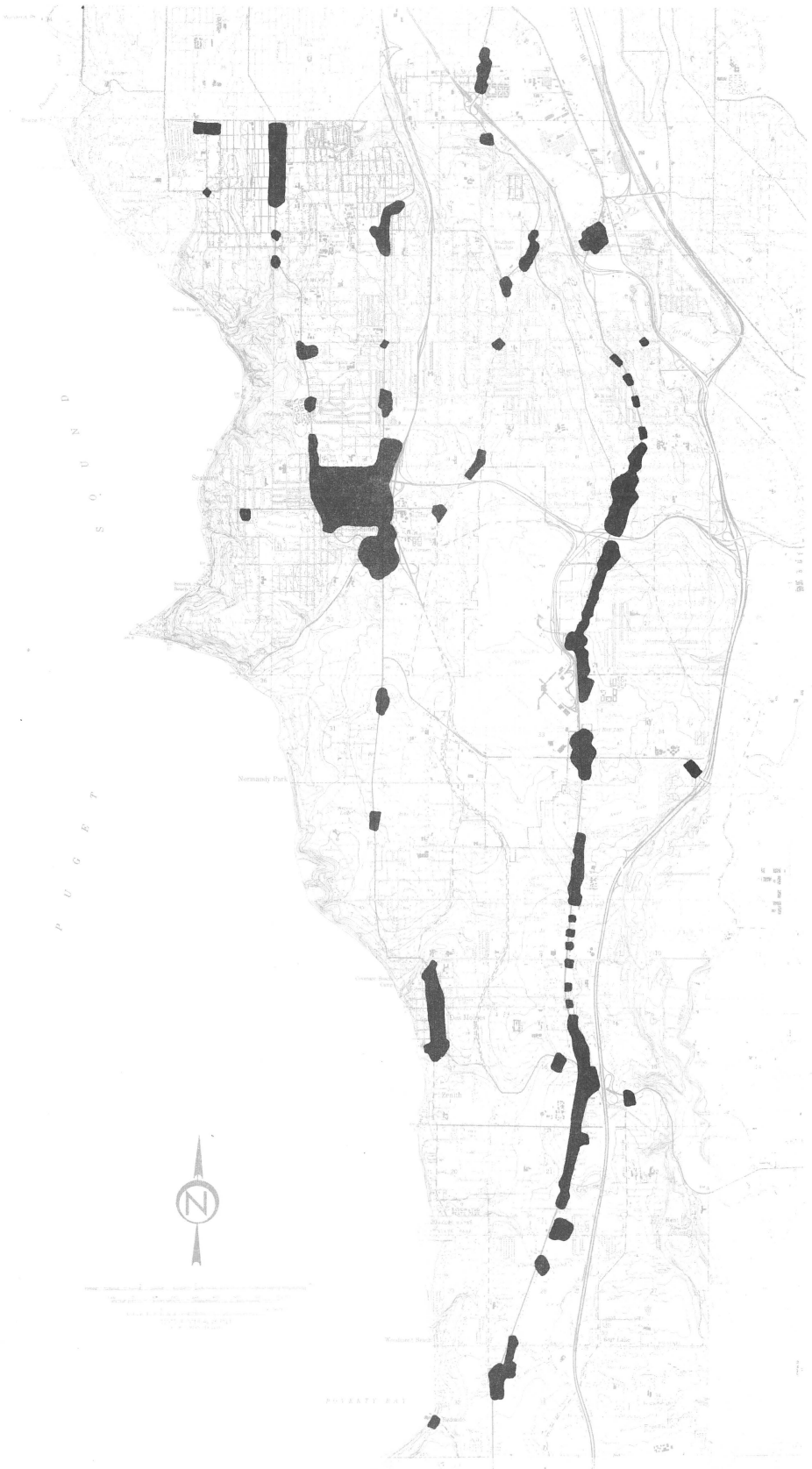
Lumber yards, several commercial nurseries, equipment rental shops, furniture stores, variety stores, music stores, boutiques and numerous other general commercial enterprises are found in the Burien complex.

Secondary or community level business centers are found at White Center, Des Moines, and Riverton Heights. White Center and Des Moines are the two oldest business centers in the Sea-Tac Communities area and, although they contain a number of general commercial enterprises, they primarily provide concentrations of grocery stores, small shops, drug and small variety stores. Riverton Heights provides the second indoor movie theatre in the area (there are also two drive-in movie theatres in the Sea-Tac communities). The Des Moines center provides the only boat marina and moorage facility in the area.

Another eight business development clusters can be classified as neighborhood level centers developed and organized around a full size grocery store. These centers provide a full line of convenience shopping and services.

