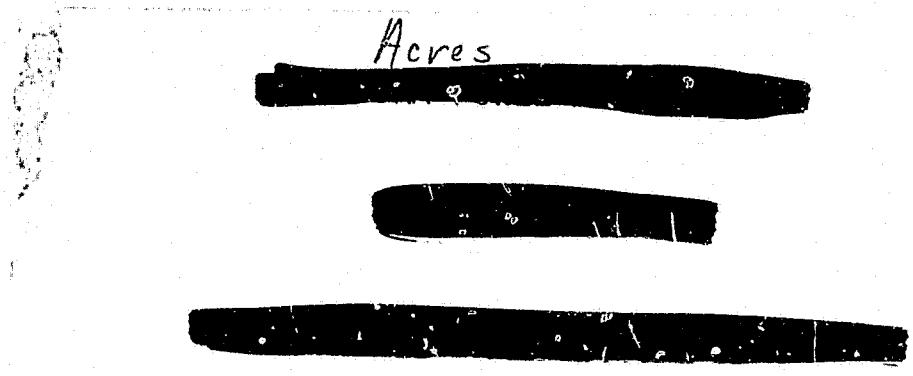
INTERNAL BOARD
REVIEW MEETING #2
OCTOBER 14, 1980

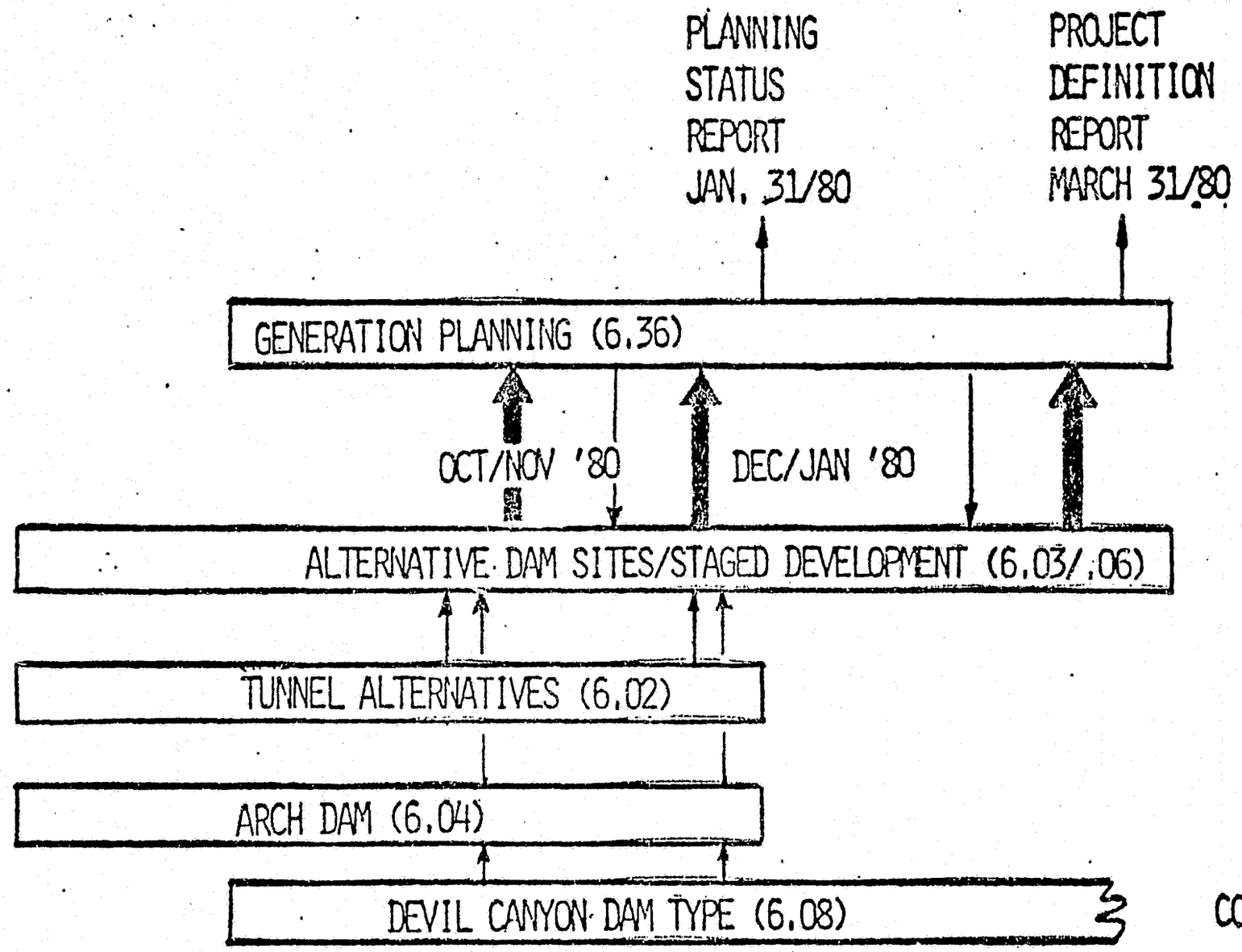
SUBTASK 6.01 - 6.08
MATERIAL PRESENTED
(ALL RESULTS SHOWN ARE PRELIMINARY)



SCOPE

6.01	REVIEW PREVIOUS STUDIES
6.02	TUNNEL ALTERNATIVES
6.03/6.06	ALTERNATIVE DAM SITES
6.04	EVALUATE ARCH DAM
6.05	REPORTING
6.08	ALTERNATIVE DAMS AT DEVILS CANYON

PROJECT DEFINITION STUDIES



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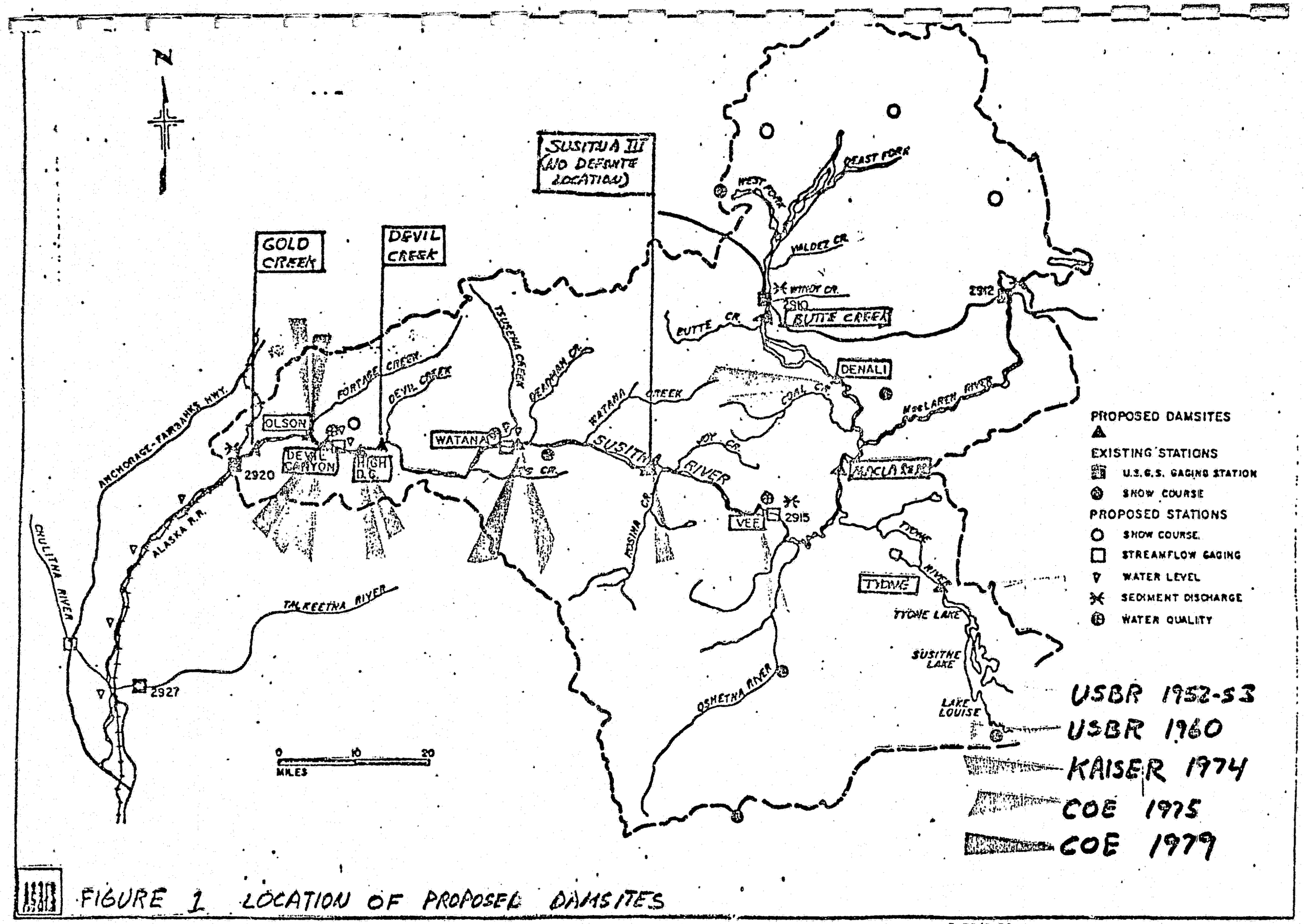


FIGURE 1 LOCATION OF PROPOSED DAMSITES

5-75/5-76

Calculations

SUBJECT:

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY AJS DATE _____
APP _____ DATE _____

