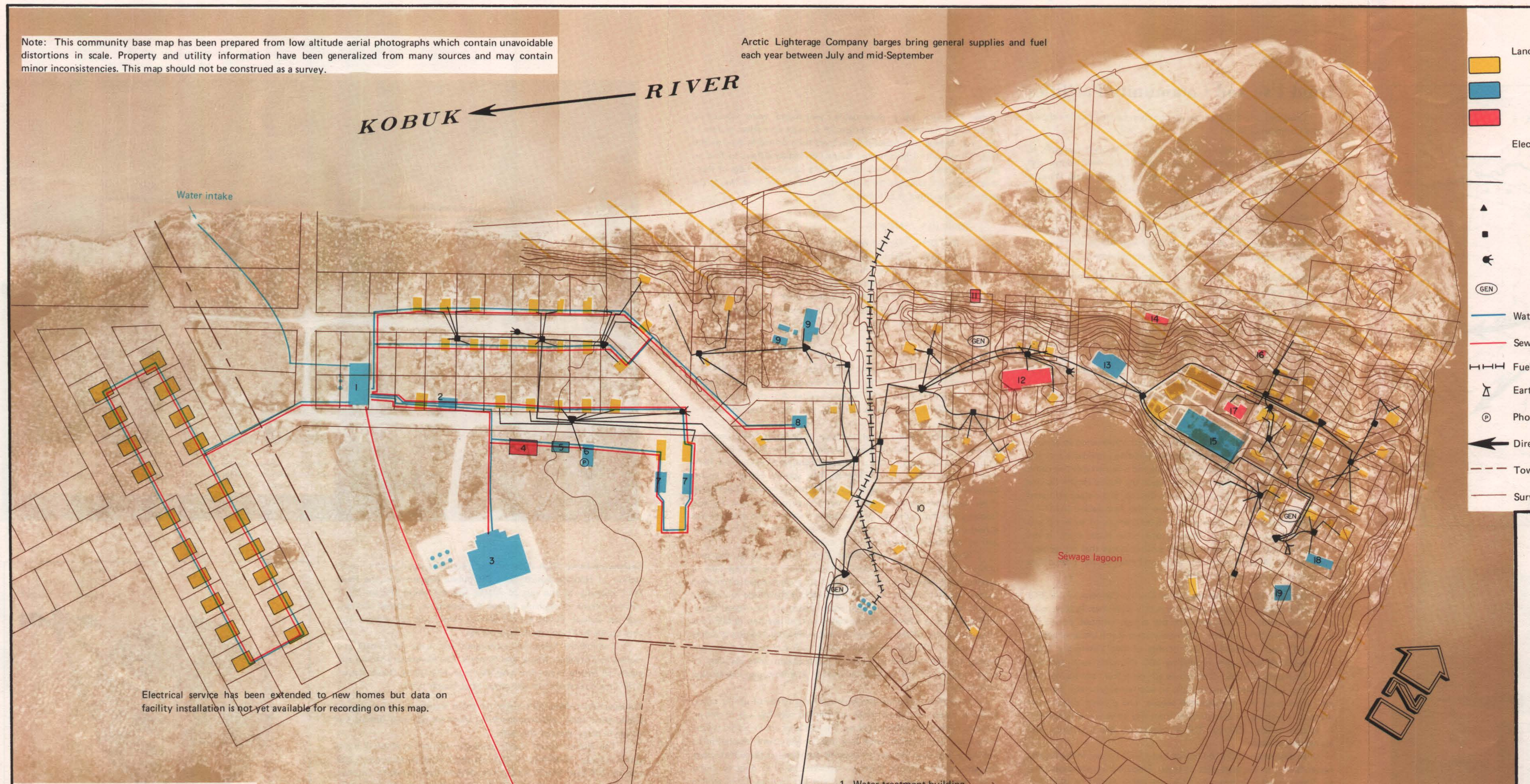


Flood Data

U.S. Army Corps of Engineers. Preliminary draft 1975. Compiled from aerial photos dated 7-8-68 by the Bureau of Land Management, Division of Engineering, Branch of Photogrammetry. 10-10-68. Assumed grid. Assumed elevation.

