# KNIK ARM CROSSING

# Draft Environmental Impact Statement and Section 4(f) Evaluation

FHWA-AK-EIS-84-01-D

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U.S. Department of Transportation
Federal Highway Administration

Alaska Department of Transportation
and Public Facilities

FHWA-AK-EIS-84-01-D

# KNIK ARM CROSSING
# ANCHORAGE AND MATANUSKA-SUSITNA BOROUGH, ALASKA

## DRAFT ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to 42 U.S.C. 4332 (2) (c)
and 49 U.S.C. 1653 (f)
by the
U. S. Department of Transportation, Federal Highway Administration
and
Alaska Department of Transportation and Public Facilities

Cooperating Agencies

Corps of Engineers; U. S. Air Force; U. S. Coast Guard; U. S. Department of Agriculture: Forest Service and Soil Conservation Service; U. S. Department of Commerce, National Oceanic and Atmospheric Administration; U. S. Department of Housing and Urban Development; U. S. Department of Interior: Fish and Wildlife Service, Geological Survey, and National Park Service; and U.S. Environmental Protection Agency.

8/21/84
Date of Approval

Barry F Morehead
For FHWA Division Administrator

The following persons may be contacted for additional information concerning this document:


Mr. Tom Neunaber
Field Operations Engineer
Federal Highway Administration
P. O. Box 1648
Juneau, Alaska 99802
(907) 586-7427

Mr. Jerry Hamel
Project Manager
Alaska Department of Transportation
and Public Facilities
4111 Aviation Avenue, Pouch 6900
Anchorage, Alaska 99502
(907) 266-1555



The Alaska Department of Transportation and Public Facilities proposes to build a 2.5 to 3.0-mile four-lane bridge across the Knik Arm of Cook Inlet from Anchorage to the Matanuska-Susitna Borough. Two alternative locations are being considered, one would begin just north of downtown Anchorage and another would begin at a point within Elmendorf Air Force Base. The project also would include approach roadways on both sides of the Arm. The bridge at downtown would be connected to the local street system at I and L Streets directly from the bridge and to Ingra and Gambell Streets via a 1.5-mile four-lane elevated connecting road. The Elmendorf bridge would connect to the Anchorage street system near the intersection of Muldoon Road and the Glenn Highway via a 6.5-mile four-lane limited-access road through Elmendorf AFB. Both bridges would be connected to the Parks Highway near Houston via a 28.5-mile four-lane then two-lane limited-access road. Principal issues are impacts on traffic volumes and flow, growth and economic development, urban and military function and operation, biological resources and wetlands, air quality, and 4(f) resources. No-Crossing Alternatives are No-Action, the addition of lanes to the Glenn and Parks Highways (the current route from Anchorage to the Borough), and a Hovercraft crossing with a two-lane connecting road to the Parks Highway near Houston.


Comments on this Draft EIS are due by October 22, 1984 and should be sent to Mr. Hamel at the above address.

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## SUMMARY

The Alaska Department of Transportation and Public Facilities is proposing to construct a crossing of the Knik Arm of Cook Inlet from the Municipality of Anchorage to the Matanuska-Susitna (Mat-Su) Borough. The termini would be at either Ingra and Gambell Streets or in the vicinity of Muldoon Road and the Glenn Highway in Anchorage and at the Parks Highway near Houston in the Mat-Su Borough. The proposed action would include a four-lane 1.5 or 6.5-mile limited-access roadway or connector leading from the Anchorage terminus to the Arm, a 3.0 or 2.5-mile four-lane bridge over Knik Arm, a two or one mile limited-access roadway leading from the bridge on the north side of the Arm to a planned Borough road, and a 28.7-mile limited-access connector to the northern terminus. The first 11.7 miles of the connector would be four lanes. The last 17 miles would be two lanes.

The purposes of the proposed action are:

- To bring additional developable land within proximity to Anchorage.
- To enhance port and industrial development opportunities in the Mat-Su Borough.
- To increase accessibility between Anchorage and communities to the north.
- To improve the efficiency of motor vehicle operations between Anchorage and areas to the north.

Other government actions proposed in the same geographic area as the proposed action include:

- The Anchorage Major Corridors Study, for which an EIS is in preparation. The Major Corridors Study will consider alternative improvements to: The Seward Highway north of Tudor Road, which follows Ingra and Gambell Street for part of its length; the Northside Corridor, which is presently served by the Glenn Highway and 5th and 6th Streets and intersects with the Seward Highway; and a 15th Street Bypass. A scoping document for the Major Corridors Study was issued in March, 1984 by the Alaska Department of Transportation and Public Facilities and the Federal Highway Administration.
- Point MacKenzie port and industrial development in the Mat-Su Borough for which the Borough is now preparing a plan as a part of their Coastal Zone Management planning (Kasprisin-Hutnik Partnership, June 21, 1984).
- Point MacKenzie Agricultural Project, which is now being implemented in the Mat-Su Borough.
- Fish Creek Agricultural Project in the Mat-Su Borough (ADNR, April 1984).

- The possible relocation of the Alaska Native Medical Center hospital at 3rd Avenue and Gambell Street in Anchorage to another site by the U. S. Public Health Service.

- Planned disposal of 95.3 acres of land by Elmendorf Air Force Base at Muldoon Road and the Glenn Highway.

- Coastal Trail development between Ship Creek and Resolution Park in Anchorage (Municipality of Anchorage, [no date]).

- Coastal Trail development between Ship Creek and Eklutna in Anchorage (Municipality of Anchorage, June 1982).

- Expansion of the State court building on K Street between 3rd and 4th Avenues in Anchorage.

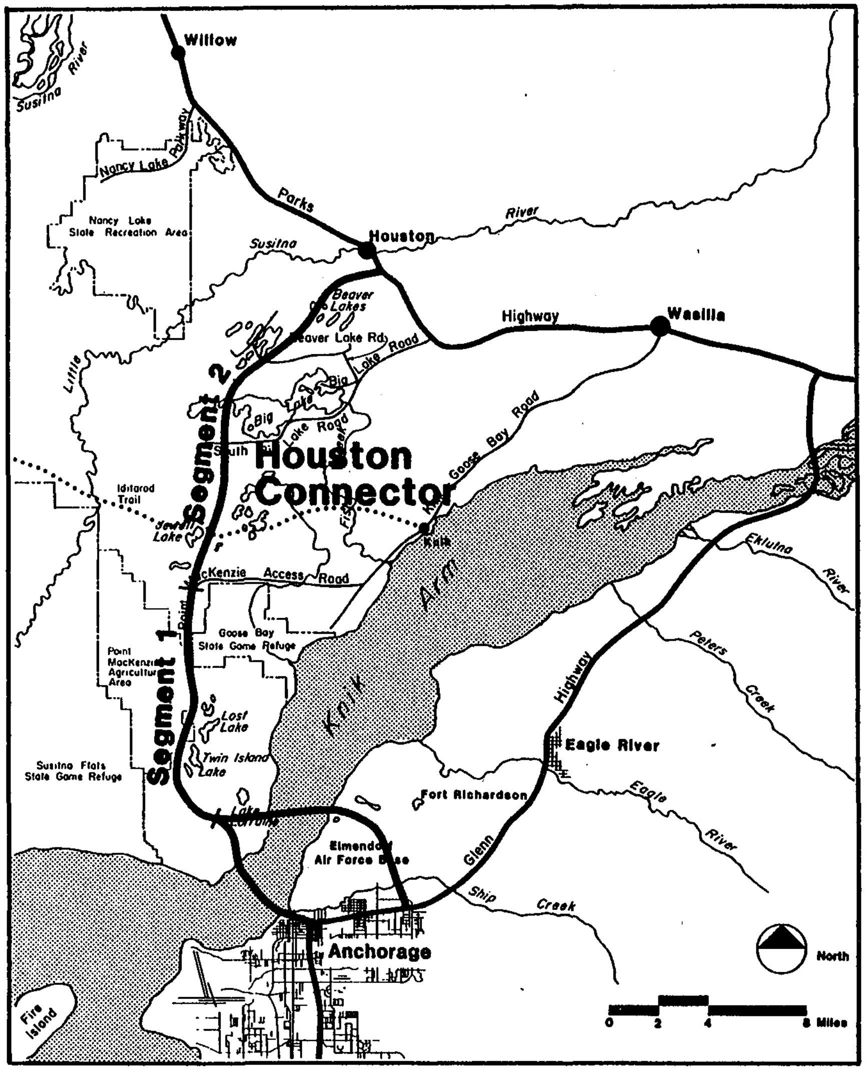
## A. ALTERNATIVES

Two Crossing and three No-Crossing Alternatives are being considered. The Crossing Alternatives are the Downtown Project and Elmendorf Project. The No-Crossing Alternatives are No-Action, Glenn/Parks Improvement, and Hovercraft.

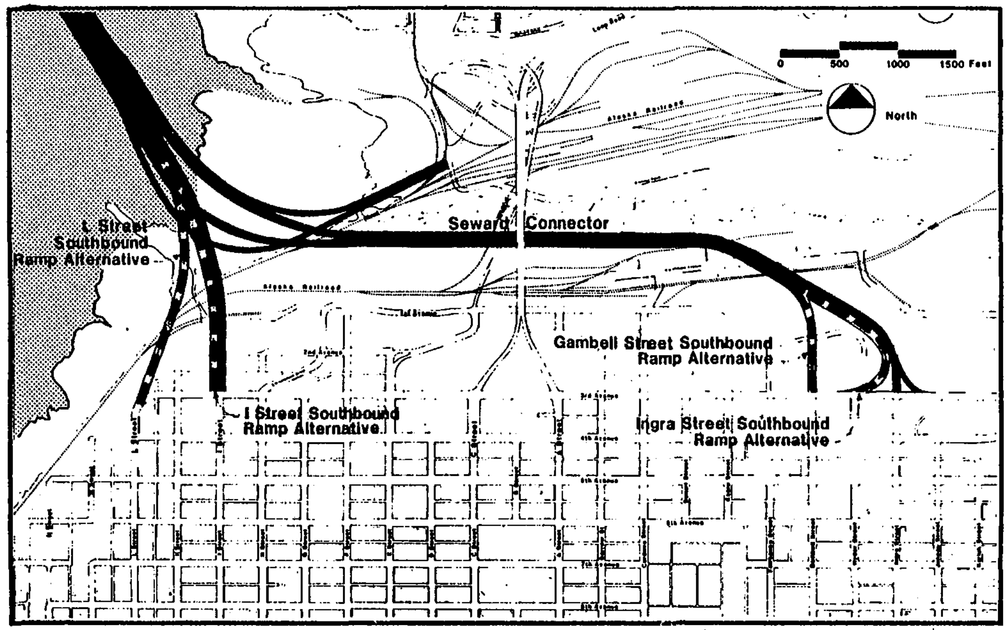
### Downtown Project

The Downtown Project is illustrated in Figure S-1. The Project would include a 5.5-mile, four-lane Downtown Crossing between I and L Streets in Anchorage and a planned extension of the Point MacKenzie Access Road in the Mat-Su Borough, including a three-mile bridge over Knik Arm. There are two southbound ramp alternatives at I/L Streets, a southbound ramp directly into L Street, which is one-way southbound, and a southbound ramp at I Street where traffic would reach L Street via 3rd Avenue. The Project would also include the 1.5-mile, elevated, four-lane Seward Connector in Anchorage. The Seward Connector would include ramps to the Port of Anchorage area and Ingra and Gambell Streets. There are two southbound ramp alternatives at Ingra/Gambell, a southbound ramp directly into Gambell Street, which is one-way southbound, and a southbound ramp at Ingra Street where traffic would reach Gambell Street via 3rd Avenue. Finally, the Project would include the Houston Connector which would connect the Crossing to the Parks Highway near Houston. Segment 1 of the Houston Connector would follow the route of the existing and planned portions of the north-south segment of the Point MacKenzie Access Road from the Crossing to the Access Road's east-west segment. Segment 1 would be an 11.7 mile limited-access, four-lane highway with five intersections. Segment 2 would continue north and reach the Parks Highway near Houston. It would be a 17-mile, limited-access, two-lane road with six intersections, and it would include a bridge over the narrows between Big and Mirror Lakes.

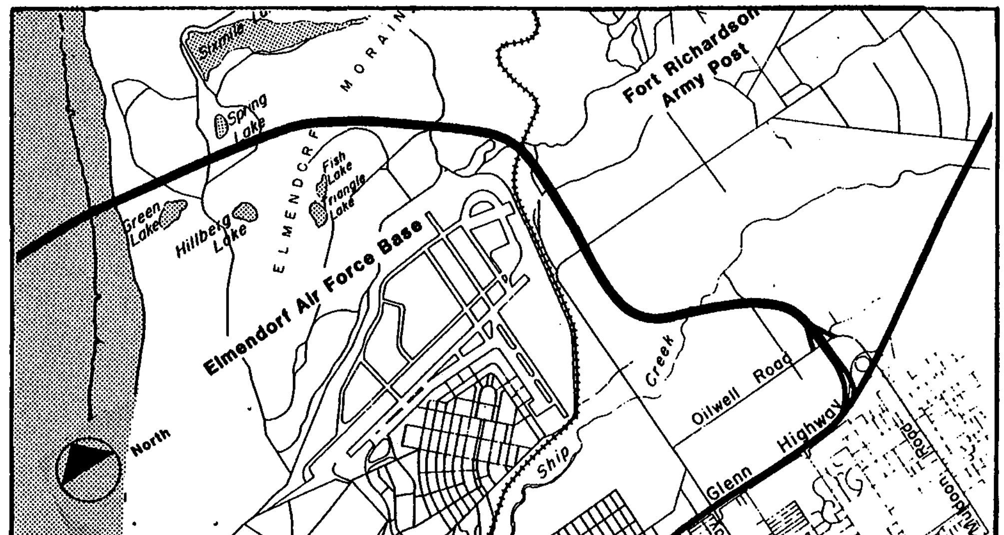
The Downtown Project would cost $742.9 million (1985 dollars). Annual maintenance costs would be $1.54 million (1985 dollars). The Crossing portion of the Project would be built between 1986 and 1990 employing 150




Crossing Alternatives




Downtown Crossing/Seward Connector




Elmendorf Crossing

**Figure S-1**

## Crossing Alternatives

workers. The Houston Connector would be built in 1989 and 1990 employing 50 workers, and the Seward Connector would be built in 2000 and 2001 employing 100 workers. Until 2001, the I and L ramps of the Crossing would adequately handle Crossing traffic entering Anchorage, and the Seward Connector would not be required.

Elmendorf Project

The Elmendorf Project is illustrated in Figure S-1. The Project would include a 10-mile, four-lane Elmendorf Crossing terminating in the vicinity of Muldoon Road and the Glenn Highway in Anchorage and in the Mat-Su Borough at a planned extension of the Point MacKenzie Access Road. The Crossing would include a 2.5-mile bridge over Knik Arm and a bridge over Ship Creek. In Anchorage, an interchange at Oilwell Road would provide access to persons coming to and from the east via the Glenn Highway and to and from the south via Muldoon Road. A Glenn Highway interchange would provide access to persons coming to and from the west via the Glenn Highway. The Elmendorf Project also would include the Houston Connector as described under the Downtown Project.

The Elmendorf Project would cost $547.0 million (1985 dollars). Annual maintenance costs would be $1.5 million (1985 dollars). The Crossing portion of the Project would be built between 1986 and 1989 employing 150 workers. The Houston Connector would be built in 1988 and 1989 employing 50 workers.

No-Crossing Alternatives

No-Action. The No-Action Alternative would consist of the existing regional street and highway system plus street and highway improvements included in the region's short-range and long-range transportation plans. These improvements would be completed whether or not a crossing is constructed.

Glenn/Parks Improvement. The Glenn/Parks Improvement Alternative would consist of the No-Action Alternative plus the widening of the Glenn Highway to six lanes between Eagle River and the Glenn and Parks Highway juncture and the widening of the Parks Highway to four lanes with a left-turn lane from the Glenn/Parks juncture to Wasilla. The Glenn Highway would remain a limited-access, grade-separated facility. The Parks Highway would continue to have unlimited access with at-grade intersections. The Glenn/Parks Improvement would cost $56.9 million (1985 dollars), and added annual maintenance costs to the two highways would be $170,000 (1985 dollars). The improvement would be built in 1988 and 1989 and employ 50 workers during construction.

Hovercraft. The Hovercraft (air-cushion vehicle) Alternative would consist of the No-Action Alternative plus the purchase of two large Hovercraft ferries. In addition, terminals would be built on each shore and a two-lane Houston Connector would be completed to the Parks Highway. The Connector would include 11 intersections and a bridge across the narrows between Big and Mirror Lakes. This Alternative would cost $226.5 million

(1985 dollars), and annual maintenance costs on the Connector would be $500,000 (1985 dollars). Purchase of Hovercraft, terminal construction, and construction of a road to the Point MacKenzie Access Road would occur in 1986. Completion of the Houston Connector would occur in 1988 and 1989, and construction of the Connector and terminals would employ 50 workers.

## B. ENVIRONMENTAL CONSEQUENCES

### Downtown Project

The Downtown Project would result in a significant change in the pattern of growth which would occur in the region containing the Municipality of Anchorage and the Mat-Su Borough; in addition, a limited amount of new growth would be induced. With the Downtown Project, the Mat-Su Borough would have approximately 12,200 more dwelling units in 2010 than is forecast with No-Action (33 percent greater). This is a mid-range growth allocation change and is considered the forecast most likely to occur. All the growth-related numbers in this summary are based on mid-range forecasts. The maximum and minimum likely change also is addressed in this document for the Downtown and Elmendorf Projects, respectively. Anchorage would have approximately 11,700 fewer dwelling units with Downtown in 2010 (six percent less than No-Action). The re-allocation from Anchorage is not the same as the re-allocation to the Borough (500 less) because of induced development. The region as a whole would have 247,600 dwelling units with Downtown, 0.2 percent more than No-Action.

Employment location patterns would change, and there also would be some induced jobs. The Mat-Su Borough would have approximately 3,800 more jobs in 2010 with the Downtown Project (19 percent more than No-Action). Anchorage would have approximately 3,200 fewer jobs than No-Action (two percent less). The region as a whole would have approximately 201,450 jobs with Downtown, 0.3 percent more than No-Action.

The Downtown Project would cause Anchorage growth to occur at slightly lower densities than are now projected in its land use plans. Borough growth would occur at higher densities and in different locations than are presently planned. The rate of growth in the Palmer/Wasilla area would be less than with No-Action. Most of the new growth would occur in the Point MacKenzie, Knik, Big Lake, and Houston areas along the Houston Connector. Development densities for the region as a whole would be lower with a Downtown Project than with No-Action.

Public service needs would be changed with the change in growth patterns. Beginning in 1990, the Borough in conjunction with the State would have to provide schools and emergency services to serve the faster growing Borough population, however needs for these services would be slowed in Anchorage. Gas, telephone, and electric service would need to be provided to those developing parts of the Borough that do not now have service. Service would be provided by existing private utility companies. The cost of this service would be paid for by the user, either initially or over a period of time. Water and sewer service in the Borough would be provided privately.

The Downtown Project would enhance to a limited extent resource development in the Borough by reducing travel time to the Anchorage market and by supporting the construction of the Borough's planned port at Point MacKenzie. The number of resource-related jobs resulting directly from the crossing by 2001 would be approximately 180.

Increased growth in the Borough would result in the loss of wildlife habitat and increased hunting and fishing pressure. The acres of land developed in the Borough beyond that with No-Action by 2010 would be 8,200 (nine percent increase and 0.85 percent of Willow Sub-Basin). A significant slowing in lands developed in Anchorage would not be expected because development densities would decrease counteracting gains resulting from less growth. Most of the Mat-Su development would be in upland forest habitat, however there is an adequate supply to serve the increased growth. Wetland use for development would be confined to intermittent, small wetlands within areas that are generally dry or perhaps near lakes with high pressure for development. The habitat lost through development would be valuable for moose, black bear, snowshoe hare, red squirrel, spruce grouse, and songbirds. Critical habitat is protected via the State of Alaska Coastal Zone Management Plan and the Corps of Engineers Section 404 permitting procedure. Increased management efforts would be required in the Mat-Su Borough to overcome adverse effects to fish and wildlife populations resulting from increased pressure associated with improved access from residential areas.

The change in growth patterns also would alter regional traffic flow. The street and highway system generally would operate in a more efficient manner with a Downtown Project than with No-Action. The vehicle-miles of travel in the region would decrease from 4.53 million daily in 2010 to 4.12 million (nine percent decrease). The number of vehicle-miles traveled daily under less than acceptable traffic flows would change from approximately 2.8 million in 2010 to approximately 2.0 million (20 percent decrease). The most significant improvement in flow would be on the Glenn and Parks Highways. The changes from No-Action would be mixed in the Anchorage bowl. A small overall flow improvement would occur in the Anchorage bowl except on I/L Streets, Minnesota Drive, Seward Highway, and 5th/6th Avenues where congestion would be greater due to bridge traffic entering and leaving the bowl. Regional transit use would be slightly less (by approximately 5,000 one-way trips in 2001 or 4.5 percent) with the Downtown Project due to the transfer of forecast dwelling units from Anchorage, which has higher per capita transit use, to the Borough, which has a lower per capita transit use. Lanes for use by buses and carpools would be provided at crossing toll booths, and bus turnouts would be provided at Houston Connector intersections.

With regard to financing of local government operating costs by local government, the Downtown Project would benefit Anchorage but would adversely affect the Borough. New growth in the Borough would result in an approximately $5 million (1983 dollars, add about 10 percent for 1985 dollars) annual shortfall of locally generated revenue required to meet costs (using current costs and tax rates). The shortfall would occur because residential development does not pay for the services it requires and residential services are supported through non-residential property taxes and taxes on vacant land. The employment shift to the Borough attributable to the Project would not be adequate to cover the costs of the new residential development. Anchorage would benefit by approximately $5 million (1983 dollars) because the amount of residential development shifted to the Borough, with its high cost in relation to revenue, would be greater than the amount of non-residential development shifted.

Finally, the changed growth patterns would alter the amount of carbon monoxide (CO) generated by traffic. Peak-hour emissions would decrease 4,200 pounds per hour in 2010 (10 percent) compared to No-Action. The pattern of site-specific CO concentrations would change but overall air quality would get slightly better in the Anchorage bowl. CO concentrations would be reduced along the Glenn and Parks Highways. The Downtown Project is consistent with the State Implementation Plan (for air quality).

In addition to the growth related impacts resulting from a Downtown Project, the Project also would have the following major site-specific impacts:

- A single family home, four businesses, and a parking lot would be displaced. Relocation would not be a serious problem.

- Ships and barges would have to pass under the bridge to reach the Port of Anchorage. Clearance would be provided, however in winter the risk of collision would be increased if ships would become trapped in ice.

- The Merrill Field aviation clear zone would be encroached by approximately 30 feet. Federal Aviation Administration approval would be likely for the encroachment.

- 999 acres of undisturbed terrestrial habitat would be taken (851 acres in Willow Sub-basin or 0.09 percent of that area), as would 134 acres of wetland (116 acres in Willow Sub-basin or 0.03 percent of the wetlands in that area). The alignment being evaluated was located to minimize wetland encroachment. No streams would be crossed, and there would be only one lake crossing.

- 55 acres of land designated by the State for small farms would be acquired (one percent of area designated).

- Views from a restaurant and several residences and businesses would be adversely affected in the vicinity of the I/L ramps. The I Street southbound ramp alternative would have the least visual impact since it would not block views of the Arm.

- For several 2nd/3rd Avenue structures eligible for the National Register of Historic Places, noise and CO levels would rise (in some cases CO standards would be exceeded), the I/L ramps would be visually dominant and block views, and access would become more circuitous.

- For Resolution Park, noise levels would rise, CO standards would be exceeded, and access would have to be altered. The L Street southbound ramp alternative would take 0.3 acres of the park.

- At Hostetler Park, noise levels would rise and CO standards would be exceeded. With the I Street southbound ramp alternative, alterations would be required to Hostetler Park in order to restore access to Resolution Park.

Finally, for an additional cost of $60 million (1985 dollars) the Knik Arm bridge could be built so that a railroad could be placed on it at some future date. This would further support implementation of the planned Point MacKenzie port, result in a slightly greater encroachment on the Merrill Field aircraft clear zone, and require larger bridge piers so there would be a slightly greater disturbance to coastal wetlands.

Elmendorf Project

The Elmendorf Project also would result in the significant change in the pattern of future growth in the region, with the accompanying effects, that was described for the Downtown Project. A small amount of development also would be induced. However, the change in growth patterns from No-Action would not be as great with the Elmendorf Project. The lower allocation change would moderate both the positive and negative allocation-related effects. The growth pattern changes of the Elmendorf Project (again using a mid-range forecast) would be:

- The Borough would have approximately 8,400 more dwelling units in 2010 than with No-Action (23 percent increase). It would have approximately 2,600 more jobs (13 percent increase).

- Anchorage would have approximately 7,900 fewer dwelling units in 2010 than with No-Action (four percent decrease). It would have approximately 2,100 fewer jobs (one percent decrease).

- The region as a whole would have 247,600 dwelling units, 0.2 percent greater than No-Action, and 201,450 jobs, 0.3 percent greater than No-Action.

The changes in densities, location of growth, and public service needs described for Downtown would be similar for Elmendorf but moderated by the smaller changes in growth patterns.

As with Downtown, Borough resource development would be enhanced to a limited extent. Approximately 180 resource development-related jobs would be induced.

Increased Borough growth would result in 5,800 acres of wildlife habitat being developed beyond what would occur with No-Action (seven percent increase and 0.6 percent of Willow Sub-basin). Again, any reduction in the amount of land development in Anchorage would be offset by lower densities. The same safeguards and mitigating measures described for Downtown would be applicable to Elmendorf. Increased pressure for fish and wildlife use would require increased management efforts.

Compared to No-Action, vehicle-miles of travel in the region would decrease from 4.53 million daily to 4.37 million (four percent decrease). Vehicle-miles traveled daily under less than acceptable traffic flows would decrease from approximately 2.8 million in 2010 to approximately 2.3 million (18 percent decrease). The most significant improvement in flow would again be on the Glenn and Parks Highways outside the Anchorage bowl. There would be small improvements on some Anchorage bowl arterials, but congestion would increase on the Glenn and Seward Highways, including the planned Northside Corridor improvements. Congestion also would increase slightly on Muldoon and Tudor Roads. These increases would result from bridge traffic heading towards downtown and mid-town Anchorage. Regional transit use would decrease slightly (approximately 3,500 one-way trips in 2001 or three percent) for the same reasons as Downtown. The same provisions for transit described for Downtown would be provided with Elmendorf.

New Borough growth would result in an approximately $3.5 million (1983 dollars) shortfall of locally generated revenues required to meet costs. The shortfall would occur for the same reasons as for Downtown. Anchorage would benefit by approximately $3.5 million (1983 dollars).

Finally, peak-hour CO emissions in the region would increase 400 pounds per hour in 2010 compared to No-Action (one percent increase). This increase includes an increase of 1,000 pounds in the Anchorage bowl and a decrease of 600 pounds outside the bowl. This trend is the opposite from what would occur with Downtown. The pattern of site-specific CO concentrations would change and overall would get slightly worse in the Anchorage bowl. The Elmendorf Project would not be in keeping with the State Implementation Plan. The impact could be offset by future improvements to Anchorage bowl arterials that would suffer traffic congestion increases. If the Elmendorf Project is selected as the preferred alternative, specific improvements will be analyzed and presented in the Final EIS.

In addition to the growth-related impacts resulting from an Elmendorf Project, the completion of the Project also would have the following major site-specific impacts:

- A single-family home would be displaced. On Elmendorf Air Force Base, a landfill, portion of storage yard, borrow area, gate, aeronautical receiver antenna, and FAA antenna would be displaced. The antennas would be the only difficult relocation. An in-depth study would be required to find a replacement site for the antennas that would minimize impacts to operations.

- The Project would cross numerous roads and road/trails on Elmendorf AFB. Access would be restored via overpasses, frontage roads, and large culverts.

- 1,183 acres of undisturbed terrestrial habitat would be taken (851 acres in Willow Sub-basin or 0.09 percent of that area) as would 124 acres of wetland (116 acres in Willow Sub-basin or 0.03 percent of the wetlands in that area). The alignment being evaluated was located to minimize wetland encroachment, and there would be only one stream and one lake crossing.

- 55 acres designated by the State for small farms would be acquired (one percent of area designated).

- The Project would take 18 acres of AFB recreation land (16 percent of approximately 115 acres of such land), alter views, and increase noise levels. Grading and revegetation matching natural conditions would mitigate impacts to views.

Finally, for an additional cost of $50 million (1985 dollars) the bridge could be built so that a railroad could be placed on it at some future date. This would further support the planned implementation of a port at Point MacKenzie but would require larger piers so there would be a slightly greater disturbance to coastal wetlands. If the railroad is provided for, views from the bridge would be improved since both directions of travel would be on top of the bridge.

No-Crossing Alternatives

No-Action. The No-Action Alternative would result in none of the growth pattern and related changes described for the Crossing Alternatives. No-Action growth forecasts are based on current trends. The Mat-Su Borough would have approximately 19,900 jobs and 37,000 dwelling units in 2010; Anchorage would have approximately 180,900 jobs and 209,900 dwelling units.

The density and location of future growth would be as described in area land use plans. Public service needs would follow current demand trends. Opportunities for resource development in the Mat-Su Borough would be based on development strategies included in existing area plans. Approximately 88,000 acres of land would be developed in the Borough by 2010. Current trends in the growth of fish and wildlife use would be unchanged.

Vehicle-miles of travel in the region would be 4.53 million daily in 2010. The number of vehicle-miles traveled at less than acceptable traffic flows would be approximately 2.8 million in 2010. Regional transit ridership would be 112,900 one-way trips in 2001. Local government cost and revenue trends would be unchanged. In 2010, traffic would generate 43,800 pounds of carbon monoxide per hour during the peak hour.

No-Action would result in no site-specific impacts.

Glenn/Parks Improvement. The Glenn/Parks Improvement Alternative also would result in none of the growth changes described for the Crossing Alternatives. The growth data described for No-Action above are applicable to the Glenn/Parks Improvement. The improvement would significantly improve traffic flow on the Glenn and Parks Highway between Eagle River and Wasilla. Transit service also would be improved through bus turnouts at interchanges and preferential bus/carpool lanes at interchanges on the Glenn Highway.

The completion of this alternative would have the following major site-specific impacts:

- Eight single-family homes, seven mobile homes, and 15 businesses would be displaced. New homes and business structures would have to be built to provide for relocation.

- 19 miles of gas transmission line either would be relocated or would be covered and 2.5 miles of electric transmission line would be relocated.

- 126 acres of terrestrial habitat would be taken, as would be 35 acres of wetland. Six major streams, several minor streams, would be crossed, including eight important fish streams. Well designed bridges, culverts, and other cross drainage (for wetlands) would minimize impact.

- Visually the roadways would become more dominant with increased width and new cut-and-fill slopes exposed. Slopes would be revegetated.

- The Eagle River to Peters Creek bikepath would be relocated within the highway right-of-way. It would be closed for two construction seasons.

Hovercraft. The Hovercraft Alternative would result in almost none of the growth changes described for the Crossing Alternatives. Most of the growth impacts described for No-Action would be applicable to Hovercraft. A slight amount of future regional growth could occur in the Borough rather than Anchorage. There would be a limited improvement in access to the Borough for hunting and fishing which would increase hunting and fishing pressures, requiring more rigid management measures. Compared to No-Action, daily vehicle-miles of travel in the region would decrease in 2010 from 4.53 million to 4.42 million (two percent decrease). Vehicle-miles of travel at less than acceptable traffic flows would decrease from approximately 2.8 million daily to approximately 2.7 million (two percent decrease). Traffic flow would improve slightly on the Glenn and Parks Highways compared to No-Action. Transit one-way trips in the region in 2001 would increase by 310 (walk-on Hovercraft users) over No-Action (0.3 percent increase). Bus/carpool preferential parking would be provided at the Borough Hovercraft terminal.

Construction of this alternative would have the following major site-specific impacts:

- One single-family home would be displaced.

- 861 acres of undisturbed terrestrial habitat would be taken (851 acres in Willow Sub-basin or 0.09 percent of that area), as would be 126 acres of wetland (116 acres in Willow Sub-basin or 0.03 percent of the wetlands in that area). The Houston Connector alignment being evaluated was located to minimize wetland encroachment.

- The Anchorage terminal would be in the tidal floodplain and would require protection.

- 55 acres of land designated by the State for small farms would be acquired (one percent of area designated).

## C. AREAS OF CONTROVERSY

Areas of controversy related to construction of the alternatives under consideration are:

- Changes in growth patterns in Anchorage and the Mat-Su Borough that would result from a Crossing and whether or not they would be of benefit to the two communities.

- Fiscal impact to the Municipality of Anchorage and the Mat-Su Borough from the change in future growth patterns resulting from a Crossing.

- Competition for State general revenue funds or Federal participating highway funds and whether or not there are other uses for those funds that are of higher priority.

- With a Downtown Crossing, the potential for ship collision with the bridge.

- The effect of the alternatives under consideration on traffic operation in and around downtown Anchorage.

Only one of these issues has produced opposition to any of the alternatives under consideration. Several ship and barge operators have expressed their opposition to the Downtown Crossing. All of these issues are expected to be among the key considerations in the selection of a preferred alternative and are addressed in Chapter IV, "Environmental Consequences".

## D. SIGNIFICANT UNRESOLVED ISSUES

The following issues are unresolved:

- The Downtown Project would penetrate the aircraft clearance zone of Merrill Field, a general aviation airport. The Federal Aviation Administration has not yet determined the acceptability of that encroachment but will do so prior to release of the Final EIS.

- U. S. Coast Guard bridge clearance requirements have not yet been determined for the crossings of Knik Arm and the narrows between Big and Mirror Lakes. Based in part on comments at the EIS public hearings, the Coast Guard will render a decision prior to the release of the Final EIS. They may also hold their own hearings on the bridge clearance question alone.

- More detailed habitat value analyses are necessary in order to develop a mitigation program for impacts to wildlife habitat resulting from increased development in the Mat-Su Borough with a Crossing Alternative. These analyses and the mitigation program will be developed in conjunction with the U. S. Fish and Wildlife Service prior to the release of the Final EIS.

- The Air Force plans to retain a consultant to develop a highway alignment through the Base that would serve an Elmendorf bridge. That alignment will be considered in the ~~Final~~ EIS if the study is completed prior to Final EIS release. The Elmendorf alignment under consideration in this document was developed based on discussions with Base officials.

- The Mat-Su Borough is preparing a land management plan for the Point MacKenzie Area Meriting Special Attention identified in their Coastal Zone Management Plan (Mat-Su Borough, Planning Department, August 1983). A discussion of the impact on this plan by the alternatives under consideration will be included in the Final EIS. A discussion on impacts to current planning options is included in Chapter IV, "Environmental Consequences".

- The Municipality of Anchorage is conducting its own study of the fiscal impacts of a Crossing. Its findings will be presented in the Final EIS.

- The Alaska Department of Transportation and Public Facilities is conducting the Cook Inlet Transportation Study which will address the economic feasibility of a railroad on the Knik Arm bridge. If available, its findings will be presented in the Final EIS.

- A determination of conformance to the State Implementation Plan for air quality by the Anchorage Metropolitan Area Transportation Study Air Quality Policy Committee is needed for the alternatives under consideration.

## E. OTHER FEDERAL ACTIONS REQUIRED

Other Federal actions required because of the proposed action include the U. S. Coast Guard and Federal Aviation Administration findings described in the previous section plus the following permit approvals:

- Corps of Engineers Section 404 permit for placing dredged or fill material in waters of the United States would be required for all wetlands filling and likely would be needed for Knik Arm bridge construction.

- Corps of Engineers Section 10 permit for construction of structures in navigable waterways of the United States would be required for the Knik Arm and Mirror/Big Lake narrows bridge, as well as the Ship Creek bridge with the Elmendorf Project and the several bridge widenings required with the Glenn/Parks Improvement.

- U. S. Coast Guard Section 9 bridge permit would be required for the Knik Arm and Mirror/Big Lake narrows crossing.

- A permit would be required from the Federal Communications Commission for aircraft clearance encroachment.
- Department of Defense agreement for use of right-of-way across Elmendorf AFB with Elmendorf Project.

# Chapter I

## PURPOSE AND NEED FOR PROPOSED ACTION

### A. PURPOSE

Nearly half the population of the State of Alaska resides in the Municipality of Anchorage. Although the Municipality has a large area, some 1,955 square miles, developable land is largely restricted to a triangularly shaped area (the Anchorage bowl) which is bordered on one side by the Chugach Mountain Range and on the other two sides by arms of Cook Inlet: Turnagain Arm and Knik Arm. Elmendorf Air Force Base (AFB) and Fort Richardson Army Post also provide a northern limit. Figures I-1 and I-2 show the Project Location and Project Area, respectively.

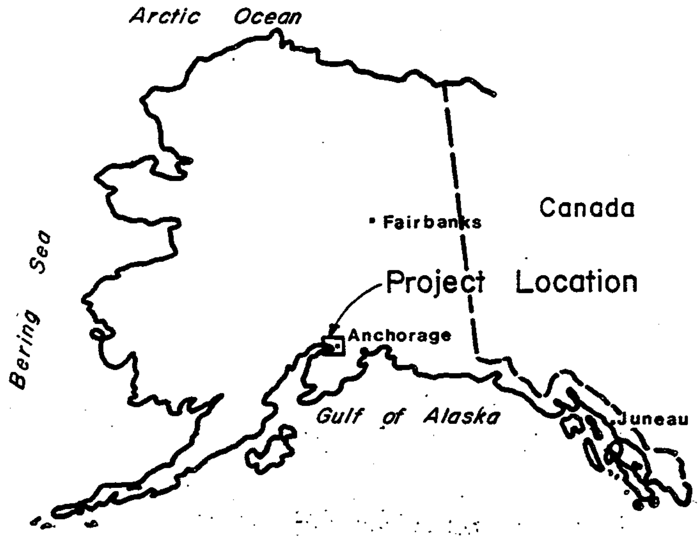
Only two highways provide access to the Anchorage bowl, the Seward Highway from the southeast and the Glenn Highway from the northeast; see Figure I-1. Suburban development is constrained to a narrow corridor along the Glenn Highway. The region is experiencing unprecedented urban growth; employment and population increase averaged 12 percent per year in 1982 and 1983. The most developable land in the bowl has been committed and costs of developing the remaining lands are increasing. The proposed action would provide a third highway into the bowl from the north, connecting the Parks Highway in the Matanuska-Susitna (Mat-Su) Borough with the Anchorage road system via a bridge across the Knik Arm of Cook Inlet.

The purposes of the proposed action are:

- To bring additional developable land within proximity to Anchorage.
- To enhance port and industrial development opportunities in the Mat-Su Borough.
- To increase accessibility between Anchorage and communities to the north.
- To improve the efficiency of motor vehicle operations between Anchorage and areas to the north.

Evaluation of a Knik Arm crossing and its alternatives within this document focuses on the issue of how best to provide for future growth of the Anchorage metropolitan area, including the Mat-Su Borough. Orderly expansion of the transportation system is important to future economic vitality of the region and the State.

Without a highway crossing of Knik Arm and opening up additional land outside the Anchorage bowl for residential and industrial development, it is anticipated that the bowl will experience a shortage of suitable building sites, rapidly escalating land prices, higher density development, traffic congestion, and slowdown in construction and business investment.



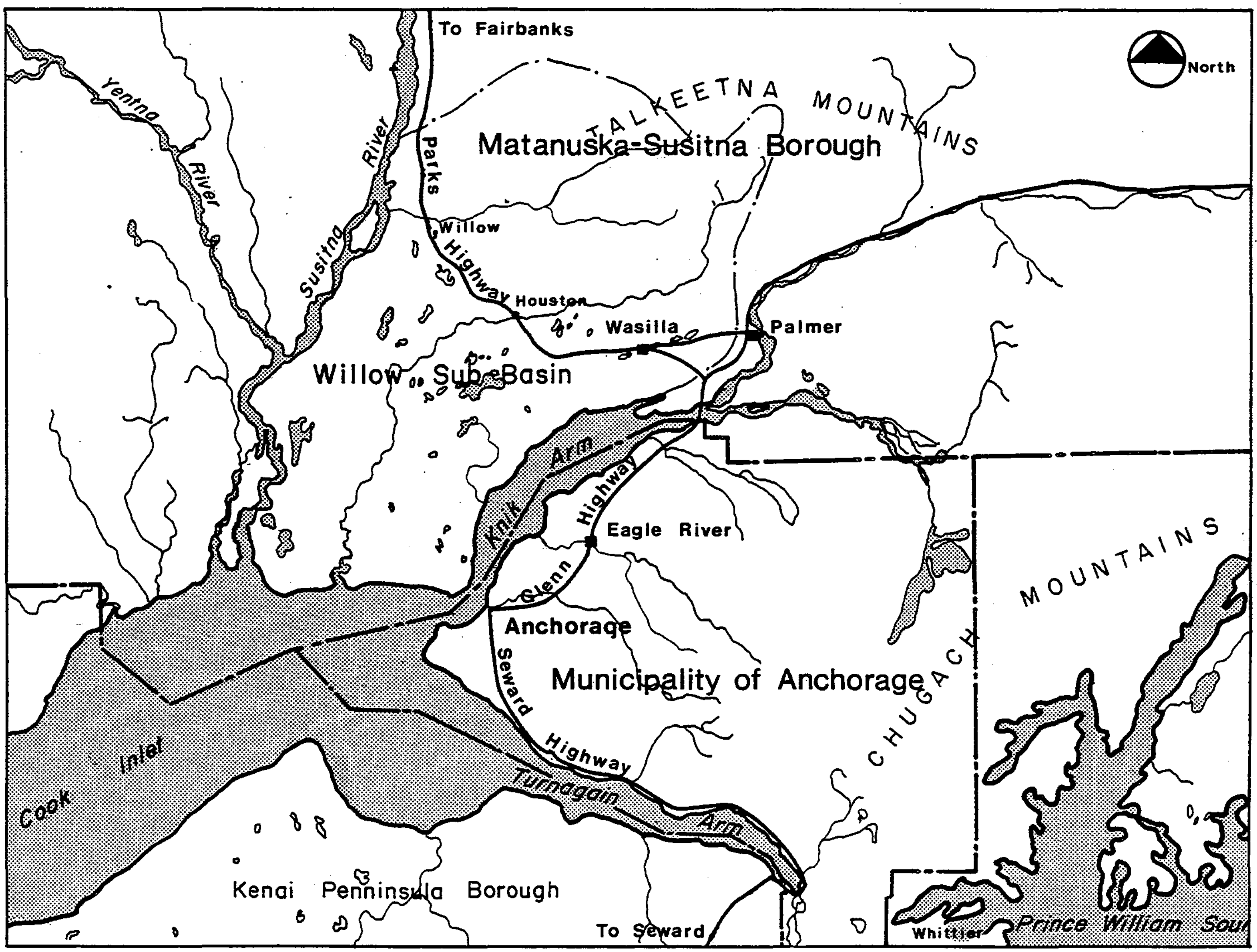




**Figure I-1**

**Project Location**

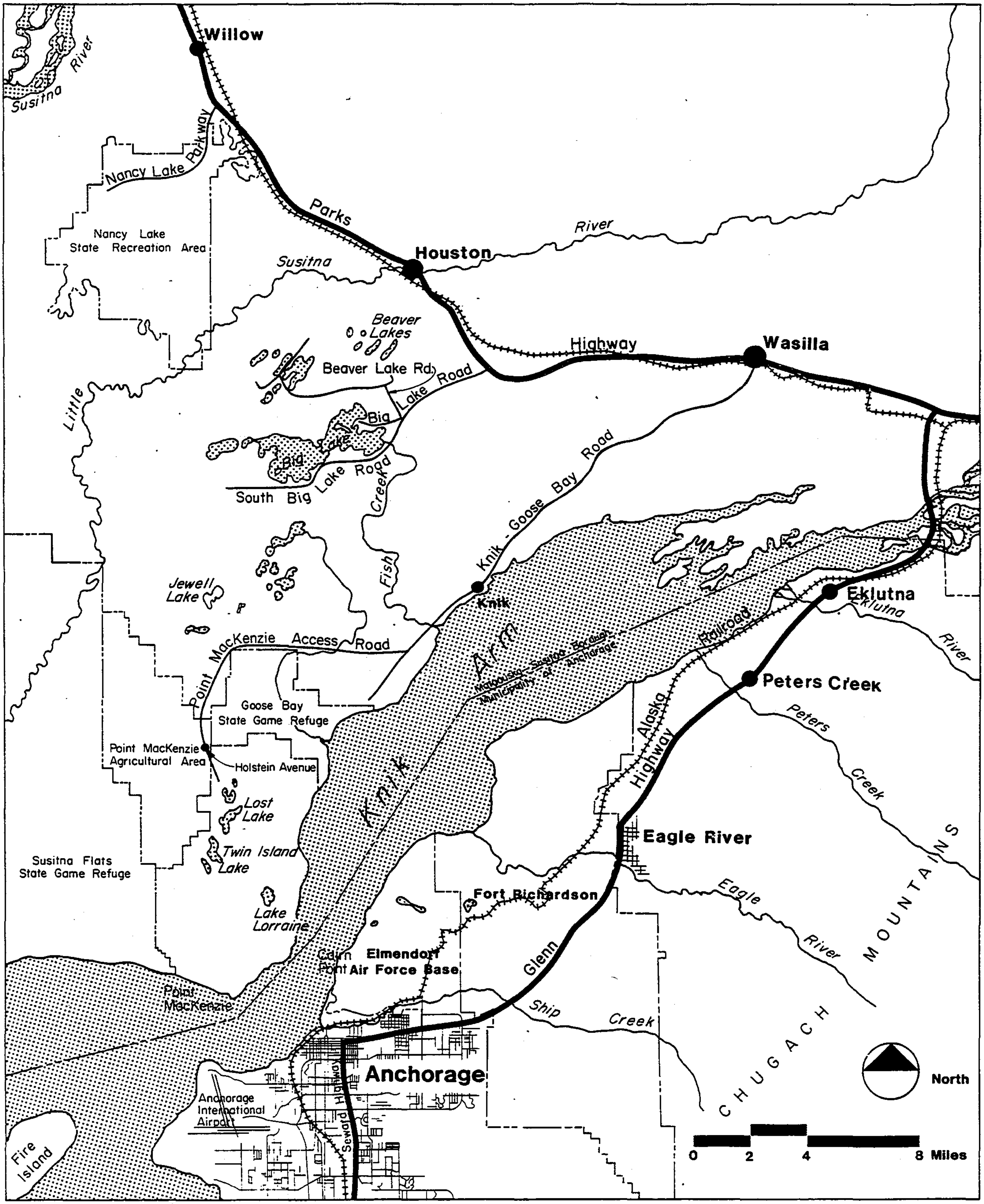



**Figure I-2**

# Project Area

A crossing of Knik Arm would add to the supply of developable land close to the Anchorage bowl, promote a more dispersed pattern of urban growth, and contribute to a more efficient transportation system. A preferred alternative and recommended course-of-action will be presented to the Governor and State legislature in early 1985, following review of this document and preparation of a Final Environmental Impact Statement.

## B. NEEDS

### Developable Land

The population of the Anchorage metropolitan area, including the suburban Mat-Su Borough, is currently more than 260,000. It is expected to grow to about 480,000 by the year 2010. Developable land within the Anchorage bowl is being consumed rapidly, and the cost of developing the remaining land, which has poor soils and drainage, is increasing. Raw land is over ten times as costly in the bowl as it is across the Arm in the Mat-Su Borough.

The Point MacKenzie area in the Mat-Su Borough, bounded by Knik Arm, the Goose Bay State Game Refuge, the Point MacKenzie Agricultural Area, and the Susitna Flats State Game Refuge, exceeds 25,000 acres; see Figure I-2. Although detailed surveys have not been made, preliminary assessments show that over half of that area is suitable for development. The crossing would bring this large supply of developable land as close as three miles from Anchorage, thereby lowering the cost of commercial and residential construction.

### Industrial Development Opportunities

Parcels of economically developable land large enough for extensive industrial development are scarce in the Anchorage bowl, but are plentiful in the Point MacKenzie area. Similarly, expansion of the Port of Anchorage is constrained and an additional port site will need to be developed in the future, particularly for export. The Alaska Department of Natural Resources and the Matanuska-Susitna Borough adopted in 1982 the Willow Sub-Basin Area Plan (ADNR, October 1982), which designates planned usage of public lands. It covers lands within the southcentral portion of the Borough including the land most affected by the proposed action; see Figure I-1. Except for the area dedicated to agriculture, the Point MacKenzie area, directly across the Arm from Anchorage, has a recommended land use of "Development of Port, Industrial Area, and Community". This intent is confirmed in the Borough's draft comprehensive plan (DOWL Engineers, February 1983), its adopted coastal zone management plan (Mat-Su Borough, August 1983), and its current Point MacKenzie planning effort (Kasprisin-Hutnik Partnership, June 21, 1984).

A Knik Arm crossing is viewed in a recent Borough planning document for Point MacKenzie as "the single most important transportation scheme to facilitate the future growth and development of the Point MacKenzie area". (Phase I - Point MacKenzie Port/Park Land Management Plan, Kasprisin-Hutnik

Partnership, 1984). The Crossing would help justify development of the Borough's proposed industrial port/park facility.

Increased Accessibility

Anchorage is the economic and cultural center of Southcentral Alaska and provides a variety of services such as health care, financial, entertainment, supplies, and equipment to outlying communities. Conversely, the area across Knik Arm from Anchorage provides municipal residents with a wide variety of recreation opportunities, natural resources such as gravel, and agricultural resources.

Present northbound motor vehicle traffic from Anchorage must travel around Knik Arm via the Glenn Highway northeast to its intersection with the Parks Highway and then the Parks Highway west to Houston (and points north); see Figure I-2. A Knik Arm crossing would shorten the approximate distance from Anchorage to Houston from 58 miles via the present route to as little as 34 miles.

The present highway route between Anchorage and the Point MacKenzie area is even more circuitous. To reach it involves traveling northeast on the Glenn Highway to its intersection with the Parks Highway, west to Wasilla, southwest on the Knik-Goose Bay Road to the Point MacKenzie Access Road, west along the north side of the Goose Bay State Game Refuge, and finally south. The proposed action would shorten the approximate distance from Anchorage to Holstein Avenue in the Point MacKenzie Agricultural Area (Figure I-2) from 72 miles via the present route to as little as 14 miles.

Efficiency of Motor Vehicle Operations

A Knik Arm crossing would affect future traffic volumes on all the major highways in the region. Growth which otherwise would have occurred either along the Glenn/Parks Highway corridor or in the Anchorage bowl would occur across Knik Arm to the north. Thus, future traffic volumes on the Glenn and Parks Highways and on many roads within the Anchorage bowl would be less if a Knik Arm crossing were built.

In the year 2010, the proposed action would reduce daily vehicle-hours of travel (VHT) in the area from about 148,000 without a crossing to as little as 129,000 with a crossing (as described later). Daily vehicle-miles of travel (VMT) within the region would be reduced from approximately 4.53 million without a crossing to as little as 4.12 million with a crossing.

## C. HISTORY AND AUTHORITY

In 1955, the Anchorage Chamber of Commerce sponsored an economic study for a causeway at Cairn Point (Bloch, 1955); see Figure I-2. In 1971, the State of Alaska Department of Highways commissioned an evaluation of the feasibility of constructing a highway crossing of Knik Arm (Howard, Needles, Tammen & Bergendoff, 1972). Although the development of a crossing did not proceed beyond the 1971 study, it was determined at that time that a permanent crossing could be constructed. The 1971 report resulted in the following conclusions:

- The construction of a crossing is feasible.

- A bridge is the most advantageous structure.

- The most favorable location is 1-1/2 miles upstream from Cairn Point.

In 1975, a Phase I Feasibility Study for a Proposed Knik Arm Crossing Utilizing a Ferry System was commissioned by the Alaska Department of Public Works. The report recommended a crossing generally at Cairn Point with an access road located between Elmendorf AFB and Fort Richardson.

The current work was authorized by the State Legislature, which in 1981 appropriated funds for an Environmental Impact Statement (EIS) and preliminary design of a Knik Arm crossing. An EIS is being prepared because it has been determined that issuance of permits by the U.S. Coast Guard and Corps of Engineers would be a major Federal action. Following a study of economic feasibility in 1983 (ADOT/PF, April 15, 1983), the project was endorsed by the Governor and key legislators.

A Draft (US DOT/FHWA, ADOT/PF, August 12, 1983) and a Final (US DOT/FHWA, ADOT/PF, December 5, 1983) Corridor Alternatives Analysis report were prepared as a part of EIS development and are considered a part of this document. Their purpose was to narrow the range of possible Knik Arm crossing project locations and configurations to be considered in the EIS. They contained cost, environmental impact, benefit-cost, cost-effectiveness, and financial analyses at a general level of detail, and they resulted in the identification of unreasonable corridors for the crossing and its approach roads, as well as unreasonable crossing configurations. Only the corridors and configurations found to be reasonable with that general level analysis are analyzed in detail in this document, along with several no-crossing alternatives. Other reports prepared as a part of the current Knik Arm crossing evaluation are listed on Appendix H under "US DOT/FHWA, ADOT/PF".

## Chapter II

## ALTERNATIVES

Two Crossing Alternatives and three No-Crossing Alternatives are evaluated in this document. The Crossing Alternatives are the Downtown Project and the Elmendorf Project. Each Crossing Alternative includes a highway bridge. The option of designing the bridges so a railroad track can be incorporated at a later date is addressed in Chapter VI. The No-Crossing Alternatives are the No-Action, Glenn/Parks Improvement, and Hovercraft (air cushion vehicle).

### A. SELECTION OF ALTERNATIVES

The alternatives analyzed in this document were selected based on two analyses, a corridor analysis and an alignment analysis, which eliminated unreasonable alternatives.

#### Corridor Analysis

Several corridor, crossing configuration, and no-crossing alternatives were considered in the corridor analysis, see Figure II-1. The results of this analysis are documented in a report entitled Final Corridor Alternatives Analysis (CAA) (USDOT/FHWA, ADOT/PF, December 5, 1983). In the Final CAA, the following analyses were made in the evaluation of alternative corridors: Benefit-cost, environmental impacts, cost-effectiveness, financing, conceptual costs, urban growth, and travel forecasts. Alternatives found to be reasonable and meriting further consideration in the Final CAA were:

- South Approach/Crossing Corridors:
  - Downtown I
  - Elmendorf
- Crossing Configuration:
  - Bridge
- North Approach Corridor:
  - Houston
- No-Crossing Alternatives
  - No-Action
  - Additional Lanes on Glenn and Parks Highways (low capital investment option)
  - Hovercraft Ferries (transit option)

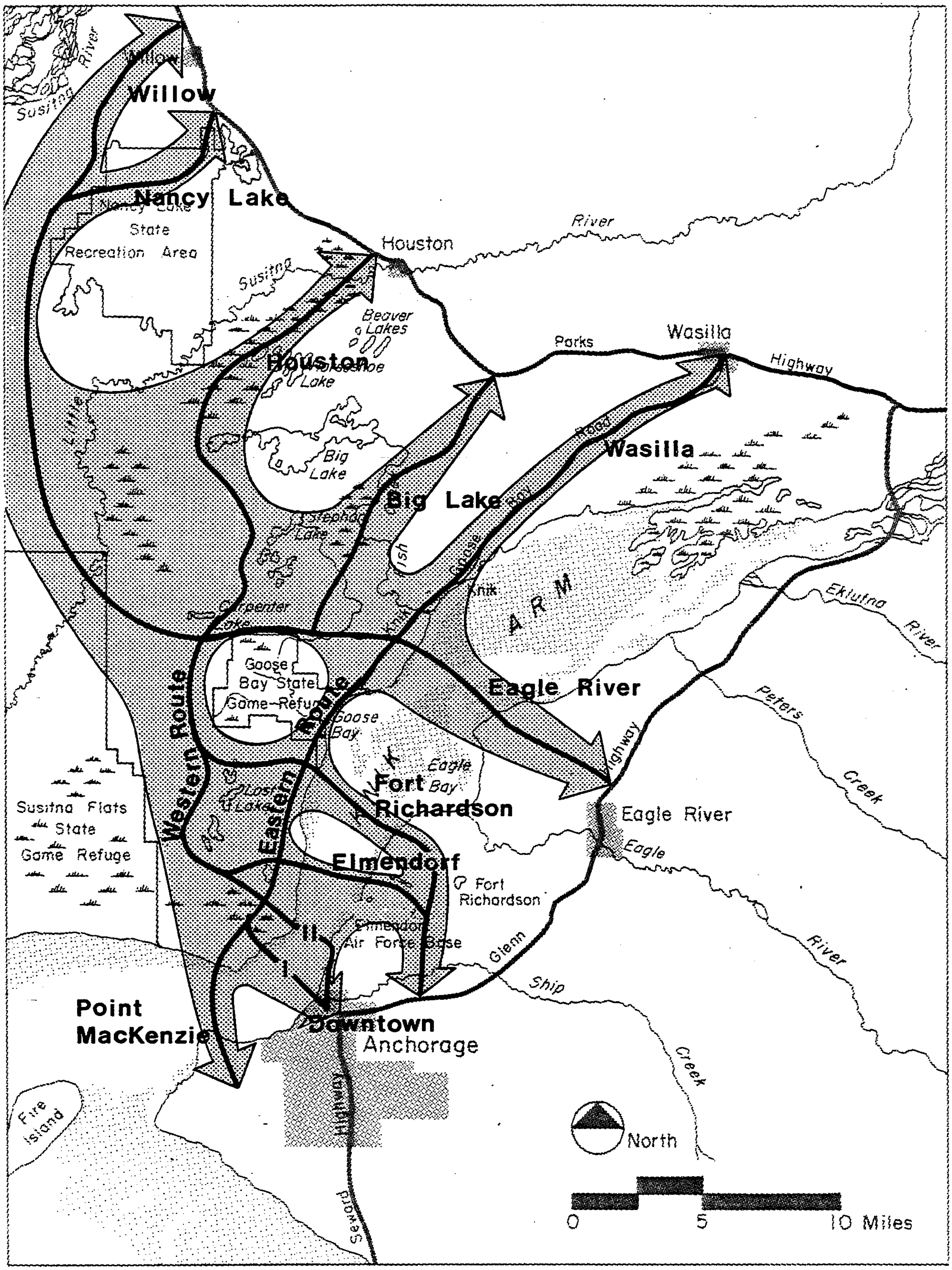



**Figure II-1**

## CAA Corridors and Representative Alignments

Improved bus service as a part of both the Crossing and No-Crossing Alternatives also was found reasonable. Those alternatives found to be unreasonable were found so for the following reasons:

- South Approach/Crossing Corridors:

  - Point MacKenzie - unacceptable aviation clear zone interference and benefit-cost ratio due to high cost

  - Downtown II - unacceptable aviation clear zone interference

  - Fort Richardson - low incentive for development in Mat-Su Borough and unacceptable return on investment

  - Eagle River - low incentive for development in the Mat-Su Borough and unacceptable benefit-cost ratio due to low benefits

- Crossing Configurations:

  - Tunnel: unacceptable benefit-cost ratio due to high cost

  - Causeway - section 4(f) impact (see Chapter V, "Section 4(f) Requirements" for definition) for which a prudent and feasible alternative does exist, high level of natural environment impacts, and unacceptable benefit-cost ratio due to high cost compared to bridge

  - Bridge/Causeway: high level of natural environment impacts, unacceptable benefit-cost ratio and return on investment due to high cost

- North Approach Corridors (via western route except Wasilla):

  - Willow - high level of natural environment impacts, and higher costs with lower benefits and toll revenue compared to other more easterly corridors

  - Nancy Lake - unacceptable changes to the character of the Nancy Lake Parkway and use of Nancy Lake Recreation area, plus the reasons listed for the Willow corridor

  - Big Lake - circuitous route results in lower benefits and toll revenue compared to more direct corridors

  - Wasilla - section 4(f) impact (see Chapter V "Section 4(f) Requirements" for definition); there are prudent and feasible alternatives to crossing Goose Bay State Game Refuge

- No-Crossing Alternatives

  - Ferry Boat - unreliable in winter, slow service, and low incentive for development in Mat-Su Borough due to poor user attraction

- Vertical Take-Off and Landing Aircraft (VTOL) or Helicopter Crossing - VTOL inappropriate for short travel distance; helicopters would have low capacity, provide no means for vehicle crossing, and operations would be adversely affected by inclement weather

- Commuter Rail - insufficient Mat-Su/Anchorage transit demand to warrant investment

A Draft Corridor Alternatives Analysis (USDOT/FHWA, ADOT/PF, August 12, 1983) was circulated for public and agency comment. The Final CAA then was prepared. The corridor alternatives analysis was part of the EIS process and Final CAA findings are considered a part of this document. Copies of the Final CAA can be obtained from the Alaska Department of Transportation and Public Facilities in Anchorage (see title page of this document for contact and address).

Alignment Analysis

EIS preparation began with the development of alignments within the Downtown I/Houston and Elmendorf/Houston corridors, now termed the Downtown Project and Elmendorf Project. Their development was based on further engineering and meetings with the Municipality of Anchorage, Mat-Su Borough, and military staff during early 1984, as well as public and agency comments on the representative alignments used in the corridor analysis. The components of the three No-Crossing Alternatives (No-Action, Glenn/Parks Improvement, and Hovercraft) similarly were defined in greater detail early in EIS preparation.

Figure II-2 locates project alignments that were considered and highlights those selected for evaluation in this document. The alignments listed below were selected for evaluation because they maximize transportation service and minimize cost and environmental disruption:

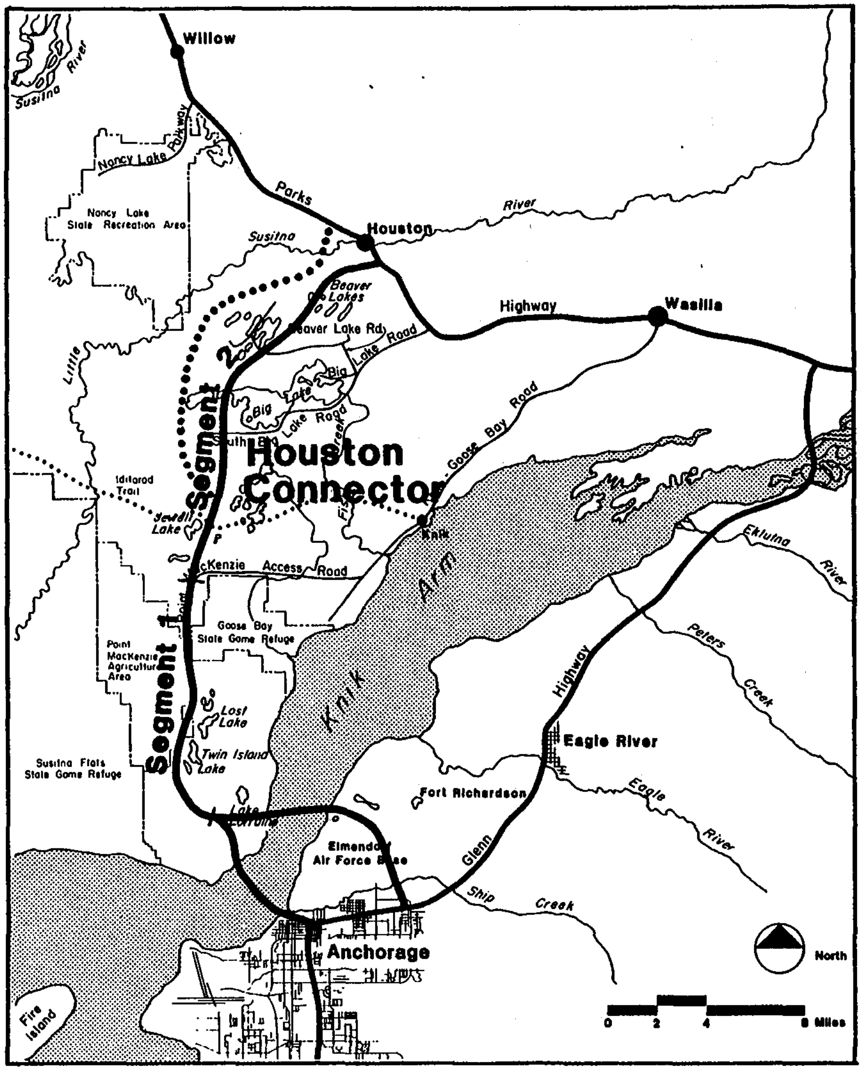
1. Downtown Project

   - Downtown Crossing -- bridge structure across the Arm plus enough roadway to bring bridge traffic to the existing road system in Anchorage (intersection of 3rd Avenue and I/L Streets) and the planned extension of the Point MacKenzie Access Road in the Mat-Su Borough (intersection near Lake Lorraine)

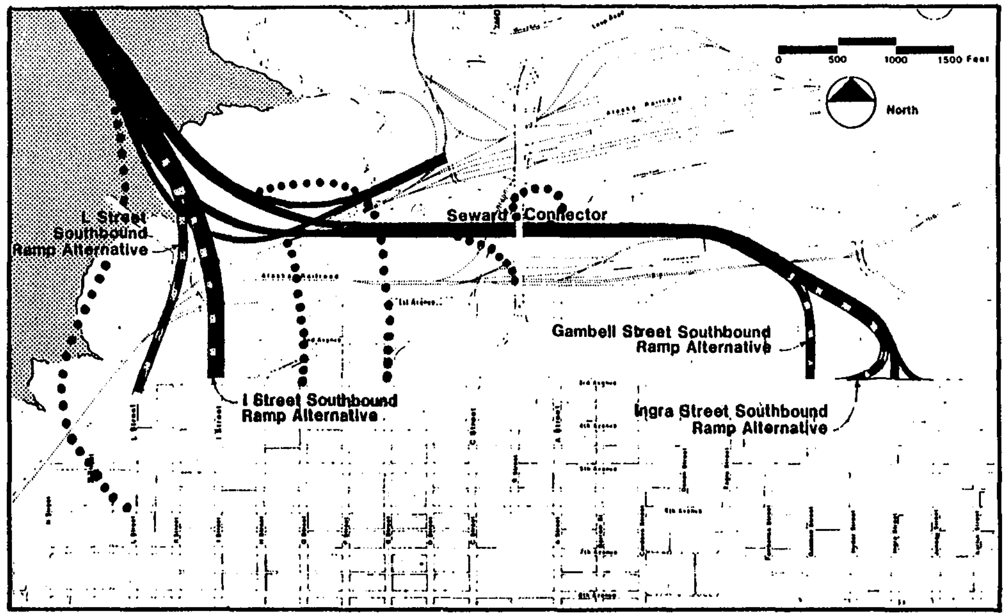
   - Seward Connector -- elevated roadway providing improved access from the crossing to the Port of Anchorage and to the intersection of 3rd Avenue and Ingra/Gambell Streets as well as the Northside and Seward corridors, for which ADOT/PF is examining major highway improvements (ADOT/PF, FHWA, March 1984).

   - Houston Connector -- roadway providing improved access from the crossing to the Parks Highway at Houston

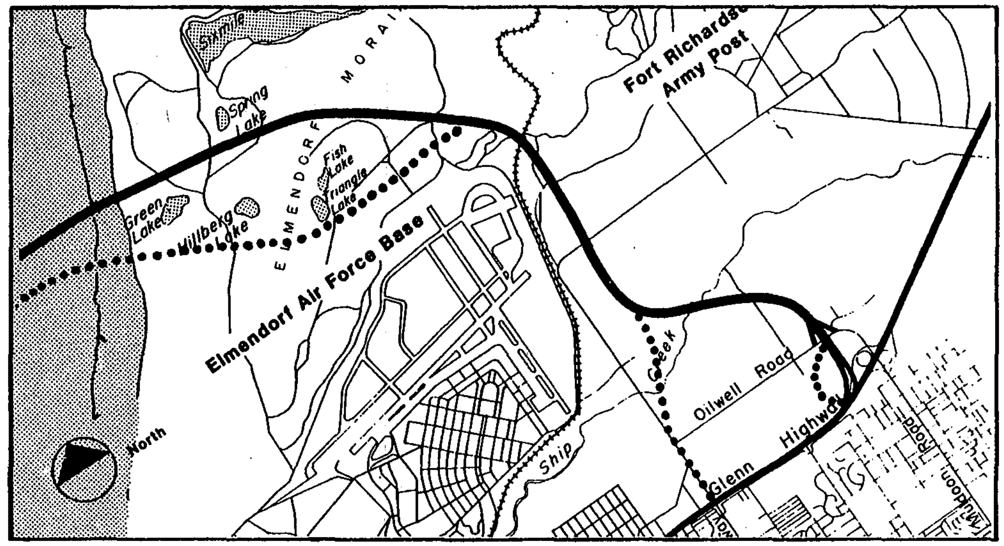
     - Segment 1 provides improved access as far north as the east-west segment of the Point MacKenzie Access Road




Crossing Alternatives




Downtown Crossing/Seward Connector




Elmendorf Crossing

•••••••• **Unreasonable Alignment**

━━━━ **Selected Alignment**

– – – **Southbound Ramp Alternative**

**Figure II-2**

## Alignment Alternatives

- Segment 2 provides improved access between the east-west segment of the Point MacKenzie Access Road and the Parks Highway

2. Elmendorf Project

   ° Elmendorf Crossing -- bridge structure across the Arm plus enough roadway to bring bridge traffic to the existing road system in Anchorage (Glenn Highway west of the Muldoon Road interchange) and the planned Point MacKenzie Access Road in the Mat-Su Borough (intersection near Lake Lorraine)

   ° Houston Connector -- Segments 1 and 2 as indicated for the Downtown Project

Other alignments were examined and dropped from further consideration. They are located in Figure II-2 and are described below:

° Downtown Crossing Southbound Ramp Connected to L Street at 6th Avenue: There would be an unacceptable level of dislocation and neighborhood disruption. The view of Knik Arm for area residents would be blocked.

° Seward Connector Ramps Serving Downtown Anchorage on the C Street Viaduct: Crossing traffic would pass through what is expected to become the center of activity in downtown Anchorage, adding to traffic congestion.

° Seward Connector Ramps Connecting to E and G Streets: G Street is not a through arterial street and E Street has limited capacity, so traffic distribution problems would occur in downtown Anchorage. In addition, the E Street ramp would pass adjacent to the planned location for several historic homes. The G Street ramp would cause unacceptable commercial and residential dislocation.

° Elmendorf Crossing Beginning at Boniface Parkway and Reaching the Arm South of Alignment Analyzed in This Document: The Air Force identified several significant and costly impacts that would result from this alignment. The present alignment responds to Air Force concerns and reduces the impact on Air Force facilities.

° Ramps Improving Access from Crossing to Glenn Highway East of Muldoon Road: This movement is provided for by the Elmendorf Crossing via a half diamond interchange at Oilwell Road. The ramps would provide a more direct route than the Oilwell Road interchange. However, it was found there would not be enough traffic (350 vehicles per average weekday in 2010, including both directions of travel) to warrant the cost of the ramps.

° Houston Connector Intersecting Parks Highway North of Houston: This alignment was used in the Final CAA. It followed an ADOT/PF designated future transportation corridor, however it passed through an extensive wetland area and required bridges across the Little Susitna River and the Alaska Railroad. Concern about the extensive wetland involvement and the Little Susitna River crossing was expressed during review of the Draft CAA. Thus, the alignment was dropped in favor of the present alignment.

- <u>Houston Connector Intersecting Parks Highway at King Arthur Road:</u> This alignment was suggested by the Houston City Council (see Appendix G), but it was dropped because it would require a bridge over the Alaska Railroad.

The components of the No-Crossing Alternatives identified in the corridor analysis and carried forward to this document are:

- No-Action - Projects presently programmed and planned between Anchorage and the Mat-Su Borough

- Glenn/Parks Improvement - Supplementing the No-Action Alternative with additional lanes on the Glenn and Parks Highways

- Hovercraft (air cushion vehicle) - Supplementing the No-Action Alternative with a Hovercraft Ferry across Knik Arm

A fourth No-Crossing Alternative was evaluated but dropped from further consideration, the Transportation Systems Management (TSM) Alternative. This is defined as limited capital improvements maximizing use of the existing road system. In examining possible actions for inclusion in this alternative, it was concluded that no TSM technique would improve significantly the access to growth areas outside the Anchorage bowl on the Glenn and Parks Highway.

Carrying capacity of the Glenn/Parks Highways could not be increased significantly by signalization, striping, and bus/high occupancy vehicles (HOV) on contraflow lanes. Pavement widths would not be sufficient to accommodate additional traffic lanes or a continuous left turn lane along the Parks Highway through Wasilla. Provision of a bus/HOV lane on the Glenn Highway would be impractical in that either a lane would have to be removed from the peak direction of traffic flow, reducing capacity to unacceptable levels, or two lanes would have to be removed from the non-peak or contraflow direction, reducing capacity to unacceptable levels. Government sponsored HOV incentives, such as leasing vans for van pools, might induce some carpooling but the shift would not be sufficient to justify the dedicated lane.

## B. DOWNTOWN PROJECT

The termini for the Downtown Project would be the Seward Highway at Ingra/ Gambell Streets in Anchorage and the Parks Highway near Houston in the Mat-Su Borough. The Downtown Project would be divided into the following parts shown in Figure II-2:

- Crossing (access ramps from I and L Streets in downtown Anchorage, a bridge across Knik Arm, and a road connecting to a planned extension of the Point MacKenzie Access Road in the Mat-Su Borough)

- Seward Connector (road connecting the crossing with the Seward Highway at Ingra and Gambell Streets and with the Port of Anchorage)

- Houston Connector

  - Segment 1 (road between crossing and east-west segment of Point MacKenzie Access Road in the Mat-Su Borough)

  - Segment 2 (road between end of Segment 1 and Parks Highway at Houston)

Crossing

Alignment Description. The southern terminus of the crossing would be at the I/L couplet near 3rd Avenue in Anchorage. Two alternative configurations for the southbound ramp are under consideration. One would end at L Street and the other at I Street. The northbound ramp would begin at I Street. Starting from the southern terminus, Knik Arm would be crossed in a north-west direction, reaching the north bluff about 1.5 miles north-east of the tip of Point MacKenzie. The crossing then would proceed north along the west slope of the Elmendorf Moraine (Figure II-3) for approximately two miles and end near Lake Lorraine at the line between Sections 22 and 23, T14N, R4W, Seward Meridian. The entire crossing would be about 5.5 miles long, see Figures II-3 and II-4. Additional detail is shown in Appendix A.

Traffic Volume. Traffic capacity of the four-lane crossing is estimated at 50,000 AWDT (average weekday daily traffic, including both directions of travel). Traffic on the crossing is forecast at 42,300 AWDT in year 2010 (design year), approximately twenty years after project completion.

Bus Service. It is anticipated that commuter bus service would use the crossing to accommodate the increased transit demand between Anchorage and the Mat-Su Borough. See description under "Houston Connector". A separate bus/carpool lane would be provided through the crossing toll booths.

Design Features. The central feature of this crossing would be the spans over Knik Arm, which would include a single-level, four-lane, cable-stayed bridge. A conceptual drawing of this bridge is shown in Figure II-5. It would consist of the 2,240-foot long cable-stayed configuration, 9,500 feet of 500-foot deck-truss spans, and approximately 4,000-feet total of shorter multiple-girder spans which would reach the bluffs on either side of the Arm. The total length would be three miles.

The bridge would accommodate installation of utilities, but there would be no provisions for use by either non-motorized vehicles or pedestrians.

Navigation clearance 1,000-feet wide and 150-feet above MHHW (Mean Higher High Water) would be provided under the main span. The two piers flanking the main span would be centered about a navigation course identified by the Coast Guard (U.S. Coast Guard, January 1981). Navigation lights would be provided on the bridge in conformance to Coast Guard requirements.

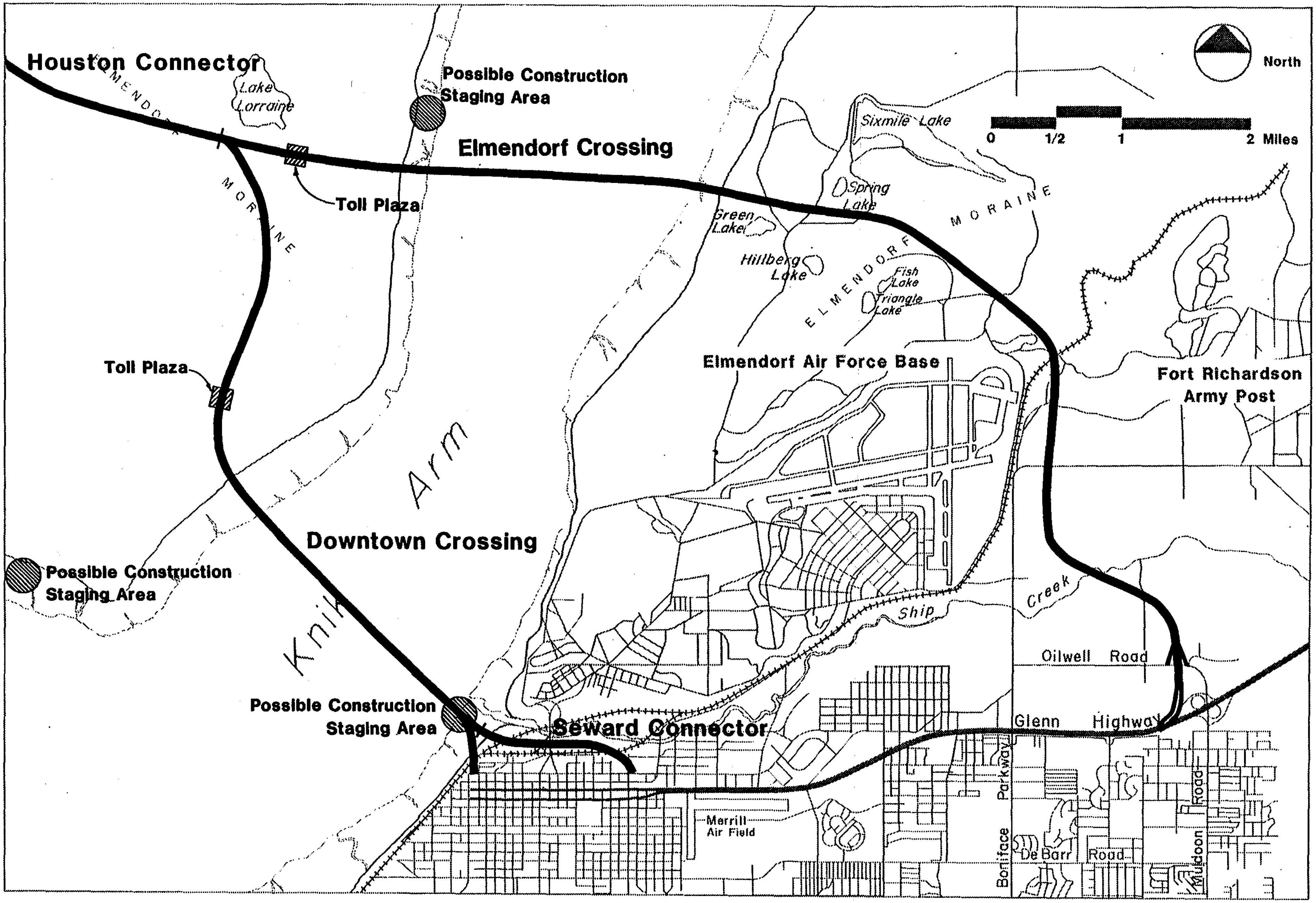



Figure II-3

**Crossings**

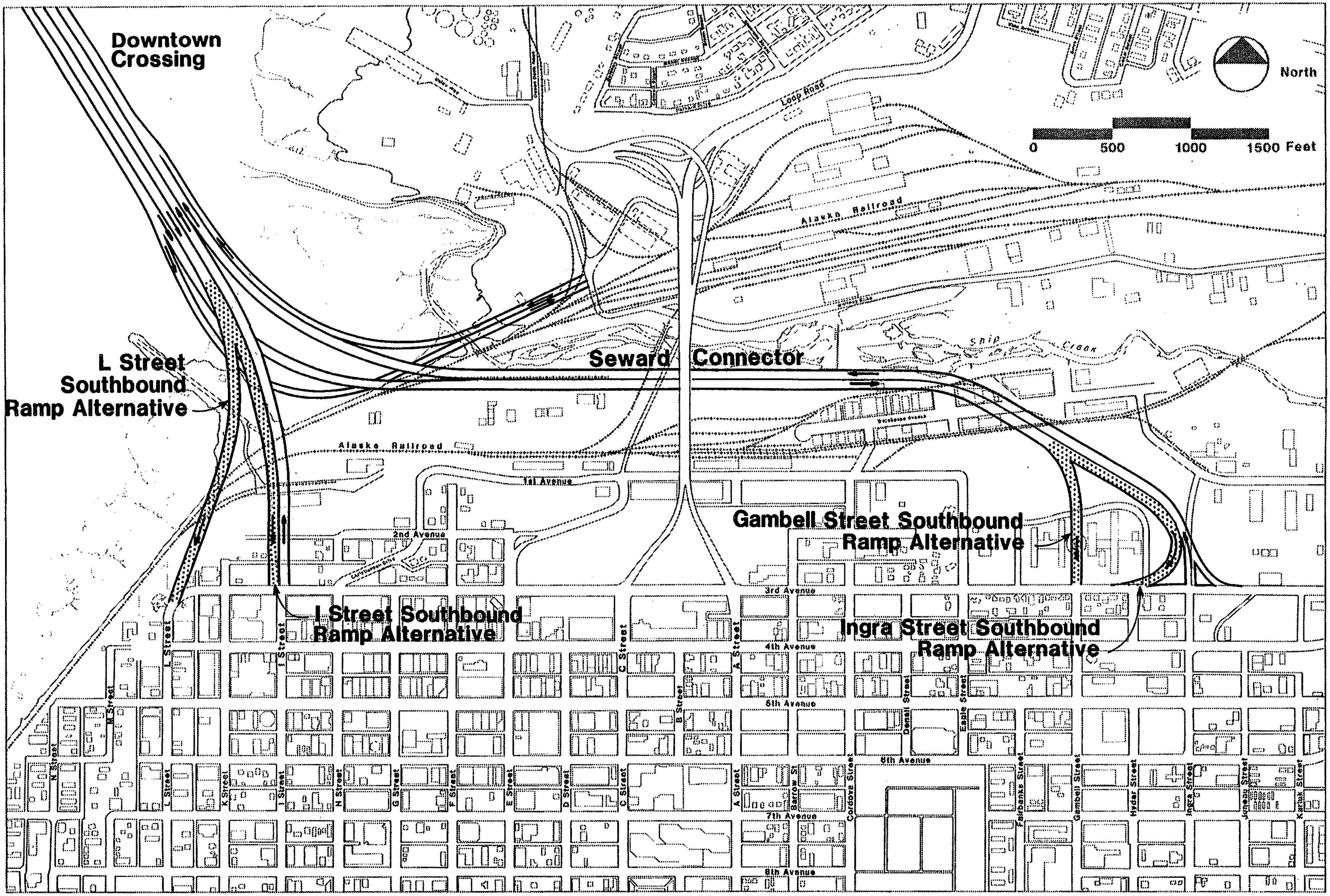



Figure II-4

**Downtown Crossing/ Seward Connector**

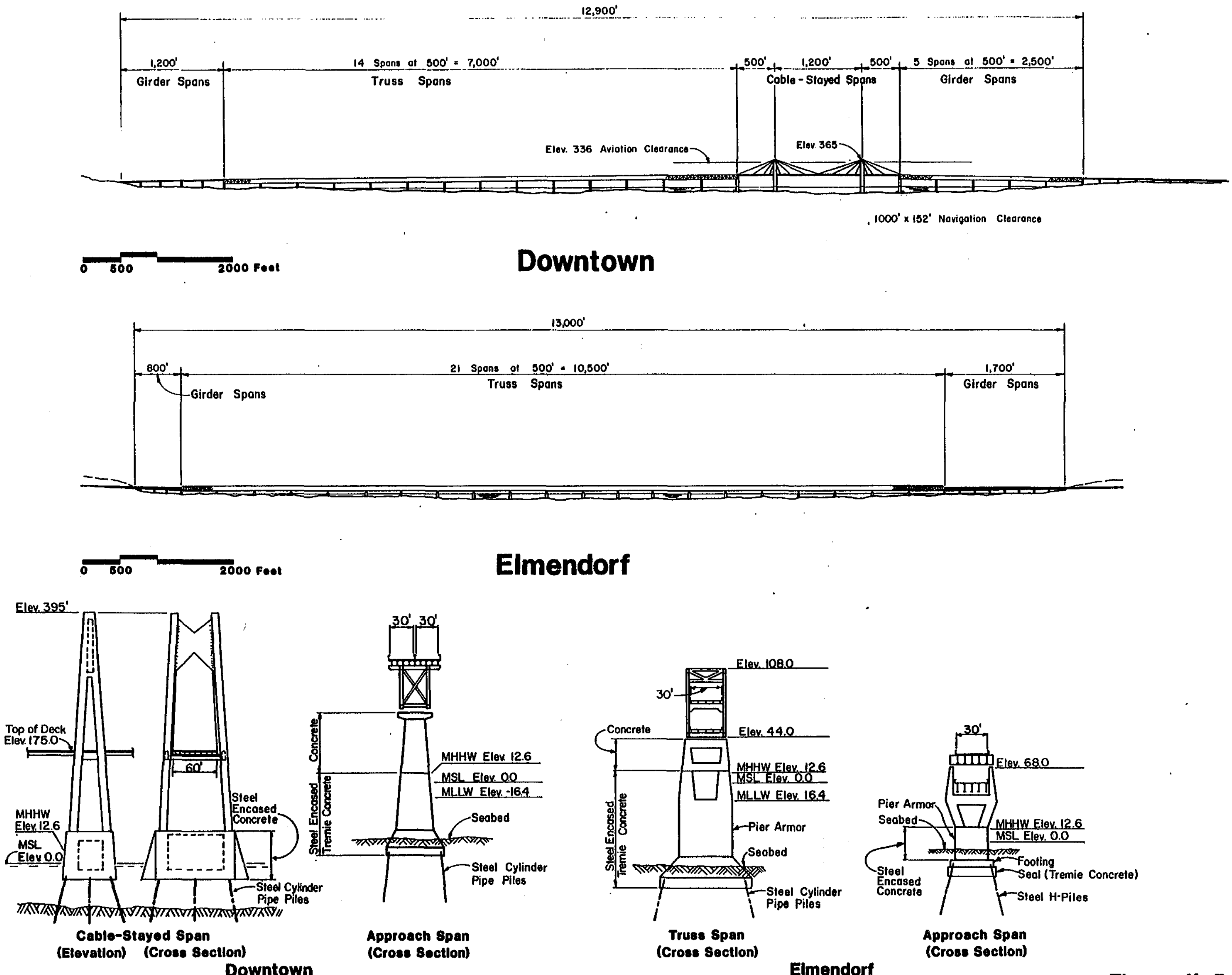



**Figure II-5**

**Bridges**

The two towers supporting the cable-stayed spans would project approximately 30 feet into the aviation clear zone for Merrill Field. Lighting for aircraft would be provided in conformance with requirements of the Federal Aviation Administration (FAA).

All bridge piers would be designed to resist earthquakes, ice, temperature extremes, wind, and other forces that would affect a structure at this location. The bridge would also be designed to minimize the chance of ship collision and the damage resulting from a collision. Design investigations would include an analysis of the following means to minimize ship collisions:

- Locate the navigation channel to provide the safest passage into and out of the Port of Anchorage

- Provide the optimum navigation clearance for the number and characteristics of ships

- Provide navigation aids to assist the passage of ships under the bridge

- Utilize ice breaking type vessels and designated pilots to assist ships during hazardous climatic conditions

The following means to minimize damage to the bridge in the event of a ship collision would be analyzed:

- Design of fendering system at the piers to partially absorb the energy from a collision and/or to deflect a ship away from the pier

- Design of the pier itself to withstand a collision without collapse of the bridge

The remainder of the Crossing north of Knik Arm would be a limited access four-lane at-grade roadway. Grades would be moderate with large cuts required north of the end of the bridge due to a large ridge called the Elmendorf Moraine. A 400-foot wide right-of-way would provide adequate width for future utilities, space for future frontage roads, and/or buffer space to protect adjacent land uses from roadway noise and visual impacts. Fencing would not be provided along the right-of-way.

Toll booths would be constructed on the Mat-Su end of the Crossing between the bluff and the first interchange. The booths would accommodate northbound and southbound users of the Crossing.

Lighting would be provided on the bridge structure, at the toll plaza, and at roadway intersections.

Cost. The estimated 1985 costs of the Downtown Crossing, plus additional costs resulting from a five percent inflation rate before project completion, are:

| | |
|---|---|
| Engineering | $ 33,600,000 |
| Right-of-Way | 1,000,000 |
| Construction | 522,900,000 |
| TOTAL 1985 costs | 557,500,000 |
| Inflation to Construction | 72,300,000 |
| TOTAL | $629,800,000 |

Inflation calculations took into account the forecast timing of construction expenditures. Annual maintenance costs (1985) are estimated to be $1,100,000.

Construction. Construction of the Crossing would take six years, allowing for design time, site characteristics, and winter shutdown. The at-grade roadway could be built independent of the bridge and would take less time. With construction starting in 1986 as planned, the Crossing would be open for traffic use in 1991.

Construction materials for the bridge, including superstructure members, steel pier shells, and steel pier bases probably would be fabricated outside of Alaska. Cement and reinforcing steel also would be shipped in from out-of-State.

Labor requirements for construction of the bridge would be solicited from within the State and then, if necessary, additional labor would be sought from outside the State. An average of 150 workers per year would be required during construction.

For the at-grade roadway portion, all labor, heavy equipment, and construction materials, except for cement and certain specialty steel items, would be available within the State.

A single central construction staging area is envisioned to provide for importation and storage of supplies and equipment for Crossing construction. This site would require:

- Dock facilities -- pier at 20-foot depth water (low tide); crane to unload barges bringing steel and concrete from the Orient or Lower 48
- Storage yard -- level cleared area approximately 15 acres (750 x 1,000 feet) in proximity to the dock and above high water to provide for storage of materials and equipment, mixing of concrete, and contractor's office
- Access road to the staging area for bringing in sand and gravel and personnel; the approximately 40-foot wide road on 100-foot right-of-way would be designed for truck loading and six percent maximum grade; crushed rock surface is envisioned

The crossing staging area would not need to be at the construction site although proximity would be desirable. The site would be occupied only during construction and therefore could be leased or purchased and sold following construction.

Three alternative sites for construction staging are shown in Figure II-3. They are:

1. South of Ship Creek on the Anchorage waterfront on land leased from the Alaska Railroad. For use as a staging site, the current site would require fill, dock construction, and dredging. York Steel, the current leaser, has Corps of Engineers permits for dock and fill at this location. Proximity to existing transportation, services, and labor would make this a preferred location for staging. This location would necessitate a subordinate Mat-Su-side construction office (perhaps one acre) to manage Mat-Su-side construction. Boat or aircraft transport would be provided between Anchorage and the Mat-Su shore.

2. Approximately one mile west of MacKenzie Point on the Mat-Su shore on land leased or purchased from private owners. Approximately one-half mile of pier would be needed to reach 20-foot water depth. Off-loaded materials would be transported to the top of the bluff or a 15 acre fill area would be created in the mud flat area. Approximately 11 miles of access road would be required to link this staging area with the existing terminus of the Point MacKenzie Access Road. This location would require a boat or aircraft transport link to Anchorage and a subordinate Anchorage-side construction office (perhaps one acre) to manage on-shore construction. Construction of a staging area dock, storage, and access road in this location could provide the nucleus for a Point MacKenzie port following Crossing construction.

3. Approximately four miles north of the Port of Anchorage on the Mat-Su shore. This site would be leased or purchased from the Borough or private owners. Approximately one-half mile of pier would be needed to reach 20-foot water depth. Alternately a 15-acre fill area would be created in the mud flat area near the dock. This location would require a boat or aircraft transport link to Anchorage and boat link to the Elmendorf shore. Approximately eight miles of gravel roadway would be needed to connect the site to the existing terminus of the Point MacKenzie Access Road. Construction of a dock, staging area, and access road in this location could provide the nucleus for a Point MacKenzie Port following Crossing construction.

Any of the three sites could be used with a Downtown Crossing. The first two would be particularly suitable.

Maintenance and Operation. Maintenance requirements for the bridge portion would include safety inspections, and navigation and aircraft lighting replacements. An eight year paint cycle would be required for the steel. Snow removal, sign repair, periodic lane striping, roadway repairs, and repaving would also be required. Periodic repairs would be made to the toll booths. Operation requirements would include 24-hour staffing by toll collectors. Approximately 25 jobs would result.

Financing. See Appendix F, "Project Financing Overview".

Permits and Approvals. The following permits and approvals would be required with the Downtown Crossing:

- Corps of Engineers Section 404 permit for all wetlands filling and likely for Knik Arm bridge construction

- Corps of Engineers Section 10 permit for construction of Knik Arm bridge

- U.S. Coast Guard Section 9 permit for Knik Arm bridge

- Approval by the Federal Aviation Administration to encroach on the Merrill Field clearance zone

- Permit from the Federal Communications Commission for the air clearance encroachment

- Department of Environmental Conservation Certificate of Reasonable Assurance (that water quality would be maintained)

- Governor's office determination of coastal zone plan consistency

- Department of Natural Resources tidelands lease and an 11 AAC 93.160 dam permit for constructing cofferdams

- Department of Fish and Game Title 16 permit (for affecting critical habitat area)

- ADOT/PF, Division of Design and Construction, Design Group II (aviation) clearance with Federal Highway Administration and Federal Aviation Administration concurrence since crossing is within two miles of an airport

Seward Connector

Alignment Description. This portion of the Downtown Project would connect both the Seward Highway and the Port of Anchorage to the Crossing. The connection from the Seward Highway would proceed north from Ingra/Gambell Streets (starting point for Seward Highway as well as end points for planned Seward and Northside Corridors, See Chapter III, "Street and Highway Plans") through an undeveloped area. Two southbound ramp alternatives are being considered, one would end at Gambell Street and one would end at Ingra Street. The northbound ramp would begin at Ingra Street. It would curve west, cross an Alaska Railroad track, and run parallel to and south of Ship Creek until it would connect with the Crossing near the shore of Knik Arm. The length of the Seward Connector would be about 1.5 miles. Vehicular access to the Port of Anchorage would be provided to the Crossing via two, one-lane ramps on the west side of the Alaska Railroad mainline track, see Figure II-4. Additional detail is shown in Appendix A.

Traffic Volumes. Traffic capacity of the four-lane Connector is estimated at 50,000 AWDT, which includes both directions of travel. Year 2010 traffic is forecast at 19,600 AWDT.

Design Features. The Seward Connector would consist of a four-lane bridge throughout its entire length. The bridge would be high enough to allow clearance underneath for railroad traffic, but low enough to pass under the existing C Street viaduct. No provisions would be made for use by either pedestrians or non-motorized vehicles except crossing underneath the bridge. Roadway lighting would be provided at all exits and entrances. The Connector would be drained into the Municipal storm sewer system.

Cost. The estimated 1985 costs of the Seward Connector, plus additional costs resulting from a five percent inflation rate before project completion, are:

| | |
|---|---|
| Engineering | $ 6,900,000 |
| Right-of-Way | 8,000,000 |
| Construction | 107,900,000 |
| TOTAL 1985 costs | 122,800,000 |
| Inflation to construction | 134,400,000 |
| TOTAL | $257,200,000 |

Inflation calculations took into account the forecast timing of construction expenditures. Annual maintenance costs (1985 dollars) are estimated to be $40,000. This figure does not include cyclical maintenance, such as repaving, which is treated as a capital expenditure by the State.

Construction. It is anticipated that construction would be completed in two years with much of the work continuing through the winter. Labor requirements would be solicited initially from within the State of Alaska. Construction would take place in 1999 and 2000 with the Connector open for traffic in 2001. The schedule would be coordinated with Major Corridor Project(s) (ADOT/PF, FHWA, March 1984). During construction activity, the project would employ about 100 workers.

Maintenance. The largest maintenance expenditures would be for snow removal, surface repair, and repaving. One or two new jobs might result.

Financing. See Appendix F, "Project Financing Overview".

Permits and Approvals. The following permits and approvals would be required with the Seward Connector:

- Corps of Engineers Section 404 permit for filling wetlands

- Department of Environmental Conservation Certificate of Reasonable Assurance (that water quality would be maintained)

- Governor's office determination of coastal zone management plan consistency

- ADOT/PF, Division of Design and Construction, Design Group II (aviation), clearance with Federal Highway Administration and Federal Aviation Administration concurrence since Connector is within two miles of an airport

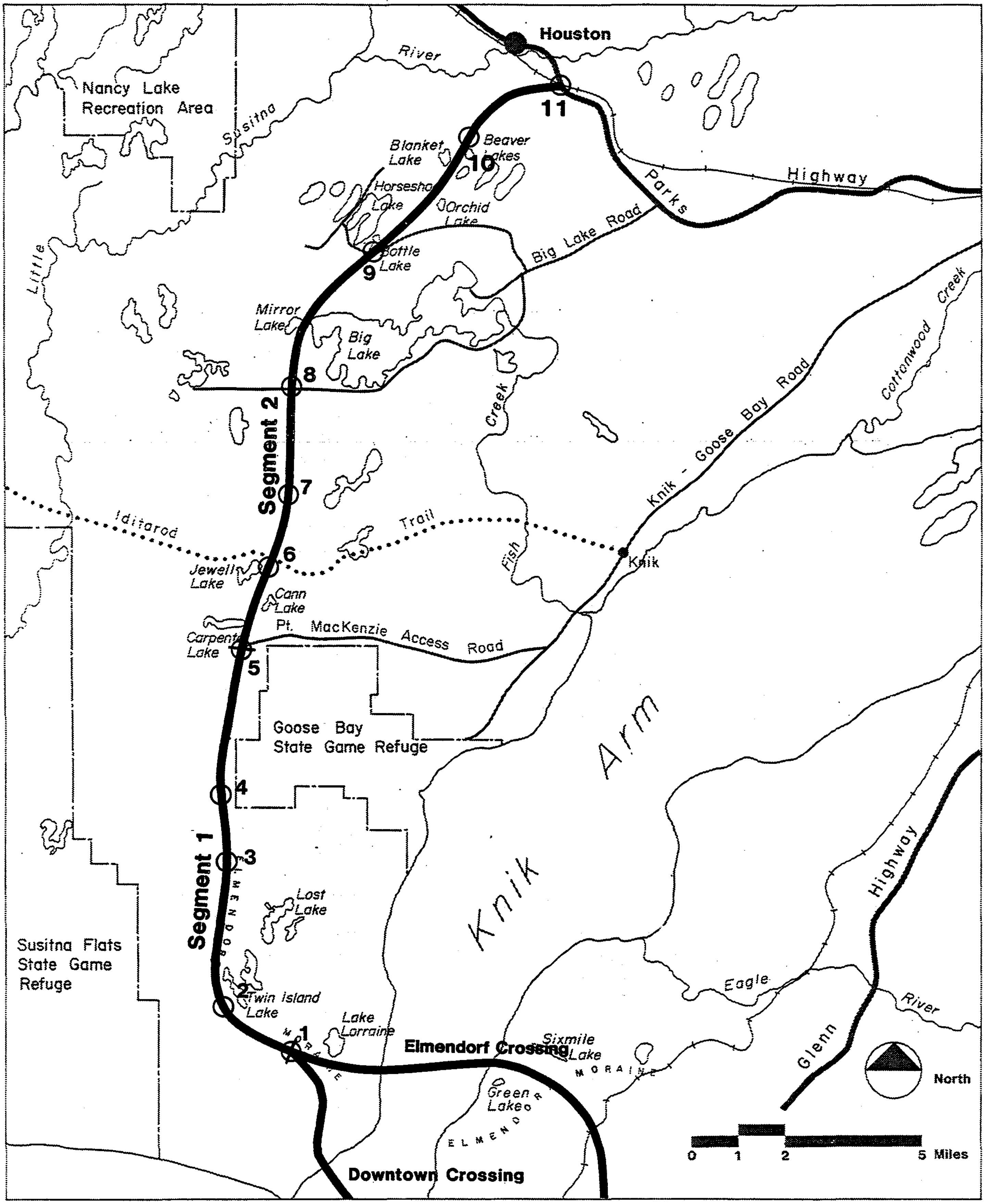
Houston Connector

Alignment Description. This Connector would connect the Crossing of either the Downtown or Elmendorf Project to the Parks Highway. Segment 1 of the Houston Connector would start at the line between Sections 22 and 23, T14N, R4W, Seward Meridian, which would be the northern terminus of the Crossings near Lake Lorraine. It then would head northwest, following the west slope of the Elmendorf Moraine for about 6.5 miles where it would join the south end of the existing Point MacKenzie Access Road. The alignment would follow this road north 5.2 miles to where the Point MacKenzie Access Road turns east. Segment 2 of the Connector would continue north, passing between Carpenter Lake and Cann Lake, then it would proceed northeast, passing between Cann Lake and Jewell Lake for about 6.3 miles to South Big Lake Road. In the next 10.2 miles, it would cross over the narrows between Mirror Lake and Big Lake, pass south of Bottle Lake and north of Orchid Lake, continue northeast between Blanket Lake and Little Beaver Lake, and then turn east and terminate at the Parks Highway about 0.25 miles south of the Alaska Railroad grade crossing in Houston, see Figure II-6. Additional detail is shown in Appendix A.

Traffic Volume. Traffic capacity would be approximately 30,000 AWDT for the four-lane Segment 1 and 15,000 for the two-lane Segment 2. Year 2010 traffic is forecast at 23,400 AWDT for Segment 1 and 11,000 AWDT for Segment 2.

Bus Service. Increased accessibility to the Anchorage bowl and the availability of developable land is expected to generate development and associated demand for commuter bus service. Because of the long travel distance, an express bus system with few stops is envisioned. Park-and-ride lots for car pooling and bus operations near major intersections could also occur. Bus/carpool turnouts would be provided at major intersections, and there would be room in the Connector right-of-way for the eventual construction of park-and-ride lots. Bus service is discussed in detail under "Public Transportation", Chapter IV.

Design Features. Segment 1 would be a limited access four-lane road. Segment 2 would be a limited access two-lane road. Limited access means that access to the connector would be permitted only at intersections. The Connector would have a grade that is gentle to rolling, with small cuts and fills. A bridge would be required for the crossing of the narrows between Mirror Lake and Big Lake. Bridge clearance would be in conformance with Coast Guard requirements.




○ Intersections

Figure II-6

Houston Connector

As shown on Figure II-6, at-grade intersections with lighting, signs, and bus/carpool turnouts would be provided at eleven locations:

1. South of Lake Lorraine
2. South of Twin Island Lake
3. West of Lost Lake
4. Holstein Heights Subdivision (Point MacKenzie Agricultural Area)
5. East-West Segment of Point MacKenzie Access Road
6. East of Jewell Lake
7. Irish Hills Subdivision
8. South Big Lake Road
9. Horseshoe Lake Road
10. West of Beaver Lakes
11. Parks Highway

There would be no provisions for non-motorized vehicles or pedestrians throughout the length of the Houston Connector, however the right-of-way would be wide enough for future inclusion of a path for non-motorized vehicles or pedestrians. A bridge would be provided for the users of the Iditarod Trail to cross over the route. Also a parking lot would be provided on the right-of-way near the trail crossing.

A 400-foot right-of-way would be required for both segments to provide adequate width for future utilities, frontage roads, future upgrading to full grade separation (interchanges), and/or buffer space to protect adjacent land uses from roadway noise and visual impact. Initially, fencing would not be provided along the right-of-way boundary. If required at some locations in the future, it would be installed.

Costs. The estimated 1985 costs for the Houston Connector, plus additional costs resulting from a five percent inflation rate before project completion, are:

| | Segment 1 | Segment 2 | Total |
|---|---|---|---|
| Engineering | $ 3,100,000 | $ 3,600,000 | $ 6,700,000 |
| Right-of-Way | 0 | 4,500,000 | 4,500,000 |
| Construction | 23,700,000 | 27,700,000 | 51,400,000 |
| TOTAL 1985 costs | 26,800,000 | 35,800,000 | 62,600,000 |
| Inflation to Construction | 5,800,000 | 7,100,000 | 12,900,000 |
| TOTAL | $32,600,000 | $42,900,000 | $75,500,000 |

Inflation calculations took into account the forecast timing of construction expenditures. Annual maintenance costs (1985 dollars) are estimated to be $230,000 for Segment 1 and $170,000 for Segment 2. These figures do not include cyclical maintenance, such as repaving, which is treated as a capital expenditure by the State.

Construction. All labor, heavy equipment, and construction materials, except for cement and reinforcing steel, would be available within Alaska. Since construction of the Connector would require little or no specialty items, the funds expended out-of-State would be negligible. Construction would occur during the final two years of the Crossing construction (1989 and 1990). Labor requirements would be solicited initially from within the State of Alaska, and it is anticipated that an average of 50 workers per year would be required during construction.

Maintenance. Maintenance requirements for this Connector would include snow removal, sign and roadway light repair, periodic lane striping, roadway repair, and repaving. One or two new jobs might result.

Financing. It is anticipated that the Houston Connector would be financed partially by Federal participating funds. See Appendix F, "Project Financing Overview".

Permits and Approvals. The following permits and approvals would be required with the Houston Connector:

- Corps of Engineers Section 404 permit for filling wetlands
- Corps of Engineers Section 10 permit for Mirror/Big Lakes narrows bridge
- U.S. Coast Guard Section 9 permit for bridge across Mirror/Big Lakes narrows
- Department of Environmental Conservation Certificate of Reasonable Assurance (that water quality would be maintained)
- Governor's office determination of coastal zone management plan consistency
- Department of Fish and Game Title 16 permit (crossing fish streams or affecting critical habitat area)

## C. ELMENDORF PROJECT

The termini for the Elmendorf Project would be an interchange with the Glenn Highway near Muldoon Road in Anchorage and an intersection of the Parks Highway near Houston in the Mat-Su Borough (Figure II-2). The Elmendorf Project would be divided into the following parts:

- Crossing (road from the Glenn Highway in Anchorage, a bridge across Knik Arm, and a road connecting to a planned extension of the Point MacKenzie Access Road in the Mat-Su Borough)
- Houston Connector (same as with Downtown Project)

## Crossing

Alignment Description. The Crossing would begin at the Glenn Highway near Muldoon Road, cross Fort Richardson and Elmendorf Air Force Base (AFB), cross Knik Arm, and end at the line between Sections 22 and 23, T14N, R4W. The alignment would be northerly from the interchange at Glenn Highway, passing between the AFB hospital and Bartlett High School. It would curve to the northwest near the hospital's helicopter pad and then curve north near Ship Creek, passing between an AFB east-west runway clear zone and munitions safety clearance zones. The alignment would continue northerly until it reached the Alaska Railroad. It then would turn to the northwest and pass north of the north-south runway clear zone, and north of the Hillberg Ski Area reaching the bluffs of Knik Arm north of Green Lake. Knik Arm then would be crossed in an east-west direction, reaching the Mat-Su side of the Arm about four miles northeast of the tip of Point MacKenzie. The Crossing would proceed west for about one mile before ending near Lake Lorraine. The length of the entire Crossing would be about 10 miles, see Figure II-3. Additional detail is shown in Appendix A.

Traffic Volume. Traffic capacity of the four-lane Crossing is estimated at 50,000 AWDT. Year 2010 traffic is forecast at 30,100 AWDT.

Bus Service. Buses would use the Crossing to serve increased transit demands between Anchorage and the Mat-Su Borough. See description under "Houston Connector". A separate bus/carpool lane would be provided through the crossing toll booths.

Design Features. The portion of the Crossing passing through Fort Richardson and Elmendorf AFB would be a fully access-controlled four-lane divided highway. Deep cuts and high fills would be required for approximately 1.7 miles.

There would be a directional interchange with the Glenn Highway near Muldoon Road and a half-diamond interchange at Oilwell Road. In the portion passing through Fort Richardson and Elmendorf AFB, 13 bridges would be needed, including two over the Alaska Railroad. For the 400-feet before reaching Knik Arm, the highway would be close to the shore of Green Lake. Except for Ship Creek, this portion of the highway would not cross any streams or lakes.

A 300-foot wide right-of-way would be required through military property. This entire portion of the Crossing would be fenced at the right-of-way boundary.

A four-lane double-level bridge would cross Knik Arm, see Figure II-5. The 2.5 mile long bridge would consist of 21 through-truss spans and about 2,500-feet of multiple-girder spans. At the bluff line on both sides of the Arm, about 1,000-feet of girder spans would project onto the shore. These spans would provide for the transition from a double-level roadway on the bridge to a side-by-side roadway on the shores.

The bottom of the steel trusses would be high enough to clear waves and spray at high tide. Navigation clearance for large boats would not be provided, however there would be clearance for small craft and the Chugach Electric maintenance barge. Lighting for aircraft and navigation would be provided in conformance to the requirements by the FAA and U.S. Coast Guard. Provisions would be made to allow for the installation of utility lines, but no provisions would be made for use by pedestrians or non-motorized vehicles.

Bridge piers would be designed to resist earthquakes, ice, temperature extremes, wind, and other forces that would affect a structure at this location.

On the Mat-Su side of the Arm, the Crossing would be a four-lane at-grade roadway with small cuts and fills. A 400-foot right-of-way would provide adequate width for utilities and future frontage roads. No fencing would be provided for this portion of the Crossing.

The bridge, toll plaza, and intersections would be lighted.

Toll booths would be constructed on the Mat-Su end of the Crossing between the bluff and the first interchange. The booths would accommodate northbound and southbound users of the Crossing.

Cost. The estimated 1985 costs for the Elmendorf Crossing, plus additional costs resulting from a five percent inflation rate before project completion, are:

| | |
|---|---|
| Engineering | $ 26,800,000 |
| Right-of-Way | 1,000,000 |
| Relocation | 89,100,000 |
| Construction | 367,500,000 |
| TOTAL 1985 costs | 484,400,000 |
| Inflation to construction | 47,200,000 |
| TOTAL | $531,600,000 |

Inflation calculations took into account the forecast timing of construction expenditures. Annual maintenance costs (1985) are estimated to be $1,100,000. This figure does not include cyclical maintenance, such as repaving, which is treated as a capital expenditure by the State.

Construction. Construction would take five years, allowing for design time, site characteristics, and winter shutdown. The at-grade roadway could be built independently of the Arm bridge and would take about two years. With construction starting in 1986 as planned, the Crossing would be open for traffic use in 1990.

Construction materials for the Arm bridge, including superstructure members, steel pier shells, and steel pier bases, likely would be fabricated outside Alaska. Cement and reinforcing steel also would be shipped in from out-of-State. Some heavy equipment needed for the Arm bridge would need to be brought in.

An average of 150 workers per year would be required during construction. Labor requirements for construction of the bridge would be solicited from within the State and then, if necessary, additional labor would be sought from outside the State.

Construction of the at-grade roads could be carried out by local contractors, utilizing labor mostly from the State of Alaska. Most of the materials needed for construction of the roads would be available within Alaska. Construction of the road through Fort Richardson and Elmendorf AFB would require about 100,000 tons of fill material which would be brought in from the Mat-Su Borough.

A staging area also would be required for this Crossing. Any of the three locations described under the Downtown Crossing could be used; the first and third would be particularly suitable.

Maintenance and Operation Requirements. Maintenance and operation requirements would be similar to those for the Crossing segment of the Downtown Project.

Financing. See Appendix F, "Project Financing Overview".

Permits and Approvals. The following permits and approvals would be required with the Elmendorf Crossing:

- Department of Defense agreement for use of right-of-way through Elmendorf AFB
- Corps of Engineers Section 404 permit for filling wetlands
- Corps of Engineers Section 10 permit for Knik Arm and Ship Creek bridges
- U.S. Coast Guard Section 9 permit for Knik Arm bridge
- Department of Environmental Conservation Certificate of Reasonable Assurance (that water quality would be maintained)
- Governor's office determination of coastal zone management plan consistency
- Department of Natural Resources tidelands lease and an 11 AAC 93.160 dam permit for constructing cofferdams
- Department of Fish and Game Title 16 permit (crossing fish streams or affecting critical habitat area)

Houston Connector

This portion of the Elmendorf Project would be identical to the Houston connector described for the Downtown Project except that construction would be started and completed one year sooner (1988 to 1989). Year 2010 traffic is forecast at 17,600 AWDT for the four-lane Segment 1, and 8,600 AWDT for the two-lane Segment 2. Traffic capacity would be approximately 30,000 AWDT for Segment 1 and 15,000 AWDT for Segment 2.

Costs. The estimated 1985 costs for the Houston Connector, plus additional costs resulting from a five percent inflation rate before project completion, are:

| | Segment 1 | Segment 2 | Total |
|---|---|---|---|
| Engineering | $ 3,100,000 | $ 3,600,000 | $ 6,700,000 |
| Right-of-Way | 0 | 4,500,000 | 4,500,000 |
| Construction | 23,700,000 | 27,700,000 | 51,400,000 |
| TOTAL 1985 Cost | 26,800,000 | 35,800,000 | 62,600,000 |
| Inflation to Construction | 4,300,000 | 5,200,000 | 9,500,000 |
| TOTAL | $31,100,000 | $41,000,000 | $72,100,000 |

Inflation calculations took into account the forecast timing of construction expenditures.

## D. NO-CROSSING ALTERNATIVES

Three No-Crossing Alternatives are analyzed in this document:

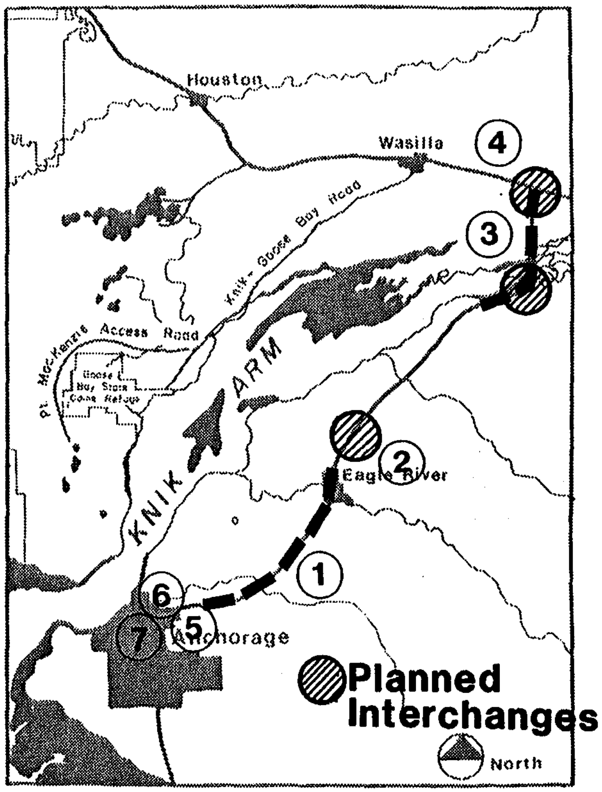
1. No-Action -- Includes only those projects presently programmed (FY 1984 to 1989) and planned (1983 to 2001) between Anchorage and the Mat-Su Borough

2. Glenn/Parks Improvement -- Supplements the No-Action Alternative with additional lanes on the Glenn and Parks Highways

3. Hovercraft (Air Cushion Vehicle) -- Supplements the No-Action alternative with Hovercraft ferries crossing Knik Arm between downtown Anchorage and Point MacKenzie plus a two-lane road from the Point MacKenzie ferry terminal to Houston

### No-Action

The No-Action Alternative is defined for two timeframes -- (1) short-range, reflected in the FY 1984 to 1988 Transportation Improvement Program (TIP) for the Anchorage Metropolitan Area Transportation Study (AMATS, September 1983), the 6-year Capital Improvement Program (CIP) for the Mat-Su Borough (Mat-Su Borough, March 1984) the ADOT/PF FY84 105 Program (ADOT/PF, September 1983), and the Anchorage Accelerated Road Program (MOA-ADOT/PF, March 1984); and (2) long-range, 1983 to 2001, reflected in the Municipality (Municipality of Anchorage, Community Planning Department, July 1983) and Borough (Mat-Su Borough, March 1984) long-range transportation plan elements. Components of the programs and plans affecting travel in the Anchorage to Mat-Su corridor are described below and shown in Figure II-7.



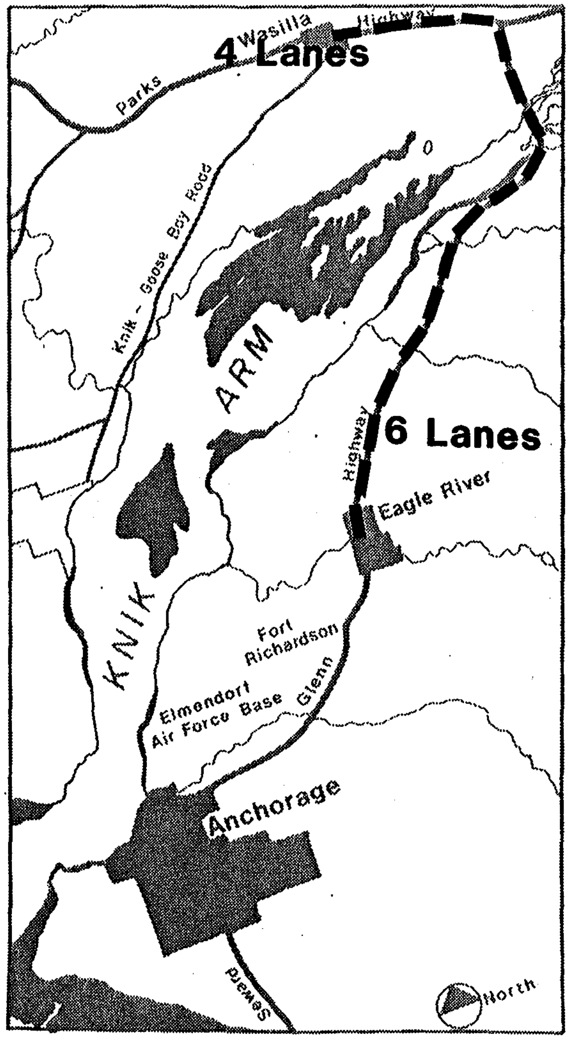

## No-Action

**Short-Range (1984-1989)**

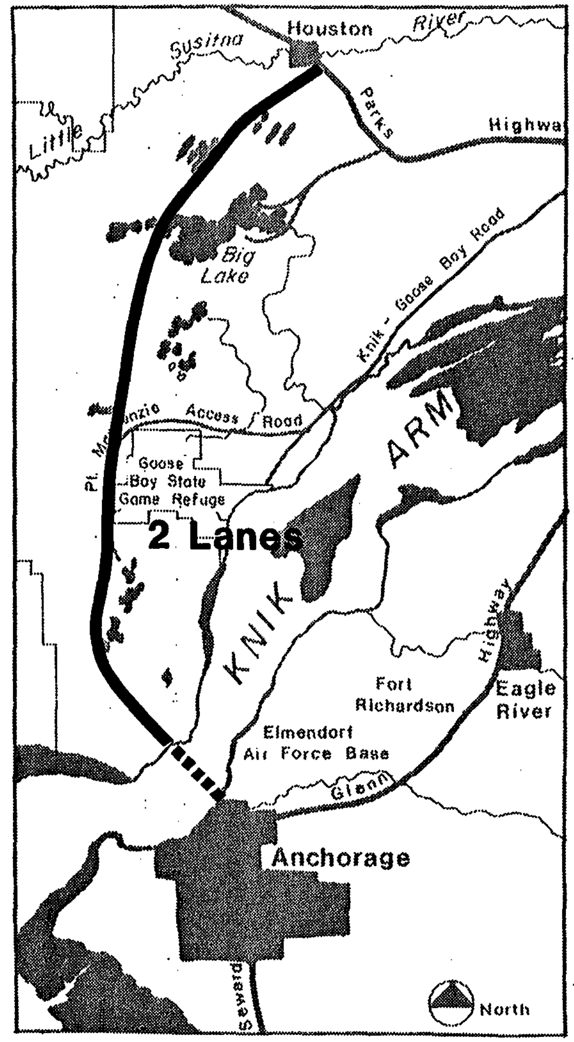
1. Widen Glenn Highway from Muldoon Road to Eagle River (6 lanes)
2. North Eagle River Interchange
3. Widen and grade separate Glenn Highway from Eklutna to Parks Highway (4 lanes)
4. Park-and-Ride lot

**Long-Range (1990-2001)**

5. Glenn Highway interchanges and widening (6 lanes)
6. Northside Bypass
7. Seward Freeway




## Glenn/Parks Improvement




## Hovercraft

**Figure II-7**

## No-Crossing Alternatives

Short-Range. Four improvements are proposed in the Anchorage to Mat-Su Borough corridor during the 1984 to 1989 timeframe:

- Widening of the Glenn Highway to six lanes from Muldoon Road to Eagle River. Traffic capacity would be increased to 75,000 AWDT. The year 2010 expected traffic volume is approximately 80,400 AWDT.

- Widening and grade separation of the Glenn Highway to four lanes from Eklutna to the Parks Highway. Interchanges would be constructed at the intersections of the Glenn and Parks Highways and at the intersection of the old and new Glenn Highways south of the Knik River. Traffic capacity would be increased to 50,000 AWDT. Year 2010 traffic volumes are forecast at 34,600 AWDT.

- North Eagle River interchange. The interchange would improve safety and increase traffic capacity to approximately 50,000 AWDT. Year 2010 traffic is forecast at 59,600 AWDT.

- A park-and-ride lot within the right-of-way of the Glenn and Parks Highway interchange. Short-range capacity of the lot would be approximately 45 spaces; long-term capacity 75 spaces.

Long-Range. Three improvements are proposed for the 1990 to 2001 timeframe:

- Bragaw Street and Boniface Parkway interchanges with Glenn Highway and Glenn Highway widening to six lanes between Turpin Street (between Muldoon Road and Boniface Parkway) and Airport Heights Road. Traffic capacity along this segment would be increased to 75,000 AWDT. Year 2010 traffic is forecast at 67,200 AWDT.

- Northside Bypass, extending the Glenn Highway in a 6-lane, grade separated configuration between Airport Heights Road and a proposed Seward Freeway beside the Ingra/Gambell one-way couplet. Traffic capacity would be increased to approximately 75,000 AWDT. Year 2010 traffic is forecast at 77,200 AWDT. Although listed in current Anchorage bowl plans, this is only one of several alternatives being considered for the Northside Corridor in ADOT/PF's Major Corridors Study; see Chapter III, "Street and Highway Plans".

- Seward Freeway, extending the Seward Highway as a freeway north from Tudor Road to connect with the Northside Bypass. Traffic capacity in this corridor would be increased to approximately 75,000 AWDT. Year 2010 traffic is forecast at 47,000 AWDT. Although listed in current Anchorage bowl plans, this is only one of several alternatives being considered for the Seward Corridor in ADOT/PF's Major Corridors Study; see Chapter III, "Street and Highway Plans".

Glenn/Parks Improvement

Alignment Description and Design Features. This alternative would widen the Glenn Highway to six lanes (three lanes in each direction) between Eagle River and the Glenn/Parks Highway juncture. The addition of one extra traffic lane in each direction would require that all of the existing bridges be either widened or replaced, depending upon the structural configuration. Additionally, some of the present interchanges would require major modification in order to accommodate the added traffic lanes.

The Parks Highway would be widened to four lanes, two lanes in each direction with provisions for a separate left-turn lane, between the Glenn Highway and Wasilla. The present alignment and grade would be followed.

Additional right-of-way or construction easements would be required for both widenings where cut or fill slopes would exceed present right-of-way limits. At interchanges on the Glenn Highway where major modifications would be dictated, additional right-of-way would be required. Bridges over six major and several minor streams would have to be widened.

These improvements would be in addition to those included under the No-Action Alternative, see Figure II-7.

Traffic Volumes. The additional lanes would increase the capacity of the Glenn Highway from Eagle River to the Parks Highway from approximately 50,000 (No-Action) to 75,000 AWDT. Forecast 2010 traffic volumes in this section are 59,600 AWDT. The additional lanes on the Parks Highway would increase its capacity to approximately 30,000 AWDT. Year 2010 traffic volumes would be approximately 27,100 AWDT between the Glenn Highway and Wasilla.

Bus Service. To complement highway widening, bus/carpool pullouts would be incorporated at freeway interchanges. The bus/carpool pullouts with passenger shelters and pedestrian access to nearby streets would encourage use of high occupancy vehicles, thereby increasing the benefit from highway investment. Ramp metering with preferential bus/carpool lanes would be incorporated.

Costs. Cost of the addition of lanes to the Glenn and Parks Highways would be approximately $56.9 million (1985 dollars), plus additional costs of approximately $8.5 million resulting from a five percent inflation rate before project completion. Inflation calculations took into account the forecast timing of construction expenditures. Maintenance costs would be approximately $170,000 (1985 dollars) annually. This does not include cyclical costs, such as repaving, which are treated as a capital expenditure by the State.

Construction. All labor, heavy equipment, and construction materials, except for cement and reinforcing steel, would be available within Alaska. Since construction would require little or no specialty items, the funds expended out-of-State would be negligible. Construction would occur from 1988 to 1989. Labor requirements would be solicited initially from within the State of Alaska, and it is anticipated that an average of 50 workers per year would be required during construction.

Maintenance. Maintenance requirements would include snow removal, sign and roadway light repair, periodic lane striping, roadway repair, and repaving.

Financing. Improvements would be partially financed with Federal participating funds.

Permits and Approvals. The following permits and approvals would be required with the Glenn/Parks Improvement:

- Corps of Engineers Section 404 permit for filling wetlands
- Corps of Engineers Section 10 permit for crossings of six major and several minor streams
- Department of Environmental Conservation Certificate of Reasonable Assurance (that water quality would be maintained)
- Governor's office determination of coastal zone management plan consistency
- Department of Fish and Game Title 16 permit (crossing fish streams or affecting critical habitat area)

## Hovercraft (Air-Cushion Vehicle)

Description. This alternative would include purchase of three large Hovercraft ferries and construction of Anchorage and Point MacKenzie terminals and access roads. The Hovercraft Alternative would provide a ferry crossing of Knik Arm with lower carrying capacity and cost than a highway bridge. The Hovercraft Alternative also would provide less accessibility and generate less travel demand than a bridge.

Each Hovercraft vehicle would have a capacity of approximately 60 autos and 420 passengers. A vehicle would depart every 30 to 40 minutes with the majority of the time used in loading and unloading the craft. Hovercraft would be relatively unconstrained by ice and tides and would have greater operating flexibility, speed, and reliability than conventional ferry boats.

Terminal facilities would consist of large stable pads just above tide flat areas. The Anchorage terminal would be immediately north of Ship Creek, while the Mat-Su Borough terminal would be approximately one-and-a-half miles north of Point MacKenzie. Approximately 14 acres of land would be required at each terminal location to provide space for Hovercraft storage, ticketing, passenger waiting/shelter, and vehicle parking. This alternative also would include completion of the Houston Connector as a two-lane road for both segments; see the earlier Houston Connector description. The Anchorage terminal would be just south of Ship Creek and adjacent to the existing Port Access Road connecting to the A/C Couplet, see Figure II-7.

Operations. Assuming a 13-hour operating day, capacity of each Hovercraft vessel per direction would be approximately 700 vehicles per day and 5,000 passengers. One-way fares would be about five to ten dollars for an automobile and driver and about two dollars per passenger. Year 2010 travel demand is estimated at approximately 980 vehicles (1.27 passengers per vehicle) and approximately 400 passengers (without vehicles) each way daily with about 75 percent of the trips occurring during the peak period.

Bus Services. Feeder buses likely would be provided for access to the Hovercraft terminals on the Anchorage side.

Construction and Maintenance. Construction and maintenance requirements would be similar to those described for the Houston Connector. Hovercraft would be purchased, terminals completed, and a gravel Houston Connector built to the Point MacKenzie Access Road in 1986. The Houston Connector would be completed in 1988 and 1989. An additional requirement would be maintenance of the Hovercraft vehicles.

Cost. Three Hovercraft vehicles, access roads, and terminals would cost approximately $226.5 million (1985 dollars). Five percent inflation would add approximately 14.5 million to the cost. Inflation calculations took into account the forecast timing of construction expenditures. Annual operating and maintenance cost would be about $18.2 million (1985 dollars).

Finance. Construction and operating costs could be financed in part (perhaps 25 percent) by user fares, however the majority of construction and operating costs would be subsidized from the State general fund and other sources.

Permits and Approvals. The following permits and approvals would be required with the Hovercraft Alternative:

- Corps of Engineers Section 404 permit for filling wetlands
- Corps of Engineers Section 10 Permit for Mirror/Big Lakes narrows bridge
- U.S. Coast Guard Section 9 permit for bridge across Mirror/Big Lakes narrows
- Department of Environmental Conservation Certificate of Reasonable Assurance (that water quality would be maintained)
- Governor's office determination of coastal zone management plan consistency
- Department of Fish and Game Title 16 permit (for affecting critical habitat area)

## E. COMPARISON OF ALTERNATIVES

Table II-1 summarizes, in a form that allows easy comparison, the characteristics of the Crossing and No-Crossing Alternatives presented in this chapter and their impacts for each of the areas of concern presented in Chapters IV, V, and VI.

Table II-1

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| CHARACTERISTICS OF ALTERNATIVES | | | | | |
| ° Design Features | None beyond current programs and plans | Widen Glenn Highway to 6 lanes between Eagle River and the Glenn/Parks juncture; widen Parks Highway between Glenn/Parks juncture and Wasilla to 4 lanes with left turn lane | Purchase three large Hovercraft ferries; build terminals and 2-lane Houston Connector from Mat-Su side terminal to Houston with 11 intersections and bridge at Big/Mirror Lakes | 5.5-mile 4-lane Crossing between I/L Streets in Anchorage and planned Point MacKenzie Access Road in Mat-Su Borough including a 3-mile bridge over Knik Arm; 1.5-mile elevated 4-lane Seward Connector to Ingra/Gambell Streets in Anchorage; 11.7-mile limited access 4-lane Houston Connector to east-west Point MacKenzie Access Road with five intersections; 17-mile limited access 2-lane Houston Connector to Parks Highway with six intersections and bridge at Big/Mirror Lakes | 10-mile 4-lane Crossing between vicinity of Glenn Highway and Muldoon Road in Anchorage and planned Point MacKenzie Access Road in Mat-su including 2.5-mile bridge over Knik Arm; 11.7-mile limited access 4-lane Houston Connectpr to east-west Point MacKenzie Access Road with five intersections; 17-mile limited access 2-lane Houston Connector to Parks Highway with six intersections and bridge at Big/Mirror Lakes |
| ° Construction Cost (millions of 1985 dollars) | $0 beyond current programs and plans | $56.9 | $226.5 | $742.9 | $547.0 |
| ° Annual Maintenance Cost (millions of 1985 dollars) | $0 beyond current programs and plans | $0.17 | $0.5 for Connector to Parks Highway plus Hovercraft maintenance. (total annual operating and maintenance cost = $18.2 | $1.54 | $1.50 |

* Two different growth allocation scenarios were considered for each Crossing Alternative. A mid-range and high allocation to Borough were considered for the Downtown Project. A mid-range and a low allocation to Borough were considered for the Elmendorf Project. The mid-range is considered the most likely to occur. For the Downtown Project, the number in parentheses relates to the high allocation scenario. For the Elmendorf Project, the number in parentheses relates to the low allocation scenario.

