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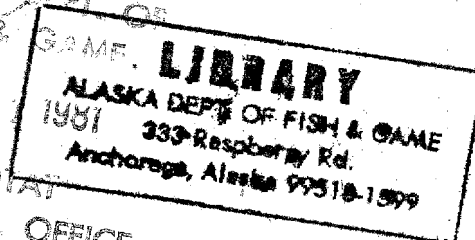
SUSITNA HYDROELECTRIC PROJECT

PROJECT CONSTRUCTION REQUIREMENTS SCHEDULING

TASK 2 - SURVEYS AND SITE
FACILITIES

SUBTASK 2.10 - ACCESS ROAD

SEPTEMBER 1981



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SUSITNA HYDROELECTRIC PROJECT

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TASK 2 - SURVEYS AND SITE
FACILITIES

OCTOBER 1981

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SUSITNA HYDROELECTRIC PROJECT

ACCESS ROAD STUDIES

PROJECT CONSTRUCTION REQUIREMENTS - SCHEDULING

1 - GENERAL

The access road studies currently being undertaken are evaluated against various criteria. The methodology of the access road selection is shown in Figure 1. The evaluation is shown as step 5 of the methodology, along with the various criteria for evaluation. The one criteria this paper addresses is scheduling.

2 - SCHEDULING CONSIDERATIONS

Access to site must allow for the orderly development and maintenance of site facilities and construction activities in order that first power can be brought on line in 1993.

The various scheduling requirements to be considered are:

(a) Schedule of Access Development

This has been shown graphically on Figures 2 and 3 as schedule Plans A and B. Both schedule plans allow for an orderly development from limited access conditions through improved to full continuous access.

(b) Flexibility of Supply System

The system of supply to the site should be flexible to accommodate the various requirements of work. The flexibility should allow for alternative means of resupply in the event of strikes, delays, and unforeseen circumstances. Movement of people quickly to and from site in case of strikes, civil disruption and emergencies must also be allowed for.

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The Schedule Plans A and B show different types of access: limited, improved, continuous, and complete. The "complete" access is the final product. The "limited" access would be extremely rough and allow only a limited number and type of vehicle travel. The "continuous" road would have all subgrade work completed and would allow reasonable truck traffic continuously. A requirement of the project is that "continuous" access is necessary by mid-1986 to support the construction activities. The "improved" access is better than "limited" and not as good as "continuous".

Schedule Plan A requires a "pioneer road" to be constructed. A "pioneer road", for definition, is a road which would allow limited access to several points along the permanent access road, to allow a rapid start and accelerated construction of the permanent road. The pioneer road would typically be a gravel surfaced road with turnouts; would be on existing ground, unless conditions made it absolutely necessary to place subgrade material or require excavation; and would have about 10 percent maximum grades and small radius curves. The pioneer road would generally have the same alignment as the permanent access road. However, in many places it would have to follow another alignment to avoid any major excavation or fill work.

A pioneer road at major river crossings would have temporary floating Bailey Bridges. These bridges would have to be removed in winter and temporary ice crossings built.

Schedule Plans A and B have the following as key dates:

1. JANUARY 1, 1985, LIMITED ACCESS REQUIREMENTS

- A. Mobilization of construction equipment and materials to build main access road.
- B. Mobilization of camp buildings and facilities to support diversion construction.
- C. Mobilization construction equipment and materials to construct diversion tunnels.

2. JANUARY 1, 1986, IMPROVED ACCESS REQUIREMENTS

- A. Supply of cement for diversion tunnel construction.
- B. Expansion of camp and facilities to support main dam contractor.

3. JULY 1, 1986, CONTINUOUS ACCESS REQUIREMENTS

- A. Support of main dam contractor's activities.
- B. Development of camp and facilities to support other contractors.

The preceding Schedule Plans A and B were developed during evaluation of the overall access plans. The schedule plans allow the orderly development and maintenance of site facilities and construction activities in order that first power be brought on line in 1993.

One small advantage of a pioneer road is it could provide some support in the Phase II investigation and design of the project.

