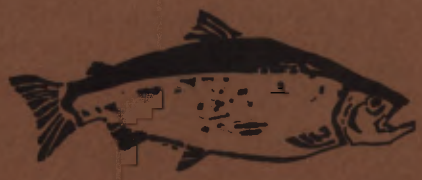
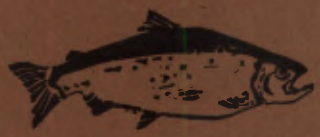
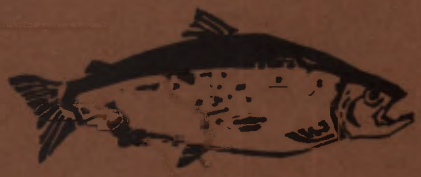
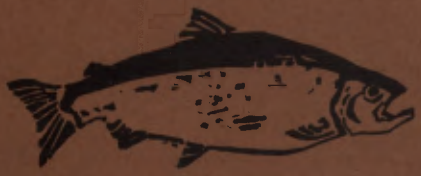
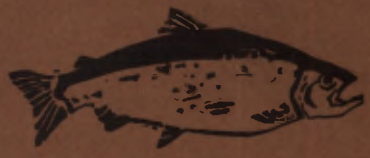



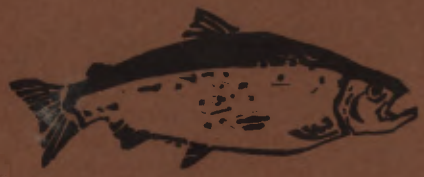
DILLINGHAM

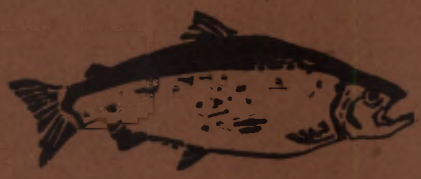
Comprehensive Plan


DRAFT






C I T Y O F D I L L I N G H A M

COMPREHENSIVE PLAN

April, 1971

STATE OF ALASKA

William A. Egan, Governor

Prepared by the Planning and Technical Department,
Alaska State Housing Authority, Anchorage, Alaska

With the

Cooperation of the Division of Planning and Research
Office of the Governor, State of Alaska, Juneau, Alaska

The preparation of this report was financed through a comprehensive planning grant from the Department of Housing and Urban Development and through funds provided by the State of Alaska.

PURPOSE OF THE REPORT

The purpose of this report will be to document the findings which are the product of the Community Comprehensive Planning Assistance activities for the City of Dillingham. These activities will include the necessary analytic studies of the social, economic and physical characteristics of the community in order to determine needed improvements. When the improvements are determined on the basis of the appropriate analytic studies and in conjunction with representatives of the community, recommendations will be made for a program of private and governmental action for upgrading the community's social, economic, and physical environments. The result of these efforts will be a Comprehensive Development Plan, which will list the community objectives and describe the basis and means of accomplishing these objectives.

GOALS AND OBJECTIVES

The City Board of Trustees has officially approved the concept of goals and objectives for planning in the City of Dillingham. These goals have been used as a basis developing the Dillingham Comprehensive Plan. Specific objectives are contained in the various parts of the report, but the following list will show the overall intent of the Plan.

Economic: To stress new economic growth and emphasize the economic security of the community's current residents.

To support a schedule of development of the areas extractable natural resources for the greatest long-term benefit of the City.

To pursue policies consistent with reduction of the seasonal fluctuations in employment opportunities.

To influence the location of economic activities in order to provide an efficient system of public services.

Land Use:

Residential. To encourage concentrated residential settlement, where a wide range of community facilities would be feasible.

Commercial. To encourage the establishment of functional, and efficient shopping areas in central business areas, neighborhood shopping areas and regional areas.

Industrial. To enhance the industrial potential of the planning area through the careful selection of zoned industrial sites coordinated with the provision of highways and utilities.

Recreation. To encourage the provision of a system of parks, playgrounds, open spaces, regional parks and conservation areas.

Streets and Roads. To designate a good network of roads and encourage their optimum usefulness.

Social: To pursue educational policies that will improve the employability of its students. To encourage social betterment through such vehicles as education, public facilities, and healthful living conditions.

GEOGRAPHIC SETTING

Dillingham is located in southwestern Alaska within the Bristol Bay region at the confluence of the Wood and Nushagak Bay. The city's location is a product of its orientation toward the sea and rivers for commercial fishing and transportation. Dillingham is 350 air miles southwest of Anchorage and 175 air miles southeast of Bethel; but there are no highway connections. Also, there are no extensive road connections with the Bristol Bay region. The frontier of twentieth century patterns of geographic organization has not yet reached this far-off corner of the United States which faces Asia on the Bering Sea.

The communities of the Bristol Bay region, however, have a common orientation toward the waters of Bristol Bay. The activities of most of the people are focused on the bays, rivers and lakes. The region is separated geographically by two mountain systems surrounding the area which is generally accepted to be the Bristol Bay region. The Ahklun Mountains to the north and west and the River Hills to the northeast, form the basin and watershed for the scenic and productive river and lake system that are the nursery grounds for the tremendously valuable Bristol Bay salmon fishery. This region is an area of about 40,000 square miles, which is larger is size than the combined area of the States of Delaware, Connecticutt, Massachusetts, New Jersey, New Hampshire, and Hawaii.

BACKGROUND AND HISTORY

The natural setting and the region are important to a comprehensive development plan for Dillingham and these aspects will be further studied, but first it will be appropriate to relate the historical background and development of the community as it pertains to the problems and needs of the existing community. The history of the emergence of Dillingham as a regional center is related to a wide variety of past decisions involving both private and governmental courses of actions, but in most instances development has occurred without regard to comprehensive planning. An understanding of the "natural" development of the community in the past will shed some light on the existing community needs and upon future development decisions.

Prior to the historic period it was believed that the Nushagak River was occupied by Eskimos of the Nushagagmiut ethnic group. Although it was felt that there was considerable mixing of the ethnic groups in this region even prior to the first Russian contact, evidence shows that these people inhabited the areas along the Igushik, Wood and Nushagak Rivers, the Tikchik Lake Region, and along the shores of Nushagak Bay[1]. At the mouth of

---

1. Federal Field Committee for Developing Planning in Alaska, Alaska Natives and the Land, Washington, D.C.: U.S. Government Printing Office, October, 1968, p. 223. and Hrdlicka, Ales, Alaska Diary: 1926-1931, Lancaster, Pennsylvania, The Jacques Cattell Press, 1944, pp. 353-379.

the Nushagak River and along much of the coast of Bristol Bay lived the Aglemiut ethnic group. By several accounts, these people were said to be "warrior people" who fought with the Kuskokuim Eksimos and other people in the Nushagak Bay area.[1] Athabascan Indians were said to occupy the Nulchatna River, a tributary of the Nushagak River about 60 miles north of Dillingham.[2]

Bristol Bay was visited by Captain James Cook in 1778 while searching for the northwest passage which he hoped would lead to the Atlantic. He named the Bay in honor of the Admiral Earl of Bristol, and sent an officer ashore at Cape Newenham for reconnaissance. The officer named the cape and claimed the country for King George III. Although this was the first well recorded visit to the Bristol Bay region by Europeans, Cook himself gives evidence of Russian presence on the Alaska Peninsula and Russian trading in the area north of Bristol Bay prior to 1778.[3]

In 1818 Alexander Baranov, first governor of the Russian American colonies, placed Koraskovsky in charge of an expedition to make a thorough exploration of the territory north of Bristol Bay, and

---

1. Federal Field Committee for Developing Planning in Alaska, Alaska Natives and the Land, Washington, D.C.: U.S. Government Printing Office, October, 1968, p. 225.

2. Federal Field Committee for Developing Planning in Alaska, Alaska Natives and the Land, Washington, D.C.: U.S. Government Printing Office, October, 1968. p. 224.

3. Hully, Clarence C., Ph. D., Alaska: Past and Present, Portland, Oregon: Binfords & Mort, Publishers, 1958, pp. 88-89; and Bancroft, Hubert Howe, History of Alaska: 1730-1885, New York, New York, Antiquarian Press Ltd., 1960, pp. 208-210.

to establish a permanent station on the Nushagak River. At the mouth of the Nushagak River he left Fedor Kolmakof with several men to build a permanent post. The fort was completed that year and was named Alexandrovsk, probably for Alexander Baranov. A census of the colonies shortly thereafter showed three Russian men and two Russian women at the post.[1] Under Kolmakof at Alexandrovsk, the Russians were said to have made peace by 1822 between the various ethnic groups in the area and the Aglemiut (the "warrior people"). By 1822, fur trade could be carried on with no difficulty.[2] At this time the Aglemiut were greatly reduced in numbers from warfare and they took refuge with Kolmakof's assistance in villages near the redoubt. In this early historic period the attraction of Alexandrovski Redoubt affected the mixing of population in the area. Records indicate that Eskimos from the Kuskokwim region, the Alaska Peninsula, Aleuts and Tanaina Indians from Cook Inlet all visited and lived about the redoubt for various periods of time.[3] A Russian Orthodox mission was established at Nushagak (Alexandrovsk) as early as 1837.[4]

---

1. Hully, Clarence C., Ph. D., Alaska: Past and Present, Portland, Oregon: Binfords & Mort, Publishers, 1958, p. 154, and Orth, Donald J., Dictionary of Alaska Place Names, Washington, U. S. Government Printing Office, 1967, p. 712.

2. Alaska Natives and the Land, p. 225

3. Alaska Natives and the Land, p. 223-225.

4. Alaska Rural Development Board, The Silver Fleece: An Economic Study of the Bristol Bay Region, Juneau, Alaska, April, 1958, p. 3

The population in the bay area grew substantially and the fur trade continued after the purchase of Alaska in 1867. One estimate placed the Eskimo population at 1,260 in 1860.[1] In 1880 the first census in Alaska reported 178 people at Nushagak and 142 people at Kanulik, an Eskimo village two miles to the northeast. In 1881, a meterological station was established at Nushagak by the U.S. Signal Corps.[2] In 1884 the Arctic Packing Company established the first salmon cannery in the Bristol Bay region at Nushagak.[3] The next year another cannery was erected on the west bank of the Bay approximately one and a half miles below the junction of the Wood and Nushagak Rivers, and the following year, 1886, a second cannery was built on the west bank about two miles below the first and at the site of the present town of Dillingham. In the meantime, the Moravian Church established a mission near Kanulik in 1886, and called its settlement Carmel. Aside from the church's missionary activities the settlement later operated a hospital, an industrial school and started a herd of 88 reindeer. 189 persons were listed for the mission in the 1890 census, but the enterprise

---

1. Alaska Natives and the Land, p. 224, and The Silver Fleece: An Economic Study of the Bristol Bay Region, p. 3.
2. The Silver Fleece: An Economic Study of the Bristol Bay Region, p. 3.
3. Alaska: Past and Present, p. 218.

was never able to become well established because of the influence of the deeply entrenched Russian Orthodox Church at Nushagak. In 1904, the Moravians ceased operations.[1] A post office was established at Alexandrovsk in 1899 and was called Nushagak.[2]

In the years following the second Alaska Census, the population and economic activity shifted from the east to the west side of Nushagak Bay. The location of the new canneries near Snag Point were responsible for an increase of 219 people at the 1890 census, and by 1900 Carmel and Kanulik completely dropped from the enumeration. In 1901, a new cannery was constructed at Wood River Village, just north of the present town of Dillingham, while Nushagak on the east shore of the Bay took a sudden drop between the 1900 and 1910 enumerations. Between 1908 and 1910, there were about ten canneries in Nushagak Bay. Prior to 1916, a small hospital for natives was operated at Kanakanak which was first run by the Department of Education, of the Department of Interior,[3] and later by the Public Health Service. The post office of Dillingham was established on Snag Point in 1904. The town of Dillingham, however, was located three miles to the southwest at what is now known as "Nelsonville", near the Native Hospital at Kanakanak.

---

1. The Silver Fleece: An Economic Study of the Bristol Bay Region, p. 4.
2. Dictionary of Alaska Place Names, p. 712.
3. Gruening, Ernest, The State of Alaska, New York, Random House, 1954, p. 216.

In 1918-1919 an influenza epidemic struck Nushagak Bay and by 1920 it was virtually certain that the entire permanent population of the Bay did not exceed 500 persons.

In 1918 the Eskimo village of Kanakanak was said to have a population of about 250, but most of the population died of influenza during the epidemic of 1918-1919.[1] During 1918 the Bureau of Education building at Kanakanak, which was erected as a school in 1909, was enlarged and remodeled as a hospital. The following year construction was started on an orphanage to care for the orphans created by the influenza epidemic. Later the buildings were converted for use as an industrial school. The census of 1920 recorded only 36 people at Kanakanak.[2] A post office was obtained in 1929 when 177 people were again living in the area. Wood River Village, known earlier as Ah-lek-nug-uk, was also hard hit by the influenza epidemic of 1918-1919. The population of the Eskimo villages along the Wood River was virtually wiped out and people did not begin to move back into the area until the late 1920's at which time families from the Togaik region, the Kuskokwim River, and Nushagak Bay began to populate the shores of Lake Aleknagik. Wood River Village, which may have included as many as 100 permanent residents before the epidemic, now has only a few families.[3]

---

1. Alaska Diary: 1926-1931, p. 380.
2. VanStone, James W., Eskimos of the Nushagak River, University of Washington Publications in Anthropology, Volume 15, 1967, p. 104.
3. Alaska Natives and the Land, p. 225.

The present location of the Dillingham townsite was originally occupied by an Eskimo village recorded as "Ah-lek-nug-uk" by Ivan Petroff in the 1880 census[1] and was also known as Chogiung.[2] Dillingham was named in 1904 for William Paul Dillingham, U.S. Senator, 1903-1923. In 1903, Dillingham conducted an extensive tour with his Senate subcommittee through Alaska. This was the first comprehensive investigation of Alaska by a congressional committee, and Senators Dillingham and Nelson became, for many years, the Senate's authorities on Alaska.

About 1944, the post office was discontinued at Kanakanak and the name "Dillingham" was transferred to Snag Point where Dillingham post office had been assigned since 1904.[3]

In more recent times, the normal gravitation of the population toward the Dillingham townsite has occurred because of the economic activity connected with the canneries and the location of various public services at the site. By 1950, the population was 577. In 1960, the population had declined to 424. A new high school was completed about 1961 and a small boat harbor was completed by the United States Army Corps of Engineers in 1962. A sewer system and sewage disposal plant were completed in the summer of 1964. The city incorporated an approximately 22 square mile area in 1963 which included Kanakanak and the 1970 census shows a population of 914 for Dillingham.

---

1. Dictionary of Alaska Place Names, p. 272.
2. Alaska Natives and the Land, p. 224.
3. Dictionary of Alaska Place Names, p. 272.

CLIMATE OF DILLINGHAM

Geographic Influence on Climate

Dillingham is located at the extreme northern end of Nushagak Bay near the mouths of the Nushagak and Wood Rivers. Nushagak Bay flows into Bristol Bay about 35 miles to the south. The land surrounding Dillingham is flat in all directions for a distance of 12 to 15 miles, except for a range of low hills about seven miles to the southwest. The Wood River Mountains, with a general orientation of north-south, lie to the west and northwest. From the foothills about 15 miles away, the terrain rises to peaks reaching up to 2,000 feet or more at approximately 20 miles distance. The distance and direction of the mountains from Dillingham are such that they do not have a significant influence on its climate. The extensive water areas to the south exert a modifying influence on the climate during certain months of the year.

