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Beluga Coal Field Development: Social Effects and Management Alternatives

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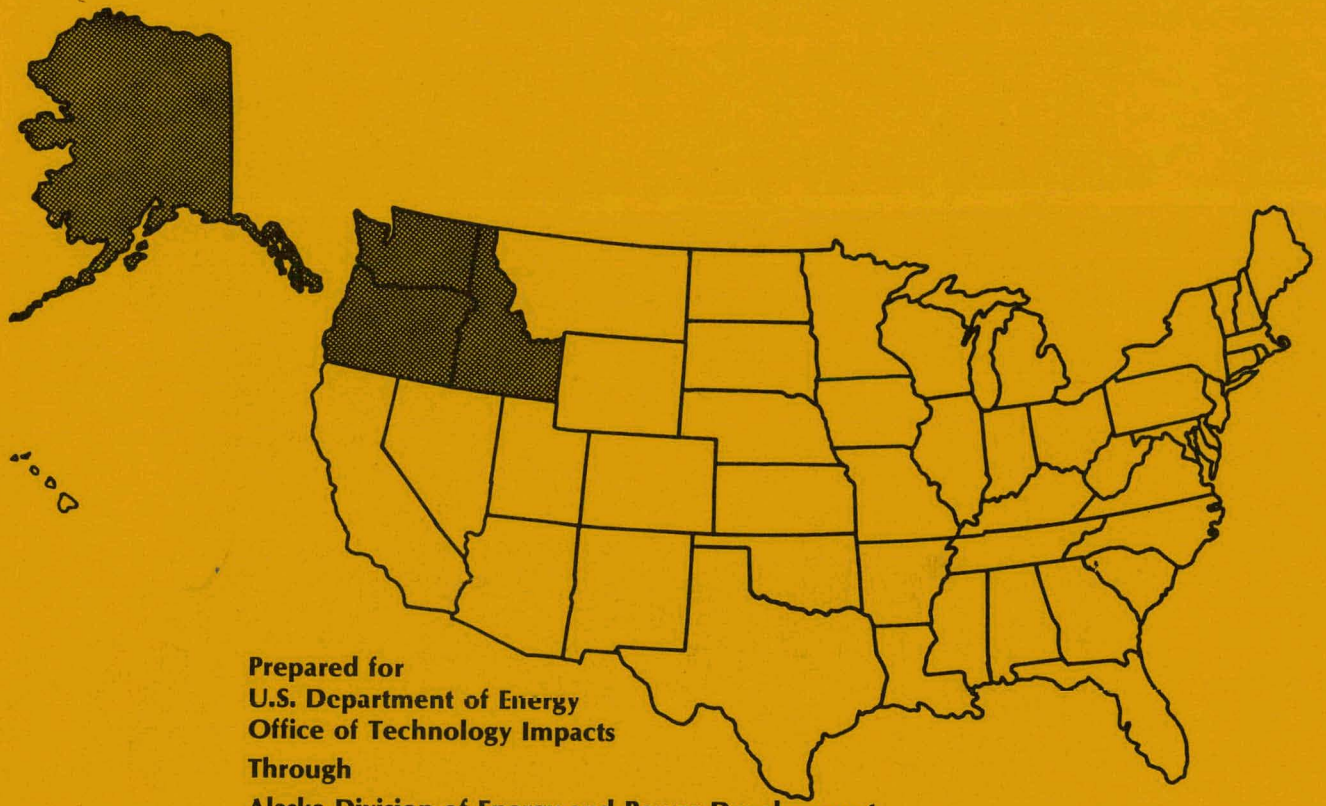

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BELUGA COAL FIELD DEVELOPMENT: SOCIAL EFFECTS AND MANAGEMENT ALTERNATIVES

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PREFACE

This study was conducted for the Division of Energy and Power Development of the Alaska Department of Commerce and Economic Development and the Regional Assessment Division of the U.S. Department of Energy. It was a joint effort by the Battelle Human Affairs Research Centers and CH2M HILL. The development scenarios in Chapter 1 were constructed by Marvin Olsen of Battelle; the evaluation of regional impacts in Chapter 2 was performed by Christopher Cluett of of Battelle; the analysis of settlement requirements and service needs in Chapter 3 was prepared by Susan Brody, Corby Howell, and Loren Leman of CH2M HILL; the assessment of effects on the Village of Tyonek in Chapter 4 was carried out by Joseph Trimble of Battelle; the decision-making framework discussed in Chapter 5 was produced by Susan Brody of CH2M HILL and Glen Svendsen, a private consultant; the recommendations for further study listed in Chapter 6 were compiled by Marvin Olsen of Battelle from suggestions made by all the project participants. Marvin Olsen and Susan Brody coordinated the project.

All written source materials for this study are listed in the bibliography. Much information for the study was also obtained through personal interviews. All of the persons interviewed are listed in the bibliography.

In addition to this study, the Division of Energy and Power Development has prepared two baseline reports on the environment and land tenure of the Beluga coal district, as well as a summary of coal technology and transportation methods for moving the coal to market.

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SUMMARY

Plans are under way to mine the Beluga coal fields on the west side of Cook Inlet. The coal will be strip-mined for export, or to supply local electric generating plants, or both. Over the next 20 years, this coal development activity is likely to generate social and economic impacts at the local, regional, and state levels. The purpose of this study is to assess the potential social and economic effects of coal development, including employment and population growth, regional impacts, and the facility and service needs of a new settlement in the Beluga area. Of special concern is identifying the role of various governmental agencies in the development process. Potential effects on the natural environment are not examined in detail since they are expected to be controlled to acceptable levels through existing federal and state laws.

This report examines three possible levels of coal-field development and the settlement requirements associated with each. Scenario 1 postulates a low level of coal mining to supply local generating facilities. Initial construction activities in 1980 would create a total population of about 200 persons, increasing to over 500 in 1982 and 1983, and leveling off at 320 in 1986, when the construction phase would be complete. Scenario 2 assumes that mining would begin in 1990 to supply coal for an export market. A population of 300 to 320 would be associated with this mining activity and would remain fairly stable over the years unless the volume of coal being mined and exported were considerably increased. Both scenarios 1 and 2 would require a permanent work camp to house construction, mining, operating, and support workers and any nonemployed dependents.

Scenario 3 assumes that two coal-fired generating plants would be constructed in the Beluga area between 1980 and 1985, and that six million tons of coal would be exported, beginning in 1990. A work camp would serve workers until about 1989, when it would begin to evolve into a full-scale community, with a diversity of housing types and services. By 1991, a population of over 1300 residents might be reached.

The most probable regional impacts associated with Beluga coal-field development will include effects on the regional labor force, the market for coal, and the generation and distribution of revenues. The main regional labor force impacts will be positive in nature. The rate of regional unemployment is likely to decline slightly for the duration of the project, with an increase in wage income available for reinvestment in the region and a reduction in the number of individuals receiving unemployment insurance payments. Coal development is not expected to induce any significant in-migration of workers from outside the Anchorage-Kenai Peninsula Borough region.

The development of the Beluga coal resources and the production of electricity from coal would add to the Kenai Peninsula Borough's tax base. The assessed value of coal lands around Beluga would likely increase and, in addition, Cook Inlet Region, Inc. would be the recipient of royalties from coal leases.

The land requirements for a new settlement in the Beluga area will vary, depending on whether a work camp or full-scale community is planned. A 500-person work camp, with dormitory housing, a kitchen-dining hall, and recreation facilities may require about 40 acres of land. A permanent community for about 1500 people would likely require from 600 to 1200 acres, depending on density and design. It would need to include a school, recreation center and park, clinic, police-fire station, city hall, and retail commercial area, in addition to both single- and multi-family housing.

A number of factors will affect the choice of settlement site, including slope, drainage, soils conditions, land ownership, and access to transportation facilities. Placer Amex Inc. has suggested an area near Congahbuna Lake, to the west of the former Moquawkie Reservation, as a likely settlement site.

Housing requirements for a work camp would probably be met by prefabricated structures, primarily dormitory units for single workers and a small number of two- and three-bedroom houses or mobile homes for families. A full-scale community would also require dormitory housing initially, until

the construction period is completed. Housing demand would then shift to a mixture of one-, two-, and three-bedroom units, including mobile homes. The total required housing units under scenario 3 is expected to be about 475 from the year 1991 on.

Classrooms and teachers will be provided by the Kenai Peninsula Borough School District for any school-age children who live in the project area. Few children are likely to live in a work-camp setting, but a full-scale community is expected to attract many families. A community with a population of 1300 residents could require school facilities for over 280 pupils.

Other services and facilities required by a new settlement include police and fire protection, recreational services, parks, libraries, medical care, water and sewer systems, roads, and electric power. The role of state and local agencies in providing these services and facilities will depend to a large extent upon the legal status of the new settlement. State support of local public services could range from actual provision to financial support of programs administered by a local government. A *Development City* could be established under existing state statute, increasing the settlement's eligibility for financial assistance from state agencies.

Life in the village of Tyonek could be disrupted by coal development and any associated new settlement in the area. Tyonek residents may become a minority in their own region and have difficulty maintaining their preferred lifestyle. Social problems can emerge that would affect education, traditional subsistence efforts, and community beliefs and attitudes. However, preventive measures can be taken to minimize adverse impacts by assisting coal developers and new workers to understand the needs and priorities of Tyonek residents.

Governmental and private agencies with interests in the Beluga area include the Tyonek Village Council, the Tyonek Native Corporation, Cook Inlet Region Inc., the Kenai Peninsula Borough, and the State of Alaska. All of these organizations are likely to become involved in various aspects of coal-field development.

The principal purpose of this study is to assess the potential social and economic impacts of Beluga development. A number of recommendations for research and governmental activities were derived from the study effort, however, and these recommendations are presented in Chapter 6.

Chapter 1
DEVELOPMENT SCENARIOS

INTRODUCTION

The extent to which coal will be mined in the Beluga area during the next 20 years cannot be predicted with any accuracy at the present time. Possibilities range from no mining at all to large-scale operations of 30 million tons per year. Numerous contingencies will affect the eventual development outcomes, including governmental requirements that utilities substitute coal for natural gas for electricity generation (unless Alaska is exempted from this requirement), the market demand for coal in the United States and around the world, the rate of industrial growth in the Cook Inlet region, and the responses of native villages and corporations to economic development in their region.

To take account of this wide range of possible future trends at Beluga, this report examines three alternative development scenarios: 1) a relatively low level of coal mining to supply fuel for additional electric generating facilities at Beluga; 2) moderate-scale mining operations for export, but no on-site use by generating facilities; and 3) a combination of both these conditions. These are the three situations that are thought most likely to occur at Beluga, and they represent considerably different levels of coal mining development.

In addition to these three possibilities, there has been considerable speculation about various forms of industrial development in the Cook Inlet region that would require coal for either process heat generation or electricity generation, or both. These possibilities include a petrochemical plant, an LGN plant, and an aluminum smelter. However, none of these projects is definite at this time. Therefore, their potential effects on coal development at Beluga cannot be estimated with any certainty. At one extreme, if a single plant were constructed on the Kenai Peninsula, and if coal were already being mined at Beluga, no more than an additional 20 to 30 miners would be required. At the other extreme, if several plants were

constructed at Beluga, the construction and operating work forces, plus the associated secondary economic growth and influx of dependents, might push the population of the community at Beluga to 3000-4000 people. Consequently, this analysis does not specifically take into account the possibility of coal-dependent industrial growth in the Cook Inlet region. If and when such plans become more definite, however, their likely social and economic effects on Beluga could be incorporated into the scenarios analyzed here.

BACKGROUND DATA

The data used in constructing the scenarios for this report were obtained from a variety of sources, through personal interviews. These sources were:

- Placer Amex, Inc.
- Chugach Electric Association
- Pacific Northwest Laboratory
- Alaska Division of Energy and Power Development
- Alaska Division of Community Planning
- Alaska Division of Community and Rural Development
- Alaska Department of Transportation and Public Facilities
- Kenai Peninsula Borough Planning Department
- Cook Inlet Region, Inc.
- Tyonek Native Corporation
- Tyonek Village Council

Considerable information relevant to future development possibilities at Beluga resulted from these interviews, the most significant of which was that:

- The Beluga Coal Company (a wholly owned subsidiary of Placer Amex, Inc.) would like to begin mining development in the Beluga area within the next two or three years if possible, but it cannot initiate any projects there until it has a firm market for the coal. At the present time that market does not exist.

- If mining is begun at Beluga, it will likely be limited to the Capps coal field for the immediate future, since it is the most accessible of the three deposits for which Placer Amex, Inc. holds leases. The land on which the Capps field is located will be owned by Cook Inlet Region, Inc., so that it would receive the royalties from all mining activities in that field. These operations would be strip-mining with heavy equipment, since the coal lies quite close to the surface. It is subbituminous coal with a moderate heat value of 7500 Btus per pound, low sulfur content (0.2 percent), but a high ash-moisture content (about 35%) which makes it expensive to transport.

- Chugach Electric Association has no plans at this time to construct any coal-fired electric generating plants at Beluga. The company estimates that the Beluga gas field contains enough natural gas to meet all its needs until at least 2020, even with an annual demand growth rate of 13%-15% (which has been the case recently but which is not expected to continue indefinitely). Any future electric generating units the company installs at its Beluga plant will be convertible to coal if necessary, but the company will not burn any coal unless required to by governmental mandate. Such legislation is presently under consideration by the U.S. Congress and is likely to become law, but the statute might provide exceptions for situations such as Beluga where ample natural gas supplies are available. If such a requirement were imposed on Chugach Electric Association, however, it would undoubtedly install a minimum of two coal-fired generators, so the case of a single generator need not be considered.

- Chugach Electric Association is not presently contemplating constructing an underwater electric power cable across Cook Inlet to the Kenai Peninsula. There is considerable disagreement among experts at the present time concerning the engineering feasibility of such a project.

- The Alaska State Department of Transportation and Public Facilities has laid out a route for a road from Knik to Beluga, but it presently has neither plans nor funds to construct that road. Moreover, it will not

consider building the road unless there is extensive development in the Beluga area to justify its expense. In other words, the road will depend on prior development at Beluga, and would be constructed by the state as a means of promoting growth on the west side of Cook Inlet.

- Chugach Electric Association believes that if coal-fired generating plants were constructed at Beluga, a permanent settlement should also be built somewhere in that area. It would not consider rotating a labor force of several hundred people back and forth between a temporary work camp and Anchorage. The company would not assume responsibility for providing any of the infrastructure necessary for such a community, however, for it sees that as the responsibility of the state.
- Cook Inlet Region, Inc. favors the creation of a moderately large, permanent community somewhere in the Beluga area that would presumably attract several industries because of the availability of coal and electricity. It wants to participate in promoting this development, but also assumes that the state has the primary responsibility for providing the infrastructure for the new community.
- The Kenai Peninsula Borough government has governmental jurisdiction over the land where a town would most likely be built near the Beluga coal field. Members of the Borough Planning Department believe, however, that the borough has no intention of actively encouraging or facilitating such a venture. Their view is that this would be a private activity of the companies and individuals involved, and that the role of the borough government would be limited to reviewing requests made by the settlement for zoning, platting, schools, and solid waste disposal. The community itself would have to decide if and how it wished to obtain any other public services or facilities.
- The village of Tyonek might likely seek to minimize contacts between itself and a town in the Beluga area. Since a road already exists between Tyonek and the proposed town site, however, such contact would probably be difficult to avoid.

Several conclusions were drawn from these data and used as a basis for constructing the scenarios for this report:

- There is a distinct possibility that no development of the Beluga coal field will occur before 1990, if at all.
- Any such development would depend on at least one of three conditions occurring:
  1. a governmental order to Chugach Electric Association to use coal rather than natural gas for generating electricity, either in place of its present gas-fired turbines or in any additional generating units.
  2. construction of one or more industrial plants in the Cook Inlet region that require large amounts of coal for process heat or large amounts of electricity, although in the latter case Chugach Electric Association would likely produce as much of that electricity as possible with natural gas unless required by the government to burn coal.
  3. establishment by the Beluga Coal Company or by other coal lessees of external (outside Alaska) markets for at least six million tons of coal per year.
- If moderate levels of development did occur in the Beluga coal field, the labor force would most likely be housed in what might be termed a permanent work camp. Workers would remain there for periods of several months to a few years, with occasional trips to Anchorage or elsewhere. They would not be rotated back and forth on a weekly basis as is now done with the crews of the oil platforms in upper Cook Inlet. Some of the workers would bring spouses to the work camp, but virtually all of these people would also be employed in some capacity at the camp, since there would be little for a nonemployed person to do there. There would probably be few school-age children at the camp because it would have limited or no school facilities, and Tyonek would probably resist

any significant influx of nonnative students into its school. Hence the number of nonemployed persons at the camp would be limited to a relatively small number of spouses and children.

- If a high level of development should occur at the Beluga coal field, however, a more complete community would probably have to be created there. It would attract a secondary labor force composed of both persons directly supporting the primary labor force, and persons employed in other activites stimulated by the needs of the growing town. It would also include a sizable number of nonemployed dependents. Such a community could be supported by air and water transportation, but demographic and economic growth at Beluga would be greatly spurred by the construction of a road from Anchorage. An alternative to creating a full community would be to merely enlarge the size of the work camp, but that possibility was judged to be relatively remote and hence is not considered in this report.
- At the present time, only Placer Amex, Inc. has assumed any responsibility for planning a townsite at Beluga. The Kenai Borough government is likely to play only a passive role of responding to whatever might occur at Beluga. Chugach Electric Association and Cook Inlet Region, Inc. are both business concerns that do not consider community organization to be their responsibility. And state agencies are just beginning to establish policies concerning economic and community development in the Beluga area.

FIRST SCENARIO: COAL-FIRED GENERATING PLANTS

If the federal government should require Chugach Electric Association to burn coal in the future, either in place of its present gas-fired turbines or in any new generators it constructed, it would probably build a plant with at least two 200-megawatt coal-fired generators at Beluga. Since there is no way of knowing when such an edict might be issued, this scenario assumes the most demanding case of issuance in 1979. Construction of the first generator might then begin in 1980, using a semi-modular form of

construction. On that schedule, the generator would be completed by 1983, with limited mining beginning that year and full-scale mining and generating operations beginning in 1984. This generator would require approximately 730,000 tons of coal per year. Construction of a second generator would begin in 1982 and be completed by 1985. Full-scale operation of this generator, which would require another 730,000 tons of coal per year, would begin in 1986.

Estimates of the labor force needed to construct the two generators are quite tentative since no previous construction experience is directly comparable to this plan for semi-modular assembly. The construction labor force figures used in this scenario are derived from estimates made by the Chugach Electric Association and Burns and Roe Co., and from a recent study of construction manpower requirements by Argonne National Laboratory.[1] (The latter figures are scaled down to take account of the planned semi-modular mode of construction.) The labor force for the first year (1980) is composed of 100 construction workers to prepare the plant site and 50 workers to build the work camp. The labor force needed to construct the second generator is assumed to be only two-thirds the size of that required for the first generator, since many of the plant facilities for both generators would be installed with the first one. Figures for the number of workers needed to operate the generators were estimated from the Argonne study, although this figure can vary widely from plant to plant depending on the nature of the equipment used.

Estimates of the labor force requirements for coal mining in this scenario are based on figures provided by Placer Amex Inc., on the current experience of the Nenana coal field, and on the Argonne study. The base figure of 60 persons needed to mine 730,000 tons per year is composed of 35 production workers, 13 maintenance workers, and 12 supervisory personnel.

In addition to the primary labor force, a relatively small support staff would be needed to operate the work camp. A coefficient of 1.3 was used to estimate the size of this support staff (0.3 support persons for each primary worker). No secondary economic activity is assumed to occur at the camp.

It is possible that some residents of Tyonek might join either the primary or support labor forces at Beluga, thus reducing somewhat the number of outside workers required. However, since there are only 60 men over age 17 in Tyonek, almost all of whom are presently engaged in some kind of occupation, the number of people who might do this is too small to significantly affect the scenario.

Because of the isolation of the Beluga area, the scenario assumes that none of the construction workers would bring any dependents with them who were not also employed there. All those persons would be counted as part of the labor force, not as nonemployed dependents. A few mining, operating, and support workers might bring nonemployed dependents with them, but for the reasons mentioned above this number would be rather small. The multiplier used to estimate the number of nonemployed dependents in this scenario was therefore only 1.2 (0.2 dependents for each mining, operating, and support worker). Since the standard multiplier used in estimating the number of nonemployed dependents who will accompany each operating (nonconstruction) worker is 2.2, the scenario is assuming only one-sixth the usual number of dependents at Beluga because of its work-camp nature.

