

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

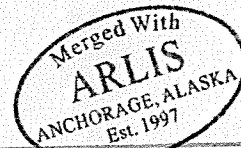
VOLUME 8

**D R A F T**

**EXHIBIT E  
CHAPTER 2**

**FIGURES**

**HARZA-EBASCO  
SUSITNA JOINT VENTURE**



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BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION  
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

| EXHIBIT | CHAPTER           | DESCRIPTION                                                 | AMENDMENT  | JULY 29, 1983             |
|---------|-------------------|-------------------------------------------------------------|------------|---------------------------|
|         |                   |                                                             | VOLUME NO. | APPLICATION<br>VOLUME NO. |
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| B       | Entire            | Project Operation and Resource Utilization                  | 2          | 2 & 2A                    |
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|         | App. D1           | Fuels Pricing                                               | 5          | 1                         |
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LICENSE APPLICATION

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WATER USE AND QUALITY

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| E.2.4.278     | STAGE III DEVIL CANYON RESERVOIR OUTFLOW SUSPENDED SOLIDS, AVERAGE YEAR                           |
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EXHIBIT E - CHAPTER 2  
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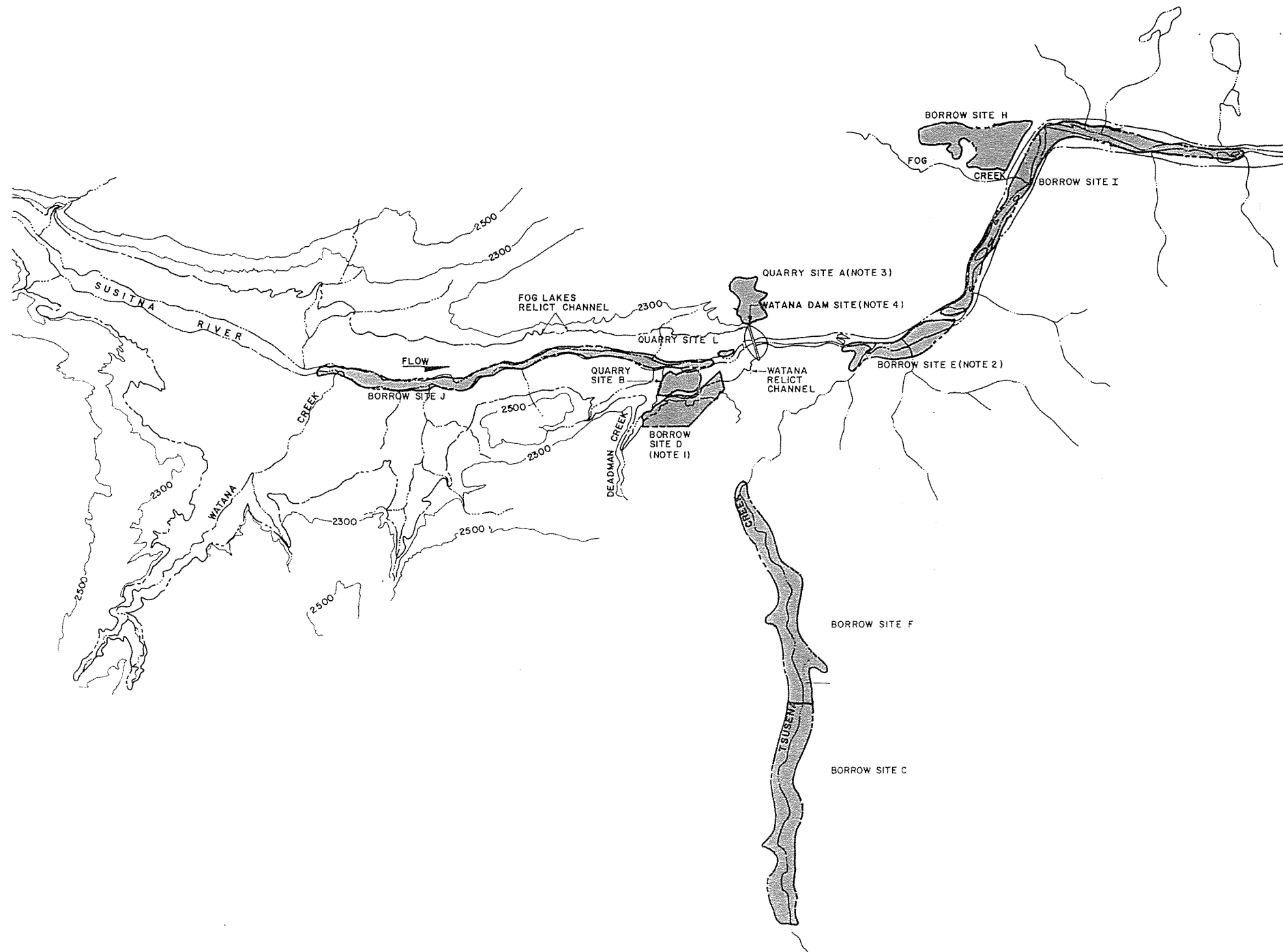
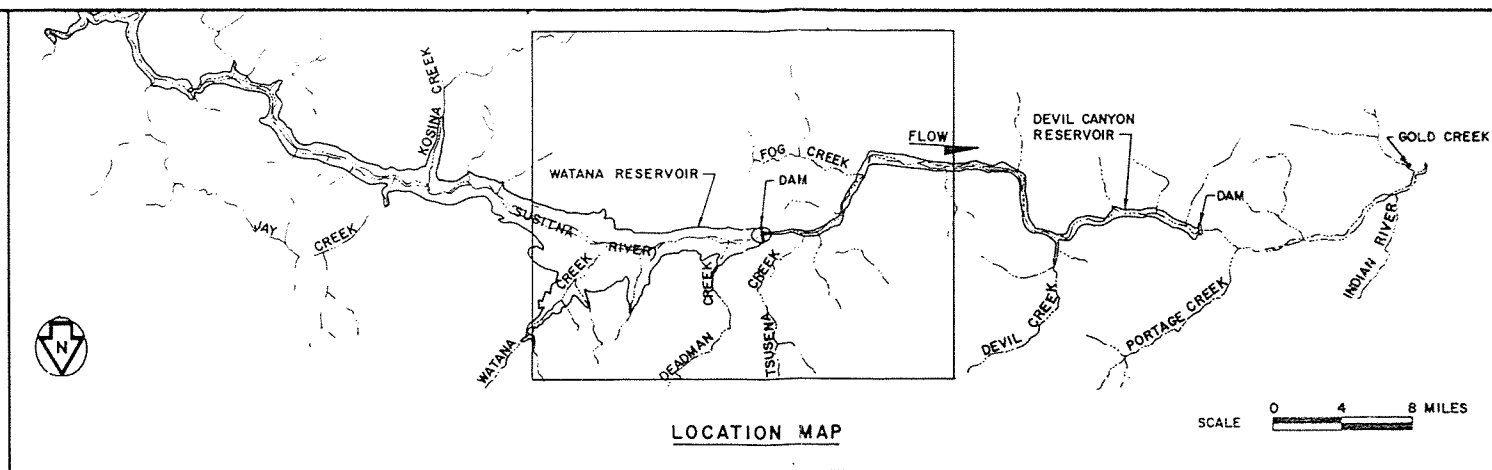
LIST OF PHOTOS

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| E.2.2.2       | ICE COVER DOWNSTREAM FROM WATANA SHOWING NATURAL<br>LODGE MENT POINT           |
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| E.2.2.4       | SLOUGH 8A FREEZE-UP, DECEMBER 1982                                             |
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## **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.

SCALE 0 1 2 MILES

WATANA BORROW SITE MAP



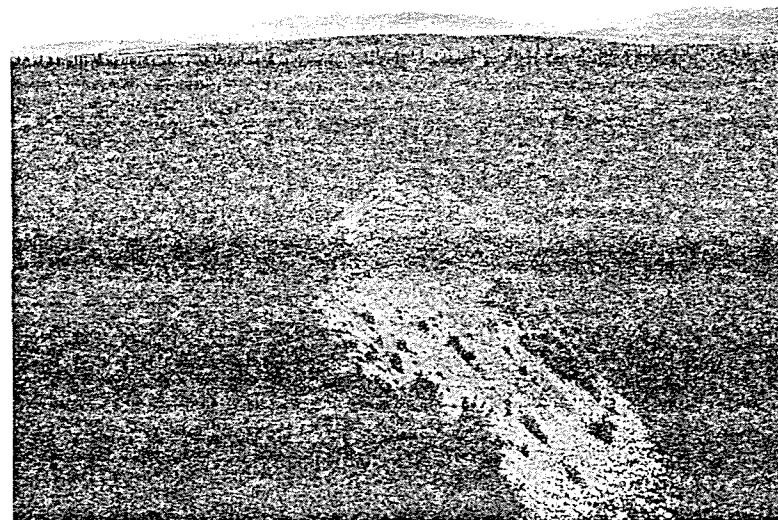
N 3,230,000

N 3,232,000

N 3,234,000

N 3,236,000

N 3,238,000



**BORROW SITE D**

PHOTO

CONTOURS OMITTED  
FOR CLARITY

FLOW

**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**

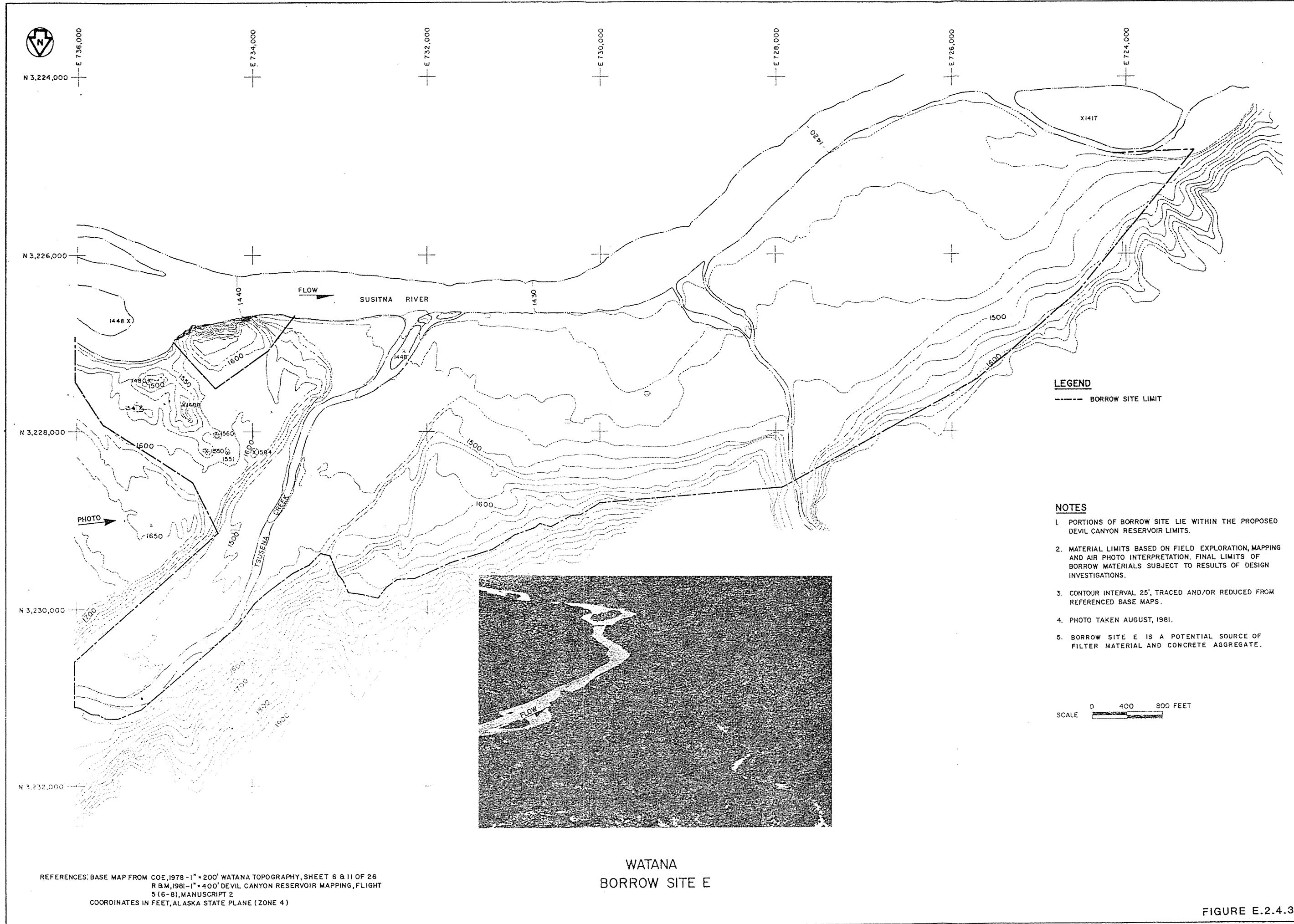
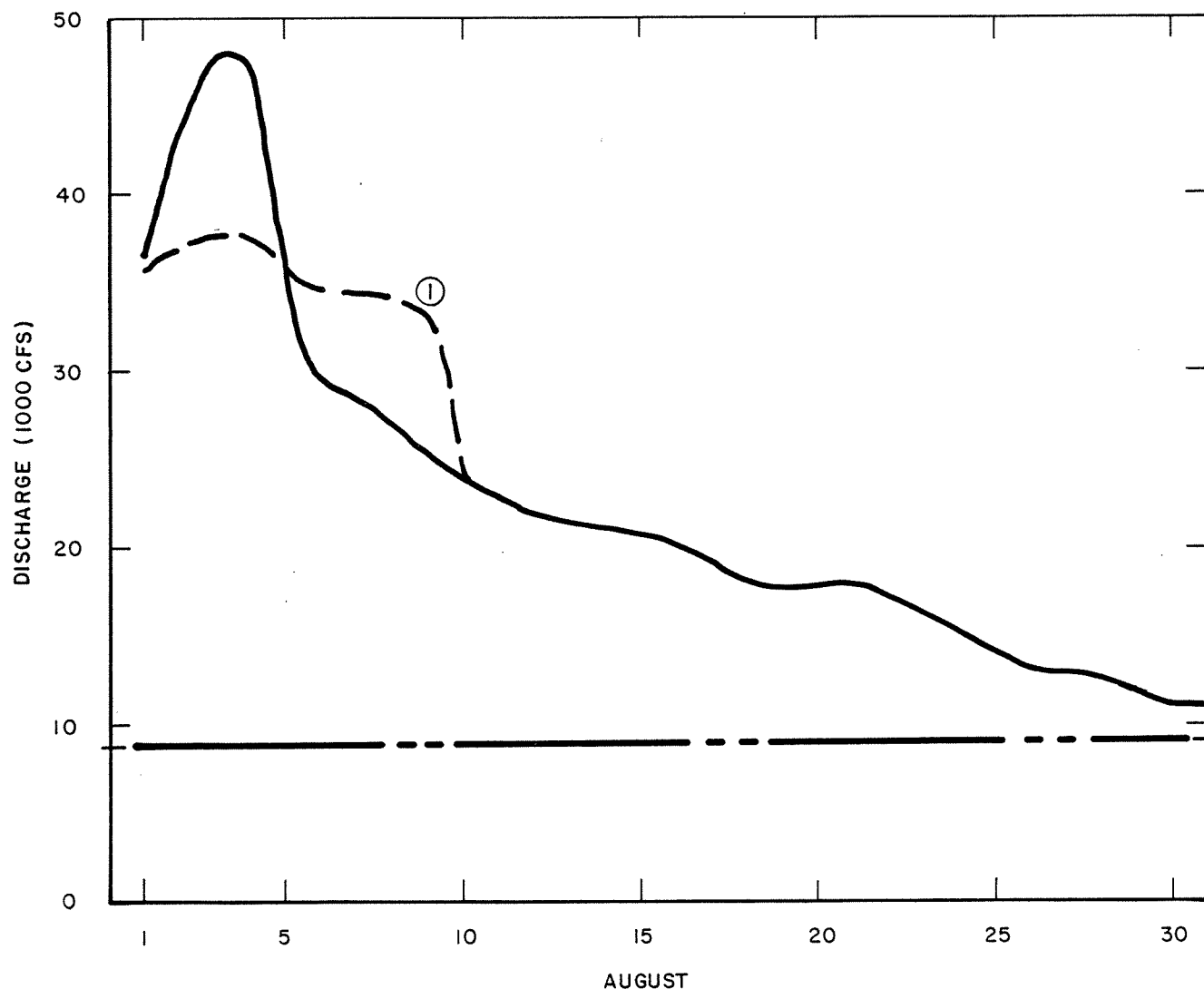


FIGURE E.2.4.3



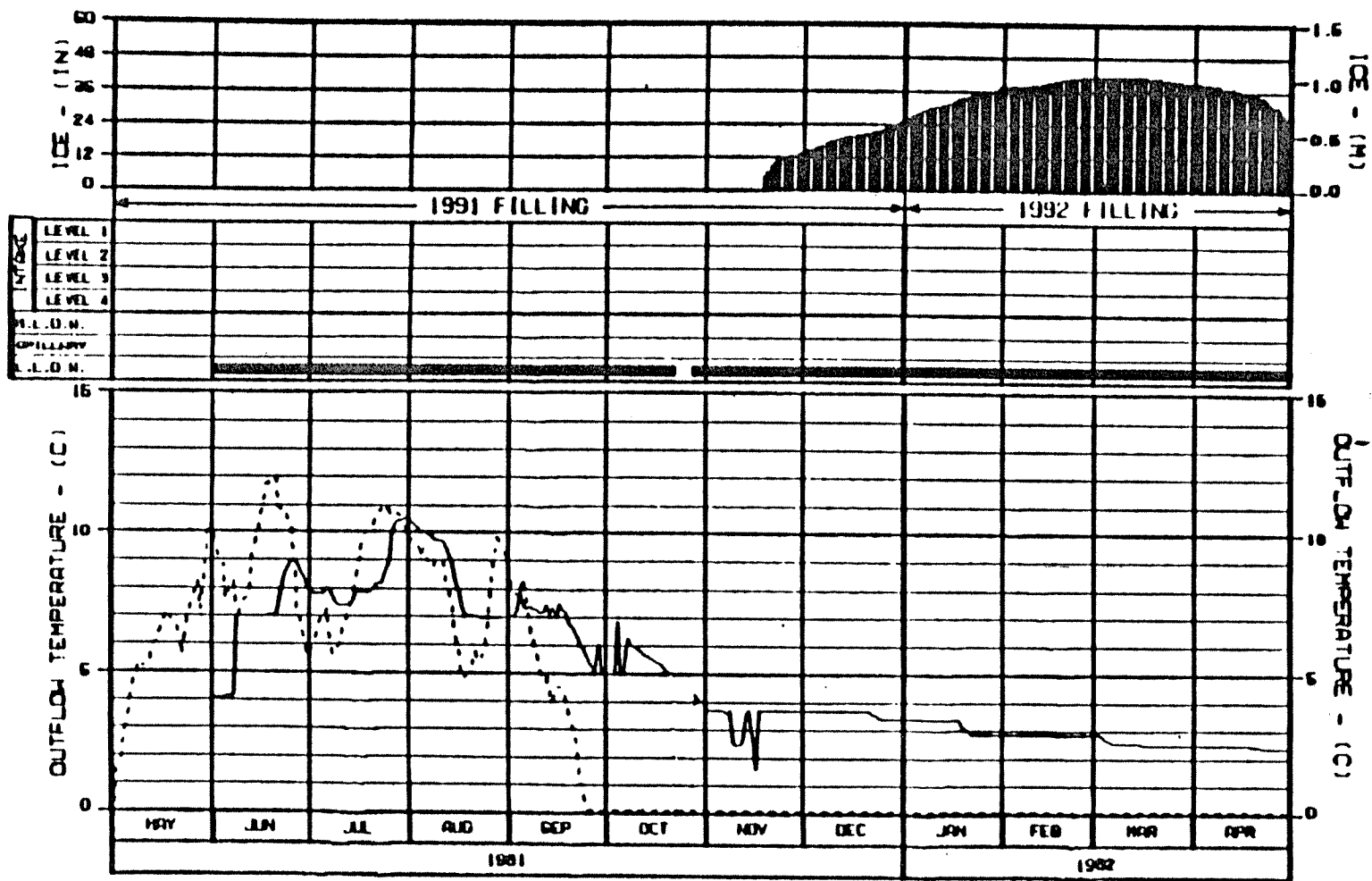
#### LEGEND:

- 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: CASE: WATANA FILLING OPERATION  
 FIRST YEAR FILLING STARTS IN MAY 1981  
 — PREDICTED OUTFLOW TEMPERATURE  
 - - - INFLOW TEMPERATURE

- NOTES:
1. INTAKE PORT LEVEL 1 AT ELEVATION 2161 FT (655.6 M)
  2. INTAKE PORT LEVEL 2 AT ELEVATION 2114 FT (644.3 M)
  3. INTAKE PORT LEVEL 3 AT ELEVATION 2077 FT (633.1 M)
  4. INTAKE PORT LEVEL 4 AT ELEVATION 2040 FT (621.0 M)
  5. CONE VALVE (INLET) AT ELEVATION 2040 FT (621.0 M)
  6. SPILLWAY CREST AT ELEVATION 2148 FT (654.7 M)
  7. LOW LEVEL OUTLET WORKS (INLET) ELEV. 1608 FT (490.96 M)

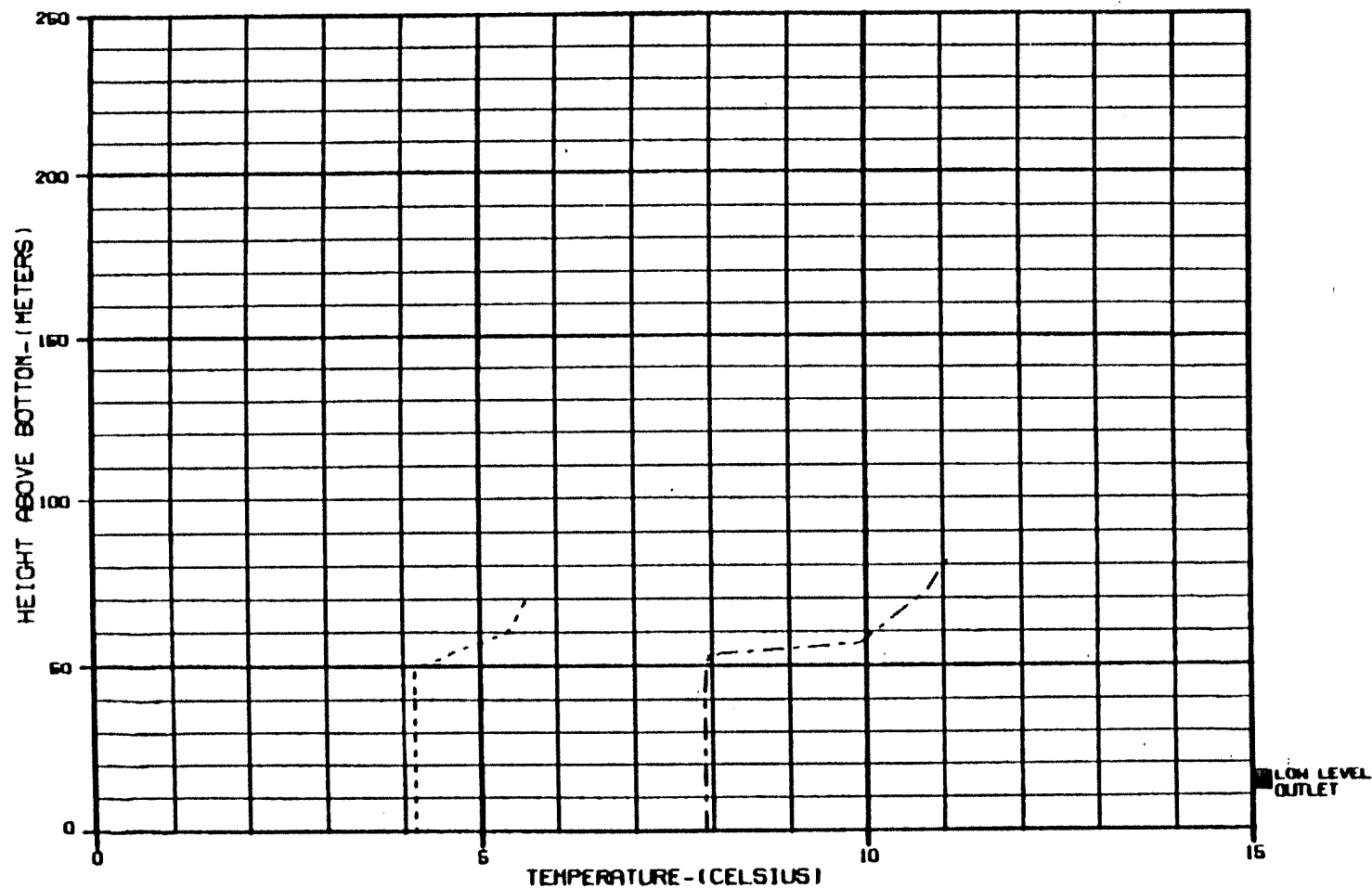
SOURCE (APA, 1984 a APPENDIX IV)

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:

—— 1 MAY 1981  
 - - - - 1 JUNE 1981  
 - . - . 1 JULY 1981

SOURCE: APA 1984a APPENDIX IV

ALASKA POWER AUTHORITY

WATANA PROJECT

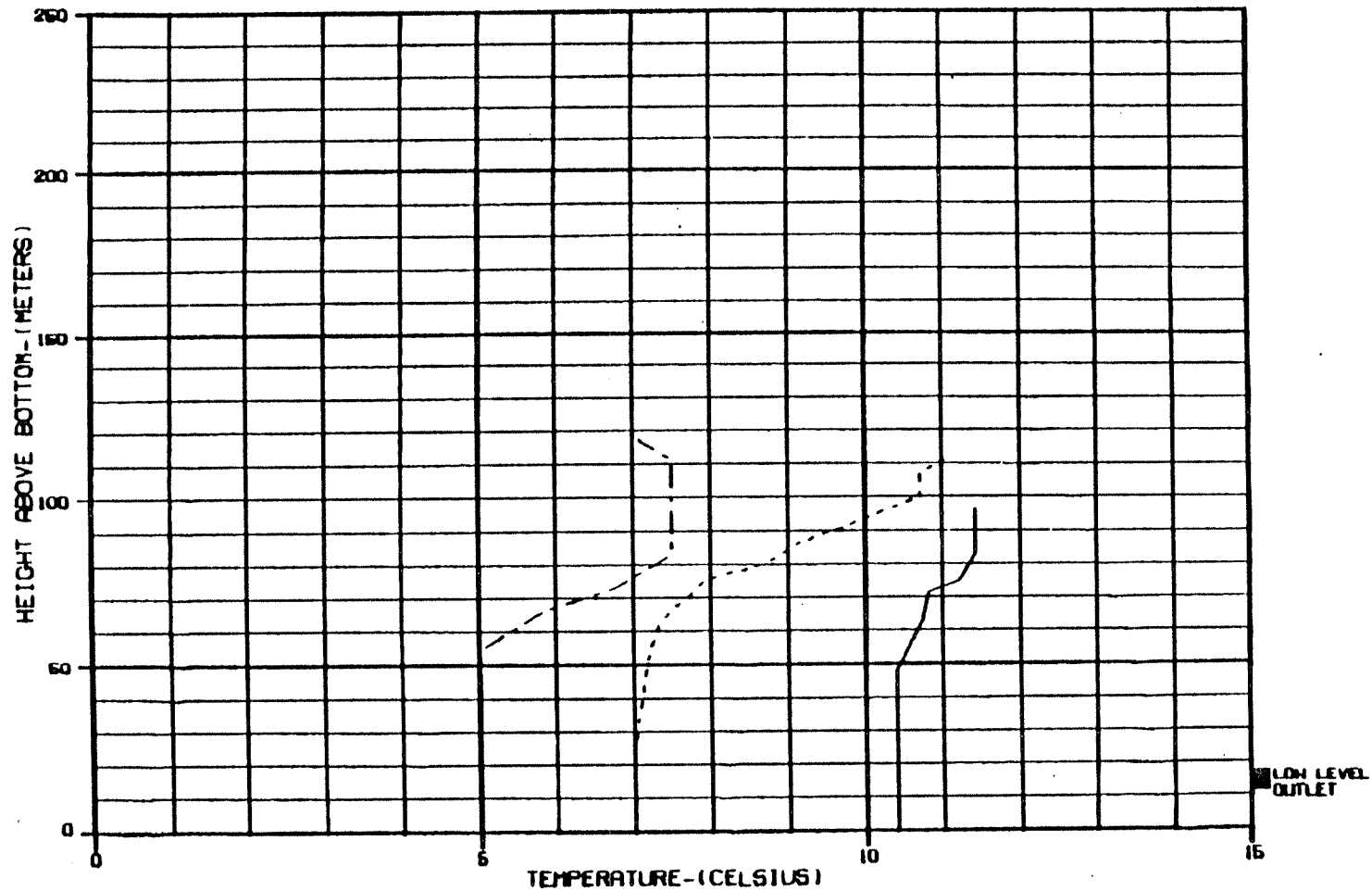
DYADON MODEL

WATANA RESERVOIR  
 TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGNED BY: J. L. DAVIS

FIGURE E. 2.4. 6



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

\_\_\_\_\_ | AUGUST 1981  
 - - - - - | SEPTEMBER 1981  
 - . - . - | OCTOBER 1981

SOURCE: APA 1984 a APPENDIX IV

ALASKA POWER AUTHORITY

WATANA PROJECT

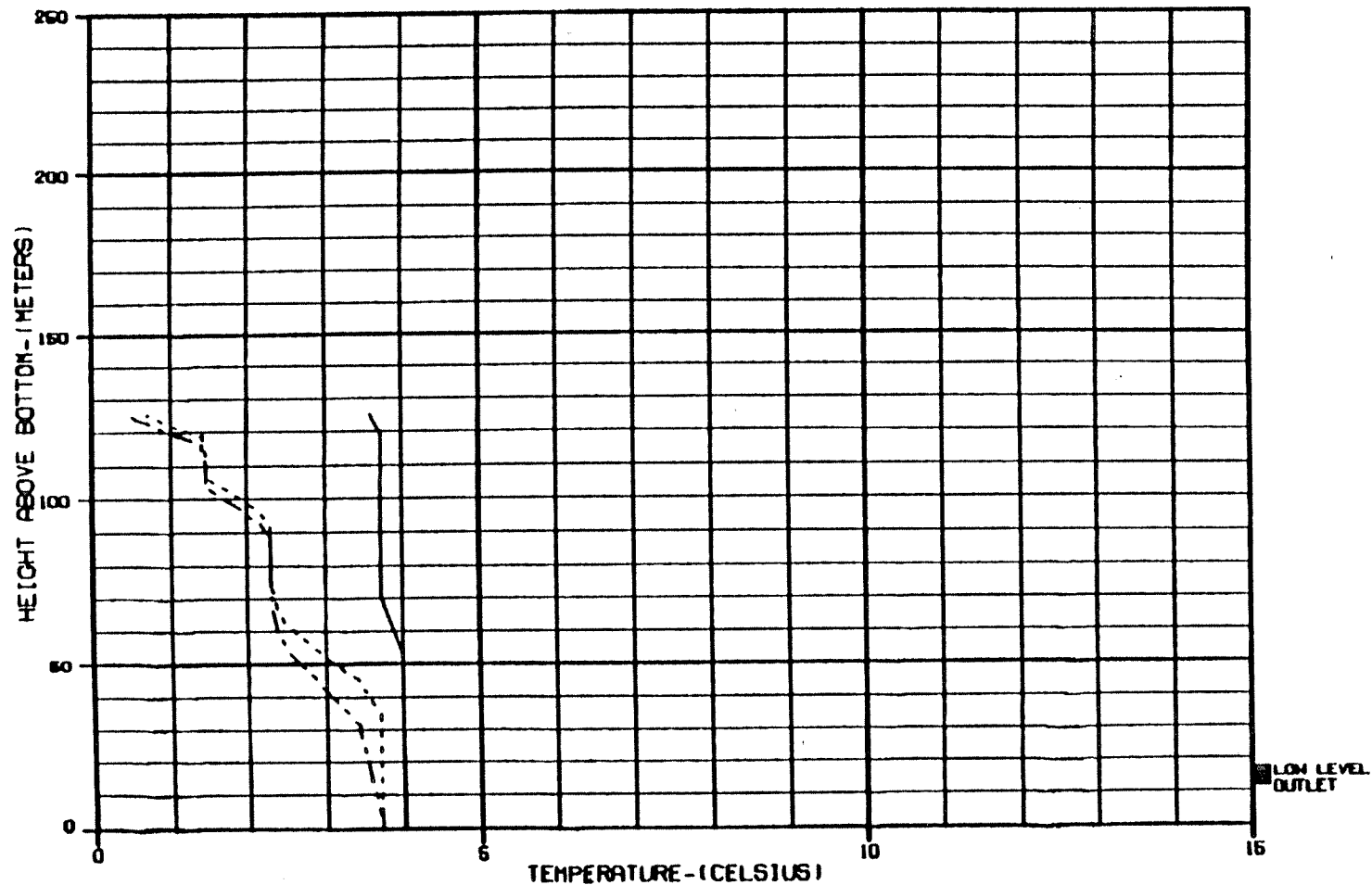
DYABOL MODEL

WATANA RESERVOIR  
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DESIGN: R. L. PUGH

FIGURE E.2.4.7



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

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

SOURCE: APA 1984 a APPENDIX IV

ALASKA POWER AUTHORITY

WATANA PROJECT

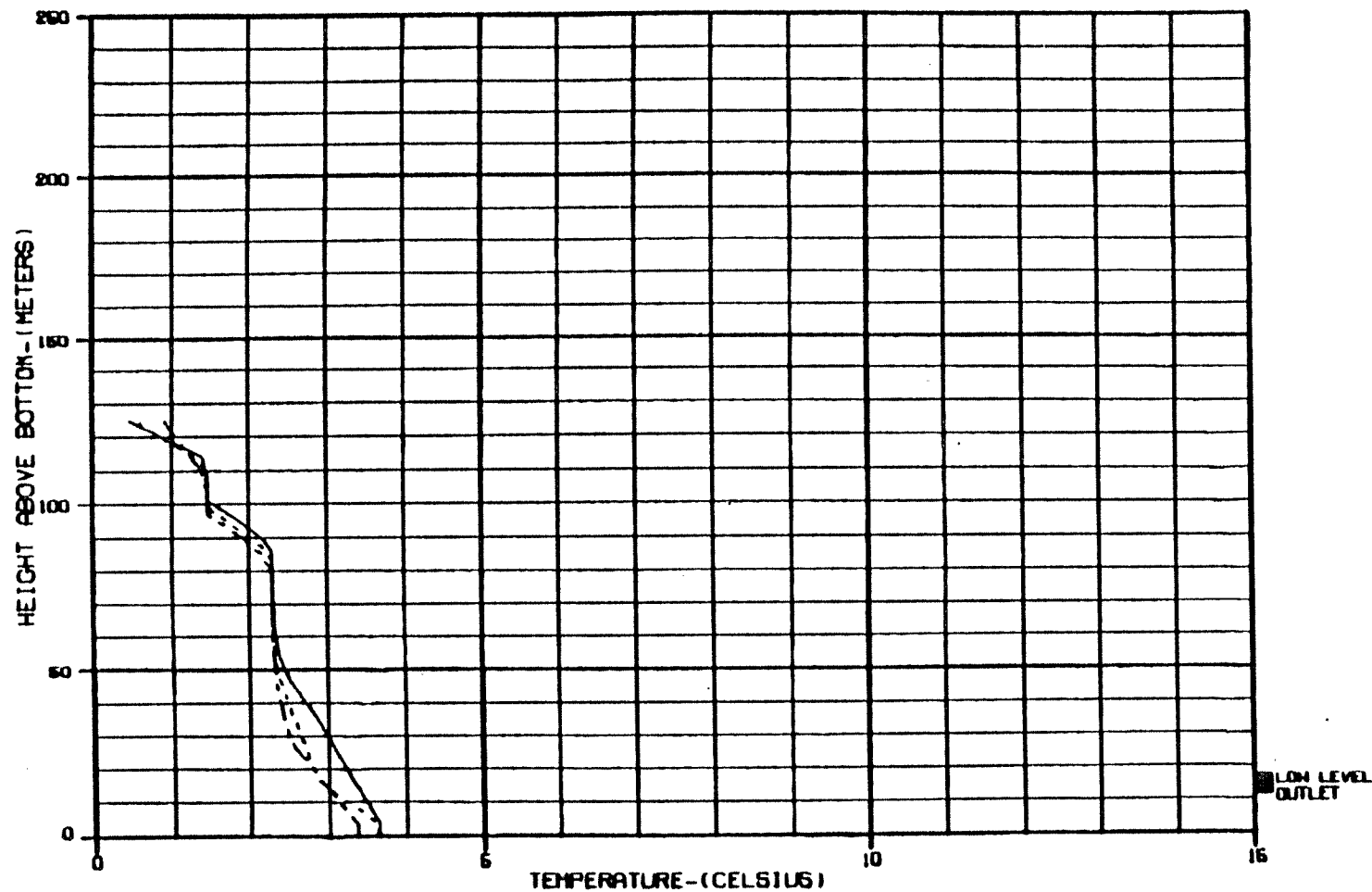
CFRDM MODEL

WATANA RESERVOIR  
 TEMPERATURE PROFILES

HARZA-EBRARD JOINT VENTURE

CHARTER: AL 10-88

FIGURE E.2.4.8



CASE: ■■ WABIFILA - WATANA FILLING OPERATION ■■

LEGEND:

PREDICTED TEMPERATURE PROFILES:

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

SOURCE: APA 1984a APPENDIX IV

ALASKA POWER AUTHORITY

WABIFILA PROJECT

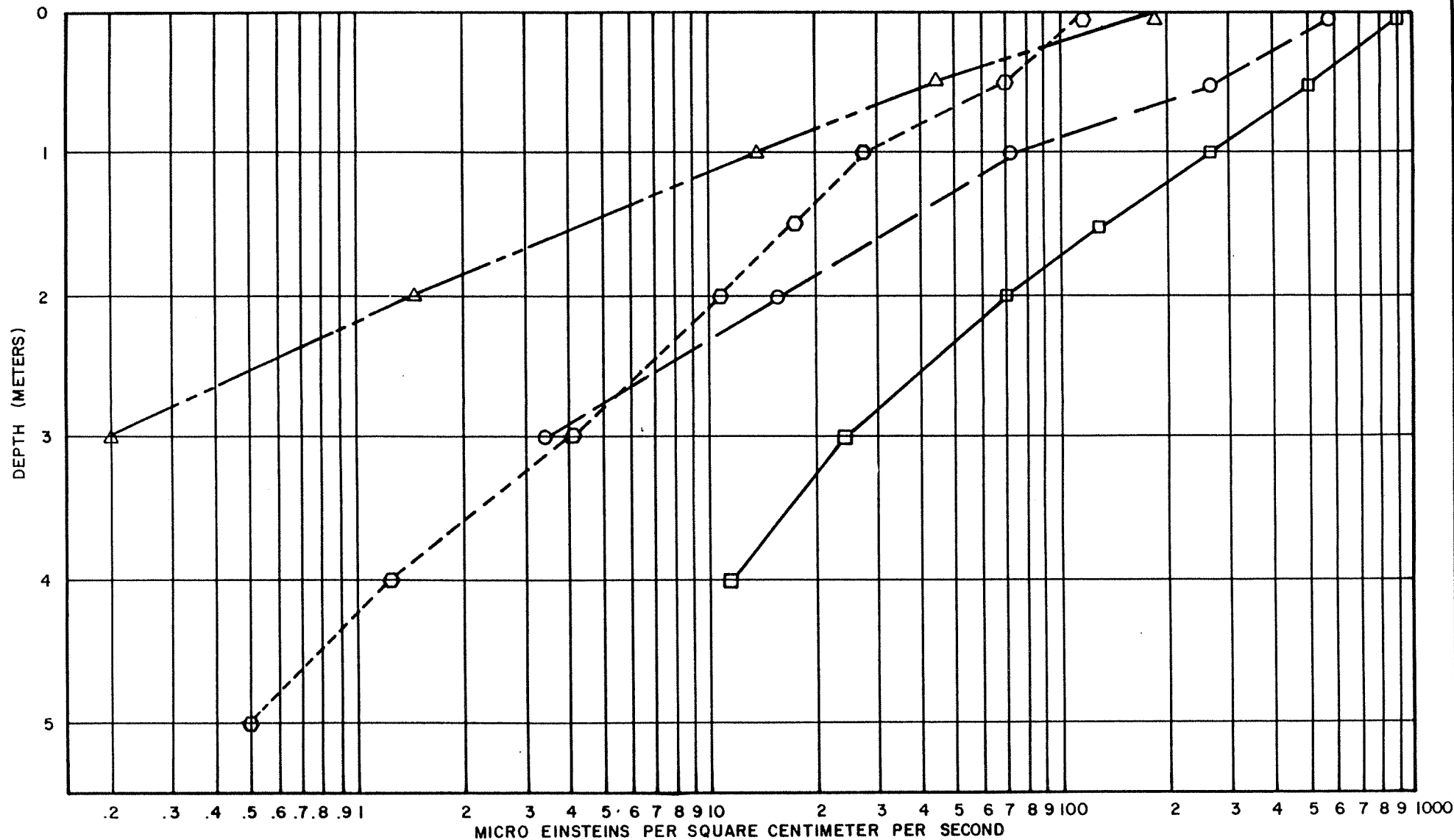
DYNDOM MODEL

WATANA RESERVOIR  
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

DATE: 11-1-82

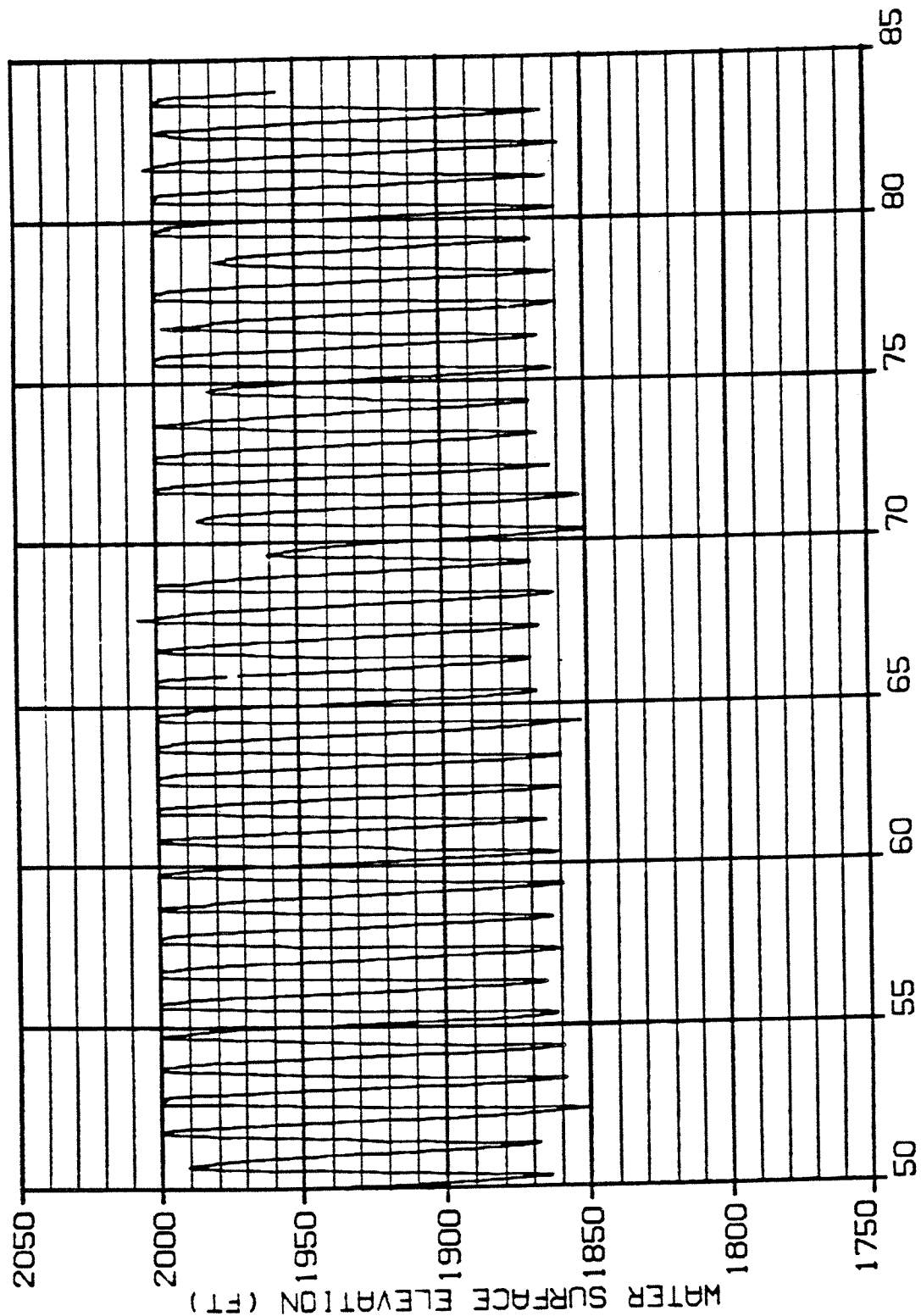
FIGURE E.2.4.9



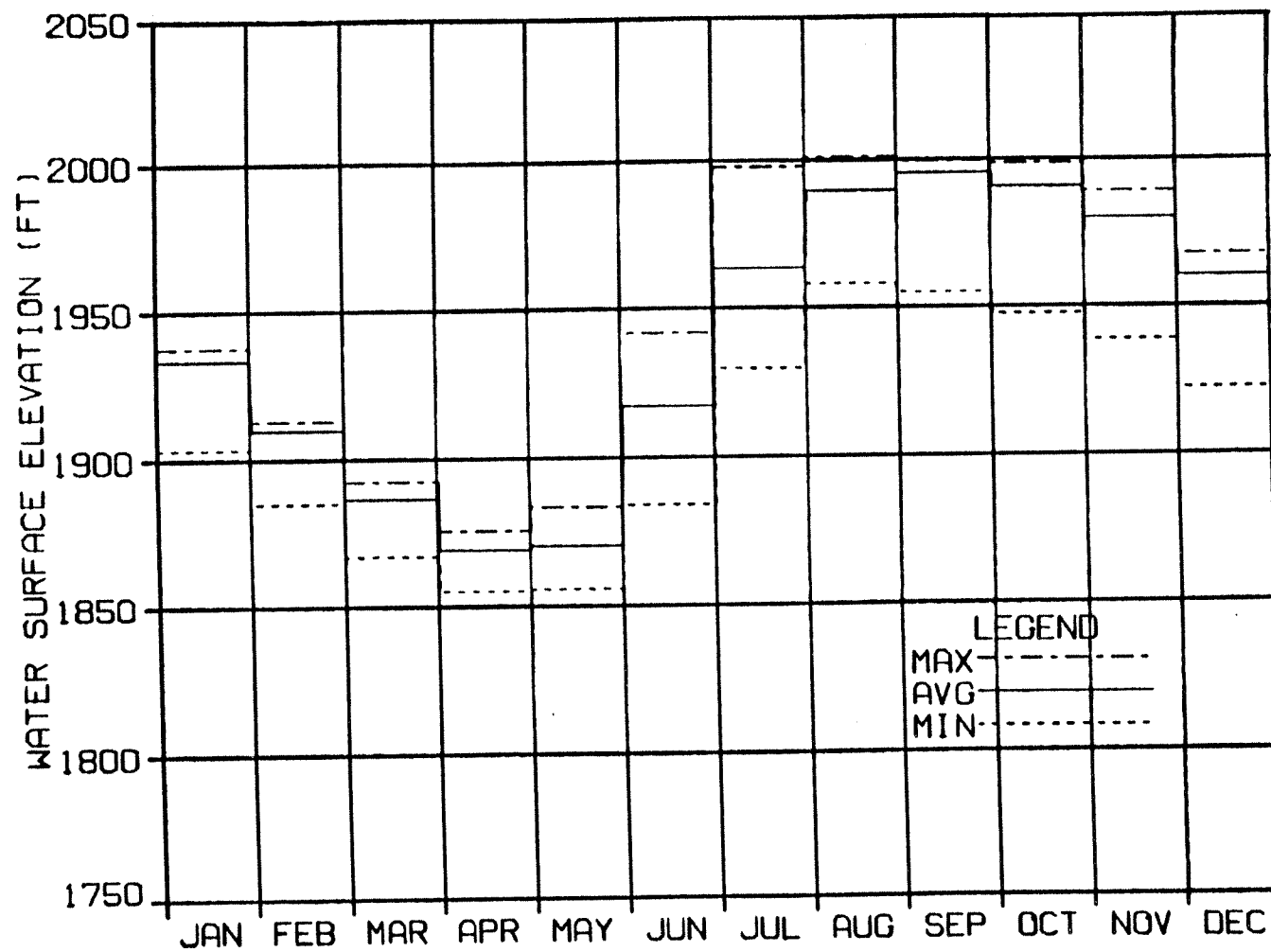
LEGEND:

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

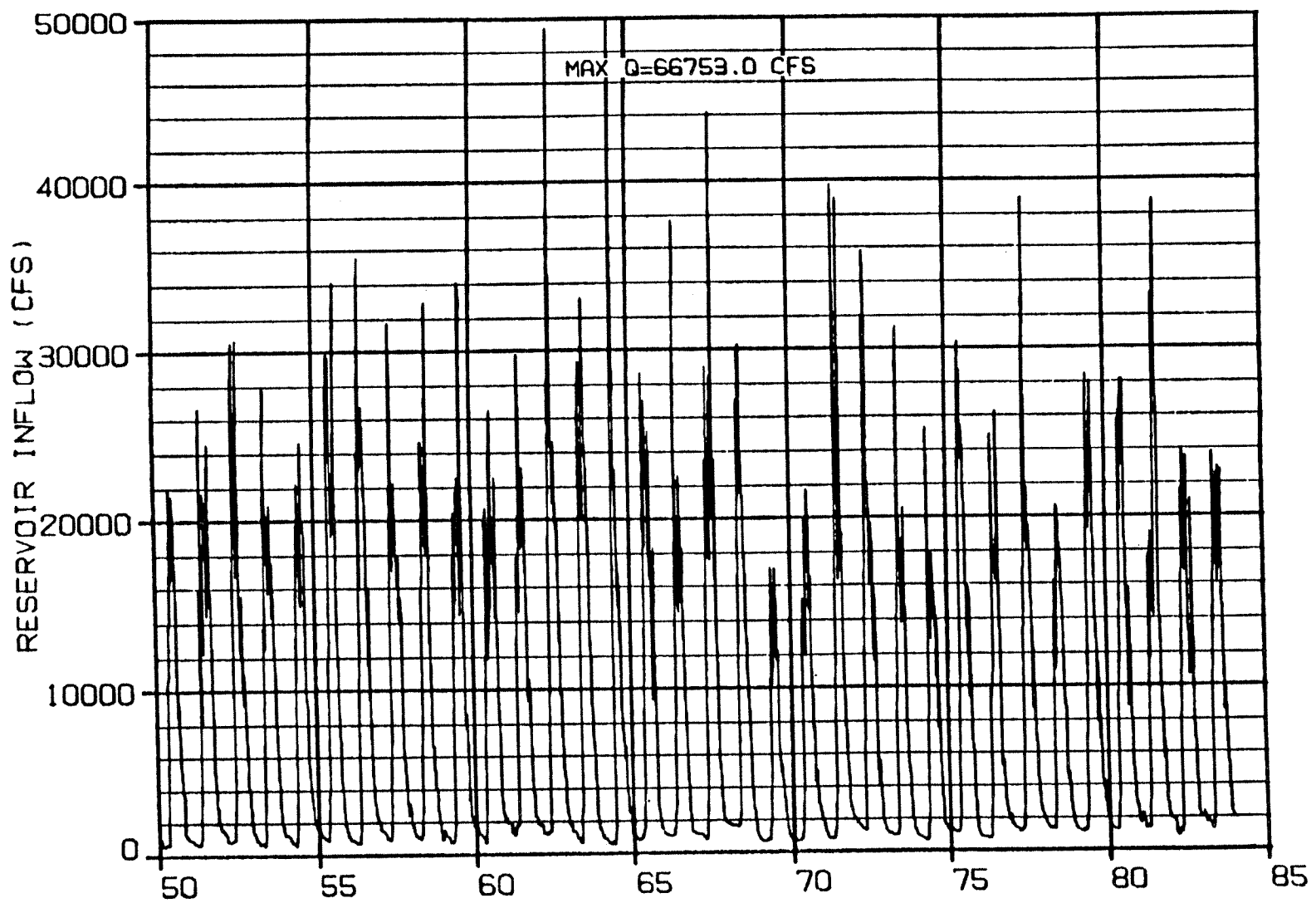
EKLUTNA LAKE  
LIGHT EXTINCTION  
IN SITU MEASUREMENTS



WATANA WATER SURFACE ELEVATION, STAGE I

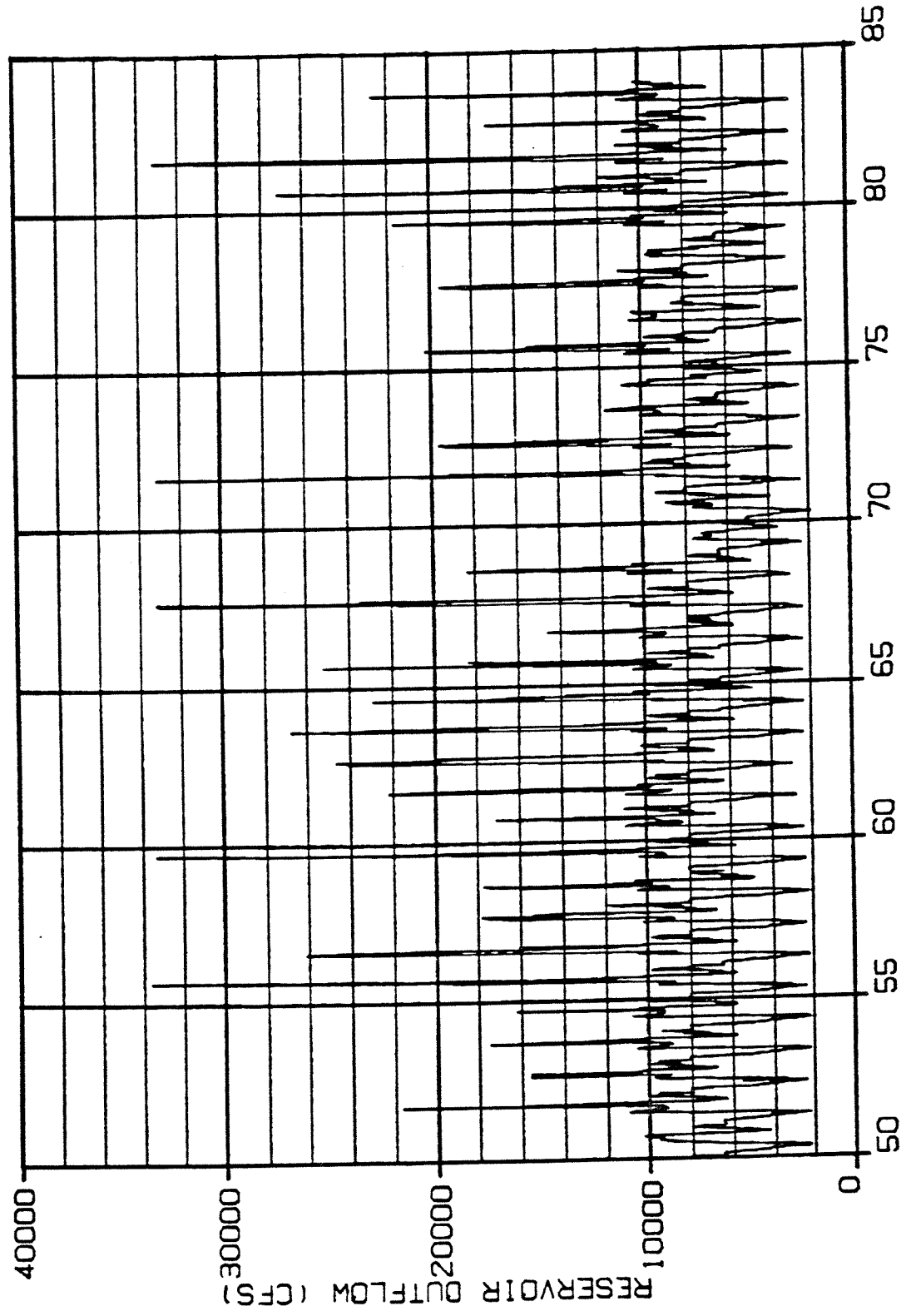


WATANA WATER SURFACE ELEVATION  
MONTHLY SUMMARY, STAGE I

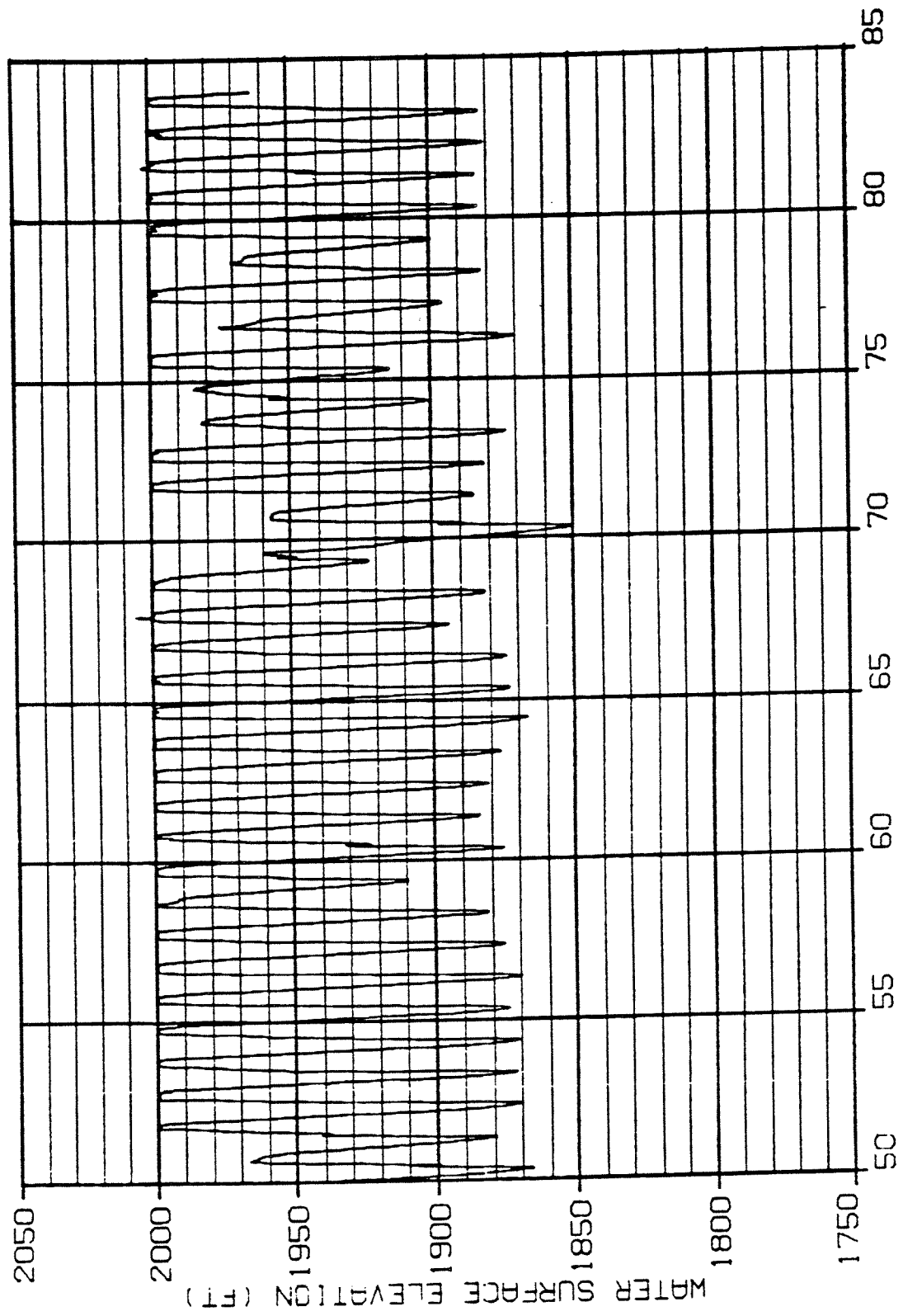


WATANA RESERVOIR INFLOW, STAGE I

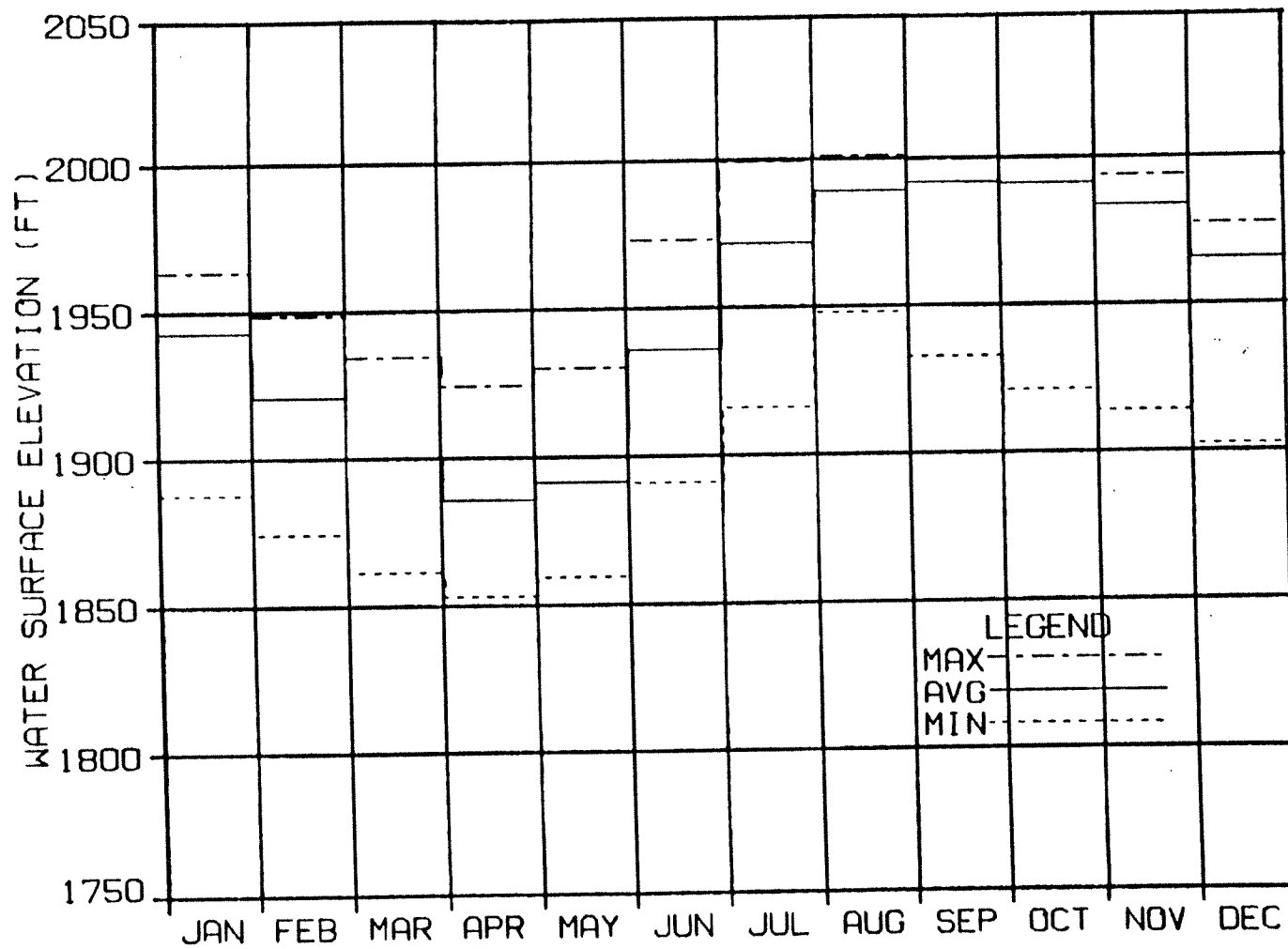




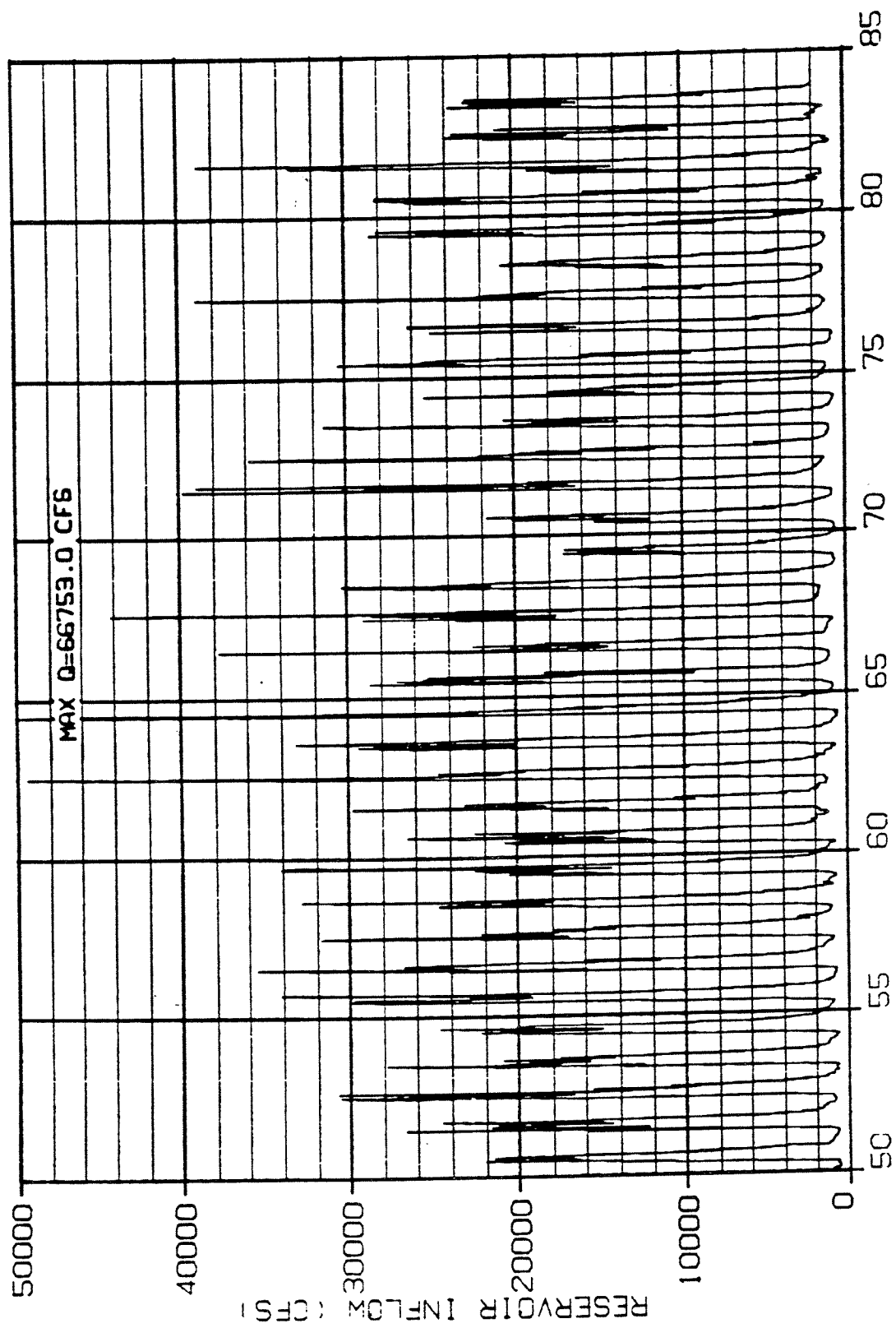
WATANA RESERVOIR OUTFLOW, STAGE I



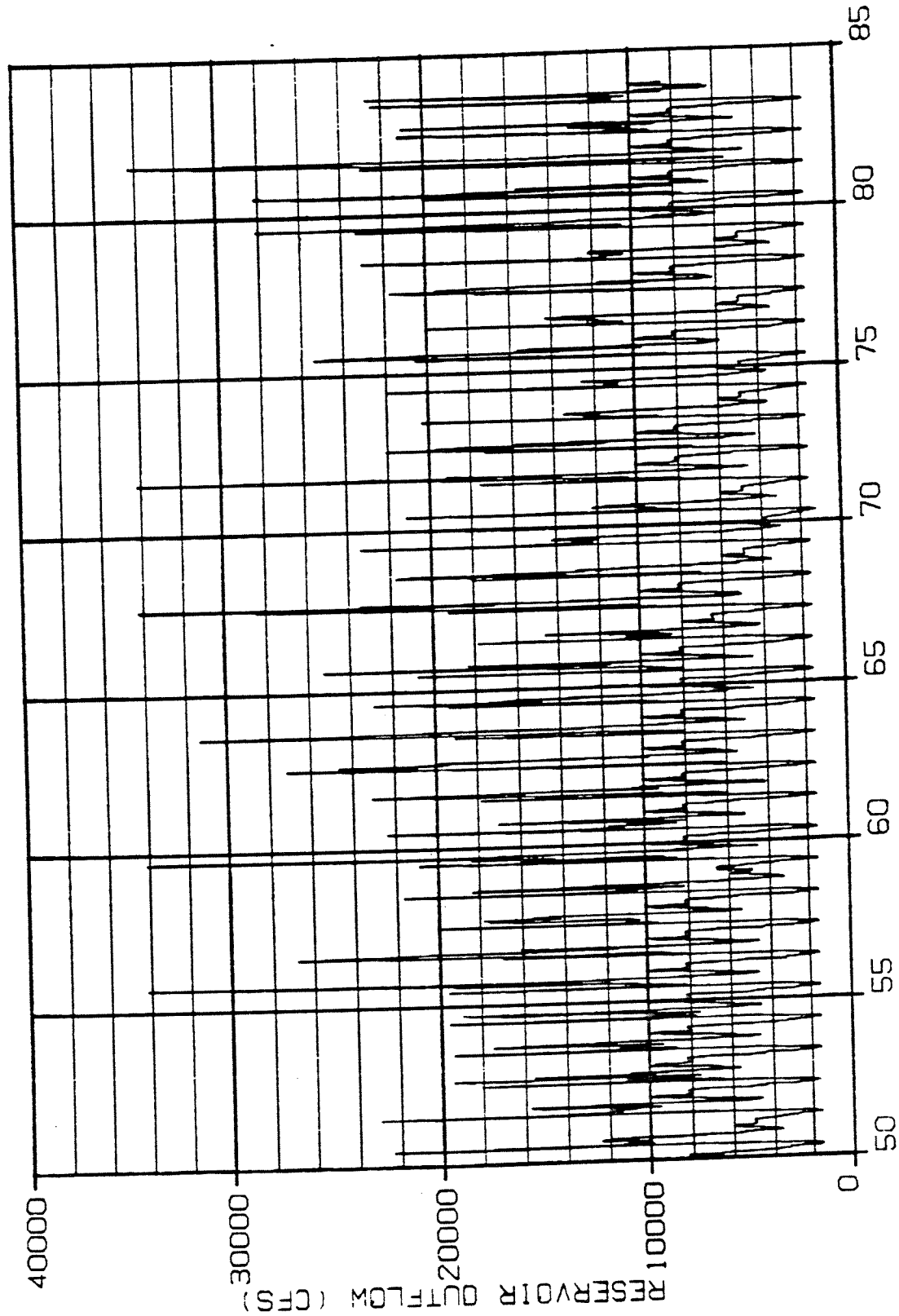
WATANA WATER SURFACE ELEVATION, E-I, STAGE I



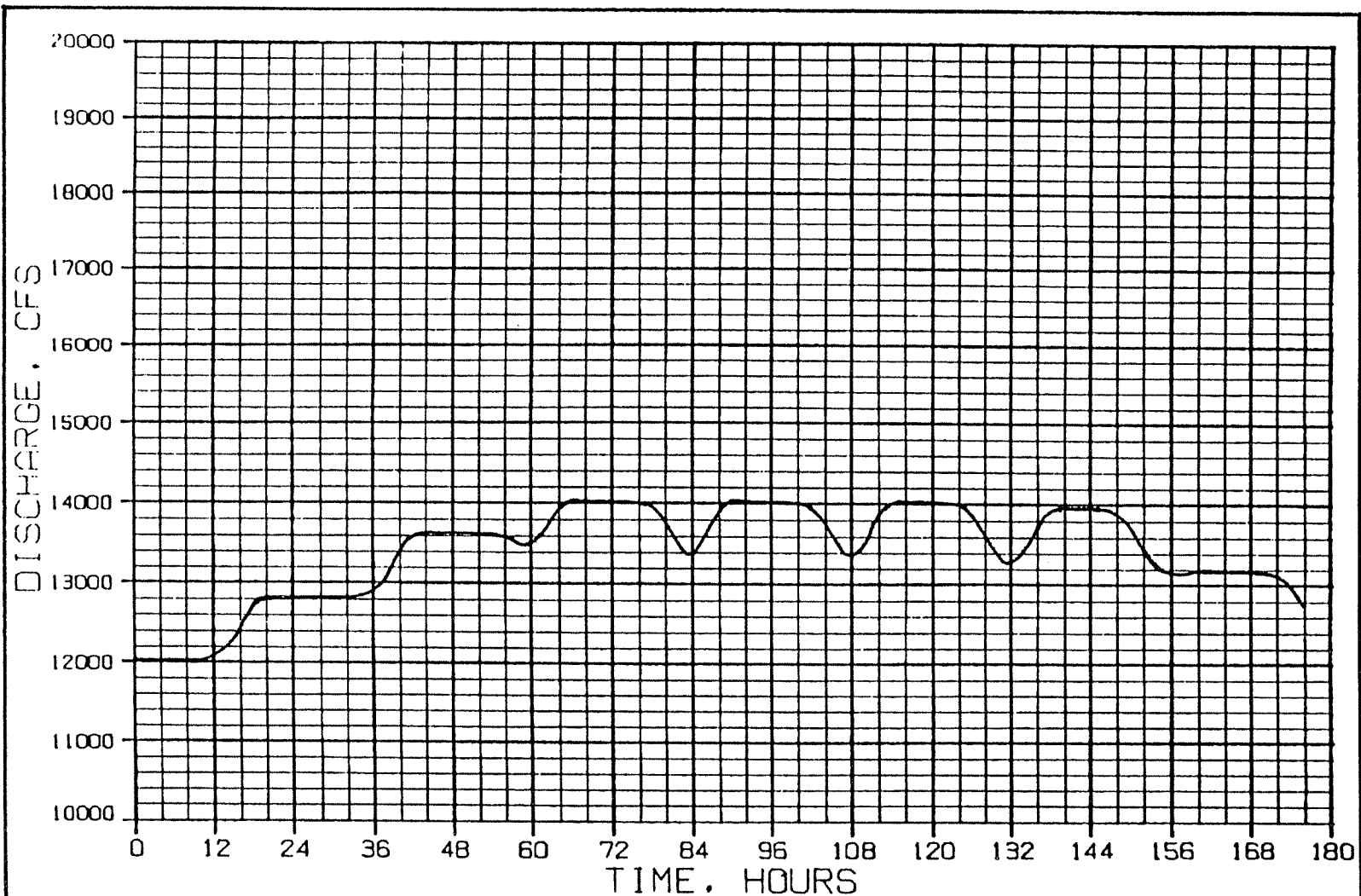
**WATANA WATER SURFACE ELEVATION  
E-I, MONTHLY SUMMARY, STAGE I**



WATANA RESERVOIR INFLOW, E-I, STAGE I



WATANA RESERVOIR OUTFLOW, E-I, STAGE I



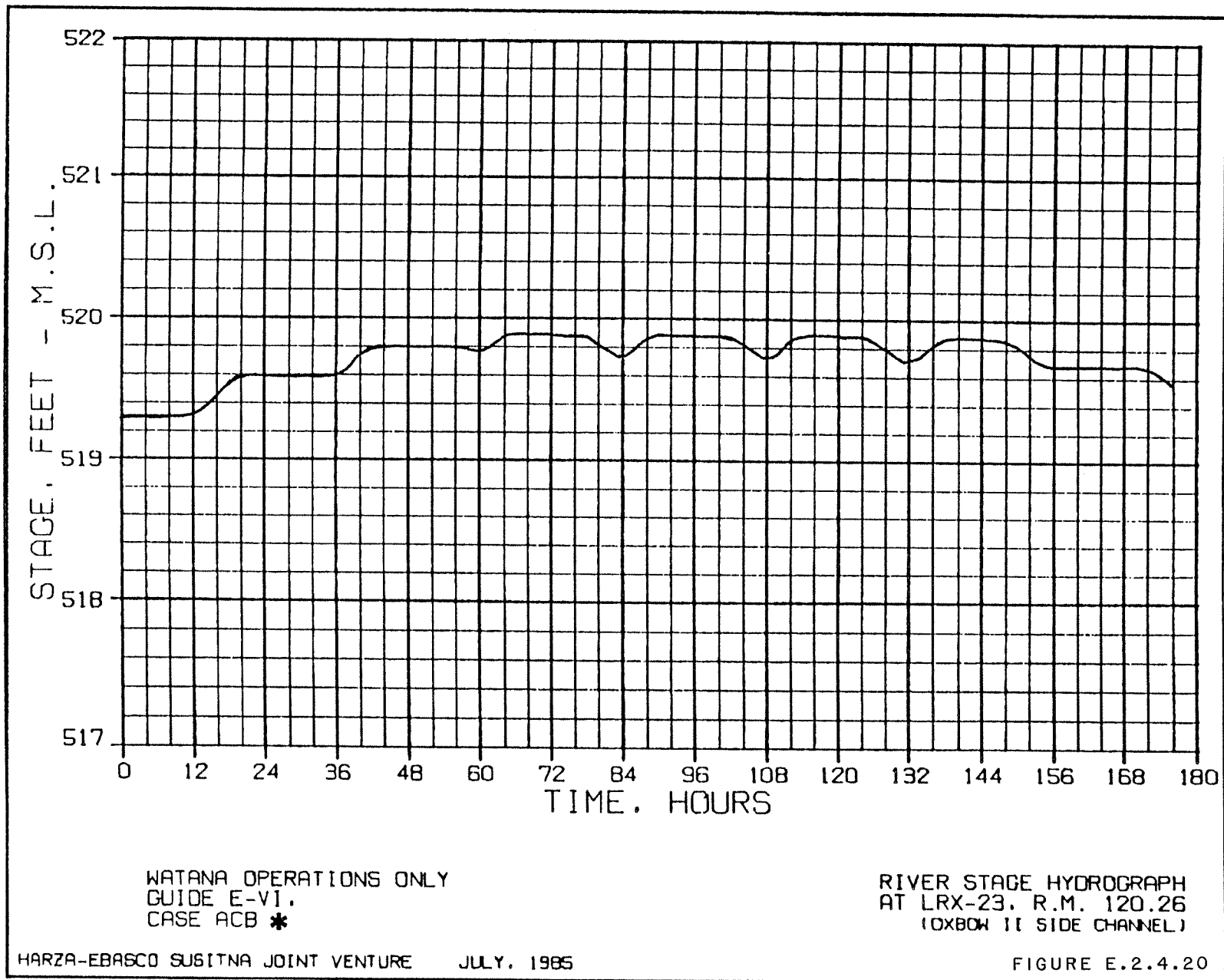
WATANA OPERATIONS ONLY  
GUIDE E-VI,  
CASE ACB \*

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

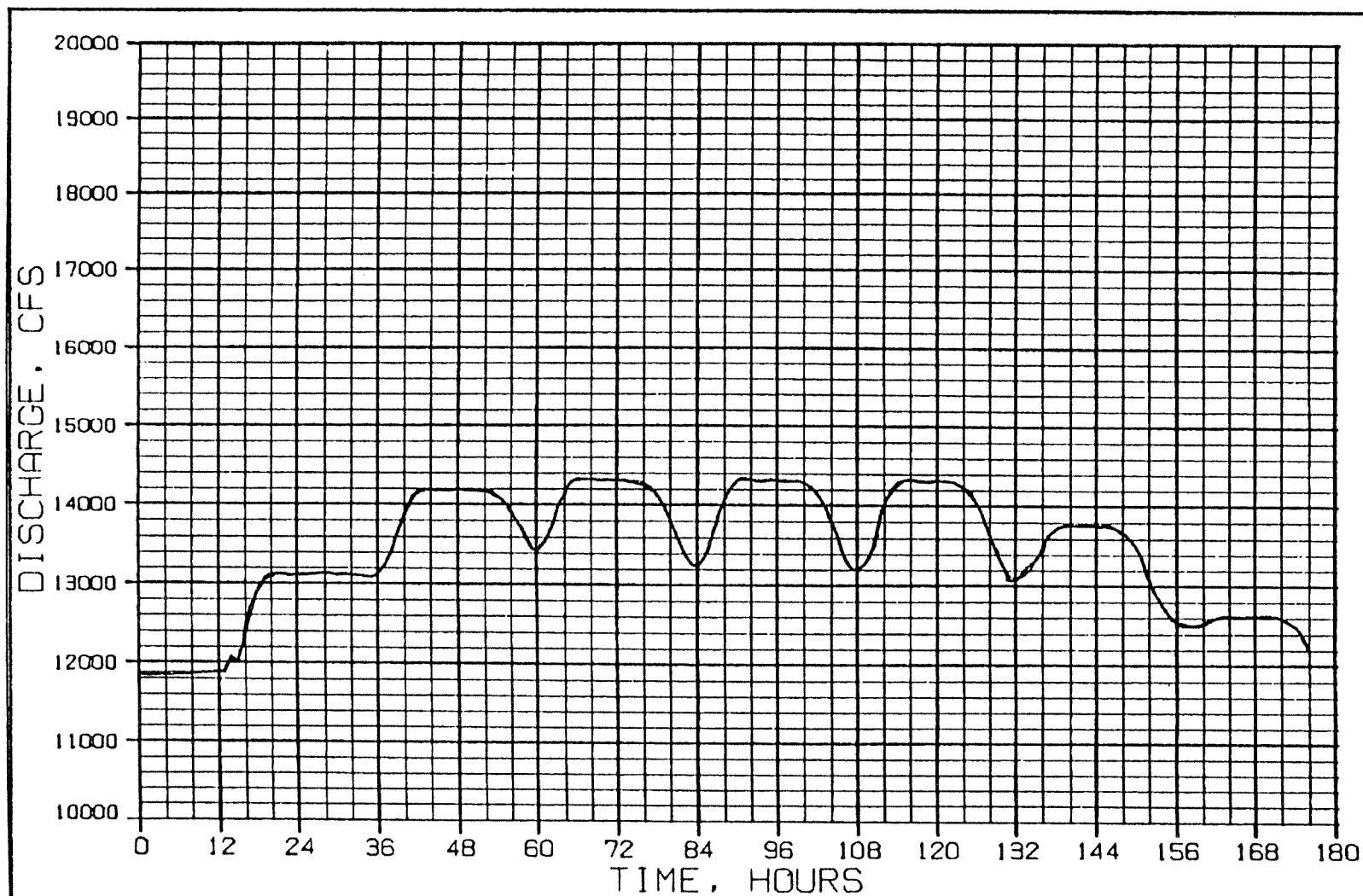
HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.19

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



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



WATANA OPERATIONS ONLY  
GUIDE E-VI,  
CASE ACC \*

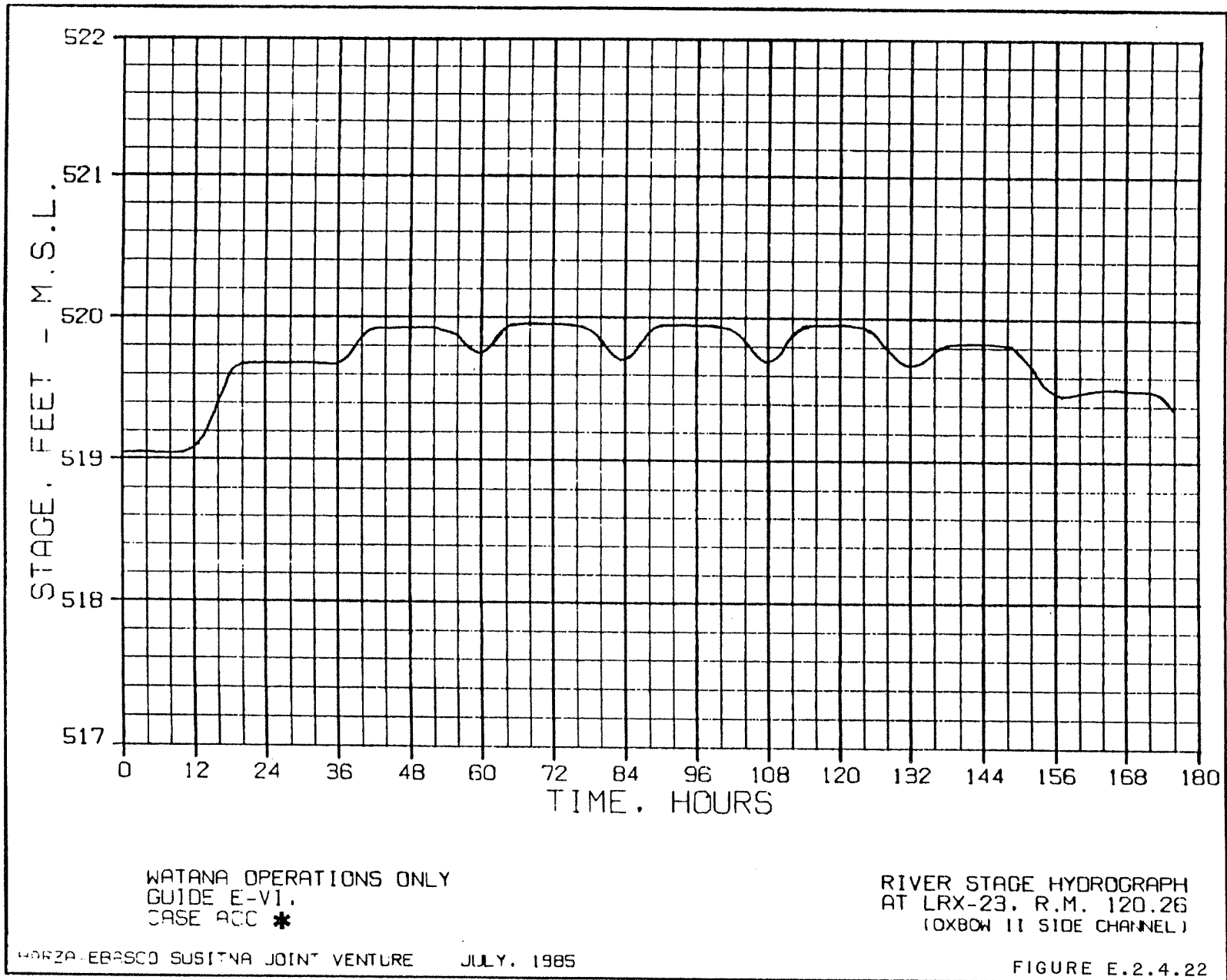
DISCHARGE HYDROGRAPH  
AT LRX-23, R.M. 120.26  
(OXBOW II SIDE CHANNEL)

HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

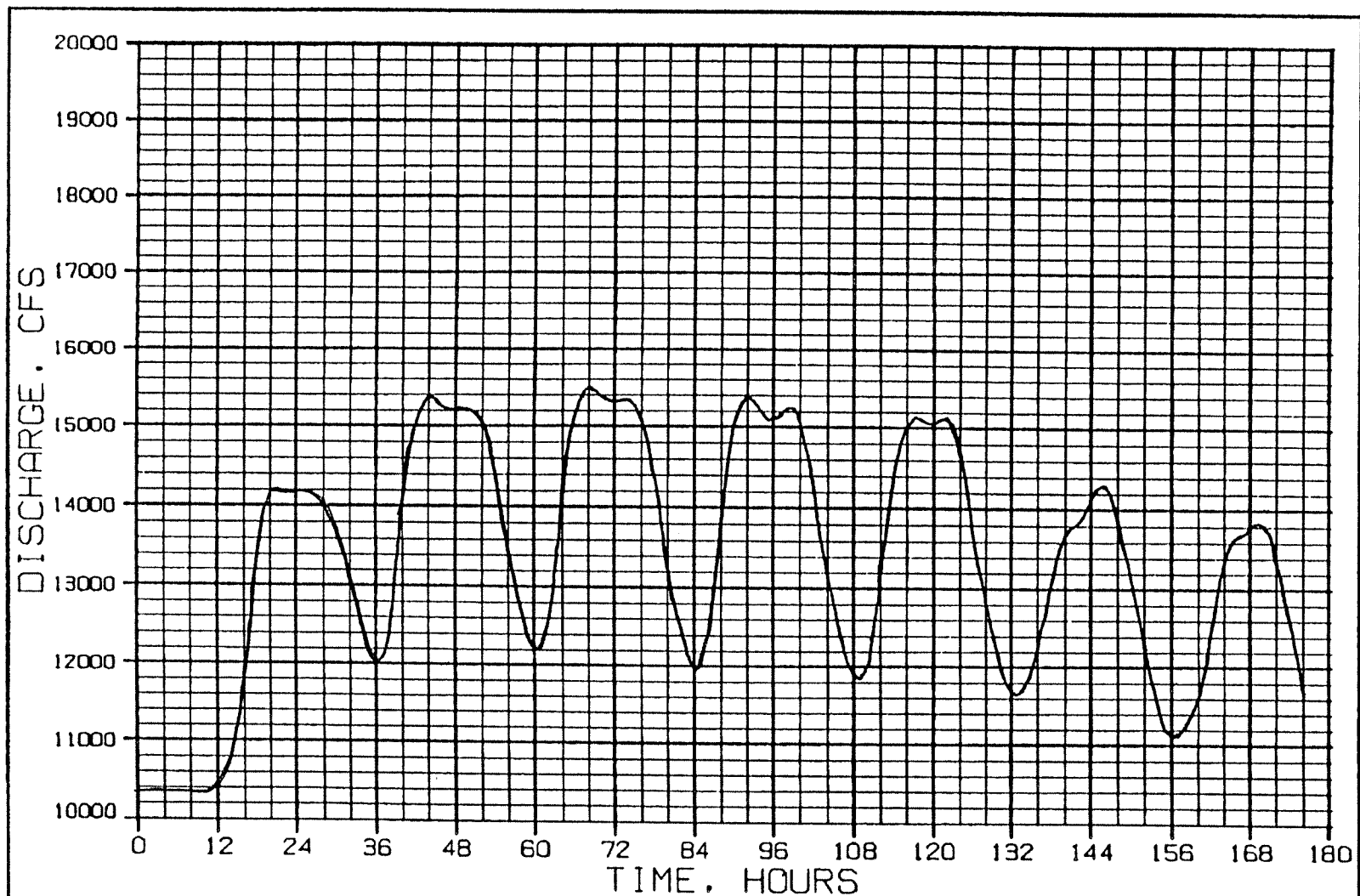
FIGURE E.2.4.21

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





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



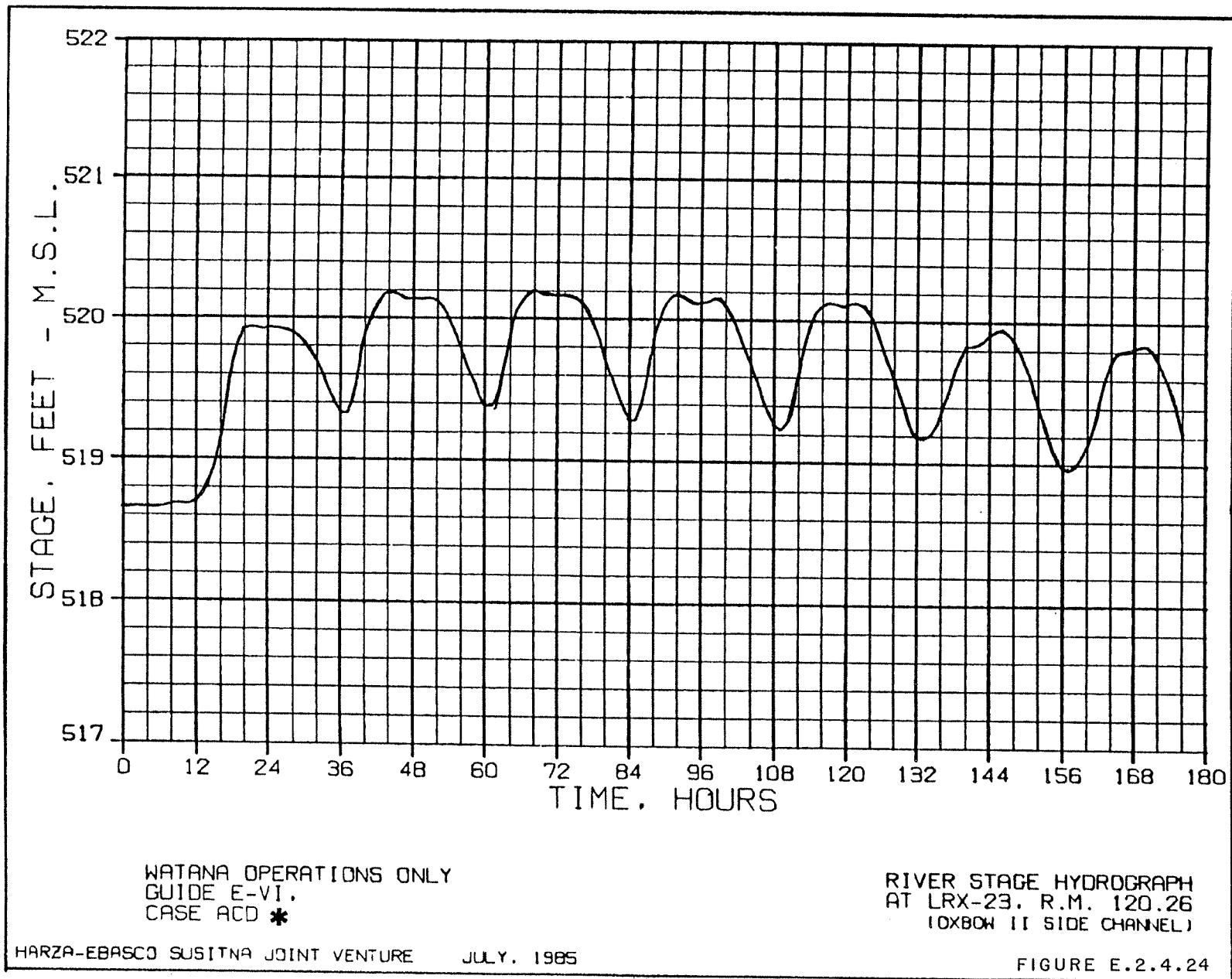
WATANA OPERATIONS ONLY  
GUIDE E-VI.  
CASE ACD \*

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

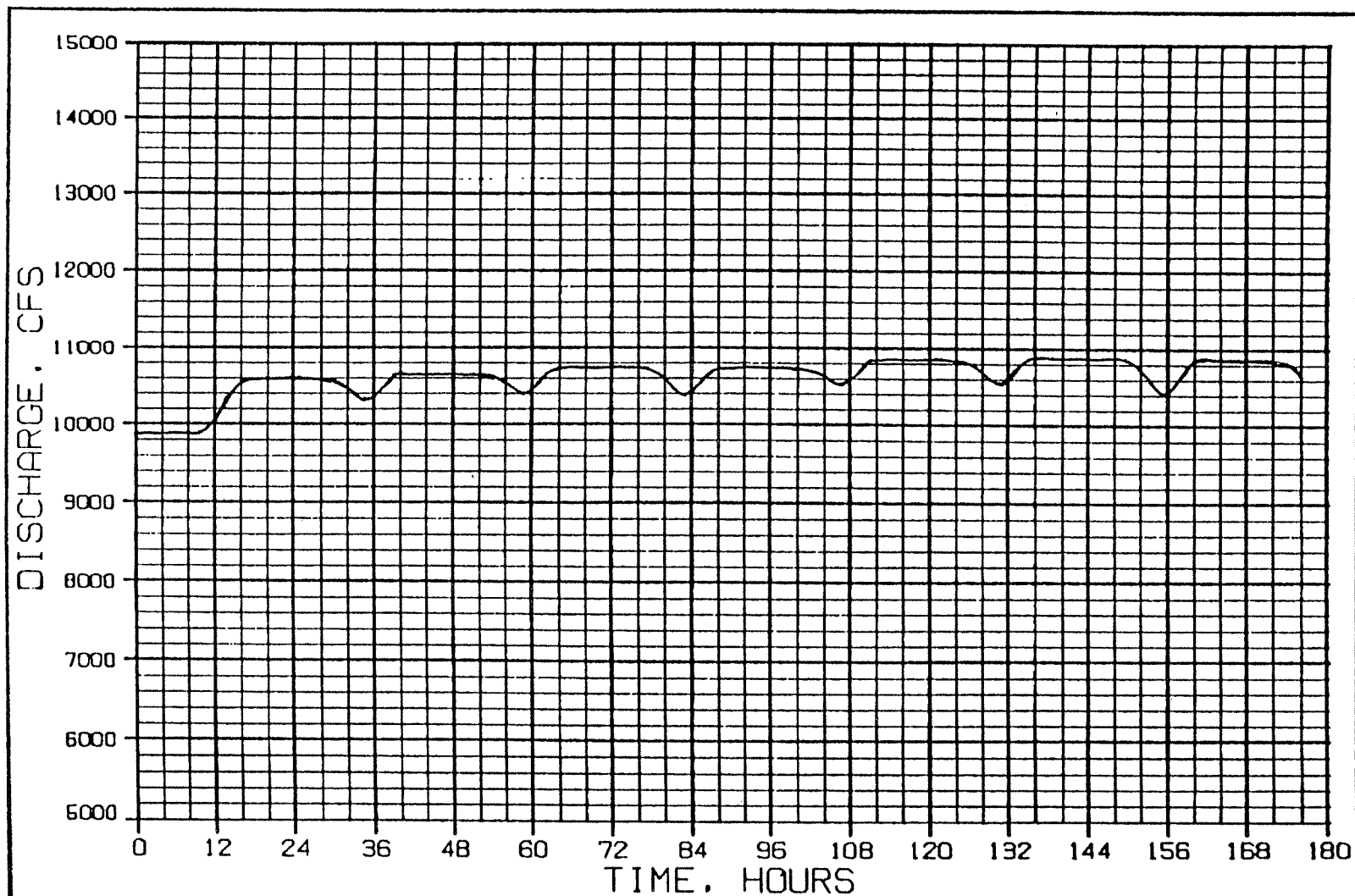
HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.23