Climate

Normally coastal located communities experience a climate dominated by marine influences, resulting in relatively heavy precipitation and small daily and annual temperature ranges. Interior communities generally recieve light precipitation, and have large daily and annual temperature ranges (continental climate). Dillingham is

a combination of both, placing it in what is called a transition zone. Seven months of the year, during the late fall, winter and early spring the prevailing winds are from the north, carrying drier and colder air over the area, modifying what would ordinarily be a warmer, wetter marine type of climate. From mid-May to early October the air flow over Dillingham is from a southerly direction. Having had a trajectory over water, it is moist and heavier precipitation occurs during these months. The water at this time of year is colder than the atmosphere over it, cooling the air near the surface, resulting in lower maximum daytime temperatures. Notice that on the average there are only 14 days each year with a maximum temperature of 70 degrees or more. If we compare this number with that of a station with a completely marine climate such as Yakutat, we find only three days a year with a maximum temperature equal or exceeding 70 degrees and when compared with the continental climate of Fairbanks the number is 53. At Aleknagik, just 15 miles north of Dillingham, the continental influences on climate also begin to appear. Aleknagik has 23 days, each with a maximum temperature of 70 degrees or more. Annual precipitation at Yakutat is 131.81 inches, and at Fairbanks is 11.29 inches. Dillingham's annual average precipitation is 25.76 inches. In all respects the climate of Dillingham falls in between the marine and continental climatic types.

There is no wind speed information available for Dillingham. At King Salmon, which has a climate quite similar to Dillingham,

average wind speeds for all months are 10 to 12 mph. The maximum speed observed was 71 mph from the north during the month of November.

Source: Environmental Data Service, National Oceanic Atmosphere Adminstration, Anchorage, Alaska.

DILLINGHAM

CLIMATOLOGICAL DATA SUMMARY

Lat. 59° 03′ Long. 158° 31′

MONTH	TEMPERATURE (°F)							PRECIPITATION TOTALS (Inches)									Wind	Mean Number of days					
	Means		Extremes								Snow and Sleet									Temperatures			
																				Max		Min	
	DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	RECORD HIGHEST	YEAR	RECORD LOWEST	YEAR	MEAN	GREATEST DAILY	YEAR	MEAN	MAXIMUM MONTHLY	YEAR	GREATEST DAILY	YEAR	GREATEST DEPTH ON GROUND	YEAR	PREVAILING DIRECTION	PRECIPITATION .10 INCHES OR MORE	70° AND ABOVE	32° AND BELOW	32° AND BELOW	0° AND BELOW
(a)	35	35	35	35	—	35	—	32	32		20	20	—	20	—	20	—	21	12	35	35	35	35
J	22.9	8.5	15.7	53	1937	-41	1902	1.87	1.30	1923	12.0	29.5	1928	14.0	1924	60	1931	N	7	0	22	30	10
F	26.1	11.0	18.6	54	1936	-30	1921+	1.52	0.96	1965	10.4	23.6	1944	12.0	1925	56	1931	N	6	0	16	27	8
M	29.5	11.1	20.3	60	1931	-27	1966	1.62	1.50	1926	13.2	41.8	1930	10.0	1929	60	1931	N	7	0	16	31	7
A	38.9	22.8	30.9	63	1938	-15	1902	1.16	0.87	1960	3.1	15.0	1924	6.0	1924	52	1931+	NE	5	0	4	27	1
M	51.3	32.5	41.9	76	1959	0	1905	1.78	1.11	1968	0.5	4.0	1933+	4.0	1933	19	1931	SE	8	*	*	14	0
J	62.0	41.6	51.8	92	1953	18	1905	1.69	1.11	1933	T	T	1954	T	1954	T	1954	SW	8	4	0	1	0
J	64.7	45.6	55.1	87	1960+	31	1966	2.57	1.35	1954	0.0	0.0	—	0.0	—	0	—	SW	10	7	0	*	0
A	62.8	45.2	54.0	81	1923	26	1956	3.99	1.50	1942	0.0	0.0	—	0.0	—	0	—	SW	14	3	0	1	0
S	56.2	38.8	47.5	73	1936+	11	1931	3.46	1.36	1932	0.1	2.4	1930	2.0	1930	2	1930	SW	10	*	0	6	0
O	42.5	26.9	34.7	70	2936	1	1961+	2.54	1.45	1952	2.0	20.0	1931	6.0	1920	6	1920	N	7	*	3	21	0
N	31.1	17.0	24.0	52	1928	-26	1963	1.78	1.20	1926	9.5	32.0	1930	8.0	1929	27	1930	N	7	0	14	28	3
D	21.8	7.3	14.6	50	1936	-30	1957	1.78	1.27	1965	14.6	37.0	1930	12.0	1938	64	1930	N	7	0	23	30	10
	42.5	25.7	34.1	92	1953	-41	1902	25.76	1.50	1942	65.4	41.8	1930	12.0	1938+	64	1930	N	96	14	98	216	39

(a) Length of record (through 1968)

\+ Also on earlier dates, months or years

* Less than one half

T An amount too small to measure (trace)

Source: Department of Commerce, National Oceanographic and Atmospheric Administration (NOAA), Anchorage, Alaska

SOILS

The City of Dillingham was once covered by glaciers and the topography of the area is characteristic of areas where dposition by continental glaciers occurred. The land within the city limits is mostly rolling hills with many irregularly shaped moraine knolls and ridges separated by flat, wet lands and muskeg. Here the deposits from the retreating glaciers interrupt the stream drainage and result in formation of many small lakes and ponds in association with the wet lands. The upland moraine hills are mantled by a thick layer of silty windlaid material called loess. This material is a mixture of silt blown from unvegetated flood plains and hills adjacent to the melting glaciers, and volcanic ash from the Aleutian Range to the east and south. Beneath this mantle of loess, the substratum is mostly a coarse grained sand and gravel type of material.

The soils within the city and the region may be interpreted in many ways which are related to land use planning decisions in the area. Agricultural land use in only one application of soil survey information. For purposes of land use recommendations for the City of Dillingham, however, the soils will be classified according to whether or not they would be suitable for building development.

The soils or land types which are mapped in the Dillingham area have many characteristics within the soil profile which determine the soil series. These characteristics are determined by such things as climate, age, and the parent material. The primary characteristic which determines a soil's suitability for building development in Dillingham, however, is the drainage within the soil profile itself. Three categories of soils and land types have been shown on the map on page . These categories include buildable soils, marginal soils, and poor building soils. A brief description of each category follows.

The buildable soils category includes the Aleknagik series and all of the Kanakanak soil series except for a small percentage. These soils cover about 37% of the area covered in the soil survey of the Dillingham area, and the location and distribution of these soils will have a significant impact on the future land use patterns in the area.[1] All of these soils are well drained and the gravel substratum makes a good to excellent material for road fills, sub-grades and foundations. The drainage properties of these soils enable the proper functioning of individual septic tank disposal systems and streets can be constructed with relative ease. The silty topsoil layer, however, is a poor material for road fill or

---

1. The soil survey covers approximately the same area which was incorporated into the Dillingham city limits but the boundaries are not conterminous.

embankments and is fair to poor as a road subgrade or foundation for structures. The silt layer ranges from 24 to 42 or more inches deep; so in most cases, this silty layer does not pose a great building limitation, but in some spots the silt may be much deeper than the general 42 inch depth and there could be some building problems. Another factor is that the depth to the gravel material may be greater under the Kanakanak soils than the Aleknagik soils.

In the buildable soil category, the slopes of the Aleknagik and the Kanakanak soil series range from nearly level to 20%. The Kanakanak soils over 20% slope were excluded from the buildable soil category because in most cases it is not economically feasible to build on these areas. The steeper slopes in these series would also be more expensive to develop, but due to the limited amount of well drained land it may be more feasible to develop this land for uses such as low density residential development rather than draining large areas of wet soils.

The Nushagak soils cover about 12.6% of the soil survey and generally occupy the lower slopes of the moraine hills and ridges between the areas of Aleknagik or Kanakanak soils on the hills and Salamatof soils in the depressions. The primary limitation of this soil for building development is that it is poorly drained. The water table

is always close to the surface and the soils generally remain frozen until midsummer. This soil is placed in the marginal building soil category because it would be possible to artifically drain these areas. After drainage, the soil properties are like those of the silty material in Aleknagik soils and the Kanakanak soils. The silt however, is only fair to poor as a road subgrade or for foundation for structures, and the depth to gravel would not generally be predictable.

The Nushagak soils range in slope from nearly level to 12%. The steeper areas where this soil is present may possibly be more easily drainged than the level areas. Also, in some areas, it may be possible to block off the seepage of water from higher wetlands, thus allowing the natural drainage of the wet Nushagak soils. In any case, the successful use of the Nushagak soils for building development will depend on individual site considerations which are related to economic uses of land and the future land use plan.

The poor building soils category includes the Salamatof soils and the Hyer soil series. The Salamatof soils which cover about 45% of the area of the soil survey are the most extensive soils in the Dillingham area. These peat soils occupy nearly all of the low-lying area. The soils are always wet and many small lakes and ponds occur in association with the soil area. Drainage is

generally not possible because of their low position, but if drained the peat in these bog soils has little value as construction material or as a foundation for roads or structures. The soils are frozen until late summer, but frost does not continue throughout the summer.

The Hyer soil series are also classified as poorly drained peat soils, but here the soils are perennially frozen below 15 to 30 inches. These soils, however, occupy only a small percentage of the soil survey area on steep north facing slopes. In addition to the unsuitability of the peat soil for building development, the slopes of these soils range for 20% to 45%. Also, the only permafrost in the Dillingham corporate limits is associated with these soils, and there could be engineering problems in the construction of streets across these areas.

Three land types were also mapped on the Dillingham soil survey. These areas are classified as tidal marsh, tidal flats, and gravel beach. They are classified as unsuitable for building development primarily because they are subject to tidal inundation and high water tables. The tidal flats are periodically flooded by high tides, and support no vegetation. The tidal marsh is wet land that supports water-tolerant plants. The silty materials in the tidal marsh and flats are unsuited to building construction. The gravel beach may have suitable construction material, but their use for building sites is limited by high tides and ice in the winter.

This evaluation of the suitability of the soils for building development in the City of Dillingham will be a valuable planning tool in the determination of future land use. Many other factors will be used in the final determination of future land uses, but the consideration of soils which are suited to building development will be a primary component. This factor alone could mean the difference between the efficient and orderly growth of Dillingham as a regional center in Bristol Bay, or stagnation because of expensive land development in unsuitable areas. In any case, poor soils and slope do not preclude the possibility of special forms of development which are designed to accommodate the natural liabilities of the area. With enough financial investment in filling land or improving a structure it is possible to build successfully almost anywhere. The important factor here in that public and private cost of building on unsuitable soil types will most likely be high while, at the same time, more suitable areas are available.

TOPOGRAPHY AND SLOPE

The topography in Dillingham ranges in elevation from mean low tide to about 160 feet in elevation on the higher moraine hills. The general topography and slope has already been discussed in connection with the soils because the soil series are closely associated with the slope. Detailed topographic information may be necessary in some areas for specific purposes such as water and sewer planning. The distribution of the various degrees of slope in specific areas, however, should give a better indication of the topography conditions, which are applicable to land use planning in the Dillingham area, than the existing contour interval information. The map on page shows five categories of areas on the basis of the degree of the slope. A brief description of these areas and their application to planning future land use follows.

The five categories shown on the map includes slopes which are 0 to 3%, 3 to 7%, 7 to 12%, 12 to 20%, and over 20%. The 0 to 3% sloping areas are nearly level. Where the soils of this slope are well drained, these areas comprise the best physical locations for most types of development. There would also be very few limitations to development on well drained soils which are 3 to 7% in slope. About 30% of the Dillingham area soil survey contains well drained soils which are under 7% slope. Another 3% of the survey includes slopes of 7 to 12% on well drained soils. These

slopes would present no major limitations to development except for special types of land use which would require level sites. For example, some commercial or industrial developments may require level areas. This land would not be suitable for a use as a baseball dimond. The danger of erosion problems are moderate on slopes which are 3 to 12 %.

Slopes which are 12 to 20%, however, begin to present major problems for many types of development. In some cases these slopes are desirable for special types of residential use, but in almost all cases it is not economically feasible to develop this land intensively. Road building is a problem on these slopes, and even on the well drained soils individual septic tank systems do not function ideally because the discharge tends to perculate down slope near the surface. The danger of erosion is severe on these soils. Although these soils include only about 3% of the soil survey area, the physical limitations of these areas should be very carefully considered in the land use plan.

Slopes which are over 20% should not be used for any type of development. The danger of erosion in these areas is very severe. Although these areas cover less than one percent of the soil survey, they may present problems for future road connections.

BEACH EROSION

Another condition which may pose some limitations upon building development in Dillingham is beach erosion. This erosion is an important consideration in the planning of future land uses, but there are also important implications for marine oriented activities. These waterfront conditions are especially important to the City because most of the basic economic activity is related to the bay and rivers.

Nushagak Bay is classified as a tidal estuary with diurnal ranges of nearly 20 feet at Dillingham. The waters in the bay are shallow, turbid and subject to tide and wave influences. Clockwise currents in the bay running from southwest to northeast along the eroding north shore and then southerly again over shallower areas on the southeast shore of the bay are produced by prevailing southwest winds. Outflows from the Wood and Nushagak Rivers contribute to this circulatory current pattern. The concentration of flows and currents have produced the deeper channel adjacent to and following the northerly shoreline. Velocities are greatest during periods of incoming tides concurrent with storm waves from the southwest with velocities under these conditions estimated at more than 5 miles per hour. Storms from the southwest with wind speeds of about 40 miles per hour or more create the greater erosion potential, however, they occur primarily during the winter months

when the bay is ice covered and resistant to wave buildup. Ice scour, however, contributes to the erosion of foreshore areas and also aids in the destruction of waterfront structures.

There are two major erosion sites in the Dillingham area which will be covered.

The most obvious erosion area is the shore on Nushagak Bay which fronts the Dillingham townsite. Visible evidence of erosion is most pronouced east of the cannery pier. As high tides occur, waves cut in to the toe of a bluff fronting the townsite. It is thought, however, that tidal currents may be causing erosion of underwater slopes which in turn reduces the fetch. Therefore, the erosion problem on the shore may be associated with extensive tidal currents rather than waves generated by the limited fetch. Through the use of "groins" it may be possible to reduce currents, buildup the foreshore and thus limit wave reach. There are economic questions which relate to the economic feasibility of protective measures, but it must be noted that the established erosion pattern may be expected to continue.[1]

A second, less obvious erosion area extends from high shores at Kanakanak northeasterly around Nushagak Bay to the old abandoned

---

1. U.S. Army Alaska District, Corps of Engineers, Anchorage, Alaska.

cannery and entrance to the small boat harbor. This shoreline is low-lying fine silt overlain by peat and muskeg. Waves from southerly quadrants induce attack to these fine-grained materials which remain in suspension and are carried away by currents in the bay. Eventual erosion along this area may result in removal of the generalized area west of the old cannery shown on map number . According to the Corps of Engineers, no economical solution to prevention of this erosion is foreseen because existing development and land value does not justify expenditure to protect the area.

Both of the above described areas then are subject to beach erosion from the sea, but the seriousness of the erosion depends upon the amount of development which is threatened. The area of erosion from Kanakanak to the old cannery has relatively little development, but in the townsite the threat is more serious because concentrated areas of development may be involved. In recent years there is visible evidence and local testimony that the bank line is receding at a rate of approximately 12 feet per year. Averaged over the years 1948 through 1967, however, a more rational figure shows an approximate rate of 4 feet per year of beach recession. This figure also takes into account the fact that the rate of erosion is not equal along all parts of the bank. The erosion is at its ~~maximum~~ minimum at the cannery progressing easterly to maximum erosion at the end of the bluffs.

FLOOD HAZARDS

Floods and flood hazards in the City of Dillingham are very closely associated with the topography which has been previously described in the sections on soils and slopes. The City is located in an area that is known to be underlain by a combination of glacial and fluvial deposits. Most of the developed parts of the City are located on this material on the upland knolls, ridges and rolling hills. The flat areas of wet land and muskeg between these uplands are the only general areas in the City which would have any significant flood potential. Excluding the waterfront properties, however, the community of Dillingham has very low or minor flood hazard potentials.