The population estimates for this first scenario are given in Table 1-1. Initial construction activities in 1980 would create a total population of about 200 persons; this figure would increase to over 500 in 1982 and 1983; it would level off at 320 beginning in 1986 when the construction phase was completed. Since the scenario does not assume any secondary economic growth, the Beluga coal development population should remain relatively stable after 1985 unless there were further expansion of either the coal mining or electricity generating activities.

The permanent work camp that would be established at the Beluga coal field under this scenario would contain all housing, service, and recreational facilities needed by the labor force and their dependents. These would likely all be owned and operated by either Placer Amex, Inc. or Chugach Electric Association. There would be no independent economic enterprises, and most public services--from water and sewerage to retail merchandising and

TABLE 1-1. Population Growth with the First Scenario for Beluga Coal Field Development

Year	Construction Workers	Mining Workers	Operating Workers	Support Workers	Secondary Workers	Nonemployed Dependents	Total Population
1980	150	--	--	50	--	--	200
1981	300	--	--	90	--	--	390
1982	400	--	--	120	--	--	520
1983	350	30	--	120	--	--	500
1984	200	60	90	100	--	50	500
1985	100	60	90	80	--	50	380
1986-on	--	90	120	60	--	50	320

governmental administration--would be provided by the parent companies or the support staff. Kenai Peninsula Borough would have to approve the land use plans for the work camp but would not otherwise become involved in its operation unless the people there applied for incorporation as a first-class or second-class city. The North Kenai Recreation Service Area (a special service administration that is responsible to the borough government but functions relatively autonomously) does include the Beluga area, and hence it might be drawn upon to provide revenues for establishing some outdoor recreational facilities accessible to Beluga. Alaska state troopers would provide police services to the work camp when needed. All serious medical cases would have to be air evacuated to Anchorage. Finally, various state agencies might provide some planning and other support services to the settlement, although these would probably be minimal because of its designation as a work camp rather than a normal community.

SECOND SCENARIO: COAL EXPORTING

In this case, we assume that Chugach Electric Association does not construct any coal-fired generators at Beluga, but that by 1990 Beluga Coal Company has established sufficient markets for its coal to allow it to produce at least six million tons per year--the minimum amount necessary for

cost-effective exporting. To export coal it would be necessary to construct docking and loading facilities at Beluga, which would occur in 1989. A rough estimate of 200 construction workers was made for this effort, plus 40 workers to construct the work camp facilities and 60 persons to operate the camp. None of these people is assumed to bring any nonemployed dependents during the first year. Mining would start in 1990 and would require a labor force of approximately 180 miners (based on the Argonne study), 30 workers to operate the docking and loading facilities and 60 support personnel. As in the first scenario, there would be no secondary economic growth and only a few nonemployed dependents (again estimated with a coefficient of 1.2).

The population estimates for this second scenario are given in Table 1-2. The total population of 300-320 should remain fairly stable unless the volume of coal being mined and exported were considerably increased in the future.

TABLE 1-2. Population Growth with the Second Scenario for Beluga Coal Field Development

Year	Construction Workers	Mining Workers	Operating Workers	Support Workers	Secondary Workers	Nonemployed Dependents	Total Population
1989	240	--	--	60	--	--	300
1990-on	--	180	30	60	--	50	320

The total population figures for the second scenario are identical to those for the first scenario after its construction phase (from 1986 on). Hence the permanent work camp envisioned in the two scenarios would be the same, except that in the second scenario it would not be established until 1989 and it would not have to accommodate a temporary "bulge" of 500 persons during the construction phase. Consequently, a single analysis will cover both scenarios except for the differing time frames and the short-term bulge of construction workers in the first scenario.

THIRD SCENARIO: GENERATING PLANTS AND COAL EXPORTING

This third scenario is simply a combination of the first two. It assumes that two coal-fired generating plants are constructed at Beluga between 1980 and 1985, and that Beluga Coal Company begins exporting six million tons of coal in 1990. Through 1988, therefore, it is identical to the first scenario in both its total population size and its work camp settlement. The population would begin to increase in 1989, however, with the arrival of the construction workers to build the docking and loading facilities. Then in 1990 the number of miners employed at the site would greatly expand, together with a corresponding increase in operating workers.

At this point, the work camp would begin to evolve into a more normal type of community because of its growing size and diversity. Secondary economic growth would develop in the area, thus the camp support staff could be cut in half in 1990 and eliminated in 1991 as support activities were taken over by private businesses. To estimate the size of the labor force employed in these secondary economic activities, a multiplier of 1.5 was used in 1990 and 2.0 in 1991. The latter figure--representing one secondary worker for each primary worker--is somewhat higher than the overall Alaska figure of 1.46.[2] since this would be a case of creating an entirely new community rather than just expanding an already existing one. However, this multiplier is still considerably lower than comparable figures for other parts of the United States (which commonly range between 2.5 and 3.5).[3]

With the availability of more housing and community services at Beluga, additional nonemployed dependents would also begin to arrive. Because of Beluga's isolated location, however, this growth would probably not be as great as in most other communities. Hence a multiplier of 1.4 was used to estimate the number of dependents in 1990 and 1.8 in 1991 (compared to the standard figure of 2.2 for Alaska as a whole as well as the rest of the country).

The population estimates for this third scenario are given in Table 1-3. The total population of this new community would jump to approximately 700 in 1989 and to over 1300 in 1991. After that time it is virtually impossible to make meaningful population estimates, since any of three different conditions could occur: (1) with no further major economic development, the population could stabilize at around 1300 people; (2) secondary economic growth could continue at Beluga because of the availability of coal, electricity, and land, thus increasing the community's population to 2000 or more within a few years; or (3) industrial growth in the Cook Inlet region or expanding export markets for coal could lead to rapid increases in the amount of coal being mined and electricity being produced, which could eventually increase Beluga's population to several thousand people. Consequently, the entries in Table 1-3 for 1992 and subsequent years are merely question marks.

TABLE 1-3. Population Growth with the Third Scenario for Beluga Coal Field Development

Year	Construction Workers	Mining Workers	Operating Workers	Support Workers	Secondary Workers	Nonemployed Dependents	Total Population
1980	150	--	--	50	--	--	200
1981	300	--	--	90	--	--	390
1982	400	--	--	120	--	--	520
1983	350	30	--	120	--	--	500
1984	200	60	90	100	--	50	500
1985	100	60	90	80	--	50	380
1986	--	90	120	60	--	50	320
1987	--	90	120	60	--	50	320
1988	--	90	120	60	--	50	320
1989	240	90	120	120	--	130	700
1990	--	220	150	60	210	260	900
1991	--	220	150	--	370	590	1330
1992-on	?	?	?	--	?	?	?

As long as the Beluga settlement remained a work camp with limited facilities and services, it would not likely attract a heavy flow of visits from the residents of Tyonek. Since a road presently runs directly from Tyonek to the proposed town site at Congahbuna Lake, however, it would be impossible to prevent interaction between the two settlements. And if the Beluga settlement evolved into a more complete community, this could pose serious problems for Tyonek if it desired to preserve its native culture. The consequences of this interaction between the two communities could be both beneficial and harmful for Tyonek, as will be examined in detail in Chapter 4.

KEY FACTORS AFFECTING BELUGA DEVELOPMENT

A wide variety of interrelated factors could influence whether or not development occurs at Beluga, and if so, in what form and at what rate. A few of these factors appear to be especially critical, since they could markedly affect what happens at Beluga in the future. All of them are incorporated into the scenarios as fixed assumptions, but in reality they are dynamic variables that will require more detailed examination in future studies of energy development in the Cook Inlet region. These key development factors are:

1. if and when the federal government should require electric utilities to burn coal rather than natural gas or oil, whether this requirement is partial or total, the time limit for its implementation, and whether any allowances are made for special circumstances such as Beluga where adequate natural gas reserves are available for long-term use. Under the National Energy Act, provisions are made for exceptions to switching requirements. Regulations for general application of these provisions and specific decisions regarding conditions in Alaska have not yet been handed down.
2. the amount and rate of future industrial and other economic growth in Anchorage and the Kenai Peninsula that would require additional coal or electricity for manufacturing processes

3. the amount and rate of population growth in Anchorage and the Kenai Peninsula that would increase the demand for electricity

4. expansion of markets for coal in the United States (especially the West Coast states) or in other countries (especially Japan)

5. whether or not an underwater power cable were laid across Cook Inlet from Beluga to Kenai and the amount of additional demand for electricity stimulated by the cable

6. whether or not a road were constructed from Knik to Beluga (construction of a causeway across the Knik Arm would shorten the road distance from Anchorage to Beluga but is not necessary since it is presently possible to drive from Anchorage to Knik)

7. if and when any industries should decide to locate plants in the Beluga area to take advantage of the availability of coal and electricity, as well as the energy requirements of those plants and the sizes of their labor forces

8. the rate and nature of secondary economic growth that would occur in the Beluga area if a permanent work camp or community were established there

9. policies and actions of the Cook Inlet Region, Inc. to promote economic development in the Beluga area

10. policies and actions of the Kenai Peninsula Borough Assembly concerning development in the Beluga area, especially in regard to land use and schools

11. policies and actions of the Tyonek Village Council and the Tyonek Native Corporation to either resist or facilitate population and economic growth in the Beluga area and the creation of a town at Beluga

12. policies and actions of the state of Alaska to restrict or promote population and economic growth in the Beluga area.

Most of these factors are outside the direct control of the Alaska State government. They will be largely determined by decisions of the U.S. government, private businesses and organizations, and individuals. Nevertheless, the government of Alaska could play a decisive role in shaping the future of Beluga by adopting a definite policy regarding development in the Beluga area, and by establishing programs to carry out that policy. At one end of the policy spectrum, the state could decide to vigorously promte development in the Beluga area. Programs to support that policy might include constructing the road from Knik to Beluga prior to the time it was urgently needed, aiding coal lessees to locate export coal markets, providing inducements or requirements for Chugach Electric Association to switch from natural gas to coal, encouraging other industries to locate there, providing (through loans or grants) the initial capital needed to construct housing and community facilities in the Beluga area prior to the community's becoming financially self-sustaining, and working with the Village of Tyonek to ensure that its autonomy and cultural heritage were protected as fully as possible. At the other end of the policy spectrum, the state could decide to oppose all development in the Beluga area, although this is relatively unlikely considering the support it has already given to the Beluga Interagency Task Force.

In reality, the exact nature of the state's policy toward Beluga development will probably evolve gradually over the next several years through a process of negotiation among all the involved parties. A central concern throughout this negotiation process will be assigning responsibility for managing the various economic and social impacts and needs associated with coal development in the Beluga area.

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Chapter 2
REGIONAL SOCIOECONOMIC IMPACTS

INTRODUCTION

The regional impact area surrounding a development activity is generally defined as that area that is likely to include most of the significant impacts associated with the project. The region that will experience most of the socioeconomic impacts from coal development at Beluga is limited to Anchorage and the Kenai Peninsula Borough in South Central Alaska. The analysis in this chapter excludes the immediate Beluga and Tyonek areas, however, since the impacts on those areas are examined in greater detail in subsequent chapters.

The principal conclusion that emerges from the analysis reported in this chapter is that the socioeconomic impacts of Beluga coal development on Anchorage and the Kenai Peninsula should be quite limited in nature. Several factors contribute to this conclusion, the most crucial of which are the isolated location of the Beluga coal field and the relatively small scale (in regional terms) of the development anticipated in all three of the scenarios sketched in the previous chapter.

Notwithstanding the paucity of data on which to base an assessment of potential regional socioeconomic impacts, three broad categories of impacts will be analyzed: 1) impacts associated with the regional labor force; 2) impacts associated with the market for coal and its by-products; and 3) impacts associated with the generation and distribution of revenues associated with the development, including secondary regional economic impacts.

The Alaskan economy has recently experienced extremely rapid growth, spurred in part by the Trans-Alaska Oil Pipeline and other energy development activities. This social and economic growth will undoubtedly continue in the future, regardless of what happens at Beluga. Consequently, it is quite difficult to forecast the regional socioeconomic impacts that might be caused by Beluga coal development, apart from the more general effects of rapid

economic growth in the region. The analysis reported in this chapter must therefore be expressed in rather general terms with a considerable margin of uncertainty. The analysis uses the three development scenarios from the previous chapter, as well as existing socioeconomic conditions in the impact region, as points of departure.

IMPACTS ASSOCIATED WITH THE WORKFORCE

The three scenarios estimate the size of the workforce, secondary employment, and nonemployed dependents associated with the construction and operation of a coal-fired generating facility, a coal mining and exporting operation, and a combination of these two. The maximum construction work force requirement in any one year under any of these scenarios is 400. These workers would be drawn primarily from the large unemployed construction labor force pool (union labor) in Anchorage. Some of them would also be drawn from the appropriate local unions that cover the Kenai Peninsula area. A few workers might be hired from the native village of Tyonek. Although the size of the unemployed labor force pool is influenced by seasonal factors, as discussed below, more than enough construction workers should be available within the region to meet the construction work force needs of each of the development scenarios.

As provided by the Alaska Department of Labor, the preliminary estimate for 1977 mean annual number of unemployed workers in the civilian labor force in Anchorage, adjusted to the current population survey of the U.S. Bureau of the Census, is 5490, representing an unemployment rate of 6.5%. Approximately 80% of these unemployed filed for unemployment insurance. Of this group, about half listed contract construction as their previous occupation during 1977, although there is seasonal variation in this figure. Assuming that the 20% uninsured workers are distributed similarly and that 45% of the total unemployed were contract construction workers, then approximately 2500 unemployed contract construction workers were available in Anchorage during 1977. Given estimated employment in contract construction of 7600, this suggests a local unemployment rate for contract construction of 25%, or about

four times the overall unemployment rate. Moreover, the total number of unemployed workers across all industries is projected to increase by about 2000 over the next five years. Clearly, there should be no need to bring in workers from outside the Anchorage-Kenai area to meet the employment requirements for Beluga coal development, unless other major construction projects such as the natural gas pipeline or the Susitna Dam) were drawing on the local labor force at the same time.

Since all coal mining associated with these development scenarios is surface strip mining, it would probably not be necessary to go far afield to find workers with special mining skills. The skills required for this type of operation are similar to many construction skills, such as operating bulldozers and scrapers, and could be adequately met by available construction workers with only a minimal amount of training. The addition of a coal mining work force to the required construction work force would not raise the total labor force requirement above the single-year figure of 400 workers. No other skill or industry category would place a demand on the labor force equalling the requirement for construction. Locally available unemployed workers would be more than adequate to meet the projected needs for operational and other secondary workers under the three scenarios.

The ready availability of local workers for future Beluga coal development has several implications for potential socioeconomic impacts. These projects should not induce any significant in-migration of workers from ouside the Anchorage-Kenai area. Although there might be some tendency for Anchorage workers to transfer to Kenai labor union locals in the belief that this would enhance their employment opportunities in the Beluga area, the magnitude of the potential labor force demand is small relative to the available labor pool. This means that there would be little job switching and little excess migration into the area in response to news of job opportunities, assuming that a large wage differential does not exist. Excess migration of workers responding to news of employment opportunities has been a serious problem on past development projects in Alaska, often resulting in increased levels of local unemployment. Thus, the main regional labor force impacts of

Beluga coal field development would be positive in nature. There would be a modest decline in the rate of regional unemployment for the duration of the project, with a commensurate increase in wage income available for reinvestment in the region and a reduction in the number of workers receiving unemployment insurance payments.

These effects would be further minimized to the extent that local residents of Tyonek were hired for construction or mining jobs. Even though there are some unemployed males with the requisite skills in Tyonek, few are union members, which puts them at a competitive disadvantage for this type of employment. However, any employment of Tyonek residents that did occur would reduce local unemployment and provide valuable skill training, both of which would directly benefit the Tyonek community.

IMPACTS ASSOCIATED WITH THE MARKET FOR COAL

The third scenario assumes the construction of two electric generators along with the annual production of six million tons of coal for export. The major market for the export coal would almost certainly be outside Alaska, so that regional market impacts would be minimal. If Chugach Electric Association merely substitutes coal for gas in the production of electricity at Beluga, the regional market impacts attributable to coal development *per se* would be negligible, but there could be a significant increase in the price of electricity. On the other hand, if the availability of coal at Beluga results in significantly altered energy costs and supply reliability, the impacts of Beluga coal development on the regional economy would be substantially greater. Chugach Electric, however, will not voluntarily switch from gas to coal. Natural gas supplies, as a by-product of oil development, are in abundant supply, sufficient to meet regional needs beyond the year 2000. It is unlikely that heavy industrial users of electricity, such as the aluminum industry, would ever be placed on interrupted service solely because of insufficient supply of the primary energy source, be it gas or coal. In addition, the cost of gas (at controlled prices) is substantially lower than any projected price of coal. Thus, the substitution of coal for gas is

expected to make the regional cost of electricity more than at present, and this relative cost differential would likely continue into the foreseeable future.

Other regional use of coal as a primary energy source could attract new industry into the region in situations where gas was not economically substitutable for coal. An analysis of potential secondary coal-based industrial development of this sort is beyond the scope of this report but would have to be made in order to forecast properly the full potential for regional socioeconomic impacts implied by this initial development activity. To the extent that these secondary or derived developments should occur within the local impact area, socioeconomic impacts on Tyonek would be even more severe than those likely to be associated with the three scenarios. The construction of a road from Anchorage to Beluga would be a major factor precipitating these kinds of impacts.

IMPACTS ASSOCIATED WITH PROJECT REVENUES

The development of the Beluga coal resources and the production of electricity from coal would significantly add to the Kenai Borough's tax base. Specifically, Tax Code Area (TCA) number 54, which contains Tyonek and the Beluga coal fields, would become the source of further revenues. These would be in addition to the substantial existing revenues obtained from oil and gas properties situated in TCA 54. It is difficult to estimate the amount of new revenues that would be generated under each of the three development scenarios. Presumably, the assessed value of the coal lands around Beluga would increase, resulting in additional property tax revenues accruing to the Borough and the state. Cook Inlet Region, Inc. owns lease holdings on the Capps coal field and would be the recipient of royalties from the development of these coal resources. Further revenues could be generated from severance taxes and sales taxes to the extent they are levied on coal production.

The problem of estimating regional economic impacts associated with these revenues is limited to ascertaining the magnitude of future income flow in the region, though this is an important factor. The more serious problem involves the distribution of these revenues within the Borough. While the overall impact of increased regional revenues could be interpreted as beneficial, inequitable distribution of these benefits to villages, towns and cities causes adverse social impacts. This problem is characteristic of most large-scale development activities, especially energy development. The people who suffer most of the primary impacts, in this case the Tyonek natives, tend not to receive benefits adequate to compensate for the negative effects.

Public revenues are typically redistributed through the provision of public services. The Kenai Borough presently provides three main services: education, solid waste disposal, and planning (zoning and subdivision). The availability of these services throughout the Borough is at least in part a function of the ability and willingness of the Borough to distribute sufficient funds for their support. To the extent that the Borough can effectively and equitably deal with the issue of revenue redistribution, the region could be made more attractive to business and industry. In this way, coal development in Beluga could encourage growth in the region beyond that which would be expected in its absence, though the separation of these effects is extremely difficult.

CONCLUSIONS

With the present rate of rapid growth in the Anchorage-Kenai region as a baseline, coal development at Beluga should have only a few small socio-economic impacts on the region. These would result from reductions in regional unemployment, provision of a new regional energy source, and the generation of new economic revenues in the region. Although a reduction in unemployment would be positive for the region, the magnitude of this effect would not be great. As a new regional source of energy, coal would likely be more costly than gas at its present price. Requiring Chugach Electric Association to convert to coal would represent a financial burden to its customers because

of the higher prices it would be forced to charge. Regionally, this would provide a disincentive to industrial development. The greatest potential impacts are associated with the generation of additional revenues to the region. These could serve both to reduce absolute tax levels and to redress existing or created regional fiscal inequities.

Chapter 3
SETTLEMENT REQUIREMENTS

SETTLEMENT SITES

Existing Settlements

Tyonek is a village of some 270 Tanaina Athabascans located on the west side of Cook Inlet about 40 air miles west-southwest of Anchorage. The village was originally located south of its present site, but was relocated in the 1950s to higher ground. The settlement includes a store, bank, gas station, and 66 housing units and is served by a water system and electricity from Chugach Electric Association. Most of the housing and community facilities are located on about 90 acres of land.

The Tyonek Timber Company camp is located about 3 miles south of Tyonek Village on former Moquawkie reservation land. Kodiak Lumber Company is sole owner of the chip mill operation, which processes timber received from a sale on the west side of Cook Inlet. The chip mill operation has been temporarily scaled-down because of a weakening in the Japanese market and shutdown of the timber salvage sale.(1) There are currently 20 people at the camp. When the mill was in full operation, it supported a community of about 200 residents that included about 30 school-aged children.