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



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



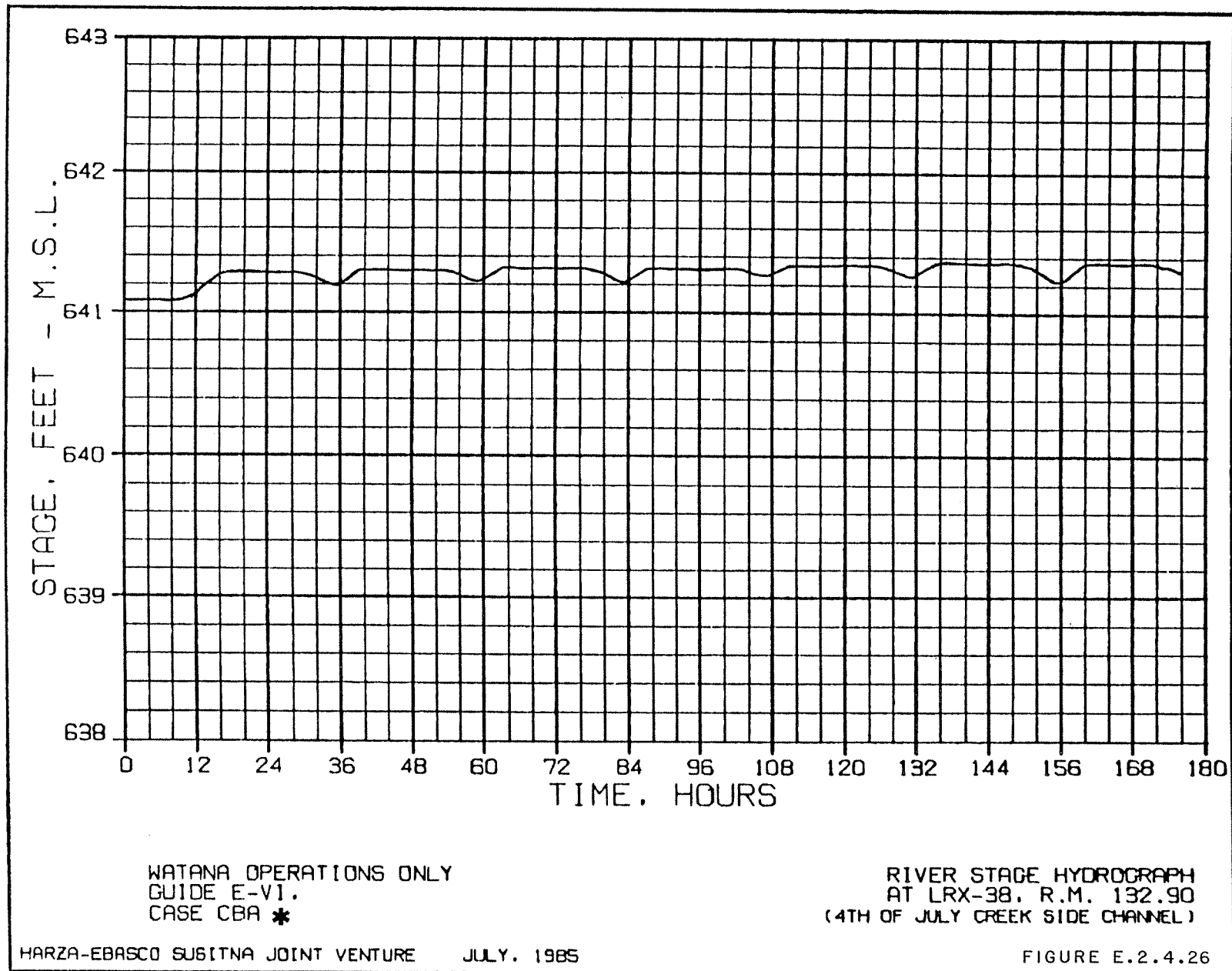
WATANA OPERATIONS ONLY  
GUIDE E-VI,  
CASE CBA \*

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

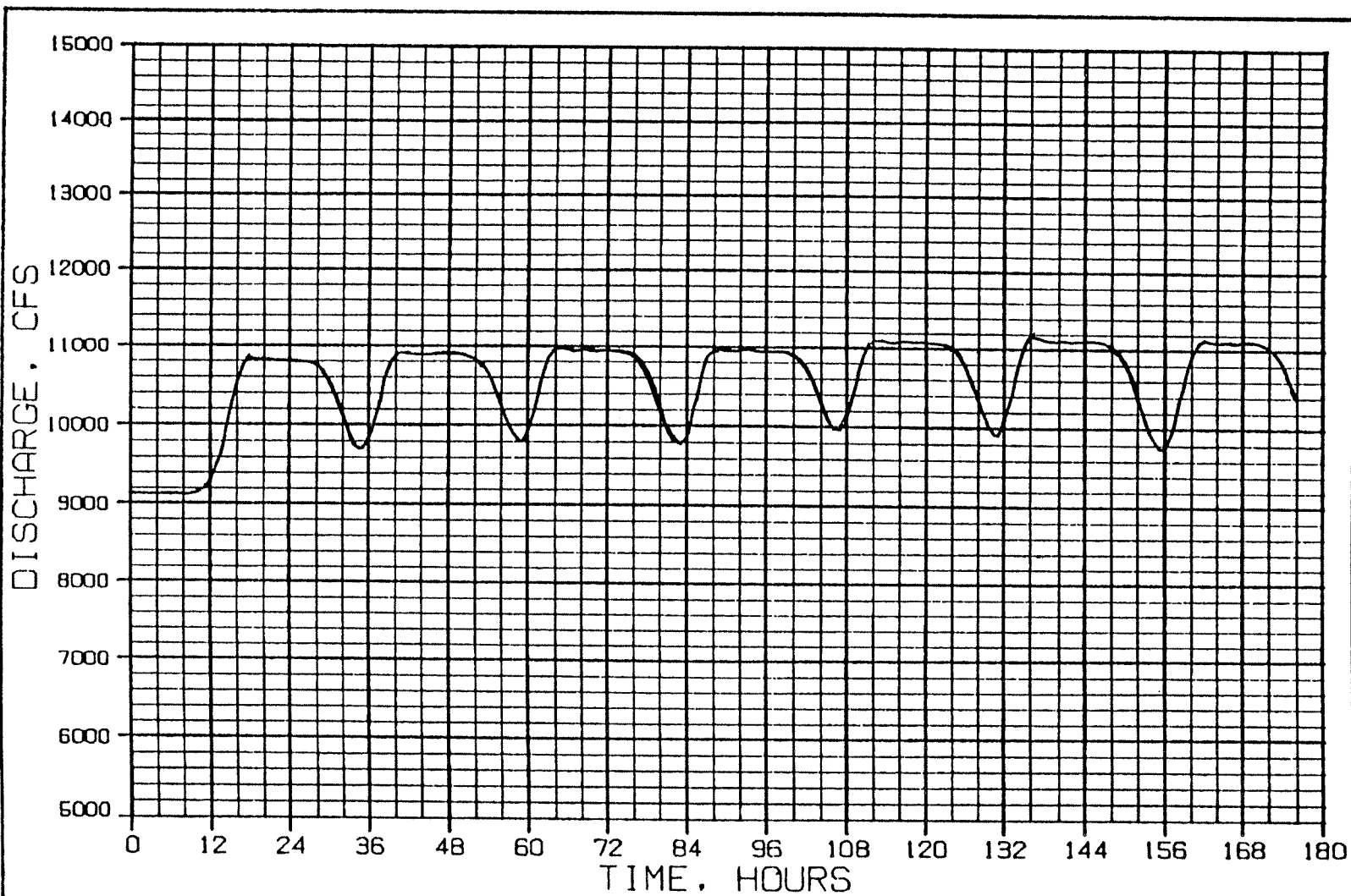
HARZA-EBASCO SUSITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.25

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



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



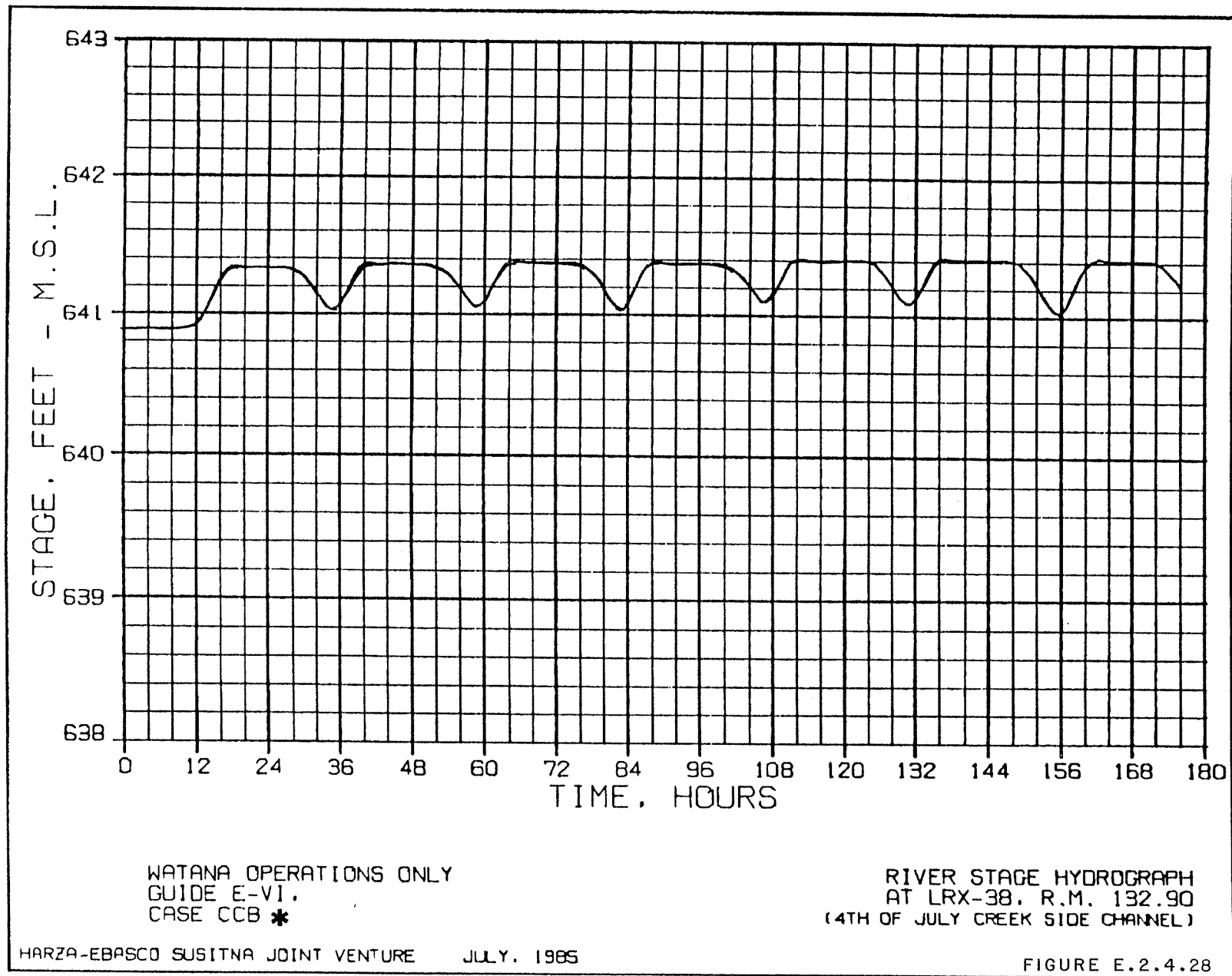
WATANA OPERATIONS ONLY  
GUIDE E-VI,  
CASE CCB \*

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

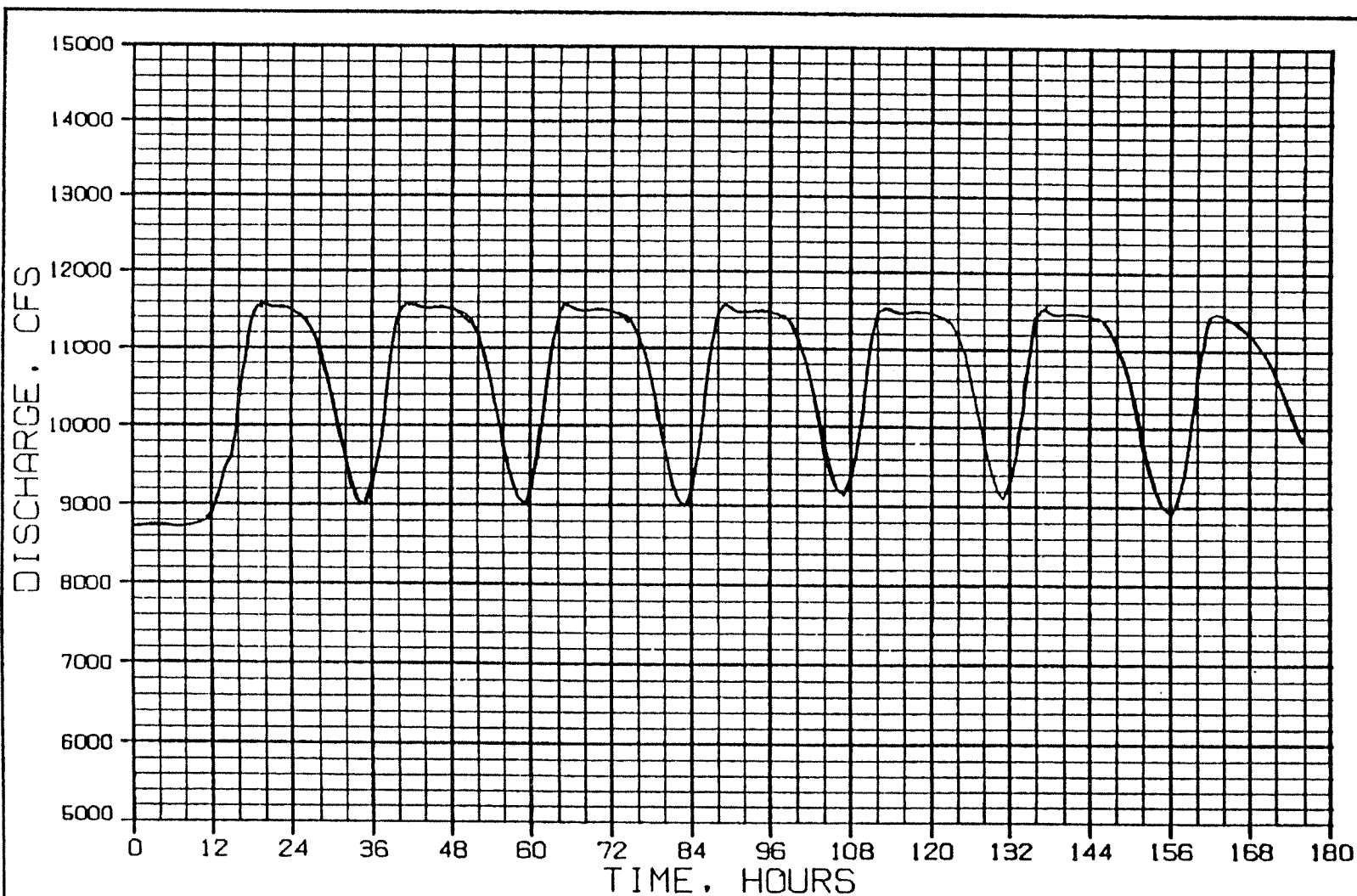
HARZA-EBASCO SUBITNA JOINT VENTURE JULY, 1985

FIGURE E.2.4.27

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



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



WATANA OPERATIONS ONLY  
GUIDE E-VI.  
CASE CCD \*

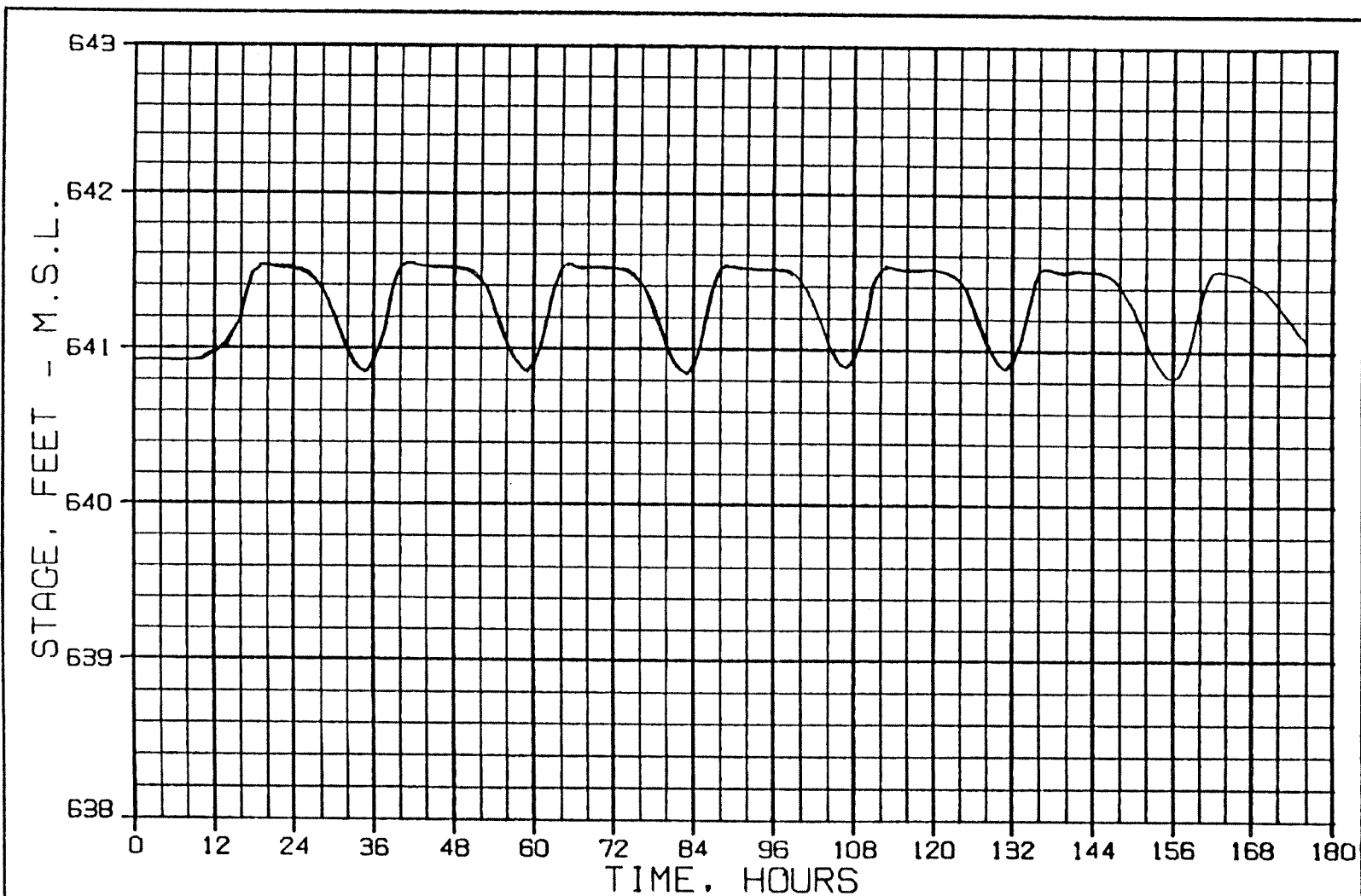
DISCHARGE HYDROGRAPH  
AT LRX-38, R.M. 132.90  
(4TH OF JULY CREEK SIDE CHANNEL)

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"

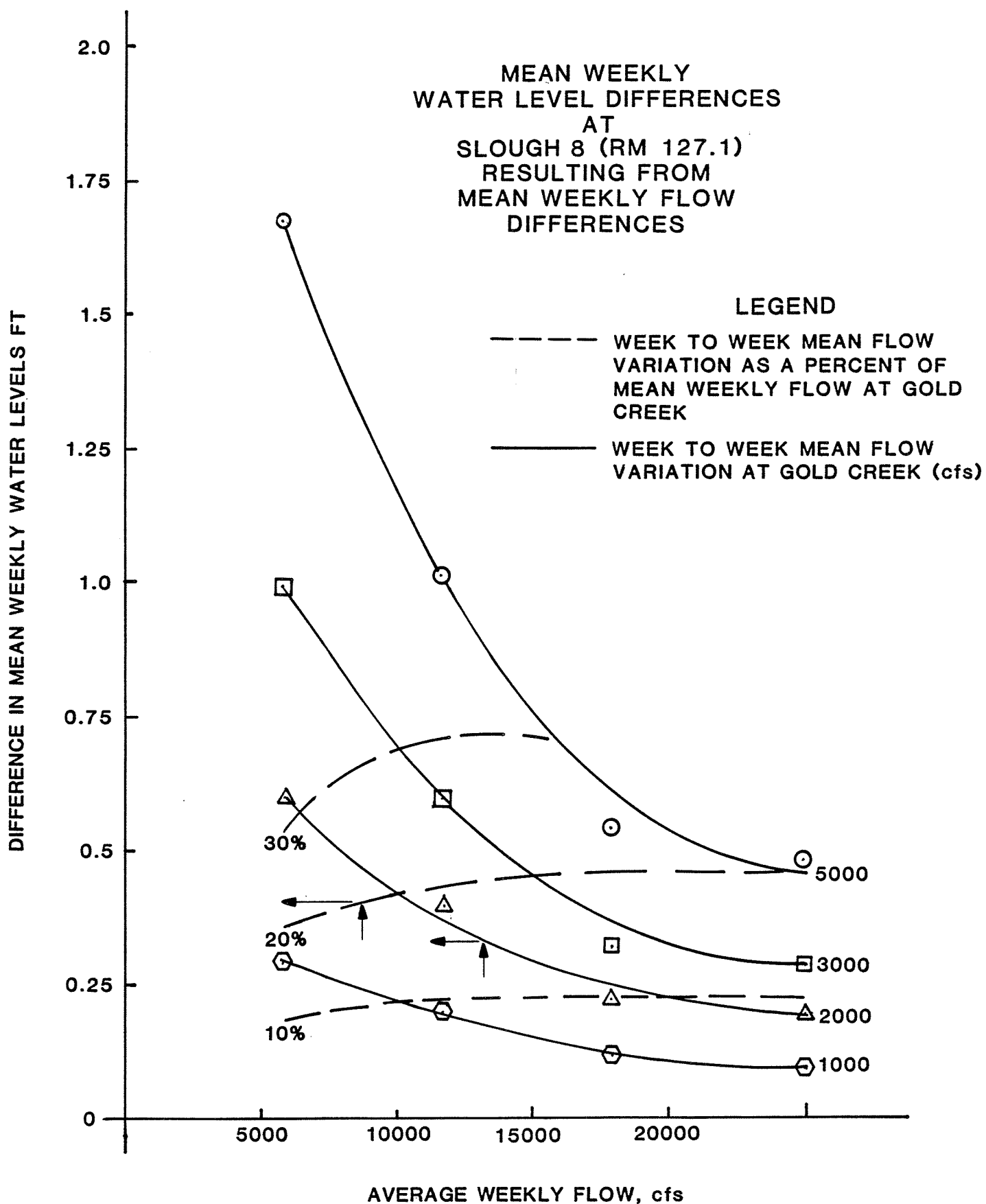


FIGURE E.2.4.31

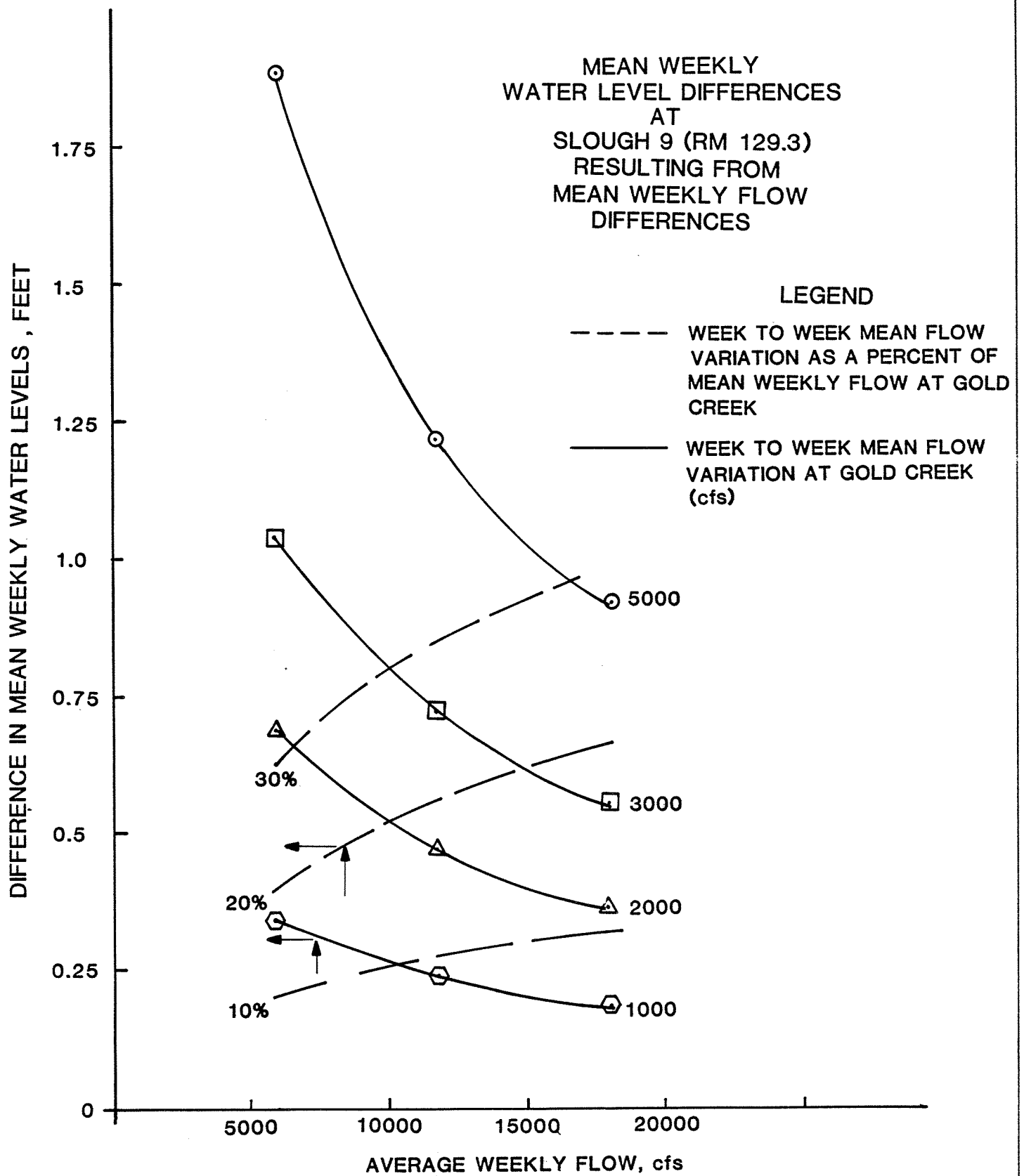


FIGURE E.2.4.32

DIFFERENCE IN MEAN WEEKLY WATER LEVELS , FEET

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

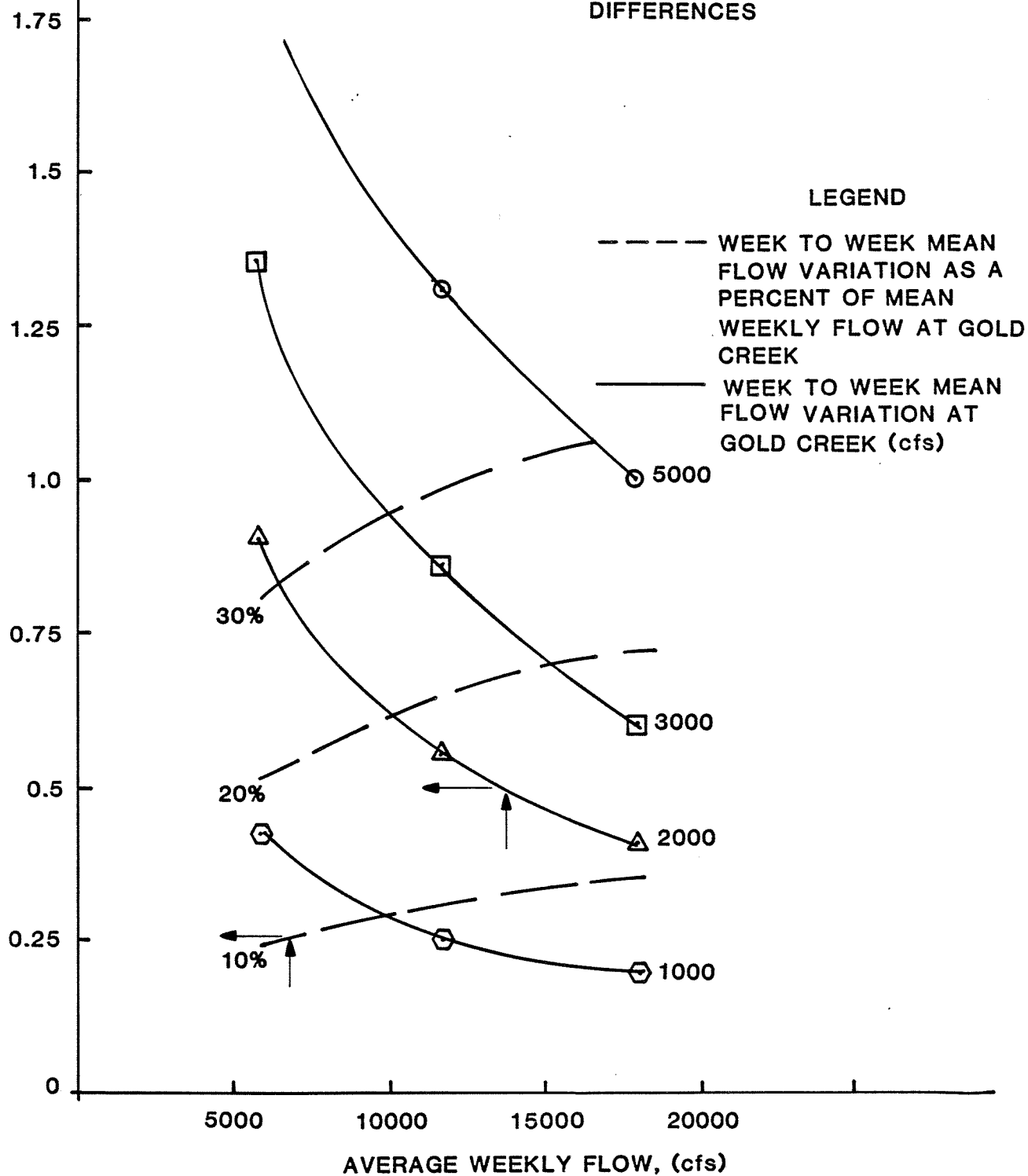


FIGURE E.2.4.33

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

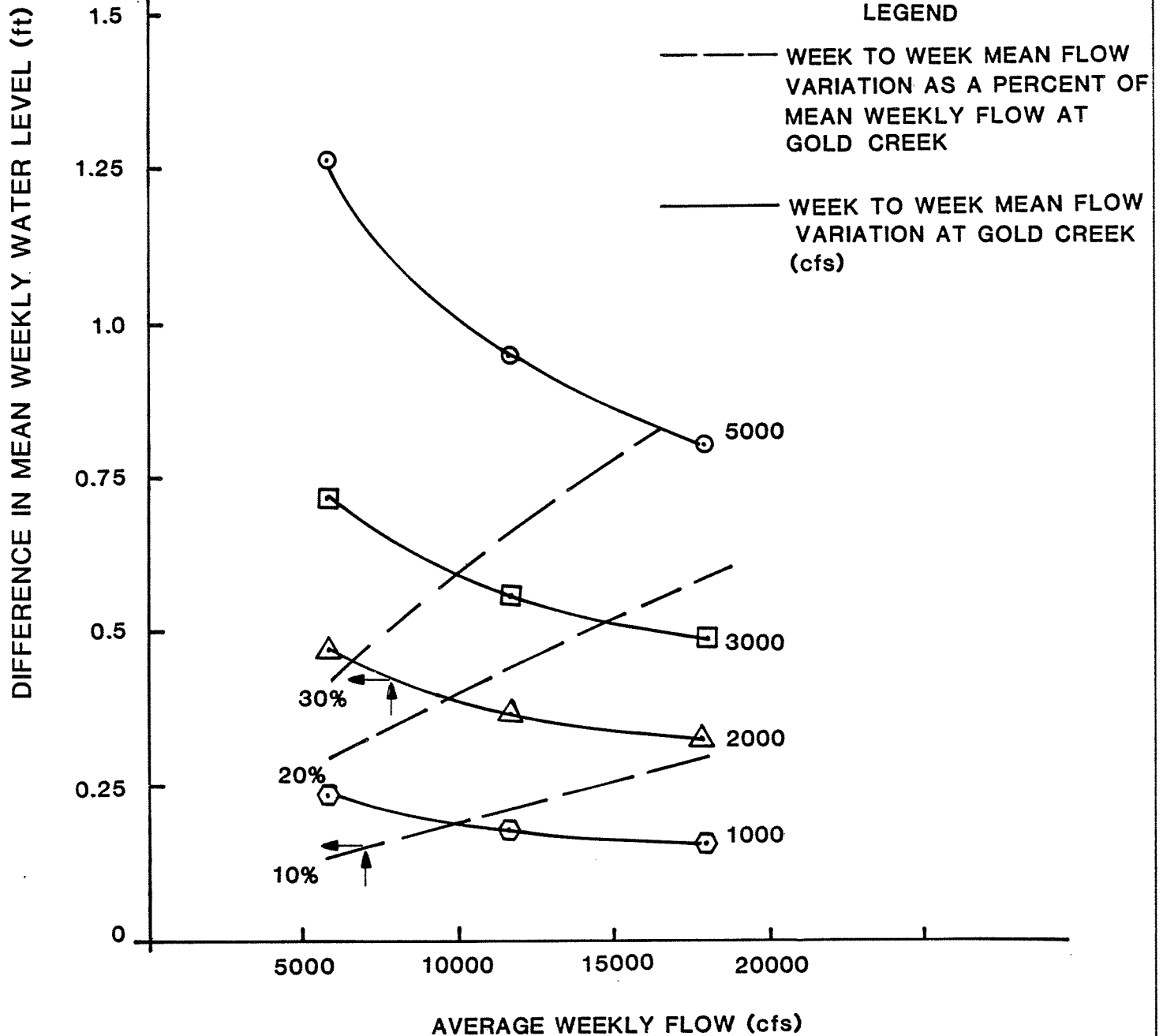
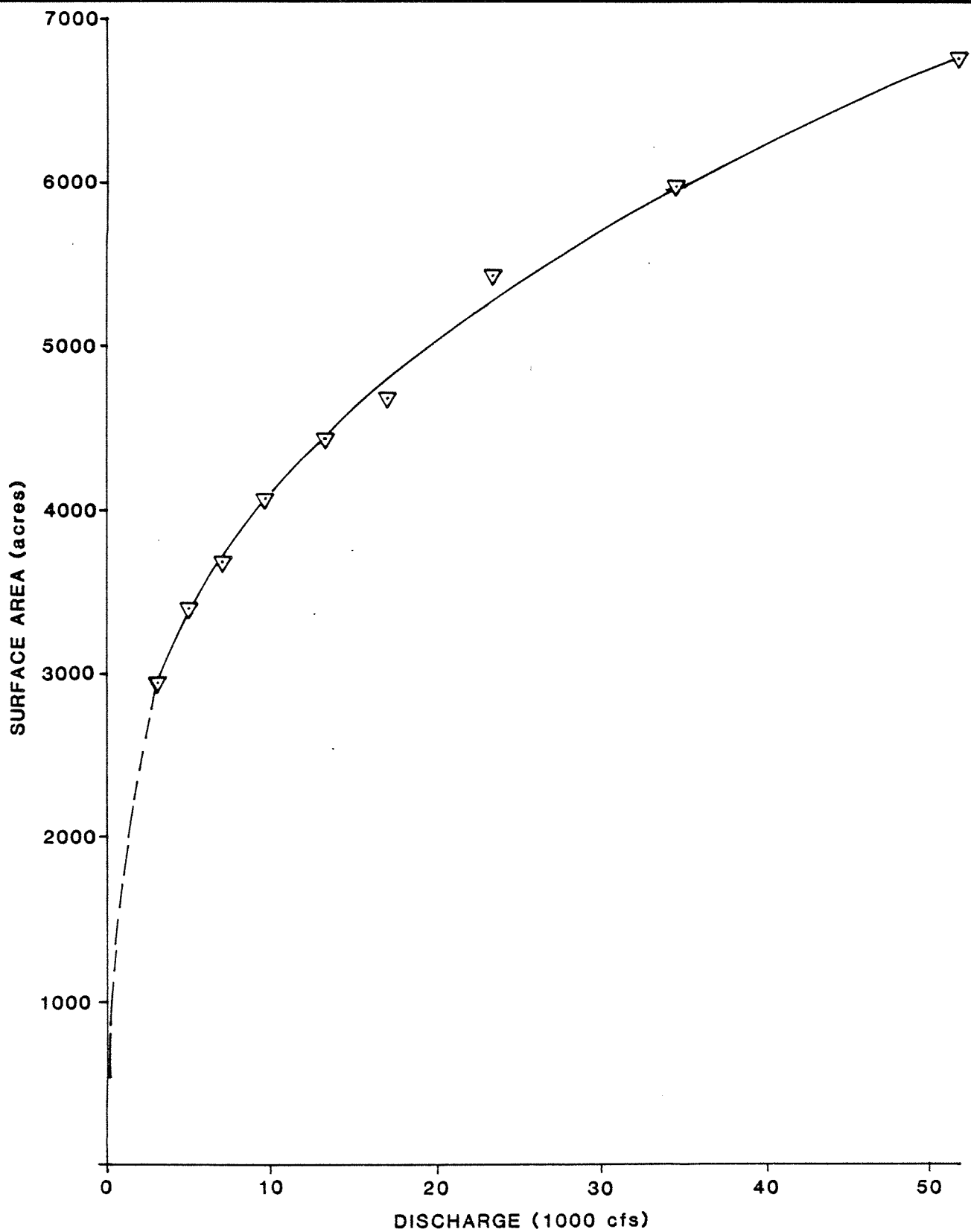


FIGURE E.2.4.34



**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        |          |      |
| HARRIS-BRISCO                 | APPROVED | DATE |
| ANCHORAGE, ALASKA             |          |      |

FIGURE E.2.4. 36

THOUSANDS

Discharge in cfs

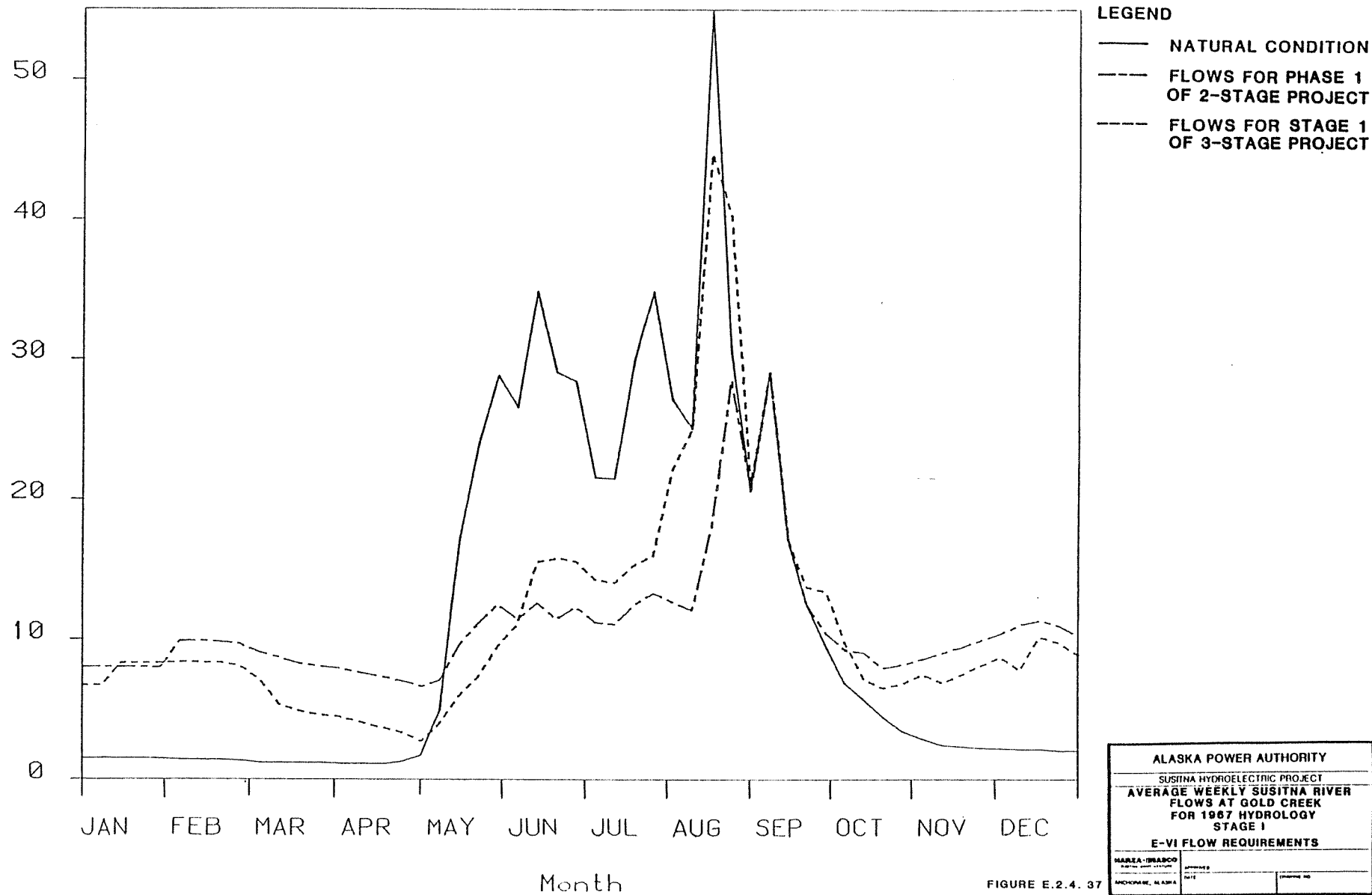


FIGURE E.2.4. 37

|                                    |                  |
|------------------------------------|------------------|
| ALASKA POWER AUTHORITY             |                  |
| SUSITNA HYDROELECTRIC PROJECT      |                  |
| AVERAGE WEEKLY SUSITNA RIVER       |                  |
| FLOWS AT GOLD CREEK                |                  |
| FOR 1967 HYDROLOGY                 |                  |
| STAGE I                            |                  |
| E-VI FLOW REQUIREMENTS             |                  |
| MAINTAINED BY<br>ANCHORAGE, ALASKA | DATE<br>DRAWN BY |



Discharge in cfs

THOUSANDS

30

25

20

15

10

5

0

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC

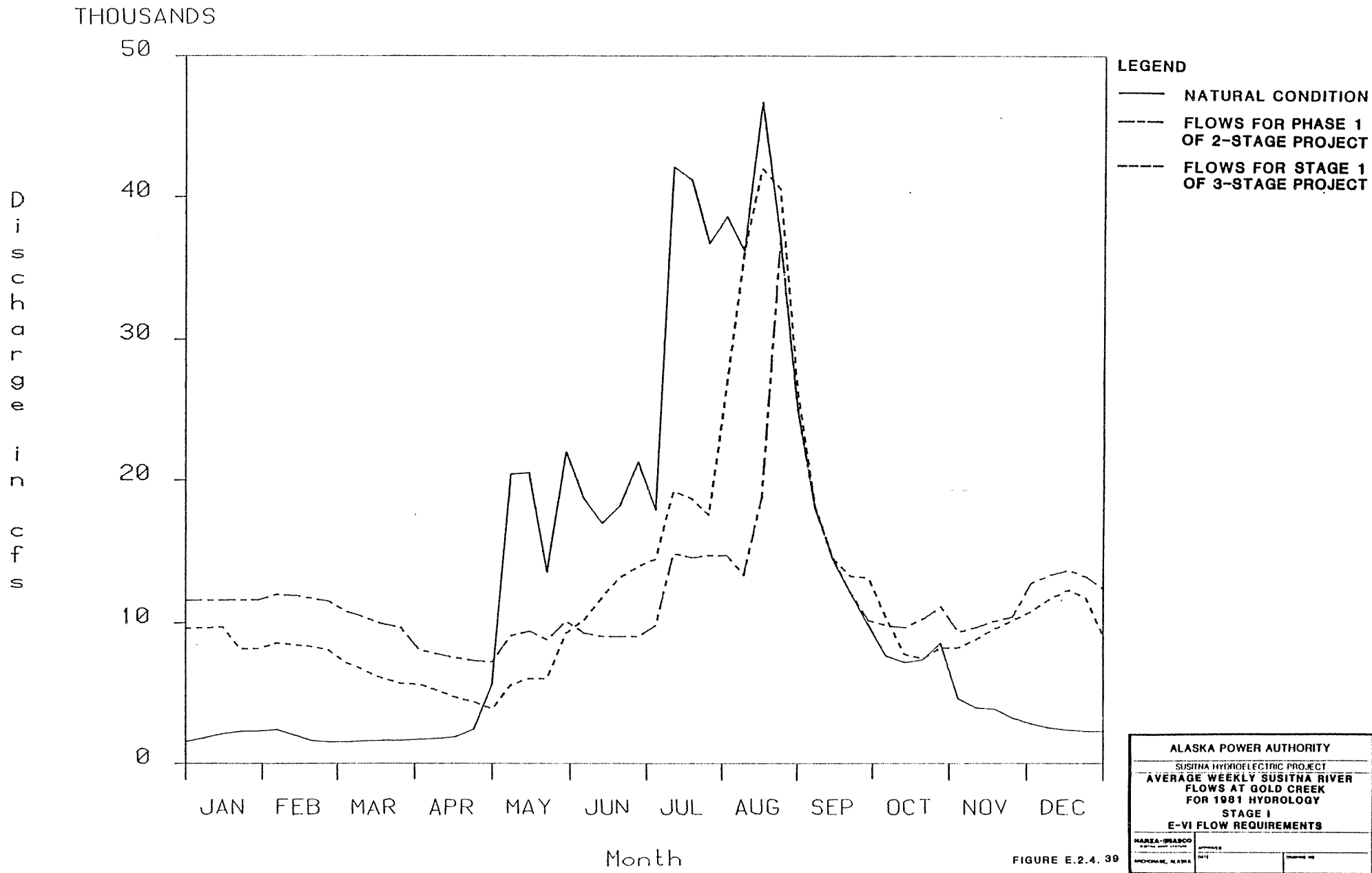
Month

**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        |             |
| HAZEL-DRABCO                  | DATE        |
| ANCHORAGE, ALASKA             | DESIGNED BY |

FIGURE E.2.4 38



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

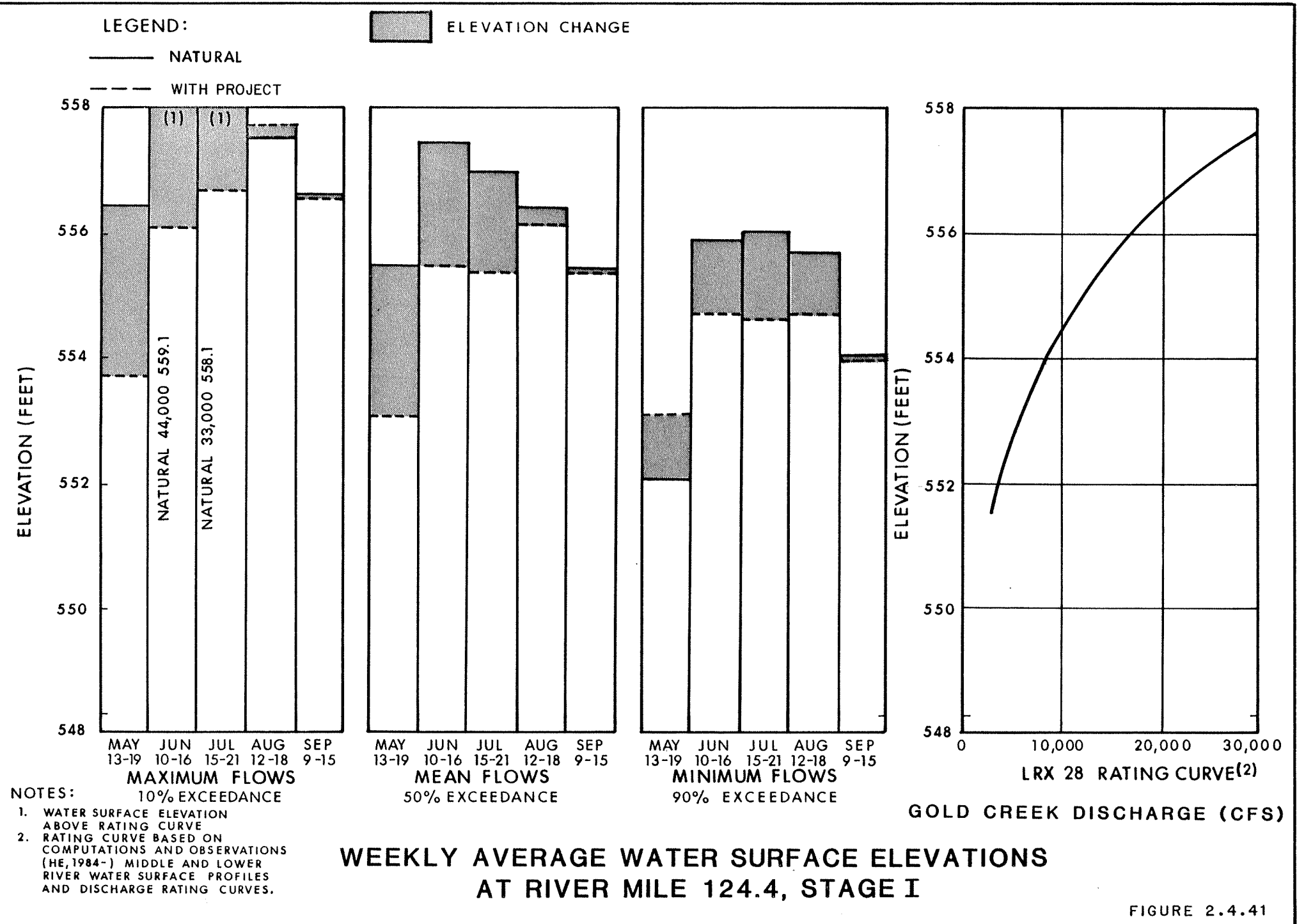
Month

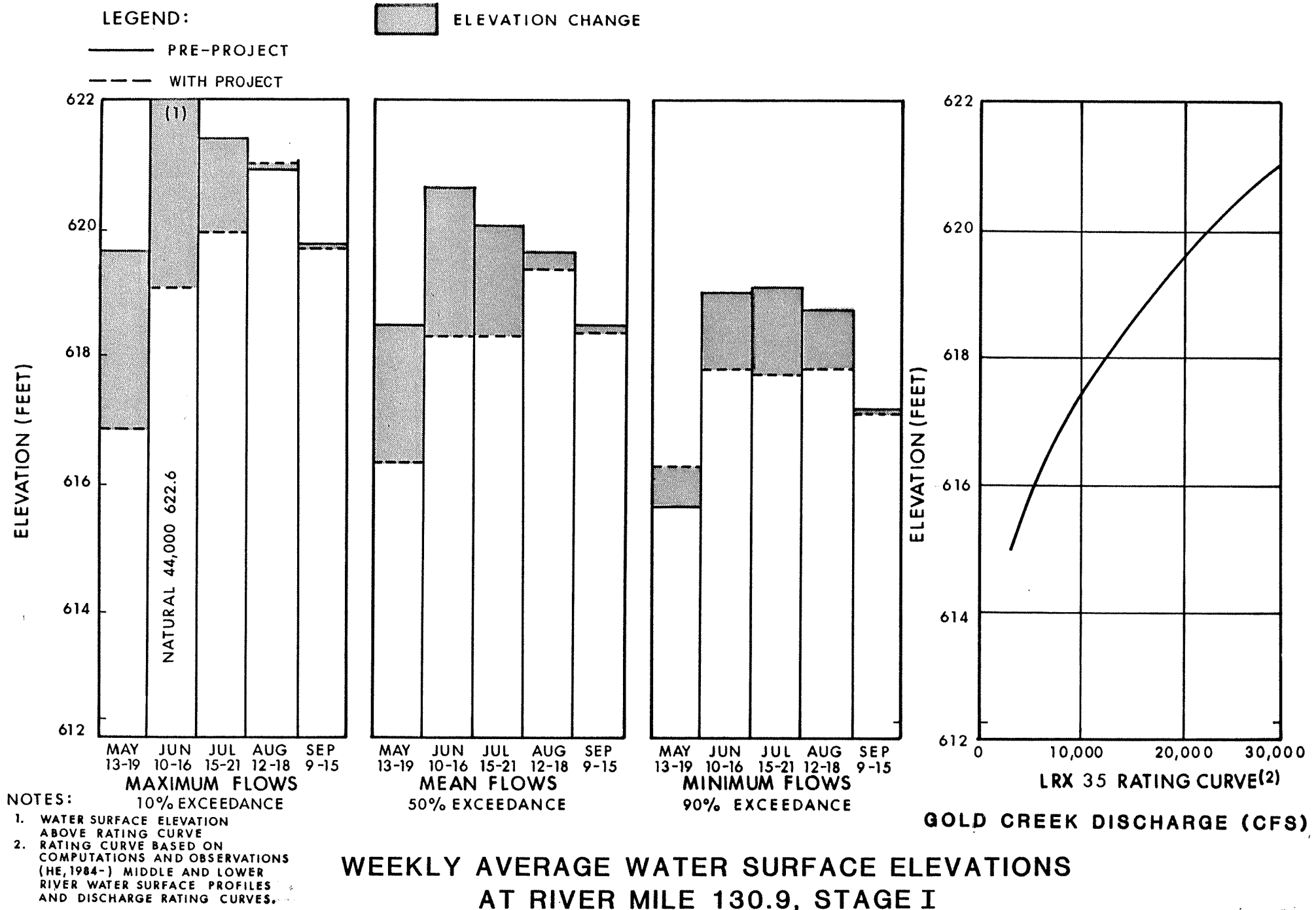
# LEGEND

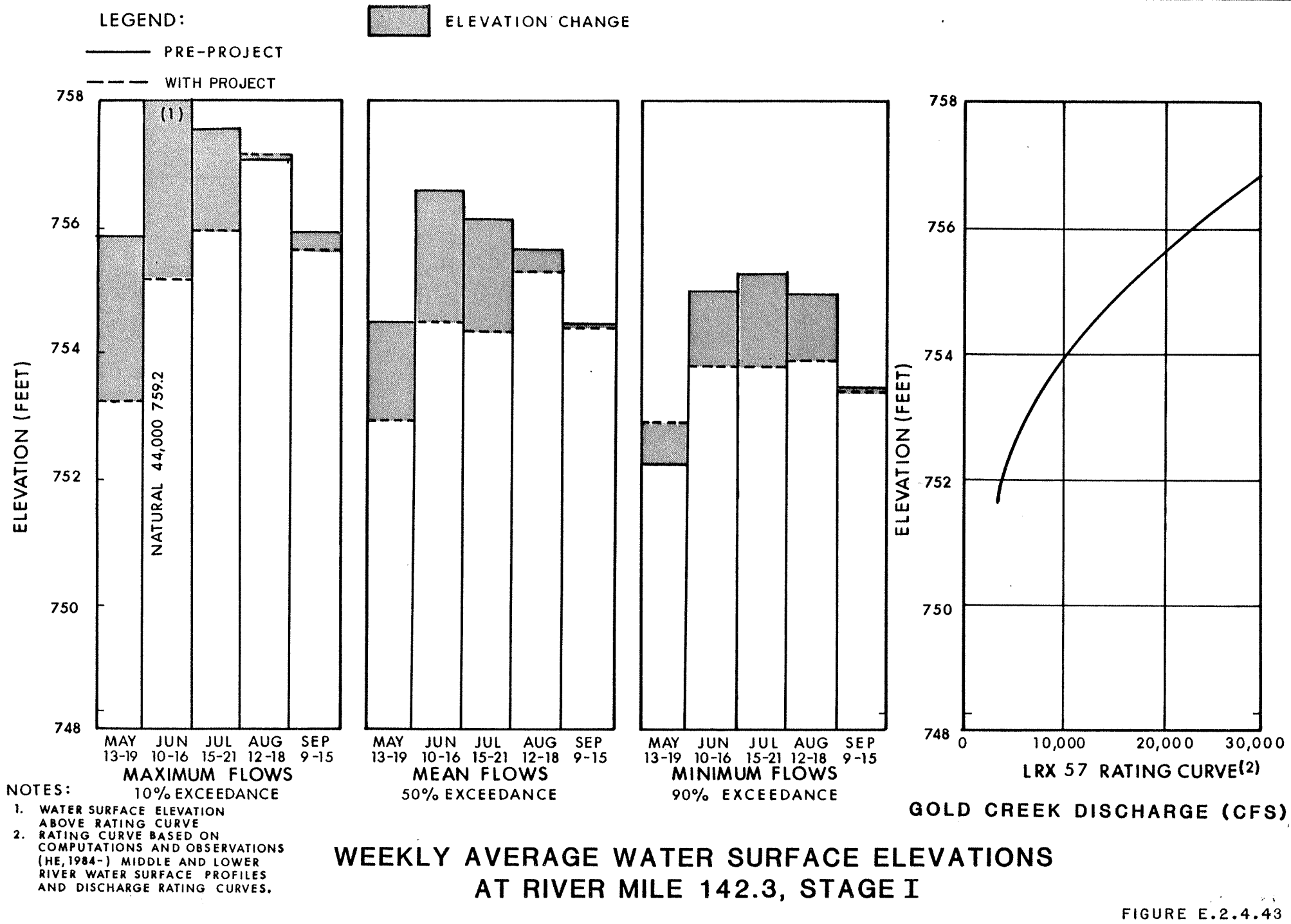
- NATURAL CONDITION
- - - FLOWS FOR PHASE 1 OF 2-STAGE PROJECT
- - - FLOWS FOR STAGE 1 OF 3-STAGE PROJECT

|                                                 |                                 |
|-------------------------------------------------|---------------------------------|
| ALASKA POWER AUTHORITY                          |                                 |
| SUSITNA HYDROELECTRIC PROJECT                   |                                 |
| AVERAGE WEEKLY SUSITNA RIVER                    |                                 |
| FLOWS AT GOLD CREEK                             |                                 |
| FOR 1982 HYDROLOGY                              |                                 |
| STAGE I                                         |                                 |
| E-VI FLOW REQUIREMENTS                          |                                 |
| HARRIS-IRASCO<br>ENGINEERS<br>ANCHORAGE, ALASKA | APPROVED<br>DATE<br>DESIGNED BY |

FIGURE E.2.4.40

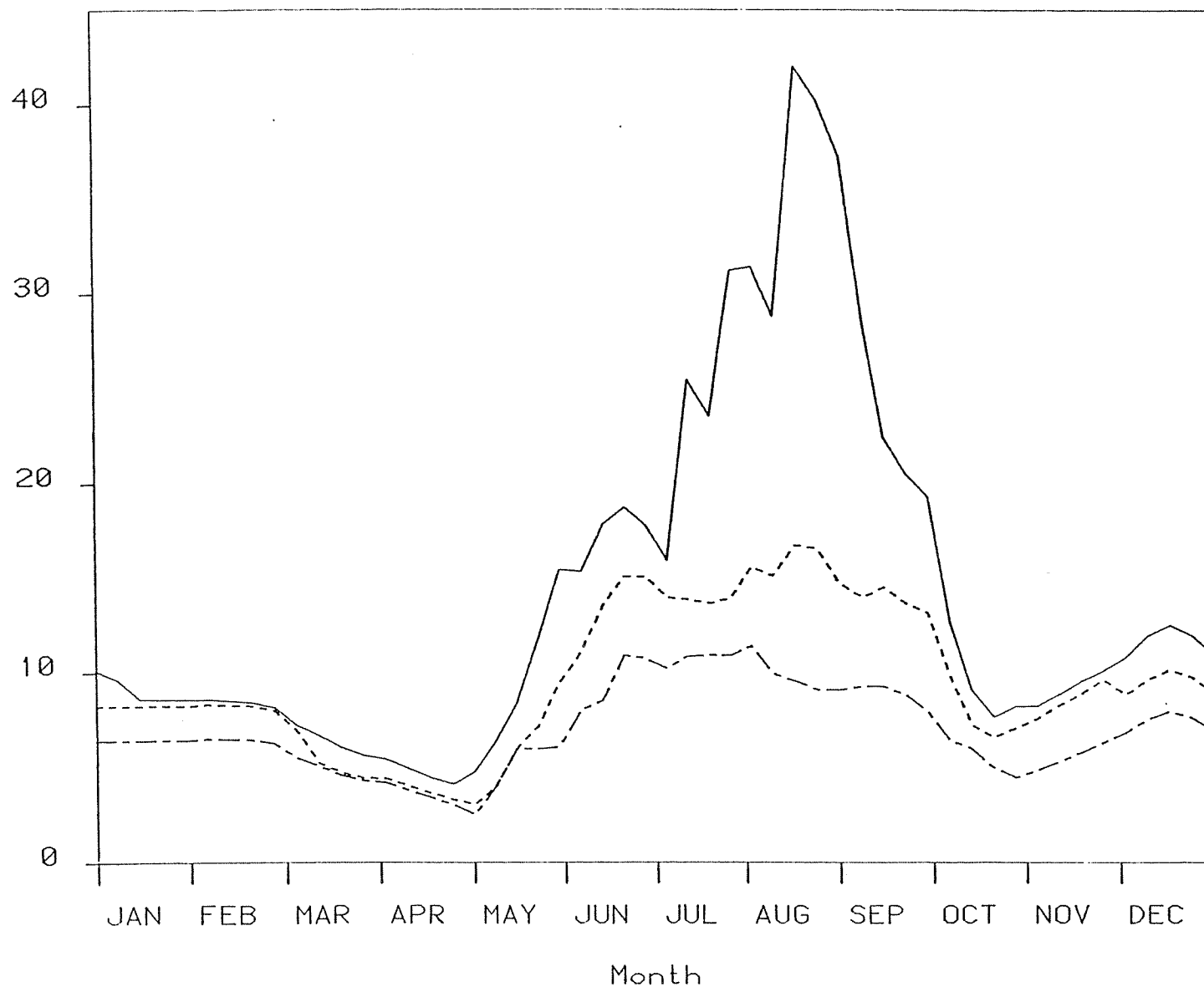






THOUSANDS

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

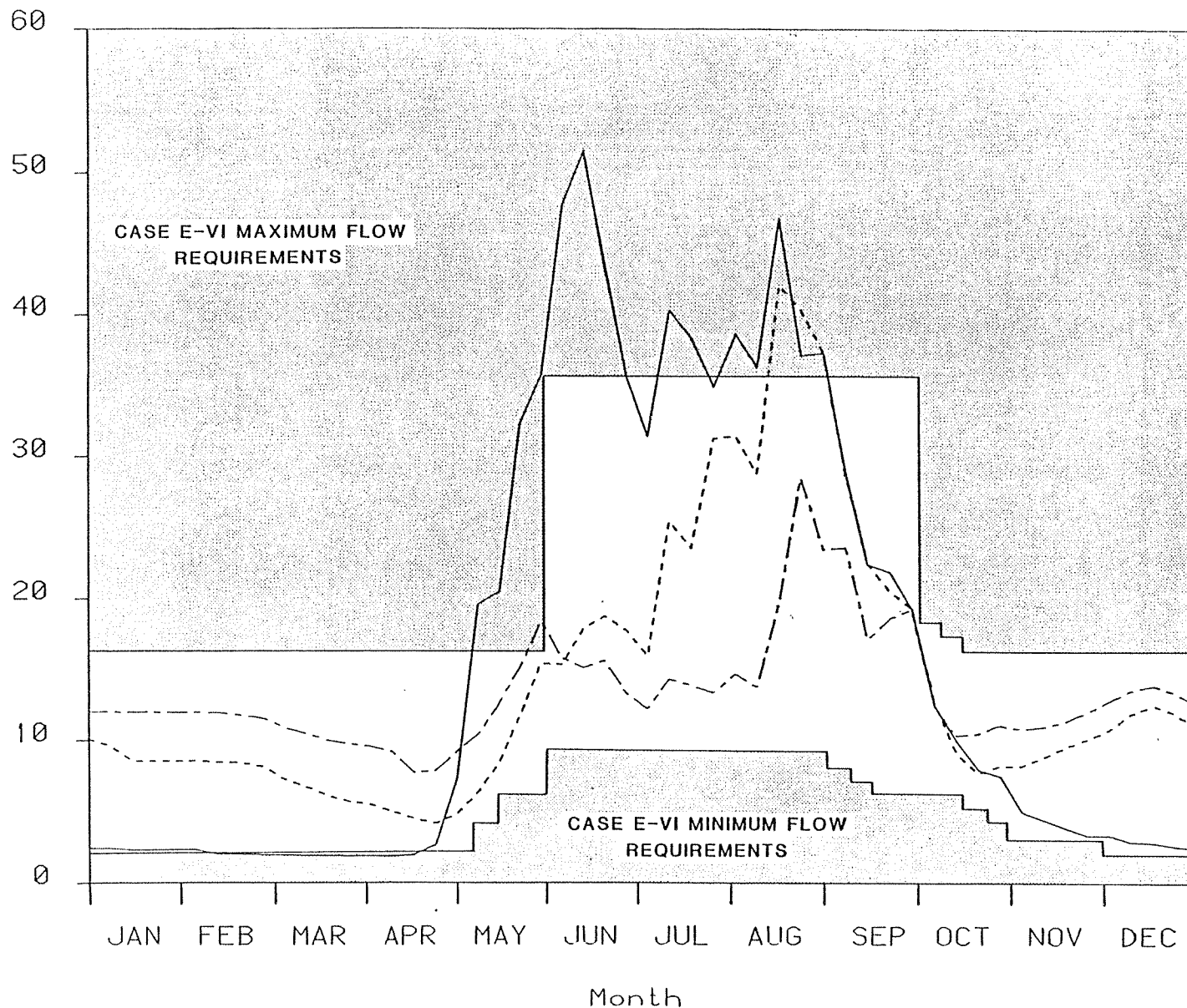
- 6% EXCEEDENCE FLOWS
- - - 50% EXCEEDENCE FLOW
- · - 97% EXCEEDENCE FLOWS

|                                                                              |          |
|------------------------------------------------------------------------------|----------|
| ALASKA POWER AUTHORITY                                                       |          |
| SUSITNA HYDROELECTRIC PROJECT                                                |          |
| SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK |          |
| AREA - BRIDGE                                                                | DATE     |
| APPROVED, 10/19/84                                                           | 10/19/84 |

FIGURE E.2.4.44

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

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

FIGURE E.2.4.46

|                                                                 |       |
|-----------------------------------------------------------------|-------|
| ALASKA POWER AUTHORITY                                          |       |
| SUSITNA HYDROELECTRIC PROJECT                                   |       |
| SUSITNA RIVER STREAMFLOWS EXCEEDED 6% OF THE TIME AT GOLD CREEK |       |
| APPROVED BY:                                                    | DATE: |
| SIGNED:                                                         | DATE: |



Discharge in cfs

THOUSANDS

30

25

20

15

10

5

0

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

Month

MAXIMUM=35,000 cfs

CASE E-VI MAXIMUM FLOW REQUIREMENTS

CASE E-VI MINIMUM FLOW REQUIREMENTS

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 |  |
| BARRE-GRAND                                                      |  |
| REVISIONS, IN DATA                                               |  |

FIGURE E.2.4. 46

THOUSANDS

Discharge in cfs

25

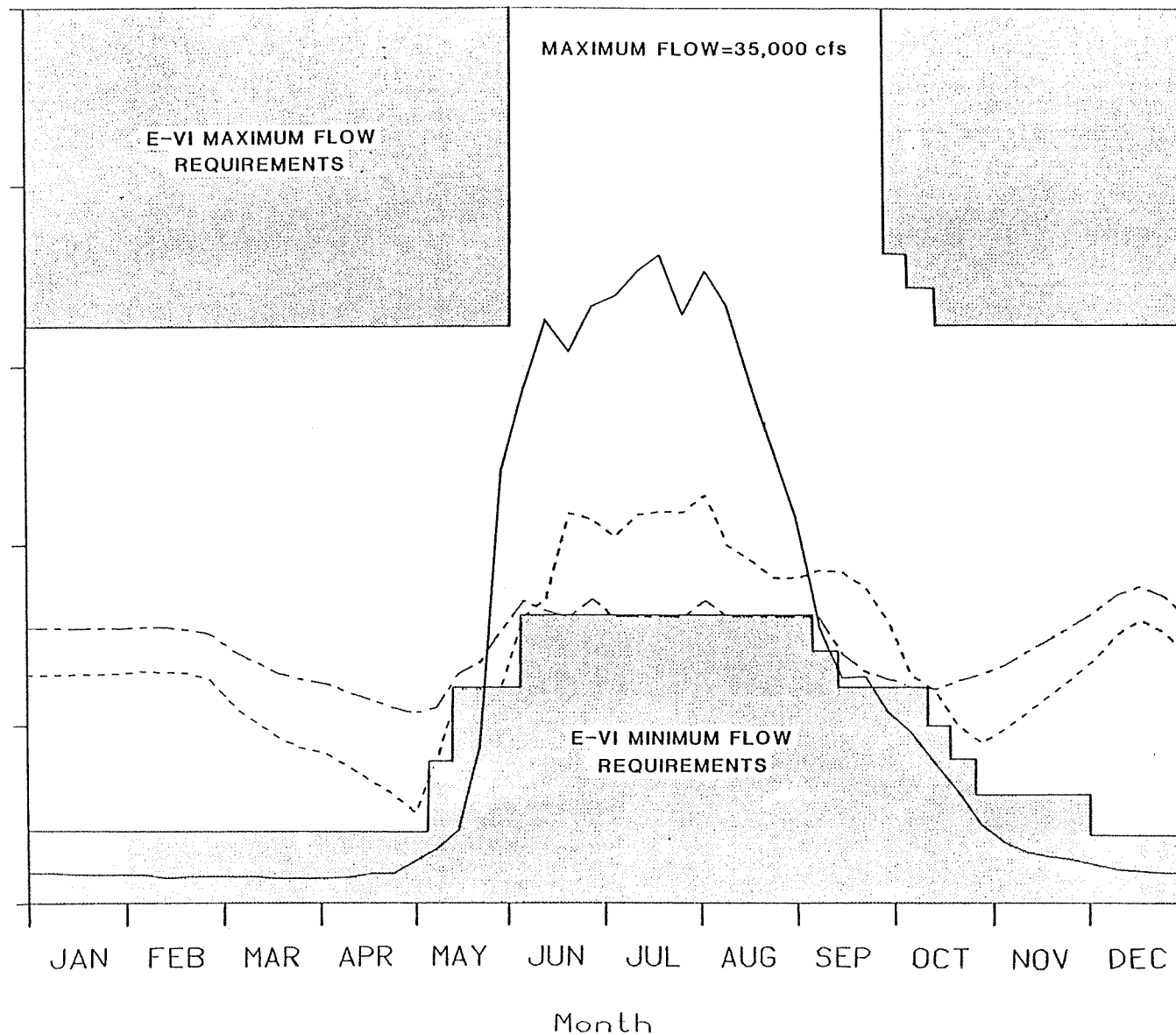
20

15

10

5

0



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 1 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. 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 |  |
| PARKA-BRACCO                                                     |  |
| DATE                                                             |  |
| BY                                                               |  |

FIGURE E.2.4.47

Discharges 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 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 |          |              |
| NARSA - BRASCO                                                              | APPENDIX |              |
| BRASCO, ALASKA                                                              | DATE     | REVISION NO. |

FIGURE E.2.4.48

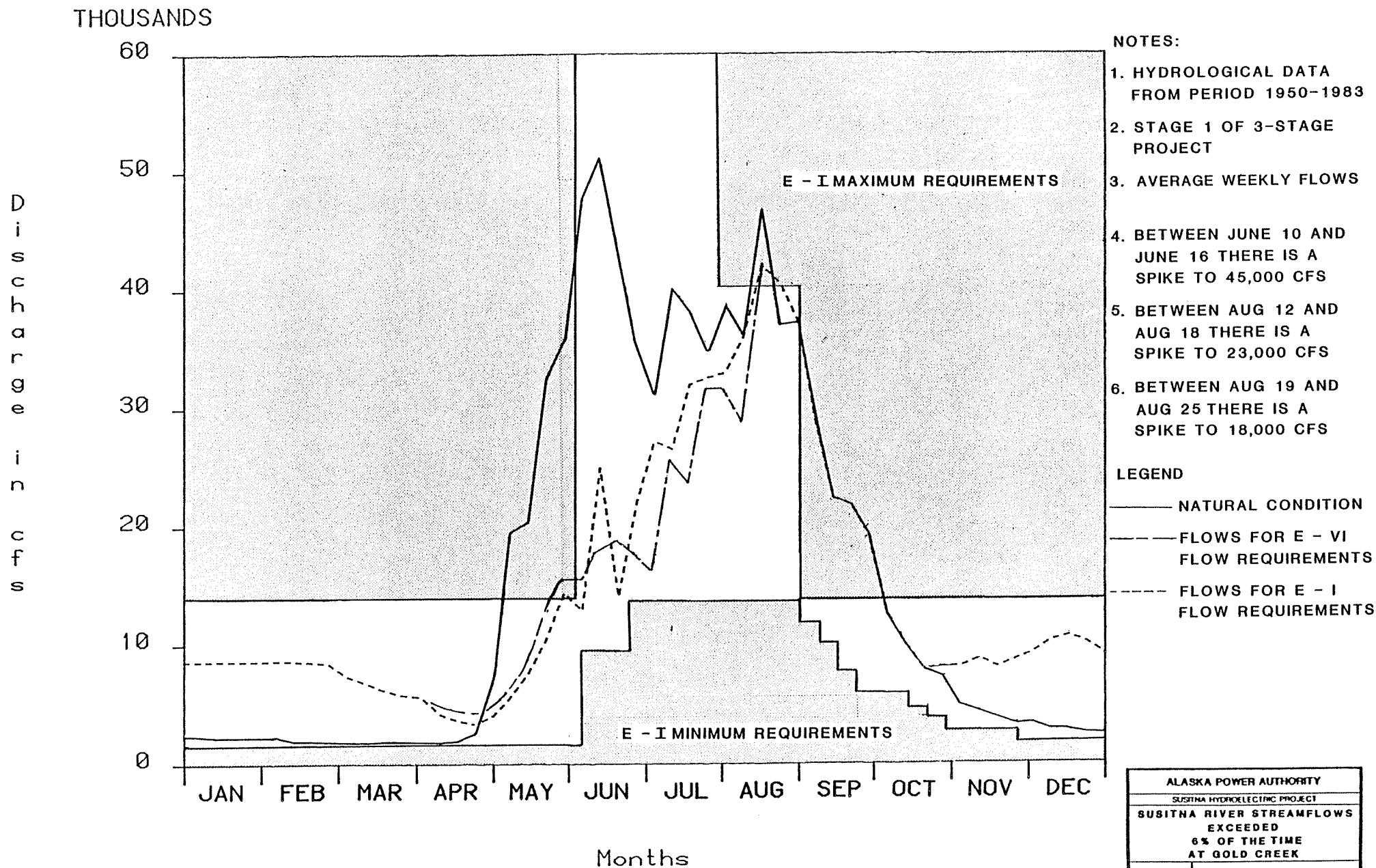


FIGURE E.2.4.49

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

THOUSANDS

30

25

20

15

10

5

0

E-I MAXIMUM FLOW REQUIREMENTS

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 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 REQUIREMENT
- - - FLOWS FOR E - I FLOW REQUIREMENT

|                                                                  |      |    |
|------------------------------------------------------------------|------|----|
| ALASKA POWER AUTHORITY                                           |      |    |
| SUSITNA HYDROELECTRIC PROJECT                                    |      |    |
| SUSITNA RIVER STREAMFLOWS EXCEEDED 50% OF THE TIME AT GOLD CREEK |      |    |
| NAME - PROJECT                                                   | DATE | BY |
| ANALYST - NAME                                                   | DATE | BY |

FIGURE E.2.4. 50

THOUSANDS

Discharge in cfs

25

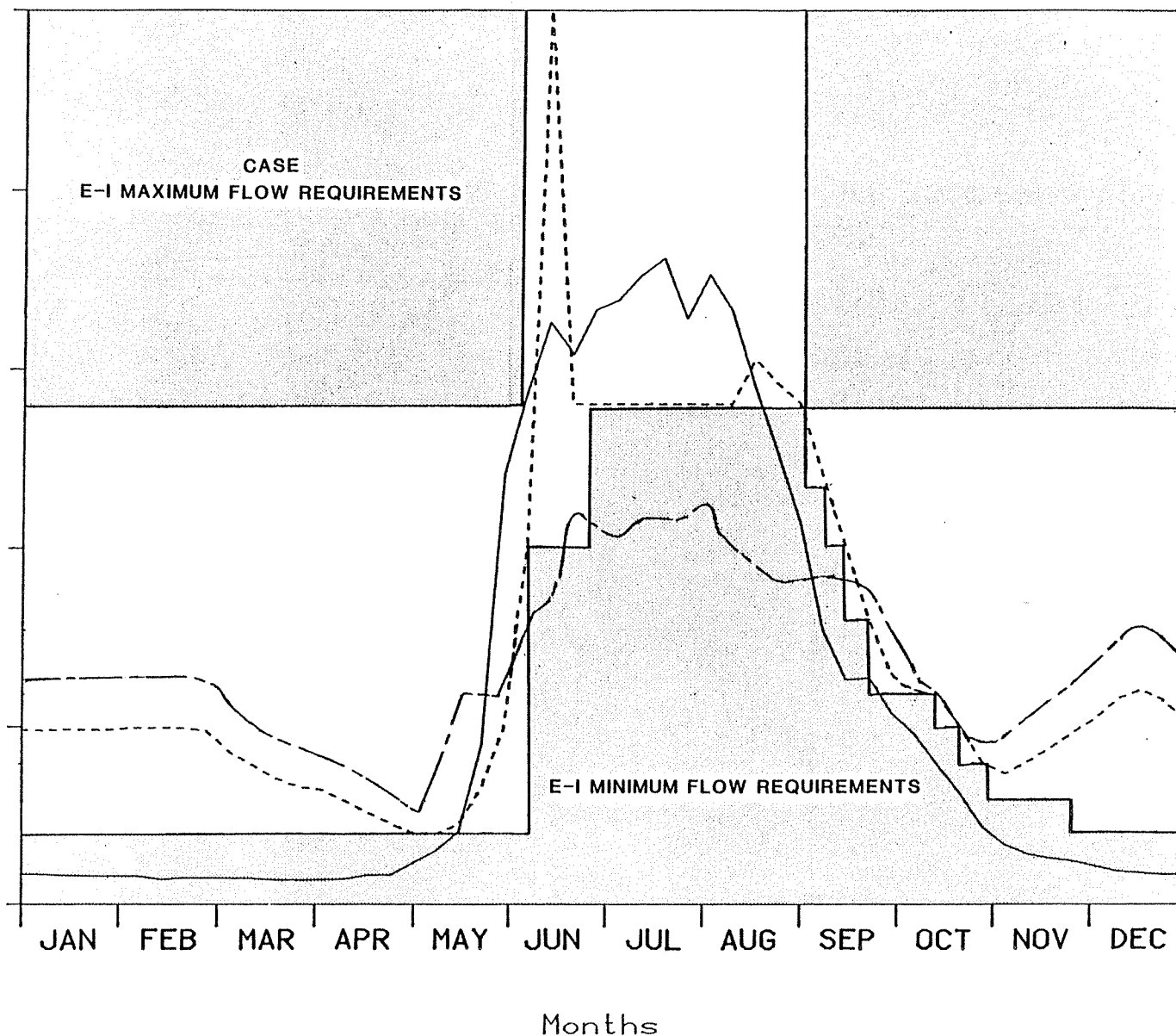
20

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. L. HARRIS |

FIGURE E.2.4.51

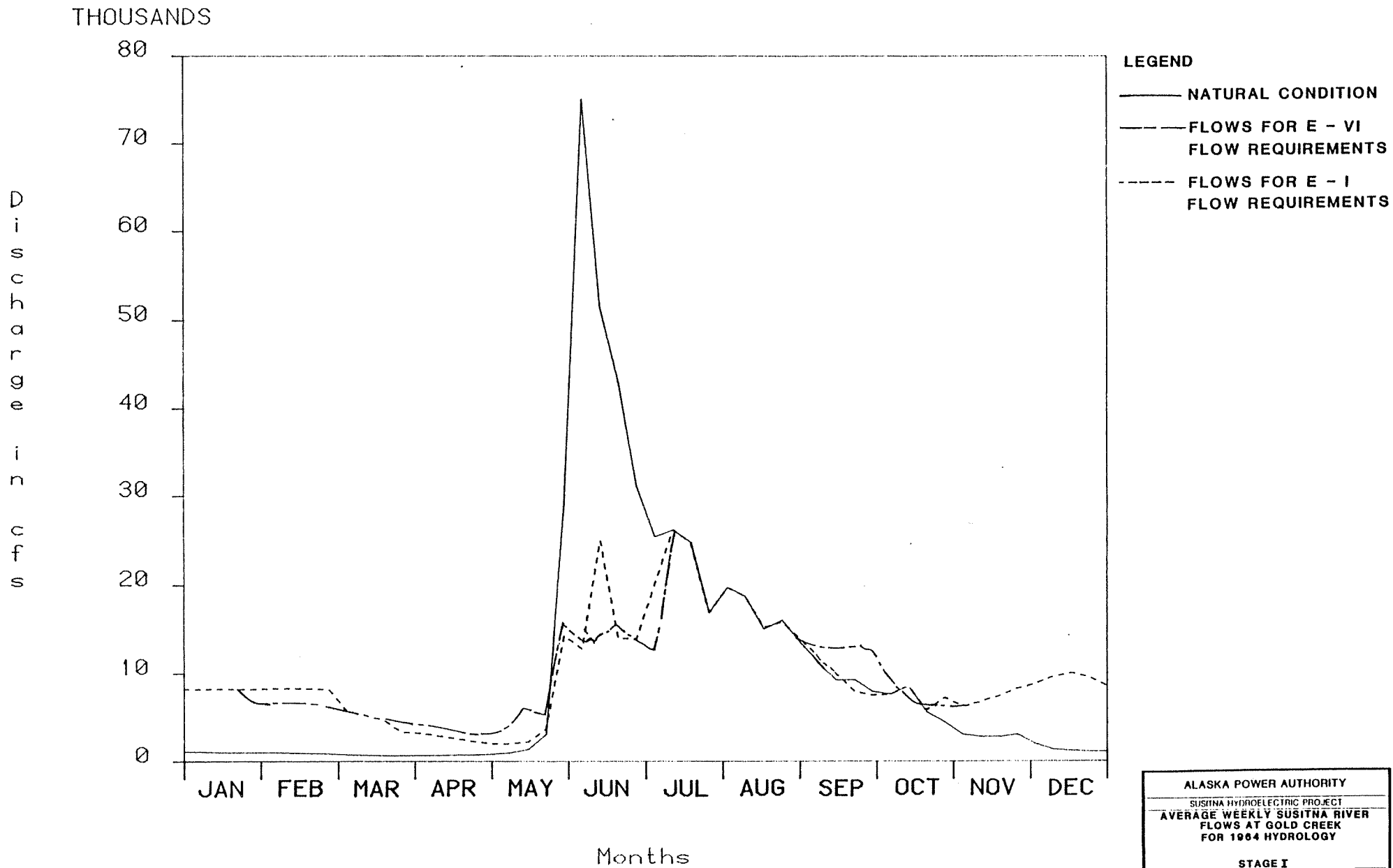
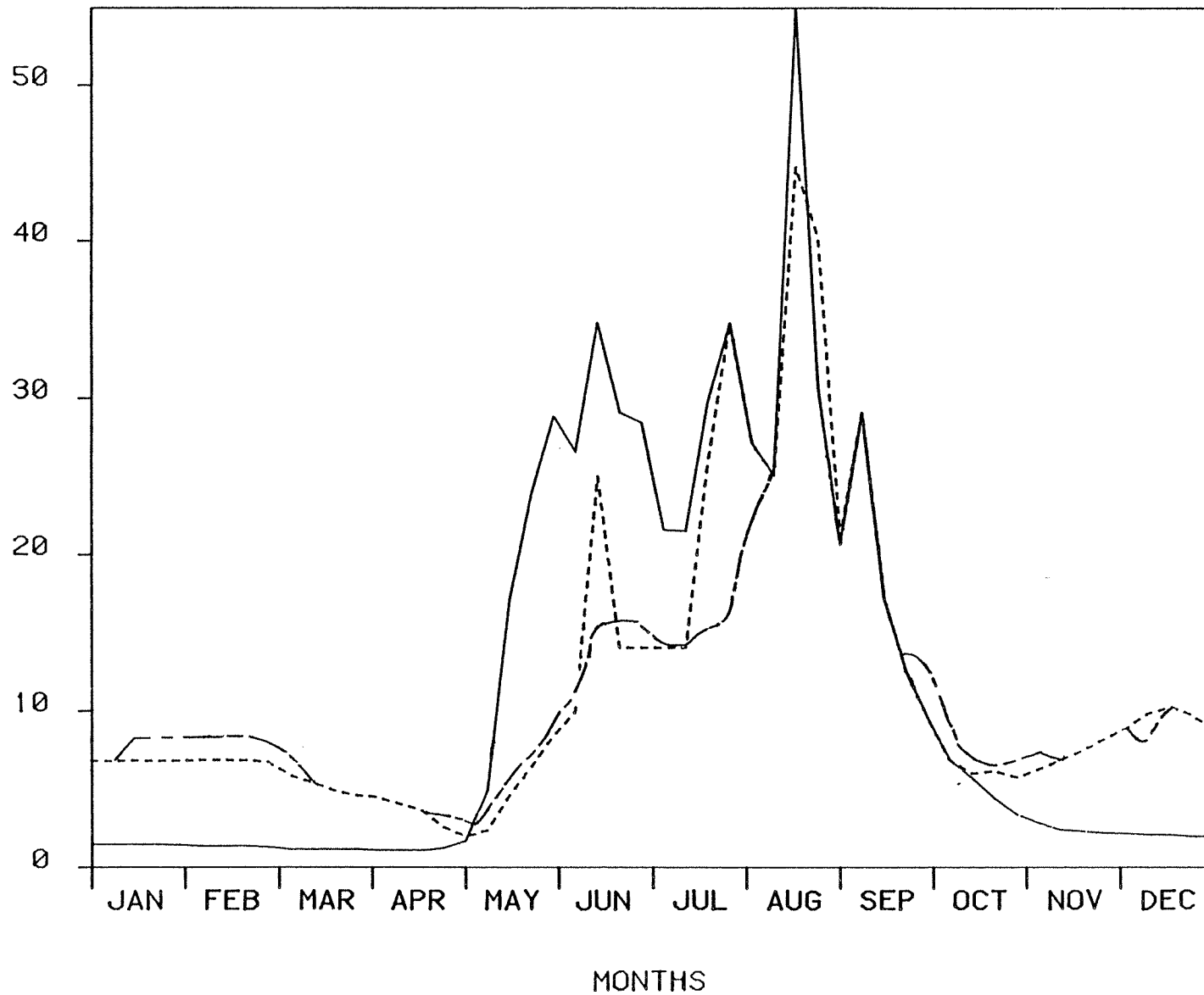


FIGURE E.2.4. 52

|                                                                           |                                |                                |
|---------------------------------------------------------------------------|--------------------------------|--------------------------------|
| ALASKA POWER AUTHORITY                                                    |                                |                                |
| SUSITNA HYDROELECTRIC PROJECT                                             |                                |                                |
| AVERAGE WEEKLY SUSITNA RIVER<br>FLOWS AT GOLD CREEK<br>FOR 1984 HYDROLOGY |                                |                                |
| STAGE I                                                                   |                                |                                |
| NAME: H. BRADDOCK<br>POSITION: PROJECT MANAGER                            | APPROVED: _____<br>DATE: _____ | DRAWN BY: _____<br>DATE: _____ |

THOUSANDS

DISCHARGE  
IN  
CFS



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<br>FLOWS AT GOLD CREEK<br>FOR 1967 HYDROLOGY |                   |
| STAGE I                                                                   |                   |
| HAILEY-GRABCO<br>ANCHORAGE, ALASKA                                        | ANCHORAGE, ALASKA |

FIGURE E.2.4.53



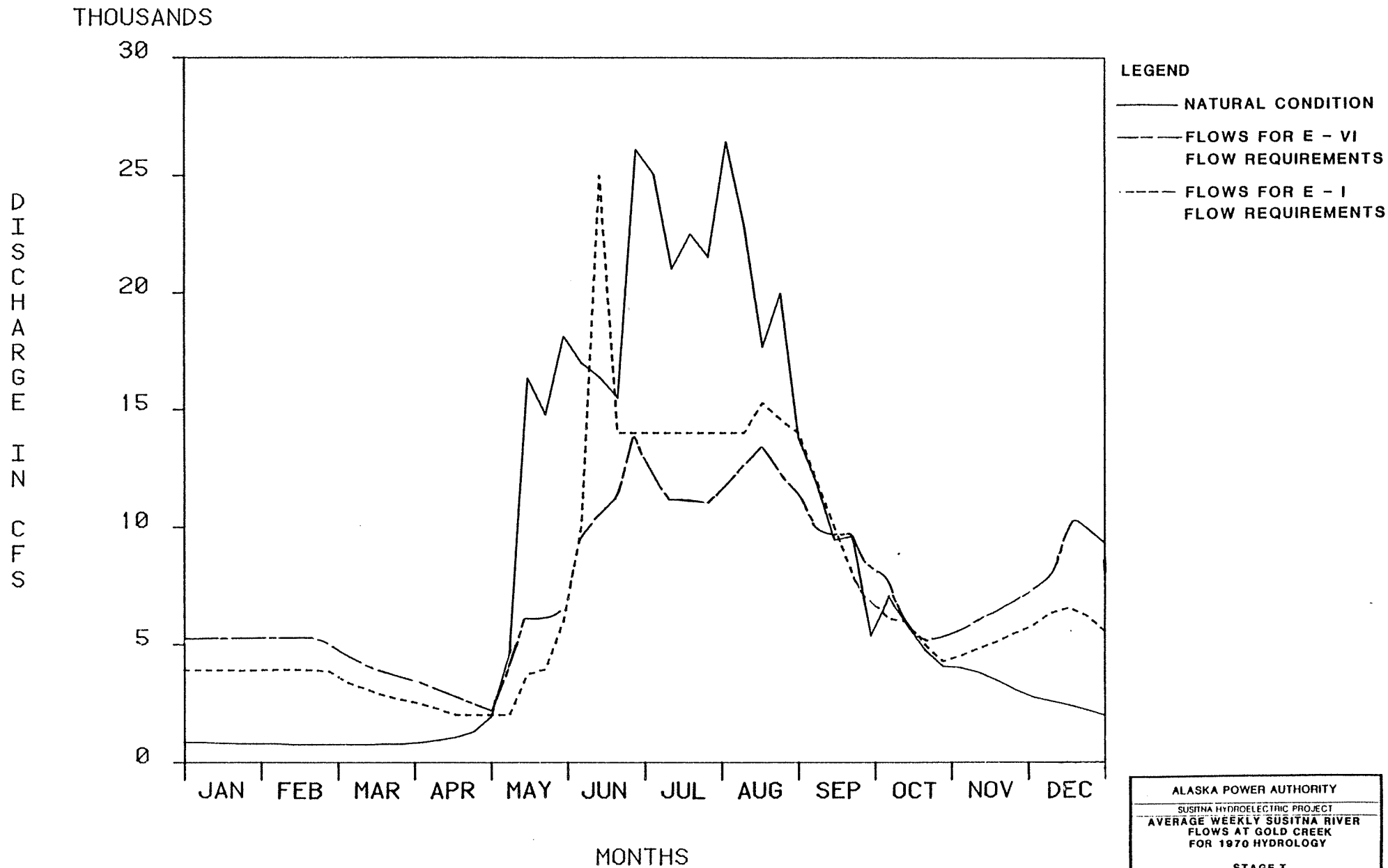


FIGURE E.2.4.54

|                                                                                                                                       |                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| ALASKA POWER AUTHORITY                                                                                                                |                                                                                |
| SUSITNA HYDROELECTRIC PROJECT                                                                                                         |                                                                                |
| AVERAGE WEEKLY SUSITNA RIVER<br>FLOWS AT GOLD CREEK<br>FOR 1970 HYDROLOGY                                                             |                                                                                |
| STAGE I                                                                                                                               |                                                                                |
| <small>NAME</small> <small>DATE</small><br><small>APPROVED</small> <small>DATE</small><br><small>REVIEWED</small> <small>DATE</small> | <small>DESIGNED BY</small><br><small>CHECKED BY</small><br><small>DATE</small> |

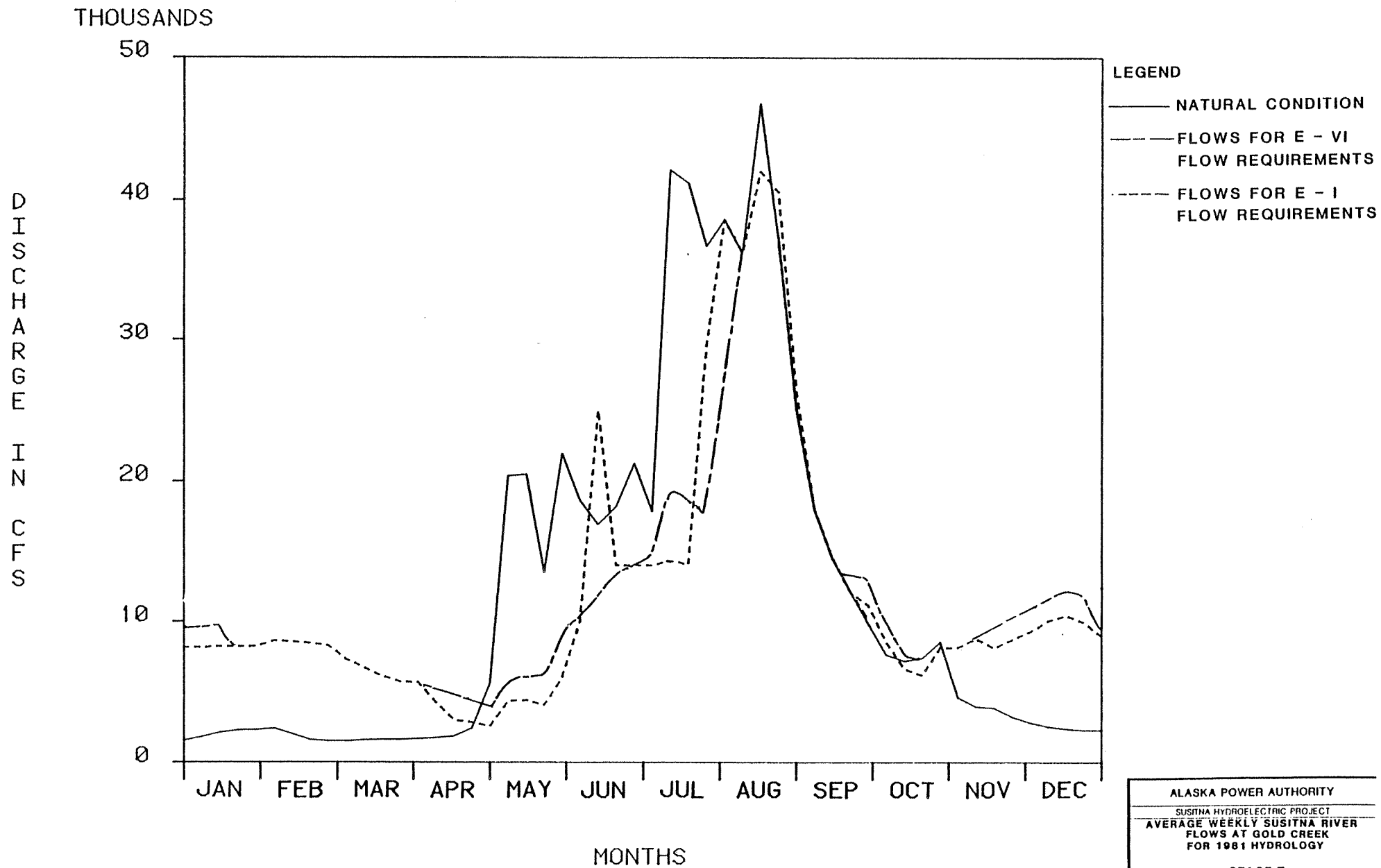


FIGURE E.2.4.55

|                               |      |              |
|-------------------------------|------|--------------|
| ALASKA POWER AUTHORITY        |      |              |
| SUSITNA HYDROELECTRIC PROJECT |      |              |
| AVERAGE WEEKLY SUSITNA RIVER  |      |              |
| FLOWS AT GOLD CREEK           |      |              |
| FOR 1981 HYDROLOGY            |      |              |
| STAGE I                       |      |              |
| HAZEL-PRASCO                  | DATE | CHARTING NO. |
| ANCHORAGE, ALASKA             |      |              |