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| CHARACTERISTICS OF ALTERNATIVES (continued) | | | | | |
| ° Construction Period | None | 1988 to 1989 | 1986 for Hovercraft, terminals, road to Point MacKenzie Access Road; 1988 to 1989 for completion of Houston Connector | 1986 to 1990 for Crossing (open 1991); 1999 to 2000 for Seward Connector; 1989 to 1990 for Houston Connector | 1986 to 1989 for Crossing (open 1990); 1988 to 1989 for Houston Connector |
| ° Construction Labor Requirements (average annual jobs) | None | 50 from 1989 to 1990 | 50 in 1986, and from 1989 to 1990 | 150 from 1986 to 1988; 200 from 1989 to 1990, 100 from 2000 to 2001 | 150 from 1986 to 1987; 200 from 1988 to 1989 |
| TRANSPORTATION IMPACTS | | | | | |
| ° Highway Accessibility | | | | | |
| - 2001 travel time Anchorage to Houston | 82 minutes | 76 minutes | 73 minutes | 44 (45)* minutes | 60 minutes |
| - 2010 daily vehicle-miles of travel in project area | 4.53 million | 4.53 million | 4.42 million | 4.12 (4.35)* million | 4.37 (4.21)* million |
| - 2010 daily vehicle-hours of travel in project area | 147.6 thousand | 143.6 thousand | 144.4 thousand | 128.6 (137.5)* thousand | 139.0 (133.4)* thousand |
| ° Traffic Volumes | | | | | |
| - 2010 Glenn Highway average weekday traffic (AWDT) at Eagle River Bridge | 80,400 AWDT | 80,400 AWDT | 78,100 AWDT | 57,100 (57,500)* AWDT | 60,900 (61,300)* AWDT |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| TRANSPORTATION IMPACTS (continued) | | | | | |
| - 2010 Crossing AWDT | --- | --- | 2,600 AWDT | 42,300 (49,000)* AWDT | 30,100 (27,600)* AWDT |
| - 2010 Anchorage bowl traffic | Current trends unchanged | Same as No-Action | Same as No-Action | Significant decreases in forecast volumes on Glenn Highway, Boniface and Lake Otis Parkways, and C Street; significant increases on I/L Streets, Minnesota Drive, and Seward Highway | Slight decreases in forecast volumes on some major arterials; increases on Glenn and Seward Highways and planned Northside Corridor improvements; small increases on Muldoon and Tudor Roads |
| ° Traffic Flow | | | | | |
| - 2010 Anchorage bowl traffic flow | Current trends unchanged | Same as No-Action | Same as No-Action | Improvements throughout Anchorage bowl except on I/L Streets, Minnesota Drive, Seward Highway, and 5/6th Avenues, which lead to the bridge, where where congestion would increase | Some improvement in Anchorage bowl; congestion would worsen slightly on Muldoon and Tudor Roads, on Glenn and Seward Highways, and on planned Northside Corridor improvements which lead to the bridge |
| - 2010 traffic flow outside Anchorage bowl | Current trends unchanged | Significant improvement on Glenn and Parks Highways | Slight improvement on Glenn and Parks Highways | Significant improvement on Glenn and Parks Highways; Crossing would operate at level-of-service C or better in 2001, and at less than acceptable D or E by 2010 | Significant improvement on Glenn and Parks Highways; Crossing would operate at level-of-service C or better through 2010 |
| - 2010 vehicle-miles of travel (VMT) at less than acceptable levels-of-service (D to F) in project area | 2.788 million VMT | 2.788 million VMT | 2.739 million VMT | 1.982 (2.816)* million VMT | 2.343 (2.223)* million VMT |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| TRANSPORTATION IMPACTS (continued) | | | | | |
| - Flow at crossing termini | --- | --- | --- | Adequate capacity at Parks Highway without changes to that road; street modifications required at I/L Streets and 3rd Avenue including removal of parking; modifications required at Ingra/Gambell Streets and 3rd Avenue, including the reduction of 3rd Avenue in that area to one or two through lanes depending on ramp configuration | Adequate capacity at Parks Highway, and Oilwell and Muldoon Roads, no alterations required to serve crossing traffic |
| ° Freight Movement | | | | | |
| - Annual truck miles Anchorage to Willow in 2010 | 1.19 million miles | 1.19 million miles | 1.19 million miles | 0.83 million miles (change due to reduced travel distance) | 0.99 million miles (change due to reduced travel distance) |
| - Access Improvements to port and industry in Anchorage | None | None | None | Direct truck access from Port of Anchorage and Ship Creek industrial area to Interior Alaska | None |
| ° Public Transportation | | | | | |
| - Daily transit one-way trips in project area, 2001 | 112,900 trips | 112,900 trips | 113,210 trips | 107,860 (103,810)* trips | 109,440 (111,350)* trips |
| - Daily transit round-trips on Glenn Highway, 2001 | 5,000 trips | 5,000 trips | 5,000 trips | 4,500 (4,300)* trips | 4,700 (4,900)* trips |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Area of Concern | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown Project | Elmendorf Project |
| TRANSPORTATION IMPACTS (continued) | | | | | |
| - Daily transit round-trips across crossing | --- | --- | 310 trips | 480 (580) trips* | 360 trips |
| - Transit improvements included in alternatives | None beyond those now planned by Borough and Anchorage | Bus/carpool turnouts at highway interchanges and preferential bus/carpool lanes at interchange ramps on Glenn Highway | Bus/carpool preferential parking at Mat-Su terminal | On Houston Connector, sites for park-and-ride lots in right-of-way, bus/carpool turnouts at intersections, and toll booth lanes | Same as Downtown |
| ° <u>Pedestrians and Bicycles</u> | | | | | |
| - Impacts to movement | No impact | Eagle River to Peters Creek bikepath would be relocated in highway right-of-way; closed for two seasons | No impact | Pedestrian access to Resolution Park inhibited (see "Section 4(f) Evaluation: below) | No impact |
| - Pedestrian and bicycle provisions included in alternatives | None | None | Walk-ons permitted on ferry | One 8-foot lane on Crossing would cost about $20 million so no provision made for pedestrians and bicycles | Same as Downtown |
| ° <u>Street and Highway Plans</u> | | | | | |
| - Planned major street and highway projects | No impact | Entrance to proposed Eklutna Frontage Road altered slightly | Some planned roads would become part of the Houston Connector; others would cross or join Connector at an intersection | Some planned roads would become part of the Houston Connector, others would cross or join Houston Connector at an intersection; need for Wasilla Bypass deferred | Same as Downtown |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| TRANSPORTATION IMPACTS (continued) | | | | | |
| - Major Corridors Study (Northside and Seward Highway Corridors, 15th Avenue Bypass) | No impact | No impact | No impact | Need for Northside Corridor improvements more critical, feasibility of two alternatives that use 3rd Avenue as part of a one-way couplet reduced by Seward Connector traffic movement at Ingra/Gambell; Need for Seward Highway Corridor improvements made less critical, alterations required to freeway extension alternatives north of Chester Creek so they would meet Seward Connector ramps | No impact |
| SOCIAL AND ECONOMIC IMPACTS | | | | | |
| ° Urban Growth and Economic Development | | | | | |
| 2010 forecast employment | | | | | |
| -Mat-Su Borough | 19,936 jobs | 19,936 jobs | 19,936 jobs | 23,717 (26,520)* jobs | 22,585 (21,274)* jobs |
| -Anchorage | 180,928 jobs | 19,936 jobs | 19,936 jobs | 16,728 (13,940)* jobs | 17,881 (19,202)* jobs |
| 2010 forecast dwelling units | | | | | |
| -Mat-Su Borough | 37,052 units | 37,052 units | 37,052 units | 49,292 (58,272)* units | 45,482 (41,282)* units |
| -Anchorage | 209,946 units | 209,946 units | 209,946 units | 198,266 (189,276)* units | 202,066 (206,266)* units |
| 2010 average square feet of land per dwelling unit (sf/du) | | | | | |
| -Anchorage bowl | 3,210 sf/du | 3,210 sf/du | 3,210 sf/du | 3,530 sf/du | 3,530 sf/du |
| -Eagle River | 4,210 sf/du | 4,210 sf/du | 4,210 sf/du | 4,840 sf/du | 4,840 sf/du |
| -Point MacKenzie | 19,600 sf/du | 19,600 sf/du | 19,600 sf/du | 4,900 sf/du | 4,900 sf/du |
| -Other Mat-Su | 19,600 sf/du | 19,600 sf/du | 19,600 sf/du | 19,600 sf/du | 19,600 sf/du |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Area of Concern | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown Project | Elmendorf Project |
| SOCIAL AND ECONOMIC IMPACTS (continued) | | | | | |
| ° Land Use Plans | No impact | Minimal impact; consistent with area Coastal Zone Management Plans to the maximum extent practicable | Minimal impact; consistent with area Coastal Zone Management Plans to the maximum extent practicable | Slows Anchorage development, reduces planned housing densities, reinforces downtown infill and multiuse development plans; increases rate of Mat-Su Borough growth, reinforces plan to develop port and industry at Port MacKenzie, increases residential densities beyond what is now planned, encourages greater amount of development in rural areas south of Big Lake, shifts planned Big Lake core area from east to west side of lake; consistent with area Coastal Zone Management Plans to the maximum extent practicable | Growth related impact similar to Downtown Project although less significant due to smaller increase in rate of Borough growth; consistent with area Coastal Zone Management Plans to the maximum extent practicable |
| ° Dislocation and Relocation | No impact | 8 single-family, 7 mobile homes, 15 businesses displaced; new homes and business structures would have to be built to provide for relocation | 1 single-family; finding home with identical amenities may be difficult | Same residential displacement as Hovercraft; four businesses and one parking lot displaced; no difficulty expected in relocating businesses without disrupting the community | Same residential displacement as Hovercraft; landfill, portion of storage yard, borrow area, gate, aeronautical receiver antenna displaced on Elmendorf AFB; in-depth study required to find replacement site for antenna that minimally impacts operations, no difficulty with other military relocations |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| SOCIAL AND ECONOMIC IMPACTS (continued) | | | | | |
| ° Urban and Military Function and Operation | | | | | |
| - Neighborhood and Business Community | No impact | No impact | Houston Connector would split privately-owned parcels; frontage roads and underpasses would provide access | Increases traffic on I/L and Ingra/Gambell couplets where passes through residential neighborhoods; some disruption of industrial operations in Ship Creek area during construction; southbound Gambell Street ramp alternative would disrupt Alaska Native Medical Center access and circulation, however the facility may be moved by the U.S. Public Health Service and this ramp would be built only if the Center is moved; Houston Connector impact same as Hovercraft | Increases traffic on Ingra/Gambell couplet where passes through residential neighborhoods but not as great an increase as Downtown; Houston Connector impact same as Hovercraft |
| - Military | No impact | No impact | No impact | No impact | Would cross numerous paved and gravel roads plus road/trails; access would be restored in all cases either via overpasses, frontage roads, or in the case of road/trails large culverts; construction equipment may need to be modified to assure no disturbance to Circularly Disposed Antenna Array |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| SOCIAL AND ECONOMIC IMPACTS (continued) | | | | | |
| - Schools | No impact | No impact | No impact | In 2010, 6,120 (10,610) students* in Mat-Su beyond No-Action forecast; same number fewer in Anchorage | In 2010, 4,215 (2,115) students* in Mat-Su beyond No-Action forecast; same number fewer in Anchorage |
| - Emergency Services | No impact | No impact | No impact | Fire and emergency medical service would need to be provided to a rapidly growing Point MacKenzie and Knik/Goose Bay areas | Same as Downtown, except not as much growth would occur |
| - Port of Anchorage and Navigation Clearance | No impact | No impact | No impact | Direct access from port to bridge provided; ships and barges would have to pass under the bridge to reach the Port of Anchorage, clearance provided, however in winter vessel control can be reduced if trapped in ice | No impact |
| - Aviation Clearance | No impact | No impact | No impact | Bridge towers penetrate approximately 30 feet into the Merrill Field aviation clear zone | No impact |
| - Utilities | No impact | 19 miles of gas transmission line either relocated or covered; 2¼ miles electric transmission line relocated; FAA antenna array may need to be relocated | Two major electric lines passed under, maintenance access across Houston Connector provided | Portions of three major electric lines would be relocated slightly by Seward Connector; same Houston Connector impact as Hovercraft; gas, electric, and telephone service would be required in Point MacKenzie and other now undeveloped areas, no difficulty is expected, water and sewer likely provided privately | Portion of major electric line would be relocated slightly, another would be raised where it would pass over crossing south approach; same Houston Connector impact as Hovercraft; same utility service required as for Downtown, but to a lesser extent because of smaller growth shift |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Area of Concern | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown Project | Elmendorf Project |
| SOCIAL AND ECONOMIC IMPACTS (continued) | | | | | |
| - Minorities, Low Income, Elderly | No impact | No communities impacted, so special effort in coordination and participation in hearings is not required | Same as Glenn/Parks Improvement | Same as Glenn/Parks Improvement | Same as Glenn/Parks Improvement |
| ° Government Finance | | | | | |
| - Local Government Operations | No Impact | No impact | No impact | New growth in Borough would result in a $5.09 ($8.85) million* shortfall of locally generated revenue required to meet costs (using current costs and tax rates); Anchorage would benefit by $5.1 ($8.35) million. (in 1983 dollars, add about 10 percent for 1985) | New growth in Borough would result in a $3.5 ($1.75) million* shortfall of locally generated revenue required to meet costs (using current costs and tax rates); Anchorage would benefit by $3.52 ($1.84) million (in 1983 dollars, add about 10 percent for 1985) |
| - Competition with Other Capital Projects | No impact | Competition for Federal highway funds minimized through scheduling construction involving State funds late in current short- and long-range planning periods; other desirable State general fund projects could be delayed but no decision to fund alternative made and would compete on own merits with other capital projects | Same as Glenn/Parks Improvement, plus ferry fares would be used to help finance | Same as Glenn/Parks Improvement, plus other sources of funding that would minimize use of State and Federal funds are being considered | Same as Downtown |
| NATURAL RESOURCE IMPACTS | | | | | |
| ° Biological Resources | | | | | |
| - Acres of terrestrial habitat taken | 0 acres | 126 acres | 1,146 acres | 1,350 acres | 1,518 acres |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Area of Concern | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown Project | Elmendorf Project |
| NATURAL RESOURCE IMPACTS (continued) | | | | | |
| - Acres of terrestrial habitat taken (by wildlife value) | | | | | |
| ° Moose | 0 acres | 90 acres | 850 acres | 980 acres | 1,182 acres |
| ° Black Bear | 0 acres | 126 acres | 810 acres | 940 acres | 1,108 acres |
| ° Snowshoe Hare | 0 acres | 90 acres | 841 acres | 971 acres | 1,155 acres |
| ° Red Squirrel | 0 acres | 90 acres | 751 acres | 881 acres | 1,065 acres |
| ° Fur Bearers | 0 acres | 35 acres | 0 acres | 0 acres | 0 acres |
| ° Spruce Grouse | 0 acres | 90 acres | 751 acres | 881 acres | 1,065 acres |
| ° Song Birds | 0 acres | 90 acres | 841 acres | 971 acres | 1,155 acres |
| ° Muskeg Nesting Birds | 0 acres | 0 acres | 9 acres | 9 acres | 28 acres |
| ° Waterfowl and shorebirds | 0 acres | 35 acres | 0 acres | 0 acres | 0 acres |
| - Acres of developed land in Mat-Su Borough, 2010 | 88,000 acres | 88,000 acres | 88,000 acres | 96,200 (102,000)* acres (would be increase in terrestrial habitat use) | 93,800 (91,000)* acres (would be increase in terrestrial habitat use) |
| - Marine habitats | No impact | No impact | Minimal impact to marine mammals and seabirds could occur during operation of Hovercraft | Temporary construction impacts; minimal long-term impacts; port development at Point MacKenzie aided by the Crossing could result in water pollution, disruption to fish migration, noise, and displacement of intertidal habitats | Same as Downtown |
| - Number of important fish streams and lakes crossed | 0 crossings | 8 crossings | 1 crossing | 1 crossing | 2 crossings |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| NATURAL RESOURCE IMPACTS (continued) | | | | | |
| - Aquatic habitat impact due to change in growth patterns | No change | No change | Minimal change | Could result in increased fishing pressure, decrease in water quality, loss of stream bank habitat, blockage of fish passage, impacts to water supply in Borough; Borough subdivision regulations place limits on "shoreland" development which would help minimize impact | Same as Downtown, but less growth increase in Borough |
| - Use of fish and wildlife | No impact | No impact | Limited improvement in access to hunting and fishing areas in Borough which would increase use, requiring more rigid management measures | Significant improvement in access to hunting and fishing areas in Borough which would increase use, requiring more rigid management measures | Same as Downtown |
| - Threatened or Endangered Species | No impact | No impact | No impact | No impact | No impact |
| ° Wetlands | | | | | |
| - Acres affected | 0 acres | 35 acres | 125 acres | 134 acres | 124 acres |
| - Effects of change in growth pattern | No change | No change | Minimum change | In Borough, small intermittent wetlands developed in areas generally dry, and possibly some developed near lakes, as a result of growth increase | Same as Downtown, but less growth increase in Borough |
| ° Water Quality | | | | | |
| - Marine Environment | No impact | No impact | Minor increase in suspended sediments during construction | Minor and temporary changes to water quality during construction; minimal long-term impacts would include runoff from bridge surfaces | Same as Downtown |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| NATURAL RESOURCE IMPACTS (continued) | | | | | |
| - Freshwater Environment | | | | | |
| Water quality | No impact | Would cross six major streams and several minor streams; impact would be would be minimal, some sedimentation | No impact | Construction impacts to Ship Creek minimized through drainage ditches, settling basins, and spill cleanup; construction impacts for Houston Connector minimized through drainage control, erosion control, and revegetation; no significant long-term impacts | Minor impacts (increased sedimentation) to Ship Creek during construction; construction impacts for Houston Connector minimized through drainage control, erosion control, and revegetation; no significant long-term impacts |
| Effects of change in growth patterns | No change | No change | Minimal change | Long-term impacts in Borough due to increased development could include increase in lake nutrient content causing eutrification process to speed up, siltation and increased turbidity, and water pollution; State and Federal regulatory and permitting programs would minimize impact | Same as Downtown, but less growth increase in Borough |
| ° Hydrology | | | | | |
| - Marine Environment | No impact | No impact | No impact | In Knik Arm, minor changes in patterns of currents and sediment deposition, minor scouring could occur due to ice pile-up | Same as Downtown |
| - Freshwater Environment | No impact | Would cross six major streams, several minor streams, tidal areas, wetlands; well designed bridges, culverts, and other cross drainage materials would minimize impact | No impact | Houston Connector could alter drainage patterns as it crosses wetlands north of Big Lake; culverts would minimize impacts | Same as Downtown |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Area of Concern | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown Project | Elmendorf Project |
| NATURAL RESOURCE IMPACTS (continued) | | | | | |
| ° Floodplains | No impact | No impact | Building and paved area would be in tidal floodplain, would require protection | Seward Connector pier foundations would encroach on the Ship Creek floodplain, however they would not affect channel capacity and flood flows | Narrowing of floodplain and encroachment of piers at Ship Creek crossing, however bridge design would result in no impact on floodwater flow |
| ° Natural Resource Development | | | | | |
| - Farmlands of State and Local importance | No impact | No impact | Right-of-way acquisition would require 55 acres of designated farmland for Houston Connector | Same as Hovercraft | Same as Hovercraft |
| - Agriculture and Marketing Processing | No impact | No impact | Minimal impact | Improved access to Anchorage local market for Point MacKenzie Agricultural Project; would support development of a Point MacKenzie port/industrial complex which would provide part of infrastructure needed for processing and export | Same as Downtown |
| - Timber | No impact | Timber could be salvaged from cleared right-of-way for firewood | Timber cleared for right-of-way could be salvaged for firewood; resource-to-market access would not improve | Timber cleared for right-of-way could be salvaged for firewood; improved access between local market and timber; supports development of Borough port/industrial facility complex which could provide opportunities for processing and exporting wood products | Same as Downtown |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Area of Concern | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown Project | Elmendorf Project |
| NATURAL RESOURCE IMPACTS (continued) | | | | | |
| - Recreation | No impact | No impact | Increased access to potential recreation areas in Mat-Su; impact limited by time, cost, and Hovercraft capacity | Increased growth to Borough and improved access would increase demand for recreation requiring additional recreation facilities and intensified management of water and wildlife resources | Same as Downtown, but growth increase less |
| - Subsurface Resources | No impact | Would require sand and gravel from known local borrow sites | Would require sand and gravel for Houston Connector, and would induce development of known, but unused, gravel sources within five miles of Connector | Same as Hovercraft, plus would support development of coal, oil, and gas, and particularly sand and gravel; would support port development which would help encourage sub-surface resource development | Same as Downtown |
| - Western Alaska Resources | No impact | No impact | No impact | Would help development of Beluga coal field and oil and gas reserves by improving access; would also support port development which could provide necessary processing and export infrastructure | Same as Downtown |
| ° Iditarod Trail | No impact | No impact | Access improved; Houston Connector would cross; a bridge that mushers and other trail users could easily use would be provided, as well as vehicle pullout and interpretive sign | Same as Hovercraft | Same as Hovercraft |
| ° Air Quality | | | | | |
| - Peak hour CO emissions (lb/hr in 2010) | 43,800 lb/hr | 43,800 lb/hr | 43,800 lb/hr | 39,600 (40,800)* lb/hr | 44,200 (42,700)* lb/hr |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| NATURAL RESOURCE IMPACTS (continued) | | | | | |
| - Peak-hour $NO_x$ emissions (lb/hr in 2010) | 1,800 lb/hr | 1,800 lb/hr | 1,800 lb/hr | 1,600 lb/hr | 1,700 (1,600)* lb/hr |
| - Maximum Predicted 8-hour CO concentrations (ppm in 2010) | | | | | |
| North Anchorage bowl (average for 14 receptors tested) | 8.6 ppm (6 receptors violate standards) | 8.6 ppm (6 receptors violate standards) | 8.6 ppm (6 receptors violate standards) | 8.4 (8.8)* ppm (5 receptors violate standards) | 8.8 (8.7)* ppm (6 receptors violate standards) |
| Outside Anchorage bowl | 6.7 ppm | 6.7 ppm | 6.7 ppm | 4.7 (4.8)* ppm | 5.2 (5.3)* ppm |
| Mat-Su Borough | Less than 1.5 ppm | Less than 1.5 ppm | Less than 1.5 ppm | Less than 1.5 ppm | Less than 1.5 ppm |
| - Anchorage Air Quality Plan Implementation | No impact | No impact | No impact | Would redistribute traffic in the Anchorage bowl but would not impede implementation of plan; conforms to State Implementation Plan | Would redistribute traffic in Anchorage bowl, reducing the success of the plan; would not conform to State Implementation Plan unless Long-Range Transportation Plan revised to offset emissions increases |
| ° Noise | | | | | |
| - Residences with peak-hour $L_{eq}$ greater than 67 dB, year 2010, outside Anchorage bowl | 681 residences | 728 residences | 536 residences | 591 (594)* residences | 551 residences |
| - Anchorage bowl noise levels | No change from current trends; levels 100 feet from arterials just below or slightly above FHWA 67 dB criterion | Same as No-Action | Same as No-Action | Generally noise levels would have either negligible or a beneficial change from No-Action along bowl arterials | Same as Downtown |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Area of Concern | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown Project | Elmendorf Project |
| NATURAL RESOURCE IMPACTS (continued) | | | | | |
| ° Energy (1990 to 2010 average annual equivalent barrels of oil/day) | 5,200 barrels | 5,300 barrels | 5,200 barrels | 5,000 (5,300)* barrels | 5,300 (5,000)* barrels |
| ° Visual | No impact | Roadway would be more dominant with increased width, new cut and fill slopes exposed | Houston Connector would provide scenic corridor, cuts and fills would be visible; views of road from Big Lake area would be a minor impact to nearby homes | Would dominate and adversely affect views from one restaurant and several residences and businesses on the north side of Downtown Anchorage where I/L ramps end; Houston Connector same as for Hovercraft | Would pass through land valued for natural setting and involve deep cuts and high fills; mitigation would include grading and revegetation to match natural conditions; Houston Connector same as for Hovercraft |
| SECTION 4(f) EVALUATION | | | | | |
| ° 918 West 2nd Avenue | No impact | No impact | No impact | L Street Southbound Ramp: noise levels increase 8 dB (barrier minimally reduces), ramps dominant visual element and L Street ramp closes views to west; I Street Southbound Ramp: noise levels increase 11 dB, exceed 67 dB criterion (barrier minimally reduces), ramps dominant visual element, and access more circuitous due to increased traffic on 3rd Avenue at K Street | No impact |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| SECTION 4(f) EVALUATION (continued) | | | | | |
| ° 935 West 3rd Avenue | No impact | No impact | No impact | L Street Southbound Ramp: views altered; I Street Southbound Ramp: Noise levels increase 7 dB, CO standards exceeded, on-street parking in front of building lost, views altered, access more circuitous due to increased traffic on 3rd Avenue at K Street | No impact |
| ° 813 and 813½ West 2nd Avenue | No impact | No impact | No impact | Noise levels raised 4 to 6 dB depending on the ramp alternative, ramps dominant visual element | No impact |
| ° Resolution Park | No impact | No impact | No impact | L Street Southbound Ramp: Takes .03 acres of land which would be replaced in accordance with Land and Water Conservation Fund Act, access affected but would be restored, noise levels increased by 6 dB, eight-hour CO standards exceeded; views altered at park entrance and from deck; I Street Southbound Ramp: Access affected, but would be restored although likely alterations to Hostetler Park (including loss of land) would result, noise levels increased by 4 dB eight-hour CO standards exceeded | No impact |

Table II-1 (continued)

COMPARISON OF ALTERNATIVES

| Area of Concern | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| SECTION 4(f) EVALUATION (continued) | | | | | |
| ° Hostetler Park | No impact | No impact | No impact | L Street Southbound Ramp: Noise levels increased by 6 dB, 8-hour CO standards exceeded; I Street Southbound Ramp: Restoration of access to Resolution Park could necessitate park alterations, noise levels increased by 4dB, 8-hour CO standards exceeded | No impact |
| ° Elmendorf AFB Recreation Facilities | No impact | No impact | No impact | No impact | 18 acres of land in recreation area taken; recreational quality affected by changes in visual character, increased noise levels (1 to 8 dB), and proximity to road; however access to all areas maintained, large culverts would carry trails under road; visual impacts mitigated by revegetation and blending cut-and-fill slopes into existing terrain |
| PROVISION FOR FUTURE RAILROAD ON BRIDGE | --- | --- | --- | $60 million added to cost (1985 dollars); 10 percent increase in construction employment; supports implementation of planned Point MacKenzie industry and port; 25 feet additional encroachment in Merrill Field aircraft clear zone; piers larger so slightly greater disturbance to coastal wetlands | $50 million added to cost (1985 dollars); 10 percent increase in construction employment; supports implementation of planned Point MacKenzie industry and port; piers larger so slightly greater disturbance to coastal wetlands; views improved from bridge since both directions of travel on top of bridge |

## Chapter III

## AFFECTED ENVIRONMENT

### A. REGIONAL SETTING

The project area is in Southcentral Alaska within the Municipality of Anchorage and the Matanuska-Susitna (Mat-Su) Borough (see Figure I-2).

Anchorage is the population, transportation, trade, service, and cultural center for Southcentral Alaska. It is the State's largest city with a 1983 population of 230,900. The Municipal boundaries extend east into the Chugach Mountains, north to the Knik River, and south around Turnagain Arm. However, the central city is in a bowl physically bounded on the west and south by the Knik and Turnagain Arms of Cook Inlet and on the east by the Chugach Mountains. Elmendorf Air Force Base and Fort Richardson Army Post provide a northern limit. Suburban-type growth occurs along Knik Arm and in other locations outside the bowl.

Key transportation links between the interior and the Lower 48 are found in Anchorage, including highway, rail, port, and air facilities. The Glenn and Parks Highways provide access to the interior and the Seward Highway offers access to the Kenai Peninsula. The Alaska Railroad connects Anchorage to Fairbanks and to ports at Whittier and Seward. Air transportation is provided by five airfields including Anchorage International Airport and Elmendorf Air Force Base.

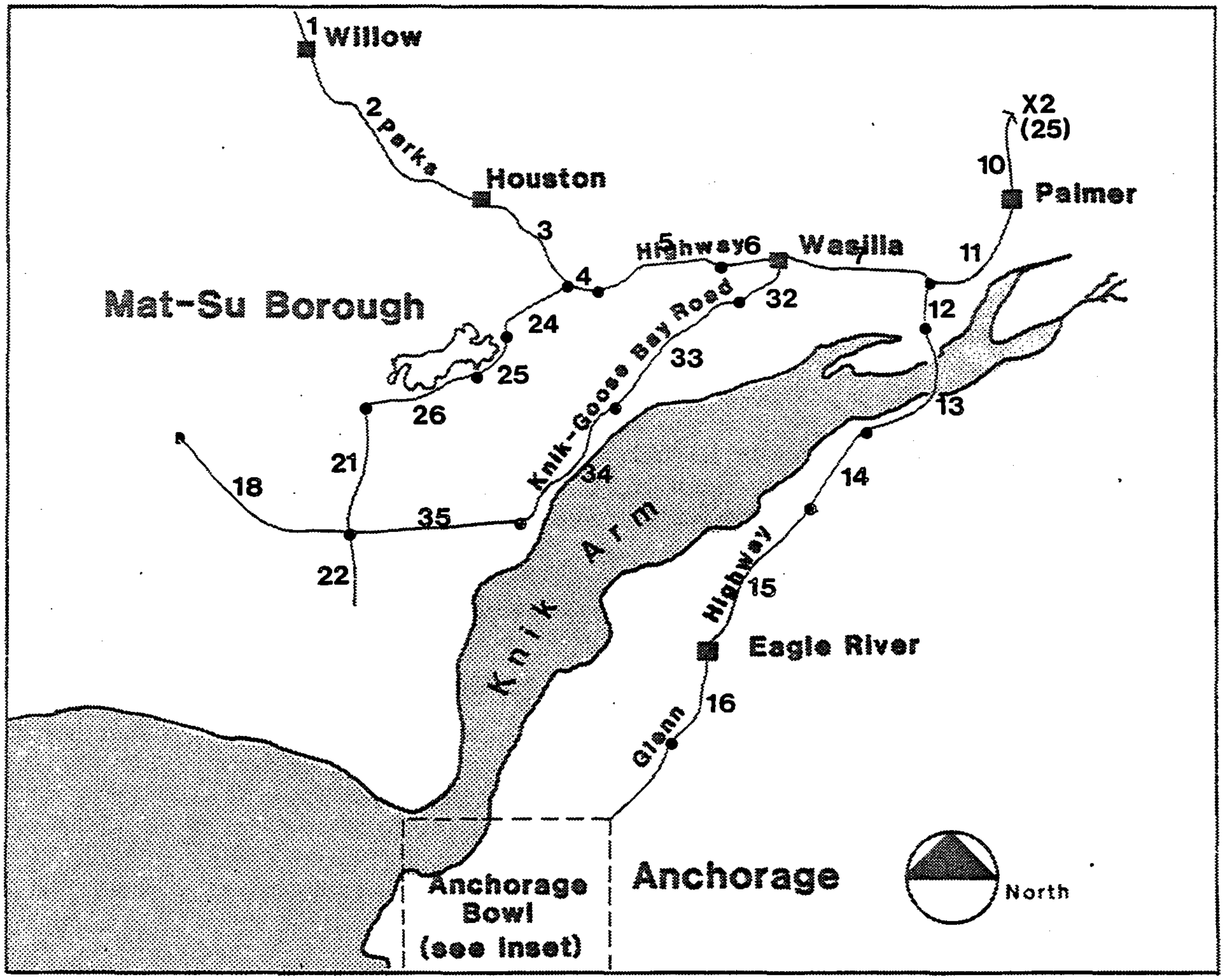
The Mat-Su Borough covers an extensive area north of Anchorage. The project area is in the southcentral portion of the Borough which is characterized by heavily vegetated lowlands with numerous waterbodies, wetlands, and small hills. This area includes large tracts of undisturbed land, land that has been cleared for agriculture, and streams and lakes valued for recreation, as well as developed areas. Population of the entire Mat-Su Borough in 1983 was 30,600 with the highest concentration of people living in the Palmer and Wasilla areas. Development also occurs along the Parks Highway, at Big Lake, and several other road-accessible lakes in the project area.

### B. TRANSPORTATION CHARACTERISTICS

The following areas of interest are discussed under transportation characteristics: Existing roadway network, traffic volumes, traffic flow, freight movement, public transportation, pedestrians and bicycles, and street and highway plans.

<u>Existing Roadway Network</u>

Key roadway links in the project area are shown in Figure III-1; each is numbered. These major urban arterials and rural highways are those on which traffic operation is most likely to be influenced by the introduction



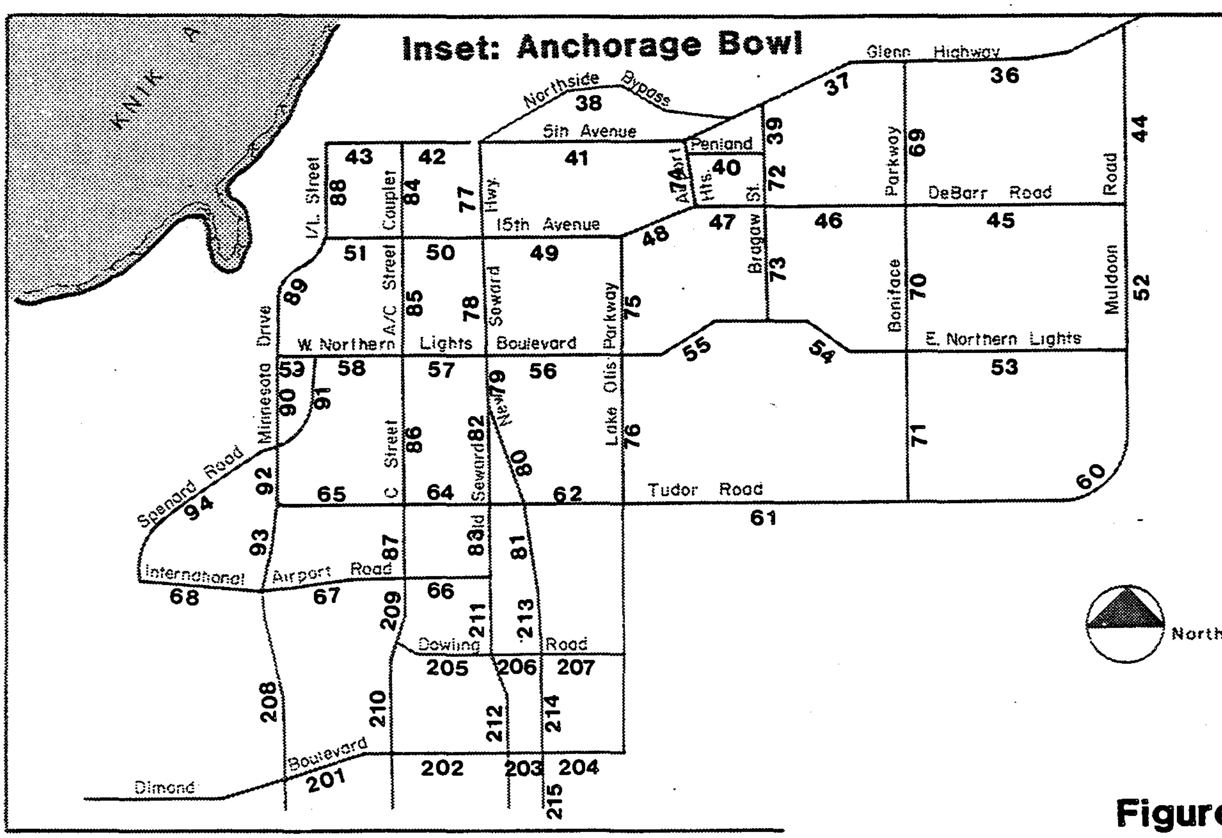




**Figure III-1**

# Key Roadway Links

of the alternatives under consideration. The links were used in modeling traffic forecasts. The transportation analysis divides the project area into two parts, an urban arterial area and a rural highway area. The urban arterial area is the Anchorage bowl south of the intersection of the Glenn Highway and Muldoon Road. The rural highway area includes all roads north of that intersection.

## Traffic Volumes

Existing (1982) and currently forecast traffic volumes (2001 and 2010) on selected key roadway links are shown on Table III-1. These volumes assume no Knik Arm Crossing is built and are shown as Average Weekday Daily Traffic (AWDT) including both directions of travel. Volumes are not listed for all links in the network shown in Figure III-1. Those listed are representative of volumes within the entire project area.

Traffic volumes on the Glenn Highway between Muldoon Road and Eagle River (link 16) are expected to increase significantly from approximately 29,000 AWDT presently to 80,400 in 2010. Volumes on the Parks Highway also are forecast to increase significantly, as shown on link 7, from 8,500 presently to 27,100 in 2010.

Within the Anchorage bowl also, traffic volumes are expected to increase significantly on many of the roadways. For example, volumes on the downtown 5th/6th Avenue Couplet between C Street and the Seward Highway (link 42) are expected to increase from a present 39,000 AWDT to about 49,700 in 2010. Volumes on the Seward Highway south of Tudor Road (link 81) are forecast to reach 54,200 in 2010 from 43,200 currently. Volumes on Muldoon Road between DeBarr Road and Northern Lights Boulevard (link 52) are projected to increase from today's 25,400 to about 51,000 in 2010, while traffic volumes on Tudor Road between Lake Otis and Boniface Parkways (link 61) are forecast to grow from a present 44,600 to 74,500 in 2010. The current traffic volume of 23,600 on Dimond Boulevard between the Old Seward Highway and the Seward Highway (link 203) is expected to increase to 51,000 AWDT in 2010.

## Traffic Flow

Table III-1 also presents the level-of-service (LOS) rating for selected key links within the project area. The LOS indicates the operational efficiency of a certain roadway segment and is determined by comparing the traffic volume to the capacity of the facility. Various facility improvements described under the No-Action Alternative in Chapter II are accounted for in the 2001 and 2010 levels. LOS A represents a free flow of traffic, while LOS F represents extreme congestion and major traffic flow interference; see Table III-2. LOS A to C are considered acceptable traffic flows, D to F are less than acceptable. Several key links are forecast to operate at a poor level-of-service. The Parks Highway between Wasilla and the Glenn/Parks Highway juncture (link 7) would operate at LOS F in 2001 and 2010. The Glenn Highway between Muldoon Road and Peters Creek (links 15 and 16) would operate at levels-of-service E and D, respectively, in 2001 and both would be at LOS F in 2010.

Table III-1

TRAFFIC VOLUMES AND TRAFFIC FLOW CHARACTERISTICS
(Current and Forecast)

| Link Number | Roadway (Location) | 1982 AWDT | 1982 No. of Lanes | 1982 LOS | 2001 AWDT | 2001 No. of Lanes | 2001 LOS | 2010 AWDT | 2010 No. of Lanes | 2010 LOS |
|---|---|---|---|---|---|---|---|---|---|---|
| RURAL HIGHWAYS | | | | | | | | | | |
| 1 | Parks Highway (from Willow north) | 1,400 | 2 | A | 3,100 | 2 | A | 3,900 | 2 | A |
| 4 | Parks Highway (just east of Big Lake Road) | 4,300 | 2 | A | 7,500 | 2 | A | 10,100 | 2 | C |
| 7 | Parks Highway (Glenn/Parks Junction to Wasilla) | 8,500 | 2 | B | 20,200 | 2 | F | 27,100 | 2 | F |
| 10 | Glenn Highway (from Palmer north) | 2,400 | 2 | A | 9,700 | 2 | C | 11,700 | 2 | C |
| 13 | Glenn Highway (Eklutna to Knik River) | 10,600 | 2 | C | 26,100 | 4 | B | 34,600 | 4 | C |
| 15 | Glenn Highway (Eagle River to Peters Creek) | 16,000 | 4 | A | 47,600 | 4 | E | 59,600 | 4 | F |
| 16 | Glenn Highway (Muldoon Road to Eagle River) | 29,000 | 4 | B | 66,800 | 6 | D | 80,400 | 6 | F |
| 24 | Big Lake Road (Parks Highway to Big Lake) | 2,200 | 2 | A | 800 | 2 | A | 1,200 | 2 | A |
| 32 | Knik-Goose Bay Road (just south of Wasilla) | 3,000 | 2 | A | 4,400 | 2 | A | 6,500 | 2 | A |
| 35 | Point MacKenzie Access Road (east-west segment) | - | 2 | - | 2,000 | 2 | A | 2,900 | 2 | A |
| URBAN ARTERIALS | | | | | | | | | | |
| 36 | Glenn Highway (Boniface Parkway to Muldoon Road) | 25,900 | 4 | A | 67,000 | 6 | C | 83,000 | 6 | D |
| 37 | Glenn Highway (Bragaw Street to Boniface Parkway) | 34,500 | 4 | D | 54,200 | 6 | B | 67,200 | 6 | C |
| 38 | Northside Bypass (planned between Old Seward Highway & Bragaw Street) | - | - | - | 63,800 | 6 | C | 77,200 | 6 | D |
| 42 | 5th/6th Avenues (C Street to Seward Highway) | 39,000 | 6 | F | 42,100 | 6 | F | 49,700 | 6 | F |
| 43 | 5th/6th Avenues (L Street to C Street) | 28,100 | 6 | D | 31,900 | 6 | E | 38,600 | 6 | F |
| 44 | Muldoon Road (Glenn Highway to DeBarr Road) | 26,700 | 4 | C | 35,700 | 4 | D | 41,500 | 4 | F |
| 45 | DeBarr Road (Boniface Parkway to Muldoon Road) | 22,700 | 4 | B | 24,200 | 4 | C | 26,600 | 4 | C |
| 49 | 15th Avenue (Seward Highway to Lake Otis Parkway) | 27,300 | 4 | C | 21,400 | 4 | B | 22,000 | 4 | B |
| 50 | 15th Avenue (C Street to Seward Highway) | 13,100 | 4 | A | 20,000 | 4 | B | 21,800 | 4 | B |
| 52 | Muldoon Road (DeBarr Road to Northern Lights Boulevard) | 25,400 | 4 | C | 45,100 | 4 | F | 51,000 | 4 | F |
| 53 | Northern Lights Boulevard (Boniface Parkway to Muldoon Road) | 13,600 | 4 | A | 14,700 | 4 | A | 16,700 | 4 | A |
| 56 | Northern Lights Boulevard (Seward Highway to Lake Otis Parkway) | 25,400 | 4 | C | 22,900 | 4 | B | 23,800 | 4 | B |
| 58 | Northern Lights/Benson Couplet (Minnesota Drive to C Street) | 41,700 | 8 | A | 44,500 | 8 | A | 47,200 | 8 | A |
| 60 | Muldoon/Tudor Roads (Northern Lights Boulevard to Boniface Parkway) | 22,100 | 4 | B | 39,400 | 4 | D | 45,300 | 4 | F |
| 61 | Tudor Road (Lake Otis to Boniface Parkway) | 44,600 | 4 | F | 64,300 | 4 | F | 74,500 | 4 | F |
| 62 | Tudor Road (Seward Highway to Lake Otis Parkway) | 40,800 | 4 | F | 54,300 | 4 | F | 61,400 | 4 | F |
| 63 | Tudor Road (Old Seward to Seward Highway) | 36,600 | 4 | F | 57,000 | 4 | F | 64,400 | 4 | F |
| 64 | Tudor Road (C Street to Old Seward Highway) | 31,600 | 4 | D | 50,100 | 4 | F | 56,600 | 4 | F |
| 65 | Tudor Road (Minnesota Drive to C Street) | 28,800 | 4 | C | 33,500 | 4 | D | 35,800 | 4 | D |
| 68 | International Airport Road (Spenard Road to Minnesota Drive) | 21,800 | 4 | A | 23,100 | 4 | A | 26,600 | 4 | A |
| 69 | Boniface Parkway (Glenn Highway to DeBarr Avenue) | 16,400 | 4 | A | 26,700 | 4 | C | 32,800 | 4 | D |
| 70 | Boniface Parkway (DeBarr Avenue to Northern Lights Boulevard) | 14,000 | 2 | C | 26,900 | 4 | C | 30,100 | 4 | D |
| 73 | Bragaw Street (DeBarr Avenue to Northern Lights Boulevard) | 12,700 | 4 | A | 18,000 | 4 | A | 18,600 | 4 | A |
| 76 | Lake Otis Parkway (Northern Lights Boulevard to Tudor Road) | 19,400 | 4 | B | 24,200 | 4 | C | 25,400 | 4 | C |
| 77 | Seward Highway (5th/6th Avenues to 15th Avenue) | 39,000 | 8 | A | 40,200 | 4 | C | 47,000 | 4 | C |
| 78 | Seward Highway (15th Avenue to Northern Lights Boulevard) | 53,100 | 6 | C | 70,300 | 4 | F | 82,300 | 4 | F |
| 80 | Seward Highway (just north of Tudor Road) | 41,600 | 4 | D | 59,900 | 6 | C | 71,300 | 6 | C |
| 81 | Seward Highway (just south of Tudor Road) | 43,200 | 4 | C | 47,500 | 6 | A | 54,200 | 6 | B |
| 82 | Old Seward Highway (36th Avenue to Tudor Road) | 16,200 | 4 | A | 27,500 | 4 | D | 30,800 | 4 | D |
| 84 | C Street or A/C Couplet (5th/6th Avenues to 15th Avenue) | 17,000 | 4 | A | 30,200 | 6 | A | 34,500 | 6 | A |

Table III-1 (Continued)

TRAFFIC VOLUMES AND TRAFFIC FLOW CHARACTERISTICS
(Current and Forecast)

| Link Number | Roadway (Location) | 1982 AWDT | 1982 No. of Lanes | 1982 LOS | 2001 AWDT | 2001 No. of Lanes | 2001 LOS | 2010 AWDT | 2010 No. of Lanes | 2010 LOS |
|---|---|---|---|---|---|---|---|---|---|---|
| | URBAN ARTERIALS (continued) | | | | | | | | | |
| 86 | C Street (Northern Lights Boulevard to Tudor Road) | 18,000 | 4 | A | 42,800 | 6 | C | 46,600 | 6 | D |
| 88 | I/L Street Couplet (5th/6th Avenues to 15th Avenue) | 39,700 | 6 | B | 35,400 | 6 | A | 41,800 | 6 | B |
| 89 | Minnesota Drive (15th Avenue to Northern Lights Boulevard) | 30,700 | 6 | B | 30,100 | 6 | B | 35,600 | 6 | B |
| 90 | Minnesota Drive (Northern Lights to Spenard Road) | 31,100 | 6 | B | 35,200 | 6 | B | 40,800 | 6 | C |
| 92 | Minnesota Drive (Northern Lights Boulevard to Tudor Road) | 29,500 | 6 | A | 35,700 | 6 | B | 40,800 | 6 | C |
| 93 | Minnesota Drive (Tudor Road to International Airport Road) | 29,000 | 6 | A | 33,600 | 6 | B | 37,600 | 6 | C |
| 94 | Spenard Road (Minnesota Drive to International Airport Road) | 21,200 | 2 | F | 27,200 | 4 | D | 31,600 | 4 | E |
| 201 | Dimond Boulevard (Minnesota Drive to C Street) | 23,500 | 2 | F | 35,400 | 6 | B | 40,000 | 6 | C |
| 202 | Dimond Boulevard (C Street to Old Seward Highway) | 25,400 | 4 | C | 50,900 | 6 | D | 57,500 | 6 | E |
| 203 | Dimond Boulevard (Old Seward Highway to Seward Highway) | 23,600 | 4 | B | 45,100 | 6 | D | 51,000 | 6 | D |
| 206 | Dowling Road (Old Seward Highway to Seward Highway) | 15,000 | 2 | C | 30,700 | 4 | D | 34,700 | 4 | D |
| 208 | Minnesota Drive (International Airport Road to Raspberry Road) | 20,400 | 4 | A | 36,900 | 4 | B | 41,700 | 4 | C |
| 210 | C Street (Dowling Road to Dimond Boulevard) | 8,100 | 2 | A | 43,700 | 4 | F | 49,400 | 4 | F |
| 212 | Old Seward Highway (Dowling Road to Dimond Boulevard) | 16,300 | 2 | D | 22,400 | 4 | B | 25,300 | 4 | C |
| 214 | Seward Highway (Dowling Road to Dimond Boulevard) | 36,700 | 4 | B | 54,800 | 6 | B | 61,900 | 6 | C |

NOTES

AWDT - signifies Average Weekday Daily Traffic (includes both directions of travel). Rounded to nearest hundred.
LOS - signifies Level-of-Service, see Table III-2.

These traffic volumes and level-of service ratings assume a Knik Arm crossing is not built.

Sources:
- 1982 traffic volumes - ADOT/PF, 1982a and ADOT/PF, 1982b.
- 2001 and 2010 volumes (rural area) - Knik Arm Crossing project team (see Chapter IX), 1984; 2001 and 2010 volumes (Anchorage bowl or urban area) - derived from Municipality of Anchorage traffic forecasts.

Table III-2

LEVEL-OF-SERVICE (LOS)

| LOS | V/C* | Description |
|---|---|---|
| A | < .50 | Free Flow |
| B | < .60 | Stable Flow - few restrictions on operating speed |
| C | < .75 | Stable Flow - higher volume, more restrictions on speed and lane changing |
| D | < .90 | Approaching Unstable Flow - little freedom to maneuver, condition tolerable for short periods |
| E | < 1.00 | Unstable Flow - lower operating speeds, some momentary stoppage |
| F | ≥ 1.00 | Forced Flow - considerable stoppage |

Source: Highway Research Board, 1965.

* V/C - Volume to Capacity Ratio used to determine level-of-service.

In the Anchorage bowl, streets operating at level-of-service D or worse would occur throughout the bowl on both major east-west and north-south arterials. Streets which would operate at LOS E or worse by 2001 include 5th and 6th Avenues (Links 42 and 43), Muldoon Road (Link 52), Tudor Road (links 61, 62, 63, and 64), Seward Highway (link 78), and C Street (link 210).

Freight Movement.

Freight movement within the project area occurs via two major transportation modes, truck and rail. Freight movement by truck outside the Anchorage bowl occurs along primarily the Glenn and Parks Highways. Within the Anchorage bowl, freight by truck follows major arterials, terminating at the Port of Anchorage and various industrial locations; see "Urban and Military Function and Operation". Table III-3 presents total annual truck ton-miles and truck load-miles for truck freight from downtown Anchorage to the Willow area. As shown, shipments of approximately 8.3 million ton-miles occurred in 1980. Shipment of freight is forecast to rise substantially to approximately 18.8 million ton-miles and 23.8 million ton-miles in 2001 and 2010, respectively. Approximately ten percent of total traffic on key links outside the Anchorage bowl is trucks and about five percent of urban traffic is truck traffic. These percentages are expected to remain constant in future years.

The Alaska Railroad provides freight service between interior Alaska and marine terminals in Anchorage, Whittier, and Seward. Whittier and Seward have ice-free ports for receiving rail cars and cargo transferred from ship. The Port of Anchorage is the State's principal seaport and handles all container shipments to and from the interior. Rail operations north of Anchorage around Knik Arm consist of a single freight train daily in each direction between Anchorage and Fairbanks, a single passenger train daily in each direction (two trains daily in summer) to and from Denali National Park/Fairbanks, and four to six gravel unit-trains in each direction between Anchorage and Palmer in the Mat-Su Borough. Future rail tonnages and train movements are forecast to increase in proportion to the population/employment at interior destinations, i.e. 250 to 300 percent increase for Mat-Su Borough rail movements by 2010 and a 100 percent increase for Fairbanks shipments.

Public Transportation

The Anchorage People Mover (bus) system accounts for approximately 1.5 percent of all Municipality travel, with about four to seven percent of person-trips in most of the primary transit corridors. (Municipality of Anchorage, 1982b). Currently, approximately 39 scheduled peak hour buses are in operation on 17 network routes. Service is available from approximately 6:00 a.m. to 12 midnight Monday through Friday and to 10:00 p.m. on Saturday.

Planned short-range transit improvements include maintenance and storage facility improvements, 115 additional buses to retire old buses and upgrade service, a downtown passenger center to accommodate a "through-routing"

Table III-3

TOTAL ANNUAL TRUCK TON-MILES AND TRUCK LOAD-MILES
(Anchorage to 1.8 miles north of Willow)

| Year | Total Tons (thousands) | Total Ton-Miles (thousands) | Total Truck Loads (Vehicles) | Total Truck Load Miles (VMT) |
|---|---|---|---|---|
| 1980 | 114 | 8,300 | 5,700 | 410,000 |
| 2001 | 258 | 18,800 | 12,900 | 940,000 |
| 2010 | 328 | 23,800 | 16,400 | 1,190,000 |

NOTES

Assumes:
- No-Crossing
- 20 tons/average truck load
- 72.7 miles (1.8 miles north of Willow to downtown Anchorage)

VMT signifies vehicle-miles of travel.

system and increased ridership, 50 additional bus turnouts, 40 passenger shelters, 2 staff vehicles, an automatic information and monitoring system, three park-and-ride lots and shelters, and 860 bus stop signs (AMATS, September 1983).

In the long range, the Municipality targets approximately 8.4 percent of total person-trips by transit in 2001. Continued operation of buses in "mixed" traffic is planned with the addition of exclusive lanes in selected locations (Municipality of Anchorage, Community Planning Department, July 1983).

Currently, two commuter buses travel between the cities of Wasilla, Palmer, and Anchorage on weekdays, one bus leaving Wasilla and one leaving Palmer at 6:30 a.m. These buses reverse their route in the afternoon. Ridership in 1981 averaged 30 persons per day on each of the Wasilla and Palmer runs (HNTB, November 1982).

It is anticipated that ridership could double in the next five years if various improvements, including greater promotion of available bus service, are made. Improvements proposed by 1986 in the Borough's transportation plan include the purchase of two additional buses (45 passenger capacity) plus preferably one additional bus or van for shuttle service between Wasilla and Palmer. Ninety percent utilization of bus seating by 1986 is assumed. The current bus schedule would be expanded (by adding one run each from Wasilla and Palmer) to four runs during each peak period, or eight runs daily. Additional information signs would be placed at stops or along highways. Also, a park-and-ride transfer station is proposed at the Glenn/Parks Highways junction, which would include 40 to 50 spaces for bus users, 20 to 25 spaces for carpoolers, and a 10-person enclosed shelter (Matanuska-Susitna Borough, March 1984b).

Pedestrians and Bicycles

Provision for pedestrian movement in the Downtown and Ship Creek areas is mostly on sidewalks or along the street edge with the exception of informal trails along the railroad tracks that follow Knik Arm. A coastal trail is planned that would go from Ship Creek to Knik Arm (Municipality of Anchorage, [no date]), see "Land Use Plans", and it would eliminate use of most of the informal trails. Bicycle movement occurs on streets throughout the area. In the area of Elmendorf AFB influenced by alternatives under consideration, provisions for pedestrian movement are limited to along roadways and hiking trails (see Chapter V). In the Borough, a segment of the Iditarod Trail extends from the town of Knik to the Little Susitna River and has several connecting trails (see "Iditarod Trail").

There is also an extensive system of bike trails in Anchorage. Within the area of the alternatives under consideration, there is a bike trail that begins at Muldoon Road, connects to Bartlett High School, and follows the Glenn Highway to North Birchwood. The only segment that could be affected by one of the alternatives begins at Eagle River and parallels the Glenn Highway for seven miles to its terminus east of the Glenn Highway North Birchwood interchange (see Figure V-1). The path is within the Glenn

Highway right-of-way and is usually visible from the road. Distances between the highway and the bikepath vary from 20 feet to over 100 feet with vegetation providing little or no buffer between them. The path is usually open to the highway on its west side and has either cut slopes with little vegetation or naturally vegetated open space on its east side. Bikepath grades vary, climbing and descending small hills. The path is 6.5 feet wide and paved with asphalt. Heaviest use is from mid-April to October, although no usage figures are available. Greatest use is by bicyclists, however 3-wheelers and hikers occasionally use the bikepath. Winter use is limited.

Bicyclists in the Mat-Su Borough use the shoulder of the Parks Highway and other local roads.

Street and Highway Plans

Table III-4 describes current street and highway plans for the project area. Two planned rail improvements are also noted. The focus is on specific projects which could be affected by implementation of the alternatives under consideration. The key transportation planning body for the Anchorage bowl is the Anchorage Metropolitan Area Transportation Study (AMATS), a cooperative effort of the Municipality of Anchorage and Alaska Department of Transportation and Public Facilities (ADOT/PF) responsible for long-range travel forecasting, planning, and capital improvement programming for the Anchorage bowl.

In addition to the above plans, ADOT/PF has recently begun the Major Corridors Study. A scoping document has been released (ADOT/PF, and FHWA, March 1984). This study will consider road improvement alternatives in the Northside Corridor (Bragaw Street to C Street in the Glenn Highway and 5th/6th Avenue area) and Seward Corridor (Tudor Road to 3rd Avenue in the Seward Highway and Ingra/Gambell Street area). The Anchorage bowl Long-Range Transportation Plan (see Table III-4) identifies the need for improvements in these corridors and proposes specific solutions. The Northside Corridor alternatives under consideration are: creating a 3rd/5th Avenue one-way couplet with high occupancy vehicle lanes, building a freeway extension of the Glenn Highway from Bragaw Street to Ingra Street, and extending the Glenn Highway as a freeway from Bragaw Street to ramps at C/E Streets and G/I Streets. The Seward Corridor alternatives are: a freeway extension of the Seward Highway from Tudor Road to Chester Creek and addition of high occupancy vehicle lanes on the A/C Street Couplet, a freeway extension from Tudor Road to 12th Avenue, and a freeway extension from Tudor Road to a Northside Corridor freeway. Also being considered in the Major Corridors Study is a 15th Avenue Bypass from the Glenn Highway to the A/C Couplet. All the above alternatives are being considered in various combinations or systems (ADOT/PF and FHWA, March 1984).

## C. SOCIAL AND ECONOMIC CHARACTERISTICS

The following areas of interest are discussed under social and economic characteristics: Urban growth and economic development, land use plans, urban and military function and operation, and government finance.

Table III-4

STREET AND HIGHWAY PLANS

| Plan | General Description | Improvements |
|---|---|---|
| <u>AMATS Transportation Improvement Program (TIP) FY 84</u><br>Date: September 1983<br>Term: FY84-FY88<br>Status: Final<br>Source: AMATS, September 1983 | Five year implementation schedule for Anchorage area transportation projects - showing projects for which one or more phases will begin between FY 84 and FY 88. TIP projects are drawn from the AMATS Long-Range Element, Short-Term Analysis Plans and Programs, and the Highway Safety Improvement Program. | ° A/C Street Couplet - construction of a 6-lane one-way couplet along A and C Streets from approximately Tudor Road to 6th Avenue.<br>° Glenn Highway-Eklutna Frontage Road construction.<br>° Glenn Highway-Muldoon Road to Eagle River - widen the Glenn Highway from 4 to 6 lanes.<br>° Glenn Highway-North Eagle River Interchange.<br>° Boniface Parkway (DeBarr to Tudor Roads) - widen Boniface Parkway from 2 to 4 lanes. |
| <u>Long-Range Transportation Plan (LRTP) For the Anchorage Bowl 1983-2001</u><br>Term: 1983-2001<br>Status: Draft<br>Source: Municipality of Anchorage, Community Planning Department, July 1983 | This long-range transportation plan updates the 1977 LRTP. It identifies goals and objectives, idendifies existing and future deficiencies based on current socio-economic projections, evaluates several alternative roadway networks, and recommends the preferred network and improvements within the AMATS study area. Major goals and objectives include:<br>° To provide a transportation system that enhances the social and economic aspects of the region<br>° To provide safe and economical mobility to all people<br>° To provide a transportation system that moves people and goods in the most efficient and cost-effective manner<br>° To provide a transportation system that protects the environment<br>° To provide a transportation system that conserves energy | ° Glenn Highway/Boniface Parkway Interchange - upgrade capacity and traffic flow.<br>° Glenn Highway-Northside Bypass - This 2.3 mile 6-lane facility from Ingra/Gambell Streets to Bragaw Street, north of the Glenn Highway/5th/6th Avenue corridor, would provide an upgraded route connecting the Glenn Highway and the Seward Highway corridors. (Also one alternate in ADOT/PF Major Corridors Study.)<br>° Glenn Highway/Bragaw Street Interchange - upgrade capacity and traffic flow.<br>° Glenn Highway-Bragaw Street to Eagle River Interchange - widen from 4 to 6 lanes.<br>° Seward Highway Corridor-3rd Avenue to Tudor Road - upgrade this corridor to a 6-lane, grade separated highway with major interchanges at 36th Avenue, Benson/Northern Lights Boulevards, 15th Avenue, and other streets north to 3rd Avenue. The highway would follow approximately its current alignment between Tudor Road and 15th Avenue and then along Hyder Street (between Ingra and Gambell Streets) from 15th to 3rd Avenues. (Also one alternate in ADOT/PF Major Corridors Study.)<br>° Seward Highway Corridor Extension - This 1-mile, 4-lane facility would connect the Seward Highway to the Northside Bypass. (Also one alternate in ADOT/PF Major Corridors Study.)<br>° A/C Street Couplet - see above.<br>° Boniface Parkway-DeBarr to Tudor Roads - see above. |

Table III-4 (continued)

STREET AND HIGHWAY PLANS

| Plan | General Description | Improvements |
|---|---|---|
| Anchorage CBD Comprehensive Development Plan<br>Term: Long-term<br>Status: Adopted<br>Source: Municipality of Anchorage, Planning Department, Fall 1983 | This plan serves as a guide for coordinated public and private investment decisions in downtown Anchorage. Several downtown circulation alternatives were evaluated. | ° E/G Streets One-Way Couplet - this improvement would provide one-way traffic flow along these facilities between 3rd and 9th Avenues.<br>° Restrict peak hour parking along the north side of 5th Avenue between Ingra Street and K Street. This would allow space to be used exclusively by HOV's (High Occupancy Vehicles) such as buses, car-pool, or van-pool vehicles during peak hours.<br>° Construction of the A/C Street Couplet is assumed. See above.<br>° Close F Street between 5th and 6th Avenues.<br>° Close G Street between 9th and 10th Avenues.<br>° Provide intersection improvements along 9th Avenue at Ingra, Gambell, A, C, E, G, I, and M Streets. |
| Matanuska-Susitna Borough Comprehensive Development Plan - Transportation<br>Term: 1981-2001<br>Status: Adopted<br>Source: Mat-Su Borough, March 1984b | The primary objective of this plan is to establish a long-range direction for planning of the primary roadways (arterials and collectors) in the Mat-Su Borough. The 20-year long-range plan is based on growth projections for the area and determined system deficiencies. | ° Susitna River Road or Susitna Corridor - This 24-mile resource road would provide an access road south from along the Susitna River to Chuitna Corridor (see below).<br>° Houston Right-of-Way - the corridor is located south and west of Houston running generally in a north-south direction and would provide a connection to the Point MacKenzie area. The right-of-way should provide space for utility use and rail, as well as the roadway.<br>° Point MacKenzie Access Road (Phase III) - An extension to provide access to a potential Point MacKenzie Port site.<br>° Fish Creek Agricultural Access - This 2.7 mile east-west project would be the first element of the Chuitna Corridor, which would ultimately provide access to the Beluga Coal Fields area west of the Susitna River.<br>° Burma Road - This 6-mile roadway would connect the existing South Big Lake Road and Point MacKenzie Access Road. It is planned as an arterial with controlled access.<br>° North Big Lake Road - a 5.5 mile roadway which would complete the loop around Big Lake.<br>° Briggs Road - A 1.7 mile road providing access between Horseshoe Lake Road and North Big Lake Road.<br>° Wasilla Bypass - This approximately 9-mile highway project would provide alternative access between the Parks Highway west of Wasilla to the Parks Highway east of Wasilla. |

Table III-4 (continued)

STREET AND HIGHWAY PLANS

| Plan | General Description | Improvements |
|---|---|---|
| Willow Sub-Basin Area Plan<br>Term: Indefinite<br>Status: Adopted<br>Source: ADNR, October 1982 | This plan is a land use plan for State and certain Borough lands in the Southcentral portion of the Matanuska-Susitna Borough. Transportation goals include:<br>° A system which supports goals and objectives of other plan elements<br>° A system with the lowest possible long-run costs<br>° A system with minimal environmental impacts<br>° A system which efficiently uses energy and encourages compact and efficient development patterns | ° Chuitna Right-of-Way - A road leading westerly from approximately Point MacKenzie Access road and along the north side of Susitna Flats State Game Refuge with bridges crossing at the Little Susitna River and Fish Creek.<br>° Winnebago Way - A connection between Willow and the Chuitna Right-of-Way.<br>° Susitna Corridor - A resources access road leading southwesterly from Willow parallel to the Susitna River.<br>° Moraine Ridge Road - A residential access road between the Chuitna Right-of-Way and the Red Shirt Lake area.<br>° Houston Right-of-Way - A corridor likely to be used for rail only. See above for approximate alignment description. |
| Fish Creek Management Plan<br>Term: Indefinite<br>Status: Public Review Draft<br>Source: ADNR, April 1984 | This plan is the final product of the Alaska Department of Natural Resource's planning process for the Fish Creek area. It includes:<br>° Policy statements as to the allocation of State land to various uses and a framework for resource decisions<br>° Refinement of land use allocations made in the Statewide plan on a regional basis<br>° Development of site specific land use allocations | ° Chuitna Right-of-Way - See description above.<br>° Winnebago Way (Chuitna Right-of-Way to Red Shirt Lake Area only) - See description above. Primary or secondary road depending on status of Moraine Ridge Road.<br>° Moraine Ridge Road - See description above. The proposed alignment would function as a primary or secondary road depending on status of Winnebago Way.<br>° Rail access to a potential Point MacKenzie Port preferably would follow an alignment along Moraine Ridge Road, however, because of the highly speculative nature of rail use in or through this area, no right-of-way is currently defined. |

Urban Growth and Economic Development

Figure III-2 presents recent growth trends and forecasts of population, dwelling units (occupied), and employment (by place of work and excluding military) for the Anchorage/Mat-Su region. Recent growth has been higher than anticipated by regional econometric modeling. Housing and employment growth during the past two years has averaged 12 percent per annum for the region compared to the approximately four percent average rate anticipated. Several factors appear responsible for the unexpectedly high growth rate:

° a construction surge as oil revenues began fueling both public and private investment

° Alaska became an attractive location for new business and retail service expansion during economic slowdown elsewhere

° the difference between Alaska and Lower 48 cost of living and cost of doing business has been steadily dropping

The result has been an unexpected broadening of the Anchorage economy. Alaska, and Anchorage as the principal service center in the Alaskan economy, is becoming less dependent on the Lower 48 for services, and the economic multiplier effect of local investment is increasing.

Forecasts developed by the project team (see Chapter IX) and adopted for Knik Arm Crossing evaluation are a summation of the Municipality of Anchorage and Mat-Su Borough's latest 1983 to 2001 forecasts (Municipality of Anchorage, July 1983) (DOWL Engineers, February 1983) and extension to 2010 assuming a growth rate slightly less than that occurring prior to 2001. Although the Anchorage and Borough forecasts were derived independently, their summation reflects what the University of Alaska's Institute for Social and Economic Research (ISER) terms "high economic growth" for the region.

A similar but slightly more conservative long-term regional forecast is presented by the baseline assumptions for the Susitna Hydroelectric Project (Alaska Power Authority, February 1984), i.e., no Susitna Hydroelectric construction. A considerably more pessimistic forecast than adopted for Knik Arm Crossing evaluation is reflected in the mid-range scenario utilized for a recent Outer Continental Shelf evaluation (Berman and Hull, 1984). Differences among these forecasts can be attributed largely to different multipliers assumed for public and private project investment, i.e., the extent to which project construction will spur additional short-range and long-range growth in State employment.

Table III-5 presents 1983 estimates and forecasts for 2001 and 2010 of dwelling units and employment for communities within the Municipality of Anchorage and the Mat-Su Borough. The communities are shown in Figure III-3. Currently, more than 80 percent of Anchorage-Mat-Su housing and employment is within the Anchorage bowl (communities 9 to 16). Approximately eight percent of housing and two percent of employment lies within the Eagle River and Turnagain Arm communities outside the bowl but within

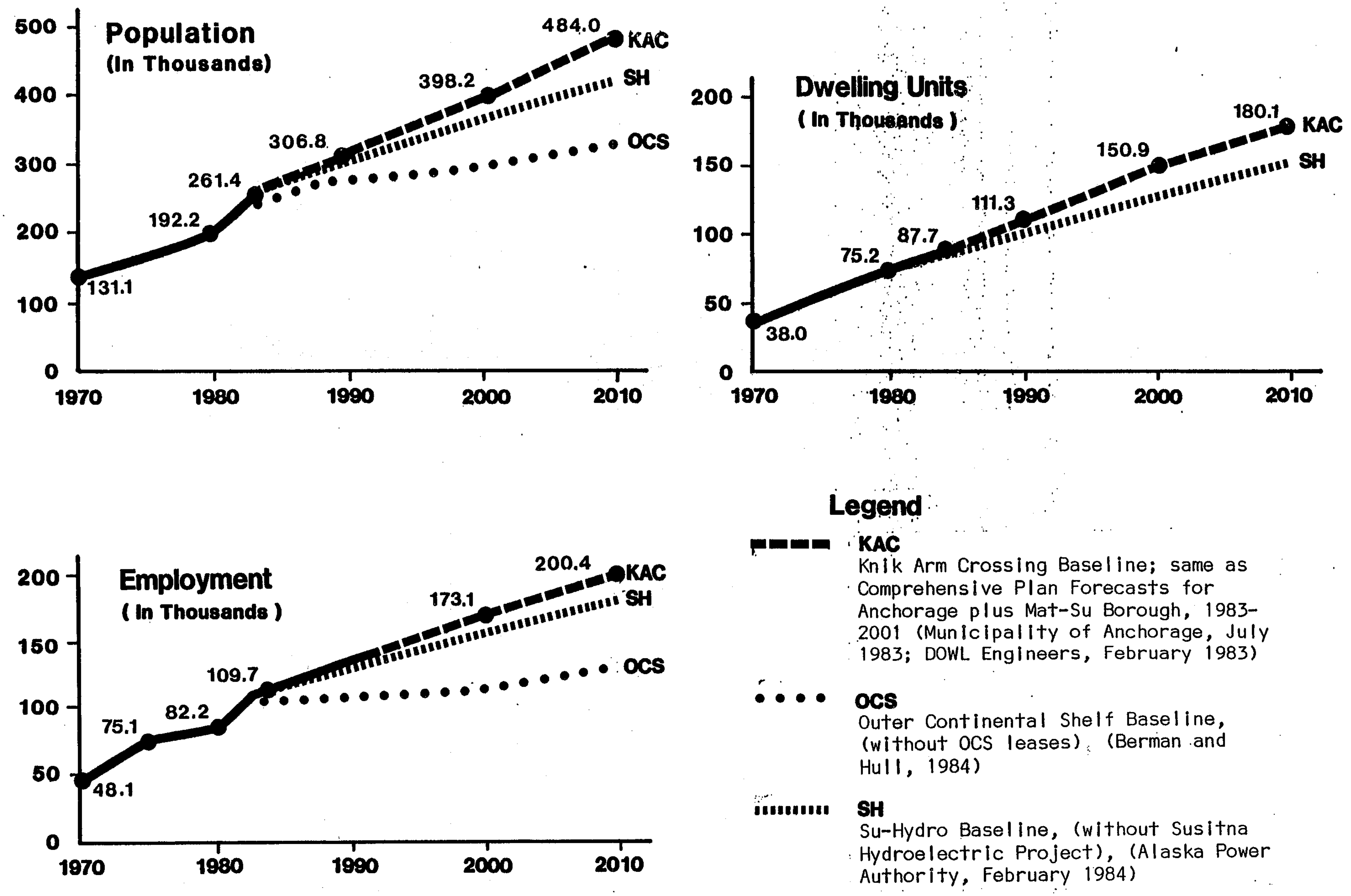



**Figure III-2**

**Growth Forecasts for the Anchorage/Mat-Su Region**

Table III-5

CURRENT AND FORECAST DWELLING UNITS
AND EMPLOYMENT BY COMMUNITY
(assumes no crossing)

| | Dwelling Units | | | Employment | | |
|---|---|---|---|---|---|---|
| | 1983 | 2001 | 2010 | 1983 | 2001 | 2010 |
| MAT-SU BOROUGH | | | | | | |
| 1. Point MacKenzie | - | 400 | 600 | - | 200 | 400 |
| 2. Knik/Goose Bay | 200 | 1,600 | 2,700 | 100 | 900 | 1,400 |
| 3. Fish Creek | - | 300 | 500 | - | 200 | 300 |
| 4. Willow/Nancy Lake | 300 | 1,300 | 2,000 | 200 | 700 | 1,100 |
| 5. Big Lake/Houston | 1,100 | 3,600 | 5,400 | 600 | 2,100 | 2,900 |
| 6. Wasilla/Fishhook | 4,300 | 7,900 | 11,000 | 2,200 | 4,500 | 5,800 |
| 7. Palmer/Sutton | 2,300 | 6,600 | 9,700 | 1,200 | 3,800 | 5,100 |
| 8. Other Mat-Su | 1,600 | 3,200 | 5,100 | 900 | 1,800 | 2,900 |
| MAT-SU SUBTOTAL | 9,800 | 24,900 | 37,000 | 5,200 | 14,200 | 19,900 |
| MUNICIPALITY OF ANCHORAGE | | | | | | |
| 9. Northeast | 23,500 | 31,600 | 35,100 | 15,400 | 21,900 | 24,900 |
| 10. Ship Creek | 1,700 | 1,600 | 1,800 | 23,600 | 24,500 | 27,800 |
| 11. Downtown | 900 | 800 | 800 | 16,500 | 17,700 | 20,100 |
| 12. Northwest | 19,200 | 23,100 | 24,700 | 24,900 | 44,200 | 50,200 |
| 13. Central | 8,400 | 14,300 | 17,400 | 9,800 | 19,200 | 21,900 |
| 14. Sand Lake | 4,600 | 11,200 | 12,700 | 6,000 | 7,500 | 8,500 |
| 15. Ocean View | 5,600 | 9,900 | 10,800 | 3,600 | 14,800 | 16,800 |
| 16. Hillside | 6,200 | 13,900 | 15,300 | 2,000 | 2,200 | 2,500 |
| 17. Eagle River | 6,700 | 16,900 | 20,700 | 2,300 | 5,900 | 6,700 |
| 18. Turnagain Arm | 1,100 | 2,700 | 3,800 | 400 | 1,000 | 1,100 |
| ANCHORAGE SUBTOTAL | 77,900 | 126,000 | 143,100 | 104,500 | 158,900 | 180,500 |
| TOTAL | 87,700 | 150,900 | 180,100 | 109,700 | 173,100 | 200,354 |

NOTES

Dwelling Units and Employment are rounded to the nearest one hundred.
Sources: 1983: Municipality of Anchorage and Mat-Su Borough
2001: Municipality of Anchorage and Mat-Su Borough adjusted to the project team's region-wide growth model.
2010: Project team's growth allocation model.
Communities are shown in Figure III-3.

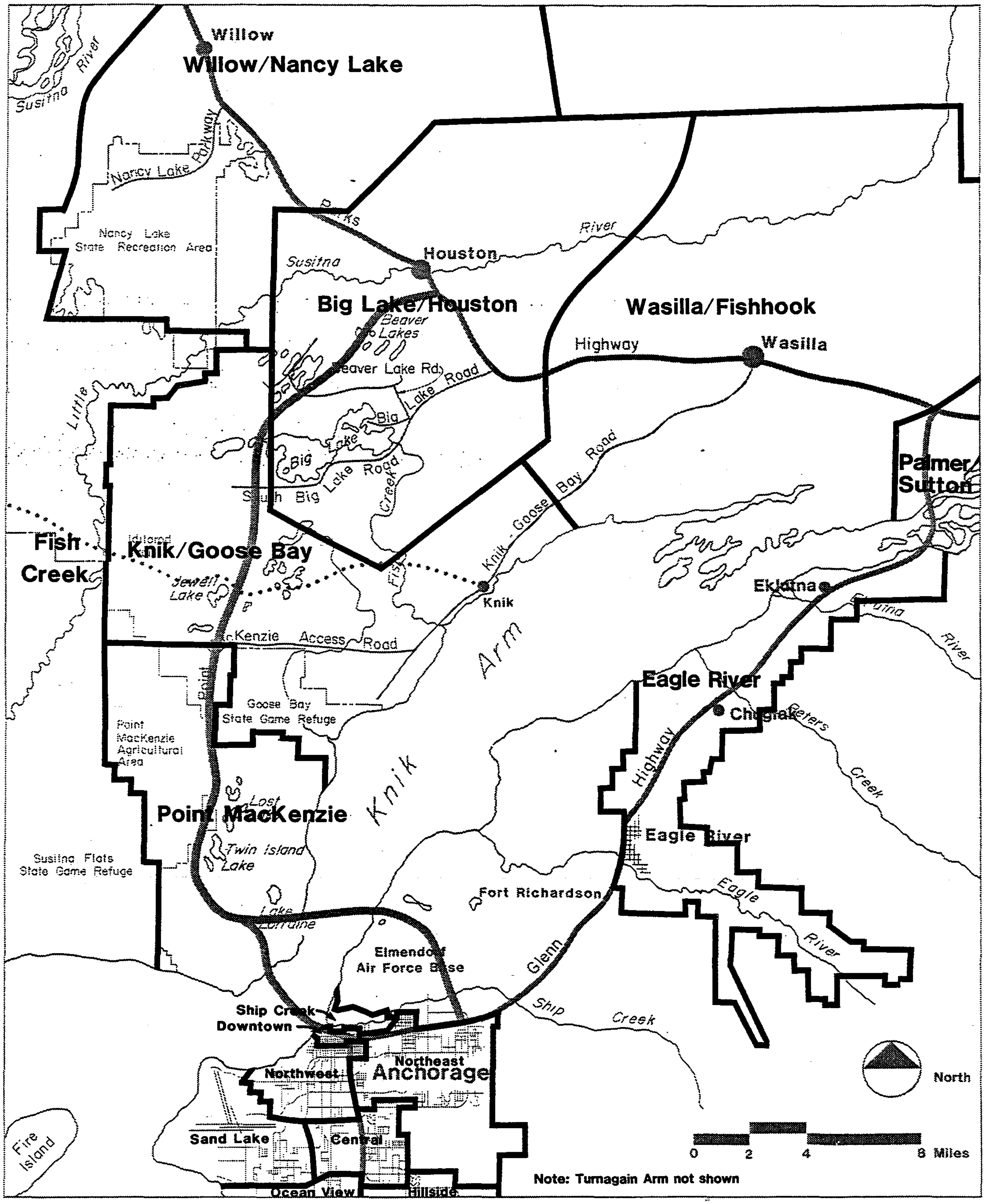



**Figure III-3**

## Communities

the Municipal boundaries. Approximately 11 percent of the region's housing and five percent of its employment are located within the Mat-Su Borough.

Significant urban growth is expected throughout the project area over the next 27 years, although at a somewhat lower rate than that experienced previously, and higher in the first 18-year timeframe than the last nine years. Because the greatest available holding capacity is in the Borough and because the cost of remaining developable land in the Anchorage bowl is rising, an increasing share of both project area dwelling units and jobs is expected to locate outside the Anchorage bowl.

Approximately 87,700 current dwelling units are forecast to increase to approximately 150,900 units by the year 2001 (average annual growth rate of 3.0 percent) and further increase to 180,100 by the year 2010 (2.0 percent per annum). Employment is forecast to increase at a slightly slower rate -- 2.8 percent per annum for the 1983 to 2001 period and 1.6 percent per annum in the 2001 to 2010 timeframe. The portion of dwelling units outside the Anchorage bowl would increase substantially from the current 19 percent to 29 percent in 2001 and 34 percent by 2010. The portion of employment outside the bowl would increase from 7 percent currently to 11 percent by 2001 and 14 percent by 2010.

Tables III-6, III-7, and III-8 illustrate in Spring 1984 dollars (increase by five percent to obtain an estimate of 1985 dollars) market dynamics for residential, commercial, and industrial development within the Anchorage/Mat-Su region. In particular, they indicate the extent to which development is more expensive within the Anchorage bowl than in outlying locations. Land is the principal component responsible for cost differences. For example, the cost of a typical single family residential lot with improvements in Spring 1984 dollars varies from $5.90 per square foot in the Anchorage bowl to $.90 per square foot in the Matanuska Valley (areas listed for Borough in Table III-5 except "Point MacKenzie" and "Other Mat-Su"). The cost of a typical commercial lot varies from $18.30 a square foot in the Anchorage bowl to $3.40 a square foot in the Matanuska Valley. The cost of a typical industrial lot varies from $5.20 per square foot in Anchorage to $1.30 per square foot in the Matanuska Valley. Point MacKenzie improved land costs are essentially the same as for the Matanuska Valley.

## Land Use Plans

Table III-9 describes area land use plans. Comprehensive development, coastal zone management, and resource management plans are included. Table III-9 descriptions focus only on those areas of the plans that could be influenced by the alternatives. Elmendorf AFB also has plans for future projects, however they are not public. They were reviewed by the project team and accounted for in alignment planning. In addition to the plans described in the table, there are three planned projects that warrant consideration.

Table III-6

CONSTRUCTION COSTS OF A TYPICAL SINGLE-FAMILY DWELLING, SPRING 1984

| Construction Costs | Anchorage Bowl | Eagle River | Chugiak | Matanuska Valley | Point MacKenzie |
|---|---|---|---|---|---|
| Land | $ 50,000 | $ 40,000 | $51,000 | $ 17,700 | $ 23,000 |
| Cost of Structure | 70,000 | 69,000 | 69,000 | 69,000 | 69,000 |
| Financing & Sales | 30,000 | 30,000 | 24,000 | 24,000 | 24,000 |
| Average Total Cost | $150,000 | $137,000 | $150,000 | $110,700 | $116,000 |

NOTES

Cost estimate for land within the Anchorage bowl and Eagle River includes an R-1 lot (8,500 square feet with all utilities including water, sewer, electric, gas, paving, curbs, and gutters. All estimates for Matanuska Valley, Point MacKenzie, and Chugiak assume one-half acre and one acre lots, respectively, with graded access, power, septic tank, and well. All estimates include interest and closing costs charged by the developer prior to lot payoff.

Cost of structures are for a typical split-entry house with the following characteristics: 1,144 square feet finished upstairs, which includes two bedrooms, 1½ baths, kitchen, dining room, and living room with fireplace; 568 square feet unfinished downstairs, plus a 440-square foot two-car garage.

Financing and Sales includes commissions, closing costs, interest on construction loan and loan fee, job supervision, and direct job overhead. It also includes general and administrative expenses such as insurance, office expense, and taxes. In addition, it includes builder's profit.

Spring 1984 dollars can be converted to an estimate of 1985 dollars by increasing them five percent.

Source: Anchorage Real Estate Research Committee, Fall 1982/Spring 1983; Les Brattain (Anchorage Bowl), Rob Gamel (Eagle River and Chugiak), and Frank Langill and Carolyn Crusey (Matanuska Valley.

Table III-7

CONSTRUCTION COSTS OF A TYPICAL COMMERCIAL STRUCTURE, SPRING 1984

| Construction Costs | Anchorage Bowl | Eagle River/ Chugiak | Matanuska Valley |
|---|---|---|---|
| Land | $ 165,000 | $ 250,000 | $ 150,000 |
| Structure | 250,000 | 90,000 | 90,000 |
| Finance & Sales | 40,000 | 35,000 | 25,000 |
| Average Total Cost | $455,000 | $375,000 | $265,000 |



NOTES

Land cost is based on a typical 9,000 square foot commercial lot in the Anchorage bowl and one-acre commercial lots in Eagle River/Chugiak and Matanuska Valley. Estimates include lots developed with water, sewer, street improvements, electricity, engineering, and other fees.

Structure costs are for a typical commercial structure 5,023 square feet in the Anchorage bowl and 3,254 square feet in Eagle River/Chugiak. Matanuska Valley structure size was assumed equal to Eagle River/Chugiak.

Financial and Sales costs include commission, closing costs, interest on construction loan and loan fee, job supervision, and direct job overhead. Also included are general and administrative expenses such as insurance, office expense, taxes, and builder's profit.

Spring 1984 dollars can be converted to an estimate of 1985 dollars by increasing them five percent.

Source: Appraisal Section, Department of Finance, Municipality of Anchorage; Terrie Peterson, Appraiser's Office, Mat-Su Borough.

Table III-8

CONSTRUCTION COSTS OF A TYPICAL INDUSTRIAL STRUCTURE, SPRING 1984

| Construction Costs | Anchorage Bowl | Eagle River/ Chugiak | Matanuska Valley |
|---|---|---|---|
| Land | $ 130,000 | $ 74,000 | $ 45,000 |
| Structure | 245,000 | 110,000 | 110,000 |
| Finance & Sales | 35,500 | 18,400 | 15,500 |
| Average Total Cost | $410,500 | $202,400 | $170,500 |
| **Major Cost Differences** | | | |
| Raw Land Costs | $ 110,000 | $ 60,000 | $ 35,000 |
| Financing | 20,000 | 10,000 | 8,000 |



NOTES

Land cost includes a typical 25,000 square foot I1 lot in the Anchorage bowl and one-acre I1 lot in Eagle River/Chugiak and Matanuska Valley. Estimates included lots developed with water, sewer, street improvements, electricity, engineering, and other fees.

Structure costs are for a typical 6,388 square foot warehouse storage structure in the Anchorage bowl and 3,098 square foot warehouse in Eagle River/Chugiak. Matanuska Valley structure size was assumed equal to Eagle River/Chugiak.

Finance and sales costs include commission, closing costs, interest on construction loan and loan fee, job supervision, and direct job overhead. Also included are general and administrative expenses such as insurance, office expense, taxes, and builder's profit.

Spring 1984 dollars can be converted to an estimate of 1985 dollars by increasing them five percent.

Source: Don Graham, Principal Appraiser, Department of Finance, Municipality of Anchorage; Terrie Peterson, Appraiser's Office, Mat-Su Borough.

Table III-9

LAND USE PLANS

| Jurisdiction/ Plan | General Description | Residential | Commercial | Industrial | Parks and Open Space | Community Services | Other |
|---|---|---|---|---|---|---|---|
| Anchorage Bowl Comprehensive Development Plan (revision) Term: 20 Years Status: Adopted Source: Municipality of Anchorage, Planning Department, March 1982 | Focus on goals, policies, and objectives for environment, transportation, parks, energy, and urban development. | Development consistent with natural characteristics of area; encourage higher densities, particularly near downtown; consider effects of development on | Concentrate rather than spread along arterials; establish neighborhood centers; encourage downtown development as multi-use district and encourage govern- adjacent land uses. | Concentrate industrial development in single-use districts, primarily at Ship Creek and along Alaska Railroad in South Anchorage. ment offices there. | Develop a system of parks, greenbelts and trails, including linear park along Ship Creek. Emphasis on neighborhood and community level. | Avoid extension of utilities through areas to be protected from development. Utilities should precede development. | Encourage energy-efficient development and use of mass transit; follow Coastal Zone Management and Wetlands Management plans. Encourage historic preservation. |
| Anchorage CBD Comprehensive Development Plan Term: Long-term Status: Adopted Source: Municipality of Anchorage, Community Planning Department, Fall 1983 | The plan is described as a strategy on which to base decisions rather than specific blueprint. Goal is integrated multi-use center. Proposes specific projects plus infill development clustering around major downtown anchors. | High density housing should be mixed with other uses. | New retail complex between 5th and 6th/A and D. | --- | Enhancement of pedestrian environment. F Street Mall between 4th & 6th and Town Center Plaza between E & F/5th & 6th; view walk linking new small parks with Resolution Park (locations are 6th & L, 4th & L, 3rd & H). | New parking structures at 5th & C, 4th & I, and 7th & H; State office complex on 5th between A and Barrow. --- | Designates area generally between 3rd & 7th/E & G as "Town Center" or civic core, includes mall, plaza, performing arts, and convention centers, plus several government buildings. Supports preservation of historic resources (e.g., Municipality plans to relocate historic homes to Quyana Park at 3rd & C for office and commercial uses). |
| Port of Anchorage Marketing and Development Plan, Phase II Term: to 2000 Status: Final Source: TAMS Engineers, 1983 | Focus on improving the utilization of existing port lands. It also views Fire Island as the best long-term option (beyond 2000) for providing for port growth, particularly in terms of bulk products. | --- | --- | Circulation, storage, and berth improvements planned on existing port site. Will discourage non-cargo use of waterfront. | Municipality should acquire waterfront lands to provide access to shoreline. | | Goal is to remain major cargo center. |

Table III-9 (Continued)

LAND USE PLANS

| Jurisdiction/ Plan | General Description | Residential | Commercial | Industrial | Parks and Open Space | Community Services | Other |
|---|---|---|---|---|---|---|---|
| Anchorage Coastal Zone Management Plan<br>Term: Indefinite<br>Status: Adopted and approved<br>Source: Municipality of Anchorage, 1980 | Management boundary includes area of coastal flooding plus adjacent floodplains, wetlands, lakes, and streams to 1,000-foot contour; excludes Federal land. Designates Areas Meriting Special Attention (AMSA) warranting preservation or careful development planning. | --- | --- | Port of Anchorage area is an AMSA to guide growth of water dependent uses. | --- | --- | Goal is to balance growth with preservation of Coastal areas. Most of Coastal zone classified preservation environment (sensitive natural environment, hazardous lands, coastal flood zone). |
| Anchorage Wetlands Management Plan (Revision)<br>Term: Indefinite<br>Status: Approved April 1982<br>Revised May 1983<br>Source: Municipality of Anchorage, Community Planning Department, May 1983 | Designates areas of wetlands for protection, conservation, and development. Establishes controls to balance preservation and development. Identifies mitigating measures. | Combine development and conservation by encouraging mixed use development of wetlands; cluster buildings to minimize portion of land covered. | | | Parks and greenbelts are effective means for conserving wetlands. | --- | Ship Creek Wetlands east of dam designated for preservation; west of dam they are designated for conservation. |
| Coastal Scenic Resources and Public Access Plan (part of Anchorage Coastal Zone Management Plan)<br>Term: Indefinite<br>Status: Guide<br>Source: Municipality of Anchorage, (no date); (c.a. 1980) | Offers plans for development of a Coastal Trail plus sites along the trail including Ship Creek Dam, Railroad Station, and Resolution Park. | --- | --- | --- | Bicycle path proposed along coastal corridor beginning at Ship Creek Dam; improvements for salmon and waterfowl viewing on north bank at Ship Creek Dam; a continuing series of scenic and recreation improvements along the trail. | --- | --- |

Table III-9 (Continued)

LAND USE PLANS

| Jurisdiction/ Plan | General Description | Residential | Commercial | Industrial | Parks and Open Space | Community Services | Other |
|---|---|---|---|---|---|---|---|
| Coastal Trail Plan: Ship Creek to Eklutna<br>Term: Indefinite<br>Status: Final<br>Source: Municipality of Anchorage, June 1982 | Presents northern section of Coastal Trail. Trail generally follows Ship Creek to Eagle River; North of Eagle River it follows the Glenn Highway bike trail with three loops to the coast. | --- | --- | --- | Trail will provide greenbelt to link existing parks and open space areas. | --- | --- |
| Eagle River-Chugiak-Eklutna Comprehensive Plan<br>Term: 1980 to 2000<br>Status: Adopted<br>Source: Municipality of Anchorage, Planning Department, September 18, 1979 | Area divided into urban/suburban development (Eagle River), resource protection (slopes and near streams), and rural development areas (all other). | Focused along Glenn Highway and Eagle River Road with highest densities in Eagle River area. Elsewhere maintain existing low density rural character. | Increased level of local employment; major commercial area downtown Eagle River; limited strips and at intersections along Glenn Highway. | Two sites available along Alaska Railroad and two in Eagle River Area. | Greenbelts on Eagle River, Fire Creek, and Peter's Creek and areawide trail system linked to Glenn Highway bike trail. | Integrated water and sewer utility for Eagle River, generally private systems elsewhere. | Water/sewer constraints will limit growth; areawide zoning to be implemented. |
| Matanuska-Susitna Borough Comprehensive Plan<br>Term: 6 Years/ 20 Years<br>Status: Draft<br>Source: DOWL Engineers, February 1983 | Focus on road-served areas, providing minimum recommendations outside that area; inside road-served areas do not expand the amount of privately owned land (6 years); coordinated with Willow Sub-basin Plan. | Most undeveloped private land expected to become residential, maintaining rural densities; create a Big Lake community core on east side of lake. | Expand commercial development, neighborhood and regional (primarily at major intersections and existing commercial areas); no new commercial nodes along Parks Highway. | Industrial and port development in Point MacKenzie area (plan in progress). | Preservation of Little Susitna River Corridor from Parks Highway south, recreation reserves on area lakes; urban recreation as required. | Sewer and water systems at Wasilla and Big Lake; 16 new fire stations, 42 schools, another hospital, added solid waste transfer stations by 2001. | Agricultural development southwest of Willow, south of Nancy Lake, Carpenter Lake area, Point MacKenzie Agricultural area, and scattered small sites. Encourage tourism, resource development. |

Table III-9 (Continued)

LAND USE PLANS

<table>
<tr><th>Jurisdiction/ Plan</th><th>General Description</th><th>Residential</th><th>Commercial</th><th>Industrial</th><th>Parks and Open Space</th><th>Community Services</th><th>Other</th></tr>
<tr><td>Matanuska-Susitna Borough Comprehensive Plan: Public Facilities<br>Term: To 1955<br>Status: Draft<br>Source: Mat-Su Borough, March 1984</td><td>Detailed recommendations for Borough public facilities and services. Based on population projections in 1983 Comprehensive Plan. Discusses potential to control growth patterns.</td><td>---</td><td>---</td><td>---</td><td>Goal is to meet recreational needs of Borough, promote tourism, and protect scenic quality and environment potential. Proposed parks include 17 neighborhood and community parks, mostly in conjunction with schools; and eight State or Borough parks including Lake Lucille and the Little Susitna River/Holstein Road area.</td><td>Specifies type, location, quantity, and timeframe for improvements to fire protection equipment and facilities; emergency medical services; solid waste, water, and sewage systems; libraries; museums; historic trails; government offices; schools; and parks.</td><td>---</td></tr>
<tr><td>Matanuska-Susitna Borough Coastal Management Plan<br>Term: Indefinite<br>Status: Approved<br>Source: Mat-Su Borough, Planning Department, August 1983</td><td>Plan to balance preservation with resource development. Management area includes townships up to 200-foot contour and selected streams up to 1,000-foot contour. This includes all of the project area.</td><td colspan="5">A review of private development plans will include consideration of impact on natural resource use, range of uses, and quality of use; effect on habitat, water bodies, water and air quality, cultural resources, floodplains, hazardous resources, and subsistence resources; consistency with local land and water use controls; and consistency with AMSA plans. New residential development shall be located in already developed areas.<br><br>Recommended AMSA's include Point MacKenzie Industrial Port/Park, Goose Bay State Game Refuge, Nancy Lake Recreation Area, Palmer Hay Flats State Game Refuge, Knik/Matanuska River Floodplains Area(s) (not in project area), and Susitna Flats Game Refuge.</td><td>All new community energy facilities, fisheries, timber, mineral, transportation, utility, agricultural, and recreation development must be consistent with plan. This includes all development falling under planning, zoning, and subdivision requirements.</td></tr>
</table>

Table III-9 (Continued)

LAND USE PLANS

| Jurisdiction/ Plan | General Description | Residential | Commercial | Industrial | Parks and Open Space | Community Services | Other |
|---|---|---|---|---|---|---|---|
| City of Houston, Comprehensive Development Plan<br>Term: 20 Years<br>Status: Adopted<br>Source: DOWL Engineers, June 1982 | Aid for decision-makers in guiding growth to meet community goals. | Moderate density along Parks Highway. South of Little Susitna River light density north of Parks Highway, rural density south. Rural density north of river and Parks Highway. | Clustered at three locations on Parks Highway; do not mix with residential uses; strip development to be avoided. | Concentrate immediately north of Little Susitna River and south of Parks Highway, (major railroad corridor shown ending at this point). | Scattered urban parks; open space along Little Susitna River and two large parcels on north and south sides of community. Provide recreation for residents and tourists. | Upgrade emergency services as population grows. Minimize public water/sewer systems. | Two sections in northwest corner of community reserved; also area along Parks Highway northwest of commercial area in middle of town. |
| Willow Sub-Basin Area Plan<br>Term: Indefibute<br>Status: Adopted<br>Source: ADNR, October 1982 | Designates uses for much of the public land within the hydrologic sub-basin of Susitna River Basin. It includes area between Knik Arm and Susitna River. | Areas designated for settlement include Moraine Ridge, Willow, Houston, Wasilla, Big Lake, Knik, and Point MacKenzie. Pear Lake and Ronald Lake areas are designated for settlement/small farms. | Sale of lands for commercial uses will be on a case by case basis consistent with plan. No specific areas designated. | Point MacKenzie area is designated for industrial development. | Recreation designations include Iditarod and related trails, Lake Lorraine, Big Lake, Horseshoe Lake, and Little Susitna River. The River is to be buffered from non-compatible uses. | --- | Resource development areas also designated. See "Natural Resource Development". |
| Fish Creek Management Plan<br>Term: Indefinite<br>Status: Public Review Draft<br>Source: ADNR, April 1984 | Management plan for 45,000 acres of public lands south of Nancy Lake Recreation area, between the Susitna River and the Little Susitna River. | Settlement in Moraine Ridge area at eastern border of management area. | Commercial center at southern end of Moraine Ridge. | Could occur in Moraine Ridge area. | Recreation areas are proposed at seven locations adjacent to lakes and several areas along streams. Iditarod Trail to have 400-foot buffer corridor. | Water and sewer systems anticipated at south end of Moraine Ridge. | Agricultural development is proposed in most of the area (exceptions are Moraine Ridge, along streams, and wetland areas); wetlands designated for wildlife habitat and resources. |

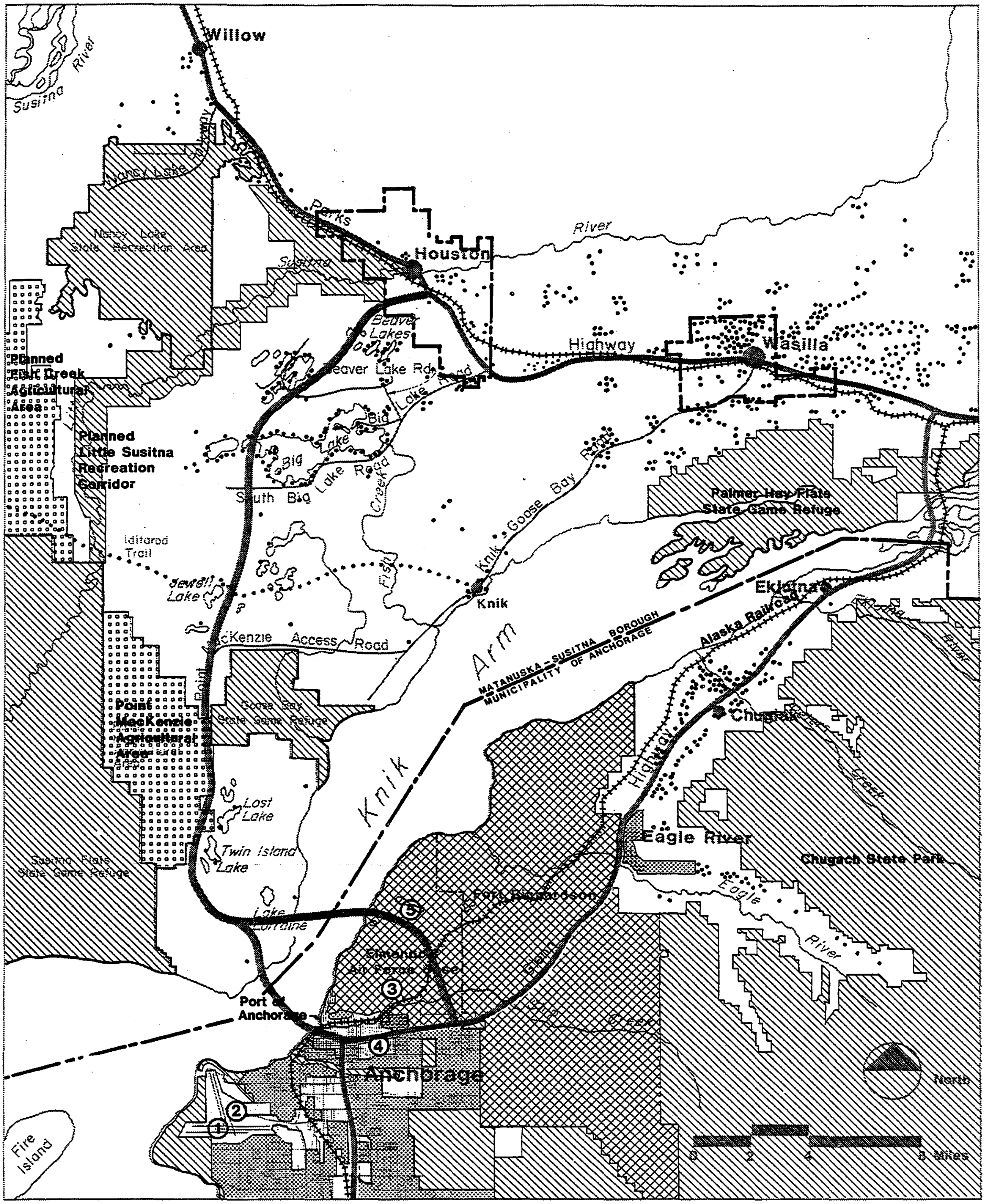
Point MacKenzie Port/Industrial Site. This development is proposed to be in the Point MacKenzie area. The Point MacKenzie area, about 15,000 acres, is surrounded by the Goose Bay State Game Refuge to the north, the Point MacKenzie Agricultural Project to the northwest, the Susitna Flats State Game Refuge on the west, and Knik Arm and Upper Cook Inlet on the east and south. The area has been defined as an Area Meriting Special Attention (AMSA) in the Borough Coastal Zone Management Plan; its primary value is identified as use for the development of water dependent facilities. Various development schemes for alternate sites have been proposed and studied. They include a port facility primarily for exporting, an industrial complex, and a residential support community. The Borough is in the process of developing a specific management plan for the Point MacKenzie area. (Kasprisin-Hutnik Partnership, June 21, 1984). Two land use plan options are under consideration. One reflects the Downtown Crossing and the other the Elmendorf Crossing. Industrial development and a port are shown in the vicinity of the crossing. Multi-use zones (commercial/higher density residential) are also shown in the vicinity of the crossing. Residential use is shown in two areas along the Point MacKenzie Access Road and on Knik Arm north and south of Goose Bay. A maximum density of two dwelling units per acre is indicated. Densities of two to five acres per dwelling unit predominate.

Susitna Hydroelectric Project. The Alaska Power Authority has proposed a two dam development on the Upper Susitna River upstream from Talkeetna at Watana and Devil Canyon, north of the Knik Arm crossing project area. The project is one of the largest hydroelectric projects ever brought before the Federal Energy Regulatory Commission for issuance of a license. It is designed to play a major role in meeting the future electrical demand of the Alaska Railbelt where over 70 percent of the State's population currently resides. Design, detailed engineering, and environmental studies are under way. It is estimated that the Watana dam could begin power production in 1993. Construction of the Devil Canyon dam is dependent on future demand, but construction could begin in 1994 with power production by 2002.

Expansion of State Courts Building. The State plans to expand the State Courts Building between 3rd and 4th Avenues and K and I Streets. Part of the expansion project is proposed across I Street from the existing building. Sub-surface and overhead pedestrian walkways across I street are planned.

Urban and Military Function and Operation

Land Use. Figure III-4 is a generalized map of existing land use in the analysis area. Additional detail north of Downtown Anchorage is shown in Figure III-5. The project area includes the urbanized Anchorage bowl, Elmendorf Air Force Base (AFB), Fort Richardson Army Post, suburban development along the Glenn Highway, the rapidly developing Wasilla area in the Mat-Su Borough, rural communities of Houston and Willow, the recreational community of Big Lake, and the generally undeveloped area of the Mat-Su Borough south of the Parks Highway. This latter area includes three game refuges, a developing agricultural area, the town of Knik, and widely scattered residential development.

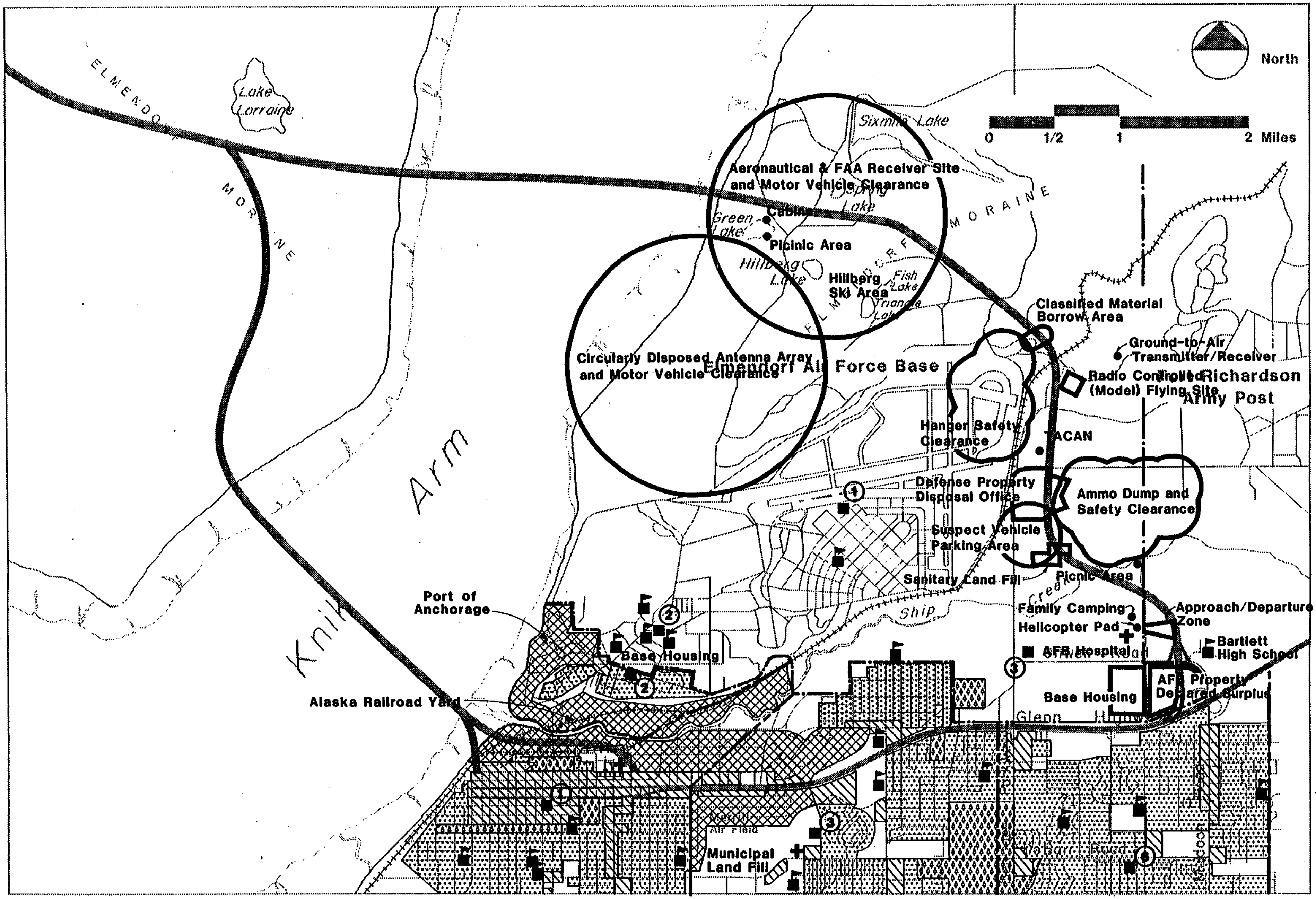



▦ Residential Concentrations
▦ Scattered Residential Development
☐ Non-Residential Concentrations
▦ Military
▦ Agricultural Developments
▨ Major Parks & Reserved Open Space
---- City Limits
++++ Railroad

① International Airport
② Lake Hood Seaplane Base
③ Elmendorf Airfield
④ Merrill Field
⑤ Six Mile Lake Airstrip

**Figure III-4**

## Existing Land Use-Project Area




Industrial, Warehousing & Transportation
Retail, Office & Services
Residential
Parks & Open Spaces
Military Boundary
Fire Service Boundary
School
Hospital
Fire Station

**Figure III-5**

## Existing Land Use - Downtown & Elmendorf AFB

Land use north of downtown Anchorage is primarily non-residential. North of Ship Creek is the Port of Anchorage and the Anchorage yard of the Alaska Railroad, described later in this section. The Government Hill residential neighborhood is also north of and overlooks Ship Creek. Immediately south of Ship Creek is industrial and warehouse development as well as additional facilities of the Alaska Railroad. West of C Street, on the hillside north of downtown are primarily small structures, many are former homes now used for office space. A private developer is considering constructing a new office building on the north side of L Street at 3rd Avenue adjacent to Resolution Park. A few residences are mixed with non-residential uses. Several parking lots also are in this area. East of C Street is a mixture of small office buildings, parking areas, and residences, both single and multifamily. The Alaska Native Medical Center (hospital) is at 3rd Avenue at Gambell Street.

Land use along the Glenn Highway, the current route from the Anchorage bowl to the Mat-Su Borough, is primarily commercial from its beginnings at the Ingra/Gambell Couplet to Bragaw Street where two schools are located. From that point east to Muldoon Road, Elmendorf AFB is to the north and residential neighborhoods are to the south. Bartlett High School is near Muldoon Road and the Glenn Highway. From Muldoon Road to Eagle River the Highway passes through undeveloped Fort Richardson lands. One cluster of base housing is near the highway. Several communities are along the Glenn Highway from Eagle River north to the Knik River. Concentrations of residential development along the highway occur at Eagle River and Lower Fire Lake (about a mile north of the Eagle River community), and at Peters Creek. Chugiak High School and Birchwood Elementary can be seen from the Glenn Highway. Scattered residential development is near the Glenn Highway at Birchwood, Chugiak, and Eklutna. Residential and commercial development is scattered along the Parks Highway with the greatest concentration at Wasilla.

The Mat-Su Borough south of the Parks Highway is largely undeveloped. South of the east-west segment of the Point MacKenzie Access Road there are only a few homes. A large area of land west of Goose Bay is being developed for agriculture. North of the Point MacKenzie Access Road residential development is scattered, but it is common along numerous private roads. A large portion of the Borough's dispersed residential lands are recreationally oriented. The shores of Big Lake and several smaller lakes in the same area are lined with residential development as are the major public roads in that area.

Emergency Services. Emergency services in Anchorage are provided by the Municipal government. Two Anchorage fire service areas are in the vicinity of Ship Creek and downtown. See Figure III-5. The northern boundary of the Station 1 (6th Avenue and C Street) service area is Ship Creek east from the Knik Arm to where the creek is crossed by the Alaska Railroad. The border then follows the railroad to Elmendorf AFB. North of this line is the service area for Station 2 (on Government Hill) which serves the Port of Anchorage and related industrial development north of the boundary described, as well as the Government Hill neighborhood. Station 1 has engine, squad, rescue, truck, aerial, and battalion companies. Station

2 has an engine company. Emergency medical service vehicles are also at Station 1. Elmendorf AFB supplies its own fire and rescue services, described below under military.

In the Mat-Su Borough, fire service is provided by several Fire Service Areas, along the Parks Highway and at Big Lake, staffed primarily by volunteers. The service area for Big Lake includes only the area immediately south and east of Big Lake and the Beaver Lake area. No fire service is provided south and west of Big Lake, including the Point MacKenzie area. Emergency Medical Service vehicles in the project area are stationed at Houston, Willow, and Wasilla.

Military. The following Elmendorf Air Force Base facilities are near alternatives under consideration: Base hospital, housing, helicopter pad (and approach/departure zone), ammunition dump (and clear zones), suspect vehicle parking (and clear zone), Defense Property Disposal Office site, Tactical Air Navigation Facility (TACAN), ground-to-air transmitter/receiver, hanger safety clearance, material borrow area, Circularly Disposed Antenna Array (CDAA) (and one-mile clear zone from outer edge of array), and Aeronautical Receiver Site including Federal Aviation Administration receiver (and 4,800-foot clear zone). These facilities are illustrated in Figure III-5. Recreation facilities are also in the area and are addressed in Chapter V.

Fire service is provided from three stations; see Figure III-5. All stations serve all areas of the base. The largest piece of equipment is a 65-ton crash vehicle whose size and weight must be accounted for in the design of overpasses for any alternative passing through the Base. The AFB has eight emergency medical service vehicles. All are stationed at the base hospital.

Port of Anchorage and Navigation Clearance. The Port of Anchorage is a general cargo port operated by the Municipality of Anchorage. It is 115 acres in size, containing four terminals and three shoreside transit yards or open storage areas. Four private terminals are operated south of the Municipally owned facility. All terminals are north of Ship Creek. The largest vessels now entering the Port area have a breadth of 105 feet, height above waterline of 140 feet, draft of 29 feet, and length of 744 feet. Highway access across Ship Creek to the port area is provided by the C Street viaduct. York steel is presently filling into the Arm south of Ship Creek. The planned use for the fill has not been determined.

There are presently no established horizontal or vertical clearances for a bridge across Knik Arm. The Coast Guard plans to make a determination prior to the publication of the Final Environmental Impact Statement (EIS). The determination will be based in part on EIS hearings, but the Coast Guard may hold separate hearings focusing on navigation clearance alone. In March 1983, the Coast Guard solicited comments on navigation requirements for several bridge sites that were under consideration at that time. South of Cairn Point, operators suggested vertical clearances of 136 to 200 feet above high high water and horizontal clearances of between 300 and 2,000 feet.

No commercial navigation requirements are expected north of Cairn Point. Operators that responded to the Coast Guard's March notice indicated that commercial navigation need not be accommodated at a location similar to that proposed for the Elmendorf Crossing. However, a crossing at that point must accommodate pleasure craft and a Chugach Electric maintenance barge.

The Coast Guard considers Ship Creek navigable up to the dam at about Cordova Street (extended). The Coast Guard also is responsible for navigation on the narrows between Mirror Lake and Big Lake and plans to determine specific navigation requirements before publication of the Final EIS.

Alaska Railroad. Intensive railroad operations and facilities are north of downtown Anchorage, see Figure III-5. The Alaska Railroad Anchorage Yard is north of Ship Creek. Its freight main line also passes through that area. South of Ship Creek is the passenger main line and numerous sidings serving area businesses. Some are shipper-owned and others are railroad-owned. The Alaska Railroad crosses Ship Creek in three locations in this area: near Knik Arm tidal flats (freight main), adjacent to the C Street Viaduct (spur between mains), and near the east end of Warehouse Avenue (passenger main).

From the area just described, a combined main line extends south along the shore of Knik Arm and north through Elmendorf AFB and Fort Richardson. In the Mat-Su Borough, it follows the Parks Highway; see Figure III-4.

Airports and Aircraft Clearance. The Federal Aviation Administration (FAA) has established standards for determining obstructions in navigable air space near airports (USDOT/FAA, March 4, 1972). Around every airport are a series of "imaginary surfaces" or clear zones. The FAA must approve any penetration of these zones since their penetration could be a hazard to aircraft. Principal airports in the project area include Anchorage International Airport, Lake Hood Seaplane Base, Merrill Field, Six Mile Lake airstrip, and Elmendorf AFB airfield; see Figure III-4. Elmendorf AFB also has a helicopter pad near its hospital in the project area; see Figure III-5.

Utilities. Several firms and agencies have facilities in the vicinity of the alternatives under consideration. These facilities include both major transmission or trunk lines and local distribution lines. The firms and agencies and their major facilities are:

° Municipality of Anchorage
  - Anchorage Telephone Utility (1,800-pair buried telephone cable on the north side of 3rd Avenue east of Ingra Street)
  - Municipal Light and Power (transmission line along H Street, sub-station at H Street and 2nd Avenue, double circuit transmission facility along the north side of 3rd Avenue, 115 KV transmission circuit with 12.5 KV distribution line and two communication cables attached along the south side of the Glenn Highway at Muldoon Road, 115 KV transmission circuit in conjunction with a military line on Elmendorf AFB)

- Anchorage Water and Waste Water Utility (36-inch RC sewer trunk line paralleling the railroad tracks in the Ship Creek area)

° ENSTAR Natural Gas (12-inch HP natural gas main on south side of 3rd Avenue east of Ingra Street tieing into an 8-inch main along the west side of Ingra and gas transmission line to Beluga along east-west segment of Point MacKenzie Access Road)

° Multivisions (cable TV) (no major facilities near alternatives)

° Tesoro (8-inch high pressure multi-purpose line on Ocean Dock Road in Ship Creek area)

° Chugach Electric Association (double-circuit transmission line near Washington Avenue in the Ship Creek area and 138 KV aerial transmission line in the Point MacKenzie area)

° Elmendorf AFB (34.5 KV electric transmission line with 12.5 KV distribution line)

° Matanuska Electric Association (115 KV transmission line near Parks Highway in Houston)

° Matanuska Telephone Association (no major facilities near alternatives)

Utilities with authority to serve the Mat-Su Borough south of the Parks Highway, the area most affected by changes in development patterns that would result from the alternatives under consideration, are:

° Matanuska Electric Association, Inc. (MEA)

° Matanuska Telephone Association, Inc. (MTA)

° ENSTAR Natural Gas Company

MEA currently provides service as far south as the north side of Goose Bay. A service extension to the Point MacKenzie Agricultural area will be built soon. The Association gets all its power from Chugach Electric and has no plans to generate its own power; additional power can be obtained as required. Front-end costs for providing new electric service are paid by the consumer. A subdivider would pay to have the lines placed and would receive a refund as other people connect to the new system. For a long line to an individual, the consumer would pay a deposit and make payments on the line extension for five years. A one-year lead time would be required to provide service.

Matanuska Telephone presently provides service as far south as the north side of Goose Bay. MTA plans to extend service to the Point MacKenzie Agricultural Area in 1984. To serve a large number of new subscribers (4,000) in a now undeveloped area, MTA likely would build a new office, install a $2 million switch, and install about $9 million in cable. Two years lead time would be needed to install a new switch which would connect to the rest of the system by either cable or antenna to Wasilla. The utility would finance the new service, but the amount invested would depend on the anticipated number of subscribers and the anticipated return.

ENSTAR Gas recently has been granted permission to serve the Mat-Su Borough and is installing lines in Wasilla and Palmer. In 1985, ENSTAR will complete a 16 to 20-inch gas line from Beluga to Anchorage around Knik Arm. It will pass through the Mat-Su Borough portion of the project area along the east-west segment of the Point MacKenzie Access Road and along Knik-Goose Bay Road. In the Municipality the gas line will follow the Glenn Highway into the Anchorage bowl. Gas service is generally user-financed. In an undeveloped area, service would be provided at the request of and upon payment by a developer. Lines running to the development from existing lines would be oversized at the cost of ENSTAR if it was believed likely that additional developers soon would want service.

### Government Finance

Table III-10 summarizes local government cost and revenue for the Mat-Su Borough (fiscal year 1983 to 1984) and the Municipality of Anchorage (fiscal year 1983). These are the most recent figures available for a single time period. They are 1983 dollars and can be converted to 1985 dollars by increasing them about 10 percent.

## D. NATURAL RESOURCE CHARACTERISTICS

The following areas of interest are discussed under natural resource characteristics: Biological resources, wetlands, water resources and quality, hydrology, floodplains, natural resource development, Iditarod Trail, air quality, noise, and visual.

### Biological Resources

Terrestrial Habitats. Terrestrial habitats within the project area primarily consist of upland boreal (northern) forest with smaller wetland areas interspersed throughout. The upland forest is characterized by mixed stands of paper birch and white spruce with occasional balsam poplar, quaking aspen, willow, and alder. The interior lowlands are mostly wetlands of the bog and fen types consisting of a sedge and sphagnum mat with ericaceous shrubs (heath) and occasional stands of black spruce. Coastal salt marsh, another wetland type, is limited to specific areas such as Goose Bay and the Susitna Flats. A variety of birds and mammals inhabit these areas. Moose is the most conspicuous and economically important species commonly found in the uplands and interior wetlands. Waterfowl are an important animal group inhabiting the coastal marshes. Table III-11 describes habitat types and wildlife use in detail.

Marine Habitats. Knik Arm is a glacial estuary characterized by very turbid water, extreme tides, and strong currents. Primary production is very low. Intertidal and subtidal benthic (living in the seabed) organisms

Table III-10

CURRENT ANNUAL LOCAL GOVERNMENT COST AND REVENUE

| | Total ($ millions) | Dollars* Per Dwelling Unit (DU), Employee, or Acre |
|---|---|---|
| ANNUAL COSTS | | |
| A. Municipality of Anchorage | | |
| a. Municipal | 190.8 | 2,449/DU |
| b. School District | 212.3 | 2,725/DU |
| | 403.1 | 5,174/DU |
| B. Mat-Su Borough | | |
| a. Areawide | 17.52 | 1,307/DU |
| b. Non-areawide | .99 | 90/DU |
| c. Wasilla Fire Service District | .29 | 97/DU |
| d. School District | 38.19 | 2,849/DU |
| | 56.99 | 4,343/DU |
| ANNUAL REVENUES | | |
| A. Anchorage Bowl (Property Tax Revenues) | | |
| a. Residential | 66.75 | 952/DU |
| b. Commercial | 6.43 | 63/Employee |
| c. Vacant | 9.18 | Vacant Residential = 643/Acre** |
| | 82.36 | Vacant Commercial = 3,641/Acre** |
| B. Eagle River-Chugiak-Eklutna (Property Tax Revenues) | | |
| a. Residential | 4.43 | 663/DU |
| b. Commercial | 0.43 | 184/Employee |
| c. Vacant | 0.61 | Vacant Residential = 427/Acre** |
| | 5.47 | Vacant Commercial = 758/Acre** |
| C. Municipality of Anchorage (Other Local Revenues) | | |
| a. Municipality | 53.00 | 680/DU |
| b. Schools | 4.84 | 62/DU |
| | 57.84 | |
| D. Mat-Su Borough (Property Tax Revenues) | | |
| 1. Area-wide | | |
| a. Residential | 3.13 | 234/DU |
| b. Commercial | 1.00 | 192/Employee |
| c. Vacant | 4.99 | 41/Acre** |
| | 9.12 | |

Table III-10 (continued)

CURRENT ANNUAL LOCAL GOVERNMENT COST AND REVENUE

| | Total ($ millions) | Dollars* Per Dwelling Unit (DU), Employee, or Acre |
|---|---|---|
| D. Mat-Su Borough (Property Tax Revenues) (continued) | | |
| 2. Non-areawide | | |
| a. Residential | 0.21 | 19/DU |
| b. Commercial | 0.09 | 16/Employee |
| c. Vacant | 0.34 | 2.5/Acre** |
| | 0.62 | |
| 3. Wasilla Fire Service District | | |
| a. Residential | 0.09 | 30/DU |
| b. Commercial | 0.03 | 26/Employee |
| c. Vacant | 0.14 | 3.5/Acre** |
| | 0.26 | |
| E. Mat-Su Borough (Other Local Revenues) | | |
| a. Areawide | 6.77 | 505/DU |
| b. Non-areawide | 0.02 | 2/DU |
| c. Wasilla Fire Service District | 0.01 | 3/DU |
| | 6.80 | 510/DU |
| PERCENT OF COSTS PAID BY LOCALLY-GENERATED REVENUES | | |
| A. Municipality | 38% | 1,974/DU |
| B. Mat-Su Borough (Areawide, Non-areawide, and WFSD) | 29% | 1,253/DU |
| OPERATING REVENUE PROVIDED BY THE STATE*** | | |
| A. Municipality of Anchorage | 224.46 (56%) | 2,880/DU |
| B. Mat-Su Borough (Areawide, Non-Areawide, and WFSD) | 30.47 (65%) | 2,293/DU |

Sources: Municipality of Anchorage, May 1983.
Anchorage School District, 1983.
Mat-Su Borough School District, February 24, 1983.
Mat-Su Borough, September 1983.
Walt Chapel, Mat-Su Borough personal communications.
Marie Keen, Mat-Su Borough School District personal communication.
Bob Kern, Alaska State Department of Revenue, personal communication.

* These figures are based on fiscal year 1983 and 1983/84 data. They are in 1983 dollars and can be converted to 1985 dollars by increasing them about 10 percent.

** Vacant residential land value in Anchorage bowl at $77,000/acre and commercial land at $436,000/acre. Vacant residential land in Eagle River-Chugiak-Eklutna at $61,500/acre and commercial land at $109,000/acre. Vacant land in Mat-Su Borough at $5,000 per acre.

*** Other non-local sources of revenue exist but are not relevant to the government finance analysis contained in Chapter IV.

Table III-11

FISH AND WILDLIFE VALUES BY HABITAT TYPES

| Habitat Type | Vegetation Types[1] | Dominant Fish and Wildlife Values | Acres in Willow Sub-Basin (thousands) |
|---|---|---|---|
| TERRESTRIAL HABITATS | | | |
| Coniferous and mixed deciduous/ coniferous forest | IC1, IC2, IC3, IA1, IA2, IA3, some IB1 | Year-round food and cover for moose, snowshoe hare, red squirrel, and spruce grouse; food and cover for black bear; nesting habitat for song birds. | 286 |
| Low Shrub scrub (part wetland) | IIB1, IIB2 | Year-round food for moose and snowshoe hare - limited cover; food for black bear; breeding habitat for shrub-nesting song birds. | 58 |
| Closed black spruce (part wetland) | IA1 (black spruce), some IC1 | Marginal year-round food and cover for moose, black bear, snowshoe hare, and spruce grouse. Year-round food and cover for red squirrel; nesting habitat for song birds. | 130 |
| Sedge/grass meadow (wet and dry) (mostly wetland) | IIIA2, IIIA3, IIIB3 | Supplemental spring, summer, and fall food for moose and black bear; breeding habitat for muskeg nesting birds such as greater yellowlegs; rearing habitat for coho salmon (when connected to stream system). | 121 |
| Tall shrub and deciduous forest | IIA1, IIA2, IB1, IB2, IB3 | Year-round food and limited cover for moose. Low quality or inadequate food for snowshoe hare, red squirrel and spruce grouse; nesting habitat for song birds. | 85 |
| Salt Marsh (wetland) | IIIC3, IIIC4 | Important habitat for migrating and nesting waterfowl and shorebirds such as: lesser Canada goose, Tule white-fronted goose, mallard, pintail, and sandhill crane; feeding habitat for black bear, furbearers, and raptorial birds. | 29 |

Table III-11 (continued)

FISH AND WILDLIFE VALUES BY HABITAT TYPES

| Habitat Type | Vegetation Types[1] | Dominant Fish and Wildlife Values | Acres in Willow Sub-Basin (thousands) |
|---|---|---|---|
| TERRESTRIAL HABITATS (continued) | | | |
| Intertidal mud flat (wetland) | --- | Feeding habitat for dabbling ducks. | 17 |
| MARINE HABITATS | | | |
| Knik Arm | --- | Migratory corridor for all five species of salmon and eulachon; marginal rearing habitat for juvenile salmon; year-round habitat for saffron cod and Bering Cisco. | --- |
| AQUATIC HABITATS[2] | | | |
| Fish Streams | | | |
| Little Susitna River | --- | Important fish stream; spawning habitat for chinook, coho, pink, and chum salmon, rainbow trout, and Dolly Varden; rearing habitat for chinook and coho salmon, rainbow trout, and Dolly Varden; migratory corridor for sockeye salmon; beaver habitat in sloughs and tributaries; bald eagle feeding habitat. | --- |
| Fish Creek | --- | Same as Little Susitna River except no chum salmon and fewer salmon spawners. | --- |
| Goose Creek | --- | Spawning and rearing habitat for coho salmon and rainbow trout; beaver habitat. | --- |
| Ship Creek | --- | Spawning habitat for chinook, coho, pink, and chum salmon; rearing habitat for coho and chinook salmon. | --- |

Table III-11 (continued)

FISH AND WILDLIFE VALUES BY HABITAT TYPES

| Habitat Type | Vegetation Types[1] | Dominant Fish and Wildlife Values | Acres in Willow Sub-Basin (thousands) |
|---|---|---|---|
| AQUATIC HABITATS[2] (continued) | | | |
| Fish Streams (continued) | | | |
| Eagle River | --- | Chum, pink, sockeye, chinook salmon migration; sockeye and chinook salmon rearing; pink and chum salmon spawning. | --- |
| Peters Creek | --- | Pink and coho salmon migration; coho rearing. | --- |
| Eklutna River | --- | Coho and sockeye salmon rearing. | --- |
| Knik River | --- | Sockeye and coho salmon migration. | --- |
| Matanuska River | --- | Migration for all five Pacific salmon; chum, chinook, and coho spawning. | --- |
| Spring Creek | --- | Coho salmon spawning and rearing. | --- |
| Rabbit Slough | --- | Coho salmon spawning and rearing. | --- |
| Wasilla Creek | --- | Coho, chinook, and chum salmon spawning; coho rearing. | --- |
| Cottonwood Creek | --- | Coho salmon spawning; sockeye salmon migration. | --- |
| Meadow Creek | --- | Coho salmon spawning and rearing; sockeye salmon spawning. | --- |
| Lakes | | | |
| Mirror Lake/Big Lake | --- | Rearing habitat for sockeye and coho salmon, rainbow trout, and Dolly Varden. | --- |

Table III-11 (continued)

FISH AND WILDLIFE VALUES BY HABITAT TYPES

| Habitat Type | Vegetation Types[1] | Dominant Fish and Wildlife Values | Acres in Willow Sub-Basin (thousands) |
|---|---|---|---|
| AQUATIC HABITATS[2] (continued) | | | |
| Lakes (continued) | | | |
| Other Mat-Su Lakes | --- | Landlocked lakes often contain rainbow trout; lakes connected to stream systems often provide coho salmon rearing habitat; beaver habitat; nesting and feeding habitat for diving birds such as common loon and goldeneye as well as trumpeter swans. | --- |
| Elmendorf Lakes (Green Lake, Spring Lake, Hillberg Lake) | --- | Habitat for stocked rainbow trout; little or no natural reproduction. | --- |

[1] From Viereck, et al., 1980 - see also Technical Memorandum No. 16 (USDOT/FHWA January 27, 1984)
IA1 - closed needleleaf (conifer) forest
IA2 - open needleleaf (conifer) woodland
IA3 - needleleaf (conifer) forest
IB1 - closed broadleaf forest
IB2 - open broadleaf forest
IB3 - broadleaf woodland
IC1 - closed mixed forest
IC2 - open mixed forest
IC3 - mixed woodland
IIA1 - closed dwarf tree scrub
IIA2 - open dwarf tree scrub
IIB1 - closed tall shrub scrub
IIB2 - open tall shrub scrub
IIIA2 - mesic graminoid herbaceous
IIIA3 - wet graminoid herbaceous (emergent)
IIIB3 - wet forb herbaceous
IIIC3 - sedge-grass marsh
IIIC4 - sedge-grass wet meadow (saline)

[2] Other aquatic habitats exist in the project area. Those described are those most likely to be affected by the alternatives under consideration. Sedge/grass meadow also can be valuable for coho salmon rearing when connected to stream system. See "Terrestrial Habitats" above. Eklutna River, Knik River, Matanuska River, Spring Creek, Rabbit Slough, and Wasilla Creek are not shown in Figure III-6. All are at or near the east end of Knik Arm.

Sources: U.S. Department of Agriculture et al., October 1981.
U.S. Fish and Wildlife Service, 1981
Alaska Department of Fish and Game, 1982.

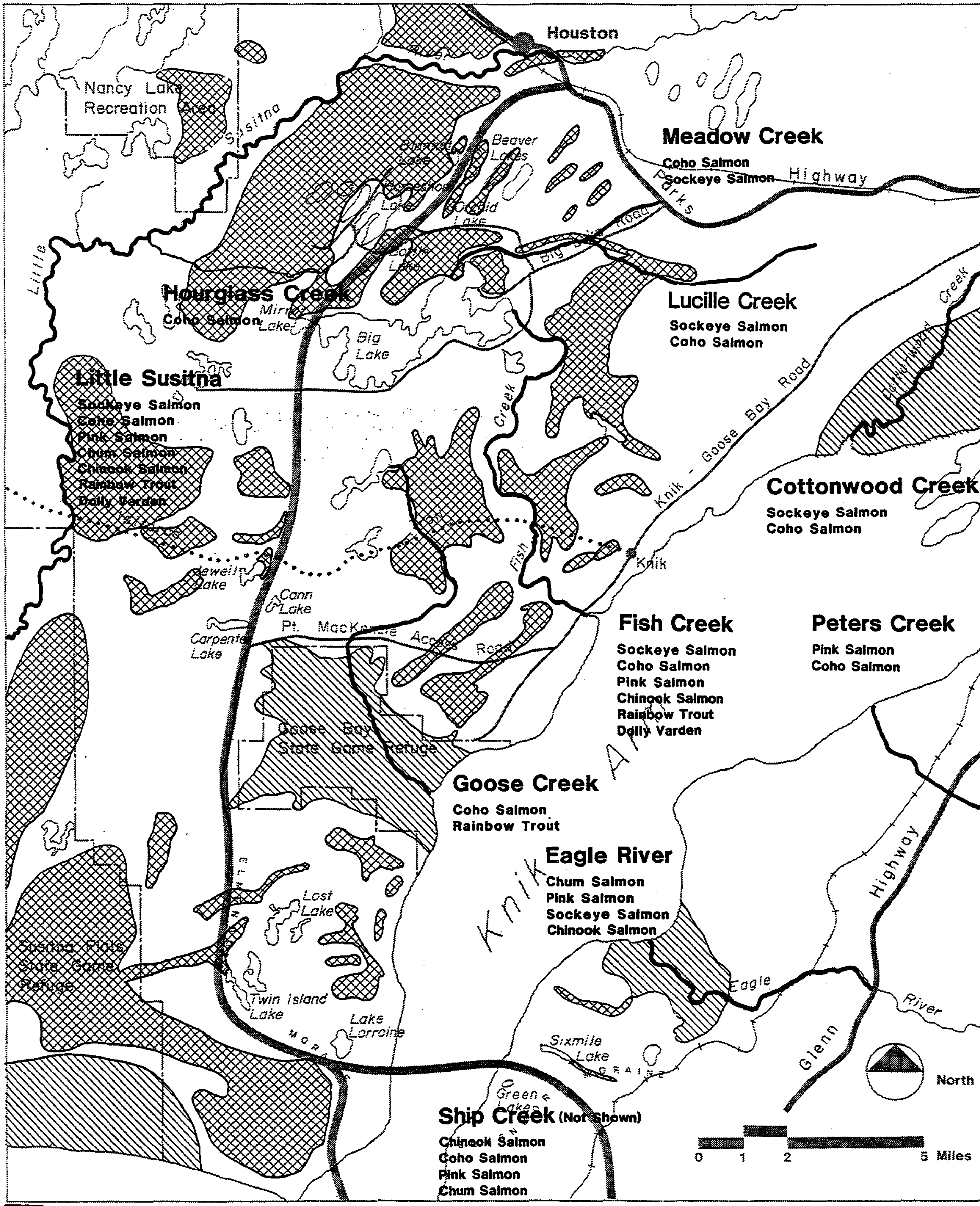
are sparse. However, recent evidence (USDOT/FHWA, ADOT/PF, December 20, 1983) suggests that moderate production of fish and epibenthic invertebrates (animals that live on or near the bottom) occurs within the Arm. Energy for this simple ecosystem is probably provided by organic detritus that enters Knik Arm from adjacent marshes and streams. Important resident fish include saffron cod and Bering Cisco; see Table III-11. Knik Arm also provides a migratory corridor and temporary residence for adult and juvenile salmon as they migrate to and from local streams. Adult salmon are present in the Arm from late May through September depending on the species. Juvenile salmon migrate through the area from May through late June and to some extent they feed on marine invertebrates while in the Arm.

Marine birds are not abundant in Knik Arm, presumably because the turbid water hampers feeding ability. However, some birds, especially greater scaup and white winged scoter, occasionally do rest in Knik Arm. Marine mammals also are not abundant; beluga whales occasionally are observed during salmon migrations.

Aquatic Habitats. Lakes and streams are abundant within some portions of the project area, particularly north of the east-west segment of the Point MacKenzie Access Road. Fish, especially anadromous species, are an important area resource and contribute to significant sport and commercial fisheries (see below). The Little Susitna and Big Lake drainages support significant populations of all five species of Pacific salmon as well as resident trout and Dolly Varden, most of which are considered key indicators of habitat quality. South of Knik Arm aquatic resources are more sparse. Ship Creek is utilized by four species of salmon. Figure III-6 and Table III-11 show important fish species and their locations in major streams and rivers.

Use of Fish and Wildlife. Because of proximity to the Anchorage metropolitan area, sport fishing pressure is heavy on all area streams and lakes that contain substantial fish resources. Harvest and fishing pressure for streams north and south of Knik Arm for 1982 are presented in Table III-12. The Little Susitna River is the most popular sport fishing stream in the Mat-Su Borough (Larry Engel, Alaska Department of Fish and Game, personal communication). For example, in 1982, fishermen spent 24,020 man-days fishing on the Little Susitna River (Mills, 1982). Other lakes and streams between Knik Arm and the Parks Highway also are fished heavily, including Big Lake. The small lakes on Elmendorf AFB adjacent to the Elmendorf Crossing also receive substantial fishing pressure. Total man-days fished in 1982 in the project area north of Knik Arm were 91,713. The Anchorage area south of Knik Arm received 82,007 man-days of fishing effort.

Knik Arm has been closed to commercial fishing since 1959, however a limited amount of set-net fishing for salmon occurs just outside the entrance to the Arm. This mid-summer fishery concentrates on sockeye salmon. A significant commercial salmon fishery also occurs in upper Cook Inlet along the Kenai Peninsula to which Knik Arm salmon stocks contribute. The average commercial salmon catch in Upper Cook Inlet in the years 1977 to 1980 was 3,800,000 fish (Braund, 1980).