3 - ACCESS PLANS AND SCHEDULING

The overall access plans are presented in Figure 4. Figure 4 also presents a summary of plans and technical points of the studies. Access plans 1, 2, 5 and 8, all of which originate from the east, the Parks Highway or Gold Creek, all require three to four years for complete construction. Access plans 3, 4, 6 and 7, all of which originate from the north and the Denali Highway, require one year to have an access to Watana.

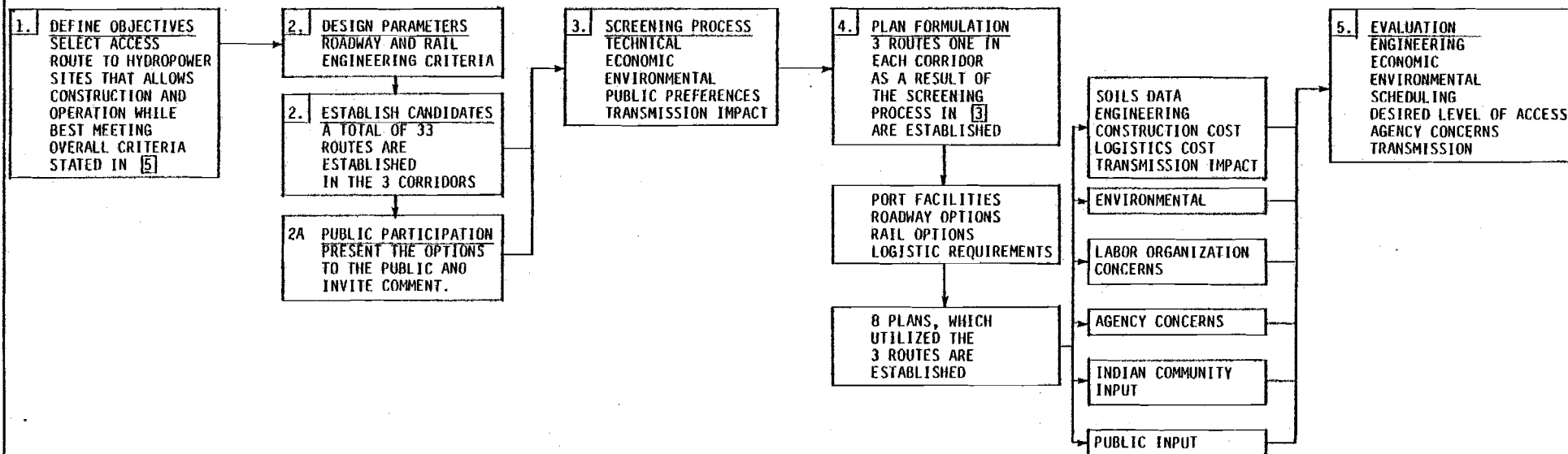
As stated above access plans 3, 4, 6 and 7, all of which originate from the Denali Highway, can meet this requirement. Access plans 1 and 2, 5 and 8 cannot meet this requirement unless a pioneer road is constructed prior to 1985. This can be accommodated in the allotted time frame. For access plans 1 and 2, 5 and 8 the pioneer road would be constructed during 1983 and 1984. Detailed design and obtaining the necessary permits would have to be carried out during the last half of 1982 and the first half of 1983. This would allow the construction

of the full access road to be commenced in 1985 and the first half of 1986, with completion in 1987. The major bridge at Gold Creek would be constructed in 1985 and 1986, with access during this period being accommodated by a floating Bailey Bridge. A floating bridge would also be required at Watana or Devil Canyon during 1985 and 1986 depending on the road location.

Access plans 5 and 8 would require construction of the permanent bridge at Devil Canyon to commence at the same time the pioneer road is started. For the bridge at Devil Canyon all necessary site work and the foundations would be complete by January 1985 to allow erection of the bridge in 1985 and completion in 1986.