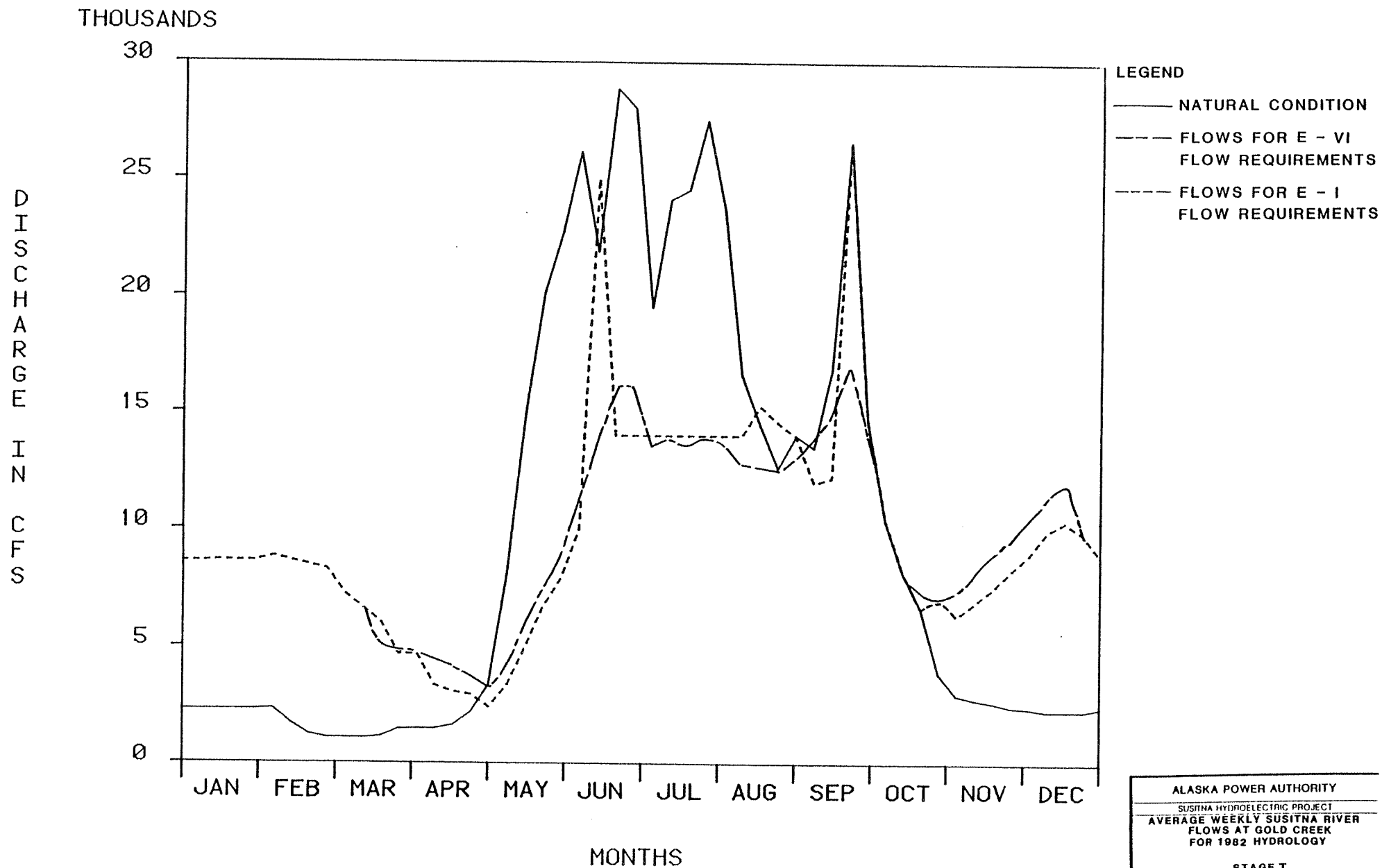
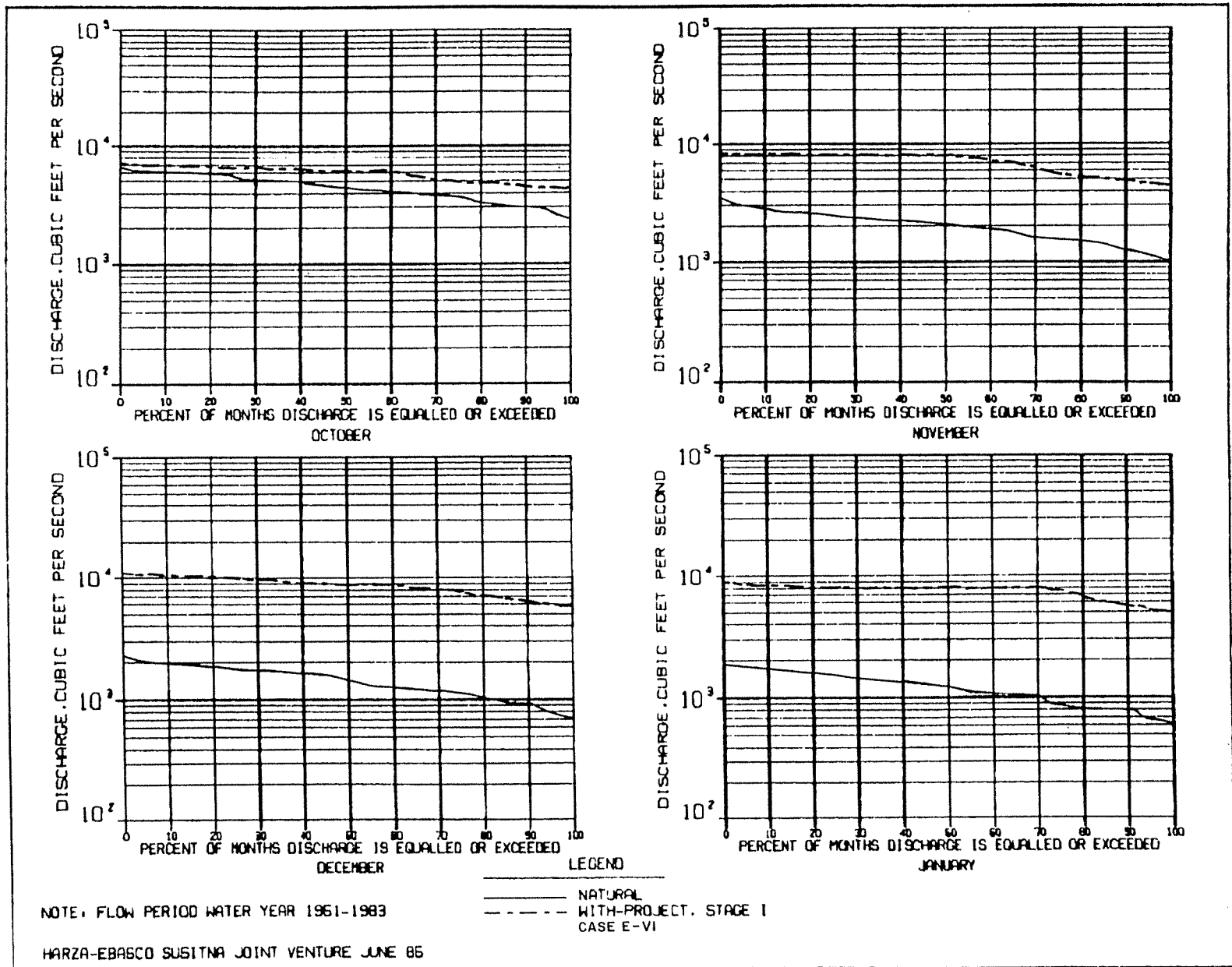
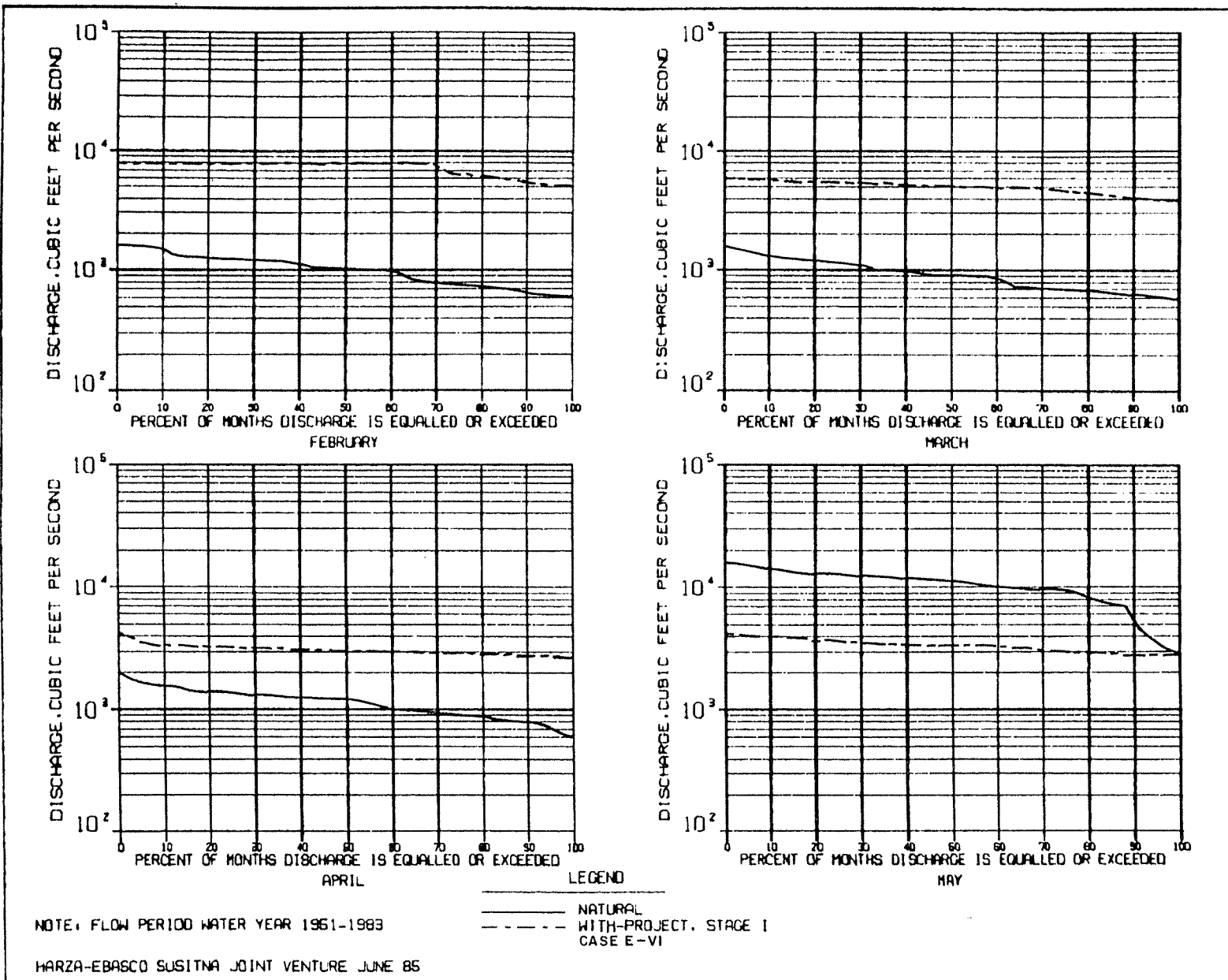


FIGURE E.2.4.66

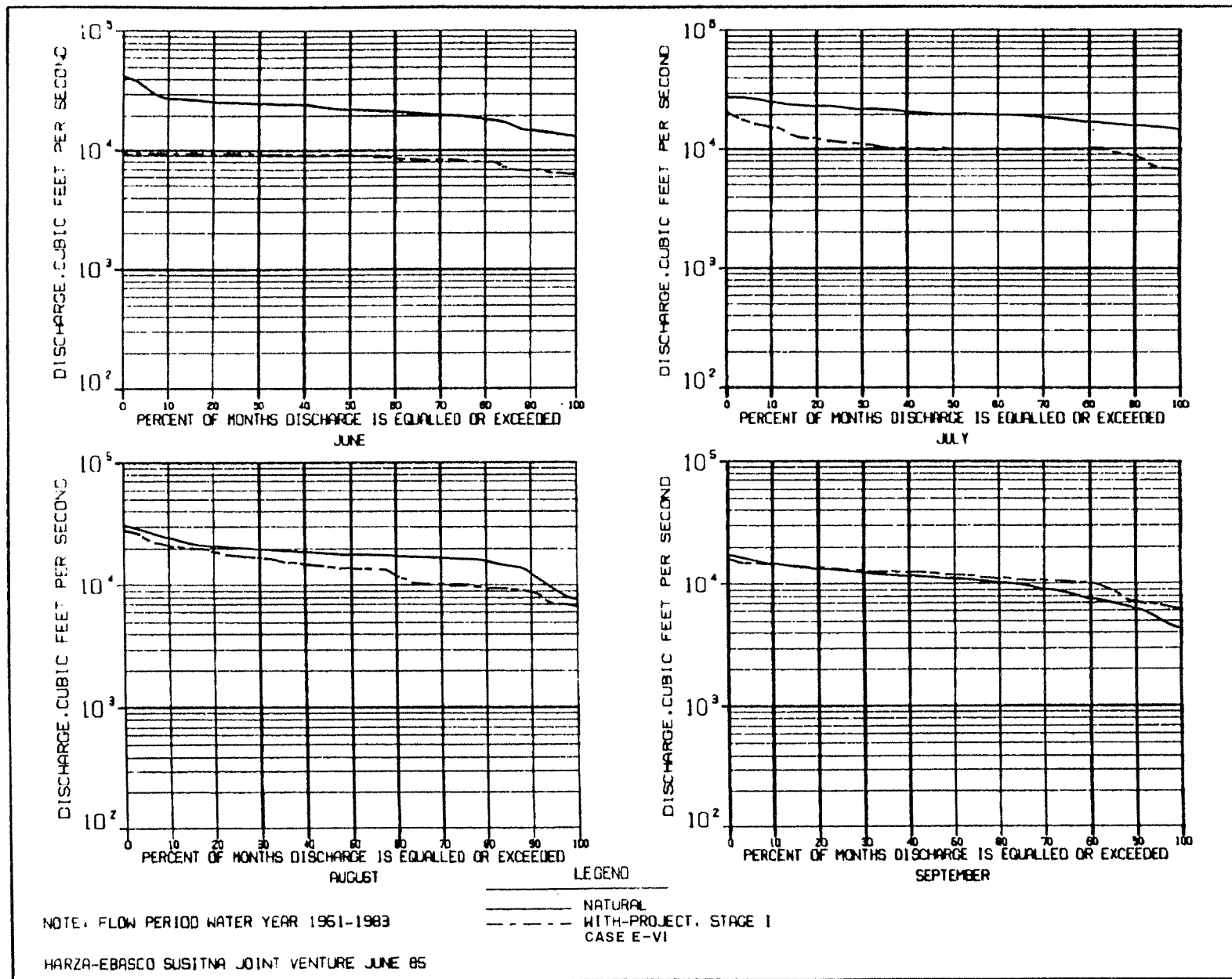
|                                                                           |           |              |
|---------------------------------------------------------------------------|-----------|--------------|
| ALASKA POWER AUTHORITY                                                    |           |              |
| SUSITNA HYDROELECTRIC PROJECT                                             |           |              |
| AVERAGE WEEKLY SUSITNA RIVER<br>FLOWS AT GOLD CREEK<br>FOR 1982 HYDROLOGY |           |              |
| STAGE I                                                                   |           |              |
| DATE: 11/1/82                                                             | APPROVED: | STAMPING NO: |
| ANCHORAGE, ALASKA                                                         | DATE:     |              |



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



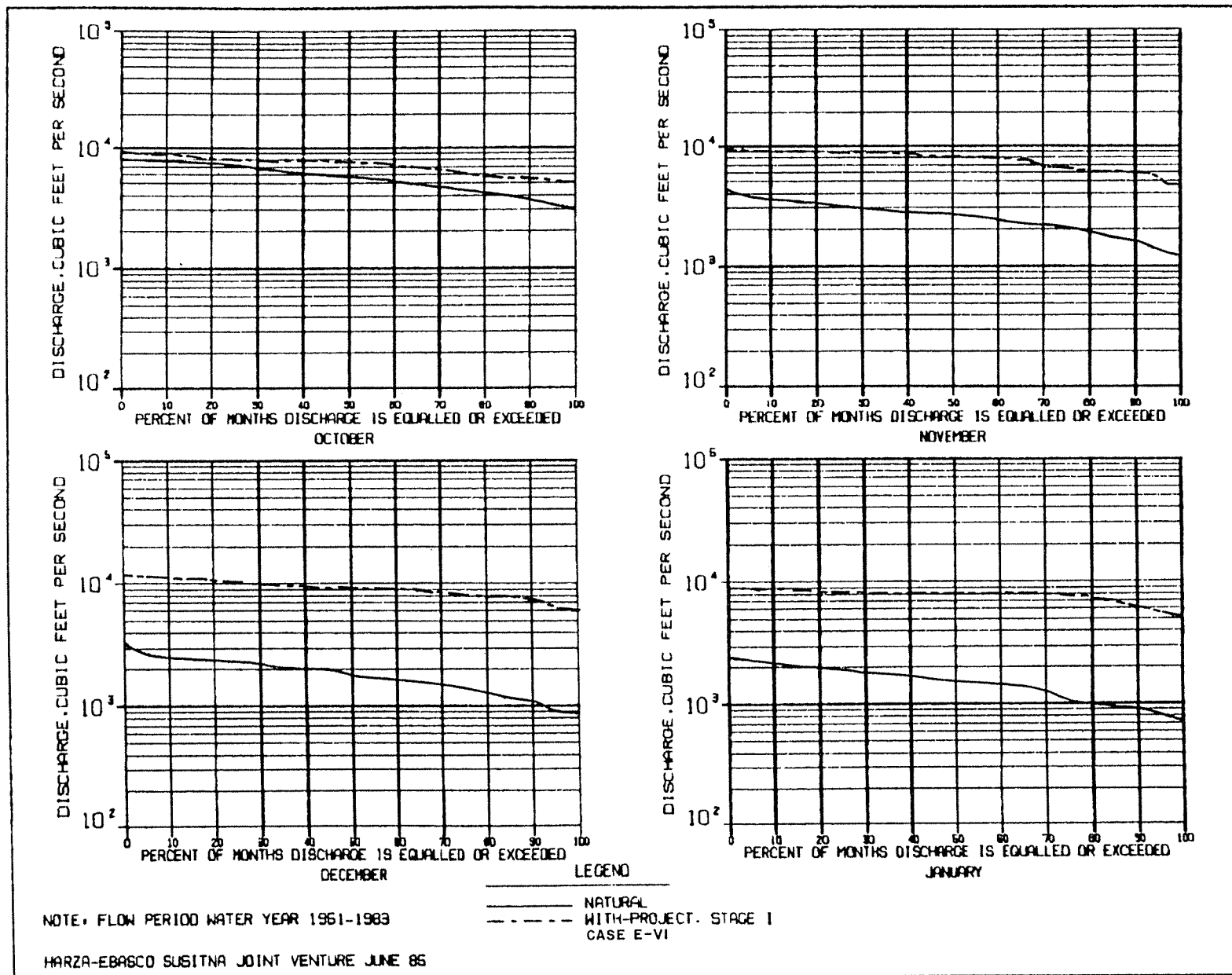
FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT WATANA DAMSITE



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

FIGURE E.2.4.57

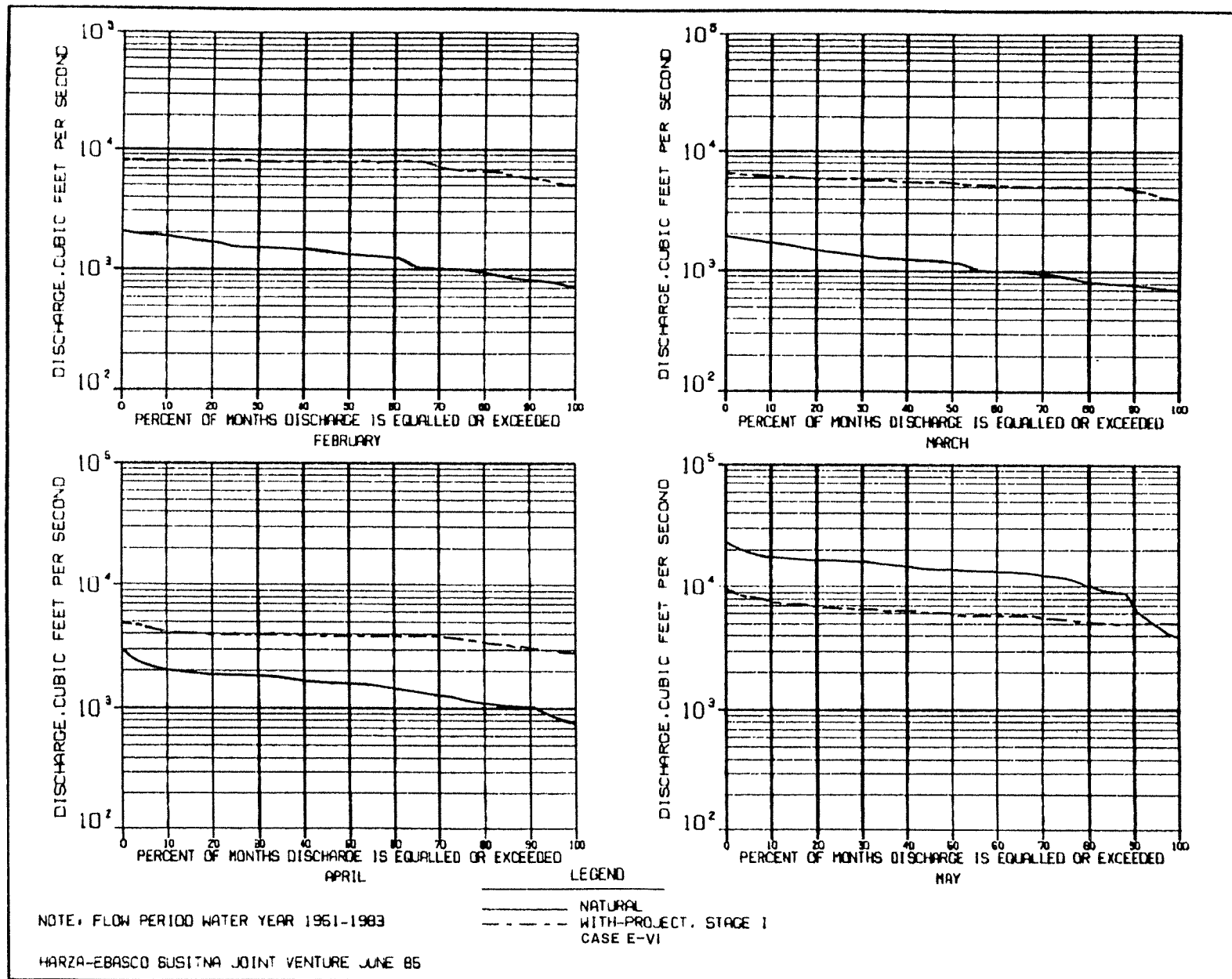
(Page 3 of 3)



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

FIGURE E.2.4.58

(Page 1 of 3)

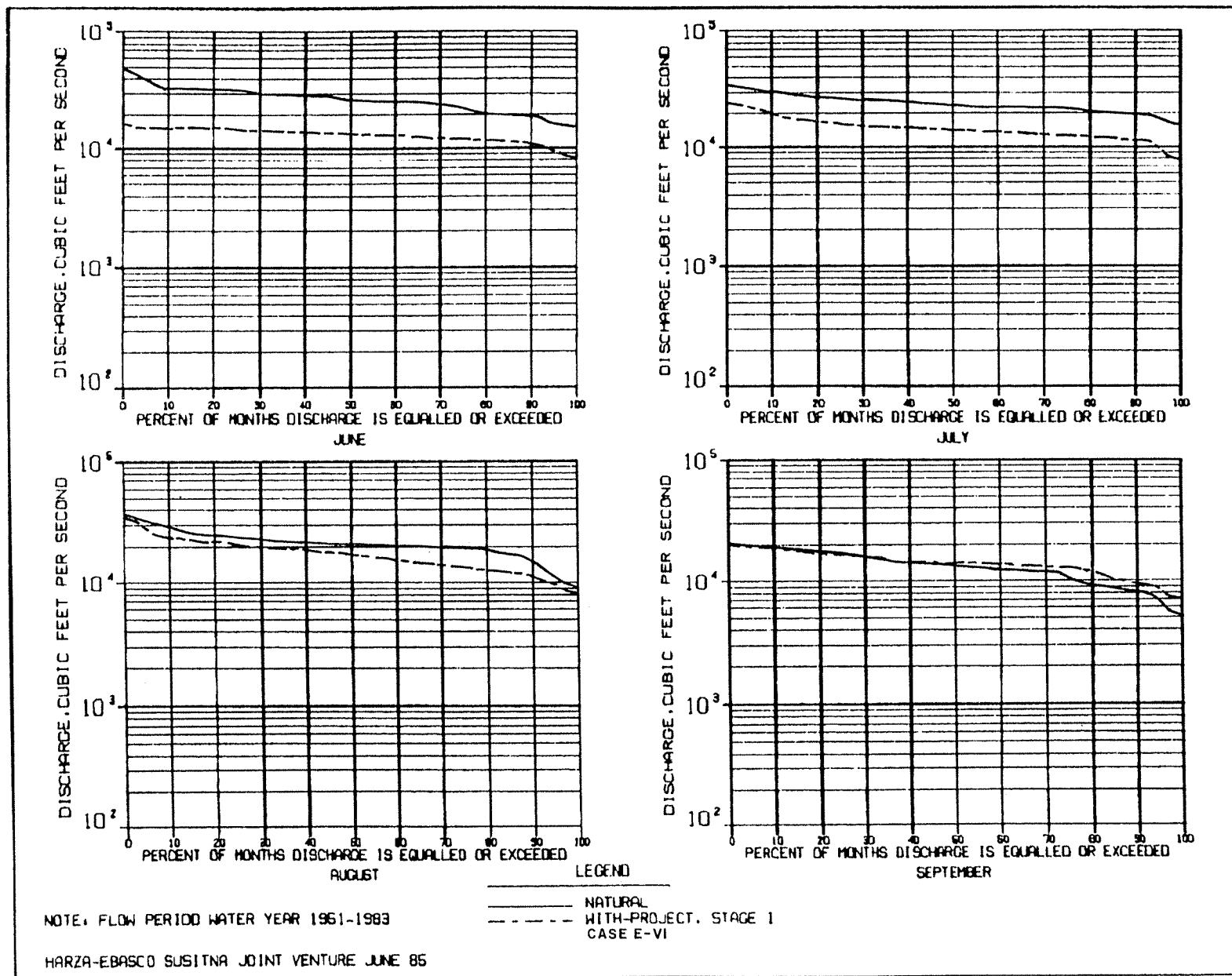


FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT GOLD CREEK

FIGURE E.2.4.58

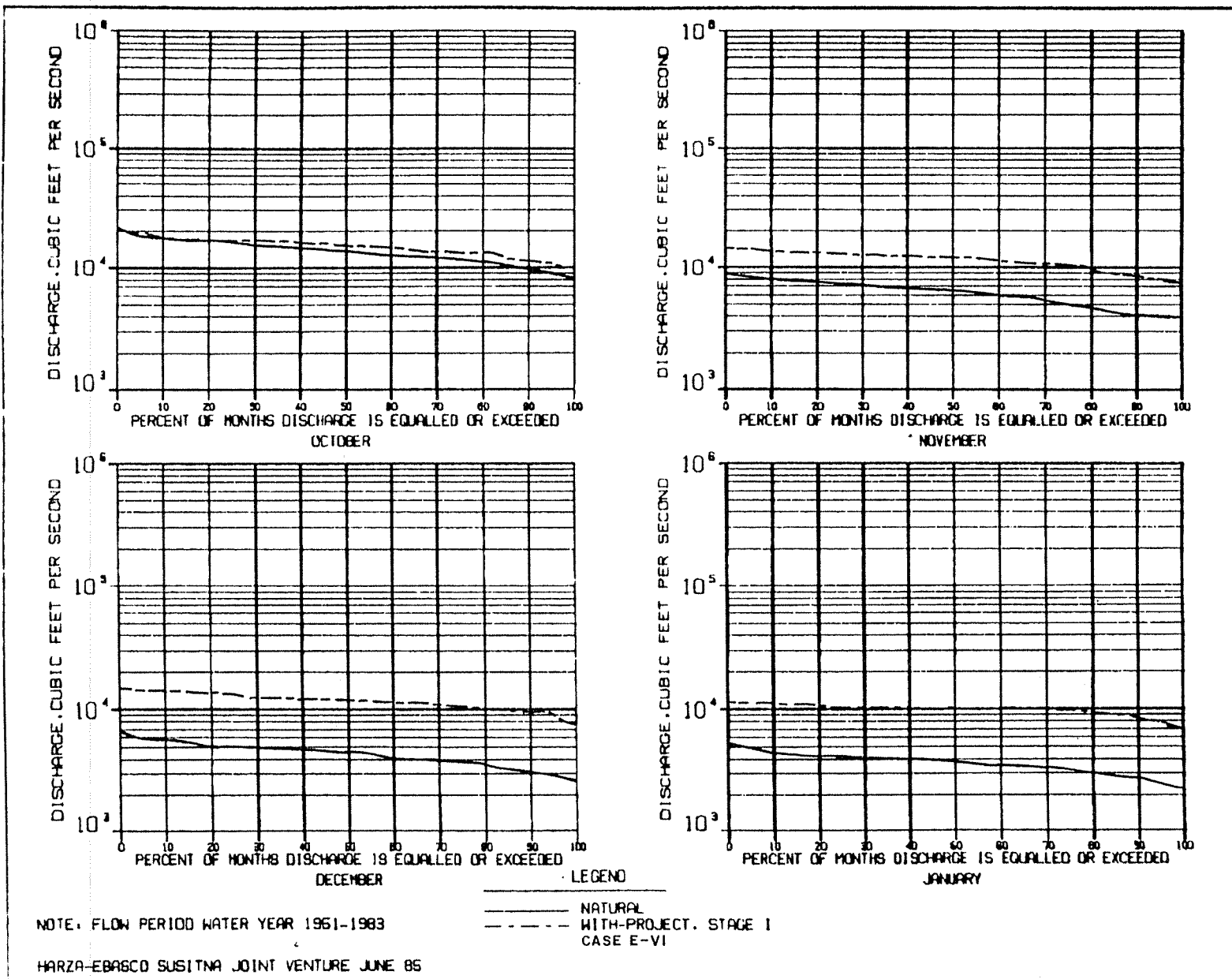
(Page 2 of 3)





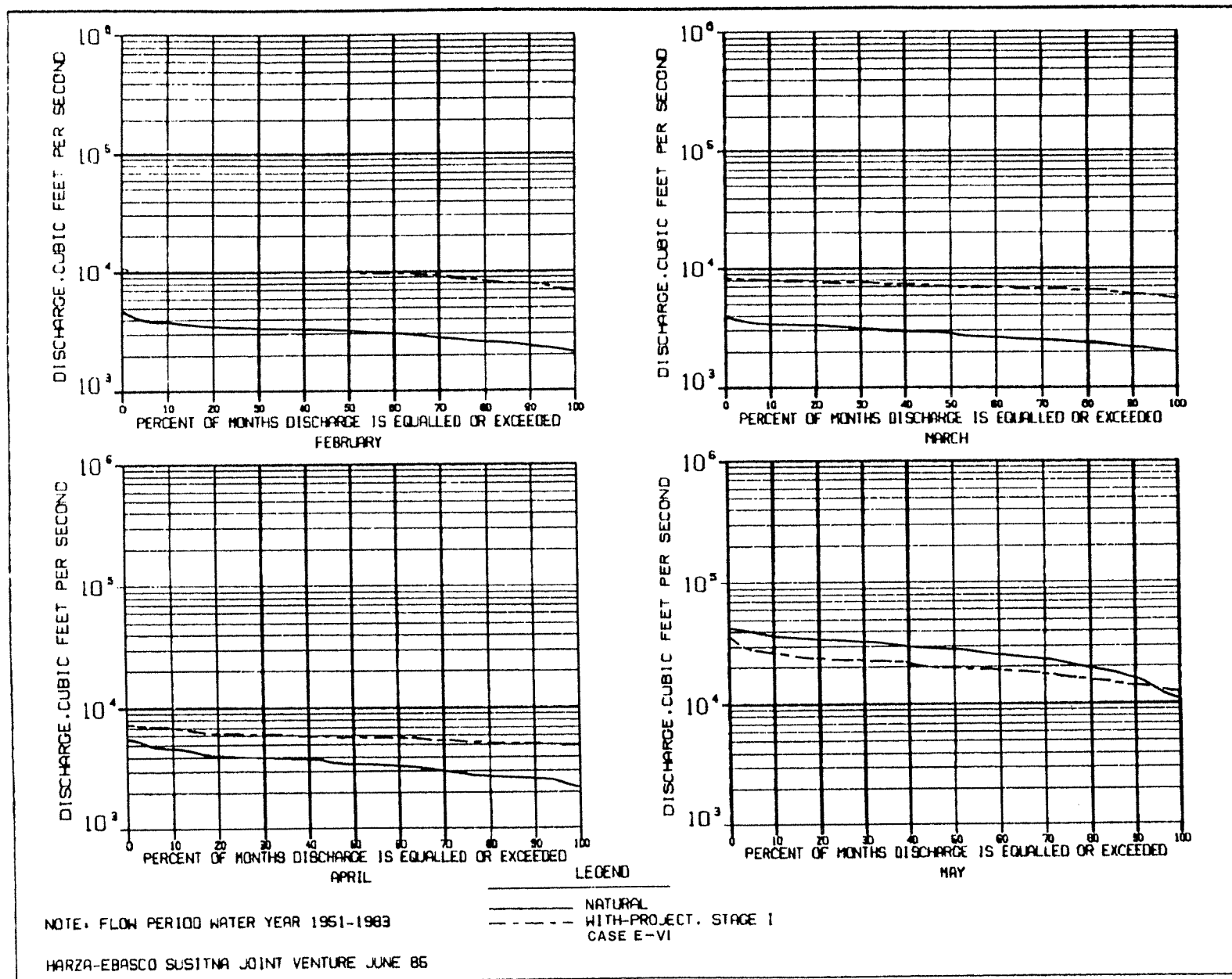
FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT GOLD CREEK

FIGURE E.2.4.58  
 (Page 3 of 3)

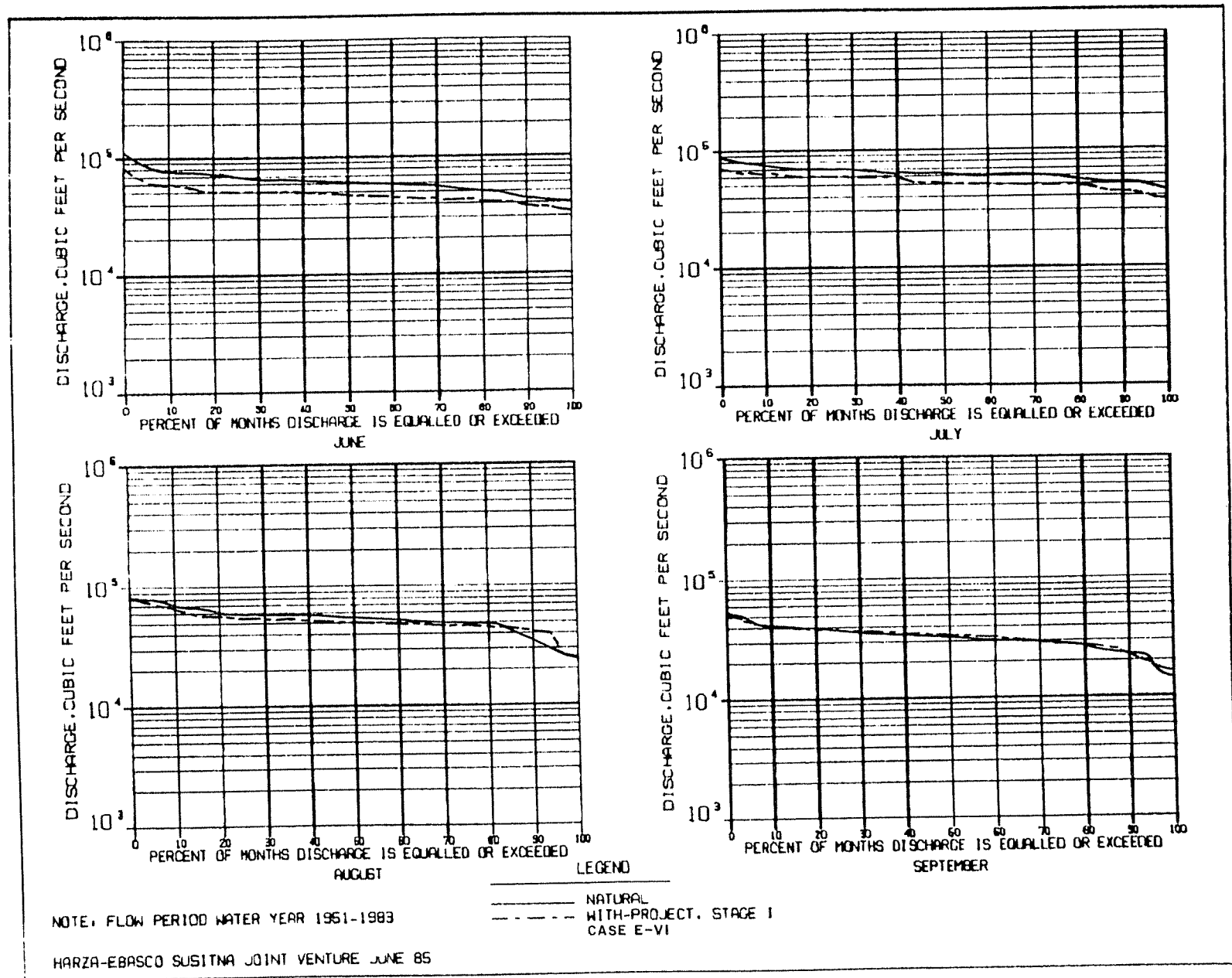


FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUNSHINE

FIGURE E.2.4.59  
(Page 1 of 3)



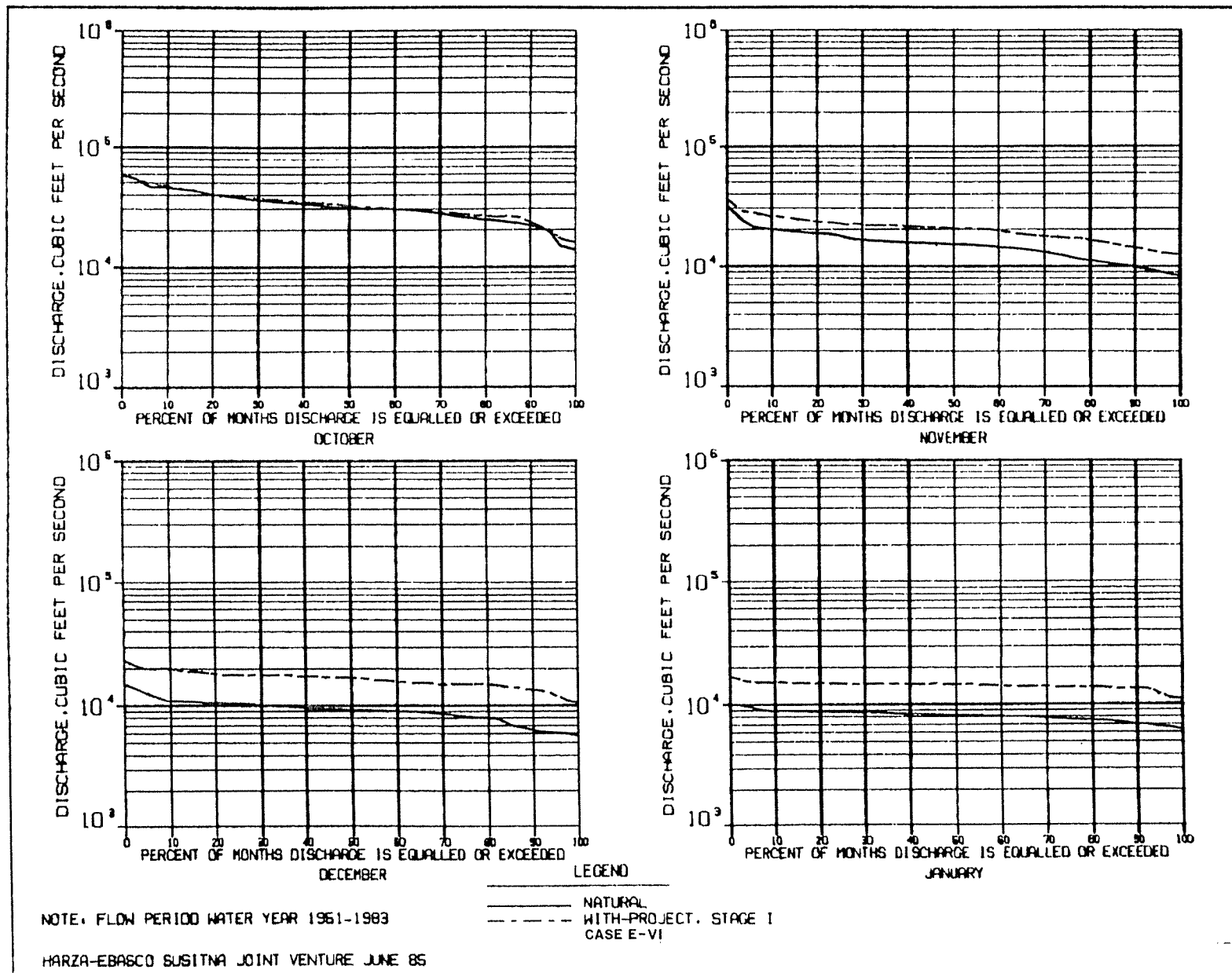
FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUNSHINE



FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUNSHINE

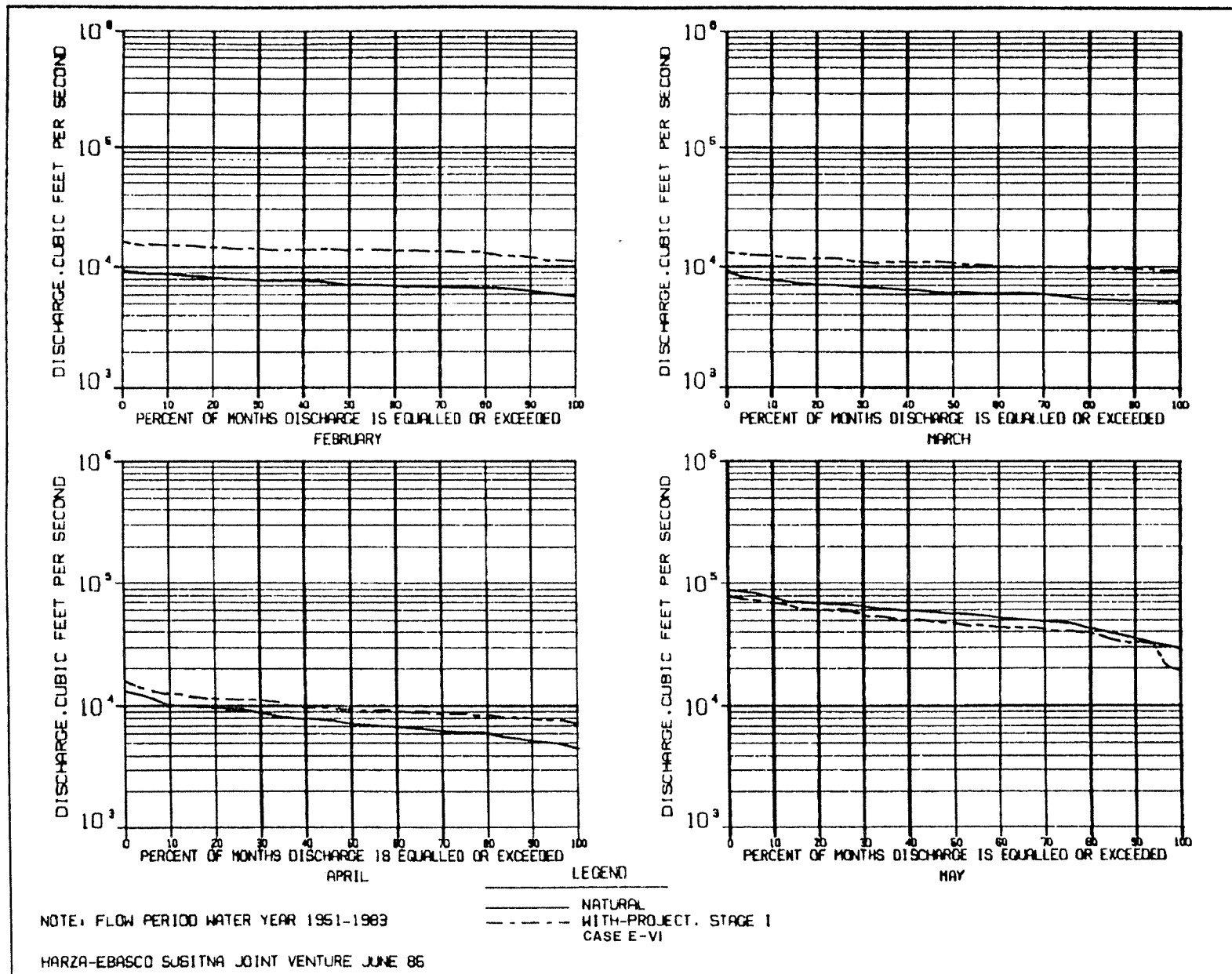
FIGURE E.2.4.59

(Page 3 of 3)



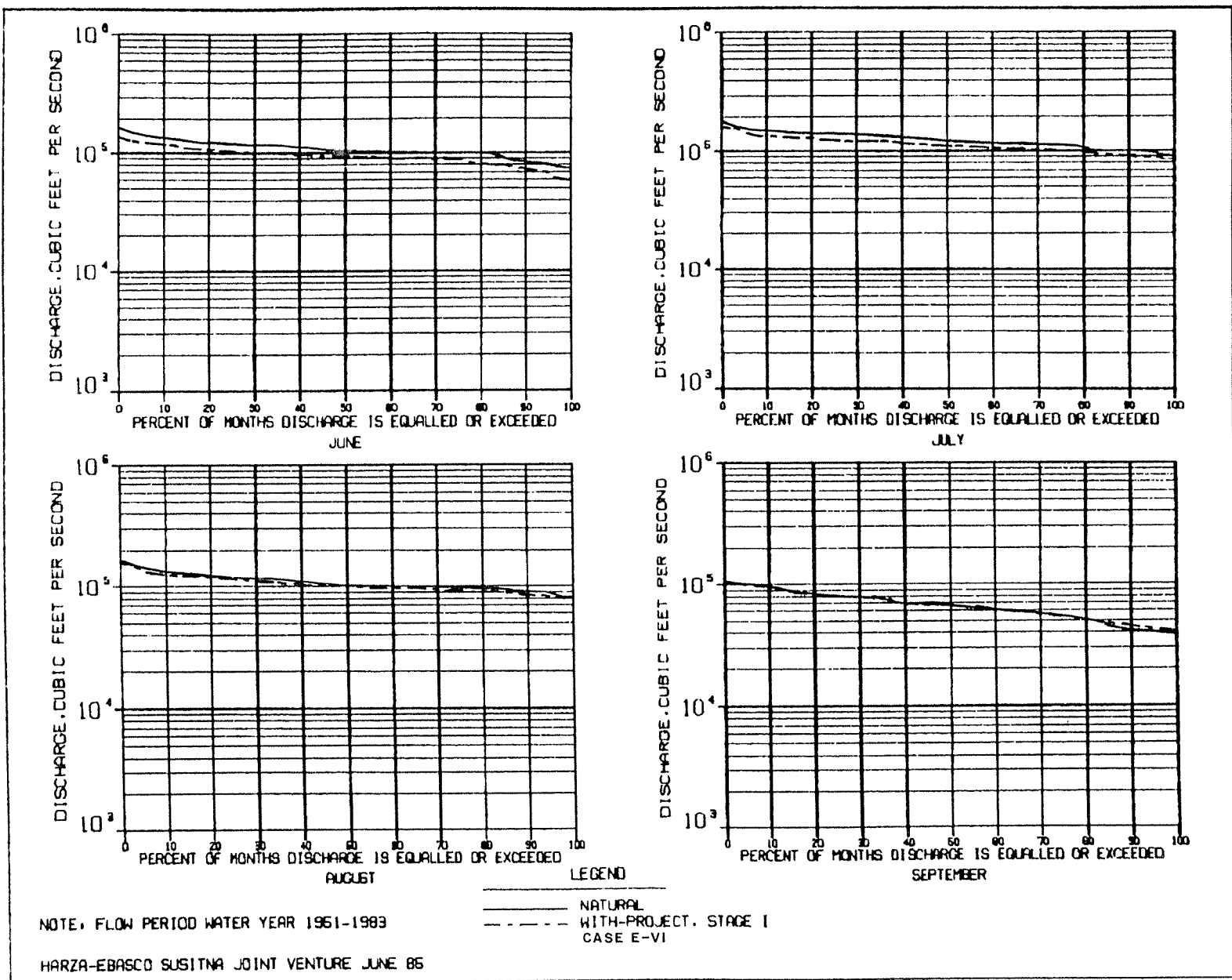
FLOW DURATION CURVES BASED ON MONTHLY DISCHARGE SUSITNA RIVER AT SUSITNA STATION

FIGURE E.2.4.60  
(Page 1 of 3)



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

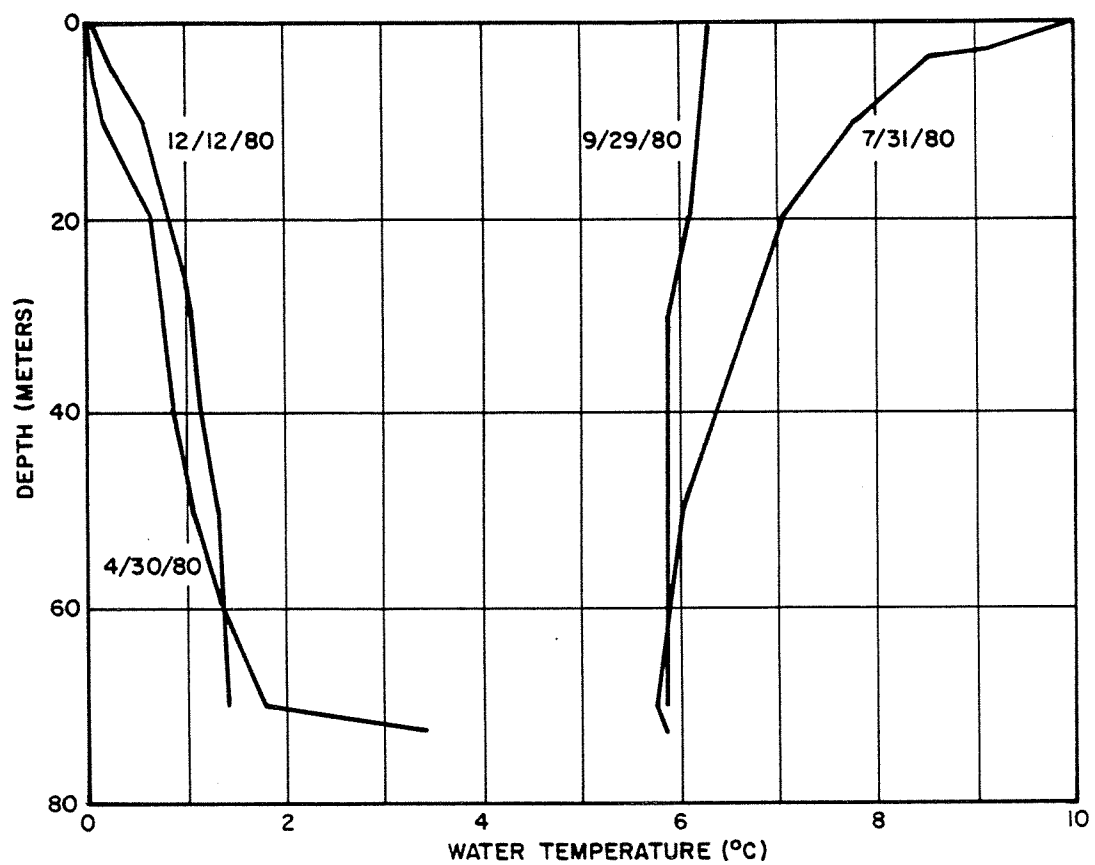
FIGURE E.2.4.60  
(Page 2 of 3)



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

FIGURE E.2.4.60

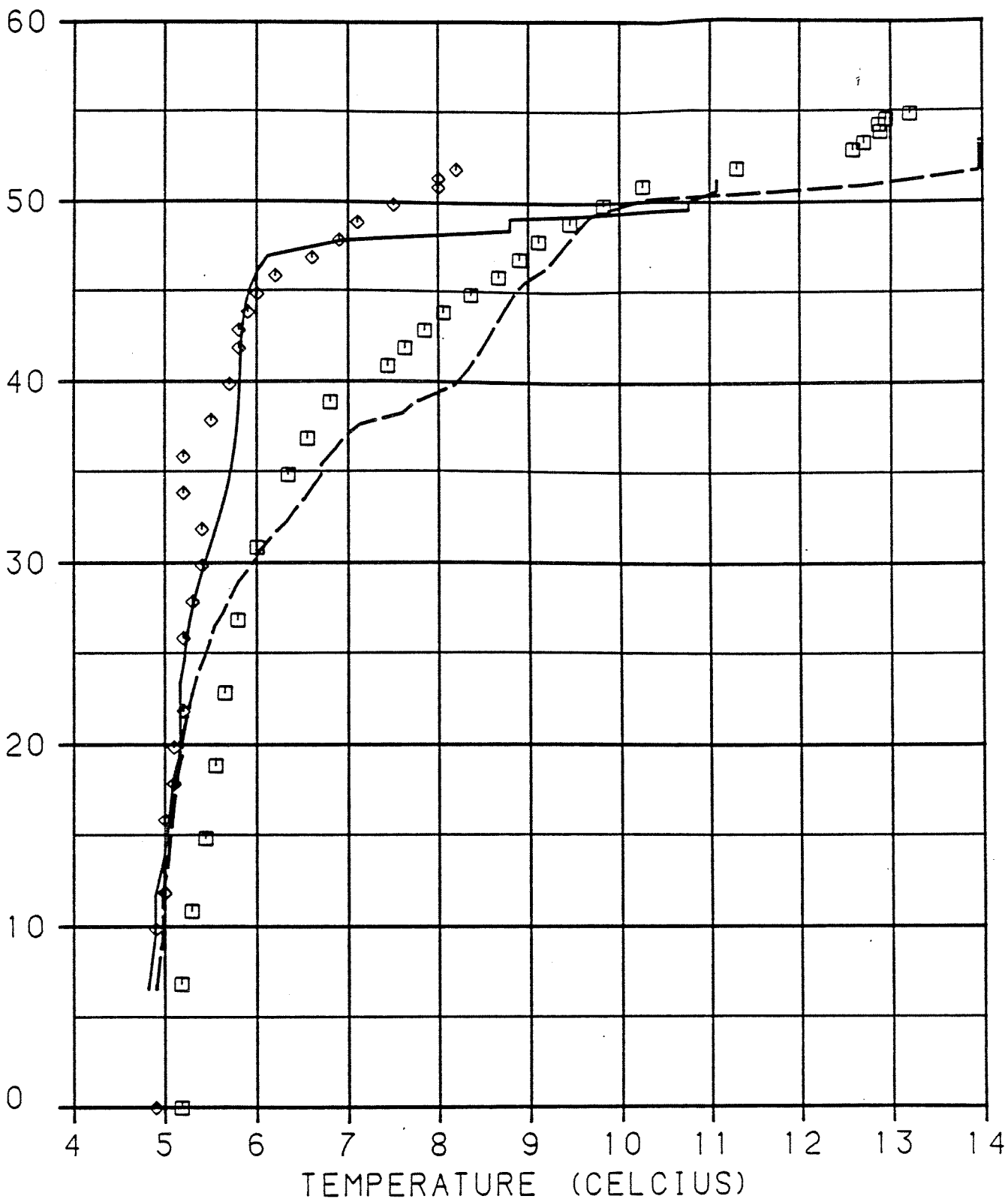
(Page 3 of 3)



WATER TEMPERATURE PROFILES  
BRADLEY LAKE, ALASKA



HEIGHT ABOVE BOTTOM (METERS)



LEGEND:

- ◆ JUNE 18. 1982 - MEASURED
- JUNE 18. 1982 - PREDICTED
- JULY 14. 1982 - MEASURED
- - - JULY 14. 1982 - PREDICTED

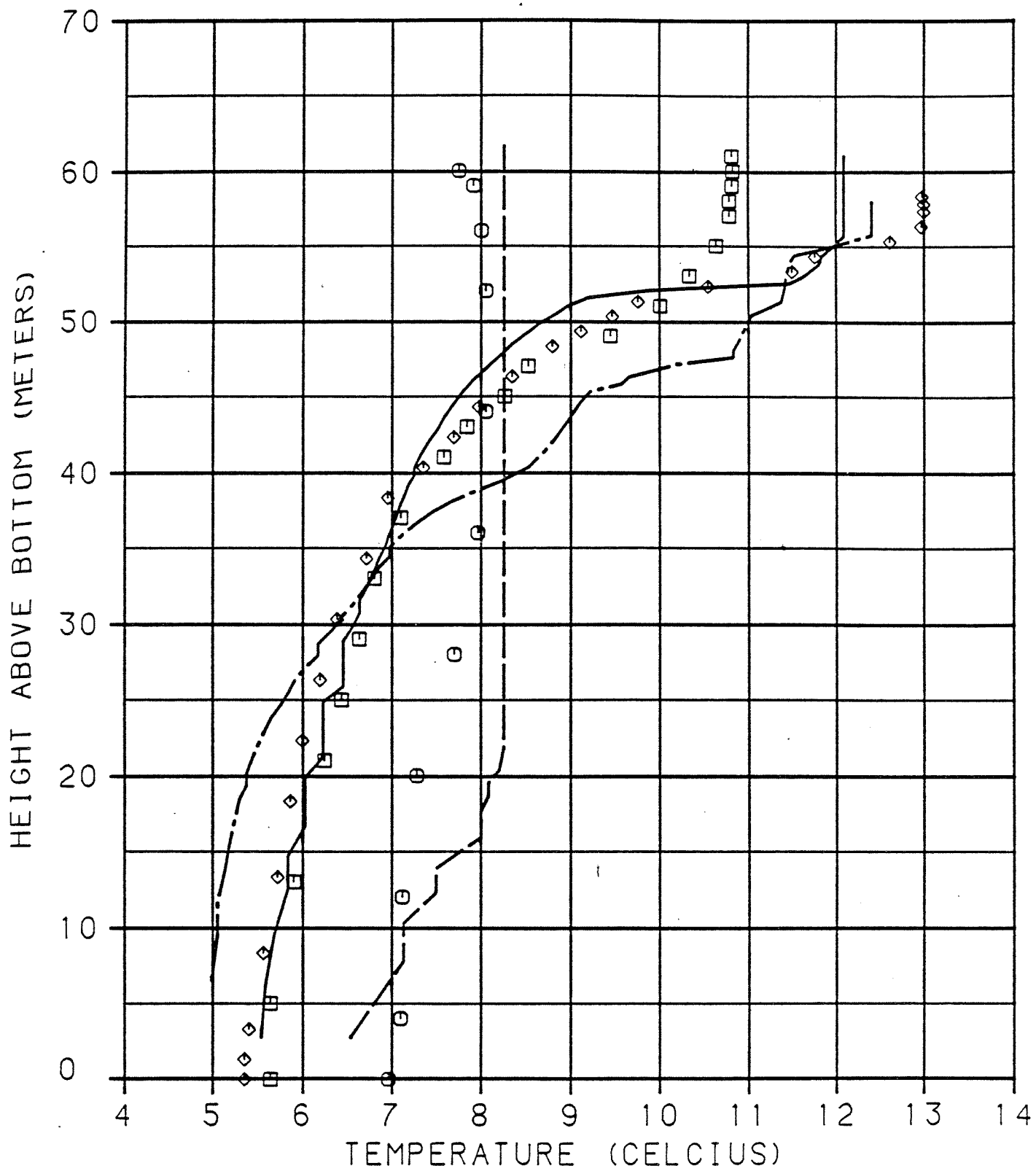
ALASKA POWER AUTHORITY

SUSITNA PROJECT

DYRESH MODEL

EKLUTNA LAKE  
OBSERVED AND PREDICTED  
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE



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

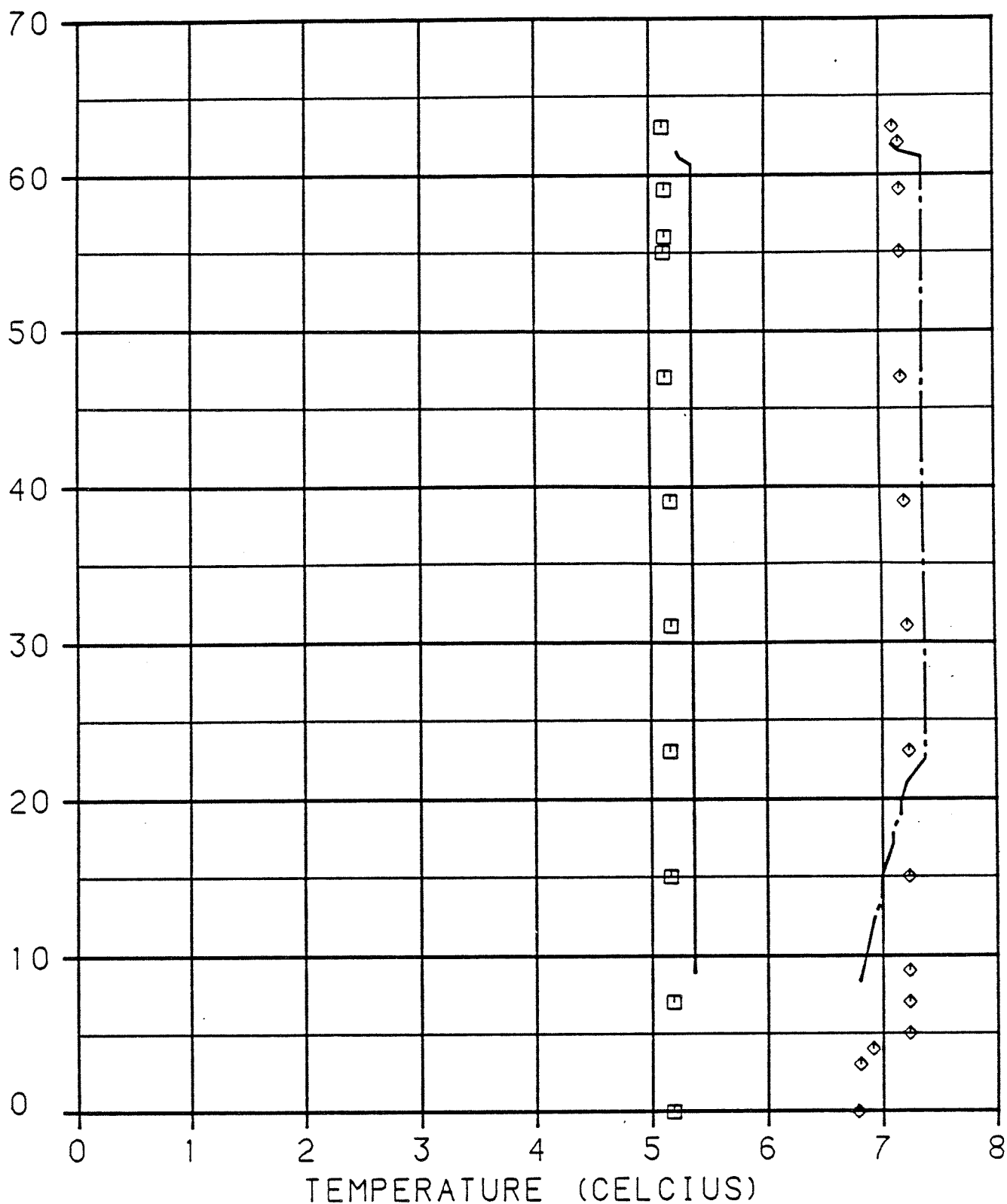
SUSITNA PROJECT

DYRESH MODEL

EKLUTNA LAKE  
OBSERVED AND PREDICTED  
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE

HEIGHT ABOVE BOTTOM (METERS)



LEGEND:

- ◇--- OCTOBER 14, 1982 - MEASURED
- ◇--- OCTOBER 14, 1982 - PREDICTED
- NOVEMBER 4, 1982 - MEASURED
- NOVEMBER 4, 1982 - PREDICTED

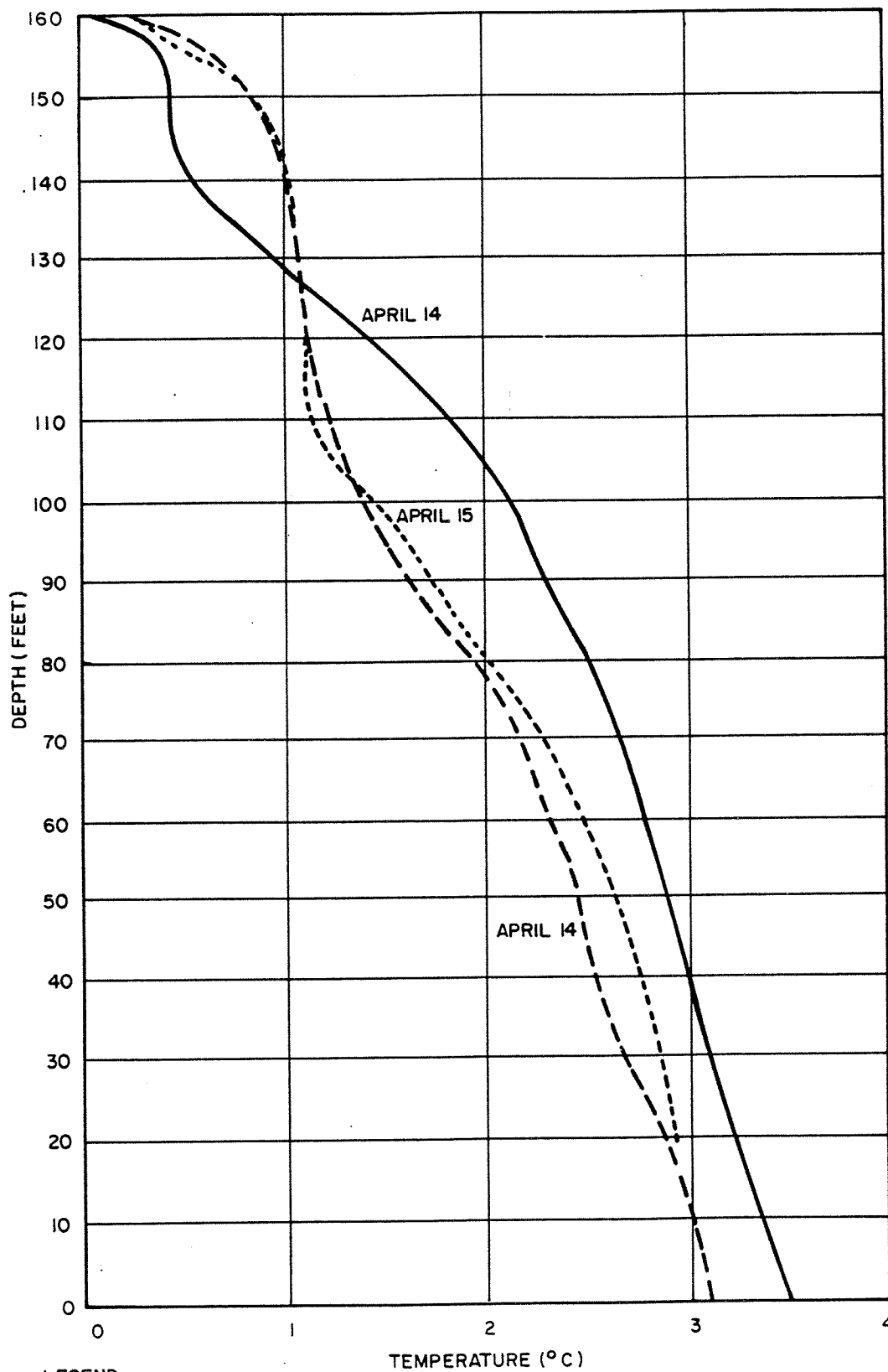
ALASKA POWER AUTHORITY

SUSITNA PROJECT

DYRESH MODEL

EKLUTNA LAKE  
OBSERVED AND PREDICTED  
TEMPERATURE PROFILES

HARZA-EBASCO JOINT VENTURE



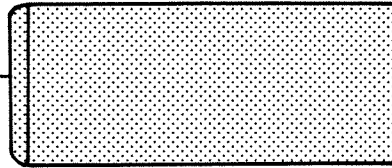
LEGEND:

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

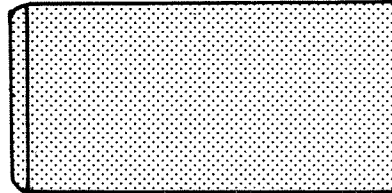
LAKE WILLISTON  
TEMPERATURE PROFILES  
APRIL 14 - 15, 1982

FIGURE E.2.4.65

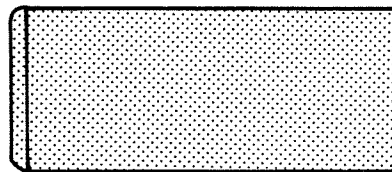
NORMAL MAXIMUM OPERATING  
RESERVOIR LEVEL EL. 2000.0



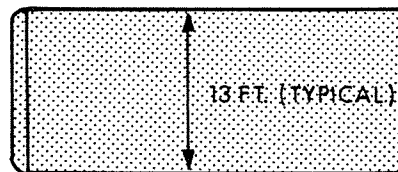
EL. 1964.5



EL. 1926.5 FT.

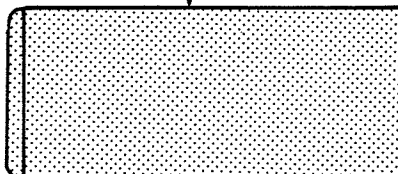


EL. 1888.5 FT.



MINIMUM RESERVOIR  
OPERATING LEVEL, EL. 1850.0 FT.

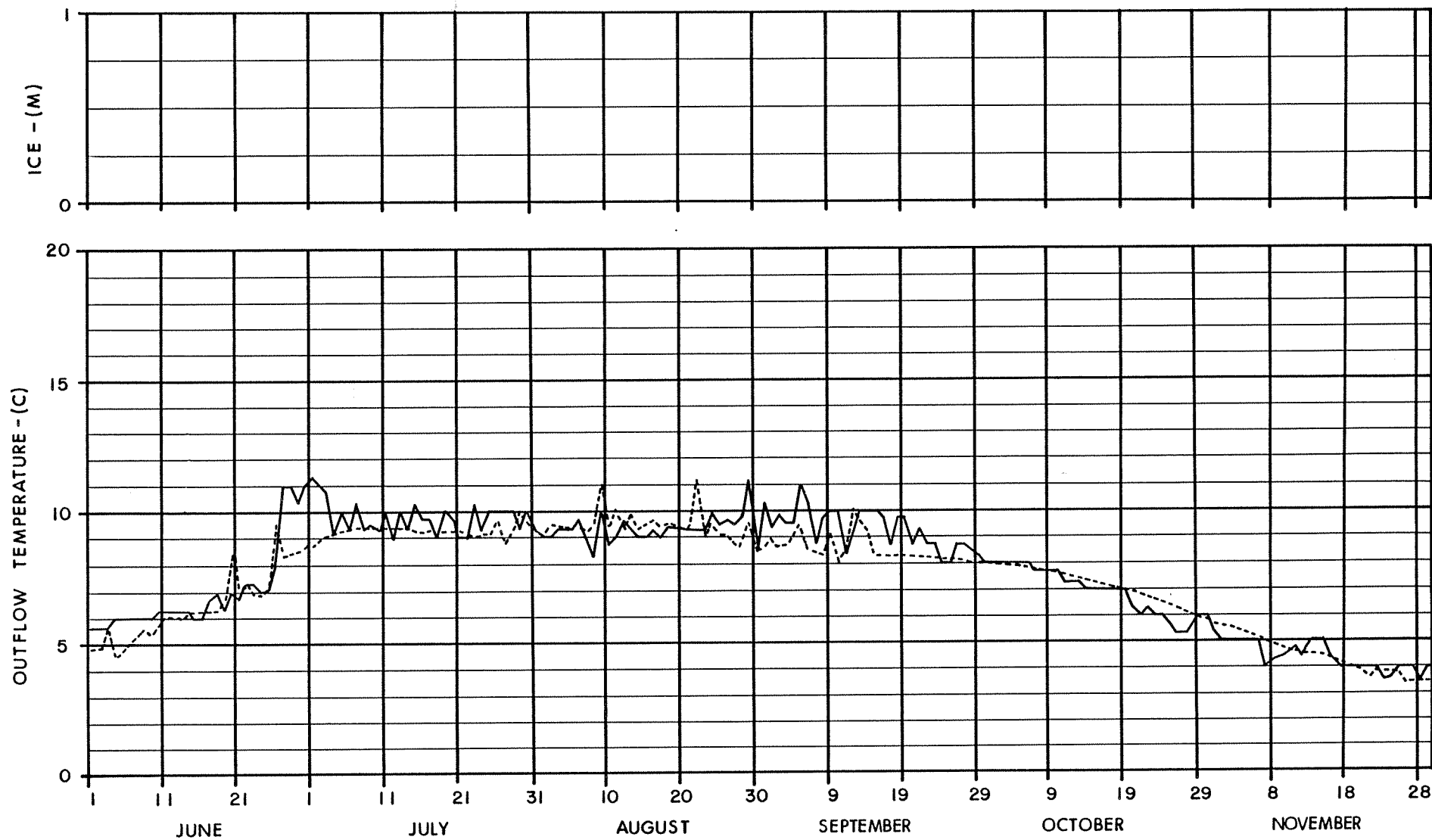
2.5 FT. (TYPICAL)



EL. 1812.5 FT.



# WATANA MULTILEVEL INTAKE STAGE I & II

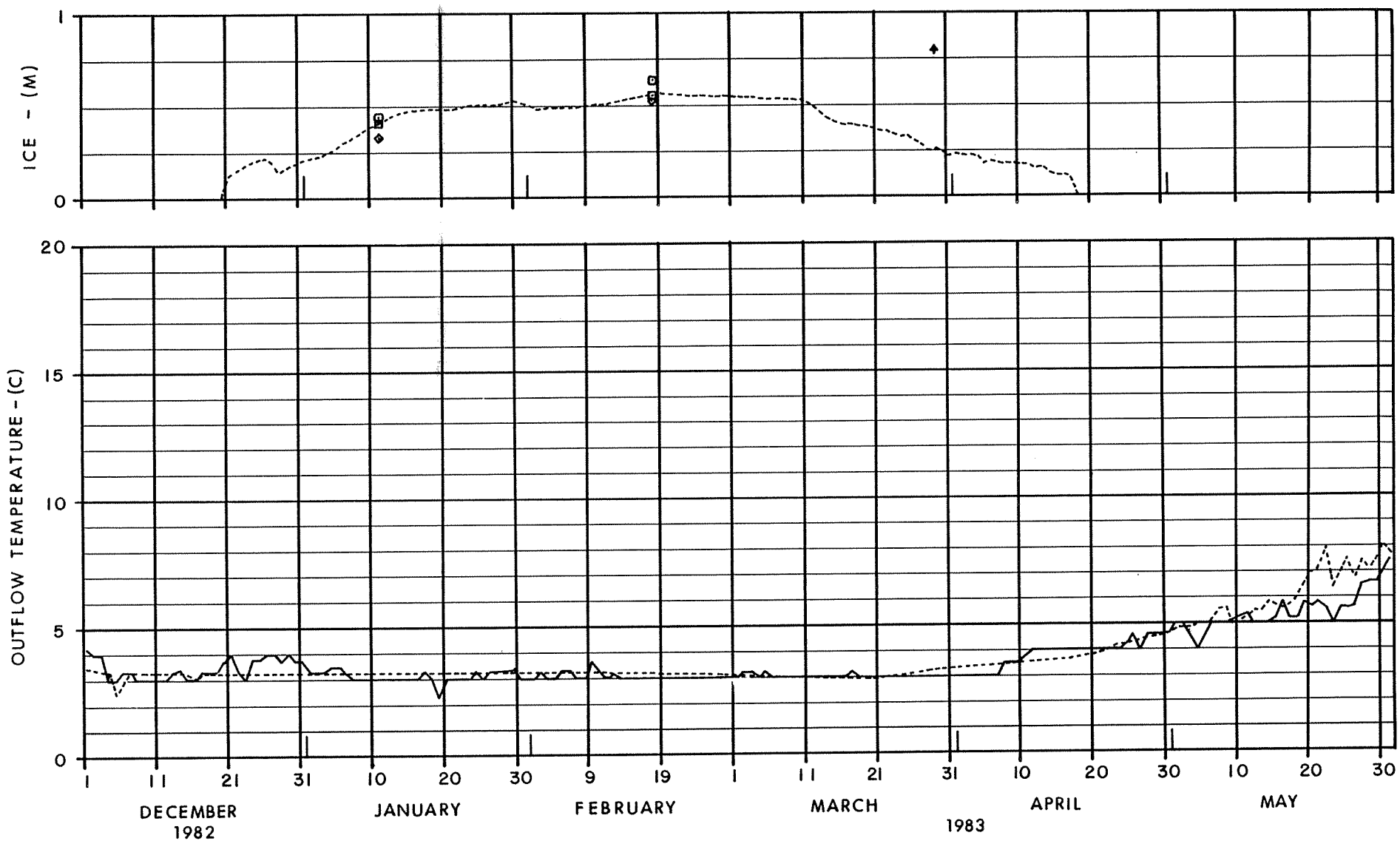


LEGEND:

- MEASURED OUTFLOW TEMPERATURE
- PREDICTED OUTFLOW TEMPERATURE

EKLUTNA LAKE MODEL CALIBRATION

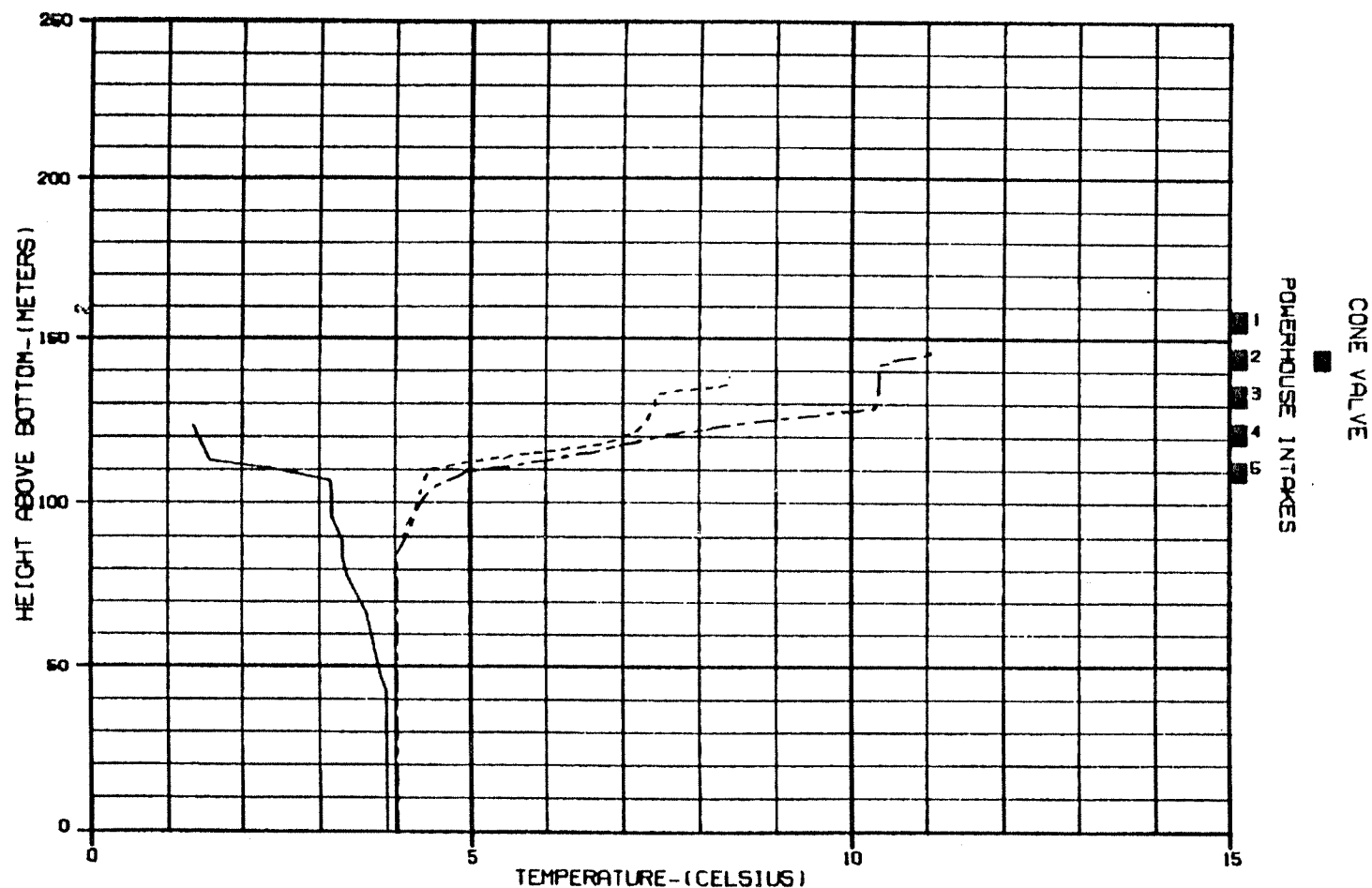
FIGURE E.2.4.67



LEGEND:

- MEASURED OUTFLOW TEMPERATURE
- - - PREDICTED OUTFLOW TEMPERATURE
- ◇ MEASURED ICE THICKNESS, STATION 5
- MEASURED ICE THICKNESS, STATION 9
- MEASURED ICE THICKNESS, STATION 11
- ◇ MEASURED ICE THICKNESS, STATION 13

EKLUTNA LAKE MODEL CALIBRATION



CASE: WAB1010 - WATANA OPERATION ALONE IN STAGE I

LEGEND:

PREDICTED TEMPERATURE PROFILES:

— 1 MAY 1981  
 --- 1 JUNE 1981  
 -.- 1 JULY 1981

ALASKA POWER AUTHORITY

SUBITNA PROJECT

DYKES MODEL

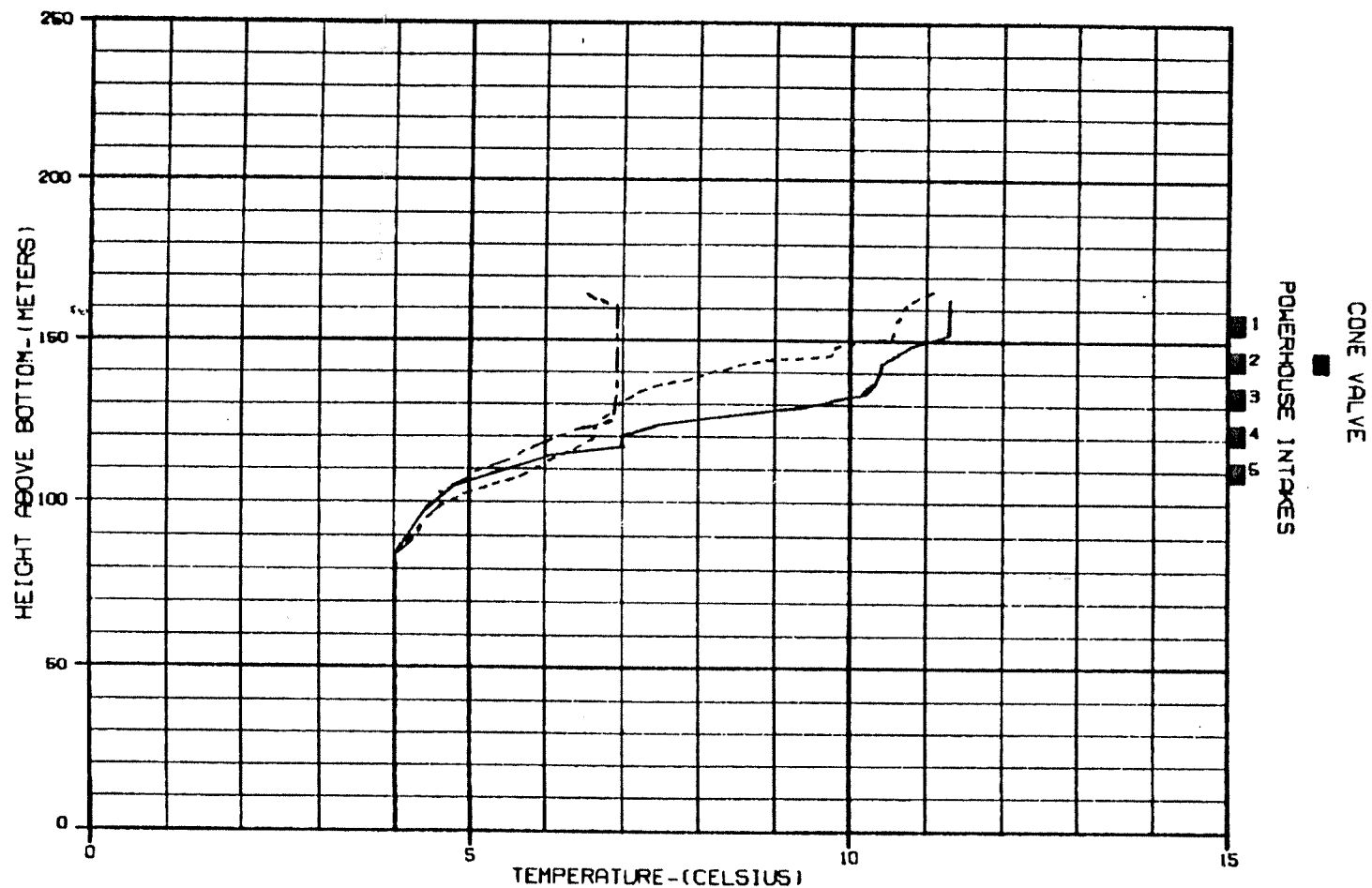
WATANA RESERVOIR  
 TEMPERATURE PROFILES  
 STAGE I

HAZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS

FIGURE E.2.4.69





CASE: WAB1010 - WATANA OPERATION ALONE IN STAGE I

LEGEND:

PREDICTED TEMPERATURE PROFILES:

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

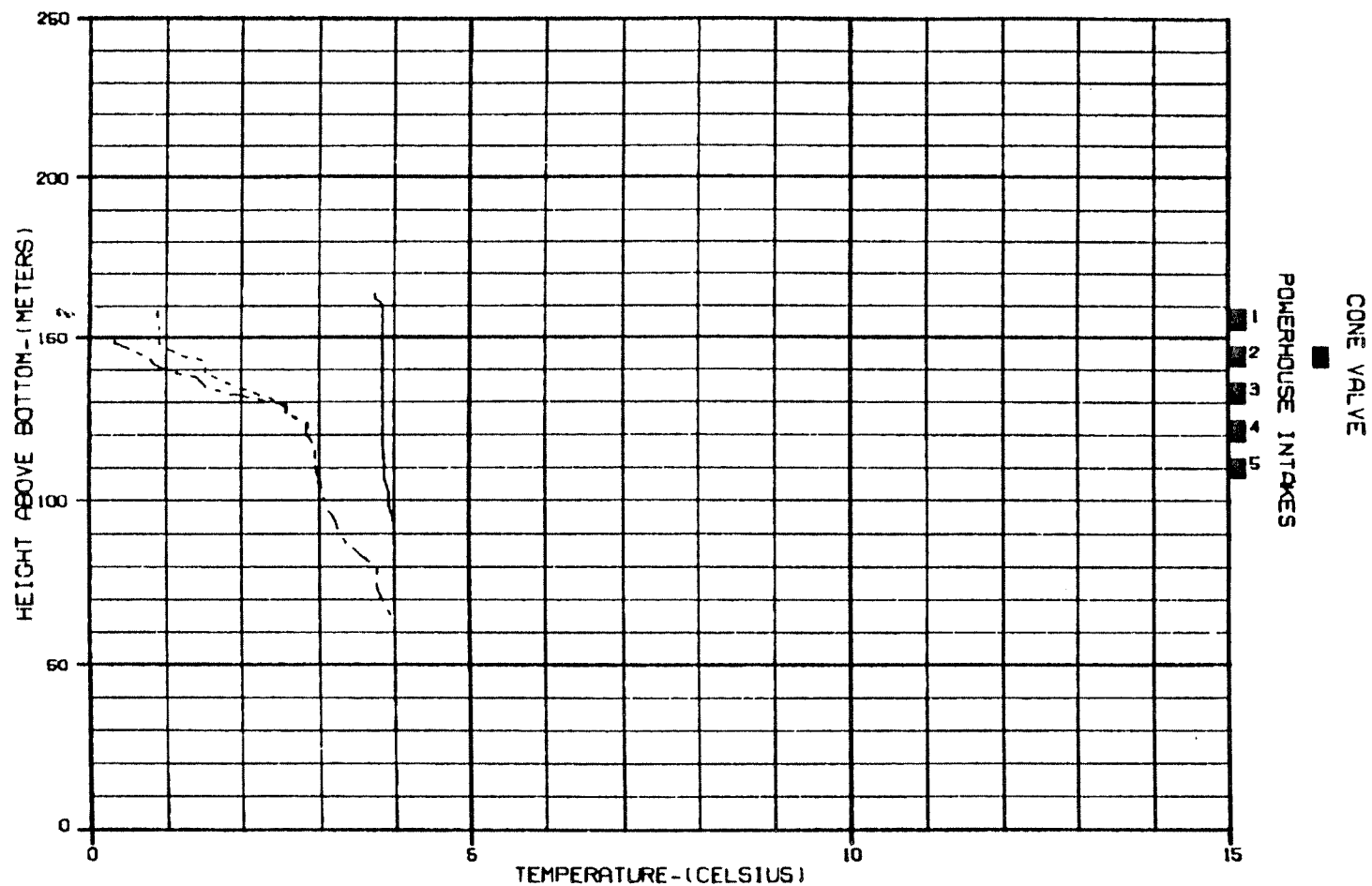
ALASKA POWER AUTHORITY

SUSTINA PROJECT DYRESH 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

SUBMITTA PROJECT

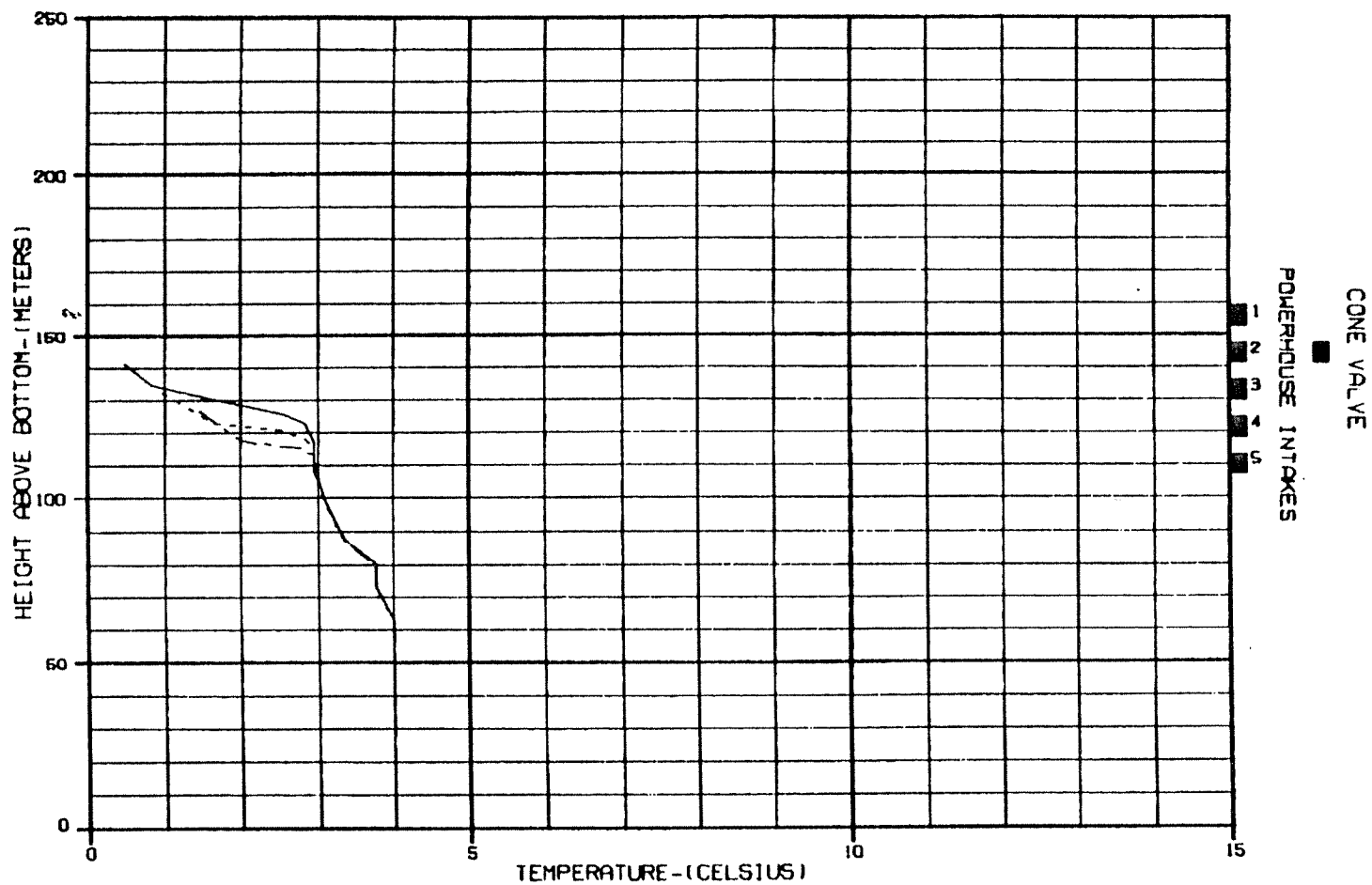
HYDRO MODEL

WATANA RESERVOIR  
 TEMPERATURE PROFILES  
 STAGE I

HARZA-EBASCO JOINT VENTURE

CHIEF: E. L. PETERSON

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

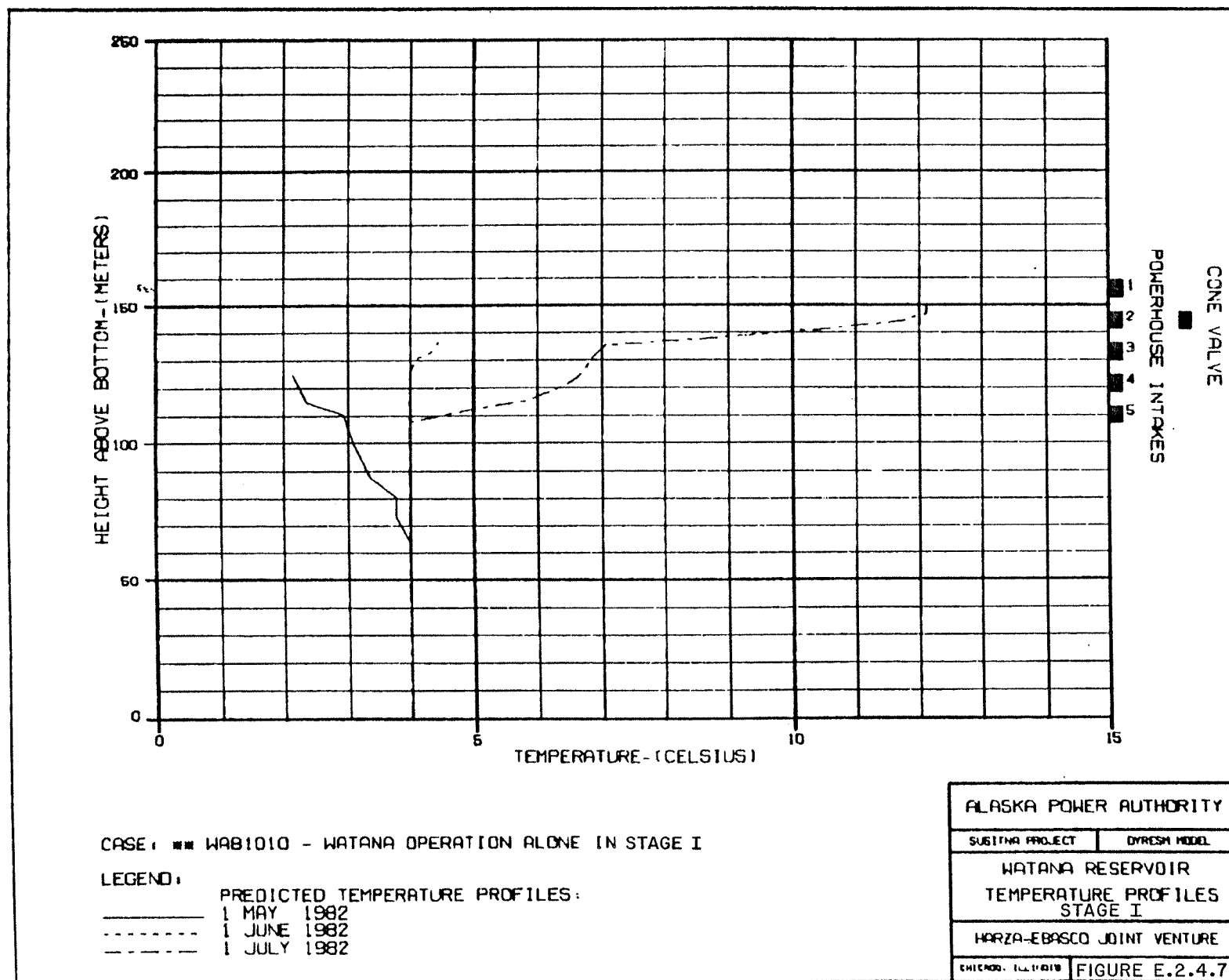
ALASKA POWER AUTHORITY

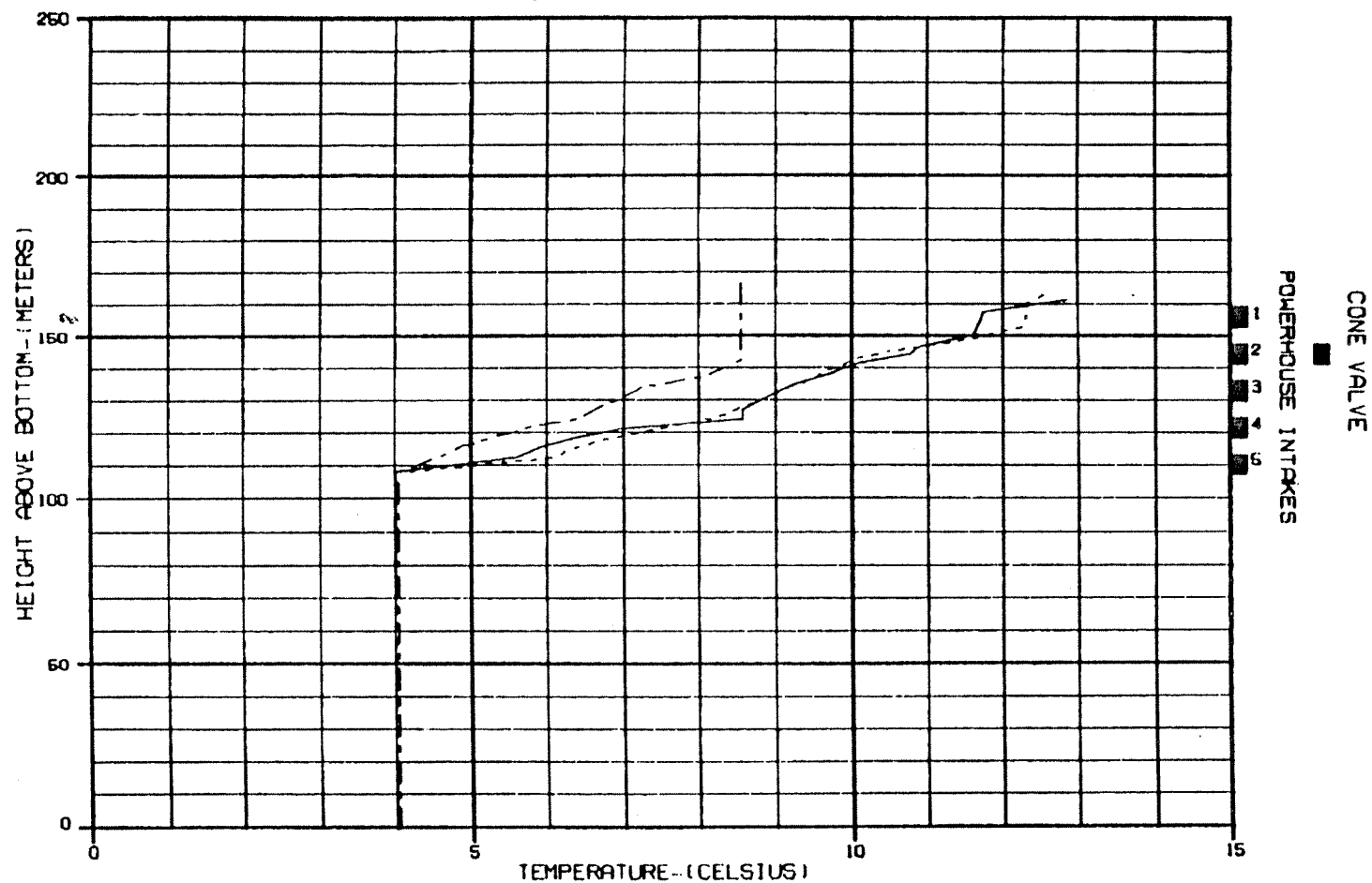
SUBTINA PROJECT DYRESM MODEL

WATANA RESERVOIR  
 TEMPERATURE PROFILES  
 STAGE I

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILL 60618 FIGURE E.2.4.72





CASE: WAB1010 - WATANA OPERATION ALONE IN STAGE I

LEGEND:

PREDICTED TEMPERATURE PROFILES:

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

ALASKA POWER AUTHORITY

SUBITNA PROJECT

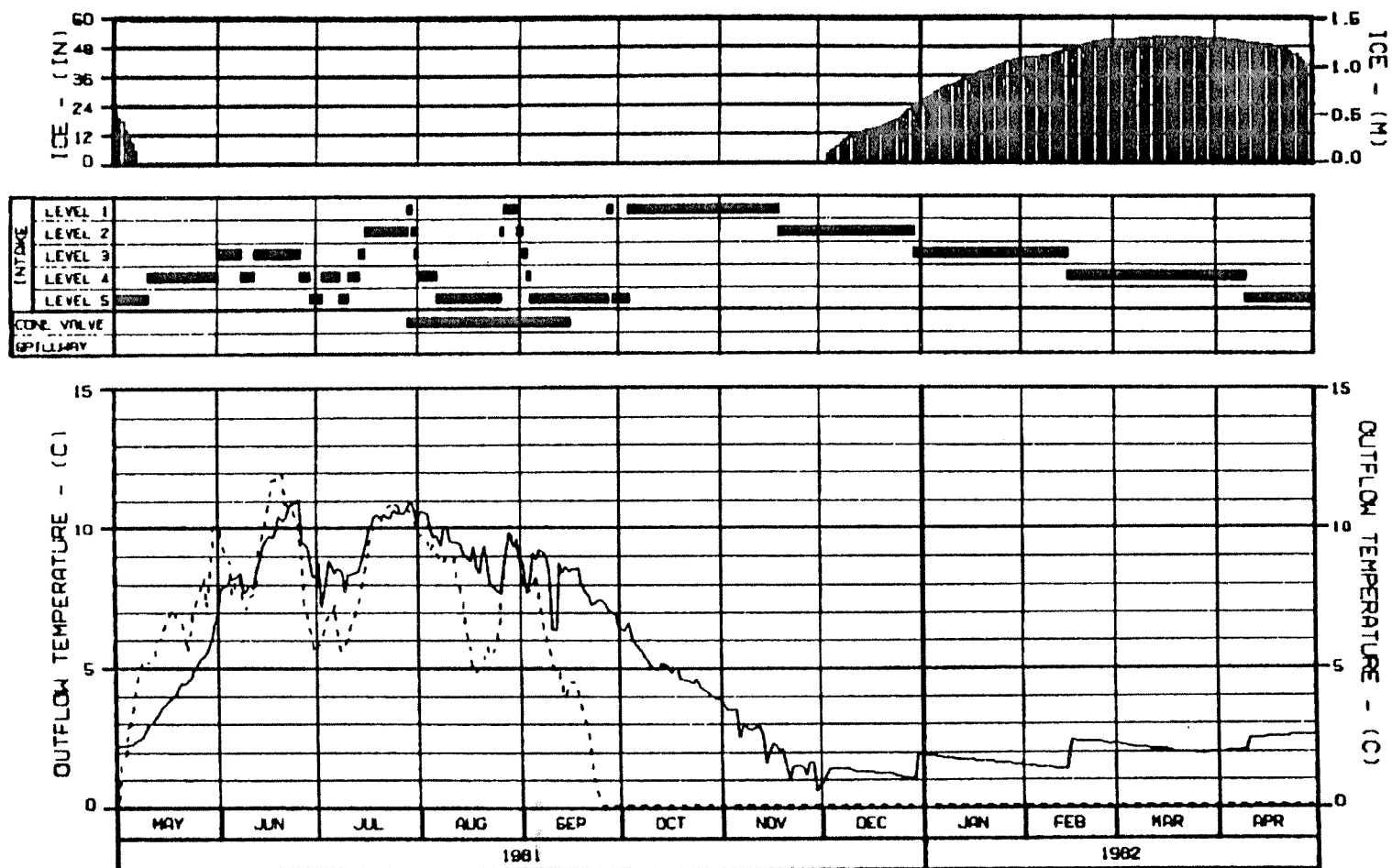
DYRESM MODEL

WATANA RESERVOIR  
 TEMPERATURE PROFILES  
 STAGE I

HARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS

FIGURE E.2.4.74



LEGEND: CASE: # 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. 1888 FT. (575.6 M)
  4. INTAKE PORT LEVEL 4 AT EL. 1850 FT. (564.0 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