Major Fish Streams Rivers

Major Coastal Wetlands

Major Freshwater Wetlands

Upland Boreal Forest

**Figure III-6**

**Habitat**

## Table III-12

### SPORT FISHERY HARVEST (1982) FOR DRAINAGES, STREAMS, AND LAKES IN PROJECT AREA

| | Days Fished (1982) | Number of Fish Caught by Species* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | KI | KS | SS | LL | RS | PS | CS | RT | DV AC | LT | GR | BB | SM | Other |
| TOTAL KNIK ARM DRAINAGE** | 91,713 | 691 | 975 | 13,676 | 10,845 | 4,621 | 1,425 | 1,174 | 30,549 | 13,540 | 1,058 | 2,924 | 681 | 0 | 817 |
| - Little Susitna River | 24,020 | 534 | 933 | 7,116 | 0 | 1,865 | 1,163 | 943 | 1,551 | 1,331 | 0 | 388 | 10 | 0 | 713 |
| - Wasilla Creek (Rabbit Slough) | 6,261 | 0 | 0 | 1,624 | 0 | 0 | 147 | 0 | 63 | 1,289 | 0 | 0 | 0 | 0 | 0 |
| - Cottonwood Creek | 5,186 | 0 | 0 | 1,886 | 0 | 608 | 0 | 0 | 786 | 10 | 0 | 0 | 0 | 0 | 0 |
| - Wasilla Lake | 2,457 | 0 | 0 | 0 | 42 | 0 | 0 | 0 | 2,243 | 63 | 0 | 0 | 0 | 0 | 0 |
| - Lucille Lake | 2,218 | 0 | 0 | 0 | 3,312 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| - Big Lake | 15,371 | 0 | 0 | 0 | 324 | 126 | 0 | 0 | 9,369 | 8,793 | 440 | 0 | 461 | 0 | 0 |
| - Nancy Lake Rec. Area, including Nancy Lake | 8,615 | 0 | 0 | 0 | 126 | 618 | 0 | 0 | 2,840 | 272 | 356 | 0 | 210 | 0 | 73 |
| TOTAL ANCHORAGE AREA DRAINAGE*** | 82,007 | 0 | 0 | 1,571 | 2,557 | 272 | 1,178 | 10 | 49,242 | 2,893 | 0 | 210 | 0 | 116,617 | 94 |
| - Otter Lake | 7,421 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6,445 | 0 | 0 | 0 | 0 | 0 | 0 |
| - Sixmile Lake | 5,016 | 0 | 0 | 0 | 136 | 0 | 0 | 0 | 1,499 | 0 | 0 | 0 | 0 | 0 | 0 |
| - Green Lake | 8,223 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4,747 | 0 | 0 | 0 | 0 | 0 | 0 |
| - Hillberg Lake | 4,828 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,162 | 0 | 0 | 0 | 0 | 0 | 0 |
| - Ship Creek | 2,695 | 0 | 0 | 168 | 0 | 0 | 0 | 0 | 639 | 210 | 0 | 0 | 0 | 0 | 0 |
| - Eagle River | 3,037 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 734 | 1,247 | 0 | 0 | 0 | 0 | 0 |

*Fish Species

KI - Chinook (king) salmon less than 20 inches
KS - Chinook (king) salmon
SS - Coho (silver) salmon
LL - Landlocked coho salmon
RS - Sockeye (red) salmon
PS - Pink salmon
CS - Chum salmon
RT - Rainbow trout
DV - Dolly Varden
AC - Arctic char
LT - Lake trout
GR - Arctic grayling
BB - Burbot
SM - Smelt

** Knik Arm Drainage: All waters inside the area bounded by the Little Susitna River on the north and west and Knik Arm on the south, including all drainages of the Matanuska and Knik Rivers. Boundary streams are included in the area.

*** Anchorage Area Drainage: All waters inside the area bounded by the Eklutna River on the north, Knik Arm on the west, Turnagain Arm to-and-to-and-including Portage Creek at Portage on the south, and the Chugach Mountains on the east. Boundary streams are included in the area.

Source: Mills, 1982

The set-net subsistence fishery was closed in Knik Arm in 1971 because of depletion of salmon stocks (Braund, 1980), but a personal use (subsistence) net fishery has been permitted under various regulations in upper Cook Inlet outside of Knik Arm in recent years. In 1980, the subsistence salmon catch was 14,775 in Upper Cook Inlet from Anchor Point north (Braund, 1980). Knik Arm salmon stocks contribute substantially to this fishery, especially for those fishermen who fish adjacent to Fire Island and Point MacKenzie.

The Alaska Department of Fish and Game (ADF&G) and the Cook Inlet Aquaculture Association (CIAA) both are involved in enhancement projects to improve sport and commercial fisheries in upper Cook Inlet drainages. CIAA operates a chum and coho salmon hatchery on the Eklutna River at the head of Knik Arm and ADF&G operates sockeye and coho salmon hatcheries on Meadow Creek near Big Lake and on Ship Creek in Elmendorf AFB. These enhancement projects involve the hatching and rearing of salmon and trout to be released in local streams, rivers, and lakes.

Big game hunting (moose and black bear) for sport and/or subsistence is a primary use of the undisturbed areas north of Knik Arm. Hunting pressure and harvest for moose are presented in Table III-13. Big game hunting in the Anchorage bowl or Elmendorf AFB generally is not permitted except under highly controlled circumstances. Controlled moose hunting regularly occurs on Fort Richardson. Smaller upland game such as snowshoe hare and spruce grouse also are pursued in areas where these species are abundant. Some trapping occurs north of Knik Arm, mostly along rivers and streams.

Waterfowl hunting (Table III-13) is another high intensity game use in the Cook Inlet area. Nearly all of the hunting occurs in coastal marsh areas; Susitna Flats, Goose Bay, and Palmer Hay Flats State Game Refuges are all hunted heavily.

Hunting and fishing pressure in the project area is considered high, but in the presence of existing management measures, current harvest levels have not been shown to be detrimental to areawide animal populations. Access to hunting and fishing areas is a key element in determining the pressure received in local areas. The Parks Highway is the primary road in the Mat-Su Borough and consequently serves as a focal point for hunting and fishing activity.

Threatened or Endangered Species. No plant species identified as threatened or endangered have been found to occur within either the wetland or upland plant communities of the project area (Murray, 1980).

Two sub-species of the peregrine falcon (*Falco peregrinus anatum* and *F. peregrinus tundrius*) are listed as endangered by the U. S. Fish & Wildlife Service and may pass over the Mat-Su Borough and Anchorage areas during migration to and from nesting areas farther north. A third sub-species (*F. peregrinus pealei*) is known to nest in coastal areas of southcentral Alaska but is not considered endangered.

Table III-13

BIG GAME[1] AND WATERFOWL[2] HARVEST
WILLOW SUB-BASIN
JULY 1982 - JUNE 1983

| Species | Number of Permits | Hunter Days | Number Harvested |
|---|---|---|---|
| Bull moose | 2,219 | -- | 311 |
| Antlerless moose | 400 | -- | 123 |
| Black bear | -- | -- | 49 |
| Brown bear | -- | -- | 10 |
| Ducks | -- | 13,145 | 28,505 |
| Geese | -- | -- | 1,325 |

NOTES
The number of permits for black bear and brown bear is unavailable. Most goose harvesting is incidental to duck hunting.

Sources:
[1] Personal communication, Jack Didrickson, Alaska Department of Fish and Game; Includes Management Unit 14A.

[2] Alaska Department of Fish and Game, February 1984; total for Susitna Flats, Palmer Hay Flats, and Goose Bay State Game Refuges.

## Wetlands

Wetlands in the project area can be divided into coastal wetlands, poorly drained low areas inundated by salt water on extreme tide, and non-tidal freshwater wetland areas, including forested wetland (black spruce bogs), low shrub bogs and fens, and freshwater marshes. Major wetland areas are illustrated in Figure III-6 and values are described in Table III-11. Wetlands traversed by the Crossing Alternatives are shown in detail in Appendix C. Detailed wetland maps of the area are available from the U.S. Fish and Wildlife Service National Wetland Inventory Program. Forty-two percent of the Willow Sub-basin, 411,300 acres, is classed as wetland (U. S. Department of Agriculture et al., October 1981). Elmendorf AFB contains 11 percent, 1,420 acres, of wetland habitat (Rothe et al., 1983).

A primary importance of the coastal marshes is providing waterfowl habitat. These areas support large numbers of waterfowl including Canada geese, pintails, green-wing teal, and mallards. Use is during migration, feeding, and resting in addition to use as summer nesting habitat. These areas are also important to adjacent salt water habitats in the production of plant material which provides nutrients for the marine food web. Furbearers such as mink and red fox also frequent these productive marsh areas.

Freshwater wetlands are scattered throughout the project area both in small isolated, poorly drained areas and also in large expanses. These areas function to recharge ground water, filter out organic pollutants from surface water, and absorb large amounts of water to act as natural flood control. Wetland areas along the streams and rivers (i.e., Fish Creek, Little Susitna River) act as overflow areas during flooding and help prevent erosion.

These non-coastal wetlands also are of major importance in providing wildlife habitat. Black spruce bogs are considered important winter habitat for moose and provide good browse species for food. Black bear utilize wetlands seasonally because of the presence of preferred plant food items. Muskeg breeding birds such as yellowlegs and common snipe also prefer these interior bog areas (Ritchie et al., 1981). Small streams draining large wetland areas were found to be utilized as rearing streams for coho salmon and rainbow trout.

## Water Resources and Quality

Marine Environment. Knik Arm is a glacial estuary characterized by extreme tides and currents. Maximum tidal range (39 feet) is second only to the Bay of Fundy in eastern Canada. Tidal currents up to 11 feet per second have been documented (Britch, 1976). The currents and resulting turbulence produce high levels of suspended sediment with values to 1,350 milligrams per liter reported (Kinney et al. 1970). In the summer, salinity can vary from 6 to 20 parts per thousand depending on tide stage. Some sources of potential pollution exist including the Anchorage sewage treatment outfall, storm drains, and spills of oil and other materials at and by ships using the Port of Anchorage. The flushing rate is so great that the pollution of Knik Arm as a whole has not been considered a problem to date, and under normal conditions the waters would be considered unpolluted except for the presence of natural suspended sediment. However, studies in the Point Woronzoff vicinity, near the Anchorage sewage outfall, have indicated higher than normal counts of fecal coliform bacteria suggesting that localized pollution could become significant (U. S. Army Corps of Engineers, 1979a). The Municipality of Anchorage currently is reviewing the need to relocate the sewage outfall.

Freshwater Environment. Water quality in the streams of the Mat-Su Borough generally is good in the sense that the streams are essentially unpolluted (Rummel, 1980). However, since the density of shoreline development is relatively high around some of the lakes (e.g., Big Lake), the potential exists for gradual increases in nutrients due to leaching of domestic wastes, as has occurred elsewhere in the country. Most of the streams in the project area have relatively clear water and do not carry a high silt load. Surface waters in the Wasilla area are relatively soft with a hardness less than 120 milligrams per liter and are of the calcium magnesium carbonate type (Rummel, 1980).

Water quality in streams and lakes south of Knik Arm is good in water bodies outside the population centers, e.g., as on the northern portion of Elmendorf AFB. Deterioration in water quality has been observed in those portions of streams that flow through the Anchorage area, e.g., Ship Creek and Chester Creek, (U. S. Army Corps of Engineers, 1979b). The water quality of Ship Creek has been monitored in recent years by Elmendorf AFB and the Army Corps of Engineers. Some contamination by petroleum products is present in lower Ship Creek, apparently the result of old spills on the AFB, but is not sufficiently serious to affect the fish at the Ship Creek hatchery (Rothe et al., 1983). Increases in total dissolved solids, iron, and coliform bacteria also have been noted (U. S. Army Corps of Engineers, 1979b).

### Hydrology

Water is a dominant feature of the project area north of Knik Arm. The flat, low-lying terrain contains abundant lakes, streams, and wetland areas. The Little Susitna River is the largest stream system, originating in the Talkeetna Mountains and flowing westerly and southerly until it enters upper Cook Inlet near the entrance to Knik Arm. Little Susitna flow is derived from a variety of sources including glacial melt, runoff, and groundwater. Maximum discharge generally occurs in June (greater than 1,000 cubic feet per second) with flows remaining high throughout the summer and decreasing drastically to a minimum of less than 25 cfs in March (Mat-Su Borough, 1981a). The other major drainage in the project area is the Big Lake/Fish Creek drainage. The presence of several lakes in the drainage tends to moderate the discharge, causing a much more uniform flow regime and less annual variation than that of the Little Susitna River. In addition to the major systems, several small streams enter the north side of Knik Arm. Numerous landlocked lakes and wetland areas provide an enormous storage capacity, moderate runoff effects, and contribute to groundwater recharge.

South of Knik Arm, in the Elmendorf and Anchorage bowl areas, surface water resources are dominated by relatively short, non-glacial stream systems that originate in the Chugach Mountains and flow westerly across the alluvial deposits of the Anchorage area before entering Knik Arm. Ship Creek is the primary drainage within the area that could be affected by the alternatives under consideration. The Ship Creek basin is an important recharge area for the Anchorage artesian aquifer, a significant source of potable water (Rothe et al., 1983). Long-term discharge records indicate that peak flows occur in June with flow gradually decreasing to a low in March. Ship Creek responds rapidly to precipitation events, and thus high flows can occur for short periods in summer and fall. A substantial portion of Ship Creek water currently is diverted for municipal and military water supply and for power plant cooling. Several diversion dams are present in the stream.

Floodplains.

The 100-year or base floodplain and regulatory floodway for Ship Creek (U. S. Army Corps of Engineers, 1975/1980 update) (U. S. Army Corps of Engineers, 1982) is shown in Figures III-7 and III-8. In the Mat-Su Borough, coastal floodplains occur in the Goose Bay and Palmer Hay Flats State Game Refuges. They also line area streams, but none are in the vicinity of Crossing Alternatives. General floodplain limits are shown for the Mat-Su Borough in their Coastal Zone Management Plan (Mat-Su Borough, August 1983).

Natural Resource Development

Farmlands of State or Local Importance. There are no prime or unique farmlands within the project area. However, there are lands determined to be of State and local importance by the Alaska Department of Natural Resources and by the Borough. Figure III-9 depicts these lands as shown in the Willow Sub-Basin Area Plan (ADNR, October 1982). The State designated lands include the Point MacKenzie Agricultural Area, Fish Creek Agricultural Area, and large concentrations at Pear Lake and Ronald Lake. The Borough designated lands include all Borough owned parcels of 40 acres or more that are at least 40 percent Class II and/or Class III soils.

Agriculture Production. Farming in the area, predominantly grain, hay, and potatoes, is limited due to the lack of clear land, productive soils, access, and processing/marketing infrastructure. In addition, farming has declined from a peak in the mid 1960's because it is more profitable to sell land for subdivision; only intensive development such as livestock or truck farming can exceed the sale price for residential use.

Both the Borough and the State want to increase agricultural activity in the project area. The Willow Sub-Basin Area Plan (ADNR, October 1982) designates lands for commercial agriculture, including the Point MacKenzie Agricultural Project and the Fish Creek Agricultural Project (see Figures III-9 and III-10). The Point MacKenzie project consists of 13,900 acres for dairy farming, hay, barley, and potatoes. The Fish Creek project consists of 16,000 acres proposed for hay, barley, and potatoes. Road access into the Fish Creek area is planned but not yet programmed for completion.

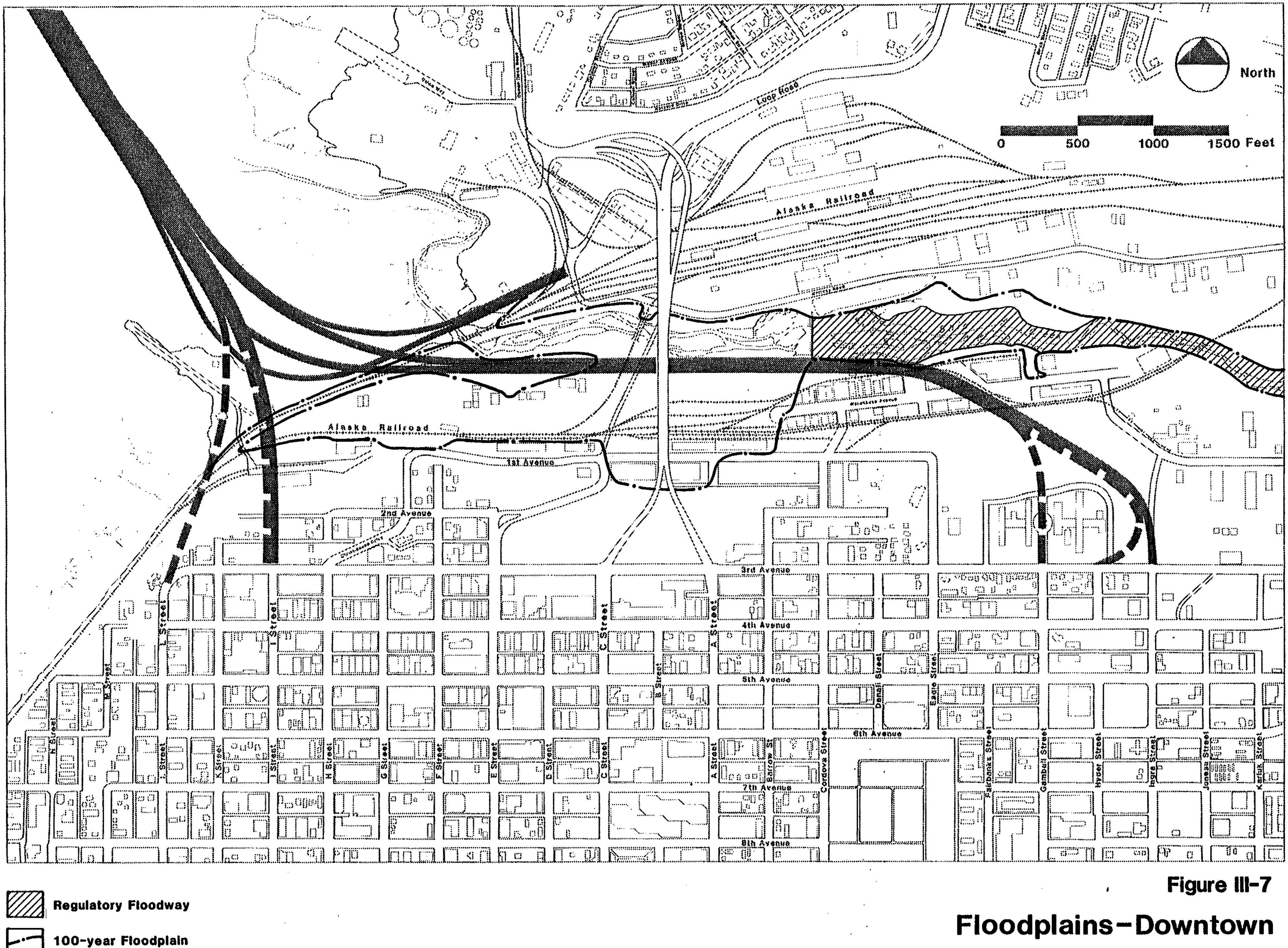
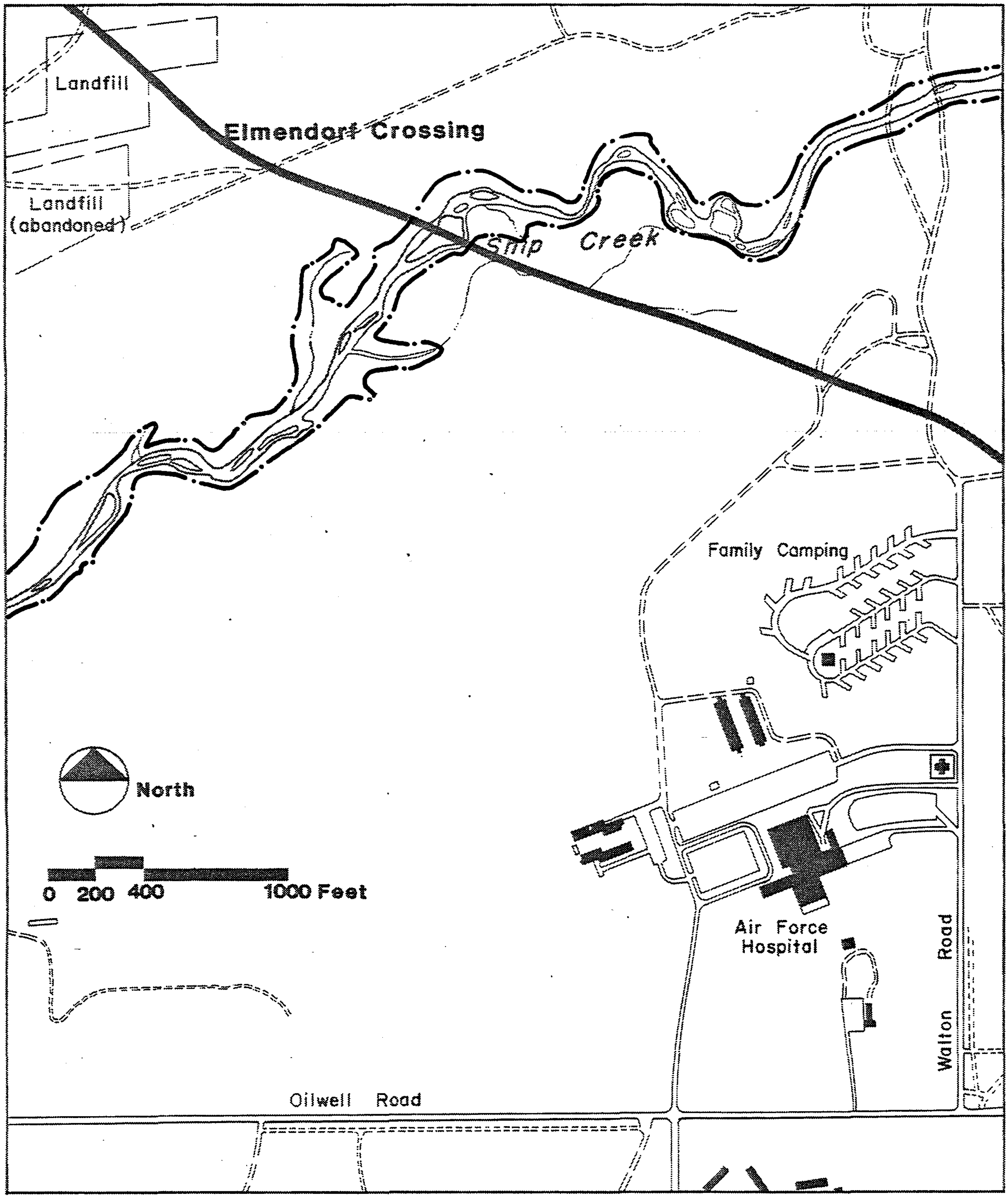



Figure III-7

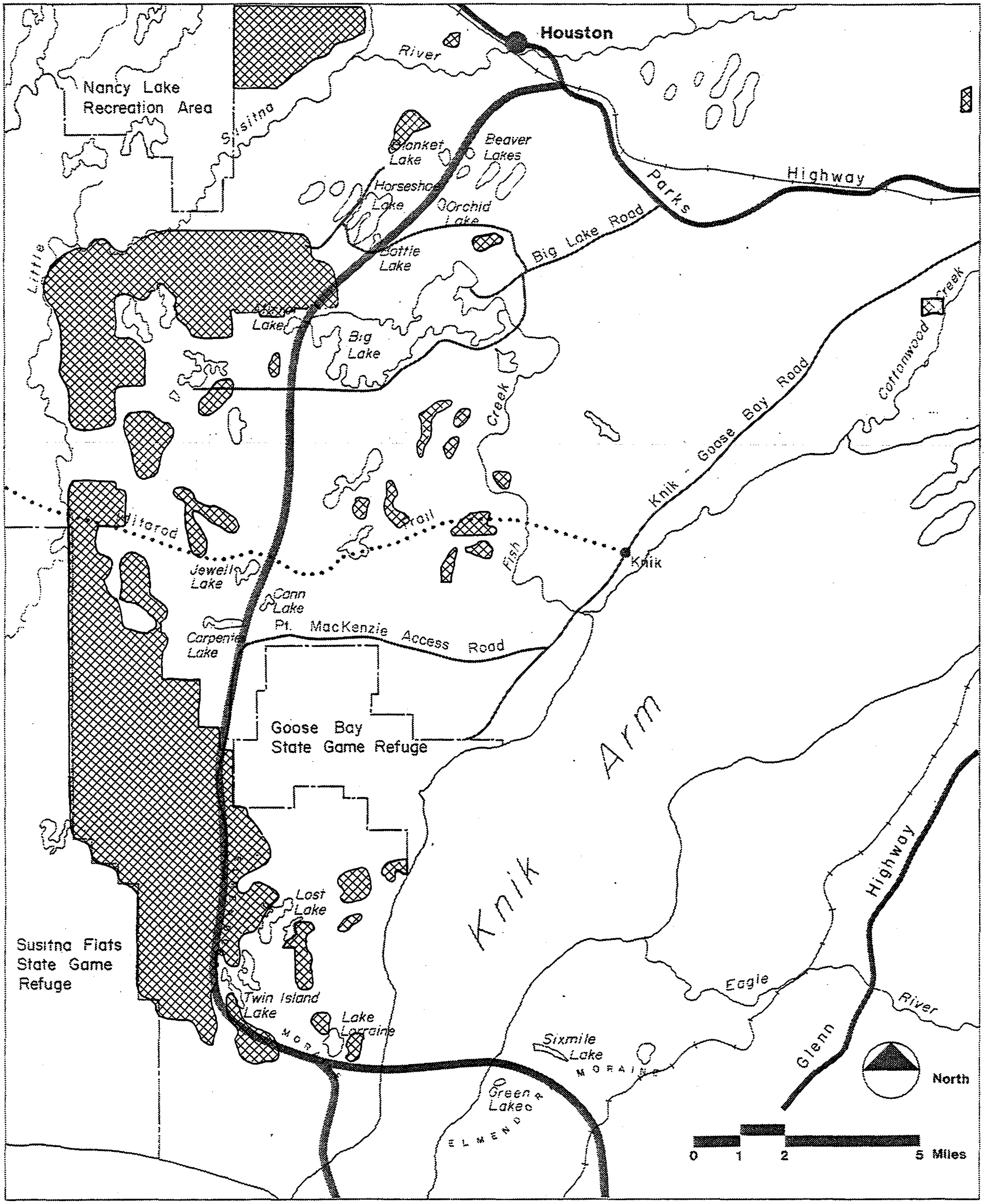
## Floodplains–Downtown




100-year Floodplain

Figure III-8

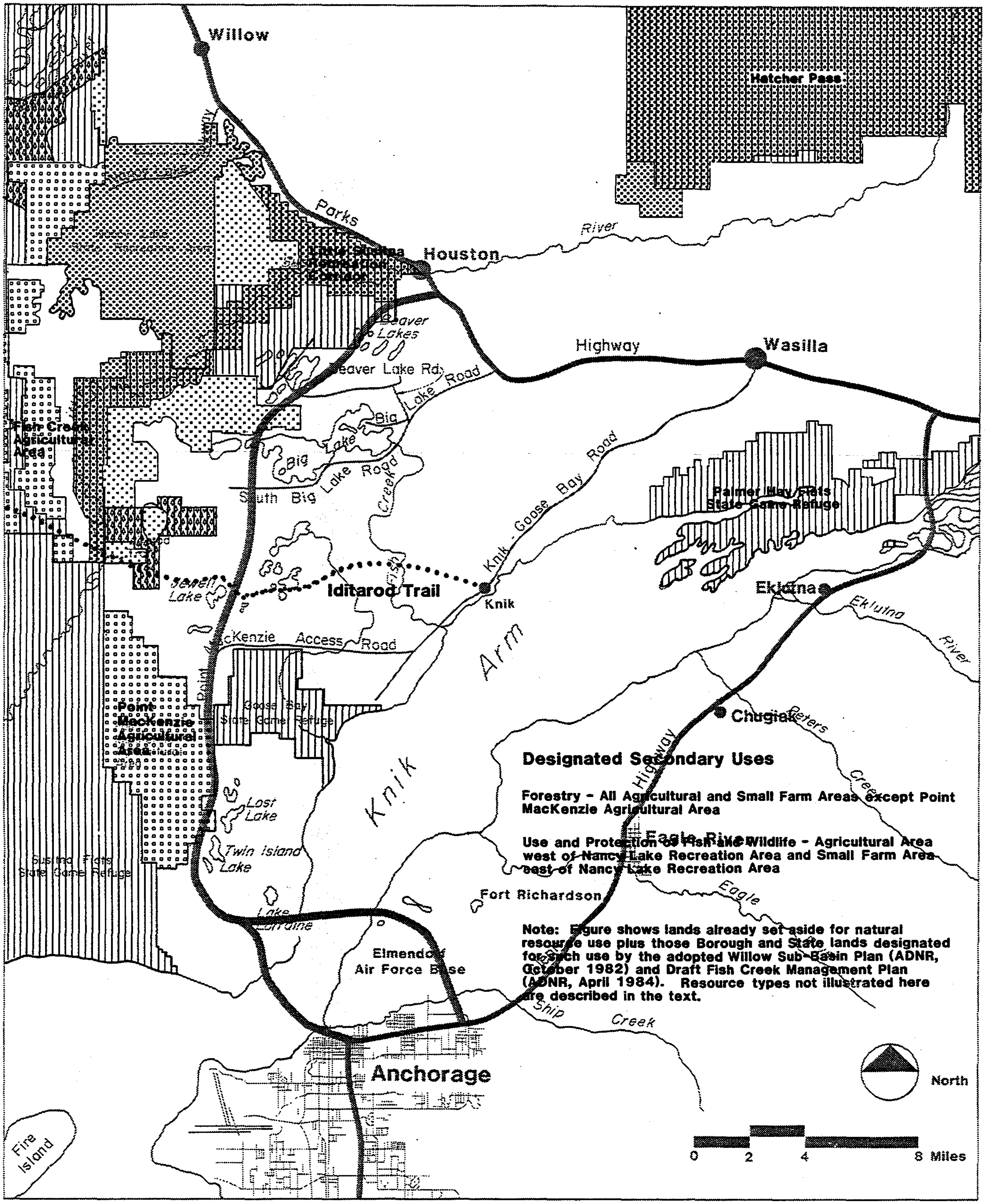
**Floodplains - Elmendorf AFB**




Farmlands of State and Local Importance

**Figure III-9**

## Farmlands of State and Local Importance




**Designated Primary Uses**

- Commercial Agriculture
- Small Farm
- Forestry
- Public Recreation
- Use and Protection of Fish and Wildlife

**Figure III-10**

**Natural Resource Development Lands**

Other Surface Resources. The project area is rich in timber, fish and wildlife, and recreation resources. There are abundant white spruce, black spruce, and cottonwood stands with the potential for firewood and some commercial timber production. However, the area imports lumber and does not meet the local demand for firewood. Commercial forestry requires large blocks of land with enough quality timber to assure long-term harvesting. However, forestry complements other resources; timber can be salvaged from lands cleared for agriculture and roads, logging roads provide access for recreation, and logging improves habitat for wildlife such as moose. Consequently, the Willow Sub-Basin Area Plan (ADNR, October 1982) designates high quality forest areas including areas north of the Point MacKenzie Agriculture Project and northwest of the Nancy Lake Recreation Area for timber production, and those areas eventually could support a few small mills. Forestry is listed as a secondary use (e.g., timber salvage) for the Little Susitna Corridor and for all agricultural areas except Point MacKenzie (Figure III-10).

The fish and wildlife resources in the project area are among the State's most abundant and diverse, and they are a significant economic resource. Due to the proximity to population centers, particularly Anchorage, these resources receive heavy utilization by recreation, commercial, and subsistence users. A fundamental issue for the Borough is the growing demand, with a simultaneous decrease in land available to support the resources. Consequently, the Willow Sub-Basin Area Plan (ADNR, October 1982) designates public recreation areas such as the Nancy Lake Recreation Area and numerous smaller sites, as well as the legislatively designated fish and wildlife use and protection areas such as Goose Bay State Game Refuge and Susitna Flats State Game Refuge, for use and protection of wildlife. This designation is listed as a secondary use of recreation areas and two agricultural areas (see Figure III-10).

Subsurface Resources. Subsurface resources in the project area include coal, oil and gas, lime, clay, and sand and gravel. Sub-bituminous coal is one of the principal nonmetallic resources in the Borough. Deposits underlie most of the project area, however the beds are deep, discontinuous, relatively thin, and appear to be uneconomical to develop. There are no active mines, and other rich deposits in the Susitna, Matanuska, and Beluga coal fields are more likely prospects for development within the next 10 to 20 years (ADNR, October 1982).

Producing oil and gas basins extend into the project area, so there is a potential for development. There are existing leases scattered throughout the project area, but there have been no commercial finds to date (ADNR, October 1982).

Gravel is another of the principal nonmetallic resources in the Borough. Glacial deposits of sand and gravel lie on both sides of Knik Arm, although many of the deposits are depleted or covered by urban and military development southeast of Knik Arm (ADNR, October 1982).

The majority of the State-owned subsurface deposits are open to exploration and development, but many of the designated recreation, agriculture, and settlement areas are closed to coal and/or metallic mineral development (ADNR, October 1982).

Western Alaska Resources. Opportunities for resource development also exist west of the project area. This includes all of the same resources that exist within the project area. The most promising for near-term development are coal, oil, and gas resources in the area of the Beluga River and Cook Inlet southwest of the Susitna River. Natural gas wells already operate, and a natural gas pipeline is being completed from that area to Anchorage. This is the only area west of the project area where the provision of road access is being considered in area planning.

Iditarod Trail

The Iditarod Trail system includes 1,500 miles of continuous trails that were used for the transportation of people and goods in the development of Alaska. The portion of the trail that is within the area of concern begins at the town of Knik and extends west for 15 miles where it meets the Little Susitna River; see Figure III-10. This portion is part of the "Knik to Susitna Station" segment which is a 20-mile trail from Knik to the Susitna River. Beginning at the town of Knik, the trail passes through lowland spruce hardwood forests, wetlands, and lakes. The segment ends at the Susitna River at the site of a deserted trading post and community. The condition of the trail varies from summer to winter, but it is impassable at many places when the ground is not frozen. Maintenance is done by volunteers and occurs in the winter in preparation for races. A survey was completed of this segment by the Alaska Department of Natural Resources (1983). This survey established the trail location for recreation purposes, however the trail location has varied over time. The historic location is not known in the area of the Houston Connector. The surveyed route is that which is used by recreationists and maintained by private interest; its location is based on what is thought to be the historical route as well as on topography, physical features, and land ownership. The trail passes through lands owned by the State, the Mat-Su Borough, and through private holdings. The intersection of the Iditarod Trail and the Houston Connector is between nine and ten miles west of Knik and is on privately-owned land.

The State Historic Preservation Officer, in a letter dated June 11, 1984 (see Appendix G), found the segment that would be crossed by the Houston Connector not eligible for the National Register because the historic trail location is unknown. The Federal Highway Administration has found that the point that would be crossed by the Houston Connector does not fall under Section 4(f) of the Department of Transportation Act of 1966 (see Chapter V, "Section 4(f) Requirements") because it is on privately-owned land.

Use of the trail is greatest in winter months by sled dog mushers, snowmachiners, and cross country skiers. The heaviest use occurs within the first 10 to 12 miles from Knik by sled dog trainers. The Iditarod Sled Dog Race, an international event, occurs on the trail in February or March of each year. Summer use occurs on dry portions of the trail and includes three-wheeling and hiking.

The only existing and planned facilities along the trail are directional signs. Intrepretive centers at the beginning and the end of the trail are in long-range trail management plans.

The trail is available for both pedestrian and motorized (snowmachine, three-wheeler) traffic and mostly is limited to winter use due to bog conditions along the trail. Users currently enter the trail at Knik and at several other connecting trails in the area.

Air Quality

Air quality is evaluated based on maximum pollutant concentrations in an area and their relation to ambient air quality standards (AAQS). State of Alaska and National AAQS are identical. Carbon monoxide (CO) and nitrogen dioxide ($NO_2$) are the two pollutants of primary concern from motor vehicles. The AAQS for CO are 35 parts per million (ppm) (1-hour average) and 9 ppm (8-hour average). These concentrations may be exceeded no more than once per year. The AAQS for $NO_2$ specify 0.05 ppm (annual average). Only CO standards are exceeded now in the project area and only within Anchorage.

CO concentrations are measured on a continuous basis by the Municipality of Anchorage at four locations in the Anchorage bowl. Available data, which include the months October through March, are summarized in Table III-14. October through March are the months when the highest CO concentrations are measured. High concentrations generally are due to light winds and stable atmospheric conditions which minimize dispersion of pollutants. These conditions generally occur in the winter months.

Data in Table III-14 indicate that, of the four monitoring sites, the highest CO concentrations were measured at the Benson Boulevard and Spenard Road site. The eight-hour AAQS was exceeded at all sites, however at the 7th and C street and Raspberry Road sites, this standard was exceeded only once in the 1982 to 1983 season. The 1-hour AAQS has been exceeded on a single day in December 1980 at the Benson and Spenard site and has not been exceeded at the other sites. Maximum concentrations generally are associated with morning and evening rush hour traffic when automobile emissions are greatest. It is difficult to detect any trends from the data in Table III-14. Differences from year to year may depend as much or more on meteorological conditions than on emissions.

An air quality monitoring program was conducted by Anchorage Municipal Power and Light Company at a site about 1/2 mile southeast of the intersection of the Glenn Highway and Muldoon Road. The maximum one-hour average CO concentration in 1982 was 6 ppm which is substantially less than maximum concentrations in the downtown area. The annual average $NO_2$ concentration measured in 1982 was 0.012 ppm, which is less than 25 percent of State and National AAQS. (Rob Wilson, U.S. Environmental Protection Agency, Seattle, personal communication).

Although monitoring data are not available, air quality north of Knik Arm in the Mat-Su Borough is considered better than in Anchorage because automobile emissions are much less. It is unlikely that AAQS are exceeded in this area. The Parks Highway is the primary generator of pollutant emissions in the northern part of the project area.

Table III-14

SUMMARY OF WINTER CARBON MONOXIDE CONCENTRATIONS
IN THE ANCHORAGE NONATTAINMENT AREA

| Site and Season[1] | Measured CO Concentrations (ppm) Mean | 1-Hr Maximum | 8-Hr Maximum | Days with Exceedance of 8-Hour Standard[2] |
|---|---|---|---|---|
| 16th and Garden | | | | |
| 1979-1980 | 2.2 | 25 | 18.9 | 12 |
| 1980-1981 | 2.7 | 23 | 17.1 | 17 |
| 1981-1982[3] | 2.4 | 21 | 15.6 | 12 |
| 1982-1983 | 3.2 | 26 | 14.9 | 22 |
| 7th and C | | | | |
| 1976-1977 | 2.7 | 21 | 11.5 | 4 |
| 1977-1978[4] | 3.3 | 23 | 16.0 | 18 |
| 1978-1979[4] | 2.8 | 21 | 13.1 | 5 |
| 1979-1980 | 2.1 | 33 | 16.5 | 9 |
| 1980-1981 | 1.9 | 20 | 12.9 | 4 |
| 1981-1982 | 2.2 | 16 | 10.0 | 3 |
| 1982-1983 | 2.4 | 15 | 9.1 | 1 |
| Benson and Spenard | | | | |
| 1978-1979[5] | 5.0 | 30 | 20.0 | 32 |
| 1979-1980 | 4.0 | 30 | 27.4 | 27 |
| 1980-1981 | 4.2 | 43 | 26.3 | 36 |
| 1981-1982 | 4.7 | 31 | 21.6 | 51 |
| 1982-1983 | 4.6 | 24 | 18.1 | 42 |
| 3340 Raspberry | | | | |
| 1980-1981 | 1.3 | 23 | 14.0 | 6 |
| 1981-1982 | 1.4 | 18 | 12.6 | 8 |
| 1982-1983 | 1.8 | 21 | 16.6 | 1 |

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1 Season includes October through March except where noted.
2 8-hour State and National Ambient Air Quality Standard is 9 ppm.
3 February missing.
4 October missing.
5 October and November missing.

The Municipality of Anchorage has an active program, presented in the Anchorage Air Quality Plan (Municipality of Anchorage, 1982a), to address air quality problems. Functions include air quality monitoring of CO, as discussed above, and input to transportation planning. A vehicle inspection and maintenance program has been approved by the Municipal Assembly and is scheduled to be implemented in July 1985. It is anticipated that this program will reduce automobile CO emissions through proper engine tuning. The plan's strategy to control air pollution also includes traffic signal improvements, street and highway improvement plans (see "Street and Highway Plans" in this chapter), encouraging carpooling and variable office hours, and public transit improvements.

Noise

To document the existing noise environment in the project area, noise levels were monitored at nine locations. As shown in Table III-15, at five of the locations the day-night sound level, $L_{dn}$, was measured. $L_{dn}$ is an average of the noise levels occurring during a full 24-hour period with a weighting of 10 decibels (dB) applied to those noises occurring during the hours of 10 p.m. to 7 a.m. At an additional four locations, the average sound level occurring during shorter periods (typically 10 to 30 minutes), $L_{eq}$, was measured.

Except for location 3 in Eagle River, aircraft noise (from military aircraft, light aircraft, and helicopters) is a major contributor to the noise environment. For those locations south of the Ship Creek area, the railroad, industry, and power plants are also major noise sources. Traffic noise is also important except for sites on Elmendorf AFB and at the locations on the Mat-Su Borough side of the Arm. At these locations (locations 1, 2, 8, and 9), in the absence of aircraft, noise levels are low.

Occasional artillery firing at Fort Richardson also affects the noise environment in the northeastern portion of Anchorage.

Additional detail on the noise measurement program is in Appendix E.

Visual

The project area can be divided into three landscape types of similar visual character. These are the Downtown/Ship Creek area, Elmendorf Air Force Base, and the Mat-Su Borough. The differences between these landscape types result from the presence and extent of manmade features and/or differences in the characteristics of natural features.

Downtown/Ship Creek. This area is highly developed with industrial and transportation uses occurring in the narrow valley formed by Ship Creek and the surrounding bluffs. Within the valley is the Ship Creek overlook at Ship Creek dam, a small park on the north edge of Ship Creek just east of the C Street viaduct. Views from this park are oriented primarily to the immediate park area and the Ship Creek dam where viewers watch salmon and water fowl.

Table III-15

SUMMARY OF NOISE MEASUREMENT RESULTS

| Location No. | Description | decibels (dB) | Major Noise Sources |
|---|---|---|---|
| 24-hour measurements ($L_{dn}$) | | | |
| 1 | Elmendorf AFB Hospital | 58 | Aircraft |
| 2 | Elmendorf AFB Housing Unit 24-334 | 63 | Aircraft |
| 3 | Residence, 136 Breckinridge, Eagle River | 68 | Traffic (Glenn Highway 100 feet away) |
| 4 | Alaska Native Medical Center | 65 | Traffic, Rail, Industry, Power Plant, Aircraft |
| 5 | Office, 211 H Street | 58 | Traffic, Rail, Construction, Industry, Aircraft |
| Short-Term Measurements ($L_{eq}$) | | | |
| 6 | Resolution Park | 60 | Traffic, Rail, Industry, Aircraft |
| 7 | Bartlett High School | 53 | Aircraft, Ventilation Equipment |
| 8 | Point MacKenzie Agricultural Area (Eastern Boundary) | 42 | Aircraft |
| 9 | South Big Lake Road | 52 | Aircraft |

The south facing bluff is covered with natural vegetation and has houses on its plateau. High quality scenic views from this plateau are directed to the west over Knik Arm; viewers include homeowners along Knik Arm and viewers from Brown's Point Park, a small park on the bluff above the Port of Anchorage. Southern views from the bluff are narrowed by vegetation on the slope and are focused on Ship Creek industry and the opposite slope and plateau.

Development on the north facing slope and plateau is both commercial and residential. High quality panoramic views are to the west and include Knik Arm and opposite shores, Mount Susitna, and the Alaska Mountain Range. The views are significant for business persons, shoppers, tourists, and users of the downtown area as well as for residents along the bluff. Tourists are directed to Resolution Park for its views of Knik Arm and the Alaska Range to the west and southwest.

Elmendorf Air Force Base. Much of the natural character in Elmendorf Air Force Base has been retained. The land is fairly flat but rises gently to the Elmendorf Moraine ridge. Dense vegetation of spruce, birch, and alder covers most of the area. There are several small lakes in the area that have a high recreation value and that provide diversity in the landscape. Man-made features include groupings of buildings, roads, powerlines, a gravel pit, and recreation facilities. These man-made features dominate the natural landscape only when they are in the foreground of views. Views of Knik Arm, the Mat-Su Borough, and the Alaska Range are possible from clearings on Elmendorf Moraine.

Mat-Su Borough. A uniform visual character is created by regular, gentle, and subtle changes in topography, similarity of vegetation, and the abundance of small lakes in the Mat-Su Borough. Man-made features are not a dominant element but are obvious features in the landscape where panoramic views exist. Clear cutting for agriculture, airstrips, powerlines, and roads breaks the uniform character of the landscape. The number of panoramic views is limited by dense foreground vegetation.

The clearing and development of the Point MacKenzie Agricultural project would change the visual character of that area to a rural/farmland character.

The Big Lake area is a visual unit within the Mat-Su Borough because of the size of the lake and the development around its perimeter. Recreational cabins, year-round homes, and small boat facilities line the shores of Big Lake and other smaller lakes in the area. Views of the lakes from their shores are a valued feature.

# Chapter IV

# ENVIRONMENTAL CONSEQUENCES

This chapter evaluates the environmental impacts of the Crossing and No-Crossing Alternatives. Positive and negative, direct and indirect, and short-term (generally construction) and long-term impacts are addressed. Planned measures to mitigate negative impacts are also described. The discussion is divided into three sections: Transportation impacts, social and economic impacts, and natural resource impacts. Cultural resource impacts are addressed in Chapter V, "Section 4(f) Evaluation". The impact of providing the structure necessary to later install rail on the bridge alternatives is discussed in Chapter VI.

## A. TRANSPORTATION IMPACTS

The following areas of interest are discussed under transportation impacts: Highway accessibility, travel volumes, traffic flow, freight movement, public transportation, pedestrians and bicyclists, and street and highway plans.

### Highway Accessibility

Long-Term. Accessibility is measured in terms of travel time and cost to reach an attractive destination. A transportation improvement would modify existing levels of accessibility by increasing or decreasing travel time or cost. A high utilization of a crossing would be a result of the increased accessibility which would be provided from Anchorage to many areas within the Mat-Su Borough.

Table IV-1 illustrates the 2001 travel times to several destinations with and without a crossing. The travel times reflect the number of minutes to travel between downtown Anchorage and several outlying areas and communities within the analysis area during the peak hour. Off-peak travel times would be faster than indicated in the table. Considerable travel time savings could be achieved to various areas in the Matanuska-Susitna (Mat-Su) Borough with a Knik Arm crossing. The Downtown Project generally would show the greatest amount of travel time savings.

Overall accessibility may be evaluated from either vehicle-miles of travel (VMT) or vehicle-hours of travel (VHT). Systemwide VMT and VHT for all alternatives for the years 2001 and 2010 is shown in Table IV-2.

The Downtown Project with a mid-range growth allocation (see "Urban Growth and Economic Development") would demonstrate the greatest improvement in accessibility by reducing VMT and VHT more than the other alternatives in both 2001 and 2010. This improvement would be attributable to two factors: (1) the allocation of dwelling units to the Point MacKenzie area in response to a crossing would reduce the average vehicle trip length compared to the No-Action Alternative which would have higher dwelling unit growth in the

Table IV-1

PEAK-HOUR TRAVEL TIMES FROM DOWNTOWN ANCHORAGE
TO OUTLYING COMMUNITIES IN 2001

| | No-Crossing Alternatives | | | Crossing Alternatives | | | |
|---|---|---|---|---|---|---|---|
| Community | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| Eagle River | 29 | 23 (-6) | 29 (0) | 27 (-2) | 28 (-1) | 28 (-1) | 27 (-2) |
| Peters Creek | 39 | 33 (-6) | 39 (0) | 36 (-3) | 37 (-2) | 37 (-2) | 37 (-2) |
| Palmer | 65 | 59 (-6) | 64 (-1) | 60 (-5) | 62 (-3) | 61 (-4) | 61 (-4) |
| Wasilla | 68 | 62 (-6) | 66 (-2) | 61 (-7) | 63 (-5) | 62 (-6) | 62 (-6) |
| Houston | 87 | 76 (-6) | 73 (-9) | 46 (-36) | 47 (-35) | 60 (-22) | 60 (-22) |
| Willow | 102 | 96 (-6) | 94 (-8) | 66 (-36) | 68 (-34) | 81 (-21) | 81 (-21) |
| Point MacKenzie Area | 110 | 104 (-6) | 40 (-70) | 12 (-98) | 12 (-98) | 28 (-82) | 28 (-82) |
| Big Lake Area | 87 | 81 (-6) | 70 (-13) | 45 (-42) | 46 (-41) | 59 (-28) | 59 (-28) |
| Knik Area | 93 | 87 (-6) | 56 (-37) | 29 (-64) | 30 (-63) | 45 (-48) | 44 (-49) |
| Fish Creek Area | 117 | 111 (-6) | 69 (-48) | 42 (-75) | 44 (-73) | 58 (-59) | 57 (-60) |

NOTES

Peak-hour travel time in minutes is shown.

Decrease in travel time due to congestion is included.

Peak hour, peak direction travel time would be greater; off-peak travel time would be less than average values shown.

2001 travel times are representative of average conditions during the 1990 to 2010 period.

All alternatives are measured from Glenn Highway at Seward Highway (Ingra/Gambell couplet).

Travel times include approximately 5.0 minutes terminal time (travel time to get from major roadway facility to the origin or destination).

Numbers in parentheses indicate change from No-Action Alternative.

Low, mid-range, and high refer to dwelling unit and growth allocation scenarios described under "Urban Growth and Economic Development"

Table IV-2

AVERAGE WEEKDAY DAILY VEHICLE-MILES OF TRAVEL (VMT)
AND VEHICLE-HOURS OF TRAVEL (VHT) BY YEAR

| | VMT (millions) | | | | | | VHT (millions) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Auto | | Truck | | Total | | Auto | | Truck | | Total | |
| | No. | Percent Change | No. | Percent Change | No. | Percent Change | No. | Percent Change | No. | Percent Change | No. | Percent Change |
| YEAR 2001 | | | | | | | | | | | | |
| NO-CROSSING | | | | | | | | | | | | |
| ° No-Action | 3.45 | - | .28 | - | 3.73 | - | 107.2 | - | 7.9 | - | 115.1 | - |
| ° Glenn/Parks Improvement | 3.45 | 0 | .28 | 0 | 3.73 | 0 | 104.9 | -2.1 | 7.6 | -3.8 | 112.5 | -2.3 |
| ° Hovercraft | 3.37 | -2.3 | .27 | -3.6 | 3.64 | -2.4 | 104.6 | -2.4 | 7.6 | -3.8 | 112.2 | -2.5 |
| CROSSING | | | | | | | | | | | | |
| ° Downtown (mid-range) | 3.29 | -4.6 | .26 | -7.1 | 3.55 | -4.8 | 99.6 | -7.1 | 7.3 | -7.6 | 106.9 | -7.1 |
| ° Downtown (high) | 3.46 | +.03 | .29 | +3.6 | 3.75 | +0.5 | 102.7 | -4.2 | 7.6 | -3.8 | 110.3 | -4.2 |
| ° Elmendorf (mid-range) | 3.44 | -0.3 | .27 | -3.6 | 3.71 | -0.5 | 105.6 | -1.5 | 7.4 | -6.3 | 113.0 | -1.8 |
| ° Elmendorf (low) | 3.33 | -3.5 | .26 | -7.1 | 3.59 | -3.8 | 100.9 | -5.9 | 7.2 | -8.9 | 108.1 | -6.1 |
| YEAR 2010 | | | | | | | | | | | | |
| NO-CROSSING | | | | | | | | | | | | |
| ° No-Action | 4.18 | - | .35 | - | 4.53 | - | 137.3 | - | 10.3 | - | 147.6 | - |
| ° Glenn/Parks Improvement | 4.18 | 0 | .35 | 0 | 4.53 | 0 | 133.7 | -2.6 | 9.9 | -3.9 | 143.6 | -2.7 |
| ° Hovercraft | 4.08 | -2.4 | .34 | -2.9 | 4.42 | -2.4 | 134.4 | -2.1 | 10.0 | -2.9 | 144.4 | -2.2 |
| CROSSING | | | | | | | | | | | | |
| ° Downtown (mid-range) | 3.80 | -9.1 | .32 | -8.6 | 4.12 | -9.1 | 119.8 | -12.7 | 8.8 | -14.6 | 128.6 | -12.9 |
| ° Downtown (high) | 4.01 | -4.1 | .34 | -2.9 | 4.35 | -4.0 | 127.9 | -6.8 | 9.6 | -6.8 | 137.5 | -6.8 |
| ° Elmendorf (mid-range) | 4.04 | -3.3 | .33 | -5.7 | 4.37 | -3.5 | 129.7 | -5.5 | 9.3 | -9.7 | 139.0 | -5.8 |
| ° Elmendorf (low) | 3.89 | -6.9 | .32 | -8.6 | 4.21 | -7.1 | 124.5 | -9.3 | 8.9 | -13.6 | 133.4 | -9.6 |

NOTES
VMT is shown in millions and VHT in thousands. Percent Change is relative to No-Action.
Low, mid-range, and high refer to the dwelling unit and employment allocation scenarios described under "Urban Growth and Economic Development".

Palmer/Wasilla area, and (2) development of a second route into Anchorage from the north would relieve traffic congestion on the Glenn and Parks Highways. The Downtown Project (high growth allocation scenario) would have approximately the same total VMT as the No-Crossing, No-Action Alternative. This would be due to the high growth scenario conclusion that dwelling units would not shift from the Palmer/Wasilla area to Point MacKenzie in response to a crossing. Rather, the high growth scenario indicates a shift in residential development to Point MacKenzie would come exclusively from the Anchorage bowl and the Eagle River/Chugiak area. Vehicle-miles of travel for trips originating in Point MacKenzie would be approximately the same as for trips within Anchorage.

The Glenn/Parks Improvement Alternative would result in no change in VMT when compared to No-Action due to unchanged traffic volumes. However, improvements would decrease travel time, producing a slight improvement in total VHT. The Hovercraft Alternative would produce improvements in both VMT and VHT.

Construction. Construction of the Downtown Crossing I/L Street ramps would have minimal impacts on local truck and auto traffic. Automobile traffic would be affected for a limited period during the construction of an L Street southbound ramp. This impact would be mitigated by designating a detour of southbound L Street traffic to H Street and 5th Avenue. The detour would not be required for more than a few days. Since all of the ramp construction would be elevated structure, much of it could continue without significantly impeding traffic.

Impacts associated with the construction of the Seward Connector would be more significant, but the same basic principles would apply. All of the construction near areas where traffic moves would be elevated structure and much of the structure would not be either within or above Municipal streets. Impact on local truck traffic would be expected in the area of the crossing at Warehouse Avenue. However, since the construction of elevated structure would be involved, much of the impact would come from local, short-duration detours around construction activity and from construction related traffic. There would be no long-term road closings.

The only significant traffic impacts associated with construction of the Elmendorf Crossing would occur during the construction of the Glenn Highway ramps. The major impact would result from construction of the northbound ramp where it crosses the highway. Lane closings would occur, and construction related traffic would interfere with Glenn Highway traffic flow. Impacts would be mitigated by not closing lanes during peak traffic periods. Temporary construction access roads on the edge of the right-of-way would be used to reduce construction-related traffic impacts.

Impacts on traffic during construction would be minor with the Houston Connector. Traffic would be allowed to pass through the construction zone at all times. The majority of this traffic would cross through the construction area at South Big Lake and Horseshoe Lake Roads.

Prior to construction of any of the alternatives, ADOT/PF would consult the Municipality, Borough, and military to develop a program that would minimize disruption to traffic on existing roadways during project construction.

Traffic Volumes

Average weekday daily traffic (AWDT) forecasts (which include both directions of travel) for 2001 and 2010 on key arterial roadways within the project area are presented in Table IV-3. The forecasts were developed by the project team (see Chapter IX) in cooperation with the Municipality of Anchorage according to the following procedural sequence:

1. Dwelling unit and employment forecasts were developed for 2001 and 2030 for small areas within Anchorage and the Mat-Su Borough as described under "Urban Growth and Economic Development". Four dwelling unit/employment scenarios that accounted for changes in growth allocation for residential development and residential-serving businesses due to improved accessibility to the Borough were determined and used for forecasting crossing traffic: (1) Downtown mid-range; (2) Downtown high; (3) Elmendorf mid-range, and (4) Elmendorf low. A single dwelling unit/employment scenario (current trends) was used to forecast traffic for all No-Crossing Alternatives.

2. Forecast trip generation rates (trip productions and attractions per dwelling unit, trips per employee) for the Anchorage bowl were obtained from the AMATS Long-Range Transportation Plan Update (Municipality of Anchorage, Community Planning Department, July 1983). Outside of the Anchorage bowl, trip generation rates reflecting the more suburban/rural character were developed based upon national averages (Transportation Research Board, [no date]) and travel survey data from Fairbanks.

3. A single No-Crossing and two Crossing highway networks were simulated by computer. Networks were developed at two different levels of detail:

   a. A regional network (connecting 20 sub-regional and five external areas) for forecasting corridor travel within the Anchorage bowl, Eagle River-Chugiak-Eklutna, and the road-served portion of the Mat-Su Borough from Palmer-Sutton west to Willow and south to Point MacKenzie

   b. The Anchorage Metropolitan Area Transportation Study (AMATS) network (356 traffic analysis zones) for forecasting arterial street travel within the Anchorage bowl

4. 2001 and 2030 traffic forecasts (AWDT) were modeled using the dwelling unit and employment forecasts, trip generation rates, and alternative networks described above. Travel demand was assigned to the shortest time path, reflecting anticipated congestion. Regional model forecasts for the crossing and the Glenn Highway were input to the AMATS model (Urban Transportation Planning System model) for calculating 2001 forecasts for the bowl.

Table IV-3

YEAR 2001 AND 2010 AVERAGE WEEKDAY DAILY TRAFFIC (AWDT) FORECASTS[1,2]
(Key Network Links)

| Link No. | Roadway (Location) | No-Action & Glenn/Parks Improvement 2001 AWDT | No-Action & Glenn/Parks Improvement 2010 AWDT | Hovercraft 2001 AWDT | Hovercraft 2010 AWDT | Downtown (Mid-Range) 2001 AWDT | Downtown (Mid-Range) 2010 AWDT | Downtown (High) 2001 AWDT | Downtown (High) 2010 AWDT | Elmendorf (Mid-Range) 2001 AWDT | Elmendorf (Mid-Range) 2010 AWDT | Elmendorf (Low) 2001 AWDT | Elmendorf (Low) 2010 AWDT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Parks Highway (from Willow north) | 3,100 | 3,900 | 3,100 | 3,900 | 3,300 | 3,900 | 3,400 | 4,100 | 3,200 | 3,900 | 3,200 | 3,800 |
| 4 | Parks Highway (just east of Big Lake Road) | 7,500 | 10,100 | 6,900 | 9,400 | 2,100 | 2,900 | 2,300 | 3,200 | 2,300 | 3,200 | 2,100 | 3,000 |
| 7 | Parks Highway (Glenn/Parks Highway junction to Wasilla) | 20,200 | 27,100 | 18,300 | 24,600 | 10,400 | 11,600 | 12,100 | 13,500 | 10,700 | 12,400 | 9,800 | 11,300 |
| 10 | Glenn Highway (from Palmer north) | 9,700 | 11,700 | 9,700 | 11,700 | 9,900 | 11,600 | 10,100 | 11,900 | 9,800 | 11,700 | 9,700 | 11,400 |
| 13 | Glenn Highway (Eklutna to Knik River) | 26,100 | 34,600 | 24,300 | 32,200 | 16,600 | 18,200 | 19,300 | 21,100 | 17,000 | 19,400 | 15,600 | 17,800 |
| 15 | Glenn Highway (Eagle River to Peters Creek) | 47,600 | 59,600 | 45,700 | 57,200 | 34,300 | 38,500 | 35,700 | 40,100 | 36,100 | 41,400 | 35,600 | 40,900 |
| 16 | Glenn Highway (Muldoon Road to Eagle River) | 66,800 | 80,400 | 64,900 | 78,100 | 50,900 | 57,100 | 51,200 | 57,500 | 53,600 | 60,900 | 54,000 | 61,300 |
| 19 | Houston Connector (Parks Highway to Horseshoe Lake Road) | 0 | 0 | 200 | 300 | 3,100 | 3,900 | 3,600 | 4,400 | 2,900 | 3,700 | 2,700 | 3,400 |
| 20 | Houston Connector (Horseshoe Lake Road to South Big Lake Road)[3] | 0 | 0 | 500 | 700 | 9,000 | 10,900 | 10,500 | 12,700 | 7,000 | 8,600 | 6,400 | 7,900 |
| 21 | Houston Connector (South Big Lake to Point MacKenzie Access Road) | 100 | 200 | 600 | 900 | 9,100 | 11,000 | 10,600 | 12,900 | 7,100 | 8,800 | 6,500 | 8,000 |
| 22 | Houston Connector (Point MacKenzie Access Road)[4] | 1,100 | 1,700 | 1,200 | 1,800 | 20,500 | 27,200 | 23,800 | 31,700 | 13,100 | 17,600 | 12,000 | 16,100 |
| 23 | Houston Connector (Point MacKenzie Access Road to Crossing) | 0 | 0 | 1,300 | 1,800 | 18,400 | 23,400 | 21,400 | 27,300 | 14,100 | 18,000 | 12,900 | 16,400 |
| 24 | Big Lake Road (Parks Highway to Big Lake Road) | 800 | 1,200 | 500 | 800 | 900 | 1,400 | 1,000 | 1,500 | 1,000 | 1,400 | 900 | 1,300 |
| 32 | Knik-Goose Bay Road (just south of Wasilla) | 4,400 | 6,500 | 3,100 | 4,500 | 400 | 600 | 400 | 600 | 300 | 500 | 300 | 500 |
| 35 | Point MacKenzie Access Road (east-west segment) | 2,000 | 2,900 | 1,000 | 1,500 | 1,400 | 2,600 | 1,600 | 3,000 | 1,200 | 2,200 | 1,100 | 2,000 |
| 36 | Glenn Highway (Boniface Parkway to Muldoon Road) | 67,000 | 83,000 | 67,000 | 83,000 | 50,500 | 57,600 | 56,900 | 64,900 | 69,800 | 84,400 | 69,100 | 83,600 |
| 37 | Glenn Highway (Bragaw Street to Boniface Parkway) | 54,200 | 67,200 | 54,200 | 67,200 | 47,300 | 54,400 | 52,600 | 60,500 | 65,800 | 78,900 | 59,000 | 70,800 |
| 38 | Northside Bypass (planned between Old Seward Highway and Bragaw Street) | 63,800 | 77,200 | 63,800 | 77,200 | 60,800 | 69,300 | 68,800 | 78,400 | 76,600 | 90,400 | 66,500 | 78,500 |

Table IV-3 (continued)

YEAR 2001 AND 2010 AVERAGE WEEKDAY DAILY TRAFFIC (AWDT) FORECASTS[1,2]
(Key Network Links)

| | | Alternative | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No-Action & Glenn/Parks Improvement | | Hovercraft | | Downtown (Mid-Range) | | Downtown (High) | | Elmendorf (Mid-Range) | | Elmendorf (Low) | |
| Link No. | Roadway (Location) | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT |
| 42 | 5th/6th Avenues (C Street to Seward Highway) | 42,100 | 49,700 | 42,100 | 49,700 | 40,600 | 46,700 | 41,000 | 47,200 | 42,000 | 49,200 | 44,400 | 51,900 |
| 43 | 5th/6th Avenues (L Street to C Street) | 31,900 | 38,600 | 31,900 | 38,600 | 35,300 | 40,300 | 35,500 | 40,500 | 32,000 | 37,100 | 31,500 | 36,600 |
| 44 | Muldoon Road (Glenn Highway to DeBarr Road) | 35,700 | 41,500 | 35,700 | 41,500 | 34,700 | 39,500 | 33,900 | 38,700 | 37,000 | 44,500 | 34,100 | 41,000 |
| 45 | DeBarr Road (Boniface Parkway to Muldoon Road) | 24,200 | 26,600 | 24,200 | 26,600 | 23,800 | 25,200 | 21,700 | 23,000 | 24,300 | 26,000 | 21,600 | 23,100 |
| 49 | 15th Avenue (Seward Highway to Lake Otis Parkway) | 21,400 | 22,000 | 21,400 | 22,000 | 19,000 | 19,600 | 18,600 | 19,100 | 22,900 | 23,600 | 22,700 | 23,400 |
| 50 | 15th Avenue (C Street to Seward Hwy.) | 20,000 | 21,800 | 20,000 | 21,800 | 17,400 | 19,100 | 17,600 | 19,400 | 20,800 | 23,600 | 19,300 | 21,800 |
| 52 | Muldoon Road (DeBarr Road to Northern Lights Boulevard) | 45,100 | 51,000 | 45,100 | 51,000 | 41,300 | 45,800 | 41,100 | 45,700 | 45,900 | 54,600 | 43,700 | 52,100 |
| 53 | Northern Lights Boulevard (Boniface Parkway to Muldoon Road) | 14,700 | 16,700 | 14,700 | 16,700 | 11,300 | 12,500 | 11,300 | 12,500 | 13,200 | 14,800 | 13,500 | 15,100 |
| 56 | Northern Lights Boulevard (Seward Highway to Lake Otis Parkway) | 22,900 | 23,800 | 22,900 | 23,800 | 20,100 | 20,900 | 18,700 | 19,400 | 21,900 | 22,800 | 22,800 | 23,700 |
| 58 | Northern Lights/Benson Boulevards Couplet (Minnesota Drive to C St.) | 44,500 | 47,200 | 44,500 | 47,200 | 44,200 | 46,800 | 43,000 | 45,600 | 44,600 | 47,700 | 50,700 | 54,200 |
| 60 | Muldoon/Tudor Roads (Northern Lights Boulevard to Boniface Parkway) | 39,400 | 45,300 | 39,400 | 45,300 | 36,500 | 40,900 | 35,000 | 39,200 | 39,600 | 46,400 | 37,300 | 43,600 |
| 61 | Tudor Road (Lake Otis Parkway to Boniface Parkway) | 64,300 | 74,500 | 64,300 | 74,500 | 60,600 | 67,900 | 57,600 | 64,500 | 67,100 | 78,500 | 65,900 | 77,100 |
| 62 | Tudor Road (Seward Highway to Lake Otis Parkway) | 54,300 | 61,400 | 54,300 | 61,400 | 57,500 | 63,200 | 53,800 | 59,200 | 60,700 | 68,600 | 55,400 | 62,600 |
| 63 | Tudor Road (Old Seward Highway to Seward Highway) | 57,000 | 64,400 | 57,000 | 64,400 | 52,500 | 58,300 | 55,000 | 61,000 | 56,300 | 63,600 | 57,500 | 64,900 |
| 64 | Tudor Road (C Street to Old Seward Highway) | 50,100 | 56,600 | 50,100 | 56,600 | 50,400 | 56,000 | 50,400 | 56,000 | 57,500 | 65,500 | 49,400 | 56,300 |
| 65 | Tudor Road (Minnesota Drive to C St.) | 33,500 | 35,800 | 33,500 | 35,800 | 38,100 | 40,800 | 37,900 | 40,600 | 38,900 | 43,900 | 33,000 | 37,300 |
| 68 | International Airport Road (Spenard Road to Minnesota Drive) | 23,100 | 26,600 | 23,100 | 26,600 | 19,800 | 22,500 | 19,400 | 22,200 | 19,900 | 22,900 | 19,700 | 22,600 |
| 69 | Boniface Parkway (Glenn Highway to DeBarr Road) | 26,700 | 32,800 | 26,700 | 32,800 | 23,400 | 27,400 | 23,400 | 27,400 | 22,400 | 26,400 | 27,400 | 32,400 |

Table IV-3 (continued)

YEAR 2001 AND 2010 AVERAGE WEEKDAY DAILY TRAFFIC (AWDT) FORECASTS[1,2]
(Key Network Links)

| | | Alternative | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No-Action & Glenn/Parks Improvement | | Hovercraft | | Downtown (Mid-Range) | | Downtown (High) | | Elmendorf (Mid-Range) | | Elmendorf (Low) | |
| Link No. | Roadway (Location) | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT |
| 70 | Boniface Parkway (DeBarr Road to Northern Lights Boulevard) | 26,900 | 30,100 | 26,900 | 30,100 | 21,100 | 22,700 | 19,700 | 21,200 | 21,100 | 23,000 | 27,900 | 30,400 |
| 73 | Bragaw Street (DeBarr Avenue to Northern Lights Boulevard) | 18,000 | 18,600 | 18,000 | 18,600 | 16,800 | 17,200 | 17,800 | 18,200 | 20,100 | 20,700 | 17,800 | 18,400 |
| 76 | Lake Otis Parkway (Northern Lights Boulevard to Tudor Road) | 24,200 | 25,400 | 24,200 | 25,400 | 17,100 | 17,900 | 16,800 | 17,700 | 22,700 | 23,800 | 24,100 | 25,300 |
| 77 | Seward Highway (5th/6th Avenues to 15th Avenue) | 40,200 | 47,000 | 40,200 | 47,000 | 52,500 | 60,400 | 54,300 | 62,500 | 49,100 | 56,500 | 42,600 | 48,900 |
| 78 | Seward Highway (15th Avenue to Northern Lights Boulevard) | 70,300 | 82,300 | 70,300 | 82,300 | 81,900 | 94,100 | 83,700 | 96,300 | 75,600 | 86,900 | 75,200 | 86,400 |
| 80 | Seward Highway (just north of Tudor Road) | 59,900 | 71,300 | 59,900 | 71,300 | 67,000 | 79,000 | 69,200 | 81,700 | 68,600 | 80,900 | 61,600 | 72,600 |
| 81 | Seward Highway (just south of Tudor Road) | 47,500 | 54,200 | 47,500 | 54,200 | 62,000 | 69,400 | 58,000 | 65,000 | 59,900 | 67,700 | 48,800 | 55,200 |
| 82 | Old Seward Highway (36th Avenue to Tudor Road) | 27,500 | 30,800 | 27,500 | 30,800 | 23,300 | 26,100 | 22,500 | 25,200 | 23,700 | 26,500 | 28,400 | 31,800 |
| 84 | C Street or A/C Couplet (5th/6th Avenues to 15th Avenue) | 30,200 | 34,500 | 30,200 | 34,500 | 24,500 | 27,900 | 23,900 | 27,200 | 27,300 | 31,100 | 29,700 | 33,900 |
| 86 | C Street (Northern Lights Boulevard to Tudor Road) | 42,800 | 46,600 | 42,800 | 46,600 | 29,500 | 31,800 | 27,900 | 30,100 | 34,000 | 37,100 | 41,600 | 45,300 |
| 88 | I/L Street Couplet (5th/6th Avenues to 15th Avenue) | 35,400 | 41,800 | 35,400 | 41,800 | 47,100 | 57,000 | 48,300 | 58,400 | 34,600 | 40,100 | 35,000 | 40,600 |
| 89 | Minnesota Drive (15th Avenue to Northern Lights Boulevard) | 30,100 | 35,600 | 30,100 | 35,600 | 37,200 | 45,000 | 36,800 | 44,600 | 34,700 | 40,200 | 30,800 | 35,700 |
| 90 | Minnesota Drive (Northern Lights Boulevard to Spenard Road) | 35,200 | 40,800 | 35,200 | 40,800 | 42,100 | 48,900 | 41,800 | 48,500 | 40,400 | 46,000 | 34,900 | 39,800 |
| 92 | Minnesota Drive (Northern Lights Boulevard to Tudor Road) | 35,700 | 40,800 | 35,700 | 40,800 | 38,200 | 43,200 | 38,000 | 43,000 | 39,000 | 43,300 | 35,200 | 39,100 |
| 93 | Minnesota Drive (Tudor Road to International Airport Road) | 33,600 | 37,600 | 33,600 | 37,600 | 38,900 | 43,500 | 38,300 | 42,900 | 40,600 | 45,500 | 32,700 | 36,700 |
| 94 | Spenard Road (Minnesota Drive to International Airport Road) | 27,200 | 31,600 | 27,200 | 31,600 | 29,600 | 34,300 | 29,800 | 34,600 | 27,200 | 31,300 | 26,500 | 30,400 |
| 101 | I/L Street ramps of Downtown Crossing | 0 | 0 | 0 | 0 | 19,400 | 25,900 | 22,000 | 29,400 | 0 | 0 | 0 | 0 |
| 104 | Seward Connector | 0 | 0 | 0 | 0 | 15,200 | 19,600 | 17,000 | 22,000 | 0 | 0 | 0 | 0 |
| 105 | Elmendorf Crossing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22,100 | 30,100 | 20,200 | 27,600 |
| 106 | Downtown Crossing | 0 | 0 | 0 | 0 | 31,500 | 42,300 | 36,500 | 49,000 | 0 | 0 | 0 | 0 |
| - | Hovercraft | 0 | 0 | 2,000 | 2,600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table IV-3 (continued)

YEAR 2001 AND 2010 AVERAGE WEEKDAY DAILY TRAFFIC (AWDT) FORECASTS[1,2]
(Key Network Links)

| | | Alternative | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No-Action & Glenn/Parks Improvement | | Hovercraft | | Downtown (Mid-Range) | | Downtown (High) | | Elmendorf (Mid-Range) | | Elmendorf (Low) | |
| Link No. | Roadway (Location) | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT | 2001 AWDT | 2010 AWDT |
| 201 | Dimond Boulevard (Minnesota Drive to C Street) | 35,400 | 40,000 | 35,400 | 40,000 | 30,600 | 34,500 | 28,800 | 32,600 | 31,500 | 35,600 | 38,200 | 43,200 |
| 202 | Dimond Boulevard (C Street to Old Seward Highway) | 50,900 | 57,500 | 50,900 | 57,500 | 48,600 | 54,900 | 47,600 | 53,800 | 50,000 | 56,500 | 49,600 | 56,000 |
| 203 | Dimond Boulevard (Old Seward Highway to Seward Highway) | 45,100 | 51,000 | 45,100 | 51,000 | 47,800 | 54,100 | 46,100 | 52,100 | 48,200 | 54,400 | 44,300 | 50,000 |
| 206 | Dowling Road (Old Seward Highway to Seward Highway) | 30,700 | 34,700 | 30,700 | 34,700 | 22,600 | 25,500 | 21,200 | 23,900 | 23,800 | 26,800 | 29,100 | 32,800 |
| 208 | Minnesota Drive (International Airport Road to Raspberry Road) | 36,900 | 41,700 | 36,900 | 41,700 | 41,500 | 46,900 | 40,500 | 45,800 | 42,200 | 47,700 | 36,500 | 41,200 |
| 210 | C Street (Dowling Road to Dimond Boulevard) | 43,700 | 49,400 | 43,700 | 49,400 | 34,500 | 38,900 | 33,600 | 38,000 | 36,600 | 41,400 | 41,300 | 46,600 |
| 212 | Old Seward Highway (Dowling Road to Dimond Boulevard) | 22,400 | 25,300 | 22,400 | 25,300 | 14,200 | 16,000 | 13,200 | 14,900 | 14,800 | 16,700 | 22,900 | 25,900 |
| 214 | Seward Highway (Dowling Road to Dimond Boulevard) | 54,800 | 61,900 | 54,800 | 61,900 | 68,900 | 77,900 | 70,200 | 79,300 | 70,000 | 79,100 | 57,300 | 64,800 |

[1] Includes both directions of travel.
[2] Low, mid-range, and high refer to the dwelling unit and employment growth allocation scenarios described under "Urban Growth and Economic Development".
[3] Burma Road if No-Action or Glenn/Parks Improvement.
[4] Point MacKenzie Access Road (existing north-south segment) if No-Action or Glenn/Parks Improvement.

Sources: 2001 and 2010 volumes (links 1 to 35 and 101 to 107) - Knik Arm Crossing project team, 1984; 2001 and 2010 volumes (links 36 to 94 and 201 to 215) - derived from Municipality of Anchorage traffic forecasts developed for the Knik Arm EIS.

5. Outside the Anchorage bowl, 2010 traffic forecasts (AWDT) were derived by interpolating 2001 and 2030 regional model forecasts (60 percent of the 2001 to 2030 demographic and traffic increase was assumed to occur by the year 2010). Within the Anchorage bowl, 2001 traffic forecasts for each link were factored up by applying regional modeled 2010/2001 ratios.

6. Although not presented in Table IV-1, 1990 traffic forecasts (AWDT) were estimated. These were interpolated from 1982 and 2001 volumes based upon 1990 dwelling units currently forecast by the Mat-Su Borough and Anchorage in the vicinity of each highway link. These forecasts were developed for the required year-of-completion air quality analysis.

The following discussion uses data presented in Table IV-3 to briefly describe some of the trends of each alternative on motor vehicle travel. The focus of this discussion is crossing volumes and changes in travel volumes on the Glenn and Parks Highways and on arterial streets within the Anchorage bowl. Traffic volumes in the project area would not differ significantly between the No-Action Alternative and the other two No-Crossing Alternatives.

<u>Downtown Project (Mid-Range)</u>. The Downtown Project with a mid-range allocation scenario would provide highly improved access between the Anchorage bowl and the southern portion of the Mat-Su Borough due to substantially lower travel times. Travel volumes on the crossing would be approximately 31,500 in 2001 and 42,300 in 2010. In the area outside the Anchorage bowl, traffic volumes along several major corridors would decrease as compared to the No-Crossing Alternative. Along the Parks Highway west of Wasilla, there would be reductions of approximately 48 percent and 57 percent in 2001 and in 2010, respectively. Along the Glenn Highway between Muldoon Road and Eagle River, decreases of approximately 24 percent and 29 percent would occur in 2001 and in 2010, respectively.

Within the Anchorage bowl, there would be significant reductions in traffic volumes on the Glenn Highway, Boniface and Lake Otis Parkways, and C Street between 5th Avenue and International Airport Road. Small reductions would occur along the Old Seward Highway between the Seward Highway and Tudor Road, and Muldoon Road between DeBarr Road and Northern Lights Boulevard. The 5th/6th Avenue Couplet between C Street and the Seward Highway would also experience a slight reduction in traffic volumes.

Two north-south arterial routes would receive significant increases in volume when compared to the No-Crossing Alternative. First, along the I/L Street Couplet, increases would be approximately 33 percent and 36 percent in 2001 and 2010, respectively. Along Minnesota Drive (I/L's extension) between 5th Avenue and Northern Lights Boulevard, traffic volumes would increase by 24 percent and 26 percent in 2001 and 2010, respectively. Second, traffic volumes along the Seward Highway would increase substantially. For example, the Seward Highway between 5th Avenue and Northern Lights Boulevard would increase an average of approximately 24 percent in 2001 and 22 percent in 2010. Other areas with slight volume increases would include Spenard Road, between Minnesota Drive and International Airport Road, and Tudor Road, between the Seward Highway and Lake Otis Parkway.

Downtown Project (High). - The Downtown Project with a high growth allocation scenario would be very similar to the Downtown mid-range since it would result in the same roadway network. Because higher growth outside the Anchorage bowl was assumed, changes in traffic volumes in this area would be slightly greater than those with a mid-range allocation. Travel volumes on the Crossing would be approximately 36,500 in 2001 and 49,000 in 2010. Traffic would decrease along the Parks Highway, west of Wasilla, by approximately 40 percent in 2001 and 50 percent in 2010. Traffic would decrease along the Glenn Highway between Muldoon Road and Eagle River by about 23 percent in 2001 and 29 percent in 2010.

Within the Anchorage bowl, impacts would be about the same as with a mid-range allocation. However, because the Crossing would produce slightly higher volumes, the I/L/Minnesota and Seward Highway increases would be slightly greater. Again, traffic would decrease on almost all other major streets and highways within the bowl. Significant decreases would occur on the Glenn Highway, C Street, and Boniface and Lake Otis Parkways.

Elmendorf Project (Mid-Range). The Elmendorf Project would produce a slightly greater travel time to the Anchorage bowl from the Mat-Su Borough than the Downtown Project. Therefore, traffic volumes on the Elmendorf Crossing would be lower. With a mid-range growth allocation scenario, they would be approximately 22,100 in 2001 and 30,100 in 2010. Compared to No-Action, traffic volumes along the Parks Highway west of Wasilla would be reduced by approximately 47 percent in 2001 and 54 percent in 2010. Along the Glenn Highway between Muldoon Road and Eagle River, traffic volumes would be reduced by about 20 percent in 2001 and 24 percent in 2010. These reductions would be slightly less than with the Downtown Project.

Within the Anchorage bowl, traffic volumes would be reduced slightly on some arterial streets such as Northern Lights Boulevard and Boniface Parkway. Traffic would increase slightly along the entire length of Muldoon Road and Tudor Road, a direct route from the Crossing to employment areas in the mid-town business district. Traffic would increase more significantly along portions of the Glenn Highway, the planned Northside Bypass, and the Seward Highway which also would lead to mid-town.

Elmendorf Project (Low). Only slight variances from Elmendorf mid-range would occur since the roadway network would be the same. Fewer vehicles would use the Elmendorf crossing due to the reduced residential growth which would occur in the Mat-Su Borough. Crossing volumes would be approximately 20,200 in 2001 and 27,600 in 2010. Compared to No-Crossing, traffic volumes along the Parks Highway west of Wasilla would be reduced by approximately 51 percent in 2001 and about 58 percent in 2010. Along the Glenn Highway, between Muldoon Road and Eagle River, traffic volumes would be reduced by about 19 percent in 2001 and 24 percent in 2010.

The effect on the Anchorage bowl would be similar, but slightly less than Elmendorf mid-range since a low growth allocation scenario was assumed. In addition, Northern Lights Boulevard west of the Seward Highway would experience some increase in traffic. For example, Northern Lights Boulevard between Minnesota Drive and C Street would have a traffic volume increase of approximately 15 percent in 2001 and 2010.

No-Crossing. Hovercraft would result in little change in traffic volume forecasts as compared to No-Action. However, traffic circulation patterns would be altered along roadways in the Knik/Goose Bay and Big Lake areas, which would lower forecast volumes on existing roadways. The Glenn/Parks Improvement would not alter forecast traffic volumes from those now forecast with No-Action.

Other Growth Changes. The traffic volumes presented above account for only the residential and residential-serving business change in growth allocation, the principal growth change presented under "Urban Growth and Economic Development". It was estimated that traffic volume on the Downtown bridge (mid-range growth scenario) would increase between zero and 3.7 percent (zero to 1,200 AWDT in 2001) by including the other categories of growth change. This increase would be small because, first most of the new jobs in the Borough would be taken by people choosing to live in the Borough, and second, there would be no net gain of jobs in Anchorage. There would be some additional traffic across the crossing from the Anchorage bowl to the new Mat-Su Borough jobs since travel time to the Borough would be low.

With the Elmendorf Project, mid-range, the change in crossing volume would be close to zero. The greater distance to Anchorage with an Elmendorf Project would increase the likelihood that almost all persons who would take the additional jobs in the Mat-Su Borough would live in the Borough.

Changes in traffic volumes within the Anchorage bowl would be minimal as a result of the additional crossing traffic volumes and growth changes. No significant impacts on traffic flow beyond those discussed in the next section would occur. For example, with the Downtown mid-range, approximately 280 AWDT would be added to existing traffic along the Seward Highway between 15th Avenue and Northern Lights Boulevard. This would represent an increase in traffic volume of less than one percent.

Effect of Bridge Toll. Traffic volumes on the crossings were estimated for several toll amounts. The 2001 Downtown bridge traffic (AWDT) would be about 31,500, 25,700, and 20,900 with tolls in each direction of $1.00, $2.00, and $3.00, respectively (1983 dollars, to estimate 1985 dollars add about 10 percent). The 2001 Elmendorf bridge traffic would be about 22,100 with a $1.00 toll, 17,700 AWDT with a $2.00 toll, and about 14,100 AWDT with a $3.00 toll. These forecasts assume mid-range growth scenarios.

For either Crossing, revenue would increase despite the increase in toll. It would take a toll over $3.00 (1983 dollars) to discourage enough drivers from using the Crossing that revenues would begin to decline.

Effect of Susitna Hydroelectric Project. Construction of the Susitna Hydroelectric Project would have minimal impact on traffic volumes currently forecast within the project area. Based on discussions with Alaska Power Authority and Susitna Hydroelectric Project staff, it was estimated that about 2,500 construction employees would commute to the project from Anchorage. Employees would work probably 10-day shifts with seven days off. Based on an average vehicle occupancy rate of 1.5 employees per vehicle and two one-way trips per vehicle, approximately 3,300 vehicle trips would occur over a 17 day period. Assuming about 50 percent more trips for service vehicles (trucks, etc.) to the project area, about 5,000 vehicle trips or approximately 300 AWDT would occur. This would be added either to the Glenn and Parks Highway traffic volumes with No-Crossing or to the Crossing traffic volumes.

Assuming this traffic demand would occur in 2001, the Downtown bridge mid-range volume would increase by approximately one percent to 31,800 AWDT. The Elmendorf bridge mid-range volume would increase by about 1.4 percent to 22,400 AWDT. Construction-generated traffic would end shortly after 2001. About 50 to 100 AWDT would be generated between Anchorage and the hydroelectric project by operating, maintenance, and recreational users at the dam after its completion.

Traffic Flow

This section addresses impacts that the alternatives would have on efficient operation of the regional highway system. The impacts were evaluated link-by-link using a level-of-service (LOS) rating system as defined in Table III-2. Levels-of-service A through C are considered acceptable traffic flows, while LOS D through F indicate unacceptable and progressively poorer traffic flow characteristics.

Figure IV-1 presents the traffic flow characteristics for each Crossing Alternative within the Anchorage bowl. No significant difference in traffic volumes and, therefore, traffic flow characteristics would occur between the No-Action and the other two No-Crossing Alternatives within the Anchorage bowl. Also, a sensitivity analysis was conducted to determine the impacts upon the Anchorage bowl of not providing a Seward Connector by year 2001 and 2010. Thus, all traffic to and from the Downtown Crossing would use only the I/L ramps for access to downtown Anchorage. The results also are shown in Figure IV-1. Only roads which would operate at LOS D, E, and F are shown on Figure IV-1. Those roadways for which the LOS is not shown would operate at LOS C or better. The traffic volume/capacity ratio (V/C) also is shown for each roadway link which would have an LOS D or worse.

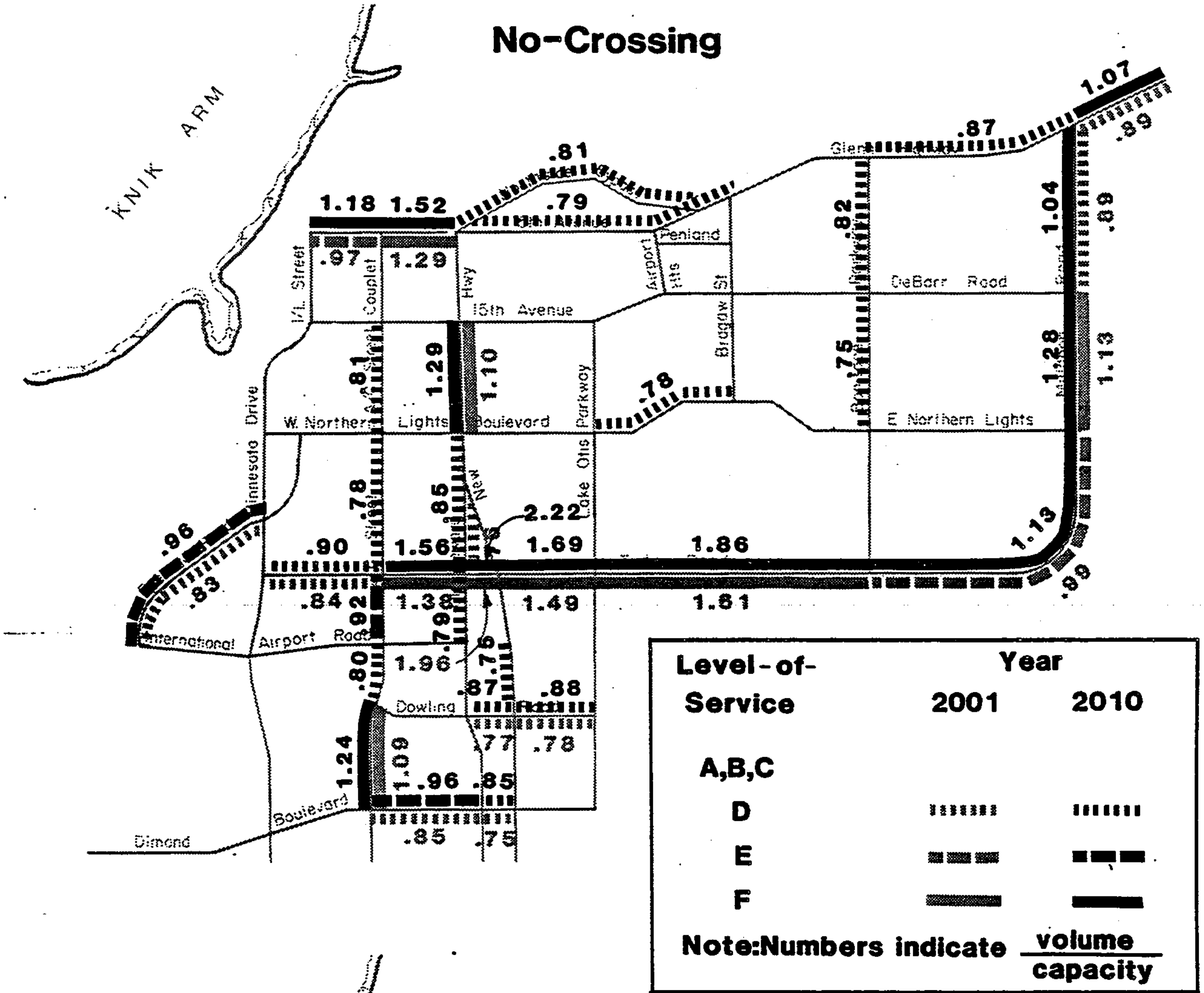
The following discussion summarizes differences between the Crossing Alternatives, Glenn/Parks Improvement, Hovercraft, and No-Action.

Flow on Anchorage Bowl Streets. Traffic flow changes in the Anchorage bowl for the Crossing Alternatives would be:

- Downtown/West Anchorage Bowl

  - Traffic flow along 5th/6th Avenues would be slightly worse with the Downtown Project. The impact would be greater without the Seward Connector. However, traffic would already operate at LOS E and F on 5th/6th Avenues with No-Crossing, indicating that measures would be necessary to improve traffic flow with or without a Crossing.

  - Traffic flow along the I/L Couplet and Minnesota Drive would worsen from LOS C or better to LOS D with the Downtown Project in 2010. Without the Seward Connector, most of the additional



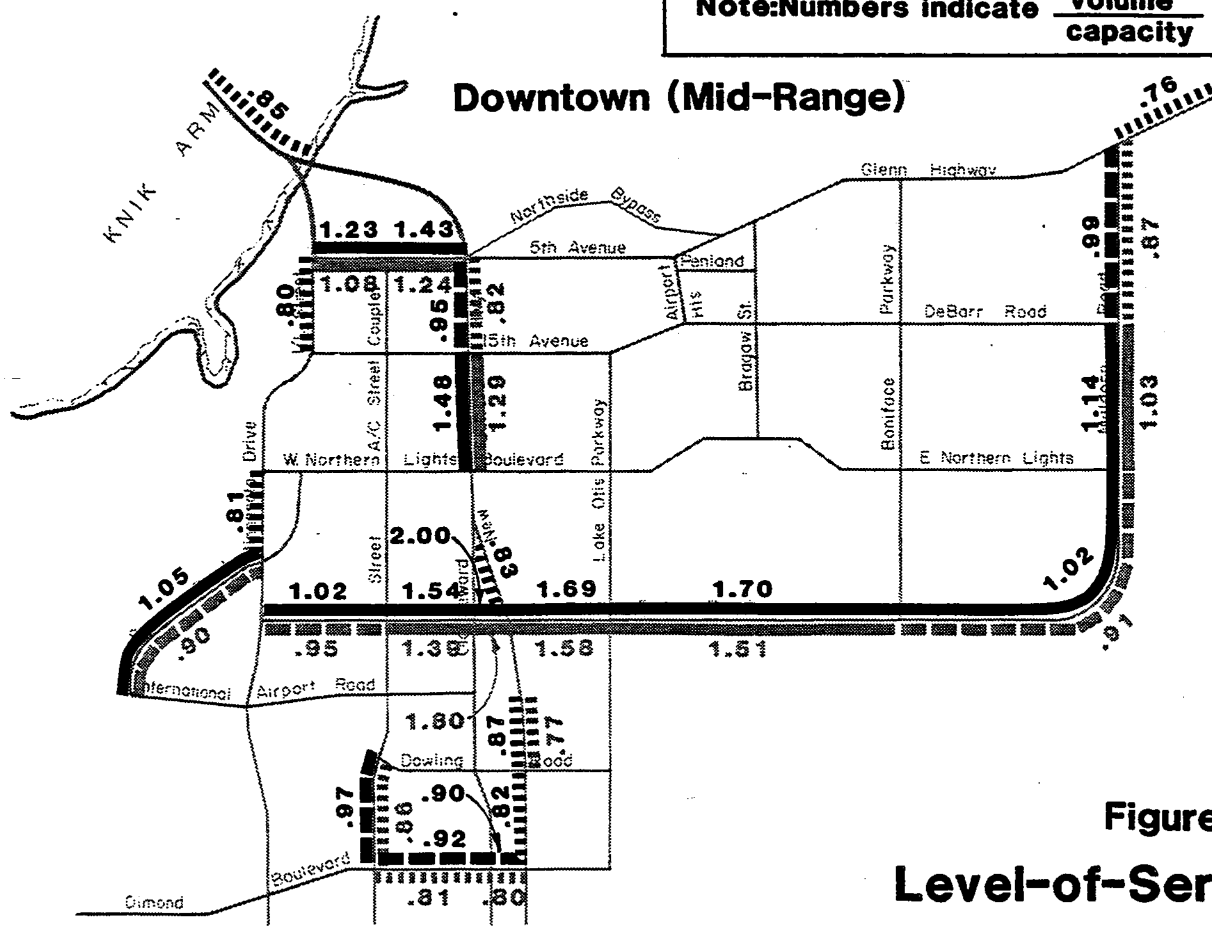
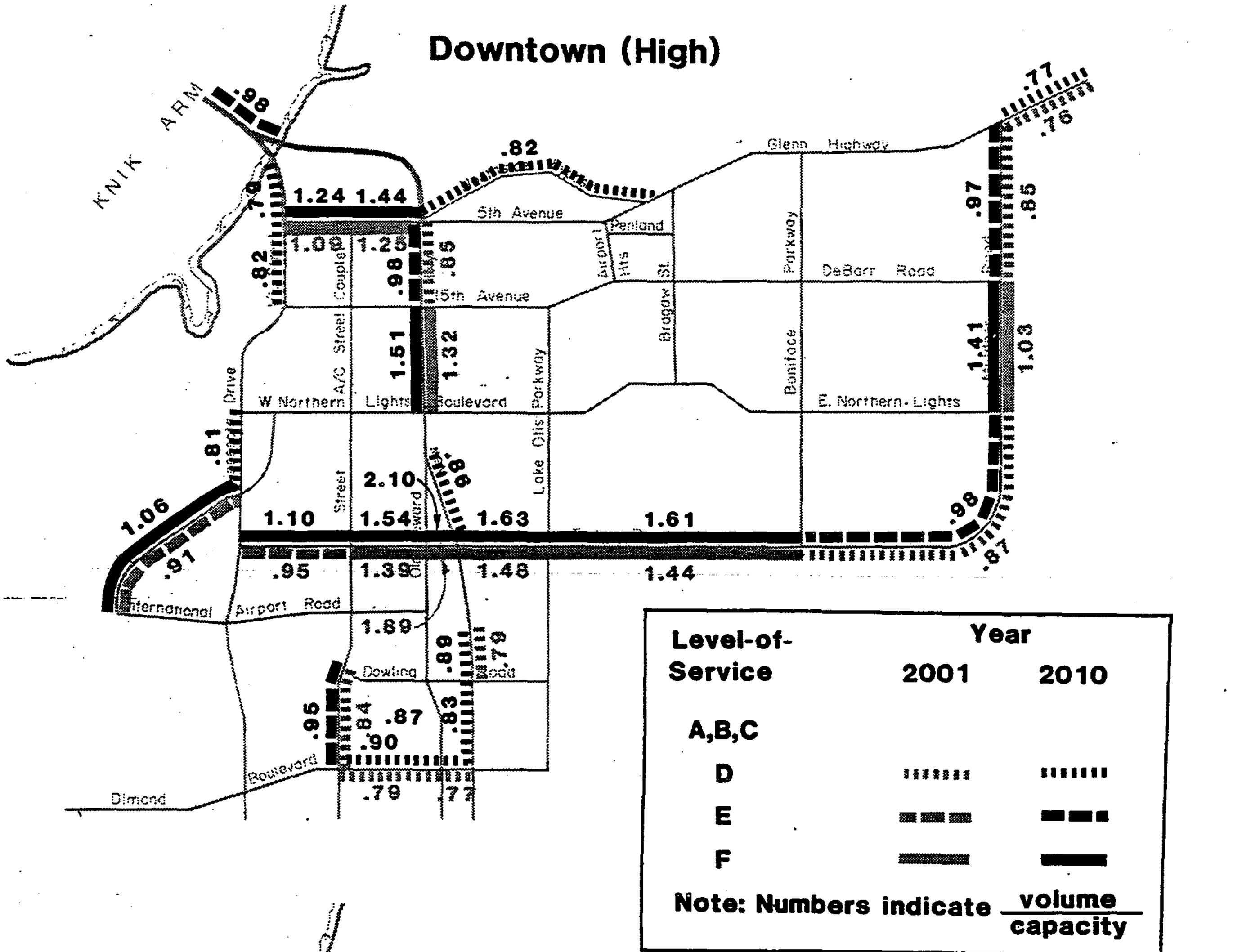




**Figure IV-1**

# Level-of-Service



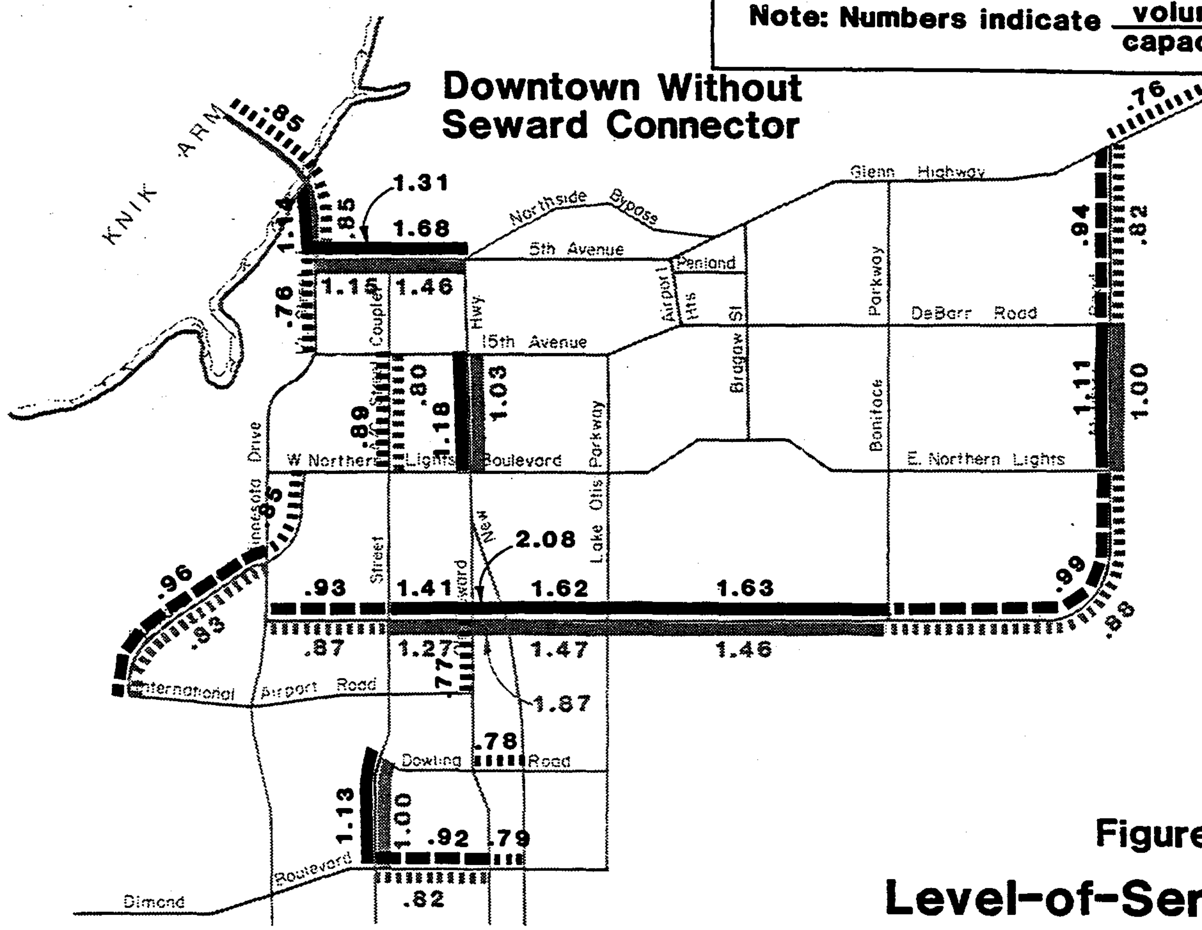
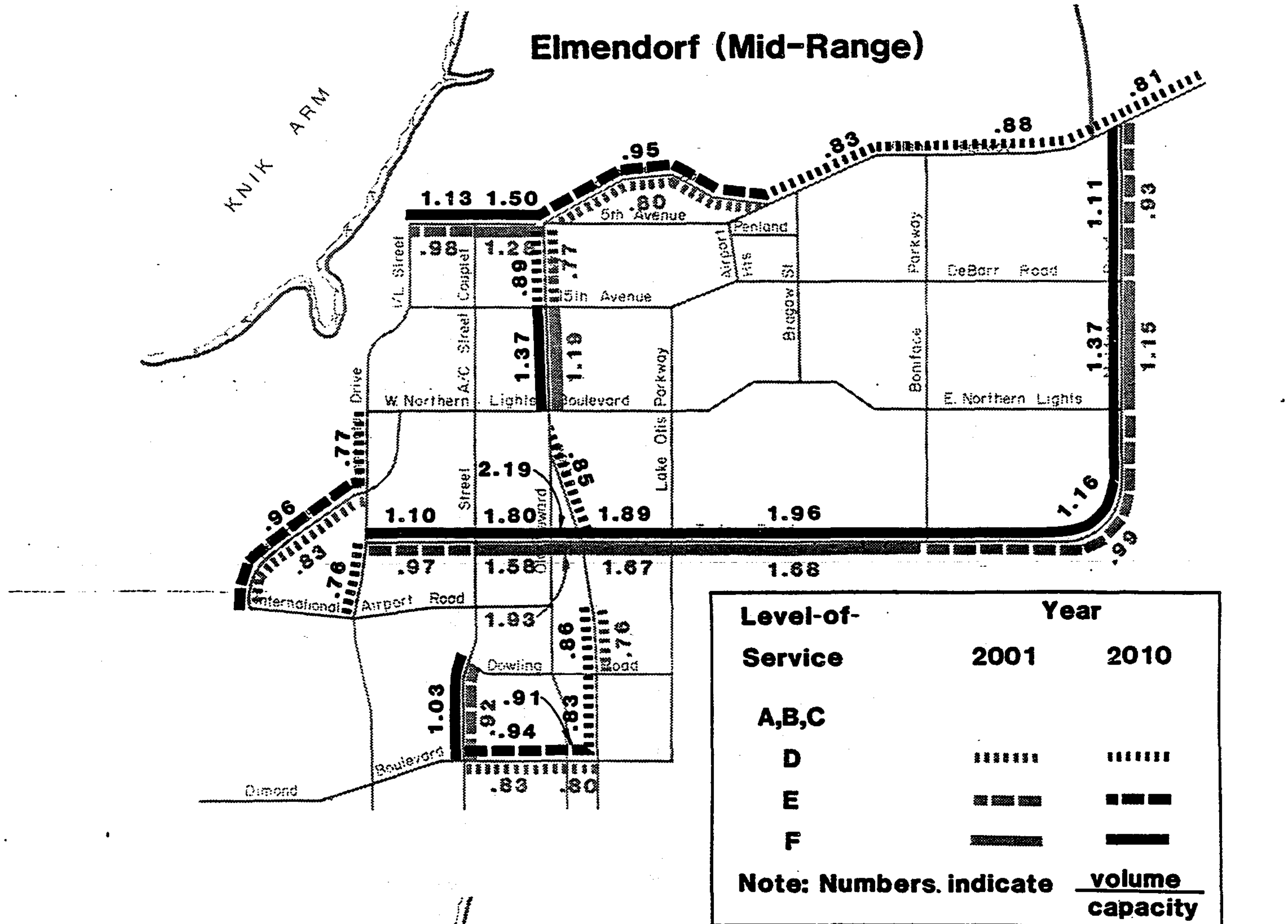




Figure IV-1

**Level-of-Service**



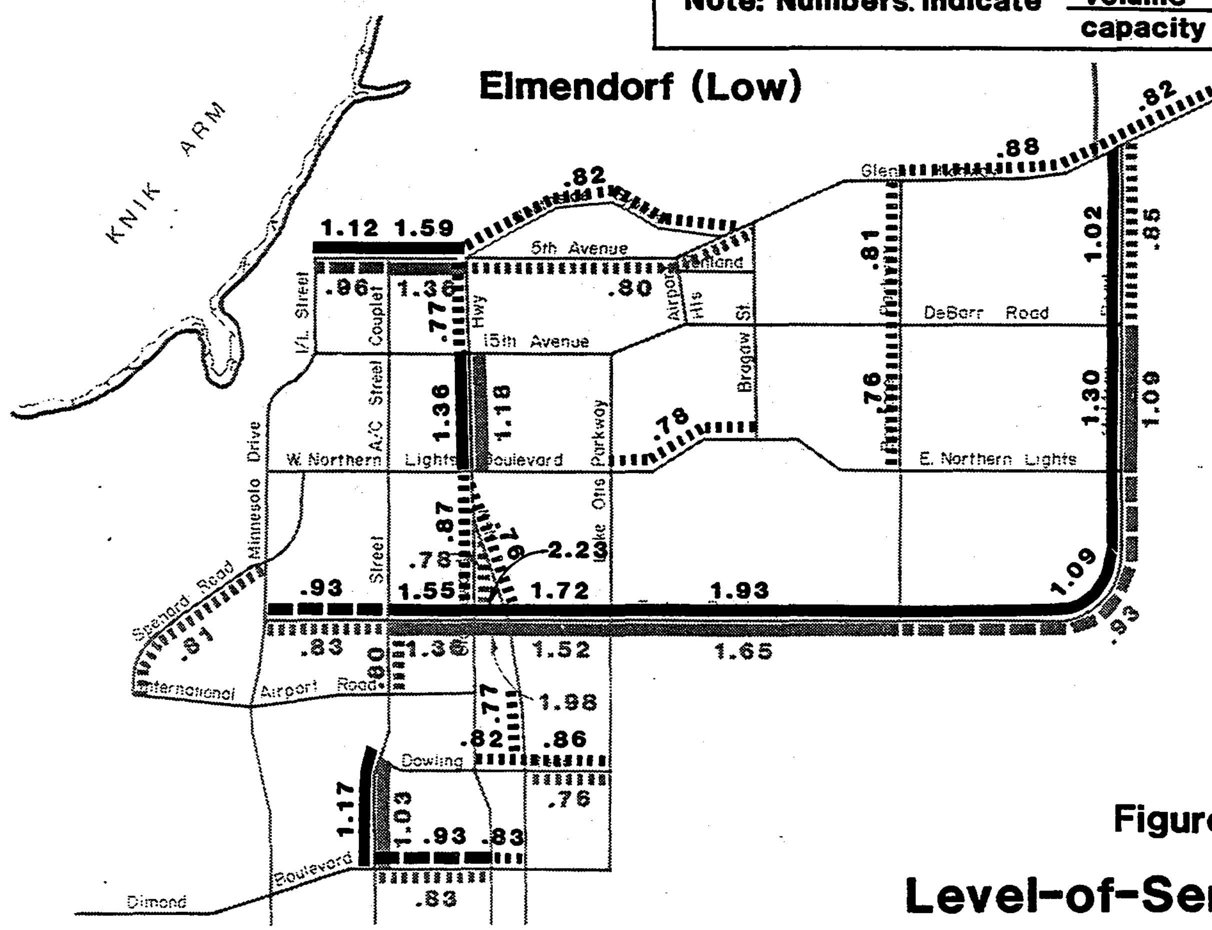




**Figure IV-1**

**Level-of-Service**

traffic would divert to the A/C Couplet through downtown instead of further increasing traffic on Minnesota Drive.

- The Downtown Project would slightly worsen the traffic flow along Spenard Road in 2001 and 2010. This would be a result of greater traffic volumes on Minnesota.

- Traffic flow along the A/C Couplet would improve with the Downtown Project except that without the Seward Connector, traffic flow would worsen slightly since it would be diverted from the I/L Couplet to the A/C Couplet.

- Traffic flow either would remain at acceptable levels with the Elmendorf Project or in the case of 5th/6th would remain at less than acceptable levels but improve slightly.

° <u>Central Anchorage Bowl</u>

- With the Downtown Project, traffic flow along the Seward Highway north of Tudor Road would be slightly worse than with No-Action. The Elmendorf (mid-range) would have somewhat less impact than the Downtown Project. The Downtown Project (without the Seward Connector) would result in improved traffic flow along the Seward Highway due to use by Crossing traffic of the I/L and A/C Couplets instead of the Seward Highway.

- Traffic flow along Tudor Road would be improved by the Downtown Project and slightly worsened with the Elmendorf Project. However, the traffic flow along Tudor Road would operate at LOS F with or without a Crossing and, therefore, would require measures to improve traffic flow characteristics in any case.

° <u>East Anchorage Bowl</u>

- Traffic flow along Muldoon Road would worsen slightly with the Elmendorf (mid-range), but would be improved with the Downtown Project.

- Boniface Parkway and the central Northern Lights Boulevard area would have improved traffic flow with any Crossing Alternative except the Elmendorf (low), which would cause similar traffic flow to the No-Action Alternative.

° <u>Far North Anchorage Bowl</u>

- Traffic flow along the Glenn Highway would be improved with the Downtown Project, but would not change significantly with the Elmendorf Project, although improvement on some links would be evident in 2010 with the mid-range growth shift.

- Traffic flow along the planned Northside Bypass would worsen slightly with the Elmendorf (mid-range) in 2001 and 2010. Traffic flow along this corridor would be improved with the Downtown (mid-range) even without the Seward Connector.

- **South Anchorage Bowl**

  - Traffic flow along C Street south of Tudor Road, when compared to the No-Action Alternative, would improve significantly with either the Downtown Project or the Elmendorf (mid-range) in 2001. In 2010, the improvement in LOS ratings would not be as significant.

  - Traffic flow along the Seward Highway south of Tudor Road would be slightly worse in 2001 and 2010 with either the Downtown Project or the Elmendorf (mid-range).

  - No major effects would be evident along Dimond Boulevard. Only slight LOS improvement would occur by 2010 with a Crossing.

Flow on Outside the Anchorage Bowl Highways. Traffic flow changes outside the Anchorage bowl for the Crossing Alternatives would be:

- **Parks Highway**

  Traffic flow along the Parks Highway between Wasilla and the Glenn/Parks Highway junction, which would operate at LOS F with No-Action, would be significantly improved with either a Crossing Alternative or the Glenn/Parks Improvement. In 2001, traffic flow would be maintained at LOS C or better with either the Downtown (mid-range), the Elmendorf Project, or the Glenn/Parks Improvement. Downtown (high) would improve traffic flow to LOS D. The Hovercraft Alternative would improve traffic flow only slightly; it would remain at LOS F.

  In 2010, traffic impacts would be similar to those in 2001, except that traffic flow would worsen to LOS D with either the Elmendorf (mid-range) or the Glenn/Parks Improvement.

- **Glenn Highway**

  Traffic flow along the Glenn Highway (LOS E north of Eagle River and LOS D south of Eagle River with No-Action) would be improved significantly with either a Crossing Alternative or the Glenn/Parks Improvement. Most alternatives would have LOS C or better in 2001. The Hovercraft Alternative would improve traffic flow only slightly. In 2010, traffic would operate at LOS F along this corridor with No-Action. Again, traffic would be improved significantly, to LOS D, with either a Crossing Alternative or the Glenn/Parks Improvement. The Downtown Project would provide the greatest improvement in Glenn Highway traffic flow; the Hovercraft Alternative would provide little improvement.

- **Houston Connector**

  Traffic along the Houston Connector would operate at LOS C or better with either the Elmendorf Project, the Downtown (mid-range), or Hovercraft in both 2001 and 2010. Traffic would operate at LOS D along most of the Houston Connector by year 2010 with Downtown (high), LOS C in 2001.

- Crossings

  All crossings would operate at LOS C or better in 2001. In 2010, the Downtown Crossing would operate at either LOS D (mid-range), or LOS E (high).

Area-wide Flow Change. Table IV-4 presents daily VMT (vehicle-miles of travel) in the project area and in only the Anchorage bowl for each alternative by LOS rating. This analysis indicates to what degree traffic flow within the project area would become better or worse compared to No-Action.

In the entire project area, for year 2001, the VMT at LOS F (the most unacceptable LOS rating) would be reduced by approximately 24 to 28 percent with any alternative except Hovercraft. For LOS D, E, and F combined, Downtown (mid-range) and Elmendorf (low) would show the greatest traffic improvement with a 64 percent reduction in VMT from No-Action. Either the Downtown or the Elmendorf Projects would have a VMT increase of 46 to 47 percent in LOS A, B, and C combined (the range of traffic flow rating considered to be acceptable).

In 2010, the Downtown (mid-range) would show the greatest VMT decrease in LOS D to F of approximately 29 percent. Thus, Downtown (with a mid-range growth allocation) would be most effective in improving overall traffic flow within the project area.

Within the Anchorage bowl, no change in LOS would occur with either Glenn/Parks Improvement or Hovercraft since travel demand and traffic volumes would not change from No-Action. In year 2001, Downtown (mid-range) would produce slightly more congested traffic than No-Action. The number of vehicles affected by congested traffic (VMT with LOS D to F) would not increase, however a significant shift would occur from LOS D to LOS E, indicating longer delays for those experiencing congested traffic. Elmendorf (mid-range) would result in a substantial increase in the number of vehicles affected by congested traffic.

In 2010, Downtown (mid-range) would cause a substantial decrease of approximately 20 percent in VMT in the LOS D to F category. Almost no change would occur with the Elmendorf Project.

Intersection Operational Efficiency. Table IV-5 presents a comparison of selected intersection volume-to-capacity (V/C) ratios by alternative for the year 2010. The V/C ratio would be an indication of the level-of-service (LOS) and operational efficiency of an intersection. As the V/C ratio would decrease, the LOS and the operational efficiency of the intersection would increase. The table compares the V/C ratios of each Crossing Alternative to the V/C ratios of No-Action by indicating the percentage of change. There was no change from No-Action to the other No-Crossing Alternatives. Forecast daily two-directional volumes from the Anchorage Metropolitan Area Transportation Study (AMATS) traffic model were

Table IV-4

DAILY VEHICLE-MILES OF TRAVEL (VMT) IN THOUSANDS
BY LEVEL-OF-SERVICE (LOS) RATING

| | No-Crossing Alternatives | | | | | Crossing Alternatives | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOS | No-Action | Glenn/Parks Improvement | | Hovercraft | | Downtown (Mid-Range) | | Downtown (High) | | Elmendorf (Mid-Range) | | Elmendorf (Low) | |
| PROJECT AREA | | | | | | | | | | | | | |
| 2001 | | | | | | | | | | | | | |
| A-C | 1,982 | 2,467 | (+24) | 1,921 | (-3) | 2,923 | (+47) | 2,903 | (+46) | 2,888 | (+46) | 2,956 | (+49) |
| D | 781 | 788 | (+1) | 770 | (-1) | 78 | (-90) | 373 | (-52) | 245 | (-69) | 155 | (-80) |
| E | 466 | 113 | (-76) | 457 | (-2) | 167 | (-64) | 81 | (-83) | 195 | (-58) | 108 | (-77) |
| F | 501 | 362 | (-28) | 493 | (-2) | 382 | (-24) | 378 | (-25) | 382 | (-24) | 371 | (-26) |
| D-F | 1,748 | 1,263 | (-28) | 1,719 | (-2) | 627 | (-64) | 832 | (-52) | 822 | (-53) | 634 | (-64) |
| Total | 3,730 | 3,730 | (0) | 3,640 | (-2) | 3,550 | (-5) | 3,735 | (0) | 3,710 | (-1) | 3,570 | (-4) |
| 2010 | | | | | | | | | | | | | |
| A-C | 1,742 | 1,742 | (0) | 1,681 | (-4) | 2,138 | (+23) | 1,531 | (-12) | 2,027 | (+16) | 1,987 | (+14) |
| D | 716 | 1,356 | (+89) | 718 | (0) | 1,274 | (+78) | 1,741 | (+143) | 1,420 | (+98) | 1,534 | (+114) |
| E | 74 | 74 | (0) | 74 | (0) | 89 | (+20) | 395 | (+433) | 251 | (+239) | 81 | (+9) |
| F | 1,998 | 1,358 | (-32) | 1,947 | (-3) | 619 | (-69) | 680 | (-66) | 673 | (-66) | 608 | (-70) |
| D-F | 2,788 | 2,788 | (0) | 2,739 | (-2) | 1,982 | (-29) | 2,816 | (+1) | 2,343 | (-16) | 2,223 | (-20) |
| Total | 4,530 | 4,530 | (0) | 4,420 | (-2) | 4,120 | (-9) | 4,347 | (-4) | 4,370 | (-4) | 4,210 | (-7) |
| ANCHORAGE BOWL ONLY | | | | | | | | | | | | | |
| 2001 | | | | | | | | | | | | | |
| A-C | 1,230 | 1,230 | (0) | 1,230 | (0) | 1,111 | (-10) | 1,124 | (-9) | 1,073 | (-13) | 1,216 | (-1) |
| D | 159 | 159 | (0) | 159 | (0) | 78 | (-51) | 162 | (+2) | 246 | (+55) | 155 | (-3) |
| E | 113 | 113 | (0) | 113 | (0) | 168 | (+49) | 81 | (-28) | 196 | (+73) | 108 | (-4) |
| F | 362 | 362 | (0) | 362 | (0) | 383 | (+6) | 377 | (+4) | 383 | (+6) | 371 | (+2) |
| D-F | 634 | 634 | (0) | 634 | (0) | 629 | (-1) | 620 | (-2) | 825 | (+30) | 634 | (0) |
| Total | 1,864 | 1,864 | (0) | 1,864 | (0) | 1,740 | (-7) | 1,744 | (-6) | 1,878 | (+2) | 1,850 | (-1) |
| 2010 | | | | | | | | | | | | | |
| A-C | 838 | 838 | (0) | 838 | (0) | 1,119 | (+33) | 957 | (+14) | 878 | (+5) | 770 | (-8) |
| D | 623 | 623 | (0) | 623 | (0) | 123 | (-80) | 303 | (-51) | 366 | (-41) | 649 | (+4) |
| E | 74 | 74 | (0) | 74 | (0) | 89 | (+20) | 184 | (+148) | 251 | (+239) | 81 | (+9) |
| F | 600 | 600 | (0) | 600 | (0) | 619 | (+3) | 514 | (-14) | 673 | (+12) | 607 | (+1) |
| D-F | 1,298 | 1,298 | (0) | 1,298 | (0) | 831 | (-36) | 1,000 | (-23) | 1,290 | (-1) | 1,337 | (+3) |
| Total | 2,136 | 2,136 | (0) | 2,136 | (0) | 1,950 | (-9) | 1,957 | (-8) | 2,168 | (+2) | 2,107 | (-1) |

NOTES
Numbers in parentheses are the percentage change from No-Action.
LOS signifies level-of-service. See Chapter II, Table III-2 for definition of level-of-service ratings.
Low, mid-range, and high refer to the growth allocation scenarios described in Chapter IV "Urban Growth and Economic Development".

Table IV-5

2010 INTERSECTION VOLUME TO CAPACITY RATIO (V/C) COMPARISON

| Intersection | No-Action | Downtown (Mid-Range) V/C | Downtown (Mid-Range) Percent Change | Downtown (High) V/C | Downtown (High) Percent Change | Elmendorf (Mid-Range) V/C | Elmendorf (Mid-Range) Percent Change | Elmendorf (High) V/C | Elmendorf (High) Percent Change |
|---|---|---|---|---|---|---|---|---|---|
| Boniface Parkway/Northern Lights Boulevard | 1.26 | 1.04 | -17 | 1.01 | -20 | 1.11 | -12 | 1.37 | +9 |
| DeBarr Road/Muldoon Road Road | 1.98 | 1.82 | -8 | 1.75 | -12 | 2.05 | +4 | 1.90 | -4 |
| Lake Otis Parkway/Northern Lights Boulevard | 1.03 | .84 | -18 | .80 | -22 | .93 | -10 | 1.02 | -1 |
| C Street/Tudor Road | 1.99 | 1.66 | -17 | 1.62 | -19 | 1.92 | -4 | 1.95 | -2 |
| 15th Avenue/Gambell Street | .97 | 1.00 | +3 | 1.02 | +5 | 1.09 | +12 | 1.00 | +3 |
| 15th Avenue/Ingra Street | 1.11 | 1.16 | +5 | 1.17 | +5 | 1.18 | +6 | 1.17 | +5 |
| C Street/Dimond Boulevard | 3.44 | 2.81 | -18 | 2.74 | -20 | 2.96 | -14 | 3.30 | -4 |
| Minnesota Drive/Northern Lights Boulevard | 1.16 | 1.31 | +13 | 1.29 | +11 | 1.25 | +8 | 1.23 | +6 |

NOTES

V/C signifies ratio of volume to capacity; see Table III-2 for relationship of V/C to level-of-service ratings.

Percent Change is relative to No-Action.

allocated by direction and turn movements, and then proportioned to the peak hour based upon current intersection traffic patterns. A critical movement analysis procedure was used to compute intersection V/C.

Most of the selected intersections would operate at LOS F, indicating a very poor efficiency needing substantial improvement. The Boniface Parkway/Northern Lights Boulevard, DeBarr Road/Muldoon Road, and Lake Otis Parkway/Northern Lights Boulevard intersections in the east Anchorage bowl would be improved with the Downtown Project while the Elmendorf Project would provide less improvement or a slight decrease in intersection efficiency.

In the central Anchorage bowl, the C Street/Tudor Road intersection V/C would be improved by approximately 17 percent with Downtown (mid-range) and 19 percent with the Downtown (high), while the Elmendorf Project would provide only marginal improvement (approximately two to four percent).

The Ingra/Gambell Couplet/15th Avenue intersections each would decrease slightly in operational efficiency with a Crossing. Elmendorf (mid-range) would cause the greatest V/C decrease of approximately 12 percent at 15th Avenue/Gambell Street and about six percent at 15th Avenue/Ingra Street.

In the south Anchorage bowl, the C Street/Dimond Boulevard intersection V/C would improve with any Crossing Alternative by approximately four to 18 percent, with Downtown (mid-range) causing the greatest improvement.

In the west Anchorage bowl, the Crossing Alternatives would decrease operational efficiency of the Minnesota Drive/Northern Lights Boulevard intersection V/C by about six to 13 percent, with Downtown (mid-range) causing the greatest decrease.

Although some improvements would occur with the Crossing Alternatives, none of the intersections in Table IV-5 would operate at an acceptable level-of-service, with or without a crossing, by the year 2010.

With some exceptions, traffic flow at intersections along streets which would be directly connected to Crossing access points would get worse, while the efficiency of intersections along streets which would not directly approach crossing access points would improve in 2010.

Area-Wide Traffic Mitigation. The following measures could be incorporated in area transportation planning to mitigate traffic congestion which would be caused by a Crossing Alternative. No measures would be required for either Hovercraft or Glenn/Parks Improvements.

1. Promote downtown Anchorage bypass route (Northside Bypass, see "Street and Highway Plan").

2. Continue promotion of transit and carpool/vanpool use - This measure would apply regionally, and particularly to the Glenn/Parks Highway and Crossing commute corridors.

3. Work to establish staggered or flexible work hour programs - This measure would help to reduce peak-hour traffic congestion within and outside the Anchorage bowl.

Other mitigating measures which would not be recommended include:

1. Earlier construction of the Seward Connector of the Downtown Project -- Although construction of the connector prior to 2001 would relieve traffic congestion in the vicinity of I/L Streets and along 5th/6th Avenues through downtown, construction would be scheduled to minimize competition for Federal-Aid Highway financing of projects within the 2001 Long-Range Transportation Plan for the Anchorage bowl (Municipality of Anchorage Community Planning Department, July, 1983).

2. Seward Connector interchange with A/C Couplet -- Although an interchange with the A/C Couplet would mitigate adverse impacts on I/L/Minnesota and on the Seward Highway, an A/C interchange would not be recommended since it would contribute to traffic congestion through the downtown area. An A/C interchange could be warranted if the Seward Highway improvement between Tudor Road and 3rd Avenue (see Chapter III, "Street and Highway Plans") was not built prior to the Seward Connector.

3. Implement a second couplet of east-west one-way avenues through downtown Anchorage, i.e., 7th/8th, 8th/9th, or 9th/10th -- A second set of one-way avenues would relieve 5th/6th Avenue traffic congestion which would be caused by construction of a Downtown Project without the Seward Connector. However, the Seward Connector would provide the needed traffic distribution without the disruption which would be associated with conversion to one-way avenues.

4. Increase the capacity of the Elmendorf Crossing/Oilwell Road interchange by providing directional ramps (no traffic signal) for southbound crossing traffic to eastbound Oilwell Road/Muldoon Road and for westbound Oilwell Road/Muldoon Road traffic to northbound crossing. Travel forecasts indicate directional ramps would not be warranted by 2010 unless Northside Corridor improvements were not built before the crossing.

Traffic Flow at Crossing Termini and Mitigation. The Glenn Highway would have adequate capacity at Muldoon Road/Oilwell Road to handle Elmendorf Crossing traffic. The same would be true at the Parks Highway end of the Houston Connector. However, modifications would be required to I and L Streets and 3rd Avenue for a Downtown Crossing. Modifications also would be required at Ingra and Gambell Streets at the end of the Seward Connector.

Street modifications that would accompany the Downtown Project are:

° Downtown Crossing (L Street southbound ramp):

  - The two-lane southbound ramp would enter L Street, adjacent to Resolution Park, at a slight angle.

- 3rd Avenue would continue to be one-way westbound. One lane of westbound traffic along 3rd Avenue would curve southbound onto L Street, along with the two ramp lanes, which would provide three lanes of traffic continuing south on L Street. The first L Street traffic signal would be at 5th Avenue except for the existing red flashers for westbound traffic approaching L Street along 4th Avenue.

- Parking would be removed along I Street between 3rd and 7th Avenues, along L Street between 3rd and 5th Avenues, and along the south side of 3rd Avenue between K and L Streets.

- Driveway access would be eliminated along L Street between 3rd and 5th Avenues.

- Northbound traffic would reach the Crossing from I Street, which would consist of four lanes at 3rd Avenue; two through lanes, a left-turn lane, and a right-turn lane.

- A traffic signal would be added to the I Street/3rd Avenue intersection.

- A free-right-turn lane would be provided for westbound traffic on 3rd Avenue turning onto the Crossing.

° Downtown Crossing (I Street southbound ramp):

- The two-lane southbound ramp would enter 3rd Avenue, between I and K Streets, with two free-right-turn lanes.

- Westbound 3rd Avenue traffic would be confined to a single one-way lane between I and L Streets. The 3rd Avenue traffic lane would join the two southbound ramp lanes and continue as three lanes turning south onto L Street. The first L Street traffic signal would be at 5th Avenue except for the existing red flashers for westbound traffic approaching L Street along 4th Avenue.

- Parking would be removed along I and L Streets between 3rd and 5th Avenues and along 3rd Avenue between I and K Streets. Driveway access would be eliminated along the same street segments except for the alley south of 3rd Avenue between K and L Streets.

- Northbound traffic would reach the Crossing from I Street the same as with the L Street southbound ramp.

- A traffic signal would be added to the I Street/3rd Avenue intersection.

- A free-right-turn lane would be provided for westbound traffic on 3rd Avenue turning northbound onto the crossing.

- Seward Connector (Gambell Street southbound ramp):

  - The two-lane southbound ramp would extend between the sites of two main buildings of the Alaska Native Medical Center. This alternative would not be implemented unless the Medical Center has moved. A free-right-turn lane would be provided onto 3rd Avenue for westbound traffic.

  - 3rd Avenue would continue to have one-way, westbound traffic. A free-right-turn and merge lane would be provided from 3rd Avenue to the northbound ramp.

  - Two northbound through-lanes would be provided on Ingra Street for traffic to the Crossing. There also would be a left-turn lane for traffic turning west onto 3rd Avenue.

- Seward Connector (Ingra Street southbound ramp):

  - The two-lane southbound ramp would be aligned parallel to the northbound ramp until it curves westward to provide two free-right-turn lanes into 3rd Avenue between Ingra and Hyder Streets. One through-lane and one optional through/left-turn lane would continue west on 3rd Avenue.

  - Westbound 3rd Avenue traffic would be restricted to one lane at Ingra Street. A traffic signal would be installed at 3rd Avenue and Ingra. West of Ingra, westbound 3rd Avenue traffic would merge with ramp traffic and be required to turn left at Gambell Street to avoid conflicts between through traffic and left turn traffic.

  - Two left-turn lanes would be provided for westbound 3rd Avenue traffic onto southbound Gambell Street (one lane would be an optional through-lane as noted above).

  - Two northbound through-lanes would be provided on Ingra Street for traffic to the Crossing. There also would be a left-turn lane for traffic turning west onto 3rd Avenue.

  - Traffic signals would be installed at 3rd Avenue and Ingra Street.

  - A free-right-turn and merge lane would be provided from 3rd Avenue onto the northbound ramp.

## Freight Movement

Two criteria were used to evaluate Project impact on regional freight movement: truck ton-miles traveled and truck vehicle-miles traveled. Both analyses based on these criteria indicate there would be significant benefit to truck movement between Anchorage and points north with a crossing and greater benefit from a Downtown Project than from an Elmendorf Project.

Table IV-6 presents truck freight movement between Anchorage and Willow by alternative (No-Crossing, Downtown Project, and Elmendorf Project) for 2001 and 2010. Local truck traffic was not included. Total tons (including container, neo-bulk, dry bulk, and liquid bulk freight movement), direction of freight movement (northbound and southbound), year, and length of route associated with each alternative were considered. It was assumed that the amount of transported freight tonnage would stay the same for each alternative, with only the routes changing. In each year, the Downtown Project would offer a 30 percent reduction in ton-miles and VMT, while the Elmendorf Project would provide a reduction of about 17 percent. These percentages also would represent time savings on the part of the operator.

Principal truck trip origins and destinations within Anchorage currently are concentrated in the Port of Anchorage, the industrial zone along Ship Creek and within the industrial zones along the Alaska Railroad between International Airport Road and Minnesota Drive. Intercity truck movement to and from these areas is principally along A and C Streets, emanating from the Port to 5th/6th Avenues and along 5th/6th Avenues and the Glenn Highway to the northeast, and along the Seward Highway through central Anchorage. The Downtown Project would provide direct truck access to the Ship Creek port and industrial area from interior Alaska (there would be no need to pass through downtown) and would encourage truck use of Minnesota Drive, particularly prior to Seward Connector construction. The Elmendorf Crossing would tend to encourage greater use of the planned Northside Corridor improvements and Seward Highway as truck routes.

None of the alternatives would affect freight movement by rail.

Public Transportation

Regional Transit Ridership. Table IV-7 indicates expected regional transit ridership in the year 2001, the latest year transit use has been forecast by Anchorage and Mat-Su planning agencies.

The Crossing Alternatives would reduce transit demand in the Anchorage bowl and Eagle River in proportion to the amount of growth that would shift to the Mat-Su Borough. A reduction in future transit demand would reduce the Municipality of Anchorage's need for additional transit routes and buses. The reductions in transit riders, shown in Table IV-6 for the alternatives under consideration, represent maximum anticipated reductions since many current and projected riders may be "captive" (without alternative transportation available). Although there is no current data on captive transit riders, many of them would reside in the Anchorage bowl rather than in the Borough because of their need for transit. Therefore, the reduction of transit riders with a Crossing Alternative might be less than shown in Table IV-7. With a Crossing Alternative, the Point MacKenzie and Big Lake areas would have increases in population great enough to justify transit service; see Table IV-7. Because of long travel distances, relatively good transit travel time, and cost competitiveness with the automobile, it is likely that an express bus system with few stops would develop. A local/feeder bus system would be less likely because of anticipated low population densities. Highway bus stops and park-and-ride lots at Houston

Table IV-6

TRUCK FREIGHT MOVEMENT
(Anchorage to 1.8 miles north of Willow)

| | Total Annual Tons (thousands) | Total Annual Ton-Miles (thousands) | Total Annual Truck Loads (Vehicles) | Total Annual Truck Miles (VMT) |
|---|---|---|---|---|
| YEAR 2001 | | | | |
| No-Crossing | 260 | 18,800 | 12,900 | 940,000 |
| Downtown Project | 260 | 13,100 | 12,900 | 650,000 |
| Elmendorf Project | 260 | 15,500 | 12,900 | 780,000 |
| YEAR 2010 | | | | |
| No-Crossing | 330 | 23,800 | 16,400 | 1,190,000 |
| Downtown Project | 330 | 16,600 | 16,400 | 830,000 |
| Elmendorf Project | 330 | 19,700 | 16,400 | 990,000 |

ASSUMPTIONS

20 tons average truck load.

Mileage measured from 1.8 miles north of Willow on Parks Highway to downtown Anchorage:

- No-Crossing - 72.7 miles
- Downtown Crossing - 50.6 miles
- Elmendorf Crossing - 60.1 miles

VMT denotes Vehicle-Miles of Travel.

Table IV-7

CHANGE IN
REGIONAL TRANSIT RIDERSHIP IN 2001
FROM NO-ACTION
(Daily One-Way Trips)

| | No-Crossing Alternatives | | | Crossing Alternatives | | | |
|---|---|---|---|---|---|---|---|
| | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| Anchorage Bowl | 102,900[1] | +0 | +0 | -5,150 | -9,050 | -3,600 | -1,850 |
| Eagle River/Chugiak | 9,200[1] | +0 | +0 | -500 | -700 | -300 | -100 |
| Palmer/Wasilla | 800[2] | +0 | +0 | +0 | +0 | +0 | +0 |
| Point MacKenzie/ Houston/Big Lake | 0 | +0 | +310 | +610 | +660 | +440 | +400 |
| Total | 112,900 | +0 | +310 | -5,040 | -9,090 | -3,460 | -1,550 |

NOTES
Low, mid-range, and high refer to the growth allocation scenarios described under "Urban Growth and Economic Development".

1 Source: Municipality of Anchorage, Community Planning Department, July 1983.
2 Source: DOWL Engineers, February 1983 (1988 projections extrapolated to 2001 based upon dwelling unit forecasts).

Connector intersections likely would be part of the express bus system. Based on current experience in the Anchorage bowl, Eagle River, and Wasilla/Palmer areas and their growth objectives, about eight percent of peak-hour trips from the Point MacKenzie and Knik/Goose Bay areas would be by bus. About four percent of peak-hour trips from the Big Lake/ Houston, Willow, and Fish Creek areas would be by bus. Virtually no transit demand would occur during non-peak periods.

