

BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION
APPLICATION FOR LICENSE FOR MAJOR PROJECT
SUSITNA HYDROELECTRIC PROJECT

VOLUME 8

D R A F T

EXHIBIT E
CHAPTER 2

FIGURES

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BEFORE THE
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APPLICATION FOR LICENSE FOR MAJOR PROJECT

SUSITNA HYDROELECTRIC PROJECT
DRAFT LICENSE APPLICATION

VOLUME 8

EXHIBIT E
CHAPTER 2 - WATER USE AND QUALITY
FIGURES

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VOLUME COMPARISON

VOLUME NUMBER COMPARISON

LICENSE APPLICATION AMENDMENT VS. JULY 29, 1983 LICENSE APPLICATION

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E.2.4.143	SUSITNA RIVER STREAMFLOWS EXCEEDED 6% OF THE TIME AT GOLD CREEK, STAGE II
E.2.4.144	SUSITNA RIVER STREAMFLOWS EXCEEDED 50% OF THE TIME AT GOLD CREEK, STAGE II
E.2.4.145	SUSITNA RIVER STREAMFLOWS EXCEEDED 97% OF THE TIME AT GOLD CREEK, STAGE II
E.2.4.146	AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1964 HYDROLOGY, STAGE II
E.2.4.147	AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1967 HYDROLOGY, STAGE II
E.2.4.148	AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1970 HYDROLOGY, STAGE II
E.2.4.149	AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1981 HYDROLOGY, STAGE II
E.2.4.150	AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1982 HYDROLOGY, STAGE II
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E.2.4.152	FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE, SUSITNA RIVER AT DEVIL CANYON DAMSITE, STAGE II

EXHIBIT E - CHAPTER 2
WATER USE AND QUALITY

LIST OF FIGURES (cont'd)

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E.2.4.155	FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE, SUSITNA RIVER AT SUSITNA STATION, STAGE II
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E.2.4.157	STAGE II DEVIL CANYON RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH, (E-VI), TWO LEVEL INTAKE, PROPOSED PROJECT
E.2.4.158	STAGE II DEVIL CANYON RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH, (E-VI), TWO LEVEL INTAKE, PROPOSED PROJECT
E.2.4.159	STAGE II DEVIL CANYON RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH, (E-VI), THREE LEVEL INTAKE
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EXHIBIT E - CHAPTER 2
WATER USE AND QUALITY

LIST OF FIGURES (cont'd)

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E.2.4.174	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 150, STAGE II
E.2.4.175	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 130, STAGE II
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E.2.4.177	SUSITNA RIVER TEMPERATURES AT RIVER MILE 130, WATANA AND DEVIL CANYON OPERATING
E.2.4.178	SUSITNA RIVER TEMPERATURES AT RIVER MILE 84, WATANA AND DEVIL CANYON OPERATING
E.2.4.179	SIMULATED TEMPERATURES AT RIVER MILE 130, VARIOUS INTAKE OPERATING POLICIES
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EXHIBIT E - CHAPTER 2
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E.2.4.188	WATANA QUARRY SITE A PLAN AND SECTIONS
E.2.4.189	WATANA WATER SURFACE ELEVATION, EARLY STAGE III
E.2.4.190	WATANA WATER SURFACE ELEVATION, MONTHLY SUMMARY, EARLY STAGE III
E.2.4.191	WATANA RESERVOIR INFLOW, EARLY STAGE III
E.2.4.192	WATANA RESERVOIR OUTFLOW, EARLY STAGE III
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EXHIBIT E - CHAPTER 2
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E.2.4.204	DEVIL CANYON RESERVOIR OUTFLOW, LATE STAGE III
E.2.4.205	WATANA WATER SURFACE ELEVATION, E-1 FLOW REQUIREMENTS, LATE STAGE III
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EXHIBIT E - CHAPTER 2
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E.2.4.218	AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1964 HYDROLOGY, LATE STAGE III,
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E.2.4.237	SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK, LATE STAGE III
E.2.4.238	SUSITNA RIVER STREAMFLOWS EXCEEDED 6% OF THE TIME AT GOLD CREEK, LATE STAGE III
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EXHIBIT E - CHAPTER 2
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LIST OF FIGURES (cont'd)

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E.2.4.252	LATE STAGE III DEVIL CANYON RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH, E-VI
E.2.4.253	LATE STAGE III DEVIL CANYON RESERVOIR OUTFLOW TEMPERATURE AND ICE GROWTH, E-VI
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WATER USE AND QUALITY

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E.2.4.260	WATANA RESERVOIR TEMPERATURE PROFILES, LATE STAGE III
E.2.4.261	WATANA RESERVOIR TEMPERATURE PROFILES, LATE STAGE III
E.2.4.262	WATANA RESERVOIR TEMPERATURE PROFILES, LATE STAGE III
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E.2.4.264	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 150, LATE STAGE III
E.2.4.265	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 130, LATE STAGE III
E.2.4.266	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 100, LATE STAGE III
E.2.4.267	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 150, LATE AND EARLY STAGE III
E.2.4.268	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 130, LATE AND EARLY STAGE III
E.2.4.269	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 100, LATE AND EARLY STAGE III
E.2.4.270	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 150, LATE STAGE III, E-I FLOW REQUIREMENTS

EXHIBIT E - CHAPTER 2
WATER USE AND QUALITY

LIST OF FIGURES (cont'd)

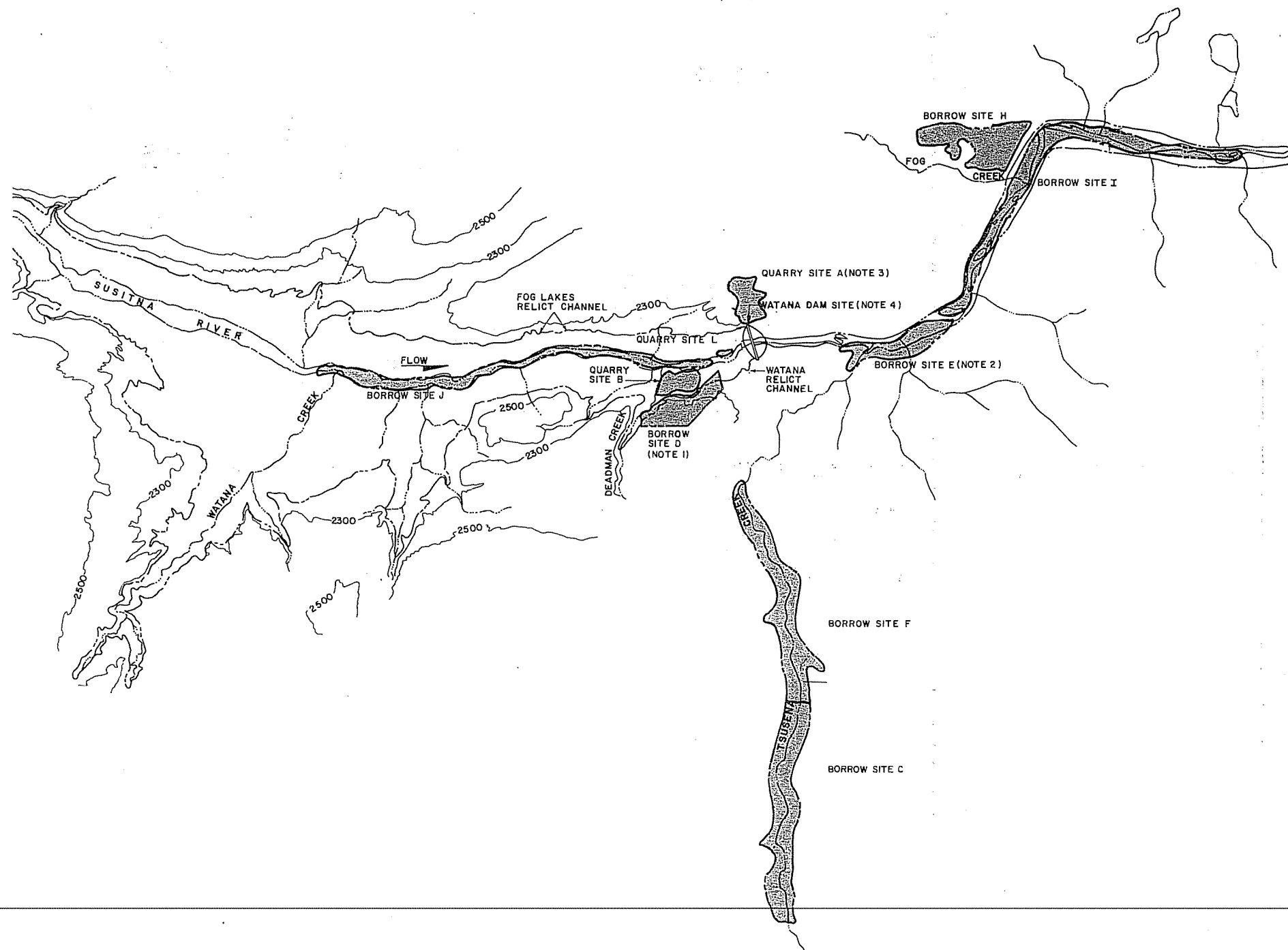
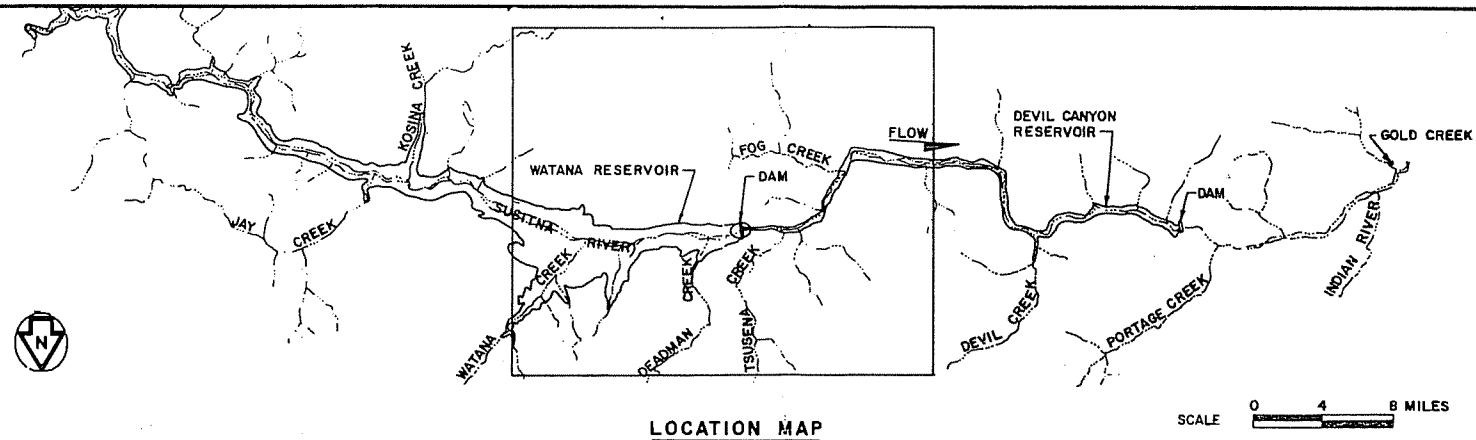
<u>Number</u>	<u>Title</u>
E.2.4.271	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 130, LATE STAGE III, E-I FLOW REQUIREMENTS
E.2.4.272	SIMULATED SUSITNA RIVER TEMPERATURES, RIVER MILE 100, LATE STAGE III, E-I FLOW REQUIREMENTS
E.2.4.273	SUSITNA RIVER TEMPERATURES AT RIVER MILE 130, WATANA AND DEVIL CANYON OPERATING
E.2.4.274	SUSITNA RIVER TEMPERATURES AT RIVER MILE 84, WATANA AND DEVIL CANYON OPERATING
E.2.4.275	SIMULATED RIVER ICE CONDITIONS, STAGE III VS. NATURAL 1981-82 WEATHER CONDITIONS, CASE E-VI FLOWS
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E.2.4.277	STAGE III DEVIL CANYON RESERVOIR OUTFLOW SUSPENDED SOLIDS, AVERAGE YEAR
E.2.4.278	STAGE III DEVIL CANYON RESERVOIR OUTFLOW SUSPENDED SOLIDS, AVERAGE YEAR
E.2.4.279	STAGE III WATANA RESERVOIR OUTFLOW SUSPENDED SOLIDS, AVERAGE YEAR
E.2.4.280	STAGE III WATANA RESERVOIR OUTFLOW SUSPENDED SOLIDS, AVERAGE YEAR

EXHIBIT E - CHAPTER 2
WATER USE AND QUALITY

LIST OF PHOTOS

<u>Number</u>	<u>Title</u>
E.2.2.1	FRAZIL ICE UPSTREAM FROM WATANA
E.2.2.2	ICE COVER DOWNSTREAM FROM WATANA SHOWING NATURAL LODGEMENT POINT
E.2.2.3	SLOUGH 9 APPROXIMATELY 3,500 FEET UPSTREAM FROM SLOUGH MOUTH, DECEMBER 1982
E.2.2.4	SLOUGH 8A FREEZE-UP, DECEMBER 1982
E.2.2.5	SLOUGH 8A NEAR LRX-29 LOOKING UPSTREAM
E.2.2.6	SLOUGH 8A
E.2.2.7	SLOUGH 8A SHOWING FLOODING DURING FREEZE-UP
E.2.2.8	ENLARGEMENT OF PHOTO E.2.2.7 SHOWING TURBULENT FLOW

2 - WATER USE AND QUALITY FIGURES



LEGEND
BORROW/QUARRY SITE

- NOTE:**
1. PROPOSED SOURCE OF IMPERVIOUS MATERIAL IN ALL THREE PROJECT STAGES.
 2. PROPOSED SOURCE OF AGGREGATE AND FILTER MATERIAL IN STAGES I AND III.
 3. PROPOSED SOURCE OF ROCKFILL IN STAGE III ONLY.
 4. REQUIRED EXCAVATIONS WILL SATISFY ALL STAGE I ROCKFILL REQUIREMENTS.

WATANA BORROW SITE MAP



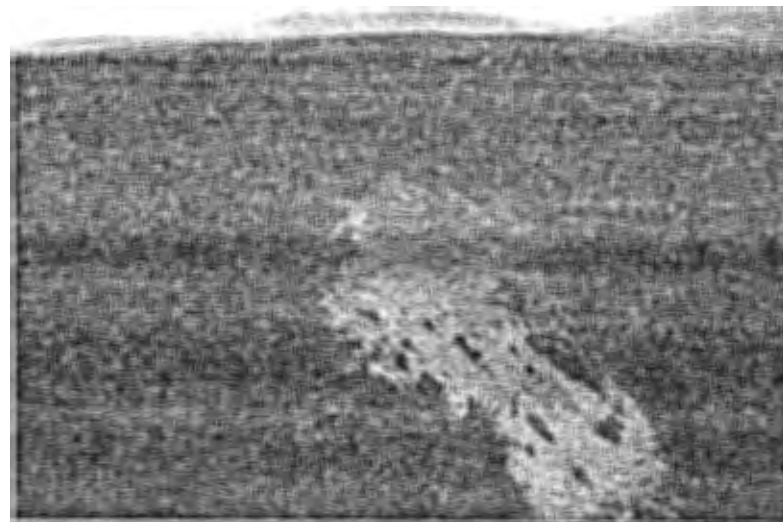
N 3,230,000

N 3,232,000

N 3,234,000

N 3,236,000

N 3,238,000



CONTOURS OMITTED
FOR CLARITY

FLOW

BORROW SITE D

PHOTO

LEGEND

--- BORROW SITE LIMIT

NOTES

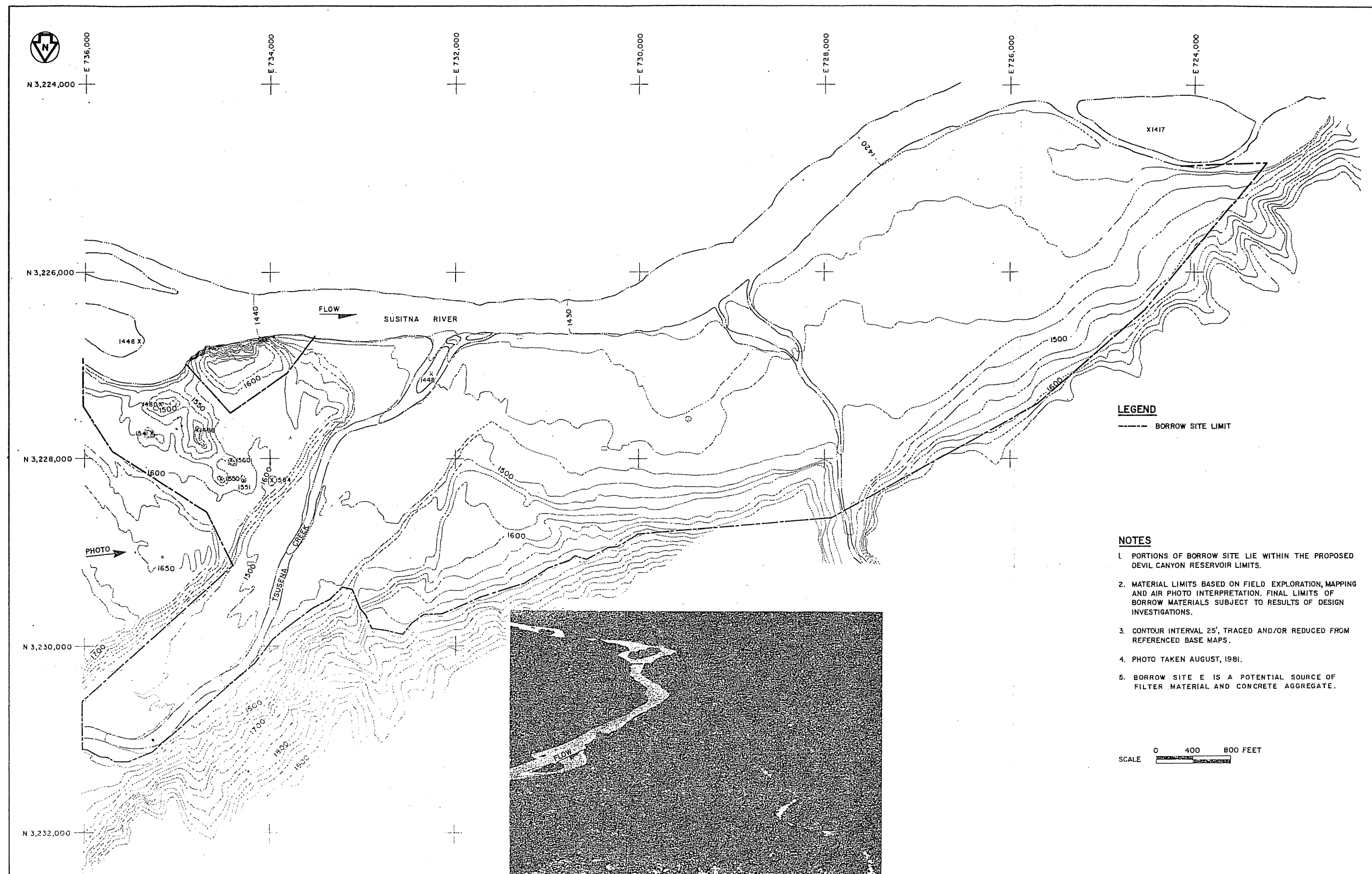
1. MOST OF BORROW SITE LIES OUTSIDE OF PROPOSED STAGE III WATANA RESERVOIR LIMITS.
2. BORROW MATERIAL IS COMPRISED OF UP TO 600 FEET OF GLACIAL TILL, OUTWASH, AND ALLUVIUM.
3. CONTOUR INTERVAL 25 FEET, REDUCED AND TRACED FROM REFERENCED BASE MAPS.
4. PHOTO TAKEN AUGUST, 1981.
5. BORROW SITE D IS A POTENTIAL SOURCE OF IMPERVIOUS MATERIAL.

SCALE 0 400 800 FEET

REFERENCE: BASE MAP FROM 1978, COE - 1" = 200' DAMSITE TOPOGRAPHY,
SHEETS 13-15, 18-20 OF 26

**WATANA
BORROW SITE D**

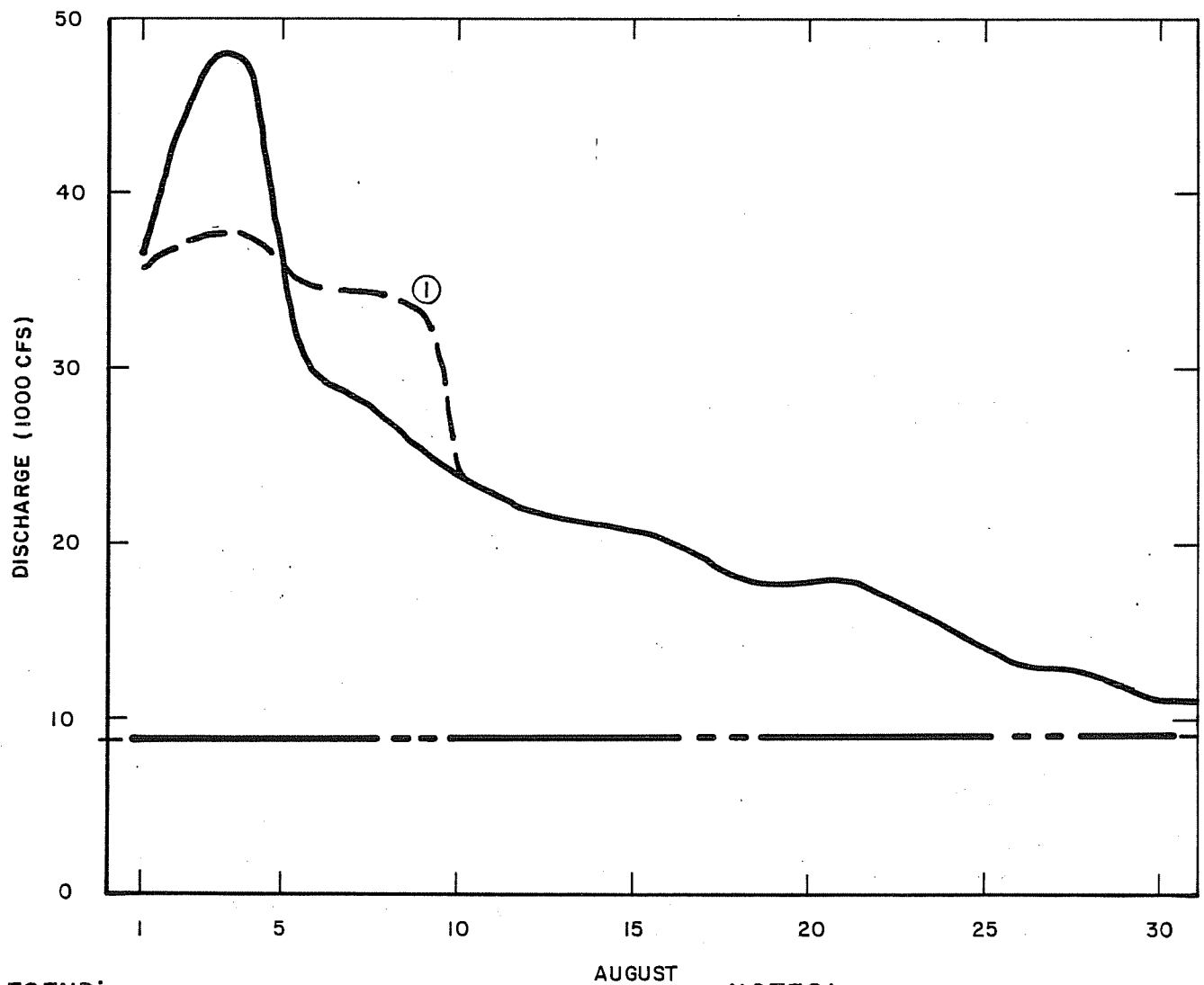
FIGURE E.2.4.2



REFERENCES: BASE MAP FROM COE, 1978 - 1" = 200' WATANA TOPOGRAPHY, SHEET 6 & 11 OF 26
 R & M, 1981 - 1" = 400' DEVIL CANYON RESERVOIR MAPPING, FLIGHT
 5 (6-B), MANUSCRIPT 2
 COORDINATES IN FEET, ALASKA STATE PLANE (ZONE 4)

WATANA BORROW SITE E

FIGURE E.2.4.3



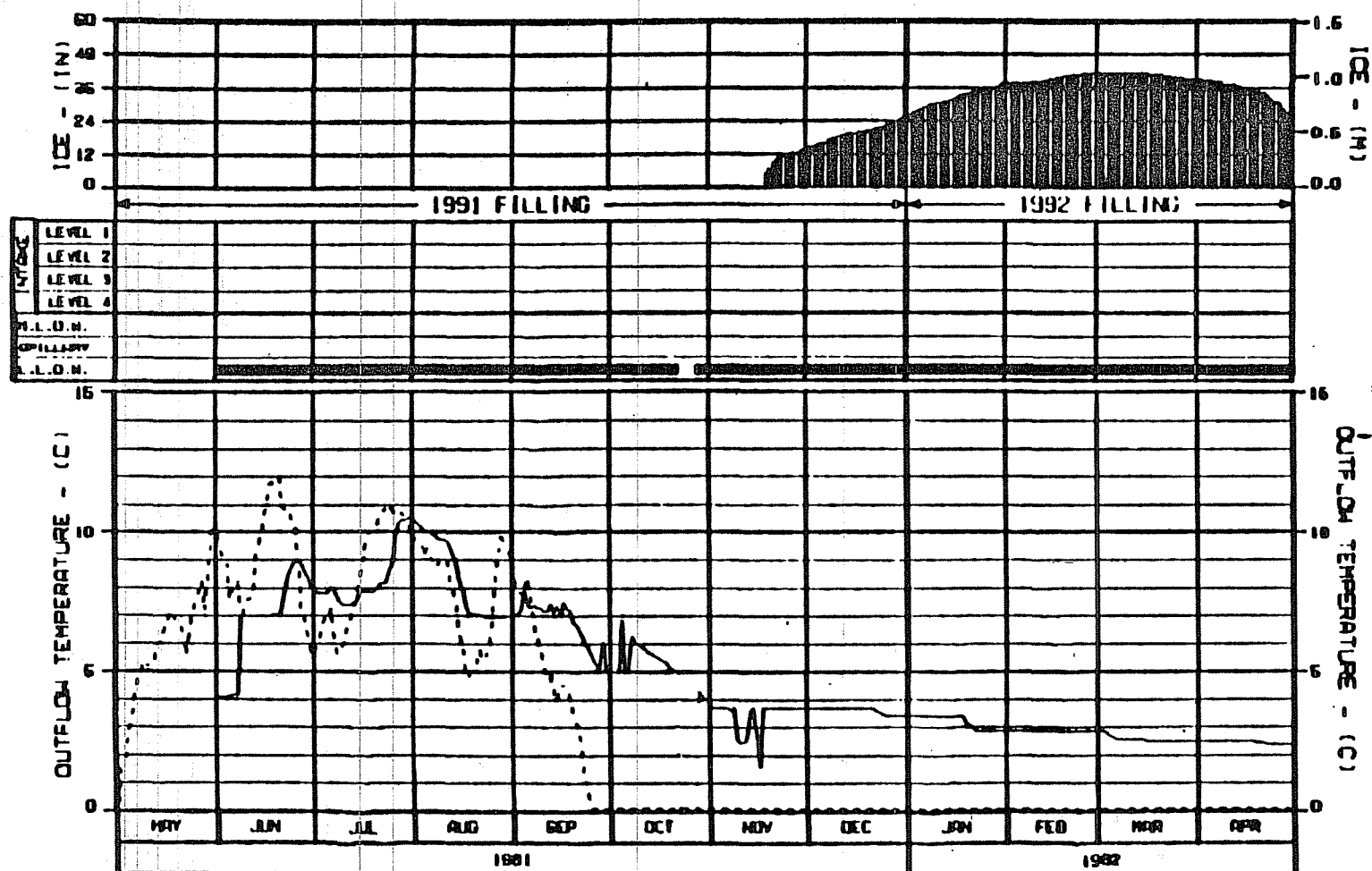
LEGEND:

- AUGUST 1958 FLOWS
- FILLING SEQUENCE 1, AUGUST 1958 FLOWS—WATANA MINIMUM STORAGE CRITERIA VIOLATED
- FILLING SEQUENCE 2, AUGUST 1958 FLOWS—WATANA CAPABLE OF ABSORBING HYDROGRAPH

NOTES:

1. WATANA FLOW ASSUMED TO BE 84 % OF GOLD CREEK FLOW.
2. RESERVOIR FILLING CRITERIA EXCEEDED WITH SEQUENCE ①
3. NEGLIGIBLE CHANGE IN DAM HEIGHT DURING FLOOD EVENT
4. MAXIMUM RELEASE AT WATANA 31,000 CFS (COMBINED POWERHOUSE AND OUTLET FACILITY DISCHARGE).

**FLOW VARIABILITY AT GOLD CREEK
DURING WATANA FILLING**



LEGEND: WATANA FILLING OPERATION
 FIRST YEAR FILLING STARTS IN MAY 1991
 PREDICTED OUTFLOW TEMPERATURE
 INFLOW TEMPERATURE

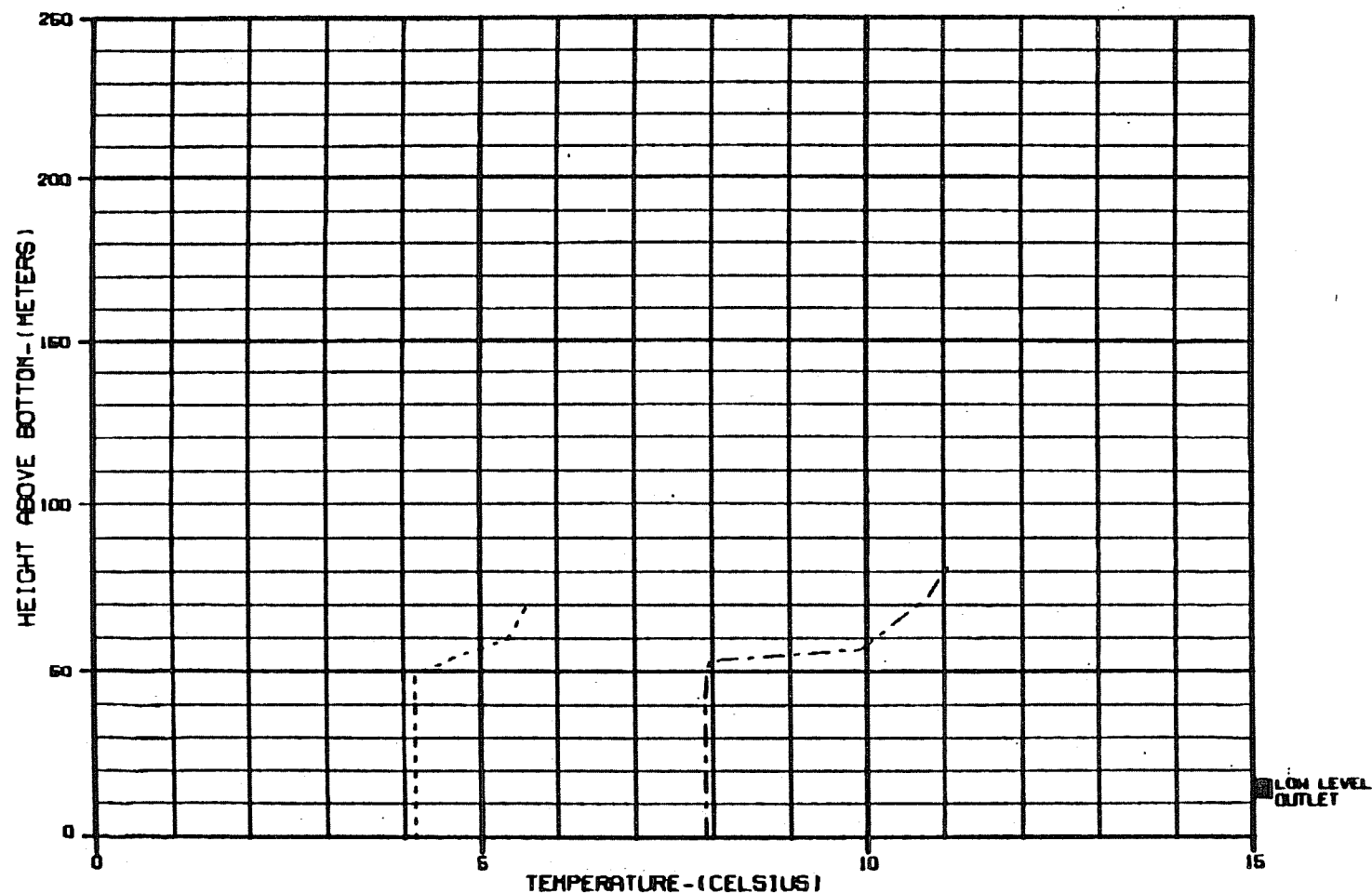
- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT 1655.5 M
 2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT 1644.3 M
 3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT 1633.1 M
 4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT 1621.0 M
 5. CONE VALVE INLOW AT ELEVATION 2040 FT 1621.0 M
 6. SPILLWAY CREST AT ELEVATION 2149 FT 1654.7 M
 7. LOW LEVEL OUTLET WORKS INLOW ELEV. 1508 FT 1459.05 M

SOURCE (APA, 1984 a APPENDIX IV)

NOTE: SIMULATION WAS FOR FIRST YEAR OF FILLING WATANA 2-STAGE PROJECT. TEMPERATURES FROM MAY THROUGH SEPTEMBER WOULD BE APPLICABLE TO SUMMER OF FILLING WATANA STAGE-1. TEMPERATURES FOR OCTOBER THROUGH NOVEMBER ARE NOT APPLICABLE TO WATANA STAGE-1.

WATANA RESERVOIR **SUMMER OF FILLING** **OUTFLOW TEMPERATURE AND ICE GROWTH**

FIGURE E.2.4.5



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— MAY 1981
 - - - JUNE 1981
 - - - JULY 1981

SOURCE: APA 1984a APPENDIX IV

ALASKA POWER AUTHORITY

WATANA PROJECT

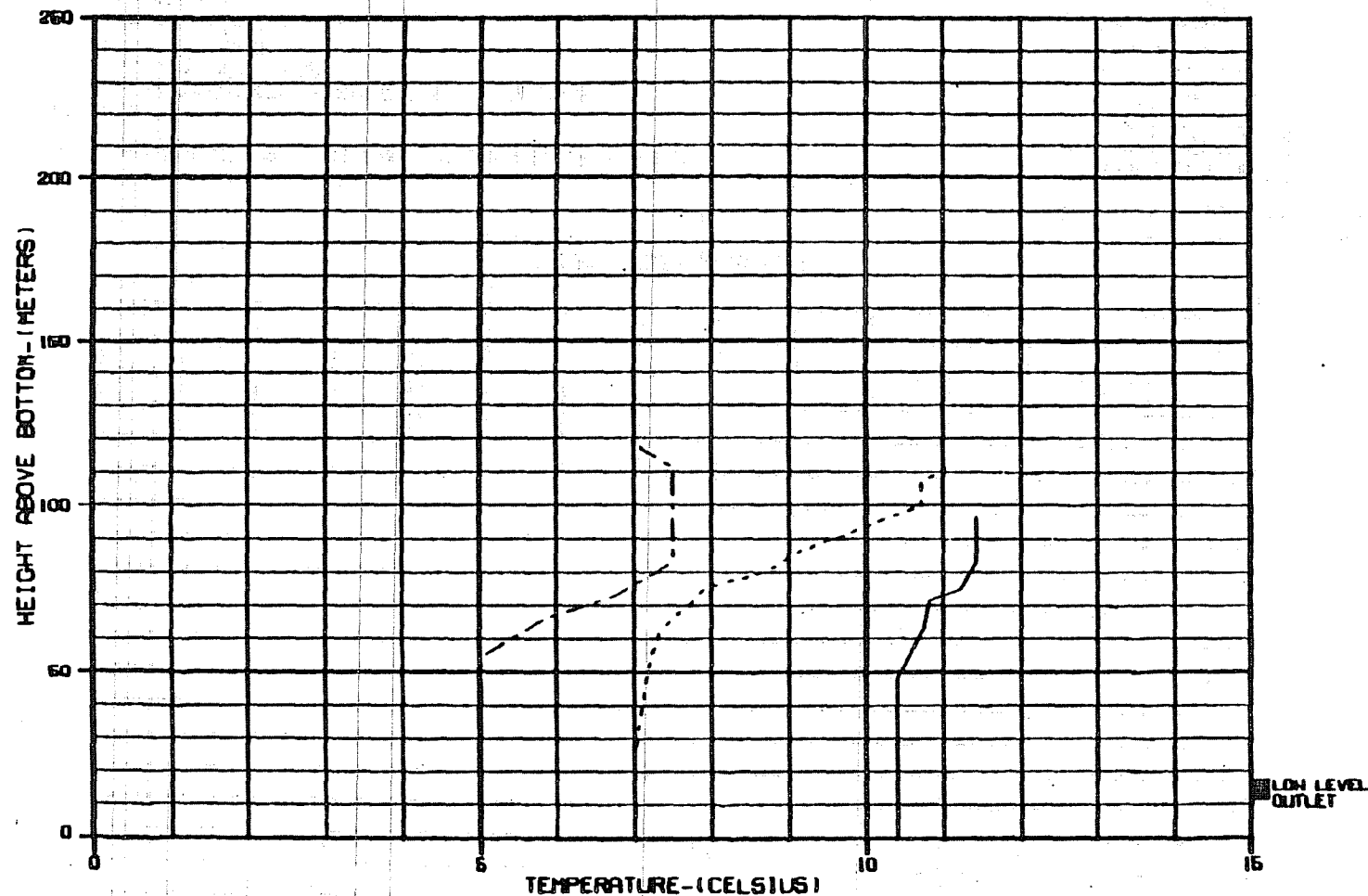
DYNAME MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBRARD JOINT VENTURE

DESIGN: A.L. 1988

FIGURE E.2.4.6



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— AUGUST 1981
 - - - SEPTEMBER 1981
 . . . OCTOBER 1981

SOURCE: APA 1984 □ APPENDIX IV

ALASKA POWER AUTHORITY

WATANA PROJECT

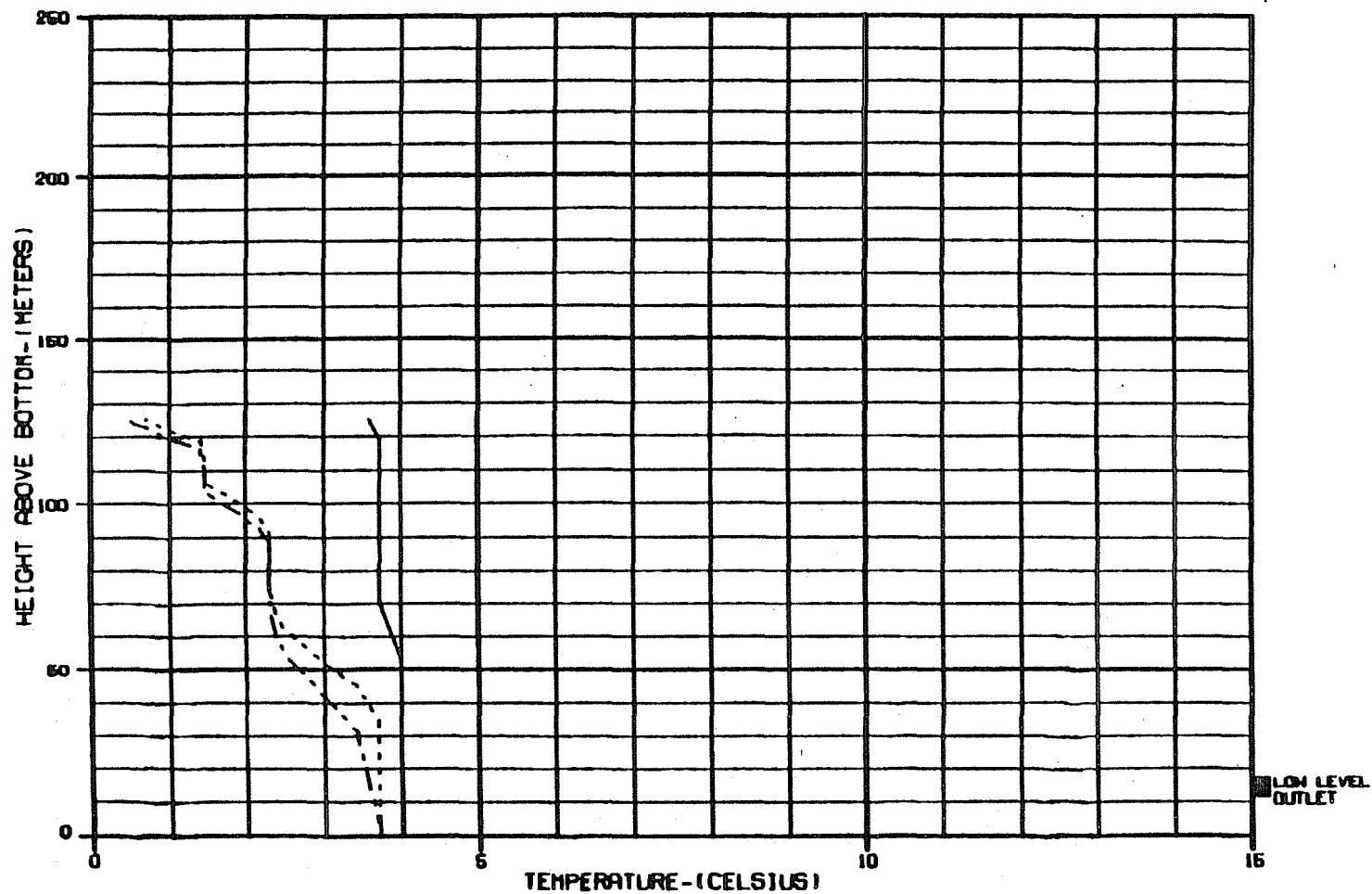
HYDRO MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DATE: 11-1-83

FIGURE E.2.4.7



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— NOVEMBER 1981
 - - - DECEMBER 1981
 - . - JANUARY 1982

SOURCE: APA 1984 ■ APPENDIX IV

ALASKA POWER AUTHORITY

WATANA PROJECT

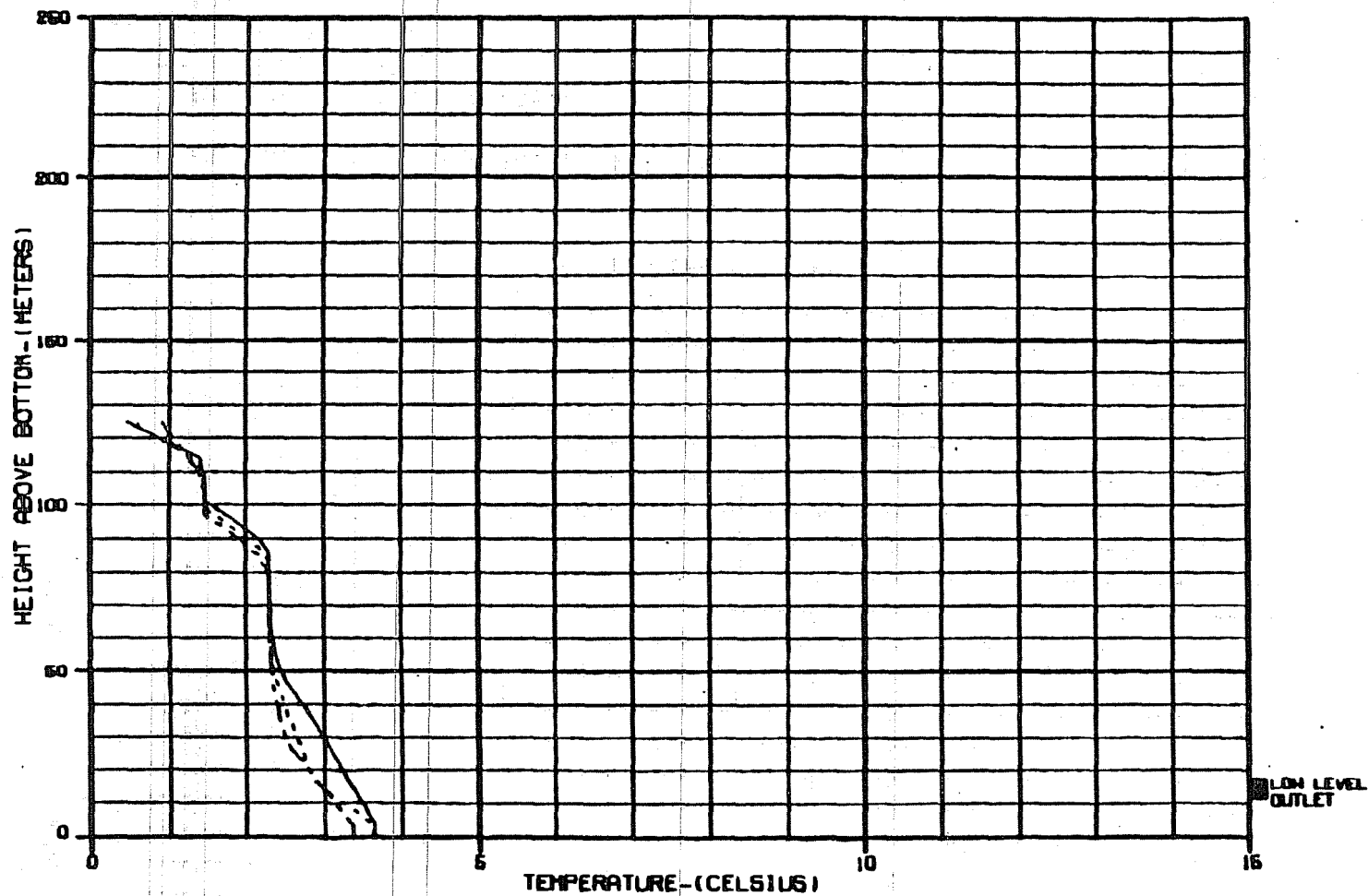
DYABOL MODEL

WATANA RESERVOIR
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHARTER: AL 1-8-82

FIGURE E.2.4.8



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

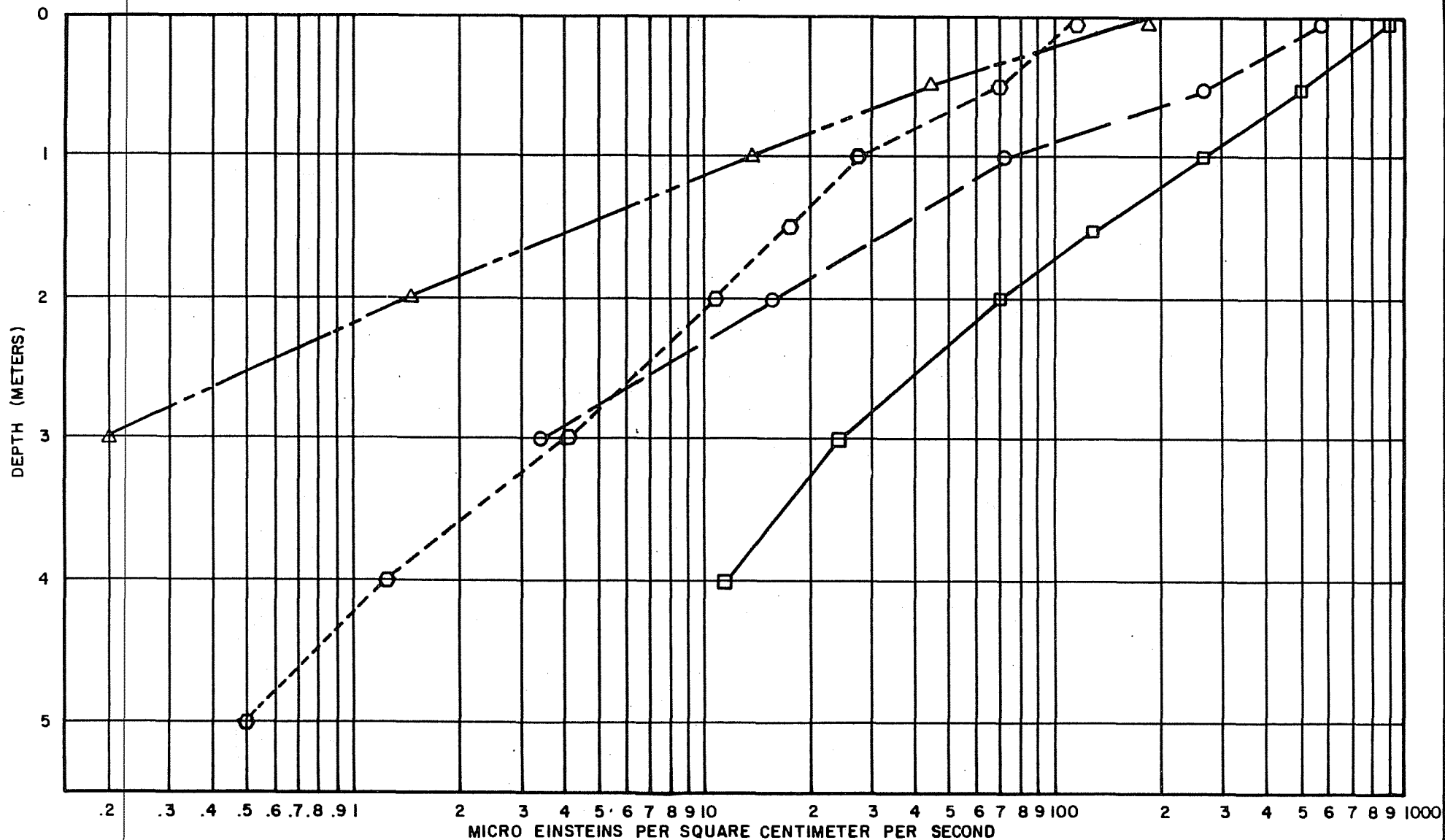
LEGEND:

PREDICTED TEMPERATURE PROFILES:

— FEBRUARY 1982
 - - - MARCH 1982
 - . - . APRIL 1982

SOURCE: APA 1984a APPENDIX IV

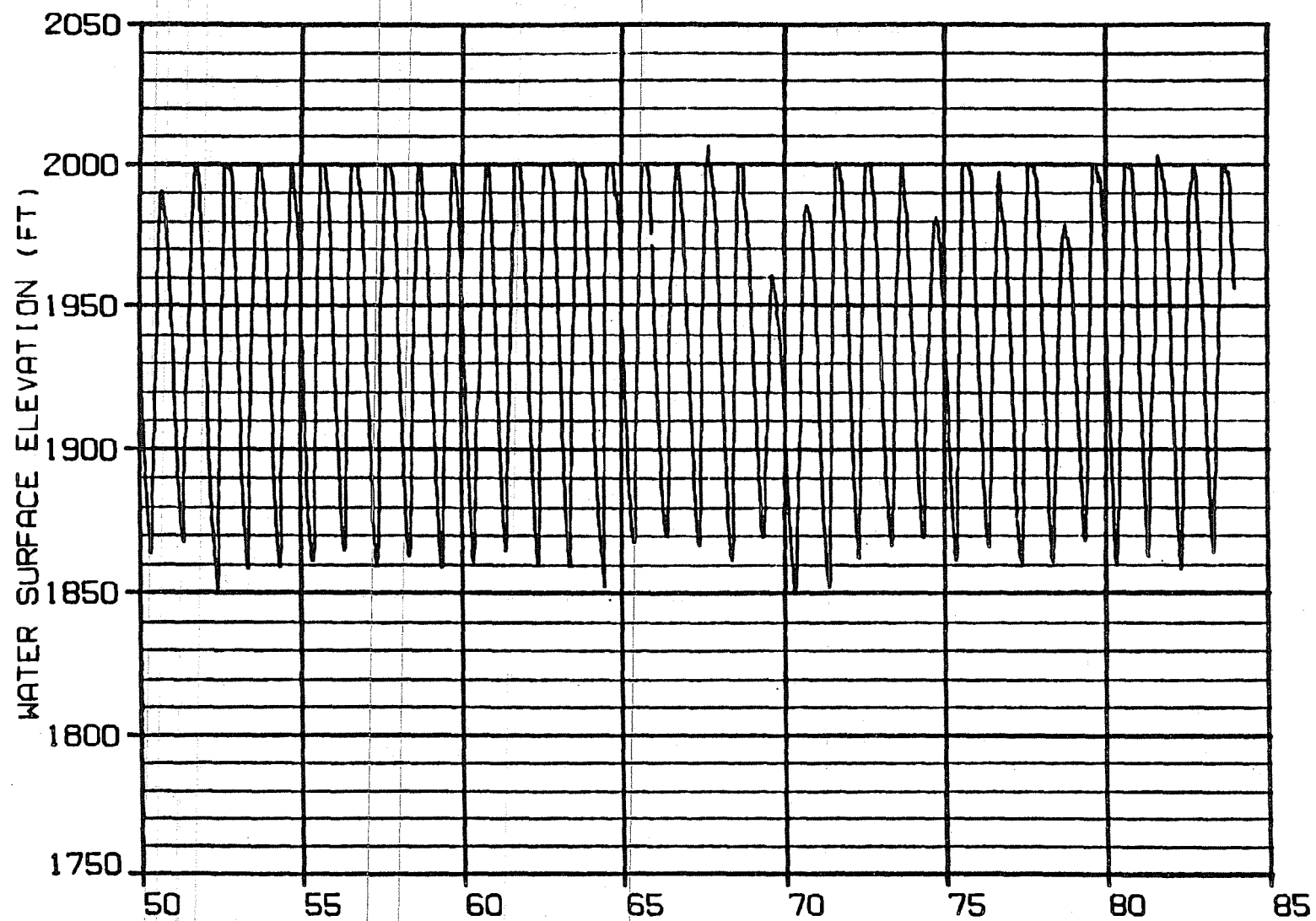
ALASKA POWER AUTHORITY	
SOUTH PROJECT	WATANA RESERVOIR
WATANA RESERVOIR TEMPERATURE PROFILES	
HARZA-EBASCO JOINT VENTURE	
DESIGNED BY: B. J. BENT	FIGURE E.2.4.9



LEGEND:

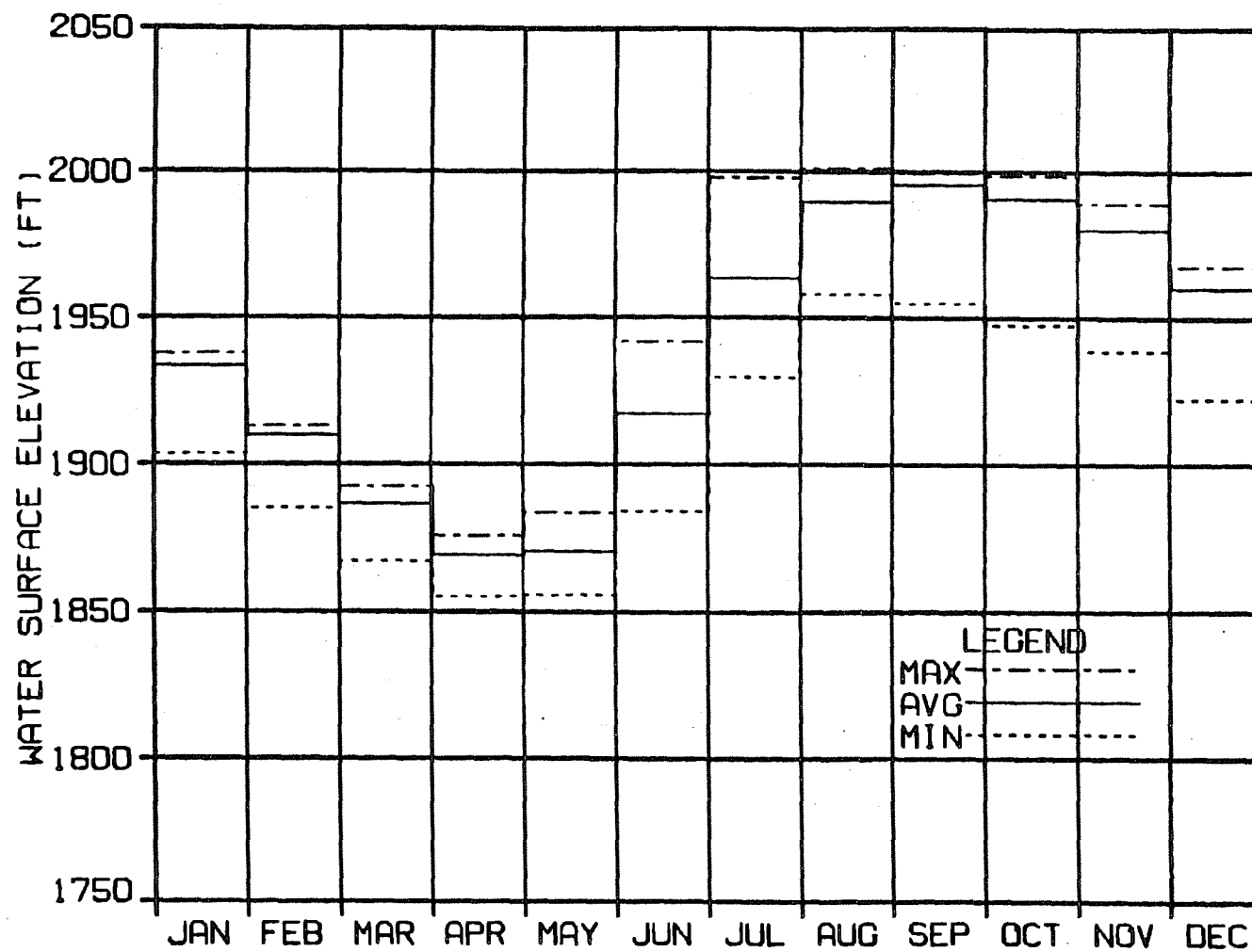
DATA	STATION	DATE
—□—	STA. II	JULY 15, 1982
—○—	STA. II	JULY 28, 1982
- - -○- - -	STA. II	SEPT. 10, 1982
- - -△- - -	STA. II	AUG. 10, 1982

EKLUTNA LAKE
LIGHT EXTINCTION
IN SITU MEASUREMENTS



WATANA WATER SURFACE ELEVATION, STAGE I

FIGURE E.2.4.11



WATANA WATER SURFACE ELEVATION
MONTHLY SUMMARY, STAGE I

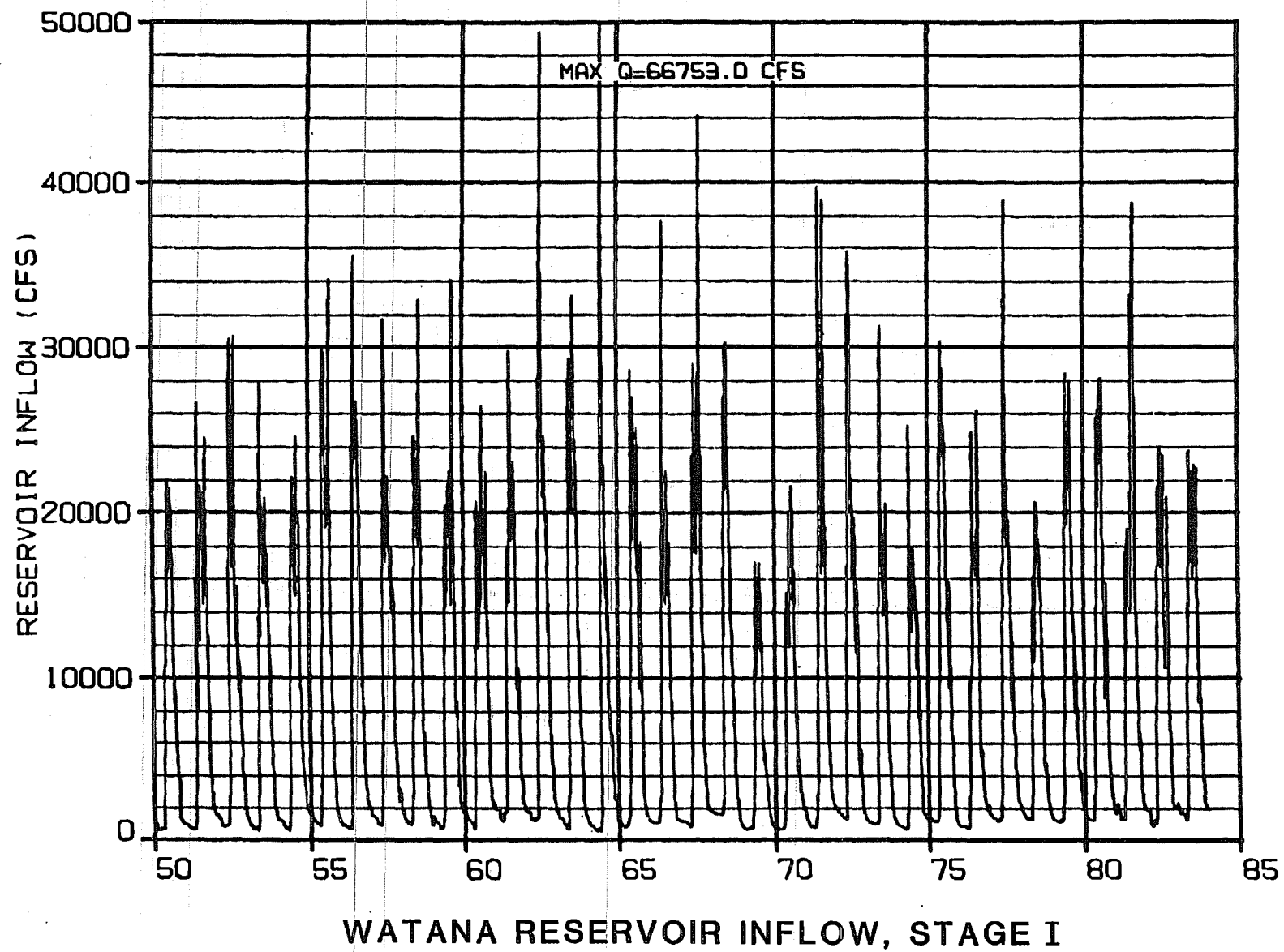
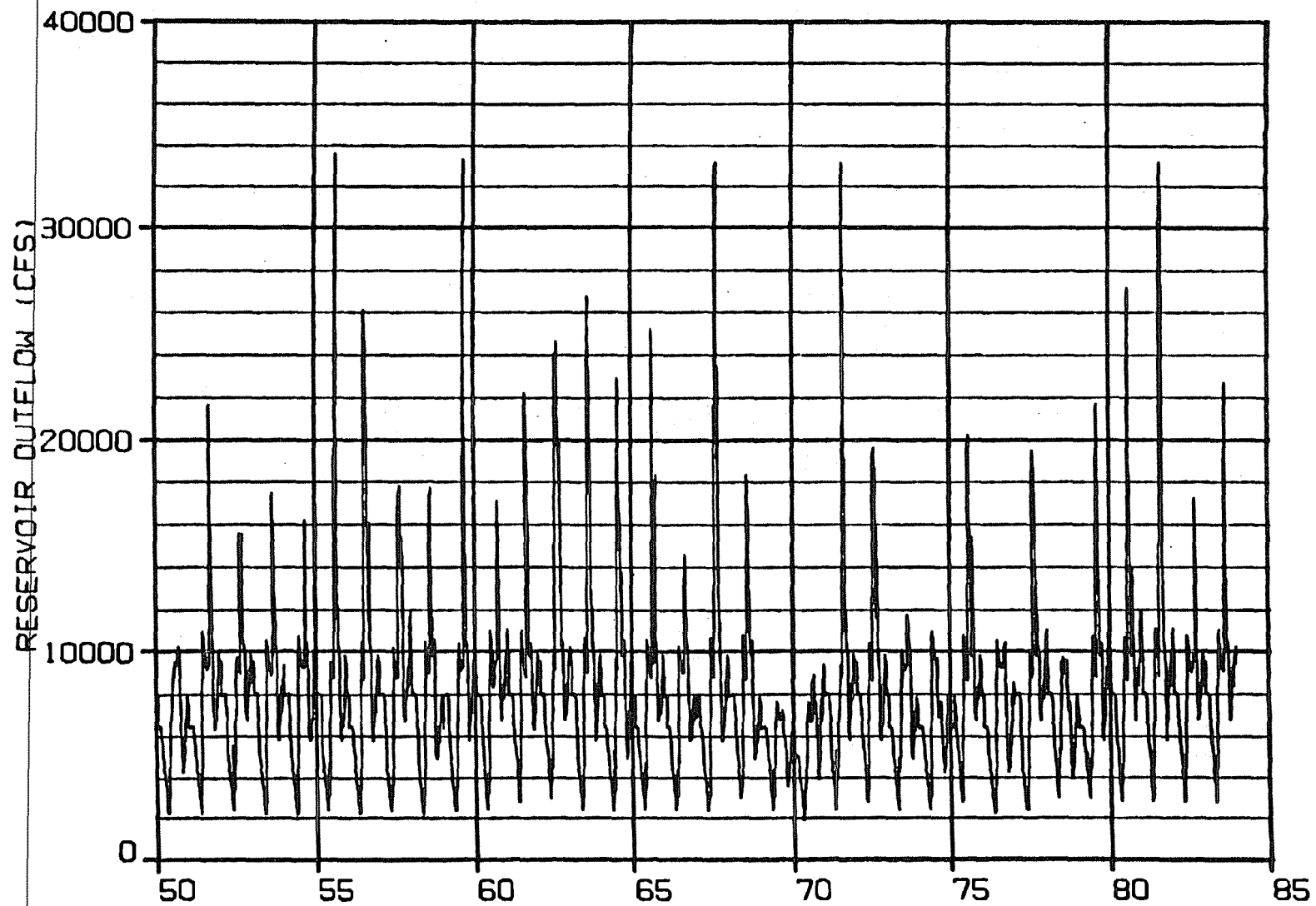
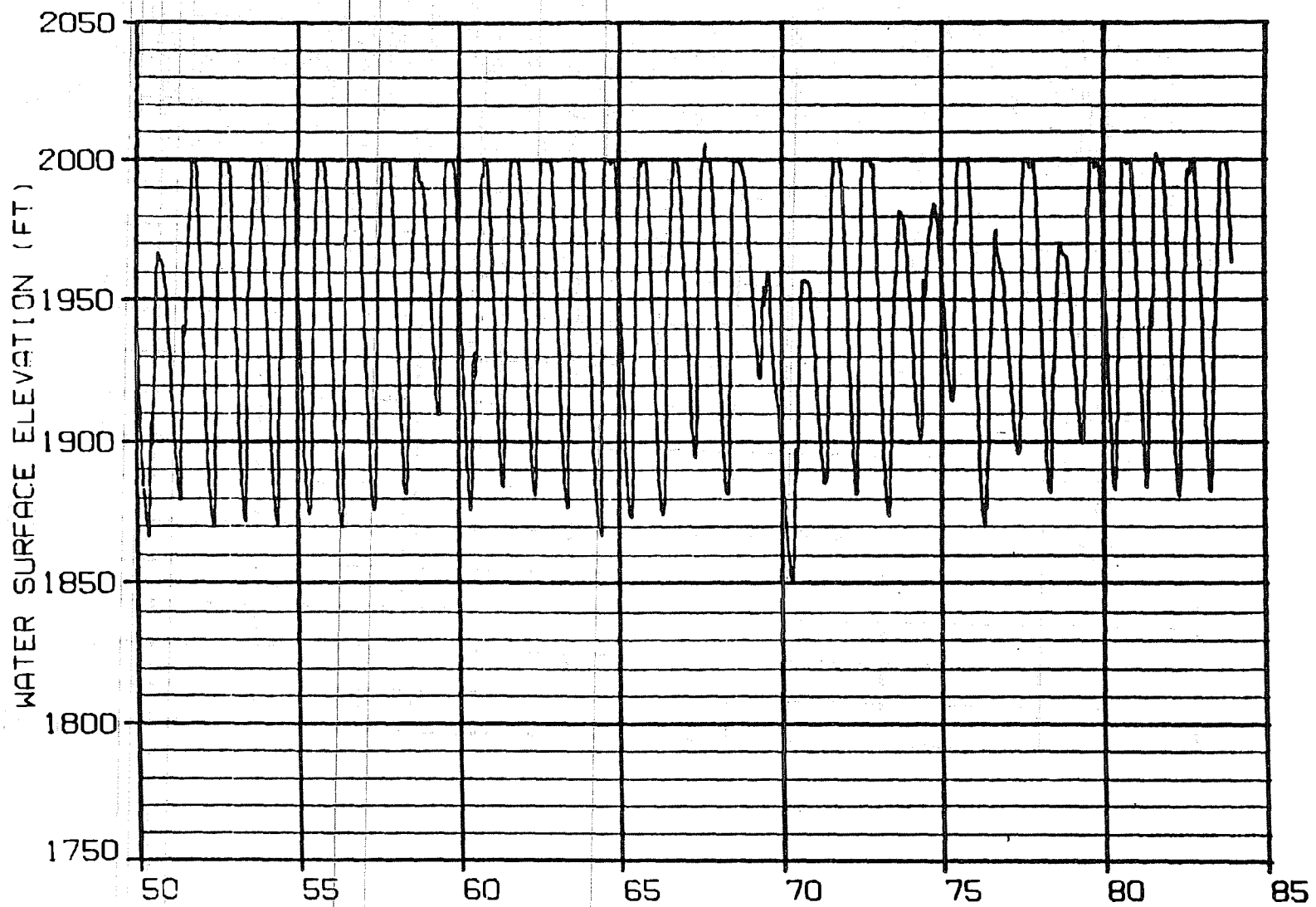


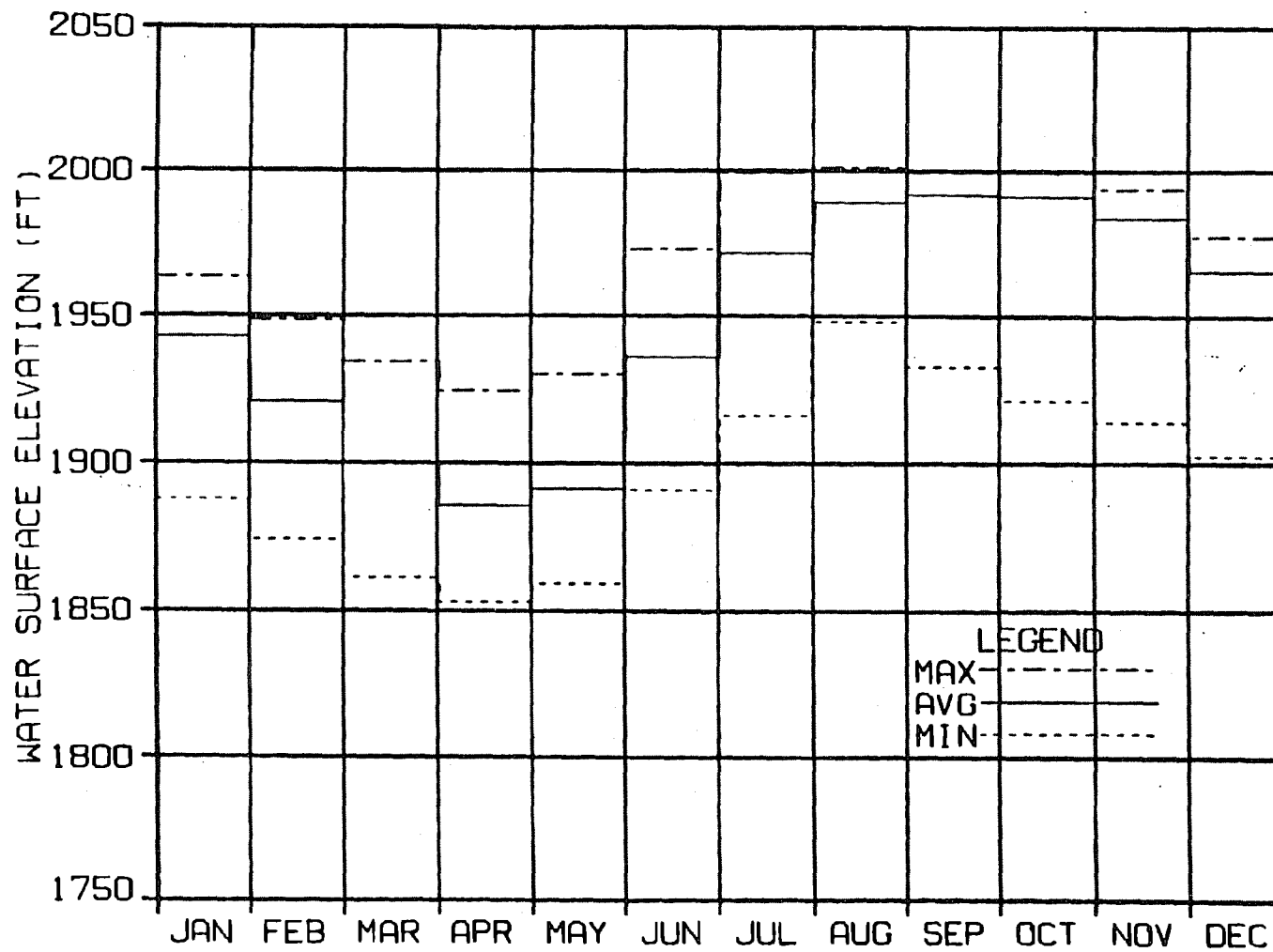
FIGURE E. 2. 4. 13



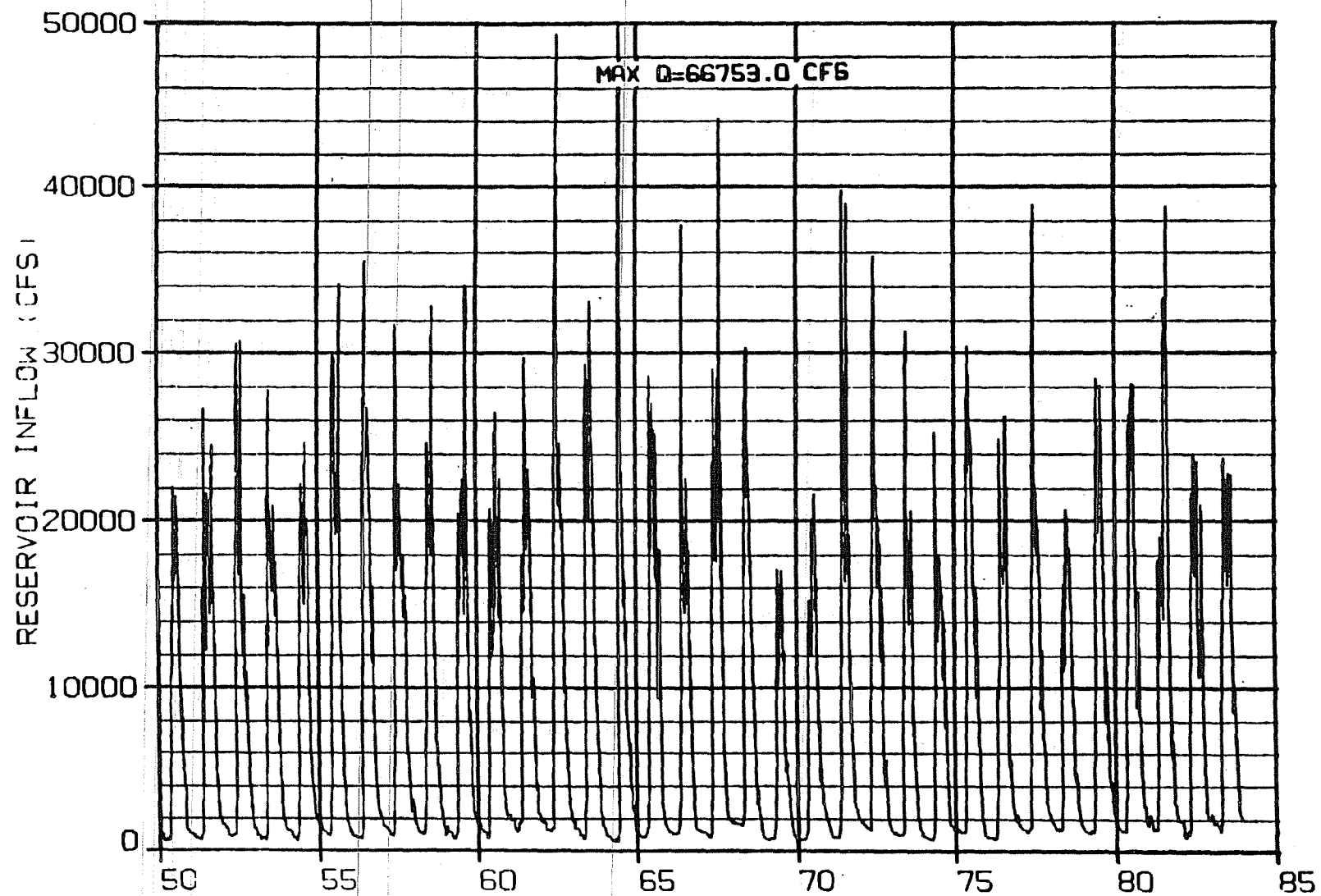
WATANA RESERVOIR OUTFLOW, STAGE I



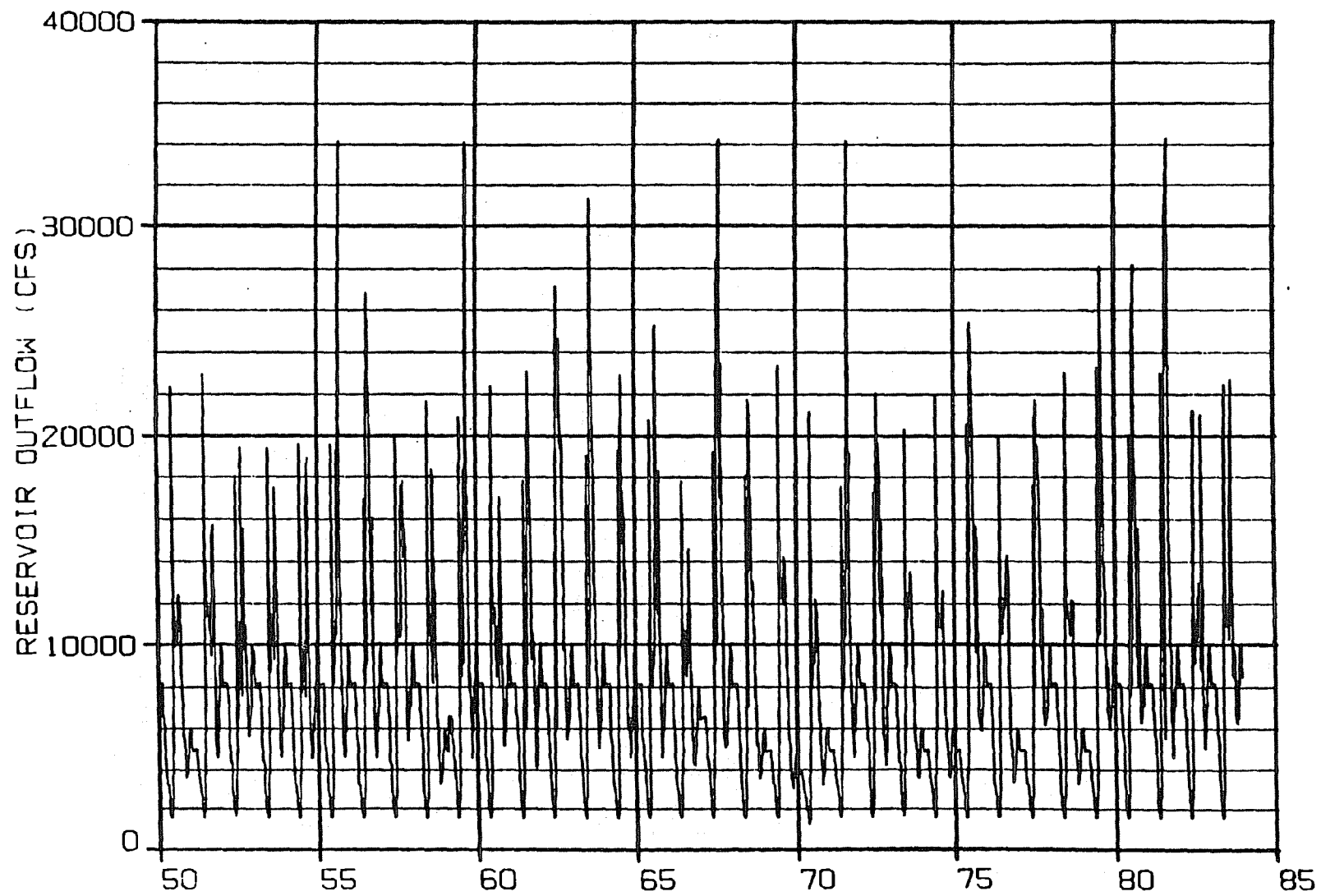
WATANA WATER SURFACE ELEVATION, E-I, STAGE I



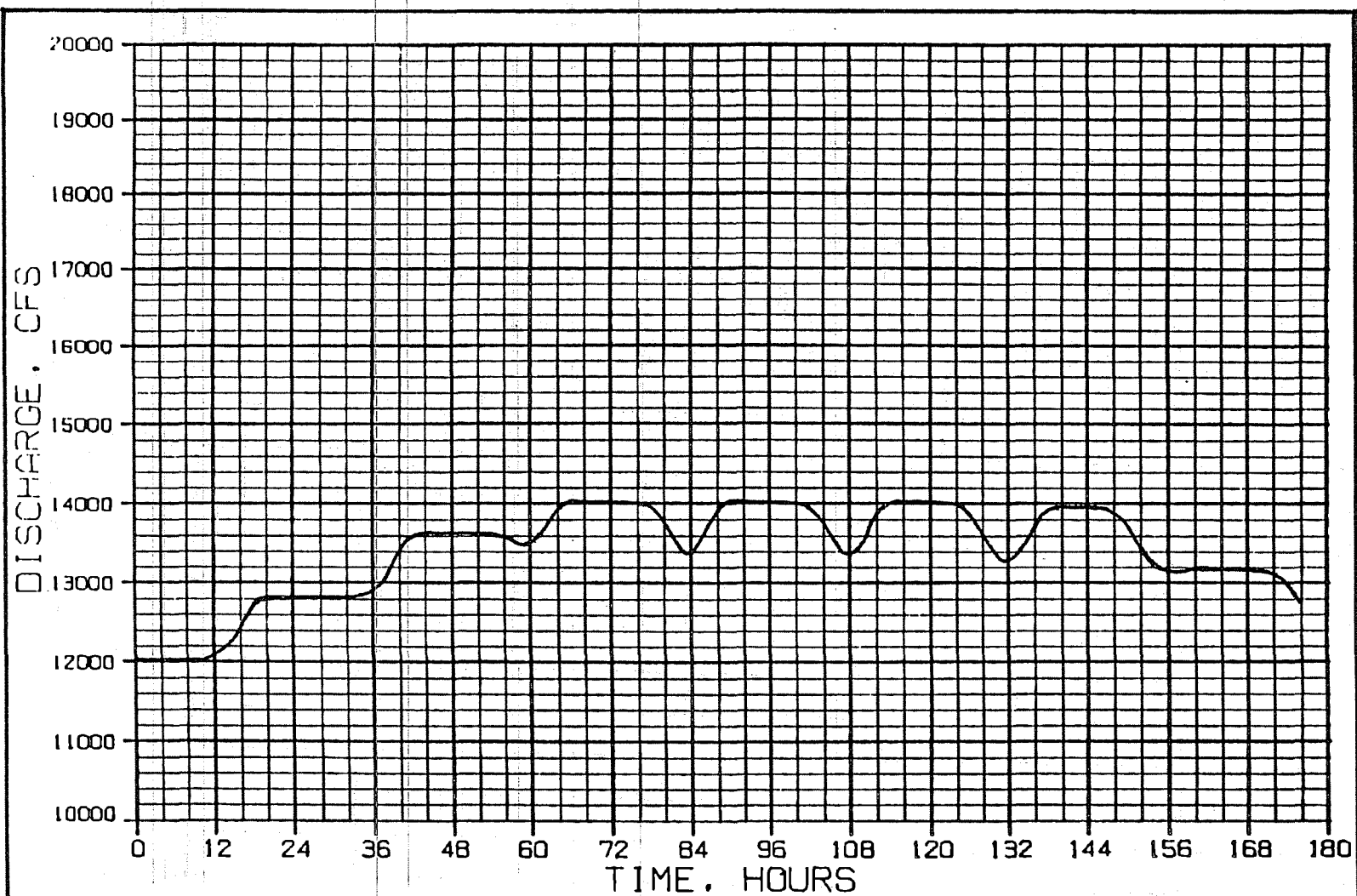
**WATANA WATER SURFACE ELEVATION
E-I, MONTHLY SUMMARY, STAGE I**



WATANA RESERVOIR INFLOW, E-I, STAGE I



WATANA RESERVOIR OUTFLOW, E-I, STAGE I



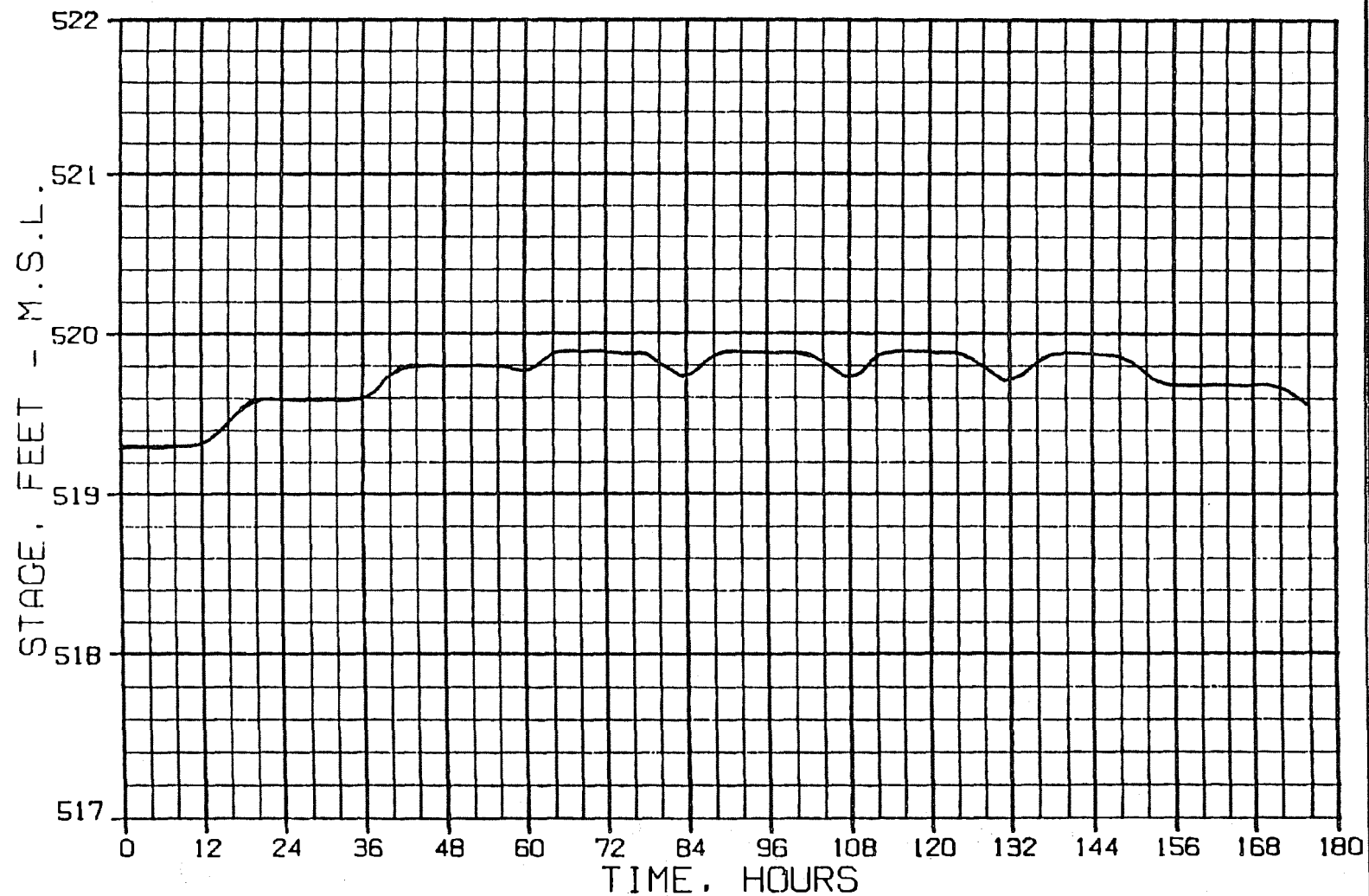
WATANA OPERATIONS ONLY
GUIDE E-VI.
CASE ACB *

DISCHARGE HYDROGRAPH
AT LRX-23, R.M. 120.26
(OXBOW II SIDE CHANNEL)

HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.19

* SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"



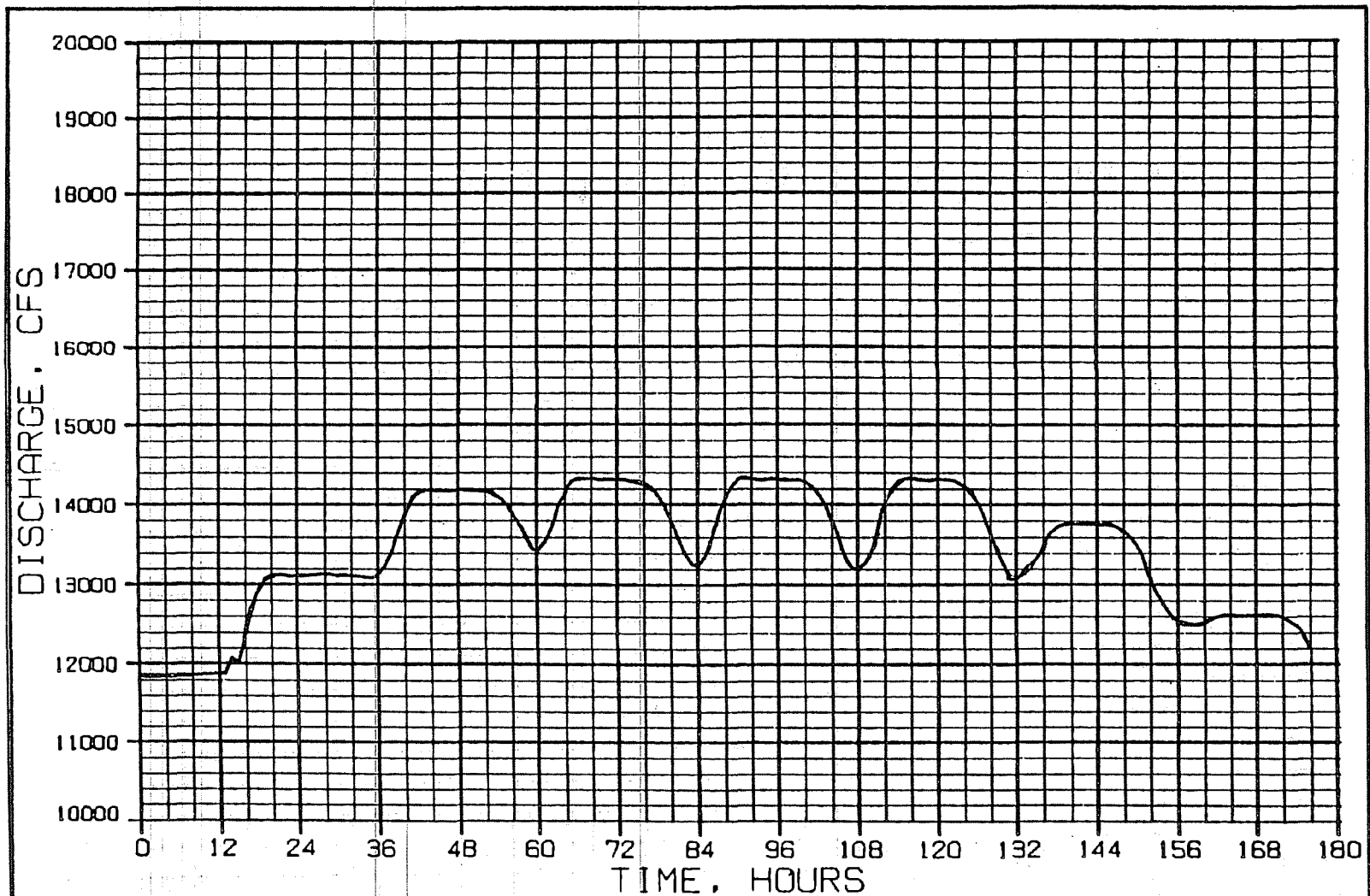
WATANA OPERATIONS ONLY
GUIDE E-VI.
CASE ACB *

RIVER STAGE HYDROGRAPH
AT LRX-23, R.M. 120.26
(OXBOW II SIDE CHANNEL)

HARZA-EBASCO SUBITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.20

* SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"



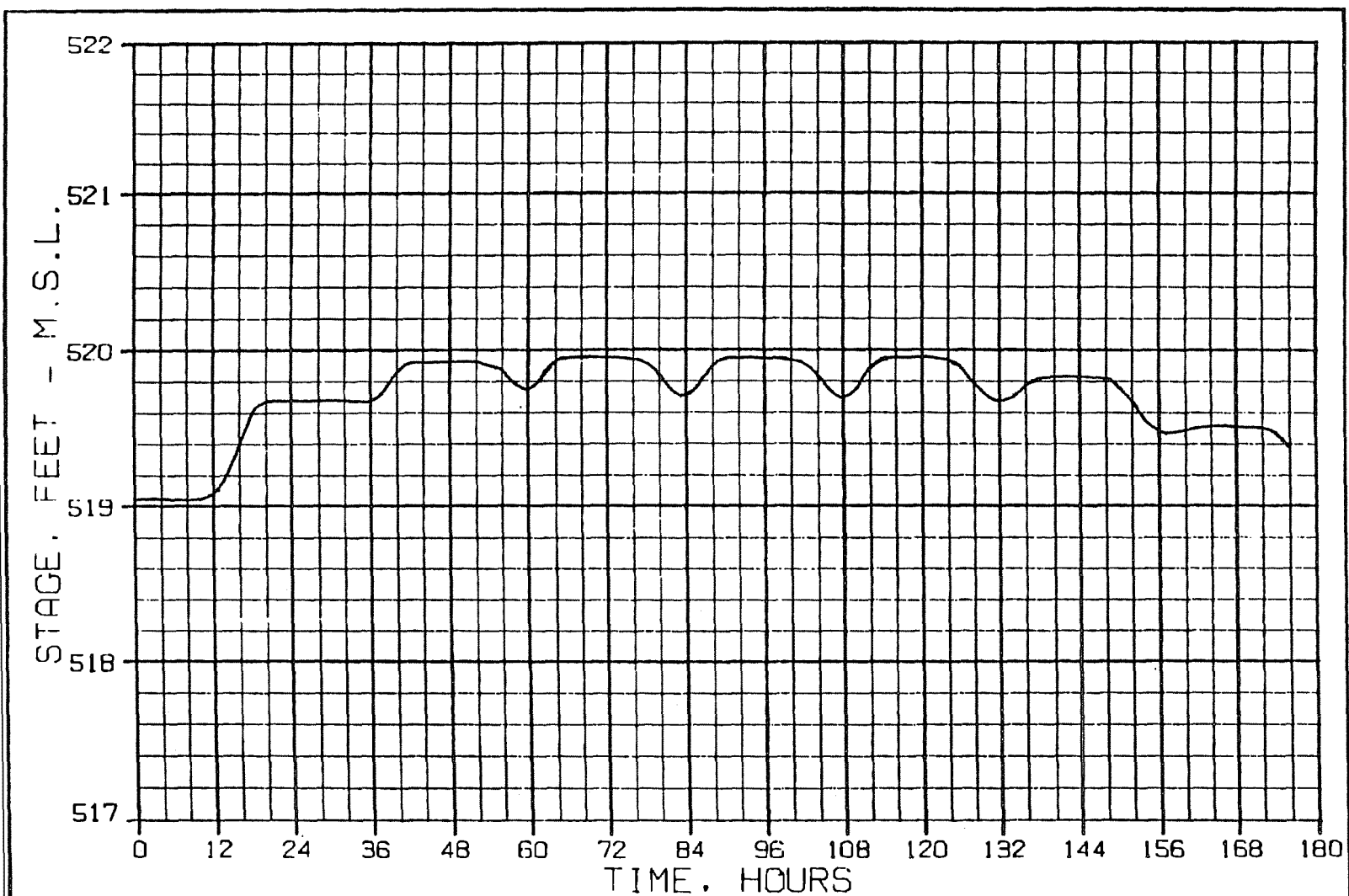
WATANA OPERATIONS ONLY
GUIDE E-VI.
CASE ACC *

DISCHARGE HYDROGRAPH
AT LRX-23, R.M. 120.26
(OXBOW II SIDE CHANNEL)

HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.21

* SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"



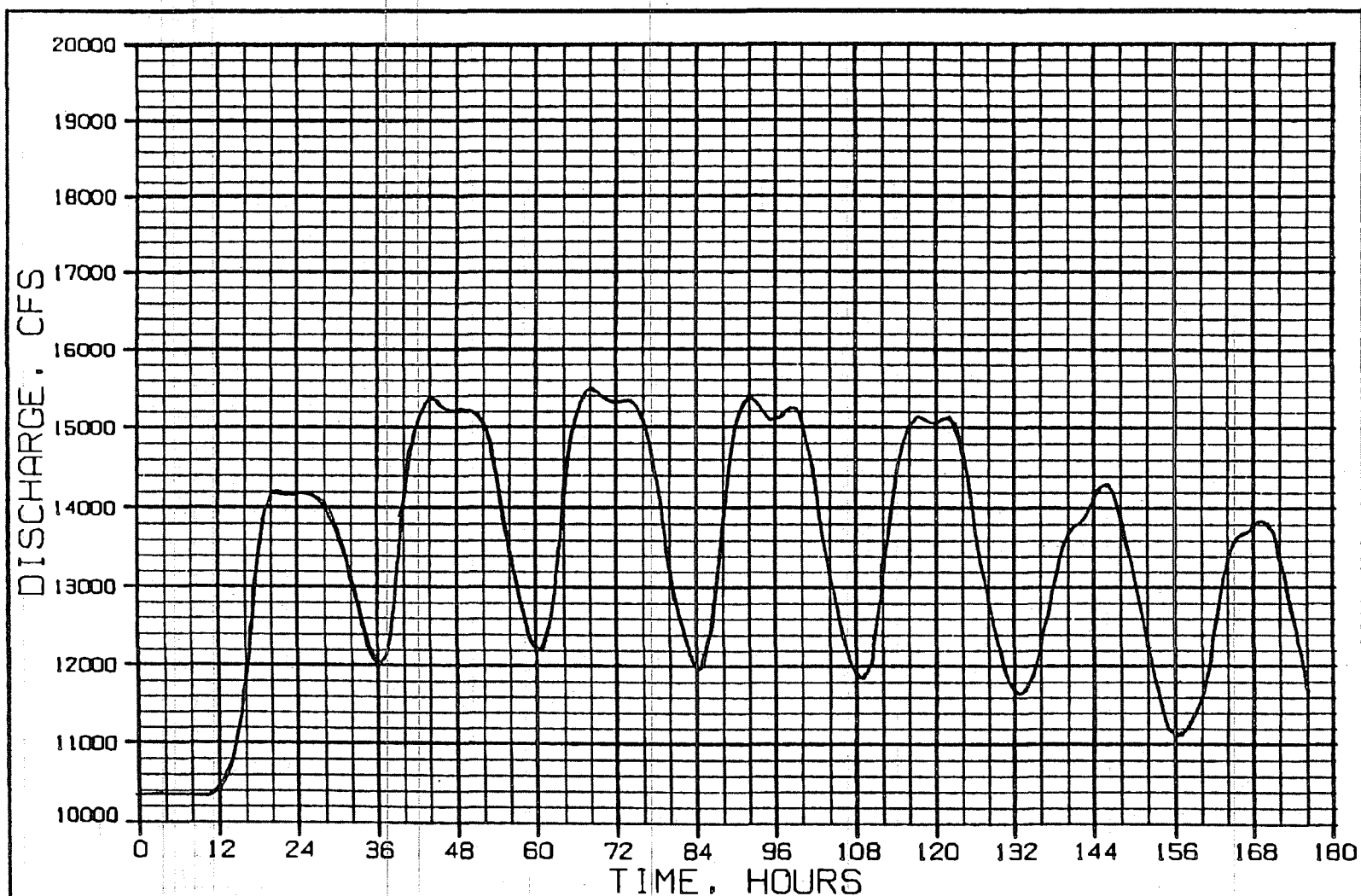
WATANA OPERATIONS ONLY
GUIDE E-VI.
CASE ACC *

RIVER STAGE HYDROGRAPH
AT LRX-23, R.M. 120.26
(OXBOW II SIDE CHANNEL)

WAFZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.22

* SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"



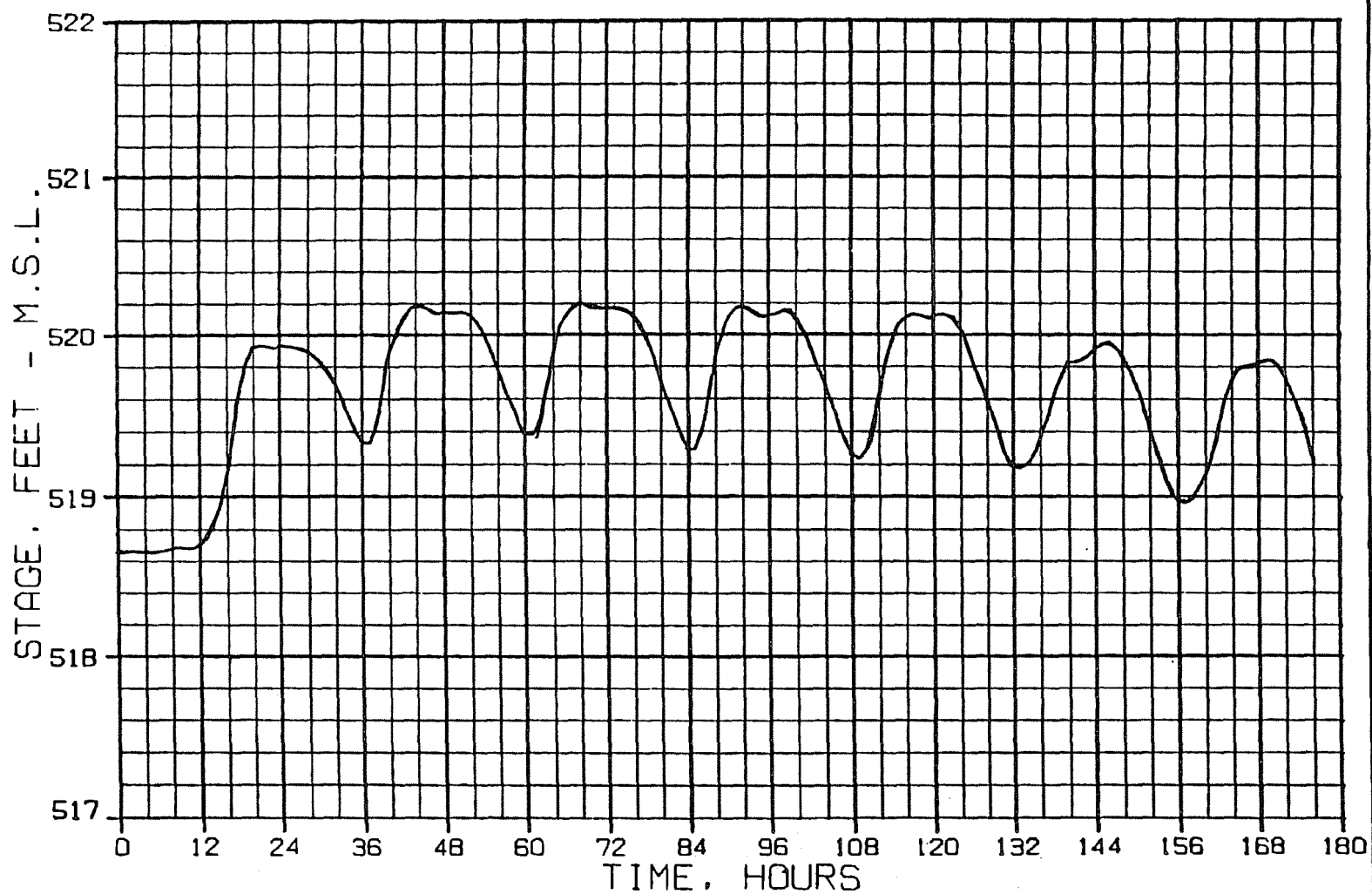
WATANA OPERATIONS ONLY
GUIDE E-VI,
CASE ACD *

DISCHARGE HYDROGRAPH
AT LRX-23, R.M. 120.26
(OXBOW II SIDE CHANNEL)

HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.23

* SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"



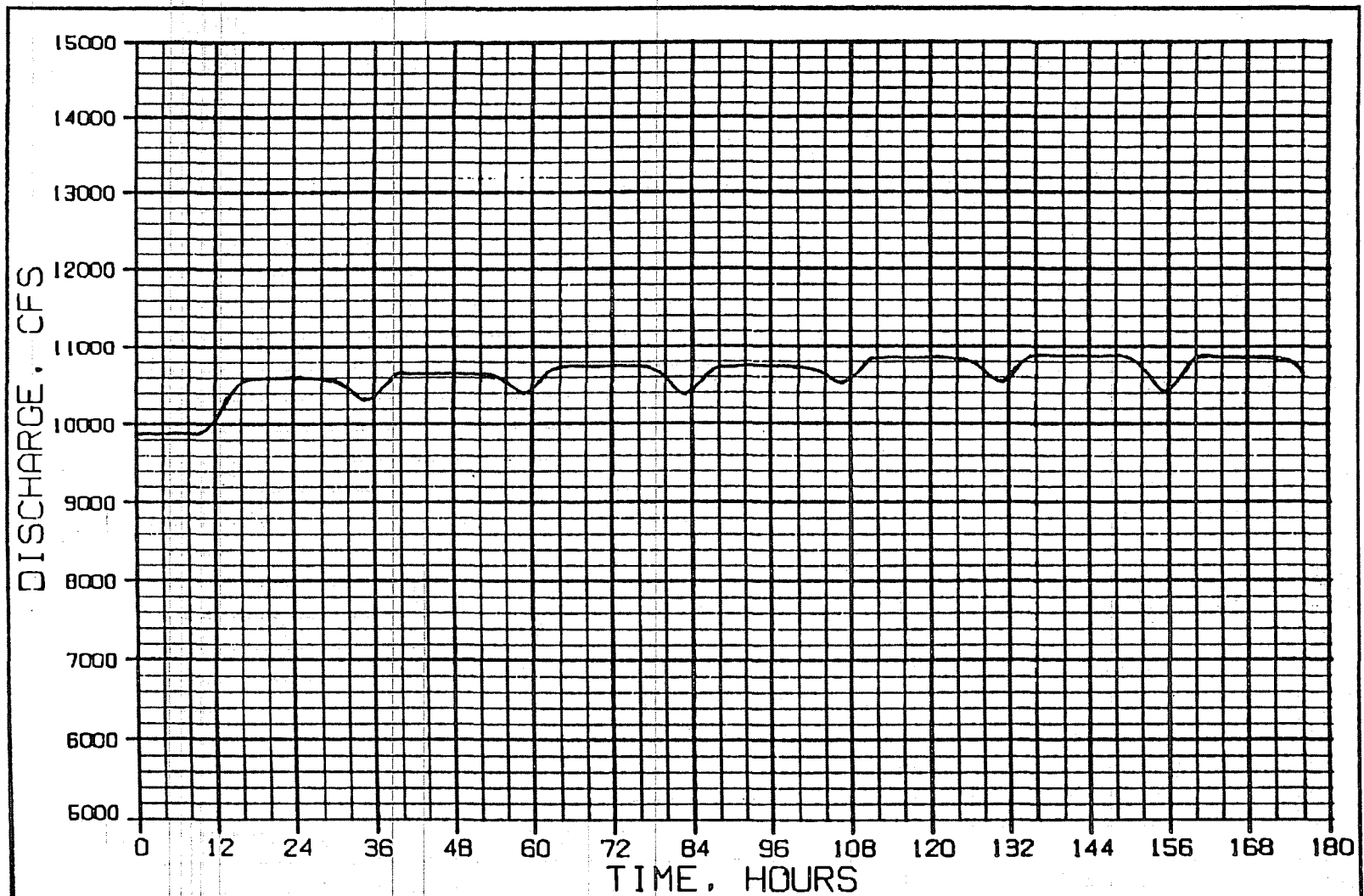
WATANA OPERATIONS ONLY
GUIDE E-VI,
CASE ACD *

RIVER STAGE HYDROGRAPH
AT LRX-23, R.M. 120.26
(OXBOW II SIDE CHANNEL)

HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.24

* SEE TABLE E.2.4.5 FOR DEFINATION OF "CASE"



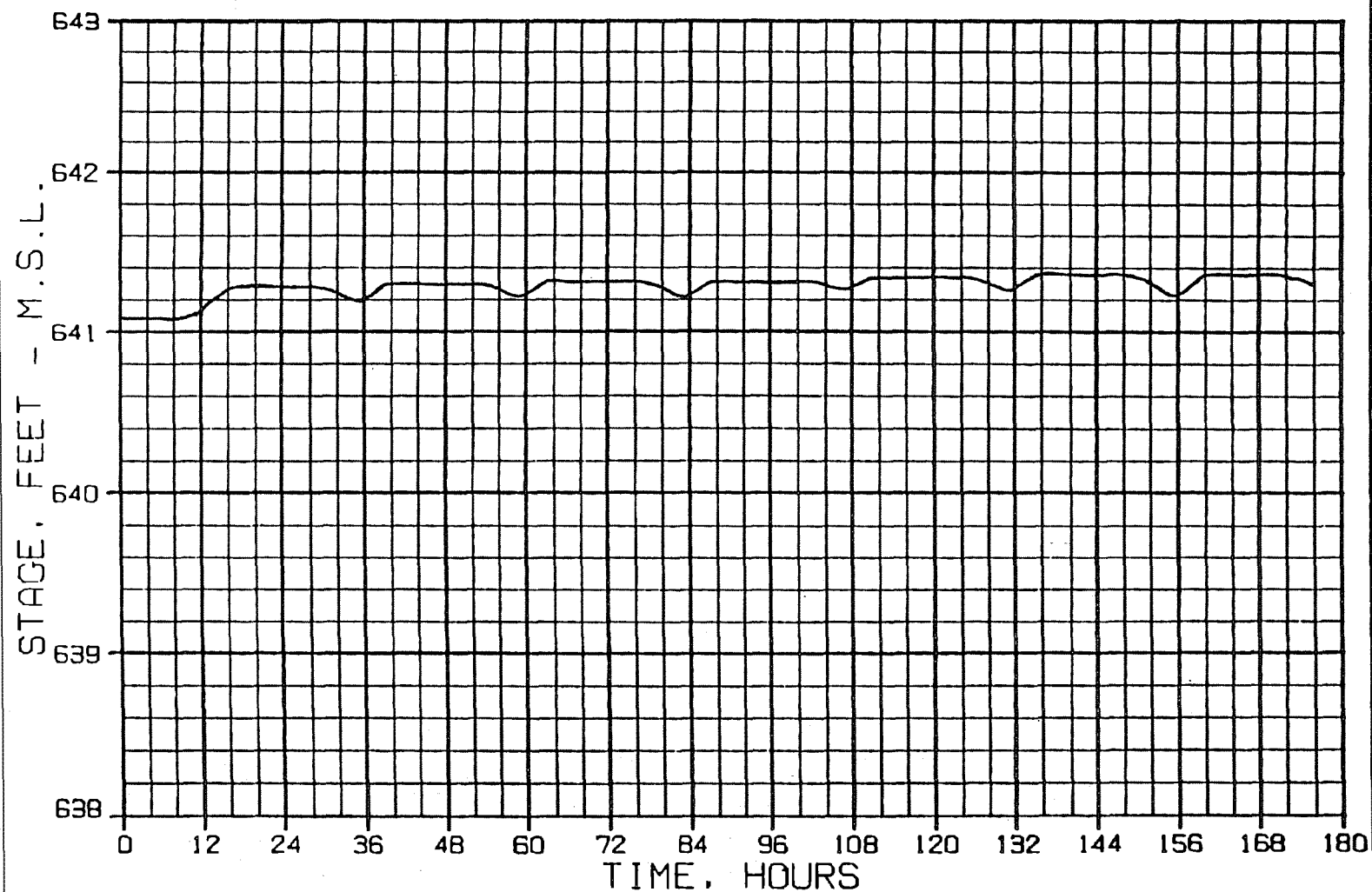
WATANA OPERATIONS ONLY
GUIDE E-VI,
CASE CBA *

DISCHARGE HYDROGRAPH
AT LRX-38, R.M. 132.90
(4TH OF JULY CREEK SIDE CHANNEL)

HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.25

* SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"



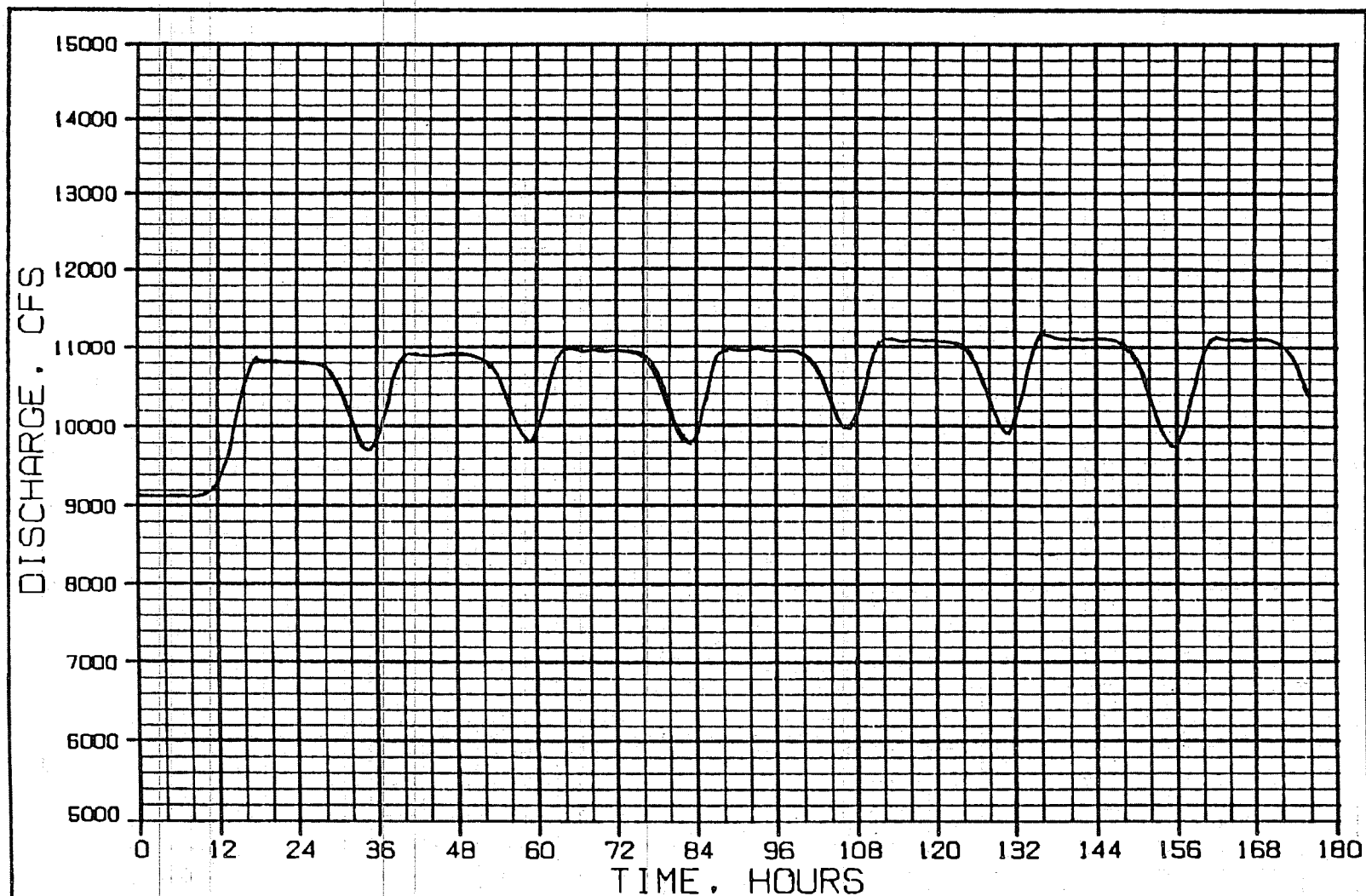
WATANA OPERATIONS ONLY
GUIDE E-VI.
CASE CBA *

RIVER STAGE HYDROGRAPH
AT LRX-38, R.M. 132.90
(4TH OF JULY CREEK SIDE CHANNEL)

HARZA-EBASCO SUBITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.26

* SEE TABLE E.2.4.5 FOR DEFINATION OF "CASE"



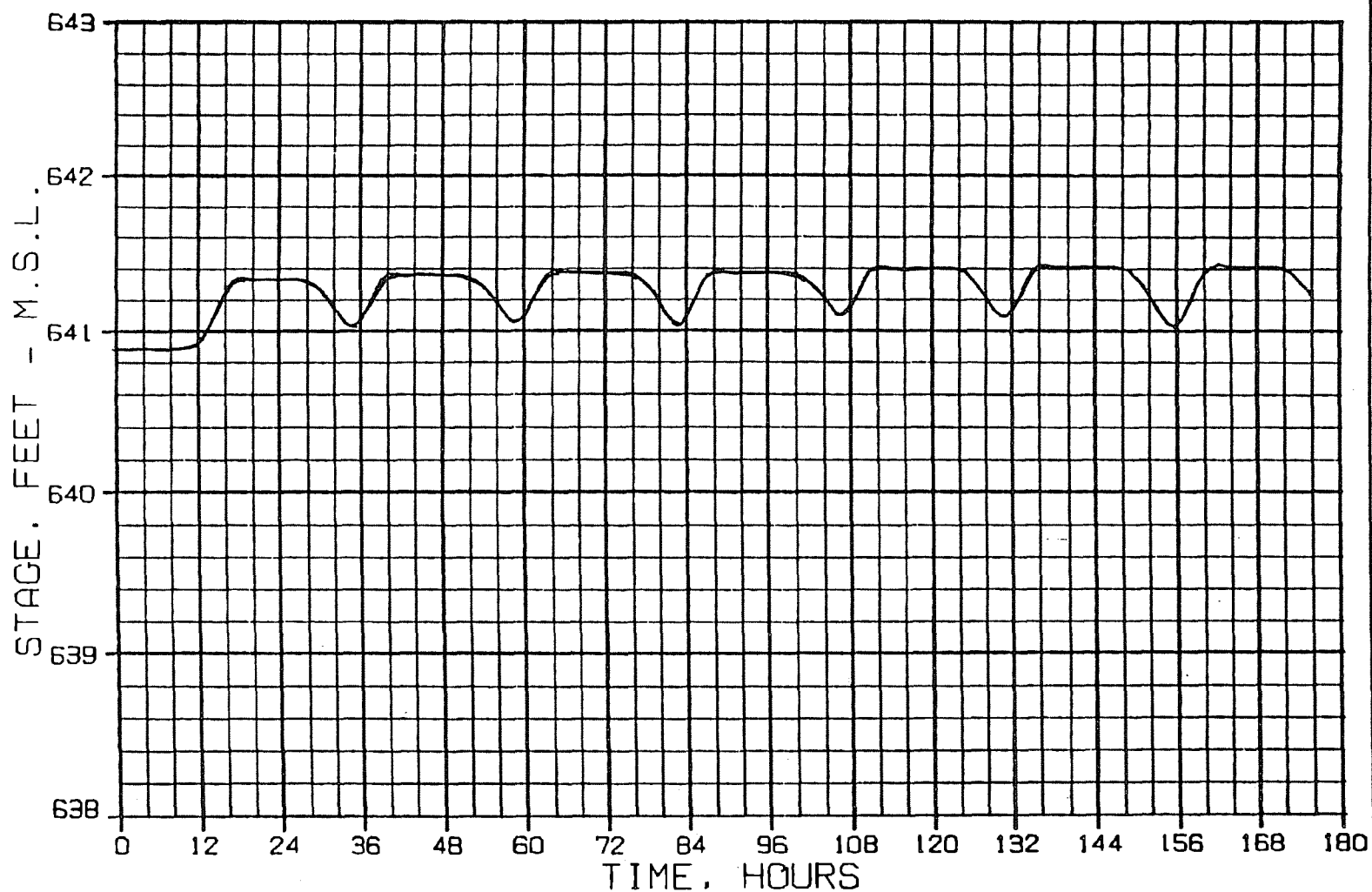
WATANA OPERATIONS ONLY
GUIDE E-VI,
CASE CCB *

DISCHARGE HYDROGRAPH
AT LRX-38, R.M. 132.90
(4TH OF JULY CREEK SIDE CHANNEL)

HARZA-EBASCO SUBITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.27

* SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"



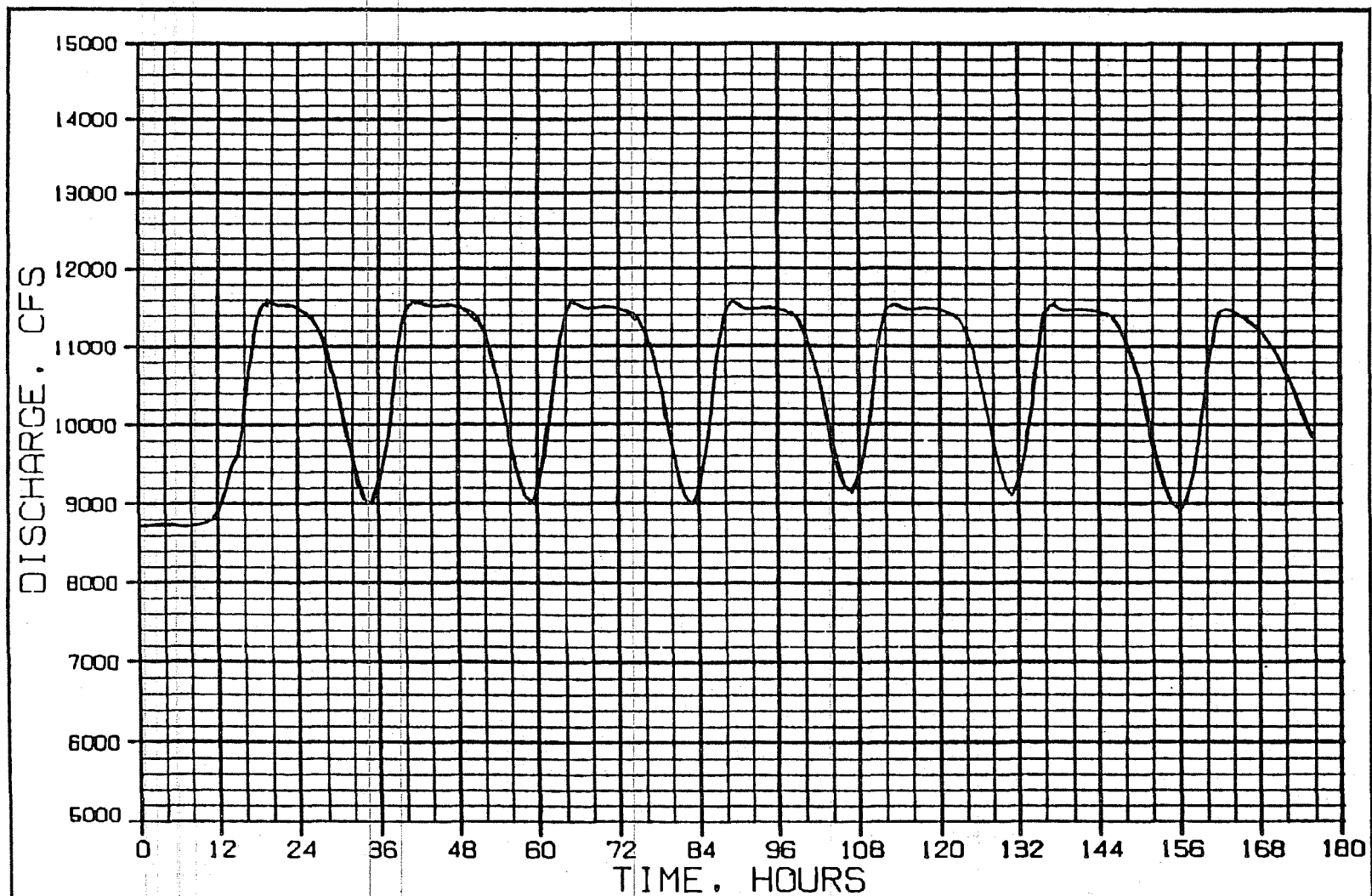
WATANA OPERATIONS ONLY
GUIDE E-VI.
CASE CCB *

RIVER STAGE HYDROGRAPH
AT LRX-38, R.M. 132.90
(4TH OF JULY CREEK SIDE CHANNEL)

HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.28

* SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"



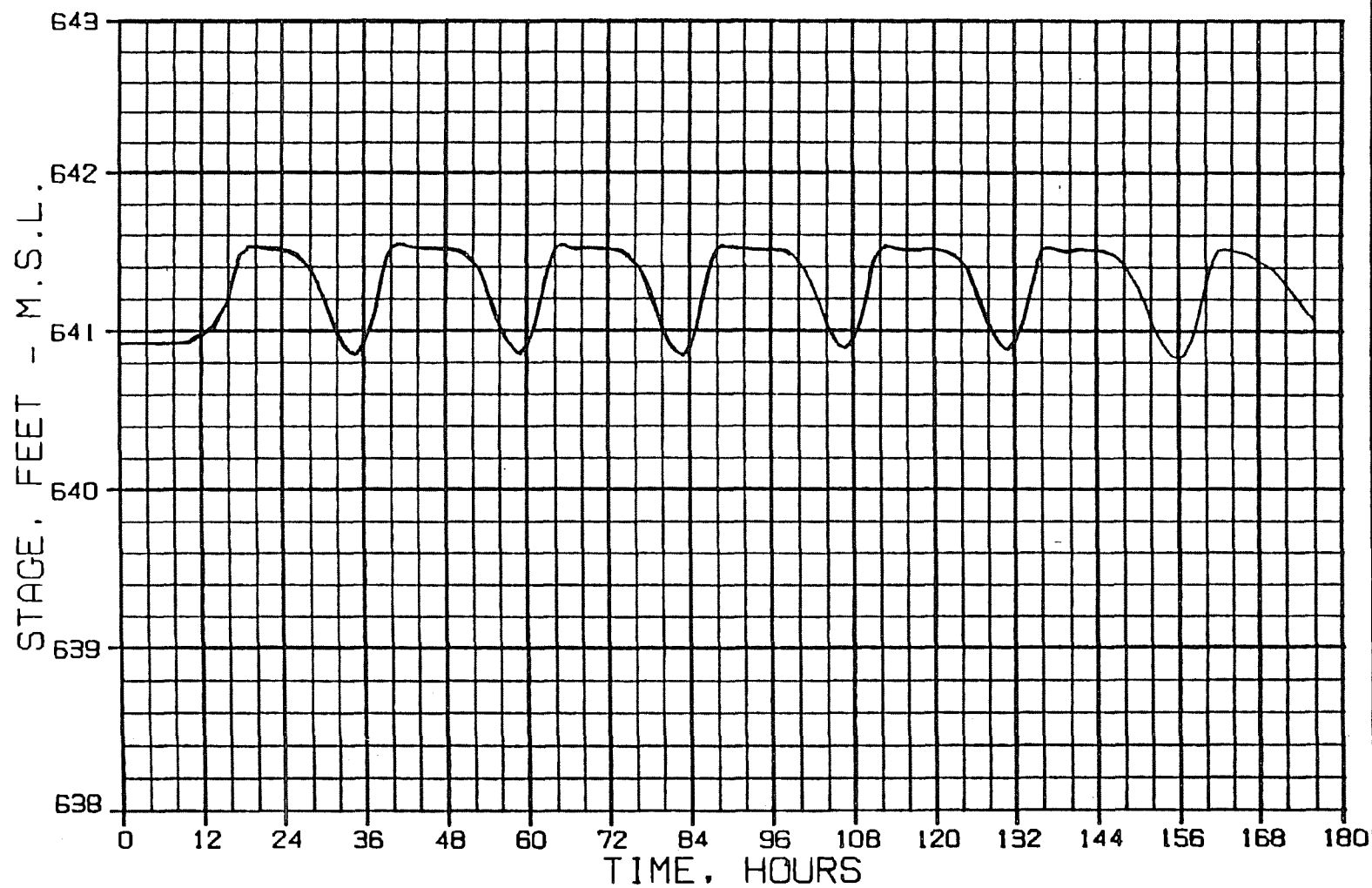
WATANA OPERATIONS ONLY
GUIDE E-VI.
CASE CCD *

DISCHARGE HYDROGRAPH
AT LRX-38, R.M. 132.90
(4TH OF JULY CREEK SIDE CHANNEL)

HARZA-EBASCO SUBITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.29

* SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"



WATANA OPERATIONS ONLY
GUIDE E-VI.
CASE CCD *

RIVER STAGE HYDROGRAPH
AT LRX-38. R.M. 132.90
(4TH OF JULY CREEK SIDE CHANNEL)

HARZA-EBASCO SUBITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.30

*SEE TABLE E.2.4.5 FOR DEFINITION OF "CASE"

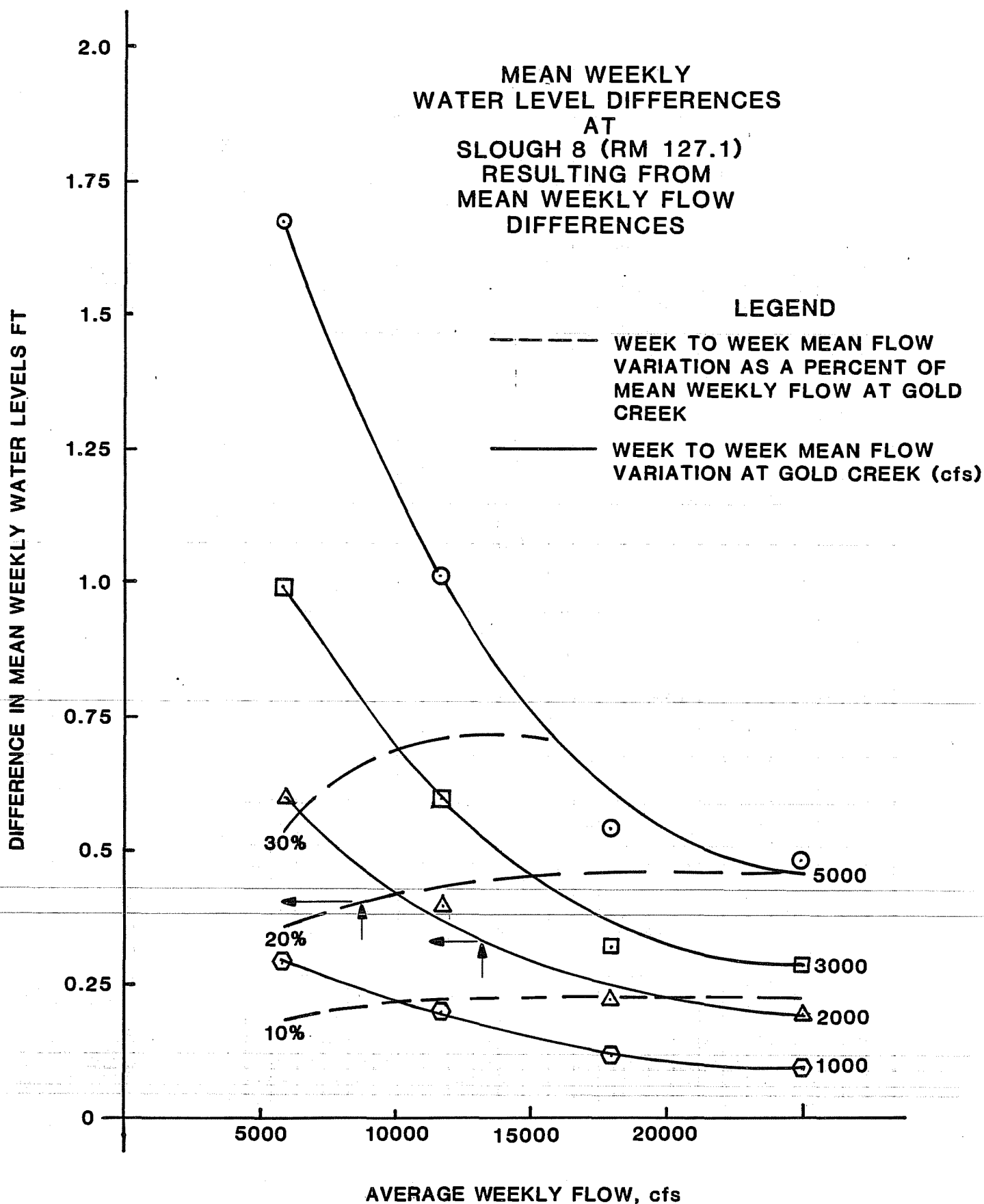


FIGURE E.2.4.31

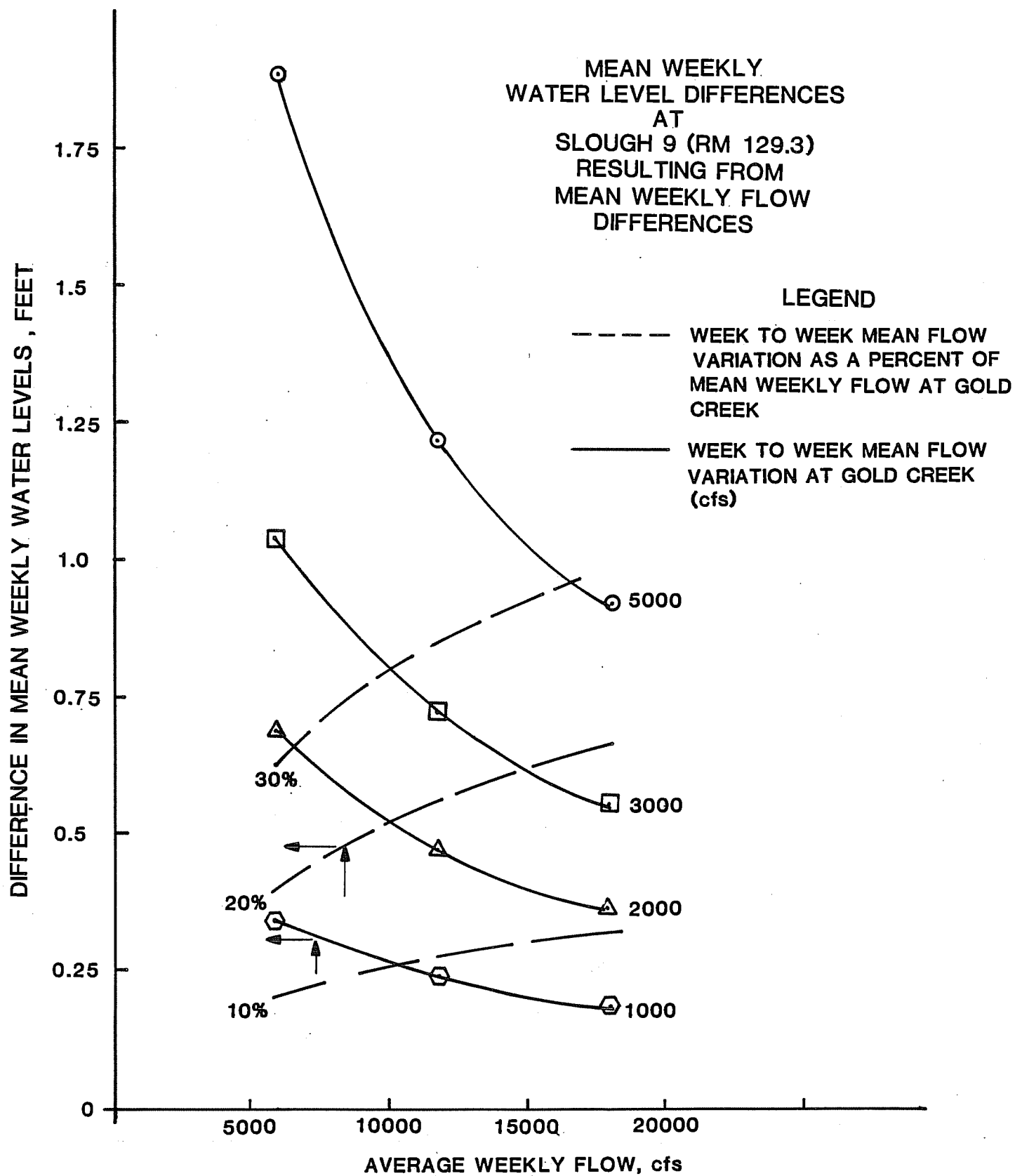


FIGURE E.2.4.32

MEAN WEEKLY WATER
LEVEL DIFFERENCES
AT
SLOUGH 11 (RM 136.7)
RESULTING FROM
MEAN WEEKLY FLOW
DIFFERENCES

DIFFERENCE IN MEAN WEEKLY WATER LEVELS, FEET

2.0
1.75
1.5
1.25
1.0
0.75
0.5
0.25
0

LEGEND

- WEEK TO WEEK MEAN FLOW VARIATION AS A PERCENT OF MEAN WEEKLY FLOW AT GOLD CREEK
- WEEK TO WEEK MEAN FLOW VARIATION AT GOLD CREEK (cfs)

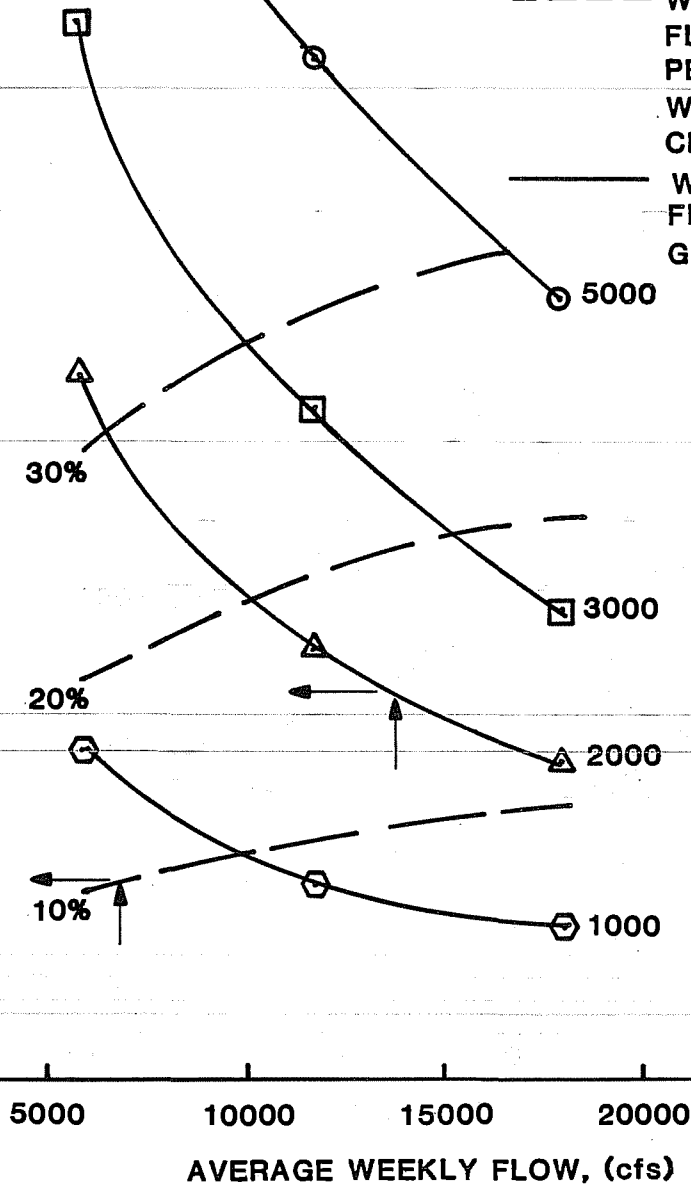
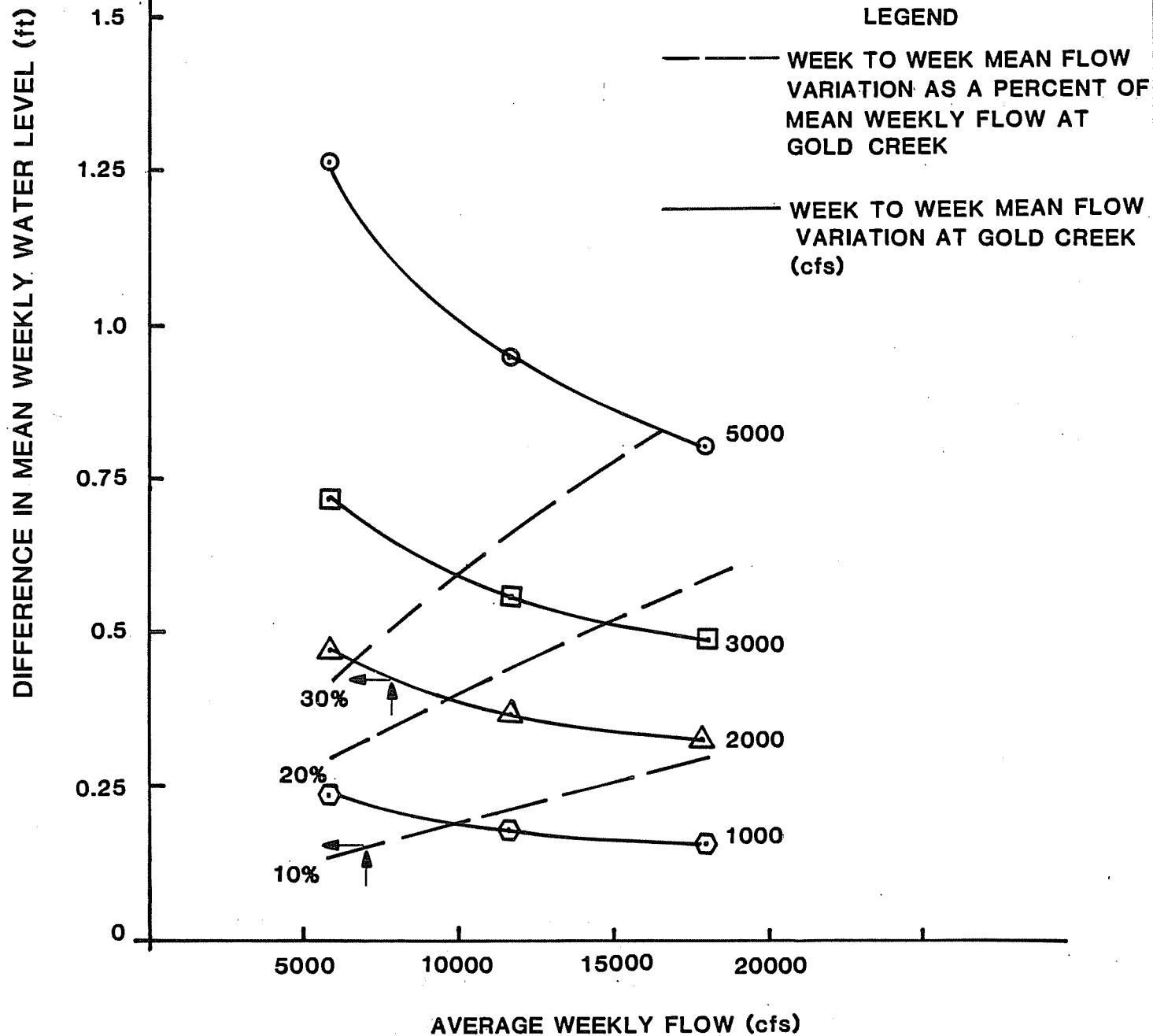
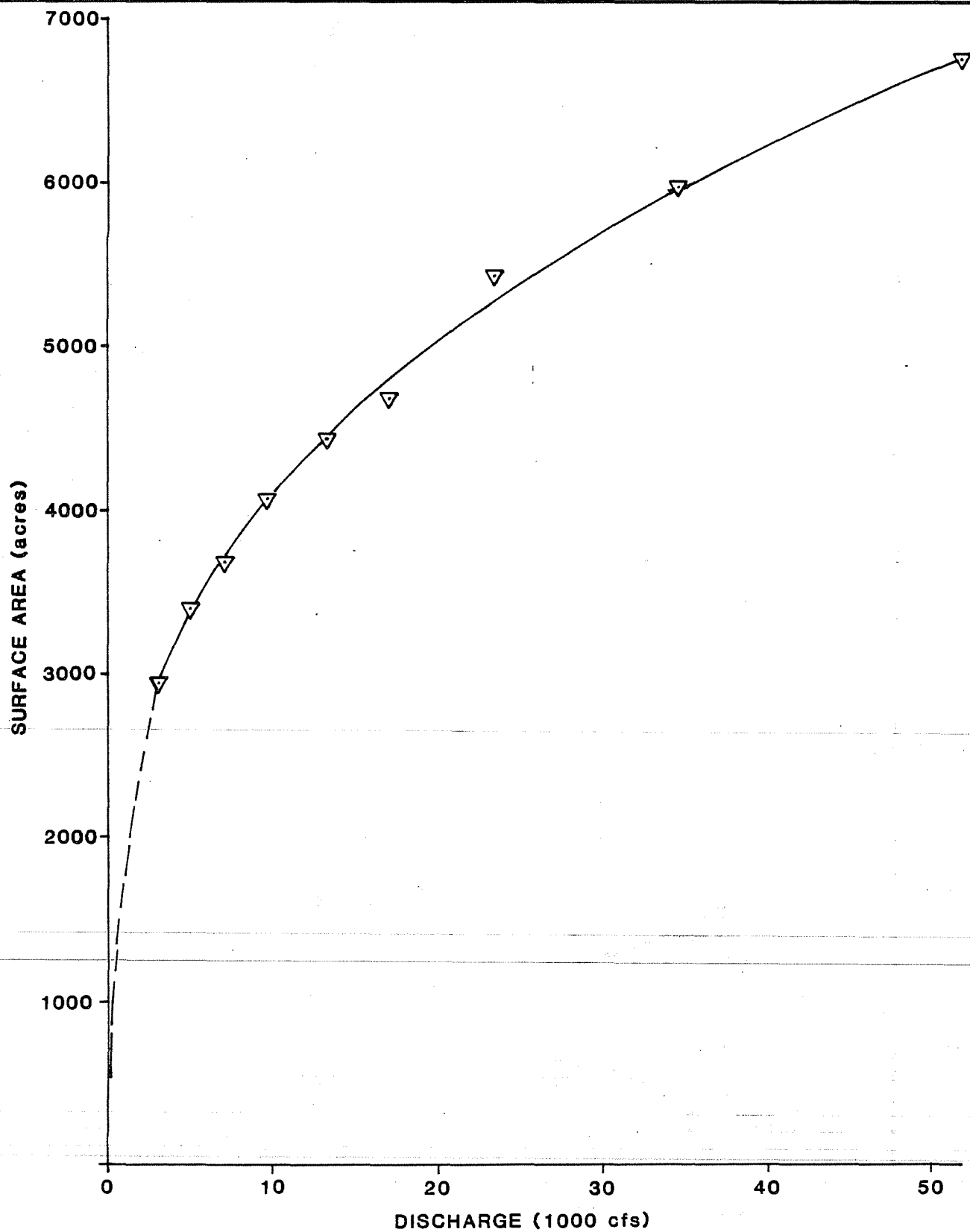


FIGURE E.2.4.33

MEAN WEEKLY
WATER LEVEL DIFFERENCES
AT SLOUGH 21 (RM 142.2)
RESULTING FROM
MEAN WEEKLY FLOW
DIFFERENCES





**SURFACE AREA VS DISCHARGE
SUSITNA RIVER BETWEEN
DEVIL CANYON AND CHULITNA RIVER**

FIGURE E.2.4.35

Discharge in cfs

THOUSANDS

80

70

60

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Month

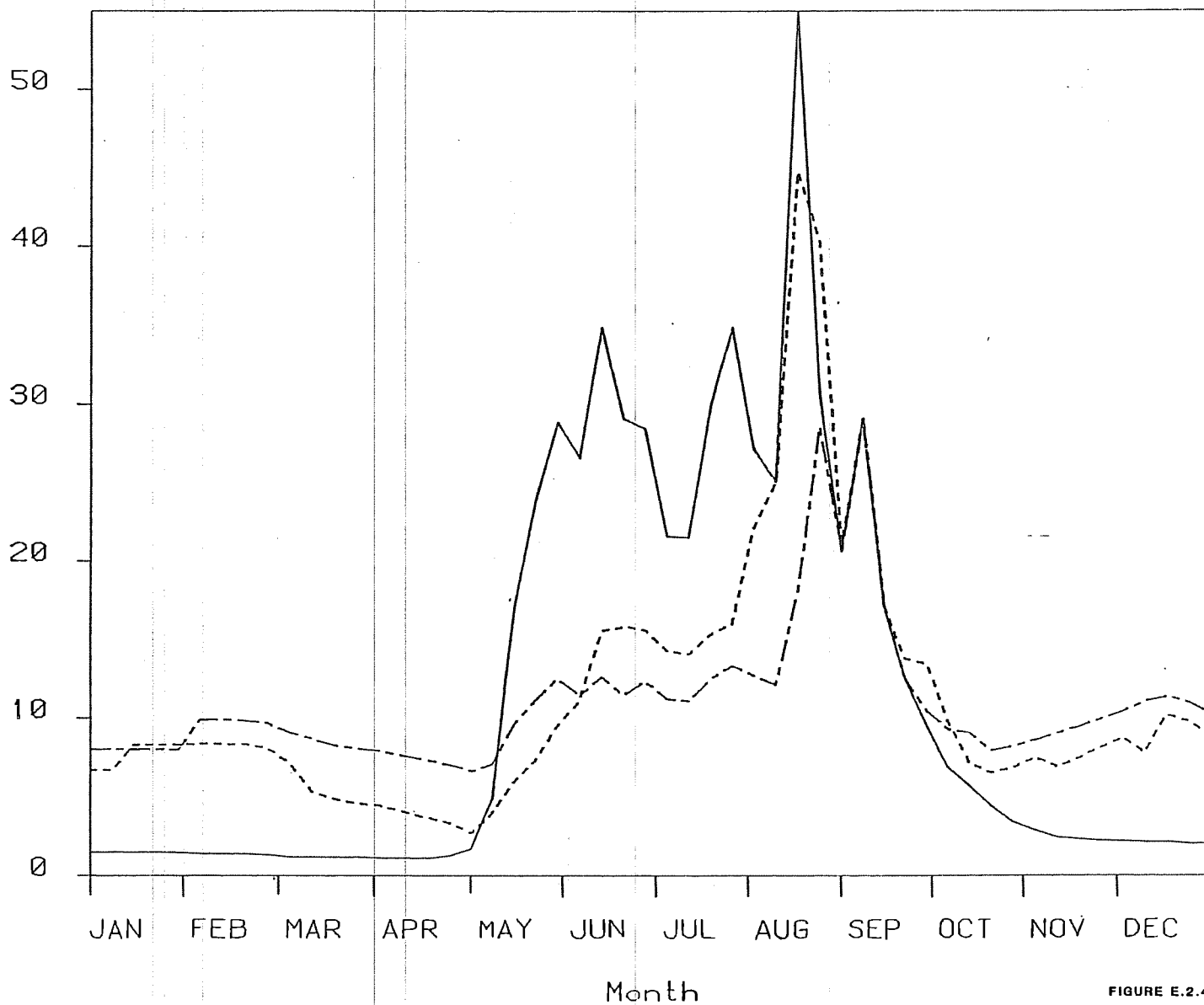
LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 1 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 1 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1964 HYDROLOGY STAGE I	
E-VI FLOW REQUIREMENTS	
HARVEY GRADCO DESIGNED BY MOORE, ALASKA	APPROVED DATE DRAWING NO.