SUBITNA PROJECT DYKES MODEL

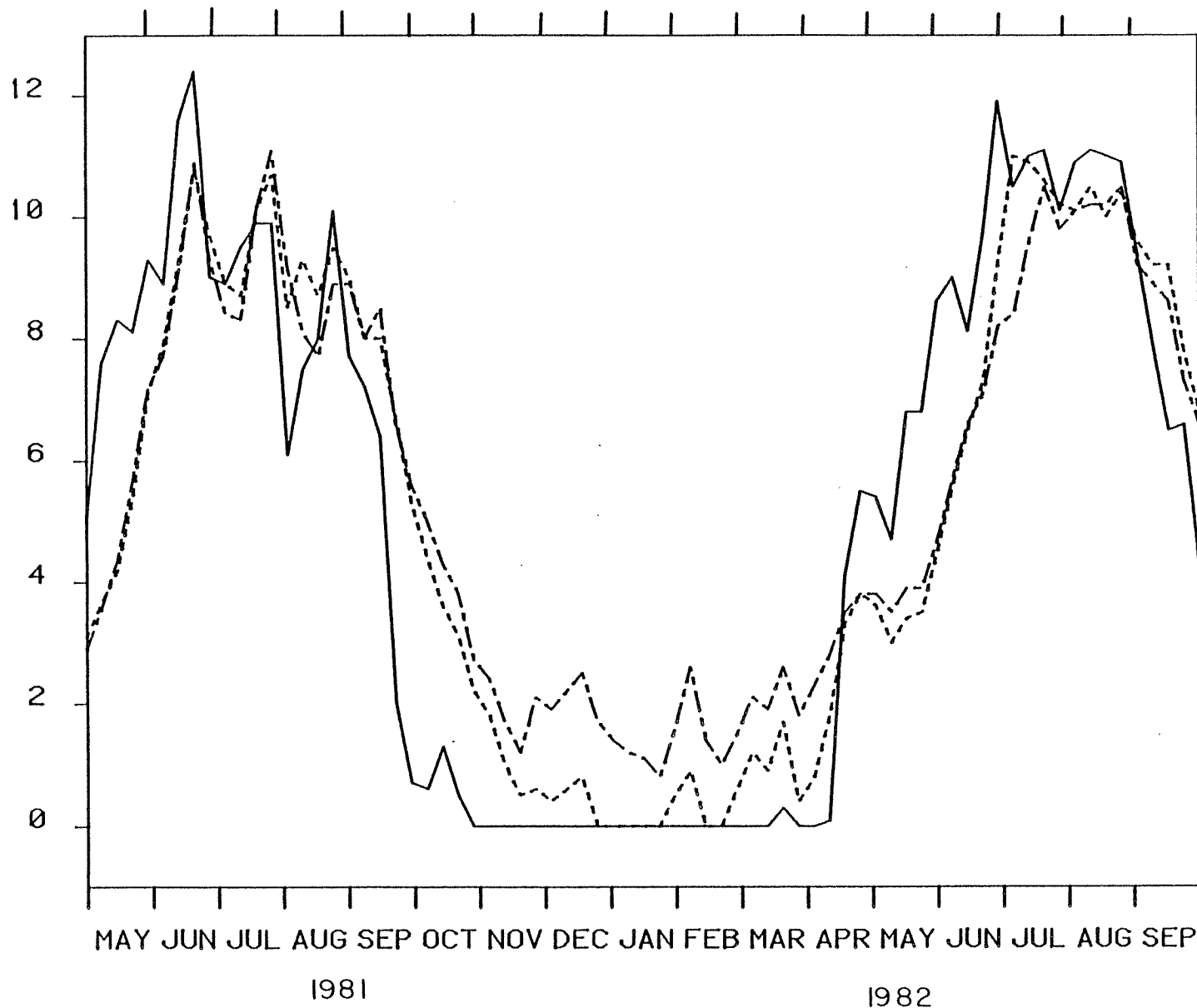
STAGE I WATANA RESERVOIR  
 OUTFLOW TEMPERATURE  
 AND ICE GROWTH (E-VI)

HARZA-EBASCO JOINT VENTURE

ENCLOSURE ILLUSTRATION 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

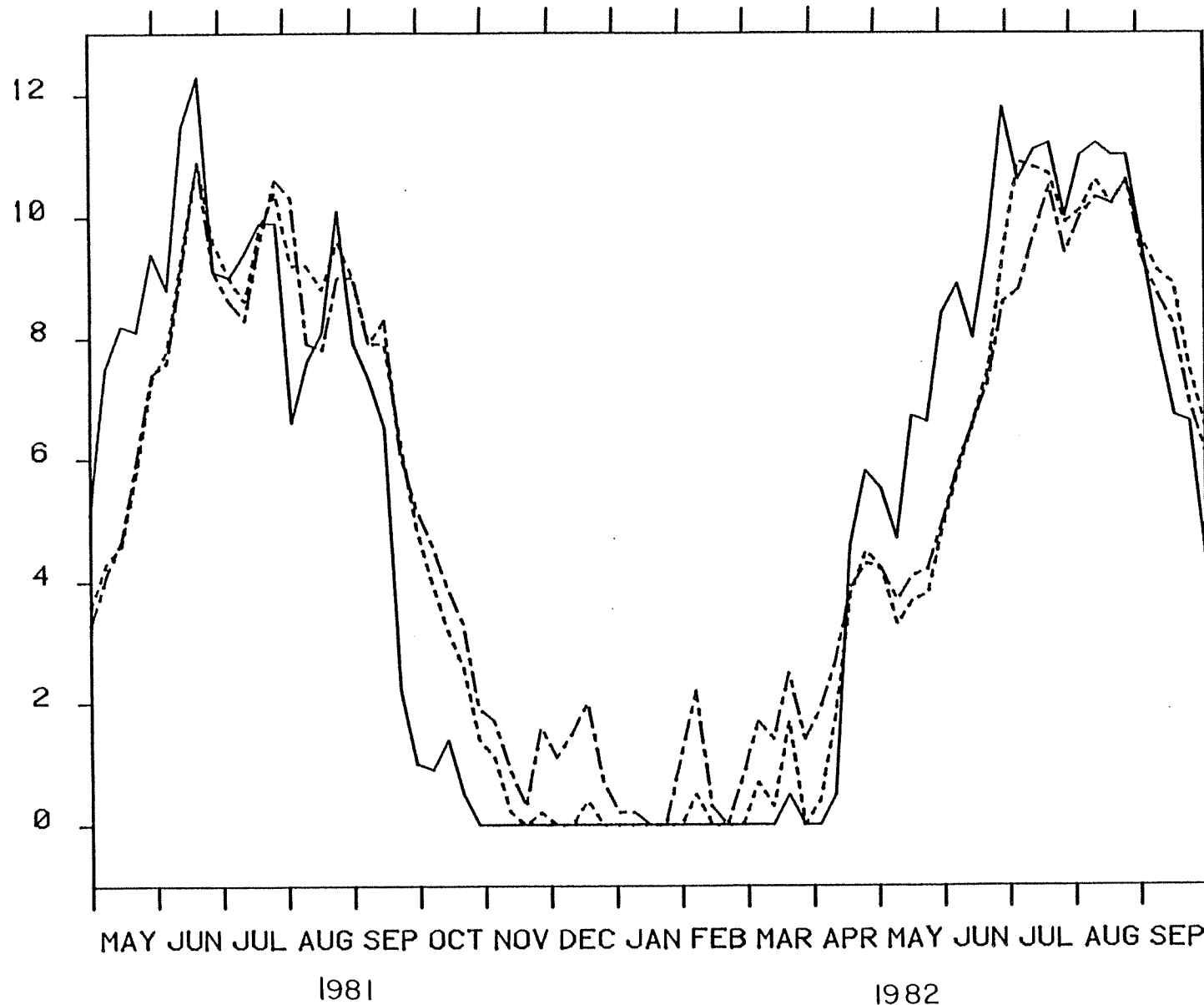
- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURE PHASE 1 OF TWO STAGE PROJECT (FOR COMPARIS)
- - - SIMULATED TEMPERATURE STAGE 1 OF PROPOSED PROJECT

ALASKA POWER AUTHORITY  
 SUSITNA RIVER PROJECT  
 SIMULATED SUSITNA  
 RIVER TEMPERATURES  
 RIVER MILE 150  
 STAGE I

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)

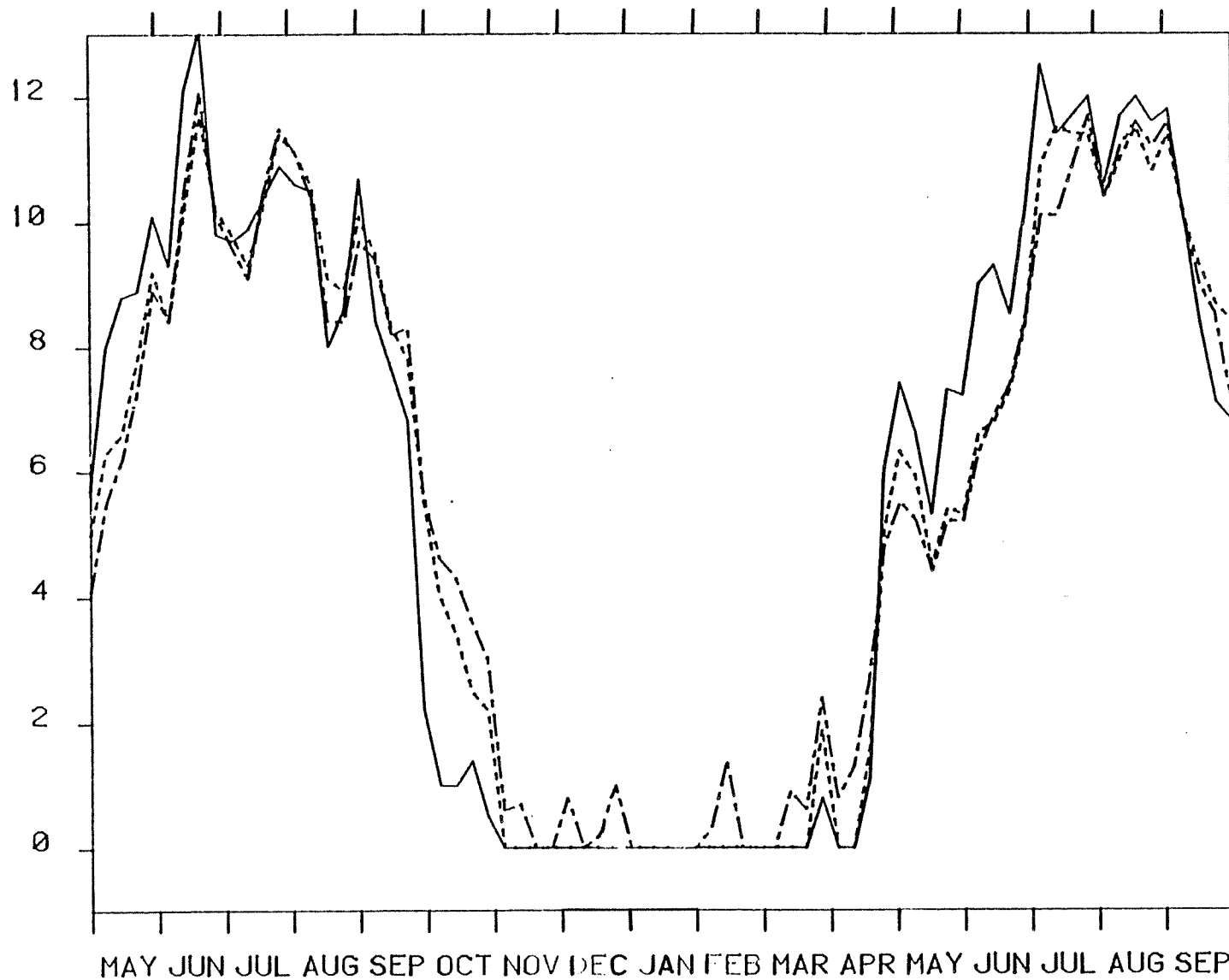
LEGEND

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

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

FIGURE E.2.4.78

DEGREES C



NOTES:

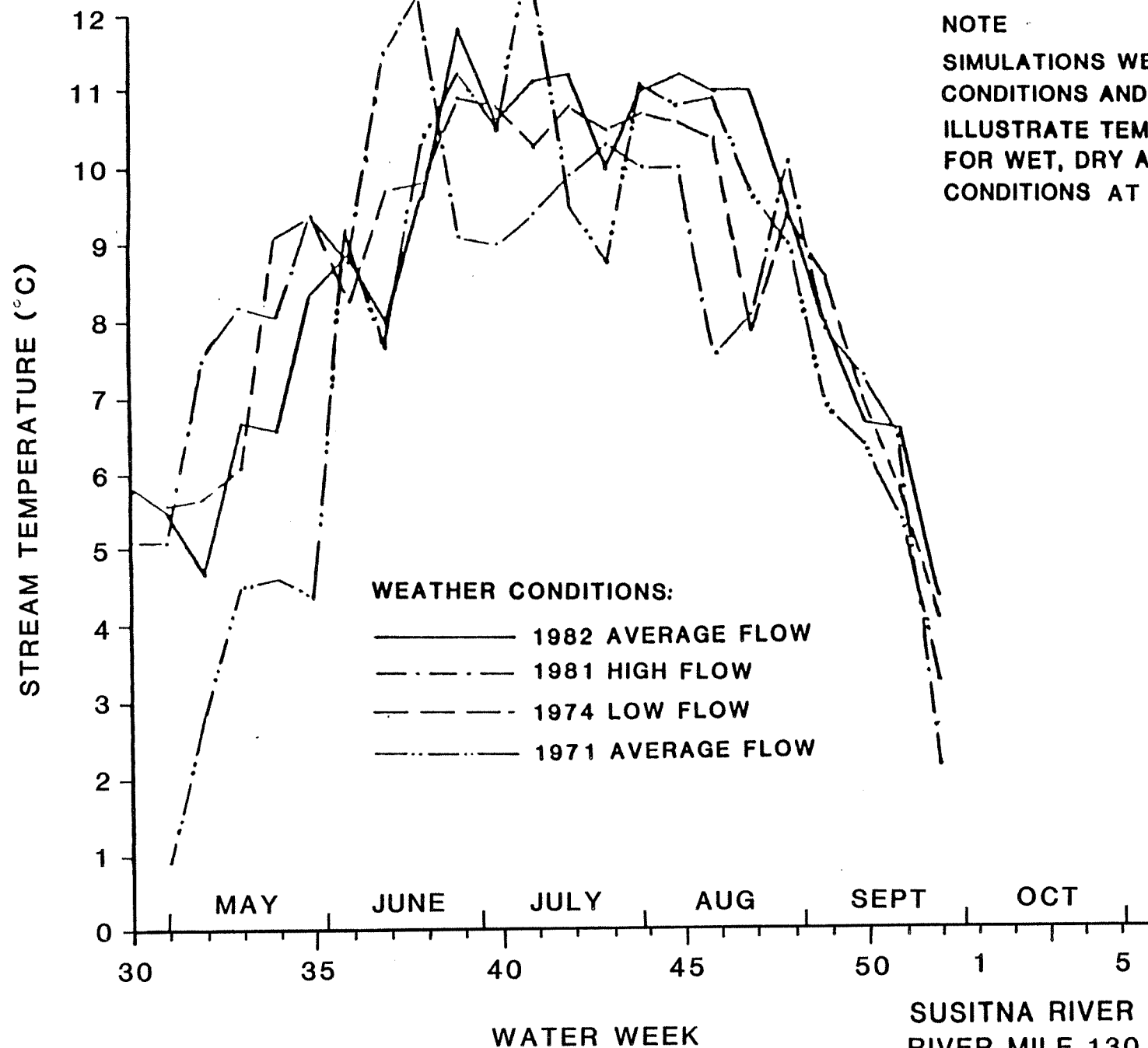
1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 1 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. E-VI FLOW REQUIREMENTS
6. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER - APRIL SHOULD BE USED WITH CAUTION AS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

LEGEND

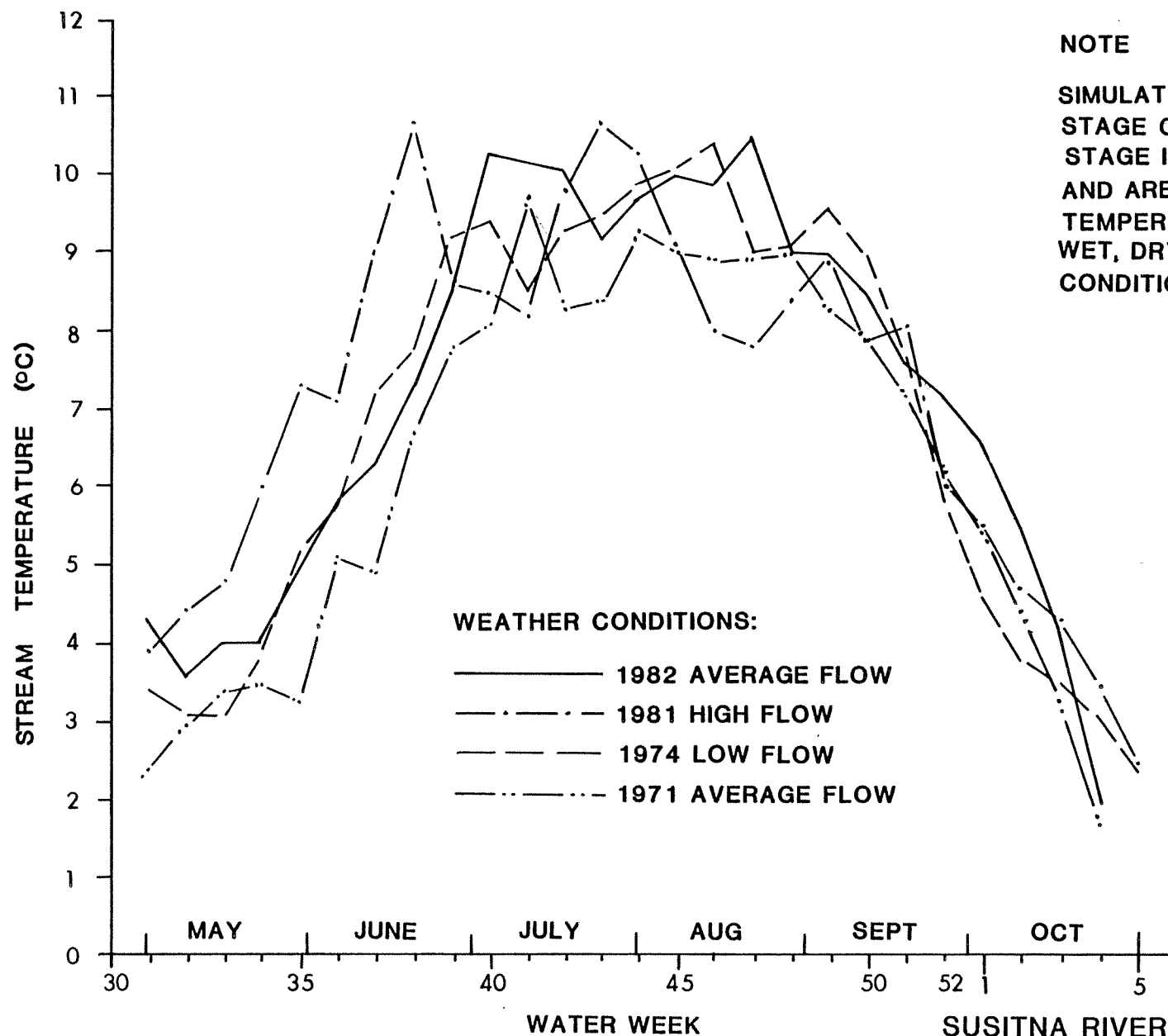
- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURE PHASE 1 OF TWO STAGE PROJECT (FOR COMPARISON)
- ... SIMULATED TEMPERATURE STAGE 1 OF PROPOSED PROJECT

|                                                             |                        |
|-------------------------------------------------------------|------------------------|
| ALASKA POWER AUTHORITY                                      |                        |
| SUSITNA HYDROELECTRIC PROJECT                               |                        |
| SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 100 STAGE I |                        |
| DATE: 10/1/82                                               | BY: J. L. HARRIS       |
| REVISION: 1                                                 | APPROVED: J. L. HARRIS |

FIGURE E.2.4.79

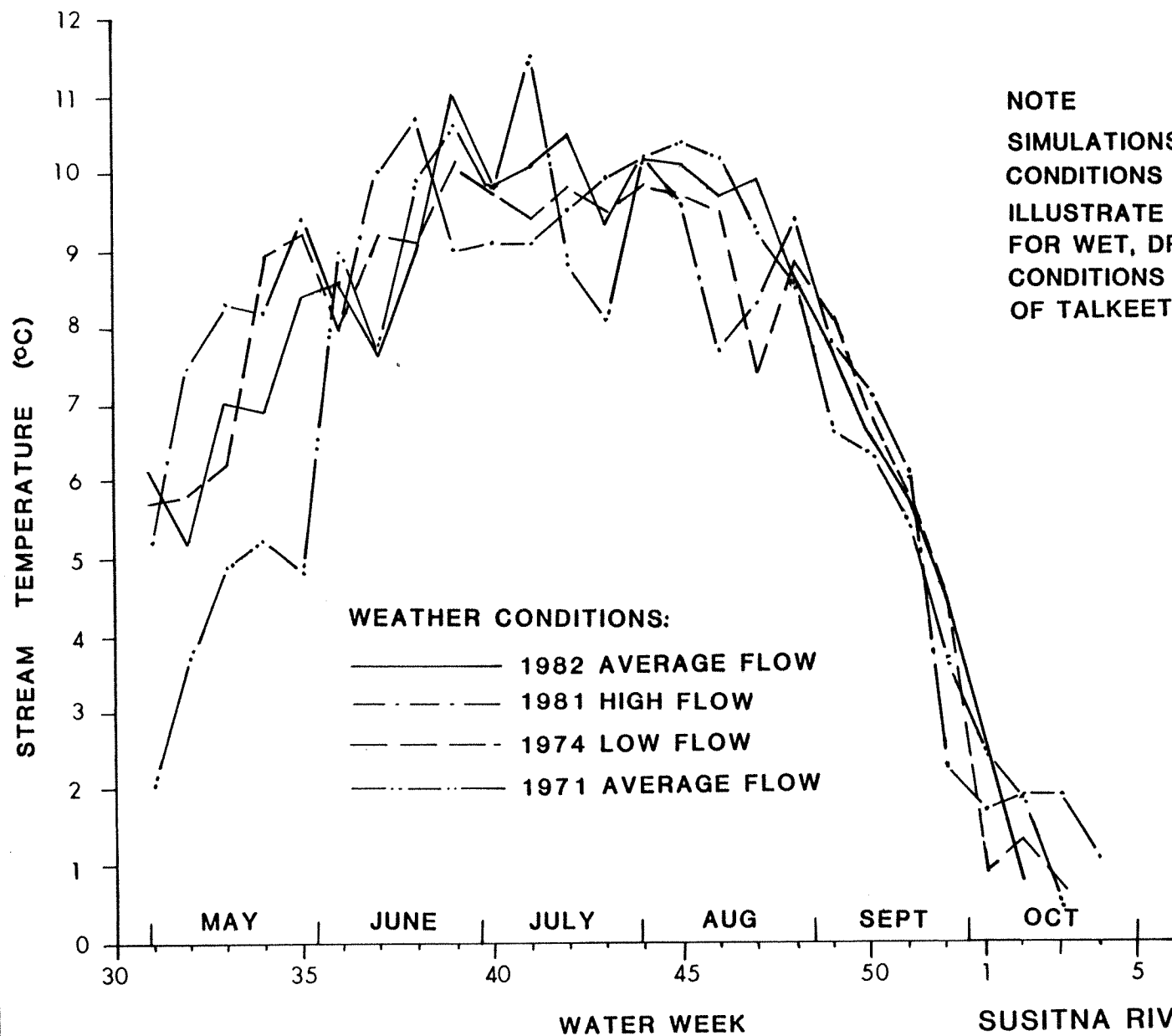


**SUSITNA RIVER TEMPERATURES AT  
RIVER MILE 130 NATURAL CONDITIONS**  
FIGURE E.2.4.80



SUSITNA RIVER TEMPERATURE AT RIVER MILE 130 WATANA OPERATING

FIGURE E.2.4.81



**NOTE**

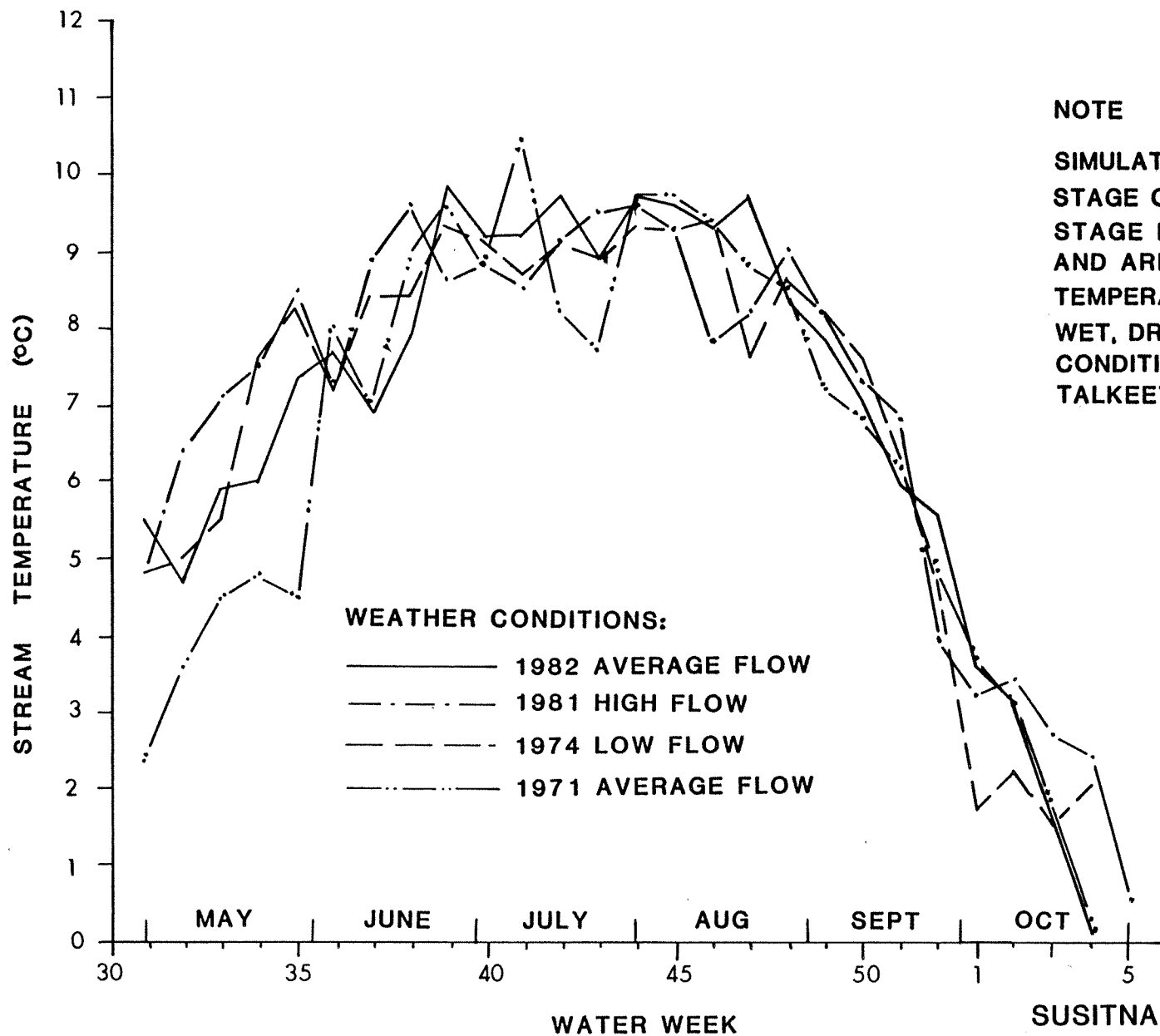
SIMULATIONS WERE MADE FOR NATURAL CONDITIONS AND ARE PRESENTED TO ILLUSTRATE TEMPERATURE DIFFERENCES FOR WET, DRY AND AVERAGE FLOW CONDITIONS IN RIVER DOWNSTREAM OF TALKEETNA

**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

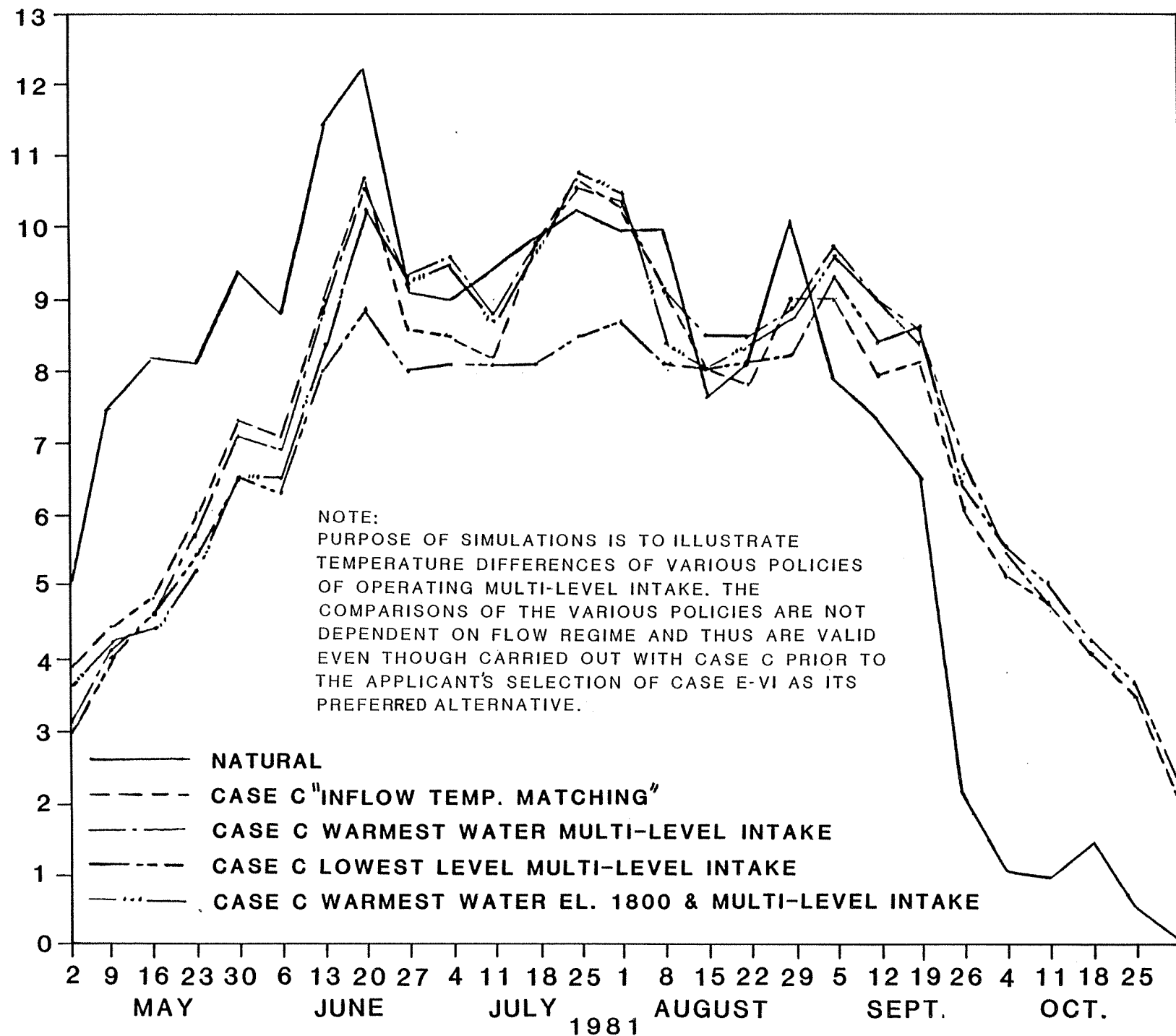


**NOTE**

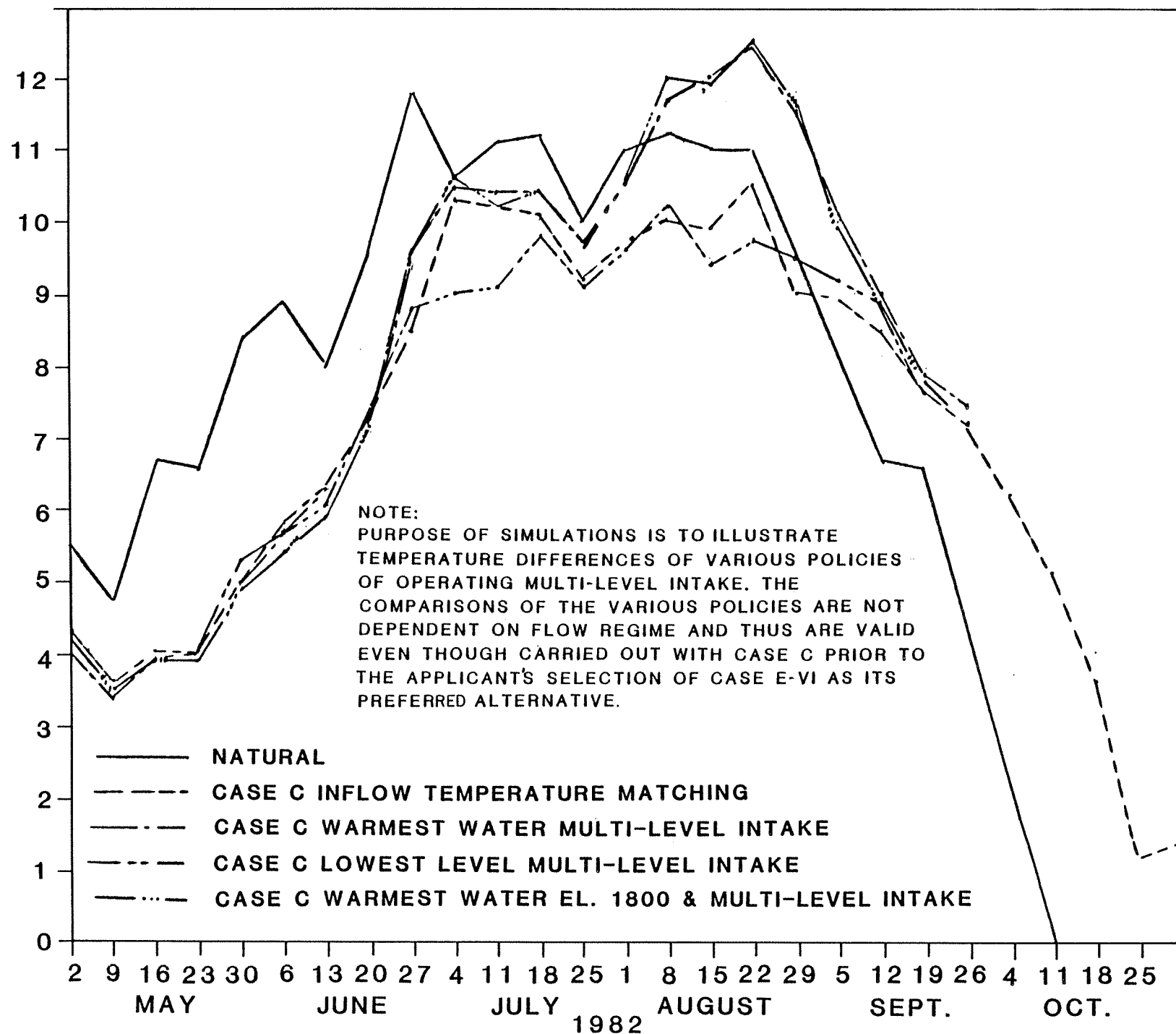
SIMULATIONS WERE MADE FOR FIRST STAGE OF TWO STAGE PROJECT FOR STAGE I ENERGY DEMANDS AND ARE PRESENTED TO ILLUSTRATE TEMPERATURE DIFFERENCES FOR WET, DRY AND AVERAGE FLOW CONDITIONS DOWNSTREAM OF TALKEETNA

**SUSITNA RIVER TEMPERATURES AT RIVER MILE 84 WATANA OPERATING**

FIGURE E.2.4.83

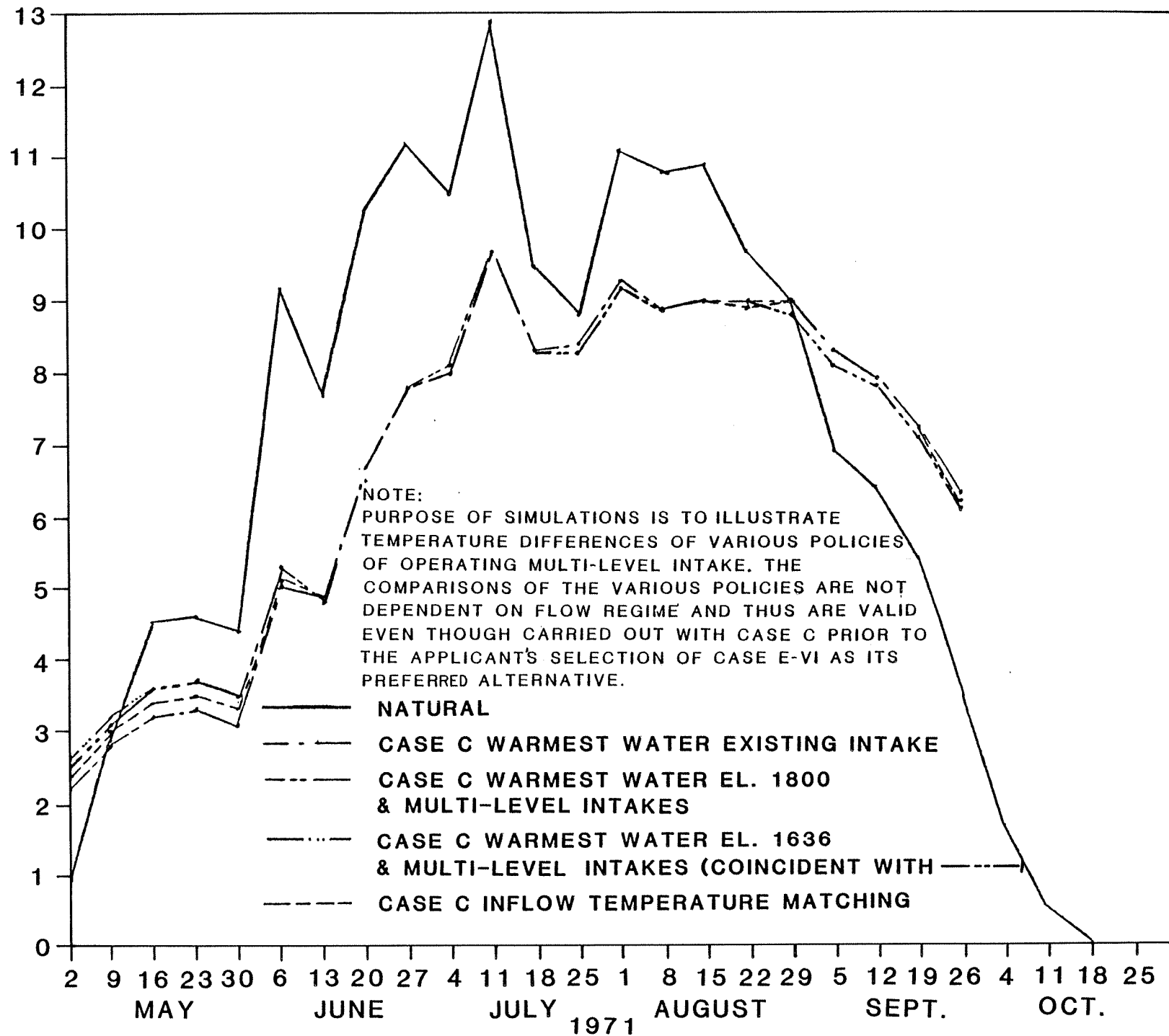


**SIMULATED TEMPERATURES AT RIVER MILE 130  
 VARIOUS INTAKE OPERATING POLICIES**



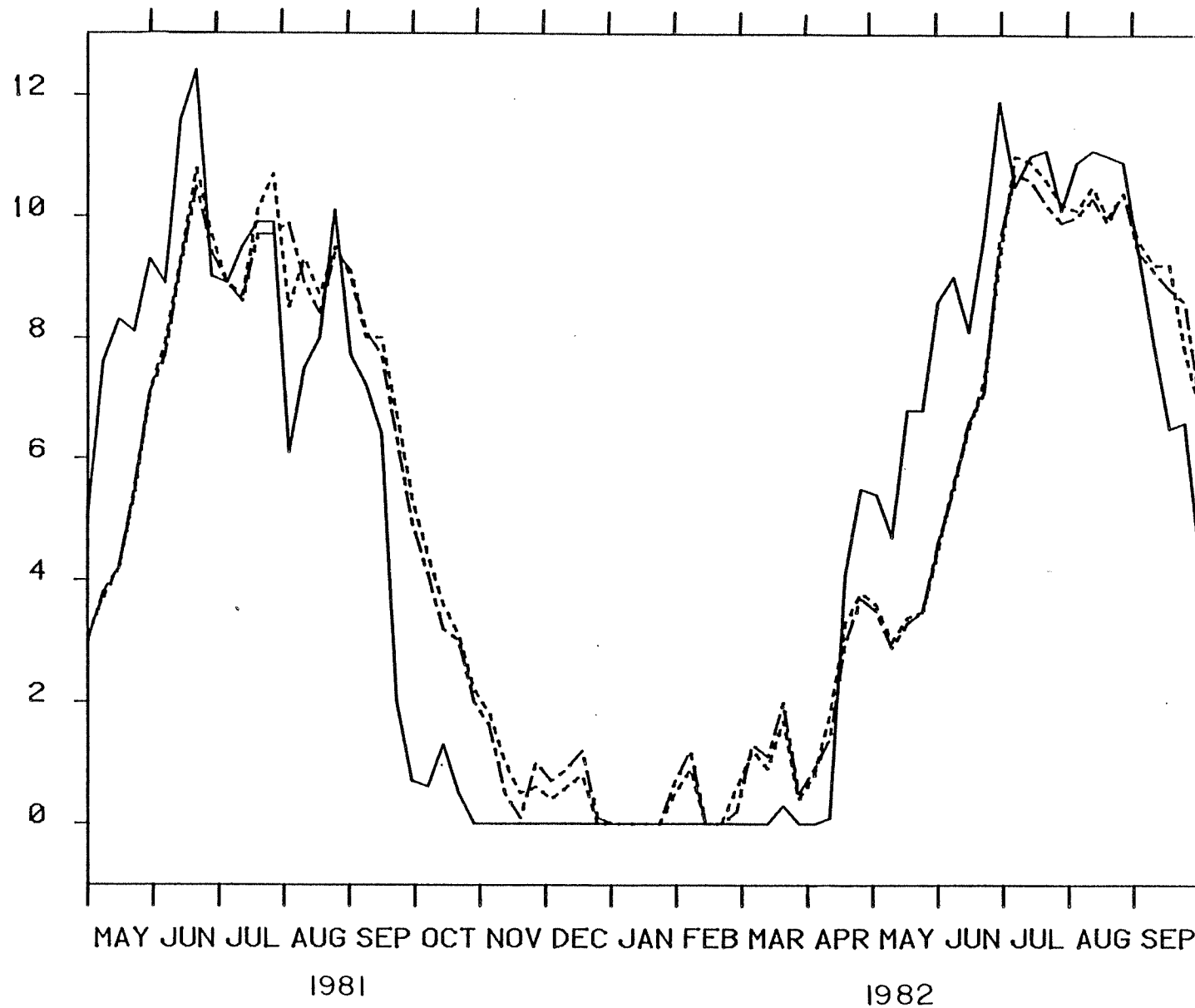
**SIMULATED TEMPERATURES AT RIVER MILE 130**





**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

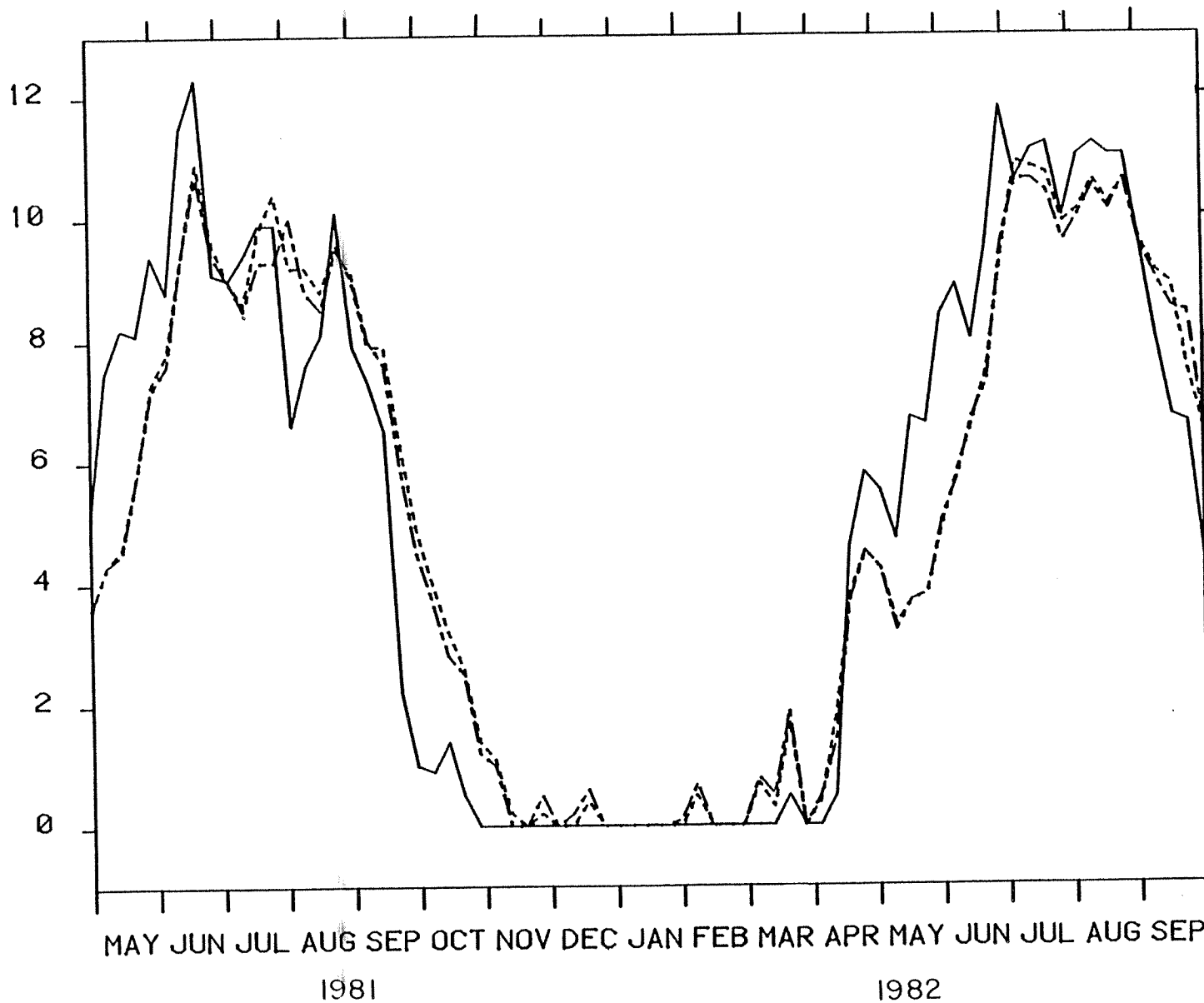
LEGEND

- 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<br>RIVER MILE 150<br>STAGE I |             |
| DATE: _____                                                       | BY: _____   |
| APPROVED: _____                                                   | DATE: _____ |

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

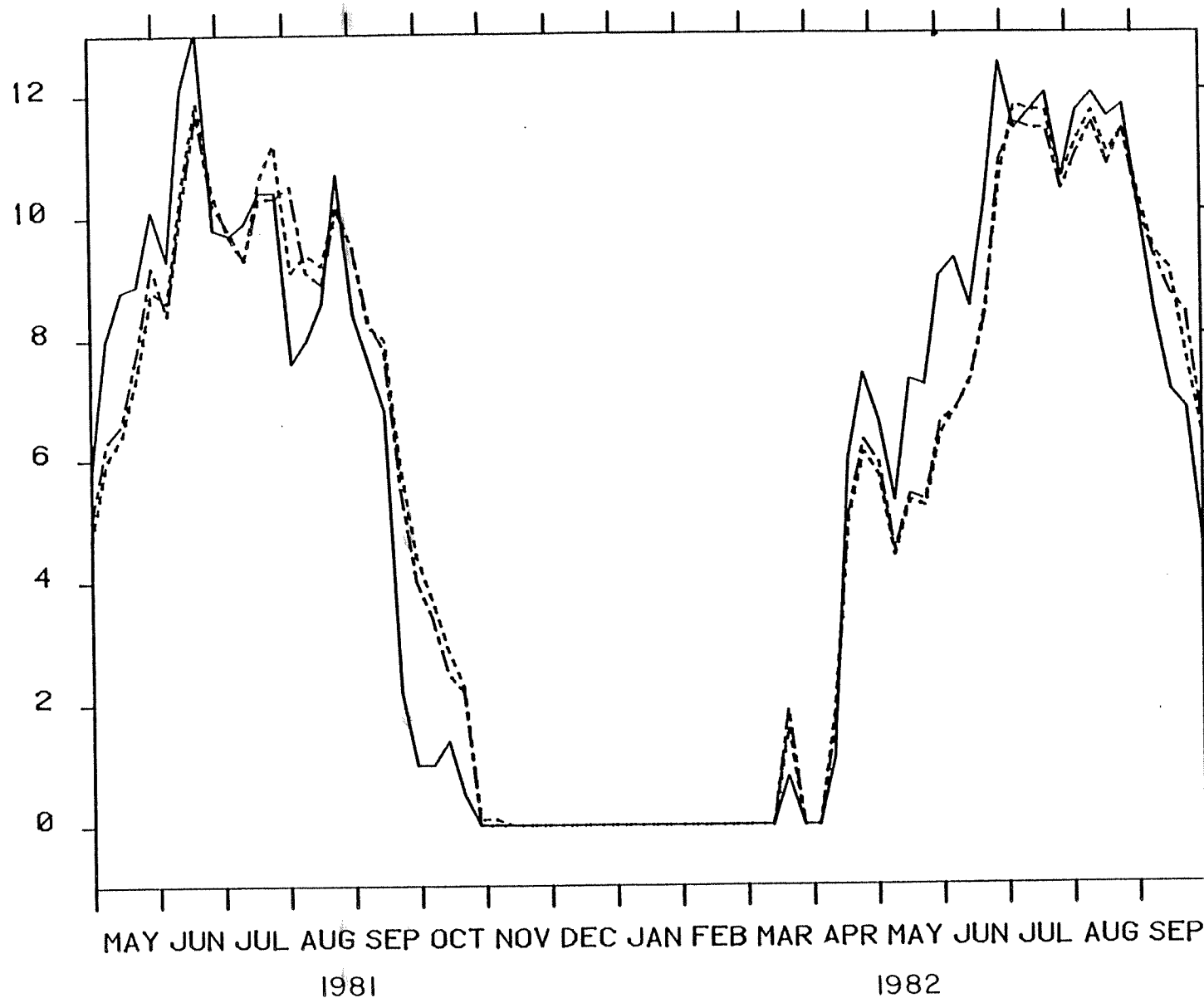
#### LEGEND

- 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. L. HARRIS |

FIGURE E.2.4. 88

DEGREES C



NOTES:

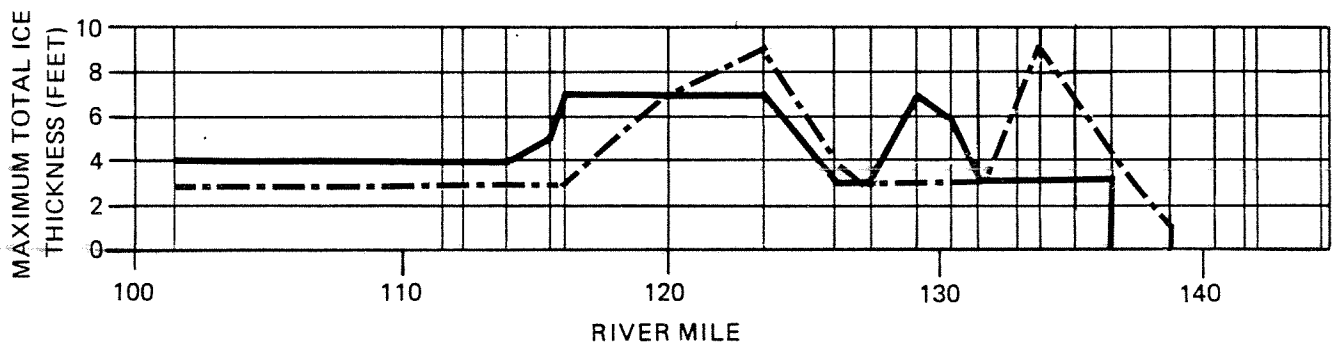
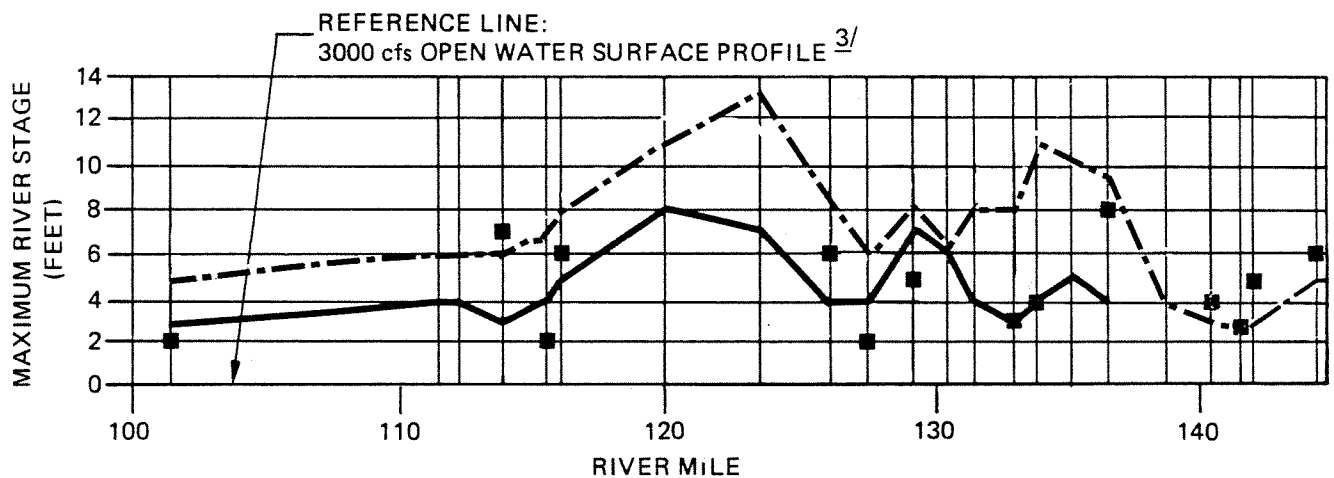
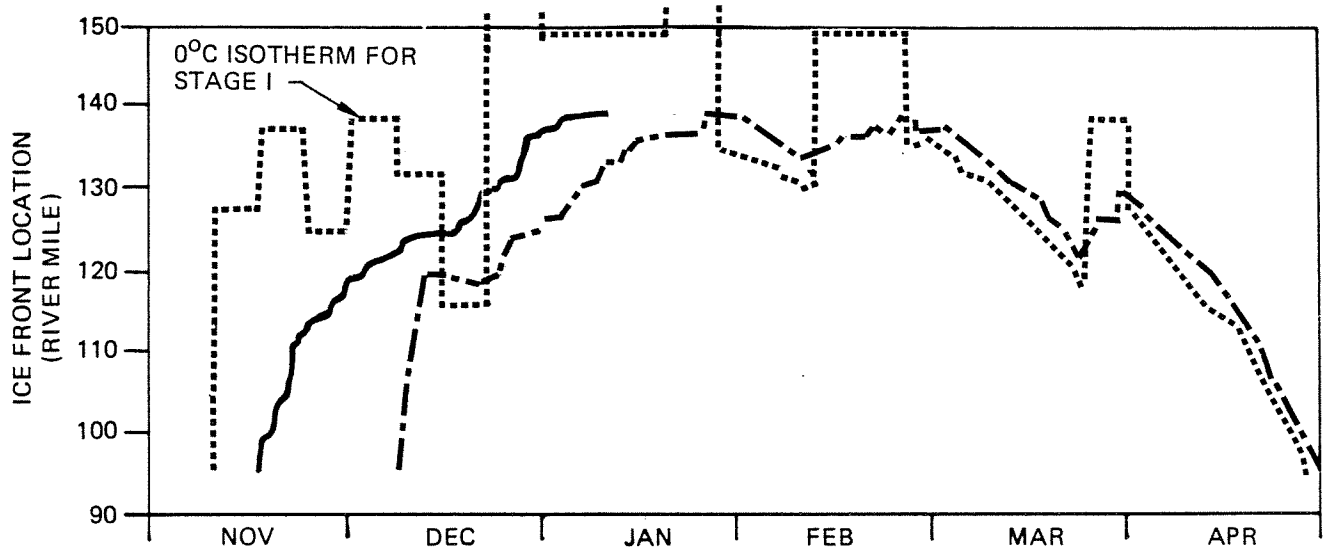
1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 1 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-APRIL SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON 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: MAY 1981                                              | BY: J. L. HARRIS |
| REVISION: 1.0                                               | DATE: MAY 1981   |

FIGURE E.2.4.89



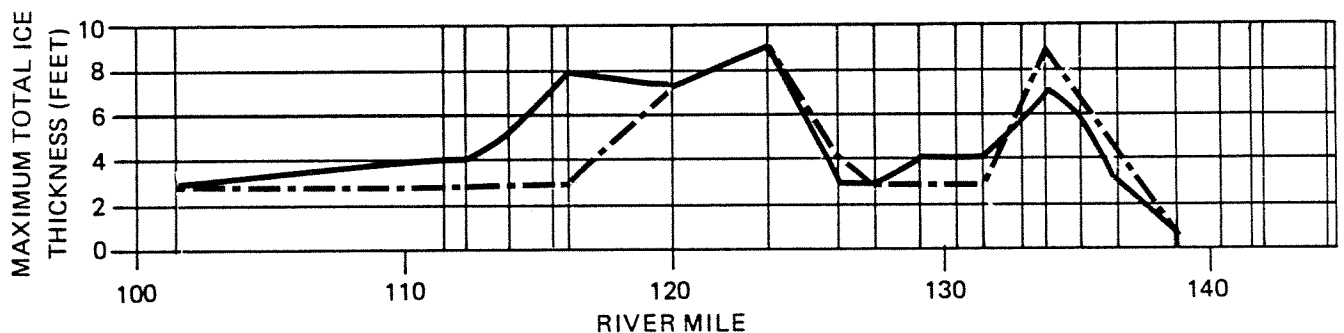
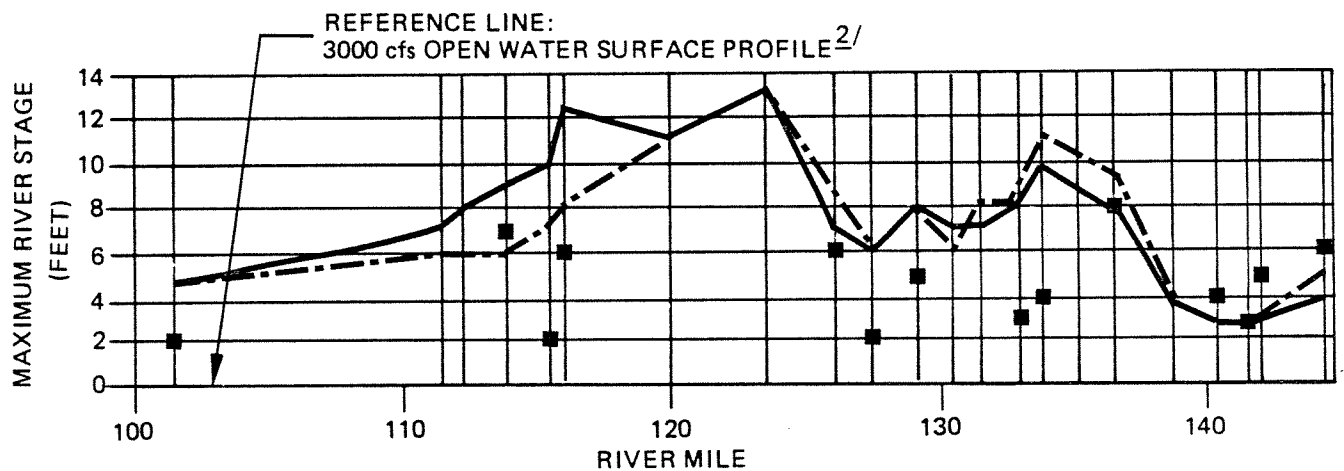
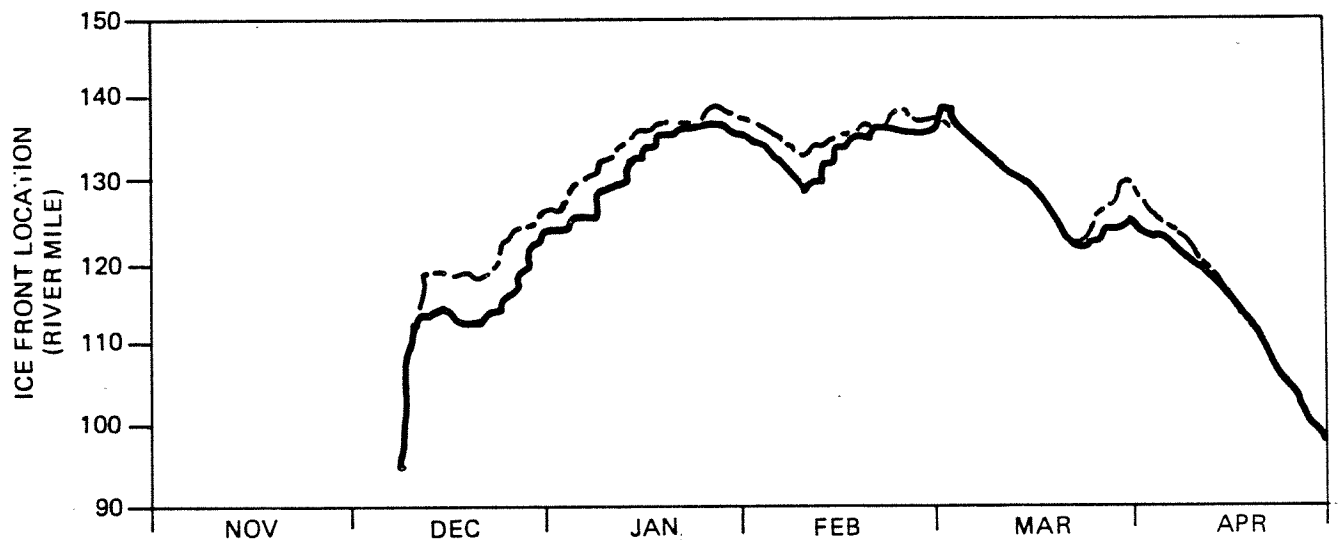
NOTES:

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.

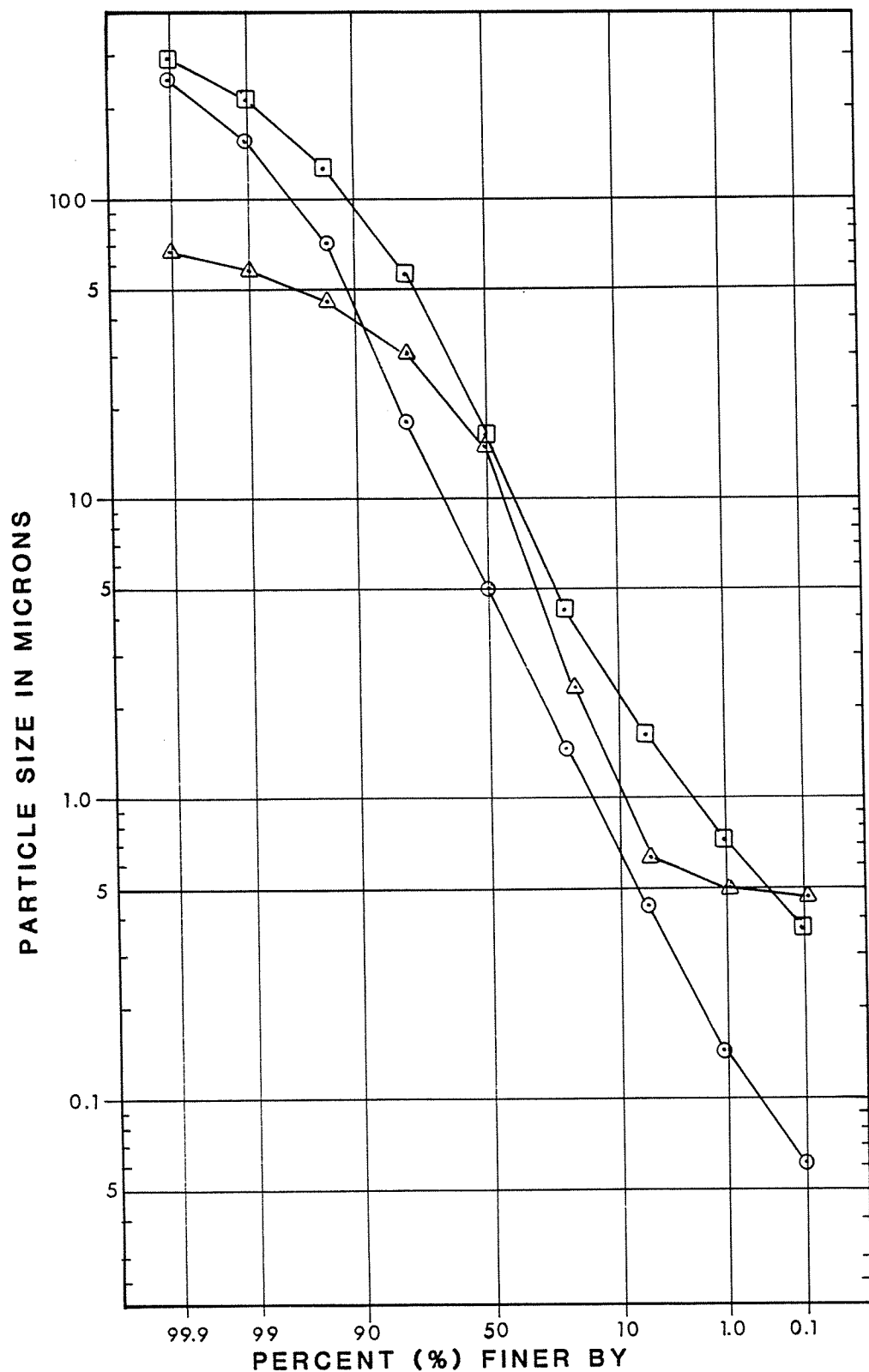
LEGEND:

— 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

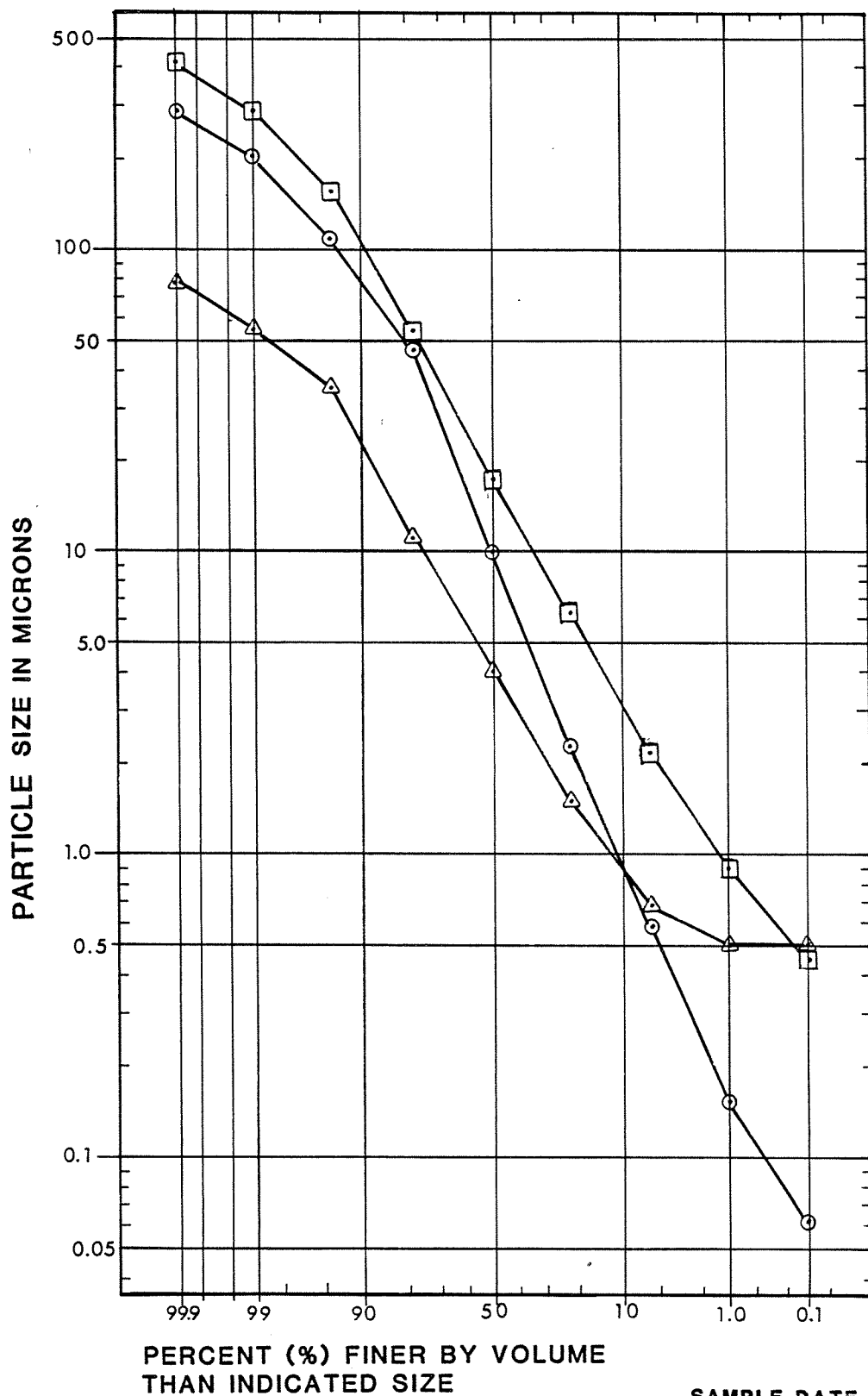
○ 7/20/84

□ 8/28/84

△ 10/23/84

EAST FORK EKLUTNA CREEK

SUSPENDED SEDIMENT PARTICLE SIZE DISTRIBUTION



SAMPLE DATE

○ 7/20/84

□ 8/28/84

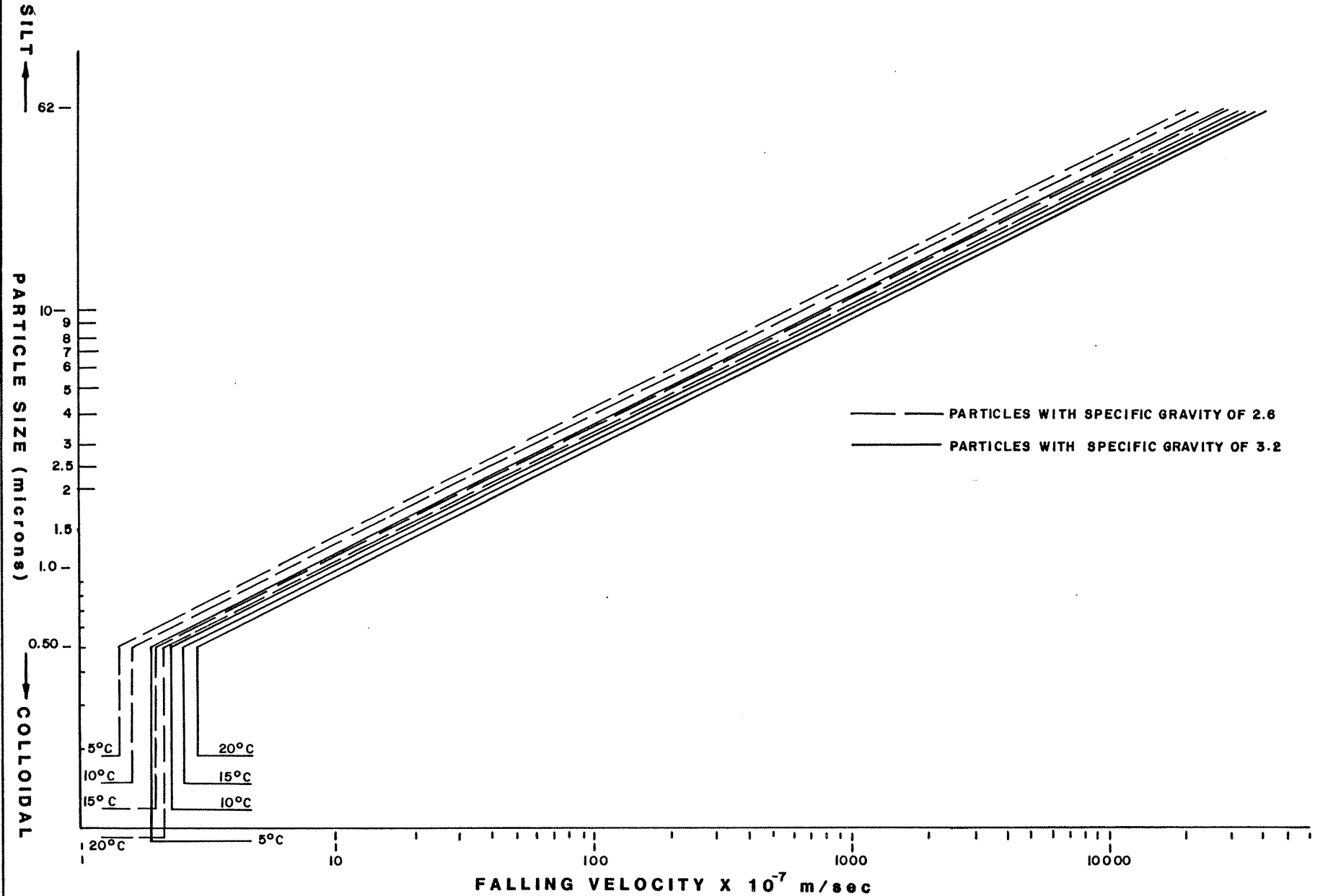
△ 10/23/84

SOURCE: R & M 1985f

GLACIER FORK EKLUTNA CREEK  
SUSPENDED SEDIMENT PARTICLE SIZE DISTRIBUTION

FIGURE  
E.2.4.93

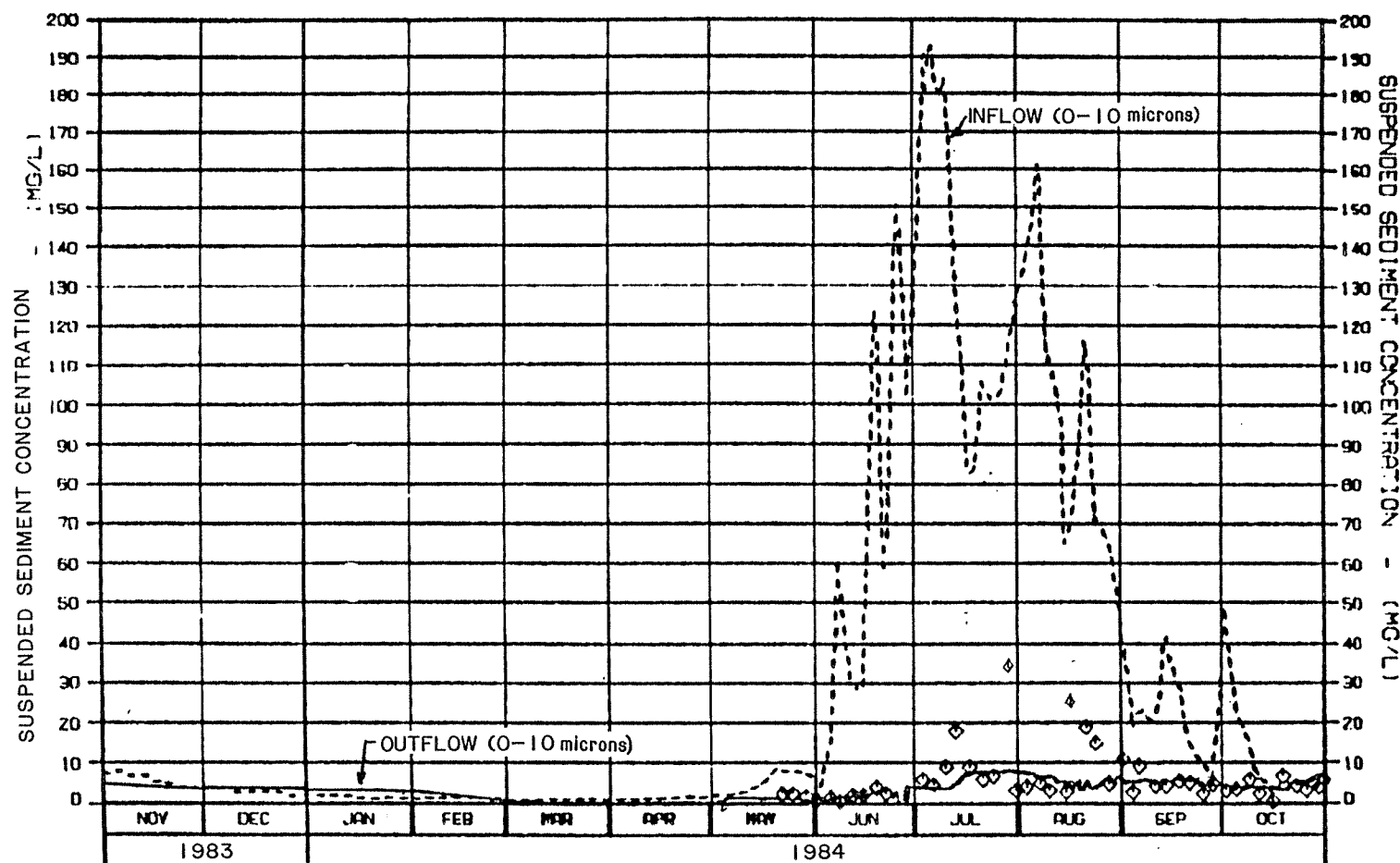




**STOKES LAW FOR FALL VELOCITIES  
VARIATIONS WITH RESPECT TO  
TEMPERATURE AND PARTICLE DENSITY**

SOURCE: R&M 1985f

FIGURE E.2.4.94



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

FIGURE  
 E.2.4.95

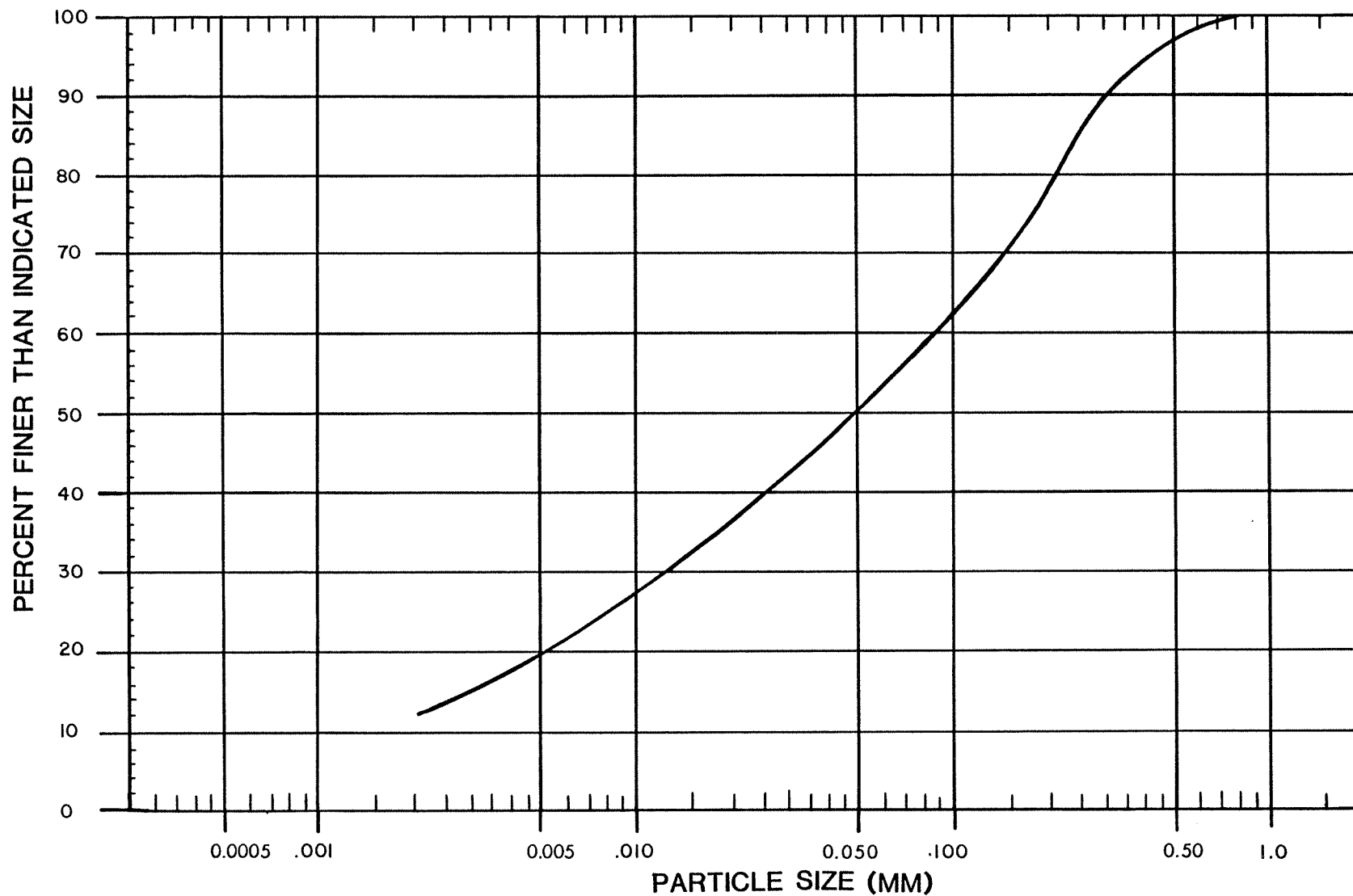
ALASKA POWER AUTHORITY

SUBMITTER PROJECT CYROSEM MODEL

EKLUTNA LAKE  
 OUTFLOW (0-10 MICRON)  
 SUSPENDED SEDIMENT

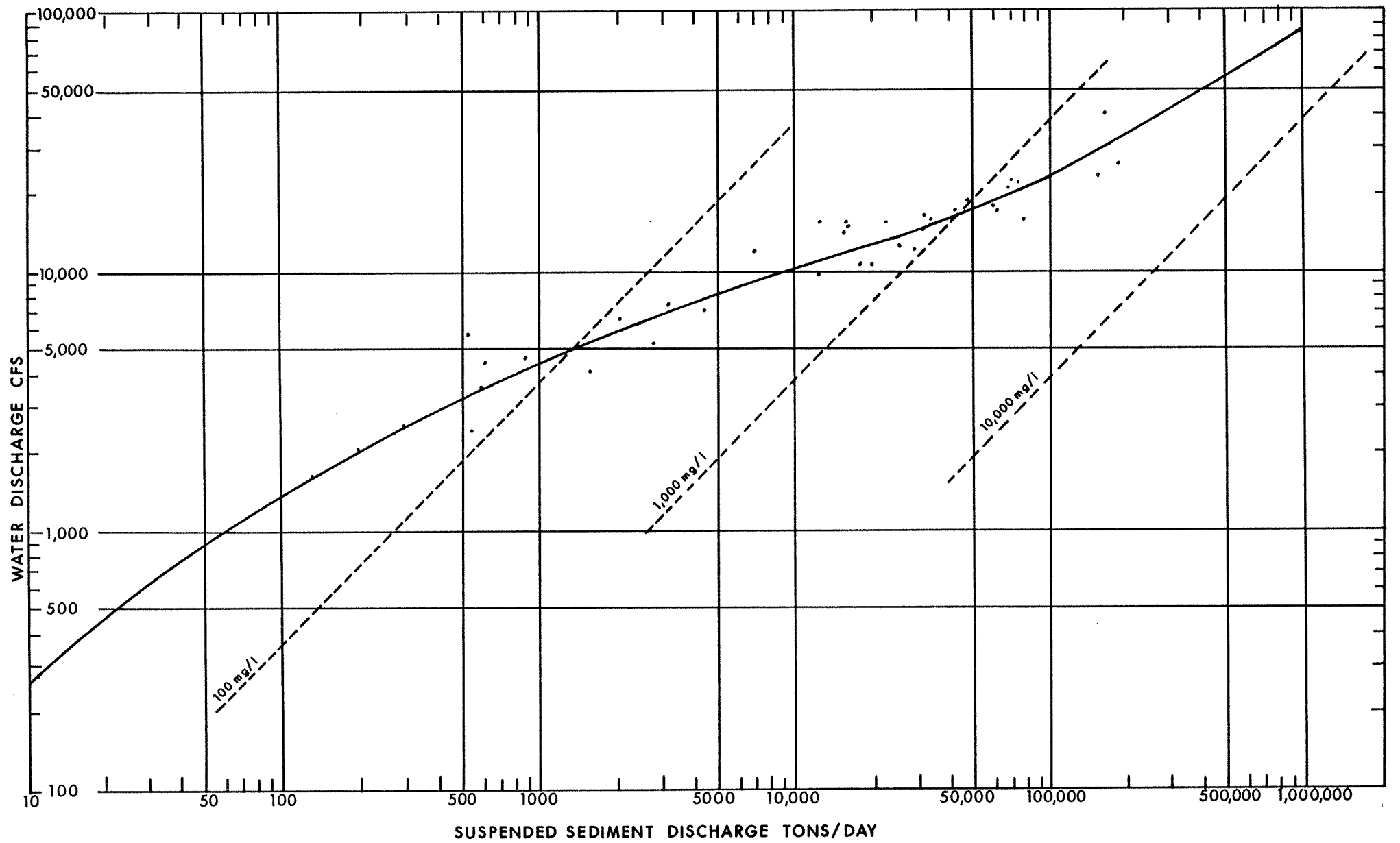
HARZA-EBASCO JOINT VENTURE

CHICAGO, ILL. 60678 8 JUL 85 42-010-04

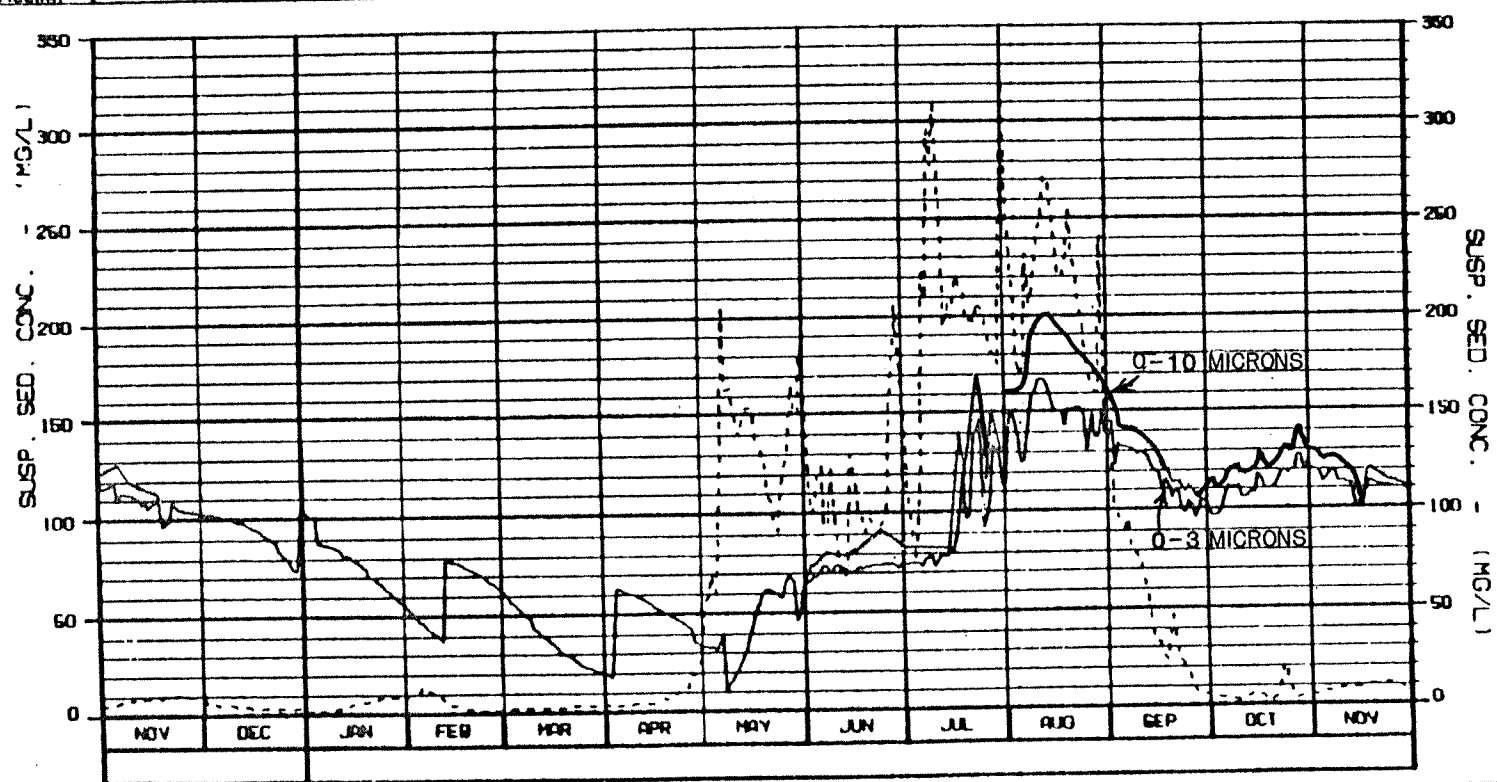


SUSPENDED SEDIMENT SIZE DISTRIBUTION  
SUSITNA RIVER NEAR CANTWELL

FIGURE E.2.4.96



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



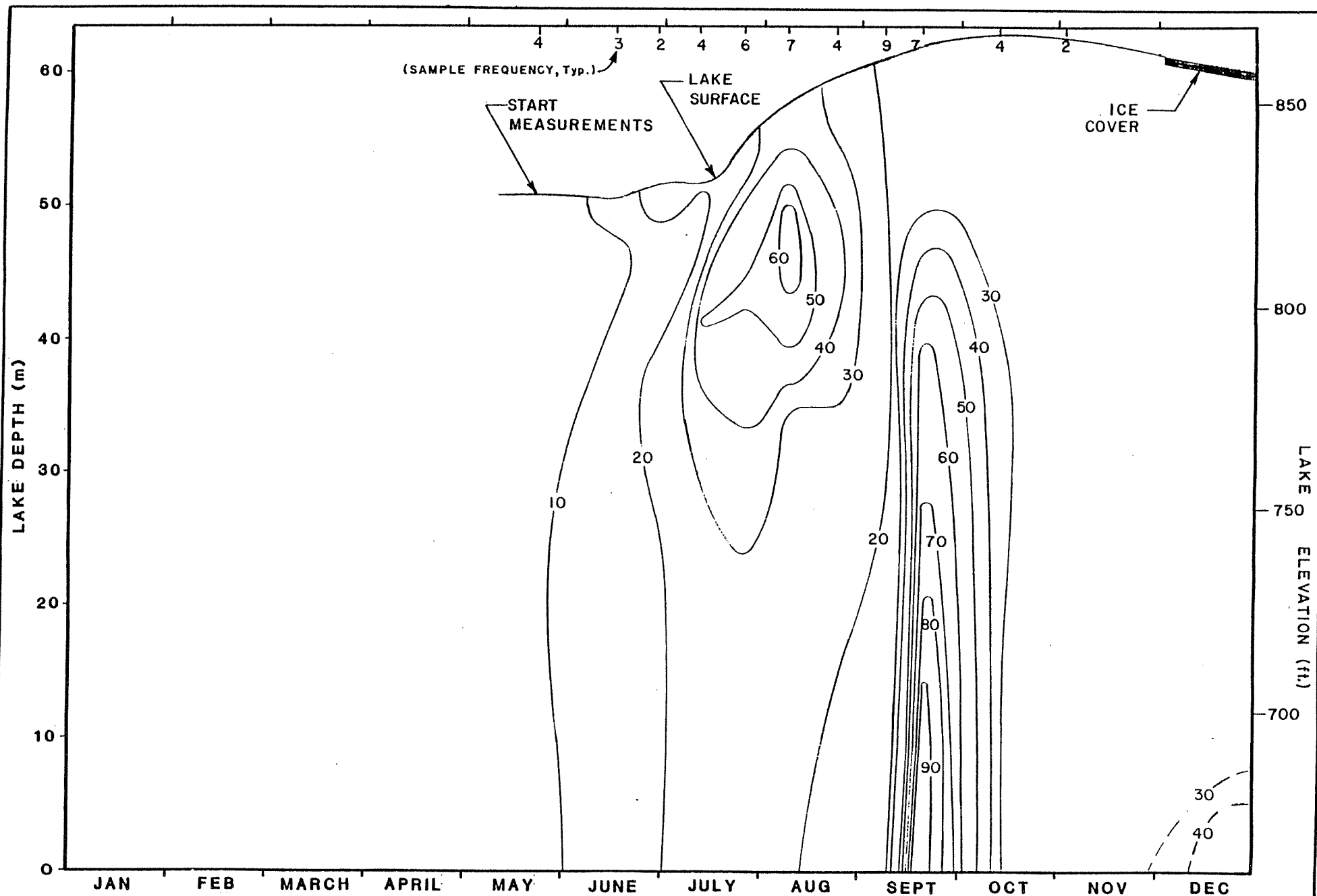
|        | PREDICTED OUTFLOW                                  | SUSP. SED. CONCENTRATION (MG/L) |
|--------|----------------------------------------------------|---------------------------------|
| INFLOW | SUSP. SED. CONCENTRATION (MG/L) (0-3 MICRONS ONLY) |                                 |
| 1      | 2                                                  | 3                               |
| 4      | 5                                                  | 6                               |
| 7      | 8                                                  | 9                               |
| 10     | 11                                                 | 12                              |
| 13     | 14                                                 | 15                              |
| 16     | 17                                                 | 18                              |
| 19     | 20                                                 | 21                              |
| 22     | 23                                                 | 24                              |
| 25     | 26                                                 | 27                              |
| 28     | 29                                                 | 30                              |
| 31     | 32                                                 | 33                              |
| 34     | 35                                                 | 36                              |
| 37     | 38                                                 | 39                              |
| 40     | 41                                                 | 42                              |
| 43     | 44                                                 | 45                              |
| 46     | 47                                                 | 48                              |
| 49     | 50                                                 | 51                              |
| 52     | 53                                                 | 54                              |
| 55     | 56                                                 | 57                              |
| 58     | 59                                                 | 60                              |
| 61     | 62                                                 | 63                              |
| 64     | 65                                                 | 66                              |
| 67     | 68                                                 | 69                              |
| 70     | 71                                                 | 72                              |
| 73     | 74                                                 | 75                              |
| 76     | 77                                                 | 78                              |
| 79     | 80                                                 | 81                              |
| 82     | 83                                                 | 84                              |
| 85     | 86                                                 | 87                              |
| 88     | 89                                                 | 90                              |
| 91     | 92                                                 | 93                              |
| 94     | 95                                                 | 96                              |
| 97     | 98                                                 | 99                              |
| 100    | 101                                                | 102                             |

|                    |           |           |
|--------------------|-----------|-----------|
| ENCLOSURE, 11-1-68 | 20 NOV 68 | 42-010-00 |
|--------------------|-----------|-----------|

FIGURE 2.4.98

|                        |          |           |
|------------------------|----------|-----------|
| CHURCH, H. L. 10-10-10 | 10-10-10 | 42-010-05 |
|------------------------|----------|-----------|