The Nushagak River is tidal in this area and prior to flooding any of the area, it would flood the flat areas to the south. There is a remote possibility of extreme ice jamming, but this has not been known in the past and the chances of it occurring are unlikely.

Part of Dillingham is on an area that has been detlaic tidal flats and is now a portion of the abandoned flood plain of Scandinavian Creek. The width and development of this flood plain suggests that the ancestral stream was much larger than the present stream. The Scandinavian Creek flood plain merges with

the Wood River flood plain a short distance northeast of the Dillingham townsite and there is little or nor separation of the two flood plains. The overdevelopment of the Scandinavian Creek flood plain and its coalescence with the Wood River flood plain suggest two possible conditions. The first is that Scandinavian Creek is the old channel and remnant of the drainage area abandoned by Wood River where it shortened its channel, thus increasing its gradient by breaking through to Nushagak Bay east of Dillingham. The second is that Scandinavian Creek was once a much larger stream and was reduced to its present status by having a large part of its drainage pirated by Wood River. There is the possibility that in the event of severe flooding, the Wood River might breakthrough into Scandinavian Creek, damaging or at least inundating portions of the lower community. This possibility, however, appears to be unlikely. In any case, development of this area should be restricted because of the very poor drainage and continuously wet soils.

The only significant stream within the city limits is Squaw Creek. Development along this stream is presently very sparse, but if the need becomes apparent the Corps of Engineers could determine the limits of the largest flood which could occur along the creek. In the meantime, development which will occur near this stream should consider the logical distance and height which is needed to avoid any possibility of flood damage. In any case, much of

the land which borders this stream is poorly drained and should not be built upon. Also, any plans which would involve this stream should attempt to leave adequate openings for future flows and should consider the Intermediate Regional Flood in designing these openings.

REGIONAL TRANSPORTATION

Highways

At present, Dillingham does not have a land highway connection or a marine highway connection with the rest of Alaska and the United States. The transportation needs of the community are fulfilled by means of sea and air, but the cost of shipping goods is high, especially during the seven or eight months of the year when Bristol Bay is closed to navigation. A highway connection could lower the costs of goods and services considerably in the Dillingham area, but the cost of highway construction and maintenance at the present time would not be offset by the benefits it would give in less expensive transportation costs. The reason that costs and benefits of highways are not generally economic in the region is that the population density is so small. The Bristol Bay region, which is about the same size as the State of Virginia, has only about 65 miles that are graded and drained. But what makes the difference is that the population density in Virginia is 114 persons per square mile while the Bristol Bay region has approximately 8 square miles for every person in the whole region.

The economics of future highway construction in the Bristol Bay region, therefore, depends upon development in the region which would increase the prospects of greater highway use. In some

cases, however, highways in the region would stimulate economic development which would make a highway feasible in the long run. In this sense, highways could become a good investment if the end result was a significant improvement in the very poor economic conditions which exist in Bristol Bay today. In any case, the Alaska Department of Highways has established the 20 and 50 year highway needs in the region. These needs are not defined as plans, in the sense that the routes and time table have been set, but they do give a good indication of the future highway connections in the region. These routes will be only briefly discussed as they relate to the future development of the City of Dillingham.

Within a period of 20 years there are two proposed highway connections, which could influence the future development of the City of Dillingham. The first, and most likely route within this period, is a highway across the Alaska Peninsula which would connect, by ferry, with Homer and Kodiak. The location of this route, however, depends on a suitable place for docking facilities on Cook Inlet. The initiation of a highway on Cook Inlet could also depend on the plans for development of Kasna Creek copper deposits north of Iliamna Lake. These deposits presently have the most significant known potential for mineral development in the area of the proposed road. Large scale production could begin in a few years if surface transportation were available to an ocean

harbor, thus creating a very strong economic justification for the initiation of construction of at least this segment of a highway across the Alaska Peninsula to King Salmon and Dillingham. Depending on economic considerations and a suitable site for a harbor, a route around the southern end of Lake Iliamna is also a possibility. Another possible route would be through Katmai to a deep water port on Shelikof Strait, however, the National Park Service has consistently opposed any such route.

The second highway connection which is proposed in the Bristol Bay region within a period of 20 years is a route which would approach Dillingham from the north. This would be an all land connection beginning somewhere near Big Lake in the Matanuska-Susitna Borough. The highway would likely cross the Alaska Range at Rainy Pass and continue northwestward toward McGrath on the Kuskokwim River. Here the highway would head south along the Kuskokwim until the river turns to the west. The highway would then cross the divide between the Kuskokwim and Nushagak River basins, and proceed to Dillingham near the Nushagak River. This route, however, would be approximately 500 miles in length in order to connect Dillingham with the existing road system in Alaska. The expense of construction and maintenance could be assumed to be very high in relation to the benefits of the highway within the near future, but unforeseen economic development could possibly justify this highway into Dillingham.

The 50 year needs for highways in the Bristol Bay region as determined by the Alaska Department of Highways include two long-range but important extensions of the Alaska highway system. The first route would proceed south along the west side of Cook Inlet, then west and southwest across Lake Clark Pass, and intersect with the Alaska Peninsula Crossing just north of Iliamna Lake. The second route would extend the highway system southwest along the Alaska Peninsula from Naknek and King Salmon about 250 miles to Port Moller. At present, these highway proposals would have to be considered only tentative because unforeseen economic development could change the situation concerning highway needs. Whatever takes place in Bristol Bay, it will be very important to plan these routes on a regional and interregional basis and in relation to the land use, population, and economy of the region.

Existing Highways

Considering the size of the region, existing highways in the Bristol Bay region are very few and far between. The more important sections are in the Bristol Bay Borough and the Dillingham area. The 15.5 mile Portage Road from Iliamna Bay to Iliamna Lake is an important link for supplying the Iliamna Lake communities and the portage of fishing boats in season, but the road crosses very rugged terrain and the average daily traffic is only one or two vehicles per day.

The remainder of the roads in the region consist of unimproved roads, jeep trails, Air Force roads, and a few short, private spurs.

The Naknek-King Salmon Road carries the most freight and traffic, both, because of air freight for Naknek and ocean freight for King Salmon which is carried on this route; but the longest improved highway system in Bristol Bay is in the Dillingham area. Most of the traffic on the Dillingham highway is from main Dillingham townsite to the Kanakanak Spur. The average daily traffic is then approximately split between the 22 mile road to Aleknagik and the 2.6 mile spur to the Public Health Service Hospital at Kanakanak.

Water Transportation

At present, sea transportation to Dillingham is possible only during the four or five months of the year when Bristol Bay and the Nushagak River are free of winter ice. The economy of water transportation is therefore limited to a relatively short season. Much of the freight shipping, however, corresponds with commercial fishing, canning, and construction during the summer. Goods are delivered to residents and businesses in the area at this time.

Service to Dillingham has been provided by steamship from Seattle. The ships stop at Dillingham two or three times a year. Because of the shallow water, the ships must anchor a mile or more offshore. The cargo is transferred to flat boats (barges) and then beached. The lightered freight is moved between the flat boats and shore manually by a gang of longshoremen. Once on shore, the cargo is considered delivered and the owner must pick it up or pay extra to have it delivered.

Deep draft shipping, however, is further limited by the conditions in the bay. Constantly changing channels and mud bar conditions in the area make such offshore approach and anchorage hazardous to ships. Anchored ships are particularly vulnerable when storm winds begin to blow. Therefore, ships enter only under ideal weather conditions. Further, because of tidal estuary conditions and the

heavy load of sediments in the water, a dredged entrance channel is not considered feasible. It has required installation of a special dredge just to maintain the five acre small boat harbor. Based upon this experience, a dredged channel would be expected to fill up immediately after dredging.[1]

Movements of freight northbound consisted mainly of commodities while southbound movements were primarily made up of canned salmon. Of all the areas in Alaska, the Bristol Bay region had the largest per voyage return of cargo (FMC p III-3). In 1966 the total Federal Marine Commission regulated traffic to and from the Dillingham area amounted to approximately 9,000 tons. FMC p v-2.

The ocean freight rates are somewhat higher than a port such as Homer on Cook Inlet, but in addition to the ocean shipping rates, the cost of lightering the cargo from ship to shore is added to the cost. FMC p V-4. A Federal Maritime Commission study indicated that the lighterage charges of one lighterage firm in Dillingham amounted to about 43% as much as the unweighted average rate, and 74% of the commodities analyzed moved at lighterage charges of 40 to 92% as high as the total freight charges from Seattle to Dillingham. These lighterage charges in Dillingham generally reflect high labor costs and high inactive vessel expenses because of the relatively short operating season of only four to five months.

---

1. U.S. Army Engineer District, Alaska Corps of Engineers, March, 1971.

In the past, the Alaska Steamship Company has provided almost all the sea transportation into Dillingham. Alaska Steamship's fleet of 14 vessels, however, is of World War II vintage. In terms of speed and cargo handling equipment, these ships cannot economically compete with the newer and more efficient type of ships. Solutions to the problems of sea transportation will eventually come through improvements in terminal facilities, types of ocean transportation, lighterage services and cargo handling equipment.

Source: Alaska Trade Study, Federal Maritime Commission, Bureau of Domestic Regulation, Washington, D.C., March, 1967.

Air Transportation

Air transportation will be a very important factor in the future development of Dillingham as a regional center in Bristol Bay. Air travel and freight shipping is the only day-to-day source of contact with Anchorage and the rest of Alaska. Wien Consolidated Airlines serves Dillingham daily except Sunday via King Salmon, and returns direct to Anchorage. Boeing 727 jet service is now provided four days a week. Dillingham also serves as a transhipment point for several small communities within the Dillingham service area. This service is provided by Western Alaska Airlines.

Passenger traffic is increasing at Dillingham. In 1970, some 5,700 passengers, which is over five times the population of the city, enplaned at the Dillingham airport on scheduled commercial flights. This is about 60% higher than the number of passengers enplaned in 1967.[1] Most of the passenger traffic is from Anchorage, although some originates in Bethel. Oneway passenger fare from Anchorage to Dillingham is $52.00; fare from Anchorage to King Salmon is $44.00. Oneway fares from Dillingham to about ten places in the Nushagak River Basin and Bristol Bay Region west, range from $10.00 to $20.00. Fares on Western to about 18 other places in the Bristol Bay Region, range from $10.00 to $40.00.

---

1. Wien Consolidated statistics.

Dillingham's isolated location, lack of roads to supply points, and short summer shipping seasons make first class air freight transportation a must if the community is to continue to grow. Although a higher proportion of freight generally arrives by sea, the importance of air freight to Dillingham cannot be underestimated.[1] In 1970, some 1,486 tons of air freight and 803 tons of mail arrived by air in Dillingham. The total tonage represents about a 60% increase over 1965.[2] The cost of air freight from Anchorage to Dillingham is 10 cents per pound for shipments over 100 pounds and 13 cents per pound for shipments under 100 pounds, with a minimum charge of $6.00. An Alaska Air Highway Cargo System, which is under study, would include Dillingham as a high priority in the system. The purpose of the system would be to provide regular and subsidized cargo service to remote areas.

The Dillingham Municipal Airport in the Bristol Bay Region is second in quality only to the joint military and civil airport at King Salmon. The 4,000 foot gravel runway is adequate for Boeing 727 jet aircraft under most weather conditions, but conditions such as ice on the runway limit its use because of the braking distance needed for the large jets. The improvements which are planned for the airport at Dillingham, however, include the lengthening of the runway to 6,100 feet. This should greatly increase the capability of the facility. Other improvements which are planned include the

---

1. Alaska Peninsula Crossing, Socio-economic study, State of Alaska Department of Highways, 1969, p. A-18.
2. Wien Consolidated Airlines statistics.

construction of additional taxiways, parking aprons, acquisition of land for clear zones, lights and approach lights are also planned.[1] A longer range plan calls for the construction of a cross runway which should remedy problems associated with crosswind landings.

---

1. National Airport Plan FY 1969-1973, Department of Transportation Federal Aviation Adminstration, 1968, p. 45.

POPULATION

The population both in and around Dillingham is an important factor in the future development of a comprehensive community plan for the City. Economic, social and geographic factors influence the size of the population, but first something must be known about the past and present population. The population in the City of Dillingham is of most importance, but the population in the Bristol Bay Region and the Dillingham service and distribution area should also be considered.

Regional Population

The Bristol Bay Region had a population of 4,632 according to the recent 1970 U.S. Census of Population. This represented an increase of about 13% over the 1960 enumeration of 4,024. By comparison, the State as a whole increased by about 33% between 1960 and 1970. The population of the United States, however, increased by about 14.7%, so the increase in the Bristol Bay Region is not much different than the United States as a whole.

The population in the region is important to Dillingham's future development, mainly for economic reasons. The population is located in the watershed of the valuable Bristol Bay salmon fishery. The residents therefore share a common economic interest, but also the population in the villages and rural areas support

the growth of trade, employment and service centers. With the exception of the upper Iliamna Lake communities, Western Alaska Airlines serves most of the villages of the whole region. This local carrier operates out of Dillingham, thus making the city a transfer point for passenger and freight traffic. Also, Dillingham itself services as a marketing and service center. Many of the area residents buy their goods in Dillingham, and the natives in the outlying villages come to the Kanakanak Public Health Service Hospital at Dillingham.

There are no clear distinctions between sub-regions within the Bristol Bay Region, but there is some grouping of villages in the area along the main rivers and on Iliamna Lake. For purposes of evaluation, however, it will be practical to separate the Bristol Bay Region roughly at the divide between the Nushagak River watershed and the Kvichak River watershed.

In the area southeast of this divide, the most important concentration of population is located within the Bristol Bay Borough. In 1970, the total population in the Borough was 1,147, including about 400 personnel at King Salmon Air Force Base. South, along the Alaska Peninsula, there were 282 people along the Kvichak River and in the Iliamna Lake area. The total population, including military personnel, for this part of the Region is estimated at 2,200. The civilian population increased by about 10% between

1960 and 1970; however, if the military population is included, the increase would total somewhat less than 10%.

The west half of the Bristol Bay Region includes the Nushagak River communities, the Togiak area, the communities surrounding Nushagak Bay and the City of Dillingham. It is estimated that this population is about 2,432. This population would be almost completely non-military. The population has increased by about 20% over the 1960 census count of 1,962.

Although the regional orientation of these communities in the western part of the Bristol Bay Region is not firmly established, it does appear that there is a certain affinity between Dillingham and the communities in the area.

The Nushagak River communities are strongly oriented toward Dillingham because of river transportation, summer commercial fishing in Nushagak Bay, and trade. Goods are transported on the fishing boats and Western Alaska Airlines serves the villages five times a week in winter and three times a week in summer. Most of the people are involved in some way with commercial fishing in Nushagak Bay, and people from Koliganek and Ekwok camp near the beach in Dillingham during the fishing season. The residents on the river very seldom make trips to other parts of Alaska to shop and most of the residents make at least one extra trip to Dillingham each year to sell furs at the annual Beaver Roundup.

The communities surrounding Nushagak Bay include Clarks Point, Ekuk, Aleknagik, and Manokotak. These villages share a common economic orientation to Dillingham in commercial fishing activity, and also, these communities are more directly associated with the Dillingham service area because of their close proximity to the city. Clarks Point and Ekuk are located south of Dillingham and across Nushagak Bay. These two communities are built around canneries which are only about two miles apart. Although Ekuk was once an Eskimo village, both communities are now mainly cannery towns. In the summer, most of the people in Ekuk are from other villages in the western part of the Bristol Bay Region who are engaged in fishing activity during the fishing season. The population at Aleknagik is decidedly oriented to the Dillingham service area because of a 22 mile road connection. Most of the population is scattered around the eastern end of Lake Aleknagik near the mission. Manolotak is a growing Eskimo village about 25 miles southwest of Dillingham on the Igushik River, which empties into Nushagak Bay. The people depend on salmon fishing in Nushagak Bay for their main source of income, and most goods are brought from Dillingham by boat in the summer. The village is also within the reach of Dillingham by means of snowmobile or dogteam in winter.