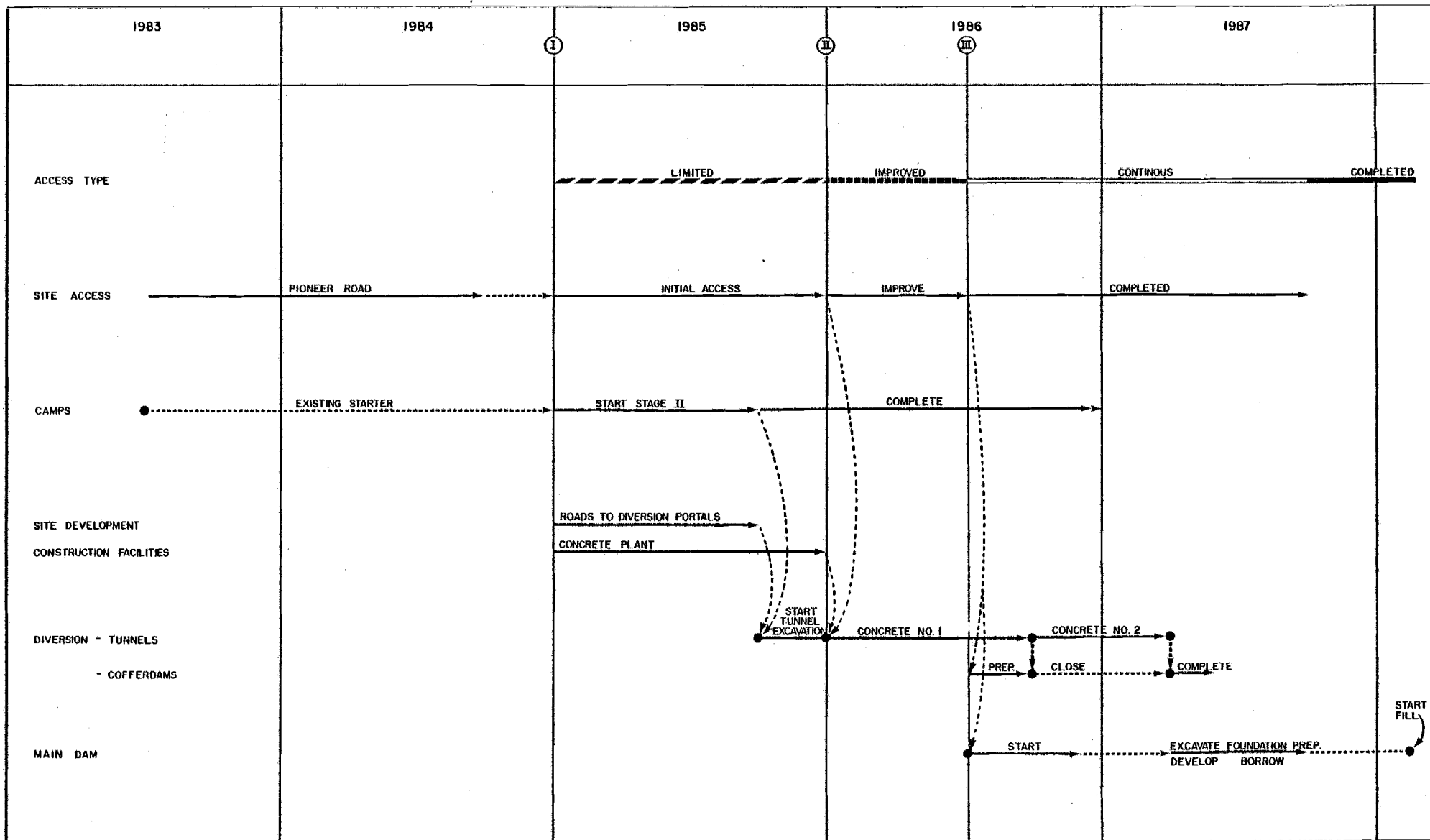
Access plans 2 and 8, which do not have a connection to a major highway, would have to bear an additional expense of transporting personnel in and out of the sites. By not having a connection to a major highway the option of having a portion of the personnel bear the cost of transportation to and from the site by private vehicle is eliminated. This shuttle expense is estimated to be in the order of \$25,000,000 by air. Shuttle train service would be less expensive.