More than a dozen convenience business centers are scattered throughout the Sea-Tac area. They range in size from a small "Mom& Pop" store to a full size grocery store with some convenience shopping and service shops.

sea-tac communities plan



business / commercial land use

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Along Pacific Highway S. is virtually an eight-mile strip of mixed general commercial, heavy commercial, community business, neighborhood business and convenience business development.

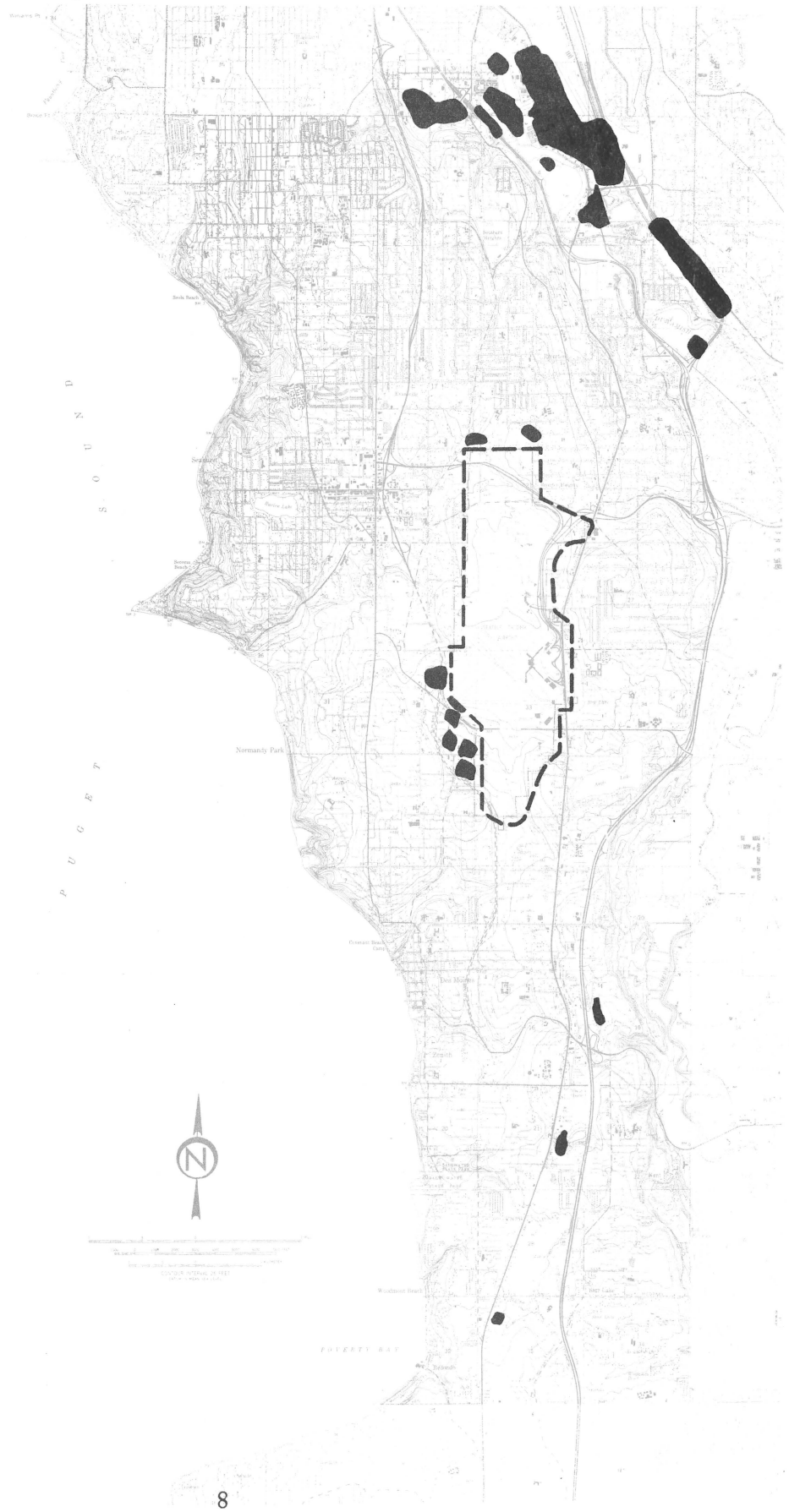
At Bow Lake on the east side of Sea-Tac Airport a major concentration of motel and service business development has occurred. The complex includes at least five major motel/hotel operations and several smaller ones along with car rental offices and storage yards. Although there are other scattered small motels throughout the area, the only other location of a major motel operation is in the Duwamish Industrial area. The Bow Lake area has also been considered as a location for several proposed office tower developments in recent years.