FIGURE E.2.4. 38

THOUSANDS



LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 1 OF 2-STAGE PROJECT
- · · FLOWS FOR STAGE 1 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1967 HYDROLOGY STAGE I		
E-VI FLOW REQUIREMENTS		
BARZA-TRABCO Alaska Power Authority	APPROVED DATE	ENGINEER NO.

FIGURE E.2.4. 37

Discharge in cfs

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Month

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 1 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 1 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER	
FLOWS AT GOLD CREEK	
FOR 1970 HYDROLOGY	
STAGE I	
E-VI FLOW REQUIREMENTS	
DAREA-DRESCO ALASKA POWER AUTHORITY	APPROVED DATE SIGNATURE

FIGURE E.2.4.38

Discharge (cfs)

THOUSANDS

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Month

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 1 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 1 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
AVERAGE WEEKLY SUSITNA RIVER		
FLOWS AT GOLD CREEK		
FOR 1981 HYDROLOGY		
STAGE I		
E-VI FLOW REQUIREMENTS		
DATE	APPROVED	THROWN AWAY
ANCHORAGE, ALASKA		

FIGURE E.2.4. 39

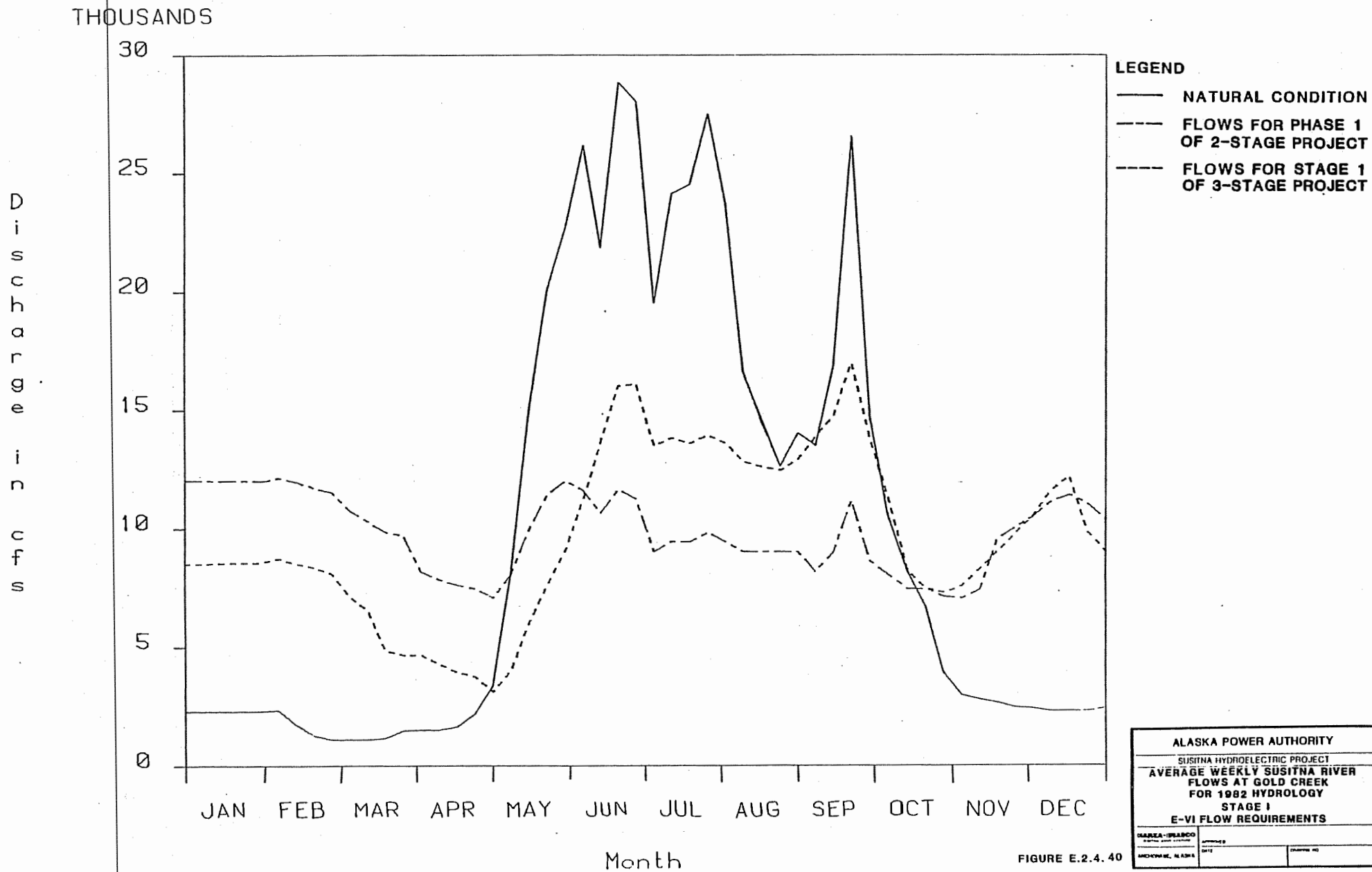


FIGURE E.2.4. 40

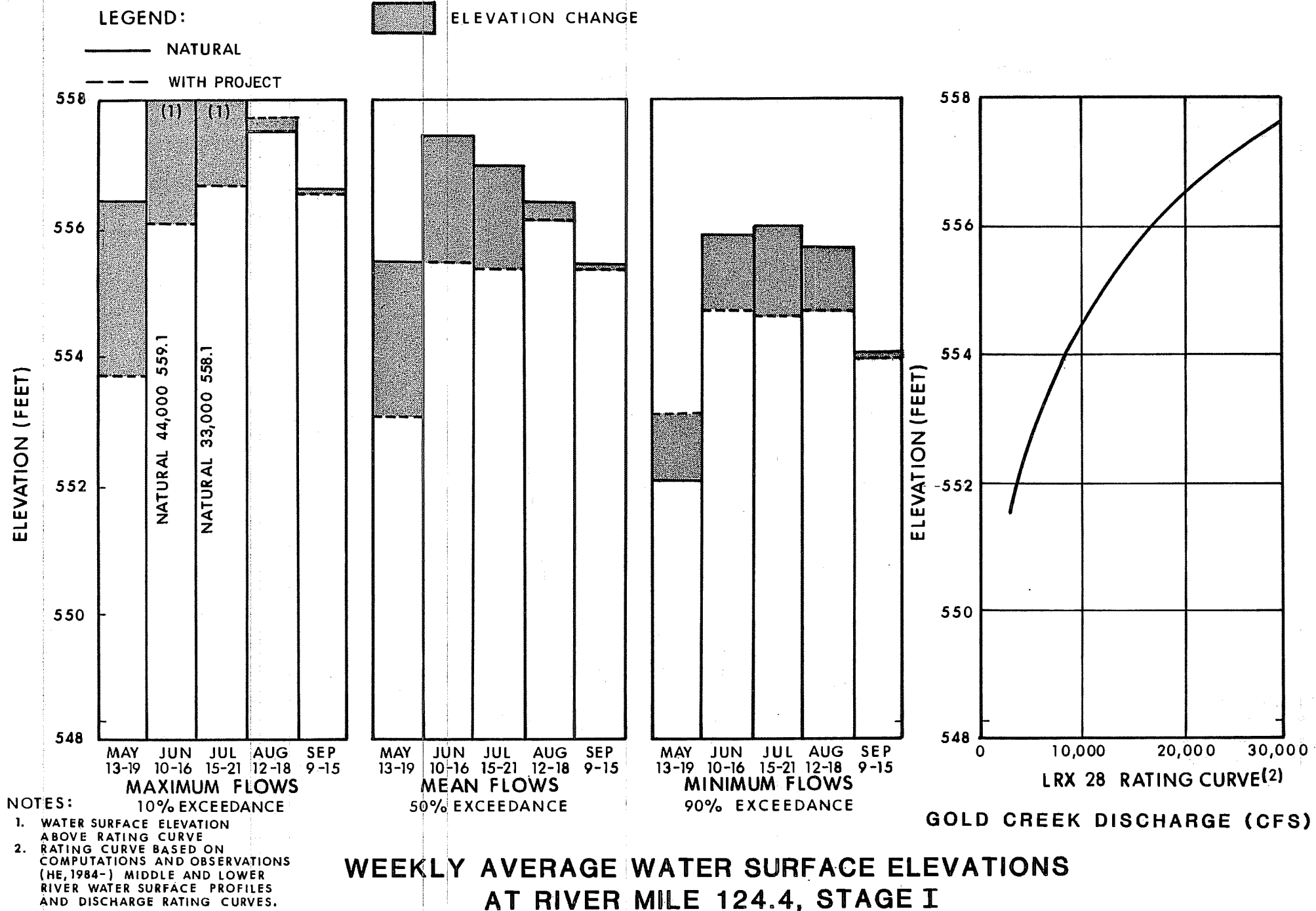
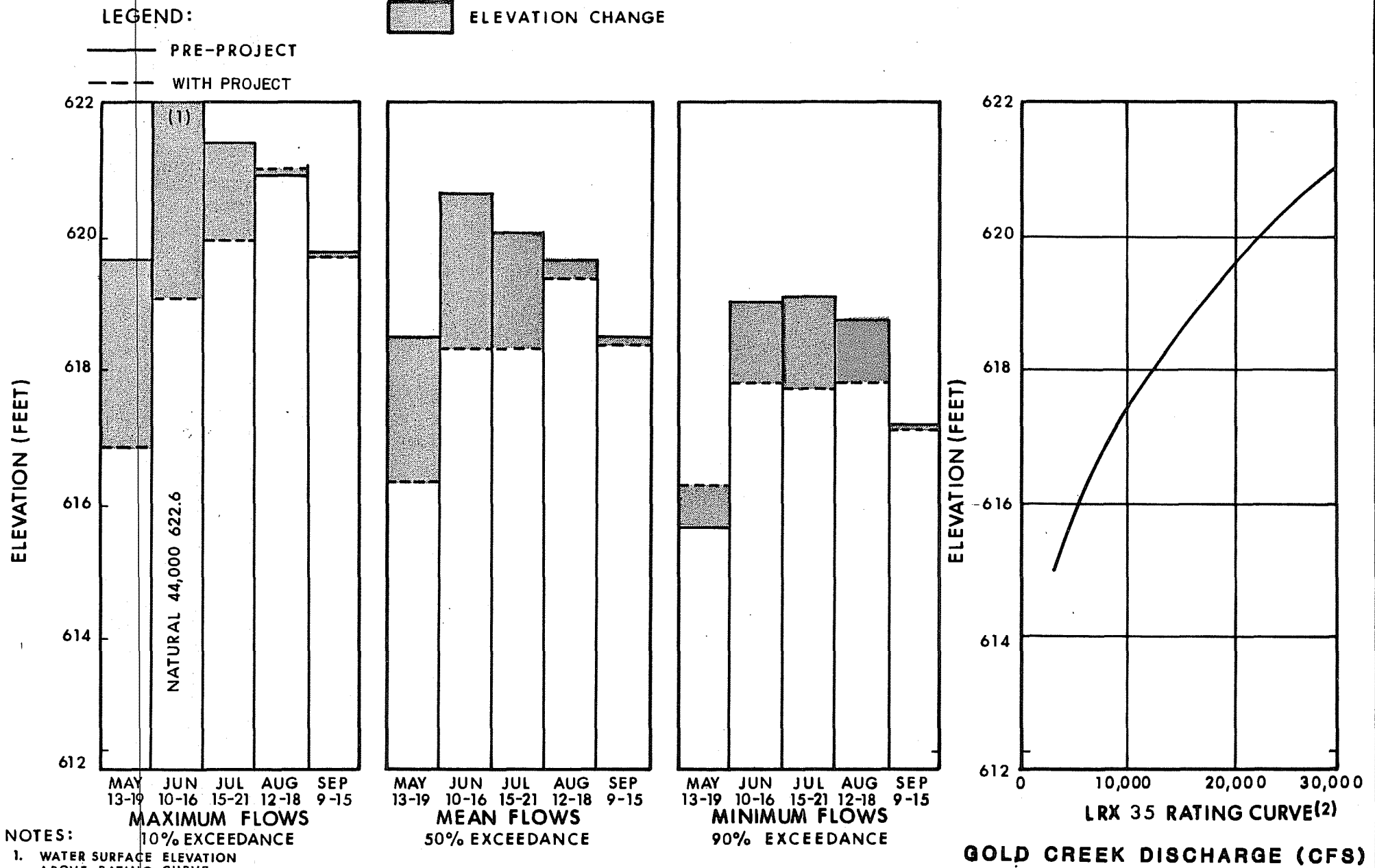


FIGURE 2.4.41



**WEEKLY AVERAGE WATER SURFACE ELEVATIONS
 AT RIVER MILE 130.9, STAGE I**

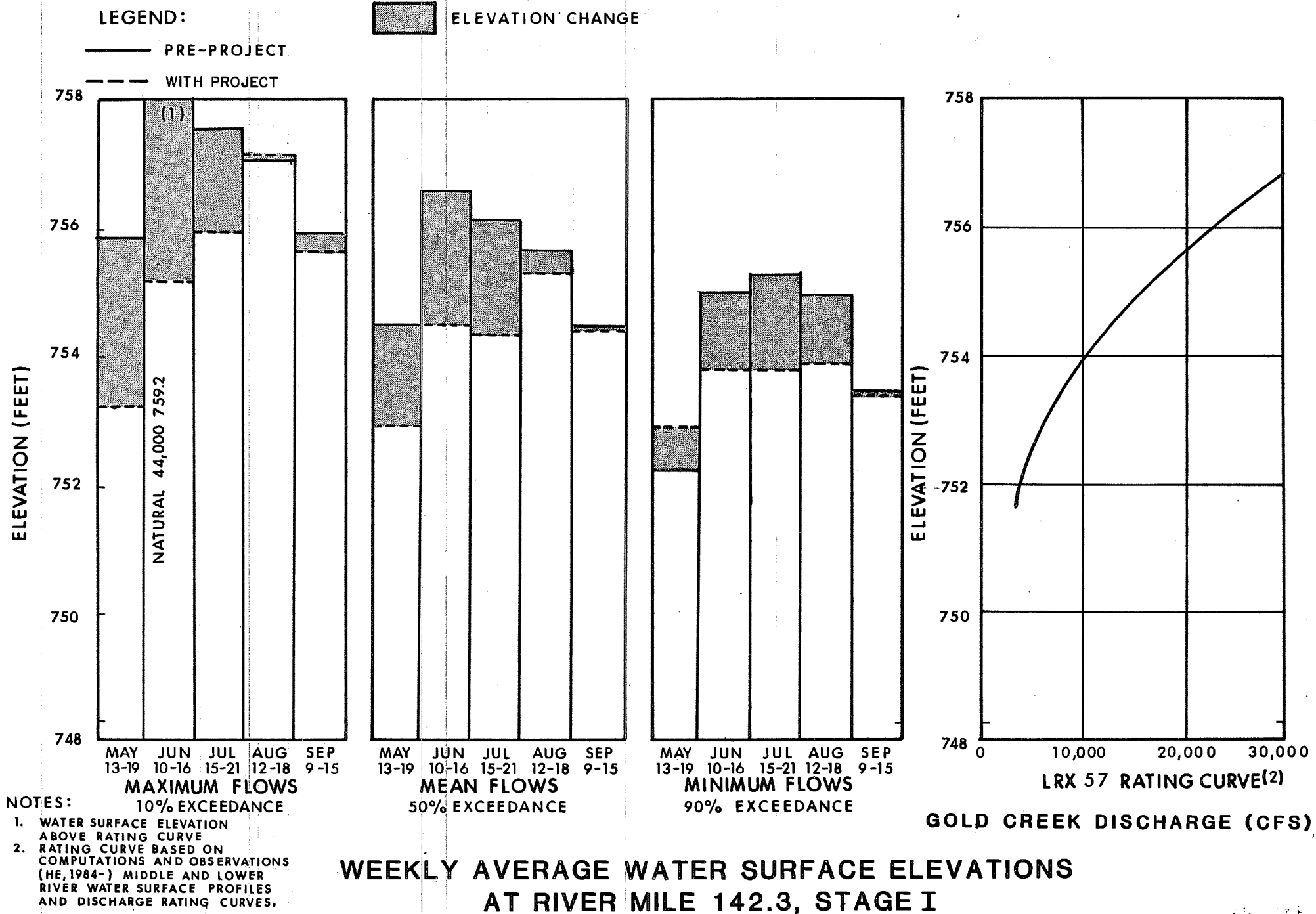
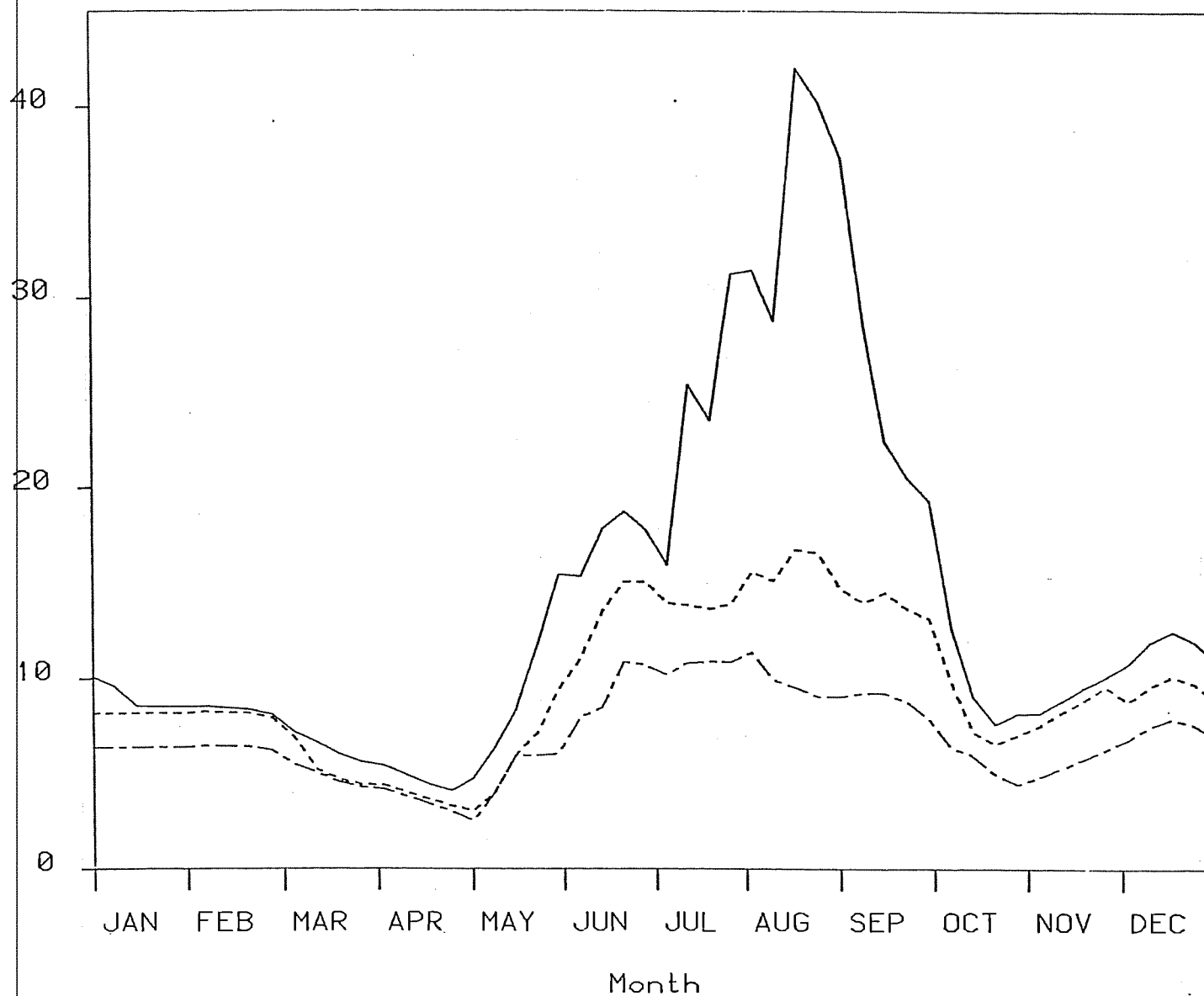


FIGURE E.2.4.43

THOUSANDS

Discharge in cfs



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 1 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS

LEGEND

- 6% EXCEEDENCE FLOWS
- - - 50% EXCEEDENCE FLOWS
- ... 97% EXCEEDENCE FLOWS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK	
BARRETT-SPANGLO	
RICHMOND, ALABAMA	

FIGURE E.2.4.44

THOUSANDS

60

50

40

30

20

10

0

CASE E-VI MAXIMUM FLOW REQUIREMENTS

CASE E-VI MINIMUM FLOW REQUIREMENTS

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Month

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 1 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 1 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 1 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 8% OF THE TIME AT GOLD CREEK	
APPROVED BY:	DATE:
SIGNED:	SIGNED:

FIGURE E.2.4.46

THOUSANDS

Dis
c
h
a
r
g
e
i
n
c
f
s

30

25

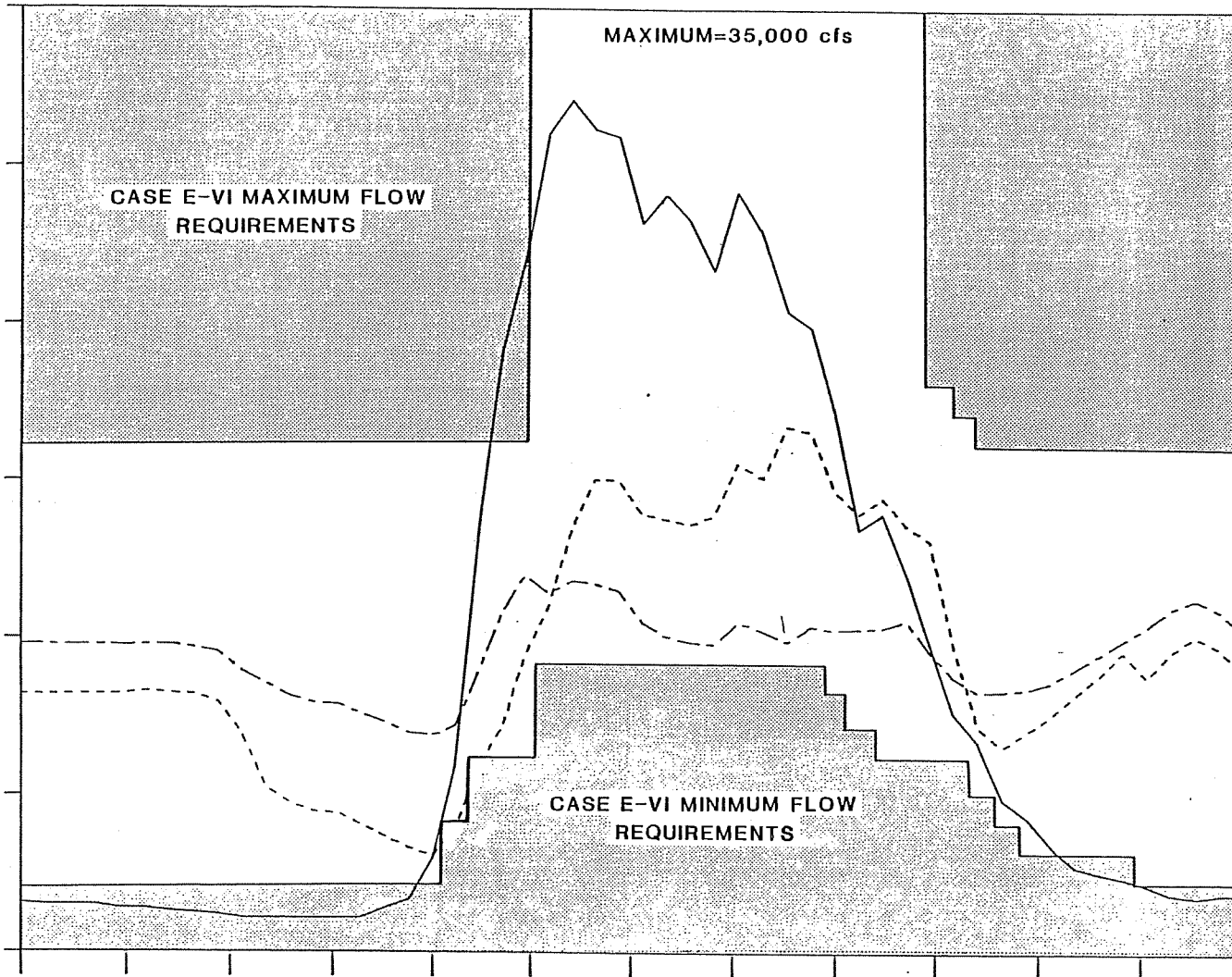
20

15

10

5

0



MAXIMUM=35,000 cfs

CASE E-VI MAXIMUM FLOW
REQUIREMENTS

CASE E-VI MINIMUM FLOW
REQUIREMENTS

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Month

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 1 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 1 OF 2-STAGE PROJECT
- · · FLOWS FOR STAGE 1 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 50% OF THE TIME AT GOLD CREEK	
MARKER - BRANDS	DATE
REVISIONS	DATE

FIGURE E.2.4. 46

THOUSANDS

25

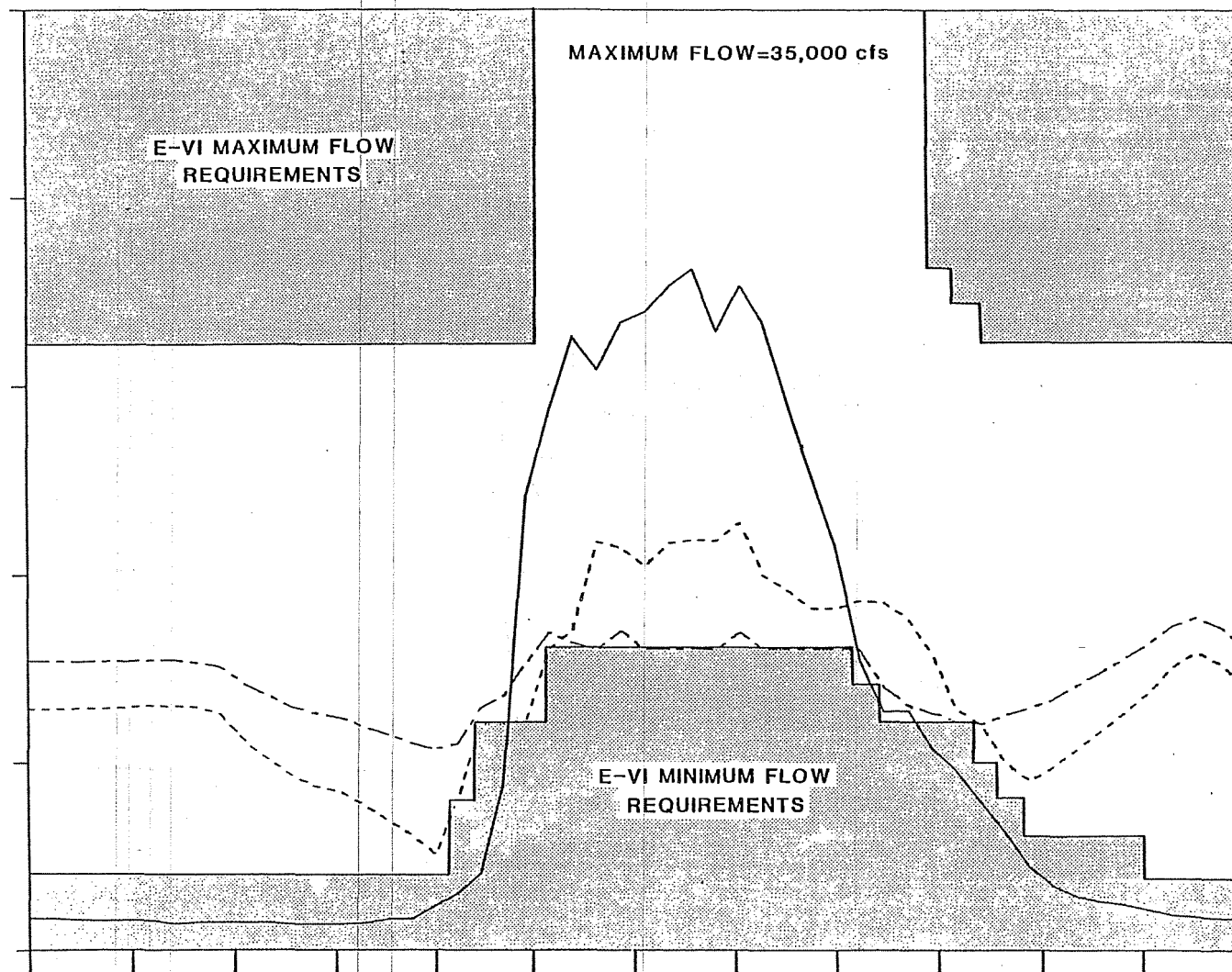
20

15

10

5

0



JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Month

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 1 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS

LEGEND

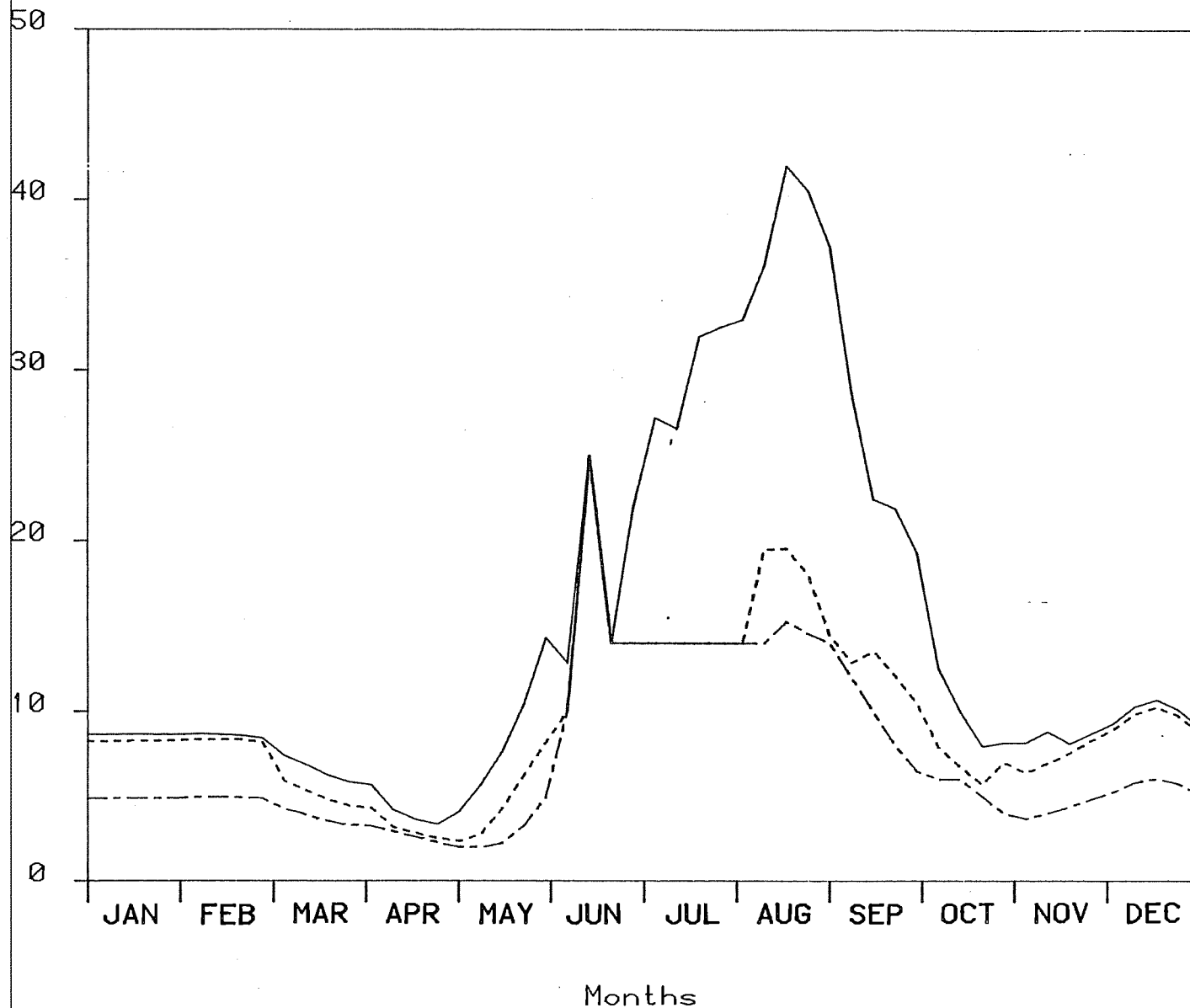
- NATURAL CONDITION
- - - FLOWS FOR PHASE 1 OF 2-STAGE PROJECT
- ... FLOWS FOR STAGE 1 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 97% OF THE TIME AT GOLD CREEK	
TABLE E-2.4.47	FIGURE E.2.4.47

FIGURE E.2.4.47

Discharge in cfs

THOUSANDS



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 1 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-I FLOW REQUIREMENTS

LEGEND

- 6% EXCEEDENCE FLOWS
- - - 50% EXCEEDENCE FLOWS
- · · 97% EXCEEDENCE FLOWS

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
SUSITNA RIVER STREAMFLOWS EXCEEDED 6, 50, AND 97% OF THE TIME AT GOLD CREEK		
BARZA-BRABCO SUSITNA RIVER PROJECT ANCHORAGE, ALASKA	APPROVED DATE	DESIGNED BY DATE

FIGURE E.2.4.48

Discharge in cfs

THOUSANDS

60

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Months

E - I MAXIMUM REQUIREMENTS

E - I MINIMUM REQUIREMENTS

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 1 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. BETWEEN JUNE 10 AND JUNE 16 THERE IS A SPIKE TO 45,000 CFS
5. BETWEEN AUG 12 AND AUG 18 THERE IS A SPIKE TO 23,000 CFS
6. BETWEEN AUG 19 AND AUG 25 THERE IS A SPIKE TO 18,000 CFS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- - - FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY	
SUSTINA HYDROELECTRIC PROJECT	
SUBITNA RIVER STREAMFLOWS EXCEEDED 6% OF THE TIME AT GOLD CREEK	
DATE: 08/08/00	BY: J. J. J.
REVIEW: J. J. J.	DATE: 08/08/00

FIGURE E.2.4.49

THOUSANDS

Discharge in cfs

30

25

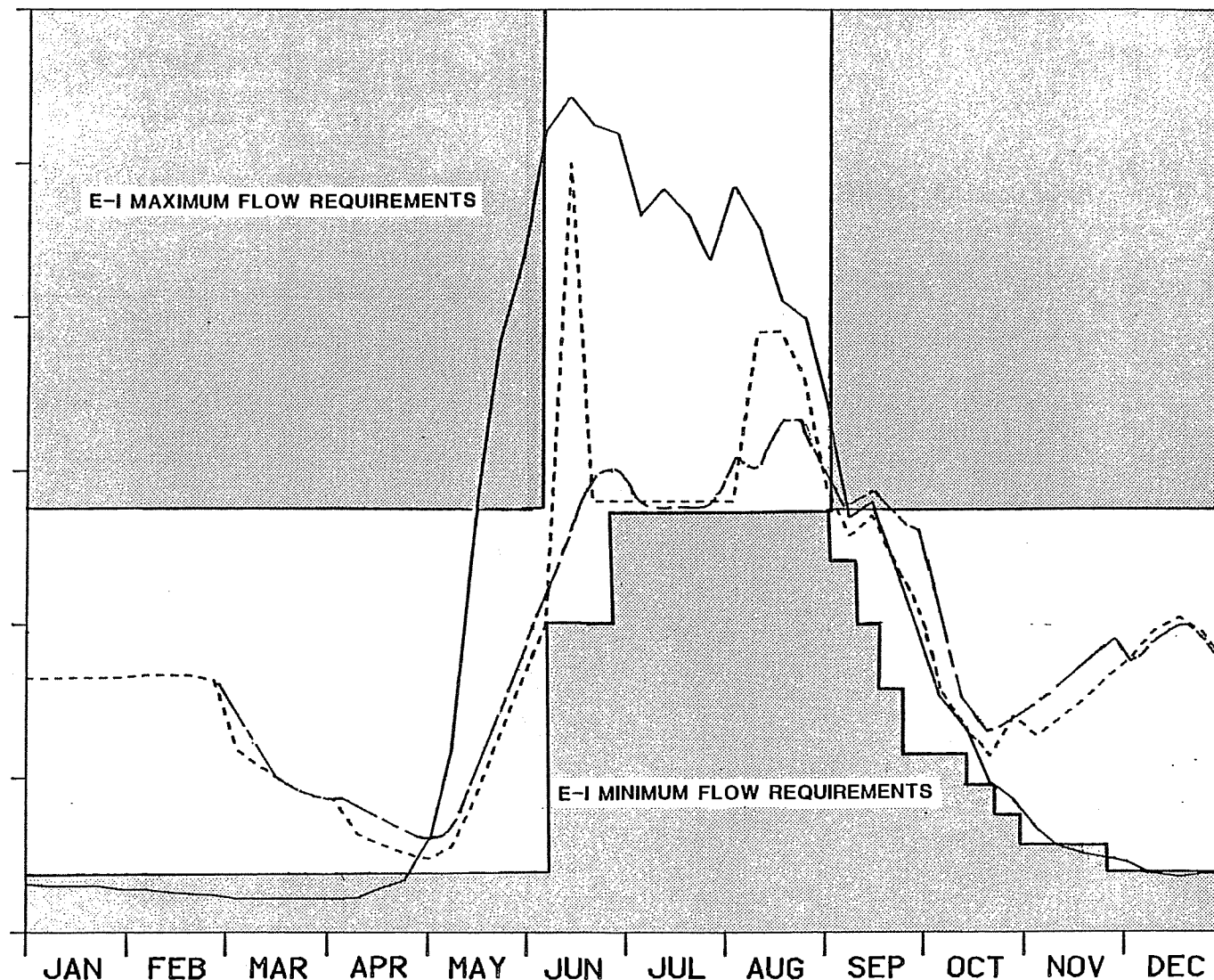
20

15

10

5

0



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 1 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. BETWEEN JUNE 10 AND JUNE 16 THERE IS A SPIKE TO 45,000 CFS
5. BETWEEN AUG 12 AND AUG 18 THERE IS A SPIKE TO 23,000 CFS
6. BETWEEN AUG 19 AND AUG 25 THERE IS A SPIKE TO 18,000 CFS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- ... FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 50% OF THE TIME AT GOLD CREEK	
DANIEL SPANOS	DATE
REVISION, 8/19/84	REVISION, 8/19/84

FIGURE E.2.4. 60

Discharge in cfs

THOUSANDS

25

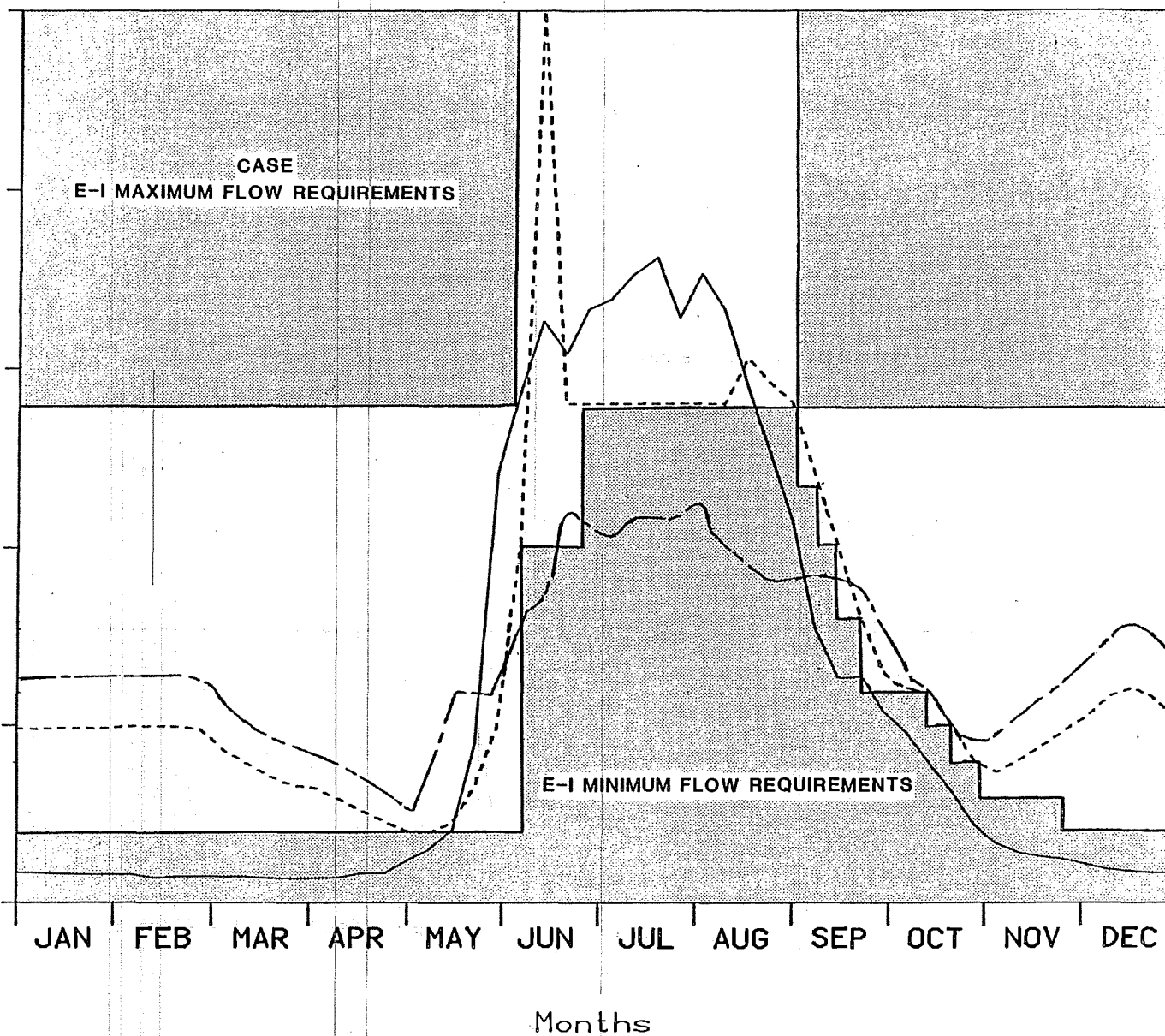
20

15

10

5

0



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 1 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. BETWEEN JUNE 10 AND JUNE 16 THERE IS A SPIKE TO 45,000 CFS
5. BETWEEN AUG 12 AND AUG 18 THERE IS A SPIKE TO 23,000 CFS
6. BETWEEN AUG 19 AND AUG 25 THERE IS A SPIKE TO 18,000 CFS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- ... FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 97% OF THE TIME AT GOLD CREEK	
DATE: 10/1/83	BY: J. H. HARRIS
REVISION: 1.0	APPROVED: J. H. HARRIS

FIGURE E.2.4.51

Discharges in cfs

THOUSANDS

80

70

60

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Months

LEGEND

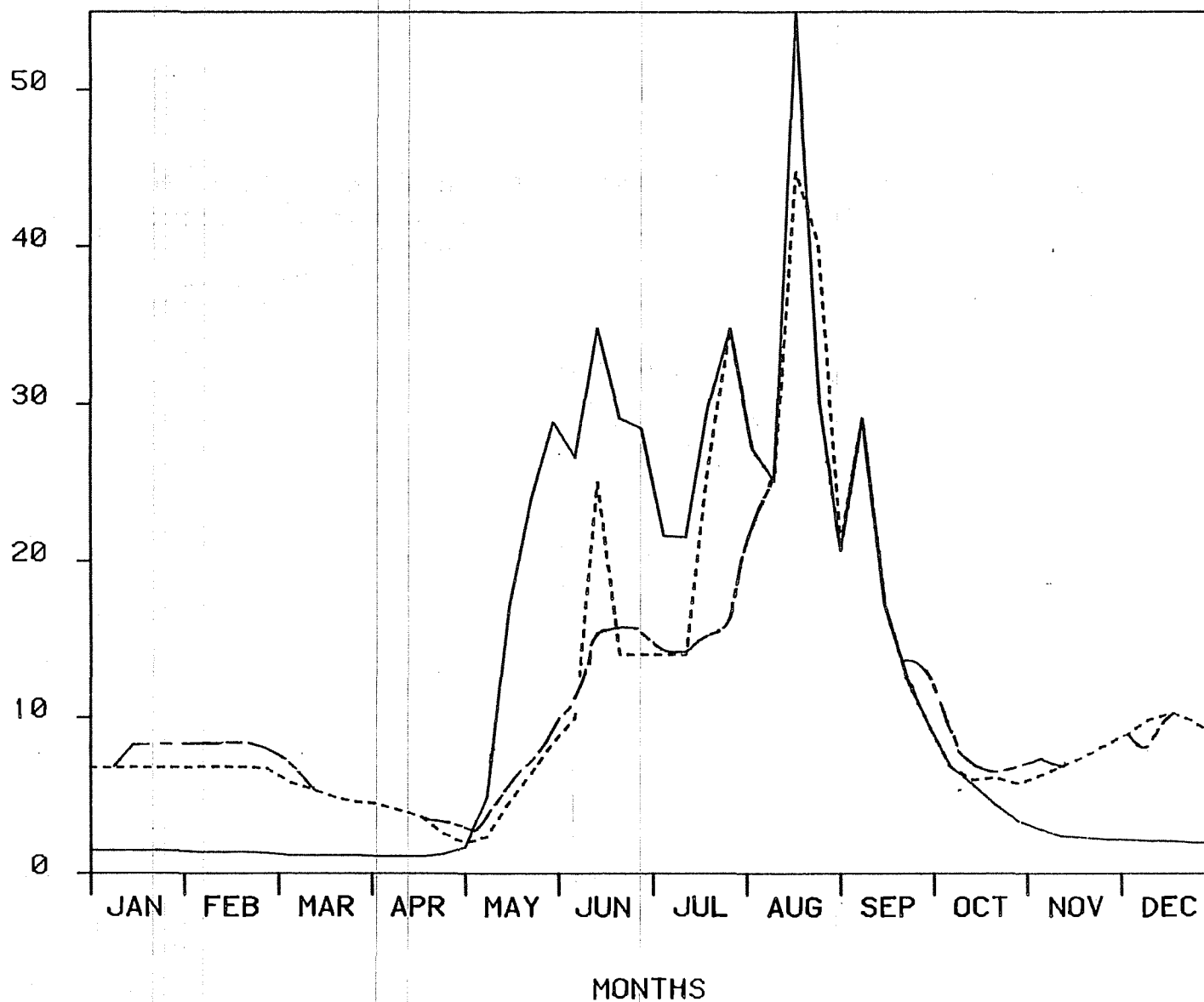
- NATURAL CONDITION
- FLOWS FOR E - VI
FLOW REQUIREMENTS
- - - FLOWS FOR E - I
FLOW REQUIREMENTS

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1964 HYDROLOGY		
STAGE I		
DATE APPROVED BY	DATE APPROVED BY	DATE APPROVED BY

FIGURE E.2.4.52

DISCHARGE IN CFS

THOUSANDS



LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- . - FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1967 HYDROLOGY	
STAGE I	
MAKSA-MERSON ANCHORAGE, ALASKA	DATE: 7/75

FIGURE E.2.4.53

DISCHARGE IN CFS

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

MONTHS

LEGEND

— NATURAL CONDITION

- - - FLOWS FOR E - VI
FLOW REQUIREMENTS

- - - FLOWS FOR E - I
FLOW REQUIREMENTS

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

AVERAGE WEEKLY SUSITNA RIVER
FLOWS AT GOLD CREEK
FOR 1970 HYDROLOGY

STAGE I

DATE: 10/1/70	BY: J. L. HARRIS	REVISION: 1
---------------	------------------	-------------

FIGURE E.2.4.54

DISCHARGE IN CFS

THOUSANDS

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

MONTHS

LEGEND

— NATURAL CONDITION

- - - FLOWS FOR E - VI
FLOW REQUIREMENTS

- - - FLOWS FOR E - I
FLOW REQUIREMENTS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1981 HYDROLOGY	
STAGE I	
HALEA-DEASCO SUSITNA RIVER PROJECT NOME, ALASKA	DATE _____ DRAWN BY _____

FIGURE E.2.4.55

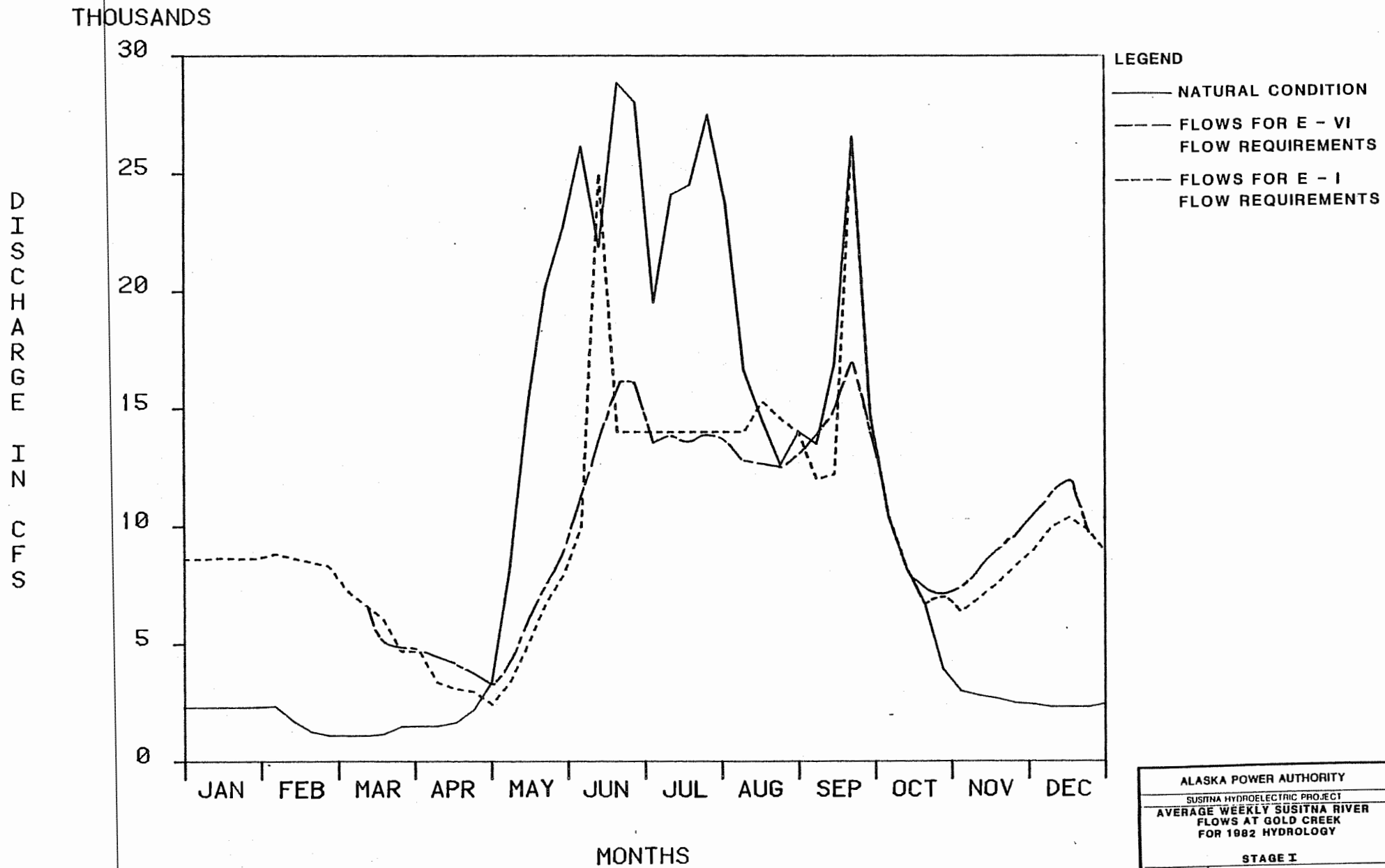
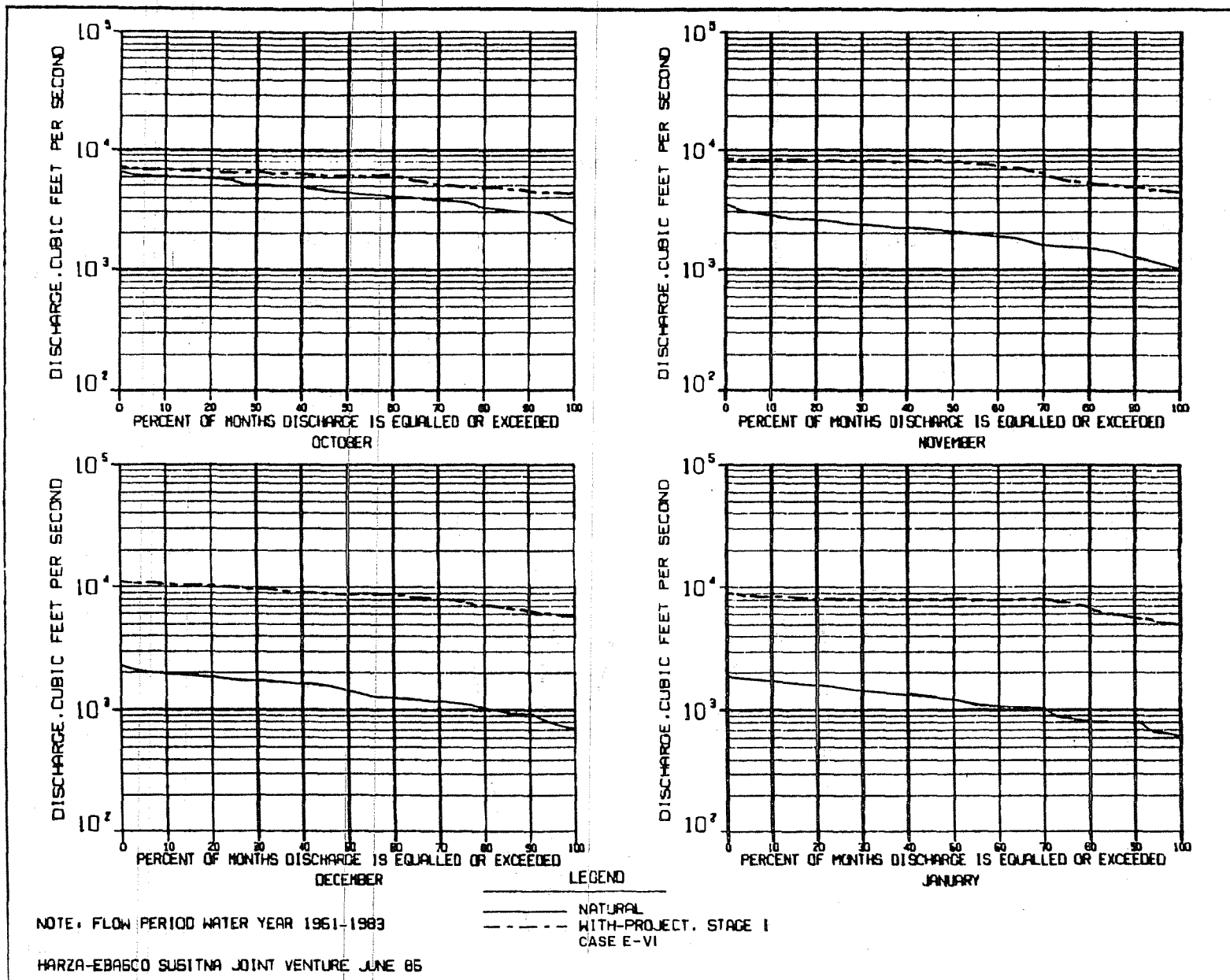
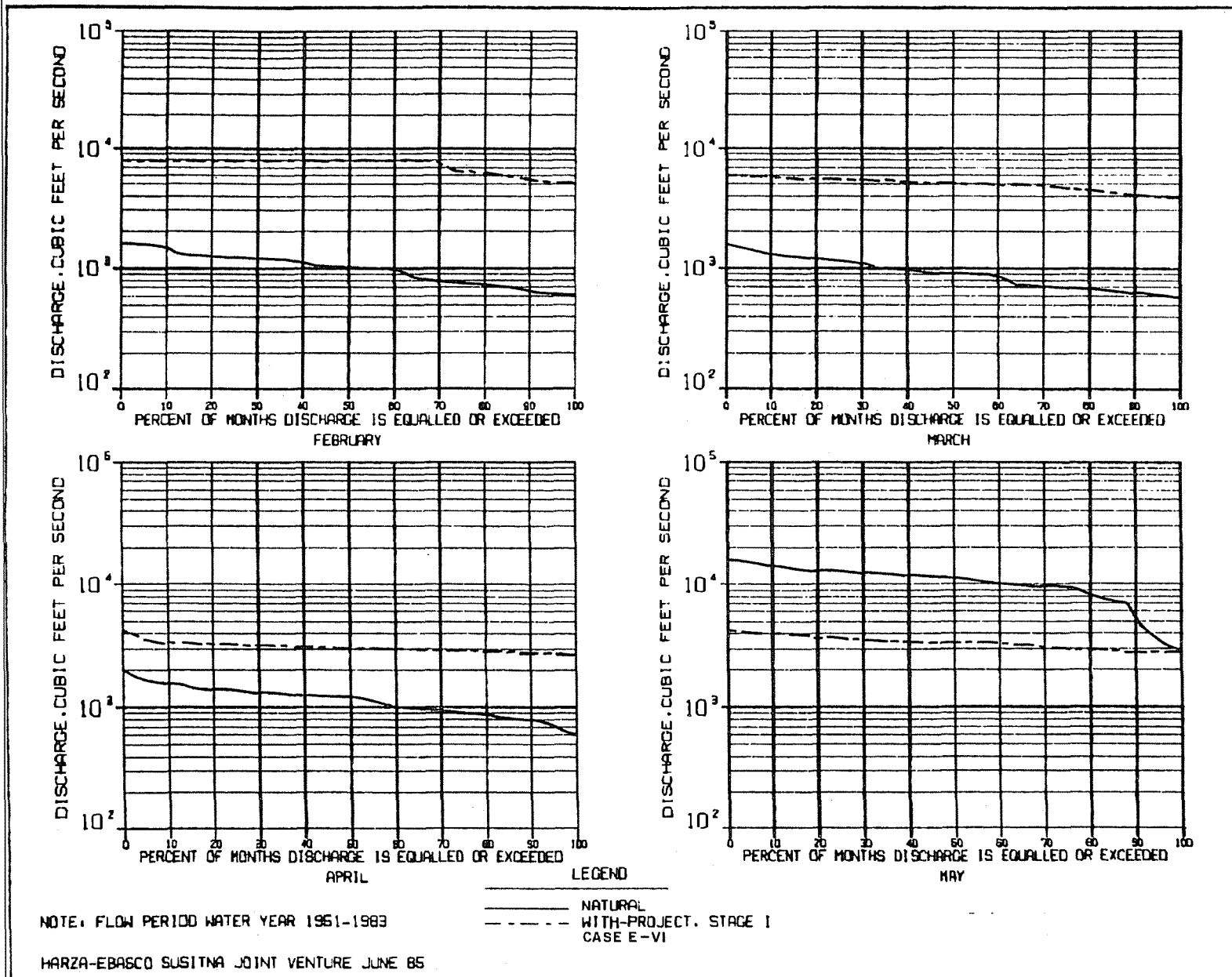


FIGURE E.2.4.56

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1982 HYDROLOGY		
STAGE I		
HAZEL TRACCO NORTH SLOPE DISTRICT	APPROVED	DATE
ANCHORAGE, ALASKA		



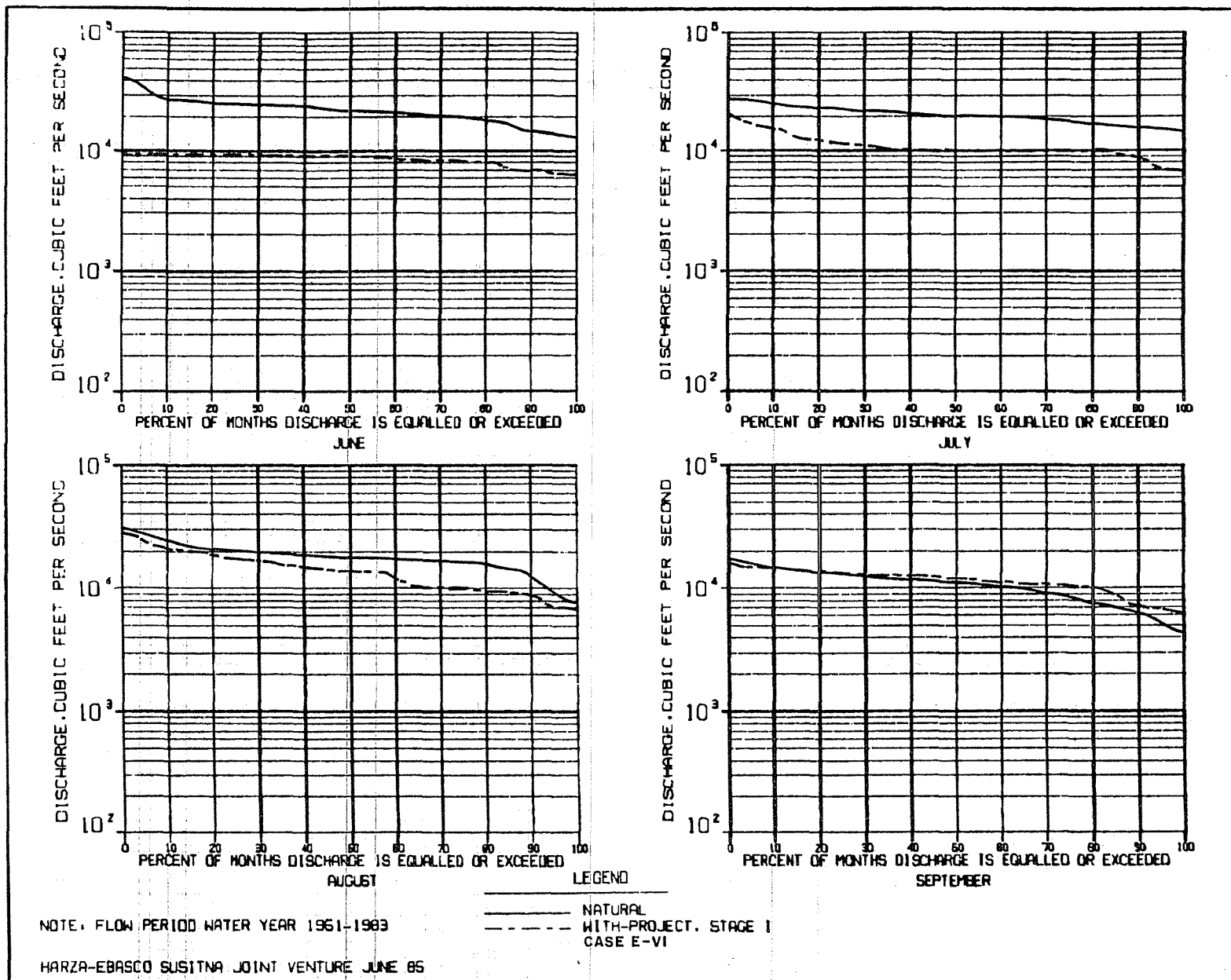
FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT WATANA DAMSITE



FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT WATANA DAMSITE

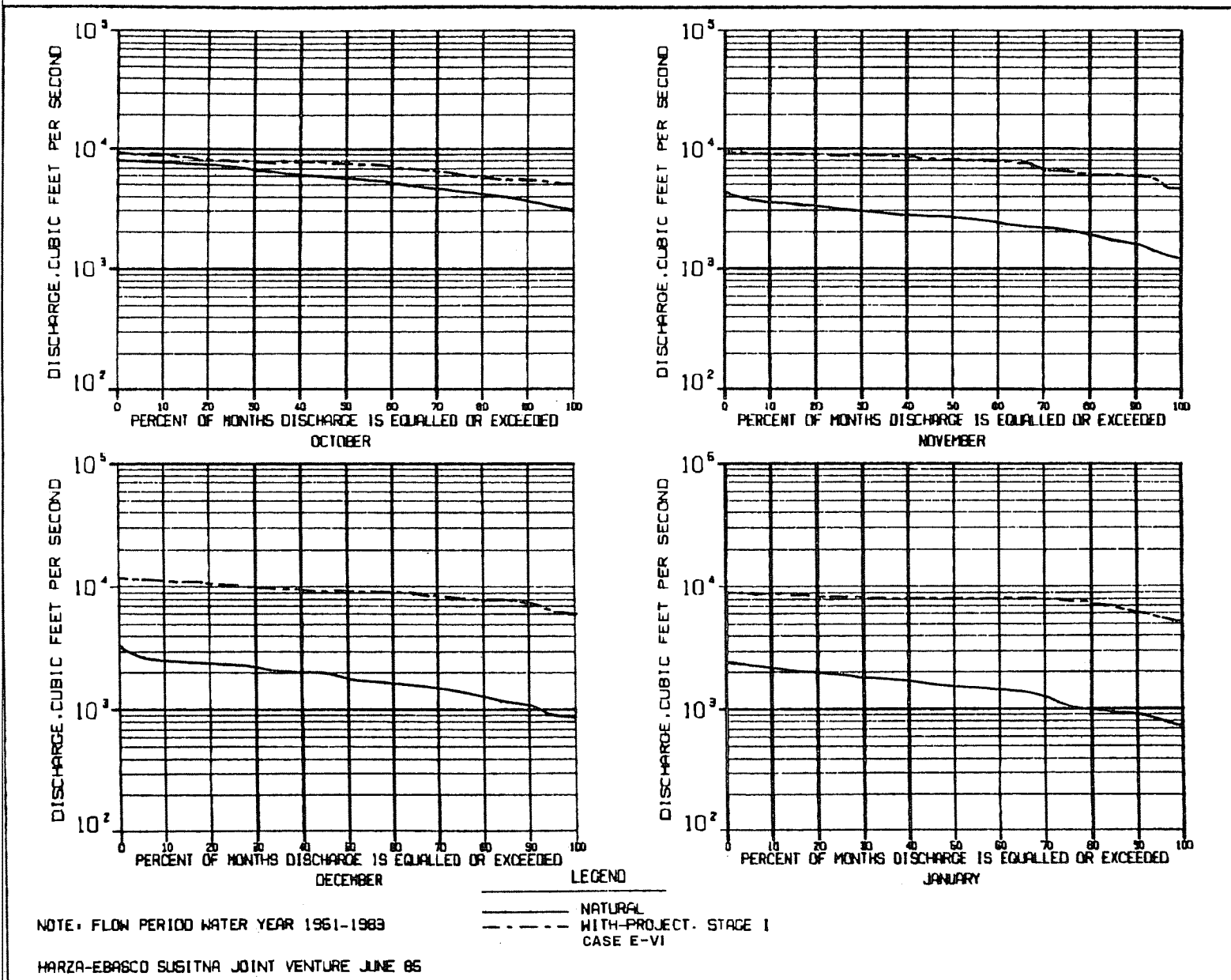
FIGURE E.2.4.57

(Page 2 of 3)



FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT WATANA DAMSITE

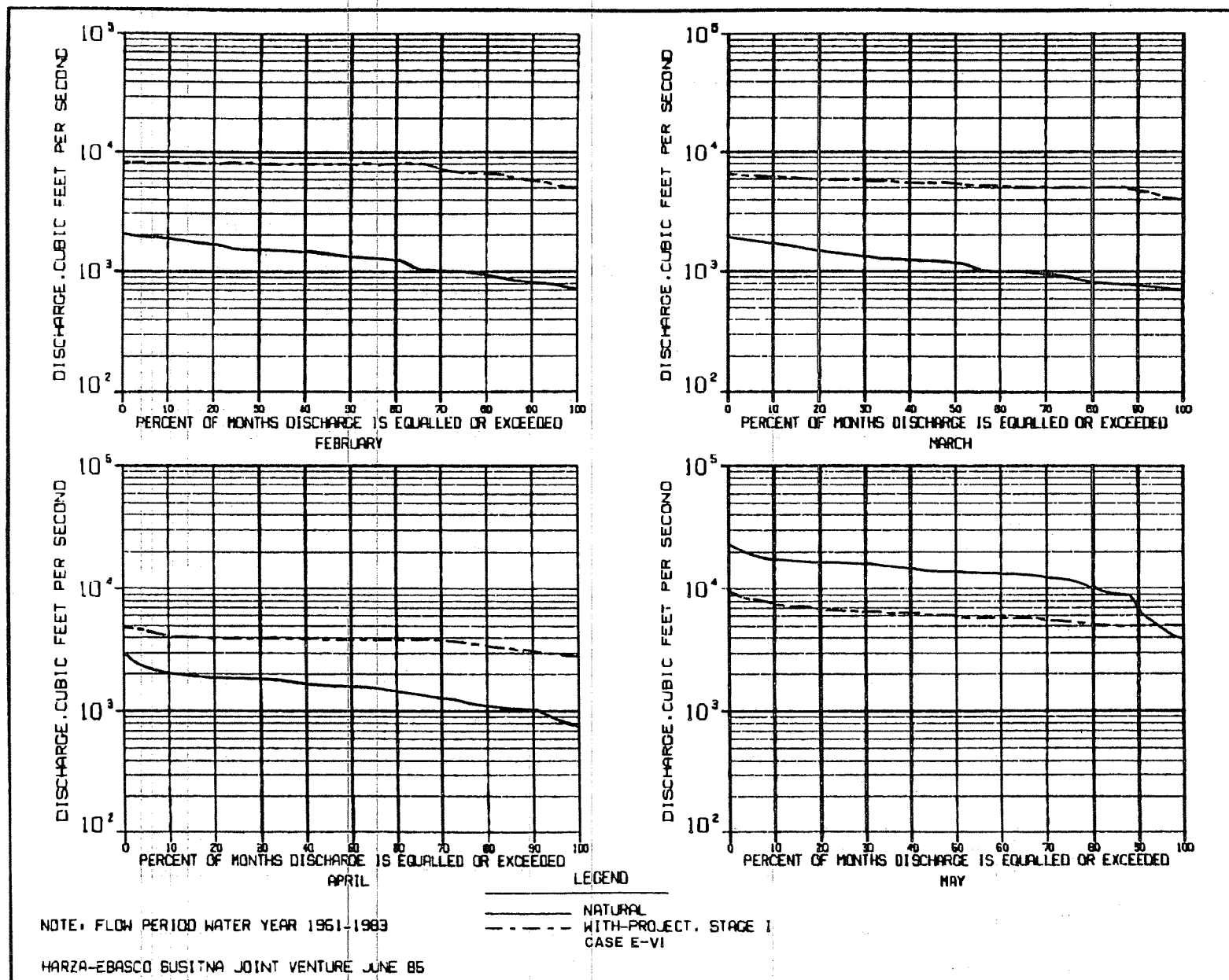
FIGURE E.2.4.57
(Page 3 of 3)



FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT GOLD CREEK

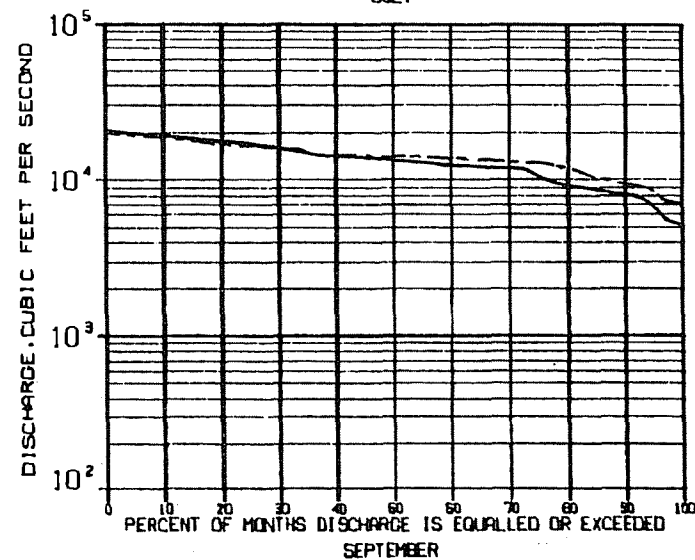
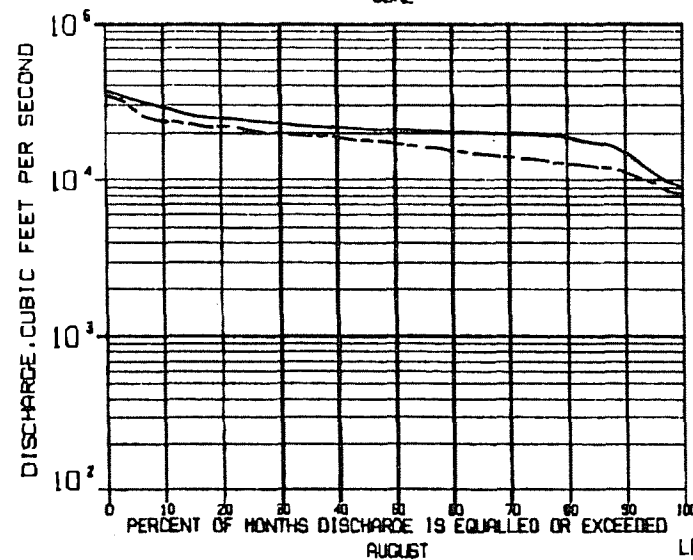
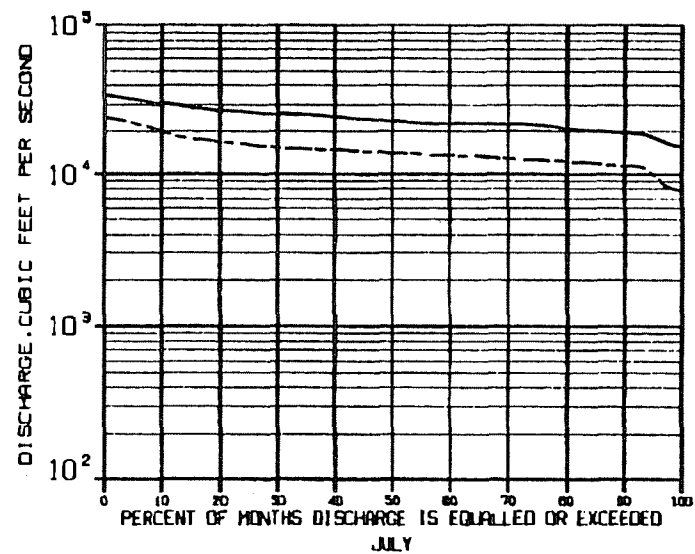
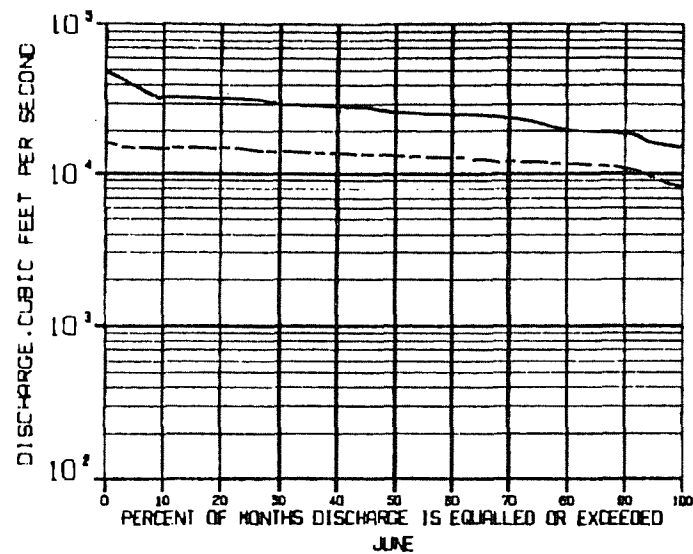
FIGURE E.2.4.58

(Page 1 of 3)



FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT GOLD CREEK

FIGURE E.2.4.58
(Page 2 of 3)



LEGEND

—— NATURAL
 ---- WITH-PROJECT, STAGE I
 CASE E-VI

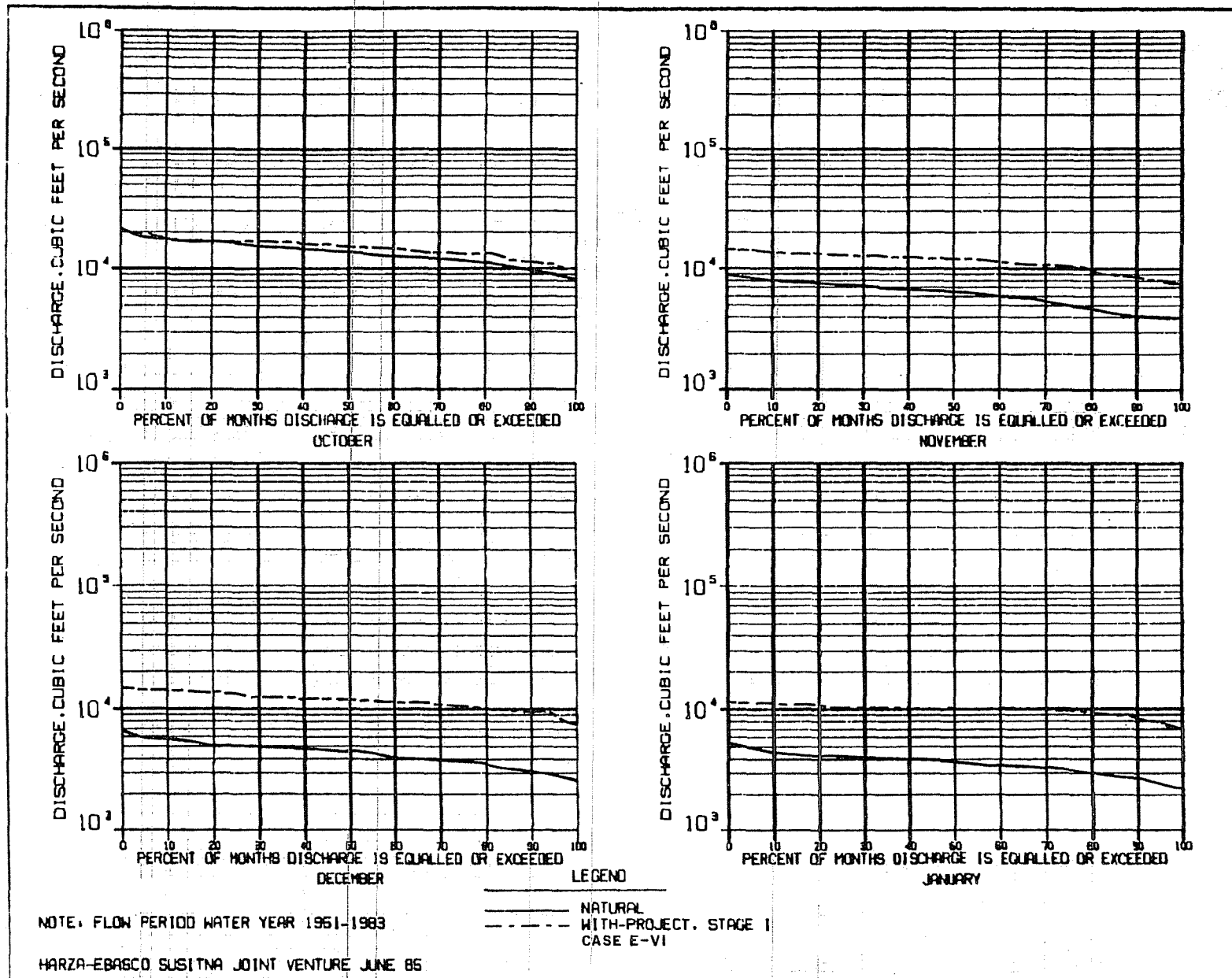
NOTE: FLOW PERIOD WATER YEAR 1961-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT GOLD CREEK

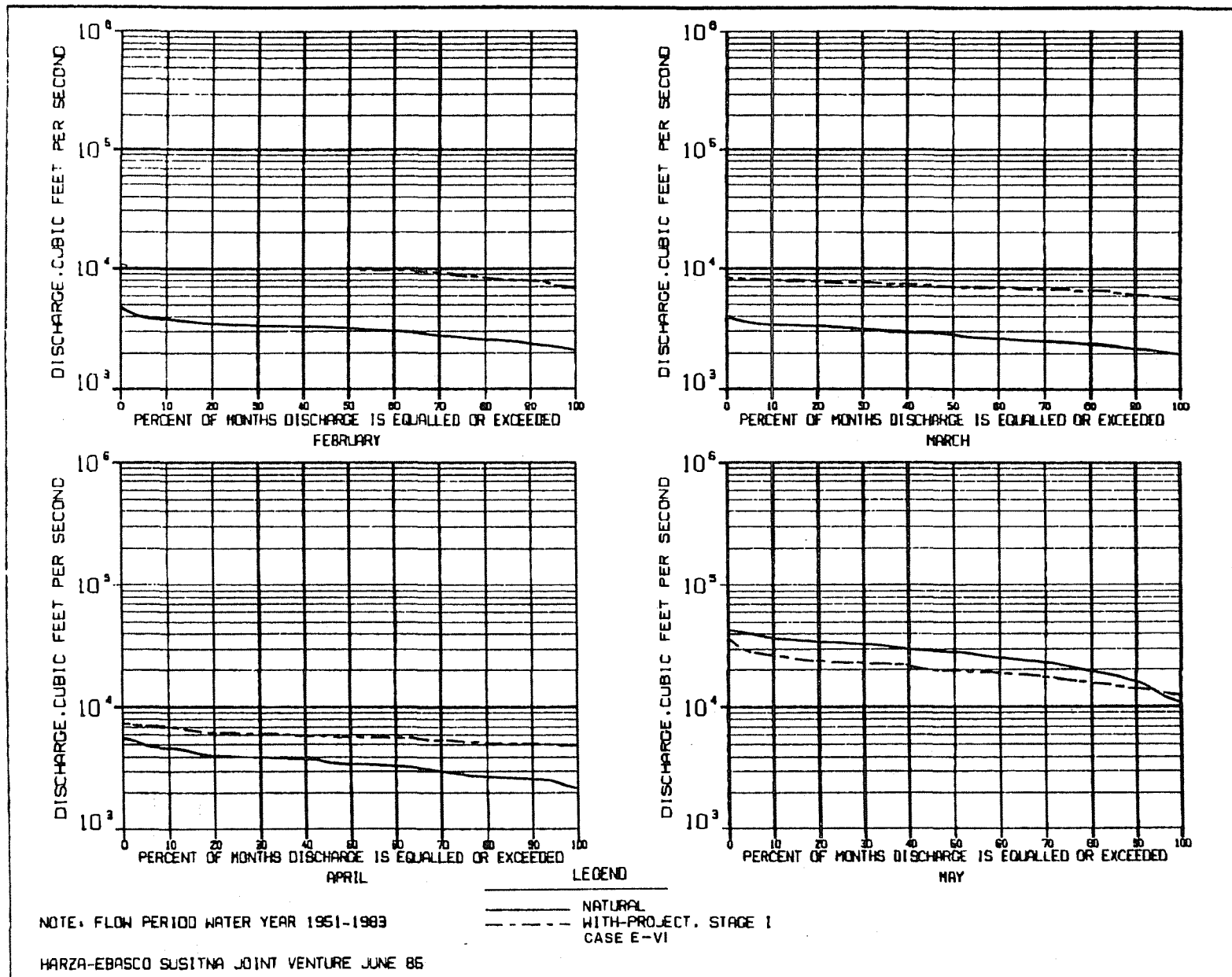
FIGURE E.2.4.58

(Page 3 of 3)



FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUNSHINE

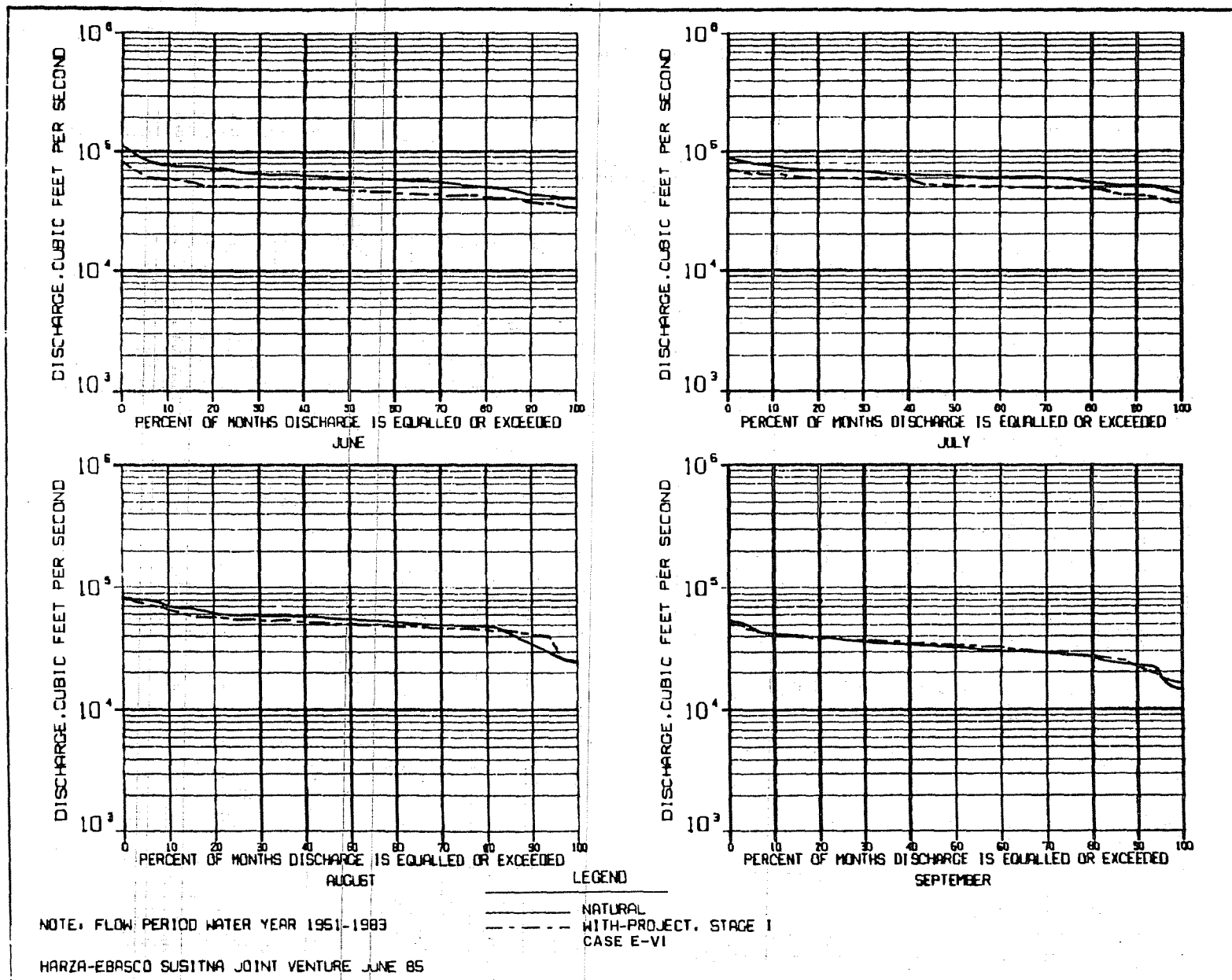
FIGURE E.2.4.59
(Page 1 of 3)



FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUNSHINE

FIGURE E.2.4.59

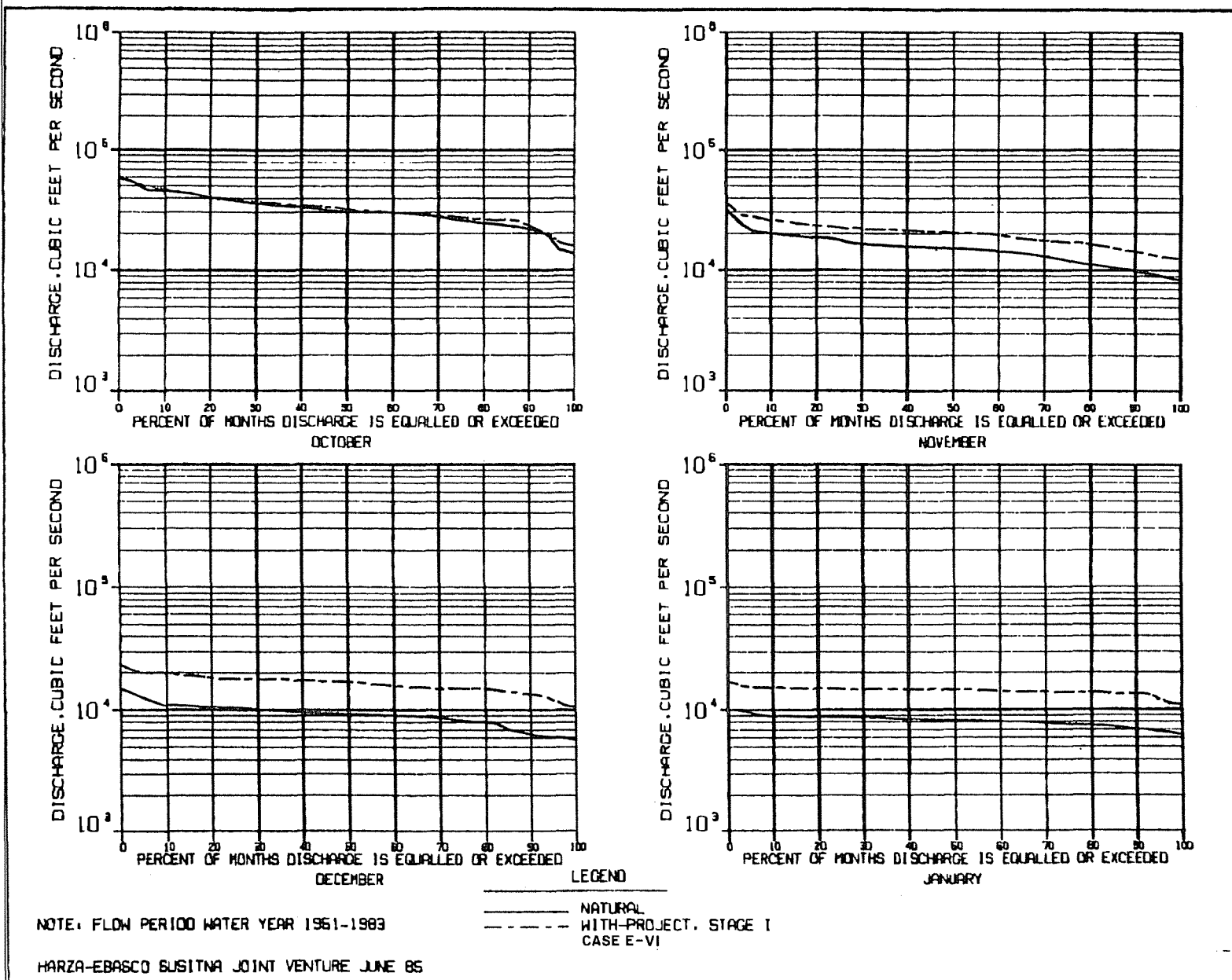
(Page 2 of 3)



FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUNSHINE

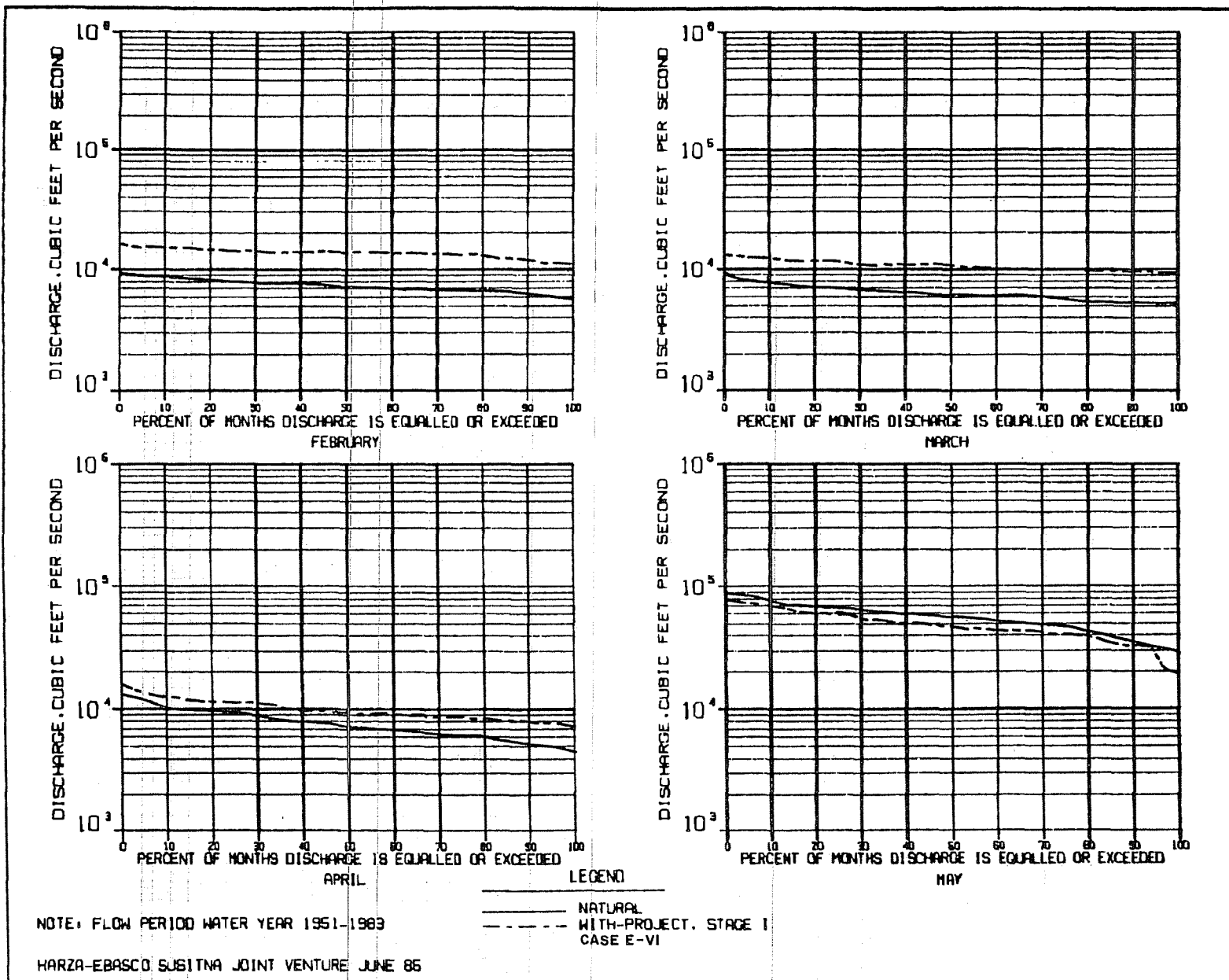
FIGURE E.2.4.59

(Page 3 of 3)



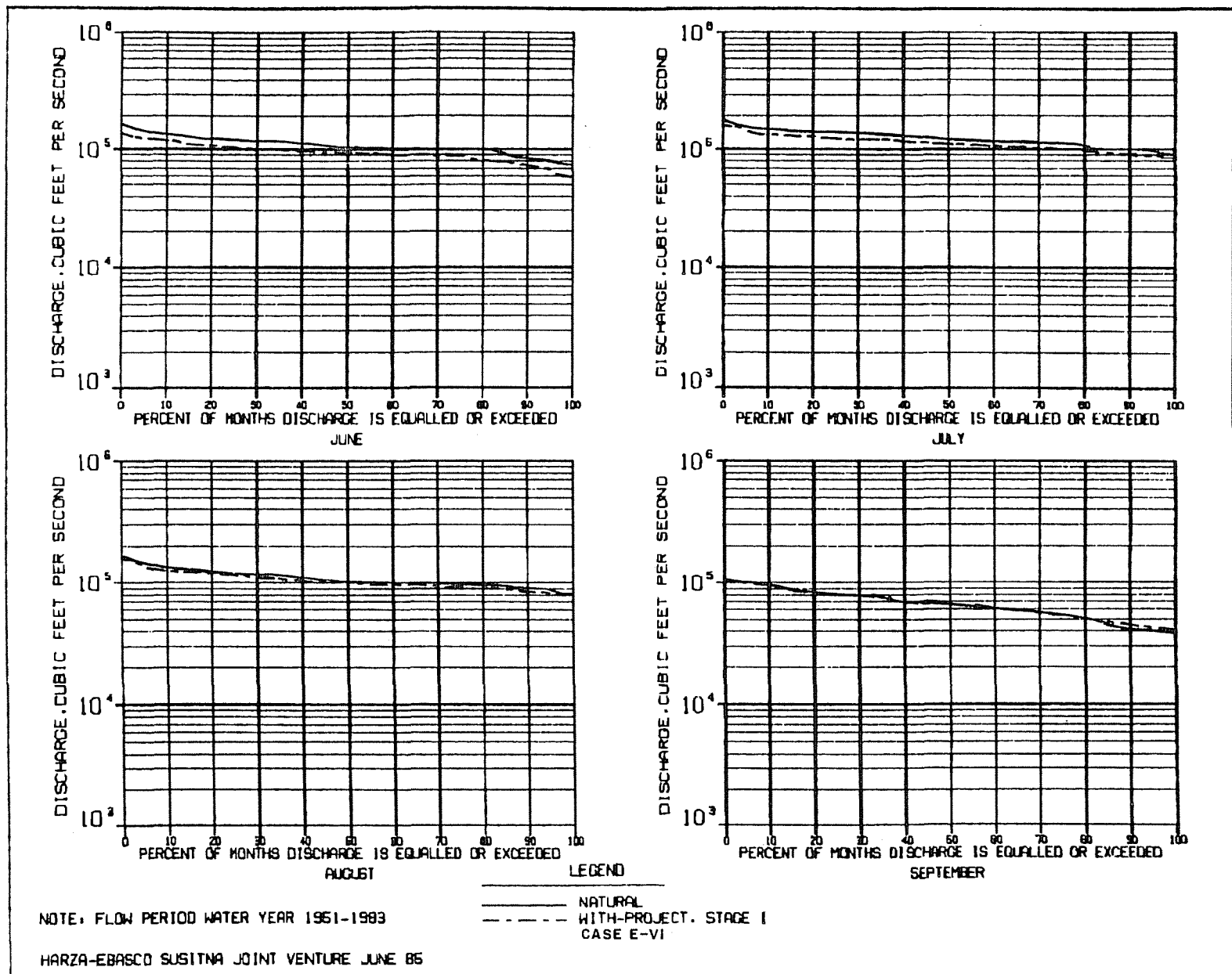
FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUSITNA STATION

FIGURE E.2.4.60
(Page 1 of 3)



FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUSITNA STATION

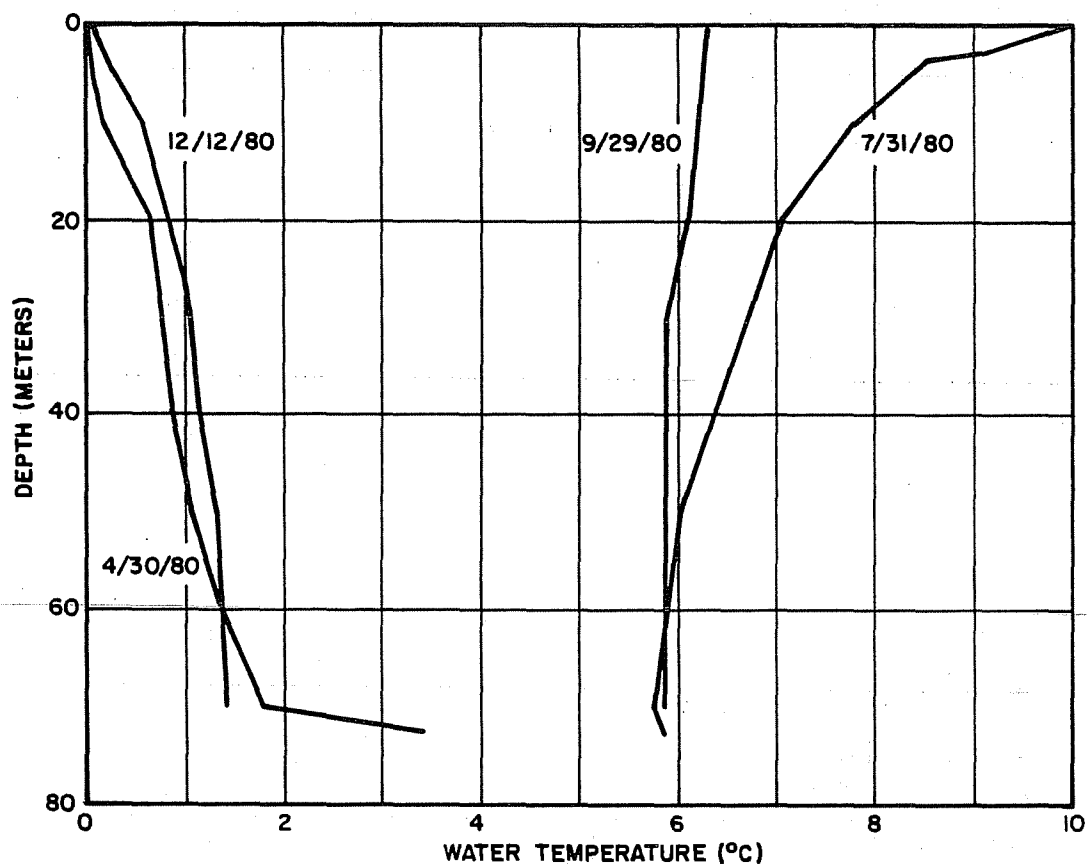
FIGURE E.2.4.60
(Page 2 of 3)



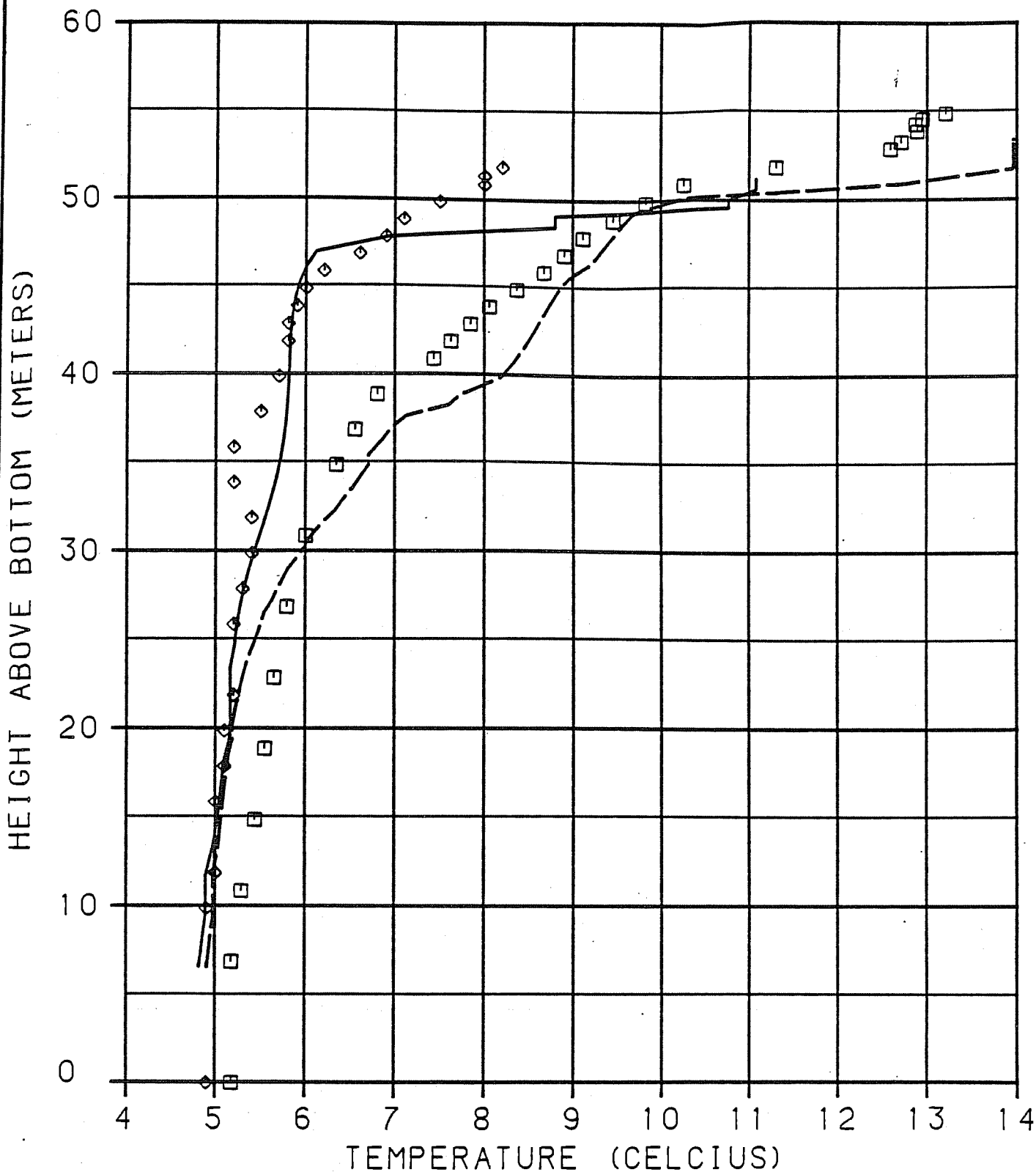
FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUSITNA STATION

FIGURE E.2.4.60

(Page 3 of 3)



**WATER TEMPERATURE PROFILES
BRADLEY LAKE, ALASKA**



LEGEND:

- ◆ JUNE 18, 1982 - MEASURED
 — JUNE 18, 1982 - PREDICTED
 □ JULY 14, 1982 - MEASURED
 - - JULY 14, 1982 - PREDICTED

ALASKA POWER AUTHORITY

SUSITNA PROJECT

DYRESH MODEL

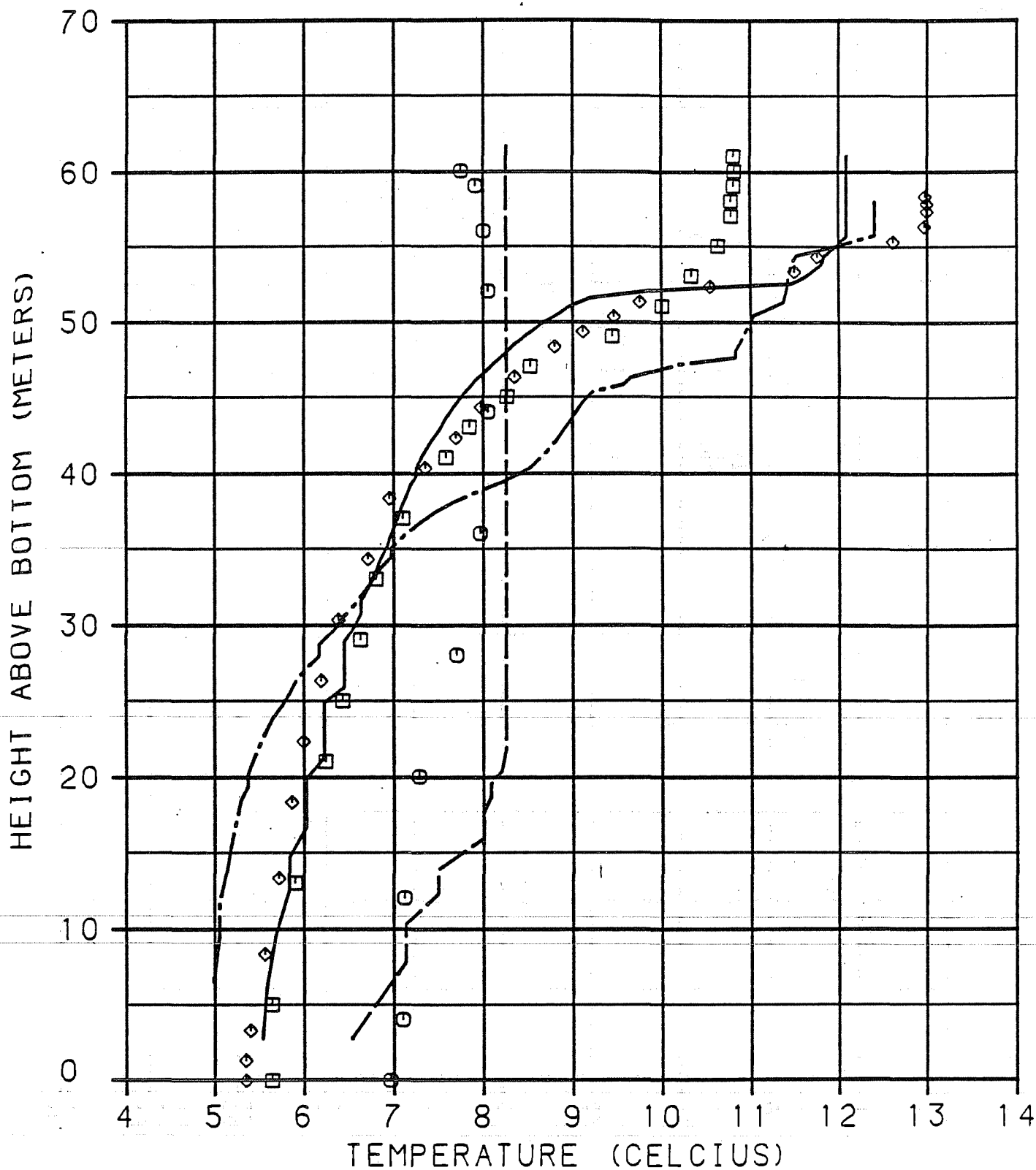
EKLUTNA LAKE
 OBSERVED AND PREDICTED
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS

30 DEC 83

FIGURE E.2.4.62



LEGEND:

- ◇ AUGUST 11, 1982 - MEASURED
- AUGUST 11, 1982 - PREDICTED
- SEPTEMBER 9, 1982 - MEASURED
- SEPTEMBER 9, 1982 - PREDICTED
- SEPTEMBER 21, 1982 - MEASURED
- SEPTEMBER 21, 1982 - PREDICTED

ALASKA POWER AUTHORITY

SUSITNA PROJECT

DYRESH MODEL

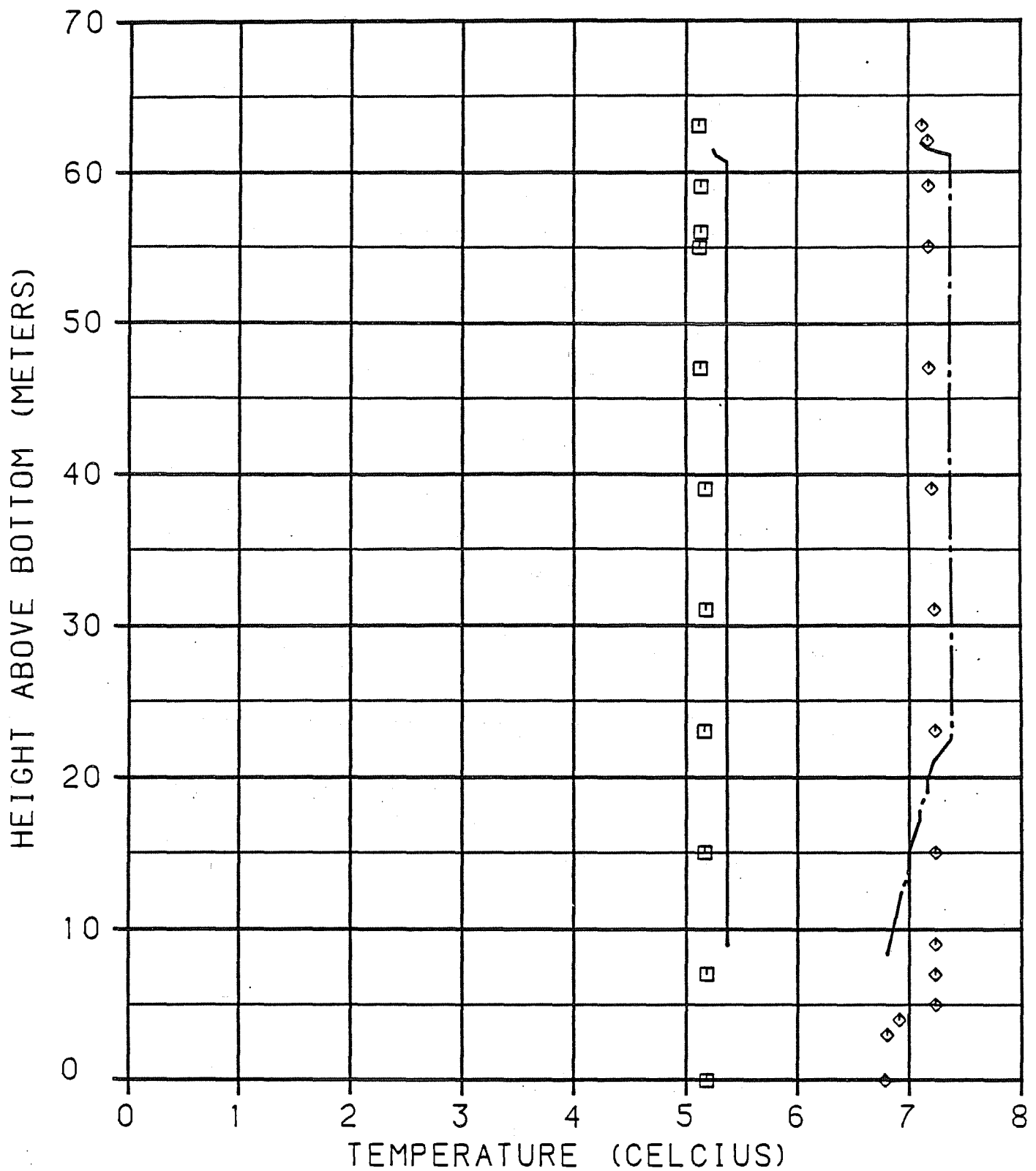
EKLUTNA LAKE
OBSERVED AND PREDICTED
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS

30 DEC 83

FIGURE E.2.4.63



LEGEND:

- ◆— OCTOBER 14, 1982 - MEASURED
 - - - - - OCTOBER 14, 1982 - PREDICTED
 —■— NOVEMBER 4, 1982 - MEASURED
 - - - - - NOVEMBER 4, 1982 - PREDICTED

ALASKA POWER AUTHORITY

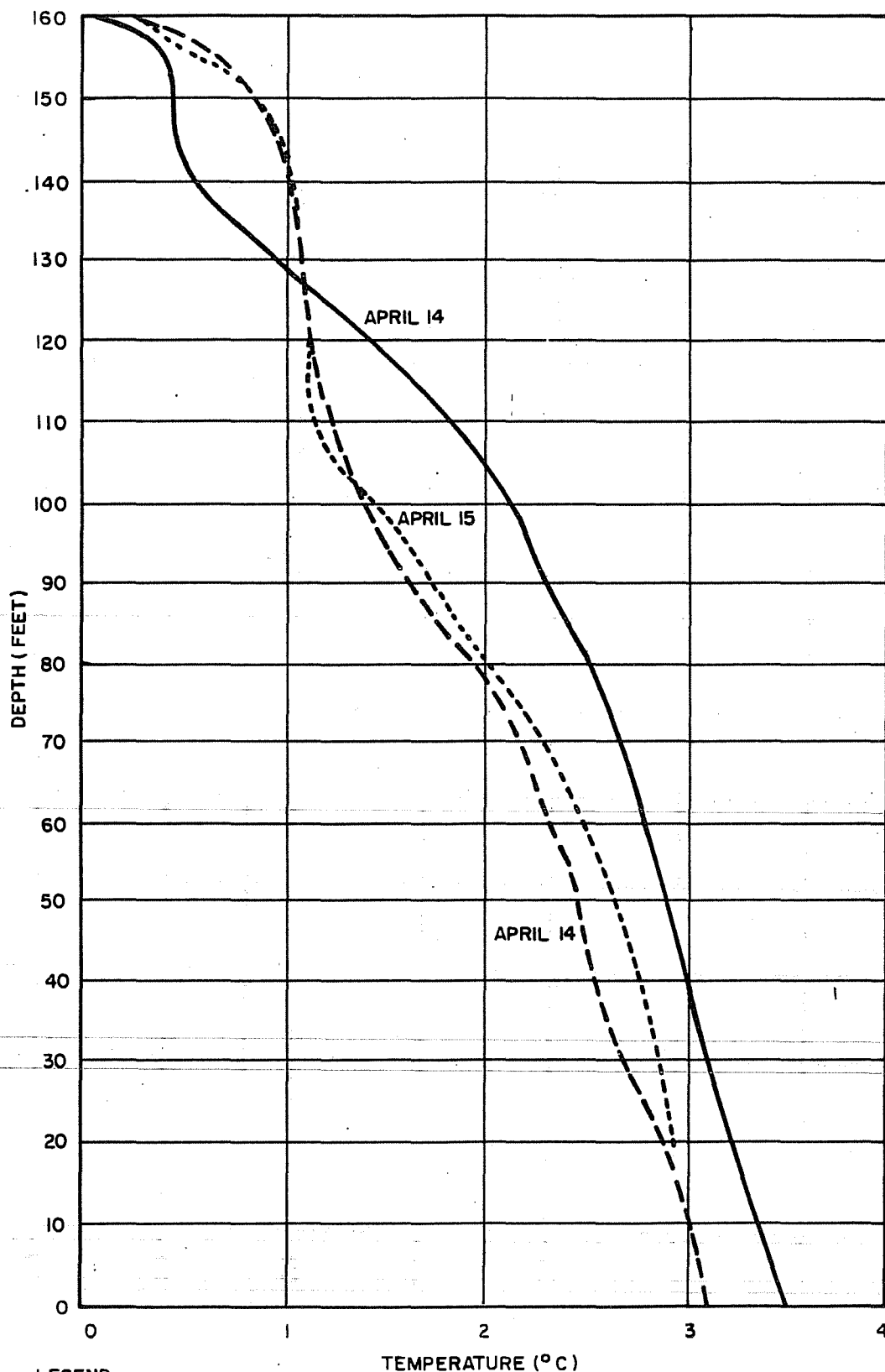
SUSTITNA PROJECT

DYRESH MODEL

EKLUTNA LAKE
 OBSERVED AND PREDICTED
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS 30 DEC 83 FIGURE E.2.4.64

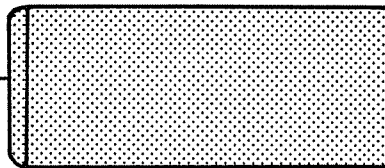


LEGEND:

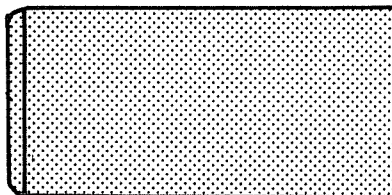
- SITE 1 FOREBAY
- - - SITE 2 UPSTREAM OF FOREBAY
- · · SITE 3 FINDLAY FORKS (APPROXIMATELY 60 MILES UPSTREAM)

**LAKE WILLISTON
TEMPERATURE PROFILES
APRIL 14-15, 1982**

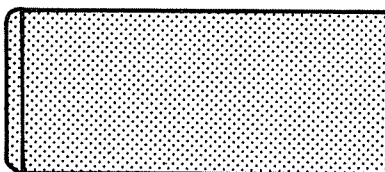
NORMAL MAXIMUM OPERATING
RESERVOIR LEVEL EL. 2000.0



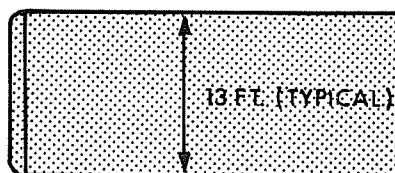
EL. 1964.5



EL. 1926.5 FT.

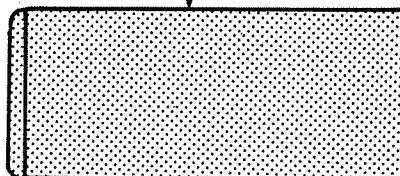


EL. 1888.5 FT.

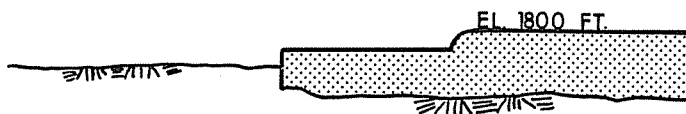


MINIMUM RESERVOIR
OPERATING LEVEL, EL. 1850.0 FT.

25 FT. (TYPICAL)

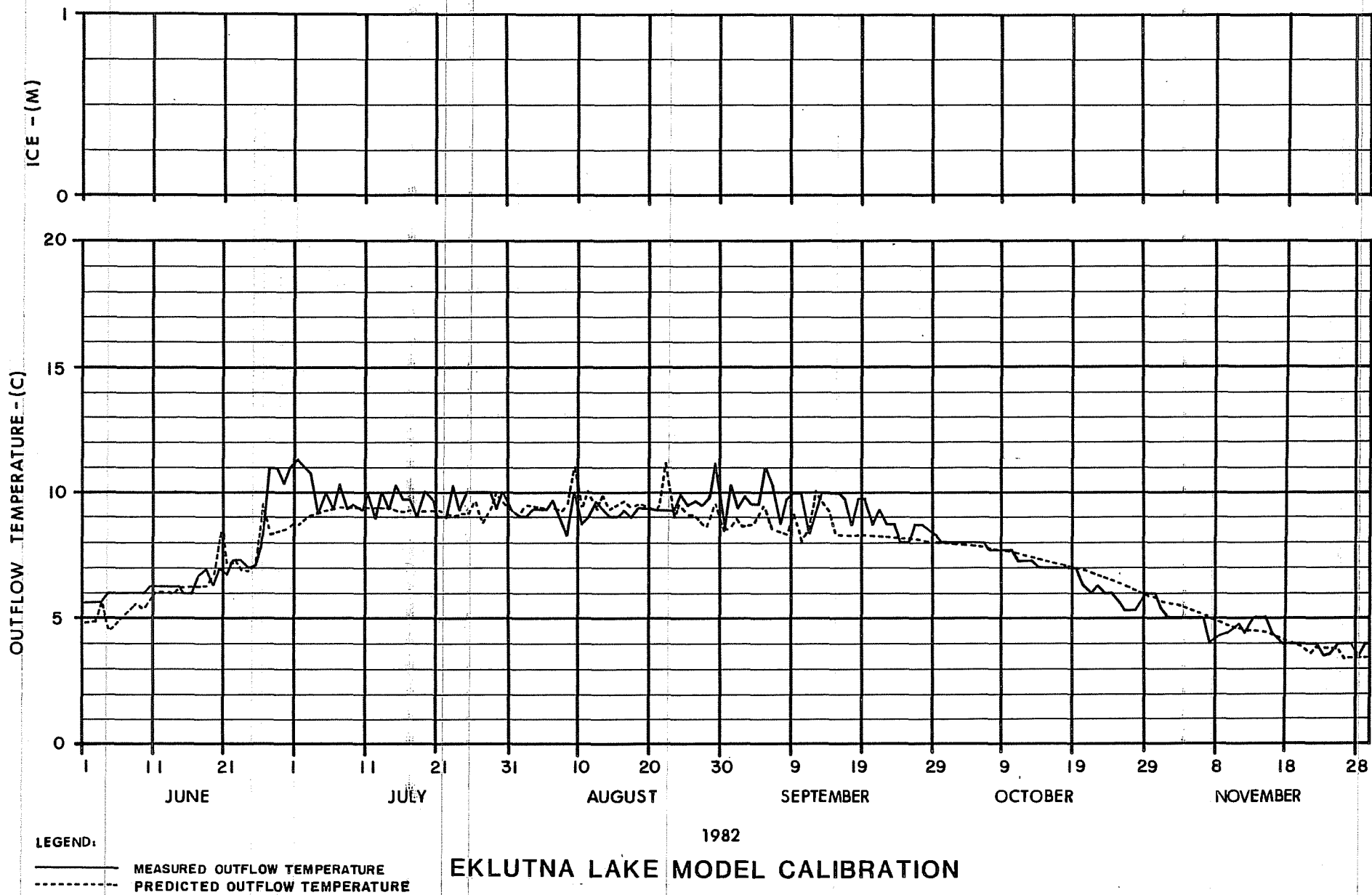


EL. 1812.5 FT.