Rail access plans 2 and 8 have a higher contingency risk than a roadway access. The risk is the possible loss of all ground transport and supply to the site associated with a breakdown of the rail system. Rail access does not provide the flexibility provided by a road access. A road access allows more control over the project by the contractors themselves. A road access from a major highway is more flexible to adapt to different situations, thus lessening the risk of work delays, stoppages, and contractor's claims. It has a "safety valve" the rail access options do not have.



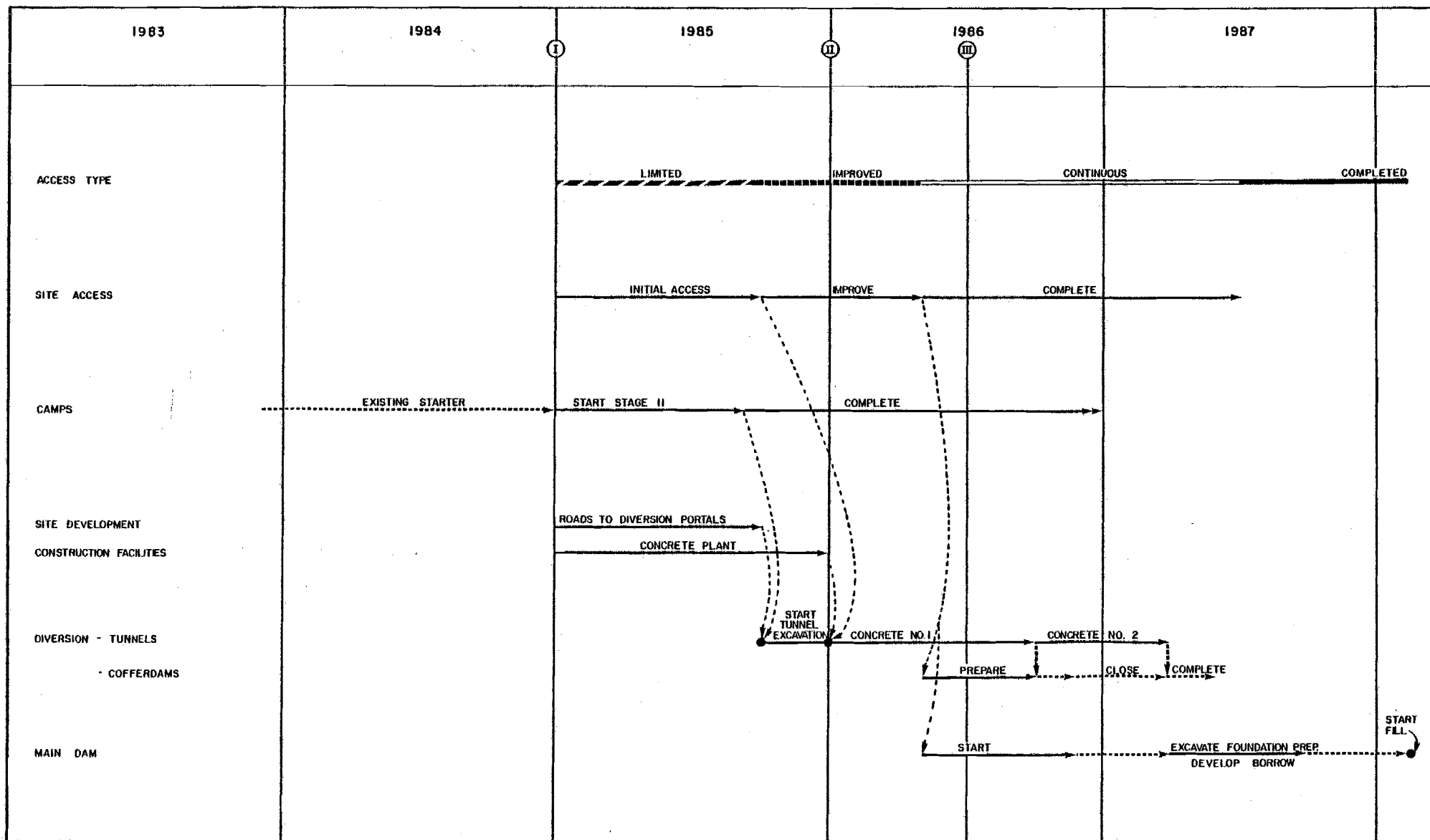
ACCESS PLAN SELECTION METHODOLOGY

FIGURE 1



SCHEDULE PLAN A

SUSITNA HYDROELECTRIC PROJECT
CONSTRUCTION SCHEDULE
ACCESS FROM PARKS HIGHWAY



SCHEDULE PLAN B

SUSITNA HYDROELECTRIC PROJECT
CONSTRUCTION SCHEDULE
ACCESS FROM DENALI HIGHWAY



SUSITNA ACCESS PLANS

PLAN	1	2	3	4	5	6	7	8
DESCRIPTION:	ROADWAY: PARKS HIGHWAY TO DEVIL CANYON & WATANA ON SOUTH SIDE OF SUSITNA	RAIL: GOLD CREEK TO DEVIL CANYON & WATANA ON SOUTH SIDE OF SUSITNA	ROADWAY: DENALI HIGHWAY TO WATANA, PARKS HIGHWAY TO DEVIL CANYON ON SOUTH SIDE OF SUSITNA. NO