Southcenter, a major regional shopping center, is located on the outside edge of the eastern boundary of the study area. It contains four major department stores and 106 other business which run the gamut from an optical dispensary to intimate boutiques. The center, which has a fully enclosed air-conditioned mall, provides parking space for 8,500 cars.

INDUSTRIAL LAND USE:

With the exception of the area along the Duwamish River north of I-5 there is very little industrial development in the Sea-Tac communities. The area along the Duwamish contains such things as the Boeing Developmental Center and Plant 2, auto wrecking yards, warehouses, manufacturing-fabricating facilities, storage yards, trucking terminals and along the east edge of Allentown a railroad switching yard.

sea-tac communities plan



industrial land use

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Scattered throughout the area are a couple of sand and gravel pit operations, concrete batching plants, a surplus military equipment repair plant (trucks, etc.), several small fabricating plants around the southwest border of Sea-Tac Airport, a central maintenance and equipment facility for the school district, a telephone company warehouse, a wrecking yard, a couple of fabricating plants at the north end of the airport, and numerous backyard contractor/fabricator operations scattered about the communities.

The single most significant non-residential land use in the area is the Sea-Tac Airport complex which includes terminals, airplane maintenance facilities, a fuel storage depot, warehouses and freight terminal facilities.

SCHOOLS:

The study area includes all of HIghline S. D. #401 and portions of Federal Way S.D. #210, South Central S.D. #406, Kent S.D. #415 and Seattle S.D. #1. An inventory of public schools and associated facilities located in the study area are as follows:

SCHOOL DIST.	TYPE & NUMBER OF FACILITIES				
	ELEMENTARY	JR. HIGH.	SR. HIGH	SPECIAL	ADM & OTHER
HIGHLINE #401	33	9	5	3	12
FEDERAL WAY#210	5	1	1		
So. CENTRAL #406	4	1	1		1
KENT #415				1	1
SEATTLE #1	1				
TOTAL	43	11	7	4	14

The Highline Community College is also in the study area. All Highline schools and many of the other schools in the area are utilized as "community schools", open after school hours for use by the community in a variety of educational and recreational programs. These programs are offered either by the school districts, the King County Parks Division or by the Highline Community College. The College operates community service-type programs not only at their central college facility but at high schools, public housing projects, retirement homes and other suitable locations within the community.

Private and Parochial Schools:

Other schools services to the community are offered by private and parochial schools, totaling eleven within the area. These cover a range of service from preschool to the parochial Kennedy High School.

PARKS:

The County currently has 19 park sites in the study area (plus one memorial). Fourteen of these sites are considered developed. of the five remaining, one is currently under development and three are in the planning stage. The largest park, including recent additions, is Seahurst with 172,8 acres; the smallest is Highline Neighborhood Park #1 with 2.4 acres. Five of the parks have enclosed community buildings ranging in size from 625 to 13,400 sq. ft. The County parks include salt and fresh water access, full recreational capabilities including passive use areas and nature trails,

facilities for athletic events, and picnic areas. Many County playfields are utilized by school districts where their own facilities are inadequate. In turn, the County utilizes school facilities for recreational programs wherever possible.

Two parks are in Normandy Park, there is one in Des Moines plus the city-owned Marina and Marine overlook, and two developed parks and one undeveloped park are in the City of Kent in addition to two landfill areas committed for park use. The State of Washington Saltwater State Park of 80 acres is located in the study area and rates as having the highest number of total visits (almost one million in 1971) as compared to other state parks. The County has one existing swimming pool in the Highline area and another is under construction; another pool is located in the South Central School District area.

LIBRARIES:

The County operates eight libraries in the unincorporated study area and contracts with the City of Des Moines for one more. Three are located in owned facilities and six are in leased facilities. These vary in size from 500 to 16,700 sq. ft. A discussion with the King County Library representative indicates that a site has been purchased to replace the White Center Library (2,100 sq. ft.). This does not necessarily solve the problem for the nearby Park Lake Library (500 sq. ft.), which is considered inadequate but serves

an area of non-mobile people. Consideration is also being given to developing one library to replace both the McMicken Heights (500 sq. ft.) and the Valley Ridge (1,200 sq. ft.) facilities. The South Park Court facility with 500 sq. ft., is considered inadequate but there are no firm plans for change at this time. Redondo Library (500 sq. ft.) is another inadequate facility, but a significant population increase would have to be projected to implement a change in this area.

5.5.2 CIRCULATION

STREETS AND HIGHWAYS:

The movement of ground transportation within and through the Sea-Tac Communities area is complicated by the involvement of three levels of government - state, county and city - and by eight different governmental jurisdictions - Kent, Des Moines, Normandy Park, Seattle, Tukwila, Metro, King County and the State of Washington. Over the years there have been instances where some of the jurisdictions have worked against others in preserving their own desires, but cooperation has been the more common rule.