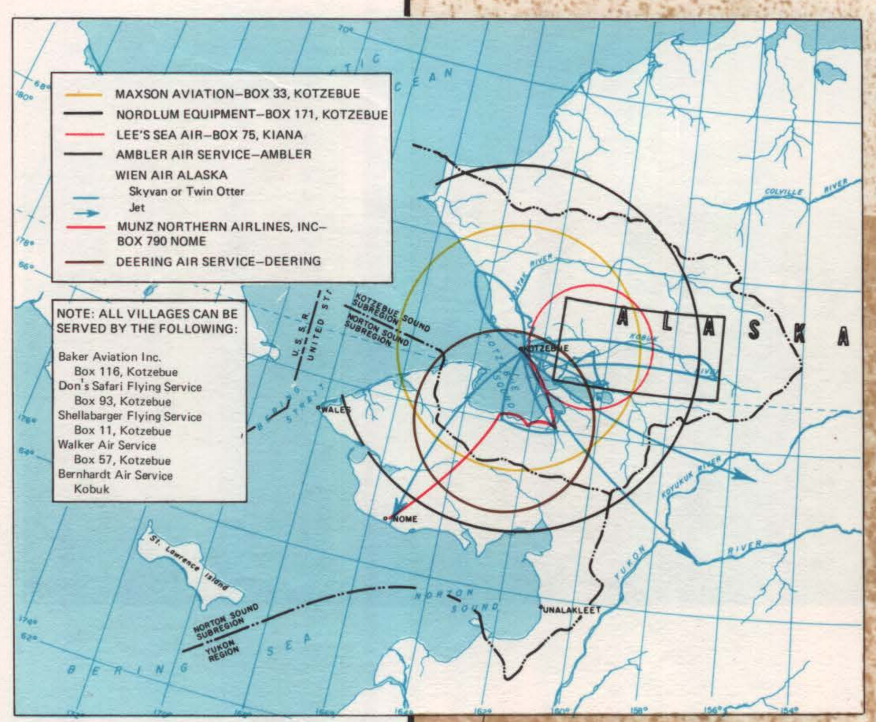
Area that would be inundated by a flood with a frequency of approximately 100 years.

- Flood hazard work was performed by the Alaska District Corps of Engineers at the request of and funded by the Federal Insurance Administration.
- The flood hazard area shown hereon is based on meager data, plus a minimum of historical flooding information and should be considered as preliminary.
- The major flooding that occurs at this location is the result of spring ice jams.
- Any levees or dikes were considered in delineating the approximate 100 year flood.

1. Water treatment building
2. Public Safety building
3. High school
4. Restaurant and motel
5. Post office
6. Head Start building
7. Junior High school
8. Clinic
9. Friends Mission grounds
10. Cemetery
11. Warehouse
12. ANICA store
13. Friends Church
14. Warehouse
15. Elementary school
16. Store
17. Store
18. National Guard Armory
19. Old city office building

The description of the municipal boundaries approved by the State under the Village Incorporation Act is as follows:

Starting at the NW corner of the Bureau of Indian Affairs School and measuring a distance of 1053 ft. on a magnetic bearing of 304 degrees to a point near the shore of the Kobuk River, this point is designated as the beginning point; thence in a southerly direction 1795 ft. following the shore of the Kobuk River to a point where the Selawik Dogteam Trail intersects the Kobuk River Shore; thence following the Selawik Dogteam Trail in an Easterly direction for 1110 ft. to a point where the said trail is intersected by a feeder trail; thence in a northeasterly direction 1450 ft. to a point intersecting the Kobuk River shore; thence following the shore in a northwesterly direction 1050 ft.; thence following the shore in a westerly direction 1200 ft. to beginning point.



Community Base Map—Maps are needed to show land use, ownership, location of utilities, and to plan for future village improvements. These maps can be prepared by either surveying the land on the ground or through enlargement of aerial photos or by a combination of both. Air photos can be taken at various heights. The height determines the extent of the area covered by the photograph.