Currently forecast transit demand from Wasilla and Palmer would not be significantly affected.

Comparing Mat-Su Borough transit ridership increases with decreases that would occur in the Anchorage bowl and Eagle River area, it can be seen in Table IV-7 that a Crossing Alternative would result in a net decrease in area-wide transit usage. This reduction would be due to the shifting of growth from the Anchorage bowl/Eagle River area to the Mat-Su Borough. Borough growth would be at a lower density, reducing the efficiency of transit service and creating a heavier reliance on the automobile for transportation. The Glenn/Parks Improvement and Hovercraft Alternatives would not significantly affect No-Action transit ridership. However, transit travel times from Palmer and Wasilla to Anchorage would be reduced by approximately six minutes with the Glenn/Parks Improvement and one to two minutes with the Hovercraft Alternative.

By 2001, approximately 310 passengers daily (without automobiles) would use the Hovercraft Alternative. Of those passengers, approximately 230 (or 75 percent) would utilize Hovercraft during the peak period, while about 80 passengers (or 25 percent) would ride during the off-peak period. Because bus transit service from Wasilla and Palmer would not change significantly with the Hovercraft Alternative, the Hovercraft riders would represent an increase in transit use between the Mat-Su Borough and the Anchorage bowl. Although transit service would not change significantly within the Anchorage bowl, some additional service in the form of shuttles for Hovercraft passengers to and from downtown would be required. Moreover, some of the Hovercraft passengers would transfer to Anchorage buses destined outside downtown.

<u>Transit Service Outside Anchorage Bowl</u>. Table IV-8 presents forecast transit use and vehicle requirements in 2001 on the Glenn Highway and the Crossing for the alternatives under consideration. No-Action requirements of 29 buses in the peak hour, peak direction on the Glenn Highway would not be reduced with either Hovercraft or Glenn/Parks Improvement. Bus requirements would be reduced only 2 to 14 percent by a Crossing Alternative. Peak-hour, peak direction bus flow would be one bus every two minutes, approximately, and about one-third of these buses would originate in the Mat-Su Borough and two-thirds in the Eagle River/Chugiak area.

Bus requirements on the Houston Connector with the Crossing Alternatives would be four to six buses in the peak-hour, peak direction, considerably lower than on the Glenn Highway. There would be only half the population and lower ridership rates along the Houston Connector compared to the Glenn Highway.

Table IV-8

GLENN HIGHWAY AND CROSSING TRANSIT USE
AND VEHICLE REQUIREMENTS, 2001

| | No-Crossing Alternatives | | | Crossing Alternatives | | | |
|---|---|---|---|---|---|---|---|
| | No-Action | Hovercraft | Glenn/Parks Improvement | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| GLENN HIGHWAY (Scalehouse) | | | | | | | |
| Daily Passengers | 5,000 | 5,000 | 5,000 | 4,500 | 4,300 | 4,700 | 4,900 |
| Buses in Peak Hour, Peak Direction | 29 | 29 | 29 | 27 | 26 | 28 | 29 |
| CROSSING | | | | | | | |
| Daily Passengers | - | 310 | - | 480 | 580 | 360 | 360 |
| Buses in Peak Hour, Peak Direction | - | 2 | - | 6 | 6 | 4 | 4 |

NOTES
Daily Passengers represents round-trips.
Assumes:
- AMATS 2001 transit ridership projections of 4,600 round trips from Eagle River area for No-Action (19 buses) (Municipality of Anchorage, Community Planning Department, July 1983).
- Ridership projections based on 1988 Mat-Su Borough Comprehensive Development Plan projections (400 round trips from Palmer and Wasilla and 10 buses by year 2001) (DOWL Engineers, February 1983).

Low, mid-range, and high refer to the growth allocation scenarios described under "Urban Growth and Economic Development".

The combined transit use on the Houston Connector and the Glenn Highway would be almost the same for any Alternative except Hovercraft, which would be higher, the reasons for which were discussed previously. However, more buses would be required with a Crossing Alternative to serve the same number of riders. Thus, a Crossing Alternative would reduce the efficiency and increase the cost of non-Anchorage bowl transit service.

Auto Use in Congested Areas. Auto use would increase with a Crossing because of the growth shift from Anchorage to the Mat-Su Borough and the more limited availability of Mat-Su transit. However, several factors would limit increases in auto commuting and parking demand in downtown Anchorage:

° Average vehicle occupancy would increase with length of trip; potential for carpooling would be increased.

° Many current and projected transit riders are transit "captives" and would remain in the Anchorage bowl. Experience in other cities shows that those dependent on transit would tend to live close-in to employment.

° A bridge toll would constitute an incentive for transit and carpool use and a dis-incentive for single occupant auto use. Toll discounts or free passage could be offered to buses and carpools as an even greater incentive for use of high occupancy vehicles.

Transit Subsidy. Most transit systems require substantial financial subsidy. Should ridership decrease due to a Knik Arm Crossing, expenditures would be adjusted so the subsidy per rider would be unchanged. (Anchorage transit staff, personal communication, June 1984).

Mitigation of Transit Impacts. Bus service would complement any Crossing or No-Crossing Alternative, and would contribute to achievement of regional transportation and air quality objectives. The Crossing Alternatives would be designed to accommodate bus service, although funding of buses and bus operations would not be a part of the crossing project. Table IV-9 lists measures that would be incorporated with each alternative to promote transit usage and thus mitigate anticipated reductions in transit use.

Pedestrians and Bicycles

Currently, there are no provisions for pedestrians and bicycles planned with any of the alternatives. Both the Downtown and Elmendorf Projects would be constructed as limited-access facilities. The Houston Connector would have sufficient right-of-way for the addition of pedestrian and bicycle facilities at a later date. This would be the only location with provision for future pedestrian and bicycle facilities. Provision of a pedestrian/bicycle lane across either bridge would be prohibitively expensive. An 8-foot-wide lane would cost about $20 million for either alternative.

Table IV-9

MITIGATION OF TRANSIT IMPACTS

| Mitigating Measure | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Hovercraft | No-Crossing Alternatives: Glenn/Parks Improvement | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| Sites for park-and-ride lots in right-of-way | - | - | - | K | K |
| Bus/carpool turnouts at highway interchanges | - | - | G | K | K |
| Bus/carpool toll lanes at toll booths | - | - | - | K | K |
| Bus/carpool preferential parking | - | K | - | - | - |
| Sites for ramp metering with preferential bus/carpool lanes entering freeway right-of-way | - | - | G | - | - |

NOTES

G signifies Glenn/Parks Highway Corridor.
K signifies Crossing/Houston Connector.

Pedestrian and bicycle movement within the Anchorage bowl would not be affected significantly by either Crossing Alternative because current and planned bicycle and pedestrian trails would remain separated from major traffic flow. There would be two exceptions. First, the Downtown Project would increase traffic at 3rd Avenue and L Street which would inhibit pedestrian access to Resolution Park. Additional details on this impact and mitigating measures are included in Chapter V, "Section 4(f) Evaluation". Second, a coastal trail has been proposed that would pass through the area where the I and L Street ramps of the Downtown Crossing would be located. Additional detail on impacts is included in "Land Use Plans".

The only impact outside the Anchorage bowl would result from the Glenn/Parks Improvement Alternative. This alternative would affect the bikepath that follows the Glenn Highway for seven miles from Eagle River to just east of the North Birchwood interchange. Widening the northbound lanes of the Glenn Highway would result in the loss of the length of the bikepath. However, the widening project would include replacement of lost portions of the bikepath by re-constructing it within the highway right-of-way. The new bikepath would equal or improve upon the existing conditions such as separation from the highway, grades, surfacing, and width. It would be separated from the highway by a buffer where possible. During construction, the bikepath would be closed to users for up to two seasons.

Street and Highway Plans

Table IV-10 lists impacts which would occur to the major planned street and highway improvements (noted in Chapter III, Table III-4) as a result of the alternatives under consideration. Those improvements which would incur no significant impacts are not included in the table. The improvements listed would be consistent with the No-Action Alternative. The Hovercraft and the Glenn/Parks Improvement Alternatives would not affect current street and highway plans with two exceptions. First, Hovercraft would incorporate a Houston Connector, and impacts attributed to the Houston Connector in Table IV-10 thus also would occur with Hovercraft. Second, the road widening included in the Glenn/Parks Improvement would slightly alter the design of the entrance to the Eklutna Frontage Road described in the AMATS Transportation Improvement Program, FY 84 (ADOT/PF, September 1983) and scheduled for construction in 1985.

Table IV-10 indicates that none of the Crossing Alternatives would have significant impacts on most street and highway improvements planned within either the Anchorage bowl and Mat-Su Borough. Although some roadways would experience a decrease in traffic volume as a result of a crossing, the decrease would not be significant enough to eliminate need for the planned improvement. Neither would the traffic volume reductions justify reducing the level of improvement of those projects. However, with either a Crossing or the Glenn/Parks Improvement, traffic flow on the Parks Highway east of Wasilla would be improved sufficiently to delay need for a Wasilla Bypass until well after 2001.

In addition to the above street and highway plans, the Seward Connector would affect some of the alternatives being considered as a part of ADOT/PF's Major Corridors Study:

Table IV-10

CROSSING IMPACTS ON MAJOR STREET AND HIGHWAY PROJECTS

| Plan/Improvements | Crossing Alternatives: Downtown | Crossing Alternatives: Elmendorf |
|---|---|---|
| AMATS Transportation Improvement Program FY 84 | | |
| ° Glenn Highway-Muldoon Road to Eagle River - Widen the Glenn Highway from 4 to 6 lanes. | Traffic reduced; no impact on design. | Traffic reduced; no impact on design. |
| Long-Range Transportation Plan (LRTP) For the Anchorage Bowl 1983 - 2001 | | |
| ° Glenn Highway-Northside Corridor - This 2.3 mile 6-lane facility from approximately Hyder Street to Bragaw Street, north of the Glenn Highway/5th/6th Avenue corridor would provide an upgraded route connecting the Glenn Highway and the Seward Highway corridors. (Also one alternative in ADOT/PF Major Corridors Study.) | Traffic reduced; see Major Corridors Study discussion in text for design impact. | Traffic would increase with mid-range growth scenario; no design impact. |
| ° Seward Highway Corridor - 3rd Avenue to Tudor Road - upgrade this corridor to a 6-lane, grade-separated highway with major interchanges at 36th Avenue, Benson/Northern Lights Boulevards, 15th Avenue and other avenues north to 3rd Avenue. The highway would follow approximately its current alignment between Tudor Road and 15th Avenue and then along Hyder Street between 15th and 3rd Avenues. (Also one alternative in ADOT/PF Major Corridors Study.) | Some change in directional flow of traffic; see Major Corridors Study discussion in text for design impact. | Some change in directional flow of traffic; no impact on design. |
| ° Seward Highway Corridor Extension - This 1-mile, 4-lane facility would connect the Seward Highway to the Northside Corridor. (Also part of one alternative in ADOT/PF Major Corridors Study). | See Major Corridors Study discussion in text for design impact. | No Impact. |
| Matanuska-Susitna Borough Comprehensive Development Plan - Transportation | | |
| ° Houston Right-of-Way - This corridor is south and west of Houston. It runs generally in a north-south direction and would provide a connection to the Point MacKenzie area. The right-of-way should provide space for utilities, rail, and the roadway. | Right-of-Way (ROW) realigned as Houston Connector. | ROW realigned as Houston Connector. |
| ° Point MacKenzie Access Road (Phase III) - An extension to provide access to a potential Point MacKenzie Port site. | To be part of Houston Connector. | To be part of Houston Connector. |

Table IV-10 (continued)

CROSSING IMPACTS ON MAJOR STREET AND HIGHWAY PROJECTS

| Plan/Improvements | Crossing Alternatives: Downtown | Crossing Alternatives: Elmendorf |
|---|---|---|
| Matanuska-Susitna Borough Comprehensive Development Plan - Transportation (continued) | | |
| ° Fish Creek Access Road - This 2.7 mile east-west project would be the first element of the Chuitna Corridor, which would ultimately provide access to the Beluga Coal Fields area. (First segment is Little Susitna Recreation Access Road included in 6-year improvement plan.) | An intersection with the Houston Connector will be added. | An intersection with the Houston Connector will be added. |
| ° Burma Road - This 6-mile roadway would connect the existing South Big Lake Road and Point MacKenzie Access Road. It is planned as an arterial with controlled access. (Included in 6-year improvement plan.) | Two-thirds to be part of Houston Connector. | Two-thirds to be part of Houston Connector. |
| ° North Big Lake Road - a 5.5 mile roadway which would complete the loop around Big Lake. | An intersection with the Houston Connector will be added. | An intersection with the Houston Connector will be added. |
| ° Briggs Road - A 1.7 mile road providing access between Horseshoe Lake Access Road and North Big Lake Road. (Included in 6-year improvement plan.) | To be part of Houston Connector. | To be part of Houston Connector. |
| ° Wasilla Bypass - This approximately 9+ mile highway project would provide alternative access between the Parks Highway, west of Wasilla, to the Parks Highway, east of Wasilla. | Reduced traffic volumes on Parks Highway may delay need for this improvement until 2010. | Reduced traffic volumes on Parks Highway may delay need for this improvement until 2010. |
| Willow Sub-Basin Plan | | |
| ° Chuitna Right-of-Way - An extension leading westerly from approximately Point MacKenzie Access Road (along the north side of Susitna Flats State Game Refuge) with bridges crossing at the Little Susitna River and Fish Creek. | An intersection with Houston Connector will be added. | An intersection with Houston Connector will be added. |
| Fish Creek Management Plan | | |
| ° Chuitna Right-of-Way - See description above. | See description above. | See description above. |

NOTES
Impacts for Hovercraft and Glenn/Parks Improvement are addressed in the text.
These plans represent planned improvements/modifications associated with the No-Action Alternative.

- Northside Corridor

  - 3rd/5th Avenues Couplet with High Occupancy Vehicle (HOV) Lanes. With the Gambell Street southbound ramp alternative, the number of lanes available for use by 3rd Avenue through-traffic would be reduced by the free-right-turn lane from the Seward Connector. With the Ingra Street southbound ramp alternative, southbound Connector traffic also would be added to 3rd Avenue, as well as left-turn lanes from 3rd to Gambell Street, further reducing available unused capacity of 3rd Avenue.

  - Freeway Extension to Ingra Street; same impacts as to the 3rd/5th Avenues couplet.

  - Freeway Extension to C/E Streets and G/I Streets. The Seward Connector could serve as the Ingra to C/E and G/I segment of this alternative. The ramps at C/E and G/I could be added to the Connector.

- Seward Highway Corridor

  - Freeway Extension to Chester Creek; no impact.

  - Freeway Extension to 12th Avenue. No impact, but consideration would need to be given to altering the Seward Connector to connect with Hyder Street, which would become the southbound lanes of a Hyder/Ingra couplet.

  - Freeway to Northside Corridor. No impact, but Ingra Street southbound ramp would be most compatible since a southbound ramp at Gambell Street would not connect directly into the planned freeway.

- 15th Avenue Bypass. There would be no impact from the Seward Connector.

Traffic volumes and congestion through the Northside Corridor would be increased by the Elmendorf Project (approximately five years ahead of No-Action for mid-range traffic growth) and would be reduced by the Downtown Project (traffic growth approximately five years behind No-Action). Total north-south traffic in the Anchorage bowl would not be increased by either a Downtown or an Elmendorf Project, however the Seward Connector of the Downtown Project would focus and increase traffic in the Seward Highway Corridor. Similarly, an Elmendorf Crossing with Northside Corridor improvements would increase Seward Highway Corridor traffic. Seward Highway traffic would not increase over No-Action if the Northside Corridor were not improved; rather the traffic increase on Muldoon and Tudor Roads would be greater than that described under "Traffic Volumes".

As indicated in the "Traffic Volume" and "Traffic Flow" sections, a Crossing Alternative would reduce traffic volumes on some streets within the Anchorage bowl and would increase traffic volumes on other streets. As a result, some scheduled street and intersection improvements might be deferred while others might need to be accelerated.

## B. SOCIAL AND ECONOMIC IMPACTS

The following areas of interest are discussed under social and economic impacts: Urban growth and economic development, land use plans, dislocation and relocation, urban and military function and operation, and government finance.

### Urban Growth and Economic Development

Urban growth and economic development impacts have been measured in dwelling units and employment (jobs). Impacts were estimated in four separate tiers to distinguish direct project effects; allocation of forecast employment and residential growth in response to crossing-enhanced accessibility; and additional new growth attributable to the crossing, termed "induced" development. The four tiers are:

- Project Employment Impact and Associated Residential Growth - 1985 to 2000 construction, operations and maintenance, and related employment directly and indirectly attributable to a crossing. Residential growth (in dwelling units) resulting from this employment (in terms of full-time annual equivalents) also was estimated and allocated to communities for the Crossing Alternatives in the years 2001 and 2010.

- Redistribution of Anticipated Residential Growth and Residential-Serving Employment - Year 2001 and 2010 dwelling units and associated residential-serving employment was re-allocated among communities in the Anchorage/Mat-Su region, in response to crossing-enhanced accessibility.

- Redistribution of Region-Serving Employment Growth and Associated Residences - Forecast year 2001 and 2010 region-serving employment growth which would transfer from Anchorage to the Mat-Su area in response to crossing-enhanced accessibility. Dwelling units associated with this additional employment transfer were estimated and allocated to communities for the Crossing Alternatives in the years 2001 and 2010.

- Induced Employment - additional new regional employment resulting from new development opportunities created by a crossing, with residential growth in the years 2001 and 2010.

The following text discusses the above growth changes. The results of analyses of crossing-induced changes in residential land values and resultant impacts on housing opportunities and the residential market are also included.

Project Employment Impact. Direct employment resulting from either the Downtown or the Elmendorf Project is presented in Table IV-11. Direct employment estimates were based on construction schedules presented in Chapter II, labor requirements of similar projects elsewhere, and estimates of the proportion of construction that would take place in Alaska versus outside Alaska. The Elmendorf bridge and the deck-truss and multi-girder

Table IV-11

DIRECT PROJECT CONSTRUCTION, OPERATING, AND MAINTENANCE EMPLOYMENT IMPACTS
(number of employees)

| | Downtown Project | | | | Elmendorf Project | | |
|---|---|---|---|---|---|---|---|
| Year | Crossing | Seward Connector | Houston Connector | Total | Crossing | Houston Connector | Total |
| 1985 | 25 | 0 | 0 | 25 | 15 | 0 | 15 |
| 1986 | 175 | 0 | 0 | 175 | 150 | 0 | 150 |
| 1987 | 185 | 0 | 0 | 185 | 210 | 0 | 210 |
| 1988 | 175 | 0 | 0 | 175 | 145 | 50 | 195 |
| 1989 | 155 | 0 | 50 | 205 | 105 | 50 | 155 |
| 1990 | 65 | 0 | 50 | 115 | 25 | 0 | 25 |
| 1991 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 1992 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 1993 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 1994 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 1995 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 1996 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 1997 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 1998 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 1999 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 2000 | 25 | 100 | 0 | 25 | 25 | 0 | 25 |
| 2001 | 25 | 100 | 0 | 25 | 25 | 0 | 25 |
| 2002 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 2003 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 2004 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 2005 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 2006 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 2007 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 2008 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 2009 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| 2010 | 25 | 0 | 0 | 25 | 25 | 0 | 25 |
| Total Man-Years | 1,280 | 200 | 100 | 1,380 | 1,150 | 100 | 1,250 |
| ° Construction | 780 | 200 | 100 | 880 | 630 | 100 | 730 |
| ° Operation and Maintenance | 500 | 0* | 0* | 500 | 520 | 0* | 520 |

* One or two would result; number rounded to the nearest five.

spans of the Downtown bridge across Knik Arm likely would be built with steel manufactured and fabricated in the Far East and floated into place. Construction of the cable-stayed spans for the Downtown bridge likely would take place on-site.

Labor required for either the Downtown or the Elmendorf Project (inclusive of connector roads) would peak in 1987 at either 185 or 210 employees, respectively. All construction labor skills for the crossing would be available in the Anchorage/Mat-Su area. The demand for iron workers (75 in the peak year) and earth moving equipment operators (25 in the peak year) might require importation of labor from the Lower 48, depending on the number of similar projects underway during the same timeframe, e.g., Susitna Hydroelectric Project, major buildings.

Indirect employment impact would result from the need that construction workers and their families, as well as construction contractors, would have for goods and services. Monies spent by construction workers and contractors in the local economy would create an employment "multiplier" effect, which in the Anchorage area and for the type of project proposed, would be about 0.8 to 1.2 times the number of local construction jobs. Local construction employment plus multiplier effect would cause less than a one-half percent increase in the local labor force during any one year. Table IV-12 presents estimated dwelling units which would be associated with total project construction and operations employment (direct and indirect), allocated to communities according to the project team's growth allocation model. Impacts would be extremely modest, in accordance with the relatively small number of new full-time annual jobs.

<u>Redistribution of Anticipated Residential Growth and Residential-Serving Employment</u>. The allocation of currently forecast residential development would change with construction of a Knik Arm crossing and the improved access from Anchorage jobs and other job opportunities to less expensive, yet highly developable, residential sites in the Mat-Su Borough. The principal shift in residential activity would be from Anchorage to a suburban Point MacKenzie/ Houston corridor. A second residential shift would be from Palmer/Wasilla to the Point MacKenzie/Houston corridor.

The Institute for Social and Economic Research (ISER), under contract with the Municipality, and the Knik Arm crossing project team both calculated 2001 dwelling unit forecasts for the Elmendorf and Downtown Projects, but by different methodologies. The starting point for both forecasts was a "No-Crossing" scenario consisting of dwelling unit forecasts used in the Long-Range Transportation Plan for the Anchorage bowl (Municipality of Anchorage, Community Planning Department, July 1983); outside the bowl, the official Anchorage and Mat-Su Borough planning forecasts were used. The "No-Crossing" scenario with 126,000 dwelling units (excluding military) and 158,900 jobs (including military) would reflect "high economic growth" as designated by ISER.

Table IV-13 summarizes the range of 2001 and 2010 dwelling unit forecasts prepared by ISER and the project team. Four scenarios are presented; these were used in travel forecasting and other impact analyses. First, the project team forecasts for the Elmendorf and Downtown Projects were

Table IV-12

ALLOCATION OF DWELLING UNITS REPRESENTED BY PROJECT CONSTRUCTION, OPERATIONS, AND MAINTENANCE-RELATED EMPLOYMENT
(Number of Employees)

| | 2001 | | 2010 | |
|---|---|---|---|---|
| | Downtown | Elmendorf | Downtown | Elmendorf |
| Mat-Su Borough | 55 | 10 | 14 | 12 |
| Municipality of Anchorage | | | | |
| ° Anchorage Bowl | 159 | 33 | 29 | 31 |
| ° Eagle River | 23 | 5 | 5 | 5 |
| ° Turnagain Arm | 4 | 1 | 1 | 1 |
| SUBTOTAL | 186 | 39 | 35 | 37 |
| TOTAL | 241 | 49 | 49 | 49 |

NOTES
Total employment is equal to (2.1 x direct employment) x either 1.13 jobs/DU (2001) or 1.09 jobs/DU (2010), allocated to communities according to project team's growth allocation model.

Turnagain Arm is not in project area. It is included so that area totals will equal Municipality of Anchorage subtotal.

Table IV-13

DWELLING UNIT ALLOCATION WITH CROSSING
(Number of Dwelling Units)

| | 2001 | | | | | 2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| MAT-SU BOROUGH | | | | | | | | | | |
| 1. Point MacKenzie | 369 | +4,600 | +5,440 | +3,330 | +3,010 | 600 | +8,200 | +9,720 | +6,230 | +5,630 |
| 2. Knik/Goose Bay | 1,609 | +1,930 | +2,560 | +1,180 | +940 | 2,700 | +3,320 | +4,390 | +2,040 | +1,640 |
| 3. Fish Creek | 331 | +1,220 | +1,490 | +1,130 | +1,010 | 500 | +1,950 | +2,390 | +1,870 | +1,660 |
| 4. Willow/Nancy Lake | 1,299 | +390 | +690 | +190 | +60 | 2,000 | +550 | +1,010 | +200 | 0 |
| 5. Big Lake/Houston | 3,607 | +650 | +1,400 | +270 | -60 | 5,400 | +720 | +1,790 | +100 | -370 |
| 6. Wasilla/Fishhook | 7,846 | -860 | +370 | -600 | -1,240 | 11,000 | -2,460 | -970 | -1,860 | -2,660 |
| 7. Palmer/Sutton | 6,642 | -850 | +150 | -580 | -1,120 | 9,700 | -2,370 | -1,110 | -1,770 | -2,500 |
| 8. Other Mat-Su | 3,200 | +20 | 0 | -20 | 0 | 5,100 | 0 | 0 | 0 | 0 |
| MAT-SU SUBTOTAL | 24,903 | +7,100 | +12,100 | +4,900 | +2,600 | 37,000 | +9,910 | +17,220 | +6,810 | +3,400 |
| MUNICIPALITY OF ANCHORAGE | | | | | | | | | | |
| 9. Northeast | 31,614 | -1,200 | -2,630 | -850 | -590 | 35,100 | -1,680 | -3,750 | -1,180 | -775 |
| 10. Ship Creek | 1,638 | 0 | 0 | 0 | 0 | 1,800 | 0 | 0 | 0 | 0 |
| 11. Downtown | 782 | 0 | 0 | 0 | 0 | 800 | 0 | 0 | 0 | 0 |
| 12. Northwest | 23,134 | -500 | -2,150 | -350 | -420 | 24,700 | -700 | -3,060 | -490 | -550 |
| 13. Central | 14,258 | -1,200 | -1,560 | -800 | -340 | 17,400 | -1,680 | -2,210 | -1,110 | -440 |
| 14. Sand Lake | 11,184 | -900 | -1,270 | -650 | -250 | 12,700 | -1,250 | -1,810 | -900 | -330 |
| 15. Ocean View | 9,877 | -500 | -590 | -350 | -80 | 10,800 | -700 | -840 | -490 | -100 |
| 16. Hillside | 13,953 | -1,000 | -1,170 | -700 | -250 | 15,300 | -1,400 | -1,660 | -970 | -330 |
| 17. Eagle River | 16,870 | -1,800 | -2,630 | -1,200 | -590 | 20,700 | -2,500 | -3,750 | -1,670 | -775 |
| 18. Turnagain Arm | 2,729 | 0 | -100 | 0 | -80 | 3,800 | 0 | -140 | 0 | -100 |
| ANCHORAGE SUBTOTAL | 126,039 | -7,100 | -12,100 | -4,900 | -2,600 | 143,100 | -9,910 | -17,220 | -6,810 | -3,400 |
| TOTAL | 150,942 | 0 | 0 | 0 | 0 | 180,100 | 0 | 0 | 0 | 0 |

modeled; they reflect a middle range of residential allocation change and incorporate the difference in accessibility afforded by the two alternative crossing locations. They are considered the most likely growth scenarios. Two additional scenarios developed by ISER, Elmendorf low and Downtown high, were modeled to reflect the full range of residential relocation activity and density which would be possible in the southern end of the Mat-Su Borough.

Results of the 2001 modeling indicate Anchorage as a whole would have 2,600 to 12,100 fewer dwelling units (2 to 10 percent less) with a Knik Arm crossing than without a crossing. These units transferring to the Borough would be equivalent to a 10 to 49 percent increase in Mat-Su dwelling units compared to No-Crossing. Based on the mid-range forecasts, the Downtown Project would generate about 45 percent greater impact than the Elmendorf Project.

The allocation of year 2001 dwelling units to the communities (see Figure III-3) within Anchorage and the Mat-Su Borough varied by growth scenario, reflecting differences in methodology. Within Anchorage, the mid-range forecasts generated by the project team model (based on accessibility to jobs and available land carrying capacity) anticipate that introduction of a crossing would slow dwelling unit growth principally in the Northeast, Central, Sand Lake, Hillside, and Eagle River communities of Anchorage, see Figure III-3. The high and low forecasts modeled by ISER (based on available carrying capacity and residential density considerations) indicate a similar pattern of impact, but the Northwest community also would be in the principal impact category. Maximum impact would occur in Eagle River under the Downtown high scenario; this community would have 16 percent fewer dwelling units than anticipated without a crossing.

Within the Mat-Su Borough, 2001 forecasts indicate that principal impacts would be in Point MacKenzie at the southern end of the Borough. This area would attract 3,000 to 5,400 more dwelling units with a crossing than without a crossing. The majority of these Point MacKenzie units would be transferred from Anchorage, but there would also be a residential shift from the Palmer/Wasilla area to communities along the Houston Connector. With the mid-range forecasts, the crossing impact on Palmer and Wasilla would be relatively modest -- 8 to 13 percent fewer dwelling units in 2001 than without a crossing. The Downtown high scenario would reflect no shift from the Palmer/Wasilla area. The Elmendorf low scenario would reflect a greater shift from the Palmer/Wasilla area to the southern end of the Borough.

Estimates of urban growth impact in 2010 were extrapolated from 2001, based on two percent per annum average regional growth and growth modeling to allocate dwelling units within the region. Thus, the pattern of 2010 impact would remain generally the same as for 2001, although the magnitude of impact would increase. By the year 2010, Anchorage as a whole would have 3,400 to 12,400 fewer dwelling units (3 to 14 percent less) with a crossing than without. For the Borough, this transfer would represent a 9 to 47 percent increase compared to the No-Crossing Alternative. The Downtown Project would generate approximately 46 percent greater impact than the Elmendorf Project.

Within Anchorage the greatest impact in 2010, as in 2001, would be on the Eagle River community -- a maximum 18 percent fewer dwelling units with the Downtown high forecast. Within the Mat-Su Borough, the major impacts would be at Point MacKenzie, which would receive 5,600 to 9,700 dwelling units more with a crossing than without. The Palmer/Wasilla area would receive up to 26 percent less growth with a crossing.

A limited amount of residential-serving commercial development would relocate within the Anchorage/Mat-Su region in response to (and in proportion to) the dwelling unit allocation change. A conservative residential-serving employment rate of 0.13 employees per dwelling unit was applied to the dwelling unit forecasts shown in Table IV-13 to derive this employment allocation change (see Table IV-14). Total current employment rates are 0.53 employees per dwelling unit for the Mat-Su Borough, 0.35 employees per dwelling unit for Eagle River, and 1.34 employees per dwelling unit for Anchorage.

Table IV-14 (re-allocation of residential-serving employment only) indicates that by the year 2001, approximately 300 to 1,600 fewer employees would be in Anchorage with a crossing than without. By 2010, this impact would increase to 400 to 2,200 fewer employees. This would represent no more than about one percent of Anchorage's total employment, and this slight reduction in jobs would be spread throughout the Municipality. The only exception would be in the Downtown/Ship Creek area, where ISER estimates forecast employment would increase slightly; the crossing would attract employment growth to the Ship Creek area that might have located elsewhere in the Municipality. Within the Borough, employment impact would be distributed in proportion to dwelling unit impacts -- forecast employment would increase in Point MacKenzie and along the Houston Connector; forecast employment would decrease in the Palmer/Wasilla area.

Redistribution of Region-Serving Employment Growth and Associated Residences. An estimate was also developed for a broader range of industrial and commercial activities to relocate or expand to the Mat-Su Borough (instead of Anchorage) in response to a crossing. A panel of experts in commercial/industrial real estate, finance, and market economics assisted in developing this estimate.

The panel's forecast was based on the year 2001 with a Downtown Project, mid-range allocation scenario, and assuming no rail service or port in Point MacKenzie. Extrapolations were derived by the project team from panel results for the year 2010, Downtown high, and both Elmendorf scenarios. These estimates are presented in Table IV-15. They include the residential-serving change shown in Table IV-14.

The panel predicted that the employment shift from Anchorage to the Borough with the Downtown Project (mid-range) would be approximately 3,300 jobs in the year 2001, which would represent a two percent reduction for Anchorage and a 27 percent increase for the Mat-Su Borough. The employment transfer would be less with an Elmendorf Project than with a Downtown Project owing to the lower rate of residential development and the additional 16 minutes travel time between the Borough and Anchorage. The range of forecasts, shown in Table IV-15, would be from 1,200 to 5,600 fewer forecast jobs in

Table IV-14

EMPLOYMENT ALLOCATION WITH CROSSING
(Number of Employees)

| | 2001 | | | | | 2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| MAT-SU BOROUGH | | | | | | | | | | |
| 1. Point MacKenzie | 210 | +600 | +710 | +430 | +390 | 400 | +1,070 | +1,260 | +810 | +730 |
| 2. Knik/Goose Bay | 917 | +250 | +330 | +150 | +120 | 1,400 | +430 | +570 | +270 | +210 |
| 3. Fish Creek | 189 | +160 | +190 | +150 | +130 | 300 | +250 | +310 | +240 | +210 |
| 4. Willow/Nancy Lake | 740 | +50 | +90 | +25 | +10 | 1,100 | +70 | +130 | +30 | +10 |
| 5. Big Lake/Houston | 2,055 | +80 | +180 | +40 | -10 | 2,900 | +90 | +230 | +10 | -50 |
| 6. Wasilla/Fishhook | 4,471 | -110 | +50 | -80 | -160 | 5,800 | -320 | -130 | -240 | -350 |
| 7. Palmer/Sutton | 3,785 | -110 | +20 | -75 | -160 | 500 | -310 | -140 | -230 | -320 |
| 8. Other Mat-Su | 1,800 | 0 | 0 | 0 | 0 | 2,900 | 0 | 0 | 0 | 0 |
| MAT-SU SUBTOTAL | 12,367 | +920 | +1,570 | +640 | +340 | 15,300 | +1,280 | +2,230 | +890 | +440 |
| MUNICIPALITY OF ANCHORAGE | | | | | | | | | | |
| 9. Northeast | 21,878 | -80 | -140 | -60 | -30 | 24,847 | -110 | -200 | -80 | -40 |
| 10. Ship Creek | 24,494 | +40 | +70 | +30 | +10 | 27,818 | +60 | +100 | +40 | +10 |
| 11. Downtown | 17,678 | +30 | +50 | +20 | +10 | 20,077 | +40 | +70 | +30 | +10 |
| 12. Northwest | 44,195 | -180 | -300 | -120 | -60 | 50,192 | -250 | -430 | -170 | -70 |
| 13. Central | 19,249 | -260 | -440 | -190 | -100 | 21,861 | -360 | -620 | -265 | -130 |
| 14. Sand Lake | 7,467 | -10 | -20 | -10 | -10 | 8,480 | -10 | -30 | -10 | -10 |
| 15. Ocean View | 14,797 | -150 | -260 | -100 | -50 | 16,805 | -210 | -370 | -140 | -70 |
| 16. Hillside | 2,225 | -30 | -50 | -20 | -10 | 2,527 | -40 | -70 | -30 | -10 |
| 17. Eagle River | 5,936 | -280 | -480 | -190 | -100 | 6,742 | -400 | -680 | -265 | -130 |
| 18. Turnagain Arm | 973 | 0 | 0 | 0 | 0 | 1,105 | 0 | 0 | 0 | 0 |
| ANCHORAGE SUBTOTAL | 158,892 | -920 | -1,570 | -640 | -340 | 180,454 | -1,280 | -2,230 | -890 | -440 |
| TOTAL | 171,259 | 0 | 0 | 0 | 0 | 195,754 | 0 | 0 | 0 | 0 |

Table IV-15

REGION-SERVING EMPLOYMENT GROWTH SHIFT FROM
ANCHORAGE WITH CROSSING, BY SECTOR
(Number of Employees)

| Standard Industrial Classification | 2001 No-Crossing | 2001 Downtown (Mid-Range) | 2001 Downtown (High) | 2001 Elmendorf (Mid-Range) | 2001 Elmendorf (Low) | 2010 No-Crossing | 2010 Downtown (Mid-Range) | 2010 Downtown (High) | 2010 Elmendorf (Mid-Range) | 2010 Elmendorf (Low) |
|---|---|---|---|---|---|---|---|---|---|---|
| Agricultural, Forestry, and Fisheries | 500 | -32 | -55 | -22 | -12 | 570 | -35 | -63 | -25 | -12 |
| Mining | 6,030 | -39 | -67 | -30 | -14 | 6,850 | -44 | -77 | -31 | -15 |
| Manufacturing | 4,200 | -297 | -507 | -210 | -110 | 4,770 | -337 | -587 | -234 | -120 |
| Construction | 7,800 | -509 | -869 | -355 | -188 | 8,860 | -580 | -1,007 | -402 | -200 |
| Transportation and Public Utilities | 14,700 | -290 | -495 | -202 | -107 | 16,690 | -330 | -575 | -229 | -113 |
| Wholesale Trade Durable Goods | 6,000 | -187 | -319 | -130 | -69 | 6,810 | -212 | -369 | -147 | -73 |
| Wholesale Trade Non-Durable Goods | 3,900 | -105 | -179 | -73 | -39 | 4,430 | -120 | -209 | -83 | -40 |
| Retail Trade | 32,600 | -850 | -1,450 | -590 | -314 | 37,020 | -965 | -1,680 | -671 | -332 |
| Finance, Insurance, and Real Estate | 11,900 | -237 | -402 | -165 | -88 | 13,510 | -270 | -469 | -187 | -90 |
| Services | 38,300 | -549 | -937 | -380 | -203 | 43,500 | -624 | -1,088 | -434 | -215 |
| Government | 40,800 | -205 | -350 | -143 | -76 | 46,340 | -233 | -406 | -162 | -80 |
| TOTAL | 166,730 | -3,300 | -5,630 | -2,300 | -1,220 | 189,350 | -3,750 | -6,530 | -2,605 | -1,290 |

NOTE

Number of employees is based on panel estimates of total employment transfer to Mat-Su for 2001, Downtown Project, and mid-range growth allocation scenario; includes residential-serving employment presented in Table IV-14.

No-Crossing Anchorage employment is included for comparison only; no shift to Borough with No-Crossing Alternative.

Anchorage (a maximum three percent reduction) and up to a 46 percent increase in the Borough.

The year 2010 forecasts would range from 1,300 to 6,500 Anchorage jobs transferred (reduction up to three percent), with an increase of from eight percent to 43 percent in the Borough.

Local residential-serving jobs (retail, banking, personal services, etc.) would be about one-half of the total estimated transfer to the Mat-Su Borough, approximately 1.75 times the assumption in the geographic allocation alone (Table IV-14). The balance of the transfer would be in industries that would benefit from a Borough location, particularly from the availability of large, less expensive sites in proximity to Anchorage markets and transportation. Industries with the highest propensity to transfer would be:

- Horticultural (greenhouses, nurseries)
- Sand and gravel quarrying
- Concrete and metal fabrication
- Trucking and warehousing
- Heavy construction

Industries strongly linked to rail transport and municipal utilities would be the least likely to transfer.

In order to assess the full impact of this employment transfer, the project team estimated the number of dwelling units associated with relocating employment, and allocated them to communities in accordance with the team's growth allocation model. This allocation is presented in Table IV-16. Dwelling units were estimated on the basis of an overall regional multiplier of 1.13 jobs per dwelling unit in 2001, and 1.09 jobs per dwelling unit in 2010. The change over time would reflect an increase in smaller (one and two-person) households. The total growth shift would range from 800 to 3,600 Anchorage households (2001) relocated to the Mat-Su Borough, principally to Point MacKenzie and along the Houston Corridor. This transfer would represent up to a three percent decrease in forecast Anchorage dwelling units in addition to the residential growth re-allocation presented in Table IV-13 for a total transfer of as much as 13 percent. The total transfer would increase forecast Borough employment by 63 percent. Year 2010 forecasts would be proportionately higher, indicating from 800 to 3,900 households relocating to the Borough (chiefly to Point MacKenzie), for a total transfer of up to 15 percent of Anchorage dwelling units. The increase in the Borough would range up to 57 percent.

<u>Induced Employment</u>. The project team estimated induced employment from two perspectives. The first was employment based on specific industrial development proposals and opportunities for area growth which would have little or no chance of occurring by 2001 without a crossing. The second was the added residential and infrastructure construction employment which would be associated with crossing-induced changes in residential

Table IV-16

ALLOCATION OF DWELLING UNITS RESULTING FROM
REGION-SERVING EMPLOYMENT GROWTH SHIFT
(Number of Dwelling Units)

| | 2001 | | | | | 2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| MAT-SU BOROUGH | | | | | | | | | | |
| 1. Point MacKenzie | 369 | +1,440 | +1,620 | +1,000 | +900 | 600 | +1,870 | +2,210 | +1,440 | +1,290 |
| 2. Knik/Goose Bay | 1,609 | +510 | +760 | +350 | +290 | 2,700 | +760 | +1,000 | +460 | +380 |
| 3. Fish Creek | 331 | +480 | +440 | +340 | +310 | 500 | +450 | +540 | +430 | +380 |
| 4. Willow/Nancy Lake | 1,299 | +80 | +200 | +60 | +20 | 2,000 | +130 | +240 | +50 | 0 |
| 5. Big Lake/Houston | 3,607 | +120 | +420 | -80 | -20 | 5,400 | +160 | +410 | +30 | -80 |
| 6. Wasilla/Fish Hook | 7,846 | -260 | +110 | -180 | -380 | 11,000 | -560 | -220 | -430 | -610 |
| 7. Palmer/Sutton | 6,642 | -250 | +40 | -170 | -340 | 9,700 | -540 | -240 | -410 | -580 |
| 8. Other Mat-Su | 3,200 | -10 | 0 | -10 | 0 | 5,100 | 0 | 0 | 0 | 0 |
| MAT-SU SUBTOTAL | 24,903 | +2,110 | +3,590 | +1,470 | +780 | 37,000 | +2,270 | +3,940 | +1,570 | +780 |
| MUNICIPALITY OF ANCHORAGE | | | | | | | | | | |
| 9. Northeast | 31,614 | -360 | -780 | -250 | -180 | 35,100 | -390 | -860 | -260 | -180 |
| 10. Ship Creek | 1,638 | 0 | 0 | 0 | 0 | 1,800 | 0 | 0 | 0 | 0 |
| 11. Downtown | 782 | 0 | 0 | 0 | 0 | 800 | 0 | 0 | 0 | 0 |
| 12. Northwest | 23,134 | -140 | -640 | -110 | -130 | 24,700 | -160 | -700 | -110 | -130 |
| 13. Central | 14,258 | -360 | -460 | -240 | -110 | 17,400 | -390 | -510 | -260 | -110 |
| 14. Sand Lake | 11,184 | -270 | -370 | -190 | -70 | 12,700 | -280 | -410 | -220 | -70 |
| 15. Ocean View | 9,877 | -140 | -170 | -110 | -20 | 10,800 | -160 | -190 | -110 | -20 |
| 16. Hillside | 13,953 | -300 | -350 | -210 | -70 | 15,300 | -320 | -380 | -220 | -70 |
| 17. Eagle River | 16,870 | -540 | -780 | -360 | -180 | 20,700 | -570 | -860 | -390 | -180 |
| 18. Turnagain Arm | 2,729 | 0 | -40 | 0 | -20 | 3,800 | 0 | -30 | 0 | -20 |
| ANCHORAGE SUBTOTAL | 126,039 | -2,110 | -3,590 | -1,470 | -780 | 143,100 | -2,270 | -3,940 | -1,570 | -780 |
| TOTAL | 150,942 | | | | | 180,100 | | | | |

NOTE
Dwelling units were calculated from region-serving employment (excluding the amount presented in Table IV-14) divided by either 1.13 (2001) or 1.09 (2010) jobs/dwelling units.

development costs. (These housing market impacts are discussed in detail under "Housing Impacts", below.)

Induced Industrial Employment: Several land-extensive industrial activities have been proposed within the region. These activities chiefly would involve development of Mat-Su Borough natural resources, either for export to greater Alaska and elsewhere or to substitute for current imports. The feasibility of such proposals would depend in part upon improved access attributable to a crossing. Other primary factors would include availability of capital and raw materials, access to transportation, and in several instances, prior development of related industrial or power projects.

The project team attempted to quantify only that proportion of the employment which would be strictly attributable to a crossing. To assist in this process, the panel of experts described earlier was used. The panel assisted in estimating the probability of the industrial developments with and without a crossing.

Table IV-17 summarizes forecast employment for each major industry. A total of 177 jobs would be directly attributable to a crossing; total employment would be 443 jobs, using a multiplier of 2.5. These jobs would be distributed primarily over four categories: agricultural-related, mining, manufacturing, and tourism. Potential industrial projects were obtained from prior studies for the Borough (NORTEC, March 1981; DOWL Engineers, February 1983); for the Alaska Department of Natural Resources and the Port of Anchorage (TAMS Engineers, 1983); for the Dow-Shell Group, (September 9, 1981); and for Yukon-Pacific (Mead Treadwell, Corporate Secretary, Personal Communication).

Agricultural projects would include more extensive use of Point MacKenzie agricultural lands, additional fish processing, timber harvesting and processing, port facilities for fertilizer, and development of the Fish Creek Agricultural project. This latter proposal is currently pending appropriation of funds for access roads. In general, crossing-provided accessibility to Anchorage would enhance agriculture-related development. The 50 jobs which would be attributed to the crossing would be part of a maximum of 350 agriculture and related jobs that could possibly occur in the region by 2001.

Crossing-enhanced accessibility also would increase the development potential for mining, chiefly sand and gravel and Beluga coal. Some 33 jobs of 225 forecast mining jobs would be attributed directly to crossing completion (83 total jobs with multiplier).

Development of land-extensive manufacturing plants, such as for cement, concrete products, millwork and other wood products, and metal fabrication, would be enhanced by crossing accessibility to large tracts of low-cost lands in the Mat-Su Borough. Since many of these employment activities also would be capital-intensive, however, the impact attributable to a crossing would be somewhat limited. About 36 jobs of a total 290 manufacturing jobs which would be likely to occur

Table IV-17

INDUSTRIAL SECTOR INDUCED EMPLOYMENT, 2001
(Number of Employees)

| Industry/Sector | Direct Induced Employment | Total Induced Employment |
|---|---|---|
| Agricultural-Related<br>Fish Creek Agricultural Project, Point MacKenzie Agricultural Project, agricultural processing, timber harvesting and processing, fertilizer, fish processing | 50 | 125 |
| Mining<br>Sand and gravel and Beluga coal | 33 | 83 |
| Manufacturing<br>Concrete products and cement plant, wood products manufacturing, metal fabrication, foundry | 36 | 90 |
| Oil and Gas Related | 0 | 0 |
| Port at Point MacKenzie<br>Gas pipeline and pump stations, LNG plant and feedstocks, petro-chemical plant | 0 | 0 |
| Tourism | 58 | 145 |
| TOTALS | 177 | 443 |

NOTES
Total induced employment is 2.5 times direct induced employment to account for jobs created to provide goods and services demanded by the induced industries.
Mining excludes employment at Beluga immediately outside Mat-Su Borough.
There is no net regional increase for a port at Point MacKenzie because employment is assumed to develop at Seward without a crossing.

in the region by 2001 would be directly attributable to crossing-enhanced development; total manufacturing employment was calculated at 90 jobs (36 times the 2.5 multiplier) attributable to a crossing.

Finally, crossing-enhanced accessibility and forecast growth would contribute to development of added recreational and tourist-related businesses (motels, lodges, boat harbors, dude ranches, restaurants, etc.). Some 58 jobs of an estimated 200 recreation and tourist-related jobs which possibly could occur in the region by 2001 would be directly attributable to crossing-enhanced development; total future tourist-related employment attributed to a crossing would be 145 jobs.

Development of oil and gas-related activities, such as an LNG plant and feedstocks, a petrochemical plant, and expansion of the Port of Anchorage at Point MacKenzie, were also considered. The panel and project team ultimately rejected the possibility that a crossing would appreciably enhance the development of either a major petrochemical plant or other oil and gas-related activities. Moreover, the estimated direct employment of such facilities was so large that even a very low probability of crossing-induced development would yield a substantial employment impact. For these reasons, it was decided to exclude oil and gas-related jobs from estimated crossing-induced employment.

In contrast, since many export industries would depend upon expanded port facilities, development of a port at Point MacKenzie, to the extent its development would be aided by a crossing, was included in the estimates of crossing-enhanced development for specific industries. Port employment was not considered attributable to a crossing, since expansion likely would take place at Seward or elsewhere in Southcentral Alaska by 2001 without a crossing.

Other assumptions governing the estimates of crossing-induced employment included the absence of rail facilities either in place or on the crossing itself. Employment estimates previously described were derived for the region in 2001, projected to 2010, and allocated to the Borough and Anchorage bowl based on project team residential allocation modeling. These projections were added to estimates of crossing-induced residential construction and infrastructure employment, discussed next, to yield total induced employment.

Induced Residential and Infrastructure Construction Employment: The housing market analysis, described in "Housing Impacts", shows that decreases in residential development cost as a result of a Knik Arm Crossing would allow residents to purchase larger homes on larger lots than without a crossing. The project team estimated the employment impacts of increased residential and infrastructure construction caused by the demand for larger units and lots as an effect of a crossing. The estimate was based on lot size and dwelling unit size information and on cost of construction and site preparation in individual communities. Estimated person-years of employment were then calculated and converted to full-time annual equivalents. Construction costs were converted to person-years based on Goldsmith and Rowe (April 1983). Total employment was estimated from direct employment using a multiplier of 2.5. This estimate included direct construction employment, plus induced employment due to local production of construction materials as well as goods and services demanded by those earning income in these activities.

The effects of induced construction employment would be small, as shown by the full-time annual equivalent jobs below:

| | Direct Employment | Total Employment |
|---|---|---|
| 2001 | 14 | 35 |
| 2010 | 17 | 43 |

Total Induced Employment: Table IV-18 presents total crossing-induced employment (industrial/tourism and residential construction and infrastructure) and dwelling units, distributed to communities in proportion to the ISER/project team growth allocation forecasts and allocation model. Projected households associated with these induced jobs were calculated at 1.13 jobs/dwelling unit (2001) and 1.09 jobs/dwelling unit (2010). The procedure used here underestimated the portion of induced employment that would be in the Borough by perhaps 150 to 200 employees and correspondingly overestimated the portion of induced employment in Anchorage. A small under(over) estimate of Mat-Su (Anchorage) dwelling units also could be expected from the allocation procedure used here. This lack of precision in estimating crossing-induced employment would not be significant because induced employment would compose only five to 10 percent of total Point MacKenzie employment.

Summary of Effects on Economic Development. Table IV-19 presents a summary of the impacts of the Crossing Alternatives in terms of relocated and induced employment. The major impact would be in the shift of new employment out of the Anchorage bowl and into the Point MacKenzie and Parks Highway-south areas of the Mat-Su Borough. A smaller impact also would be felt in the shift of activities from Palmer/Wasilla to the southern Borough. Induced development (in the form of added industrial and construction employment and direct project employment) would be small in comparison to the estimated employment transfer, and thus would have little effect on the general pattern of urban development.

From 1,300 to 5,700 additional jobs would occur in the Mat-Su Borough (an increase of from nine percent to 40 percent) by 2001, and between 1,300 and 6,600 added jobs would be forecast by 2010. The maximum impact would be with the Downtown Project, high growth allocation scenario. The Point MacKenzie area would receive the greatest single increment, with from 1,400 to 2,500 added jobs projected by 2001, and from 2,100 to 3,700 shifted and new jobs by 2010.

The projected reductions in future Anchorage employment would be small when considered in the context of regional growth and expansion of Anchorage's market area. The employment transfer from Anchorage to Mat-Su under the highest scenario, Downtown Project would be only four percent. Moreover,

Table IV-18

ALLOCATION OF INDUCED EMPLOYMENT AND DWELLING UNITS

| | 2001 | | | | | 2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No-Crossing | Downtown (Mid Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| EMPLOYMENT (Number of employees) | | | | | | | | | | |
| Mat-Su Borough | NA | 38 | 39 | 36 | 35 | NA | 46 | 49 | 45 | 44 |
| Municipality of Anchorage | | | | | | | | | | |
| ° Anchorage Bowl | | 422 | 421 | 424 | 424 | | 480 | 477 | 480 | 480 |
| ° Eagle River | | 15 | 15 | 15 | 16 | | 17 | 17 | 18 | 19 |
| ° Turnagain Arm | | 3 | 3 | 3 | 3 | | 3 | 3 | 3 | 3 |
| MOA TOTAL | NA | 440 | 439 | 442 | 443 | NA | 500 | 497 | 501 | 502 |
| TOTAL | NA | 478 | 478 | 478 | 478 | NA | 546 | 546 | 546 | 546 |
| DWELLING UNITS (Number of Dwelling Units) | | | | | | | | | | |
| Mat-Su Borough | NA | 34 | 35 | 32 | 31 | NA | 42 | 45 | 41 | 40 |
| Municipality of Anchorage | | | | | | | | | | |
| ° Anchorage Bowl | | 373 | 373 | 375 | 375 | | 440 | 438 | 440 | 440 |
| ° Eagle River | | 13 | 12 | 13 | 14 | | 16 | 15 | 17 | 18 |
| ° Turnagain Arm | | 3 | 3 | 3 | 3 | | 3 | 3 | 3 | 3 |
| MOA TOTAL | NA | 389 | 388 | 391 | 392 | NA | 459 | 456 | 460 | 461 |
| TOTAL | NA | 423 | 423 | 423 | 423 | NA | 501 | 501 | 501 | 501 |

NOTES

Total employment is estimated at 2.5 x direct employment. Dwelling units are estimated at either 1.13 (2001) or 1.09 (2010) jobs. Dwelling units are allocated to communities according to ISER/project team growth shift forecasts and allocation model.

NA signifies Not Applicable.

Turnagain Arm is not in project area. It is included for clarity so area subtotals would equal Municipality of Anchorage total.

Table IV-19

SUMMARY OF EMPLOYMENT CHANGES WITH CROSSING
(Number of Employees)

| | 2001 | | | | | 2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| Mat-Su Borough | | | | | | | | | | |
| Point MacKenzie | 210 | +2,153 | +2,543 | +1,552 | +1,401 | 403 | +3,144 | +3,695 | +2,363 | +2,143 |
| Big Lake/Houston/ Knik/Goose Bay | 3,909 | +1,945 | +2,855 | +1,321 | +912 | 5,720 | +2,460 | +3,652 | +1,630 | +1,139 |
| Palmer/Wasilla | 8,289 | -747 | +284 | -539 | -1,059 | 10,900 | -1,832 | -772 | -1,353 | -1,953 |
| Other Mat-Su | 1,808 | +8 | +8 | +6 | +5 | 2,913 | +9 | +9 | +9 | +9 |
| Mat-Su Subtotal | 14,216 | +3,359 | +5,690 | +2,340 | +1,259 | 19,936 | +3,781 | +6,584 | +2,649 | +1,338 |
| Municipality of Anchorage | | | | | | | | | | |
| North Anchorage | 135,556 | -1,108 | -2,219 | -771 | -221 | 153,721 | -1,372 | -2,799 | -861 | -201 |
| South Anchorage | 77 | -539 | -1,039 | -378 | -168 | 19,337 | -682 | -1,223 | -441 | -171 |
| Eagle River | 20 | -956 | -1,697 | -663 | -342 | 6,762 | -1,151 | -1,971 | -750 | -359 |
| Turnagain Arm | 4 | -4 | -4 | -3 | -3 | 1,108 | -3 | -3 | -3 | -3 |
| Anchorage Subtotal | 135,657 | -2,607 | -4,959 | -1,815 | -734 | 180,928 | -3,208 | -5,996 | -2,055 | -734 |
| TOTAL | 149,873 | +752 | +731 | +525 | +525 | 200,864 | +573 | +588 | +594 | +604 |

NOTES
North Anchorage includes Northeast, Ship Creek, Downtown, and Northwest communities; see Figure III-3. South Anchorage includes Central, Sand Lake, Ocean View, and Hillside communities.

the transfer would be from projected future employment; no reductions in present employment levels would occur as a result of a crossing.

Similar qualifications should be applied to the shifts that would occur from the Palmer/Wasilla areas. That is, the forecast employment shift to Point MacKenzie and other areas south of the Parks Highway would be from future growth. No reductions in present employment would occur as a result of a crossing. An increasing percentage of business customers would come from the rapidly growing local market, and a declining percentage from recreational and other through traffic. Specific businesses might relocate southward in response to shifting growth, however Wasilla would remain the Borough's chief population center, and Palmer would grow as the seat of Borough government. Forecast growth rates in the Palmer/Wasilla area between 2001 and 2010 would be reduced only modestly by crossing-induced shifts in growth.

Table IV-20 presents a summary of the change in regional dwelling units caused by crossing-enhanced accessibility, employment transfer, and induced jobs. The allocation of dwelling units among communities reflects the employment pattern in accordance with the ISER/project team forecasts and the allocation model.

Housing Development Impacts. Crossing enhanced accessibility to a greater supply of lower-cost land in the Mat-Su Borough would increase housing development opportunities in the Anchorage/Mat-Su region. The added land supply would reduce housing development pressure in the Anchorage bowl and other areas close to central Anchorage, and would allow for a slower rate of increase in land and housing prices than without a crossing. Lower dwelling unit prices would permit households in the project area to purchase or rent larger dwellings on larger lots without increasing their total housing cost. These benefits would vary only modestly among the four Crossing Alternatives/growth scenarios.

The impact of a crossing was forecast using a basic model of households' and housing developers' behavior in response to variations in the prices of land and structures. The model used two facts: (1) when housing (combinations of land and structure) becomes less expensive relative to other goods and services, people buy or rent more of it, and (2) when land becomes less costly relative to the cost of dwellings, people will place a given size dwelling on a larger lot (similarly, if land costs rise , less land will be used with a given size dwelling). The analysis focused on five geographic areas: the Anchorage bowl, Eagle River, Point MacKenzie, Wasilla/Palmer, and Big Lake/Houston/Knik/Goose Bay. The model drew on estimates of household and developer responses to cost and price changes previously developed in empirical studies in many cities throughout the United States. The model also incorporated specific Anchorage/Mat-Su information about construction costs and land prices, the size of dwellings and lots typically purchased currently, the amounts households spent on housing, and past cost and price changes. It also drew on the estimates of household growth and allocation just described in this section.

Table IV-20

SUMMARY OF DWELLING UNIT CHANGES WITH CROSSING
(Number of Dwelling Units)

| | 2001 | | | | | 2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) | No-Crossing | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| Mat-Su Borough | | | | | | | | | | |
| Point MacKenzie | 377 | +6,050 | +7,070 | +4,330 | +3,910 | 610 | +10,080 | +11,940 | +7,680 | +6,930 |
| Big Lake/Houston/ Knik/Goose Bay | 6,859 | +5,410 | +7,990 | +3,610 | +2,560 | 10,623 | +8,060 | +11,790 | +5,200 | +3,630 |
| Palmer/Wasilla | 14,507 | -2,190 | +710 | -1,510 | -3,060 | 20,712 | -5,910 | -2,520 | -4,450 | -6,330 |
| Other Mat-Su | 3,206 | +20 | +10 | -20 | +10 | 5,107 | +10 | +10 | 0 | 0 |
| Mat-Su Subtotal | 24,949 | +9,290 | +15,780 | +6,410 | +3,420 | 37,052 | +12,240 | +21,220 | +8,430 | +4,230 |
| Municipality of Anchorage | | | | | | | | | | |
| North Anchorage | 82,934 | -4,480 | -9,460 | -3,110 | -1,760 | 92,768 | -6,160 | -12,940 | -4,150 | -2,210 |
| South Anchorage | 23,965 | -1,850 | -2,160 | -1,280 | -330 | 92,672 | -2,470 | -2,970 | -1,690 | -420 |
| Eagle River | 16,884 | -2,300 | -3,370 | -1,540 | -750 | 20,705 | -3,050 | -4,590 | -2,040 | -930 |
| Turnagain Arm | 2,731 | +10 | -130 | 0 | -100 | 3,801 | 0 | -170 | 0 | -120 |
| Anchorage Subtotal | 126,514 | -8,620 | -15,120 | -5,930 | -2,940 | 209,946 | -11,680 | -20,670 | -7,880 | -3,680 |
| TOTAL | 151,463 | +670 | +660 | +480 | +480 | 246,998 | +560 | +550 | +550 | +550 |

NOTES
North Anchorage includes Northeast, Ship Creek, Downtown, and Northwest communities; see Figure III-3. South Anchorage includes Central, Sand Lake, Ocean View, and Hillside communities.

The following key assumptions were made, in part based on the above kinds of information:

- Household income would rise at about the same rate as inflation over the analysis period.

- Total household spending on housing would stay about the same when housing prices change. That is, people would buy or rent a larger dwelling/land combination if housing prices decrease (just enough larger to offset the price decline). This corresponds, in economists' terms, to a price elasticity of demand for housing of -1, which reasonably reflects the empirical studies noted in the previous paragraph.

- The cost of construction of dwellings, in general, would increase at the inflation rate (and so be unchanged in constant dollars).

- Neither a significant number of existing dwellings would be demolished nor would land be redeveloped at changed densities (in response to housing price changes).

- Households and developers would be highly responsive to shifts in land and structural prices in choosing how much land to combine with a given size dwelling. In particular, in economists' terms, an elasticity of substitution between land and structure of .75 was assumed, reflecting the empirical studies.

Between 1983 and 2001, with No-Crossing, demands for housing from growing numbers of households would continue to cause prices of developed land in the Anchorage bowl and Eagle River areas to increase faster than inflation, though less rapidly than in the past decade because of slower expected population growth. For the 1983 to 2001 period, the housing model indicated a 25 percent real increase would occur in Anchorage bowl land prices (after eliminating the effects of inflation) and there would be a 30 percent real increase in Eagle River prices in the absence of a crossing. These are total increases over the 18 years and represent 1975 to 1983 trends extrapolated to 2001 and dampened to reflect a relatively slower growth rate forecast in the Anchorage bowl. In the Mat-Su Borough, land prices would increase at the inflation rate.

The results of household and developer responses to these changing circumstances, which would be due to a crossing, are shown in Table IV-21. In 2001 with No-Crossing, housing added in the Anchorage bowl and Eagle River to serve population growth would be slightly smaller in size, and each dwelling unit would have significantly less land, compared to 1983. No such change would occur in the Mat-Su Borough (because land and construction costs would not change in real terms).

A crossing would reduce Anchorage bowl land prices by 10 percent and Eagle River land prices by 15 percent in 2001, compared to No-Crossing. That means that between 1983 and 2001 only about half of these areas' expected increase in land prices <u>(in excess of inflation)</u> with no crossing would

Table IV-21

HOUSING IMPACT, 2001

| | Size of Lot (sq. ft.) | | | | Size of Dwelling Unit (sq. ft.) | | | |
|---|---|---|---|---|---|---|---|---|
| | 1983 | 2001 No-Crossing | 2001 Crossing | 2001 Change | 1983 | 2001 No-Crossing | 2001 Crossing | 2001 Change |
| Anchorage Bowl | 4,060 | 3,740 | 4,060 | +8% | 915 | 900 | 910 | +1% |
| Eagle River | 5,470 | 4,500 | 5,120 | +14% | 930 | 915 | 930 | +1% |
| Point MacKenzie | 19,600 | 19,600 | 5,120 | -74% | 1,650 | 1,650 | 930 | -44% |
| Wasilla/Palmer | 19,600 | 19,600 | 19,600 | 0% | 1,650 | 1,650 | 1,650 | 0% |
| Big Lake/Houston/Knik/ Goose Bay | 19,600 | 19,600 | 19,600 | 0% | 1,650 | 1,650 | 1,650 | 0% |
| Total (weighted) | - | 7,480 | 8,390 | +12% | - | 1,070 | 1,110 | +3% |

NOTES

Sizes shown reflect a mix of single family, multi-family/condominium and multifamily rental units.
Sizes with a Crossing assume the Downtown mid-range scenario; impact of an Elmendorf Crossing would be less due to less dwelling unit shift.

Source: Housing model based on: (1) 1975-83 trends extrapolated to 2001; (2) dampening of historic price increases of land in areas with slower dwelling unit growth rate. Estimated change in price of developed land with a Crossing: -10% in Anchorage Bowl; -15% in Eagle River; Point Mackenzie increasing to Eagle River; no change in Palmer/Wasilla or Big Lake/Houston/Knik.

occur with a crossing (60 percent for Anchorage bowl, 50 percent for Eagle River). In reaching these conclusions, a range of land price assumptions was explored. Higher and lower land prices generally would correspond to higher and lower amounts of household location-shifting in response to a Crossing Alternative. Point MacKenzie land prices would increase to Eagle River levels as a result of comparable travel times given a crossing. Point MacKenzie's initially lower construction costs would increase to Anchorage bowl and Eagle River levels, as similar higher density construction took place. Wasilla/ Palmer and Parks Highway south land prices would not be affected by a crossing.

In the Anchorage bowl and Eagle River areas, the quantity of land per (newly built) dwelling would increase significantly with a crossing. This largely would offset the otherwise continuing economic pressure for smaller lots shown for No-Crossing. The small decreases in dwelling size expected between 1983 and 2001 for No-Crossing in the Anchorage bowl and Eagle River also would be offset if a crossing were built. In Point MacKenzie, dwelling and lot sizes would decrease sharply compared to No-Crossing in response to rapidly rising raw land, infrastructure, and construction costs that would occur as travel time to Anchorage would decrease. In the rest of the Mat-Su Borough, the housing situation would be essentially unchanged. The average regional dwelling unit would be slightly larger and on substantially more land with a crossing.

A comparable analysis was performed to estimate the impacts of a crossing for the year 2010. Assumptions were the same as for 2001, except that Anchorage bowl and Eagle River land prices were assumed to grow more slowly from 2001 to 2010 than earlier, as rates of population growth currently forecast for the area further slowed. The results are shown in Table IV-22. Crossing impact on lot size would be slightly greater in 2010 than in 2001, while impact on dwelling unit size would be substantially the same in both years.

To test the sensitivity of housing impacts to the number of households which would relocate in response to a crossing, a steeper decline in Anchorage bowl and Eagle River land prices was tested. In this testing, it was found that there would be housing benefits, i.e., there would be an opportunity for the average resident to purchase a larger lot and house with a given budget. Notably, housing impacts would not be very sensitive to growth shift assumptions.

## Land Use Plans

Table IV-23 describes the impact of the alternatives under consideration on current land use plans including comprehensive development plans, coastal zone management plans, and resource development plans. Only aspects of the plans that would be affected by the alternatives are addressed. All plans were underway or complete before the State Legislature authorized the current analysis of a Knik Arm Crossing. Consequently a crossing was not included as an assumption in the plans; although several discuss the possibility. Thus, the No-Action Alternative would be compatible with all of the land use plans.

Table IV-22

HOUSING IMPACT, 2010

| | Size of Lot (sq. ft.) | | | | Size of Dwelling Unit (sq. ft.) | | | |
|---|---|---|---|---|---|---|---|---|
| | 1983 | 2010 No-Crossing | 2010 Crossing | 2010 Change | 1983 | 2010 No-Crossing | 2010 Crossing | 2010 Change |
| Anchorage | 4,060 | 3,210 | 3,530 | +10% | 915 | 900 | 910 | +1% |
| Eagle River | 5,470 | 4,210 | 4,840 | +15% | 930 | 910 | 920 | +1% |
| Point MacKenzie | 19,600 | 19,600 | 4,900 | -75% | 1,650 | 1,650 | 925 | -44% |
| Wasilla/Palmer | 19,600 | 19,600 | 19,600 | 0% | 1,650 | 1,650 | 1,650 | 0% |
| Big Lake/Houston/Knik/ Goose Bay | 19,600 | 19,600 | 19,600 | 0% | 1,650 | 1,650 | 1,650 | 0% |
| Total (weighted) | - | 9,835 | 11,170 | +14% | - | 1,190 | 1,240 | +4% |

NOTES
Average lot and dwelling unit size; reflects a mix of single-family, multi-family/condominium and multi-family rental units.

Reflects Downtown mid-range scenario; impact of an Elmendorf crossing would be less due to reduced impact on dwelling unit shift within the region.

Source: Housing model based on: (1) 1975 to 1983 trends extrapolated to 2010; (2) dampening of historic price increases of land in areas with dwelling unit growth rate slower than historic rate. Estimated change in price of developed land with a Crossing: -10% in Anchorage Bowl; -15% in Eagle River; Point MacKenzie increasing to Eagle River; no change in Palmer/Wasilla or Big Lake/Houston/Knik/Goose Bay.

Table IV-23

COMPATIBILITY WITH LAND USE PLANS

| Plan | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| Anchorage Bowl Comprehensive Development Plan (revision) | No Impact. | No Impact. | Supports mass transit. See "Public Transportation". | The rate of development of the bowl would be slowed. Planned development patterns would not be affected, however housing densities would decrease. Would reinforce development of downtown as a multi-use center. Would reduce use of mass transit (see "Public Transportation"). | The impact would be similar to Down-Project, although less significant because of smaller growth shift to Borough. |
| Anchorage CBD Comprehensive Development Plan | No Impact. | No Impact. | No Impact. | Would reinforce infill development. Impact on view from proposed Anchorage Historic Development Project for Quyana Park and from proposed "view walk" park at 3rd Avenue and H Street would be insignificant because character of existing view would not change. | No Impact. |
| Port of Anchorage Marketing and Development Plan, Phase II | No Impact. | No Impact. | No Impact. | Would support development of complementary port facility for bulk materials at Point MacKenzie; would eliminate likely need for Municipality to build access to Fire Island for development of bulk materials facility. Direct ramps between port and points north would not affect plans for site or recreational access to shoreline. | Same as Downtown, except new access north not provided. |
| Anchorage Coastal Zone Management Plan | No Impact. | No Impact. | Landing site is consistent with Port of Anchorage Area Meriting Special Attention (AMSA) designated waterfront use; consistent with Alaska Coastal Zone Management Program. | Crosses Port of Anchorage AMSA; elevated roadway is consistent with the designated industrial waterfront use to the maximum extent practicable. | No Impact. |

Table IV-23 (continued)

COMPATIBILITY WITH LAND USE PLANS

| Plan | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| Anchorage Wetlands Management Plan (revision) | No Impact. | No Impact. | Terminal within tidelands; see "Wetlands" and Appendix B. | Crosses "Conservation/Preservation" wetlands along Ship Creek as well as tidelands. Impact limited since on elevated structure, see "Wetlands" and Appendix B. | No Impact. |
| Coastal Scenic Resources and Public Access Plan | No Impact. | No Impact. | No Impact. | Would not change course of proposed trail or affect its use. It would be a dominant visual presence between Ship Creek dam and Resolution Park, but impact is insignificant because existing character of area would not change. Elevated roadway would shade approximately 1,000 feet of proposed Coastal Trail between the dam and C Street. With I Street southbound ramp alternative, one of three access points from trail to downtown would be eliminated. | No Impact. |
| Coastal Trail Plan: Ship Creek to Eklutna | No Impact. | See Pedestrians and Bicycles" for impact to existing Glenn Highway bike path from Eagle River to Mirror Lake. North of Mirror Lake planned trail could be designed to parallel roadway. | No Impact. | Elevated roadway would not change trail's proposed course or affect its use. From trail within proposed Ship Creek linear park, roadway would be dominant element, but impact would be insignificant because existing character of area would not change. | Proposed trail would cross Ship Creek at same point as alignment. Final design of bridge would include provision for Trail. |
| Eagle River-Chugiak-Eklutna Comprehensive Plan | No Impact. | No Impact. | No Impact. | Would slow forecast growth, but not affect the proposed pattern of growth. | Same as Downtown. |

Table IV-23 (continued)

COMPATIBILITY WITH LAND USE PLANS

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Plan | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown Project | Elmendorf Project |
| Matanuska-Susitna Borough Comprehensive Plan | No Impact. | No Impact. | Improvement in access to Anchorage would aid development plans in Point MacKenzie to a limited extent. Improvement limited since limited capacity. | Access to Anchorage reinforces proposed development of Point MacKenzie port/industrial area and the development of natural resources, including agriculture (see "Urban Growth and Development" and "Natural Resource Development"). Residential development on private lands would be at higher densities than now planned and also would occur in rural areas rather than existing developed areas (e.g., area from Big Lake south would draw growth from Palmer/Wasilla area). Development around Big Lake would be greater than intended, and planned core community likely would shift to west side. Tourism would be encouraged. See Chapter V for impact to Iditarod Trail. | Similar to, but to a lesser degree than Downtown Project. |
| Matanuska-Susitna Borough Comprehensive Plan: Public Facilities | No Impact. | No Impact. | No Impact. | Would be increased demand for facilities commensurate with increased development resulting from reduced travel time to Anchorage. See "Urban and Military Function and Operation". | Same as Downtown, but to a lesser degree since travel time reduction would be less. |
| Matanuska-Susitna Borough Coastal Zone Management Plan | No Impact. | Crosses Palmer Hay Flats AMSA; widens existing route; is consistent to the maximum extent practicable with the Alaska Coastal Zone Management Program. | Same as Downtown plus landing site is consistent to maximum extent practicable. | Crosses Point MacKenzie Industrial AMSA using existing road and transportation corridor; is consistent with designated industrial use; and is consistent to the maximum extent practicable with the Alaska Coastal Zone Management Program. | Same as Downtown. |

Table IV-23 (continued)

COMPATIBILITY WITH LAND USE PLANS

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Plan | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown Project | Elmendorf Project |
| City of Houston Comprehensive Development Plan | No Impact. | No Impact. | No Impact. | Decreased travel time to Anchorage (approximately 45 minutes) would increase rate of forecast growth, but would not change planned development pattern since access is limited to Parks Highway intersection. | Same as Downtown, but to a lesser degree because decrease in travel time is less (approximately 22 minutes). |
| Willow Sub-basin Area Plan | No Impact. | No Impact. | No Impact. | Supports goal to increase resource development and develop proposed Point MacKenzie port/industrial site. Would increase demand on recreation areas such as Lake Lorraine, Little Susitna River, Big Lake, and Horseshoe Lake. Residential development would be at greater densities than planned in area south of Big Lake. See Chapter V for impact to Iditarod Trail. | Same as Downtown. |
| Fish Creek Management Plan | No Impact. | No Impact. | No Impact. | Would permit more rapid development of planned Moraine Ridge development assuming the planned connecting road is completed. Would support implementation of proposed agricultural development (see "Urban Growth and Economic Development"). Travel time to Anchorage would be approximately 75 minutes less. | Same as Downtown but time would be approximately 60 minutes less. |

The Downtown and Elmendorf Projects would be generally compatible with land use plans with the exception of some site specific impacts, see Table IV-23. The Glenn/Parks Improvement and Hovercraft Alternatives also would be compatible with the plans except for one site specific impact with the Glenn/Parks Improvement.

All of the alternatives except No-Action would require a determination of consistency with area Coastal Zone Management Plans by the State Office of Management and Budget.

Chapter III noted three planned projects warranting special mention: the Point MacKenzie port and industrial complex, the Susitna Hydroelectric Project, and the State Courts expansion. As indicated in Table IV-23, any alternative would be compatible with the Point MacKenzie development. A crossing would reinforce port development plans although the development is proposed with or without a crossing. Land use plan options take into account the crossing Alternative alignments (Kasprisin-Hutnik Partnership, June 21, 1984). Higher residential densities than indicated in current planning would be expected. None of the alternatives would have any impact on the implementation of either the Susitna Hydroelectric Project or the State Courts expansion.

Dislocation and Relocation

This section summarizes the "Conceptual Stage Relocation Plan", Appendix C. Table IV-24 identifies the estimated number and type of households, businesses, farms, and military facilities that would be displaced with each alternative, as well as relocation opportunities and the anticipated effect on the community.

The most costly and difficult relocations would occur with the Elmendorf Project as a result of its displacement of two antennas. The greatest displacement of homes and businesses would occur with the Glenn/Parks Improvement, principally due to interchange modifications on the Glenn Highway. New houses and commercial structures would have to be built to provide for relocation. The only other relocation that would be difficult would be a home on the Houston Connector applicable to both Crossing Alternatives and Hovercraft. The rural home which would be taken is on lakefront property and includes an airstrip. Lake front property with unobstructed air access for an airstrip would be difficult to replace. The Connector location at this point would result in the least disruption to the Big Lake residential area, despite the dislocation.

If the office building proposed by private developers at L Street and 3rd Avenue is built, it would be displaced by the L Street southbound ramp.

Table IV-24

DISLOCATION AND RELOCATION

| Alternative | Households | Businesses | Farms | Military Facilities | Effect of Relocation on the Community |
|---|---|---|---|---|---|
| No-Action | 0 | 0 | 0 | 0 | No effect |
| Glenn/Parks Improvement | 8 single-family<br>7 mobile homes | 15 businesses serving nearby community | 0 | 0 | Adequate land available for commercial relocations, but limited available commercial structures. No difficulty in mobile home relocation. Replacement housing in same area limited, and single-family residents may have to build replacement dwellings |
| Hovercraft | 1 single-family with air strip and outbuildings | 0 | 0 | 0 | Household could relocate to available rural land with no effect to community; would be difficult to locate lakefront property with unobstructed air access for air strip |
| Downtown Project | 1 single-family with air strip and outbuildings | 1 freight operation,<br>1 private parking lot<br>1 Floor and wall operation<br>1 marina<br>1 Trucking firm | 0 | 0 | Relocation of floor and wall operation and trucking firm, even out of the immediate area, would not disrupt the community. Relocation of freight operation and parking lot from immediate area would adversely affect the community, however adjacent railroad land would be sought. Marina is for sale and probably would not relocate; could be relocated without adverse affect. Household could relocate to available rural land with no effect to community; would be difficult to locate lakefront property with unobstructed air access for air strip |
| Elmendorf Project | 1 single-family with air strip and outbuildings | 0 | 0 | 1 Sanitary landfill<br>1 portion of Defense Property Disposal Office storage yard<br>1 Borrow area<br>1 Aeronautical receiver antenna<br>1 Federal Aviation Administration Antenna<br>1 Gate | Relocation of the land fill, gate, borrow area, and storage yard could be readily accomplished and would not adversely affect military operations. Relocation of the two antennas likely would be off-base resulting in increased travel time from center of Base activity. An in-depth study would be required to identify a replacement site. Household could relocate to available rural land with no effect to community; would be difficult to locate lakefront property with unobstructed air access air strip |

## Urban and Military Function and Operation

Neighborhood and Business Community. Either the Downtown Project or the Elmendorf Project would have limited indirect, long-term impacts on Anchorage neighborhoods through changes in patterns of traffic operation. Similar traffic-related impacts would not occur with the No-Crossing Alternatives.

The Downtown Project would increase traffic significantly on the I/L Street Couplet and the Ingra/Gambell Couplet between 5th Avenue and 15th Avenue. The I/L couplet is currently the major north/south arterial for the west side of Anchorage and the Ingra/Gambell Couplet serves the same function for central Anchorage. The two couplets pass through residential communities, and homes are immediately adjacent to the couplet and/or face the streets between 10th and 15th for I/L and between 9th and 15th for Gambell. The additional traffic on these streets would further isolate homes between I and L and west of Gambell from their neighbors. Difficulties in getting out of driveways would be increased.

With the Elmendorf Project, there would be increases in traffic on Muldoon and Tudor Roads as well as on the Ingra/Gambell Couplet between 8th and 15th Avenues. Both Muldoon and Tudor Roads are boundaries between neighborhoods and are major arterials, so no disruption to intra-neighborhood circulation would occur. The increase in traffic on Gambell Street would not be as great as with the Downtown Project, but the impact would be similar.

Other indirect impacts to neighborhoods and the business community would be changes in noise levels and air pollution. These impacts are addressed elsewhere in this chapter under "Noise" and "Air Quality".

None of the alternatives would have a direct impact on residential neighborhoods. The Elmendorf Crossing would have an impact only on military facilities which are discussed in the next section. The Downtown Crossing and Seward Connector would have the following community impacts:

- The I/L ramps would cross an area of the Arm now being filled by York Steel. The builder has indicated that the elevated ramps would not disrupt use of the site which is indefinite at this time. The freight and passenger main lines of the Alaska Railroad would be crossed but with a pier design and at sufficient height such that no disruption of service would result. Ramp construction would be planned so as not to disrupt rail service. One freight operation and a parking lot would be displaced. See "Displacement and Relocation". Visual and noise level impacts would occur where the ramps approach 3rd Avenue. See the "Visual" and "Noise" sections of this chapter.

- The Port of Anchorage access ramp would pass across a boat facility and a trucking operation. Both would be dislocated; see "Dislocation and Relocation".

- From Station 142 to 155 (See Appendix A), the Seward Connector would pass over an industrial railroad spur. Although it might have to be moved slightly during construction, its usefulness would not be impaired by the completed overhead roadway. Its users would be consulted during design and prior to construction to minimize adverse impacts.

- From Station 162 to 170, the Connector would pass over storage areas for new automobiles and for steel pipe. The automobile storage would have to be moved to another location, perhaps on Alaska Railroad lands elsewhere in the area, during Seward Connector construction. Although the materials would likely need to be arranged to accommodate piers, the steel pipe operation could remain during construction. Both uses could readily continue underneath the completed structure.

- At Station 77, a business would be displaced. See "Dislocation and Relocation". Also, in this area, the Connector would follow a railroad spur and cross the Alaska Railroad main passenger line. The impact would be similar to the railroad crossings described earlier. The same mitigating measures would be used.

- The southbound Gambell Street ramp alternative for the Seward Connector would pass between the administration and hospital buildings of the Alaska Native Medical Center. Since the driveway at this location leads to the main entrance of both buildings, vehicular and pedestrian access would be adversely affected. There would also be a noise impact, see "Noise". Discussions with Medical Center staff suggest that relocating the main entrance and modifying the facility's internal circulation patterns would not be feasible. An estimated 2,000 pedestrians per day, in addition to ambulatory and wheelchair patients conveyed by the Medical Center's van-based patient transportation program, currently use the main entrance to enter the hospital. A pedestrian overpass would be used to mitigate some circulation problems, but only for pedestrian traffic between the two buildings, not for persons arriving and departing. Parking space and access to it would also be affected. Parking is currently limited, and access to the northern lot, already difficult, would be adversely affected by eliminating the hospital's main driveway for a Gambell Street ramp. Delivery and emergency services access on the hospital's east side would not be adversely affected. Only placing the ramp in a tunnel or relocating the medical center would fully mitigate the above impacts. Both would have unacceptably high cost. Two million dollars has been appropriated but not yet passed down to the Indian Health Service for relocation of or improvements to the existing hospital, which is number one on the U.S. Public Health Service's National Priority List for replacement. This ramp alternative would be selected only if the Public Health Service decides to proceed with replacement of the hospital on another site as part of their own planning. The southbound Ingra ramp and northbound ramp alternatives would pass north and east of the hospital and there would be no significant impact.

The Houston Connector would pass through primarily publicly-owned undeveloped parcels. The principal impact would be the splitting of privately-owned parcels (including native-owned lands). Most parcels are 40 acres and larger. This impact would be mitigated by providing access to both parts of the large split parcels via frontage roads and underpasses. See the drawings in Appendix A. Undevelopable remnants of both large and small parcels would be purchased as a part of right-of-way acquisition. A final impact would result from placing the Houston Connector through the Big Lake/Horseshoe Lake community. The character of the area would be altered by its proximity to the road and changed proximity to Anchorage. The pace of development in the area would increase, the number of full-time residents would increase, and the core of growth likely would shift from the east side of Big Lake to the west side; see "Land Use Plans".

None of the No-Crossing Alternatives would affect the functioning of neighborhoods or the business community.

Military. Only the Elmendorf Crossing would affect military facilities. Impacts to Elmendorf AFB facilities are listed below, and impacts to emergency services are discussed later in this section. Impacts to recreation facilities are discussed in Chapter V. The station numbers referenced are shown on the drawings in Appendix A. The impacts would be:

- At Stations 34 and 53, unpaved roads/trails would be severed, but an access road from Walton Road would be provided to restore access.
- At Station 57, Walton Road would be crossed. A bridge over the Crossing approach would be provided.
- At Station 61, an unpaved road would be severed, however access would be provided via the overpass at Station 50+80.
- At Stations 86, 97, 101, and 108, roads into the adjacent ammo dump would be severed, however all are overgrown and presently unused. The principal access into the dump would not be affected.
- At Station 93, the Crossing would pass through the middle of an active sanitary land fill which would need to be relocated elsewhere on the Base.
- From Station 104 to 112, the Crossing would pass through the edge of a "suspect vehicle parking area". That designation requires that all vehicles parked in the area be considered suspect until examined. No adverse impact would result since the Crossing would be fenced and there would be no opportunity for Crossing users to enter the area not used for the roadway.
- From Station 106 to 116, the Crossing would pass through the Defense Property Disposal Office storage yard (east side). Space would be available to relocate stored materials south of the western portion of the storage yard.

- From Station 106 to 116, the Crossing would displace an unpaved road from the south into the Defense Property Disposal Office site. It would be relocated to serve the altered storage yard.

- At Station 130, a road would be crossed and a bridge over the Crossing approach would be provided.

- At Station 138, the unpaved east-west runway centerline road would be crossed just to the east of the Tactical Air Navigation (TACAN) facility. A bridge over the Crossing approach would be provided at the runway centerline.

- At Station 159, a corner of the ARCS radio-controlled model flying site would be within the Crossing right-of-way. The area would be replaced by expanding the site to the east.

- At Station 164, a road leading to the ARCS site and the ground-to-air transmitter/receiver would be crossed and a bridge across the Crossing approach would be provided.

- At Station 171, the Alaska Railroad would be crossed. The Crossing approach would be on a bridge over the Railroad.

- At Station 174, Ladue Road would be crossed. The Crossing approach would be on a bridge and the road would be moved slightly.

- From Station 174 to 184, the Crossing would split a borrow area; 40 percent of its area would be displaced. Another site would be developed on the Base.

- At Stations 187 and 200, the Crossing would sever two overgrown roads/trails. A large culvert would be provided to restore access at Station 187 and a road from Hubble Road would be provided at Station 200 to restore access.

- At Station 204, Hubble Road would be crossed. It would be relocated and the Crossing approach would pass over it on a bridge.

- At Station 239, and from Station 260 to 172, sections of overgrown road/trails would be severed, however large culverts would be provided at Stations 242 and 265 to restore access.

- At Station 273, Loop Road would be crossed by the Crossing approach on a bridge.

- At Station 289, an overgrown road/trail would be severed, however a large culvert would be provided for access.

- The Aeronautical Antenna Receiver and Federal Aviation Administration antenna site would be displaced; see "Dislocation and Relocation". The road to the site at Station 292 would be severed and a road would be built parallel to the Crossing approach to restore access.

- At Station 312, the gravel Mountain Road would be severed, but the access road described in the previous note would be extended to Mountain Road to restore access.

- Although the Elmendorf Project would meet minimum distance separation requirements for electromagnetic interference and radio frequency interference for the Air Force's Circularly Disposed Antenna Array (CDAA) and it would not require relocation, the construction phase of the project could cause interference problems. Machinery, vehicles, and equipment used in the construction would need to be modified to limit interference and would be subject to testing by an Air Force approved agent. Faulty equipment would have to be either modified immediately or removed from the sites.

Schools. As discussed earlier, the Downtown Project would increase traffic on I/L Streets and Ingra/Gambell Streets. The Elmendorf Project would increase traffic on Muldoon and Tudor Roads, as well as on Ingra/Gambell Streets.

The roads just described all would cross elementary school attendance boundaries. The increase in traffic on these roads would not have an impact on students going to and from school since these streets are already designated as hazardous for walking students and bus transportation or adult crossing guards are provided.

Changes in regional growth patterns with the Crossing Alternatives would decrease school needs in Anchorage and increase school needs in the Mat-Su Borough. Since changes in growth patterns would involve primarily a growth shift of children from one school district to another, the effect would be one of changing where schools would be needed - not an increase in how many would be required. Schools are financed by bonds issued by the local school district. Most of the debt service is paid by the State with an annual appropriation from the general fund.

Anchorage currently has 0.5 public school students per dwelling unit. School District forecasts predict this percentage to continue for a least the next ten years (Anchorage School District, December 1983 and project team dwelling unit forecasts). Using the changes in dwelling units from Table IV-20 in 2001, the following changes in forecast students would occur:

| | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
|---|---|---|---|---|
| 2001 | | | | |
| Anchorage | 4,310 | 7,560 | 3,000 | 1,470 |
| Mat-Su Borough | 4,645 | 7,890 | 3,205 | 1,700 |
| 2010 | | | | |
| Anchorage | 5,840 | 10,335 | 3,940 | 1,840 |
| Mat-Su Borough | 6,120 | 10,610 | 4,215 | 2,115 |

Using grade distribution for Anchorage in 1993 to 1994 (the last year currently forecast by the school district) (Anchorage School District, December 1983), the growth change would include he following ranges of number of students:

| | Downtown | | Elmendorf | |
|---|---|---|---|---|
| | 2001 | 2010 | 2001 | 2010 |
| Kindergarten - 6 | 2,583 - 4,388 | 3,403 - 5,900 | 945 - 1,782 | 1,176 - 2,344 |
| 7-8 | 754 - 1,280 | 993 - 1,722 | 216 - 520 | 343 - 684 |
| 9-12 | 1,233 - 2,094 | 1,624 - 2,815 | 451 - 851 | 561 - 1,118 |
| Special Services | 75 - 128 | 100 - 1,173 | 28 - 52 | 35 - 69 |
| Total | 4,645 - 7,890 | 6,120 -11,610 | 1,700 - 3,205 | 2,115 - 4,215 |

Using the Mat-Su Borough design criteria of a 525 student capacity for suburban elementary schools, 600 for junior high schools, and 1,200 for senior high schools (Mat-Su Borough, March 1984a), the number of new schools that the Borough would need beyond those that would occur with No-Action are:

| | Downtown | | Elmendorf | |
|---|---|---|---|---|
| | 2001 | 2010 | 2001 | 2010 |
| Kindergarten - 6 | 4.9 - 8.4 | 6.5 -11.2 | 1.8 - 3.4 | 2.2 - 4.5 |
| 7-8 | 1.3 - 2.1 | 1.7 - 2.9 | 0.5 - 0.9 | 0.6 - 1.1 |
| 9-12 | 1.0 - 1.7 | 1.4 - 2.3 | 0.4 - 0.7 | 0.5 - 0.9 |
| Total | 7.2 - 12.2 | 9.6- 16.4 | 2.7 - 5.0 | 3.3 - 6.5 |

At Station 22 of the Elmendorf Crossing, a driveway to parking at Bartlett High School would be partially taken. It would be restored east of its present location.

Emergency Services. Neither a Crossing nor a No-Crossing Alternative would affect significantly the operation of area (Municipal, Borough, and military) emergency services. In general, access to areas now served would be unchanged. Response time for the Emergency Medical Service vehicle from Houston to the Horseshoe Lake and west Big Lake area would be reduced. Joint agreements between the Municipality of Anchorage and Mat-Su Borough would have to be reached for providing emergency services on a crossing. An assistance agreement would also be needed between Elmendorf AFB and the Municipality with the Elmendorf Crossing. Facilities for fire fighting on the bridge would be determined in consultation with representatives from the Municipality Fire Department and the Borough during final design.

The principal impact of a Crossing Alternative would come from the shift of planned growth from the Municipality to the Mat-Su Borough. Except in Palmer, fire service is provided in the Mat-Su Borough by Fire Service Areas along the Parks Highway and at Big Lake, staffed primarily by volunteers. In general, citizens petition for fire service and the Borough reacts. The level of service provided is based on demand and citizen willingness to support operating costs and provide volunteers. The areas expected to receive the greatest shifted growth would be the Point MacKenzie and the Knik/Goose Bay areas. Neither area has fire service. Within 10 years of project completion, the Knik-Goose Bay area would have a population similar to the current population in the Palmer area, and Point MacKenzie's population would be similar to the current population in the Wasilla area. Thus, fire service would need to be quickly mobilized in these areas following crossing completion in order not to leave significant areas of development unprotected. The Borough would organize the new Fire Service areas and the State would bear the cost of equipment and buildings. This cost likely would not be offset by savings in Anchorage, since its current facilities plus one station under construction are considered adequate to meet Municipal needs until 2000.

Emergency Medical Service (EMS) also would be required in the Knik/Goose Bay and Point MacKenzie areas. Again the vehicles would be purchased by the State at the request of the Borough, which provides EMS or ambulance service to the entire Borough. Anchorage plans to expand EMS service as Anchorage grows, so it is likely that the extra cost in the Borough would be offset by savings in Anchorage.

Port of Anchorage and Navigation Clearance. The Downtown Project is the only alternative that would affect port-related activities. The Project would not affect current port and private dock road access, and would improve access upon completion of the Seward Connector by providing direct ramps from the port to the bridge. This would eliminate the need for northbound port trucking to pass through downtown Anchorage.

Conversations with the Port of Anchorage and users of the Port and private docks to the south indicate that the Crossing would not adversely affect their ability to approach berths and to dock once they have passed under the bridge. However, concern was expressed about the potential for striking bridge piers. Vertical navigation clearance (150 feet above mean higher high water) and span location are viewed as appropriate, and the span width (1,000 feet) is viewed as adequate under normal operating conditions. However, currents and ice in the Arm make navigation difficult. Ships and barges have in the past been trapped in ice reducing the amount of control their operators have. Operators differ in opinion on whether or not this difficulty in combination with a Downtown bridge is manageable. The U.S. Coast Guard presently views the bridge as having a substantial risk of vessel collision. Means of minimizing the potential for ship collision and minimizing damage if a collision occurs are described in Chapter II, and they would be examined in detail during project design.

The Elmendorf Crossing and Houston Connector would be the only other alternatives with navigation impacts. The Elmendorf bridge would have 500-foot spans and would be 31 feet above mean higher high water. Chugach Electric Association has indicated that this would be adequate for their maintenance barge. The Coast Guard views this clearance as acceptable for any existing or reasonably forseeable marine traffic and has indicated that such traffic would present very little risk of collision with the bridge. Provisions for commercial navigation would not be required. With the Houston Connector, a height for navigation of approximately 50 feet would be provided across the narrows between Mirror Lake and Big Lake.

The U.S. Coast Guard will determine bridge clearance requirements for Knik Arm and Mirror/Big Lakes. This determination will be reported and taken into account in the Final EIS. The determination will be based in part on comments made at the EIS public hearing. The Coast Guard may hold individual hearings which solely would address navigation clearance.

Aviation Clearance. The only alternative that would encroach on aviation clearance zones is the Downtown Crossing. The bridge's towers would penetrate approximately 30 feet into the aviation clear zone for Merrill Field. The Federal Aviation Administration (FAA) will determine the acceptability of the encroachment prior to completion of the Final EIS. The determination will be reported and taken into account in that document. Conversations with the FAA indicate that the encroachment will probably be found acceptable. Obstruction lighting would be provided in conformance with FAA requirements.

Utilities. The following utilities have facilities within the construction limits of the Crossing Alternatives:

- Municipality of Anchorage
  - Anchorage Telephone Utility
  - Municipal Light and Power (ML&P)
  - Anchorage Water and Waste Water Utility

- ENSTAR Natural Gas

- Multivisions (Cable TV)

- Tesoro

- Chugach Electric Association

It is anticipated that all of the buried utilities within the limits of either Project except sewer and water would have to be adjusted/relocated due to their shallow depth. If substantial fills or cuts are required in the vicinity of sewer or water mains, these also would have to be adjusted or relocated. Utility involvement would be approximately the same for the various Downtown Project ramp alternatives.

Significant utility facilities affected by the Downtown Crossing and Seward Connector would be:

- Tesoro's 8-inch high pressure multipurpose line in the vicinity of the Ocean Dock Road Access Ramp. However, bridge piers could be designed to avoid an impact.

- ML&P's aerial transmission line which goes north along H Street crossing the mud flats and the Seward Connector to the Anchorage marine area. Six to eight line structures would be relocated with either I/L ramp alternative.

- Anchorage Water and Waste Water Utility has a 36-inch RC sewer trunk paralleling the railroad tracks, Tesoro's facility, and the proposed Port access ramp. However, bridge piers could be designed to avoid an impact.

- A major double-circuit transmission facility belonging to Chugach Electric Association is between stations 79 and 88 (see Appendix A). Approximately five line structures would need to be relocated slightly to the north.

- ML&P has a double-circuit transmission facility along the northside of 3rd Avenue. A few line poles would need to be relocated since street lights for the new intersection would interfere with the lines. The impact would be similar for both Ingra/Gambell ramp alternative.

- An ENSTAR 12-inch HP natural gas main goes along the south side of 3rd Avenue east of Ingra Street and ties into an 8-inch main along the west side of Ingra. The project would be designed to avoid impacts.

- An 1,800-pair buried telephone cable lies along the north side of 3rd Avenue east of Ingra, it then turns south along the west side of Ingra. The project would be designed to avoid impact.

Other smaller, miscellaneous utility facilities would also have to be adjusted with the Downtown Crossing and Seward Connector.

Significant utility facilities affected by the Elmendorf Crossing would be:

- Along the south side of Glenn Highway there is a ML&P aerial 115 KV transmission circuit with 12.5 KV distribution underbuilt and 2 communication cables attached. It would be relocated slightly to the south to accommodate the ramps to the Glenn Highway.

- At approximately station 21 (see Appendix A), the roadway would cross an aerial military power facility. ML&P has a 115 KV transmission circuit on top with the military's 34.5 KV transmission and 12.5 KV distribution underbuilt. The lines would have to be raised over the elevated road.

There are other various smaller aerial and buried military utilities which would be encountered throughout the base such as communication cables, power distribution circuits, and water and sewer mains that would be adjusted.

Significant utility facilities affected by the Houston Connector would be:

- The road would pass under Chugach Electric Association's 138 KV aerial transmission facility at station 140, but the facility would be unaffected. So that right-of-way access would not be severed, a road would be provided across the Connector at this point for use by Chugach personnel only.

- A new 20-inch natural gas transmission main from Beluga (ENSTAR Natural Gas) would also cross the Connector. The line would be protected under the Connector.

- In the Horseshoe Lake area, the Connector would cross Matanuska Electric Association's aerial 115 KV transmission circuit. The impact and mitigating measure would be the same as for the Chugach line discussed above.

There are other aerial and buried power and telephone distribution circuits for local consumers belonging to Matanuska Electric Association and Matanuska Telephone Association that also would be adjusted.

Utilities impacts for the Hovercraft Alternative would be those for the Houston Connector which is included in that alternative. The Glenn/Parks Improvement would affect the following major utilities along the Glenn Highway:

- Approximately 19 miles of the ENSTAR gas line, currently under construction, would be affected. Where the line is at the top of existing cut slopes, it would require relocation. In other areas, it would be covered over with new fills.

- Matanuska Electric Association presently has a 69 KV transmission line adjacent to the highway through the Eklutna Flats area. Approximately 2½ miles of this line probably would need to be relocated.

No major utility lines are within the limits of the portion of the Parks Highway that would be widened.

All utilities affected by the alternatives under consideration would be relocated or modified as required. Costs would be paid by the project. ADOT/PF would work closely with the organizations whose facilities would be affected to develop a strategy for utility modification that would not significantly affect customer service.

It is expected that water and sewer service for new development in the Mat-Su Borough would be provided privately either by household wells and septic systems or by cooperatively owned wells and package waste treatment systems. Mat-Su Borough subdivision regulations (Mat-Su Borough, March 1982) regulate sanitary waste disposal of new subdivisions to assure a hazard is not created. No sewage system can be closer than 100 feet to any water body or water course.

Matanuska Electric Association would serve the area south of the Parks Highway where increased growth would occur. The association gets its power from Chugach Electric and could arrange for the needed power. Chugach generation needs would not be significantly affected since it generates power for the entire project area, and most of the new growth in the Borough would be shifted from the Anchorage bowl. The extension policy described in Chapter III would be applied to new Mat-Su Borough development. However, in the Point MacKenzie area a new trunk system would be required and not merely extension. The consumer charging system for paying for the new system would thus be complex to administer.

Matanuska Telephone Association (MTA) would serve new growth in the Borough. MTA probably would need to finance a new switch and office to serve the Point MacKenzie area. The way service is provided and the amount invested would depend on the anticipated number of subscribers and anticipated return. Subscribers ultimately would pay the cost of the new service by fees from the new subscribers. ENSTAR readily could provide service to new growth south of the Parks Highway from the new gas line which will pass just north of the Point MacKenzie area. Distribution lines would be built when requested by developers at the developer's cost.

Finally, utility lines could be accommodated on either Crossing Alternative. ADOT/PF would work closely with utilities during crossing design to meet their needs. All costs of adding utilities to a Knik Arm bridge would be paid by the utilities. During the corridor studies, Chugach Electric Association, Anchorage Telephone Utility, ENSTAR Gas Company, and Alaska Power Authority indicated an interest in placing lines on a crossing.

Minorities, Low Income, Elderly. None of the alternatives would directly affect concentrations of minorities, low-income persons, or the elderly. None of the alternatives would pass through residential communities. Displacement of businesses and homes would be minor and relocation would not be a problem; see "Displacement and Relocation".

The only impact to residential neighborhoods would be an indirect impact resulting from changed traffic patterns with the two Crossing Alternatives. As discussed under "Neighborhood and Business Community", traffic would increase on the I/L Couplet and the Ingra Street portion of the Ingra/Gambell Couplet with the Downtown Project, and on Ingra Street with the Elmendorf Project. Both these major arterials would pass through residential neighborhoods. Racial, income, and age characteristics for block groups in the affected areas from the 1980 Census of Population and Housing are:

| | Municipality of Anchorage | Ingra Street Area[1] | I/L Streets Area[2] |
|---|---|---|---|
| Percent Minorities | 15 | 22 | 3 |
| Percent Aged, 62 and over | 3 | 9 | 19 |
| Percent of Households Below the Poverty Level | 6 | 17 | 7 |

[1] Census tract 10, block group 2
[2] Census tract 12, block group 2

The Ingra Street area has a higher percentage of minorities and households below the poverty level than the Municipality as a whole. The I/L Street area has a higher percentage of elderly, primarily because the Anchorage Pioneer Home for elderly Alaskans is between I and L Streets on 11th Street.

However, minorities, low income persons, and the elderly do not predominate in either area. Thus, it is concluded that none of the alternatives would have an adverse impact on minority, low income, and elderly communities which would require separate consideration in this document, special community coordination, or special efforts to assure their ability to participate fully in public hearings.

Government Finance

This section begins with a discussion of impacts on local government revenue and operating costs. It concludes with a discussion of competition for funding with other proposed capital projects. See "Urban and Military Function and Operation" for a discussion of how utilities and emergency services would be provided for new development in the Mat-Su Borough.

Table IV-25 presents the change in local government costs and revenues that would result from each Crossing Alternative/growth allocation scenario, without and with added induced development. "Without induced development" takes into account shifts in residential and business growth due to improved accessibility to the Mat-Su Borough. "With Induced Development" adds new regional employment that would be generated by a Crossing, see "Urban Growth and Economic Development". The methods used to calculate these amounts were developed in the corridor level analysis; see the "Final Corridor Alternatives Analysis" report (USDOT/FHWA, ADOT/PF, December 5, 1983). Revenue figures are based on average current (1983 to 1984) local property taxes collected for residential real and personal property, per dwelling unit; average current revenue collected for commercial real and personal property, per employee; and average other local revenues and service fees, per dwelling unit. Cost figures are based upon average current costs for schools and local government, per dwelling unit. These are shown in Table III-10. They are the most recent figures available for a single time period. They are in 1983 dollars; estimate 1985 dollars by adding about 10 percent.

Mat-Su Borough Operating Revenue and Cost. In the Mat-Su Borough, the current cost per dwelling unit is $4,343 (for a locality where areawide, non-areawide, and fire service district taxes apply), of which 29 percent is paid from locally-generated funds, and 71 percent, or $3,090 must be generated from non-local sources (see Table III-6). Without any induced industrial development, new local revenues from residential development and employment shifted to the Borough as a result of either Crossing Alternative would pay only about 19 percent of the local costs generated by this shift. The Borough would need to either obtain additional revenue to meet the shortfall or reduce services provided. The absolute dollars of revenue shortfall (difference between local revenue projected and revenue required to cover 29 percent of costs) would be:

| Crossing Alternatives | Revenue Shortfall (millions) |
|---|---|
| Downtown | |
| Mid-range | $5.09 |
| High | $8.85 |
| Elmendorf | |
| Mid-range | $3.50 |
| Low | $1.75 |

Table IV-25

GOVERNMENT FINANCE, 2010
(millions of dollars)

| Alternative/Scenario | Municipality of Anchorage: Change In Total Cost | Municipality of Anchorage: Change In Local Revenue | Matanuska-Susitna Borough: Change In Total Cost | Matanuska-Susitna Borough: Change In Local Revenue | Total Region: Change In Total Cost | Total Region: Change In Local Revenue |
|---|---|---|---|---|---|---|
| Downtown (Mid-Range) | | | | | | |
| Without induced development | -62.81 | -18.77 | +52.90 | +10.25 | -9.91 | -8.52 |
| With induced development | -60.43 | -18.03 | +53.11 | +10.30 | -7.32 | -7.73 |
| Downtown (High) | | | | | | |
| Without induced development | -109.37 | -33.21 | +91.98 | +17.83 | -17.39 | -15.38 |
| With induced development | -106.95 | -32.62 | +92.16 | +17.87 | -14.74 | -14.75 |
| Elmendorf (Mid-Range) | | | | | | |
| Without induced development | -43.10 | -12.86 | +36.44 | +7.07 | -6.66 | -5.79 |
| With induced development | -40.77 | -12.22 | +36.61 | +7.11 | -4.16 | -5.11 |
| Elmendorf (Low) | | | | | | |
| Without induced development | -21.47 | -6.32 | +18.20 | +3.53 | -3.27 | -2.79 |
| With induced development | -19.04 | -5.65 | +18.37 | +3.57 | -0.67 | -2.08 |

NOTES

Based on average current Municipal or Borough expenditures per dwelling unit; average current revenue collected for residential real and personal property per dwelling unit; average current revenue collected for commercial real and and personal property per employee; and average current other local revenues collected per dwelling unit.

Low, mid-range, and high refer to the growth allocation scenarios described under "Urban Growth and Economic Development".

In 1983 dollars, add about 10 percent to estimate 1985 dollars.

Low, mid-range, and high refer to the growth allocation scenarios presented under "Urban Growth and Economic Development".

These estimates are based on the State's continuing to provide its current share of local costs. Should future State revenue shortages require that local sources cover a larger share of costs, the estimated shortfall would increase commensurately. The relative difference between alternatives would not be affected by such shifts in State support. Rising tax rates due to non-crossing related growth also would not influence the relative difference between alternatives.

The share of local costs paid from local revenues would not vary significantly with induced development. Costs would continue to exceed revenues generated. The fiscal benefits that would be gained from the very limited non-residential development added would be offset by the residential development that would accompany the induced jobs. The absolute dollars of shortfall between local revenues and costs would remain at $1.75 million to $8.85 million.

The projected revenue shortfall could be met by increasing Borough millage rates, selling Borough lands, or increasing the State share of local costs. Some sales of Borough land would be required in order to provide for the estimated growth shifts and induced development; see "Urban Growth and Economic Development". Alternatively, Borough financial requirements could be reduced by requiring subdivisions to be responsible for road and utility services through resident associations or local improvement districts.

<u>Municipality of Anchorage Operating Revenue and Cost</u>. In the Municipality of Anchorage, public service costs would decrease more rapidly than revenues for any Crossing Alternative/growth allocation scenario. This effect reflects the movement of residential growth out of Anchorage while substantial numbers of employees remain, with or without induced development. The reduction in costs would be over three times higher than the reduction in revenues from shifted residential development and employment.

Current local cost per dwelling unit for the Municipality of Anchorage is $5,174, of which 38 percent is generated locally, leaving 62 percent, or $3,200 to be funded from non-local sources. The revenue gains that would be realized by the movement of forecast population and employment growth out of Anchorage (that is, the difference between revenue lost and revenue equal to 38 percent of reduced costs) would vary as follows for the different Crossing Alternatives/growth allocation scenarios without induced development:

| Crossing Alternatives | Revenue Gain (millions) |
|---|---|
| Downtown | |
| Mid-range | $5.10 |
| High | $8.35 |
| Elmendorf | |
| Mid-range | $3.52 |
| Low | $1.84 |

The Municipality's financial picture would not be negatively affected by including induced development with any Crossing Alternative; gains would be only slightly less.

Total Regional Operating Revenue and Cost. With or without induced development, a Crossing would reduce costs regionwide under any Alternative/scenario; see Table IV-25. The cost reduction generally would be in excess of local revenue loss. Shifts in forecast growth and induced development would reduce non-local as well as local revenue requirements. Assuming no increase in Borough costs per dwelling unit, each household moving from Anchorage to the Mat-Su Borough would reduce the burden on non-local sources by $110. Using the number of dwelling units that would move from Anchorage to the Borough in 2010 without induced development, the following burden would be lifted from non-local sources for each Crossing Alternative/scenario:

| Crossing Alternatives | Cost Reduction (millions) |
|---|---|
| Downtown | |
| Mid-range | $1.34 |
| High | $2.32 |
| Elmendorf | |
| Mid-range | $0.91 |
| Low | $0.45 |

Competition with Other Capital Projects. If legislative appropriations and/or Federal highway participating funds are used to complete all or part of one of the alternatives under consideration (see Appendix F), an alternative would be competing for funds with other proposed capital projects, both road and non-road.

Competition for Federal highway funds would be reduced by the project scheduling described in Chapter II. The Houston Connector, Seward Connector, and Glenn/Parks Improvement most likely would be financed with Federal highway funds. However, the construction would be scheduled to start after completion of the Anchorage accelerated road program. Construction of the Houston Connector and Glenn/Parks Improvement would not begin until 1988 or 1989 towards the end of the current short-range transportation planning period (1989); see "Street and Highway Plans". Construction of the Seward Connector would not begin until 2000, near the end of the current long-range planning period (2001). By scheduling Crossing projects at the end of planning periods, neither short-term nor long-term planned projects would be delayed more than a year or two and most would be completed on schedule. Yet, the Crossing-related projects still would be completed in time to serve Crossing traffic.

It is impossible to predict what other capital projects might be delayed by the use of State general funds since funding recommendations and decisions are made on an annual basis. Undoubtedly, the use of State funds for one of the alternatives would delay the implementation of other desirable capital projects. However, no commitment has been made to fund any of the alternatives using State general funds. Thus, in funding decisions by the legislature, a selected alternative would be competing with other capital projects on its own merits. A decision could be made to delay implementation of a selected alternative if implementation of other capital projects was found to be of greater importance.

The use of toll revenues, land value capture, and private financing are being considered for use in building the Crossing Alternatives so that use of State and Federal monies can be minimized; see Appendix F.

## C. NATURAL RESOURCE IMPACTS

The following areas of interest are discussed under natural resource impacts: Biological resources, wetlands, water quality and hydrology, floodplains, natural resource development, Iditarod Trail, air quality, noise, energy, and visual.

### Biological Resources

Impacts are discussed within terrestrial, marine, and freshwater environments. Within each of these sections, impacts resulting either directly or indirectly from construction and operation of the alternatives are discussed, followed by a discussion of secondary impacts - that is, those impacts resulting from shifted or induced development. Separate sections discuss changes to uses of fish and wildlife and impacts to threatened and endangered species.

Terrestrial Habitats. The surface areas of habitat that would be directly altered by the alternatives under consideration are presented in Tables IV-26 amd IV-27. These groupings of habitat types are consistent with the system used in the Willow Sub-basin study program (U.S. Department of Agriculture, October 1981). Habitat mapping procedures are described in Technical Memorandum No. 16, "Freshwater and Terrestrial Habitat Studies" (USDOT/FHWA, ADOT/PF, January 27, 1984). Table IV-27 shows surface area altered with respect to wildlife value.

As indicated by Table IV-26, when right-of-way impacts alone are considered, the Elmendorf Project would disturb more natural habitat than would the Downtown Project because of the length of roadway passing through Elmendorf AFB. The opposite is true when secondary impacts are considered (as discussed below). The primary habitat type which would be disturbed by either Crossing Alternative would be mixed coniferous/deciduous upland forest. This forest type, although valuable for moose and other upland species (see Table III-11), is widespread. There are 286,110 acres in the Willow Sub-basin (Bob Bennett, ADNR, personal communication), and the Houston Connector would take 0.2 percent of it. Removal of this habitat as a result of road construction probably would not affect wildlife populations significantly with the possible exception of the southern portion of Elmendorf AFB which is known to be valuable moose winter range (Rothe et al., 1983). Interference with the movement of moose might be a significant impact of the Elmendorf Project since the portion of the roadway within Elmendorf AFB would be fenced at the right-of-way boundaries. This barrier would prevent moose from reaching the southwest portion of the Base where

Table IV-26

DIRECT TERRESTRIAL HABITAT IMPACTS
(Acres of Habitat)

| | No-Crossing | | | Downtown Project | | | | Elmendorf Project | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Habitat Type | No-Action | Glenn/Parks Improvement | Hovercraft (includes Houston Connector) | Crossing (North Bridge Approach) | Seward Connector | Houston Connector | Total | Crossing (South Bridge Approach) | Crossing (North Bridge Approach) | Houston Connector | Total |
| Coniferous and mixed deciduous/ coniferous forest | 0 | 90.2 | 611.6 | 122.4 | 7.3 | 611.6 | 741.3 | 210.2 | 53.8 | 611.6 | 875.6 |
| Low shrub scrub (part wetland) | 0 | 0 | 90.0 | 0 | 0 | 90.0 | 90.0 | 0 | 0 | 90.0 | 90.0 |
| Closed black spruce (part wetland) | 0 | 0 | 99.3 | 0 | 0 | 99.3 | 99.3 | 15.6 | 0 | 99.3 | 114.9 |
| Sedge/grass meadow (wet and dry) (mostly wetland) | 0 | 0 | 9.3 | 0 | 0 | 9.3 | 9.3 | 18.4 | 0 | 9.3 | 27.7 |
| Tall shrub and deciduous forest | 0 | 0 | 40.3 | 0 | 0 | 40.3 | 40.3 | 34.0 | 0 | 40.3 | 74.3 |
| Salt marsh (wetland) | 0 | 35.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Intertidal mudflat (wetland) | 0 | 0 | 10.0 | 0 | 18.7 | 0 | 18.7 | 0 | 0 | 0 | 0 |
| Disturbed areas | 0 | 0 | 285.5 | 0 | 65.4 | 285.5 | 350.9 | 50.6 | 0 | 285.5 | 336.1 |
| TOTAL | 0 | 125.6 | 1,146.0 | 122.4 | 91.4 | 1,136.0 | 1,349.8 | 328.8 | 53.8 | 1,136.0 | 1,518.6 |
| Total wetlands | 0 | 35.4 | 125.5 | 0 | 18.7 | 115.5 | 134.2 | 8.4 | 0 | 115.5 | 123.9 |

NOTES

Vegetation types and fish and wildlife values for each habitat type are shown in Table III-11.

Roadway acreages are based on total right-of-way width: 300 feet for Elmendorf AFB segment and 400 feet for all other Crossing Alternative roadways. Glenn/Parks Improvement is for improvements beyond those already planned (No-Action). Action). Two 12-foot lanes added to outside of 4-lane Glenn Highway; two 12-foot lanes and left turn lanes added to Parks Highway to Wasilla.

Habitat values within Elmendorf Air Force Base were interpreted from vegetation mapping by Rothe et al., 1983.

Table IV-27

DIRECT TERRESTRIAL HABITAT IMPACTS BY WILDLIFE VALUE
(Acres)

| | No-Crossing | | | Downtown Project | | | | Elmendorf Project | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No-Action | Glenn/Parks Improvement | Hovercraft (Includes Houston Connector) | Crossing (North Bridge Approach) | Seward Connector | Houston Connector | Total | Crossing (South Bridge Approach) | Crossing (North Bridge Approach) | Houston Connector | Total |
| **Moose** | | | | | | | | | | | |
| ° Year-round food and cover | 0 | 90.2 | 611.6 | 122.4 | 7.3 | 611.6 | 741.3 | 210.2 | 53.8 | 611.6 | 875.6 |
| ° Year-round food, limited cover | 0 | 0 | 90.0 | 0 | 0 | 90.0 | 90.0 | 0 | 0 | 90.0 | 90.0 |
| ° Marginal year-round food and cover | 0 | 0 | 139.6 | 0 | 0 | 139.6 | 139.6 | 49.6 | 0 | 139.6 | 189.2 |
| ° Supplemental spring, summer, fall food | 0 | 0 | 9.3 | 0 | 0 | 9.3 | 9.3 | 18.4 | 0 | 9.3 | 27.7 |
| TOTAL | 0 | 90.2 | 850.5 | 122.4 | 7.3 | 850.5 | 980.2 | 278.2 | 53.8 | 850.5 | 1,182.5 |
| **Black Bear** | | | | | | | | | | | |
| ° Food and cover | 0 | 90.2 | 611.6 | 122.4 | 7.3 | 611.6 | 741.3 | 210.2 | 53.8 | 611.6 | 875.6 |
| ° Food | 0 | 35.4 | 90.0 | 0 | 0 | 90.0 | 90.0 | 0 | 0 | 90.0 | 90.0 |
| ° Marginal year-round food and cover | 0 | 0 | 99.3 | 0 | 0 | 99.3 | 99.3 | 15.6 | 0 | 99.3 | 114.9 |
| ° Supplemental spring, summer, fall food | 0 | 0 | 9.3 | 0 | 0 | 9.3 | 9.3 | 18.4 | 0 | 9.3 | 27.7 |
| TOTAL | 0 | 125.6 | 810.2 | 122.4 | 7.3 | 810.2 | 939.9 | 244.2 | 53.8 | 810.2 | 1,108.2 |
| **Snowshoe Hare** | | | | | | | | | | | |
| ° Year-round food and cover | 0 | 90.2 | 611.6 | 122.4 | 7.3 | 611.6 | 741.3 | 210.2 | 53.8 | 611.6 | 875.6 |
| ° Year-round food, limited cover | 0 | 0 | 90.0 | 0 | 0 | 90.0 | 90.0 | 0 | 0 | 90.0 | 90.0 |
| ° Marginal year-round food and cover | 0 | 0 | 99.3 | 0 | 0 | 99.3 | 99.3 | 15.6 | 0 | 99.3 | 114.9 |
| ° Low quality or inadequate food | 0 | 0 | 40.3 | 0 | 0 | 40.3 | 40.3 | 34.0 | 0 | 40.3 | 74.3 |
| TOTAL | 0 | 90.2 | 841.2 | 122.4 | 7.3 | 841.2 | 970.9 | 259.8 | 53.8 | 841.2 | 1,154.8 |
| **Red Squirrel** | | | | | | | | | | | |
| ° Year-round food and cover | 0 | 90.2 | 710.9 | 122.4 | 7.3 | 710.9 | 840.6 | 225.8 | 53.8 | 710.9 | 990.5 |
| ° Low quality or inadequate food | 0 | 0 | 40.3 | 0 | 0 | 40.3 | 40.3 | 34.0 | 0 | 40.3 | 74.3 |
| TOTAL | 0 | 90.2 | 751.2 | 122.4 | 7.3 | 751.2 | 880.9 | 259.8 | 53.8 | 751.2 | 1,064.8 |
| **Fur Bearers -** important feeding | 0 | 35.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table IV-27 (continued)

DIRECT TERRESTRIAL HABITAT IMPACTS BY WILDLIFE VALUE
(Acres)

| | No-Crossing | | | Downtown Project | | | | Elmendorf Project | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No-Action | Glenn/Parks Improvement | Hovercraft (Includes Houston Connector) | Crossing (North Bridge Approach) | Seward Connector | Houston Connector | Total | Crossing (South Bridge Approach) | Crossing (North Bridge Approach) | Houston Connector | Total |
| Spruce Grouse | | | | | | | | | | | |
| ° Year-round food and cover | 0 | 90.2 | 611.6 | 122.4 | 7.3 | 611.6 | 741.3 | 210.2 | 53.8 | 611.6 | 875.6 |
| ° Marginal year-round food and cover | 0 | 0 | 99.3 | 0 | 0 | 99.3 | 99.3 | 15.6 | 0 | 99.3 | 114.9 |
| ° Low quality or inadequate food | 0 | 0 | 40.3 | 0 | 0 | 40.3 | 40.3 | 34.0 | 0 | 40.3 | 74.3 |
| TOTAL | 0 | 90.2 | 751.2 | 122.4 | 7.3 | 751.2 | 880.9 | 259.8 | 53.8 | 751.2 | 1,064.8 |
| Song Birds - nesting habitat (shrub nesting only) | 0 | 90.2 | 841.2 | 122.4 | 7.3 | 841.2 | 970.9 | 259.8 | 53.8 | 841.2 | 1,154.8 |
| Muskeg Nesting Birds (e.g. greater yellowlegs) - breeding habitat | 0 | 0 | 9.3 | 0 | 0 | 9.3 | 9.3 | 18.4 | 0 | 9.3 | 27.7 |
| Waterfowl and shore Birds (e.g., lesser Canada goose, Tule white-fronted goose, mallard, pintail, sand-hill crane) - important migration and nesting | 0 | 35.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: Table is derived from the information presented in Tables III-11 and IV-26 some of the best winter range is located (Rothe et al., 1983). Winter range on the Base and Fort Richardson is already heavily grazed, and a decrease in range availability could decrease the local moose population or cause degradation of remaining winter range through overgrazing. The other habitat types that would be altered are generally less valuable than the mixed forest, with the possible exception of the meadow and low shrub types which are less widespread but provide important habitat diversity and winter moose food. The Houston Connector would take 0.06 percent of the 178,960 acres in the Willow Sub-Basin. The latter habitat groups would be contacted to a minor extent by the Houston Connector, but again, significant effects on wildlife populations would not be expected from habitat alteration alone.

Because of uncertainty regarding location and design of construction staging facilities, habitat disturbance from these facilities and their access roads was not included in Tables IV-26 and IV-27. A staging yard on the Anchorage waterfront could involve dredge and fill of up to 15 acres of unvegetated intertidal mudflats. The fill would be within an industrial area and filling of the mudflats likely would occur regardless of Crossing Alternative implementation since permits have already been obtained by a private developer for the filling. A staging area north of Knik Arm at either of the two locations described in Chapter II would involve either clearing about 15 acres of mixed coniferous/deciduous forest on the bluff top or filling about 15 acres of intertidal mudflat/gravel beach area. Access roads to the north shore sites would cause the alteration of upland forest habitat, however the greater portion of these roadways would be coincident with the southern portion of the Houston Connector and Crossing north approach roads, thus little additional habitat would be altered. The road to a staging area in the Point MacKenzie area would add about 25 acres (assuming a 100-foot right-of-way) of upland forest habitat to the total altered by the project.

Up to 15 acres of additional wetland (unvegetated mudflat) could be altered by filling in the intertidal zone for construction staging facilities at one of the three locations described.

Little direct impact to waterfowl would occur as a result of habitat alteration from either of the Crossing Alternatives. Most wetlands traversed either north or south of Knik Arm are of the bog type. Bog-type wetlands are used to some extent by waterfowl, especially when connected to open water. Most of the wetlands crossed are not associated with open water, and their significance to waterfowl is minor, particularly when compared to coastal wetlands. The Seward Connector would cross intertidal mud flats that are utilized by some species of dabbling ducks for feeding in summer and fall. These birds would be disturbed during construction, but since this portion of the roadway would be elevated, there would be little long-term impact.

Direct impacts from the Hovercraft Alternative would include habitat use for terminal facilities (approximately 10 acres) and for the Houston Connector, see Tables IV-26 and IV-27. Moose mortality would be less than with a Crossing Alternative because traffic on the Connector would be considerably less.

The Glenn/Parks Improvement would expand the width of the existing highway from Eagle River to Wasilla, and thus would alter some natural terrain adjacent to areas already disturbed; see Tables IV-26 and IV-27. The impact of upland habitat alteration on wildlife probably would be insignificant. The impact would be more significant on the wetland habitats in the Eklutna and Palmer Hay Flats areas; the amount of available habitat for waterfowl and moose use of these coastal marshes would be reduced.

Of greater significance to large mammals (such as moose and black bear) than direct habitat loss, would be the disturbance caused by highway noise and human presence. This disturbance would decrease usable habitat beyond the area taken by the roadway. As far as is known, there have been no studies comparing the density of large mammals adjacent to highways with their density away from highways in northern wooded environments. Various studies of the behavioral response of wildlife to noise suggest that most species act to avoid loud intermittent noises, but reaction to constant moderate noise is variable and noise accommodation often occurs (Dufour, 1980). Human presence also acts to deter some animals, however vegetation growing within cleared right-of-ways often attracts some species such as moose and snowshoe hare, and some species learn to be attracted by roadway noise. Thus, it would be likely that the density of birds (especially nesting birds) and mammals would be somewhat lower adjacent to the proposed highways than in non-highway areas. Using noise levels presented in Table IV-35, and the factors for noise drop-off of 4.5 dB per doubling distance for a vegetated site (FHWA, December 1978) and five dB per 100 feet of dense forest, either Crossing Alternative would cause increased noise levels for about 1,200 acres of wildlife habitat. The type of habitat affected would be similar to that taken by project right-of-way. This disturbance would occur along the Houston Connector with the Downtown Project and both along the Houston Connector and in the undeveloped portion of Elmendorf AFB with the Elmendorf Project. Along the Houston Connector with the Hovercraft Alternative, traffic volumes would be lower and only about 250 acres would be disturbed. No additional wildlife disturbance would occur with the Glenn/Parks Improvement.

Mortality of moose from vehicle collisions would probably be a significant impact along non-fenced portions of the proposed highways, judging from the high mortality that has occurred along the Glenn Highway adjacent to Fort Richardson and Elmendorf AFB (Rothe et al., 1983). The Elmendorf Project probably would cause less mortality than the Downtown Project because traffic volumes on the unfenced Houston Connector would be less with Elmendorf. Winter concentrations of moose could occur in lowland areas along the Houston Connector north of Big Lake, and mortality likely would be heaviest in that area. Either Crossing Alternative would reduce traffic on the Glenn and Parks Highways, reducing mortality. Little mortality would occur on Elmendorf AFB, even though moose tend to concentrate in the winter in the southeastern portion of the base because of pockets of good quality winter range (Rothe et al., 1983), since the roadway would be fenced. Moose mortality also would occur along the Houston Connector with the Hovercraft Alternative but the impact would be much less than with a Crossing due to significantly lower volumes. The Glenn/Parks Improvement would have no impact on moose mortality.

No-Action would not directly affect the terrestrial habitats.

Secondary impacts could occur to terrestrial biota (plants and animals) either as a result of development induced by the Crossing Alternatives or as a result of altered patterns of human activity. The Crossing Alternatives would greatly increase the development opportunities north of Knik Arm and would provide convenient access into areas previously accessible only with difficulty. Secondary impacts that could occur to wildlife resources and their habitats would include: Direct withdrawal of habitat as a result of residential, commercial, and industrial development and local access road construction; and increased hunting and trapping pressure. The former will be discussed here and the latter in a subsequent section.

Withdrawal of habitat for development would be a long-term impact and would be similar but more extensive than direct impacts from the Crossing Alternatives themselves. The extent of secondary impacts on the terrestrial environment would depend on which Alternative is implemented. No significant secondary impacts would occur with No-Crossing, although a limited amount of increased development would occur with Hovercraft.

Tables IV-19 and IV-20, under "Urban Growth and Economic Development", indicate the amount of additional Mat-Su Borough residential and non-residential growth expected for several growth allocation scenarios. Acres of development can be calculated using those figures and the following residential and employment densities:

| | Dwelling Units Per Acre | Employees Per Acre |
|---|---|---|
| Point MacKenzie | 2 | 0.48 |
| Knik/Goose Bay | 1.5 | 0.87 |
| Fish Creek | 1 | 0.87 |
| Willow/Nancy Lake | 1 | 0.87 |
| Houston/Big Lake | 2 | 0.87 |
| Wasilla/Fishhook | 2 | 0.48 |
| Palmer/Sutton | 1.5 | 0.48 |

These densities were judged to be those most likely to occur by the project team in consultation with the Mat-Su Borough.

A maximum of between 8,200 and 14,000 acres would develop by 2010 with the Downtown Project beyond that which would develop with No-Crossing. This would be 3,100 to 5,800 acres with the Elmendorf Project. New growth would be the greatest in the Point MacKenzie area. Significant growth also would occur in the Knik/Goose Bay, Big Lake/Houston, and Fish Creek areas. The development would tend to occur on land easily developed, e.g., well drained soils and gentle topography. More than enough of this type of land exists to fill development needs; over 350,000 acres are classified by the Willow Sub-Basin Study as having moderate to high capability for moderate to high density development (U. S. Department of Agriculture et al., October 1981). Development in wetlands might occur either in specific high demand areas (such as near lakes) or on small intermittent wetlands in areas generally dry, but upland areas would be developed first, see "Wetlands".

In 1981, the Borough had 18,374 acres of developed land excluding agricultural (DOWL Engineers, February, 1983). In 2010, with No-Crossing the number of dwelling units in the Borough would be 4.8 times that in 1981. Multiplying this number times the 1981 acres of developed land would indicate that the Borough would have an estimated 88,000 developed acres in 2010 with No-Crossing. Thus, using the numbers described in the previous paragraph, the Elmendorf Project would increase the amount of developed acreage in 2010 by 3.5 to 6.6 percent over No-Crossing. The increase would be 9.3 to 15.9 percent with the Downtown Crossing.

Table IV-28 breaks down the additional acres which would be developed in the Mat-Su Borough by the same habitat types as used in Table IV-26. Table IV-29 shows the additional acres which would be developed with respect to habitat value. Mapping showing 34 categories of vegetation prepared by the U. S. Soil Conservation Service (SCS) and Alaska Department of Natural Resources (ADNR) for the Willow Sub-basin was used to identify area habitat (Bob Bennett, ADNR, personal communication). Development was assumed to cluster in the vicinity of intersections and to occur on land with moderate to high capacity for development. The two forest habitats where development is indicated would be the only two habitats on the SCS and ADNR maps that would be both suitable for development and in the area where shifted growth would be located. Salt marsh and intertidal wetlands are also shown on these maps but it was judged they would be unlikely to develop. As with the direct impact, the primary habitat disturbed would be mixed coniferous/ deciduous forest. Additional development with the Elmendorf Project would take 0.9 to 1.8 percent (2,600 to 5,100 acres) of the 286,100 acres of this habitat type in the Willow Sub-basin. The take would be 2.6 to 4.4 percent (7,300 to 12,600 acres) with the Downtown Project. Additional development with the Elmendorf Project also would take 3.8 to 5.4 percent (500 to 700 acres) of the 13,000 acres (Bob Bennett, ADNR, personal communication) of closed black spruce habitat in the Willow Sub-basin. The take would be 6.9 to 10.8 percent (900 to 1,400 acres) with the Downtown Project.

Secondary impacts would be substantially more extensive than direct impacts, however several factors need to be considered to put secondary impacts into perspective:

- The area developed would be that area where future Borough development is expected to be concentrated even with No-Crossing. This expectation is based on the findings of the Borough Draft Comprehensive Plan (DOWL Engineers, February 1983).

- Safeguards exist to protect critical habitat via the State of Alaska Coastal Zone Management Plan, as well as the U.S. Army Corps of Engineers Section 404 permitting procedure (regulating the excavating and filling of water bodies and wetlands), and the Alaska Department of Fish and Game anadromous fish stream permit program.

- Substantial areas of critical habitat already have been set aside in this part of the Borough, including three State game refuges and a State park, see Chapter II, "Urban and Military Function and Operation". In addition, Alaska Department of Natural Resources

Table IV-28

GROWTH ALLOCATION
IMPACT ON TERRESTRIAL HABITAT IN MAT-SU BOROUGH
BY HABITAT TYPE 2010
(Acres)

| Habitat Type | No-Crossing Alternative | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|
| Coniferous and mixed deciduous/ coniferous forest | 0 | 7,300 to 12,600 | 2,600 to 5,100 |
| Low shrub scrub (part wetland) | 0 | 0 | 0 |
| Closed black spruce (part wetland) | 0 | 900 to 1,400 | 500 to 700 |
| Sedge/grass meadow (wet and dry) (mostly wetland) | 0 | 0 | 0 |
| Tall shrub and deciduous forest | 0 | 0 | 0 |
| Salt marsh (wetland) | 0 | 0 | 0 |
| Intertidal mudflat (wetland) | 0 | 0 | 0 |
| Disturbed areas | 0 | 0 | 0 |
| TOTAL | 0 | 8,200 to 14,000 | 3,100 to 5,800 |

NOTE
Vegetation types and dominant wildlife values for each habitat type are shown in Table III-11.

Table IV-29

GROWTH ALLOCATION
IMPACT ON TERRESTRIAL HABITAT IN MAT-SU BOROUGH
BY HABITAT VALUE (2010)
(Acres)

| Habitat Value | No-Crossing Alternative | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|
| **Moose** | | | |
| ° Year-round food and cover | 0 | 7,300 to 12,600 | 2,600 to 5,100 |
| ° Year-round food, limited cover | 0 | 0 | 0 |
| ° Marginal year-round food and cover | 0 | 900 to 1,400 | 500 to 700 |
| ° Supplemental spring, summer, fall food | 0 | 0 | 0 |
| TOTAL | 0 | 8,200 to 14,000 | 3,100 to 5,800 |
| **Black Bear** | | | |
| ° Food and cover | 0 | 7,300 to 12,600 | 2,600 to 5,100 |
| ° Food | 0 | 0 | 0 |
| ° Marginal year-round food and cover | 0 | 0 | 0 |
| ° Supplemental spring, summer, fall food | 0 | 0 | 0 |
| TOTAL | 0 | 7,300 to 12,600 | 2,600 to 5,100 |
| **Snowshoe Hare** | | | |
| ° Year-round food and cover | 0 | 7,300 to 12,600 | 2,600 to 5,100 |
| ° Year-round food, limited cover | 0 | 0 | 0 |
| ° Marginal year-round food and cover | 0 | 900 to 1,400 | 500 to 700 |
| ° Low quality or inadequate food | 0 | 0 | 0 |
| TOTAL | 0 | 8,200 to 14,000 | 3,100 to 5,800 |
| **Red Squirrel** | | | |
| ° Year-round food and cover | 0 | 8,200 to 14,000 | 3,100 to 5,800 |
| ° Low quality or inadequate food | 0 | 0 | 0 |
| TOTAL | 0 | 8,200 to 14,000 | 3,100 to 5,800 |
| **Fur Bearers** - important feeding | 0 | 0 | 0 |
| **Spruce Grouse** | | | |
| ° Year-round food and cover | 0 | 7,300 to 12,600 | 2,600 to 5,100 |
| ° Marginal year-round food and cover | 0 | 900 to 1,400 | 500 to 700 |
| ° Low quality or inadequate food | 0 | 0 | 0 |
| TOTAL | 0 | 8,200 to 14,000 | 3,100 to 5,800 |
| **Song Birds** - nesting habitat | 0 | 8,200 to 14,000 | 3,100 to 5,800 |
| **Muskeg Nesting Birds** (e.g. greater yellowlegs) - breeding habitat | 0 | 0 | 0 |
| **Water Fowl and Shore Birds** (e.g., lesser Canada goose, Tule white-fronted goose, mallard, pintail, sandhill crane) - important migration and nesting | 0 | 0 | 0 |

NOTE
Table is derived from information in Tables III-11 and IV-28.

planning calls for the maintenance of the Little Susitna River as a wilderness/recreation corridor permitting access only at the Parks Highway, Holstein Drive, and the proposed Chuitna Highway Corridor, see Chapter III, "Land Use Plans".