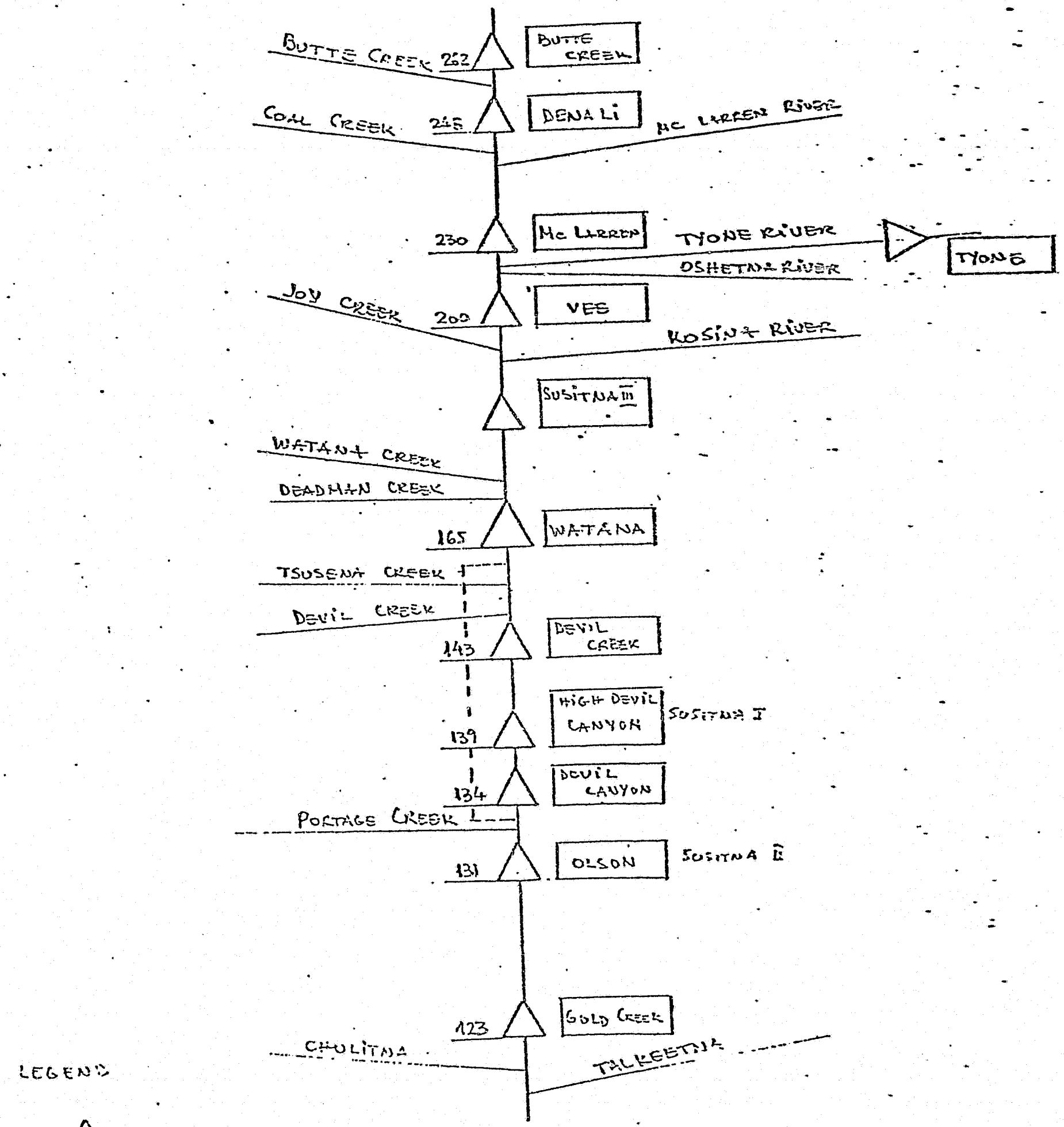


Fig. SUSITNA HYDROELECTRIC SYSTEM SITES FROM PREVIOUS STUDIES

FORM NO. 152 REV. 1

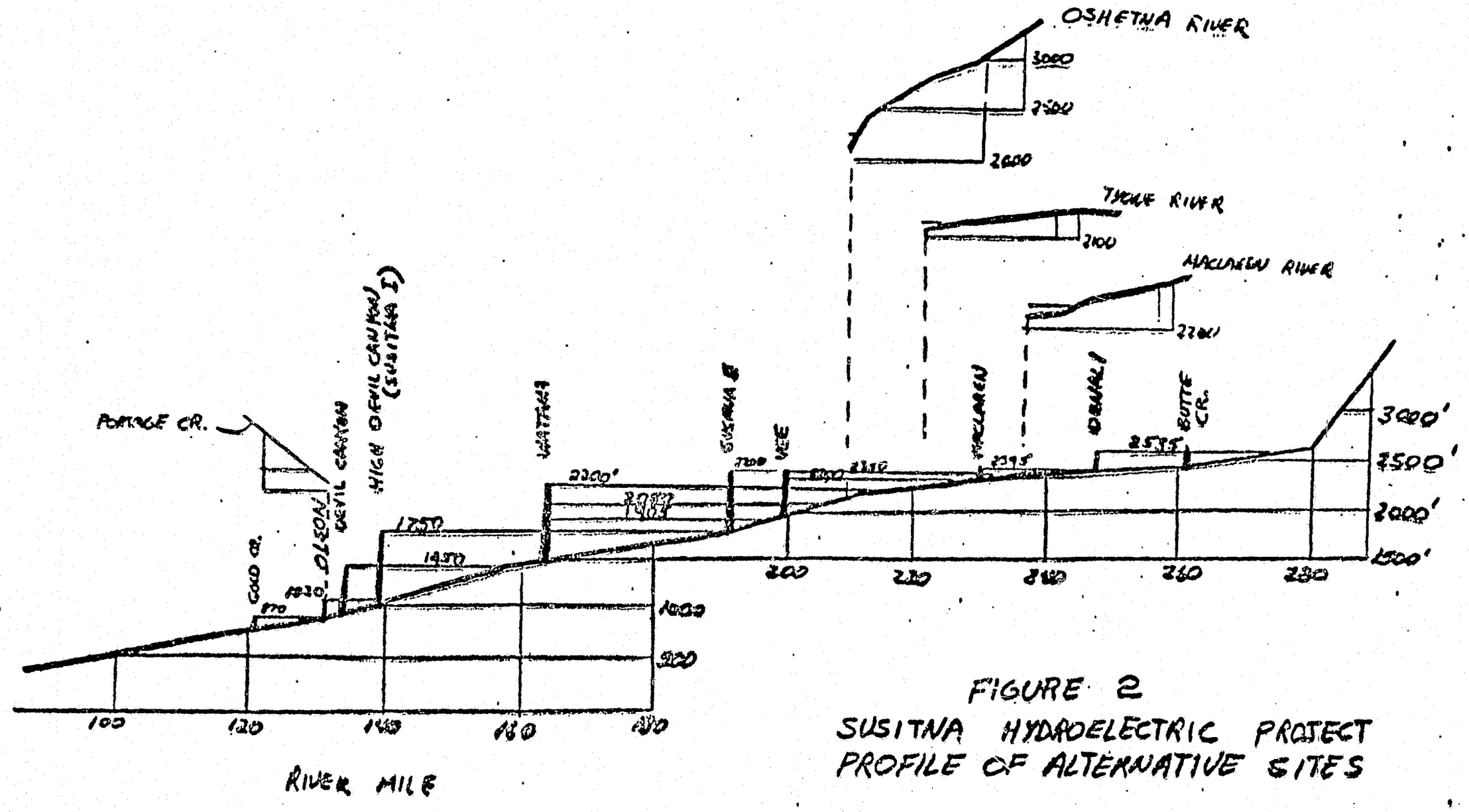


FIGURE 2
SUSITNA HYDROELECTRIC PROJECT
PROFILE OF ALTERNATIVE SITES

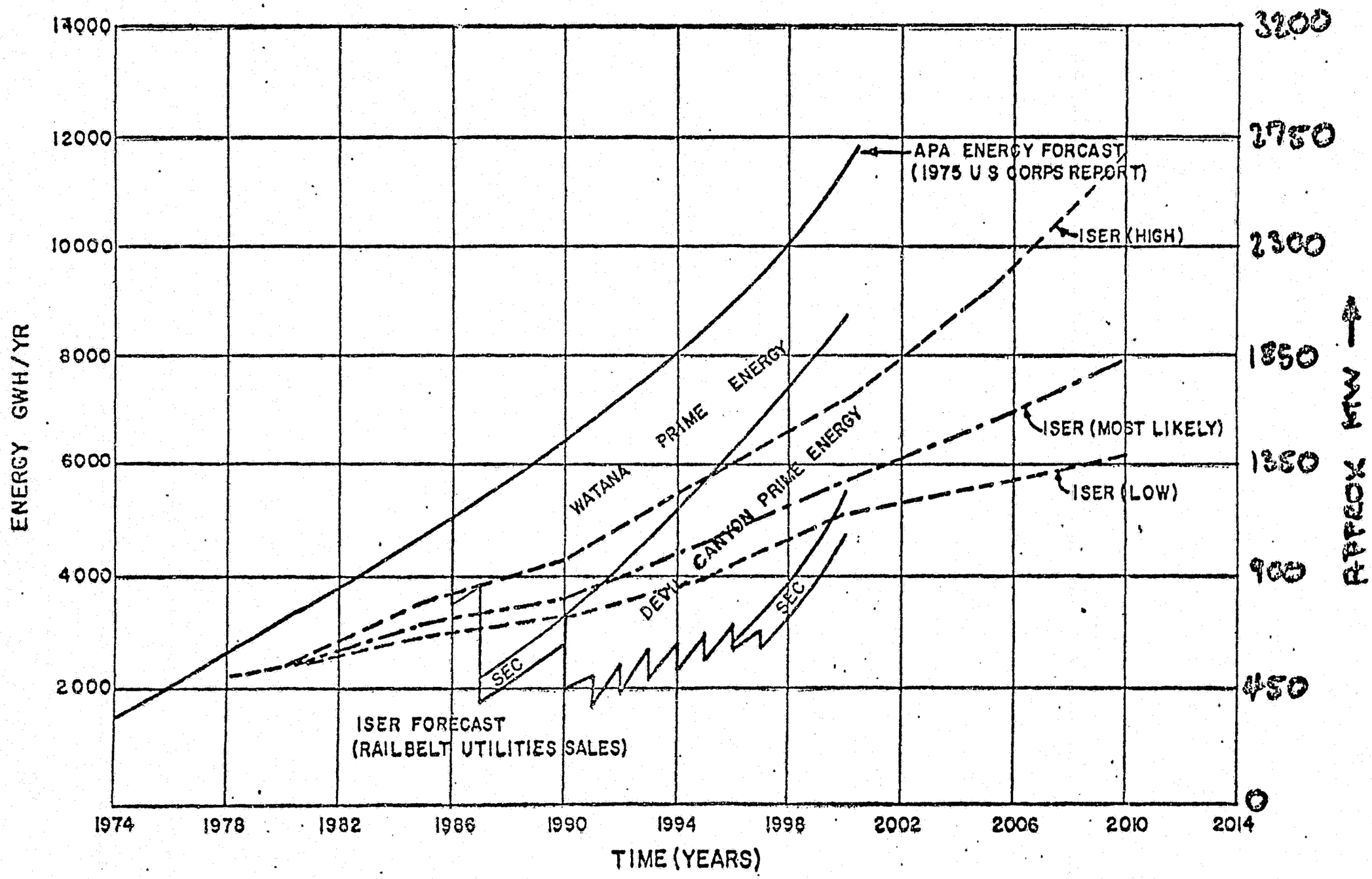
Table 6

CIVIL DESIGN PARAMETERS

Site (Pool El.)	Dam Type	Height (ft)	Length (ft)	Length / Height	Reservoir Area (acres)	Gross Storage x 10^6 Ac-ft	Spillway Type	Low Level Outlet
Gold Creek	Earthfill	135	4,900	36	--	--	--	--
Olson (920)	Concrete Gravity	50	400	7	--	.01	Overflow Section of Dam	--
Olson (1020)	Concrete Gravity	145	--	--	--	--	--	--
Devil Canyon (1450)	Thin Arch) 74	635	1,370	2	7,550	1.1	Chute w/Flip Bucket	Yes
	Thrust Block) Alternative	110	155	1.4	--	--		
	Earthfill	200	950	4.2	--	--	--	--
	Gravity &) 79	650	1,590	2.4	7,550	1.1	Center Section of Dam	
	Earthfill) Alternative	200	720	3.6	--	--		Yes
High Devil Canyon (1750)	Concrete-faced Rockfill	810	3,050	3.8	24,200	4.7	Channel Cut Into South Abutment	--
Devil Creek	Concrete	350 Max	--	--	--	--	--	--
Low Watana (1905)	Earthfill	515	1,650	3.2	--	2.5	Channel Cut In Saddle Into Tsusena Creek	--
Mid Watana (2050)	Earthfill	660	2,600	3.9	--	5.2	" " "	--
High Watana (2200)	Earthfill	810	3,450	4.3	43,000	9.4	" " "	--
Susitna III	--	--	--	--	--	--	--	--
Vee (2300)	Earthfill	455	--	--	--	3.4	--	--
Vee (2350)	Earthfill	--	--	--	--	--	--	--
Maclaren (2395)	Earth & Concrete	100	2,300	23	--	0.2	--	--
Denali (2535)	Earthfill	260	--	--	--	3.9	19' Dia. Glory Hole w/Conduit Through Embankment	--
Denali (2552)	Earthfill	219*	2,050	9.4	51,000	5.4	--	--
Denali (2590)	Earthfill	205*	1,900	9.3	--	5.7	--	--
Butte Creek	--	100	500	5	--	--	--	--
Tyone	Earthfill & Concrete	35	500	14		--	--	--

*Discrepancy must be due to better information in the 1961 study - Denali (2552)

FIGURE 1


14000
12000
10000
8000
6000
4000
2000
ENERGY GWH/YR
3200
2750
2300
1850
1350
900
450
0
RESOURCE MW
APA ENERGY FORCAST
(1975 U S CORPS REPORT)
ISER (HIGH)
ISER (MOST LIKELY)
ISER (LOW)
WATANA PRIME ENERGY
DEVIL CANYON PRIME ENERGY
SEC
SEC
ISER FORECAST
(RAILBELT UTILITIES SALES)
1974
1978
1982
1986
1990
1994
1998
2002
2006
2010
2014
TIME (YEARS)

TUNNEL ALTERNATIVES (6.02)

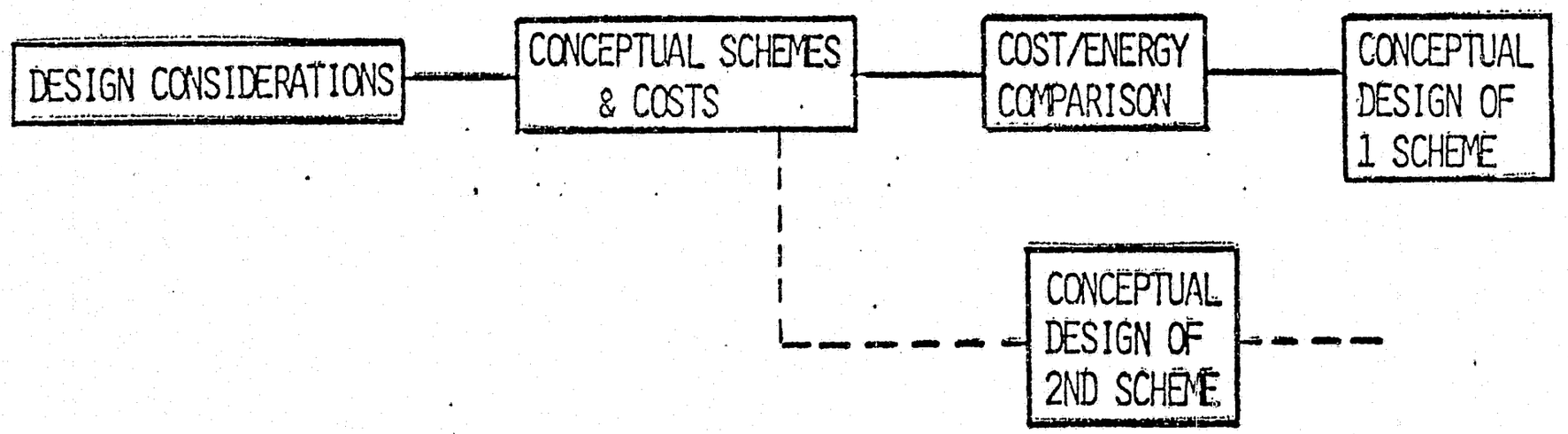
OBJECTIVES

INVESTIGATE FEASIBILITY OF TUNNEL VS. US CORPS SCHEME.

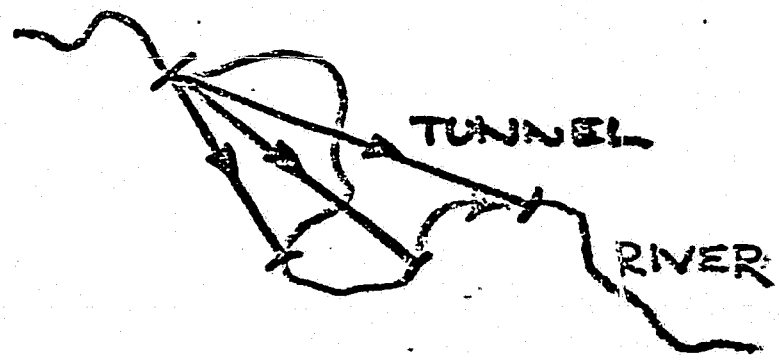
ADD: SMALLER CAPACITY TUNNEL SCHEME

GENERAL APPROACH

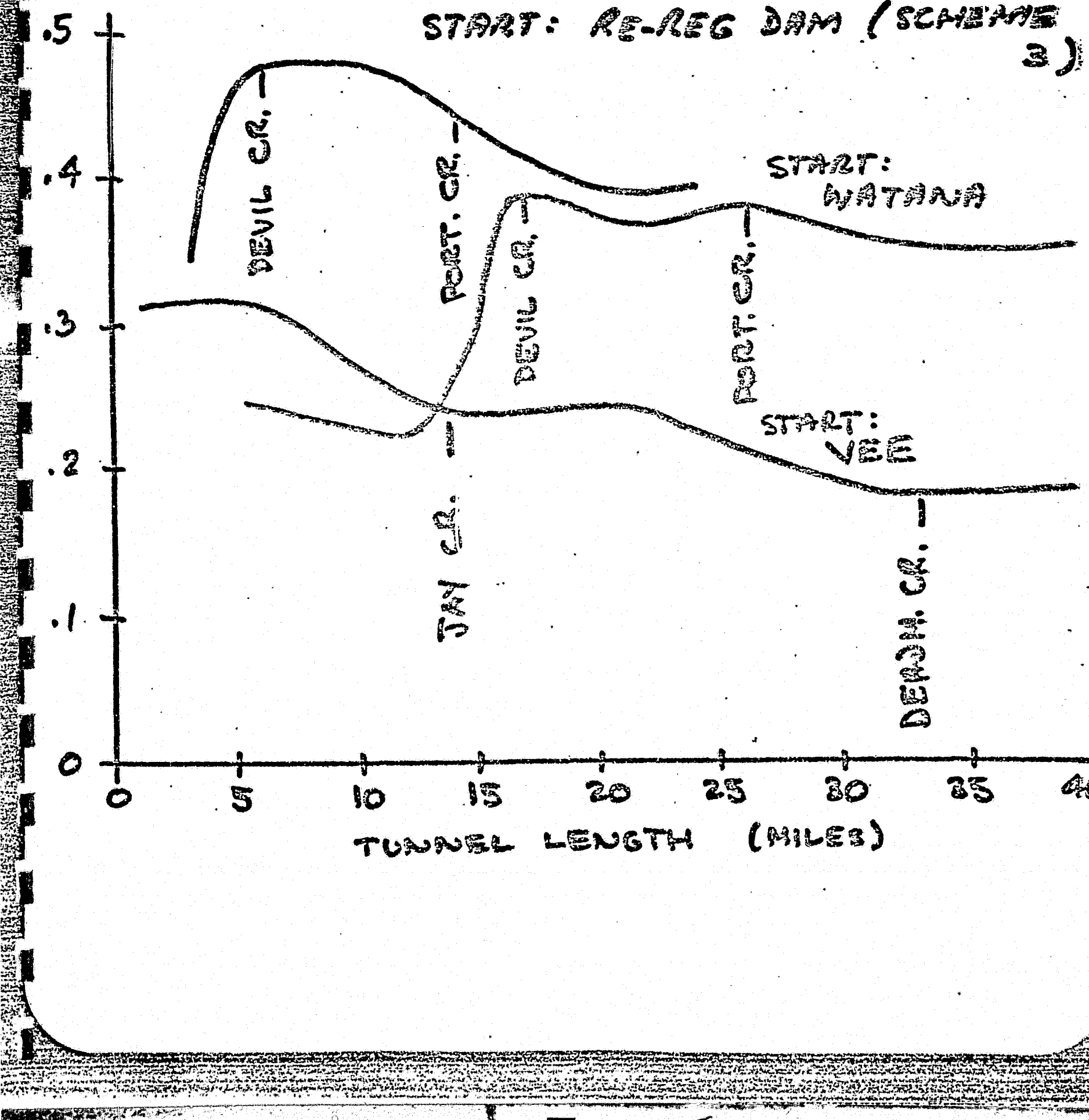
TUNNEL ALTERNATIVES (6.02)



TUNNEL POTENTIAL



START: RE-REG DAM (SCHEME 3)



HISTORICAL PRECEDENCE - TUNNELING

A. TUNNELING FILE (ENR, TUNNELS & TUNNELING, CE, ETC.)
   1. WORLD WIDE
   2. METHODS - TECHNIQUES
   3. PRODUCTION RATES
   4. COSTS

B. OTHER JOBS
   1. PEPCO - UPH
   2. TARP - CHICAGO
   3. METRO - WASHINGTON
   4. MARTA - ATLANTA
   5. KEMANO - B.C.
   6. SWEDISH OIL STORAGE
   7. CHURCHILL FALLS - LABRADOR
   8. BATH CO. - VIRGINIA
   9. SNOWY MTS. - AUSTRALIA
   10. NAVAJO

C. TUNNELING METHODS
   1. DRILL & BLAST
   2. MOLE
   3. ROAD HEADER

SNOWY MOUNTAIN - AUSTRALIA

POWERHOUSE ABOUT 1,100 FT DEEP
GRANITE AND GRANITE-GNEISS ROCKS
TUNNEL LENGTH ABOUT 2 MILES

KEMANO - B.C.

TWO TEN MILE TUNNELS
25 FT EXCAVATED DIAMETER
PORPHYRY, ANDESITE AND QUARTZ
DIORITE ROCK

TARP - CHICAGO

140 MILES OF SEWER TUNNEL
18 FT TO 35 FT DIAMETERS
TBM DRIVEN
LIMESTONE AND DOLOMITIC ROCKS

BATH CO. - VIRGINIA

THREE 7,000 FT LONG POWER TUNNELS
32 FT DIAMETER TUNNELS
DRILL AND BLAST EXCAVATION
SEDIMENTARY ROCKS

PEPCO

DEEP UNDERGROUND EXCAVATION
DRILL AND BLAST EXCAVATION
LARGE EXCAVATED VOLUME
METAMORPHIC ROCKS

SWEDISH OIL STORAGE

3.7×10^6 CY OF EXCAVATION
$12/CY
65 FT X 65 FT OPENING
GRANITE-GNEISS ROCK
UNLINED BELOW WATER TABLE

CHURCHILL FALLS - LABRADOR

ACRES DESIGN

GEOLOGY

A. VERY COMPLEX
   1. FOLDED
   2. FAULTED - THRUSTED - SHEARED
   3. INTRUDED
   4. JOINTED

B. LITHOLOGIES
   1. IGNEOUS
   2. SEDIMENTARY
   3. METAMORPHIC

C. STRUCTURAL TREND
   1. NE-SW
   2. NW-SE

Lithology

A. Volcanics
1. Latite, Rhyalite, Andesite, Basalt, Tuff
2. Stocks, Dikes

B. Granodiorite
1. Hornblende and/or Biotite,
2. Med. to Coarse Grained
3. Intruded

C. Schist, Migmatite, Granite
1. Flow Foliation, moderately to well developed
2. Flow banded minerals

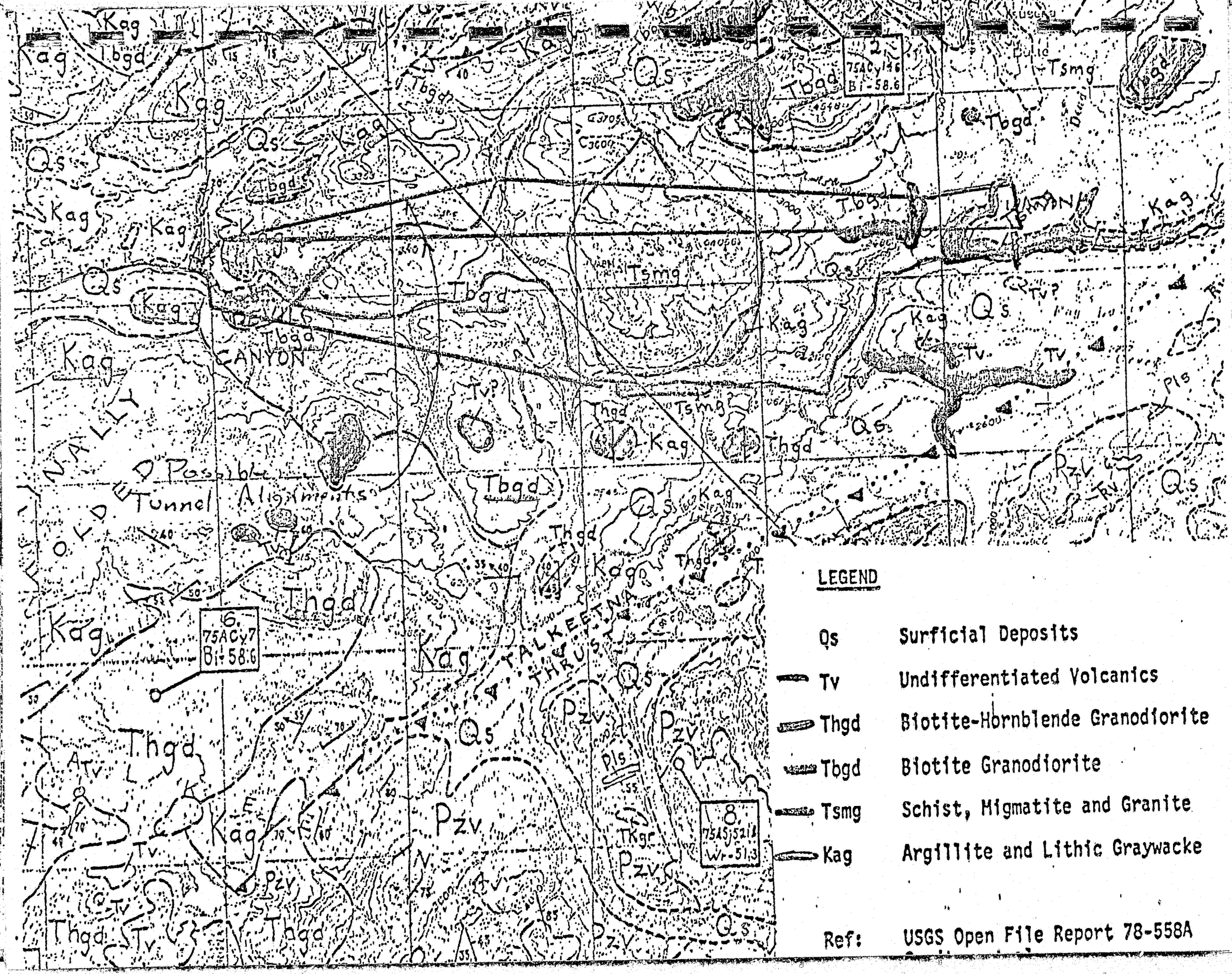
D. Argillite and Graywacke
1. Highly Indurated
2. Grades to Phyllite, Slate

Structure

A. Very complex
1. Folded, Faulted, Thrusted, intruded
2. Metamorphism plutonism

B. NE-SW Trend
1. Folds have axial plane slaty cleavage

C. NW-SE Secondary structure


Kag
Tbgd
Qs
Tsmg
Thgd
Tv
Pzv
Pls
TKgr
Tv?
Possible Tunnel Alignments
TALKEETNA THRUST
CANYON
VALLEY
6. 75ACy7 Bi-58.6
7. 75ACy146 Bi-58.6
8. 75AS/521A Wr-51.3
LEGEND
Qs Surficial Deposits
Tv Undifferentiated Volcanics
Thgd Biotite-Hornblende Granodiorite
Tbgd Biotite Granodiorite
Tsmg Schist, Migmatite and Granite
Kag Argillite and Lithic Graywacke
Ref: USGS Open File Report 78-558A