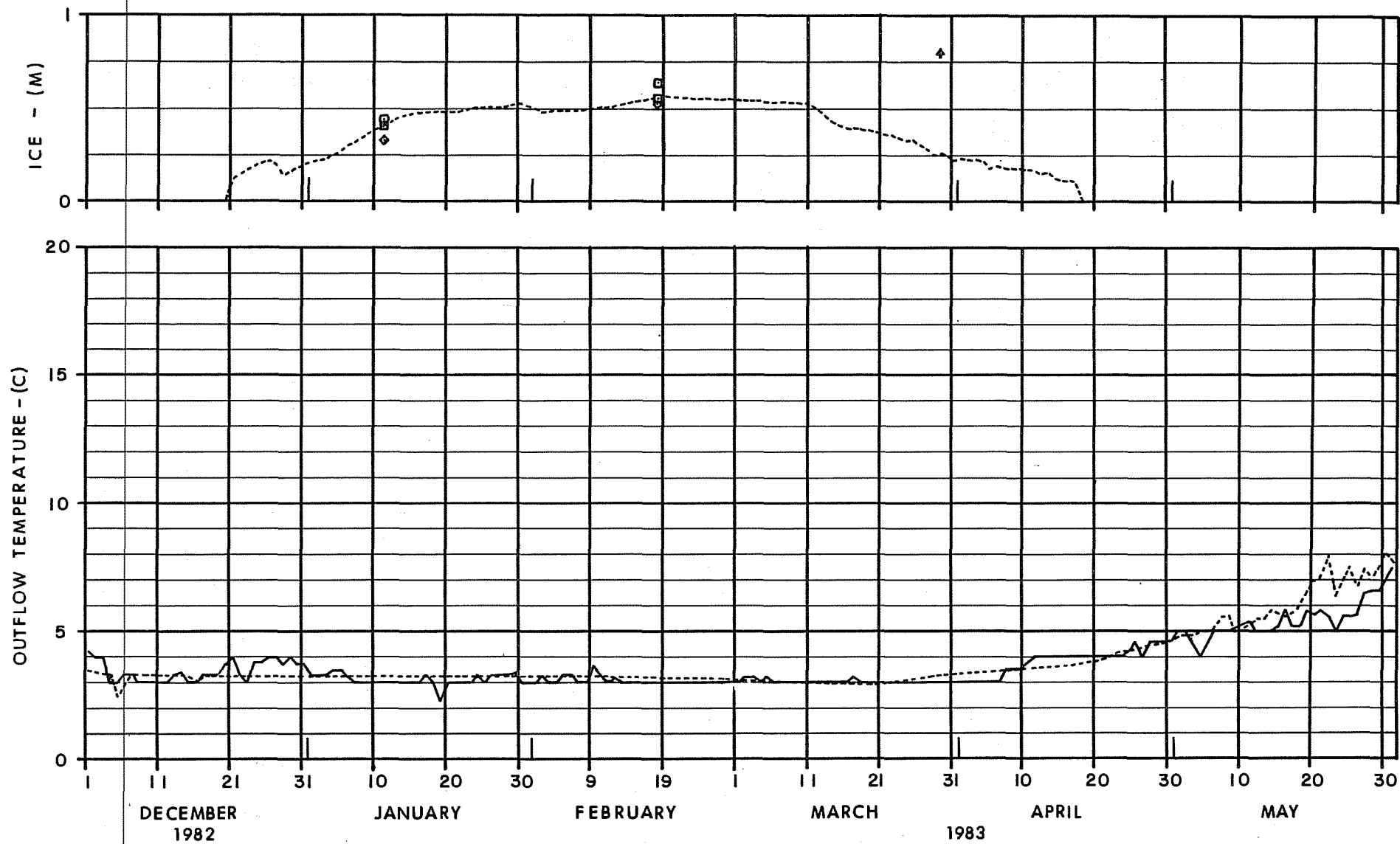
WATANA MULTILEVEL INTAKE STAGE I & II

FIGURE E.2.4.66



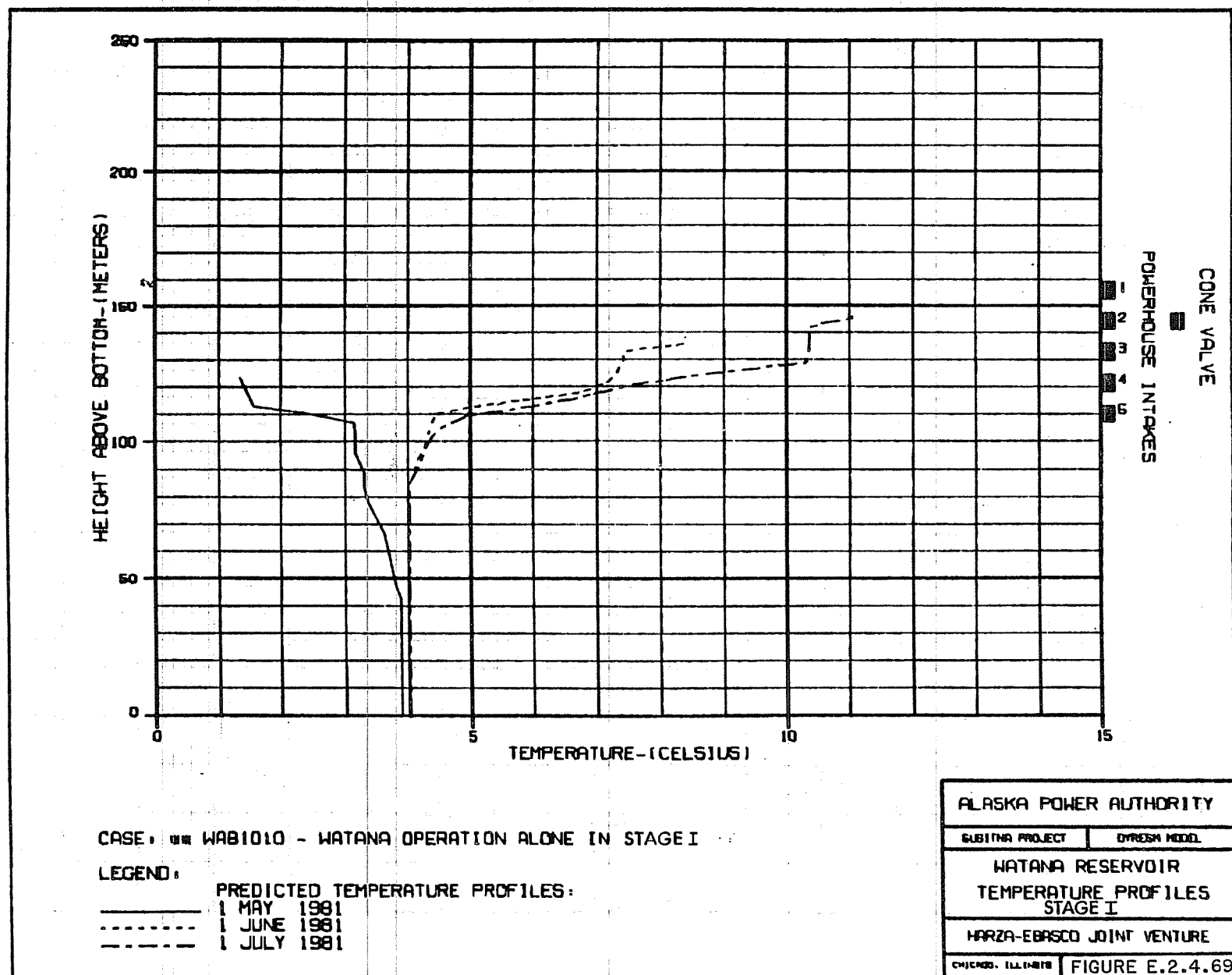
EKLUTNA LAKE MODEL CALIBRATION

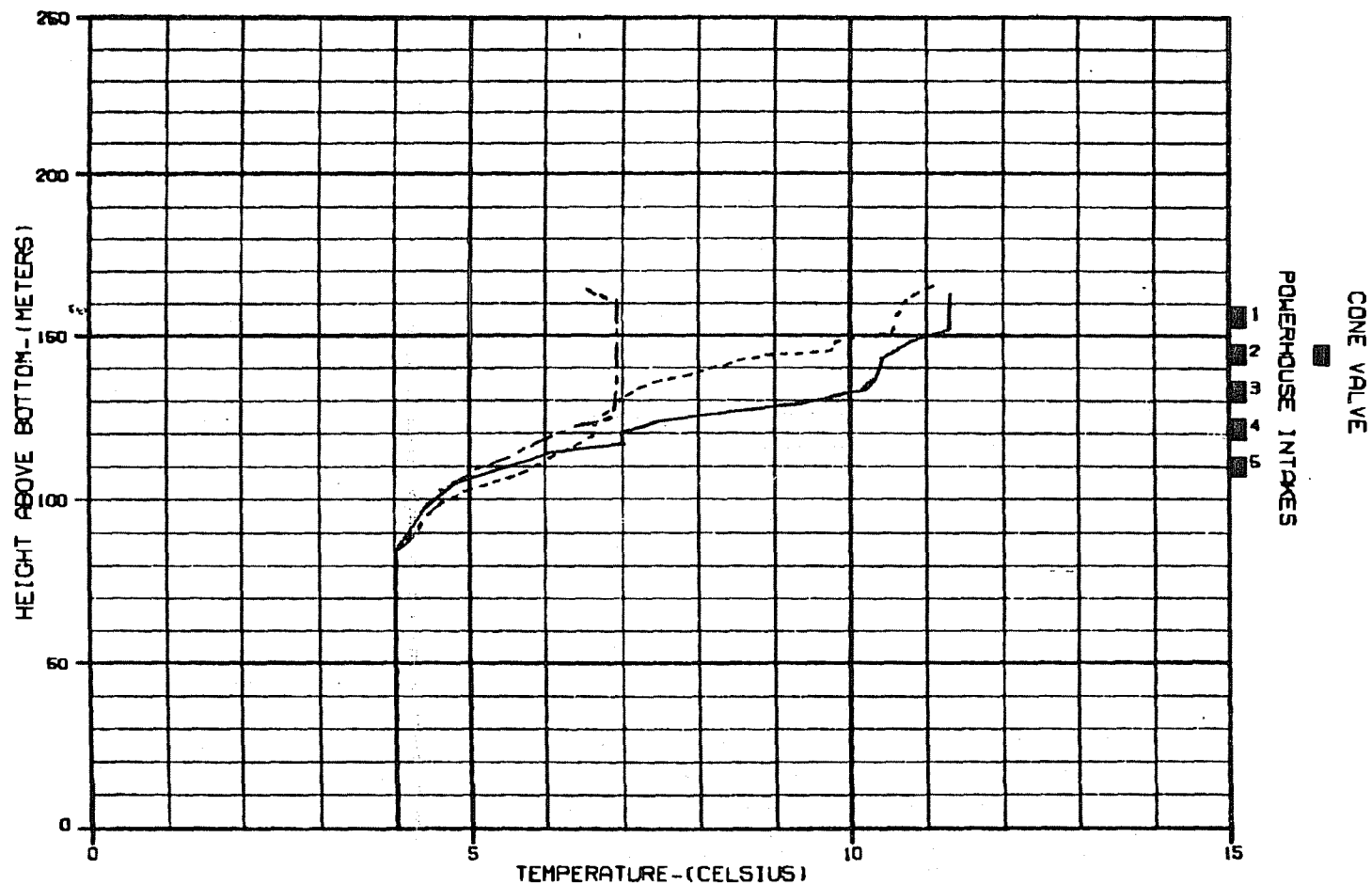
FIGURE E.2.4.67



EKLUTNA LAKE MODEL CALIBRATION

FIGURE E.2.4.68





CASE: WAB1010 - WATANA OPERATION ALONE IN STAGE I

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 AUGUST 1981
 - - - 1 SEPTEMBER 1981
 . . . 1 OCTOBER 1981

ALASKA POWER AUTHORITY

SUBMITTA PROJECT

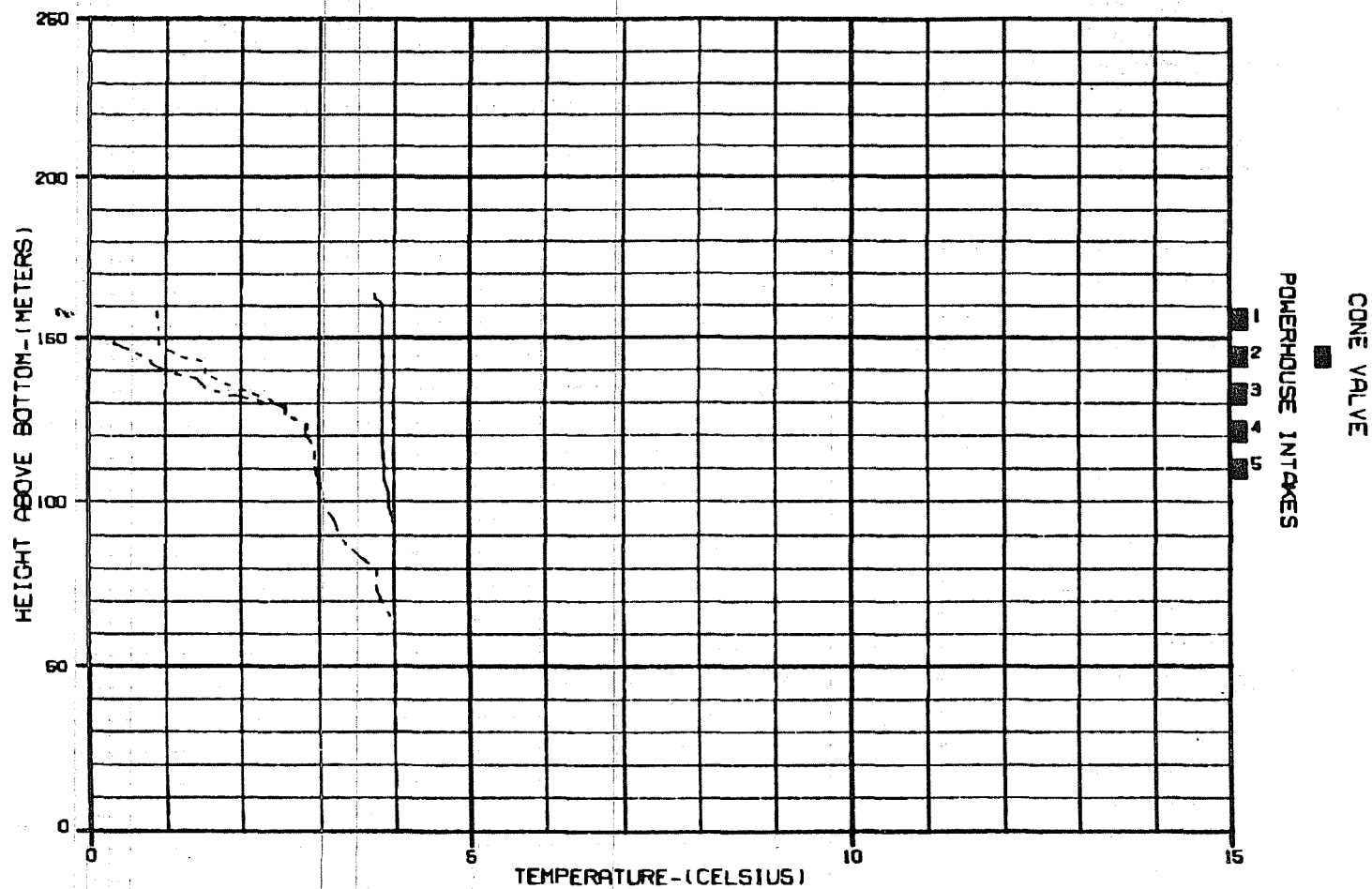
DYKES MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES
 STAGE I

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS

FIGURE E.2.4.70



CASE: WAB1010 - WATANA OPERATION ALONE IN STAGE I

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 NOVEMBER 1981
 - - - 1 DECEMBER 1981
 - . - 1 JANUARY 1982

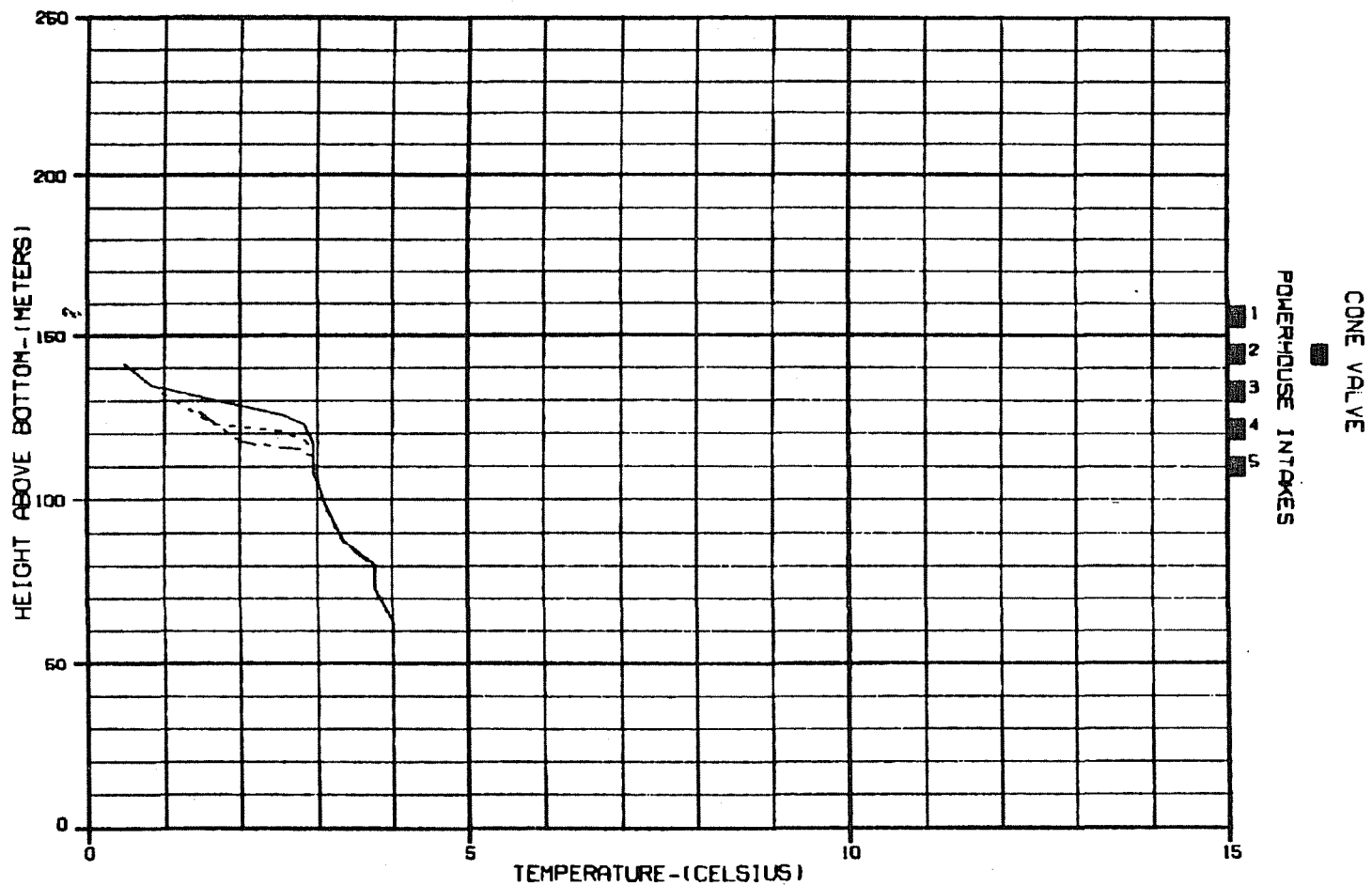
ALASKA POWER AUTHORITY

SUBITNA PROJECT DYWIDAG MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES
 STAGE I

WARZA-EBASCO JOINT VENTURE

CHICAGO, ILL. 60601 FIGURE E.2.4.71



CASE: WAB1010 - WATANA OPERATION ALONE IN STAGE I

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 FEBRUARY 1982
 1 MARCH 1982
 - - - - - 1 APRIL 1982

ALASKA POWER AUTHORITY

SUBTINA PROJECT

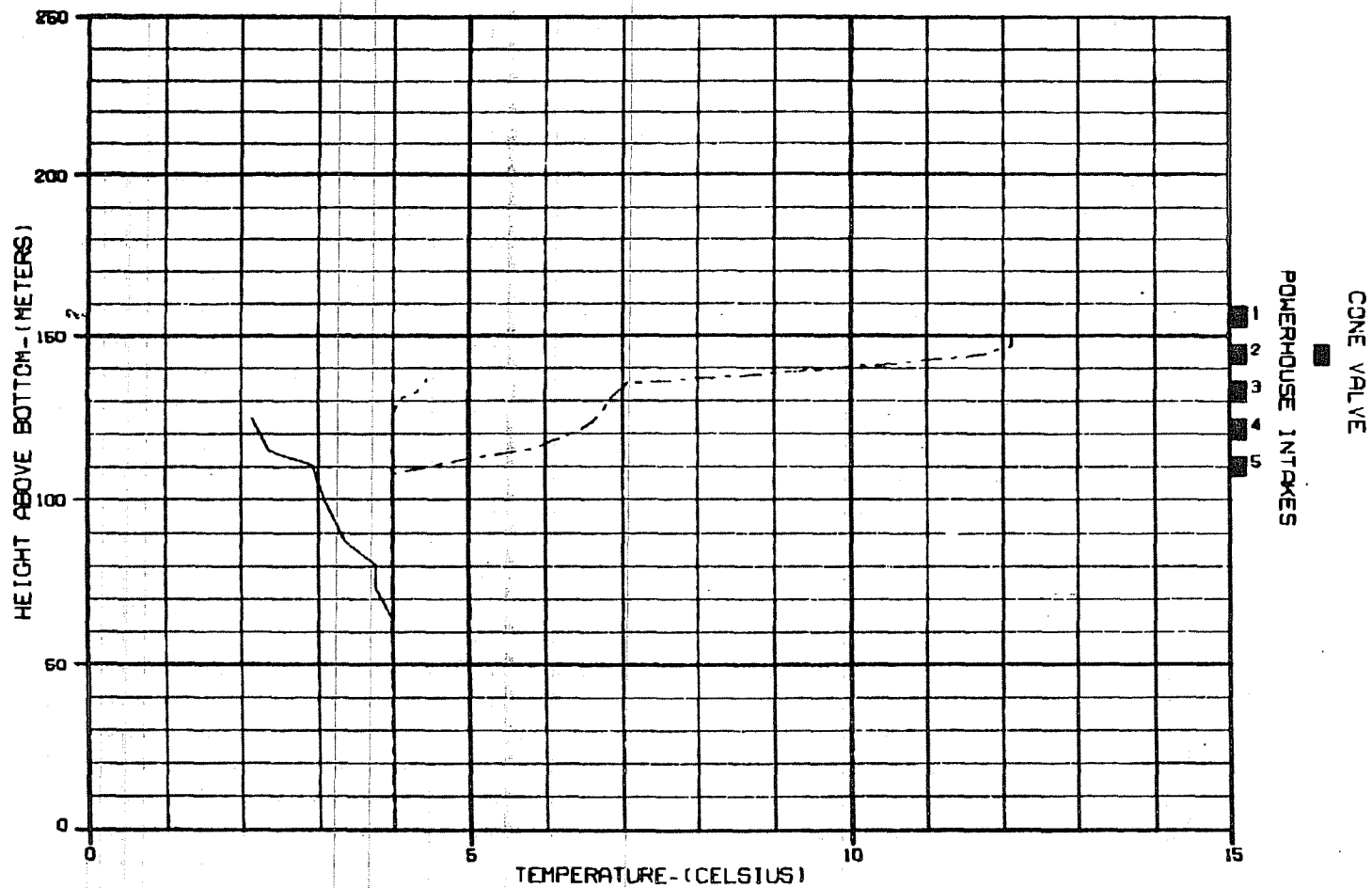
DYDASH MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES
 STAGE I

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS

FIGURE E.2.4.72



CASE: WAB1010 - WATANA OPERATION ALONE IN STAGE I

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 MAY 1982
 --- 1 JUNE 1982
 -.- 1 JULY 1982

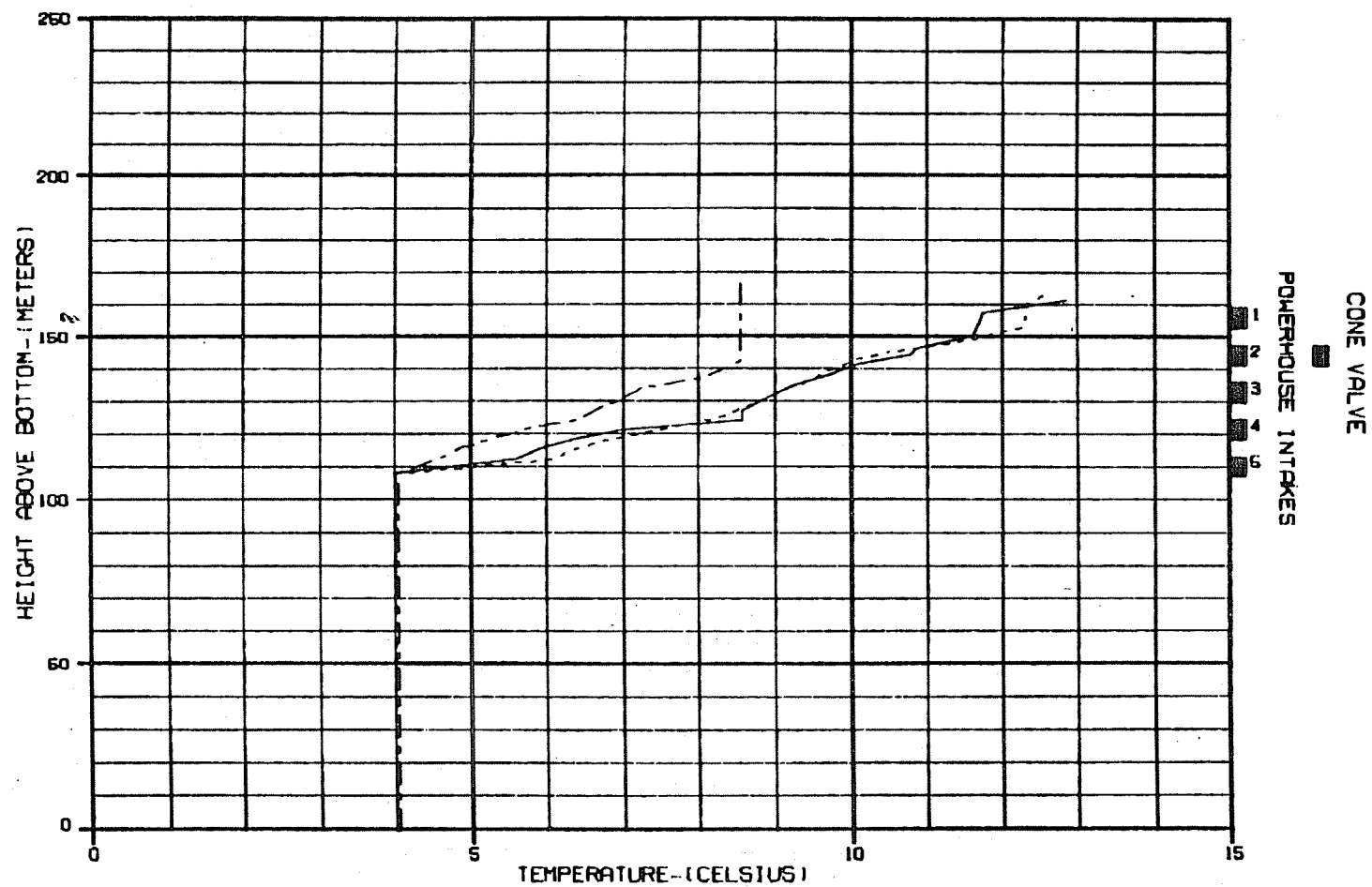
ALASKA POWER AUTHORITY

SUSTAINA PROJECT - DYWIDAG MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES
 STAGE I

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS FIGURE E.2.4.73



CASE: WAB1010 - WATANA OPERATION ALONE IN STAGE I

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 AUGUST 1982
 - - - 1 SEPTEMBER 1982
 - - - 1 OCTOBER 1982

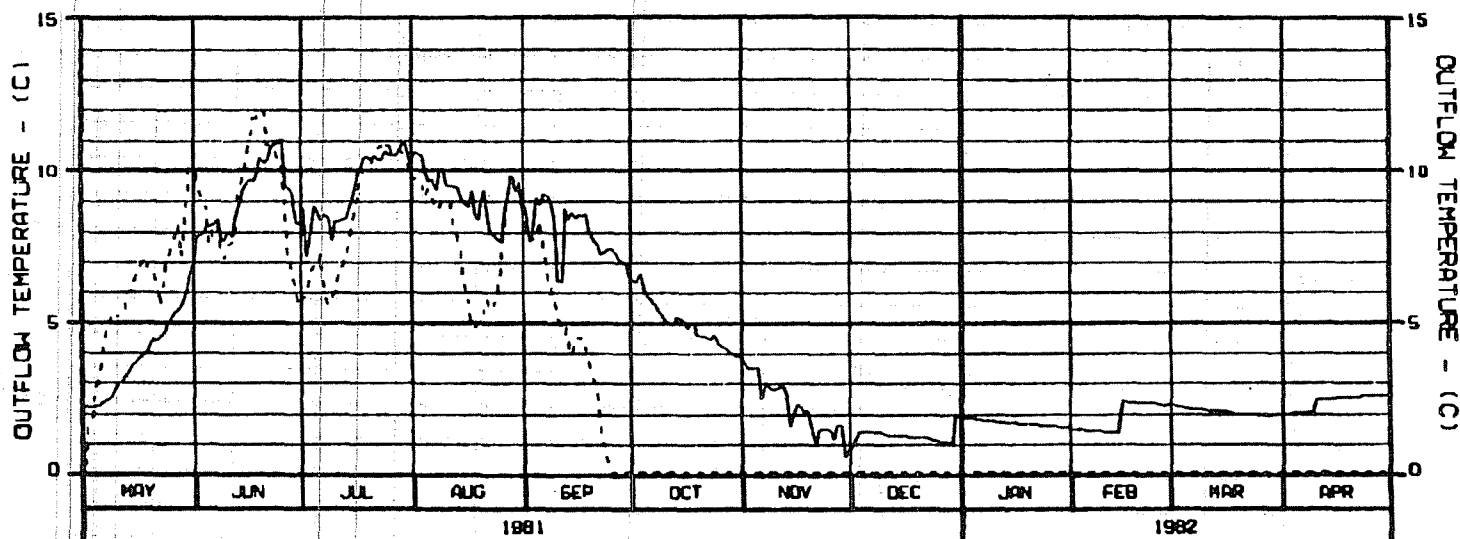
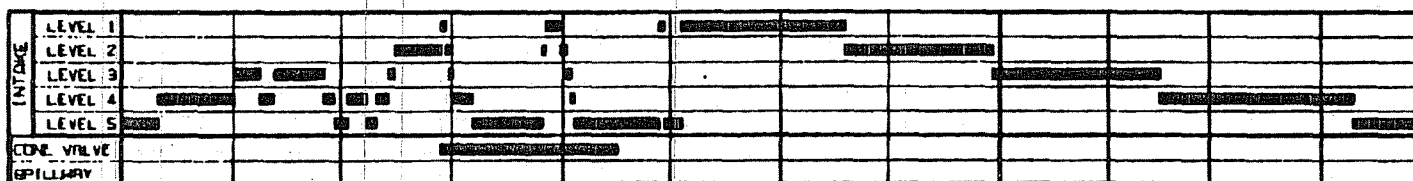
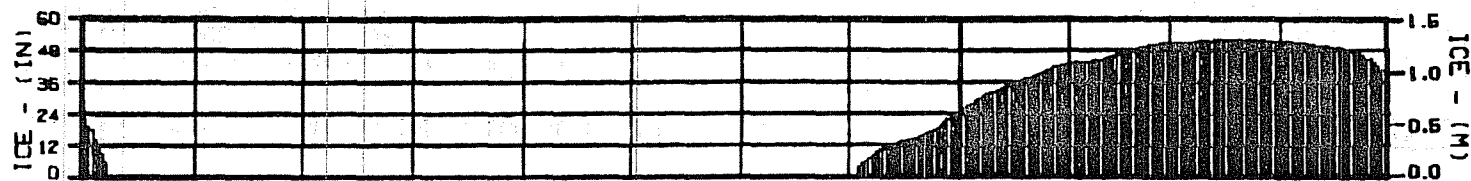
ALASKA POWER AUTHORITY

SUSTAINA PROJECT DYKES MODEL

WATANA RESERVOIR
 TEMPERATURE PROFILES
 STAGE I

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS FIGURE E.2.4.74



LEGEND: CASE: 88 WAB1010 - WATANA OPERATION

— PREDICTED OUTFLOW TEMPERATURE
 - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT EL. 1964 FT. (598.8 M)
 2. INTAKE PORT LEVEL 2 AT EL. 1926 FT. (587.2 M)
 3. INTAKE PORT LEVEL 3 AT EL. 1898 FT. (578.6 M)
 4. INTAKE PORT LEVEL 4 AT EL. 1860 FT. (566.0 M)
 5. INTAKE PORT LEVEL 5 AT EL. 1812 FT. (552.4 M)
 6. CONE VALVE AT ELEVATION 1929 FT. (588.0 M)
 7. SPILLWAY CREST AT ELEVATION 2148 FT. (654.7 M)

ALASKA POWER AUTHORITY

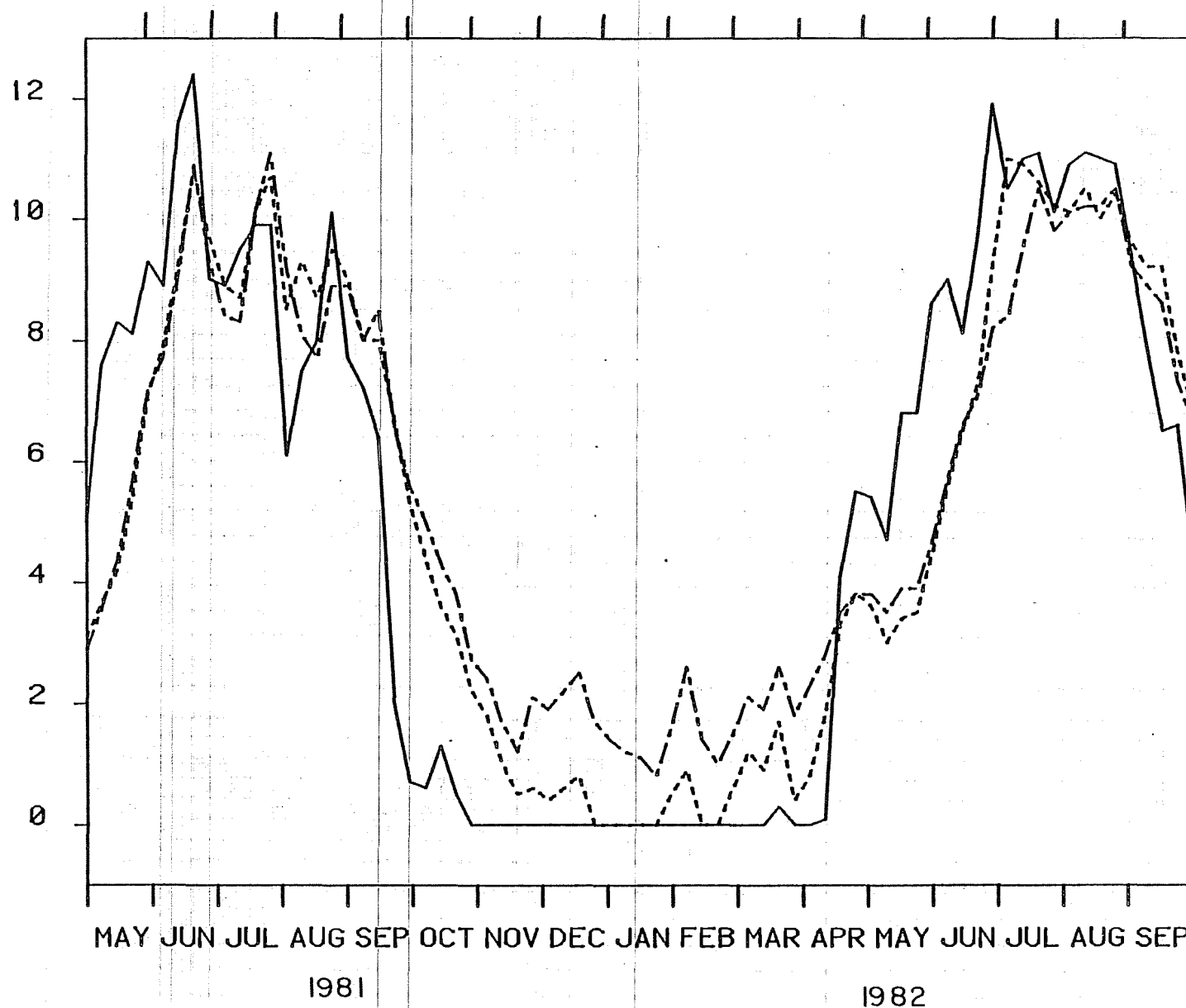
SUBMITTA PROJECT DYNASM MODEL

STAGE I WATANA RESERVOIR
 OUTFLOW TEMPERATURE
 AND ICE GROWTH (E-VI)

HARZA-EBASCO JOINT VENTURE

CHECKED: ILLI/1010 FIGURE E.2.4.75

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 1 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD DECEMBER-MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)

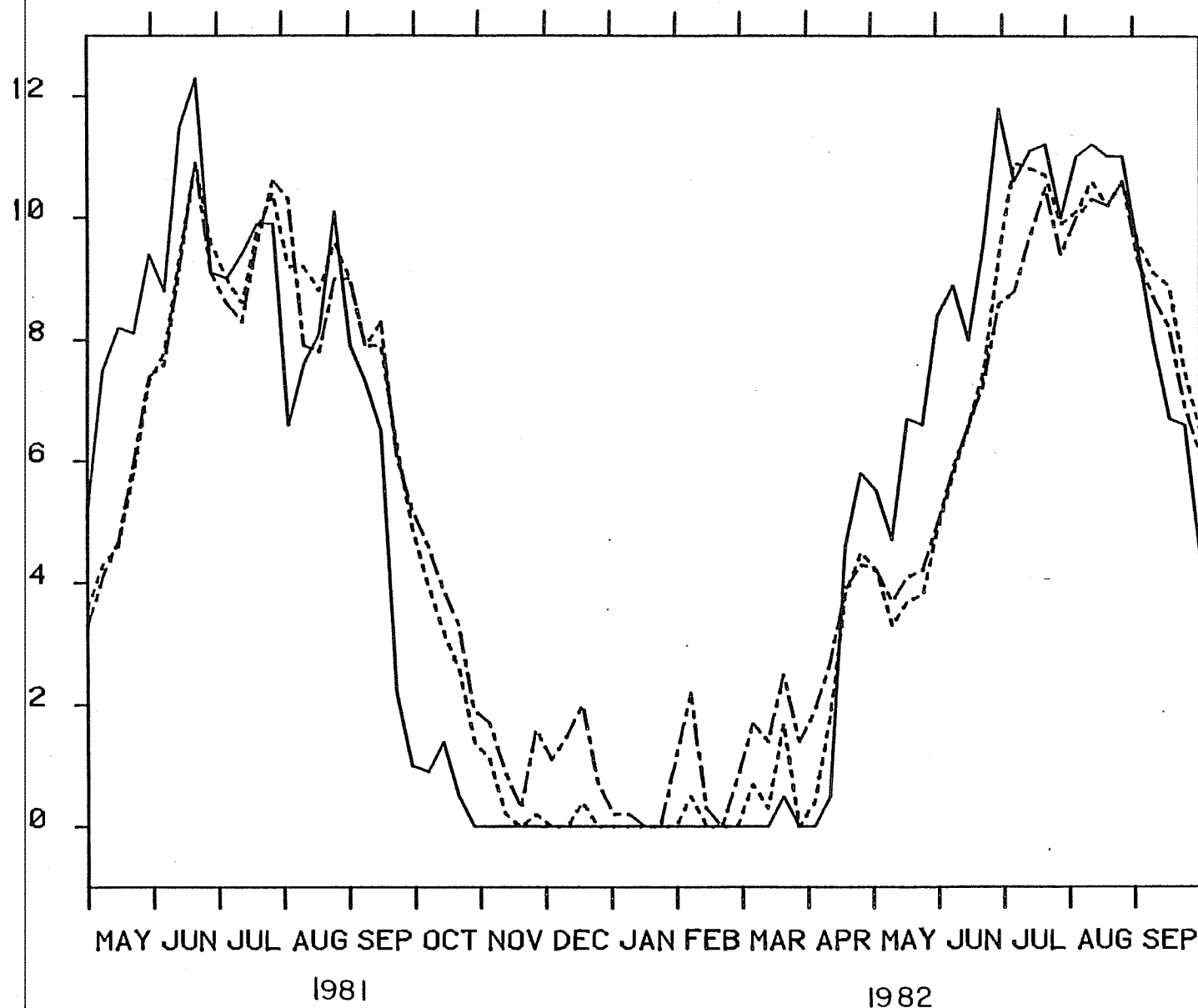
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES PHASE 1 OF TWO STAGE PROJECT (FOR COMPARISON)
- . - . - SIMULATED TEMPERATURES STAGE 1 OF PROPOSED PROJECT

ALASKA POWER AUTHORITY	
SUSITNA RIVER PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 150 STAGE 1	
DATE: 1982	BY: []
CHECKED: []	DATE: []

FIGURE E.2.4. 77

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 1 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-APRIL SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)

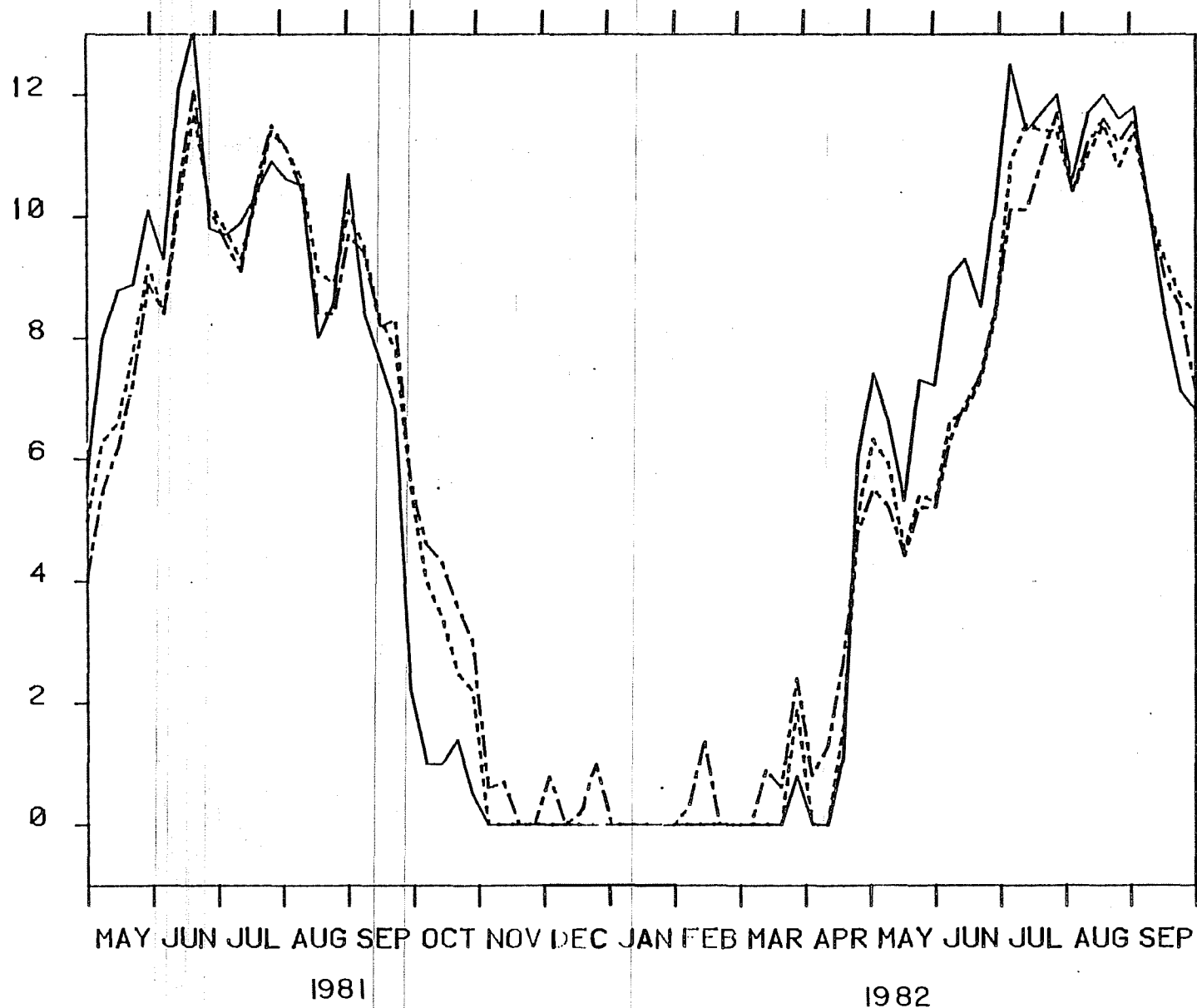
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES PHASE 1 OF TWO STAGE PROJECT (FOR COMPARISON)
- . - SIMULATED TEMPERATURES STAGE I OF PROPOSED PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 130	
STAGE I	
TABLE - 1	
DATE	
BY	

FIGURE E.2.4.78

DEGREES C



NOTES:

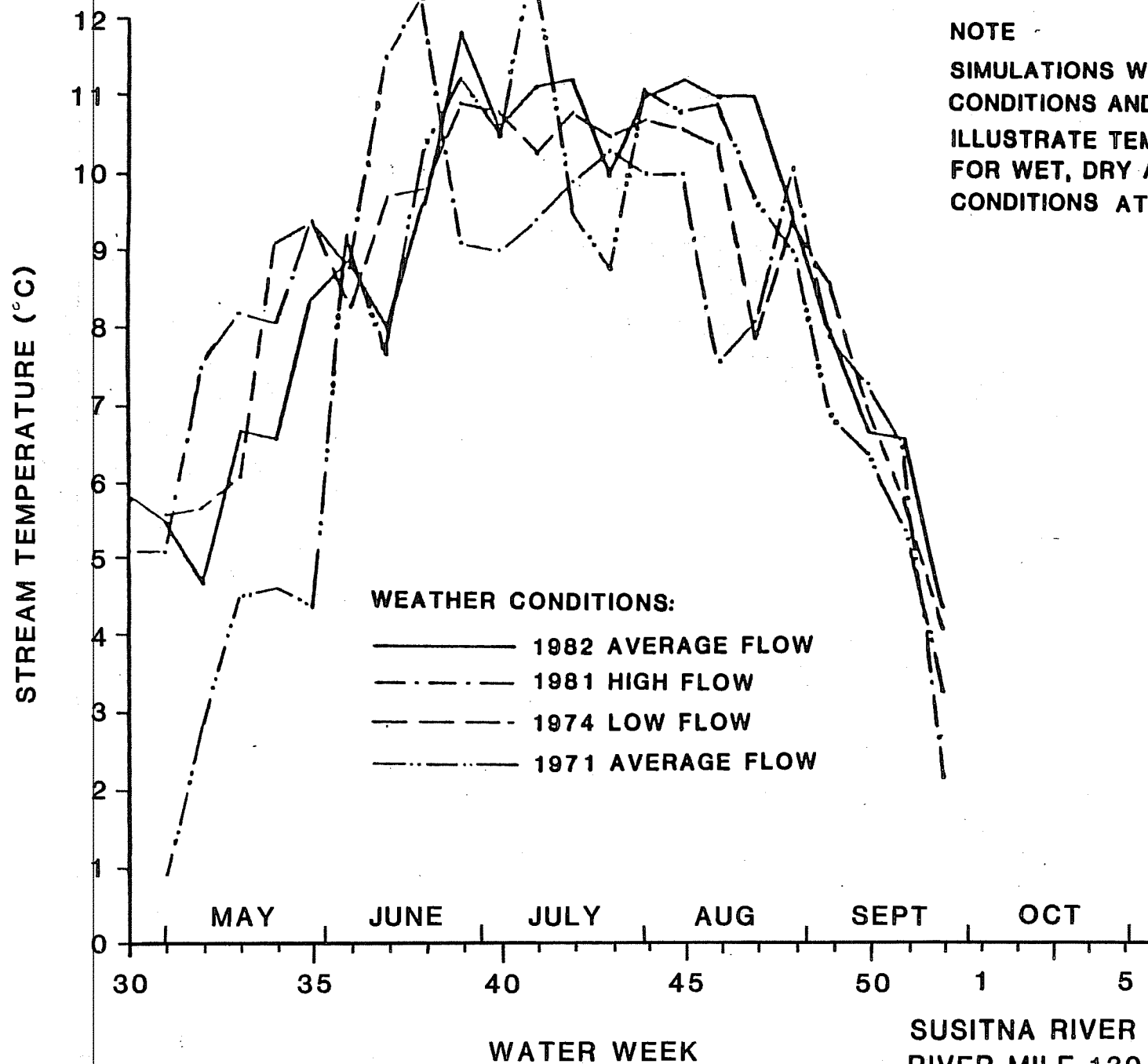
1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 1 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER - APRIL SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)

LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURE PHASE 1 OF TWO STAGE PROJECT (FOR COMPARI
- - - SIMULATED TEMPERATURE STAGE 1 OF PROPOSED PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 100	
STAGE I	
DATE: 10/1/82	BY: J. J. J.
APPROVED: J. J. J.	REVIEWED: J. J. J.

FIGURE E.2.4.79



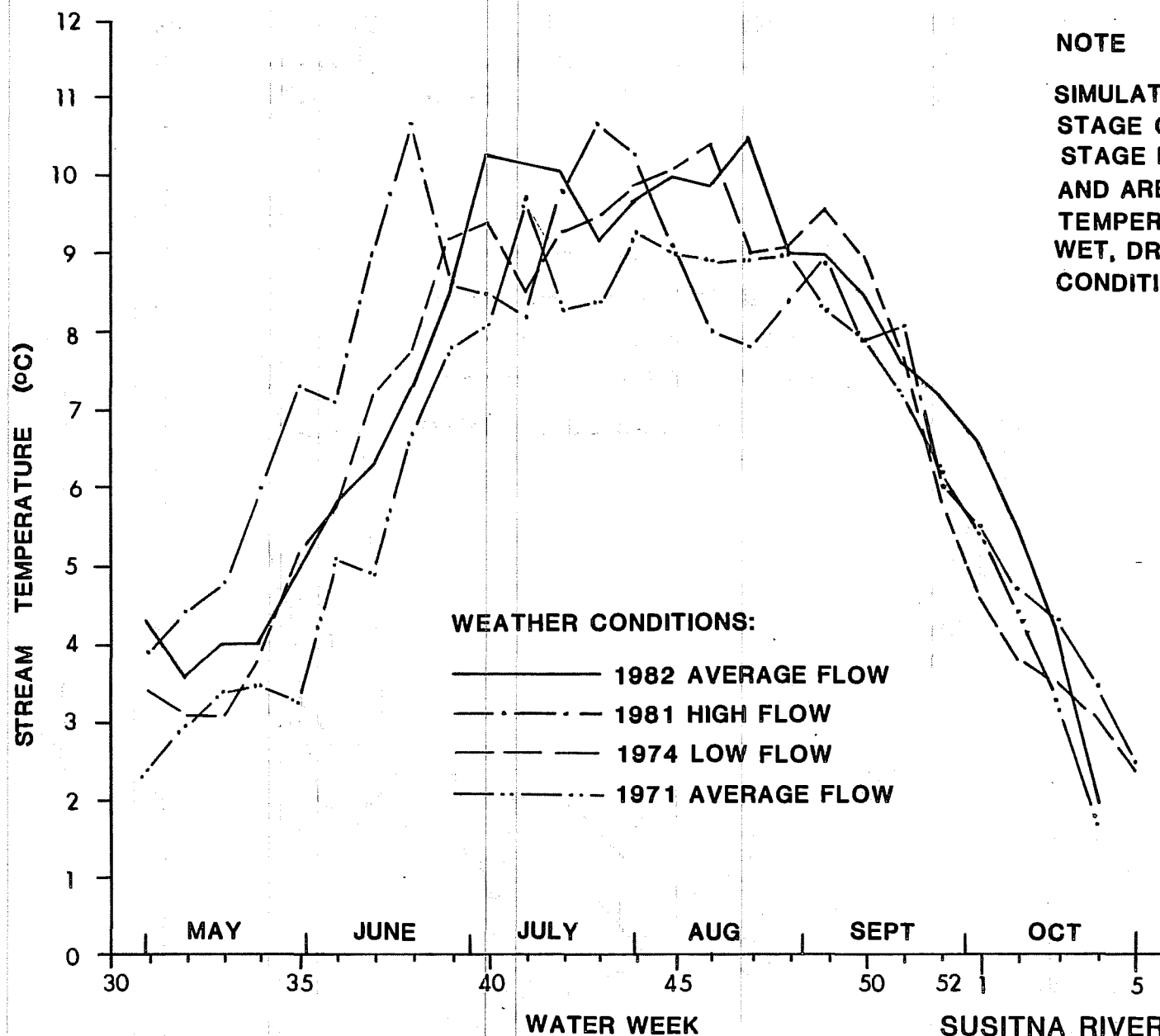
NOTE

SIMULATIONS WERE MADE FOR NATURAL CONDITIONS AND ARE PRESENTED TO ILLUSTRATE TEMPERATURE DIFFERENCES FOR WET, DRY AND AVERAGE FLOW CONDITIONS AT RIVER MILE 130

WEATHER CONDITIONS:

- 1982 AVERAGE FLOW
- . - . 1981 HIGH FLOW
- - - 1974 LOW FLOW
- ... 1971 AVERAGE FLOW

SUSITNA RIVER TEMPERATURES AT RIVER MILE 130 NATURAL CONDITIONS
FIGURE E.2.4.80

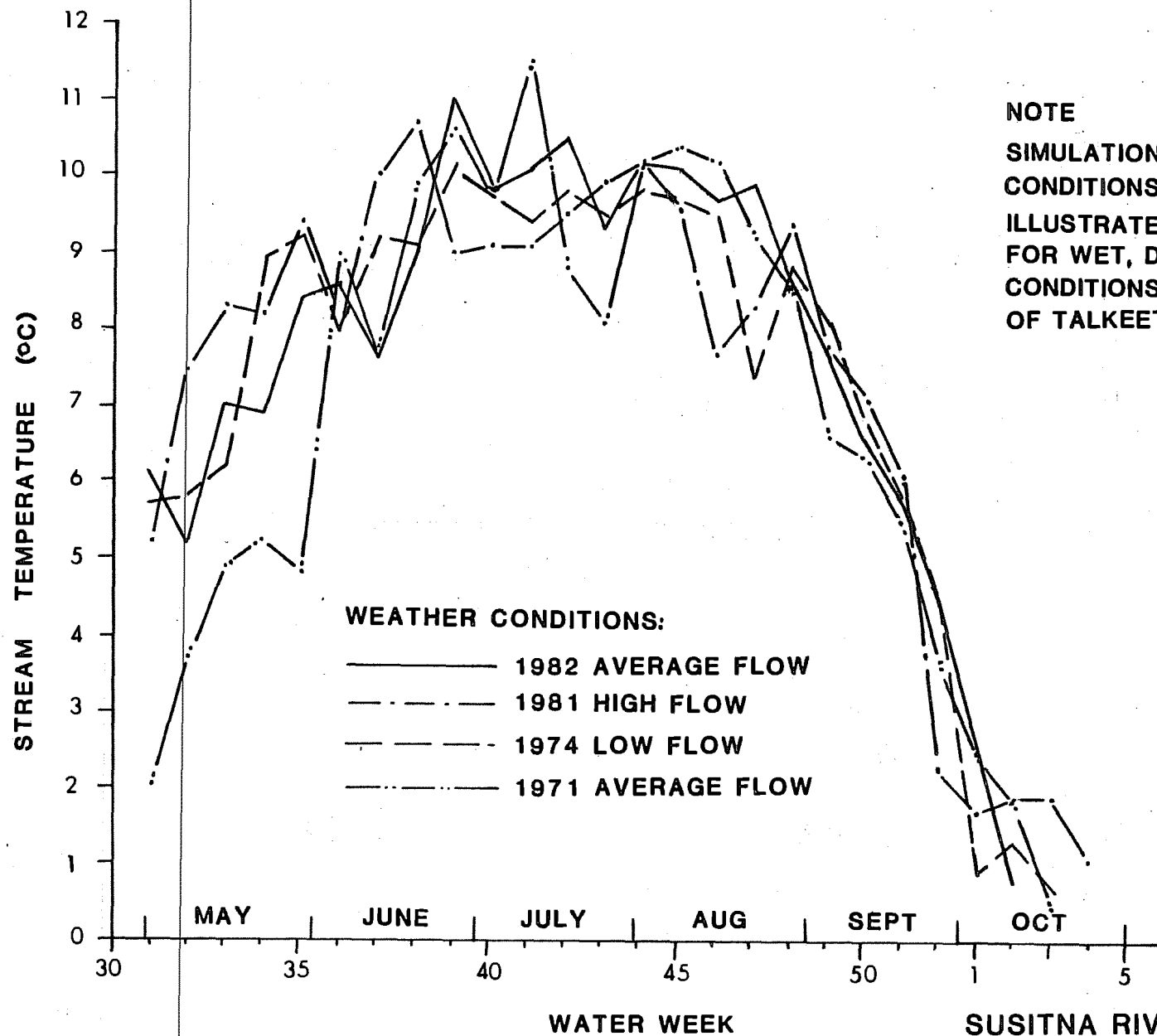


NOTE

SIMULATIONS WERE MADE FOR FIRST STAGE OF TWO STAGE PROJECT FOR STAGE I ENERGY DEMANDS AND ARE PRESENTED TO ILLUSTRATE TEMPERATURE DIFFERENCES FOR WET, DRY AND AVERAGE FLOW CONDITIONS

SUSITNA RIVER TEMPERATURE AT RIVER MILE 130 WATANA OPERATING

FIGURE E.2.4.81



NOTE

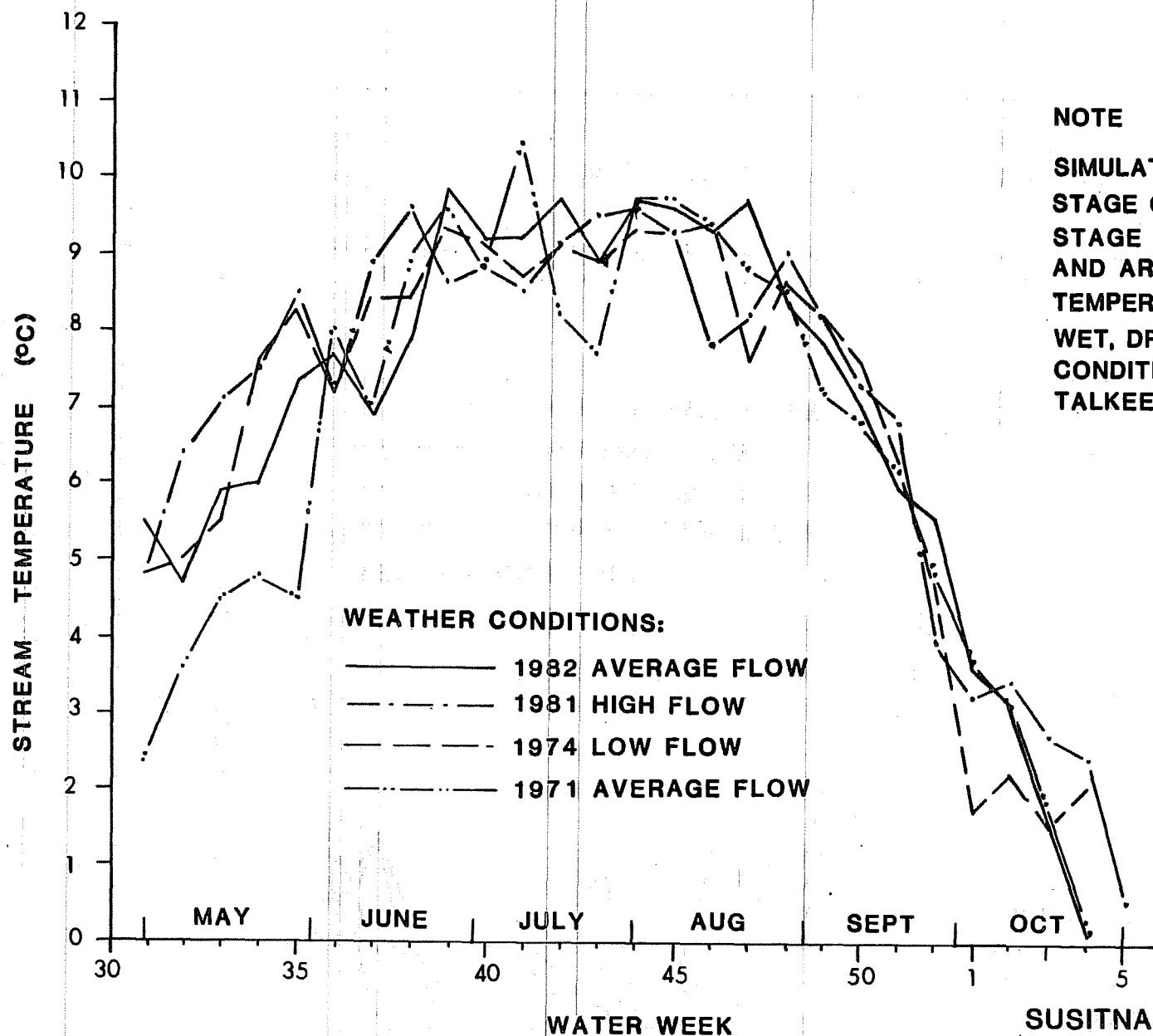
SIMULATIONS WERE MADE FOR NATURAL CONDITIONS AND ARE PRESENTED TO ILLUSTRATE TEMPERATURE DIFFERENCES FOR WET, DRY AND AVERAGE FLOW CONDITIONS IN RIVER DOWNSTREAM OF TALKEETNA

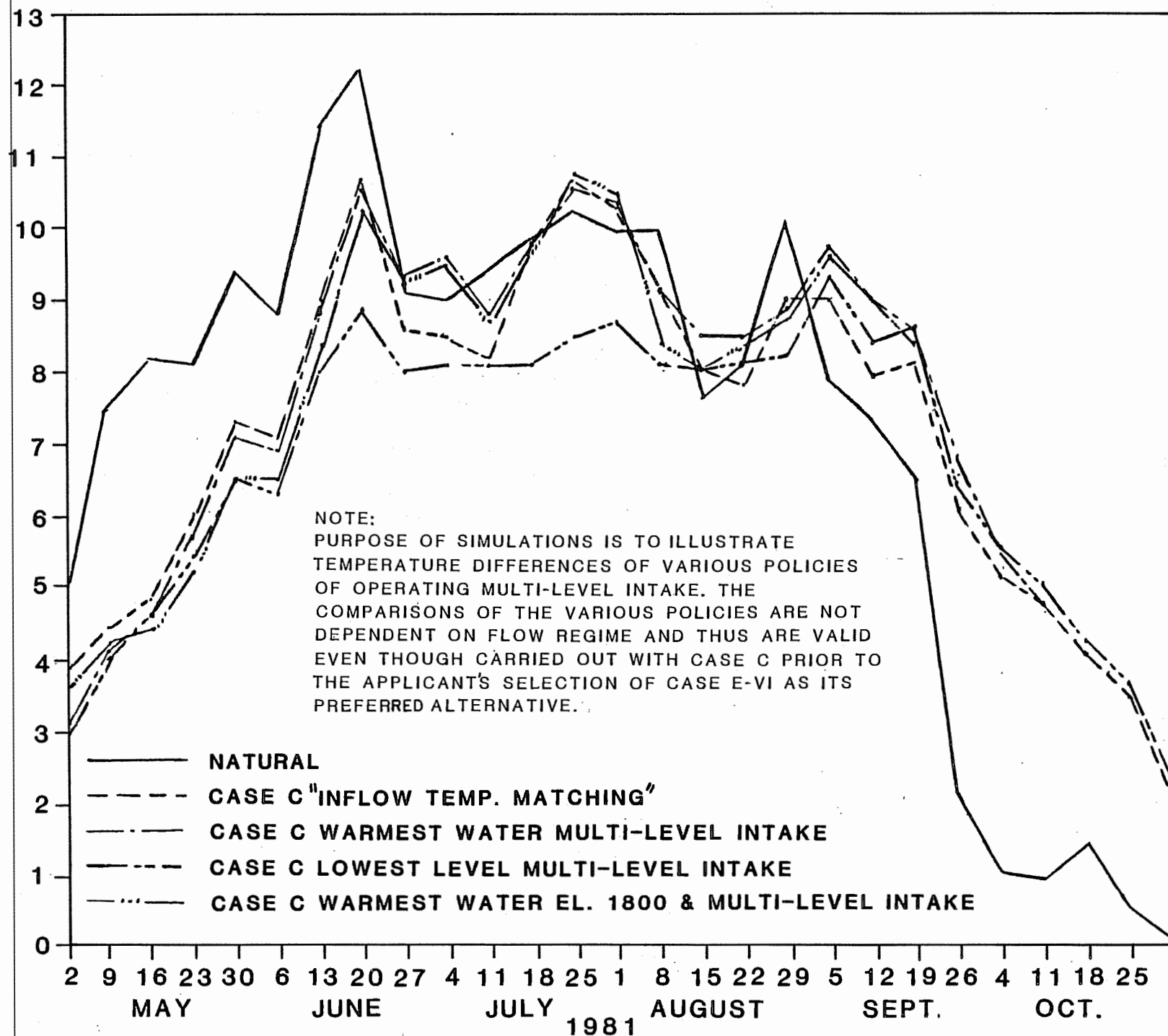
WEATHER CONDITIONS:

- 1982 AVERAGE FLOW
- - - - - 1981 HIGH FLOW
- . - . - 1974 LOW FLOW
- 1971 AVERAGE FLOW

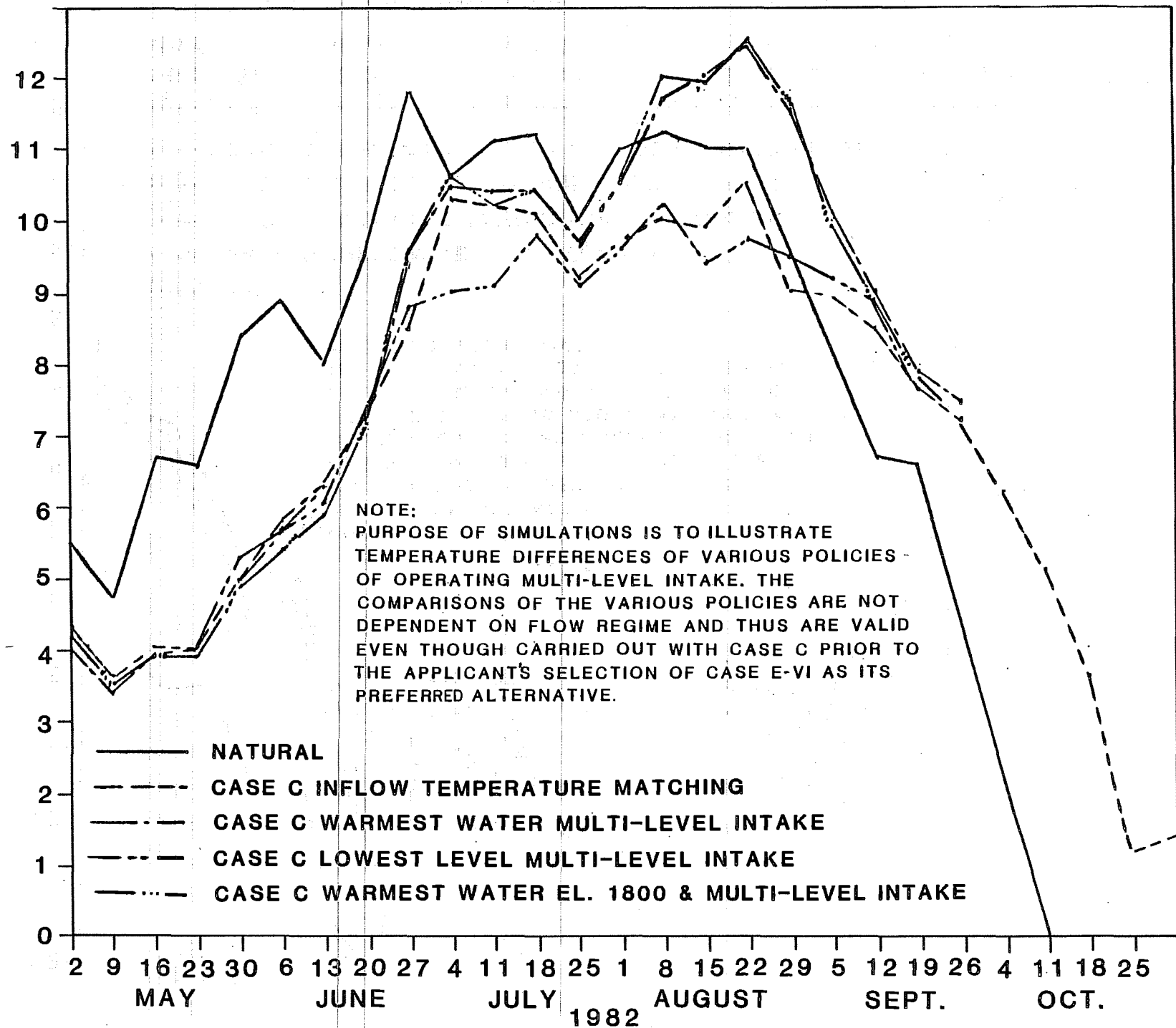
**SUSITNA RIVER TEMPERATURES AT
RIVER MILE 84 NATURAL CONDITIONS**

FIGURE E.2.4.82

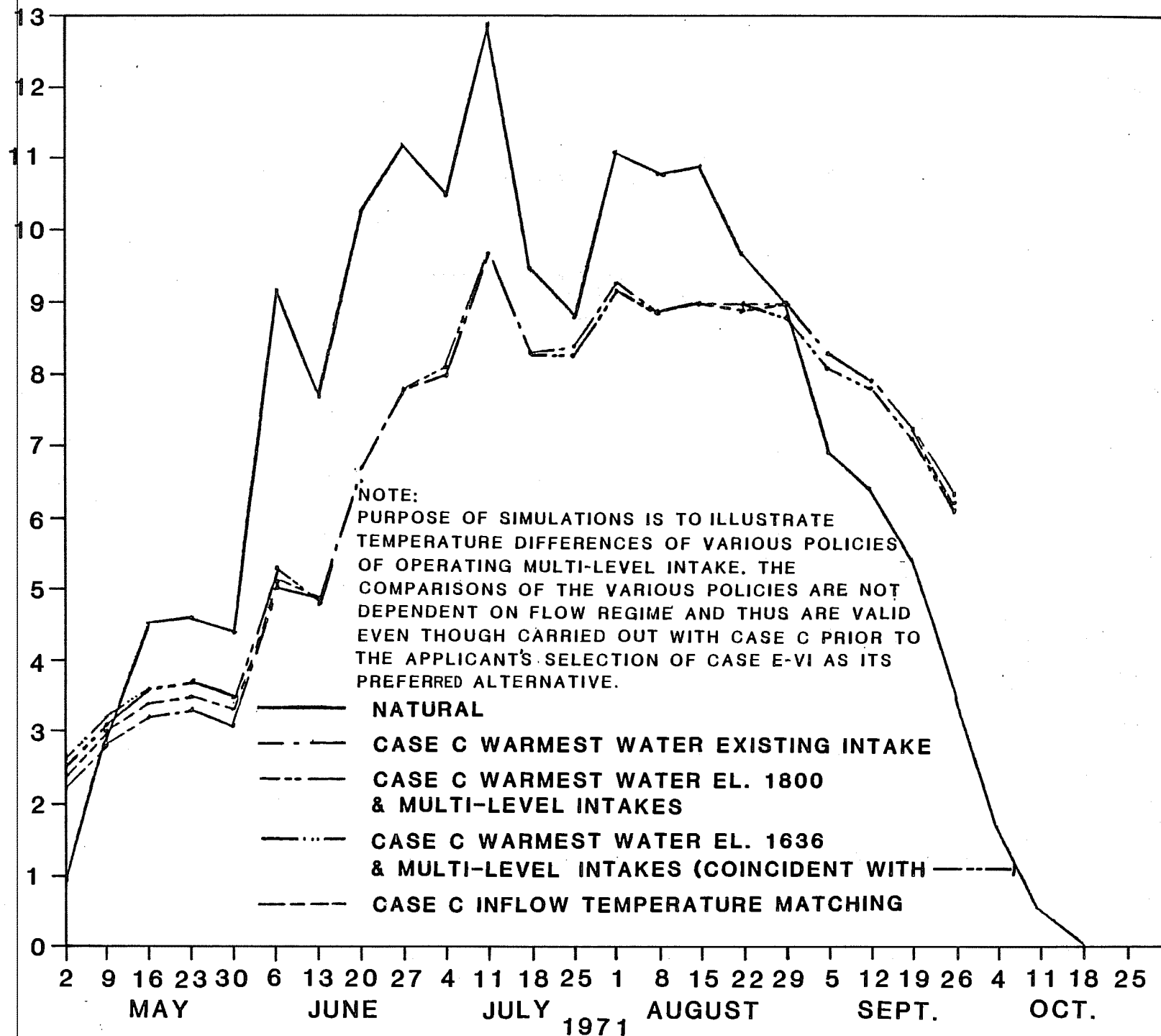




**SIMULATED TEMPERATURES AT RIVER MILE 130
 VARIOUS INTAKE OPERATING POLICIES**

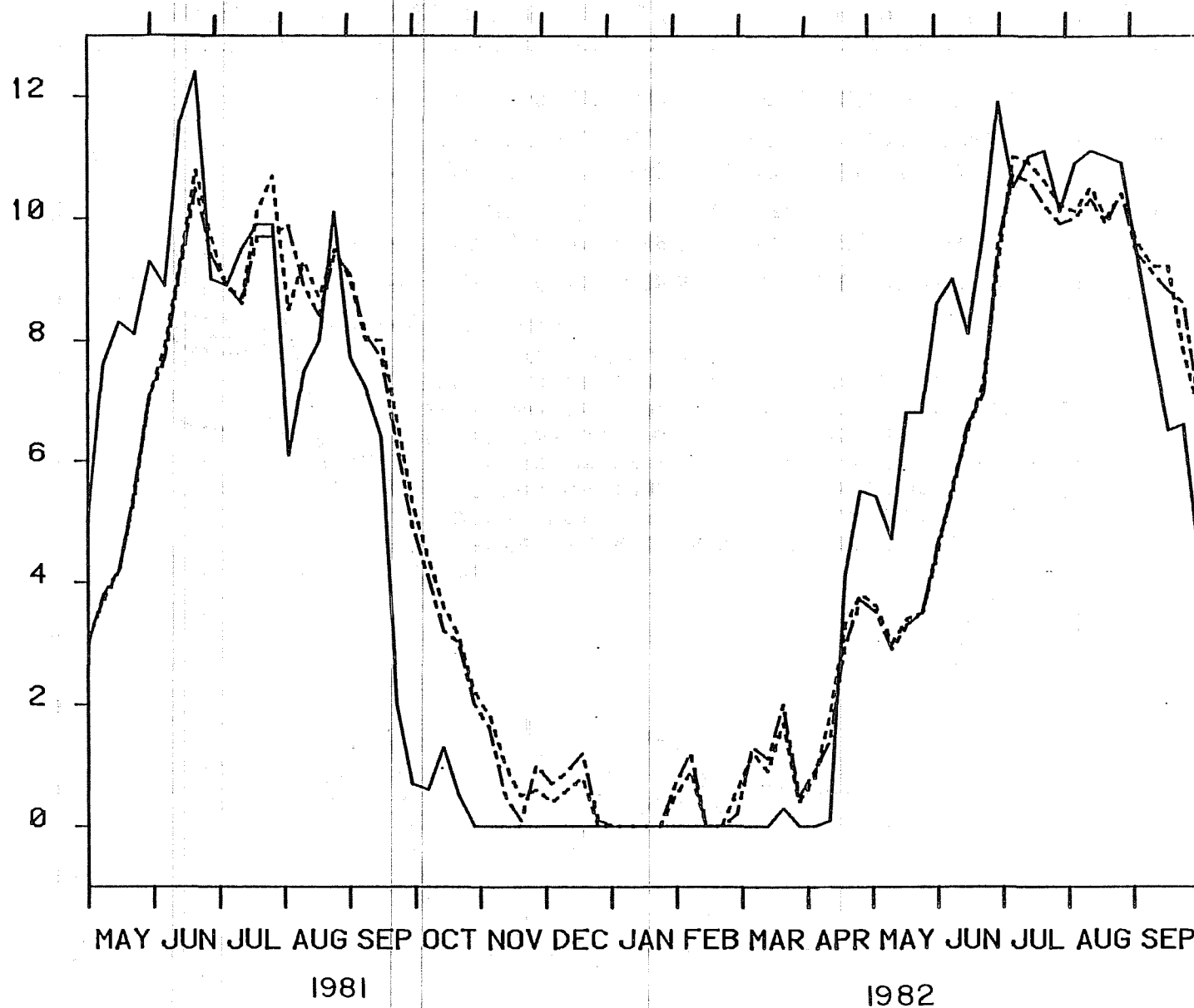


**SIMULATED TEMPERATURES AT RIVER MILE 130
VARIOUS INTAKE OPERATING POLICIES**



**SIMULATED TEMPERATURES AT RIVER MILE 130
 VARIOUS INTAKE OPERATING POLICIES**

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 1 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD DECEMBER - MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER

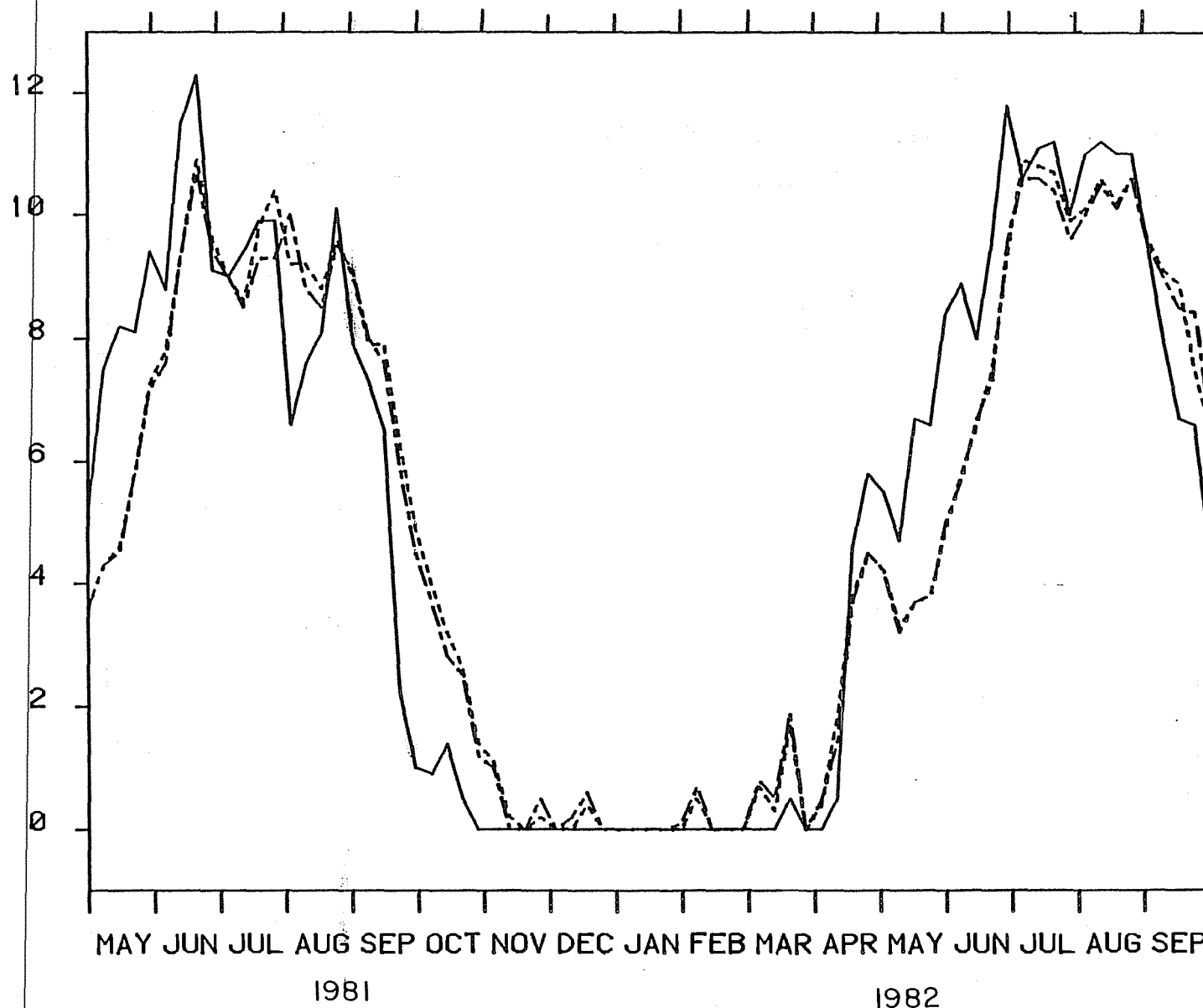
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES E-VI FLOW REQUIREMENTS PROPOSED PROJECT
- . - SIMULATED TEMPERATURES E-I FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 160 STAGE I	
DATE: 10/1/82	BY: J. H. HARRIS
REVISION: 10/1/82	BY: J. H. HARRIS

FIGURE E.2.4. 87

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 1 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-APRIL SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER

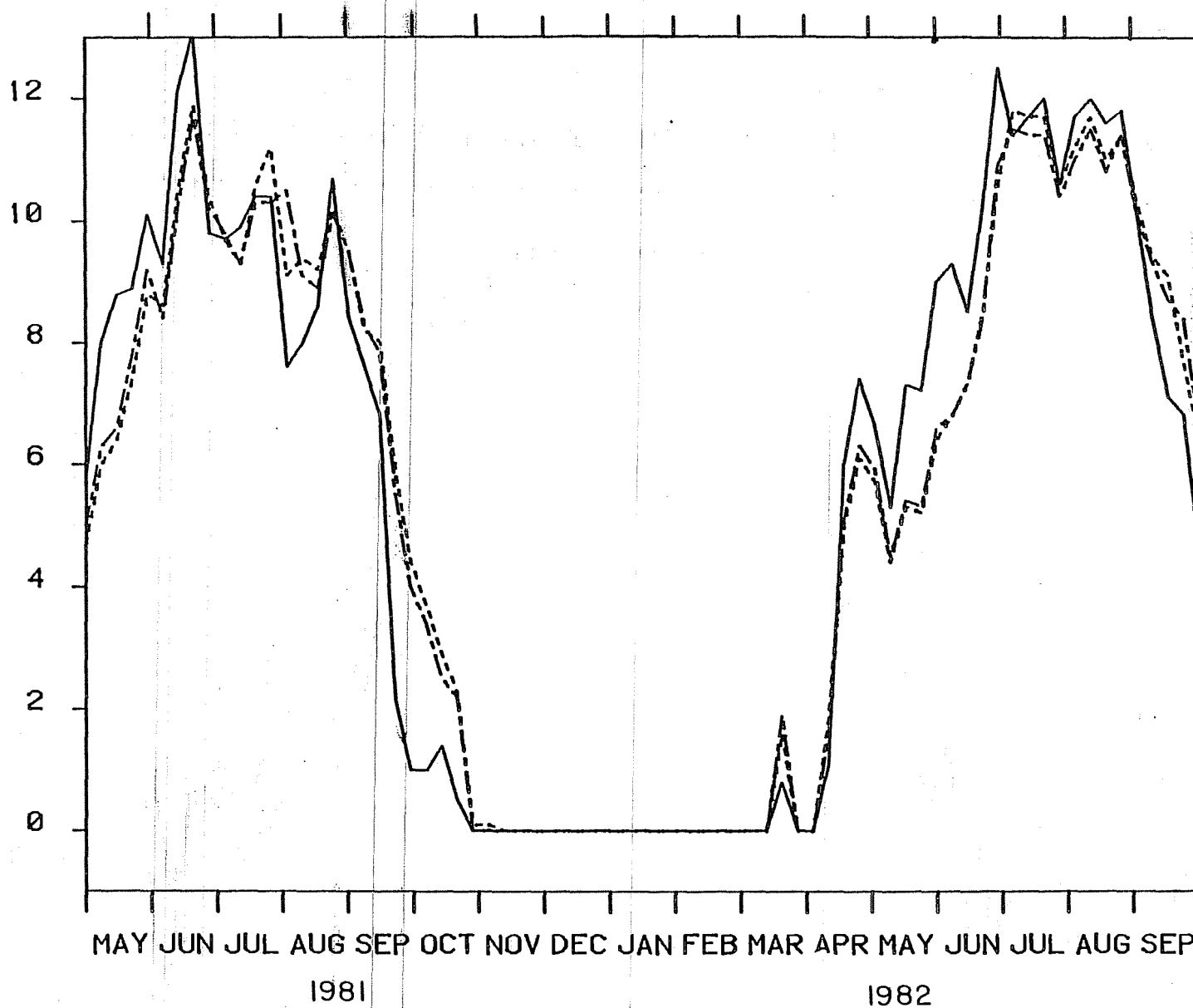
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES E-VI FLOW REQUIREMENTS PROPOSED PROJECT
- . - SIMULATED TEMPERATURES E-I FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 130 STAGE I	
DATE: 10/1/82	BY: J. H. HARRIS
APPROVED: J. H. HARRIS	DATE: 10/1/82

FIGURE E.2.4. 88

DEGREES
C



NOTES:

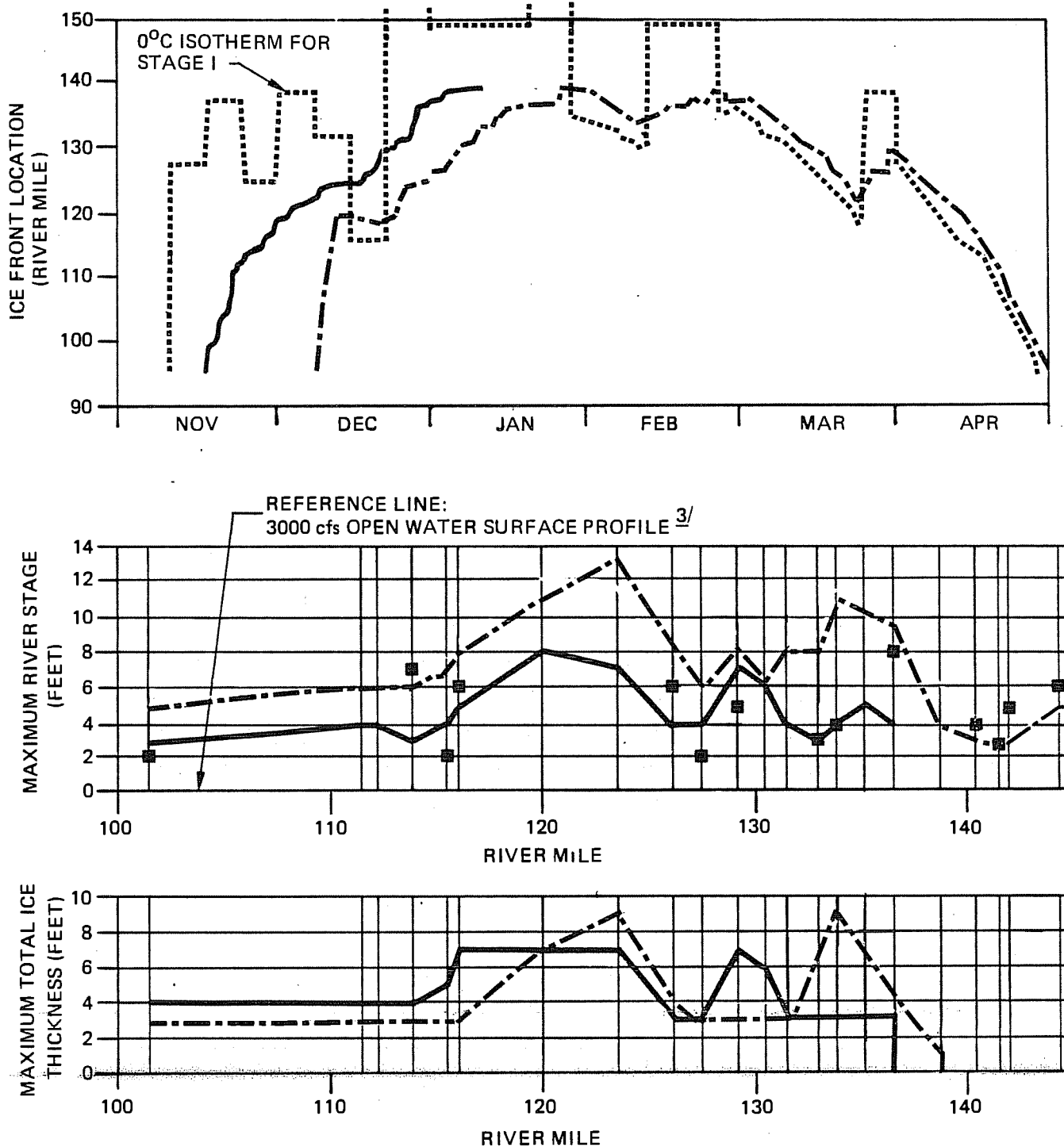
1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 1 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-APRIL SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)

LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES E-VI FLOW REQUIREMENTS PROPOSED PROJECT
- . - SIMULATED TEMPERATURES E-I FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 100 STAGE I	
DATE: 11/1/82	BY: J. J. J.
REVISION: 1.0	REVISION: 1.0

FIGURE E.2.4. 89



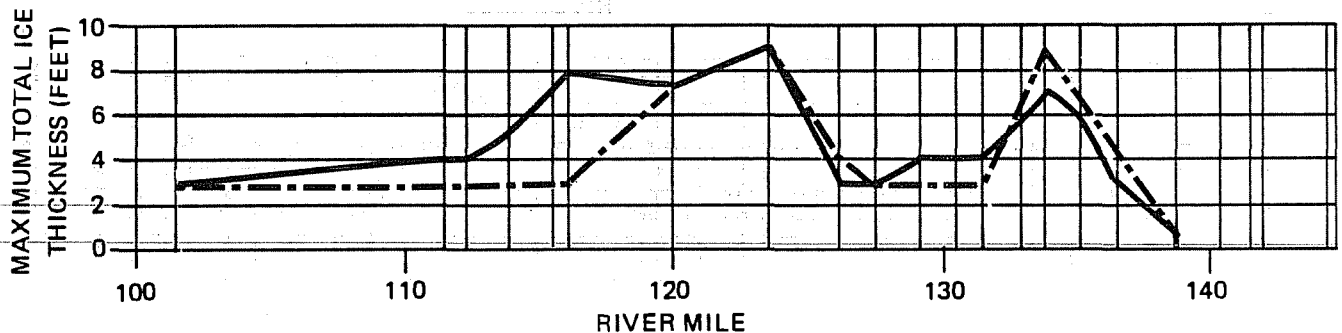
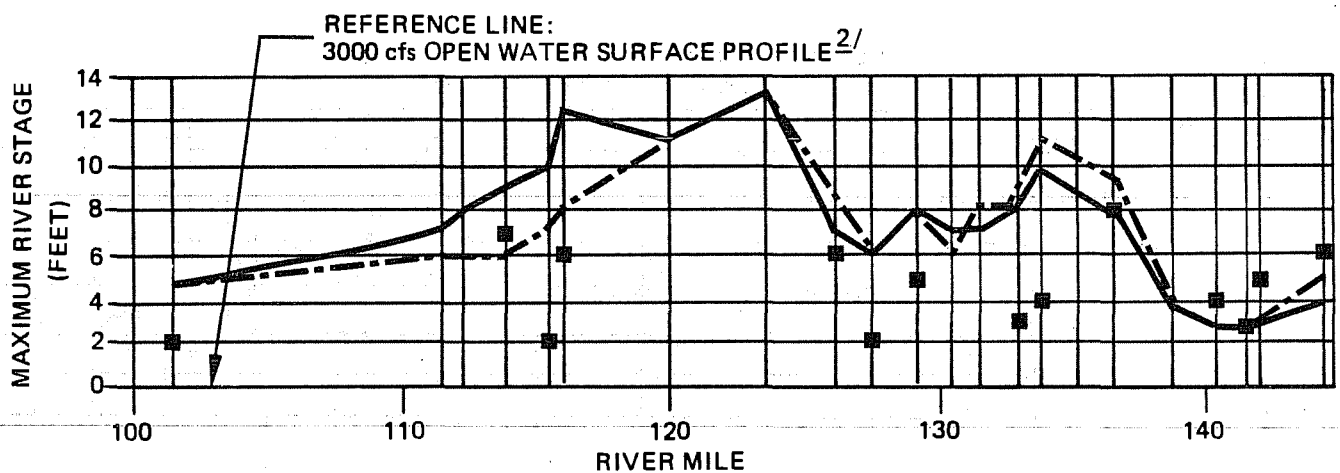
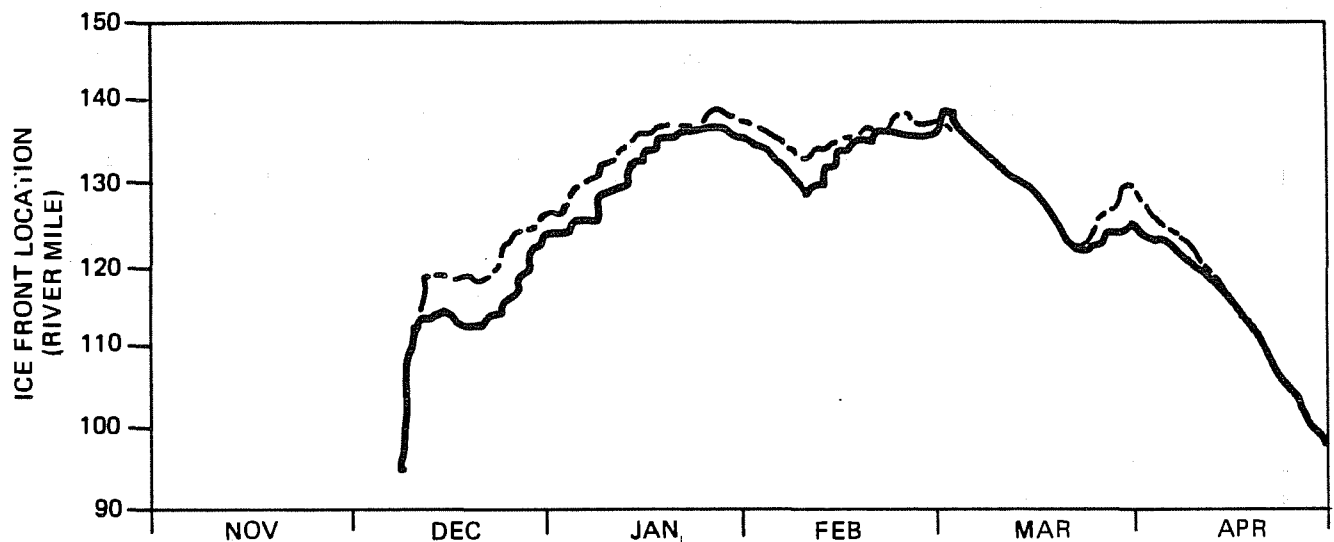
NOTES:

1. STAGE I SIMULATION BASED ON CASE E-VI FLOWS. STAGE I ENERGY DEMAND, INFLOW MATCHING TEMPERATURE POLICY.
2. NATURAL CONDITIONS NOT SIMULATED UPSTREAM OF RM 140.
3. 3000 cfs REPRESENTS TYPICAL WINTER FLOW UNDER NATURAL CONDITIONS AT FREEZE UP.

LEGEND:

- NATURAL CONDITIONS
- STAGE I OPERATING
- NATURAL SLOUGH BERM ELEVATION
(SEE TABLE E.2.4.23)

**SIMULATED RIVER ICE CONDITIONS
STAGE I vs. NATURAL
1981-82 WEATHER CONDITIONS
CASE E-VI FLOWS**



NOTES:

1. SIMULATIONS BASED ON STAGE I ENERGY DEMAND, INFLOW MATCHING TEMPERATURE POLICY.
2. 3000 cfs REPRESENTS TYPICAL FLOW UNDER NATURAL CONDITIONS AT FREEZE UP.

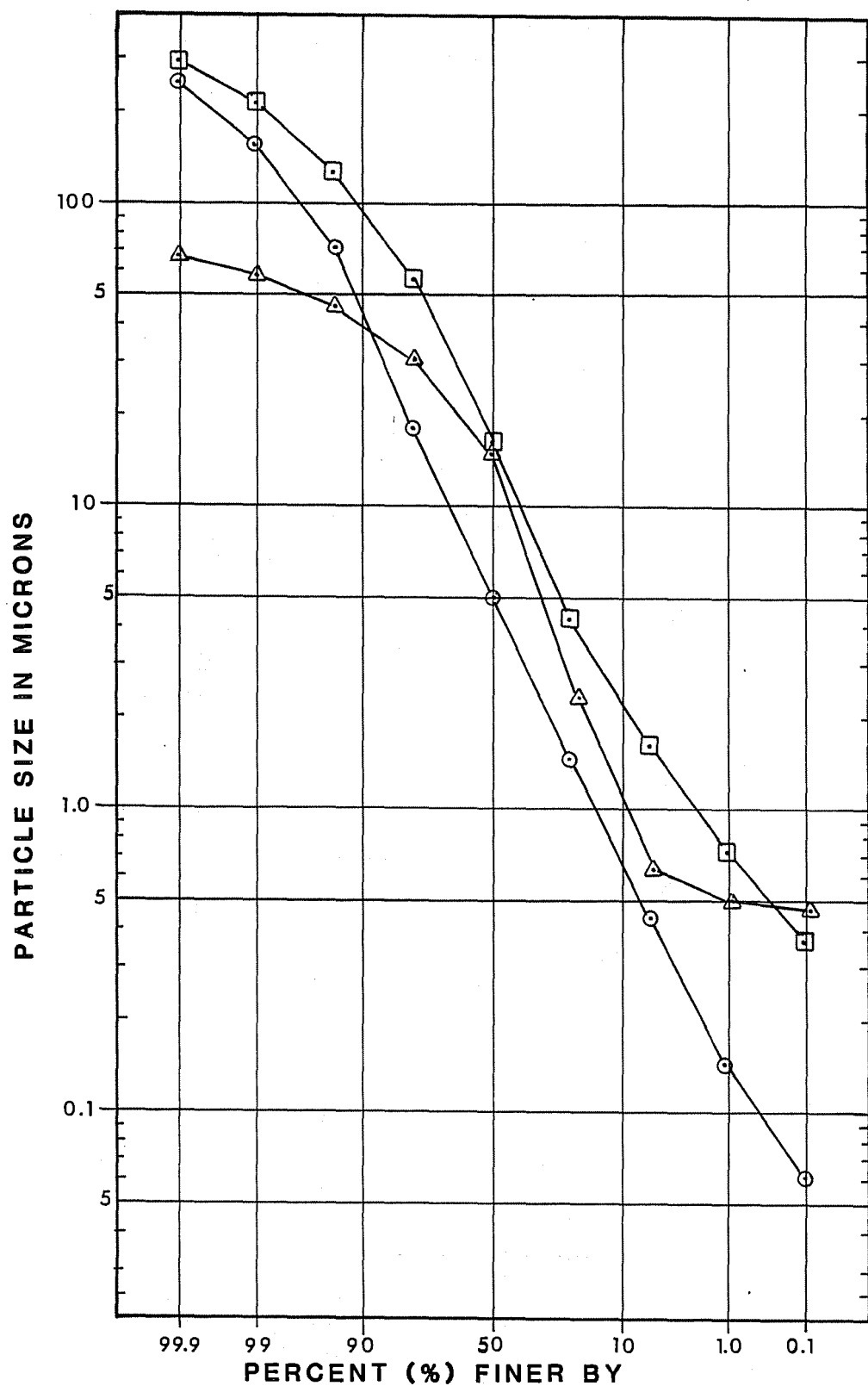
LEGEND:

— CASE E-1 FLOWS

- - - CASE E-VI FLOWS

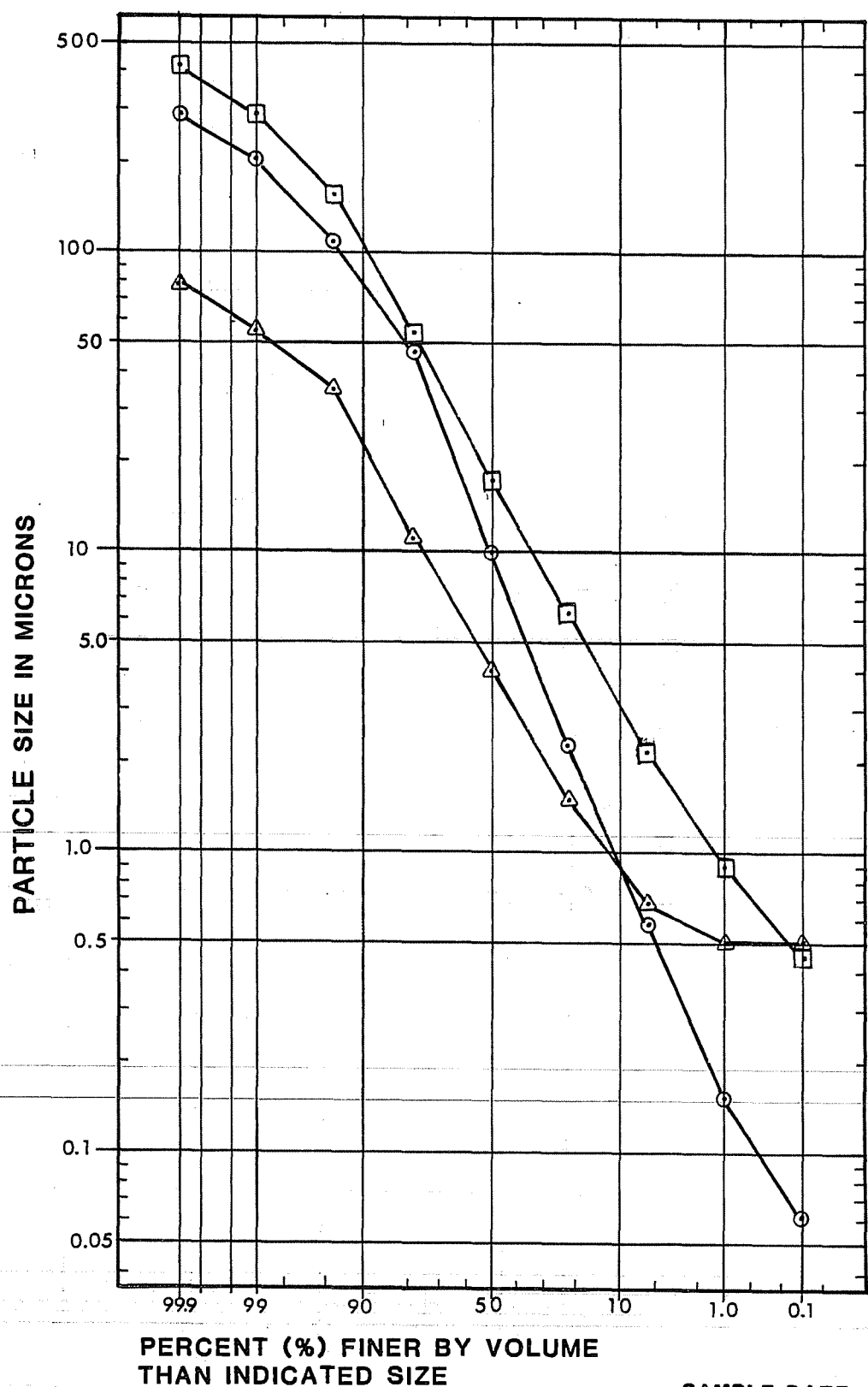
..... NATURAL SLOUGH BERM ELEVATION
(SEE TABLE E.2.4.24)

**SIMULATED RIVER ICE CONDITIONS
STAGE I
1981-82 WEATHER CONDITIONS
CASE E-I vs. CASE E-VI**



VOLUME THAN INDICATED SIZE SAMPLE DATE
 ○ 7/20/84
 □ 8/28/84
 △ 10/23/84

EAST FORK EKLUTNA CREEK
 SUSPENDED SEDIMENT PARTICLE SIZE DISTRIBUTION



SAMPLE DATE

○ 7/20/84

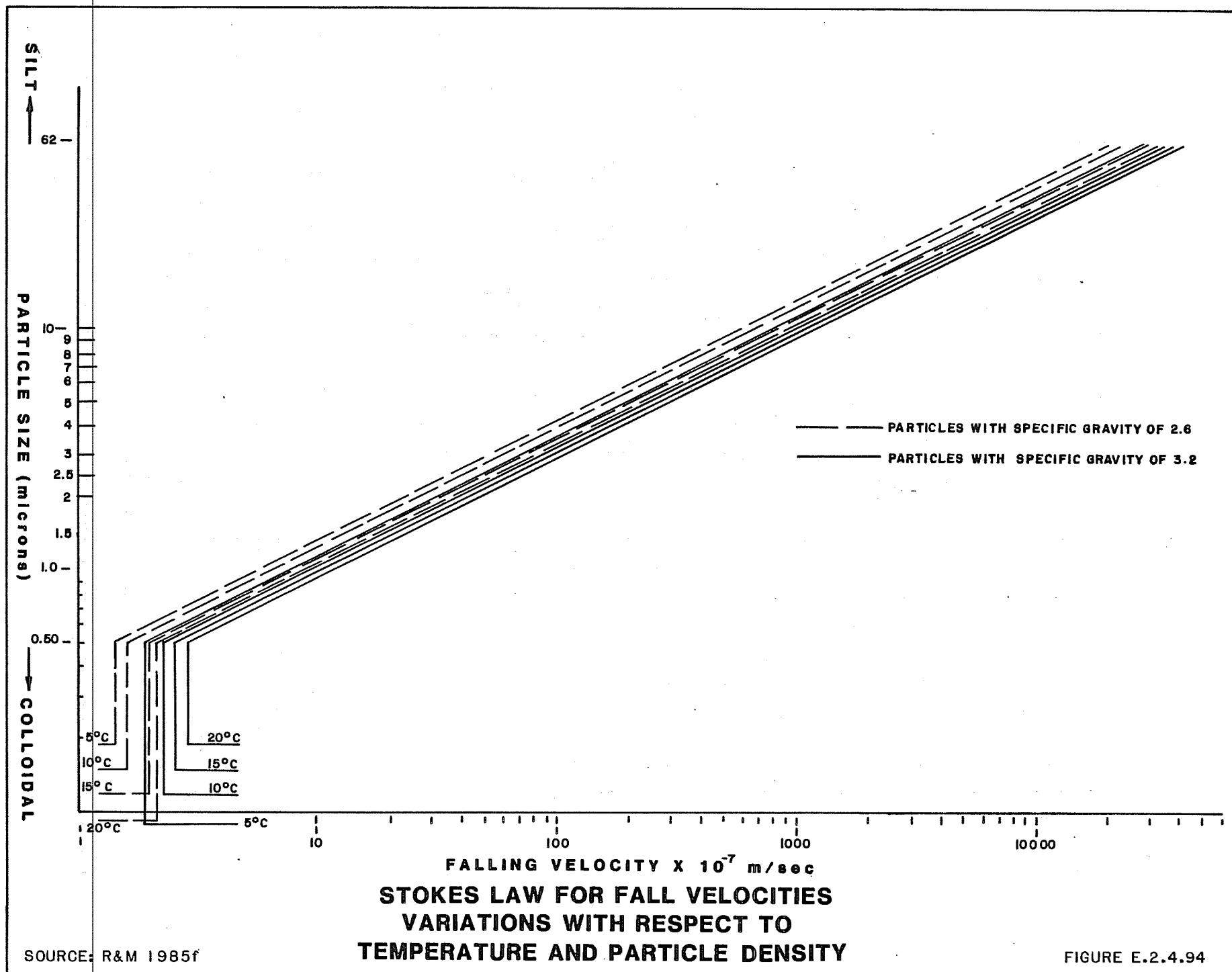
□ 8/28/84

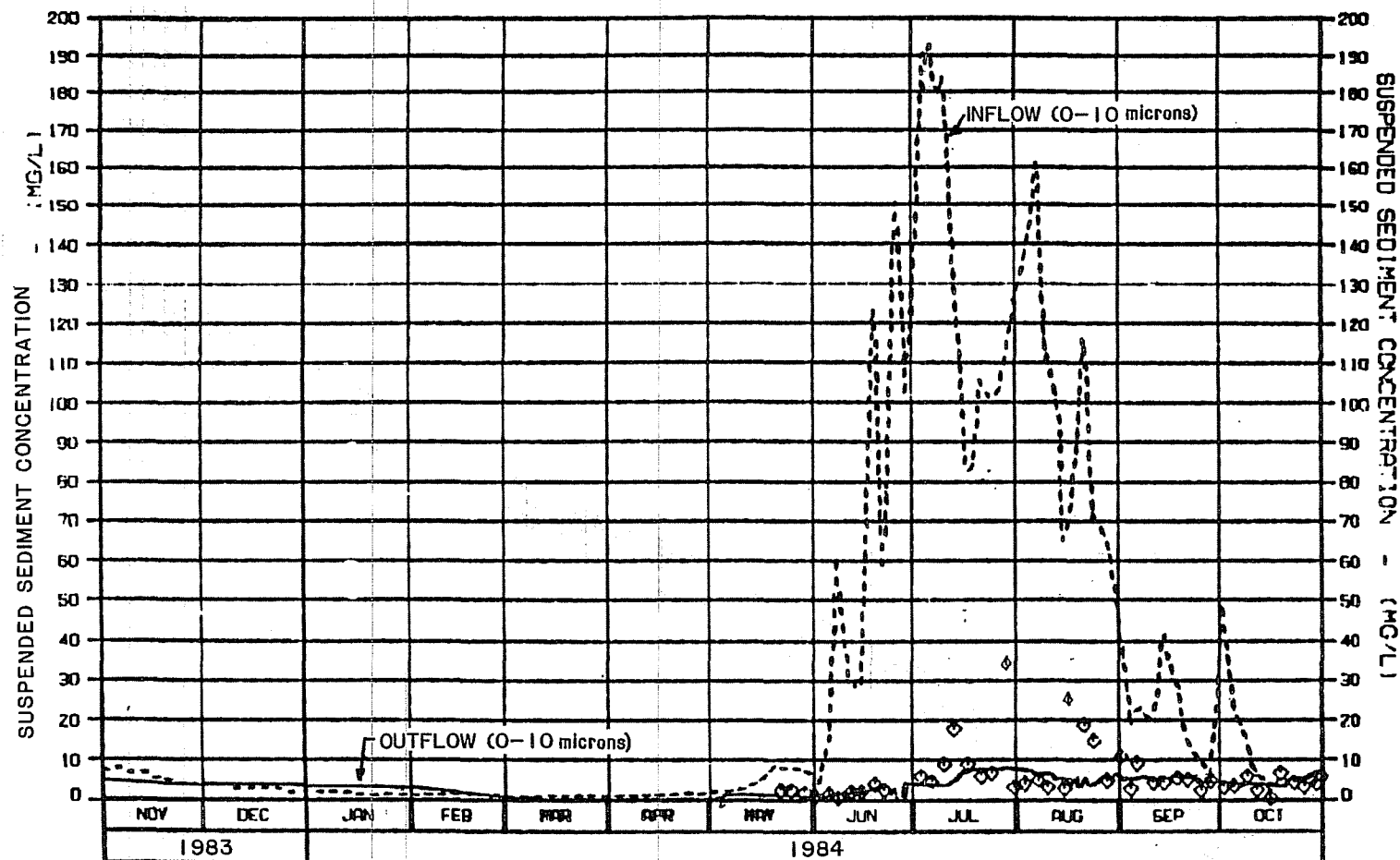
△ 10/23/84

SOURCE: R & M 1985f

GLACIER FORK EKLUTNA CREEK
SUSPENDED SEDIMENT PARTICLE SIZE DISTRIBUTION

FIGURE
E.2.4.93





LEGEND: EK8488 0-10 MICRON SUSPENDED SEDIMENT SIMULATION
 0-3 MICRON AND 3-10 MICRON RUNS COMBINED (EK848803+EK848810)
 ——— PREDICTED OUTFLOW SUSPENDED SEDIMENT CONCENTRATION (MG/L)
 - - - - - INFLOW SUSPENDED SEDIMENT CONCENTRATION (MG/L)
 ◇ OBSERVED OUTFLOW SUSPENDED SEDIMENT CONCENTRATION (MG/L) TSS

NOTES: 1. INFLOW SUSP. SED. CONC. IS BASED ON 7/20 8/28 10/23 (1984) PARTICLE SIZE DISTRIBUTIONS
 2. SSC INFLOW VALUES REPRESENT THE 0-10 MICRON RANGE AND ARE 51.8% OF TSS EXCEPT DURING 7/20/84-10/23/84. DURING THIS PERIOD, SSC PERCENTAGES (OF TSS) ARE LINEARLY INTERPOLATED BETWEEN THE FOLLOWING VALUES:
 56.6% ON 7/20/84 35.8% ON 8/28/84 51.8% ON 10/23/84

ALASKA POWER AUTHORITY

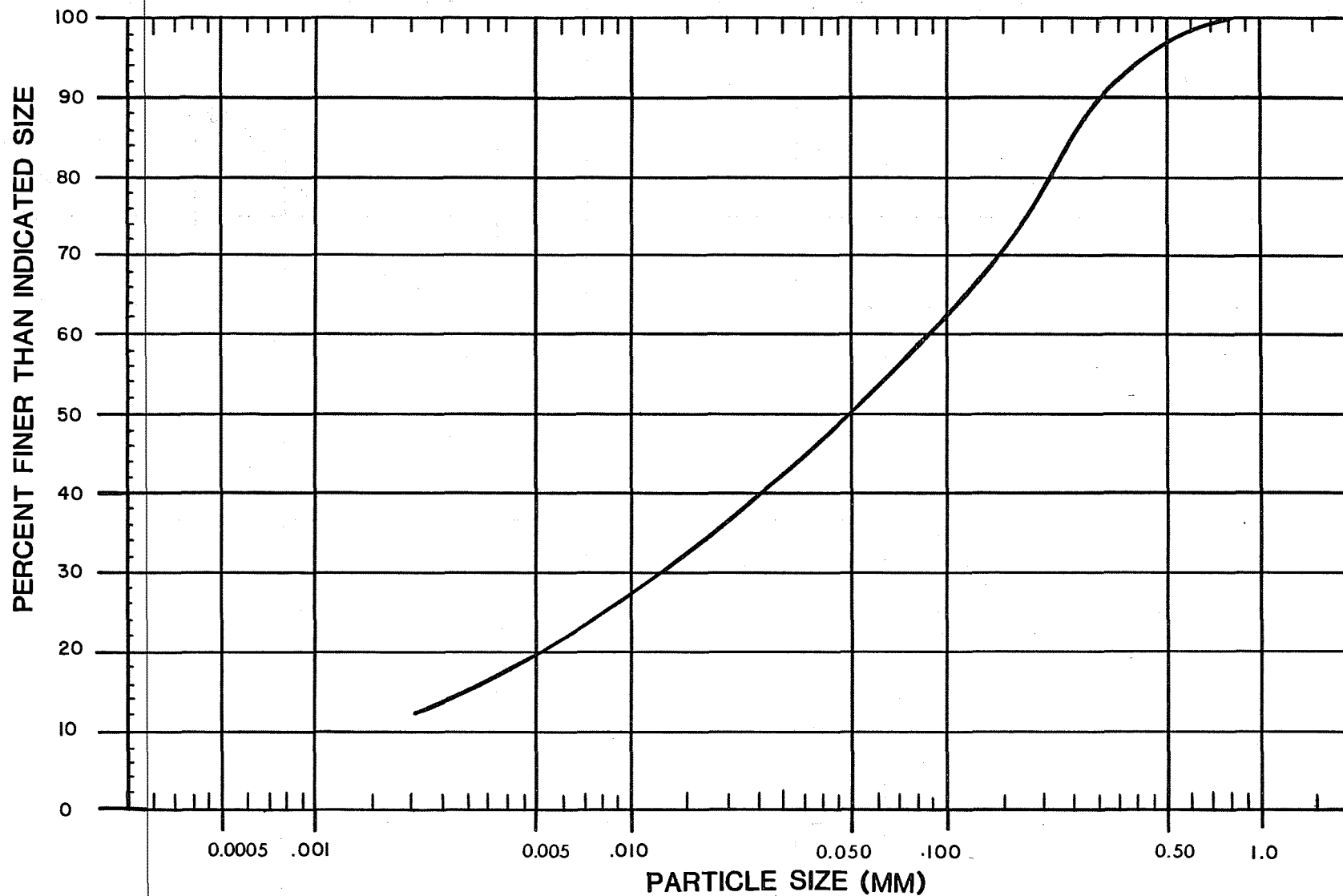
SUBMITTA PROJECT DYNASM MODEL

EKLUTNA LAKE
 OUTFLOW (0-10 MICRON)
 SUSPENDED SEDIMENT

HARZA-EBASCO JOINT VENTURE

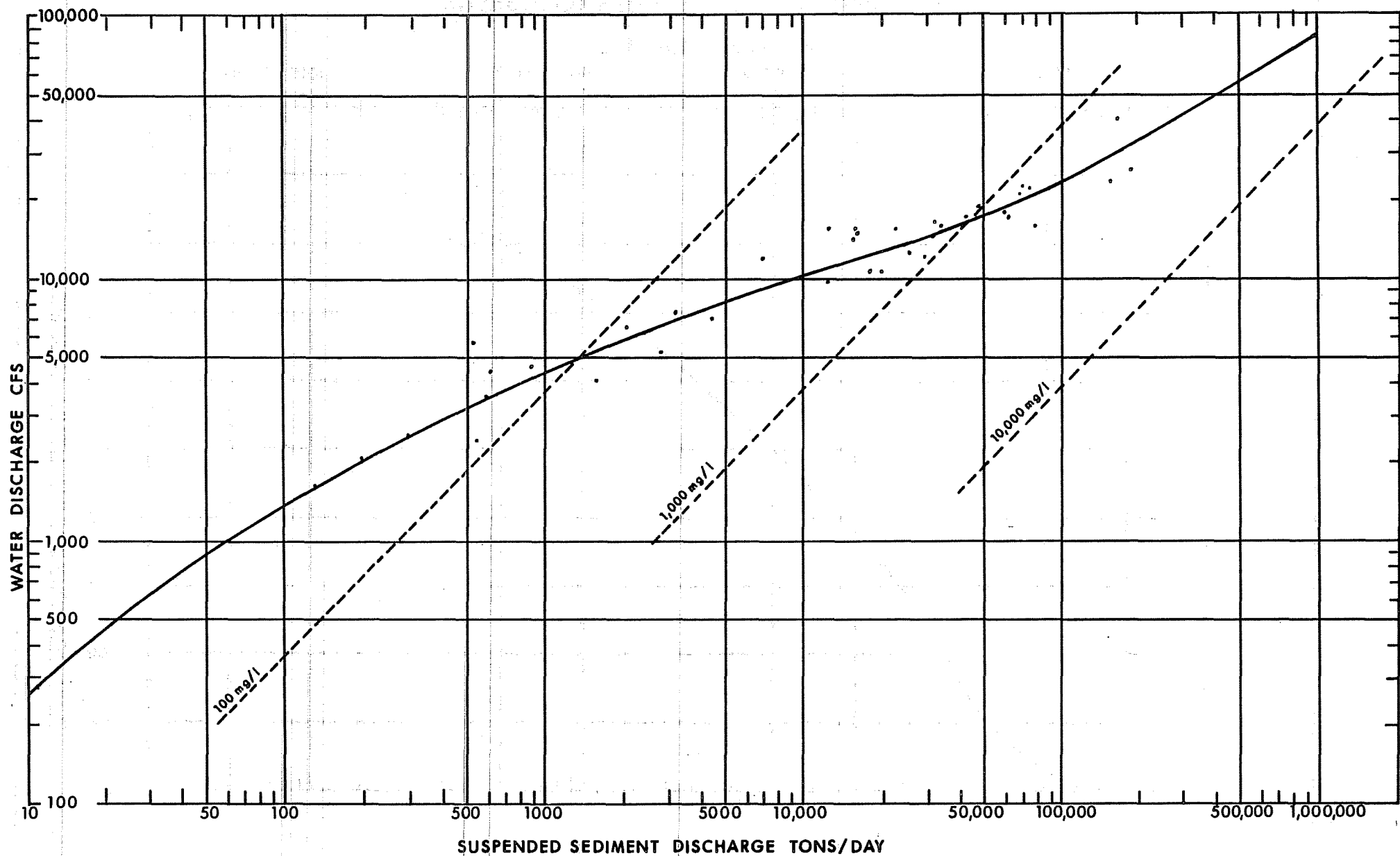
FIGURE
 E.2.4.95

ENCLOS. PL. 0015 8 JUL 85 42-010-04



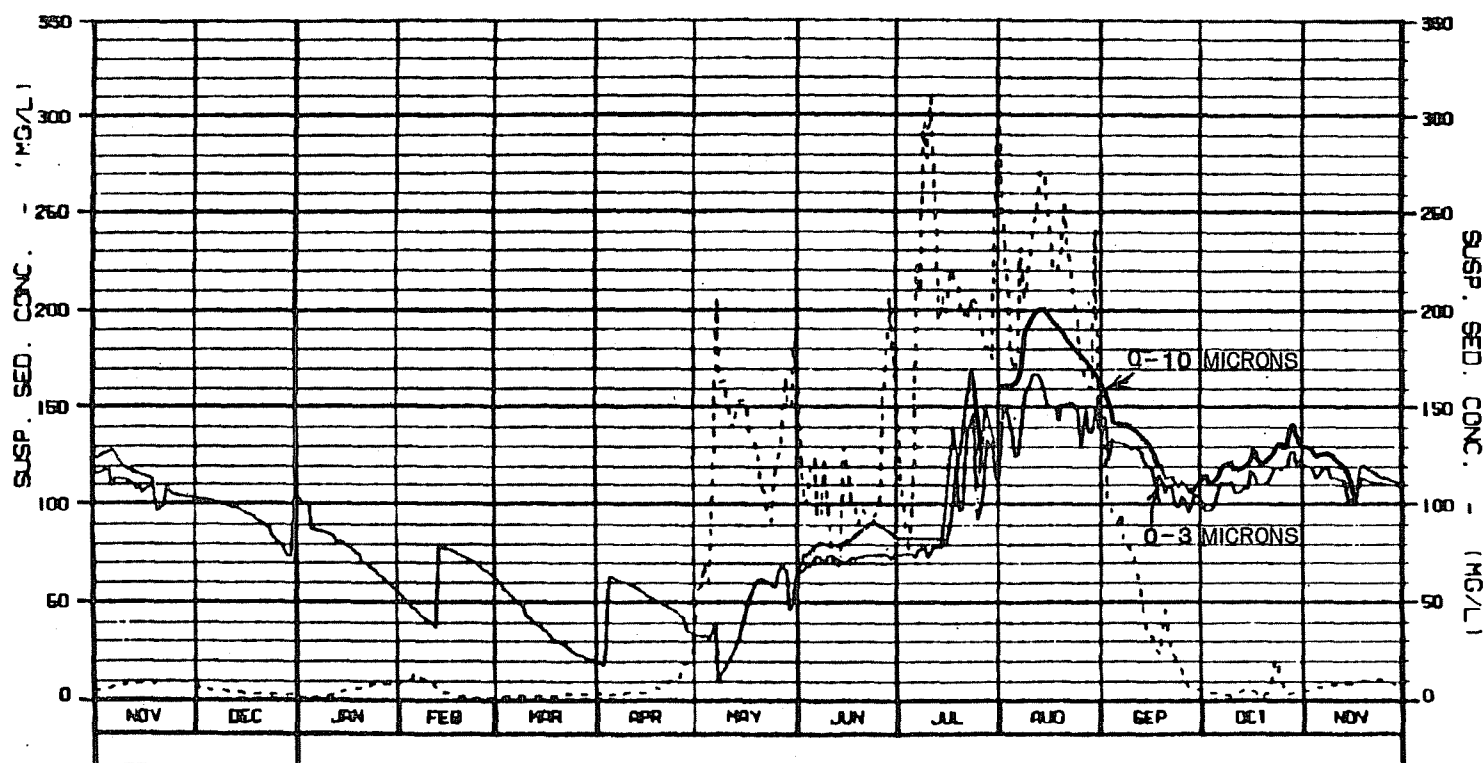
SUSPENDED SEDIMENT SIZE DISTRIBUTION
SUSITNA RIVER NEAR CANTWELL

FIGURE E.2.4.96



SUSPENDED SEDIMENT RATING CURVE
AT USGS GAGING STATION
SUSITNA RIVER NEAR CANTWELL, ALASKA

	DATE	TIME	LOCATION	DESCRIPTION	STATUS	REMARKS
INTAKE	LEVEL 1	07/28/2009				
	LEVEL 2	07/28/2009				
	LEVEL 3	07/28/2009				
	LEVEL 4	07/28/2009				
	LEVEL 5	07/28/2009				
	CONE VALVE SPILL VALVE	07/28/2009				



LEGEND:

-----	PREDICTED OUTFLOW SUSP. SED. CONCENTRATION (MG/L)
-----	INFLOW SUSP. SED. CONCENTRATION (MG/L) (0-3 MICRONS ONLY)
1	1.0
2	1.0
3	1.0
4	1.0
5	1.0
6	1.0
7	1.0
8	1.0
9	1.0
10	1.0
11	1.0
12	1.0
13	1.0
14	1.0
15	1.0
16	1.0
17	1.0
18	1.0
19	1.0
20	1.0
21	1.0
22	1.0
23	1.0
24	1.0
25	1.0
26	1.0
27	1.0
28	1.0
29	1.0
30	1.0
31	1.0
32	1.0
33	1.0
34	1.0
35	1.0
36	1.0
37	1.0
38	1.0
39	1.0
40	1.0
41	1.0
42	1.0
43	1.0
44	1.0
45	1.0
46	1.0
47	1.0
48	1.0
49	1.0
50	1.0
51	1.0
52	1.0
53	1.0
54	1.0
55	1.0
56	1.0
57	1.0
58	1.0
59	1.0
60	1.0
61	1.0
62	1.0
63	1.0
64	1.0
65	1.0
66	1.0
67	1.0
68	1.0
69	1.0
70	1.0
71	1.0
72	1.0
73	1.0
74	1.0
75	1.0
76	1.0
77	1.0
78	1.0
79	1.0
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85	1.0
86	1.0
87	1.0
88	1.0
89	1.0
90	1.0
91	1.0
92	1.0
93	1.0
94	1.0
95	1.0
96	1.0
97	1.0
98	1.0
99	1.0
100	1.0

NOTES: 1. SSC INFLOW VALUES REPRESENT THE 0-3 MICRON RANGE AND ARE 15% OF TSS

ALASKA POWER AUTHORITY

SUBJINA PROJECT	DATE BY MODEL
-----------------	---------------

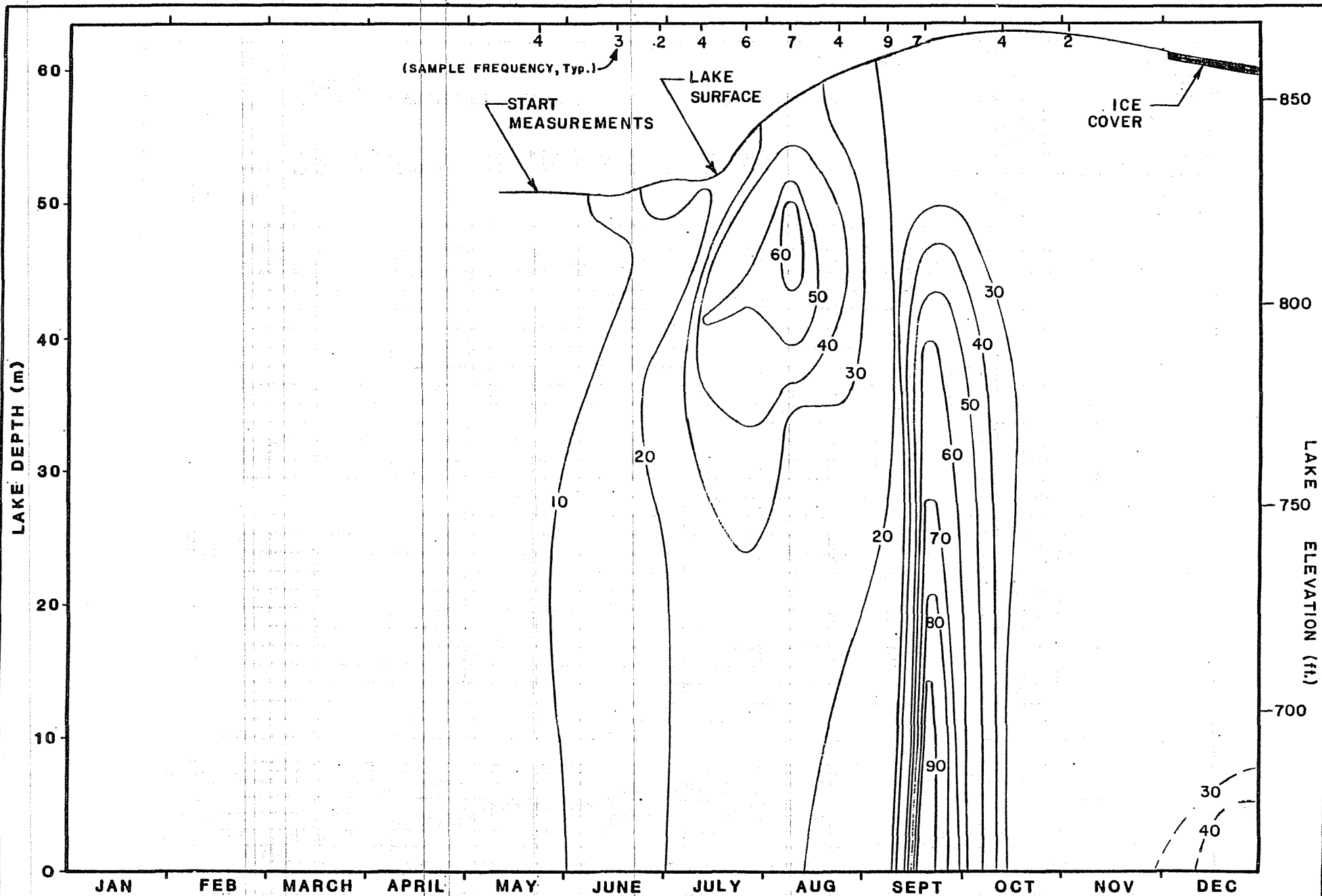
WATANA RESERVOIR
OUTFLOW (0-10)
SUSPENDED SOLIDS
HIGH INFLOW YEAR

MARZA-EBASCO JOINT VENTURE

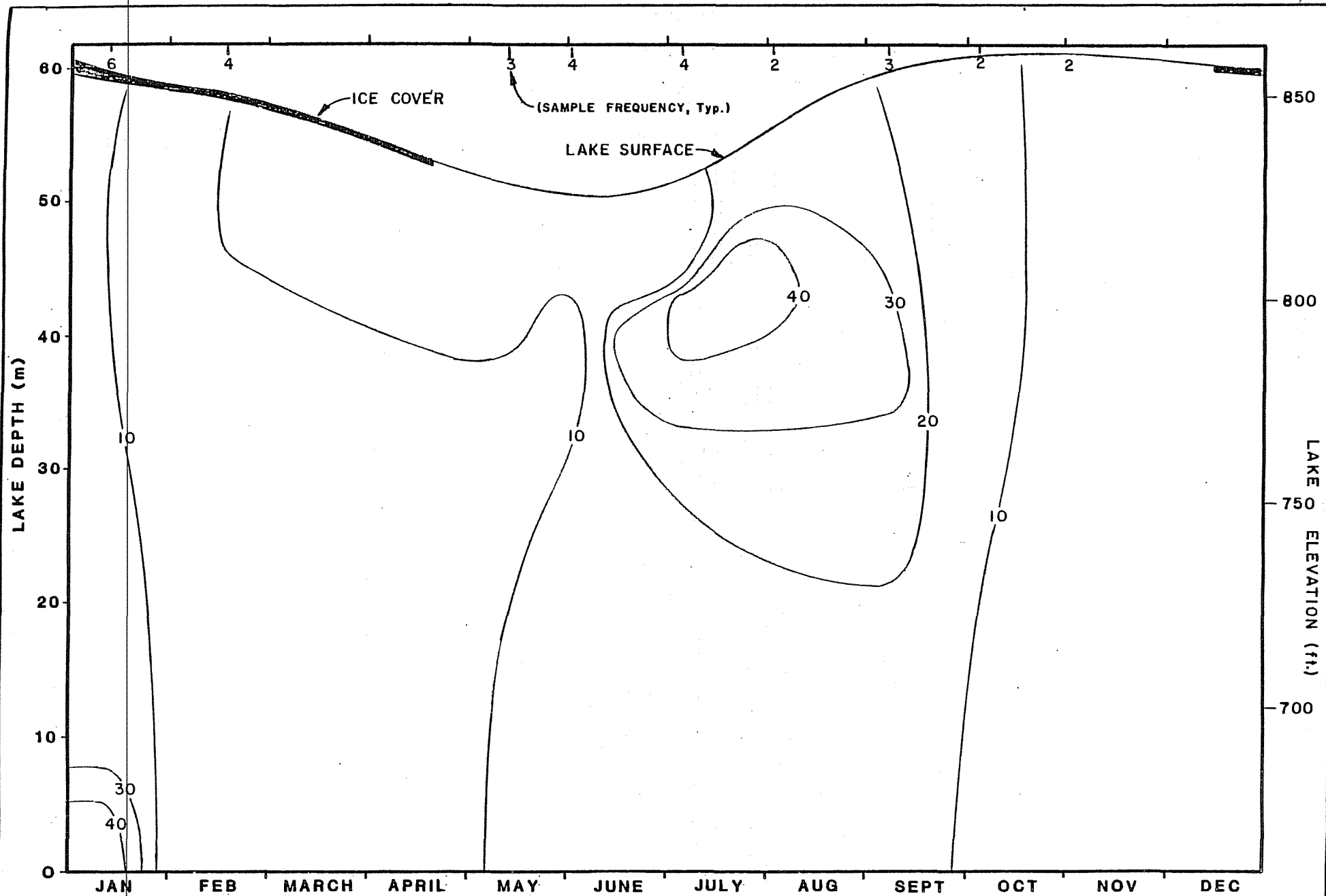
ENCLOSURE. 1-1-61 10 11 12 42-010-00

FIGURE 2.4.98

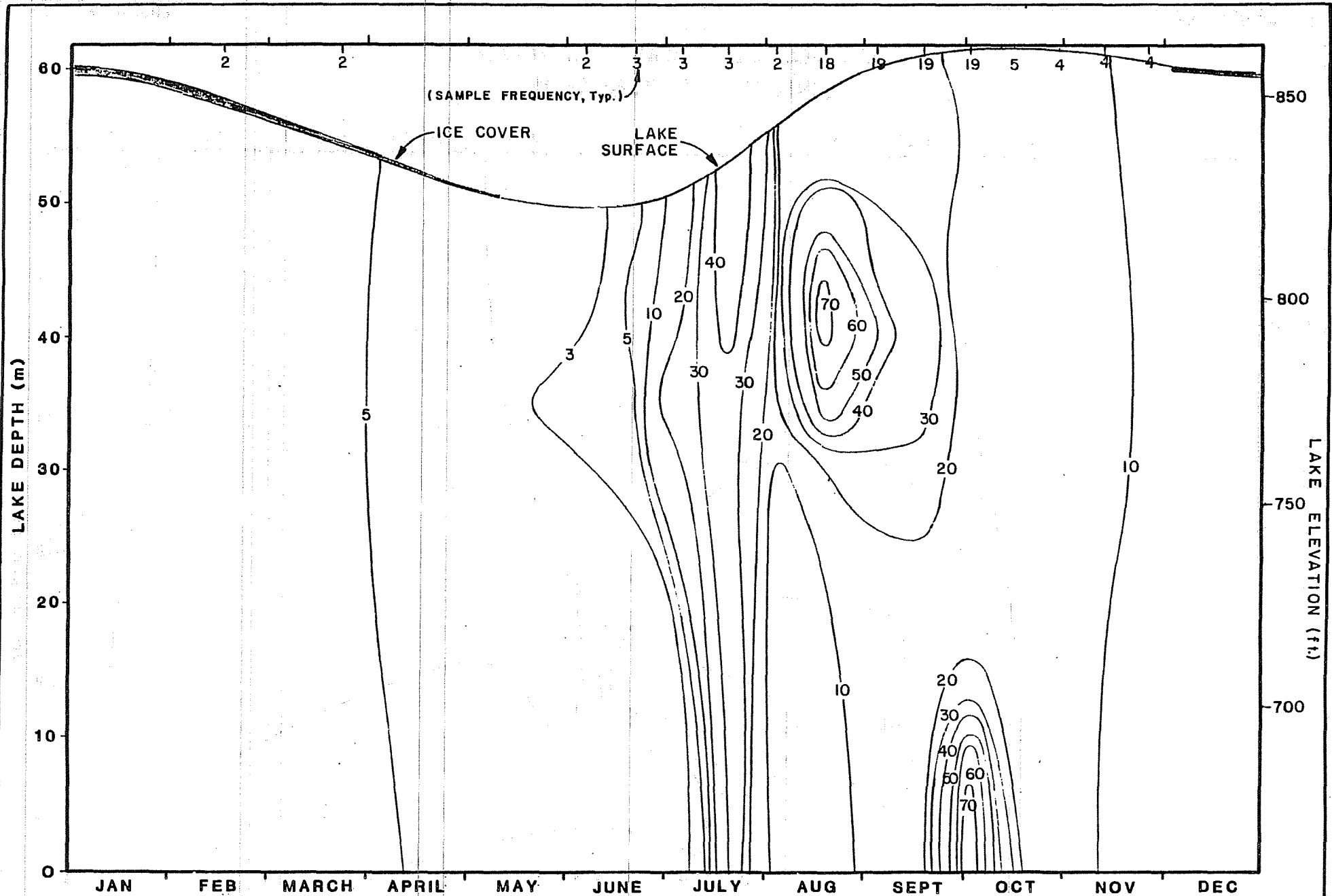
CHIEF, PLANNING	NO 07 02	42-010-05
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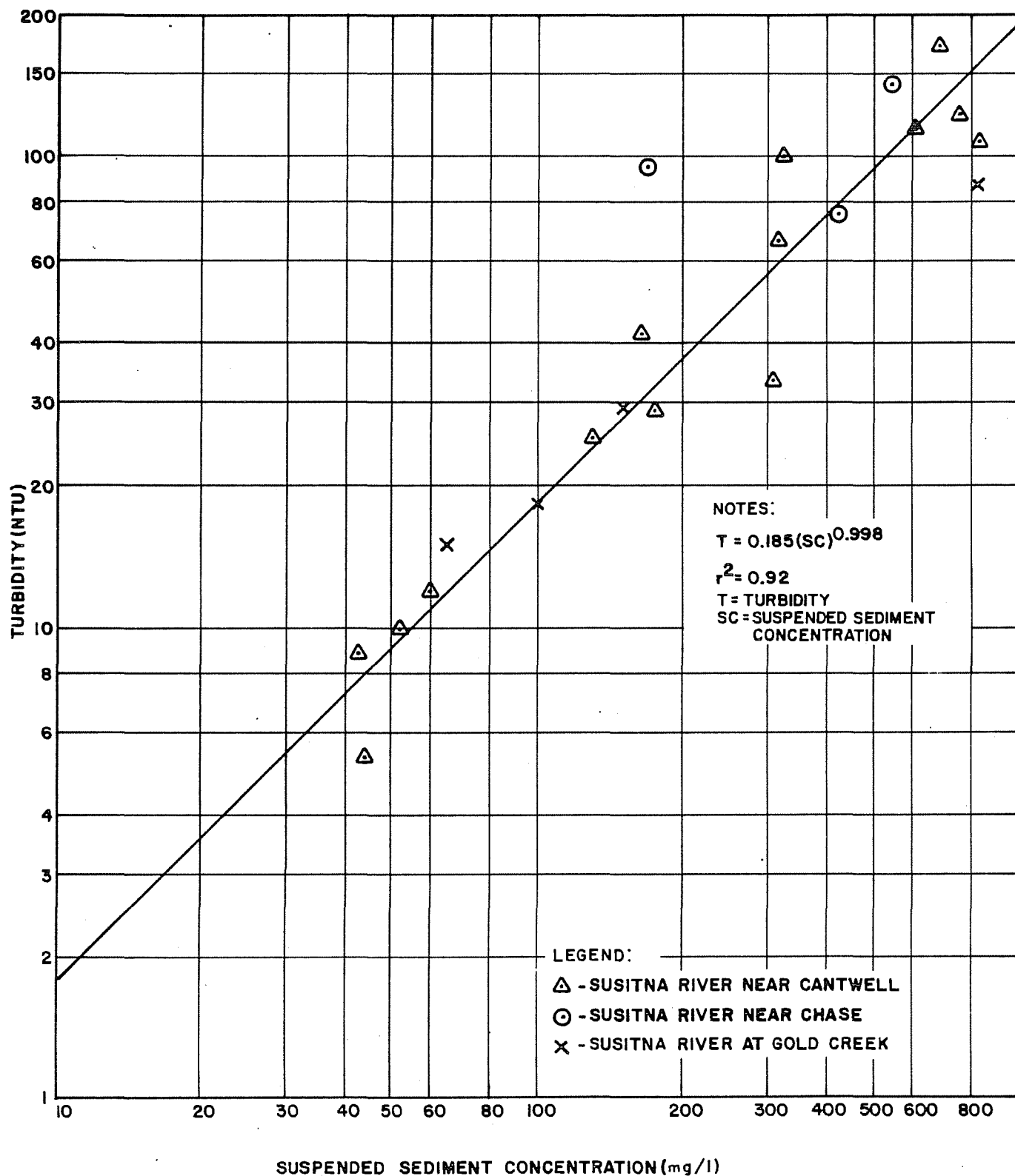
ISO-TURBIDITY vs. TIME
 EKLUTNA LAKE at STATION 9
 1982



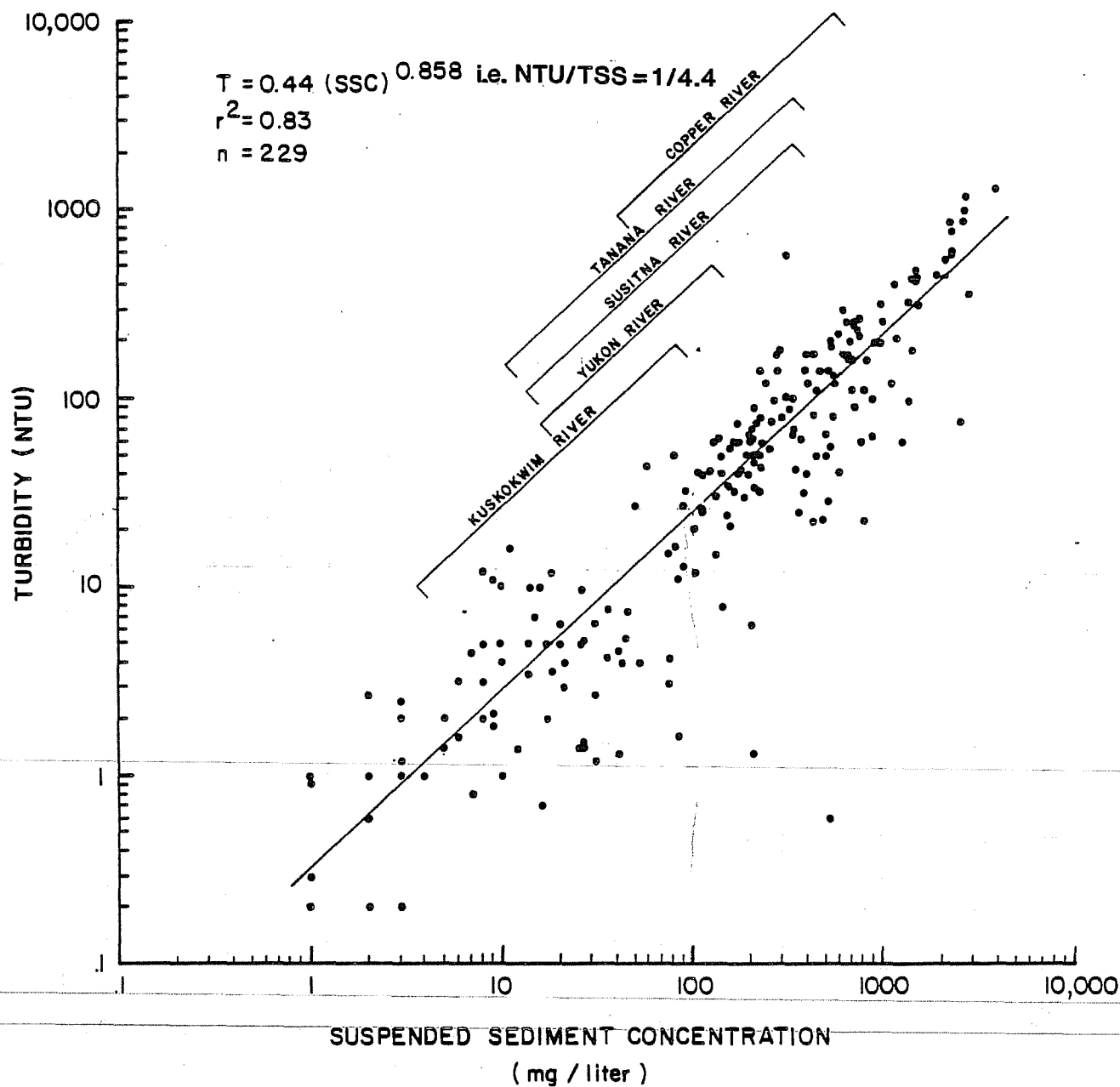
**ISO-TURBIDITY vs. TIME
EKLUTNA LAKE at STATION 9
1983**



**ISO-TURBIDITY vs. TIME
EKLUTNA LAKE at STATION 9
1984**



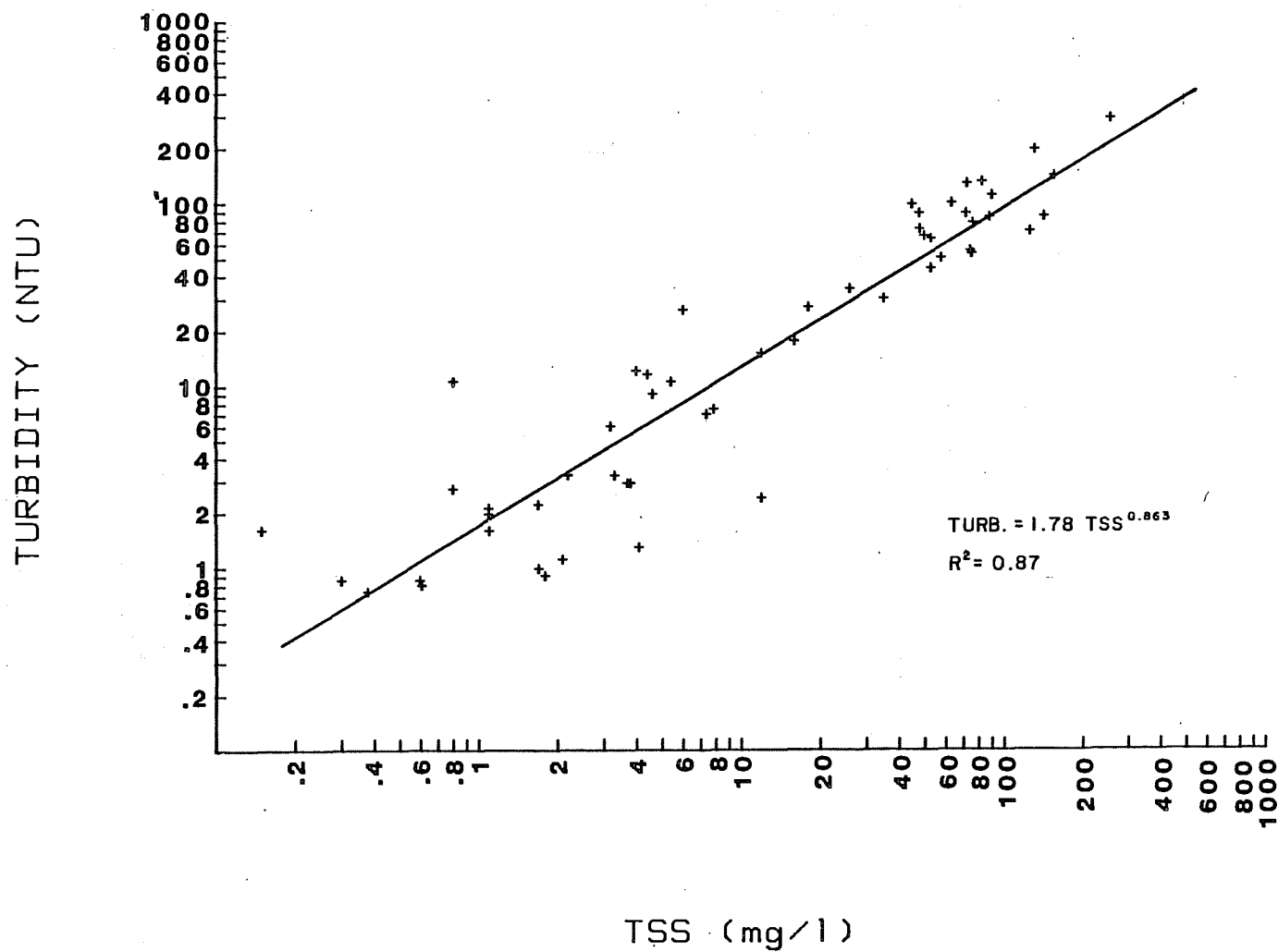
**TURBIDITY VS.
SUSPENDED SEDIMENT CONCENTRATION
SUSITNA RIVER**



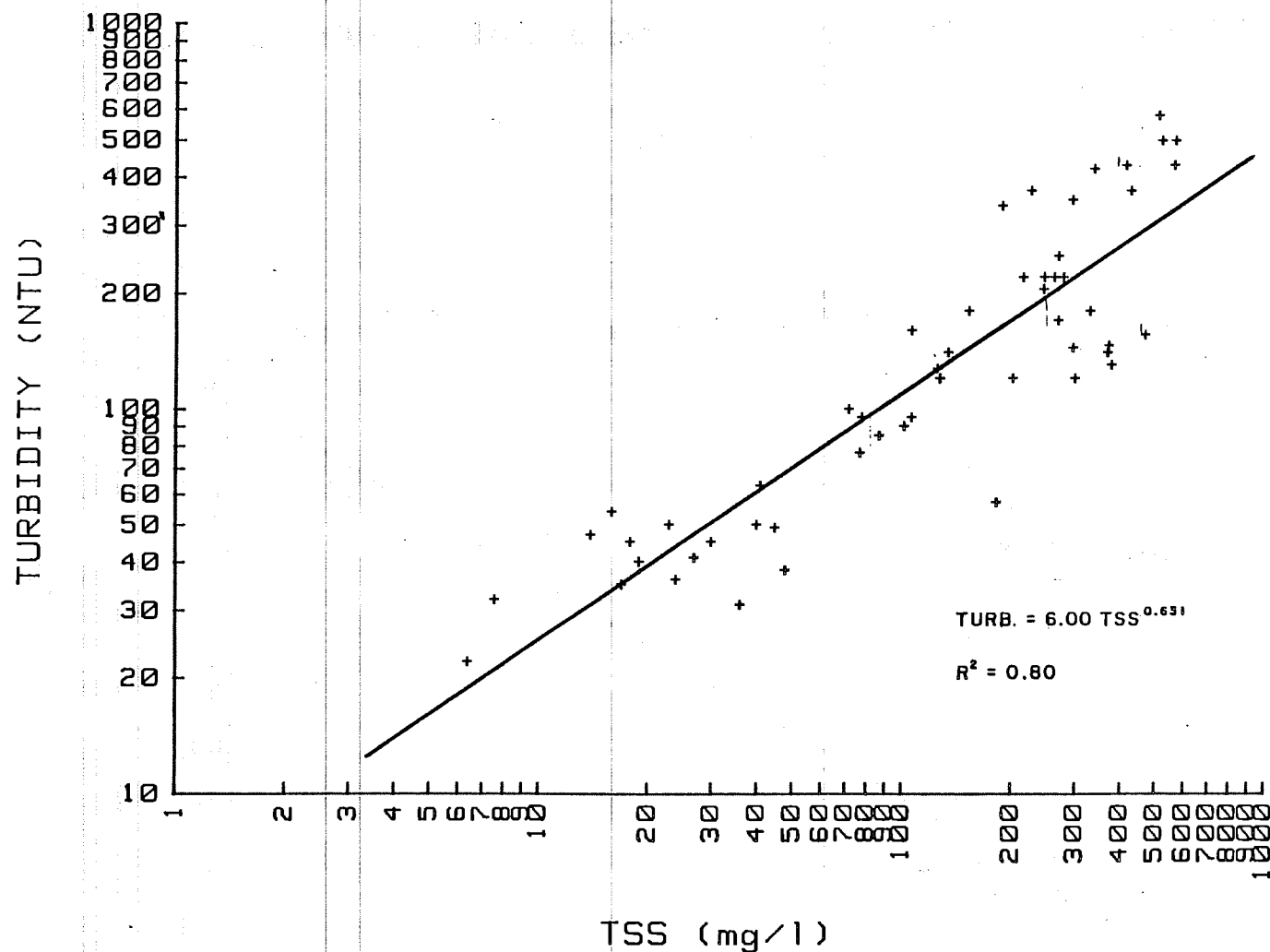
**TURBIDITY VS SUSPENDED SEDIMENT
 CONCENTRATION IN SEVERAL ALASKAN RIVERS**

Figure Empirical relationship of naturally occurring turbidity versus suspended sediment concentration for rivers and streams in Alaska, sampled during May-October, 1976 - 1983 (derived in this report from data provided by USGS, 1984).

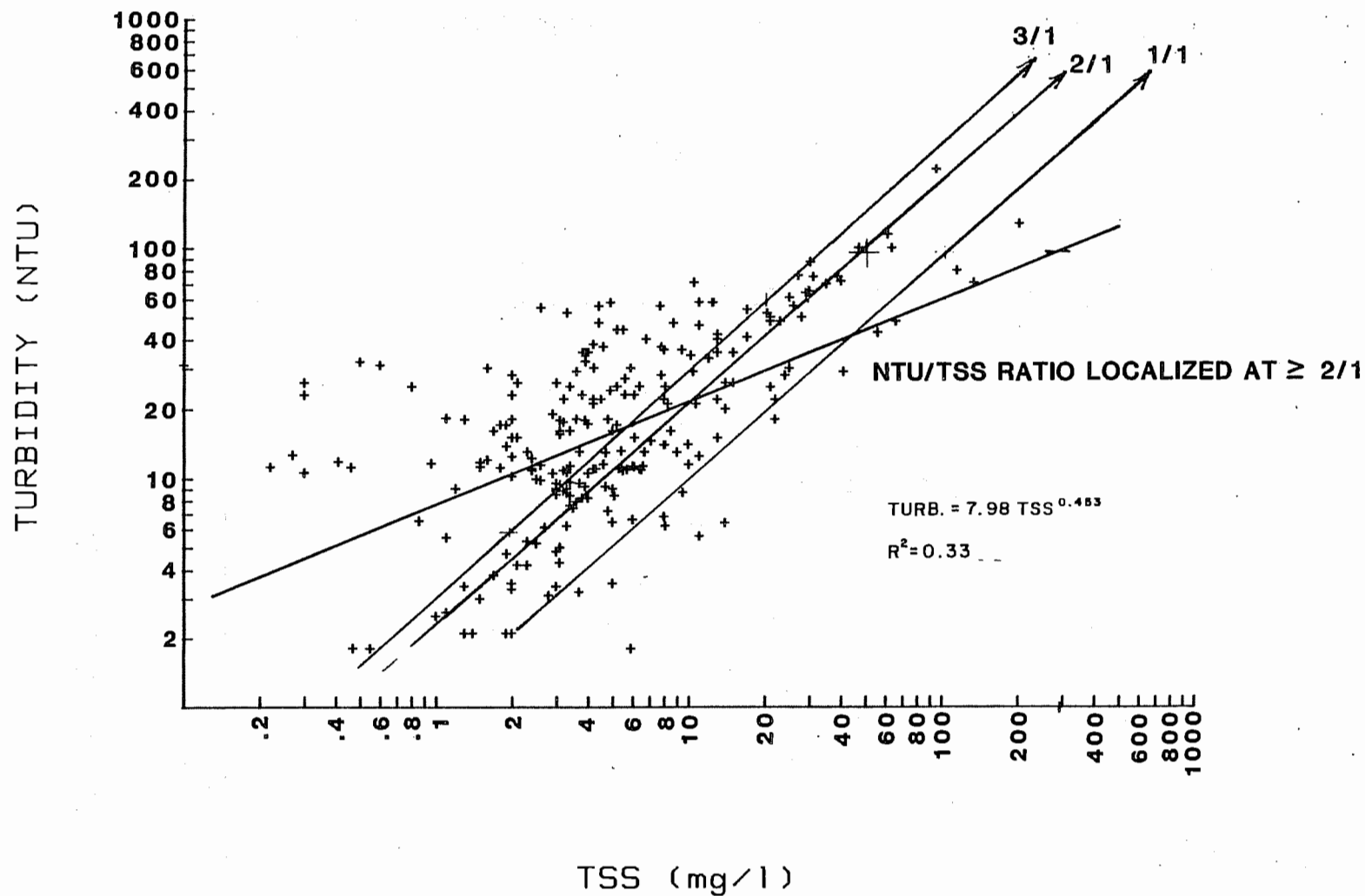
SOURCE: LLOYD 1985.