Togiak and Twin Hills are located in the western part of the Bristol Bay Region 70 miles due west of Dillingham on Togiak Bay and River. Togiak is a growing community, and almost all the residents are natives. There is a comparatively new cannery and

the residents are all dependent on the salmon fishery for their main source of income. Western Alaska Airlines provides scheduled year-round service from Dillingham. A family may make as many as six trips to Dillingham each year.[1] Twin Hills is a small new community on the 1970 census reports. It is located just north of Togiak.

Excluding Dillingham proper, the communities in the western part of the Bristol Bay Region which have been previously covered appear to have gained by about 21% on the whole. Of the previously discussed communities, the Nushagak River villages appear to have increased by about 34%. This percentage increase, however, assumes a population of about 70 people at Portage Creek which was apparently omitted from the 1970 Census of Population, Advanced Report. The Togiak-Twin Hills area grew very substantially by 230 people or about 52%. The communities surrounding Nushagak Bay, however, appear to have declined by slightly more than 10% on the whole. The population of Manokotak increased by 63 people and Ekuk gained 10 people, but Clarks Point and Aleknagik apparently lost a total of 146 people. Clarks Point declined by 43 people and Aleknagik by 103.

The present 22 square mile area of the City of Dillingham which was incorporated in 1963, includes the population of Kanakanak,

---

1. Alaska Peninsula Crossing, Socio-Economic Study, State of Alaska, Department of Highways.

Nelsonville (Olsenville), Wood River Village, and the Dillingham Townsite. The incorporation also included people who are spread along the Aleknagik Road, the Wood River Road, and the Kanakanak Spur. The 1930 Federal Census listed 177 people at Kanakanak and 85 at the Dillingham Townsite on Snag Point. After 1930, Dillingham recorded 278 people while Kanakanak had 113. The trend continued to be evident at the 1950 census when Dillingham recorded 577 people and only 54 people at Kanakanak. In 1960 Kanakanak did not appear on the census role. Dillingham recorded a reduced population of 424; however, there were probably about 800 people within the area now known as Dillingham. The 1970 Census of Population showed 914 people within the City of Dillingham. Subsequent to the official census in April, however, an Alaska State Housing Authority Survey in October of 1970 projected that the City had a population of 960, or an increase of about 17%.

Thus, it appears that Dillingham may have grown at a slightly slower rate than the population in the western part of the Bristol Bay Region, but Dillingham has emerged as the main population center in a large part of the Bristol Bay Region. In any case, the growing regional population in the western part of the Bristol Bay Region will support the growth of Dillingham, and as regional services continue to concentrate in Dillingham, the city will grow accordingly.

Dillingham Population

The main concentration of population within the City of Dillingham is in the townsite. Based on the Alaska State Housing Authority Housing and Land Use Survey, however, the population in the townsite appears to have remained approximately the same as the 1960 census of 424. The outlying areas within the corporate limits have apparently increased by about 160 people. The current population in the respective areas is estimated at 400 in the townsite and 500 in the outlying area within the corporate limit.

According to the Alaska State Housing Authority Housing and Land Use Survey there are roughly equal numbers of Native and white families in Dillingham. A precise breakdown, however, is complicated by several factors. The survey is based just on the race of the head of the household and includes only a sample of 188 out of an estimated 240 units in Dillingham. Also a large number of people are of mixed race, and the figures would not necessarily be comparable with the U.S. Census information. In any case, it appears that there is a decidedly higher proportion of white families living in the townsite, while the rest of the city has a higher proportion of Native families. If the families living at the Public Health Service Hospital are omitted this observation becomes even more pronounced. Of the Native families in the city, it appears that the Aleuts make up the largest proportion.

The Housing Survey also produced a sample of the sex and age distribution of Dillingham residents. Table No. gives this breakdown. About 40% of the population, both in Dillingham and the Bristol Bay Region, is 14 years old or younger. According to the Alaska State Housing Authority survey and the 1970 census figures Barrow, Alaska, which is another rural Alaska regional center, had 51% in this same age group in 1969. Table No. indicates a sharp decrease in the number os persons of both sexes in the age ranges of 20-24. The lack of population in this age range is a reflection of the lack of employment opportunities in the city. Some of the young men enter military service but emigration may be the only way to become exposed to a larger labor market in other areas that offer wider job opportunities.

Although it is evident that many people must move for better job opportunities, the Housing Survey indicated that there was no wide spread desire to move from Dillingham. Of 159 persons who were asked the question "Are you planning to stay in Dillingham?", 140 persons responded affirmatively. Only 11 persons said no and eight were undecided. Ten peopole said they were planning to move to Anchorage, three to other Bristol Bay communities, and three more outside Alaska.

The origin of the people of Dillingham reflects a picture of much diversity in the character of the Dillingham population as well as giving an indication of the migration into the city. The Housing Survey asked the question "What place did you come from?". Of 163 people responding, 38.6% said that they were from Dillingham. Another 18.4% said that they were from other areas in the Bristol Bay vicinity, 16.5% said that they were from other areas in Alaska and 26.4% said that they were from other states or a foreign country. Therefore, about 57% of the people responding in the survey indicated that they were from the general Dillingham area, in and near the Bristol Bay Region, while 43% were from parts of Alaska well removed from the area or from out of state.

The place of birth of the population in Dillingham compliments the above information in an understanding of the population characteristics. The Survey asked the question "Where was the head of household born?". Of 173 people responding, 48.5% indicated that they were born in another state or a foreign country, 5.2% said they were born in other Alaskan communities and 27.2% said they were born in Dillingham with 18.4% reporting their place of birth as the Bristol Bay area. Thus, about half (53.5%) of the people surveyed were born in other states, countries, or other parts of Alaska. From these figures, it would appear that Dillingham has a very mobile population as well as a number of people who call Dillingham their home.

SEX AND AGE DISTRIBUTION OF DILLINGHAM RESIDENTS

Age	Male	%	Female	%	Total	%	Cum. %
0-4	29	9.0	30	9.6	59	9.2	9.2
5-9	51	15.7	50	15.9	101	15.8	25.0
10-14	48	14.8	49	15.6	97	15.2	40.0
15-19	39	12.0	28	8.9	67	10.5	50.7
20-24	18	5.6	13	4.1	31	4.9	55.6
25-29	21	6.5	27	8.6	48	7.5	63.1
30-34	29	9.0	25	8.0	54	8.5	71.6
35-39	24	7.4	17	5.4	41	6.3	77.9
40-44	9	2.8	17	5.4	26	4.1	82.0
45-49	8	2.5	12	3.8	20	3.1	85.1
50-54	6	1.9	17	5.4	23	3.6	88.7
55-59	15	4.6	11	3.5	26	4.1	92.8
60-64	15	4.6	9	2.9	24	3.8	96.6
65-69	9	2.8	3	1.0	12	1.9	98.5
70-74	0	-	3	1.0	3	.5	99.0
75-79	2	.6	2	.6	4	.6	99.6
80+	1	.3	1	.3	2	.3	99.9
TOTAL	324	100.1	314	100.0	638	99.9	99.9

Population Projection

The 1970 Census of Population officially reported 914 persons living within the City of Dillingham on April 1, 1970. Based on the Alaska State Housing Authority Housing Survey in October of 1970 and further substantiated by a recent land use survey, however, it is reasonably certain that there are about ~~986~~ 960 persons residing within the corporate limits of Dillingham.[1] If the boarding home students living in Dillingham were included this figure could easily reach 1,000.

For purposes of forecasting the future population of the planning area, it will be reasonable to use a base figure of 1,000. It will not be possible, however, to project the future population within a rational degree of accuracy if the forecast is based primarily on the rate of population increase. The problem of accuracy in this respect results from the fact that the statistical areas are not comparable with the present city limits of Dillingham and the population counts of the villages in the immediate vicinity have fluctuated widely in the past. Therefore, the primary method of forecasting the future population in Dillingham will be based upon the analytic studies, which are summarized in the Dillingham Comprehensive Plan.

---

1. Refer to page for further description of the population estimate through the Housing Survey.

Although it was necessary to consider the past growth, the studies presented in the comprehensive plan, along with other investigations, provide the best indication of those factors which will influence the future development of the planning area. In a free society it is not possible to be certain about population growth but the analytic studies in combination form a reasonably good basis for prediction.

Direct reference to many of the factors affecting future growth are incorporated into this report, but the most significant factor which will assure the continued growth of Dillingham, is the City's role as a regional trade and service center. Development in the region will always have some effect on Dillingham as long as the City continues to emerge as the trade, transportation, and educational center for its region. Without suitable provisions made for types of land use and services, it would be possible for Dillingham to lose out as the major population center in Bristol Bay, but with proper planning, government and regional services should continue to concentrate in Dillingham.

There has been a normal rate of natural increase in the Bristol Bay area in the last ten years, however, it would appear that about half of the natural increase has been lost through migration.

This migration has apparently been somewhat less in the western part of the Bristol Bay Borough but this condition here is still evident. Unfortunately, the out-migration many times includes the young people in the age group 20 to 29. In Dillingham there are about twice the number of young people in the age group 10 to 19 as there are in the age group 20 to 29.

In any case the population in Dillingham should continue to grow in spite of the negative effects of out-migration. This increase should continue at the moderated rate of about 2.5% per year over the period of the next 20 years. It must be remembered, however, that unforeseen prospects of economic development could dramatically change this rate of growth. Also, this rate of growth will not be uniformly characteristic for each and every year.

In the immediate future the somewhat poor outlook for substantial expansion of the economic base in Dillingham will be out weighed by several planned projects. The population growth will therefore be supported to a greater degree than the present conditions indicate. These projects include the construction of a cold storage facility, airport expansion, a high school addition, high school dormitory construction, and increased housing construction programs. Much of the construction employment will be only

temporary, but other employment will be generated by the operation of the projects which are completed. Accordingly, the population in Dillingham should be approximately 1,125 by the year 1975. Building on this base, the population should reach approximately 1,270 by 1980.

Beyond 1980 any forecast of future population numbers becomes much more speculative. Other forms of economic development such as oil exploration and development would more likely emerge in this period, but it is not presently possible to predict the type or the extent of the development potential. Unresolved decisions relating to land use and ownership in the region will also effect the rate of population growth. Based on the normal rate of growth of Dillingham as a regional center, however, the population may reach 1,435 by 1985 and 1,625 by 1990.

HOUSING

Housing conditions in Dillingham are a handicap to the welfare of the community. For many people shelter is an obstacle to good health and safety. By any standards in the country it is only too aparent that very substantial improvement is essential to meet the goal of "a decent home and a suitable living environment for every American family" as established by the Housing Act of 1949.

In October of 1970 a house-to-house planning and housing survey took place in Dillingham to assemble information on the City's housing and population. The survey was conducted jointly by the City of Dillingham and the Alaska State Housing Authority. The material collected in the survey will form the primary basis for the analysis and recommendations in the Dillingham housing element.

Problems

The housing survey contacted 206 or 86% of the estimated 240 occupied residences in Dillingham. This represented a total population of about 823 of an estimated 906 people within the city limits. Of the 206 homes contacted there were 20 from state and federal housing units. These units are used only by governmental employees of the state and the Public Health Service and are not

considered to be in the Dillingham housing market. In addition, there were 38 forms which did not contain enough information to be considered in the analysis. This left a total of 148 samples, the results of which are tabulated in Table No. .

HOUSING CONDITION

Table No.

Total Units Reporting. 148

Rating	No. of Units	% of Total	Explanation
Sound	45	30.4	Good construction and adequate space
Deteriorating	75	50.6	Structurally sound, but repairs needed.
Dilapidated	28	18.9	Too costly to repair. Often dangerous to health and safety.
Total	148	99.9	

Only 30% of the units reporting in the survey were of sound construction with adequate space. By some standards, however, some of these units would be considered substandard. Considering the high cost of construction many of these units are quite adequate when compared to the majority of the housing, but in relation to housing in other parts of the country, some of this housing could be considered only marginal. In addition, better houses are required in Dillingham than in other parts of the country because of the cold and windy climate. Also, many of these units do not have public water and sewer.

Most of Dillingham's housing is either deteriorating or dilapidated. This housing which is classified as unsound makes up close to 70% of the total units reporting in the survey. The largest proportion in this category (55.6%) is classified as being in a deteriorating condition. This means that the units are structurally sound but in need of repair. About 20% of the housing is dilapidated. This housing is too costly to repair, and is often dangerous to health and safety. It is for this latter category that solutions to housing are urgent and immediate.

The survey further showed that more of the units outside the central city were unsound than units within the townsite itself. Of 76 dwelling units outside the central city, 59 were found to be unsound.* This is not to say, however, that the townsite is in good housing condition. Of 72 units in the townsite, or central city, 44 houses were in unsound condition. It should be further noted that of the housing surveyed in the outlying areas 68.2% had Natives as head of the household. Table number summarizes this breakdown.

DILLINGHAM FAMILIES BY RACE* AND AREA

Table No.

	White	%	Eskimo	Aleut	Indian	Mixed	Total Native	%
City Proper	47	(58.8)	8	13	2	10	33	(41.3)
Outlying Areas	28	(31.8)	14	36	2	8	60	(68.2)
PHS and State Hill	19	(95.0)	0	1	0	0	1	(05.0)
Total	94	(50.0)	22	50	4	18	94	(50.0)

*Race was based on the race of the head of the household.

---

*Note: Includes homes within the city limits on Kanakanak Road, Wood River Road, Aleknagik Road and other areas which are not contiguous with the central area.

Another problem related to the housing situation in Dillingham is a need for water and sanitary facilities. The following table will summarize the deficiencies which exist for these shelter related services. Again, the townsite is in better shape where water and sanitary facilities are concerned, but even in the townsite where water and sewer lines exist only 44% are hooked up to the water system and only 51.5% to the sewer system. The state housing units in the central city should hook up to the city system in order to bring down the cost of the facilities.[1]

Aside from the condition of the housing, there appears to be inadequacy relating to the availability of housing and room within the houses themselves. There are virtually no houses of any kind of quality available for sale, and the vacancy rate is very low for rental units and apartments. There is a problem also which compounds the situation in the summer when the population nearly doubles during the fishing season. According to the 1970 Census of Housing, Advanced Report, there were about 100 units of vacant, seasonal and migratory housing units in the whole Bristol Bay Region, but of the "vacant year-round units" there were only six units in the whole region listed for sale, only 23 units were listed as being for rent, but 11 of these were in the Bristol Bay Borough, which is detached from the Dillingham housing market. The Alaska State Housing Authority Survey also showed that the housing in Dillingham has an average of

---

1. Another section of this report will formulate a water and sewer plan in relation to housing, land use, and the comprehensive plan.

WATER AND SANITARY FACILITIES

Table No.

City Proper

Facility	Units Reporting	Units Having	% Having Facility
Cold Running Water	81	69	85.2
Hot Running Water	80	62	77.5
Flush Toilet	80	64	80.0
Tub and/or Shower	79	63	79.7
City Water	68	30	44.1
City Sewer	66	34	51.5

(Note: The city water and running water figures overlap. For example, a person having city water would also have at least cold running water.)

Outlying Areas*

Facility	Units Reporting	Units Having	% Having Facility
Cold Running Water	92	52	56.5
Hot Running Water	90	43	47.8
Flush Toilet	91	47	51.6
Tub and/or Shower	89	45	50.6
City Water	0	0	0
City Sewer	0	0	0

*Includes homes within the city limits on Kanakanak Road, Wood River Road, Aleknagik Road and other areas which are not contiguous with the central area. As previously mentioned, the PHS and the state housing are not included in this tabulation.

four persons per occupied dwelling unit. In the 1970 Census of Housing, the statewide average was 3.5 persons per occupied dwelling unit. Thus, dwellings in Dillingham are only slightly more crowded than the average unit throughout the state. Forty-two outside students boarding in Dillingham homes, however, were not counted.