The Community Base Map was prepared from a photograph taken at a height of 1,800 feet and enlarged to a scale of 1:2,400 (1 in. = 200 ft.). This map was used to locate the present utilities, residential development, and various community services and can be used in the future to evaluate the area for village expansion and to locate new construction.

The photograph to the right was taken at a height of 8,400 feet or one inch equals 1,400 feet. From this height the village as well as the land around it can be clearly evaluated. This photograph shows that Noorvik has no roads leading into the community and that the river has changed its bed many times in the past, as reflected by the remnants of stream channels presently occupied by lakes and vegetative succession. The terrain reflects the presence of permafrost, and the topography of the area is very flat. This kind of data is very important in the development of community growth and expansion as well as to understand some of the environmental conditions that are presently affecting the community, such as flood, erosion, source of water supply, and location for disposition of waste.

COMMUNITY MAP

NOORVIK

66°50'N 161°03'W Elevation 63'

Scale: 100 0 200 400 Feet; 50 0 50 100 150 Meters

Prepared by the Arctic Environmental Information and Data Center, University of Alaska, for the Alaska Department of Community and Regional Affairs

The preparation of this document was financed in part through a comprehensive planning grant from the Department of Housing and Urban Development under provisions of Section 701 of the Housing Act of 1954, as amended, and the Division of Community Planning, Department of Community and Regional Affairs of the State of Alaska. December, 1976.

Environmental Considerations for Community Development

Community development must consider all environmental factors that affect the engineering design and location of structures, including climate, topography, soils, permafrost, erosion, and flooding.

Climate

Climatic data on winds, precipitation, temperature, and snowfall (Figure 5) allow engineers to design buildings strong enough to withstand heavy winds and deep snow, select type and thickness of insulation to reduce heat loss, and estimate fuel requirements. Climatic data are also needed to determine the type of clothing needed to protect the human body against extreme temperatures.

Chill Factor—If the air temperature is below body temperature, a person loses heat to the atmosphere. When the wind blows, the rate of heat loss increases; therefore, air temperature and wind velocity are the two environmental factors which affect body heat loss. Wind chill data (Figure 6) were developed by combining wind and temperature measurements into numbers which express equivalent chill temperatures.

Snow Load—Snow load data are used in the design of structures to determine the strength needed to withstand the weight of packed snow. The U.S. Army Cold Regions Research and Engineering Laboratory has estimated local ground snow loads in pounds per square foot (psf) for many areas of Alaska. The design load selected depends on the expected use, life span, and geographic location of the building. For example, a five-year life span could be selected for a temporary facility. A structure that can withstand 56 pounds of snow per square foot is considered safe for five years in Noorvik. A building with a life expectancy of 25 years must be able to withstand a snow load of 77 psf; a 50-year structure should be designed to withstand 86 psf; and buildings with an anticipated life of 100 years or more, such as hospitals and other long-lasting, permanent facilities, should be able to withstand 95 psf.