Additional measures to mitigate impacts will be investigated jointly by FHWA, ADOT/PF, and the U.S. Fish and Wildlife Service (in consultation with other interested local, State, and Federal agencies) prior to release of the Final EIS.

Marine Habitats. Construction of a staging dock and construction of a bridge at either the Downtown or Elmendorf locations would cause temporary disturbance to marine biota. Dredging for bridge piers would cause localized mortality of organisms associated with the sea bottom in the dredge area. Benthic infauna (animals living in the bottom sediments) are uncommon in the project area (Bakus et al., 1979); however, epifaunal (animals living on or near the bottom) crustaceans such as shrimp are common, as indicated in Technical Memorandum No. 15, Marine Biological Studies (U.S. DOT/ADOT/PF, December 20, 1983), and likely would be affected during construction. Most fish would move away from the areas of disturbances. The area to be excavated would be very small relative to the total area of Knik Arm and mortality to marine invertebrates would not be significant in terms of the total ecosystem. The epifauna are mobile and would quickly re-colonize dredged areas. Increased suspended sediment as a result of dredging probably would not affect the biological community, since organisms are adapted to extreme turbidity, high sediment loads, and continually changing conditions.

Noise and activity associated with pile driving and dredging could interfere with the movements of fish and possibly Beluga whales. Of particular concern would be out-migrating juvenile salmon and in-migrating adult salmon. Other migratory species such as eulachon ("hooligan") and stickleback also could be affected. At any given time, construction would be occurring within only a limited portion of Knik Arm, therefore ample area would be available for fish passage, and impact on adult salmon would be minimal and short-term. Of greater concern would be the less mobile, smaller fish (juvenile salmon, eulachon) that typically migrate along the shoreline. Construction activity occurring within the intertidal zone could block movement or cause direct mortality during periods when the tide stage corresponds with the activity zone. Evidence suggests that most juvenile salmon move out of Knik Arm within a period of a few days. Delays in this outmigration as a result of construction activities could cause young salmon to expend additional energy and postpone feeding thus increasing overall mortality rates. Species that form large schools such as chum and pink salmon, eulachon, and sticklebacks would be especially vulnerable to direct mortality from dredging in shallow water. These impacts would be mitigated by limiting activity in the intertidal zone to low tide during the sensitive period May 1 to July 1. Disturbance of marine-oriented water birds also could occur as a result of construction activity. However, such birds are uncommon on Knik Arm, as indicated in Technical Memorandum No. 15, Marine Biological Studies (USDOT/FHWA, ADOT/PF, December 20, 1983) and thus a significant impact would not occur.

Long-term impacts to marine biota from either bridge alternative would be minimal. The bridge piers would create eddies, where existing currents are normally strong, which could be beneficial to fish by increasing habitat diversity and adding areas of refuge from the current. Temporary ice pile-up against the piers could cause scour, especially in shallow areas, and possibly decrease marine invertebrate survival in these areas during the winter. Means to minimize ice pile-up would be considered during bridge pier design.

The magnitude of direct marine biological impacts from the Downtown or Elmendorf Projects would be similar. Construction impacts would occur over a longer time period for the Downtown Project because of the additional construction time required.

No direct impacts to marine biological resources would occur as a result of either No-Action or the Glenn/Parks Improvement. Hovercraft would disturb animals such as seabirds and marine mammals that are oriented to the water surface. Both these categories of animals are uncommon along Knik Arm, and impacts could be minimized if Hovercraft operators would watch for and avoid the animals when they are seasonally present.

Secondary impacts to the marine environment could occur to the extent that a Crossing Alternative would help to induce the development of port facilities in the Point MacKenzie area, as currently conceptualized in Mat-Su Borough planning documents, see "Land Use Plans". Impacts to the biological community from such a development probably would be substantially greater than the direct impacts from construction and operation of a Knik Arm bridge. The kinds of impacts to marine biota that could occur as a result of a major port development include:

- Localized water pollution from spills of petroleum products, sanitary wastes, and other hazardous substances could decrease marine productivity.

- Shoreline structures such as bulkheads and piers could interfere with migrating fish, and smaller fish such as juvenile salmon could be subjected to additional predation due to forced exposure to deep water conditions.

- Noise and activity associated with shipping could decrease populations of marine birds and mammals in the vicinity of the port.

- Intertidal habitats would be displaced.

No secondary impacts would occur with No-Crossing.

Aquatic Habitats. Table IV-30 shows the important fish streams and lakes which would be crossed by each alternative. Table IV-31 shows the same information by habitat value. Direct adverse effects on fish or other components of aquatic ecosystems would be minimal with the Downtown Project. Only one water body, Mirror Lake, would be crossed by the proposed roadways along the Houston Connector portion of the project. Construction of the 400-foot Mirror Lake bridge would involve working in the water and thus would disturb fish in the immediate vicinity. Mirror Lake, at the crossing location, is shallow with a soft bottom and is not used by spawning fish (Robert Chlupach, Alaska Department of Fish & Game, personal communication). Some rearing of juvenile salmonids would be expected in the area. Temporary displacement of resident fish would occur in the construction area and increased turbidity could interfere temporarily with fish feeding activity within the affected area. Bridge construction activities would be coordinated with the Alaska Department of Fish and Game to minimize impacts. Construction adjacent to Ship Creek associated with the Seward Connector could cause short-term siltation or turbidity and minor adverse impacts to fish resources. Long-term direct impacts to freshwater fish resources would not be anticipated as a result of the Downtown Project.

The Elmendorf Project would have direct impacts similar to those of the Downtown Project since they both would utilize the Houston Connector on the north. The south approach to the bridge would cross Ship Creek via a single span bridge. Direct disturbance to the stream probably would not occur during construction since access would be available to the stream from both sides, and all work would occur from the banks. No adverse effects on fish or the aquatic-ecosystem of Ship Creek would be expected.

No impact to freshwater biota would occur as a result of either the No-Action or the Hovercraft Alternative. The Glenn/Parks Improvement would have considerable potential for direct impact since the improvements would affect six major streams and several minor streams, nearly all of which contain anadromous fish resources. Impacts which resulted from the existing Glenn and Parks Highways have not been examined in detail, but there is no reason to believe that severe impacts have occurred to fish populations. Single span bridges would be used where feasible to avoid instream work and alteration of stream channels. Structure design and instream work would be closely coordinated with the Alaska Department of Fish and Game to assure minimum damage to aquatic habitats and provide for fish passage. Nevertheless, the potential for direct impact to aquatic biota would be substantially greater for this Alternative than for the other Alternatives.

Secondary impacts could occur to aquatic biota as a result of development induced by the Crossing Alternatives or as a result of altered patterns of human activity. A Crossing Alternative would significantly increase development opportunities north of Knik Arm and would provide convenient access into areas previously accessible only with difficulty. The kinds of secondary impacts that could occur to fish resources and their habitats would include:

- Increased fishing pressure and harvest in the lower Little Susitna River, its tributaries, and lakes adjacent to the Houston Connector route

Table IV-30

CROSSING OF IMPORTANT FISH STREAMS AND LAKES

| | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| Streams | No-Action | Glenn/Parks Improvement | Hovercraft (including Houston Connector) | Downtown Project | Elmendorf Project |
| Little Susitna River | | | | | |
| Fish Creek | | | | | |
| Goose Creek | | | | | |
| Ship Creek | | | | X* | X |
| Eagle River | | | | | |
| Peters Creek | | X | | | |
| Eklutna River | | X | | | |
| Knik River | | X | | | |
| Matanuska River | | X | | | |
| Spring Creek | | X | | | |
| Rabbit Slough | | X | | | |
| Wasilla Creek | | X | | | |
| Cottonwood Creek | | X | | | |
| Meadow Creek | | | | | |
| **Lakes** | | | | | |
| Mirror Lake/Big Lake | | | X | X | X |

* Parallels but does not cross Ship Creek

Table IV-31

CROSSING OF IMPORTANT FISH STREAMS AND LAKES
BY HABITAT VALUE
(Number of Crossings)

| Habitat Value | No-Crossing Alternatives | | | Crossing Alternatives | |
|---|---|---|---|---|---|
| | No-Action | Glenn/Parks Improvement | Hovercraft (including Houston Connector) | Downtown Project | Elmendorf Project |
| STREAM HABITAT | | | | | |
| Chinook Salmon | | | | | |
| ° Spawning | 0 | 2 | 0 | 1* | 1 |
| ° Rearing | 0 | 0 | 0 | 1* | 1 |
| ° Migration | 0 | 1 | 0 | 0 | 0 |
| Coho Salmon | | | | | |
| ° Spawning | 0 | 5 | 0 | 1* | 1 |
| ° Rearing | 0 | 5 | 0 | 1* | 1 |
| ° Migration | 0 | 3 | 0 | 0 | 0 |
| Pink Salmon | | | | | |
| ° Spawning | 0 | 0 | 0 | 1* | 1 |
| ° Rearing | 0 | 0 | 0 | 0 | 0 |
| ° Migration | 0 | 2 | 0 | 0 | 0 |
| Chum Salmon | | | | | |
| ° Spawning | 0 | 2 | 0 | 0 | 1 |
| ° Rearing | 0 | 0 | 0 | 0 | 0 |
| ° Migration | 0 | 1 | 0 | 0 | 0 |
| Sockeye Salmon | | | | | |
| ° Spawning | 0 | 0 | 0 | 0 | 0 |
| ° Rearing | 0 | 1 | 0 | 0 | 0 |
| ° Migration | 0 | 3 | 0 | 0 | 0 |
| Rainbow Trout | | | | | |
| ° Spawning | 0 | 0 | 0 | 0 | 0 |
| ° Rearing | 0 | 0 | 0 | 0 | 0 |
| Dolly Varden | | | | | |
| ° Spawning | 0 | 0 | 0 | 0 | 0 |
| ° Rearing | 0 | 0 | 0 | 0 | 0 |

Table IV-31 (continued)

CROSSING OF IMPORTANT FISH STREAMS AND LAKES
BY HABITAT VALUE
(Number of Crossings)

| Habitat Value | No-Crossing Alternatives: No-Action | No-Crossing Alternatives: Glenn/Parks Improvement | No-Crossing Alternatives: Hovercraft (including Houston Connector) | Crossing Alternatives: Downtown Project | Crossing Alternatives: Elmendorf Project |
|---|---|---|---|---|---|
| LAKE HABITAT | | | | | |
| Coho Salmon - rearing | 0 | 0 | 1 | 1 | 1 |
| Sockeye Salmon - rearing | 0 | 0 | 1 | 1 | 1 |
| Rainbow Trout | | | | | |
| ° Rearing | 0 | 0 | 1 | 1 | 0 |
| ° Habitat for stocked | 0 | 0 | 0 | 0 | 0 |
| Dolly Varden - rearing | 0 | 0 | 1 | 1 | 1 |
| Diving Birds (e.g. common loon, golden eye trumpeter swan) - feeding and nesting | 0 | 0 | 0 | 0 | 0 |

* Parallels but does not cross Ship Creek

NOTE
Table was derived from information contained in Tables III-11 and IV-28

- Decrease in habitat quality or water quality as a result of direct alteration of stream systems from residential or industrial development, road proliferation, etc. -- small streams used as rearing habitat by coho salmon and other salmonids may be the most vulnerable

- Loss of stream bank habitat as a result of fishing pressure - trampling and littering

- Decrease in lake shore habitats due to development - loss of salmonid rearing habitat

- Blockage of fish passage as a result of inadequate stream crossing design on local access roadways -- subdivision roads are often not built to State design standards

- Adverse impacts to water supply as a result of surface and groundwater demands, altered surface drainage, and wetland development

The above secondary impacts would be long-term and would be much more significant than the direct impacts from the Crossing Alternatives themselves. Increased fishing pressure and harvest is addressed in the next section. The extent of development resulting from the Crossing Alternatives was described under "Terrestrial Environment". There is no way to estimate the extent to which new development in the Borough would occur adjacent to lakes and streams. Lakeside or streamside homes are viewed as desirable, and much of the development occurring south of the Parks Highway now is around area lakes. The Mat-Su Borough places limitations on "shoreland" development in subdivision regulations (Mat-Su Borough, March 1982) which would help minimize adverse impacts from development along lakes and streams. The regulations specify that no structure (except a dock or related) can be closer than 75 feet from the high water mark of the stream or lake. Also, lots must be at least 140 feet in width at the water line unless community sewerage is provided and then they can be as narrow as 85 feet. No part of a subsurface sewage disposal system can be closer than 100 feet from any body of water or watercourse. No significant secondary impact would result from a No-Crossing Alternative, although a limited amount of increased development could occur with Hovercraft.

Use of Fish and Wildlife. Probably the most significant indirect effect of either of the Crossing Alternatives relates to the increased access to the area between Knik Arm and the Little Susitna River. The proposed Houston Connector, in combination with existing and probable future roads, would allow residents of the Anchorage metropolitan area to reach key recreational areas in 30 to 60 minutes. This would provide enhanced hunting and fishing opportunity north of Knik Arm and would relieve pressure on other heavily used areas near Anchorage. A Crossing Alternative would shift already forecast hunting and fishing demand, and in addition, improved access would serve latent demand. The Alaska Outdoor Recreation Plan (ADNR, Division of Parks, 1981) shows that fishing and hunting are among the most popular activities of Southcentral residents. Reasons given for lack of participation often include high transportation costs, lack of hunting and fishing sites, areas too crowded, and areas inaccessible by car.

Fishing pressure in the lower portion of the Little Susitna River and other fish streams would increase greatly. The Little Susitna drainage is already heavily fished in its upper reaches. Increased fishing in the lower river would require more rigid management measures to protect salmon stocks, and a heavily managed fishery such as now occurs on the Kenai River could result. Competition between sport and subsistence fishermen for salmon would intensify, and salmon stocks could be reduced if escapement to spawning areas would not be sufficient to sustain population levels. Fishing pressure on the lakes adjacent to the Houston Connector also would increase.

Waterfowl hunting and harvest would increase in two key areas: The Goose Bay State Game Refuge and the Susitna Flats State Game Refuge. The Susitna Flats is a highly productive area which currently has no ground access other than all-terrain vehicle trails. A Crossing Alternative would not provide ground access but would bring the refuge closer in terms of travel time to Anchorage. Ground access to the periphery of the Goose Bay State Game Refuge does exist, and an influx of urban hunters could cause significant impact on fall migrant birds. The extent of impact would be dependent on the ultimate location and number of roadways resulting from development in the Point MacKenzie area and their proximity to good hunting areas in the refuges. Increased management of both refuges would be required to respond to hunter demands and the end result probably would be little or no impact to waterfowl populations.

Pressure for harvest of moose, bear, spruce grouse, and other similar species also would increase in the area north of Knik Arm with the greatest pressure occurring near roads. These animals are widely dispersed through the area and hunting pressure probably would be less affected by convenient access than for fish and waterfowl that are concentrated in special habitat areas. Trapping pressure and furbearer harvest also would increase adjacent to access points. Increased management of the area would be required to respond to hunter demands and the end result probably would be little or no impact to animal populations.

Threatened or Endangered Species. No impact to threatened or endangered species would occur as a result of any of the alternatives.

Wetlands

Table IV-26 presents the surface area and Appendix C describes the location and type of wetlands that would be directly disturbed by the various components of either the Downtown or the Elmendorf Project. Appendix C also presents additional detail on wetlands (that would be directly affected by the alternatives under consideration) and mitigating measures. Wetlands compose 10.1 and 8.2 percent of the total area that would be disturbed directly by the Downtown and Elmendorf Projects, respectively. In routing the connecting roadways, especially north of Knik Arm, wetlands were avoided to the greatest degree feasible as is evidenced by the large percentage of wetland (42 percent) (U.S. Department of Agriculture et al., October 1981) in the Willow Sub-basin (where most of the wetland impact would occur) compared to the percentage that would be disturbed by a Project.

Some plant and animal productivity would be lost as a result of highway fill and clearing of wetlands. In addition, wetland structure and function could be altered by blockage of natural drainage patterns. This latter impact would be mitigated by use of bridges, culverts, and other drainage structures to retain natural drainage as much as possible. No significant impacts on local hydrological regimes and nutrient chemistry would occur because wetland encroachments proposed for the Crossing Alternatives would be small relative to the total area of wetland. No wetlands known to be used for salmon rearing would be affected.

Impacts to wetlands caused by Hovercraft would include disturbance of intertidal mud flats at the two terminal locations and alteration of wetlands by the Houston Connector. Less than 10 acres of relatively unproductive intertidal area would be altered along with about 40 acres of interior wetland along the Houston Connector.

The Glenn/Parks Improvement would traverse about 8.3 miles of productive coastal marsh wetland in the Eklutna Flats and Palmer Hay Flats areas. Widening the Glenn Highway from four to six lanes would require filling 35 acres of wetland to provide the needed roadbed. This would be a substantial loss of productive marsh. In addition, the roadway could alter the movement of fish and salt water within the remaining marsh and could affect the composition of vegetation by altering salinity. However, the likelihood of this impact would be low since an existing roadway would be widened and no new barrier to fish and water movement would be created. Existing provisions for water flow under the highway would be maintained. Wildlife impacts are discussed in the terrestrial habitats section of "Biological Resources".

As a result of changing development patterns in the Mat-Su Borough that would occur with a Crossing Alternative, the area of wetlands that would be developed (in addition to that with No-Action) would be small. Wetlands that would be developed as a result of new Mat-Su growth would be intermittent, small wetlands in areas that generally would be dry. High demand areas, such as near lakes and streams, also would be likely places for some wetlands development, but uplands would develop first. There is no reason to expect that large areas of wetland would be developed, because the Willow Sub-basin has a large area of non-wetland available for development (over 350,000 acres of land with moderate to high capability for development according to the ADNR data base for the Sub-basin). As discussed under "Biological Resources", area wetlands would be protected from unacceptable harm due to development by the Corps of Engineers 404 permit program and the State of Alaska's Coastal Zone Management review process. Mitigation of wetlands disturbance by new Borough growth will be considered in the mitigation program to be developed in cooperation with the U.S. Fish and Wildlife Service, as described under "Biological Resources".

Water Quality

Marine Environment. Construction of a Knik Arm bridge with either the Downtown or the Elmendorf Crossing would cause some temporary, localized alteration to the water quality of Knik Arm. Excavation of the sea bottom, using either a suction dredge or a clamshell, might be required to set the concrete base structure of each pier. This activity would cause some increase in suspended sediment in the pier vicinity even if done within a cofferdam. The very high level of natural suspended sediment in Knik Arm (Kinney et al., 1970) and the strong tidal currents would tend to obscure the impacts of construction-induced sediment suspension, and impacts would not be noticeable except in the immediate vicinity of ongoing excavations. In some coastal areas, dredging has caused release of contaminants into the water column because of disturbance of polluted sediments. Analysis of sediments in the Point Woronzoff shoreline area near the Anchorage sewer outfall indicated no unusual chemical characteristics but did show some contamination by fecal coliform bacteria, an indicator of the presence of pollution (U. S. Army Corps of Engineers, 1979). Contamination of sediments near the Knik Arm Crossing locations would not be anticipated, however sediment samples from selected locations would be collected and analyzed prior to construction. If contaminants were shown to be present, then dredge and spoil disposal techniques that would minimize water pollution would be selected. Also, during construction, some minimal contamination of Knik Arm by petroleum products would be inevitable from the various vessels and equipment employed. Careful operation, adequate maintenance, and spill cleanup contingency plans would be utilized to minimize this source of pollution. Construction impacts would be similar for the two bridges except that the Downtown bridge would require an additional year of construction and thus impacts would occur over a longer time period.

Long-term impacts to marine water quality from either the Downtown or the Elmendorf Crossing would be minimal. Water runoff from the bridge surfaces likely would contain small quantities of oil, grease, and de-icers, but the tidal flushing of Knik Arm would prevent buildup and no significant pollution from this source would occur. There is a remote possibility that a vehicle accident on the proposed bridge would cause significant quantities of fuel or other hazardous substances to be spilled into Knik Arm. In the event of a spill, the U.S. Coast Guard and the Alaska Department of Environmental Conservation would evaluate the situation and initiate cleanup procedures. If the spill were large, the Regional Response Team, an alliance of Federal agencies, would be activated to aid clean-up and minimize environmental damage.

No short-term or long-term impact to marine water quality would be caused by either the No-Action or the Glenn/Parks Improvement Alternative. Hovercraft also would have little impact on water quality except that a minor increase in suspended sediments could occur in localized areas of Knik Arm during terminal construction, depending on terminal location and design. Hovercraft fueling operations could increase the risk of fuel spills into Knik Arm, however the vehicles would be fueled on land and terminal design would provide for containment of runoff from fueling stations.

Freshwater Environment. Either the Downtown Project or the Elmendorf Project could alter water quality within the project area's several watersheds. Water quality impacts, as a result of highway construction and operation, might include: Increased suspended solids in stream or wetland waters from soil erosion and in-stream construction work; sediment deposition and stream siltation; pollution from road runoff (fuel, oil, de-icer, etc.); and pollution from accidental spills of oil or hazardous substances. Water resources impact, regardless of impact type, would be related directly to the extent of exposure to these resources; that is, the proximity of the project to streams, lakes, and wetlands along with local topographic characteristics would determine to a large extent whether or not pollution originating from roadways would be significant.

The Seward Connector would cross primarily urban or disturbed terrain. The roadway would closely parallel Ship Creek for much of its length, but would not interfere directly with the creek. The proximity to the creek suggests that muddy water generated during construction of the roadway could enter Ship Creek. Although care would be taken to minimize this pollution source, it is likely that the suspended sediment content of Ship Creek water would increase adjacent to and downstream from construction areas, especially during rainfall and spring breakup. Construction impacts would be controlled by a variety of mitigation measures including drainage ditches and settling basins as well as by timing construction to avoid sensitive periods such as breakup. Even so, small spills of fuel, oil, and grease could spill into Ship Creek during construction. Standard spill cleanup procedures would be employed to minimize damage from these pollution sources. In the long term, runoff from the roadway surface, possibly containing small amounts of oil, grease, and de-icing salts, also could enter Ship Creek. However, all of the Connector's drainage would be collected and introduced into the Municipality's storm drainage system, so very little adverse impact to Ship Creek actually would occur.

The south approach of the Elmendorf Crossing would cross relatively undisturbed terrain on Elmendorf AFB. Only one stream, Ship Creek, would be crossed by the road. The roadway would cross Ship Creek via a pre-cast bridge that would span the entire creek. Access would be available on both sides of the creek, therefore little or no in-stream work would be required. Erosion at abutments and staging areas could cause a small quantity of sediment-laden water to enter Ship Creek during construction and prior to stabilization of disturbed surfaces. The roadway would pass close to several small lakes and thus some pollution from road runoff could occur. However, at least a 500-foot distance would be maintained, and runoff from roads (passing over or briefly adjacent to water bodies) has not been shown by any known studies to be a significant source of pollution in Alaska. As with the Seward Connector, small amounts of pollutants might enter the streams during construction. Construction methods discussed above would be utilized to either reduce or eliminate this potential impact.

The Houston Connector was located carefully to minimize impacts to streams and other water resources. The Connector would cross only one water body, a narrow portion of Mirror Lake just west of Big Lake, on a 400-foot bridge with several sets of piers in the water. Disturbance of the lake bottom during in-water work would cause an increase in suspended sediment in Mirror Lake during construction and for a short period thereafter. Runoff from abutment areas and staging areas also could contribute sediment to the lake until stabilized by revegetation and other measures.

Most of the remainder of the Houston Connector would traverse well-drained upland terrain, consequently there would be little significant impact to water resources. Some erosion of fresh cut and fill slopes would occur, especially during spring breakup, and sediments could enter water bodies depending on local topographic features. Drainage and erosion control, as well as revegetation, would minimize this potential impact and eliminate long-term effects. Such mitigation measures would be implemented as soon as possible after ground disturbance to assure that such impacts, if they occur, would be short-term. The Houston Connector also would cross several wetland areas; possible impact to these areas is discussed under "Wetlands".

No significant long-term impacts to water quality would be expected from the Houston Connector. As with the other roadway segments, road surface runoff could carry small quantities of pollutants, but impacts would not be significant, especially in view of the minimum exposure to water bodies.

Among the No-Crossing Alternatives, neither No-Action nor Hovercraft would have a direct impact on freshwater resources. However, the Glenn/Parks Improvement would involve drainage structures over six major streams and several minor streams (described under "Biological Resources"), therefore direct impacts to freshwater resources clearly would be greater for this alternative than for the other alternatives under consideration. Impacts would be minimized through proper design of stream crossings and drainage facilities and through careful construction procedures.

Secondary impacts could occur to water resources as a result of development induced by the Crossing Alternatives or as a result of altered patterns of human activity. Neither the No-Action nor the Glenn/Parks Improvement Alternative would alter current trends in development. A Crossing Alternative would increase development north of Knik Arm and probably would cause long-term impact to water resources in selected locations. The extent of this development is described under "Biological Resources". A limited increase in development would result from the Hovercraft Alternative. Past trends in the Mat-Su Borough suggest that lakes and streams would be a focus for development, thus a Crossing Alternative would increase the impact on water resources. The impacts would be greatest for the Downtown Crossing, which would have the greatest shift of growth to the Mat-Su Borough. The kinds of impacts that could occur over the long term would include:

- Gradual increase in nutrients within the waters of lakes with heavily developed shorelines, causing an acceleration of the eutrophication (aging) process and altering plant and animal life within the lakes

- Siltation or increased turbidity of streams and lakes as a result of soil erosion from various development activities such as road building, shoreline fills, and drainage from industrial facilities

- Water pollution from industrial or agricultural effluents

Existing State and Federal regulatory and permitting programs would minimize the above impacts but probably not prevent them completely. In addition, the Mat-Su Borough Coastal Zone Management (CZM) Plan requires State review of all major development plans for consistency with the CZM program; see Table III-9. This also would help prevent major impacts to water resources. Mitigation of possible water quality impacts by new Borough growth will be considered in the mitigation program to be developed in cooperation with the U.S. Fish and Wildlife Service, as described under "Biological Resources".

Hydrology

Marine Environment. Very little impact to the hydrology of Knik Arm would occur from either of the Crossing Alternatives. Bridge piers would cause changes in the patterns of currents and sediment deposition in the immediate vicinity of the piers, but they would not affect the hydrology of Knik Arm as a whole. Short-term ice pile-up could occur on the upstream side of the piers, possibly causing scour of the sea bottom adjacent to the pier, especially in shallow water. The piers would be designed to deflect ice, and neither ice damming nor serious scour would be expected.

The No-Crossing Alternatives would not affect the physical characteristics of marine environments.

Freshwater Environment. Roadways associated with the Downtown and Elmendorf Projects would alter to a small degree the hydrological characteristics of several watersheds. Hydrologic impacts that might occur would include: alteration of stream dynamics as a result of culverts, bridges, and other structures; damming or diversion of surface water flow; ponding; and altered soil moisture leading to either drying of wetlands or flooding of dry areas.

The Seward Connector would be mostly elevated and thus would have little impact on hydrologic regimes. The south approach of the Elmendorf Crossing would traverse relatively undisturbed terrain, most of which is upland. Except for the crossing of Ship Creek, there would be little interference with surface water drainage patterns. The Ship Creek bridge would span the stream and thus would not affect stream characteristics. See "Floodplains".

The Houston Connector would cross only one water body, Mirror Lake, and the alignment also would avoid wetlands as much as possible. Much of the route would be aligned on ridges near the top of drainage divides which would minimize impacts from altered surface water flow. However, substantial wetlands would be crossed north of Big Lake and drainage patterns could be altered in this area. During final design, cross drainage problems would be minimized by frequent use of culverts and careful surveys of elevations to locate culverts in the lowest areas.

Neither No-Action nor Hovercraft would have a direct effect on freshwater resources. The Glenn/Parks Improvement would cross six major streams, several minor streams, extensive wetlands, and tidally influenced areas, and therefore impact to hydrologic regimes could be significantly greater for this alternative than for the others. Well designed bridges, culverts, and other cross drainage measures would minimize these impacts.

As discussed in the previous section, secondary impacts to water resources as a result of long-term development in the area north of Knik Arm probably would be significant. The kinds of impacts that could occur over the long term include:

° Altered stream flow as a result of changes in groundwater or surface water hydrology caused by water wells, wetland fills, and other terrain alterations

° Decreased groundwater supplies as a result of water wells and filling of wetland recharge areas

° Diversion of stream flow for industrial or agricultural purposes

Existing State and Federal regulatory and permitting programs would minimize the above impacts. In addition, the Mat-Su Borough Coastal Zone Management (CZM) Plan requires State review of all major development plans for consistency with the CZM program; see Table III-9. This also would help prevent major hydrology impacts.

Floodplains

The Seward Connector of the Downtown Project, the Crossing south approach road of the Elmendorf Project, and the Glenn/Parks Improvement Alternative would be the only alternatives to cross or closely parallel streams or drainage channels.

The Seward Connector generally parallels the Ship Creek floodplain (see Figure III-7) and encroaches upon it beginning at approximately the intersection of 1st Avenue and Barrow Street. It remains within the floodplain until reaching the tidelands at the mouth of Ship Creek. The Connector would be built when required to distribute 2001 (and beyond) Downtown traffic on two different north-south arterials and thus reduce congestion on I/L Streets. The location selected for the Seward Connector would minimize impact to existing Ship Creek area structures, rights-of-way, utilities, and streets. There would be no encroachment in the regulatory floodway.

The Connector would be an elevated structure with only its pier foundations encroaching on the floodplain. Consequently, the structure would have negligible impact upon channel capacity and flood flows. The amount of water displaced would be minimal and would not raise flood levels. Flood waters would be able to flow freely around the foundations, and they would be designed to withstand both the erosive effects of flood flows and the impacts of floating debris.

There would be minimal damming due to debris wedging around piers and columns. The encroachment would not take place in the floodway, rather it would be in an inundated area where velocities would be low. Moreover, any dam created behind a pier would represent a small portion of the total stream cross-section.

No other streams or drainage channels would be crossed by the Seward Connector.

The Elmendorf Crossing south approach would cross Ship Creek (see Figure III-8) via a bridge having piers within the floodplain. This would create a narrowing of the floodplain at the crossing, but the bridge would be designed to accommodate floodwaters at a rate adequate to minimize any upstream backwater effect. The bridge would have no impact on the floodplain outside its immediate vicinity. Erosion at the bridge would be avoided by use of armor stone and by foundation design. No other streams or drainage channels would be crossed by the Elmendorf Crossing.

The Glenn/Parks Improvement would require widening of bridges over Peters Creek, Eklutna River, Knik River, Matanuska River, Wasilla Creek, and Cottonwood Creek. No impact on their floodplains would occur. Either new bridges or widened existing bridges would be designed not to constrain the flow more than existing bridges. Other drainages now passing under the highways would be retained with the same capacity.

It is conceivable that some of the development shifted from the Anchorage bowl to the Mat-Su Borough would occur in floodplains. No records are available on the current extent of development in floodplains, however Borough subdivision regulations (applicable Borough-wide) do not permit structures (except docks and related) closer than 75 feet from the high water mark of a stream or lake (Mat-Su Borough, March 1982). Thus, there is no reason to believe development in the floodplain would be significant.

Natural Resource Development

Farmlands of State or Local Importance. Right-of-way for the Houston Connector, included in the Downtown Project, Elmendorf Project, and Hovercraft Alternative would require the acquisition of approximately 55 acres of farmland of State or local importance. The alignment for the Connector would pass adjacent to farmland designated in the Willow Sub-basin Plan (ADNR, October 1982) in the Point MacKenzie Agricultural Area and cross lands designated for small farms in the Pear Lake area (northwest of Big Lake). In the Point MacKenzie area, the State owns and has designated a 600-foot wide transportation corridor; the Connector would stay within this corridor, so no right-of-way acquisition from agricultural lands would be necessary. In the Pear Lake area, the alignments would cross the southeast corner of the area designated for small farms. The area that would be acquired is approximately one mile in length and includes about 55 acres of designated farmland. However, this acquisition would not include Class II or III soils, and due to the nature of the designated use, small farms, the area would accommodate division by a roadway without leaving parcels that would be unusable due to size or shape. In addition, the Willow Sub-basin Plan designates 5,500 acres for small farms; the Houston Connector would take only one percent of that total. During final design, efforts would be made to reduce the take by narrowing the right-of-way to the greatest extent possible while still leaving room for future widening and utilities. There would be no encroachment on non-small farm development due to increased growth, because the designated farmlands are owned by the State or Borough, both of which could control future use.

Neither the Glenn/Parks Improvement nor the No-Action Alternative would affect farmland of State or local importance.

Agriculture Marketing and Processing. Either Crossing Alternative would support the Point MacKenzie Agriculture Project by providing improved access to Anchorage, the local market, and it would support implementation of the proposed Fish Creek Agricultural Project once planned road access is complete. A Crossing also would support development of a port/industrial complex in the Point MacKenzie area, and, if the complex were developed, a Crossing would provide part of the infrastructure needed to export agricultural products, produce fertilizer, and handle agricultural processing (e.g., freezing and canning, tanning hides). This would increase the incentive for and profitability of local agriculture.

With the Hovercraft Alternative, the access provided would not improve farm-to-market access to Anchorage and would be unlikely to increase agricultural productivity. The likelihood of port/industrial development would not be increased with this alternative, but, were the development to occur, the benefits to agriculture would be similar to those described above in relation to a Crossing Alternative.

Neither the Glenn/Parks Improvement nor the No-Action Alternative would have an impact on agriculture productivity.

Other Surface Resources. A Crossing Alternative would affect the development of timber, fish and wildlife, and recreation resources. The timber cleared from the right-of-way could be salvaged for firewood, however much of the right-of-way would not be accessible except through the construction area, and most contractors would be unwilling to allow salvagers access. In addition, accommodating salvagers in the construction area would reduce efficiency and increase project cost. A Crossing would improve access between Anchorage, the major local market, and areas designated for timber. A Crossing would also support development of a port/industrial facility at Point MacKenzie which, if developed, could provide opportunities to process and export wood products.

A Crossing Alternative would affect fish and wildlife habitat and use through both Project completion and resulting increased development in the Borough, see "Biological Resources".

Access to recreation resources, also would be increased. For example, travel time from Anchorage to the Nancy Lakes Recreation area would be reduced by almost 40 percent (92 to 54 minutes) with the Downtown Project, and approximately 20 percent (92 to 71 minutes) with the Elmendorf Project. The reduction in travel time would be even greater to planned recreation areas south of Big Lake and to the Iditarod Trail (to which a new point of access would be provided).

The Willow Sub-basin Plan indicates that the current combination of heavy use and limited facilities creates congestion, reduces user satisfaction, and causes management problems at Willow sub-basin recreation areas. This is a problem particularly during salmon fishing season when few road accessed areas exist to accommodate many users. In addition, many recreational activities in the sub-basin, especially hunting and fishing, occur on or across private lands. Increased development of private lands as well as pressure to dispose of public lands would reduce public recreational opportunities and create trespass problems.

The Willow Sub-basin Plan identifies several critical, important, and notable needs for recreation facilities and designates specific lands to be managed for recreation (see Chapter III, "Natural Resource Development"). The growth shift resulting from the Crossing Alternatives would increase the demand for recreation opportunities and facilities in the sub-basin beyond what would occur with No-Action. Demand also would shift southward from the Parks Highway area. This would require increased government investment in the development of recreation facilities and intensified management to assure that their value would not be depleted by overuse. However, it is expected that the new demand in the sub-basin would result partially from a shifting of demand from other areas since the Crossing Alternatives primarily would alter development patterns rather than generate new development. The new "closeness" of recreation to the user would generate use that would not have occurred otherwise. The 1981 Alaska Outdoor Recreation Plan (ADNR, Division of Parks, 1981) shows a need for recreation activities closer to Anchorage. Fishing is by far the activity in highest demand in Southcentral Alaska. Tent camping and hunting, respectively, have the next largest demands. These demands would be partially met by bringing Borough recreation areas closer to Anchorage. Thus, pressure on Borough streams and lakes would be increased and they would require more intensive management.

The Hovercraft Alternative, which would include the Houston Connector, would take wildlife habitat and affect fish resources, although increased development in the Borough and resulting impacts would be minimal. Fish and wildlife use increases also would be less; see discussions related to these impacts under "Biological Resources". The timber cleared from the right-of-way could be salvaged for firewood, but resource-to-market access improvements would not occur for timber. As with a Crossing Alternative, the use of Borough park and recreation resources would be increased due to reduced travel time from Anchorage. The Hovercraft impact would be less than with a Crossing due to a longer travel time across the Arm, the cost of crossing with a vehicle, and limited capacity.

The Glenn/Parks Improvement could provide salvage timber from the widened right-of-way, but otherwise it would not have any impact on resource development. No-Action would not have any impact on development of timber, fish and wildlife, or recreation resources.

<u>Subsurface Resources</u>. A Crossing Alternative would support the development of coal, oil and gas, and particularly sand and gravel. Construction and maintenance of either alternative would require considerable quantities of sand and gravel. Due to the high cost which would result from long hauling distances, known but as yet unused sources within five miles of the Houston Connector normally would be developed. Improved access likely would increase interest in developing the existing oil and gas leases in the area. Since there are potentially more productive coal fields outside the project area (see "Western Alaska Resources"), it would be unlikely that a Crossing would induce development of local coal deposits. The development of a port/industrial facility at Point MacKenzie supported by Crossing development could further encourage subsurface resource development by providing processing and/or export capability.

The Houston Connector portion of the Hovercraft Alternative also would require sand and gravel and would induce the development of known, but as yet unused, gravel sources within five miles of the Connector.

The Glenn/Parks Improvement would require sand and gravel, but there are known borrow sites within five miles of the route, and this alternative would not have any other impact on subsurface resource development. No-Action would not have an impact on the development of subsurface resources.

Western Alaska Resources. A Crossing Alternative would support development of the Beluga coal field and oil and gas reserves by shortening the distance to Anchorage if roads should be developed west of the Houston Connector and beyond the project area to Beluga. Travel time would be reduced by 45 minutes to one hour depending on the project selected. A Crossing would also support development of a port/industrial facility at Point MacKenzie which could provide infrastructure necessary to process and/or export coal, oil, and gas.

The passenger/auto service provided by Hovercraft would have no impact on the development of Western Alaska resources. Neither the Glenn/Parks Improvement nor No-Action would have an impact on the development of Western Alaska resources.

### Iditarod Trail

The Iditarod Trail would be crossed by the Houston Connector. The trail crossing would occur at a natural clearing, so removal of vegetation would be unnecessary. A bridge over the Houston Connector would be built to accommodate users of the Iditarod Trail. It would be designed to be easily negotiated by mushers and other trail users. A minimum ten-foot wide trail, with grades not exceeding eight percent, would cross the road. Low walls on the sides of the bridge would help to keep snow on the trail during the winter. Assuring snow on the bridge would be an added responsibility for those presently maintaining the trail. Vehicle pullouts and signs also would be provided to increase accessibility and visibility.

### Air Quality

The air quality analysis consisted of estimating motor vehicle emissions which would be associated with each alternative and air quality impacts which would result from these emissions. This section summarizes a more detailed description of the air quality analysis and its conclusions contained in Appendix D.

Traffic forecasts were based on the five different growth allocation scenarios presented under "Urban Growth and Economic Development". They are:

- No-Crossing (applicable to all No-Crossing Alternatives)
- Downtown Project (mid-range growth allocation)
- Downtown Project (high growth allocation)
- Elmendorf Project (mid-range growth allocation)
- Elmendorf Project (low growth allocation)

Emissions were calculated for major arterial streets and highways in the project area, including the Mat-Su Borough, Eagle River/Chugiak/Eklutna area, and the north Anchorage bowl (north of International Airport Road/Tudor Road). This is the area where significant changes in traffic volumes would occur with each alternative. The specific links used are shown in Figure III-1.

The following four years were considered in the analysis:

1. 1982 - Present case based on most recent available data
2. 1990/91 - Anticipated project opening year
3. 2001 - Year of project opening plus 10
4. 2010 - Design year

Emissions Analysis. Emissions of primary concern from motor vehicles in the Anchorage area are carbon monoxide (CO) and nitrogen oxides ($NO_x$). There are National and State ambient air quality standards (AAQS) for CO and for nitrogen dioxide ($NO_2$) which is formed from $NO_x$. The Anchorage bowl experiences periodic violations of the 8-hour standards for CO. Although extensive $NO_2$ monitoring has not been conducted, the area is considered to be in attainment for $NO_2$ (i.e., the $NO_2$ standards are met).

Emission estimates were calculated with the EPA-developed MOBILE2 model. Vehicle operating assumptions are described in Appendix D. All emissions calculations were made for peak-hour traffic which was assumed to be 10 percent of average weekday daily traffic (AWDT).

CO emissions for each alternative and growth scenario are shown in Table IV-32. With the exception of Downtown (high) in 1990/91, lowest emissions would be associated with the Downtown Project. Highest emissions generally would be associated with the Elmendorf Project and No-Crossing Alternative. Highest emissions would exceed the lowest by 11 to 13 percent in the north Anchorage bowl and by 9 to 12 percent in the entire project area. The significance of these emissions differences on air quality would be largely a function of how well they would be distributed on the street system within the Anchorage bowl.

Within the north Anchorage bowl, CO emissions would drop by approximately half from 1982 to 1990 under any alternative. This drop would be primarily due to reductions in per vehicle CO emissions as a result of modernization the vehicle fleet and implementation of an Inspection and Maintenance (I&M) program. Further drops would occur by 2001 due to further fleet modernization. Emissions would increase again by 2010 because per vehicle emission rates are not expected to change from 2001 to 2010, and traffic (vehicle-miles of travel) would increase. Outside the Anchorage bowl, emissions would increase steadily from 1990 through 2010 because traffic volumes would grow at a faster rate than per vehicle emissions would decline.

Estimates of $NO_x$ emissions are shown in Table IV-33. Future $NO_x$ emissions would drop somewhat from present levels under any alternative. Ranking from lowest to highest would depend on the year and area considered. Lowest $NO_x$

Table IV-32

CARBON MONOXIDE
ESTIMATES OF PEAK-HOUR EMISSIONS

| Alternative | CO Emissions (lb/hr) 1982 | 1990/91 | 2001 | 2010 |
|---|---|---|---|---|
| No-Crossing | | | | |
| North Anchorage Bowl | 78,900 | 36,800 | 30,700 | 36,400 |
| Outside Anchorage Bowl | 4,100 | 3,800 | 6,000 | 7,400 |
| Total | 83,000 | 40,600 | 36,600 | 43,800 |
| Downtown (Mid-Range) | | | | |
| North Anchorage Bowl | - | 36,100 | 28,900 | 33,000 |
| Outside Anchorage Bowl | - | 3,400 | 5,600 | 6,600 |
| Total | | 39,500 | 34,400 | 39,600 |
| Downtown (High) | | | | |
| North Anchorage Bowl | - | 40,200 | 28,600 | 33,400 |
| Outside Anchorage Bowl | - | 3,800 | 6,200 | 7,400 |
| Total | | 44,000 | 34,800 | 40,800 |
| Elmendorf (Mid-Range) | | | | |
| North Anchorage Bowl | - | 39,300 | 31,900 | 37,400 |
| Outside Anchorage Bowl | - | 3,500 | 5,600 | 6,800 |
| Total | | 42,800 | 37,600 | 44,200 |
| Elmendorf (Low) | | | | |
| North Anchorage Bowl | - | 38,800 | 30,600 | 36,200 |
| Outside Anchorage Bowl | - | 3,400 | 5,400 | 6,500 |
| Total | | 42,300 | 36,000 | 42,700 |

NOTES
Estimates are for peak-hour traffic.
Emissions for north Anchorage bowl are based on 100 percent cold start mode.
Emissions for outside Anchorage bowl are based on 100 percent hot stabilized mode.
Low, mid-range, and high refer to the growth allocation scenarios described under "Urban Growth and Economic Development".

Table IV-33

NITROGEN OXIDES
ESTIMATES OF PEAK-HOUR EMISSIONS

| Corridor | $NO_x$ Emissions (lb/hr) | | | |
|---|---|---|---|---|
| | 1982 | 1990/91 | 2001 | 2010 |
| No-Crossing | | | | |
| North Anchorage Bowl | 1,200 | 900 | 800 | 900 |
| Outside Anchorage Bowl | 800 | 600 | 700 | 900 |
| Total | 2,000 | 1,500 | 1,500 | 1,800 |
| Downtown (Mid-Range) | | | | |
| North Anchorage Bowl | - | 900 | 700 | 800 |
| Outside Anchorage Bowl | - | 600 | 700 | 800 |
| Total | | 1,500 | 1,400 | 1,600 |
| Downtown (High) | | | | |
| North Anchorage Bowl | - | 1,000 | 700 | 800 |
| Outside Anchorage Bowl | - | 600 | 700 | 800 |
| Total | | 1,600 | 1,400 | 1,600 |
| Elmendorf (Mid-Range) | | | | |
| North Anchorage Bowl | - | 900 | 800 | 900 |
| Outside Anchorage Bowl | - | 600 | 700 | 800 |
| Total | | 1,500 | 1,500 | 1,700 |
| Elmendorf (Low) | | | | |
| North Anchorage Bowl | - | 900 | 800 | 900 |
| Outside Anchorage Bowl | - | 600 | 700 | 800 |
| Total | | 1,500 | 1,500 | 1,600 |

NOTES
Estimates are for peak-hour traffic.
Emissions for north Anchorage bowl are based on 100 percent cold start mode.
Emissions for outside Anchorage bowl are based on 100 percent hot stabilized mode.
Low, mid-range, and high refer to the growth allocation scenarios described under "Urban Growth and Economic Development".

emissions generally would be associated with Downtown (mid-range). Elmendorf Project $NO_x$ emissions generally would be higher than for the Downtown Project. Highest emissions estimates would exceed lowest by 7 to 13 percent overall. Year-to-year trends would be similar to those for CO and for the same reasons. Emissions of $NO_x$ within the bowl would be comparable to those outside the bowl. This contrasts with CO emissions which would be much higher within the bowl. The reasons for this are given in Appendix D.

Air Quality Impact Analysis. Using the emissions data discussed above, air quality modeling was conducted to estimate CO concentrations which would result from the various Crossing Alternatives. Concentrations of CO were calculated with the CALINE3 dispersion model developed by the California Department of Transportation. CALINE3 is specifically formulated to calculate concentrations due to vehicle emissions from roadways.

Dispersion calculations were made for the same years and alternatives/ growth scenarios as in the emissions analysis. The north Anchorage bowl and the area outside the bowl were modeled separately. Assumed meteorological conditions are described in Appendix D.

Concentrations were calculated at several representative receptor locations to estimate air quality impacts. In the north Anchorage bowl area, receptors were selected at 14 locations as follows:

- Two monitor receptors - one at each of two CO monitors operated by the Municipality of Anchorage. These are Spenard Road and Benson Boulevard and 7th Avenue and C Street. These monitors are adjacent to roads included in the traffic and emissions analyses. The Garden Street monitor was not included because traffic on the roads adjacent to this monitor was not included in the traffic data used for modeling. Therefore, local emissions, which are of greatest importance in determining concentrations, were not accounted for. The Raspberry Road monitor, near the airport, was not included because it is south of the north Anchorage bowl area of analyses.

- Four special receptors -

  1) Alaska Native Medical Center on 3rd Avenue between Ingra and Gambell Streets;

  2) Bartlett High School north of Glenn Highway at Muldoon Road;

  3) Resolution Park at 3rd Avenue and L Streets; and

  4) 918 West 2nd Avenue, an historic structure.

- Eight roadside receptors 10 meters from the road along selected traffic links, including the most heavily traveled.

Receptor locations are shown in Figure D-1 of Appendix D.

CALINE3 is designed to estimate 1-hour average concentrations. Therefore, it was necessary to apply a factor to model predictions to estimate 8-hour average concentrations. The average ratio of 8-hour maximum to 1-hour maximum CO concentrations in Anchorage was determined to be 0.67. Thus, calculated 1-hour maximum concentrations at each receptor were multiplied by 0.67 to obtain estimates of 8-hour concentrations.

The results are compared against Ambient Air Quality Standards (AAQS) of 35 ppm for 1-hour average concentrations and 9 ppm for 8-hour average concentrations.

Modeling results are shown in Table IV-34 for selected representative receptors. Complete results are given in Appendix D. Predicted concentrations at the two monitor locations considered (Spenard and Benson; 7th and C) and at the Anchorage Native Medical Center would be below the 8-hour AAQS (9 ppm) for any alternative in any year. Concentrations for the Downtown (high) and Elmendorf (low) would approach the AAQS at Spenard and Benson in 1990. Concentrations at Resolution Park would exceed the AAQS in 1990 and 2010 for any alternative and in 2001 for the Downtown Project. Higher concentrations associated with the Downtown Project would be the result of southbound traffic feeding into L Street from the Downtown bridge. Impacts at Resolution Park for No-Crossing and the Elmendorf Project would be approximately the same.

Of all receptors considered, highest concentrations would occur along the Seward Highway. Highest concentrations on this link would be associated with the Downtown Project, and high growth shift impacts would be greater than mid-range impacts. Lowest concentrations on this link would be associated with the No-Crossing Alternative and they would be less than Downtown (high) concentrations by up to 30 percent.

In general, the best and worst alternatives from an air quality standpoint would vary by receptor location and year. In order to find a common ground for comparing alternatives, two sets of statistics were compiled based on the 14 receptors considered in the analysis. These are:

- average concentration over all receptors

- number of receptors with predicted AAQS violations

These statistics are shown at the bottom of Table IV-34. Average concentrations should not be interpreted as average worst-case concentrations throughout the north Anchorage bowl because receptors were generally chosen at areas of expected high concentrations.

In 1990, average Downtown (high) concentrations would be highest and No-Crossing concentrations would be lowest with a difference of about 20 percent. Predicted average concentrations for other alternatives in 1990 would be essentially equal and between the low and high. The number of receptors with predicted AAQS violations would differ by only one. This may not be a significant difference since the difference would be small enough that a different choice of receptors likely would have produced slightly

Table IV-34

MAXIMUM PREDICTED CO CONCENTRATIONS
IN THE NORTH ANCHORAGE BOWL

| Receptor and Alternative | Maximum 8-Hour Concentrations (ppm) 1990/91 | 2001 | 2010 |
|---|---|---|---|
| Spenard and Benson | | | |
| No-Crossing | 7.8 | 6.5 | 7.0 |
| Downtown (mid-range) | 8.0 | 6.2 | 6.8 |
| Downtown (high) | 8.7 | 6.2 | 6.9 |
| Elmendorf (mid-range) | 8.0 | 6.4 | 7.3 |
| Elmendorf (low) | 8.6 | 7.1 | 7.8 |
| 7th and C | | | |
| No-Crossing | 5.7 | 4.6 | 5.8 |
| Downtown (mid-range) | 5.6 | 4.4 | 4.8 |
| Downtown (high) | 6.1 | 4.5 | 5.2 |
| Elmendorf (mid-range) | 6.0 | 4.8 | 5.9 |
| Elmendorf (low) | 6.2 | 4.6 | 6.0 |
| Alaska Native Medical Center | | | |
| No-Crossing | 3.6 | 2.9 | 3.6 |
| Downtown (mid-range) | 4.1 | 3.4 | 3.8 |
| Downtown (high) | 4.7 | 3.4 | 3.9 |
| Elmendorf (mid-range) | 4.1 | 3.2 | 3.8 |
| Elmendorf (low) | 4.0 | 3.0 | 3.6 |
| Resolution Park | | | |
| No-Crossing | 10.5 | 8.4 | 10.9 |
| Downtown (mid-range) | 15.5 | 12.1 | 15.3 |
| Downtown (high) | 17.4 | 12.5 | 15.7 |
| Elmendorf (mid-range) | 10.5 | 8.2 | 10.5 |
| Elmendorf (low) | 10.8 | 8.3 | 10.6 |
| New Seward Highway | | | |
| No-Crossing | 20.5 | 17.8 | 20.4 |
| Downtown (mid-range) | 26.5 | 20.4 | 23.1 |
| Downtown (high) | 29.5 | 21.0 | 26.1 |
| Elmendorf (mid-range) | 24.5 | 19.1 | 21.5 |
| Elmendorf (low) | 24.9 | 18.9 | 21.3 |
| Overall Average* | | | |
| No-Crossing | 8.5/6 | 7.1/4 | 8.6/6 |
| Downtown (mid-range) | 9/1/5 | 7.2/5 | 8.4/5 |
| Downtown (high) | 10.2/6 | 7.3/5 | 8.8/5 |
| Elmendorf (mid-range) | 9.2/6 | 7.4/4 | 8.8/6 |
| Elmendorf (low) | 9.2/6 | 7.2/4 | 8.7/6 |

* Numbers after slash indicate number of receptors out of 14 considered which showed violations of the 8-hour AAQS under worst-case conditions.

different results. On the basis of receptor averaged concentrations and predicted AAQS violations, differences among alternatives would not be significant in 2001 and 2010. Concentrations would be higher in 2010 than in 2001 due to increased traffic volume which would not be offset by slight improvements in average per vehicle emission rates.

Outside the Anchorage bowl, maximum 8-hour roadside concentrations were predicted to occur along the Glenn Highway on the first link out of the Anchorage bowl, Muldoon Road to Eagle River. Maximum concentrations (ppm) on this link are shown below. These concentrations include modeled background due to emissions in the Anchorage bowl.

| | 1990 | 2001 | 2010 |
|---|---|---|---|
| No-Crossing | 4.2 | 5.4 | 6.7 |
| Downtown (Mid-Range) | 3.4 | 4.3 | 4.7 |
| Downtown (High) | 3.9 | 4.3 | 4.8 |
| Elmendorf (Mid-Range) | 3.5 | 4.6 | 5.2 |
| Elmendorf (Low) | 3.5 | 4.6 | 5.3 |

Maximum predicted concentrations would be associated with the No-Crossing alternative and lowest concentrations would be associated with the Downtown Project in most cases. However, differences between the Downtown and Elmendorf Projects would be minor. In no case would there be a violation of the 8-hour standard. Maximum predicted concentrations in the Mat-Su Borough would be less than 1.5 ppm in any year; see Appendix D.

Impact on Anchorage Air Quality Plan. The Anchorage Air Quality Plan includes expansion of existing traffic improvement programs and implementation of a vehicle I&M program (Municipality of Anchorage, 1982a). Traffic improvements would include synchronization of traffic signals to improve traffic flow and reduce time in the acceleration, deceleration, and idle modes, thereby reducing CO emissions. Several road and highway construction projects also have been proposed to improve traffic flow. In addition, encouragement of carpooling, transit use, and variable work hours are included in the Air Quality Plan. The vehicle I&M program has been proposed to reduce per vehicle emissions by requiring periodic vehicle exhaust inspection. Vehicles not meeting exhaust requirements would be required to undergo maintenance to bring them into compliance.

Most of the Anchorage bowl air quality non-attainment area has transportation control measures in the State Implementation Plan (SIP) which was conditionally approved by the Environmental Protection Agency in September 1982. The Anchorage measures for control of CO were noted in Chapter III. The No-Action and Glenn/Parks Improvement Alternatives only include bowl projects found within the area's long-range transportation plan and transportation improvement program. The Federal Highway Administration (FHWA) has determined both to conform to the SIP. Thus, pursuant to 23 CFR 770 both of these alternatives would conform to the SIP.

The Hovercraft Alternative and Crossing Alternatives are not in bowl transportation plans. To be in conformance with the SIP, the Anchorage Air Quality Control Plan (Municipality of Anchorage, 1982a) indicates these alternatives must:

- Provide a net areawide air quality benefit and not delay attainment of National Air Quality Standards

- Reflect reasonable progress in implementing those transportation control measures called for in the SIP to meet air quality standards and not include any actions that would reduce the effectiveness of those measures

Neither Hovercraft nor a Crossing Alternative would adversely affect implementation of the traffic improvements, inspection/maintenance program, carpool/variable work hours program, or transit improvements described in the Anchorage Plan. As discussed under "Public Transportation", a Crossing Alternative would reduce transit use in the bowl but only because fewer people would be living in the bowl compared to No-Action. The percentage of travelers using transit in the bowl would not be affected. In fact, the percentage may rise because those households making the decision to live in the Borough due to a crossing, rather than the bowl, would likely not be transit users anyway and captive transit riders likely would not move to the Borough where transit service would be less frequent.

The Hovercraft Alternative would not significantly affect traffic patterns or flow in the bowl and thus would not change CO emissions. Therefore, Hovercraft would not change the effectiveness of bowl transportation control measures.

As indicated in Table IV-32, the Downtown Project (with the most likely mid-range growth allocation) would reduce total CO emissions in the north Anchorage bowl (six percent in 2001, nine percent in 2010). Thus, the Downtown Project would provide a net air quality benefit and increase the effectiveness of transportation control measures for the bowl.

For the Elmendorf Project (with the most likely mid-range growth allocation), total CO emissions in the north Anchorage bowl would rise four percent in 2001 and three percent in 2010 compared to No-Action. Thus, the Project would provide a small net air quality decrease and lessen the effectiveness of transportation control measures in the bowl. This would occur for two reasons:

1. As indicated in Table IV-4, the Elmendorf Project would increase total vehicle-miles of travel in the bowl slightly, two percent in 2001 and 1.5 percent in 2010.

2. As shown on Figure IV-1, the traffic pattern resulting from the Project adds traffic to streets which would be congested under No-Action, slowing traffic further and increasing emissions. Table IV-4 shows an increase of 30 percent in 2001 of vehicle-miles traveled at less than acceptable levels-of-service (D to F). However, a decrease of only one percent occurs in 2010.

In light of the above, it is concluded pursuant to 23 CFR 770 that the No-Crossing Alternatives and the Downtown Project would conform to the State Implementation Plan. Without mitigation of the emissions impact described above, the Elmendorf Project would not conform. The small percentage increase in emissions could be mitigated by a re-evaluation of the area's Long-Range Transportation Plan (Municipality of Anchorage, Community Planning Department, July 1983) to take into account the changed pattern of area-wide traffic flows resulting from the Elmendorf Project. Planning could be altered such that congestion and increases in emissions which would result from the changed traffic patterns would be minimized (e.g., incorporating traffic improvements on roads feeding into the crossing such as the Glenn Highway), and the Elmendorf Project in combination with a revised Long-Range Transportation Plan would achieve the same level of emissions or better as the current Transportation Plan. Specific changes that could be made will be analyzed and presented in the Final EIS if the Elmendorf Project is selected as the preferred alternative.

A final determination of conformance will be made by the Anchorage Metropolitan Area Transportation Study (AMATS) Air Quality Policy Committee based on the air quality analysis in this document. This determination will be presented in the Final EIS.

Noise

The following analysis is a summary of a more detailed discussion of the noise analysis found in Appendix E.

Noise Sensitive Areas. The primary noise-sensitive land use in the Mat-Su Borough and in the Eagle River-Chugiak-Eklutna area is low density residential along the Houston Connector and the Glenn and Parks Highways. The majority of these residences lie along the Glenn Highway.

In the urbanized Anchorage bowl area, noise-sensitive land uses include residences, hospitals, schools, and parks.

Noise Abatement Criteria. "Noise Abatement Criteria" have been promulgated by the Federal Highway Administration (FHWA, July 1982) to control the noise of roadway projects. An hourly average A-weighted sound level ($L_{eq}$) of 67 decibels (dB) has been set as the limit for this exposure during the peak traffic hour in residential areas and for parks, schools, hospitals, and many other noise sensitive areas. A noise impact severe enough to warrant mitigation would occur if the sound level including traffic in the project design year (2010) would exceed this criterion.

An FHWA study (FHWA, June 1982) recommends that a noise impact also be considered severe enough to warrant mitigation if increased noise levels meet the following criteria:

| dB's Below Noise Abatement Criteria | dB Increase from No-Action |
|---|---|
| 1 | 10 |
| 2 | 12 |
| 3 | 13 |
| 4 | 14 |
| 5 | 14 |
| 6 | 15 |
| 7 | 15 |
| 8 | 15 |
| 9 | 15 |
| 10+ | 16+ |

This abatement criteria is also used in this analysis to determine the need for mitigation at noise sensitive sites where the FHWA "Noise Abatement Criteria" would not be exceeded.

As a further measure of noise impact, the "Level Weighted Population" (National Academy of Sciences, 1977) is used to compare sound levels associated with a variety of alternatives for which there are different numbers of people exposed to different levels of sound. The level weighted population (LWP) is a count of the number of people exposed to different levels of sound, with a weighting employed in the counting which increases with increasing magnitude of sound. Thus, both the extent and the severity of noise exposure are taken into account in the level weighted population. The level weighted population utilizes the day-night average sound level ($L_{dn}$) as the measure of noise exposure. The $L_{dn}$ is a measure of average 24-hour noise exposure that has nighttime levels weighted to account for heightened sensitivity to noise during this period. For most roadways of interest, the $L_{dn}$ and the peak-hour $L_{eq}$ are numerically equal.

Impact Analysis Results. Peak-hour average sound levels (and equivalently, day-night average sound levels) were estimated for all the major roadway links in the rural area and in the Anchorage bowl. All sound levels used in this document are A-weighted levels, in units of decibels (dB). Table IV-35 lists for key links and each alternative the projected peak-hour average sound level at 100 feet from the roadway centerline.

The table shows that for those roadway links outside the Anchorage bowl with moderate to heavy existing traffic (Glenn and Parks Highways), the three No-Crossing Alternatives generally would provide the highest noise exposure of any of the Alternatives under consideration. This would be due to a higher traffic volume on these roadways than would occur if a Crossing Alternative were built. However, the differences are often insignificant because differences in noise exposure of 3 dB or less typically are imperceptible to the average person.

For those roadway links where traffic would be light or non-existent with No-Crossing, implementation of a Crossing Alternative would result in a significant increase in noise exposure. The estimated sound levels at 100 feet would exceed the 67 dB FHWA criterion along most of the Houston Connector.

Table IV-35

PROJECTED PEAK-HOUR TRAFFIC NOISE LEVELS FOR THE YEAR 2010

| Link ID | Roadway (location) | Noise Level In Decibels (dB) No-Action | Glenn/Parks Improvements | Hovercraft | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
|---|---|---|---|---|---|---|---|---|
| 1 | Parks Highway (from Willow north) | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| 4 | Parks Highway (just east of Big Lake Road) | 68 | 68 | 68 | 63 | 64 | 64 | 63 |
| 7 | Parks Highway (Glenn/Parks Highway junction to Wasilla) | 69 | 71 | 69 | 69 | 68 | 68 | 68 |
| 10 | Glenn Highway (from Palmer north) | 69 | 69 | 69 | 69 | 68 | 69 | 69 |
| 13 | Glenn Highway (Eklutna to Knik River) | 74 | 75 | 74 | 72 | 73 | 72 | 72 |
| 15 | Glenn Highway (Eagle River to Peters Creek) | 75 | 75 | 74 | 74 | 74 | 74 | 74 |
| 16 | Glenn Highway (Muldoon Road to Eagle River) | 76 | 75 | 76 | 75 | 75 | 76 | 76 |
| 19 | Houston Connector (Parks Highway to Horseshoe Lake Road) | - | - | 53 | 65 | 65 | 64 | 64 |
| 20 | Houston Connector (Horseshoe Lake Road to South Big Lake Road) | - | - | 57 | 69 | 68 | 67 | 67 |
| 21 | Houston Connector (South Big Lake Road to Point MacKenzie Access Road) | 51 | 51 | 59 | 68 | 68 | 67 | 67 |
| 22 | Houston Connector (Point MacKenzie Access Road) | 61 | 61 | 61 | 71 | 71 | 70 | 70 |
| 23 | Houston Connector (Point MacKenzie Access Road to Crossing) | - | - | 61 | 72 | 71 | 70 | 70 |
| 24 | Big Lake Road (Parks Highway to Big Lake Road) | 58 | 58 | 56 | 59 | 59 | 59 | 59 |
| 32 | Knik-Goose Bay Road (just south of Wasilla) | 66 | 66 | 64 | 55 | 56 | 55 | 54 |
| 35 | Point MacKenzie Access Road (east-west segment) | 62 | 62 | 59 | 62 | 62 | 61 | 61 |
| 36 | Glenn Highway (Boniface Parkway to Muldoon Road) | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| 37 | Glenn Highway (Bragaw Street to Boniface Parkway) | 70 | 70 | 70 | 69 | 69 | 69 | 70 |
| 38 | Northside Bypass (planned between Old Seward Highway & Bragaw Street) | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| 42 | 5th/6th Avenues (C Street to Seward Highway) | 64 | 64 | 64 | 74 | 74 | 64 | 64 |
| 43 | 5th/6th Avenues (L Street to C Street) | 64 | 64 | 64 | 64 | 64 | 64 | 64 |
| 44 | Muldoon Road (Glenn Highway to DeBarr Road) | 69 | 69 | 69 | 70 | 70 | 70 | 69 |
| 45 | DeBarr Road (Boniface Parkway to Muldoon Road) | 69 | 69 | 69 | 68 | 68 | 69 | 68 |
| 49 | 15th Avenue (Seward Highway to Lake Otis Parkway) | 65 | 65 | 65 | 66 | 66 | 66 | 66 |
| 50 | 15th Avenue (C Street to Seward Highway) | 64 | 64 | 64 | 63 | 63 | 64 | 64 |
| 52 | Muldoon Road (DeBarr Road to Northern Lights Boulevard) | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| 53 | Northern Lights Boulevard (Boniface Parkway to Muldoon Road) | 67 | 67 | 67 | 66 | 66 | 66 | 66 |
| 56 | Northern Lights Boulevard (Seward Highway to Lake Otis Parkway) | 66 | 66 | 66 | 65 | 66 | 66 | 66 |
| 58 | Northern Lights/Benson Boulevards Couplet (Minnesota Drive to C Street) | 70 | 70 | 70 | 70 | 69 | 69 | 69 |
| 60 | Muldoon/Tudor Roads (Northern Lights Boulevard to Boniface Parkway) | 68 | 68 | 68 | 68 | 69 | 68 | 68 |
| 61 | Tudor Road (Lake Otis Parkway to Boniface Parkway) | 68 | 68 | 68 | 68 | 67 | 68 | 68 |
| 62 | Tudor Road (Seward Highway to Lake Otis Parkway) | 66 | 66 | 66 | 66 | 66 | 67 | 66 |
| 63 | Tudor Road (Old Seward Highway to Seward Highway) | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| 64 | Tudor Road (C Street to Old Seward Highway) | 67 | 67 | 67 | 67 | 67 | 68 | 67 |
| 65 | Tudor Road (Minnesota Drive to C Street) | 67 | 67 | 67 | 67 | 66 | 67 | 67 |
| 68 | International Airport Road (Spenard Road to Minnesota Drive) | 68 | 68 | 68 | 67 | 67 | 67 | 67 |
| 69 | Boniface Parkway (Glenn Highway to DeBarr Road) | 68 | 68 | 68 | 69 | 69 | 68 | 68 |
| 70 | Boniface Parkway (DeBarr Road to Northern Lights Boulevard) | 67 | 67 | 67 | 67 | 66 | 67 | 67 |
| 73 | Bragaw Street (DeBarr Avenue to Northern Lights Boulevard) | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| 76 | Lake Otis Parkway (Northern Lights to Tudor Road) | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| 77 | Seward Highway (5th/6th Avenues to 15th Avenue) | 70 | 70 | 70 | 70 | 70 | 70 | 69 |

Table IV-35 (continued)

PROJECTED PEAK-HOUR TRAFFIC NOISE LEVELS FOR THE YEAR 2010

| Link ID | Roadway (location) | Noise Level In Decibels (dB) No-Action | Glenn/Parks Improvements | Hovercraft | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
|---|---|---|---|---|---|---|---|---|
| 78 | Seward Highway (15th Avenue to Northern Lights Boulevard) | 66 | 66 | 66 | 66 | 65 | 66 | 66 |
| 80 | Seward Highway (just north of Tudor Road) | 70 | 70 | 70 | 69 | 69 | 69 | 67 |
| 81 | Seward Highway (just south of Tudor Road) | 70 | 70 | 70 | 71 | 70 | 71 | 70 |
| 82 | Old Seward Highway (36th Avenue to Tudor Road) | 65 | 65 | 65 | 66 | 65 | 66 | 65 |
| 84 | C Street or A/C Couplet (5th/6th Avenues to 15th Avenue) | 66 | 66 | 66 | 66 | 65 | 66 | 66 |
| 86 | C Street (Northern Lights Boulevard to Tudor Road) | 68 | 68 | 68 | 67 | 67 | 68 | 68 |
| 88 | I/L Street Couplet (5th/6th Avenues to 15th Avenue) | 67 | 67 | 67 | 67 | 67 | 66 | 67 |
| 89 | Minnesota Drive (15th Avenue to Northern Lights Boulevard) | 67 | 67 | 67 | 68 | 68 | 67 | 67 |
| 90 | Minnesota Drive (Northern Lights Boulevard to Spenard Road) | 68 | 68 | 68 | 68 | 68 | 67 | 68 |
| 92 | Minnesota Drive (Northern Lights Boulevard to Tudor Road) | 68 | 68 | 68 | 69 | 69 | 69 | 68 |
| 93 | Minnesota Drive (Tudor Road to International Airport Road) | 68 | 68 | 68 | 69 | 69 | 68 | 68 |
| 94 | Spenard Road (Minnesota Drive to International Airport Road) | 63 | 63 | 63 | 62 | 63 | 63 | 63 |
| 101 | I/L Street ramps of Downtown Crossing | - | - | - | 72 | 72 | - | - |
| 104 | Seward Connector | - | - | - | 72 | 72 | - | - |
| 105 | Elmendorf Crossing | - | - | - | - | - | 74 | 73 |
| 106 | Downtown Crossing | - | - | - | 74 | 75 | - | - |
| 107 | Hovercraft | | | | | | | |

NOTE
Low, mid-range, and high refer to the growth allocation scenarios described under "Urban Growth and Economic Development".

For areas outside the Anchorage bowl, aerial photographs were examined to identify residential structures within 500 feet of major roadways. Estimates were made of the peak-hour average sound level for each residence. Table IV-36 lists the number of residences with expected $L_{eq}$ in excess of 67 dB for each alternative. The table shows a decrease in the number of such residences for the Crossing Alternatives and an increase for Glenn/Parks Improvement relative to No-Action. All but four of the homes listed would be along the Glenn and Parks Highways. For that area, the decrease shown in Table IV-36 reflects for the Crossing and Hovercraft Alternatives an absolute reduction in the number of homes which would exceed the criteria. It does not reflect a net reduction that would include some homes with increased levels and others with reduced levels. Thus, along the Glenn and Parks Highways no mitigation would be required for those alternatives. The remaining four homes are on the Houston Connector, and noise levels would be one dB over the 67 dB criteria and would represent a substantial increase over current levels. All four homes are in the Point MacKenzie area where the measured noise level was 42 dB; see Table III-15. The impact would be mitigated either by maintaining vegetation on the right-of-way to reduce noise levels or by moving the alignment away from the homes during final design.

For the Glenn/Parks Improvement, since the increased noise level for the homes along those roads would be one dB or less (see Table IV-35), no mitigation would be incorporated into project design.

The level weighted population was determined for each alternative and also is listed in Table IV-36. As a way of comparing the level weighted population values among alternatives, the relative change in impact (RCI) is also listed. The RCI represents the percentage change in LWP relative to the LWP of No-Action. Any of the Crossing Alternatives would provide a decrease in noise impact except the Glenn/Parks Improvement.

Where the Houston Connector would cross the Iditarod Trail, the FHWA criteria of 67 dB would be exceeded beginning about 100-feet from the center-line of the road during the peak hour. This noise level would be a significant increase over existing levels since the trail is in an undeveloped area. The impact would be mitigated by maintaining as much vegetation as possible at the trail so the area of impact would be minimized. Manmade sound barriers would not be in keeping with the trail's natural character

Within the Anchorage bowl, there would be two types of impacts to be considered. The first type would be the direct impact of traffic using the crossing and its various connectors, while the second type would be the indirect effect of changes in traffic flow on arterial streets within Anchorage. The Elmendorf Project would come near Elmendorf AFB Hospital, an area of Elmendorf housing, an area of Elmendorf recreation facilities, and Bartlett High School. However, at each of these locations the projected peak-hour average sound level would be well below 67 dB, and increases above the present levels (measured during the field survey, see Chapter III, "Noise") would not be significant enough to require mitigation.

Table IV-36

PROJECTED RESIDENTIAL NOISE IMPACT OUTSIDE THE ANCHORAGE BOWL[1]
FOR THE YEAR 2010

| | Number of Residences[2,3] | | | | | | |
|---|---|---|---|---|---|---|---|
| | No-Crossing Alternatives | | | Crossing Alternatives | | | |
| | No-Action | Glenn/Parks Improvements | Hovercraft | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| No. 67 dB[4] | 681 | 728 | 536 | 591 | 594 | 551 | 551 |
| LWP[5] | 647 | 693 | 631 | 566 | 572 | 563 | 564 |
| RCI[6] | - | +7% | -2% | -13% | -12% | -13% | -13% |



NOTES

1. Mat-Su Borough and Eagle River-Chugiak-Eklutna.
2. Total number of residences within 1,000 feet of all roadways examined in rural areas is approximately 1,060.
3. Low, mid-range, and high refer to the growth allocation scenarios described under "Urban Growth and Economic Development".
4. Number of residences with projected peak hour $L_{eq}$ greater than 67 dB.
5. Level weighted population.
6. Relative change in impact, compared to the No-Action Alternative.

The levels would be:

| | Existing (24-Hour $L_{dn}$) | Elmendorf Project (Peak-Hour $L_{eq}$) |
|---|---|---|
| Base Hospital | 58 | 57 |
| Base Housing | 63 | 57 |
| Base Recreation | | |
| ° Family Camp | 58 | 65 |
| ° Green Lake | 55 | 62 |
| ° Spring Lake | 62 | 62 |
| Bartlett High School | 53 | 57 |

For the Downtown Project, the Seward connector would intersect with Ingra Street in the vicinity of the Alaska Native Medical Center. The estimated sound level resulting from traffic on this connector would be 65 dB, below 67 dB, and comparable to levels already existing in the area. However, the alternative southbound ramp which would intersect with Gambell Street and would run between the two major buildings of the Medical Center would cause sound levels greater than 67 dB and greater than existing levels. The Gambell Street ramp would not be completed unless the Medical Center had moved to another location as is planned. Homes closest to the Seward Connector would experience sound levels of 64 dB, also below 67 dB. The increase above present levels (measured during the field survey) would not be significant enough to require mitigation.

The I/L Ramps of the Downtown Crossing would adversely affect noise levels at Resolution Park, Hostetler Park, and four historic structures. This noise impact is addressed in Chapter V, "Section 4(f) Evaluation".

The indirect effects of the project on noise-sensitive land uses along the arterial street system in urban Anchorage can be seen in Table IV-35. Typically, peak-hour average sound levels would vary by only 1 to 2 dB among alternatives, and in many cases would be lower for a Crossing Alternative than for a No-Crossing Alternative. Therefore, no impact would occur at any noise-sensitive site in the Anchorage area as a result of changes in traffic flow on the street system.

Construction activity would not cause a major impact due to its temporary nature and the scarcity of noise-sensitive sites along the alternatives.

In summary, a Crossing Alternative generally would have either a negligible or a beneficial impact at noise-sensitive locations throughout the Anchorage bowl. Outside the Anchorage bowl, the decrease in traffic along existing roadways would provide a decrease in noise exposure from that with a No-Crossing Alternative. Areas of significant adverse noise impact would be at four homes and the Iditarod Trail on the Houston Connector, at parks and historic structures at the I/L ramps of the Downtown Crossing (see Chapter V), and at the Alaska Native Medical Center with the southbound Gambell ramp.

Energy

Energy consumed by transportation facilities and operations is of four types:

1. Direct vehicle: Energy used by transportation vehicles, based on number of vehicles, vehicle mix, miles per gallon of fuel used, speed and other operating characteristics, and roadway characteristics.

2. Indirect vehicle: Energy required to manufacture and maintain the transportation vehicles.

3. Indirect maintenance: Energy required to maintain transportation facilities such as streets and highways.

4. Indirect construction: Energy required to construct transportation facilities.

Energy consumption estimates in this section were calculated using consumption factors from the 1978 California Department of Transportation Report, "Energy and Transportation Systems" (Apostolos et al., 1978), as applied in the Illinois Department of Transportation's Highway Energy Handbook (1981).

The estimates take into account:

- Average daily traffic for automobiles, medium trucks, and heavy trucks

- Major street and highway mileage in the project area, including the north Anchorage bowl, Glenn and Parks Highways to Houston, and the alternatives under consideration

- Average daily speed

- Federal automobile fuel economy requirements

- Variations in fuel consumption due to roadway curvature and grades for the alternatives under consideration and the Glenn and Parks Highways

- Construction energy consumption spread over the expected life of the alternative

- Variations in maintenance energy consumption by pavement type and number of lanes

The estimated energy consumption for the No-Crossing and Crossing Alternatives is presented in Table IV-37. Energy is shown in British Thermal Units (BTU's) used annually and total equivalent barrels of oil per day. The rates shown are the average levels of consumption that would occur from 1990/91 (year of project opening) to the year 2010. The traffic volumes used were those calculated by the project team and AMATS and they are described in the "Traffic Volumes" section of this chapter. With the model used, a difference in energy consumption is considered significant only if it is greater than 10 percent.

Table IV-37

ANNUAL AVERAGE (1990-2010) ENERGY CONSUMPTION
PROJECT AREA ARTERIALS
(billions of BTU's except as noted)

| | Direct Vehicle | Indirect Vehicle | Alternative Construction | Maintenance | Total | Equivalent Barrels of Oil/Day |
|---|---|---|---|---|---|---|
| NO-CROSSING | | | | | | |
| 1. No-Action | | | | | | |
| - North Anchorage bowl | 2,300 | 2,500 | -- | 33 | 4,800 | |
| - Glenn/Parks Highway | 3,200 | 3,000 | -- | 35 | 6,200 | |
| TOTAL | 5,500 | 5,500 | | 68 | 11,000 | 5,200 |
| 2. Glenn/Parks Improvement | | | | | | |
| - North Anchorage bowl | 2,300 | 2,500 | -- | 33 | 4,800 | |
| - Glenn/Parks Highway (including Project) | 3,300 | 3,000 | 29 | 50 | 6,400 | |
| TOTAL | 5,600 | 5,500 | 29 | 83 | 11,200 | 5,300 |
| 3. Hovercraft | | | | | | |
| - North Anchorage bowl | 2,300 | 2,500 | -- | 33 | 4,800 | |
| - Glenn/Parks Highway | 3,000 | 2,800 | -- | 42 | 5,800 | |
| - Project | 200 | -- | 57 | 8 | 300 | |
| TOTAL | 5,500 | 5,300 | 57 | 83 | 10,900 | 5,200 |
| CROSSING | | | | | | |
| 1. Downtown Project (Mid-Range) | | | | | | |
| - North Anchorage bowl | 2,300 | 2,400 | -- | 33 | 4,700 | |
| - Glenn/Parks Highway | 2,200 | 2,000 | -- | 42 | 4,200 | |
| - Project | 800 | 700 | 240 | 13 | 1,700 | |
| TOTAL | 5,300 | 5,100 | 240 | 88 | 10,600 | 5,000 |

Table IV-37 (continued)

ANNUAL AVERAGE (1990-2010) ENERGY CONSUMPTION
PROJECT AREA ARTERIALS
(billions of BTU's except as noted)

| | Direct Vehicle | Indirect Vehicle | Alternative Construction | Maintenance | Total | Barrels of Oil/Day |
|---|---|---|---|---|---|---|
| 2. Downtown Project (High) | | | | | | |
| - North Anchorage bowl | 2,200 | 2,400 | -- | 33 | 4,600 | |
| - Glenn/Parks Highway | 2,400 | 2,200 | -- | 42 | 4,600 | |
| - Project | 900 | 800 | 240 | 13 | 2,000 | |
| TOTAL | 5,500 | 5,400 | 240 | 88 | 11,200 | 5,300 |
| 3. Elmendorf Project (Mid-Range) | | | | | | |
| - North Anchorage bowl | 2,400 | 2,600 | -- | 33 | 5,000 | |
| - Glenn/Parks Highway | 2,400 | 2,100 | -- | 42 | 4,500 | |
| - Project | 800 | 700 | 190 | 16 | 1,700 | |
| TOTAL | 5,600 | 5,400 | 190 | 91 | 11,200 | 5,300 |
| 4. Elmendorf Project (Low) | | | | | | |
| - North Anchorage bowl | 2,300 | 2,500 | -- | 33 | 4,800 | |
| - Glenn/Parks Highway | 2,300 | 2,000 | -- | 42 | 4,300 | |
| - Project | 700 | 600 | 190 | 16 | 1,500 | |
| TOTAL | 5,300 | 5,100 | 190 | 91 | 10,600 | 5,000 |

NOTES

Hovercraft Alternative includes direct vehicle consumption by the Hovercrafts. Indirect vehicle consumption is not included since the amount of consumption is unknown and is insignificant.

Low, mid-range, and high refer to the dwelling unit and employment growth allocation scenarios described under "Urban Growth and Economic Development."

Table IV-37 shows that the direct, indirect, and total energy consumption for the seven alternatives would differ from low to high less than seven percent, an insignificant amount. Thus, the No-Crossing and the Crossing Alternatives should be considered identical in terms of energy consumption. The differences that would occur result from differences in traffic volumes and highway geometry of individual links rather than general trends for the complete alternative road systems. Of course, construction energy consumption would be higher for those alternatives involving completion of a crossing structure. Maintenance energy would be higher for all alternatives relative to No-Action because of the additional roadway and structures to be maintained; however, these energy items account for only a small portion of the total energy consumption.

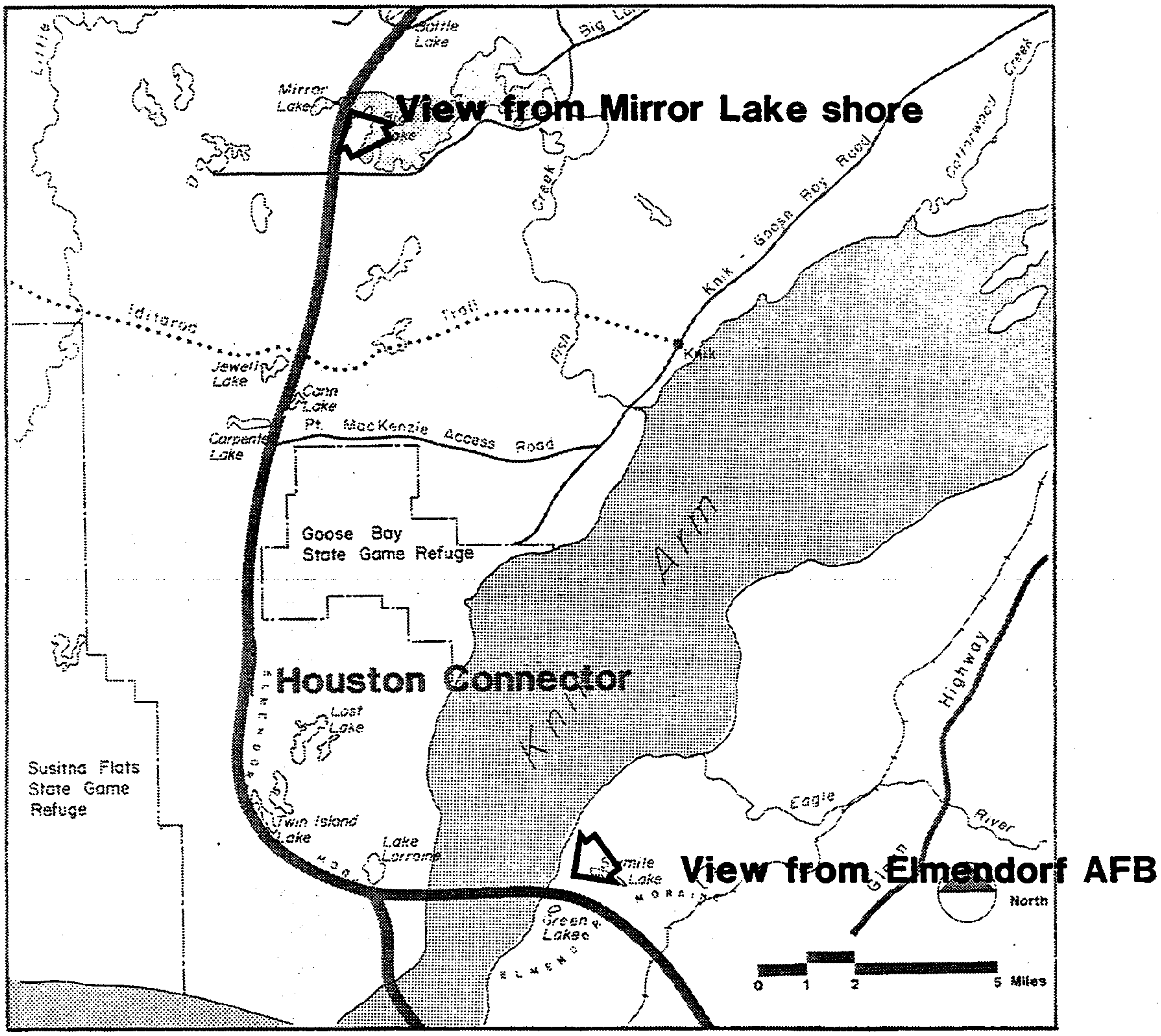
Visual

This analysis evaluates the changes in scenic quality created by each alternative including views of the alternatives from vantage points considered to be significant (see Chapter III, under "Visual") and views from the alternatives. Figures IV-2, IV-3, and IV-4 illustrate some of the significant views of the alternatives.

Both the Elmendorf Project and the Downtown Project would have an adverse effect on visual quality. The Elmendorf Project would pass through Elmendorf AFB recreation lands which are heavily used by base residents and valued for their natural setting. The Downtown Project would adversely affect views where it would be close enough to viewers to be a dominant element, including views from several residences and businesses. The Houston Connector would have minor visual impacts; most views of the road and from the road as it passes through the Mat-Su Borough would be limited by vegetation cover and topography.

Downtown Project. The bridge structure would be visible from numerous points along the southern coast of Knik Arm. However, from most points the distance between the viewer and the bridge and the view angle are such that the bridge would appear as a thin horizontal line across the Arm blending in with the existing landscape which is dominated by the horizontal lines created by the water's edge, the bluff, and the mountains.

In the area of downtown Anchorage, the bridge would be a dominant element. Views from the north side of downtown would be significantly altered with a southbound ramp alternative at either I or L Streets. The southbound L Street ramp alternative would dominate and adversely affect views from the Elevation 92 restaurant, which has a location capitalizing on views of Knik Arm. Views would be enclosed on both sides by the ramps, limiting views of Knik Arm. The ramps would be approximately 15 feet above the diner's line-of-sight. The I Street Southbound Ramp would dominate views and would obscure views of Knik Arm but would not enclose views. Resolution Park is also on the Arm and views from the Park to the northwest would be changed (see Figures IV-2 and IV-3) with either of the ramp alternatives. However, views from the Park are more spectacular looking west and southwest; these vistas would not be affected by the ramp. The I Street ramp would become a dominant visual element for several residences and small offices on 2nd and



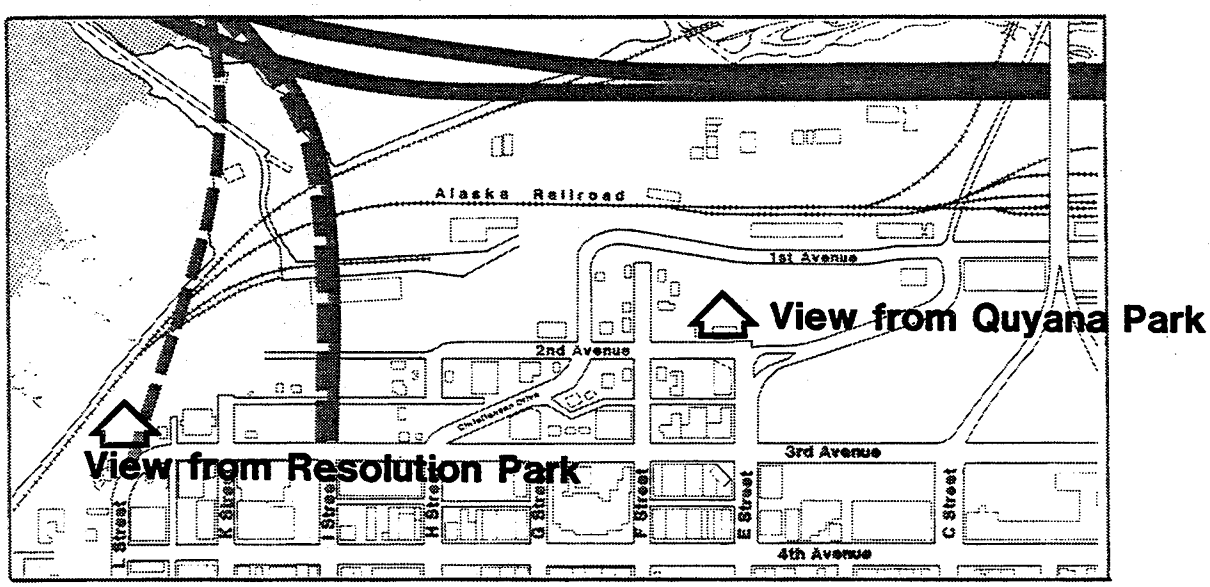
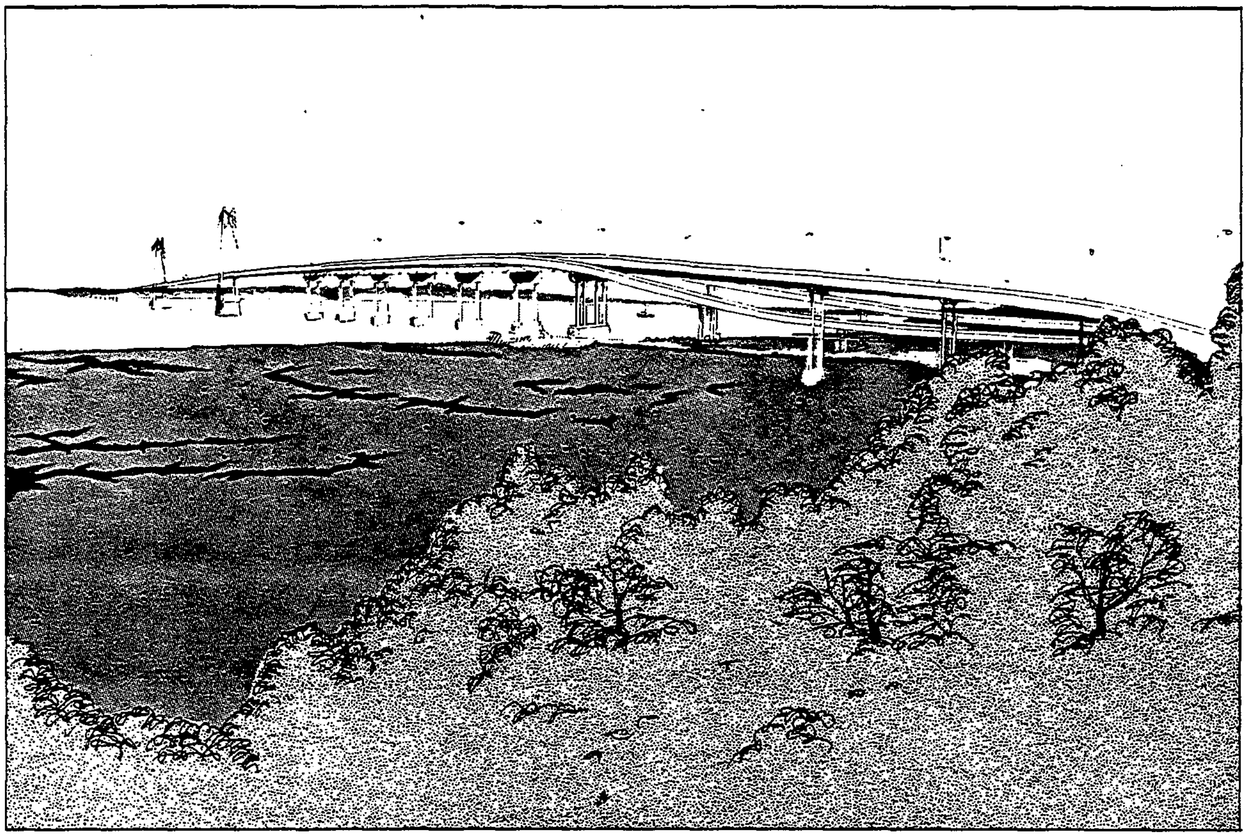
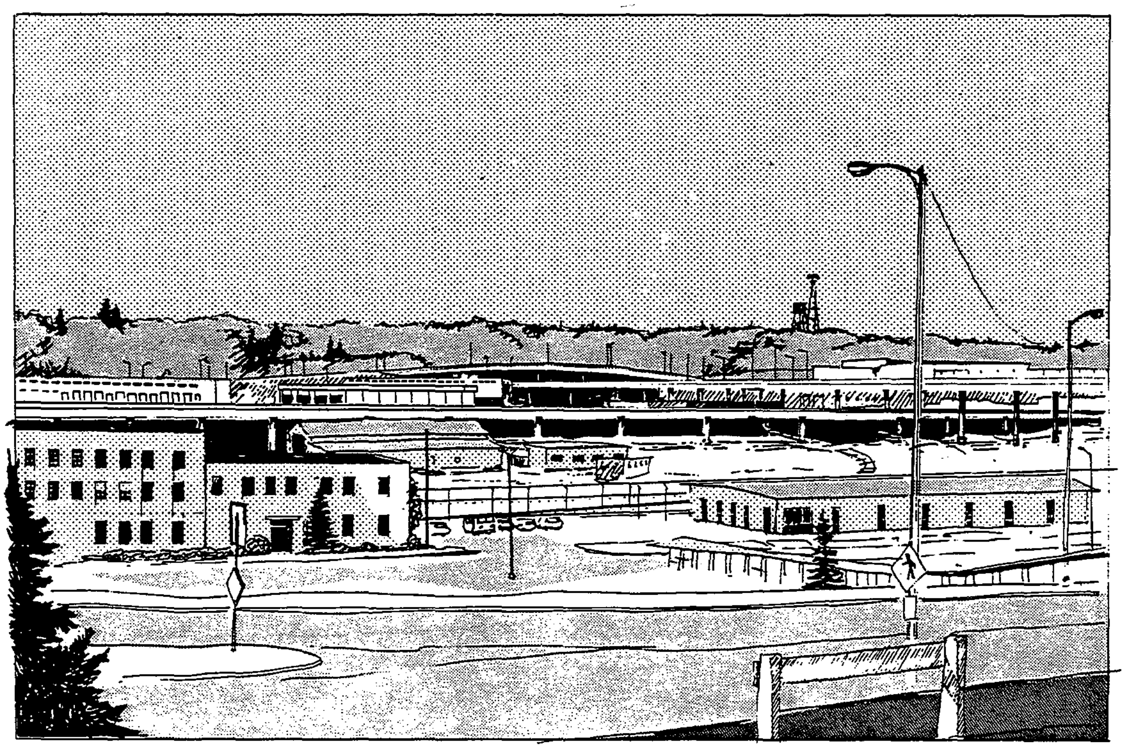




**Figure IV-2**

# Illustration Locations



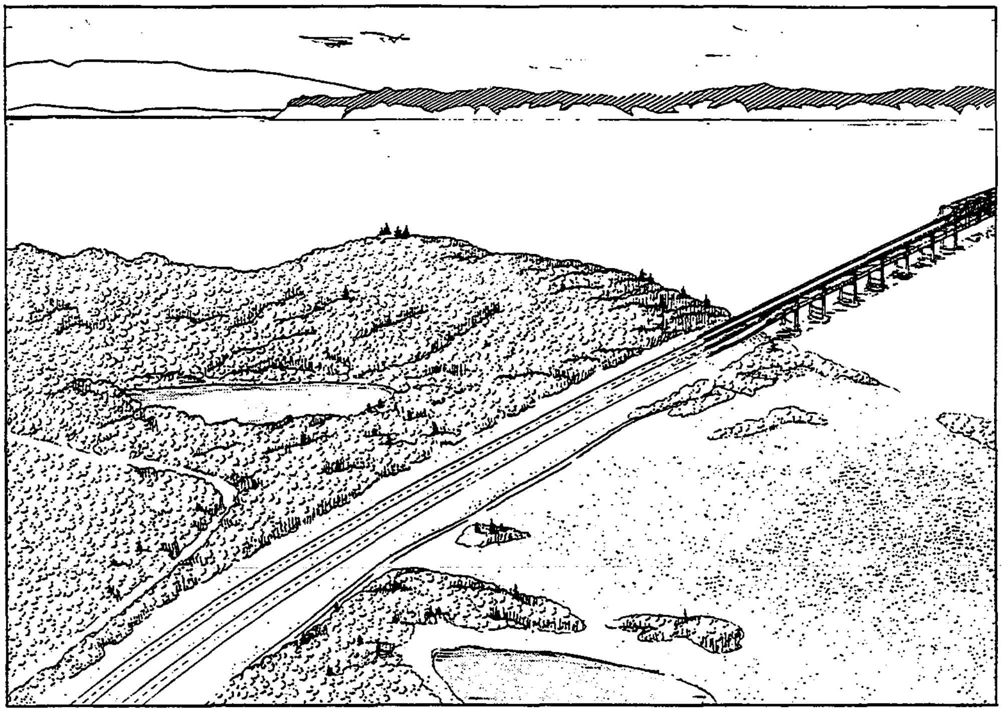
**View From Resolution Park**



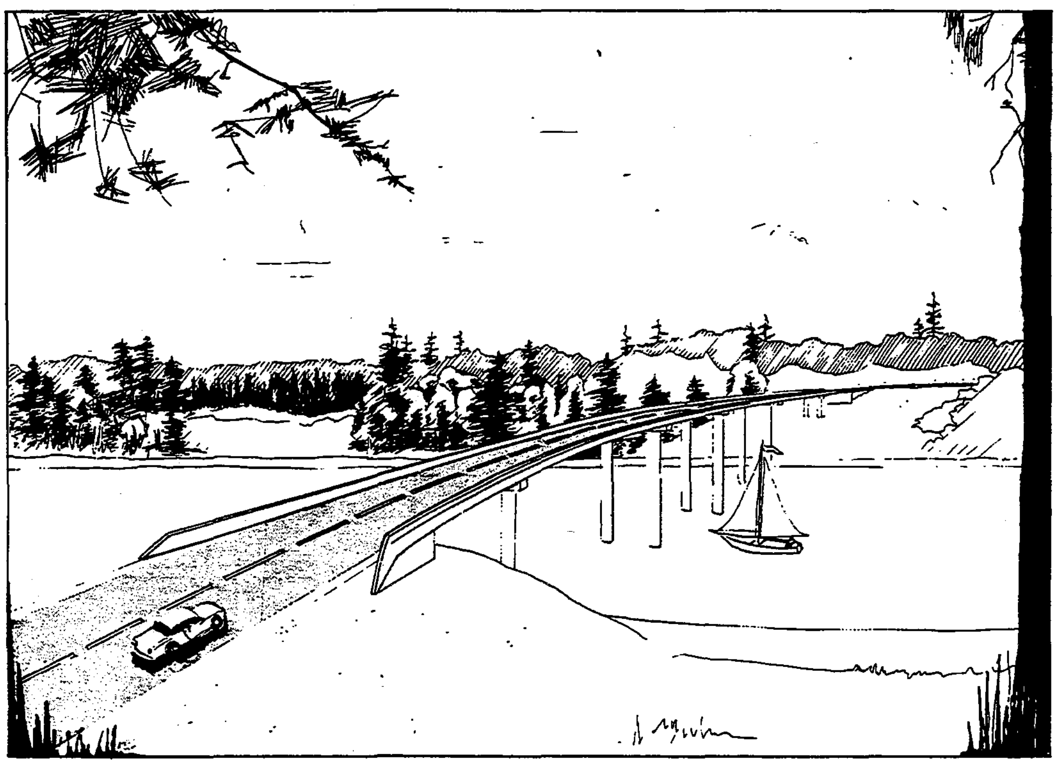
**View From Quyana Park**

**Figure IV-3**

## Views of Downtown Crossing/ Seward Connector



**View From Elmendorf AFB**



**View From Mirror Lake Shore**

**Figure IV-4**

## Views of Elmendorf and Mirror Lake Crossings

3rd Avenues. Four of the structures are eligible for the National Register of Historic Places. A more detailed visual impact analysis for these structures is presented in Chapter V, "Section 4(f) Evaluation". From the Quyana Park area, the Seward Connector would be visible, but would blend into the industrial character of the area (see Figures IV-2 and IV-3). The industrial character of Ship Creek would not be visually affected by the Seward Connector, however views from the Ship Creek Overlook would be dominated by the Connector. The ramp alternatives joining either at Gambell or at Ingra Streets would be visible from the Alaska Native Medical Center because of the proximity to the Seward Connector, however views would not be blocked. The Connector would be at the same elevation as the ground floor of the Medical Center and would be below the line-of-sight. The Gambell Street ramp would not be built unless the Medical Center was relocated by the U.S. Public Health Service.

From the Crossing, panoramic views of the Alaska Range and Mount Susitna would be seen by northbound motorists as they cross Knik Arm. The potential distraction created by the view would not be a safety hazard because the crossing would be straight and near level. Entering the Mat-Su Borough, views would be dominated by long cut slopes on either side of the roadway. These would extend for the first half mile from the bluff's edge and average about eight feet high. Slope contouring and revegetation would be used to create a natural character.

The Houston Connector then would pass through a hilly area which would include several deep cuts and high fills for short stretches along the alignment. An average width of 220 feet would be cleared. Most views toward the road and from the road would be of adjacent vegetation. However, there are occasional views of the Chugach and Talkeetna mountains. Severe cuts that would dominate views from the road would occur along the Elmendorf Moraine near Lost Lake, where high cut slopes would extend for 0.5 to 0.75 miles. Few changes in visual character would occur where the road would meet with and follow the Point MacKenzie Access Road.

Beginning where the Point MacKenzie Access Road turns east, a 120-foot corridor would be cleared which would pass through vegetated areas, open wetland areas, and manmade clearings. Up to South Big Lake Road, cuts would not exceed 2,000 feet in length and would be widely spaced. There would be very few views of the road in this area; they would be screened by surrounding vegetation. A change of view for the motorist would occur with vistas of Mirror Lake from the 400-foot bridge which would pass over the narrows linking Big Lake and Mirror Lake. Views from adjacent recreational property would be adversely affected by the road; see Figure IV-2 and IV-4. Fill slopes would be 40 feet high and over 150 feet wide on each side of the roadway. The impact would be partially mitigated with revegetation. From the Big Lake area to the Parks Highway, the road would follow the existing topography with little cut and fill except for one 3,000 foot section that would have cuts averaging around ten feet high. This cut would only be visible to roadway users and would blend into the natural surroundings with revegetation and slope contouring.

In general, views from the road north of Point MacKenzie Access Road would be similar to those described south of the Access Road, in that most views would be dominated by adjacent vegetation. Long, hypnotic segments of straight roadway shown in the conceptual drawings found in Appendix A would be eliminated in final design refinements.

Elmendorf Project. Within Elmendorf Air Force Base, the roadway would occupy a 300-foot right-of-way which would be fenced at the edges. Adverse visual impacts would result from deep cuts and high fills, as well as from the presence of the road. Viewers most affected would be persons pursuing recreational activities; see Figures IV-2 and IV-4. Recreation is concentrated around the Family Camp, Hillberg Ski Area, Hillberg and Green Lakes, and Spring Lake which are all presently in a natural setting. The roadway would be below grade as it passes the Family Camp area, so there would be little visual impact. At the top of Hillberg Ski area, the roadway would be visible as it passes by Spring Lake and as it crosses Knik Arm, however it would not be a dominant visual element since it would be partially obscured by the topography and vegetation. Both Hillberg and Green Lakes are surrounded by vegetation and gentle hills that would block views of the proposed road. Views of the road from Spring Lake would be partially hidden by existing vegetation, however fill slopes would be visible where the proposed road would cross Loop Road (at Station 273, see Appendix A).

Views from the roadway typically would be of the birch and spruce forests with large clearings where base facilities have been developed. Severe cuts that would dominate views would occur for short intervals crossing Elmendorf Moraine and at the bluff at Knik Arm. The highest cuts (up to 25 feet) would be on the Moraine.

To mitigate visual impacts created by cut and fill, slopes would be contoured and revegetated with standard seed mixes as well as nursery stock plant materials to help create a natural appearance.

As the roadway crosses Knik Arm, panoramic views would be available to users of the road, particularly those on the upper deck. Again, the bridge would be straight and nearly level, minimizing safety hazards resulting from driver distraction. Views from the lower deck would be constrained by the upper deck. Beginning at the bluff on the Arm's western shore, 15 to 90-foot high cut slopes on each side of the road would dominate views for the first half mile, however the slopes would be contoured and revegetated. Views then would be dominated by vegetation adjacent to the road. Northward, up to Houston, visual impacts would be the same as those described for the Downtown Project.

## Chapter V

## SECTION 4(f) EVALUATION

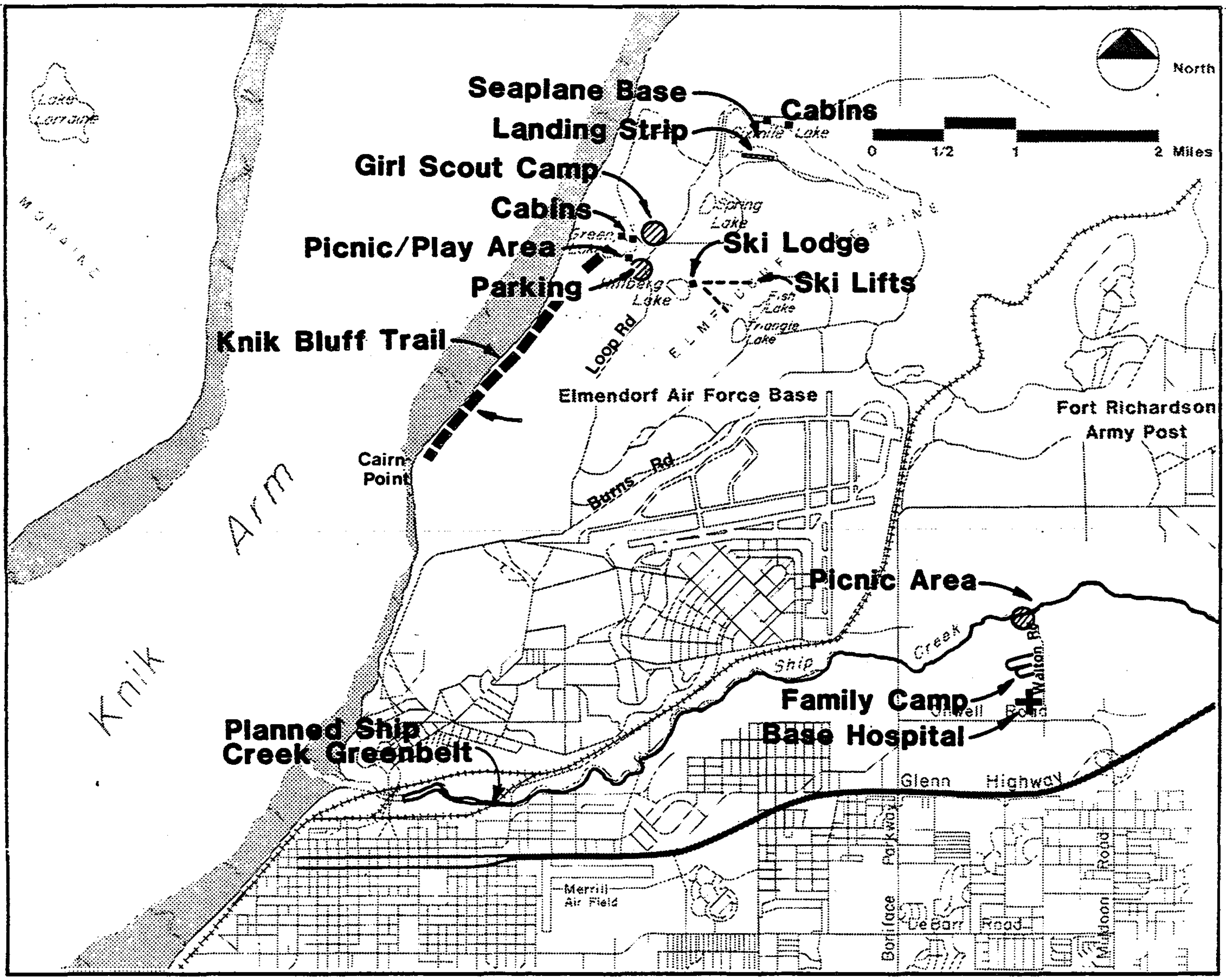
### A. SECTION 4(f) REQUIREMENTS

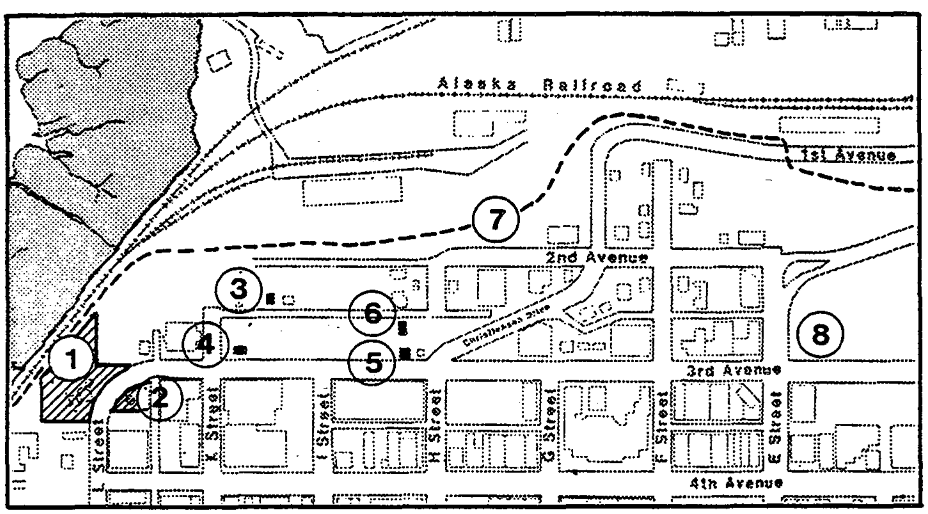
In compliance with section 4(f) of the Department of Transportation Act of 1966, as amended, 23 U.S.C 138, this chapter evaluates impacts to cultural resources, alternatives to avoid impacts, and mitigation of impacts. Section 4(f) states that "the Secretary (of Transportation) shall not approve any program or project which requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance as determined by the Federal, State, or local officials having jurisdiction thereof, or any land from an historic site of national, State, or local significance as so determined by such officials unless (1) there is no feasible and prudent alternative to the use of such land, and (2) such program includes all possible planning to minimize harm to such park, recreational area, wildlife and waterfowl refuge, or historic site resulting from such use."

This 4(f) evaluation also provides information required by the Advisory Council on Historic Preservation for a "Preliminary Case Report" under Section 106 of the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470f. Section 106 states that a Federal agency, before approving the expenditure of Federal funds or issuing a license (such as a permit), must "take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register".

### B. DESCRIPTION OF 4(f) RESOURCES

The 4(f) resources in proximity to the project are shown in Figure V-1. Included are four buildings eligible for the National Register of Historic Places, two parks in the downtown Anchorage area, and a recreation area in Elmendorf Air Force Base. Each of these resources is described in detail below. These resources and their characteristics were identified through interviews with government officials, existing surveys of historic resources and plans for their use, and the parks component of area comprehensive plans. In addition, an archeological survey was conducted of the corridor followed by the Houston Connector. This survey found no significant archeological resources and is documented in Knik Arm Crossing Technical Memorandum No. 17, <u>Survey of Archeological and Historic Resources</u> (USDOT/FHWA, ADOT/PF, January 27, 1984). If previously unidentified archeological resources are encountered during construction, work that would affect the resources would cease and the Alaska State Historic Preservation Officer (SHPO) and Federal Highway Administration would be immediately notified. The SHPO considers the four historic structures to be eligible for the National Register. The Keeper of the National Register was asked to make a final determination of eligibility in a letter dated June 27, 1984 and made that determination for two of the four structures on July 16; see Appendix G. Eligibility of the other two structures is still under consideration.




1. Resolution Park
2. Hostetler Park
3. 918 West 2nd Avenue
4. 935 West 3rd Avenue
5. 813 West 3rd Avenue
6. 813½ West 3rd Avenue
7. Planned Coastal Trail
8. Planned Anchorage Historic Development in Quyana Park

**Figure V-1**

## 4(f) Resources Project Area

Facilities planned but not now existing are also described briefly in this section. These include the coastal trail, the Ship Creek greenbelt, and the Anchorage Historic Development in Quyana Park (see Figure V-1).

918 West 2nd Avenue

918 West 2nd Avenue is a privately-owned single-family house built on a 130 foot by 50 foot lot on Anchorage's original townsite. The house was built in 1916 and is a white wood frame structure with bungalow style architecture. There are no plans for enhancing or changing the structure, and it is not currently considered a historic attraction. However, this house is considered significant historically because there are very few buildings on their original townsite locations remaining in Anchorage. There is both pedestrian and vehicle access to the house. Similar residences in the area include 813½ West 3rd Avenue. The SHPO in a May 29, 1984 letter and the Keeper of the National Register in a July 16, 1984 letter (see Appendix G) have determined that 918 West 2nd Avenue is eligible for the National Register of Historic Places.

935 West 3rd Avenue

This is a white wood-frame one and one-half story building on its original townsite lot. Its high gable roof and arched dormer windows are unique in Anchorage. It was built in 1936 as a residence and later owned by Walter J. Hickel, a former Governor. The building is now owned by the Hickel Investment Company and is used for office space. It is part of a walking tour developed by the Anchorage Convention and Visitors' Bureau (Anchorage Convention and Visitors' Bureau, 1984), however the building is not open to the public. There are no current plans to enhance the building or change the type of use. Its significance is due to its location on an original townsite lot, its unique architecture, and its ownership by a prominent public figure. Similar structures in the area include the Christensen House on the corner of E Street and 2nd Avenue, the Leopold David House a block west on 2nd Avenue and F Street, and the Edes House, also at 2nd Avenue and F Street. There is both pedestrian and vehicular access to 935 West 3rd Avenue. The SHPO in a May 29, 1984 letter (see Appendix G) indicated that this house is considered eligible for the National Register of Historic Places.

813 West 3rd Avenue

This is a privately-owned two-story apartment building that faces 3rd Avenue. The original building was built in Chickaloon (40 miles east of Palmer) in the early 1920's and used as offices. After being disassembled and moved by train to Anchorage in 1935, it was remodeled into a seven-unit apartment building. It is still used for apartments and it shares a 140 foot x 50 foot lot with 813½ West 3rd Avenue. The building reflects the "Art Moderne" architectural style popular in the mid 1930's and 1940's in Anchorage. It is square with a white and pink stuccoed facade and has a flat roof with no eaves. It is not considered a historic attraction and there are currently no plans to make it so. It is significant because of its style and because few buildings remain in Anchorage that reflect this period of architecture. The few similar buildings in the area that reflect the "Art Moderne" style include the Old Federal Building on 4th Avenue between F and E Streets and the 4th Avenue Theatre across the street. There is both pedestrian and vehicular access to 813 West 3rd Avenue. The SHPO in a May 29, 1984 letter (see Appendix G) indicated that this structure is considered eligible for the National Register of Historic Places.

813½ West 3rd Avenue

This is a long, rectangular, one-story, wood-frame house built on a bench overlooking Ship Creek. It is on an original townsite lot and was first built as a four-unit rental property in circa 1916. It is now privately owned and used as a single-family residence. The building is not a historic attraction and there are currently no plans to make it so. Its significance is its location on an original townsite lot. A similar residence is 918 West 2nd Avenue described above. There is both pedestrian and vehicular access. The SHPO in a May 29, 1984 letter and the Keeper of the National Register in a July 16, 1984 letter (see Appendix G) have determined that this house is eligible for the National Register of Historic Places.

Resolution Park

Resolution Park is a small, approximately 1.1 acre park that overlooks Knik Arm from the bluff southwest of Ship Creek. The park commemorates the 200th anniversary of Captain James Cook's exploration of Cook Inlet. A bronze statue of Captain Cook stands high on a pedestal in the center of a large view platform. The view platform is a wood deck structure with a series of terraced decks that are connected with ramps. The structure is built into a slope and extends out over the terrain, with an elevation difference between ground and view platform of over 30 feet. Benches, trash bins, two high-powered telescopes, and interpretive plaques make up the park's facilities. A short wood railing surrounds the view platform and also follows the sidewalk on either side of the entrance, preventing access to the natural and landscaped areas around and below the structure. Landscape planting is limited to the small level area between the railing and the steep slopes of the park. Street trees have been planted between the sidewalk and the guard rail along the curve of 3rd Avenue and L Street.

Steep and heavily vegetated slopes make the land beneath the structure unusable. Views from the top platform are excellent and include the Chugach mountains on the east, the Talkeetnas to the northeast, and views of the Alaska Range toward the west. Use of the park is by tourists and residents alike. Activities are passive and include historic interpretation, looking at views, and resting on benches. There are no official park attendance figures; however, the park is heavily used for short periods of time by tourists. During the peak tourist season (mid-June to September), between 10 and 15 tour buses stop each day on L Street, where a special bus parking zone has been provided. The park is recommended as a part of the "Walking Tour" in the 1984 Visitors' Guide (Anchorage Convention and Visitor's Bureau, 1984) and is also part of several organized walking tours.

There are several parks in the downtown area including Hostetler Park (described below), Elderberry Park, Nulbay Park, and Delaney Park. However, Resolution Park is unique in character and location. Both Elderberry

Park and Nulbay Park provide excellent views, although they are not centrally located and do not provide intrepretive activities. Delaney Park is more a local attraction, used as a lunch and resting area for downtown workers.

Resolution Park is owned and maintained by the Municipality of Anchorage. Proximity to downtown, the terraced view platform and intrepretive features, and the excellent views make the park a valuable attraction to both tourists and users of the downtown area. There is both pedestrian and vehicular access. Parking is limited but is available along 3rd Avenue on both sides of the street except immediately in front of the park.

Land and Water Conservation Funds were used in the appropriation and development of Resolution Park. Section 6(f) of the Land and Water Conservation Fund Act of 1965, as amended, P.L. 95-42 states that:

> "No property acquired or developed with assistance under this section shall, without the approval of the Secretary (of Interior), be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location".

<u>Hostetler Park</u>

Hostetler Park is a small park (approximately 0.2 acres) across L Street from Resolution Park. It is dedicated to Chet Hostetler, a respected and active civic leader of the 1950's. Facilities include a picnic table, a trash bin, and a commemorative plaque centrally located in a planted bed in the center of the park. The park is flat with a grass ground cover. A birch tree, a spruce, and a small mixed clump of birch and spruce make up the major vegetation in the park. The park is identified as part of the walking tour in the 1984 Visitors' Guide (Anchorage Convention and Visitors' Bureau, 1984). Uses include picnicking, reading the commemorative plaque, and resting. There are no official use figures for the park.

Several characteristics of the park reduce its value as a usable space, including its location between two tall buildings that shade it, parked cars that surround the park, and noise from L Street traffic. Views from the park are dominated by parked cars and traffic.

Of all the parks in the downtown Anchorage area, Hostetler Park is the smallest. Its major value is as a commemorative park and a visual amenity. It fits in visually with Resolution Park across the street, and the landscaped area along the west edge of L Street. Access to Hostetler Park is both pedestrian and vehicular. The park is owned and maintained by the Municipality of Anchorage.

Elmendorf Air Force Base Recreational Facilities

Several recreational facilities on Elmendorf Air Force Base are within the vicinity of the Elmendorf Crossing and are shown in Figure V-1. Two recreation areas are at the southeast corner of the Base. The Family Camp is a heavily used campsite. It has 39 vehicle and motor home pull-ins set in a densely vegetated area north of the Base hospital off of Walton Road.

Each space has a picnic table and fire pit. Laundry facilities, Base water, and electricity are also available. North of the Family Camp is a day-use picnic area on the edge of Ship Creek. Facilities include picnic tables and trash cans. The area is accessible by road and trail.

Numerous recreation areas and facilities are on the north side of the Base including the area around Triangle and Fish Lakes, Hillberg Ski Area, and Hillberg and Green Lakes. These areas serve the Base's main recreation needs. In the summer, activities include hiking, horseback riding, three-wheeling (all terrain cycling), picnicking, fishing, bird watching, and camping. In winter, activities include snowmachining, cross-country skiing, and downhill skiing. Facilities in the area include trails, recreational cabins, fishing docks, picnic tables, children's playground equipment, and Hillberg Ski Area facilities which include runs, two lifts, and the lodge. Snow making equipment has just been added to the ski area.

Use of the just described area is intense, including both day users and overnight users. Use is mostly by people living on Base and Air Force people living in nearby areas. The cabins average 150 users per month for every month of the year; the ski area averages 1,230 lift tickets per month between mid-November and the end of March. Figures are not available for trail use. The lakes are stocked by the Alaska Department of Fish and Game.

Located just north of Green Lake is a Girl Scout camp that is used during the summer. Facilities include picnic and tent sites, outhouses, and trails. The Knik Bluff Trail begins at Green Lake and follows the bluff to the Cairn Point area. It is a popular summer trail and is also used by cross-country skiers. Spring Lake, just north of Hillberg Lake, is used primarily for fishing. It is a shallow lake, 300 feet off the nearest road, and is accessible by trails. Further north, Six Mile Lake is heavily fished. It is used by several sportsman clubs and has recreational lodges along the shore. It also accommodates a seaplane base.

Access to north-side recreation facilities is mostly by private vehicles and is provided by several roads leading into the area including Loop Road and Burns Road (Figure V-1). Other transportation to the area is provided by Base buses. Parking occurs at the ski facility, at the entrance to Green Lake, and randomly along roads.

There are no similar areas of open space on the Base that provide the same recreational opportunities and experiences as those facilities described. However, within the Anchorage area similar recreational opportunities are plentiful and include Arctic Valley (10 miles east), Hilltop Ski Area (12 miles southeast), Kincaid Park (13 miles south), Flattop Mountain (15 miles southeast), and innumerable hiking areas. Lakes offering similar facilities and recreation opportunities are not found in the Anchorage area. The recreation areas are all Elmendorf Air Force Base lands. These lands are Federally controlled by the Department of Defense. If the Department of Defense declares the land as excess, ownership would be conveyed jointly to Eklutna, Inc. and the Municipality of Anchorage, under Section 1425 of Alaska National Interest Lands Conservation Act (ANILCA).

Planned Activities

There are three recreation facilities planned within the project area that would be affected by alternatives under consideration if they were completed prior to the beginning of alternative construction. A coastal trail, the Ship Creek Greenbelt, and the Anchorage Historic Development project are planned by the Municipality of Anchorage (see Figure V-1), however they are not currently in the jurisdiction of the Municipal Park and Recreation Department and are not 4(f) resources. The coastal trail would begin at the Ship Creek Dam, join the bluff near the Alaska Railroad station, and then continue around Knik Arm. Ship Creek greenbelt would include a bike/pedestrian path that is planned to follow Ship Creek, beginning at the Dam and going northeast to Eklutna (approximately 28 miles), connecting with other planned bikepaths. The Anchorage Historic Development project will be built on the corner of 3rd Avenue and E Street. These projects are described in Chapter III under "Land Use Plans". Impacts are discussed in Chapter IV under the same heading.

## C. IMPACTS OF EACH ALTERNATIVE

4(f) resources would be affected by the Crossing (I/L ramps) and the Seward Connector segments of the Downtown Project, and the Crossing (south approach) segment of the Elmendorf Project. The following discussion describes those impacts. The Section 106 criteria of effect and criteria of adverse affect (36 CFR 800) was used in considering historic structure impacts.

Downtown Crossing/Seward Connector

Approximately 0.03 acres (1,300 square feet) of Resolution Park would be taken by the L Street southbound ramp alternative (Figure V-2). The I Street southbound ramp alternative would not take park land. No other 4(f) resources would be displaced by the Downtown Crossing/Seward Connector. The portion of Resolution Park that would be taken is a small triangular area along 3rd Avenue where the ramp would connect to L Street. This would include the area taken by the ramp plus a 20-foot wide strip on both sides of the ramp where vegetation would be removed. The taking of Resolution Park lands would require replacement with lands of equal value and usefulness in accordance with Section 6(f) requirements of the Land and Water Conservation Act. Replacement lands would be appraised to assure equal fair market value. Immediately following release of the Draft EIS, this 4(f) evaluation, along with additional required legal documentation on Resolution Park, will be submitted to the Municipality for an initial review to determine if replacement lands are of equal value. Concurrence by the Municipality would be followed by a request to the National Park

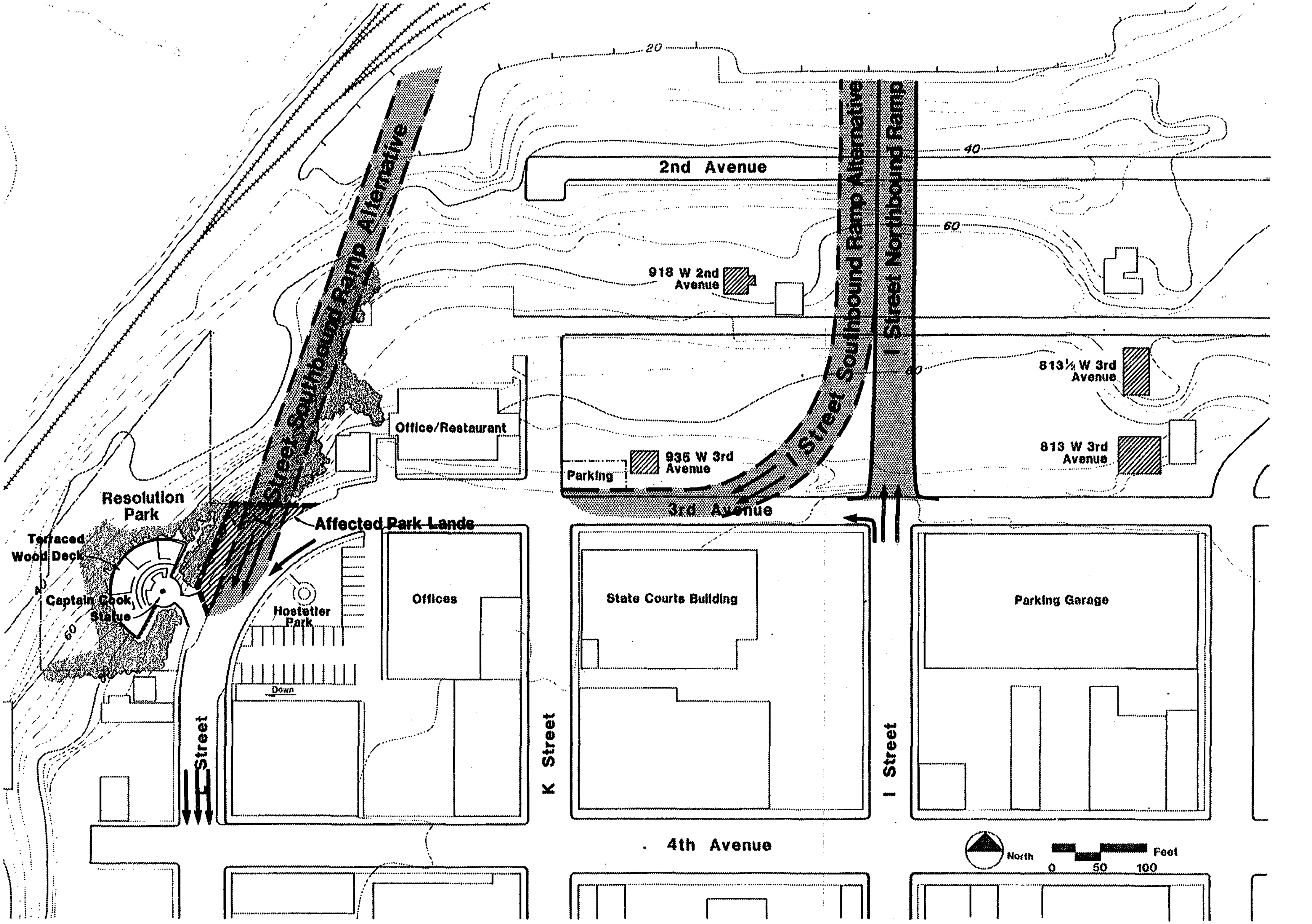



**Figure V-2**
**Downtown Project and 4(f) Resources**

Service (Alaska branch) for approval. The approval would be documented in the Final EIS if the Downtown Project with the L Street southbound ramp is selected for implementation.

Access to Resolution Park would be adversely affected by increased traffic with either southbound ramp alternative. Due to increased traffic, pedestrians would be able to safely cross L Street only at the corner of 5th and L at the signal instead of at 3rd and L. In addition to reducing pedestrian access, parking along 3rd Avenue and L Street would need to be eliminated to accommodate increased traffic, greatly reducing tour bus and vehicle accessibility. With the L Street southbound ramp, eight parking spaces would be displaced as well as the tour bus parking. With the I Street southbound ramp, 33 parking spaces would be displaced as well as bus parking. Access would be made more circuitous to 918 West 2nd Avenue and to 935 West 3rd Avenue since crossing K Street at 3rd Avenue would be more difficult with the I Street southbound ramp due to increased traffic volumes on 3rd Avenue. The most likely route that would be taken to avoid crossing K Street would be via H Street and Christiansen Drive to the alley between 2nd and 3rd Avenues. Parking in front of 935 3rd Avenue also would be lost.

Increased traffic would raise design year sound levels for both Resolution and Hostetler parks from 61 decibels (dB) to 67 dB. This would match the FHWA noise abatement criterion for residences and parks (67 dB, see Table E-1 in Appendix E). The noise increase criteria described in Appendix E would not be exceeded. However, the increased sound levels would be noticeable and would affect the quality of park experience, especially upon entering and using the first level platforms of Resolution Park.

Sound levels also would be increased at the other 4(f) resources with either southbound ramp alternative. With the I Street southbound ramp alternative, the residential FHWA criterion of 67 dB would be exceeded only for 918 West 2nd Avenue. The FHWA criterion of 72 dB applies to 935 West 3rd Avenue since it is used for offices; the criterion would not be exceeded. The noise increase criteria described in Appendix E would not be exceeded. Sound levels (dB) at each location and with each alternative are shown below (methodology and assumptions are described in Appendix E, "Noise Report").

| | No Action | L Street Southbound Ramp Alternative | I Street Southbound Ramp Alternative |
|---|---|---|---|
| Resolution Park upper deck | 61 | 67 | 65 |
| 918 West 2nd Avenue | 57 | 65 | 68 |
| 935 West 3rd Avenue | 64 | 65 | 71 |
| 813 & 813½ West 3rd Avenue | 59 | 63 | 65 |

Note: Shown are peak-hour $L_{eq}$ or $L_{dn}$, in dB for year 2010; see Appendix E. All levels include only surface traffic. Noise from rail, aircraft, and industry are not included in estimates.

Air quality would be adversely affected by the Downtown Crossing/Seward Connector with either the I or the L Street southbound ramps. At Resolution Park, the eight-hour EPA National Ambient Air Quality Standard (AAQS) for carbon monoxide (9 ppm) would be exceeded by 3.1 to 3.5 ppm (see Appendix D). A similar concentration level would occur at Hostetler Park where traffic volumes and distance from the road would be about the same as at Resolution Park. With the I Street southbound ramp, similar CO concentrations also would occur at 935 West 3rd Avenue. Eight-hour CO levels would increase (4.2 to 6.1 or 6.8 ppm) at 918 West 2nd Avenue, but would not exceed AAQS (see Appendix D). CO levels at 813 and 813½ West 2nd Avenue would be even less than at 935 West 3rd Avenue due to their greater distance from the road. Changes in air quality would not increase the deterioration of any of the buildings.

Visual impacts to 4(f) resources would occur at Resolution Park, and at buildings on 2nd and 3rd Avenues (see Chapter IV, "Visual"). The bridge would be visible from the view platform in Resolution Park, but it would not dominate or detract from existing views (see Figures IV-2 and IV-3 in Chapter IV). The L Street southbound ramp would change northward views from the park entrance. However, views from the park are more spectacular west and southwest and these vistas would not be affected. Views from Hostetler Park are of low quality, mostly of parked cars and traffic, so the crossing would not have an adverse impact on existing views. With either southbound ramp alternative, views would be of traffic along L Street.

With either of the southbound ramp alternatives, views from 918 West 2nd Avenue and 935 West 3rd Avenue would be affected, however the I Street southbound ramp would leave views open to the west, whereas the L Street southbound ramp also would obscure views to the west across Knik Arm. Views from 918 West 2nd Avenue would be dominated by the bridge which would be approximately ten feet above the line of sight with either ramp alternative. From 935 West 3rd Avenue, the road would be at eye level with either ramp alternative. Views would be affected to a lesser extent at 813 and 813½ West 3rd Avenue because the ramps would be further from each of the buildings. At 813 West 3rd Avenue, first floor views would be eye level with the ramps and views of Knik Arm would be obscured. Second floor views would be over the ramps leaving views of Knik Arm open but dominated by the ramps. Views from 813½ West 3rd Avenue would be dominated by ramp piers and the underside of the roadway. Knik Arm would be visible, although obscured, through the piers.

Temporary construction impacts on Resolution Park and historic structures would include increased noise levels, dust, and interference with access.

In summary, both ramp alternatives would result in similar types of impact; however, their degree would differ. The L Street southbound ramp alternative would have the greatest impact on views from the 4(f) resources. With the I Street southbound ramp, the impact on views would be less, but impacts that affect the functioning of the 4(f) resources would be greater, including decreased accessibility, less parking availability, and increased noise and CO levels.

Elmendorf Crossing

The Project would take approximately 18 acres of land for road right-of-way in the recreation area on Elmendorf Air Force Base (16 percent of an estimated 115 acres used for recreation); see Figure V-3. Recreational quality in the area would be affected by changes in visual character, increased noise levels, and proximity of the road. The proposed alignment would pass between the Family Camp and the picnic area by Ship Creek. However, the road would be located below existing grade (depressed) and the Family Camp would be separated by a buffer of approximately 50 feet of mixed birch and spruce forest. There is a width of over 100 feet of existing vegetation that would provide a buffer for the picnic area. The depressed road and the vegetation buffers would eliminate any noise and visual impacts.

Impacts would occur where the road would pass south of Spring Lake, and north of Green Lake, but access to all recreation areas would be maintained and trails would be unaffected. Large culverts would carry existing trails under the roadway, however visual, noise, and proximity impacts would occur. Cut and fill slopes would be visible as the road passes through Elmendorf Moraine. Twenty-five foot high cuts would be visible from Spring Lake, Hillberg Ski Area, and Loop Road.

Extensive fill slopes and a right-of-way fence also would be visible from Spring Lake, Hillberg Ski Area, and Loop Road.