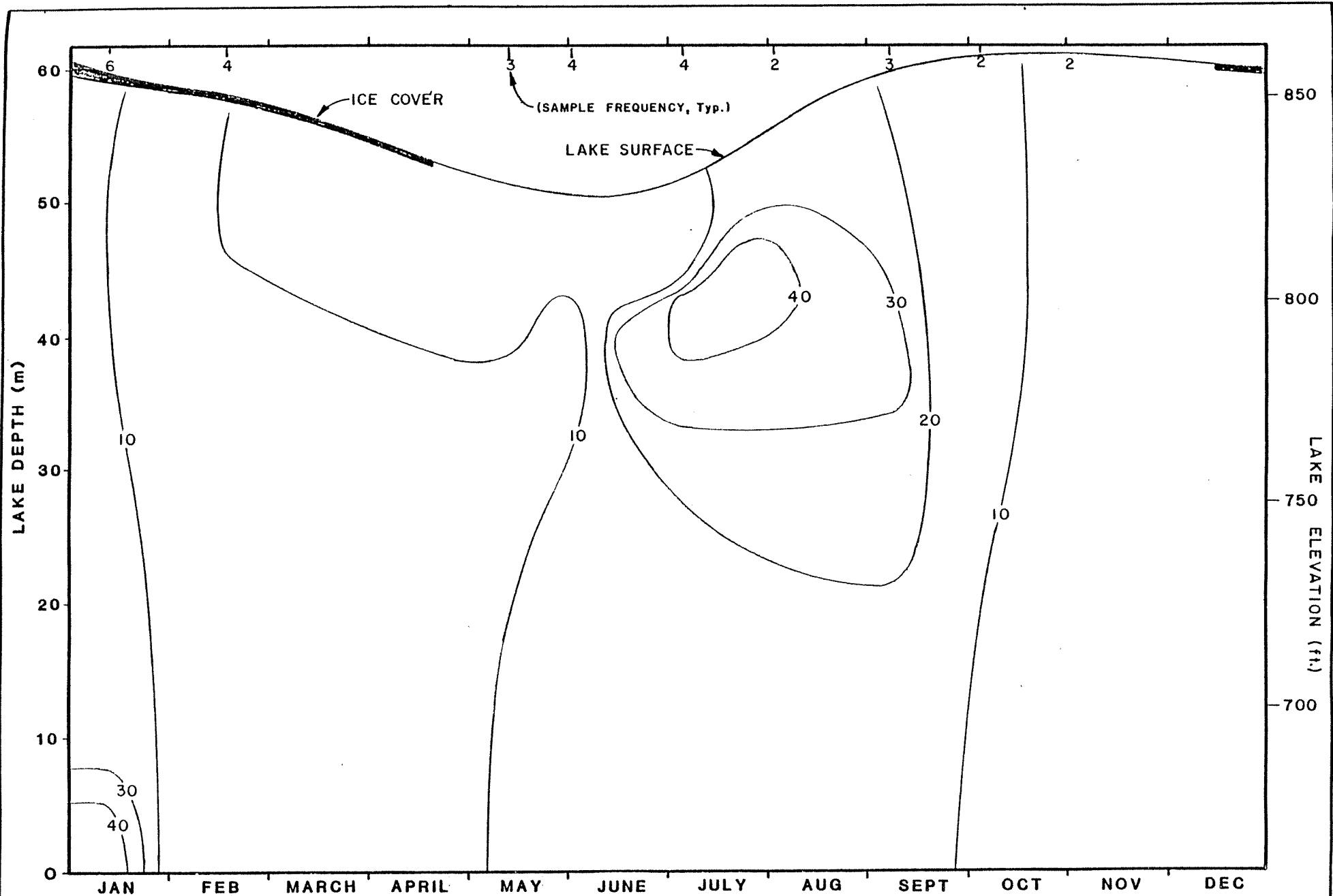




SOURCE : R & M 1982 f

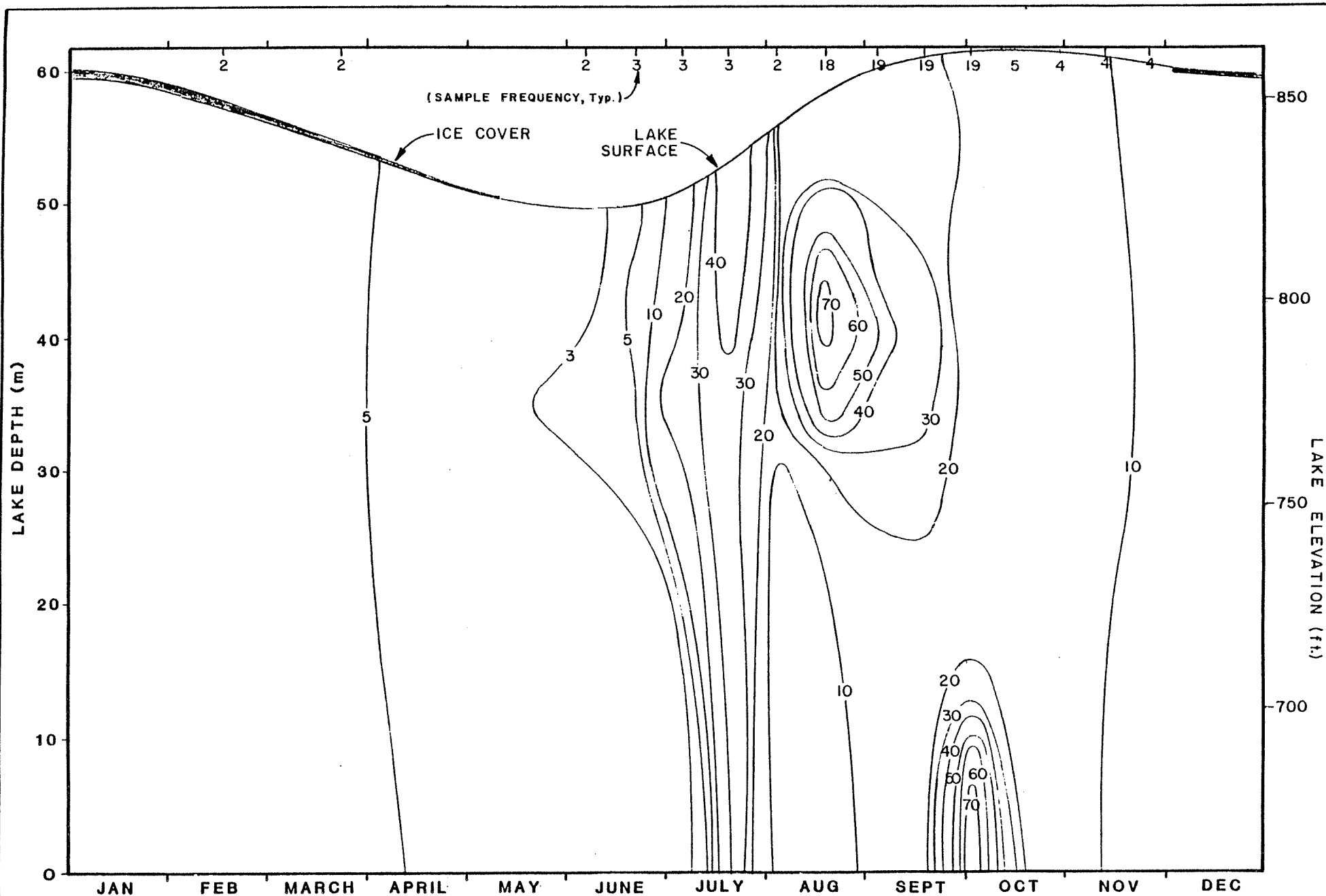
FIGURE E.2.4.101





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

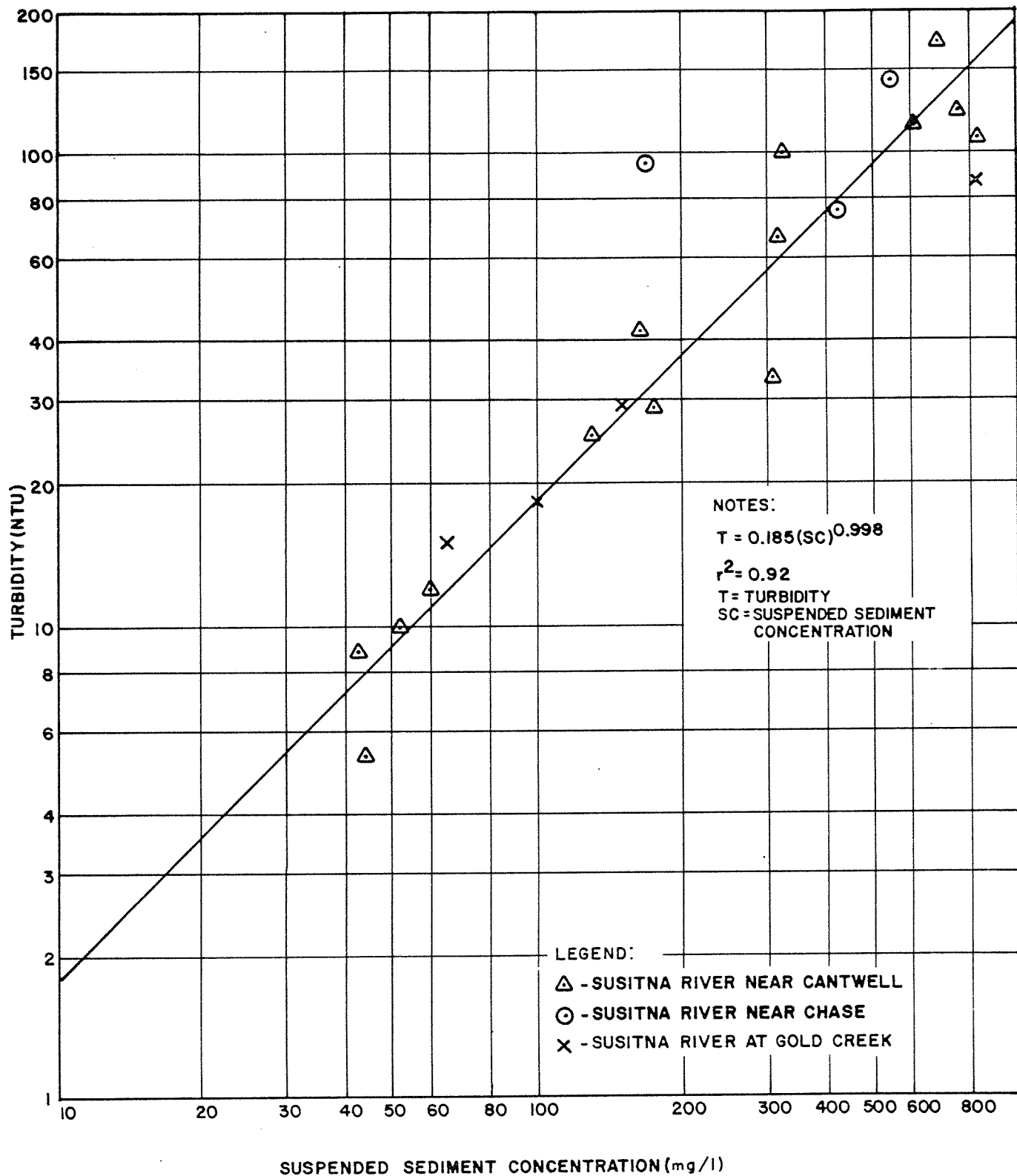
SOURCE: R & M 1982 f



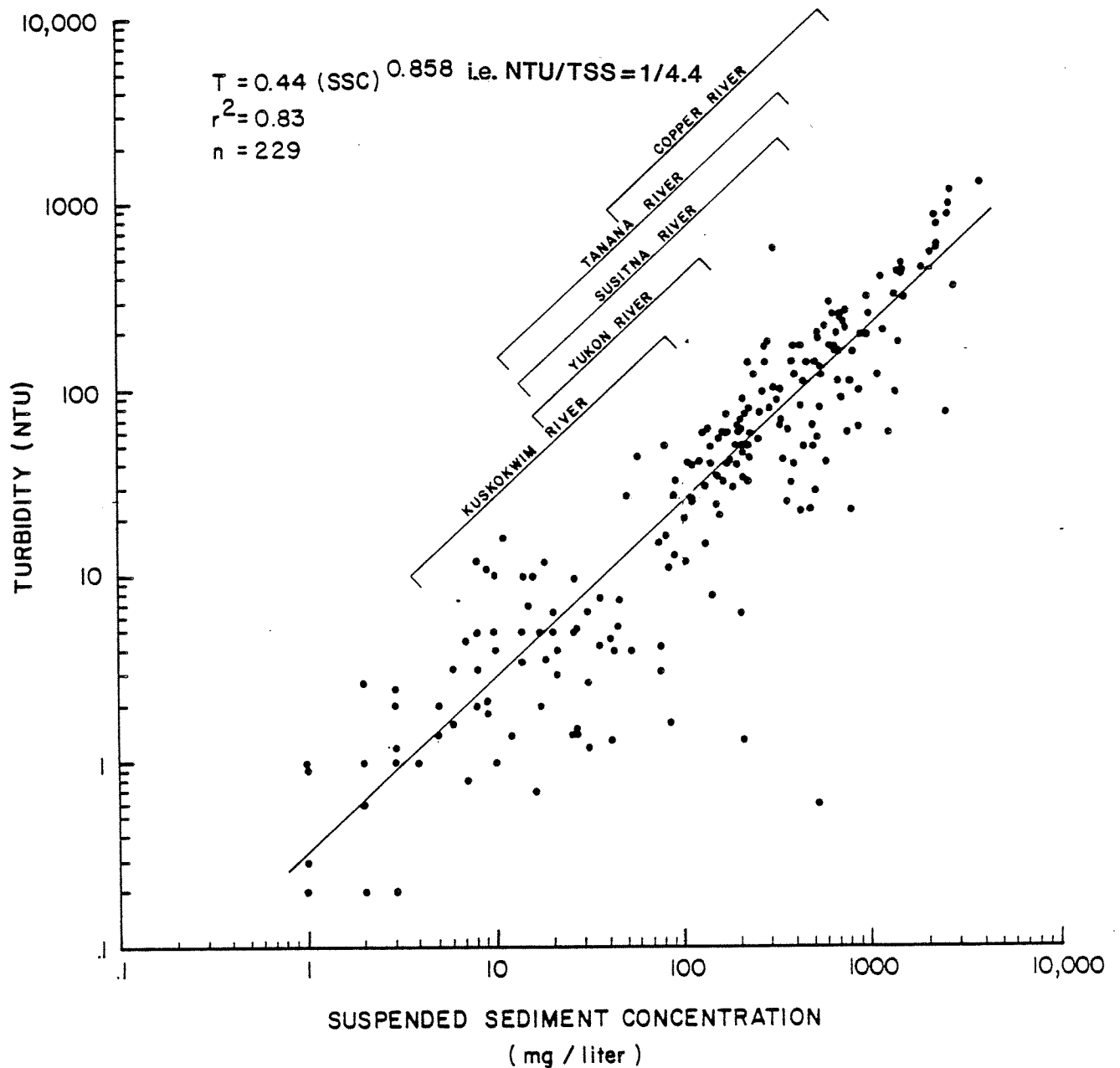
**ISO-TURBIDITY vs. TIME**  
**EKLUTNA LAKE at STATION 9**  
**1984**

SOURCE: R & M 1982f

FIGURE E.2.4.103

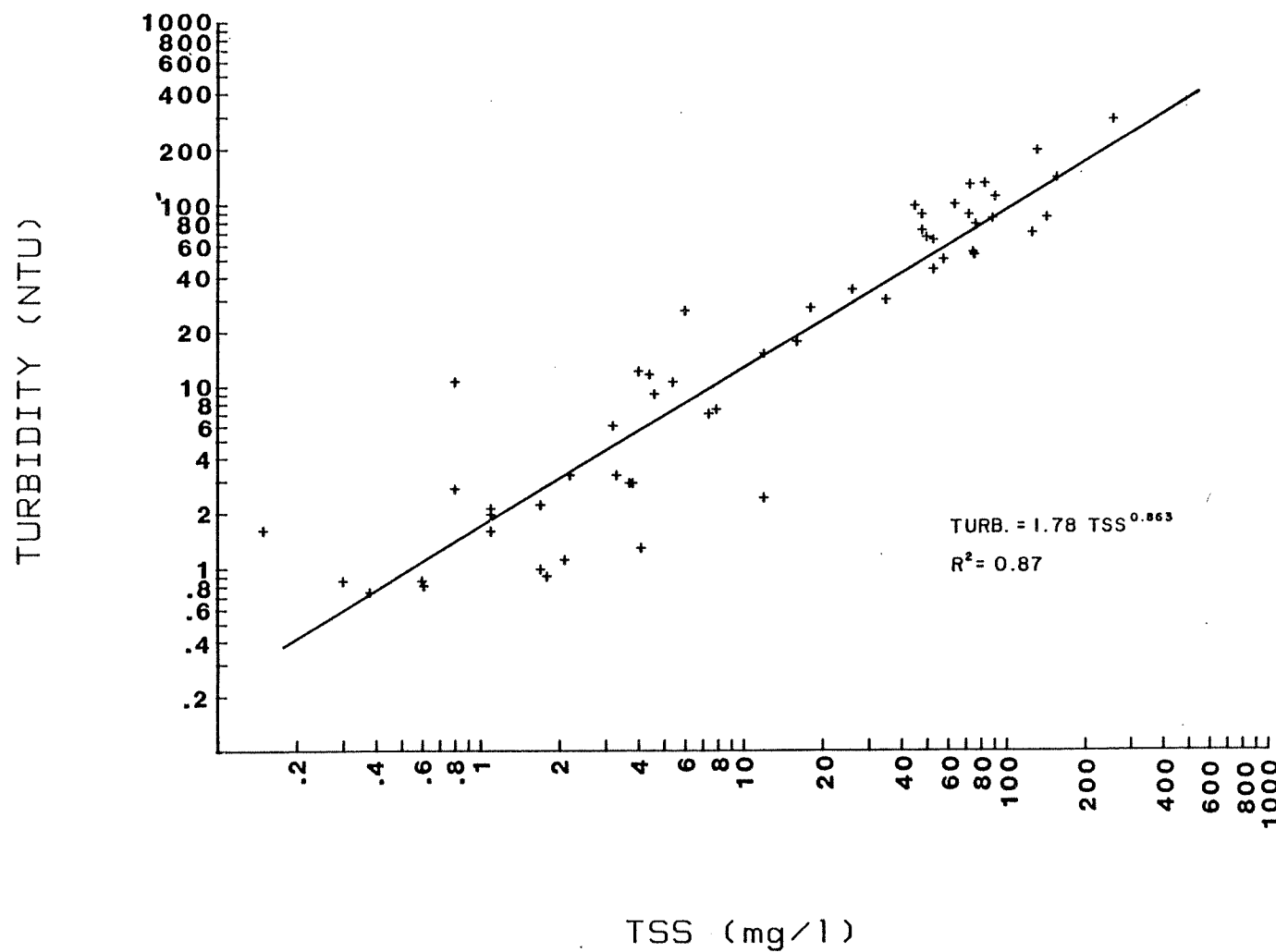


TURBIDITY VS.  
SUSPENDED SEDIMENT CONCENTRATION  
SUSITNA RIVER

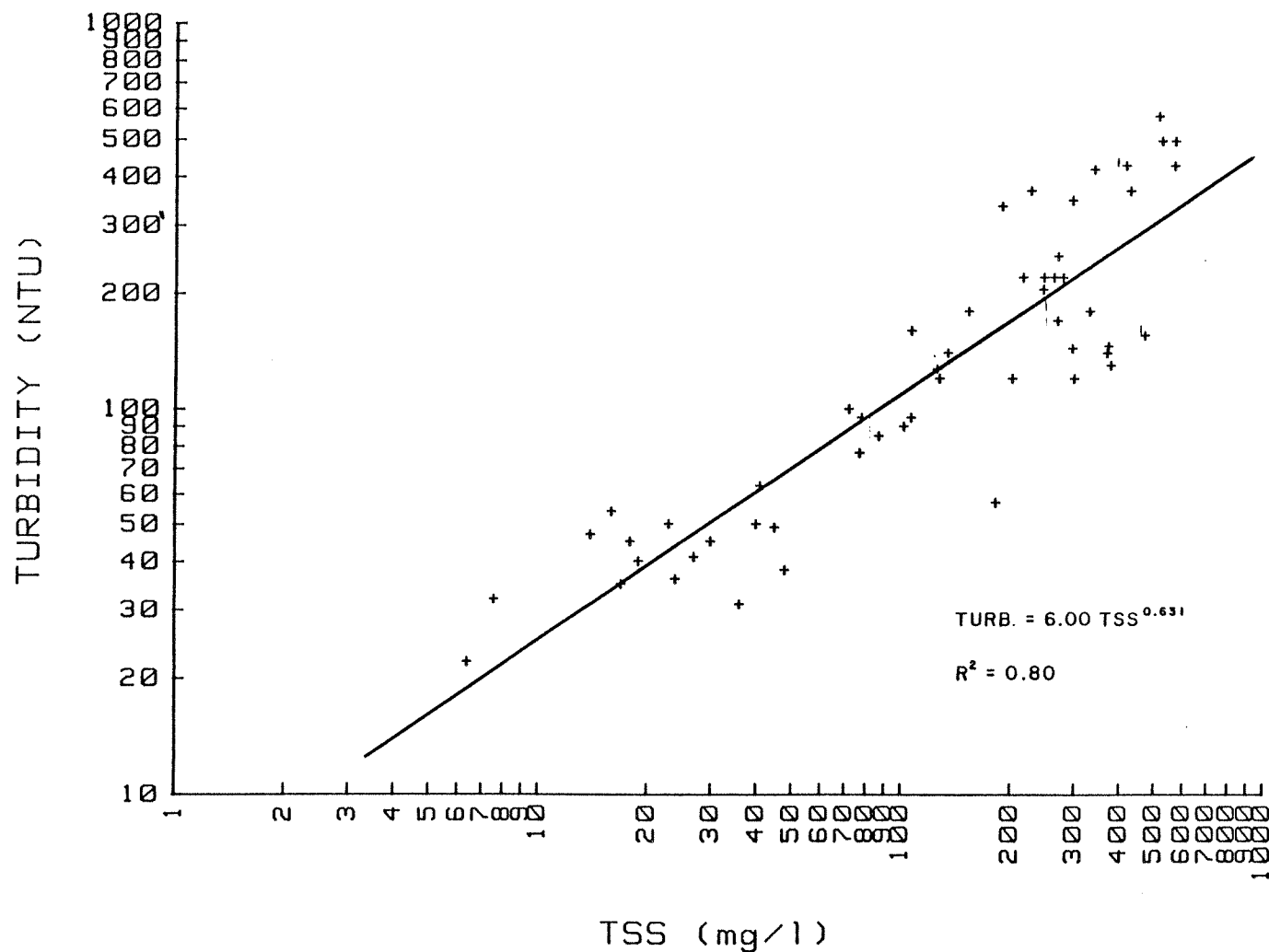


### TURBIDITY VS SUSPENDED SEDIMENT CONCENTRATION IN SEVERAL ALASKAN RIVERS

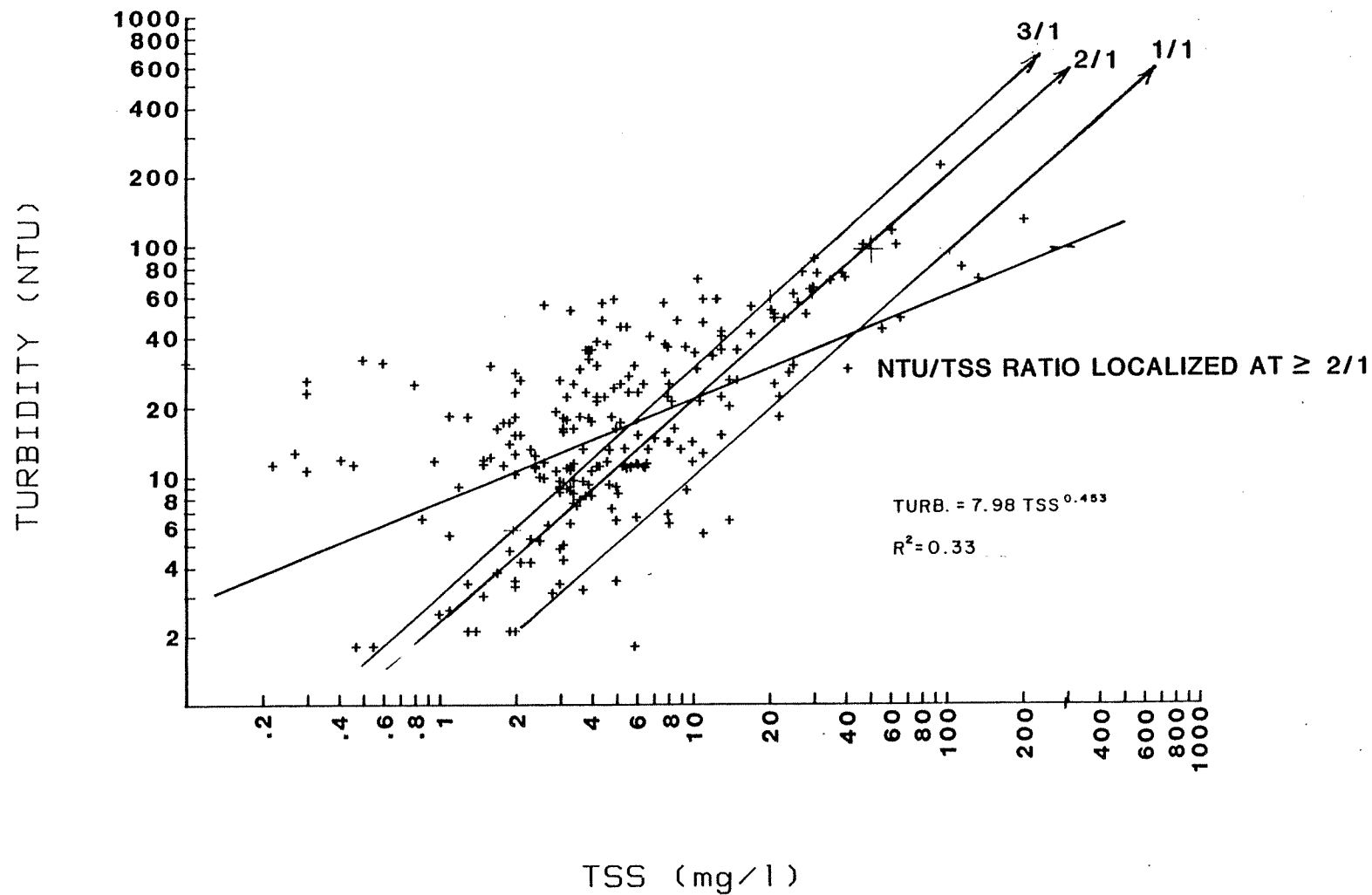
Figure Empirical relationship of naturally occurring turbidity versus suspended sediment concentration for rivers and streams in Alaska, sampled during May-October, 1976 - 1983 (derived in this report from data provided by USGS, 1984).



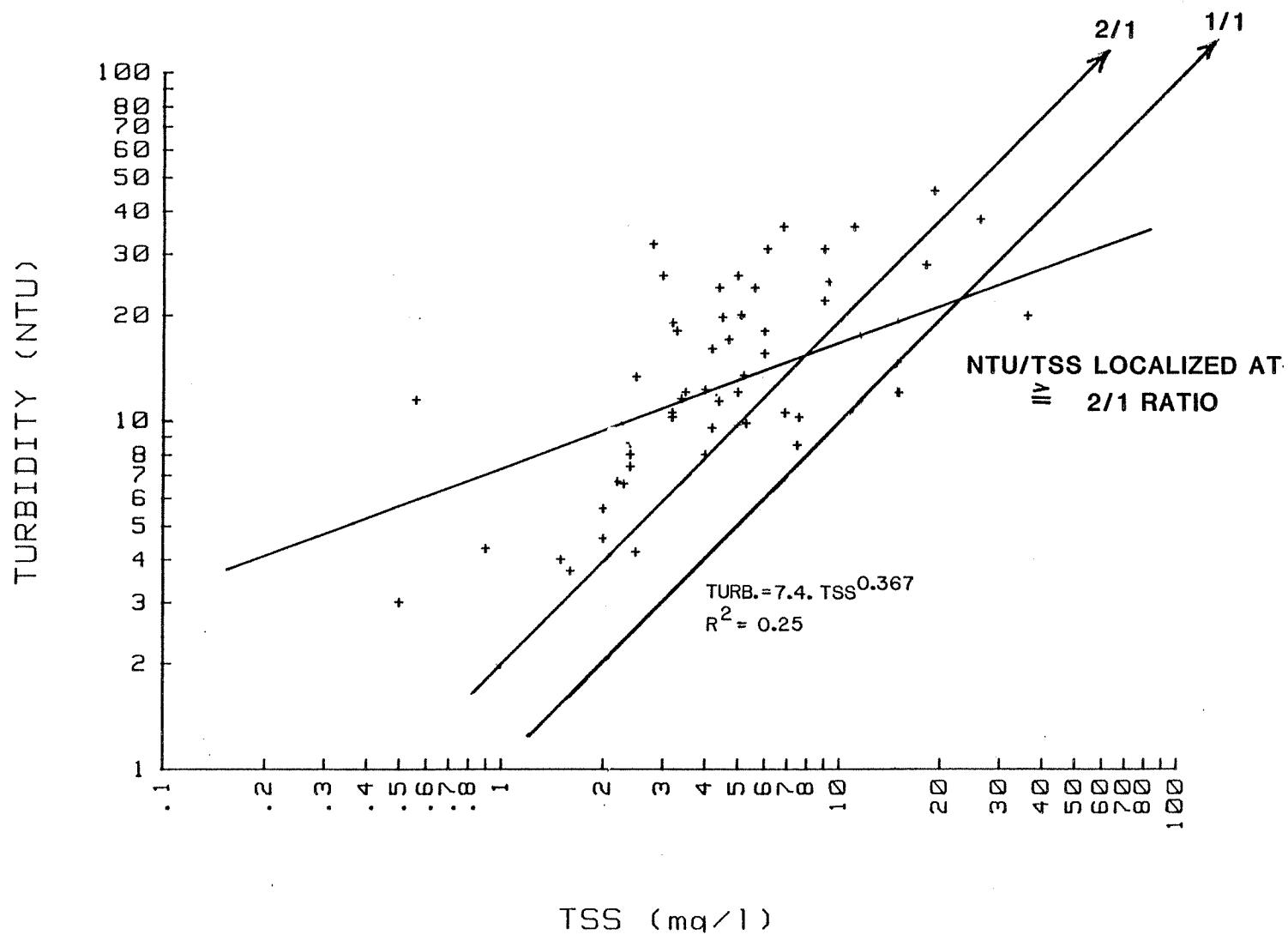
**TURBIDITY VS SUSPENDED SEDIMENT CONCENTRATION  
EAST FORK TRIBUTARY TO EKLUTNA LAKE, 1984**



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

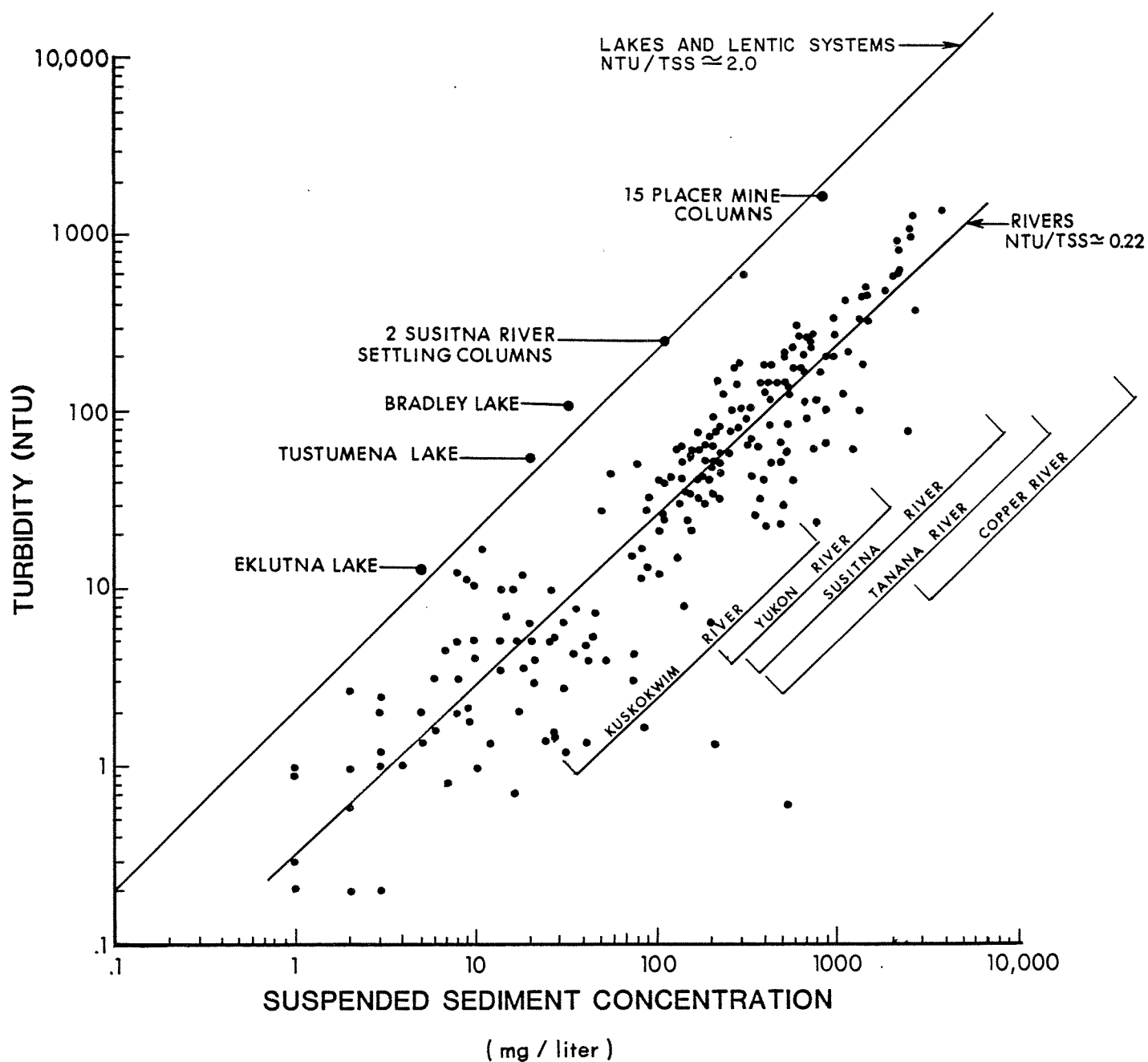


TURBIDITY VS SUSPENDED SEDIMENT CONCENTRATION  
EKLUTNA LAKE

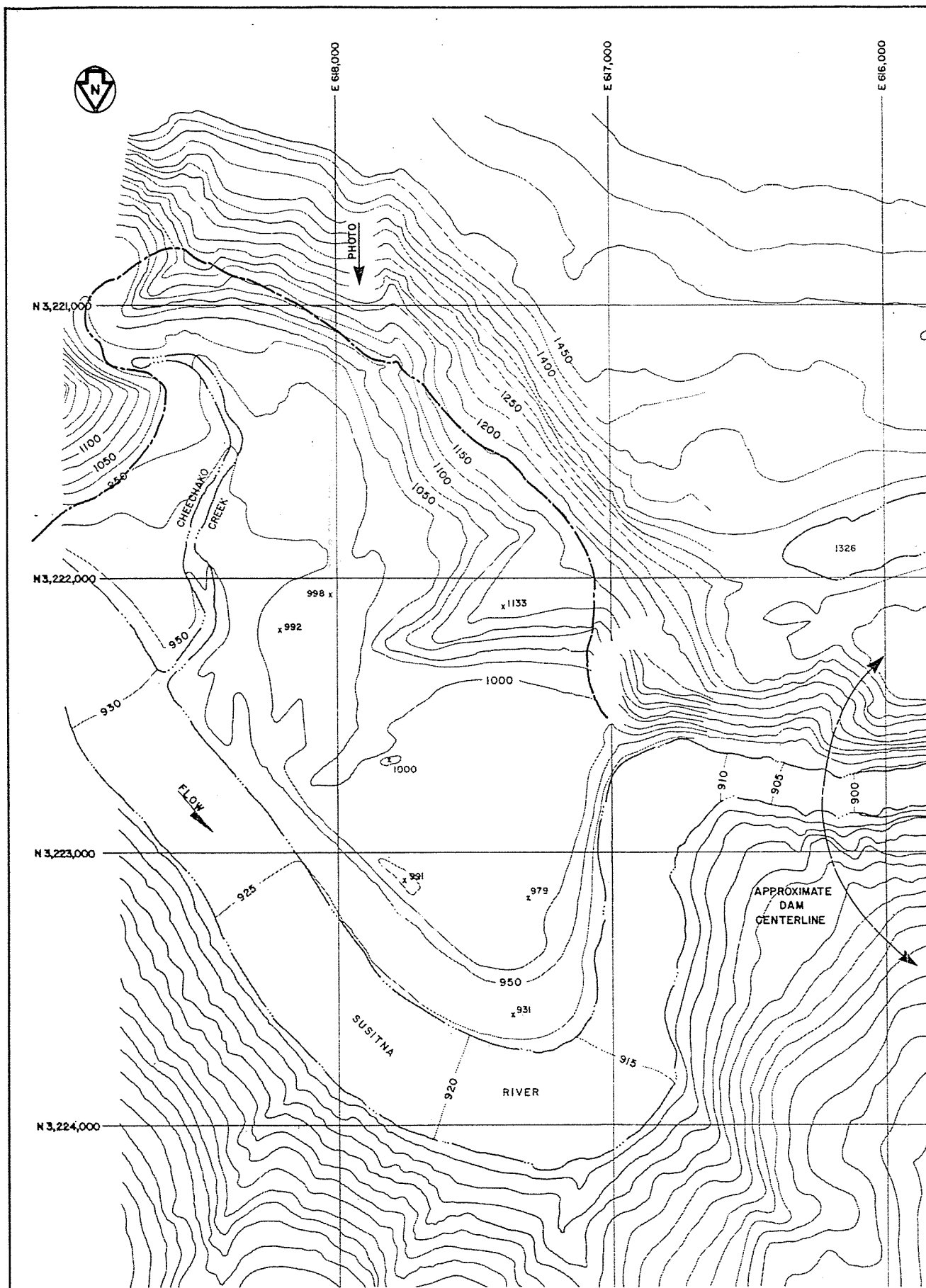


TURBIDITY VS SUSPENDED SEDIMENT CONCENTRATION  
 EKLUTNA LAKE POWERHOUSE TAILRACE, 1984





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

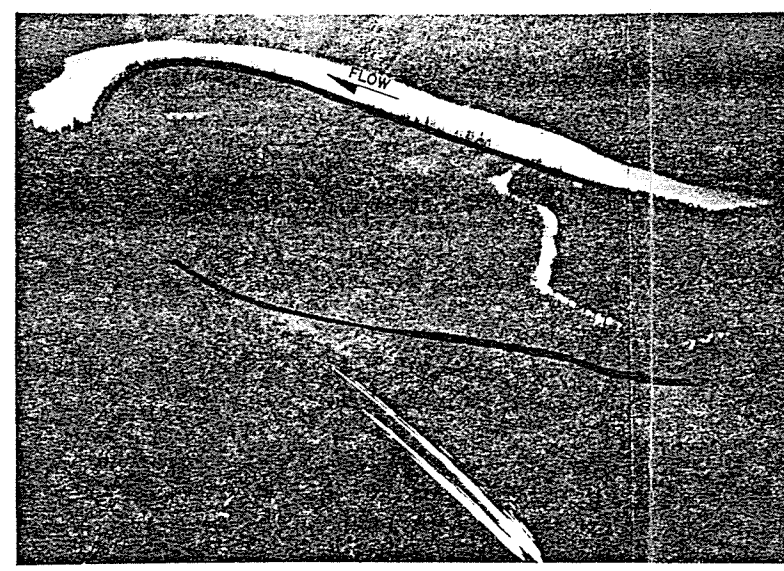


REFERENCE: BASE MAP FROM R & M, 1981 - 1" = 200' DEVIL CANYON  
 TOPOGRAPHY, RETRACED AT 25' CONTOURS  
 USBR, 1960  
 COE, 1978  
 WCC, 1978

DEVIL CANYON  
 BORROW SITE G

**LEGEND**

----- BORROW SITE LIMIT



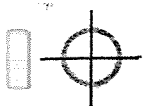
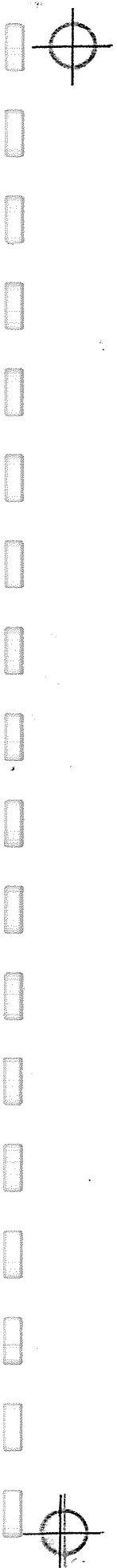
BORROW SITE G

**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





E 620,000

E 618,000

E 616,000

E 614,000

E 612,000

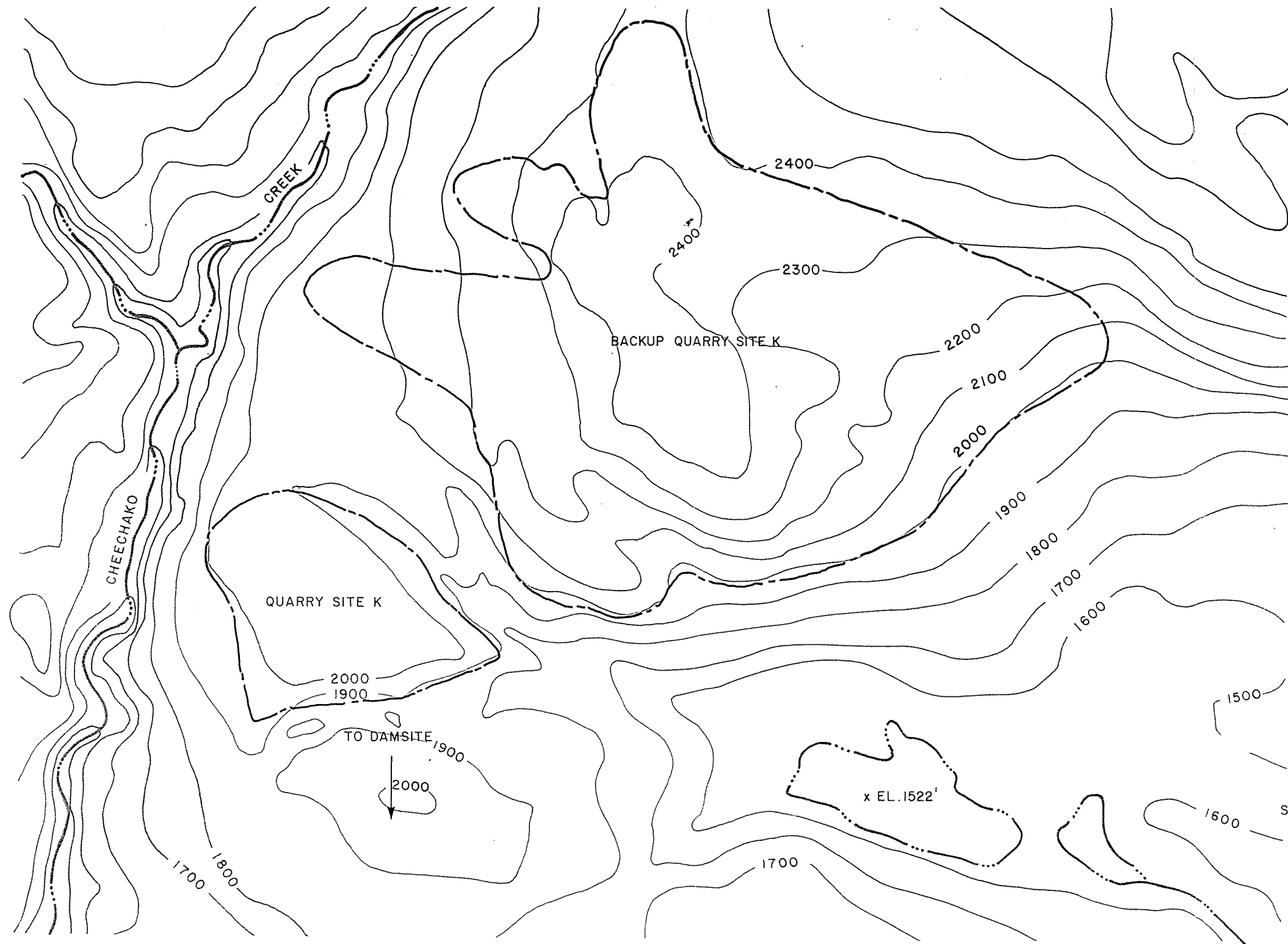
E 610,000

N 3,212,000

N 3,214,000

N 3,216,000

N 3,218,000

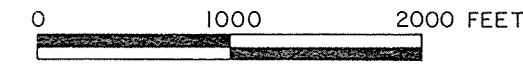


LEGEND

--- MATERIAL LIMITS

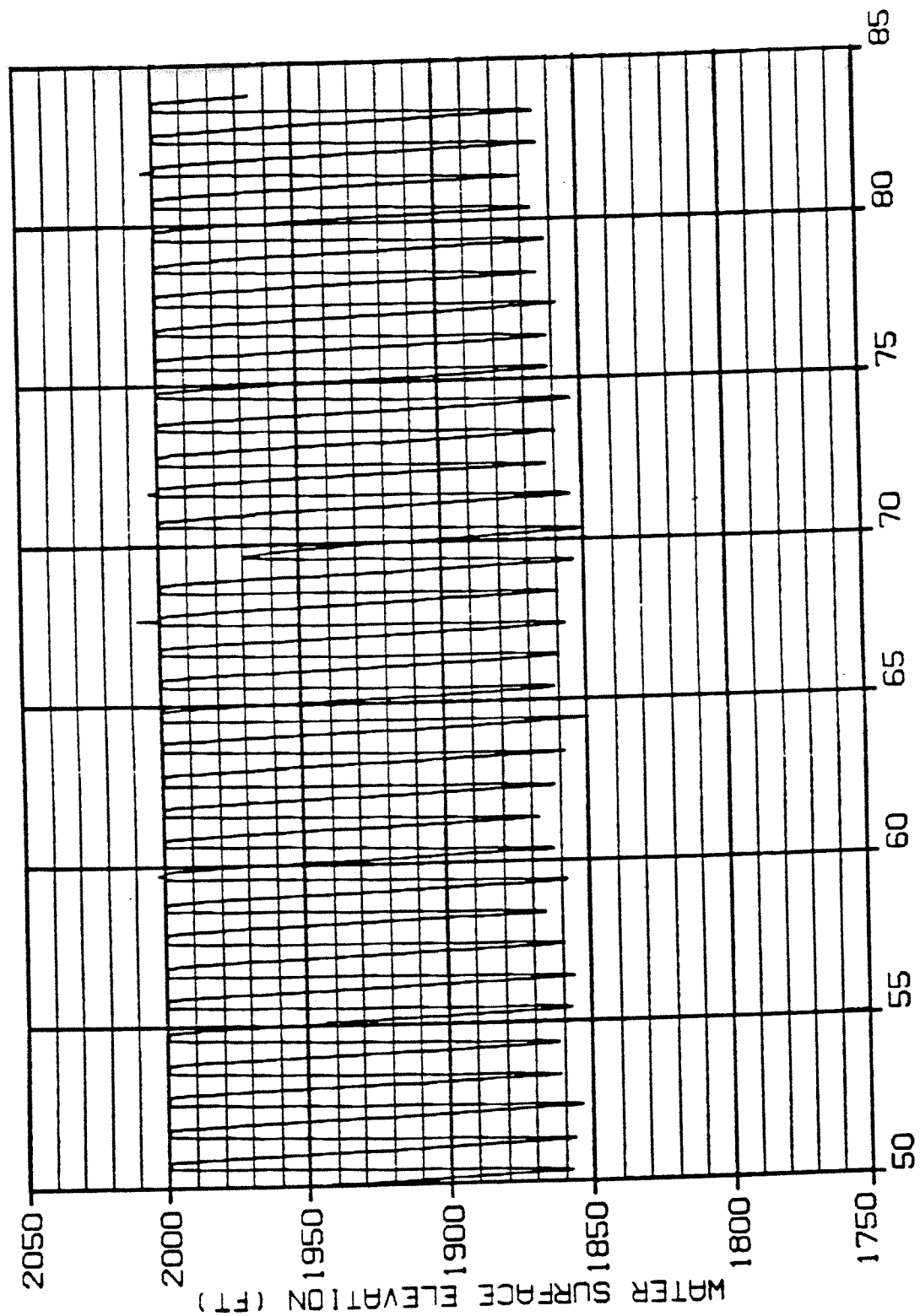
NOTES

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.

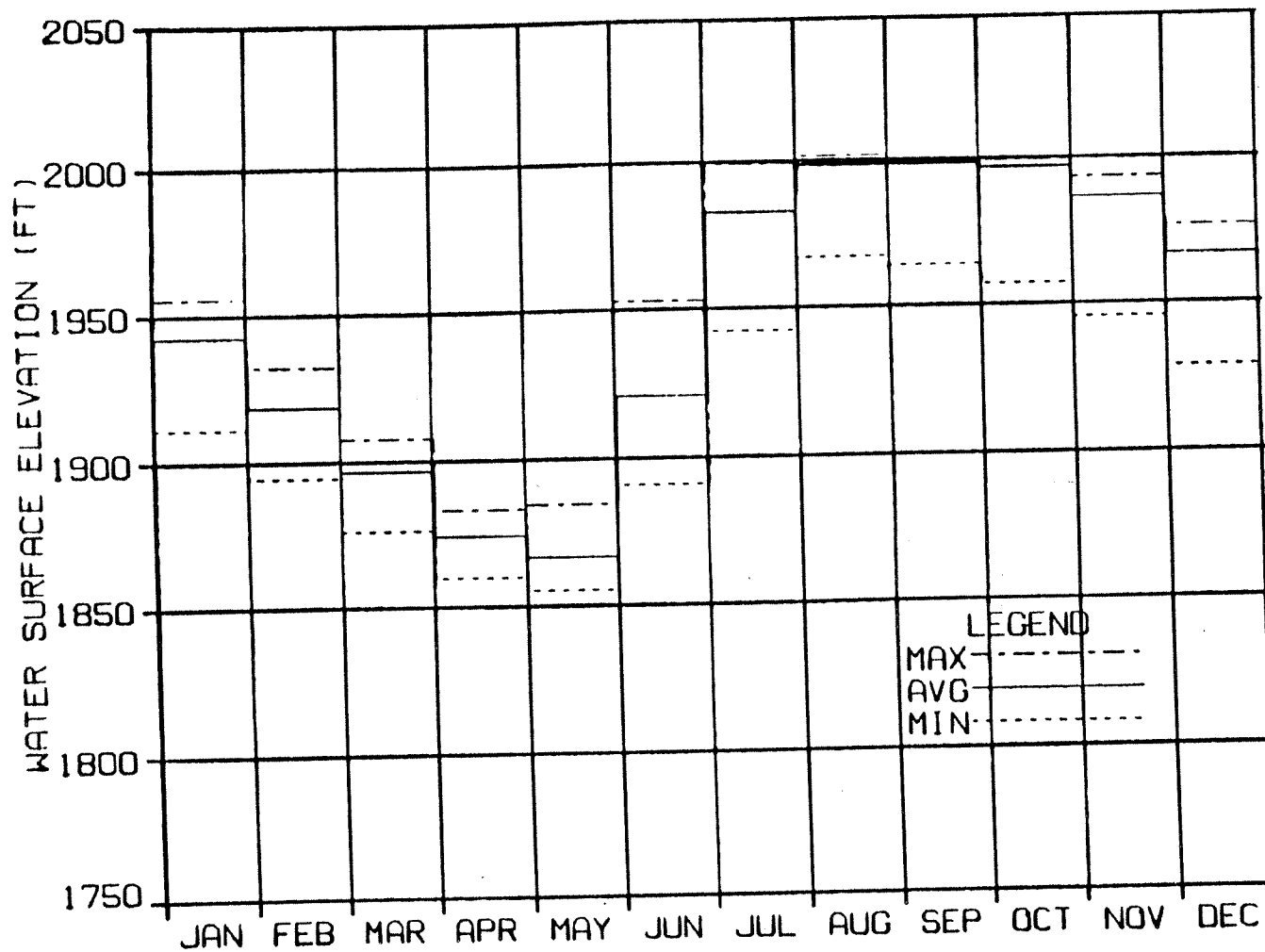


REFERENCE: BASE MAP FROM USGS 1:63,360 ALASKA QUADRANGLE TALKEETNA MOUNTAINS (D-5).  
COORDINATES IN FEET, ALASKA STATE PLANE (ZONE 4)