For many years the principal streets (at that time often designated highways) in the area were a commuter's nightmare of congested stop and go traffic. At the same time the area was strictly a bedroom community relying on a network of streets and highways for its survival.

The development of Interstate 5 along the eastern boundary of the area brought a level of sanity back to driving conditions on Pacific Highway South which now serves as a major local traffic route. State freeways SR 509, connecting Burien and the Seattle industrial complex and SR 518, connecting Burien and I-5 have greatly modernized and eased the traffic problems in the study area.

The arterials and local streets in the Sea-Tac area are laid out on a grid pattern with a very strong north-south orientation largely determined by

topography and the employment centers in Seattle, The principal north-south routes are I-5, with a 1973 peak average daily traffic (ADT) volume of 70,300 (north of Southcenter and 68,000 south of S 216th), Pacific Highway South- 21,000 (at the airport), Des Moines Way - 13,300 (in Des Moines), 1st Ave. South- 20,000 (at Burien), SR 509 - 19,800 (at Burien), and Ambaum Blvd. - 17,800 (south of SW 116th).

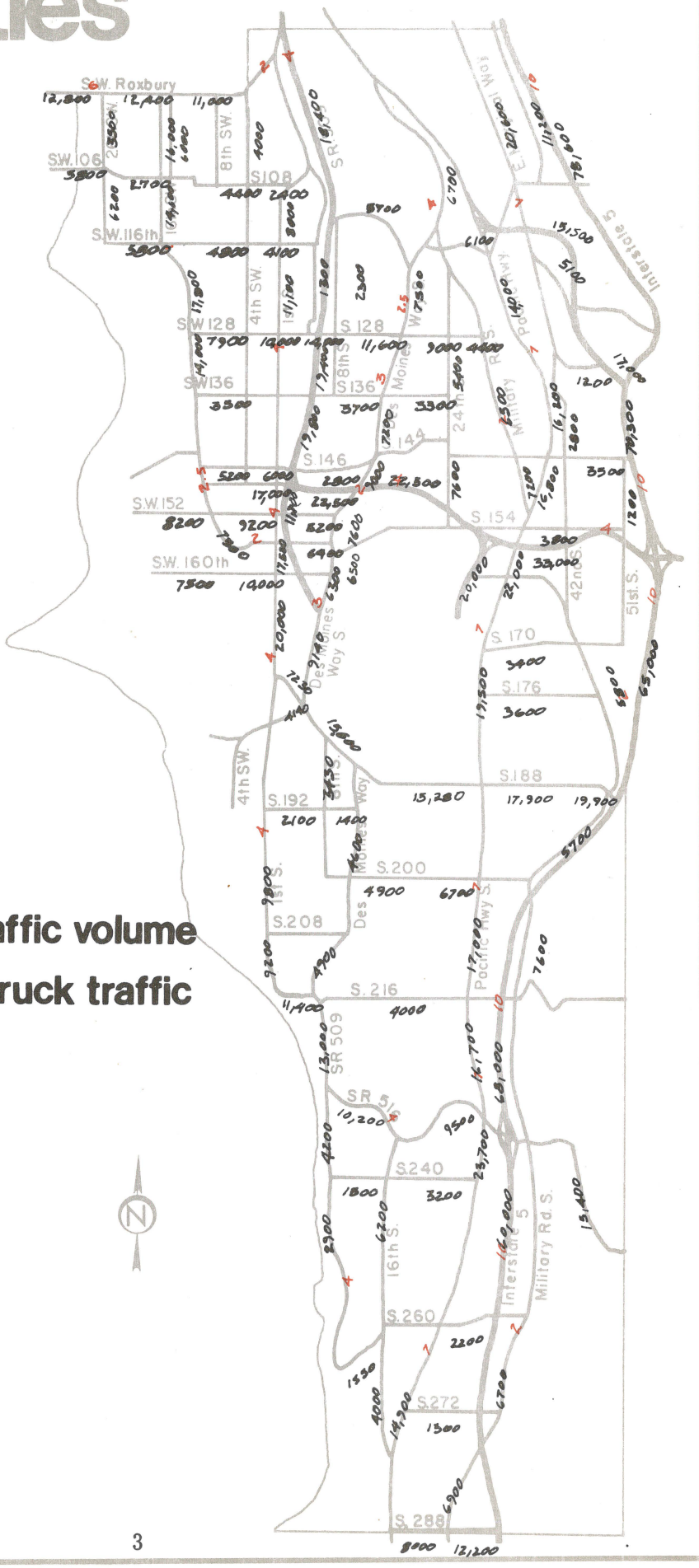
The more recent industrial development and Southcenter in the Green River Valley has in turn created more east-west orientation of traffic, particularly along the Kent-Des Moines Highway with a 1973 peak ADT cunty of 15,400 (east of I-5), S. 188th - 19,900 (west of I-5), SR 518 - 33,000 (between I-5 and Pacific Highway South and 22,500 at Burien), S. 148th - 17,000 (in Burien), SW 128th - 14,000 (between ST 509 and 1st Ave. South), and SW Roxbury - 12,800 (west of 26th Ave. SW).