Sound levels would be increased, however they would not exceed either the FHWA 67 dB criteria or the increase criteria. Sound levels (dB) would be:

| | Existing | Elmendorf Project |
|---|---|---|
| Family Camp | 58 | 65 |
| Green Lake | 55 | 62 |
| Spring Lake | 62 | 62 |

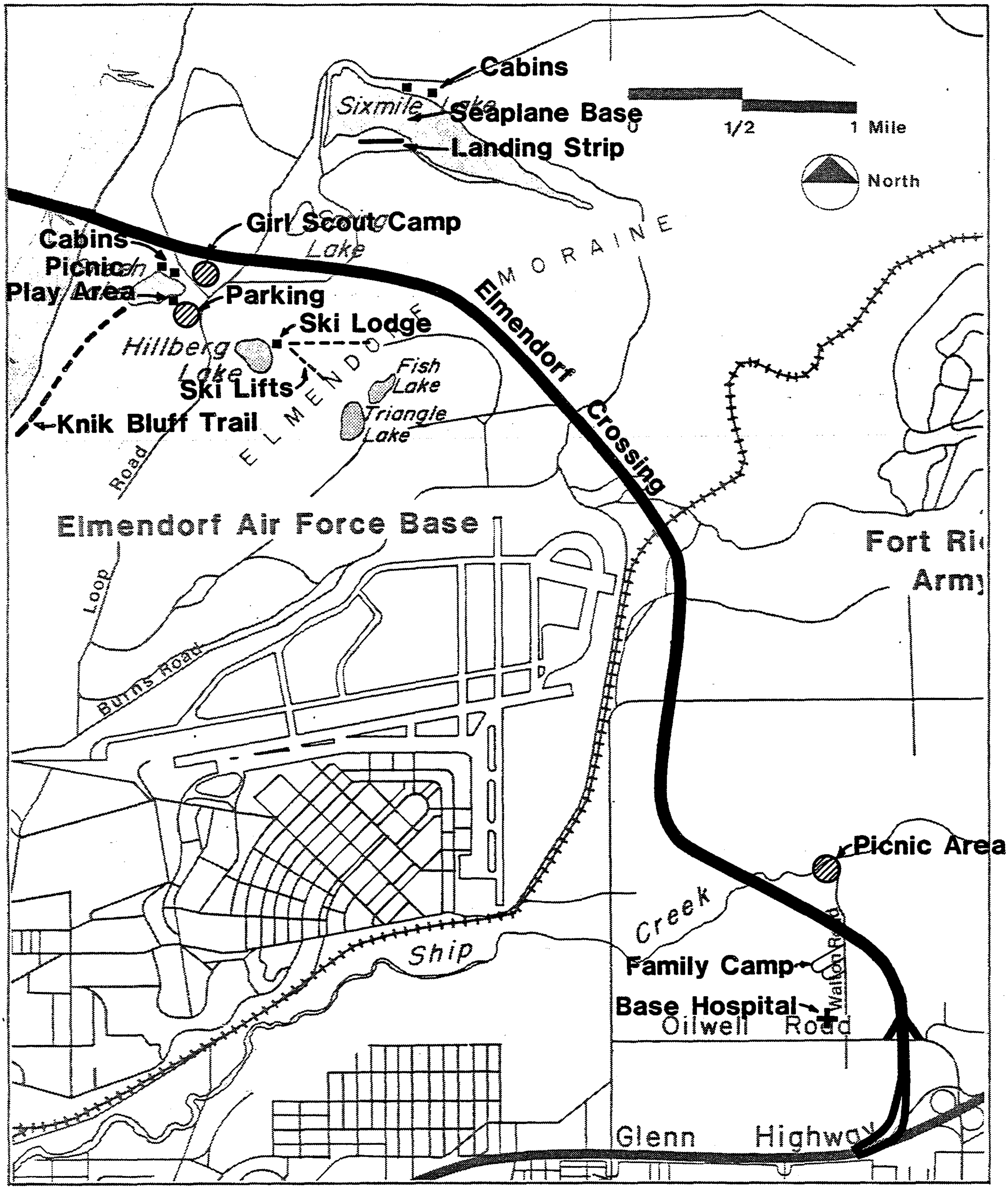
See Appendix E for methodology and assumptions.

There would be no impact to air quality around any of the recreation facilities on Elmendorf AFB (see Appendix D). Temporary construction impacts on Elmendorf recreation facilities would include increased noise levels, dust, and the blocking of recreation trails.

## D. AVOIDANCE ALTERNATIVES

Downtown Crossing/Seward Connector

Alternatives that would avoid displacement of a portion of Resolution Park, traffic impacts, and ramp-related visual impacts include: Replacement of ramps at I or L Streets with north and southbound ramps connecting to 6th Avenue and L Street; ramps connecting to E and G Streets at 3rd Avenue; or




Note: Only those recreation facilities in the vicinity of the Elmendorf Project are shown.

Figure V-3
**Elmendorf Project & Recreation Facilities**

ramps connecting to the C Street viaduct. A single connection of the project to the Anchorage street system at Ingra and Gambell Streets also would minimize impacts. The first three alternatives are discussed in Chapter II and were eliminated from consideration either for major disruption and dislocation reasons or because resulting traffic operations would be unacceptable.

The final alternative, a single connection to Ingra and Gambell, would not adequately serve forecast traffic. By the year 2001, increased traffic would require a second connection to the Anchorage street system to disperse traffic, otherwise congestion would result in a reduced level-of-service and unacceptable traffic flow. Thus, the I/L ramps would be required within ten years of crossing completion anyway. Building the I/L ramps first would keep initial crossing costs lower, making financing easier.

Combining the southbound and northbound ramps at L Street (under consideration, its impacts were described earlier) would eliminate the Resolution Park displacement and some ramp related visual impacts. However, the traffic related impacts on Resolution Park would remain since southbound traffic would use 3rd Avenue to reach L Street. Routing of traffic down either I Street or I and K Streets to 4th and 5th Avenues would avoid these traffic impacts. However, I Street is not wide enough to handle the traffic at an acceptable level-of-service. Widening I Street to handle additional traffic would require removing parking on either side of I Street and would affect pedestrian access to the parking garage on I and 3rd; see Figure V-2. Traffic signals would be required at 4th and 5th Avenues, which would slow traffic movement to unacceptable levels. Moving the southbound traffic on to K Street would create unacceptable impacts to the "pedestrian mall" atmosphere of K Street, as well as slow traffic movement and reduce the level-of-service in a manner similar to that just discussed for I Street. K Street is landscaped with mature trees and planting beds, and widening would require removal of the landscaped area. Heavier traffic also would adversely affect pedestrian movement between the Captain Cook Hotel (5th Avenue and K Street) and its parking garage (which includes shops) across K Street.

Elmendorf Crossing

The current alignment would minimize total impacts to Base facilities. Changes in the alignment would require a more costly relocation of facilities and would cause greater impacts as discussed in Chapter II under "Selection of Alternatives".

## E. MITIGATING MEASURES

Downtown Crossing/Seward Connector

Mitigating measures proposed for impacts to 4(f) resources caused by the L Street southbound ramp alternative are shown in Figure V-4. These measures would be:

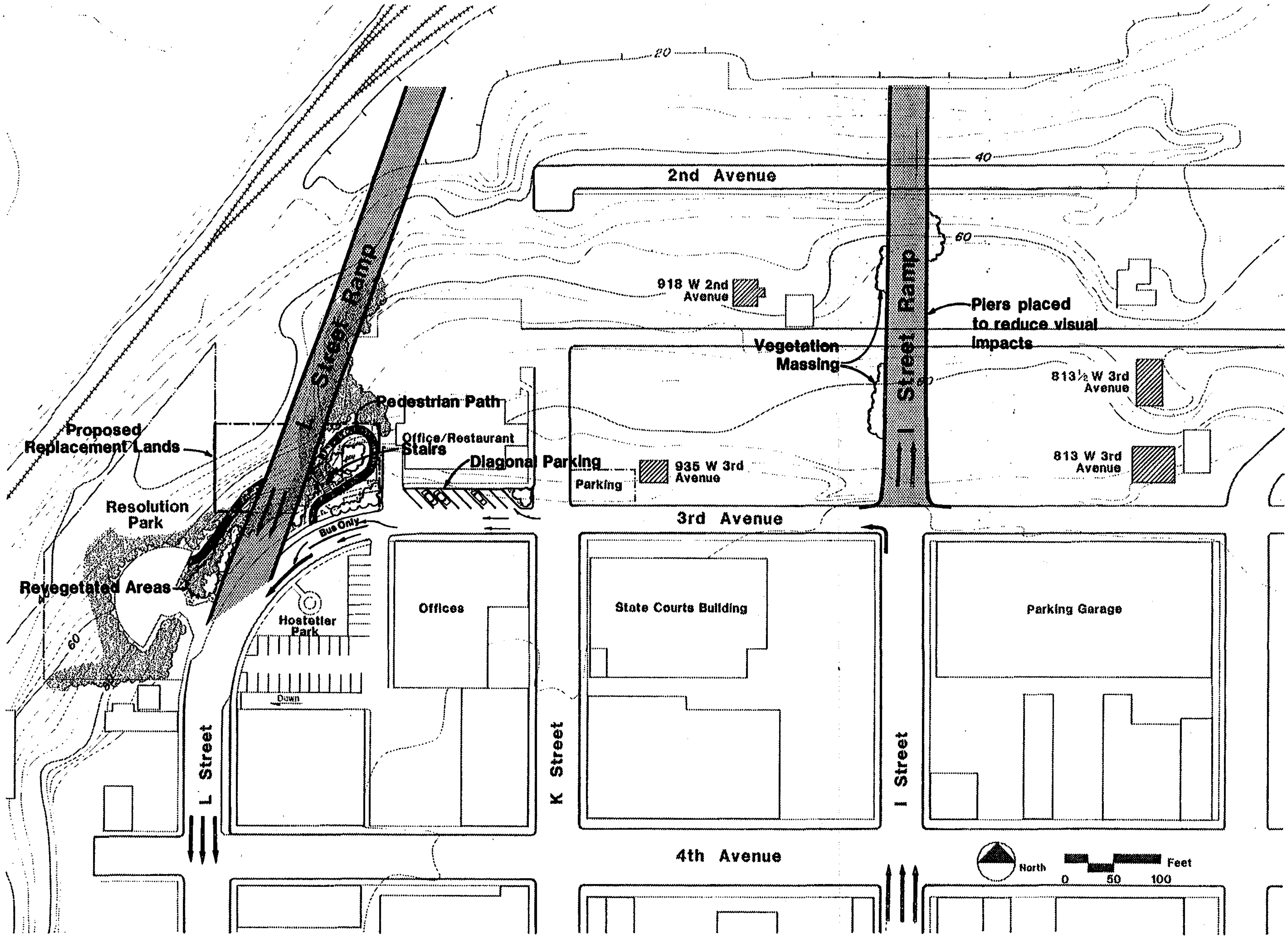



**Figure V-4**
**Mitigation of Impacts**
**L Street Southbound Ramp**

- Replacement of land taken from Resolution Park with adjacent land to the northeast of the Park to meet the requirements of the Land and Water Conservation Fund Act. The replacement lands would be appraised to assure that they are of equal market value to the land taken. The replacement lands would be a useful addition to the park because pedestrian access would be improved. A path would cross the replacement lands joining the parking area with Resolution Park

- Location of ramp piers out of line-of-sight as much as possible to reduce visual impacts

- Revegetation and landscaping of construction affected areas, added park land, and plant groupings under ramps and around piers to reduce perceived mass of bridge and piers

- Construction of pedestrian path to lower level of park, wheelchair access, and connection to planned coastal trail

- Provision of eleven spaces of angle parking along 3rd Avenue

- Construction of bus pull-in (one bus) on 3rd Avenue

Impacts that would not be mitigated would include:

- Pedestrians would have to cross L Street at 5th Avenue where crosswalks and traffic signals would provide the closest safe crossing

- Four parking spaces (including two loading spaces) would be lost

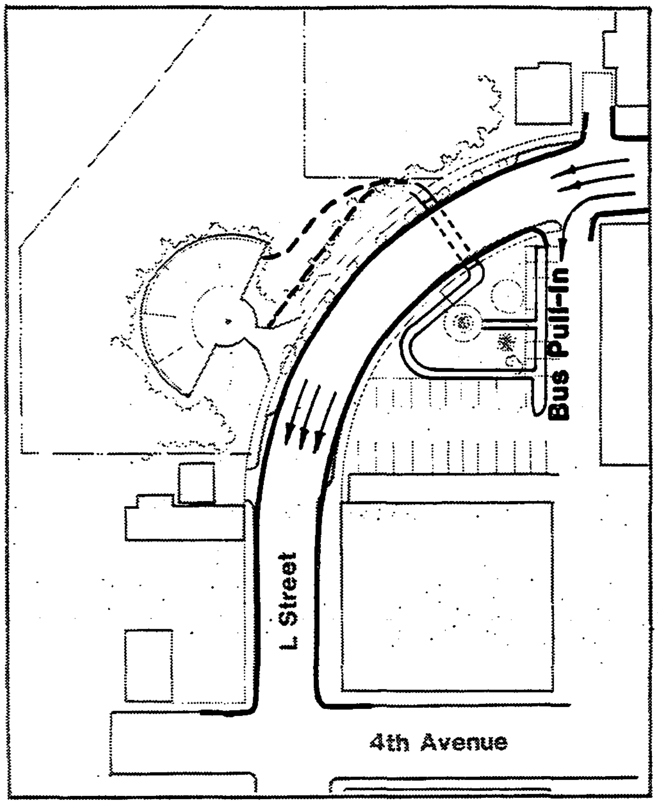
- Visual impacts upon entering park and views from houses would be dominated by the road

- Increased noise levels (noise levels match the FHWA criterion of 67 dB for parks)

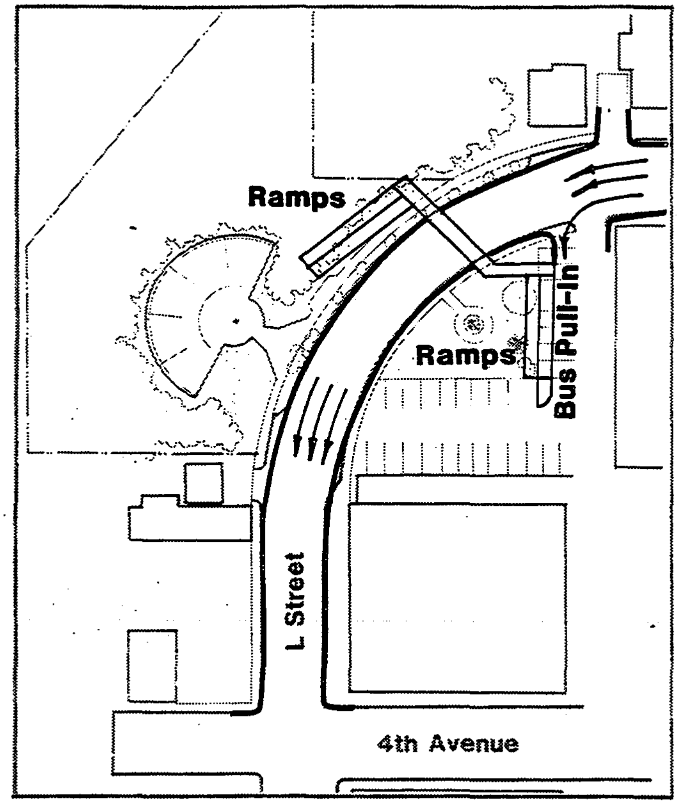
- Temporary construction impacts; noise, dust, etc.

Mitigation proposed for impacts created by the I Street southbound ramp alternative would include four alternatives to provide pedestrian access to Resolution Park. These are shown in Figure V-5 and are described below with a list of their advantages and disadvantages:

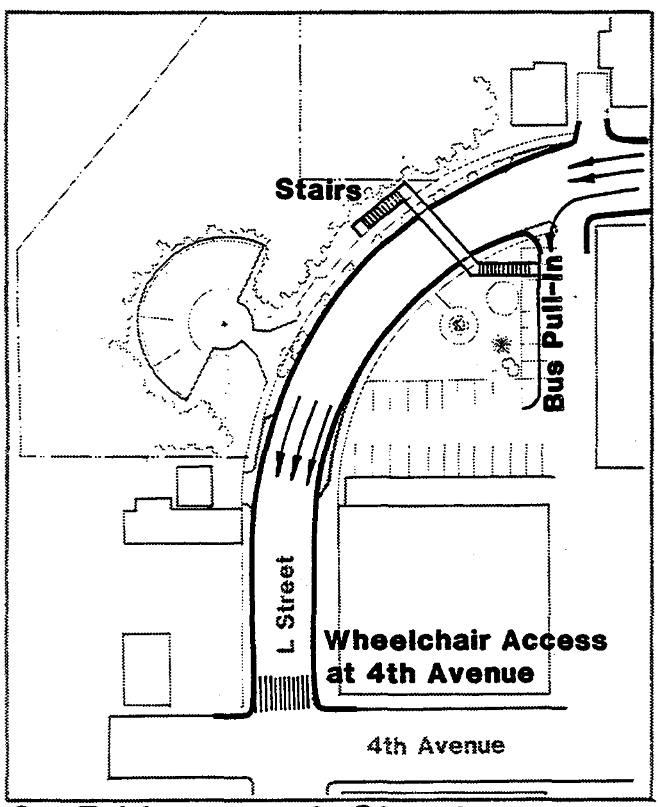
1. Pedestrian tunnel under L Street between Hostetler Park and Resolution Park would include 150-foot path with seven percent grades through Hostetler Park. The path could connect to either the lower or upper deck of Resolution Park. Within Hostetler Park, the path would cut across an existing sidewalk which would be relocated. There would be a bus pull-in adjacent to Hostetler Park. Advantages of this mitigation alternative include:



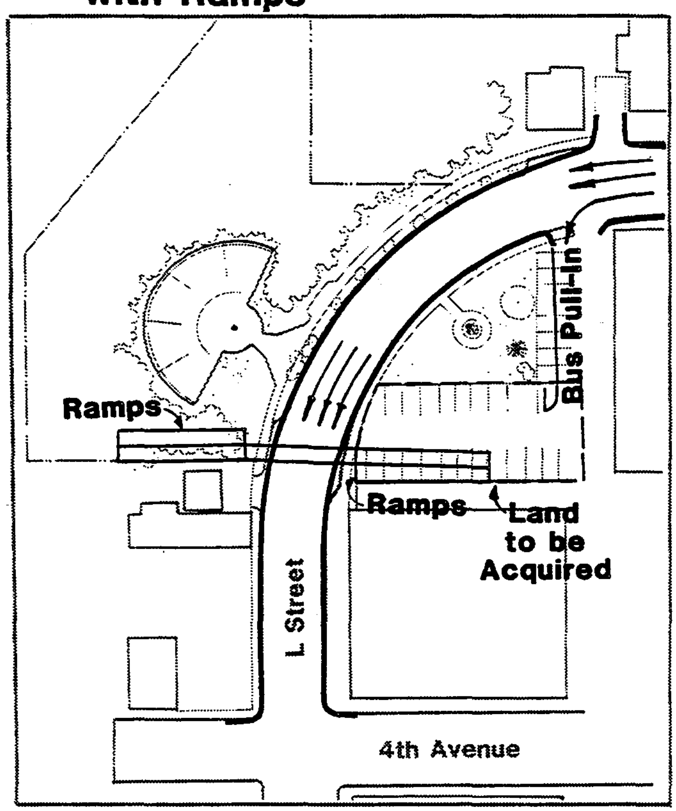

1. Tunnel under L Street




2. Bridge over L Street with Ramps




3. Bridge over L Street with Stairs




4. Bridge over L Street with Land Acquisition

Figure V-5


## Alternative Mitigation of Impacts I Street Southbound Ramp

- Direct pedestrian and wheelchair access would be maintained
- Minimum visual impacts
- Bus pull-in would be provided close to both parks

Impacts that would not be mitigated and impacts created by the above mitigation would include:

- Path would be out of view and could be a security problem for users
- Would take approximately .03 acres (14 percent) of Hostetler Park; park would need to be redesigned and rebuilt
- Thirty-nine parking spaces would be lost including six public off-street parking spaces, two off-street spaces for park maintenance vehicles, and 31 spaces of on-street parking in front of 935 West 3rd Avenue and on L Street

2. Pedestrian bridge over L Street between Hostetler Park and Resolution Park would include 230 feet of ramps with 7.5 percent grades for wheelchair access. There would be a bus pull-in adjacent to Hostetler Park. Advantages of this mitigation alternative would include:

- Pedestrian and wheelchair access would be maintained
- Path would be highly visible, lower likelihood of security problems than with the first alternative

Impacts that would not be mitigated and impacts created by the above mitigation would include:

- Bridge would be visually dominant element from Hostetler Park
- Would take approximately .05 acres (28 percent) of Hostetler Park including some vegetation
- Thirty-nine parking spaces would be lost including six public off-street parking spaces, two off-street spaces for park maintenance vehicles, and 31 spaces of on-street parking in front of 935 West 3rd Avenue and on L Street

3. Pedestrian bridge over L Street between Hostetler Park and Resolution Park would include stairs to reduce land take. Wheelchair access would be provided at 4th Avenue and L Street where curb cuts and signals would be provided. A bus pull-in would be provided adjacent to Hostetler Park. Advantages of this mitigation alternative would include:

- Direct pedestrian access would be maintained

- Bridge would be highly visible, lower likelihood of security problems than the first alternative

- Would require least land (approximately 0.007 acres) and vegetation take; use of Hostetler Park would be unaltered

Impacts that would not be mitigated and impacts created by the above mitigation would include:

- Indirect wheelchair access

- Bridge would be visually dominant element from Hostetler Park

- Thirty-nine parking spaces would be lost including six off-street public parking spaces, two off-street spaces for park maintenance vehicles, and 31 spaces of on-street parking in front of 935 West 3rd Avenue and on L Street

4. Pedestrian bridge over L Street with 250 feet of ramps at seven percent grades. Location of ramp would be on land adjacent to Hostetler Park (south side) which would be acquired. Advantages of this mitigation alternative would include:

- Would not take land from Hostetler Park

- Pedestrian and wheelchair access would be maintained

- Bridge would be highly visible, lower likelihood of security problems than the first alternative

- 20 off-street public parking spaces would be provided plus two for park maintenance

Impacts that would not be mitigated and impacts created by the above mitigation would include:

- Acquisition of private land, loss of 20 private parking spaces

- Bridge would be visually dominant element from Hostetler Park

- Seventeen on-street parking spaces would be lost including parking in front of 935 West 3rd Avenue and on L Street

Adverse impacts to Resolution Park resulting from any of these mitigation alternatives would be insignificant. The connecting trail from the tunnel temporarily would take vegetation, the bridge landing would be in an unused portion of the park land and would not affect use or views.

Measures to mitigate other impacts on 4(f) resources resulting from the combined ramps at I Street would include:

- Location of piers out of line-of-sight as much as possible to reduce visual impacts

- Revegetation and landscaping of construction affected areas and plant groupings under ramps and around piers to reduce perceived mass of bridge and piers

There are impacts that would not be mitigated by any of the above alternatives. These would include:

- Access to 935 West 3rd Avenue and 918 West 2nd Avenue would be more circuitous

- Proximity of road to 935 West 3rd Avenue. Structure would be within 15 feet of front entrance with accompanying noise and air quality impacts

- Visual impacts to houses by dominance of roadway structure

- Increased noise levels would exceed FHWA criterion at 918 West 2nd Avenue. Mitigation could include a 600-foot long, 6-foot high, solid barrier. However, this would reduce noise levels by only 2 to 3 dB. The low reduction of noise levels would not justify the cost of the barrier.

- Temporary construction impacts; noise, dust, etc.

<u>Elmendorf Crossing</u>

Mitigation for impacts to the recreation area on Elmendorf AFB primarily would involve revegetation of areas disturbed during construction. Portions of the roadway that would be visible from Green and Spring Lakes would be planted with larger plant materials that are native to the area. The linear character of the road and fence would be broken with randomly spaced group plantings. Where appropriate, cut-and-fill slopes would be varied to blend into the existing terrain. Variable slopes would decrease visual impacts by creating an irregular line that more closely resembles natural terrain. Uniform fill slopes would tend to reinforce the linear character of the road by creating a long, even band at the road's edge. Noise mitigation would not be required since noise levels would be below FHWA criteria and the noise increase criteria. Construction impacts also would not be mitigated.

## F. AGENCY COORDINATION

Overall coordination during the development and evaluation of alternatives is described in Chapter VIII. The following agency coordination was conducted in connection with the 4(f) evaluation:

- State Historic Preservation Office staff (2/16/84, 3/28/84, 5/11/84, 7/12/84)

- Elmendorf Air Force Base (5/8/84)

- Municipality of Anchorage - Parks and Recreation (5/11/84)

- Municipality of Anchorage - Planning (5/29/84)

A determination of eligibility was requested from the State Historic Preservation Officer (SHPO) for several potentially eligible historic resources that were identified by the project team. The need for an eligibility determination was confirmed in the February 16, 1984 meeting with representatives of the SHPO. The May 29, 1984 letter from the SHPO indicated that the following are eligible for placement on the Register of Historic Places, see (Appendix G):

- 918 West 2nd Avenue
- 935 West 3rd Avenue
- 813 West 3rd Avenue
- 813½ West 3rd Avenue

On July 12, 1984, a meeting was held with representatives of the SHPO to discuss impacts to historic resources and mitigating measures. Formal meetings held with the Municipality of Anchorage planning staff and the Department of Parks and Recreation (5/29/84 and 5/11/84, respectively) addressed impacts to Resolution and Hostetler Parks and possible mitigating measures.

An evaluation of the Knik Arm Crossing was prepared by the Planning Assistance Team for Elmendorf AFB (Planning Assistance Team, September 1983). This evaluation was used by the project team to identify impacts and possible mitigation of impacts to Base recreation facilities. During the May 8, 1984 meeting with Elmendorf AFB, road alignment and existing recreation facilities were discussed.

The 6(f) coordination with the Municipality Parks and Recreation Department discussed under "Impacts of Each Alternative", will occur after release of the Draft and prior to release of the Final EIS. This process is required as a result of impacts to Resolution Park. A Memorandum of Agreement for mitigating impacts to the historic resources will be developed with the Advisory Council on Historic Preservation during the same time period.

## Chapter VI

## PROVISION FOR FUTURE RAILROAD ON THE BRIDGE

### A. PURPOSE AND NEED

The major focus of this EIS is on a highway crossing of Knik Arm, however a major structure over the Arm would lend itself to joint use for other purposes, e.g., utilities and railroad. This chapter addresses the potential inclusion of railroad on the Knik Arm highway crossing. The railroad option would be to structurally reinforce and configure the Knik Arm highway bridge to permit future addition of rail trackage. The incremental cost of providing for future railroad operations would be funded separately from the Knik Arm highway crossing project.

The Alaska Railroad has played an important role in the growth of Alaska, especially the City of Anchorage. The existing railroad route around Knik Arm to Fairbanks by present day standards is slow due to tight curves and at-grade highway crossings, especially the route between Anchorage and Wasilla. The Final Corridor Alternatives Analysis (CAA) found significant railroad benefits would be derived from including it on a crossing (USDOT/FHWA, ADOT/PF, December 5, 1983).

Additional benefits from a rail crossing of Knik Arm would be derived from providing access to proposed industrial and port development in Point MacKenzie. Evaluation in the Final CAA indicated substantial benefit to Point MacKenzie development would be attributable to a rail line across Knik Arm (USDOT/FHWA, ADOT/PF, December 5, 1983).

Either the Downtown or the Elmendorf highway bridge could be reinforced and configured to permit addition of a single railroad track at some future date. Providing for future railroad addition to a highway crossing would be substantially less expensive than a separate railroad bridge (a factor of five to six difference in cost).

An important policy issue from a State perspective would be whether or not added near-term investment in a Knik Arm crossing highway bridge to accommodate future rail operations would pay sufficient long-term railroad benefits. That issue is being addressed by ADOT/PF's currently on-going Cook Inlet Transportation Study. This chapter presents design concepts for reinforcing and altering the configuration of either the Downtown or the Elmendorf highway bridge to accommodate future railroad track and analyses of the direct impact on the natural and human environment. Placing railroad track on the bridge and building railroad approaches to the bridge are not considered herein and would require a separate EIS.

### B. ALTERNATIVES

#### Downtown Project

Alignment Description. The location of the bridge would not change from that with the highway only, see Figure II-3. To maintain shipping channel clearance of 150 feet above mean higher high water, the roadway deck would need to be higher than the highway only bridge by about 40 feet in the main span of the cable-stayed structure. The roadway deck would be at the same height for both bridges at the Mat-Su end, but the bridge with provision for railroad would be 33 feet higher at the Anchorage side. The Seward Connector would also be 33 feet higher at its western end.

Design Features. The span length of the cable-stayed bridge configuration would not differ from the highway only bridge. The 2,240-foot long cable-stayed configuration with a railroad would consist of a double-level truss in which the upper level would provide for four lanes of highway traffic and the lower level would provide for a single-track railroad with a trainman's walkway; see Figure VI-1. Due to additional deck height and weight, the two towers supporting the cable-stayed spans would project about 55 feet into the aviation clear zone for Merrill Field, 25 feet higher than the highway-only bridge.

The number of piers and length of spans would be the same as for the highway only bridge. The spans adjacent to the cable-stayed spans would consist of double-level trusses in which the highway lanes would be atop the railroad level. The superstructure and substructure would have a larger mass to provide for the additional railroad loading. Construction time, labor, and materials for a highway bridge with railroad would be about 10 percent greater than for the highway bridge described in Chapter II.

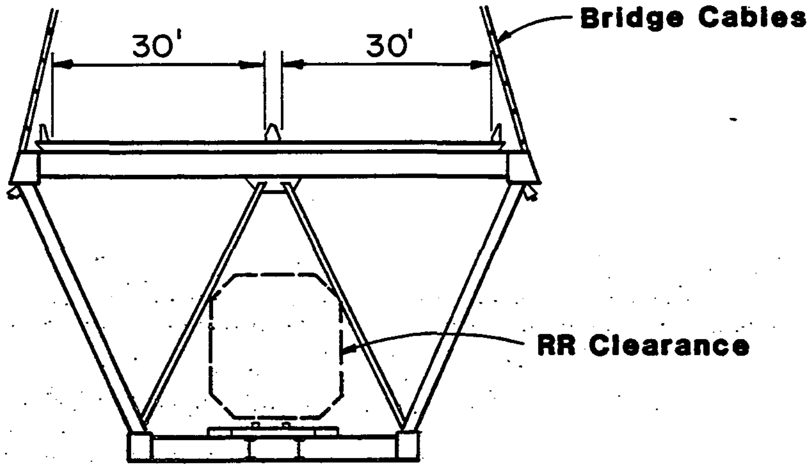
Cost. The additional estimated 1985 costs to provide for a future railroad on the Downtown highway bridge would be about $60 million.

Elmendorf Project

Alignment Description. The bridge alignment would be identical to the alignment of the highway-only bridge; see Figure II-3. The upper roadway deck would be about ten feet higher than the highway-only bridge.

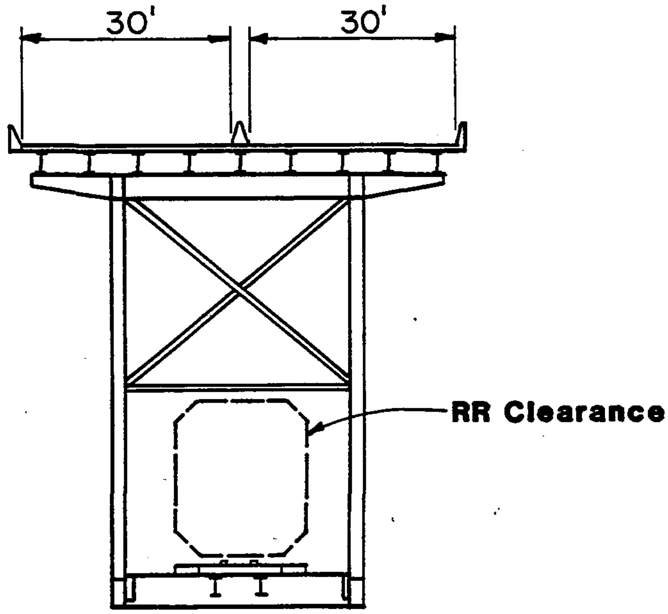
Design Features. The number of bridge piers and the span lengths would be the same as for the highway-only bridge. The highway bridge with a railroad would consist of a double-level truss in which the upper level would provide for four highway lanes. The lower level would provide for a single-track railroad with a trainman's walkway; see Figure VI-1. The trusses and piers would have a larger mass than the highway-only bridge to account for the additional railroad loading. Construction time, labor, and materials for a highway bridge with railroad would be about 10 percent greater than for the highway-only bridge.

Cost. The additional estimated 1985 cost to provide for a future railroad on the Elmendorf highway bridge would be about $50 million.




Cross Section of Cable-Stayed Spans

## Downtown Project




Cross Sections of Truss Spans

## Elmendorf Project

Figure VI-1

# Bridges with a Railroad

## C. ENVIRONMENTAL CONSEQUENCES

Changes in bridge height and structural dimensions would affect construction employment, port and industrial development planning, aircraft clearance, marine biology and wetlands, construction energy, and visual impact. The affect on total average energy consumption between 1990 and 2010 would be insignificant.

### Construction Employment

Construction employment would be approximately 10 percent greater with provision for future addition of railroad on the Knik Arm highway crossing, i.e., 15 employees more per year for either a Downtown or an Elmendorf location. Applying a 2.0 multiplier to account for indirect employment increase, regional impact of the railroad option would be 30 employees per year during construction. This would translate to approximately 27 additional dwelling units within the region.

### Port and Industrial Development Planning

The provision for future addition of railroad on the Knik Arm highway crossing would be compatible with Anchorage and Mat-Su Borough port and industrial planning to the extent that the rail option supports planned facilities. Both jurisdictions recognize the need to expand regional port facilities outside the confines of the current Port of Anchorage site along Ship Creek, particularly to accommodate export and industrial uses in proximity to a port. Both jurisdictions also recognize in their plans the importance of rail access as infrastructure for the port.

### Aircraft Clearance

The towers for the cable-stayed bridge (Downtown Project) would project approximately 55 feet into the aviation clear zone surrounding Merrill Field. This would be approximately 25 feet higher than for the highway-only option. Federal Aviation approval would be required but would be likely. Several structures in downtown Anchorage penetrate Merrill Field airspace to a similar extent. Elmendorf AFB and Anchorage International Airport clear zones would not be encroached upon. Bridge towers would be lighted in conformance with FAA requirements.

### Marine Biology and Wetlands

The size of either Downtown or Elmendorf bridge piers and footings would be increased approximately 10 percent to accommodate future railroad operations. Hence, the amount of disturbance of coastal wetlands and the bottom of Knik Arm would increase approximately 10 percent compared to a highway-only bridge.

The number and location of bridge piers and footings and duration of construction would not be changed. Since much of the marine impact of a crossing is attributable to the presence of construction rather than the extent of the area involved, provision for future railroad would not significantly alter marine impacts.

## Construction Energy

Crossing construction energy requirements would be increased approximately 10 percent with provision for future railroad at either the Downtown or the Elmendorf locations. This is based on an estimated 10 percent increase in materials and labor at either location. The effect on total average energy consumption between 1990 and 2010 would be insignificant.

## Visual

Railroad on a bridge would change the visual character of the bridge for either the Downtown or the Elmendorf Project.

Downtown Project. Views of the crossing from Anchorage would be affected by the addition of the railroad. The bridge would be taller, having towers 25 feet higher and top of deck 40 feet higher, and more massive, having an additional deck and slightly larger structural members and support piers (average five percent wider than highway dimensions). However, the increased mass would not change the overall proportion of the bridge. For this reason distant views of the bridge would not change significantly. Views from the bridge would not be affected.

Elmendorf Project. Adding a railroad to the Elmendorf bridge would have an insignificant affect on views of the bridge. The depth of the structure would not be changed significantly, and the location of the roadway on top of the structure would not create a dominant visual element.

Views from the roadway would be significantly improved with the location of the roadway on top of the bridge. Views outward would be open and unobstructed by structural members.

## Chapter VII

## LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT WERE SENT

This document has been circulated to, and comments have been requested from, the following agencies, organizations, and persons:

FEDERAL AGENCIES

Advisory Council on Historic Preservation (Washington, D.C.)
U.S. Army Corps of Engineers, Alaska District - Environmental Coordinator, Chief Regulatory Function, and Chief Floodplains Management (Anchorage)
U.S. Department of the Air Force - Elmendorf Air Force Base (Anchorage)
U.S. Department of the Army - Fort Richardson (Anchorage)
U.S. Department of Agriculture
- Chugach National Forest (Anchorage)
- Soil Conservation Service - Director, Agricultural Research Services and State Conservationist (Palmer)
- Farmer's Home Administration (Palmer)

U.S. Department of Commerce, National Oceanic and Atmospheric Administration - National Marine Fisheries Service Anchorage Field Office, Regional Director (Anchorage), and Office of Ecology/Conservation (Washington, D.C.)
U.S. Department of Defense - Pentagon (Washington, D.C.)
U.S. Department of Energy
- Alaska Field Office (Anchorage)
- Division of NEPA Affairs (Washington, D.C.)
- Federal Energy Administration (Washington, D.C.)

U.S. Department of Health and Human Services - Director, Office of Environmental Affairs (Washington, D.C.)
U.S. Environmental Protection Agency
- Office of Federal Activities (Washington, D.C.)
- Environmental Review Branch (Seattle)

U.S. Federal Emergency Management Agency (Bothell, Washington)
U.S. Department of Housing and Urban Development
- Alaska Area Office and Manager (Anchorage)
- Environmental Officer (Seattle)

U.S. Department of the Interior
- Alaskan Geology Branch (Anchorage)
- Bureau of Indian Affairs - Area Director (Juneau) and Superintendent (Anchorage)
- Bureau of Land Management - Anchorage District Manager and Alaska State Director (Anchorage)
- Director of Environmental Project Review (Washington, D.C.)
- Fish and Wildlife Service - Area Director (Anchorage) and Western Alaska Ecological Service (Anchorage)
- Geological Survey - Public Inquiries Office (Anchorage)
- National Park Service - General Superintendent, Alaska Group (Anchorage)
- Office of Deputy Assistant Secretary for Environmental Affairs (Washington, D.C.)
- Office of the Secretary (Anchorage)

U.S. Department of Transportation
- Alaska Railroad - General Manager (Anchorage)
- Federal Aviation Administration (Anchorage)
- U. S. Coast Guard (Anchorage)

STATE AGENCIES

Alaska Power Authority (Anchorage)
Alaska State Department of Commerce and Economic Development - Office of Industrial Development (Juneau)
Alaska State Department of Community and Regional Affairs (Juneau)
Alaska State Department of Environmental Conservation - Regional Supervisor (Anchorage)
Alaska State Department of Fish and Game (Juneau) and Habitat Division (Anchorage)
Alaska State Department of Natural Resources
- Division of Commerce and Economic Development (Juneau)
- Division of Development (Anchorage)
- Division of Forestry (Anchorage)
- Division of Lands - Director (Anchorage)
- Division of Land and Water Management (Anchorage)
- Division of Mineral and Energy Management (Anchorage)
- Division of Parks and Outdoor Recreation, Historic Preservation Officer (Anchorage)

Alaska State Department of Public Safety - State Troopers (Anchorage)
Alaska State Housing Authority - Executive Director (Anchorage)
Alaska State Office of Coastal Management - Division of Policy Development and Planning (Juneau)
Alaska State Office of Management and Budget
- Division of Strategic Planning (Juneau)
- Division of Governmental Coordination (Juneau)

Office of the Governor (Juneau)
University of Alaska
- Geophysical Institute
- Institute of Social and Economic Research (Anchorage)
- School of Engineering (Anchorage)

LOCAL GOVERNMENTAL AGENCIES

Alaska Pacific University (Anchorage)
Anchorage Air Pollution Control Agency
Anchorage Community Councils
- Federation of Councils
- Advisory Board
- Abbott Loop
- Airport Heights
- Bayshore/Klatt
- Birchwood
- Campbell Park
- Chugiak

- Downtown
- Eagle River
- Eagle River Valley
- Eklutna
- Fairview
- Girdwood Valley
- Glen Alps
- Government Hill
- Hillside East
- Huffman/O'Malley
- Mid-Hillside
- Northeast
- North Mountain View
- North Star
- Old Seward/Oceanview
- Rabbit Creek
- Rogers Park
- Russian Jack
- Sand Lake
- Scenic Park Area
- South Addition
- South Fork (Eagle River)
- Spenard
- Taku/Campbell
- Tudor Area
- Turnagain
- Turnagain Arm

Anchorage Economic Development Commission - Community Planning Department
Anchorage Geotechnical Advisory Commission
Anchorage Municipal School District
- Assistant Superintendent
- Educational Facilities Planning
- Management Information Systems

Anchorage Parks and Recreation Commission
City of Houston
City of Palmer
City of Wasilla
Matanuska-Susitna Borough (Palmer)
- Historical Preservation and Restoration Commission
- Planning Department

Matanuska-Susitna Borough School District (Palmer)
Matanuska-Susitna Community College (Palmer)
Municipality of Anchorage
- Department of Community Planning - Anchorage Urban Beautification, Director, Division of Community Planning, Planning and Zoning Commission, Transportation Planning Division, and Water Quality Management
- Department of Health and Environmental Protection - Director
- Department of Parks and Recreation
- Department of Property Management and Right-of-Way
- Department of Public Works - Director
- Land Use Planning Commission
- Municipal Clerk
- Water and Wastewater Utility

Nancy Lake Association (Willow)
Port of Anchorage
Water Utility Advisory Commission (Anchorage)

STATE LEGISLATORS

Representative Mitchell Abood
Representative Albert P. Adams
Representative Ramona Barnes
Representative Robert Bettisworth
Representative Charlie Bussell
Representative Bette M. Cato
Representative Donald Clocksin
Representative John Cowdery
Representative Mike Davis
Representative Jeff Day
Representative Jim Duncan
Representative Joe Flood
Representative Milo H. Fritz
Representative John G. Fuller
Representative Walt Furnace
Representative Peter Goll
Representative Ben Grussendorf
Representative Joe L. Hayes
Representative Adelheid Herrmann
Representative Vernon L. Hurlbert
Representative Niilo Koponen
Representative Barbara Lacher
Representative Ronald L. Larson
Representative John Lindauer
Representative John J. Liska
Representative Hugh Malone
Representative Terry Martin
Representative Jack McBride
Representative Mike Miller (Juneau)
Representative Mike Miller (North Pole)
Representative Sam Pestinger
Representative Randy Phillips
Representative John Ringstad
Representative Richard Schultz
Representative Mike Szymanski
Representative Mae Tischer
Representative Rich Uehling
Representative Anthony Vaska
Representative Jerry Ward
Representative Ron Wendte
Representative Fred F. Zharoff
Matanuska-Susitna Legislative Information Office

Senator Don Bennett
Senator Richard I. Eliason
Senator Bettye Fahrenkamp
Senator Jan Faiks
Senator Frank R. Ferguson
Senator Paul Fischer
Senator Vic Fischer
Senator Donald E. Gilman
Senator Rick Halford
Senator Joe P. Josephson
Senator Tim Kelly
Senator Jalmar M. Kerttula
Senator Pappy H. Moss
Senator Bob Mulcahy
Senator Fritz Pettyjohn
Senator Bill Ray
Senator Patrick M. Rodey
Senator John C. Sackett
Senator Arliss Sturgulewski
Senator Robert H. Ziegler, Sr.

CONGRESSIONAL DELEGATION

Mr. John Katz,
Special Counsel,
State/Federal Relations

The Honorable Ted Stevens,
United States Senate

The Honorable Frank H. Murkowski,
United States Senate

The Honorable Donald E. Young,
House of Representatives

KNIK ARM CROSSING STEERING COMMITTEE

The Honorable Edna Armstrong,
Mayor, Matanuska-Susitna Borough

Colonel Richard O. Bennett,
Vice Commander, Alaska Air Command
Elmendorf Air Force Base

Mr. Tyler Jones,
Port Director
Municipality of Anchorage

Mr. Riley Snell
Director of Planning and Programming
Alaska State Department of Transportation and Public Facilities

NOT-FOR-PROFIT ORGANIZATIONS

Alaska Center for the Environment (Anchorage)
Alaska Federation of Natives (Anchorage)
Alaska Federation of Women's Clubs (Anchorage)
Alaska Jaycees, Inc. (Anchorage)
Alaska Public Interest Research Group (Anchorage)
Alaska Rifle Club (Anchorage)
Alaska Society of Professional Engineers - Professional Design Council (Anchorage)
Alaska State Rifle and Pistol Association (Eagle River)
Aleut Corporation (Anchorage)
American Institute of Architects (Anchorage)
American Society of Civil Engineers (Anchorage)
Anchorage Audubon Society
Anchorage Board of Realtors
Anchorage Chamber of Commerce
Anchorage Convention and Visitors Bureau
Association of General Contractors (Anchorage)
Calista Corporation (Anchorage)
Chugach Natives, Inc. (Anchorage)
Cook Inlet Region, Inc. (Anchorage)
Denali Citizen's Committee (McKinley Park)
Eklutna, Inc. (Anchorage)
Federation of Western Outdoor Clubs (Fairbanks)
Friends of the Earth (Fairbanks)
Highway Users' Federation of Alaska (Anchorage)
Homebuilder's Association of Alaska, Anchorage
Iditarod Trail Blazers (Wasilla)
Kiwanis Club (Anchorage)
Knik Village Corporation (Wasilla)
League of Women Voters (Anchorage)
National Audubon Society (Anchorage)
Palmer Chamber of Commerce
Resource Development Council for Alaska, Inc. (Anchorage)
Sierra Club (Anchorage)
Talkeetna Chamber of Commerce
Teamsters Union Local 959 (Anchorage)
Trustees for Alaska (Anchorage)
Tyonek Native Corporation (Anchorage)
TSA Senior Citizens (Eagle River)
United Food and Commercial Workers Union (Anchorage)
Wasilla Chamber of Commerce

## PUBLIC REVIEW LOCATIONS

Alaska Resources Library (Anchorage)
Anchorage Public Libraries
- Chugiak/Eagle River Branch
- Scott and Wesley Gerrish Library (Girdwood)
- Grandview Gardens Branch
- Z.J. Loussac Library
- Mountain View Branch
- Samson Dimond Branch
- Sand Lake Branch
- Spenard Community Branch

Big Lake Community School
Houston City Hall
Kenai Peninsula Borough Libraries
- Joyce K. Carver Memorial Library (Soldotna)
- Homer Public Library
- Kenai Community Library, Inc.
- Ninilchick Community Library

Matanuska-Susitna Borough Community College Library
Matanuska-Susitna Borough Public Libraries
- Palmer
- Sutton
- Talkeetna
- Wasilla
- Willow

Tyonek Community Center
University of Alaska, Anchorage Library
Whittier City Clerk's Office

# Chapter VIII

# COORDINATION

## A. AGENCY COORDINATION

Coordination with Federal, State, and local government agencies, as well as private organizations, was conducted informally and formally as a part of scoping, data gathering, and Draft Environmental Impact Statement preparation.

### Scoping

"Scoping" is the term applied to the activities required by Federal regulations (40 CFR 1501.7) to initiate preparation of an Environmental Impact Statement (EIS). Knik Arm crossing scoping activities included:

- Publication of a Notice of Intent to File an Environmental Impact Statement (Federal Register, December 3, 1982)

- Preparation of a Scoping Document (USDOT/FHWA, ADOT/PF, November 29, 1982) identifying project alternatives to be evaluated, impact assessment procedures, and a schedule for environmental document preparation

- Establishment of lines of communication with Federal, State, and local agencies and organizations with interest in the project

- Scoping meetings with agencies as well as the public providing information on project alternatives and impact assessment. Four scoping meetings were held on January 12 and 13, 1983, two for the public (January 12 in Wasilla, January 13 in Anchorage) and two for government agencies (both on January 13 in Anchorage)

- Performance of initial technical analyses to aid in refining key design and environmental issues, project alternatives, and assessment procedures

The scoping process and its results are documented in a Scoping Report (USDOT/FHWA, ADOT/PF, March 8, 1983). Included in that document are: copies of agency and organization correspondence, summary of scoping meeting comments, description of initial technical analyses, final list of corridor alternatives, and final list of evaluation issues.

The following Federal agencies agreed to serve as cooperating agencies:

- U. S. Air Force
- U. S. Army Corps of Engineers
- U. S. Coast Guard

- U. S. Department of Agriculture
  - Forest Service
  - Soil Conservation Service
- U. S. Department of Commerce, National Oceanic and Atmospheric Administration
- U. S. Department of Housing and Urban Development
- U. S. Department of Interior
  - Fish and Wildlife Service
  - Geological Survey
  - National Park Service
- U. S. Environmental Protection Agency

<u>Agency Meetings</u>

Meetings were held with representatives of interested Federal, State, and local government agencies, as well as private organizations throughout the EIS preparation process.

A chronological summary of the <u>major</u> contacts and/or meetings occurring during this timeframe follows:

- FEDERAL AGENCIES

| | |
|---|---|
| - Alaska Native Medical Center | (4/24/84, telephone) |
| - Alaska Railroad | (11/13/81, 2/7/83, 5/10/83, 2/1/84, 2/8,84) |
| - Bureau of Land Management | (2/9/84) |
| - Corps of Engineers | (3/21/84, 4/12/84, 4/23/84, 4/26/84) |
| - Federal Aviation Administration | (4/22/83) |
| - Soil Conservation Service | (11/9/82) |
| - U. S. Army | (11/22/82) |
| - U. S. Air Force | (3/3/82, 10/21/82, 11/2/82, 4/2/83, 9/26/83, 9/29/83,12/1/83, 12/14/83, 1/23/84, 5/8/84) |
| - U. S. Coast Guard | (12/21/82, 1/4/83, 2/24/84) |
| - U. S. Fish and Wildlife Service | (11/9/82, 12/10/82, 11/16/83, 1/2/84, 4/16/84, 4/17/84, 5/4/84, 5/10/84 |

- STATE AGENCIES

| | |
|---|---|
| - Department of Fish and Game | (12/9/82, 1/12/84) |
| - Department of Natural Resources | (12/1/82, 10/17/83, 11/15/83, 2/16/84, 3/2/84) |
| - Office of the Governor | (4/15/83, 3/8/84) |
| - Senate Transportation Committee | (4/27/83, 8/29/83, 3/8/84, 4/24/84) |
| - State Historic Preservation Officer | (2/16/84, 3/28/84, 5/11/84, 7/12/84) |
| - University of Alaska, Institute of Social and Economic Research | (10/5/83) |

- LOCAL GOVERNMENT

| | |
|---|---|
| - Anchorage Metropolitan Area Transportation Study | (3/1/82, 10/19/82, 5/11/83, 5/17/83, 8/24,83, 9/20/83, 9/27/83, 9/29/83, 1/16/84, 2/16/84, 3/20/84, 2/2/84) |
| - Anchorage School District | (3/9/84) |
| - City of Houston | (12/13/83, 4/26/84) |
| - Matanuska-Susitna Borough | (2/24/82, 3/2/82, 10/14/82, 11/23/82, 12/9/82, 12/14/82, 12/20/82, 1/24/83, 5/5/83, 5/12/83, 9/21/82, 10/19/83, 10/21/83, 12/13/83, 2/8/84, 3/13/84, 4/9/84, 5/21/84) |
| - Matanuska-Susitna Borough School District | (5/13/84) |
| - Port of Anchorage | (8/30/83, 12/17,83, 4/2/84) |
| - Municipality of Anchorage | (12/1/82, 12/12/83, 1/16/84, 1/30/84, 2/22/84, 3/12/84, 3/19/84, 3/22/84, 5/11/84, 5/17/84, 5/21/84, 5/29/84) |

- UTILITIES

| | |
|---|---|
| - Alaska Power Authority | (5/29/84) |
| - Chugach Electric Association | (4/21/83, 5/10/83) |

- ENSTAR Natural Gas Company (5/9/83)
- Matanuska Electric Association (5/12/83, 2/21/84)
- Matanuska Telephone Association (5/12/84)

° KNIK ARM CROSSING STEERING COMMITTEE (1/6/83, 3/17/83, 7/1/83, 9/13/83, 2/16/84)

° CHAMBERS OF COMMERCE

- Anchorage (2/24/84)
- Palmer (5/9/84)
- Wasilla (9/27/83)

° PROFESSIONAL ORGANIZATIONS

- American Institute of Architects (12/9/83)
- American Planning Association (10/24/83)
- American Public Works Association (7/27/83, 5/23/84)
- American Right-of-Way Association (3/15/84)
- American Society of Civil Engineers (6/21/83)
- Construction Specification Institute (7/19/83)
- Society of American Military Engineers (9/30/82)
- Society of Real Estate Appraisers (4/12/84)

° INDUSTRY

- Brown and Root (2/21/84)
- Calista Corporation (2/23/84, 3/14/84)
- Chevron (4/11/84)

| | |
|---|---|
| - Crowley Maritime | (4/17/84) |
| - Kaiser Cement | (4/10/84) |
| - McCool-McDonald Architects | (4/17/84) |
| - Multi Systems International | (10/83) |
| - Pacific Western | (4/11/84) |
| - Samwhan Corporation | (2/10/84) |
| - Sealand | (4/24/84) |
| - Stone, Ltd. | (6/27/83) |
| - Suneel Alaska Corporation | (9/2/83) |
| - Tote | (4/25/84, 5/31/84) |
| - Union Oil Company | (9/23/83) |
| - URS Company, Inc. | (6/3/83) |

## B. PUBLIC INVOLVEMENT PROGRAM

Public involvement opportunities have been a continuing part of the Knik Arm crossing EIS preparation. Public meetings were held in Wasilla and Anchorage on January 12 and 13, 1983 (Scoping) and on September 14 and 15, 1983 (Draft Corridor Alternatives Analysis review). Throughout the analysis, a newsletter covering ongoing activities and progress was published and distributed to all who expressed an interest. The following summary indicates the dates and major topic of each newsletter:

° Number 1 - January 1983
  Scoping

° Number 2 - June 1983
  Economic Feasibility

° Number 3 - September 1983
  Draft Corridor Alternatives Analysis

° Number 4 - January 1984
  Final Corridor Alternatives Analysis

° Number 5 - April 1984
  Crossing Alignments to be analyzed in EIS

A public information and exhibit display booth was provided during the Anchorage Fur Rendezvous in February of 1983.

Further information regarding public involvement and agency coordination is included in the Scoping Report (USDOT/FHWA, ADOT/PF, March 8, 1983) and Final Corridor Alternatives Analysis (USDOT/FHWA, ADOT/PF, December 5, 1983).

# Chapter IX

## LIST OF PREPARERS

This Draft Environmental Impact Statement was prepared by the U.S. Department of Transportation, Federal Highway Administration (FHWA) and the Alaska Department of Transportation and Public Facilities (ADOT/PF). Assistance was provided by EMPS/Sverdrup and principal associates DeLeuw, Cather and Company and Tryck, Nyman and Hayes. The following FHWA personnel were involved in EIS preparation:

| | |
|---|---|
| o Barry Morehead | Division Administrator |
| o Kurt Dunn | Area Engineer |
| o Tom Neunaber | Environmental Coordinator |
| o Steve Moreno | Transportation Planner |
| o Gary Wilson | Right-of-Way Officer |
| o Charles Seslar | Structural Engineer |
| o Karen Tennison | EEO Coordinator |

The technical analyses were performed by or under the direction of the persons listed on the following pages, who are referred to as the "project team" in document text.

| Name and Degree | Responsibility | Experience | Professional Discipline |
|---|---|---|---|
| ADOT/PF | | | |
| John B. Olson, BSCE, MSCE, MS Environmental Engineering, Ph D Civil/Environmental Engineering | Project Director | 17 years, Civil/ Environmental Engineering | Director, Major Project Management; P.E. |
| Jerry Hamel, BSCE | Project Manager | 10 years, Civil Engineering; 6 years, Project Management | Design Manager |
| Chris Storey, BA Anthropology, Geography | Environmental Consistency Review | 4 years, Environmental Impact Analysis | Environmental Assistant |
| Larry Munson | Utilities Impact Analysis | 15 years, Utilities Engineer | Civil Engineer |
| Joey Hartley, BBA | Stage Relocation Study | 1 year, Right-of-Way Assistant | Right-of-Way Agent |
| SVERDRUP & PARCEL AND ASSOCIATES, INC. | | | |
| Gordon R. Pennington, BSCE | Consultant Project Executive; member Consultant Executive Committee | 35 years, civil, structural, and transportation engineering | Structural Engineer; P.E. |
| R. Jack Allen, BSCE, MSCE | Consultant Project Manager | 30 years, structural and civil engineering | Structural Engineer; P.E. |
| Robert A. Wokurka, BSCE | Knik Arm Bridge Design | 10 years, civil and structural engineering | Structural Engineer; P.E. |
| Gerhard Joehnk, MSCE | Knik Arm Bridge Design | 30 years, bridge engineering | Structural Engineer; P.E. |

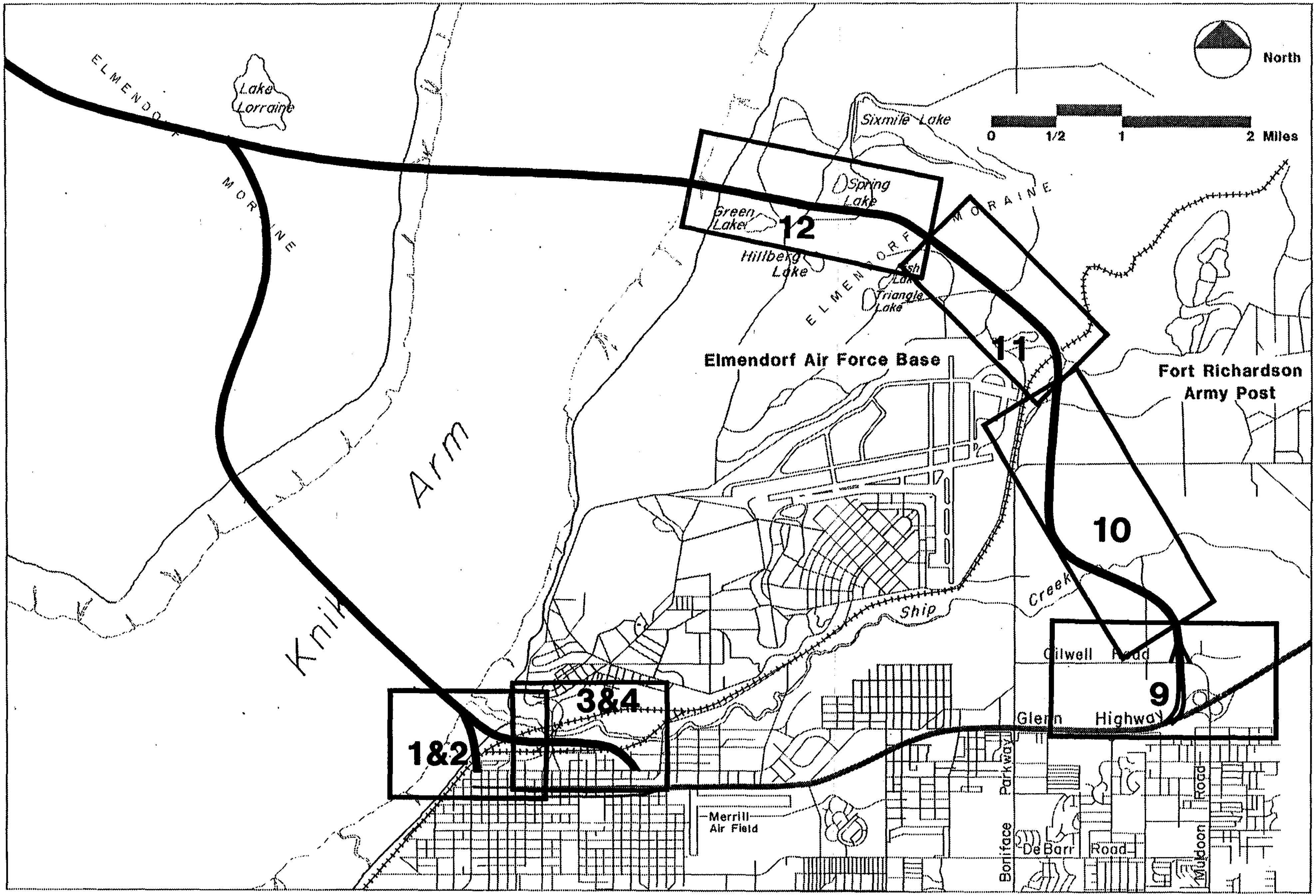
| Name and Degree | Responsibility | Experience | Professional Discipline |
|---|---|---|---|
| EMPS | | | |
| Warren E. Wild, BSCE | Chairman, Consultant Executive Committee | Over 30 years, transportation engineering | Civil Engineer; P.E. |
| John C. Becker, BSCE | Houston Connector Highway Design | 25 years, highway engineering | Civil Engineer; P.E., R.L.S. |
| David W. Roden | Houston Connector Highway Design | 30 years, highway design | Highway Design Engineer; C.E.T. |
| DeLEUW CATHER AND COMPANY | | | |
| Lawrence D. Hazzard, BS Architectural Engineering | Member Consultant Executive Committee | 22 years, civil engineering | Civil Engineer; P.E. |
| Paul F. Holley, BSCE, MUP | Consultant Deputy Project Manager; Urban growth and economic development analysis | 18 years, transportation economics, planning, design, and impact assessment | Transportation Engineer; P.E., and Community and Environmental Planner; AICP |
| John M. Page, BS, MUP | Document production; urban and military function and operation, land use plans, government finance, natural resource development, energy analysis | 10 years, land use planning, socioeconomic, air, noise, and energy analysis | Community and Environmental Planner; AICP |
| Ronald V. Sherwood, BS, MS Urban Planning | Traffic forecasts; transportation analysis | 8 years, transportation and traffic engineering | Transportation Planner |
| M. Elise Huggins, BA, Landscape Architecture | 4(f) Evaluation; parks and recreation, visual, pedestrian and bicycle analyses; and graphics | 5 years, landscape design and environmental impact analysis | Landscape Architect |

| Name and Degree | Responsibility | Experience | Professional Discipline |
|---|---|---|---|
| Pat M. Gelb, BS, MS | Urban growth and economic development, and government finance analysis | 13 years, urban and transportation planner | Transportation Planner |
| Jean L. Jenkins, BA, History | Land use plans and natural resource development analysis | 8 years, environmental analysis | Environmental Planner |
| TRYCK, NYMAN & HAYES | | | |
| Frank Nyman, BSCE, MSCE | Member Consultant Executive Committee | Over 40 years, civil engineering | Civil Engineer; P.E., R.L.S. |
| James Lake, BSCE, MSAE | Project Manager for Seward Connector and Elmendorf south approach design | 8 years, project management civil engineering | Civil Engineer; P.E. |
| Robert Culross, BS Geology | Highway Engineer for Seward Connector and Elmendorf south approach design | 21 years, highway design | Geologist; Highway Engineer |
| Denise Bousley, BA, MSW | Public Involvement community planning | 4 years social work and 4 years public relations | Social Work - Community Organization |
| HARDING LAWSON ASSOCIATES | | | |
| Jay M. England, BSCE | Project Director for geotechnical engineering | 25 years, highway, geotechnical, and arctic engineering | Civil - Geotechnical Engineer, P.E., R.L.S. |
| Donald E. Bruggers, MSCE | Project Manager for geotechnical engineering | 7 years, geotechnical engineering | Civil - Geotechnical Engineer; P.E. |
| Mark R. Musial, MSCE | Project Engineer for geotechnical engineering | 3 years, geotechnical engineering | Geotechnical Engineer |

| Name and Degree | Responsibility | Experience | Professional Discipline |
|---|---|---|---|
| J. P. Singh, Ph D, Civil Engineering | Principal Engineer for earthquake engineering and site-response analysis | 17 years, soil mechanics, soil dynamics, earthquake engineering, and engineering seismology | Civil - Geotechnical Engineer; P.E. |
| **DAMES AND MOORE** | | | |
| John Morsell, MS | Natural environment studies; ecological impact analysis | 16 years, biological research, impact analysis, mitigation planning | Northern Regions Ecologist |
| Alex W. Bealer, BS Mathematics, MS Atmospheric Science | Air quality impact modeling and analysis | 10 years, air quality impact modeling | Meteorologist |
| **BOLT BERANEK & NEWMAN** | | | |
| Myles Simpson, BS Physics, MS Physics | Measurements of existing sound levels, sound level prediction calculations, noise impact analysis | 16 years, noise analysis and control | Noise Specialist |
| **CULTURAL RESOURCE CONSULTANTS** | | | |
| M. Yarborough, MA | Archeological identification and impact analysis | 9 years, inventory and analysis of archeological sites | Archeologist |
| Linda Yarborough, MA | Archeological identification and impact analysis | 9 years, inventory and analysis of archeological sites | Anthropologist |

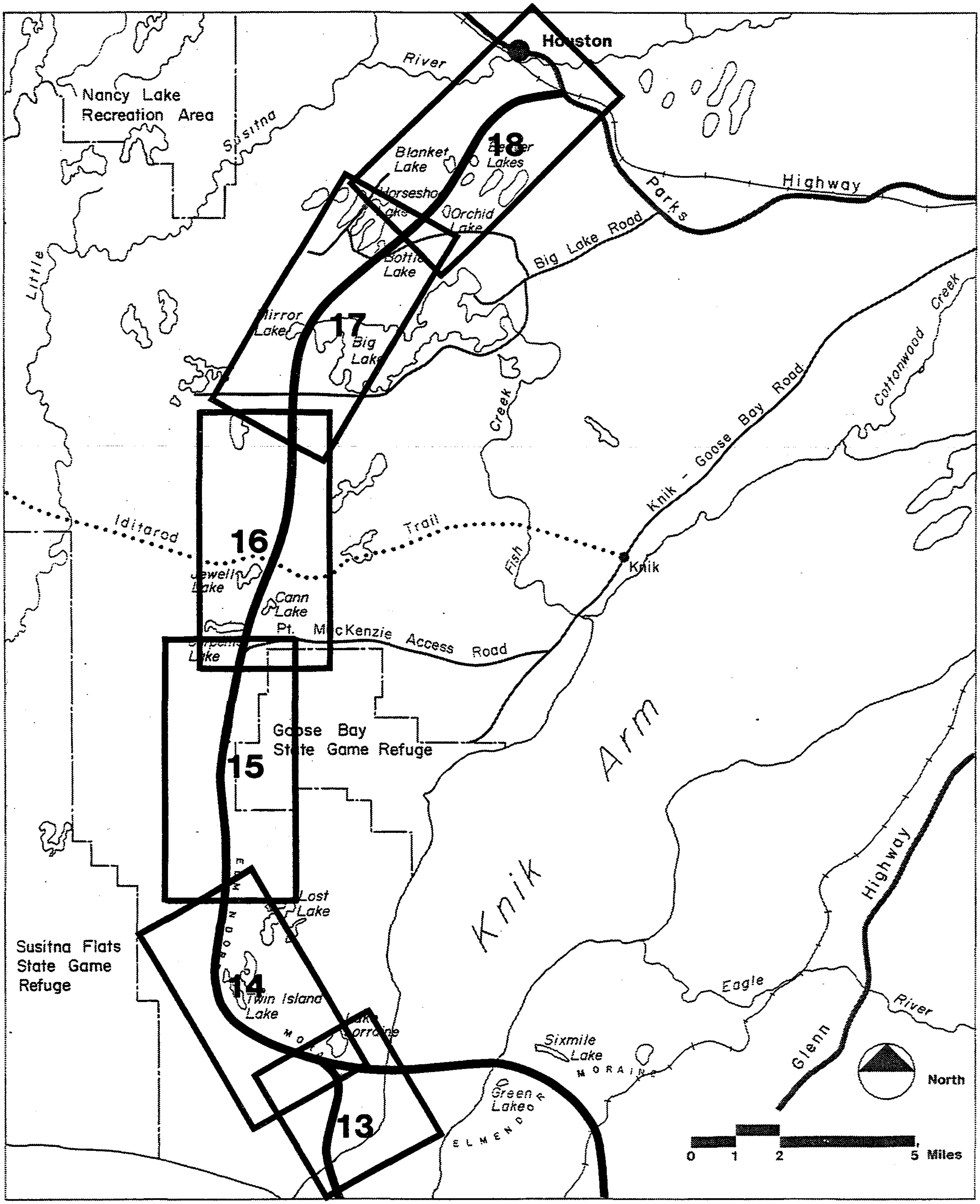
| Name and Degree | Responsibility | Experience | Professional Discipline |
|---|---|---|---|
| OTHERS | | | |
| Patrick L. Burden, BS Business Administration, MS Economic Geography | Economic development analysis | 14 years, economics | Economist |
| Neil S. Mayer, BA Economics, Ph D Economics | Housing market analysis and economic development analysis methods | 9 years, economics | Economist |

# Appendix A
# Engineering Drawings

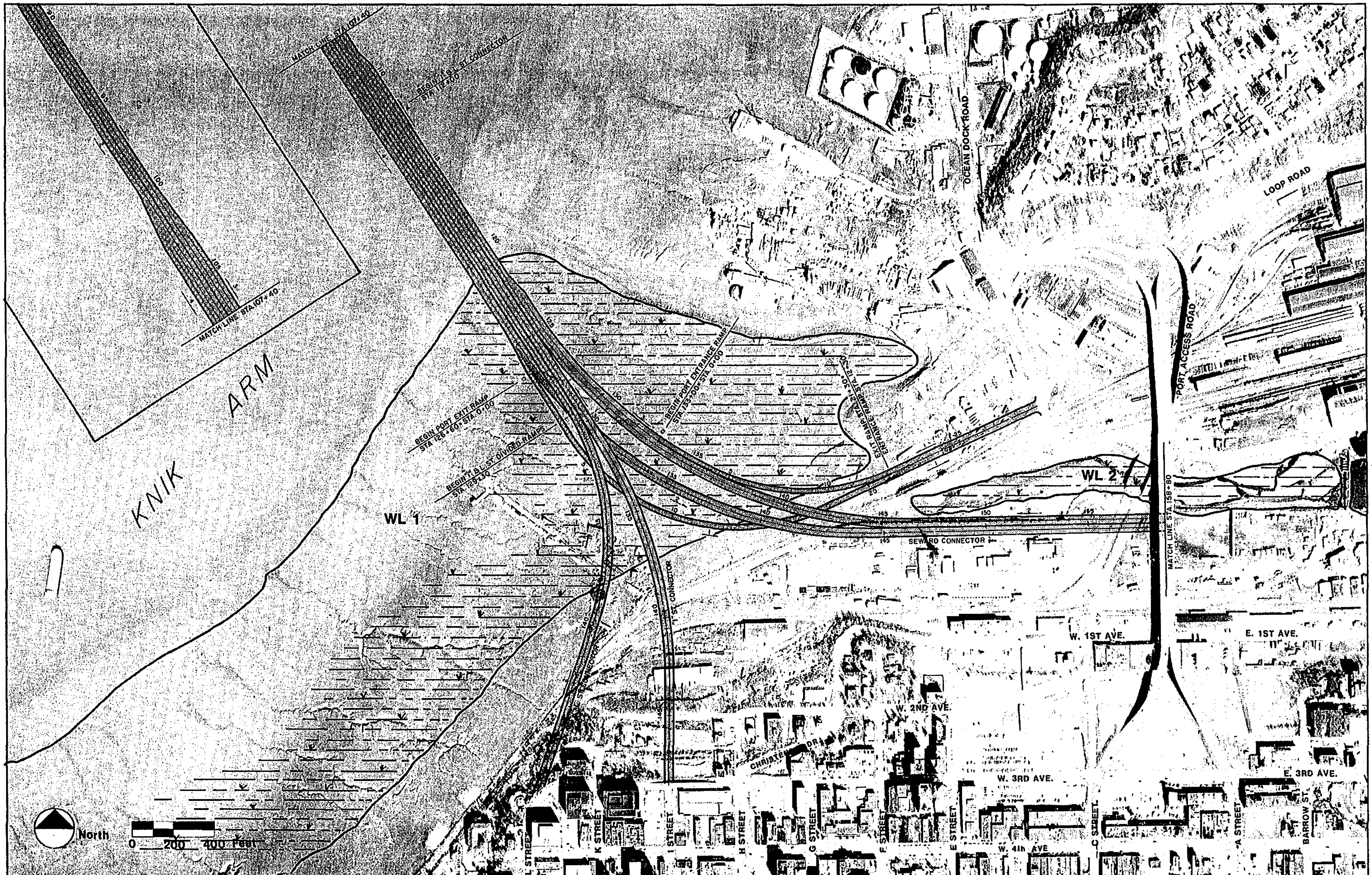



**Note: Plates 5 to 8 contain profiles of plans found in Plates 1 to 4.**

## Index to Plates

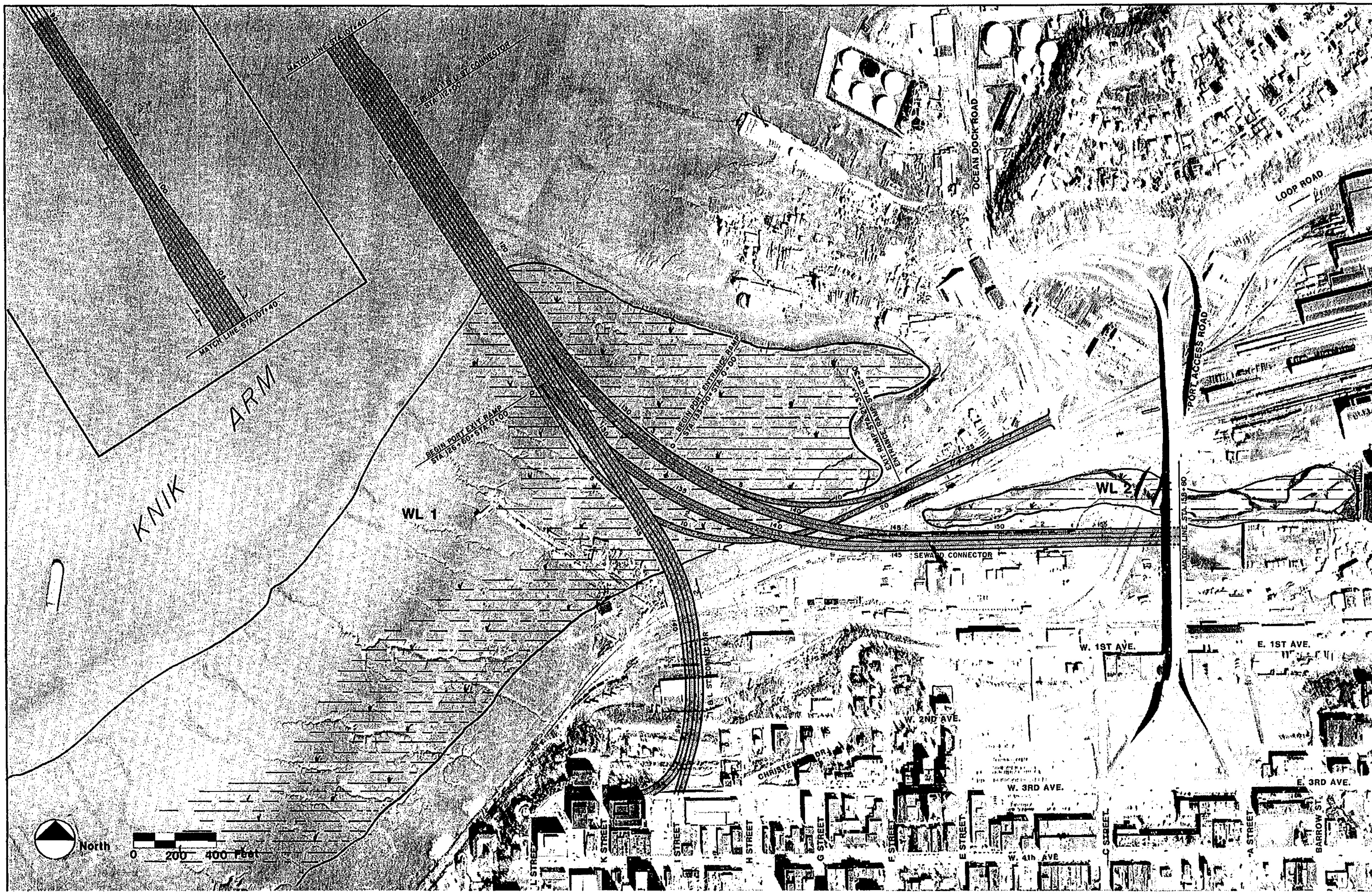



**Index to Plates**



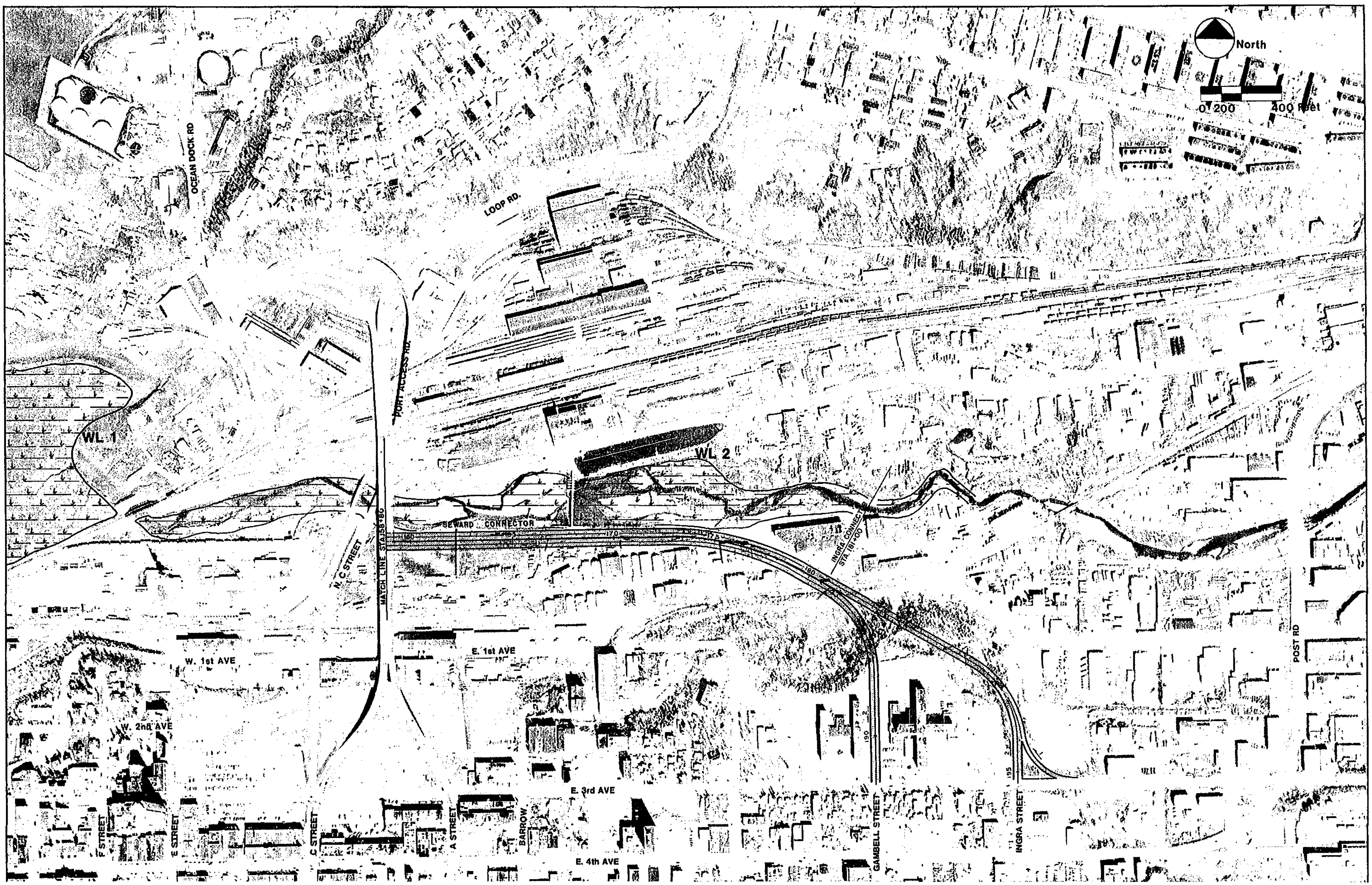

KNIK ARM CROSSING

Plate 1
Downtown Crossing & Seward Connector
(with L Street Southbound Ramp)



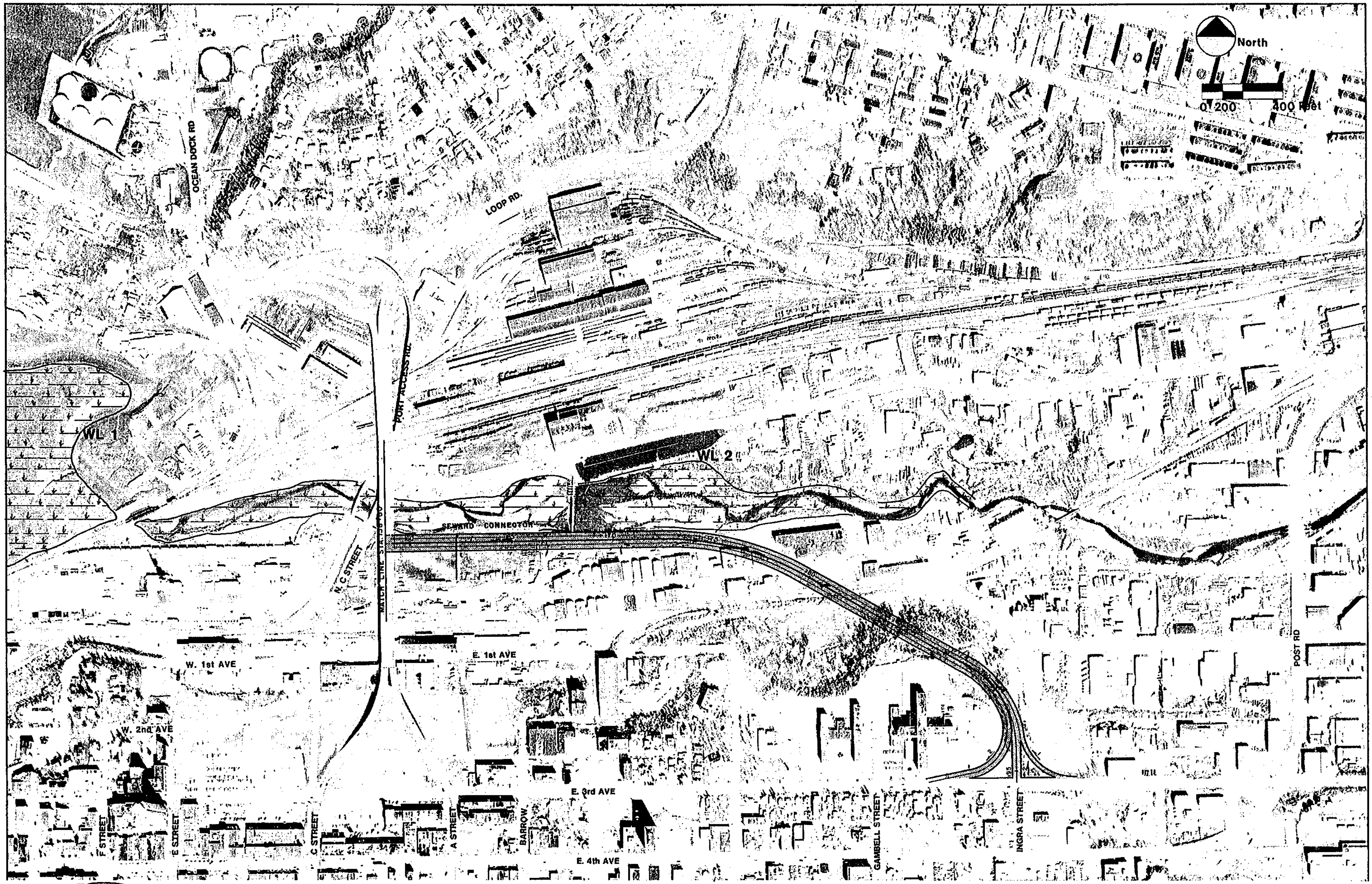

KNIK ARM CROSSING

**Plate 2**
**Downtown Crossing & Seward Connector (with I Street Southbound Ramp)**



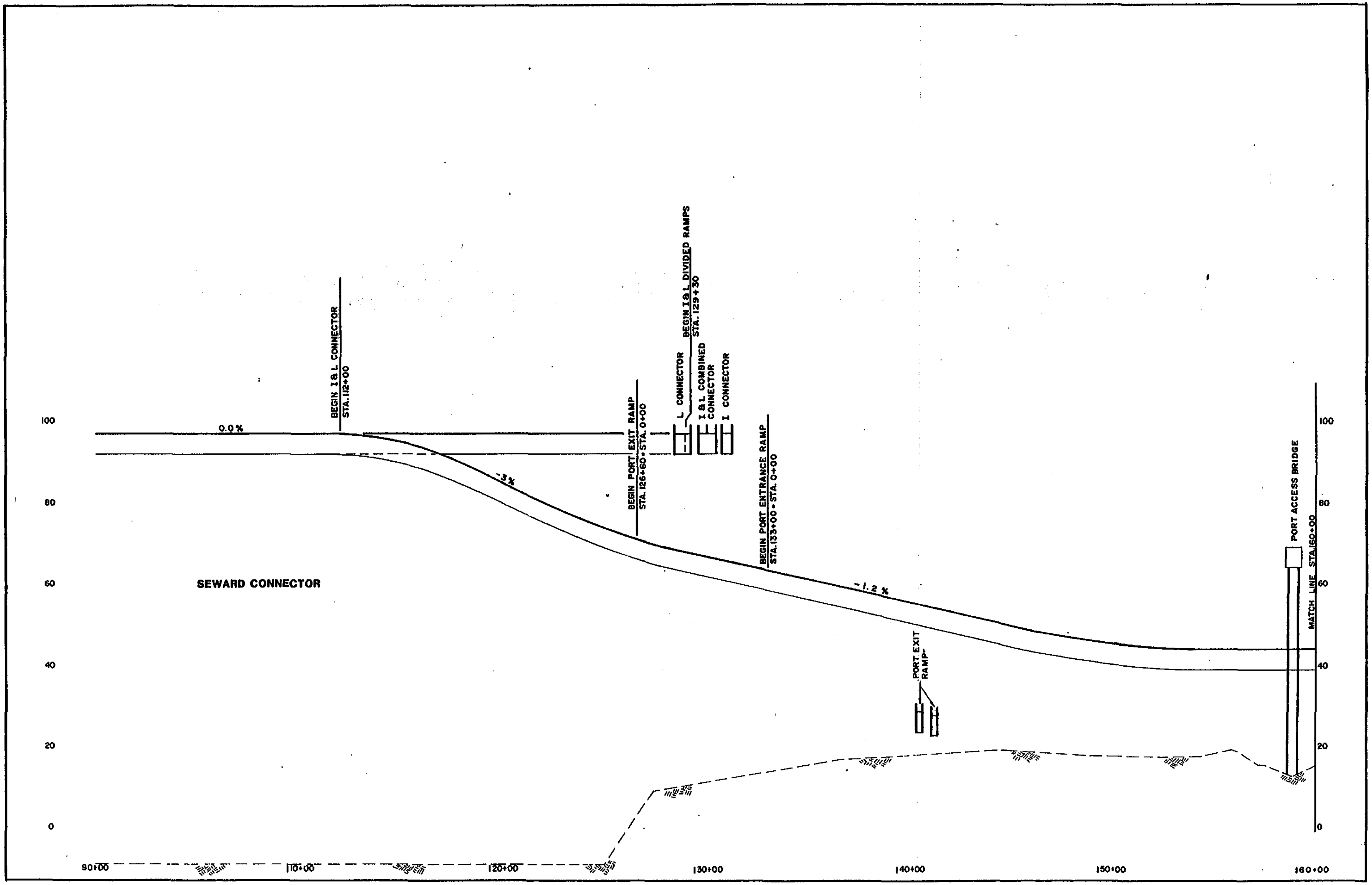

KNIK ARM CROSSING

Plate 3
Seward Connector
(with Gambell Street Southbound Ramp)




KNIK ARM CROSSING

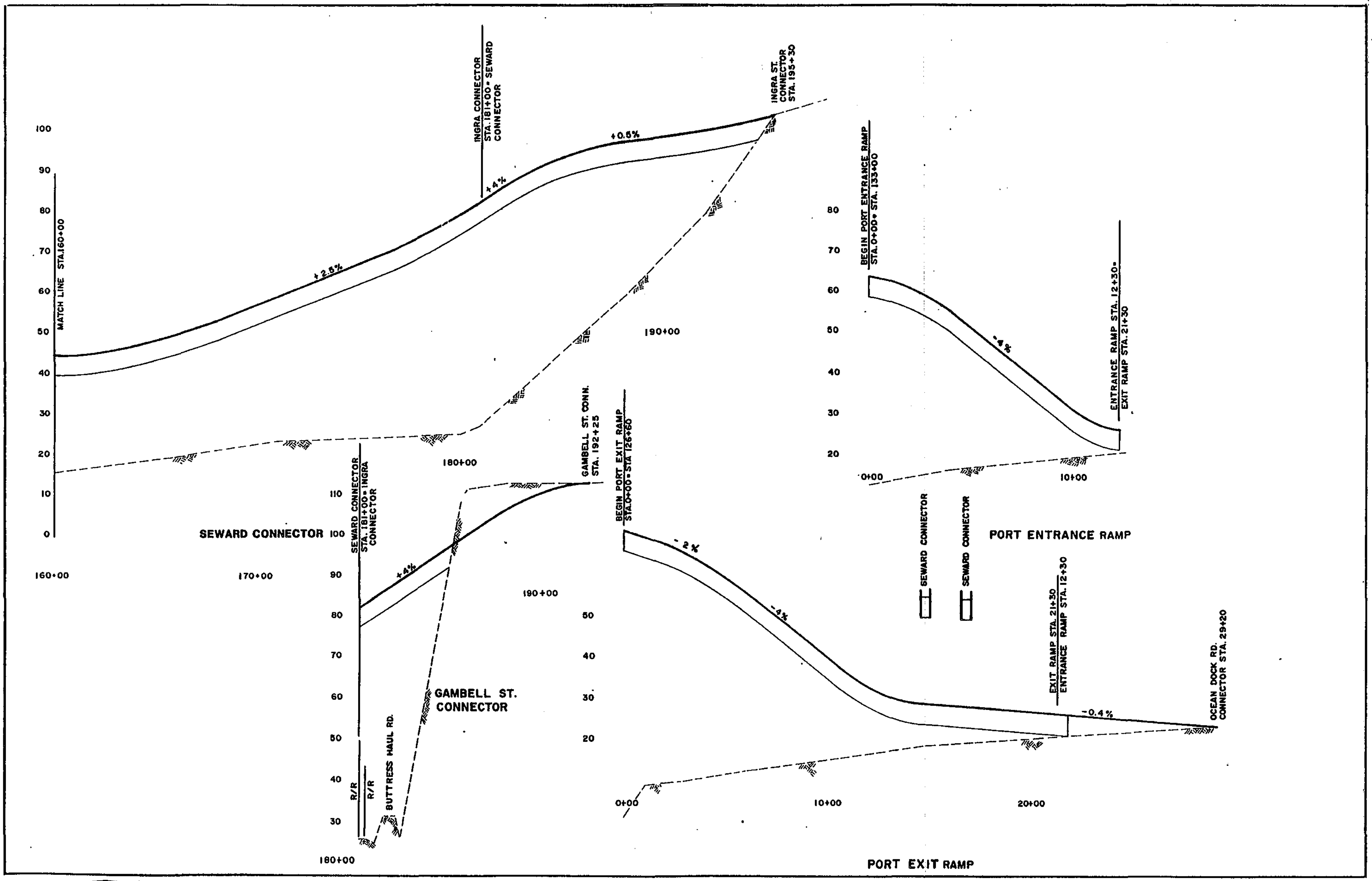
Plate 4
Seward Connector
(with Ingra Street Southbound Ramp)




**KNIK ARM CROSSING**

**Plate 5**

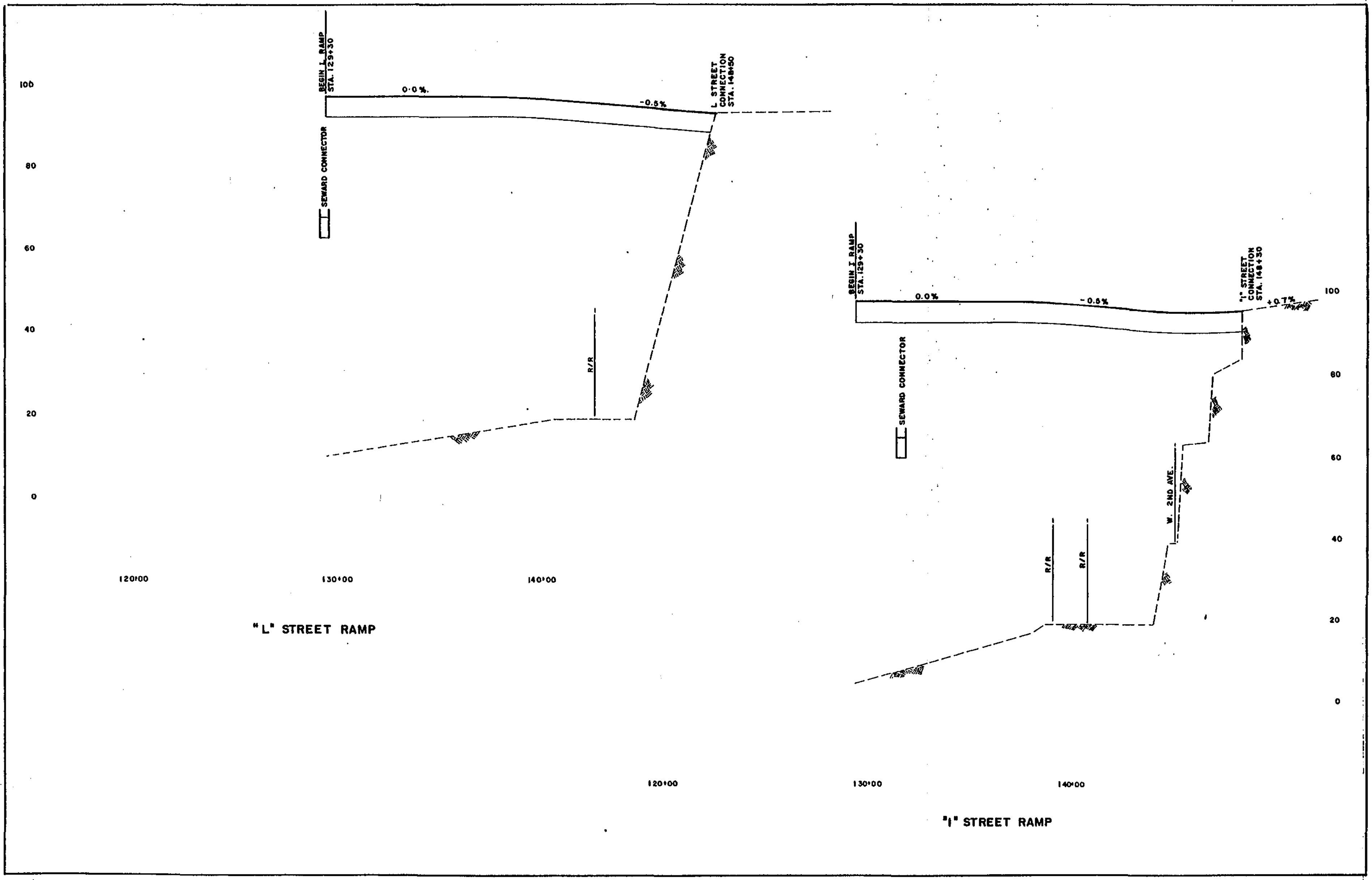
**Seward Connector Profile**




KNIK ARM CROSSING

Plate 6

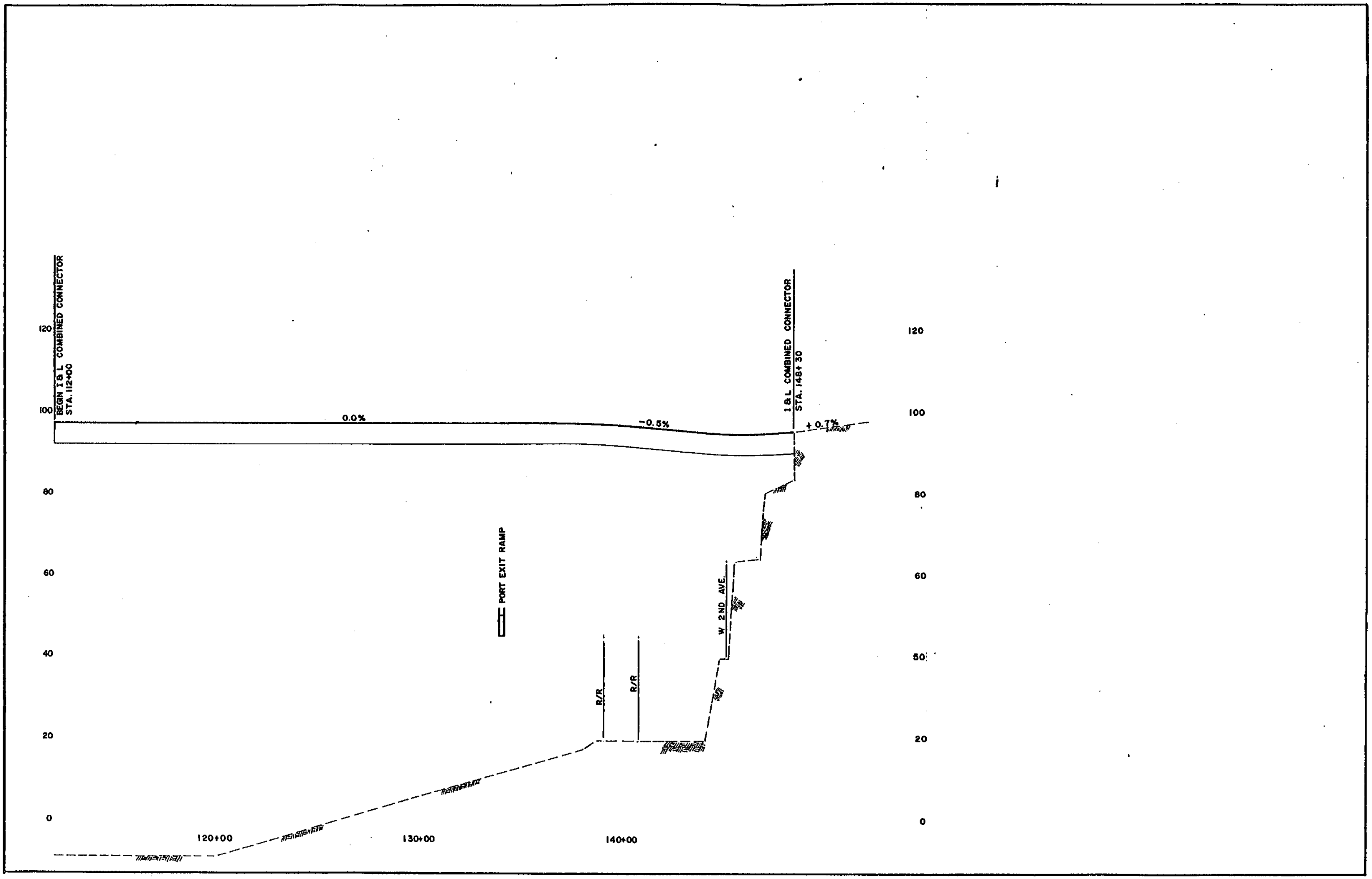
**Seward Connector Profile**




KNIK ARM CROSSING

Plate 7

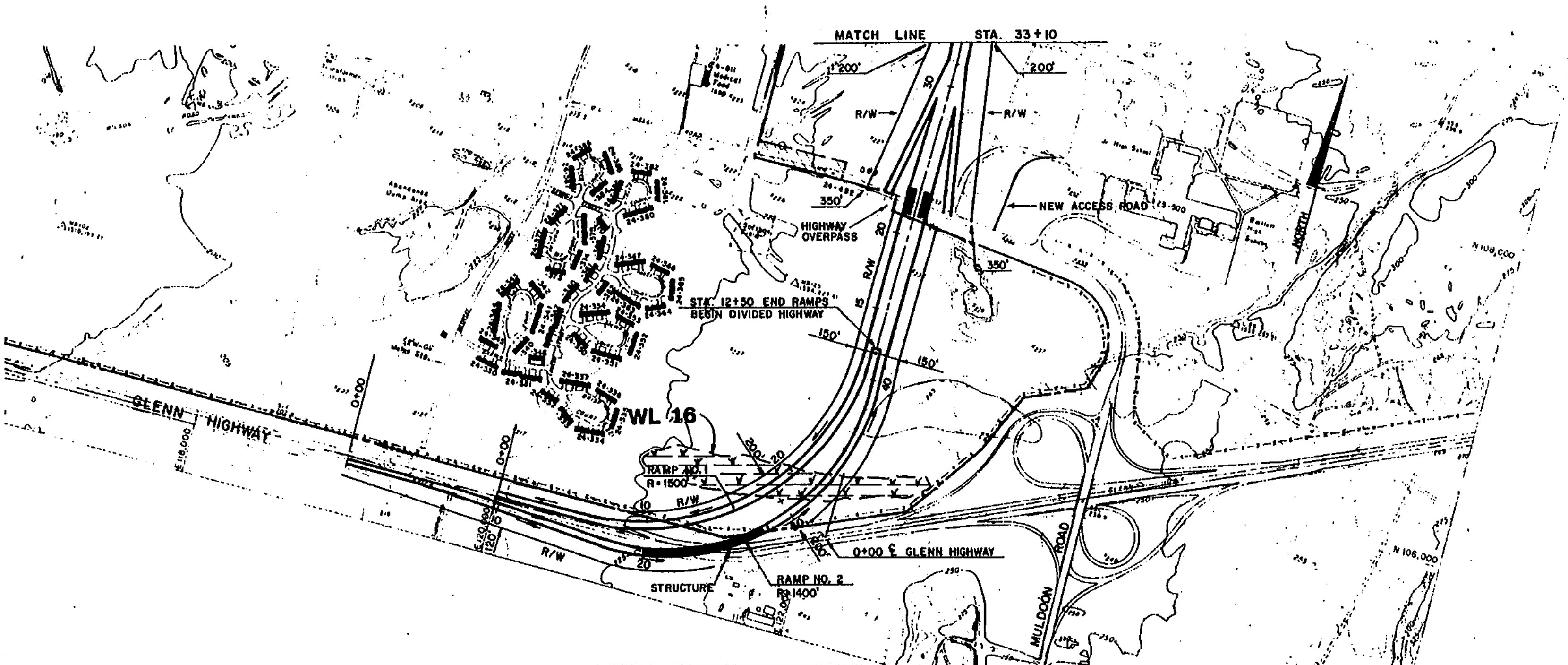
L Street Southbound and I Street Northbound Ramp Profile

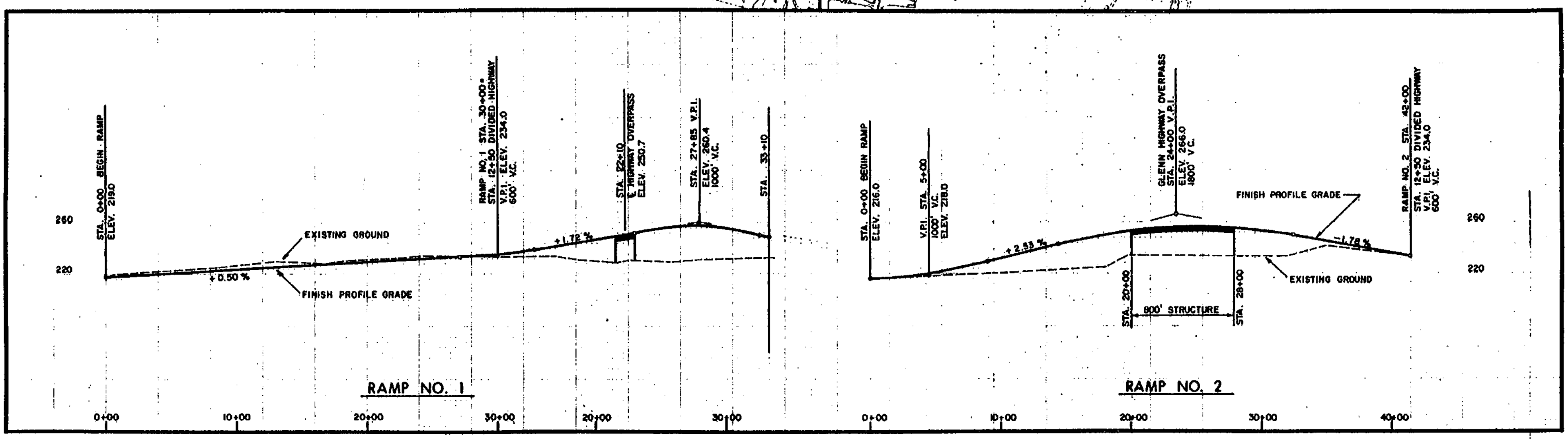



KNIK ARM CROSSING

Plate 8

**I Street Southbound and Northbound Ramp Profile**

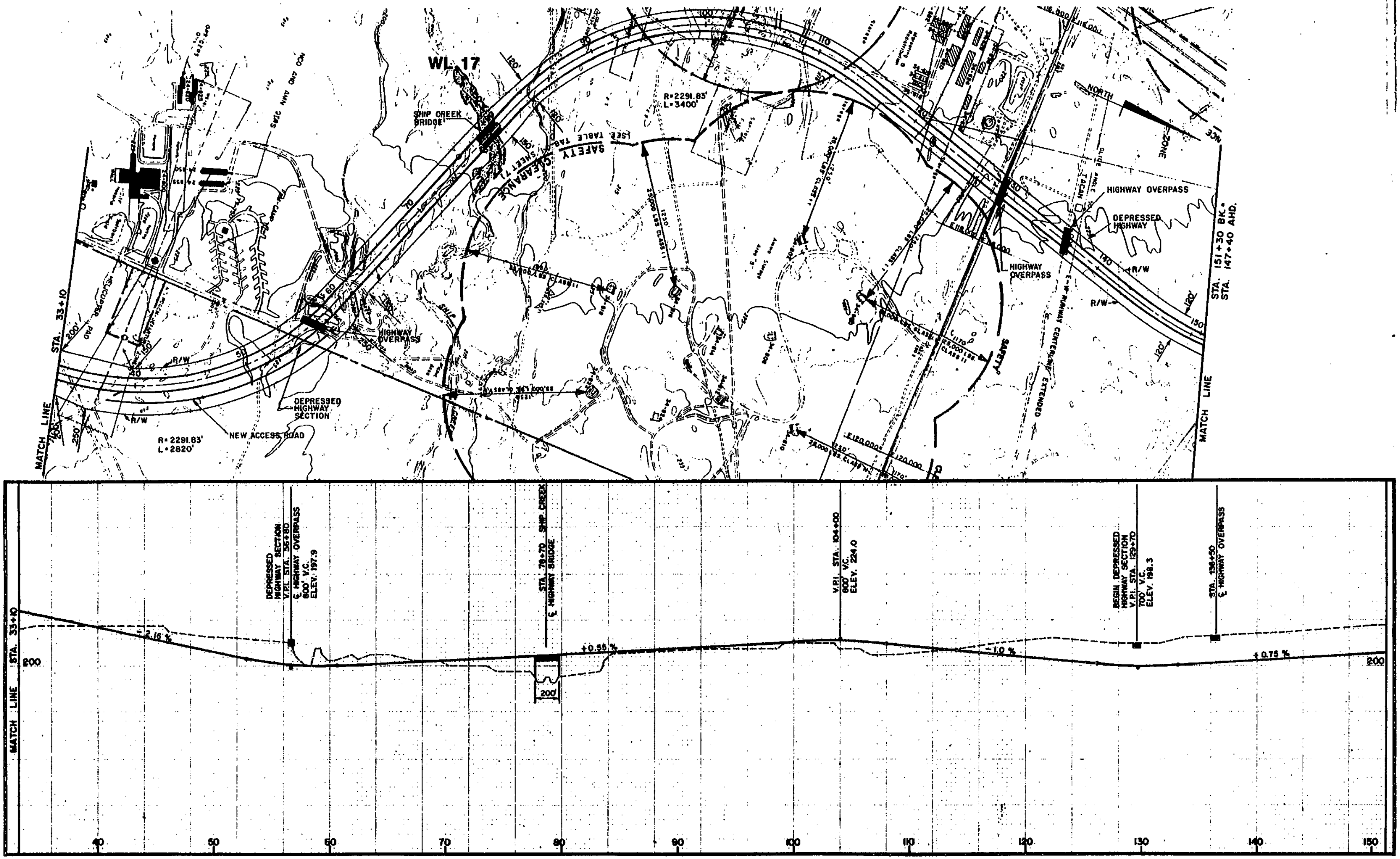



**KNIK ARM CROSSING**

**Plate 9**

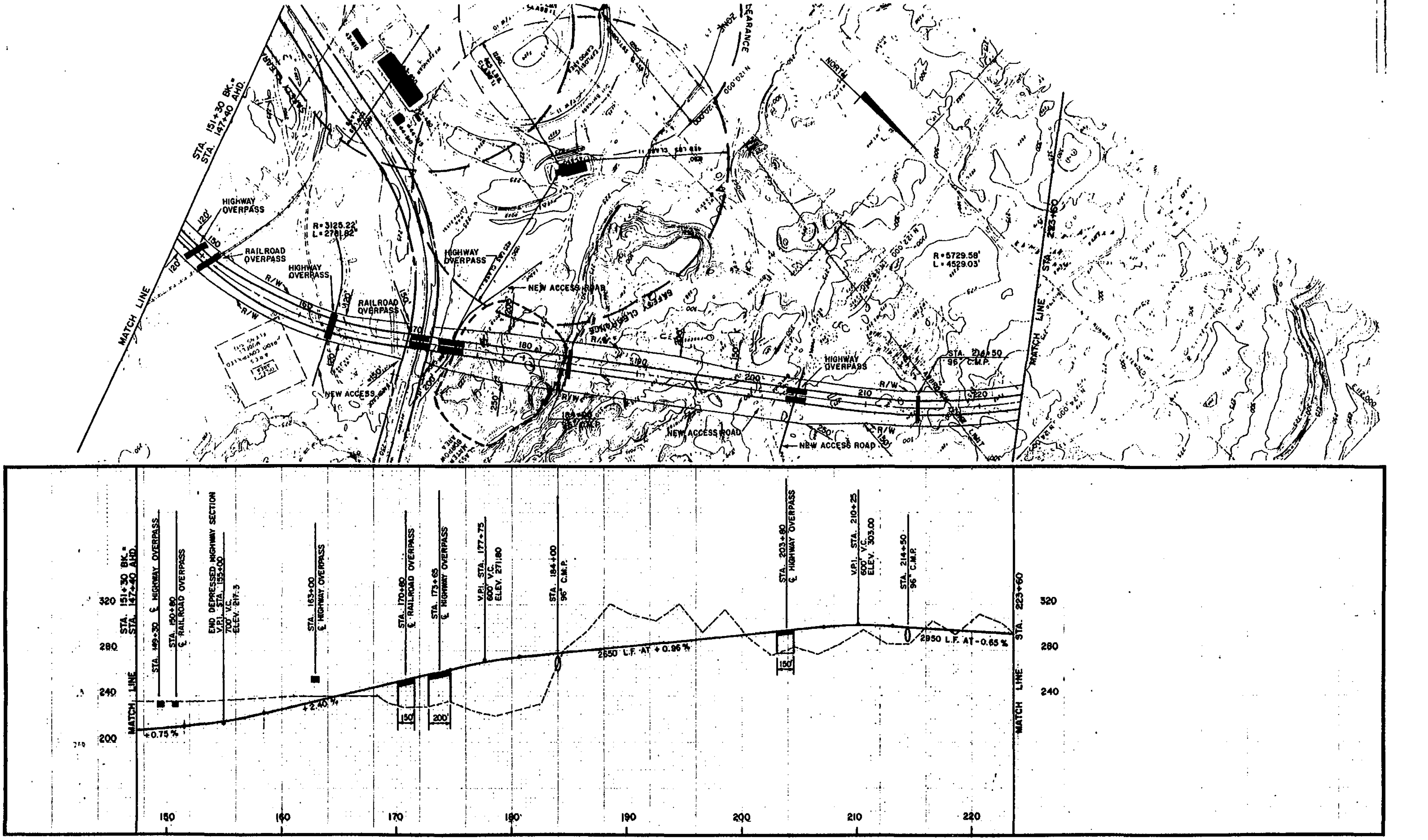
**Elmendorf Crossing**




KNIK ARM CROSSING

Plate 10

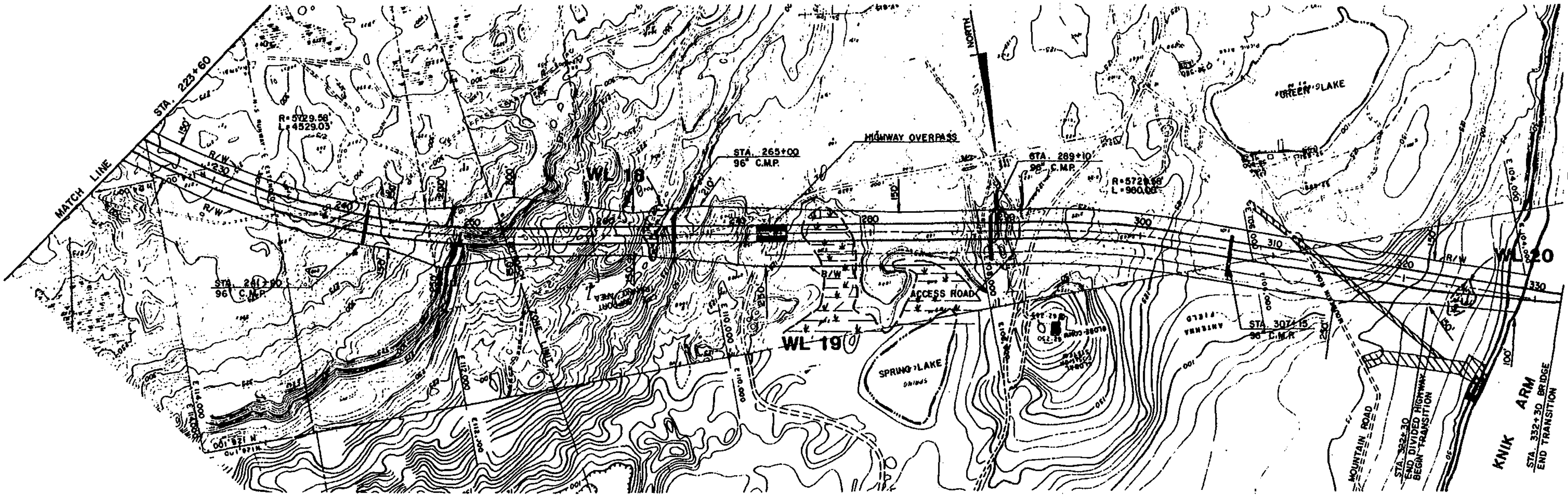
Elmendorf Crossing

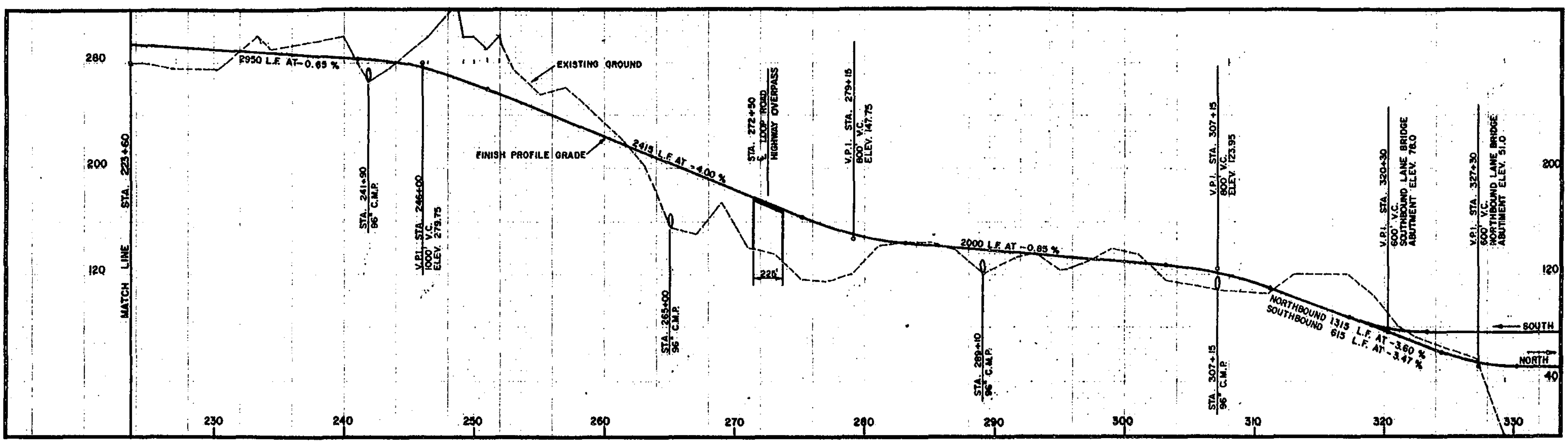



KNIK ARM CROSSING

**Plate 11**

**Elmendorf Crossing**

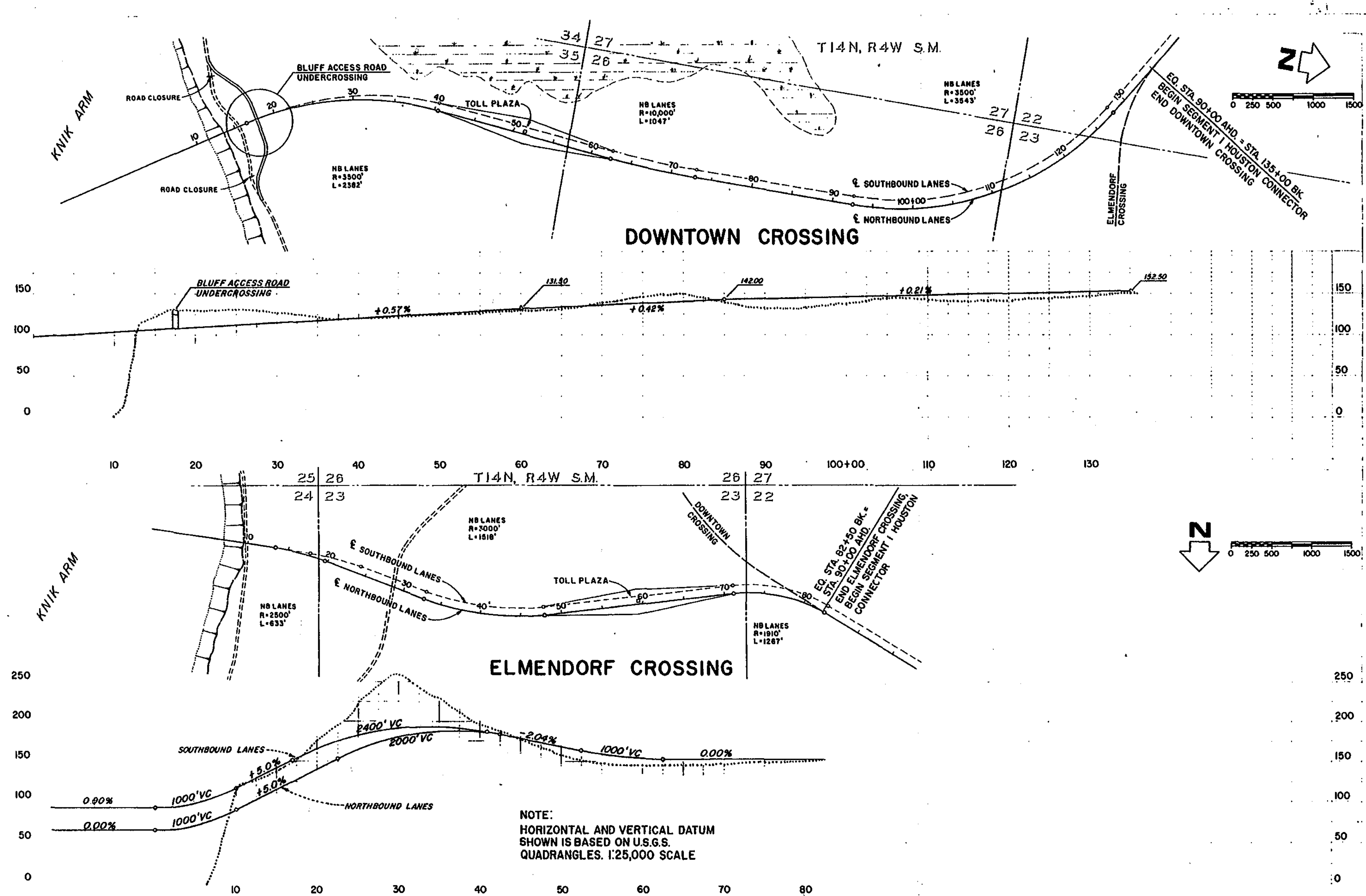



KNIK ARM CROSSING

**Plate 12**

## Elmendorf Crossing

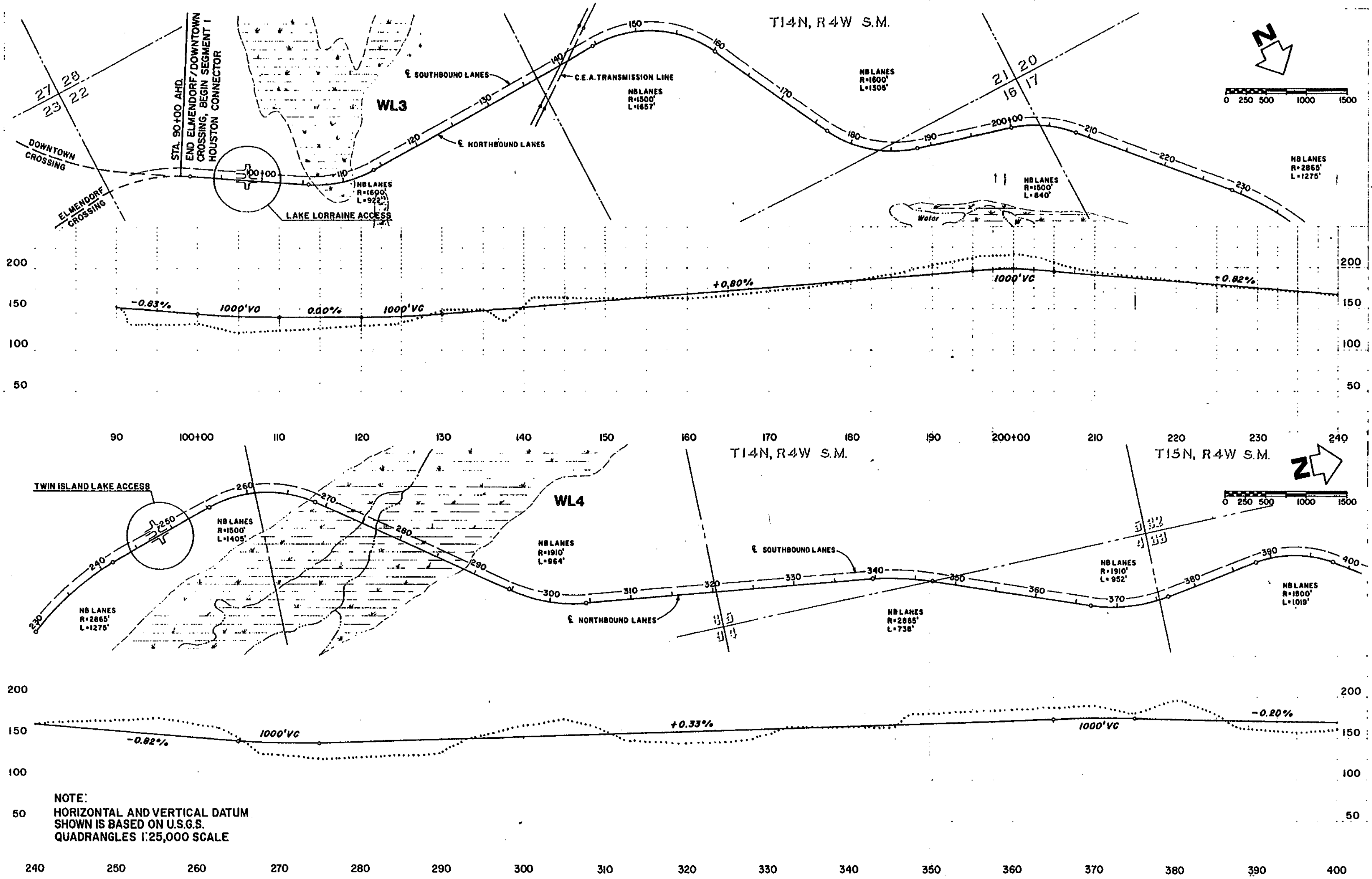



NOTE:
HORIZONTAL AND VERTICAL DATUM SHOWN IS BASED ON U.S.G.S. QUADRANGLES. 1:25,000 SCALE

KNIK ARM CROSSING

**Plate 13**

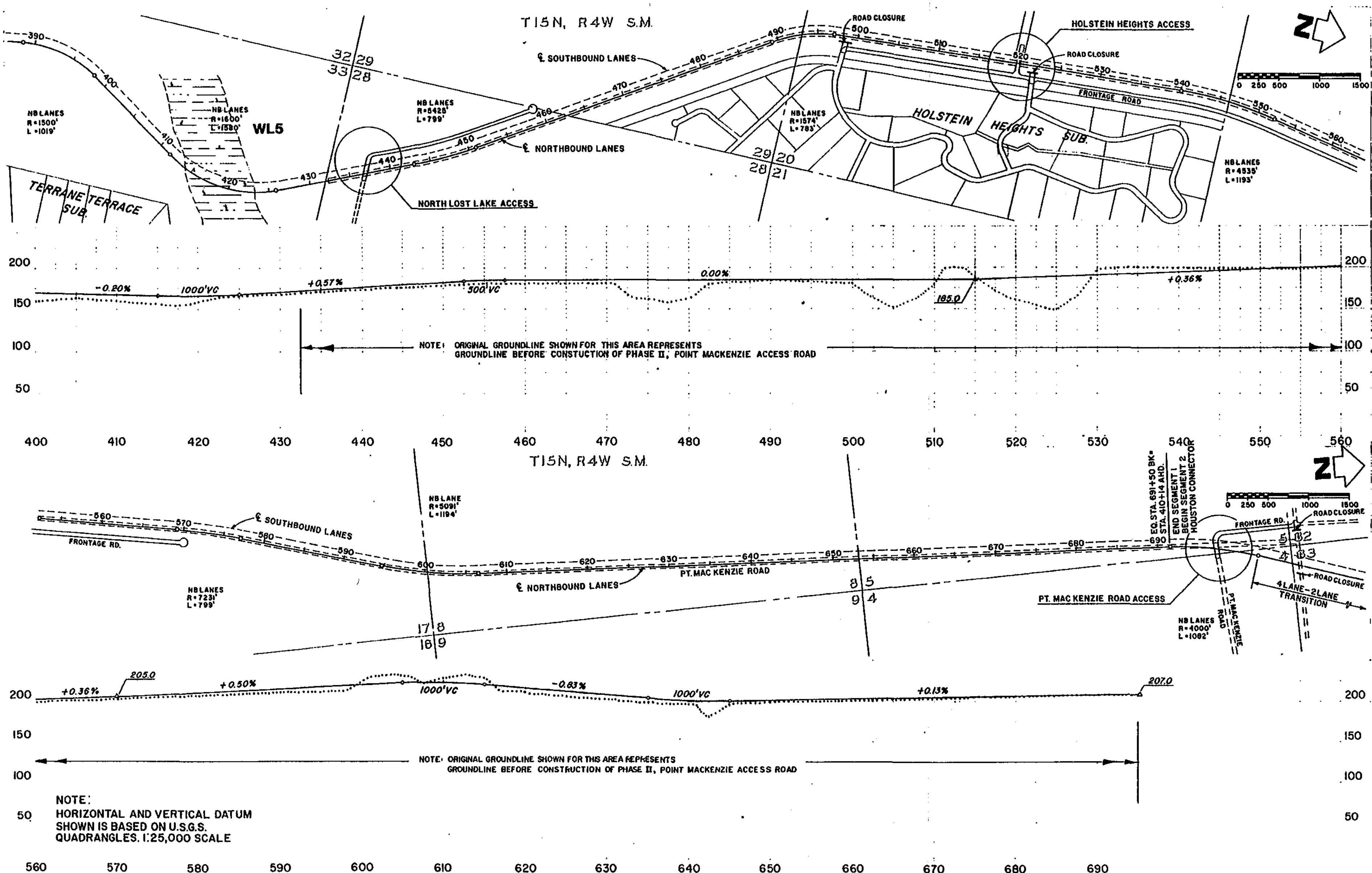
**Downtown / Elmendorf Crossing**




**KNIK ARM CROSSING**

## Plate 14

## Houston Connector Segment 1

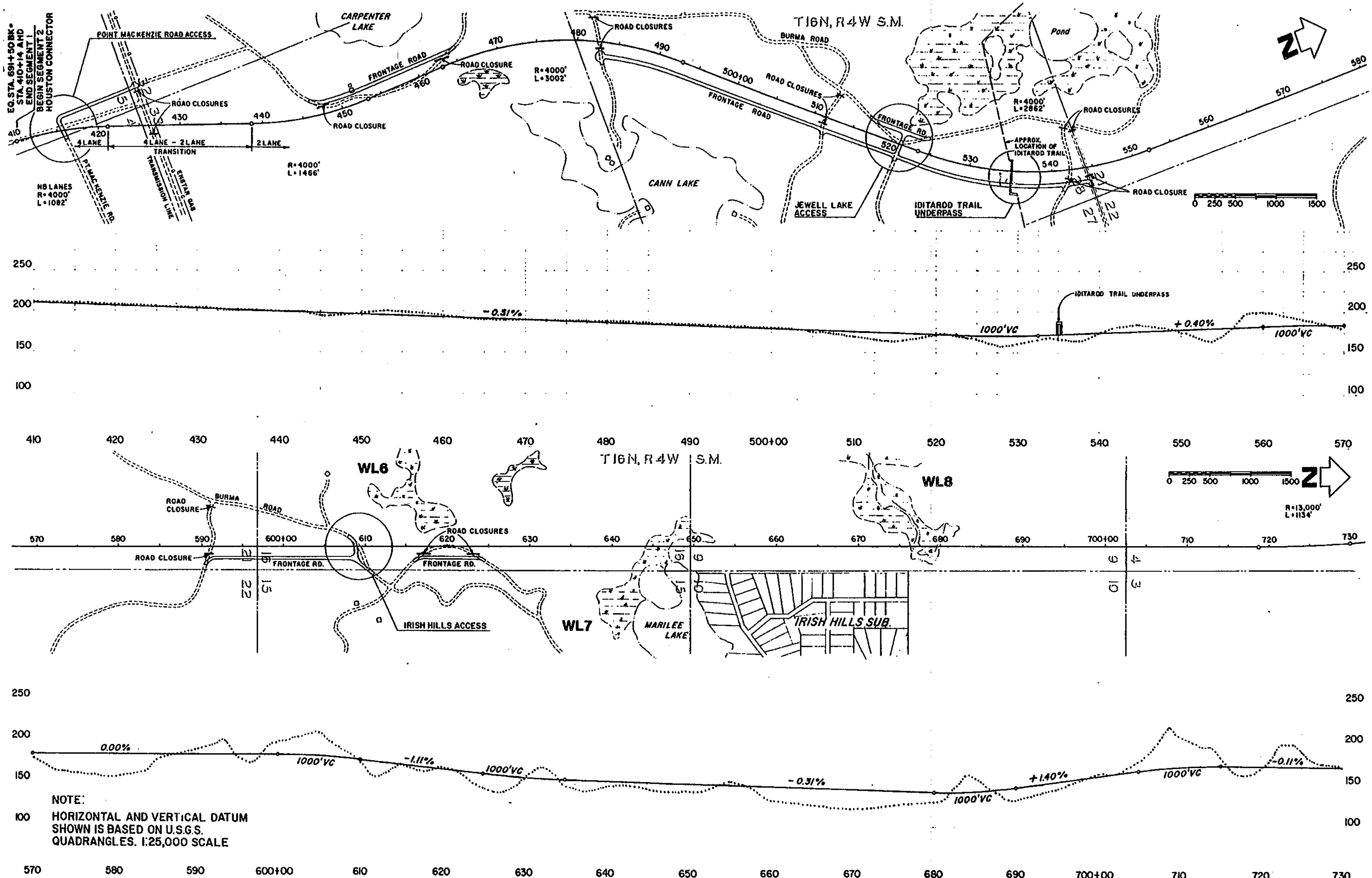



NOTE:
HORIZONTAL AND VERTICAL DATUM SHOWN IS BASED ON U.S.G.S. QUADRANGLES. 1:25,000 SCALE

KNIK ARM CROSSING

**Plate 15**

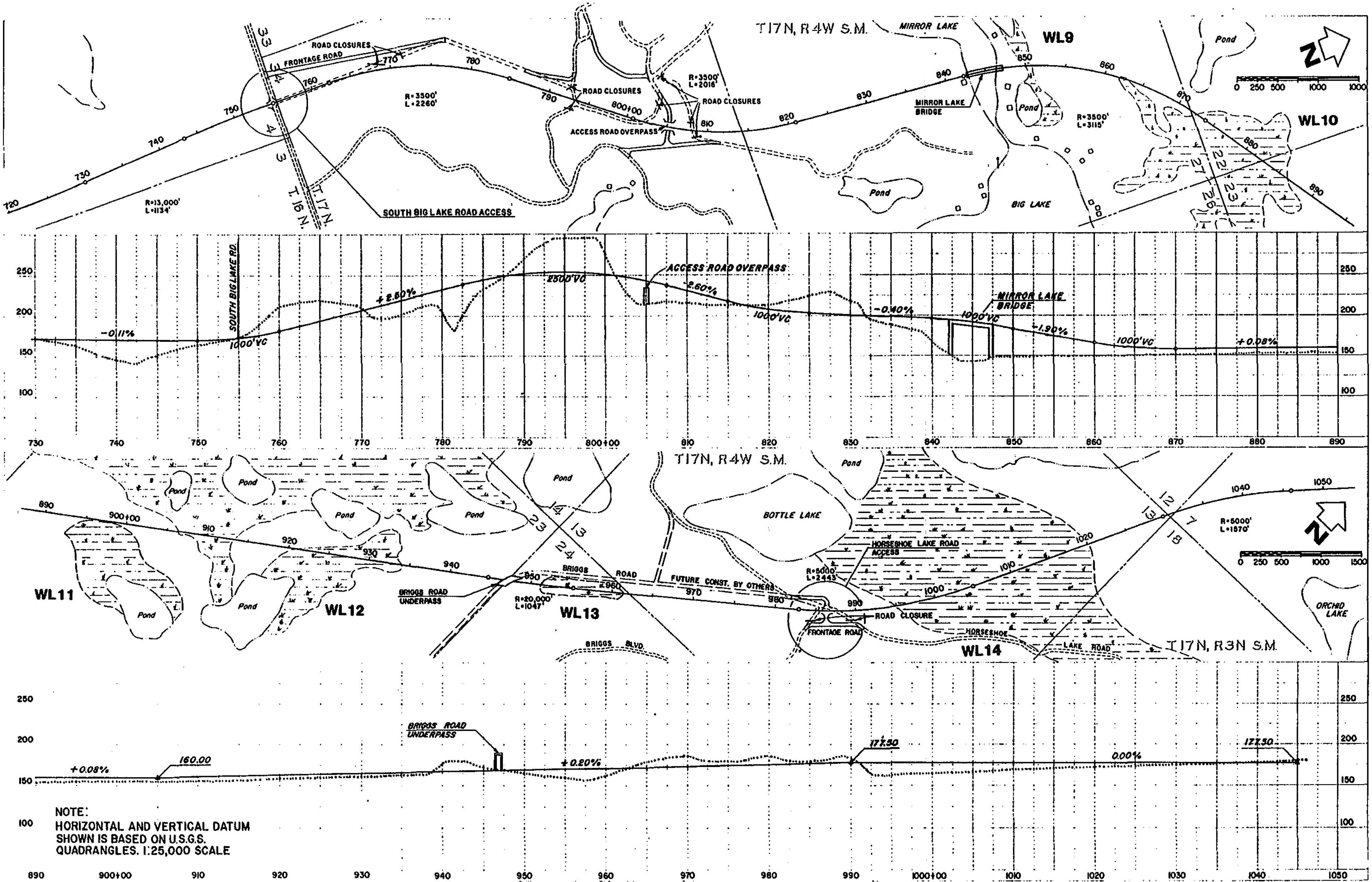
**Houston Connector Segment 1**




KNIK ARM CROSSING

**Plate 16**

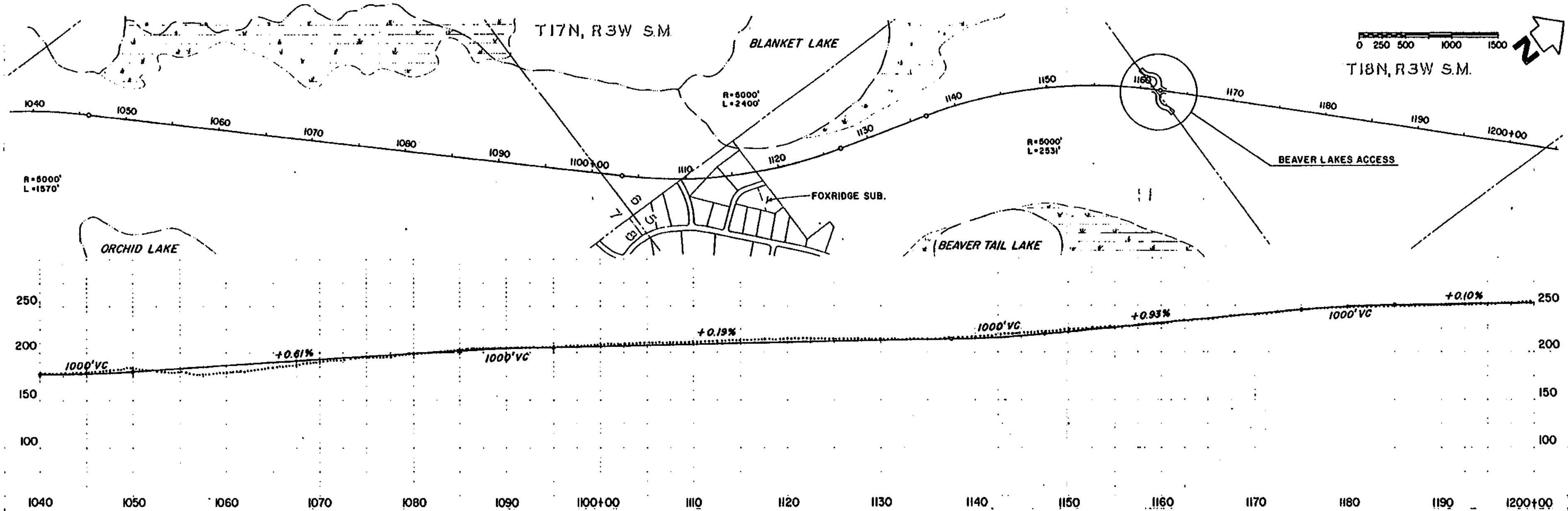
**Houston Connector Segment 2**

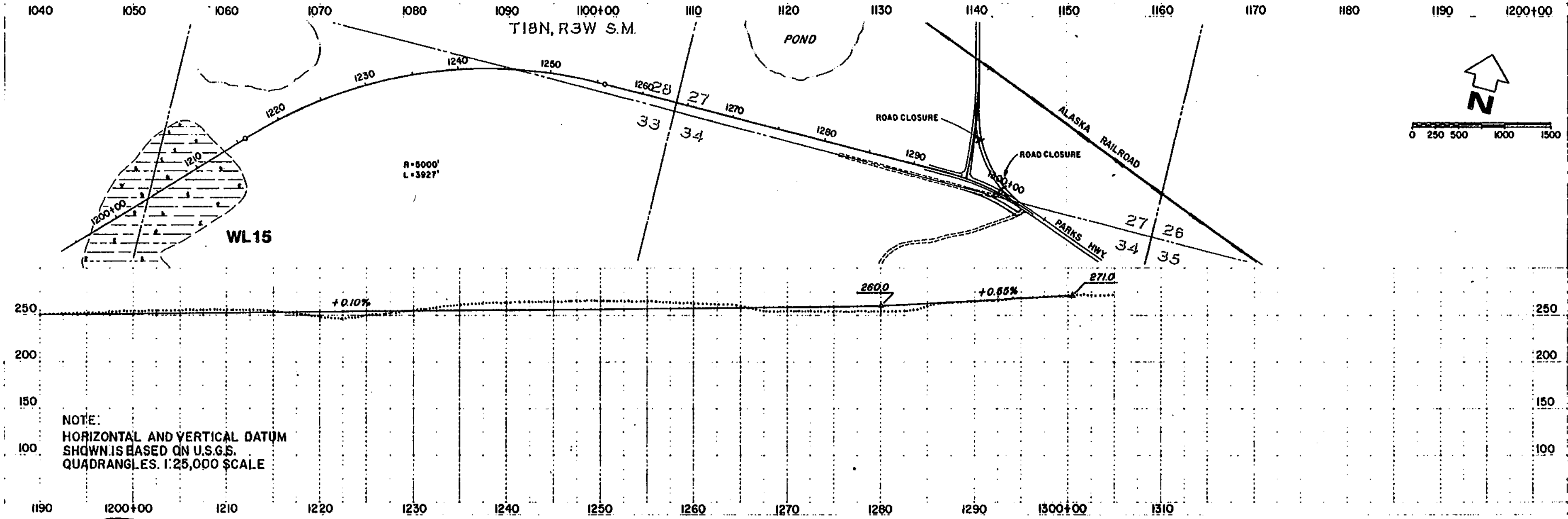



KNIK ARM CROSSING

Plate 17

**Houston Connector Segment 2**




**KNIK ARM CROSSING**

**Plate 18**
**Houston Connector Segment 2**

# Appendix B
# Wetlands Report

## Appendix B

## WETLANDS REPORT

Executive Order 11990, "Protection of Wetlands", requires Federal agencies "... to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative...." This appendix examines the direct wetlands impact that would occur with the various alternatives under consideration. The information in this appendix will provide the basis for a "Wetlands Findings Report" to be included in the Final EIS after a preferred alternative has been selected.