The population projections in another section of this report indicate that Dillingham will continue to grow because of its role as a regional trade and service center. Housing will be needed for this growth, but if there is a surge in population because of unforeseen economic development, the housing situation will be critical. In any case, there are some immediate developments which could influence the need for housing within the next few years. Plans in various stages of completion are being formulated for the construction of a highschool addition, a major cold storage facility, airport expansion, water and sewer facility improvement, and possible construction of a remote housing project. These plans are slated for the next one or two years and each project could individually increase the need for housing of construction workers, engineers and related services, but if the construction occurred simultaneously, there would be a critical shortage of available housing. The situation is even further compounded by the fact that much of this activity would correspond with the summer fishing season when the shortage of housing would be at its highest. In direct relationship to the proposed construction activities, the airport expansion would create a need for the relocation of about two families, and the construction

of the cold storage facility in front of the town in the area of the river bank will create a need for new housing of at least three families.

Obstacles

Obstacles to housing improvement in Dillingham are related to many physical, institutional or socio-economic factors, most of which are mentioned in the Comprehensive Plan. The obstacles will be listed here in the order of their importance, but will be related to other parts of the plan for further elaboration.

1. The shortage of land and the lack of suitable sites for housing development is the foremost question at the immediate time. This is not an overwhelming problem, but there are aspects of this concern which are mainly related to a need for land use planning. The townsite itself is quite small in area, especially when compared to the total land area of the city. The reason that the townsite is small and compact, however, is that it is surrounded on all sides by land which is not developable. There is a water and sewer system in the townsite, but it is not possible for the city to have outward expansion which would be contiguous to the concentrated area of development.

   The problem which is evident in the townsite, however, relates to poor land use planning. The streets are narrow, and intersections are hazardous, the lots are of many sizes and

irregularly shaped, and most important, there has been virtually no provisions made for public purposes other than schools. Almost all the useable land is, therefore, in private ownership. The implications for housing improvement in this type of situation are therefore limited.

An alternative to this situation would be planning for the development of housing in an outlying area. This would seem logical in one respect because most of the unsound private housing is located outside the townsite. Also, there appear to be a few more families in the outlying area than in the townsite who indicated that they would take part in a housing project and were eligible by income for a turnkey type low income project. There were about 16 families in the outlying area and about 13 families in the townsite in this category; but the prospective participants in the outlying area, however, are located mainly in two separate areas. Also, almost all of the eight persons who indicated they would participate in a housing project were not counted because their income was unknown were in the townsite. Further, the townsite would be more desirable because central services such as water and sewer would be available. In any case, these alternatives confirm the need for comprehensive land use and community planning before decisions are made concerning housing.

2. Construction and maintenance costs are the next obstacle to housing in Dillingham. Building materials must be shipped in by air or water. Another section of the report refers to transportation costs, but in brief the problems of high cost are due to lack of highway and rail transportation, the brief ocean shipping season, and the high cost of lightering from ship to shore. Housing construction is further handicapped because the fishing season occurs during the months when the weather is most favorable for housing construction. Also, the smallness and dispersion of the remote communities such as Dillingham precludes possible economies of large scale building operations.

3. The sources of finacial credit, both for potential home buyers and for builders, are inadequate. This is evidenced by the fact that only 13 homeowners out of 104 people in the ASHA Housing Survey indicated that their source of financing was through a bank or other financing. 91 persons reported themselves as their source of financing.

4. There is also a need for shelter related public services. Among the services that need improvement are water supply, waste disposal, garbage and trash collection, recreation and fire protection. These aspects of the plan are discussed in other sections of the plan.

5. Dillingham lacks adequate public resources to solve its housing and related urban problems. This is due largely to the highly seasonal and cyclical economy.

Recent Actions to Improve Housing

Recent actions to improve housing in Dillingham have centered around land use planning, evaluation of the housing situation, and coordination of housing resource services. A primary basis for evaluation and planning has been the ASHA Planning and Housing Survey, Dillingham, Alaska, October, 1970.

The house-to-house survey conducted in Dillingham in October, 1970 had two main purposes. The first objective was to assemble information on Dillingham's housing and population for ultimate use in the city's comprehensive plan. The second objective was to determine if a Turnkey or some similar low-income housing program would be feasible. The material presented here is primarily oriented toward the question dealing with a Turnkey housing program, a remote housing project, or some similar type of low-income housing program, but other housing needs will also be considered.

There are three major factors which affect a city's eligibility for a Turnkey housing program. First is income. Families whose annual income exceeds the maximum income ceiling are not eligible for

this particular program. The applicable income ceiling varies from $5,300 to $8,000 according to the family size as shown below.

Income Limits for Low-Income Housing

Family Size	-	Maximum Income
1		$ 5,300
2		5,900
3		6,500
4		7,200
5		7,500
6		7,700
7		7,900
8+		8,000

The second eligibility requirement for the Turnkey housing program is that a family must presently be living in housing that issub-standard or of inadequate size for its family needs. The standards for evaluating the quality and adequacy of housing are the same standards applied in other places to determine eligibility for this federally assisted housing program.

As mentioned in the section on population, survey sheets were filled out on 206 occupied residences which had a total population of 823 persons. This works out to an average of four persons per occupied dwelling unit in Dillingham. This average was true both for the residences in the central city and in the outlying area. In 1970,

the statewide average was 3.5 persons per occupied dwelling unit, and 4.7 in the Bristol Bay Census Division.

Based on the records of the local electric utility, it is estimated that there are 240 occupied residences within the Dillingham city limits. Thus the ASHA survey ocvered about 86% of the occupied residences. Based on this projection, it appears that a population estimate of 960 people would be reasonably accurate. The 1970 census report showed only 914 persons, but the ASHA Survey took place a full six months after the time of the 1970 census. Normal growth could have accounted for an increase of 46 persons in this period, but also the summer of 1970 was an especially good fishing year and this alone could have accounted for the growth. In any case, it seems entirely clear that the population in Dillingham is at least 960 at the present time and if the boarding home students living in Dillingham were included in this figure could easily reach 1,000. On top of all this, it is generally agreed that the population about doubles in the summer during the fishing season.

Of the forms received there were 20 from state and federal housing units. These units were used only by governmental employees of the state and the Public Health Service. They were not considered

to be in the Dillingham housing market, and therefore were not included in the analysis. In addition, there were 38 forms which did not contain enough information to be considered in the Turnkey analysis. This left a total of 148 forms which were analyzed as follows:

1. Income. Of the 148 forms considered, 64 reported incomes which met the Turnkey eligibility limits. In some cases, the reported incomes were higher than the limits, but 1970 was an above-average fishing year. Families which were slightly over the income limits because of fishing income were considered eligible.

2. Quality of present housing. Of the 64 families with eligible incomes, 53 or about 83% were living in unsound housing.

3. Willingness to participate in a housing program. Of the 53 families eligible by income and housing condition 31, or about 58%, said they would participate in a housing program.

Therefore, there are at least 31 families in Dillingham who are qualified and who might be interested in participating in a Turnkey

or similar housing program. While this number is small in relation to existing and proposed Turnkey projects throughout the state, it does not mean that this stated housing demand should be ignored. An additional eight families indicated a desire to participate, but they did not provide information on their incomes. In addition, Dillingham has a road link to Aleknagik, which is only about 18 miles from the city limits. Aleknagik has 128 people who might easily absorb 10 to 15 units. A summary of the housing survey data is presented in table number .

An alternative housing program for Dillingham might be the HUD-sponsored successor to the remote housing program, or the new state-sponsored remote housing program. These new mutual-help programs are expected to built 200 units in rural Alaskan communities in 1971. Based on the results of the ASHA Housing Survey, Dillingham could absorb as many as 30 units of such housing. Dillingham's seasonal fishing economy would lend itself to a mutual-help program since many men would be available to build the houses once the fishing season was over. Direct action and coordination is taking place on these programs through the Housing Department at ASHA.

Low income housing in Dillingham, however, is not the only need in Dillingham. There is also a very evident need for middle income housing. This is evidenced by the 26 people who indicated

they would take part in a housing program but were ineligible for a low income housing program. Also, 70% of the nongovernmental housing units in the survey were found to be unsound, and only 13 families out of 104 surveyed had bank or other financing.

For these needs of families with more moderate incomes, actions have been initiated with the Farmers Home Administration in order to identify programs suited to middle income homeowners, and with respect to the particular situation in Dillingham. The following section will summarize the Rural Housing Authorities of the Farmers Home in Alaska. These programs may have many helpful applications to the housing situation in Dillingham.

The Farmers Home Administration offers "Section 502 Loans" to build new homes, purchase existing homes and land, and rehabilitate existing homes. To be eligible for these loans, a person must be an owner of land or a rural resident in need of housing, and have sufficient resources to repay a loan and related facilities. Also, a person must be a U.S. Citizen, of legal age, and possess character, ability, and experience to carry out purposes of the loan. Another provision is that a person be without sufficient resources to obtain the needed credit from other sources. There are also maximum income limits for loan eligibility. The income limit guidelines would be:

1-2 member family	$10,000
3 member family	11,000
4 member family	12,000
5 member family	13,000
6 member family	14,000
7 member family or more	15,000

The current rate of interest for these loans is 7-1/4% and loan repayments must be scheduled for 33 years or less.

Another program of the Farmers Home Administration is their mutual self-help housing to assist rural low-income families. Funds may be used to purchase materials, to purchase an adequate site, and to pay for skilled labor and contract costs that cannot be obtained by the applicant. The Farmers Home Administration contracts with a responsible organization to provide the necessary supervision, and these funds are supplied by the FHA without cost to the borrower. Through the mutual exchange of labor, families will construct their own homes.

Special programs under the Section 502 loans can be used to help low-income families who would not be eligible for regular 502 loans to improve the quality of their housing. Funds may be used to improve or enlarge a dwelling and related facilities so as to make the housing decent, safe, and sanitary. Loan funds, however, may not be used to purchase a dwelling, buy land, refinance debts or build a new house. The loans cannot exceed $3,500 and the applicant must be the record owner.

assets needed for a sound loan. Also, the applicant must be unable to secure other credit.

Conditional commitments may be made to a contractor to construct not more than fifteen dwellings at one time. Under this provision a contractor obtains credit from a bank and the Farmers Home Administration finances houses under an individual basis when they are completed.

Rural Housing Site Loans can be made to a prviate or non-profit organization to permit the purchase and development of adequate sites, including essential access road, utility lines and necessary equipment which will be a permanent part of the development. These loans, however, are limited to low-income persons. There is a loan limit of $100,000 and the loan must be repaid within two years.

The Farmers Home Administration places emphasis on providing housing for families in the low- to moderate-income level. There are resources and regulations. Loans are limited according to the income level and the size of families, but it is estimated that up to 60% of the households in Dillingham may be eligible for FHA assistance. There are no grant funds available, however, and families must have full ability to repay the loan. Housing construction costs may, in fact, price low-income families out of homeownership, but some of these programs may be the answer for the many moderate-income families in Dillingham who do not qualify for other low-income housing programs.

In any case, the housing actions which are taken in Dillingham should be taken in conjunction with the intent of the comprehensive plan. This recent action has closely considered the housing situation in the community. The plan will be comprehensive to the greatest extent possible, but it is essential that the housing decisions take place within the context of a complete look at the community. The plan should have the backing of the community leaders as a policy guide-line so that when decisions such as locations for future housing construction come up the plan will justify the selection of the best site. On the other hand, the plan should be able to satisfy many of the requirements that are necessary for the consideration of a project.

Housing Objectives and Implementing Actions

There are no immediate or easy solutions to housing problems in Dillingham. It is necessary that there be steady and consistent work toward specified housing objectives in order to improve housing conditions. Since the community must rely upon an economy that is highly seasonal, substantial federal and state aid will be needed. Local initiative will be essential to promote, direct and carry through a long-range program to improve housing. The following list of objectives to improve housing represents priorites for local action.

1. Successful completion of a State or Federal Remote Housing Project. This is the most pressing housing objective. A project of this type would greatly alleviate the shortage of housing and also improve the overall condition of the total housing picture in Dillingham. Using the Comprehensive Plan as a framework for planning, the Board of Trustees should share responsibility with ASHA for tailoring the housing projects to the specific needs of the residents of Dillingham.

There should be a local participation in project planning and development to assure that the housing will reflect the ideas and preferences of the people who will be benefited. There should be good communication between ASHA and the community about the many aspects of a project that will be new to people. Many decisions must be made about site selections and building design. Also, there must be provision made for coordinative planning of housing-related facilities such as utilities and playgrounds. The community should take an active role in formulating these decisions.

2. Development of conditions which encourage the construction of conventional private housing through the Farmers Home Administration or other agencies at a lower cost. Progress on this objective may depend upon other factors brought out in the plan such as transportation or a more stable economy, but there are

steps which can be taken to get help in this area. Communication with the right agencies could confirm exactly what would be available to ease the problems such as financing and high construction costs. For lack of information the community is not able to effectively take advantage of the public and private housing resources available. The tools for community-building that are taken for granted elsewhere have been of little help in Dillingham. Examples of housing interest include the Federal Housing Administration, Farmers Home Administration, Alaska State Housing Authority, Department of Housing and Urban Development, Veteran's Administration, the banking industry and the mobile and modular homes industries.

3. Adoption of building, fire and health codes, and a program of implementation. A program of code adoption and code enforcement will help the city improve the quality of the existing housing and lay the groundwork for orderly growth and development in the future. Fire and sanitation are examples of problems which are of concern to the whole community. These codes need not be as sophisticated as some of the larger communities in Alaska, but the objective should be to upgrade the security and quality of life in the community.

4. Adoption of a zoning ordinance. Zoning on the basis of the comprehensive plan is an implementation measure which would help assure orderly development, compatible land uses, maintenance of property values, and implementation of the comprehensive plan.

5. Housing related objectives should be encouraged to enhance the quality of housing. This objective is again related to the objectives in other parts of the plan; however, housing services will increasingly become necessary as the community grows. Some of the more important housing related objectives would include the improvement of the water and sewer system, improvement of the city fire protection capabilities and the provision of neighborhood playgrounds for children which are close to their homes.

ECONOMY

Without a doubt, the economy in Dillingham is primarily dependent upon the salmon fishery in Bristol Bay. There are possibilities for future development of certain natural resources, but for the present salmon fishing and processing is the only real economic base for the community. There is some promise of oil development, but the multiplier effect of resource extract industries on service employment and income generated in a community is not great compared to manufacturing and processing industries. Dillingham shows potential for development as a regional service center, but the extent of growth depends again on development of the economic base in the region and on transportation. The following discussion will summarize the more important aspects of the regional economy as it may influence the future development of the city.

The Salmon Resource* and Management

Considering the many scientific, economic, social, geographic and political ramifications there is probably no topic more complex than the Bristol Bay Salmon Fishery. This comprehensive plan probably cannot offer anything new in the way of economic recommendations, but it may be helpful to gain some kind of perspective because of

---

* Source, Bristol Bay Data Report No. 21, Status of the Bristol Bay Commercial Salmon Fishery, Alaska Department of Fish and Game, Dillingham, Alaska, January 20, 1970.

the current importance of fishing to the future development of the City of Dillingham. Because this will be the community's plan, the primary source of the following information will be from within the City of Dillingham.

The salmon fishing area that is considered to be the Bristol Bay fishery is divided into five inshore districts: Naknek-Kvichak, Egegik, Ugashik, Nushagak and Togiak. The Naknek-Kvichak district is the largest producer of commercially caught red salmon; Togiak the smallest. The Nushagak district ranks second in commercial catches of red salmon and ranks first in commercial catches of four other salmon species.

The commercial harvest in Bristol Bay began in the Nushagak district in 1884 with catches recorded since 1893. Salmon were harvested initially with gill nets and traps. Gill nets were used exclusively when seines were prohibited soon after their introduction in 1922 and traps were eliminated in 1923.