DEVIL CANYON  
QUARRY SITE K

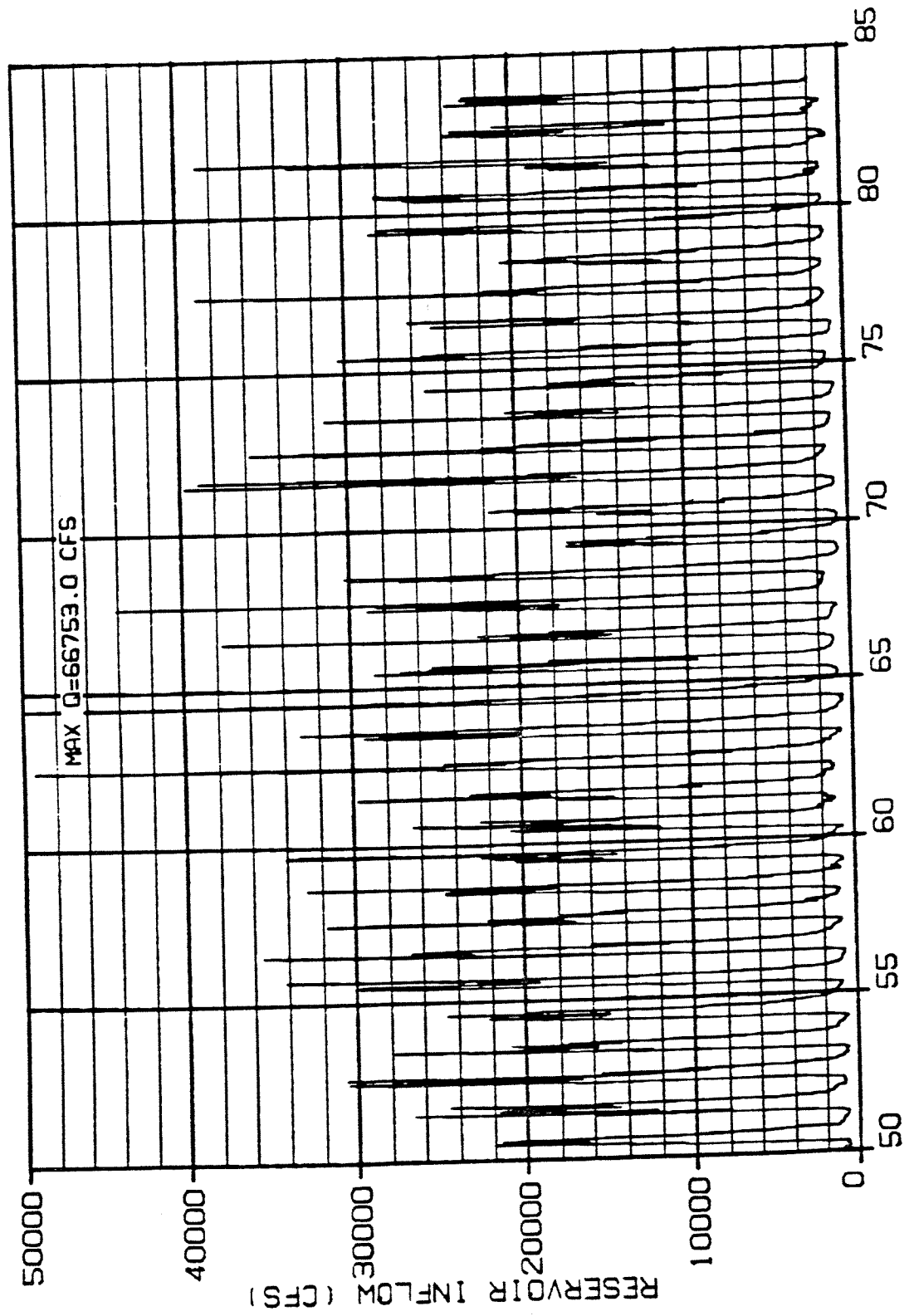


WATANA WATER SURFACE ELEVATION, STAGE II

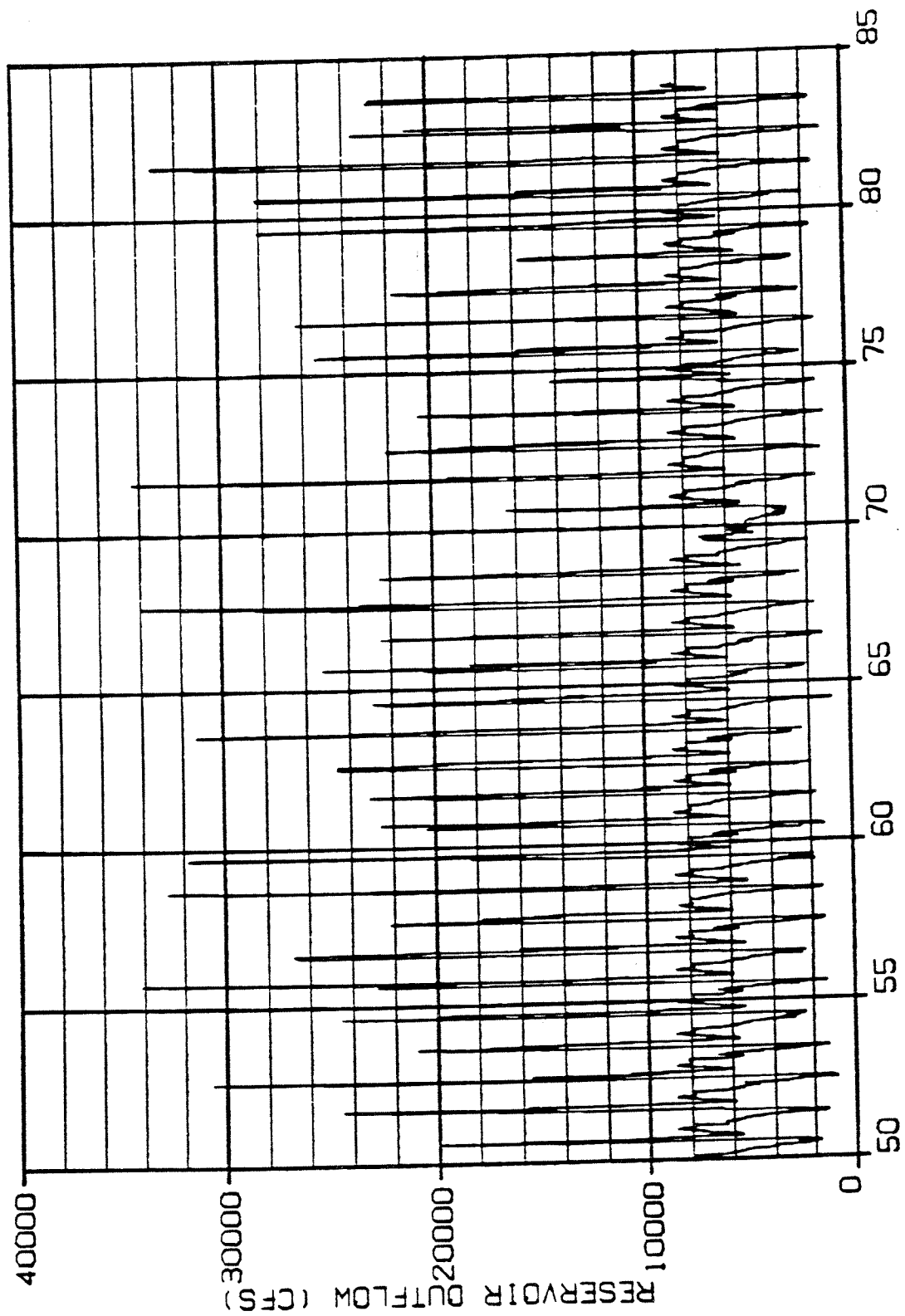


WATANA WATER SURFACE ELEVATION  
MONTHLY SUMMARY, STAGE II

FIGURE E.2.4.115

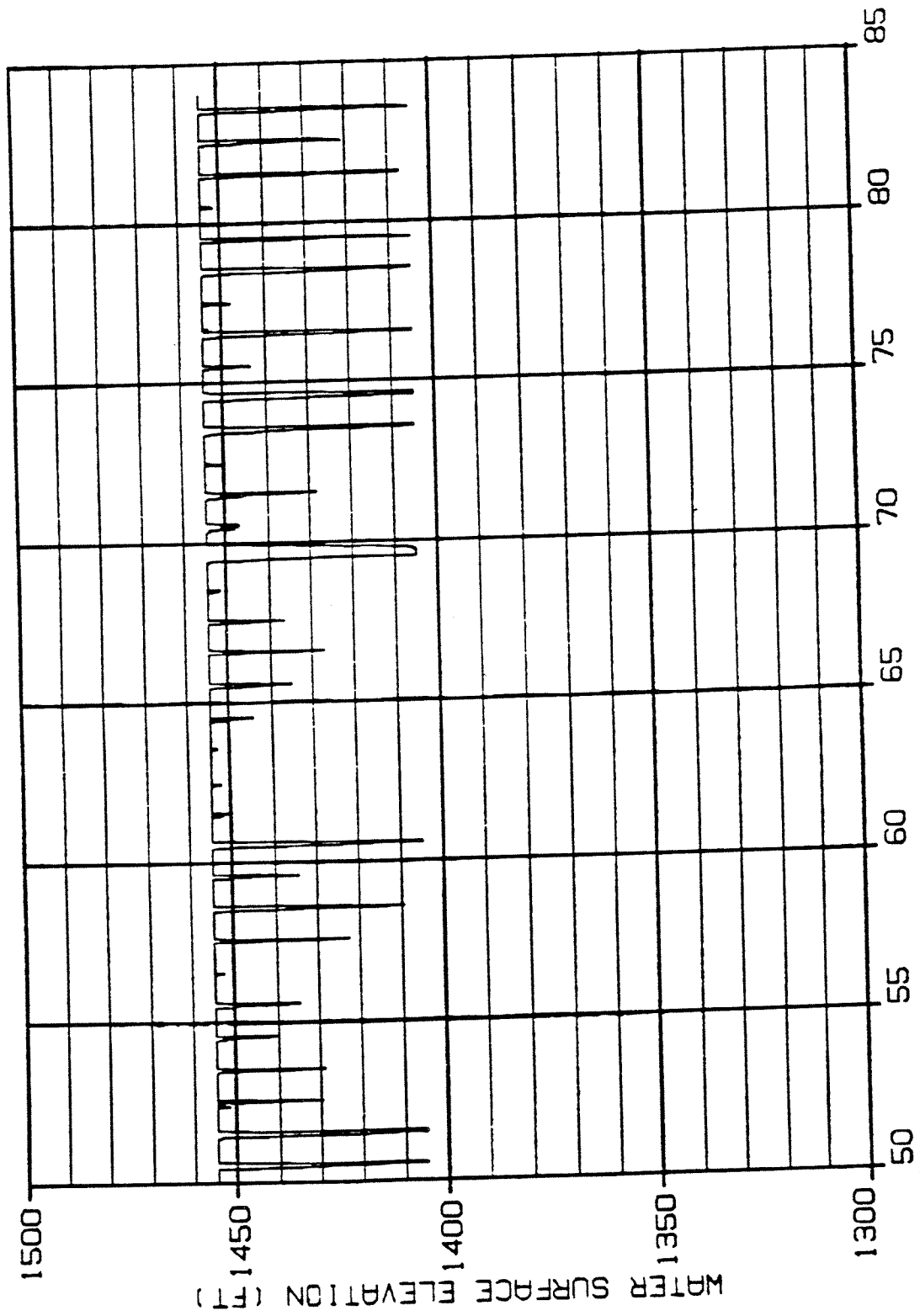


WATANA RESERVOIR INFLOW, STAGE II

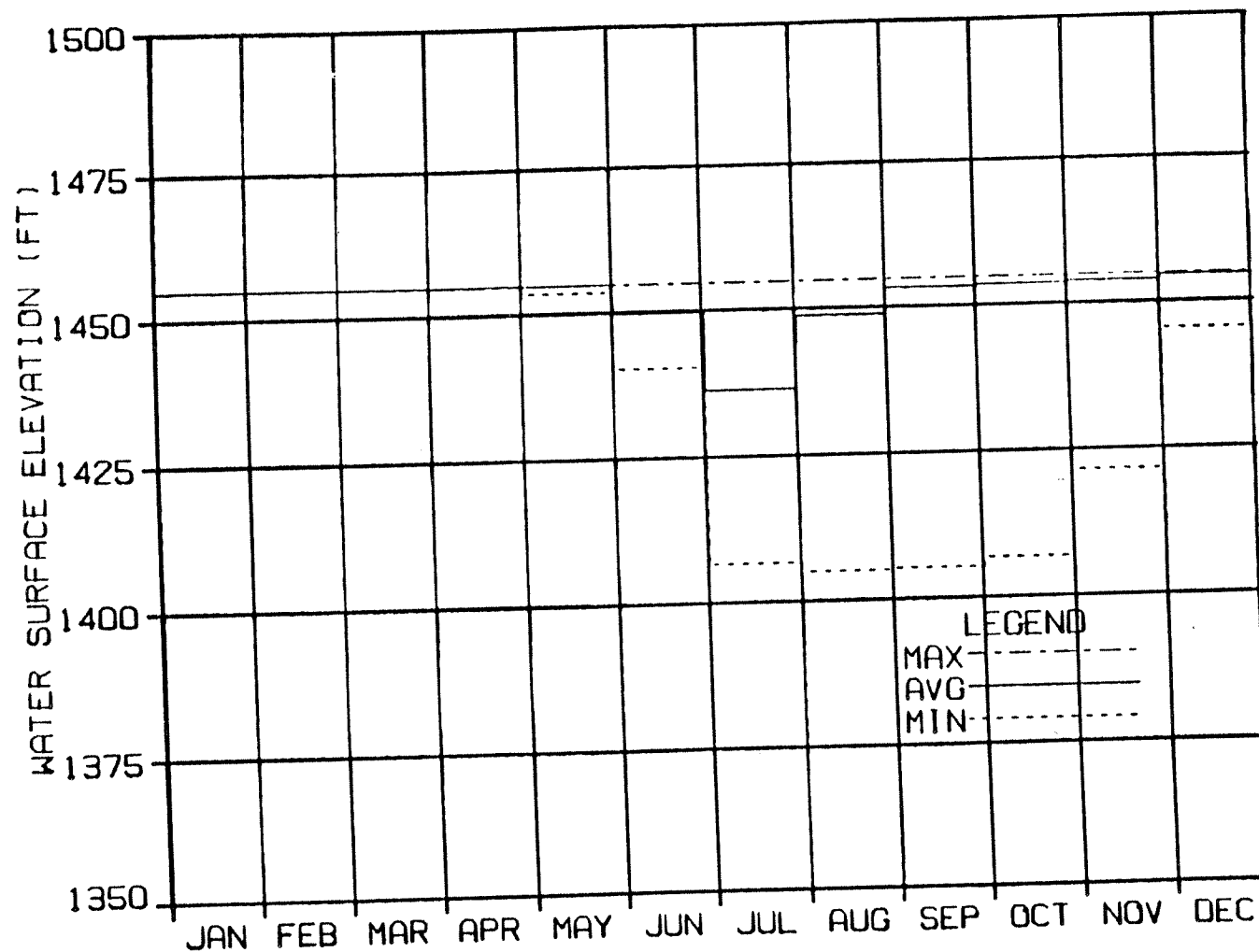


WATANA RESERVOIR OUTFLOW, STAGE II



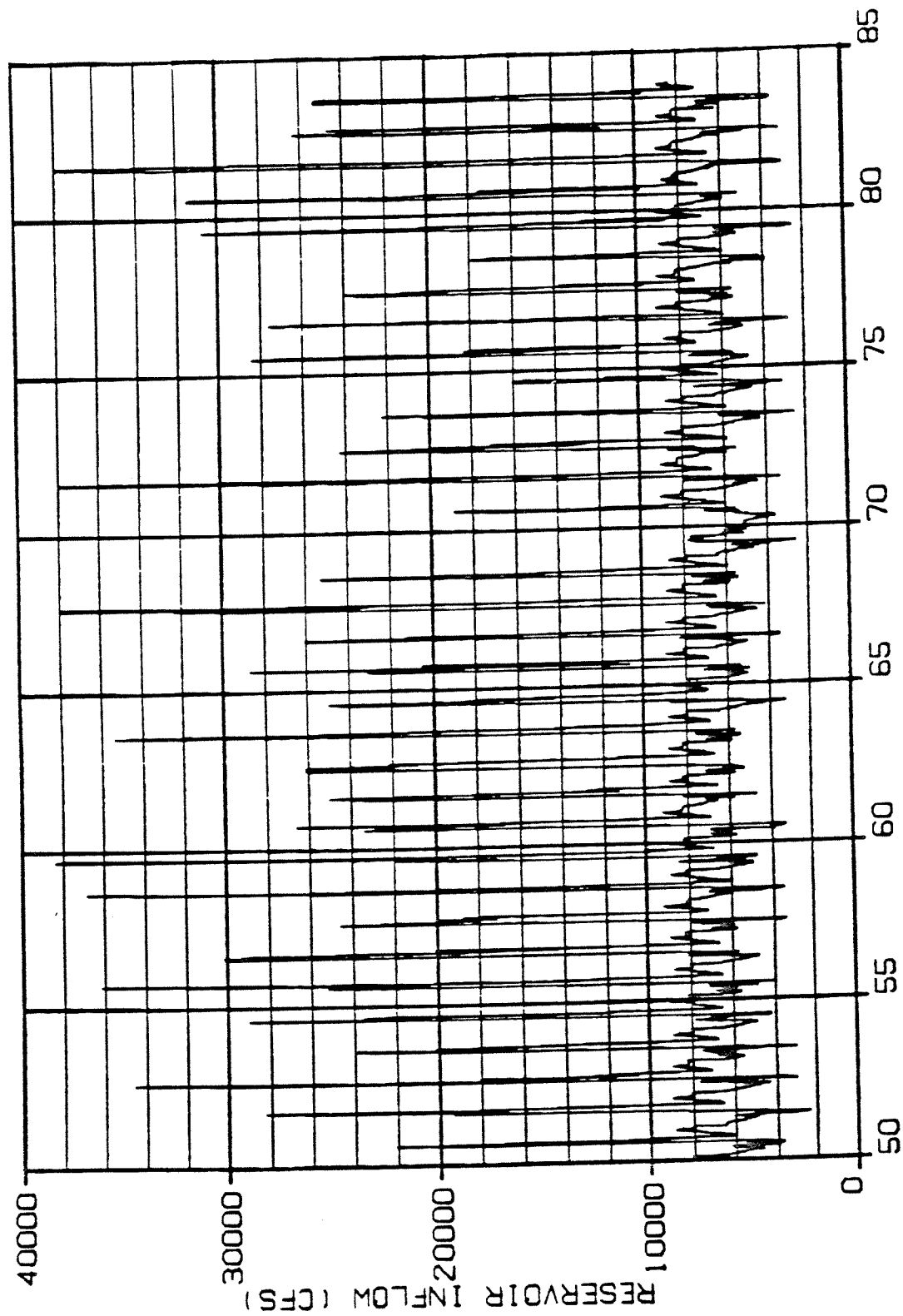


DEVIL CANYON WATER SURFACE ELEVATION, STAGE II

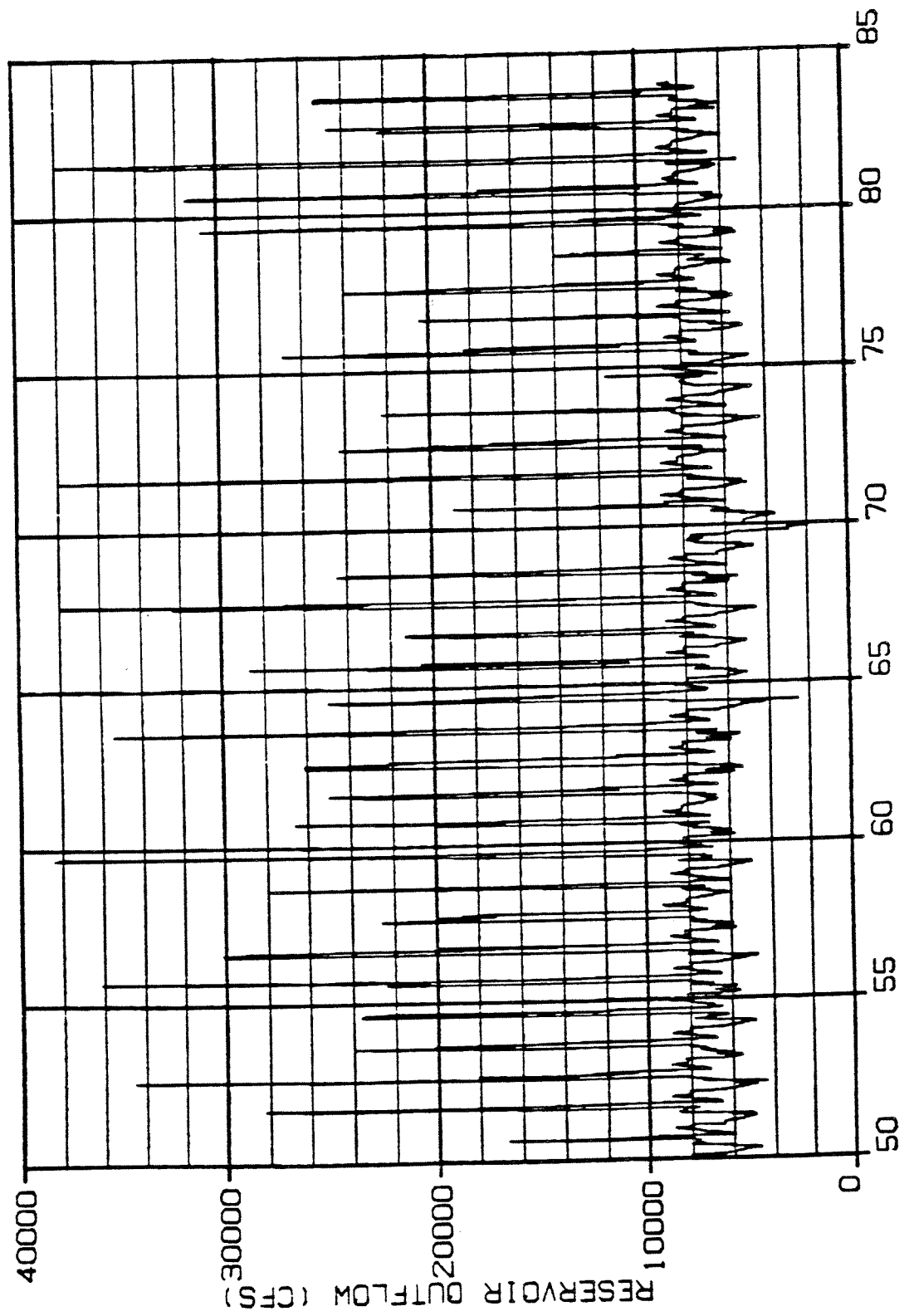


DEVIL CANYON WATER SURFACE ELEVATION  
MONTHLY SUMMARY, STAGE II

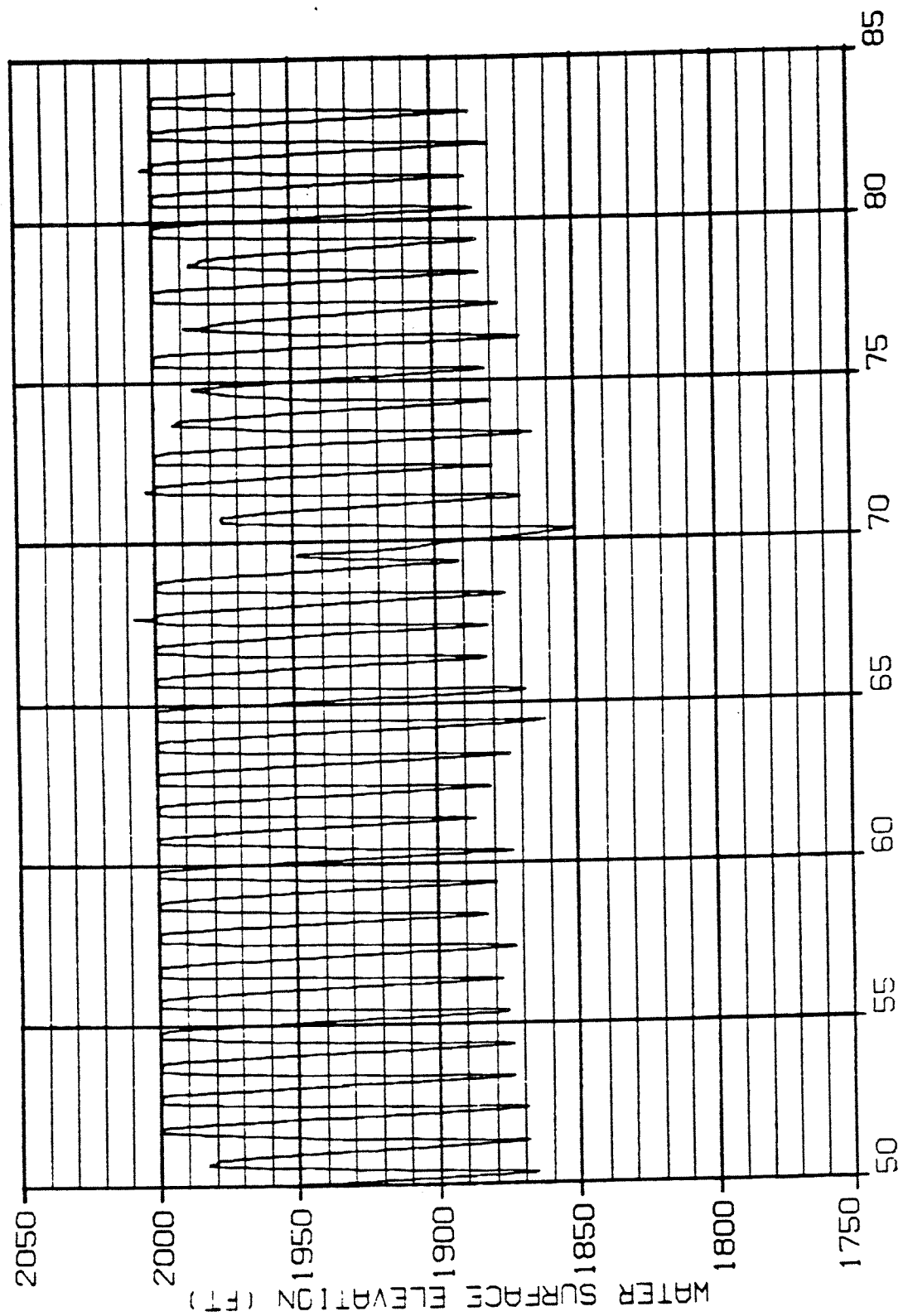
FIGURE E.2.4.119



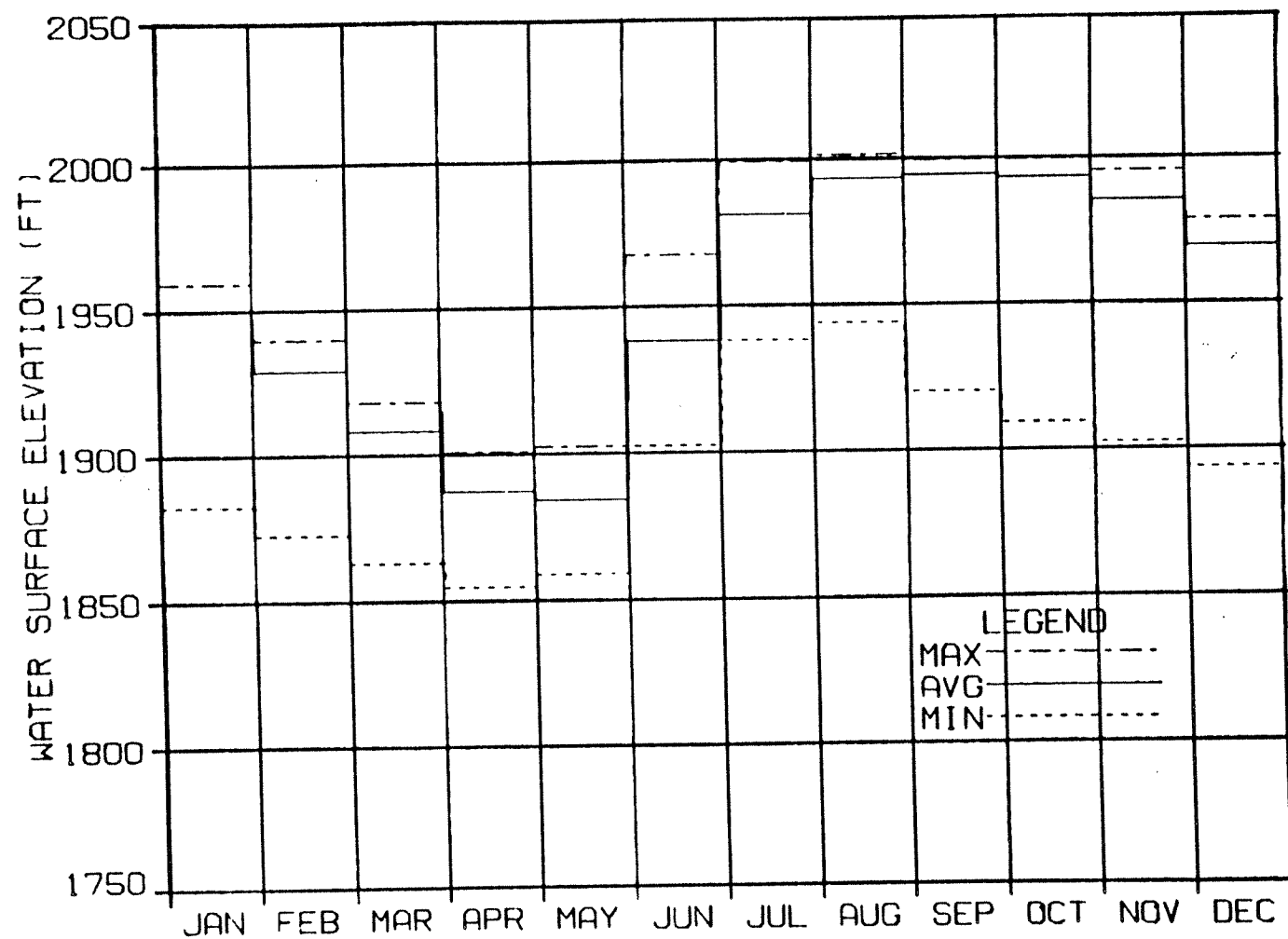
DEVIL CANYON RESERVOIR INFLOW, STAGE II



DEVIL CANYON RESERVOIR OUTFLOW, STAGE II

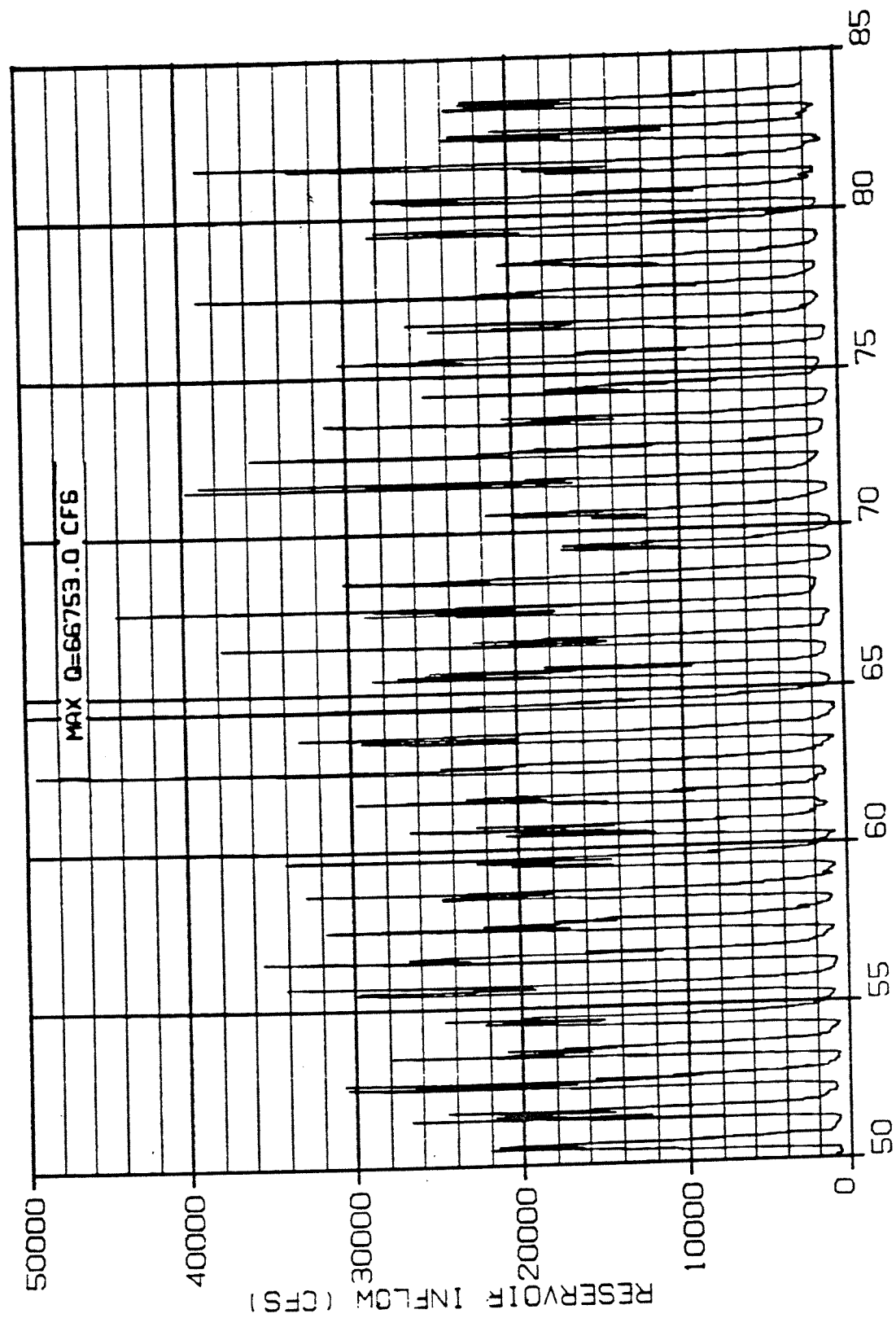


WATANA WATER SURFACE ELEVATION, E-I, STAGE II

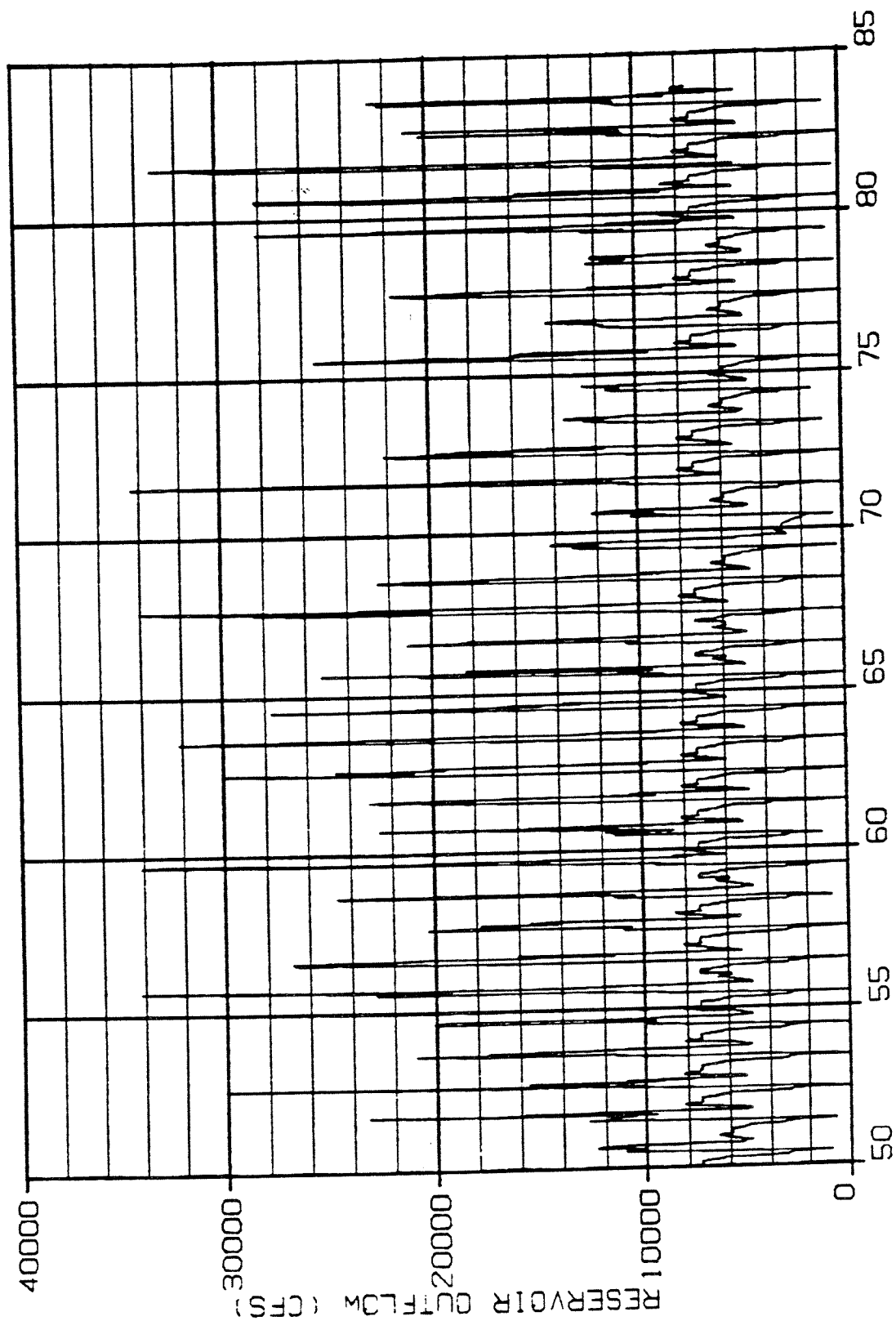


**WATANA WATER SURFACE ELEVATION  
MONTHLY SUMMARY, E-I, STAGE II**

**FIGURE E.2.4.123**

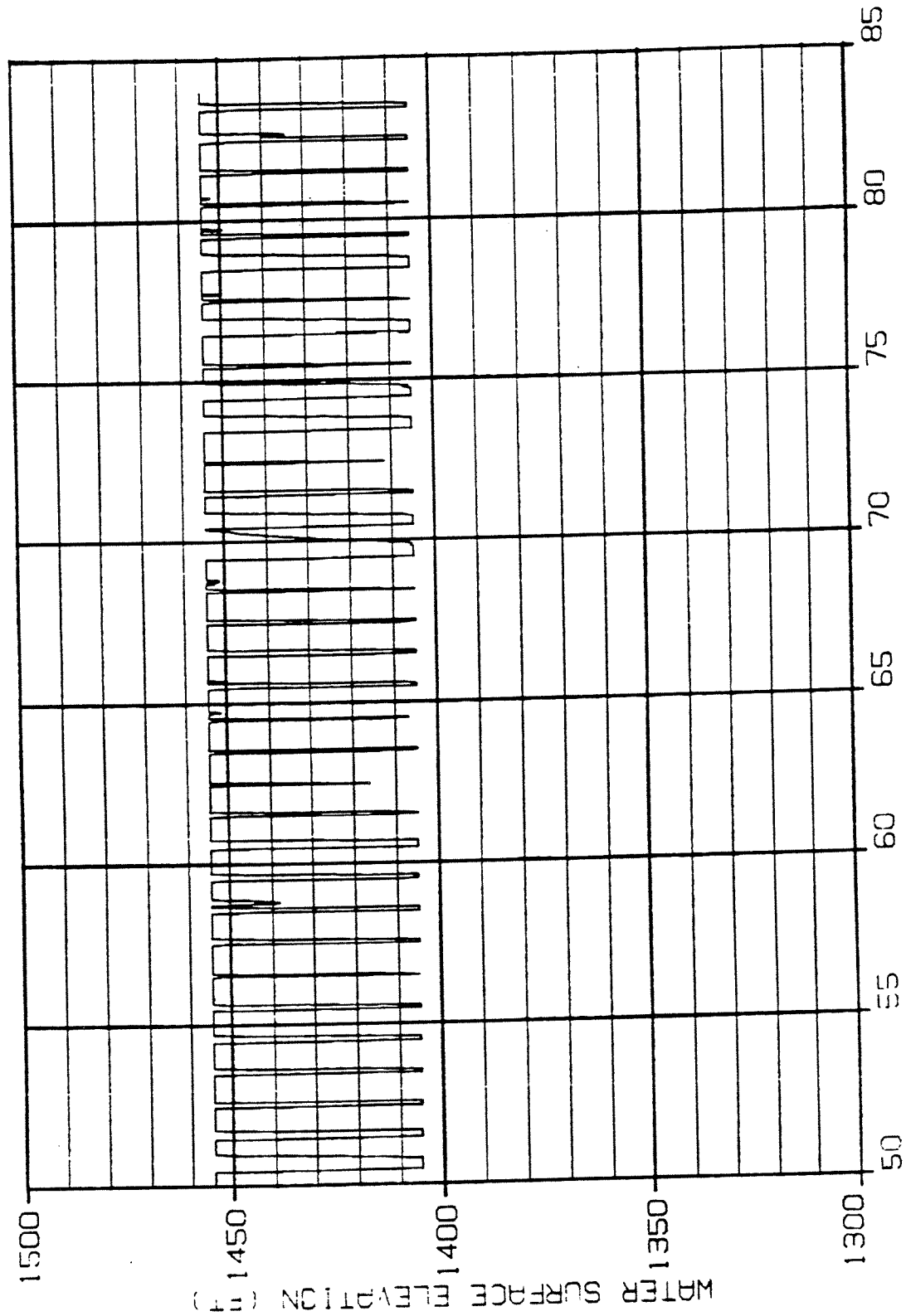


WATANA RESERVOIR INFLOW, E-I, STAGE II

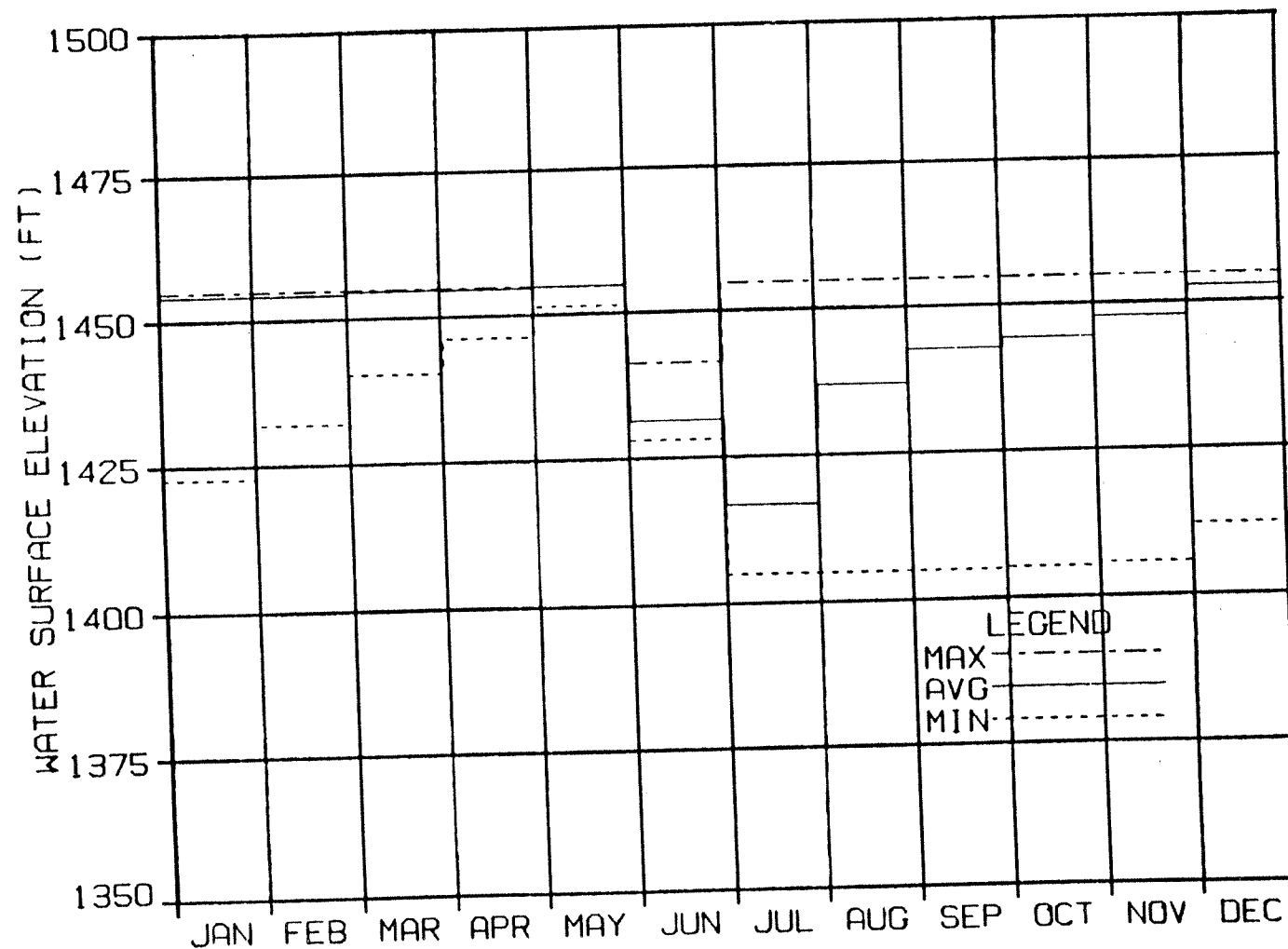


WATANA RESERVOIR OUTFLOW, E-I, STAGE II



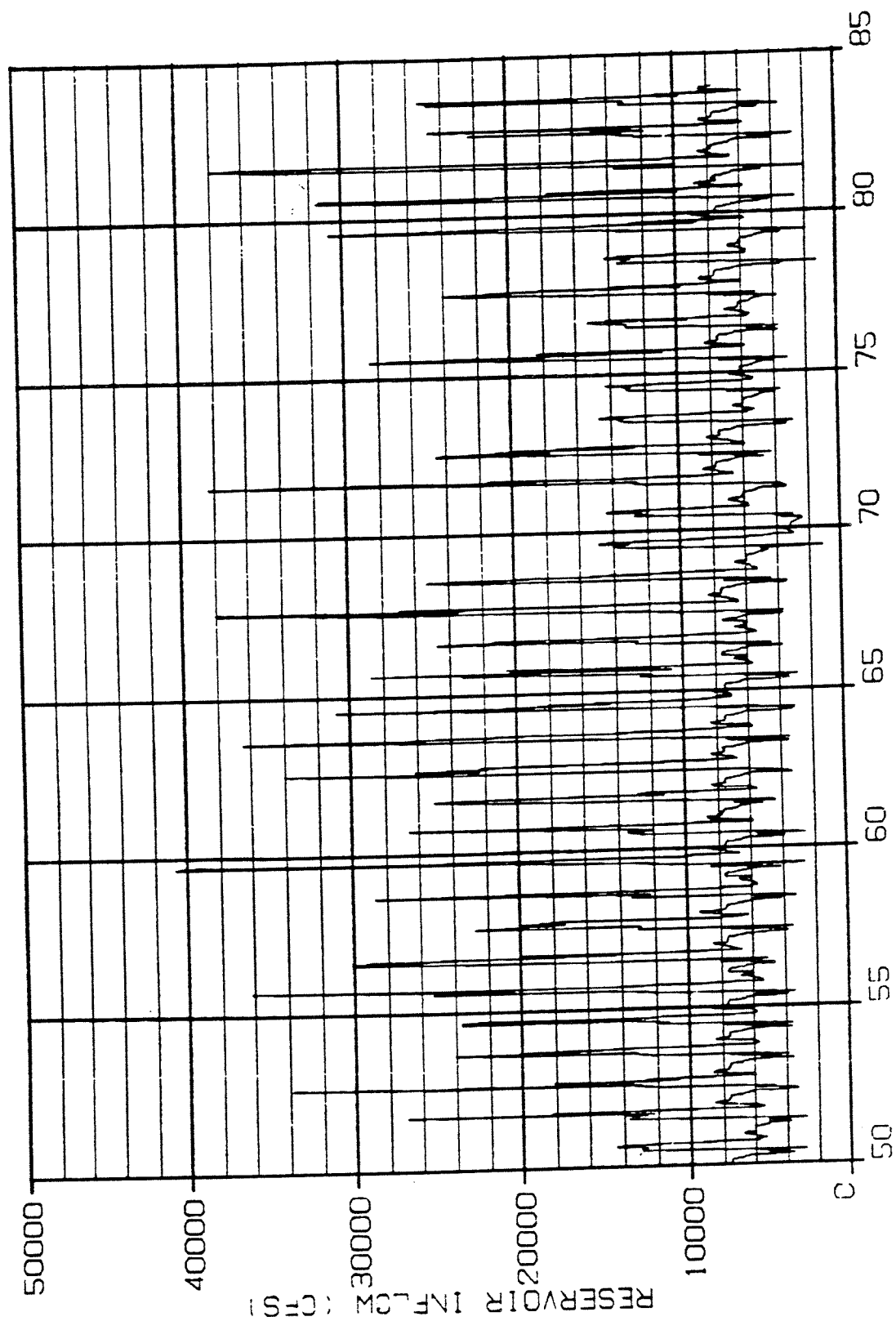


DEVIL CANYON WATER SURFACE ELEVATION, E-I, STAGE II

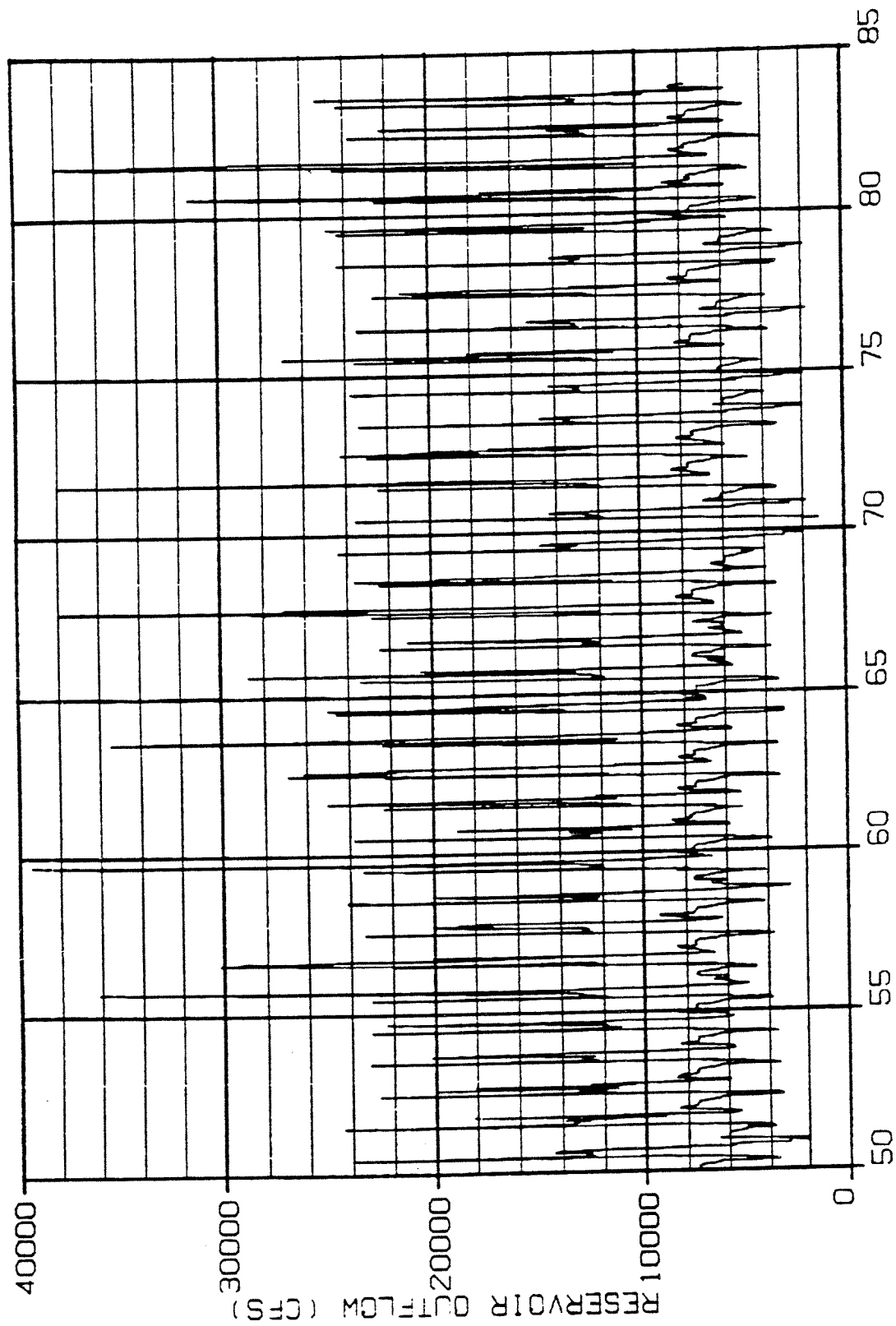


DEVIL CANYON WATER SURFACE ELEVATION  
MONTHLY SUMMARY, E-I, STAGE II

FIGURE E.2.4.127



DEVIL CANYON RESERVOIR INFLOW, E-I, STAGE II



DEVIL CANYON RESERVOIR OUTFLOW, E-I, STAGE II

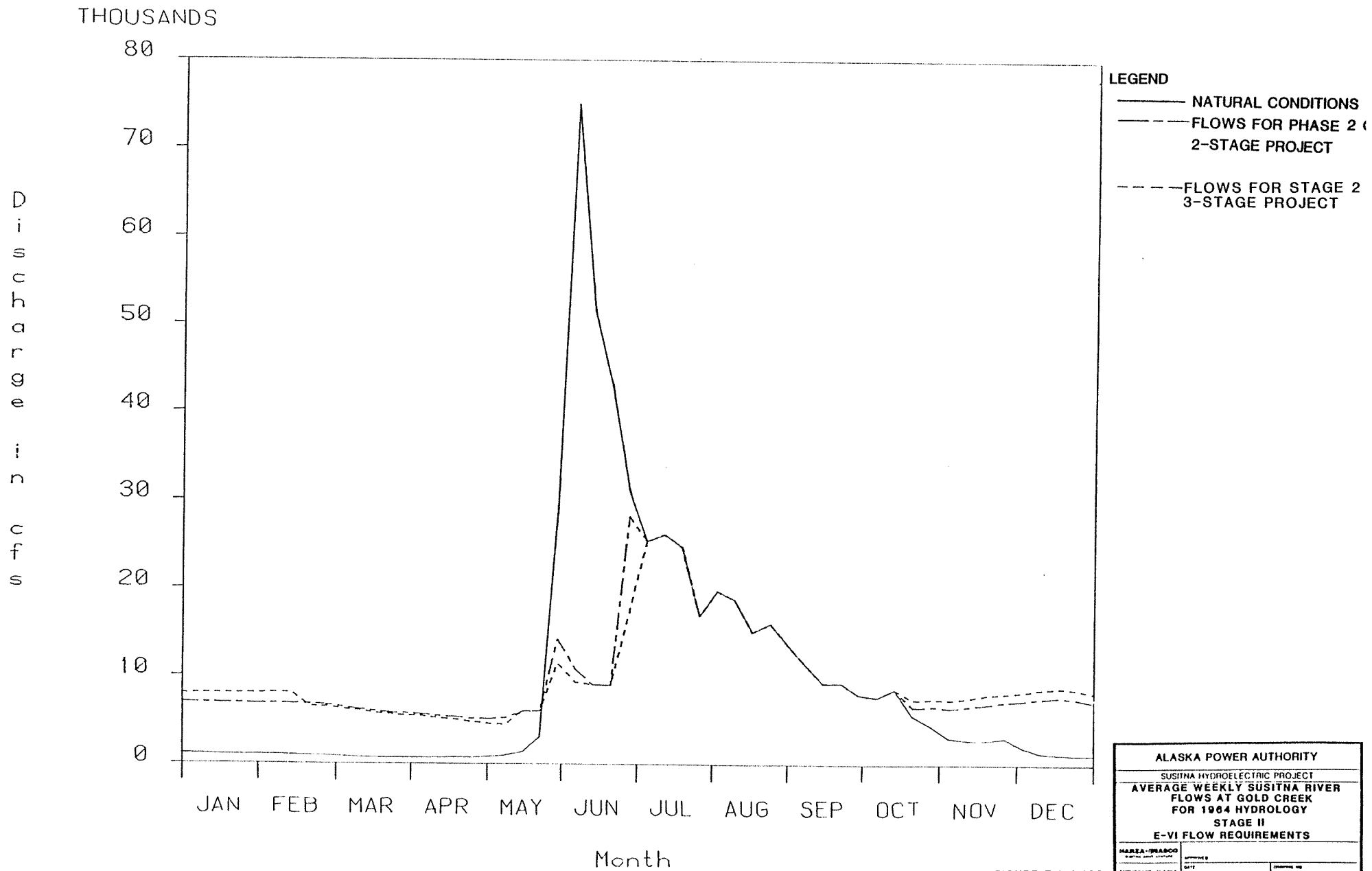


FIGURE E.2.4.130

THOUSANDS

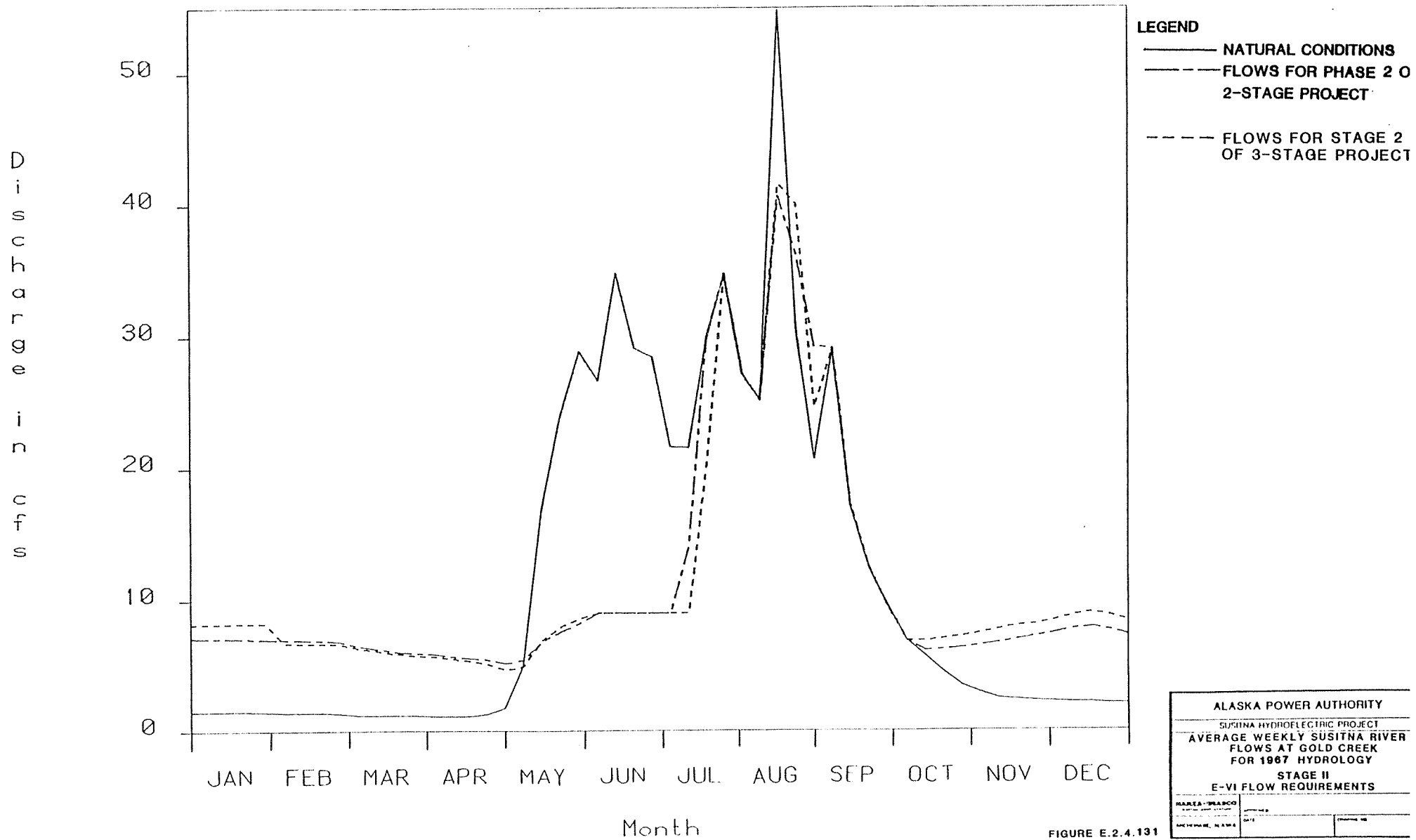


FIGURE E.2.4.131

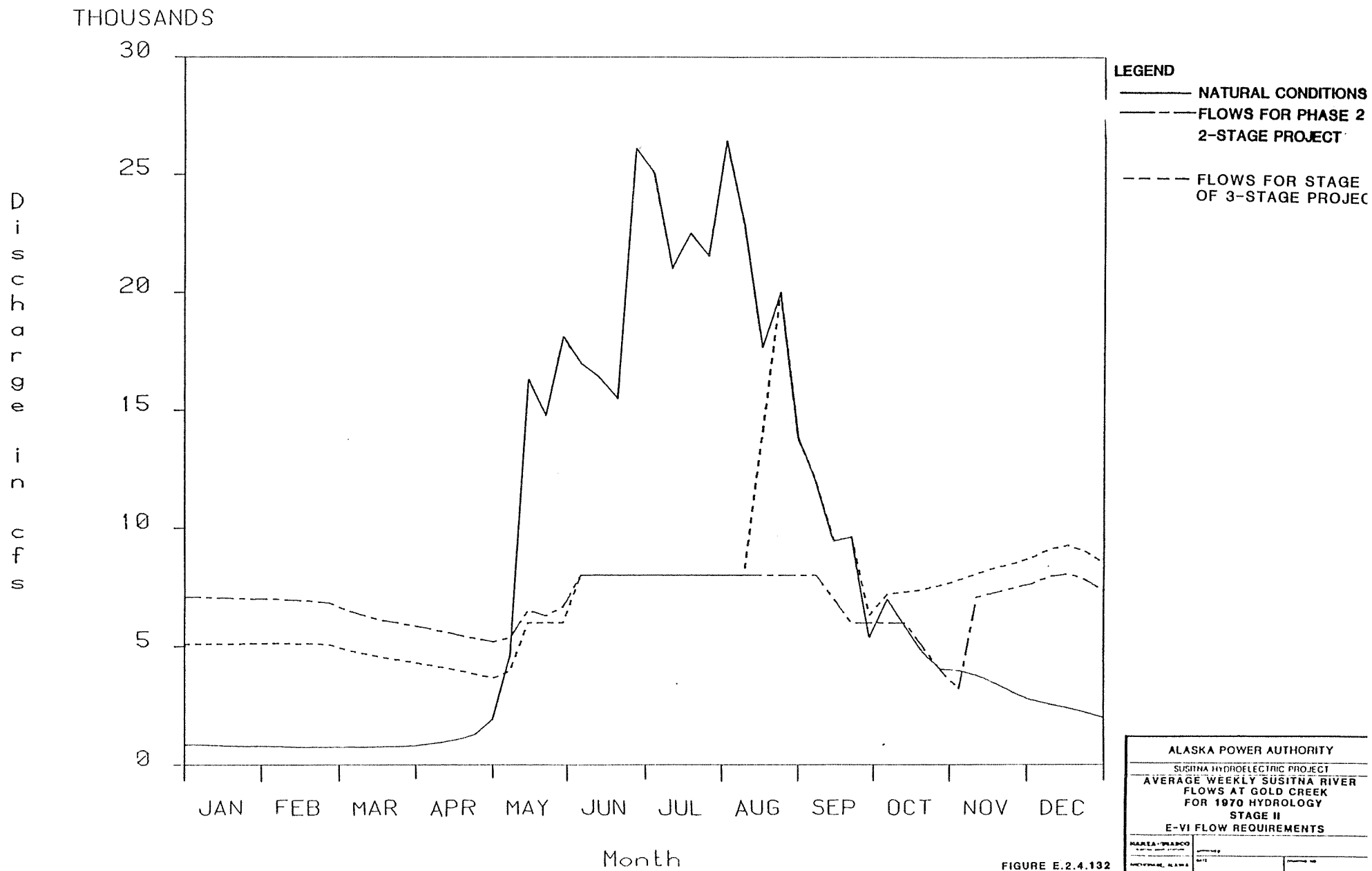


FIGURE E.2.4.132

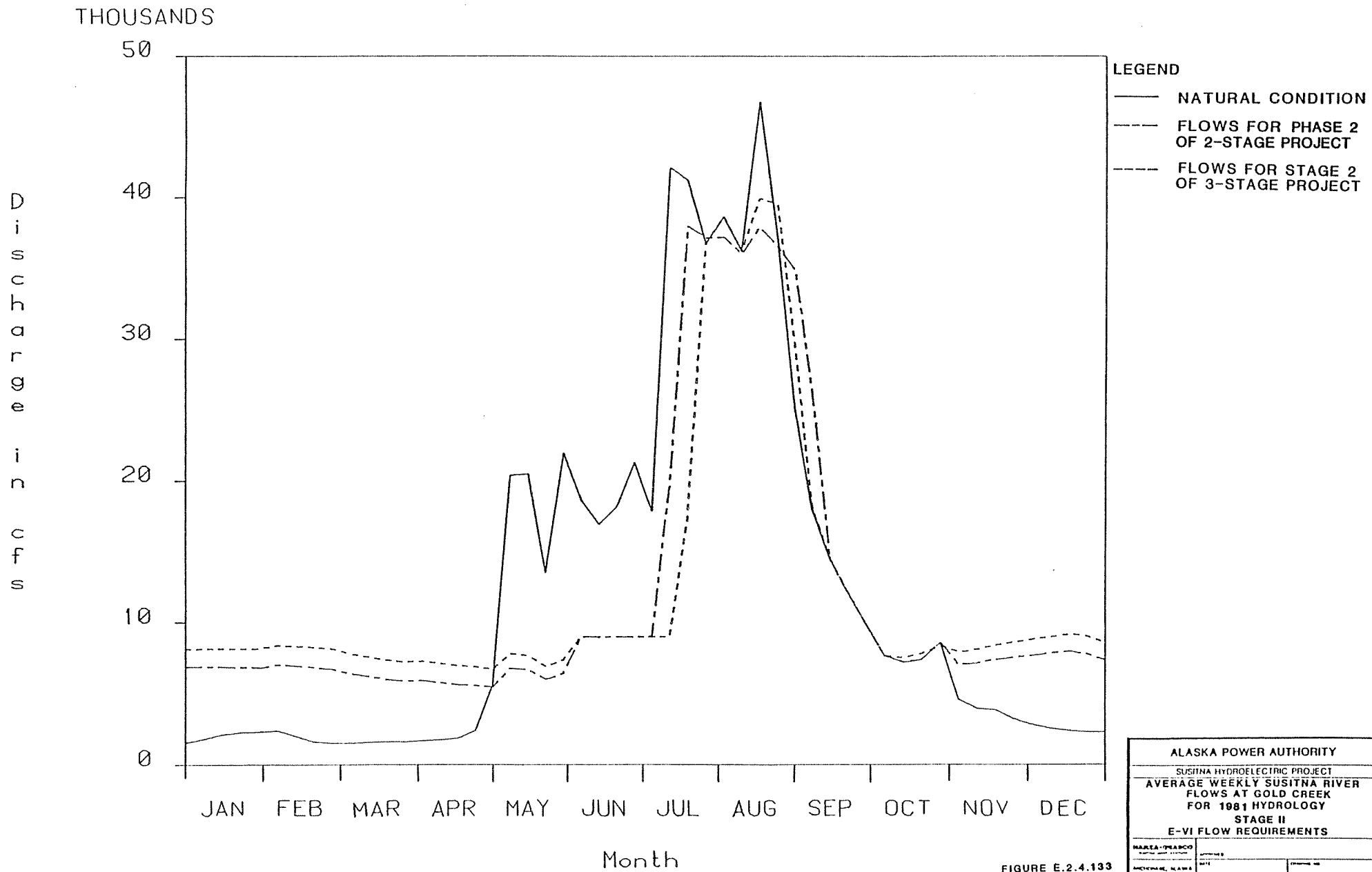


FIGURE E.2.4.133

|                               |      |            |
|-------------------------------|------|------------|
| ALASKA POWER AUTHORITY        |      |            |
| SUSITNA HYDROELECTRIC PROJECT |      |            |
| AVERAGE WEEKLY SUSITNA RIVER  |      |            |
| FLOWS AT GOLD CREEK           |      |            |
| FOR 1981 HYDROLOGY            |      |            |
| STAGE II                      |      |            |
| E-VI FLOW REQUIREMENTS        |      |            |
| HALEA-TRACCO                  | DATE | FIGURE NO. |
| ANCHORAGE, ALASKA             | 1981 | 10         |



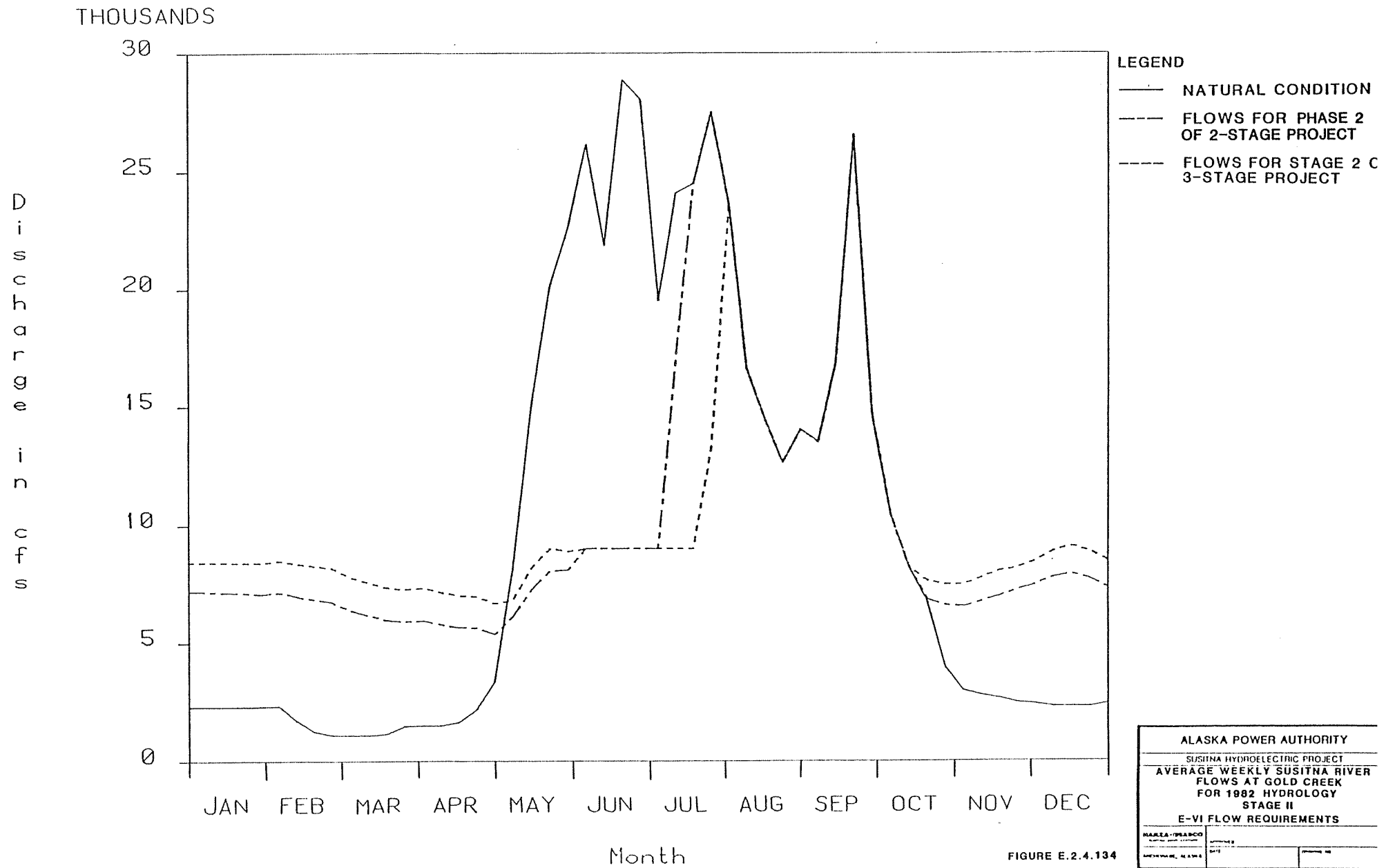


FIGURE E.2.4.134

|                               |      |
|-------------------------------|------|
| ALASKA POWER AUTHORITY        |      |
| SUSITNA HYDROELECTRIC PROJECT |      |
| AVERAGE WEEKLY SUSITNA RIVER  |      |
| FLOWS AT GOLD CREEK           |      |
| FOR 1982 HYDROLOGY            |      |
| STAGE II                      |      |
| E-VI FLOW REQUIREMENTS        |      |
| HAILEY-PRABCO                 | DATE |
| APPROVED BY                   | DATE |

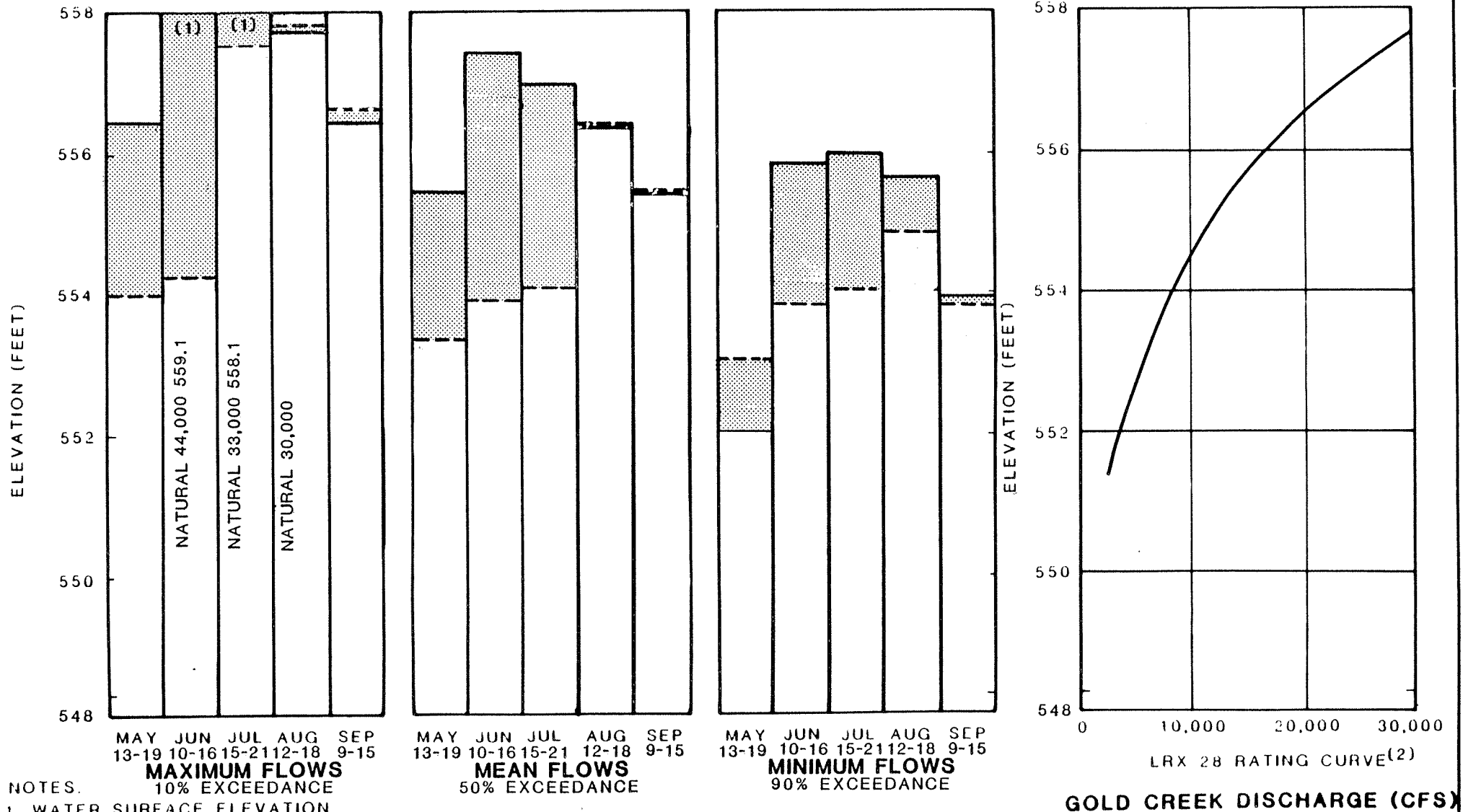
LEGEND:

— NATURAL

- - - WITH PROJECT



ELEVATION CHANGE



NOTES:

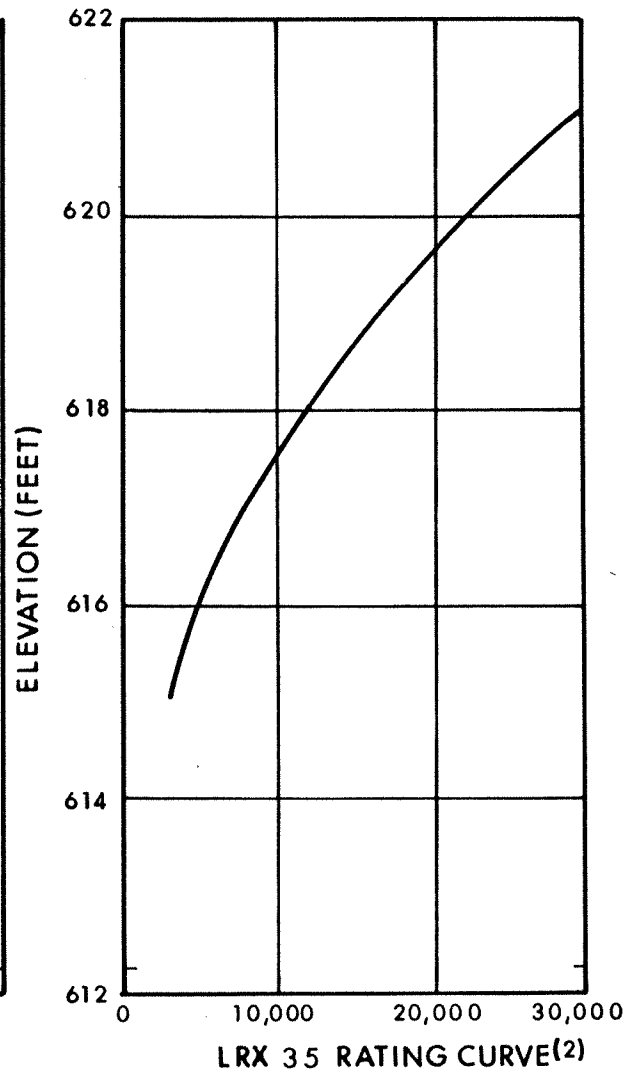
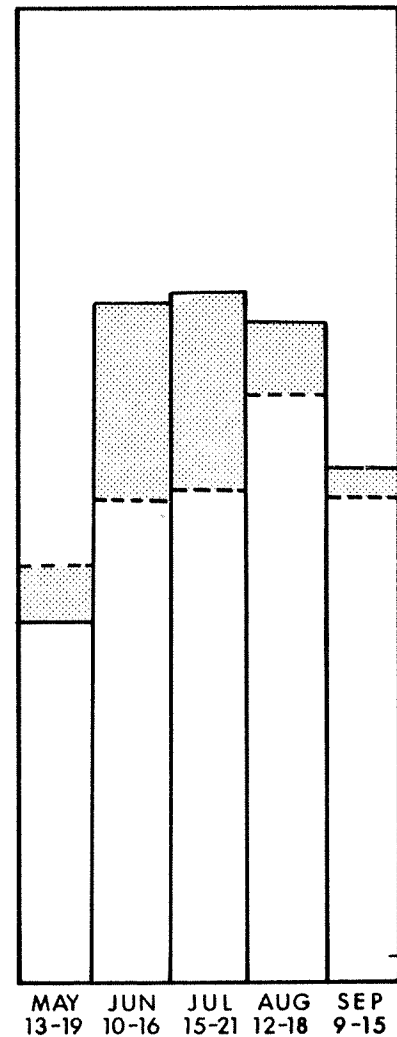
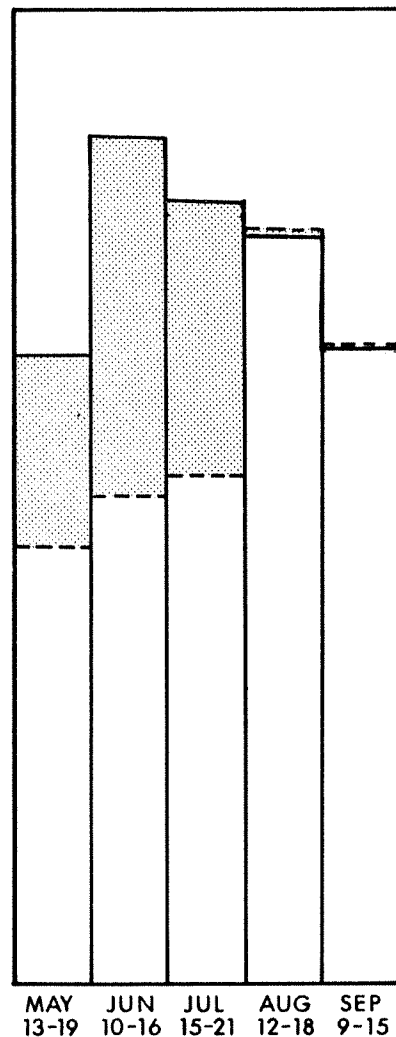
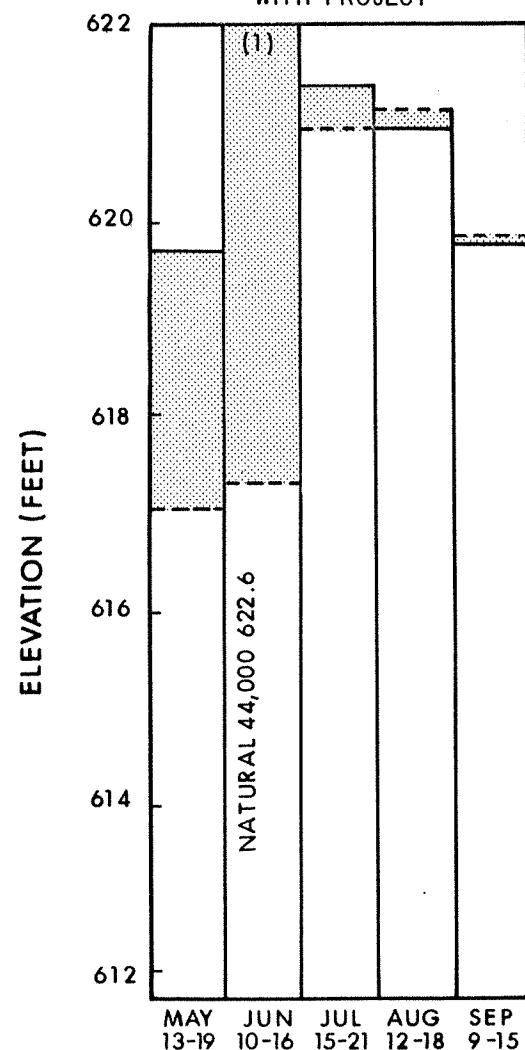
1. WATER SURFACE ELEVATION ABOVE RATING CURVE
2. RATING CURVE BASED ON COMPUTATIONS AND OBSERVATIONS (HE, 1984-) MIDDLE AND LOWER RIVER WATER SURFACE PROFILES AND DISCHARGE RATING CURVES

## WEEKLY AVERAGE WATER SURFACE ELEVATIONS AT RIVER MILE 124.4, STAGE II

FIGURE E.2.4.135

LEGEND:  ELEVATION CHANGE

— NATURAL  
 - - - WITH PROJECT



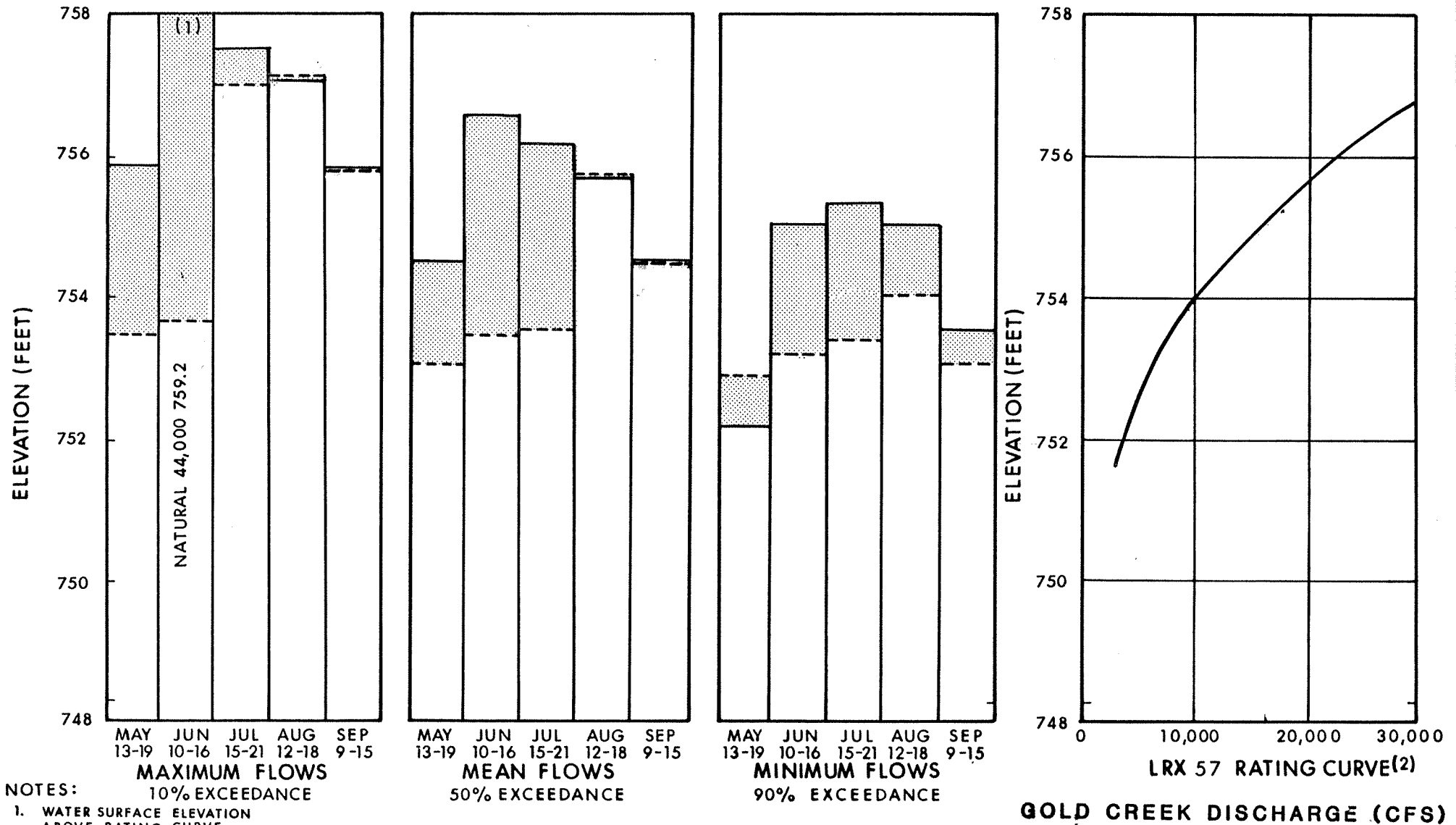
- NOTES:
1. WATER SURFACE ELEVATION ABOVE RATING CURVE
  2. RATING CURVE BASED ON COMPUTATIONS AND OBSERVATIONS (HE, 1984-) MIDDLE AND LOWER RIVER WATER SURFACE PROFILES AND DISCHARGE RATING CURVES.

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

**LEGEND:**

— NATURAL  
 - - - WITH PROJECT

 ELEVATION CHANGE



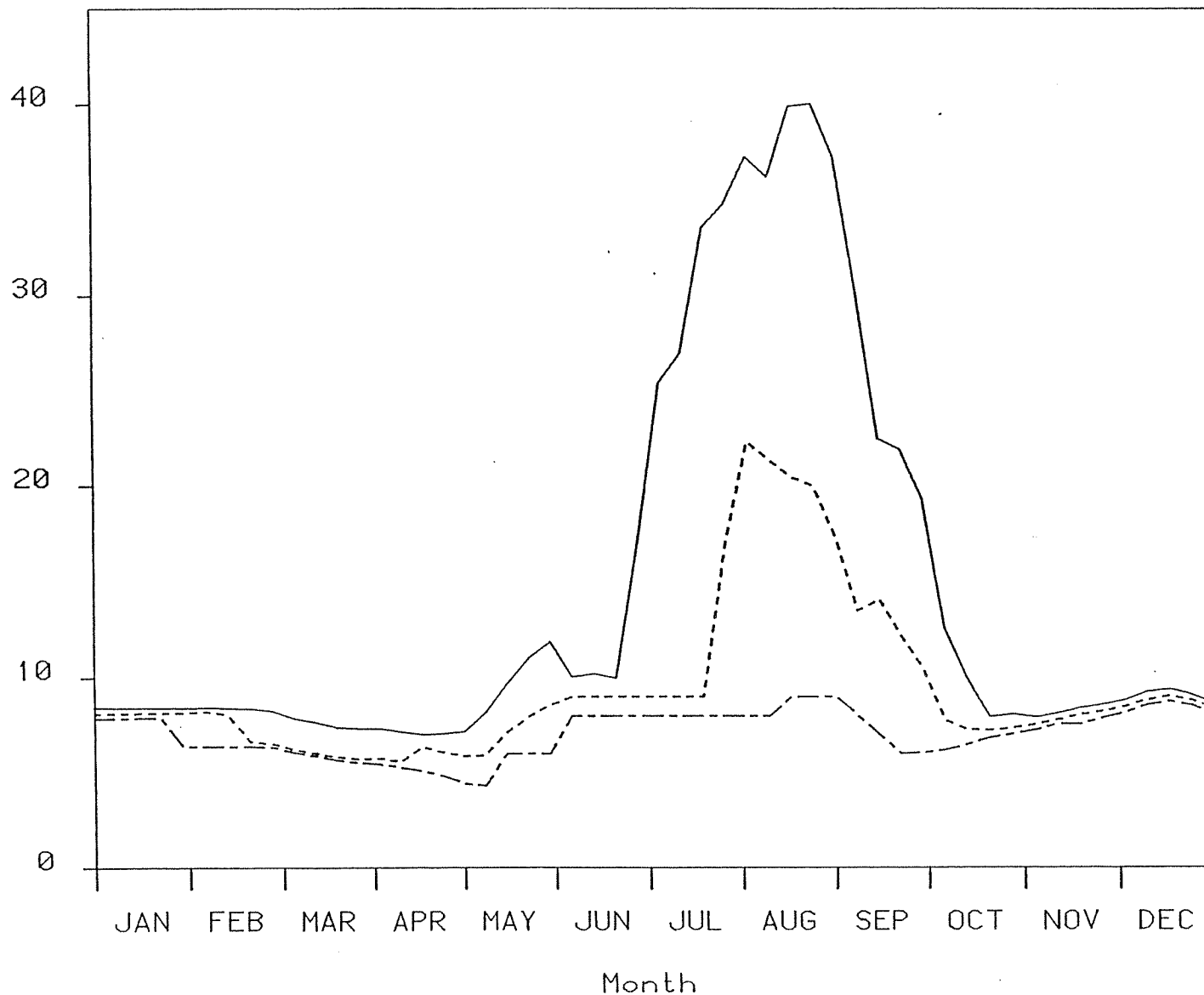
**WEEKLY AVERAGE WATER SURFACE ELEVATIONS  
 AT RIVER MILE 142.3, STAGE II**

FIGURE E.2.4.137



THOUSANDS

Dis  
charge  
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

LEGEND

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

|                                                                                                |      |          |
|------------------------------------------------------------------------------------------------|------|----------|
| ALASKA POWER AUTHORITY                                                                         |      |          |
| SUSITNA HYDROELECTRIC PROJECT                                                                  |      |          |
| SUSITNA RIVER STREAMFLOWS<br>EXCEEDED 6%, 50% AND 97%<br>OF THE TIME AT GOLD CREEK<br>STAGE II |      |          |
| TABLE 1-1                                                                                      | DATE | REVISION |

FIGURE E.2.4.138

THOUSANDS

Discharge in cfs

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

FIGURE E.2.4.139

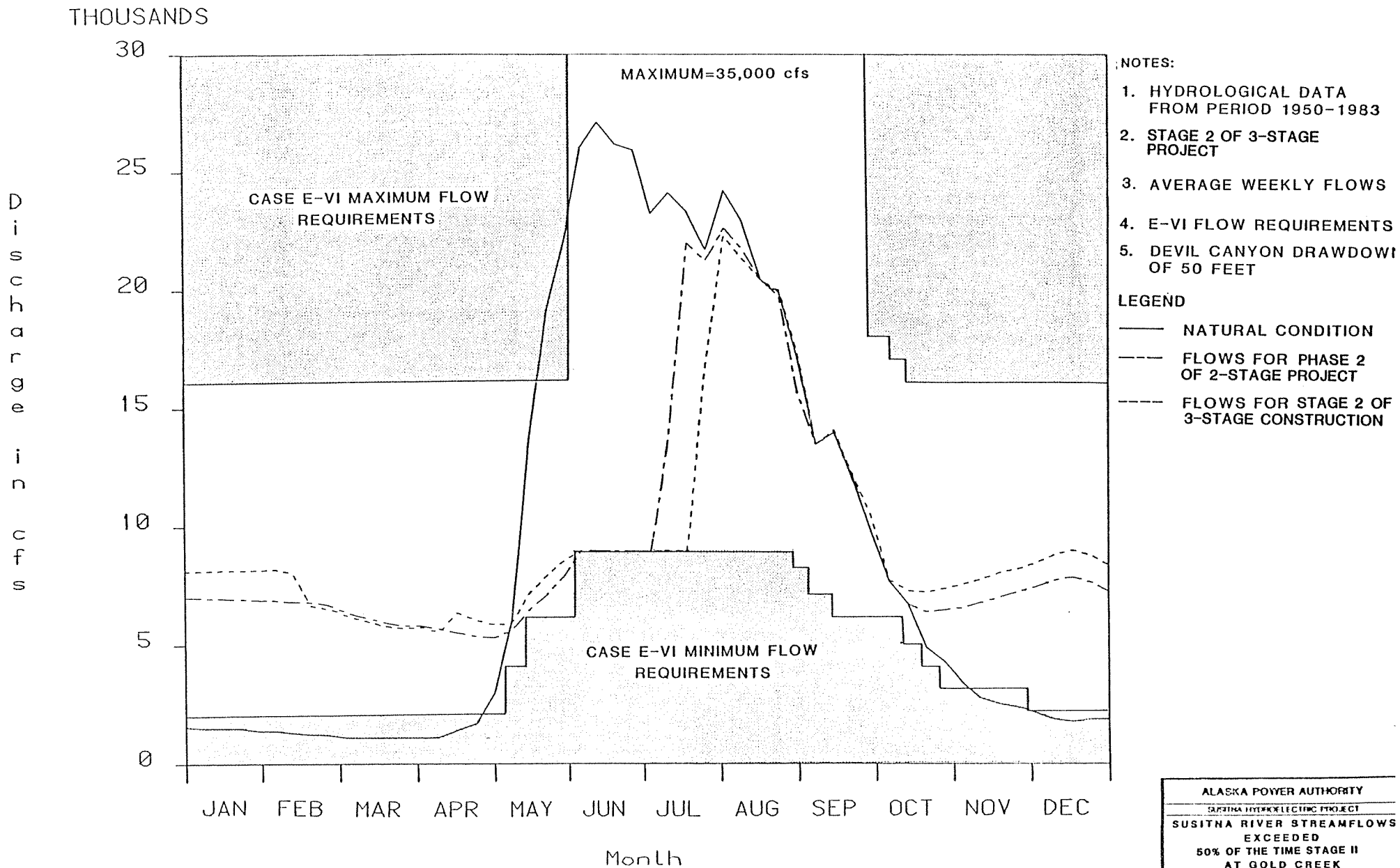


FIGURE E.2.4.140

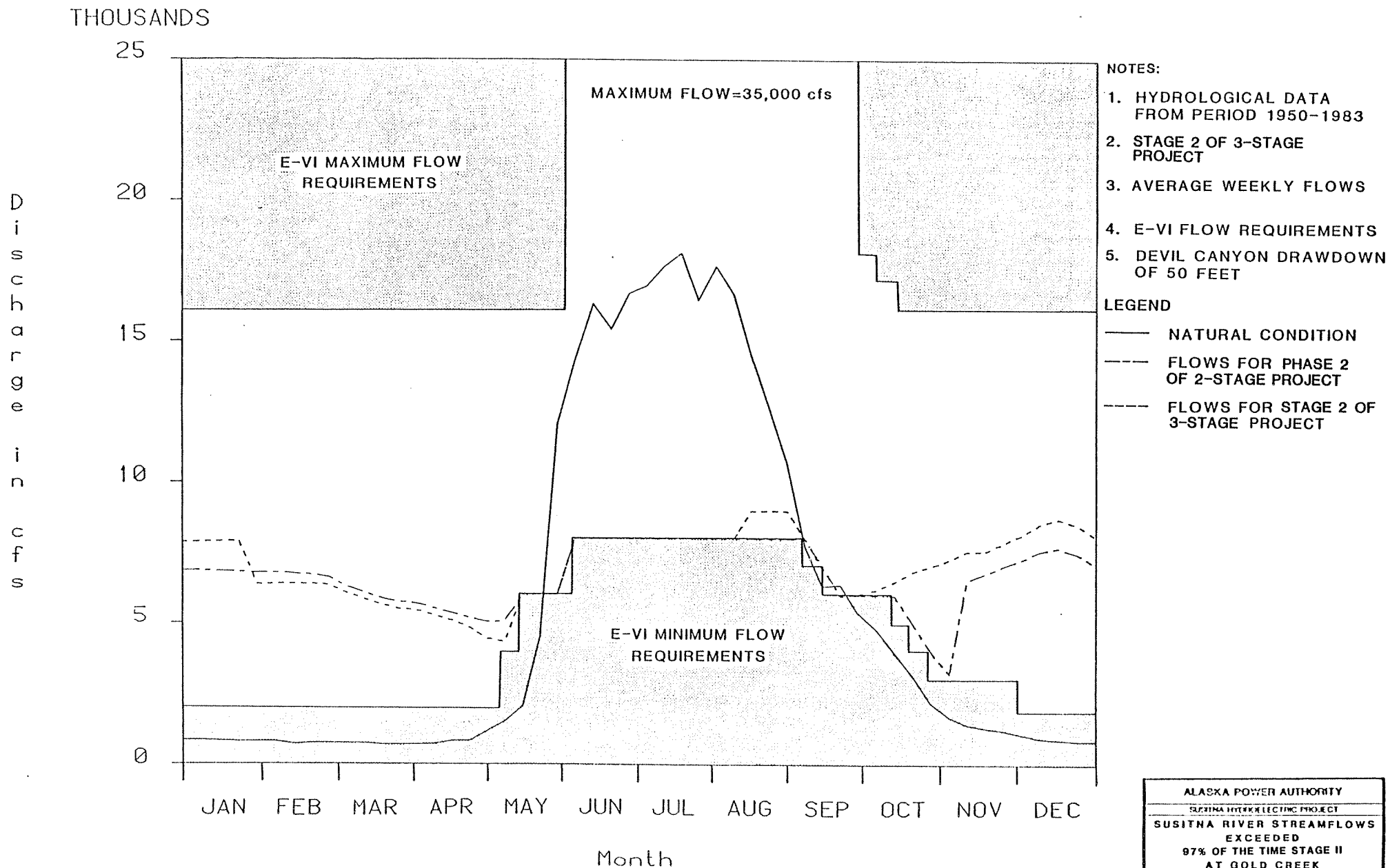
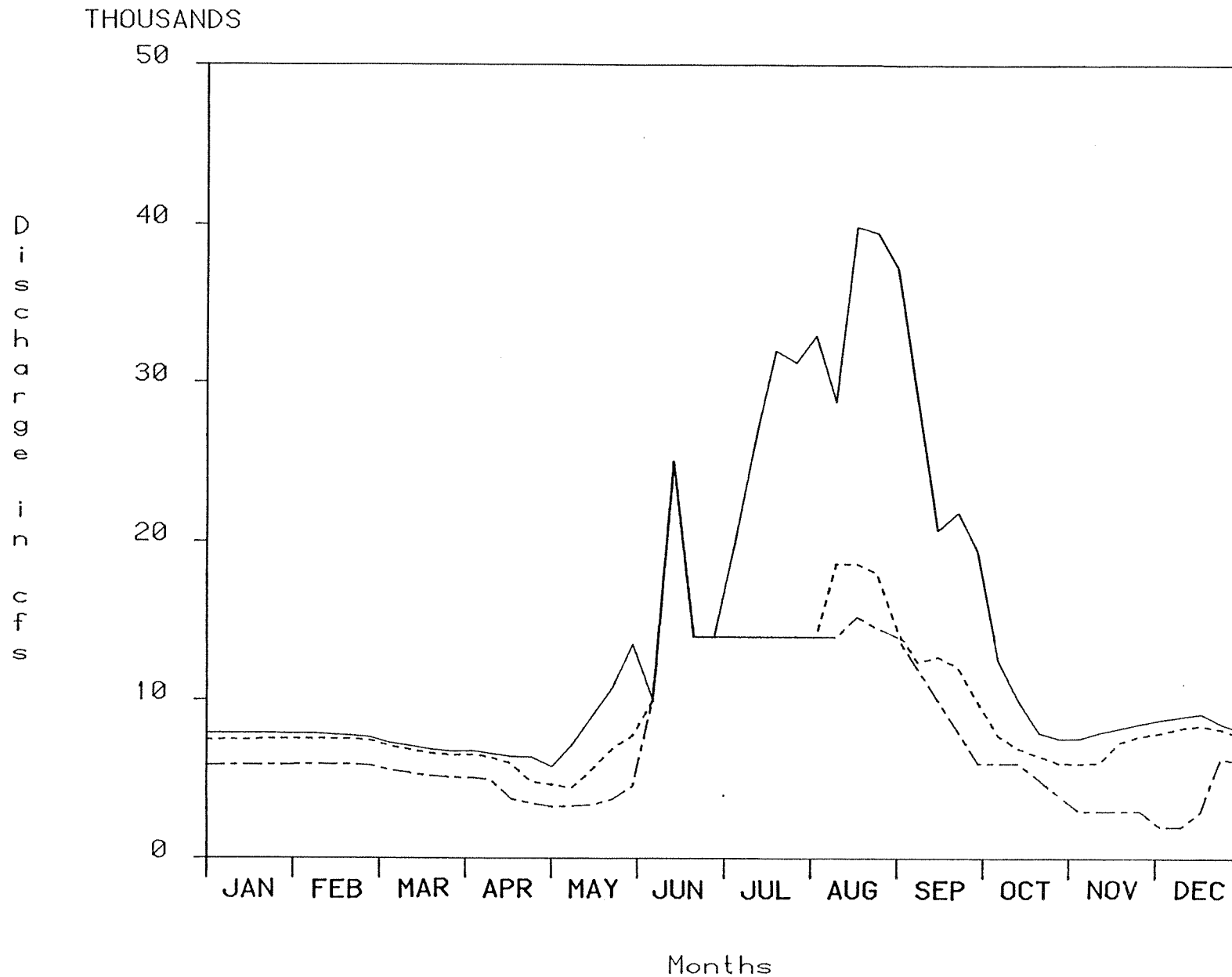


FIGURE E.2.4.141

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





NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-198
2. STAGE 2 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-I FLOW REQUIREMEN

LEGEND

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

|                                                                                       |                  |
|---------------------------------------------------------------------------------------|------------------|
| ALASKA POWER AUTHORITY                                                                |                  |
| SUSITNA HYDROLECTRIC PROJECT                                                          |                  |
| SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK STAGE II |                  |
| DATE: 10/1/88                                                                         | BY: J. H. HARRIS |
| REVISION: 1.0                                                                         | DATE: 10/1/88    |

FIGURE E.2.4.142

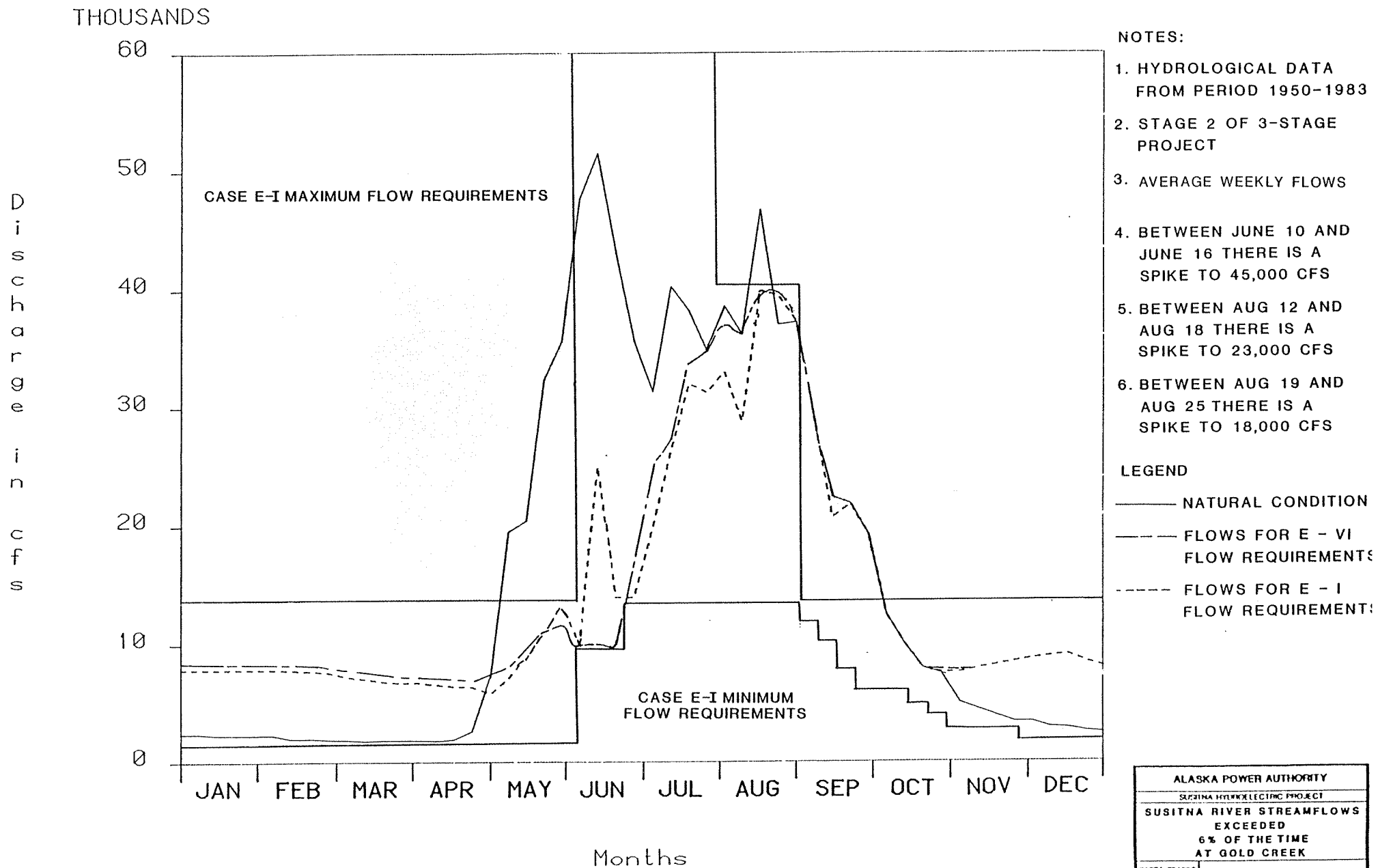


FIGURE E.2.4.143



THOUSANDS

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

30

25

20

15

10

5

0

CASE E-1 MAXIMUM FLOW REQUIREMENTS

CASE E-1 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 18 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

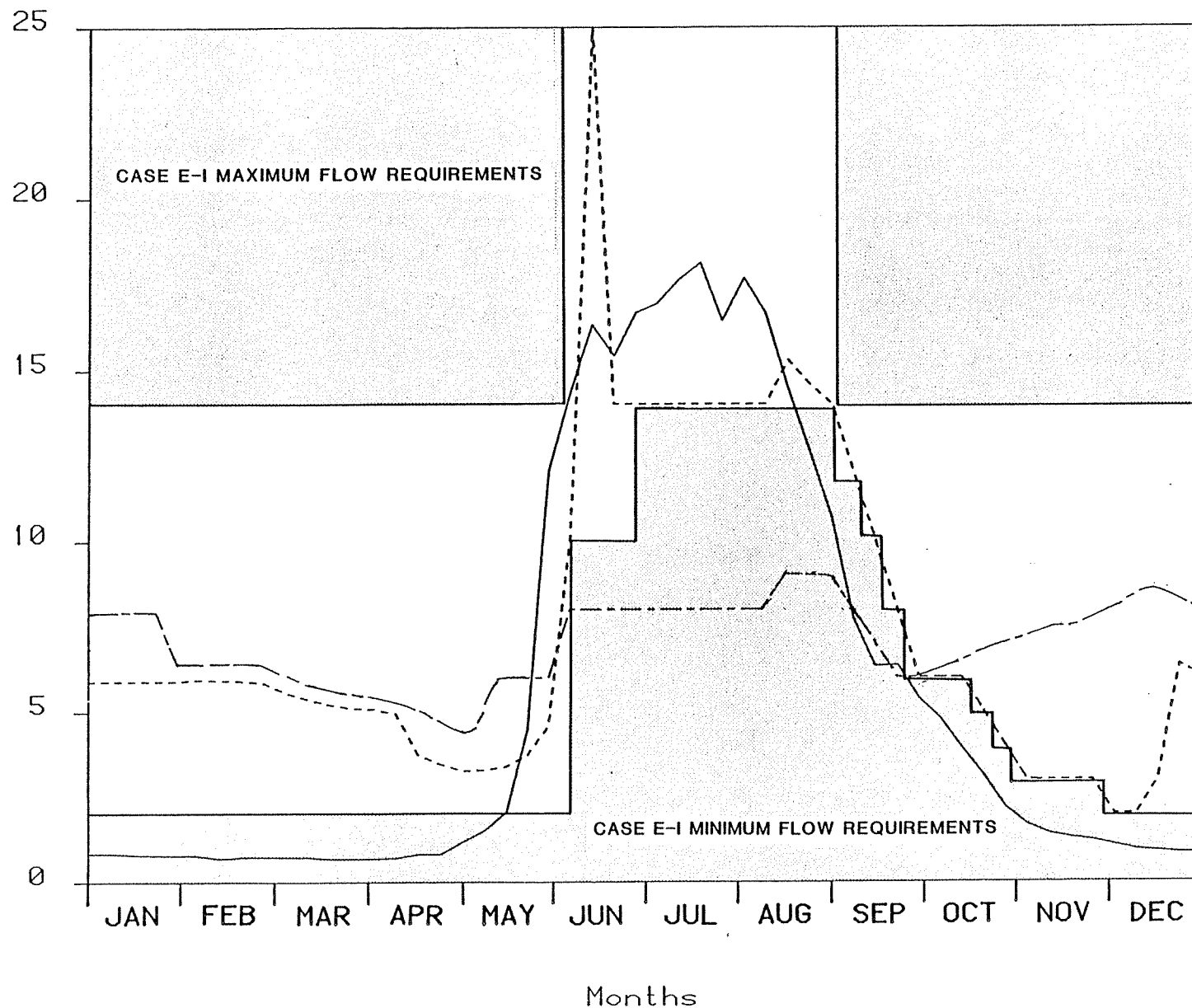
- NATURAL CONDITION
- - - FLOWS FOR E - VI FLOW REQUIREMENTS
- - - FLOWS FOR E - I FLOW REQUIREMENTS

|                                                                  |  |
|------------------------------------------------------------------|--|
| ALASKA POWER AUTHORITY                                           |  |
| SUSITNA HYDROELECTRIC PROJECT                                    |  |
| SUSITNA RIVER STREAMFLOWS EXCEEDED 50% OF THE TIME AT GOLD CREEK |  |
| HAKEA-SWANDS                                                     |  |
| DATE                                                             |  |
| REVISION                                                         |  |

FIGURE E.2.4.144

Discharge in cfs

THOUSANDS



**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 97% OF THE TIME AT GOLD CREEK |                 |                       |
| DATE: 1980                                                       | BY: [Signature] | REVIEWED: [Signature] |

FIGURE E.2.4.145

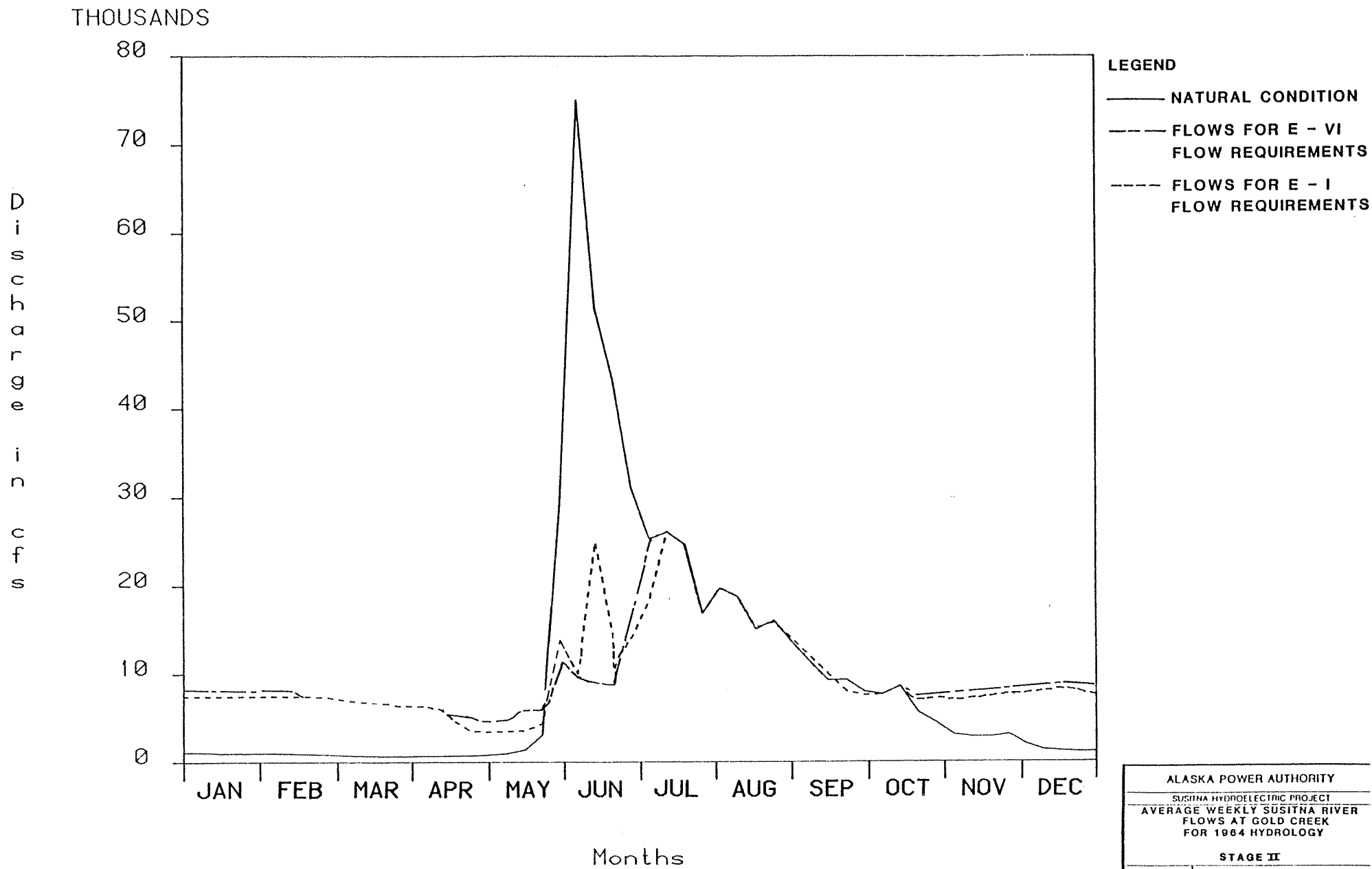
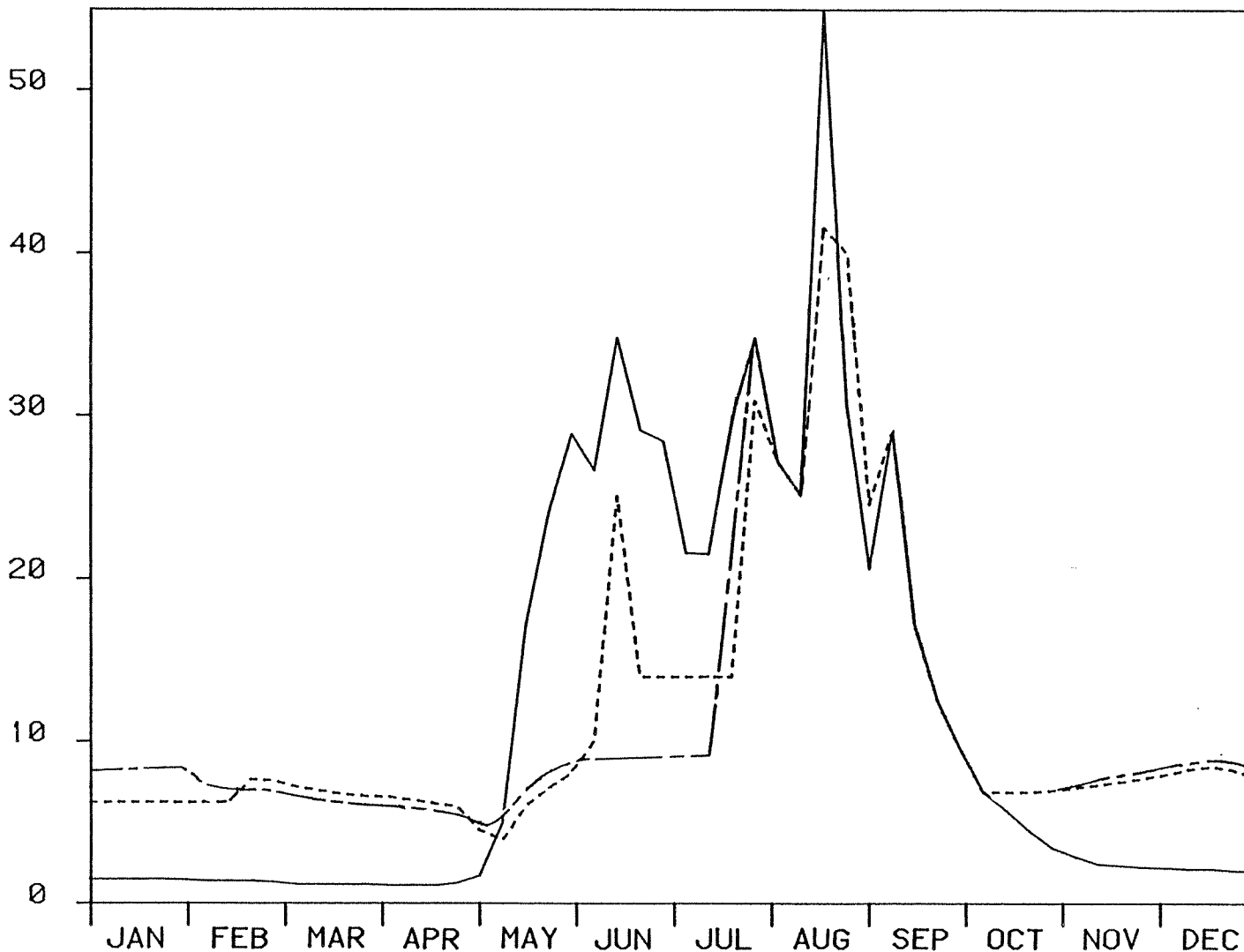


FIGURE E.2.4.146

|                               |  |
|-------------------------------|--|
| ALASKA POWER AUTHORITY        |  |
| SUSITNA HYDROELECTRIC PROJECT |  |
| AVERAGE WEEKLY SUSITNA RIVER  |  |
| FLOWS AT GOLD CREEK           |  |
| FOR 1964 HYDROLOGY            |  |
| STAGE II                      |  |
| BARRETT/BRANCO                |  |
| ANCHORAGE, ALASKA             |  |

THOUSANDS

DISCHARGE  
IN  
CFS



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<br>FLOWS AT GOLD CREEK<br>FOR 1967 HYDROLOGY |                  |
| STAGE II                                                                  |                  |
| DATE: 11/1/67                                                             | BY: J. M. WILSON |
| CHECKED: J. M. WILSON                                                     | DATE: 11/1/67    |

FIGURE E.2.4.147

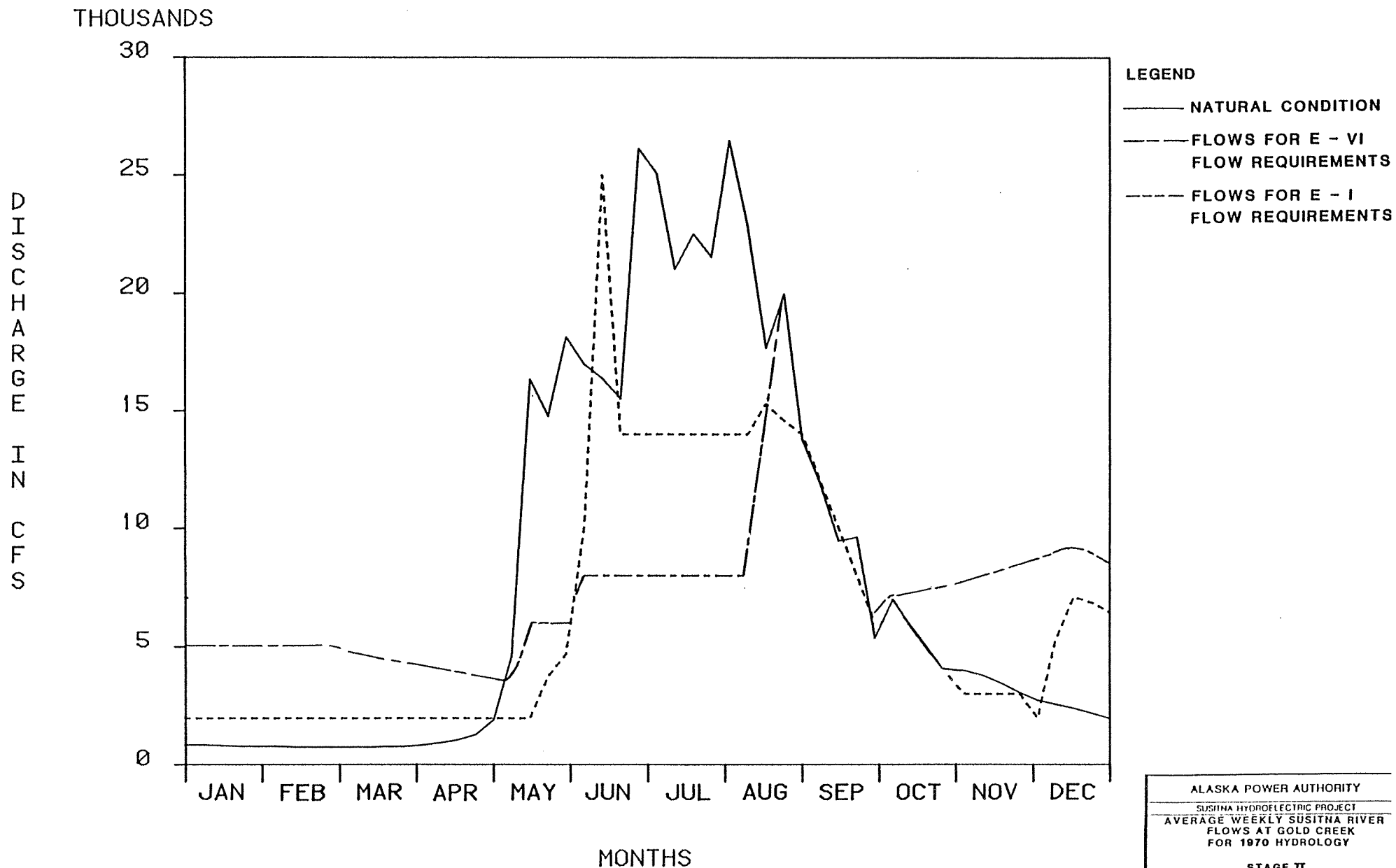


FIGURE E.2.4.148

|                               |      |             |
|-------------------------------|------|-------------|
| ALASKA POWER AUTHORITY        |      |             |
| SUSITNA HYDROELECTRIC PROJECT |      |             |
| AVERAGE WEEKLY SUSITNA RIVER  |      |             |
| FLOWS AT GOLD CREEK           |      |             |
| FOR 1970 HYDROLOGY            |      |             |
| STAGE II                      |      |             |
| AREA - BLANCO                 | DATE | PROJECT NO. |
| DATE                          | DATE | DATE        |

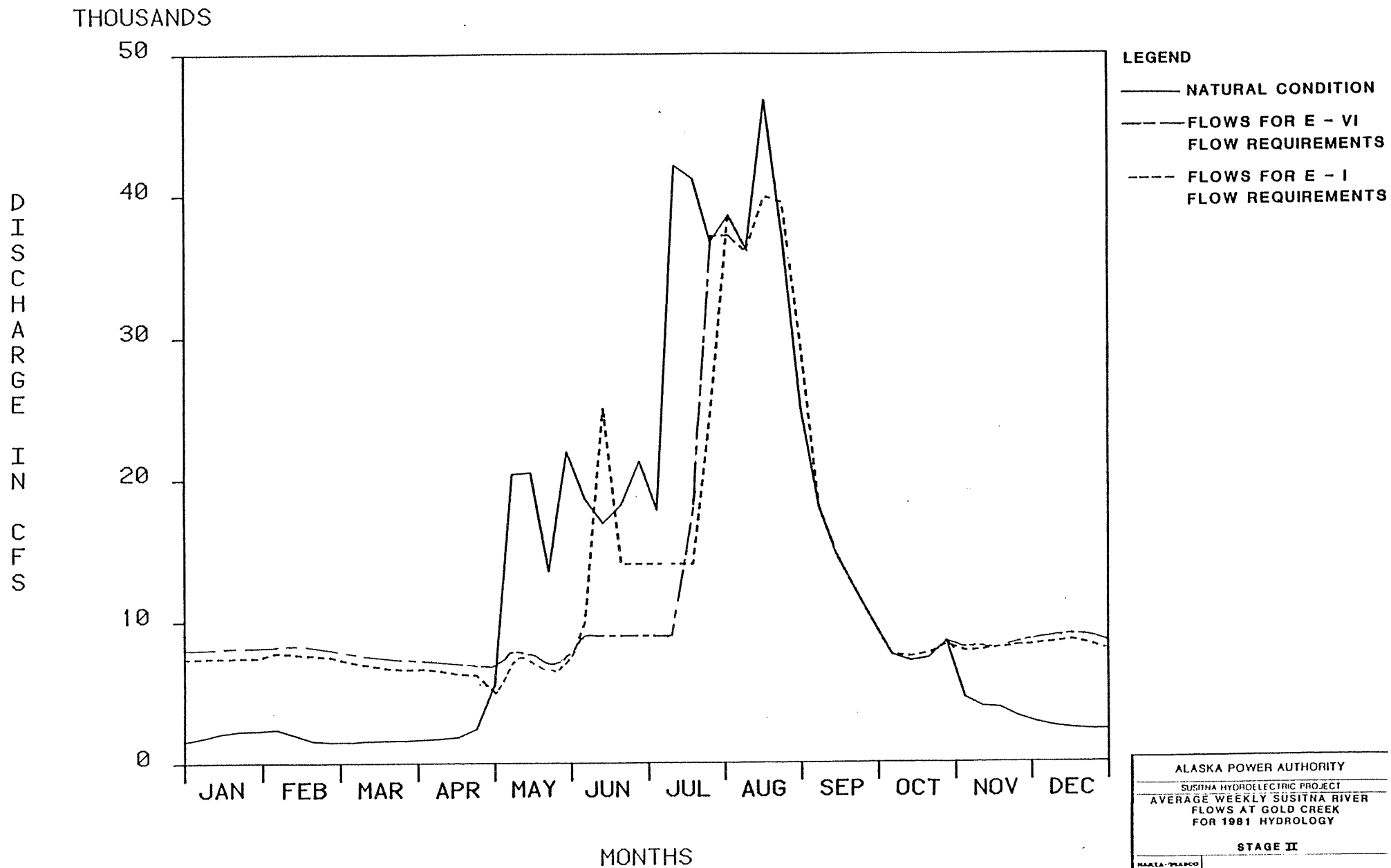


FIGURE E.2.4.149



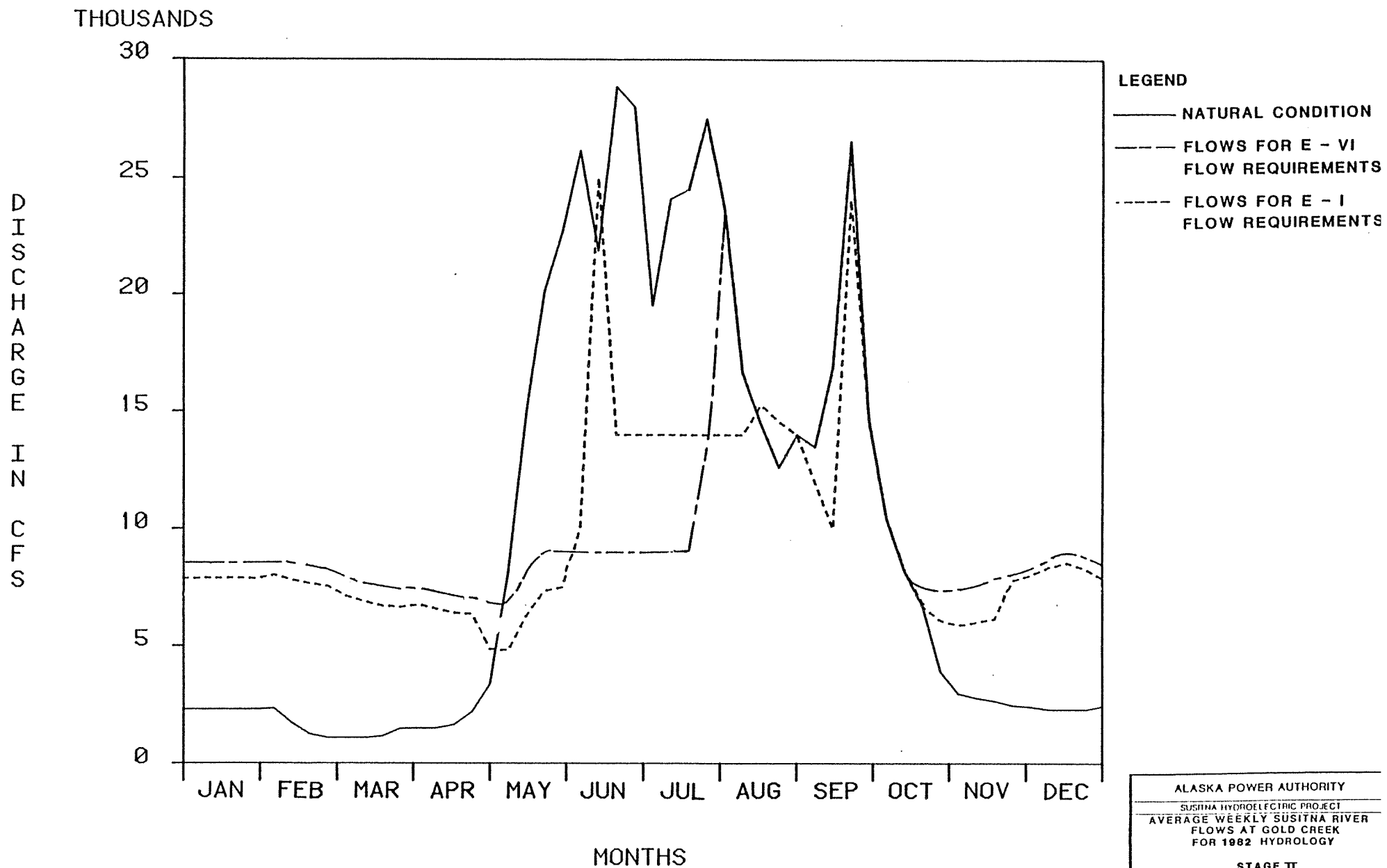


FIGURE E.2.4.150

|                               |      |             |
|-------------------------------|------|-------------|
| ALASKA POWER AUTHORITY        |      |             |
| SUSITNA HYDROELECTRIC PROJECT |      |             |
| AVERAGE WEEKLY SUSITNA RIVER  |      |             |
| FLOWS AT GOLD CREEK           |      |             |
| FOR 1982 HYDROLOGY            |      |             |
| STAGE II                      |      |             |
| BARRETT-IRAPCO                | DATE | PROJECT NO. |
| ENGINEER, NAME                | DATE | PROJECT NO. |