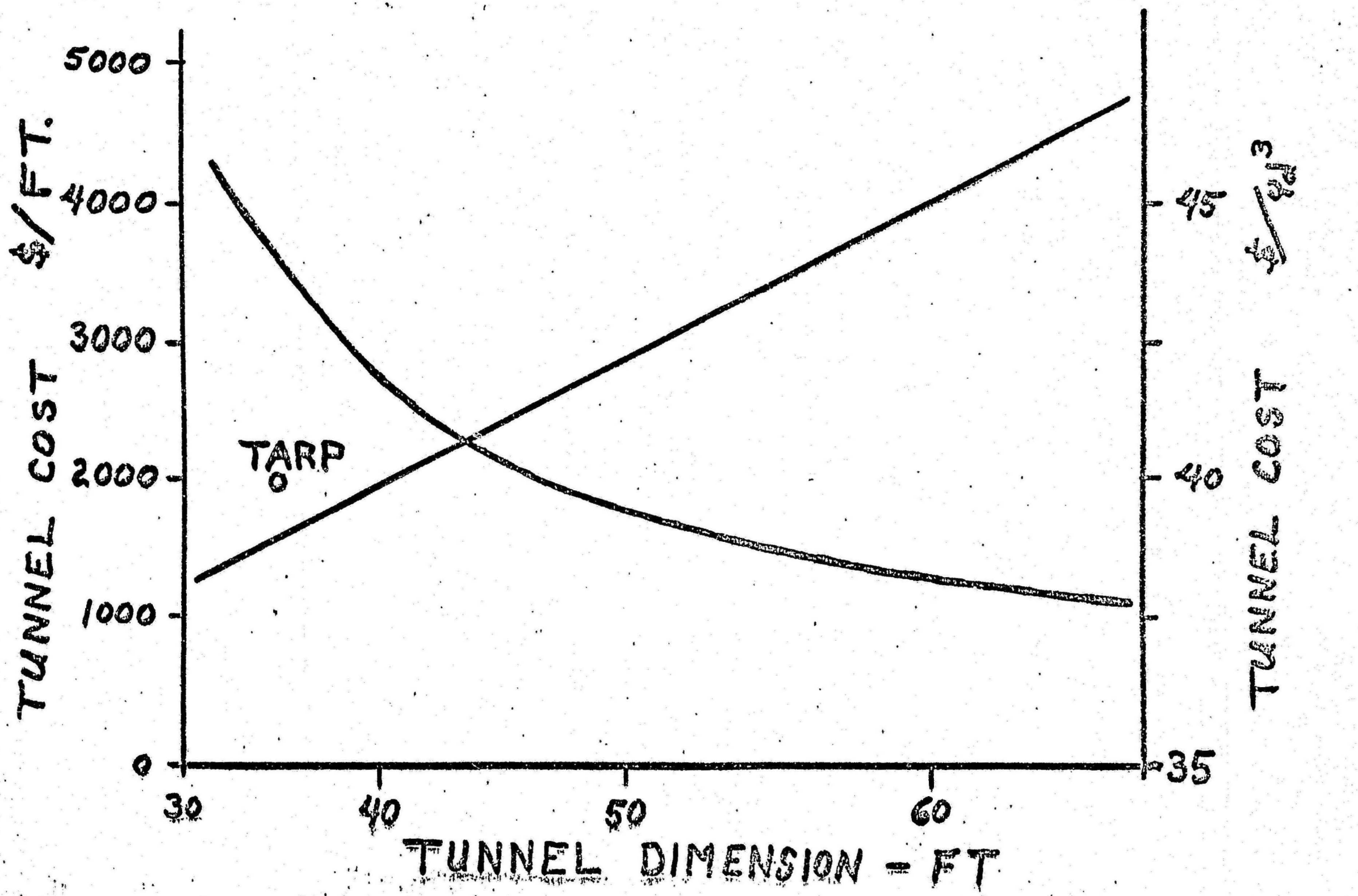
TUNNEL ALTERNATIVE STUDY METHOD

1. DEVELOP GEOLOGY
   a. REPORTS
   b. MAPS
   c. EXPLORATION
2. SELECT POSSIBLE TUNNEL ALIGNMENTS BASED ON GEOLOGY AND TOPO
3. PLOT SECTIONS ALONG TUNNEL ALIGNMENT
4. SELECT TUNNEL GRADE
5. SELECT TUNNEL SIZE BASED ON ECONOMICS
6. LOCATE ACCESS ADITS (AT LEAST 2)
7. SELECT SUITABLE TUNNELING METHODS
8. ESTIMATE TUNNELING COST
9. MAKE ADJUSTMENTS IN: (AS MORE INFORMATION BECOMES AVAILABLE)
   a. ALIGNMENT
   b. GRADE
   c. TUNNELING METHODS
   d. COST

SUSITNA HYDROELECTRIC PROJECT
TUNNEL ALTERNATIVES COST ASSUMPTIONS

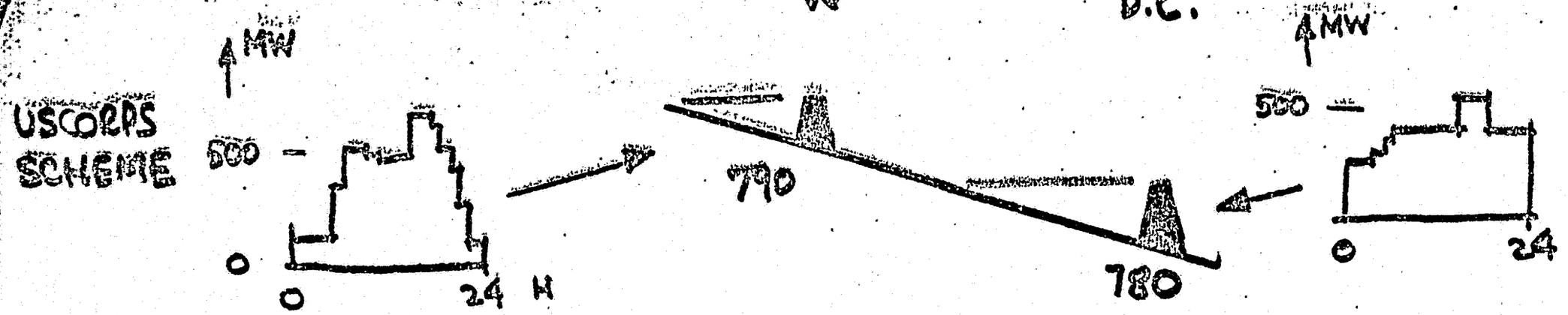
THE FOLLOWING ASSUMPATIONS HAVE BEEN USED IN DEVELOPING THE COST ESTIMATES FOR THE TUNNEL SCHEME ALTERNATIVES:

- TUNNEL LENGTH ~ 29 MILES
- TUNNEL CROSS SECTIONAL AREA 800 SF; 1250 SF; 1500 SF AND 3325 SF
- CONSTRUCTION ACCESS ~ 4 MILES OF 20 X 20 FT ADITS (ALL SCHEMES)
- 12 FT OF DRILLING DEPTH ADVANCES TUNNEL 10.5 FT PER ROUND
- SPECIFIC DRILLING ~ 3.16 FT/CY
- SPECIFIC CHARGE ~ 1.77 LB/CY
- DRILL PRODUCTION ~ 5 FT / MINUTE


5000
4000
3000
2000
1000
0
$/FT.
TUNNEL COST
TARP
45
40
35
$/FT³
TUNNEL COST
30
40
50
60
TUNNEL DIMENSION - FT

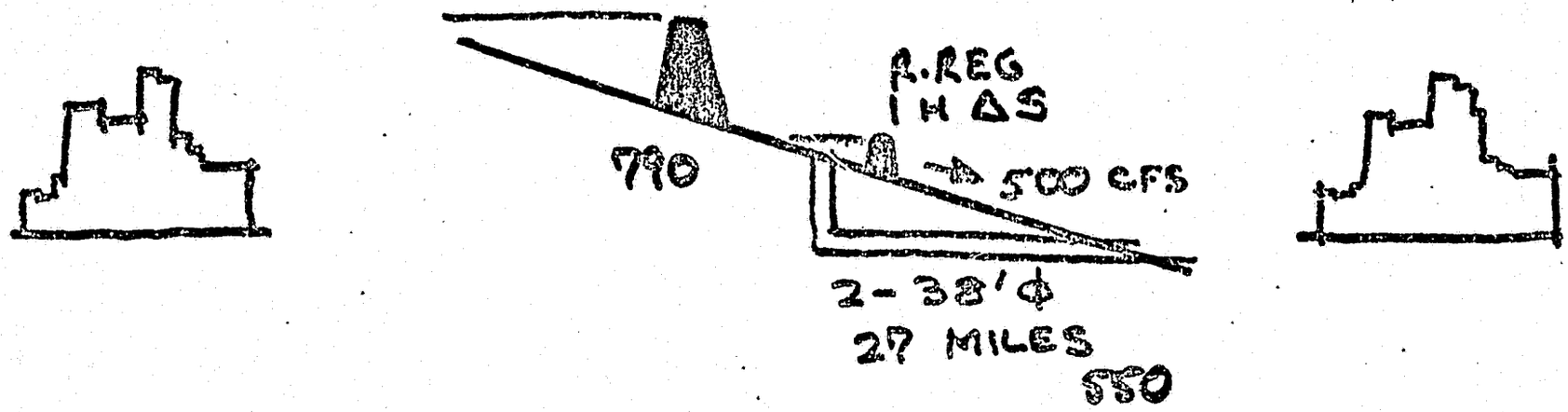
W

D.C.

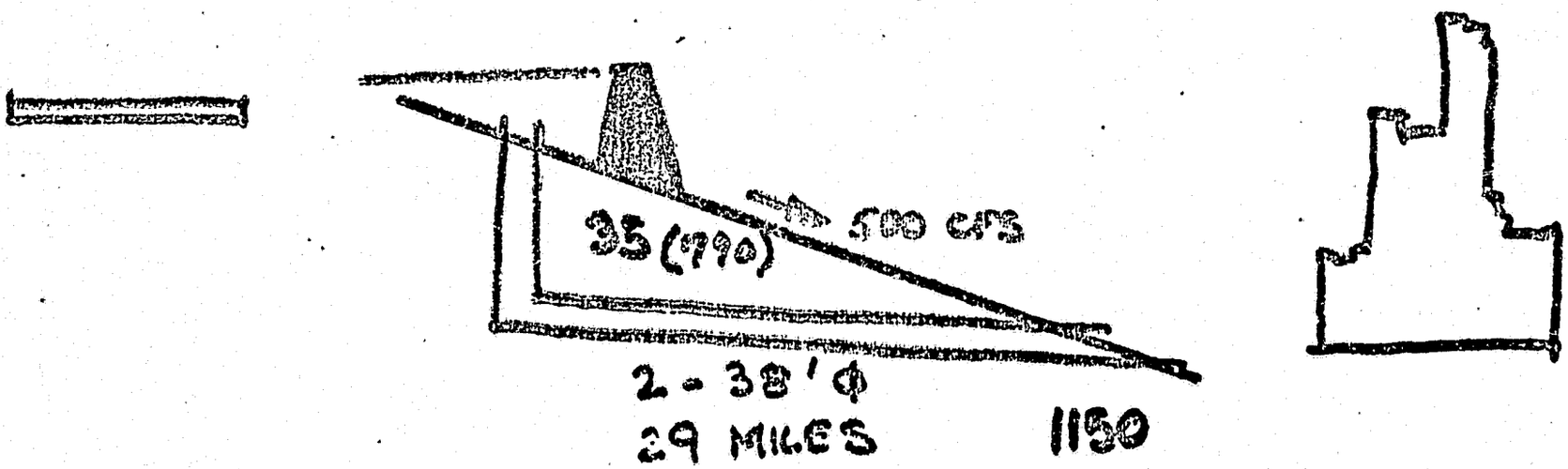


TUNNEL SCHEMES

1.

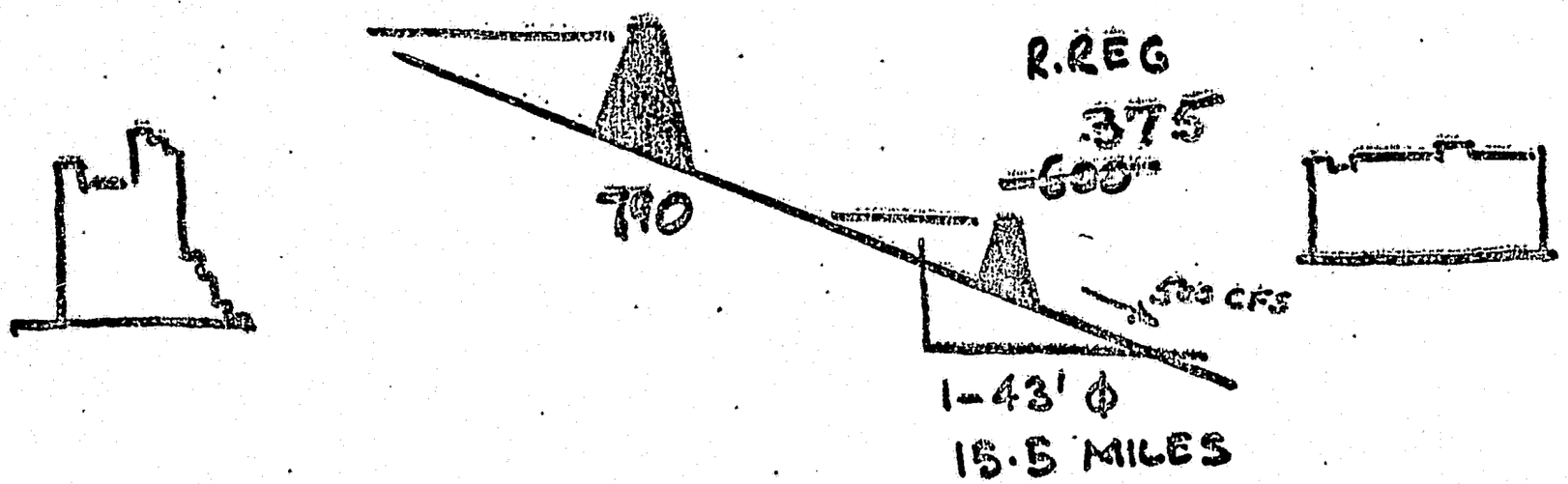


2.



TUNNEL ALTERNATIVES - "PEAKING"

3



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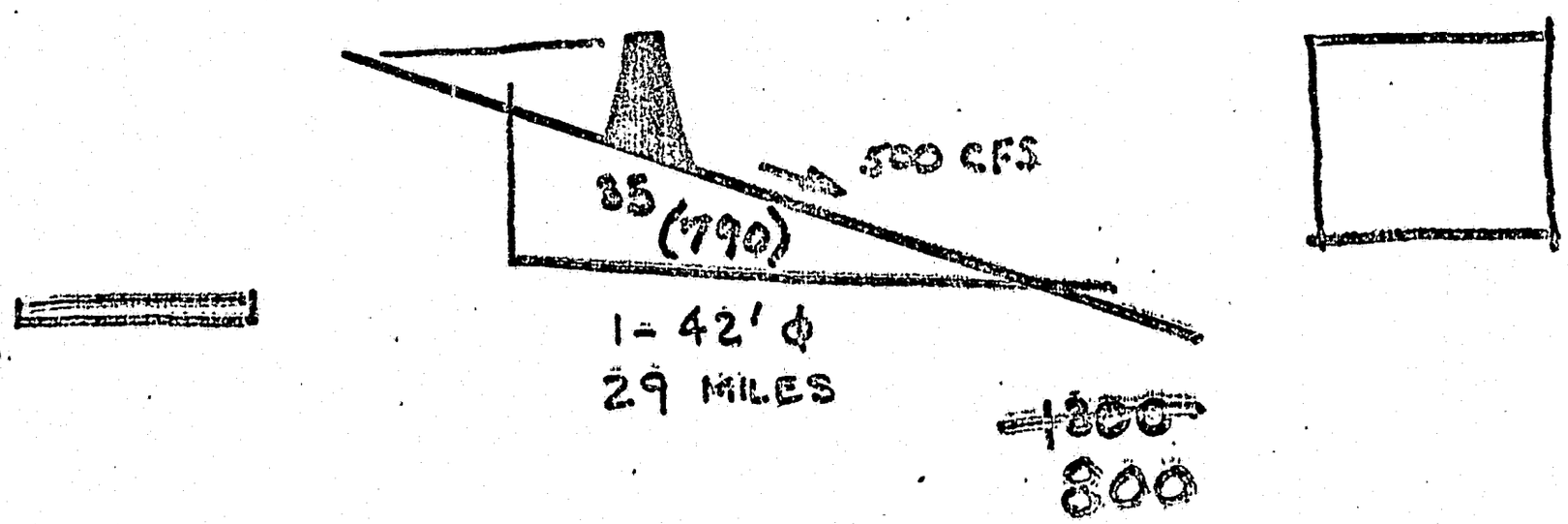


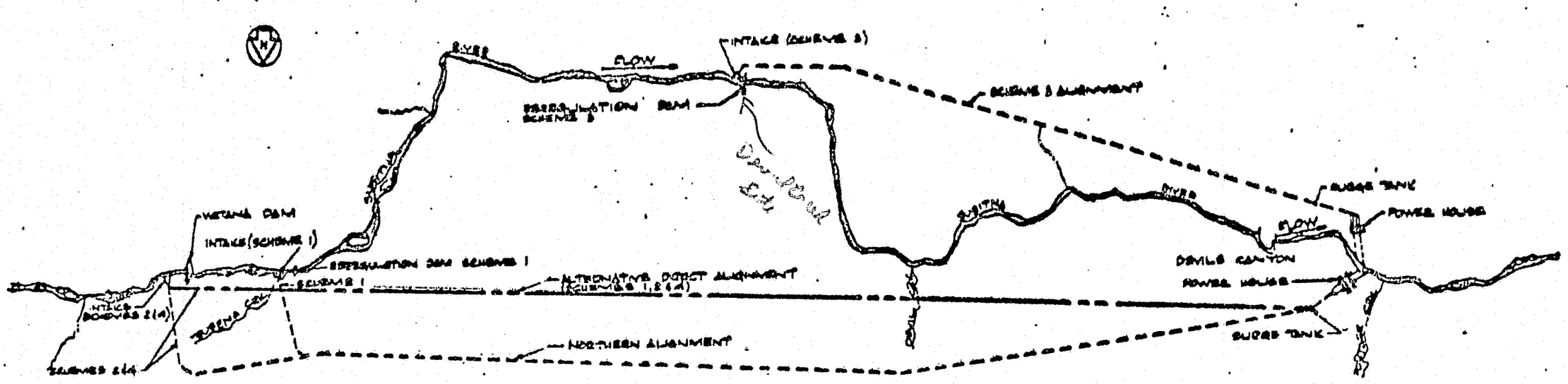
TUNNEL ALTERNATIVES - "BASE LOAD"

ECONOMICS OF TUNNEL ALTERNATIVES

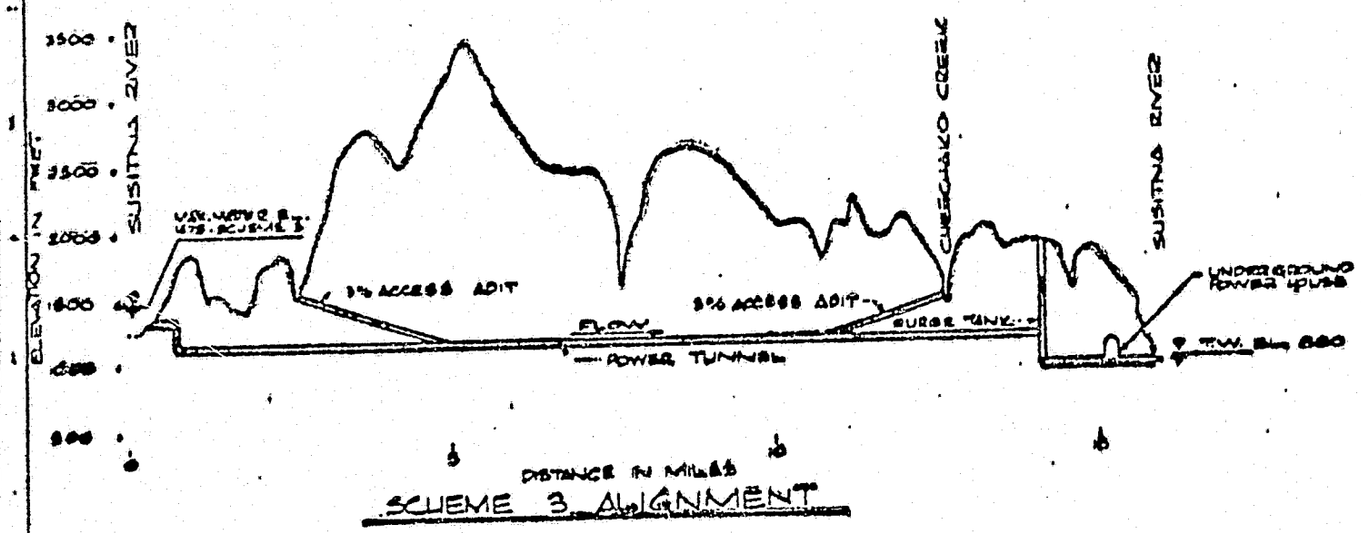
	INST. CAP. U/S MW	INST. CAP. D/S MW	AV. AN. ENER. GWH		CAP COST 10^6 $	ENERGY COST $/1000 KWH
USCORPS DAMS	790	780	6855		2150	35
TUNNEL SCHEMES						
1	790	560	5700	A	2250	45
				B	2300	50
				C	2750	55
2	35 (790)	1150	4900	A	2100	50
				B	2200	50
				C	2650	65
3	790	~~600~~ 375	~~6100~~ 6021	A	~~1950~~ 1900	35
				B	1950	40
				C	2100	40
4	35 (790)	~~1300~~ 800	~~5840~~ 5650	A	~~2100~~ 2050	40
				B	~~2150~~ 2100	45
				C	~~2450~~ 2400	50