Power boats were first introduced in 1922 but were immediately outlawed until 1951. Sailboats were predominate method of fishing in Bristol Bay during this period. Staked or set gill nets along the beaches were utilized only by a few women and those men

too young or too old to drift fish. In later years the set nets were utilized by able-bodied fishermen. Today, practically all productive beach areas are utilized by set nets. The number of units of fishing gear remained fairly constant up to World War II, except during those years with complete district closures. During the war years the number of units decreased markedly, but a trend of gradually increasing gear emerged in the late nineteen forties. The gear increase became more rapid with the legalizing of powered fishing craft in 1951. An increase of over 100% during the sixties resulted in gear limitation during the 1963 salmon season. Prior to the 1969 season, however, the gear limitation regulation was ruled unconstitutional by the courts. The gear limitation law limits issuance of salmon net gear licenses to persons who previously held a commercial fishing license for the salmon net gear registration area in which he is making application.

Regulations affecting gear and vessels went through numerous change with the passage of the White Act, which was the first attempt to apply regulatory measures to the Bristol Bay Fishery. A brief summary of those changes is listed below:

1924 - 1. Drift gill nets limited to 200 fathoms in length and designated as the only legal salmon gear in Bristol Bay.

1938 - 1. Drift gill nets returned to 150 fathoms in length.

1950 - 1. Maximum overall length of 32 feet was established for all fishing vessels in Bristol Bay.

1951 - 1. Power fishing boats made legal in Bristol Bay.

1956 - 1. King salmon nets limited to 28 meshes in depth.

2. Trolling gear added to legal salmon gear in Bristol Bay.

The regulations affecting gear and vessels underwent little change after State control of the fishery in 1960.

Prior to 1960 the rate of harvest was regulated by adjustment of fishing time based on the estimated size of the run, before the fishing season. Run estimates prior to the middle fifties, when escapement counts began, were based on a five-year cycle. Shifts between four and five years of the peak year run often resulted in lopsided harvests, usually to the detriment of the escapement

method openings and closures are set from day to day on the basis of daily information on catches and estimated escapements. This flexibility allows adjustments to compensate for variables caused by the run timing, actual run size compared to the long-range forecast, fishing mixed stocks, and the delay caused by the migration distance between the fisheries and escapement counting towers.

In addition to the adjustments on the fishing fleet, the boundaries have also been changed. Various tagging studies have been initiated and the boundaries adjusted accordingly to enable the fishing fleet to harvest each river system's stocks separately if possible. The trend has been to move the boundaries farther up into the river mouths. Subdistricts have been formed in some cases for further stock-differentiated fishing. The ability to control stocks to be harvested by creating subdistricts is readily observed in the case of the Igushik subdistrict of the Nushagak district.

The five species of salmon in Bristol Bay are the Red Salmon, King Salmon, Chum Salmon, Pink Salmon and Coho Salmon. Red Salmon are the predominate species in all five districts of Bristol Bay, and there has been an upward trend during the last ten years in catch. The only managed King Salmon commercial fishery is

concentrated in the Nushagak district. The King Salmon catch declined after 1930, but since 1960 the annual harvest is considered to be near the optimum allowable catch. The Chum Salmon are of major importance only in the Nushagak and Togiak districts. The run coincides with the Red Salmon fishery. The Pink Salmon in Bristol Bay is of major importance only in the Nushagak district where they occur in appreciable numbers on even-numbered years. The Coho fishery in Bristol Bay is also located primarily in the Nushagak and Togiak districts. This is the smallest of the five fisheries.

The runs in recent years have been more widely fluctuating in abundance and on a lower average than in the earlier years of the fishery despite the large peak Bristol Bay Red Salmon runs in 1960, 1961 and 1965. Continued comprehensive biological studies are needed on Bristol Bay Red Salmon, both in the lakes and in the ocean, to:

1. Understand current fluctuations in runs as a basis for reestablishing maximum yield.

2. Forecast annual abundance to alert management as to needed proportions for optimum spawning escapement and to alert industry as to the size of potential yearly pack.

3. Negotiate more intelligently through the International North Pacific Fisheries Commission with foreign nations involved in Bristol Bay salmon on the high seas.

4. Avoid the present frequent wide deviations between interagency forecasts of abundance and actual abundance.

The future outlook of the other Bristol Bay salmon fisheries is being approached with cautious optimism. The increasing pink run in the Nushagak seems to be overflowing into the Kvichak and Togiak Rivers. The utilizaion of the Nushagak King run is increasing. Coho production, though not extremely large, is relatively untouched. The 10 year average catch of all species from 1950-59 was 1,229,000 compared to the 10 year average catch of 2,049,000 from 1960-69, an increase of 67%*. These factors combine to present an optimistic picture while the rapidly increasing fishing effort and the uncontrollable biological factors necessitate caution.

*Source: Alaska State Division of Commercial Fisheries, Dillingham Alaska, March, 1971

The Salmon Industry

Prior to the purchase of Alaska by the United States there was no permanent economic enterprise in the Bristol Bay area. The region then was sparsely inhabited by a few fur trappers and by Natives oriented to a modified tribal and nomadic existence. Toward the end of the Civil War, however, techniques were developed to permit the preservation of food for extended periods of time. It was not long after this development that the processing of salmon was included in the products of the rapidly expanding new canning industry. In 1884, the Arctic Packing Company put up its first experimental pack of 400 cases at its location on the Nushagak River. The success of these canners is history, and before 1900 there were around a dozen such plants on the shores of Bristol Bay. By 1920 there were 25 canneries in operation. Prior to World War II, nearly all personnel involved with the industry were brought in from outside Alaska. The labor shortage of the war years, however, created a considerable market for local labor. This trend has continued and the distribution of income to workers, which at one time had virtually all gone out of State, now came in large part to the residents. Although the total income generated by the fishery may have declined from the years of over exploitation, a large percentage is now distributed to the residents than in the former days of larger packs. Also, more independent operators have come on

the scene. Since their establishment in the bay area, the nature of the cannery operations have changed very little except for certain technical modifications to equipment. For years the pattern of operations that now function has been the rule. In the spring the canneries prepare for the six week run. Workers arrive from all over Alaska and "Outside" and, as July approaches the labor force grows tremendously. Many independent fishermen from the Dillingham area and the Nushagak River communities also arrive and await the salmon run. When the fish begin to run, they are processed within hours after being caught. Production lines are kept open as long as necessary to accommodate the catch. However, during the summer of 1970, the run was so large that the canneries could not handle the entire catch. Consequently, the canneries limited the number of fish that they would buy from each fisherman and much income was lost to the residents.

The prices paid to fishermen for the salmon have been going up; however, the number of fishermen attracted to the Bristol Bay fishery have increased tremendously. The effect in recent years has been to keep the resident, individual fisherman's income depressed despite rising fish prices. The average catch per fisherman has been going down. Based on a 5.5 pound red salmon, the price paid to fishermen for red salmon has increased from approximately 19.6¢ a pound in 1963 to a little more than 24¢ a pound in 1964. On the other hand, since 1963 through 1969

an average of about 28 new gear registrants have come into the Nushagak area each year. In all of Bristol Bay this average was 91 per year. In terms of the entire catch of salmon for all species for all Bristol Bay, the catch per fisherman has decreased since 1953 at an estimated rate of about 73 fish per year. This decrease has occurred despite the fact that the total catch of the bay has actually been on the increase during the last several years. In the period 1960-69 the ten-year average catch in the Nushagak district has increased by 67% over the ten-year average catch from 1950-59, however, during this same period the gear has increased by 100%. Therefore, even though the salmon runs are on the increase and the catches are larger, the individual fishermen's share is smaller.

Many times the new fishermen come into the area in years immediately following good catches in Bristol Bay. These amateurs then compound the situation for the full-time resident fisherman who must compete for fewer numbers of fish. Solutions to this problem center around either limiting the number of fishermen or limiting the type of gear or hours of fishing. Limitations which are placed on the methods of commercial fishing, however, also limit commercial salmon fishing as an economic, private enterprise. It still remains to be seen if a new limited entry law will hold up in the courts.

Another problem may be the State's policy requiring primary processing of natural resource products prior to their export from Alaska. A recent study concludes that the application of the primary processing policy to the salmon fishery provides a form

of subsidy to domestic canners and the State's fishermen bear the financial burden of this subsidy.[1] The study points out that since the State's primary processing policy prevents Japanese or other foreign fresh fish purchases, prices paid for salmon remain at the level set by established operators. The difference between the higher prices paid by the Japanese and the established prices represents a form of subsidy to the non-resident, established canners, and processors in Alaska. The price paid for fish is lower than the price obtainable in an internationally competitive system. Also, unrealized revenue from fish sales that are not taken by the canneries represents a loss not only to the State or Federal government, but to the fishermen - many of whom are Natives - the poorest segment of the State's population. There is little or no compensating benefit to the total economy of Alaska as a result of the application of the primary processing requirement to the salmon fishery, because salmon processing in Alaska is largely an activity of non-resident capital and transient labor. The main point of the study, however, is that the elimination of the primary processing requirement would, in all probability, result in a net gain to the resident of Alaska economy.

Other plans to assist the fishing industry includes a grant and loan approved by the Economic Development Administration for a new

---

1. Politics of Resource Development in Alaska: Primary Processing in the Salmon Industry by Gordon Scott Harrison, Institute of Social, Economic and Government Research, University of Alaska, Fairbanks, Alaska, July 1, 1970.

$650,000 flash freezing and cold storage facility in Dillingham. A cooperative has been selected to operate this facility and the Community Enterprise Development Corporation, an off-shoot of OEO, has also contributed assistance and funds. The new cooperative will help to increase the local economic impact of the salmon fishing industry. It will enjoy some marketing advantages since certain species of salmon command a higher price when frozen than when canned or salted. Further marketing potential will be gained by the co-op's plans to develop and market unharvested fishery sources over the region such as crabs, herring, and fresh water species such as white fish and arctic char. Other advantages will be gained by extending employment through holding the number of two fish for processing after the peak season. This should extend the fishing activity for a couple of months. Also, sea run trout may be processed in the spring before the main salmon run begins.

As previously mentioned, the taking of salmon is near optimum levels but with proper management it is generally agreed that the fishing industry will continue to be the mainstay of the Bristol Bay economy. There are, however, other fish resource possibilities including the taking of more less desirable species of salmon, and the harvesting of lake fish resources. Changes in the processing industry will benefit the industry and increase the

utilization of both unused fish resources and parts of the presently harvested fishing resources that are currently wasted. Also, the establishment of cooperative fishing enterprises should substantially increase the economic benefits of other resource use. The number of fishermen may, however, need to be limited in some way if the present fishermen are to operate at a profit. By limiting gear, the violations can be reduced, along with the cost of enforcement, and regulations can be simplified without a threat to the resource. Fish quality would be improved simply by avoiding the pile up of fish for one or two days.

Petroleum

The Bristol Bay Region is part of a large sedimentary basin that is considered to be a future province for oil and gas development. The true potential of this area is not known, however, two areas of high potential are thought to be along the Alaska Peninsula southwest of the Ugashik River and around the Nushagak River in the vicinity of Dillingham. Oil seepages have been reported on the peninsula, but to date there has been very little exploratory activity.

Early in the century, there was some unsuccessful drilling just south of Becharof Lake and recently there has been interest in oil exploration south of the Bristol Bay Borough. Two wells have been drilled, plugged and abandoned in the areas near Port Moller in 1963, and near Ugashik in 1966. More recently, several oil companies were conducting offshore oil exploration in the area. Over one thousand square miles is held in onshore leases from the federal government, but to date the State has not held any auctions of offshore oil lands.

There may be two types of exploration and drilling operations in the study area. Onshore oil exploration takes place mostly in the winter months when the ground is frozen, while offshore

exploration is limited to the summer season when the bay is free of ice. A typical onshore expedition would employ about 20 to 25 men, 10 track vehicles and a seismic drill weighing several tons. According to some estimates, such a party would use about 50 tons of supplies in a season. The technical and administrative functions, however, generally originate in Anchorage. Onshore operations would be supplied by air, but offshore operations would be supplied almost entirely by sea.

There would have to be a major discovery of oil in the Bristol Bay Region, however, in order to be successfully exploited at a profit. By comparison with the costs on the Kenai Peninsula, the expense of drilling a test well in Alaska run two to four times higher than a similar operation in California. The costs for a similar operation in the Bristol Bay Region would probably be somewhat higher.

Alaska Petroleum Company, representing Japanese interests, and Gulf Oil Corporation have joined with Scurry Rainbow and Skelly Oil Companies for exploratory drilling in the Port Heiden area in April, 1971.[1]

There is, however, a conflict between the development of the petroleum industry in the Bristol Bay area and its relationship

---

1. Office of the Governor, February 10, 1971.

to the salmon resource. Many of the fishermen are afraid that the oil operations in the bay would cause pollution damaging to fish and game. The State Department of Fish and Game has also expressed concern about the oil activity which would cause pollution in water fowl nesting areas and interfere with drift net fishing on Bristol Bay. One solution may be to drill for offshore oil from onshore sites. In any case, this conflict between two of Alaska's greatest resources and sources of revenue should not be overlooked.

Considering the present supply of oil on the world market, the recent discoveries on the North Slope of Alaska and the oil available in Cook Inlet, it seems likely that exploration and drilling activity in the Bristol Bay Region has been held down. Activity will probably increase as the demand for petroleum rises. However, a major oil strike on the bay would immediately attract significant exploration.

Coal

The potential for coal is small in the Bristol Bay Region, but wells in the area are reported to have penetrated coal layers. Deposits of coal have been mined on the Alaska Peninsula on the south side of Bristol Bay near Port Moller.

Metallic Minerals

Metallic minerals are found in all the mountainous parts of the Bristol Bay Region. The mineral potential covers a broad spectrum of mercury, gold, iron, platinum, and base metals which would include copper, lead, and zinc. The development of many of these resources depends upon economic considerations such as transportation, marketing and demand. The region appears to have a very good potential but until more exploration is done no large scale developments can be predicted with any reasonable degree of certainty. The following summaries of particular metallic minerals may be related to the economic development in Dillingham.

Most immediate and best known metallic resource potential, which could have an effect on the economy in Dillingham, is mercury at the Red Top Mine on Marsh Mountain. The deposit is about 17 air miles north of Dillingham, at an elevation of about 1,100 feet near the top of the southernmost peak of Marsh Mountain, less than five miles from the Aleknagik. A five mile truck road connects the mine with a point on the Wood River about two miles below Aleknagik. Boats and barges drawing less than about five feet of water can navigate the Wood River to Lake Aleknagik. About three miles from the property, landing strips which are suitable for light planes have been built near the base of the mountain and the area is also accessible by aircraft on floats from the Wood River.

Cinnabar, which is an ore of mercury, was discovered by Frank Waskey in Arcana Creek, which drains Marsh Mountain. The lodes were found by Charles Wolfe and Clance Wren, who at Waskey's suggestion traced the placer Cinnabar to its source. In 1952-53, a Federal loan was made under the Defense Mineral Exploration Administration to the Red Top Mining Company to explore for mercury at Marsh Mountain. As a result of this work, a potential deposit was outlined and 22 flasks of mercury were recovered from ore stock piled during this time. In 1955, Moneta-Porcupine Mines Ltd. took an option on the property from the Red Top Mining Co. and a second contract for underground exploration was signed between Moneta-Porcupine Ltd. and the Defense Minerals Exploration Administration. More underground workings were driven during the period of the second contract and subsequently a lower entrance was driven under a joing agreement by the DeCourcy Mountain Mining Company and the Moneta-Porcupine Mines Ltd. More work took place in 1958 and mapping of the underground workings and the surface took place in August of 1959. As of 1959, production had amounted to 60 flasks of mercury and rich ore that would yield at least this much, which was stock piled at the property.[1]

Apparently there has been little activity at the mine since the late 1950's, but Marsh Mountain has the potential for a small

---

1. Quick Silver Deposits of Southwest Alaska, Geological Survey Bulletin 1187, C. L. Sainsdury and E. M. MacKevett, Jr., U.S. Government Printing Office, Washington, 1965.

producing mine. Reportedly, about four men were employed on the property last summer, but the total employment could amount to as many as 75 men.[1]

At present, Alaskan production is marginal because of the high cost of transportaion, labor, materials and overhead due to the short working season. Prices have been good but the mining of mercury in Alaska has been profitable mainly during periods of high prices, during World War II and the late 1950's with government supported price levels. Production of mercury in Alaska has dropped remarkably since 1960.[2] The work mercury market is dominated by Italy and Spain and their production is apparently not decreasing. Prices for mercury, however, have been quite good and transportation accounts for only a small percentage of the total production cost. If prices or conditions should change, larger scale mining operations at Marsh Mountain would have a small but very beneficial effect on the Dillingham economy.