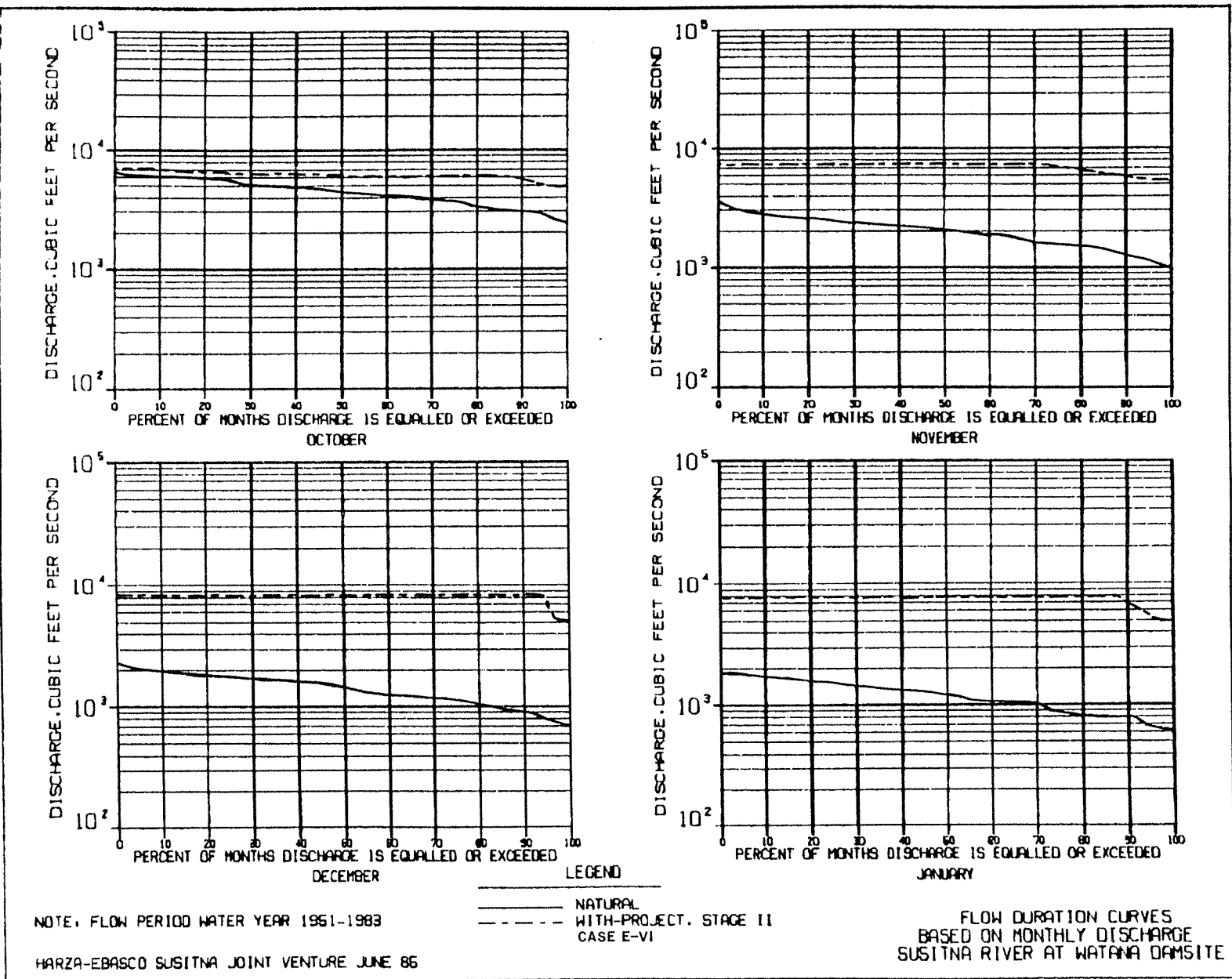


FIGURE E.2.4.151

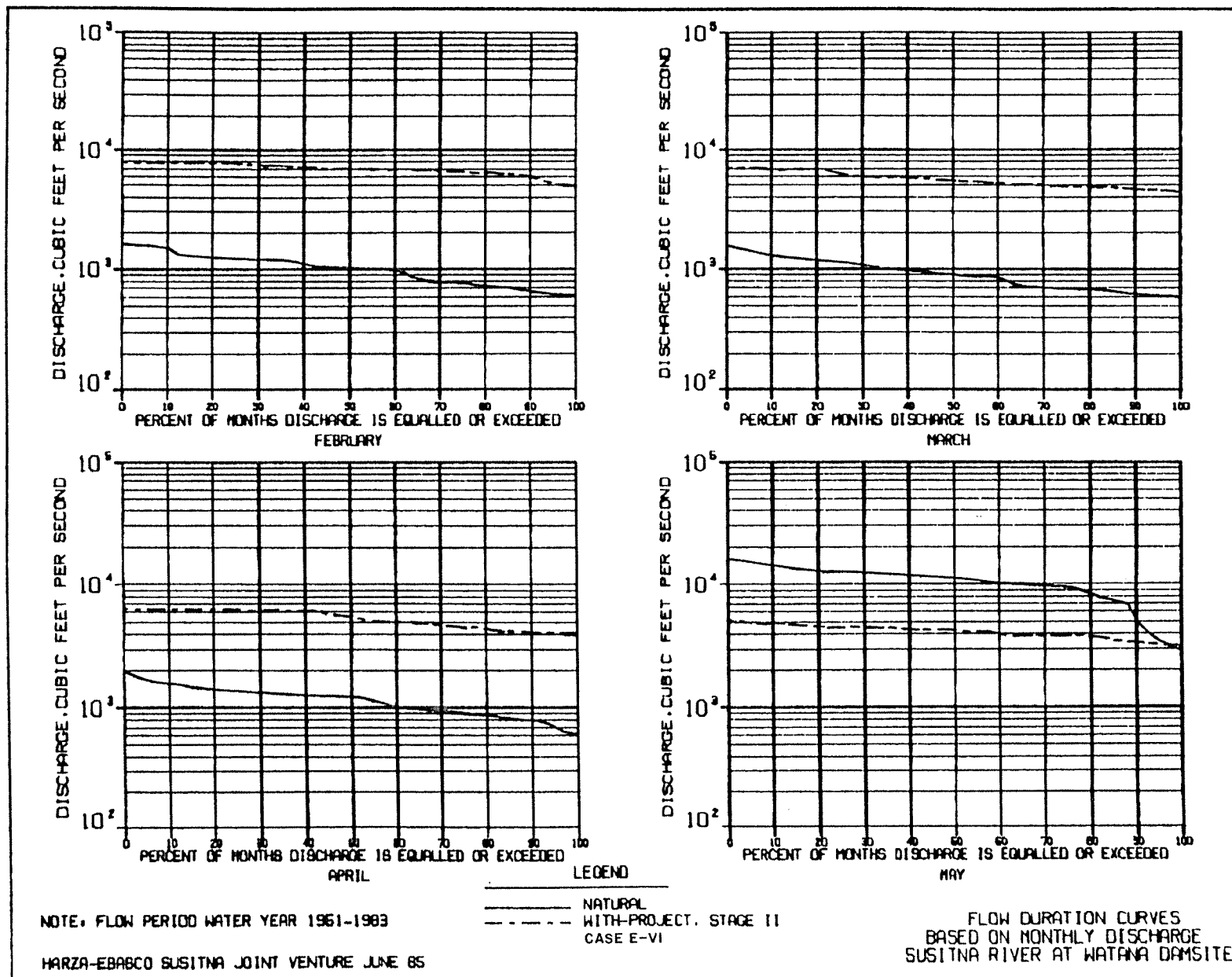


FIGURE E.2.4.151

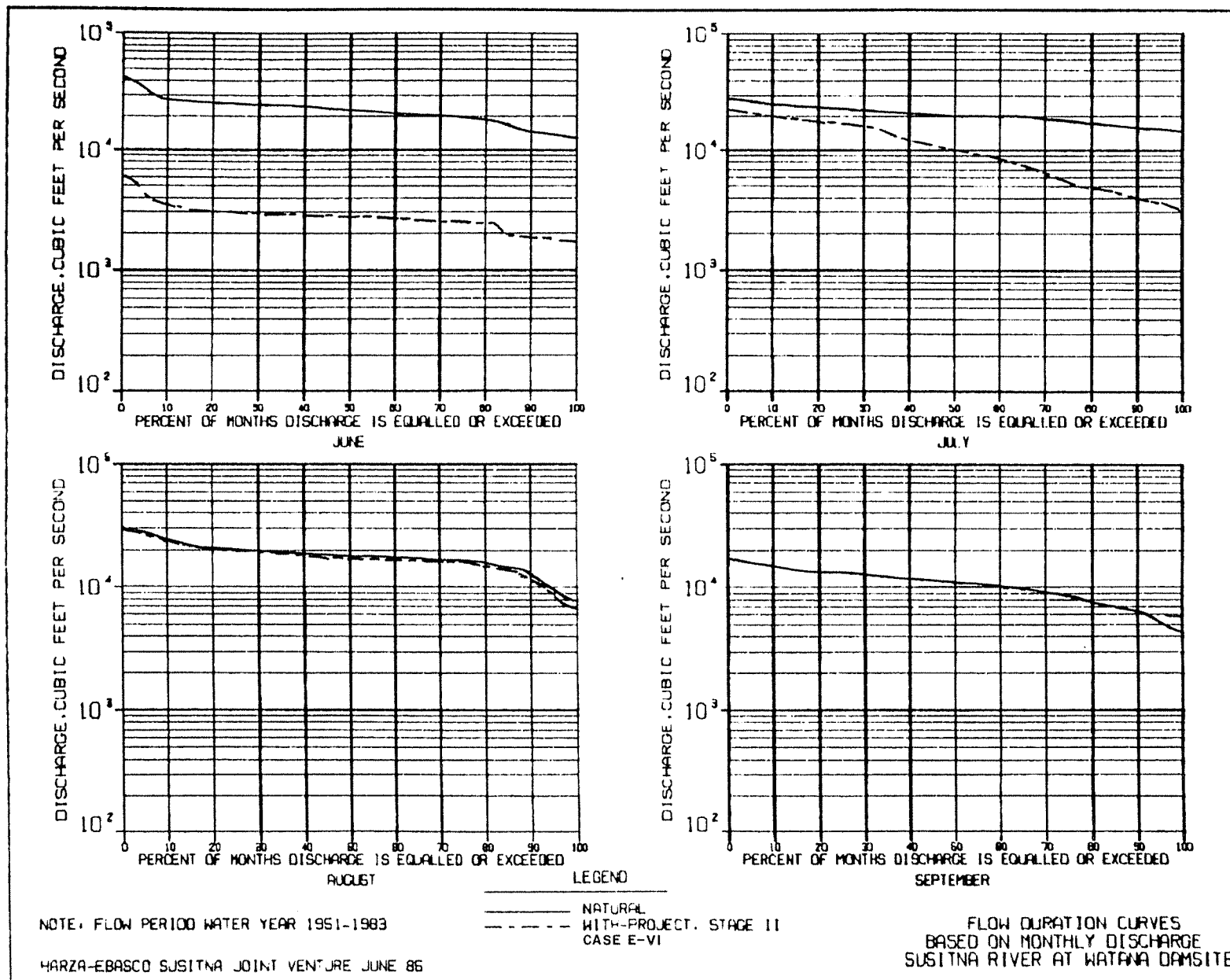


FIGURE E.2.4.151

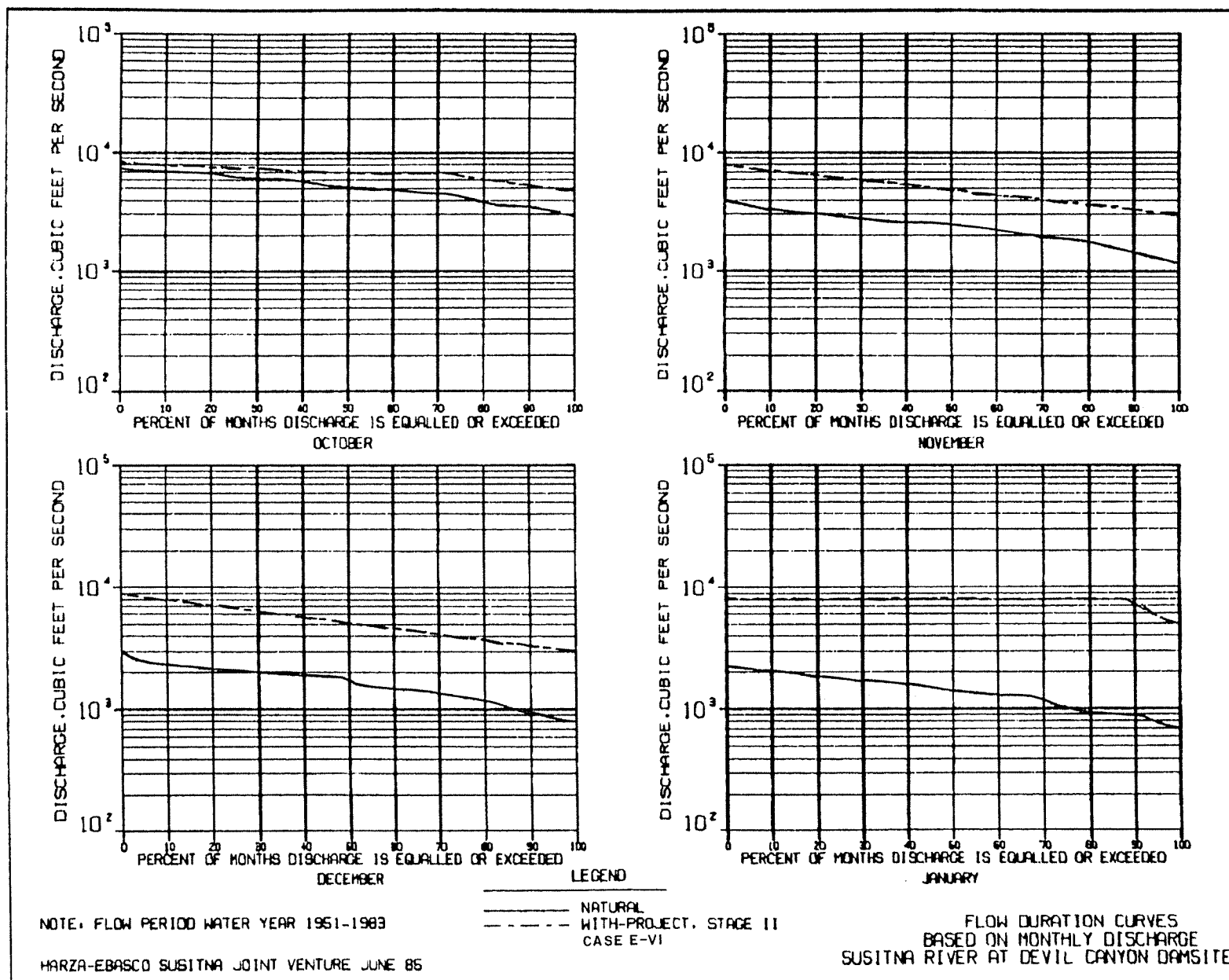


FIGURE E.2.4.152

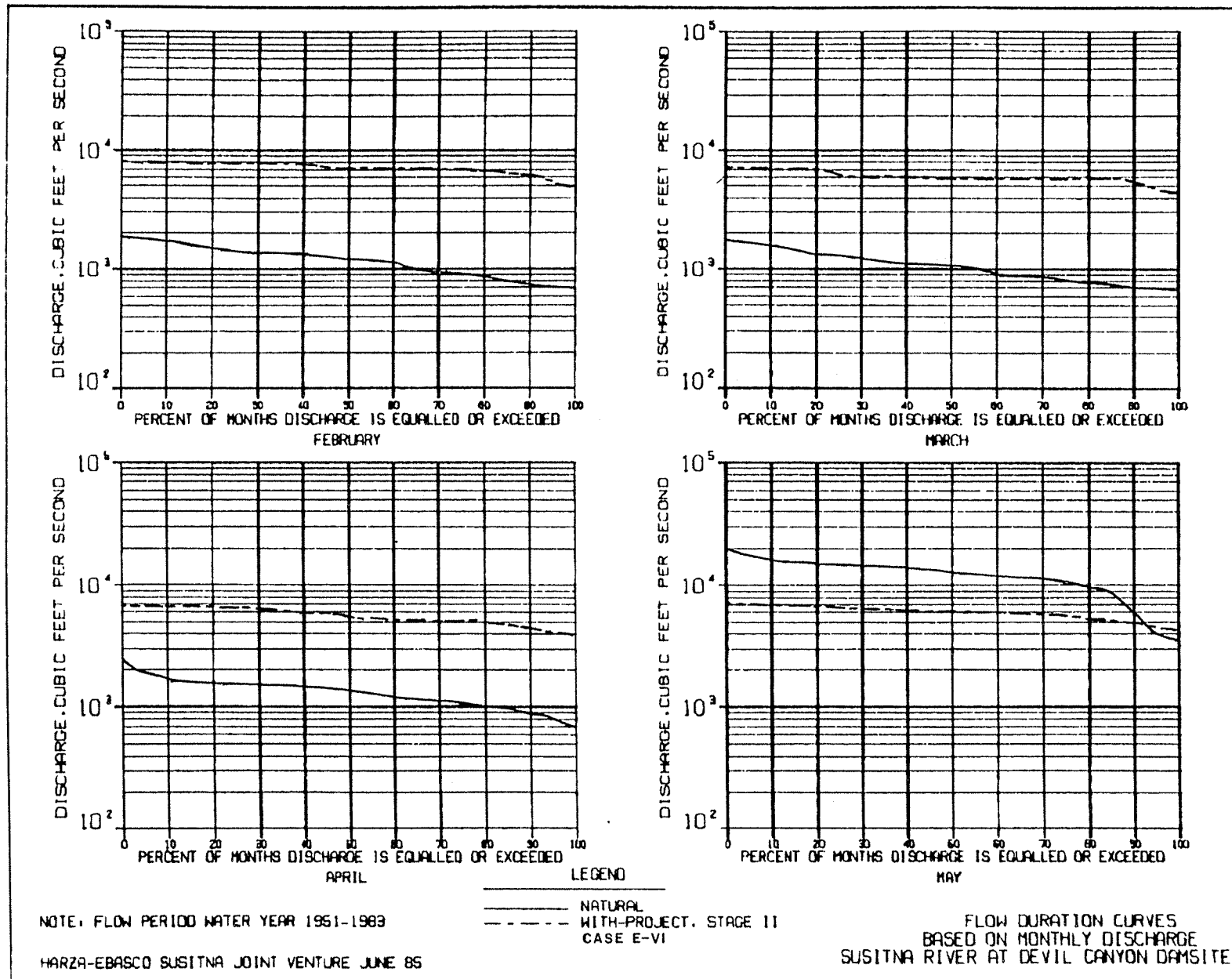


FIGURE E.2.4.152

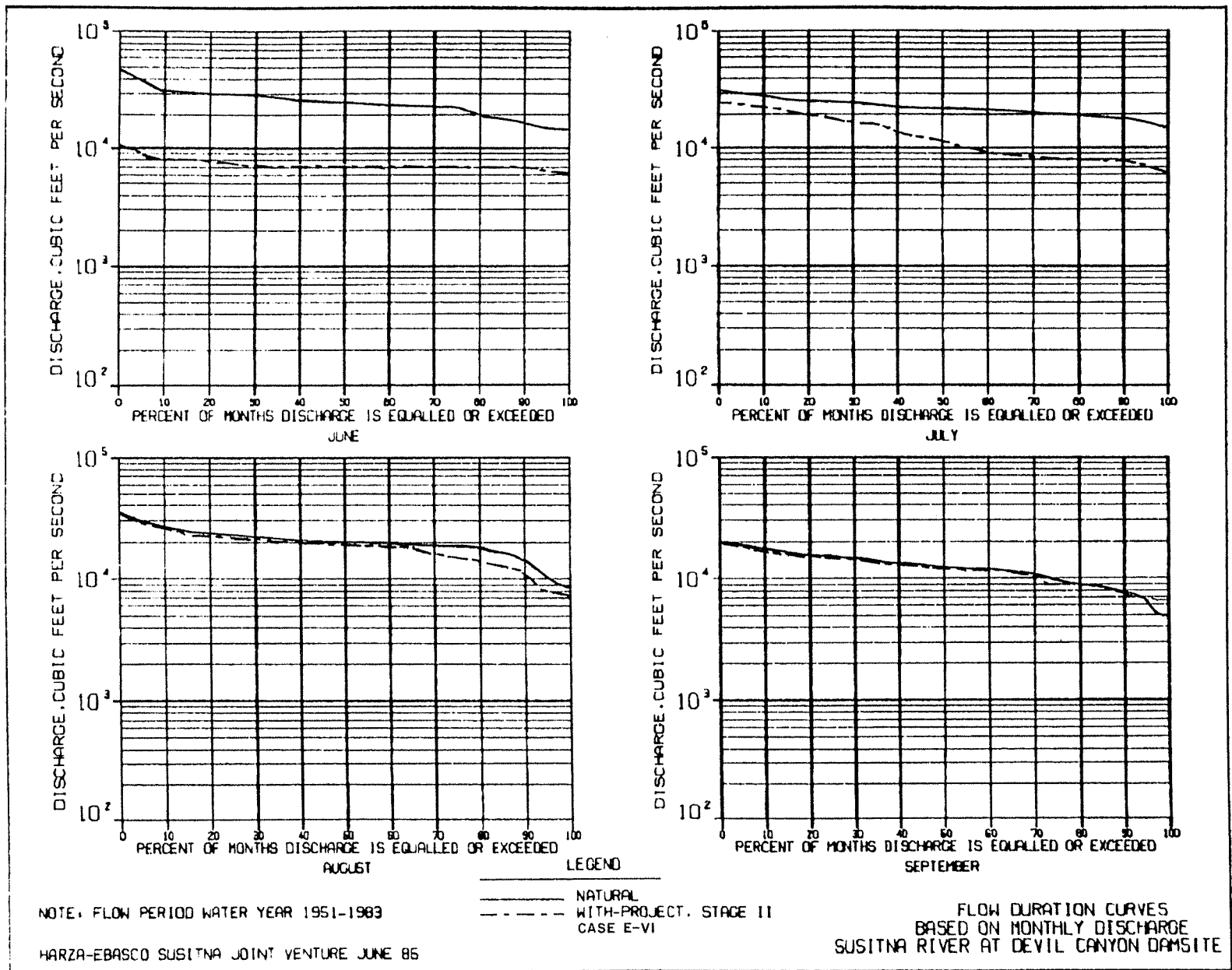


FIGURE E.2.4.152

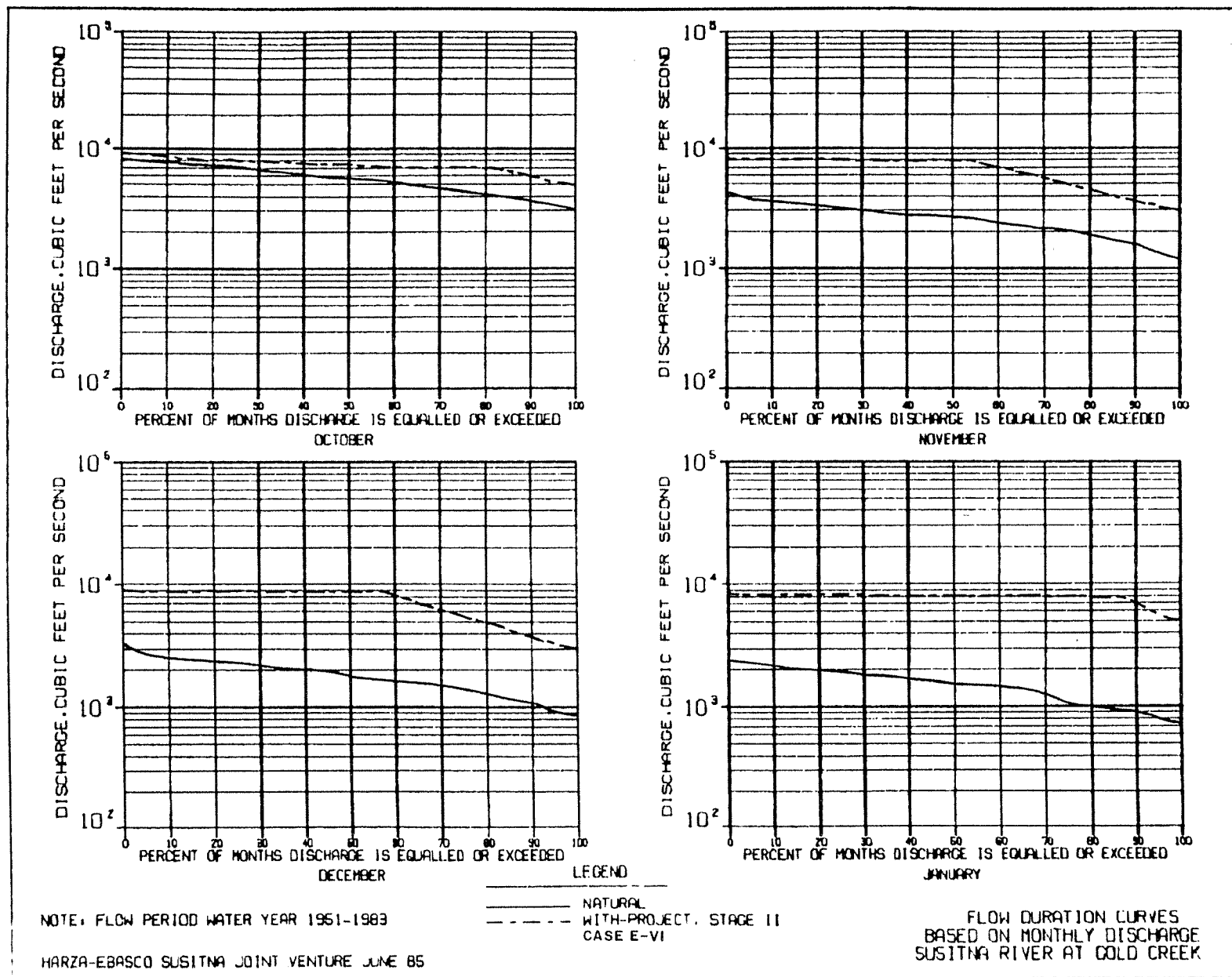


FIGURE E.2.4.153



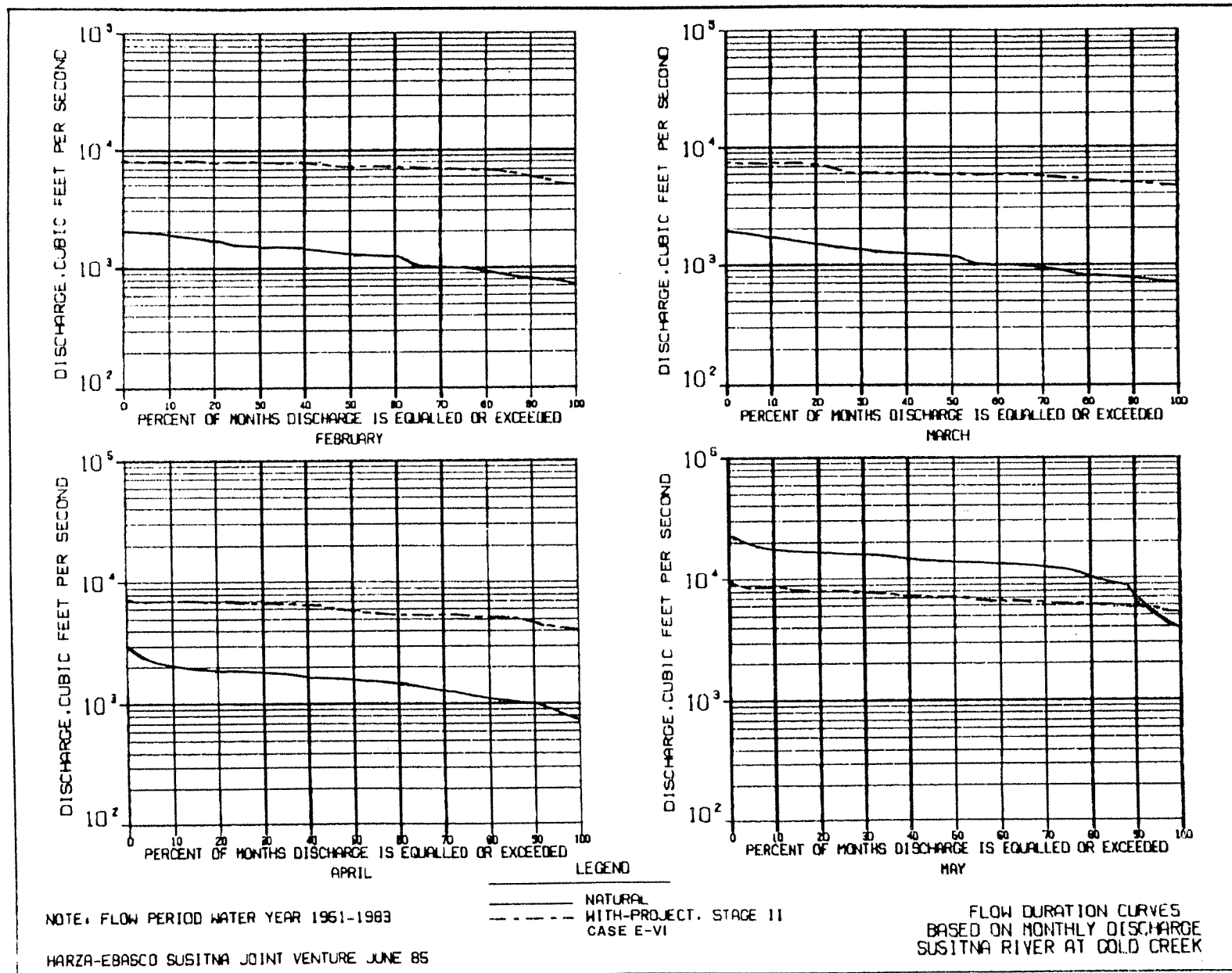


FIGURE 2.4.153

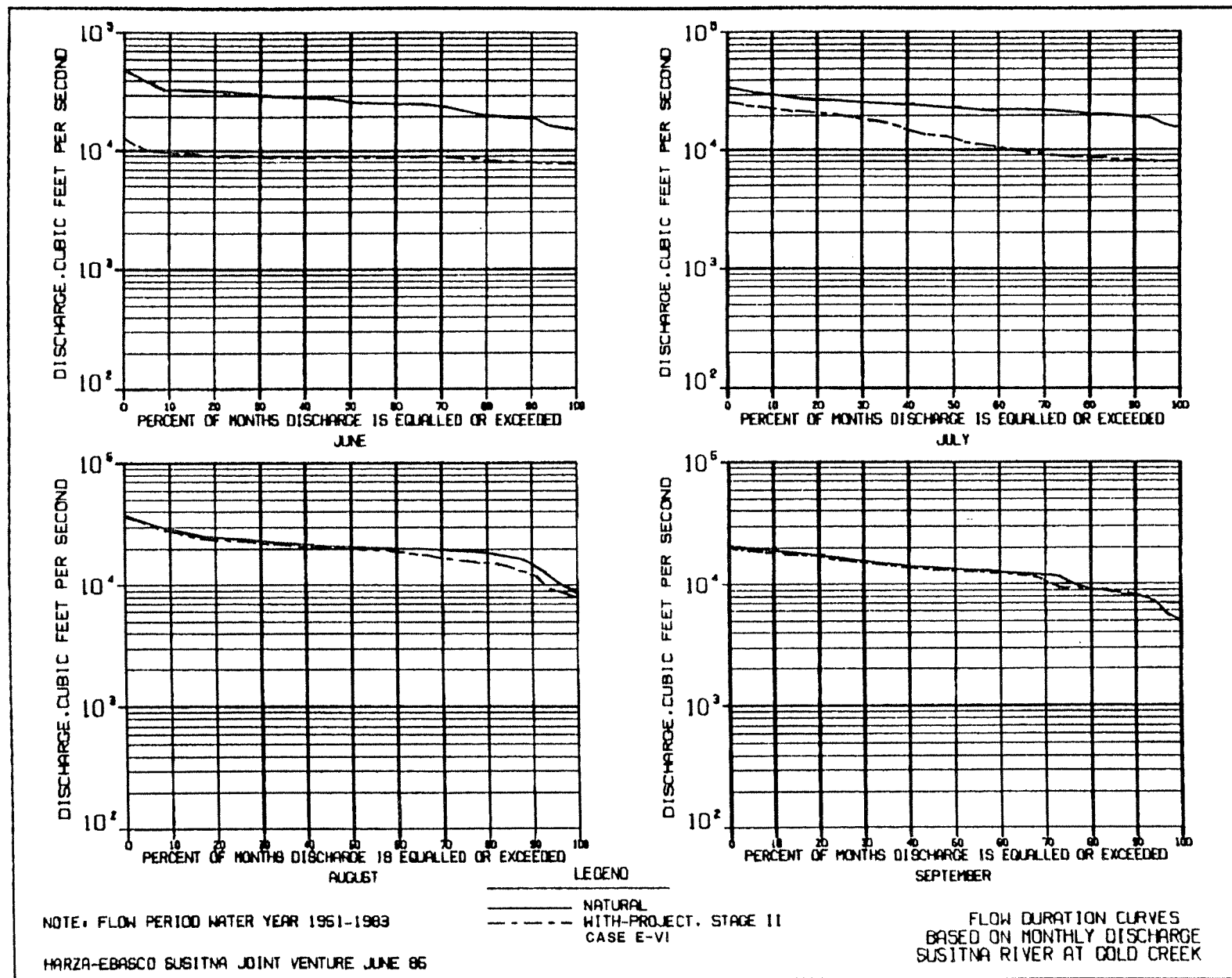


FIGURE E.2.4.153

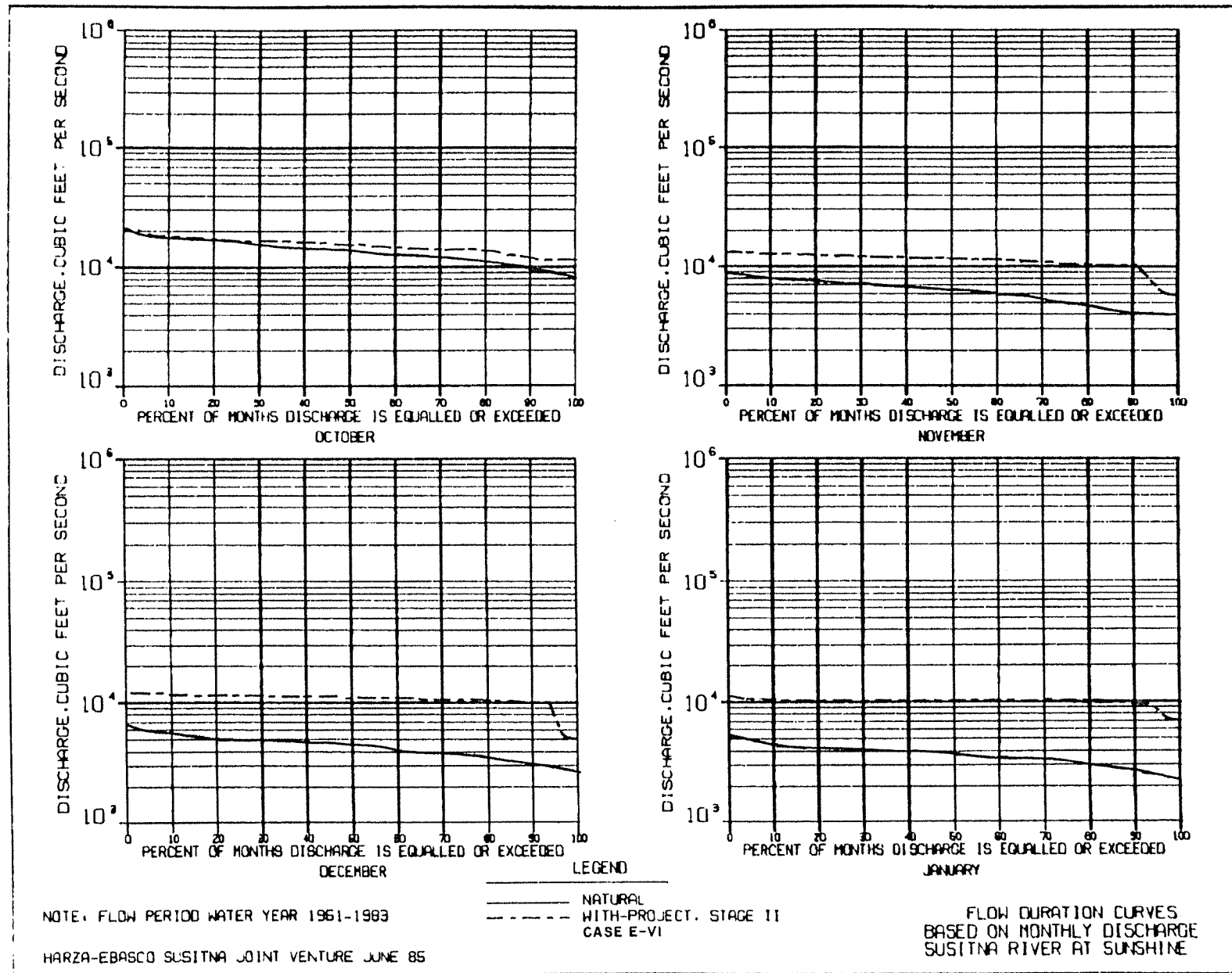


FIGURE 2.4.154

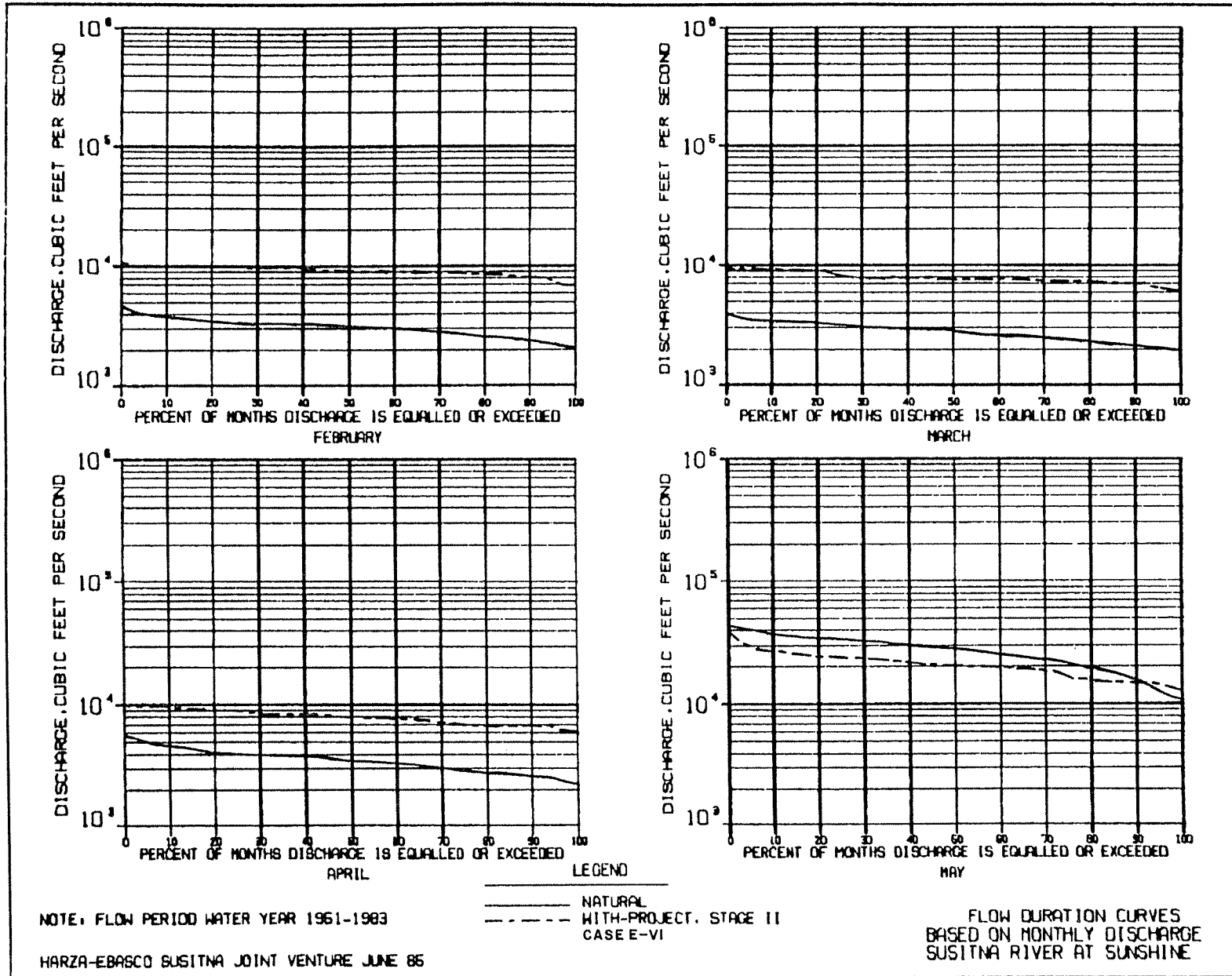


FIGURE E.2.4.154

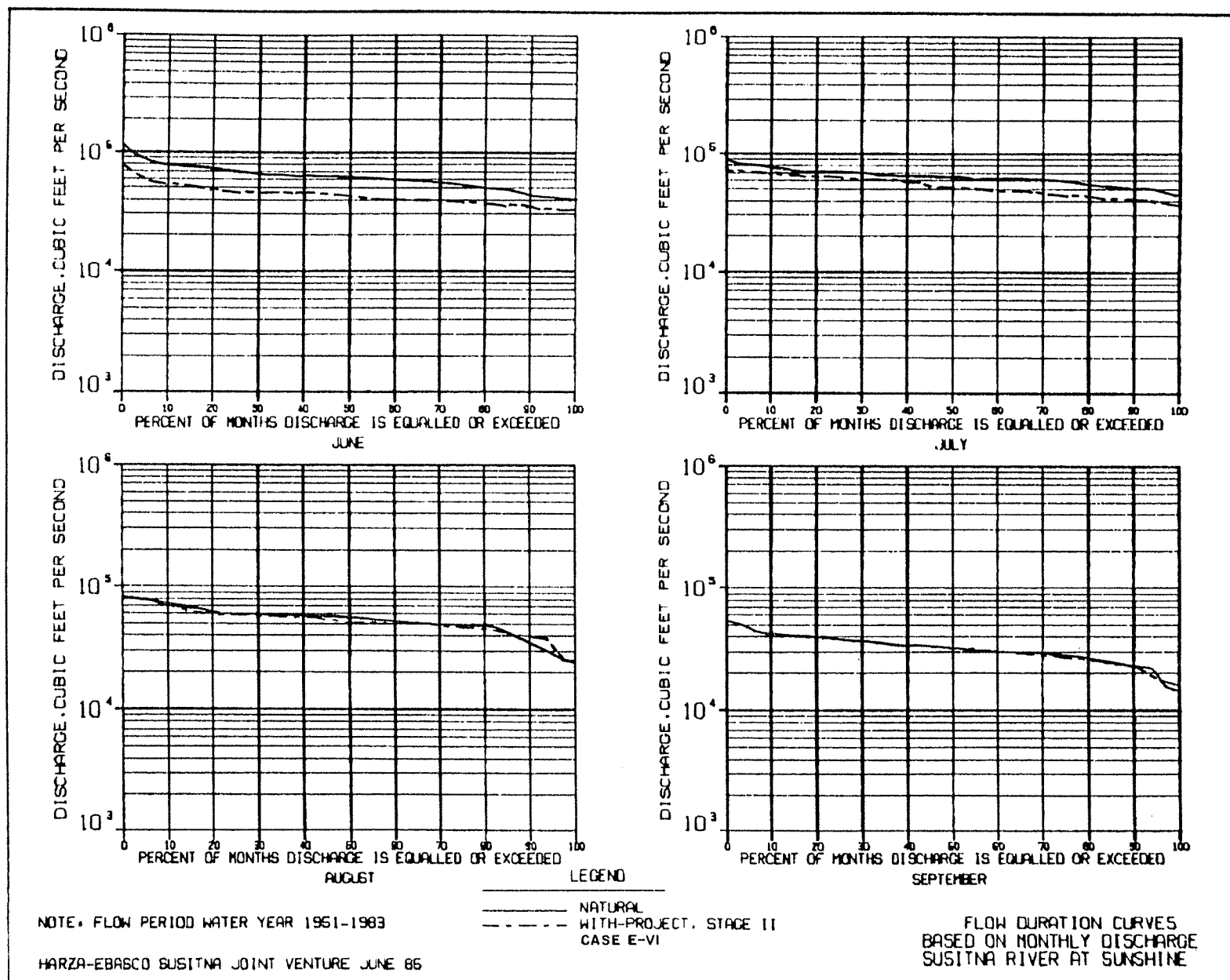


FIGURE E.2.4.154

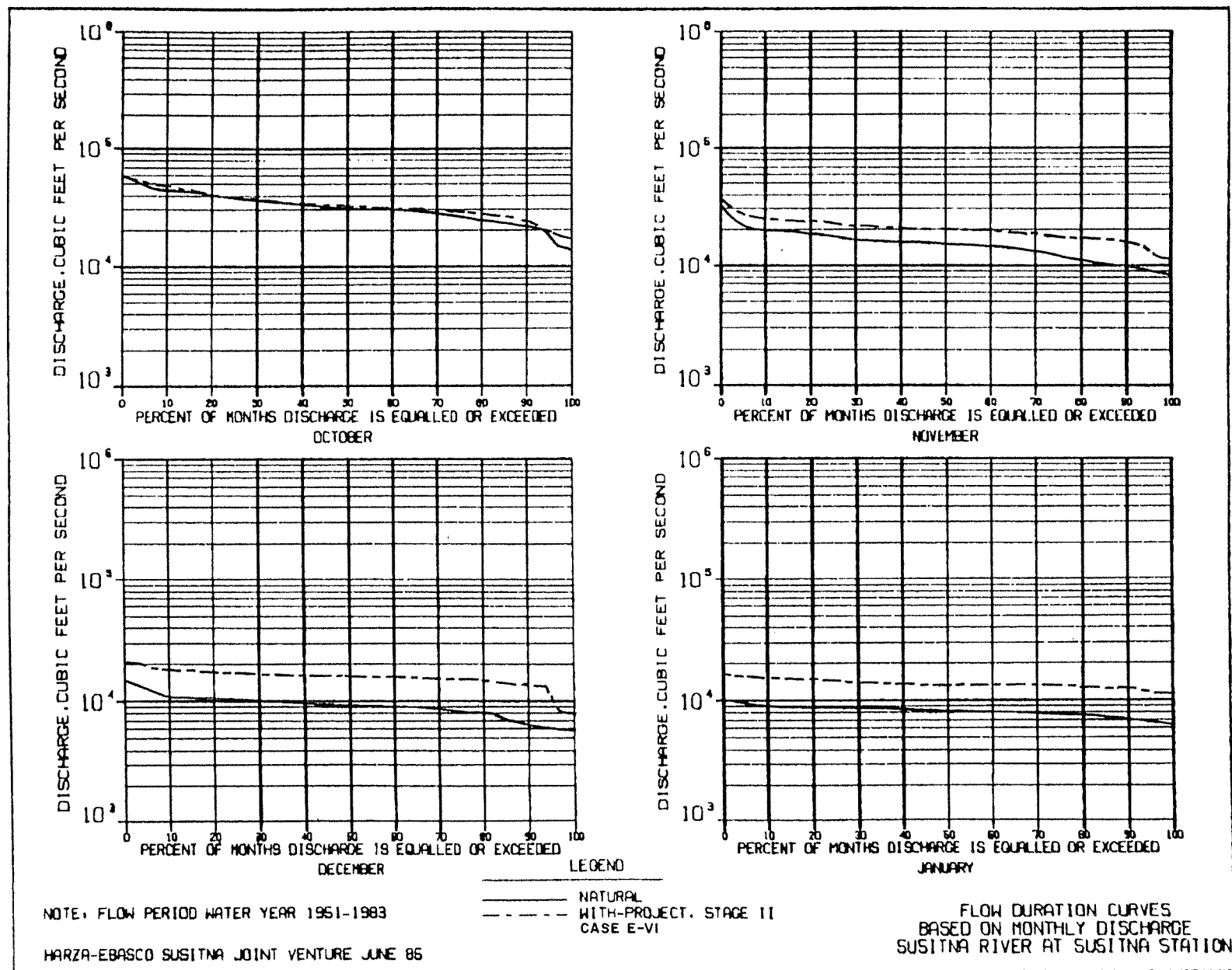


FIGURE E.2.4.155

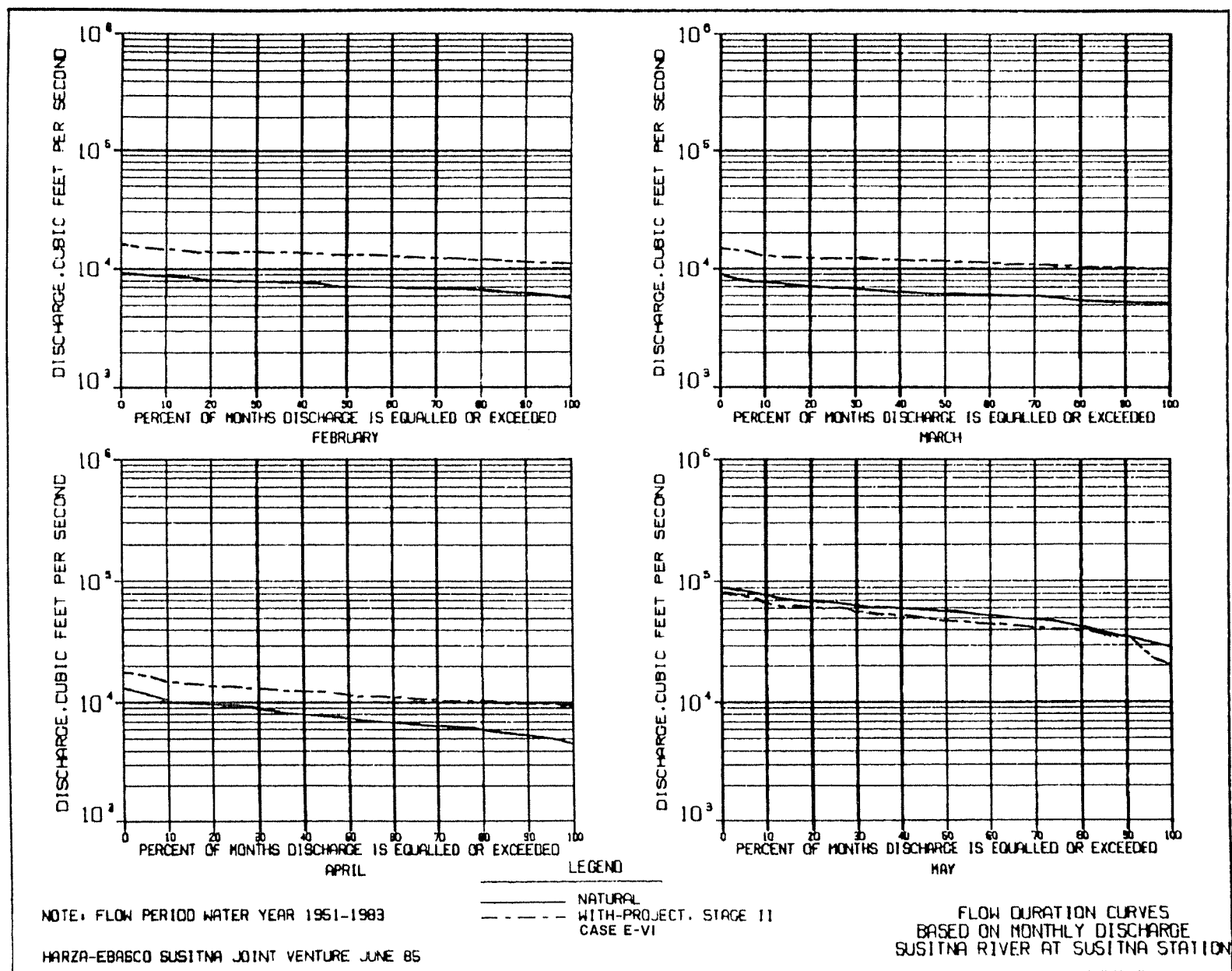


FIGURE E.2.4.155

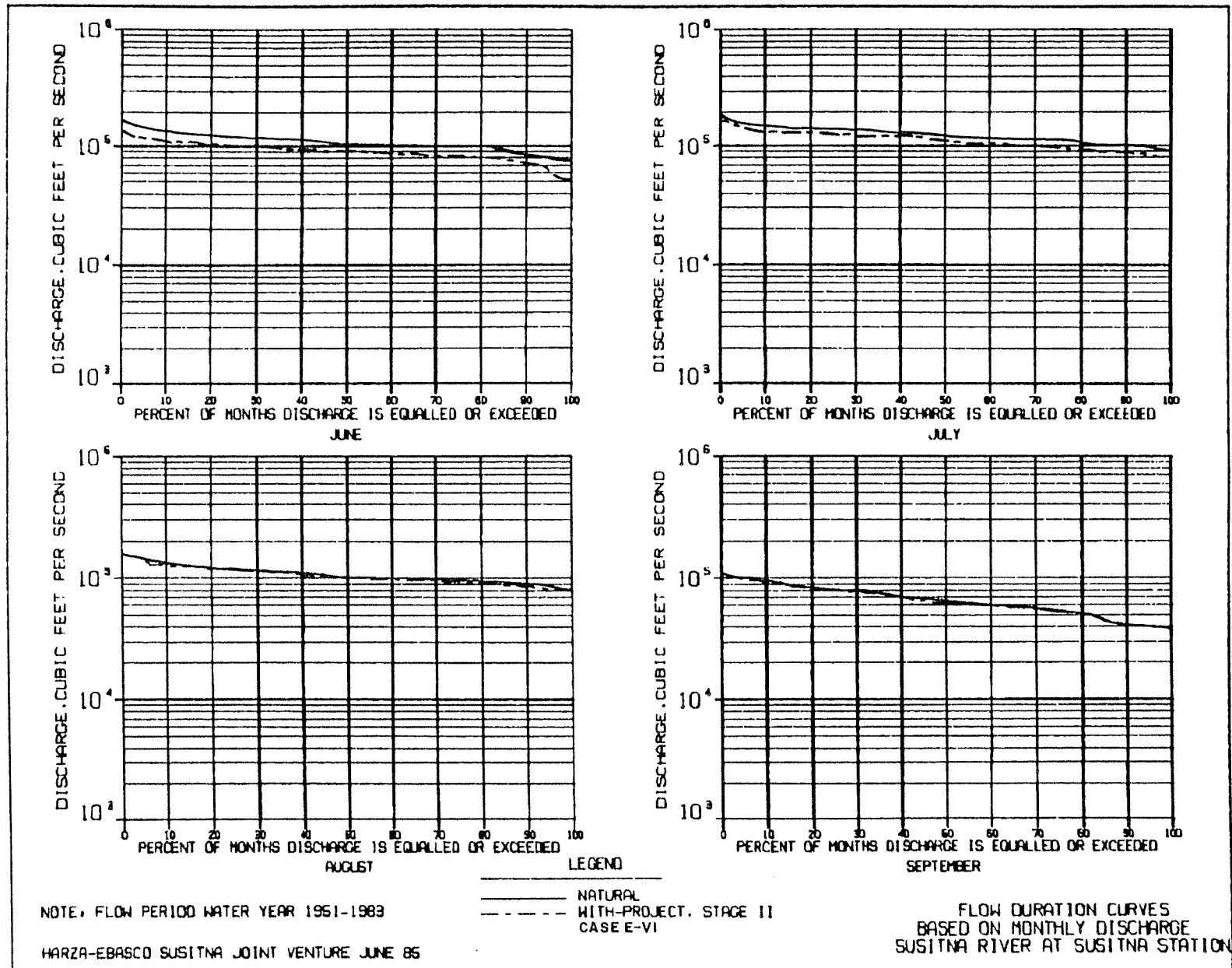


FIGURE E.2.4.155



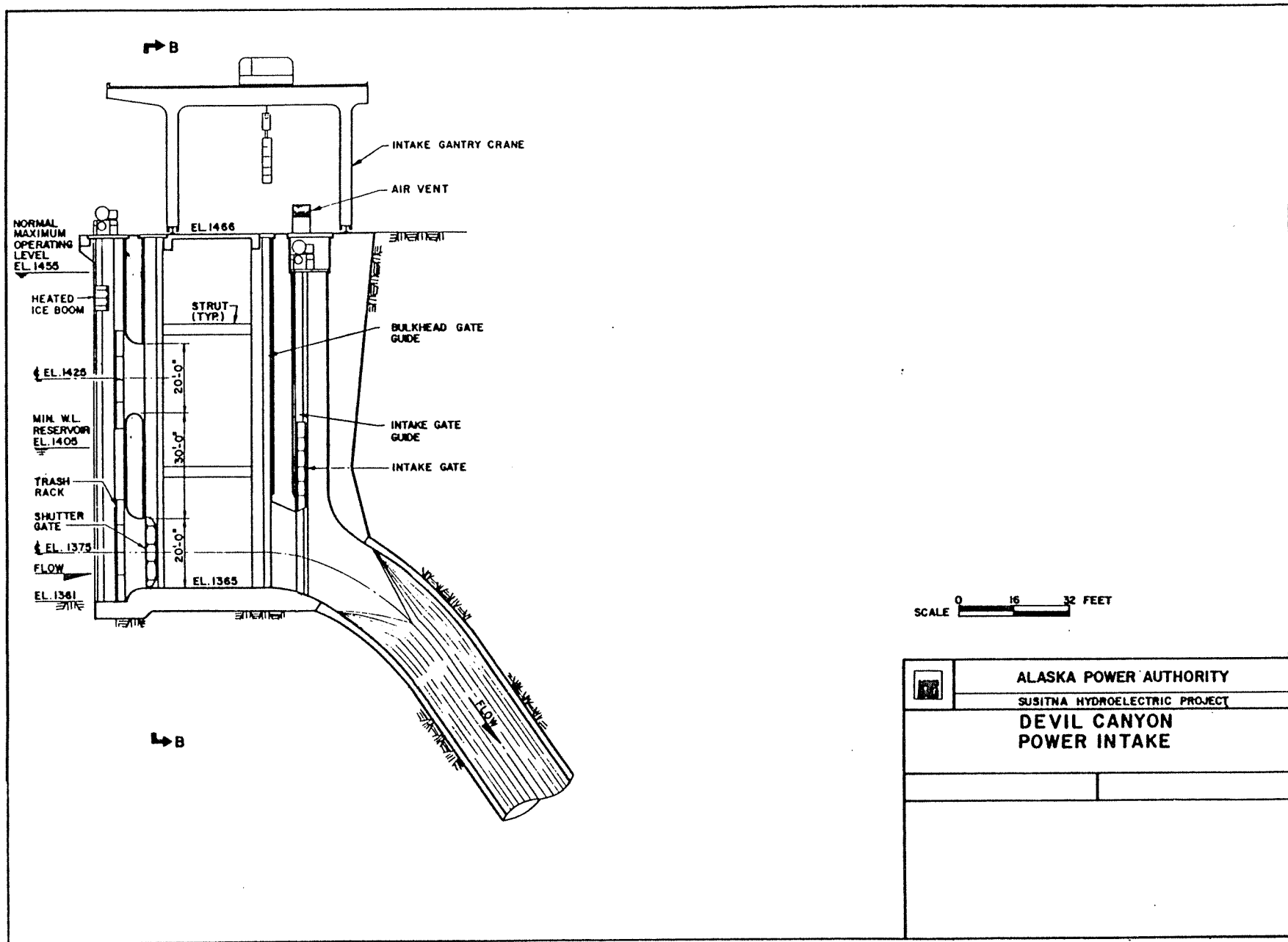


FIGURE E.2.4.156

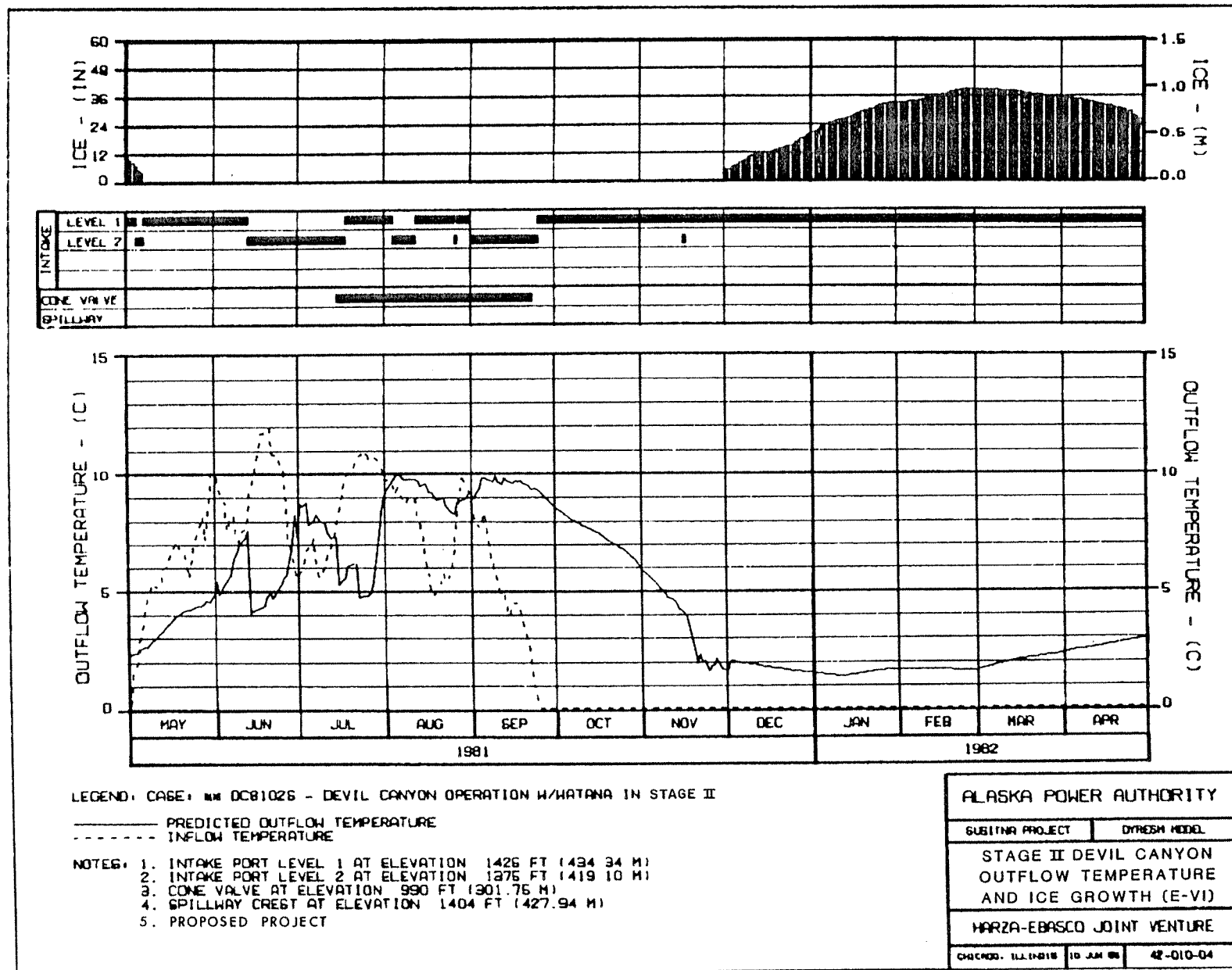


FIGURE E.2.4.157

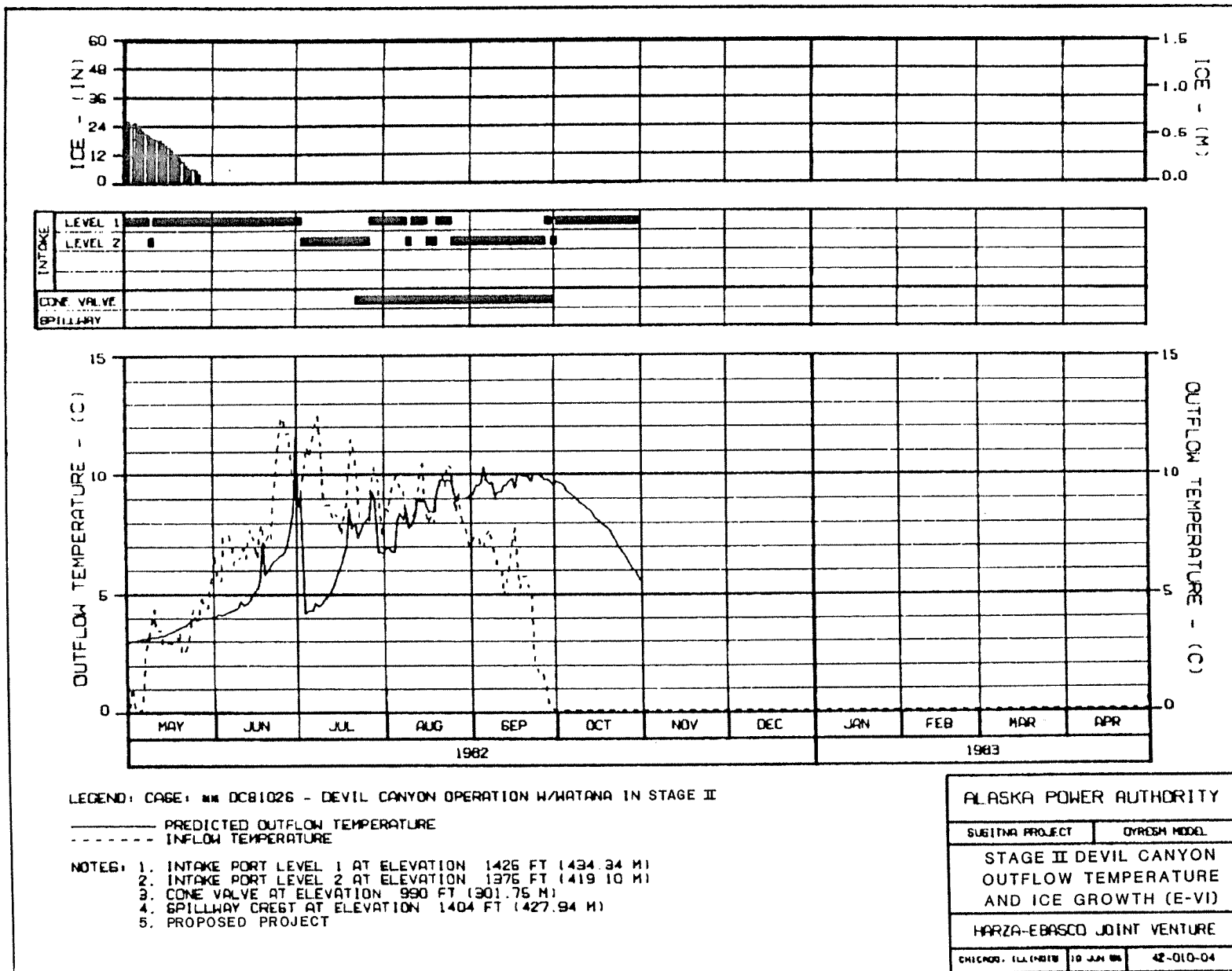


FIGURE E.2.4.158

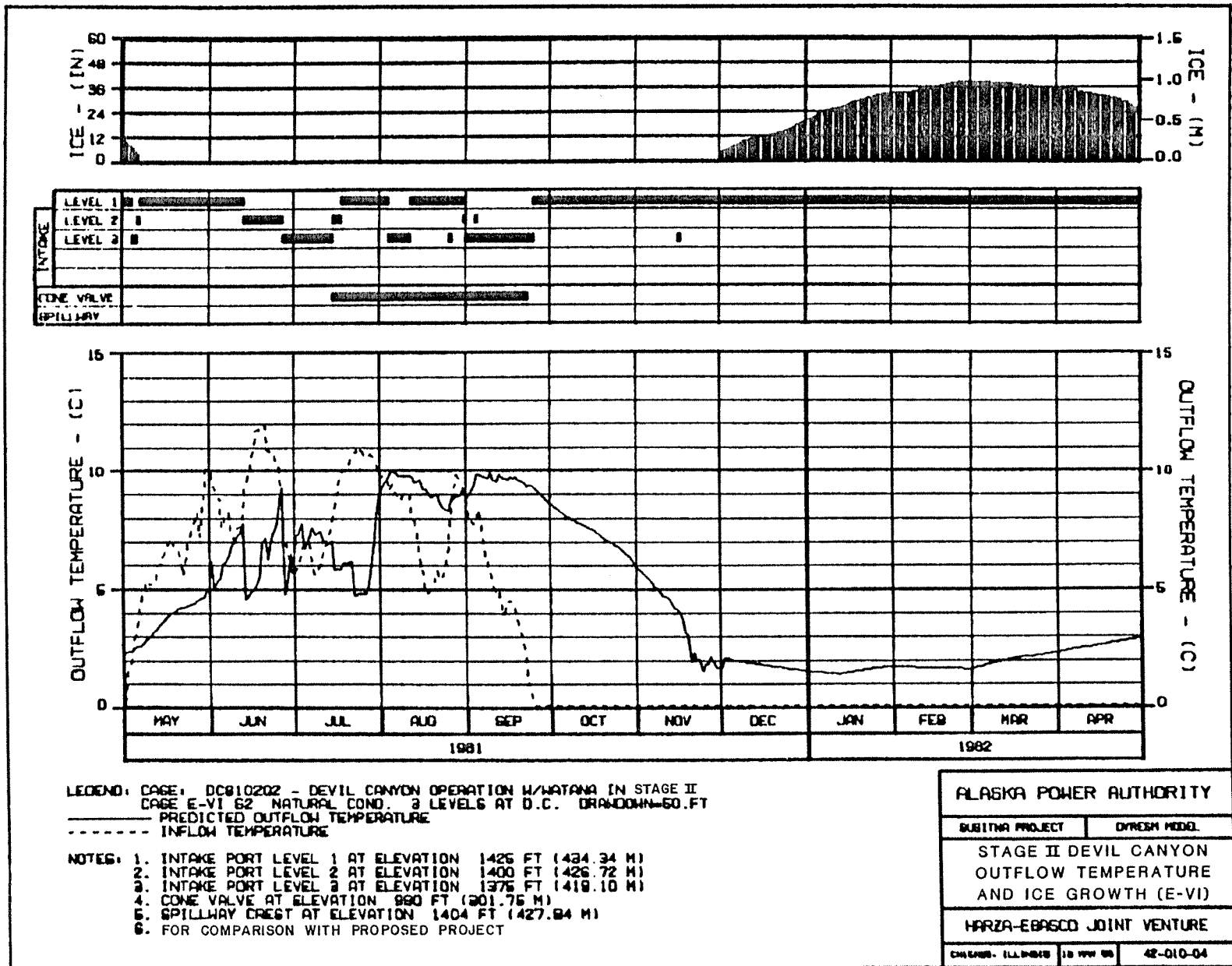


FIGURE E.2.4.159

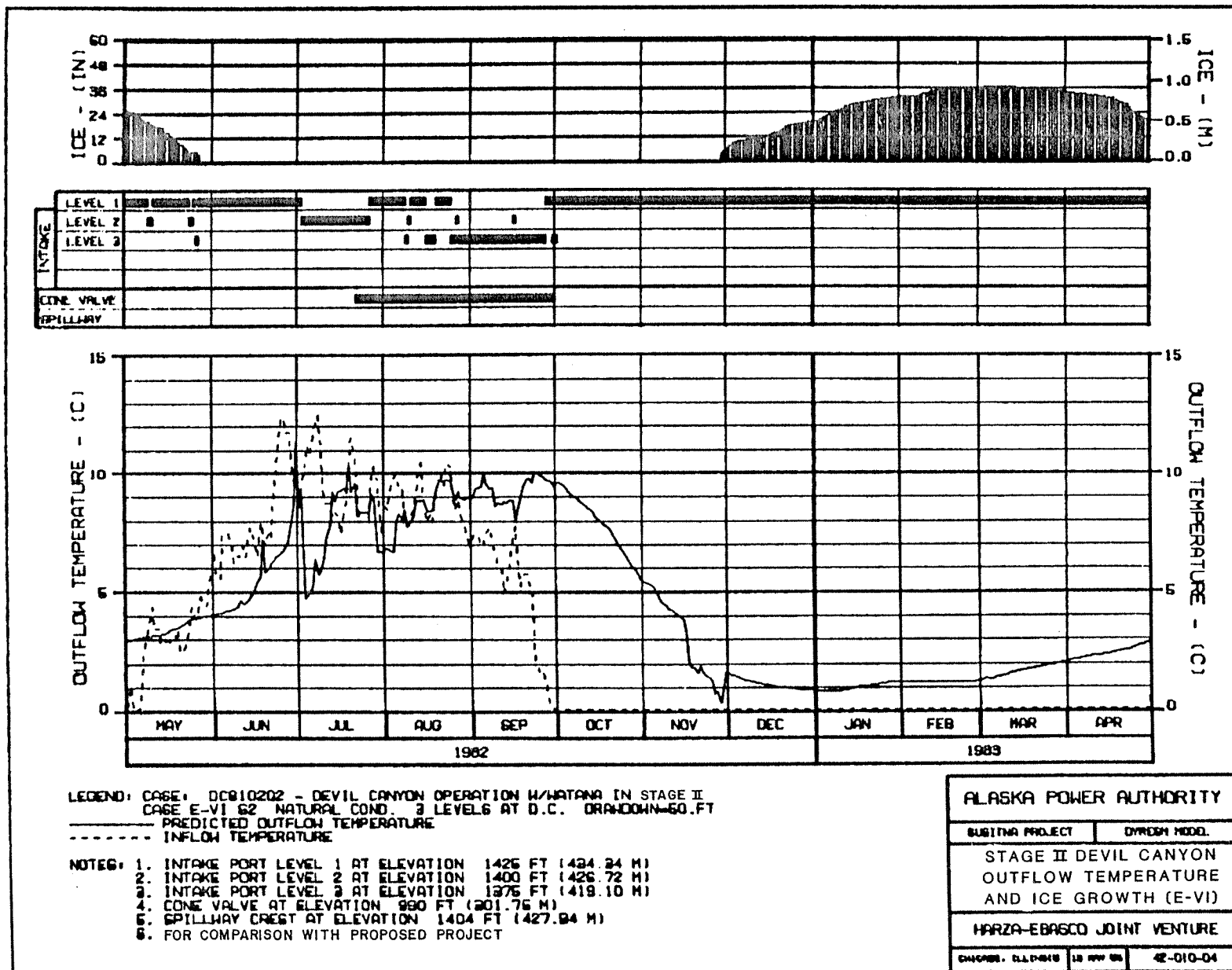


FIGURE E.2.4.160

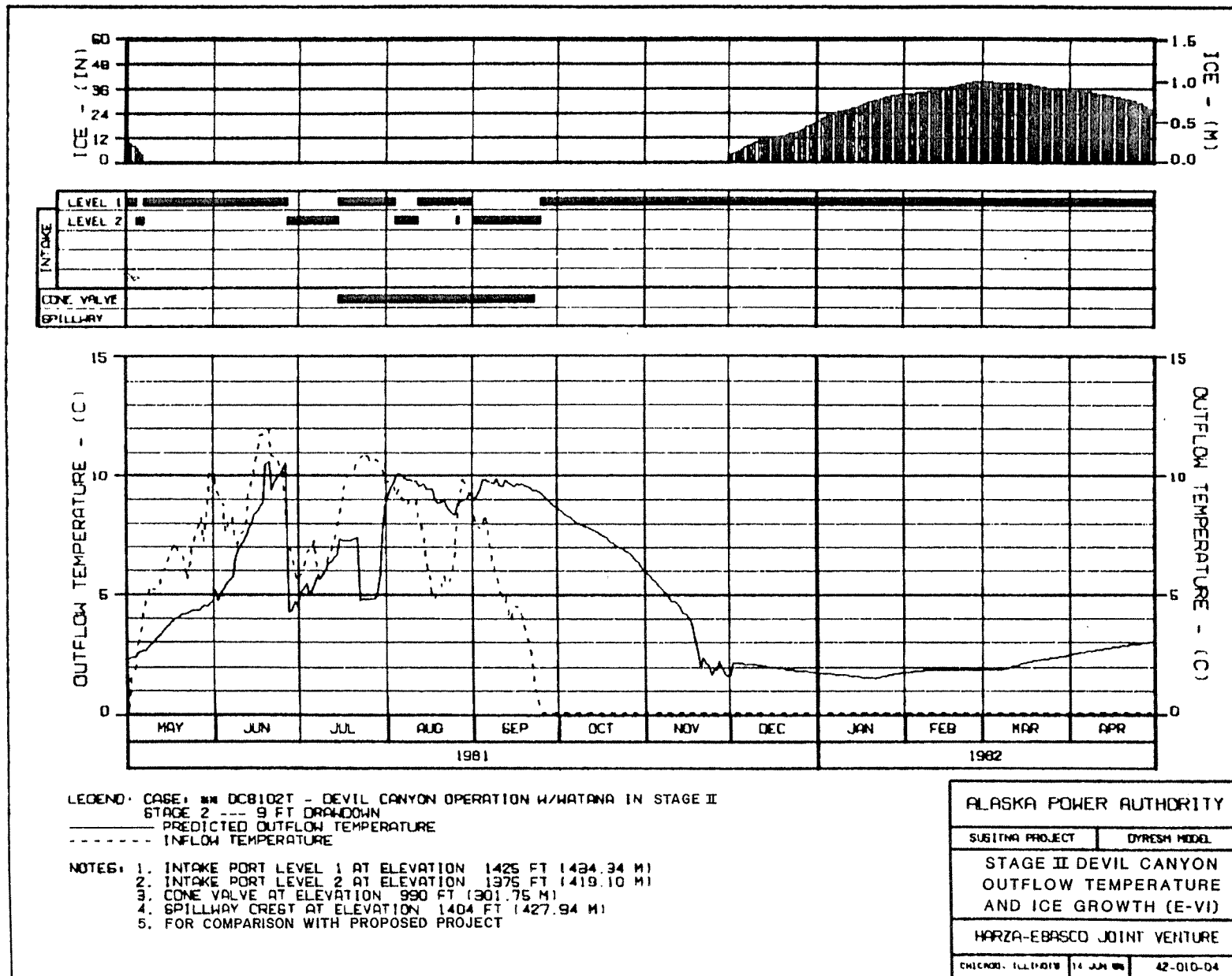


FIGURE E.2.4.161

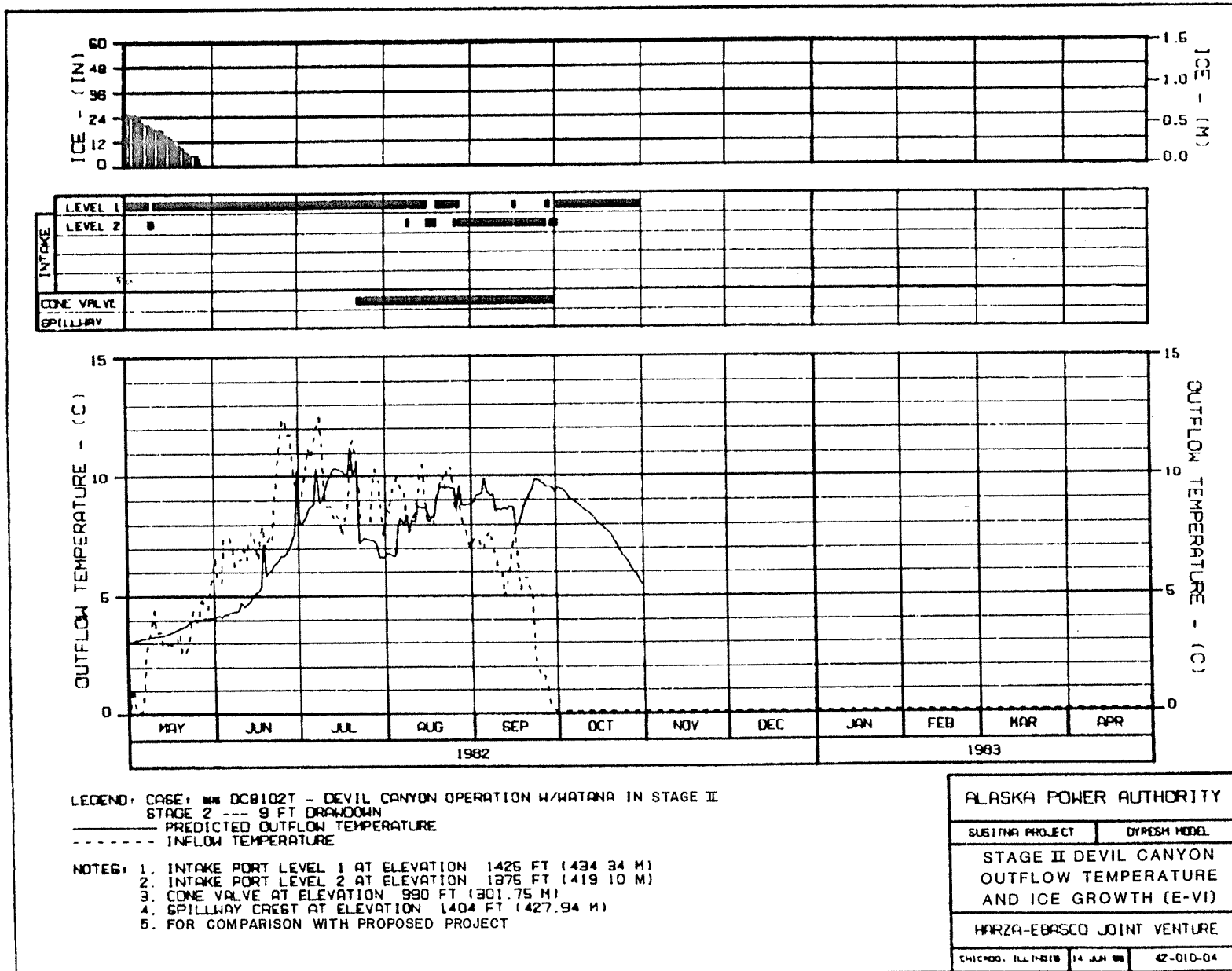
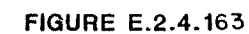


FIGURE E.2.4.162





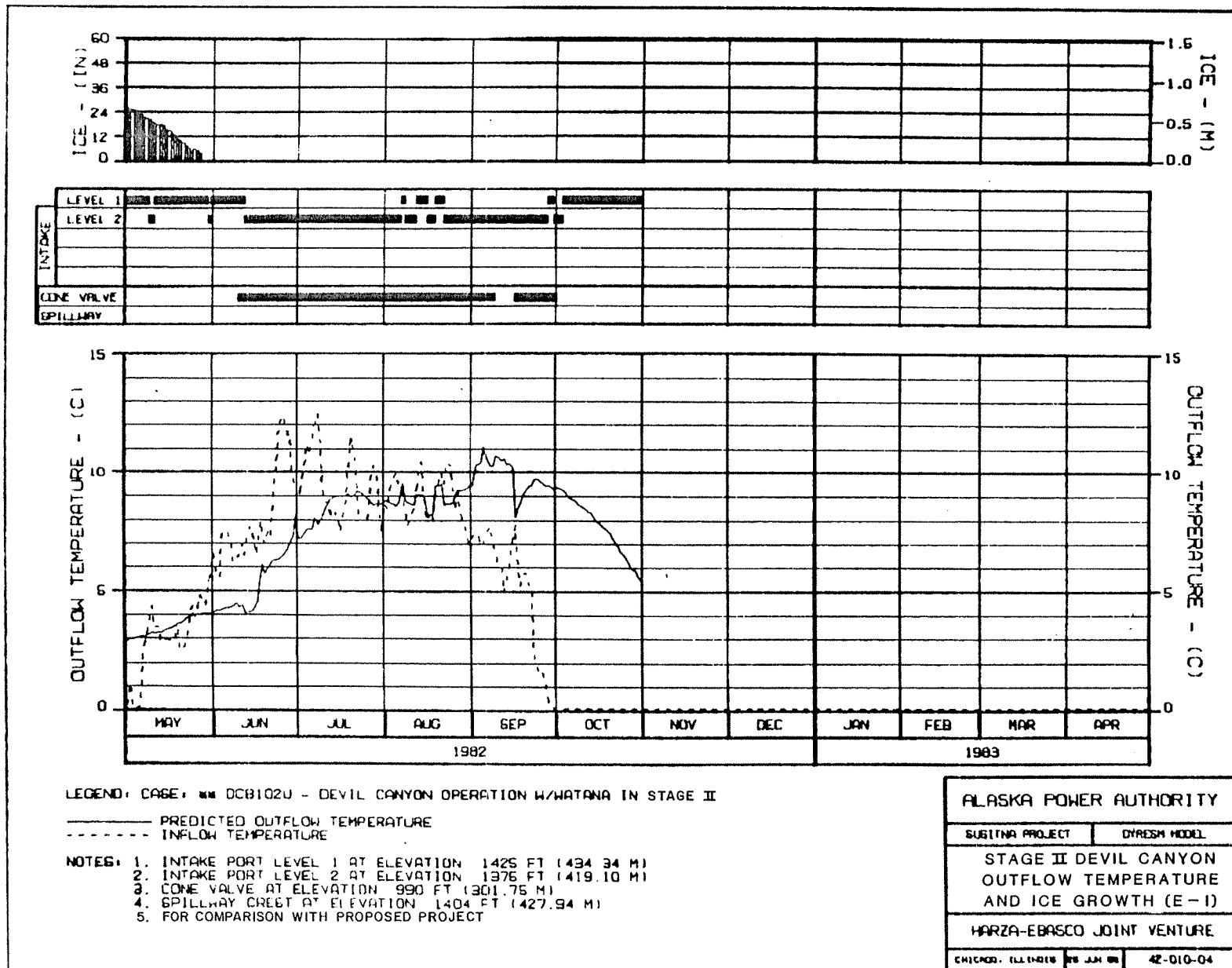


FIGURE E.2.4.164

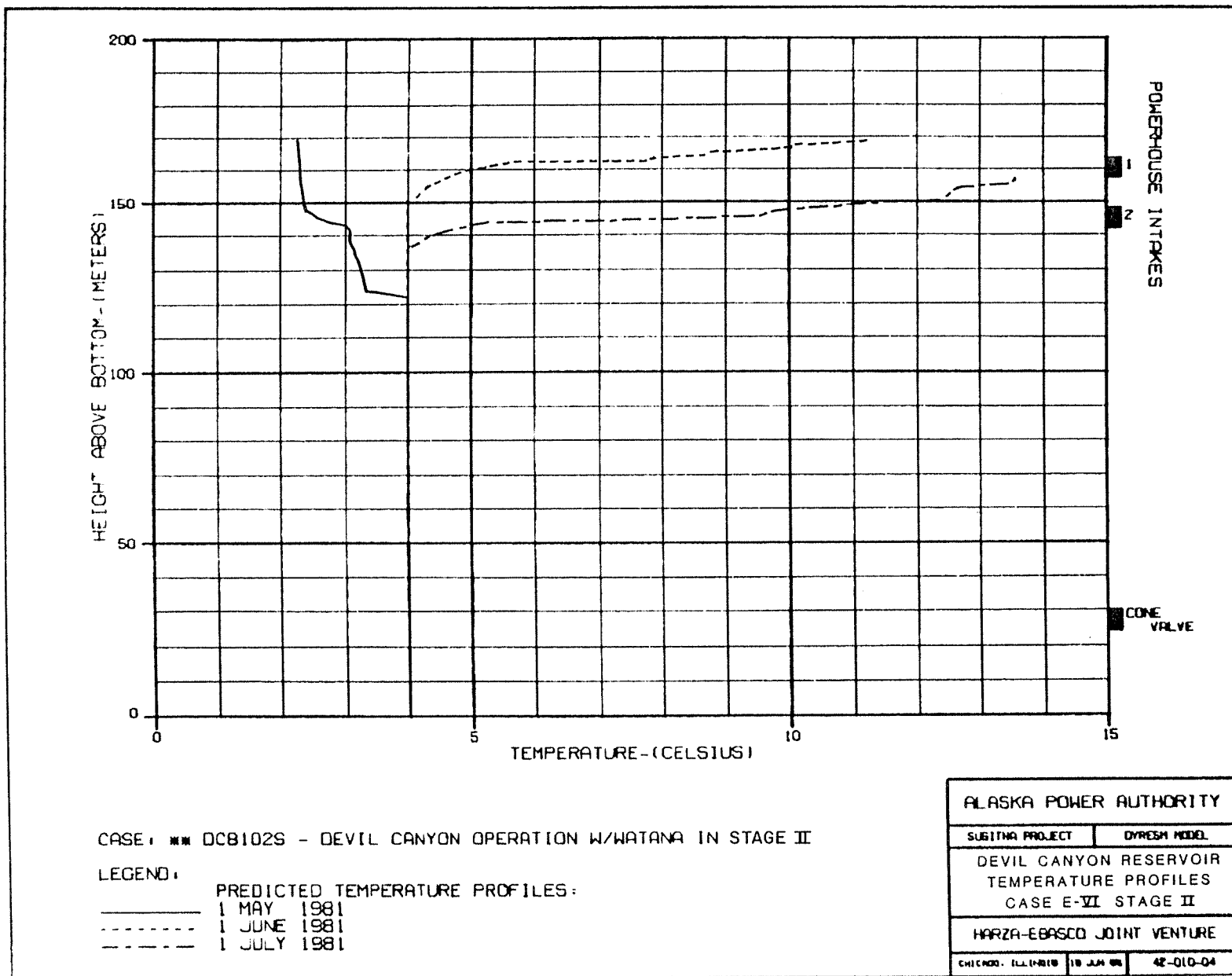


FIGURE E.2.4.165

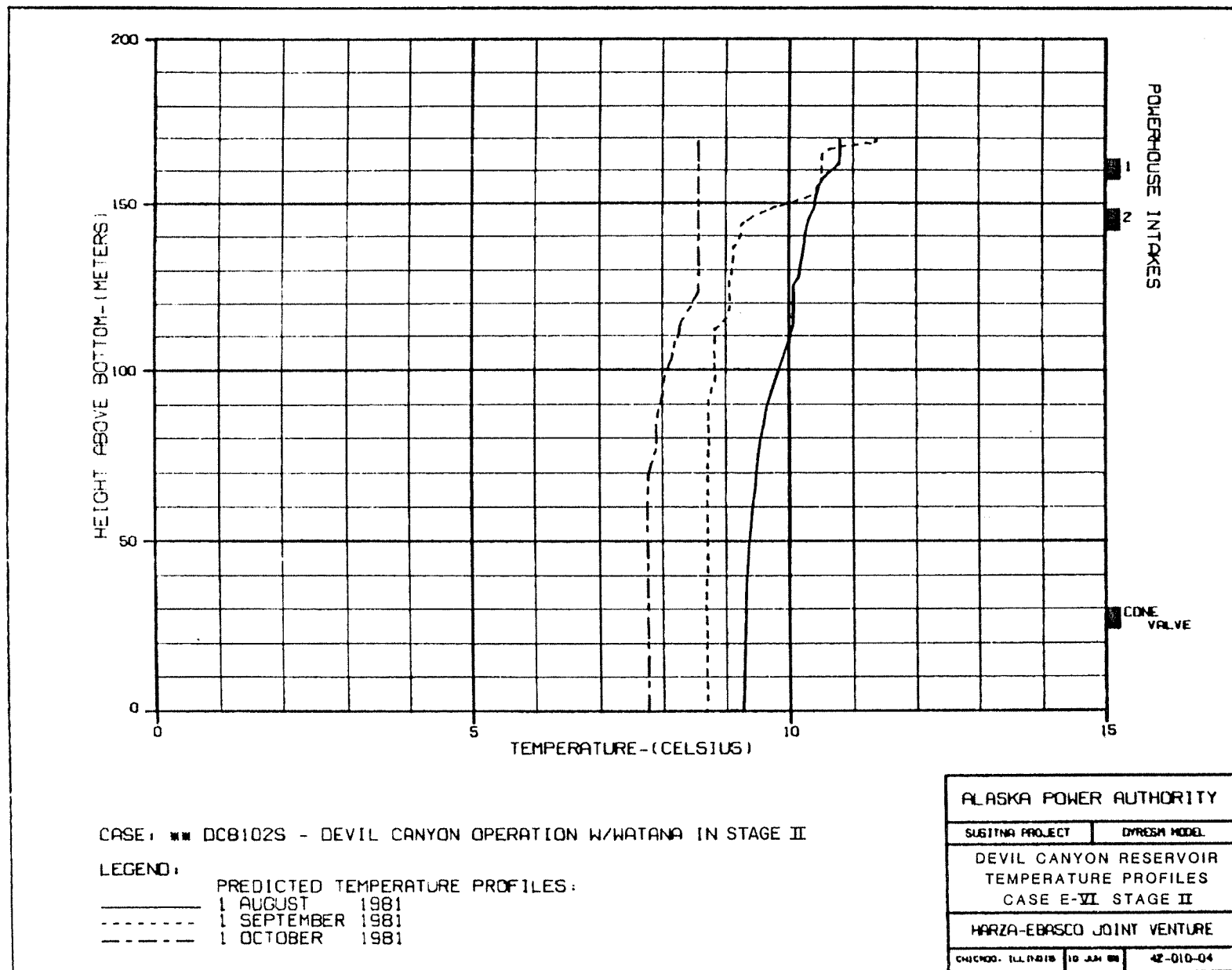


FIGURE E.2.4.166

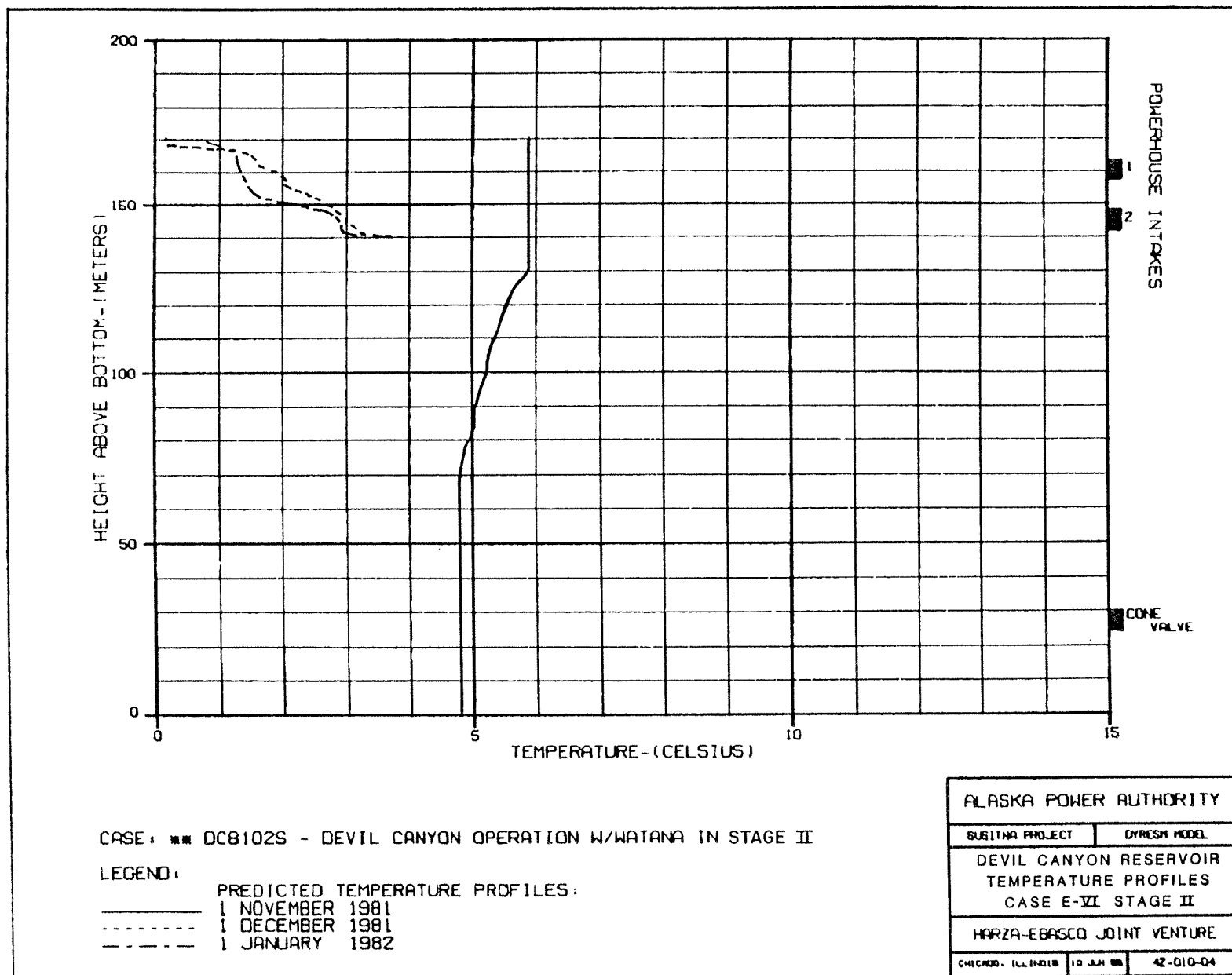


FIGURE E.2.4.167

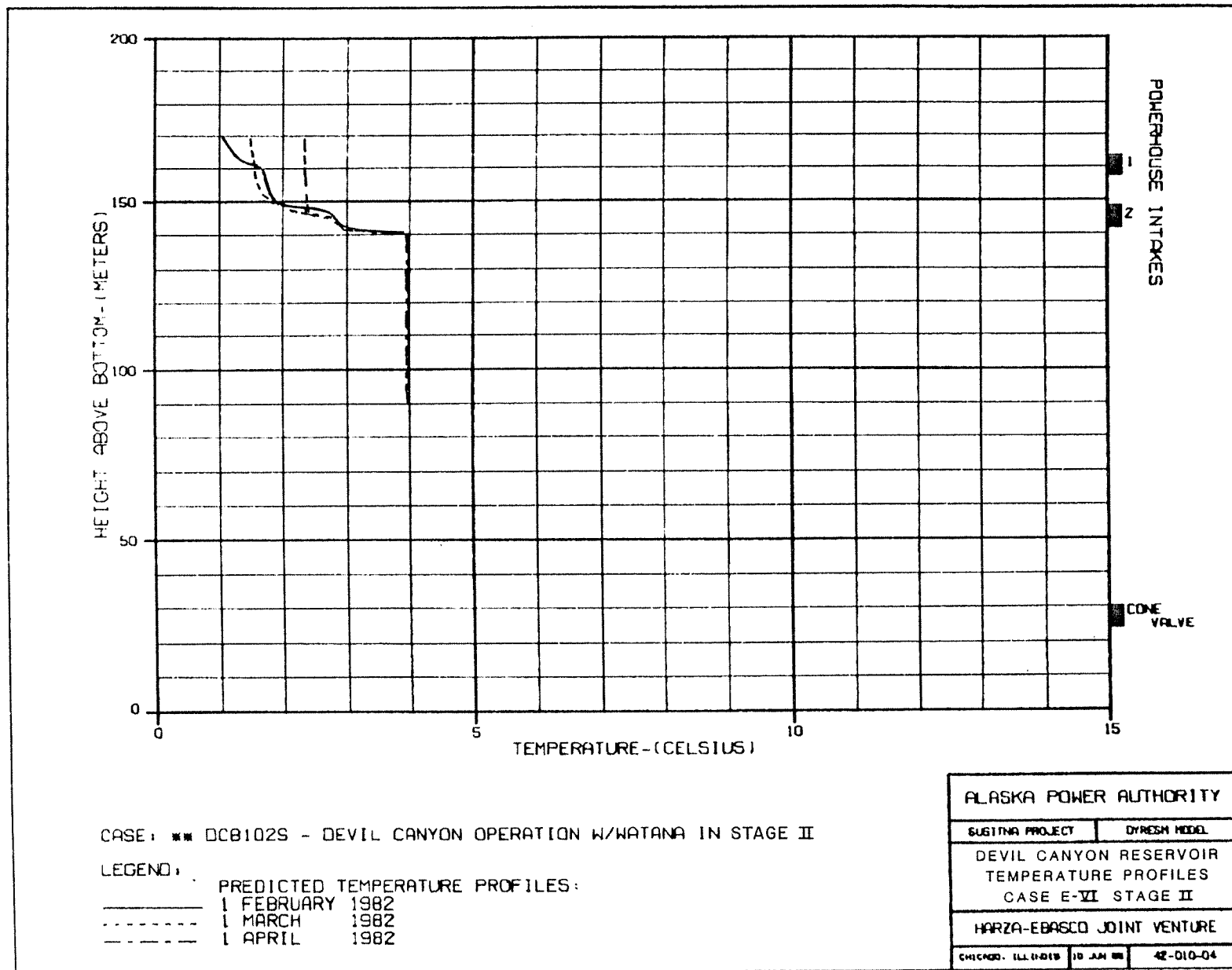


FIGURE E.2.4.168

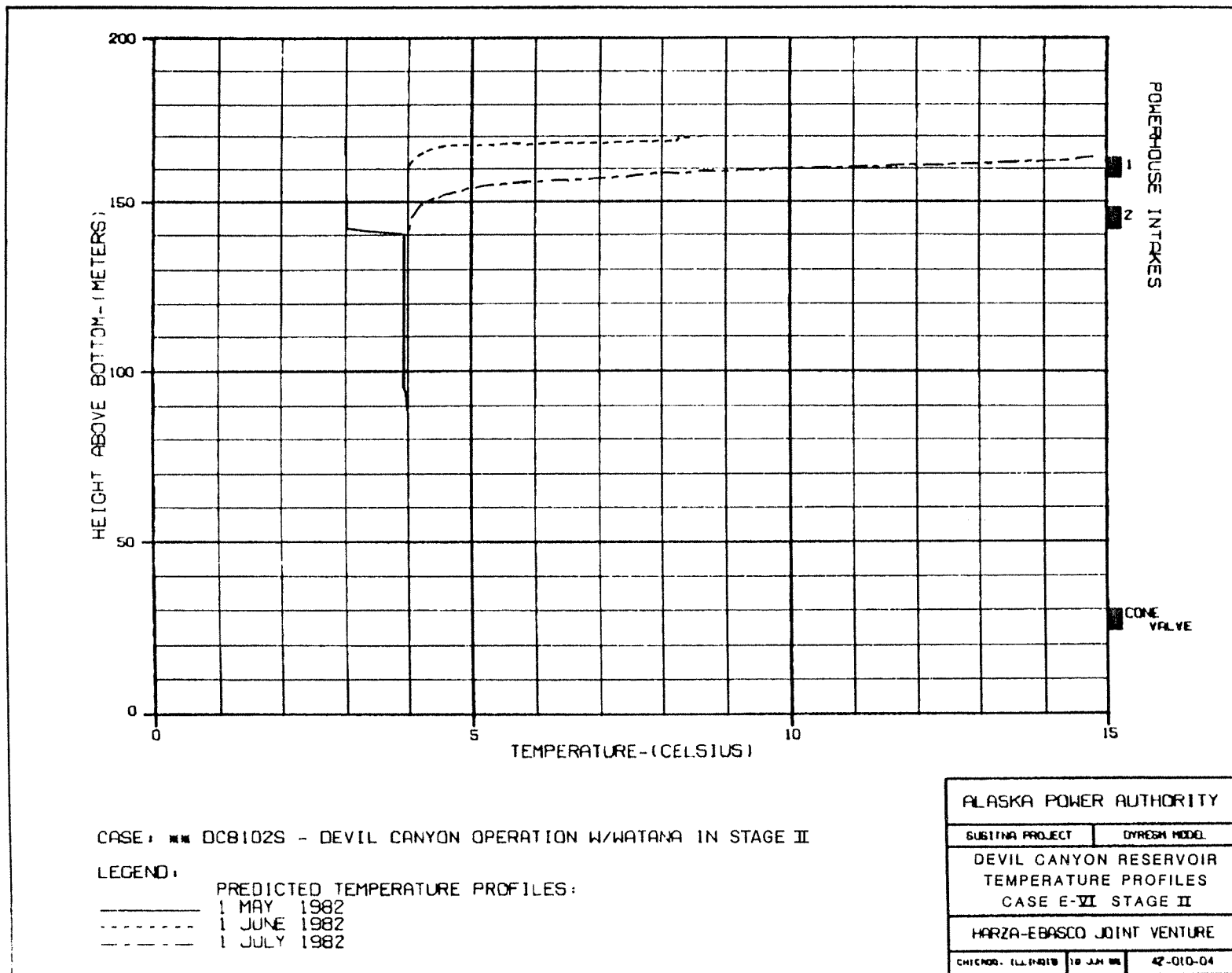


FIGURE E.2.4.169

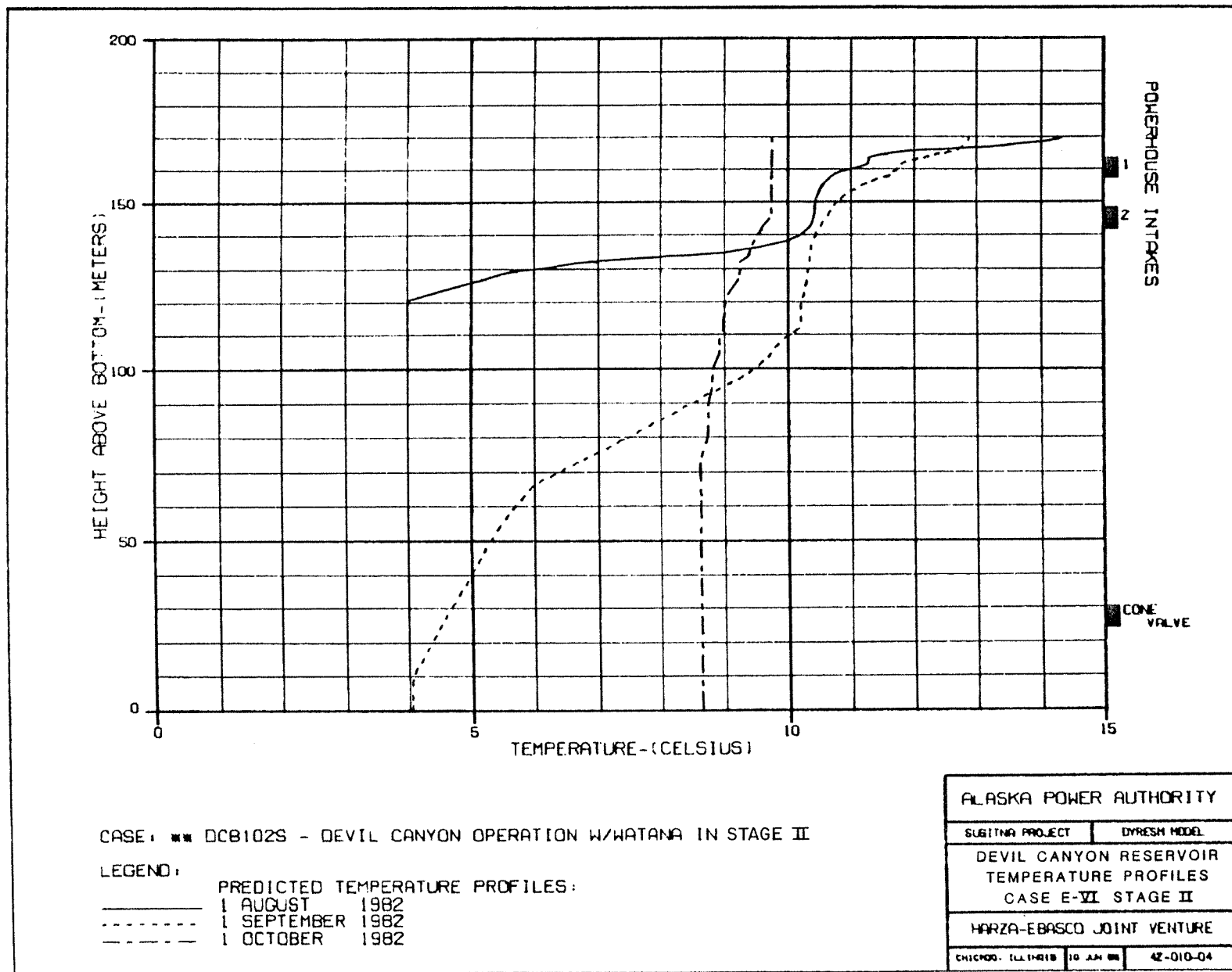


FIGURE E.2.4.170

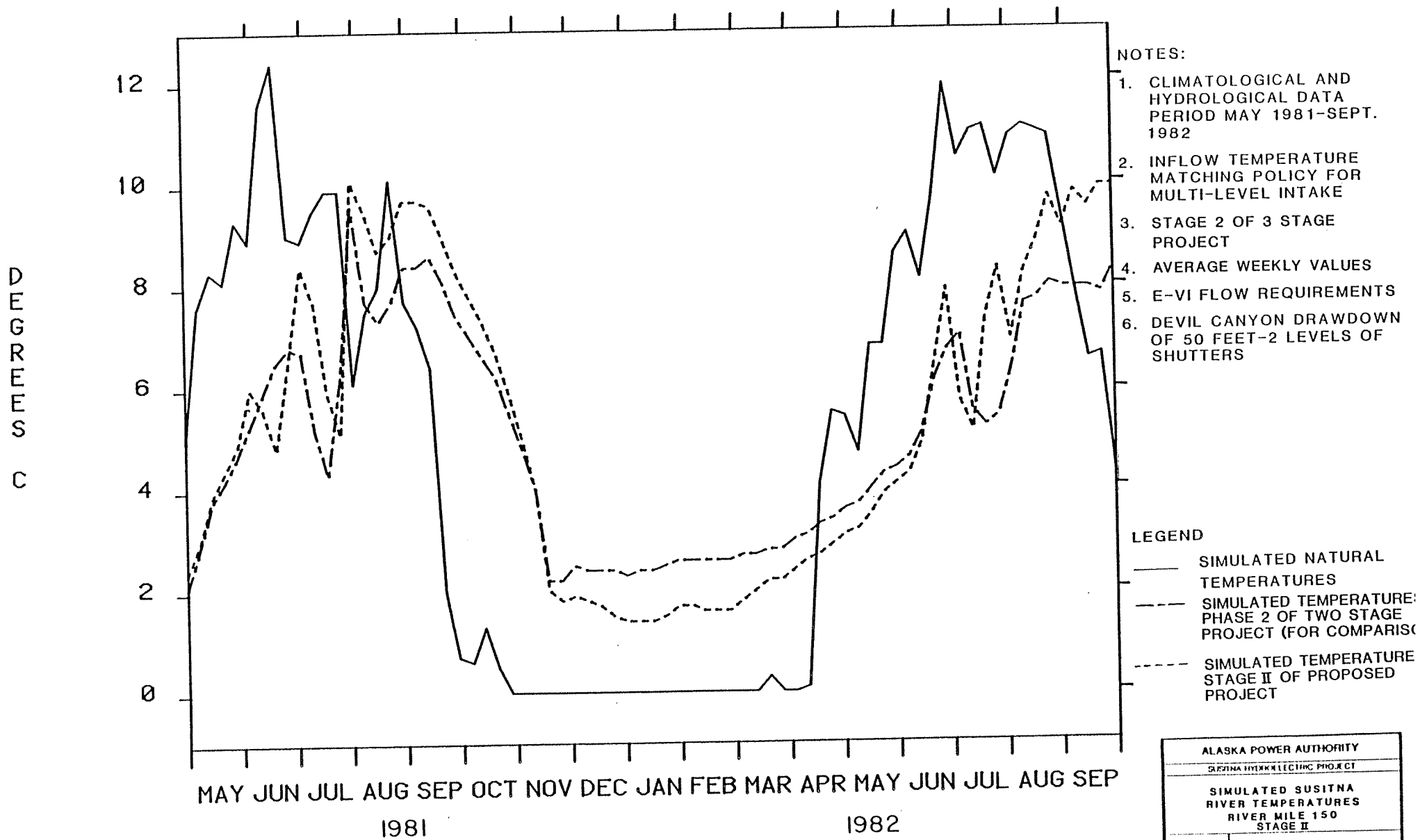
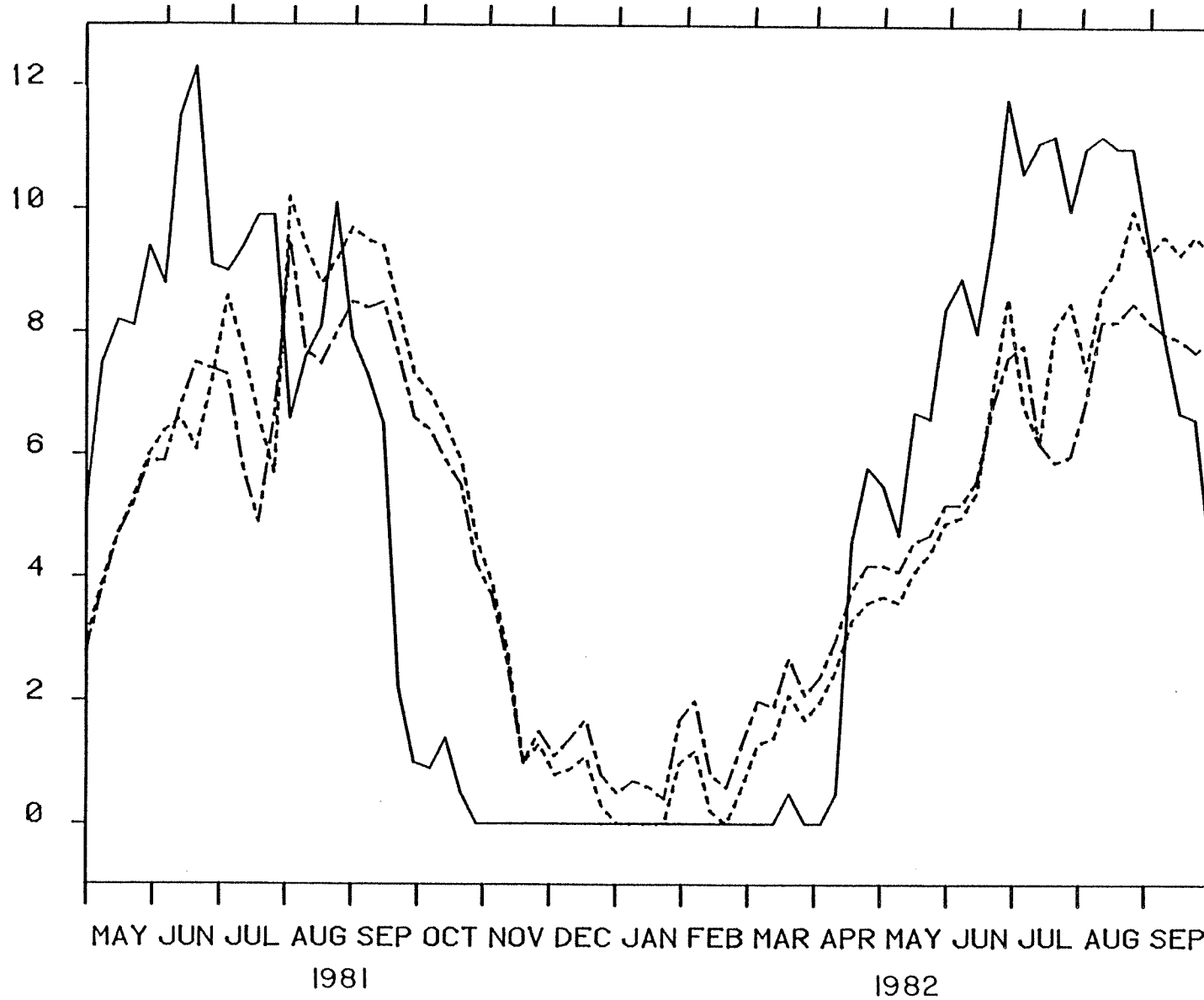