### A. GENERAL WETLANDS DESCRIPTION

Wetland areas crossed by, or immediately adjacent to Crossing Alternatives are shown and numbered on the drawings in Appendix A. Table B-1 provides wetland type for each numbered area. Wetland types are from Cowardin et. al. (1979) and are consistent with those used in the National Wetlands Inventory Program. Wetland types affected by the No-Crossing Alternatives also are described in Table B-1.

### B. DOWNTOWN PROJECT

#### Seward Connector

The Seward Connector, an elevated roadway, would conflict with two wetland areas. The intertidal mudflats (wetland 1) that would be traversed by the west end of the connector are relatively unproductive. They are bare of vegetation except algal growth in summer and intertidal invertebrates are sparse (Bakus et. al., 1979). Dabbling ducks and gulls feed in the algal zone during summer and late fall. These mudflats are classed in the "Conservation" category in the Municipality of Anchorage Wetland Plan. The other wetland area (wetland 2) that would be adjacent to the Seward Connector (but not directly affected) consists of riparian (riverine) habitat along Ship Creek. The vegetation within these wetlands serves the important function of maintaining stream bank stability and preventing erosion. Some filtration of urban runoff probably also occurs thus helping to prevent pollution of Ship Creek. Wildlife values along lower Ship Creek are limited because of the urban setting. The Ship Creek wetlands near the Seward Connector are classed in either the "Conservation" or the "Preservation" categories in the Municipal Wetland Plan depending on location.

The primary mitigation measure which would be employed to protect the above wetland areas would be the use of elevated roadway. Thus, most long-term impact would be avoided. Shading of the mudflat could reduce primary productivity under the road and therefore reduce waterfowl use in a very small area. Activities would be monitored to prevent disturbance of the Ship Creek riverine wetland during construction of the overhead structure.

Table B-1

WETLAND AREAS AFFECTED

| Alternative | Wetland Number or Location | Wetland Type(s) (as per Cowardin et al. 1979) | Approximate Surface Area That Would be Altered (acres) | SCS Code | USFWS Code |
|---|---|---|---|---|---|
| Downtown Project | | | | | |
| Seward Connector | 1 | Intertidal mudflat and intertidal emergent persistent | 18.7 | 12/13/14 | E2EM1/ E2FL3 |
| | 2 | Upper perennial riverine | no direct impact | 21 | R3UB1 |
| Houston Connector including Crossing north approach | 3 | Forested needle-leaved evergreen | 2.9 | 1 | PF04 |
| | 4 | Scrub-shrub broad-leaved deciduous with subdominant emergent persistent | 19.3 | 5/6 | PSS1/PEM1 |
| | 5 | Same as 4 | 3.9 | 5/6 | PSS1/PEM1 |
| | 6 | Same as 4 | 1.0 | 5/6 | PSS1/PEM1 |
| | 7 | Same as 4 | 2.1 | 5/6 | PSS1/PEM1 |
| | 8 | Same as 4 | 3.8 | 5/6 | PSS1/PEM1 |
| | 9 | Same as 4 | 1.0 | 5/6 | PSS1/PEM1 |
| | 10 | Same as 4 | 18.6 | 5/6 | PSS1/PEM1 |
| | 11 | Same as 4 | 1.6 | 5/6 | PSS1/PEM1 |
| | 12 | Same as 4 | 18.6 | 5/6 | PSS1/PEM1 |
| | 13 | Same as 4 | 2.9 | 5/6 | PSS1/PEM1 |
| | 14 | Same as 4 | 22.3 | 5/6 | PSS1/PEM1 |
| | 15 | Scrub-shrub needle-leaved evergreen | 17.5 | 4 | PSS4 |
| TOTAL | | | 134.2 | | |
| Elmendorf Project | | | | | |
| Elmendorf Crossing (south approach) | 16 | Forested needle-leaved evergreen | 3.5 | 1 | PF04 |
| | 17 | Upper perennial riverine | 1.4 | 21 | R3UB1 |
| | 18 | Scrub-shrub broad-leaved deciduous | 0.7 | 5 | PSS1 |
| | 19 | Scrub-shrub broad-leaved deciduous with subdominant emergent persistent | 2.1 | 5/6 | PSS1/ PEM1 |
| | 20 | Emergent persistent | 0.7 | 6 | PEM1 |
| Houston Connector | see above | --- | 115.5 | - | - |
| TOTAL | | | 123.9 | | |
| Glenn/Parks Improvement | Eklutna Flats and Palmer Hay Flats | Scrub-shrub broad-leaved deciduous with subdominant emergent persistent | 35.4 | 5/6 | PSS1/ PEMI |
| TOTAL | | | 35.4 | | |
| Hovercraft | | | | | |
| Terminal Facilities | Near Port of Anchorage | Intertidal mudflat and intertidal emergent persistent | 5.0 | 12/13/14 | E2EM1/ E2FL3 |
| | Point MacKenzie Shoreline | Intertidal mudflat | 5.0 | 14 | E2FL3 |
| Houston Connector | see above | | 115.5 | - | |
| TOTAL | | | 125.5 | | |

NOTES: SCS signifies U.S. Soil Conservation Service.
USFWS signifies U.S. Fish & Wildlife Service.

## Houston Connector

The Houston Connector would be designed as a conventional roadway and would cross about 13 separate wetland areas of varying size (see Appendix A). Twelve of the 13 wetland areas (numbers 4 to 15) have been classed by the National Wetland Inventory Program as being dominated by the scrub-shrub wetland type with the emergent persistent type as subdominant. In reality, these two types intergrade and are hard to separate. The scrub-shrub and emergent wetland types are very common in the Willow Sub-basin, covering 15.8 percent of the total area or 153,850 acres (U.S. Department of Agriculture et. al., October 1981). Taken as a whole, these wetlands perform numerous important functions including:

- Storage of huge quantities of water, thus moderating stream flow and flooding potential
- Groundwater recharge
- Nutrient cycling - Chemical reactions that occur within the wetland environment may affect water quality and have regional ecological implications. The relatively high rate of decay that occurs within the organic matter underlying this type of wetland may accelerate the exchange of materials between water and sediment and thus release nutrients into the waters of the area
- Primary productivity - Although less productive than other kinds of wetland communities, these interior muskeg wetlands contribute substantial organic matter to the ecosystem
- Wildlife habitat - These wetlands provide important feeding habitat for moose and breeding habitat for muskeg nesting birds (see Chapter III, "Biological Resources")

Wetland 3 is the forested needle-leaved evergreen type (black spruce muskeg). The importance of this type is similar to that described for the scrub-shrub except that productivity is probably lower and wildlife values somewhat less. This type grades into the scrub-shrub type as soil moisture increases. The Willow Sub-basin contains 21,450 acres of this wetland type (2.2 percent).

Although on an areawide basis the scrub-shrub/emergent and forested wetlands are important, the actual area of wetland that would be affected by Houston Connector right-of-way would be very small relative to the total area of this type of wetland in the Willow Sub-basin, about 0.06 percent. The primary mitigation measure available to mitigate wetland impacts, avoidance in alignment planning, already has been employed. The Houston Connector alignment was routed to avoid wetlands to the greatest degree practicable. In addition, culverts would be installed where necessary in wetland areas to assure adequate cross drainage and perpetuation of existing soil moisture levels. Where elevations are poorly defined, surveys would establish low points to aid in culvert placement during final design. Monitoring of drainage would occur post-construction, and if problem areas developed, steps would be taken to solve the problem (e.g. installation of additional culverts).

## C. ELMENDORF PROJECT

### Elmendorf Crossing (South Approach)

Five very small wetland areas of several different types would be affected by the Elmendorf segment (Table B-1). Three of the five wetlands (numbers 18 to 20) are of the scrub-shrub or emergent types. The importance of these types is as described above for the Houston Connector except that the ratio of wetland to upland is much lower for the Elmendorf area then for the Willow Sub-basin. Therefore, each individual wetland may be more important to the functioning of physical and biological systems. Wetland 16 is of the forested needle-leaved evergreen type and would be immediately adjacent to the area already disturbed by the Glenn Highway. Wildlife and other values are probably minimal at this location. Wetland 17 consists of the riverine area within the Ship Creek channel. As discussed for the Seward Connector, vegetated riverine wetlands serve the important function of soil stabilization and erosion protection as well as contributing to aquatic habitat productivity.

Impacts and mitigation measures relative to forested, scrub-shrub, and emergent wetland types would be similar to those described for the Houston Connector. The route of the Elmendorf south approach was selected to avoid wetlands where feasible, although the principal emphasis was on avoiding impact to military facilities and operations, and the area of wetland that would be disturbed would be very small. Carefully installed culverts would be used where necessary to preserve natural drainage patterns. The Ship Creek riverine wetlands would be preserved by using a single span bridge to completely span the creek. Construction in the creek bed would not be required.

### Houston Connector

Wetland aspects would be identical to those described for the Downtown Project.

## D. GLENN/PARKS IMPROVEMENT

The Glenn Highway traverses large wetland areas in the Eklutna Flats and Palmer Hay Flats. These wetlands are classed in the scrub-shrub/emergent persistent type under the National Wetlands Inventory program. However, these are coastal wetlands with some saltwater influence and consequently are ecologically different from the interior wetlands of the same type as described under the Houston Connector section. The wetlands of the Palmer Hay Flats are made up of several different communities depending on salinity and soil moisture (Ritchie et al., 1981). These coastal wetlands perform several important functions:

° Primary production - coastal wetlands are among the more productive ecosystems and thus produce a disproportionate amount of organic matter relative to other ecosystems

- Contribution of organic matter to the marine ecosystem through tidal flushing
- Nutrient cycling and probable release of nutrients to marine waters
- Waterfowl feeding and breeding habitat
- Moose winter feeding habitat and calving habitat
- Prevention of coastal erosion

Expansion of the existing roadway would involve only increasing the width of the existing wetland fill by about 34 feet. Therefore, the overall impact in addition to what is already present would be relatively minor. The primary mitigation measure employed would be maintenance of the existing highway cross drainage to prevent any additional hydrological alteration and thus maintain the existing soil moisture regime in areas adjacent to the highway.

## E. HOVERCRAFT

### Terminal Facilities

Terminal facilities for the Hovercraft Alternative would affect intertidal mudflat type wetlands in both the Port of Anchorage vicinity and near Point MacKenzie. As described in the Seward Connector section, mudflat wetlands adjacent to Knik Arm are relatively unproductive but do provide some feeding habitat for ducks and shorebirds. Terminal facilities would be designed to minimize impact to wetland areas by using available uplands to the maximum feasible extent.

### Houston Connector

This two-lane roadway would be essentially identical in route to the Houston Connector described under the Downtown Project. Wetland impacts and mitigation measures would be the same as previously described for the Houston Connector.

# Appendix C

# Conceptual Stage Relocation Plan

## Appendix C

## CONCEPTUAL STAGE RELOCATION PLAN

It is the purpose of this appendix to identify the estimated number of households, businesses, and farms which would be displaced as a result of the alternatives analyzed in this document. Further, this appendix identifies the availability of replacement housing and relocation advisory services, the effects of relocation on the community, and the results of consultation with local social agencies, officials, and community groups.

This conceptual stage analysis was performed by Alaska Department of Transportation and Public Facilities relocation personnel May 18 and 21, 1984. No contact was made with the potential relocatees.

### A. DOWNTOWN CROSSING

Dislocation with the Crossing portion of the Downtown Project would be associated with the completion of the I/L Streets ramps. Dislocation would be identical for both southbound ramp alternatives.

#### Number of Displaced Households

0 Households

#### Number of Displaced Businesses and Farms

0 Farms
1 Freight operation
1 Private parking lot

#### Effect of Business Relocation on the Community

The parking area and freight operation are dependent on their downtown locations. Removal of these operations from their downtown location could adversely affect the community. Alaska Railroad lands would be evaluated for available lease areas following a final design.

#### Results of Consultations

Local social agencies identified no social impacts from the proposed project. Comments from local officials and community groups were generally favorable. Negative comments were singularly related to priorities in funding; see Chapter IV, "Government Finance".

### B. SEWARD CONNECTOR

Dislocation with the Seward Connector portion of the Downtown Project would occur near its eastern end where it would cross Warehouse Avenue.

Number of Displaced Households

0 Households

Number of Displaced Businesses and Farms

0 Farms
1 Floor and wall operation
1 Marina
1 Trucking firm

Effects of Business Relocation on the Community

There is currently an excess of commercial space available in the Anchorage area. The floor and wall operation could relocate anywhere within the Municipality without a negative impact on the community. The trucking firm does not appear to be a freight operation and also could be relocated without disrupting the community. The marina is dependent on its location, however it is now for sale and it is not likely this particular business would be relocated. In any case, relocation of a small marina would not adversely affect the community.

C. ELMENDORF CROSSING

Several military facilities would be displaced with the Crossing portion of the Elmendorf Project. All displacement would be in connection with the Crossing's south approach.

Number of Displaced Households

0 Households

Number of Displaced Military Facilities

1 Sanitary land fill
1 Defense Property Disposal Office storage yard (part)
1 Borrow area
1 Aeronautical receiver antenna
1 Federal Aviation Administration (FAA) antenna
1 Gate

Effect of Relocation on Military

The sanitary land fill and borrow area would be relocated elsewhere in the undeveloped portion of the Base. The eastern portion of the Defense Property Disposal Office yard would be displaced, but it would be relocated immediately to the south of the portion not taken. The Oilwell Road gate would be relocated to the west. No significant adverse effect on military operations would occur with these four relocations.

There does not appear to be an adequate site on Base to relocate either the aeronautical antenna receiver or the FAA antenna. An in-depth study would be required to determine an off-base site for the antennas that would meet military and FAA requirements. This study would be conducted in cooperation with the military. Replacement antennas would be operational prior to the de-activation of the current antennas. Military and FAA operations would be altered because of the longer travel time required to reach the new off-base facility compared to the old one.

Results of Consultations

The U. S. Air Force is a cooperating agency and has been involved in project development from its beginning. The Crossing location through the Base is viewed by the military as the most reasonable at this time. They are in the process of selecting a consultant to develop their preferred alignment through the Base beginning in the Fall of 1984.

## D. HOUSTON CONNECTOR

The Houston Connector is included as a part of the Downtown Project, Elmendorf Project, and the Hovercraft Alternative. Dislocation would occur only with Segment 2 where it would cross the Mirror/Big Lake narrows.

Number of Displaced Households

1 Single family residence with airstrip and outbuildings at Mirror Lake

Number of Businesses and Farms

0 Farms
0 Businesses

Effect of Relocation on the Community

Removing the identified household from the project area would have no effect on the community as a whole. The availability of rural land would allow a single family to relocate without a negative impact on the community.

Availability of Replacement Housing

Local realtors were interviewed to determine the current and projected availability of housing and land in the project area. It was the consensus of those interviewed that available land and housing were currently more than adequate to absorb numerous displaced households. However, the airstrip would pose a unique relocation problem. The replacement property must be lake front and also afford unobstructed air access. Further, those interviewed agreed that the project would increase real estate values but not result in housing shortages.

Available Advisory Services

There would be a full range of services available within the Wasilla area to deal with any special needs identified during the Acquisition Stage Study.

Results of Consultations

Local social agencies identified no social impact from the proposed crossing, however a variety of concerns were related by local officials and community representatives. Borough officials advanced concerns regarding the ability of the City of Houston to accommodate unplanned growth. It was suggested that even though the City of Houston was planned as an urban community, that the City and Borough should begin as soon as possible to plan for the growth that would occur should the project connect at Houston; see Chapter IV, "Land Use Plans". Community sentiment was generally favorable, however there were expressed concerns regarding public safety. Further, it was suggested that an intersection which would allow traffic to bypass Houston would be preferred to the proposed design; see Chapter II, "Selection of Alternatives".

D. GLENN/PARKS IMPROVEMENT

Dislocation with this alternative would occur solely along the Glenn Highway, primarily at interchanges that would have to be rebuilt or substantially modified to accommodate the added lanes. No displacement would occur along the Parks Highway.

Number of Displaced Households

15 Households

Number of Displaced Businesses and Farms

0 Farms
15 Businesses

Effect of Relocation on the Community

Business relocations would be limited to the North Birchwood, Peters Creek, and Eklutna interchanges. An estimated 15 businesses which vary is size and type would require relocation. Because the businesses serve the communities near the interchanges, they would need to be relocated within these communities. There would be adequate land available in these areas for these relocations, however there would be limited existing commercial structures available and businesses could be required to build replacements.

An estimated eight single-family residences between Peters Creek and Eklutna would require relocation, and seven mobile homes also would be displaced. Because zoning is not very restrictive, there should be no difficulty in the mobile home relocation. Existing replacement housing in these areas would be limited and occupants of single family residences could be required to build replacement homes.

# Appendix D
# Air Quality Report

Appendix D

AIR QUALITY REPORT

This appendix describes in detail the analysis conducted to estimate the impact on air quality of the alternatives under consideration. The analysis consisted of estimating motor vehicle emissions associated with each alternative and calculating air quality impacts (concentrations) resulting from these emissions. The following sections describe existing conditions, calculated motor vehicle emissions, and calculated air quality impacts of each alternative.

## A. EXISTING CONDITIONS

### Ambient Air Quality Standards

Air quality is evaluated based on maximum pollutant concentrations in an area and their relation to ambient air quality standards (AAQS). State of Alaska and National, U.S. Environmental Protection Agency (EPA), AAQS are identical for both carbon monoxide (CO) and nitrogen dioxide ($NO_2$). The AAQS for CO are 35 parts per million (ppm) (1-hour average) and 9 ppm (8-hour average). These standards specify concentrations which may be exceeded no more than once per year. The AAQS for $NO_2$ is 0.05 ppm (annual average).

### CO Concentration Measurements

CO concentrations are measured on a continuous basis by the Municipality of Anchorage at four locations. Available data, which include the months October through March, are summarized in Table D-1. October through March are the months when high CO concentrations occur. High concentrations generally are due to light winds and relatively stable atmospheric conditions which minimize dispersion of pollutants. These conditions generally occur in the winter months and are caused by the lack of solar radiation. The atmosphere usually is less stable in urban areas than rural areas because of the de-stabilizing effects of heat generated within the urban area.

Data in Table D-1 indicate that, of the four monitoring sites, the highest CO concentrations occur at the Benson Boulevard and Spenard Road site. The 8-hour AAQS is exceeded at all sites. However, at the 7th Avenue and C Street and Raspberry Road sites, this standard was exceeded only once in the 1982 to 1983 season. The 1-hour AAQS has been exceeded on a single day in December 1980 at the Benson and Spenard site and has not been exceeded at the other sites. Maximum concentrations generally are associated with morning and evening rush hour traffic when automobile emissions are greatest. It is difficult to detect any trends from the data in Table D-1. Differences from year to year may depend as much or more on meteorological conditions than on emissions.

Table D-1

SUMMARY OF WINTER CARBON MONOXIDE CONCENTRATIONS
IN THE ANCHORAGE NON-ATTAINMENT AREA

| Site and Season | Measured CO Concentrations (ppm) Mean | 1-Hour Maximum | 8-Hour Maximum | Days with Exceedance of 8-Hour Standard |
|---|---|---|---|---|
| 16th and Garden | | | | |
| 1979-1980 | 2.2 | 25 | 18.9 | 12 |
| 1980-1981 | 2.7 | 23 | 17.1 | 17 |
| 1981-1982[1] | 2.4 | 21 | 15.6 | 12 |
| 1982-1983 | 3.2 | 26 | 14.9 | 22 |
| 7th and C | | | | |
| 1976-1977 | 2.7 | 21 | 11.5 | 4 |
| 1977-1978[2] | 3.3 | 23 | 16.0 | 18 |
| 1978-1979[2] | 2.8 | 21 | 13.1 | 5 |
| 1979-1980 | 2.1 | 33 | 16.5 | 9 |
| 1980-1981 | 1.9 | 20 | 12.9 | 4 |
| 1981-1982 | 2.2 | 16 | 10.0 | 3 |
| 1982-1983 | 1.4 | 15 | 9.1 | 1 |
| Benson and Spenard | | | | |
| 1978-1979[3] | 5.0 | 30 | 20.0 | 32 |
| 1979-1980 | 4.0 | 30 | 27.4 | 27 |
| 1980-1981 | 4.2 | 43 | 26.3 | 36 |
| 1981-1982 | 4.7 | 31 | 21.6 | 51 |
| 1982-1983 | 4.6 | 24 | 18.1 | 42 |
| 3340 Raspberry | | | | |
| 1980-1981 | 1.3 | 23 | 14.0 | 6 |
| 1981-1982 | 1.4 | 18 | 12.6 | 8 |
| 1982-1983 | 1.8 | 21 | 16.6 | 1 |

NOTES

Season includes October through March except where noted.
8-hour State and National Ambient Air Quality Standard is 9 ppm.

[1] February data are missing.
[2] October data are missing.
[3] October and November data are missing.

An air quality monitoring program was conducted by Anchorage Municipal Power and Light Company at a site on the east side of Anchorage about one-half mile southeast of the intersection of the Glenn Highway and Muldoon Road. The maximum 1-hour average CO concentration in 1982 was 6 ppm, which is substantially less than maximum concentrations in the downtown area. The annual average $NO_2$ concentration measured in 1982 was 0.012 ppm, which is less than 25 percent of State and National AAQS. (Rob Wilson, U. S. Environmental Protection Agency, Seattle, personal communication).

Although monitoring data are not available, air quality north of Knik Arm in the Mat-Su Borough is considered better than in Anchorage because automobile emissions are much less. It is unlikely that AAQS are exceeded in the Borough. The Glenn and Parks Highways are the primary generators of pollutant emissions in the northern part of the project area.

Anchorage Air Quality Plan

The Municipality of Anchorage has an active program, presented in the Anchorage Air Quality Plan (Municipality of Anchorage, 1982a), to address air quality problems. Functions of the program include air quality monitoring of CO, as discussed above, and input to transportation planning. A vehicle inspection and maintenance (I/M) program has been approved by the Municipal Assembly and is scheduled to be implemented in July 1985. It is anticipated that this I/M program will reduce automobile CO emissions through proper engine tuning. The plan's strategy to control air pollution also includes traffic signal improvements, street and highway improvement plans (see "Street and Highway Plans" in this chapter), encouraging carpooling and variable office hours, and public transit improvements.

## B. TRAFFIC RELATED EMISSIONS

Traffic related emissions generally consist of nitrogen oxides ($NO_x$), CO, and hydrocarbons (HC) which result from the use of gasoline or diesel powered internal combustion engines. As discussed under "Existing Conditions", the Anchorage area is currently in non-attainment with EPA standards for CO. Therefore, the following analyses focus on emissions and air quality impacts from CO concentrations.

$NO_x$ analyses were restricted to only emissions, for several reasons. First, air quality models are not available for estimating annual average impacts from $NO_x$ emissions for comparison to the annual AAQS. In addition, if appropriate models were available, there would be a great deal of uncertainty in converting primary nitrogen oxide (NO) emissions, which the models would estimate, to $NO_2$ since this conversion depends on complex atmospheric chemistry.

Unlike CO and $NO_2$, there are no EPA standards for HC. However, HC is a precursor to ozone formation (for this reason, ozone is called a secondary pollutant). Since Anchorage is designated as "attainment" for ozone, and HC emissions are not a direct indication of ozone potential, no analyses of HC were performed.

Alternatives and Analysis Years

Emission and air quality analyses were performed for the following alternatives:

- No-Crossing Alternative
- Downtown Project - Mid-range growth allocation
- Downtown Project - High growth allocation
- Elmendorf Project - Mid-range growth allocation
- Elmendorf Project - Low growth allocation

Traffic volumes and speeds for the three No-Crossing Alternatives are not different enough to significantly affect analysis results, thus only one No-Crossing analysis was done. No-Action volumes and speeds were used for No-Crossing calculations.

The following four years were analyzed:

1. 1982 - Present case based on most recent available data
2. 1990/1991 - Anticipated project opening year
3. 2001 - Year of opening plus 10 years
4. 2010 - Design year

Emission Factors

Emission factors contained in the MOBILE2 (U.S. EPA, 1981) model were used to calculate CO and $NO_x$ emissions (in grams/vehicle/mile). MOBILE2 is an EPA-developed computer program which calculates an average vehicle emission rate based on user-supplied input data. These input data include:

- vehicle type (auto, medium truck, heavy truck)
- temperature
- vehicle speed
- calendar year (restricted to 1970 through 2020, inclusive)
- Inspection and maintenance (I/M) program requirements
- vehicle loading
- vehicle operating mode (cold start, hot start, and hot stabilized)

MOBILE2 was updated as described in Appendix C of the model User's Guide (U.S. EPA, 1981). This update corrected emission rates for non heavy-duty vehicles when using operating modes other than the Federal Test Procedure.

Input data available with MOBILE2 were selected in order to calculate, as much as possible, realistic worst-case conditions. As mentioned under "Existing Conditions", the EPA standards for CO are exceeded in Anchorage during the winter season. Therefore, a temperature of 0°F was assumed since this is the coldest temperature allowed by MOBILE2. Because vehicle emissions increase with decreasing temperatures, this results in maximum emission rates calculated by MOBILE2. Based on climatic data for Anchorage (USDOC/NOAA, 1982), the daily minimum temperature is expected to be 0°F or below approximately 35 days during a typical year. The average daily minimum temperatures for the months of December, January, and

February are 5.3°F, 3.5°F, and 8.9°F, respectively. Thus, an input temperature of 0°F to MOBILE2 represents a reasonable assumption for worst-case conditions.

Emissions were calculated by MOBILE2 using non-California low altitude emission factors. Vehicle age distributions and annual mileage accrual rates included in MOBILE2 were used. No vehicle loading factors (such as trailer towing or air conditioning) were used for light-duty gasoline vehicles.

The mode of vehicle operation was assumed to be cold start for all vehicles in the Anchorage bowl. Because CO and $NO_x$ emissions are highest in this mode, this represents a worst-case assumption and reflects evening commuter traffic leaving the area with all vehicles having recently started. Outside the Anchorage bowl, a hot stabilized mode of vehicle operation was used assuming that all vehicles on the road had already warmed up. These assumptions were recommended by Sierra Research (G. S. Rubenstein, Sierra Research, personal communication), consultants to the State of Alaska for vehicle I/M programs. No data were available to assign more rigorous percentages to vehicles in the cold start, hot start, and hot stabilized modes.

A recent study has indicated that cold start CO emissions are underestimated using assumptions in MOBILE2 (Austin et al., 1983). Inclusion of this information in emissions calculations was beyond the scope of this study. These possible underestimates may be compensated for somewhat because of the assumption that all vehicles in the Anchorage bowl would be in the worst-case cold start mode, an overestimate of actual conditions. In any event, emissions for all alternatives were calculated on a common basis. Therefore, differences in emissions should be adequately reflected in this analysis.

Vehicle type mix was based on Alaska Department of Transportation Vehicle Registration Summaries for the Anchorage Census District for 1977 through 1981 (G. S. Rubenstein, Sierra Research, personal communication, 1984). These vehicle mix percentages are given in Table D-2. An I/M stringency level of 30 percent with required mechanic training was also assumed. This is consistent with the currently proposed I/M program for Anchorage (G. S. Rubenstein, personal communication). The program is not scheduled to start until 1985, therefore I/M assumptions were not used in calculating 1982 emissions.

Calculated CO emission factors are given for the four years identified earlier in Table D-2. Large differences between the Anchorage bowl and outside the bowl reflect higher emissions for the cold start mode of operation used for the Anchorage bowl. Year by year emission factor decreases in both areas reflect implementation of an I/M program and modernization of the vehicle fleet with newer vehicles having more stringent emission controls.

Calculated $NO_x$ emission factors are given in Table D-3. As with CO, emission factors are highest for the cold start operation assumed for the

Table D-2

CARBON MONOXIDE EMISSION FACTORS
(grams per vehicle-mile)

| Average Vehicle Speed (mph) | Anchorage Bowl 1982 | Anchorage Bowl 1990 | Anchorage Bowl 2001 | Anchorage Bowl 2010 | Outside Anchorage Bowl 1982 | Outside Anchorage Bowl 1990 | Outside Anchorage Bowl 2001 | Outside Anchorage Bowl 2010 |
|---|---|---|---|---|---|---|---|---|
| 10 | 641 | 223 | 152 | 149 | 89 | 51 | 48 | 47 |
| 15 | 455 | 165 | 114 | 112 | 63 | 38 | 36 | 35 |
| 20 | 367 | 136 | 95 | 93 | 50 | 31 | 30 | 29 |
| 25 | 302 | 113 | 79 | 77 | 41 | 26 | 25 | 24 |
| 30 | 247 | 92 | 64 | 63 | 34 | 21 | 20 | 20 |
| 35 | 207 | 77 | 53 | 53 | 28 | 18 | 17 | 17 |
| 40 | 182 | 68 | 47 | 47 | 25 | 16 | 15 | 15 |
| 45 | 172 | 65 | 46 | 45 | 24 | 15 | 14 | 14 |
| 50 | 170 | 65 | 46 | 45 | 24 | 15 | 14 | 14 |
| 55 | 156 | 59 | 42 | 41 | 22 | 14 | 13 | 13 |

MOBILE2 Assumptions

Temperature - 0°F

Vehicle Mix:

| | | |
|---|---|---|
| Light duty gas vehicles | - | 68.9% |
| Light duty gas trucks less than 6,001 lbs. | - | 19.8% |
| Light duty gas trucks greater than 6,000 lbs. | - | 8.9% |
| Heavy duty gas vehicles | - | 1.7% |
| Light duty diesel vehicles | - | 0.2% |
| Light duty diesel trucks | - | 0.1% |
| Heavy duty diesel vehicles | - | 0.4% |

100 percent cold start - Anchorage bowl
100 percent hot stabilized - outside Anchorage bowl
Inspection and maintenance stringency level - 30% (1990, 2001, 2010 only)
Mechanic training required for I/M (1990, 2001, 2010 only)

Table D-3

NITROGEN OXIDES EMISSION FACTORS
(grams per vehicle-mile)

| Average Vehicle Speed (mph) | Anchorage Bowl 1982 | Anchorage Bowl 1990 | Anchorage Bowl 2001 | Anchorage Bowl 2010 | Outside Anchorage Bowl 1982 | Outside Anchorage Bowl 1990 | Outside Anchorage Bowl 2001 | Outside Anchorage Bowl 2010 |
|---|---|---|---|---|---|---|---|---|
| 10 | 3.3 | 1.9 | 1.4 | 1.4 | 2.7 | 1.4 | 1.0 | 1.0 |
| 15 | 3.5 | 2.0 | 1.5 | 1.5 | 2.9 | 1.5 | 1.1 | 1.1 |
| 20 | 3.8 | 2.2 | 1.7 | 1.6 | 3.2 | 1.7 | 1.2 | 1.2 |
| 25 | 4.1 | 2.5 | 1.8 | 1.8 | 3.4 | 1.9 | 1.3 | 1.3 |
| 30 | 4.4 | 2.7 | 2.0 | 2.0 | 3.7 | 2.0 | 1.5 | 1.4 |
| 35 | 4.7 | 2.8 | 2.1 | 2.1 | 3.8 | 2.1 | 1.5 | 1.5 |
| 40 | 4.8 | 2.9 | 2.2 | 2.2 | 4.0 | 2.2 | 1.6 | 1.6 |
| 45 | 5.0 | 3.0 | 2.3 | 2.2 | 4.1 | 2.3 | 1.7 | 1.6 |
| 50 | 5.2 | 3.2 | 2.4 | 2.3 | 4.3 | 2.4 | 1.7 | 1.7 |
| 55 | 5.6 | 3.4 | 2.5 | 2.5 | 4.6 | 2.6 | 1.9 | 1.8 |

NOTE
For MOBILE2 assumptions, see Table D-2

Anchorage bowl. However, percentage differences between the two areas are much less for $NO_x$ than for CO indicating that cold start operation has much less effect for $NO_x$. Grams per vehicle-mile increase with increasing speed because $NO_x$ emissions from internal combustion engines are highest when the engine is at full power. Emissions decrease from year to year due to implementation of an I/M program and modernization of the vehicle fleet.

Emission factors for CO and $NO_x$ were combined with link-by-link traffic data to estimate total emission for each year and alternative. Traffic data needed for this calculation were peak-hour traffic volumes (assumed to be 10 percent of average weekday daily traffic), length of the road link and average speed during peak hours. Estimates are based only on the major traffic links included in the traffic analysis. Therefore, not all emissions are accounted for. However, since the links studied represent the major traffic arteries, most emissions should be accounted for. Since all emissions calculations were made for the same road network, these estimates provide a good basis for comparison of alternatives.

## CO Emissions

CO emissions for each alternative are given in Table D-4. Only major arterials in the north half of Anchorage (north of International Airport Road/Tudor Road) were included in Anchorage bowl calculations since none of the alternatives under consideration would significantly affect traffic on south Anchorage streets; see Chapter IV, "Traffic Volumes". With the exception of the Downtown (High) in 1990, lowest emissions would be with the Downtown Project. Highest emissions generally would be with either the Elmendorf Project or a No-Crossing Alternative. Highest emissions estimates exceed lowest estimates by 11 to 13 percent in the north Anchorage bowl and by 9 to 12 percent in total. The significance of these emissions differences on air quality is largely a function of how well they are distributed within the Anchorage bowl. The effect due to distribution is considered later under "Air Quality Impact Analysis".

Within the north Anchorage bowl, CO emissions would drop by approximately half from 1982 to 1990 under any alternative. This drop would result primarily from reductions in CO emissions due to modernization of the vehicle fleet and implementation of an I/M program. Further drops would occur by 2001 due to further fleet modernization. Emissions would increase again by 2010 because although emission rates would not change significantly from 2001 to 2010, traffic volume would increase. Outside the Anchorage bowl, emissions would increase steadily from 1990 through 2010 because traffic volumes would grow at a faster rate than vehicle emissions would decline.

## $NO_x$ Emissions

Estimates of $NO_x$ emissions are shown in Table D-5. Future $NO_x$ emissions would drop somewhat from present levels under any alternative. Ranking from lowest to highest depends on the year and area considered. Lowest $NO_x$ emissions generally would be associated with Downtown (Mid-Range).

Table D-4

CARBON MONOXIDE
ESTIMATES OF PEAK-HOUR EMISSIONS

| Alternative | CO Emissions (lb/hr) 1982 | 1990 | 2001 | 2010 |
|---|---|---|---|---|
| No-Crossing | | | | |
| North Anchorage Bowl | 78,900 | 36,800 | 30,700 | 36,400 |
| Outside Anchorage Bowl | 4,100 | 3,800 | 6,000 | 7,400 |
| Total | 83,000 | 40,600 | 36,600 | 43,800 |
| Downtown (Mid-Range) | | | | |
| North Anchorage Bowl | - | 36,100 | 28,900 | 33,000 |
| Outside Anchorage Bowl | - | 3,400 | 5,600 | 6,600 |
| Total | | 39,500 | 34,400 | 39,600 |
| Downtown (High) | | | | |
| North Anchorage Bowl | - | 40,200 | 28,600 | 33,400 |
| Outside Anchorage Bowl | - | 3,800 | 6,200 | 7,400 |
| Total | | 44,000 | 34,800 | 40;800 |
| Elmendorf (Mid-Range) | | | | |
| North Anchorage Bowl | - | 39,300 | 31,900 | 37,400 |
| Outside Anchorage Bowl | - | 3,500 | 5,600 | 6,800 |
| Total | | 42,800 | 37,600 | 44,200 |
| Elmendorf (Low) | | | | |
| North Anchorage Bowl | - | 38,800 | 30,600 | 36,200 |
| Outside Anchorage Bowl | - | 3,400 | 5,400 | 6,500 |
| Total | | 42,300 | 36,000 | 42,700 |

NOTES

Estimates are for peak hour traffic.

Emissions for north Anchorage bowl are based on 100 percent cold start mode.

Emissions for outside Anchorage bowl are based on 100 percent hot stabilized mode.

Low, mid-range, and high refer to the growth allocation scenarios described in Chapter IV under "Urban Growth and Economic Development".

Table D-5

NITROGEN OXIDES
ESTIMATES OF PEAK-HOUR EMISSIONS

| Corridor | $NO_x$ Emissions (lb/hr) 1982 | 1990 | 2001 | 2010 |
|---|---|---|---|---|
| No-Crossing | | | | |
| North Anchorage Bowl | 1,200 | 900 | 800 | 900 |
| Outside Anchorage Bowl | 800 | 600 | 700 | 900 |
| Total | 2,000 | 1,500 | 1,500 | 1,800 |
| Downtown (Mid-Range) | | | | |
| North Anchorage Bowl | - | 900 | 700 | 800 |
| Outside Anchorage Bowl | - | 600 | 700 | 800 |
| Total | | 1,500 | 1,400 | 1,600 |
| Downtown (High) | | | | |
| North Anchorage Bowl | - | 1,000 | 700 | 800 |
| Outside Anchorage Bowl | - | 600 | 700 | 800 |
| Total | | 1,600 | 1,400 | 1,600 |
| Elmendorf (Mid-Range) | | | | |
| North Anchorage Bowl | - | 900 | 800 | 900 |
| Outside Anchorage Bowl | - | 600 | 700 | 800 |
| Total | | 1,500 | 1,500 | 1,700 |
| Elmendorf (Low) | | | | |
| North Anchorage Bowl | - | 900 | 800 | 900 |
| Outside Anchorage Bowl | - | 600 | 700 | 800 |
| Total | | 1,500 | 1,500 | 1,600 |

NOTES

Estimates are for peak hour traffic.
Emissions for north Anchorage bowl are based on 100 percent cold start mode.
Emissions for outside Anchorage bowl are based on 100 percent hot stabilized mode.
Low, mid-range, and high refer to the growth allocation scenarios described in Chapter IV under "Urban Growth and Economic Development".

Elmendorf Project $NO_x$ emissions generally would be higher than for the Downtown Project. Highest emissions would exceed lowest by 7 to 13 percent overall. Year-to-year trends would be similar to those for CO and for the same reasons.

Emissions of $NO_x$ within the bowl would be comparable to those outside the bowl. This contrasts with CO emissions which would be much higher within the bowl. This is due to two factors. First, cold start CO emissions (assumed for north Anchorage bowl calculations) are greater than hot stabilized emissions by a factor of about seven, while cold start $NO_x$ emissions are higher than hot stabilized emissions by only about 20 percent. This accentuates the difference between CO emissions in the bowl and those outside the bowl to a much greater degree than for $NO_x$ emissions. Second, CO emissions decrease with increasing speed whereas $NO_x$ emissions increase with increasing speed due to the nature of internal combustion engines. Since average vehicle speeds would be greater outside the bowl than within the bowl, CO emissions would be greatest inside the bowl while $NO_x$ emissions would be greatest outside the bowl.

## C. AIR QUALITY IMPACT ANALYSIS

Using the emissions data discussed above, air quality modeling was conducted to estimate CO concentrations resulting from the various alternatives. Concentrations of CO were calculated with the CALINE3 dispersion model developed by the California Department of Transportation (Benson, 1979). CALINE3 is specifically formulated to calculate concentrations due to vehicle emissions from roadways. No attempt was made to calculate air quality impacts due to link intersections because the information necessary (such as cycle time, queue lengths, green time for each approach lane, etc.) for such an analysis was not available.

CALINE3 is a Gaussian dispersion model, with highway segments represented as a series of finite line sources positioned perpendicular to the wind direction. The model treats the region directly over the highway as a zone of uniform emissions and turbulence. This "mixing zone" is assigned an initial vehicle dispersion due to mechanical turbulence created by moving vehicles and thermal turbulence created by hot vehicle exhaust. CALINE3 has the capability to model elevated highways (either embankment or bridge types) and depressed highways, as well as the normal at-grade type of highways. For elevated or depressed highways, the height of the highway above or below the local terrain is limited to a maximum of 10 meters.

### Model Inputs and Assumptions

CALINE3 requires input data for the characteristics and dimensions of each roadway link. Roadway links considered are shown in Chapter III, Figure III-1. It was assumed that all links were composed of 12-foot wide lanes, medians were included as appropriate, and a width of three meters was added to each side of every link as required by CALINE3. This accounts for mechanical and thermal turbulence in the highway vicinity.

Couplets are links which are actually composed of two separate one-way roadways, usually separated by more than one city block. Each road in north Anchorage bowl couplets was modeled individually, with couplet traffic divided evenly between the two roads. The Seward Connector was modeled as an elevated roadway, as were the bridges over Knik Arm. The maximum height of 10 meters was assigned to these links.

In CALINE3, roadways must be modeled as straight segments, not to exceed 10 kilometers in length. Therefore, some links were divided into smaller segments in order to approximate an irregularly shaped link or to restrict modeled links to 10 kilometers in length.

Dispersion calculations were made for 1990, 2001, and 2010 for each of the two Crossing Alternatives, with their two growth shift scenarios, and the No-Crossing Alternative. The north Anchorage bowl and the area outside the bowl were modeled separately.

Surface roughness, which affects dispersion, is a measure of the mechanical turbulence generated by air movement over features of the earth's surface, such as trees, buildings, etc. A surface roughness of 15 centimeters was chosen for modeling the area outside the Anchorage bowl. This surface roughness is used in most EPA models (U.S. EPA, 1983) and represents a reasonable estimate for rural areas. The surface roughness was assumed to be greater within the Anchorage bowl primarily due to the presence of commercial and residential buildings within the bowl. A surface roughness of 150 centimeters was chosen for the bowl, which is representative of city areas primarily composed of residential and office buildings.

Because road links in the area have varying orientations, modeling calculations were made for each of 36 wind directions (10 to 360 degrees by 10 degree increments). This was done in order to determine concentrations using a worst-case wind angle at each receptor. Worst-case conditions near a given link are generally associated with winds approximately parallel to the link.

Worst-case meteorological conditions outside the Anchorage Bowl were assumed to be atmospheric stability Class F (very stable) with a wind speed of one meter per second (mps). This is consistent with the rural nature of the area where, in the absence of significant heat generating sources, stable (low dispersion) conditions usually would prevail during winter months.

For the north Anchorage bowl, worst-case conditions were assumed to be stability Class D (neutral) with a wind speed of one meter per second. This choice was based on a model performance assessment, discussed later, whereby use of these conditions showed close agreement with maximum measured concentrations in the area. Use of Class D conditions as least dispersive for an urban area is consistent with EPA recommendations (U.S. EPA, 1979) and reflects the de-stabilizing effects of heat generated within the urban area.

Other inputs to CALINE3 were an averaging time of 60 minutes and zero deposition and settling velocities (deposition/settling velocities are appropriate for particulate emissions only).

## Representative Receptors

Concentrations of pollutants were calculated at several representative receptor locations to estimate air quality impacts. In the north Anchorage bowl area, representative receptors were selected at 14 locations as follows:

- Two monitor receptors - one at each of two CO monitors operated by the Municipality of Anchorage. These are at Spenard Road and Benson Boulevard and at 7th Avenue and C Street. The monitors are adjacent to roads included in the traffic and emissions analyses. The Garden Street monitor was not included because traffic on the roads adjacent to this monitor was not included in the data used for modeling. Therefore, local emissions, which are of greatest importance in determining concentrations, would not be accounted for. The Raspberry Road monitor, near the airport, was not included because it is outside the north Anchorage bowl.

- Four special receptors:

  1. Alaska Native Medical Center on 3rd Avenue between Ingra and Gambell Streets

  2. Bartlett High School north of Glenn Highway at Muldoon Road

  3. Resolution Park at 3rd Avenue and L Street

  4. Historic residence at 918 West 2nd Avenue

- Eight roadside receptors 10 meters from the road along selected traffic links including the most heavily traveled

Receptor locations are shown in Figure D-1. Receptors outside the Anchorage bowl were placed at 10 meters from the edge of the road.

Two ramp alternatives are under consideration at I/L Streets with the Downtown Project. For purposes of modeling, the I Street southbound ramp configuration was assumed. This choice would not significantly affect calculated concentrations with the possible exception of the historic structure on 2nd Avenue because it is in the vicinity of the ramp lanes. Concentrations at the historic structure would probably be lower under the L Street southbound ramp configuration because inbound and outbound emissions would be spread out more than for the configuration modeled.

## Relation of 1-Hour and 8-Hour Concentrations

CALINE3 is designed to estimate 1-hour average concentrations. Therefore, a multiplier was applied to model 1-hour predictions to estimate 8-hour average concentrations. The average ratio of 8-hour maximum to 1-hour maximum CO concentrations in Anchorage was determined by the project team (see Chapter IX) to be 0.67. Thus, calculated 1-hour maximum concentrations at each receptor were multiplied by 0.67 to obtain estimates of 8-hour maximums.

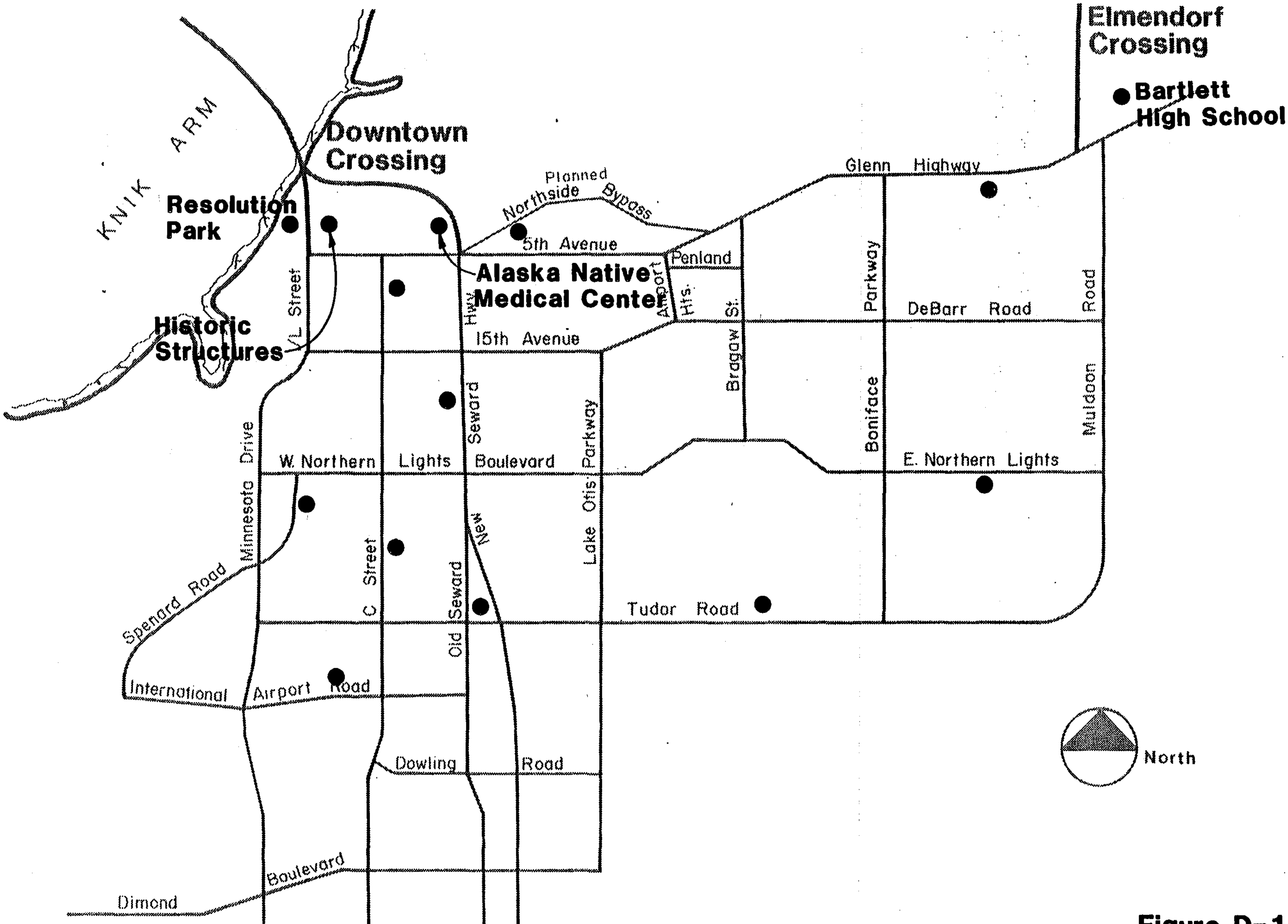



**Figure D-1**

**Representative Receptor Locations**

Model Performance

Model performance in the north Anchorage bowl was evaluated by calculating concentrations at two CO monitor locations in Anchorage using emission estimates based on 1982 traffic data. Three types of meteorological conditions were modeled to assess which conditions resulted in best agreement between modeled and measured concentrations. Conditions modeled were stability Classes D, E, and F, each with a wind speed of one meter per second. Results are given in Table D-6 and are compared to measured concentrations in 1981 to 1982 from Table D-1.

These results indicate that measured maximum 1-hour and 8-hour concentrations are best predicted by CALINE3 using Class D conditions. Under these conditions, maximum 1-hour concentrations are overpredicted by 8 percent at Spenard and Benson and by 13 percent at 7th and C. Results are similar for 8-hour average concentrations. The percentage of overprediction by Class E and F conditions was substantially greater due to the lesser amount of dispersion assumed for these stable cases. Due to uncertainties in both emissions estimates and meteorological conditions associated with maximum measured concentrations, it cannot be said that the model is necessarily predicting dispersion within the accuracy indicated for Class D conditions. However, the good agreement between predicted and measured concentrations indicates that CALINE3 using Class D stability is a useful tool for assessing the relative differences in air quality impacts due to various traffic scenarios. Based on this analysis, future year traffic scenarios in the north Anchorage bowl were modeled using Class D stability and a wind speed of one meter per second.

CO Concentration Analysis Results

Modeling results are shown in Tables D-7, D-8, and D-9 for 1990, 2001, and 2010, respectively.

Anchorage Bowl. In 1990, no AAQS violations would occur at the two monitoring locations modeled. However, concentrations at Spenard and Benson would be only slightly below the 8-hour standard (9 ppm) for Downtown (High) and Elmendorf (Low). Of the special receptors, 8-hour AAQS violations would occur at Resolution Park for all alternatives with the most significant violations occurring with the Downtown Project. This would reflect inbound traffic passing by Resolution Park after crossing the Downtown bridge. Predicted violations at Resolution Park would not be significantly different for either a No-Crossing Alternative or the Elmendorf Project.

At the roadside receptors, violations of the 1-hour AAQS (35 ppm) would occur in 1990 near New Seward Highway under all but a No-Crossing Alternative. Downtown Project concentrations would be the highest. Violations of 8-hour AAQS would occur at several roadside receptors for all alternatives. In general, concentrations at these receptors would be lowest for the No-Crossing and Downtown Project (Mid-Range).

Table D-6

CALINE3 PERFORMANCE ASSESSMENT

| Concentrations (ppm) | Monitor Location<br>Spenard and Benson | 7th and C |
|---|---|---|
| 1-Hour Maximum | | |
| Measured | 31 | 16 |
| Predicted | | |
| Class D | 33.6 | 18.0 |
| Class E | 43.2 | 26.2 |
| Class F | 71.2 | 42.5 |
| 8-Hour Maximum | | |
| Measured | 21.6 | 10.1 |
| Predicted | | |
| Class D | 22.5 | 12.1 |
| Class E | 28.9 | 17.6 |
| Class F | 47.7 | 28.5 |

NOTES

Maximum concentrations were measured in the 1981 to 1982 and 1982 to 1983 winter seasons.

Predicted concentrations are based on stability class indicated and a wind speed of one meter per second. Wind direction was based on worst-case alignment for each receptor determined by considering 36 different directions.

Table D-7

CALINE3 RESULTS FOR YEAR 1990

| Receptor Location | Predicted CO Concentrations (ppm) No-Crossing 1-hr | 8-hr | Downtown (Mid-Range) 1-hr | 8-hr | Downtown (High) 1-hr | 8-hr | Elmendorf (Mid-Range) 1-hr | 8-hr | Elmendorf (Low) 1-hr | 8-hr |
|---|---|---|---|---|---|---|---|---|---|---|
| North Anchorage Bowl | | | | | | | | | | |
| Spenard and Benson | 11.7 | 7.8 | 11.9 | 8.0 | 13.0 | 8.7 | 12.0 | 8.0 | 12.9 | 8.6 |
| 7th and C | 8.5 | 5.7 | 8.3 | 5.6 | 9.1 | 6.1 | 9.0 | 6.0 | 9.2 | 6.2 |
| Native Medical Center | 5.4 | 3.6 | 6.1 | 4.1 | 7.0 | 4.7 | 6.1 | 4.1 | 6.0 | 4.0 |
| Bartlett High School | 1.3 | 0.9 | 1.3 | 0.9 | 1.3 | 0.9 | 1.4 | 0.9 | 1.5 | 1.0 |
| Resolution Park | 15.7 | 10.5 | 23.1 | 15.5 | 25.9 | 17.4 | 15.6 | 10.5 | 16.1 | 10.8 |
| Historic Structures | 6.2 | 4.2 | 9.1 | 6.1 | 10.1 | 6.8 | 6.2 | 4.2 | 6.3 | 4.2 |
| Link 36 - Glenn Highway | 15.2 | 10.2 | 11.4 | 7.6 | 15.3 | 10.3 | 16.7 | 11.2 | 16.7 | 11.2 |
| Link 38 - Planned Northside Bypass | 21.0 | 14.1 | 21.0 | 14.1 | 25.6 | 17.2 | 25.5 | 17.1 | 22.8 | 15.3 |
| Link 53 - Northern Lights Boulevard | 3.9 | 2.6 | 3.4 | 2.3 | 3.6 | 2.4 | 3.6 | 2.4 | 3.7 | 2.5 |
| Link 61 - Tudor Road | 21.7 | 14.5 | 21.3 | 14.3 | 22.0 | 14.7 | 23.2 | 15.5 | 23.2 | 15.5 |
| Link 63 - Tudor Road | 22.9 | 15.3 | 23.2 | 15.5 | 25.4 | 17.0 | 24.3 | 16.3 | 23.4 | 15.7 |
| Link 67 - International Airport Road | 4.5 | 3.0 | 4.1 | 2.7 | 4.4 | 2.9 | 4.2 | 2.8 | 4.5 | 3.0 |
| Link 78 - New Seward Hwy. | 30.6 | 20.5 | 39.5 | 26.5 | 44.0 | 29.5 | 36.6 | 24.5 | 37.1 | 24.9 |
| Link 86 - C Street | 9.1 | 6.1 | 6.9 | 4.6 | 7.1 | 4.8 | 8.0 | 5.4 | 9.4 | 6.3 |
| Average - All receptors | 12.7 | 8.5 | 13.6 | 9.1 | 15.3 | 10.2 | 13.7 | 9.2 | 13.8 | 9.2 |
| No. of AAQS Violations | 0 | 6 | 1 | 5 | 1 | 6 | 1 | 6 | 1 | 6 |
| Outside Anchorage Bowl | | | | | | | | | | |
| Link 7 - Parks Highway | 1.9 | 1.3 | 1.1 | 0.7 | 1.1 | 0.7 | 1.0 | 0.7 | 1.1 | 0.7 |
| Link 12 - Glenn Highway | 2.1 | 1.4 | 1.5 | 1.0 | 1.6 | 1.1 | 1.5 | 1.0 | 1.5 | 1.0 |
| Link 13 - Glenn Highway | 1.9 | 1.3 | 1.3 | 0.9 | 1.7 | 1.1 | 1.3 | 0.9 | 1.2 | 0.8 |
| Link 14 - Glenn Highway | 1.6 | 1.1 | 1.2 | 0.8 | 1.5 | 1.0 | 1.2 | 0.8 | 1.1 | 0.7 |
| Link 15 - Glenn Highway | 3.7 | 2.5 | 2.7 | 1.8 | 3.4 | 2.3 | 2.8 | 1.9 | 2.7 | 1.8 |
| Link 16 - Glenn Highway | 6.2 | 4.2 | 5.0 | 3.4 | 5.8 | 3.9 | 5.2 | 3.5 | 5.2 | 3.5 |
| Link 22 - Houston Connector | 0.1 | 0.1 | 0.9 | 0.6 | 0.9 | 0.6 | 0.6 | 0.4 | 0.6 | 0.4 |
| Link 23 - Houston Connector | - | - | 1.0 | 0.7 | 1.0 | 0.7 | 0.8 | 0.5 | 0.8 | 0.5 |
| Link 105 - Elmendorf Crossing | - | - | - | - | - | - | 1.4 | 0.9 | 1.4 | 0.9 |
| Link 106 - Downtown Crossing | - | - | 1.4 | 0.9 | 1.4 | 0.9 | - | - | - | - |

NOTES

Low, mid-range, and high refer to the growth allocation scenarios described in Chapter IV under "Urban Growth and Economic Development".

Receptors for all links placed at 10 meters from edge of road.

1-hour AAQS = 35 ppm; 8-hour AAQS = 9 ppm.

Only those links outside the Anchorage bowl with 1-hour concentrations predicted to be greater than 2 ppm for any year or alternative are shown.

A dash (-) signifies that this link does not exist for this alternative or year.

Table D-8

CALINE3 RESULTS FOR YEAR 2001

| Receptor Location | Predicted CO Concentrations (ppm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No-Crossing | | Downtown (Mid-Range) | | Downtown (High) | | Elmendorf (Mid-Range) | | Elmendorf (Low) | |
| | 1-hr | 8-hr | 1-hr | 8-hr | 1-hr | 8-hr | 1-hr | 8-hr | 1-hr | 8-hr |
| North Anchorage Bowl | | | | | | | | | | |
| Spenard and Benson | 9.7 | 6.5 | 9.3 | 6.2 | 9.2 | 6.2 | 9.5 | 6.4 | 10.6 | 7.1 |
| 7th and C | 6.8 | 4.6 | 6.5 | 4.4 | 6.7 | 4.5 | 7.2 | 4.8 | 6.9 | 4.6 |
| Native Medical Center | 4.4 | 2.9 | 5.1 | 3.4 | 5.1 | 3.4 | 4.8 | 3.2 | 4.5 | 3.0 |
| Bartlett High School | 1.2 | 0.8 | 1.1 | 0.7 | 1.1 | 0.7 | 1.2 | 0.8 | 1.2 | 0.8 |
| Resolution Park | 12.6 | 8.4 | 18.1 | 12.1 | 18.6 | 12.5 | 12.2 | 8.2 | 12.4 | 8.3 |
| Historic Structures | 5.0 | 3.4 | 7.6 | 5.1 | 7.6 | 5.1 | 4.9 | 3.3 | 5.0 | 3.4 |
| Link 36 - Glenn Highway | 12.3 | 8.2 | 9.6 | 6.4 | 10.9 | 7.3 | 13.0 | 8.7 | 12.7 | 8.5 |
| Link 38 - Planned Northside Bypass | 16.7 | 11.2 | 16.2 | 10.9 | 18.2 | 12.2 | 21.3 | 14.3 | 17.4 | 11.7 |
| Link 53 - Northern Lights Boulevard | 3.0 | 2.0 | 2.5 | 1.7 | 2.5 | 1.7 | 2.9 | 1.9 | 2.7 | 1.8 |
| Link 61 - Tudor Road | 19.2 | 12.9 | 18.1 | 12.1 | 15.5 | 10.4 | 20.1 | 13.5 | 19.7 | 13.2 |
| Link 63 - Tudor Road | 18.3 | 12.3 | 18.4 | 12.3 | 18.0 | 12.1 | 19.7 | 13.2 | 18.4 | 12.3 |
| Link 67 - International Airport Road | 4.0 | 2.7 | 3.1 | 2.1 | 3.1 | 2.1 | 3.2 | 2.1 | 3.8 | 2.5 |
| Link 78 - New Seward Hwy. | 26.6 | 17.8 | 30.5 | 20.4 | 31.3 | 21.0 | 28.5 | 19.1 | 28.2 | 18.9 |
| Link 86 - C Street | 7.5 | 5.0 | 5.3 | 3.6 | 5.1 | 3.4 | 6.2 | 4.2 | 7.5 | 5.0 |
| Average - All receptors | 10.5 | 7.1 | 10.8 | 7.2 | 10.9 | 7.3 | 11.1 | 7.4 | 10.8 | 7.2 |
| No. of AAQS Violations | 0 | 4 | 0 | 5 | 0 | 5 | 0 | 4 | 0 | 4 |
| Outside Anchorage Bowl | | | | | | | | | | |
| Link 7 - Parks Highway | 3.2 | 2.1 | 1.4 | 0.9 | 1.7 | 1.1 | 1.4 | 0.9 | 1.3 | 0.9 |
| Link 12 - Glenn Highway | 3.4 | 2.3 | 2.0 | 1.3 | 2.3 | 1.5 | 2.0 | 1.3 | 1.9 | 1.3 |
| Link 13 - Glenn Highway | 3.1 | 2.1 | 1.8 | 1.2 | 2.1 | 1.4 | 1.8 | 1.2 | 1.7 | 1.1 |
| Link 14 - Glenn Highway | 2.9 | 1.9 | 1.8 | 1.2 | 2.0 | 1.3 | 1.8 | 1.2 | 1.7 | 1.1 |
| Link 15 - Glenn Highway | 5.8 | 3.9 | 4.2 | 2.8 | 4.4 | 2.9 | 4.4 | 2.9 | 4.3 | 2.9 |
| Link 16 - Glenn Highway | 8.1 | 5.4 | 6.4 | 4.3 | 6.4 | 4.3 | 6.8 | 4.6 | 6.8 | 4.6 |
| Link 22 - Houston Connector | 0.1 | 0.1 | 2.1 | 1.4 | 2.5 | 1.7 | 1.4 | 0.9 | 1.2 | 0.8 |
| Link 23 - Houston Connector | - | - | 2.2 | 1.5 | 2.6 | 1.7 | 1.7 | 1.1 | 1.6 | 1.1 |
| Link 105 - Elmendorf Crossing | - | - | - | - | - | - | 2.8 | 1.9 | 2.6 | 1.7 |
| Link 106 - Downtown Crossing | - | - | 3.5 | 2.3 | 4.0 | 2.7 | - | - | - | - |

NOTES

Low, mid-range, and high refer to the growth allocation scenarios described in Chapter IV under "Urban Growth and Economic Development".

Receptors for all links placed at 10 meters from edge of road.

1-hour AAQS = 35 ppm; 8-hour AAQS = 9 ppm.

Only those links outside the Anchorage bowl with 1-hour concentrations predicted to be greater than 2 ppm for any year or alternative are shown.

A dash (-) signifies that this link does not exist for this alternative or year.

Table D-9

CALINE3 RESULTS FOR YEAR 2010

| Receptor Location | Predicted CO Concentrations (ppm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No-Crossing | | Downtown (Mid-Range) | | Downtown (High) | | Elmendorf (Mid-Range) | | Elmendorf (Low) | |
| | 1-hr | 8-hr | 1-hr | 8-hr | 1-hr | 8-hr | 1-hr | 8-hr | 1-hr | 8-hr |
| **North Anchorage Bowl** | | | | | | | | | | |
| Spenard and Benson | 10.4 | 7.0 | 10.1 | 6.8 | 10.3 | 6.9 | 10.9 | 7.3 | 11.6 | 7.8 |
| 7th and C | 8.6 | 5.8 | 7.2 | 4.8 | 7.8 | 5.2 | 8.8 | 5.9 | 8.9 | 6.0 |
| Native Medical Center | 5.4 | 3.6 | 5.6 | 3.8 | 5.8 | 3.9 | 5.7 | 3.8 | 5.4 | 3.6 |
| Bartlett High School | 1.5 | 1.0 | 1.2 | 0.8 | 1.3 | 0.9 | 1.6 | 1.1 | 1.4 | 0.9 |
| Resolution Park | 16.2 | 10.9 | 22.8 | 15.3 | 23.4 | 15.7 | 15.6 | 10.5 | 15.8 | 10.6 |
| Historic Structures | 6.4 | 4.3 | 9.4 | 6.3 | 9.8 | 6.6 | 6.1 | 4.1 | 6.2 | 4.2 |
| Link 36 - Glenn Highway | 17.2 | 11.5 | 11.0 | 7.4 | 12.2 | 8.2 | 17.8 | 11.9 | 17.5 | 11.7 |
| Link 38 - Planned Northside Bypass | 21.4 | 14.3 | 18.3 | 12.3 | 22.0 | 14.7 | 24.9 | 16.7 | 21.8 | 14.6 |
| Link 53 - Northern Lights Boulevard | 3.7 | 2.5 | 2.6 | 1.7 | 2.7 | 1.8 | 3.3 | 2.2 | 3.2 | 2.1 |
| Link 61 - Tudor Road | 22.1 | 14.8 | 20.1 | 13.5 | 19.1 | 12.8 | 23.3 | 15.6 | 22.8 | 15.3 |
| Link 63 - Tudor Road | 22.5 | 15.1 | 21.8 | 14.6 | 21.7 | 14.5 | 23.4 | 15.7 | 22.1 | 14.8 |
| Link 67 - International Airport Road | 4.5 | 3.0 | 4.0 | 2.7 | 3.9 | 2.6 | 4.1 | 2.7 | 4.2 | 2.8 |
| Link 78 - New Seward Hwy. | 30.5 | 20.4 | 34.5 | 23.1 | 39.0 | 26.1 | 32.1 | 21.5 | 31.8 | 21.3 |
| Link 86 - C Street | 8.6 | 5.8 | 6.1 | 4.1 | 5.9 | 4.0 | 6.9 | 4.6 | 8.5 | 5.7 |
| Average - All receptors | 12.8 | 8.6 | 12.5 | 8.4 | 13.2 | 8.8 | 13.2 | 8.8 | 12.9 | 8.7 |
| No. of AAQS Violations | 0 | 6 | 0 | 5 | 1 | 5 | 0 | 6 | 0 | 6 |
| **Outside Anchorage Bowl** | | | | | | | | | | |
| Link 7 - Parks Highway | 3.6 | 2.4 | 1.5 | 1.0 | 1.9 | 1.3 | 1.7 | 1.1 | 1.5 | 1.0 |
| Link 12 - Glenn Highway | 4.0 | 2.7 | 2.1 | 1.4 | 2.5 | 1.7 | 2.3 | 1.5 | 2.1 | 1.4 |
| Link 13 - Glenn Highway | 3.7 | 2.5 | 1.9 | 1.3 | 2.3 | 1.5 | 2.1 | 1.4 | 1.9 | 1.3 |
| Link 14 - Glenn Highway | 3.5 | 2.3 | 1.9 | 1.3 | 2.1 | 1.4 | 2.0 | 1.3 | 1.9 | 1.3 |
| Link 15 - Glenn Highway | 7.1 | 4.8 | 4.7 | 3.1 | 4.8 | 3.2 | 5.1 | 3.4 | 4.9 | 3.3 |
| Link 16 - Glenn Highway | 10.0 | 6.7 | 7.0 | 4.7 | 7.1 | 4.8 | 7.7 | 5.2 | 7.9 | 5.3 |
| Link 22 - Houston Connector | 0.2 | 0.1 | 2.8 | 1.9 | 3.6 | 2.4 | 1.8 | 1.2 | 1.6 | 1.1 |
| Link 23 - Houston Connector | - | - | 2.8 | 1.9 | 3.4 | 2.3 | 2.2 | 1.5 | 2.0 | 1.3 |
| Link 105 - Elmendorf Crossing | - | - | - | - | - | - | 4.2 | 2.8 | 3.8 | 2.5 |
| Link 106 - Downtown Crossing | - | - | 4.6 | 3.1 | 5.4 | 3.6 | - | - | - | - |

NOTES

Low, mid-range, and high refer to the growth allocation scenarios described in Chapter IV under "Urban Growth and Economic Development".

Receptors for all links placed at 10 meters from edge of road.

1-hour AAQS = 35 ppm; 8-hour AAQS = 9 ppm.

Only those links outside the Anchorage bowl with 1-hour concentrations predicted to be greater than 2 ppm for any year or alternative are shown.

A dash (-) signifies that this link does not exist for this alternative or year.

The number of predicted AAQS violations in 1990 would be approximately the same for all alternatives. When concentrations are averaged over all north Anchorage bowl receptors, lowest concentrations would be associated with the No-Crossing Alternative and highest concentrations would be associated with the Downtown Project with the high growth shift. Average concentrations for the other growth scenarios would be approximately equal. Concentrations in the north Anchorage bowl in 1990 would increase under either Crossing Project with all growth shift scenarios compared to the No-Crossing case. With the exception of Downtown (High), these increases would be less than 10 percent.

However, these receptor average concentrations are not average concentrations within the bowl. Most of the receptors averaged were purposely chosen at areas of expected high concentrations. These averages are presented solely as a means of comparing alternatives on a relative basis.

In 2001, predicted concentrations indicate a general improvement over 1990 for all alternatives (Table D-8). Fewer AAQS violations would occur and average concentrations would decrease by 20 percent or more. This improvement would be primarily due to lower vehicle emissions rates associated with newer vehicles. Concentrations for the Crossing Alternatives would decrease more than for the No-Crossing Alternative between 1990 and 2001. On the average, air quality impacts in 2001 would not differ significantly among the alternatives.

In 2010, concentrations would increase over 2001 levels (Table D-9). Overall average concentrations in 2010 would be comparable to those in 1990. However, unlike 1990, concentrations would not differ significantly among alternatives. Increased concentrations in 2010, as compared to 2001, would be due to increased traffic which would more than offset slight improvements in per vehicle emission rates.

A sensitivity analysis was performed for the north Anchorage bowl roadside receptors to show concentration as a function of distance from the road. The sensitivity analysis was performed for the No-Crossing Alternative in 1990. Results of the sensitivity analysis are shown in Table D-10. Concentrations were reduced by approximately 30 percent at 25 meters from the road edge (as compared to results for the receptor 10 meters from the road edge). At approximately 50 meters from the road, roadside concentrations are decreased to half of the corresponding concentrations at 10 meters.

Outside Anchorage Bowl. Outside the Anchorage bowl, maximum 1-hour and 8-hour roadside concentrations would occur along the Glenn Highway on the first link out of the Anchorage bowl area (Muldoon Road to Eagle River). Maximum concentrations for links outside the Anchorage bowl are also given in Tables D-7 through D-9. All links with a 1-hour CO concentration greater than 2 ppm for any year or alternative are shown in Tables D-7 through D-9. As the tables indicate, no violation of the 1-hour or 8-hour CO standards would occur. Maximum predicted concentrations would be

Table D-10

NORTH ANCHORAGE BOWL ROADSIDE CONCENTRATIONS
AT VARIOUS DISTANCES FROM ROAD

| | Receptor Distance From Road Edge (meters) | | | |
|---|---|---|---|---|
| Receptor Location | 10 | 25 | 50 | 100 |
| Link 36 - Glenn Highway | 15.2 | 10.6 | 7.8 | 5.5 |
| Link 38 - Northside Bypass | 21.0 | 14.2 | 10.1 | 7.1 |
| Link 53 - Northern Lights Boulevard | 3.9 | 2.9 | 2.3 | 1.9 |
| Link 61 - Tudor Road | 21.7 | 14.5 | 10.0 | 6.5 |
| Link 63 - Tudor Road | 22.9 | 15.9 | 11.6 | 8.6 |
| Link 78 - New Seward Highway | 30.6 | 20.0 | 13.7 | 9.2 |
| Link 86 - C Street | 9.1 | 7.0 | 5.7 | 4.7 |
| Average Reduction from 10 Meter Concentration | - | 31% | 49% | 64% |

NOTE

Values are CALINE3 1-hour CO concentrations (in ppm) for No-Crossing Alternative in 1990.

associated with the No-Crossing Alternative and lowest concentrations would be associated with the Downtown Project in most cases. However, differences between the Downtown and Elmendorf projects would be minor.

## D. CONSTRUCTION IMPACTS

Air quality impacts due to construction activities would be caused by:

- An increase in on-road vehicle emissions near areas of construction due to the decreased speeds caused by detours and the construction activity

- Emissions from heavy duty diesel construction equipment, fugitive particulate emissions due to the dust stirred up by construction activity

Construction vehicle operations would not be of sufficient magnitude to significantly affect areas of maximum modeled concentrations (i.e., the north Anchorage bowl). Operational techniques, such as watering of dusty construction areas, would be used to minimize construction impacts.

## E. ANCHORAGE AIR QUALITY PLAN IMPACT

The Anchorage Air Quality Plan includes expansion of existing traffic improvement programs and implementation of a vehicle I/M program (Municipality of Anchorage, 1982a). Traffic improvements would include synchronization of traffic signals to improve traffic flow and to reduce time in the acceleration, deceleration, and idle modes, thereby reducing CO emissions. Several road and highway construction projects have also been proposed to improve traffic flow. In addition, encouragement of carpooling, transit use, and variable work hours are included in the Air Quality Plan. The vehicle I/M program has been proposed to reduce emissions by requiring periodic vehicle exhaust inspection. Vehicles not meeting exhaust requirements would be required to undergo maintenance to bring them into compliance.

Most of the Anchorage bowl air quality non-attainment area has transportation control measures in the State Implementation Plan (SIP), which was conditionally approved by the Environmental Protection Agency in September 1982. The Anchorage measures for control of CO were noted in Chapter III. The No-Action and Glenn/Parks Improvement Alternatives only include bowl projects found within the area's long-range transportation plan and transportation improvement program. The Federal Highway Administration (FHWA) has determined both to conform to the SIP. Thus, pursuant to 23 CFR 770 either of these alternatives would conform to the SIP.

The Hovercraft Alternative and Crossing Alternatives are not in bowl transportation plans. To be in conformance with the SIP, the Anchorage Air Quality Control Plan (Municipality of Anchorage, 1982a) indicates these alternatives must:

- Provide a net areawide air quality benefit and not delay attainment of National Air Quality Standards

- Reflect reasonable progress in implementing those transportation control measures called for in the SIP to meet air quality standards and not include any actions that would reduce the effectiveness of those measures

Neither Hovercraft nor a Crossing Alternatives would adversely affect implementation of the traffic improvements, inspection/maintenance program, carpool/variable work hours program, or transit improvements described in the Anchorage Plan. As discussed under "Public Transportation", the Crossing Alternatives would reduce transit use in the bowl but only because fewer people would be living in the bowl compared to No-Action. The percentage of travelers using transit in the bowl would not be affected. In fact, the percentage may rise because those households making the decision to live in the Borough due to a crossing, rather than the bowl, likely would not be transit users anyway, and captive transit riders likely would not move to the Borough where transit service would be less frequent.

The Hovercraft Alternative would not affect traffic patterns or flow in the bowl significantly and would not change CO emissions. Thus, Hovercraft would not change the effectiveness of bowl transportation control measures.

As indicated in Table IV-32, the Downtown Project (with the most likely mid-range growth allocation) would reduce total CO emissions in the north Anchorage bowl (six percent in 2001, nine percent in 2010). Thus, the Downtown Project would provide a net air quality benefit and would increase the effectiveness of transportation control measures for the bowl.

For the Elmendorf Project (with the most likely mid-range growth allocation), total CO emissions in the north Anchorage bowl would increase four percent in 2001 and three percent in 2010 compared to No-Action. Thus, the Project would provide a small net air quality decrease and lessen the effectiveness of transportation control measures in the bowl. This decrease would occur for two reasons:

1. As indicated in Table IV-4, the Elmendorf Project would increase total vehicle-miles of travel in the bowl slightly, two percent in 2001 and 1.5 percent in 2010.

2. As shown on Figure IV-1, the traffic pattern resulting from the Project would add traffic to streets already congested under No-Action, which would slow traffic further and increas emissions. Table IV-4 shows an increase of 30 percent of vehicle-miles traveled in 2001 at less than acceptable levels-of-service (D to F). However, a decrease of only one percent would occur in 2010.

In light of the above, it is concluded pursuant to 23 CFR 770 that the No-Crossing Alternatives and the Downtown Project would conform to the State Implementation Plan. Without mitigation of the emissions impact described above, the Elmendorf Project would not conform. The small percentage increase in emissions could be mitigated by a re-evaluation of the area's Long-Range Transportation Plan (Municipality of Anchorage, Community Planning Department, July 1983), whose projects are listed in the Anchorage Air Quality Plan, to take into account the changed pattern of area-wide traffic flows resulting from the Elmendorf Project. Planning could be altered such that congestion and increases in emissions which would result from the changed traffic patterns would be minimized (e.g., incorporating traffic improvements on roads feeding into the crossing such as the Glenn Highway). The Elmendorf Project, in combination with a revised Long-Range Transportation Plan, then would achieve the same level of emissions or better as the current Transportation Plan. Specific changes that could be made will be analyzed and presented in the Final EIS if the Elmendorf Project is selected as the preferred alternative.

A final determination of conformance will be made by the Anchorage Metropolitan Area Transportation Study (AMATS) Air Quality Policy Committee based on the air quality analysis in this document. This determination will be presented in the Final EIS.

# Appendix E
# Noise Report

Appendix E

NOISE REPORT

## A. INTRODUCTION

This appendix documents the noise impact assessment for the alternatives under consideration in the year 2010. The assessment is based primarily on an estimate of the number of people exposed to various levels of noise, that is, the impact of noise on residential land use. The appendix is divided into the following sections:

- Description of noise criteria on which the impact analysis is based
- Results of field measurements of existing noise levels
- Documentation of the procedures for forecasting noise levels
- Noise impact of each alternative
- Construction noise impact

## B. NOISE IMPACT CRITERIA

Fundamental Concepts of Noise

Three characteristics of noise affect people's reaction to the noise environment. These are:

- intensity or level
- frequency spectrum
- time-varying character

Sound levels (intensity) are measured on a logarithmic scale and are expressed in decibels (dB), with 0 dB corresponding roughly to the threshold of sensitivity of hearing.

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. The "frequency" of a sound refers to the number of complete pressure fluctuations per second in the sound, and the unit of measurement is the cycle per second or hertz (Hz). Most of the sounds which are heard do not consist of a single frequency, but of a broad band of frequencies, differing in relative level. Many rating methods have been devised to permit comparison of sounds having quite different frequency characteristics. Fortunately, the simplest method correlates with human response almost as well as the more complex methods; this method consists of weighting the various frequency components in a manner similar to the characteristics of the human ear. This type of frequency weighting reflects the fact that human hearing is less sensitive at low frequencies and extreme high frequencies than in the frequency midrange. The weighting curve most often used is called "A" weighting, and the level so measured is called the "A-weighted sound level".

In practice, the A-weighted level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve. All U.S. and international standard sound level meters include such a filter. Figure E-1 shows the A-weighted levels of typical outdoor and indoor sounds.

Although the A-weighted level may adequately describe environmental noise at any instant, the noise level varies continuously. Most environmental noise includes a conglomeration of distant noise sources creating a relatively steady background noise in which no particular source is identifiable. These distant sources may include traffic, wind in trees, industrial, or farming activities, etc. These noise sources are relatively constant from moment-to-moment, but vary slowly from hour-to-hour as natural forces change or as human activity follows its daily cycle. Superimposed on this slowly varying background is a succession of identifiable noisy events of brief duration. These may include nearby activities or single vehicle passages, aircraft flyovers, etc., which cause the environmental noise level to vary from time to time.

One way to describe sounds which vary with time is to analyze them statistically, to determine sound levels which are exceeded for some percent of a specified time. The median sound level is the level exceeded 50 percent of the time and is designated $L_{50}$. Similarly, the level exceeded 10 percent of the time is designated $L_{10}$; this is the statistical measure preferred by the FHWA (see next section).

In the interests of avoiding a complicated description of the fluctuations of noise at a location and thereby simplifying the description of noise exposure, a single number <u>average sound level</u> has recently become popular. The average sound level is the steady noise level that would convey the same noise <u>energy</u> as the actual time-varying noise at the site in the same time period. This "equivalent steady noise" is designated $L_{eq}$. The time periods over which the average sound level usually is expressed are by hour, by day (defined as the hours from 7:00 AM to 10:00 PM), by night (defined as the hours from 10:00 PM to 7:00 AM), and by 24-hour day.

A modification of the 24-hour average sound level is the "Day-Night Average Sound Level" which incorporates a 10dB penalty for all noise occurring during the night-time between the hours of 10:00 PM and 7:00 AM. The "Day-Night Average Sound Level" ($L_{dn}$) has been adopted by many Federal and local agencies as the descriptor to be used for general noise that affects a community over the full 24-hour day.

<u>Abatement Criteria</u>

In this appendix, noise impact will be defined in two different ways. The first relates to increases at specific sites. The Federal Highway Administration (FHWA) has promulgated "Noise Abatement Criteria" (FHWA, July 1982) listing levels which, if exceeded by roadway traffic, must be mitigated when it is reasonable and feasible to do so. The levels vary for

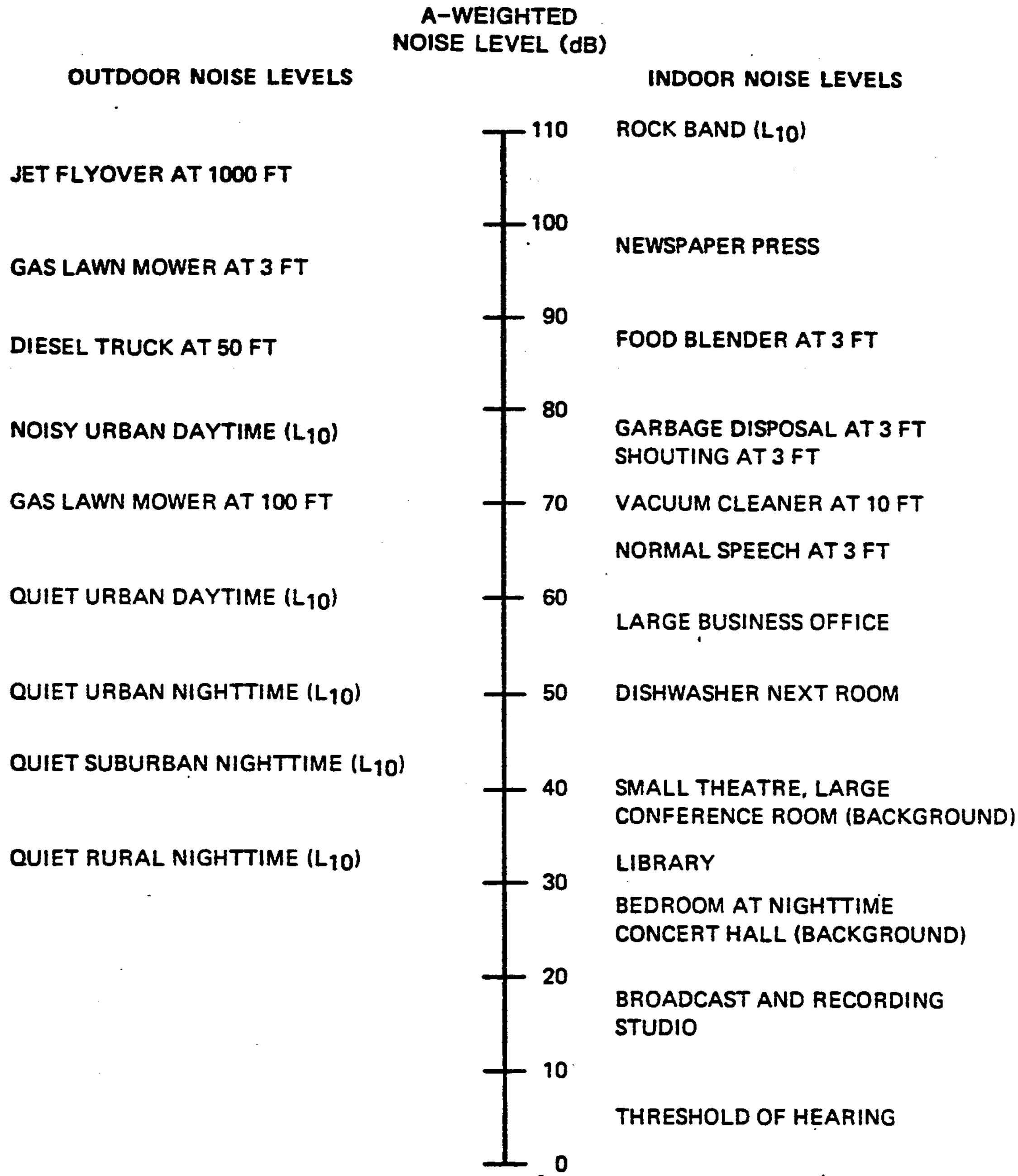



**Figure E-1**

**Typical Noise Levels**

different land uses; Table E-1 reproduces these noise abatement criteria. The table lists maximum noise levels for different land use categories in terms of two noise exposure measures related to forecast peak-hour traffic flow, the $L_{10}$ and the $L_{eq}$ levels. Typically, for roadways with moderate to high traffic flows, the peak-hour $L_{eq}$ is numerically 3 decibels less than the peak-hour $L_{10}$, thus the criteria listed in the table for the two measures are equivalent, and in the remainder of this appendix only the peak-hour $L_{eq}$ will be cited. The table shows that for most land uses of interest (residences, schools, hospitals, churches, etc.), the peak-hour $L_{eq}$ should not exceed 67 dB.

A FHWA study (FHWA, June 1982) recommends that a noise impact also be considered severe enough to warrant mitigation if increased noise levels meet the following criteria:

| dB's Below Noise Abatement Criteria | dB Increase from No-Action |
|---|---|
| 1 | 10 |
| 2 | 12 |
| 3 | 13 |
| 4 | 14 |
| 5 | 14 |
| 6 | 15 |
| 7 | 15 |
| 8 | 15 |
| 9 | 15 |
| 10+ | 16+ |

Both these abatement criteria were used in this analysis to determine the need for mitigation at noise sensitive locations.

The above criteria indicate that mitigation would be required when either the noise exceeds a certain level or the increase in noise is substantial. However, the criteria do not describe a way in which to compare impact along several proposed corridors where there are different numbers of people exposed to different levels of noise exposure, all above the criterion level. In order to permit such a comparison, a second procedure for defining noise impact has been developed by the National Academy of Sciences (National Academy of Sciences, 1977) called the "fractional impact methodology". This methodology has the advantage that it takes into account both the absolute level of the noise environment, as well as the level of the existing noise environment.

The fractional impact methodology uses as its base the day-night average sound level, $L_{dn}$. Several social surveys have been conducted in which people's reactions to their noise environment have been determined as a function of the day-night sound level occurring outside their homes. The curve in Figure E-2 shows the results of many of these surveys (Schultz, August 1978). Community response to noise is measured by the percentage of the sampled population who indicated that they were "highly annoyed" with their noise environment. This curve has been found to be appropriate for a variety of noise sources, ranging from aircraft to surface transportation to railroad noise.

Table E-1

NOISE ABATEMENT CRITERIA
(Hourly A-Weighted Sound Level - decibels (dB))

| Activity Category | $L_{eq}$ | $L_{10}$ | Description of Activity Category |
|---|---|---|---|
| A | 57 (Exterior) | 60 (Exterior) | Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. |
| B | 67 (Exterior) | 70 (Exterior) | Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals. |
| C | 72 (Exterior) | 75 (Exterior) | Developed lands, properties, or activities not included in Categories A or B above. |
| D | -- | -- | Undeveloped lands. |
| E | 52 (Interior) | 55 (Interior) | Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums. |

Source: FHWA, July 1982

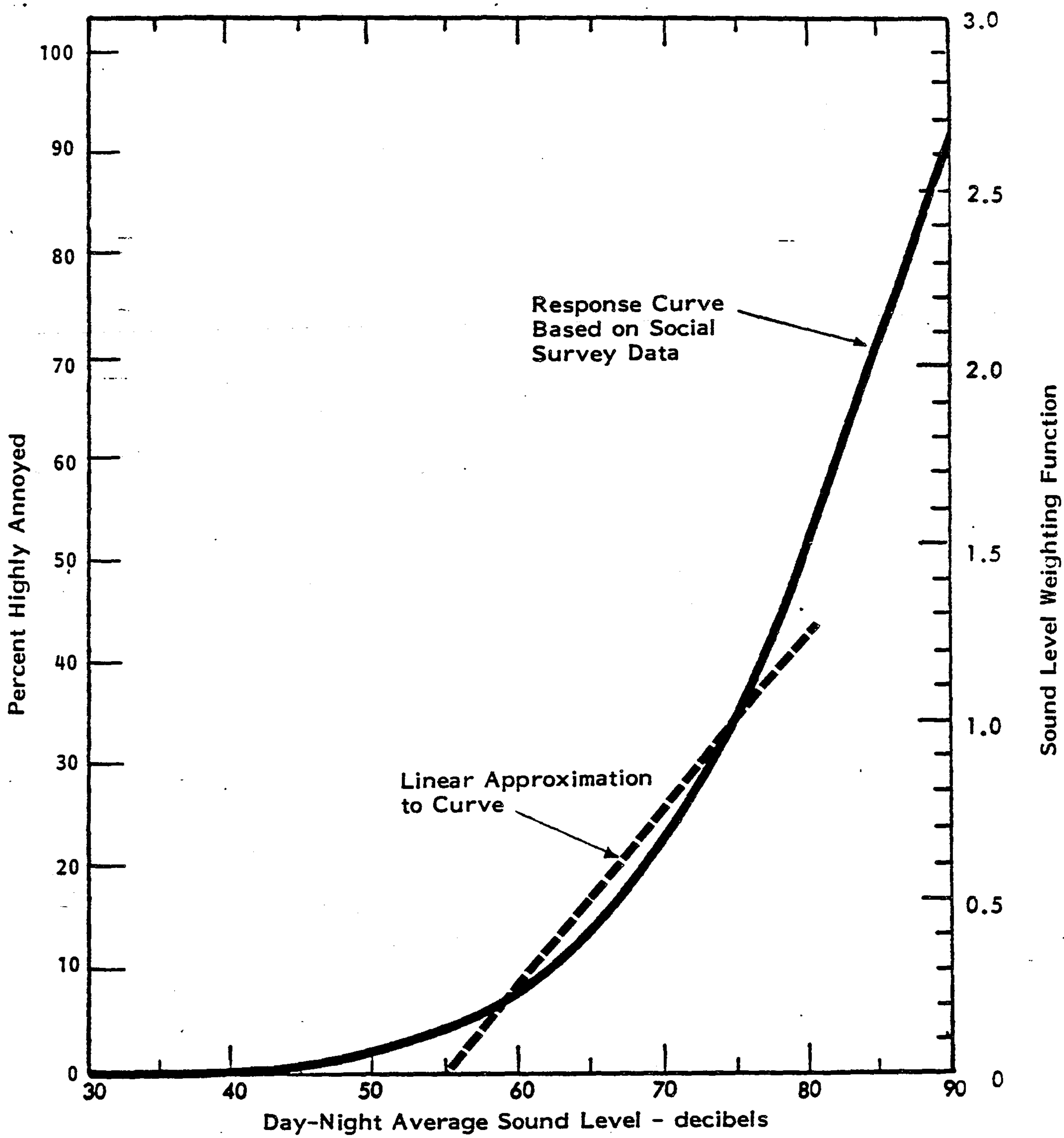



**Figure E-2**

## Community Response to Noise

While the day-night sound level is a measure of the 24-hour noise environment, and the $L_{eq}$ used in the Federal Highway Administration Noise Abatement Criteria is a measure of a single hour, for many roadways the $L_{dn}$ and the peak-hour $L_{eq}$ are numerically equal. Comparing the Federal Highway Administration Criteria with Figure E-2 shows that a peak-hour $L_{eq}$ (and an $L_{dn}$) of 67 dB would result in approximately 18 percent of the population being highly annoyed. (It should be recognized that in any noise environment some people will always indicate annoyance, and some people will never indicate annoyance regardless of noise level.) The Federal Highway Administration criterion is in fact just 2 dB higher than the $L_{dn}$ value of 65 dB endorsed by several other Federal agencies (U.S. Department of Housing and Urban Development, U.S. Department of Defense, etc.) as a general dividing line between an unacceptable and an acceptable noise environment for residential land use (Federal Interagency Committee on Urban Noise, June 1980).

The fractional impact methodology employs the curve in Figure E-2 as a weighting function, which is normalized to one at an $L_{dn}$ of 75 dB (see the right-hand scale on Figure E-2). For practical application of the methodology, the linear approximation to the curve shown in the figure may be used with reasonable accuracy. Thus, in the impact analysis, the number of people exposed to different $L_{dn}$ levels is determined, and then these populations are weighted in accordance with the linear weighting function of Figure E-2, starting at an $L_{dn}$ value of 55 dB. For example, the number of people exposed to an $L_{dn}$ value of 60 dB is weighted by a factor of 0.25. The number of people exposed to an $L_{dn}$ value of 70 dB is weighted by a factor of 0.8. These "fractional populations" are then added together, to provide a single number known as the level weighted population, LWP. The LWP is the number of people that experience an impact at an equivalent sound level of 75dB.

The impact analysis was conducted for existing conditions projected into the future, i.e. the No-Action Alternative, to determine the level weighted population for existing noise sources. An analysis was then conducted for each proposed No-Crossing and Crossing Alternative. The differences in LWP among the various alternatives indicate the relative impact of one alternative versus the other.

In summary, the fractional impact methodology permits the assessment of noise impact by collapsing to a single number the noise exposure of the population for existing and proposed conditions.

## C. NOISE SURVEY

In order to document the existing noise environment along the alternatives under consideration, a field measurement survey was conducted in February and March, 1984. During the survey, noise levels were monitored for a continuous 24-hour period at five noise sensitive locations. Short-term measurements of noise were collected at an additional four locations. In addition to measuring noise levels, the survey provided information on the sources of noise occurring at each location.

Two of the 24-hour monitoring locations were selected on Elmendorf Air Force Base along the proposed Elmendorf Project corridor. Two additional locations were selected in downtown Anchorage, along the Downtown Project. The fifth 24-hour measurement location was in Eagle River, adjacent to the Glenn Highway, to document the existing conditions at a location which would experience increased noise levels under the No-Action and other No-Crossing Alternatives.

Short-term measurements included two locations in the Mat-Su Borough along the Houston Connector and two additional locations within Anchorage.

Figure E-3 shows each selected measurement location.

All measurements were obtained using a DAI Model 607 Environmental Noise Analyzer. At each of the 24-hour locations, the DAI 607 monitored the noise levels continuously, and each hour it printed the hourly average noise level. From these hourly values, the $L_{dn}$ was computed. At the four additional short-term locations, the average sound level occurring during shorter periods (typically 10 to 30 minutes) was measured.

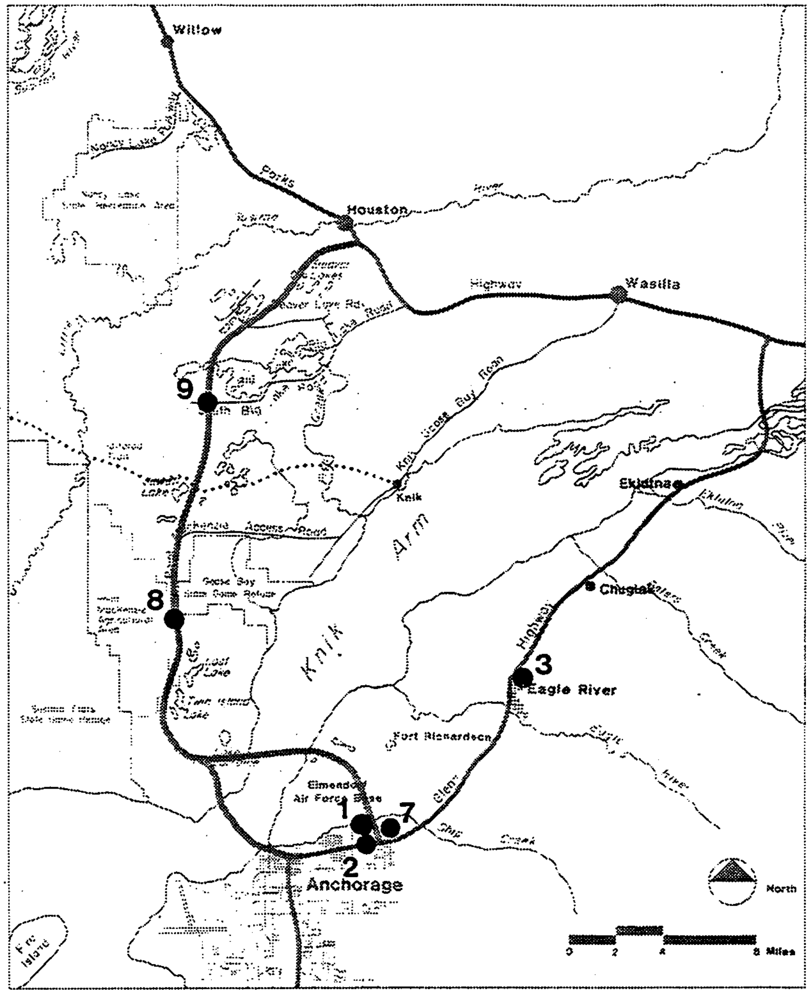
Table E-2 summarizes the results of these measurements, and it includes a listing of the major noise sources occurring at each location.

Figure E-4 shows a plot of the hourly average sound levels measured at each of the five 24-hour monitoring locations. At Location 3 near the Glenn Highway in Eagle River, the normal pattern of noise levels which follows the pattern of traffic flow can be seen. This same pattern can be seen to a lesser extent at Location 4, the Alaska Native Medical Center, where local traffic noise is a major contributor to the noise environment. At the other three locations, miscellaneous discrete noise sources such as aircraft, rail, and industrial sources provide irregularities to the 24-hour patterns shown on the figure.

Except for Location 3 in Eagle River, aircraft noise (from military aircraft, light aircraft, and helicopters) is a major contributor to the noise environment. For those locations south of the Ship Creek area, rail noise, industrial noise, and power plant noise are major noise sources. Traffic noise is also important except for sites on Elmendorf Air Force Base and at the locations on the Mat-Su Borough side of the Arm. At these locations (Locations 1, 2, 8, and 9), in the absence of aircraft noise the noise environment is low, particularly in the Mat-Su Borough. Artillery firing at Fort Richardson also affects the noise environment on an irregular basis in the northeastern portion of Anchorage.

## D. NOISE EXPOSURE ESTIMATES

Peak-hour $L_{eq}$ values (and, equivalently, $L_{dn}$ values) have been estimated using traffic noise prediction procedures (FHWA, December 1978) and traffic flow information for projected 2010 traffic volumes for the alternatives under consideration. These estimates have been made on a street and highway link-by-link basis, corresponding to the links for which traffic data have been tabulated.



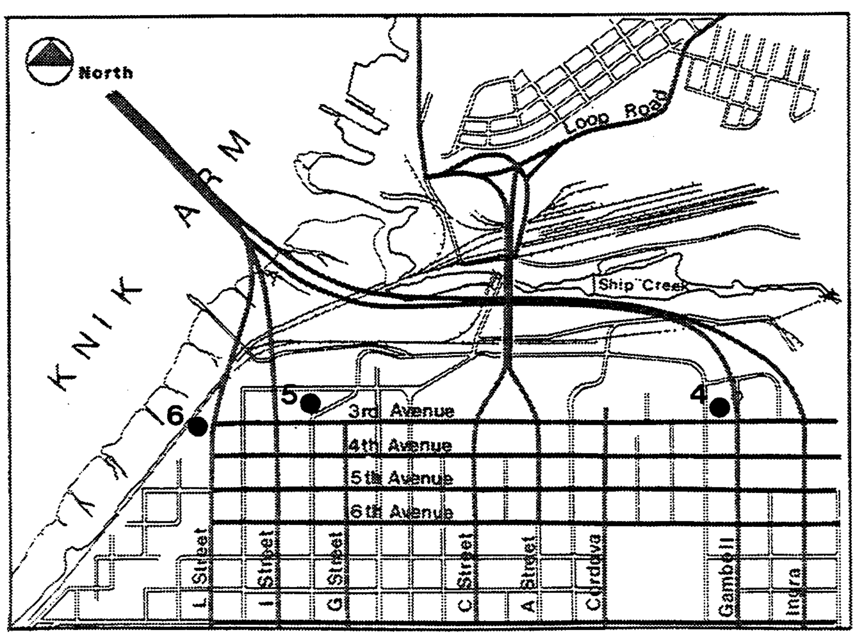



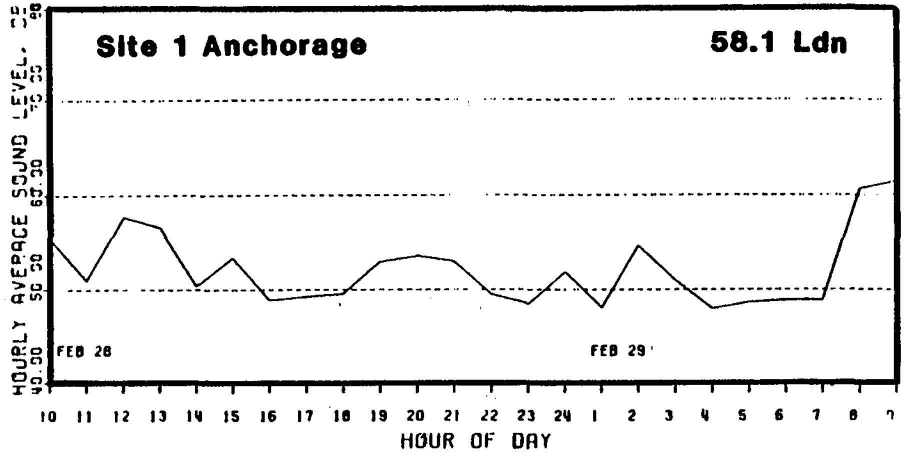

**Figure E-3**

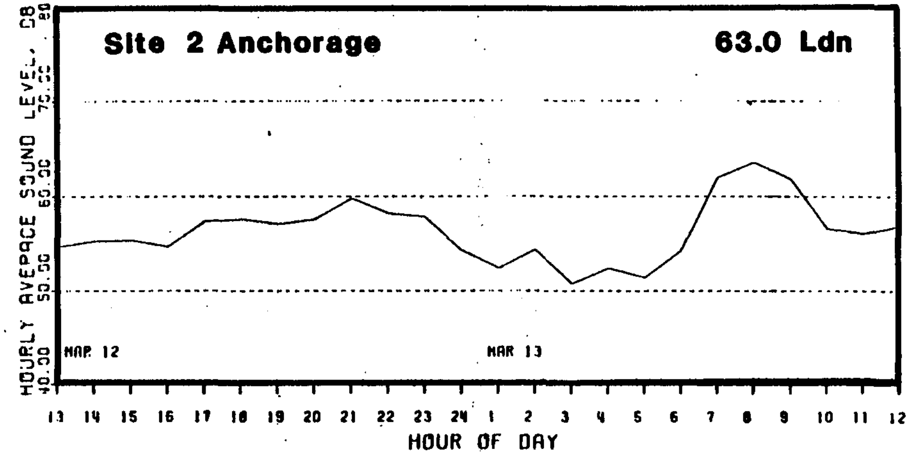
**Measurement Locations**

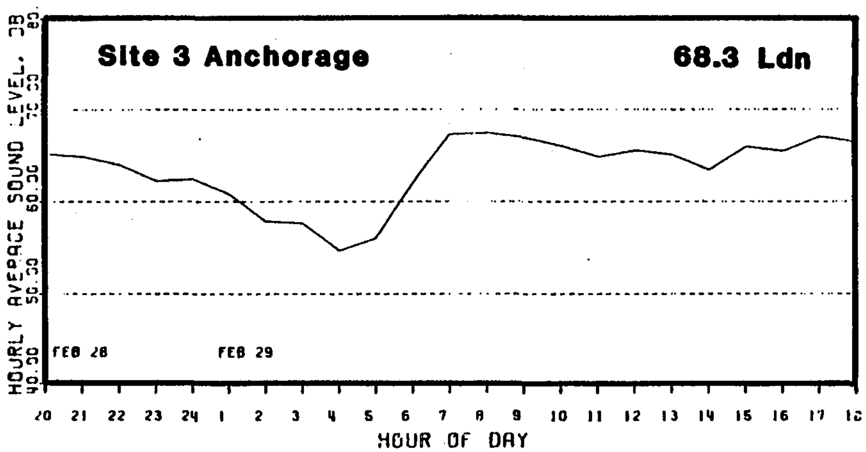
Table E-2

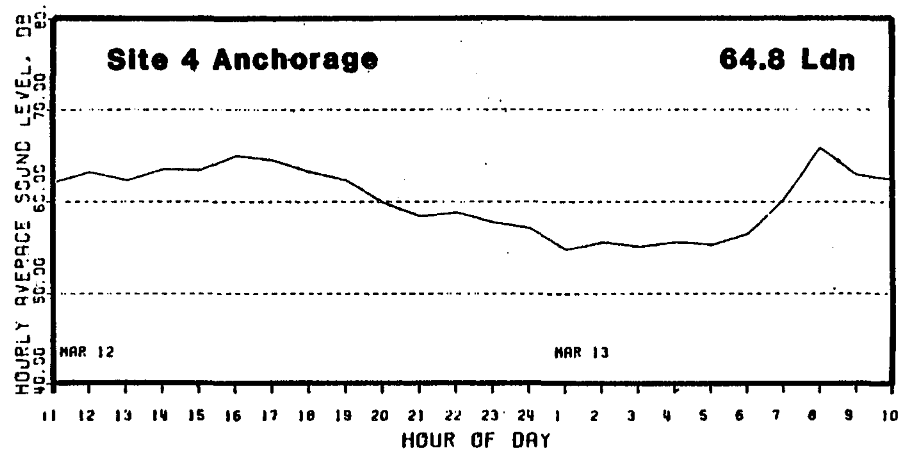
SUMMARY OF NOISE MEASUREMENT RESULTS

| Location No. | Description | $L_{dn}$ or $L_{eq}$ (dB) | Major Noise Sources |
|---|---|---|---|
| **24-Hour Measurements** | | | |
| 1 | Elmendorf AFB Hospital | 58 | Aircraft |
| 2 | Elmendorf AFB Housing Unit 24-334 | 63 | Aircraft |
| 3 | Residence, 136 Breckinridge, Eagle River | 68 | Traffic (Glenn Highway 100 feet away) |
| 4 | Alaska Native Medical Center | 65 | Traffic, Rail, Industry, Power Plant, Aircraft |
| 5 | Office, 211 H Street | 58 | Traffic, Rail, Construction, Industry, Aircraft |
| **Short-Term Measurements** | | | |
| 6 | Resolution Park | 60 | Traffic, Rail, Industry, Aircraft |
| 7 | Bartlett High School | 53 | Aircraft, Ventilation Equipment |
| 8 | Point MacKenzie Agricultural Area (Eastern Boundary), Mat-Su Borough | 42 | Aircraft |
| 9 | South Big Lake Road, Mat-Su Borough | 52 | Aircraft |



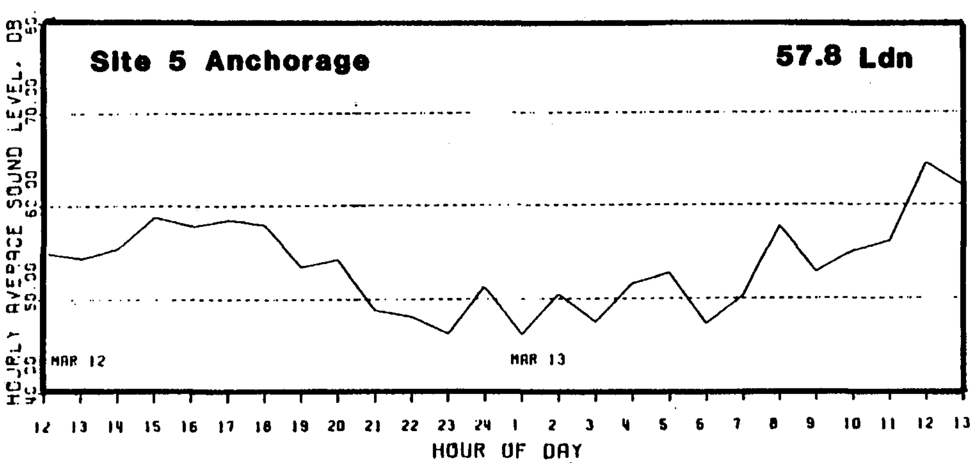




**Figure E-4**

## Hourly Average Sound Levels

The noise exposure estimates take into account total traffic volumes, heavy truck volumes (assumed to be one half of total truck volumes), and average speed. Table E-3 lists the estimated $L_{eq}$ at 100 feet from each of the roadway links. $L_{eq}$ values would diminish by 3 dB for each doubling of the distance from the roadway centerline. The 3 dB reduction is applicable principally to developed areas. For undeveloped areas the reduction would be 4.5 dB per doubling distance. Heavy forest vegetation would reduce sound levels further at an additional rate of 5 dB per 100 feet of forest. A projected noise exposure of 67 dB typically would occur within 300 feet from the roadway segment, except in the immediate vicinity of the Glenn Highway and the Elmendorf and Downtown Crossings, where a projected noise exposure of 67 dB typically would occur within 600 feet of the roadway.

## E. IMPACT ASSESSMENT

### Outside Anchorage Bowl

Table E-3 shows that for those roadway links outside the Anchorage bowl with moderate-to-heavy existing traffic (Glenn and Parks Highways), the three No-Crossing Alternatives would provide the highest noise exposure of the alternatives under consideration. This would be due to the increased traffic flow on these roadways compared to the situation which would occur if a Crossing were built. However, differences in noise exposure of up to 3 dB typically are imperceptible to the average person and therefore do not represent a significant difference.

For those roadway links where traffic would be light or non-existent, implementation of a Crossing Alternative would result in a significant increase in noise exposure; the projected noise exposure values at 100 feet would exceed the 67 dB FHWA criterion for most of the Houston Connector.

For this area outside the Anchorage bowl, aerial photographs were examined to identify residential structures within 500 feet of important roadways. Estimates were made of the peak hour average sound level for each residence. Table E-4 lists the number of residences with expected $L_{eq}$ in excess of 67 dB for each alternative under consideration. Out of approximately 1,060 residences in a 1,000-foot wide corridor along the various alternatives, 681 would be exposed to levels in excess of 67 dB in the year 2010 with No-Action. The table shows a decrease in the number of residences for either a Crossing or a Hovercraft Alternative, and an increase for the Glenn/Parks Improvement, all relative to the No-Action Alternative.

All but four of the homes listed as being exposed to levels in excess of 67 dB would be along the Glenn and Parks Highways. For that area, and for the Crossing and Hovercraft Alternatives, Table E-4 shows a reduction in the absolute number of homes which would exceed the criteria. This is not a net reduction that would include some homes with increased levels and others with reduced levels. Thus, along the Glenn and Parks Highways no mitigation would be required for those alternatives. The remaining four homes are on the Houston Connector, and would be 1 dB over the 67 dB criteria, which would represent a substantial increase over current levels. All four homes are in the Point MacKenzie area where the measured noise level is 42 dB; see Table E-2. The impact would be mitigated either by

Table E-3

PROJECTED TRAFFIC NOISE LEVELS FOR THE YEAR 2010
(Peak-hour $L_{eq}$ in dB at 100 feet from Roadway Centerline)

| | | No-Crossing Alternatives | | | Crossing Alternatives | | | |
|---|---|---|---|---|---|---|---|---|
| Link Number | Roadway (location) | No-Action | Glenn/Parks Improvements | Hovercraft | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| 1 | Parks Highway (from Willow north) | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| 2 | Parks Highway (Houston to Willow) | 65 | 65 | 65 | 65 | 66 | 65 | 65 |
| 3 | Parks Highway (Big Lake Road to Houston) | 68 | 68 | 68 | 61 | 62 | 61 | 61 |
| 4 | Parks Highway (just east of Big Lake Road) | 68 | 68 | 68 | 63 | 64 | 64 | 63 |
| 5 | Parks Highway (between Wasilla and Big Lake Road) | 68 | 68 | 68 | 63 | 64 | 64 | 63 |
| 6 | Parks Highway (just west of Wasilla) | 67 | 67 | 68 | 58 | 58 | 58 | 58 |
| 7 | Parks Highway (Glenn/Parks Highway Junction to Wasilla) | 69 | 71 | 69 | 69 | 68 | 68 | 68 |
| 10 | Glenn Highway (from Palmer north) | 69 | 69 | 69 | 69 | 68 | 69 | 69 |
| 11 | Glenn Highway (Glenn/Parks Highway Junction to Palmer) | 68 | 68 | 68 | 69 | 68 | 68 | 69 |
| 12 | Glenn Highway (Knik River to Glenn/Parks junction) | 74 | 75 | 74 | 72 | 73 | 72 | 72 |
| 13 | Glenn Highway (Eklutna to Knik River) | 74 | 75 | 74 | 72 | 73 | 72 | 72 |
| 14 | Glenn Highway (Peters Creek to Eklutna) | 74 | 75 | 74 | 72 | 73 | 72 | 72 |
| 15 | Glenn Highway (Eagle River to Peters Creek) | 75 | 75 | 74 | 74 | 74 | 74 | 74 |
| 16 | Glenn Highway (Muldoon Road to Eagle River) | 76 | 75 | 76 | 75 | 75 | 76 | 76 |
| 18 | Chuitna Corridor (to Fish Creek Agricultural Area) | 58 | 58 | 58 | 64 | 63 | 63 | 63 |
| 19 | Houston Connector (Parks Highway to Horseshoe Lake Road) | - | - | 53 | 65 | 65 | 64 | 64 |
| 20 | Houston Connector (Horseshoe Lake Road to South Big Lake Road) | - | - | 57 | 69 | 68 | 67 | 67 |
| 21 | Houston Connector (South Big Lake Road to Point MacKenzie Access Road) | 51 | 51 | 59 | 68 | 68 | 67 | 67 |
| 22 | Houston Connector (Point MacKenzie Access Road) | 61 | 61 | 61 | 71 | 71 | 70 | 70 |
| 23 | Houston Connector (Point MacKenzie Access Road to Crossing) | - | - | 61 | 72 | 71 | 70 | 70 |
| 24 | Big Lake Road (Parks Highway to Big Lake Road) | 58 | 58 | 56 | 59 | 59 | 59 | 59 |
| 25 | South Big Lake Road (from east side of Big Lake) | 62 | 62 | 61 | 63 | 64 | 63 | 63 |
| 26 | South Big Lake Road (east of Houston Connector) | 50 | 50 | 49 | 48 | 49 | 49 | 48 |
| 32 | Knik-Goose Bay Road (just south of Wasilla) | 66 | 66 | 64 | 55 | 56 | 55 | 54 |
| 33 | Knik-Goose Bay Road (north of Knik) | 66 | 66 | 64 | 56 | 56 | 55 | 54 |
| 34 | Knik-Goose Bay Road (south of Knik) | 66 | 66 | 64 | 56 | 56 | 55 | 54 |
| 35 | Point MacKenzie Access Road (east-west segment) | 62 | 62 | 59 | 62 | 62 | 61 | 61 |
| 36 | Glenn Highway (Boniface Parkway to Muldoon Road) | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| 37 | Glenn Highway (Bragaw Street to Boniface Parkway) | 70 | 70 | 70 | 69 | 69 | 69 | 70 |
| 38 | Northside Bypass (planned between Old Seward Highway & Bragaw Street) | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| 39 | Bragaw Street (Penland Parkway to Glenn Highway) | 65 | 65 | 65 | 65 | 65 | 65 | 64 |
| 40 | Penland Parkway (Bragaw Street to Airport Heights Road) | 65 | 65 | 65 | 63 | 63 | 63 | 65 |
| 41 | 5th/6th Avenues (Airport Heights Road to Seward Highway) | 66 | 66 | 66 | 65 | 66 | 66 | 66 |
| 42 | 5th/6th Avenues (C Street to Seward Highway) | 64 | 64 | 64 | 65 | 65 | 64 | 64 |
| 43 | 5th/6th Avenues (L Street to C Street) | 64 | 64 | 64 | 64 | 64 | 64 | 64 |
| 44 | Muldoon Road (Glenn Highway to DeBarr Road) | 69 | 69 | 69 | 70 | 70 | 70 | 69 |
| 45 | DeBarr Road (Boniface Parkway to Muldoon Road) | 69 | 69 | 69 | 68 | 68 | 69 | 68 |
| 46 | DeBarr Avenue (Bragaw Street to Boniface Parkway) | 66 | 66 | 66 | 65 | 64 | 65 | 66 |
| 47 | DeBarr Avenue (Airport Heights Road to Bragaw Street) | 65 | 65 | 65 | 65 | 65 | 66 | 66 |
| 48 | DeBarr Avenue (Lake Otis Parkway to Airport Heights Road) | 66 | 66 | 66 | 65 | 65 | 66 | 66 |
| 49 | 15th Avenue (Seward Highway to Lake Otis Parkway) | 65 | 65 | 65 | 66 | 66 | 66 | 66 |
| 50 | 15th Avenue (C Street to Seward Highway) | 64 | 64 | 64 | 63 | 63 | 64 | 64 |
| 51 | 18th Avenue (Minnesota Drive to C Street) | 60 | 60 | 60 | 59 | 59 | 60 | 60 |
| 52 | Muldoon Road (DeBarr Road to Northern Lights Boulevard) | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| 53 | Northern Lights Boulevard (Boniface Parkway to Muldoon Road) | 67 | 67 | 67 | 66 | 66 | 66 | 66 |
| 54 | Northern Lights Boulevard (Bragaw Street to Boniface Parkway) | 68 | 68 | 68 | 66 | 66 | 67 | 67 |

Table E-3 (Continued)

PROJECTED TRAFFIC NOISE LEVELS FOR THE YEAR 2010
(Peak hour $L_{eq}$ in dB at 100 Feet From Roadway Centerline)

| Link Number | Roadway (location) | No-Crossing Alternatives | | | Crossing Alternatives | | | |
|---|---|---|---|---|---|---|---|---|
| | | No-Action | Glenn/Parks Improvements | Hovercraft | Downtown (Mid-Range) | Downtown (High) | Elmendorf (Mid-Range) | Elmendorf (Low) |
| 55 | Northern Lights Boulevard (Lake Otis Parkway to Bragaw Street) | 65 | 65 | 65 | 64 | 64 | 65 | 65 |
| 56 | Northern Lights Boulevard (Seward Highway to Lake Otis Parkway) | 66 | 66 | 66 | 65 | 66 | 66 | 66 |
| 57 | Northern Lights/Benson Blvds. Couplet (C Street to Seward Highway) | 68 | 68 | 68 | 67 | 67 | 68 | 68 |
| 58 | Northern Lights/Benson Blvds. Couplet (Spenard Road to C Street) | 70 | 70 | 70 | 70 | 69 | 69 | 69 |
| 59 | Northern Lights/Benson Blvds. Couplet (Minnesota Drive to Spenard Road) | 67 | 67 | 67 | 68 | 67 | 67 | 67 |
| 60 | Muldoon/Tudor Roads (Northern Lights Boulevard to Boniface Parkway) | 68 | 68 | 68 | 68 | 69 | 68 | 68 |
| 61 | Tudor Road (Lake Otis Parkway to Boniface Parkway) | 68 | 68 | 68 | 68 | 67 | 68 | 68 |
| 62 | Tudor Road (Seward Highway to Lake Otis Parkway) | 66 | 66 | 66 | 66 | 66 | 67 | 66 |
| 63 | Tudor Road (Old Seward Highway to Seward Highway) | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| 64 | Tudor Road (C Street to Old Seward Highway) | 67 | 67 | 67 | 67 | 67 | 68 | 67 |
| 65 | Tudor Road (Minnesota Drive to C Street) | 67 | 67 | 67 | 67 | 66 | 67 | 67 |
| 66 | International Airport Road (C Street to Old Seward Highway) | 65 | 65 | 65 | 65 | 64 | 65 | 65 |
| 67 | International Airport Road (Minnesota Drive to C Street) | 67 | 67 | 67 | 66 | 66 | 66 | 66 |
| 68 | International Airport Road (Spenard Road to Minnesota Drive) | 68 | 68 | 68 | 67 | 67 | 67 | 67 |
| 69 | Boniface Parkway (Glenn Highway to DeBarr Road) | 68 | 68 | 68 | 69 | 69 | 68 | 68 |
| 70 | Boniface Parkway (DeBarr Road to Northern Lights Boulevard) | 67 | 67 | 67 | 67 | 66 | 67 | 67 |
| 71 | Boniface Parkway (Tudor Road to Northern Lights Boulevard) | 67 | 67 | 67 | 66 | 66 | 67 | 67 |
| 72 | Bragaw Street (Penland Parkway to DeBarr Avenue) | 65 | 65 | 65 | 64 | 65 | 65 | 65 |
| 73 | Bragaw Street (DeBarr Avenue to Northern Lights Boulevard) | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| 74 | Airport Heights Road (DeBarr Avenue to Glenn Highway) | 64 | 64 | 64 | 63 | 63 | 64 | 64 |
| 75 | Lake Otis Parkway (15th Avenue to Northern Lights Boulevard) | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| 76 | Lake Otis Parkway (Northern Lights Boulevard to Tudor Road) | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| 77 | Seward Highway (5th/6th Avenues to 15th Avenue) | 70 | 70 | 70 | 70 | 70 | 70 | 69 |
| 78 | Seward Highway (15th Avenue to Northern Lights Boulevard) | 66 | 66 | 66 | 66 | 65 | 66 | 66 |
| 79 | Seward Highway (just south of Northern Lights Boulevard) | 70 | 70 | 70 | 71 | 71 | 70 | 70 |
| 80 | Seward Highway (just north of Tudor Road) | 70 | 70 | 70 | 69 | 69 | 69 | 67 |
| 81 | Seward Highway (just south of Tudor Road) | 70 | 70 | 70 | 71 | 70 | 71 | 70 |
| 82 | Old Seward Highway (36th Avenue to Tudor Road) | 65 | 65 | 65 | 66 | 65 | 66 | 65 |
| 83 | Old Seward Highway (Tudor Road to International Airport Road) | 66 | 66 | 66 | 66 | 65 | 65 | 66 |
| 84 | C Street or A/C Couplet (5th/6th Avenues to 15th Avenue) | 66 | 66 | 66 | 66 | 65 | 66 | 66 |
| 85 | C Street (15th Avenue to Northern Lights Boulevard) | 68 | 68 | 68 | 68 | 68 | 69 | 68 |
| 86 | C Street (Northern Lights Boulevard to Tudor Road) | 68 | 68 | 68 | 67 | 67 | 68 | 68 |
| 87 | C Street (Tudor Road to International Airport Road) | 69 | 69 | 69 | 68 | 67 | 68 | 69 |
| 88 | I/L Street Couplet (5th/6th Avenues to 15th Avenue) | 67 | 67 | 67 | 67 | 67 | 66 | 67 |
| 89 | Minnesota Drive (15th Avenue to Northern Lights Boulevard) | 67 | 67 | 67 | 68 | 68 | 67 | 67 |
| 90 | Minnesota Drive (Northern Lights Boulevard to Spenard Road) | 68 | 68 | 68 | 68 | 68 | 67 | 68 |
| 91 | Spenard Road (Northern Lights Boulevard to Minnesota Drive) | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| 92 | Minnesota Drive (Northern Lights Boulevard to Tudor Road) | 68 | 68 | 68 | 69 | 69 | 69 | 68 |
| 93 | Minnesota Drive (Tudor Road to International Airport Road) | 68 | 68 | 68 | 69 | 69 | 68 | 68 |
| 94 | Spenard Road (Minnesota Drive to International Airport Road) | 63 | 63 | 63 | 62 | 63 | 63 | 63 |
| 101 | I/L Street ramps of Downtown Crossing | - | - | - | 72 | 72 | - | - |
| 104 | Seward Connector | - | - | - | 72 | 72 | - | - |
| 105 | Elmendorf Crossing | - | - | - | - | - | 74 | 73 |
| 106 | Downtown Crossing | - | - | - | 74 | 75 | - | - |

NOTE
Low, mid-range, and high refer to the growth allocation scenarios described in Chapter IV, "Urban Growth and Economic Development".

Table E-4

PROJECTED RESIDENTIAL NOISE IMPACT OUTSIDE THE ANCHORAGE BOWL
FOR THE YEAR 2010

| | No-Crossing Alternatives | | Crossing Alternatives | | | | |
|---|---|---|---|---|---|---|---|
| | No-Action | Glenn/Parks Improvement | Hovercraft | Downtown (Mid-range) | Downtown (High) | Elmendorf (Mid-range) | Elmendorf (Low) |
| No. of Res. | 681 | 728 | 536 | 591 | 594 | 551 | 551 |
| LWP | 647 | 693 | 631 | 566 | 572 | 563 | 564 |
| RCI | - | +7% | -2% | -13% | -12% | -13% | -13% |

NOTES

Total number of residences within 1000 feet of all roadways examined in rural areas was approximately 1,060.

Low, mid-range, and high refer to the growth allocation scenarios described in Chapter IV, "Urban Growth and Economic Development".

"No. of Res." is the number of residences with projected peak hour $L_{eq}$ greater than 67 dB.

LWP signifies level weighted population.

RCI signifies relative change in impact, compared to the impact of the No-Action Alternative.

maintaining vegetation on the 400-foot right-of-way adequate to reduce noise levels or by moving the alignment away from the homes during final design.

For the Glenn/Parks Improvement, since the increased noise level for the homes along those roads would be one dB or less (see Table E-3), no mitigation would be incorporated into project design.

The level weighted population (LWP) was determined for each alternative and is listed in the table as well. As a way of comparing the LWP values among alternatives, the relative change in impact (RCI) is also listed. The RCI represents the percentage change in LWP relative to the LWP of the No-Action Alternative. As can be seen from the table, any of the Crossing Alternatives would provide a decrease in noise impact, but an increase in impact is indicated for the Glenn/Parks Improvement Alternative.

Where the Houston Connector would cross the Iditarod Trail, the FHWA criterion of 67 dBA would be exceeded beginning about 100 feet from the center-line of the road during the peak hour. This noise level would be a significant increase over existing levels since the trail is in an undeveloped area. The impact would be mitigated by maintaining as much vegetation as possible at the trail so the area of impact would be minimized. Man-made barriers would not be in keeping with the trail's natural character.

Anchorage Bowl

Within the Anchorage bowl, there would be two types of impacts to be considered. The first type would be the direct impact of traffic on a Crossing and its Connectors, and the second type would be the indirect impact of changes in traffic flow on the urban arterials within Anchorage. With regard to the direct impact, for the Elmendorf Project the roadway would come in proximity to the Elmendorf AFB Hospital, Elmendorf AFB housing, an area of Elmendorf recreation facilities, and Bartlett High School. However, at each of these locations the projected peak-hour average sound level would be well below 67 dB, and increases above measured levels would not be significant enough to require mitigation. The levels would be:

| | Existing (24-hour $L_{dn}$) | Elmendorf Project (peak-hour $L_{eq}$) |
|---|---|---|
| Base Hospital | 58 | 57 |
| Base Housing | 63 | 57 |
| Base Recreation | | |
| ° Family Camp | 58 | 65 |
| ° Green Lake | 55 | 62 |
| ° Spring Lake | 62 | 62 |
| Bartlett High School | 53 | 57 |

For the Downtown Project, the Seward Connector would intersect with Ingra Street in the vicinity of the Alaska Native Medical Center. The estimated sound level resulting from traffic on the Connector would be below 67 dB, and comparable to levels already existing in the area. However, the Gambell Street southbound ramp alternative, which would run between the two major buildings of the Medical Center would cause sound levels greater than 67 dB and greater than existing levels. The Gambell Street southbound ramp alternative would not be built unless the Medical Center has moved to another location, as is planned. Homes closest to the Seward Connector also would experience sound levels below 67 dB (64 dB). The increase above present levels (measured during the field survey) would not be significant enough to require mitigation.

The I/L Ramps of the Downtown Crossing would adversely affect noise levels at Resolution Park, Hostetler Park, and four historic structures. The impact is addressed under "4(f) Resources".

The indirect impact of the alternatives on noise sensitive land uses along the street system in Anchorage can be seen in Table E-3. Typically, peak-hour average sound levels would vary by only 1 to 2 dB among the alternatives, and in many cases would be lower for a Crossing Alternative than for a No-Crossing Alternative. Thus, no substantial impact would be expected at any noise sensitive land use in the Anchorage bowl as a result of changes in traffic flow.

4(f) Resources

In addition to the sensitive land uses in the Anchorage bowl discussed above, several sensitive 4(f) resources have been identified, including Resolution Park, several historic buildings, and selected camping and recreation areas.