Another mineral which is in the immediate vicinity of Dillingham is iron. There are other deposits of iron ore in the Bristol Bay Region but the deposits at Kemuk Mountain are the most important potential mineral resource within the general Dillingham service

---

1. State of Alaska, Department of Natural Resources, Division of Geological Survey.
2. Alaska Department of Natural Resources, Division of Mines and Minerals, Yearly Reports, 1961-67

goals and objectives

Beach Erosion

Flood Hazards

Billingham Population

check air transportation

Population Projection

Housing Farmers Pond

Economy

Salmon Resource ✓
one page only

Samlon Ind one page only ✓

Major streets

Fire Protection (New fire truck)

Small Boat harbor ✓

Water and Sewer

area which could influence the future economic development of the City. The Kemuk Mountain ore deposits are located about 55 air miles northeast of Dillingham, about ten miles west of the Nushagak River. The deposits were discovered in 1967 by aerial magnetometer surveys in 1958. The deposits were staked by Humble Oil Company and explorations were intermittently carried on through 1963. In 1965, considerable attention was focused on deposits in this region. The magnetite deposits, although large in size, is reported to contain about 20% iron. It would probably take a deposit with a grade of 50% iron or better, however, to be economically mineable at this time.

Some high grade deposits of magnetite, however, reportedly have been found in beach sands at tidewater in an area generally running from Egegik to Port Hyden in the southern part of the Bristol Bay Region on the Alaska Peninsula. Formal investigations concerning the extent of these deposits, however, have not been made. These iron ore deposits which are also within proximity of the coal deposits on the Alaska Peninsula would fulfill one requirement of economic geography for the processing of iron ore. Other factors, such as marketing, labor supply, production costs, and transportation could, of course, be more important and until more is know about both the magetite deposits and the coal deposits, any predictions of economic development would only be speculative at best.

Near the boundary of the Bristol Bay Region but only about 100 miles west of Dillingham, platinum is mined at Goodnews Bay. Although this operation is some distance from Dillingham, there is a continuing search for this metal. If another deposit were found in the region, the mine could very easily employ another 50 men.

There is other potential for metallic mineral development in the Bristol Bay Region but almost all the prospects at the present time depend on economic considerations and more exploration. The Kasna Creek copper deposit north of Iliamna Lake is some distance from the Dillingham area but the Alaska Department of Natural Resources stated in 1967 that the Kasna Creek property has an excellent chance of producing a copper mine. The main significance of this development to the Dillingham area, however, may be that this mining would justify the initiation of a peninsula highway crossing which could then be extended into the Dillingham area. Gold deposits exist in the Bristol Bay Region but the probability of any increase in any gold mining under present economic conditions does not appear to be good. At time of extremely high prices, tin has been taken from placer operations around Dillingham and Naknek. The tin is found near tidewater but can be mined only in the summer and the reserves do not appear large enough for a sizeable mining operation.

There are several known non-metallic minerals in the Bristol Bay Region. These include limestone, pumus, sand and gravel. The amount of sand and gravel in the area would be helpful in meeting the needs of any future highway construction. No detailed information, however, is presently available on these non-metallic minerals.

The State, Federal government agencies and private companies have been continuously searching for a base metal deposit in this area. The continuing world-wide demand for metals and the increasing interest in Alaska by the major mining companies give promise to further exploration in the Bristol Bay Region in the upcoming years. If such a deposit is found and the mine developed, much of the housing would probably be at the mine. However, if support was from Dillingham, it might indirectly add anywhere from ten to 25 families to the population.

Hydro-Electric Power

According to the Alaska Power Administration, the potential hydro-electric sites in the Bristol Bay area would have a developmental possibility of about 323,900 kilowatts. The Nuyakuk-Tikchik-Kulik Lakes system would be the largest development and could produce prime power of some 70,200 kilowatts. Nuyakuk-Tikchik Lakes are connected by a wide, deep channel and they would develop about 53,200 kilowatts from a dam placed across the Tikchik outlet. A five mile tunnel connecting Lake Kulik with the Nuyakuk-Tikchik system could increase the overall prime capacity to about 70,200 kilowatts. This development would be of considerable distance from the Dillingham area and the development of this potential would probably not be warranted until some time in the very distant future. Very significant population increases, along with economic developments, may be needed before this project would become feasible. In the meantime, the lack of installed power resources is a hinderance to the economy of the region. Electric rates in Dillingham are several times higher than similar rates in Anchorage.

Tourism

Another resource which exists in the Dillingham area is its natural environment. This is a tremendous resource which cannot always be defined in monetary terms. This resource is harvested when it attracts tourists and recreationists to the City. One of the most important attractions within the economic sphere of Dillingham is the Wood River-Tikchik Lakes area which covers a very large area in the western part of the Bristol Bay Region north of Dillingham. About 1.8 million acres of this area is State-owned land. A resource inventory study administered by the Alaska Division of Parks is now taking place to determine the future use of this area. The second phase of this study will develop a master plan. A primary consideration in the study will consider the recreational potential as compared with alternative uses. The area is an outstanding scenic and wildlife area with very few inhabitants, however, the proposals should consider the possibilities of multiple use and balanced development. In any case, it is recommended here that the land use plan be related to the Bristol Bay Region so that both public and private land use needs are met. Any proposals should conform with statewide land use plans.

There are also some very desirable features in the immediate vicinity of Dillingham. Hunting and fishing is available in the surrounding area. The development of historic and attractive points in the area, along with the promotion of recreational uses, could benefit the tourist potential.

Despite the high cost of flying, this method of travel is used a great deal by tourists. About 25% of highway travelers, and 25% of all travelers, use the airlines to see Alaska once they arrive in the state. If these proportions continue into the future, there will be an increasing number of air traveling tourists along with the general trend of increased tourism in the State of Alaska. The promotion of recreational attractions such as the Wood River-Tikchik Lakes area would substantially benefit the economy of Dillingham by increasing tourist travel to Dillingham and the surrounding area.

Timber

There are some good stands of timber in the Dillingham area, especially north of the City. It does not appear, however, that this timber is of commercial quality. The existing timber stands may, in fact, have a much greater value for recreation.

Agriculture

There is no significant agricultural development in the Dillingham area except from small vegetable gardens. With proper management, however, there is reason to believe that good yields of forage crops, potatoes, hardy vegetables, and berries can be obtained.

Management practices would include heavy fertilization, liming, and erosion control practices on sloping land. But there are large areas of well drained agricultural soils in the immediate vicinity of Dillingham. The main physical limitations are the cool summer climate and acid soils. The proper selection of corps and the availability of an inexpensive source of lime fertilizer could overcome these problems if a market for agricultural products develops.

EMPLOYMENT AND INCOME

The primary basis of employment and income in Dillingham is commercial fishing. Most of the related employment is therefore dependent upon this economic base. Overall, the fishing resource has not been declining, however, there is general involvement with the salmon based industries for only two or three months out of the year. Also, there are risks which are inherent in dependency on a "one crop" economy and this is even futher accentuated by the fact that the salmon runs vary greatly in abundance from season to season.

Employment

The Alaska State Housing Authority Housing Survey in Dillingham found that about 1/3 of the people responding indicated fishing as their occupation. Almost 2/3 of the regional village population, however, is economically dependent upon the seasonal salmon fisheries. In the Bristol Bay Region as a whole, 37% of the skills listed by the men surveyed represent occupations in the salmon industry.[1]

The effort of the individual to equip and maintain himself in the commercial fishing business is usually financed out of his seasonal earnings. In view of the low income levels this financing often requires remarkable sacrifices at the expense of fundamental needs

---

1. Alaska Manpower Resources, Bristol Bay, Alaska State Employment Security Division, Alaska State Department of Labor, March, 1971.

as housing, utilities, nutrition, heating, clothing and education. As a result, many of the fishermen in the region have concentrated their small amount of capital in specialized forms of property which can only be employed during the few months of the year.

Many of the villagers and residents in other parts of rural Alaska are still very much dependent upon subsistence hunting and fishing activities. In the Bristol Bay Region and Dillingham many of these people have become skilled operators in the salmon gill net fisheries, during the last half of the century. Many have become competent in the operation, maintenance and repair of gas and diesel engines. They have acquired a working knowledge of hull construction, radio telephones, depth sounders and direction finders, and have participated in the activities of local unions and marketing associations. They are therefore committed to a cash economy based upon full utilization of the salmon resources of Bristol Bay. A return to the old way of life is not possible.

In the spring of 1970 an Alaska Department of Labor Survey in Dillingham indicated the seriousness of the unemployment during the off-fishing season. Of 109 persons in the survey population, a total of 52 persons indicated they were available for employment. In the Bristol Bay region 422 persons or 62% of 680 surveyed were available workers.[1] The survey indicated in Dillingham that more persons who had less than a high school education

---

1. Ibid.

indicated they were available for work. A higher proportion of the young people in the community are now receiving more education than the older people, however.

Other occupations in Dillingham include service industries, professional services, government, transportation and trades. There is a farily high proportion of professional occupations in Dillingham. The staff at the Public Health Service Hospital along with the usual proportions of professionals such as teachers, gives the city a large number of professional occupations. Total employment at the hospital early in 1971 was 52 employees, making the hospital the highest single year-round employer in the City of Dillingham. There are also a number of State employees in the Dillingham area. According the Alaska Division of Personnel there are 41 State employees in the Dillingham area. Although all employees are not necessarily located in the city, this would be a significant source of employment in the city. Other employment is in transportation, mainly with Wein Consolidated Airlines, Western Alaska Airlines, or lighterage of goods from ship to shore. Others work in the mechancial trades in relation to the air service role of Dillingham, while others are in the building trades.

Income

Personal income as reported by householders in Dillingham is related to the employment and the economy in the city and in the region. The average income for 12 months up to October, 1970 as reported by householders in the housing survey was $10,990. The median income came to $10,000. As previously mentioned, these incomes reflect fishing earnings from 1970 which were exceptionally high. Fishermen make considerably less during the many poor and fair salmon runs and this would be reflected to a lesser extent in the personal incomes of the community as a whole. Also, in the Bristol Bay Region as a whole, in this same year, 54% of 605 persons surveyed, had incomes of less than $8,000.[1]

One aspect of the income ranges of the households should be mentioned. Of the 126 households in the survey, 51 or 40.5% of the total reported incomes of $12,000 and over, 41 households or 32.5% of the total reported incomes less than $6,000, but 17.5% of the total would be considered extremely poor with incomes less than $3,000. The unusual characteristic of this distribution of incomes is that the smallest proportion of households reported incomes in the middle range of $6,000 to $11,999. This group consisted of 34 households or 27% of the total surveyed. A normal distribution of income which would be characteristic of the nation as a whole would have

---

1. Alaska Manpower Resources, Bristol Bay, Alaska State Employment Security Division, State Department of Labor, March, 1971. (Note: The Bristol Bay income was reported by individual rather than family income.)

the fewest number and percent in the very high and very low income levels with by far the greatest majority of individual incomes in the middle ranges. In Dillingham this would seem to be just the reverse. Thus, it is somewhat of a paradox that many families are well off while others are extremely poor in Dillingham. Table No. will illustrate the distribution of income in Dillingham.

INCOME FOR 12 MONTHS UP TO OCTOBER, 1970 (As Reported by Householders)

Table No.

Income	No. of Households		Percent of Total	
$ 0 - $ 2,999	22)		17.5)	
		41		32.5
$ 3,000 - $ 5,999	19)		15.1)	
$ 6,000 - $ 8,999	14)		11.1)	
		34		27.0
$ 9,000 - $11,999	20)		15.9)	
$ 12,000 - $14,999	19)		15.1)	
		51		40.5
$ 15,000 - and over	32)		25.4)	
TOTAL	126		100.1	

Average Income. $10,990

Median Income. $10,000

FUTURE LAND USE

One of the primary objectives for improving the environment in the City of Dillingham is the improvement of the physical environment. A prime tool for improving the physical environment is a future land use plan. Future land use planning should confirm the future overall intended use of sites in the City and insure the orderly development of the City in whatever way that is appropriate for Dillingham. Future land use plans, however, are based on the many social, economic, and physical factors which make up the comprehensive plan. In this way, future land use will relate to community facility needs of the particular uses, needs for streets and highways, social needs, economic needs, and based on the future projection of population.

Rural Residential

The objective for rural land use should be to encourage an orderly, safe, and aesthetically pleasing environment for rural residential development in the City. Many of the people in the City of Dillingham would prefer living in an uncrowded rural area. Without rural residential planning, however, rural areas could possibly be subdivided and developed to a point where they are no longer rural. It is therefore recommended that certain areas in the City develop on large lots which would be a minimum of approximately one acre in size.

Minimum lot size regulations would help insure that part of the City be preserved for rural residential and recreation development. Without this type of regulation, concentration could devalue the area in terms of the very qualities which have made it desirable as a place away from concentrated development. Another important reason for maintaining a minimum lot size in rural areas is to prevent well contamination, and other health hazards. To function successfully, a septic tank must be located in soils with good drainage characteristics, and, to prevent contamination there must be adequate separation between well and septic tanks. The Public Health Service recommends 100 feet between a well and a septic tank seepage field, and a minimum residential lot of half an acre where there is no common sewer. Depending on the soil conditions, many areas would need more than a half acre. In some soils septic tanks do not function satisfactorily under any circumstances. The map on page recommends general areas of general desirable rural residential development in the City. These areas for the most part coincide with existing road access and development. Some of these areas will be more desirable than others because of proximity to jobs and stores. Other areas will be desirable because of the scenic and recreational attractions such as lakes and wood land. The residential land on the map on page also coincides with general areas where there would be well drained soils which are suitable for building development as well as their nearness to roads and existing development. People choosing to live in a rural part of the Borough should realize the consequences

of their choice. Their population is widely scattered. It is not economically feasible to provide community water and sewer systems. Also, to collect enough children at one place to fill even a small elementary school, many children from rural areas must travel some distance to school by bus. Local routes generally must be constructed at great individual expense in rural areas. It is not fair and equitable to use public funds to pay for public facilities that benefit only a few people. The community must reach a certain size and density before the cost of adequate police and fire protection are justifiable. Public monies are limited and must be spent where they will benefit as many people as possible. Often the tax revenues gained from sparsely settled rural areas fall short of covering even the costs of providing schools.

There are other large areas in the City of suitable soils. However, development of these areas is not recommended at the present time. Development of these areas will depend upon the need and the funds for development of roads to such areas. Although the space that is needed for residential development depends on the size of the sites they are placed on, there appears to be ample room still available on the Dillingham-Alegnigik Road, the Kanakanak Spur, and the Wood River Road in the City.

Townsite Development

The objective for development of the townsite should be to encourage contiguous medium and high density residential development in the areas served by existing water and sewer systems. Without sufficient density, the cost of common utilities cannot be justified. Generally, the lots should not exceed 10,000 sq. ft. in area and lot frontage should be under 100 lineal feet to enable public utility service within a concentrated area. Beyond these limits, the cost to property owners for public water and sewer becomes higher than many owners will pay. Also, the more distributed the population, the greater will be the distances between residences and schools, means of fire and police protection and other public services.