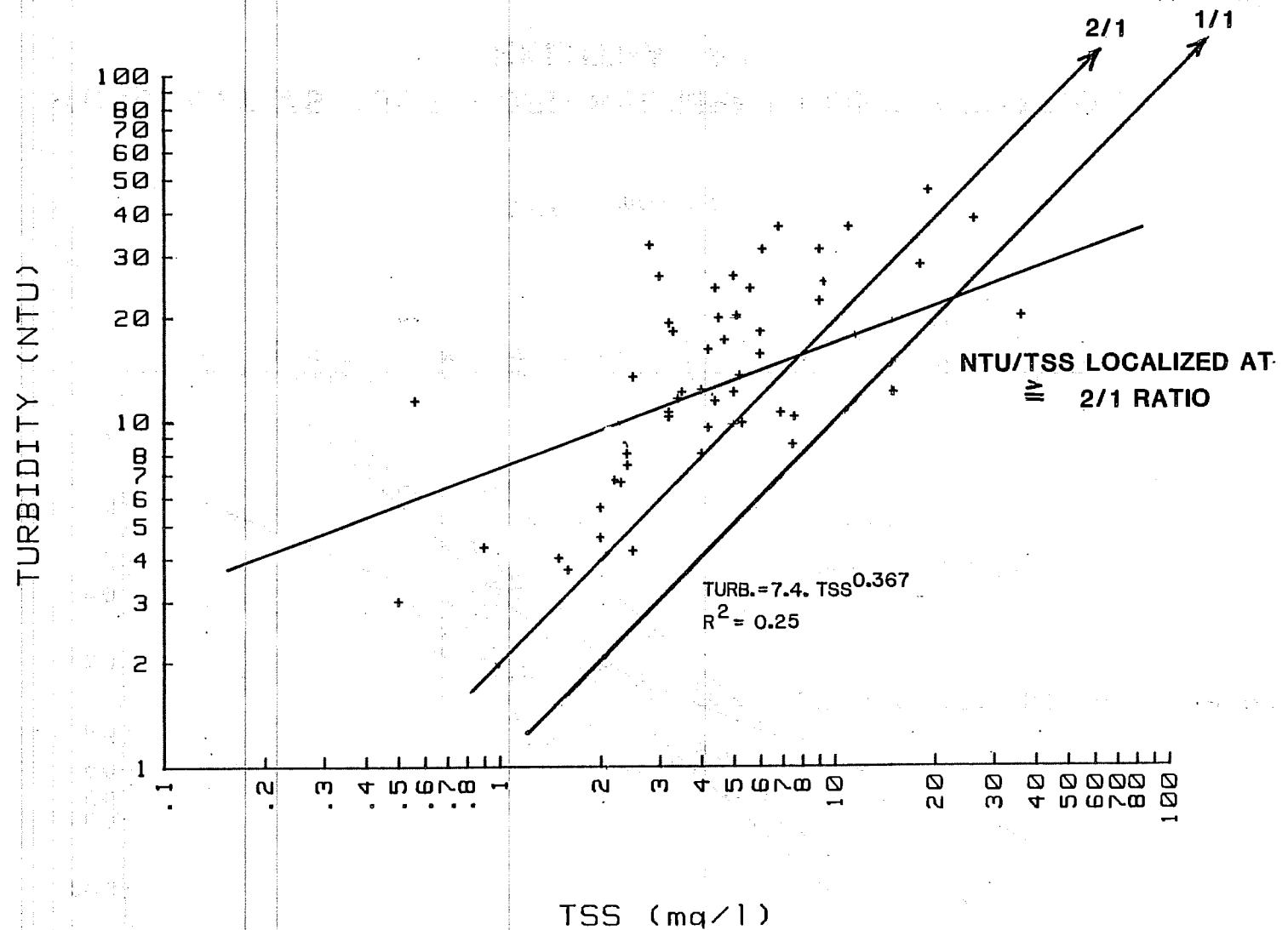
**TURBIDITY VS SUSPENDED SEDIMENT CONCENTRATION
EAST FORK TRIBUTARY TO EKLUTNA LAKE, 1984**



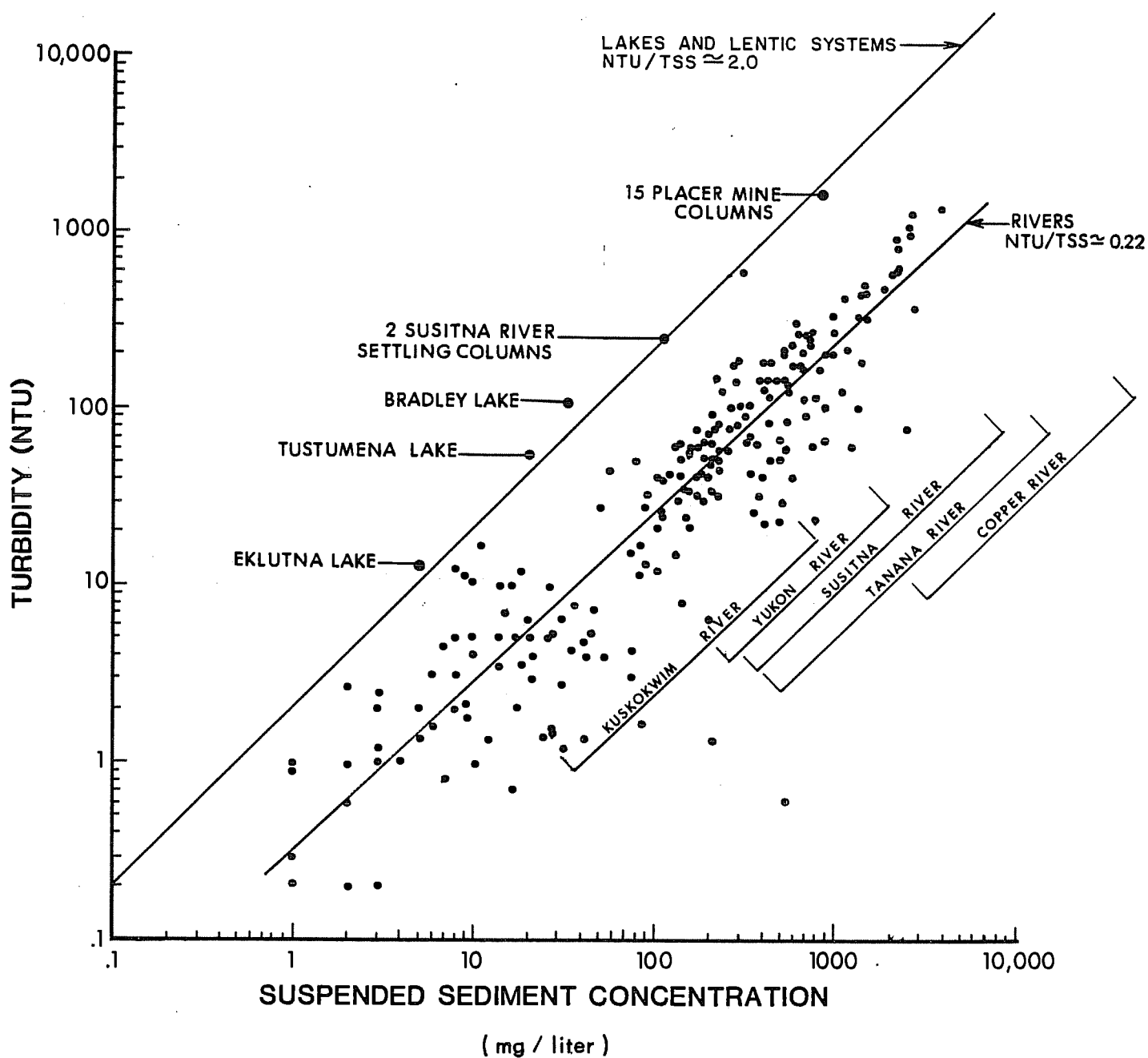
**TURBIDITY VS SUSPENDED SEDIMENT CONCENTRATION
GLACIER FORK TRIBUTARY TO EKLUTNA LAKE, 1984**



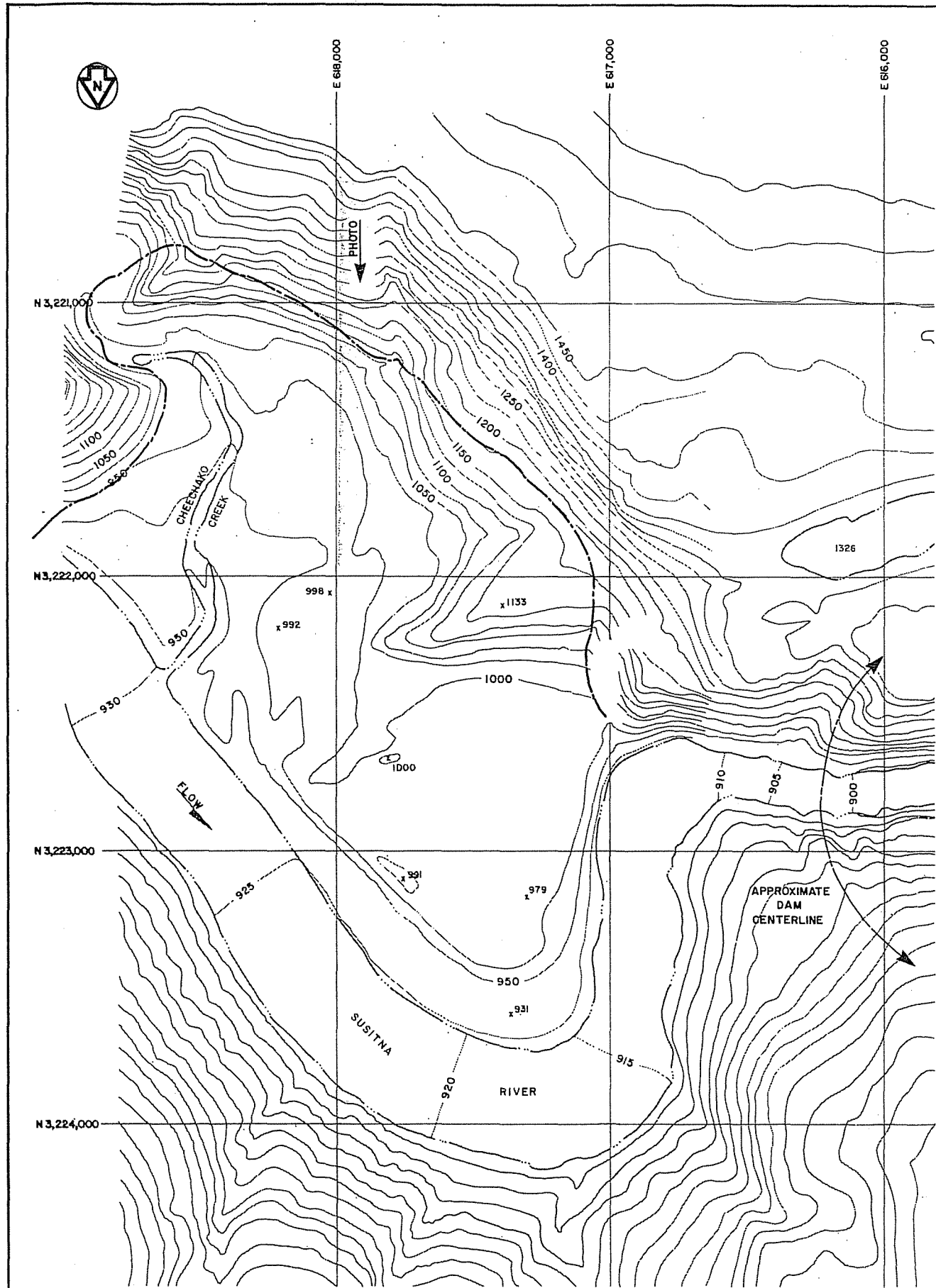
**TURBIDITY VS SUSPENDED SEDIMENT CONCENTRATION
EKLUTNA LAKE**



TURBIDITY VS SUSPENDED SEDIMENT CONCENTRATION
 EKLUTNA LAKE POWERHOUSE TAILRACE, 1984

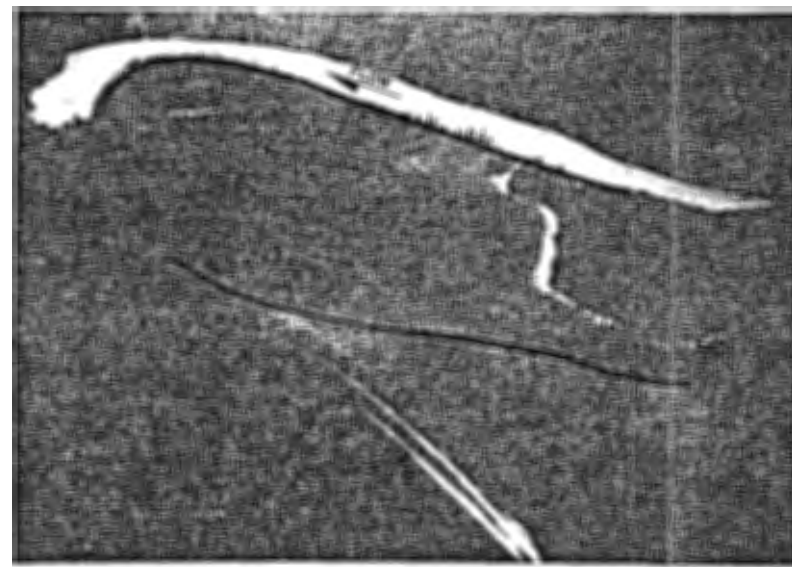


EMPIRICAL RELATIONSHIP OF NATURALLY OCCURRING TURBIDITY VERSUS SUSPENDED SEDIMENT CONCENTRATION FOR RIVERS AND LAKES IN ALASKA
(MODIFIED AFTER LLOYD 1985)



LEGEND

----- BORROW SITE LIMIT



BORROW SITE G

NOTES

1. ENTIRE BORROW SITE LIES WITHIN PROPOSED DEVIL CANYON RESERVOIR LIMITS.
2. BORROW SITE LIMITS BASED ON FIELD AND AIR PHOTO INTERPRETATION OF BORROW MATERIAL. FINAL LIMITS SUBJECT TO RESULTS OF DESIGN INVESTIGATIONS.
3. 25 FOOT CONTOUR INTERVAL ADDED FROM SOURCE MAP (REFERENCED) IN BORROW SITE ONLY.
4. PHOTO TAKEN AUGUST, 1981.
5. BORROW SITE G IS A POTENTIAL SOURCE OF FILTER MATERIAL AND CONCRETE AGGREGATE.

SCALE 0 200 400 FEET

REFERENCE: BASE MAP FROM R & M, 1981 - 1" = 200' DEVIL CANYON TOPOGRAPHY, RETRACED AT 25' CONTOURS
 USBR, 1960
 COE, 1978
 WCC, 1978

**DEVIL CANYON
BORROW SITE G**

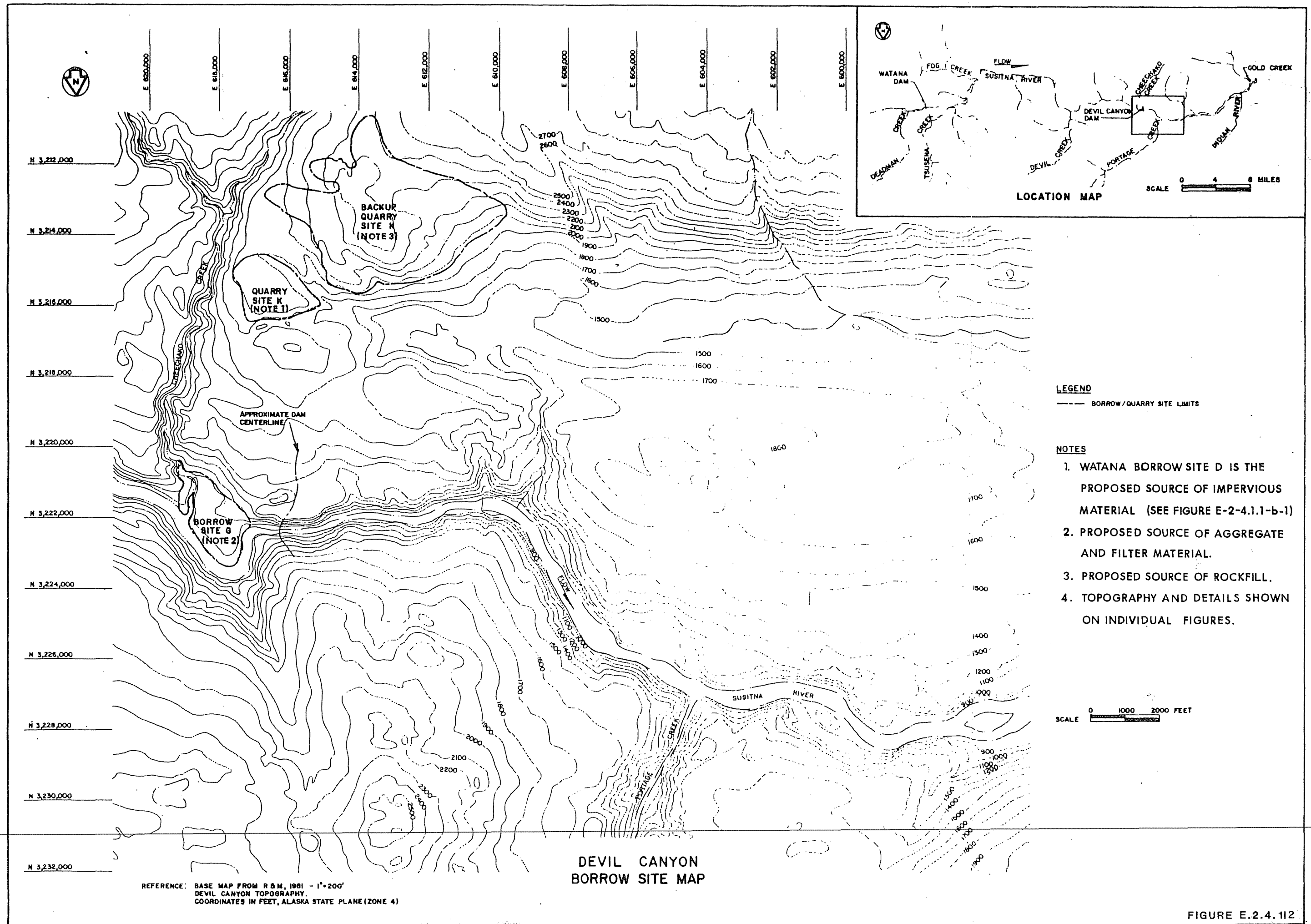


FIGURE E.2.4.112

E 620,000

E 618,000

E 616,000

E 614,000

E 612,000

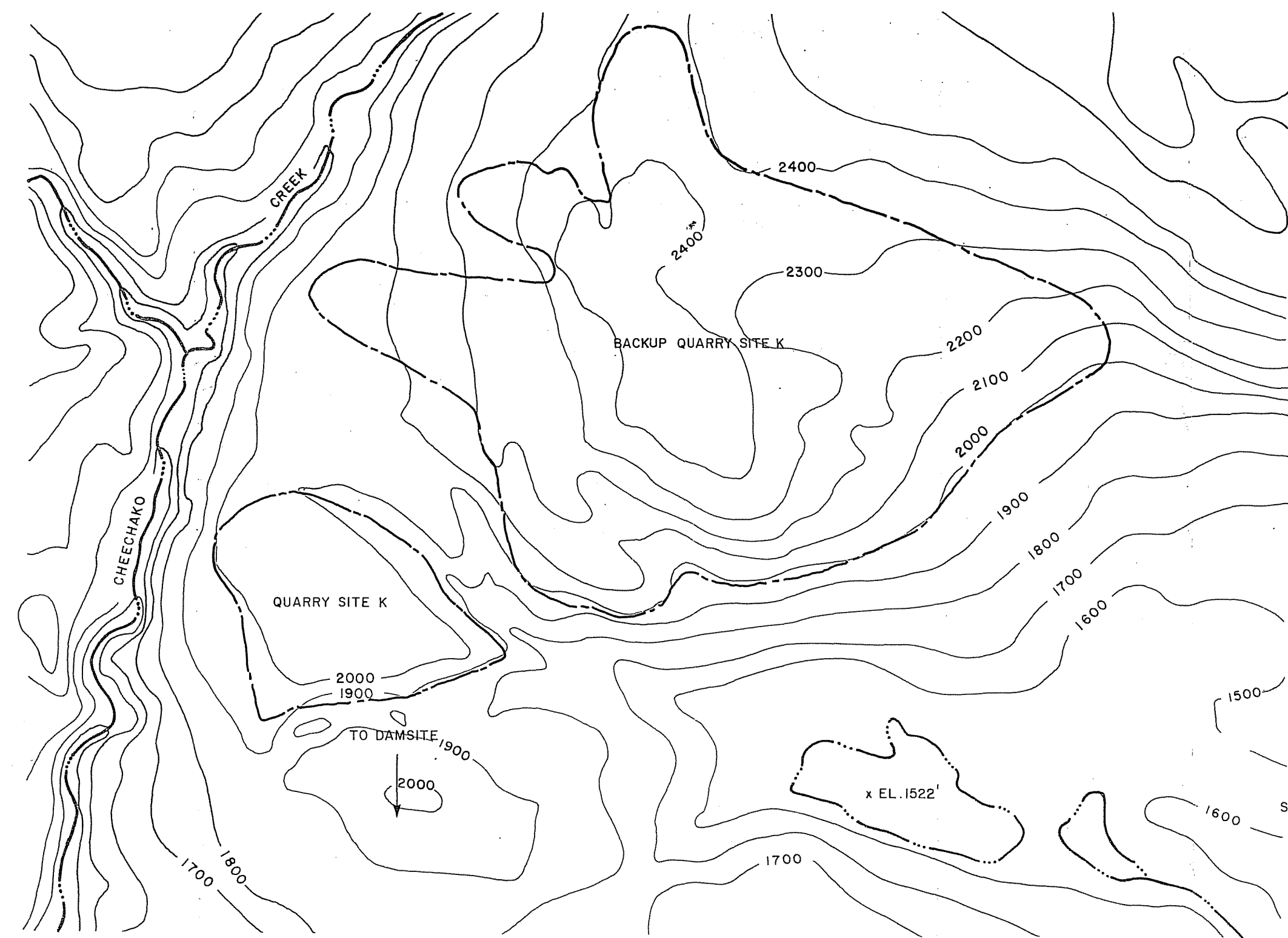
E 610,000

N 3,212,000

N 3,214,000

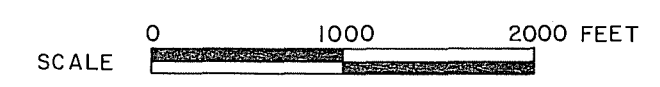
N 3,216,000

N 3,218,000



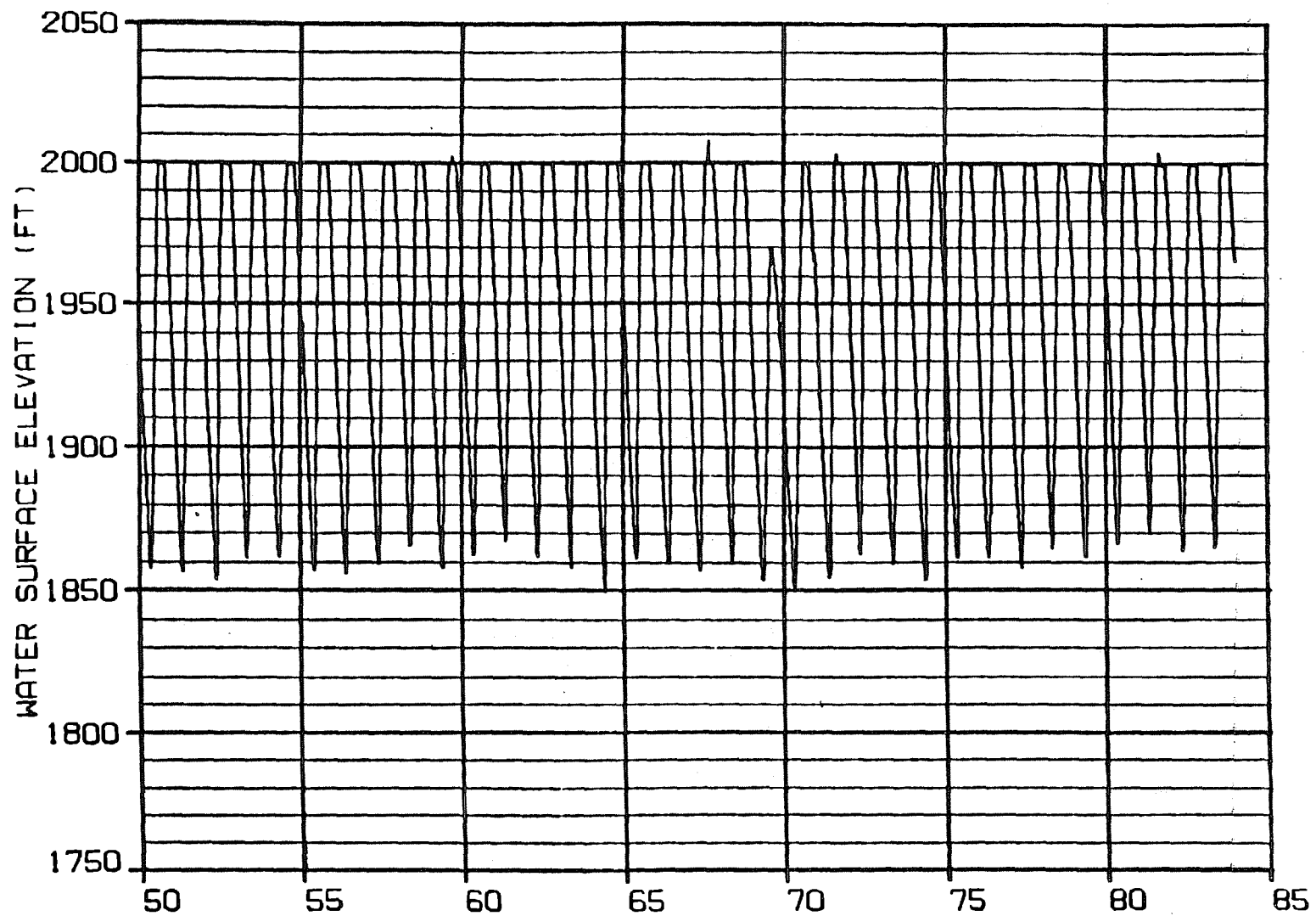
LEGEND
--- MATERIAL LIMITS

- NOTES
1. ENTIRE QUARRY SITE LIES OUTSIDE OF PROPOSED RESERVOIR LIMITS.
 2. MATERIAL LIMIT SHOWN IS OUTCROP LIMIT AS DETERMINED FROM AIR PHOTO INTERPRETATION. NORTH FACES OF SITES ARE EXPOSED ROCK CLIFFS, AND LOCATION OF SAMPLES.
 3. CONTOURS TRACED FROM ENLARGED, REFERENCE BASE MAP, AT 100' INTERVALS.
 4. QUARRY SITE K IS A POTENTIAL SOURCE OF ROCKFILL.

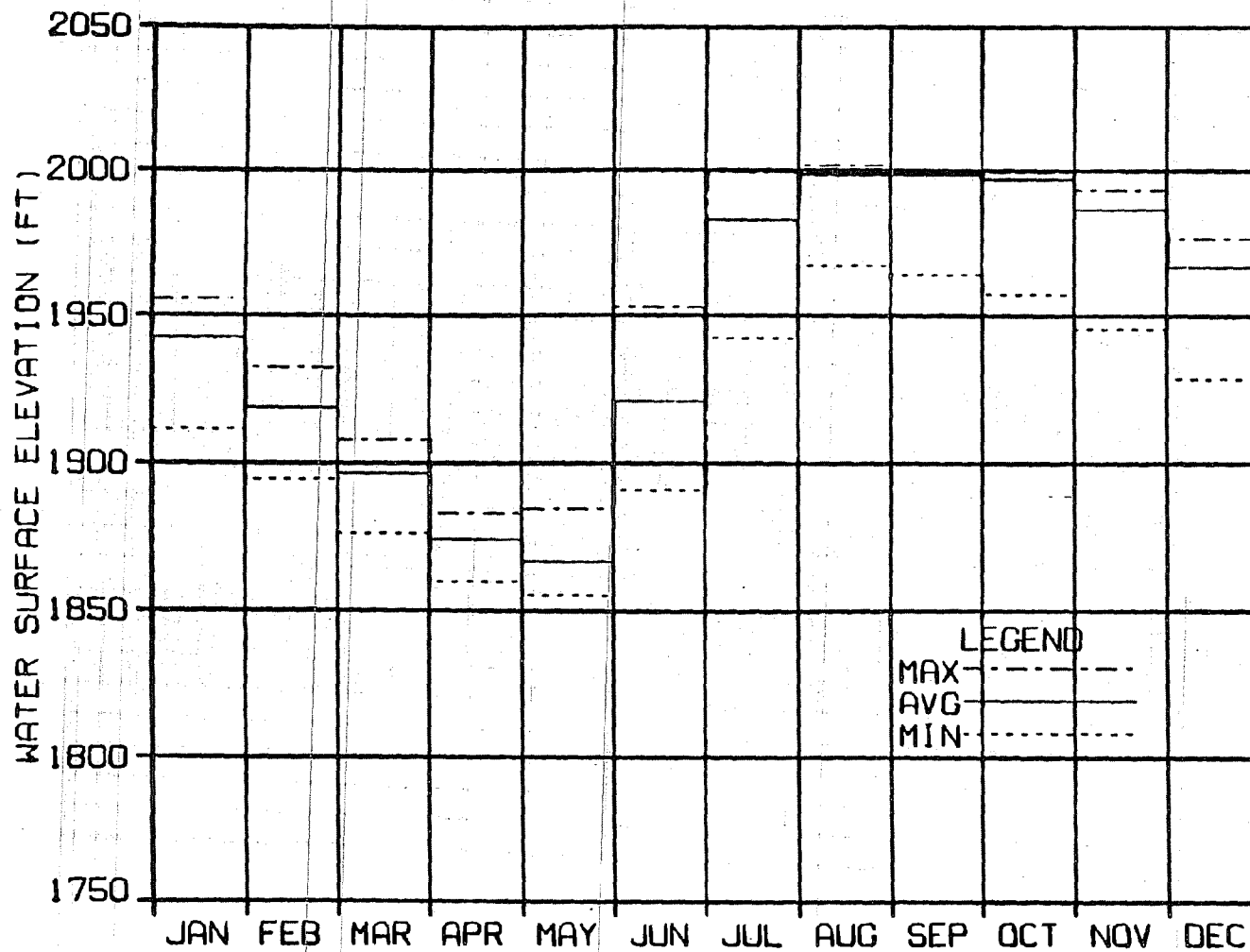


REFERENCE: BASE MAP FROM USGS 1:63,360 ALASKA QUADRANGLE
TALKEETNA MOUNTAINS (D-5).
COORDINATES IN FEET, ALASKA STATE PLANE
(ZONE 4)

DEVIL CANYON
QUARRY SITE K

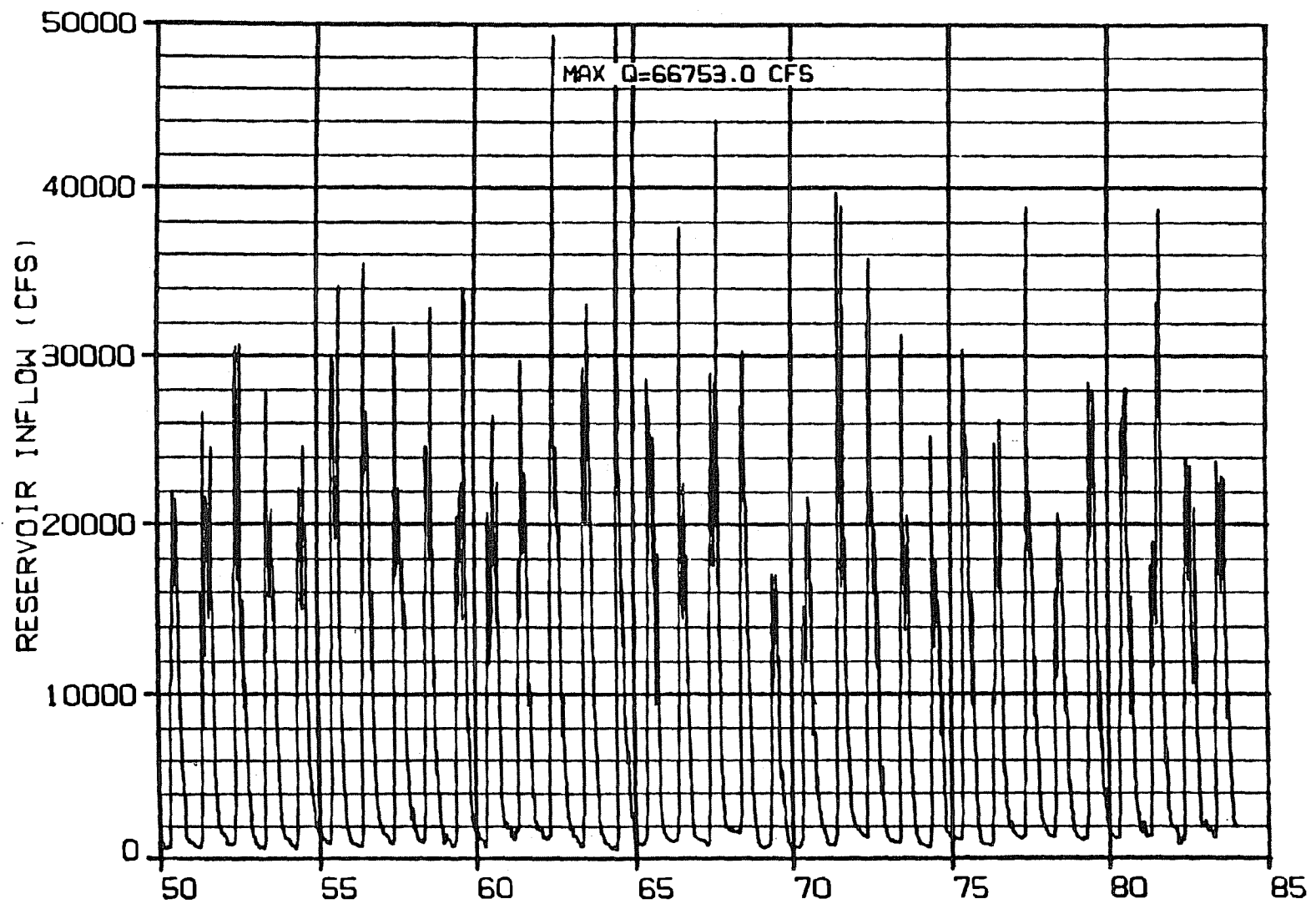


WATANA WATER SURFACE ELEVATION, STAGE II

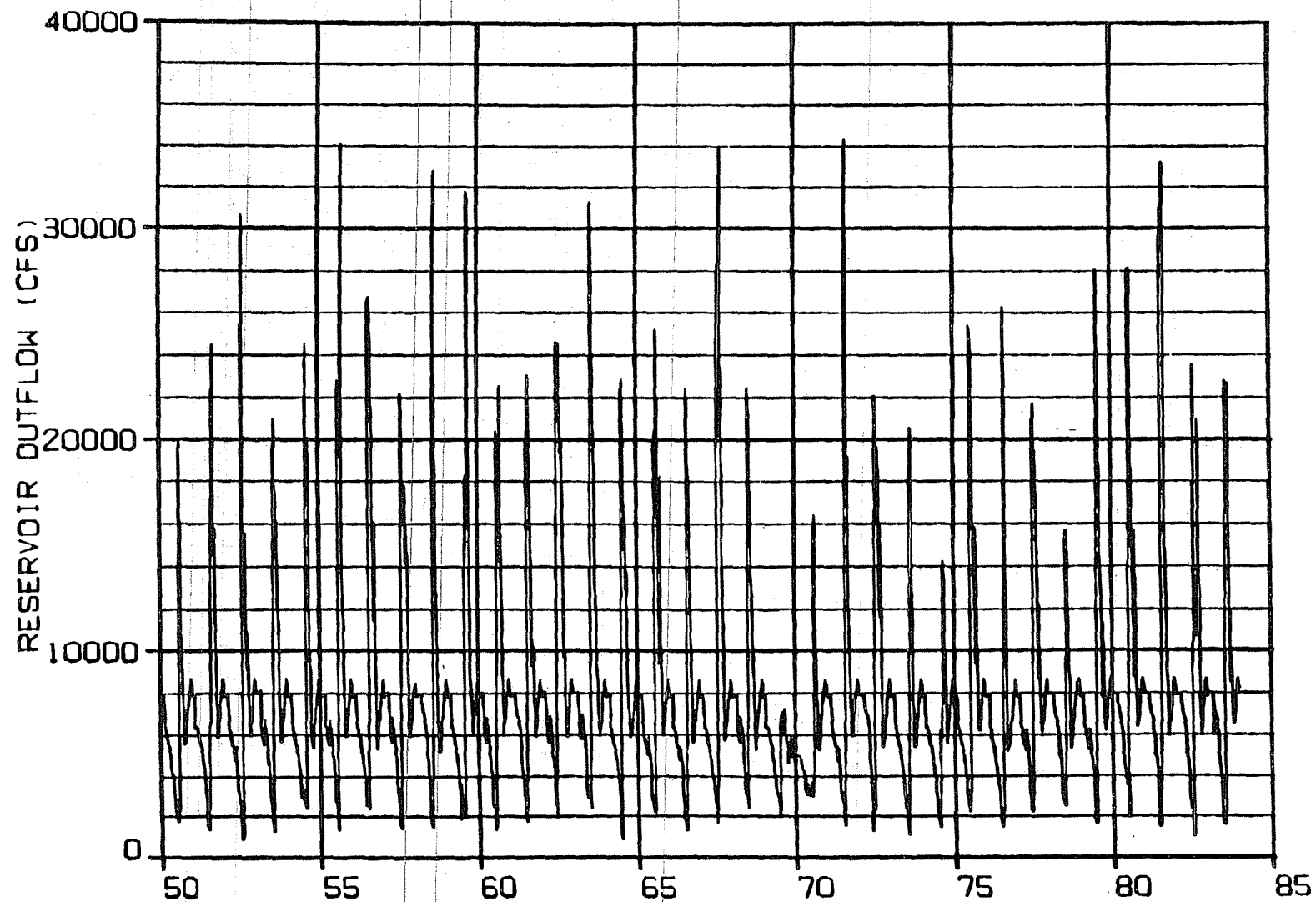


**WATANA WATER SURFACE ELEVATION
MONTHLY SUMMARY, STAGE II**

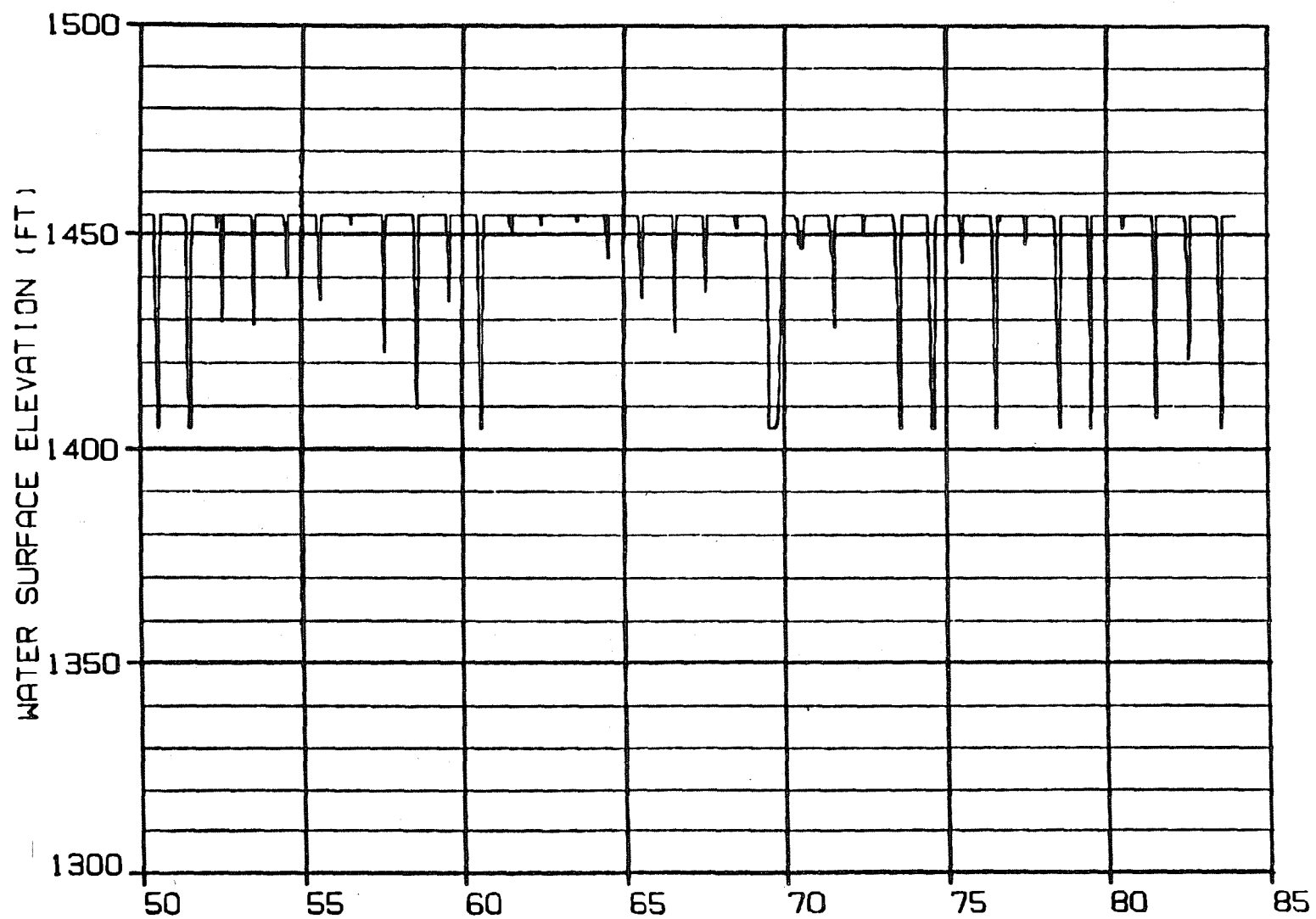
FIGURE E.2.4.115



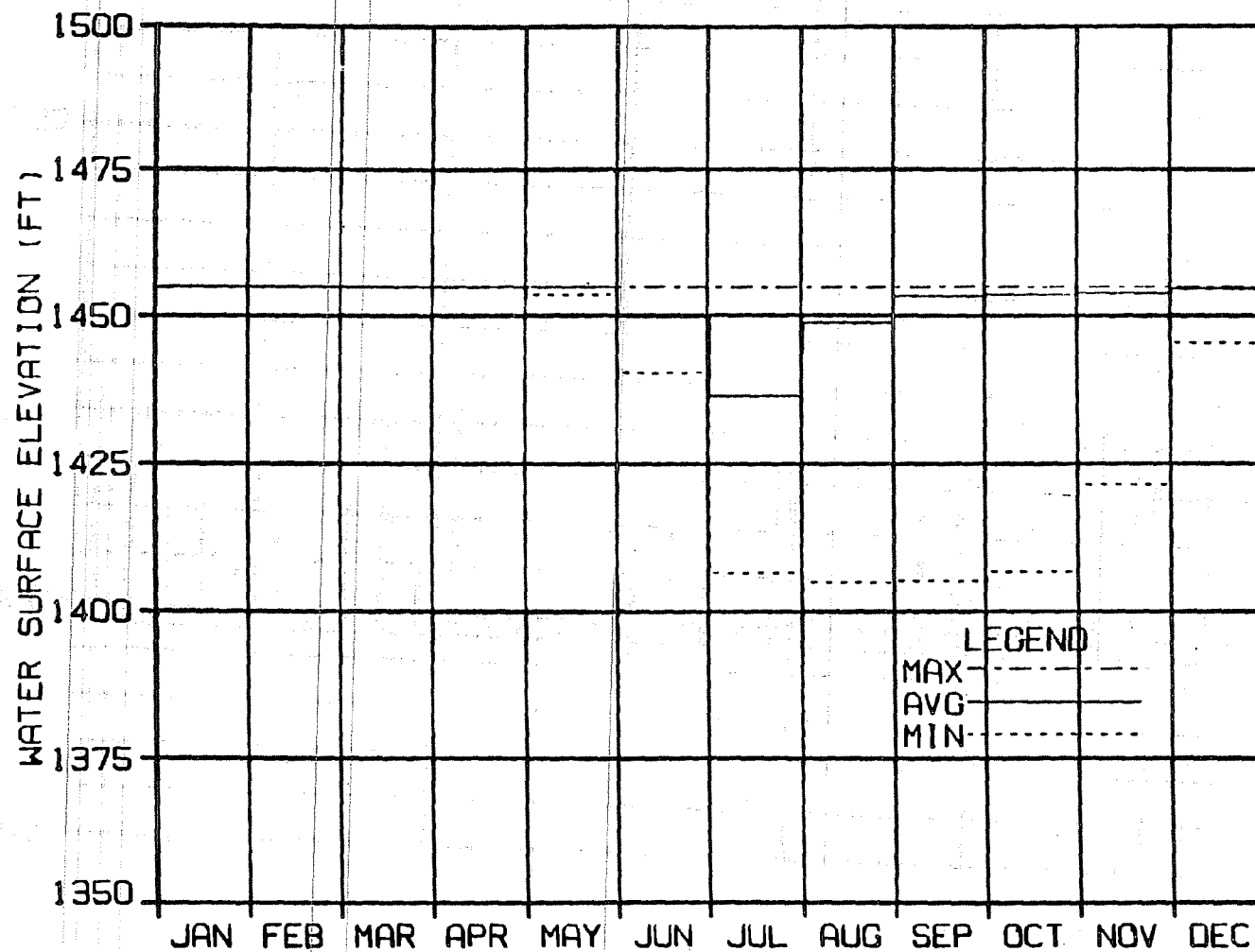
WATANA RESERVOIR INFLOW, STAGE II



WATANA RESERVOIR OUTFLOW, STAGE II

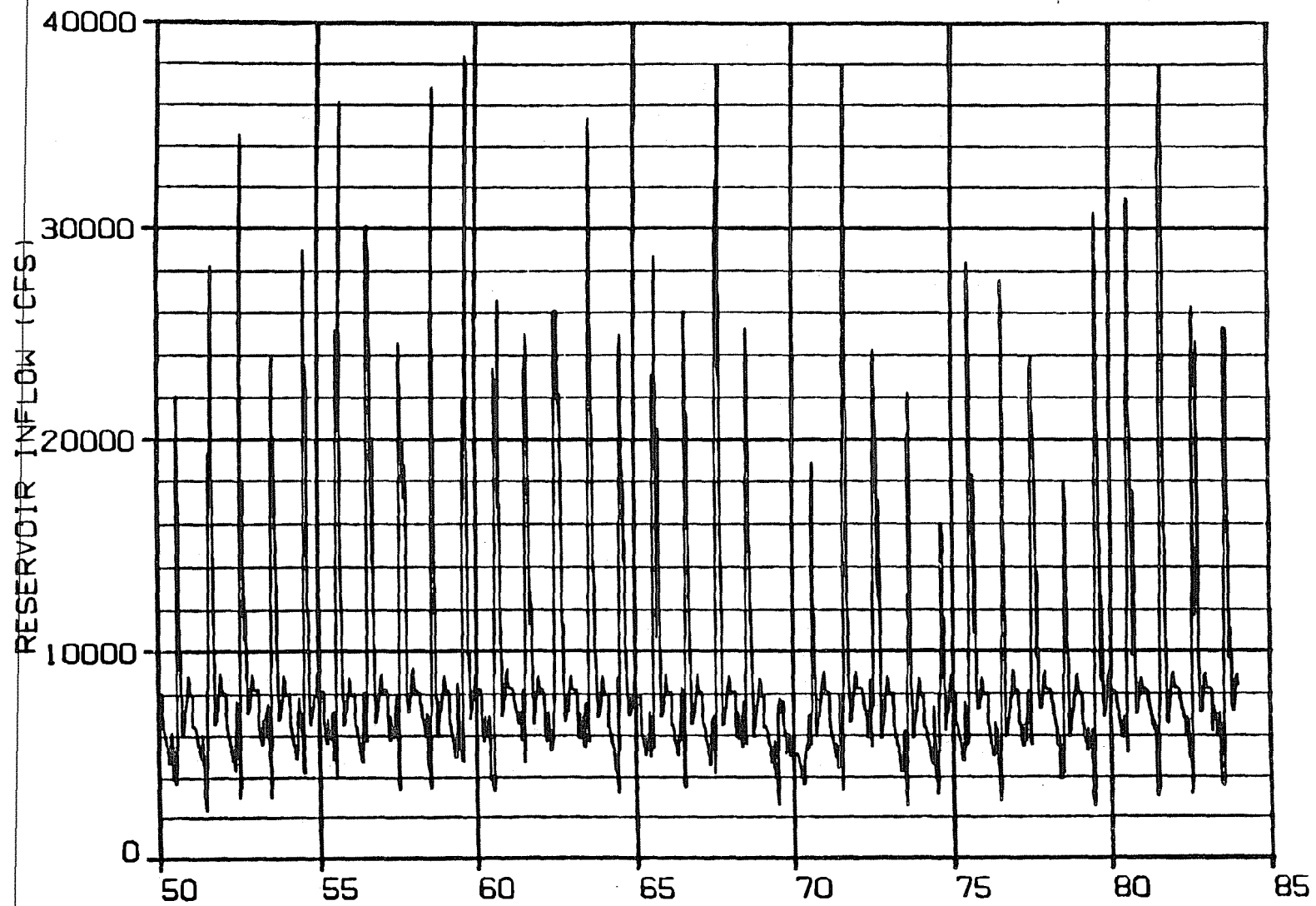


DEVIL CANYON WATER SURFACE ELEVATION, STAGE II

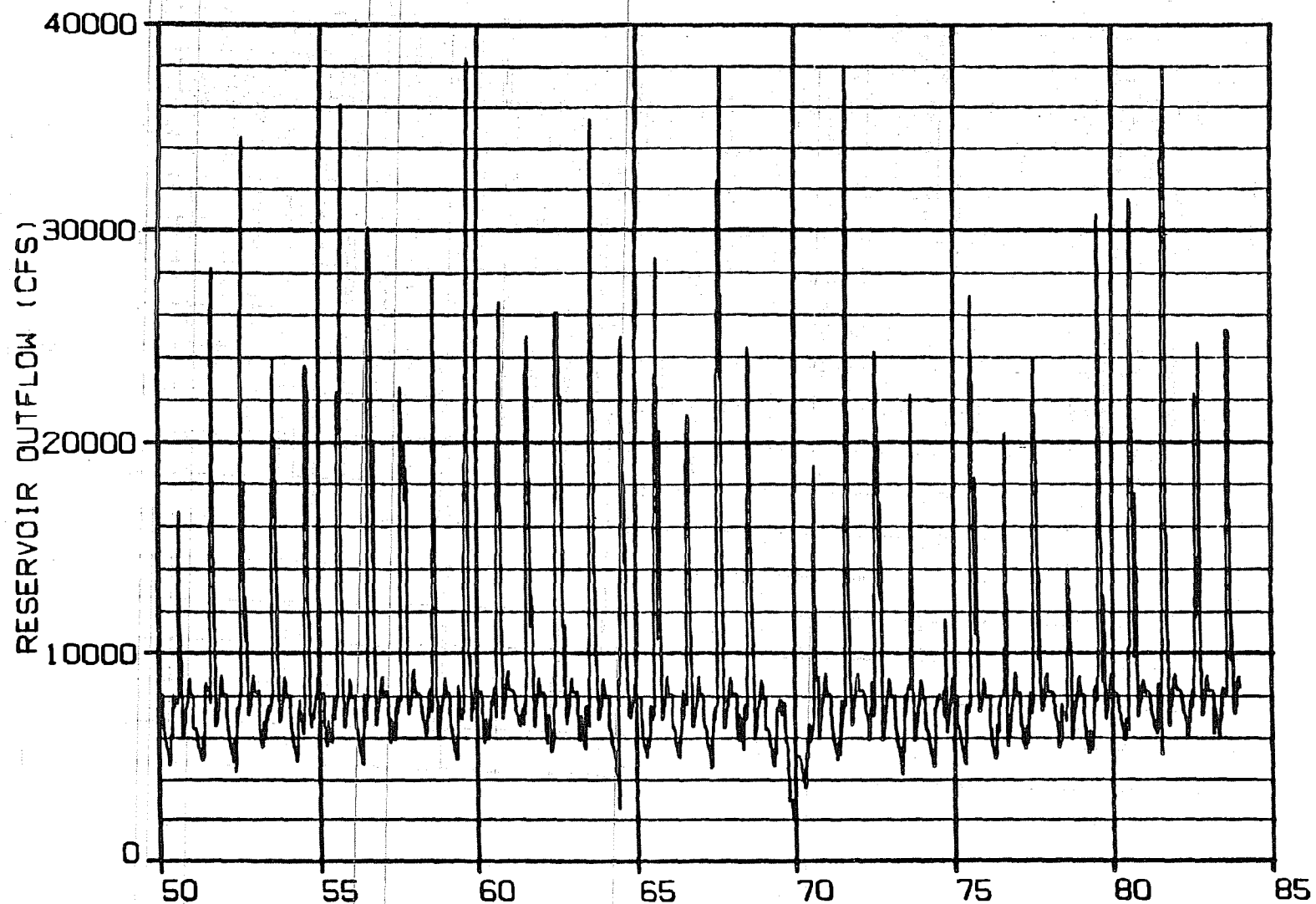


DEVIL CANYON WATER SURFACE ELEVATION
MONTHLY SUMMARY, STAGE II

FIGURE E.2.4.119

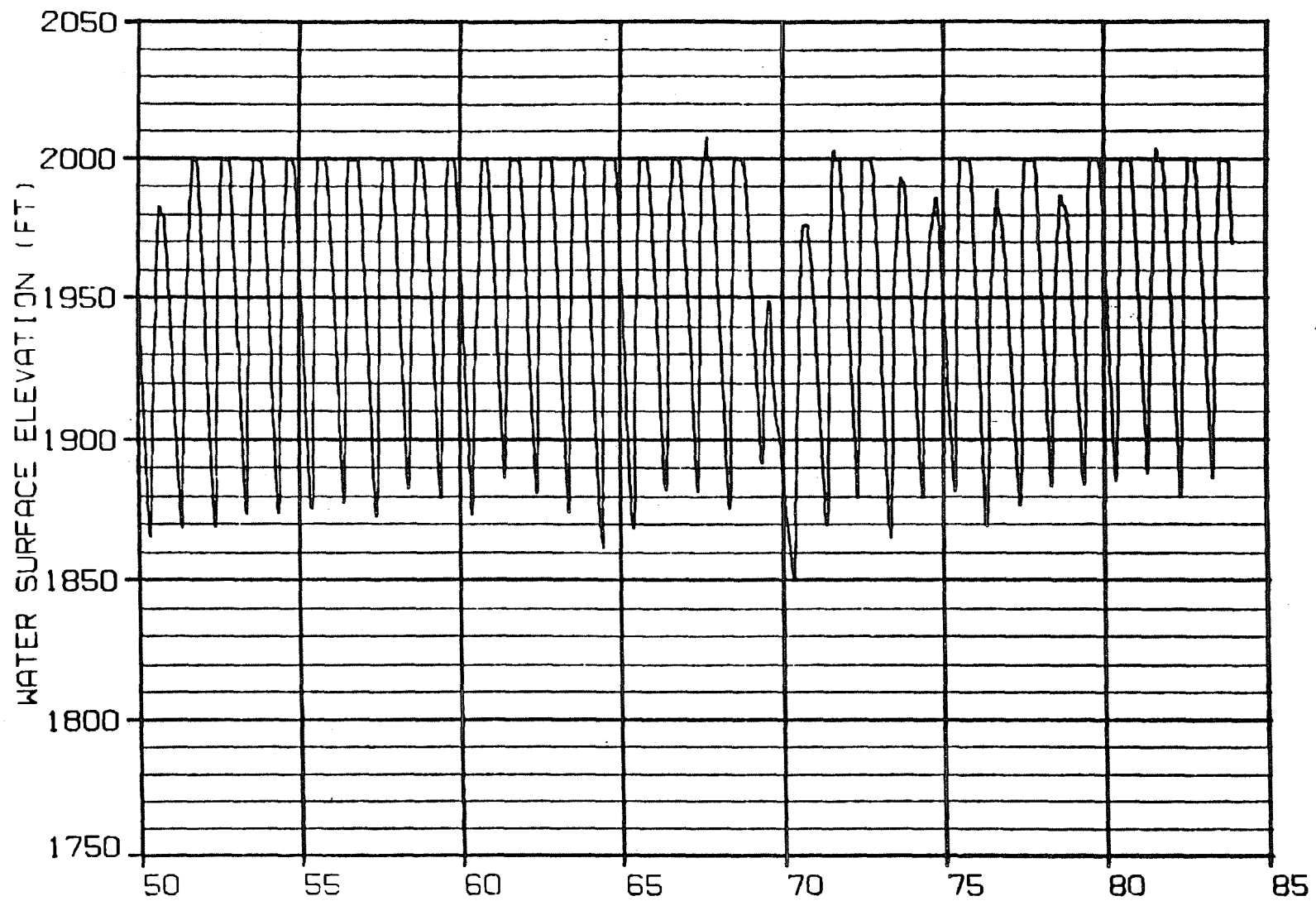


DEVIL CANYON RESERVOIR INFLOW, STAGE II

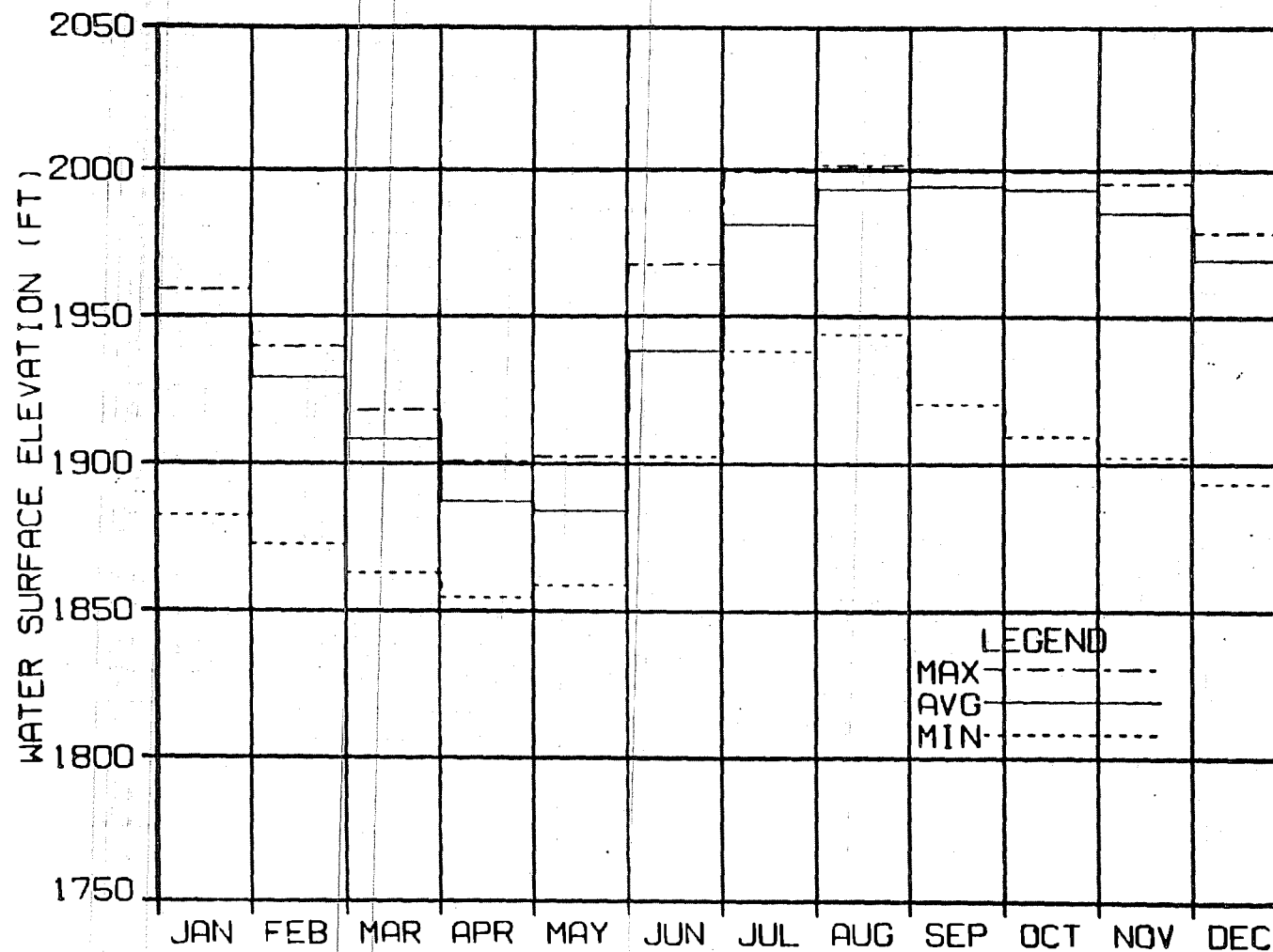


DEVIL CANYON RESERVOIR OUTFLOW, STAGE II

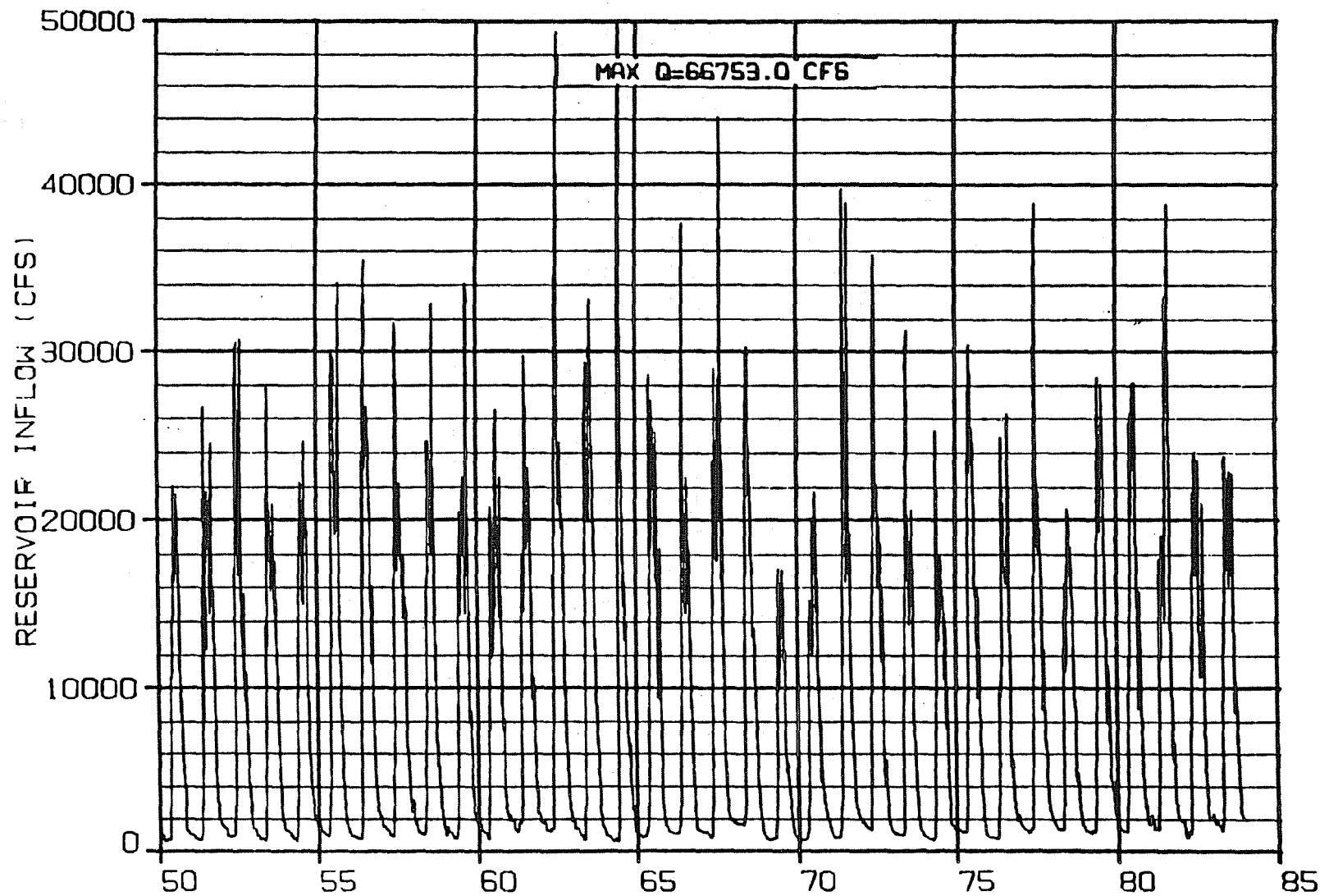
FIGURE E.2.4.121



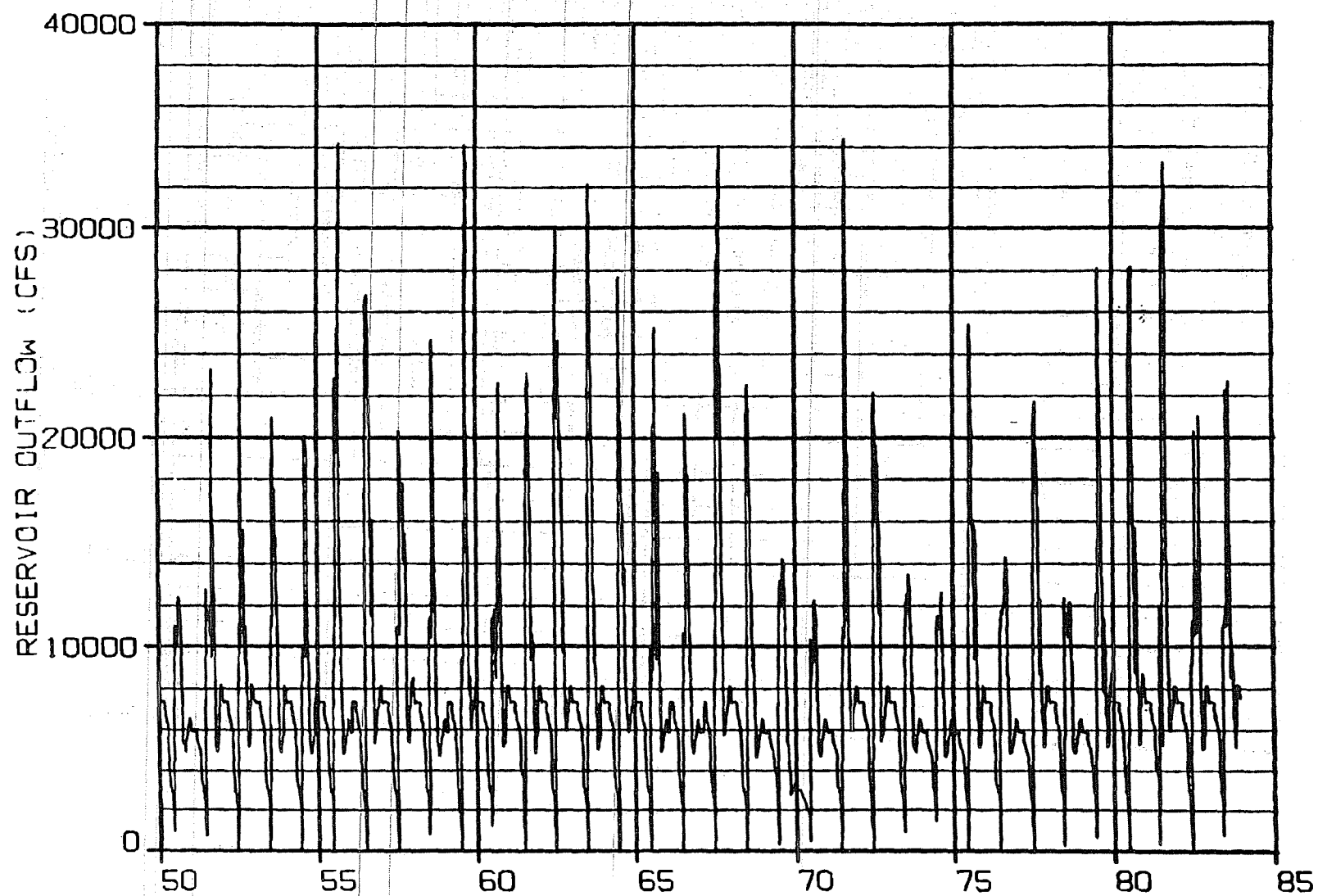
WATANA WATER SURFACE ELEVATION, E-I, STAGE II



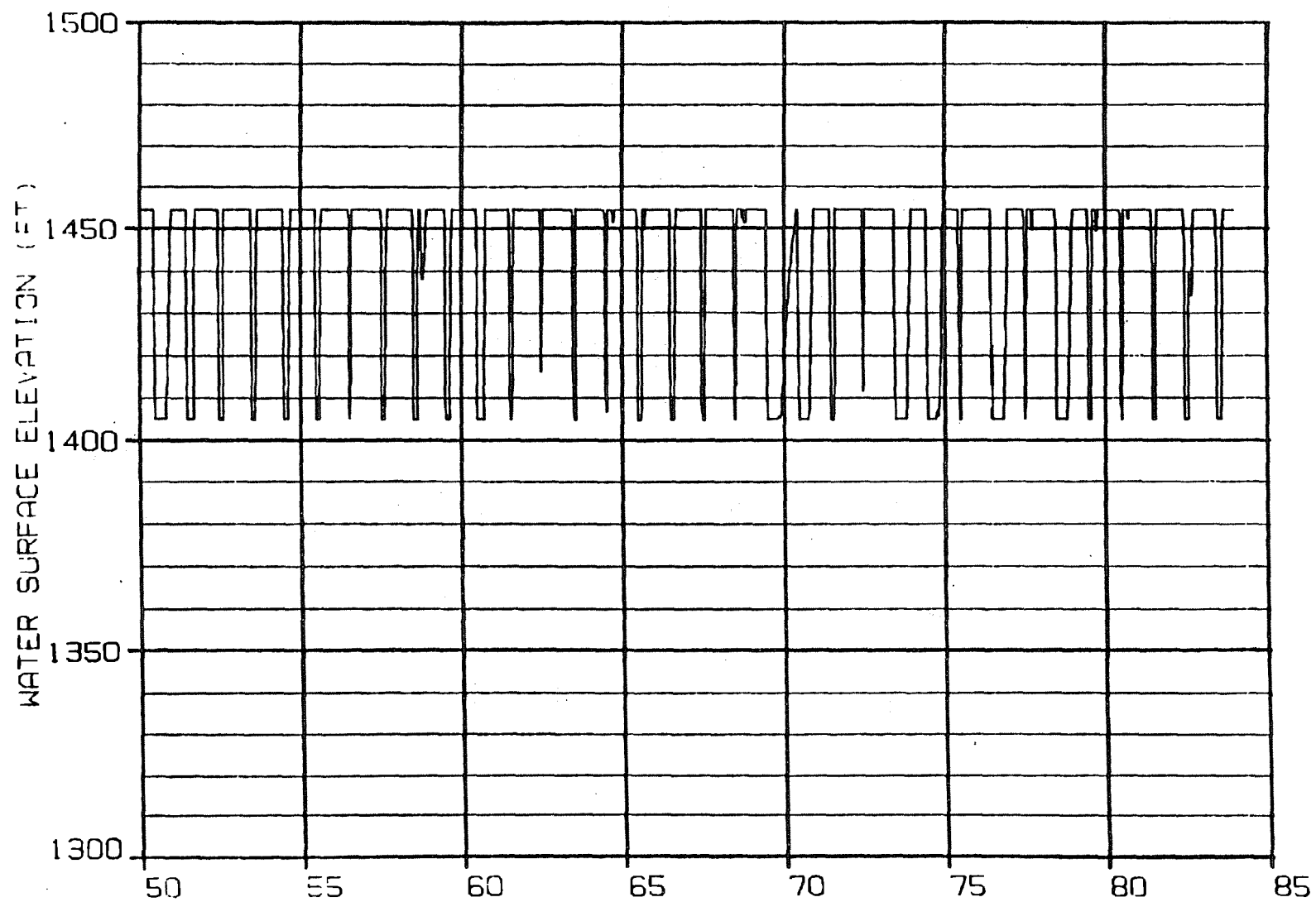
**WATANA WATER SURFACE ELEVATION
MONTHLY SUMMARY, E-I, STAGE II**



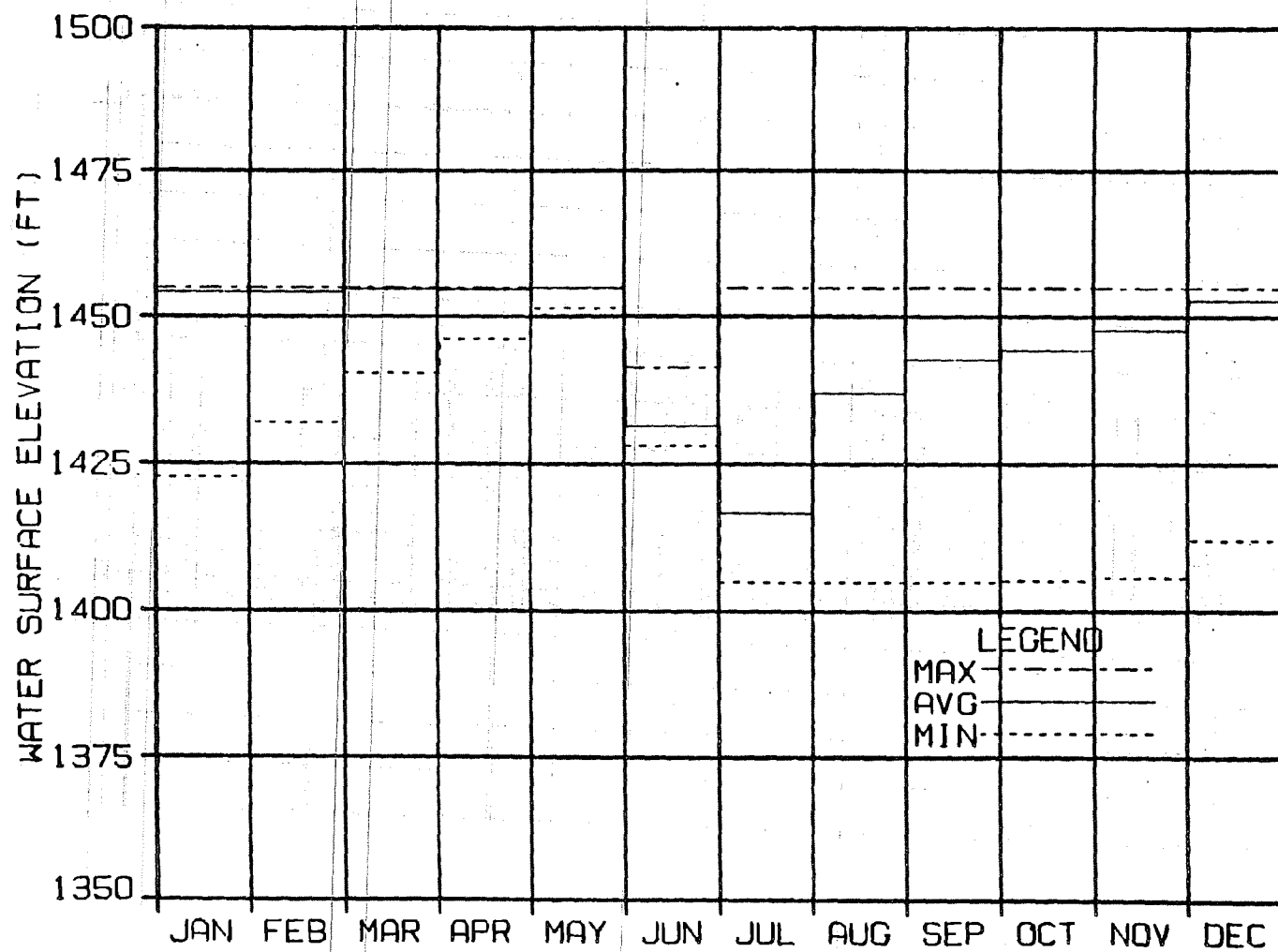
WATANA RESERVOIR INFLOW, E-I, STAGE II



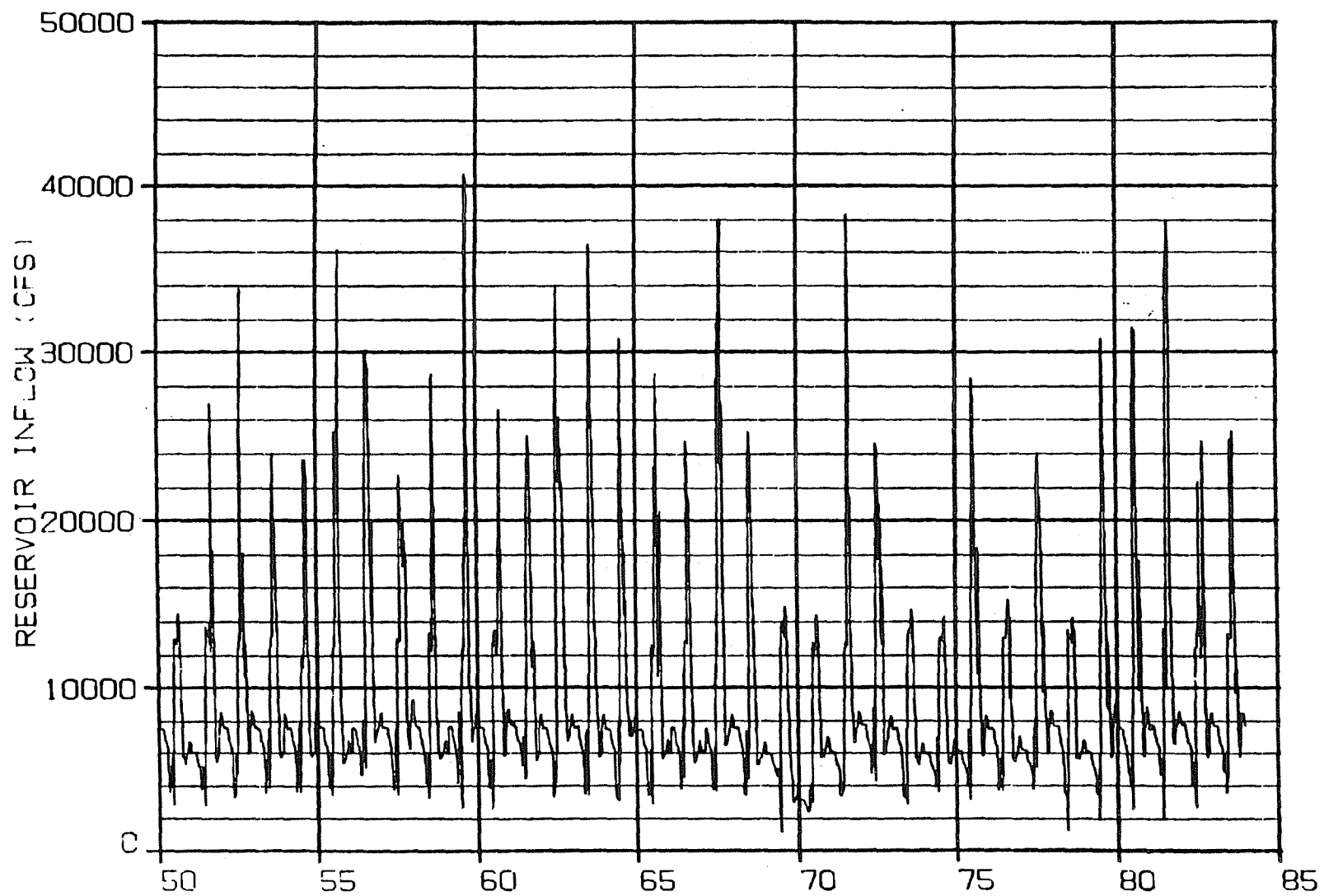
WATANA RESERVOIR OUTFLOW, E-I, STAGE II



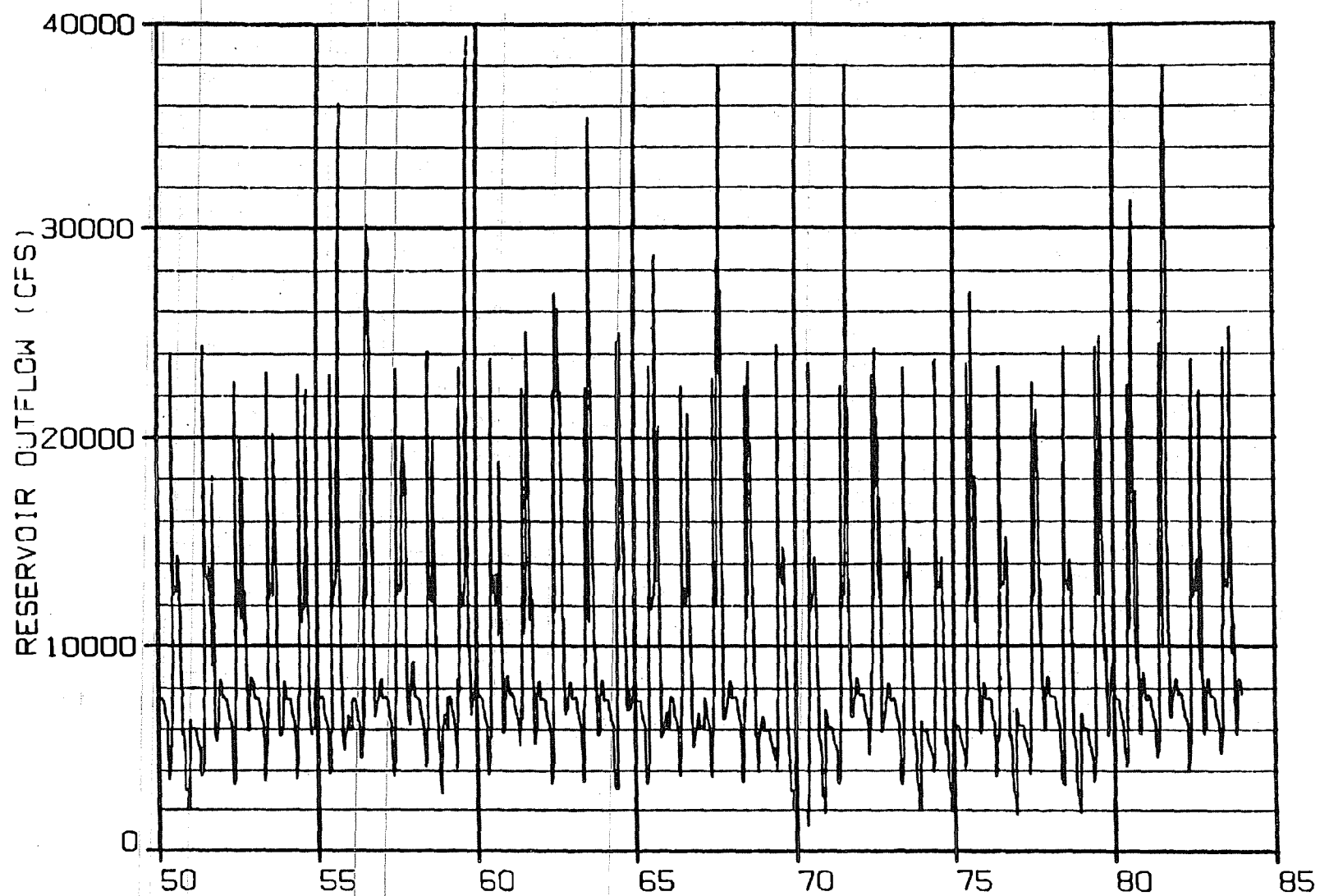
DEVIL CANYON WATER SURFACE ELEVATION, E-I, STAGE II



**DEVIL CANYON WATER SURFACE ELEVATION
MONTHLY SUMMARY, E-I, STAGE II**



DEVIL CANYON RESERVOIR INFLOW, E-I, STAGE II



DEVIL CANYON RESERVOIR OUTFLOW, E-I, STAGE II

Discharge in cfs

THOUSANDS

80

70

60

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Month

LEGEND

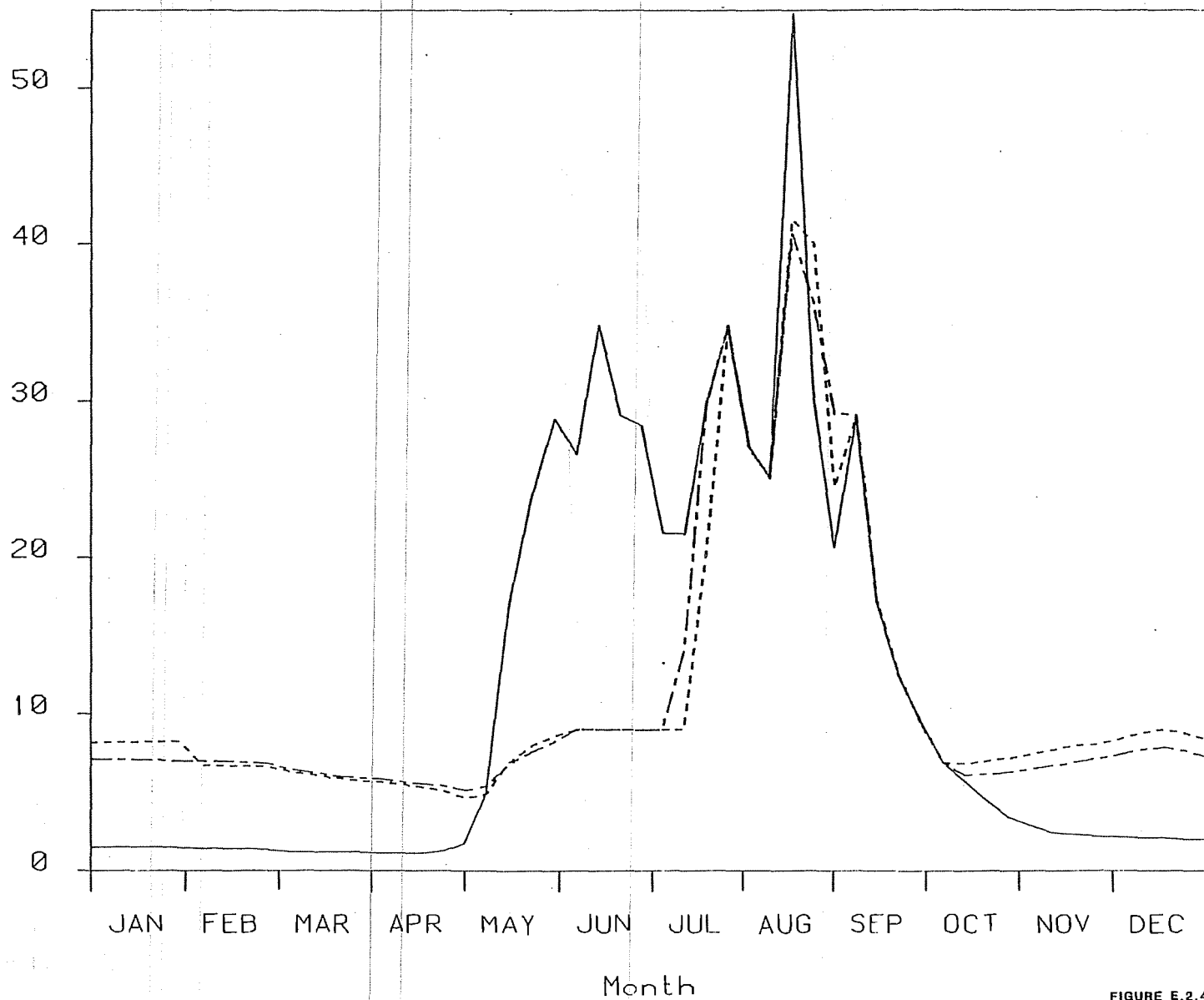
- NATURAL CONDITIONS
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 2 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER	
FLOWS AT GOLD CREEK	
FOR 1964 HYDROLOGY	
STAGE II	
E-VI FLOW REQUIREMENTS	
MADEA-TRABCO Bureau of Reclamation	APPROVED
MOYHANE, ALASKA	DATE

FIGURE E.2.4.130

SUSITNA RIVER

THOUSANDS



LEGEND

- NATURAL CONDITIONS
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 2 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1967 HYDROLOGY	
STAGE II	
E-VI FLOW REQUIREMENTS	
DATE	REVISION NO.
1967	10

FIGURE E.2.4.131

Discharge in cfs

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Month

LEGEND

— NATURAL CONDITIONS

— FLOWS FOR PHASE 2 OF 2-STAGE PROJECT

--- FLOWS FOR STAGE 2 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1870 HYDROLOGY	
STAGE II	
E-VI FLOW REQUIREMENTS	
DATE	PROJECT NO.

FIGURE E.2.4.132

THOUSANDS

50

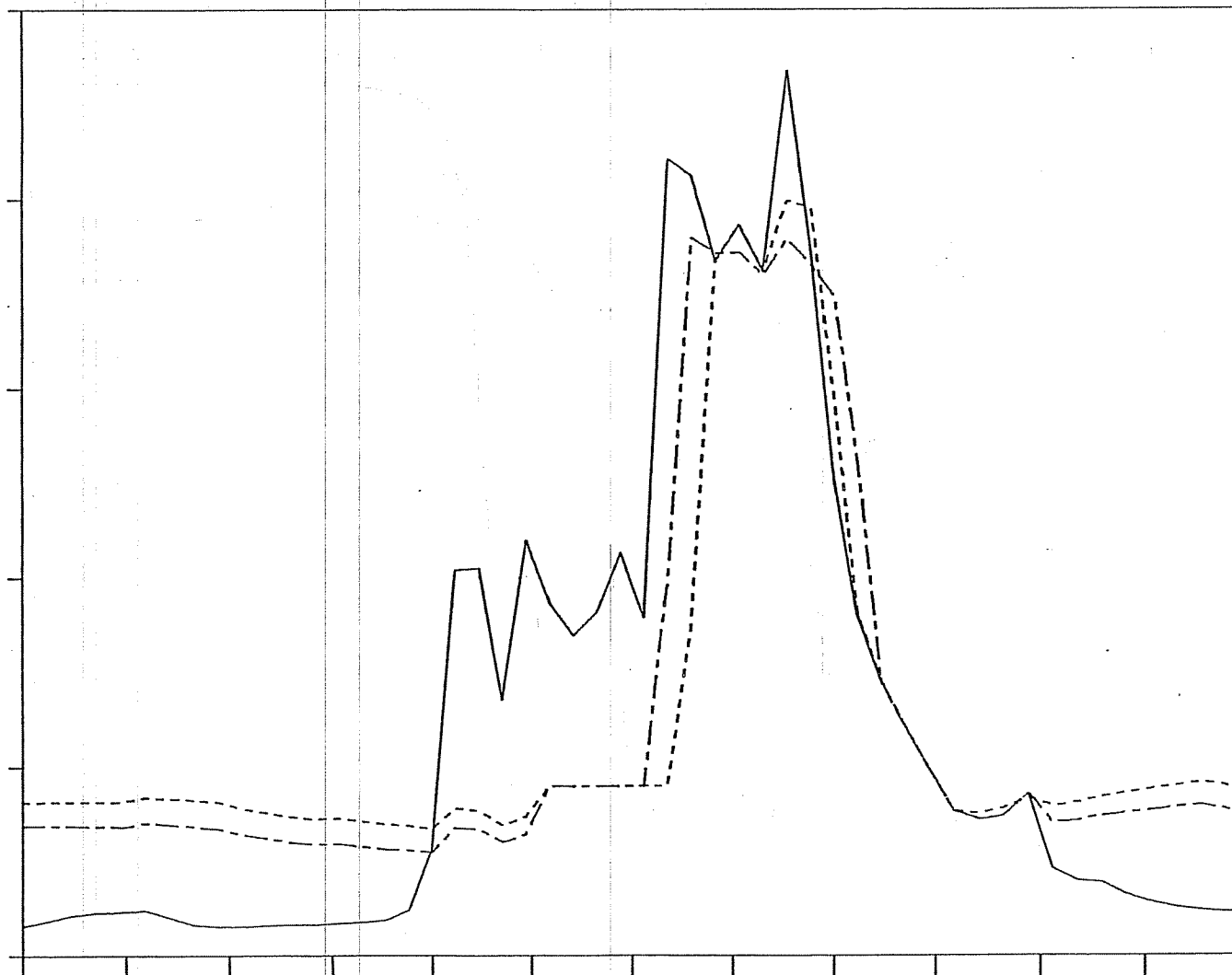
40

30

20

10

0



LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- ... FLOWS FOR STAGE 2 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1981 HYDROLOGY		
STAGE II		
E-VI FLOW REQUIREMENTS		
MAKER/PRACCO	DATE	PROJECT NO.
MONTREAL, ALASKA		

FIGURE E.2.4.133

Discharges

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Month

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 2 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

AVERAGE WEEKLY SUSITNA RIVER
FLOWS AT GOLD CREEK
FOR 1982 HYDROLOGY
STAGE II

E-VI FLOW REQUIREMENTS

HALES-TRABCO SUSITNA RIVER PROJECT	APPROVED BY	DATE	REVISION NO.
MOOREHEAD, ALASKA			

FIGURE E.2.4.134

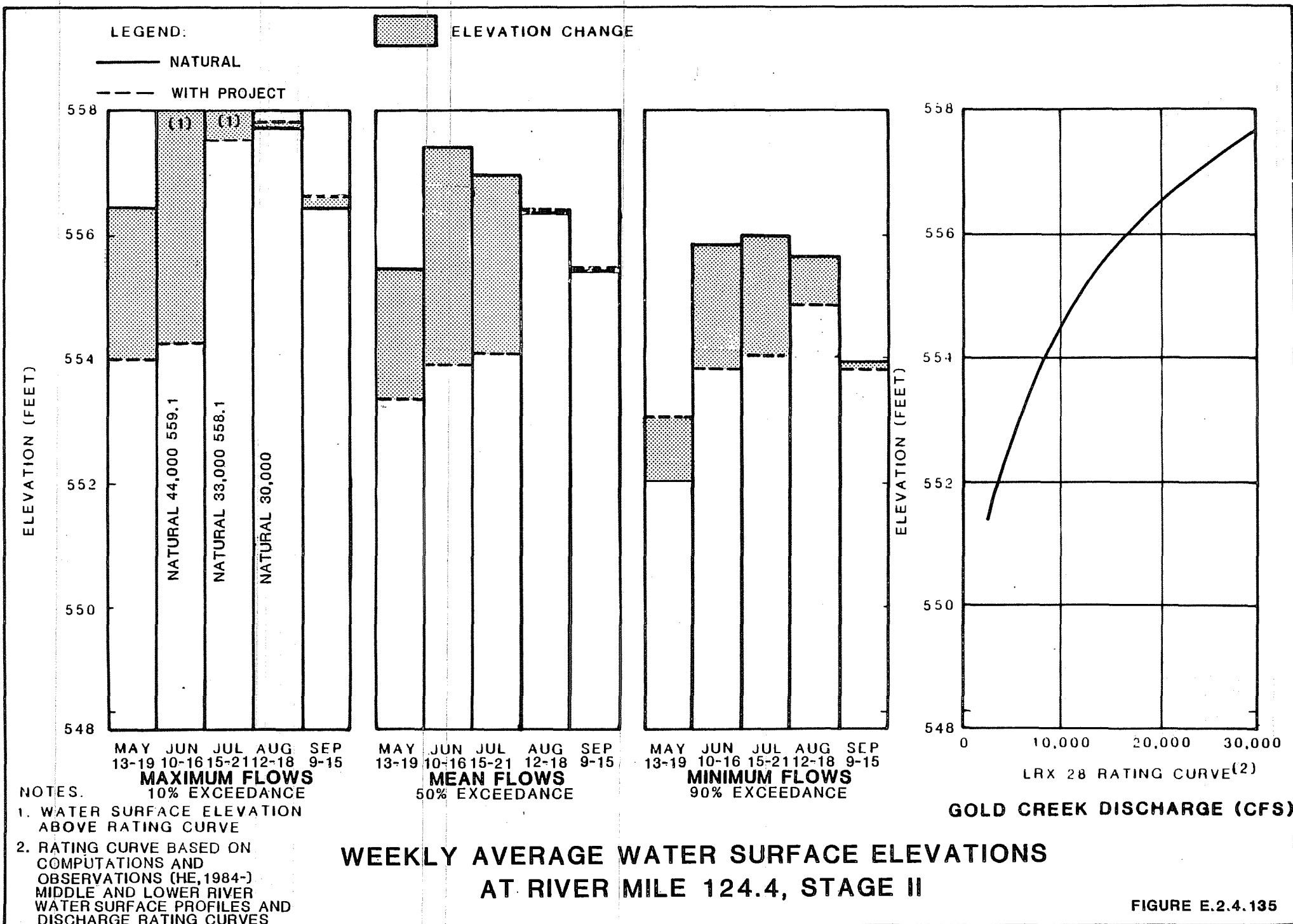
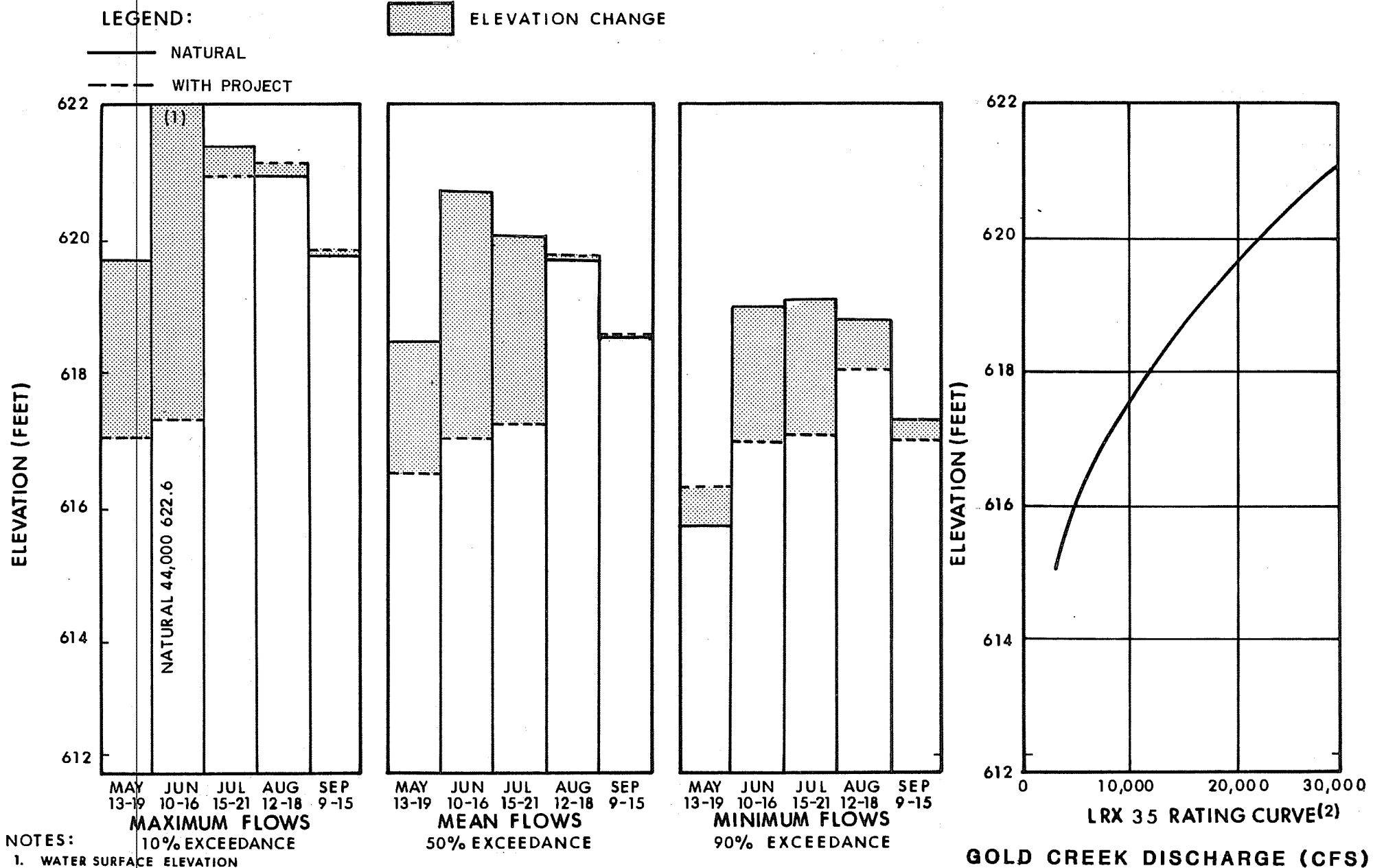


FIGURE E.2.4.135



NOTES:

1. WATER SURFACE ELEVATION ABOVE RATING CURVE
2. RATING CURVE BASED ON COMPUTATIONS AND OBSERVATIONS (HE, 1984-) MIDDLE AND LOWER RIVER WATER SURFACE PROFILES AND DISCHARGE RATING CURVES.

**WEEKLY AVERAGE WATER SURFACE ELEVATIONS
 AT RIVER MILE 130.9, STAGE II**

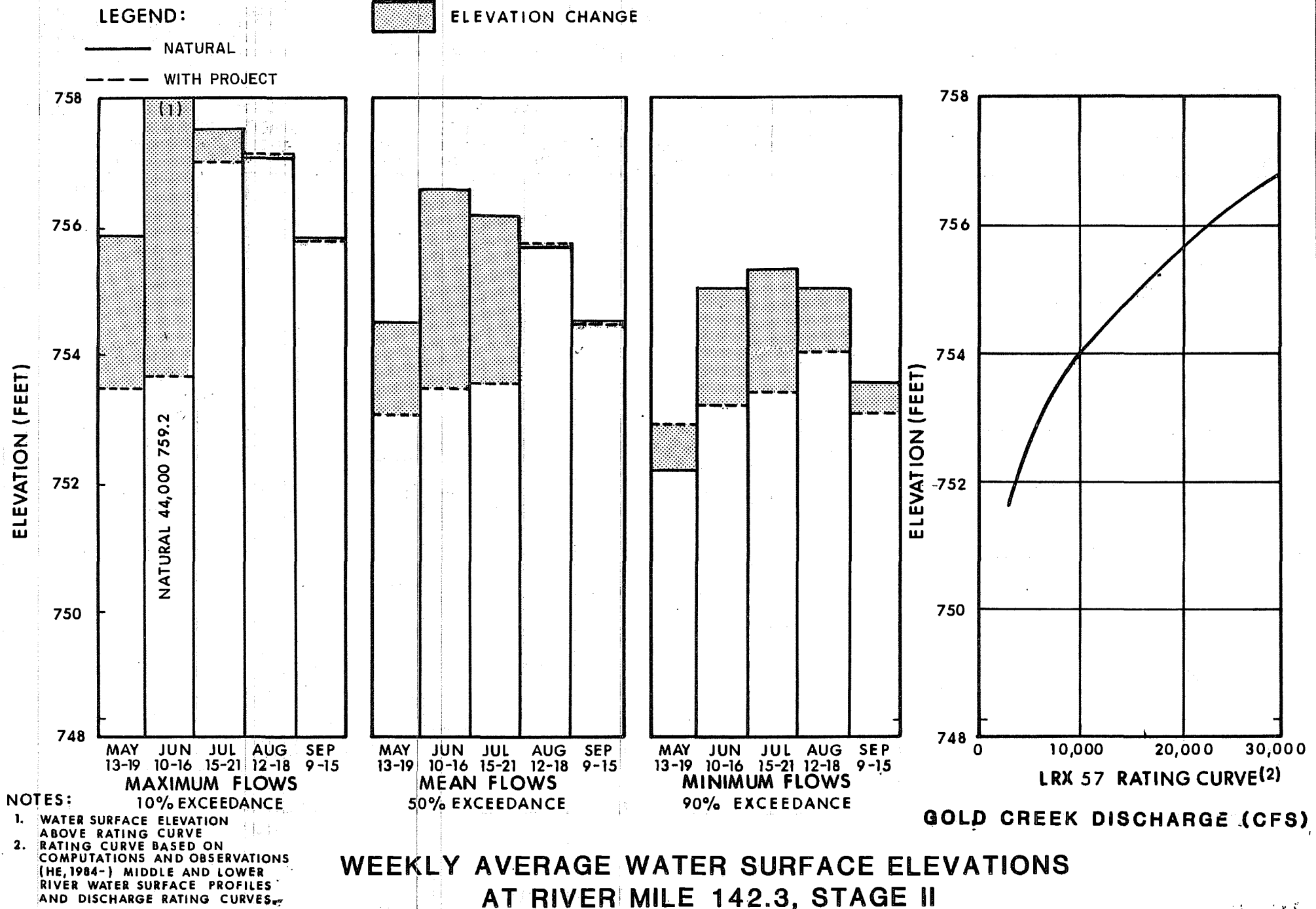
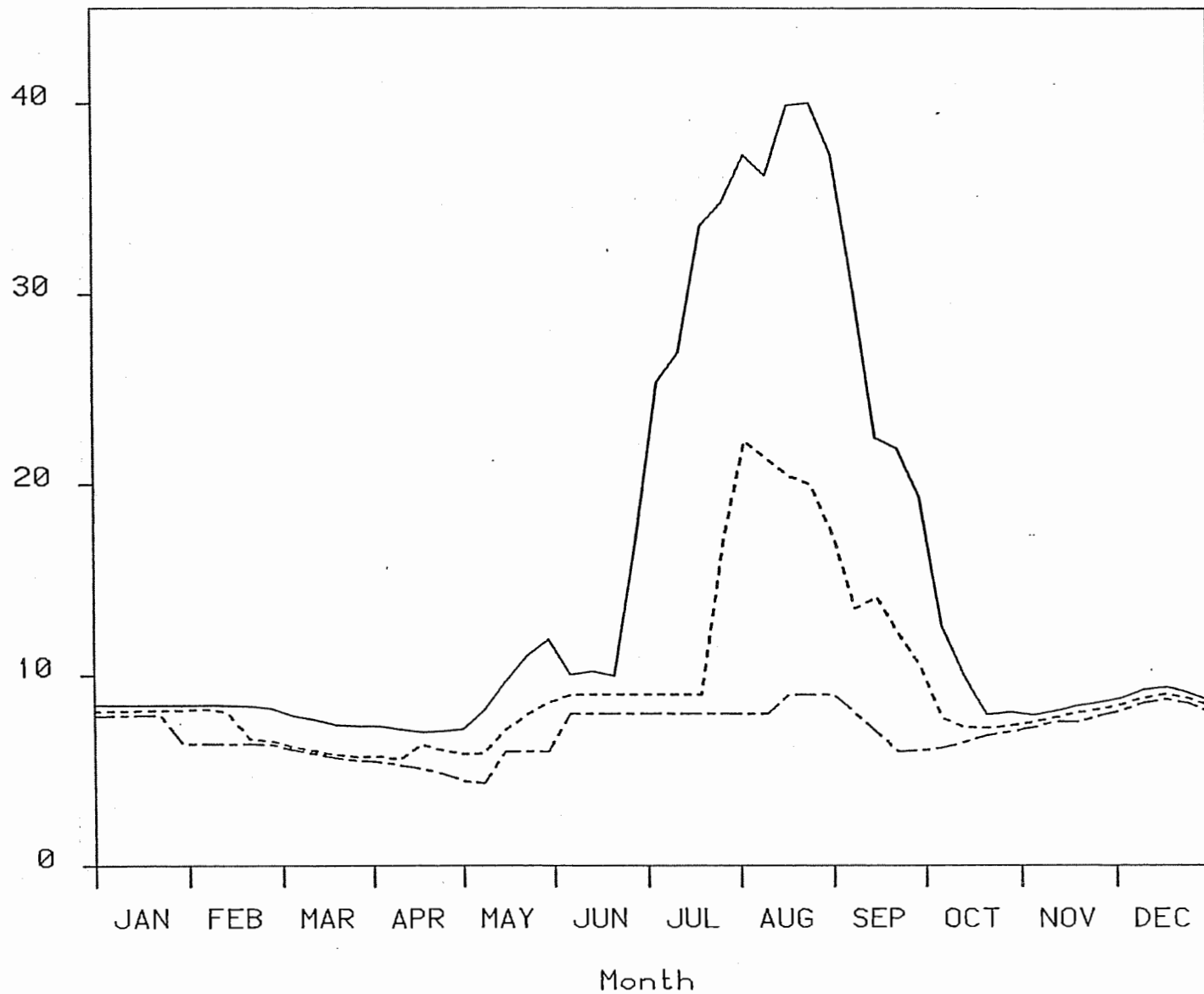


FIGURE E.2.4.137

Discharge in cfs

THOUSANDS



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 2 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS

LEGEND

- 6% EXCEEDENCE FLOWS
- - - 50% EXCEEDENCE FLOWS
- . - 97% EXCEEDENCE FLOWS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK STAGE II	
BARZA-SPRINGS	APPROVED
BY: [Signature]	DATE: [Blank]

FIGURE E.2.4.138

Discharge in cfs

THOUSANDS

60

50

40

30

20

10

0

CASE E-VI MAXIMUM FLOW REQUIREMENTS

CASE E-VI MINIMUM FLOW REQUIREMENTS

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Month

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 2 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS
5. DEVIL CANYON DRAWDOWN OF 50 FEET

LEGEND

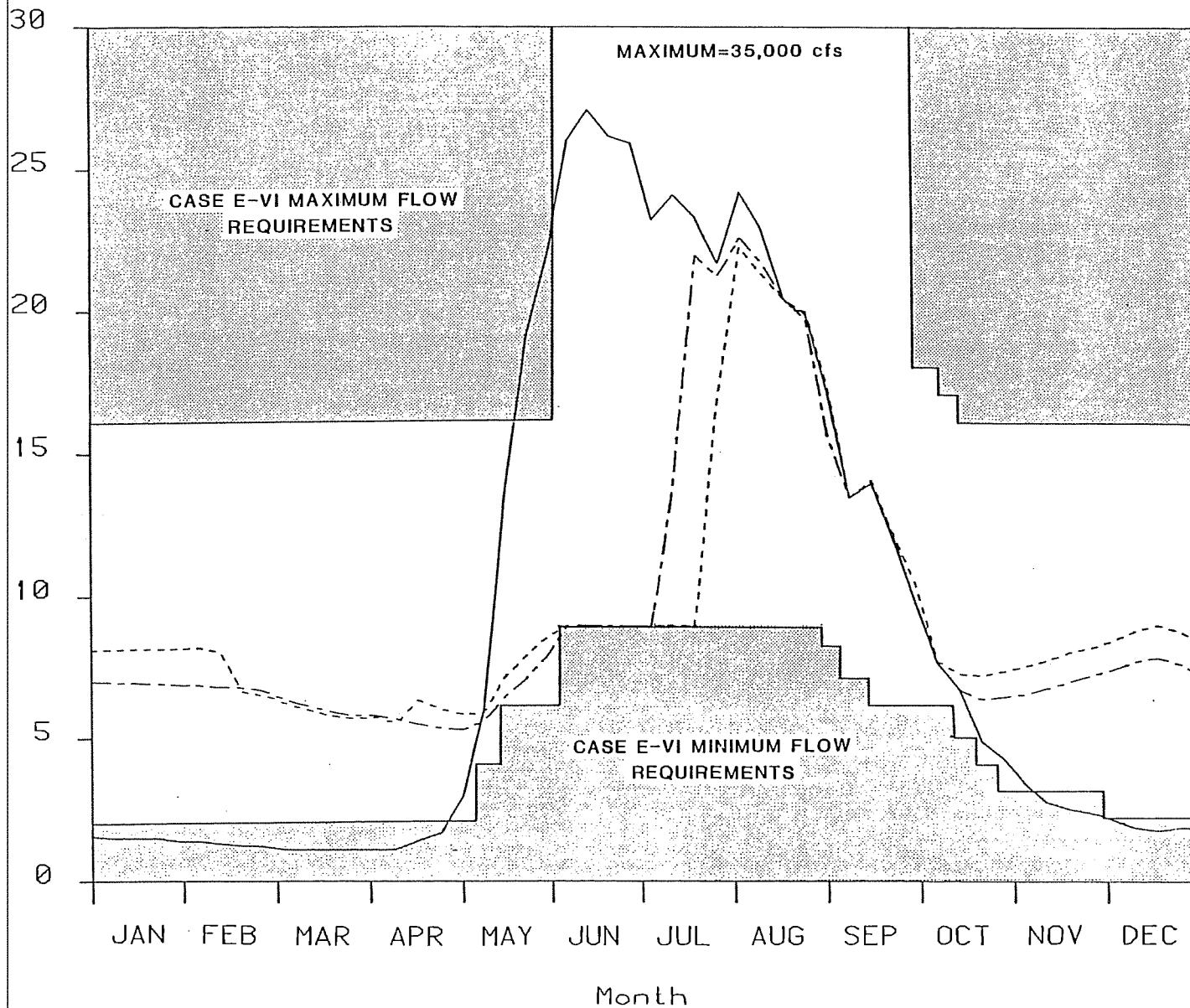
- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 2 OF 3-STAGE CONSTRUCTION

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 6% OF THE TIME STAGE II AT GOLD CREEK	
DATE: 1984-08-08	BY: J. H. HARRIS
REVISION: 1.0	APPROVED: J. H. HARRIS

FIGURE E.2.4.139

THOUSANDS

Discharge in cfs



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 2 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS
5. DEVIL CANYON DRAWDOWN OF 50 FEET

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- ... FLOWS FOR STAGE 2 OF 3-STAGE CONSTRUCTION

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 50% OF THE TIME STAGE II AT GOLD CREEK	
DATE: 1983-08-01	BY: J. H. HARRIS
DATE: 1983-08-01	BY: J. H. HARRIS

FIGURE E.2.4.140

THOUSANDS

25

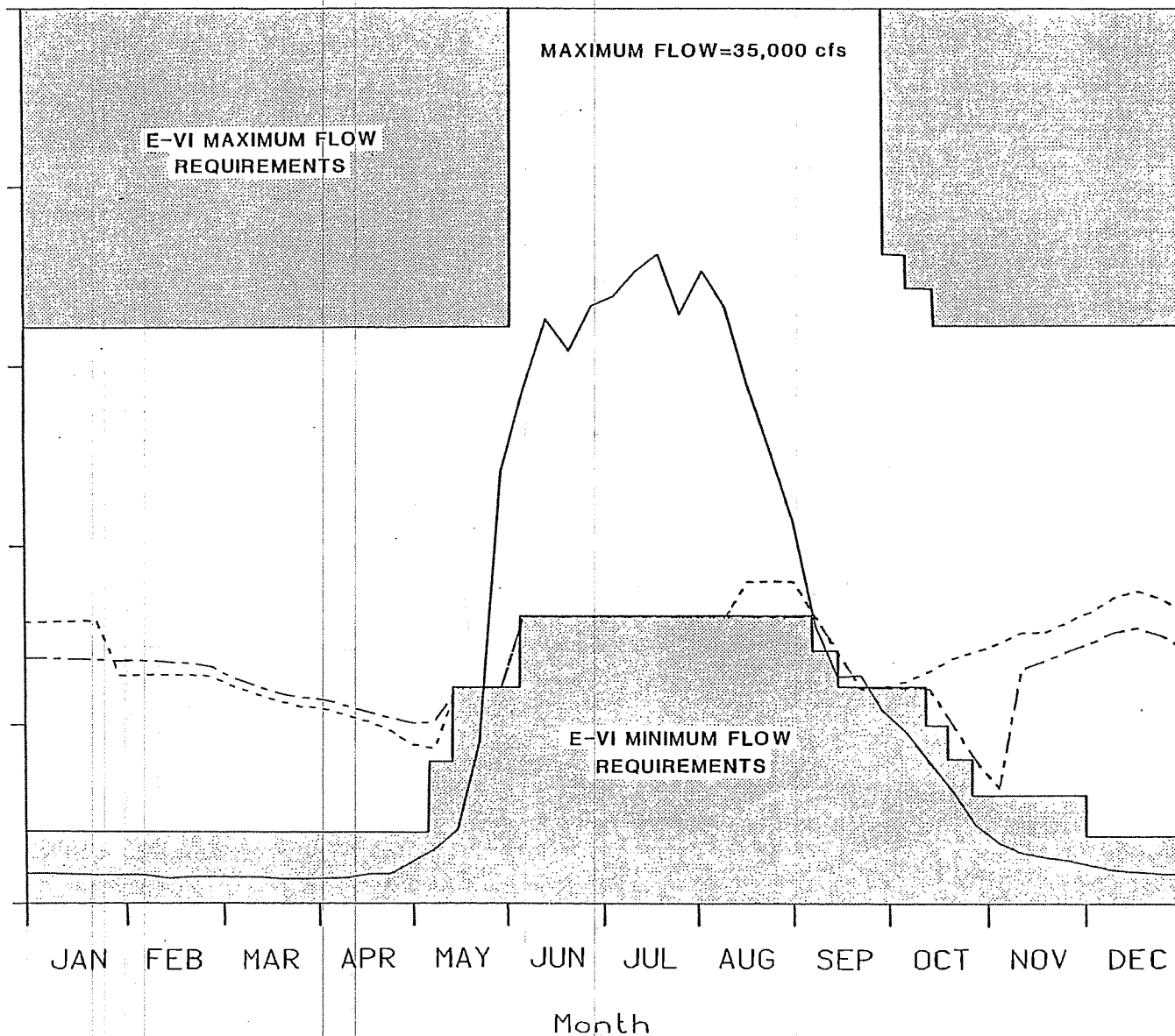
20

15

10

5

0



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 2 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS
5. DEVIL CANYON DRAWDOWN OF 50 FEET

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- ... FLOWS FOR STAGE 2 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 97% OF THE TIME STAGE II AT GOLD CREEK	
DATE: 10/1/83	BY: J. H. HARRIS

FIGURE E.2.4.141

Discharge in cfs

THOUSANDS

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Months

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 2 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-I FLOW REQUIREMENT

LEGEND

- 6% EXCEEDENCE FLOWS
- - - 50% EXCEEDENCE FLOW
- - - 97% EXCEEDENCE FLOW

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK STAGE II	
DATE: 10/1/83	BY: J. H. HARRIS
REVISION: 10/1/83	BY: J. H. HARRIS

FIGURE E.2.4.142

THOUSANDS

60

50

40

30

20

10

0

CASE E-I MAXIMUM FLOW REQUIREMENTS

CASE E-I MINIMUM FLOW REQUIREMENTS

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Months

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 2 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. BETWEEN JUNE 10 AND JUNE 16 THERE IS A SPIKE TO 45,000 CFS
5. BETWEEN AUG 12 AND AUG 18 THERE IS A SPIKE TO 23,000 CFS
6. BETWEEN AUG 19 AND AUG 25 THERE IS A SPIKE TO 18,000 CFS

LEGEND

- NATURAL CONDITION
- FLOWS FOR E - VI FLOW REQUIREMENTS
- - - FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 6% OF THE TIME AT OOLD CREEK	
NAME: _____	DATE: _____
BY: _____	DATE: _____

FIGURE E.2.4.143

D
i
s
c
h
a
r
g
e

i
n

c
f
s

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Months

CASE E-I MAXIMUM FLOW REQUIREMENTS

CASE E-I MINIMUM FLOW REQUIREMENTS

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 2 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. BETWEEN JUNE 10 AND JUNE 16 THERE IS A SPIKE TO 45,000 CFS
5. BETWEEN AUG 12 AND AUG 18 THERE IS A SPIKE TO 23,000 CFS
6. BETWEEN AUG 19 AND AUG 25 THERE IS A SPIKE TO 18,000 CFS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- - - FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 50% OF THE TIME AT GOLD CREEK	
BARCEL-STRAND	DATE
APPROVED, ALASKA	APPROVED, AIA

FIGURE E.2.4.144

Discharge in cfs

THOUSANDS

25

20

15

10

5

0

CASE E-I MAXIMUM FLOW REQUIREMENTS

CASE E-I MINIMUM FLOW REQUIREMENTS

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Months

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 2 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. BETWEEN JUNE 10 AND JUNE 16 THERE IS A SPIKE TO 45,000 CFS
5. BETWEEN AUG 12 AND AUG 18 THERE IS A SPIKE TO 23,000 CFS
6. BETWEEN AUG 19 AND AUG 25 THERE IS A SPIKE TO 18,000 CFS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENT
- . - FLOWS FOR E - I FLOW REQUIREMENT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 97% OF THE TIME AT GOLD CREEK	
PARCEL - 000000	
DATE - 01/01/84	

FIGURE E.2.4.145

Discharge in cfs

THOUSANDS

80

70

60

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

Months

LEGEND

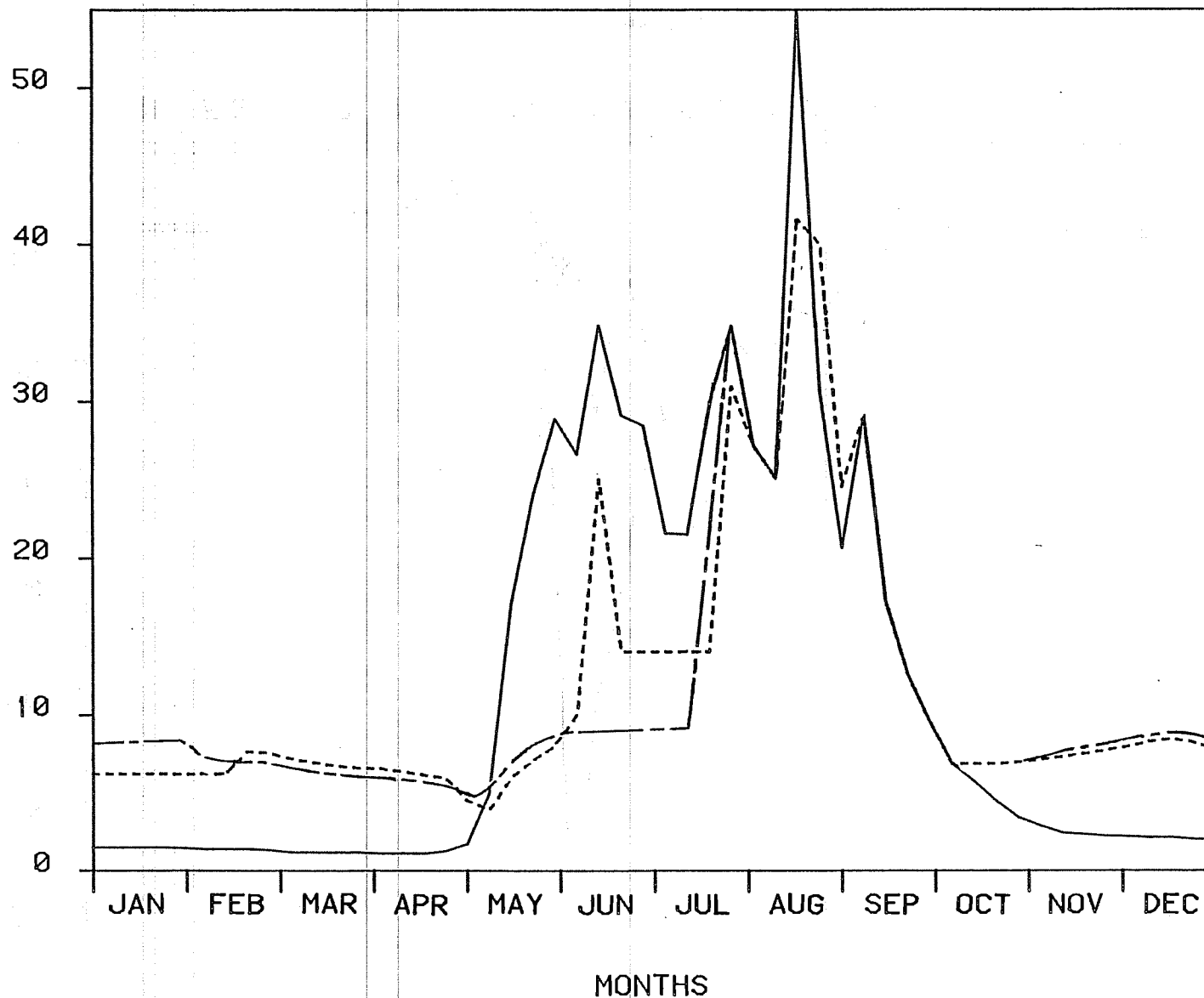
- NATURAL CONDITION
- - - FLOWS FOR E - VI
FLOW REQUIREMENTS
- - - FLOWS FOR E - I
FLOW REQUIREMENTS

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1984 HYDROLOGY		
STAGE II		
DRAWN BY: M. A. DODD	DATE: 10/1/84	
CHECKED BY: M. A. DODD	DATE: 10/1/84	PROJECT NO: 10000000

FIGURE E.2.4.148

DISCHARGE IN CFS

THOUSANDS



LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- . - FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER FLOWS AT GOLD CREEK FOR 1987 HYDROLOGY	
STAGE II	
BARRETT-PLACCO	DATE
APPROVED NAME	DATE

FIGURE E.2.4.147

DISCHARGE IN CFS

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

MONTHS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- - - FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
AVERAGE WEEKLY SUSITNA RIVER		
FLOWS AT GOLD CREEK		
FOR 1970 HYDROLOGY		
STAGE II		
DATE: 1/1/80	BY: JMS	FIGURE NO.

FIGURE E.2.4.148

DISCHARGE IN CFS

THOUSANDS

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

MONTHS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI
FLOW REQUIREMENTS
- - - FLOWS FOR E - I
FLOW REQUIREMENTS

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

AVERAGE WEEKLY SUSITNA RIVER
FLOWS AT GOLD CREEK
FOR 1981 HYDROLOGY

STAGE II

HARLES - PERACIO

ALASKA POWER AUTHORITY

ANCHORAGE, ALASKA

DATE

REVISION

BY

DATE

FIGURE E.2.4.148

DISCHARGE
IN
CFS

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

MONTHS

LEGEND

— NATURAL CONDITION

- - - FLOWS FOR E - VI
FLOW REQUIREMENTS

- - - FLOWS FOR E - I
FLOW REQUIREMENTS

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

AVERAGE WEEKLY SUSITNA RIVER
FLOWS AT GOLD CREEK
FOR 1982 HYDROLOGY

STAGE II

HALEA-TRAPCO

DATE

REVISIONS

DATE

REVISIONS

DATE

REVISIONS

FIGURE E.2.4.150

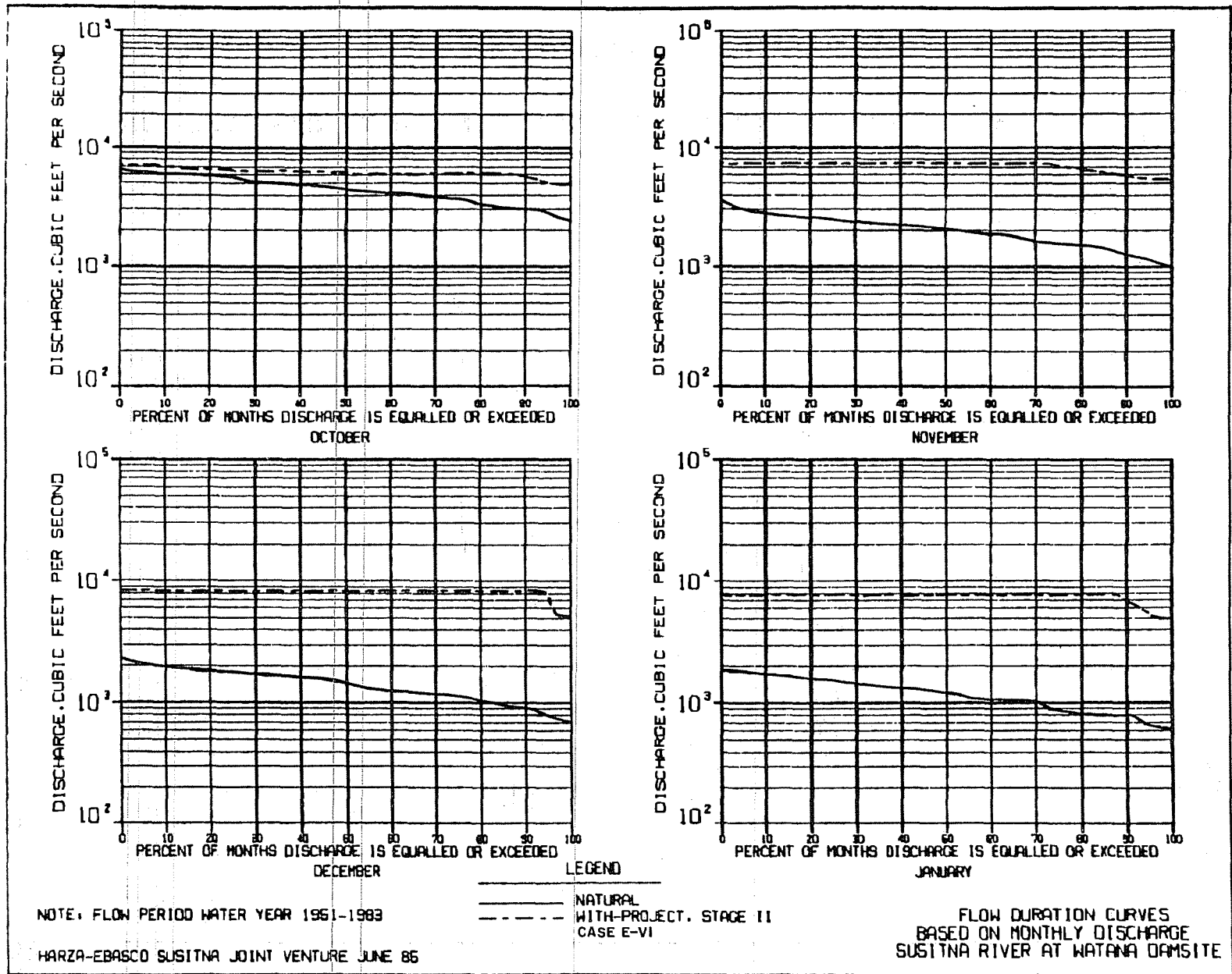
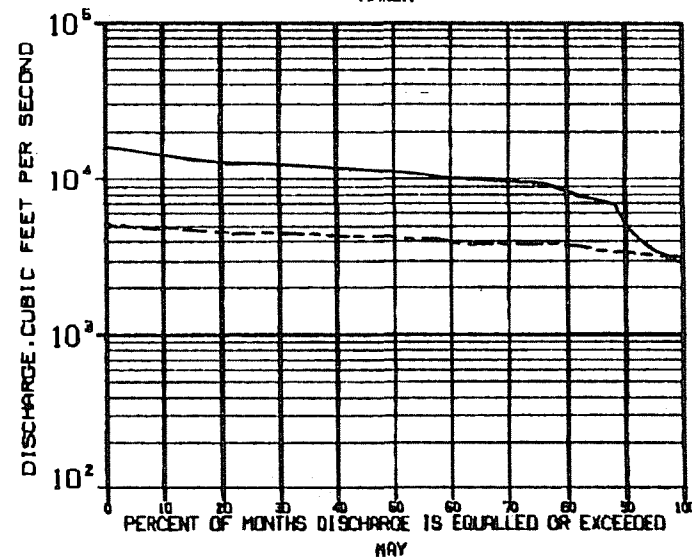
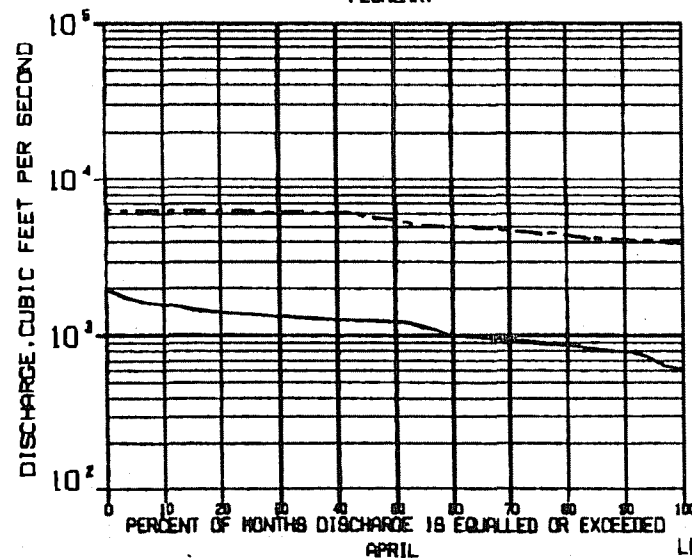
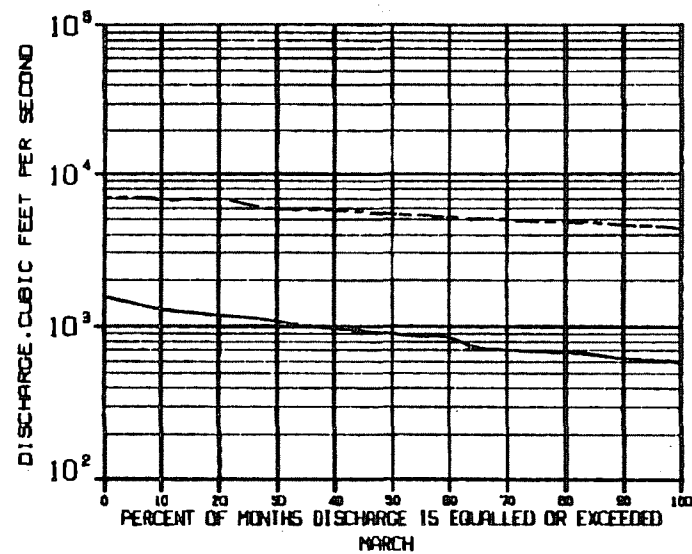
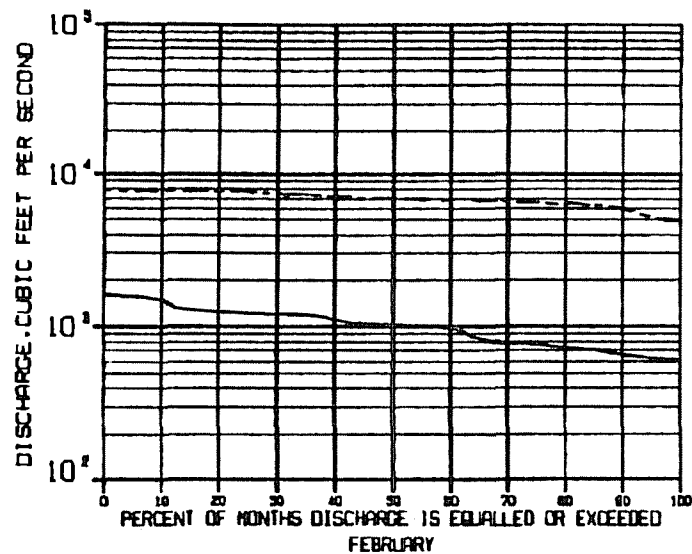


FIGURE E.2.4.151



LEGEND
 ——— NATURAL
 - - - WITH-PROJECT, STAGE II
 CASE E-VI

NOTE: FLOW PERIOD WATER YEAR 1961-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT WATANA DAMSITE

FIGURE E.2.4.151

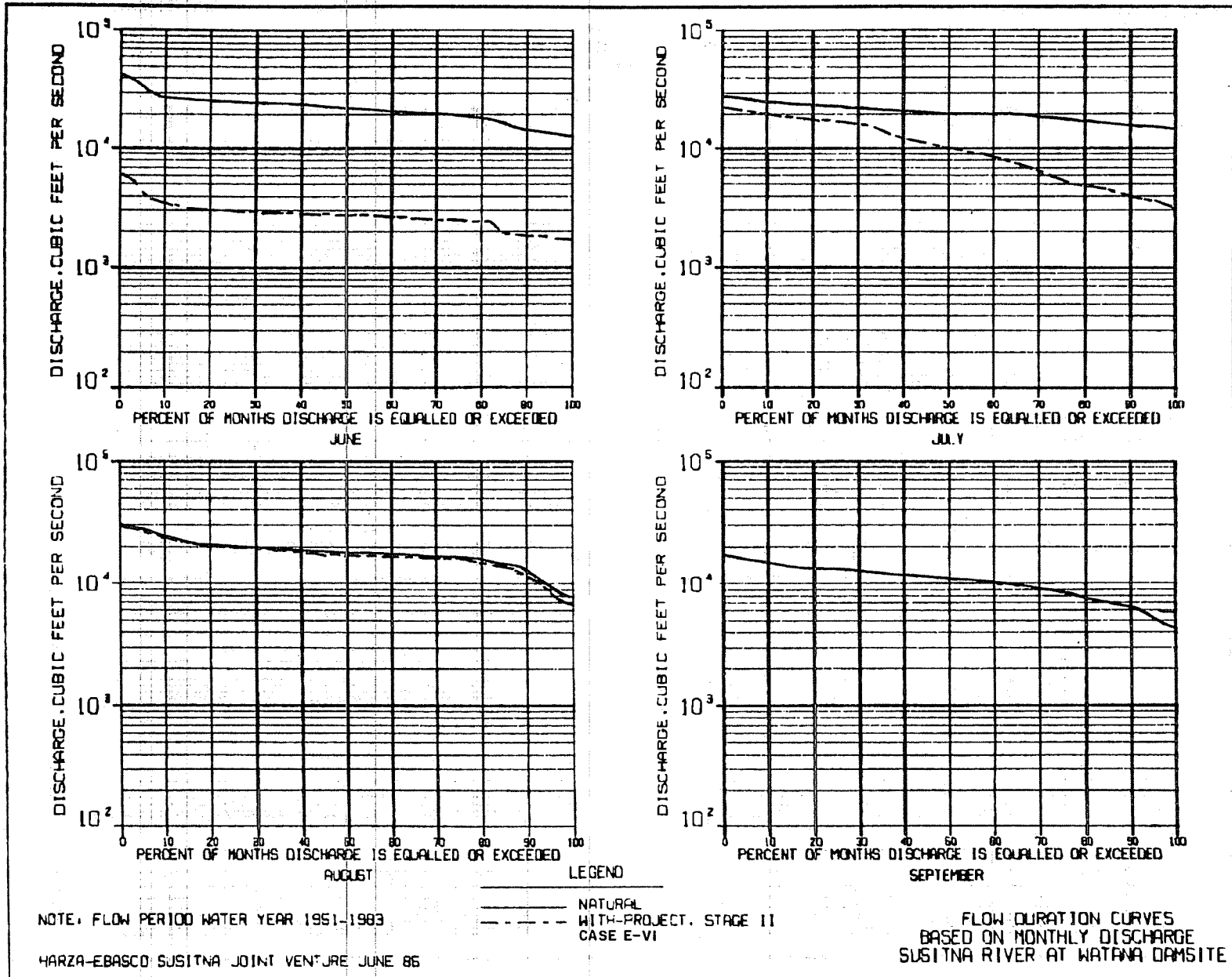
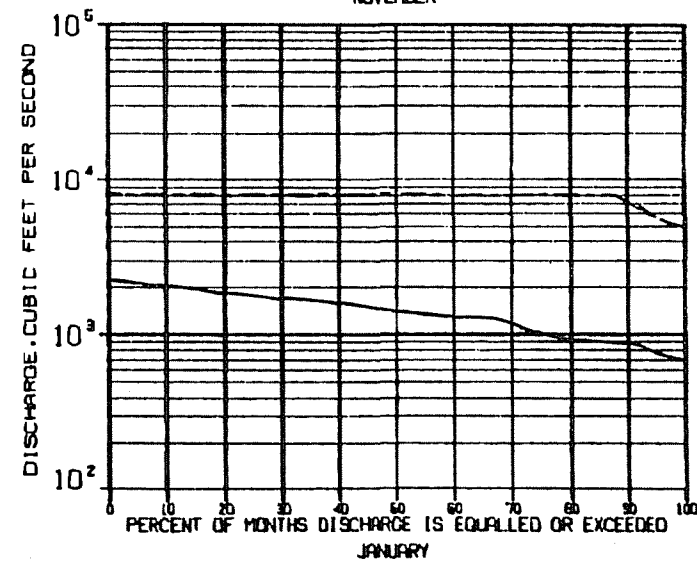
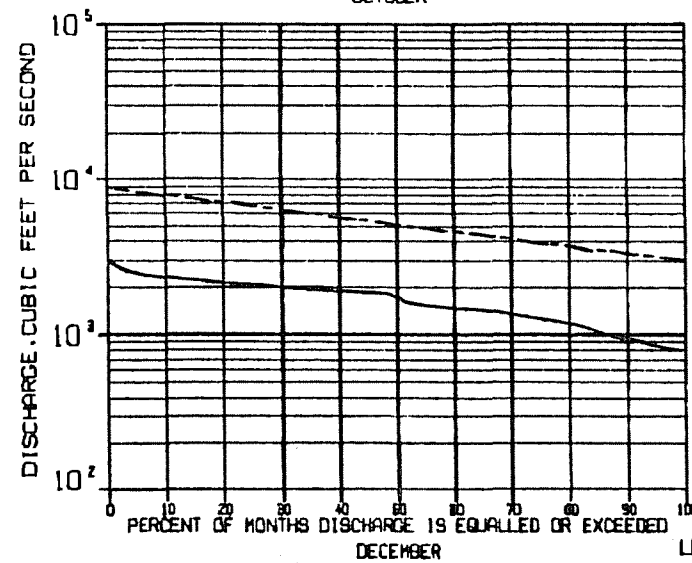
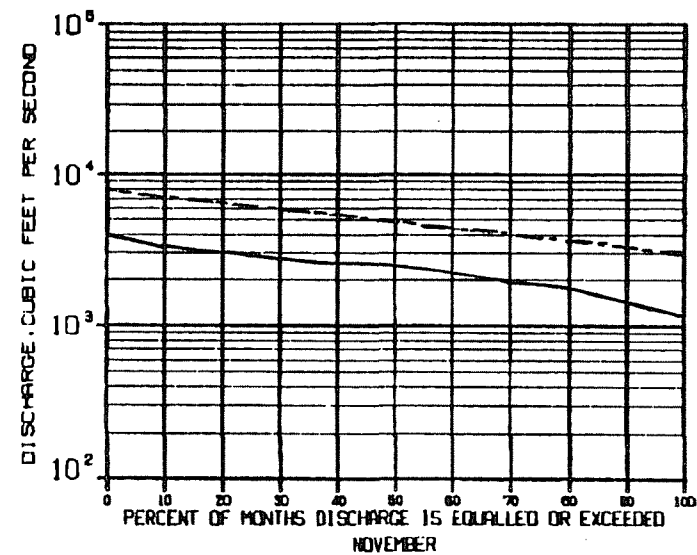
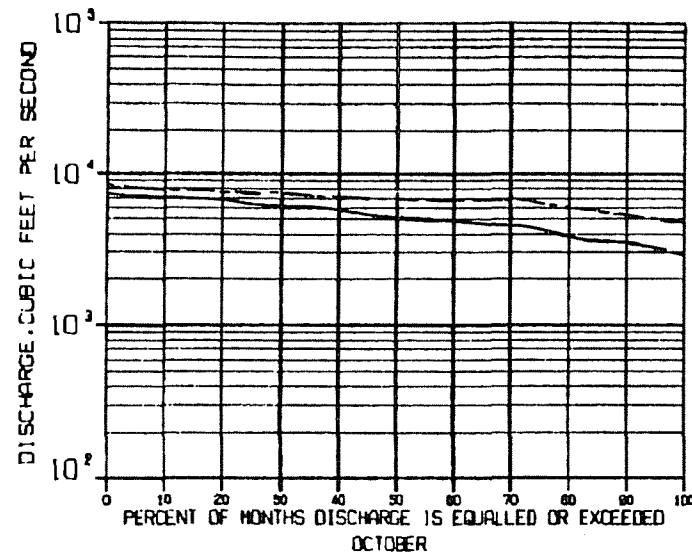


FIGURE E.2.4.151



NOTE: FLOW PERIOD WATER YEAR 1951-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