CONNECTING ROAD	ROADWAY: DENALI HIGHWAY TO WATANA, RAIL, GOLD CREEK TO DEVIL CANYON ON SOUTH SIDE OF SUSITNA. NO CONNECTING ROAD	ROADWAY: PARKS HIGHWAY TO DEVIL CANYON ON SOUTH SIDE OF SUSITNA, DEVIL CANYON TO WATANA ON NORTH SIDE OF SUSITNA.	ROADWAY: DENALI HIGHWAY TO WATANA, RAIL, GOLD CREEK TO DEVIL CANYON ON SOUTH SIDE OF SUSITNA. CONNECTING ROAD ON NORTH SIDE OF SUSITNA.	ROADWAY: DENALI HIGHWAY TO WATANA, PARKS HIGHWAY TO DEVIL CANYON ON SOUTH SIDE OF SUSITNA. CONNECTING ROAD ON NORTH SIDE OF SUSITNA.	ROADWAY: GOLD CREEK TO DEVIL CANYON ON SOUTH SIDE OF SUSITNA, DEVIL CANYON TO WATANA ON NORTH SIDE OF SUSITNA.
MILEAGE OF NEW ROAD	62	58	70	60	68	102	111	54
CONSTRUCTION COST (\$ x 1,000,000)	158	140	151	119	143	179	209	93
MAINTENANCE COST (\$ x 1,000,000)	5	4	6	5	8	8	9	7
LOGISTICS COST (\$ x 1,000,000)	215	210	231	230	214	230	231	214
TOTAL COST (\$ x 1,000,000)	378	354	388	354	365	417	449	314
PERSONNEL SHUTTLE COST (\$ x 1,000,000)	0	45	0	20	0	0	0	45
CONSTRUCTION SCHEDULE (YEARS)	3-4	3-4	1	1	3-4	1	1	3-4
MAJOR BRIDGES	2	2	0/1	0	2	0	0/1	1
SCHEDULE PLAN	A	A	B	B	A	B	B	A
ADDED CONTINGENCY RISK	NO	YES	NO	NO - WATANA YES - DEVIL CANYON	NO	NO	NO	YES