In addition to these settlement sites, there are several oil- and gas-related facilities on the west side of Cook Inlet at Drift River, Trading Bay, and Granite Point. Marathon Oil Company's Trading Bay facility has a large dormitory building to house workers.

Three-Mile Creek Subdivison, located north of Tyonek on the coast, consists of privately owned recreational lots and covers about one-half square mile of land area. Some of the lots have cabins and trailers. In addition, fishing and hunting cabins are scattered throughout the study area, especially along the coast.

Site Characteristics and Land Requirements

The land requirements for a new settlement will vary, depending on whether a work camp or permanent new community is planned.

There is very little data to substantiate the amount of land necessary to support commercial and residential development in areas such as Beluga. A village or town will typically have a small amount of commercial development to supply the local population with essential goods. Anchorage will still be likely to supply the majority of household goods and specialty items. Commercial development would tend to remain relatively small in a work camp, but would expand in the case of a permanent community to reflect other Alaskan towns.

Land needed for residential development will vary, according to preference and availability. The work camp described in scenarios 1 and 2 (Chapter 1) would tend to be compact and dense since industry-provided housing will have double occupancy. If the work camp is relatively compact, up to 8 to 10 units per acre would be accommodated. A permanent community would be less dense. Workers with families will tend to seek space and privacy and will be more likely to build single-family, detached homes. The density of subdivisions for single-family residences could range from two to six units per acre, depending on both the type of sewer and water system and the Kenai Peninsula Borough's subdivision standards.[a]

A 500-person work camp, with dormitory housing, a kitchen-dining annex, and a recreation annex may require about 40 acres of land. A permanent community for 1500 people, however, would likely require from 600 to 1200 acres, depending on density and design. The permanent community might include a school, recreation complex and park, clinic, and retail commercial area, in addition to both single- and multi-family housing.

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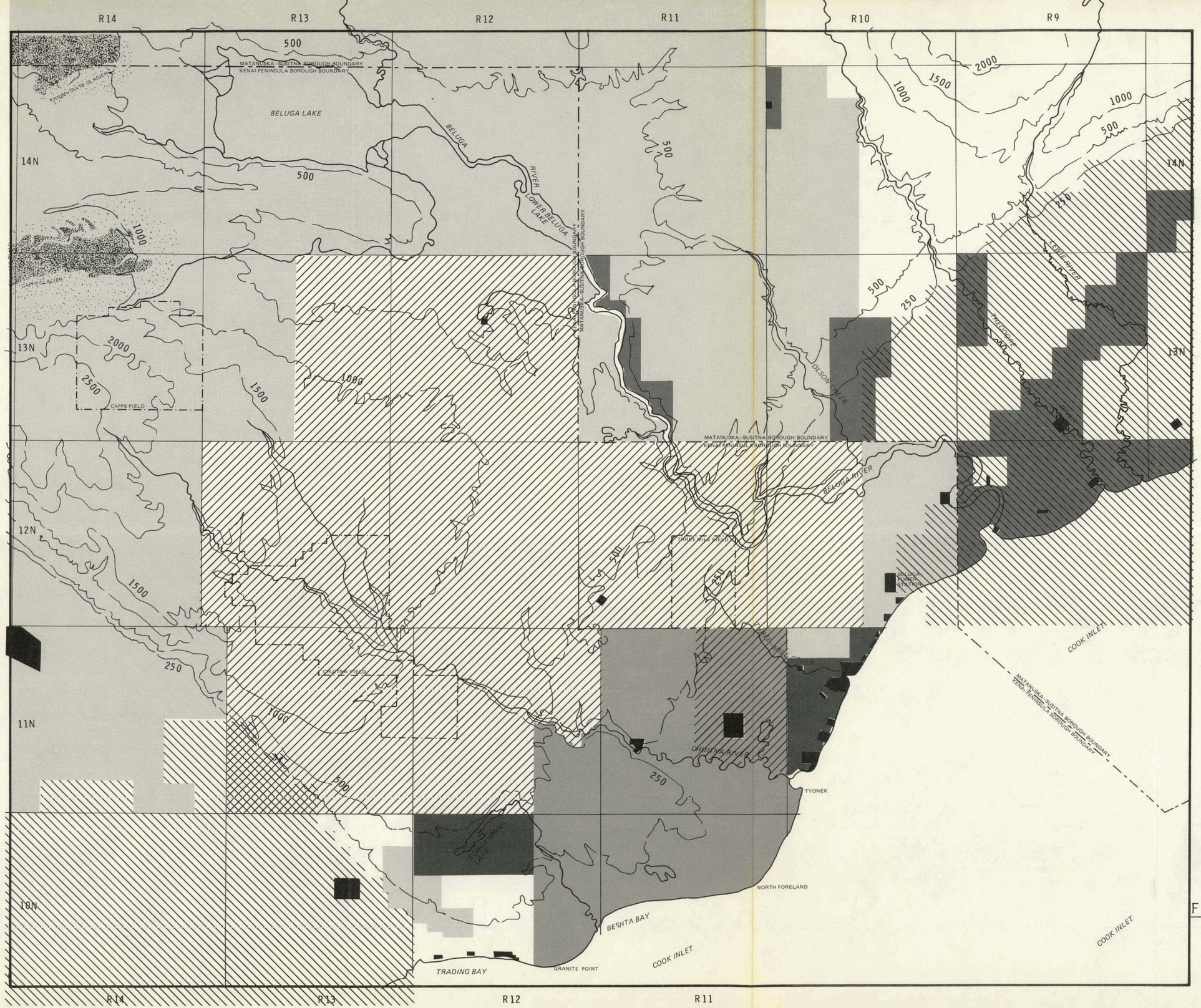
[a] The Kenai Peninsula Borough Subdivision ordinance allows a lot size of 6000 square feet for single-family residences served by public water and sewer. A 20,000-square-foot minimum is placed on a lot that has on-lot systems for both sewer and water.

A number of factors affect the choice of settlement site, including slope, drainage, soils conditions, land ownership, and access to transportation facilities. Land ownership is shown in Figure 1. The major landholders in the Beluga study area are the state (mental health lands), Cook Inlet Region, Inc., Tyonek Village Corporation, and the Kenai Peninsula Borough. A new settlement could potentially be located on any of these lands where slopes and drainage characteristics are not a limiting factor.

For purposes of this analysis, several assumptions were made regarding site suitability for development:

- A new community should not be located in an area with poor drainage or with slopes greater than 10%.
- Based on an analysis of slope only, there appear to be some potential settlement sites on State Mental Health lands to the north and northwest of the reservation, and northeast of Capps Field on land owned by Cook Inlet Region, Inc. (south of Beluga Lake, north of Chichantna River, and west of Beluga River).
- A new settlement is not likely to be located on the lands owned by the Tyonek Village Corporation (former Moquawkie Reservation lands) (see Chapter 4 of this report).
- Coastal lands northeast of the reservation may be unsuitable for building and road construction because of soil and drainage characteristics.(2)
- Land along Trading Bay, to the north and east of the McArthur River, appears to be unsuitable for development because of soil type and poor drainage.
- Lands west of the reservation (Township 11N, Range 12W) appear to offer the best potential for community development.

Beluga Coal Company, owned by Placer Amex Inc., has suggested an area near Congahbuna Lake to the west of the Tyonek Reservation as a possible settlement site.(3) This area has slopes of less than 10% and includes two large land parcels, owned by the Kenai Peninsula Borough and Cook Inlet



KENAI PENINSULA BOROUGH LAND

MATANUSKA–SUSITNA BOROUGH LAND

WILDLIFE REFUGE
(Trading Bay and Susitna)

FORMER STATE MENTAL HEALTH LAND

STATE GENERAL GRANT LAND
Those lands not indicated as Former Mental Health, Tyonek Native Corporation, or U. S. Survey are General Grant Lands

TYONEK NATIVE CORPORATION OWNED AND SELECTED

COOK INLET REGION, INC. SELECTIONS

PRIVATE LANDS

0 1.5 3 6 miles

Source:
1. State of Alaska, Department of Commerce and Economic Development, Division of Energy and Power Development
2. Beluga Coal Company
3. CH2M HILL, Consulting Engineers

The land status designations shown on this map reflect the best available information at this time and should be confirmed.

September 1978

FIGURE 3-1. Land Status: Surface Estate Central Beluga Coal District

Region, Inc. These two ownerships are shown in Figure 1. The borough-owned land covers about an 8-square-mile area (about 5000 acres). The Cook Inlet Region Inc. land is just to the west and south of the borough parcel and includes about 2800 acres of land. The distance from Congahbuna Lake to the village of Tyonek is about 10 miles.

The lake area offers an attractive site for a new community. There are views to the Inlet and the lake can be used for recreation and float-plane landing. The area is served by existing logging roads and has easy access to the Cook Inlet Region, Inc. transportation corridor to Capps Field. Poor drainage may present some problems for development on the west side of Congahbuna Lake. Drainage characteristics appear to be more suitable to the east side.

Figure 2 shows a conceptual layout for a community at Congahbuna Lake developed for Beluga Coal Company. The lake has also been suggested as the possible site for a power plant, with lake water serving as cooling water for the power plant, which, in turn, might increase the lake's fishery potential.(3)

HOUSING

Existing Conditions

Three primary settlement sites exist within the study area, including the village of Tyonek, the Tyonek Timber Camp, and Marathon Oil Company's Trading Bay facility.

The major housing concentration is at Tyonek Village, which has 66 housing units (60 woodframe; 6 mobile homes). Many of the wood-frame houses are in need of rehabilitation. They are poorly insulated and energy inefficient.

Twenty-seven HUD-financed houses are planned for construction this year. This will satisfy the immediate need for additional housing, but many young people in the village will still want the opportunity to have their own house. In addition, teacher housing is in short supply; six units are needed.

All village housing is owned by the Tyonek Village IRA Council. The Kenai Peninsula Borough School Distric

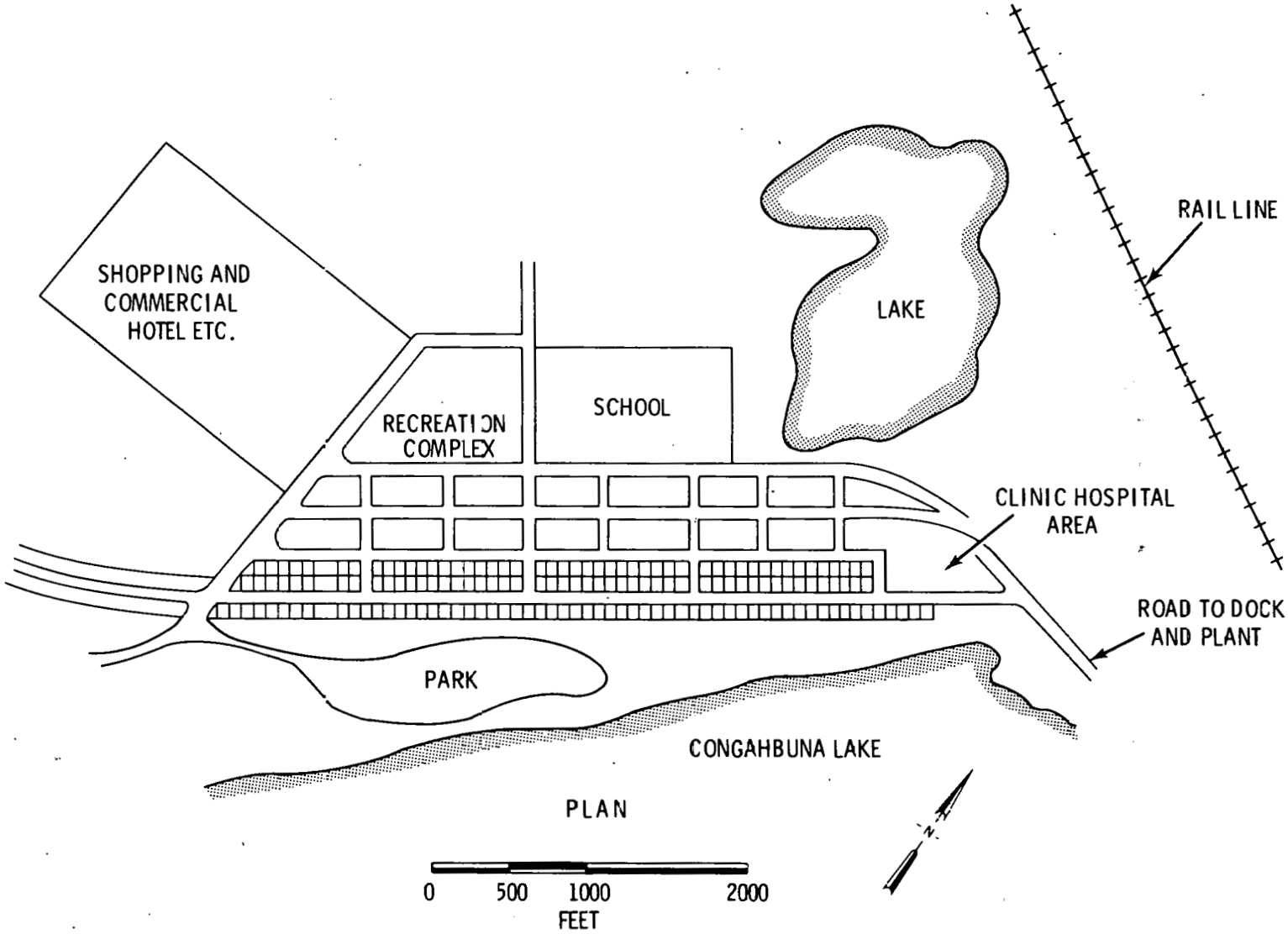


FIGURE 3-2. Conceptual Residential Layout

All village housing is owned by the Tyonek Village IRA Council. The Kenai Peninsula Borough School District might be able to subsidize teacher housing since the district has responsibility for education within the borough. Once built, a program for managing the housing units would need to be established.

Village houses are heated by electricity, which is provided without charge through an agreement with Chugach Electric. The contract for the electricity was signed in 1972 and is scheduled to expire when the village has used a total of 50 million kVh. At current rates of use (under 5 million kVh per year), this is likely to occur between 1982 and 1984.

The costs of heating with electricity are higher than those associated with oil heat, and village residents may find it difficult to pay for the electricity when the contract with Chugach Electric expires. The new housing units will have oil-fired, forced-air heating systems, with fuel purchased from Tyonek Timber. The older units can be converted from electric to oil heat, but at a cost of at least $2000 per unit.

Housing is also located about 2 miles from the village at Tyonek Timber Camp. The camp has six 20-person bunkhouses, five 3-bedroom modular homes, about 12 trailers, and six duplexes. This number of units is capable of housing about 200 individuals.

Marathon Oil Company has one dormitory building with a capacity of about 60 people at their Trading Bay facility. There are several trailers at Granite Point, and both trailers and cabins at the Three-Mile Creek recreational subdivision. In addition, small shacks and shelters are scattered along the coast at private fish sites.

Housing Requirements

The coal development scenarios presented in Chapter 1 suggest two possible types of settlement: a permanent work camp and a small community.

The first and second coal development scenarios described in Chapter 1 would establish a permanent work camp at Beluga. In the first scenario for coal-fired generating plants, the first-year (1980) labor force is

composed of 100 construction workers to prepare the plant site and 50 workers to build the permanent work camp. About 50 support workers are projected to be needed initially. The total first-year population is projected to be 200, rising to 500 in 1983-84, and declining to 320 from 1986 on.

Because the Beluga area is isolated from other development, this scenario assumes that none of the construction workers would bring any dependents who would not also be employed. The mining, operating, and support workers might bring nonemployed dependents with them, but very few are expected.

The primary means of housing for construction workers and support personnel is typically mobile homes, modular houses, or prefabricated, dormitory-like sleeping structures in a permanent work camp. The permanent work camp would contain all housing, service, and recreation facilities needed by the labor force. Based on the design of much construction camp housing, we have assumed an overall average of two persons per housing unit. Some units with single occupancy may be built for executive quarters, but most workers are likely to be housed in double occupancy rooms. The number of housing units projected for the work camp is based on two persons per unit for construction workers and a small number of four-person families among the permanent workers. Estimates of projected housing demands are presented in Table 3-1.

TABLE 3-1. Projected Housing Demand for the First Scenario

Year	Population	Dormitory Units	3-4 Bedroom Family Units
1980	200	100	
1981	390	195	
1982	520	260	
1983	500	250	
1984	500	220	15
1985	380	160	15
1986-on	320	130	15

The total population in the second scenario (coal exporting) is the same as in the first development scenario beginning in 1989. The permanent work camps are expected to be similar, except that in the second scenario the temporary "bulge" of 500 persons would not have to be accommodated. The estimate of units needed would be about 160 from 1989 on.

Portable ATCO-design prefabricated structures have often been used for construction camp housing in Alaska. These are typically single-story structures with segmented, 2-person sleeping rooms off a main hallway that connects to lavatories. These dormitory-like complexes can range in size from a 4- to a 400-person unit. This type of sleeping structure was typical of pipeline construction camps.

Families can be accommodated in prefabricated 2- and 3-bedroom modular homes or mobile homes. This is typical for family housing at many lumber camps and was used at Valdez during pipeline construction.

A prefabricated kitchen annex and recreational annex are likely to be included as part of the construction camp. Most buildings will be wood-frame on a steel chassis with steel roof and siding with baked enamel finish.

The construction materials can either be barged to the site or transported by airplane. Barging may require a temporary dock and roadway from the dock to the camp site. Barges can also be off-loaded onto the beach. For construction camp development at Beluga, materials could be trucked from Anchorage to Kenai and then barged across Cook Inlet to Trading Bay or the Tyonek Timber dock. Materials could also be barged directly from Anchorage or Seattle. A rough cost estimate (in 1978 dollars) for work-camp housing is $250,000 for a 52-person sleeping complex and $700,000 for a 500-person kitchen-dining facility.

The third scenario, which combines generating plants with coal export, is identical to the work-camp scenarios through 1988 in terms of total population and size of the work-camp settlement. The population begins to increase in 1989 as construction workers arrive to begin work on the docking

and loading facilities. Mining and operating workers increase rapidly in 1990. By 1990, the "permanent work camp" will develop into a community, with ancillary businesses, services, and facilities.

For the purpose of projecting housing demand, we have assumed that the construction workers will all live in two-person units (as in the previous scenarios). A few nonemployed dependents would accompany mining, operating, and support workers through 1988, as in the first two scenarios. After 1988, there would be a diversity of household sizes, including single persons, couples, and families with children.

To project the demand for permanent housing, we have estimated a possible mix of housing types based on the nonconstruction worker population and on what construction companies are likely to build. After 1989, demand for dormitory housing will cease. In 1990, we have assumed a demand for about 100 3- to 4-bedroom houses, 225 2-bedroom units, and 50 1-bedroom units. The number of families with children is expected to increase in 1991, requiring additional 3- to 4-bedroom housing units. Projected housing demand by type of unit is shown in Table 3-2.

TABLE 3-2. Projected Housing Demand for the Third Scenario

	Population			Housing Units				
Year	Construction Workers	Other Workers & Dependents	Total	Dormitory Units	3- to 4-Bedroom Units	2-Bedroom Units	1-Bedroom Units	Total
1980	150	50	200	100				100
1981	300	90	390	195				195
1982	400	120	520	260				260
1983	350	150	500	250				250
1984	200	300	500	220	15			235
1985	100	280	380	160	15			175
1986	--	320	320	130	15			145
1987	--	320	320	130	15			145
1988	00	320	320	130	15			145
1989	240	460	700	120	50	225	35	430
1990	--	900	900	0	100	225	50	375
1991 on	--	1330	1330	0	200	225	50	475

SCHOOLS

Existing Conditions

Bob Bartlett School serves grades K through 12 and is financed and managed by the Kenai Peninsula Borough School District. Located at the village of Tyonek, it is the only school serving the Beluga area. The school has four regular classrooms, a home-economics suite, and a portable classroom, for a total capacity of 240 students.(4)

Enrollment history and school district projections are presented in Table 3-3. The total 1976-1977 enrollment was 108, with 75 in grades K-8, and 33 in grades 9-12. As of May 1978, 98 students were enrolled and 7 teachers (5 regular and 2 cultural resource teachers) were employed. The Borough's 1977 school-construction report indicates that no facilities other than a new home-economics suite need to be provided during the 5-year period ending in 1982.

When the Tyonek Timber Company mill was in full operation, approximately 20 children were bussed from the camp to the village to attend the school.

TABLE 3-3. Pupil Enrollment and Projections
Bob Bartlet School, Tyonek(a)

School Year	K-8	9-12	Total
1972-73	76	21	97
1973-74	65	22	87
1974-75	73	18	91
1975-76	87	28	115
1976-77	75	33	108
1977-78	82	34	116
1978-79	90	34	124
1979-80	95	37	132
1980-81	103	38	141
1981-82	110	41	151

(a) Kenai Peninsula Borough School District, Enrollment Projections and School Construction Report, April 1977.