LEGEND
 ——— NATURAL
 - - - - - WITH-PROJECT, STAGE II
 CASE E-VI

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT DEVIL CANYON DAMSITE

FIGURE E.2.4.152

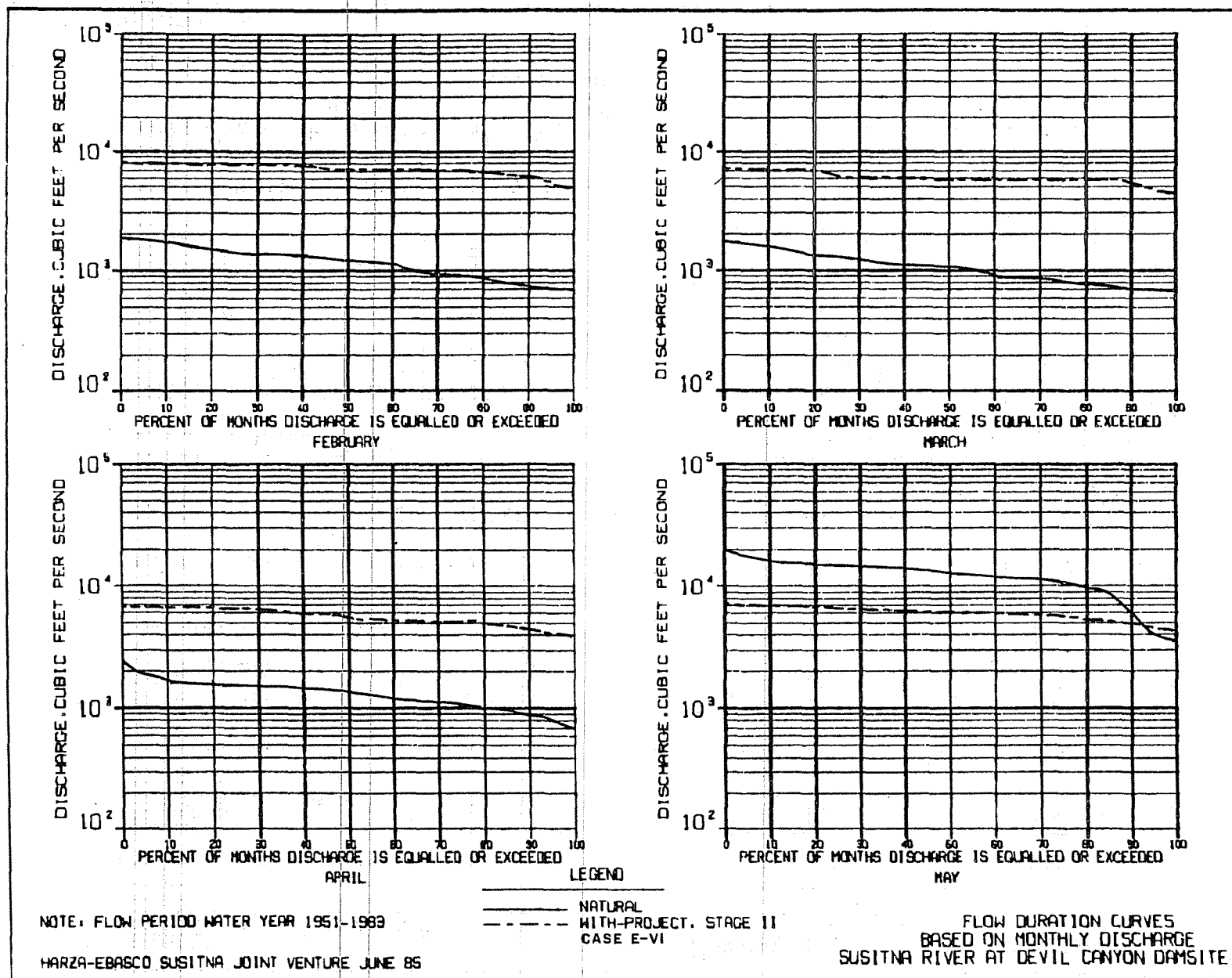


FIGURE E.2.4.152

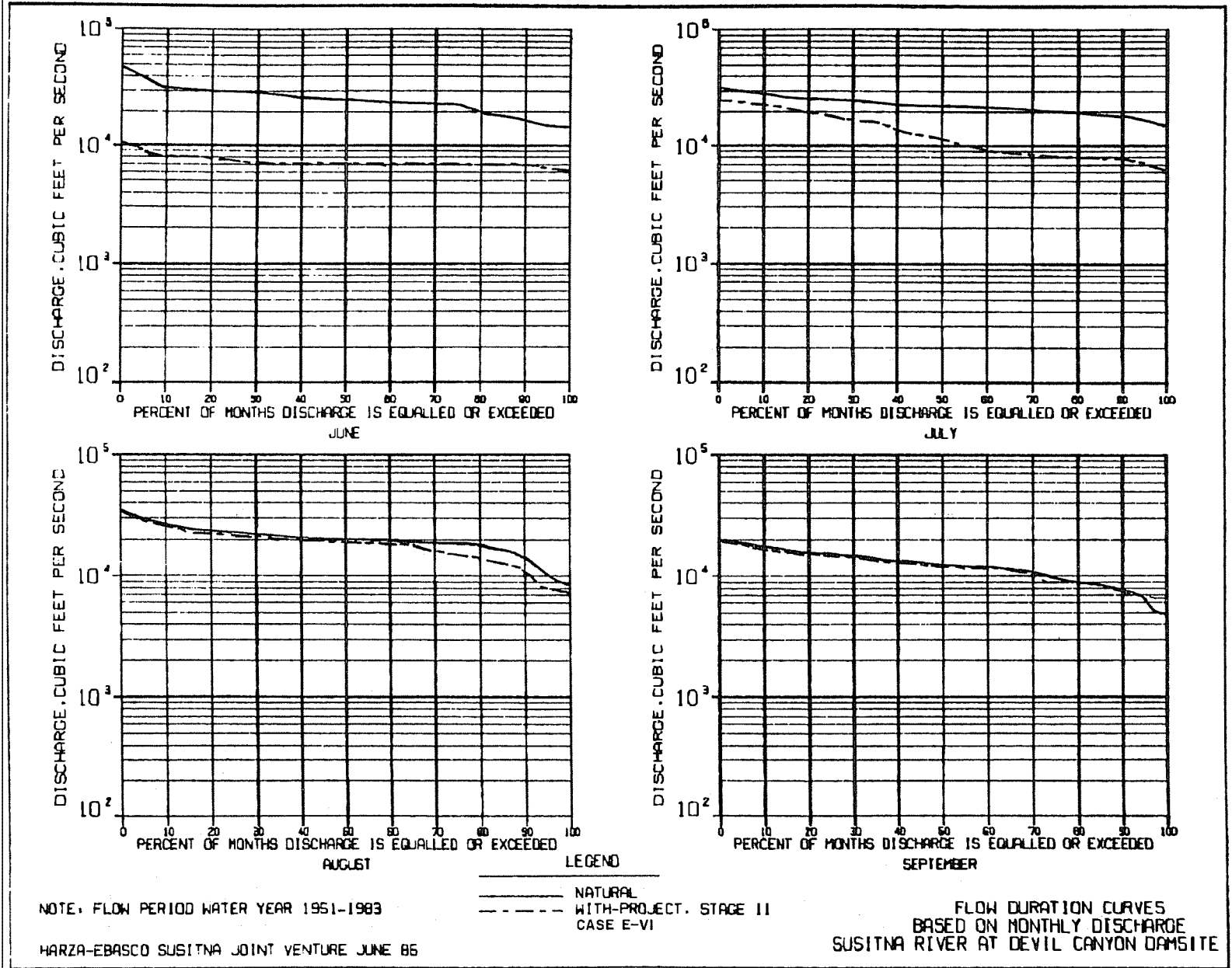


FIGURE E.2.4.152

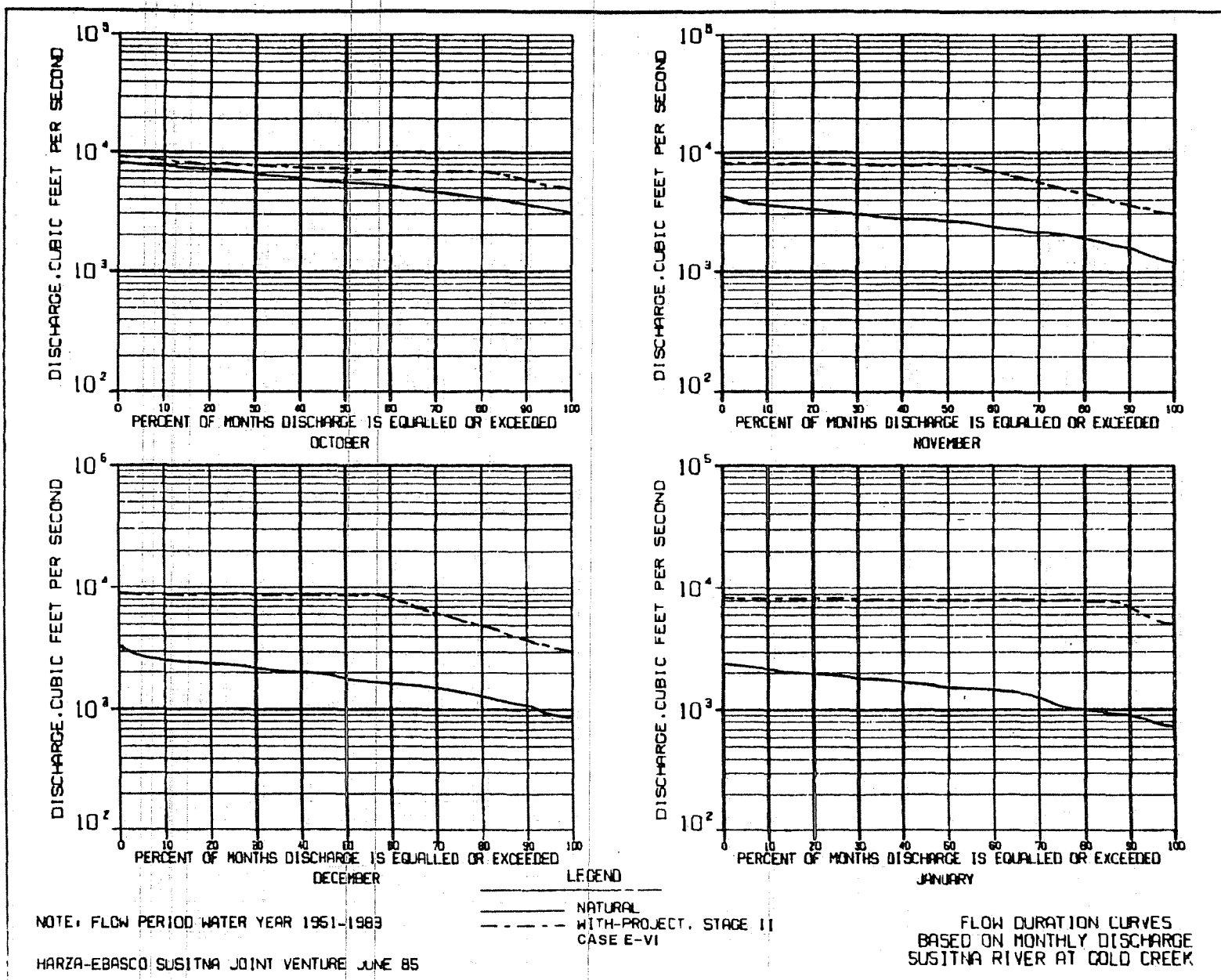


FIGURE E.2.4.153

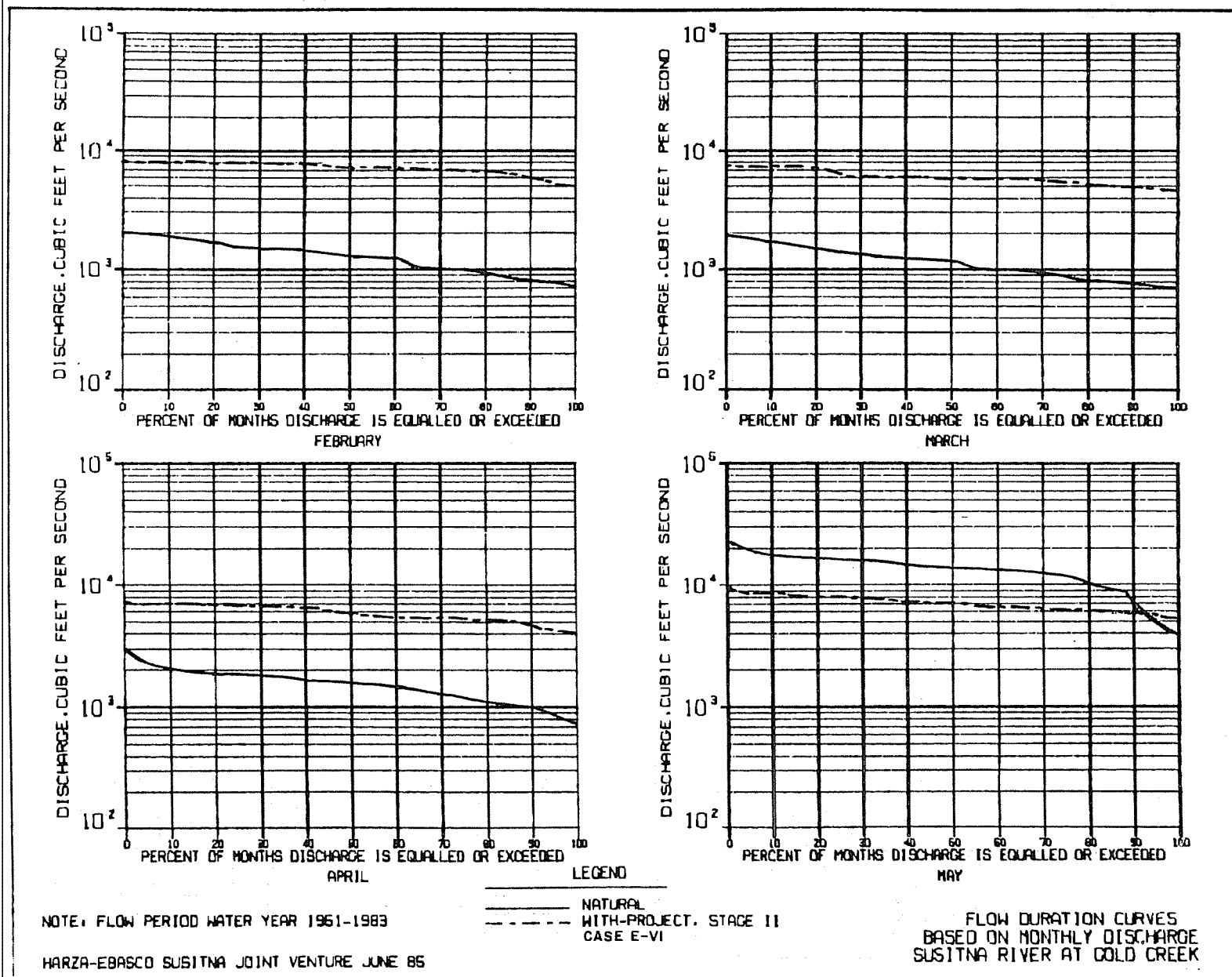


FIGURE 2.4.153

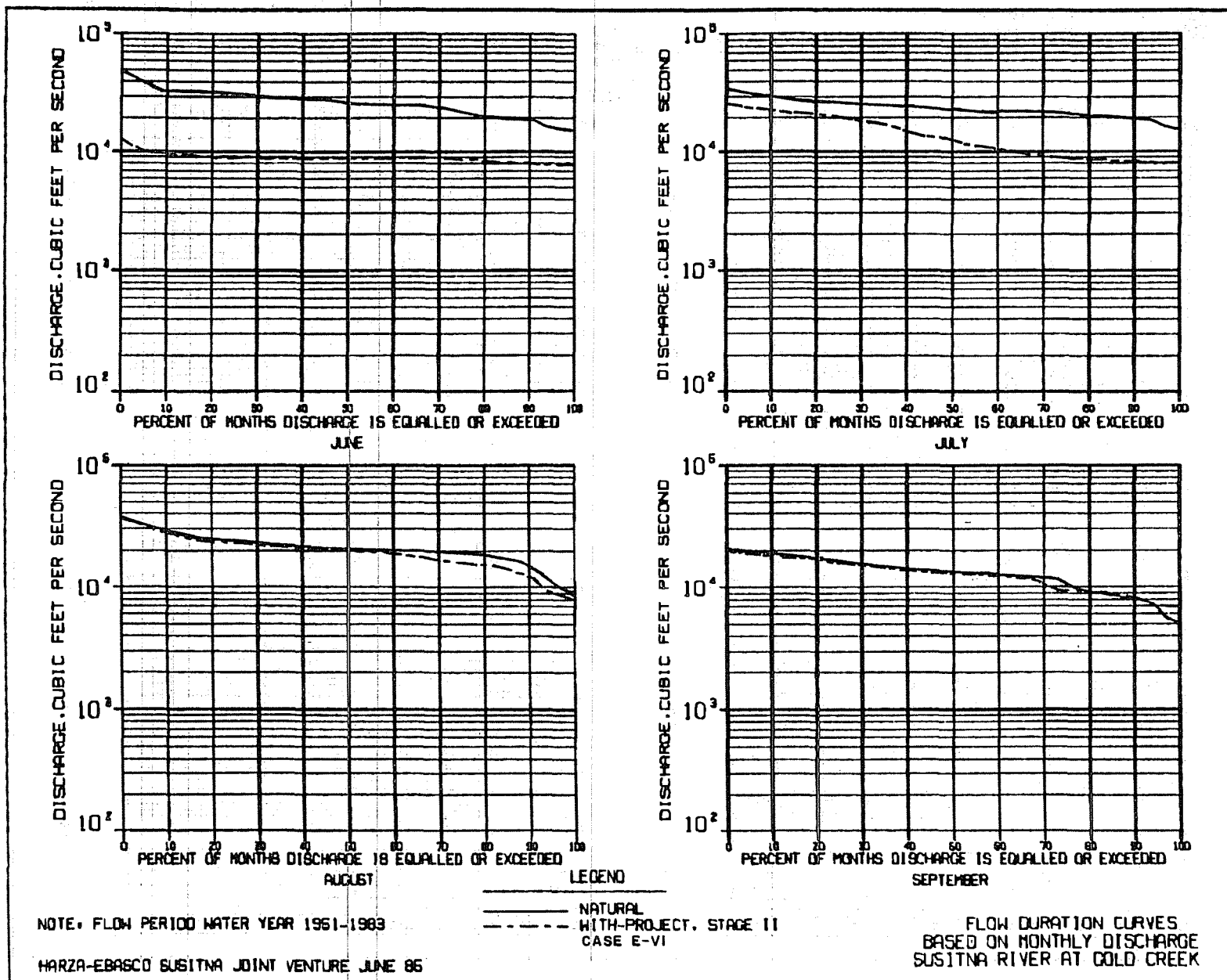


FIGURE E.2.4.153

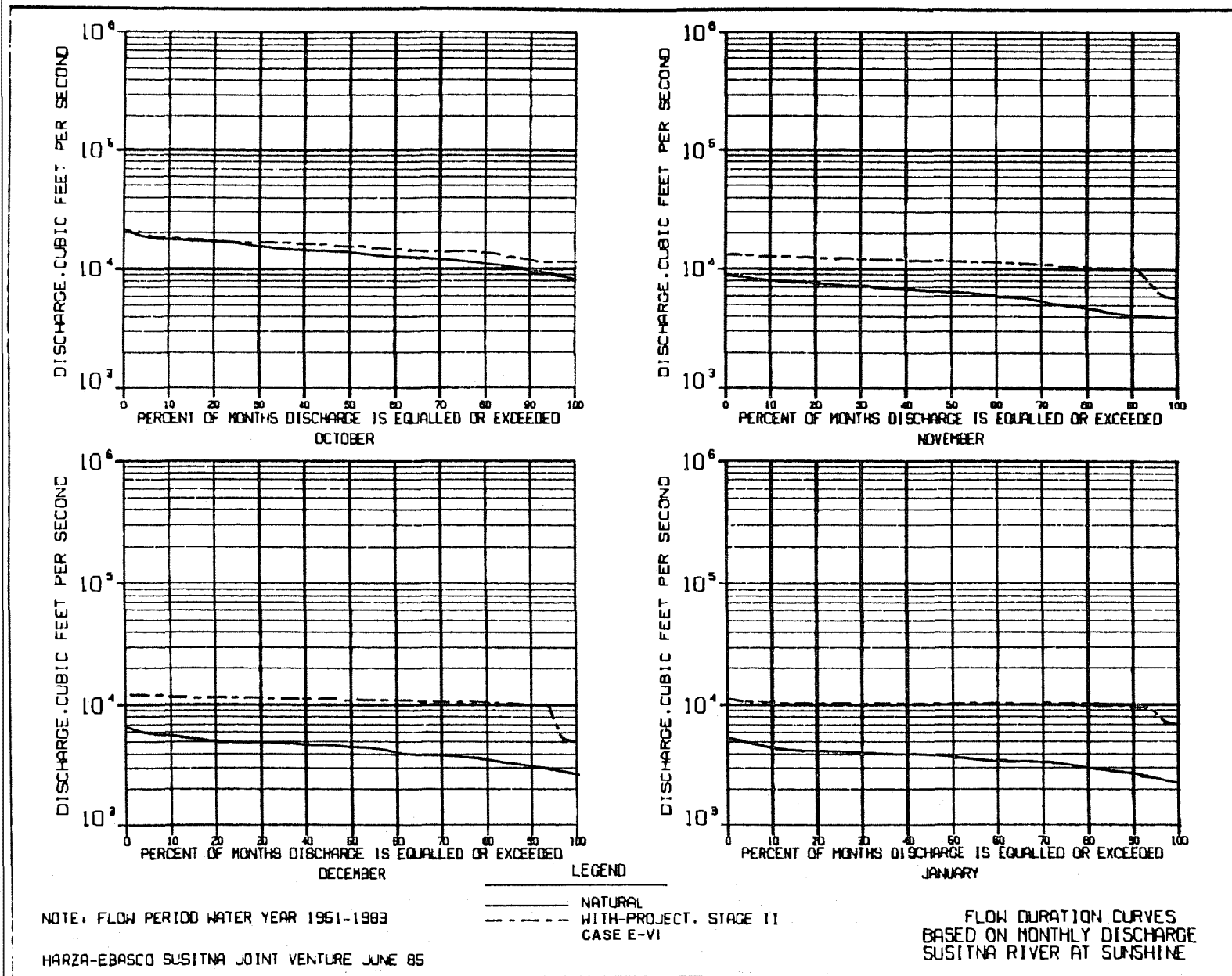


FIGURE 2.4.154

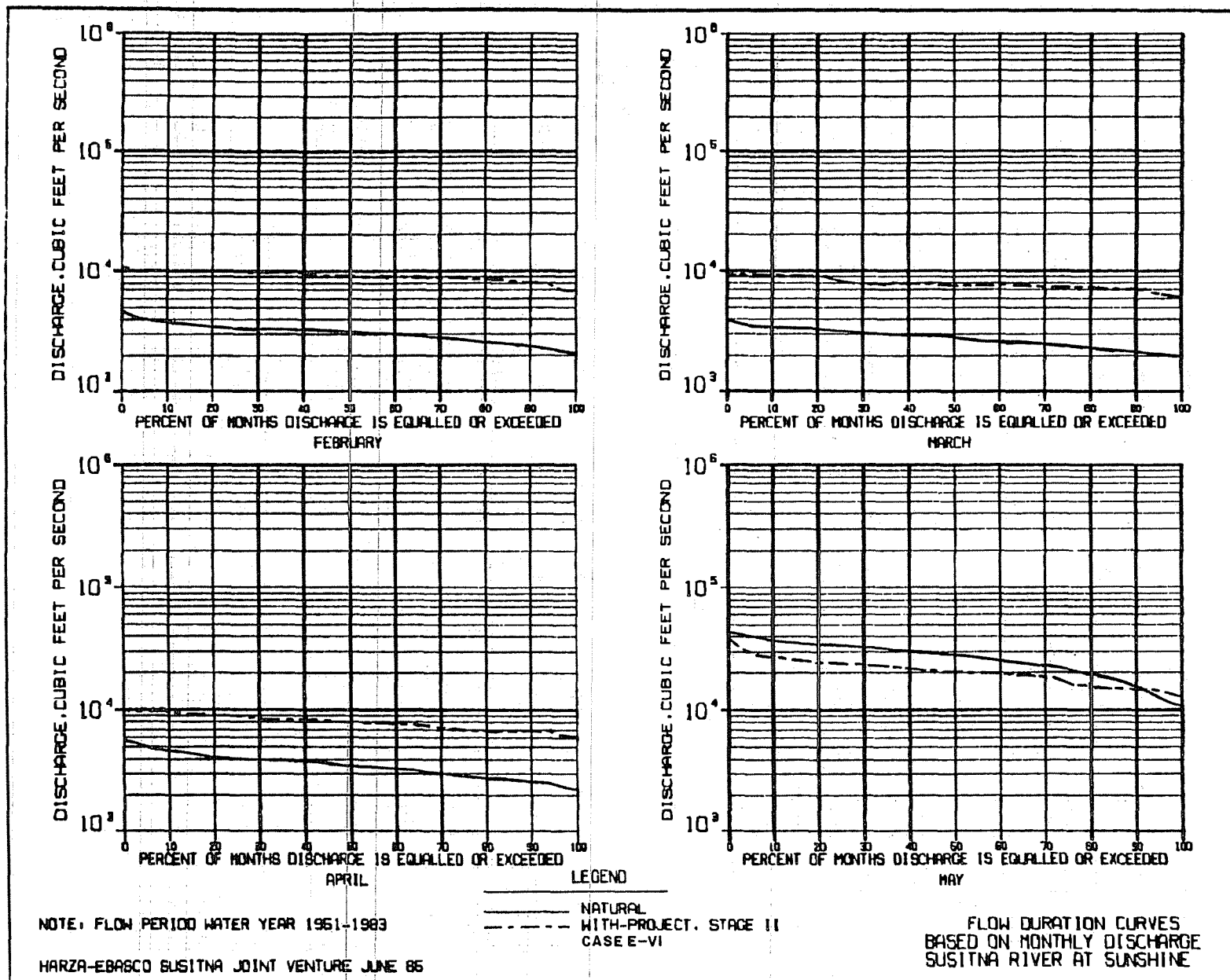


FIGURE E.2.4.154

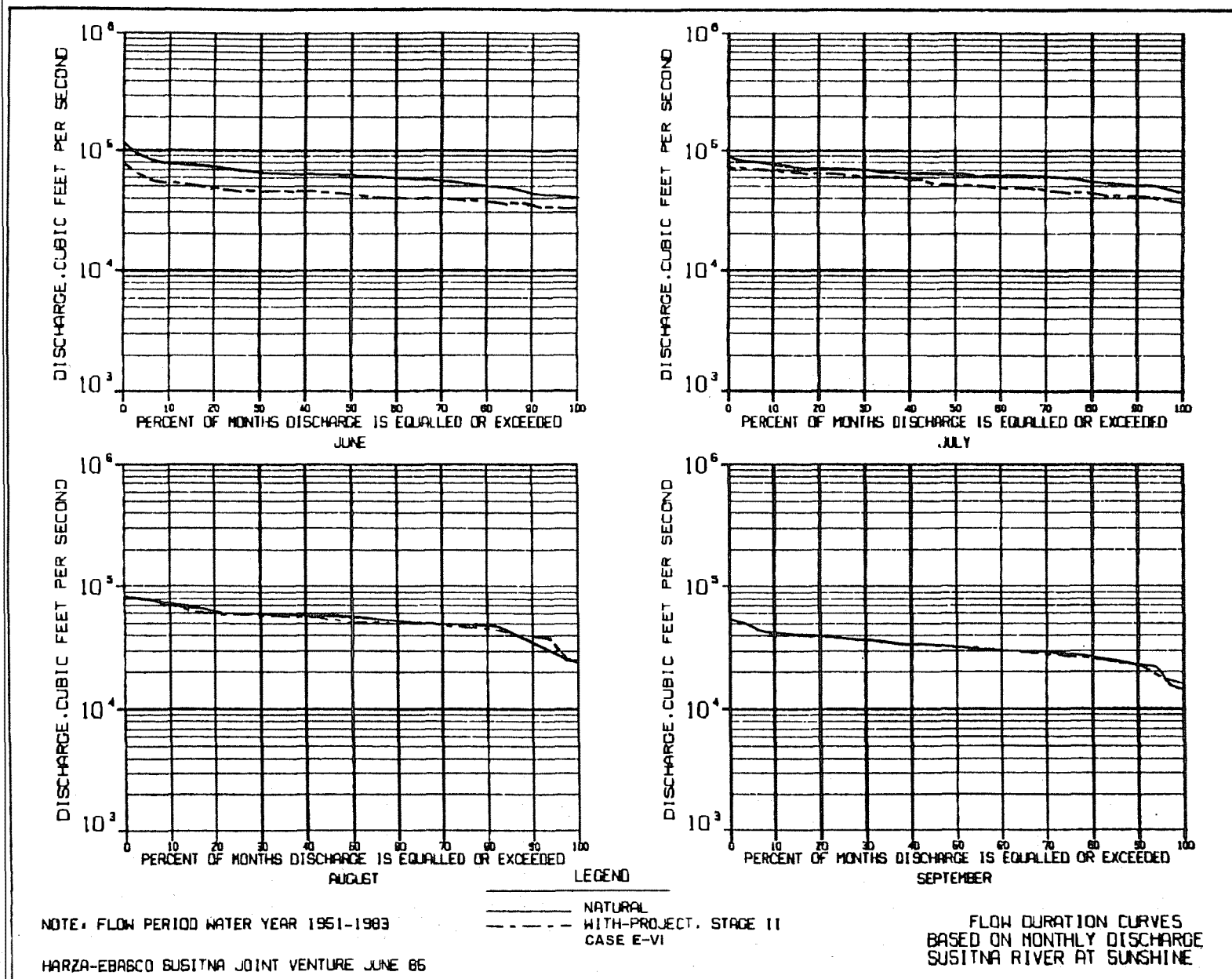


FIGURE E.2.4.154

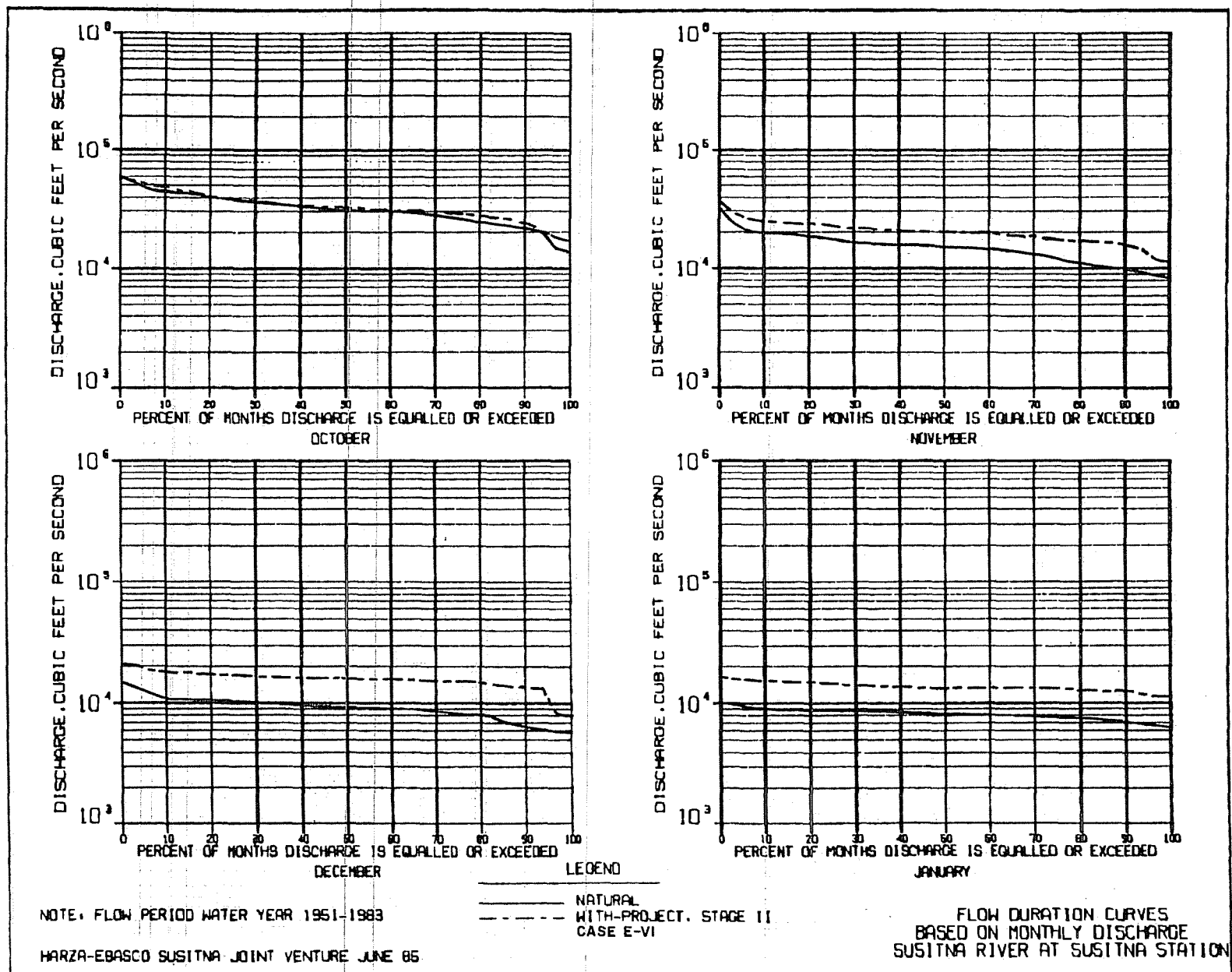
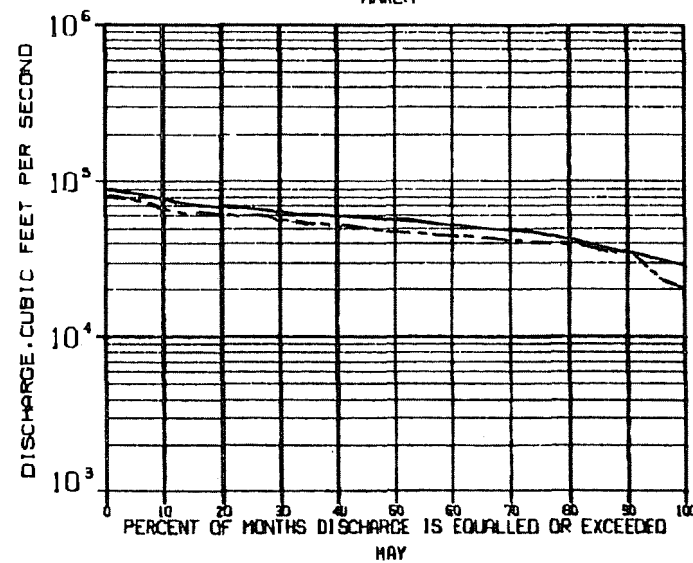
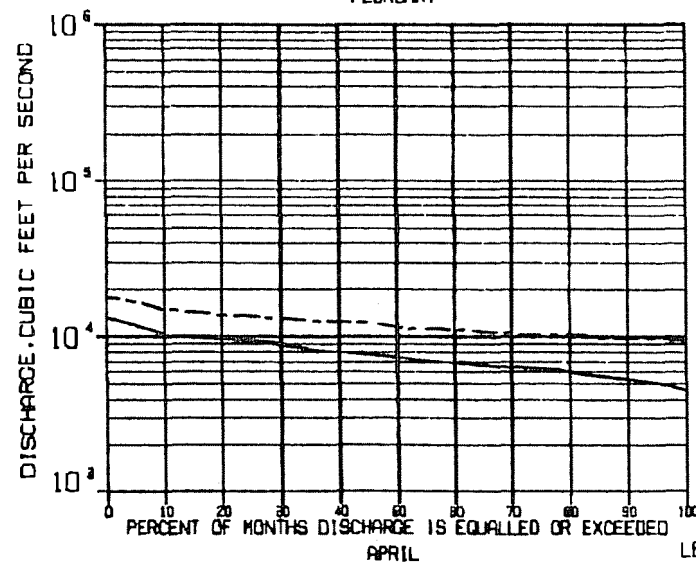
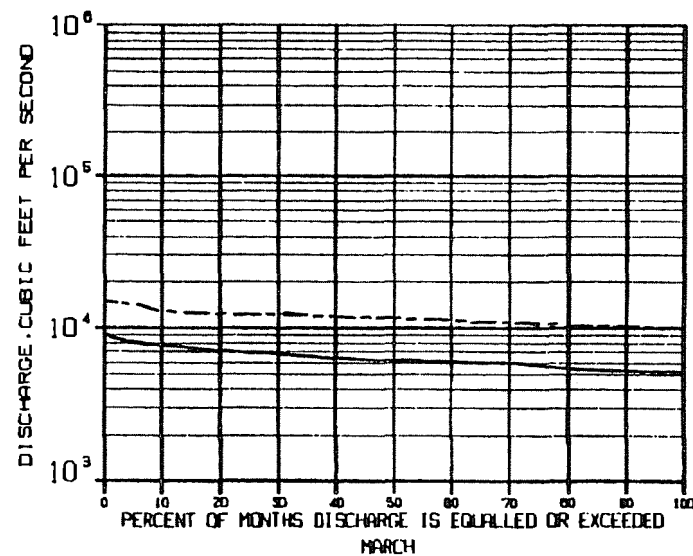
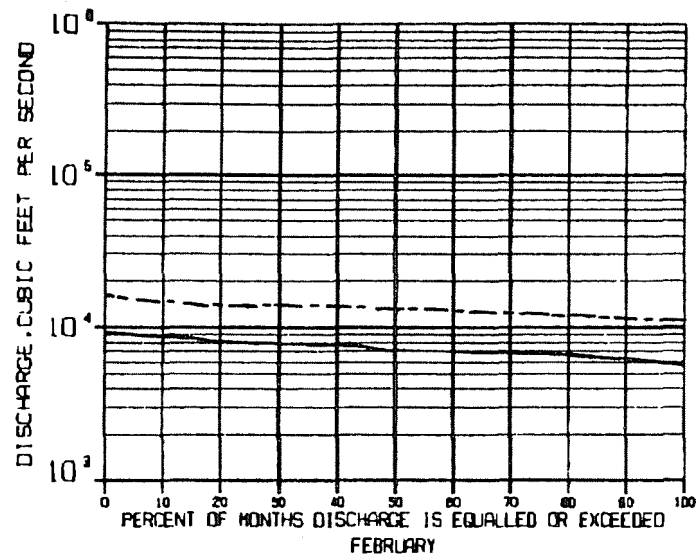


FIGURE E.2.4.155



LEGEND

—— NATURAL

----- WITH-PROJECT, STAGE II CASE E-VI

NOTE: FLOW PERIOD WATER YEAR 1951-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

FLOW DURATION CURVES
BASED ON MONTHLY DISCHARGE
SUSITNA RIVER AT SUSITNA STATION

FIGURE E.2.4.155

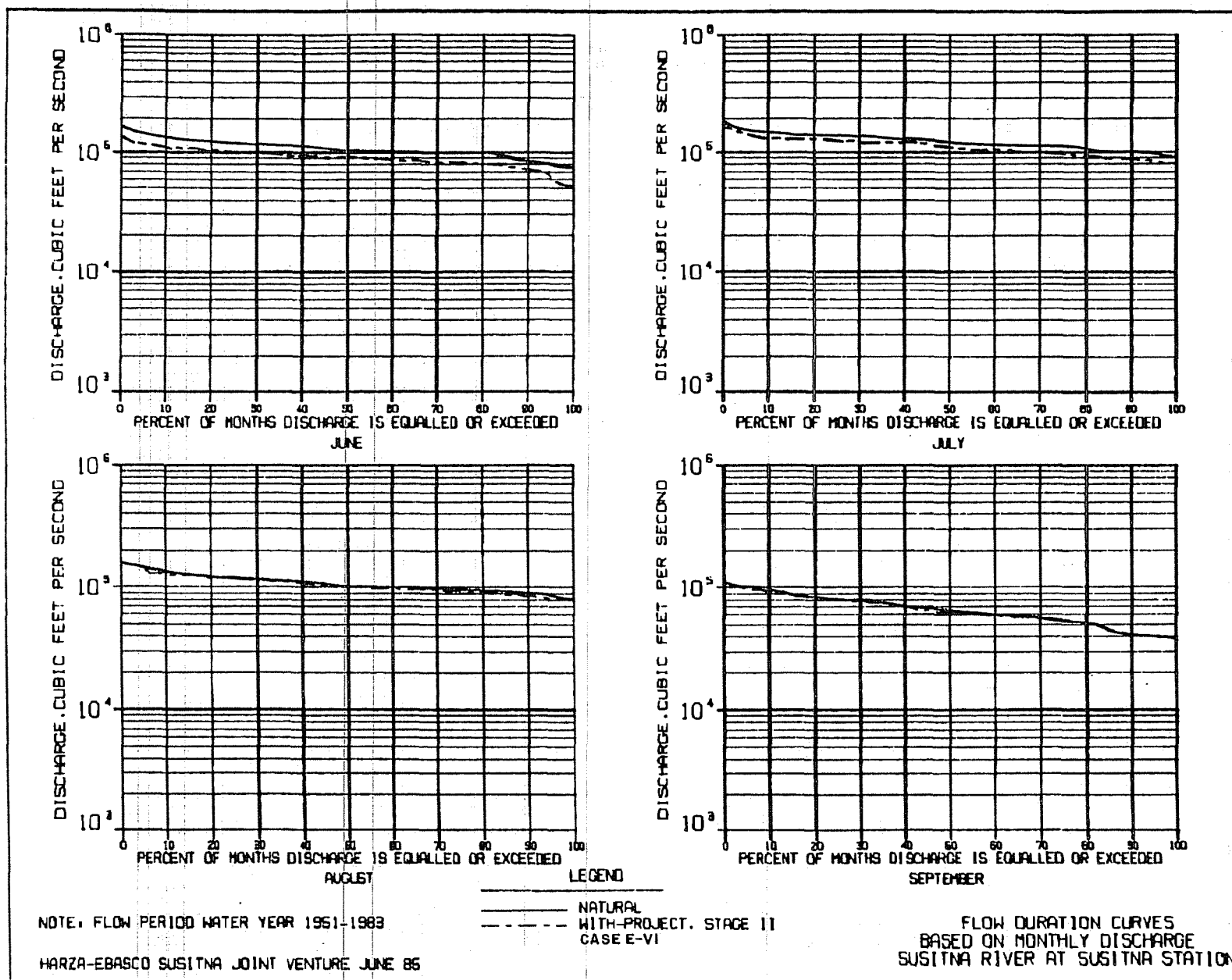


FIGURE E.2.4.155

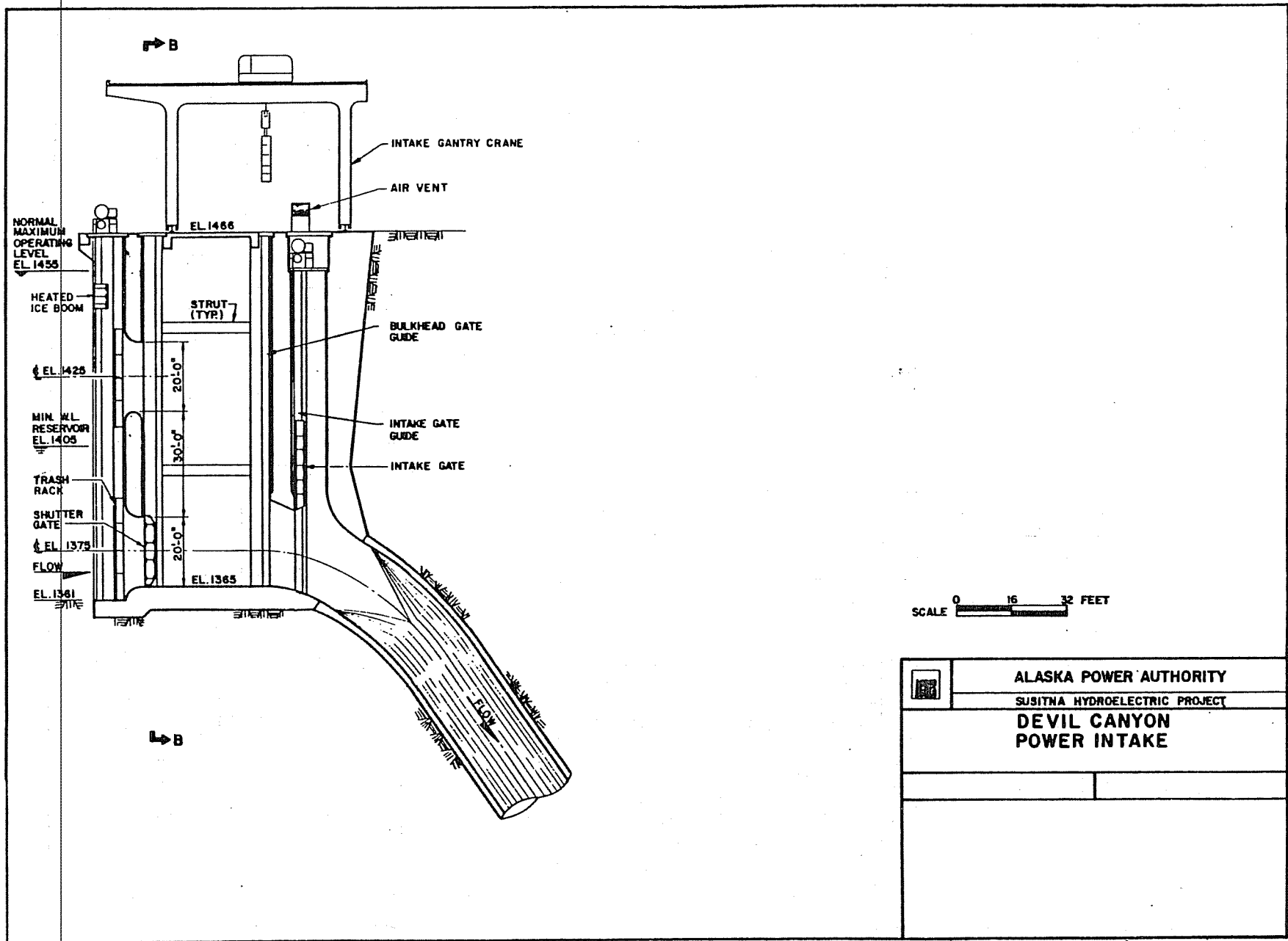


FIGURE E.2.4.156

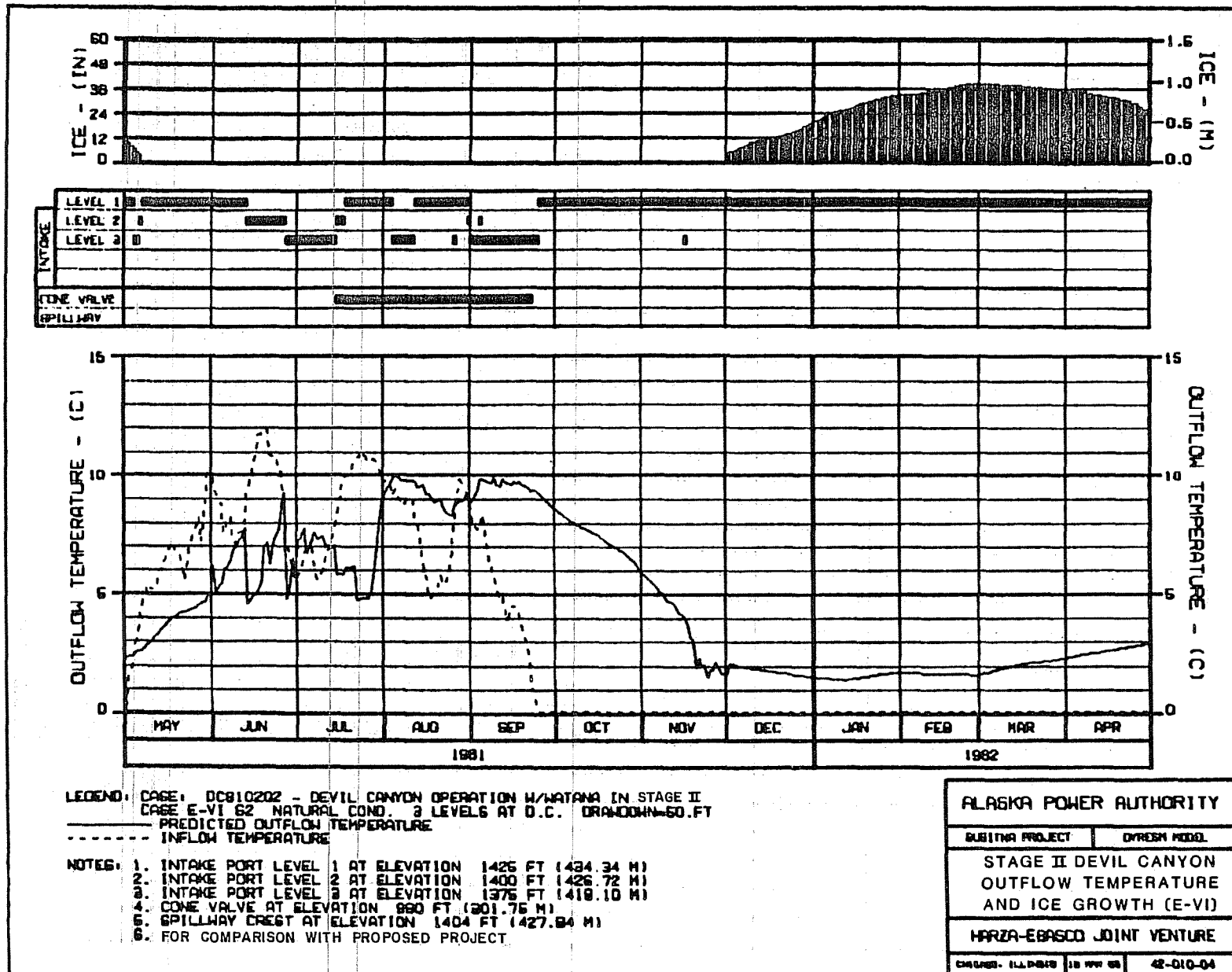


FIGURE E.2.4.159

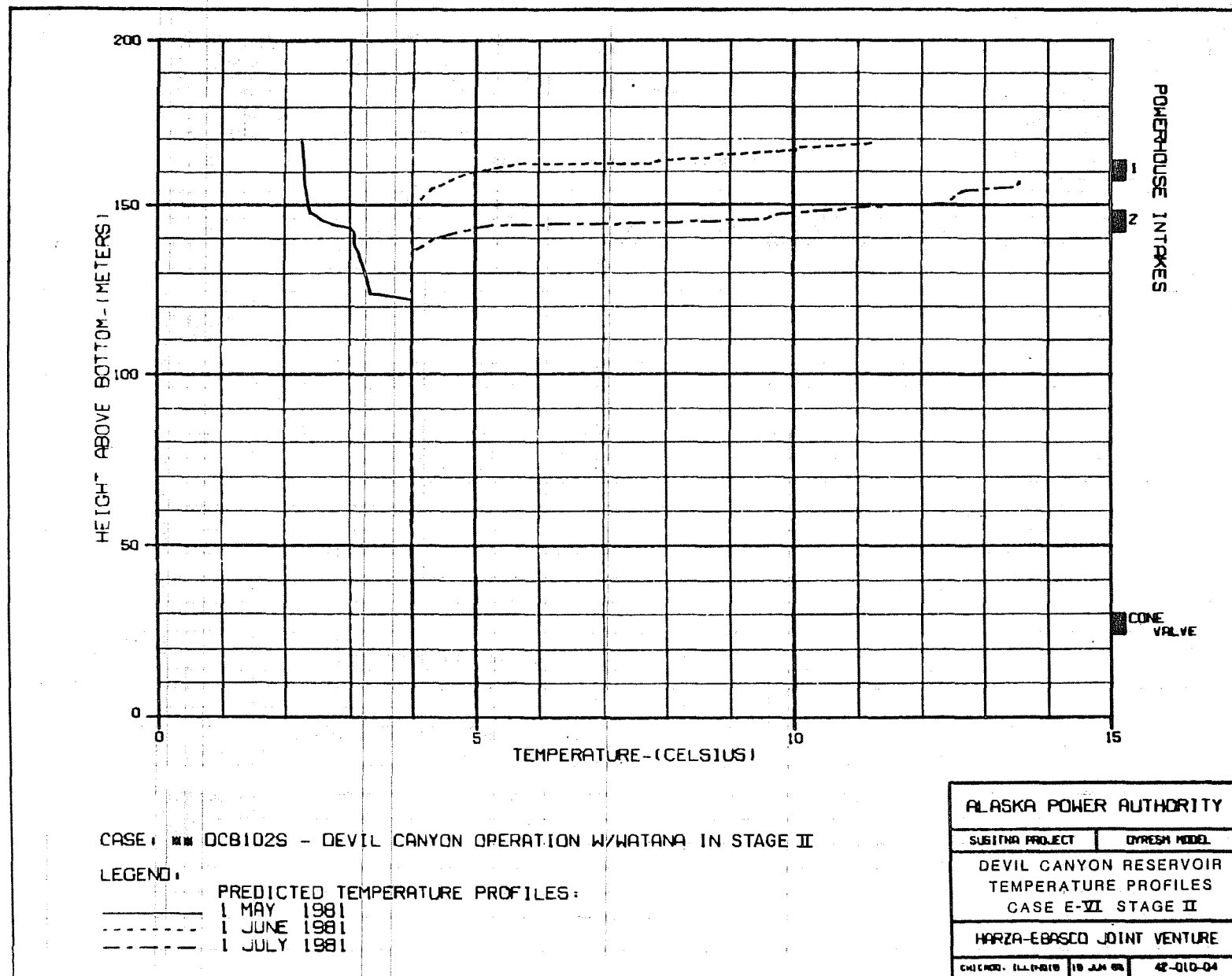
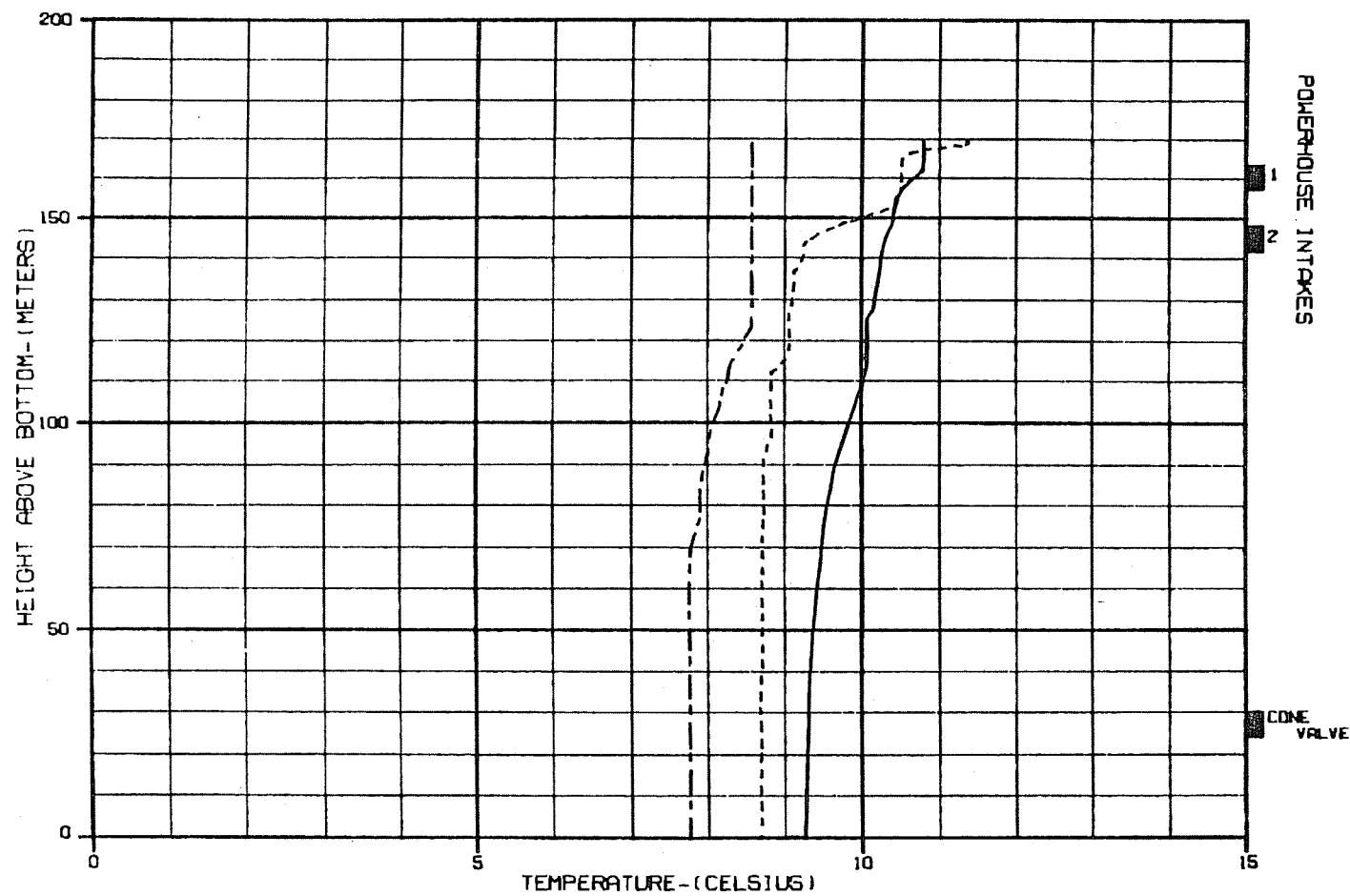


FIGURE E.2.4.165



CASE: ■■ DCB102S - DEVIL CANYON OPERATION W/WATANA IN STAGE II

LEGEND:

PREDICTED TEMPERATURE PROFILES:

- 1 AUGUST 1981
- 1 SEPTEMBER 1981
- · - · - 1 OCTOBER 1981

ALASKA POWER AUTHORITY		
SUSTINA PROJECT		DYRESM MODEL
DEVIL CANYON RESERVOIR TEMPERATURE PROFILES CASE E-VII STAGE II		
WARZA-EBASCO JOINT VENTURE		
CHICAGO, ILL. 60618	10 JAN 82	42-010-04

FIGURE E.2.4.166

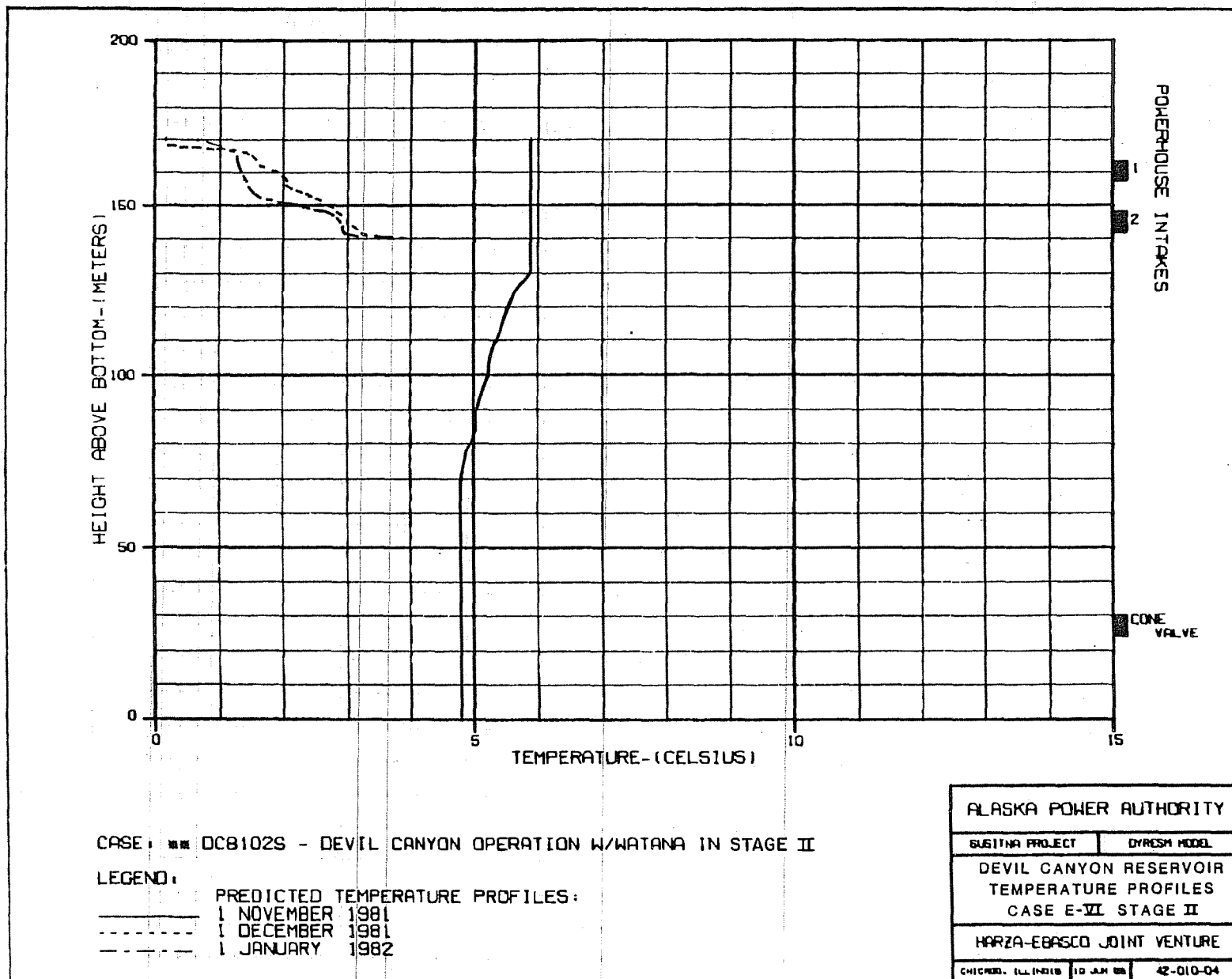
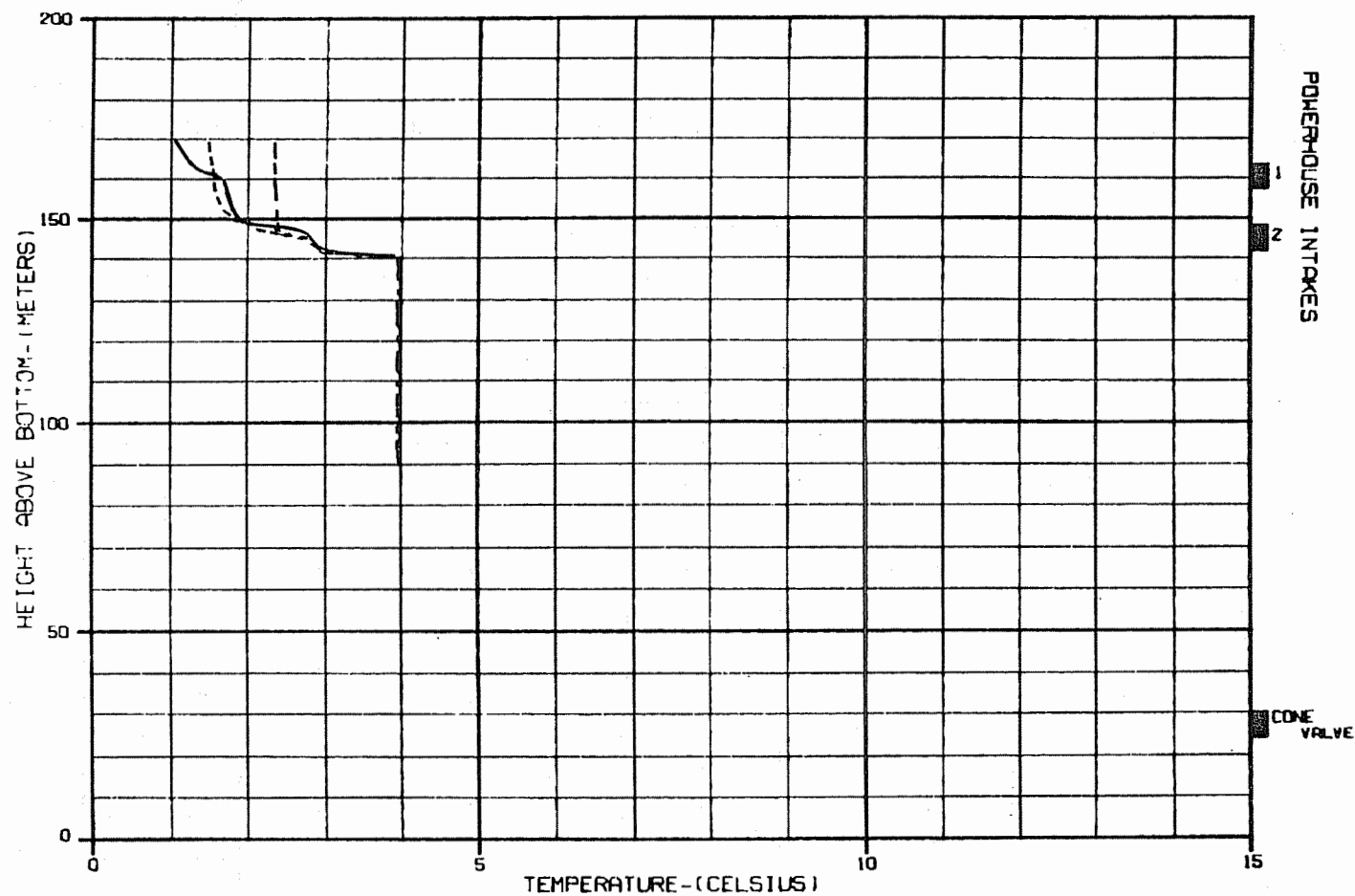


FIGURE E.2.4.167



CASE: WDCB102S - DEVIL CANYON OPERATION W/WATANA IN STAGE II

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 FEBRUARY 1982
 - - - 1 MARCH 1982
 . . . 1 APRIL 1982

ALASKA POWER AUTHORITY

SUSTINA PROJECT DYRESM MODEL

DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES
 CASE E-VI STAGE II

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILL. 60615 10 JAN 88 42-D10-04

FIGURE E.2.4.168

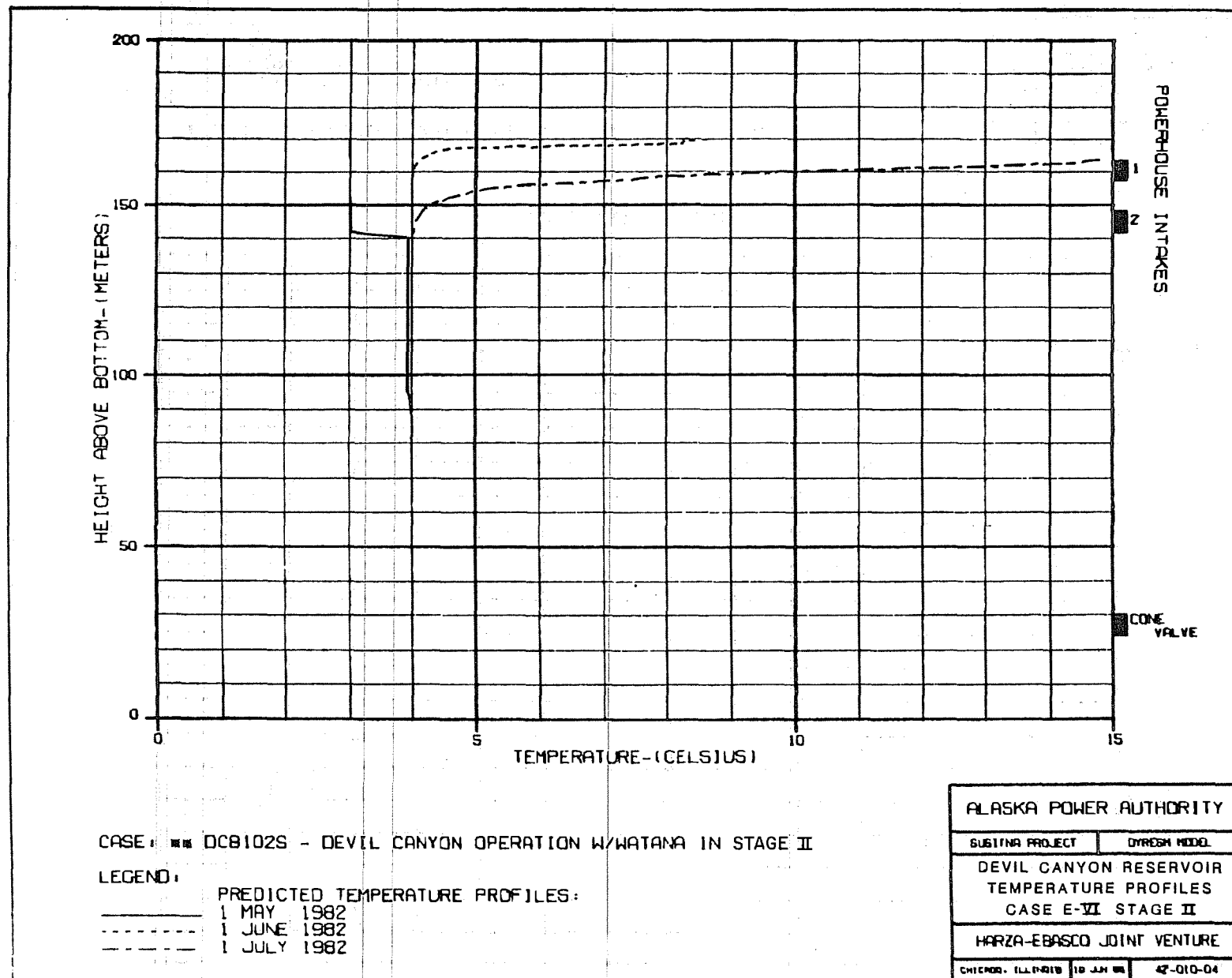
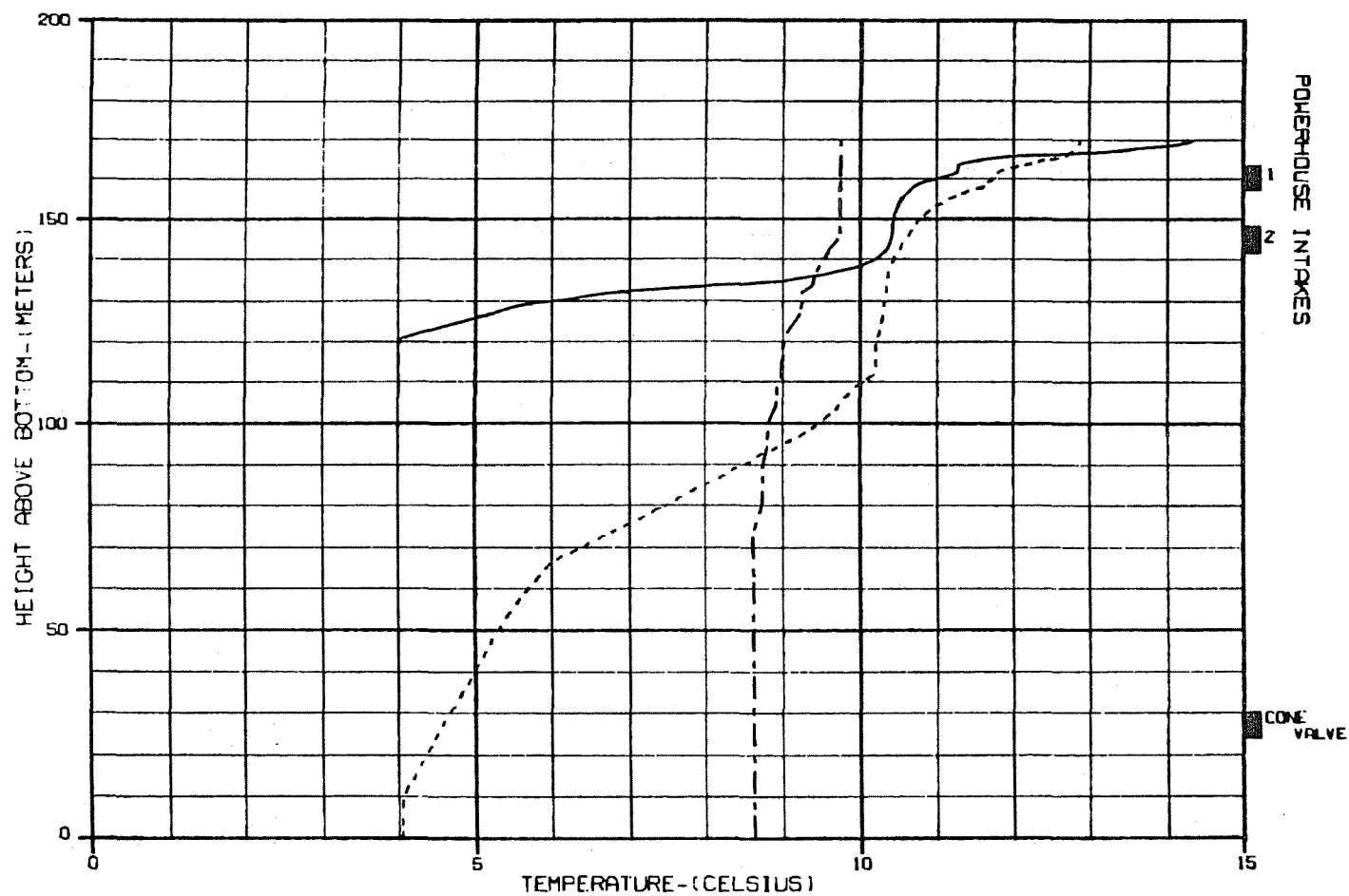


FIGURE E.2.4.169



CASE: DCB102S - DEVIL CANYON OPERATION W/WATANA IN STAGE II

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 AUGUST 1982
 - - - 1 SEPTEMBER 1982
 - . - 1 OCTOBER 1982

ALASKA POWER AUTHORITY

SUSITNA PROJECT

DYRESH MODEL

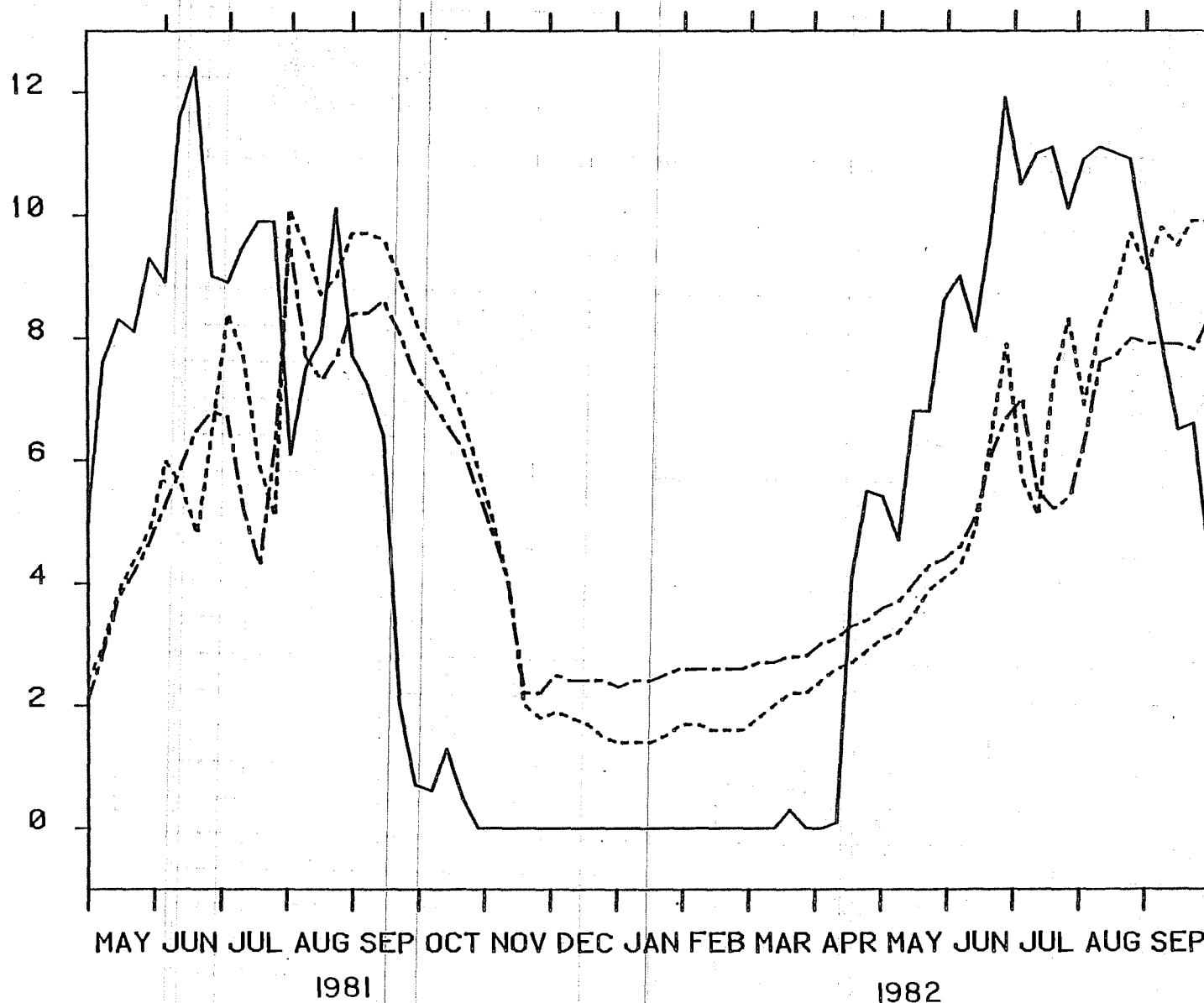
DEVIL CANYON RESERVOIR
 TEMPERATURE PROFILES
 CASE E-VI STAGE II

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS 10 JAN 83 42-010-04

FIGURE E.2.4.170

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. DEVIL CANYON DRAWDOWN OF 50 FEET-2 LEVELS OF SHUTTERS

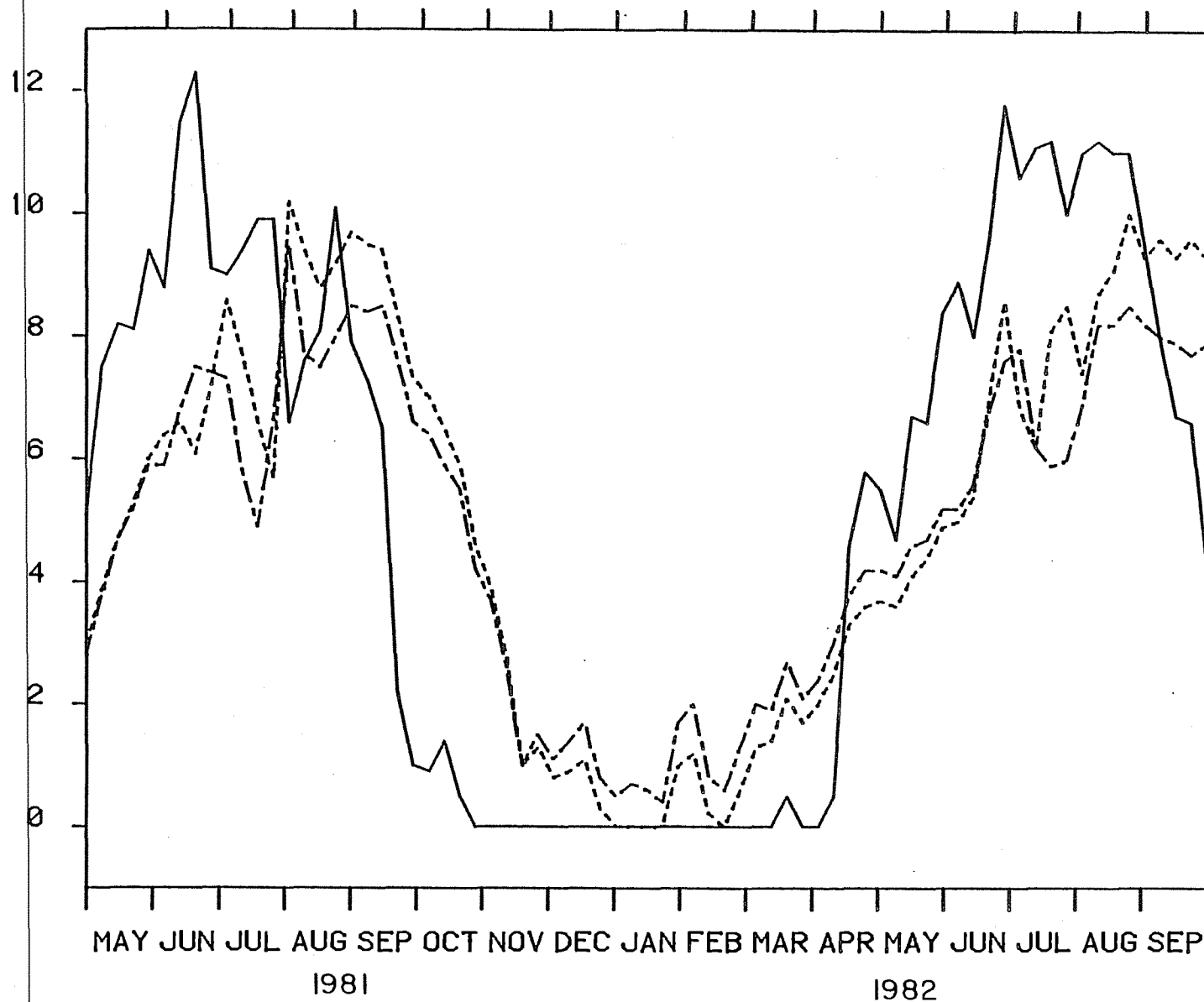
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURE: PHASE 2 OF TWO STAGE PROJECT (FOR COMPARISON)
- ... SIMULATED TEMPERATURE STAGE II OF PROPOSED PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 150 STAGE II	
DATE: MAY 1981	BY: J. E. HARRIS

FIGURE E.2.4.171

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD JANUARY - MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)
7. DEVIL CANYON DRAWDOWN OF 50 FEET-2 LEVELS OF SHUTTERS

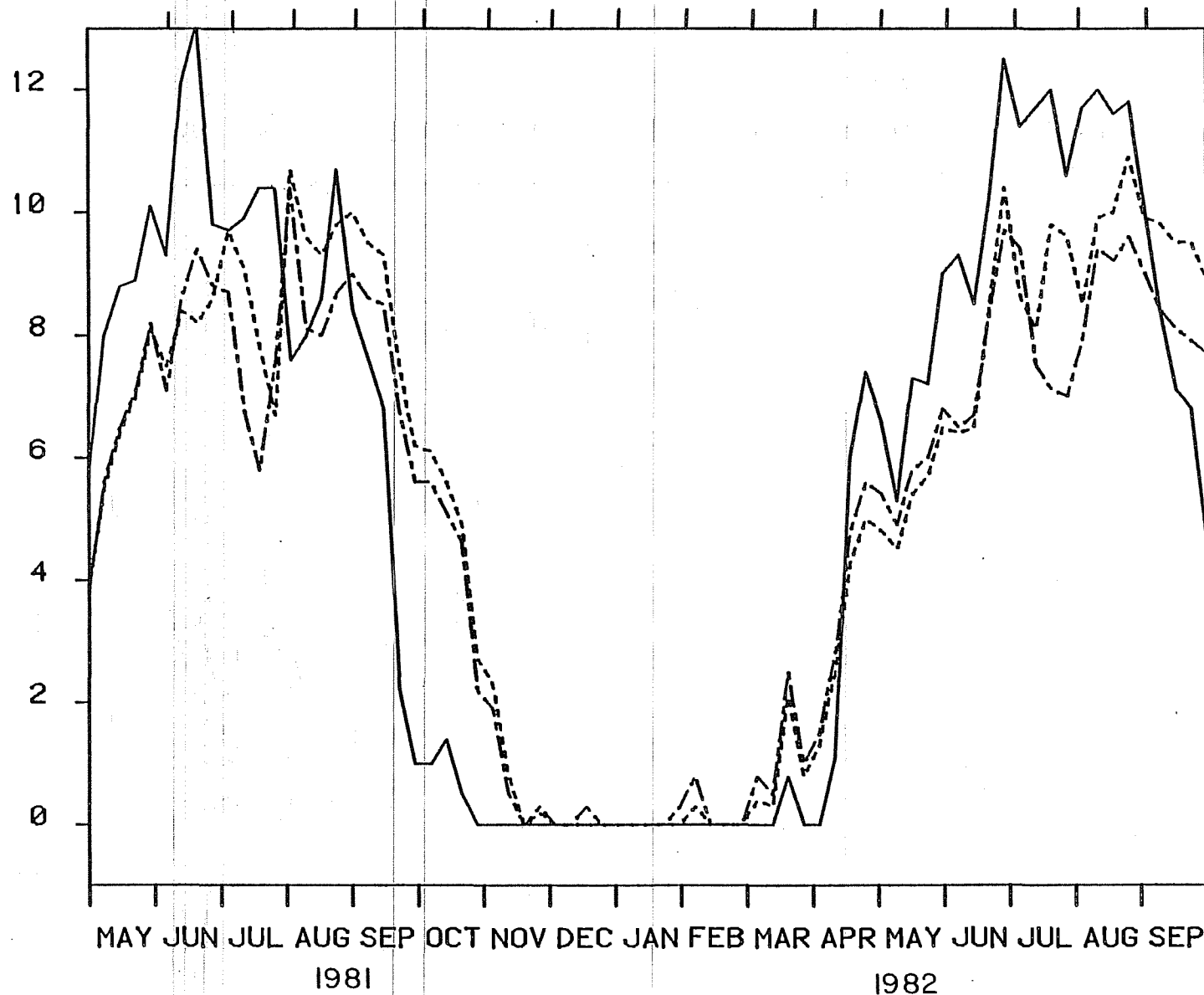
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES PHASE 2 OF TWO STAGE PROJECT (FOR COMPARISON)
- . - SIMULATED TEMPERATURES STAGE 2 OF PROPOSED PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 130	
STAGE II	
DATE: 08/01/82	BY: J. J. J.
REVISION: 1.0	DATE: 08/01/82

FIGURE E.2.4.172

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)
7. DEVIL CANYON DRAWDOWN OF 50 FEET-2 LEVELS OF SHUTTERS

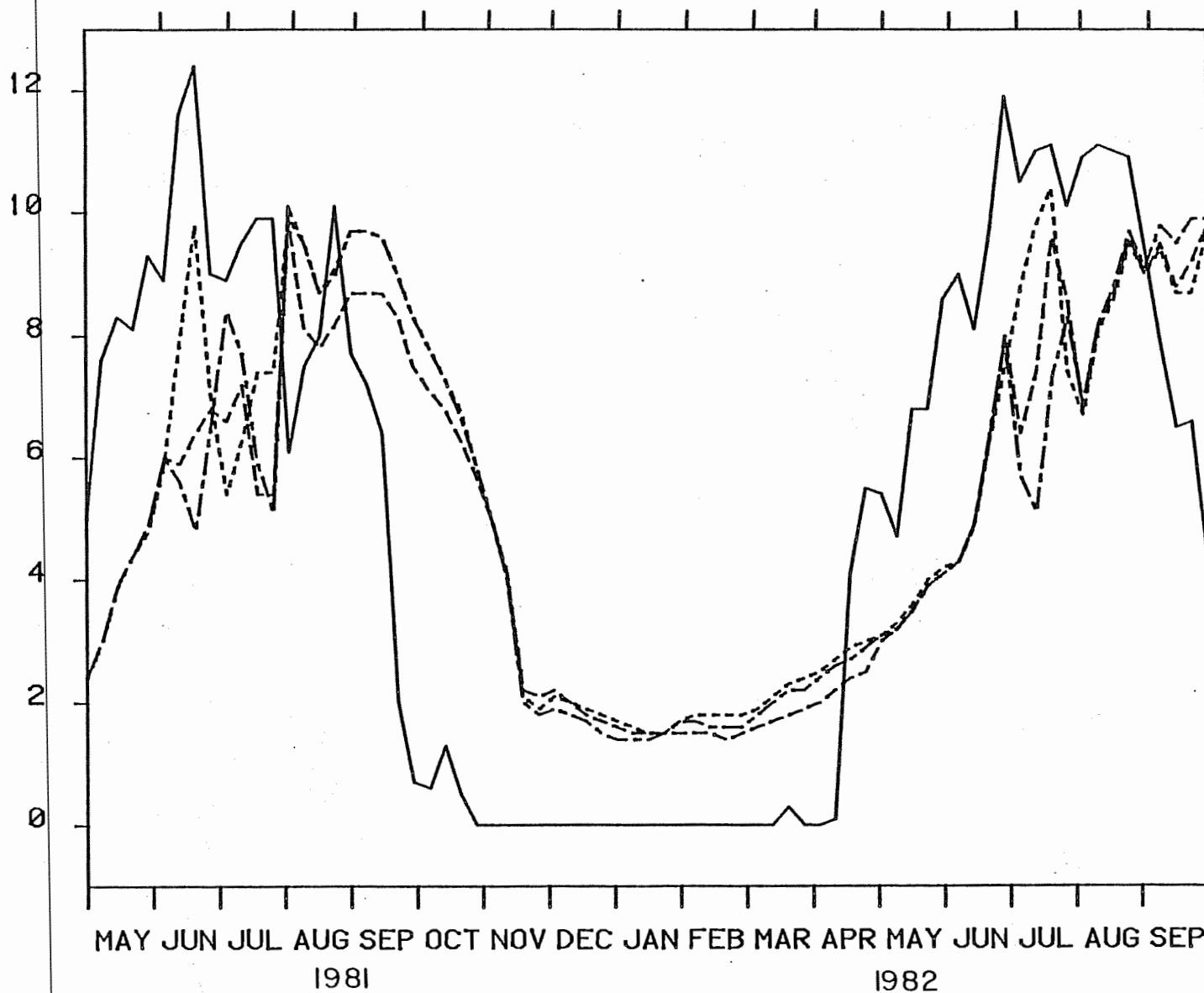
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES PHASE 2 OF TWO STAGE PROJECT (FOR COMPARISON)
- ... SIMULATED TEMPERATURES STAGE 2 OF PROPOSED PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 100	
STAGE II	
DATE: _____	BY: _____
APPROVED: _____	DATE: _____

FIGURE E.2.4.173

DEGREES
C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3-STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS

LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - DEVIL CANYON DRAWDOWN OF 50 FEET, 2 LEVELS OF SHUTTERS -PROPOSED PROJECT
- - - DEVIL CANYON DRAWDOWN OF 9 FEET, 2 LEVELS OF SHUTTERS
- - - DEVIL CANYON DRAWDOWN OF 50 FEET, 3 LEVELS OF SHUTTERS

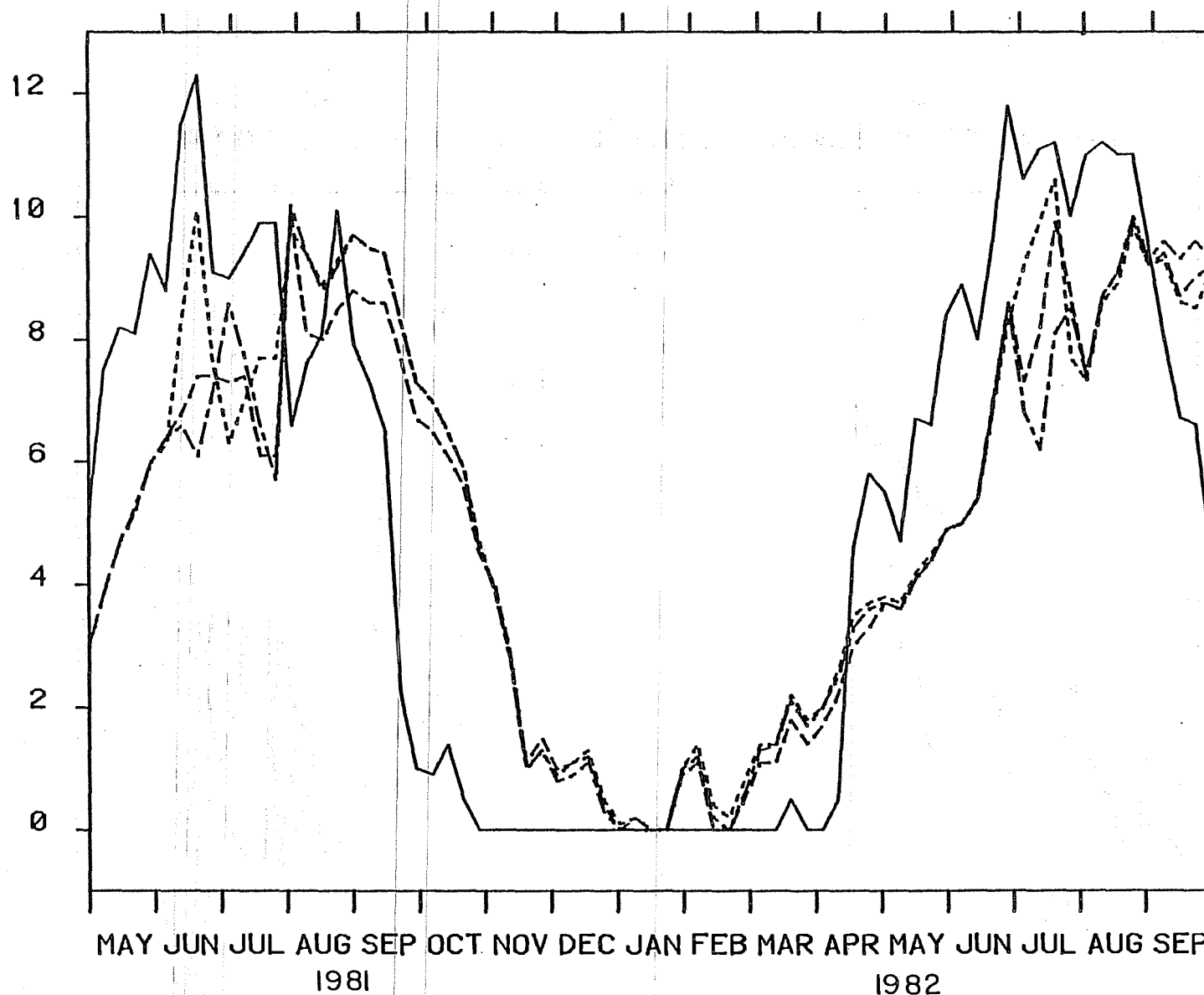
FOR COMPARISON WITH

- - - DEVIL CANYON DRAWDOWN OF 50 FEET, 2 LEVELS OF SHUTTERS
- - - DEVIL CANYON DRAWDOWN OF 9 FEET, 2 LEVELS OF SHUTTERS
- - - DEVIL CANYON DRAWDOWN OF 50 FEET, 3 LEVELS OF SHUTTERS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 160 STAGE II	
DATE: 08/01/82	BY: J. W. HARRIS
REVISION: 01	DATE: 08/01/82

FIGURE E.2.4.174

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3-STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD DECEMBER-MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)

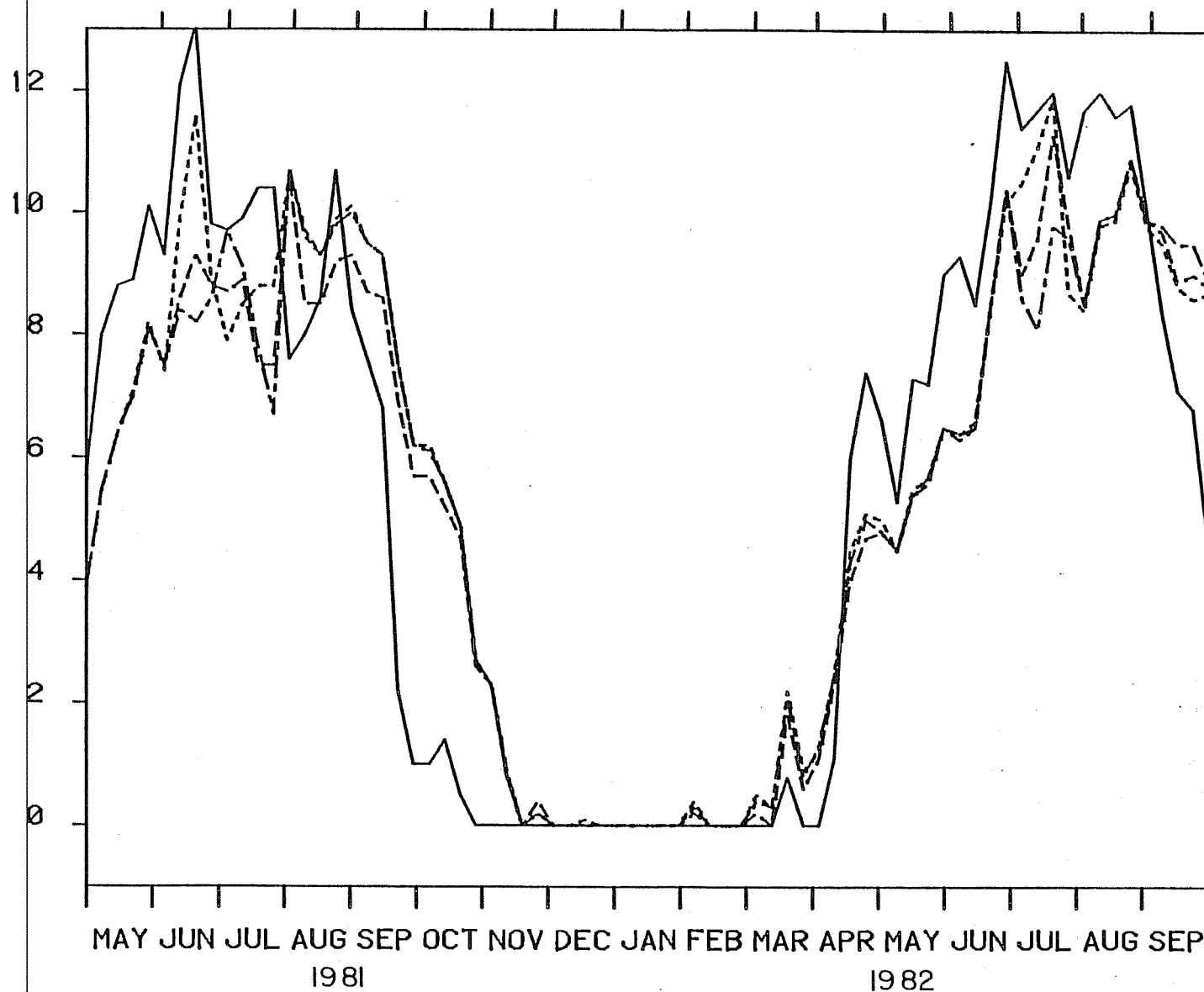
LEGEND

- DEVIL CANYON DRAWDOWN OF 50 FEET, 2 LEVELS OF SHUTTERS - PROPOSED PROJECT
- FOR COMPARISON WITH
- DEVIL CANYON DRAWDOWN OF 9 FEET, 2 LEVELS OF SHUTTERS
- .-.- DEVIL CANYON DRAWDOWN OF 50 FEET, 3 LEVELS OF SHUTTERS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 130	
STAGE II	
DATE: 10/1/82	BY: J. L. HARRIS
REVISION: 1.0	APPROVED: J. L. HARRIS

FIGURE E.2.4.175

DEGREES C



NOTES:

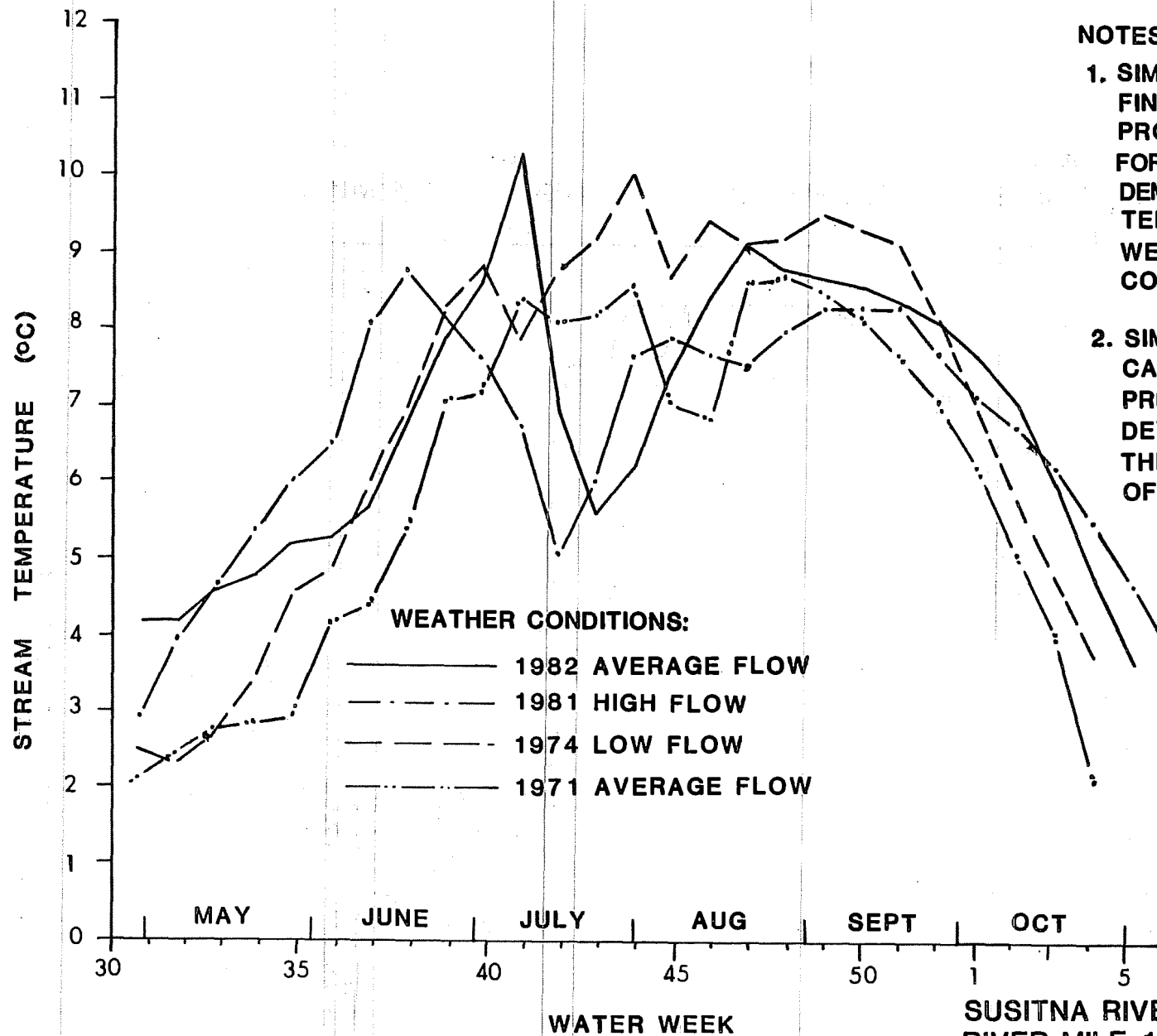
1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3-STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-APRIL SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)

LEGEND

- DEVIL CANYON DRAWDOWN OF 50 FEET, 2 LEVELS OF SHUTTERS -PROPOSED PROJECT
- DEVIL CANYON DRAWDOWN OF 9 FEET, 2 LEVELS OF SHUTTERS
- DEVIL CANYON DRAWDOWN OF 50 FEET, 3 LEVELS OF SHUTTERS

ALASKA POWER AUTHORITY	
SUSITNA INTERCOMPLEX PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 100 STAGE II	
DATE: 10/1/82	BY: J. L. HARRIS

FIGURE E.2.4.176

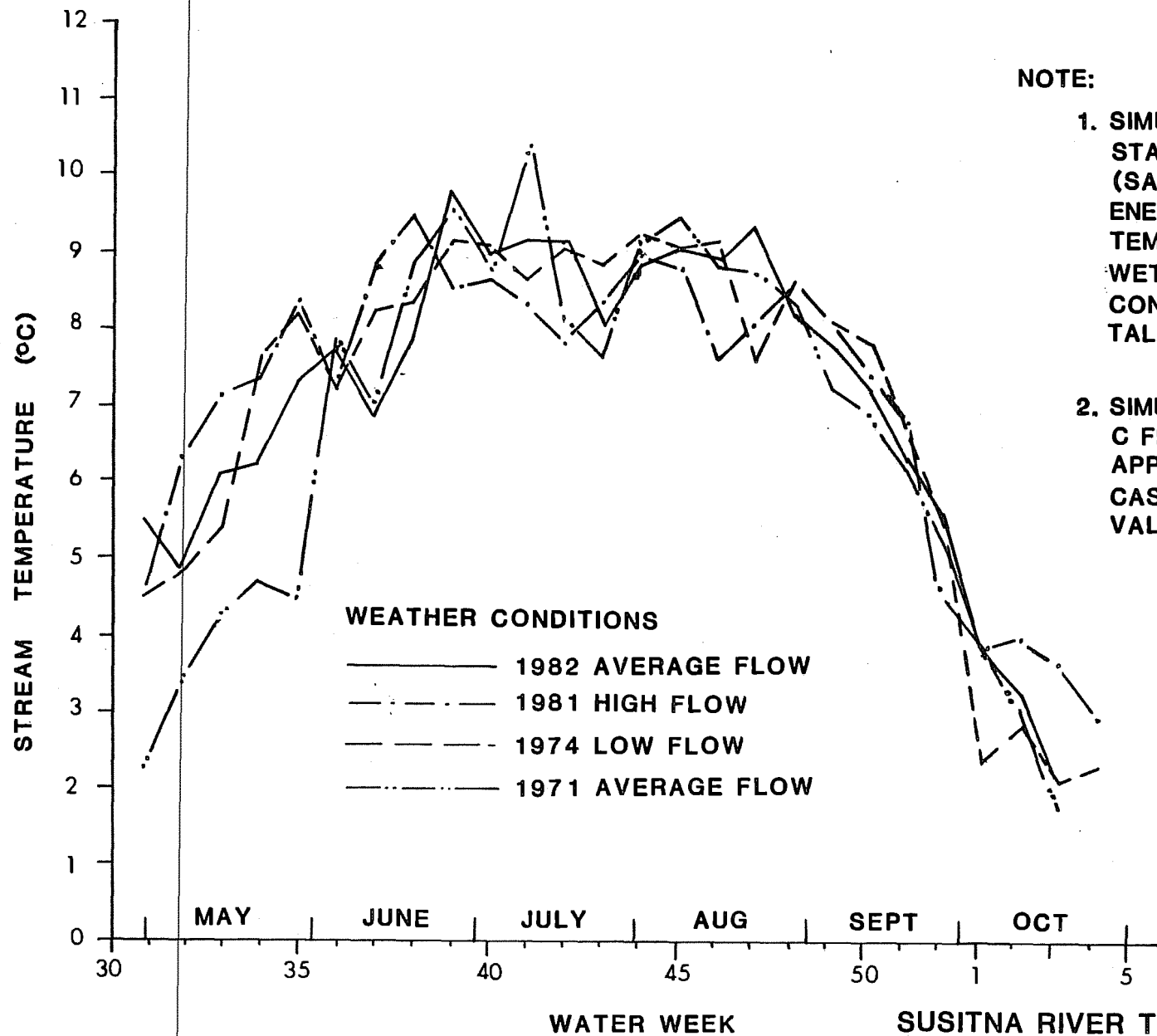


NOTES:

1. SIMULATIONS WERE MADE FOR FINAL STAGE OF TWO-STAGE PROJECT (SAME AS STAGE III) FOR STAGE II ENERGY DEMANDS AND ILLUSTRATE TEMPERATURE DIFFERENCES FOR WET, DRY AND AVERAGE FLOW CONDITIONS
2. SIMULATIONS WERE MADE FOR CASE C FLOW REQUIREMENTS PRIOR TO APPLICANTS DEVELOPMENT OF CASE E-VI . THIS DOES NOT AFFECT VALIDITY OF COMPARISON

SUSITNA RIVER TEMPERATURES AT RIVER MILE 130 WATANA AND DEVIL CANYON OPERATING

FIGURE E.2.4.177

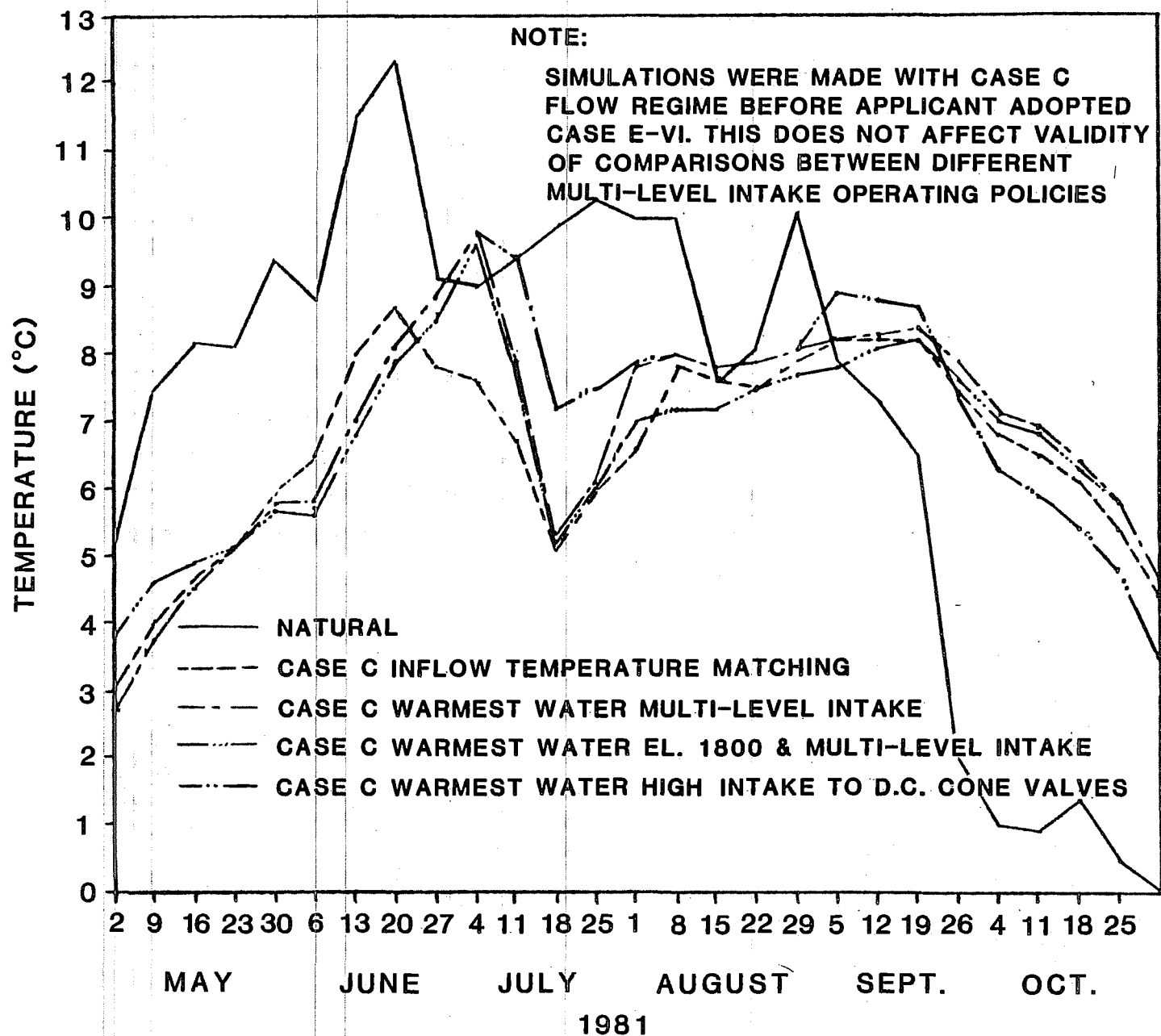


NOTE:

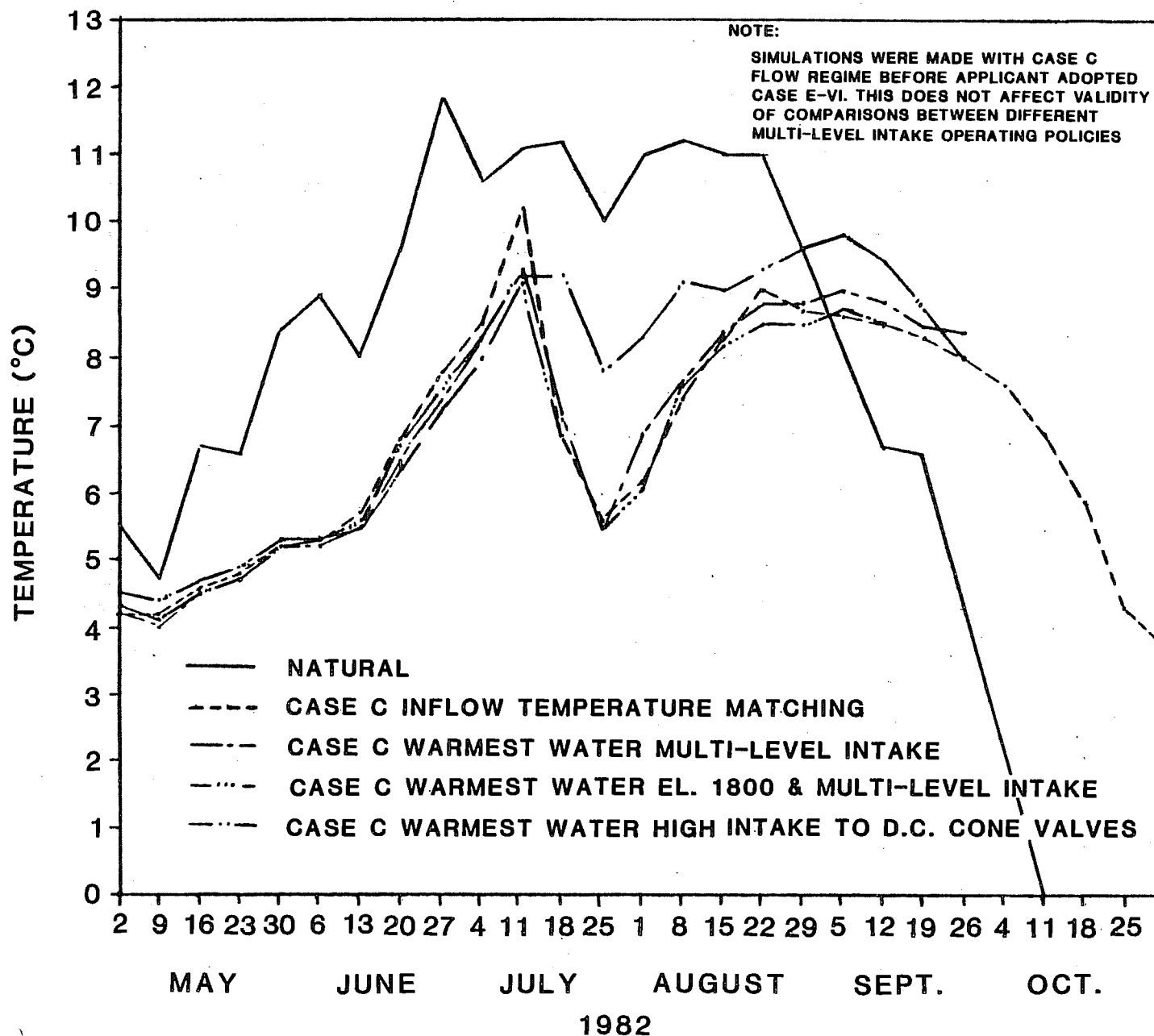
1. SIMULATIONS WERE MADE FOR FINAL STAGE OF TWO STAGE PROJECT (SAME AS STAGE III) FOR STAGE II ENERGY DEMANDS AND ILLUSTRATE TEMPERATURE DIFFERENCES FOR WET, DRY AND AVERAGE FLOW CONDITIONS DOWNSTREAM OF TALKEETNA.
2. SIMULATIONS WERE MADE FOR CASE C FLOW REQUIREMENTS PRIOR TO APPLICANTS DEVELOPMENT OF CASE E-VI. THIS DOES NOT AFFECT VALIDITY OF COMPARISON.

SUSITNA RIVER TEMPERATURES AT RIVER MILE 84 WATANA AND DEVIL CANYON OPERATING

FIGURE E.2.4.178

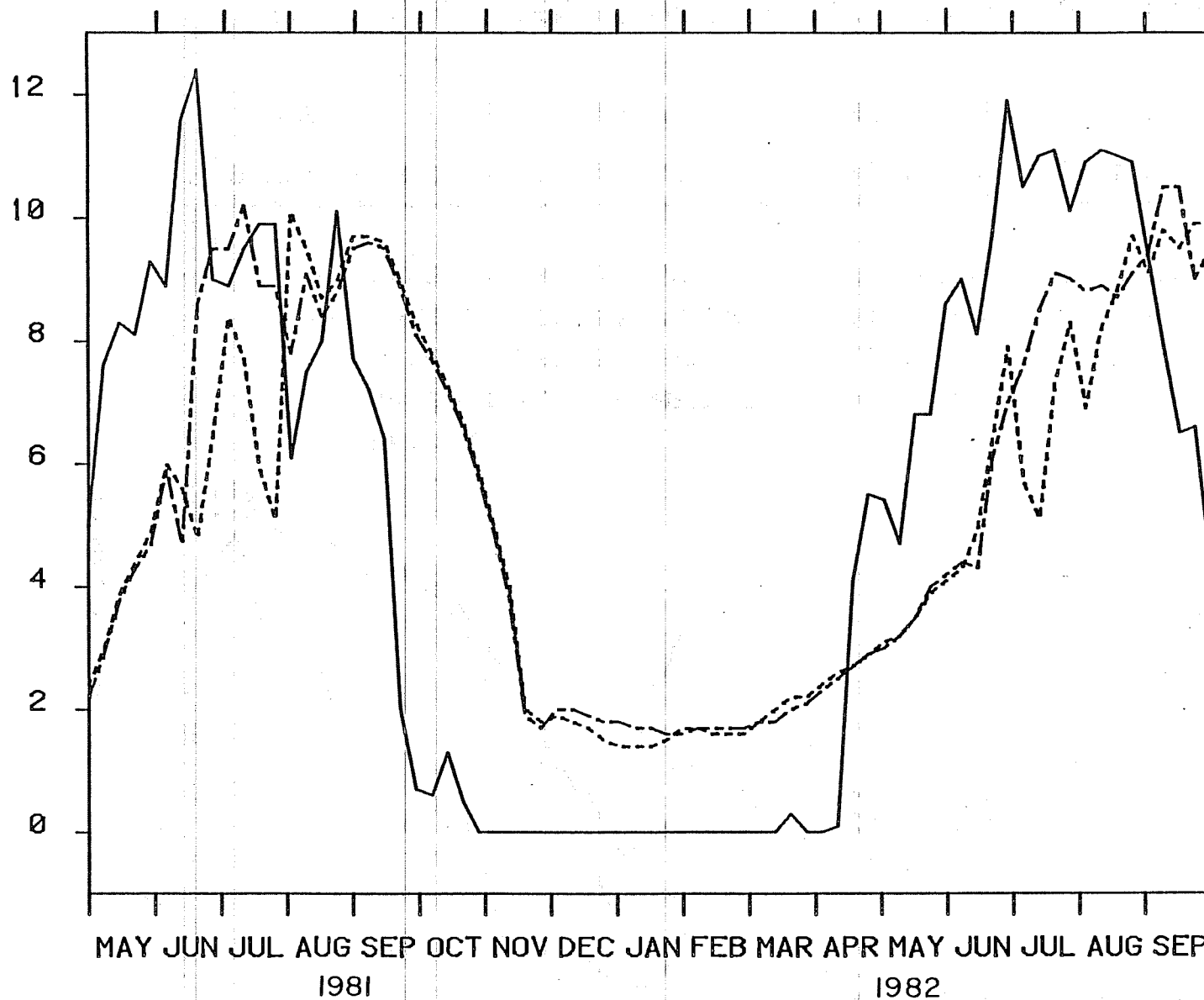


**SIMULATED TEMPERATURES AT RIVER MILE 130
VARIOUS INTAKE OPERATING POLICIES**



**SIMULATED TEMPERATURES AT RIVER MILE 130
VARIOUS INTAKE OPERATING POLICIES**

DEGREES
C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. DEVIL CANYON DRAWDOWN OF 50 FEET - 2 LEVELS OF SHUTTERS

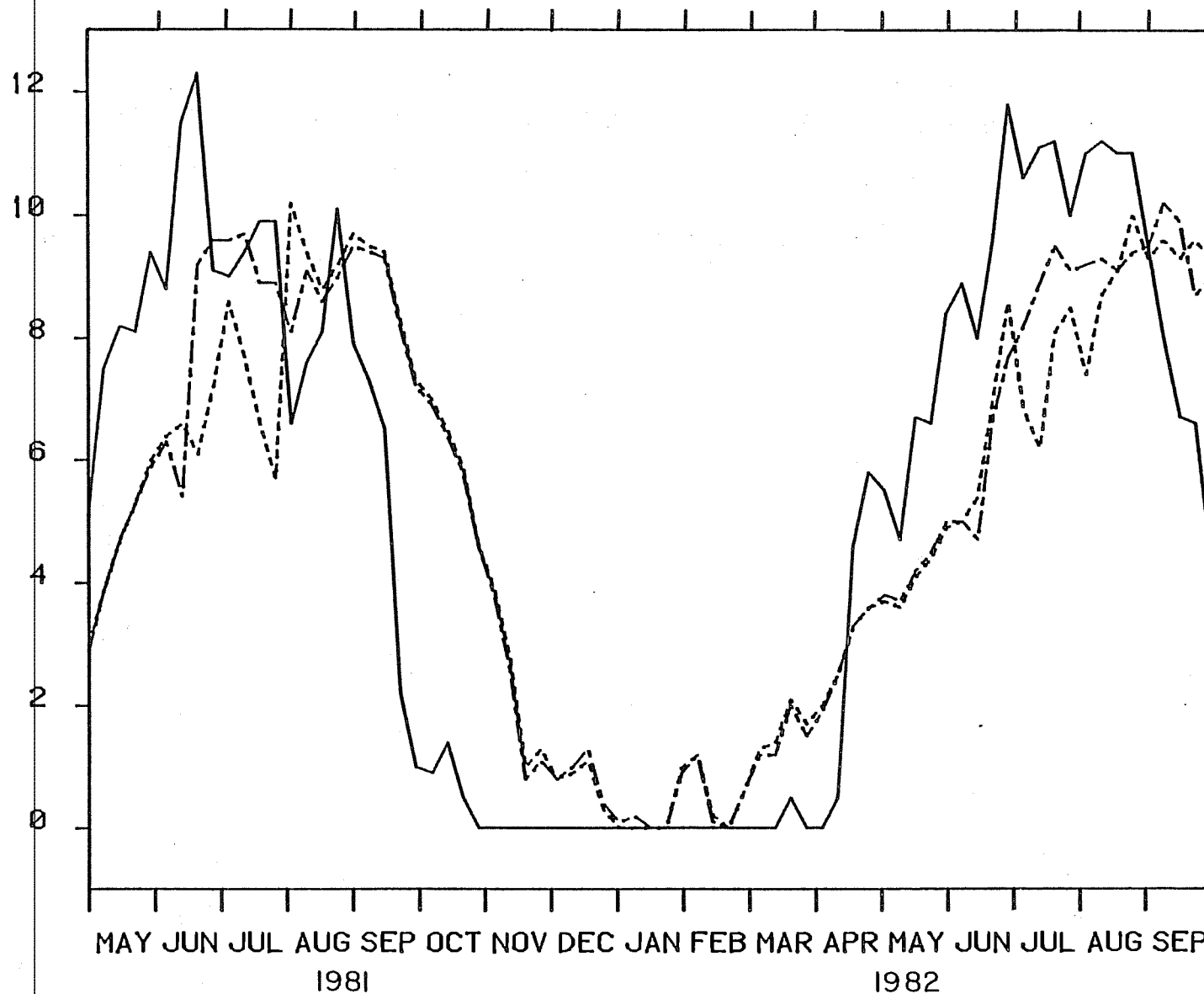
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES E-VI FLOW REQUIREMENTS PROPOSED PROJECT
- . - . - SIMULATED TEMPERATURES E-I FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 150 STAGE II	
DATE: 10/1/82	BY: J. L. HARRIS
REVISION: 1.0	REVISION: 1.0

FIGURE E.2.4.181

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD DECEMBER -MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER
6. DEVIL CANYON DRAWDOWN OF 50 FEET- 2 LEVELS OF SHUTTERS

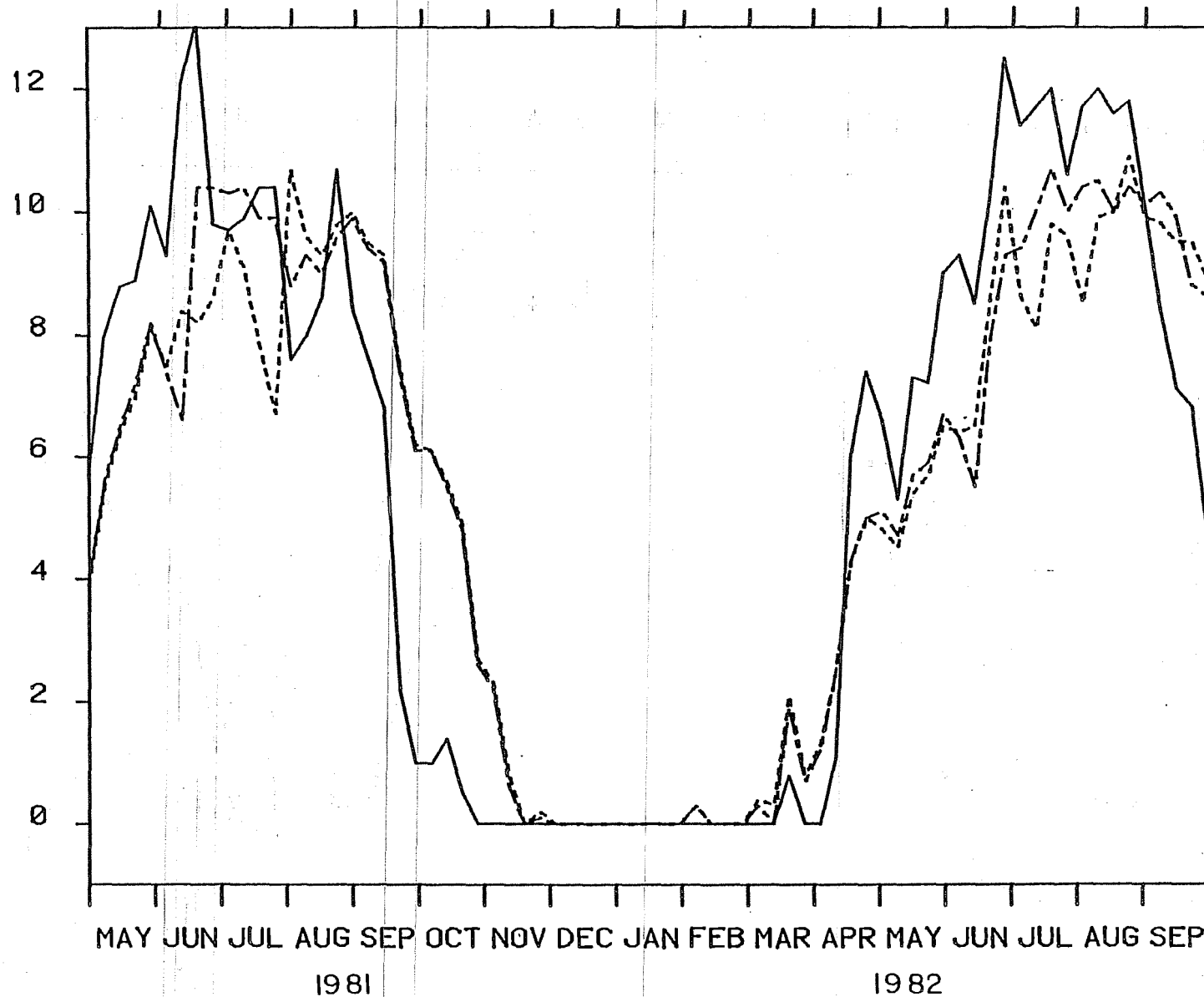
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES E-VI FLOW REQUIREMENTS PROPOSED PROJECT
- - - SIMULATED TEMPERATURES E-I FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 130 STAGE II	
DATE: 10/1/82	BY: [signature]
APPROVED: [signature]	DATE: 10/1/82

FIGURE E.2.4.1B2

DEGREES C



NOTES:

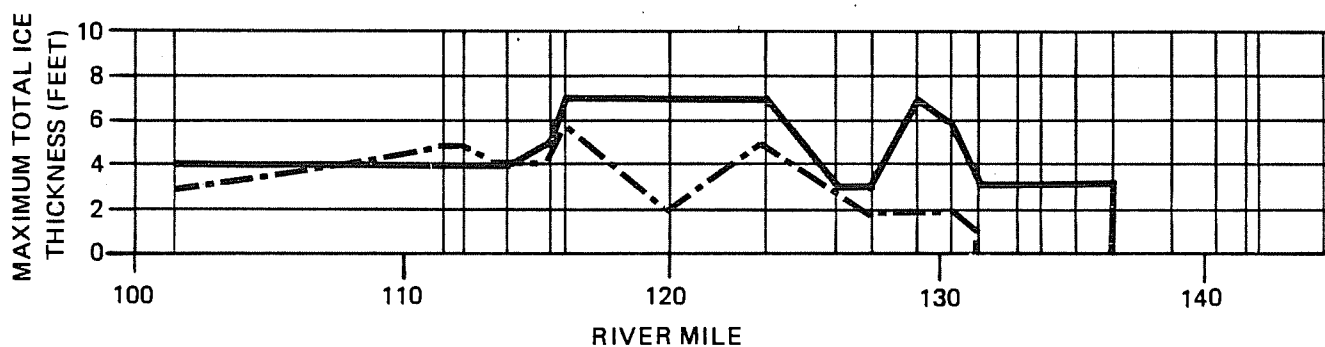
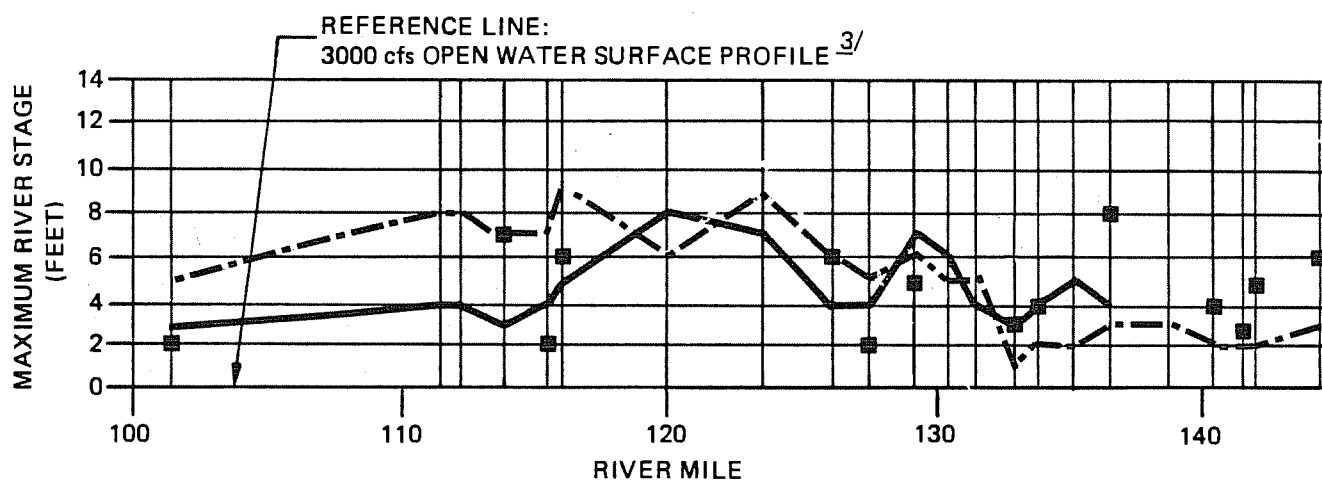
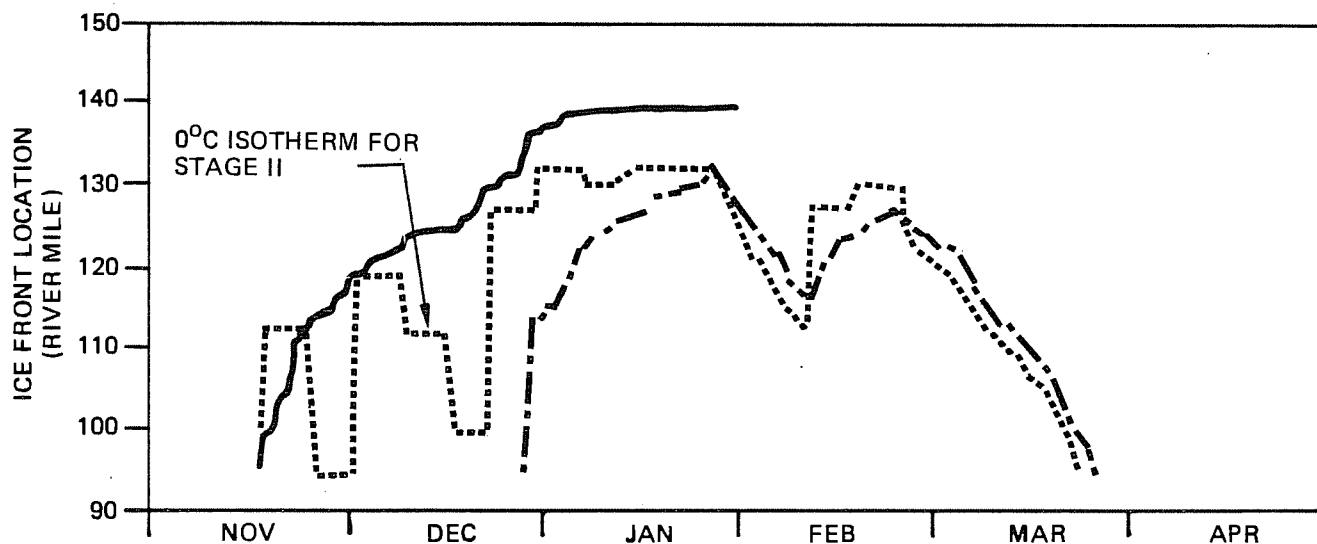
1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)

LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES E-VI FLOW REQUIREMENTS PROPOSED PROJECT
- . - SIMULATED TEMPERATURES E-I FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 100 STAGE II	
AREA-GRABER	DATE
APPROVED BY	DATE

FIGURE E.2.4.183



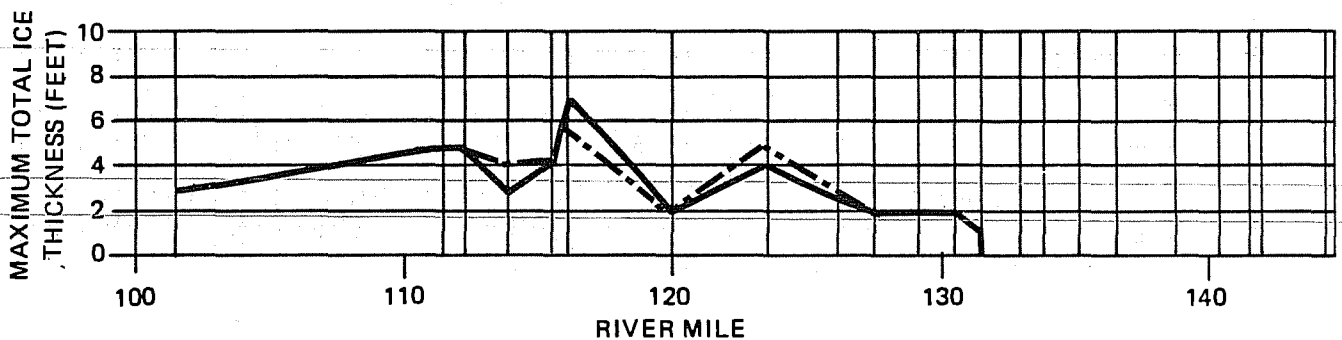
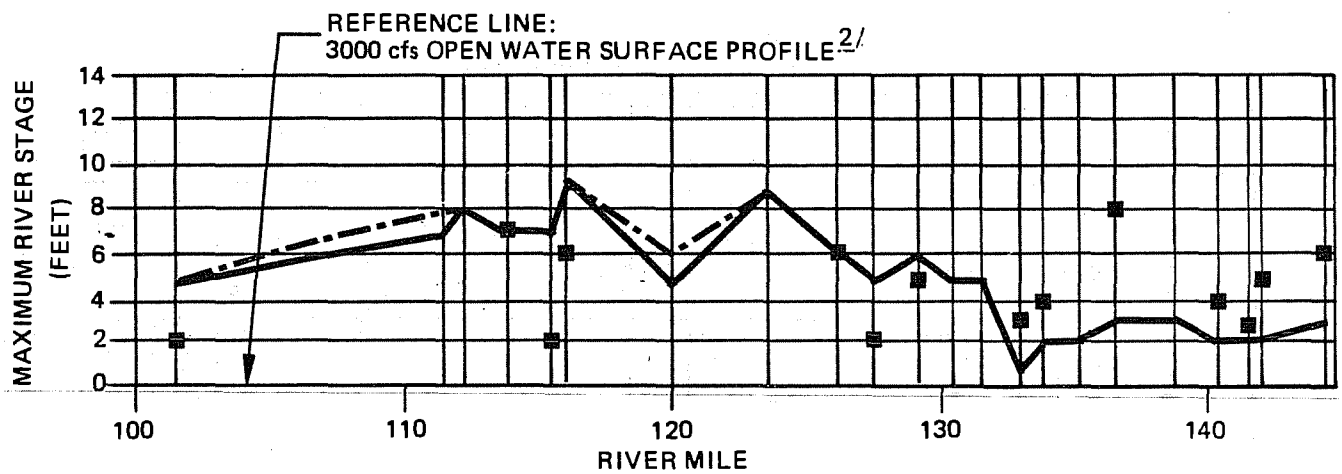
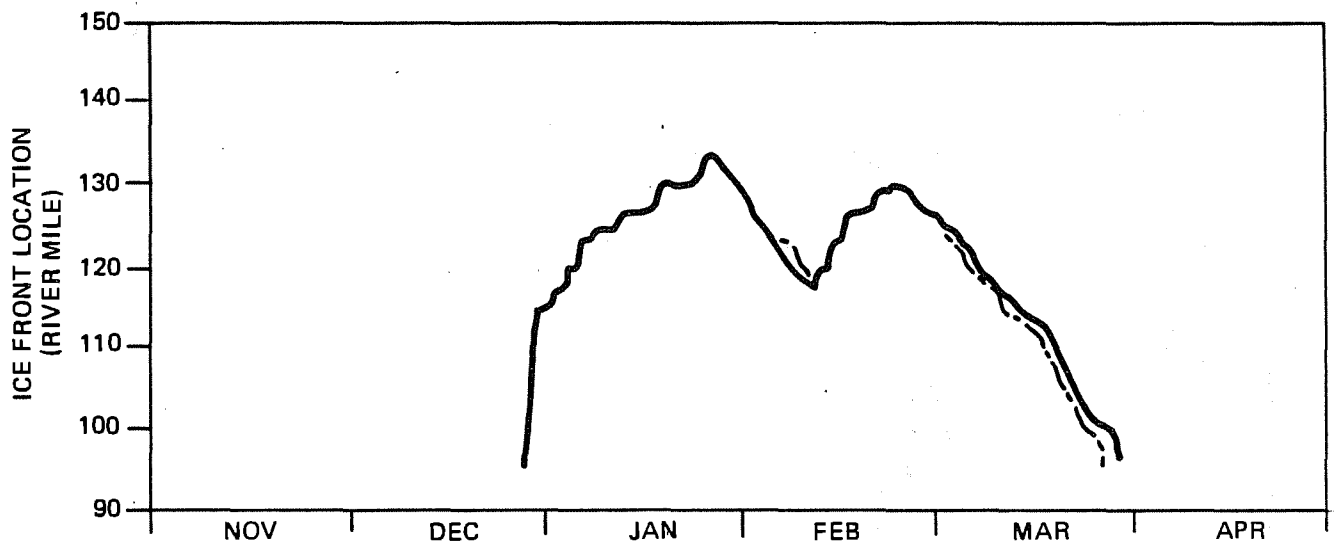
NOTES:

1. STAGE II SIMULATION BASED ON CASE E-VI FLOWS, STAGE II ENERGY DEMAND, INFLOW MATCHING TEMPERATURE POLICY
2. NATURAL CONDITIONS NOT SIMULATED UPSTREAM OF RM 140.
3. 3000 cfs REPRESENTS TYPICAL WINTER FLOW UNDER NATURAL CONDITIONS AT FREEZE UP

LEGEND:

- NATURAL CONDITIONS
- - - STAGE II OPERATING
- NATURAL SLOUGH BERM ELEVATION
SEE TABLE E.2.4.23

**SIMULATED RIVER ICE CONDITIONS
STAGE II vs. NATURAL
1981-82 WEATHER CONDITIONS
CASE E-VI FLOWS**



NOTES:

1. SIMULATIONS BASED ON STAGE II ENERGY DEMAND, INFLOW MATCHING TEMPERATURE POLICY.
2. 3000 cfs REPRESENTS TYPICAL WINTER FLOW UNDER NATURAL CONDITIONS AT FREEZE UP.

LEGEND:

- CASE E-I FLOWS
- - - CASE E-VI FLOWS
- NATURAL SLOUGH BERM ELEVATION (SEE TABLE E.2.4.24)

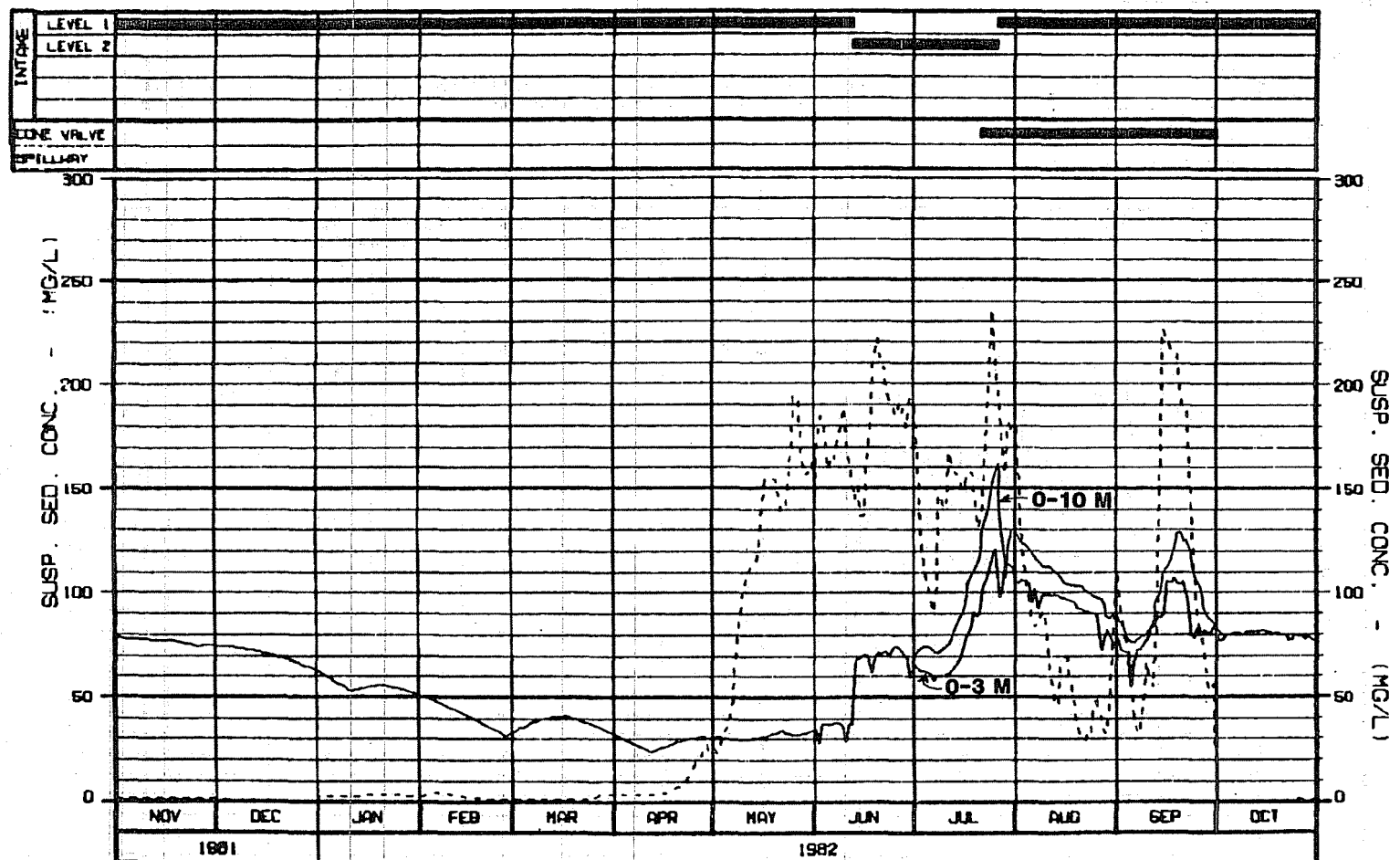
**SIMULATED RIVER ICE CONDITIONS
STAGE II
1981-82 WEATHER CONDITIONS
CASE E-I vs. CASE E-VI**

The graph displays suspended sediment concentration (SUSP. SED. CONC. - (MG/L)) on the y-axis (0 to 300) against time on the x-axis (NOV 1981 to OCT 1982). Two data series are plotted: 0-3 M (solid line) and 0-10 M (dashed line). The 0-3 M series shows a significant increase in concentration starting in May, peaking in July at approximately 150 MG/L, and then fluctuating between 100 and 150 MG/L through October. The 0-10 M series shows a similar trend but with lower overall concentrations, peaking in July at approximately 100 MG/L and fluctuating between 50 and 100 MG/L through October.

-----	PREDICTED "OUTFLOW SUSP. SED. CONCENTRATION (MG/L)
-----	INFLOW SUSP. SED. CONCENTRATION (MG/L) (0-3 MICRONS ONLY)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25
26	26
27	27
28	28
29	29
30	30
31	31
32	32
33	33
34	34
35	35
36	36
37	37
38	38
39	39
40	40
41	41
42	42
43	43
44	44
45	45
46	46
47	47
48	48
49	49
50	50
51	51
52	52
53	53
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89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

1. SSC INFLOW VALUES REPRESENT THE 0-3 MICRON RANGE AND ARE 15% OF TSS

FIGURE E.2.4.186



LEGEND:

— PREDICTED OUTFLOW SUSP. SED. CONCENTRATION (MG/L)
 - - - INFLOW SUSP. SED. CONCENTRATION AT WATANA (MG/L) (0-3 M)

NOTES:

1. SSC INFLOW VALUES REPRESENT THE 0-3 MICRON RANGE AND ARE 15% OF TSS.

ALASKA POWER AUTHORITY

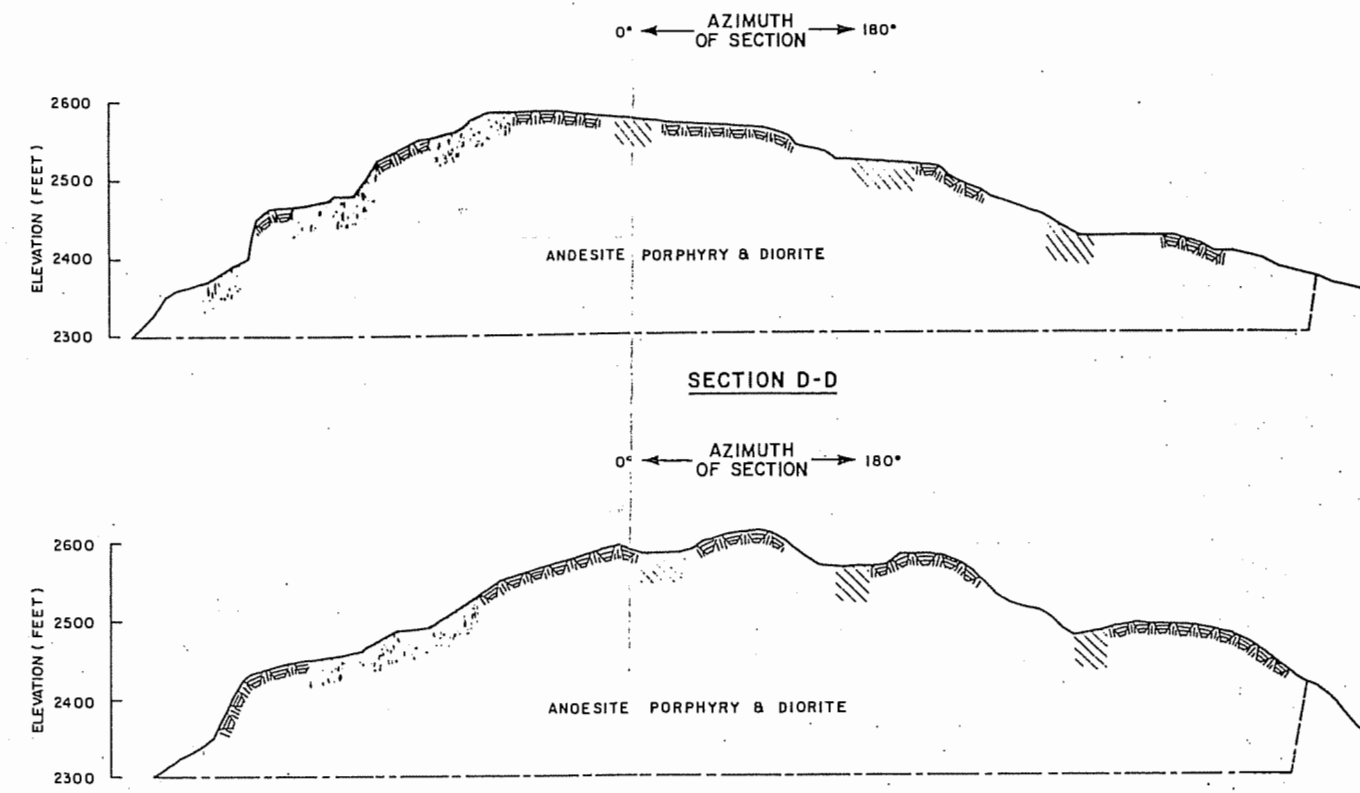
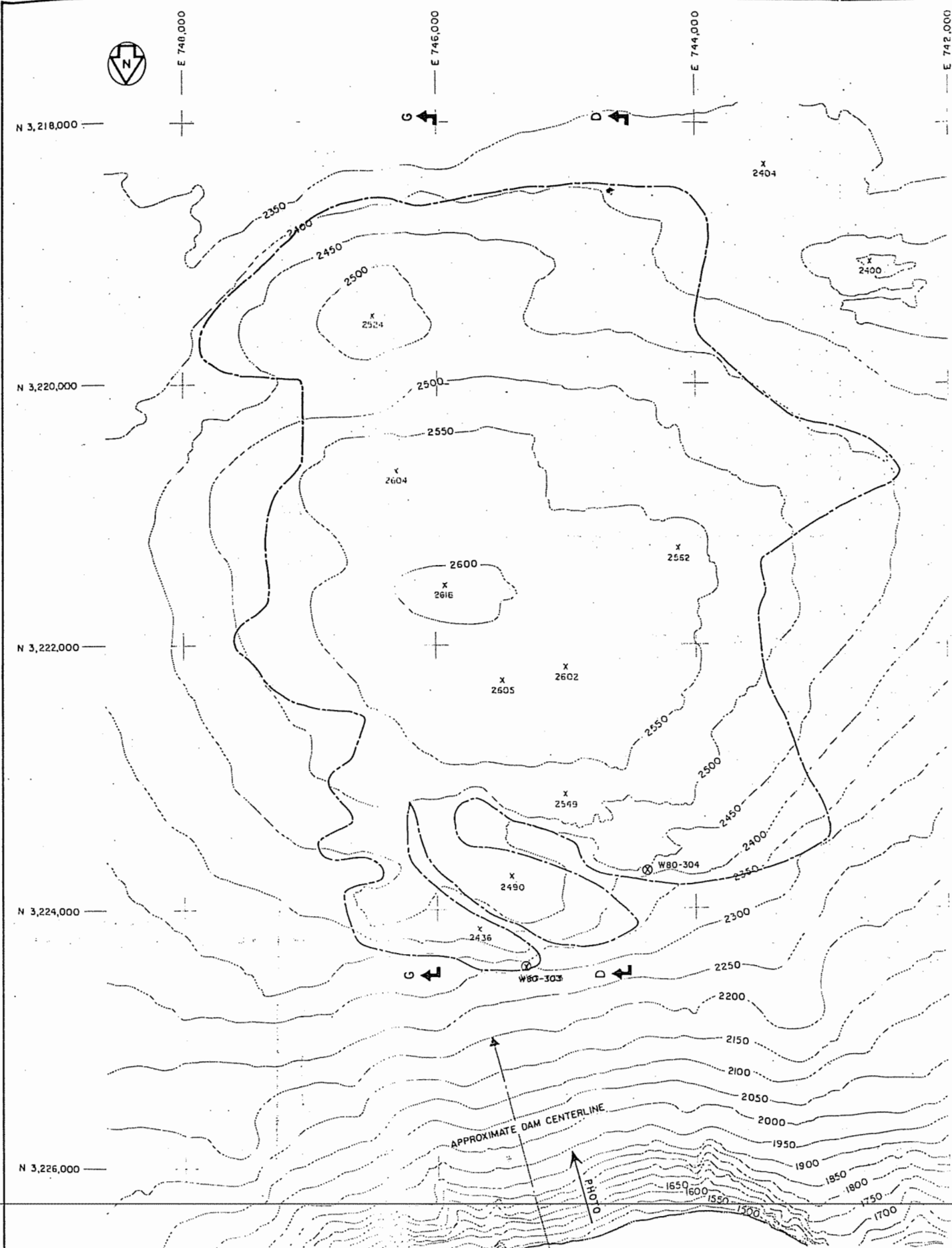
SUSTINA PROJECT DYRESH MODEL

**DEVIL CANYON
 OUTFLOW (0-10)
 SUSPENDED SOLIDS
 STAGE II AVERAGE YEAR**

HARZA-EBASCO JOINT VENTURE

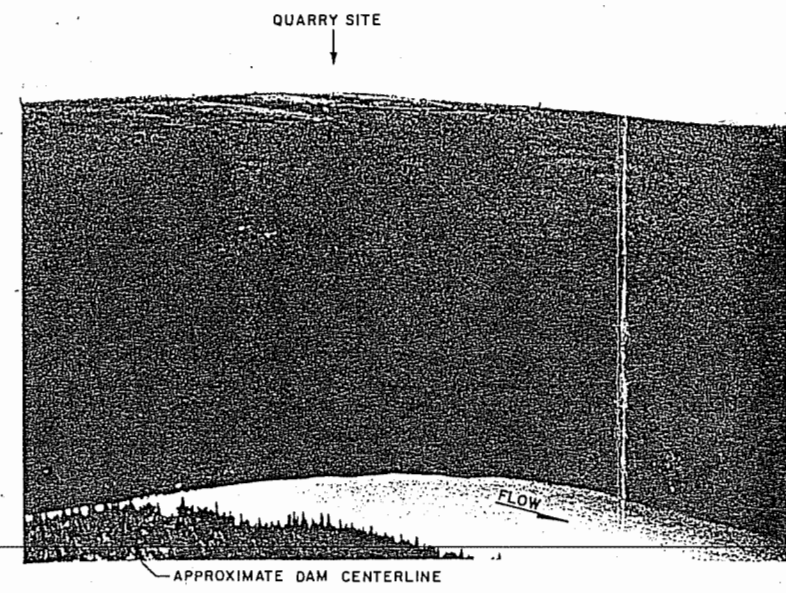
CHICAGO, ILLINOIS 10 JAN 83 42-010-06

FIGURE E.2.4.187



- LEGEND**
- STRUCTURE**
- SUSPECTED FRACTURE ZONE WITH LOCAL SHEARING
 - BEDROCK OUTCROP
 - SHEAR ZONE
- CONTACTS**
- MAPPED LIMIT OF BORROW SITE
- OTHER**
- CROSS-SECTION LOCATIONS
 - SAMPLE LOCATION (APPROXIMATE)

- NOTES**
1. SELECTED TYPICAL SECTIONS SHOWN.
 2. VERTICAL SCALE 4 TIMES HORIZONTAL SCALE.
 3. 50 FOOT CONTOURS REPRODUCED FROM REFERENCED BASE MAP.
 4. CONTOUR INTERVAL 50 FEET
 5. QUARRY SITE LIMITS BASED ON PRELIMINARY MAPPING AND IS SUBJECT TO RESULTS OF DESIGN EXPLORATIONS.
 6. INTERPRETATION BASED ON AIR PHOTO INTERPRETATION AND RECONNAISSANCE, AND SURFICIAL GEOLOGY MAPPING.
 7. PHOTO TAKEN AUGUST, 1981.
 8. LITHOLOGY AND CONTACTS WITHIN QUARRY A REQUIRE FUTURE DELINEATION
 9. QUARRY SITE A IS A PROPOSED SOURCE OF ROCKFILL FOR STAGE III CONSTRUCTION.