Concentrated communities must be designed for efficient and adequate service by streets, underground and overhead utilities, schools and parks. A well planned community with provisions made for all public services can be an inexpensive and convenient place to live, but if development takes place at random, these advantages may be greatly reduced.

Except for some concentrated development which is located at the Public Health Service Hospital land, recommendations for this type of development are principally in the Dillingham townsite. Water

and sewer, schools, fire protection, and other services are available. Proper planning with provisions for services in the future will greatly reduce the inefficiencies which have been a result of inconsistent planning in the past.

Depending upon the type of development that takes place, it is very roughly estimated that the townsite could contain more than twice the number of residences and people who are now located here. The map on page makes recommendations for this type of growth in desirable areas. The population projections indicate the townsite could absorb the projected population increase for at least the next ten to twenty years. Unforeseen economic development, however, could greatly expand the demand for higher density residential development. Also, the townsite is limited in the amount of good, well-drained level land that is adjacent to the townsite. In order to plan for the eventuality of very sudden economic developments which would increase the population greatly, a large area of very suitable public land in the northwest corner of the City should be held as a community reserve. This area is nicely wooded, level, the soils are well-drained and a couple of lakes adjoining good land in this area would have high recreation potential for possible long-range residential use in this area. If a population increase warrants it, Dillingham could have a chance to plan a model community. The area would begin on slightly more than two miles from the proposed airport terminal. This area should not be developed under any circumstances, however, until the need exists and until land use controls are in force.

Commercial Development

The objective for commercial land use should be to encourage clustering of commercial development in the townsite and near the airport. Clustering of commercial development is actually beneficial to both the shoppers and the business community. Businesses which most frequently locate in central business areas include clothing stores, jewelry stores, banks and speciality stores. Many types of businesses benefit from the "joint magnetism" of centers of commercial development. In such locations, businesses attract more trade than they would if they were separated. This is particularly true of small businesses.

The main business area in the townsite should continue to serve as the business center for the City of Dillingham. Unless very substantial population increases occur, it will be to the advantage of new businesses to locate within the commercial area. The City should consider developing a small parking lot near the center of town. The map on page shows the extent of this commercial area along with another area of special commercial development near the airport.

Industrial Development

The objective for industrial land use should be to encourage industrial development to locate in a pattern consistent with efficient extension of public utilities and transportation and in regard to compatibility with other land uses. The only industrial land use in Dillingham at present is the marine oriented processing industries and other light industrial land uses. There will be provision made for airport related industrial uses as the airport is developed. If a need for other industrial land use becomes apparent, its use should be considered in relation to the other forms of land use surrounding it.

Major Streets

In general, a community has several types of streets. Each traffic carrier should fulfill a defined function. Highways and arterials carry traffic passing from one part of the community to the other. At the other end of the scale, local access roads and streets serve the primary function of providing access to residences and commercial establishments. These different functions generally correspond to different traffic volumes, but the location of the highway or local access streets in relation to the total road network and to the pattern of development is the main determinant of this function.

When the functions of the arterial and access street are mixed, neither function is achieved completely or efficiently. When development fronts on a major arterial and there are many exits and entrances, vehicles must frequently cut across or into traffic. Traffic cannot safely travel at the higher sppeds desired for inter-community travel in these high density access areas, and the speed of the traffic must be reduced. The amount of accessibility which is allowed on a traffic carrier may at some point affect the intended function of a street as a through highway.

In Dillingham, the proposed street system, shown on the map on page , is not complicated. The State maintained highway

system in the area would be generally classified as the arterial highways while the streets in the townsite serve as a local access system. The proposed highway around the south end of the airport will be essential when the airport is expanded but the proposed roads crossing the northwest portion of the City should not be developed until a need is evident. The map on page also shows some desirable street connections in the townsite in relation to the future land use plan.

Immediate improvements on the existing highway system other than normal maintenance should include raising and grading the road from the west edge of the townsite, about one mile, to Windmill Hill, and straightening the Aleknagik Lake road within the city limits past Mile 4. Beyond Mile 8 road improvement should consist of raising and widening, eventually all the way to Aleknagik.

COMMUNITY FACILITIES

This section describes recommendations for community facilities in the City of Dillingham. Because schools, sewer and water, fire and police services, and other community facilities are more effectively provided as part of an overall system, this section considers various kinds of community facilities in relation to projected population throughout the whole area. The recommendations here are formulated with the overall objective of creating a balanced system for community facilities to serve the whole city as efficiently and equitably as possible.

Schools

School enrollment in Dillingham in February of 1971 was 347 students; 165 studnets were in kindergarten through sixth grade, 155 students were in grades six through twelve, and 27 students were in special education. Of the total, there were 42 boarding home students attending school in Dillingham. About 148 students or 42.6% of the total ride the school bus from the Kanakanak, Wood River, and Alegnigik Lake Road areas.

The scope of the plan for Dillingham schools will be to provide a means for fulfilling the needs of the school system in stages of development for the foreseeable future. The sequence of construction of the various stages in the plan, however, will

depend on the availability of the funding. The physical needs may therefore have to be adjusted to the quantity of funding available at each stage.

Expansion and consolidation of the shop facilities is of prime importance at this time and should ahve first priority. The proposed location of the shop at the high school allows joint use of tools as well as the central mechanical system. Direct access to the stage is also available for activities such as set construction. With the completion of the new shop, the small existing shop can be remodeled into a faculty lounge and work room with storage space available. This will release the class room in the existing building which is now being used as a faculty lounge and work room.

The proposed gymnasium, provides a standard size high school game court for practice or physical education courts, folding seating, stage, and locker facilities for both boys and girls. A small office and gymnasium and gym storage are also provided.

Renovation of the existing gymnasium consists of adding a floor to provide two levels with approximately nine foot ceiling heights. This renovation will provide space for an instruction materials center, teaching areas, and space for seminar and work areas.

The instructional materials center is centrally located and will efficiently serve both the existing and the new structures.

The teaching and multi-use construction consists of two stories of team teaching and multi-use areas as well as related facilities. Construction has already started on this addition and a large quantity of material is in place on the site. If this construction is completed prior to the renovation of the existing gymnasium, however, a temporary instructional materials center would be included.

The present funding of $720,000 should be adequate to construct the shop facilities and the teaching and multi-use unit by using materials on hand and incorporating the existing foundation. The major problem with this sequence is access from the existing building into the new unit. Traffic would have to flow either through the gymnasium or go outside. Unless further funds are available, however, the construction of the shop facilities, the new gymnasium, and the renovation of the existing gymnasium at this time is not feasible.

The old wing of the existing elementary school is condemned and will be abandoned except for storage. The other six classrooms in the elementary school are to be remodeled to provide approximately nine teaching stations.

Additional land at the high school must be obtained to provide all the facilities as designed. Ideally, a high school should be located on a site of about 20 to 30 acres. The site needs for a high school in Dillingham, however, may not be this great, but consideration should be given to any particular needs of the school facility. The playground at the elementary school appears to be adequate for the immediate future.

Plans are now being drawn up for a boarding student dormitory for as many as 80 students at Dillingham. The location of this dormitory should be near the high school. The exact date that this facility would be completed has not been established. However, the Department of Education has designated September, 1973 as a possible opening date. If hot lunch facilities are not provided in the proposed dormitory, a portion of the multi-use space could be converted into an eating area.

Recreational Facilities

As part of the comprehensive plan, the City of Dillingham should encourage the development of parks and other recreational facilities located to conveniently serve the concentrated areas of residential development. Recreational facility needs vary in relation to the type and function of the facility as well as the population and area that the facility serves. Regional parks, for example, serve functions such as wildlife management, multiple use, environmental preservation, and outdoor recreation. Recreational uses of regional parks or reservations include activities such as camping, hiking, hunting, fishing and nature study, and the use of these areas is primarily oriented towards regional, intra-state and inter-state needs rather than local needs. An example of this type of recreational preservation in the Dillingham area might be parts of the Wood River-Tikchik Lakes area.

The local recreational facilities which are discussed in this section are the type of facilities which would be provided in areas of concentrated residential development rather than in rural or undeveloped regions. These local facilities include neighborhood parks and playgrounds.

Neighborhood parks should serve the local recreational needs of people within a radius of about one-half mile. Types of recreational activities which would be suitable for neighborhood parks facilities including play areas for young children and children's play areas with playground equipment. This type of park is meant to serve a large population on a site of about 10 acres, with about 7.5 acres used as a playfield and 2.5 acres for playground equipment. The map on page makes recommendations for a neighborhood park in Dillingham.

The public school playgrounds and gymnasiums offer an economical means of providing after school, weekend, and summer recreation for children. It is essential to a good program serving local school children that the City arrange to allow maximum after school and summer use of school recreational facilities. If such facilities must stand unused for part of the year, the taxpayers investment is partially wasted. Such extra curricular use of school facilities can also serve the functions of the community center.

Like elementary schools, playgrounds should be dispersed to be as near as possible to the residences of the children who will use the facility. Wherever warranted by the existing or potential incident of residential development and where school

playgrounds are beyond convenient walking distance, separate playgrounds should be provided. Playgrounds or children's play areas with equipment should have a minimum of about one acre and ideally four acres. Playgrounds should serve people within a radius of about one-quarter mile. The playground at the elementary school in Dillingham should serve this purpose.

Fire Protection

The City has a ten member volunteer fire department and the equipment consists of a 2,000 gal. pumper tanker truck, a trailer pumper tanker, a jeep with ladder sides, and CO^2 fire extinguishers. There are fire hydrants at several locations in the townsite. Fire alarm communication is by telephone to the individual members of the volunteer fire department. The department is involved with the training program on a continuing basis, and has conducted a pre-fire survey.

Improvements which are needed in the immediate future include a new fire truck and a more rapid method of fire alarm communication. The existing pumper tanker is serviceable but it is slow. The system whereby telephones would ring simultaneously at the City Hall and the homes of all the volunteer fire department members would also greatly improve the response time and thus improve fire protection. The driveway at the fire hall also needs improvement so that the fire trucks can swing onto the highway more easily.

The fire hall in Dillingham is in a good location. Also this location at the edge of the townsite is on the State highway road. The fire equipment can therefore serve the outlying area without the necessity of traveling through the townsite, but the distance to some of the more outlying areas is not desirable for good fire protection.

One possibility of more effective coverage of the City is joint use of fire equipment with the State Division of Aviation. The Division of Aviation could, with the help of the federal grant, purchase a fire crash truck with apparatus having the ability to extinguish wood, fuel or electrical fires. Two fulltime maintenance men - firemen, paid by the State, would live in homes to be built adjacent to the new fire station at the airport. These firemen would belong to the volunteer fire department and because of their proximity to the fire equipment, the response time would be greatly reduced. The volunteer department could be primarily located at the airport, although the city pumper would remain in town. The City would then pay a portion of the maintenance of all the equipment. If this arrangement would be workable, fire protection could be provided at greater efficiency and economy through elimination of duplication of effort, but also the distance required to cover other parts of the City would be greatly reduced.

The Pacific Fire Rating, a branch of the American Insurance Association (formerly known as the National Board of Fire Underwriters), established mercantile and residential fire protection standards for small municipalities. This organization analyzes each city building department, water department and fire department in arriving at the rating which is a basis

for calculating insurance premiums. A grading schedule of the American Insurance Association is a means of classifying municipalities with reference to their fire defenses and physical conditions.

The annual savings in fire insurance premiums to a homeowner living within an area served by fire hydrants is substantial. It is not economically feasible, however, to install a public water supply and hydrants where development is sparse. Improving fire protection service in the City will not only serve the main objective, residents against loss of life and property, but will also have a secondary effect of reducing the cost of fire insurance. The location of fire stations should be selected with care so that the best possible fire protection can be provided per dollar of public investment. Individual fire stations should be planned as part of a total fire protection system and their location and capacity should be determined in relation to land use and population density. Standards are set quite explicitly by the American Insurance Association. When additional stations are needed, a distribution standard recommended by the Association should be used. Most of the outlying area in the City of Dillingham must meet the standards set for buildings having an average separation of 100 feet or more. In such areas the Association recommends four miles as an optimum service radius.

Small Boat Harbor

The existing project provides for a small boat basin five acres in area. Controlling depth in the harbor is 2.0 feet about mean lower low water, which provides safe moorage for approximately 100 fishing vessels and services for 100-personally-owned boats used to haul supplies to river settlements. Dredging of the basin was completed October, 1961. However, siltation has since reduced the project depth in the basin. Therefore, a study of the siltation problem was completed, and as a result a Government-owned cutter head dredge was purchased. Annual dredging commenced June, 1969, continued that season and the following season of 1970. The harbor is now being maintained at project depth.[1]

---

1. U. S. Army Engineer District, Alaska Corps of Engineers, March 1971.

WATER AND SEWER

The Township of the City of Dillingham, an area of approximately 22 square miles, has two settlements which have a population density which warrants community or centralized water and sewer systems. These two areas are the City proper and Kanakanak. The remainder of the township population is not, nor will be in the near future, of sufficient density to justify additional or greatly extended community or centralized water or sewer systems. This rural area presently utilizes individual, private wells and septic tanks or seepage pits.

The City manages and operates the public water and sewer systems at the townsite. The Kanakanak water and sewer systems are managed, owned, and operated by the Public Health Service Hospital for the resident hospital staff and they are not "public" systems in the truest sense.

Water is available in the area from shallow wells. It is hard and has a high iron content. The Public Health Service Hospital has two such wells, two underground storage tanks with a hydro-pneumatic pressure system. The City has a single well (capacity 20 gpm) with a 120,000 gallon elevated wooden storage tank. Both the Public Health Service Hospital and the City have water treatment for hardness reduction and iron removal.

The Public Health Service Hospital oxidizes the collected sewage by the use of a Yoeman-Shone "slinger," controlled by a timed cycle to keep operating costs at a minimum. A new chlorinator is being installed for final effluent treatment.

The City has an extended aeriation sewage treatment facility which was oversized for the City's needs. The operating costs were so high (approximately $550.00 per month for electric power alone) during the first four months of use, that the City shut down the plant (February 1966). A bypass around the plant was constructed and raw sewage has been dumped into the Nushagak River ever since.

It is very sombering to compare the City and Hospital systems together. The Public Health Service Hospital has a large, permanent maintenance crew and a superb preventative maintenance program. As a result, the Kanakanak central water and sewer systems are in perfect condition, neatly painted, clean, etc. The City water and sewer systems represent the exact antithesis to those of the Public Health Service Hospital. The original water system was installed on a minimum budget basis and until recently the City has been unable to establish a permanent maintenance crew. A severe lack of operating capital has dictated that maintenance programs and system repair be accomplished by "make-do" methods. The new maintenance crew has had to perform tasks that would keep two times as many men busy, work with "hand-me-down" equipment from State surpluses. The surplus equipment has been more of a hindrance than a help - valuable time is lost during the short construction season just keeping the equipment running. Consequently, the City water and sewer systems are in a sad state of disrepair, so much so, in fact, that the City was plunged into a State of Emergency this past winter, suffering from severe silting of the single, inadequate water well and general freezing problems with the storage tank.

Due to poor performance, there is general antagonistic public opinion regarding the City's water and sewer system, so much so, in fact, that the City Council is reluctant to even approach the citizenry for additional funds to properly repair the systems. Without public support, State and Federal aid is impossible on a share basis.

The existing City water and sewer should be extended as shown on Map _____ to complete water loops and extend services to total population in the townsite. This will provide a greater source for revenue. The current user charges should be increased to finance a program for system repair.

It is not recommended that any attempts be made to centralize the independent water and sewer in the now rural areas between the townsite and Kanakanak until a definite increase in the population density occurs. The normal accepted break even point between private and community water and sewer systems occurs when the lot sizes approach two acres.