School Requirements

The permanent work-camp situations described in scenarios 1 and 2 (see Chapter 1) are expected to include few, if any, school-aged children. The possibility of a limited number of school-aged children should be anticipated, however, and ways to provide for their educational needs should be considered.

At its maximum level of operation, the Tyonek lumber camp had a ratio of about 0.10 school children per adult. If this ratio is applied to the mining, operation, and support workers in scenarios 1 and 2, a possible school population of 30 students for the work-camp situation is derived.

Even in the third coal development scenario, where a permanent community is anticipated, a lower than average pupil-per-household ratio should be used to estimate numbers of school children. Few school-aged children are likely to arrive until 1989, when the number of nonemployed dependents would begin increasing and secondary workers would begin arriving to provide services. Total housing (nondormitory) units are expected to reach 310 in 1989, 375 in 1990, and 475 from 1991 on.

The current pupil-per-household ratio in the Kenai Borough is 0.74, but the isolated nature of the Beluga settlement is expected to discourage families with school children from moving to the new settlement. A gradually increasing pupil-per-household ratio has been used instead to estimate numbers of school-aged children.[a](5) For 1989, a ratio of 0.3 yields approximately 90 pupils; for 1990, a ratio of 0.4 yields 150 pupils; from 1991 on, a ratio of 0.6 yields 285 pupils. Assuming a class size of 20 pupils with one teacher per class, 5 to 14 classrooms and teachers would be required to serve their needs.[b](6)

The educational needs of school-aged children in the Kenai Peninsula can be met in a variety of ways, depending on the number and location of the pupils to be served. The school board of the Kenai Borough School District is responsible for making final decisions on such matters. Several options are listed below:

- New pupils could be accommodated at the existing school at Tyonek.
- A school could be constructed at a new settlement site.
- Portable classrooms could be used to handle a temporary peak in school enrollment during construction periods.
- Pupils could be enrolled in correspondence classes through the school district.

The Bob Bartlet School facility has the potential to serve another 100 pupils given its current capacity and enrollment trends. For students to attend the Tyonek School, however, roads and bus transportation must be established from the new settlement to Tyonek. If a new school were built at the settlement site, it would probably be a prefabricated structure similar to the ATCO-designed dormitory housing.

The decision of whether to send children to the existing school at Tyonek or to construct a new school will be based on a number of factors. The number of school children associated with a work camp would probably not justify the cost of new school construction, although a school might be built to serve the combined needs of the lumber camp and the coal development work camp. On the other hand, a full-scale community in the Beluga area (scenario 3) would almost certainly require a new school facility. Another important consideration is the attitude of Tyonek villagers toward use of their school by nonnatives. Issues related to this concern are discussed in Chapters 4 and 5.

Correspondence courses are an alternative that should be explored if only a few children are associated with a work-camp situation. The Kenai Borough School District currently has one of the largest correspondence programs in the state, with over 100 students participating.

POLICE, FIRE, AND EMERGENCY MEDICAL SERVICES

Police Services

Police services in the Beluga area are provided by the Alaska State Troopers through a resident constable. The constable serves the area from the Beluga power station south to Trading Bay, including the oil and gas facilities at Trading Bay and Granite Point and the lumber mill camp near Tyonek. A four-wheel drive vehicle is used by the constable to patrol the area and an airplane is available to fly the area if the need arises.

The constable at Tyonek has the time and ability to handle an additional number of complaints and other police activity, but the point at which population increases will require the state troopers to add another policeman is difficult to estimate.

A need for additional police officers in the Beluga area will definitely be generated by the combined activity of the village, the Tyonek lumber camp, and any settlement associated with coal field development. In most cases, the state troopers wait to add staff until the new position can be justified by increasing population numbers. During construction of the Alaska pipeline, however, police service needs were anticipated and additional troopers were assigned to affected areas in advance of actual population increases.

In a work-camp situation, the troopers encourage private companies to hire their own staff for internal security. The troopers are then available to provide emergency assistance. The temporary assignment of additional troopers to the area is another option, especially if camp activity is short-term or seasonal. In the Beluga area, this would involve assigning staff from the Soldotna regional office of the state troopers.

A permanent community of 700 to 1400 residents in the Beluga area is likely to require a full-time police officer just to serve local community needs. The city of Seldovia, with a population of 600 and no road access to the other Kenai Peninsula cities, has one police officer and police car. The Kenai Peninsula cities of Kenai and Soldotna maintain a ratio of about two police officers per 1000 residents.(6)

The method of providing police services to a new community in the Beluga area will depend somewhat on whether the community incorporates as a city. A rough estimate of police manpower requirements can be obtained by applying a ratio of 1.5 policemen per 1000 residents to the projected population under coal development scenario 3.[7] These estimates are shown in Table 3-4.

TABLE 3-4. Police Service Projections for the Third Scenario

Year	Population	Police Officers
1980	200	0.3
1981	390	0.6
1982	520	0.8
1983	500	0.8
1984	500	0.8
1985	380	0.6
1986	320	0.5
1987	320	0.5
1988	320	0.5
1989	700	1.0
1990	900	1.4
1991	1330	2.0

If the new community does not incorporate, the present constable can probably handle the increased work load until 1989. During the years 1982-84, however, he may require some staff assistance from the Soldotna office of the state troopers.

Fire Protection

No publicly provided fire protection services are currently available in the Beluga area except through the U.S. Department of Interior, Bureau of Land Management. However, a work camp would typically have its own fire-fighting equipment on hand. A permanent community of 1400 residents would require some fire-fighting capability and equipment of its own.

Estimates of staff and equipment needs can be based on the experience of other Kenai Peninsula towns. The city of Seldovia, with 600 residents, has 24 volunteer firemen, 2 pumper trucks, and a jeep pumper. Soldotna,

with about 2500 residents has 3 paid staff, 20 volunteers, 2 pumper trucks, and 2 tankers. Fire services may also be provided through a borough service area. An example is the Nikiski fire service area, which serves a 33-square-mile area, including the unincorporated residential and industrial area north of the city of Kenai on the east side of Cook Inlet. The service area has 2 fire stations, a paid staff of 19, 20 volunteers, and trained emergency medical technicians. One pumper and tanker are located at each station.

Fire protection needs for cities of all sizes are based upon the water flow in gallons per minute that may be required. According to the National Fire Protection Association, one pumper truck (plus supporting units) is required, in general, for each 500 gallons per minute (gpm).[7] Required water flow by community population size is presented in Table 3-5.

TABLE 3-5. Water Flow Requirements for Fire Protection

Population	In Gallons Per Minute	In Million Gallons Per Day	Pumper Trucks	Water Flow Duration In Hours
1000	1000	1.44	2.0	4
1500	1250	1.80	2.5	5
2000	1500	2.16	3.0	6
3000	1750	2.52	3.5	7

Health Care and Emergency Medical Services

The state troopers are responsible for supervising rescue operations for emergency situations in the Beluga area. Medical evacuations are usually accomplished by private charter plane. The RCC (U.S. Air Force) also handles some emergency evacuations.

Health care services are available to the residents of Tyonek through a medical center located in the village. The facility handles both medical and dental work and is staffed by a resident, licensed practical nurse. Emergency medical care is received at the ANS hospital in Anchorage.[8] The clinic also has a community health aide (and alternate) provided through

the U.S. Public Health Service. The health aide may provide services to nonnatives on an emergency basis only. Nonnatives are billed for the service.[9]

The Kenai Borough's Central Hospital service area encompasses over 1000 square miles of land on both the east and west side of Cook Inlet. On the west side of Cook Inlet, the service area extends from Beluga River to Drift River, including the study area. A 32-bed hospital is located at Soldotna.

The health care needs of a work camp of 300 to 500 workers could be met in several ways. The camp could train or hire its own paramedics or obtain the services of a resident nurse or doctor. Tyonek Timber Company, for example, has its own paramedics at the lumber camp. Emergency medical situations could be handled by air evacuation to either the Soldotna hospital or a hospital in Anchorage. A small clinic could also be built at the work-camp site. Prefabricated first-aid units are available and can be barged to the site. A 14-bed, 58-foot by 56-foot unit costs about $125,000 in 1978 dollars.

A permanent community of 1000 or more without road access should have its own resident doctor, nurse, and clinic. Needs for hospital and clinic facilities and staff are usually based on the expected number of patients, but, a rule-of-thumb "bed multiplier" is 4.0 to 4.5 beds per 1000 population.[7]

RECREATION NEEDS AND OPPORTUNITIES

For either a work camp or a community, adequate opportunities for both indoor and outdoor recreation must be provided. Libraries, parks, community centers, restaurants, bars, and shops all help to meet recreational needs. Some problems were encountered during pipeline construction in those camps that did not provide adequate recreation opportunities. Studies of energy development communities elsewhere in the United States have also demonstrated that a lack of recreation facilities and services can contribute to stress

and mental health problems, especially for nonemployed dependents. In addition, worker productivity may decline if opportunities for rest and relaxation are absent.[10]

Recreation needs in a work-camp setting can be met in several ways. Work schedules might be arranged on a "three-weeks-on, one-week-off" basis, with transportation provided to Anchorage (or elsewhere) during the off-period. The camp operators could also provide a recreation annex onsite, including indoor exercise facilities, informal meeting space, reading materials, and a bar.

Business opportunities will generate restaurants and other retail establishments in a permanent small city. In addition, residents will want to develop a range of facilities, including libraries and parks. Requirements for park and library space will vary depending on the expectations and desires of community residents. General standards for small rural communities indicate that a library facility for a population of 1000 should have a minimum of 6000 square feet, 10 patron seats, and 3000 to 4000 volumes. The facility should be open at least 20 hours per week at fixed times.[7] Bookmobiles (in this case, airplanes) may also be used to provide library services to an isolated area. If a school is built to serve the community, the school library might also be designed to serve the adult population.

The need for parks will be influenced by the character of the land surrounding the settlement site and the opportunities it offers for outdoor recreation--hiking, picnicking, and so forth. In any case, park space within the city for children is undesirable. Community-based park facilities are generally of three types: playgrounds (about 3 acres), neighborhood parks (about 10 acres), and community parks (about 60 acres). A new community in the Beluga area of 700 to 1400 residents could require a total of about 4 acres of park space. Parks might include play apparatus, a baseball diamond, and tennis courts.[7]

WATER AND WASTEWATER SYSTEMS

Existing Systems

Existing water sources for the village of Tyonek, the Tyonek Timber Company and the Trading Bay are described below.

Village of Tyonek

The existing water source for the village is a nearby lake.[a] The former ground water supply was abandoned because of its high iron content (with manganese).

The water system, which includes an infiltration gallery and pump house, was installed by the village in 1976. The lake water is chlorinated, stored in a tank, and filtered with activated carbon before being delivered to the underground distribution system, which was completed in 1972 under an EDA contract. A previous groundwater well was developed in 1964 by the U.S. Public Health Service, but is used only for public water supply. Each house and the school is served by the distribution system. The 27 new housing units planned for the village by Cook Inlet Housing Authority will be connected to the distribution system.

Several water system problems were identified in a recent Public Health Service survey:[11]

- The chlorinator is not working properly.
- The activated carbon supply needs to be replenished.
- The lake level is very low, primarily because of extensive winter pumping to keep waterlines from freezing.

The report also identified other potential water sources, including Second Lake, Chuitna River, and Bunka Lake. Water quality tests indicate

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[a] Water quality, prior to treatment, has the following characteristics:

Fe (Iron)	0.2 mg/ℓ
Hardness	9.0 mg/ℓ as $CaCO_3$
Total Dissolved Solids	10.0 mg/ℓ

that both Rainbow and Second Lakes are low in iron and should be good water sources. The Public Health Service is investigating future water-source development.

The primary method of wastewater disposal is septic tanks with subsurface leach fields; some cesspools are also used. The septic tanks were installed in 1965, have a capacity of 200 to 400 gallons, and are constructed of low-grade steel. Some of the tanks are rusting.[11]

The soils have a gravel base, making them good for subsurface disposal. The problems that have developed with the onsite systems are probably a result of the small size of the tanks and inadequate maintenance.

An unfenced sanitary landfill is located 4.2 miles from the village. The Kenai Peninsula Borough is in the process of establishing a new landfill for the village, but it may be a year before all approvals are obtained.

Tyonek Timber Camp

Water is supplied from three wells, which have been adequate to support 200 people to date; no water shortages have occurred. The water contains an excessive amount of iron and barely meets water quality standards. However, no bacteria problems exist.

Water is distributed through an underground system that requires standard maintenance. No winter freezing problems have been encountered.

Septic tanks with perforated-pipe drainfields are used for waste disposal. The systems have required normal maintenance; no special problems have developed. The soils (consisting of a gravel base, covered with a few feet of sandy loam and some clay) are good for subsurface disposal.

Trading Bay

Water is supplied from wells at Marathon Oil Company's Trading Bay facility and no shortages have occurred. Septic tanks with drain fields have also been used with very few problems.

Requirements

To project water demand and system requirements for communities associated with Beluga coal-field development, we have assumed a demand of 70 gallons per capita, per day (gpcd) for a resident work camp[a] and 90 gpcd for a permanent community. We have also assumed that 100% of the total water supplied becomes sewage.

The first coal development scenario (generating plants only) estimates an initial population of 200 in 1980, or a water demand of 14,000 gallons per day (gpd), that must be supplied, treated, and disposed of. In the peak year (1982), a 36,400-gpd capacity is required. This demand declines in 1985, and the system requirements from 1986 on should be capable of handling about 23,400 gpd.

In the case of coal export only (scenario 2), water demand is likely to remain fairly constant, ranging from 21,000 gpd in the first year to 23,400 gpd from 1990 on.

Water demand for the third scenario is initially quite similar to scenarios 1 and 2. Water supply, treatment, and disposal systems must accommodate 21,000 gpd in 1980, rising to about 36,000 gpd in 1982-84, and then declining to about 23,000 gpd in 1988. Estimates for 1991 and after assume a permanent community with a 90-gpd demand, or a total daily demand of about 120,000 gallons.

Water Availability

Water to meet the demands of a work camp or permanent settlement can be supplied from either surface water or ground water sources. Potential surface water supply sources in the Beluga area include the Beluga River, with an average flow of 2400 cubic feet per second (cfs), and the Chuitna River (about 5 miles northwest of Tyonek), with a minimum flow of 60 cfs. Water quality data indicate that Chuitna River water would be acceptable for drinking with minimal treatment.[b]

(a) Based on the experience at Alyeska pipeline construction camps.

(b) USGS surface flow and well records for several locations in the Beluga area are contained in the Appendix.

System Alternatives

The alternatives available for meeting the water supply and wastewater disposal needs of new settlements include onsite systems, new community systems, and expansion of existing systems.

Onsite Systems

Onsite systems (wells and septic tanks) will function well if good soils and adequate separation (about 4 feet) are available between the leaching bed and the water table. In general, areas suitable for subsurface disposal systems have gravel and other permeable soils.

Onsite systems are best used where residential lot sizes are 20,000 to 40,000 square feet. When both individual wells and septic tanks are employed, the minimum lot size should be 40,000 square feet; when water is supplied through a community system, but waste disposal is onsite, a 20,000-square-foot minimum lot size is desirable.[12]

Multifamily residences (including work camp dormitories and bunkhouses) are less suited than single-family residences for onsite waste disposal. Large quantities of wastewater must be disposed of, requiring large septic tanks and leach fields.

Community Water and Sewer Systems

If onsite disposal is not possible, either because of adverse soil conditions or living unit configuration, community water and sewer systems must be developed.

A water treatment plant may be required, especially in the case of a permanent community. The length of water transmission mains will vary, based on the plant location in relation to the supply source. Small, outlying communities of low density are likely to have deep-well systems located adjacent to treatment plants and distribution points and, thus, do not require transmission mains.

Water-saving fixtures should be a part of the community water system, and their use should be encouraged. They will help to decrease the total water demand of a new settlement.

For sewage treatment, the system should be as simple as regulatory agencies will allow, while still maintaining adequate effluent discharge quality and receiving water quality. Types of sewage treatment systems, in order of preference, are listed below:[a]

1. facultative lagoon (requires the greatest land area of the alternatives)
2. aerated lagoon
3. mechanical systems (biological: activated sludge, RBS, ABF; or physical/chemical).

Discharge of sewage to a stream will require approval from EPA and the Alaska Department of Environmental Conservation. Discharge to Cook Inlet is another possibility if the new community is located close to the Inlet. This would not be feasible for a community in the Congahbuna Lake area because the distance to the Inlet is too great to make it economically feasible.

For solid waste disposal, the sanitary landfill method tends to work best, especially for a publicly used and operated system. In most cases, incineration is uneconomical when compared with sanitary landfill disposal. If the flow of solid waste can be carefully controlled (as in an industry-operated work camp), an incinerator might be an economical alternative.

Expansion of Existing Systems

A new community in the Beluga area is unlikely to be able to use existing water systems to serve its needs. For example, the present Tyonek water supply system is too remote to be used by a community next to Congahbuna Lake.

[a] For a brief description of each of these system types, see Appendix.

TRANSPORTATION AND POWER

Existing Systems

Existing road, air, and shipping transportation facilities as well as power supplies are described below.

Roads

Most of the road system in the Beluga area has been developed by Tyonek Timber Company in the form of logging roads that connect Granite Point, Tyonek, Nicolai Creek, Kaloa, North Foreland, and Beluga. There are about 100 miles of primary and secondary roads. These roads are in good condition, especially the main roads (see Figure 3).

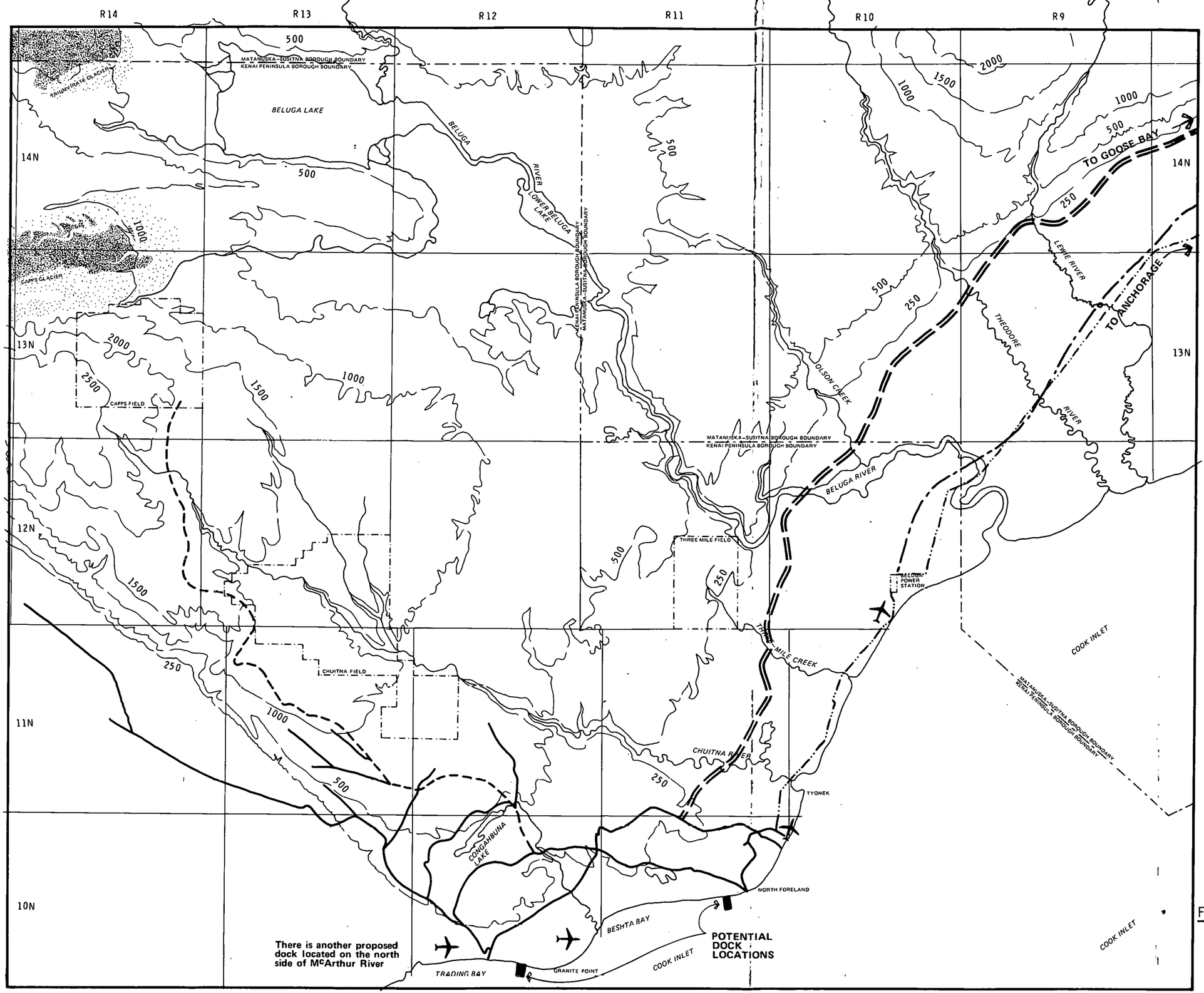
The main logging road extends approximately 16 miles northwest of Congahbuna Lake to within 8 miles of Capps Coal Field. Most roads are sand, overlain with gravel, and require no special maintenance. The roads are retopped following breakup.