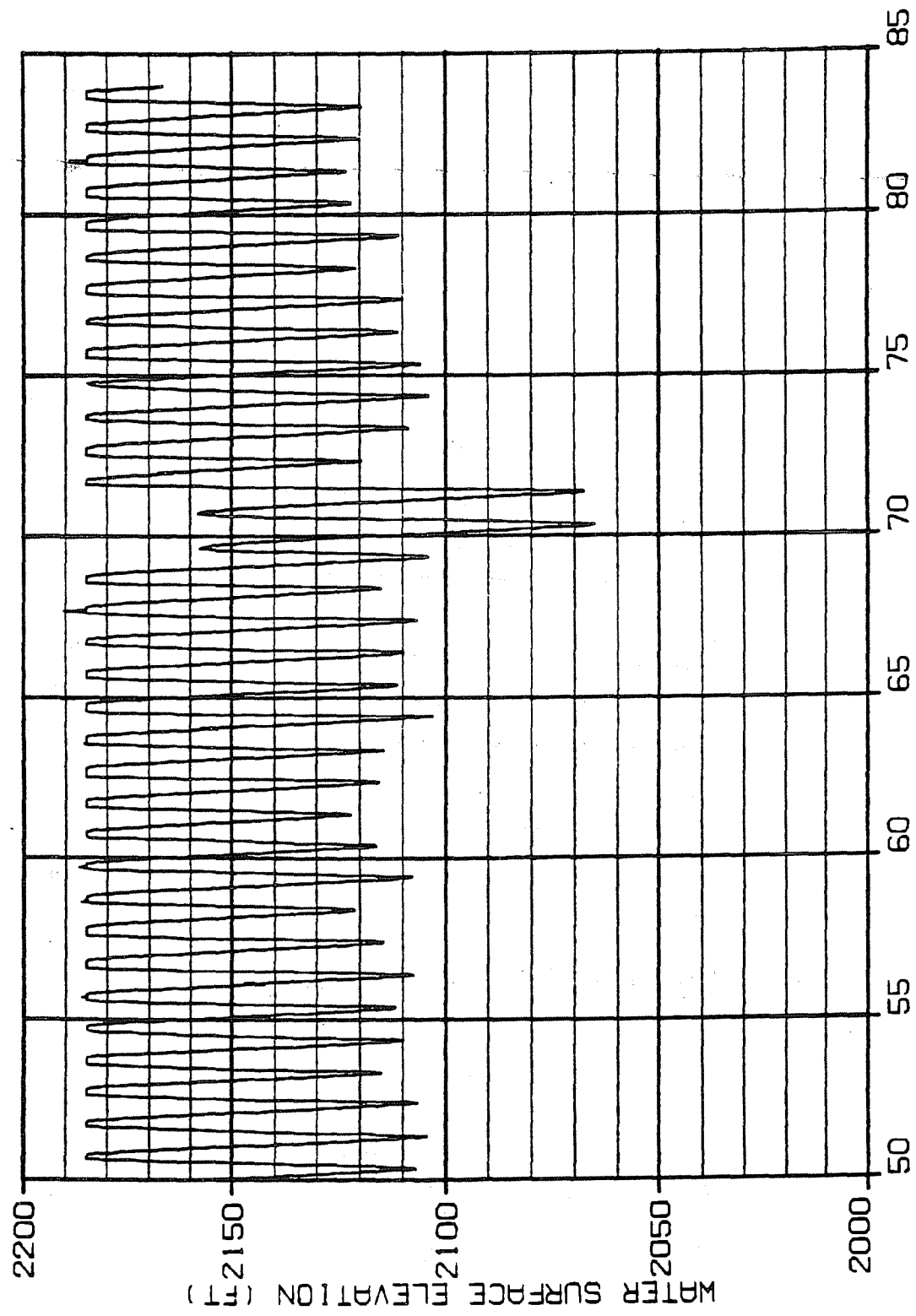
QUARRY A PLAN

WATANA
QUARRY SITE A PLAN AND SECTIONS

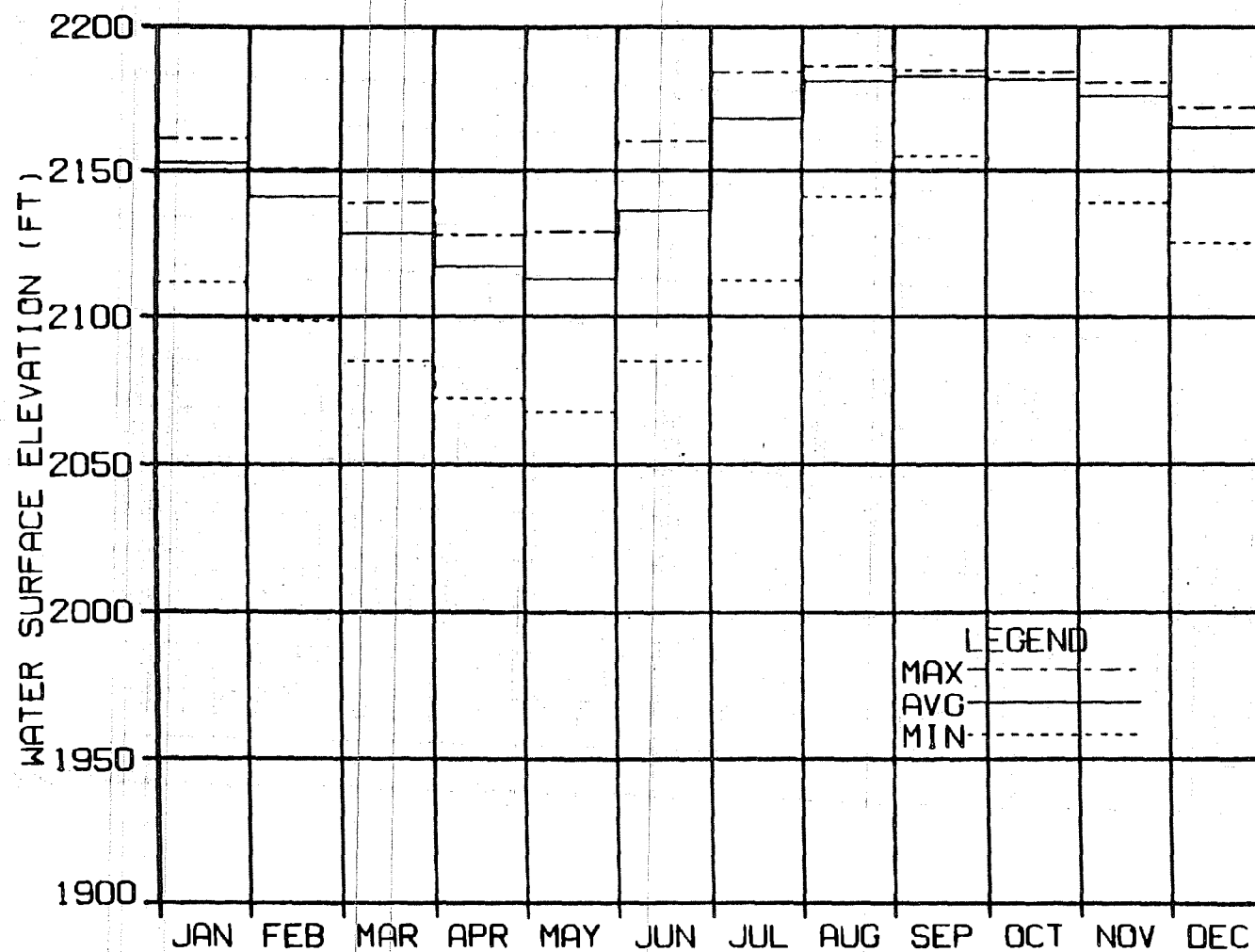
SCALE 0 400 800 FEET

REFERENCE: 1" = 200' TOPOGRAPHY 1978 COE, (NPAS) SHEET 8/26.
1" = 400' TOPOGRAPHY 1981 AAI, (NPAS) SHEET 1 OF 1, FLT. NO. 4-4.

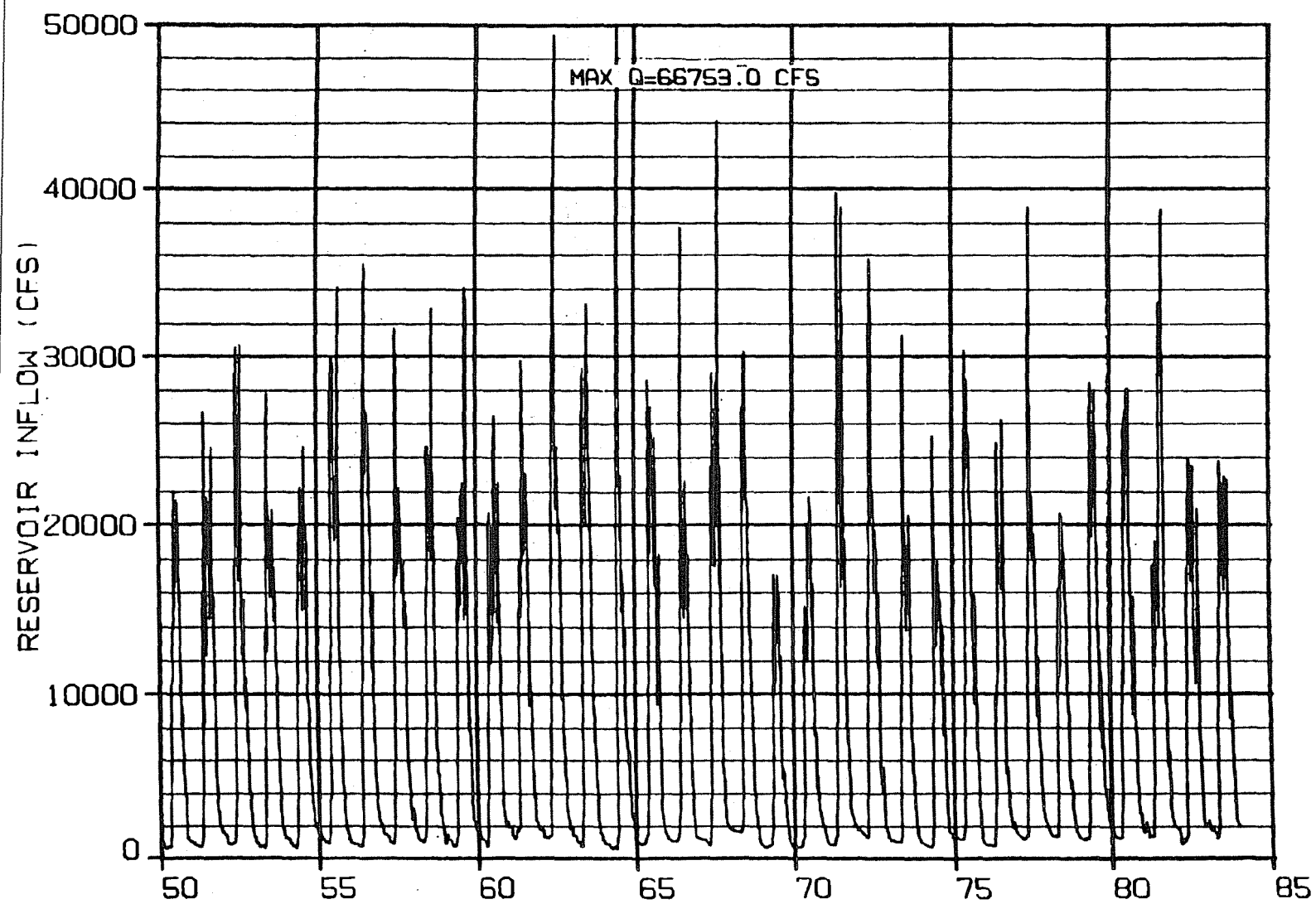




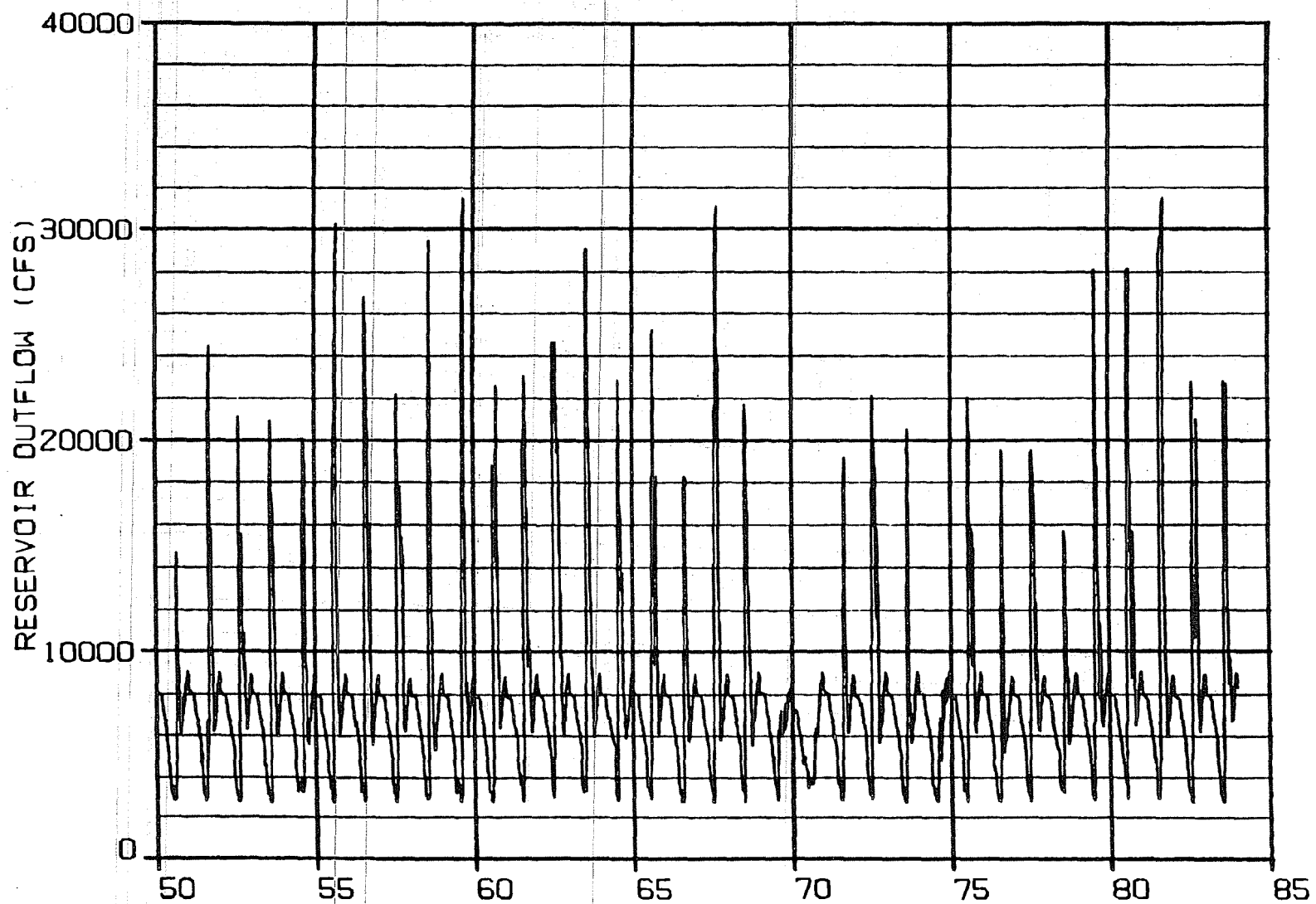
WATANA WATER SURFACE ELEVATION, EARLY STAGE III



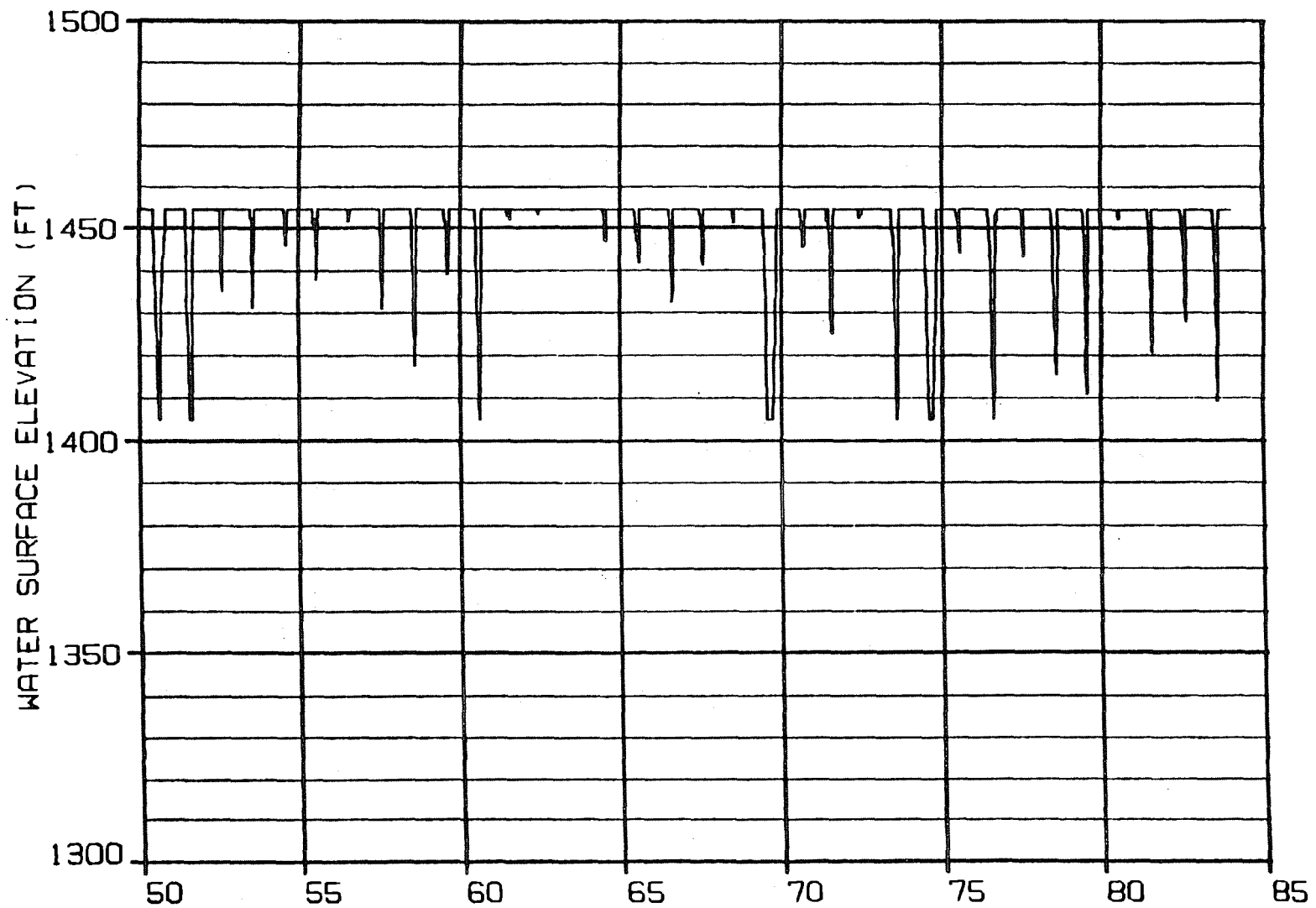
WATANA WATER SURFACE ELEVATION
MONTHLY SUMMARY, EARLY STAGE III



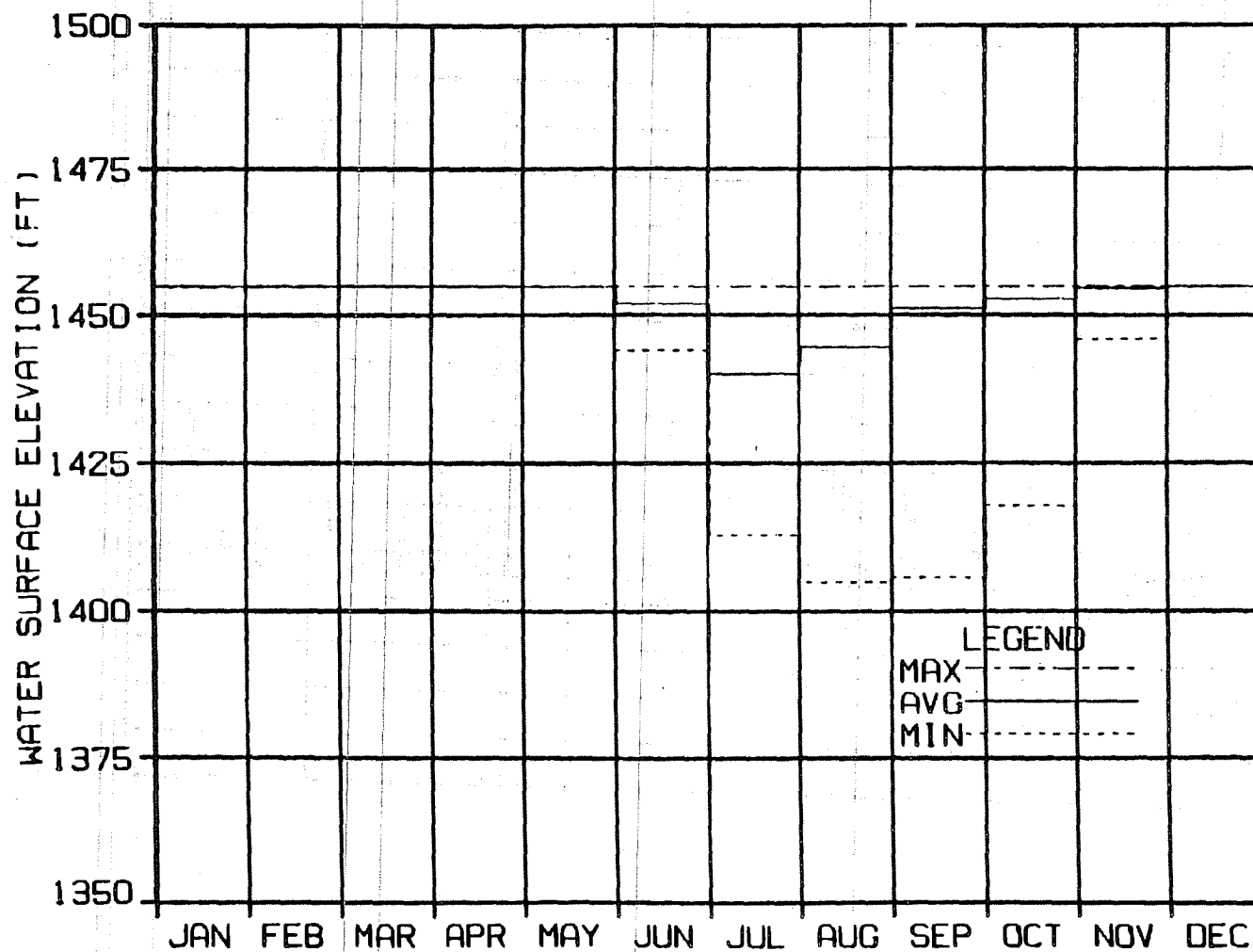
WATANA RESERVOIR INFLOW, EARLY STAGE III



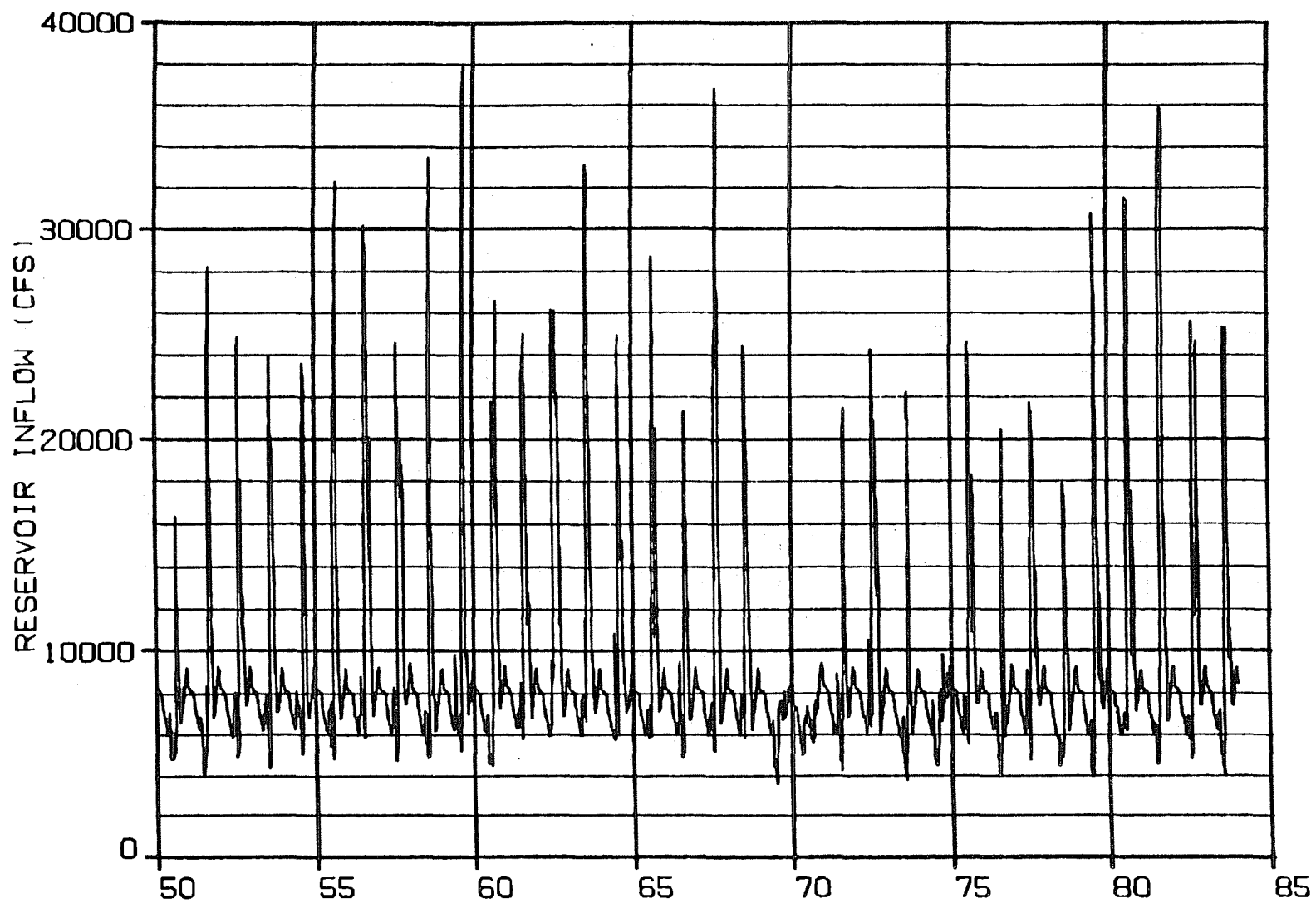
WATANA RESERVOIR OUTFLOW, EARLY STAGE III



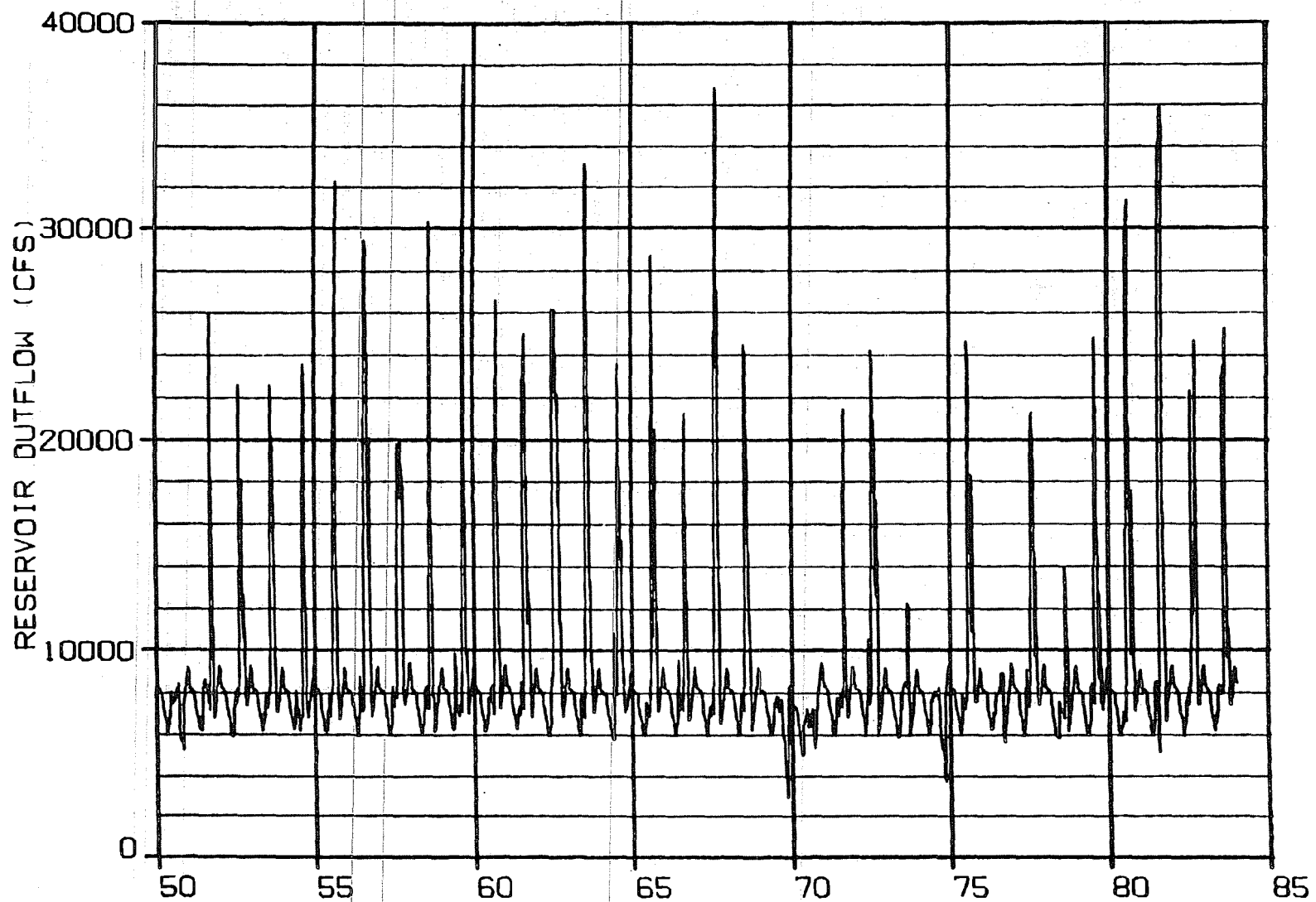
DEVIL CANYON WATER SURFACE ELEVATION, EARLY STAGE III



DEVIL CANYON WATER SURFACE ELEVATION
MONTHLY SUMMARY, EARLY STAGE III



DEVIL CANYON RESERVOIR INFLOW, EARLY STAGE III



DEVIL CANYON RESERVOIR OUTFLOW, EARLY STAGE III

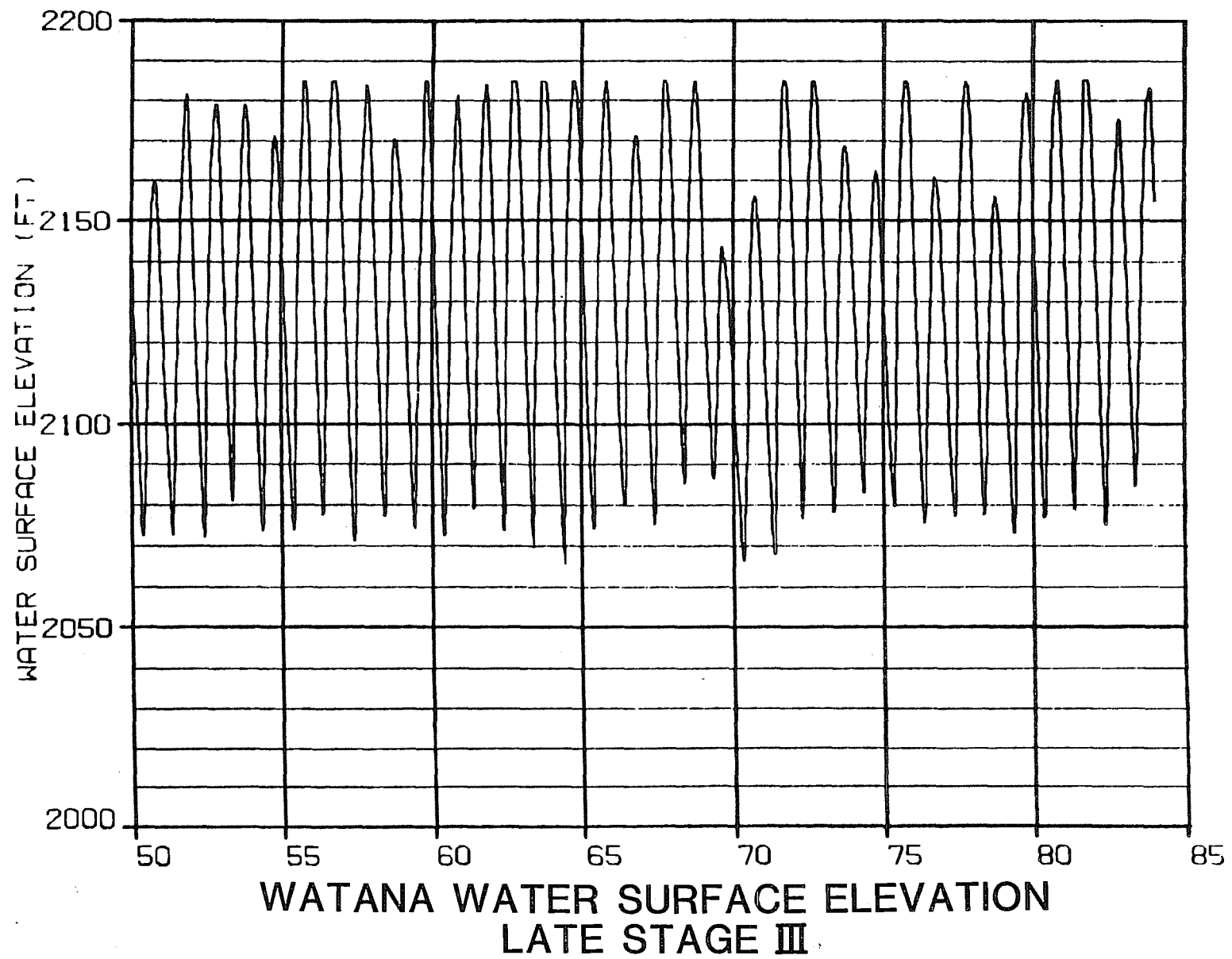
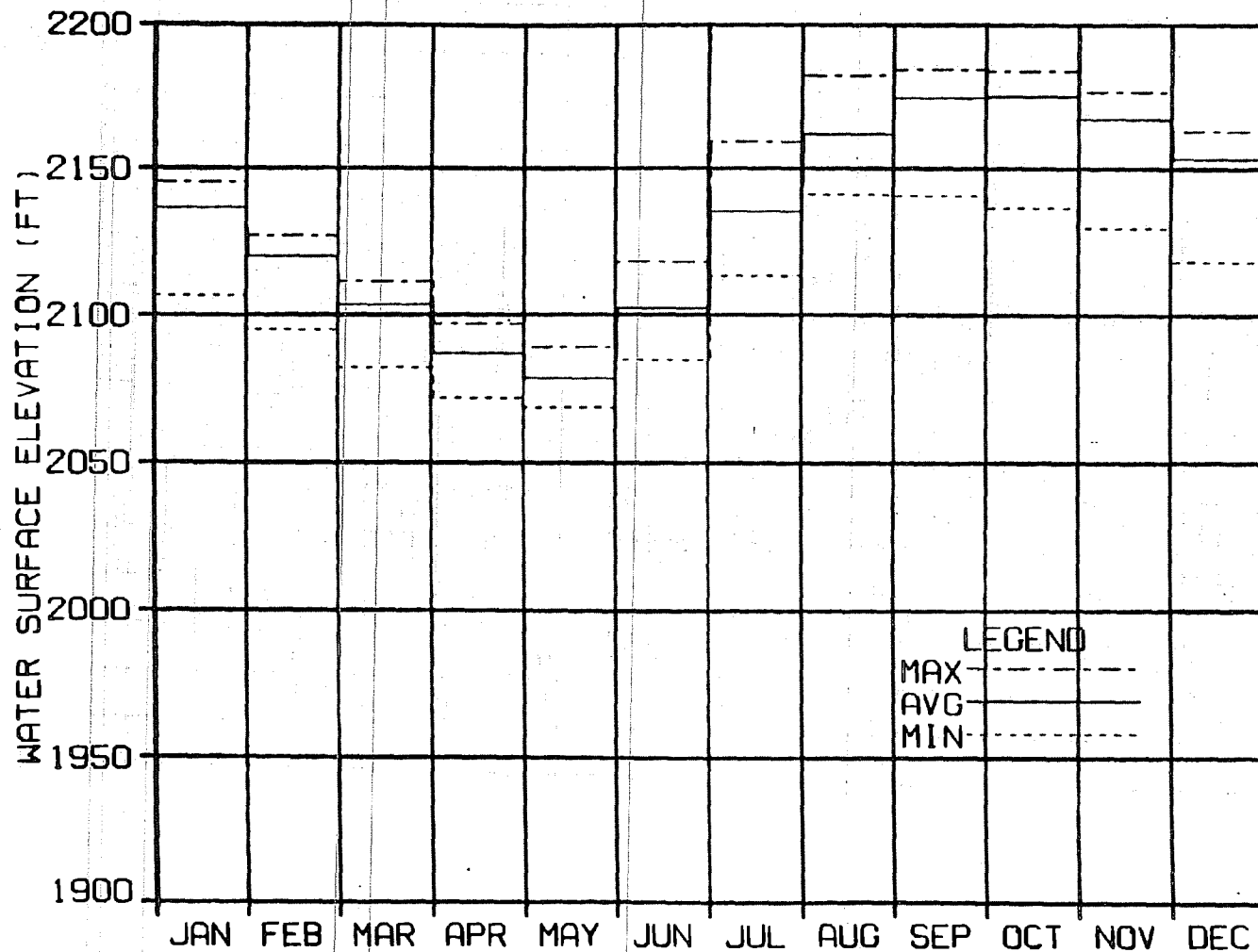


FIGURE E.2.4.197



**WATANA WATER SURFACE ELEVATION
MONTHLY SUMMARY LATE STAGE III**

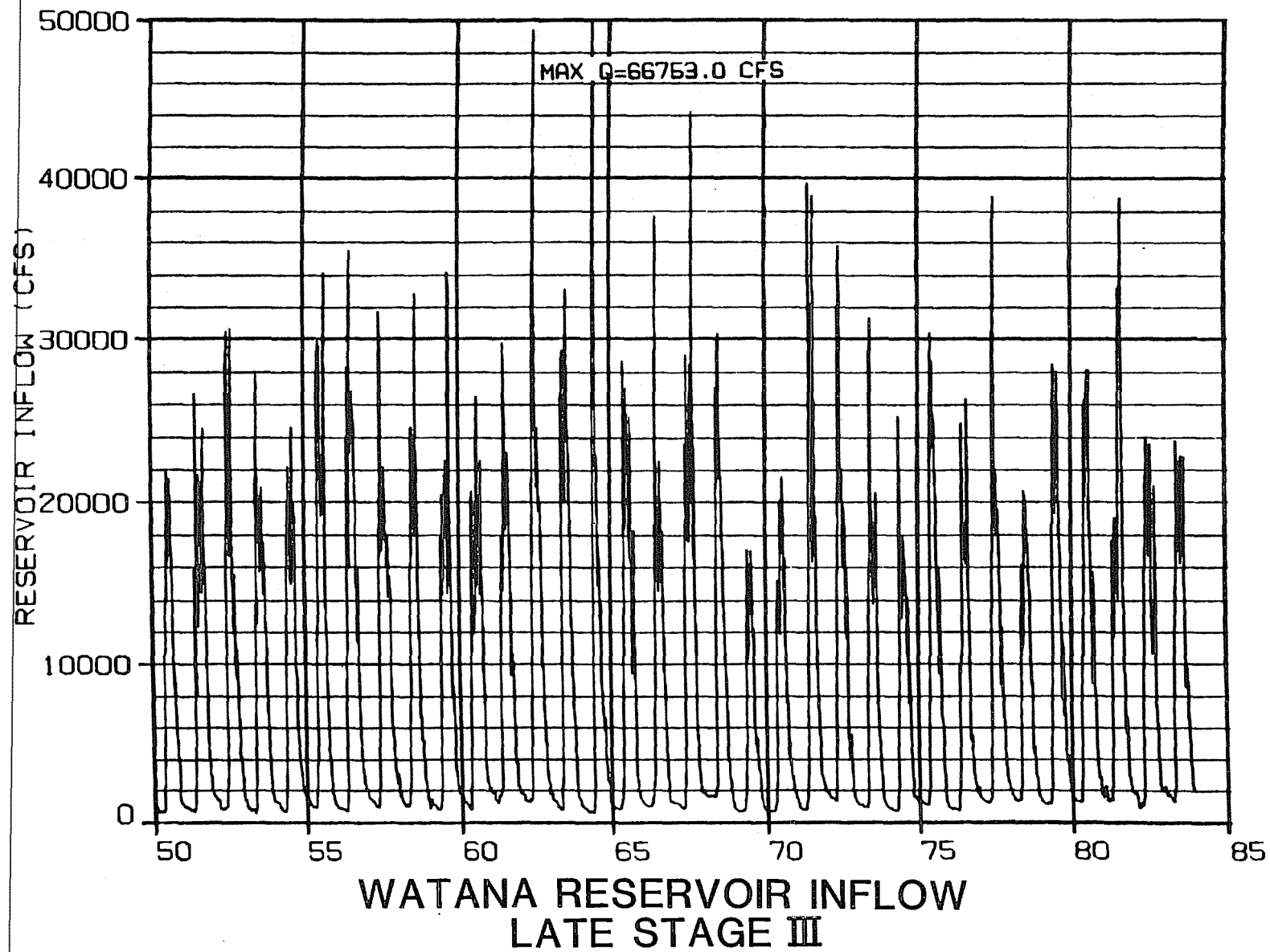
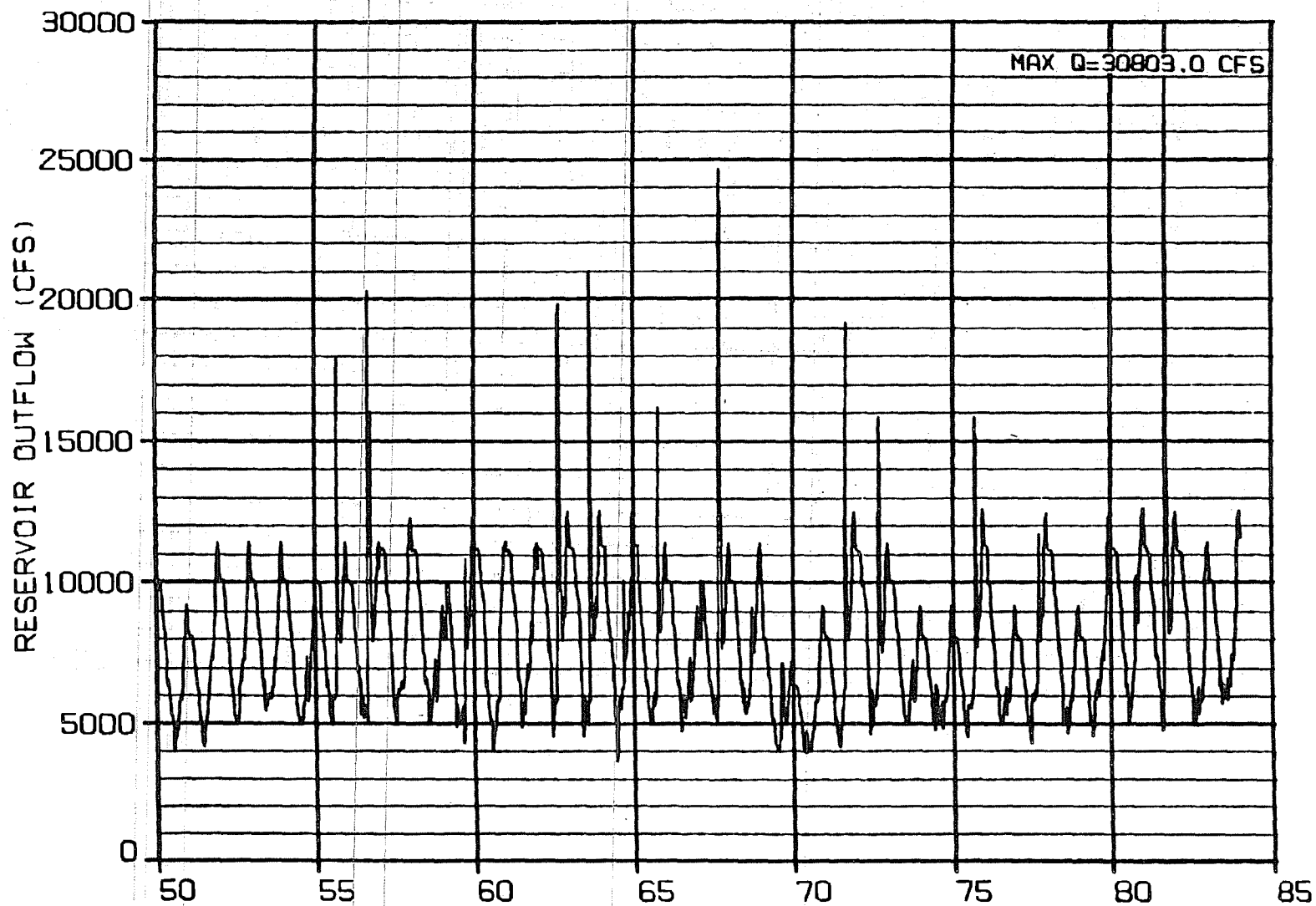


FIGURE E.2.4.199



WATANA RESERVOIR OUTFLOW
LATE STAGE III

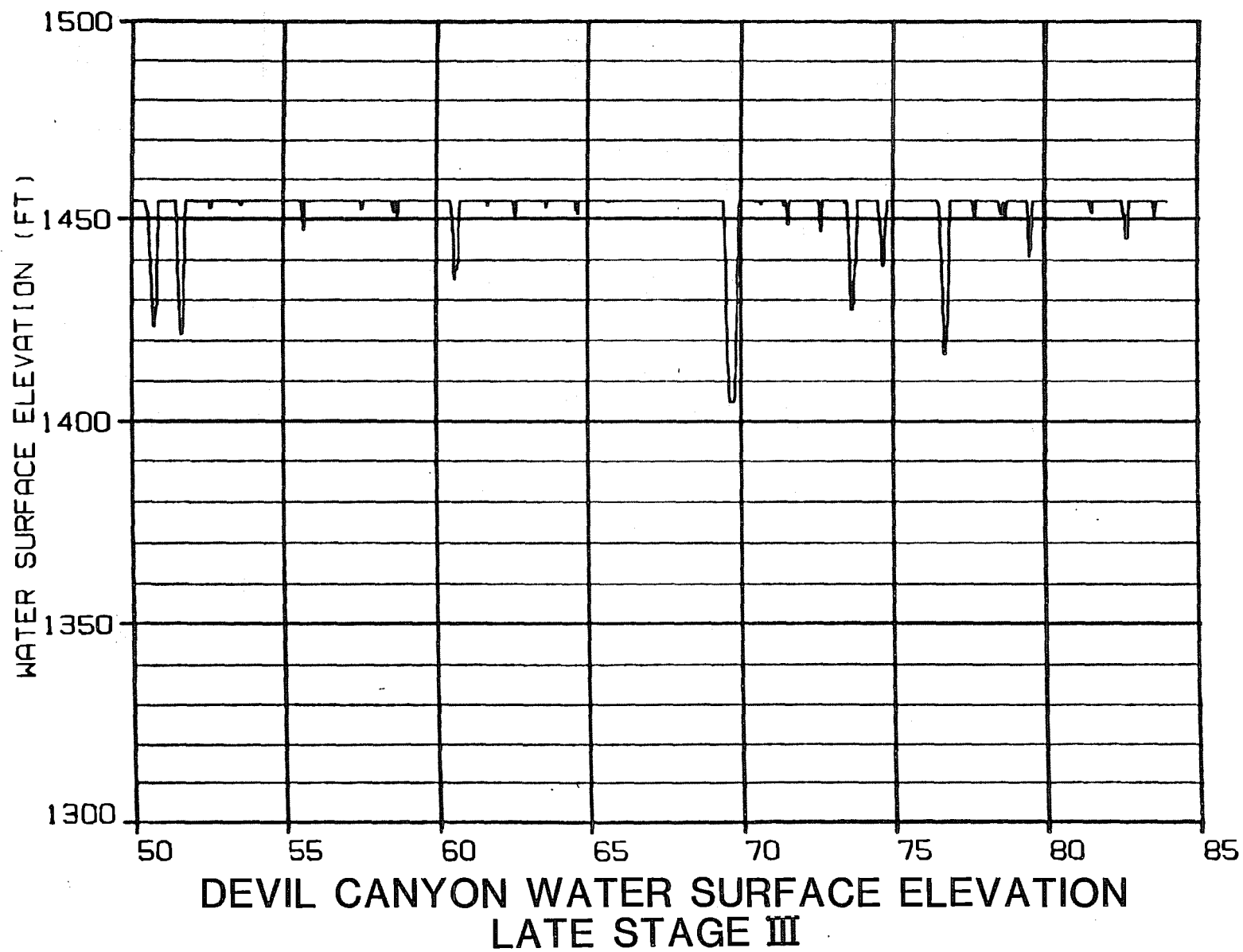
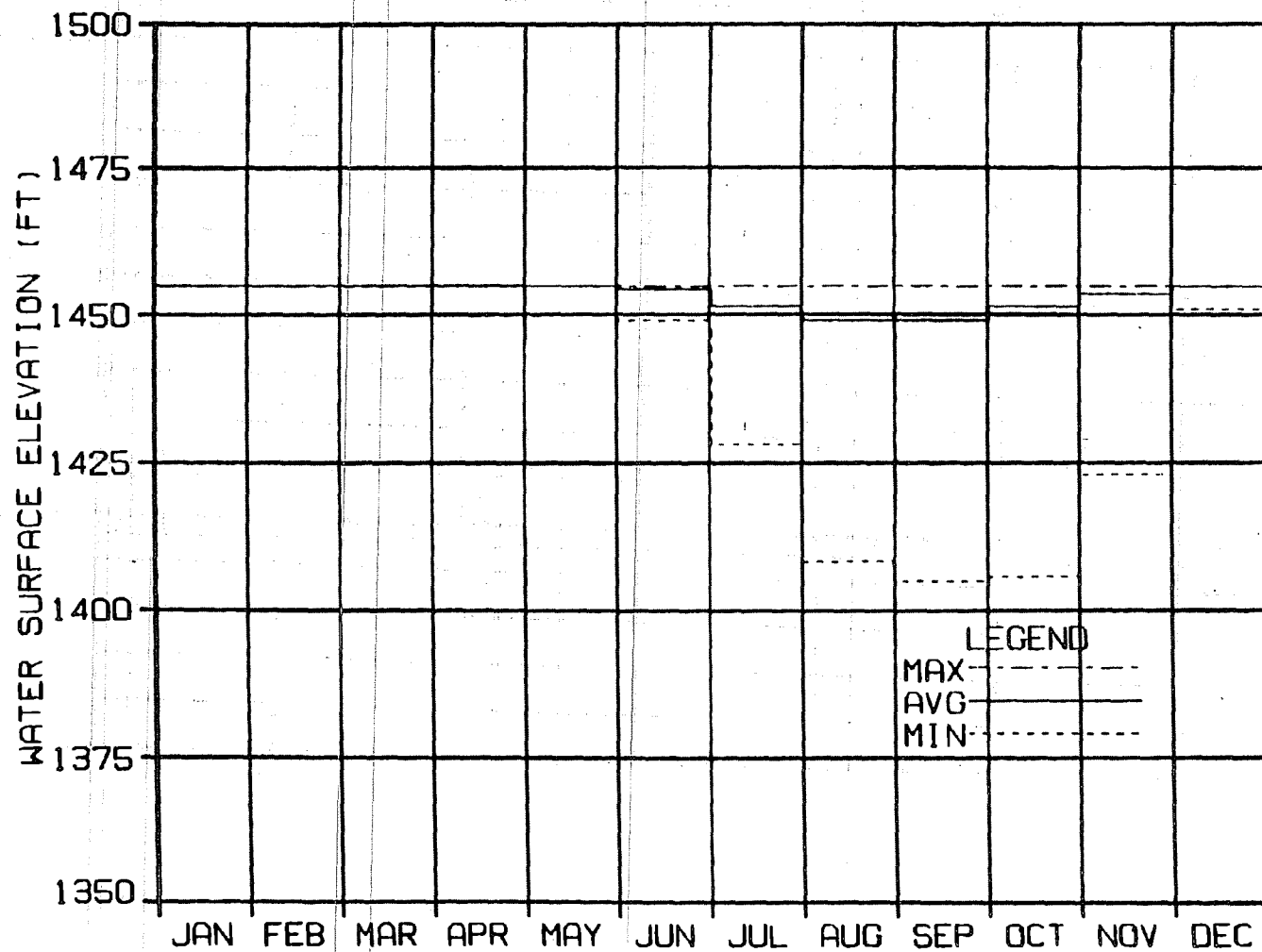


FIGURE E.2.4. 201.



DEVIL CANYON WATER SURFACE ELEVATION
MONTHLY SUMMARY
LATE STAGE III

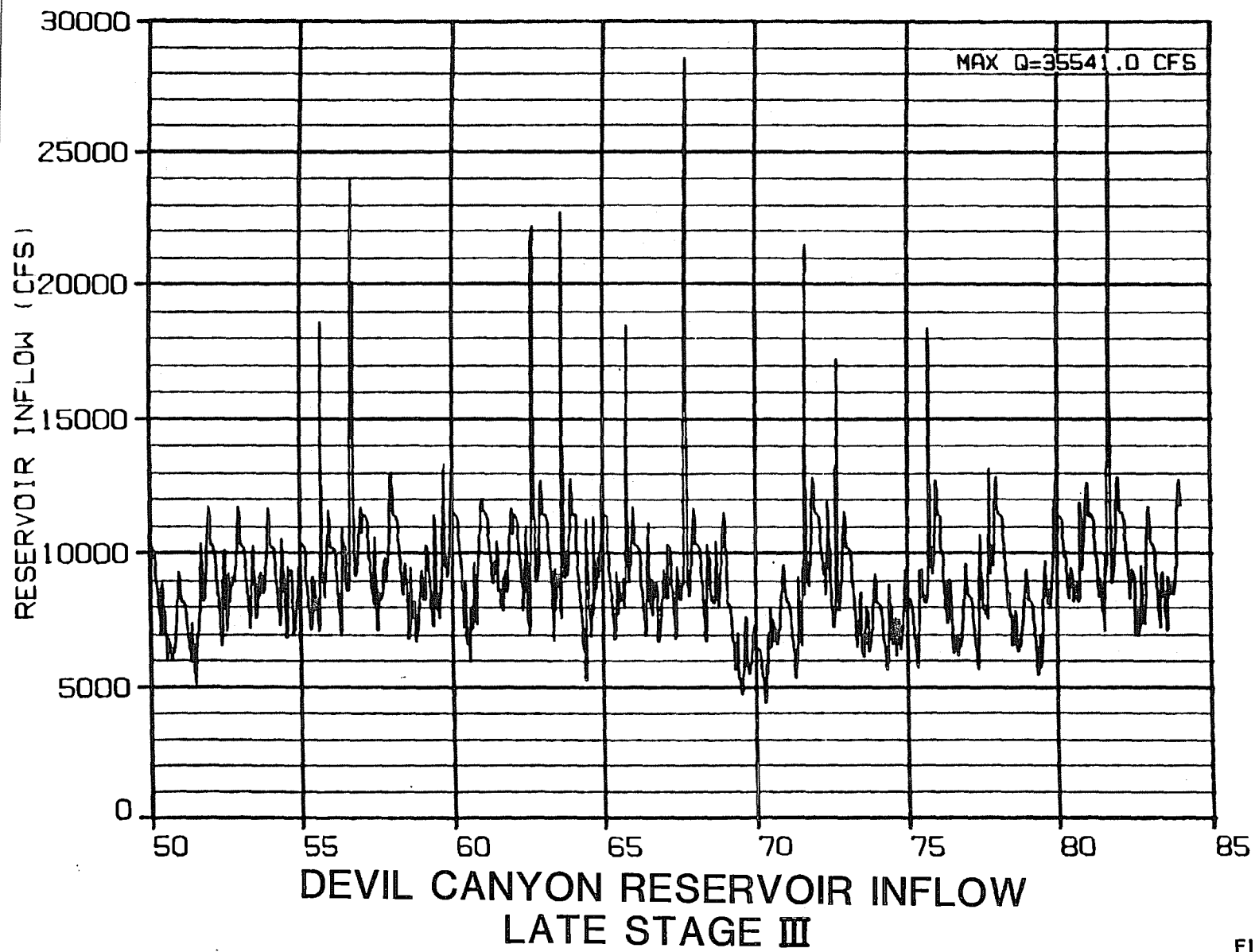
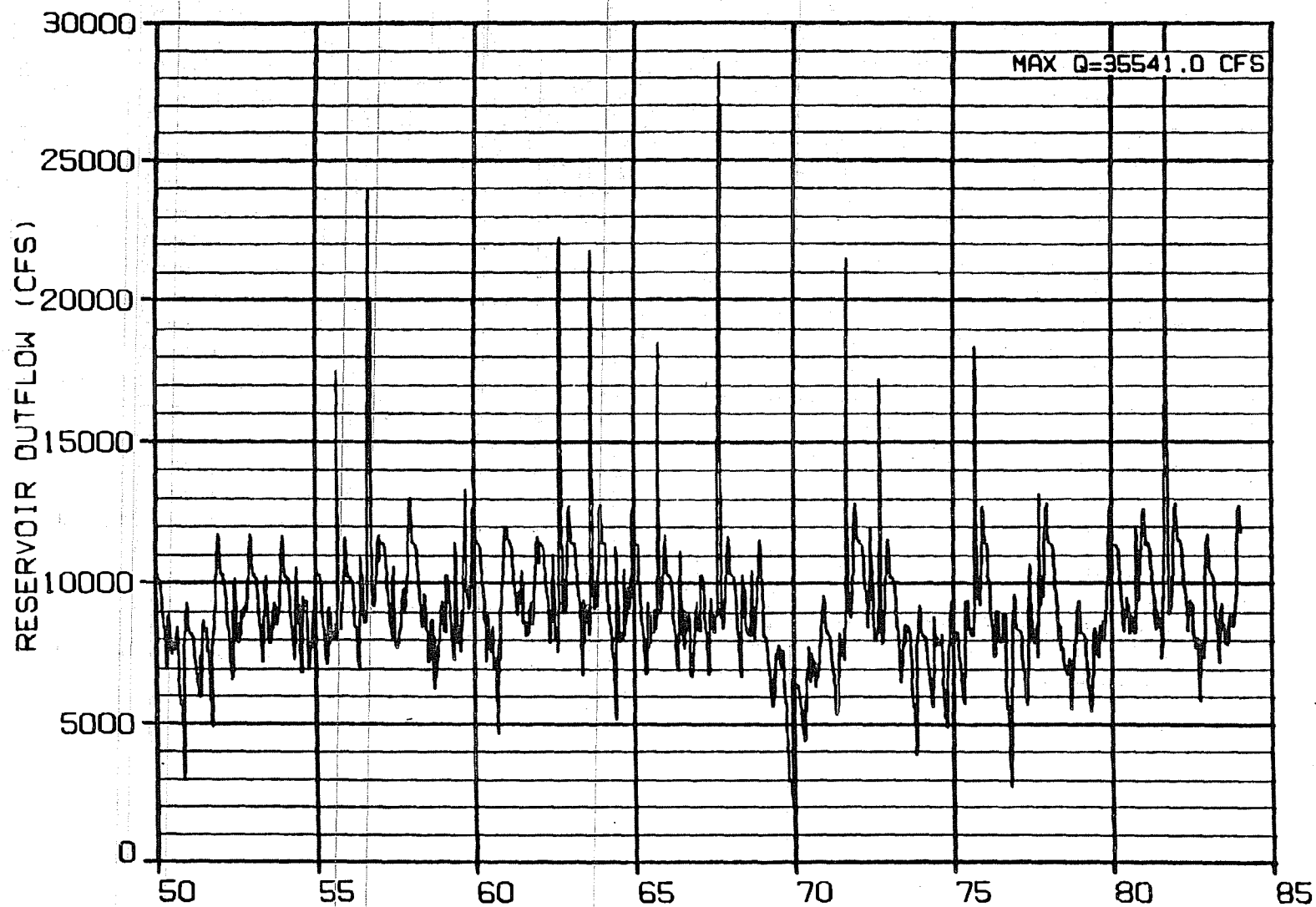


FIGURE E.2.4.203



DEVIL CANYON RESERVOIR OUTFLOW
I ATF STAGE III

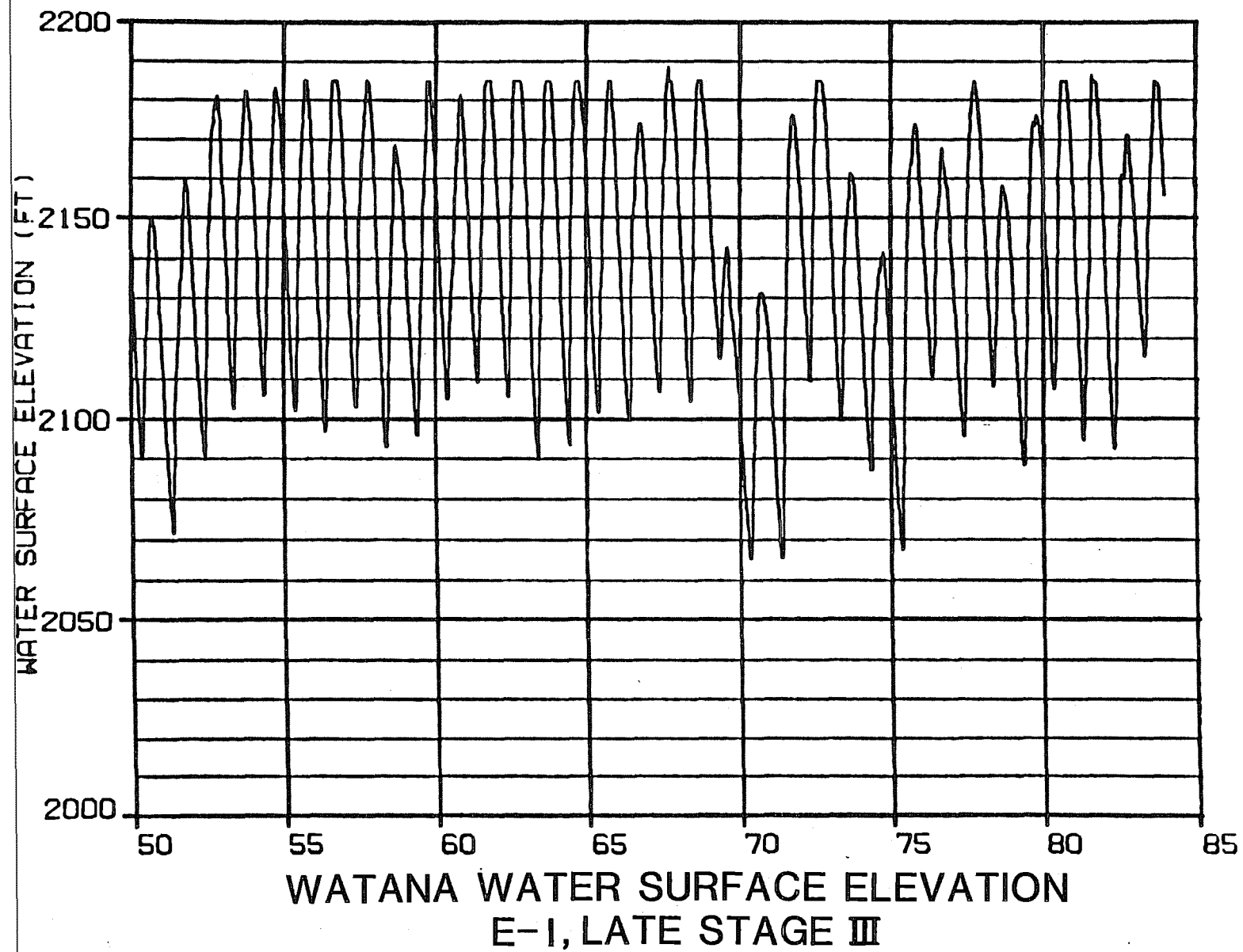
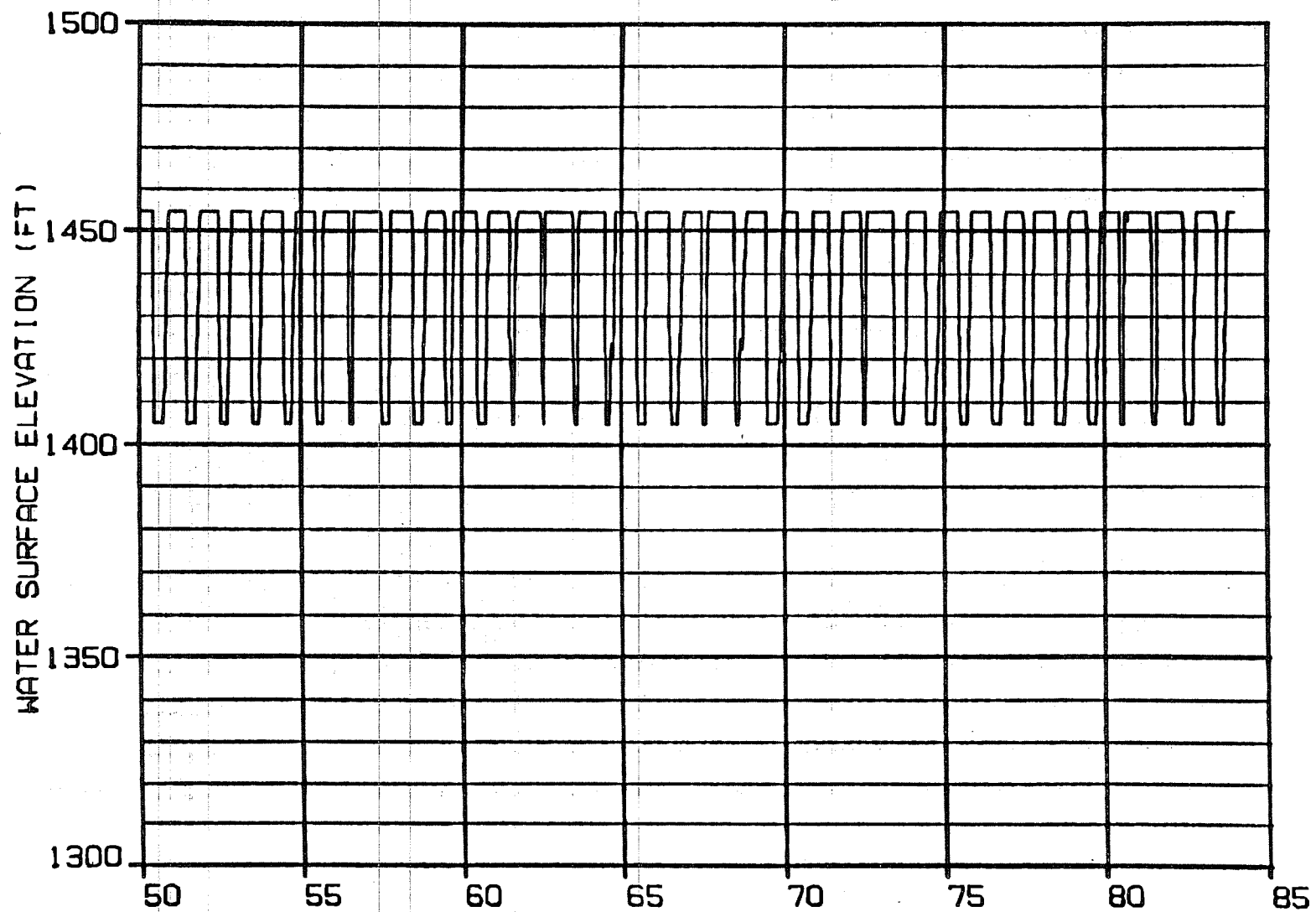
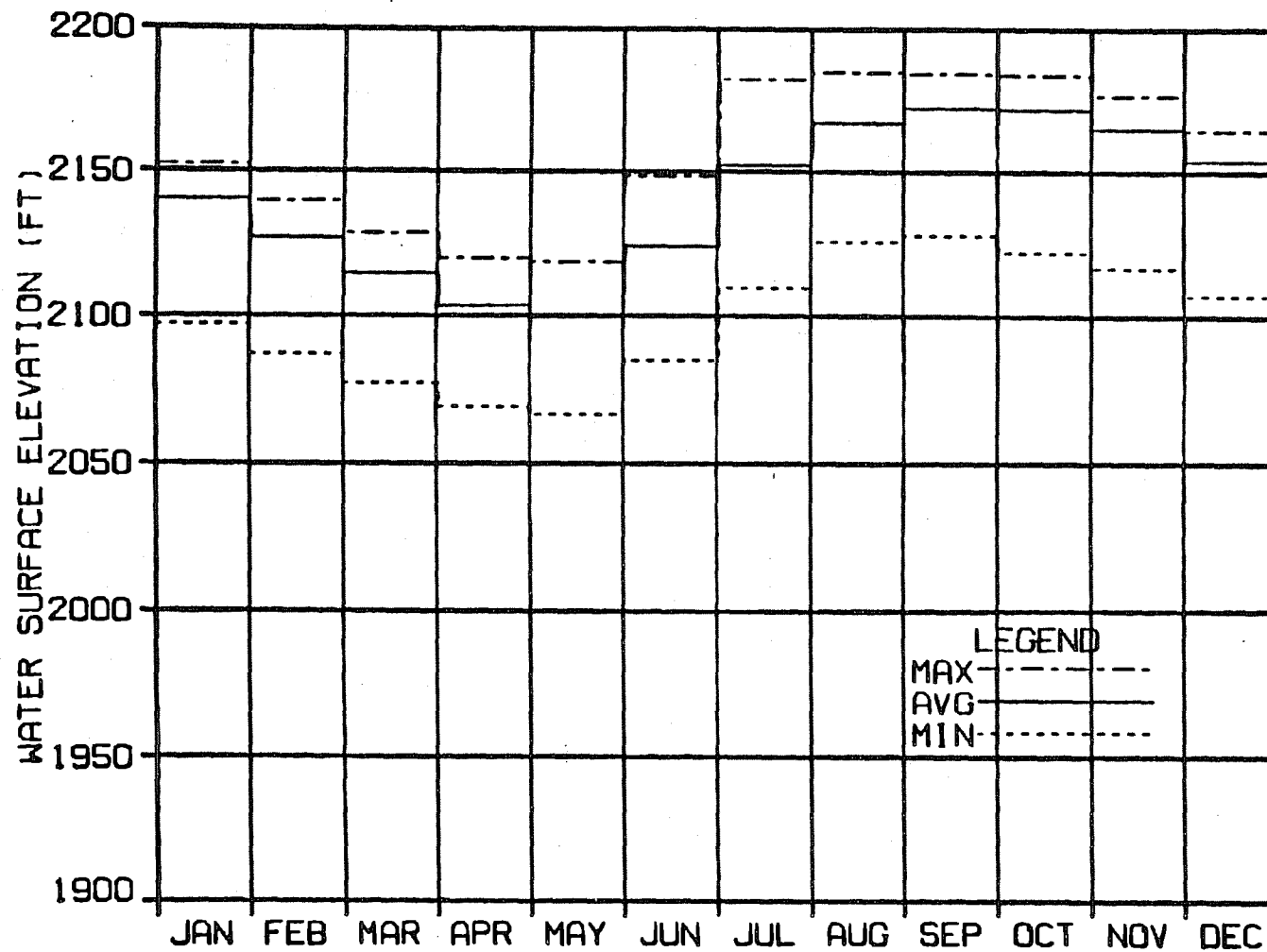


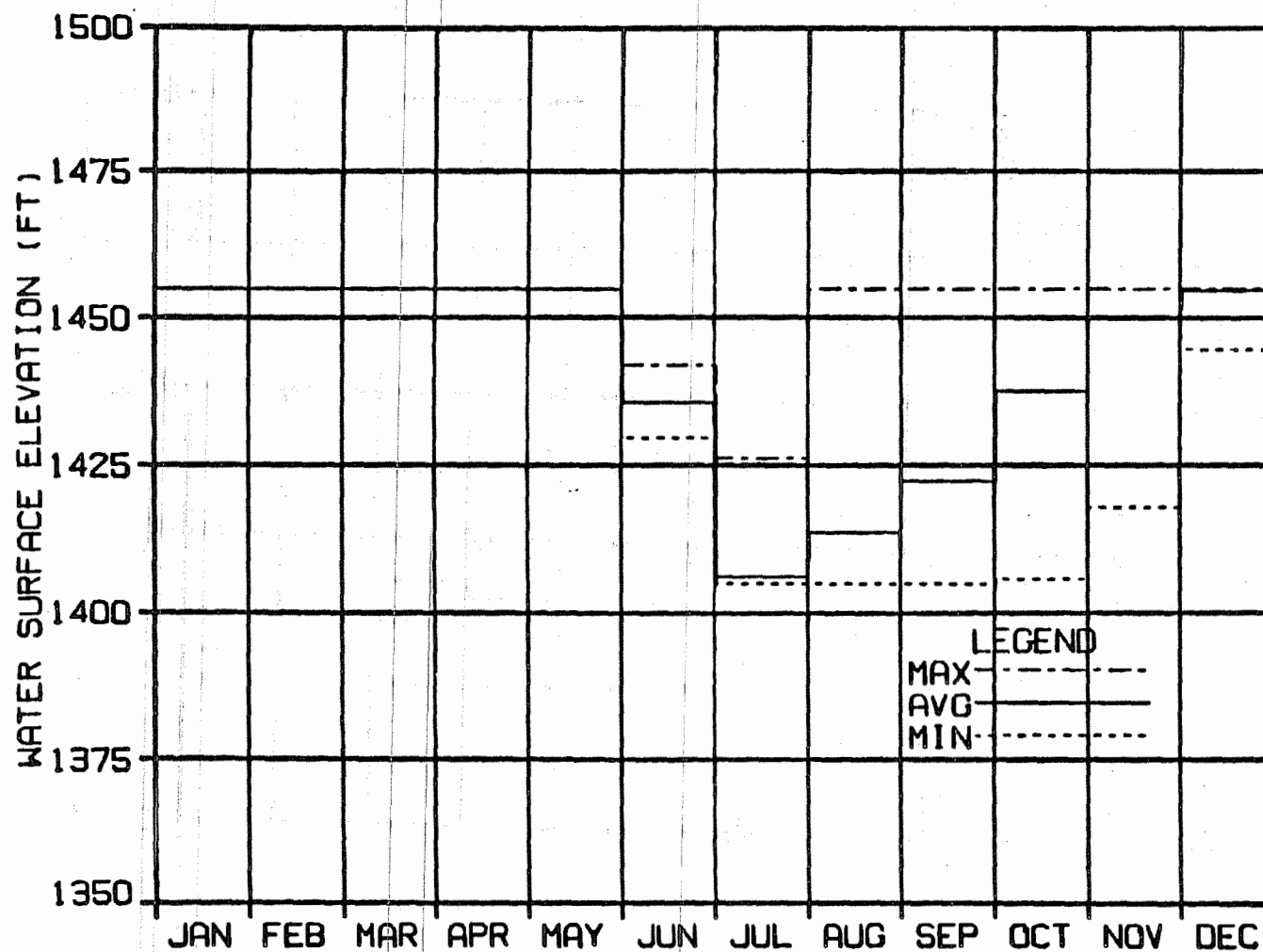
FIGURE E.2.4.205



DEVIL CANYON WATER SURFACE ELEVATION
E-I, LATE STAGE III



WATANA WATER SURFACE ELEVATION
MONTHLY SUMMARY
E-I, LATE STAGE III



DEVIL CANYON WATER SURFACE ELEVATION
MONTHLY SUMMARY
E-I, LATE STAGE III

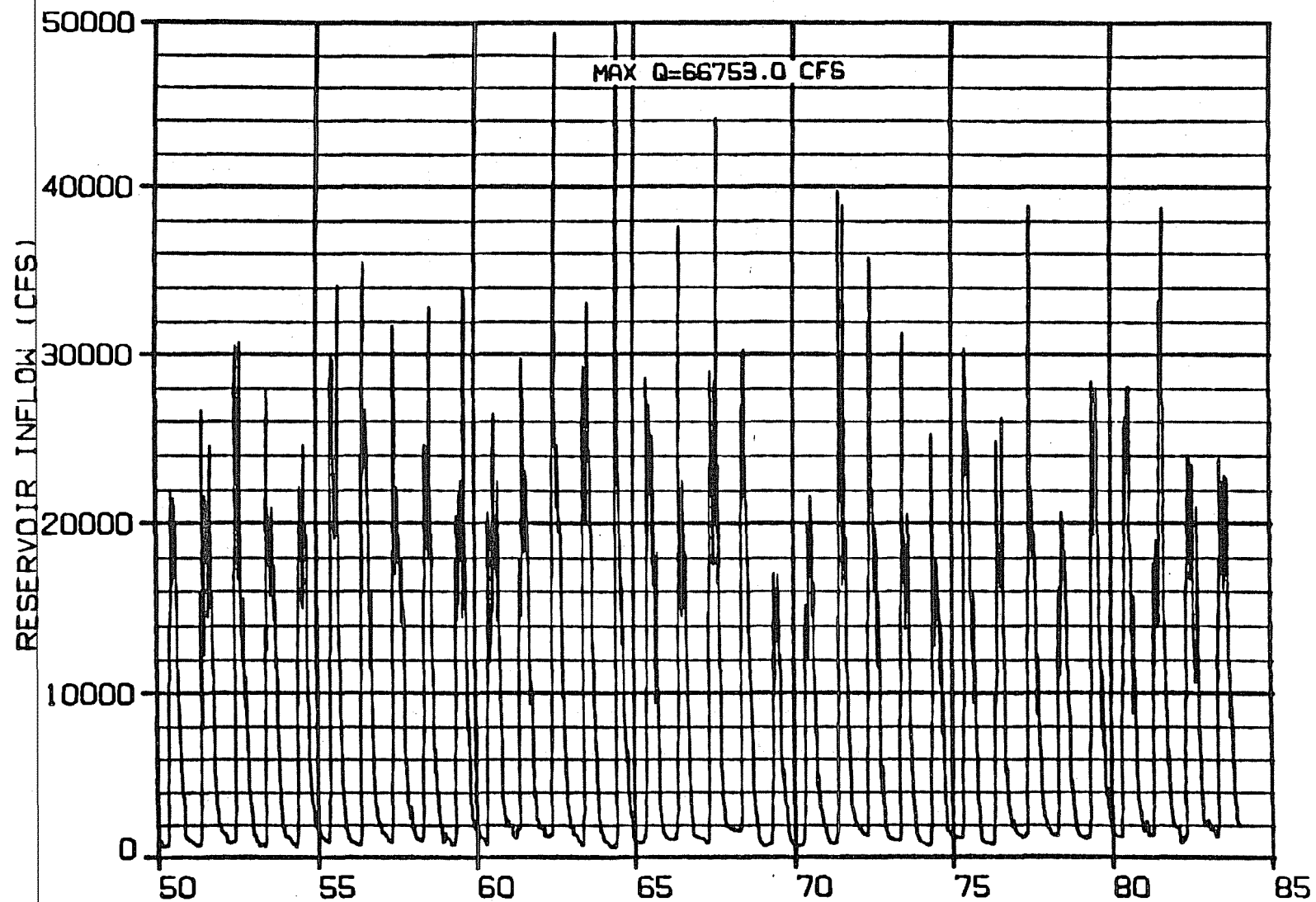
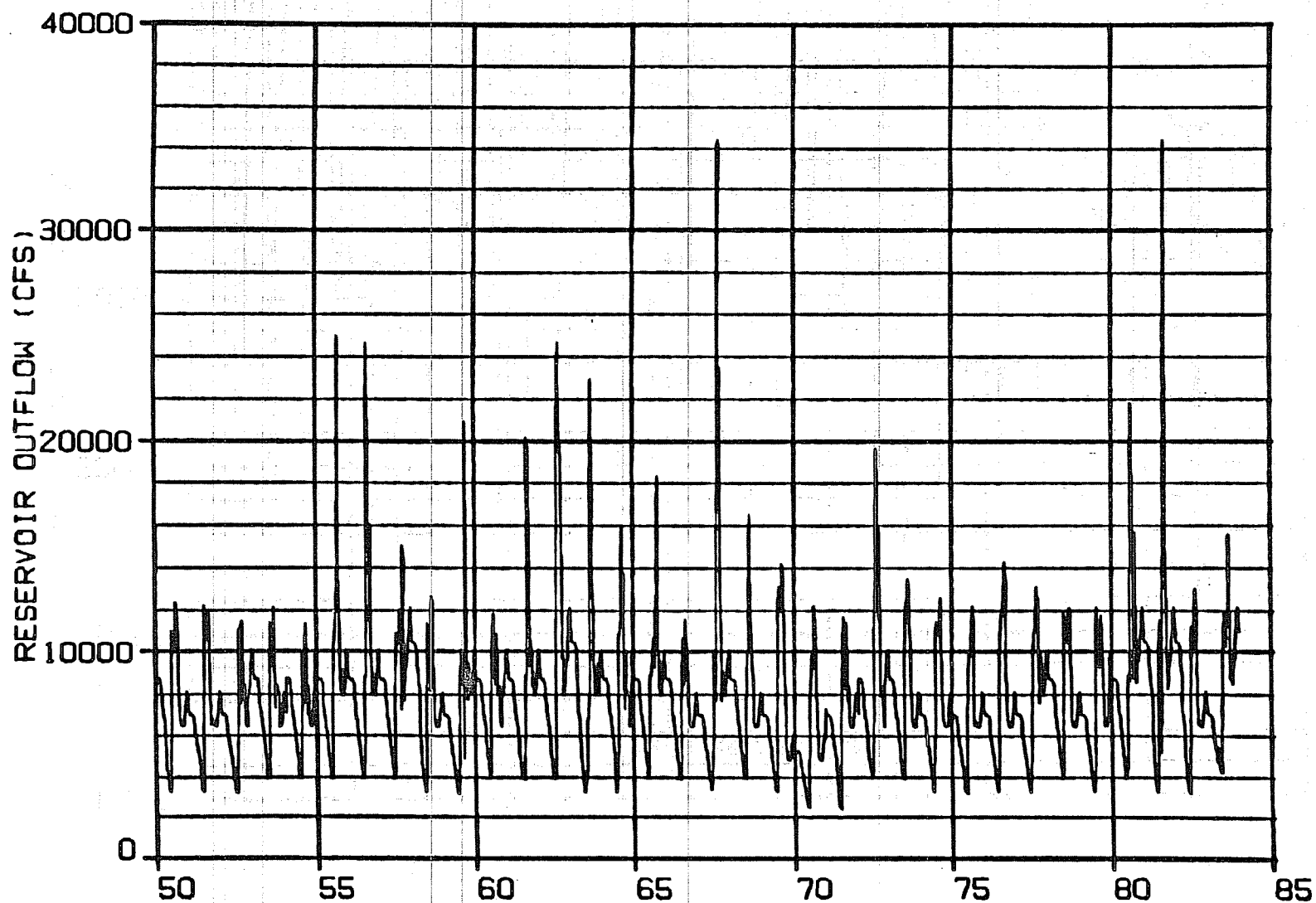


FIGURE E.2.4.209



WATANA RESERVOIR OUTFLOW
E-I, LATE STAGE III

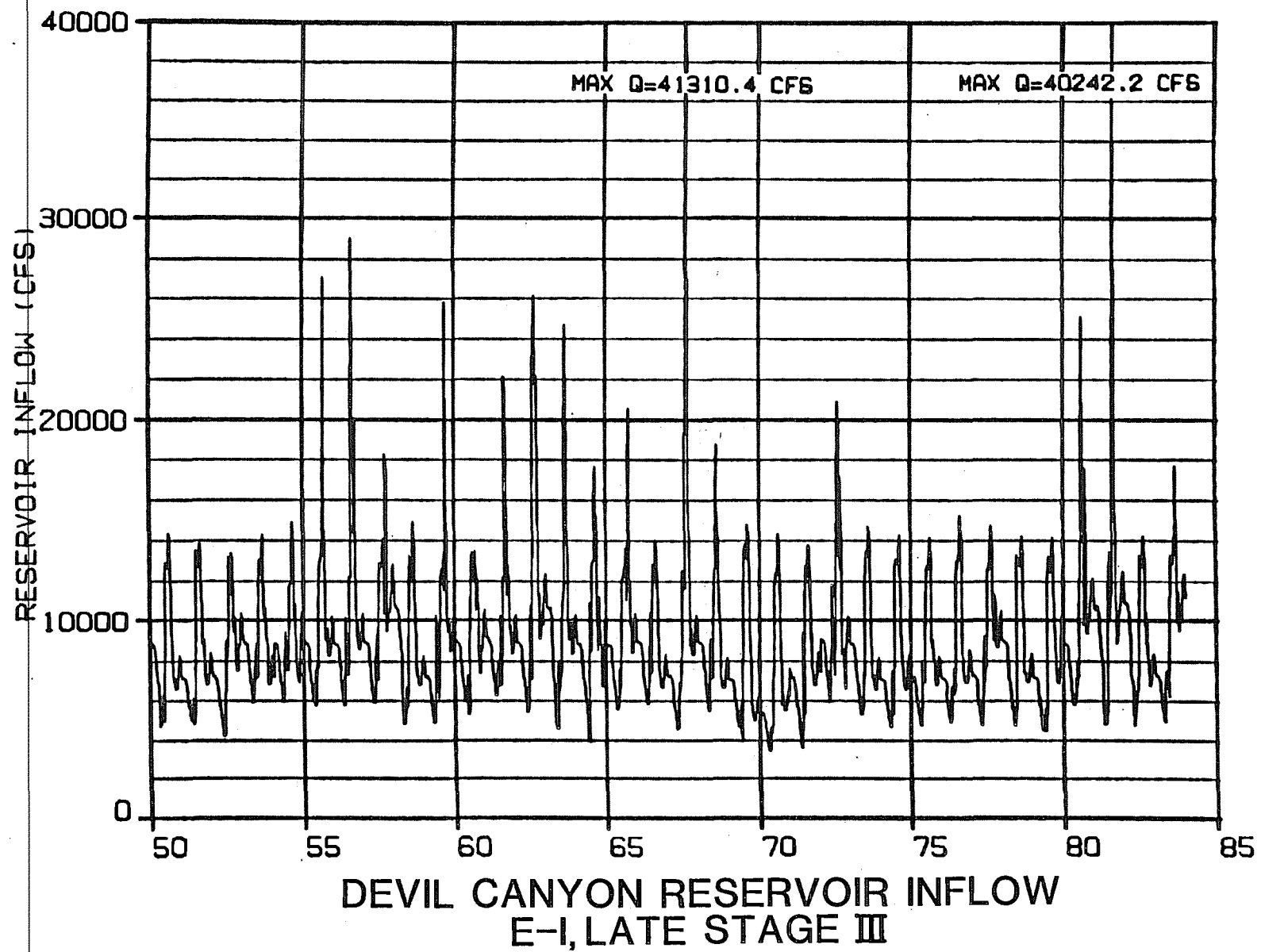
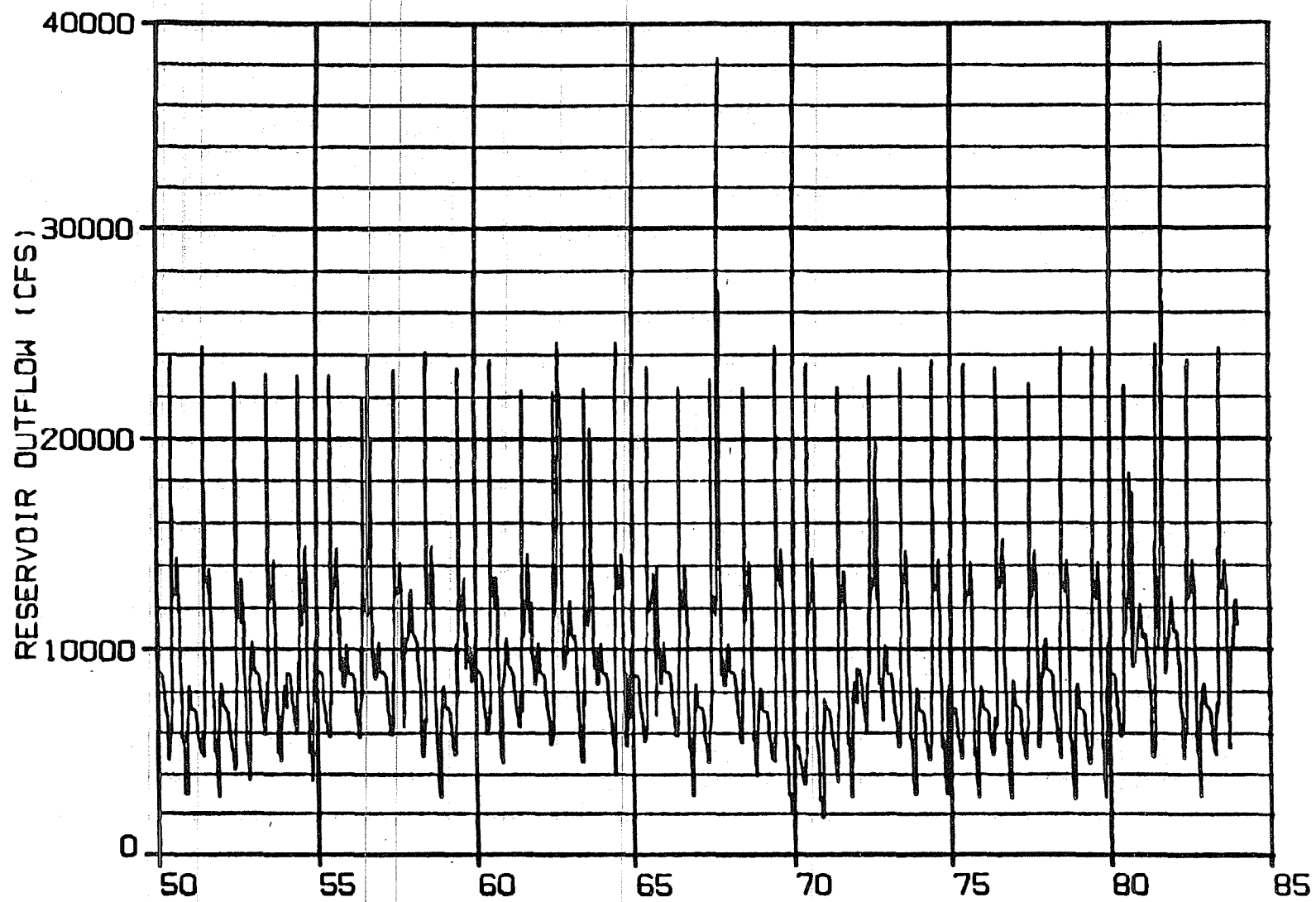


FIGURE E.2.4.211



DEVIL CANYON RESERVOIR OUTFLOW
E-I, LATE STAGE III

DISCHARGE IN CFS

THOUSANDS

80

70

60

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

MONTH

LEGEND

— NATURAL CONDITION

- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT

- - - FLOWS FOR STAGE 3 OF 3-STAGE PROJECT

LINES ARE COINCIDENTAL

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

AVERAGE WEEKLY SUSITNA RIVER

FLOWS AT GOLD CREEK

FOR 1964 HYDROLOGY

LATE STAGE III

E-VI FLOW REQUIREMENTS

HALE & HALE

ANCHORAGE, ALASKA

DATE

BY

DATE

BY

FIGURE E.2.4. 213

DISCHARGE IN CFS

THOUSANDS

60

50

40

30

20

10

0

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

MONTH

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 3 OF 3-STAGE PROJECT

LINES ARE COINCIDENT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER	
FLOWS AT GOLD CREEK	
FOR 1967 HYDROLOGY	
LATE STAGE III	
E-VI FLOW REQUIREMENTS	
DATE: 10/1/78	BY: J. H. HARRIS
APPROVED: J. H. HARRIS	DATE: 10/1/78

FIGURE E.2.4.214

DISCHARGE
IN
CFS

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

MONTH

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 3 OF 3-STAGE PROJECT

LINES ARE COINCIDENT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER	
FLOWS AT GOLD CREEK	
FOR 1970 HYDROLOGY	
LATE STAGE III	
E-VI FLOW REQUIREMENTS	
DATE	BY

FIGURE E.2.4. 215

DISCHARGE IN CFS

THOUSANDS

50

40

30

20

10

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

MONTH

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT

LINES ARE COINCIDENT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER	
FLOWS AT GOLD CREEK	
FOR 1981 HYDROLOGY	
LATE STAGE III	
E-VI FLOW REQUIREMENTS	
DATE: 10/1/81	BY: J. H. HARRIS
PROJECT: 10	FIGURE: 10

FIGURE E.2.4.218

DISCHARGE
IN
CFS

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

MONTH

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT

LINES ARE COINCIDENT

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
AVERAGE WEEKLY SUSITNA RIVER		
FLOWS AT GOLD CREEK		
FOR 1982 HYDROLOGY		
LATE STAGE III		
E-VI FLOW REQUIREMENTS		
DATE: 10/1/82	BY: JWS	REVIEWED BY: JWS
DATE: 10/1/82	BY: JWS	REVIEWED BY: JWS

FIGURE E.2.4. 217

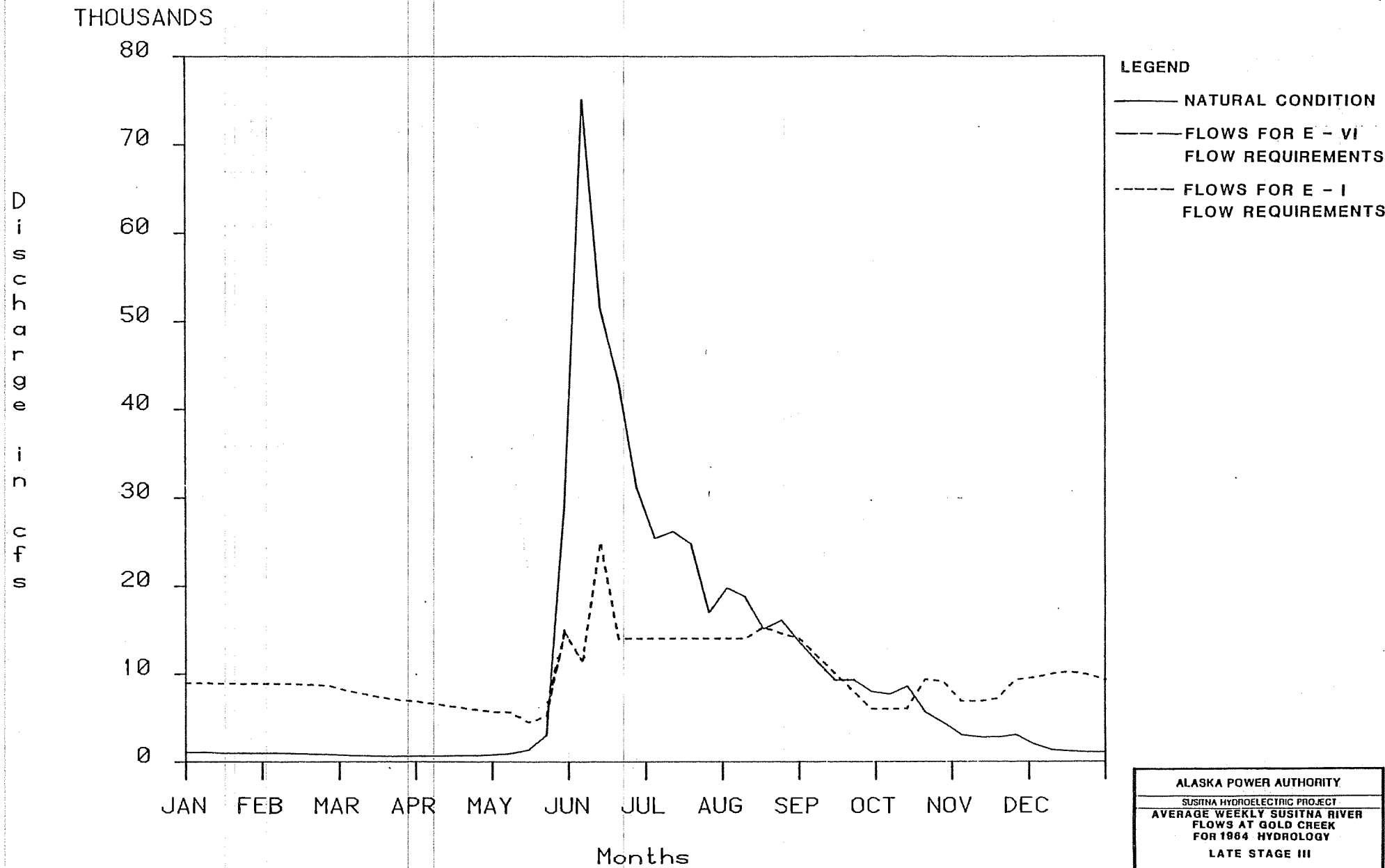
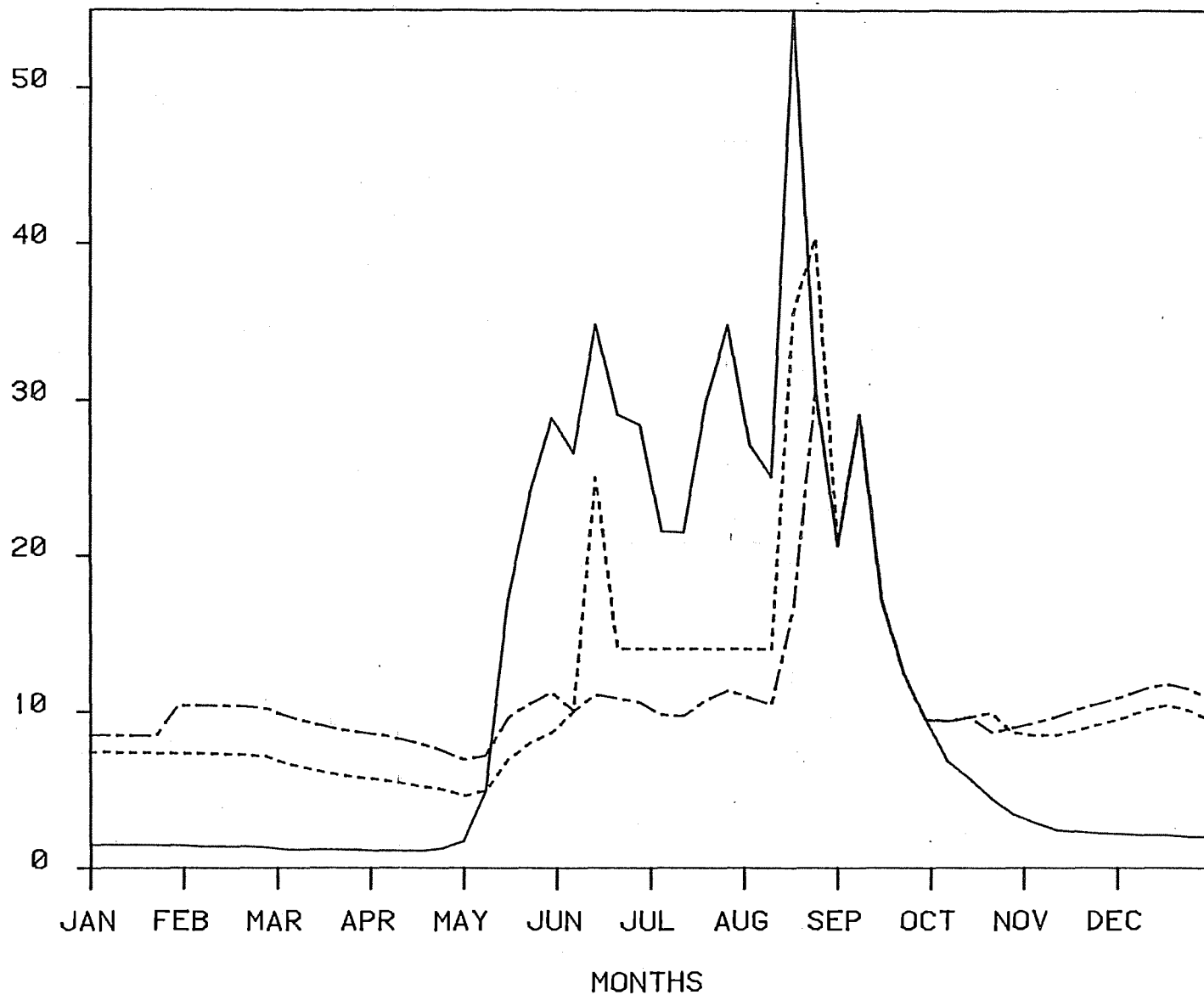


FIGURE E.2.4.218

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER	
FLOWS AT GOLD CREEK	
FOR 1964 HYDROLOGY	
LATE STAGE III	
NAME: HIRAPPOO	DATE: _____
LOCATION: ANCHORAGE, ALASKA	PROJECT NO: _____

DISCHARGE IN CFS

THOUSANDS



LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- · · FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
AVERAGE WEEKLY SUSITNA RIVER		
FLOWS AT GOLD CREEK		
FOR 1987 HYDROLOGY		
LATE STAGE III		
MAKELA-IPADDO SUSITNA RIVER DIVISION	DATE	REVISION NO.

FIGURE E.2.4.219

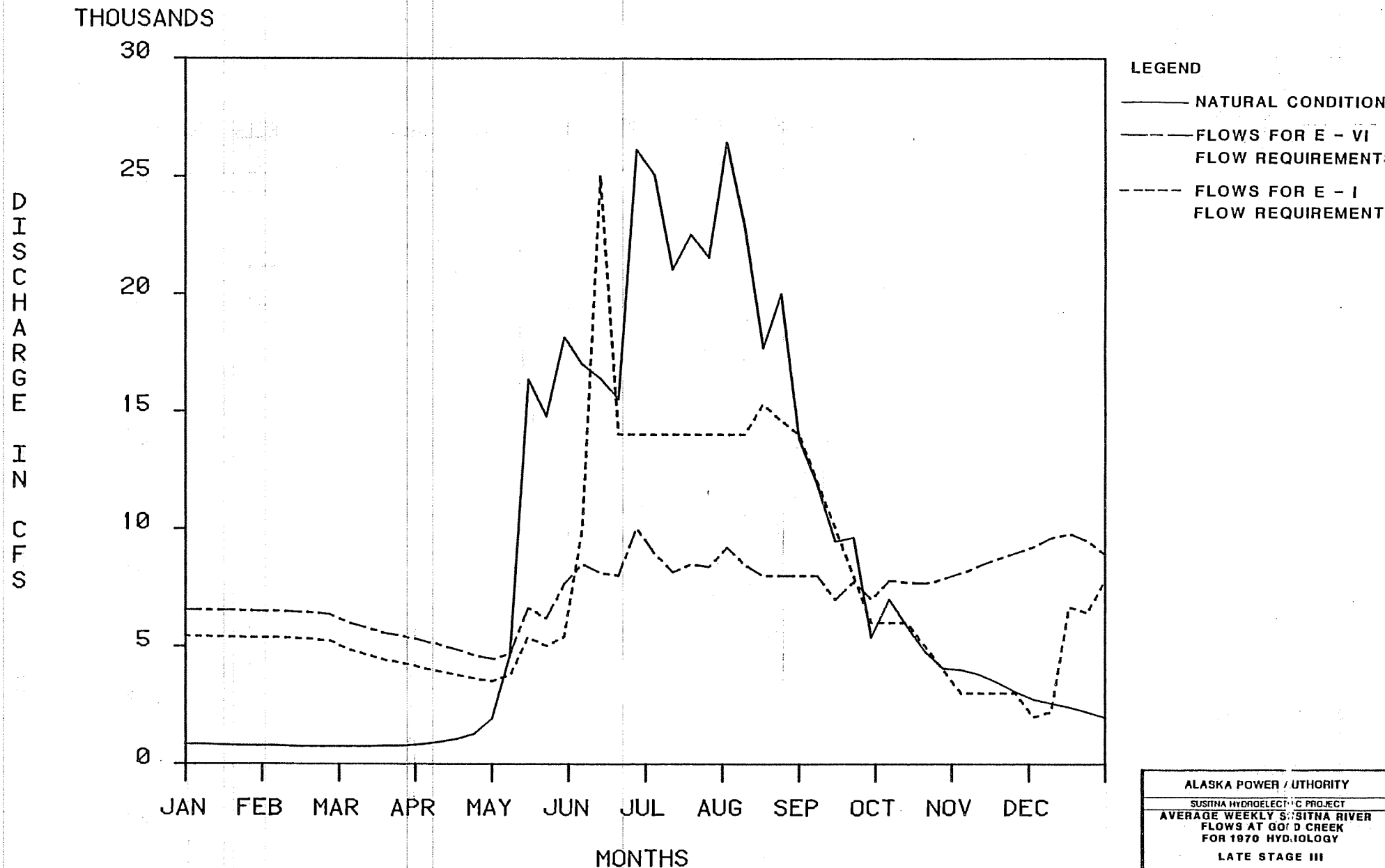


FIGURE E.2.4. 220

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER	
FLOWS AT GOLD CREEK	
FOR 1970 HYDROLOGY	
LATE STAGE III	
HAZEL-GRABO	DATE
MOYNIHAN, ALABE	APPROVED BY

DISCHARGE
IN
CFS

THOUSANDS

50

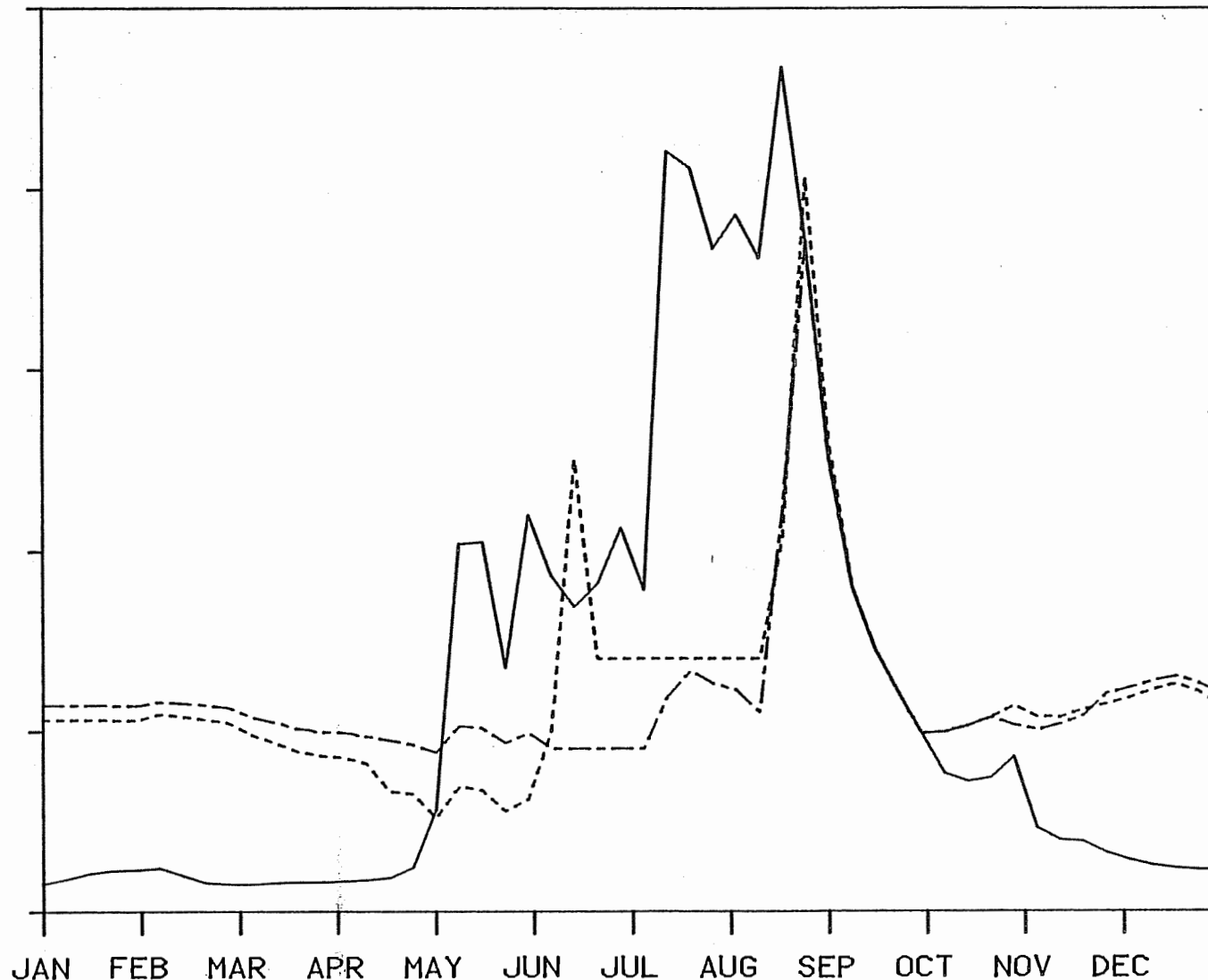
40

30

20

10

0



MONTHS

LEGEND

— NATURAL CONDITION

- - - FLOWS FOR E - VI
FLOW REQUIREMENTS

- - - FLOWS FOR E - I
FLOW REQUIREMENTS

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

AVERAGE WEEKLY SUSITNA RIVER
FLOWS AT GOLD CREEK
FOR 1981 HYDROLOGY

LATE STAGE III

BARRETT-BRANDO Author and Compiler	Approved	Reviewed
MECHANICAL, ALASKA	DATE	DATE

FIGURE E.2.4.221

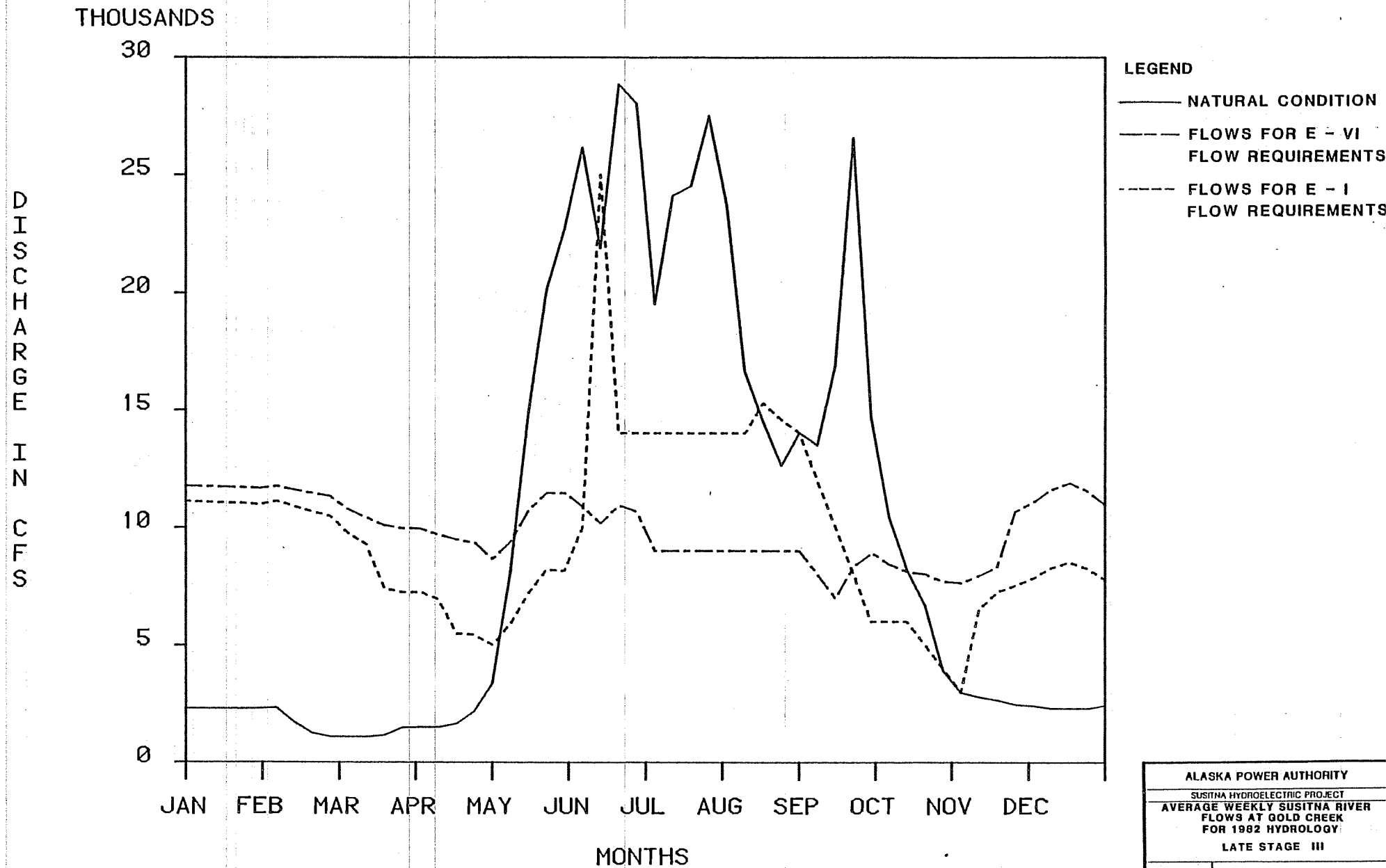
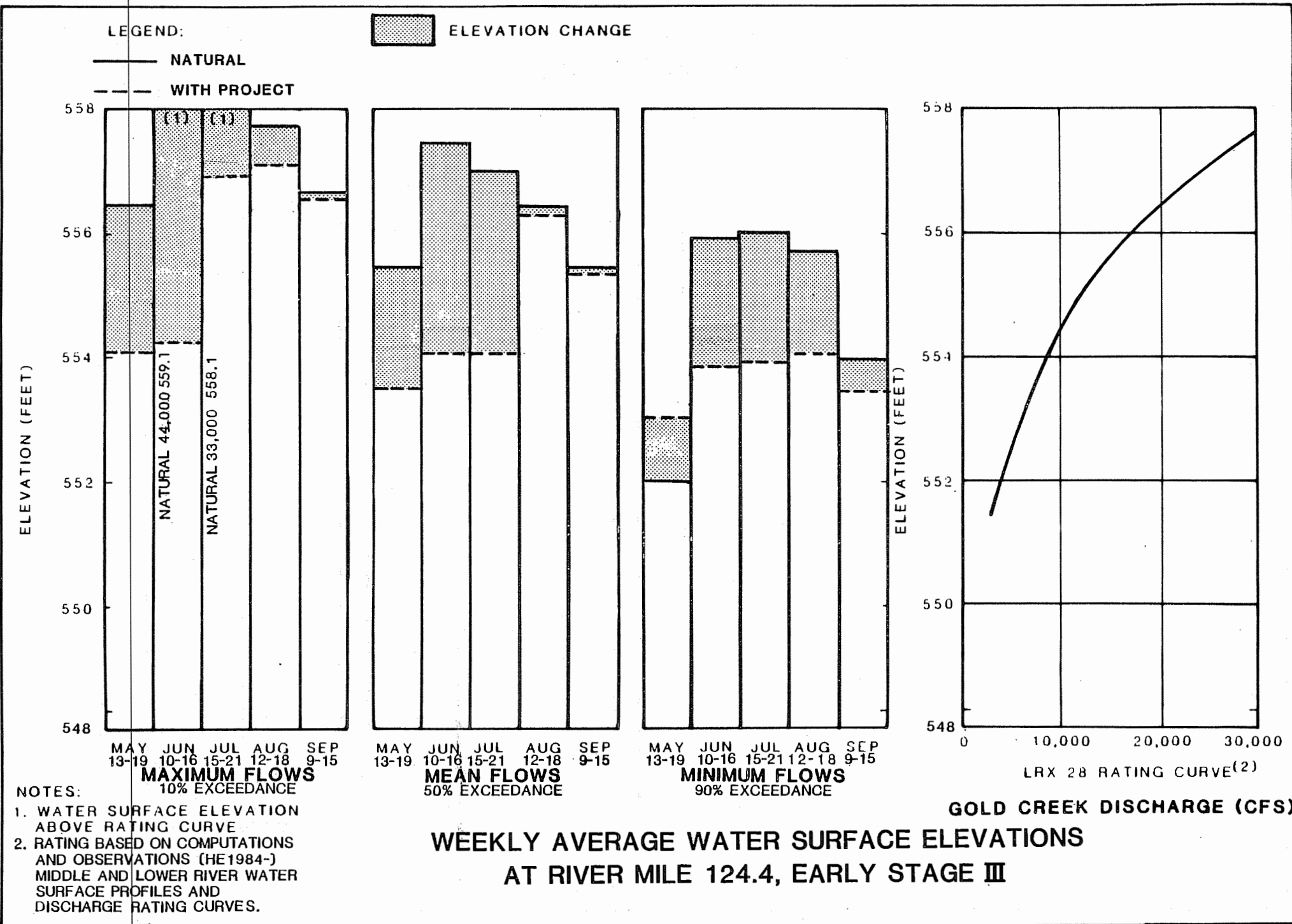


FIGURE E.2.4.222

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
AVERAGE WEEKLY SUSITNA RIVER	
FLOWS AT GOLD CREEK	
FOR 1982 HYDROLOGY	
LATE STAGE III	
DATE	APPROVED BY
DATE	APPROVED BY



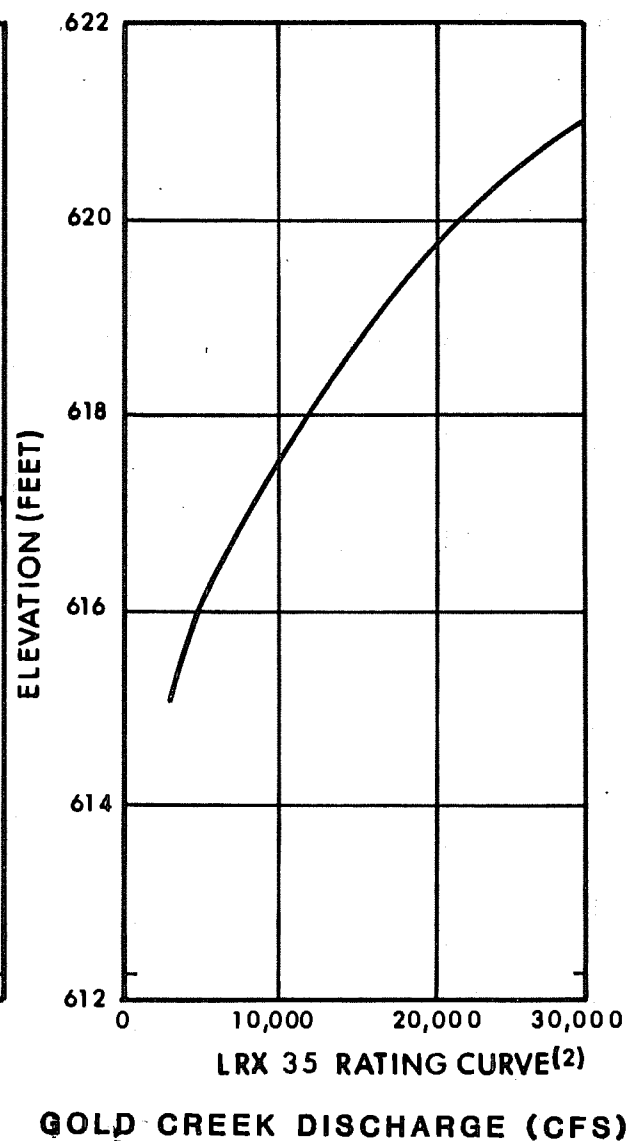
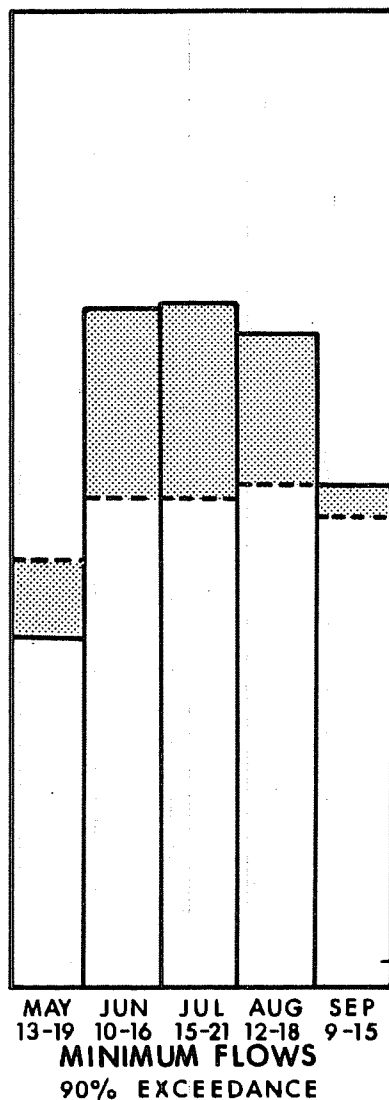
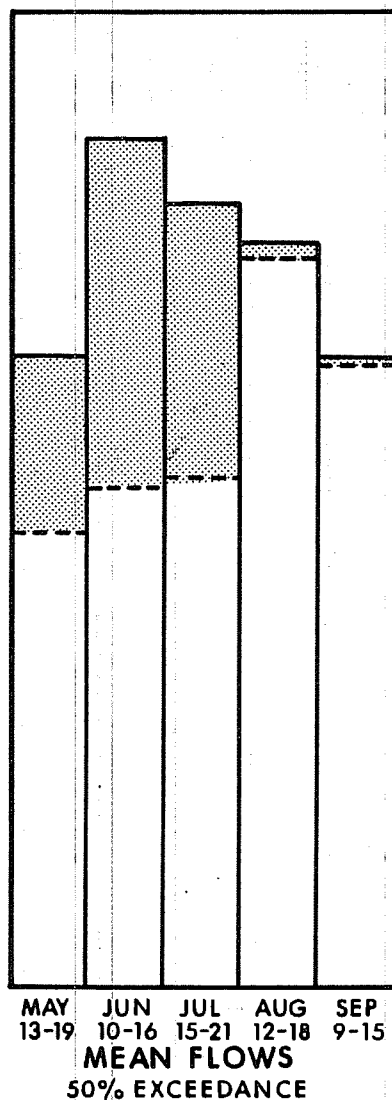
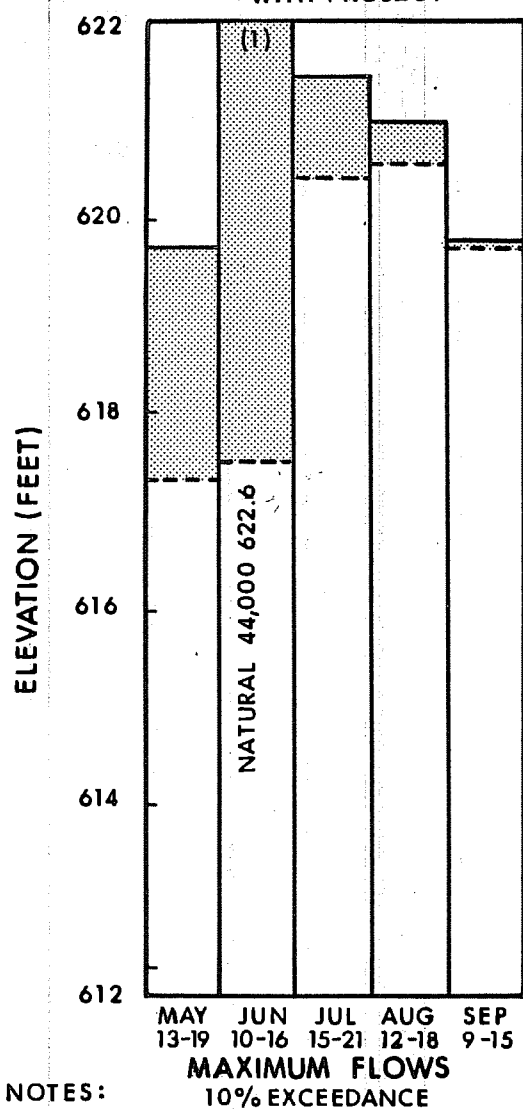
**WEEKLY AVERAGE WATER SURFACE ELEVATIONS
 AT RIVER MILE 124.4, EARLY STAGE III**

NOTES:
 1. WATER SURFACE ELEVATION ABOVE RATING CURVE
 2. RATING BASED ON COMPUTATIONS AND OBSERVATIONS (HE1984-) MIDDLE AND LOWER RIVER WATER SURFACE PROFILES AND DISCHARGE RATING CURVES.

LEGEND:

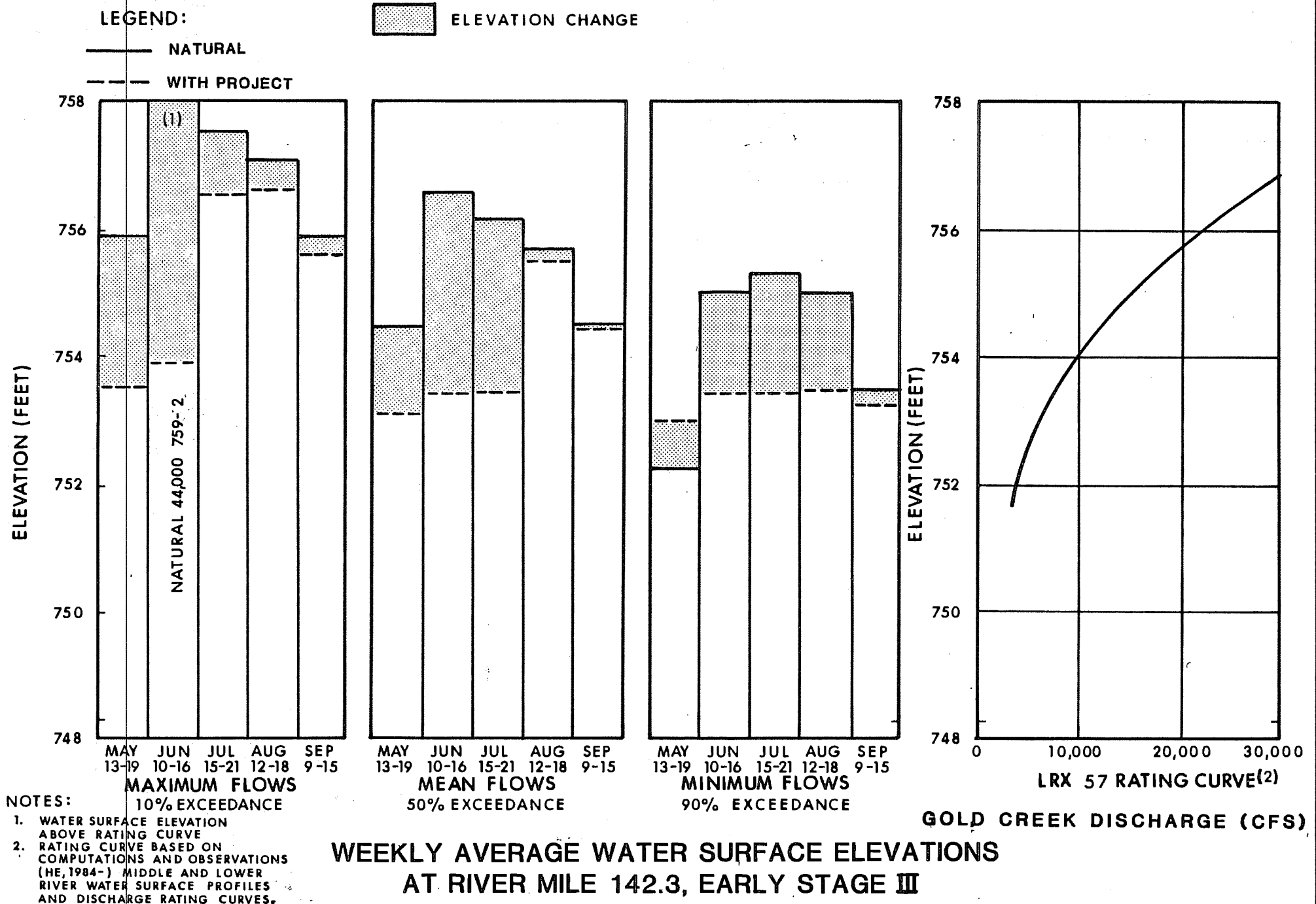
— NATURAL
 - - - WITH PROJECT

 ELEVATION CHANGE



- NOTES:**
1. WATER SURFACE ELEVATION ABOVE RATING CURVE
 2. RATING CURVE BASED ON COMPUTATIONS AND OBSERVATIONS (HE, 1984-) MIDDLE AND LOWER RIVER WATER SURFACE PROFILES AND DISCHARGE RATING CURVES.

**WEEKLY AVERAGE WATER SURFACE ELEVATIONS
 AT RIVER MILE 130.9, EARLY STAGE III**



**WEEKLY AVERAGE WATER SURFACE ELEVATIONS
 AT RIVER MILE 142.3, EARLY STAGE III**

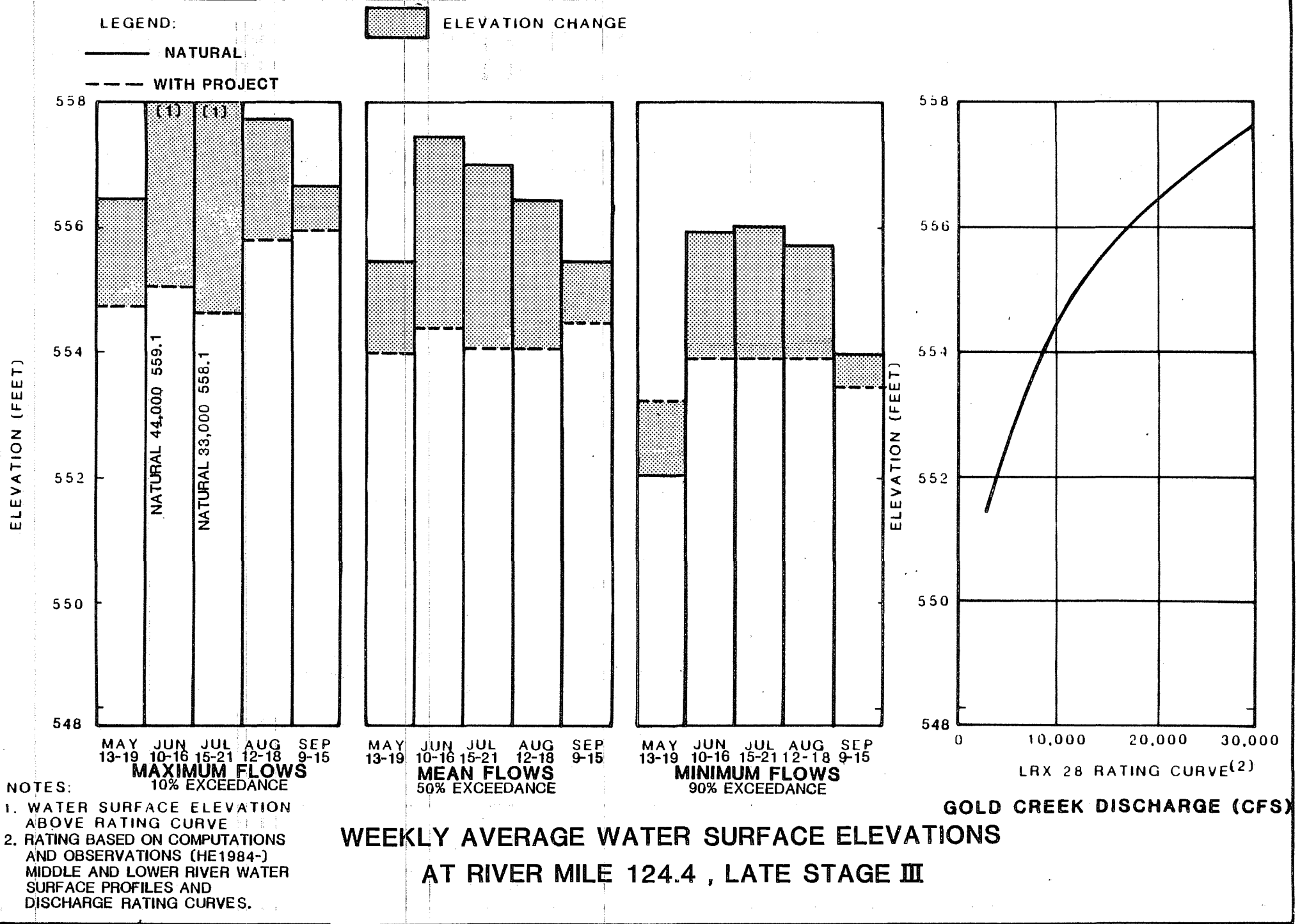
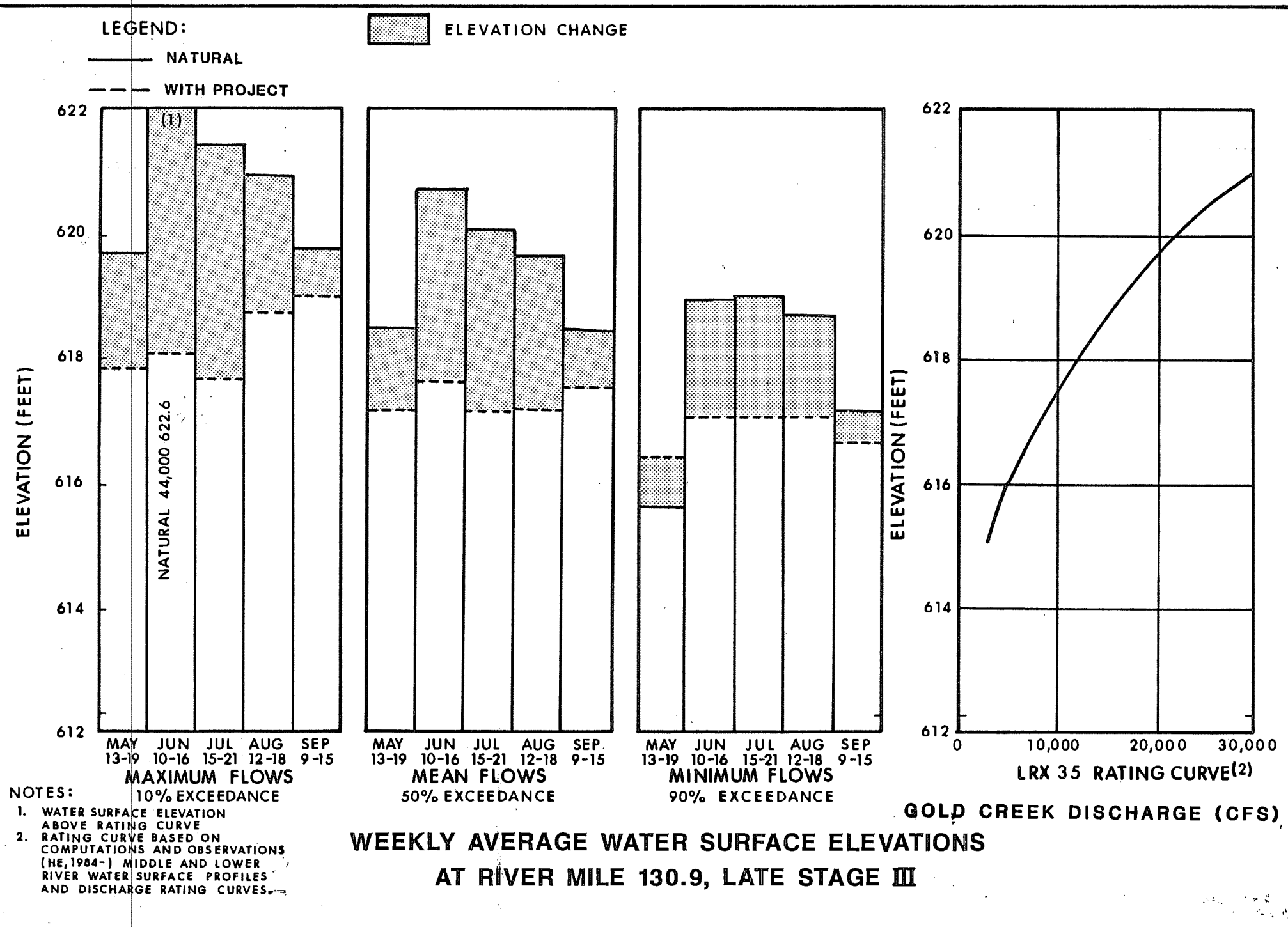


FIGURE E.2.4.226

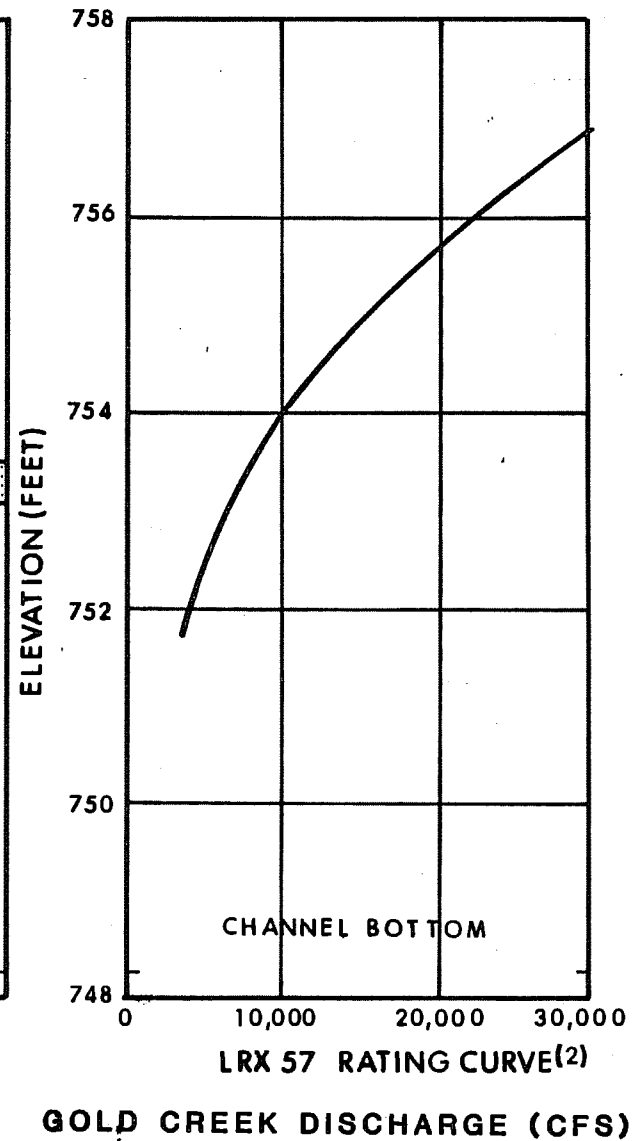
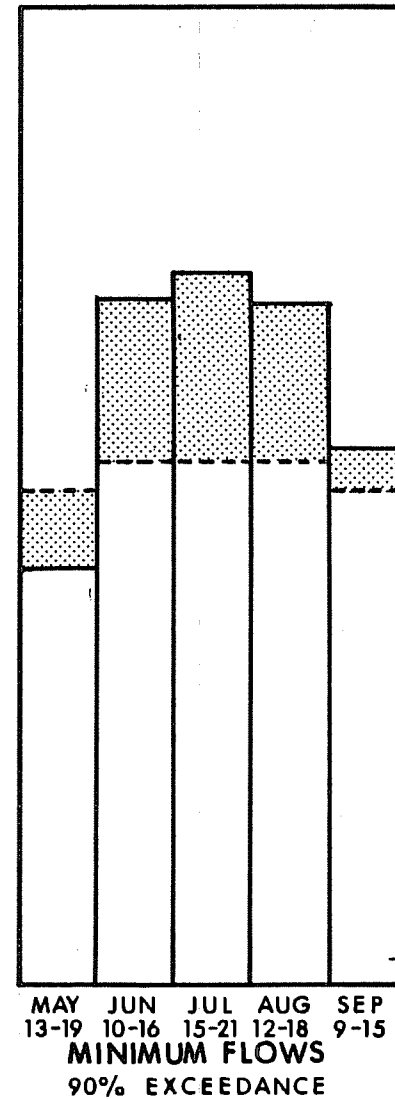
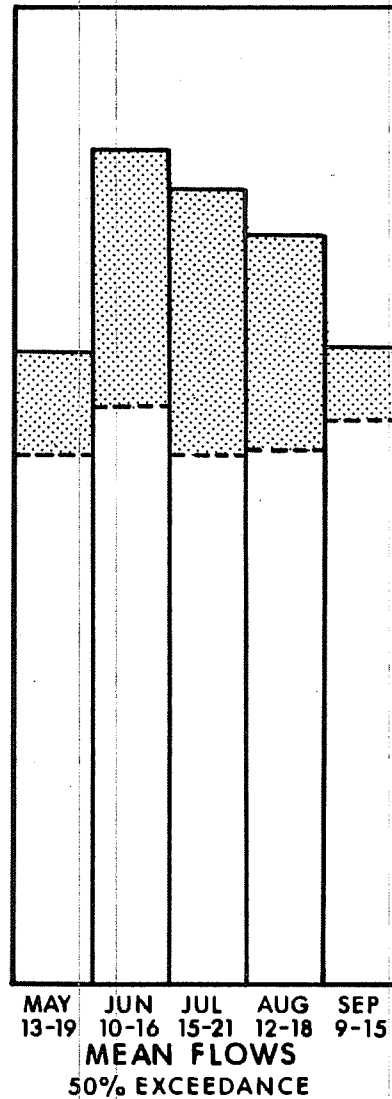
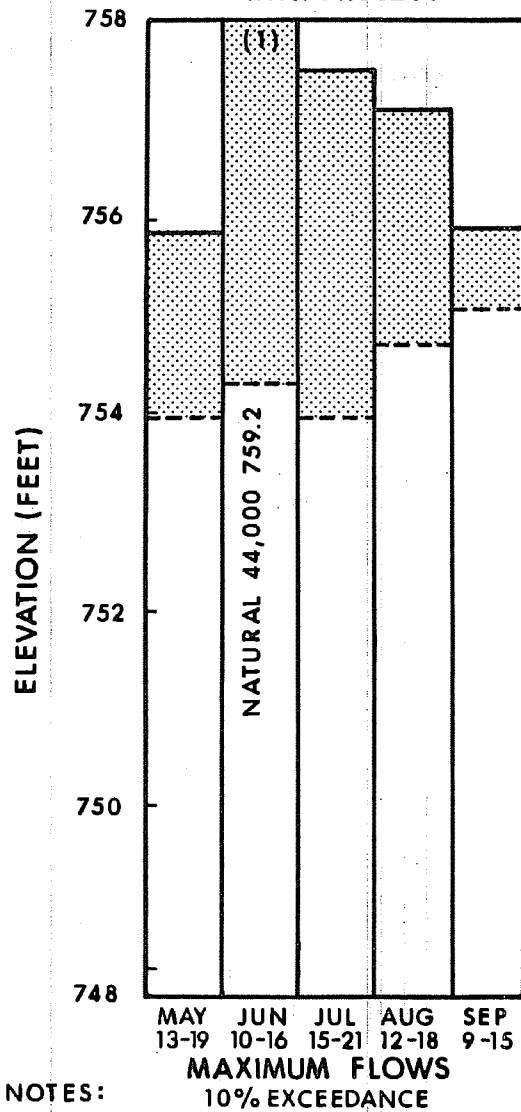


**WEEKLY AVERAGE WATER SURFACE ELEVATIONS
AT RIVER MILE 130.9, LATE STAGE III**

LEGEND:

— NATURAL
 - - - WITH PROJECT

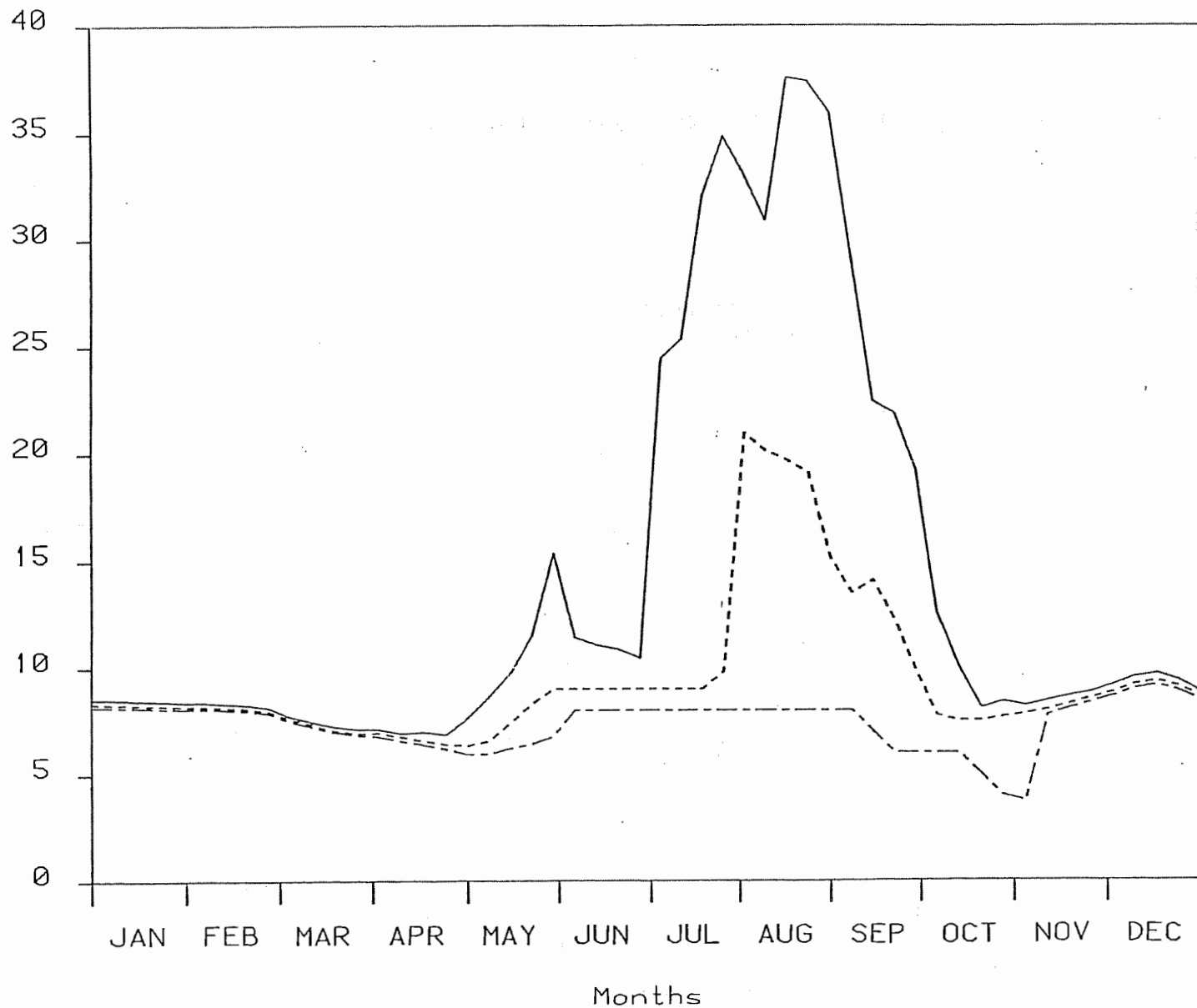
 ELEVATION CHANGE



- NOTES:**
1. WATER SURFACE ELEVATION ABOVE RATING CURVE
 2. RATING CURVE BASED ON COMPUTATIONS AND OBSERVATIONS (HE, 1984-) MIDDLE AND LOWER RIVER WATER SURFACE PROFILES AND DISCHARGE RATING CURVES.