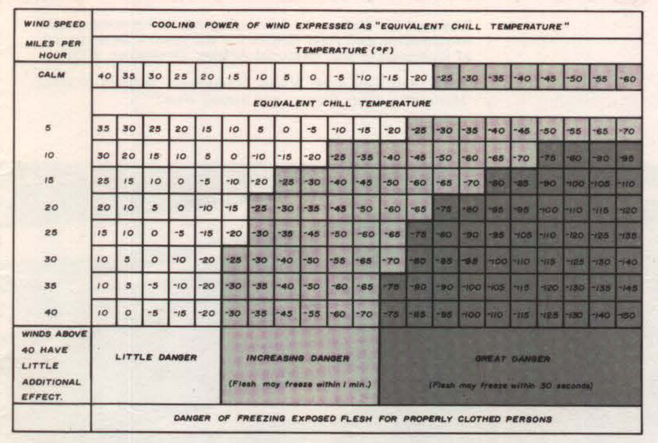
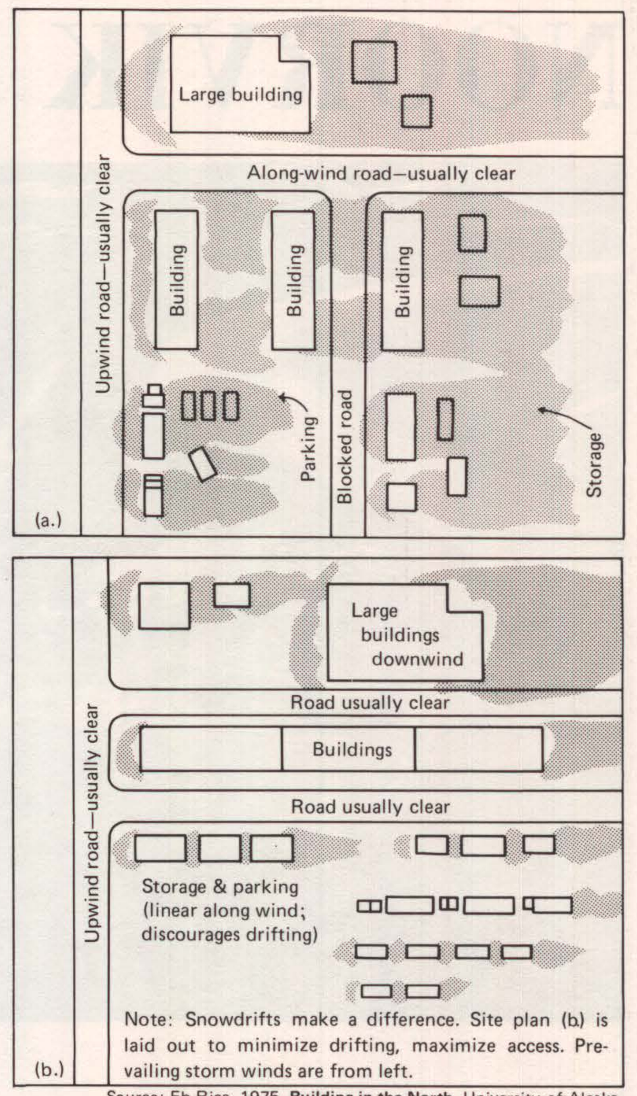


Figure 6
Wind Chill Temperatures

Wind Speed—Information on wind speed and direction is necessary to design and orient airports and other structures. It has been estimated that for a structure with an expected life of 10 years a structural design that could withstand extreme wind speeds of at least 80 miles per hour should be chosen; 90 miles per hour for a structure with an expected life of 25 years; 100 miles per hour for a 50-year life; and 105 miles per hour for a structure with a life expectancy of 100 years or more.

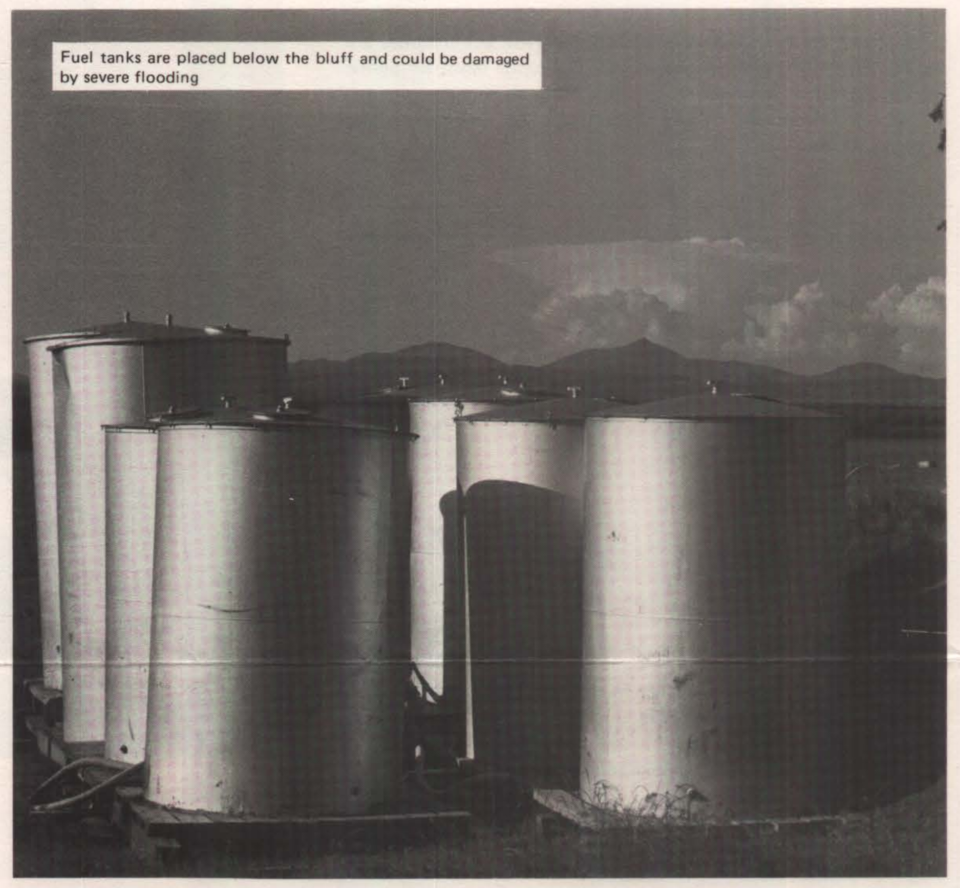
Location of buildings must also consider the direction of wind to minimize snowdrifts (Figure 7).