Road rights-of-way (100 feet wide) are established along the section lines of all state land (or land acquired from the state). All other land has a 66-foot right-of-way along section lines. Some legal questions have been raised about how this right-of-way provision applies to land "reserved for public use." No rights-of-way are associated with the network of logging roads. Access was permitted as part of the state's timber sale contract with Tyonek Timber Company.

Beluga and Anchorage are not connected by a year-round road; however a winter road has been used in the past when the Susitna River was frozen. The road was originally constructed to carry large, heavy equipment to the area, but it has not been used for the last two winters.[a]

The Alaska Department of Transportation and Public Facilities has studied the Beluga area and developed plans for river crossings and roadways. A proposed highway would run from the Moquawkie Reservation to Goose Bay (about 65 miles), crossing the Susitna and Beluga Rivers. An existing road

[a] During the 1975-1976 winter, the Susitna River did not freeze over.



ACCESS CORRIDOR
300' wide floating transportation easement

LOGGING ROADS

WINTER ROAD

PROPOSED KNIK HIGHWAY

EXISTING TRANSMISSION LINES

PRIMARY AIRSTRIP

0 1.5 3 6 miles

Source:
1. State of Alaska, Department of Commerce and Economic Development, Division of Energy and Power Development
2. Beluga Coal Company
3. CH2M HILL. Consulting Engineers

The land status designations shown on this map reflect the best available information at this time and should be confirmed.

September 1978

FIGURE 3-3. Transportation Facilities. Central Beluga Coal District

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already connects Goose Bay to Knik (10 miles), Knik to Wasilla (19 miles), and Wasilla to Anchorage (47 miles). The approximate location of the road is shown in Figure 3.

The proposed highway is not likely to be constructed in the near future, primarily because the economic benefits to be derived from it do not justify the construction costs. The river crossing alone would cost an estimated $250 million (1978 dollars). This may be compared with an annual state highway budget of a little over $100 million. The proposed highway may become more attractive as additional projects for resource and industrial development in the Beluga area (aluminum smelter, coal generating plants, etc.) are proposed or become feasible.

Airport Facilities

Four primary airstrips are located in the Beluga area: at the Beluga power plantsite, Tyonek Village, Kaloa, and Granite Point. Characteristics of these four strips are described briefly:[a]

- Beluga: 5000 feet, gravel surface, landing lights, good condition
- Tyonek: 3500 feet, gravel surface, landing lights, good condition
- Kaloa: 5000 feet, gravel surface, landing lights, good condition
- Granite Point: 3500 feet, gravel surface, poorly maintained.

Other airstrips in the area include a poorly maintained 3500-foot City Services Oil Co. field, 8 to 10 miles west of Beluga; a 1700-foot airstrip in good condition at North Foreland that will handle a Sky Van; and several light aircraft strips, including two 900-foot strips at Capps Field.[3]

All airfields in the Tyonek-Beluga area are privately owned and maintained. Use of the airstrips requires permission of the owners.

(a) Airstrip length requirements vary by type of aircraft. Both the Sky Van and Titan need about 2000 feet of runway. A C-130 requires close to 5000 feet. (A Titan will hold 10 people, or can be converted to cargo only up to 3500 pounds. A Sky Van will hold 10 to 12 people or 3000 to 3500 pounds of cargo. A C-130 is a large, 4-engine, turbo-prop plane, much larger than the Titan and Sky Van.)

Dock Facilities

A 1466-foot dock at North Foreland is the only dock located in the Beluga area. Owned by Tyonek Timber Company, it has 685 feet of berthing space and a water depth of 36 feet at mean low water. The largest ship to dock at North Foreland was 607 feet long and 45,000 metric tons. The dock would need to extend about 3700 feet from shore to reach a 60-foot depth. The dock is used from April to November, depending on shipping schedules. No unusual maintenance has been required to date with respect to ice or current problems.

Power

Chugach Electric Association operates a large, gas-fired generating plant at Beluga with a present capacity of 297.7 megawatts (MW) and a planned capacity in 1979 of 362.1 MW.[1] Chugach Electric supplies power to Three-Mile Creek Subdivision, the village of Tyonek, the Tyonek Timber Company, and others. Transmission line location is shown in Figure 3.

The village of Tyonek constructed a 10 MW generating plant some years ago to be run with gas from two prospective wells. When these wells failed to produce, the generating plant was sold to Chugach Electric Association in 1972 for $447,500, a contract was negotiated to supply Tyonek with 50 million kilowatt hours (kWh). Tyonek has used somewhat less than 5 million kWh per year since 1972.

Requirements

Future power and transportation requirements are discussed in the following sections.

Power

Power for a work camp in the Beluga area could be supplied from the existing Beluga generating station, especially during the initial construction phase of coal field development. If coal-fired generating plants are constructed in the Beluga area (scenario 1), these could eventually supply the work camp with electricity. Standby generators should also be available in case of a power or transmission line failure.

A permanent community of 1300 people or more (as projected in scenario 3) could eventually be supplied with power from a coal-fired generating station, depending to some extent on its distance from the community. Power would probably be available from the Beluga generating station during the initial phases of community development.

A peak demand of 2.0 to 2.5 kW per household can be used to estimate minimal power requirements for a small, isolated residential community.[a] For the community described in scenario 3, a 1500-kW-demand load should be anticipated. This would be adequate to serve residences, small businesses, and a school but would not supply the power needs of any heavy industry in the area. The potential 1500 kW demand is an almost insignificant percentage of the Beluga generating station's eventual 400-megawatt capability.

Airport Facilities

A 3500-foot airstrip can support a work camp of 200 to 500 people if barging is also relied on to bring in construction material, equipment, and other bulky goods. Currently, all people, and most goods, are transported to the Beluga area by air. Some goods are also shipped by small barges.

A permanent community of 1300 people or more will likely require at least a 5000-foot airstrip with adequate lighting and a building for travelers and cargo.

Dock Facilities

Dock facilities will be required to export coal from the Beluga area. Coal transport ships must have a water depth of 65 feet at low tide in which to maneuver and take on cargo.[3] A barging operation requires less depth; a loaded barge draws from 18 to 30 feet, depending on its size.[13]

Placer Amex, Inc. investigated a number of potential harbor sites for dock facilities on the west side of Cook Inlet between West Foreland and North Foreland. The three potential harbor sites that were identified are shown in Figure 3.[3]

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[a] CH2M HILL estimate.

One site is adjacent to the Tyonek Timber Company dock at North Foreland; access to the dock would be through Tyonek village lands. The other two sites are adjacent to state-owned lands at Granite Point and Trading Bay.

The shortest distance to 65-foot depths is at North Foreland (about 3700 feet from shore). The distance at Granite Point is over 8000 feet and over 12,000 feet at Trading Bay. These lengths assume that berthing must be available on a 24-hour basis (i.e., including the period of lower low water). If berthing space is required only part of the day, shorter dock lengths are possible.

A road or rail connection must be constructed from the dock to the new community and to Capps Field. It would be easier to build and supply a settlement in the Beluga area if it were located fairly close to the dock. Construction materials, equipment, and other supplies could be barged or shipped in and then trucked a short distance to the site. The Granite Point dock location is about 4 miles overland from the proposed community site at Congahbuna Lake. This configuration of dock and community site would avoid the need to cross Tyonek village lands.

Dock siting and construction require a permit from the Corps of Engineers (see Chapter 5). The permit is subject to public notice and review before it can be issued. Although the Corps has indicated that the permit should present few problems, it could be the subject of considerable controversy if road access is required across Tyonek lands to connect the new community and dock.

Overland Transportation

Of primary concern for coal development in the Beluga area is transporting the coal overland from Capps Field to either a coal-fired generating facility or a dock for export. Gravel surface roads are preferable since they are fairly stable, can handle heavy traffic, and are easy to maintain, especially given the frost heave problems. A road from Capps Field must be designed for at least 150-ton haul trucks.(3)

The quantity of coal required to supply coal-fired generating plants does not justify a rail connection. Rail becomes a feasible alternative when over 2 million tons of coal must be transported.[3] The two methods of transporting coal, railroad and truck, are not mutually exclusive. A truck-haul system may be used initially until the market has built up sufficiently to warrant railroad construction.

A third overland transportation method for coal is the slurry pipeline. Slurry may be a mixture of coal and either oil or water. The capital costs associated with a pipeline are much lower than with railroad construction. Costs are increased somewhat by other factors, however, such as storage and use of oil to mix with the coal. The coal must be crushed more finely than is necessary for truck and rail transport. The more finely the coal is ground, the more fly dust is produced and lost.

Loading would be simplified with a pipeline, since extending a pipe out to a large ship is simpler than constructing a dock. A catenary (a metal trestle), built to withstand the ice conditions and currents would suffice for a pipeline. A platform or T-section would be anchored at the end of the pipeline, so a ship can berth. A road would still be needed along the pipeline for maintenance and personnel transport, but less road maintenance would be required for this than with the truck-haul system.

The amount of road construction required to support a work camp or full-scale permanent community will depend on site design and living configurations. A work camp with bunkhouses would require a minimum road network. A full-scale community might require anywhere from 6 to 20 miles of local streets. The city of Seldovia (population 600) maintains 6 miles of community streets; Homer (population 1800) has 8 miles of local streets; Soldotna (population 2600) has 27 miles of city-maintained roads.[5]

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Chapter 4
PSYCHOSOCIAL PROSPECTS FOR TYONEK

OVERVIEW

The development of coal in the Beluga field is likely to have extensive impacts on the residents of the native village of Tyonek. Both negative and positive consequences may occur. Unlike many native villages in Alaska, Tyonek has previously experienced the impacts of development through: (1) royalties obtained from gas and oil leases in 1964, and (2) the construction and development of a large lumber chip mill just outside village boundaries. Like all native villages, Tyonek also faces the complicated and sometimes confusing conditions created by the Alaska Native Claims Settlement Act of 1971 (ANCSA). Past and current experiences with economic development have made Tyonek residents more sensitive to their consequences than most native Alaskans. They view development of the Beluga coal field with apprehension, skepticism, and caution because its impacts may forever change their village life style, quality of life, and life satisfaction.

This section of the report focuses on the concerns of the village residents. It examines the potential impacts of development on their community and life style and includes recommendations for minimizing negative social and individual impacts on village residents. Throughout this section emphasis is placed on the unique cultural orientation of Tyonek residents and on problems faced because of accelerated contact with the values, beliefs, and life styles of nonnatives and outsiders.

The scenarios presented and discussed earlier in this report suggest various levels of coal development. Elements such as the presence of a mining camp and the population size would vary as a function of the level of development. Any one of the scenarios would affect the quality of life and lifestyle of the Tyonek people, although the full-scale development depicted in the third scenario would have the greatest effects on the Tyonek village. To anticipate those maximum impacts, this section focuses entirely on that scenario, which includes the development of a new community of approximately 1300 people at Beluga.

A HISTORICAL PERSPECTIVE ON THE VILLAGE OF TYONEK

No one is certain when the first residents settled in the area now known as Tyonek. As late as 1880, Ivan Petroff, a Russian territorial governor, noted that the area around Tyonek contained "2 whites, 6 creoles and 109 natives." The native population has steadily increased to the present-day level of 271.

The native residents are related to the Athabascan-speaking clans and tribes that inhabit the central interior of Alaska and certain provinces of Canada. Many of the early folkways and mores of the Cook Inlet natives were heavily influenced by various Eskimo groups and Northwest Coastal tribes. Anthropologists noted that the Alaskan Athabascans displayed a "lack of precisely definable cultural base".(1) The tribes and clans have always been hunters and fishermen; as a consequence, they experienced a great deal of mobility and mingling with members of other villages. These factors have led many historians and anthropologists to believe that the Athabascan groups were highly adaptive, resourceful, and susceptible to external influences.

While the residents of the northwest shore of the Cook Inlet are often referred to as Tyoneks, they are actually of the Moquawkie tribe and of the Tanaina component of the Athabascan linguistic group. Through the years, outsiders have referred to the area as Moquawkie (many maps still show it as the Moquawkie Indian Reservation), Tyonek, and in rare instances, Beluga. Today, the native residents are identified as Tyonek.

Vestiges of traditional life style are still apparent in present-day Tyonek. Fishing and hunting are highly valued among villagers and the catches form the mainstay of the typical diet. Family networks are extended to include all relatives, however far removed. As one resident pointed out, "In one way we are probably all related." Tenets of the Russian Orthodox Church dominate religious beliefs and values and have a strong, bonding influence on everyday behavior. But while the tenets of Christianity guide behavior, values generally attributable to American Indian and Alaska Native groups are apparent. Tyonek residents value generosity, sharing, cooperation,

humility, and a present-time orientation. In general, the villagers believe in living in harmony with nature and using only what is necessary. In this regard, every part of something (such as a moose, fish, or tree) has a functional use and should not be wasted. Moreover, most Tyoneks believe that the old traditional ways are functional and should not be changed simply because something new might be better.

Up to 1963, few major changes occurred in the Tyonek region. Daily living patterns centered around routine subsistence tasks. The quality of life was well below modern standards; many considered it close to poverty level because of substandard housing and diet and lack of basic utilities. However, the discovery of oil and gas reserves in the region and around the boundaries of the community had a dramatic impact on the Tyonek life style and quality of life. In 1964, the Tyonek community, with the assistance of the Bureau of Indian Affairs (BIA) and a few beneficient attorneys, gained about $12 million from oil and gas leases. In addition to undertaking many profitable ventures, the Tyonek Village Council approved a program that included improvements to roads, the airstrip, and community buildings, and increased opportunities for youth. More importantly, 59 new homes were constructed, one for each family residing in the village.

Some of the lease money was also invested, primarily in the Anchorage area. The Tyonek Management Corporation was established to plan and oversee those investments. Buildings were purchased and leased, and a construction campaign was initiated that resulted in office buildings and homes for Tyonek natives living in Anchorage. About 302 enrolled members of the village share in the profits from the investments.

Money generated from the 1964 oil and gas leases had a dramatic impact on the quality of life and life style of Tyonek residents. Many claim that their diets have improved, resulting in better overall physical health. Educational opportunities have been expanded with the construction of a new school. Employment opportunities and skill training have advanced, particularly in the construction fields. But wealth also brought the Tyoneks into closer contact with outsiders, largely through individual purchases of

television sets, home entertainment equipment, and motor vehicles. Most villagers welcomed the sudden change and adapted to it with ease, but some did not and resented the intrusions and distractions created by the wealth. Through all these changes, however, the village remained a reservation and the Village Council retained the right to control access by outsiders and developments on reservation lands.

The second major impact on the Tyoneks came about seven years after the oil and gas lease. In 1971, the Alaska Native Claims Settlement Act went into effect. Through ANCSA, some 79,000 Aleuts, Eskimos, and Indians in Alaska were given about 40 million acres of land and close to $962,500,000. Tyonek natives shared in the settlement through their choice to become part of the Cook Inlet Region Corporation, one of 12 native regional corporations established as a result of ANCSA. Within five years after ANCSA went into effect, each regional corporation was required to distribute 10% of the monies derived from ANCSA to shareholders. Tyonek residents participated in this settlement and received an average payment of about $400 each.

While ANCSA meant income to Tyonek residents, problems emerged that seemed to outweigh the small amount of money received. Questions concerning jurisdiction, land use, water rights, and enforcement of village ordinances soon plagued the Tyonek Village Council, otherwise referred to as the Indian Reorganization Act (IRA) Council (see Chapter 5). Village residents today feel that outsiders have abused visiting privileges, have contributed to the disruption of hunting and fishing patterns and, in general, have negatively affected the life style. In effect, ANCSA has led to the dissolution of the reservation status, has created complicated institutional arrangements, and is threatening traditional life styles among the Tyoneks.

The third major impact on the village of Tyonek occurred in 1975. At that time Tyonek Timber Company (TTC), a subsidiary of Kodiak Lumber Mills (KLM) began operations. TTC basically reduces wood to chips, which are eventually marketed for newsprint and paper products. The main processing plant is located just south of the present Tyonek village and occupies land

once "owned" by the Tyoneks. From time to time, TTC employs Tyonek residents, but the bulk of the employees are transient nonnatives.

KLM and the accompanying housing settlement was the first "outside" venture to locate near Tyonek. While TTC means jobs for Tyonek residents, it also presents some problems:

1. Job opportunities for Tyonek residents are seasonal and skill-dependent, i.e., many jobs require specialized skills.

2. Work schedules are oriented around a nonnative way of life. Workers are required to put in eight hours a day, five days a week. Many Tyonek residents are not accustomed to this schedule and find it too constraining Although some residents want to work at KLM, their first priority is fishing. When the season starts, many would rather be in their boats and at their sites casting nets than operating heavy equipment.

3. The presence of outsiders who have a different cultural life style is viewed with suspicion and concern. Some villagers feel that the TTC workers have contributed to the increase of alcoholism and drug abuse in Tyonek. Others feel that teachers are more responsive to the educational needs and life orientations of the nonnative students attending the Tyonek school than they are to those of the native students. There have been a few isolated instances of hostility and overt conflict with TTC workers which have tended to heighten suspicions and concerns. Overall, many villagers feel they have little to gain from TTC's present operation.

By way of review, village life at Tyonek has been dramatically affected and altered by three major events. Within the past 14 years, Tyonek revenues have increased owing to gas and oil leases, ANCSA, and employment opportunities at the lumber chip mill. Nonetheless, the three events have created problems in life style, organization and management of the land, and individual preferences for improved standards of living. Tyonek residents

have coped reasonably well with the changes evoked by the three events. However, many problems have been introduced that are creating adjustment and adaptation difficulties. By nature of their cultural tradition, Tyonek natives have had to adjust and adapt to many circumstances, for the changes introduced in the past decade and a half have posed problems never before faced by the Tyonek people.

PRESENT LIFE STYLE

At present, slightly more than 270 people live in the Tyonek village. Most, if not all, live in the houses constructed during the mid-sixties. Most families have established a moderate standard of living; trucks, cars, television sets, and citizens band two-way radios are commonplace. It is apparent that the diffusion of technology and contact with the outside world are influencing their life style.

For the most part, five major families tend to dominate village life and decisions made by the IRA Council. This does not imply, however, that other families are excluded from participation in community activities and the decision-making process. Rudiments of traditional decision-making procedures are clearly evident in the efforts by the IRA Council to involve everyone in current and future ventures affecting the village as a whole. Participatory management seems to be the main organizational style of village government.

At present, women hold key leadership roles in the village: the president and vice-president of the Village Council are women, as is the president of Tyonek Native Corporation in Anchorage. As a result, some outsiders consider the Tyoneks to be matriarchal (i.e., women control decision-making patterns). However, the present administrative arrangement is unique in the long history of the Tyoneks. Instead of Tyonek social organization being matriarchal or patriarchal, it is probably more a system of shared responsibility in which males and females are joint participants in decision making. Kinship is typically traced through the lines of the father (patrilineality); but otherwise neither sex appears to exert more decision-making influence than the other.

At one time, the Village Council prohibited outsiders from living in the village. In fact, at one point during the late sixties, visitors were not permitted in Tyonek unless they had been invited. This policy is still nominally in effect, but it is not enforced as rigorously as in the past. Moreover, a few nonnatives married to native residents are now living in the village. Ordinarily, nonnatives were supposed to appear before the Council to make their resident requests known. In addition, such individuals had to state their intentions; i.e., what they planned to do, where they would work, etc. The Village Council has also become somewhat lax in enforcing this policy, although there is talk that it will be reaffirmed in the near future. This reaffirmation is closely aligned with the sentiments of a few villagers who feel that ouside influences are becoming too disruptive and are having a negative effect, especially on youth.

Employment opportunities in the village are limited. Apart from the seasonal employees and the lumber chip mill, the major employer is the Village Council itself. Positions are varied and include secretarial/clerical work, heavy equipment maintenance and operation, and unskilled labor such as painting, janitorial service, etc. Apart from those who work in the native store, and occasionally on offshore oil rigs and at the Beluga power station, most natives are subsistence fishermen. Fishing seems to be the main interest, as it has always been. Many look forward with great enthusiasm and anticipation to the fishing season. Although it is not entirely true, it often appears as if all nonfishing-related village activities cease during the season and everyone seems to participate in the fishing activity.