B: 15 MILE HAUL

C: SENSITIVITY 2x TUNNEL COST



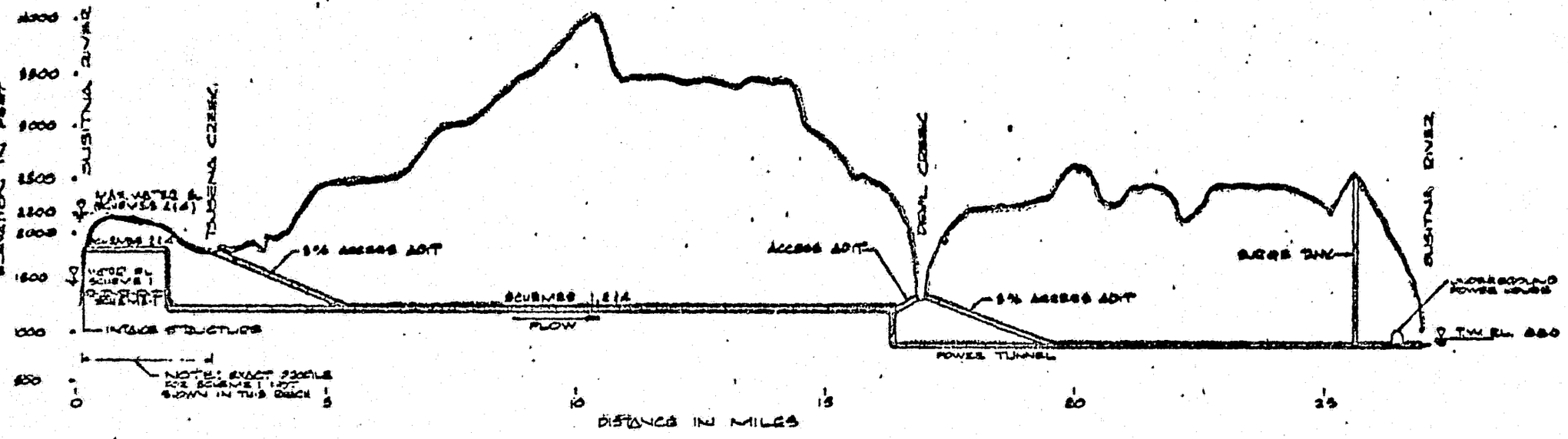
TUNNEL PLAN
SCALE 1" = 1 MILE



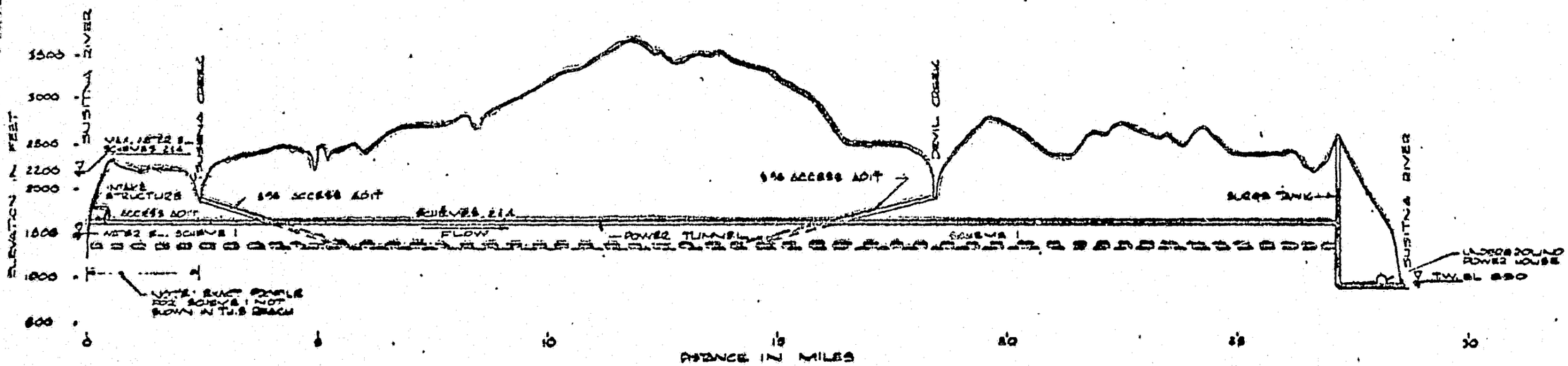
SCHEME 3 ALIGNMENT

ALASKA POWER AUTHOR

CONCEPTUAL TUNNEL ALTERNATIVES - PLANS PROFILE OF SCHEME 3



ALTERNATIVE - DIRECT ALIGNMENT (SCHEMES 1,2&4)



NORTHERN ALIGNMENT (SCHEMES 1,2&4)

ALASKA POWER AUTHORITY

CONCEPTUAL TUNNEL ALTERNATIVES PROFILES SCHEMES 1,2&4

VOLUMES OF TUNNEL ALTERNATIVES

	DAM VOL. 10^6 yd^3	TUNNEL VOL. 10^6 yd^3
USCORPS WATANA DAM	57.6	—
TUNNEL SCHEMES		
1	57.6	12.0
2	57.6	12.9
3	62.5*	4.4
4	57.6	7.9

* Note: INCLUDES 4.9×10^6 yd^3 RE-REG DAM

OBJECTIVES (6.03/.05)

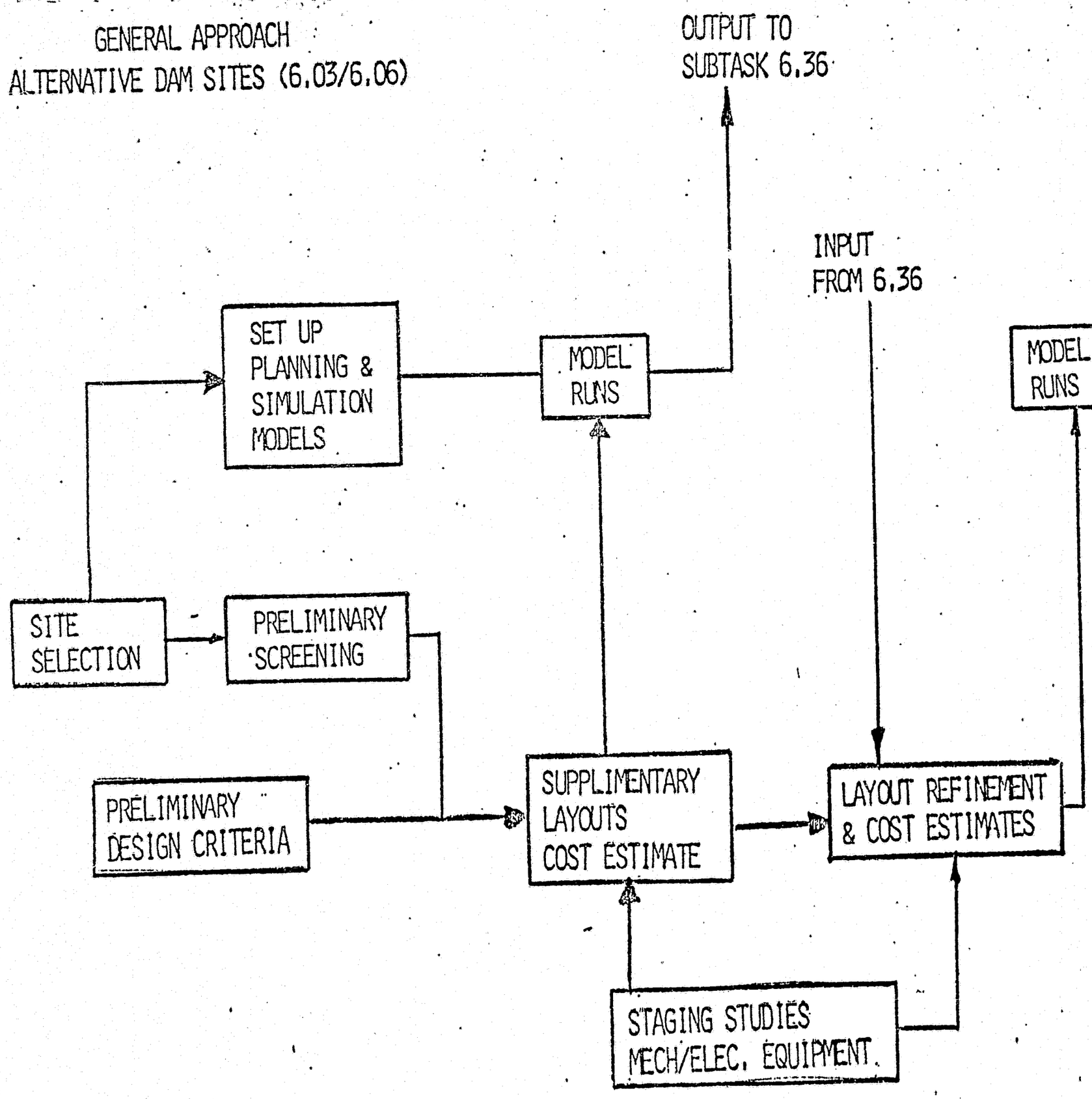
6.03: IDENTIFY APPROPRIATE SCHEME.

ADD: STUDIES OF SMALLER FACILITIES

6.06: REVIEW POTENTIAL FOR STAGED DEVELOPMENT AT WATANA AND DEVILS CANYON

ADD: STAGING OF ALTERNATIVE SITES
STUDY OF MECHANICAL/ELECTRICAL EQUIPMENT

GENERAL APPROACH
ALTERNATIVE DAM SITES (6.03/6.06)



Calculations

SUBJECT:

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY AJS DATE _____
APP _____ DATE _____

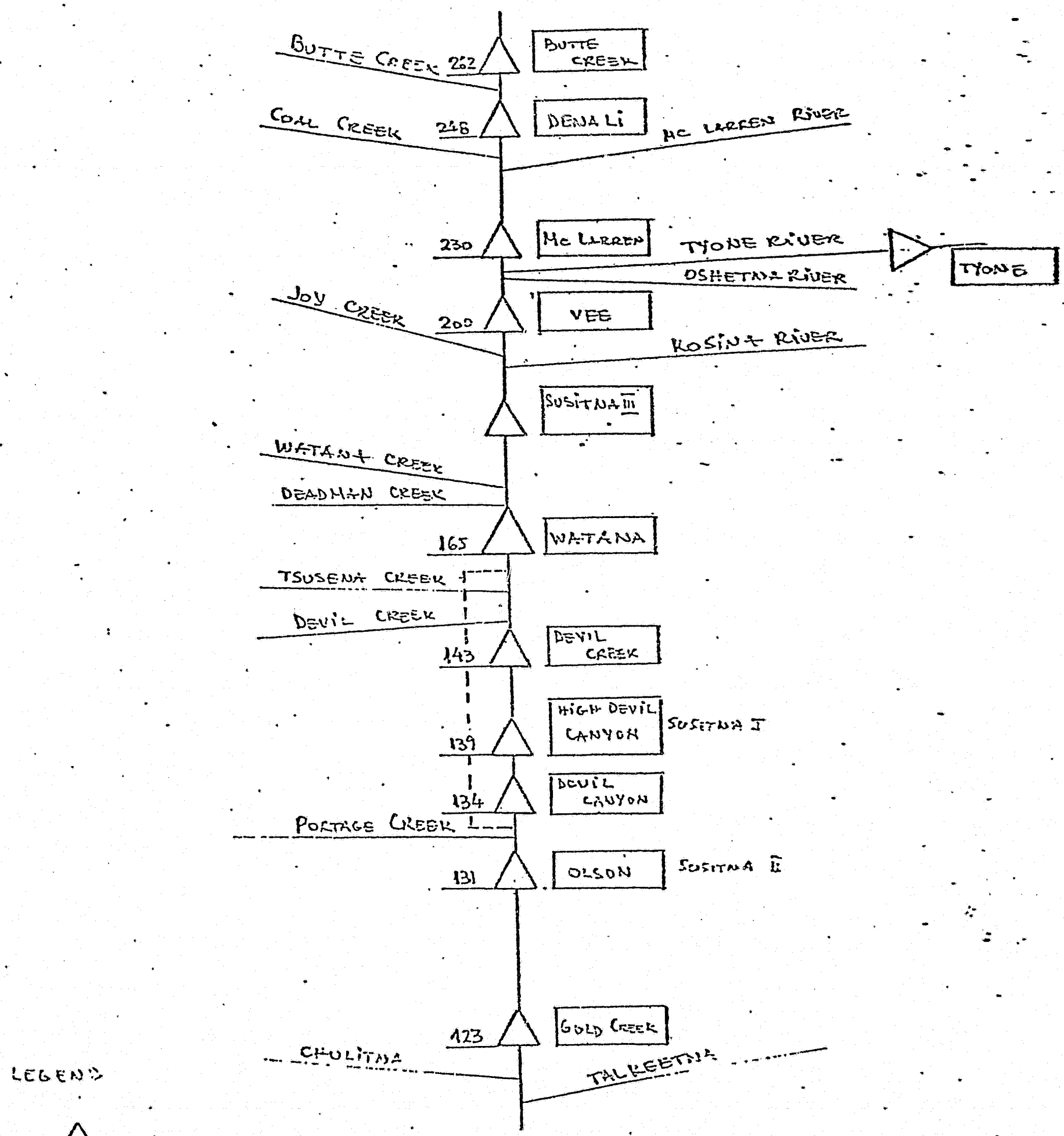


Fig. SUSITNA HYDROELECTRIC SYSTEM SITES FROM PREVIOUS STUDIES

FORM NO. 152 REV. 1

No	SITE		CAPACITY		ENERGY			COST (1980)	
			INST. (MW)	DEP. (MW)	AV. 10^9 Kwh	FIRM 10^9 Kwh	SEC. 10^9 Kwh	TOTAL $\$ \times 10^6$	ENERGY mills/Kwh
1	GOLD CREEK	a							
		b	260			1,140		300	30
2	OLSON (SUSITNA I)	a							
		b		187	.915	.820		550	70
3	DEVIL CANYON	a	265	230	1.125	1.010		750	80
		b		594	3,285			800	30
4	H DEVIL CANYON (SUSITNA I)	a	630	550	3360	2,330		1000	35
		b							
5	DEVIL CREEK	a							
		b							
6	WATANA	a	640	560	3.500	2.440		1,350	45
		b							
7	SUSITNA III	a	330	290	1.750			1350	90
		b							
8	VEE	a	230	200	0.970	.880		550	65
		b		300	1450	1310			45
9	Mc LAREN	a	11	9	.045	.040		500	1,600
		b							
10	DENALI	a	70	60	.370	.260		500	107
11	BUTTE CREEK	a	AV. FLOW 2700 cfs						
12	THÖNE	a	MAX STORAGE 1200 cfs/mon AV. FLOW 300 cfs						

No	Site	ENVIRONMENTAL IMPLICATIONS					
		Biological		Social		Instream	Overall
		Fish	Wild	Local	Reg.		
1	Gold Creek	M	M	M	L	X	H
2	Olson (Susitna)	M	M	M	L	X	H
3	Devil Canyon	L	L	M-H	M-H	M	L
4	" Devil Canyon (Susitna)	L	M	M-H	M-H	M	M
5	Devil Creek	L	M	M-H	M	M	M
6	Watana	L	M-H	L-M	L-M	M	M
7	Susitna @	L-M	M-H	M-H	M-H	M-H	M
8	Vee	L-M	M-H	H-H	M-H	M-H	H
9	Mc Laren	L-M	M-H	L-M	L-M	M-H	M
10	Denali	L	L-M	L-M	L-M	M-H	L
11	Butte Creek	L	M-H	L-M	L-M	M	L
12	Tyone	L	M-H	M	H	M-H	M

Calculations

SUBJECT:

JOB NUMBER _____

FILE NUMBER _____

SHEET _____ OF _____

BY AJS DATE _____

APP _____ DATE _____

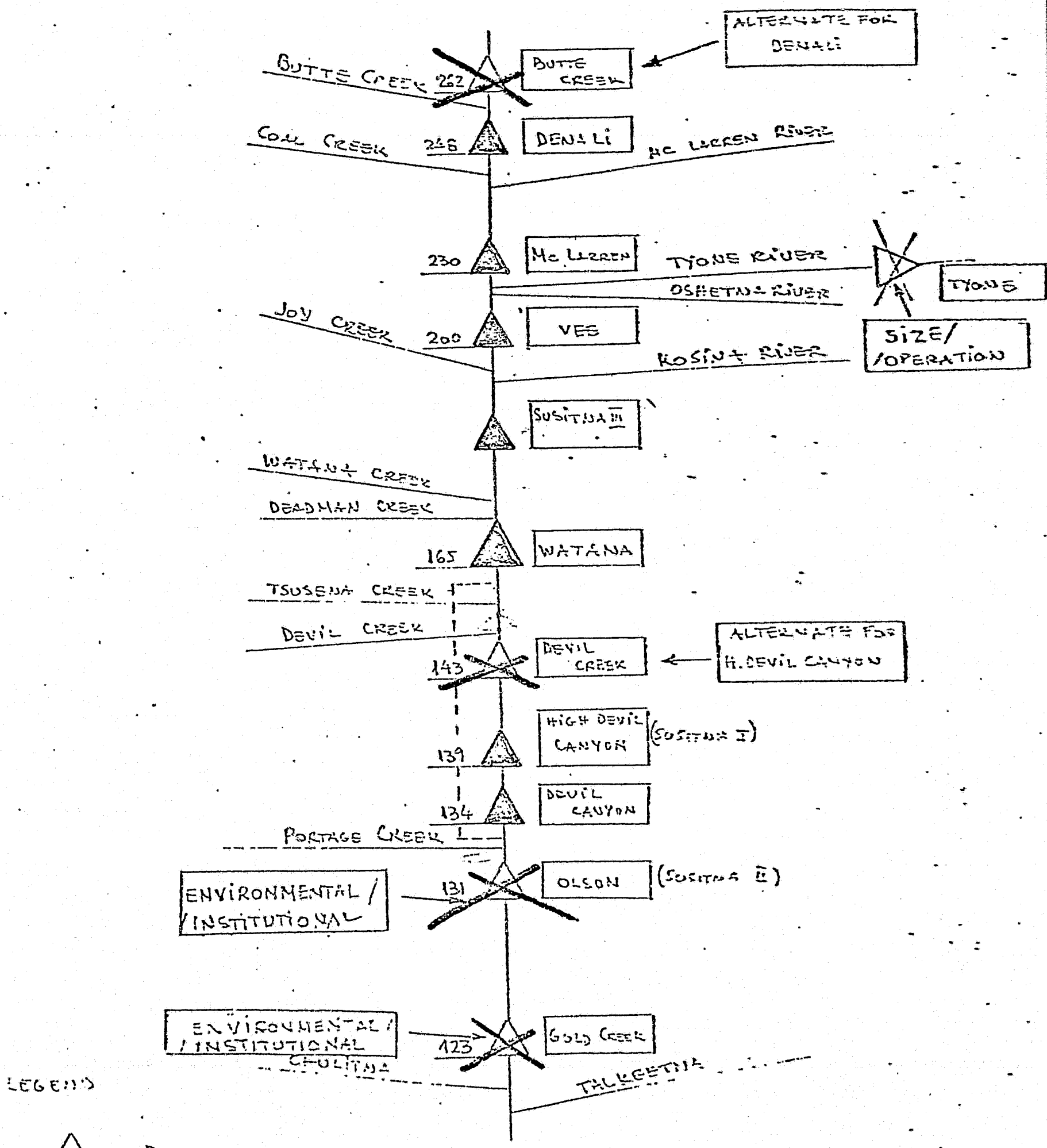
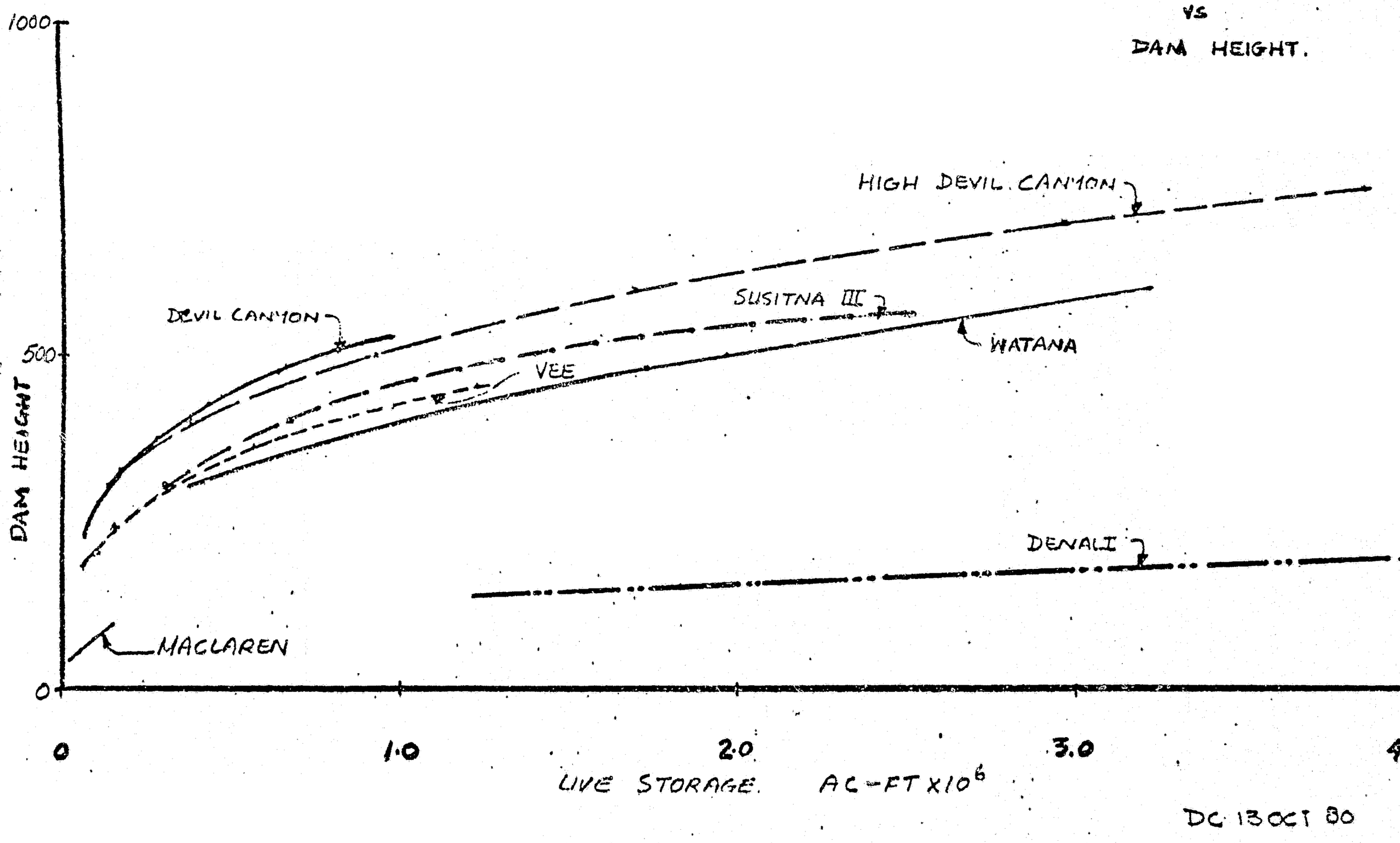


Fig. SUSITNA HYDROELECTRIC SYSTEM SITES SCREENING

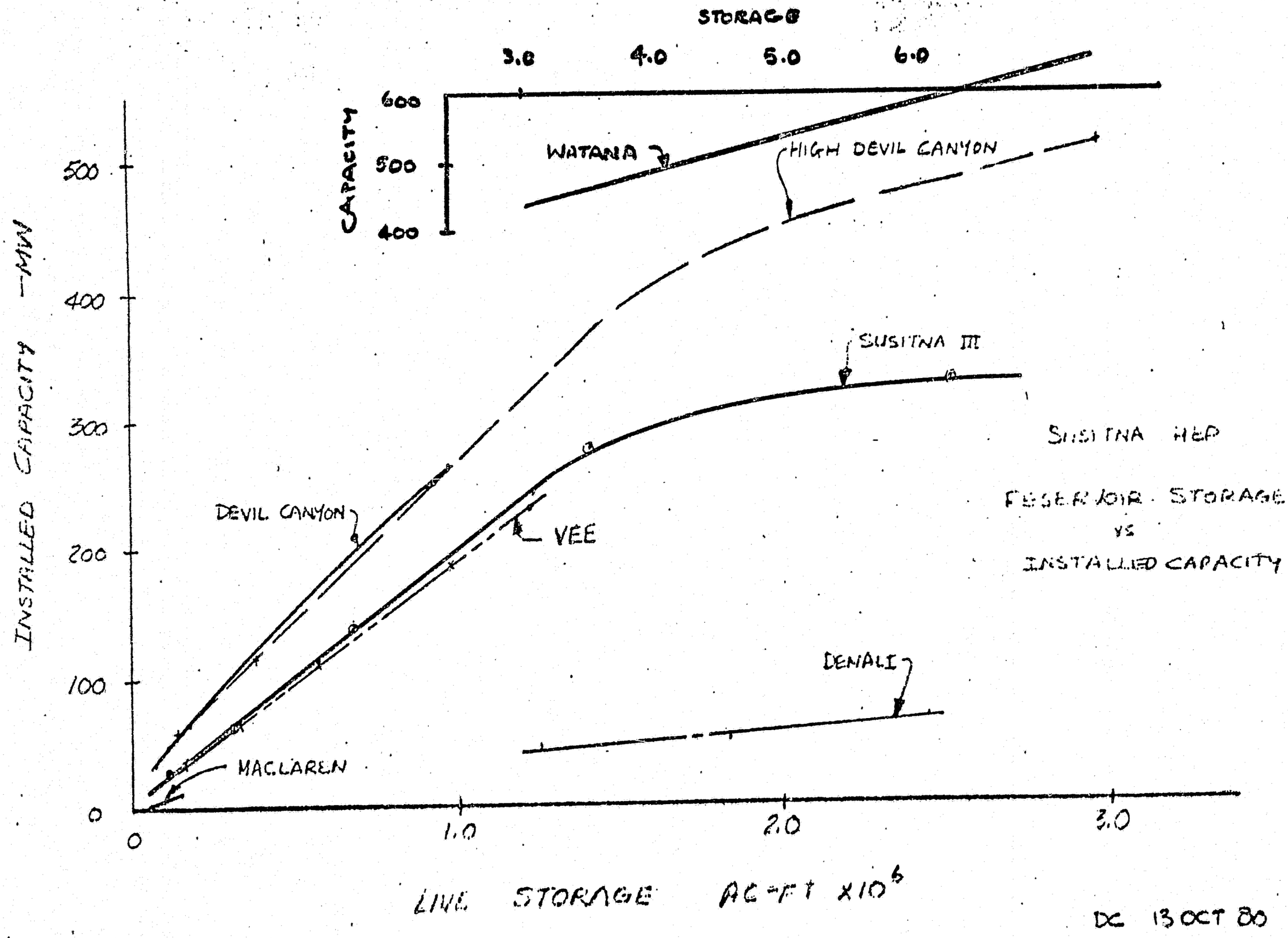
DRM NO. 152 REV. 1

SUSITNA HEP

LIVE STORAGE
VS
DAM HEIGHT.

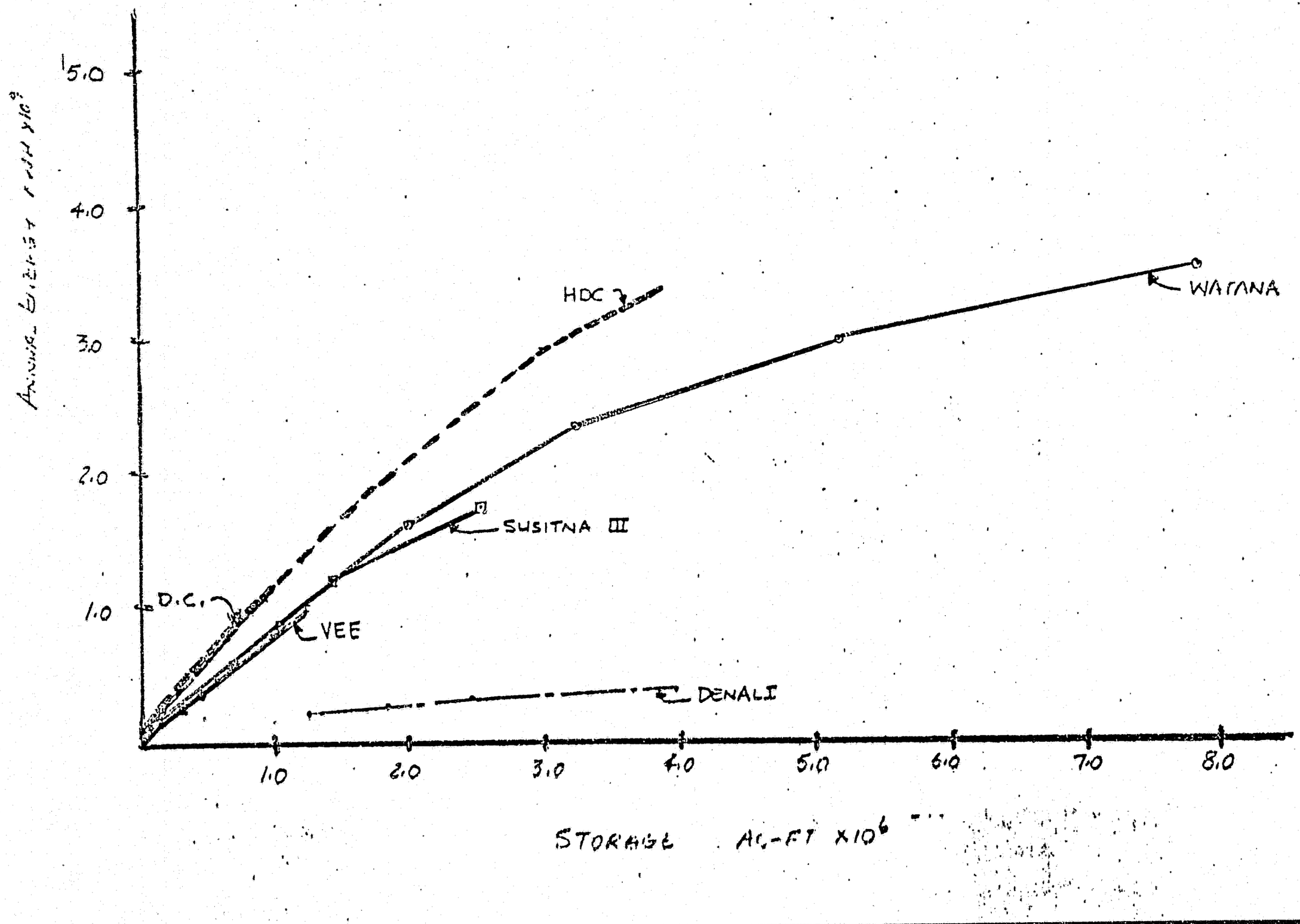


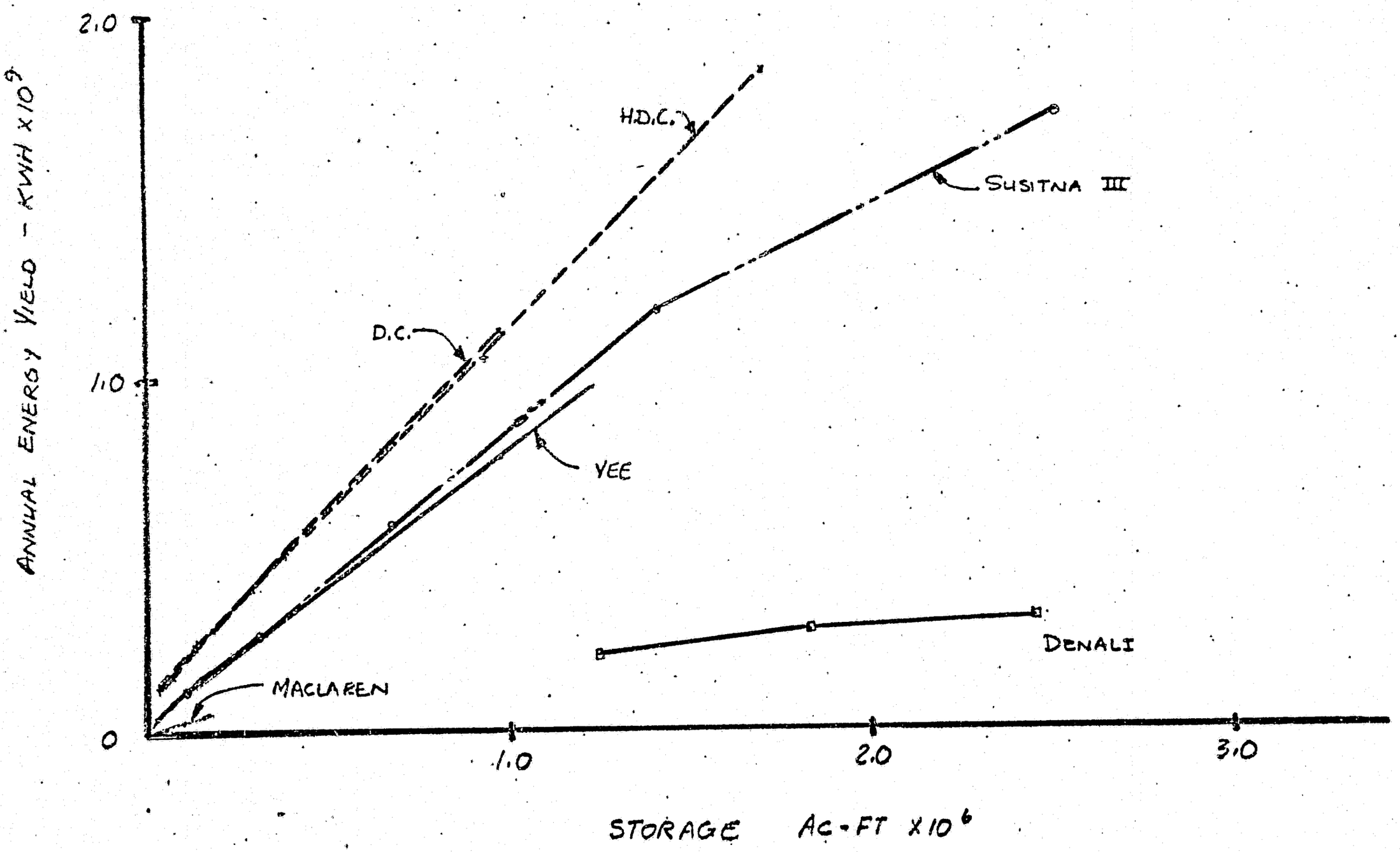
DC 13 OCT 80

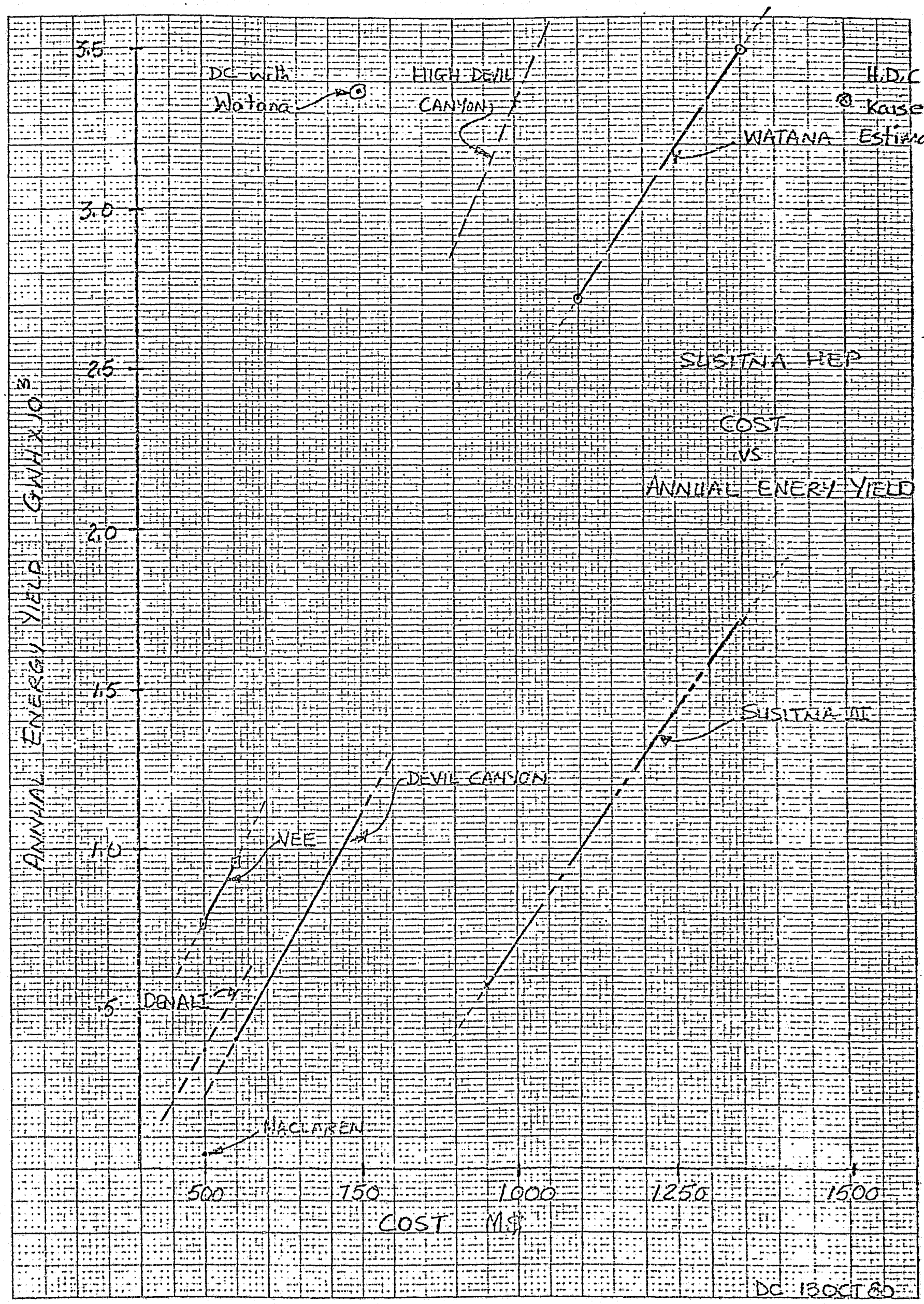


RESERVOIR STORAGE
VS
INSTALLED CAPACITY

DC 13 OCT 80


5.0
4.0
3.0
2.0
1.0
HDC
WATANA
SUSITNA III
D.C.
VEE
DENALI
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
STORAGE AC.-FT X10⁶


ANNUAL ENERGY YIELD - KWH X 10⁹
2.0
1.0
0
H.D.C.
SUSITNA III
D.C.
YEE
DENALI
MACLAREN
1.0
2.0
3.0
STORAGE AC-FT X 10⁶


3.5
3.0
2.5
2.0
1.5
1.0
.5
ANNUAL ENERGY YIELD GWH X 10
DC with Watana
HIGH DEVIL CANYON
H.D.C
Kaser
WATANA Estimate
SUSITNA HEP
COST
VS
ANNUAL ENERGY YIELD
SUSITNA III
DEVIL CANYON
WEE
DONALL
MACLAREN
500
750
1000
1250
1500
COST M.$
DC 13OCT80

COMPUTER MODELING

SCREENING MODEL (L.P.)