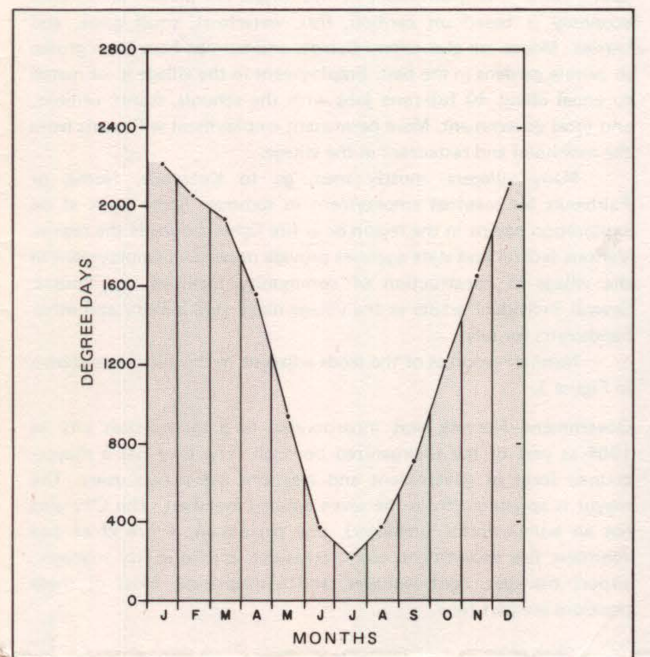
Heating Degree Days—Annual fuel requirements for heating a building can be calculated from heating degree day information. Structural heating usually begins when the air temperature is near 65 degrees F, the index temperature. If a particular day has a mean temperature of 50 degrees F, 15 heating degree days accumulate (65 minus 50). For the entire year the heating load is the sum of the daily degree days. The degree days for each month of the year for Noorvik are shown in Figure 8. This information, combined with an inventory of types, sizes, and insulative qualities of buildings, can determine the amount of fuel required for a specific time period in the village.



Source: Eb Rice, 1975. **Building in the North.** University of Alaska.