FIGURE 4

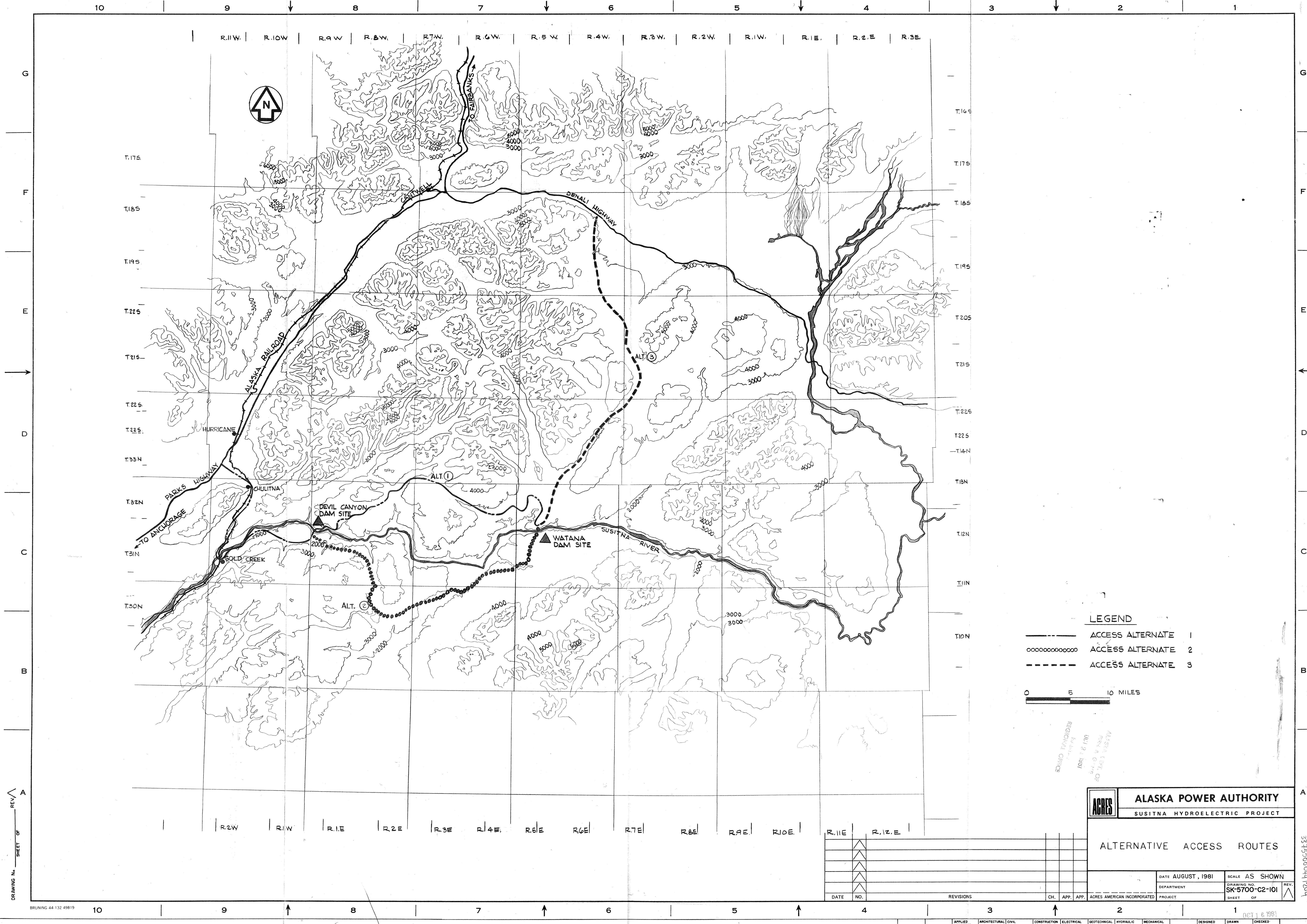


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- LEGEND**
- ACCESS ALTERNATE 1
 - oooooooooooooo ACCESS ALTERNATE 2
 - ACCESS ALTERNATE 3

0 5 10 MILES

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ALTERNATIVE ACCESS ROUTES

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	▲		▲								
	▲		▲								
	▲		▲								
	▲		▲								
DATE	NO.	REVISIONS				CH.	APP.	APP.	ACRES AMERICAN INCORPORATED		

DATE	AUGUST, 1981	SCALE	AS SHOWN
DEPARTMENT		DRAWING NO.	SK-5700-C2-101
PROJECT		SHEET	OF