On all of the routes, truck traffic is a small percentage of the total. Interstate 5, with the highest volume of truck traffic, has only 10%. The next highest volume is on Pacific Highway South, 7%.

TRANSIT:

The study area is served by the Metro Transit System, which is routed on a north-south axis (see map supplement). At the time of this report, it is impossible to tell how a patron could make a direct or indirect trip to points east of the study area. The five transit routes do provide for direct connection with points within Seattle and one of the five also connects with Tacoma. The

sea-tac communities plan



traffic: 1973 routes, volume and mix- state and county arterials

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routes utilize the same north-south routes which carry the greatest volume of automobile traffic. During peak commuting hours the buses run on a 15 minute or less schedule. During the non-peak hours the schedule slips to 1 hour or less between buses. The schedule compares favorably with those within the City of Seattle.

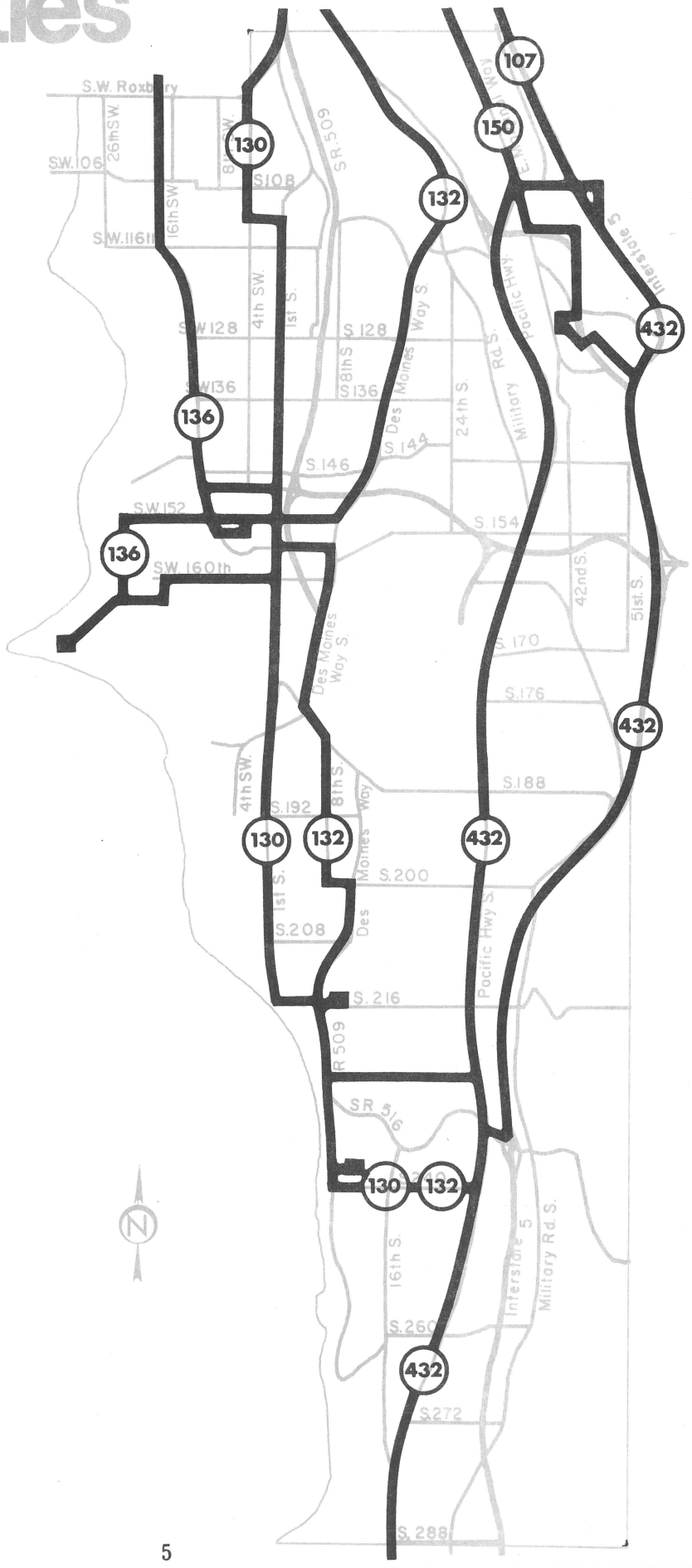
The Metro Transit System is too new, established in 1973 (based on the acquisition and expansion of a private transit company's limited system which had operated in the area for several years), to evaluate fairly how effectively it serves the needs of the Sea-Tac Communities area. Routes and regular pick-up points have not been established long enough for patronage to become clearly established. Metro management has indicated a willingness to develop innovative techniques for serving the public and has recently opened a large Park & Ride lot in the center of Burien. As demand for new or modified routes is clearly defined, it is anticipated Metro will show a willingness to provide the service.