In July 1978, 44 village males were unemployed although able to work if jobs had been available. In addition, 40 individuals were receiving some form of state welfare assistance, 10 of whom were participating in the food stamp program. While the unemployment rate is consistent with other native villages, participation in the welfare program was slightly less than the average for the region.

Tyonek residents have more contact with urban life and the nonnative world than do typical Alaska natives. Their close proximity to Anchorage (about 88 air kilometers) affords them line-of-sight television and commercial radio reception and easy air access (round-trip air charter fare ranges from $30 to $60) to the city. Through the media and visits to the city, many Tyonek residents are keenly aware of the impacts of industrial and land development and of population expansion on people and communities. Many recognize that idleness and boredom stemming from unemployment can lead to socially disruptive behavior such as vandalism, alcoholism, and drug abuse. Similarly, the role models provided youth by the unemployed and their exposure to the electronic media are potentially disruptive and considered counter to the preferred village pattern of living.

The present living standards of Tyonek are perhaps changing more rapidly now than ever before. While Tyonek received an earlier start than most Alaska native villages, its attempts to adjust to and cope with social change differ little from those of Alaska natives in general. The preferred life style is to retain the cultural traditions within a typical slow-paced rural environment. Tyonek's future is tenuous, however, like that of many Alaska native villages; it hinges on the potential impacts of coal and industrial development in the region.

EFFECTS OF COAL DEVELOPMENT ON COMMUNITY LIFE STYLE

Life in Tyonek would indeed be changed by coal development in the Beluga coal fields. Everyone in the village would be affected by it. Coal development would mean more jobs and overall economic growth for the village as a whole. It would also mean accelerated contact with outsiders and an introduction to new life styles.

Coal development would also produce population increases in the northwestern area of Cook Inlet. As many as five times the current population of Tyonek could settle in that area temporarily or permanently. Along with these people would come support services and other economic activities. Children from the community might attend the school at Tyonek, and because

of their numbers could relegate the Tyonek youth to minority status. Overall, the changes induced by this population expansion could have extensive and very disruptive effects on Tyonek.

At a broad social level of analysis, development implies that two distinctly different cultures would come together rapidly. Although Tyonek residents have had considerable contact with the dominant American lifestyle, this contact would be greatly expanded by coal development. Under those circumstances, a variety of interpersonal and intergroup conflicts would likely surface. The contact generated by employment, the proximity of the mining camp to Tyonek, and the presence of nonnative children in Tyonek schools could intensify salient and subtle cultural differences between the two groups. The values, beliefs and customs of both parties would be challenged and could become points of controversy.

Coal development would also mean that, for the first time in their long history, Tyonek residents would be in the minority in their own region. Minority status usually is often a breeding ground for racism and discrimination. Status and cultural differences therefore can be factors in intensifying unfriendly and perhaps hostile relationships.

With the potential for social conflict comes a potential for social deviancy such as vandalism, larceny, alcoholism, and drug abuse. All of these forms of deviancy contribute to one another and in many cases can be emphasized by prevailing differences of opinions, intergroup relations, and feelings of inferiority, especially on the part of the group relegated to a minority status. Intergroup conflict can also affect employment, job productivity, learning in the classroom, and can disrupt a community's total way of life. At present, however, Tyonek is faced with only limited forms of alcoholism and drug abuse. Relationships between village residents and TTC employees and their families appear amiable. Tyonek residents have had only limited experience with the sort of problems generated by rapid economic and community development. Long-term development of the Beluga coal fields could therefore set in motion an irreversible change process in which the negative outcomes might far outweigh the economic benefits to Tyonek residents.

COMMUNITY PERCEPTION TOWARDS DEVELOPMENT

In contrast to the Kenai Peninsula area on the eastern shore of Cook Inlet, the northwestern shore is relatively isolated and, as yet, undeveloped. The power station at Beluga, the TTC lumber chip mill, the Granite Point Oil Facility, and the village at Tyonek make up the bulk of the activity and are the primary populated areas. At the same time, the area is ripe for extensive industrial development, especially if a plentiful supply of coal were readily available. How do Tyonek village residents feel about this present and potential development? What are their preferences? Can they hope to maintain their present life style in the face of population expansion? What are their major concerns? In their opinions, who is responsible for preventing the negative consequences associated with development?

Tyonek residents have had experience with developmental efforts. Through the media and visits to other communities outside the region, residents have acquired a sense of what the effects of development would be on the land and their community. To assess community feelings towards the questions listed above, interviews were conducted with a small representative sample of Tyonek residents. The results are summarized below.

All of the respondents expressed concern about the effects that coal development would have on their way of life, their culture, and the land on which they live. They recognize that development is inevitable. Some prefer that it not occur at all; a few acknowledge the economic benefits and hope that development will occur in an orderly, nondisruptive manner. All of the elderly respondents questioned are against development occurring within the village and especially in outlying areas. One elderly male best summarized this feeling when he said: "We want to live our life the way we have lived it. We don't want to be impacted in a sudden manner by something that's different to our way of life." One woman expressed concern for her children and grandchildren and saw more negative consequences than positive benefits emerging from coal development. She was especially concerned about "the abuse of alcohol and dope" and the effect these elements would have on the community as a whole.

Most people acknowledged the opportunity for employment and training, but some definite concerns were raised. "It will be all right," said one young male respondent, "if the coal company gives us training. But after the coal is gone what good are our skills? There's nothing else to mine in the area and I want to live here, not in Anchorage or some place else." Another male focused on the job requirements when he said, "I can do the work but I don't like to punch a clock and have the union tell me what to do. I know fishing and that's what I like to do. You can't fish all the time so I can use the job [at the coal field]. When it's time to fish I want time off to do that and still have a job to go back to. The union and coal company won't permit that." In general, the respondents felt that jobs were probably the only positive benefit associated with development.

Many respondents raised questions about jurisdiction and use of present facilities at Tyonek. Since Tyonek has the only school in the region, many expressed concern over student enrollments, classroom space, student/teacher ratios, and curriculum content. Of particular concern was the possibility of the school losing federal monies for education. Villagers believe that increases in nonnative student enrollment would lead to decreases in federal support for educational programs earmarked for native students. "Who would pay for the additional teachers, secretaries, additional classroom space, and facilities?" asked a mother of four children. She continued, "We built that school with our own money and assistance from the BIA [Bureau of Indian Affairs]. Those developers and Kenai Borough can't expect us to foot the bill for something we don't want in the first place." Another respondent added, "Right now we get along with the nonnative children in the school. Pretty soon there will be more nonnatives [in the school] and our kinds will be left out. A few of the elderly are teaching the children the native language, native crafts such as making moccasins and weaving baskets, including legends and stories about our history. What good will this be? Our culture is very important to us and we want to keep it. The school is the best way to teach our children the things they should know about our history, the language, and our way of life. We want to keep this."

Preservation of culture, intensification of external influences, and pressures to change are serious matters of discussion in Tyonek. Equally important are concerns over maintenance of cultural identity, a personal sense of worth, and the way of life. Problems have arisen over the matter of jurisdiction, since with the advent of ANCSA, traditional Tyonek forms of government and control have been challenged. Said one respondent, "Look, there was a time when the Village Council had complete control over use and occupancy of the land. Now, Kenai [Borough] wants to tax us, build public roads through our village, and bring in new laws. Now, who's going to enforce them? There is a constable for this whole area and he can't enforce anything. People come and go. Pilots bring in booze and dope. Hunters shoot moose and leave it lying in the village dump. Now, we'll have 3000 mining people around here and they'll probably take over the whole damn place. I'm 150% against development around here. Our life will be ruined and the land destroyed, all for coal that isn't very good anyway."

Tyonek residents have strong feelings about the land and wildlife. Like their ancestors, they want the area to stay pretty much the same as it has always been. Many feel that they have lost the opportunity to exert control over land use through ANCSA, some are bitter and wish they had not made the choice, others reluctantly accept their situation, and some prefer to go along with development without comment. Nonetheless, the deep-rooted feelings for the community and its way of life are strongly entrenched. One young student best summarized these feelings when she stated: "There is a certain warmth and sense of belonging here. When away at school, I look forward to coming home to be with the people and live with the land. When I finish school, I want to live here and provide a service. But, if coal development comes and change happens, I'm afraid our people will be faced with their greatest challenge."

The Tyonek community is apprehensive, even fearful, of the consequences of growth and development in the region. They have experienced the effects of progress and know that large-scale development can be overpowering. They recognize the negative impact of alcoholism, drug abuse, and other forms of deviancy, but feel that as long as they have some jurisdiction, reasonable

controls can be maintained. However, the location of a mining camp some 10 to 15 kilometers from their village would present jurisdictional problems and would challenge the authority of the IRA Council to govern and to regulate. Current IRA Council members are exploring the nature and extent of their powers in an attempt to define, once and for all, how much control they do have. Tyonek residents are not bitter over past experiences with development. Instead, those experiences have made most residents cautious and somewhat pessimistic toward future development.

Currently, Tyonek residents have a sense of freedom of expression and movement. Apart from difficulties and problems associated with ANCSA, the the Tyonek do not feel subordinated or restrained in terms of mobility. In some ways they are fairly autonomous and value the sense of freedom that comes with living in a somewhat isolated environment. Should development occur, however, their autonomy would be challenged. Their energy would have to be redirected to protect their autonomy and to avoid feelings of powerlessness.

The presence of an outside community with a population five times greater than that of the native people would directly challenge traditional authority and group norms. Under similar situations, especially when communities are quickly and abruptly relegated to a minority status, feelings of alienation and powerlessness have tended to increase. Along with experiencing such feelings, individuals may find life meaningless. People in this situation not only attribute similar characteristics to those about them, but also become confused about norms and values. Insight, clarity, practicality, and thought processes in turn can be distorted. Taken together these physiological and sociological phenomena can lead to low levels of personal involvement in family and community responsibilities, lack of personal support, high levels of aggression, and premature speculation about remedial recourses of action.

It is probable that many residents could effectively adapt to the changing conditions brought on by development. Nonetheless, they would experience some psychological and cultural loss. The pace of daily living

could change, values and beliefs could be altered to accommodate changes, and a bit of the cultural heritage could disappear. As long as the residents remain at Tyonek during the development process, there is every reason to speculate that, even in a small way, everyone will be negatively affected. The anticipated psychological and sociological problems, therefore, demand that preventive and corrective mental health efforts be undertaken.

The Tyonek people are proud of their life style, their village, and the environs, and they want to protect it. Just as federal and state governments seek to protect flora and fauna through environmental impact statements, village residents feel that their cultural life style should be equally considered and protected under the same guidelines.

SUMMARY

Development of the Beluga coal fields--especially under scenario 3--would likely have serious effects on the cultural life style of the residents of Tyonek. Increases in population could place Tyonek residents at a distinct disadvantage in maintaining their preferred standard of living and cultural heritage. Indeed, they could become a minority in their own region. Distinct social problems could emerge that would affect education, traditional subsistence efforts, community feelings, and beliefs and attitudes, and that could permanently alter the current way of life. Development could mean jobs for a few Tyonek residents, and with those jobs, increases in economic opportunities. Nonetheless, such gains might be overshadowed by the potential negative impacts associated with large-scale development in remote, rural areas of Alaska. Preventative measures could be taken before development begins, including establishing a standing committee composed of developers, planners, and Tyonek residents.

REFERENCES FOR CHAPTER 4

1. Spencer, R. F., et al. The Native Americans. New York, Harper and Row. 1965,155.

Chapter 5
DECISION MAKING FRAMEWORK

GOVERNMENTAL JURISDICTION AND POWERS

This chapter describes the governmental and private agencies with major jurisdiction in the Beluga area and suggests possible ways to influence coalfield development. The principal agencies[a] that will be involved in any future Beluga coal development project are:

- Tyonek Village Council
- Tyonek Native Corporation
- Cook Inlet Regional Corporation
- Kenai Peninsula Borough
- State of Alaska

Tyonek Village Council

The Tyonek Village Council is the federally chartered local "government" that manages Tyonek's public affairs. The council acts as spokesperson for the community-at-large, controls local use of village public lands and buildings, and has responsibility for public services within the community.

The Tyonek Village Council, at this writing, believes it can control access to lands encompassed by the former Tyonek reservation. When the federal reserve was abolished by the Alaska Native Claims Settlement Act, the village council's authority over the reserve lands was terminated. This did not, however, negate the role of the council in speaking for the village nor the importance of the views of Tyonek residents toward development at Beluga.

Tyonek Native Corporation

The Tyonek Native Corporation owns surface title to the site of the former Moquawkie Indian Reservation as well as other lands within the area.

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[a] The role of Federal agencies will not be discussed except for those programs administered at the State level.

As a major landowner, the Tyonek Native Corporation's policies toward industrial development and use of corporation lands may affect transportation routes, location of community and industrial facilities, and location of transshipment or power plant facilities. (See Chapter 4.)

Cook Inlet Region, Incorporated (CIRI)

As a result of an exchange of land between the federal government, the state of Alaska, and the Cook Inlet Region, Inc., CIRI will become a major landholder in the Tyonek area. In addition to holding the subsurface rights to most of the land selected by the Tyonek Village Corporation, CIRI selected the surface and subsurface rights to major portions of the land surrounding and including the private coal leases within Capps Field. CIRI was also granted a 300-foot right-of-way to connect its holdings in the Capps coal field area to land along the coast.

As a further condition of the land trade, CIRI took over the ownership of leased lands within Capps Field. Future lease revenues will accrue to the corporation, and any lease renewals or extensions must be negotiated with CIRI.

Because of its land ownership, CIRI will have a major role in determining the development of coal deposits and access to those deposits.

Kenai Peninsula Borough

The Kenai Peninsula Borough (KPB) is the only local, general government in the project area. As a borough of the second class, KPB is charged with providing education, planning, and tax assessment in the area. In addition, KPB has taken over responsibility for the provision and management of public solid waste disposal sites throughout the borough.

Under its planning authority, the borough is charged with land-use planning, zoning, and platting. No borough land-use plan now exists for the area surrounding Tyonek. The project area is zoned "rural," which allows any use except some specific activities that are noxious or harmful to public health. Subdivision of private land must be approved by the borough, but the subdivision ordinance has few requirements for subdivision improvements in rural areas.

The borough also owns land that contains one portion of Congahbuna Lake and part of the proposed site for a permanent community. As such, the borough may have some ability to influence the nature of community development through land leasing agreements.

Although a proposed land-management system ordinance is under KPB Assembly review, the borough has not yet developed policies regarding lease of borough land for industrial or community development. The borough would consider the implications of the project after receipt of a land-lease application.

Two borough service areas encompass the project site: the North Peninsula Recreation Area and the Central Hospital Service Area. Neither of these service areas provides facilities in Tyonek or the Beluga area, although the North Kenai Recreation Area is considering extending some form of outdoor recreation programs to Tyonek.

The Kenai Peninsula Borough is initiating a coastal zone management policy study and a study of ports and harbor needs in relation to energy facility development. The coastal zone management policy study will recommend a set of policies for the management of coastal resources. This document, designed for extensive public review, will be used by the KPB as a basis for their own coastal management program. The question of coal development at Beluga will not be specifically considered, and energy facility siting will be included only in a general discussion of policies.

The port and harbors study will focus on the harbor resources and facility needs related to energy development in the KPB. As such, it will consider the possibility of development at Beluga, but will recommend policies only in relation to the location and provision of port facilities.

The KPB is a participant in the Cook Inlet Air Resources Management District, a three-borough organization responsible for air-quality monitoring and enforcement in cooperation with the Department of Environmental Conservation (DEC). DEC retains the authority to set air quality standards, grant air emissions permits, and regulate surface air emissions.

In summary, the Kenai Peninsula Borough is unlikely to begin developing a policy for development at Beluga until industry approaches the borough with a land-lease or subdivision application.

State of Alaska

The state of Alaska, through its various departments, has broad authority to mitigate the environmental and, to some extent, the socioeconomic impacts of coal development. Two inter-agency organizations, the Beluga Interagency Task Force and the Coastal Zone Regional Planning Team, could also provide a means for state intervention in energy development at Beluga.

The principal state agencies with program interest or responsibility are:

- Office of the Governor, Division of Policy Development and Planning (DPDP)
- Department of Commerce and Economic Development (DCED)
- Department of Community and Regional Affairs (DCRA)
- Department of Environmental Conservation (DEC)
- Department of Fish and Game (DF&G)
- Department of Natural Resources (DNR)

Although it would not have a major regulatory role, the Department of Labor would have a voice in the setting of policy concerning labor needs, local hire, and in the inspection of construction-camp housing.

The Coastal Zone Regional Planning Team, headed by DPDP, includes the Departments of Fish and Game, Community and Regional Affairs, Natural Resources, Environmental Conservation, and Commerce and Economic Development. The team is charged with preparing a regional resource management program for the Cook Inlet Region for submission to the State Coastal Policy Council. At present, the planning team is developing criteria for identifying uses of state concern and areas meriting special attention. It is studying whether these uses and areas should be specifically identified and located or defined more generally. As a result, the extent to which Beluga-area

development will be addressed under the regional resource management program is unclear. However, its progress to date and its December 1978 report deadline suggest that recommendations and policies on development at Beluga will be limited and fairly general.

The Beluga Interagency Task Force, chaired by DCED's Division of Economic Enterprise, includes the Department of Environmental Conservation, Community and Regional Affairs, Fish and Game, Labor (in a research and information capacity), Natural Resources, and the Governor's Division of Policy Development and Planning--in addition to DCED's own Division of Energy and Power Development. The task force is charged with providing a coordinated state response to industry proposals on energy development in the Beluga area.

Office of the Governor, Division of Policy Development and Planning (DPDP)

DPDP's role in the Beluga project will primarily be one of agency coordination and policy formulation. As a policy spokesman for the Office of the Governor, DPDP can encourage line agencies to adopt programs in support of a state policy position. DPDP chairs the interagency Cook Inlet Regional Planning Team, which may address the siting of an energy facility at Beluga in the regional resource management plan in progress.

Department of Commerce and Economic Development (DCED)

DCED's Division of Economic Enterprise (DEE) also has a coordination and policy role in the Beluga project. As head of the Beluga Interagency Task Force, DEE is primarily responsible for coordinating state agency information-sharing and policy development.

In the latter stages of Beluga development, DCED's role as a regulator of private and public commerce, especially through various licensing authorities and the regulative powers of the Alaska Public Utilities Commission, may allow it to influence aspects of Beluga development.

Department of Community and Regional Affairs (DCRA)

DCRA's primary responsibilities regarding the Beluga project would involve analyzing the public costs and benefits of establishing a new community, including an evaluation of its effects on the provision of public

facilities and services. DCRA's ability to provide technical assistance and program funds for local planning and management efforts could be used to affect the nature and extent of new community development. In addition, DCRA's participation on the coastal zone regional planning team and the Beluga Interagency Task Force gives it a direct voice in formulating overall state policy on the Beluga project.

Department of Environmental Conservation (DEC)

The Department of Environmental Conservation regulates the environmental effects of industrial development, construction, handling of petroleum products, and the disposal of solid waste and wastewater. In general, any activity that affects air and water quality or involves the (potential) spillage of petroleum products or noxious substances falls within the scope of DEC regulations. Of importance for the Beluga project is DEC's administration of permits related to air quality, wastewater discharge, and solid waste disposal. DEC's regulation of activities affecting air quality includes identifying air quality districts and emissions standards under the *Federal Clean Air Act*.

Department of Fish and Game (DF&G)

The Department of Fish and Game has primary responsibility for the management of fish and game populations and the protection of their habitats. Any activity that could potentially disrupt an anadromous fish stream or affect an established game refuge or critical habitat area must be reviewed and approved by the department.

Department of Natural Resources (DNR)

The Department of Natural Resources has a potentially important role to play in developing policy concerning Beluga coal-field development. DNR regulates the use and disposal of state land and tidelands, including temporary access and rights-of-way across state land, and the appropriation and use of surface and ground water. The use of surface materials located on state land (such as rock and gravel) also falls within DNR's jurisdiction.

DNR's responsibility for classifying and managing state lands affords the state a useful tool for dealing with activities on state land. DNR may also include performance stipulations in its land leases and permits.

DNR is preparing a land management plan for state lands within the Kenai Peninsula Borough. This plan will identify land and resource entities, develop resource management objectives and implementation recommendations, and set guidelines for management and disposal of state lands. This management plan will be coordinated with ohter state, borough, and private sector planning efforts and will involve extensive local review and input. Land management options and policy alternatives are scheduled for public presentation and review in November 1978.

The department will also have responsibility for administering and enforcing federal regulations on surface mining and land reclamation. The procedures for administering the surface-mining regulations will be established by DNR.