**WEEKLY AVERAGE WATER SURFACE ELEVATIONS
 AT RIVER MILE 142.3, LATE STAGE III**

Discharge in cfs



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS

LEGEND

- 6% EXCEEDENCE FLOWS
- - - 50% EXCEEDENCE FLOW
- ... 97% EXCEEDENCE FLOW

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK EARLY STAGE III	
DATE: 10/1/83	BY: J. L. BROWN
REVISION: 1	DATE: 10/1/83

FIGURE E.2.4.229

Discharge in cfs

THOUSANDS

25

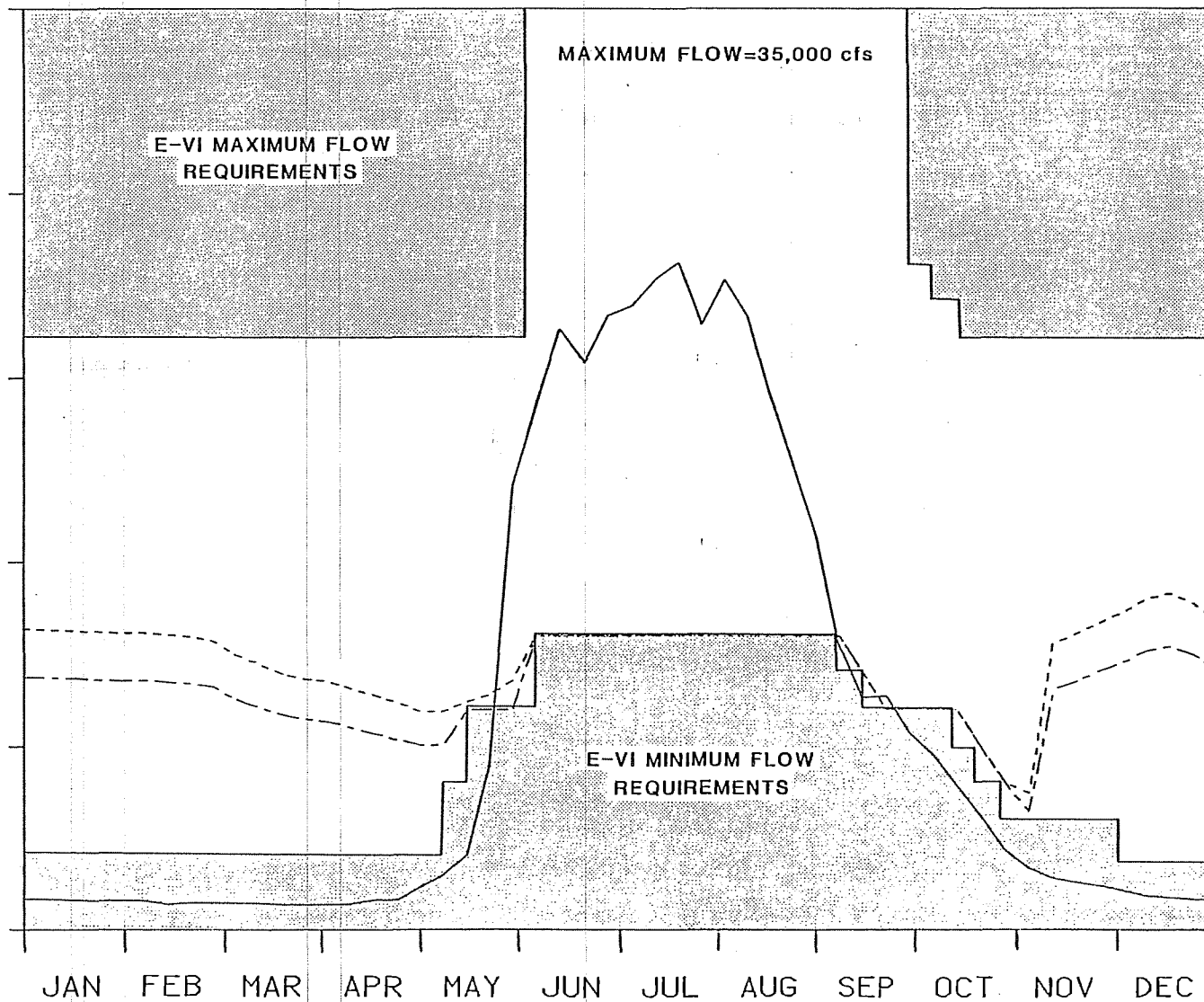
20

15

10

5

0



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENT
5. PHASE 2 OF 2-STAGE PROJECT IS EQUIVALENT TO STAGE 3 OF 3-STAGE PROJECT

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 3 OF 3-STAGE PROJECT

COMPARISON INDICATES FLOWS FOR EARLY STAGE II ARE MORE STABLE THAN FOR EARLY PHASE II BECAUSE EARLY STAGE III ENERGY PRODUCTION IS HIGHER THAN FOR EARLY PHASE II

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUSITNA RIVER STREAMFLOWS

EXCEEDED

97% OF THE TIME EARLY STAGE III AT GOLD CREEK

DATE		
BY		
REVISION		

FIGURE E.2.4.230

Discharge in cfs

THOUSANDS

30

25

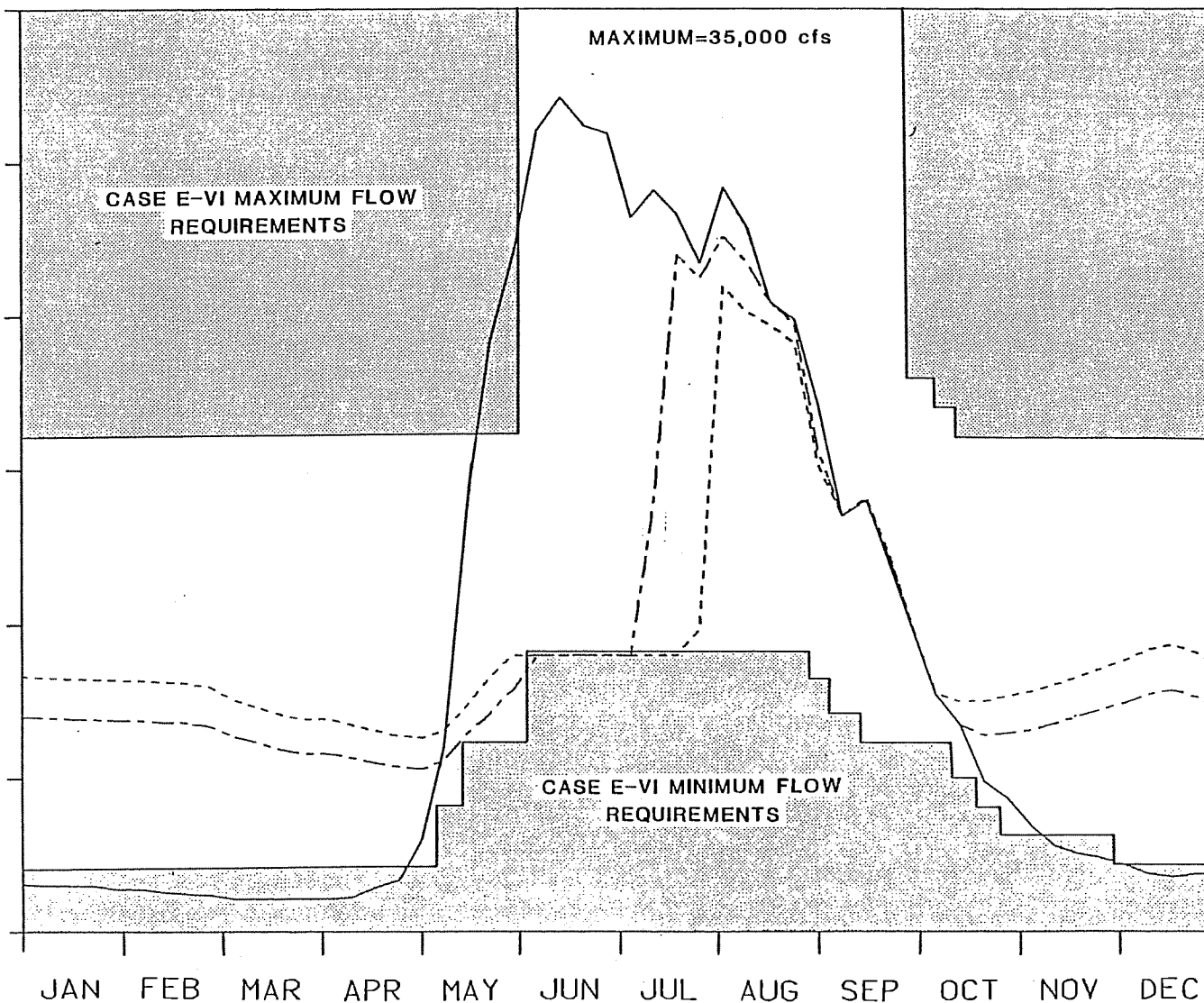
20

15

10

5

0



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS
5. PHASE 2 OF 2-STAGE PROJECT IS EQUIVALENT TO STAGE 3 OF 3-STAGE PROJECT

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 3 OF 3-STAGE PROJECT

COMPARISON INDICATES FLOWS FOR EARLY STAGE III ARE MORE STABLE THAN FOR EARLY PHASE II BECAUSE EARLY STAGE III ENERGY PRODUCTION IS HIGHER THAN FOR EARLY PHASE II

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 50% OF THE TIME EARLY STAGE III AT GOLD CREEK	
DATE: 10/1/83	BY: J. L. BROWN

FIGURE E.2.4.231

Months

THOUSANDS

60

50

40

30

20

10

0

CASE E-VI MAXIMUM FLOW REQUIREMENTS

CASE E-VI MINIMUM FLOW REQUIREMENTS

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Month

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENT
5. PHASE 2 OF 2-STAGE PROJECT IS EQUIVALENT TO STAGE 3 OF 3-STAGE PROJECT

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 3 OF 3-STAGE PROJECT

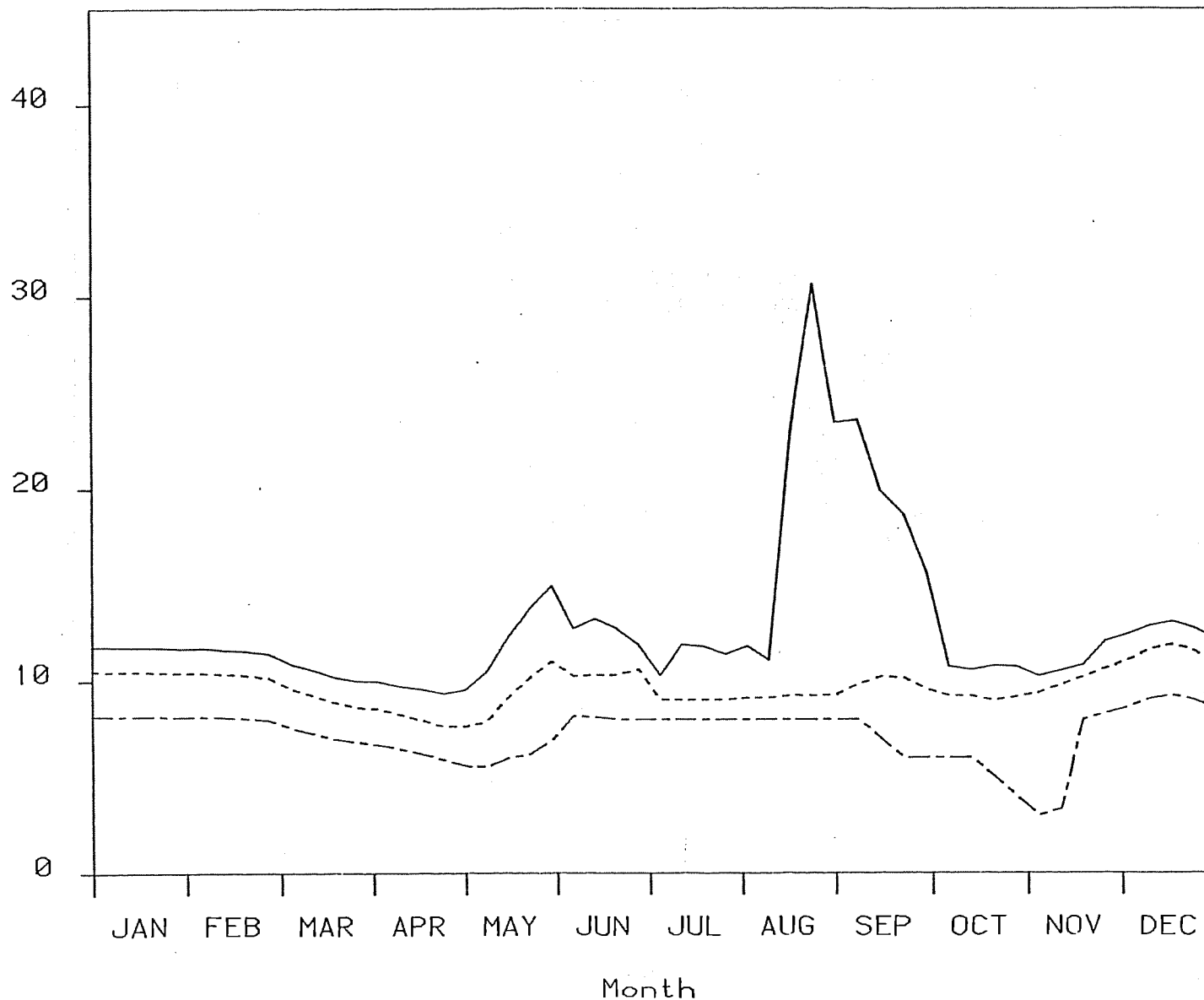
COMPARISON INDICATES FLOWS FOR EARLY STAGE II ARE MORE STABLE THAN FOR EARLY PHASE II BECAUSE EARLY STAGE III ENERGY PRODUCTION IS HIGHER THAN FOR EARLY PHASE II

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS	
EXCEEDED	
6% OF THE TIME EARLY STAGE III	
AT GOLD CREEK	
DATE: 1983-08-01	BY: J. E. BROWN
PROJECT: SUSITNA	FIGURE NO. E-2.4.232

FIGURE E.2.4.232

THOUSANDS

Discharge in cfs



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS

LEGEND

- 6% EXCEEDENCE FLOWS
- - - 50% EXCEEDENCE FLOWS
- . - 97% EXCEEDENCE FLOWS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK LATE STAGE III	
DATE: 10/1/83	BY: J. H. HARRIS
APPROVED: 10/1/83	BY: J. H. HARRIS

FIGURE E.2.4.233

Discharge in cfs

THOUSANDS

25

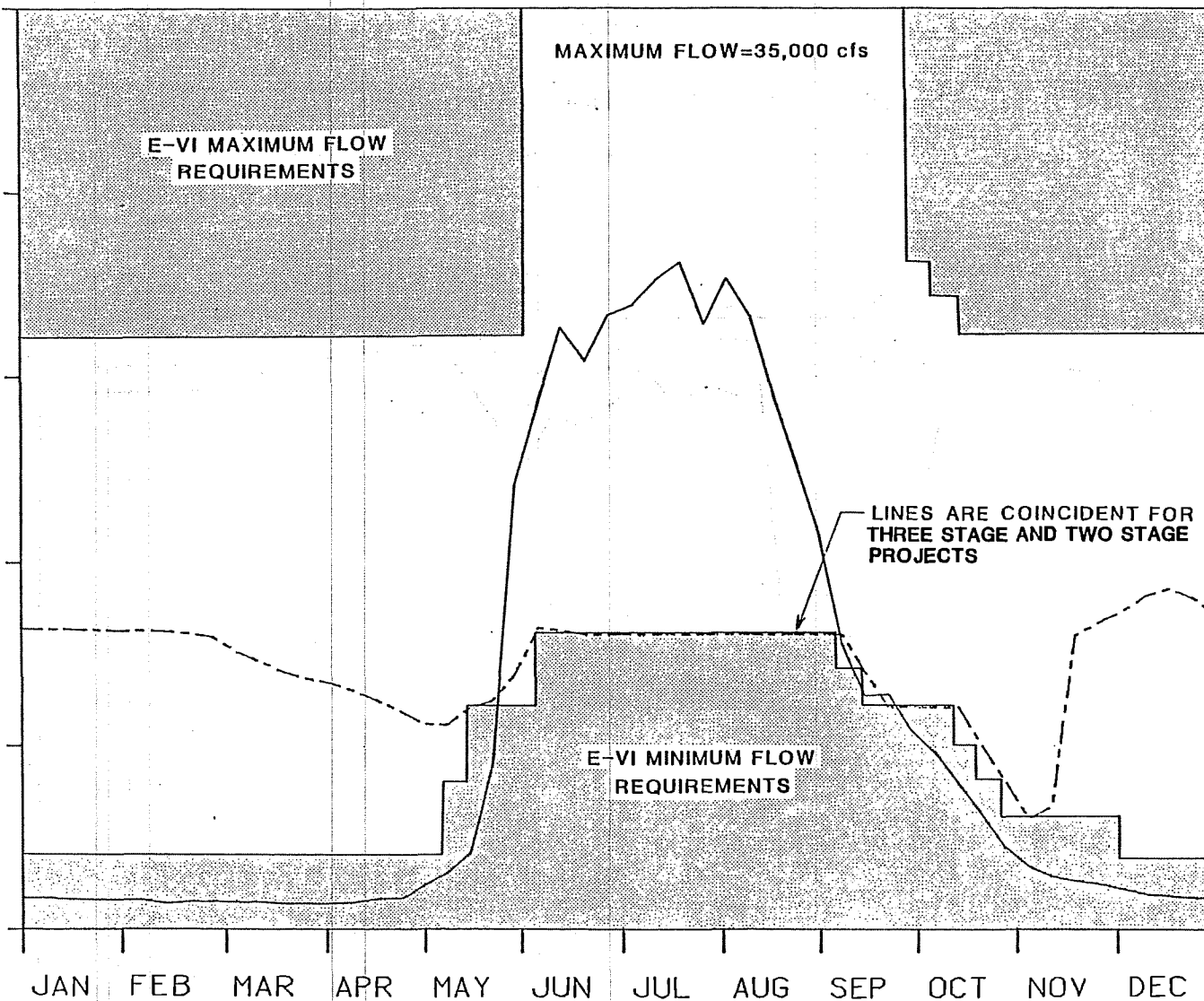
20

15

10

5

0



MAXIMUM FLOW=35,000 cfs

E-VI MAXIMUM FLOW REQUIREMENTS

E-VI MINIMUM FLOW REQUIREMENTS

LINES ARE COINCIDENT FOR THREE STAGE AND TWO STAGE PROJECTS

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS
5. PHASE 2 OF 2-STAGE PROJECT IS EQUIVALENT TO STAGE 3 OF 3-STAGE PROJECT

LEGEND

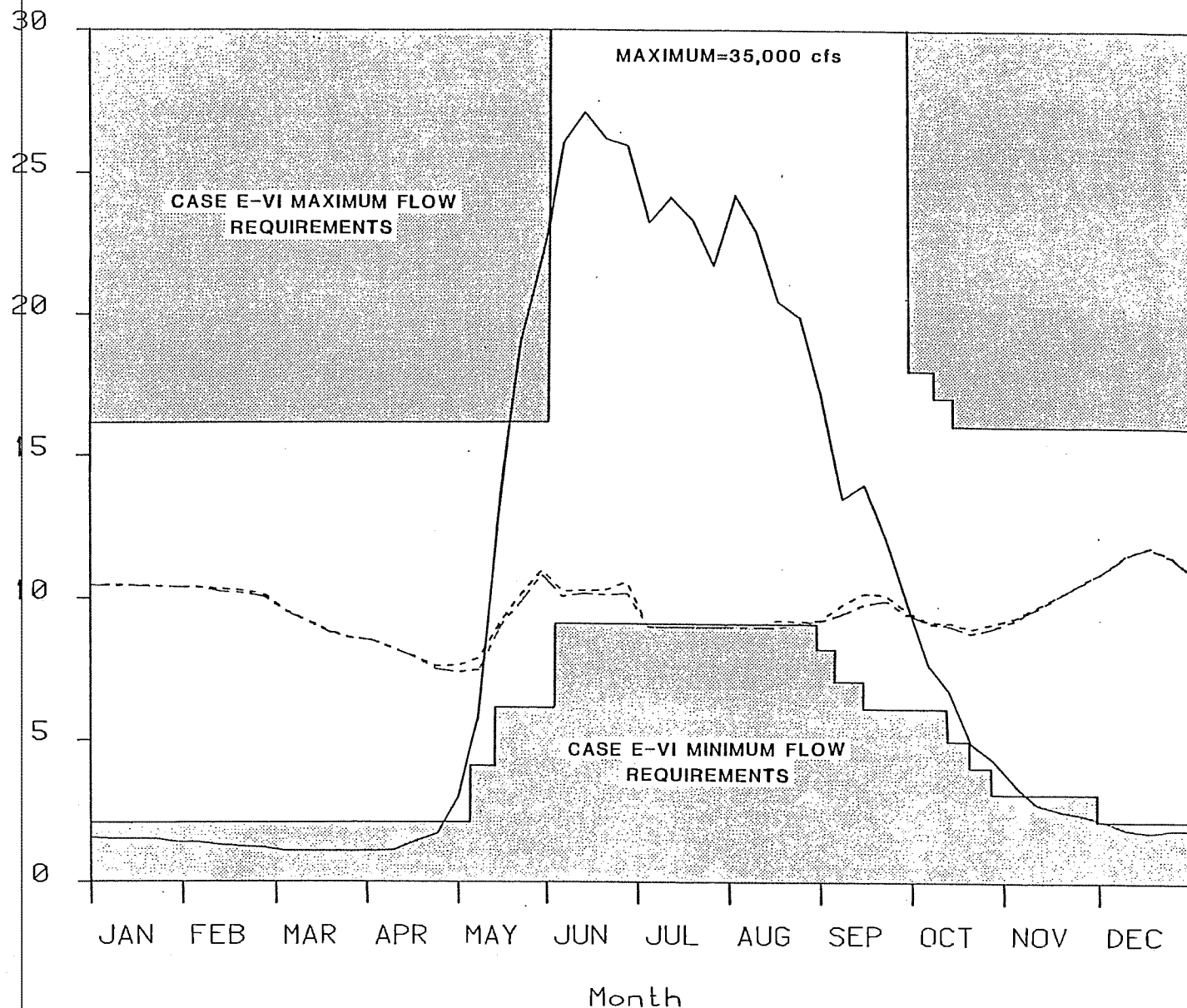
- NATURAL CONDITIONS
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 3 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED	
97% OF THE TIME LATE STAGE III AT GOLD CREEK	
WATERS-ERANDS	APPROVED BY
DATE	DATE

FIGURE E.2.4.234

Discharge in cfs

THOUSANDS



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS
5. PHASE 2 OF 2-STAGE PROJECT IS EQUIVALENT TO STAGE 3 OF 3-STAGE PROJECT

LEGEND

- NATURAL CONDITIONS
- FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- FLOWS FOR STAGE 3 OF 3-STAGE PROJECT CONSTRUCTION

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED	
50% OF THE TIME LATE STAGE III AT GOLD CREEK	
DATE: 12/1/83	BY: J. H. HARRIS
PROJECT: SUSITNA	REVISION: 1

FIGURE E.2.4.235

THOUSANDS

60

50

40

30

20

10

0

CASE E-VI MAXIMUM FLOW
REQUIREMENTS

CASE E-VI MINIMUM FLOW
REQUIREMENTS

LINES ARE COINCIDENT
FOR TWO STAGE PROJECT
AND THREE STAGE PROJECT

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Month

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS
5. PHASE 2 OF 2-STAGE PROJECT IS EQUIVALENT TO STAGE 3 OF 3-STAGE PROJECT

LEGEND

- NATURAL CONDITIONS
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 3 OF 3-STAGE PROJECT

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED	
6% OF THE TIME LATE STAGE III AT GOLD CREEK	
DATE: 8/24/88	BY: [Signature]
REVISION: 0.0000	DATE: 8/24/88

FIGURE E.2.4.236

Discharge in cfs

THOUSANDS

50

40

30

20

10

0

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Months

NOTES:

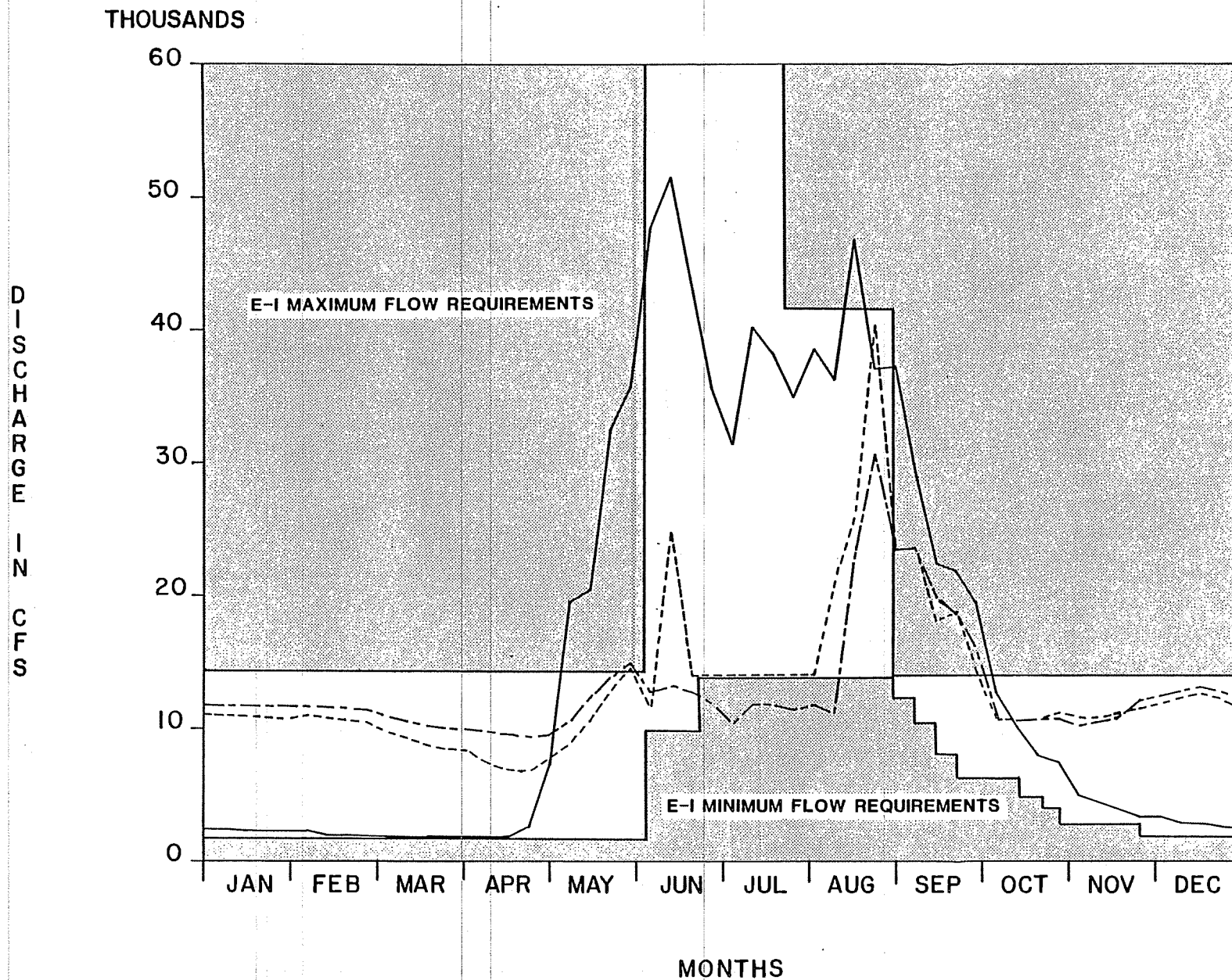
1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-I FLOW REQUIREMENT

LEGEND

- 6% EXCEEDENCE FLOWS
- - - 50% EXCEEDENCE FLOW
- . - 97% EXCEEDENCE FLOW

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK LATE STAGE III	
NAME: VANDER	DATE:
PROJECT: AL 1000	REVISION: 00

FIGURE E.2.4.237



NOTES:

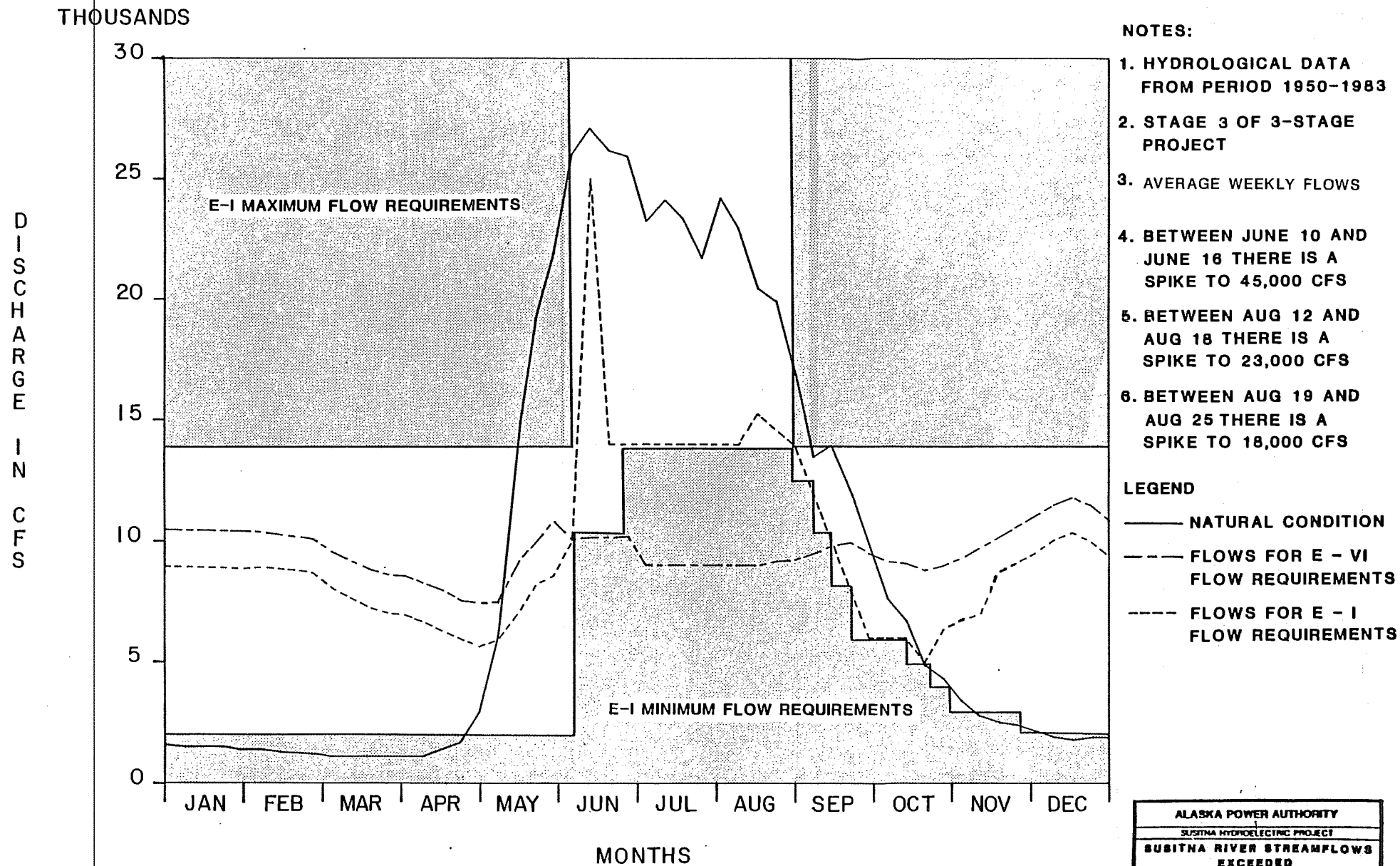
1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. BETWEEN JUNE 10 AND JUNE 16 THERE IS A SPIKE TO 45,000 CFS
5. BETWEEN AUG 12 AND AUG 18 THERE IS A SPIKE TO 23,000 CFS
6. BETWEEN AUG 19 AND AUG 25 THERE IS A SPIKE TO 18,000 CFS

LEGEND

- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- ... FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY		
SUSITNA HYDROELECTRIC PROJECT		
SUSITNA RIVER STREAMFLOWS		
EXCEEDED		
6% OF THE TIME LATE STAGE III		
AT GOLD CREEK		
APPROVED	DATE	BY
AMERICAN, ALASKA		

FIGURE E.2.4.238



ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED 50% OF THE TIME LATE STAGE III AT GOLD CREEK	
DATE: 10/1/83	BY: J. L. HARRIS
REVISION: 1, 10/1/83	REVISION: 2, 10/1/83

FIGURE E.2.4.239

THOUSANDS

25

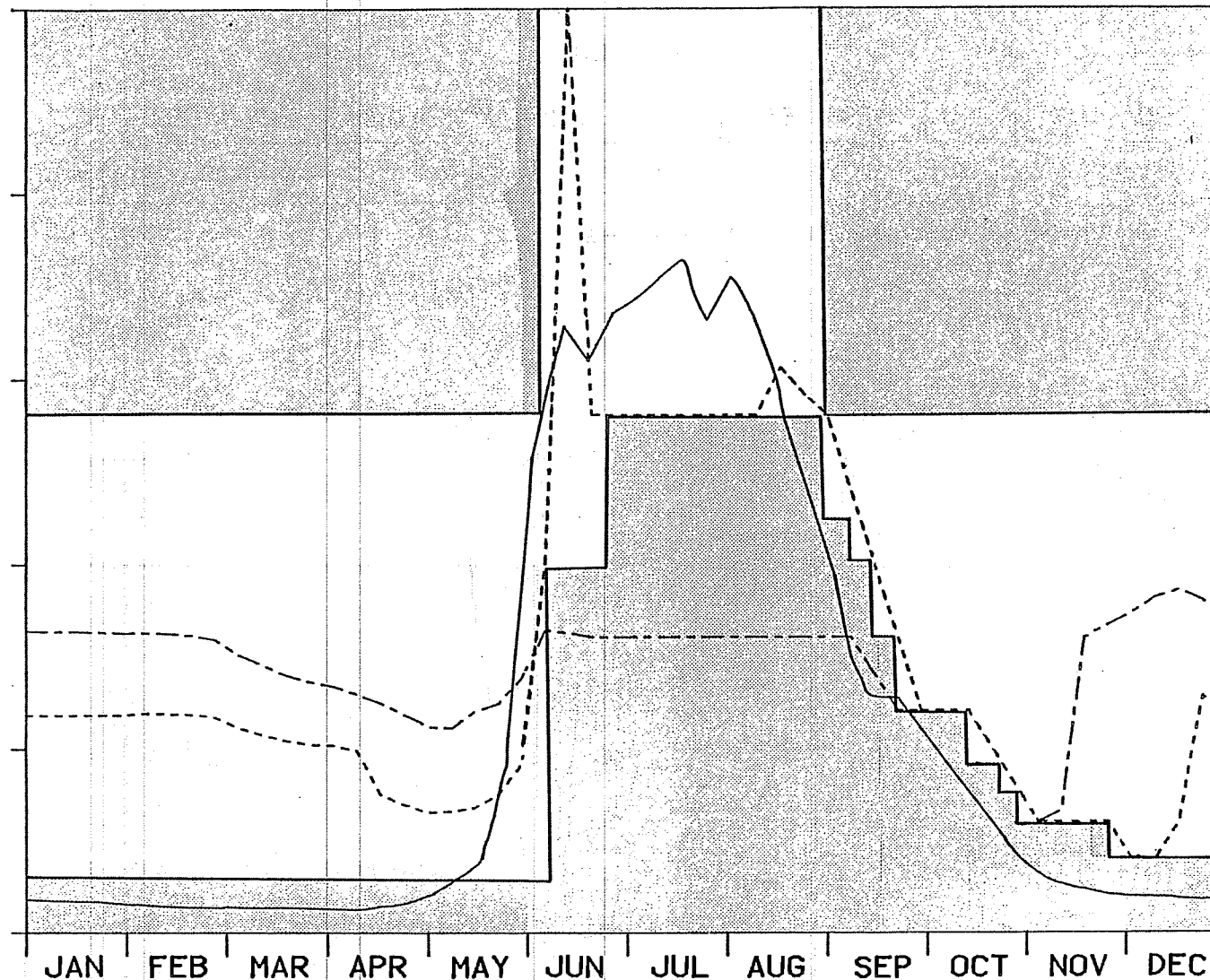
20

15

10

5

0



Months

NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS
5. BETWEEN JUNE 10 AND JUNE 16 THERE IS A SPIKE TO 45,000 CFS
6. BETWEEN AUG 12 AND AUG 18 THERE IS A SPIKE TO 23,000 CFS
7. BETWEEN AUG 19 AND AUG 25 THERE IS A SPIKE TO 18,000 CFS

LEGEND

- NATURAL CONDITIONS
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- ... FLOWS FOR E - I FLOW REQUIREMENTS

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SUSITNA RIVER STREAMFLOWS EXCEEDED	
97% OF THE TIME LATE STAGE III AT GOLD CREEK	
DATE: 10/1/83	BY: J. H. HARRIS
REVISION: 10/1/83	BY: J. H. HARRIS

FIGURE E.2.4.240

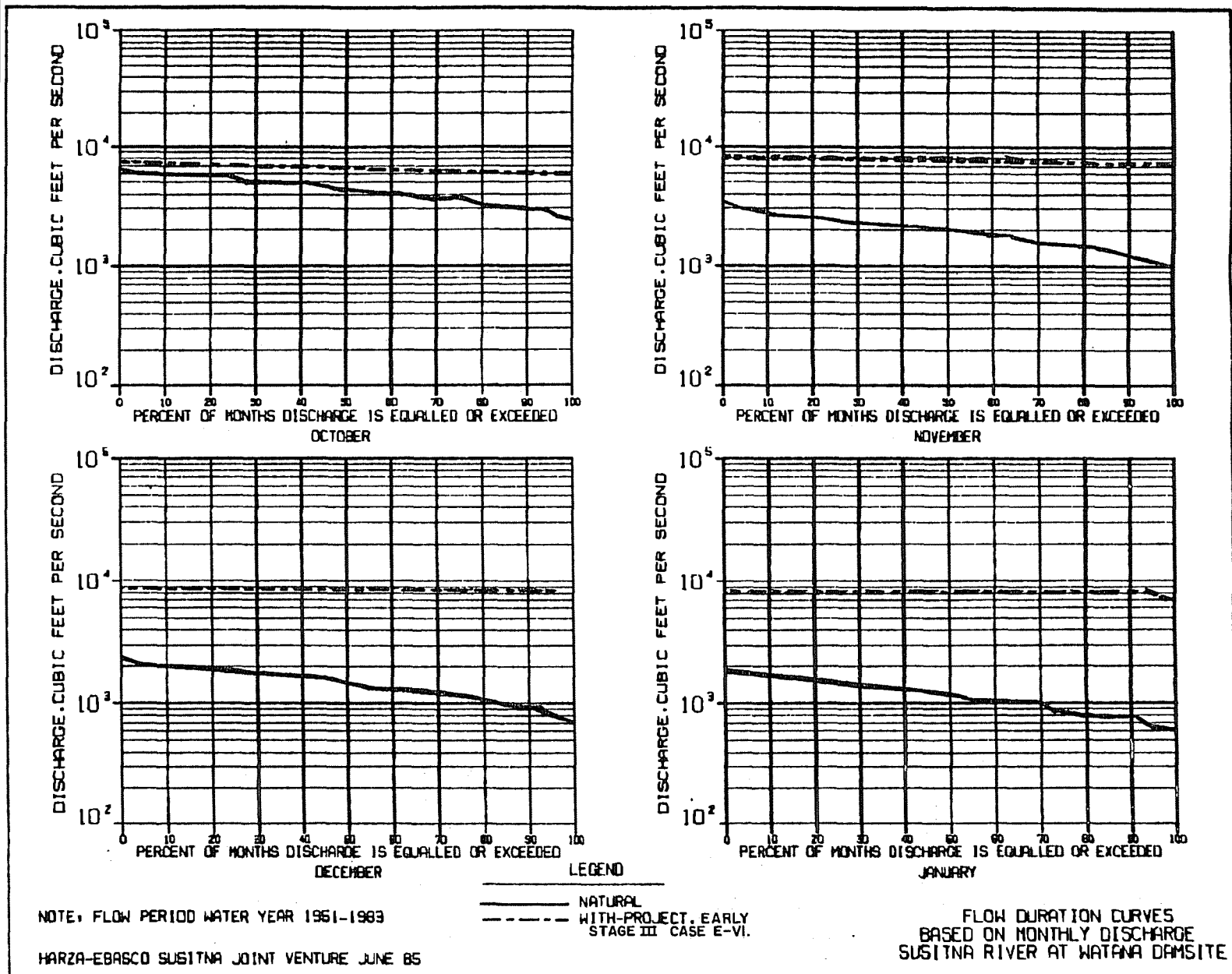


FIGURE E.2.4.241

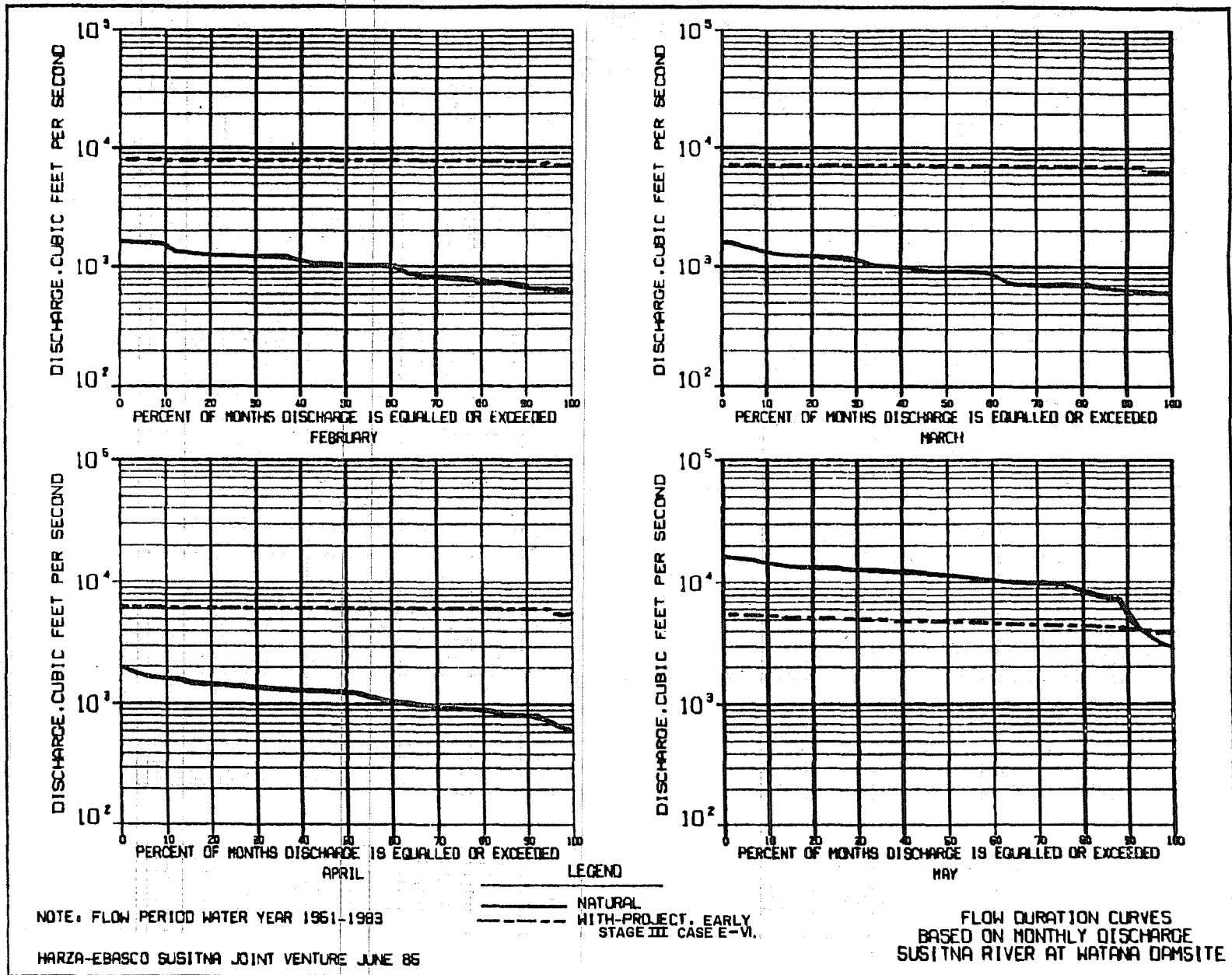
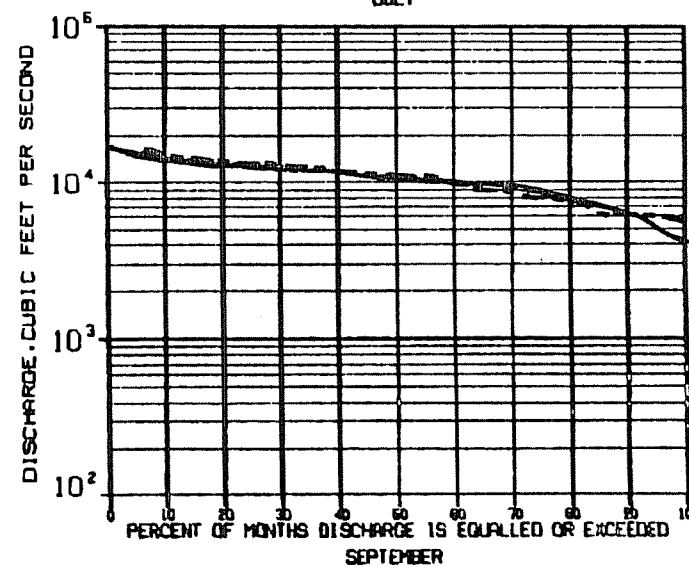
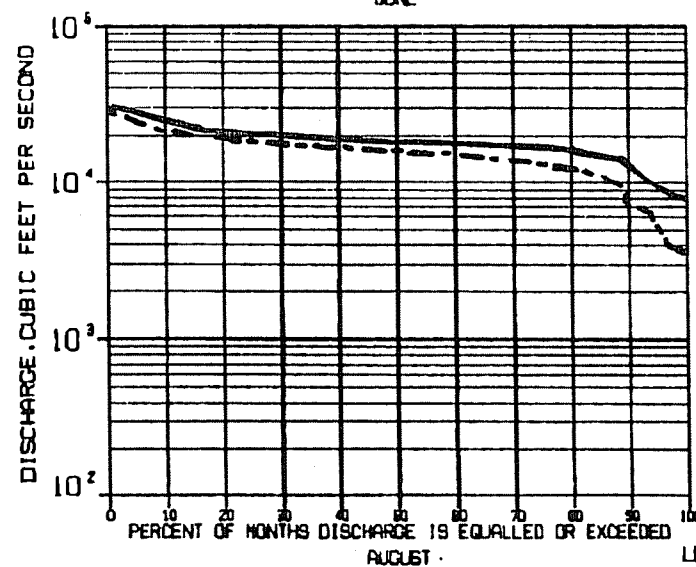
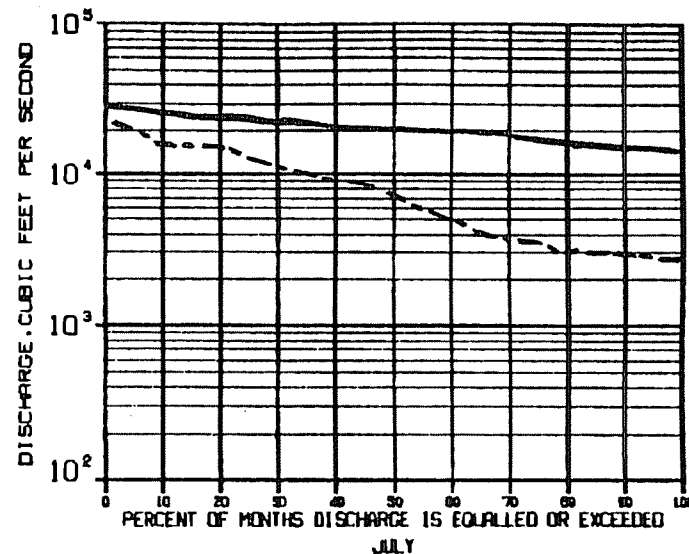
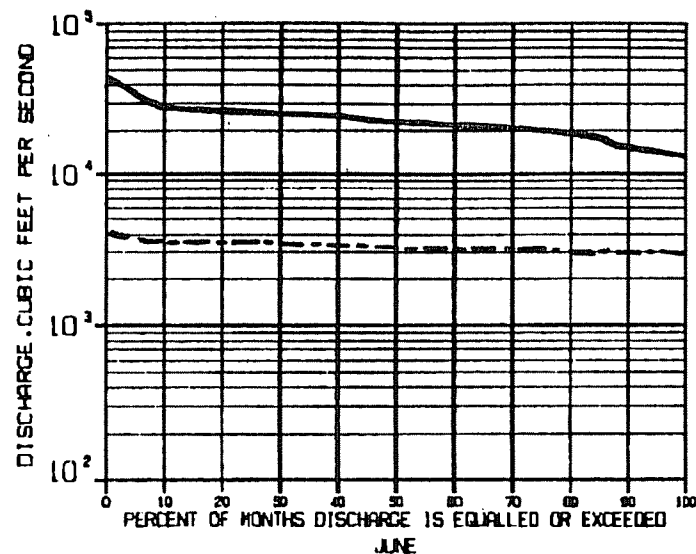


FIGURE E.2.4.241



——— NATURAL
 - - - - - WITH-PROJECT, EARLY
 STAGE III CASE E-VI.

NOTE: FLOW PERIOD WATER YEAR 1951-1983
 HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT WATANA DAMSITE

FIGURE E.2.4.241

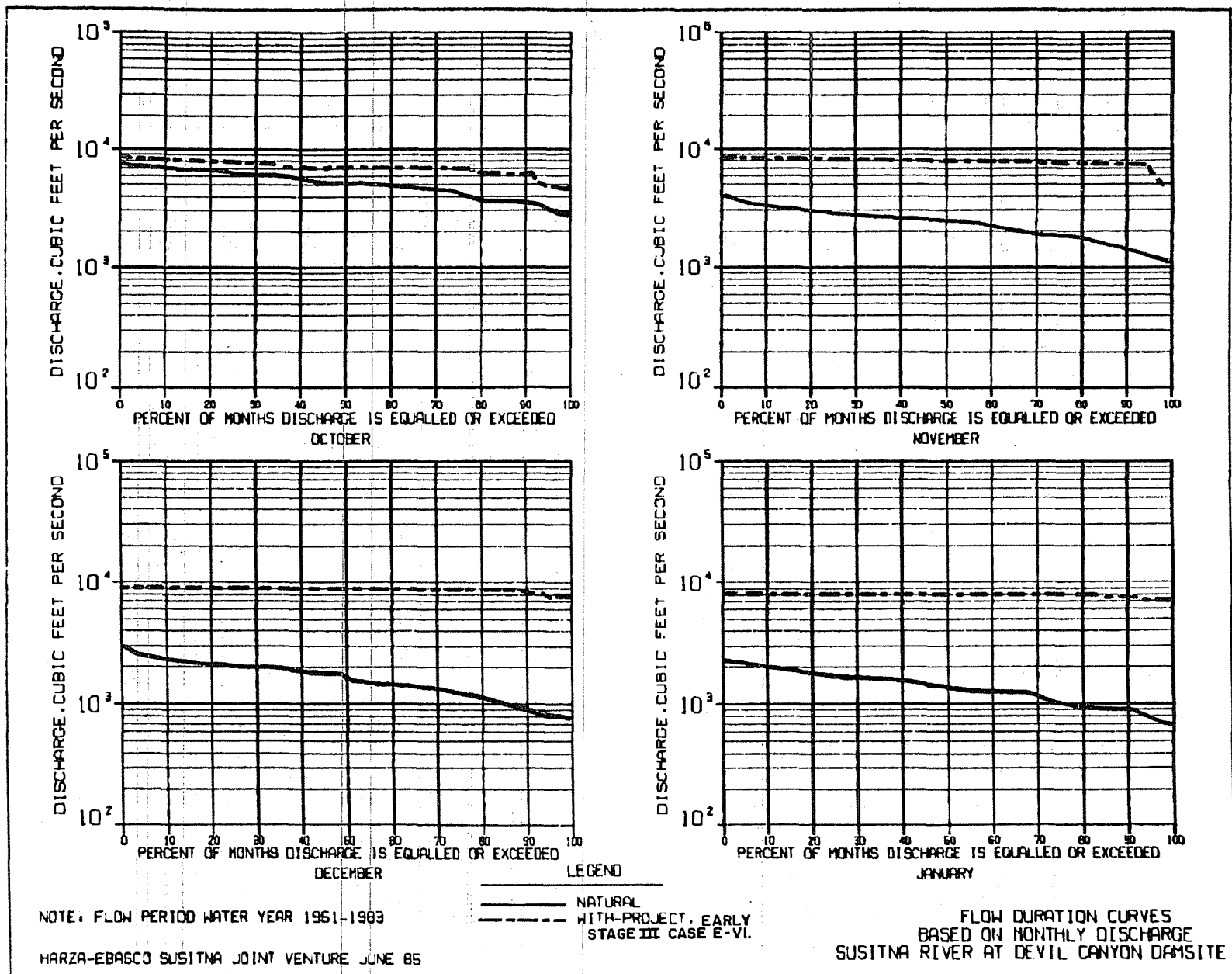
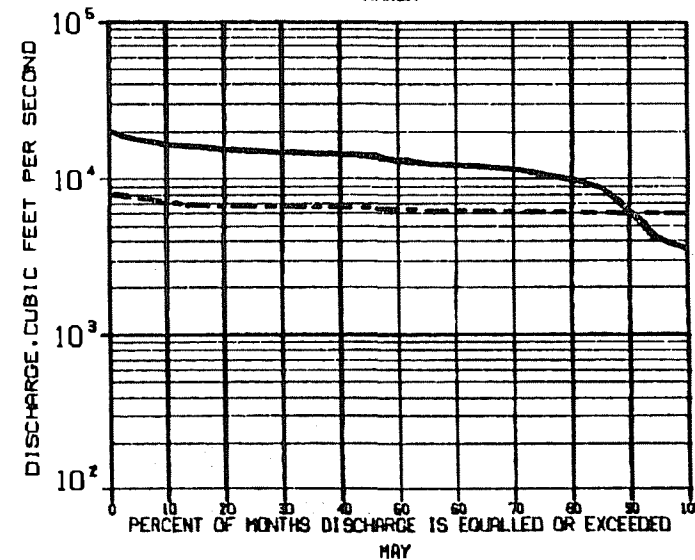
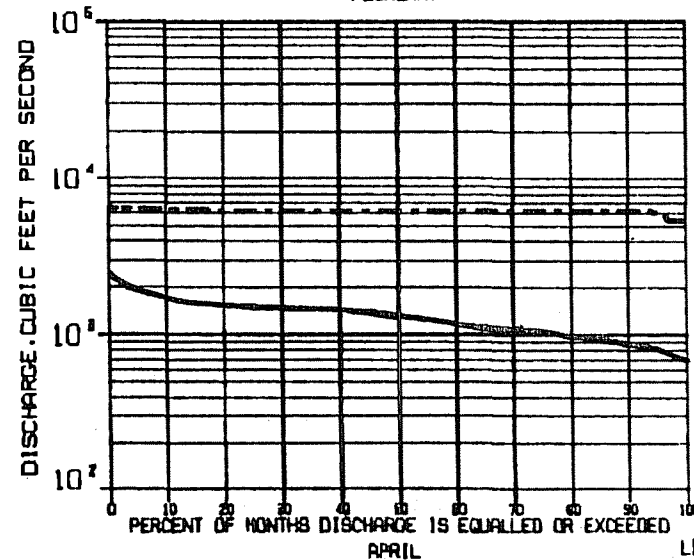
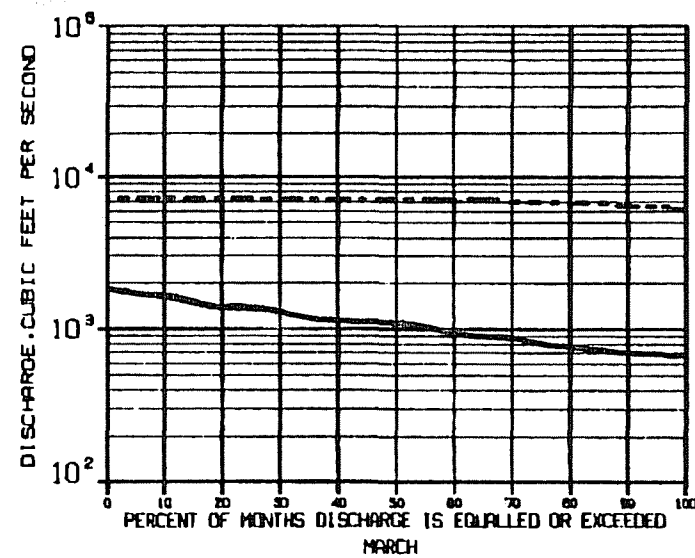
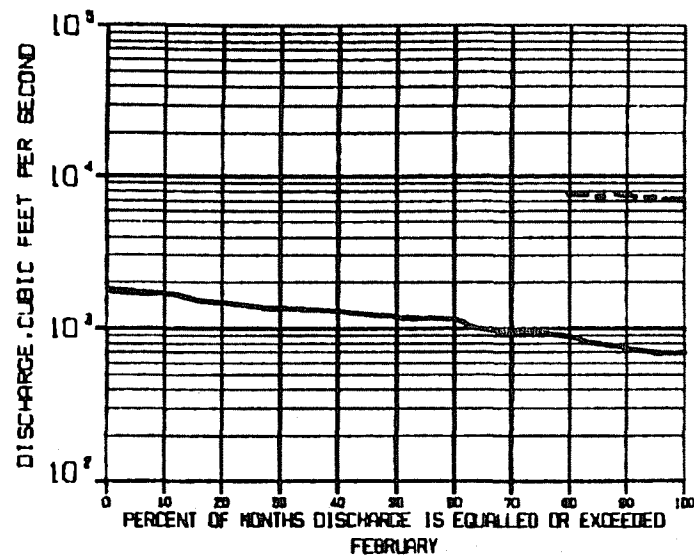


FIGURE E.2.4.242



LEGEND

— NATURAL

- - - WITH-PROJECT, EARLY

STAGE III, CASE E-VI.

NOTE: FLOW PERIOD WATER YEAR 1961-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 86

FLOW DURATION CURVES
BASED ON MONTHLY DISCHARGE
SUSITNA RIVER AT DEVIL CANYON DAMSITE

FIGURE E.2.4.242

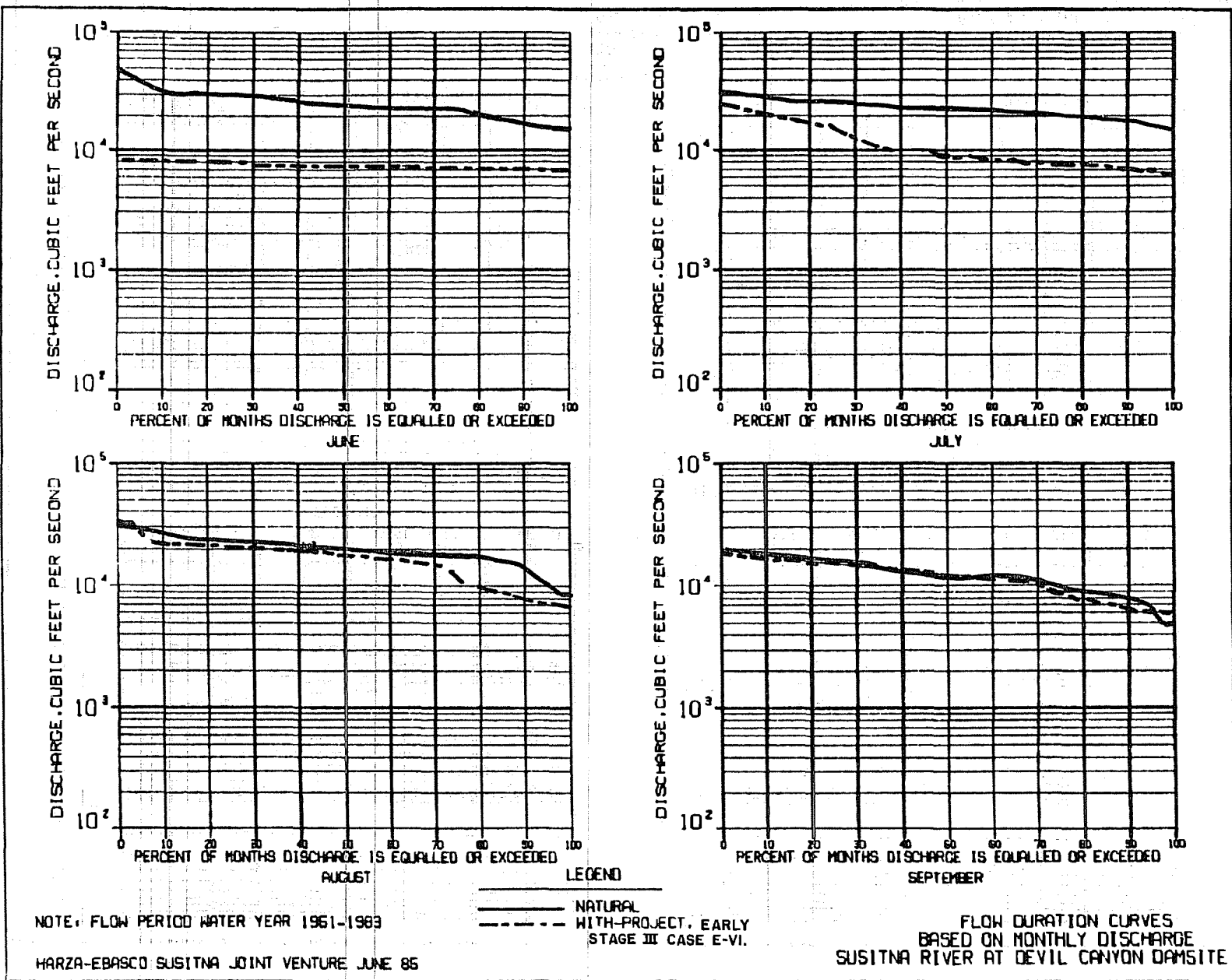
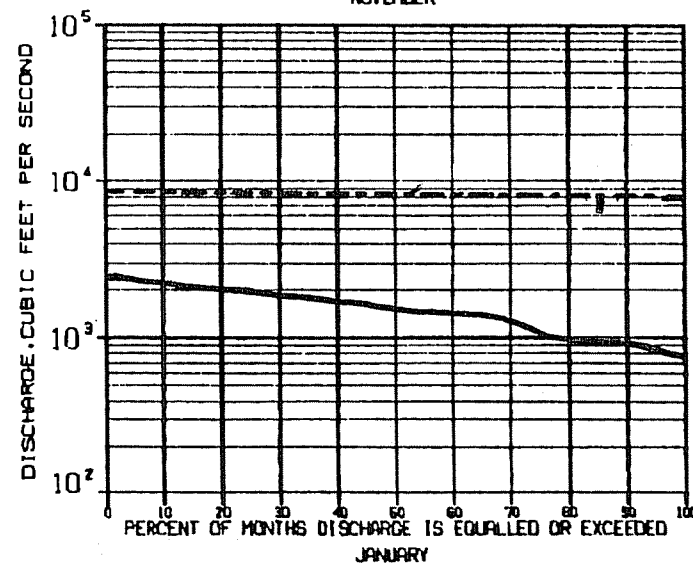
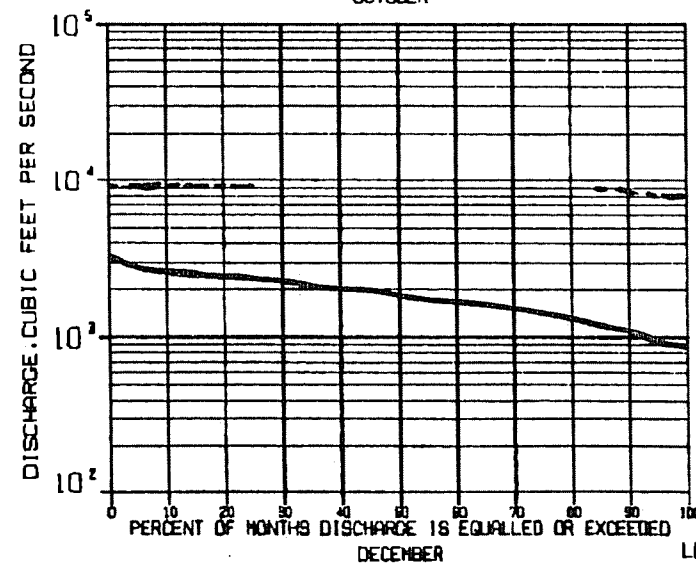
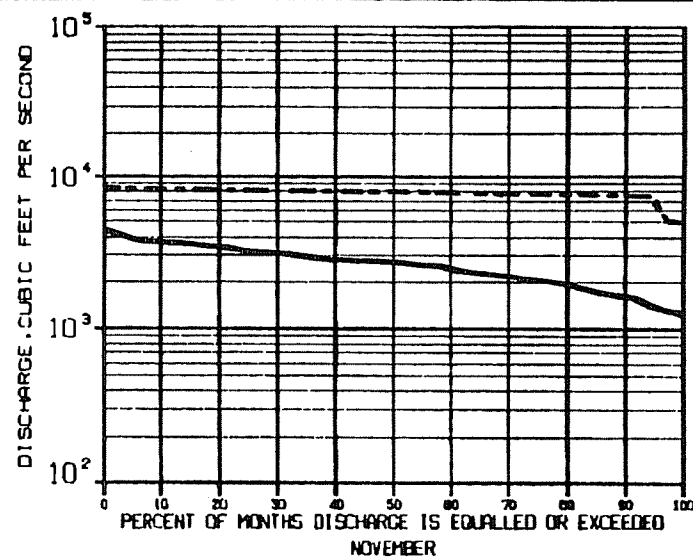
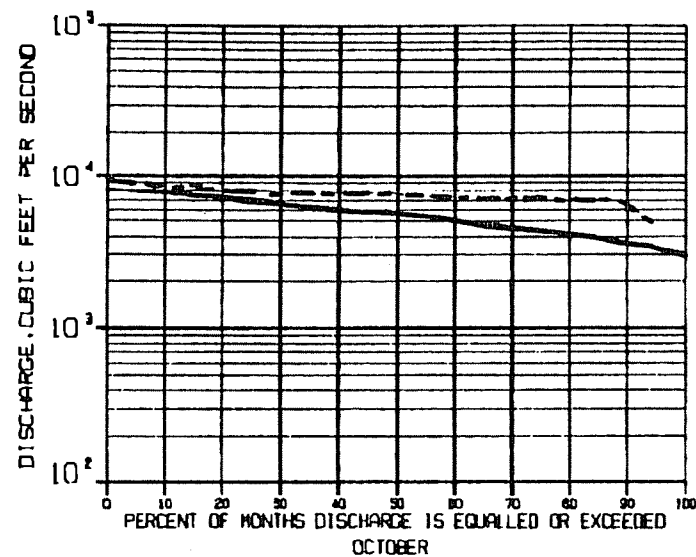


FIGURE E.2.4.242



LEGEND

— NATURAL
 - - - WITH-PROJECT, EARLY
 STAGE III CASE E-VI.

NOTE: FLOW PERIOD WATER YEAR 1961-1963

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 86

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT GOLD CREEK

FIGURE E.2.4.243

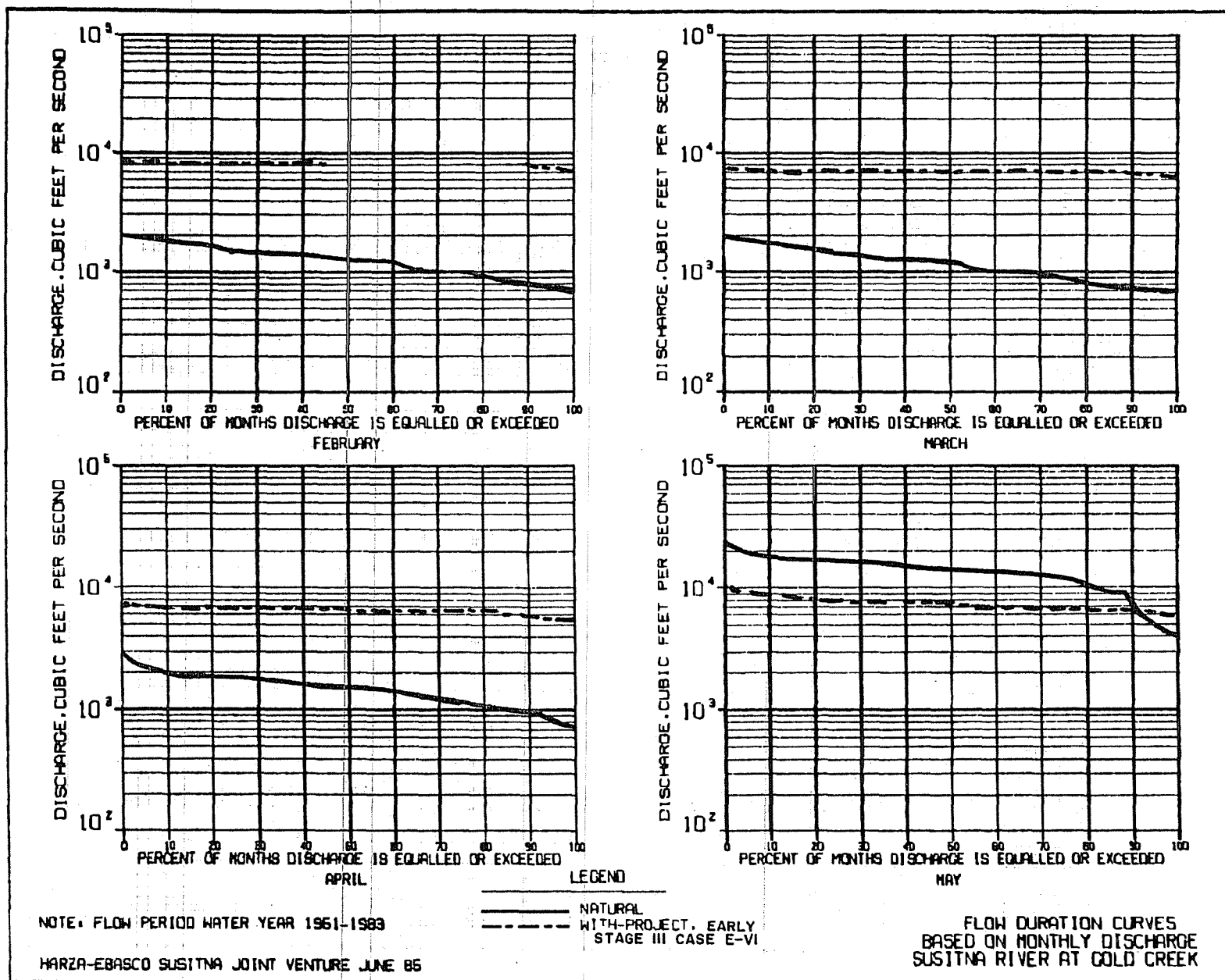
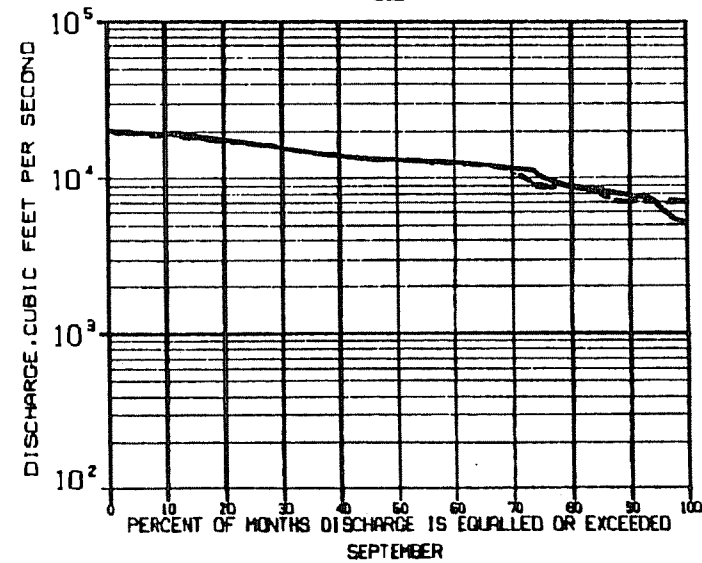
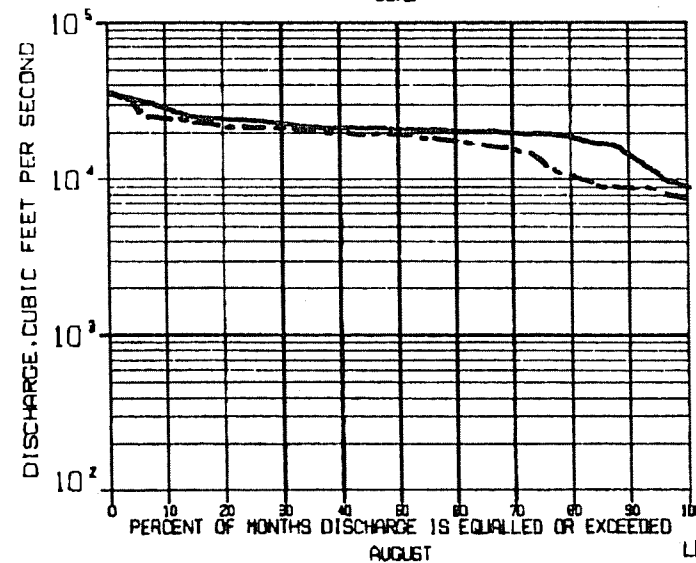
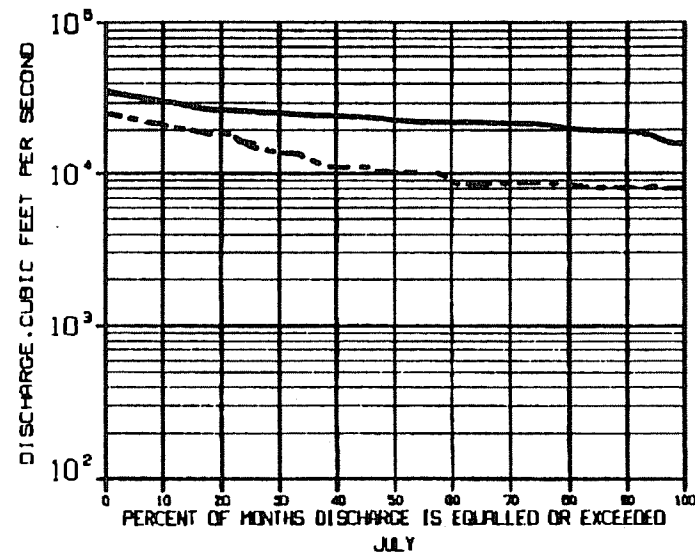
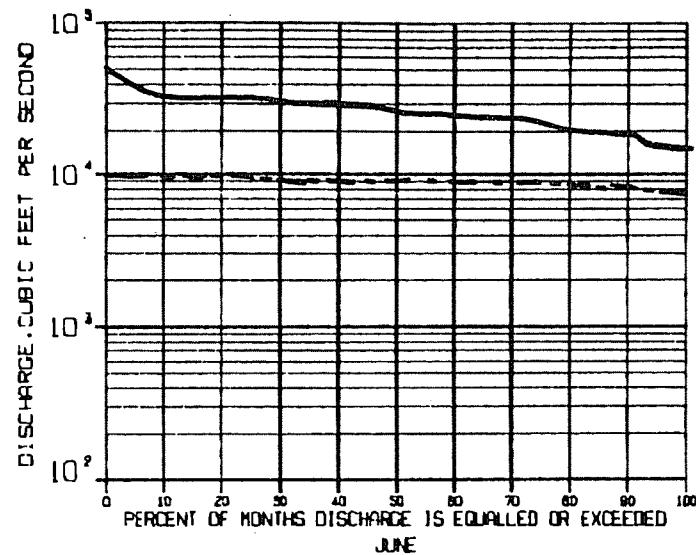


FIGURE E.2.4.243



——— NATURAL
 - - - WITH-PROJECT, EARLY
 STAGE III CASE E-VI.

NOTE: FLOW PERIOD WATER YEAR 1951-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT GOLD CREEK

FIGURE E.2.4.243

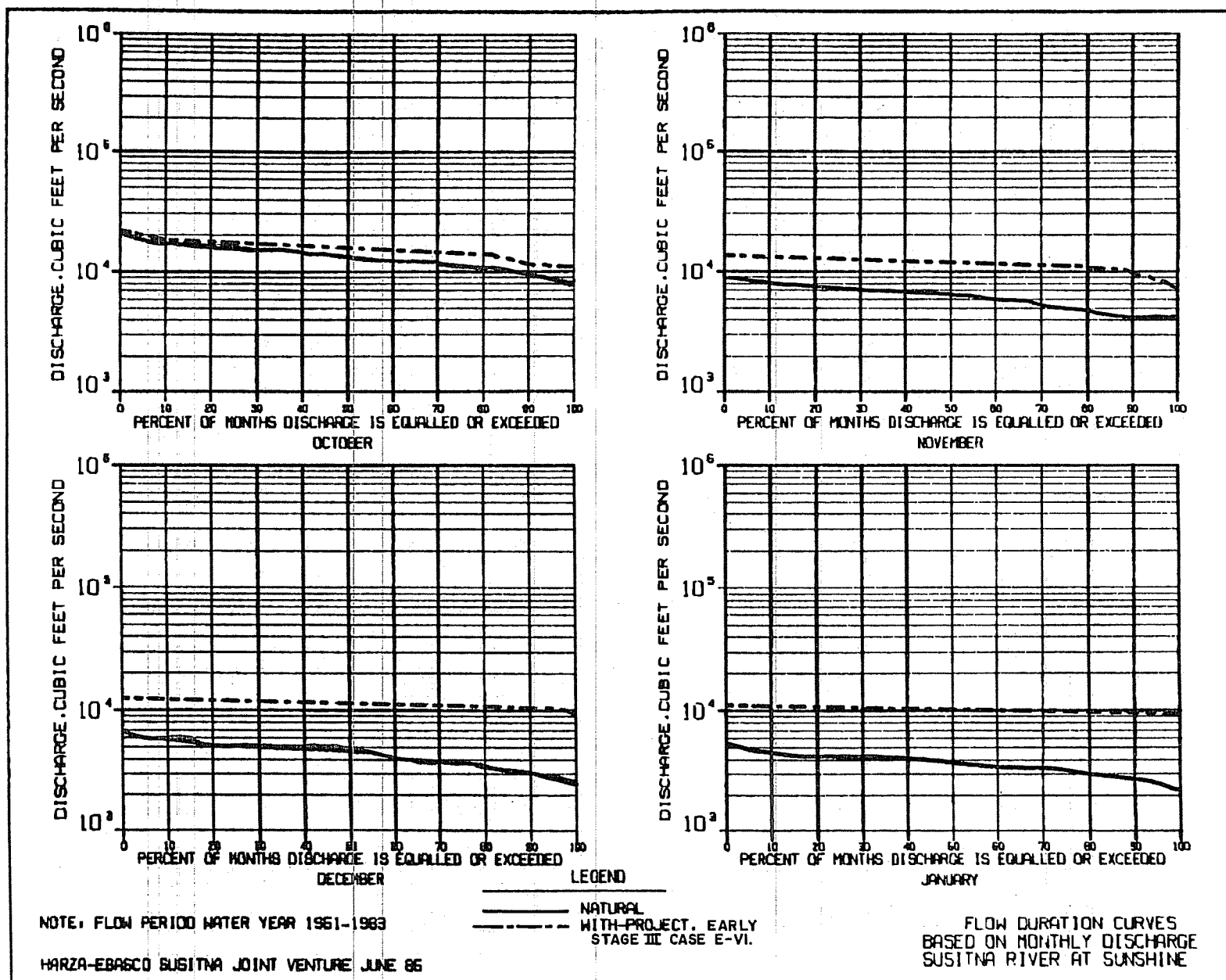


FIGURE E.2.4.244

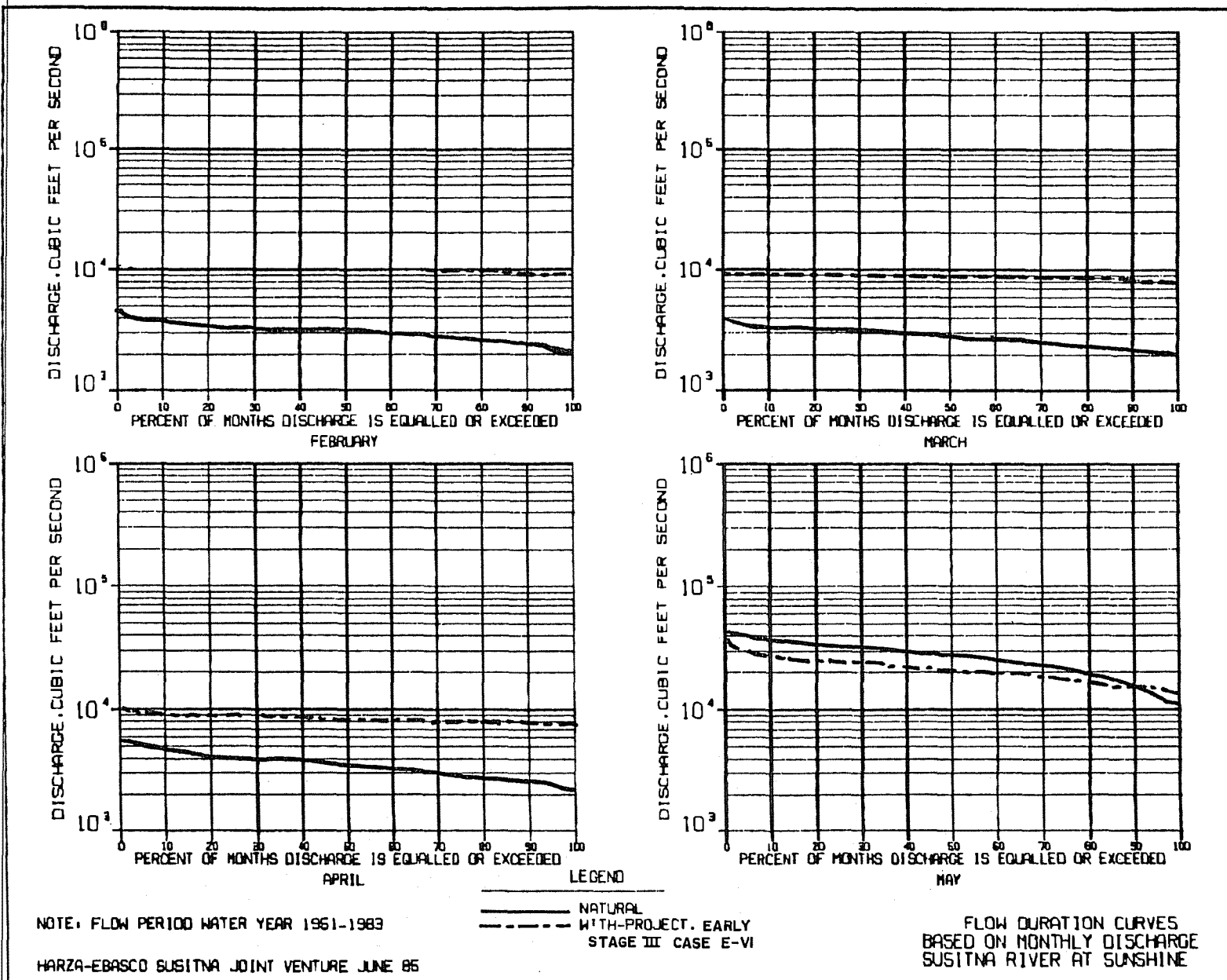


FIGURE E.2.4.244

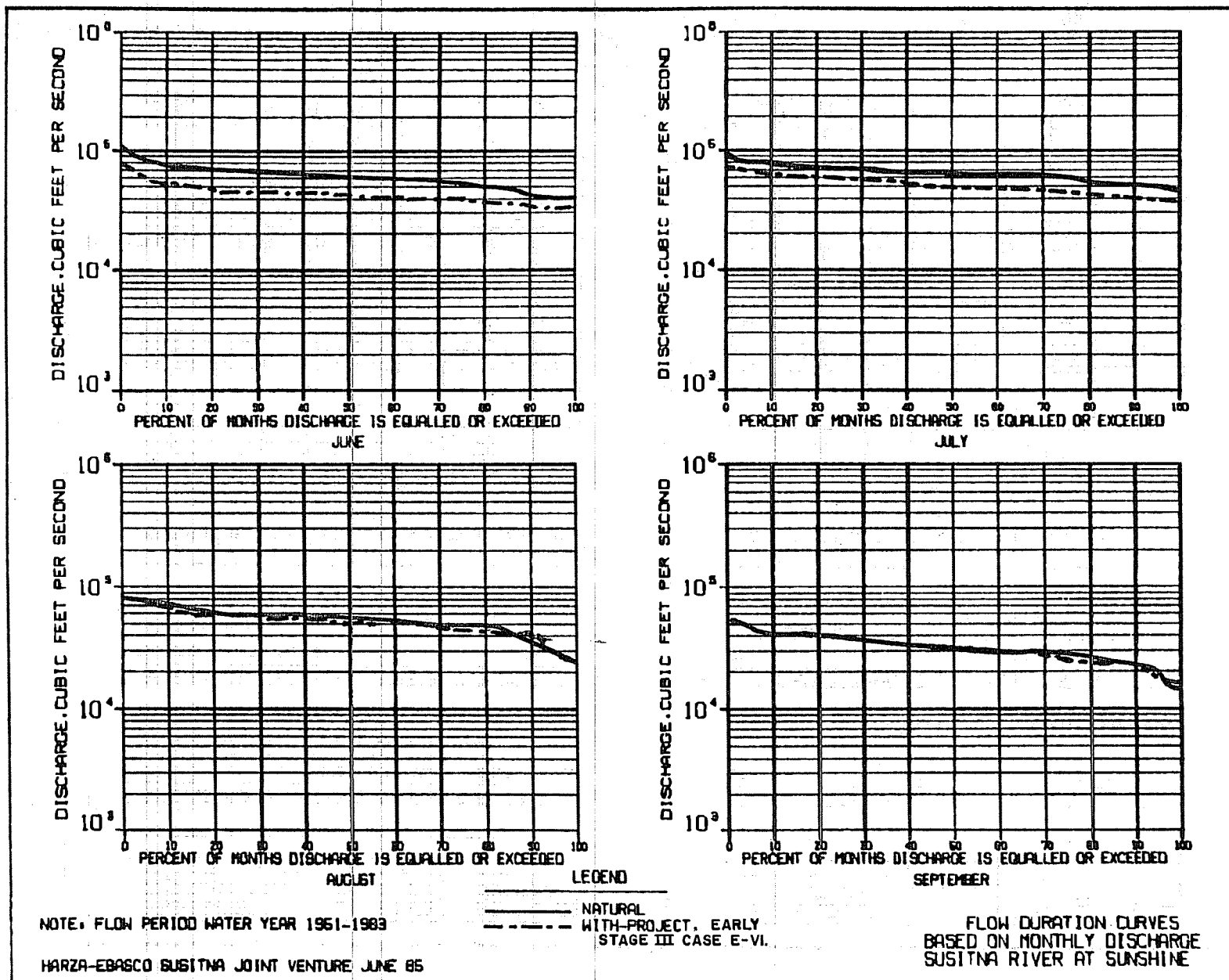
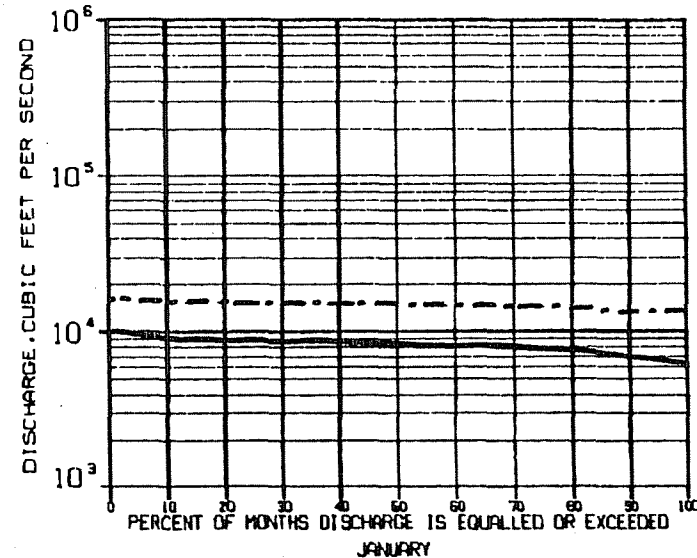
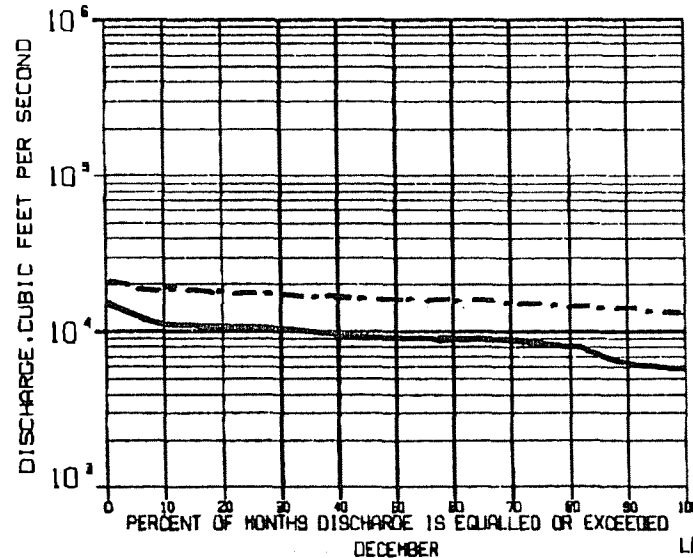
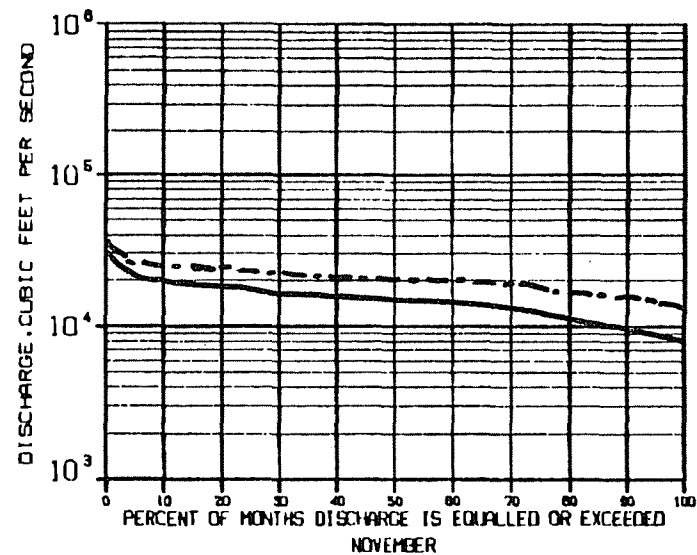
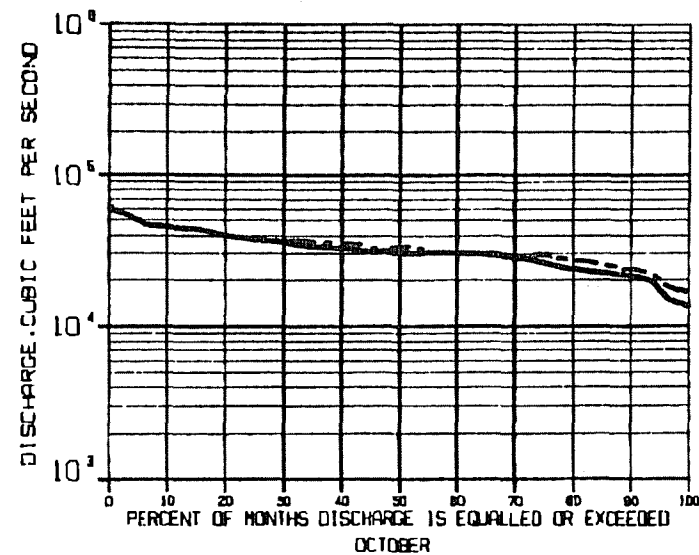


FIGURE 2.4.244



LEGEND

—— NATURAL

----- WITH-PROJECT, EARLY STAGE III CASE E-VI

NOTE: FLOW PERIOD WATER YEAR 1951-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

FLOW DURATION CURVES
BASED ON MONTHLY DISCHARGE
SUSITNA RIVER AT SUSITNA STATION

FIGURE E.2.4.245

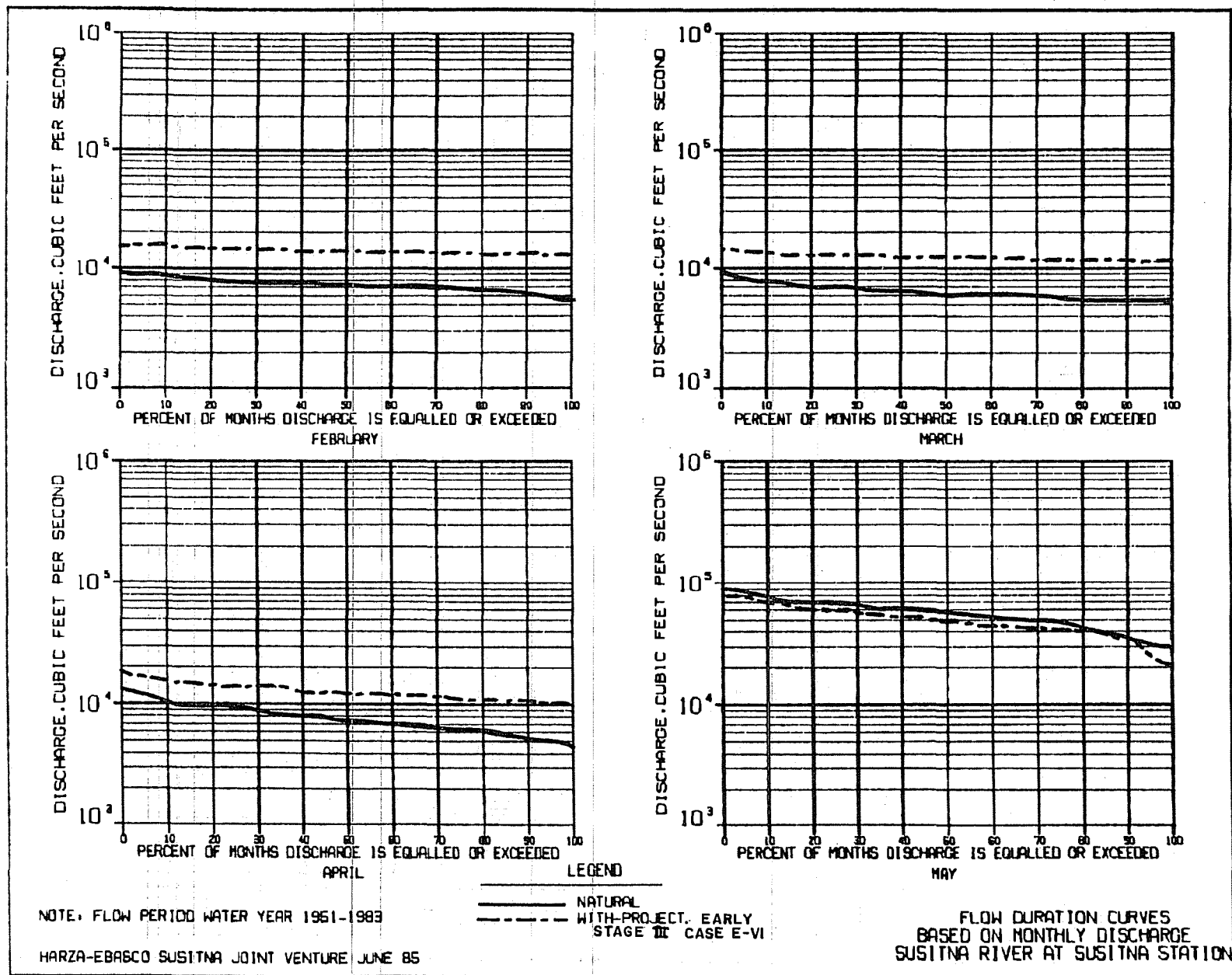
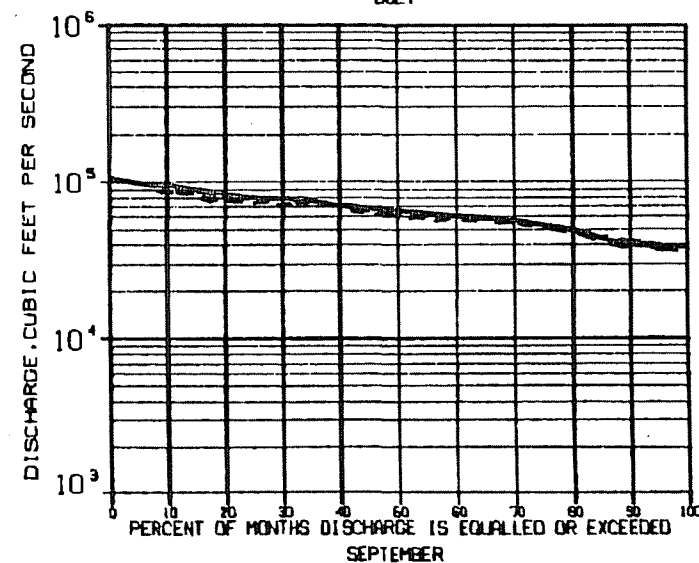
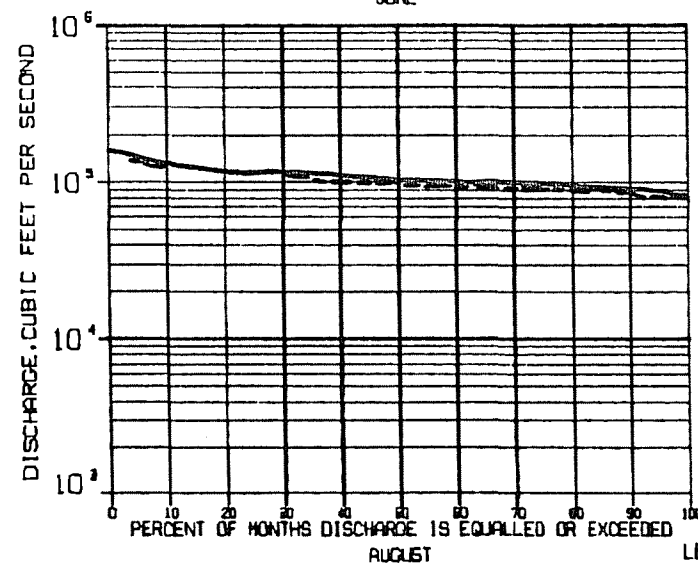
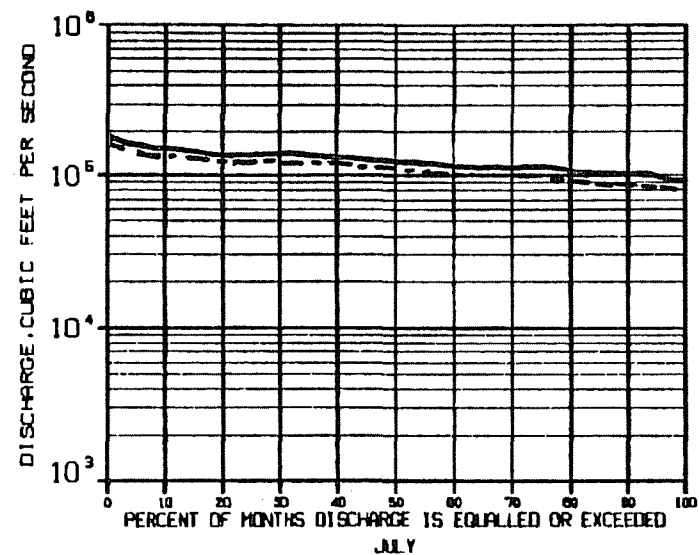
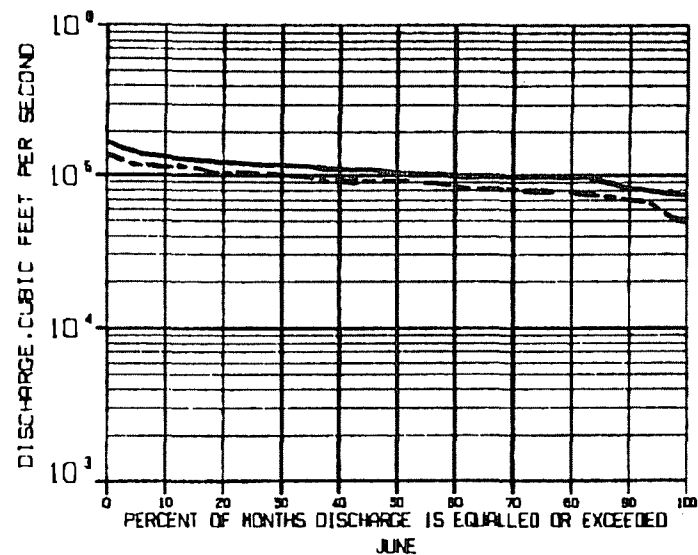


FIGURE E.2.4.245



NOTE: FLOW PERIOD WATER YEAR 1951-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

LEGEND
 — NATURAL
 - - - WITH-PROJECT, EARLY
 STAGE III CASE E-VI

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT SUSITNA STATION

FIGURE E.2.4.245

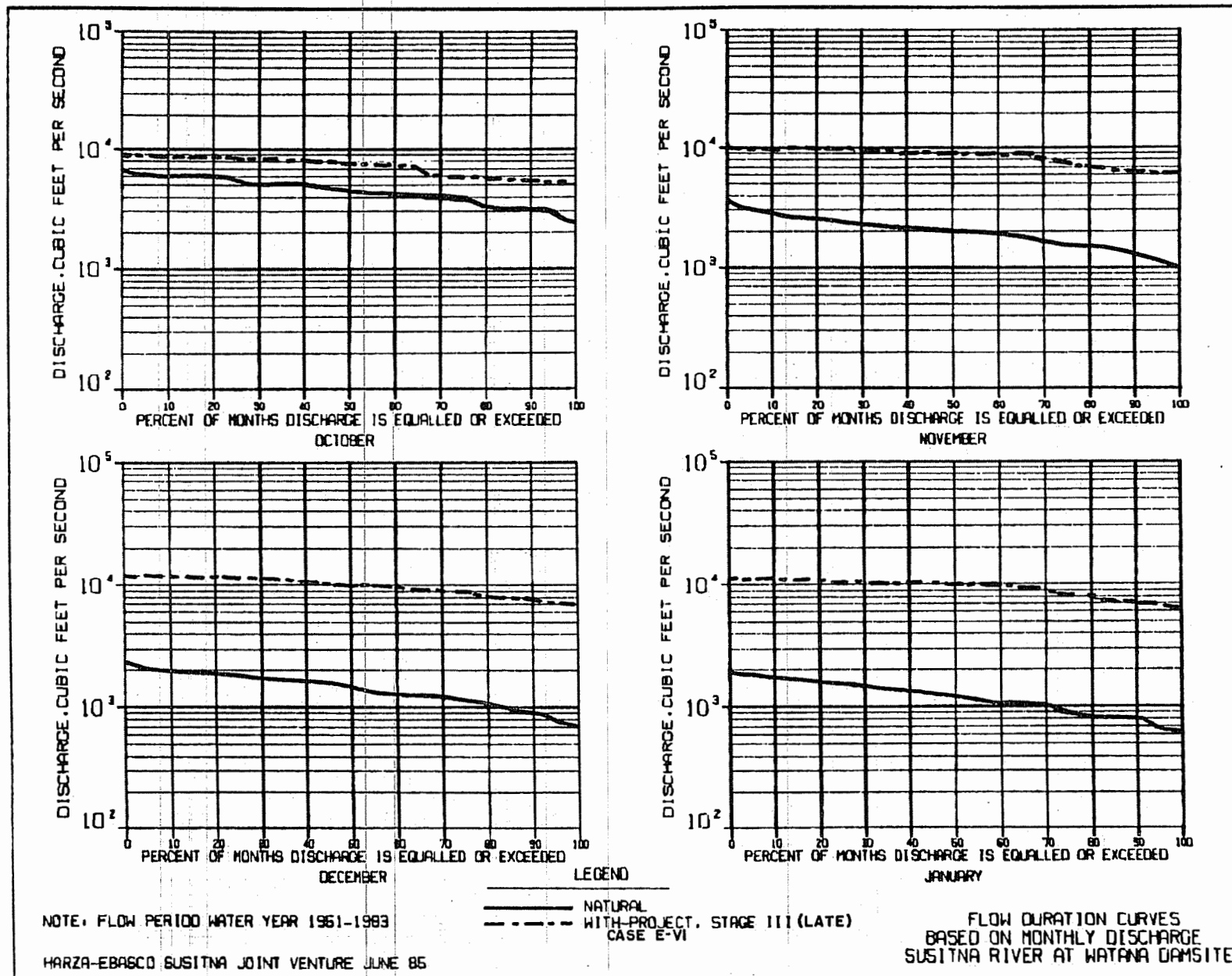
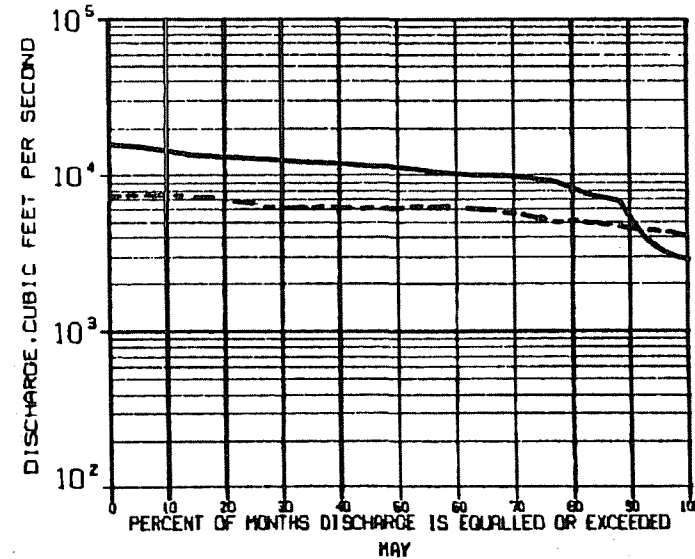
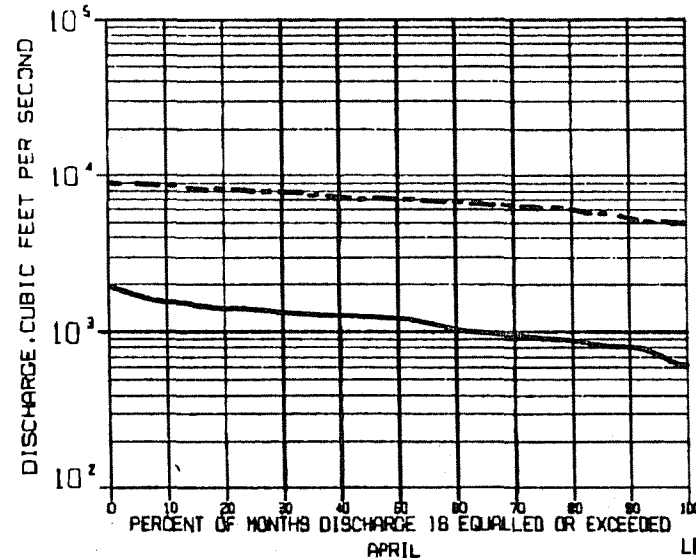
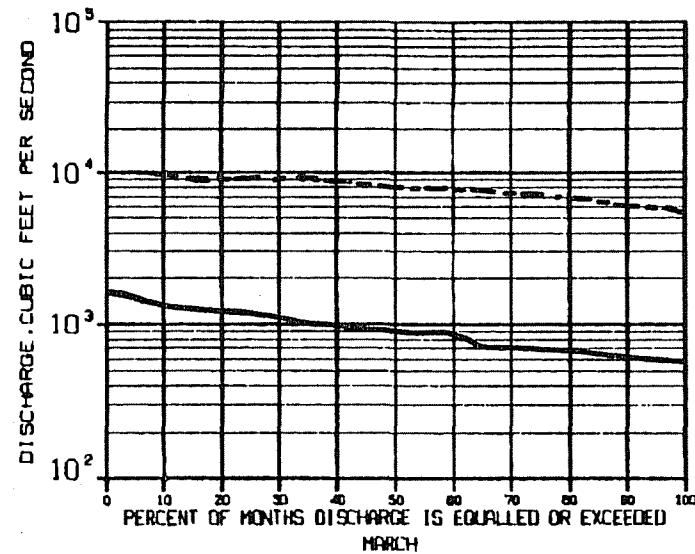
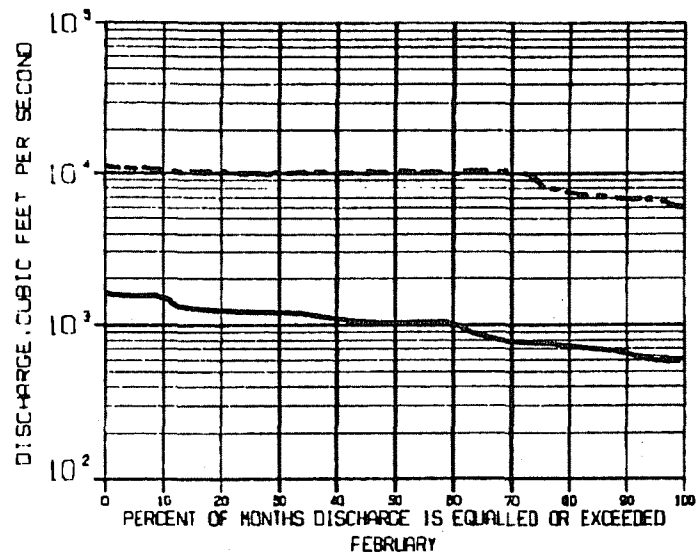


FIGURE E.2.4.246



NOTE: FLOW PERIOD WATER YEAR 1961-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

LEGEND
 — NATURAL
 - - - WITH-PROJECT, STAGE III (LATE)
 CASE E-VI.

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT WATANA DAMSITE

FIGURE E.2.4.246

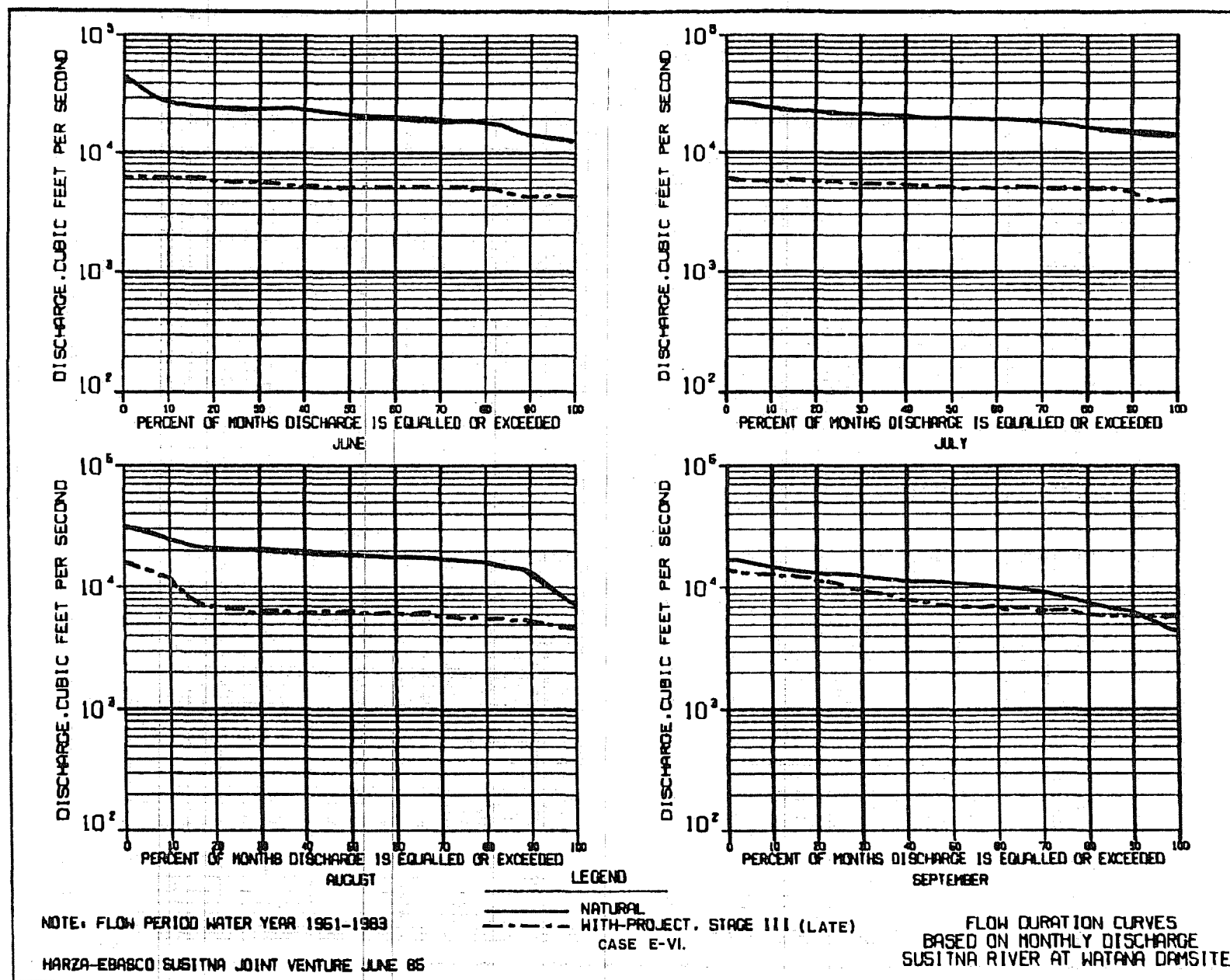
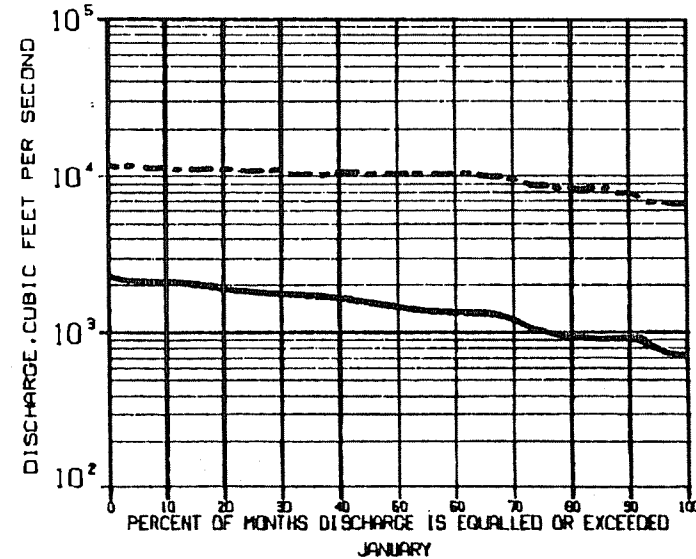
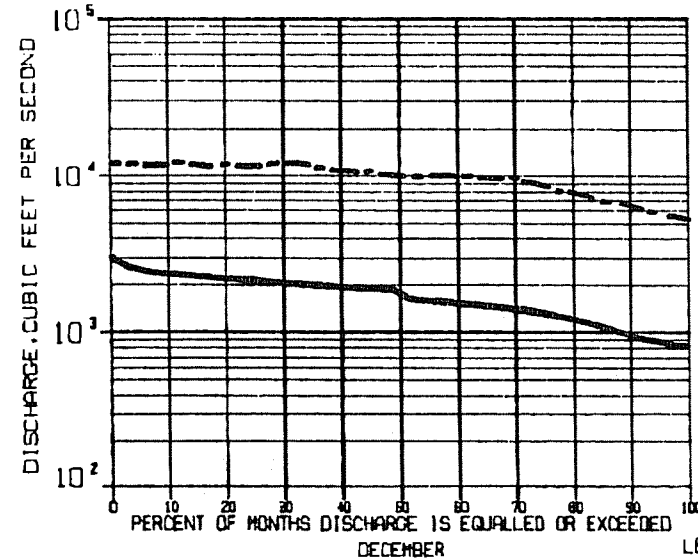
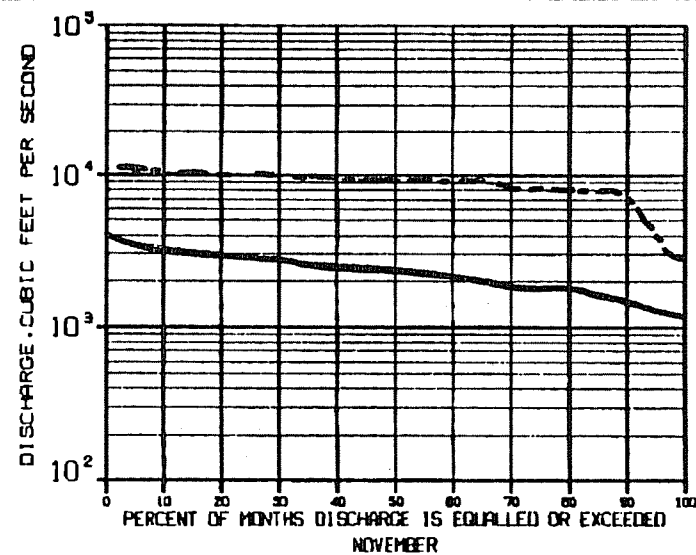
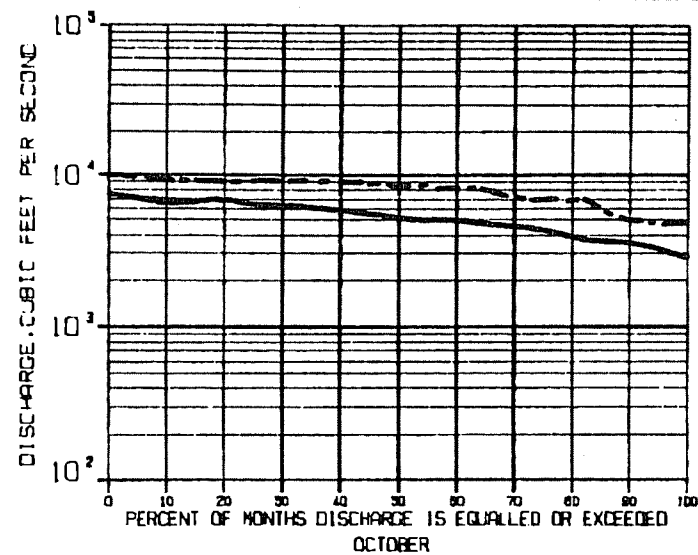


FIGURE E.2.4.246



LEGEND

—— NATURAL
 - - - - WITH-PROJECT, STAGE III (LATE)
 CASE E-VI.

NOTE: FLOW PERIOD WATER YEAR 1961-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 86

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT DEVIL CANYON DAMSITE

FIGURE E.2.4.247

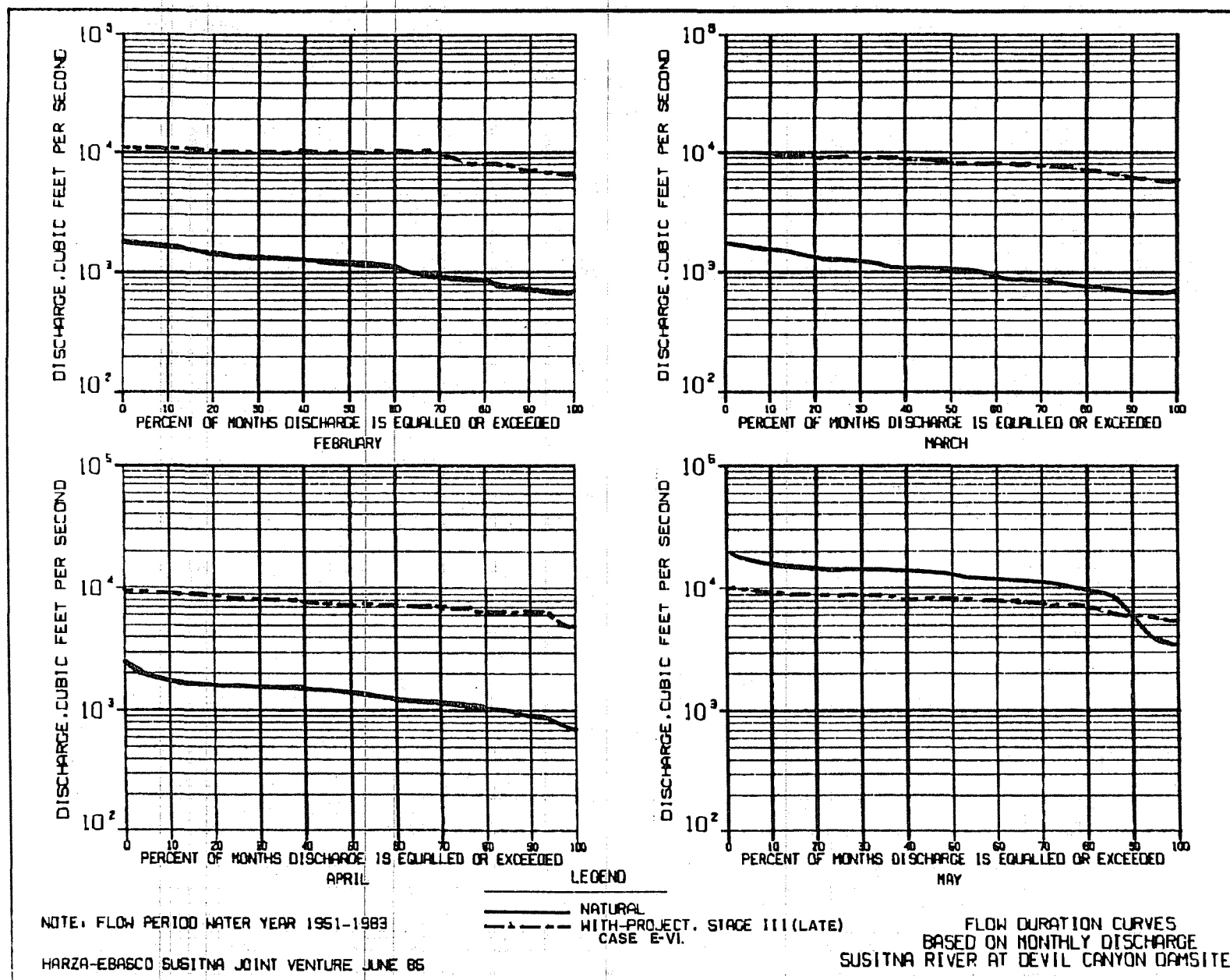
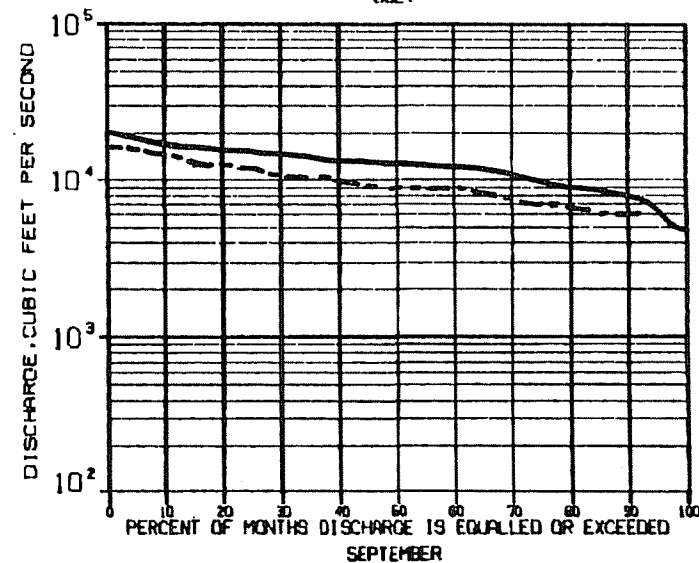
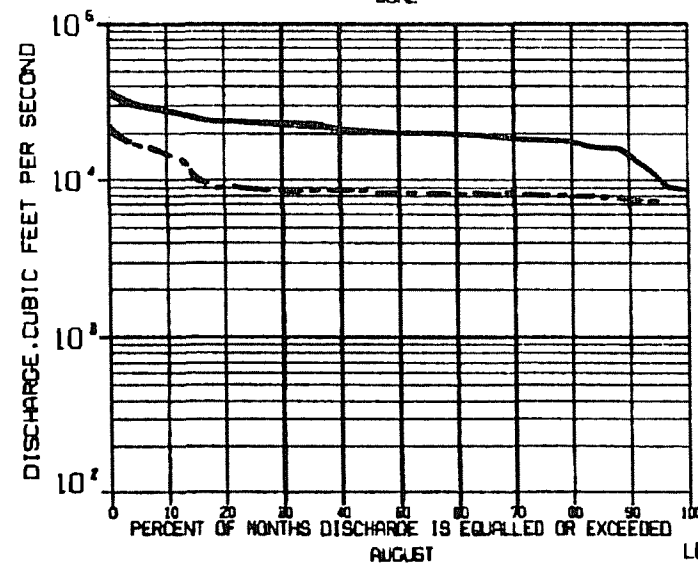
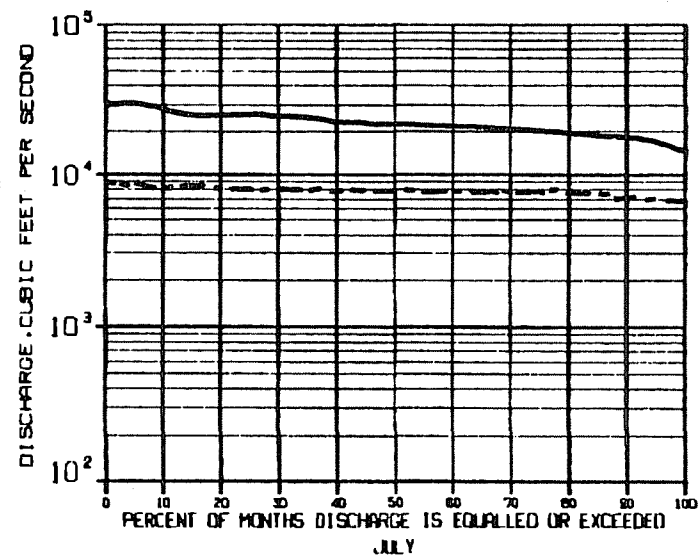
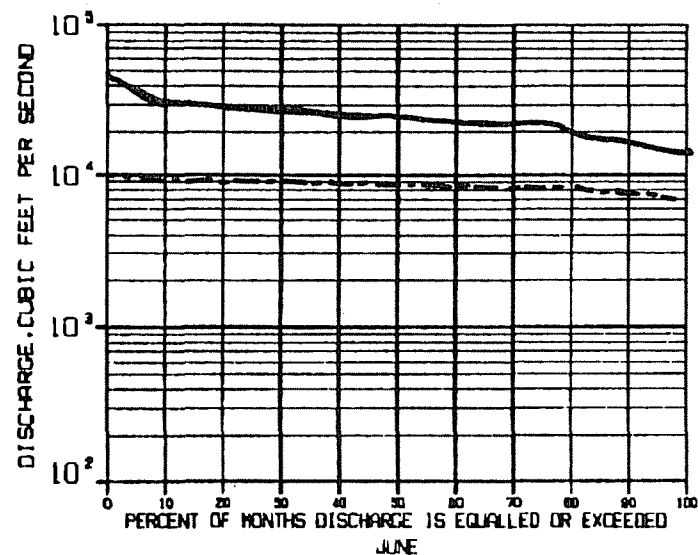


FIGURE E.2.4.247



——— NATURAL
 - - - - - WITH-PROJECT, STAGE III(LATE)
 CASE E-VI

NOTE: FLOW PERIOD WATER YEAR 1951-1983
 HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT DEVIL CANYON DAMSITE

FIGURE E.2.4.247

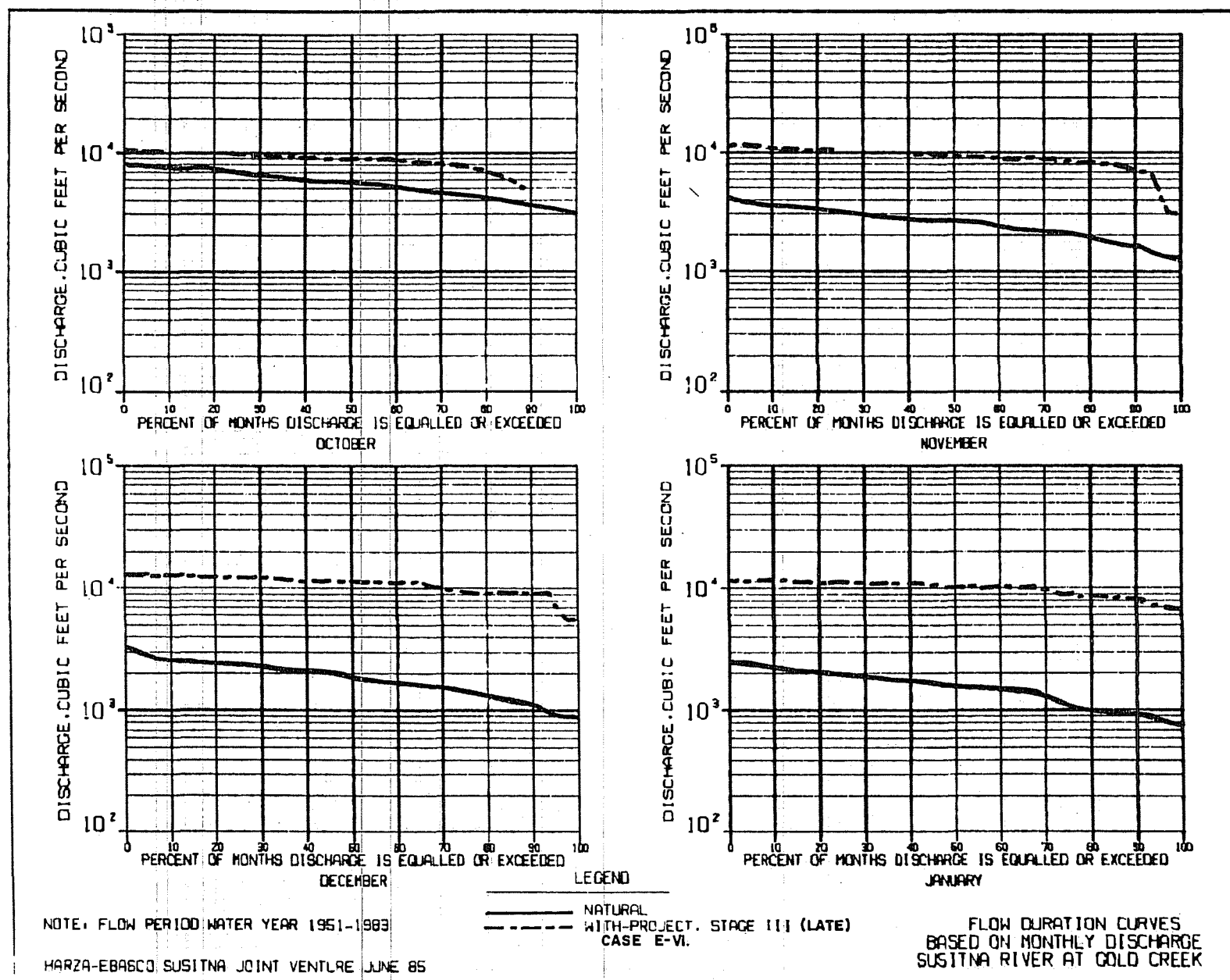


FIGURE E.2.4.248

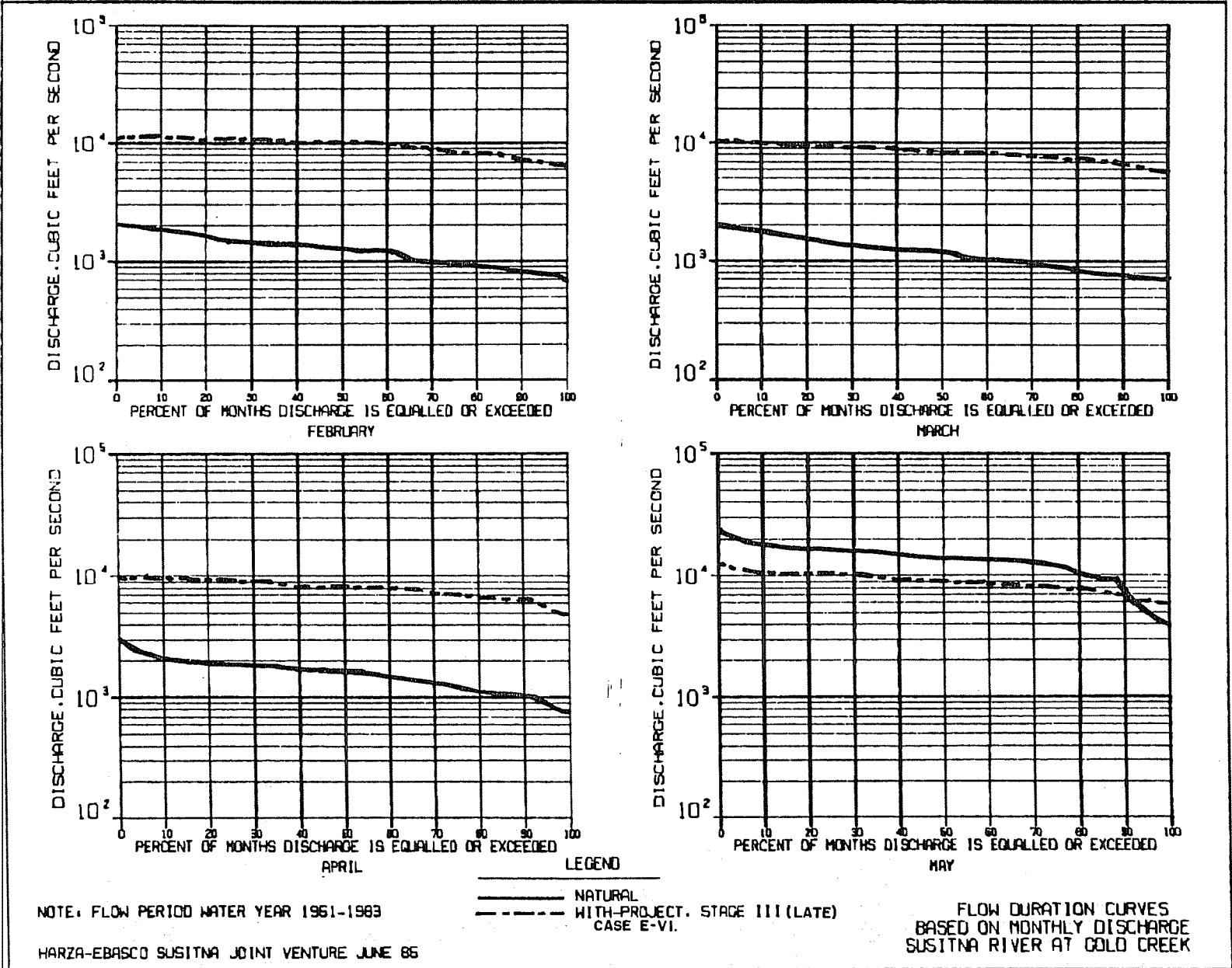


FIGURE E.2.4.248

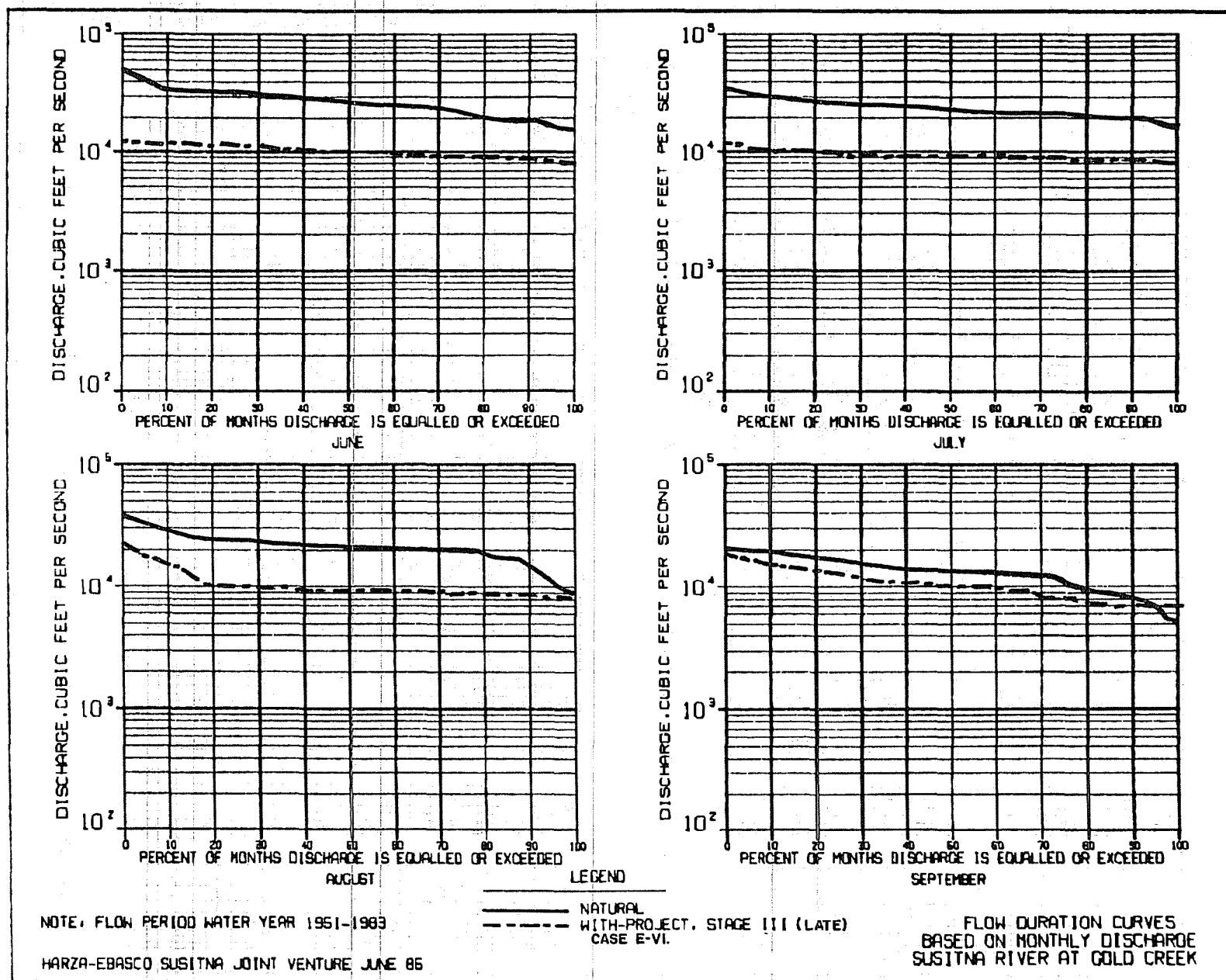
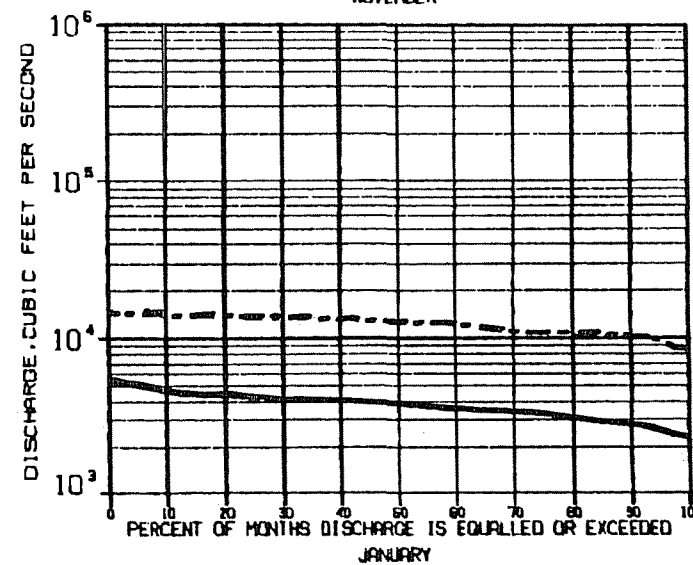
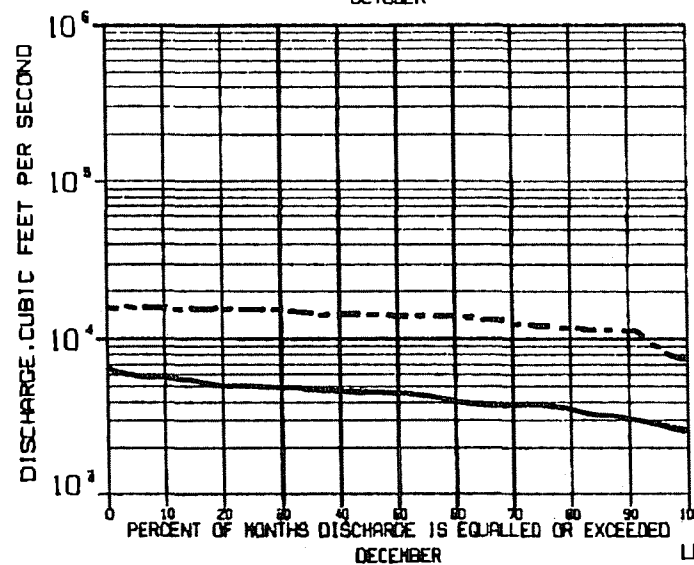
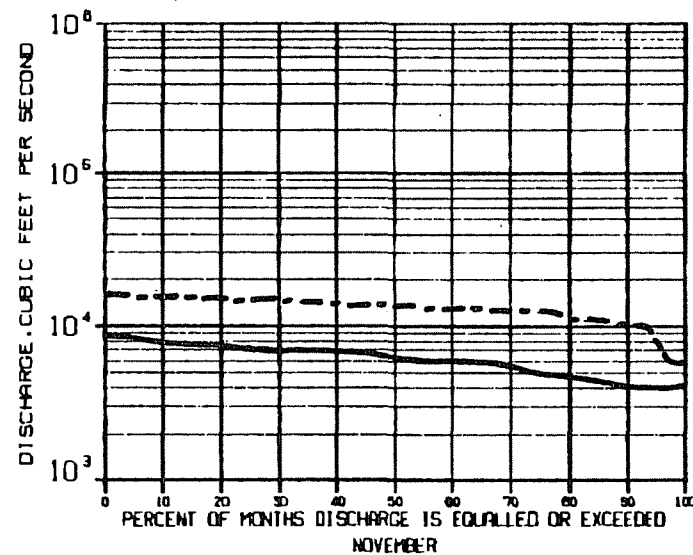
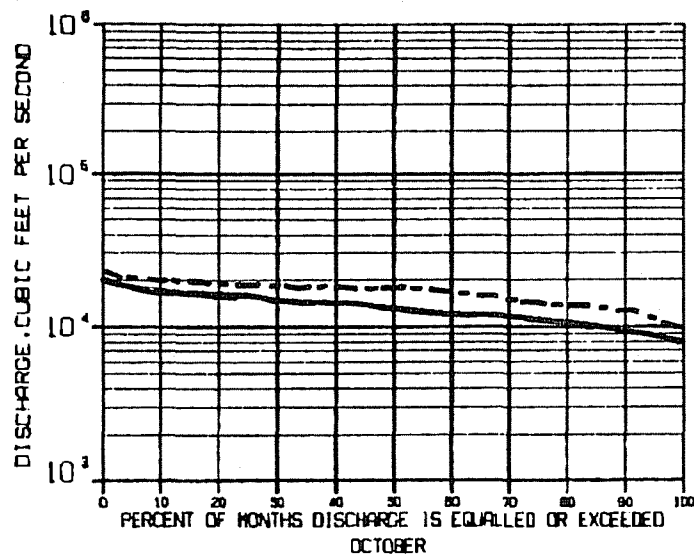


FIGURE E.2.4.248



LEGEND
 — NATURAL
 - - - WITH-PROJECT, STAGE III (LATE)
 CASE E-VI.