Figure 7
Snowdrifts and Wind Direction

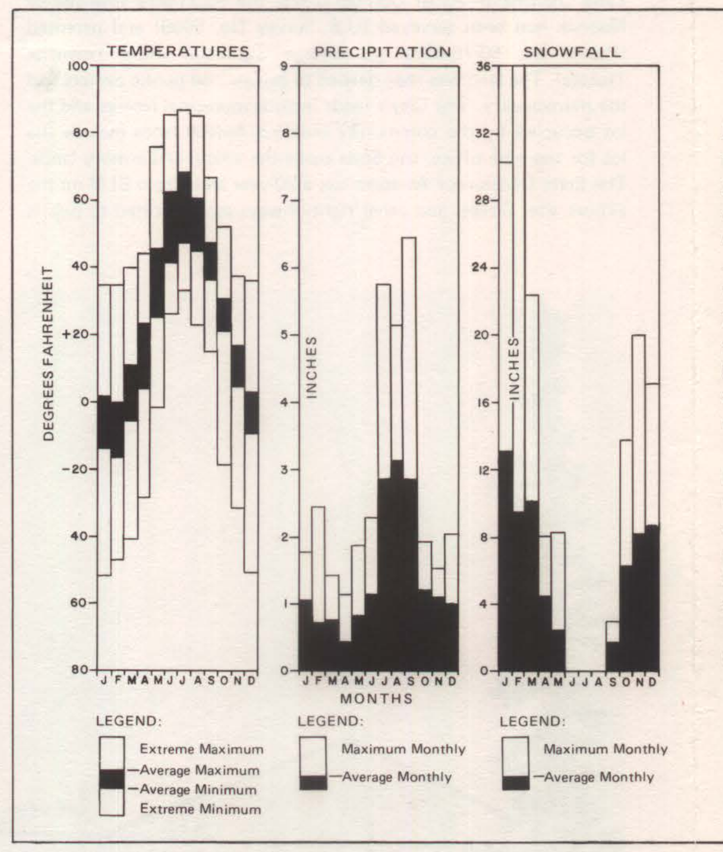




A rectangular 500-square-foot home insulated with fiberglass requires about 50 gallons of fuel oil for heating during January in Noorvik. This estimate is based on four-inch-thick fiberglass in the walls and floor, six inches in the ceiling, and a desired temperature of 70°F inside the home. Fuel consumption could be reduced by adding more insulation, minimizing window sizes, and by installing a subfloor to trap air between the floor and crawl space. Heaters should also be adjusted for efficient burning. Assistance in construction can be obtained from data developed by Dr. Eb Rice, University of Alaska, Fairbanks.

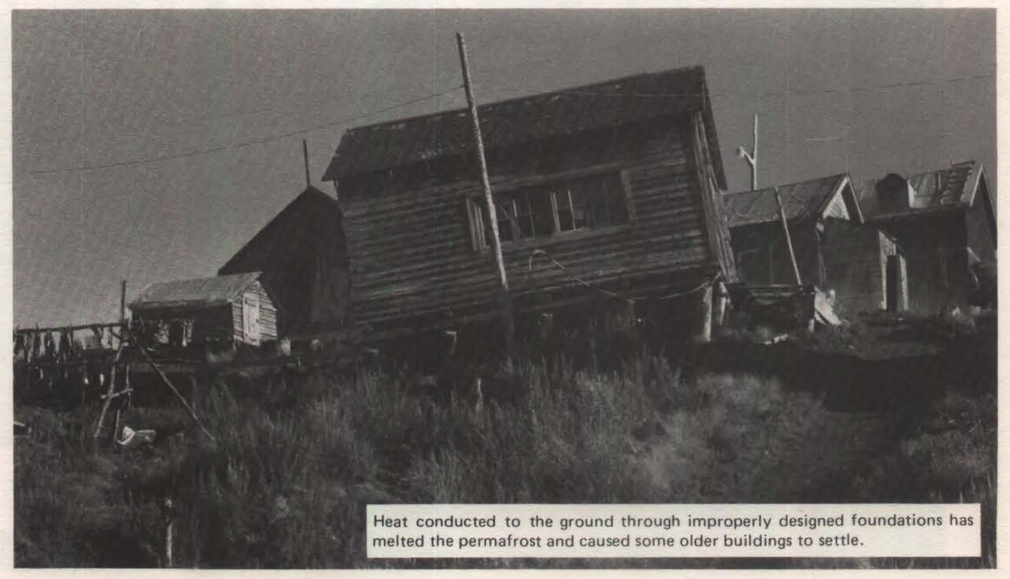
Figure 8
Heating Degree Days—Noorvik

Figure 5
Climatic Data Recorded at Noorvik



Note: Noorvik is located in the transitional climate zone which is characterized by long, cold winters and cool summers. Temperature extremes of 87°F in summer and -54°F in winter have been recorded with summer temperatures averaging 60°F. Precipitation averages over 16 inches annually, including 60 inches of snow. There are an estimated 1,354 growing degree days at Noorvik, less than the 1,500 considered necessary for large-scale agriculture. Prevailing winds average 10 knots annually and are easterly in winter and westerly in summer. Additional information on climate is available at the Arctic Environmental Information and Data Center, University of Alaska.