INPUT: STORAGE/YEILD/COST INFORMATION
SIMPLIFIED HYDROLOGY
POWER DEMAND

OUTPUT: OPTIMUM SITES/HEIGHTS
APPROX. RULE CURVES
APPROX. FIRM POWER/ENERGY
APPROX. INPUT TO GENERATION PLANNING MODEL

SIMULATION MODEL

INPUT: PHYSICAL DATA
RULE CURVES
MONTHLY HYDROLOGY
MONTHLY DEMAND

OUTPUT: MONTHLY ENERGY/POWER OUTPUT
DEGREE OF FAILURE TO MEET DEMAND
INPUT TO GEN. PLANNING MODEL

INTERFACE WITH GENERATION PLANNING STUDIES

INFO TRANSFER.

1. OPTIMUM 400 MW SCHEME
   800 MW
   1600 MW

2. CURVES FOR INTERMEDIATE SCHEMES

3. DATA FOR GENERATION PLANNING MODEL.

"

FEEDBACK

OPTIMUM SIZE OF DEVELOPMENT (OR RANGE).

STAGING SCHEDULES

SUSITNA HYDROELECTRIC DEVELOPMENT
POTENTIAL DAMSITES - LEVELS OF DEVELOPMENT

SITE		MAX. LEVEL OF DEV.	LAYOUTS DEVELOPED IN PREVIOUS STUDIES		CURRENT STUDIES	
			DAM CREST	DAM HT.□	DAM CREST	DAM HT.□
BUTTE CREEK		2700	-	-	-	-
DENALI		2650	2552	200	2552	200
MACLAREN		2410	—	—	2410	135
VEE	i	2378	—	-	2360	460
SUSITNA II	i	2375	-	-	2375	600
	ii		-	-	2215	440
WATANA	i	2360	2215	775	2215*	775
	ii		2050	620	2060*	620
	iii		1915	470		
HIGH DC	i	2000	1755	720	1755	720
DC	i	1800	1455	550	1455	550
	ii				1310	405
	iii				1455 &	550
OLSON		1400	-	-	-	-
GOLD CREEK		1000	-	-	-	-

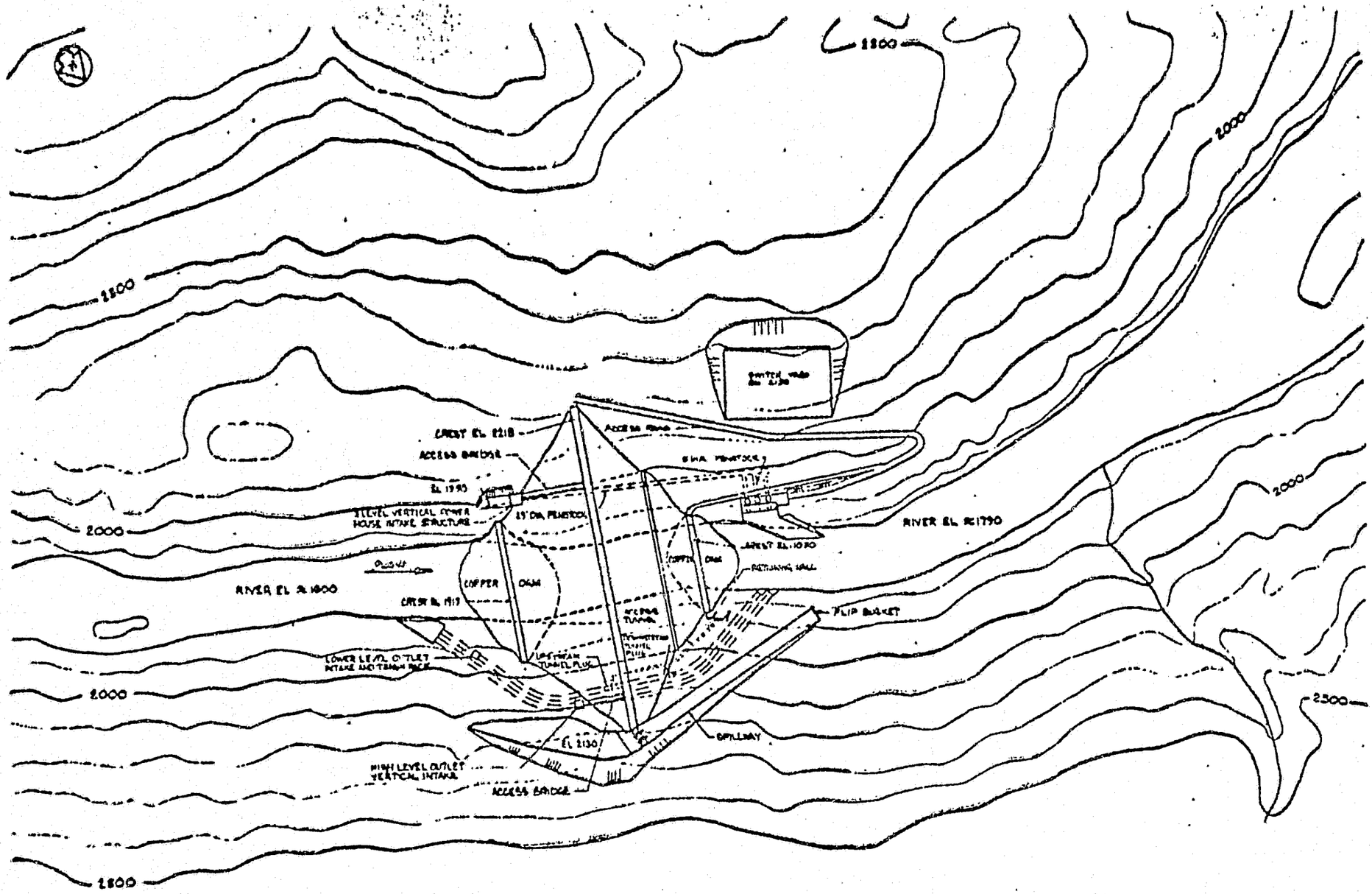
* ALTERNATIVE SPILLWAY ARRANGEMENT

& ROCKFILL DAM ALTERNATIVE

□ DAM HTS. FROM APPROX. STREAM BED ELEVATION.

2300
2400
2450
ACCESS ROAD
ACCESS ROAD
2400
2300
COFFERDAM
SPILLWAY
FLOW
2300
2400
2300
ACCESS ROAD
INTAKE CHAMBER
SWITCH YARD
POND
6' DIA. PENSTOCK
FLOW
0 400 800
GRAPHIC SCALE (1"=400')

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT
MACLAREN HYDRO DEVELOPMENT (2410) PLAN

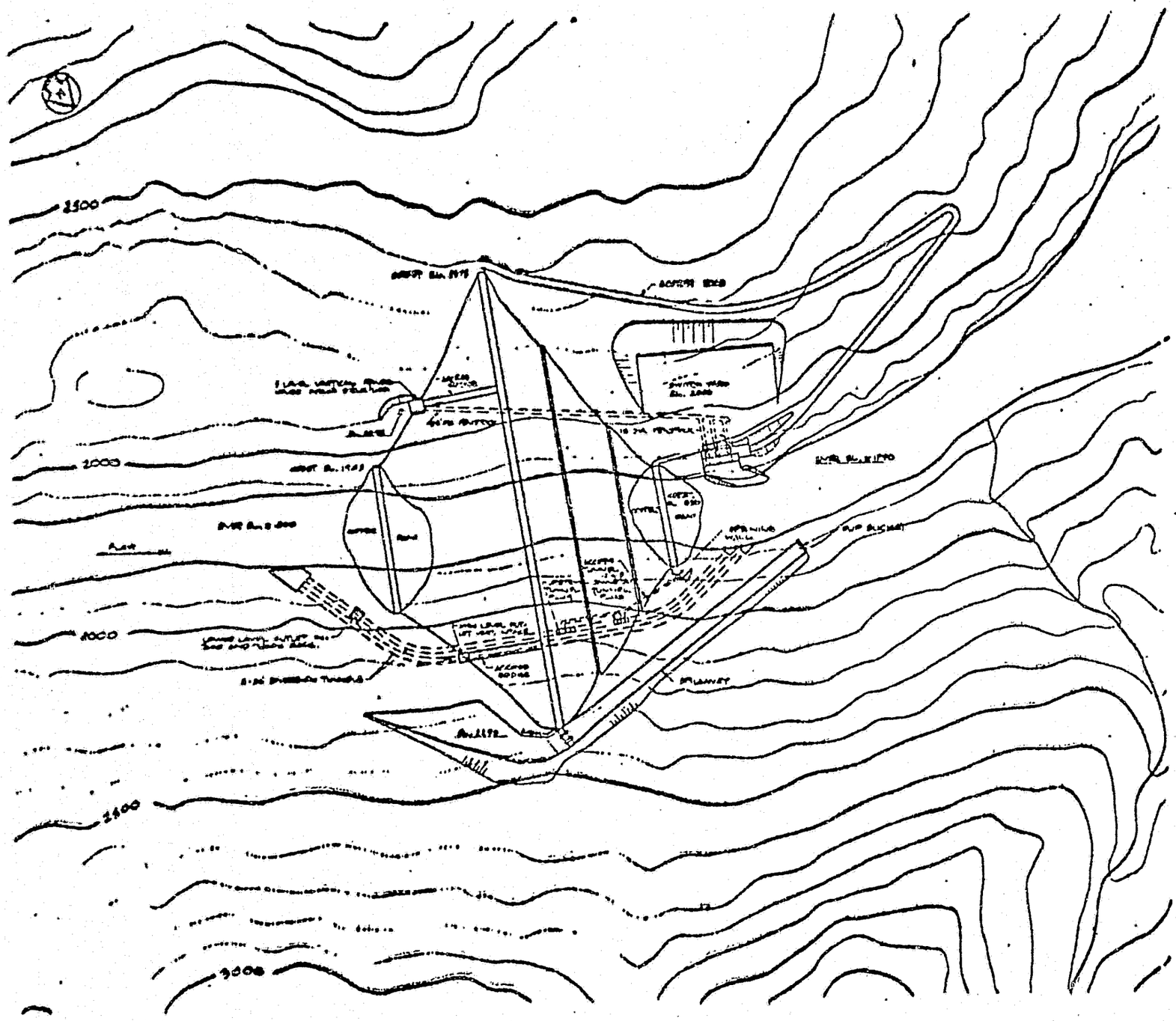


ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

SUSITNA III HYDRO DEVELOPMENT (2215) PLAN

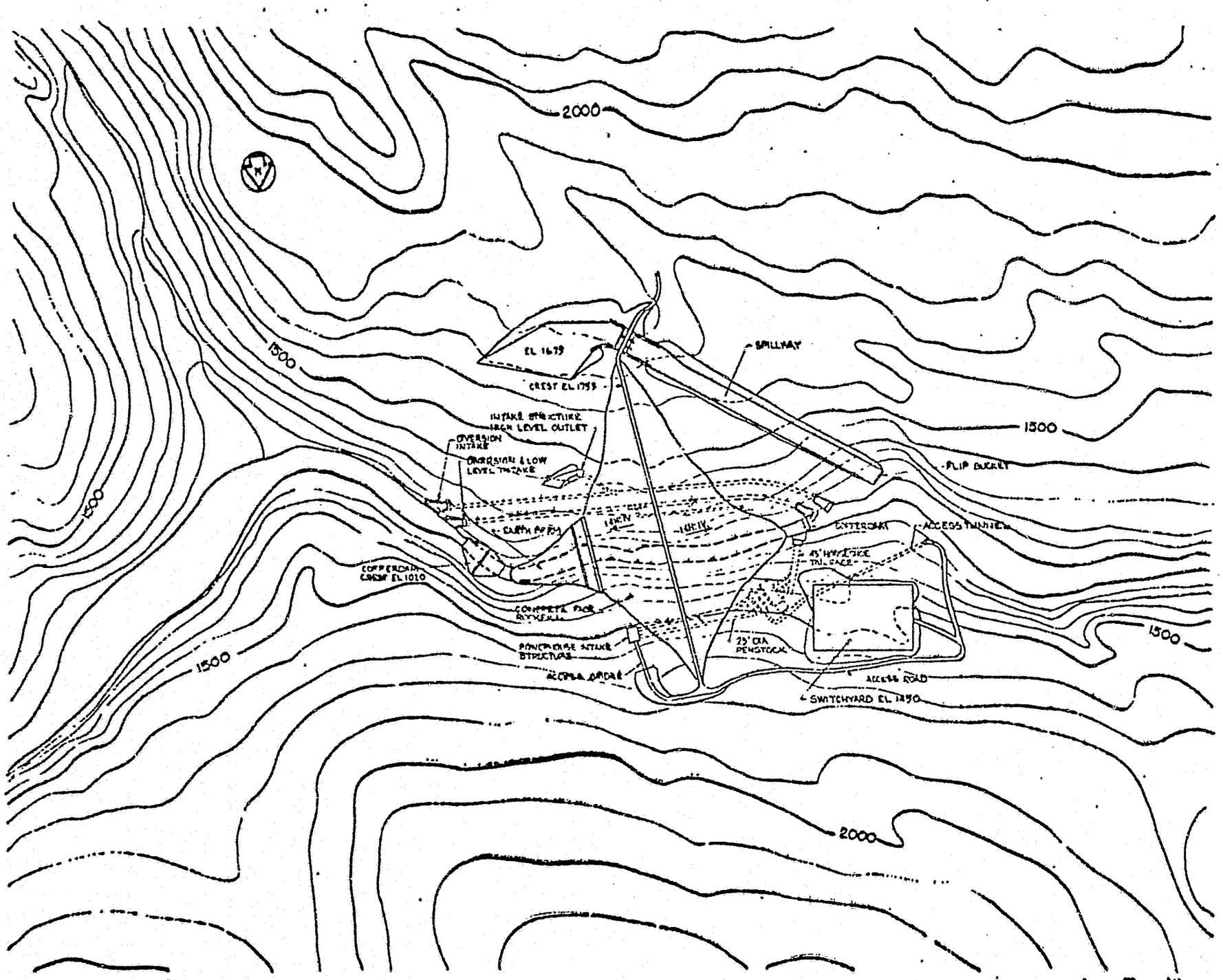
SEPT 1980

3700-D6-03



ALASKA POWER AUTHORITY

SUSITNA III HYDRO DEVELOPMENT (2375) PLAN

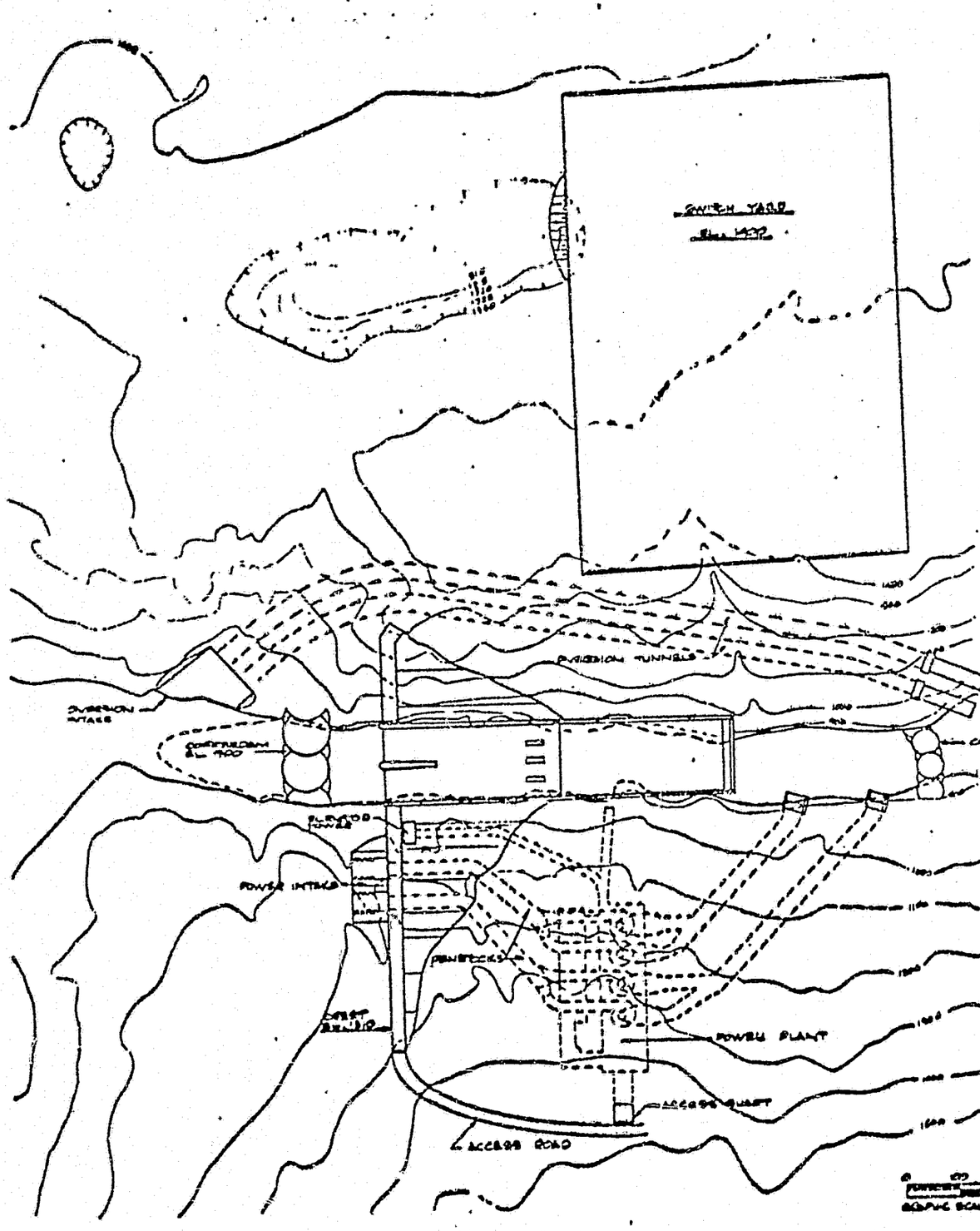


0 400 800
GRAPHIC SCALE: 1" = 800'