NOTE: FLOW PERIOD WATER YEAR 1961-1963

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 86

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT SUNSHINE

FIGURE E.2.4.249

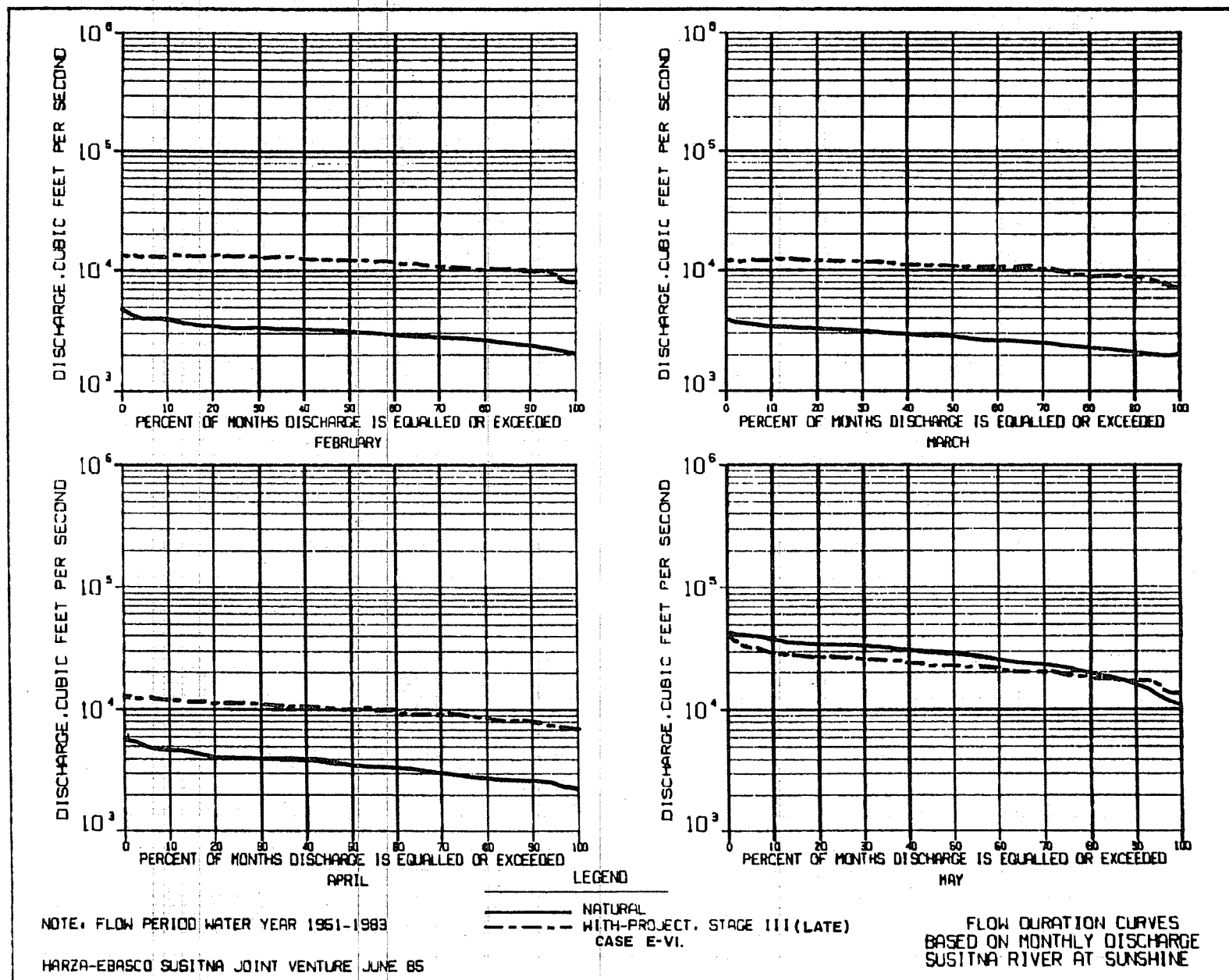
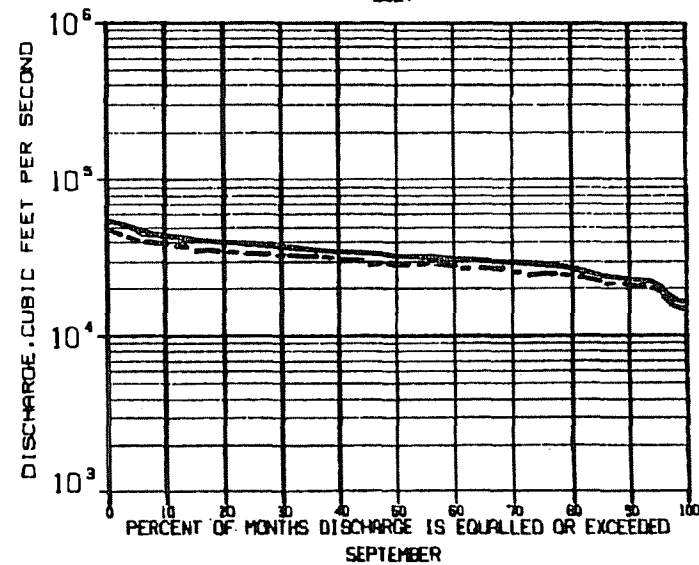
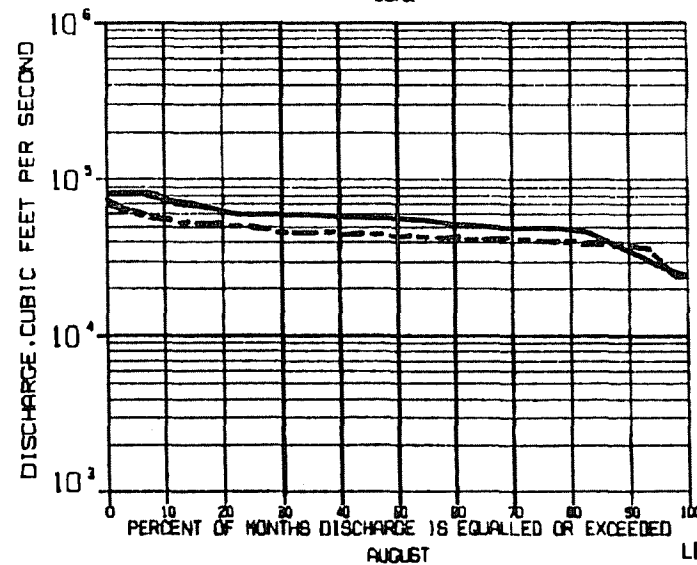
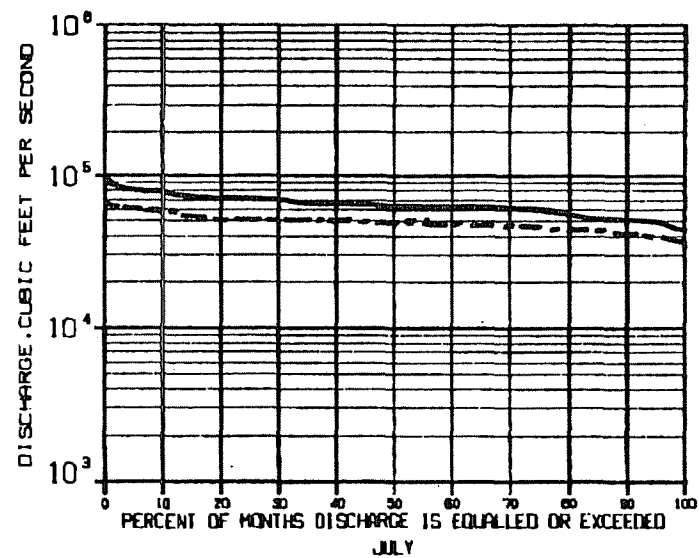
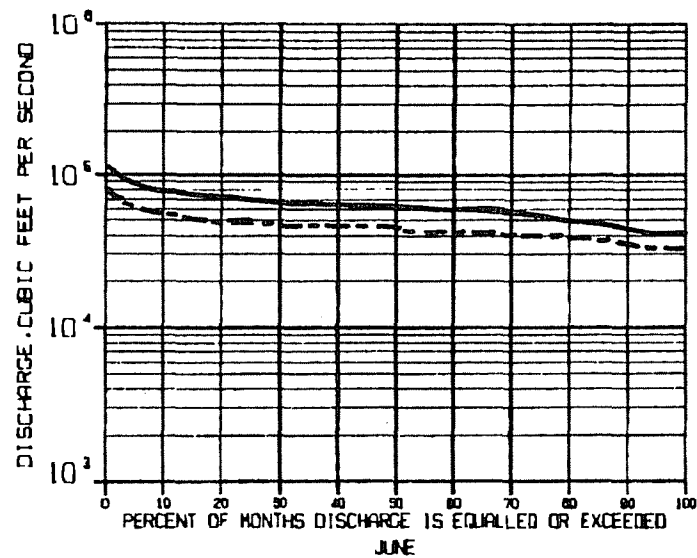


FIGURE E.2.4.249



— NATURAL
 - - - WITH-PROJECT, STAGE III (LATE)
 CASE E-VI.

NOTE: FLOW PERIOD WATER YEAR 1951-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT SUNSHINE

FIGURE E.2.4.249

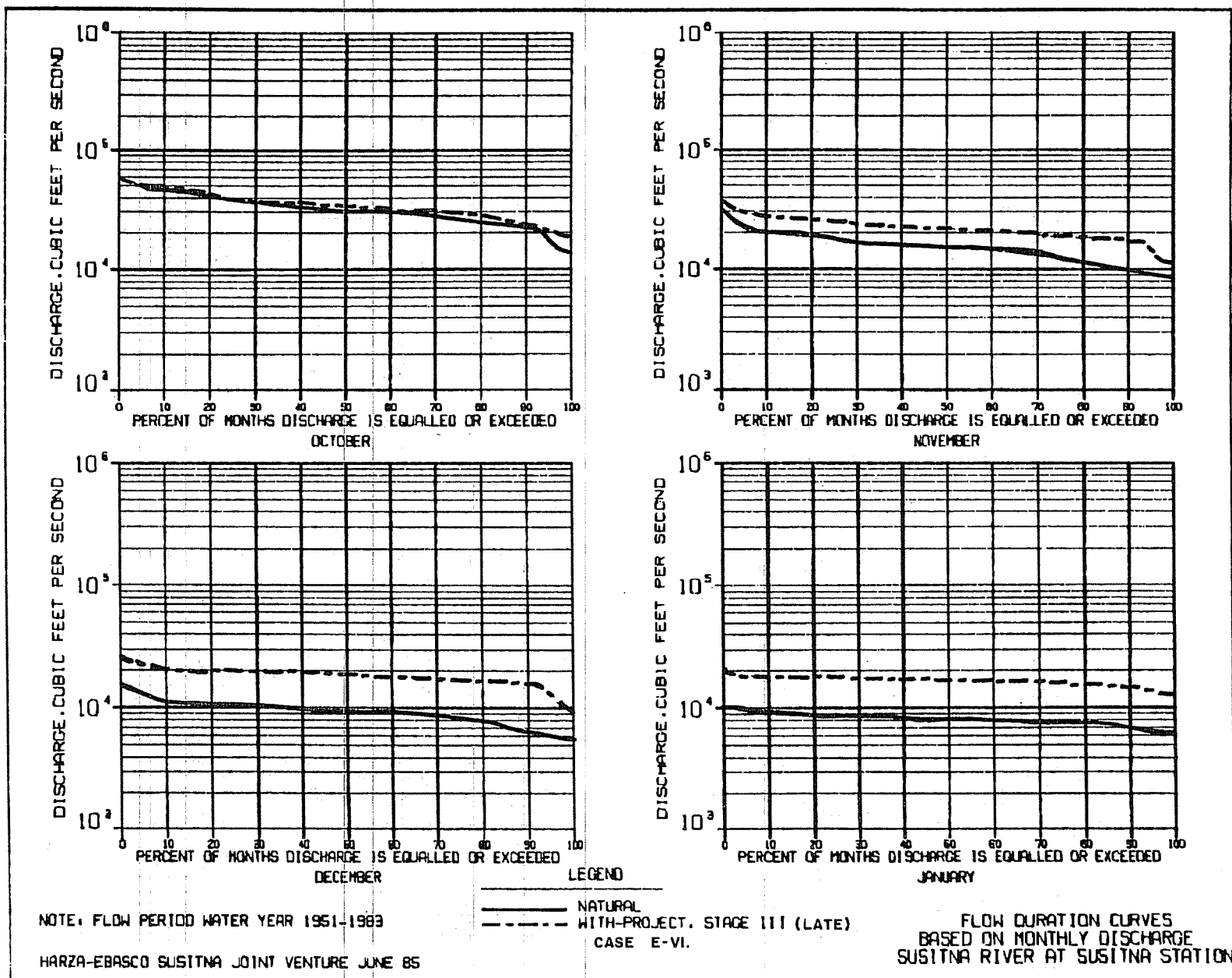
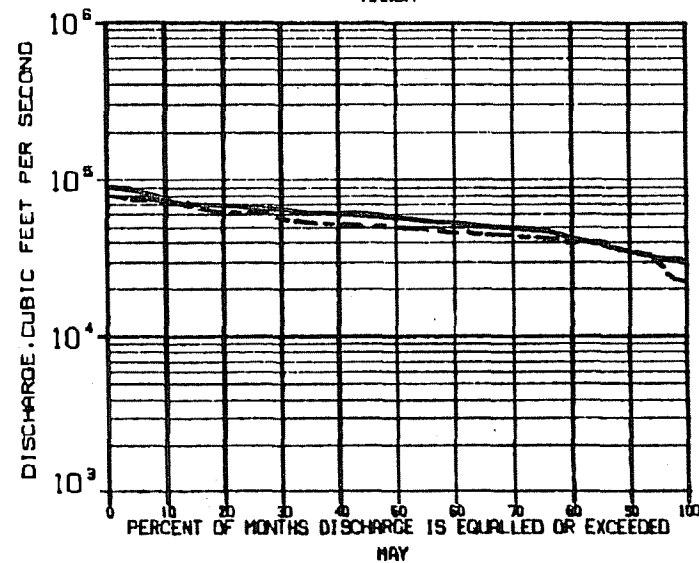
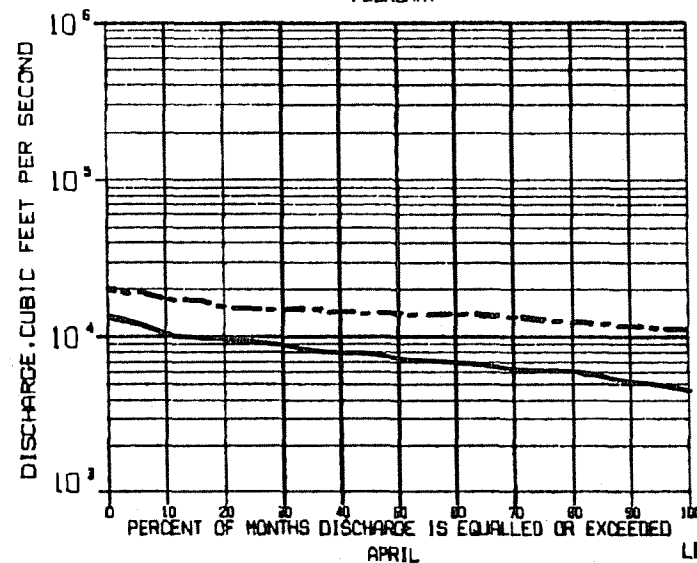
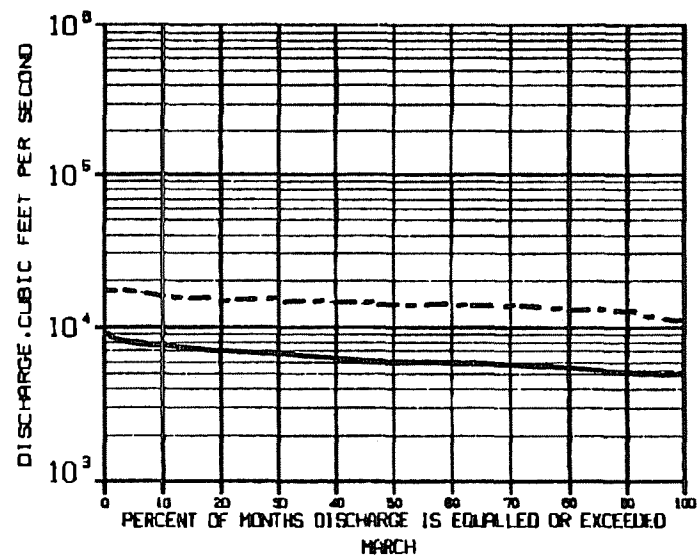
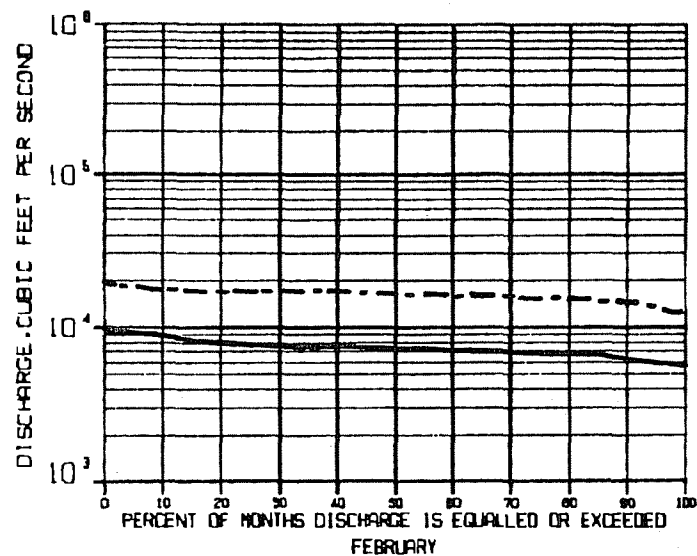


FIGURE E.2.4.250



——— NATURAL
 - - - - - WITH-PROJECT, STAGE III (LATE)
 CASE E-VI.

NOTE: FLOW PERIOD WATER YEAR 1961-1983

HARZA-EBASCO SUSITNA JOINT VENTURE JUNE 85

FLOW DURATION CURVES
 BASED ON MONTHLY DISCHARGE
 SUSITNA RIVER AT SUSITNA STATION

FIGURE E.2.4.250

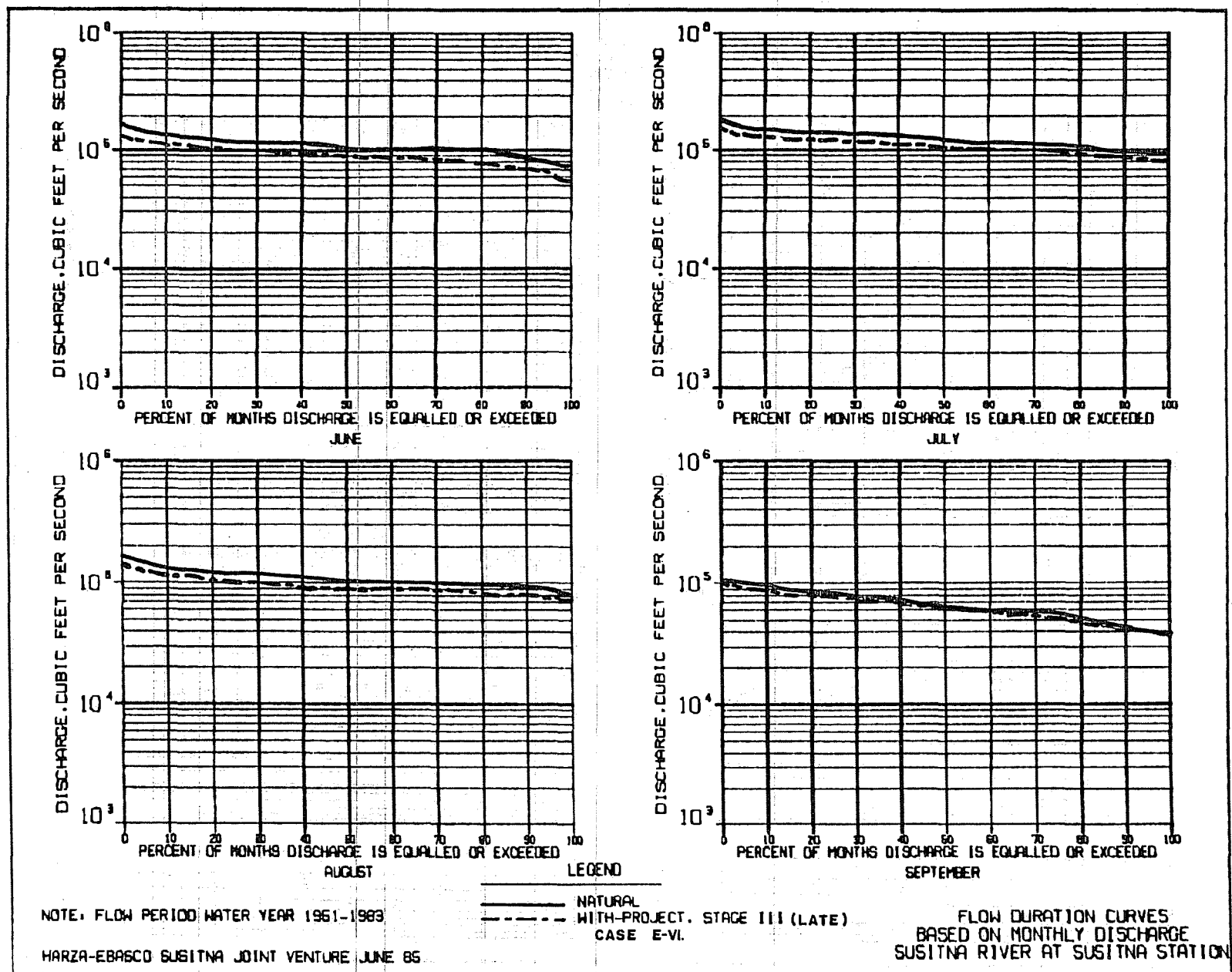
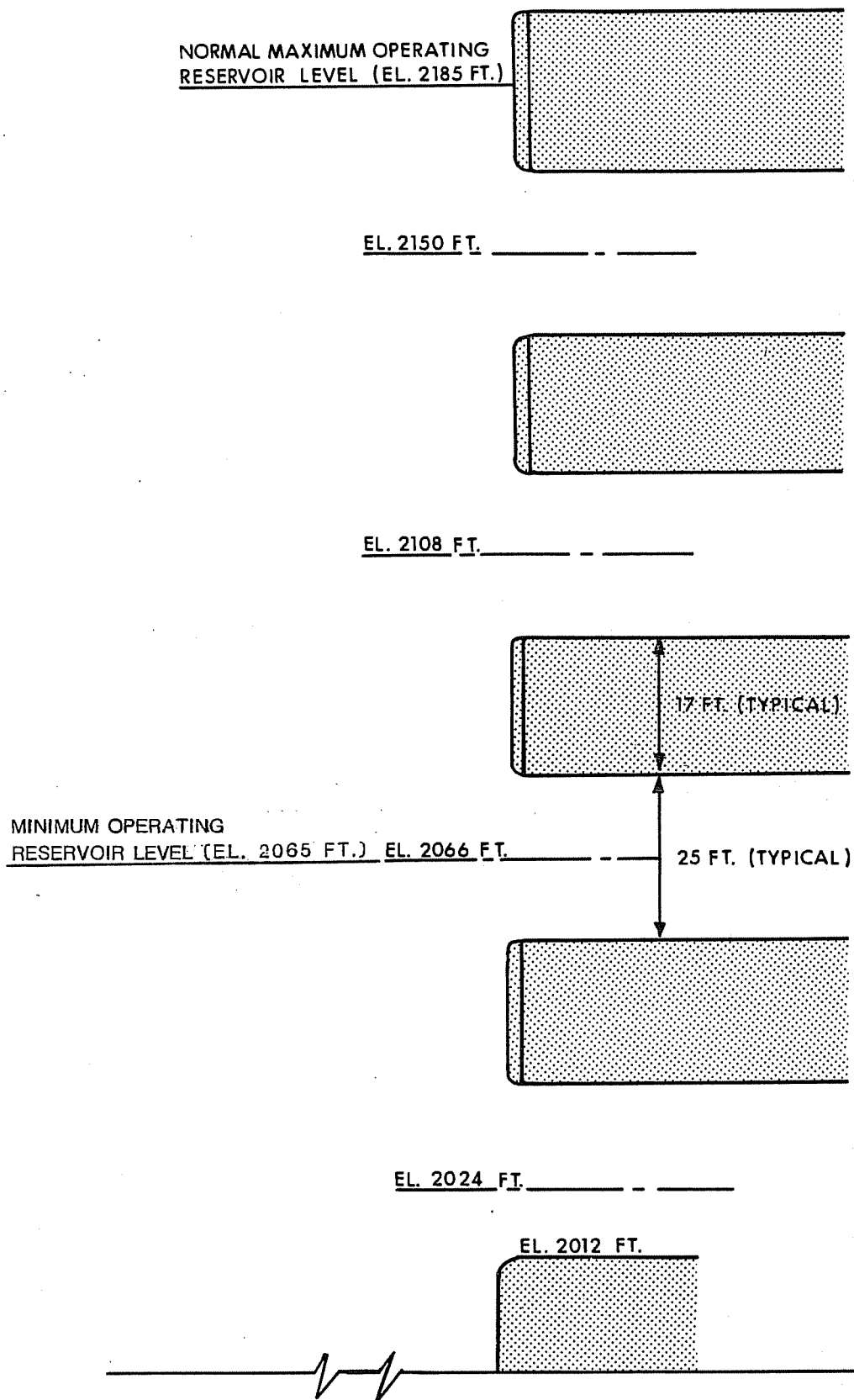


FIGURE E.2.4.250



WATANA MULTILEVEL INTAKE
STAGE III

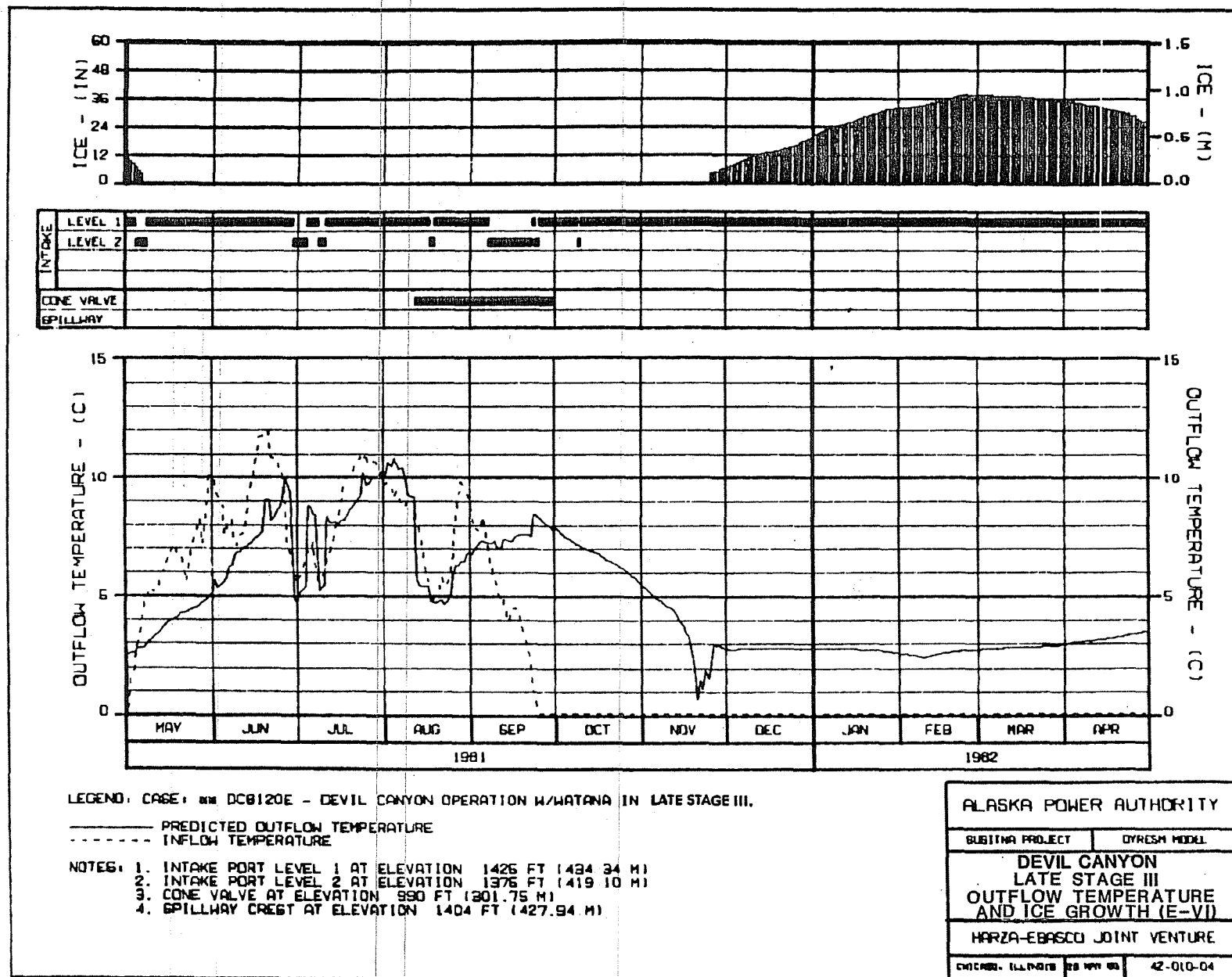
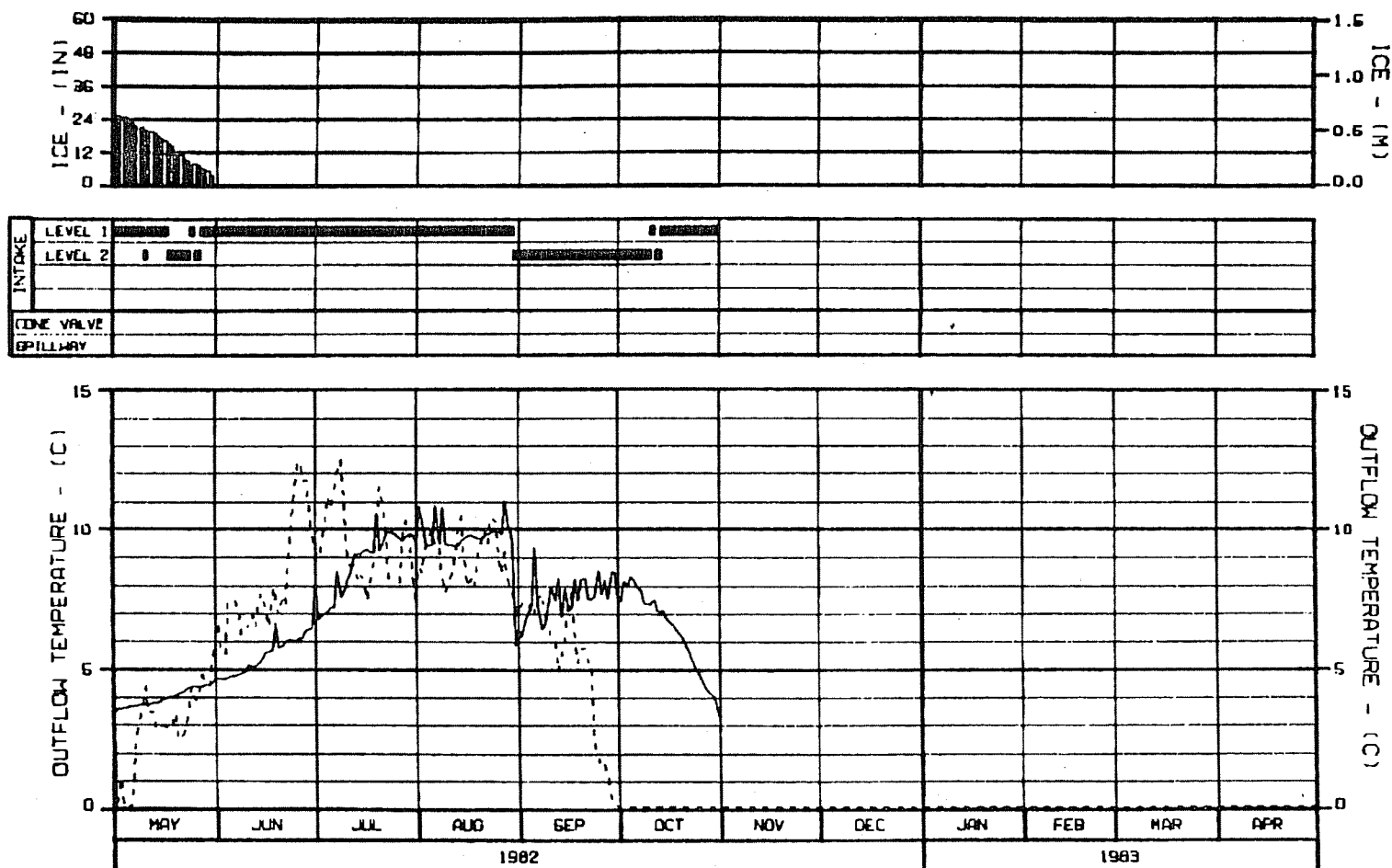


FIGURE E.2.4.252



LEGEND: CASE: W/ DCB120E - DEVIL CANYON OPERATION W/WATANA IN LATE STAGE III.

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES: 1. INTAKE PORT LEVEL 1 AT ELEVATION 1426 FT (434.94 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1375 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.84 M)

ALASKA POWER AUTHORITY

SUSTINA PROJECT DYWIDOR MODEL

DEVIL CANYON
 LATE STAGE III
 OUTFLOW TEMPERATURE
 AND ICE GROWTH (F-VI)

HARZA-EBASCO JOINT VENTURE

DUCROS, ELLIOTT 28 MAY 83 42-010-04

FIGURE E.2.4.253



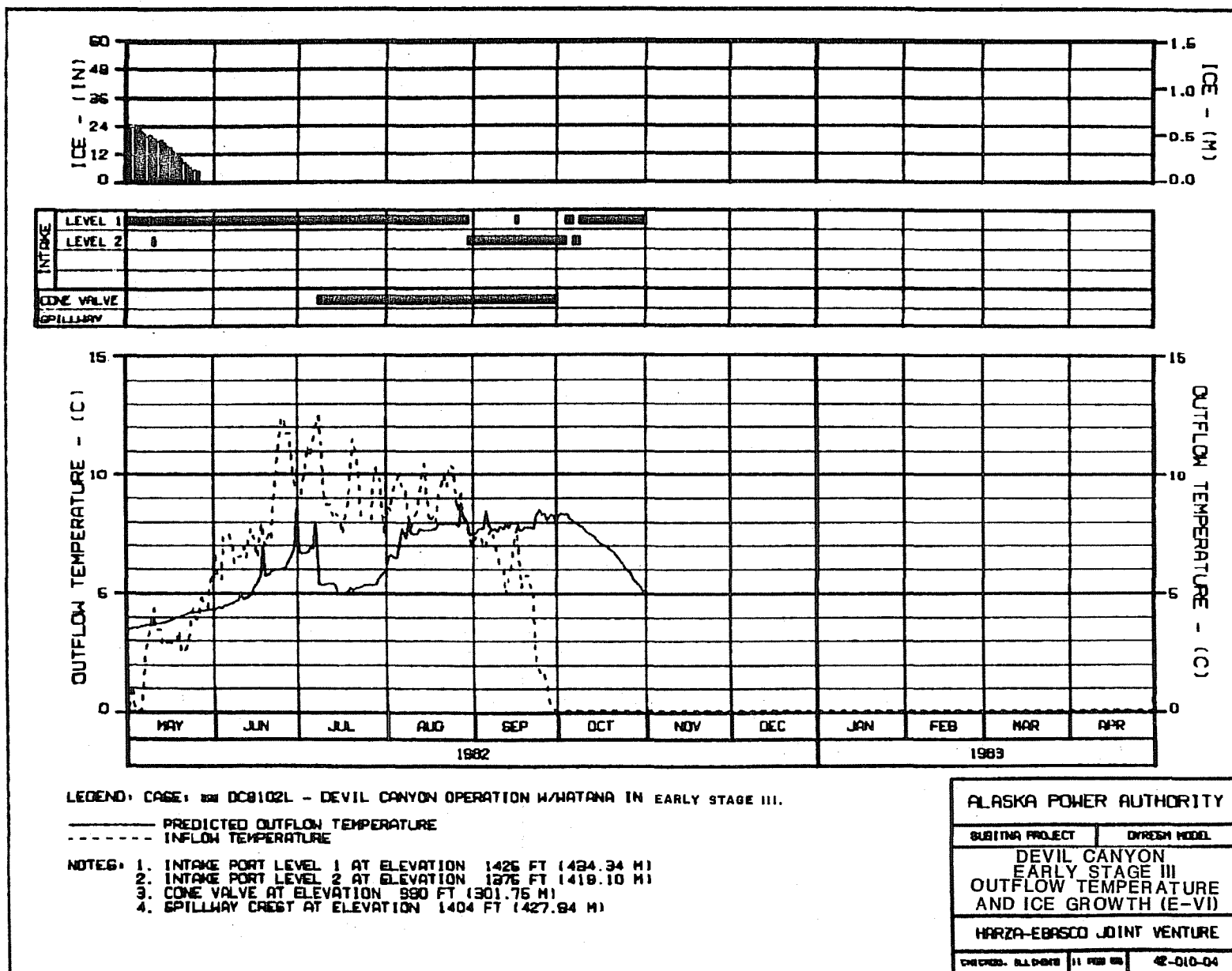
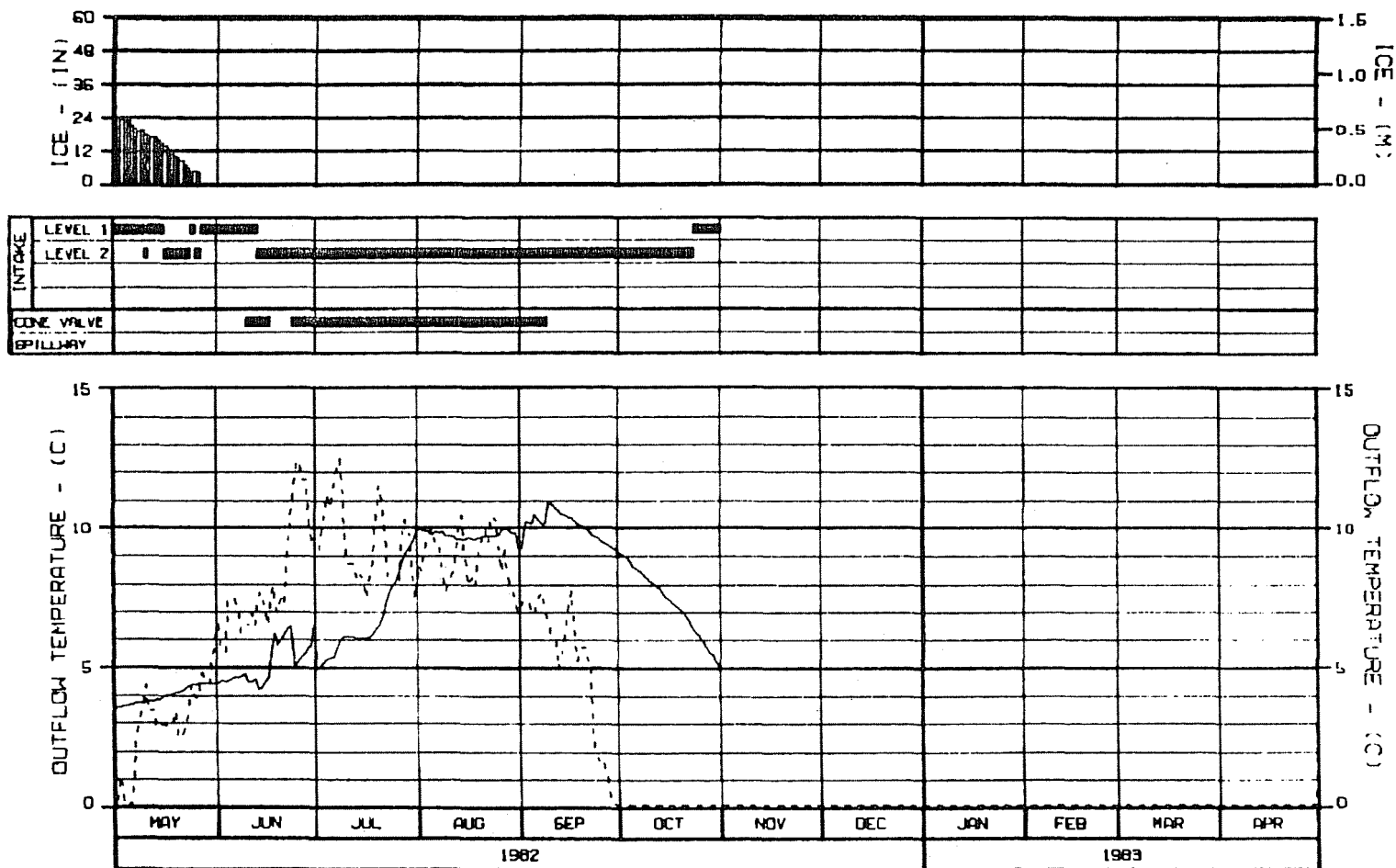


FIGURE E.2.4.255



LEGEND: CASE: DC81200 - DEVIL CANYON OPERATION W/WATANA IN LATE STAGE III.

———— PREDICTED OUTFLOW TEMPERATURE
 - - - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 1426 FT (434.34 M)
 2. INTAKE PORT LEVEL 2 AT ELEVATION 1376 FT (419.10 M)
 3. CONE VALVE AT ELEVATION 990 FT (301.75 M)
 4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)
 5. FOR COMPARISON WITH PROPOSED PROJECT.

ALASKA POWER AUTHORITY

SUSTINA PROJECT DYRESM MODEL

DEVIL CANYON
 LATE STAGE III
 OUTFLOW TEMPERATURE
 AND ICE GROWTH (E-I)

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS 60606 MAY 1983 42-010-04

FIGURE E.2.4.257

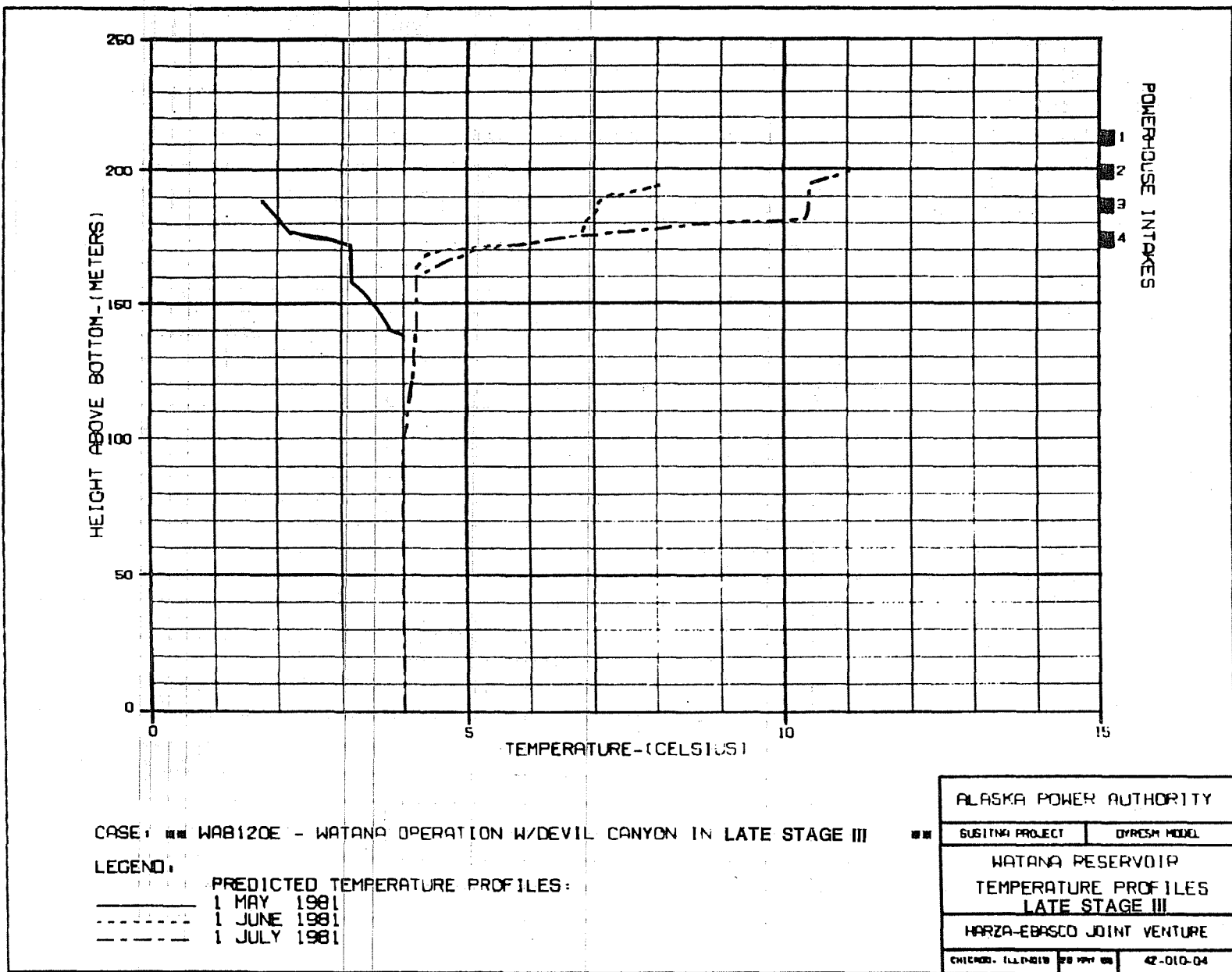
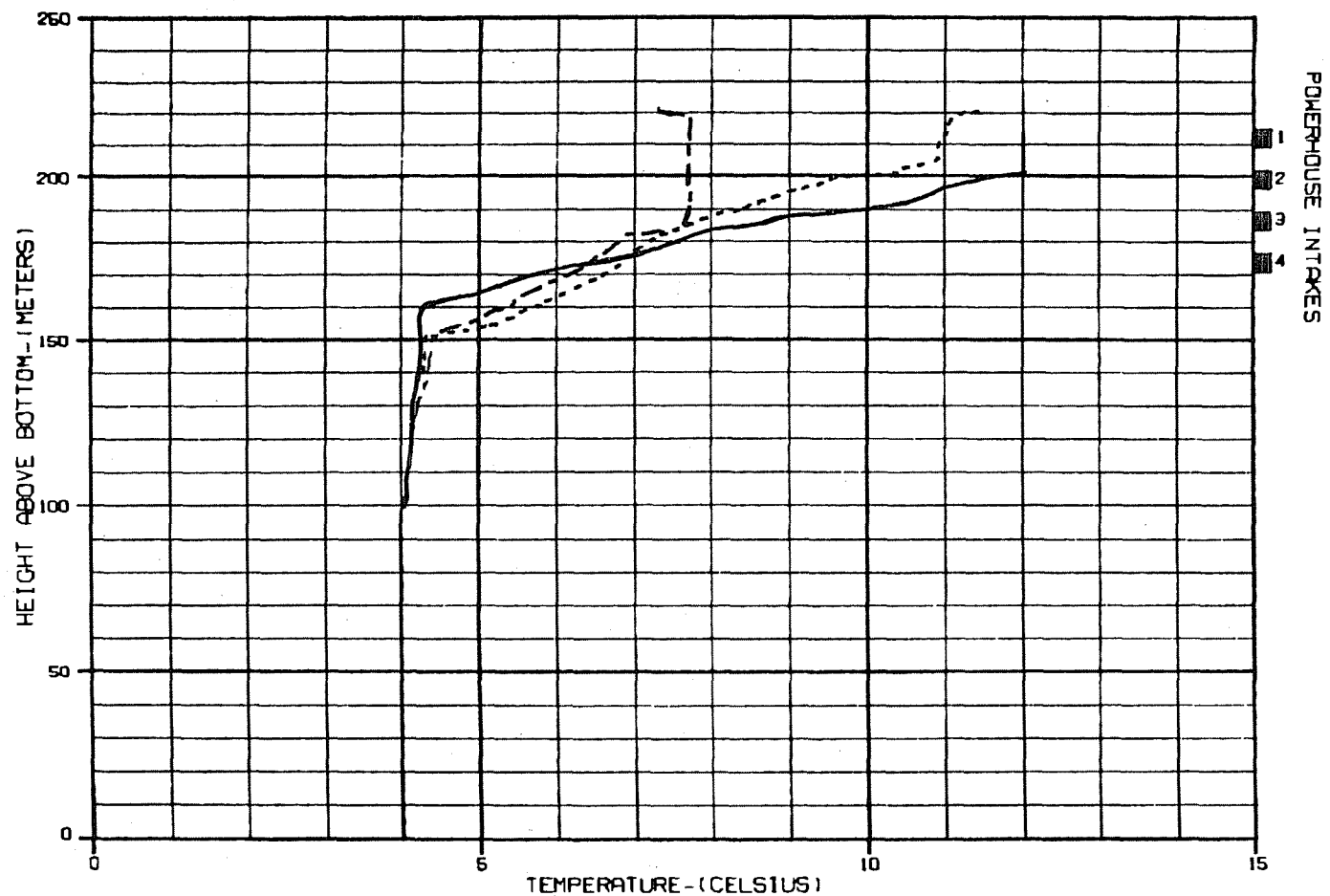


FIGURE E.2.4.258



CASE: WAB120E - WATANA OPERATION W/DEVIL CANYON IN LATE STAGE III

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 AUGUST 1981
 - - - 1 SEPTEMBER 1981
 - . - 1 OCTOBER 1981

ALASKA POWER AUTHORITY

SUBITNA PROJECT

DYRESH MODEL

WATANA RESERVOIR

TEMPERATURE PROFILES
 LATE STAGE III

WARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS

28 MAY 81

42-010-04

FIGURE E.2.4.259

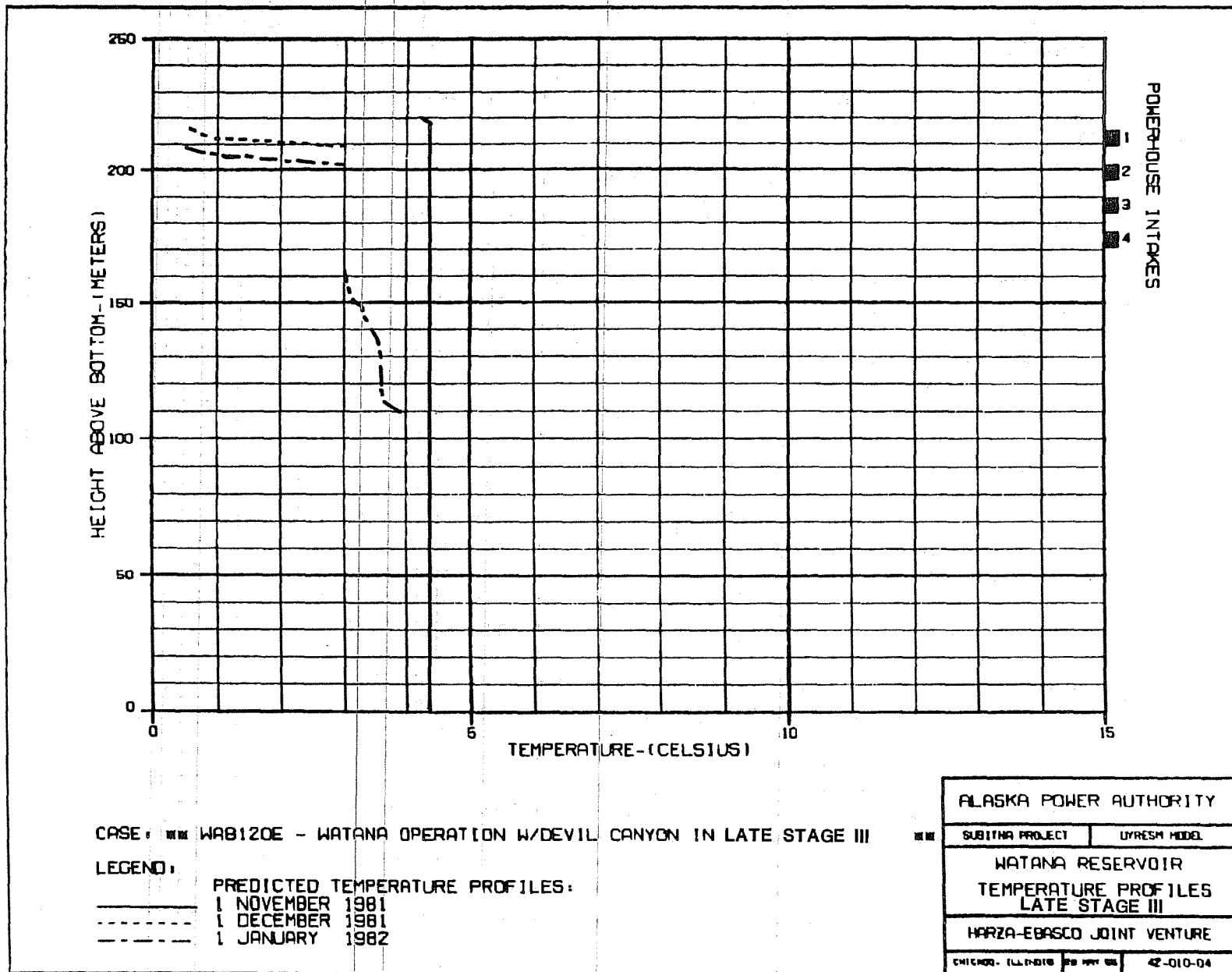
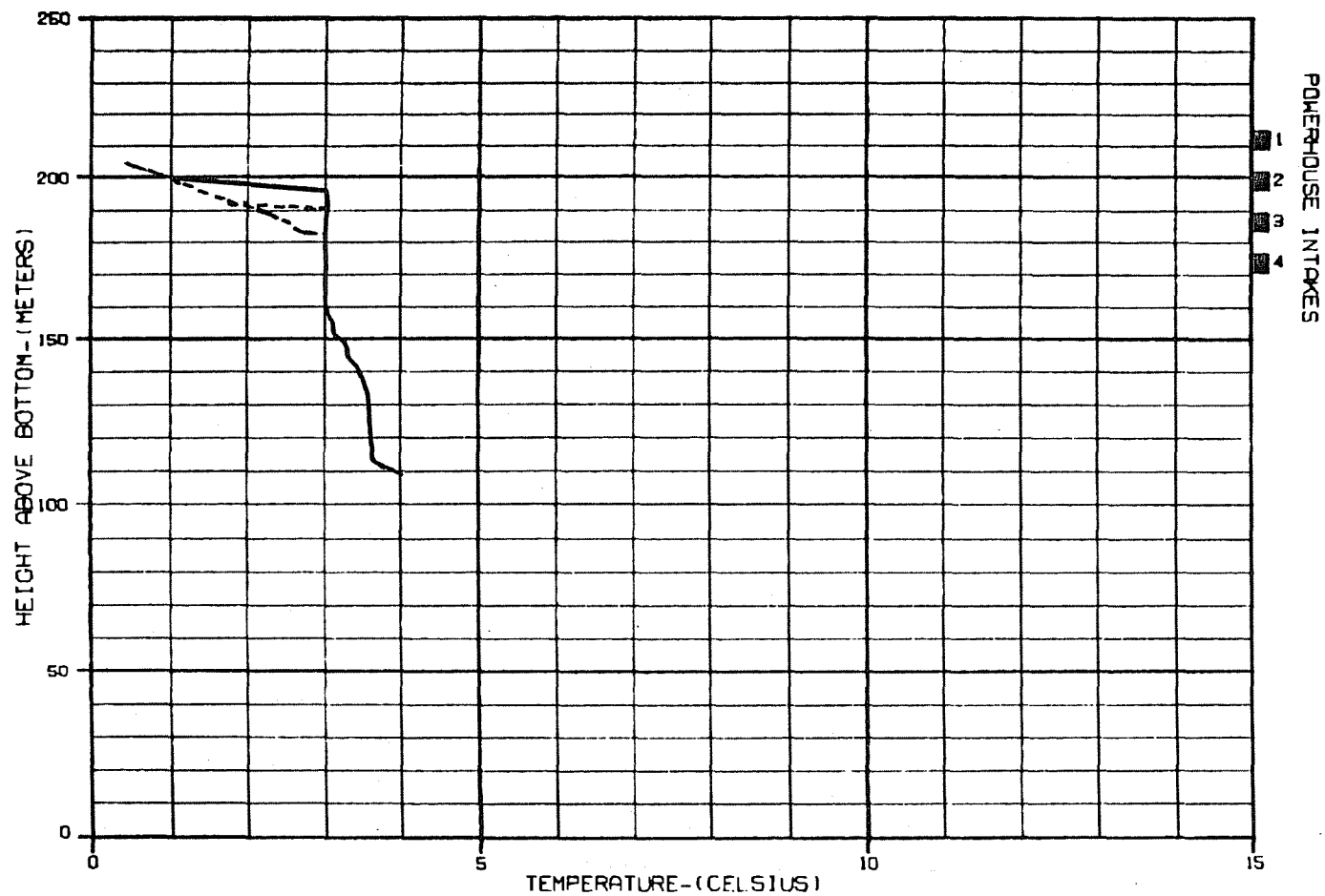


FIGURE E.2.4.260



CASE: WAB120E - WATANA OPERATION W/DEVIL CANYON IN LATE STAGE III

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 FEBRUARY 1982
 - - - 1 MARCH 1982
 . . . 1 APRIL 1982

ALASKA POWER AUTHORITY

GUSTINA PROJECT

DYKES MODEL

WATANA RESERVOIR

TEMPERATURE PROFILES
 LATE STAGE III

HARZA-EBASCO JOINT VENTURE

CHICHO - ILLINOIS

20 MAY 82

42-010-04

FIGURE E.2.4.261

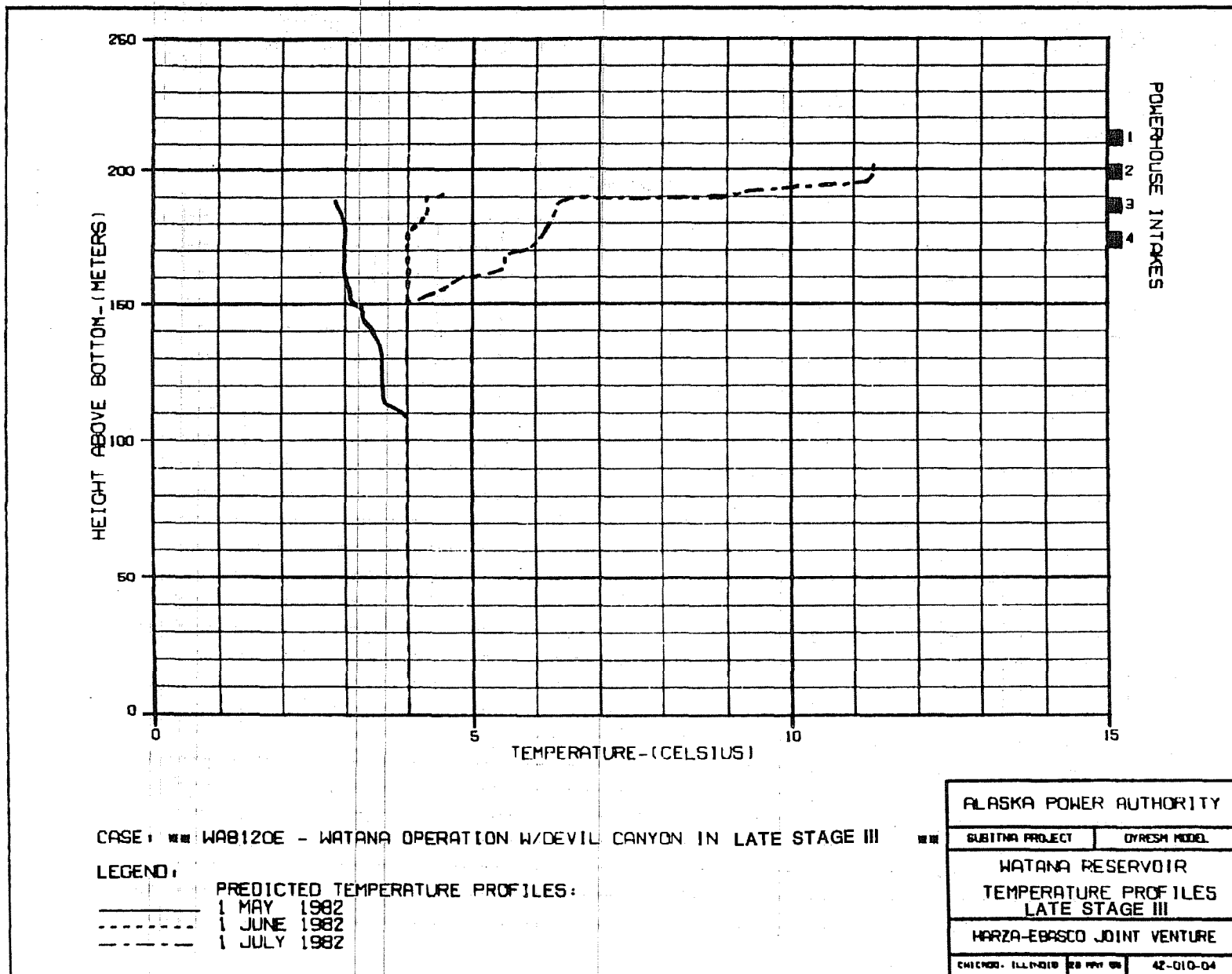
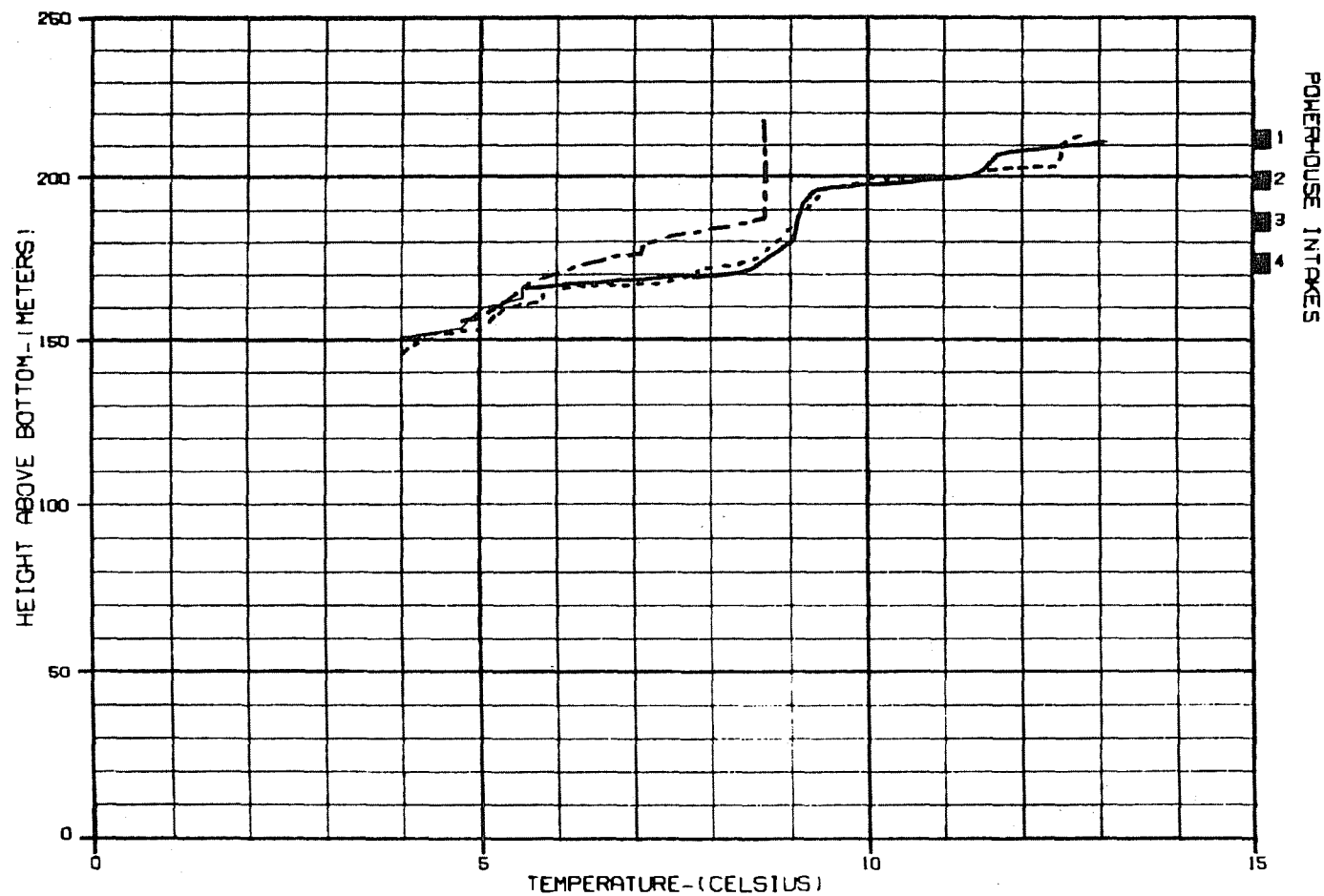


FIGURE E.2.4.262



CASE: WAB120E - WATANA OPERATION W/DEVIL CANYON IN LATE STAGE III

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 AUGUST 1982
 --- 1 SEPTEMBER 1982
 -.- 1 OCTOBER 1982

ALASKA POWER AUTHORITY

SUGITNA PROJECT

DYKES MODEL

WATANA RESERVOIR

TEMPERATURE PROFILES
 LATE STAGE III

HARZA-EBASCO JOINT VENTURE

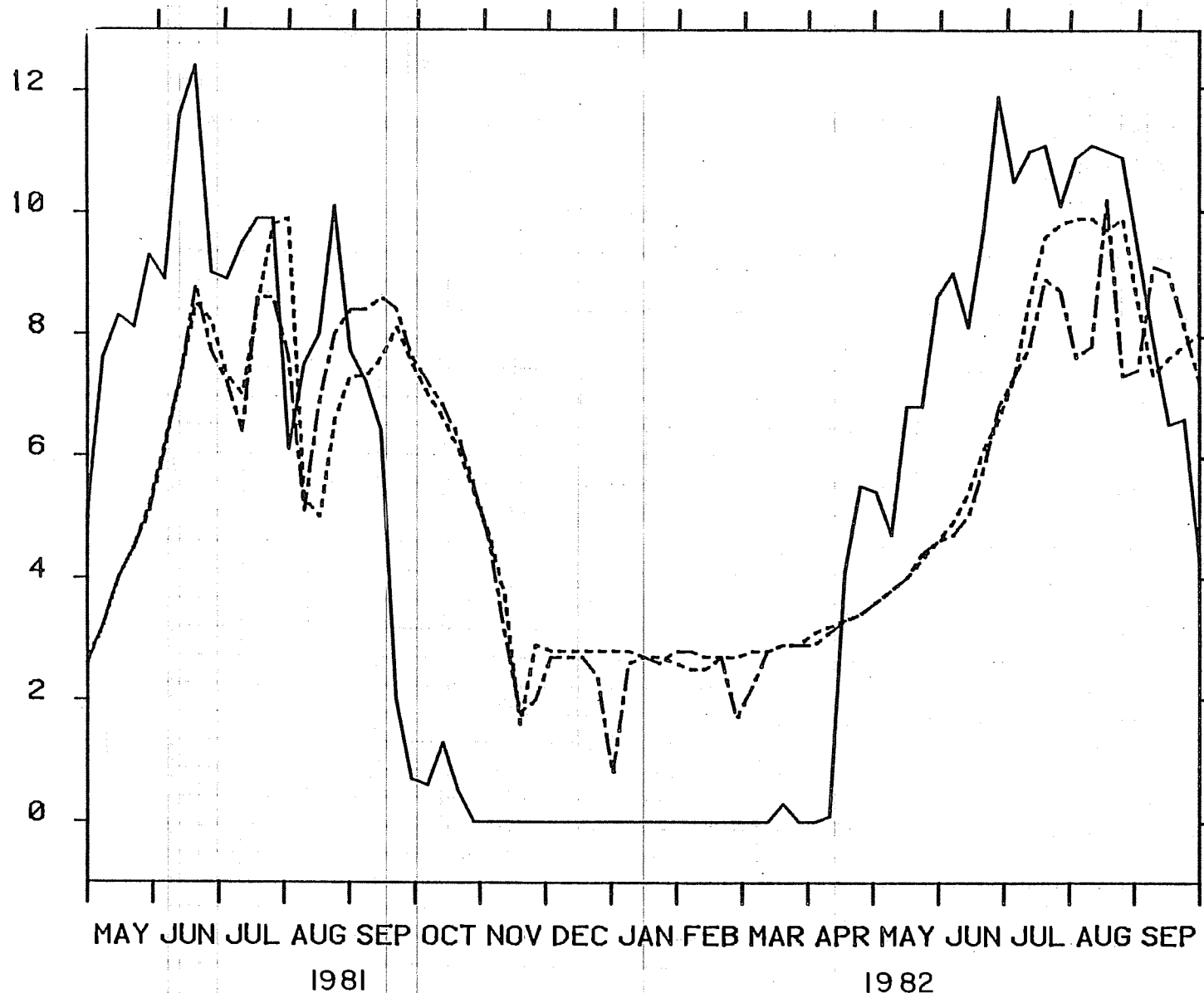
CHICAGO, ILLINOIS

10 MAY 83

42-010-04

FIGURE E.2.4.263

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 3 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. DEVIL CANYON DRAWDOWN OF 50 FEET-2 LEVELS OF SHUTTERS

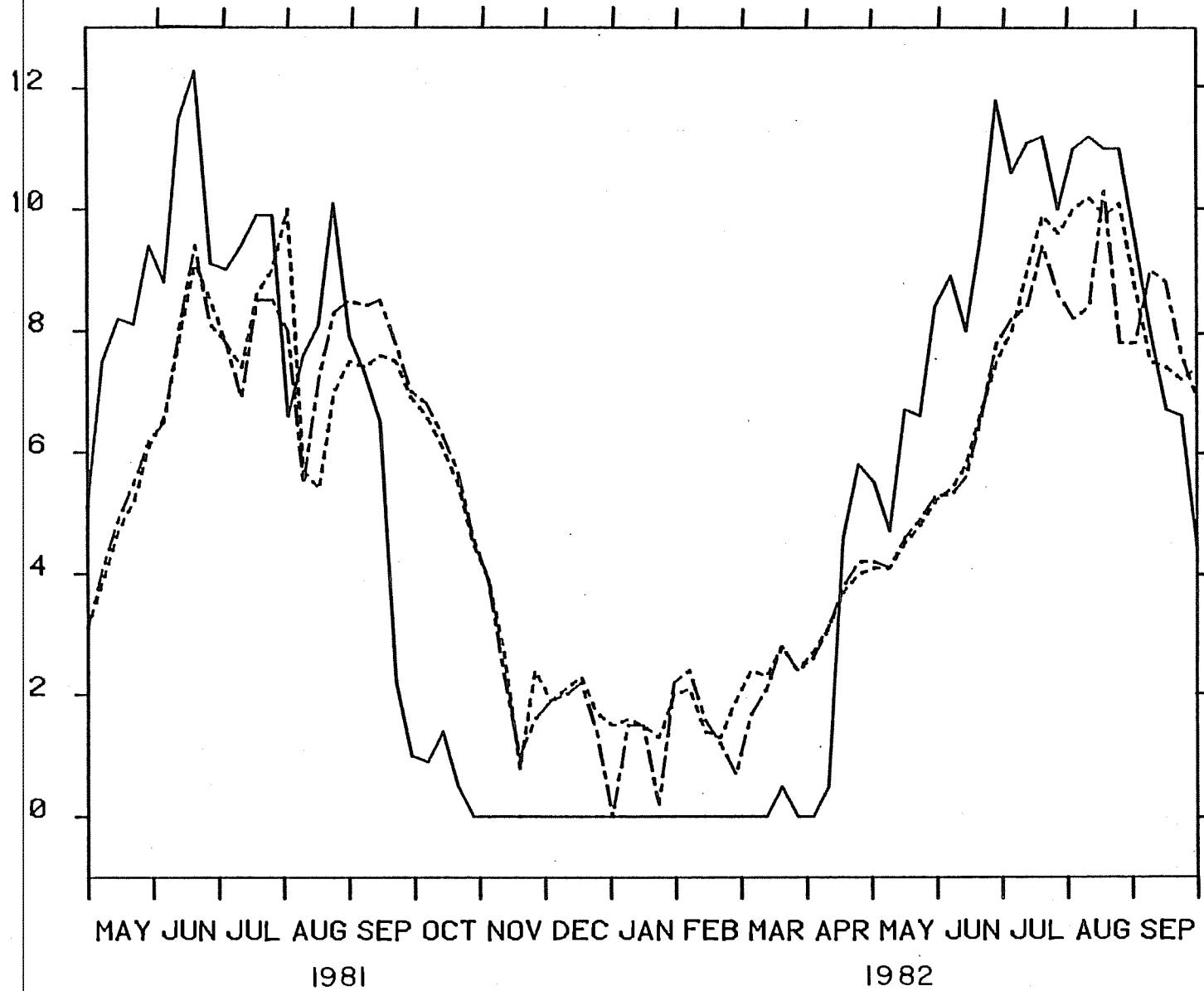
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES STAGE 3 OF PROPOSED PROJECT
- . - . - SIMULATED TEMPERATURES PHASE 2 OF TWO STAGE PROJECT, CASE C FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 150	
LATE STAGE III	
DATE: 10/1/82	BY: J. H. HARRIS
REVISION: 1	APPROVED: J. H. HARRIS

FIGURE E.2.4.264

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 3 OF 3-STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. DEVIL CANYON DRAWDOWN OF 50 FEET- 2 LEVELS OF SHUTTERS

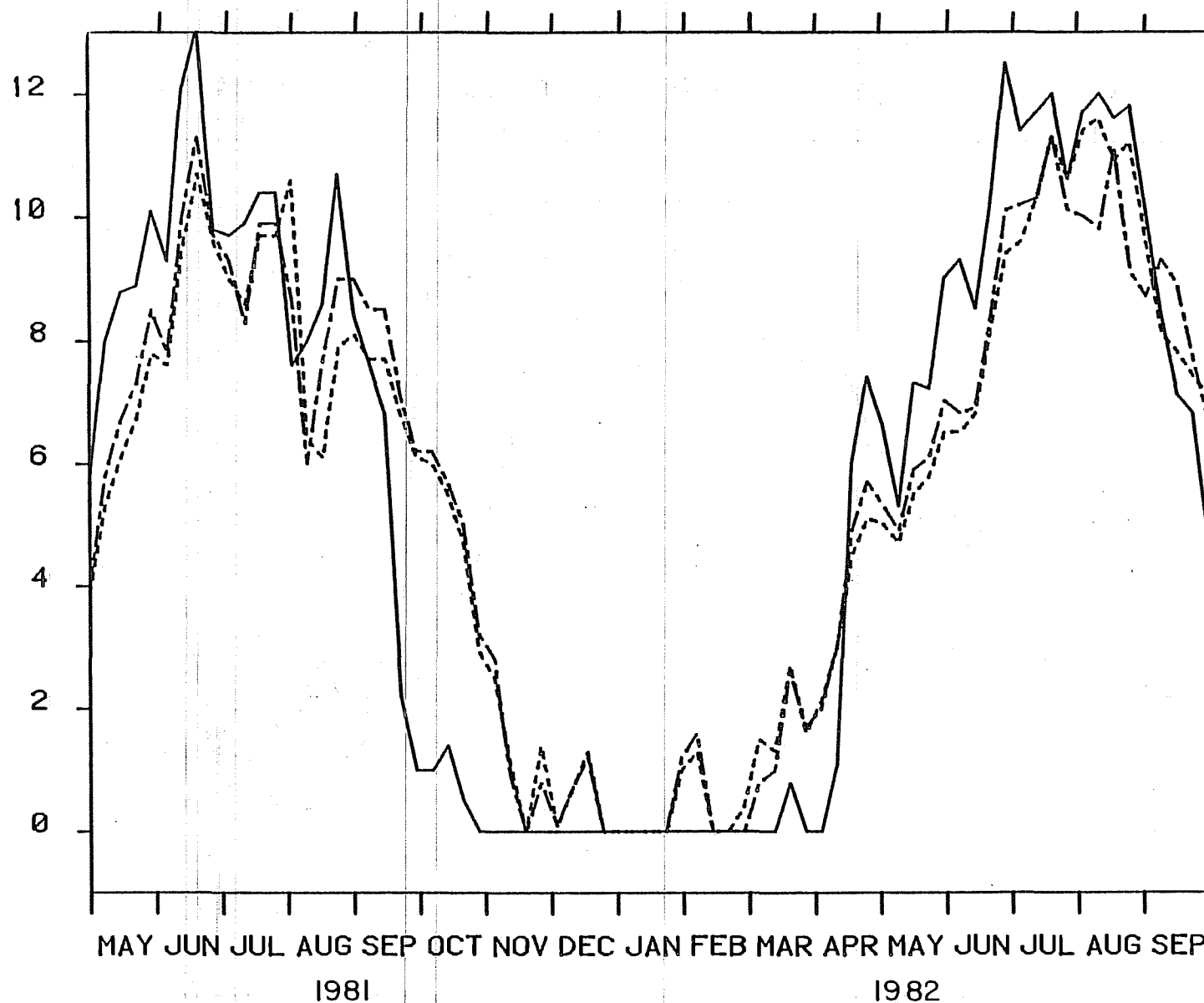
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES PHASE 2 OF TWO STAGE PROJECT, CASE C FLOW REQUIREMENTS (FOR COMPARISON)
- . - . - SIMULATED TEMPERATURES STAGE 3 OF PROPOSED PROJECT

ALASKA POWER AUTHORITY	
BUSITNA HYDROELECTRIC PROJECT	
SIMULATED BUSITNA RIVER TEMPERATURES	
RIVER MILE 130	
LATE STAGE III	
DATE: 08/08/82	BY: J. H. HARRIS
REVISION: 01	REVISION: 01

FIGURE E.2.4.265

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 3 OF 3-STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER
7. DEVIL CANYON DRAWDOWN OF 50 FEET- 2 LEVELS OF SHUTTERS

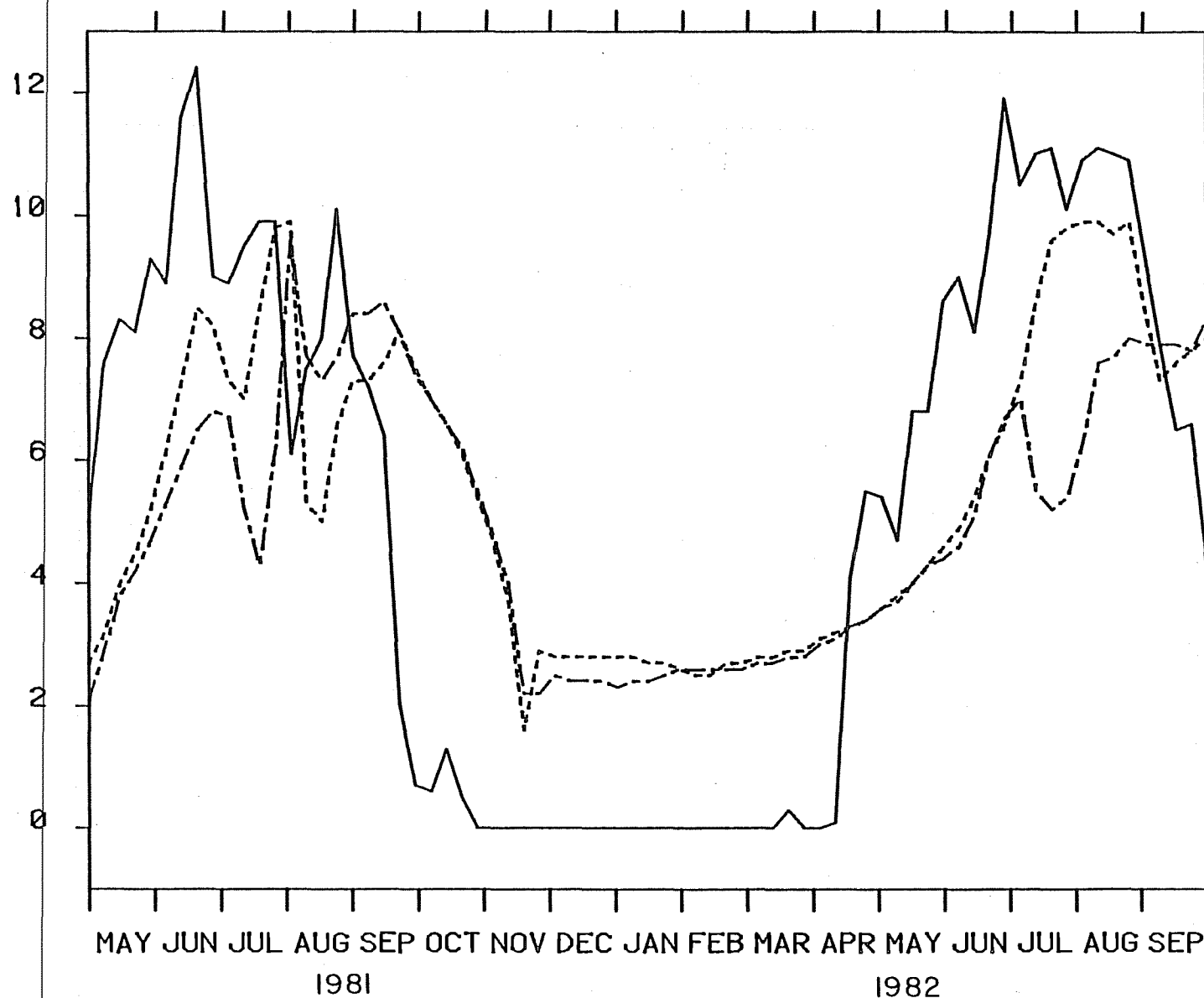
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES PHASE 2 OF TWO STAGE PROJECT, CASE C FLOW REQUIREMENTS (FOR COMPARISON)
- · · SIMULATED TEMPERATURES STAGE 3 OF PROPOSED PROJECT

ALASKA POWER AUTHORITY	
BUSITNA HYDROLECTRIC PROJECT	
SIMULATED BUSITNA RIVER TEMPERATURES	
RIVER MILE 100	
LATE STAGE III	
DATE: 10/1/82	BY: J. H. HARRIS
APPROVED: J. H. HARRIS	REVIEWED: J. H. HARRIS

FIGURE E.2.4.266

DEGREES C



NOTES:

CLIMATOLOGICAL AND
HYDROLOGICAL DATA
PERIOD MAY 1981-SEPT.
1982

2. INFLOW TEMPERATURE
MATCHING POLICY FOR
MULTI-LEVEL INTAKE
3. STAGE 3 OF 3 STAGE
PROJECT
4. DEVIL CANYON DRAWDOWN
OF 50 FEET-2 LEVELS OF
SHUTTERS
5. THE TWO SIMULATIONS SHOWN
PROVIDE BOUNDS ON TEMPERATURES
WHICH CAN BE EXPECTED DURING
STAGE III, AS ENERGY DEMAND AND
PROJECT ENERGY PRODUCTION
INCREASES TEMPERATURES WILL
PROGRESS FROM THOSE SHOWN FOR
EARLY STAGE III DEMANDS TO THOSE
SHOWN FOR LATE STAGE III DEMANDS

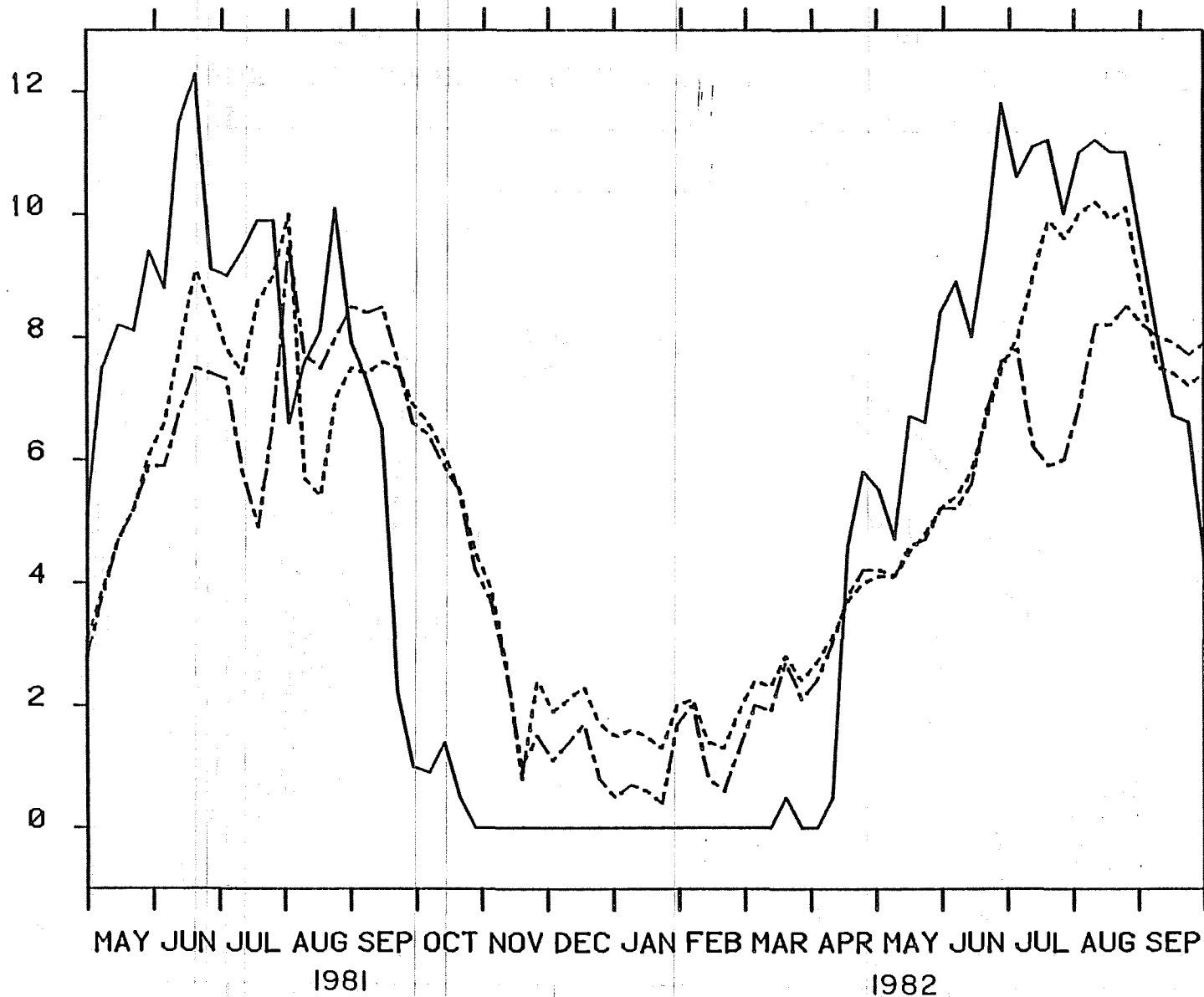
LEGEND

- SIMULATED NATURAL
TEMPERATURES
- - - LATE STAGE III
- . - EARLY STAGE III

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 150 STAGE III	
DATE: 10/1/82	BY: J. H. HARRIS
REVISION: 1.0	APPROVED: 10/1/82

FIGURE E.2.4.267

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 3 OF 3 STAGE PROJECT
4. DEVIL CANYON DRAWDOWN OF 50 FEET-2 LEVELS OF SHUTTERS
5. THE TWO SIMULATIONS SHOWN PROVIDE BOUNDS ON TEMPERATURES WHICH CAN BE EXPECTED DURING STAGE III. AS ENERGY DEMAND AND PROJECT ENERGY PRODUCTION INCREASES TEMPERATURES WILL PROGRESS FROM THOSE SHOWN FOR EARLY STAGE III DEMANDS TO THOSE SHOWN FOR LATE STAGE III DEMANDS

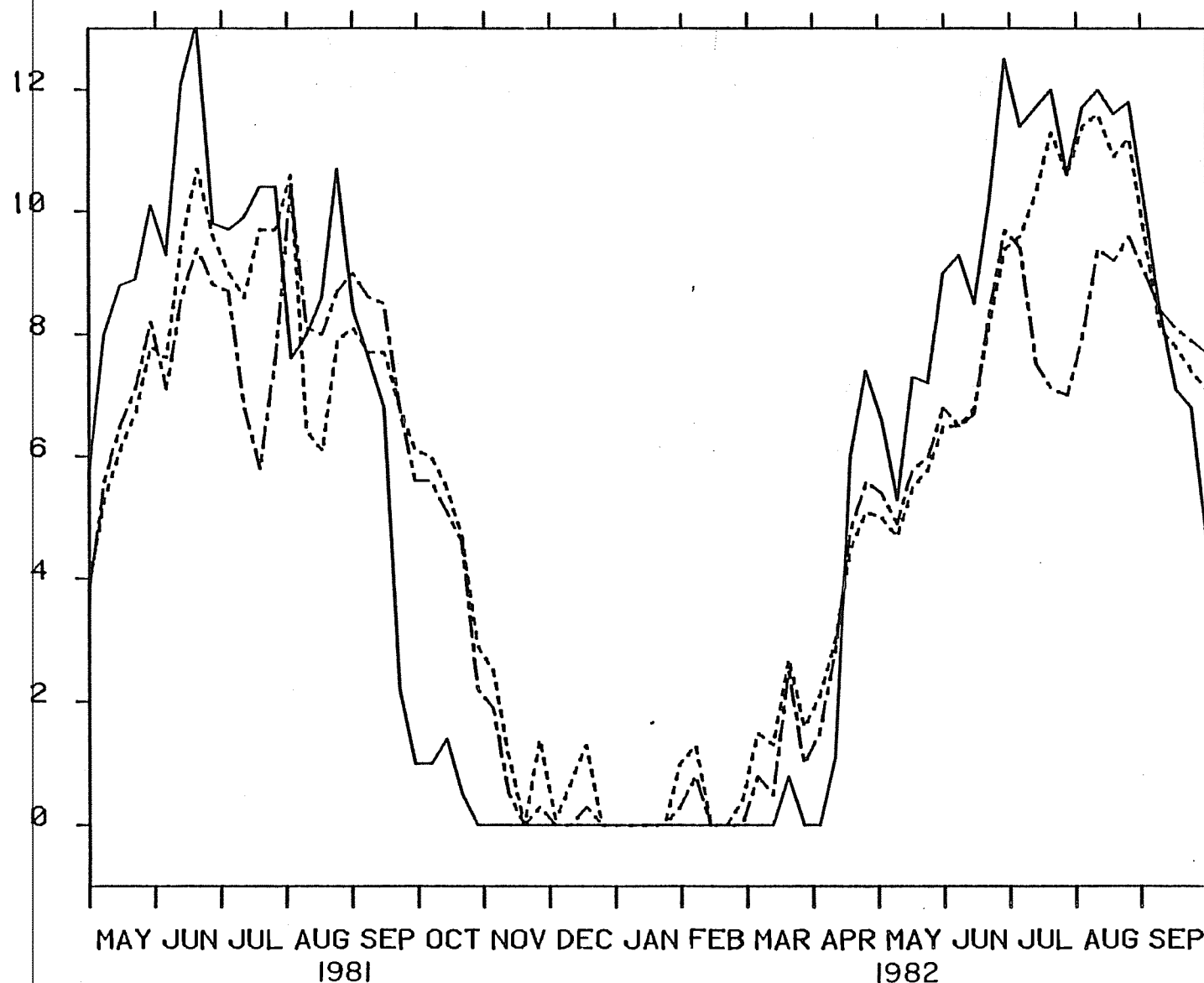
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - LATE STAGE III
- . - EARLY STAGE III

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 130	
STAGE III	
DATE: 10/1/82	BY: [Signature]

FIGURE E.2.4.268

DEGREES
C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 3 OF 3 STAGE PROJECT
4. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)
5. DEVIL CANYON DRAWDOWN OF 50 FEET-2 LEVELS OF SHUTTERS
6. THE TWO SIMULATIONS SHOWN PROVIDE BOUNDS ON TEMPERATURES WHICH CAN BE EXPECTED DURING STAGE III. AS ENERGY DEMAND AND PROJECT ENERGY PRODUCTION INCREASES TEMPERATURES WILL PROGRESS FROM THOSE SHOWN FOR EARLY STAGE III DEMANDS TO THOSE SHOWN FOR LATE STAGE III DEMAND

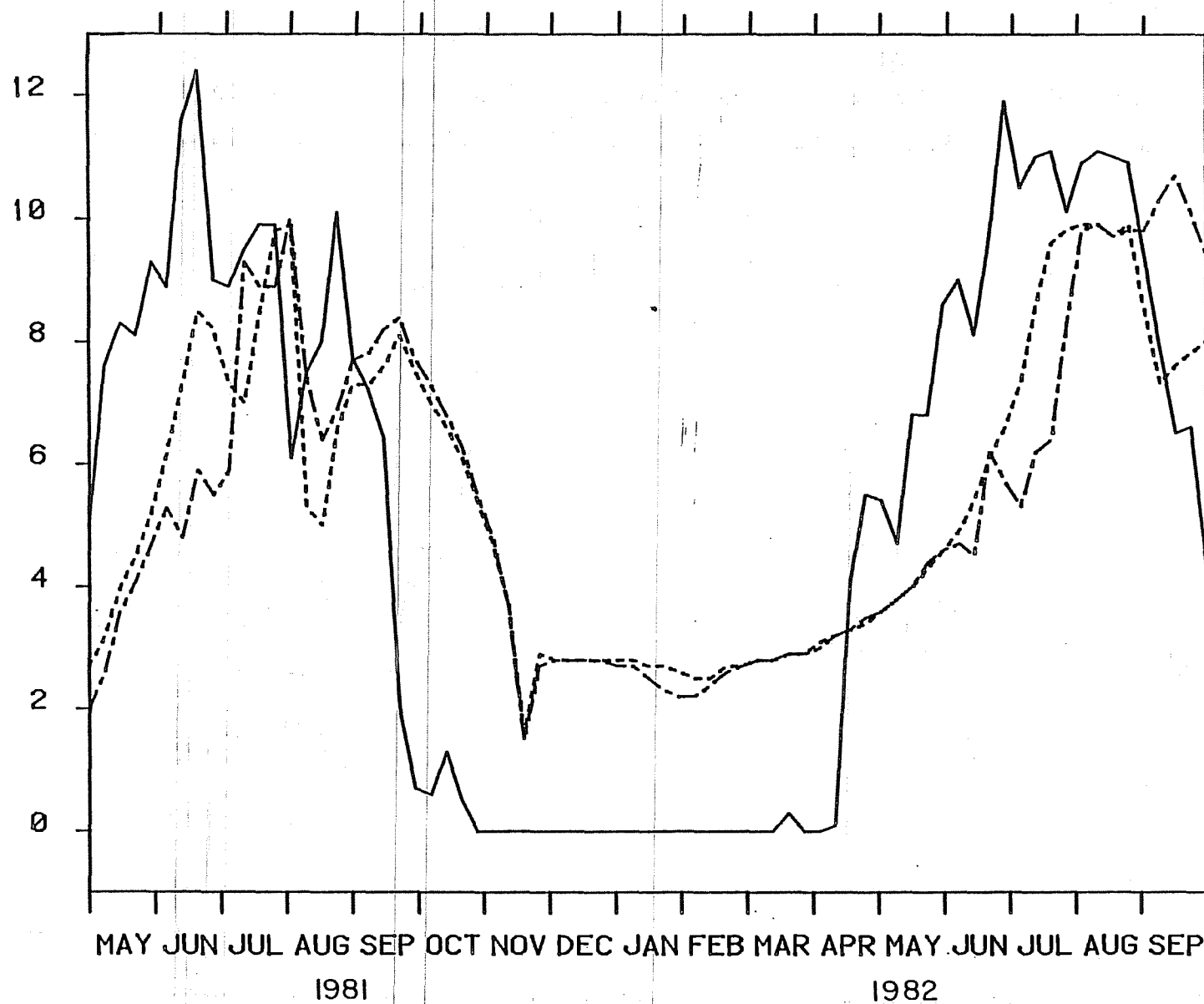
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - LATE STAGE III
- . - EARLY STAGE III

ALASKA POWER AUTHORITY	
BUSITNA HYDROELECTRIC PROJECT	
SIMULATED BUSITNA RIVER TEMPERATURES	
RIVER MILE 100	
STAGE III	
DATE: 10/1/82	BY: J. J. J.
REVISION: 1.0	DATE: 10/1/82

FIGURE E.2.4.269

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 3 OF 3-STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. DEVIL CANYON DRAWDOWN OF 50 FEET-2 LEVELS OF SHUTTERS

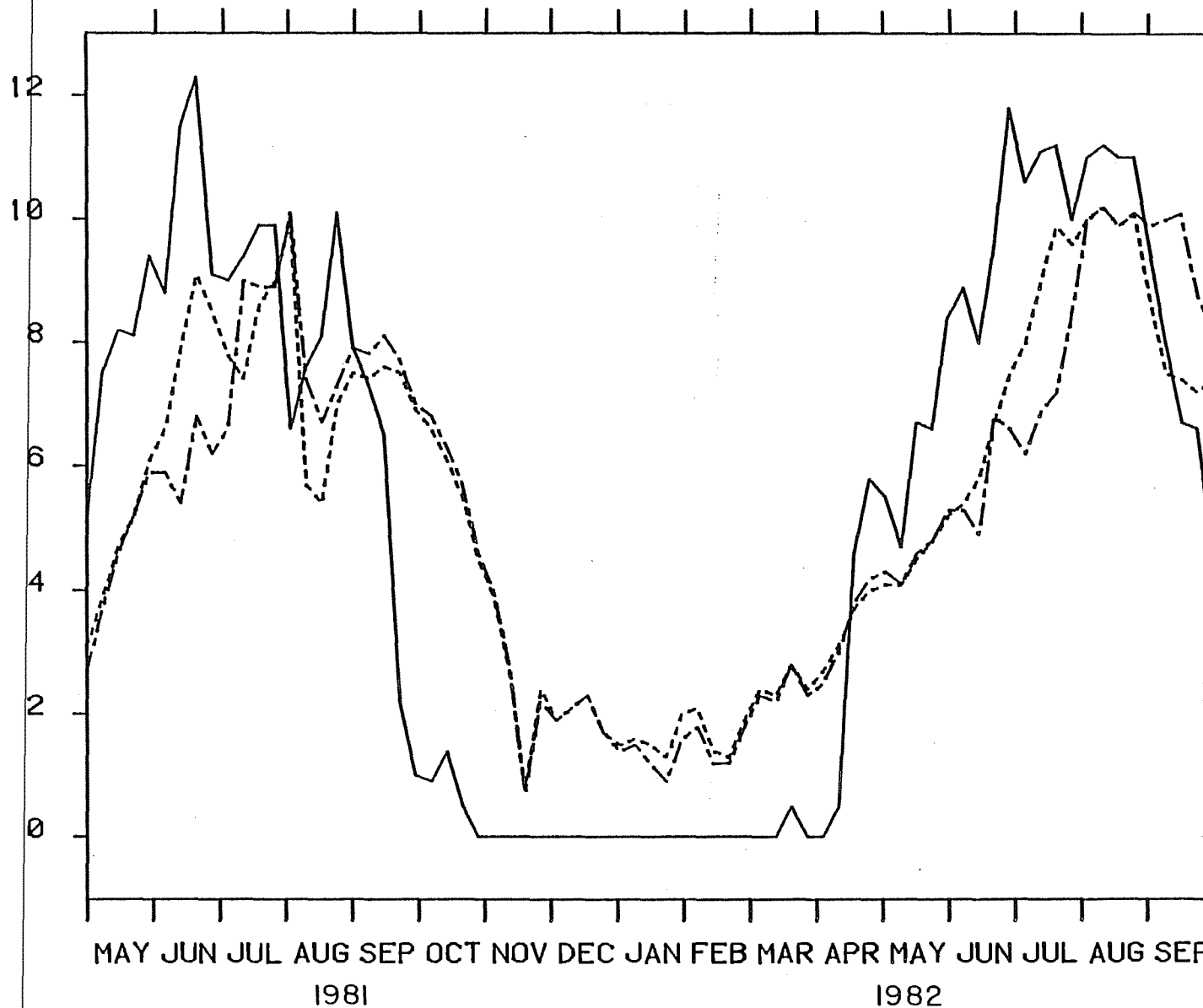
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES E-VI FLOW REQUIREMENTS PROPOSED PROJECT
- · · SIMULATED TEMPERATURES E-I FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 150	
LATE STAGE III	
DATE: 10/1/82	BY: J. H. HARRIS
REVISION: 10/1/82	BY: J. H. HARRIS

FIGURE E.2.4.270

DEGREES C



NOTES:

1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 3 OF 3-STAGE
4. AVERAGE WEEKLY VALUES
5. DEVIL CANYON DRAWDOWN OF 50 FEET - 2 LEVELS OF SHUTTERS

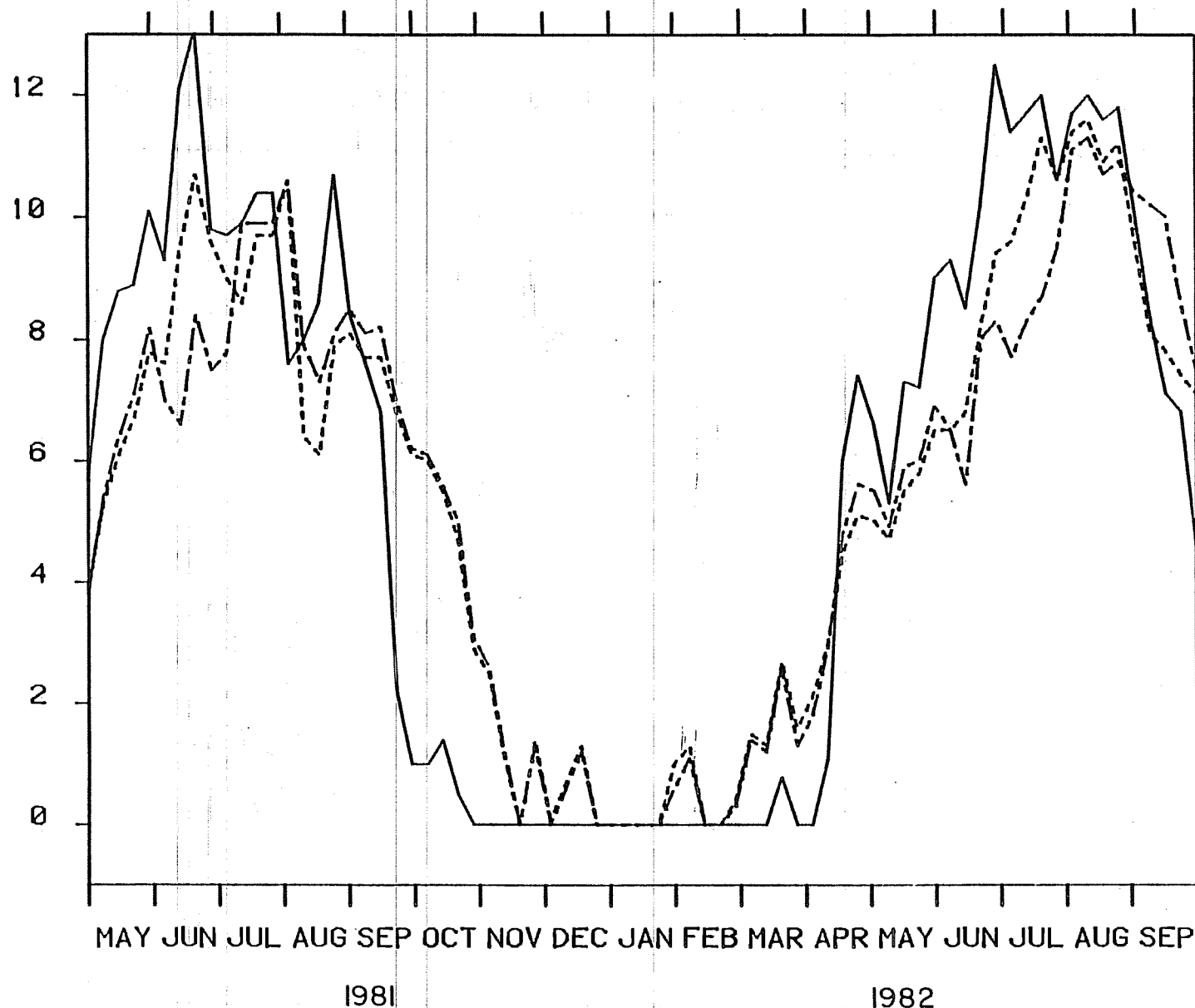
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES E-VI FLOW REQUIREMENTS PROPOSED PROJECT
- . - SIMULATED TEMPERATURES E-I FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 130	
LATE STAGE III	
DATE: 10/1/82	BY: [Signature]
APPROVED: [Signature]	DATE: 10/1/82

FIGURE E.2.4.271

DEGREES C



NOTES:

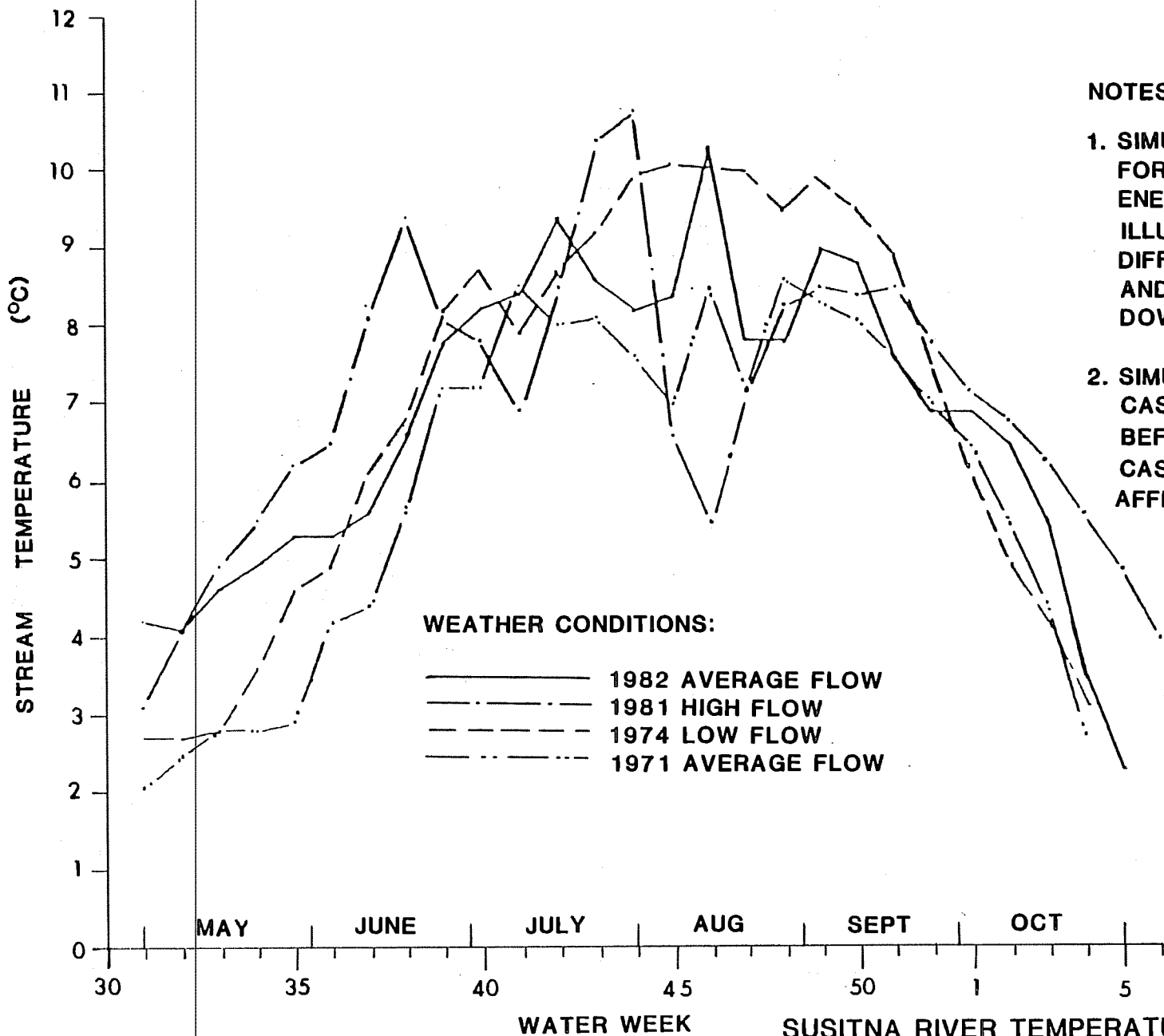
1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 3 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON RIVER AND SNTMP DOES NOT SIMULATE TEMPERATURES UNDER AN ICE COVER (SEE RIVER ICE SIMULATIONS)
6. DEVIL CANYON DRAWDOWN OF 50 FEET-2 LEVELS OF SHUTTERS

LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURES E-VI FLOW REQUIREMENTS PROPOSED PROJECT
- . - SIMULATED TEMPERATURES E-I FLOW REQUIREMENTS (FOR COMPARISON)

ALASKA POWER AUTHORITY	
SUSITNA HYDROELECTRIC PROJECT	
SIMULATED SUSITNA RIVER TEMPERATURES	
RIVER MILE 100	
LATE STAGE III	
DATE: 10/1/82	BY: J. J. J.
REVISION: 1.0	DATE: 10/1/82

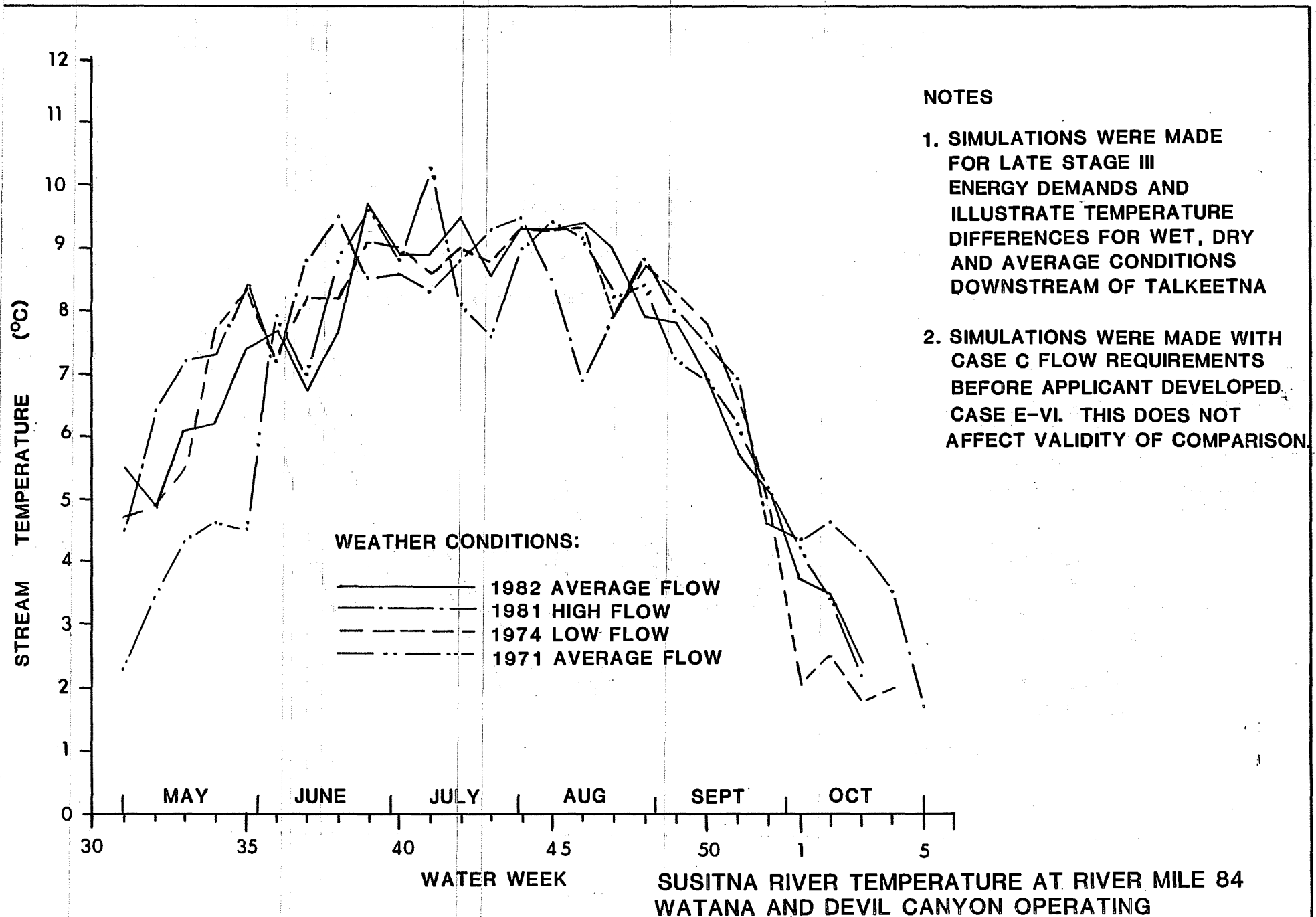
FIGURE E.2.4.272

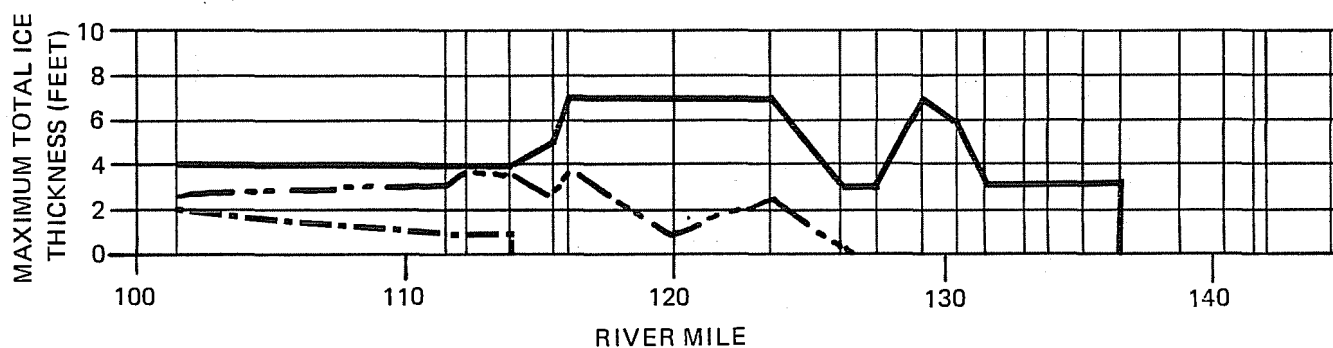
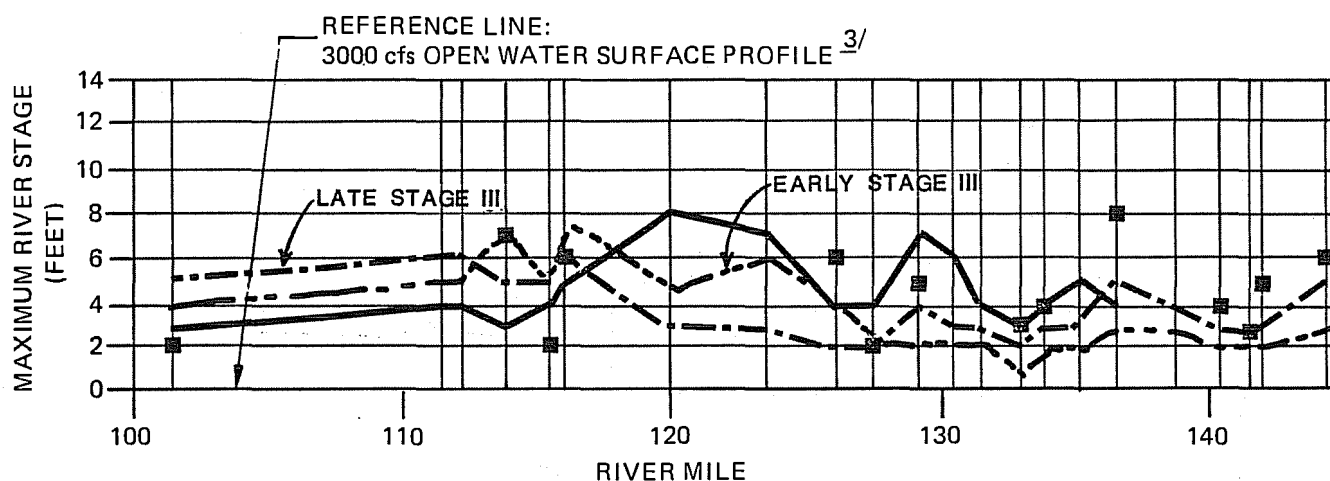
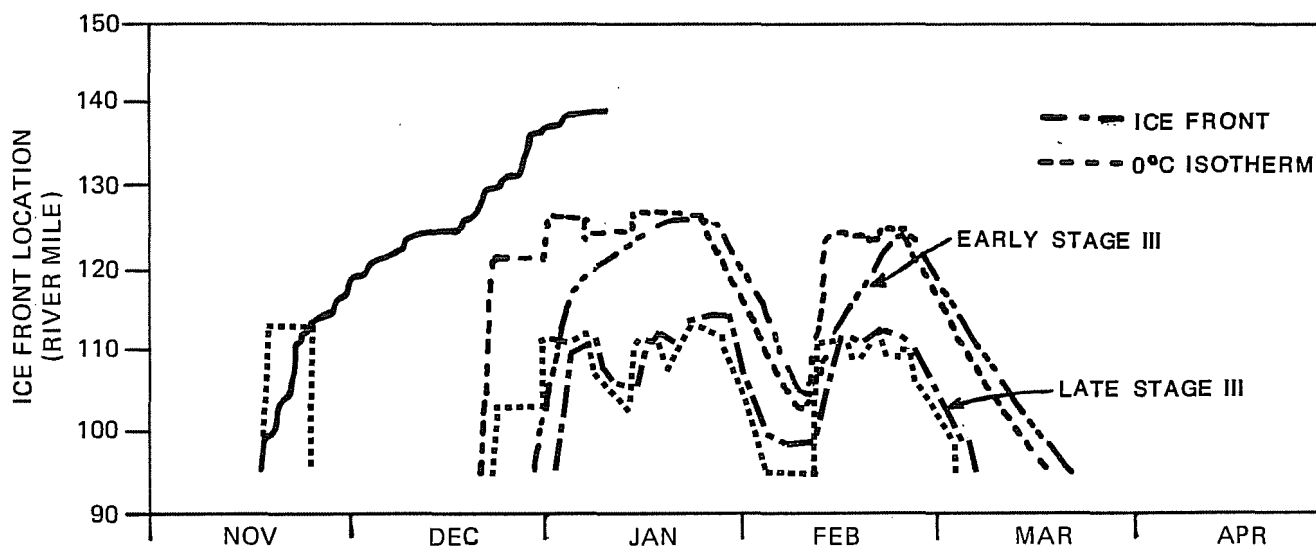


NOTES

1. SIMULATIONS WERE MADE FOR LATE STAGE III ENERGY DEMANDS AND ILLUSTRATE TEMPERATURE DIFFERENCES FOR WET, DRY AND AVERAGE CONDITIONS DOWNSTREAM OF TALKEETNA
2. SIMULATIONS WERE MADE WITH CASE C FLOW REQUIREMENTS BEFORE APPLICANT DEVELOPED CASE E-VI. THIS DOES NOT AFFECT VALIDITY OF COMPARISON.

**SUSITNA RIVER TEMPERATURE AT RIVER MILE 130
WATANA AND DEVIL CANYON OPERATING**





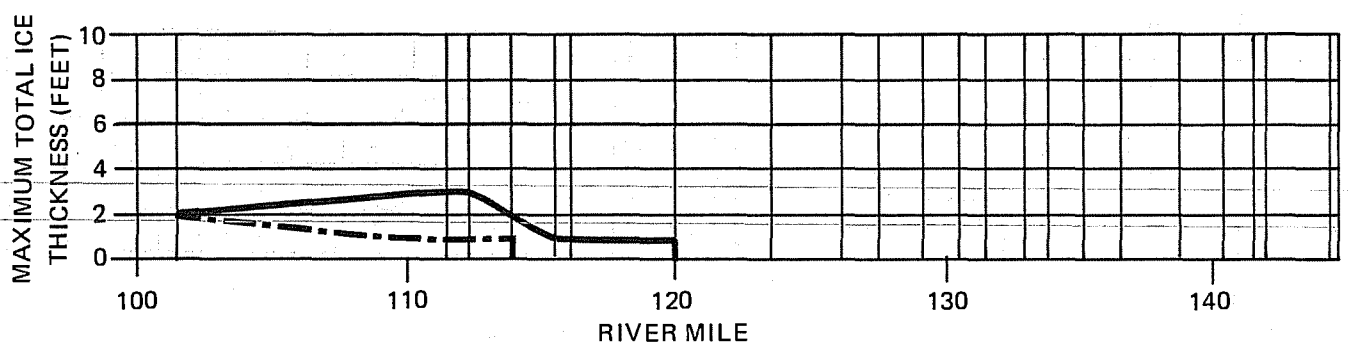
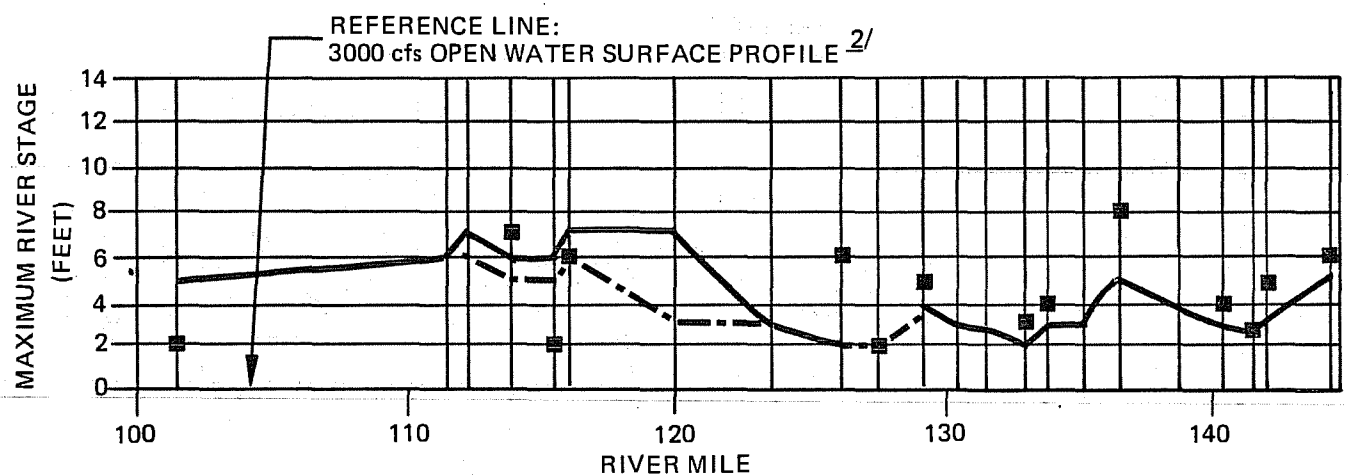
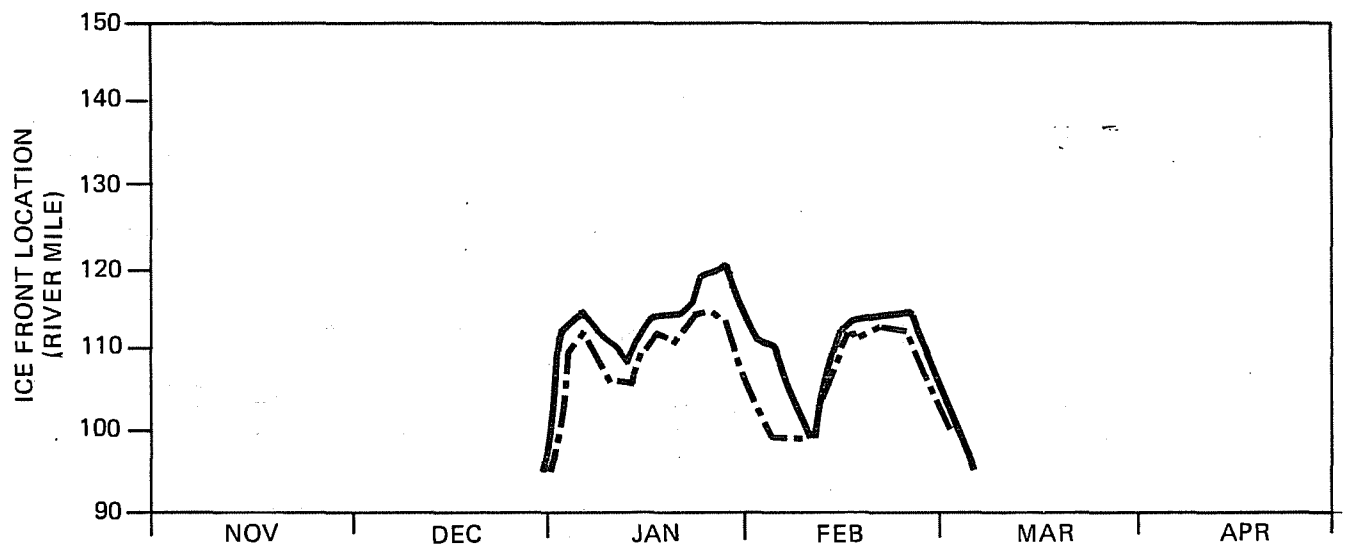
NOTES:

1. STAGE III SIMULATION BASED ON CASE E-VI FLOWS, LATE STAGE III ENERGY DEMAND, INFLOW MATCHING TEMPERATURE POLICY
2. NATURAL CONDITIONS NOT SIMULATED UPSTREAM OF RM 140.
3. 3000 cfs REPRESENTS TYPICAL WINTER FLOW UNDER NATURAL CONDITIONS AT FREEZE UP.

LEGEND:

- NATURAL CONDITIONS
- LATE STAGE III OPERATING
- NATURAL SLOUGH BERM ELEVATION (See Table E.2.4.23)
- EARLY STAGE III OPERATING

**SIMULATED RIVER ICE CONDITIONS
STAGE III vs. NATURAL
1981-82 WEATHER CONDITIONS
CASE E-VI FLOWS**



NOTES:

1. SIMULATIONS BASED ON LATE STAGE III ENERGY DEMAND, INFLOW MATCHING TEMPERATURE POLICY.
2. 3000 cfs REPRESENTS TYPICAL WINTER FLOW UNDER NATURAL CONDITIONS AT FREEZE UP.

LEGEND:

- CASE E-1 FLOWS
- - - CASE E-V1 FLOWS
- NATURAL BERM OVERTOPPING ELEVATION (See Table E.2.4.24)

**SIMULATED RIVER ICE CONDITIONS
STAGE III
1981-82 WEATHER CONDITIONS
CASE E-1 vs. CASE E-VI**

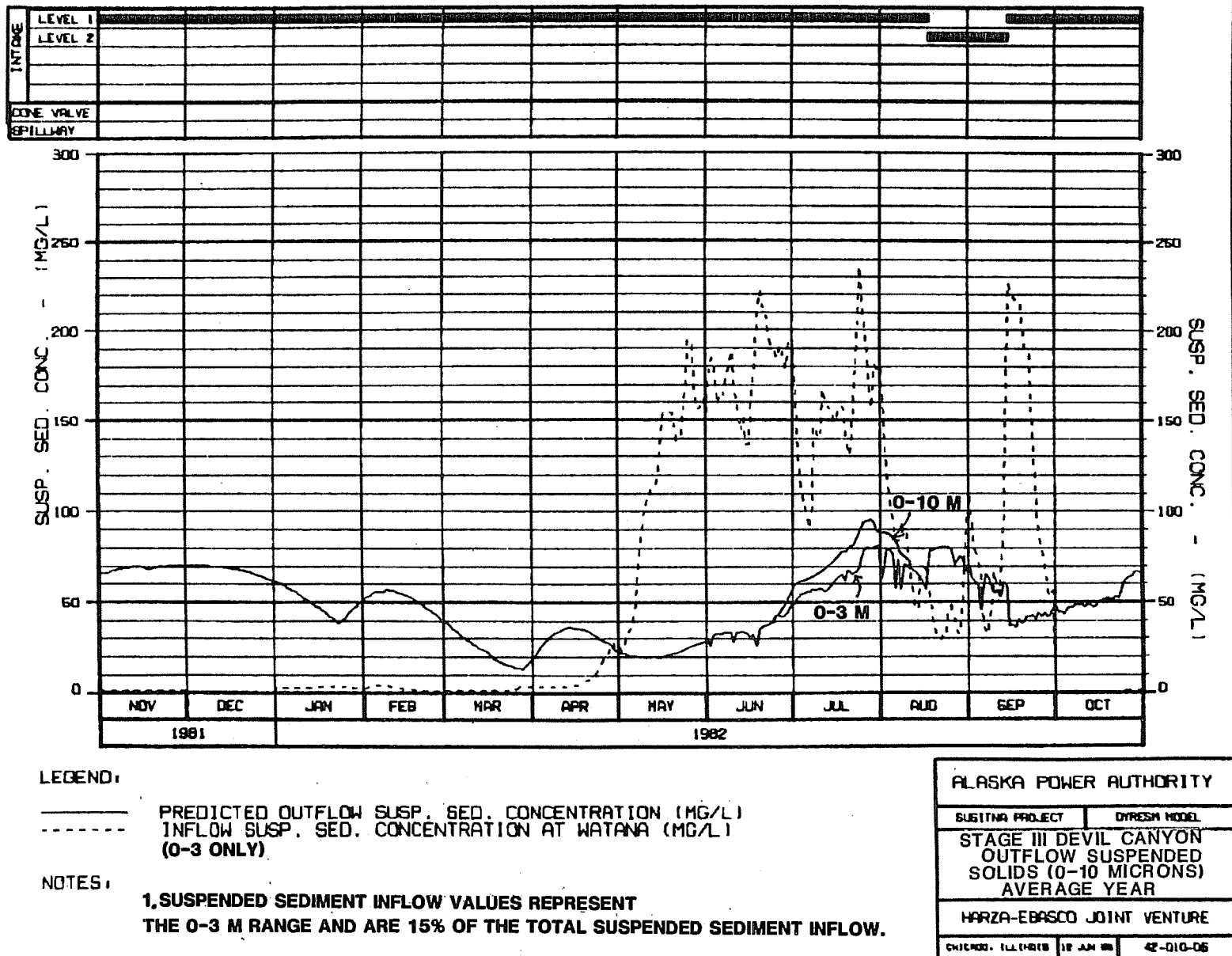
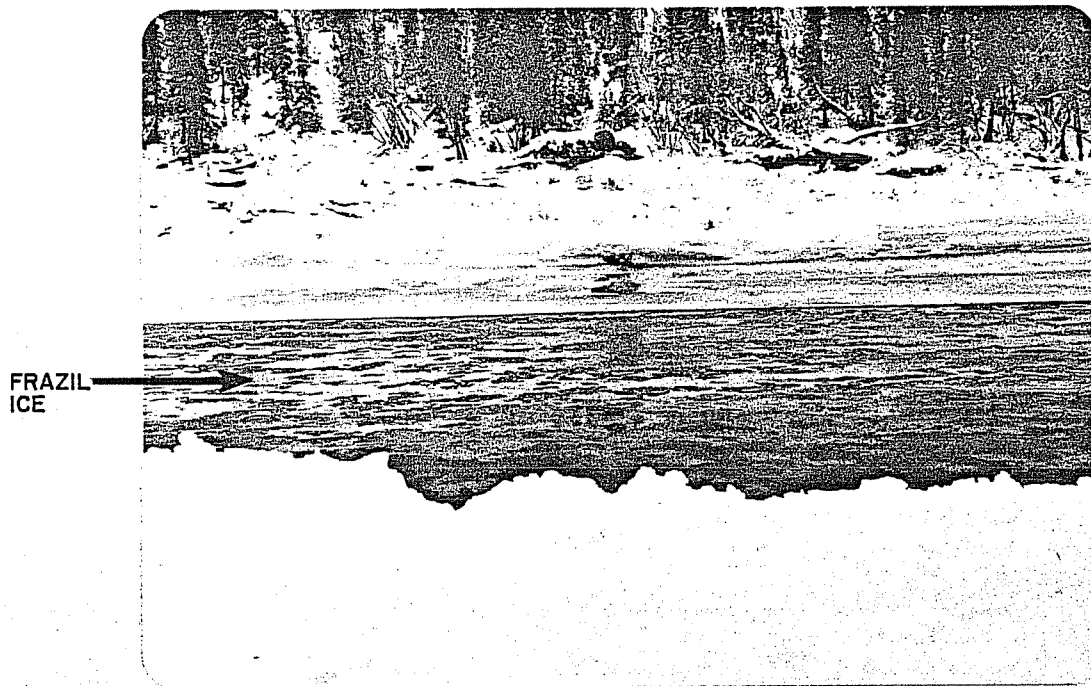


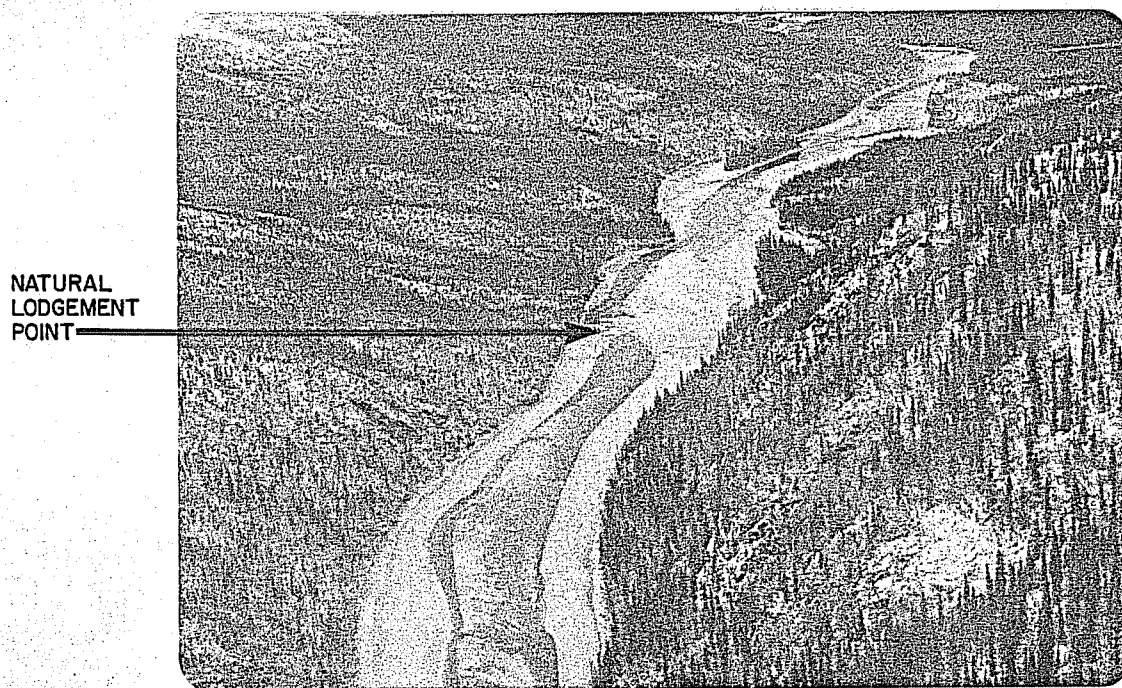
FIGURE E.2.4.277

PHOTOGRAPHS



FRAZIL
ICE

PHOTO E.2.2.1 FRAZIL ICE UPSTREAM FROM WATANA



NATURAL
LODGEMENT
POINT

PHOTO E.2.2.2 ICE COVER DOWNSTREAM FROM WATANA SHOWING
NATURAL LODGEMENT POINT

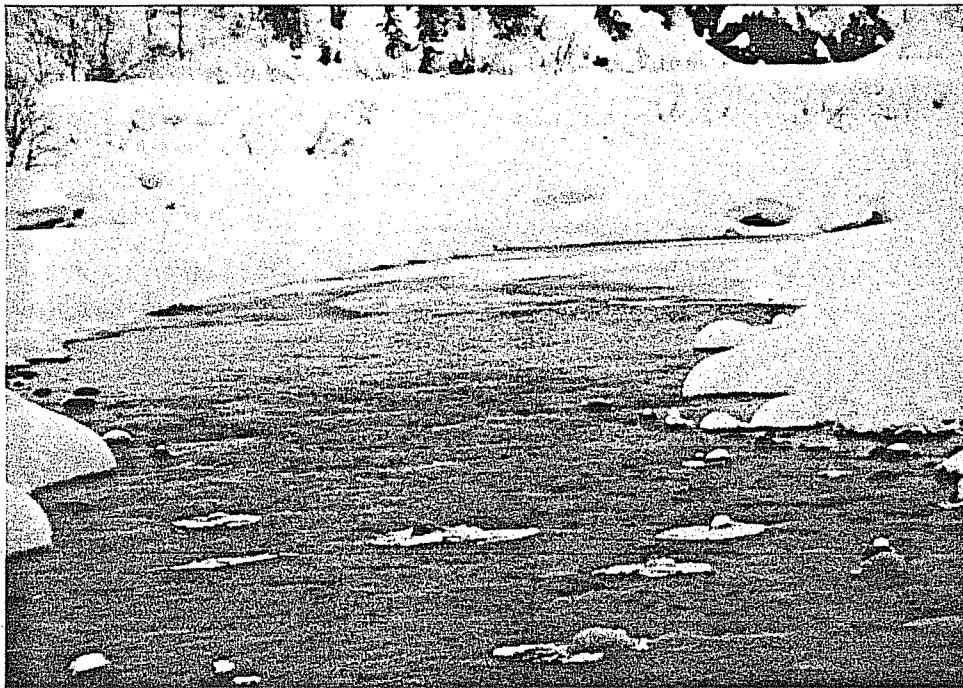
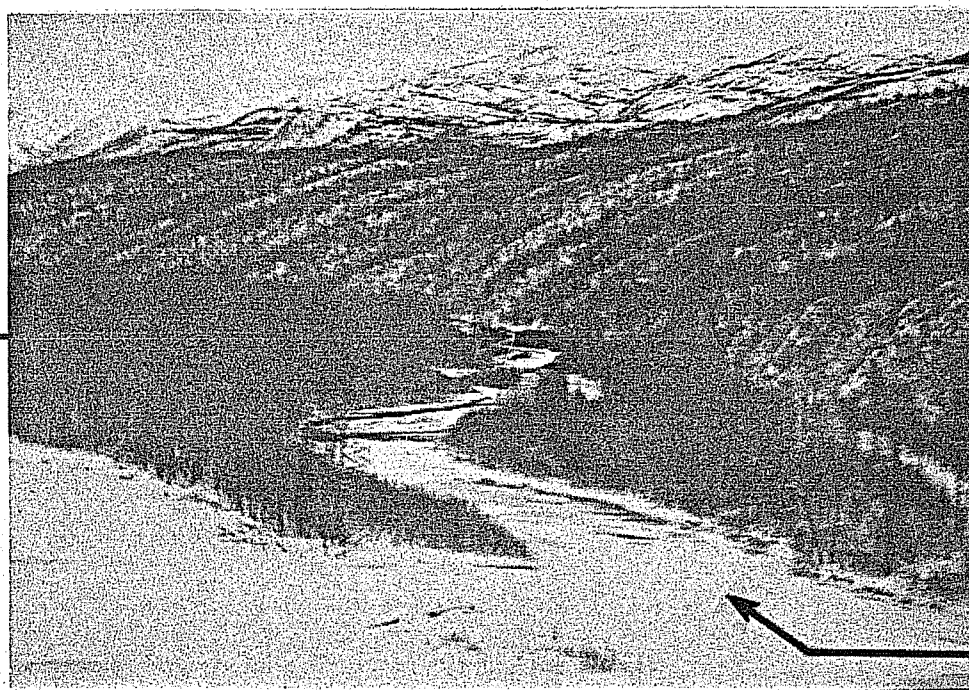


PHOTO E.2.2.3 SLOUGH 9 APPROXIMATELY 3500 FEET
UPSTREAM FROM SLOUGH MOUTH, DECEMBER 1982



PHOTOS E.2.2.5
E.2.2.6
E.2.2.7
E.2.2.8

MOUTH
SLOUGH 8A

PHOTO E.2.2.4 SLOUGH 8A FREEZE-UP, DECEMBER 1982

PHOTO E.2.2.6

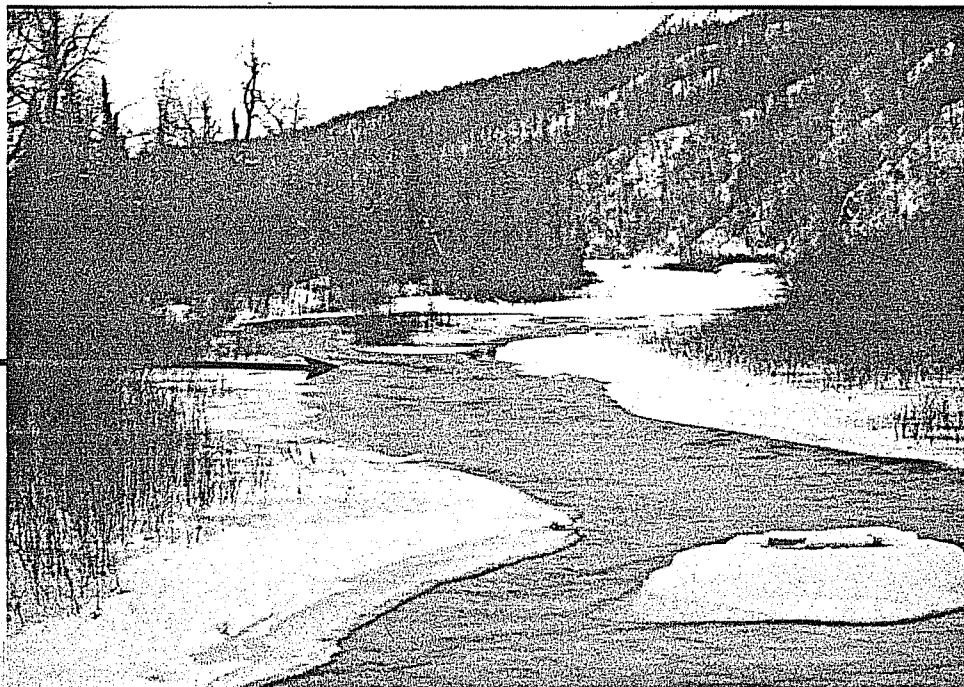


PHOTO E.2.2.5 SLOUGH 8A NEAR LRX-29 LOOKING UPSTREAM

PHOTO E.2.2.7



PHOTO E.2.2.6 SLOUGH 8A

PHOTO E.2.2.8



PHOTO E.2.2.7 SLOUGH 8A SHOWING FLOODING DURING FREEZE-UP

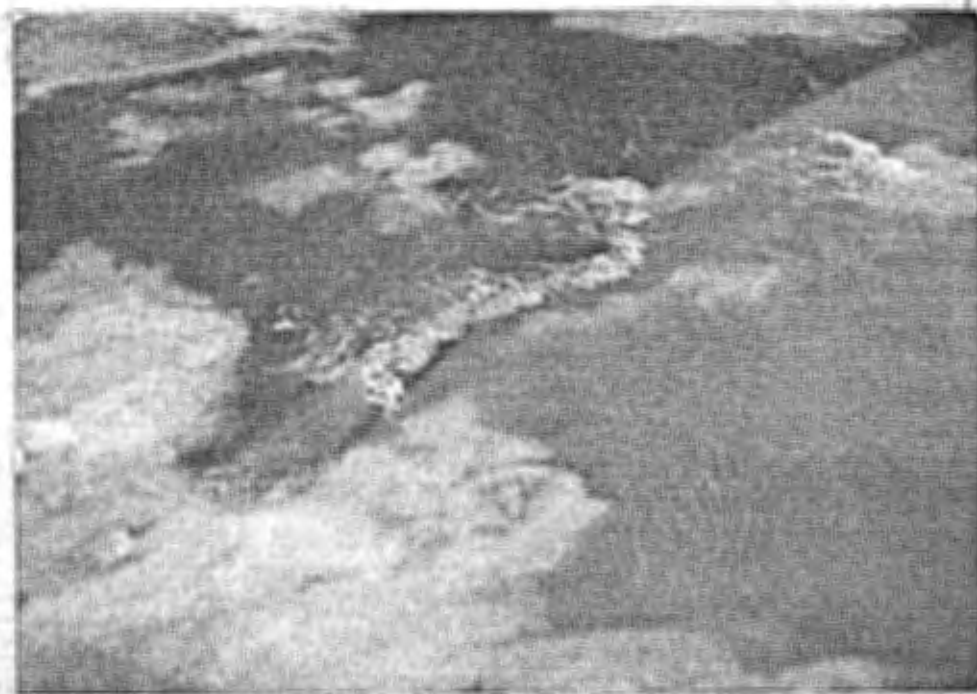


PHOTO E.2.2.8 ENLARGEMENT OF PHOTO E.2.2.7 SHOWING
TURBULENT FLOW