TRAILS:

There are no other developed modes of ground transportation in the Sea-Tac Communities area. In 1972, King County prepared and adopted an Urban Trails Report which recommends a number of trails through the area. Funding for some limited trail development is available but lack of a clear-cut demand from the general public has given trail projects a low priority. The trails could be designed for hiking and biking and, in some instances, certain types of motorized travel or horseback riding.

There are no designated bike routes within the study area. Nor are there any designated scenic routes.

sea-tac communities plan



route

130 bus number

transit: suburban bus routes

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5.5.2

chapter 5.6
aesthetics

5.6.1 VISUAL SURVEY

The Sea-Tac Communities Plan Study included a mechanism to account for feelings about the form and appearance of the area. The knowledge of features of a community that create a negative feeling, and why, what features are considered positive, and why, can be put to use when changes in the community are considered and proposed.

The process of accounting for this mental picture, or community image, had two parts. First, a field inventory by a trained observer served as a preliminary characterization of the image elements. The results of the field inventory are summarized in a following section. The second part of the Aesthetic and Visual Survey is termed the "Memory Sketch" inventory. This process involved citizen definition of important community features. Certain elements making up an image were recalled from memory, indicated on a map, and feelings about them described by citizen participants. Analysis by both citizens and staff in conjunction with the field inventory enabled evaluation of the positive and negative forces that are at work in forming the Sea-Tac communities image.

The community image input along with the traditional elements of land use planning were used in formulating and evaluating plan alternatives.

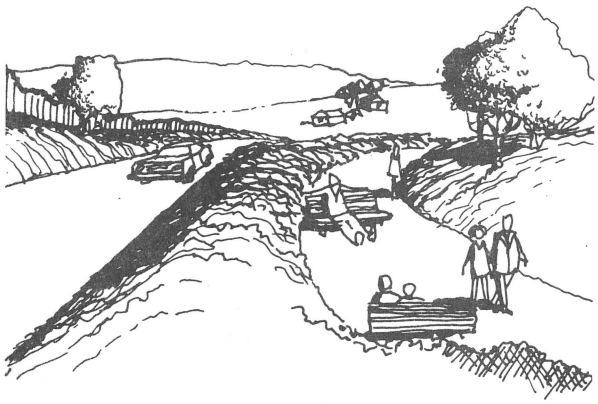
5.6.2 IMAGE ELEMENTS

There are six general categories[1] which are convenient for organizing and noting thoughts. These categories, outlined below, were used both in the field inventory and the memory sketch process.

DEFINITIONS:

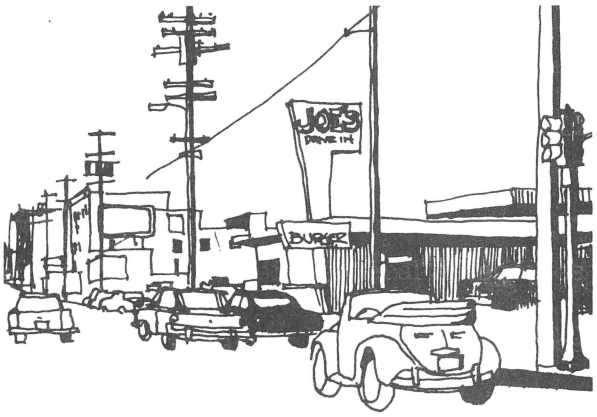
Path:

A route along which you move. This includes routes you frequently travel, sometimes travel, or never travel, but could. It can be a freeway, street (which may include automobile, transit, or pedestrian routes), footpath, or a bicycle path. A path is a route along which you do or can move.