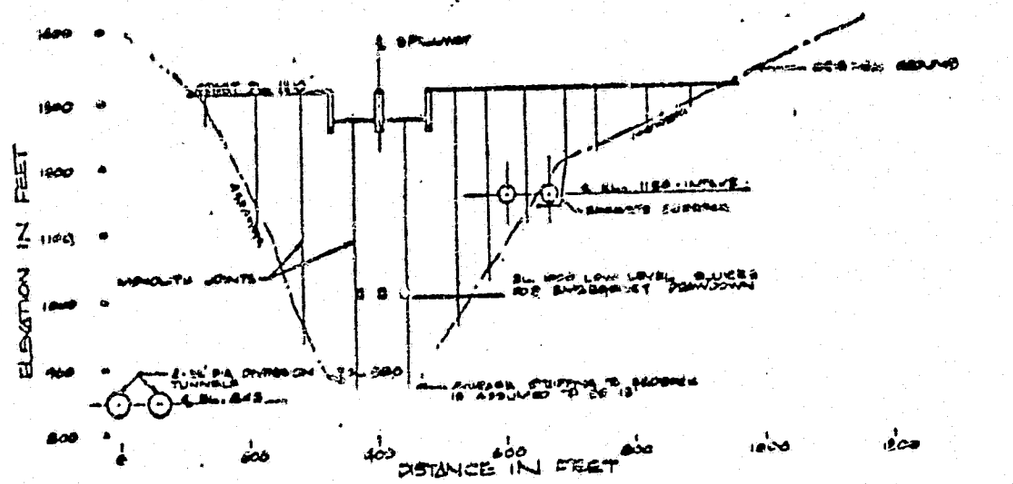
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

HIGH DEVILS CANYON
HYDRO DEVELOPMENT (1755)
PLAN

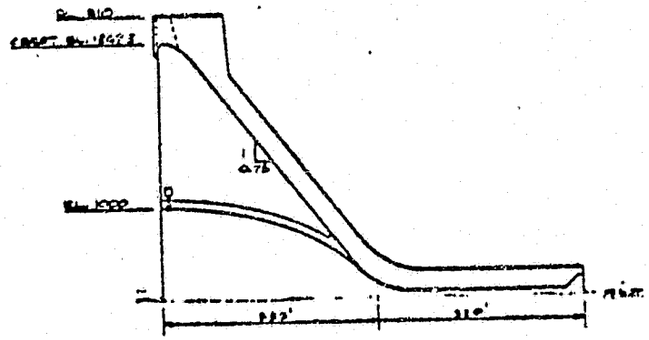
1" = 400'



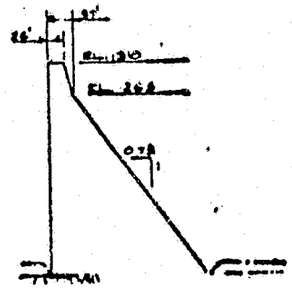
PLAN
SCALE 1"=100'



LONGITUDINAL SECTION THRU ℄ OF DAM
SCALE 1"=100'



SPILLWAY SECTION
SCALE 1"=100'



TYPICAL NON-OVERFLOW SECTION
SCALE 1"=100'

ALASKA POWER AUTHORITY

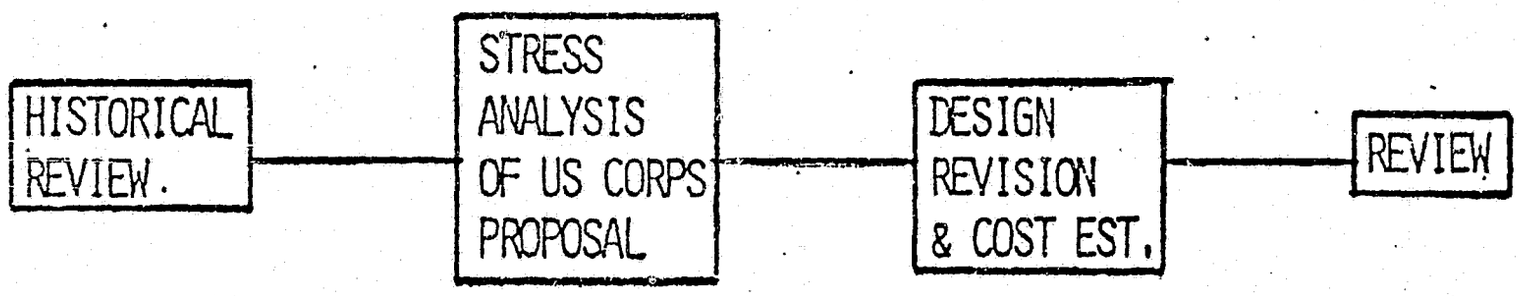
DEVILS CANYON HYDRO DEVELOPMENT (1310) PLAN

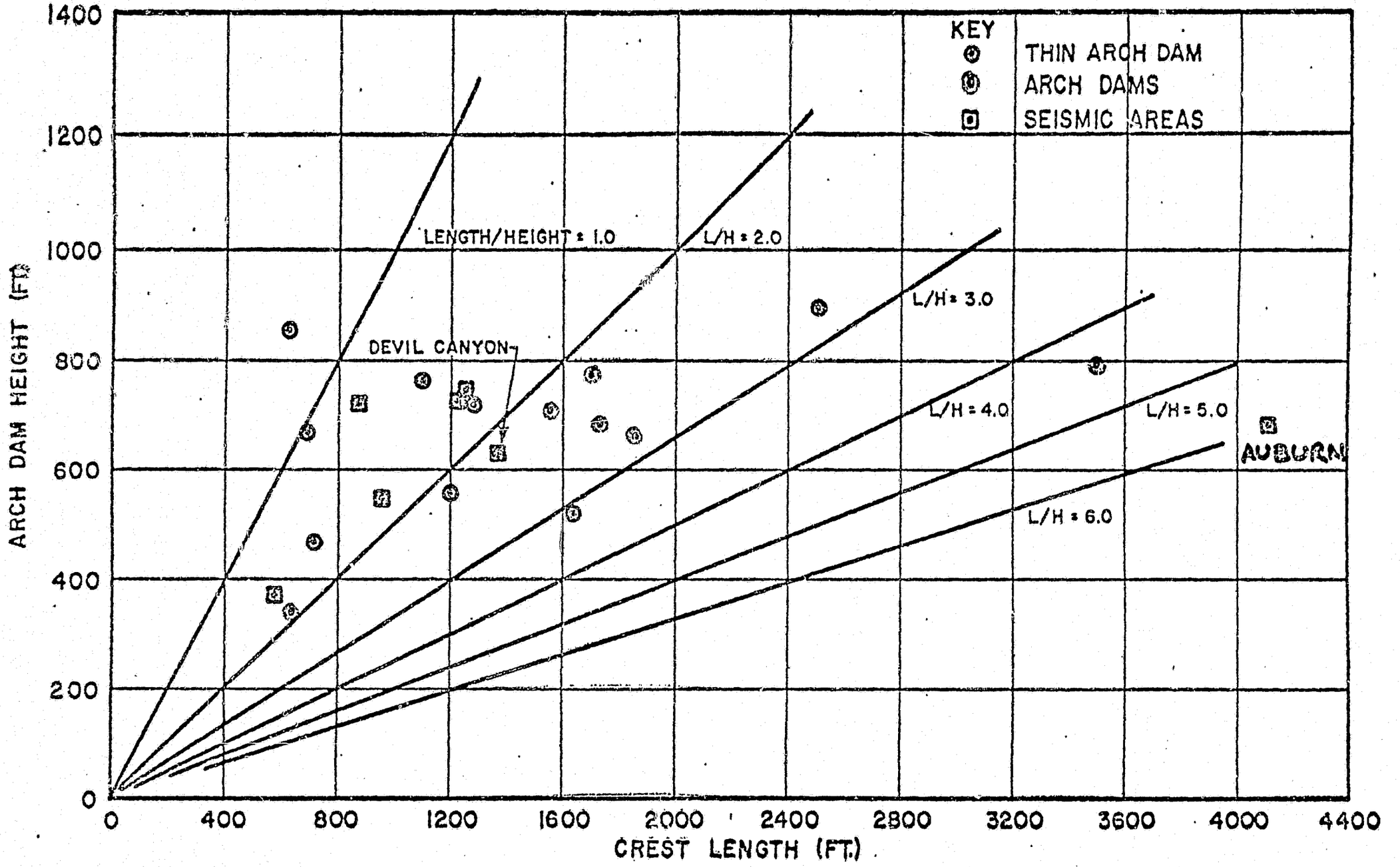
OBJECTIVES (6.04)

PRELIMINARY ASSESSMENT OF FEASIBILITY OF ARCH DAM AT DEVILS CANYON.

GENERAL APPROACH

ARCH DAM (6.04)





ARCH DAM HEIGHT VS. CREST LENGTH

DAM	LOCATION	HEIGHT	CREST LENGTH	BASE THICK.	MINIMUM THICK.	VOLUME	SEISMIC PARAMETERS	FOUNDATION	ABUTMENTS	REMARKS	CENT. ANGLE
El Cajon (1984)	Yoro/Cortes Honduras	741 (226)	1253 (383)			1,924,000 (1,472,000)					
Hoover (1936)	Nevada, Arizona, U.S.A.	726 (221)	1244 (379)	660	45	4,400,00 (3,364,000)	Spaced between two faults about 900 ft apart			Gravity Arch	
Vidraru-Arges	Romania	548 (167)	508 (292)	82 (25.0)	20 (6.0)		Earthquake in 1977 with an intensity of 7-8 on the MSk scale at the site. 7 = 2-1/2 %g. 8 = 5% g. 9 = 10% g.			Measurements after the earthquake showed no odifications to normal behavior.	
Morrow Point	Colorado	465	720	51.65'	12.0	360,000	In design it is mood up a point				
Crystal Dam	Nestren Colorado	340	620			145,000					
Green Lake Dam	Sitka, Alaska	210	460	16 ft.		26,000	Miximum Credible earthquake Magnitude = 8 Richter @ 16 mi. Acceleration = 0.40 g. Duration = 45 sec. Design Earthquake Magnitude = 8 Richter @ 33 mi. Acceleration = 0.23 g. Duration = 40 sec.	Competent massive graywacke		Unsymmetrical with	

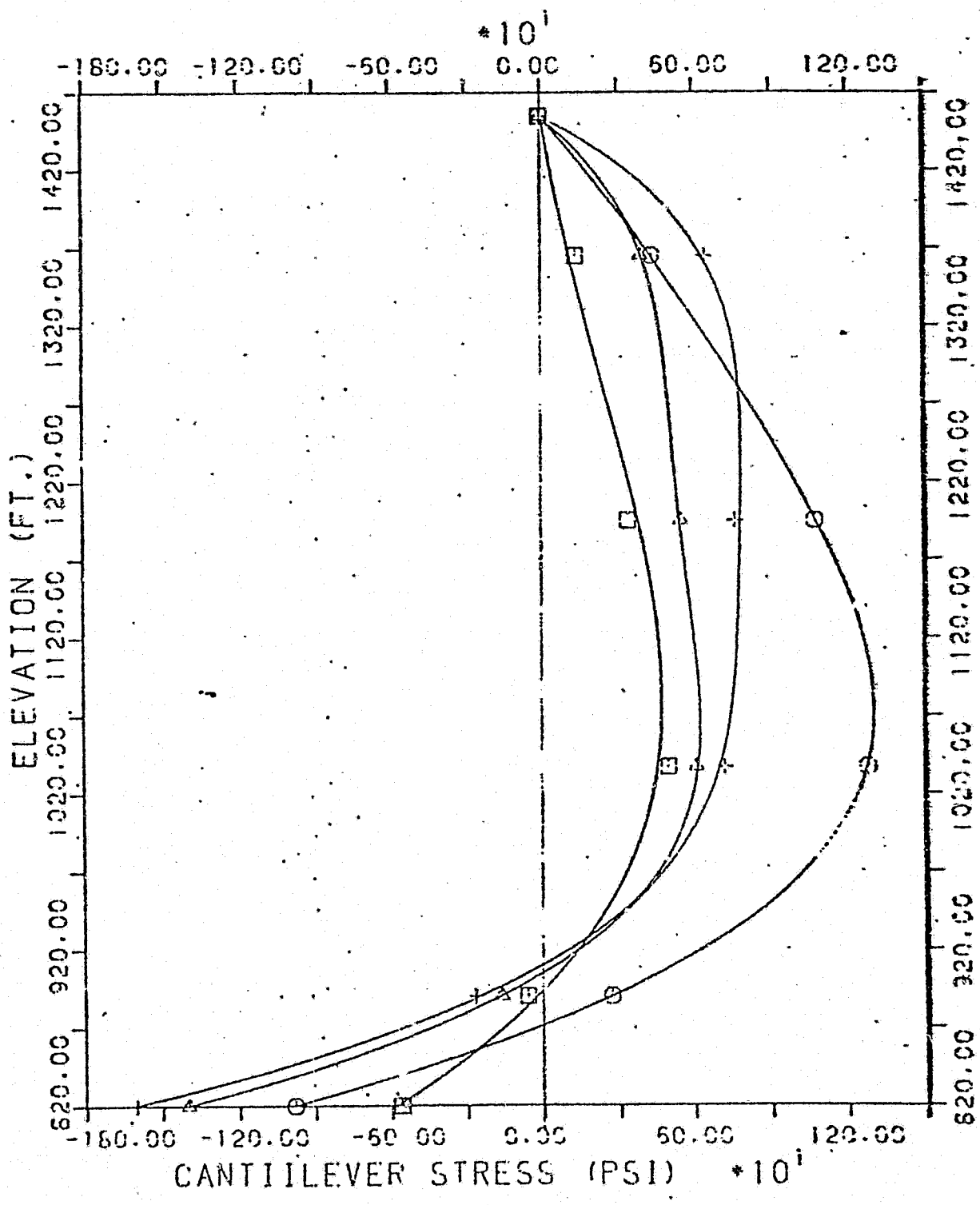
DAM	LOCATION	HEIGHT	CREST LENGTH	BASE THICK.	MINIMUM THICK.	VOLUME	SEISMIC PARAMETERS	FOUNDATION	ABUTMENTS	REMARKS	CENT. ANGLE
Contra (1965)	Ticino, Switzerland	722 (220)	1246 (380)			861,000 (658,000)					
Mratinje (1976)	Montenegro, Yugoslavia	722 (220)	879 (268)			971,000 (742,000)					
Glen Canyon (1964)	Arizona, USA	710 (216)	1560 (475)			4,901,000 (3,747,000)					
Luzzone (1963)	Ticino, Switzerland	682 (208)	1738 (530)			1,739,000 (1,330,000)					
Mohamed Reza Shah Pahlavi (1963)	Khouzestan, Iran	666 (203)	696 (212)			647,000 (497,000)					
Almendra (1970)	Salmanca, Spain	662 (202)	1860 (567)			2,188,000 (1,673,000)					
Inguri (1985)	Georgia, USSR	892 (272)	2513 (766)	282	33 (10 m)	4,967,000 (3,800,000)				ENR Dec. 14, 1978 + Dave Shandalow Info Thin Arch	
Vaiont (1961)	Veneto, Italy	858 (262)	624 (190)			460,000 (352,000)				Overtopped by 400 ft high wave on Oct. 9, 1963. Minor chipping of the top 3 ft due to boulders was the only damage.	
Sayan-Shusen (1980)	Krasnoyarsk, USSR	794 (242)	3504 (1068)			11,916,000 (9,117,000)					
Chirkei (1975)	North Caucusas, USSR	764 (233)	1109 (338)	98 (30 m)	21 (6.5 m)	1,602,000 (1,226,000)					
Mauvoisin (1957)	Valais, Switzerland	777 (237)	1706 (520)			2,655 (2,030)					
El Cajon (1984)	Yoro/Cortes, Honduras	741 (226)	1253 (382)			1,924,000 (1,472,000)					

DAM	LOCATION	HEIGHT	CREST LENGTH	BASE THICK.	MINIMUM THICK.	VOLUME	SEISMIC PARAMETERS	FOUNDATION	ABUTMENTS	REMARKS	CENT. ANGLE
Gokçekaya	Turkey	521 (159)	1620 (494)	74 (22.5)	20 (6)	933,000 (714,000)				Designed by EBASCO	107.4
Idikki	India	555	1200	80	25	613,000					
Auburn	California	685	4150	200	40	6,300,000				3 circular arcs Left 4000 ft rad 980' arc Center 1400 ft rad 1810' arc Right 4000 ft rad 1275' arc	
Pacoima	California	372 (113)	589 (180)	99 (30.2)	10.4 (3.2)	220,000 (168,000)	Seven significant faults within 3.8 miles (6 kM) radius of the site. 1952 - Earthquake of 5.0 Rickter @ 15 mi. 1971 - San Fernando earthquake 6.6 Rickter @ 4 mi. (Horizontal (Acc, 1.25 g measured (in each (direction (Vertical Acc , (0.70 g base rock estimated at 0.6 to 0.8 g	Gneissic Quartz Joint sets divide rock into angular blocks of approximately 4' 0"		- Built around 1930 - Constant angle arch - Earthquake loads not considered in design	

ADAP RESULTS: SUSITNA THIN ARCH DAM

CROWN CANTILEVER STRESSES

EXTRADOS



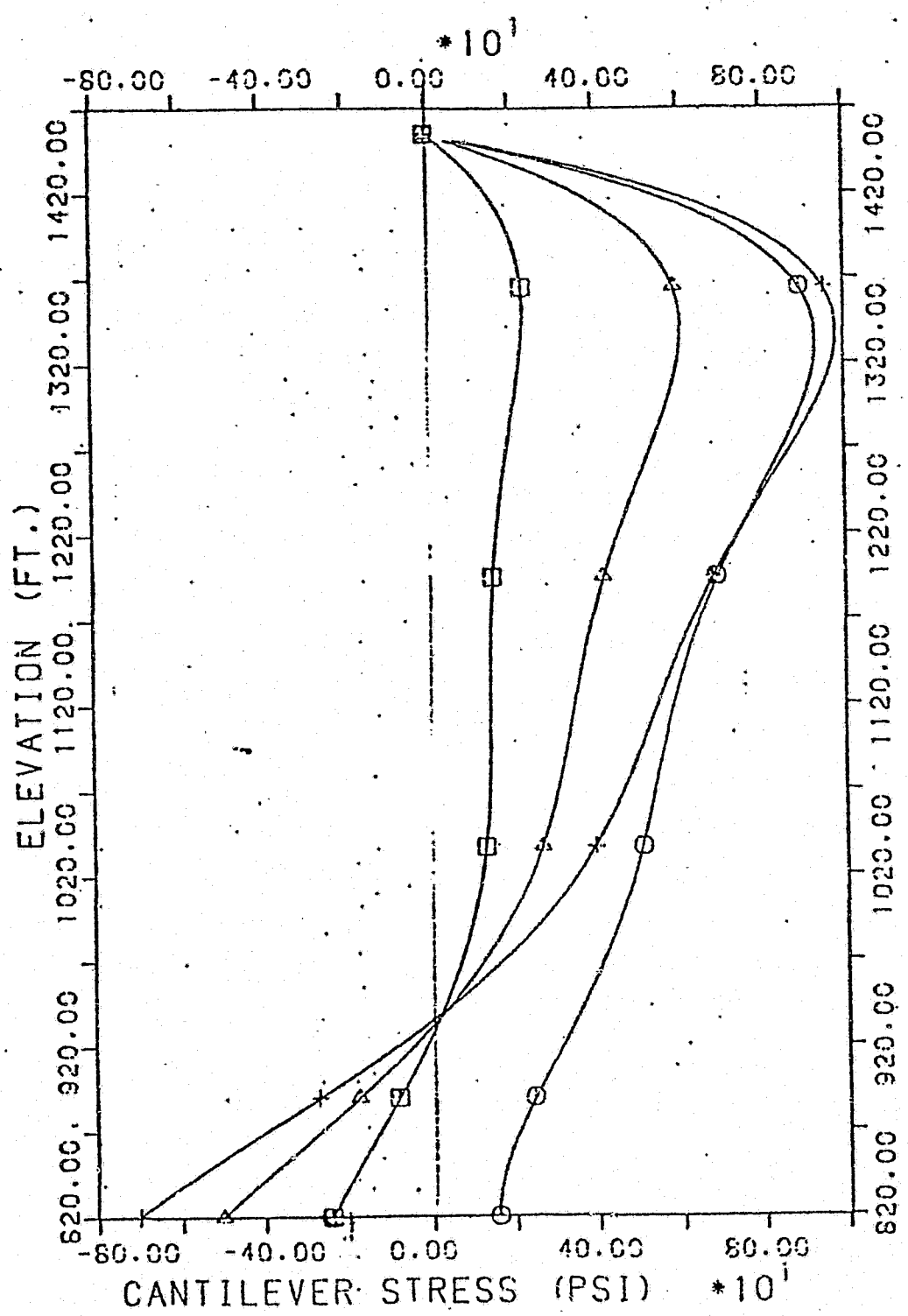
LEGEND:

- ⊡ HYDRO. +GRAV.
- ⊙ HYDRO. +GRAV. +TEMP.
- △ HYD. +GRV. +EQ (0.25G)
- \+ HYD. +GRV. +EQ (0.50G)

ADAP RESULTS: SUSITNA ARCH-GRAVITY DAM

CROWN CANTILEVER STRESSES

EXTRADOS



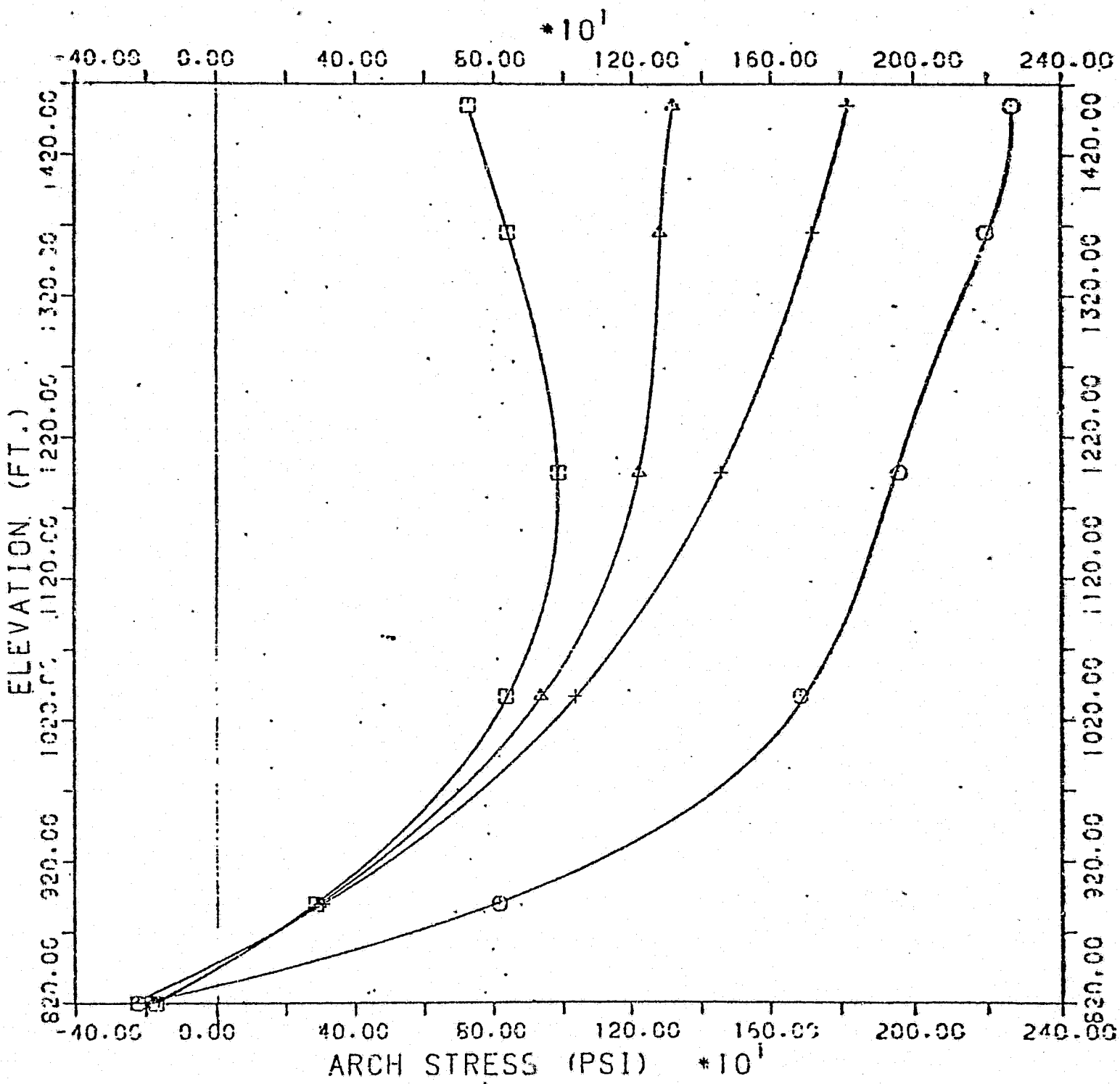
LEGEND:

- □ HYDRO.+GRAVITY
- ○ HYD.+GRV.+TEMP.
- △ HYD.+GRV.+EQ(0.25G)
- \+ HYD.+GRV.+EQ(0.50G)

ADAP RESULTS: SUSITNA THIN ARCH DAM

CROWN ARCH STRESSES

EXTRADOS

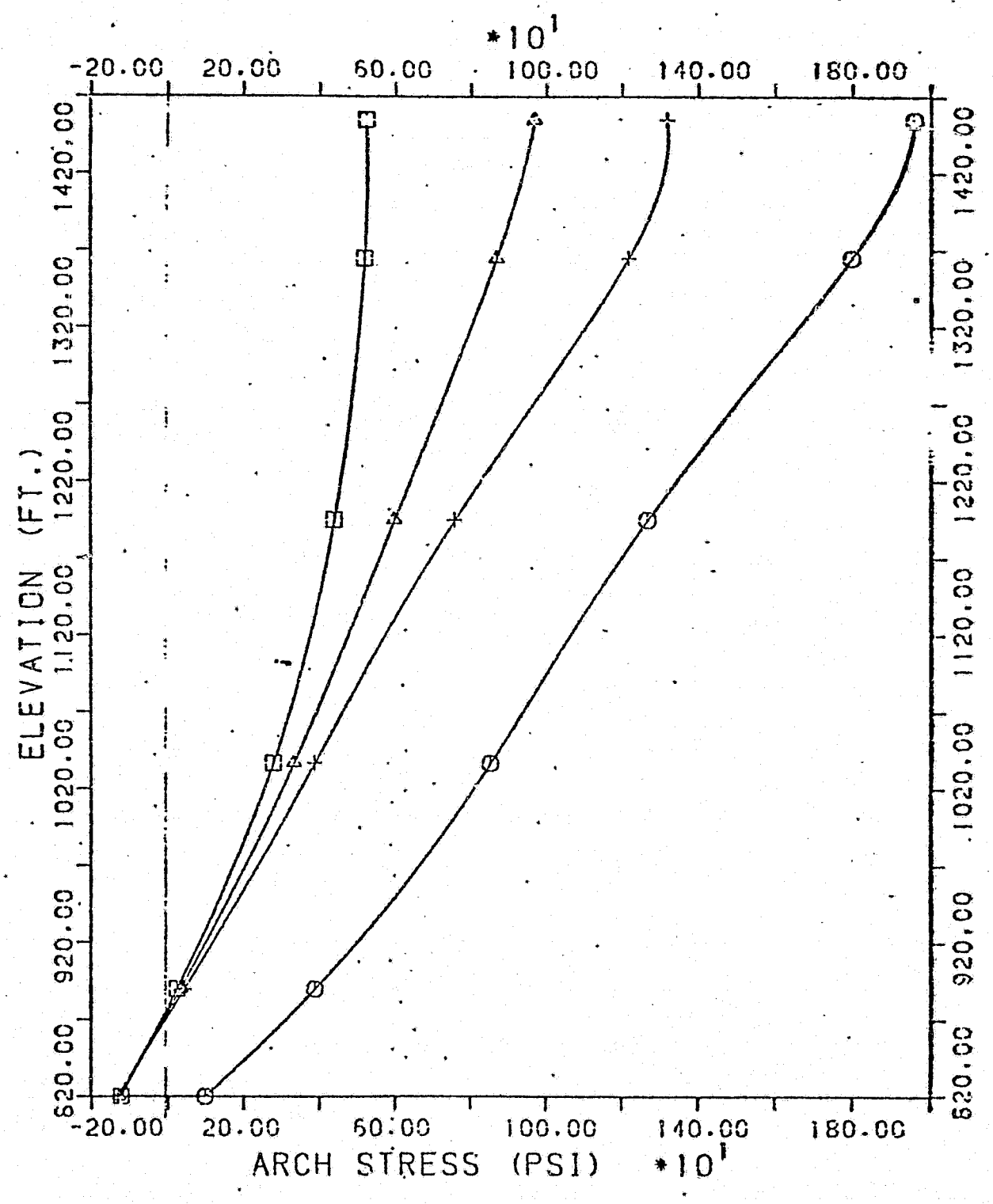


LEGEND:
- □ HYDRO.+GRAVITY
- ○ HYD.+GRV.+TEMP.
- △ HYD.+GRV.+EQ(0.25G)
- \+ HYD.+GRV.+EQ(0.50G)

ADAP RESULTS: SUSITNA ARCH-GRAVITY DAM

CROWN ARCH STRESSES

EXTRADOS



LEGEND:

- HYDRO.+GRAVITY
- HYD.+GRV.+TEMP.
- HYD.+GRV.+EQ(0.25G)
- HYD.+GRV.+EQ(0.50G)

OBJECTIVES (6.08)

ESTABLISH APPROPRIATE AXIS AND DAM TYPE AT

DEVILS CANYON.

ACRES

OFFICE MEMORANDUM

TO: R. Mohn, APA

FROM: I. Hutchison
Task 6 Supervisor

Date: October 17, 1980

File: P5700.11

SUBJECT: Susitna Hydroelectric Project
Revision to Results Presented at the
Internal Review Board Meeting on October 14, 1980

Attached are the following revised result sheets:

Subtask 6.02

1. Revised tunnel unit cost diagram. Ongoing work on our tunnel cost estimates has led to an upward revision to the tunnel costs.

2. Revised tunnel scheme economic summary table. Based on the increased costs referred to above this table has been revised. For the sensitivity calculations the increase in tunnel costs has been reduced from 100% to 50% due to the greater level of confidence we now have in the tunnel costs.

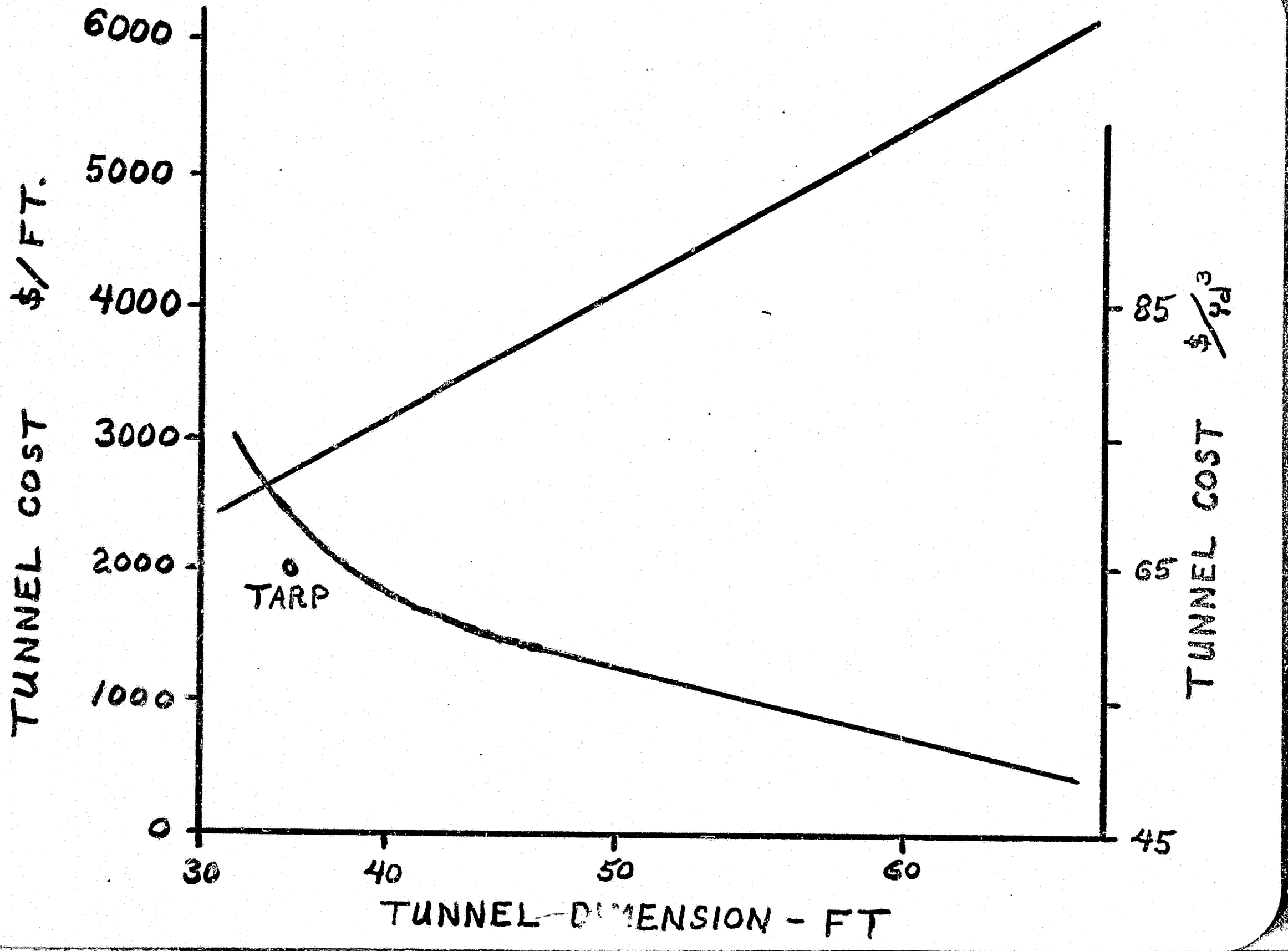
3a. The economic summary table has been expanded to include Scheme 3a, which incorporates a rockfill re-regulation dam (Scheme 3 incorporates a concrete re-regulation dam).

Subtasks 6.03/6.06

4. A revised print of the storage: dam height curve for the alternative Susitna River sites (previous print was laterally inverted).

I. Hutchison

IH:ccv
Attachments


6000
5000
4000
3000
2000
1000
0
$/FT.
TUNNEL COST
TARP
30
40
50
60
TUNNEL DIMENSION - FT
85
65
45
$/Yd^3
TUNNEL COST

ECONOMICS OF TUNNEL ALTERNATIVES

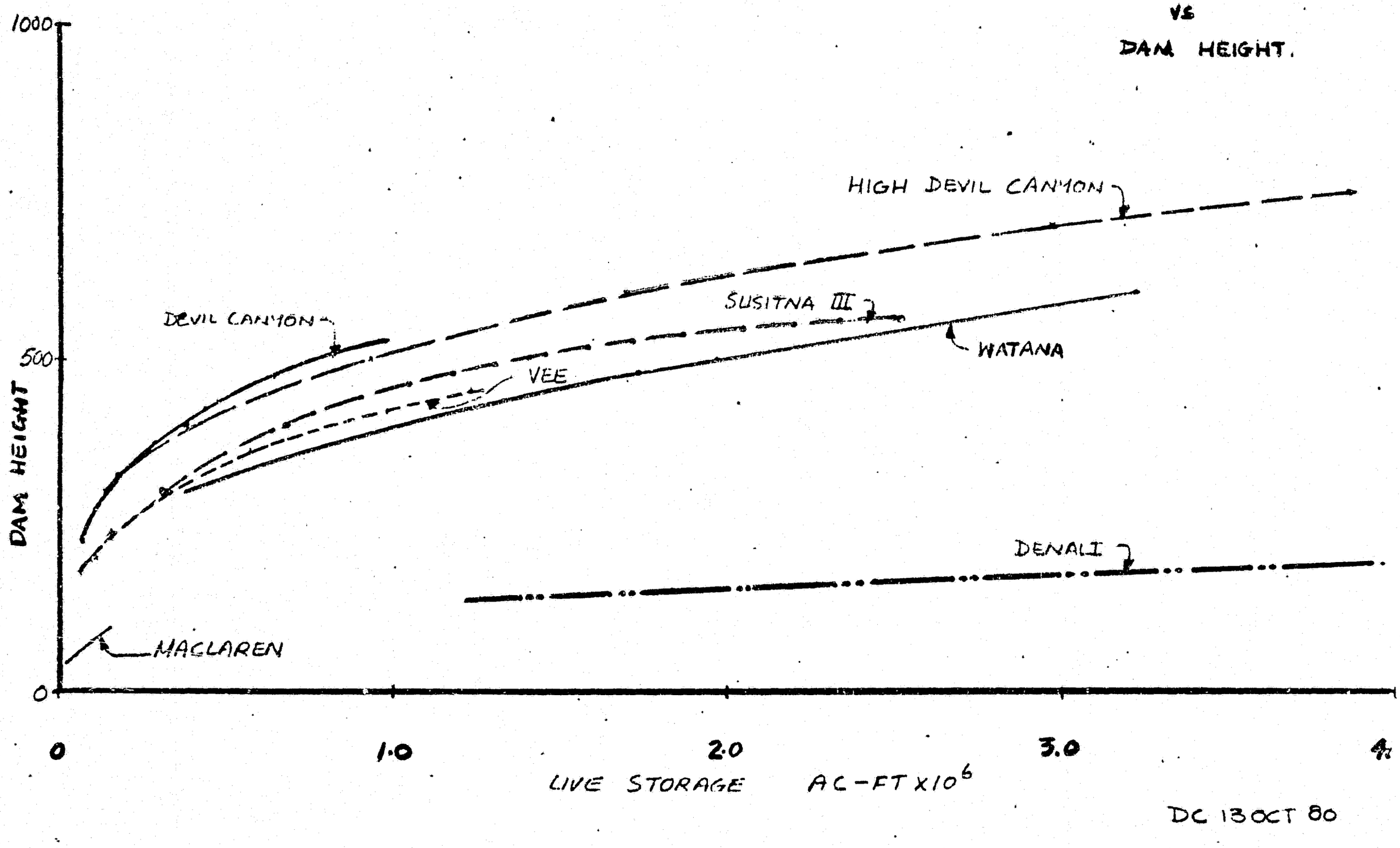
	INSTALLED CAPACITY UPSTREAM MW	INSTALLED CAPACITY DOWNSTREAM MW	AVERAGE ANNUAL ENERGY GWH	CAPITAL COST 10^6 $	ENERGY COST $/1000 KWH
U.S. CORPS DAMS	790	780	6,855	2,150	35
TUNNEL SCHEMES					
1	790	550	5,700	A 2,500	50
				B 2,600	55
				C 2,900	60
2	35 (790)	1,150	4,900	A 2,400	60
				B 2,500	65
				C 2,800	70
3	CONCRETE REGULATION DAM				
	790	375	6,029	A 2,000	40
				B 2,020	40
				C 2,120	40
3A	ROCKFILL REGULATION DAM				
	790	375	6,029	A 2,060	40
				B 2,090	40
				C 2,200	45
4	35 (790)	800	5,650	A 2,190	45
				B 2,240	45
				C 2,430	50

B: 15 MILE HAUL.

C: SENSITIVITY, 1.5 X TUNNEL COST.

SUSITNA HEP

LIVE STORAGE
VS
DAM HEIGHT.



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