OPPORTUNITIES FOR INVOLVEMENT

A number of opportunities will arise for government and private interests to influence Beluga coal-field development. Potential areas of involvement include:

- environmental concerns
- land management
- creation of a new settlement
- provision of community services and facilities

Environmental Concerns

Some environmental issues can be considered in advance of the review of a specific project proposal. These general environmental issues include air quality, water resources, fish and game populations and habitat, and surface reclamation and revegetation.

Air Quality

Air-quality issues involve the overall effect of industrial activity on air quality in the Beluga area and the surrounding region.

The responsibility for air-quality control lies with the State Department of Environmental Conservation. DEC's authority stems in part from its role in implementing the regulations of two federal programs--the *Clean Air Act* and the *National Pollution Discharge Elimination System*.

The provisions of these programs do more than give DEC authority for the review and permitting of new sources of air emissions. The *Clean Air Act* also requires any proposed new point-source developer to supply DEC with sufficient background data on ambient air quality at the project site. This allows DEC to adequately review the effects of the project and the proposed emissions control technology. This background information must include meteorologic data, measurement of a variety of pollutants, and analysis of area topography. DEC has indicated that a 1-year monitoring program would be required in the Beluga area before a coal-fired generating plant could be approved. DEC determines the nature of the monitoring program to be undertaken by the applicant, based on the expected project emissions. Consequently, the applicant must inform DEC of overall project plans prior to initiating the monitoring.

The proposed Tuxedni wilderness area, located about 50 miles south of the Beluga area, has been designated as a Class I air-quality-control area under the *Federal Clean Air Act*. Under current regulations, new sources of air emissions in the surrounding region must not have significant effect on the ambient air quality of a neighboring Class I area. In addition to ensuring that any development at Beluga will meet the discharge limitations for a "Class II" area, DEC must determine that coal-related facilities will not exceed the deterioration standards established for the proposed Tuxedni wilderness area nor adversely affect air quality in the Anchorage bowl. Air-quality standards could become a major obstacle to the development of coal-fired generating plants.

While DEC cannot change the air-quality standards and deterioration limits established in the *Federal Clean Air Act*, it does have the authority to determine the methods or processes of pollution control. This allows DEC to influence the design and operation of a facility and its process of development.

Water Resources

Water-resource issues involve the allocation and use of water for industrial and community purposes in relationship to existing water supply and other area water requirements. Also involved is the effect of industrial activity on water quality, both during the construction period and over the life of the operation.

Three state agencies regulate water use. The Department of Natural Resources is responsible for arranging the appropriation of water rights for ground and surface water located within state-, local-, and privately-owned lands. DEC is responsible for approving the discharge of pollutants into water and any discharge of wastewater. The Department of Fish and Game, under its authority to protect anadromous fish populations, reviews and approves activities that could affect the nature of an anadromous fish stream.

The Department of Natural Resources's (DNR) program of permitting the appropriation of water rights is based on the legal principle of prior appropriation; in effect, it is a first-come, first-served system. Because of its backlog of applications and limited staff, DNR has not given much attention to determining the effects of a new appropriation on ground water regimes or to forecasting future water requirements. DNR has the authority to regulate the taking of surface and ground water from private lands. Attaching conditions to a permit for the industrial use of water is one method of intervening in industrial development.

DEC permits and monitors wastewater discharges and the design and construction of public wastewater systems. The agency plays an important role in the granting of Environmental Protection Agency NPDES wastewater

discharge permits, since permits must be certified by DEC prior to approval by EPA. In those cases where an EPA permit is not required, the developer must obtain a DEC wastewater-disposal permit to discharge wastewater or pollutants into waters or onto land. This permit authority allows DEC to influence the planning and design of industrial water treatment and liquid waste discharge systems. The wastewater discharge permit application requires information on the proposed facility; the nature of the discharge, treatment, and planned disposal methods; and proposed sites.

The Department of Fish and Game's authority to protect anadromous fish streams enables some public intervention into those industrial activities that occur near streams or require crossing fish streams. Directed primarily at the protection of habitat, any activity that could affect the natural flow or bed of any anadromous water, including the use of equipment in or crossing such waters, must be approved by DF&G prior to the initiation of that activity. This includes all stream crossings by heavy equipment and the construction of bridges and culverts. Through its authority to regulate activites that could affect the flow of water in anadromous streams, DF&G could require the submission of an overall plan for water use and for the management of surface and ground water flow at the mine site.

Fish and Game

Fish and game issues related to Beluga area development include the protection and enhancement of habitat and identification of critical habitat areas. The effects of industrial and residential development on the Susitna Flats and Trading Bay State Game Refuges, and the protection of fisheries resources in the Chuitna and Beluga river drainage systems are also major concerns.

The Department of Fish and Game has identified the need for more background information on fish and game populations and use of the Beluga area by wildlife. In addition, more information on industry plans and activities is required in order to assess the potential impacts on habitat. A memo submitted to the Beluga Task Force by DF&G listed the major issues to be addressed in reviewing any project proposal: the formation of acid mine

waters, the disposal of mine waters, site restoration, anadromous stream protection, effect on water table, disturbance of waterfowl population, effect of dock construction on tideland morphology and fish migration, and the potential linkage of the Beluga area to a regional road system.

An applicant for DF&G's "Waterway/Waterbody Use Request" must submit a plan for fish and game protection; a project schedule; an outline of materials, equipment, and activity proposed in the project; and a description of the project site. Most of DF&G's concerns about Beluga coal development could be addressed during the permit process if an overview of the entire project's effects on fish and game resources and full plans for the protection of fish and game are included with the permit application. DF&G can probably require such a broad overview under state statute [AS 16.05.870(c)].

Proposed activity or development within a state game refuge must be approved by DF&G before a project is initiated. However, activity that will take place within the boundaries of the Trading Bay State Game Refuge will most likely be located on land owned by the Cook Inlet Regional Corporation. Under the statute that establishes the Trading Bay refuge, lands owned by Cook Inlet Region, Inc. are specifically excluded from refuge protection [AS 16.20.038(j)].

Surface Revegetation/Reclamation

In response to enactment of the federal *Surface Mining Control and Reclamation Act of 1977*,[(a)] the Department of Natural Resources has been designated as the state agency that will administer and enforce regulations governing surface mining and reclamation.

Under provisions of the federal act, state regulations must be at least as stringent as the federal regulations. The federal government has published a set of interim surface mining and reclamation regulations that have been adopted by the state with minor modifications. These interim federal regulations will be replaced by final regulations in early 1979; these final regulations will then be adopted as the state regulatory program.

(a) PL 95-87.

Surface and subsurface coal mining operations with surface impacts must comply with provisions of the act. The regulatory provisions include requirements for surface contouring, reclamation, revegetation, reestablishment or replacement of ground water tables and surface and subsurface water flows, as well as treatment and disposal of acid, toxic, or harmful wastes or products. In addition to performance standards for reclamation, the regulations also describe standards for industry operations such as preparation of sites for mining and storage of materials, blasting, and drainage diversions.

Before activity can be initiated at a surface-mining site, plans for the eventual use and reclamation of the area must be reviewed and approved by the state regulatory agency. This includes approval of postmining land uses as well as projection of the highest and best future use of that land. The scope of the surface-mining regulations apparently includes any area where activities attendant to the coal-mining operation disturb the natural land surface. This would cover such activities as road construction and coal transport, remote storage areas, processing areas, transfer and shipment sites, and other areas that are used in relation to surface mining, processing, and shipment activities. The broad scope of the regulations will enable DNR and other state and local agencies (through permit application review procedures) to shape the conversion and future use of coal development areas.

Land-Management Issues

Some land-management issues have already arisen from the complex land ownership patterns in the Beluga area and differences in the objectives of the various land owners. (See Figure 3-1, Chapter 3.)

Prior to passage of the *Alaska Native Claims Settlement Act* (ANCSA) in 1971, the Tyonek Village Council controlled the use of all village lands within the Tyonek reservation. However, that reservation was abolished by the act, with ownership of the reservation eventually passing to the corporations established under the act. The Tyonek Village Council maintains that it still has the right to control the use and disposal of its former trust lands and any lands that it owns now or will receive title to from the

Tyonek Native Corporation. The Council's desire to control the land surrounding the community reflects its objective of minimizing outside influences on village life and community services.

The Tyonek Village Council's position has been reinforced by the recent initiation of a HUD housing project in the village. The project consultant convinced HUD that the Council was the authorized land-management authority in the area, and the Kenai Peninsula Borough's subdivision review process was bypassed. The Council believes that borough planning, zoning, and subdivision authority does not apply to their land.

Established as a profit-making corporation under the *Native Claims Settlement Act*, the Tyonek Native Corporation (TNC) holds title to the surface estate of the land over which the Council claims jurisdiction. TNC has indicated it will defer to the opinions of the council on local land-management questions. Hence, regardless of its legal authority, the Council will have an effective voice in controlling the surface use of surrounding lands.

Section 14(c)(3) of ANCSA provides that 1280 acres is to be conveyed to the state by the Tyonek Native Corporation to be held in trust for future community expansion. Under Alaska Statutes (AS 44.47.150), the state as trustee cannot transfer the land, or any interest in the land, without a resolution to that effect from the villate.

TNC's surface ownership of the former reservation lands is complemented by ownership of the subsurface estate by the Cook Inlet Region, Inc. (CIRI). Therefore, each of these two corporations has some ability to regulate the other's use of land. Any disposals of land by TNC must be reviewed by CIRI; conversely, the disposal of subsurface rights by CIRI may be vetoed by TNC under provision of ANCSA 14(j). CIRI presently favors development in the Beluga area more than does the TNC or the Council.

Another major land-use issue concerns the public role in managing land use and development. The ability of state agencies to guide land use in the Beluga area is limited by the existence of large, privately-owned tracts.

The state can influence land use through the classification and disposal of the remaining state land, most of which was acquired under the *Mental Health Enabling Act*. Under the provisions of recently adopted state legislation (H.B. 720 and S.B. 159), land acquired under this act will become *general grant lands*, thereby facilitating the state's disposing of that land. H.B. 720 includes broad policy guidelines concerning the management of state lands for public use and their disposal for private use that could influence state land management in the Beluga area. The granting of an unspecified easement across state lands to the Cook Inlet Region, Inc. under terms of the State-Native corporation land trade has eliminated a major means of public intervention in the coal-field development process. On the other hand, the use and disposal of state tidelands for industrial or public use could be an important means of guiding the location of port and transshipment facilities.

The Kenai Peninsula Borough has general authority to regulate land use in the Beluga area through its mandatory planning, zoning, and platting responsibilities; but no zoning review or land-use permits other than subdivision review are required by the borough for development in the Beluga area. This situation could change once more specific proposals are presented by industry, especially if borough-owned land is included in, or affected by, a development proposal.

Creation of a New Settlement

Under state statute, a *development city* may be established to insure a cooperative relationship between state agencies and private industry in the creation of a new community and the provision of services and facilities.[a] A development city may be created either by act of the legislature or through an action of the state's Local Boundary Commission, following petition by an industrial developer to the Department of Community and Regional Affairs. This petition must be reviewed by the Department of Community and Regional

[a] This analysis is based on AS 29.18.220-460.

Affairs to determine if the development project is likely to occur, and if the industry proposal for community development appears to be in the public interest.

In the case of the Kenai Peninsula Borough, the creation of a development city could proceed in two ways. The Local Boundary Commission might find that a special service area could be created within the borough for the purpose of guiding and supporting community development. The Borough Assembly, in turn, could agree to approach the proposed project as a development city by creating a special service district at the site. In this case, the borough would present the Local Boundary Commission with a *contractual* agreement outlining the responsibilities of both the developer and the borough to provide for community services, facilities, and the implementation of the development project.

Alternatively, the Borough Assembly could decline to establish a special service district, instead requesting the Local Boundary Commission to create a development city that would function independently from the borough. In this case, an appointed city council would proceed with preliminary comprehensive planning for the community. Included in the planning process would be economic and population projections, a capital improvements program, an environmental assessment, and a land-use plan.

Designation of a community as a development city has a number of benefits in terms of program funding. First, state agencies are specifically directed to give priority to a development city in allocating program funds. Second, a development city is granted housing and urban renewal authority for a period of some 15 years and planning powers during a 5-year development period. Third, a development city is granted the right to select 10% of the unappropriated state land within its boundaries. (In the case of the Beluga area, however, the city would probably not be located near available state land.) Fourth, the development city is eligible to receive funds under the state shared-revenue program, based upon a projected population figure. Finally, the city council is granted broad powers to enter into agreements and raise and spend funds without voter approval, including issuing revenue bonds, during the development period.

When industry proposals for a new community in the Beluga area are more definite, the applicability of the development city's legislation to that community should be analyzed in greater depth.

Provision of Community Services and Facilities

The best mechanism for providing public services, as well as the role of state agencies in public service delivery, will depend largely on the legal status of the new settlement. This community might be a work camp or company town, an unincorporated community within the borough, a special service area, or a development city. As the community grows, it might incorporate as a home-rule, first-class, or second-class city, as provided in state statute.

State agencies would be required to provide some services, whether or not a community is incorporated. State support of local public services could vary from the actual provision of services to the financial support of programs administered by a local government. If the community remains unincorporated, planning and coordination of public service delivery could be accomplished at the state level, through either a task-force approach or direct policy direction from the office of the governor.

The community itself would be responsible for planning and coordinating state agency programs if it were designated as a development city or special borough service area. In both cases, a property-tax base would be available to help support public service provision. State agencies are also specifically directed under state legislation to give priority in the allocation of program funds to a development city or to a specially identified borough service area.

Education

The major issue in the provision of education services is the potential impact on the Tyonek school, in light of that community's desire to maintain a strong role in the local school program and its opposition to use of the school by large numbers of students from outside the village.

Education at Tyonek is provided by the Kenai Peninsula Borough, which is responsible both for the provision of facilities and the educational program. Program decisions are made by the KPB School Board, with input from local residents. The borough school board would need to determine whether the Tyonek school will be used by all Beluga-area residents or whether additional education facilities should be provided outside of the village. The needs and wishes of area residents would be considered in light of the availability of program funds and district-wide capital improvement plans and program commitments.

The Kenai Peninsula Borough receives support from the State Department of Education in the form of capital construction funds and funds for program operation, based on school attendance levels. The principal mechanism for obtaining additional funds is the borough property tax. Tax revenues are used to repay construction bonds as well as to meet operating expenses.

The village of Tyonek, however, participates directly in the federal Johnson-O'Malley (JOM) program, which funds supplementary educational programs for native Americans. JOM program funds are currently used to retain two local residents as cultural instructors. The Tyonek Village Council administers the JOM grant, under the guidance of a JOM committee composed of parents of the students in the program.

The Tyonek Village Council is concerned that an increase in the number of nonnative students would adversely affect their standing in the JOM program. JOM program allocations, however, are based on the *number* of native students in the program and are not related to the proportion of native students in the total enrollment.

According to the state attorney general, a development city created in the Beluga area could not independently receive or expend program or capital funds for education from the Department of Education.

Public Safety

Fire protection, police protection, emergency medical services, and justice services in the Beluga area could become the program responsibility

of either the state or the new community. The industry itself would have major responsibility for providing fire protection and emergency medical services initially. Training of residents in emergency medical techniques could later be requested from the state's Departments of Public Safety and Health and Social Services. Although industry would probably provide fire equipment for protection of industry facilities that would also be satisfactory for community needs, forming a volunteer fire department might be desirable. This would make the community eligible for technical assistance from the state fire marshall as well as funds from the state shared-revenue program. Both of these sources could be used to increase the volunteer department's capacity to respond to residential fires. Police protection would be provided by the state troopers if the area remained unincorporated.

If either a special borough service area or incorporated city were created, the primary responsibility for the provision of public safety facilities and services would shift to the community. The city would work directly with the Department of Public Safety, the Criminal Justice Planning Agency, the fire marshall, and state court system.

Public Utilities

Provision of public utilities to a new community in the Beluga area would present a number of opportunities for state involvement in the development process. These public utilities would include community water and sewer systems, solid waste disposal, and power.

Under recently adopted regulations, plans for new or expanded community water systems must meet certain standards and have plans approved by the Department of Environmental Conservation. DEC also approves plans for community sewer systems. DEC administers water system and sewer system construction grant programs that may provide up to 50% of planning and construction project costs not funded by the federal government. Under this program, DEC also sets the priorities for EPA-funded projects within Alaska. Construction funding programs available through the federal Economic Development Administration (EDA) include two programs for funding economic development projects. Under the provision of the "section 304" grant program, EDA would fund projects requested and prioritized by the governor's office.

The industrial developer might provide a major portion of the initial capital facilities for utilities; the state and industry could cooperate in the funding of facilities; or the public could carry the entire cost of the utilities. A city or service area would support utility construction and operation by issuing revenue or general obligation bonds. Industry purchase of local bonds is also a possibility.

One means of exerting state influence over privately operated utilities is through the Alaska Public Utilities Commission's requirements for a certificate of public convenience and necessity. This permit is required of any organization, other than a municipality, that wishes to operate a public utility, including electric power, communications, gas, water, sewer, or refuse utilities. The Alaska Public Utilities Commission has broad authority to review the nature of the proposed utility system and its ability to serve public needs adequately.

Housing

For a work camp in the Beluga area, employee housing would probably be built by Placer Amex, Inc. (the coal-field developer) or Chugach Electric Association (if it chooses to develop coal-fired generating plants).

The state's Department of Labor administers health and safety standards for construction-camp housing under Alaska's Industrial Housing Code. The Department's Safety Compliance Section inspects housing only after construction to check for compliance with state and federal standards. However, the Voluntary Compliance Section is available to review housing plans in advance of construction at the developer's request. The state standards require a minimum of 400 cubic feet per person. The state regulations do not require the developer to remove the structures when industrial activity terminates, although this can be stipulated as a condition of other state or local permit approvals.

In the case of full-scale community development, housing can be provided through the private market, with or without a government subsidy, or through a housing authority. The permanent community described in coal development

scenario 3 (see Chapters 1 and 3) would probably require a combination of industry-provided housing for construction workers and privately financed family residences to accommodate permanent residents.

There are two basic home-ownership alternatives for permanent residential development:

- conventional, single-family dwellings (individually financed and insured) located on individual lots in a residential subdivision
- individual family cooperative shares in a residential complex or planned unit development, using common project financing, utilities, open space, and insurance services.

The construction of rental units (apartments) is also a possibility.

Financing for permanent housing may be obtained through a variety of programs. The Farmers Home Administration (FmHA) housing finance program funds construction of both single-family housing and rental housing. The programs are designed for low- and moderate-income families; the effective income ceiling for Alaska is about $25,000 per family. In 1977, the state's total allocation for FmHA rental-housing-construction assistance was $3 million.

The FmHA area office in Soldotna serves the Kenai Peninsula Borough, Kodiak, and the Aleutian Chain. Currently, 90% of the office's home-loan activity is concentrated in the Kenai-Soldotna area. In the 1976-77 fiscal year, the Soldotna office of the FmHA lent a record $6.2 million for 128 single-family dwellings and $2.1 million for rental-unit projects in Kenai.

FmHA will fund individual home construction involving on-lot systems if the property is owned by the prospective resident. However, on-lot systems are not encouraged. Larger developments would be required by FmHA to include community or package water and sewer systems or, at a minimum, sewer systems with evidence of good water available on a lot-by-lot basis.

The U.S. Department of Housing and Urban Development offers a range of programs to assist in the development of new housing. Included in its

programs are mortgage and loan insurance assistance to low- and moderate-income families through the Federal Housing Administration (FHA) for single-family homes, including mobile homes. FHA also insures mortgages made by private lending institutions to finance the construction of multifamily rental housing by either private or public developers. The project must contain at least eight dwelling units. Application for funds under this program can be submitted by investors, builders, developers, and any others who meet the FHA requirements if the housing project is located in an area approved by the FHA for rental housing and if market conditions indicate a need for such housing.

Some housing construction may also be possible under the jurisdiction of the Cook Inlet Housing Authority (CIHA). It is one of 13 regional housing authorities created by a special act of the state legislature to meet moderate- and low-income housing needs. Encompassing the Beluga coal district, CIHA has worked with the Tyonek Native Corporation to finance new housing in the village.

Community Transportation

Future decisions by industry on the volume of coal to be mined will set the overall requirements for surface transportation in the Beluga area. Once that information is available to the state, community public transportation needs can be assessed. The primary state agencies involved will be the Departments of Community and Regional Affairs, Natural Resources, and Transportation and Public Facilities.

In addition to broad responsibility for planning regional road, marine, and air transportation systems, the State Department of Transportation and Public Facilities (DOT/PF) is responsible for the construction of state roads and federally assisted road and highway projects. Local transportation facilities, such as boat harbors, airports, and streets are also eligible for DOT/PF funding. Programs range from grant assistance for locally constructed projects to actual state project construction, including state airport construction and improvement projects, state boat harbor construction

and grants to eligible municipalities. Responsibility for maintenance may be assumed by the state or may be delegated to local government.