MONTH	Temperature (°F) Means: Daily Maximum	Daily Minimum	Monthly	Extr.: Record Highest	Record Lowest	Precipitation (in inches): Mean	Greatest Daily	Greatest Monthly	Snow, Ice Pellets: Mean	Greatest Daily	Greatest Monthly	Greatest Depth on Ground	Heating Degree Days
(a)	5	5	5	5	5	8	8	8	8	8	8	5	
J	0.9	-14.7	-6.9	34	-54	0.96	0.68	1.66	12.9	8.5	30.3	31	2229
F	-0.1	-16.3	-8.2	34	-49	0.63	0.47	2.39	9.2	12.0	37.8	38	2068
M	10.7	-6.3	2.2	40	-43	0.65	0.42	1.31	9.7	6.0	22.5	44	1947
A	22.7	3.1	12.9	44	-30	0.32	0.33	1.03	4.0	3.0	7.6	54	1563
M	44.8	24.4	34.6	76	-3	0.71	1.38	1.77	1.8	2.5	7.8	23	942
J	62.2	41.9	52.1	85	26	1.05	0.72	2.22	T	T	T	0	387
J	67.7	47.2	57.5	87	33	2.78	1.93	5.75	T	T	T	0	232
A	60.4	45.1	52.7	85	22	3.09	1.45	5.13	T	T	T	0	381
S	47.2	36.4	41.8	66	14	2.84	1.09	6.43	1.1	2.0	2.5	2	696
O	30.5	21.3	25.9	52	-20	1.24	1.01	1.84	5.8	5.0	13.5	8	1212
N	15.4	4.1	9.7	37	-33	1.05	0.91	1.46	7.7	7.5	19.8	13	1659
D	1.4	-10.4	-4.5	36	-52	0.88	0.49	1.99	8.1	6.0	17.1	14	2155
YR	30.3	15.4	22.9	87	-54	16.20	1.93	6.43	60.3	12.0	37.8	54	15471



Topography and Soils

Site selection and foundation design of buildings are directly affected by the strength or bearing capacity of soils, topography, drainage, erosion, and the presence of permafrost.

Noorvik lies on the old levee of an ancient floodplain of the Kobuk River. The river has now eroded a deeper channel and deposited a modern floodplain at the foot of the bluff below the village. This floodplain has numerous lakes and channels.

Most of Noorvik has been built on frozen sandy silt. The riverbank consists of locally thawed sandy silt, while sand and silty sand occur on river bars and lowlands. The back swamp areas inland from the levee consist of frozen silt and silty clay.

Permafrost—Permafrost (permanently frozen ground) is continuous under most of the area. Major engineering problems arise when permafrost occurs in fine-grained, poorly drained material. These sediments can contain large amounts of ice. If the ice melts, the soil will become unstable and may move. Polygonal ground is present wherever the tundra has not been disturbed by grading, suggesting that vertical ice lenses occur in the frozen silts.

Permafrost should be protected from thawing whenever new structures and utilities are built in the village. The most common methods of protecting permafrost are to place a thick gravel pad between the structure and the frozen ground to limit heat transfer or to raise buildings on pilings to allow air circulation under the structure. Utility pipes have been insulated and placed in utilidors so that a minimum of heat transfers from the pipes to the ground.

Erosion and Flooding—Noorvik stands on the concave side of a bend in the Kobuk River and is not endangered by river erosion. Local residents indicate, however, that portions of the bluff slough off each spring in areas free of vegetation.

Recently, fuel storage tanks have been constructed on the floodplain at the base of the bluff. These structures are subject to flooding, and their relocation should be considered. A few old buildings remain on the floodplain, but the bulk of the village is located on high ground.

The most important thing to remember when building in the Arctic is that successful design requires site investigation and the advice of competent engineers because of the special conditions in the North. Neglecting these considerations can lead to complete failure of structures.