Downtown Project. Noise levels were estimated for three alternatives for the year 2010, see Table E-5. The first alternative is the No-Action Alternative, the second is the L Street southbound ramp alternative, and the third is an I Street southbound ramp alternative.

Since the estimates of noise exposure for the No-Action Alternative include only the noise of traffic on surface streets, they are likely understated. Other noise sources in the northwestern portion of Anchorage, including aircraft, rail vehicles, industrial, and construction activities add to the noise environment. Thus, comparisons of ramp alternatives to the No-Action Alternative based solely on the noise levels presented in Table E-5 would provide somewhat misleading conclusions.

Table E-5 shows that the FHWA criterion of 67 dB (applicable to residences) would be exceeded only at Location 3 for the I Street southbound ramp alternative. Location 2 contains offices, thus it falls under Category C (Table E-1) for which the noise abatement criterion is 72 dB. This criterion is not exceeded. For Location 3, mitigation could be implemented in the form of a barrier wall six feet high above roadway level; such a wall could be either attached to or part of the guard rail. However, for a solid, continuous barrier 600-feet long centered at the residence, the resulting noise reduction would be only 2 to 3 dB (this relatively low reduction would be caused by the changing elevation of the ramp relative to the residence.).

Table E-5

PROJECTED TRAFFIC NOISE LEVELS IN 2010 AT 4(f) RESOURCE LOCATIONS, DOWNTOWN PROJECT

| | | Peak-Hour $L_{eq}$ or $L_{dn}$ (dB) | | |
|---|---|---|---|---|
| Location | Description | No-Action | L Street Southbound Ramp | I Street Southbound Ramp |
| 1 | Resolution Park | 61 | 67 | 65 |
| 2 | 935 W. 3rd Avenue | 64 | 65 | 71 |
| 3 | 910 W. 2nd Avenue | 57 | 65 | 68 |
| 4 | 813 and 813 1/2 W. 3rd Avenue | 59 | 63 | 65 |

NOTE

All levels include only surface traffic. Noise from rail, aircraft, and industry are not included.

At Resolution Park, the FHWA criterion of 67 dB would be just met for the L Street southbound ramp alternative, at the upper level. Noise levels at the lower level likely would be the same or less than at the upper level.

In no case is the increase criteria exceeded.

Elmendorf Project. For the three locations shown in Table E-6, in the absence of the Elmendorf Project there would be no traffic noise. The major contributor to the noise environment at these locations would be aircraft operations at Elmendorf AFB; the existing noise levels listed in Table E-6 are based upon extrapolations of the day-night average sound level contours provided by the Air Force for aircraft operations at the Base. The family camp area is fairly close to the Base Hospital, where noise measurements indicated a day-night level of 58 dB.

As can be seen from the table, the estimated noise exposure levels for the Elmendorf Project would be below FHWA criteria, although at Locations 1 and 2 the projected noise levels would be 7 dB higher than existing levels. The higher level would not exceed the increase criteria described earlier and would not warrant mitigation.

## F. CONSTRUCTION NOISE

Construction is one of the major noise sources in urban areas. Building construction and public works projects coupled with traffic have created an almost perpetual din in many cities. The noise and vibration from construction of a roadway can disturb quiet areas and further affect areas that are already too noisy.

Noise from construction activities would be of concern near sensitive locations where sleep or speech interference would be a consideration (for example residences, motels, schools, etc.). Sustained A-weighted noise levels over 90 dB at such locations would be likely to be disruptive to normal activities during daytime hours. Night-time construction noise would be expected to be most objectionable in residential areas. Typical noise emission levels for construction equipment are listed in Table E-7.

In order to make detailed estimates of construction noise impact at different locations, a scenario describing the number, type, location, and operating cycle of each machine would be required. At the present stage in the environmental analysis and planning for the Knik Arm crossing, however, such a scenario cannot be developed, and a detailed estimate of construction noise effects cannot be prepared.

Guidelines are available for minimizing construction noise impact. Minimizing construction noise in residential areas and other sensitive areas would require consideration of best available equipment during the construction planning stage. Such consideration would include a well-written set of noise specifications to which contractors would be required to comply. The noise specification should include guidelines to

Table E-6

PROJECTED TRAFFIC NOISE LEVELS IN 2010 AT 4(f) RESOURCE LOCATIONS, ELMENDORF PROJECT

| Location | Description | Existing | Elmendorf Project |
|---|---|---|---|
| 1 | Family Camp | 58 | 65 |
| 2 | Green Lake | 55 | 62 |
| 3 | Spring Lake | 62 | 62 |

NOTE

No-Action levels are based on extrapolations from aircraft $L_{dn}$ contours.

Table E-7

AVERAGE NOISE LEVELS FOR CONSTRUCTION EQUIPMENT

| Equipment Type | Average Noise Level at 50 feet (dB) |
|---|---|
| Air Compressor | 81 |
| Backhoe | 85 |
| Concrete Mixer | 85 |
| Concrete Pump | 82 |
| Concrete Vibrator | 76 |
| Crane, Derrick | 88 |
| Crane, Mobile | 83 |
| Dozer | 87 |
| Generator | 78 |
| Grader | 85 |
| Jackhammer | 88 |
| Loader | 84 |
| Paver | 89 |
| Pile Driver | 101 |
| Pneumatic Tool | 85 |
| Pump | 76 |
| Rock Drill | 98 |
| Roller | 80 |
| Saw | 78 |
| Scraper | 88 |
| Shovel | 82 |
| Truck | 88 |

enable contractors to bid properly. These guidelines would give the maximum noise emission levels for specific equipment, combination effects of various mixes of equipment, and distances from the machinery to the property line. Quieted machinery would be available to contractors, which, if used, would result in considerable reduction in construction noise.

Construction noise would be reduced also by planning and by proper selection of the most quiet way in which to perform an operation. The use of pile drilling rather than pile driving would be one example. Such a technique would also greatly reduce vibration impact. An example of proper planning would be placement of equipment to maximize the distance between noisy equipment and the property line. Moreover, temporary noise control barriers could be placed around some of the noisiest operations.

# Appendix F

# Knik Arm Crossing Project Financing Overview

Appendix F

# KNIK ARM CROSSING
# PROJECT FINANCING OVERVIEW

The estimated cost of a Knik Arm crossing is $484.4 million to $557.5 million (1985 dollars) for the bridge and approach ramps, plus $62.6 million to $185.4 million (1985 dollars) for the connectors. For a project of this magnitude, financing is an important consideration for decision makers.

All practical types of financial vehicles which might be used to fund the Knik Arm Crossing are being explored. These include tax-exempt revenue bonds, private financing, tax-exempt general obligation bonds, legislative appropriations, Federal highway matching funds, and others. If one of the Crossing Alternatives is selected for implementation, a financing plan will be completed prior to the next session of the State legislature (convenes in January 1985) along with other information that will compose an implementation plan.

## A. SOURCES OF REVENUE

The choice of financing vehicles for use in the recommended plan of finance will depend on the nature and timing of revenues available to the project. Projects sponsored by the State of Alaska typically are paid for through State construction appropriations or, if debt or other financing is used, repaid through State leases or debt service payments. In these cases, the ultimate source of payment is the general revenue of the State, such as Statewide taxes and royalties, and revenues from the Federal government. Two additional sources are being examined for the Knik Arm Crossing: toll revenues, and land value capture.

## B. TOLL REVENUES

The State of Alaska is considering the use of toll charges to assist in financing the bridge. Automobile and truck traffic between Anchorage and points north should be willing to pay a toll to cross the bridge because of savings in distance and time which would be made possible by the Crossing.

A bill in the State legislature to grant toll-charging authority to the Alaska Department of Transportation and Public Facilities (ADOT/PF) has passed the Legislature and has been signed by the Governor. Under this law, a Crossing financing program, in which ADOT/PF would issue bonds to be repaid through collection of tolls, could be applied for financing a portion of bridge costs. Bond sale proceeds would be used to finance project construction costs.

The maximum size of the bond issue would be determined by the forecast of toll revenues and the degree of certainty of that forecast. Under the present forecasts of toll revenues, it is likely that toll-backed revenue bonds could finance only a portion of the Crossing costs.

Additional amounts of money can be borrowed, possibly at better interest rates, if the State of Alaska offers a guarantee such as a specified traffic volume over the Crossing or a direct credit guarantee of the bonds. Such State guarantees probably constitute the equivalent of State general-obligation debt, however, and would require legislative and voter approval. Therefore, although the use of a State guarantee could enhance the financing of the Crossing, its use is by no means assured.

An alternative to the State guarantee is a type of lease or service contract in which the State agrees to pay for use of the bridge for a certain number of years, with payment subject to annual legislative appropriation. Under this system, if the legislative appropriation is not made, the State is not obligated to make the specified payment to the Crossing. This arrangement is less than a full State guarantee, and it should not constitute general-obligation debt. The use of a lease or service contract will be explored for applicability to the Knik Arm Crossing, including the possibility of its use in conjunction with toll revenues.

## C. LAND VALUE CAPTURE

The improved accessibility of land immediately north of Knik Arm in the Point MacKenzie area is expected to increase dramatically the value of property for commercial, industrial, and residential development. The great majority of developable land immediately north of the Crossing Alternatives belongs to the Matanuska-Susitna Borough, and negotiations with the Borough might allow capturing the increases in land value which would be made possible by a Crossing. The proceeds would be used to repay a portion of the financed bridge construction costs.

## D. FINANCING OF CONNECTORS

Highway connectors to the bridge would be financed through Federal highway participating funds, under administration of the Federal Highway Administration (FHWA). Each region of the State receives a periodic allocation of these funds for highway construction. The funds can be used for certain types of highway projects, with the State providing matching funds. In Alaska, the ratio between Federal money and State money in this program is approximately 90 percent to 10 percent, respectively. Uses for FHWA funds generally are planned several years in advance, with the projects proceeding as funds become available. At present, neither the Houston nor the Seward Connector are programmed into the FHWA funding process, and this would be a necessary step in financing the connectors if FHWA funds are to be used.

A Crossing itself also would be eligible for FHWA funding, however the construction cost of the bridge is far in excess of the size of the FHWA funding allocations. In addition, Federal rules would restrict the charging of bridge tolls if FHWA funds were used for Crossing construction (although use of FHWA funds only for the Connectors would not place such a restriction on Crossing tolls). For these reasons -- cost of the project and toll restrictions -- it is likely that FHWA funds would be used only for the Connectors.

## E. PRIVATE FINANCING

Private financing may be a part of a larger plan whereby a firm or consortium provides a total package of design, construction, operation, and financing. In such a plan, the amount and terms of financing could be an element of competition in a competitive bid. As part of financial plan development, this alternative will be explored with potential bidders and assessed for feasibility.

## F. STATE FUND FOR LARGE PROJECTS

The State has recently given attention to the concept of a constitutionally-established fund for investment in large capital projects. The fund would be capitalized from periodic legislative appropriations or a constitutionally-dedicated stream of revenue. The fund would invest in capital projects meeting certain size or other criteria, and collect principal repayments, and possibly interest, over the subsequent years. Under this concept, projects could be insulated from the extremely high interest rates present in today's financial markets (if the interest charged by the fund was below market) while still being required to meet the costs of operations, maintenance, and debt service.

# Appendix G
# Correspondence

## Appendix G

## CORRESPONDENCE

The following correspondence was received from government agencies during Draft EIS preparation and is included in this Appendix:

| From | Date | Subject | Page |
|---|---|---|---|
| Alaska Department of Fish and Game | 5/16/84 | Review of Draft EIS working draft | G-3 |
| Alaska Department of Natural Resources | 5/29/84 | National Register eligibility of five buildings and Iditarod Trail | G-4 |
| | 6/11/84 | National Register eligibility of Iditarod Trail | G-6 |
| City of Houston | 4/9/84 | Houston Connector Terminus at King Arthur Road | G-7 |
| Matanuska-Susitna Borough | 5/21/84 | Review of Draft EIS working draft | G-8 |
| Municipality of Anchorage | 5/8/84 | Downtown Project impact to Resolution Park and section 4(f) implications | G-11 |
| | 5/16/84 | Review of Draft EIS working draft | G-12 |
| U.S. Department of Air Force, Headquarters Alaskan Air Command | 5/14/84 | Review of Draft EIS working draft | G-22 |
| U.S. Department of Agriculture, Soil Conservation Service | 5/22/84 | Prime and unique farmlands, and farmlands of Statewide and local importance | G-24 |
| U.S. Department of Army, Corps of Engineers | 4/19/84 | Permit jurisdiction | G-25 |
| | 5/15/84 | Review of Draft EIS working draft | G-27 |

| From | Date | Subject | Page |
|---|---|---|---|
| U.S. Department of Interior, Fish and Wildlife Service | 5/14/84 | Review of Draft EIS working draft | G-34 |
| | 6/22/84 | Knik Arm crossing mitigation statement; attachments include letters of consultation from the Alaska Deparment of Fish and Game (5/29/84), U.S. Environmental Protection Agency ( 5/18/84), and National Oceanic and Atmospheric Administration (5/17/84) | G-40 |
| U.S. Department of Interior, National Park Service, Keeper of the National Register | 7/16/84 | National Register eligibility determination for two homes | G-59 |
| U.S. Department of of Transportation, Federal Highway Administration | 6/27/84 | Request for National Register eligibility determination | G-61 |
| U.S. Department of Transportation, Coast Guard | 6/11/84 | Navigation clearance on Knik Arm | G-62 |

In April 1984, the Alaska Department of Transportation and Public Facilities provided several agencies with a working draft of the Draft EIS. This working draft contained early text of the "Highway Accessibility", "Traffic Volumes", "Traffic Flow", "Urban Growth and Economic Development" (part), "Urban and Military Function and Operation", "Biological Resources", "Wetlands", "Water Quality and Hydrology", "Noise", and "Visual" sections of Chapter IV. Drafts of Chapters I, II (except Table II-1), and III, Appendices A and C, and "Description" and "Impacts" sections of Chapter V were also provided. Outlines of sections, Chapters, and Appendices planned but not in the working draft were also provided. The working draft was distributed as a means of obtaining response to early findings as an aid in refining and focusing the analyses. The agencies which examined the working draft and made suggestions for improving it were those for whom the crossing would cause particularly significant impacts. These agencies are listed in the correspondence table above. Where appropriate, notes follow the letter to which they apply.

# STATE OF ALASKA

**DEPARTMENT OF FISH AND GAME**

*BILL SHEFFIELD, GOVERNOR*

*333 RASPBERRY ROAD*
*ANCHORAGE, ALASKA 99502*

May 16, 1984

Knik Arm Crossing
430 C Street, Suite 200
Anchorage, Alaska 99501

Attention: Mr. Jack Allen, Project Manager

Gentlemen:

The Alaska Department of Fish and Game (ADF&G) has completed a review of the working draft Environmental Impact Statement for the Knik Arm Crossing project. As stated in our meeting with the U.S. Fish and Wildlife Service on Thursday May 10, 1984, the narrative sections describing the existing natural resources and the anticipated impacts to these resources should be expanded. We have provided our general and specific comments in the margins of the enclosed working draft to assist you in the development of the review draft EIS. Thank you for the opportunity to review this document and we hope you find our comments useful. If you have any questions please call Gary Liepitz of the Habitat Division at 267-2281. We look forward to reviewing your proposal for the development of an acceptable analysis of secondary impacts associated with this project.

Sincerely,

Dennis D. Kelso, Deputy Commissioner

Gary S Liepitz

BY: Philip J. Brna
Habitat Biologist
Habitat Division
267-2284

Enclosure

cc: M. Hayes, ADNR
B. Martin, ADEC
B. Bowker, USFWS
B. Lawrence, EPA

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS AND OUTDOOR RECREATION

BILL SHEFFIELD, GOVERNOR

225A CORDOVA STREET
ANCHORAGE, ALASKA 99501
PHONE: (907) 276-2653

May 29, 1984

Re: 3130-2 (DOT/PF)

Mr. Jerry Hamel
Project Manager, DG III
Central Region
Department of Transportation
and Public Facilities
4111 Aviation Drive, Pouch 6900
Anchorage, Alaska 99501

Dear Mr. Hamel:

The determinations of National Register of Historic Places eligibility for five buildings and a portion of the Iditarod Trail within the proposed right-of-way for the Knik Arm Crossing are as follows:

<u>918 West Second Avenue</u>: Because this building is within the original Anchorage townsite and was built in 1916 this structure is determined to be eligible.

<u>910 West Second Avenue</u>: This structure has had several modifications and has been determined to be ineligible.

<u>935 West Third</u>: Because this structure has unique architectural features, including arched dormers and has associations with persons of local and state significance, this structure is declared eligible.

<u>813 West Third Avenue</u>: Buildings that have been moved are not normally eligible for the National Register, had this building remained in Chickaloon it would probably be eligible Chickaloon. Because it was moved to Anchorage more than 50 years ago and because it was modified to the Art Moderne-Art Deco style, it has acquired a unique character and age which make it eligible in Anchorage for the National Register.

<u>813½ West Third Avenue</u>: This building is declared eligible for the National Register because of its association with the early Anchorage townsite and because of its long, narrow plan that is unique to early Anchorage architecture.

Iditarod Trail (Portion): Because of its association with elements of Alaska's history, including migration, gold rush, trade, homesteading, transportation, and the town of Knik (already on the National Register), portions of this trail may be eligible for the Register. The uncertain location of the original trail appears to extend from one mile east of Sevenmile Lake to the west. Additional information and on-site photography of the proposed site(s) of crossing will be helpful to determine what level of integrity remains, if the original location is to be affected and ownership of the property in question.

We look forward to reviewing the determinations of effect on the appropriate properties.

Sincerely,

Neil C. Johannsen
Director

Tim Smith

By: Tim Smith, Acting Chief
Office of History and Archaeology

PWC:clk

# STATE OF ALASKA

**DEPARTMENT OF NATURAL RESOURCES**

*DIVISION OF PARKS AND OUTDOOR RECREATION*

*BILL SHEFFIELD, GOVERNOR*

~~XXXXXXXXXXXXXXXX~~ Pouch 7001
ANCHORAGE, ALASKA ~~XXXX~~ 99510
PHONE: (907) 276-2653


June 11, 1984

Re: 3440 (FHA)
3130-2 (DOT)

Elise Huggins
Knik Arm Crossing
430 C Street, Suite 200
Anchorage, Alaska 99501

Dear Ms. Huggins:

We have reviewed our letter to Jerry Hamel concerning the Determination of Eligibility on the Knik Arm Crossing. The section concerning the Iditarod Trail is, as you pointed out, a little unclear. Paul Chattey has reevaluated that portion of the letter and has come up with a Determination of Eligibility for the trail.

That section of trail to be potentially affected by the crossing is not considered eligible for the National Register. The primary concern is that the trail location is unknown in this area - only a general location can be given for this section of trail. We still feel that all sections of the trail are important and that the concept of a continuous trail from the Kenai Peninsula to the northern parts of the state should not be forgotten or otherwise layed aside.

We urge DOT/PF to consider a pull-out or wayside near a probable crossing of the Iditarod Trail to commemorate the trail's long history and contribution to Alaska's economy. An interpretive sign at the wayside would be a very appropriate way to tell visitors about the Iditarod Trail.

If you have any questions, please contact Diana Rigg at 265-4139 or Paul Chattey at 265-4111.

Sincerely,

Neil C. Johannsen
Director

Tim Smith

By: Tim Smith
Deputy State Historic Preservation Officer

cc: Jerry Hamel, DOT/PF

DR:clk

CITY OF HOUSTON, ALASKA
INCORPORATED - JUNE 6, 1966

Robert J. Lemoine, Mayor

April 9,1984

Denvy Saxowsky, Chairman
Planning Commission
Matanuska-Susitna Borough
Box B
Palmer, Alaska 99645

RE: KNIK ARM CROSSING ALIGNMENT

Dear Sir:

Recently, the Houston City Council voted to ask that the alignment of the Knik Arm Crossing terminus at Houston be adjusted to co-ordinate with the terminus of King Arthur Road at the Parks Highway.

This vote was based upon a concern which has been expressed by citizens, as well as the City Engineer, that the proposed alignment will cause that traffic exiting King Arthur to enter the Knik Arm Crossing to make a left onto the Parks Highway, and an immediate right onto the Knik Arm Crossing. The reverse would be true for that traffic leaving the Knik Arm Crossing to enter King Arthur.

It is realized that the requested change would necessitate a railroad crossing, but the Council was of the opinion that the safety factor is important enough to make that change.

As you are aware, King Arthur Drive is the major entry to the populated area of Houston now, and will eventually be the terminus of the Borough's Parks-Pittman Connector. This proposed Parks-Pittman Connector will funnel traffic from the Meadowlakes area onto the Knik Arm Crossing, thus making the proper co-ordination very important.

Further, we request that in the series of public hearings which your Commission will likely plan on this issue, that at least one hearing be scheduled for Houston.

Sincerely,

Elsie M. O'Bryan

Elsie M. O'Bryan
City Clerk



P.O. BOX 27 • HOUSTON, ALASKA 99694 • 892-6869

**Matanuska-Susitna Borough**

BOX B, PALMER, ALASKA 99645 • PHONE 745-[illegible]

PLANNING DEPARTMENT

LAND MANAGEMENT - PLATTING - PLANNING

May 21, 1984

Mr. John Olson, Director of Major
Projects Management
Department of Transportation
and Public Facilities
Pouch 6900
Anchorage, AK 99502

Dear Mr. Olson:

The Matanuska-Susitna Borough appreciates the opportunity to review the <u>Working Draft E.I.S. Knik Arm Crossing</u> document dated 4/25/84. Following are our general comments and then a summary, by page number, of specific comments we have identified.

There appears to be a basic, underlying assumption of this study: The opening up of land within the Matanuska-Susitna Borough, for massive suburbanization or residential development. While this assumption, to some degree, would be inevitable with a Knik Arm Crossing, it should be considered a low priority goal for the Borough.

Also, there are numerous references to an Anchorage - Mat-Su commuter service including bus service, bus lanes, park and ride stops, etc., which are contrary to recent Borough Assembly action to discontinue the subsidy of the existing Borough commuter bus service. This recent action should be reflected in the study. Our specific comments follow.

Pg. I-3. While the <u>Phase I - Point MacKenzie Port/Park Land Management Plan</u> dated March 23, 1984 did state that the "crossing would justify development of the proposed industrial port/park complex", a more accurate Borough statement would insert "help" before the term justify. While the crossing would have a significant impact on the development of a port/park complex at Point MacKenzie, it is not the sole variable involved in its continued development.

Pg. II-19. The Assembly adopted Transportation Element of the Borough Comprehensive Development Plan, dated March

1984, is the official capital improvement plan for the Borough and should be recognized as such.

Pg. III-7. A grant proposal for the purchase of two additional buses was brought before the Borough Assembly some months ago. The Assembly voted not to endorse the proposal and went on record as not favoring a Borough-subsidized commuter bus program between Anchorage and the Mat-Su Borough.

Pg. III-9. See comments on Pg. II-19 regarding the Borough adopted 6-Year and 20-Year Transportation Plan dated March 1984.

Pg. III-15. The Matanuska-Susitna Borough Coastal Management Plan recommended the designation of six (6) AMSA's: The Susitna Flats Game Refuge; The Goose Bay Game Refuge; The Palmer Hay Flats Game Refuge; The Knik/Matanuska River Floodplains Area(s); The Nancy Lake Recreation Area; and the Point MacKenzie Industrial Port/Park Site.

Pg. III-20. In the Mat-Su Borough, fire service is provided by several Fire Service Areas along the Parks Highway and at Big Lake.

Figure III-7. The criteria for prime agricultural lands has not been included and would be helpful in the review of the significance of this figure.

Pg. III-37. The Point MacKenzie agricultural area(s) should also be considered a visual unit within the Borough.

Pg. IV-16-17. Again, the basic underlying assumption of this study concerning concentrated residential development at Point MacKenzie is not a high priority goal of the Borough.

Pg. IV-24. "Industries strongly linked to rail transport and municipal utilities would be the least likely to transfer." This study has not referenced a railroad crossing of the Knik Arm, including any design considerations. Rail capability of any crossing site is a high priority for the Borough and as such would interest industries within the Mat-Su Borough with rail needs for transportation of goods and services.

Pg. IV-31. Same comment as Pg. III-20 regarding Houston and Palmer Fire Service.

Pg. IV-40. Safeguards to protect critical habitat exist via the Mat-Su Borough Coastal Management Plan, the Army Corps of Engineers permitting programs, the Alaska Department of Fish and Game permitting program and the U.S. Fish and Wildlife Service.

Pg. IV-41. I suggest wording the third complete paragraph "indirect or secondary impacts to the marine environment could occur to the extent that Crossing Alternatives help to induce the development of port facilities in the Point MacKenzie area . . . .

Pg. IV-43. The Susitna Flats is a highly productive area which currently has no road access. However, there are a number of all terrain vehicle and snowmobile trails as ground access into the refuge.

Pg. IV-44. Same comment as Pg. IV-40 concerning the protection of biological resources.

Pg. IV-47. The Borough agrees that water and coastal resources within the Borough will continue to be the focus of development proposals, especially if the Knik Arm Crossing is constructed.

Pg. VI-60. Although a potentially more pleasant experience, if one has a good regional view from the bridge while crossing, it may become a safety hazard if not designed properly.

This completes our initial review comments on the Working Draft E.I.S. Thank you again for the opportunity to fine tune this draft document.

Sincerely,

Michelle R. Stearns

Michelle R. Stearns
Senior Planner

mu

POUCH 6-650
ANCHORAGE, ALASKA 99502-0650
(907) 264-4111

May 8, 1984

Elise Huggins
Knik Arm Crossing Project
430 C Street
Anchorage, Alaska 99501

Dear Ms. Huggins:

Thank you for your inquiry regarding potential impacts to Resolution Park for one of the Knik Arm Crossing alternatives. As related to you, the purpose of that park, in addition to its role in commemorating Captain Cook's voyage, is to provide a place for a respite, to find solitude from typical downtown activities. As such, with its multiple decks a person can go to the park and enjoy the Inlet, changes in the day and seasons in a relatively noise free environment. The alternative to use the L Street alignment will certainly impact the park, not only in using a piece of park land, but also in a situation in which the park's solitude would be violated. It is my initial reaction that this would result in a serious impact and has implications regarding Section 4f of the Federal Highway and Transportation Act.

Thank you for your investigation of this matter early-on. I trust that Parks and Recreation Department may also have provided you with information in this regard.

Sincerely yours,

Michael E. Carberry

Michael E. Carberry
Senior Planner

cc: Ron Crenshaw, Parks & Recreation Department

mc11/n17

Municipality of Anchorage

POUCH 6-650
ANCHORAGE, ALASKA 99502-0650
(907) 264-4111

TONY KNOWLES,
MAYOR

DEPARTMENT OF PLANNING

May 16, 1984

John Olson
State of Alaska
Department of Transportation
& Public Facilities
Pouch 6900
4111 Aviation Avenue
Anchorage, AK 99502

Dear Mr. Olson:

Enclosed are comments and questions for you to consider as you revise the Knik Arm Crossing: Environmental Impact Statement (Working Draft) of April 25, 1984. Included are both issue-related and technical comments from several Municipal agencies, specifically, the Departments of Community Planning, Parks and Recreation, Transit, Public Works and the Port. We appreciate the energy and dedication required of you, your staff, and the consultants in producing an EIS for this complex project. We sincerely hope you will accept our contributions as constructive concerns and suggestions.

Our critique of the report is organized in two levels. The first level cites concerns or questions of a more strategic or generic nature, related to the intent, scope, assumptions, and comprehensiveness of the project and the EIS. The second level identifies technical corrections needed and areas of discrepancy with Municipal studies, plans, reports. Please feel free to call us to discuss any or all of our response.

Respectfully,

Kathryn L. Carssow

Kathryn Carssow, Acting Director
Department of Community Planning

kac/il1

Enclosure

Municipality of Anchorage
Response to Preliminary EIS

The Draft Environmental Impact Statement leads us to conclude the State is committed to building a bridge across Knik Arm. This statement and the other preliminary reports focus narrowly on the bridge with minimal analyses and discussions of elements tangential to its feasibility, construction, placement, operations, and regional impact. From a sound decision making perspective, a very expensive solution is being promoted without a defined problem and without thoroughly examining the financial, social, and economic feasibility of other less costly alternatives. Noting the State's history of cost estimating for large scale capital projects, the KAC project personnel observed that a 100 percent overrun in bridge construction costs would not be unusual. And, while earlier reports suggested the project would be built with private funds, the more recent statements reflect considerable public underwriting and expense. Hence, the economic, social, and fiscal ramifications of the $1 billion Knik Arm Crossing project warrant in-depth analyses and public discussion.

The foremost objective of the EIS process is to fully inform the public of a pending decision, the alternatives, and the quantifiable and unquantifiable costs associated with those alternatives. Recognizing the decision to build or not to build the crossing rests in the political arena, this objective is paramount. This project will directly affect all Anchorage residents and many others throughout Southcentral Alaska. To be responsible, the public hearing process must go beyond merely "taking comments" to presenting visually and in writing the information Alaska's citizens need to thoroughly understand the project as proposed and to assist them in forming and expressing knowledgeable opinions.

(NOTE 1)

STRATEGIC CONCERNS

1. Unclear Definition of the Problem

The EIS contains no clear description of the problem(s) the crossing is designed to solve. Page I-1 refers to the population, land supplies and limited access to and from Anchorage but does not identify or discuss specific problems related to any of these. Neither is mention made of problems in the Mat-Su Borough calling for a bridge. The origin of the four goal statements on page I-1 is not clear. Numbers 1, 3, and 4 seem to relate to Anchorage but are not derived from the Municipal Comprehensive Plan, Central Business District Plan, Coastal Zone Management Plan or any other local policy document.

If the perceived problem is a lack of available land in Anchorage to accommodate projected population growth, the Municipality suggests that existing undeveloped acreage in the bowl, redevelopment opportunities (at higher densities), and vacant lands (over 19,000 acres) held by Eklutna Native Corporation and the federal railroad offer a sufficient land supply till well after the year 2000. If, however, moving the greatest number of people per structure dollar is the objective, we suggest you consider more thoroughly other alternatives such as light rail and an expansion of Glenn Highway to six lanes, including at least one HOV lane. These alternatives would result in comparable travel time from Anchorage to the Palmer-Wasilla area at considerably less cost than the bridge.

And last, if the real objective for the bridge is to hasten Mat-Su Borough's ability to develop their needed industrial/commercial base, we suggest that purpose be clearly stated during the public hearing process. (NOTE 2)

2. <u>Lack of Detailed Plan for Project Phasing of Construction and Financing</u>

The Draft EIS lacks a detailed description of the project plan and the relationships between the following elements: activities prior to, during and after the bridge comes online, corresponding financing activities, sources and short and long range pay back modes, and funding concommitant activities related to other major state, regional and local capital projects (e.g., Anchorage Northside Corridor, port expansion, etc.). The report will benefit from including a projected schedule for investment payback via user tolls. It needs to show how and when tolls will accommodate operating and maintainance costs as well. (NOTE 3)

There are many different perceptions of the bridge project's potential to divert funds from other needed projects. The next EIS should clarify the amounts to be diverted, the projects to be effected, and the revised schedule, plan or policies that will supercede existing schedules, plans, or policies. Though there are statements such as the one found on II-14 "...so as not to interfere with programmed projects for which the use of Federal funds is already planned," there is no explanation of how such interference can or will be avoided.

The next report needs to include responses to potential contingencies such as, What if residential development doesn't occur as readily as projected? What if Mat-Su cannot afford to build a $10 million secondary wastewater treatment plant at Pt. MacKenzie? What if population growth rates decline unexpectedly? The current draft EIS lacks descriptions or considerations of possible down-side risks.

(NOTE 4)

3. Lack of Detailed Determination of Financial Feasibility of the Bridge

Consistent with comments #1 and #2, the bridge, as a solution to a generalized land supply problem, or transportation problem is very expensive. The EIS, or some other document available within the public review process, should describe in detail for alternative approaches to the problem -- the method, levels, and timelines related to financing the project. A detailed break-even point analysis is needed to determine when and under what circumstances the bridge can pay for itself. A discussion of the cost of the bridge must include opportunity costs from both Anchorage and Mat-Su, alternative financing scenarios, and the costs of redeveloping areas surrounding the ramps or bridge connections.

The report needs to clarify current confusion over the source of financing. While it may indeed be built by private sector firms, the draft EIS cites limited State funds from other State programs as part of the funding sources. These should be identified.

4. Limitations of Demographic Variables

A project of this magnitude should be based on a range of demographic projections using a variety of action assumptions. The population series provided by the Municipal Planning Department and ISER are several years old. Many of the underlying assumptions are no longer true. If the financial viability of this project is contingent upon a projected fixed level of use, any change in that pattern could negativly effect the state's ability to meet its debt obligations. The Municipality suggests the report provide an assessment of the elasticity of the projections used. Develop several population growth and dispersement scenarios based upon a range of population projections. Discuss the impact on project feasibility of each scenario. We would further suggest carrying projections of population and other impacts to a time beyond 2010, possibly to that point in time when the bridge is operating at sufficient capacity to pay for programmed operating and maintenance costs.

(NOTE 5)

5. <u>Limited Discussion of the Projected Socio-Economic Impacts on Anchorage</u>

The Draft EIS contains little or no analysis of the socio-economic impacts likely to accrue to Anchorage and to Mat-Su valley residents. This discussion needs to include the following:

° A description of the impact on Anchorage's infrastructure as new Mat-Su residents, many of whom will work in Anchorage, thereby increasing local demands on government, are excluded from the local (Anchorage) tax paying population.

° A description of the compatibility of the project with local land use policies, plans and preferences. (NOTE 6)

° An artist's rendering of the bridge as proposed at each site. The public should have a good sense of the bridge's proportion and total visual impact on the inlet's view range.

° A description of economic and operational impact on the municipal port and port plans. (NOTE 7)

° A comparison of the projected economic development with municipal traffic projections.

° An analysis of the increased congestion pollution, required parking and roadway expansion resulting from an auto-only crossing. (NOTE 8)

A whole series of questions arise relating to the report's assumptions about the mutual benefit of the bridge and the Mat-Su Borough land use goals and objectives. How will Mat-Su finance services and infrastructure needed to support the residential development proposed to occur at Pt. MacKenzie as a result of the bridge? Is the bridge to be built to facilitate development of a Mat-Su commercial-industrial base or is such a base developing, creating the need for the bridge? If the latter, how is the need being defined? (NOTE 9)
How does the planned port and industrial park relate to the municipality's port, the new port at Seward? How will it be financed? How will the bridge enhance development now occuring along Glenn Highway between Eagle (NOTE 10)
River and Wasilla? (NOTE 11)

What is the regional impact of the bridge? The current EIS focuses predominantly on the physical impacts on areas immediately adjacent to the bridge while social and economic impacts throughout Southcentral Alaska are certain. (NOTE 12)

TECHNICAL CONCERNS

Suggestions and comments of a more technical nature are presented below.

1. The EIS should improve and enhance visual presentations for better public understanding of the project and its impact. Specifically:

   a. Include areawide maps showing Pt. MacKenzie and Pt. Cairn (Figure I-1 should label these points).

   b. Improve the legibility of Figure III-1; increase the size to include the entire bowl and label with forecasted trips which are more meaningful to a viewer than code numbers.

   c. Include on the same map level of service indicators so the viewer will be able to tell immediately where over and under capacity impacts are created; also depict volume/capacity ratios.

   d. Show local traffic circulation patterns for the No Crossing alternative and for each crossing and ramp alternative, and for Northside Corridor.

   e. Include an artist's depiction of each crossing from several viewing angles.

2. III-8 Reference the Anchorage Comprehensive Plan. (NOTE 13)

3. III-14 Change the status of comprehensive plan to "adopted."

4. III-16 "Not Applicable" comment is misleading.

5. III-17 Include Anchorage Wetlands Management Plan.

6. IV-13 Include Analysis of pedestrian/bicycle path on western side of bridge.

7. IV-15 Include detailed discussion of such elements as:

   a. Traffic evaluation especially related to I/L connection further south than depicted on current maps. MOA model indicates overcapacity effects in mid-town and other ares.

   b. Signalization.

   c. Altered circulation patterns throughout the bowl and along Glenn Highway corridor; compare to circulation of No Crossing scenario.

(NOTE 14)

d. A/C couplet access; design should not preclude but should include as part of project phasing.

e. Analysis of Ingra/Gambell connection with Northside Corridor; also part of project alternative analysis and phasing.

f. Using MOA traffic analysis for no crossing and alternative scenarios, examine other planned highway and roadway projects. (NOTE 15)

g. Impact of the timing of project construction on AMATS Long-Range Element Projects.

h. A probability or sensitivity analysis of the benefit cost analysis for the crossing and AMATS Long-Range Element Projects. (NOTE 16)

i. Detailed description of sources, uses and schedule of uses of all federal, state and local highway project monies. (NOTE 17)

j. Detailed analysis of the benefit/cost ratios other strategies to enhance traffic flow and reduce travel time along Glenn Highway Corridor, such as Alaska Railroad improvements, and for other projects in the region. (NOTE 16)

Note: Recent market survey shows a positive attitude about a high speed rail along railroad corridor. Though expensive, the cost to upgrade rail and construct amenities may be far less than $500 million - $1 billion for the bridge alternative. (Passenger/freight carrying capacities indicate that 2 rail tracks are roughly equivalent to 12 lanes of highway.) EIS should evaluate in light of rail, widened Glenn Highway with associated HOV lanes to determine capacities and relative costs.

8. IV-27 Include in analysis reference to the Municipality's CBD, Comprehensive and Coastal Zone Management plans.

9. IV-34 Anchorage Water and Wastewater utility is concerned about the last statement on this page. Revenues from AWWU rate-payors cannot be used to pay for utility projects outside its service area. How will Mat-Su finance the probable secondary treatment plant (about $10 million),

and the anticipated required outfall necessary to accommodate wastewater needs of the Pt. MacKenzie development? Without MOA subsidy, residential rates for Girdwood (tertiary treatment) would be $80 per month, Eagle River (secondary treatment) $60 per month.

10. IV-35 Include detailed discussion of impact on planned projects such as Glenn and Seward Highways identifying funding sources, phasing, transitions, etc. Explain comments found in toll authority (SB211) which cites funding sources as "...any other money that state legislature may provide exclusive of any state tax or license." Will funds be diverted from other state programs to finance?

11. IV-50,51 Include impact on air quality of anticipated Pt. MacKenzie Port/Industrial Park (proposed use of low grade coal-fired energy generator for the park). (NOTE 18)

12. Plate 2 Downtown Approach - Traffic Engineering comments indicate that it is impossible to design a reverse curve at 40 mph.; prefer Plat 1 alternative to accommodate off-ramp speeds and angles. (NOTE 19)

13. Without an acceptable A/C access, project unnecessarily forces traffic through downtown. Strongly recommend developing project phasing plan. (NOTE 20)

14. Identify access onto Gambell St., moving south. Note: Third and Ingra currently experiences 2nd highest accident rate in bowl.

15. Include a detailed table of contents.

Thank you for giving us the opportunity to comment.

kac/irs1

NOTES: MUNICIPALITY OF ANCHORAGE (5/16/84)

1. See strategic concern responses, notes 2 through 12.

2. As indicated on page I-1, the focus of the crossing analysis is how best to provide for the future growth of the Anchorage metropolitan area. The EIS focuses on the trade-offs between a Crossing and No-Action, as well as two other No-Crossing Alternatives. The objectives listed (page I-1) are State objectives. The Glenn/Parks Improvement Alternative is addressed beginning on page II-24 and throughout the document. The potential for HOV lanes is addressed with the Transportation Systems Management Alternative on page II-7.

3. See Appendix F. A financing plan is being developed for use by the State legislature in deciding whether or not to build the crossing.

4. The implications of a lack of users on financing will be included in the financing plan noted in Note 3. A range of growth forecasts was included in the working draft and beginning on page IV-37 of this document. See the utilities discussion on page IV-75.

5. The population series used in the working draft and this document are the latest available consistent with Anchorage Metropolitan Area Transportation Study (AMATS) travel forecasts. The 20-year time-frame is considered appropriate for transportation planning by the Federal Highway Administration and Alaska Department of Transportation and Public Facilities.

6. See page IV-58; a land use plan compatibility section was outlined in the working draft.

7. See page IV-60; the intent to identify impacts to port plans was noted in the working draft.

8. The impacts to air quality are addressed beginning on page IV-108; this section was outlined in the working draft. The impacts to street and highway plans are addressed beginning on page IV-33; this section was outlined in the working draft. Measures to encourage the use of transit on the crossing are addressed on page IV-32.

9. The bridge would be built to satisfy several needs; see Chapter I.

10. See the Borough's current planning report for the Point MacKenzie area (Kasprisin-Hutnick Partnership, June 21, 1984).

11. As indicated in the working draft, a crossing would slow growth in both the Eagle River and Wasilla areas; see pages IV-55 and IV-57 of this document.

12. Significant impacts are not expected beyond the project area defined in Chapter I with the exception of an enhancement of Beluga area resource development opportunities; see page IV-108.

13. The plan was referenced in the working draft; see page III-22 of this document.

14. This comparison was presented in the working draft; it has been substantially expanded and is on pages IV-13 to IV-25 of this document.

15. See pages IV-33 to IV-36; Anchorage bowl traffic forecasts for both the No-Crossing and Crossing Alternatives are based on traffic forecasts made by the AMATS forecast model.

16. ADOT/PF, in cooperation with FHWA, has decided that an extensive benefit-cost analysis, beyond the general analysis presented in the Final Corridor Alternatives Analysis (USDOT/FHWA, ADOT/PF, December 5, 1983), would not be useful enough to the decision-making process to warrant the time and expense of preparing it. Although not in terms of dollars as demanded by a benefit-cost analysis, all relevant trade-offs necessary for selecting among the alternatives under consideration are included in this document; see pages II-31 to II-49.

17. This description is not provided for reasons indicated on page IV-80.

18. The Borough's plans for the point MacKenzie area are incomplete and only conceptual plans are now being prepared. There is no reason to believe a coal-fired generator would be built.

19. Posted ramp speed limits would be appropriate to the ramps' design speed.

20. The ramps to I/L Streets and Ingra/Gambell Streets would keep through traffic out of downtown; see pages II-6 and IV-17. Construction timing of various Crossing Alternative segments is discussed in Chapter II.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ALASKAN AIR COMMAND
ELMENDORF AIR FORCE BASE, ALASKA 99506

14 MAY 1984

Mr John B. Olson
Director, Major Projects Management
State of Alaska Department of
Transportation and Public Facilities
4111 Aviation Avenue
Pouch 6900
Anchorage, Alaska 99502

Dear Mr Olson

In response to your letters of April 9 and April 27, we appreciated the effort by your staff and consultants to develop a crossing alignment which appeared to eliminate or mitigate many of the relocation impacts identified by the Planning Assistance Team. Also, we would like to assure you that we recognized that the revised Elmendorf Crossing project segment presented to Alaskan Air Command's Knik Arm Crossing study group in December 1983 was a result of the Air Force Planning Assistance Team study.

Our preliminary assessment of the proposed alignment through Elmendorf depicted in the Draft Environmental Impact Statement (DEIS) has surfaced the following major concerns.

- The alignment does not provide a minimum one mile separate distance from the perimeter of the Circularly Disposed Antenna Array (CDAA). Maintenance of the minimum separation distance is imperative to protect this system from the effects of radio frequency or electromagnetic interference (RFI/EMI).

- The placement of a highway immediately adjacent to the shore of Green Lake will destroy the recreational and visual values of this area. It is noted in Chapter V of the DEIS that there are no similar areas on the base that provide the same recreational opportunities and experiences, and further, that lakes offering similar facilities are not found in the Anchorage area.

- The proposed alignment would significantly degrade the recreational opportunities available to the military community at Hillberg Ski Area. Although there are other ski areas within the Anchorage bowl, Hillberg is the only area accessible by military personnel who live on base and do not own vehicles. Hillberg is also unique because it generates income which supports other Air Force morale, welfare and recreation programs.

- A minimum separation distance of 4,800 feet is required to provide an electromagnetic interference-free zone for the HF radio receiver site and antenna field. The proposed alignment falls within this "clear zone" as measured from Bldg 62-250.

The conclusion of our preliminary assessment is that any corridor passing through Elmendorf on the south side of Triangle Lake, Green Lake, and Hillberg Ski Area would have unacceptable impacts on the Circularly Disposed Antenna Array and base recreation facilities. We are fully aware that the alternatives would have major impacts on the numerous communications facilities located to the north of Green Lake, and that corridor construction would entail relocation of all or most of these facilities.

On balance, it appears that the possibility of an Elmendorf corridor alignment between Station 210 and the Knik Arm bluff, depicted within the fan-shaped area on the enclosed map, deserve close examination. We offer this information as a preliminary assessment for your planning purposes only, and with the mutual understanding that it is subject to substantial refinement or revision upon completion of our consultants efforts. We anticipate that our consultants will provide a detailed evaluation of the facilities relocation impacts for a corridor alignment within this area.

Concerning your question on the status of our consultants study, we have advertised in the Commerce Business Daily for submittal of proposals, and anticipate contract award by 6 August.

We appreciate the opportunity to identify our concerns and issues that should be addressed in the DEIS. We trust that this preliminary assessment will enable project development to progress.

Sincerely

Richard O. Bennett

RICHARD O. BENNETT
Colonel, USAF
Vice Commander

1 Atch
Base Plan, Elmendorf AFB

cc: R. J. Knapp,
Commissioner, DOT&PF

United States Department of Agriculture

Soil Conservation Service

Professional Center - Suite 129
2221 East Northern Lights Boulevard
Anchorage, AK 99504 (907) 276-4246

May 22, 1984

John Page
Knik Arm Crossing Office
430 C Street, Suite 200
Anchorage, AK 99508

Dear John:

Enclosed is a copy of the Soil Conservation Service "Farmland Protection Policy". There is no prime or unique farmland within the Knik Arm Crossing approach corridors. However, there are lands determined to be of statewide and local importance by the State Department of Natural Resources (DNR) and the Matanuska Susitna Borough (MSB). These lands are: (1) Those identified by DNR in the Willow Subbasin Area Plan and classified for agriculture and (2) Those lands owned by MSB that have been classified as II & III soil by the SCS and lay in blocks of 40% II & III within 40 acres.

If I can be of any further assistance, please call.

Sterling Powell

Sterling Powell
Asst. State Conservationist

DEPARTMENT OF THE ARMY
ALASKA DISTRICT. CORPS OF ENGINEERS
POUCH 898
ANCHORAGE, ALASKA 99506

April 19, 1984

REPLY TO
ATTENTION OF:
Regulatory Branch
Compliance Section

Mr. Robert A. Wokurka
Knik Arm Crossing
4111 Minnesota Drive
Anchorage, Alaska 99503

Dear Mr. Wokurka:

This letter is in response to your April 16, 1984 request for a jurisdictional determination for the Knik Arm Crossing Project.

The bridge crossing is under the jurisdiction of the U.S. Coast Guard pursuant to Section 9 of the River and Harbor Act. Associated fills and structures (i.e. cofferdams, abutments, foundation seals, piers and access fills) which are authorized by the Coast Guard bridge permit will be similarly authorized by Department of the Army (DA) nationwide permit [33 CFR 330.5(9)(15)] provided the enclosed special conditions and management practices are satisfied. You may contact Mr. Mark Millea, 17th Coast Guard District, Aids to Navigation Branch, Box 3-5000, Juneau, Alaska 99802 concerning the bridge permit.

The associated road construction from Houston to Anchorage will cross numerous wetlands under the Corps of Engineers jurisdiction. Discharge of dredged or fill material into the wetlands will require an individual DA permit. An application for a permit is enclosed for your use.

Thank you for your interest in our program. If you have any questions concerning the jurisdictional determination, you may contact Mrs. Godfrey, Regulatory Branch, Compliance Section, at (907) 552-4942.

Sincerely,

William M. Fowler
Chief, Compliance Section
Regulatory Branch

Enclosure

Copies Furnished:

Mr. Mark Millea
17th Coast Guard District
Aids to Navigation Branch
Box 3-5000
Juneau, Alaska 99802

Environmental Protection Agency
Room E535, Fed. Bldg.
701 C Street, Box 19
Anchorage, Alaska 99501

Alaska Department of Envirornmental
Conservation
Second Floor, 437 E Street
Anchorage, Alaska 99501

DEPARTMENT OF THE ARMY
ALASKA DISTRICT. CORPS OF ENGINEERS
POUCH 898
ANCHORAGE, ALASKA 99506

May 15, 1984

REPLY TO
ATTENTION OF:
Regulatory Branch
Special Actions Section

Jerry Hamel, Project Manager
Alaska Department of Transportation
and Public Facilities
4111 Aviation Avenue, Pouch 6900
Anchorage, Alaska 99502

Dear Mr. Hamel:

Thank you for the opportunity to comment of the Preliminary Draft Environmental Impact Statement (PDEIS) for the Knik Arm Crossing Project. Our review is for general compliance of the document with NEPA and specific compliance with the Corps of Engineers' regulations for implementing NEPA.

We have identifed some deficencies in your document and have provided them as Enclosure 1. We would also appreciate the opportunity to comment on any subsequent preliminary drafts which you prepare since many of your sections were not completed for review at this time. Of particular concern is the coverage of wetlands impacts in chapters III, IV, and Appendix B. It is necessary that sufficient information is presented which will address the issues to be considered in the 404(b)(1) evaluation. Enclosure 2 provides a copy of the 404(b)(1) guidelines (40 CFR Part 230) for clarification of these issues. If sufficient information is not included, it may be necessary for the Corps to supplement the final EIS which would result in a considerable delay in processing the permit.

In addition, we would like to provide clarification of the following information which will outline the permit review process which the Corps will undertake. Once a preferred crossing alternative is identified and prior to publication of the FEIS, a formal application for a permit should be submitted to the Corps. At that time a Public Notice and 404(b)(1) evaluation will be prepared for inclusion in the FEIS. In order to facilitate processing of the permit, it is requested that the lead agency prepare the 404(b)(1) evaluation. Enclosure 3 provides an example of a similar document and the Corps comments which is being prepared for another EIS in which the Corps is a cooperating agency. The publication of the FEIS which includes our Public Notice will begin the commenting period for the Corps Public Notice. This will last for 30 days and will run concurrent with the 30 day requirement set forth by NEPA for review of the FEIS. Should any public hearings be held during the review of either the DEIS or FEIS, the Corps requests that they be joint public hearings and the Corps will provide representatives to attend. At this time, we have no plans to hold a separate public hearing.

In order for a permit decision to be made at that time, it is necessary that the FEIS is adequate with respect to the Corps permit requirements in order to avoid the necessity of supplementing the EIS. We appreciated the opportunity to work with you during the preparation of this document in order to avoid any delay. Should you have any questions concerning our comments or need any additional information, please contact Ms. Carol Gorbics of the Special Actions Section, Regulatory Branch at (907) 552-2554.

Sincerely,

Larry L. Reeder

Larry L. Reeder
Chief, Special Actions Section
Regulatory Branch

Enclosures

## ENCLOSURE 1

General Comments

The cover sheet should clearly identify the Corps of Engineers as a cooperating agency.

The abstract should include reference to the major Federal permits required particularly by cooperating agencies. The reference to the Corps should be similar to "the proposed action requires issuance of a Department of the Army permit under the authority of Section 404 of the Clean Water Act by the U.S. Army Corps of Engineers," and include a similar statement for the action by the U.S. Coast Guard pursuant to Section 9 of the River and Harbor Act.

It should also be noted that an EIS is being prepared because it has been determined that issuance of the permits by the U.S. Coast Guard, the Corps of Engineers ( and any other Federal permits) would be major Federal actions significantly affecting the human environment. This could be appropoiately included in the summary section which would precede your chapter 1.

Heading Title and Subtitle treatments are not consistent and this causes confusion to the reader (i.e. use of capitals and underscoring). Numbering the sections and paragraph would make it easier to identify section and address future comments (i.e., 1.0, 1.1, 1.2. 1.2.1 etc.)
(NOTE 1)

Chapter I

Sections A through D could all be treated under a heading of "Background Information" which would make this chapter more succinct.
(NOTE 2)

In the "History and Authority" section it would be useful to list (or refer to an Appendix that lists) all the reports previously prepared pertining to the project (i.e. Marine Biological Studies, Freshwater and Terrestrial Habitat Studies, Final Corridor Alternatives Analysis, etc.) Also it would be appropriate to list (perhaps in tabular form) all the legislative actions, authorities and appropriations and dates of each.

It is necessary that the DEIS identify the involved State and Federal agencies, their required permits or approvals, and the authorities of such permits, which would be necessary in order to authorize the project including (but certainly not limited to): Corps of Engineers, Coast Guard, FAA, OMB (Coastal Zone), ADEC, ADNR, ADFG, DOT and others. The State Division of Governmental Coordination may be able to help define the State permits required. Although, many of these agencies are identified in the text it would be helpful to see them listed in one place for clarity.
(NOTE 3)

p. II - 12. Paragraph 8, under <u>Construction</u> should be reworded to indicate that labor would be first solicited from w/in Alaska, and then, if necessary, additional labor expertise would be acquired from outside the State.
(NOTE 4)

If mitigation measures have been identified or are identified in the DEIS review, they should be incorporated into the"Alternative" chapter and a discussion of their impacts (or reduction of impacts) included in the "Environmental Consequences" chapter. (40 CFR 1502.14(f)).

Although it is clear that considerations beyond measurable costs will be considered when choosing the preferred alternative, it seems appropriate to include a cost-benefit analysis comparing the various alternatives. (40 CFR 1502.23)

(NOTE 5)

The "Comparative Analysis of Alternatives" section is a critical portion of this chapter. It should clearly compare the alternatives against one another showing the relative merits of each. A table or chart is preferred for this presentation in order to provide an easy, side by side, analysis of the impacts of the alternatives. Only those features which are significant and comparable should be included in such a chart. It is important that this section reflect the information in the "Environmental Consequences" chapter.

(NOTE 6)

Chapter III

A section in subheading B should include "Pedestrains and Bicyclists" to correspond to the chapter 4 section. It should be noted that many of the existing major roads w/in the municipality include bicycle/pedestrian trails and their importance to the community.

Subheading C, Social and Economic Characterestics

Cultural resources needs to be thoroughly addressed including the known presence of or potential presence of archeological sites.

Recreational use of the project area must be thoroughly addressed as there is potential for impact.

Subheading D, Natural Resource Characteristics

Wildlife use of the project area must be thoroughly addressed as there is potential for impact.

Hydrology of the project areas must be thoroughly addressed as there is potential for impact.

Hunting would be more appropriately addressed in the Recreation section which recommended under subheading C.

(NOTE 7)

Mineral Resources need to be much more thoroughly addressed particulary as exploitation of the mineral resources is used under the project purpose section. A separate section with some specific information on the locations, amounts and accessability of the deposits should be included.

(NOTE 8)

Chapter IV

Sections corresponding to those in Chapter III and those recommended for addition to Chapter III should be included in this chapter: Wetlands, Cultural Resources, Recreational Use, Wildlife, Hydrology, and Mineral Resources.

(NOTE 9)

Under the recommended section Cultural Resources, it is necessary to note that if during construction or development a previously unidentified archeological or other cultural resource is encountered within the project area that might be eligible for listing in the National Register of Historic Places, work that could affect these cultural resources will cease and the District Engineer, Alaska District Corps of Engineers will be immediately notified. Appropriate action will be taken to avoid any loss before construction will resume.

Page IV- 4, heading and paragraph 2, sentence 1- "Travel" should be "traffic".

page IV-32, paragraph 4. It should be noted that the Coast Guard is responsible for navigation and that an appropriate determination will be made by them in order to ensure that the final proposal represents a structure with no unsafe navigation threat.

Page IV-38, 39, and IV-40. Much of this discussion should be included under impacts to Land Use. The habitat impact discussion should identify the types of habitat that would be lost as a result of the land-use changes and the importance of the habitat loss when compared with abundance and density of similar habitat types in the project area. The impacts of the habitat loss of wildlife should be included under a Wildlife subheading.

IV-43 paragraphs 1 to 5. Impacts to the fisheries should be included under a Fisheries subheading in order to correspond to the subheading in Chapter III. Impacts to wildlife should be included under a Wildlife subheading. (NOTE 10)

IV-44 paragraph 5. The U.S. Coast Guard does not administer the 404 permit program. The U.S. Army Corps of Engineers does. The Coastal Zone Management review process is undertaken by a State agency (Department of Governmental Coordination) rather than the Borough. Although the Municipality of Anchorage must review the proposal for consistency with their approved CZM plan and make recommendations and comments, it is the State of Alaska who must make the final consistency determination.

Page IV-45. Water Quality and Hydrology. Although it is acknowledged that these topics interact with each other, it would be more appropriate to address them separately and add a corresponding Hydrology section in Chapter III.

Chapter V

The Draft section 4(f) Evaluation would be more appropriatley addressed in an appendix. The descriptions of the historic places and recreational facilities should be addressed in conjunction with the "Affected Environment" and "Environmental Consequences" chapters. (NOTE 11)

Chapter VI

This information should be included in the "Alternatives" chapter, or at the least, the "Alternatives" chapter should acknowledge the railroad potential and refer the reader to this chapter. The justification for not including the railroad crossing in the project alternatives should be clearly stated.

Appendix B

In conjunction with the information in Appendix B, Draft Wetlands Finding Report, it would be appropriate to also include a draft evaluation under the Section 404(b)(1) guidelines. Enclosed is a copy of the EPA Guidelines (40 CFR part 230).

NOTES: U.S. DEPARTMENT OF ARMY, CORPS OF ENGINEERS (5/15/84)

1. The confusion was due to the incompleteness of the working draft; headings and subheadings are used consistently in this document.

2. Chapter I has been reorganized; the "Needs" section, beginning on page I-4, contains the requested information.

3. Required permits and approvals are listed on pages II-15, II-16, II-20, II-23, II-28, and II-29.

4. This change was made on pages II-13, II-16, II-20, II-23, and II-27.

5. ADOT/PF, and FHWA have decided that a benefit-cost analysis would not be useful enough to the decision-making process to warrant the time and expense of preparation.

6. See pages II-31 to II-49; the intent to prepare such a section was indicated in the working draft.

7. Most impacts to recreation are discussion in Chapter V, "Section 4(f) Evaluation". Hunting is not 4(f) so it is addressed separately under "Biological Resources" on pages IV-97 and IV-98.

8. The purpose of mineral development has been removed from Chapter I. A discussion on mineral development at a level of detail commensurate with the expected impact is on page III-53.

9. "Wetlands" can be found on page IV-98. As preferred by the Federal Highway Administration, cultural resource and recreation impacts are addressed in Chapter V, "Section 4(f) Evaluation"; see also "Iditarod Trail" on page IV-108 and "Use of Fish and Wildlife" on page IV-97. A separate "Hydrology" section has been added to Chapter IV on page IV-103. Mineral resource impacts are minimal and do not warrant a separate section; they are discussed under "Natural Resource Development", "Subsurface Resources", on page IV-107. Wildlife is addressed under "Biological Resources" by terrestrial, marine, and aquatic habitat. The wildlife habitat and wildlife impact discussions are combined in this document since the principal impact to wildlife is loss of habitat.

10. Fisheries are discussed under "Biological Resources", "Aquatic Habitats", since the largest impact to fisheries would be habitat encroachment.

11. The EIS structure that includes the Section 4(f) evaluation as a separate chapter, is preferred by the Federal Highway Administration.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Western Alaska Ecological Services
605 W. 4th, Room G-81
Anchorage, Alaska 99501

IN REPLY REFER TO:
WAES

May 14, 1984

Jerry Hamel
Alaska Department of Transportation
and Public Facilities
4111 Aviation Avenue
Pouch 6900
Anchorage, Alaska 99502

Dear Mr. Hamel,

We have reviewed the working copy of the Knik Arm Crossing Draft Environmental Impact Statement (EIS) as agreed upon in our meetings of May 4, and May 10, 1984. The following comments and recommendations are offered as means of improving the document.

PURPOSES AND NEED FOR ACTION, page I-1. It would be helpful if some figures could be provided regarding the amount of land in the Municipality that can support development activities. This would provide a basis of comparison for development opportunities in the Matanuska-Susitna Borough.

B. PORT, INDUSTRIAL AND RESOURCE DEVELOPMENT, page I-3. Previously both the Matanuska-Susitna Borough and the Knik Arm Crossing Project team have consistently asserted that the port and industrial park at Point MacKenzie is being planned regardless of whether a crossing project is built. While it is true a crossing would facilitate the realization of these plans, it seems prudent to maintain the separate identity of the two projects. Otherwise, the issue of project costs and benefits for the crossing may become clouded.

Costs, page II-12. It is unclear whether these figures are calculated in 1984 dollars and whether inflation has been factored in. Without this information, it is impossible to know the true cost of the project. Consequently, there is a need to define both the cost figures here and in subsequent sections.

Design Features, page II-14. An indication of the amount of wetlands along the road alignment of Segment 1 of the Point MacKenzie to Houston corridor would be appropriate.

Table III-4, page III-11. It is unclear whether the data in this table reflect trends that will occur with the project or without it. Clarification is needed.

Biological Resources, page III-23. This section needs to be expanded to more adequately describe the available habitats and associated fish and wildlife species. The cursory treatment given here does not provide sufficient detail to document the existing resources or to enable an evaluation of project impacts.

Terrestrial Habitats, page III-23. Descriptions of habitats for particular species which are representative of the full range of terrestrial habitats in the project area are needed. The habitats identified in the list of evaluation species in the Fish and Wildlife Service Mitigation Statement is recommended for your consideration. Similarly, their value to species other than moose and generic waterfowl need to be examined in order to provide an ecological perspective.

It is unclear whether the habitats described apply to Elmendorf Air Force Base as well as the north side of Cook Inlet. Identification of habitats that occur in this part of the project is needed.

Aquatic Habitats, page III-23. This section does not adequately describe the aquatic habitats of the project area or the fishery resources they support. It should be expanded considerably to describe the kinds and extent of habitats and the distribution and abundance of salmonids, as a minimum.

Marine Habitats, page III-23. It would be appropriate to mention marine birds, even through they are not particularly abundant in Knik Arm.

Fisheries Utilization, page III-27. This discussion would be improved considerably by including harvest data for each of the species indicated in the Aquatic Habitat section. In most cases, figures are probably available by drainage system. This kind of information is needed if impacts are to be adequately assessed in later portions of the document. In addition, subsistence use should be described, as should availability of access to the various drainages.

Threatened or Endangered Species, page III-27. There are three subspecies of peregrine falcon in Alaska. The arctic peregrine falcon is classified as threatened, the American peregrine falcon is endangered, and the Peale's peregrine falcon is unlisted. Both the arctic and, more often, the American subspecies occasionally migrate through the project area. Inclusion of this information would strengthen this section.

Hunting, page III-27. Figures indicating the level of hunting and trapping pressure should be available from Alaska Department of Fish and Game. Relating the level of pressure to the carrying capacity of the habitat would be appropriate as it would later facilitate the analysis of secondary impacts of the project.

Wetlands, pages III-27-28. The discussion would be improved by including furbearers among the wildlife species utilizing wetland habitats and by identifying waterfowl species associated with the freshwater wetlands.

Marine Waters, page III-28. Although dispersion of pollutants by high tidal currents and freshwater inflow may minimize impacts of pollutants in the Point MacKenzie area, to suggest that, therefore, there is no pollution problem ignores the fact that the pollutants go somewhere else. It also overlooks the fact that pollution levels are likely to increase as development proceeds and, at some point, could become a localized problem. It is recommended that this section be changed to reflect these concerns.

Freshwaters, page III-28. The meaning of the statement that "Some deterioration in water quality would be expected ..." is not clear. Clarification is needed to indicate whether deterioration is presently occurring, or whether it will occur in the future?

Floodplains, page III-29. While the statement that no floodplains along streams are located in the vicinity of project alternatives may be true if consideration is limited to the approach roads, it would be inaccurate when the secondary impacts area is identified. Inclusion of the area encompassing secondary impacts is recommended.

ENVIRONMENTAL CONSEQUENCES, page IV-1. The intent of the statement "Measures to mitigate negative impacts are proposed. All other impacts are considered unavoidable" is ambiguous. Mitigation has been defined by the Council on Environmental Quality as "a) avoiding the impact altogether by not taking a certain action or parts of an action; b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and e) compensating for the impact by replacing or providing substitute resources or environments." (40 CFR Part 1508.20 (a-e)). From this definition, it is evident that there are means of mitigating even unavoidable impacts of the proposed project, and that doing so is a legitimate part of a project. Consequently, the statement that "All other impacts are considered unavoidable" is unnecessary.

Highway Accessibility, page IV-1. Clarification is needed as to why vehicle hours of travel and vehicle miles of travel are computed for all alternatives in 1990 when the downtown alternative is not planned for completion until 1991.

Redistribution of Anticipated Residential Growth, page IV-15. An indication of the compatibility of the two different methodologies used by the Institute for Social and Economic Research and Knik Arm Crossing project team is needed.

Terrestrial Environment, page IV-36. It should be clearly stated that more habitat will be disturbed by the Elmendorf crossing than the downtown crossing when direct impacts only are considered. This, apparently, is not the case when secondary impacts are included in the analysis, and should be so indicated.

This discussion does not adequately assess the impacts to the moose population of Elmendorf Air Force Base. This highway corridor would traverse winter range which is in limited supply in the Anchorage Bowl. It is therefore incorrect to state that "This forest type ... is widespread and removal ... would probably not affect wildlife populations significantly." There has also been no discussion of the impact of the highway in relation to the moose migration corridor between winter range on the Base and the more abundant, dispersed summer range.

The third paragraph should be expanded to discuss other secondary impacts such as hunting pressure, poaching, conversion of habitat to other land uses, and degradation of habitat due to its juxtaposition to secondary development. The present discussion underrates the magnitude and extent of these kinds of impacts.

The statement that "Most wetlands traversed either north or south of Knik Arm are of the bog type with little value to waterfowl" has not been substantiated either by field studies or analyses of primary and secondary impacts. Without such documentation it is questionable whether this statement is supportable and should be retained in the statement.

Table IVCI-1, page IV-37. This table should be modified to include impacts along the corridor as discussed in our meeting of May 10, 1984. Without inclusion of the area incurring indirect impacts, a considerable portion of the highway right-of-way is unaccounted for. The impact to the corridor would, therefore, be underrepresented.

In addition, the analysis is heavily weighted toward upland species, with no consideration of fisheries or wetland species. While this may be generally appropriate for analysis of direct impacts for the highway corridor because of the routing, a wider range of fish and wildlife resources should be examined for secondary impacts, as agreed upon.

Page IV-38. The impacts for both the Hovercraft and the Glenn/Parks Improvement Alternative need to be quantified in order to compare results with those for the crossing alternatives. These impacts should also be related to habitat uses of evaluation species selected as indicators for the fish and wildlife commnunities of the project area.

A major deficiency of the document is the absence of a quantified analysis of secondary impacts to fish and wildlife resources. Such an analysis should be comparable to analyses done for other project issues such as traffic volumes and levels of service, employment, and urban growth. Without a comparable analysis for wildlife, an informed trade-off analysis cannot be made nor can mitigation measures be formulated on the basis of accurately assessed impacts. The scenarios defining residential and non-residential growth are the first step to developing a quantified analysis of secondary impacts for the project. The next is to draw correlations between acres developed and fish and wildlife habitat. Using the classification scheme occurring in Table IVCl-1 on page IV-37, numbers of acres for each habitat type should be delineated for each project alternative.

Page IV-39. While development in wetlands would be less prevalent than on upland sites, at least initially, it is predictable that as fewer upland sites remain, development presssure on wetlands will increase. It is also noteworthy that even with current levels of development in the Matanuska-Susitna Borough wetland development is already occurring. This assumption should therefore be qualified.

Page IV-40. While the information is presented that could be used to calculate the number of additional acres to be developed with the crossing alternatives, it would be more convenient for the reader if the percentage increase presented were supplemented by actual acreage figures.

To state that "...secondary impacts are not considered unacceptable because ..." is to represent one perspective and not necessarily the broad range of public view points. The Draft EIS will help ascertain whether or not this is a concensus opinion. It would be best to delete this statement from this document.

It is also interesting to note that it is recognized that secondary impacts will be more extensive than direct ones. This reinforces the conclusion that a secondary impacts analysis needs to be conducted.

Marine Environment, pages IV-40 and IV-41. Because of the value of the resources, it would be appropriate to elaborate on the impacts anticipated to both juvenile and adult salmonids. Similarly, definition of the "substantially greater" impacts resulting from port development at Point MacKenzie is needed.

Freshwater Environment, page IV-41. Once again, it is recommended that secondary impact be assessed. Perhaps more difficult to quantify then those for terrestrial habitats, a minimal effort would entail a comprehensive description of the kinds of impacts anticipated. Among these would be increased human access and fishing pressure, associated degradation of aquatic habitat, flow alterations, and loss of tributary streams.

Page IV-42. The statement that "...there is no reason to believe that highway improvements would cause unacceptable impacts..." is not necessarily true. Although the initial impacts were deemed acceptable either because they were minimal, mitigated, or otherwise unidentified and unquantified, the added increment of impacts is not automatically acceptable. When the increased magnitude of the impact is applied to a decreasing quantity of the environmental resource or a more valuable parcel of habitat, the cumulative impact may be unacceptable. This is the reason a quantified and thorough impact analysis needs to be conducted.

The statement concerning acceptable levels of impact in the last paragraph is inaccurate for the same reason given in the terrestrial section and should be modified accordingly.

Changes in Use of Fish and Wildlife, page IV-43. This section contains an adequate qualitative description of hunting and fishing pressure for the alternatives. However, it is not sufficient as the only indication of secondary environmental impacts. A more comprehensive description of these is needed as well as quantification of fish and wildlife habitat that will be converted to other uses, i.e., the analysis agreed upon May 10.

Wetlands, page IV-44. The need exists here also to examine secondary impacts, both qualitatively and quantitatively.

The Hovercraft Alternative should have the impact of approach roads included in the analysis.

The statement "No significant secondary impacts are expected with any of the alternatives..." is unsubstantiated. Only after a quantified analysis has been conducted can statements such as this legitimately be made. In addition it should be noted that the Corps of Engineers, rather than the Coast Guard, administers the Section 404 permit program of the Clean Water Act.

Marine Environment, page IV-45. The possibility should be explored that construction activities would disturb polluted sediments. If this could be a problem, then the impact of "activating" these sediments needs to be discussed.

Page IV-46. The statement that "Water resources impact, regardless of impact type, is directly related to the extent of exposure to these resources..." is vague . More specificity is needed.

The statement that "...all of the Connector's drainage would be caught and piped into Municipality's storm drainage system" suggests that this is an actual project feature. However, there does not seem to be any indication of this in the project description section. A clarification is needed.

Page IV-47. It is unclear whether drainage and erosion control, as well as revegetation, are planned as mitigation features of the project, or whether they would minimize the impacts if they were incorporated. This section should show what will be done as opposed to what could be done.

Page IV-58. Again, mitigation measures are couched in terms of could rather than will.

We hope these comments assist you in preparing a Draft EIS which will require a minimum of revisions. We recognize that some of the secondary impact analysis may not be fully developed in time to include it in the Draft EIS. However, we understand that this work will be completed and published in the Final EIS along with a completed mitigation plan.

We look forward to continued participation in project planning.

Sincerely,

Robert Bowker

Field Supervisor

cc: FWS-AHR (ROES)
Kurt Dunn, FHWA, Juneau
Gary Liepitz, ADFG, Anchorage
Jack ALLen, EMPS-Sverdrup
John Morsell, Dames and Moore

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Western Alaska Ecological Services
605 W. 4th, Room G-81
Anchorage, Alaska 99501

IN REPLY REFER TO:
WAES

22 JUN 1984

John B. Olson, Director
Major Projects Management
Alaska Department of Transportation
and Public Facilities
4111 Aviation Avenue
Anchorage, Alaska 99502

Dear Mr. Olson:

The Fish and Wildlife Service (FWS) has prepared the enclosed Knik Arm Crossing Mitigation Statement to provide guidance for evaluating and mitigating impacts of the proposed project to fish and wildlife resources. This statement has been formulated in accordance with the FWS Mitigation Policy and in consultation with the National Marine Fisheries Service (NMFS), the Environmental Protection Agency (EPA), and the Alaska Department of Fish and Game (ADFG). Letters of concurrence are enclosed.

This statement reflects the relative value of fish and wildlife resources by considering both the abundance and quality of habitat in the project area. By using it in conjunction with the analysis of primary and secondary impacts, specific mitigation measures can be developed. We recognize that some mitigation has already been accomplished which will effectively reduce impacts to fish, wildlife, and associated habitat. To complete the mitigation plan, however, means of mitigating unavoidable impacts need to be identified and incorporated into project plans.

The preparation of a complete mitigation plan would best be accomplished by a team of resource agency personnel, the consultants, and the project sponsor representatives. In this way, all legitimate concerns can be addressed and a plan formulated which will be supported by all of the participants. This approach has been effectively used in other planning efforts to reduce conflicts and to facilitate the processing of State and Federal permits. We highly recommend its application in this instance.

We anticipate continued active participation in the planning for the Knik Arm Crossing project. We look forward to working closely with your staff and other interested individuals and agency personnel in developing a mitigation plan that will conserve important fish and wildlife resources of the project area.

Sincerely,

Robert Bowker

Field Supervisor

Enclosures

cc. FWS, AHR, with enclosures
Kurt Dunn, FHWA, Juneau, with enclosures
Jack Allen, EMPS Sverdrup, with enclosures
John Morsell, Dames and Moore, with enclosures
Bill Lawrence, EPA, Anchorage, without enclosures
Richard Thiel, EPA, Seattle, without enclosures
Brad Smith, NMFS, Anchorage, with enclosures
Larry Reeder, CE, Anchorage, with enclosures
Gary Liepitz, ADFG, Anchorage, without enclosures
Jerry Hamel, ADOT/PF, Anchorage, with enclosures
Merlyn Paine, ADOP/PF, Anchorage, with enclosures
Michelle Stearns, Matanuska-Susitna Borough, with enclosures

## Knik Arm Crossing
## Mitigation Statement

Under the Fish and Wildlife Coordination Act (FWCA) and the National Environmental Policy Act (NEPA) regulations, the Fish and Wildlife Service (FWS) has responsibilities to insure that project-related losses to fish and wildlife resources are identified and mitigated. As part of our participation in the planning and evaluation of the Knik Arm Crossing, the following mitigation statement has been developed in accordance with the FWS Mitigation Policy (FR Vol. 46, No. 15, January 23, 1982) and in consultation with the National Marine Fisheries Service (NMFS), the Environmental Protection Agency (EPA), and the Alaska Department of Fish and Game (ADF&G). It has been prepared to provide guidance for evaluating and mitigating impacts of the proposed project to fish and wildlife.

The Knik Arm Crossing mitigation statment has been developed by first selecting important fish and wildlife habitats from among the full range of habitats occurring within the area to be impacted by both direct as well as indirect impacts. These were chosen either because they represent resources which are most characteristic of the area or because the Fish and Wildlife Service has mandated responsibilities for them. By narrowing the scope in this way, the analyses can focus on areas where significant changes are most likely to occur and not be unduly burdened by inclusion of areas with low wildlife value.

After identifying important habitats, evaluation species, which function as indicators of habitat quality and quantity, were chosen. Selection of evaluation species has an important role in determining the extent and type of mitigation achieved. A combination of two sets of criteria is typically used to choose species for this purpose. The first is to pick species with high public interest, subsistence, or economic values while the second is to select species which utilize habitats having significant ecological values.

Fish and wildlife habitats were then assigned to one of the four Resource Categories delineated in the FWS Mitigation Policy (Table 1). Designation of habitat into Resource Categories ensures that the level of mitigation recommended is consistent with the value of that habitat and its relative abundance on an ecoregion or national basis.

Fifteen species or guilds of species, i.e., species that use closely associated ecological niches, have been selected as the basis for evaluating impacts and formulating mitigation requirements for the Knik Arm Crossing project (Table 2). Available information indicates that high value habitat for each evaluation species is found within the project area but that none is considered unique or irreplaceable. Therefore, the habitat for all species have been assigned to Resource Categories 2 or 3.

Table 1. Resource Categories and Mitigation Planning Goals.[1/]

| Resource Category | Designation Criteria | Mitigation Planning Goal |
|---|---|---|
| 1 | Habitat to be impacted is of high value for evaluation species and is unique and irreplaceable on a national basis or in the ecoregion section. | No loss of existing habitat value. |
| 2 | Habitat to be impacted is of high value for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section. | No net loss of in-kind habitat value. |
| 3 | Habitat to be impacted is of high to medium value for evaluation species and is relatively abundant on a national basis. | No net loss of habitat value while minimizing loss of in-kind habitat value. |
| 4 | Habitat to be impacted is of medium to low value for evaluation species. | Minimize loss of habitat value. |

[1/]Taken from FWS Mitigation Policy (FR Vol. 46, No. 15, 23 January 1981).

Table 2. Evaluation species[1] for the Knik Arm Crossing Project and Resource Category Designations for Associated Habitat.

| Common Name | Scientific Name | Resource Category of Associated Habitat |
|---|---|---|
| Moose | *Alces alces* | 3 |
| Black bear | *Ursus americanus* | 3 |
| Beaver | *Castor canadensis* | 3 |
| Common Loon | *Gavia immer* | 2 |
| Trumpeter swan | *Cygnus buccinator* | 2 |
| Lesser Canada goose | *Branta canadensis parvipes* | 3 |
| Mallard/Pintail | *Anas platyrhynchos/A. acuta* | 3 |
| Spruce grouse | *Dendragapus canadensis* | 3 |
| Lesser sandhill crane | *Grus canadensis canadensis* | 3 |
| Yellowlegs | *Tringa* sp. | 3 |
| Chinook salmon | *Oncorhynchus tshawytscha* | 2 |
| Coho salmon | *Oncorhynchus kisutch* | 2 |
| Sockeye salmon | *Oncorhynchus nerka* | 2 |
| Rainbow trout | *Salmo gairdneri* | 3 |
| Dolly Varden | *Salvelinus malma* | 3 |

[1] The bald eagle meets several of these tests but was not included as an evaluation species for mitigation purposes because it is specifically protected by the Bald Eagle Protection Act (16 U.S.C. 668-668c).

The determination of the relative scarcity or abundance of evaluation species habitat from the national perspective is based upon (1) the historical range and habitat quality and (2) the current status of that habitat. A significant reduction in either the extent or quality of habitat for an evaluation species indicates that it is scarce or becoming scarce, while maintenance of historical quantity and quality is the basis for considering it abundant.

Specific ways to achieve the mitigation goal for Resource Category 2 when loss of habitat value is unavoidable include, "(1) physical modification of replacement habitat to convert it to the same type lost;
(2) restoration or rehabilitation of previously altered habitat;
(3) increased management of similar replacement habitat so that the in-kind value of lost habitat is replaced; or (4) a combination of these measures. By replacing habitat value losses with similar habitat values, populations of species associated with that habitat may remain relatively stable in the area over time."1/

The mitigation goal of in-kind replacement of lost habitat, however, cannot always be achieved. When opposition to a project on that basis alone is not warranted, deviation from this goal may be appropriate. Two such instances occur when either different habitats and species available for replacement are determined to be of greater value than those lost, or when in-kind replacement is not physically or biologically attainable in the ecoregion. In either case, replacement involving different habitat kinds may be recommended, provided that the total value of the lost habitat is compensated.

For Resource Category 3, in-kind replacement of lost habitat is preferred though not always possible. Substituting different habitats or increasing management of different habitats so that the value of the lost habitat is replaced may be ways of achieving the planning goal of no net loss of habitat value.

Identification of evaluation species and designation of Resource Categories represent the first of several steps to be taken toward the completion of a mitigation plan. Using socio-economic trend analysis, the types of fish and wildlife habitats potentially impacted by project induced growth may be delineated and quantified, which will permit secondary, as well as direct, impacts to be evaluated. Upon completion of an analysis that quantifies impacts, a data base will be available from which a mitigation plan can be formulated.

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1/FWS Mitigation Policy

Appendix. Knik Arm Crossing Project Evaluation Species

Terrestrial Species

1. Moose (Alces alces). Moose habitat, relative to its historical range, is considered abundant from both a national and ecoregional basis.

   In terms of hunting pressure, moose is probably the most important big game species in Alaska. Historically, moose were a source of food, clothing, and implements along the major rivers. On a local, regional, and state-wide basis, this species continues to be an important source of food and recreation. Spending by moose hunters results in benefits throughout the State's economy and is compounded by the number of non-resident hunters. Moose also have a high non-consumptive value in that observations are valued by photographers and hikers.

   Because of potential susceptibility to project impacts, moose will serve as a good evaluation species. Moose are common throughout the project area, being most closely associated with upland shrub riparian zones, lowland bog climax communities, and seral communities created by fire and glacial or fluvial action. Although post-project habitat manipulations could potentially benefit moose, a long-term adverse impact is anticipated as a result of habitat loss to secondary development and degradation of habitat from the approach roads and increased human disturbance.

2. Black bear (Ursus americanus). Black bear are widespread in Alaska as well as in the 48 conterminous states and habitat is considered abundant on a national and ecoregion basis. Black bear are considered fairly common throughout the project area, particularly in alder thicket and riparian habitats.

   Seasonal availability of foods strongly determine the occurrence of black bears in a particular area. Movement occurs from spring green-up areas, to salmon streams in summer, and then to berry-producing shrubland in summer/early fall.

   The project could directly impact black bear through modification of medium to high value habitats. Habitat losses through reductions in both quality and quantity are expected.

3. Beaver (Castor canadensis). Although neither unique to Alaska nor scarce nationally or in the ecoregion, beaver play important economic and ecological roles. Beaver trapping in Alaska continues to be an integral component of traditional lifestyles, providing a source of revenue for bush residents. Similarily, trapping of the species provides recreational benefits to more urban residents. Beaver have an important ecological function in modifying habitat in ways that benefit other wildlife species, e.g., waterfowl and moose.

Beaver are dependent upon both aquatic and riparian habitats. Studies for Chakachamna hydroelectric project have found beaver to be common in the habitats classified as Black Cottonwood Riparian, Willow Thicket Riparian, and Black Spruce Riparian (Bechtel 1983). Impacts of the Knik Arm Crossing Project to these habitats would effect beaver distribution and population levels, as well as species associated with beaver; some beaver habitat may be created by the project while other existing habitat would be lost.

4. Common loon (Gavia immer). Common loons nest throughout the lake country of the northern United States and Canada in both open and forested habitats. Habitats used by common loons are abundant throughout the state and within the project area, but are declining on a nationwide basis, especially in the northeastern United States.

   Loons use water that is deep enough for escape-diving from enemies and large enough to take flight. Lakes with many islands are preferred nesting sites, especially where there is a minimun chance of disturbance by people in summer cabins or boats. The occurrence of loons is, therefore, an indication of wilderness quality (Terres 1980).

   Loons have high non-consumptive value for birdwatchers, photographers, and recreational boaters. More importantly, they function as monitors of lake and spruce bog habitats which could be subject to heavy development pressures associated with the project, as private lakeshore property is popular for residential and recreational uses. Much of this habitat in the project area is in private ownership and is subject to minimal land use controls.

5. Trumpeter swan (Cygnus buccinator). Although never considered abundant, trumpeter swans were historically found throughout much of northcentral North America in summer and along the Mississippi River and the Atlantic, Gulf, and Pacific Coasts in winter (Bartonek 1983). As a result of commercial and sport hunting and habitat destruction during the 19th Century, trumpeter swans were nearly extirpated from Canada and the 48 contiguous states (Banko 1960). Their favorable response to recent management efforts and, perhaps, amelioration of climate has made removal from the Threatened and Endangered Species list possible. The 1980 census indicated 7,696 trumpeter swans, representing 88 percent of the world population, were on the breeding grounds in Alaska (King and Conant 1981).

   Swans in Alaska nest and rear in wetlands and ponds found, primarily, along the major river systems in the southern half of the state. Trumpeter swans are very susceptible to disturbance impacts during nesting and rearing of cygnets, and in the Cook Inlet area particularly, the species is rapidly being excluded by recreational developments from large lakes formerly used for nesting (Timm and Woject 1978). Approximately two-thirds of all trumpeter swan habitat in Alaska is held in private ownership and therefore potentially available for development. Similar land ownership patterns occur in the project area.

Trumpeter swan surveys taken in the Cook Inlet region in 1968, 1975, and 1980 indicate that the population is expanding. The western portion of the project area has available habitat capable of supporting this species which may be adversely impacted by development pressures of the project.

6. Lesser Canada goose (Branta canadensis parvipes). Two subspecies of small Canada geese, B. c. parvipes and B. c. taverneri, collectively called lesser Canada goose, nest throughout much of Alaska and Yukon Territory at elevations below 2,000 feet. Only the former of these subspecies is found in the Cook Inlet region, where coastal marshes are used as nesting habitat. Large lake systems which provide for seclusion are used for molting. Washington, Oregon, California, and British Columbia are the principal wintering grounds (U.S. Fish and Wildlife Service 1983).

   Recreational hunting is the greatest use of lesser Canada geese. Between 1974 and 1978, an average of 5,500 lesser Canada geese were harvested in Alaska while an estimated 49,000 geese were taken in Oregon and Washington (U.S. Fish and Wildlife Service 1983). Of the approximately 2,500 lesser Canada geese which inhabit Upper Cook Inlet, an estimated 300-400 are harvested in the Pacific Flyway (B. Campbell, personal communication). Little is known about the subsistence harvest, although widely scattered nesting suggests that it is small (U.S. Fish and Wildlife Service 1983). Public viewing in the Pacific Northwest and near Anchorage is an important non-consumptive use.

   Secondary impacts from the construction of a Knik Arm Crossing will reduce and/or degrade nesting habitats for lesser Canada geese.

7. Mallard (Anas platrhynchos) and Pintail (Anas acuta). The most widely distributed and numerous game duck in North America, the mallard occurs throughout much of Alaska. From 1972 to 1981 the average breeding population in surveyed areas in Alaska was approximately 250,000. This represents less than 3% of the continental population (U.S. Fish and Wildlife Service 1983). Depending upon production in a given year, pintails are either the second or third most abundant duck in North America. They are more abundant than mallards in the Pacific Flyway and in Alaska (Bellrose 1976).

   Mallards breed in low densities in many forest and tundra wetland habitats. Nesting sites are usually selected at the edge of sloughs, lakes, and reservoirs, but sometimes may be far from water on higher ground. Pintails select open areas for their nests where vegetation is either low or sparse. Nest sites also tend to be farther from water than other species of ground nesting ducks.

   Interest in the mallard and pintails is high because of their value for hunting and viewing. Approximately 35% of all ducks harvested in the Pacific Flyway are mallards (U.S. Fish and Wildlife Service 1983) and 16% are pintails (Carey et al 1983), and even with strict regulatory measures, demand exceeds the supply. Management efforts are directed at satisfying as much of the demand as possible within the constraints of habitat losses and other conflicts (U.S. Fish and Wildlife Service 1983).

Habitat for mallards and pintails is fairly common within the project area and of medium to high value. Of concern, however, are the 1982 population estimates for pintails in Alaska which showed a 46% decrease from the 1981 figures and were 30% below the ten year average. It is uncertain whether this decline is significant, as pintails tend to disperse north in drought years on the prairies and several drought years are included in the average (King and Conant 1983).

8. Spruce grouse (Dendragapus canadensis). The spruce grouse, an inhabitant of the boreal coniferous forest, ranges over much of Alaska except the Alaska Peninsula and the northern, western, and southeastern coasts. Much of the upland terrain in the project area consists of spruce-birch cover type.

   Spruce grouse use medium to open density spruce-birch stands for nest sites. Upland stands of either white spruce-birch or black spruce with understories of grasses, spirea, blueberry, and cranberry provide cover and food; white spruce needles are a major component of their winter diet (Konkel et. al. 1980).

   Spruce grouse are a popular upland game bird for recreational hunters. Dependent upon forest habitats, this species will act as an indicator of habitat changes to areas prone to be developed because of good drainage.

9. Lesser sandhill crane (Grus canadensis canadensis). The lesser sandhill crane nests throughout Alaska, as well as northcentral and northwestern Canada and northeastern U.S.S.R. Approximately 91 percent of the cranes in Alaska belong to the Mid-continent population while the remaining nine percent belong to the Pacific Flyway population. Cranes nesting in the Upper Cook Inlet produce a portion of the latter group (U.S. Fish and Wildlife Service 1983).

   Preferred nesting habitats are sedge/grass meadow and wet marsh tundra which afford an unobstructed view on all sites. Standing water is nearby (Konkel et.al. 1980).

   The primary use of Pacific Flyway cranes is non-consumptive in the form of bird-watching and photographing. Other than Wyoming which has an experimental season to reduce depredation, sport hunting is legal only in Alaska where an average of 229 were harvested annually between 1971 to 1980 (U.S. Fish and Wildlife Service 1983). Of the estimated 1,746 sandhill cranes sport harvested in Alaska in 1982, 31% occurred in Cook Inlet (Campbell 1984). Subsistence hunting on the Yukon-Kuskokwim Delta was estimated at 1,000 cranes in 1964 and 1,477 in 1981 (U.S. Fish and Wildlife Service 1983).

Boise (1977) concluded that "human activity above minimal levels appears incompatible with crane nesting, as reflected in nest desertion as a result of human activity. Loss of nesting habitat as a result of land development is a further threat to the population's stability."

10. Yellowlegs (*Tringa* sp.). Common shorebirds of the muskeg and tundra, the greater yellowlegs has a summer range from the lower Yukon Delta River Valley south and east along the coast into southeast Alaska, while the lesser yellowlegs breed from the Kobuk River Valley south to Yakutat Bay. Yellowlegs nest in depressions on the ground in timbered muskeg and lightly wooded areas. They feed in lakes, ponds, and tidal flats.

    Yellowlegs are valued as a non-consumptive resource, primarily for viewing and photographing. They are also useful as an evaluation species for wetland habitats which support a diverse array of other fish and wildlife species.

Aquatic Species

1. Chinook salmon (*Oncorhynchus tshawytscha*). Chinook salmon are distributed from southern California north to Point Hope, Alaska. Development of hydroelectric potential in the northwestern United States has resulted in the loss of a significant portion of the salmon spawning habitat. On a national basis, interest is very high in minimizing losses to chinook salmon, and, if possible, expanding existing stocks. Maximizing populations of this prized commercial, recreational, and subsistence species is also desired by State and local entities.

   Within the project area, the Little Susitna River provides both spawning and rearing habitat for chinook salmon. Recreational fishing has resulted in the harvesting of approximately 700-1,000 chinook annually in recent years. The Little Susitna River also contributes to the Tyonek subsistence catch which has averaged about 2,000 fish.

   Ready access to the Little Susitna River because of a Knik Arm Crossing will result in habitat degradation due to heavy use by recreational fishermen. Intensity of use similar to that on the Kenai and Russian Rivers are anticipated by Alaska Department of Fish and Game biologists.

2. Coho salmon (*Oncorhynchus kisutch*). On a national level hydroelectric development in the Northwest United States has resulted in a significant depletion of coho salmon stocks. The 1981 commercial harvest of cohos for the upper Cook Inlet was just under 500,000 while the 1982 commercial harvest attributable to upper Cook Inlet was 777,000 cohos (Alaska Department of Fish and Game (ADF&G)/Su Hydro 1982). Coho salmon is also a highly prized sport fish.

The Little Susitna River provides important spawning habitat for coho salmon as well as some rearing habitat. Much of the rearing, however, occurs in lateral tributaries and lakes throughout the project area. In the recent past, there has been an average escapement of 6,000 - 7,000 coho salmon in the Little Susitna River. About an equal number of fish were harvested by the recreational fishery while double that were harvested by commercial fishermen (L. Engel, Alaska Department of Fish and Game, Personal Communication).

Again, habitat degradation of both riverine and wetland areas resulting from a crossing is anticipated. The two years required for rearing make this life stage particularly vulnerable to losses of wetlands and tributary streams.

3. Sockeye salmon (Oncorhynchus nerka). Past depletion of sockeye salmon stocks in the Pacific Northwest, as well as in Alaska, has resulted in major interest in this species. Restoration programs have been ongoing in Alaska for several years. Thus, there is considerable national, state, and local interest in avoiding adverse impacts to sockeye, the most commercially important of the Pacific salmon. The 1982 upper Cook Inlet sockeye commercial catch was 3.2 million (ADF&G/Su Hydro 1982). Sockeye salmon is also considered an important species to sport and subsistence fishing interests.

   Fish Creek is a major producer of sockeye salmon within the project area. In 1983, there was an escapement of about 119,000 sockeye; in recent years prior to that, the escapement has ranged between 30,000 and 60,000 fish. Sockeye salmon spawn in both lakes and streams and rear for 1-2 years in lakes, especially Big Lake. Commercial harvest to escapement occurs at an estimated ratio between a 1:1 and 2:1. Most of the recreational use occurs in the Little Susitna River, with only limited harvesting occurring in Big Lake and Fish Creek (L. Engel, Personal Communication).

   Conversion of stream- and lakeside habitat to residential, commercial, and/or industrial sites will decrease their value for sockeye salmon. Heavy use by recreational fishermen will also degrade these areas.

4. Rainbow trout (Salmo gairdneri). This species is one of the most sought-after sport fishes in North America, if not the world. The original range of the rainbow trout is from northern Mexico to the Kuskokwim River, Alaska, and west of the continental divide. Rainbow trout have been introduced to every continent except Antarctica and most major islands. The species is now present in every state except Louisiana, Mississippi, and Florida and has been planted in several lakes in interior Alaska (Morrow 1980). Interest in this species, on a national and state basis, is high and habitat is considered abundant in comparison to historical levels.

The Big Lake system consisting of Meadow Creek with associated small lakes as the inlet and Fish Creek as the outlet supports a naturally reproducing population of rainbow trout where 9,369 fish were caught in 1982. The Little Susitna River also produces rainbow trout; the 1982 recreational harvest totaled 1,551 fish (L. Engel, Personal Communication).

Increased development pressures around water bodies, especially Big Lake, and intensified use due to a crossing will result in total loss of some areas and decreased quality of other remaining rainbow trout habitat.

5. Dolly Varden (Salvelinus malma). What is considered the historical range of this species depends upon whether or not Dolly Varden are considered to be a separate species from the Arctic char (S. alpinus) and the bull char (S. confluentus) (Morrow 1980). For the purposes of this document, Kruger's (1981) definition of Dolly Varden is accepted: it states that "Dolly Varden char are defined as those fish which occur south of the Arctic char and north of the bull char." The range of this species in North America, is thus from the arctic coast of Alaska south to southern British Columbia. Both anadromous and resident populations are found throughout its range. Current habitat is of high quality and considered abundant compared to that of historic levels.

Resident Dolly Varden occur in Big Lake. An important sport fish, 8,793 were harvested in Big Lake during 1982 while 1,331 were taken from the Little Susitna River (L. Engel, Personal Communication). Reduced habitat value is expected as a result of constructing a Knik Arm Crossing.

## Literature Cited


Alaska Department of Fish and Game/Susitna Hydro Aquatic Studies. 1982. Stock Separation Feasibility Report, Adult Anadromous Fisheries Project. Phase I Final Draft Report, Subtask 7.10. Susitna Hydroelectric Project. Alaska Power Authority. Anchorage, Alaska.

Banko, W.E. 1960. The Trumpeter Swan. North America Fauna, No. 63. U.S. Fish and Wildlife Service. Washington, D.C.

Bartonek, J. 1983. Mangement Plan for Pacific Coast and Mid-Continent Population of Trumpeter Swans (Draft). Pacific Flyway Technical Committee.

Bechtel Civil and Minerals Inc. 1983. Chakachamna Hydroelectric Project Interim Feasibility Assessment Report. Alaska Power Authority. Anchorage, Alaska.

Bellrose, Frank C. 1976. Ducks, Geese and Swans of North America. Stackpole Books. Harrisburg, Pennsylvania.

Boise, C.M. 1977. Breeding biology of the lesser sandhill crane, *Grus canadensis canadensis* (L.) on the Yukon-Kuskokwim Delta, Alaska. M.S. Thesis, University of Alaska, 79 pp.

Campbell, Bruce H. 1984. Annual Report of Survey-Inventory Activities: Part V. Waterfowl. Alaska Department of Fish and Game. Juneau, Alaska.

Carey, S.M., M.F. Sorenson, and E.M. Martin. Waterfowl Harvest Hunter Activity in the United States during the 1982 Hunting Season. U.S. Fish and Wildlife Service Administrative Report, June 21, 1983. Office Of Migratory Bird Management. Laurel, Maryland.

King, J.G. and B. Conant. 1983. Alaska - Yukon Waterfowl Breeding Pair Survey, May 18 to June 13, 1982. Fish and Wildlife Service. Juneau, Alaska.

King, J.G. and B. Conant. 1981. The 1980 Census of Trumpeter Swans on Alaska Nesting Habitats. American Birds Vol. 35, No. 5: 789-793.

Konkel, G.W., L.C. Shea, K.E. Bulchis, L.C. Byrne, D. Pengilly, and K.S. Lourie. 1980. Terrestrial Habitat Evaluation Criteria Hankbook - Alaska (Review Copy). U.S. Fish and Wildlife Service. Anchorage, Alaska.

Kruger, S.W. 1981. Freshwater Habitat Relationships Dolly Varden Char (*Salvelinus malma* (Walbaum)). Alaska Department of Fish and Game. Anchorage, Alaska.

Morrow, J.E. 1980. The Freshwater Fishes of Alaska. Alaska Northwest Publishing Co. Anchorage, Alaska.

Terres, John K. 1980. The Audubon Society Encyclopedia of North America Birds. Alfred A. Knopf. New York, New York.

Timm, D. and L. Wojeck. 1978. Trumpeter Swans. Fishtails and Game Trails. Alaska Department of Fish and Game. Juneau, Alaska Nov. pp. 4-6.

U.S. Fish and Wildlife Service. 1983. Alaska Regional Resource Plan (Draft). Anchorage, Alaska.

STATE OF ALASKA

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

P.O.BOX 3-2000
JUNEAU, ALASKA 99802
PHONE: (907) 465-4100

May 29, 1984

Dr. Robert Putz, Regional Director
United States Fish and Wildlife Service
1011 East Tudor Road
Anchorage, Alaska 99503

Dear Dr. Putz:

The Alaska Department of Fish and Game (ADF&G) has reviewed the United States Fish and Wildlife Service's (USFWS) Knik Arm Crossing Mitigation Statement which provides guidance for the evaluation and mitigation of fish and wildlife resource losses potentially resulting from the construction of the Knik Arm Crossing.

We recognize that your agency's nationwide responsibility for the protection of fish and wildlife resources must reflect concerns for habitat that may be unique or scarce on a national basis. Because the ADF&G is principally responsible for fish, wildlife and habitats within Alaska, our priority of attention to species may vary slightly from the priorities of the USFWS. Nevertheless, your mitigation statement appears to address the full range of important and indicator species in the affected area as we would define them, and accurately describes the habitat associated with these species. Furthermore, your mitigation policy is generally in accord with the department's in the sense that it first seeks to avoid and minimize impacts and, if impacts cannot be minimized, only then considers compensatory actions which emphasize in-kind and in-place actions. Your mitigation policy should provide an adequate foundation for subsequent mitigation planning.

Thank you for providing the department an opportunity to comment on the Knik Arm Crossing Mitigation Statement.

Sincerely,

Don Collinsworth

Don W. Collinsworth
Commissioner

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: M/S 443

Mr. Robert Bowker
Field Supervisor
U.S. Fish and Wildlife Service
605 West 4th, Room G-81
Anchorage, Alaska 99501

RE: Mitigation Statement - Knik Arm Crossing

Dear Mr. Bowker:

We have received the Knik Arm Crossing Mitigation Statement. It provides guidance for evaluating and mitigating impacts of proposed Knik Arm Crossing alternatives in Anchorage, Alaska.

We concur with the Mitigation Statement. We also share your concern for secondary development impacts to fish and wildlife habitat and wetlands in the Matanuska-Susitna Borough. We believe it should be the policy of involved resource agencies that potential adverse secondary impacts be minimized through appropriate development controls. This will reduce the need for in-kind replacement or restoration of lost habitat.

Thank you for including us in the review of the Mitigation Statement. Should you need assistance in the future, please contact us.

Sincerely,

Richard R. Thiel, Chief
Environmental Evaluation Branch

cc: Bill Lawrence, AOO

UNITED STATES DEPARTMENT OF COMMERCE
**National Oceanic and Atmospheric Administration**
*National Marine Fisheries Service*
*P.O. Box 1668*
*Juneau, Alaska 99802*

May 17, 1984

Mr. Robert Bowker
Fish and Wildlife Service
Western Alaska Ecological Services
605 W. 4th, Room G-81
Anchorage, Alaska 99501

Dear Mr. Bowker:

We have received your letter of April 26, 1984, and accompanying Mitigation Statement regarding the proposed Knik Arm Crossing. We recognize the importance of establishing a framework from which primary and secondary impacts can be identified and effective mitigative measures developed. We concur with those evaluation species selected and with the resource category designations presented for their respective habitats.

Sincerely,

James W. Brooks

for Robert W. McVey
Director, Alaska Region

# United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:
413

JUL 16 1984

The Director of the National Park Service is pleased to inform you of our determination pursuant to the National Historic Preservation Act, as amended, and Executive Order 11593 in response to your request for a determination of eligibility for inclusion in the National Register of Historic Places. Our determination appears on the enclosed material.

As you know, your request for our professional judgment constitutes a part of the Federal planning process. We urge that this information be integrated into the National Environmental Policy Act analysis and the analysis required under section 4 (f) of the Department of Transportation Act, if this is a transportation project, to bring about the best possible program decisions.

This determination does not serve in any manner as a veto to uses of property, with or without Federal participation or assistance. The responsibility for program planning concerning properties eligible for the National Register lies with the agency or block grant recipient after the Advisory Council on Historic Preservation has had an opportunity to comment.

We are pleased to be of assistance in the consideration of historic resources in the planning process.

Attachment

# E.O. 11593

## DETERMINATION OF ELIGIBILITY NOTIFICATION

National Register of Historic Places
National Park Service

**Project Name:** Knik Arm Crossing

**Location:** Anchorage **State:** AK

**Request submitted by:** DOT/FHWA Barry F. Morehead

**Date Received:** 7-2-84 **Additional information received:**

36 CFR Part 63.3
Determination

| Name of property | SHPO opinion | Eligibility: Secretary of the Interior's opinion | Criteria |
|---|---|---|---|
| 918 West 2nd Ave. | Eligible | Eligible | |
| 813 1/2 West 3rd Ave. | Eligible | Eligible | |

for Beth L. Savage
Keeper of the National Register

Date: Determined Eligible 7-16-84

WASO-27

June 27, 1984

HFO-AK

734.2

NEUNABER

Ms. Carol Schul
Keeper of the National Register
National Park Service
1100 "L" Street Northwest
Washington, D.C. 20240

RUBY

Dear Ms. Schul:

Alaska Project A-81021
Knik Arm Crossing

The Federal Highway Administration (FHWA) and the Alaska Department of Transportation and Public Facilities are in the process of developing a highway project between Anchorage and the Parks Highway including a bridge across Knik Arm.

A survey of the project area was made to determine if there are any items eligible for the National Register of Historic Places. In consultation with the State Historic Preservation Officer and ADOT/PF, the National Register criteria were applied to six sites and it is our opinion that four of these sites appear to meet these criteria. We are requesting a determination of eligibility for these four sites based on the enclosed information.

An expeditious review and comment from the Secretary as to the eligibility of inclusion in the National Register would be appreciated.

Sincerely yours,

/s/ BARRY F. MOREHEAD

Barry F. Morehead
Division Administrator

Enclosure

KCDunn:seb

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER (oan)
Seventeenth Coast Guard District
P.O. Box 3—5000
Juneau, Alaska 99802
(907) 586-7368

16590

Knik Arm Crossing
Attn: Mr. Robert Wokurka
430 C Street, Suite 200
Anchorage, Alaska 99501

RE: Proposed Knik Arm Crossing

Dear Mr. Wokurka:

This is in reply to your letter of 28 February 1984 concerning the proposed Knik Arm crossing. As you indicate, a subsequent formal determination by the Coast Guard about navigational clearance considerations will be required. In the interim, an informal review of the alternatives is provided at your request as follows:

a. Elmendorf Crossing, north of Cairn Point, with the proposed clearances of 500 feet horizontal and 31 feet above Mean Higher High Water vertical, is acceptable for any existing and reasonably forseeable marine traffic. Such marine traffic would present very little risk of collision with the bridge.

b. The Downtown Crossing, regardless of clearance, would have a substantial risk of vessel collision. This intuitive judgement is reinforced by the recent study of the National Research Council, "Ship Collisions with Bridges". Many of the comments herein are based on that study.

c. A comparison of the relative costs of the two crossings would be unrealistic if it did not include the costs of suitable structural and vehicle traffic protection against ship collision for the Downtown Crossing. Since the majority of serious collisions take place outside of normal navigation channels anywhere a vessel in ballast can float at high water, nearly all the in-water portions of the Downtown bridge are at risk.

d. The navigation route you show is as recommended in the Coast Pilot, and is a reasonable approach to the Port of Anchorage. It would be beneficial if a bridge span over it were perpendicular to the route, as this provides a clearer picture to the approaching mariner.

e. The clearance you show is 140 feet above Mean Higher High Water (MHHW) vertical and 1000 feet horizontal. In our letter of 3 August 1983 we did not specify clearances at the downtown location, since we recommended against any bridge there. In that letter, user recommendations of up to 200 feet MHHW and 2000 feet horizontal were given. The methodology by which the clearances were determined is not known, and therefore the validity is open to question.

f. A Coast Guard approved navigational clearance will require the following information from you:

1. An analysis of current vessel traffic using the area, and a projection of the vessels likely to be in use over the life of the bridge, with the vertical and horizontal clearances they require, both for normal approaches and for extreme circumstances. Note that deeper draft vessels, which may well have higher masts, tend to approach Anchorage at higher tide stages so they can clear Knik Arm Shoal.

2. An analysis of various horizontal clearances and the attendent risks of bridge collisions. Possibly methods discussed in the National Research Council Study could be employed in this. Possibly, too, the circumstances at this site are too complex to be subjectable to rational analysis, which would tend to give greater weight to the comments of users.

3. Comments you have received from users.

4. Your conclusions, based on the above and any other factors that pertain, including economics.

g. We will ask the users to comment on your recommendations and the reasoning behind them, and then be in a position to make a decision on your recommendations.

When two bridge sites exist across the same body of water, one of which has almost no effect on marine and land transportation safety, and the other of which is in an area where the conditions of nature on vessel operation tend to produce a substantial risk of bridge collision, there is no question that the Coast Guard would prefer the safer location.

Sincerely,

E. R. RIUTTA
Commander, U. S. Coast Guard
Chief, Aids to Navigation Branch
Seventeenth Coast Guard District
By direction of the District Commander

# Appendix H
# Bibliography

## Appendix H

## BIBLIOGRAPHY


Acres American, Inc. September 1981. Preliminary Assessment of Cook Inlet Tidal Power, Phase I, Volume I. For the State of Alaska, Office of the Governor.

Acres American, Inc. February 1983. Susitna Hydroelectric Project, Volume 8. For the Alaska Power Authority.

Alaska Department of Environmental Conservation. 1980. State Air Quality Control Plan, Final Report.

Alaska Department of Fish & Game (ADF&G). 1973. Alaska's Wildlife and Habitat: Vol. I. Juneau, Alaska.

ADF&G. 1978a. Alaska's Fisheries Atlas: Vol. I and II. Juneau, Alaska.

ADF&G. 1978b. Alaska's Wildlife and Habitat: Vol. II. Juneau, Alaska.

ADF&G. February 1984. Annual Report of Survey-Inventory Activities, Part V, Waterfowl.

ADF&G. 1982. An Atlas to the Catalog of Waters Important for Spawning, Rearing and Migration of Anadromous Species.

ADF&G. 1980a. Susitna Flats Refuge Management Plan. Anchorage, Alaska.

ADF&G. (No date-a). Draft Goose Bay Refuge Management Plan.

ADF&G. (No date-b). Draft Palmer Hay Flats Refuge Management Plan.

ADF&G. 1980b. A Synthesis and Evaluation of ADF&G Fish and Wildlife Information for the Willow and Talkeetna Sub-basins. For USDA Soil Conservation Service Interagency Cooperative, Susitna River Basin Study.

Alaska Department of Natural Resources (ADNR). 1981. Alaska Outdoor Recreation Plan.

ADNR. 1983. "Iditarod Trail Location Survey, Goose Creek to Susitna Station", ASLS 83-001, map.

ADNR. April 1984. Fish Creek Management Plan, draft. In cooperation with the Matanuska-Susitna Borough.

ADNR. May 1982. Land Use Issues and Preliminary Resource Inventory. For the Matanuska-Susitna-Beluga Cooperative Planning Program.

ADNR. 1983. Susitna Area Plan Public Meetings. For the Matanuska-Susitna-Beluga Cooperative Planning Program.

ADNR. 1980. Susitna Basin Land Use/Recreation Atlas.

ADNR. October 1982. Willow Sub-basin Area Plan.

ADNR et al. 1970. Alaska Outdoor Recreation Plan, Volume 2, Outdoor Recreation in Alaska.

Alaska Department of Natural Resources, Division of Parks. 1981. Alaska Outdoor Recreation Plan.

Alaska Department of Transportation and Public Facilities (ADOT/PF). 1982a. "Anchorage and Vicinity 1982 Average Daily Traffic", map.

ADOT/PF. April, 1981. Anchorage International Airport Master Plan Study. Anchorage, Alaska

ADOT/PF. 1982. Boniface Interchange Location and Design Study Report, RF-042-1 (66). Anchorage, Alaska.

ADOT/PF. 1982. Draft Environmental Impact Statement for New Parks Highway, Wasilla, Alaska.

ADOT/PF. 1983. Highway Preconstruction Manual Chapter 11 Design. Juneau, Alaska.

ADOT/PF. April 15, 1983. Knik Arm Crossing Economic Feasibility. Anchorage, Alaska.

ADOT/PF. September, 1983. "105 Program" FY 1984.

ADOT/PF. February 24, 1982. 1981 Highway Cost Index. Juneau, Alaska.

ADOT/PF. 1982b. 1982 Travel Inventory-Central Region.

ADOT/PF and Federal Highway Administration (FHWA). March 1984. Major Corridors Study - Scoping Document.

Alaska Housing Authority. 1969. Timber Resources in the Matanuska-Susitna Borough. For Matanuska-Susitna Borough.

Alaska Power Authority. (no date). 1982 Year-End Report.

Alaska Power Authority. February 1984. Susitna Hydroelectric Project, Economic and Financial Update. (draft report)

Alaska Road and Recreation Maps. 1981. "Big Lake and Vicinity."

American Association of State Highway and Transportation Officials (AASHTO). 1965. A Policy on Geometric Design of Rural Highways. Washington, D.C.

AASHTO. 1973. A Policy on Geometric Design of Urban Highways and Arterial Streets. Washington, D. C.

AASHTO. 1977. Standard Specifications for Highway Bridges, and the 1978 to 1982 ASHTO Interim Specifications.

Anchorage Air Pollution Control Agency. (no date). Air Quality Summaries for the Municipality of Anchorage, unpublished.

Anchorage Convention and Visitors Bureau. March 1984. Anchorage Visitors Study.

Anchorage Convention and Visitors Bureau. 1984. 1984 Visitors Guide.

Anchorage Metropolitan Area Transportation Study (AMATS). 1982. Transportation Improvement Program FY 83. Anchorage, Alaska.

AMATS. September 1983. Transportation Improvement Program FY 84 - FY 88.

Anchorage Real Estate Research Committee. Fall 1982/Spring 1983. Anchorage Real Estate Research Report, Volume IX.

Anchorage School District. 1983. Financial Plan, FY 1983-84.

Anchorage School District. December 1983. Ten-Year Capital Improvement Program - Analysis and Recommendations, July 1, 1984 - June 30, 1994.

Apostolos, J. A. et al. December 1978. Energy and Transportation Systems. California Department of Transportation.

Arneson, P.D. 1981. Susitna Hydroelectric Project Annual Progress Report, Big Game Studies, Part II: Moose-Downstream. For Alaska Power Authority.

Austin, T.C., G.S. Rubenstein, L.D. Verrelli, T.E. Moyer. 1983. Light Duty CO Emissions During Cold Weather. Paper presented at the Fuels and Lubricants Meeting, San Francisco, October 31-November 3, 1983, Sponsored by Society of Automotive Engineers.

Bakus, G. J., M. Orys and D. J. Hendrick. 1979. "The Marine Biology and Oceanography of the Anchorage Region, Upper Cook Inlet, Alaska," Astarte, Vol. 12, no. 1. pp 13-20.

Battelle Pacific Northwest Industries. December 1982. Railbelt Electric Power Alternatives Study: Evaluation of Railbelt Electric Energy Plans. For the Office of the Governor, State of Alaska.

Bell, M. C. 1973 (rev. 1980). Fisheries Handbook of Engineering Requirements and Biological Criteria. For Fisheries Engineering Research Program, U.S. Army Corps of Engineers, Northern Pacific Division, Portland, Oregon.

Benson, Paul E. 1979. CALINE3 - A Versatile Dispersion Model for Predicting Air Pollutant Levels near Highways and Arterial Streets. California Department of Transportation, Sacramento, California.

Berman, M. and T. Hull. Alaska Statewide and Regional Economic and Demographic Systems: Effects of OCS Exploration and Development. Social and economic studies program, Technical Report No. 106. Prepared for Minerals Management Service, Alaska OCS Office. University of Alaska, Institute of Social and Economic Research, Anchorage.

Blackburn, J. E. 1978. Pelagic and Demersal Fish Assessment in the Lower Cook Inlet Estuary System. Alaska Department of Fish & Game.

Bloch, Ivan & Associates. 1955. Preliminary Appraisal of Proposed Knik Arm Causeway.

Bomhoff & Associates. 1982. Extension of the Alaska Railroad to Point MacKenzie. For the Matanuska-Susitna Borough.

Braund, S.R. 1980. Cook Inlet Subsistence Salmon Fishery. Alaska Department of Fish and Game, Subsistence Division, Tech Paper No. 54.

Britch, R. 1976. Tidal Currents in Knik Arm, Cook Inlet, Alaska. M.S. Thesis, University of Alaska, Fairbanks, AK.

Canadian Journal of Fisheries and Aquatic-Sciences. 1983. Proceedings of the Symposium on the Dynamics of Turbid Coastal Environments. Canadian Journal of Fisheries and Aquatic-Sciences, Vol. 40, Supplement No. 1.

Carberry, Michael E. 1979. Patterns of the Past: An Inventory of Anchorage's Heritage Resources. Municipality of Anchorage, Historic Landmarks Preservation Commission.

Colorado Division of Highways. 1977. Benefit-Cost Analysis Report.

Cowardin, L., V. Carter, F. Golet and E. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. For the U.S. Fish and Wild Service, Office of Biological Services, Washington, D.C.

DeLaguna, F. 1975. The Archeology of Cook Inlet, Alaska. Alaska Historical Society, Anchorage.

The Dow-Shell Group. September 9, 1981. Report to the State of Alaska, Volumes 1, 2, 5, and 7.

DOWL Engineers. June 1982. City of Houston Comprehensive Development Plan.

DOWL Engineers. May 1982. Growth Potential, Development Issues, Settlement Patterns. For the Matanuska-Susitna Borough Comprehensive Planning Program and the Matanuska-Susitna-Beluga Cooperative Planning Program.

DOWL Engineers. February 1983. Matanuska-Susitna Borough Comprehensive Plan, draft. For the Matanuska-Susitna Borough, Alaska.

Dufour, P.A. 1980 Effects of Noise on Wildlife and Other Animals, Review of Research Since 1971. For the U.S. Environmental Protection Agency. By: Informatics, Inc., Rockville, MD.

Dumond, D. F. and R.L.A. Mace. 1968. "An Archeological Survey Along Turnagain Arm," APVA, Vol. 14, no. 1. pp. 1-21.

Environmental Services, Ltd. 1978. Point MacKenzie Industrial Siting Study. For Matanuska-Susitna Borough.

Evans, C. D., E. Buck, R. Buffler, G. Fisk, R. Forbes, and W. Parker. 1972. The Cook Inlet Environment: A Background Study of Available Knowledge. For U. S. Army Corps of Engineers, Alaska District.

Federal Energy Regulatory Commission. 1978. Western LGN Project - Final Environmental Impact Statement, Vol. I: Construction and Operation of an LNG Liquefaction Terminal at Nikski, Alaska.

Federal Highway Administration (FHWA). December 1978. FHWA Highway Traffic Noise Prediction Model, Report FHWA-RD-77-108.

FHWA. July 1982. Procedures For Abatement of Highway Traffic Noise and Construction Noise.

FHWA. June 1982. Report of Field Review - Highway Traffic Noise Impact Identification and Mitigation Decision-making Process.

Federal Interagency Committee on Urban Noise. June 1980. Guidelines for Considering Noise in Land Use Planning and Control.

"First Quarterly Cost Roundup," Engineering News-Record, Volume 210, No. 12. March 24, 1983. pp. 77-121.

Gibson, D. E. 1980. "Cultural Resource Survey Along the Palmer-Wasilla Highway," Archeological Survey Projects 1978, Series No. 22. pp. 40-54.

Goldsmith, S. and P. Rowe. April 1983. The Economic Impacts of Capital Construction Expenditures in Alaska. Institute of Social and Economic Research, University of Alaska.

Goldsmith, S. October 1978. Important Economic Relationships in the Alaskan Macroeconomy. University of Alaska.

Goldsmith, S. (no date). Alaska Economic Multiplier Experiments with the MAP Model. University of Alaska.

Hendrick, T. D., G. T. Bakus and staff. 1977. Water Quality Study, Knik Arm and Upper Cook Inlet, Alaska, Tetra Tech Report TC827.

Highway Research Board. 1965. Highway Capacity Manual, Special Report 87.

Howard, Needles, Tammen & Bergendoff. 1972. Basic Research, Analysis and Exploratory Investigations, Knik Arm Highway Crossing. For the State of Alaska Department of Highways, Anchorage. Alaska.

Howard, Needles, Tammen & Bergendoff. November 1982. Matanuska-Susitna Borough Transportation Plan.

Illinois Department of Transportation. 1981. Highway Energy Handbook.

Joyce, M. R., L. A. Rundquist, L. L. Moulton. 1980a. Gravel Removal Studies in Arctic and Subarctic Floodplains in Alaska - Technical Report. U.S. Fish and Wildlife Service, Anchorage, Alaska.

Joyce, M. R., L. A. Rundquist, L. L. Moulton. 1980b. Gravel Removal Guidelines Manual for Arctic and Subarctic Floodplains, FWS/OBS-80-09. U.S. Fish and Wildlife Service, Biological Service Program.

Kasprisin-Hutnik Partnership. March 1984. Phase I, Point MacKenzie Port/Park Land Management Plan, draft. For the Matanuska-Susitna Borough, Alaska.

Kasprisin-Hutnick Partnership. June 21, 1984. Point Mackenzie Area Meriting Special Attention Phase II Summary Report. For the Matanuska-Susitna Borough, Alaska.

Kessel, B. and G. Gibson. 1978. Status and Distribution of Alaska Birds, Studies in Avian Biology No. 1.

Kinney, P. T., T. Grove, and D. K. Button. 1970. Cook Inlet Environmental Data R/V Acona Cruise 065 - May 21-28, 1968, Report No. R-70-2. University of Alaska, Institute of Marine Science.

Loeffler, B. 1980. Water Supply and Demand in the Susitna Basin. Alaska Department of Natural Resources.

Matanuska-Susitna Borough. 1981a. Coastal Management Program, Phase I Completion Report. Alaska Coastal Management Program.

Matanuska-Susitna Borough. March 1984a. Comprehensive Development Plan - Public Facilities (draft).

Matanuska-Susitna Borough. March 1984b. Comprehensive Development Plan - Transportation.

Matanuska-Susitna Borough. March 3, 1981. Dow/Shell Information Response to Point MacKenzie Siting, Book 1 of 2. Alaska

Matanuska-Susitna Borough. 1983. 1983-84 Annual Budget (Preliminary). Alaska.

Matanusak-Susitna Borough. September 1983. 1983 Sample Census

Matanuska-Susitna Borough. 1983. Service Areas 1983-84 Annual Budget (Preliminary). Alaska.

Matanuska-Susitna Borough. March 1982. Title 16, Subdivisions.

Matanuska-Susitna Borough. 1981b. Unpublished study reports for the Goose Bay-MacKenzie Point Road.

Matanuska-Susitna Borough, Planning Department. August 1983. Matanuska-Susitna Borough Coastal Management Plan.

Matanuska-Susitna Borough School District. February 24, 1983. School Board Approved Budget 1983-84.

Maynard & Partch, Woodward-Clyde Consultants. 1981. Matanuska-Susitna Borough Coastal Management Program, Phase I, Completion Report.

Maynard & Partch, Woodward-Clyde Consultants. 1982. Matanuska-Susitna Borough Coastal Management Program, Phase II, Completion Report.

Maynard NBBJ Alaska. (no date). Housing Report -- Part of the Comprehensive Plan and Zoning Ordinance Revision, Municipality of Anchorage, Alaska. For the Municipality of Anchorage.

McCormick, J., and W. Pichon. 1978. Wetlands of Potter Marsh-Point Campbell to Potter - Final Report. Wapora, Inc., for Alaska District, U.S. Army Corps of Engineers.

Mills, M.J. 1982. Statewide Harvest Study, Federal Aid in Fish Restoration, July 1, 1982 - June 30, 1983. Vol. 24. Alaska Department of Fish and Game.

Mishan, E.V. 1976. Cost-Benefit Analysis. Praeger Publishers, New York.

Morrow, J. E. 1980. The Freshwater Fishes of Alaska. Alaska Northwest Publishing Company, Alaska.

Muir, Robert G., & Associates. August 1979. "Fort Richardson Master Plan/Future Development Plans," maps. For the U. S. Army Engineer District, Alaska.

Municipality of Anchorage. June 1979. Alternative Land Use Study Technical Report.

Municipality of Anchorage. 1982a. Anchorage Air Quality Plan, 1982 SIP Revisions. Prepared by the Air Quality Technical Committee, adopted May 27, 1982.

Municipality of Anchorage. 1980. Anchorage Coastal Zone Management Plan.

Municipality of Anchorage. 1982b. Anchorage Transit Technical Study - Preliminary Evaluation Report.

Municipality of Anchorage. (no date). Coastal Scenic Resources Plan.

Municipality of Anchorage. June 1982. Coastal Trail Plan: Ship Creek to Eklutna.

Municipality of Anchorage. May 1983. Fact Sheet 1983 Approved Budget (After Mill Levy Revision). Anchorage, Alaska.

Municipality of Anchorage. November 1982. Fiscal Trends Report 1978-1988. Anchorage, Alaska.

Municipality of Anchorage, Alaska Department of Transportation and Public Facilities. March 1984. Anchorage Accelerated Road Program.

Municipality of Anchorage, Community Planning Department. Fall 1983. Anchorage CBD Comprehensive Development Plan.

Municipality of Anchorage, Community Planning Department. May 1983. Anchorage Wetlands Management Plan.

Municipality of Anchorage, Community Planning Department. July 1983. Long-Range Transportation Plan for the Anchorage Bowl, 1983-2001, draft. For the Anchorage Metropolitan Area Transportation Study.

Municipality of Anchorage, Community Planning Department. November 1983. Official 1983 Population Estimates and Methodology.

Municipality of Anchorage, Planning Department. March 1982. Anchorage Bowl Comprehensive Development Plan (Revision).

Municipality of Anchorage, Planning Department. September 18, 1979. Eagle River-Chugiak-Eklutna Comprehensive Plan. Alaska.

Municipality of Anchorage, Planning Department. August 1980. Land Use and Vacant Land Analysis of the Anchorage Bowl. Alaska.

Municipality of Anchorage, Planning Department. September 1981. 1981 Long-Range Element Update. For the Anchorage Metropolitan Area Transportation Study, Alaska.

Murray D. 1980. Threatened and Endangered Plants of Alaska. U.S. Forest Service and Bureau of Land Management, joint publication.

National Academy of Sciences. 1977. Guidelines for Preparing Environmental Impact Statements on Noise.

Northern Technical Services (NORTEC). March 1981. Draft Industrial Development Profiles -- Volume I. For the Matanuska-Susitna Borough, Alaska.

Osgood, C. 1966. "The Ethnography of the Tanaina," Anthropology, No. 16.

Pamplin, W. L. 1979. Construction-Related Impacts of the Trans-Alaska Pipeline System on Terrestrial Wildlife Habitats, Joint Fish and Wildlife Advisory Team Special Report No. 24. U.S. Fish and Wildlife Service Joint State/Federal Fish and Wildlife Advisory Team, Alaska.

Potter, L. 1963. A Study of a Frontier Town in Alaska: Wasilla to 1959. Thetford Center, Vermont.

Real Estate Research Corporation. 1974. Costs of Urban Sprawl. For the U. S. Department of Housing and Urban Development, Washington, D. C.

Reger, D. P. 1977. Excavations on the Beluga Point Site, unpublished M.S. thesis.

Reger, D. P. (no date). Prehistory of the Northwest Kenai Peninsula Area, unpublished Ph.D. dissertation proposal.

Reger, D. P. 1980. "Report of Archeological Field Survey in Willow-Wasilla Area," Archeological Survey Projects 1978, Series No. 22.

Ritchie, R., J. Curatolo, and A. Batten. 1981. Knik Arm Wetlands Study. U.S. Fish and Wildlife Service, WAES. Anchorage, Alaska.

Rosenberg, D. H., D. C. Burrell, K. V. Natarajan, and D. W. Hood. 1967. Oceanography of Cook Inlet and Special Reference to the Effluent from the Collier Carbon and Chemical Plant, Report No. R67-5. University of Alaska, Institute of Marine Science.

Rothe, T.C., S.H. Lanigan, P.A. Martin, and G.F. Tande. 1983. Natural Resource Inventory of Elmendorf Airforce Base, Alaska. For: 21st Combat Support Group/DEEV, Elmendorf Airforce Base. By: U.S. Fish and Wildlife Service, Special Studies, Region 7.

Rummel, B. 1980. Susitna Basin Planning Background Report: Water Quality. For Alaska Department of Natural Resources in cooperation with U.S. Soil Conservation Service.

Scott, M.J. and staff. 1979. Southcentral Alaska's Economy and Population, 1965-2025, A Base Study and Projections. Institute for Social and Economic Research, University of Alaska, Anchorage.

Sellers. 1979. Waterbird Use and Management Considerations for Cook Inlet State Game Refuge, unpublished report. Alaska Department of Fish and Game, Anchorage.

Sharma, G. D. and D. C. Burrell. 1970. "Sedimentary Environment and Sediments of Cook Inlet, Alaska, " American Association of Petroleum Geologists Bulletin.

Shultz, T. J. August 1978. "Synthesis of Social Surveys on Noise Annoyance," JASA, Vol. 64, No. 2.

Timm, Dan. 1974, 1975, 1976, 1977, 1978, 1979, 1980. Report of Survey and Inventory Activities of Waterfowl. Alaska Department of Fish and Game, Juneau, Alaska.

Tippetts-Abbett-McCarthy-Stratton (TAMS Engineers). July 1983. Anchorage International Airport Surface Transportation Study, Phase III Report.

TAMS Engineers. May 1, 1975. Phase I Feasibility Study Proposed Knik Arm Crossing Utilizing a Ferry System. For the State of Alaska.

TAMS Engineers. 1983. The Port of Anchorage Marketing and Development Plan -- Phase II Final Draft Report. For the Port of Anchorage, Alaska.

Transportation Research Board. (no date). National Cooperative Highway Research Program Report 187.

U. S. Air Force. 1979. "Master Base Plan Elmendorf Air Force Base," maps. Elmendorf, Alaska.

U. S. Air Force, Planning Assistance Teams. September 1983. Knik Arm Crossing Proposals, An Air Force Evaluation.

U. S. Army, Alaska. 1974. Draft Environmental Impact Statement: Construction and Operation - Parachute Drop Zone and Short Field Assault Landing Strip. Fort Richardson, Alaska.

U. S. Army Corps of Engineers. 1979a. Metropolitan Anchorage Urban Study. Alaska District, U. S. Army Corps of Engineers.

U. S. Army Corps of Engineers. 1979b. Metropolitan Anchorage Urban Study. Vol 3. Water Quality, Knik Arm, Upper Cook Inlet. For Municipality of Anchorage.

U. S. Army Corps of Engineers. 1979c. Metropolitan Anchorage Urban Study. Vol 5. Storm Water Quality Management For Existing Areas. For Municipality of Anchorage.

U. S. Army Corps of Engineers. 1975. South Central Railbelt Area Alaska Upper Susitna River Basin Interior Feasibility Report, Appendix I, Part I, Section A - Hydrology.

U. S. Army Corps of Engineers. 1975/1980 update. Special Flood Hazard Report For Ship Creek, Anchorage, Alaska.

U. S. Army Corps of Engineers. 1982. Special Flood Hazard Information For Ship Creek, Elmendorf Air Force Base, Anchorage, Alaska.

U. S. Coast Guard. "Cook Inlet, Fire Island to Goose Bay," Map No. 16664.

U. S. Coast Guard. January 1981. "Pacific and Arctic Coast, Alaska," Pilot 9, 10th edition.

U. S. Department of Agriculture et al. October 1981. Willow Sub-basin, Susitna River Basin Study-Alaska. Anchorage.

U. S. Department of Commerce (USDOC), Coast and Geodetic Survey. April 7, 1970. Tidal Bench Marks. Anchorage, Alaska.

U. S. Department of Commerce, National Oceanic and Atmospheric Administration (USDOC/NOAA). 1982. Local Climatological Data. Anchorage, Alaska.

U. S. Department of Transportation, Federal Aviation Administration (USDOT/FAA). March 4, 1972. Federal Aviation Regulations, Part 77, Objects Affecting Navigable Airspace.

U. S. Department of Transportation, Federal Highway Administration (USDOT/FHWA). 1974. "Urban Trip Distribution Friction Factors," Trip Assignment. Washington, D. C.

U. S. Department of Transportation, Federal Highway Administration and Alaska Department of Transportation and Public Facilities (USDOT/FHWA, ADOT/PF). December 5, 1983. Knik Arm Crossing Final Corridor Alternatives Analysis.

USDOT/FHWA, ADOT/PF. November 29, 1982. Knik Arm Crossing Scoping Document.

USDOT/FHWA, ADOT/PF. March 8, 1983. Knik Arm Crossing Scoping Report.

USDOT/FHWA, ADOT/PF. February 1983a. Technical Memorandum No. 1, Corridor Evaluation Methodology.

USDOT/FHWA, ADOT/PF. February 1983b. Technical Memorandum No. 2, Marine Seismic Reflection Survey.

USDOT/FHWA, ADOT/PF. November 21, 1983. Technical Memorandum No. 3, Onshore Geotechnical Analysis.

USDOT/FHWA, ADOT/PF. March 8, 1983a. Technical Memorandum No. 4, Public Involvement Plan.

USDOT/FHWA, ADOT/PF. March 8, 1983b. Technical Memorandum No. 5, Scoping Corridor Evaluation.

USDOT/FHWA, ADOT/PF. March 5, 1983. Technical Memorandum No. 6, Scoping Sessions.

USDOT/FHWA, ADOT/PF. August 12, 1983a. Technical Memorandum No. 7, Urban Growth Forecasts, Corridor Alternatives Analysis

USDOT/FHWA, ADOT/PF. August 12, 1983b. Technical Memorandum No. 8, Design Concepts and Costs, Corridor Alternatives Analysis.

USDOT/FHWA, ADOT/PF. August 12, 1983c. Technical Memorandum No. 9, Travel Forecasts, Corridor Alternatives Analysis.

USDOT/FHWA, ADOT/PF. August 12, 1983d. Technical Memorandum No. 10, Environmental Impact, Corridor Alternatives Analysis.

USDOT/FHWA, ADOT/PF. August 12, 1983e. Technical Memorandum No. 11, Benefit-Cost Analysis, Corridor Alternatives Analysis.

USDOT/FHWA, ADOT/PF. December 1, 1983. Technical Memorandum No. 12, Cost-Effectiveness, Corridor Alternatives Analysis.

USDOT/FHWA, ADOT/PF. August 12, 1983f. Technical Memorandum No. 13, Financing, Corridor Alternatives Analysis.

USDOT/FHWA, ADOT/PF. October 21, 1983. Technical Memorandum No. 14, Public Involvement, Corridor Alternatives Analysis.

USDOT/FHWA, ADOT/PF. December 20, 1983. Technical Memorandum No. 15, Marine Biological Studies.

USDOT/FHWA, ADOT/PF. January 27, 1984a. Technical Memorandum No. 16, Freshwater and Terrestrial Habitat Studies.

USDOT/FHWA, ADOT/PF. January 27, 1984b. Technical Memorandum No. 17, Survey of Archeological and Historic Resources.

U. S. Environmental Protection Agency. 1981. Compilation of Air Pollutant Emission Factors: Highway Mobile Sources.

U. S. Environmental Protection Agency. 1979. Dispersion Model User's Guide, Volume 1. Report No. EPA-450/4-79-030. Industrial Source Complex (ISC).

U. S. Environmental Protection Agency. 1983. Regional Workshops on Air Quality Modeling - A Summary Report. Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

U. S. Environmental Protection Agency. 1981. User's Guide to MOBILE2 (Mobile Source Emissions Model), Report No. EPA-460/3-81-006. Motor Vehicle Emission Lab, Ann Arbor, Michigan.

U. S. Fish and Wildlife Service. (No Date). Distribution and Abundance of Swans in Alaska. Anchorage.

U. S. Fish and Wildlife Service. 1981. Technical Appendix - Fish and Wildlife Resources. Susitna River Basin Cooperative Study, Willow Sub-basin Portion.

U. S. Fish and Wildlife Service. 1982. "Wetland Maps for the Susitna Drainage Area," unpublished. U. S. Fish and Wildlife Service National Wetlands Inventory Program.

U. S. Forest Service. 1979. Roadway Drainage Guide for Installing Culverts to Accommodate Fish, Alaska Region Report No. 12. U. S. Department of Agriculture, Alaska.

U. S. Soil Conservation Service. 1979. Alaska Rivers Cooperative Study, Susitna Basin, Willow, and Talkeetna Sub-basins - Plan of work.

U. S. Soil Conservation Service. 1982. "Vegetation Maps for the Susitna Basin Area, " unpublished. U. S. Department of Agriculture, Soil Conservation Service Interagency Cooperative, Susitna River Basin Study.

Viereck, L. and C. Dyrness. 1980. A Preliminary Classification System for Vegetation of Alaska. U.S. Department of Agriculture, Forest Service General Technical Report PNW-106.

Yarborough, L. 1979a. Report of Archeological Survey on the Goose Bay-MacKenzie Point LSR&P Project, Phase I. For Matanuska-Susitna Borough.

Yarborough, L. 1979b. Report of Archeological Survey on Goose Bay-MacKenzie Point LSR&P Project, Phase II: North Portion. For Matanuska-Susitna Borough.

Yarborough, L. 1980. Report of Archeological Survey on Goose Bay-MacKenzie Point LSR&P Project, Phase II: South Portion. For Matanuska-Susitna Borough.

Yarborough, M. R. 1983. An Aerial Reconnaissance and Limited Surface Survey of the Proposed Houston and Wasilla Corridors of the Knik Arm Crossing Project. Report prepared for Dames and Moore, Anchorage.

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