DOT/PF grant funds are usually dispersed to a home-rule city, first-class city, or a borough. A new community in the Beluga area could apply directly to DOT/PF if it were incorporated or designated as a development city. Otherwise, DOT/PF would work through the Kenai Peninsula Borough to set project priorities and funding levels for local projects.

Chapter 6
RECOMMENDATIONS

RECOMMENDED RESEARCH

As an outgrowth of the research reported in this report, the authors have become aware of a number of pressing topics associated with energy and economic development in the Beluga area that we believe should receive further study in the near future. This section briefly describes these proposed research topics.

All such future research should be addressed in order to:

1. clarify and emphasize the processes of change and adjustment associated with energy and economic development that are unique to Alaska;
2. resolve the problem of distinguishing development impacts from baseline trends that will occur in any case because of the overall economic and social growth occurring in Alaska;
3. give special attention to the interests and problems of Alaskan natives;
4. examine the distribution of economic and social costs and benefits throughout the impact region;
5. suggest clear policy implications of the development and its impacts for both the Kenai Peninsula Borough and the state of Alaska.

All research and planning efforts concerning the Beluga area should be approached from an interdisciplinary perspective, with social scientists, physical scientists, planners, public officials, engineers, and representatives of native organizations working together as a team. All of this work should be coordinated by a central body to prevent wasteful duplication and to facilitate open communication among all involved parties. And this work should be initiated well in advance of the actual beginning of development

activities, to ensure that adequate preparatory steps are taken before rather than after impacts begin occurring.

Alaska Energy Worker Profile

Research has been conducted on the characteristics of construction workers in the Great Plains area, but the people who work on energy development projects in Alaska may be different in many respects. We therefore propose that a study be conducted to determine the characteristics and actions of workers who both seek and obtain employment on energy projects in Alaska. Such information would be of great value in forecasting the planning for the socioeconomic impacts that might result from a future project such as Beluga coal-field development. This study should gather the following kinds of information about the workers:

1. age, sex, race, education, marital status, number and ages of dependents, income, and similar personal characteristics;
2. previous employment, migration history, labor union status, range of occupational skills, and other occupational background data;
3. current employment status, job activities and responsibilities, job satisfaction, spouse employment, and other current occupational data;
4. residential location and housing preferences, satisfaction with the area and the community, and similar social orientations;
5. job preferences, anticipated tenure on current job, future job plans, desire to remain in Alaska, and related future plans.

This research might also explore the role of local labor unions in finding and recruiting energy workers in Alaska. These union policies and practices will significantly influence who works on energy development projects, where they come from, where they will live, how they will differ from local residents, regional employment levels, and future economic growth in the region.

Energy Development Monitoring

Assessments of anticipated future impacts of energy development projects are forecasts based on judgments and estimates, and hence are subject to considerable error. If and when these projects are initiated, it is vital that they be closely monitored to identify and measure their actual impacts so that appropriate impact management strategies can be implemented as needed. In addition, such monitoring provides much valuable data for improving future impact assessments. Consequently, as soon as a decision is made to move ahead with coal development at Beluga, an impact monitoring program should immediately be implemented. This program would collect data on an ongoing basis on both local and regional socioeconomic impacts of the project, with particular attention to the native village of Tyonek. Especially crucial in this endeavor would be identifying the distribution of costs and benefits associated with the project, to determine what people were bearing what kinds of costs from the project, and what people were reaping what kinds of benefits.

Meanwhile, prior to the initiation of any energy development projects, a considerable amount of preparatory work needs to be done, so that a monitoring program can be implemented quickly whenever necessary. This preparatory research would include collecting and standardizing current baseline data within uniform geographical boundaries, identifying key impact indicators and devising measures of them, and selecting appropriate levels and units of analysis for impact monitoring.

New Community Planning

With extensive development of the Beluga coal field, as depicted in our scenario 3, a new permanent community would almost certainly be established in that area. To minimize the problems that could occur in this process, and to ensure that the new community met the needs of its inhabitants, considerable contingency physical and social planning for the community should be conducted well in advance of actual coal-field development. This planning should cover such topics as the following:

1. selection of a suitable town site;
2. comprehensive land-use planning for this site and the surrounding area;
3. ground and surface water availability and soil conditions suitable for waste disposal;
4. desirability of applying the development city statute (AS 29.18.220-460) to the community;
5. design and financing of community public buildings and recreational facilities;
6. provision of adequate housing accommodations;
7. development and financing of public services, especially during the first years of the community's existence;
8. organization of a community government;
9. transportation facilities between the community and Anchorage;
10. economic and political relationships between the community and Anchorage, the Kenai Peninsula Borough, and the State of Alaska.

Area Development Assessment

Large-scale coal mining in the Beluga area could induce various industries to locate there to utilize the coal. If this should occur, the entire Beluga area would experience rapid and intensive economic and social growth, leading to numerous socioeconomic and other impacts and problems. An adequate impact assessment, performed well in advance of any such growth, could provide the information necessary to plan for and manage these impacts, however. We therefore suggest that an impact assessment be performed now on the potential consequences of extensive industrial development in the Beluga area. This assessment should cover such topics as:

1. alternative land-use plans for the entire area;
2. necessary and feasible transportation facilities between the area and Anchorage;

3. responsibilities of the Kenai Peninsula Borough and the state of Alaska for coordinating and regulating development in the area;

4. potential accrual of tax revenues to the borough and the state;

5. potential lease royalties to Cook Inlet Region, Inc.;

6. effects of development on the water resources, soil conditions, wildlife and fish habitats, and other environmental conditions;

7. labor force availability and the need to attract additional workers from outside the Cook Inlet region;

8. effects of development on the regional economy, including stimulation of secondary economic growth;

9. possible population growth in the region resulting directly or indirectly from development in the Beluga area;

10. consequences of such development for the native village of Tyonek.

Tyonek Ethnographic Profile

The sociocultural and historical characteristics of the Tyonek natives differ markedly from those of nonnative people in Alaska, and the Tyoneks are also culturally distinct from other Alaskan native peoples such as Eskimos, Aleuts, and southeastern Alaska tribal communities. If conflicts over development on or near native lands are to be avoided or minimized, it is vital that those who initiate and manage this development understand the Tyonek value and belief systems, normative standards, conflict resolution procedures, and similar cultural traits. Without such understanding among developers, planners, and public officials, even minor disputes with the Tyonek people could easily flare into major confrontations.

At the present time, very little is known about the Tyonek culture. We therefore recommend that a carefully researched ethnographic profile of the Tyonek people and their culture should be compiled in advance of any development project in the area. Compiling this profile would require considerable effort and time, since the Tyoneks are very hesitant to talk

openly with outsiders. Nevertheless, this profile--in conjunction with the energy worker profile--could provide a basis for establishing effective interaction and communication processes with the Tyonek people. The result would be a more cooperative and beneficial climate for everyone involved, natives and developers.

Tyonek Impact Prevention

When energy development projects are located near native villages such as Tyonek, the residents of these villages are very likely to experience severe social, cultural, and psychological impacts that they cannot handle. The consequences of these pressures can range from alcohol and drug abuse or other forms of personal deviance to the disappearance of native cultural traditions or destruction of the entire village.

Two lines of action are required to prevent these impacts from occurring, both of which call for extensive research and planning in advance of any development projects. The first approach focuses on the village as a whole. It involves devising strategies and procedures that the village can use to minimize the extent to which the development project impinges on village life, thereby limiting the nature and intensity of the impacts experienced. The second approach is aimed at individuals who are seriously affected by disruptions of native cultural patterns. Common symptoms of such personal problems are alcohol and drug abuse and mental illness, so that the aim in this case is to establish programs to prevent such problems from developing by helping individuals to cope with the stresses they are experiencing. Tyonek is already experiencing a serious alcohol problem, yet very little is presently known about how to organize and operate alcohol and drug prevention programs in native villages. The goal of research on both these approaches to impact prevention would be to provide native villages such as Tyonek with opportunities for exercising self-determination in preserving their traditional culture and lifestyle.

POSSIBLE STEPS TO PREVENT UNACCEPTABLE IMPACTS

General Guidelines

Interpersonal and intergroup conflict between Tyonek residents and coal field developers can be minimized or prevented. In addition, the preferred life style of Tyonek residents can be maintained in the presence of a minimum of influence and impact by the development. If change is to occur in Tyonek, the decision should emanate from the village residents and not from an outside development firm.

An effective procedure for minimizing social impacts and social conflicts would be to establish an active collaborative arrangement between the two groups. A standing committee of community representatives could be formed to meet at least monthly to review, discuss, and recommend various courses of action. Committee members would be responsible for processing information and preparing relevant materials, distributing materials to their respective constituents, soliciting and consolidating feedback from community members at all levels, and promoting a consensus concerning steps to take on matters requiring action.

Needs and concerns of both communities could be channeled through the committee. In some cases, the committee might find it necessary to form subcommittees to address particular community concerns or issues. Equal representation at all levels would be essential if the communities were to achieve reasonable policy decisions. The formation of a permanent collaborative working committee would be a simple but reasonable approach to maintaining open channels of communication between the two communities.

It must be emphasized that the Tyoneks are the native residents of the region. Their cultural heritage, life style, and desire to retain their way of life must be respected and acknowledged by outside developers. The Tyonek residents have a right to exert some controls on the impact that coal development may have on the village. Whether outsiders intend to reside in the region permanently is not important; what is important is the fact that Tyonek residents are the permanent residents.

Coal developers must be aware of the impact of their presence and of the long-term effects on the community produced by the entire coal mining operation. In planning, coal developers should give direct and immediate attention to several considerations:

1. recognition of the differences in cultural backgrounds of community residents. If developers anticipate training and hiring Tyonek residents, steps should be taken to accommodate cultural and life-style orientations. For example, instead of requiring Tyoneks to "punch a clock" or work "from 9 to 5," developers could institute flexible time schedules.

2. preparation of formalized and rigid controls to regulate the sale and consumption of alcoholic beverages. Tyonek has an ordinance that forbids the sale and consumption of alcohol within the village boundaries. Alcohol consumption and the potential for alcoholism is a major concern of the IRA Council. Future developers should be aware of this concern and should take steps to regulate and control alcohol consumption within their own communities.

3. recognition of the differences between the Tyonek life style and that of the typical outsider. To understand, appreciate, and be in a position to respond positively to Tyonek interests, developers should make efforts to inform incoming residents and workers of the differences in life styles. This could be accomplished through a short series of preentry workshops in which the values, beliefs, preferences, and life styles of the Tyonek are explained in detail. Tyonek representatives could be extremely helpful in preparing instructional materials.

4. assessment of the impact that coal development in the Beluga region could have on migratory patterns of indigenous fauna. Some Tyonek residents are subsistence hunters who rely heavily on seasonal wildlife migratory patterns. The impact of the entire coal development operation on wildlife should be assessed, not only for the sake of the wildlife itself but for its effect on subsistence hunting.

5. assessment by the Kenai Borough in collaboration with Tyonek representatives of the impact and added burden of additional students attending the Tyonek school. Specific efforts should be made to hire more native teachers, counselors, and administrators to ensure that the particular cultural and educational needs of Tyonek youth will be met.

6. assessment by Kenai Borough and state law enforcement agencies, in collaboration with Tyonek representatives and developers of law enforcement issues and policy. Jurisdictional matters should be clarified and confirmed. Use of Tyonek residents as potential law enforcement agents should be encouraged.

7. review and assessment of land use and right-of-way issues. At present, roads connect Tyonek with the TTC operation and the area around the coal fields. In addition, several lakes on Tyonek land could be used for recreational purposes. Use of the roads for travel through Tyonek, and of the lakes and the land in general should be discussed with Tyonek representatives. Village boundaries should be made clear to developers and outsiders and the desires of the Tyonek residents should be acknowledged and followed.

8. recognition of the Tyonek residents' long-standing traditional fishing sites. As indicated previously, many of the Tyonek are subsistence fishermen. Developers and outsiders should be aware of the location of fishing sites and their use should be of primary concern in planning discussions with Tyonek representatives.

9. monitoring and evaluation of the process of coal development and its subsequent effects on the Tyonek natives by a third party. Data could be collected to determine the impacts on quality of life, life satisfaction, impacts on overall standards of living, and the success or failure of collaborative efforts.

Implementation Suggestions

These recommendations are offered for discussion purposes. They primarily suggest ways to plan for coal-field development so that adverse effects are minimized.

State Policy Development

An essential first step in the planning effort is formulating an overall state policy toward Beluga coal-field development and the provision of related services and facilities. One of the policy questions to be addressed is whether the state wishes to encourage and subsidize the development of a permanent, full-scale community in the Beluga area. A related question is whether the success of the coal development project depends on developing such a community.

The infrastructure needs and public service costs of alternative community types (work camp, company town, full-scale community) should be assessed, along with the possible relationship of a new community to Tyonek and the Kenai Peninsula Borough. Tyonek wants to minimize impacts on its facilities and potential disruption of village life. The borough, on the other hand, has expressed little interest in actively influencing or guiding development in the area. Together, these two positions indicate that most program responsibility for providing community infrastructure and support would rest with the state.

The Beluga Task Force should analyze these issues and develop policy options for review by the governor's office. The ability of each state agency to support community development through ongoing programs must be delineated and a possible plan of action developed. Policy development should include a detailed investigation of the desirability of applying the Development Cities legislation to the Beluga project.

The task force should not initiate a detailed analysis of community development needs until it appears likely that Placer Amex, Inc. will proceed with coal development. As noted in Chapter 1, this will depend on Chugach Electric Association's interest in developing coal-fired generating plants,

or Placer Amex's ability to develop an export market for the coal. In the interim, the three scenarios and possible areas of intervention presented in this report can guide the task force in assessing some of the key policy issues.

The membership of the Beluga Task Force, with one exception, encompasses the state agencies most closely linked to the policy issues. The Department of Transportation and Public Facilities, which has responsibility for transportation systems and planning, might also be included because questions of long-term policy related to transportation are important components of new community development in the Beluga area. Representatives from the Kenai Peninsula Borough, the Cook Inlet Region, Inc., and the Tyonek Native Corporation should be invited to participate in at least some of the task force meetings and, possibly, as permanent members of the task force.

Land-Use Planning

The Kenai Peninsula Borough should develop land use policies to guide development on private lands in the Beluga area. These land-use policies should include criteria or performance standards for siting both industrial and residential uses. Guidelines for the lease and sale of borough-owned land should also be developed, especially since portions of borough land have been identified as possible sites for the proposed community. It is crucial that policies and standards be adopted by the Borough Assembly before coal-field development begins.

This planning effort could be coordinated with the borough's port and harbor study and development of the district coastal management program. Background information and policy suggestions will be available from the Cook Inlet Coastal Zone Regional Planning Study and the ongoing South Central Water Resources Study. Because of the regional and statewide implications of industrial development in the Beluga area, it would be appropriate for the state to assist in funding this planning effort.

Town Site Planning

If a full-scale community is to be developed in the Beluga area, detailed physical and social planning must be accomplished for the town site. This plan should be a cooperative effort involving the coal-field developer, the Kenai Borough, and state agencies. Placer Amex, Inc. might be willing to help fund the planning work, possibly in conjunction with Chugach Electric Association. The Kenai Peninsula Borough Planning Department might administer the actual planning study, which could be accomplished in-house or by a private consultant.

Several considerations should be incorporated into town-site planning and construction:

- Community development should be staged because expected population levels may change if coal-field development does not proceed as predicted.
- Utilities (water, sewer, power) could be provided initially by industry, with eventual transfer to a public body as the community grows and revenue sources develop.
- Transportation facilities such as roads, docks, and airports should be built to serve the combined needs of the mining operation and the new community.
- Housing units should be clustered, rather than dispersed over a large area, to save costs on the provision of water, sewer, and other utilities.
- Industries should be required, through contract stipulations, to remove temporary work-camp housing, and to convert it to other community uses following the construction period.
- Potential or typical residents of the new community should be surveyed about their preferences and expectations for housing, recreational opportunities, and shopping facilities. This information should be distributed to local builders.

- The community site should be located at a sufficient distance from the village of Tyonek to minimize interchange and possible disruption to village life.

Employment and Job Training

Coal-field development could benefit the local economy by providing new jobs for Tyonek and other Kenai Peninsula Borough residents. Industry hiring practices should be carefully monitored to ensure that qualified local workers are hired for both permanent and temporary jobs. Local job training programs should be established with financial and technical support from the coal-field developer.

Financing Community Services

The coal-field developer should be required to bear most of the costs of establishing and operating a work camp since its purpose would be to facilitate coal-field development. A full-scale community, on the other hand, would serve many purposes. Its financial support should therefore come from a combination of local, state, and private sources.

While coal-field development would eventually contribute financially to service provision through the property tax, capital improvements are likely to be required before these new tax revenues become available. This problem with the timing of property tax revenues can be alleviated through the prepayment of industry taxes. Several states, including Oregon and Montana, have passed legislation to allow for the prepayment of taxes. In exchange for the tax prepayment, the industrial developer is usually offered a reduction in future taxes directly or, indirectly, through a reduced tax assessment. The reduction should never exceed the total amount of the prepayment plus interest.

In another example, Skagit County in Washington State recently executed a tax prepayment agreement with Puget Sound Power and Light Company as a condition of a zone change agreement for a proposed nuclear power plant. The agreement provides for *construction impact payments* to the school district and for law enforcement. The school impact payments are designed to cover

whatever additional maintenance, operation, and capital costs the school district incurs as a result of enrollments during project construction. The developer also agrees to pay the cost of portable classrooms, if they are required, and any law enforcement staff and equipment costs incurred as a result of the construction-period population influx. Tax prepayment agreements should be investigated as a possibility for Beluga-area development.

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APPENDIX A

TYONEK HOUSE-TO-HOUSE SURVEY*

Total number of dwellings in Tyonek - 57 hourse and 9 trailers

Total number of dwellings surveyed - 52

Sewage Systems	No. of Houses	Percent
No sewage problems in past few years	13	25
Leaching problems	20	38
New seepage pit or septic tank within past 3 years	15	29
Septic tank pumped within last 2 years	11	21
Pipes breaking or seepage pit or septic tank freezing	7	13
Water System		
Like the water	26	50
Dislike water because of:	22	42
Swampy taste or smell	(8)	(15)
Cl_2 taste or smell	(4)	(8)
Iron taste or smell	(8)	(15)
Sulfur smell	(1)	(2)
"Bad" smell	(2)	(4)
Do not drink the water but use for washing clothes and bathing purposes	6	12

NOTE: Some houses had multiple sewage and multiple water problems. Above columns may add up to more than 52 houses or more than 100 percent.

*23 May 1978.

APPENDIX B

COMMUNITY SEWAGE TREATMENT SYSTEMS

1) Facultative Lagoon. This system could only be used if ample land is available (requires the most land).

   A facultative pond is a way of treatment using bacteria that have the ability to survive with or without oxygen to break down the organic load.

2) Aerated Lagoon. An aerated lagoon is a basin in which wastewater contents are kept in suspension and to which oxygen is supplied, to provide a primarily aerobic environment for the microorganisms. (Similar to activated-sludge system, without sludge recycle.)

3) Mechanical Systems

   Biological

   Activated sludge. Uses a concentrated mass of microorganisms capable of aerobically stabilizing a waste in conjunction with diffusion or mechanical aeration to maintain the aerobic environment.

   RBS. A fixed film reactor, in which media are continuously rotated through wastewater. Biological degradation occurs through both aerobic and anaerobic processes. A low operating cost system for small installations.

   ABF. A fixed film reactor, in which wastewater is circulated over solid media (wood, plastic, rock); it is often used in conjunction with aeration (see activated sludge).

   Physical/Chemical

   Chemicals are used to enhance physical reactions (i.e., lime, ferric chloride, alum). This system requires high maintenance.

APPENDIX C

USGS SURFACE FLOW AND WELL RECORDS FOR THE BELUGA AREA

Location	Flow Well Records (Permit)	Type (In Permit)
T13N, R10W		
Section 13	50 gpm	
24	50 gpm	
25	75 gpm	
27	40 gpm, 50 gpm, 500 gpm (144,000 gpd)	Ground water
34	27 gpm, 10 gpm (28,400 gpd)	Ground water
35	8 gpm	
T12N, R10W		
Section 4a	60 gpm (2,000 gpd)	Surface
4b	25 gpm (1,000 gpd)	Surface
8	25 gpm	
9	5,000 gpd	Surface
T12N, R11W		
Section 8	12 gpm, 16 gpm, 16 gpm	
T11N, R11W		
Section 1	22 gpm	

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