District:

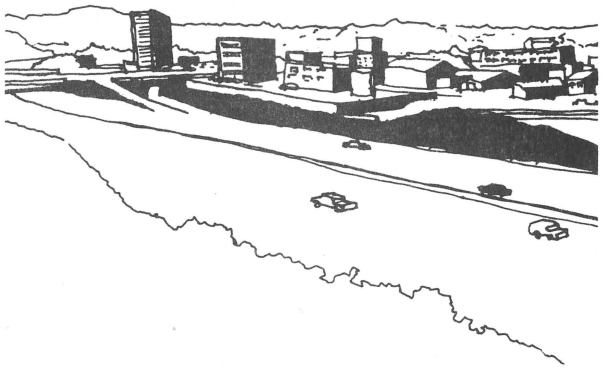
A medium or large size area of similar character or type. It is a place you can have the feeling of being "inside of". It is an area that you can move into, around, and through. A district is a place of common character of theme.



(1. Kevin Lynch, Image of the City, the M.I.T. Press, 1960)

Edge:

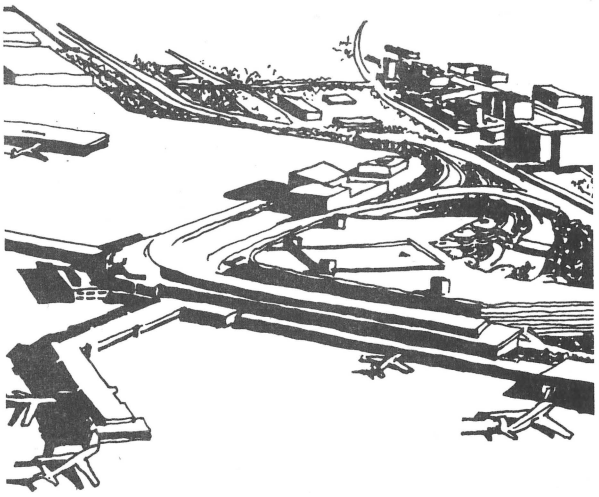
A man-made or natural feature that serves as a boundary between one area and another; a break in continuity



It can be a strong physical barrier or a change in character or type of activity. A path may sometimes act as an edge also. An edge is a boundary.

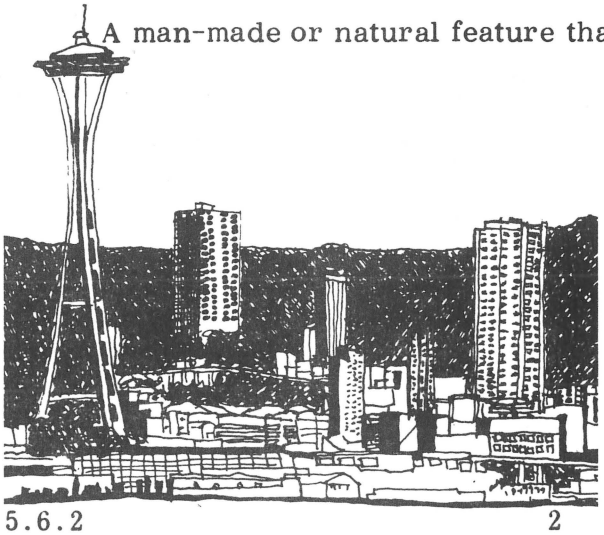
Node:

A concentration of activity, a focal point. It is a place or structure where the activity that takes place there is the primary feature. It may sometimes be an intersection or junction of paths. In addition, the concentration of some physical characteristic that indicates an intensity and type of activity would be a node. It is also something that you can enter into and pass through. A node is a center of activity.



Landmark:

A man-made or natural feature that serves as a reference point.



It is a physical object that derives its importance from visibility (locational reference) or time (historical reference). In some instances a node or an edge may also act as a landmark. A landmark is a reference point.

View:

The way you see things is one way you form an image of a place. Sometimes a particular view may itself be a major factor in forming your mental picture. Two types of view which may act in this way are described below.

Vista. A view corridor. A distant view along an avenue or opening.

Panorama. A sweeping, unobstructed view of a large area or region.

Listed below are the image elements and the characteristics that may affect, in a positive way, the overall community form and appearance. The lack of those positive characteristics may contribute to a monotonous, disorderly unpleasant image.

There are two factors which can affect the desirability and potential desirability of all element characteristics. One is the level of maintenance (preserved and well kept versus deteriorated and declining). The other is the use of open space and landscaping as a visual focus, and an activity center, and/or an insulator.

Path:

a. It has identity (the organization of people and spaces along it is identifiable).

b. It serves to link spaces (district to district)

c. The identification or implication of direction is part of the traveling experience.

d. The topography is emphasized.

District:

a. There are strong nodes and landmarks with it.

b. Its relationship to other spaces is clear.

c. There are comfortable boundaries around it.

Edge:

a. It is made up of natural features or strong, compatible development.

Node:

a. The flow, pattern, and importance of the activity is clear.

b. There is ease of movement within it and through it.

Landmark:

a. It is located within a node.

b. It is located in a large area of monotony.

c. It has historical or social significance.

View:

a. Natural features or well-maintained, man-made features are the view subjects.

b. It provides visual linkage of spaces (district to district) and regional orientation.

5.6.3 FIELD INVESTIGATION SUMMARY

The results of the field investigation are depicted on five maps contained in 8.0.1 ref. 14. Below is a summary, for each map, of those results.

PATHS:

This map includes an evaluation of the appearance and impressions of paths. Views gained while moving along paths account for most areas of positive image impact. Confusing intersections and the visual assault of strip commercial development account for most areas of negative effect.

DISTRICTS & EDGES:

Evaluation of the image effects of districts and edges is also included on this map.

Within the districts a negative image is primarily the result of a low level of maintenance, strip commercial development and its resultant chaos, and the anachronistic nature of a small community being engulfed by urbanization.

For example, the "White Center Residential" district, as a whole, reflects a relatively low level of maintenance. The quality of the district improves somewhat, however, to the south of SW 112th Street. View properties in the district do not, in general, exhibit the high value houses

and associated upkeep level that are normally a reflection of them.

The "White Center Business" district is also a definite part of the overall community image, yet the impression is again a negative one. Unimpressive strip commercial development marks the southerly entrance to the district. The business area as a whole imparts impressions such as "old buildings", "vacant land", "dusty" and "poorly maintained". The street planters and the Washington Mutual Savings Bank are the only positive forces in the overall picture.

Some district leave an impression comprised of mixed feelings. In the "Des Moines Business" district, for example, the pleasant, bustling, small town seems threatened by traffic congestion. The "Allentown" district is another that is comprised of mixed reactions. What once may have been a pleasant, small community is now an anachronism. Urbanization characterized by Interstate 5 and an industrial development surround this district.

Many of the districts leaving a positive impression did so because of well-maintained homes, expansive views, the abundance of natural features or uniqueness of activity.

The "rural contrast" district, for example, a pocket of undeveloped land between the airport and Burien commercial development, is graced with unique topography, plentiful vegetation, and view. The "Burien Business" district has a pleasant compactness in comparison to nearby 1st Avenue South development and is greatly enhanced by street tree plantings. The "Airport/Motel" district seems chaotic as does much of the nearby strip commercial development. However, the airport hustle and bustle along with

the specialized commercial activities associated with it, makes this district a positive image force because of curiosity, interest and awe.

The most distinct edges are Puget Sound, the hills along the Duwamish and Kent Valleys, Interstate 5, and the Sea-Tac Airport. The only edges of distinct negative impression are I-5 and the airport runway. Interstate 5, near the Angle Lake area, is a noisy, inpenetrable barrier. The airport, on the north and west sides, "looms" as an unnatural feature. Inasmuch as the runway is built up, most views are of the runway edge only. It is the subject of many vistas from the west and, while there is no doubt what activity this edge implies, it has an overpowering, eerie effect. This barrier also cannot be penetrated and is not well-meshed with its surroundings.

NODES:

The nodes have been characterized as to the type of activity involved. The major activity center in the study area is, of course, the airport itself. Other notable ones include the White Center Business district, the Lakewood Park and School complex, the Glendale and Rainier Golf Clubs, Seahurst Park, the Burien Business district, Five Corners, the intersection of SR-518 and 1st Avenue South, the Des Moines Marina, Des Moines County Park, and Saltwater State Park. The "Districts & Edges" and "Paths" maps make evaluative statements with reference to many of the activity centers.

LANDMARKS:

This map also characterizes the element as to type. Many of the landmarks are also the subjects of evaluation in connection with the districts in which they are located. Notable exceptions include the airport runway approach light structures and gravel pit sites. The runway approach light structures, especially the one on the north side of the airport, contribute to the eerie effect of the runway itself. It is one more hint of the magnitude of what lies beyond the runway edge. The gravel pit sites are notable in that they are visible and immediately portray a "rape of the land" image when seen.

VIEWS:

Much of the area has great amenity as a result of topography. Much view advantage can be found along the east, west and north edges of the plateau. In addition, some areas offer views down onto the airport facilities. The fact that many people who live near the airport enjoy these views is testimony to their attraction.

As will be noted from examination of the maps and the discussion of image element characteristics, none of the elements stand alone in the community's form and appearance. The Aesthetic and Visual Survey merely established categories for noting impressions, thoughts and feelings which are often difficult to articulate when speaking of the community environment as a whole.

The field inventory served as a direction and information source in the analysis of the memory sketch data contained in Community Perceived Image and Community Expressed Concerns, 8.0.1 ref. 15. In this way, aesthetic and visual consideration was given in the development of plans, policies, and programs.

chapter 5.7
community attitudes

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.