FIGURE E.2.4.171



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

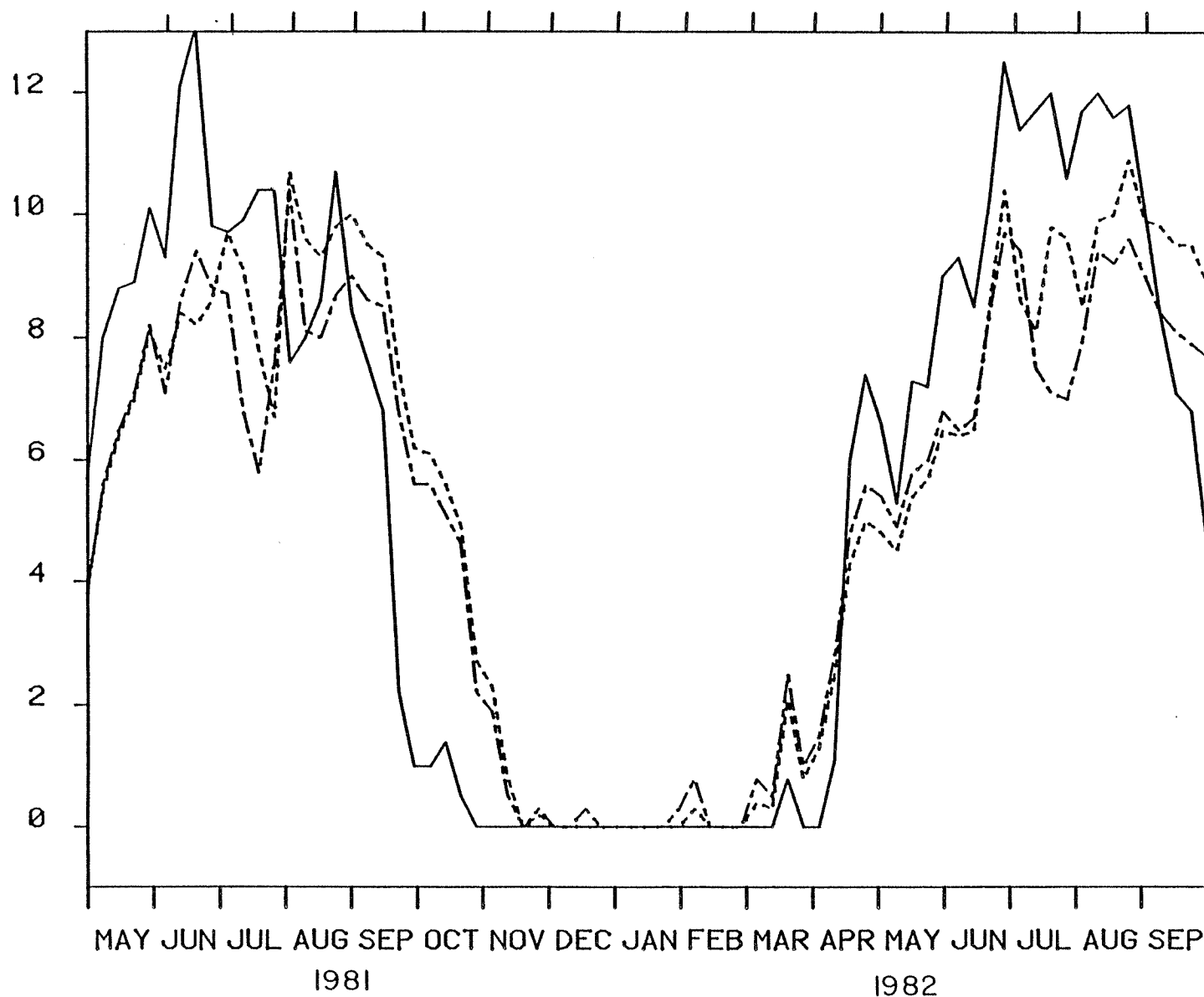
LEGEND

- 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                             |      |    |
| AREA - WASHNE                        | DATE | BY |
|                                      |      |    |

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

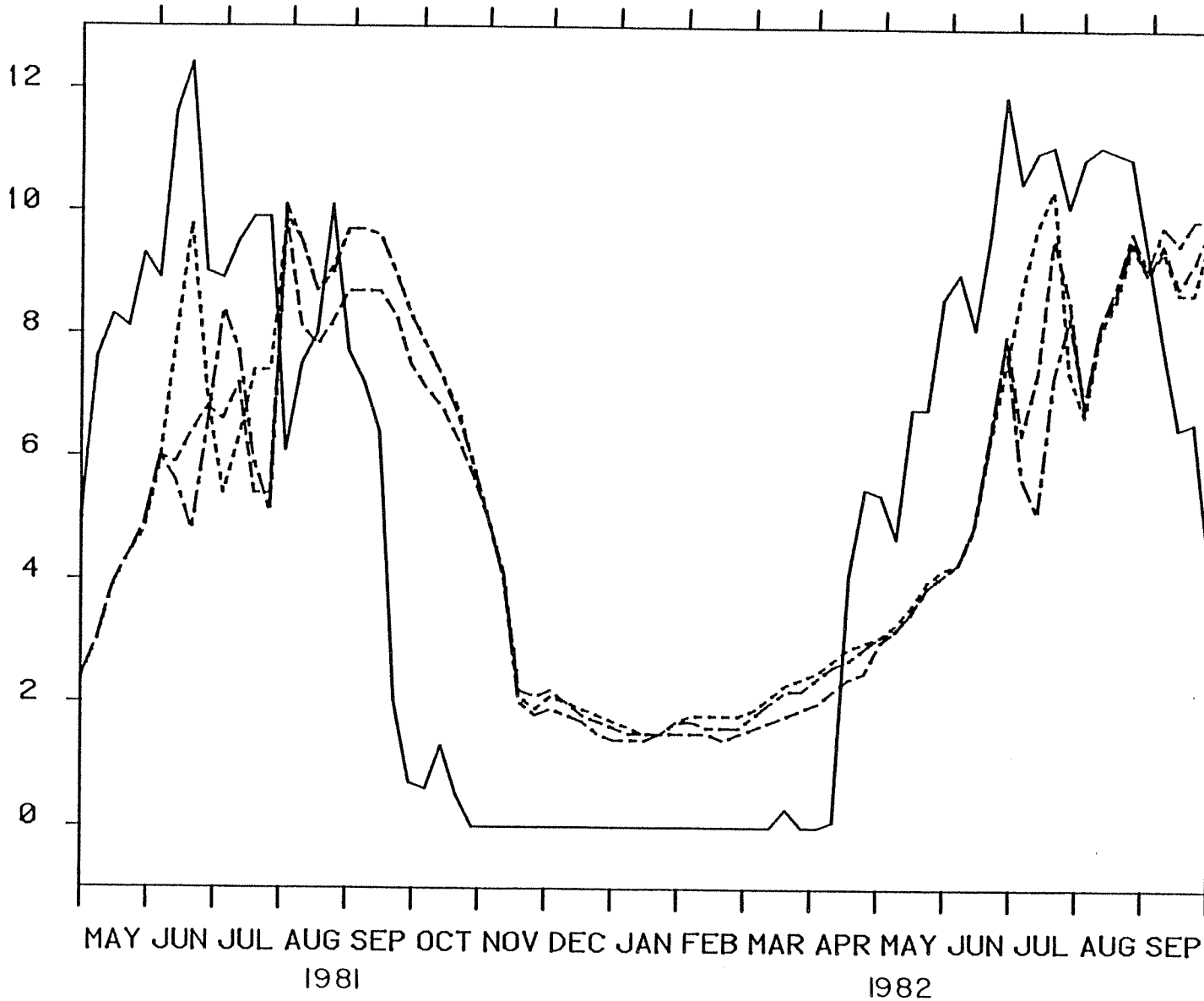
LEGEND

- 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 |  |
| AREA: PHASE II                                               |  |
| DATE: 10/1/82                                                |  |
| BY: J. H. HARRIS                                             |  |

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

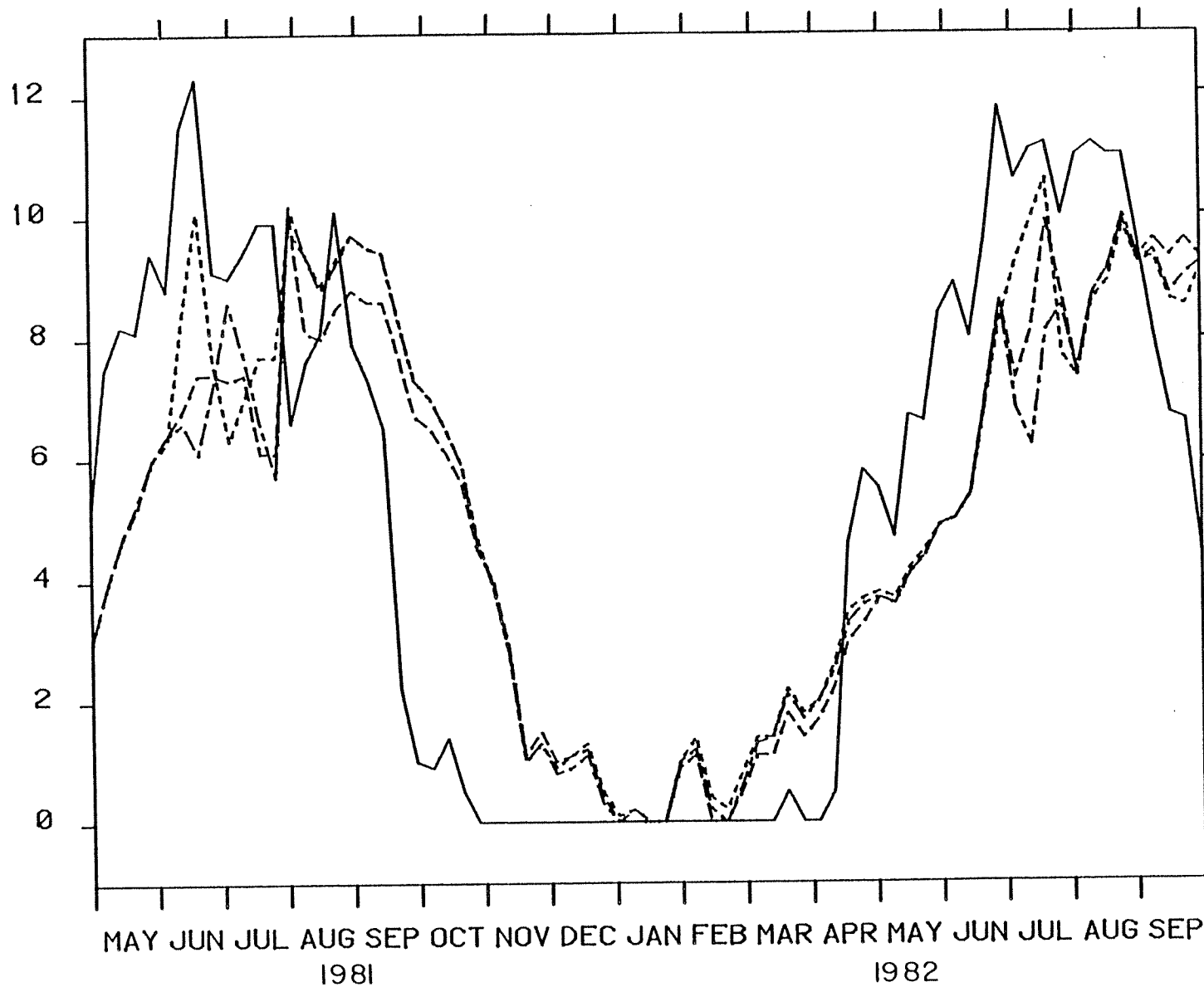
LEGEND

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

|                                                              |                  |                           |
|--------------------------------------------------------------|------------------|---------------------------|
| ALASKA POWER AUTHORITY                                       |                  |                           |
| SUSITNA HYDROELECTRIC PROJECT                                |                  |                           |
| SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 150 STAGE II |                  |                           |
| DATE: 08/01/82                                               | BY: J. H. HARRIS | REVIEWED BY: J. H. HARRIS |

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)

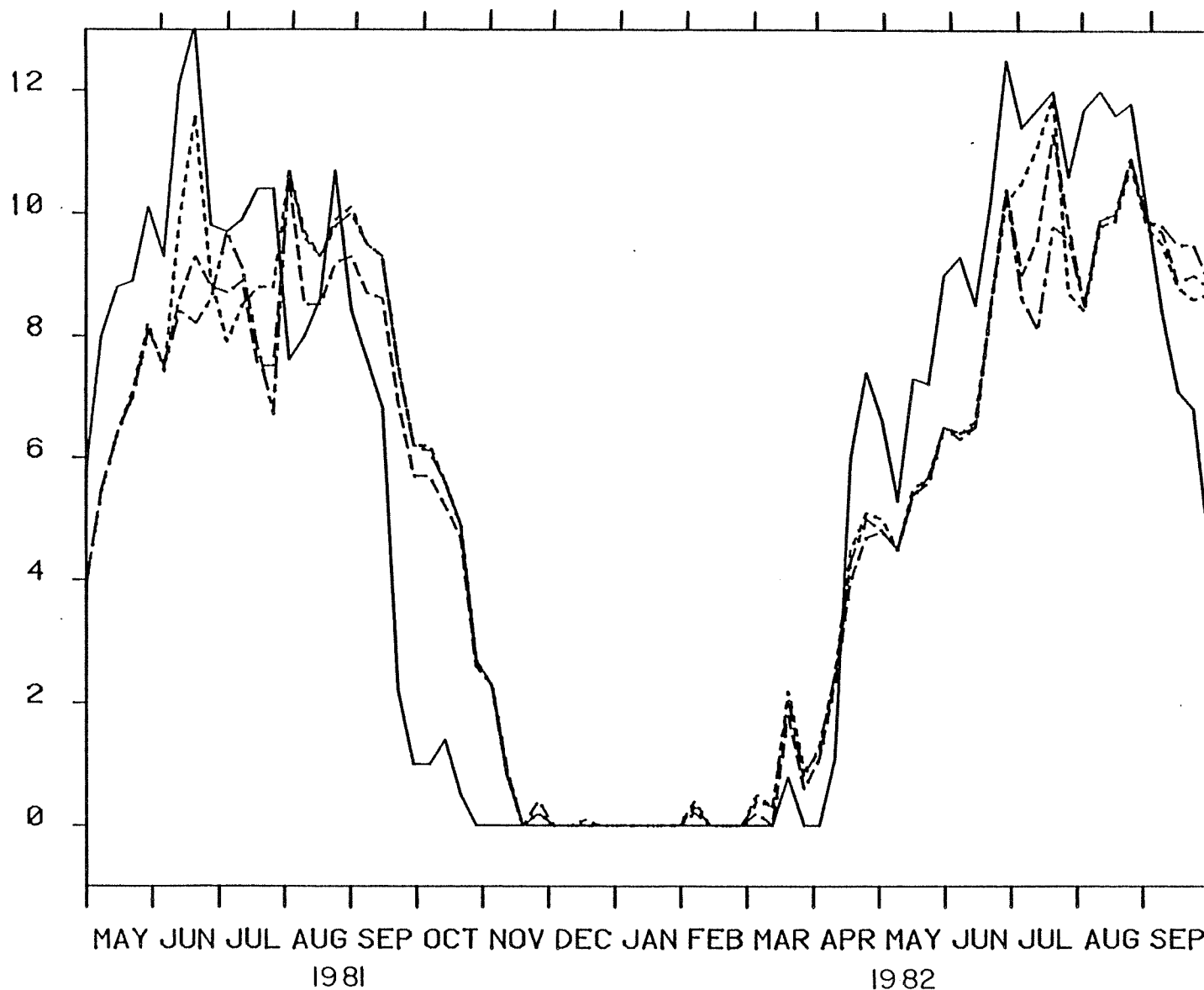
LEGEND

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

|                                                              |                    |
|--------------------------------------------------------------|--------------------|
| ALASKA POWER AUTHORITY                                       |                    |
| SUSITNA HYDROELECTRIC PROJECT                                |                    |
| SIMULATED SUSITNA RIVER TEMPERATURES RIVER MILE 130 STAGE II |                    |
| DATE: 10/1/82                                                | BY: J. L. HARRIS   |
| PROJECT: SUSITNA                                             | SCALE: 1" = 100' H |

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

|                                      |                      |
|--------------------------------------|----------------------|
| ALASKA POWER AUTHORITY               |                      |
| SUSITNA HYDROELECTRIC PROJECT        |                      |
| SIMULATED SUSITNA RIVER TEMPERATURES |                      |
| RIVER MILE 100                       |                      |
| STAGE II                             |                      |
| DATE: 10/1/82                        | BY: J. L. HARRIS     |
| REVISION: 1.0                        | FIGURE NO. E.2.4.176 |

FIGURE E.2.4.176

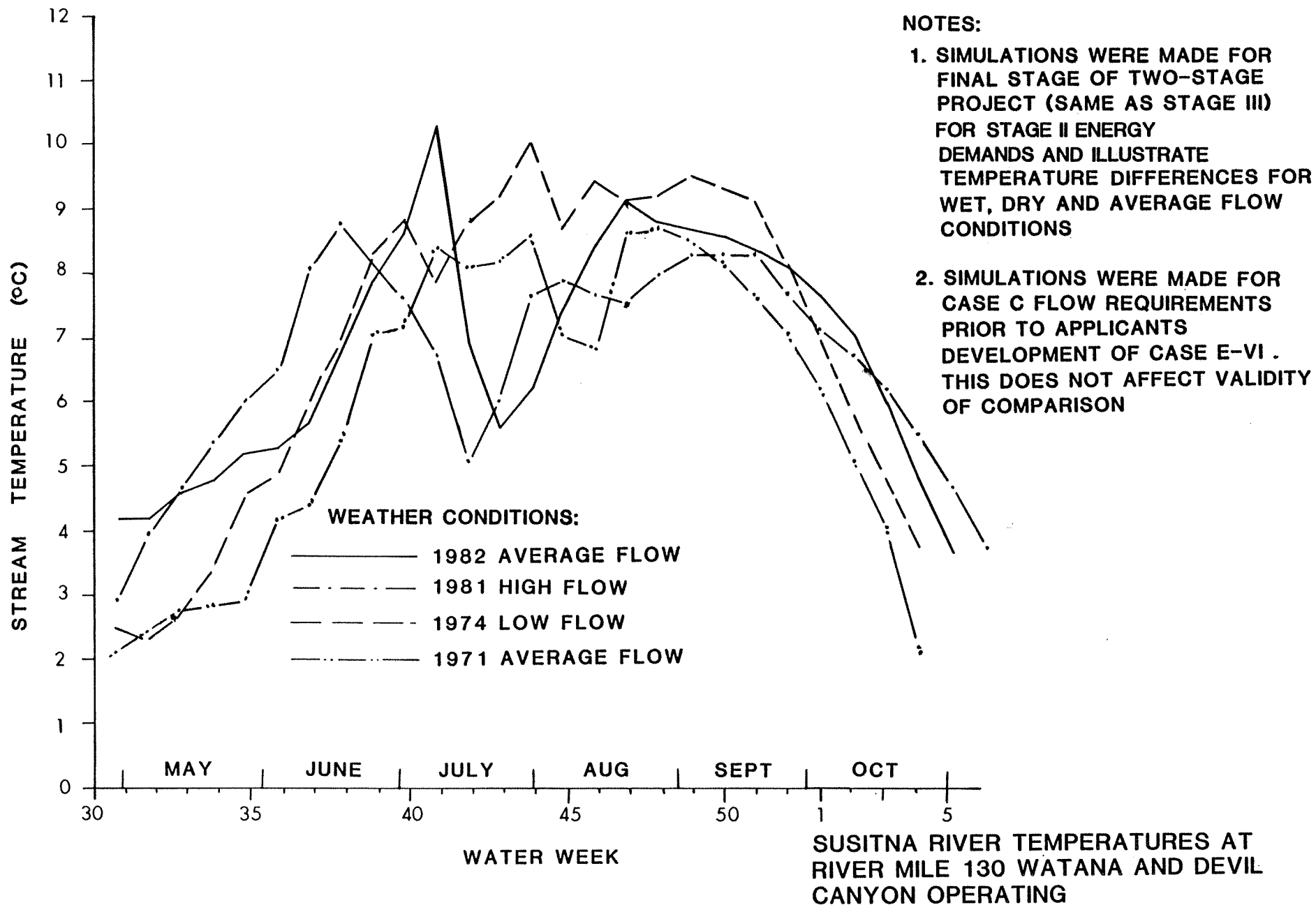
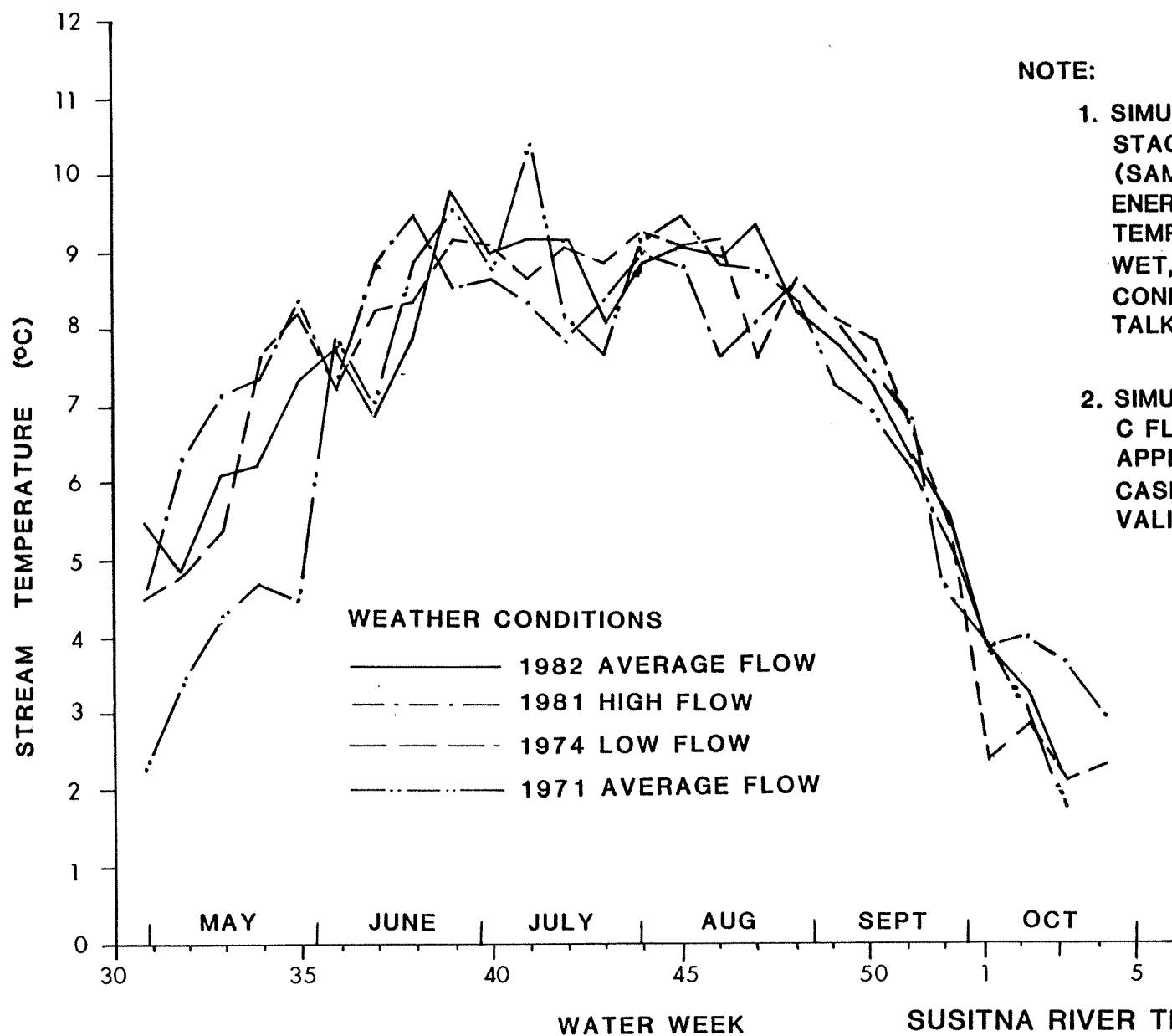


FIGURE E.2.4.177

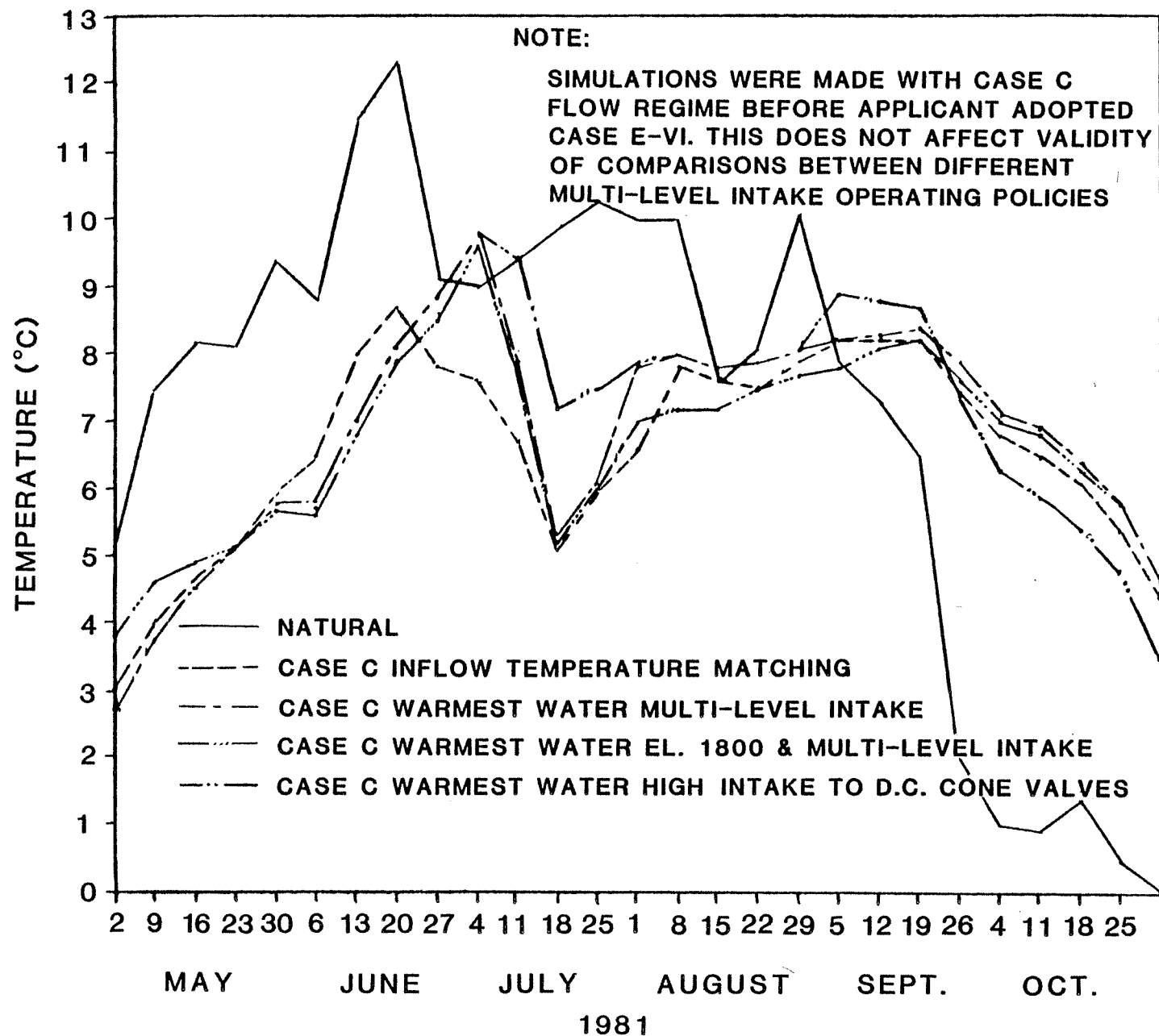


**NOTE:**

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.

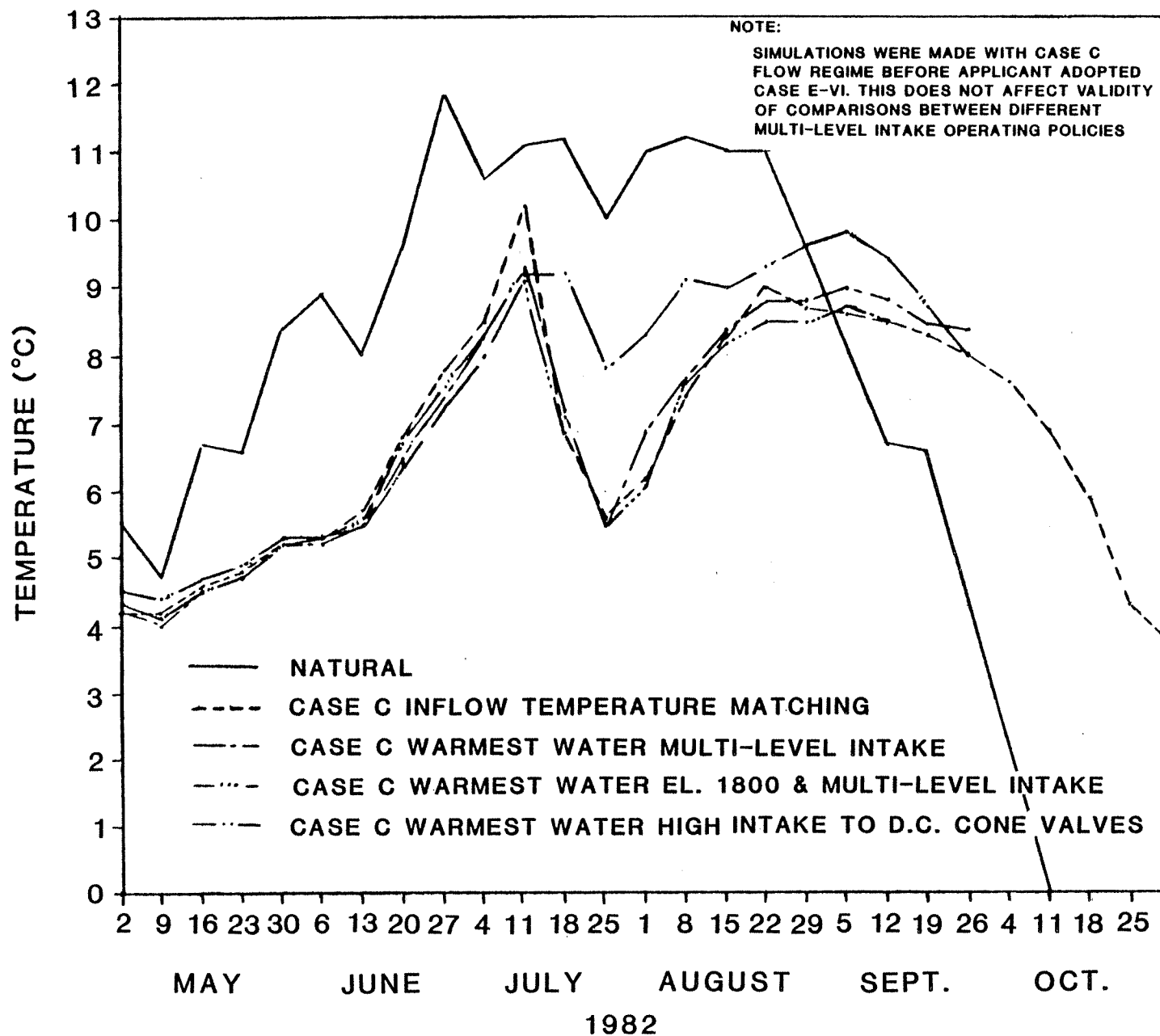
**SUSITNA RIVER TEMPERATURES AT RIVER MILE 84 WATANA AND DEVIL CANYON OPERATING**

**FIGURE E.2.4.178**



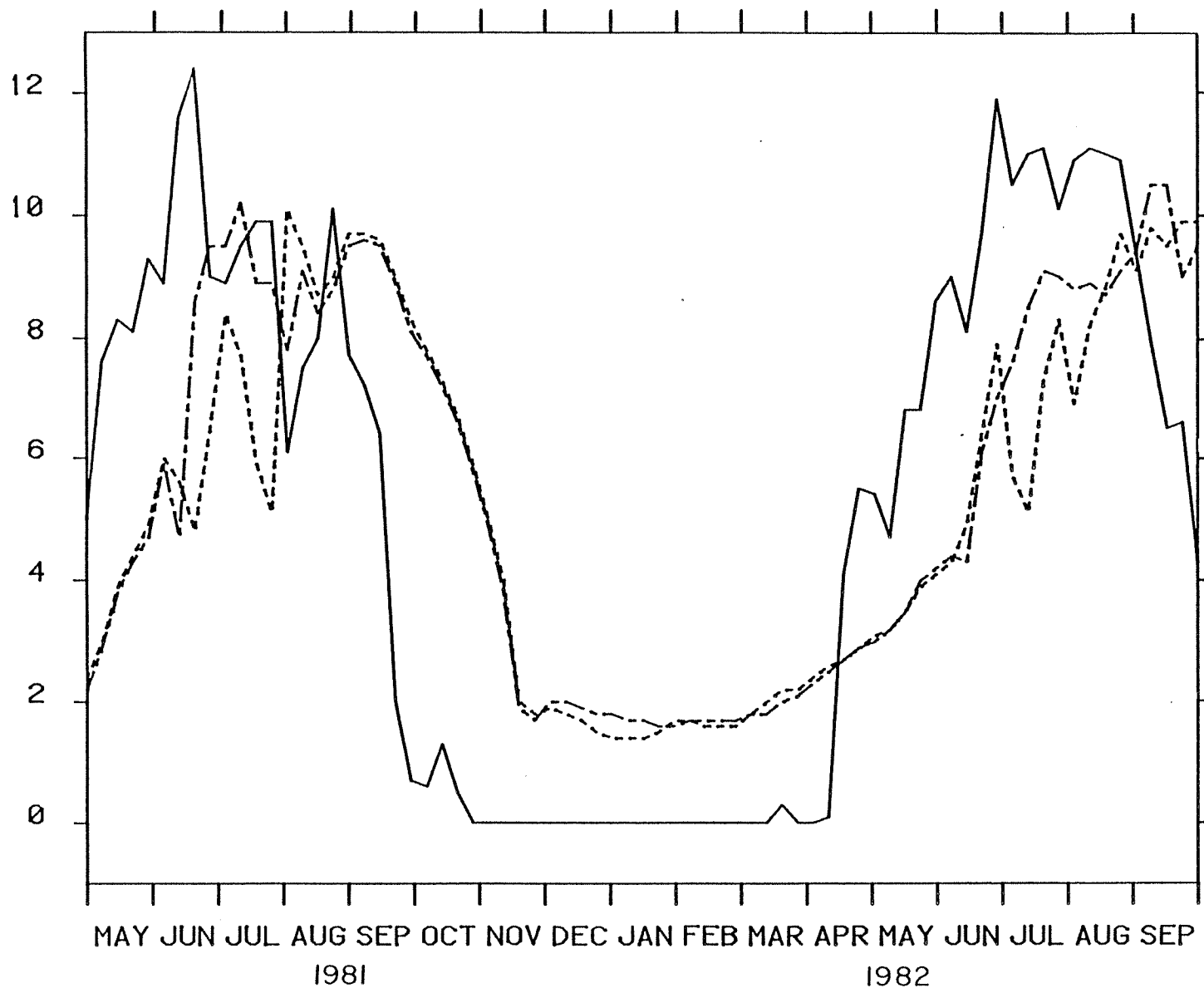
**SIMULATED TEMPERATURES AT RIVER MILE 130  
VARIOUS INTAKE OPERATING POLICIES**





**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

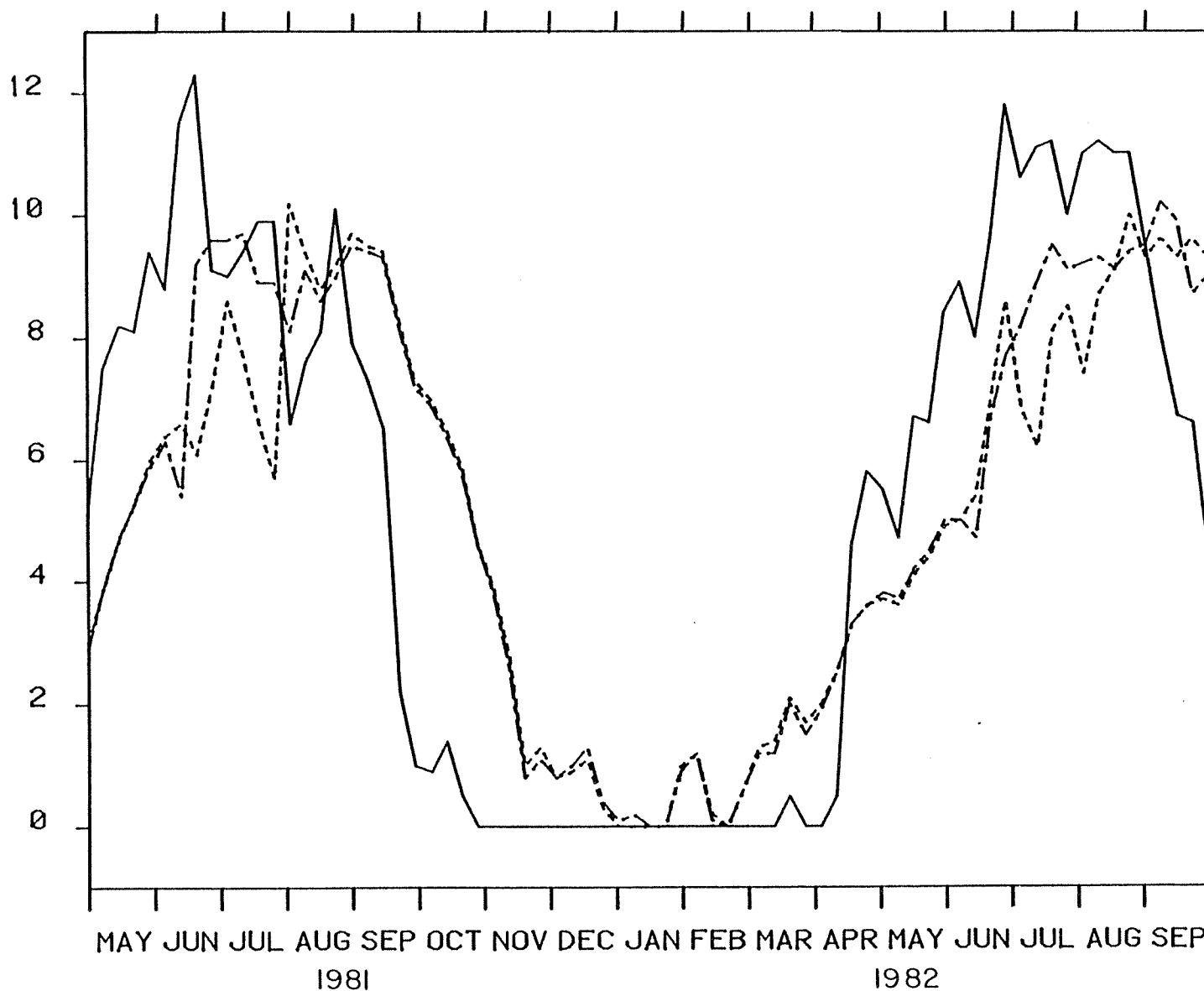
LEGEND

- 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. H. HARRIS |
| APPROVED: 10/1/82                    | BY: J. H. HARRIS |

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

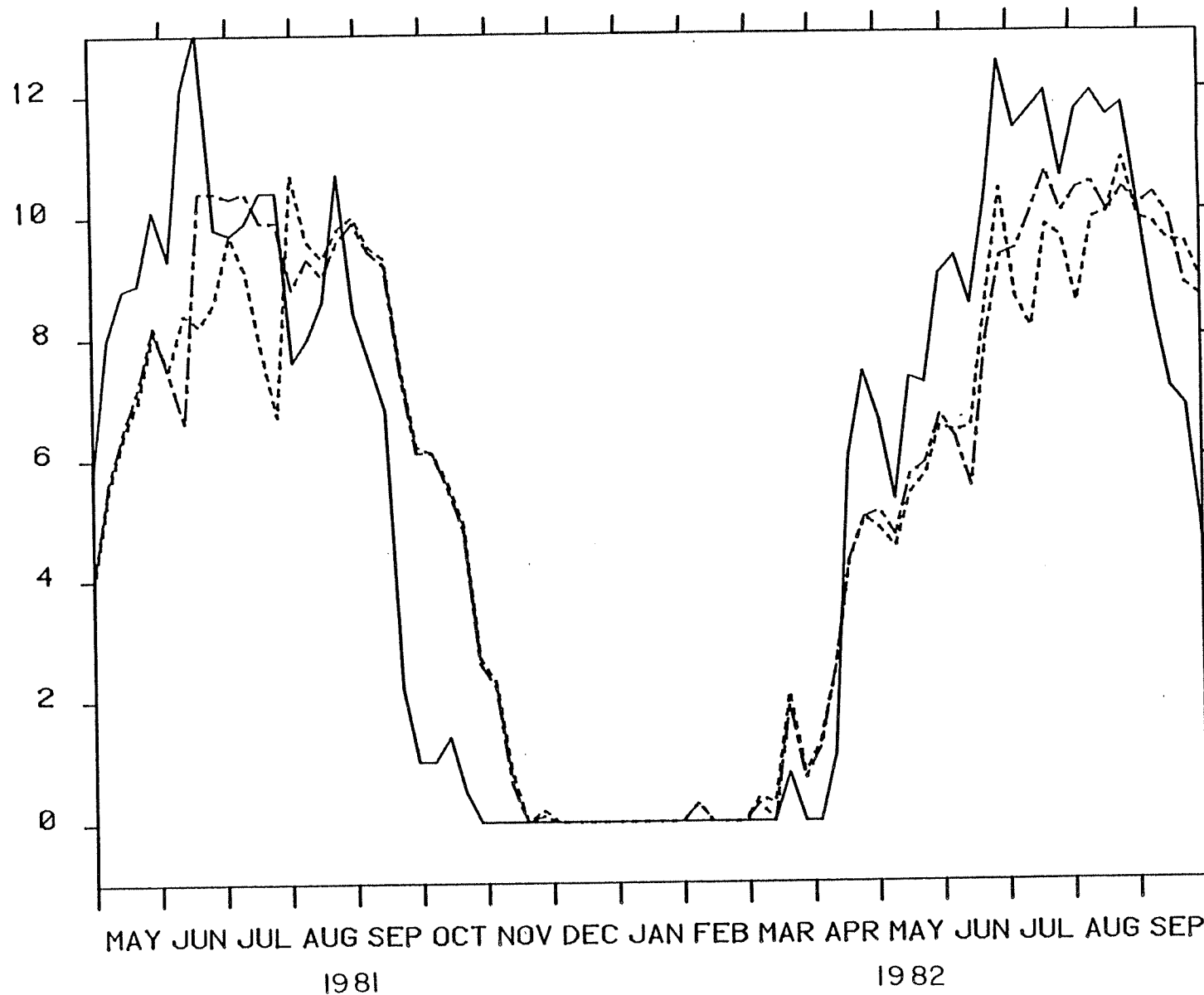
LEGEND

- 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: J. L. HARRIS |
| REVISION: 1                                                  | REVISION: 1      |

FIGURE E.2.4.182

DEGREES C



NOTES:

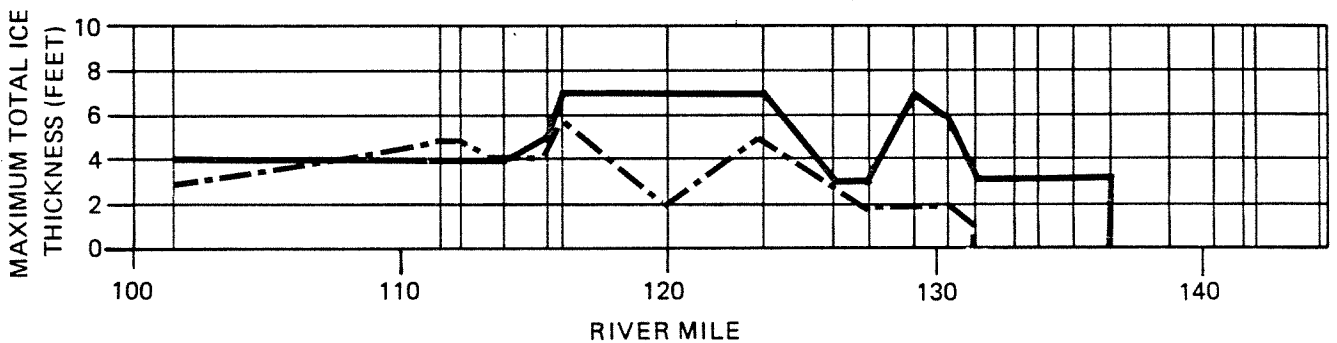
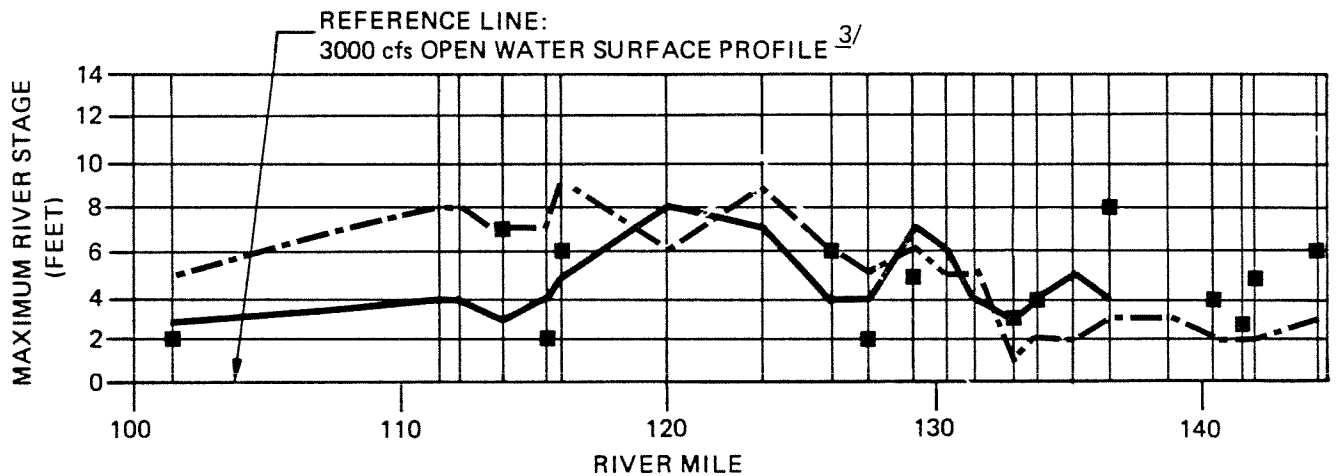
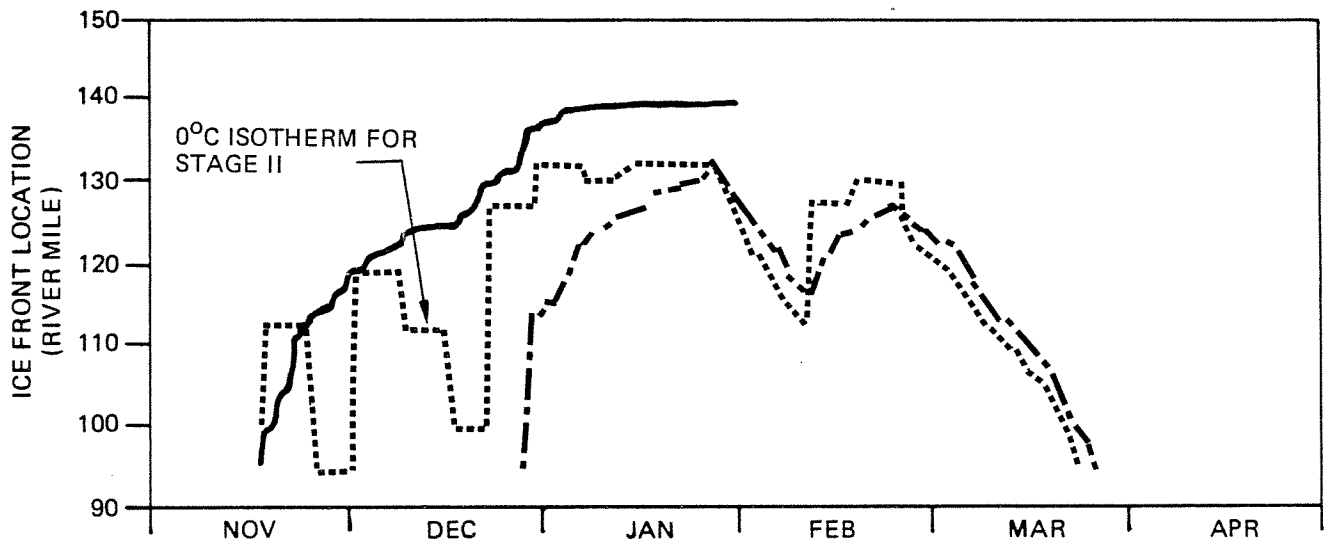
1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 2 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON 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 |                  |                |
| DATE: 10/1/82                                                | BY: J. H. HARRIS | FOR: A. HARRIS |

FIGURE E.2.4.183



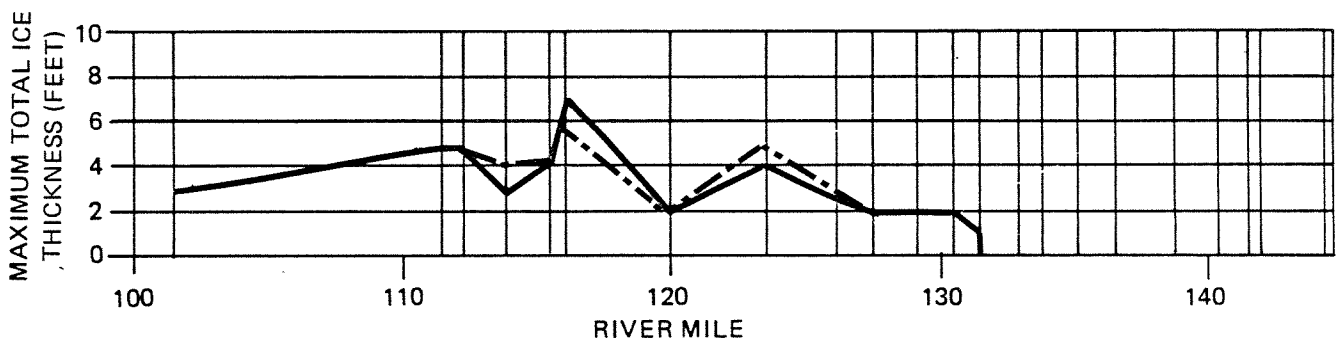
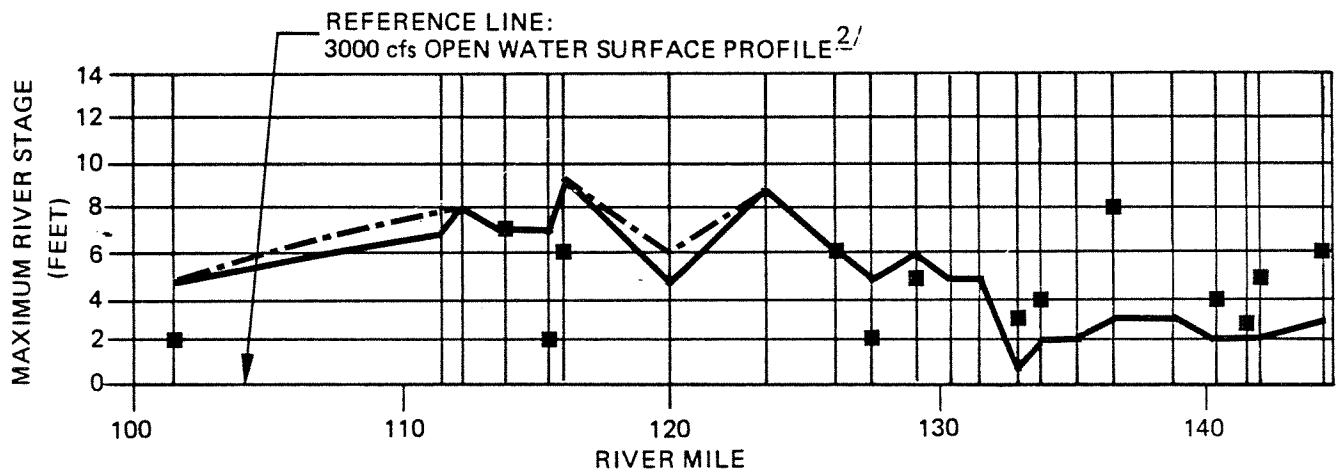
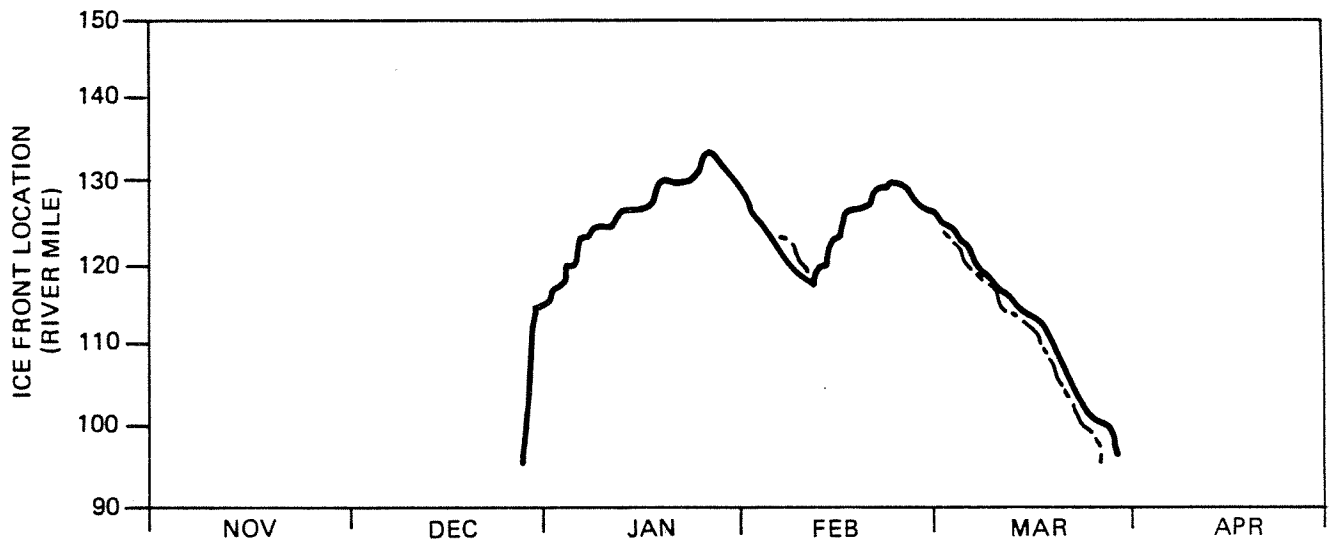
NOTES:

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:**

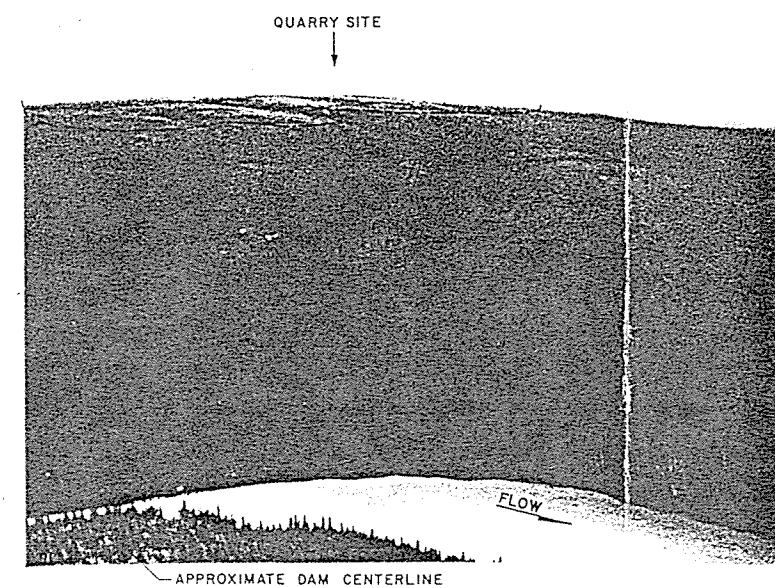
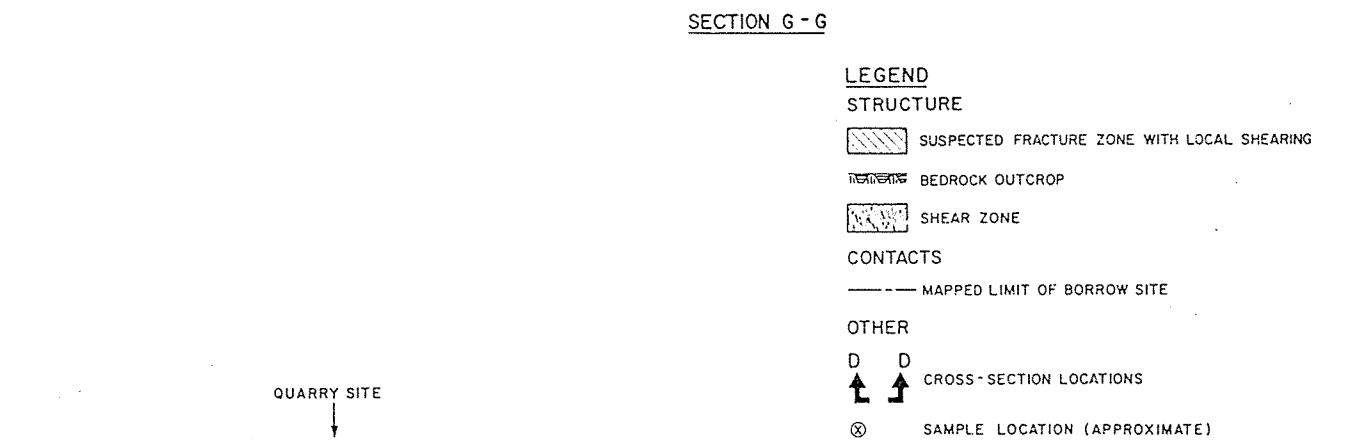
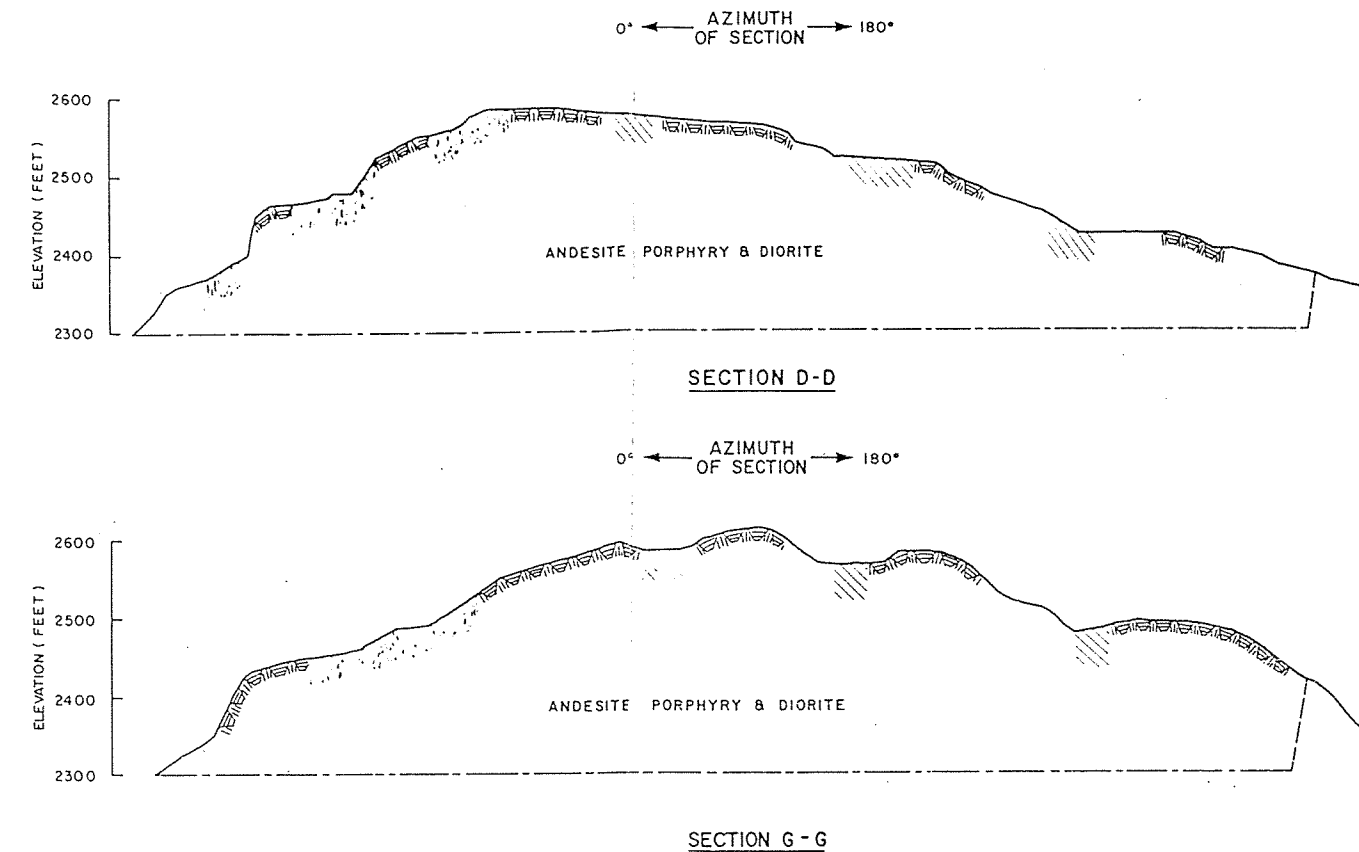
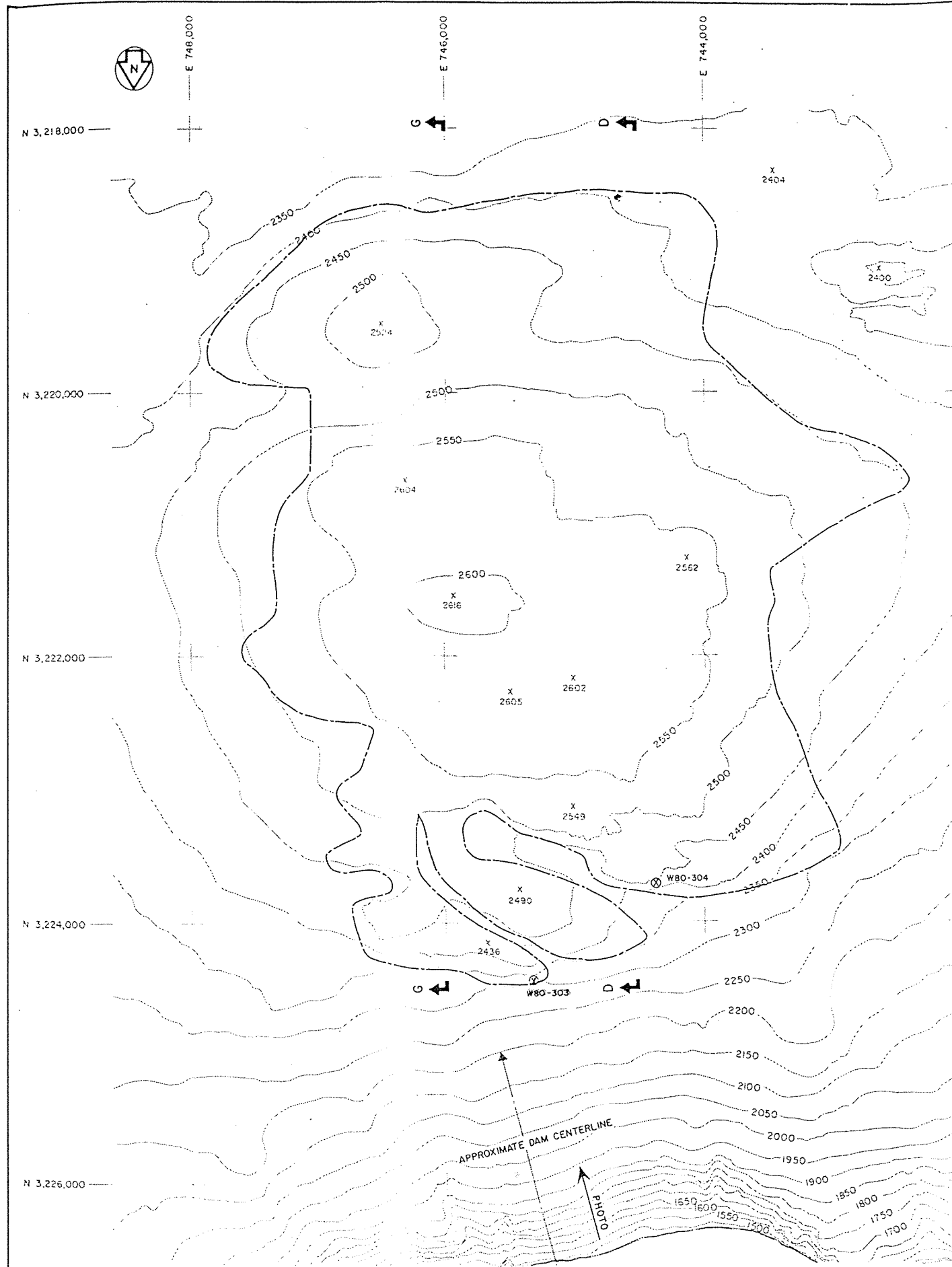
- CASE E-I FLOWS
- - - CASE E-VI FLOWS
- NATURAL SLOUGH BERM ELEVATION (SEE TABLE E.2.4.24)

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









- LEGEND**
- STRUCTURE**
-  SUSPECTED FRACTURE ZONE WITH LOCAL SHEARING
-  BEDROCK OUTCROP
-  SHEAR ZONE
- CONTACTS**
- MAPPED LIMIT OF BORROW SITE
- OTHER**
- D D  
  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.

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

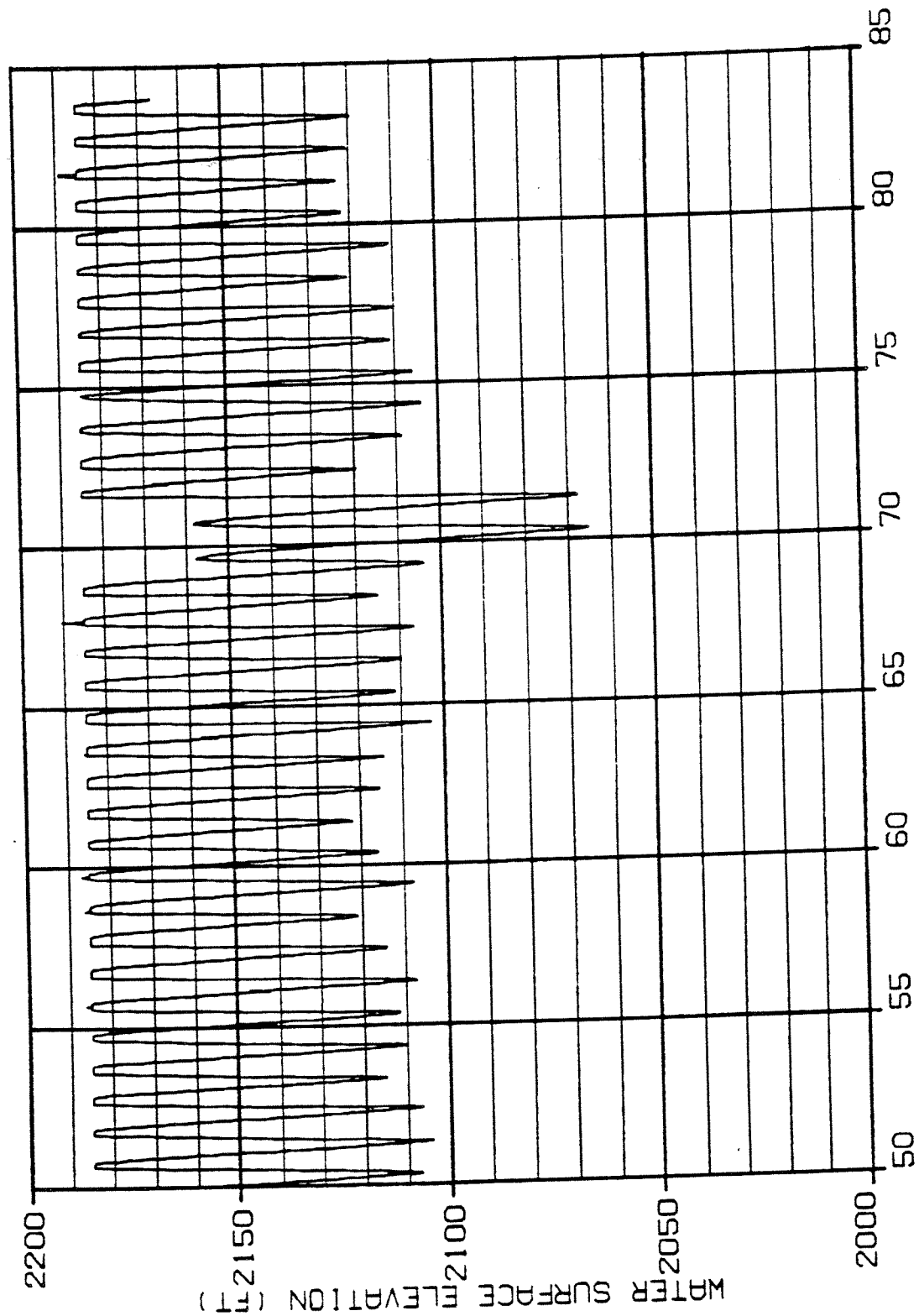
WATANA  
QUARRY SITE A PLAN AND SECTIONS

SCALE 0 400 800 FEET

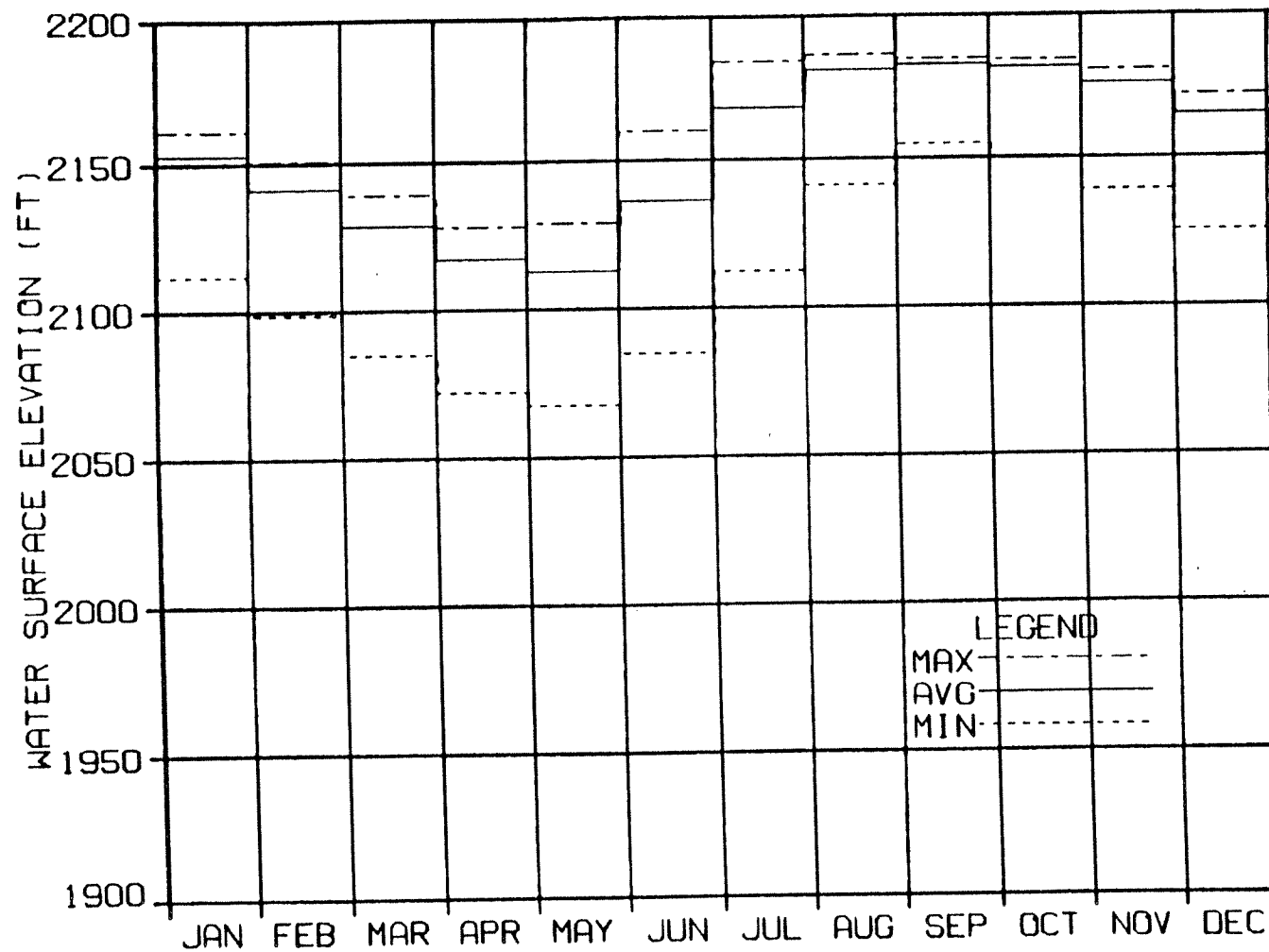
FIGURE E.2.4.188

ACRES

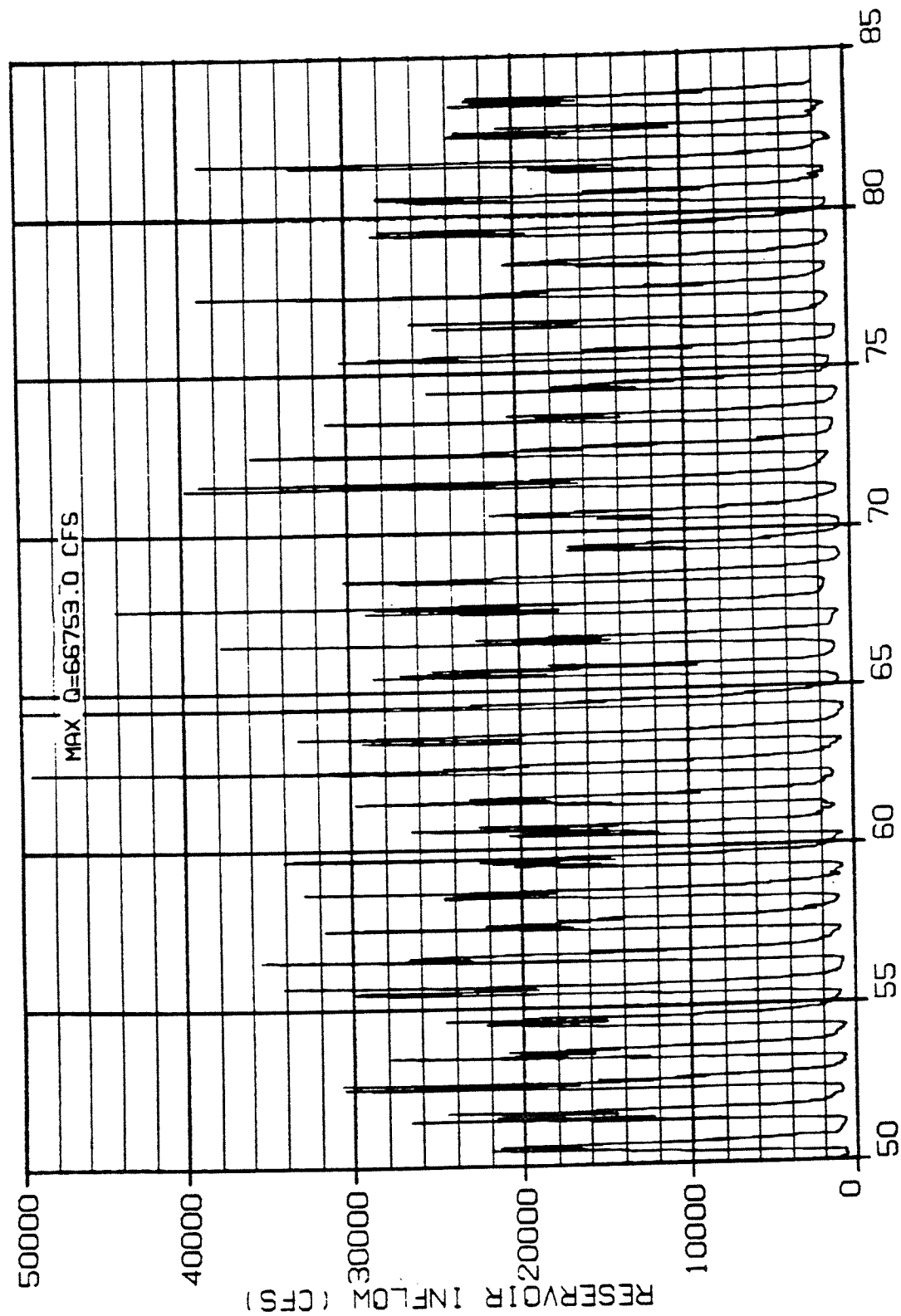




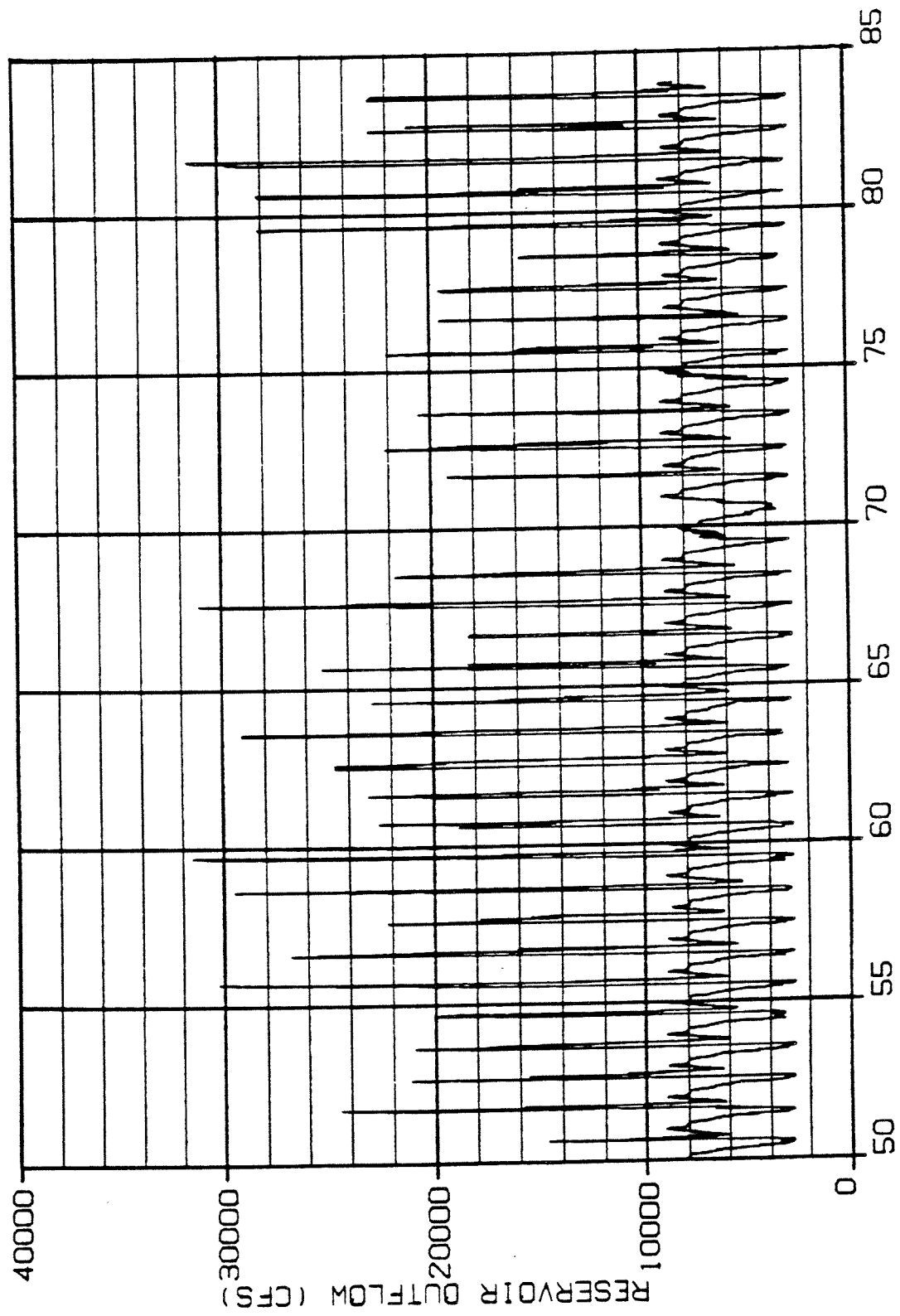
WATANA WATER SURFACE ELEVATION, EARLY STAGE III



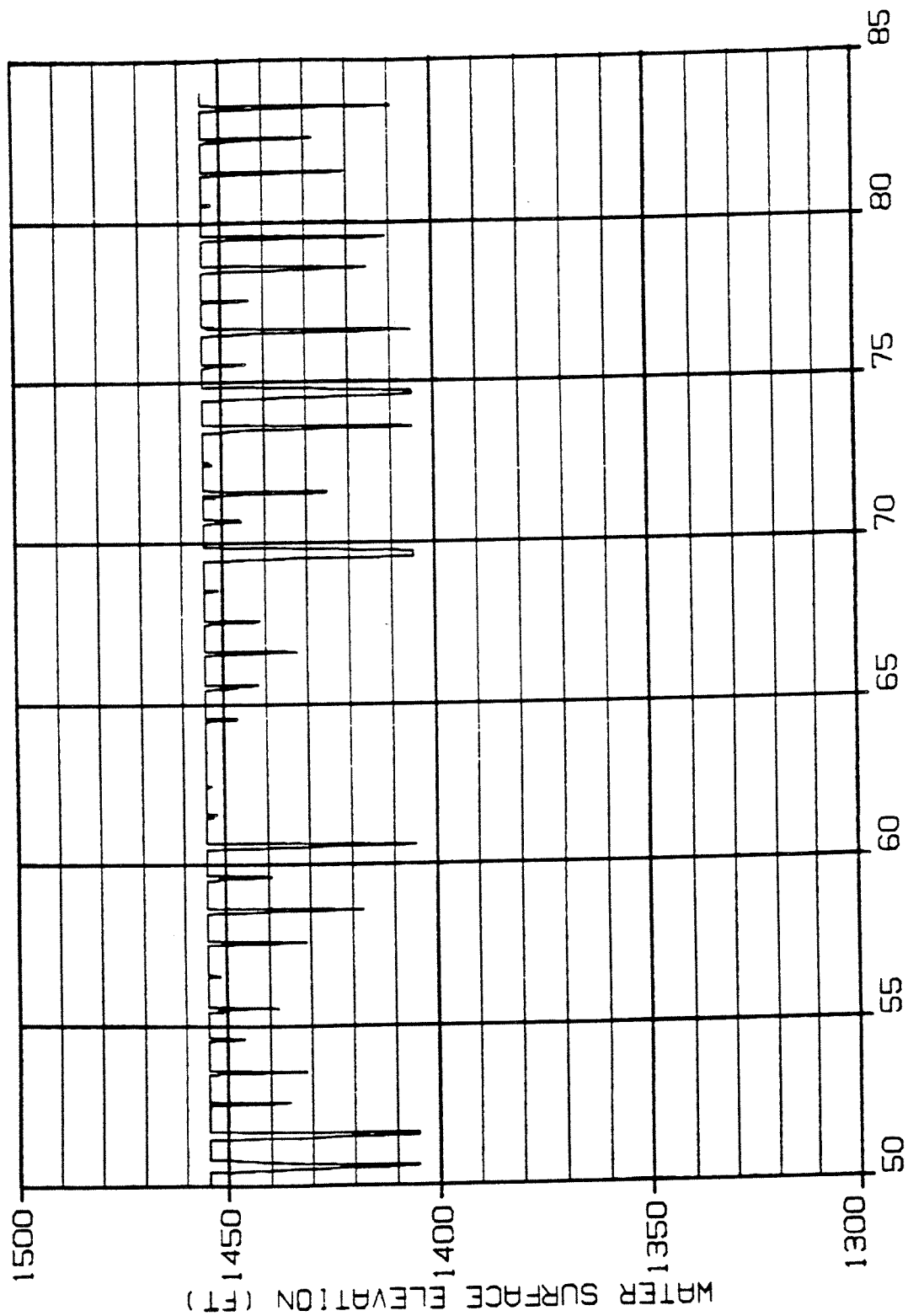
WATANA WATER SURFACE ELEVATION  
MONTHLY SUMMARY, EARLY STAGE III



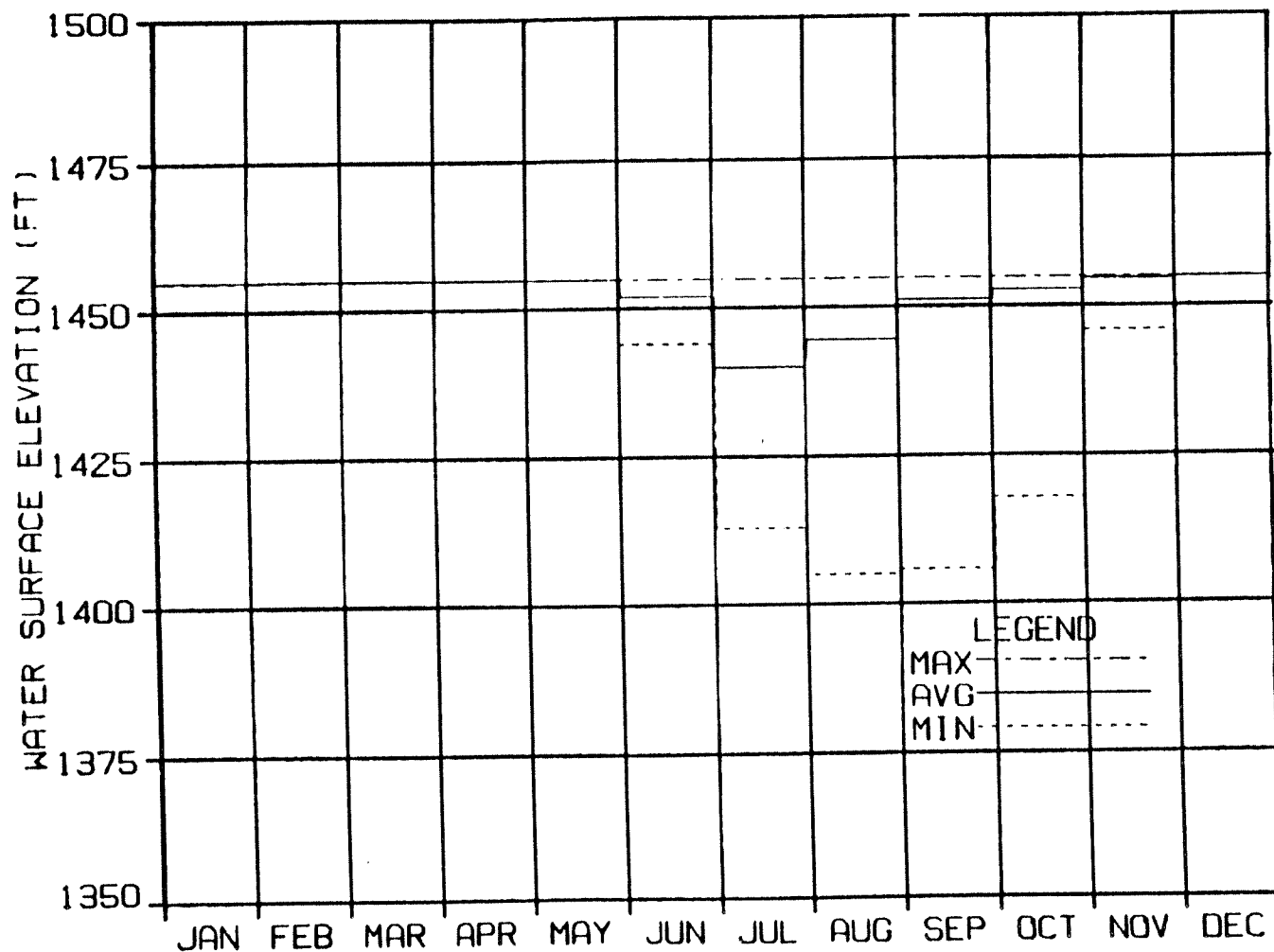
WATANA RESERVOIR INFLOW, EARLY STAGE III



WATANA RESERVOIR OUTFLOW, EARLY STAGE III

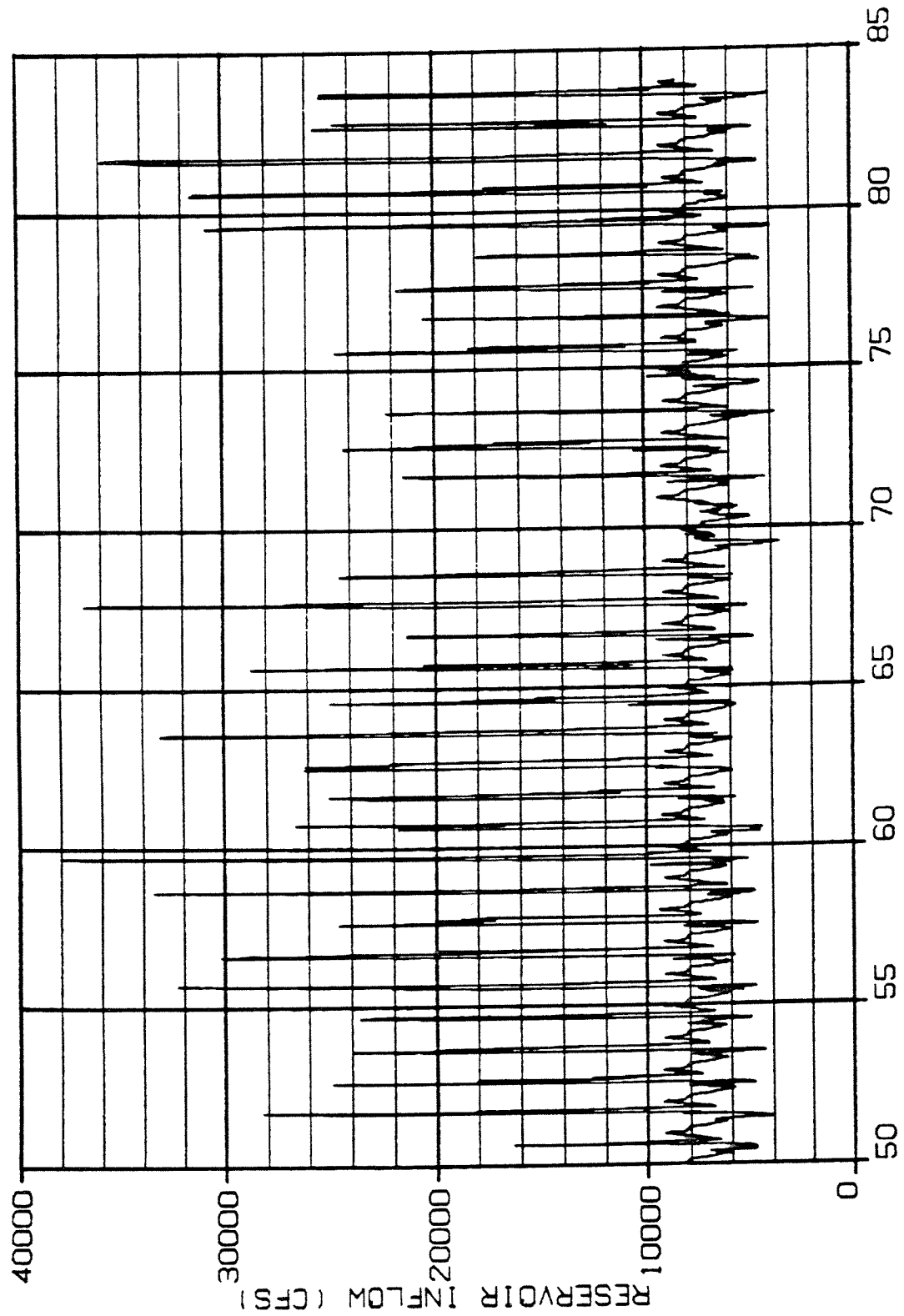


DEVIL CANYON WATER SURFACE ELEVATION, EARLY STAGE III

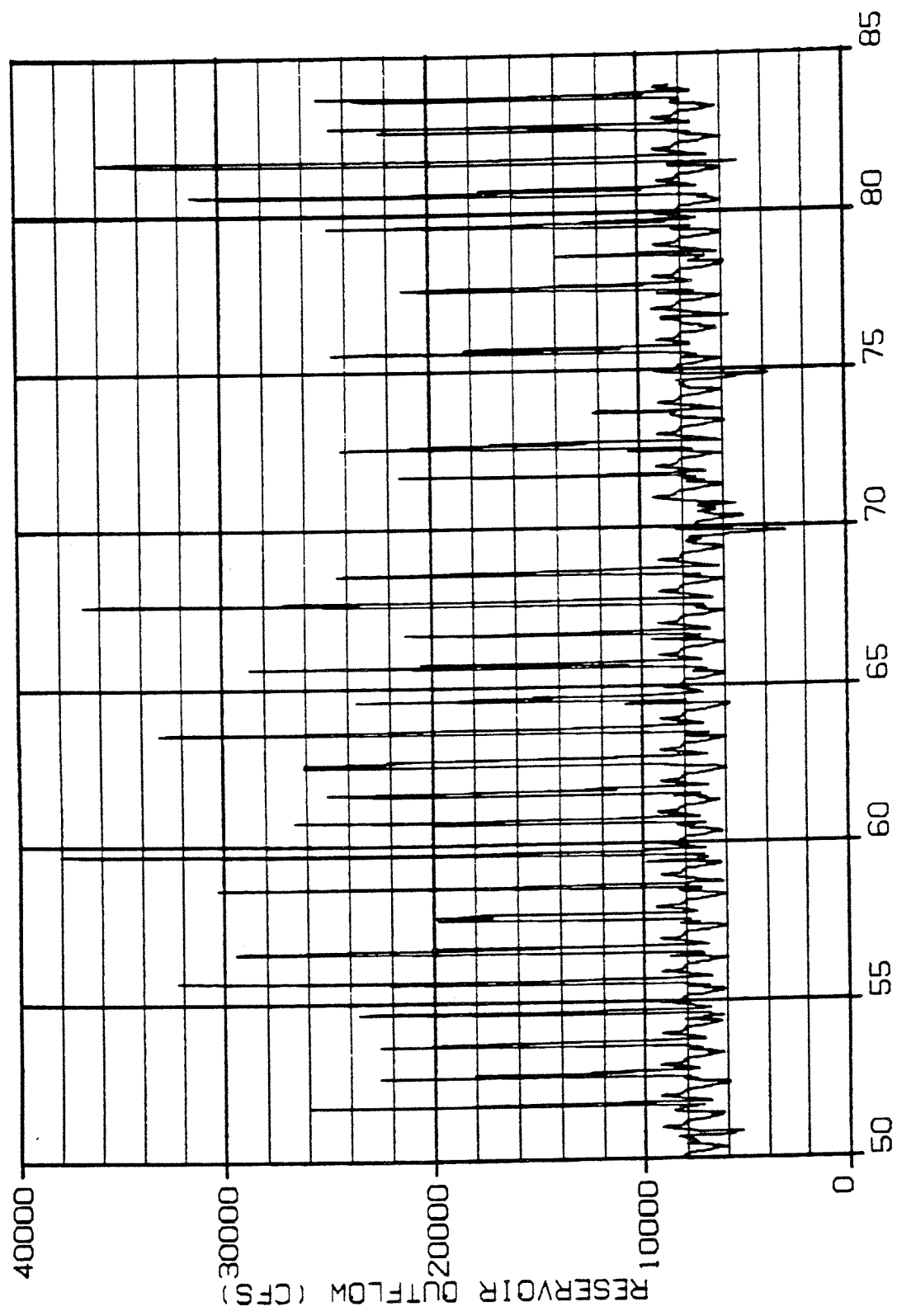


DEVIL CANYON WATER SURFACE ELEVATION  
MONTHLY SUMMARY, EARLY STAGE III

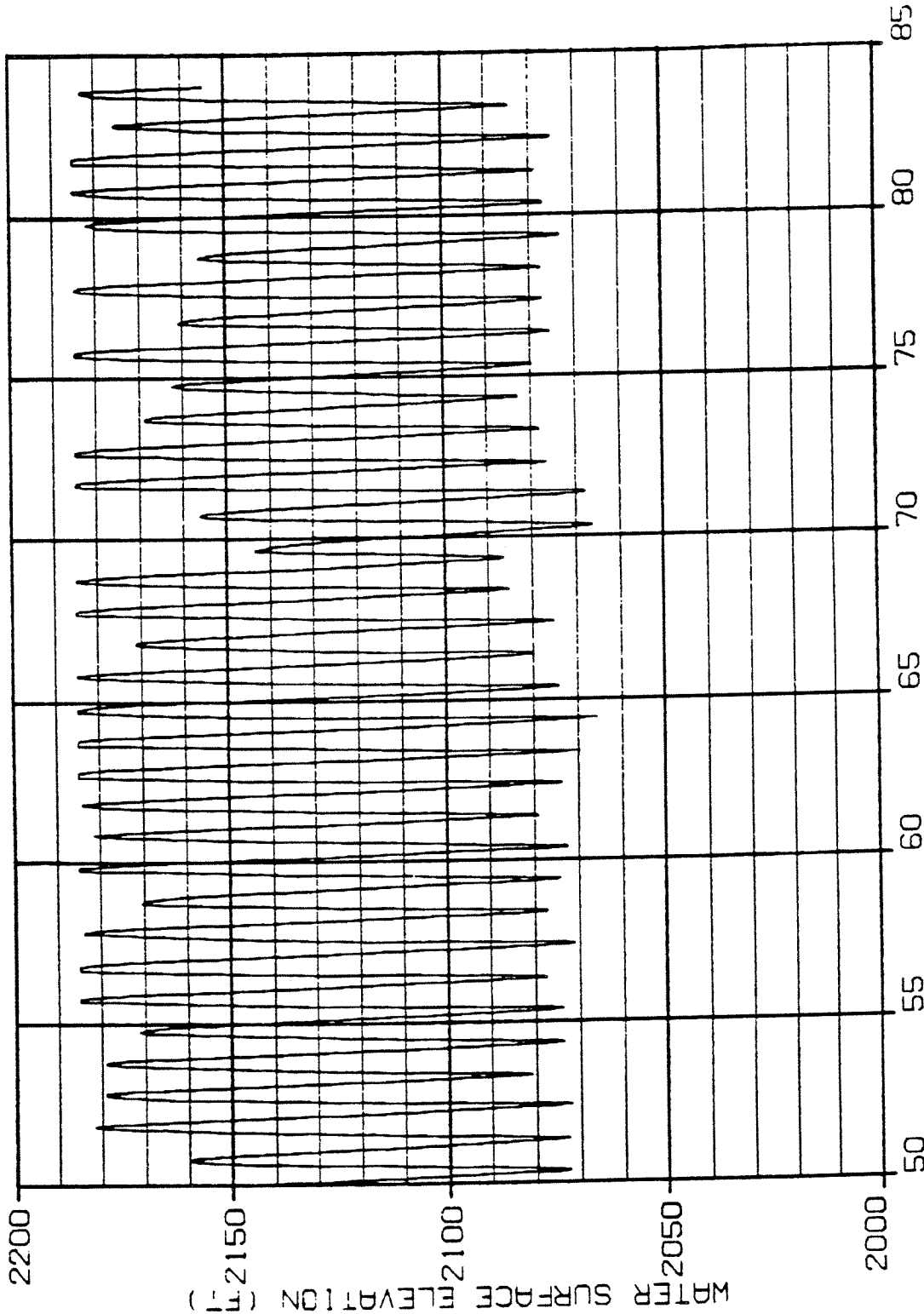




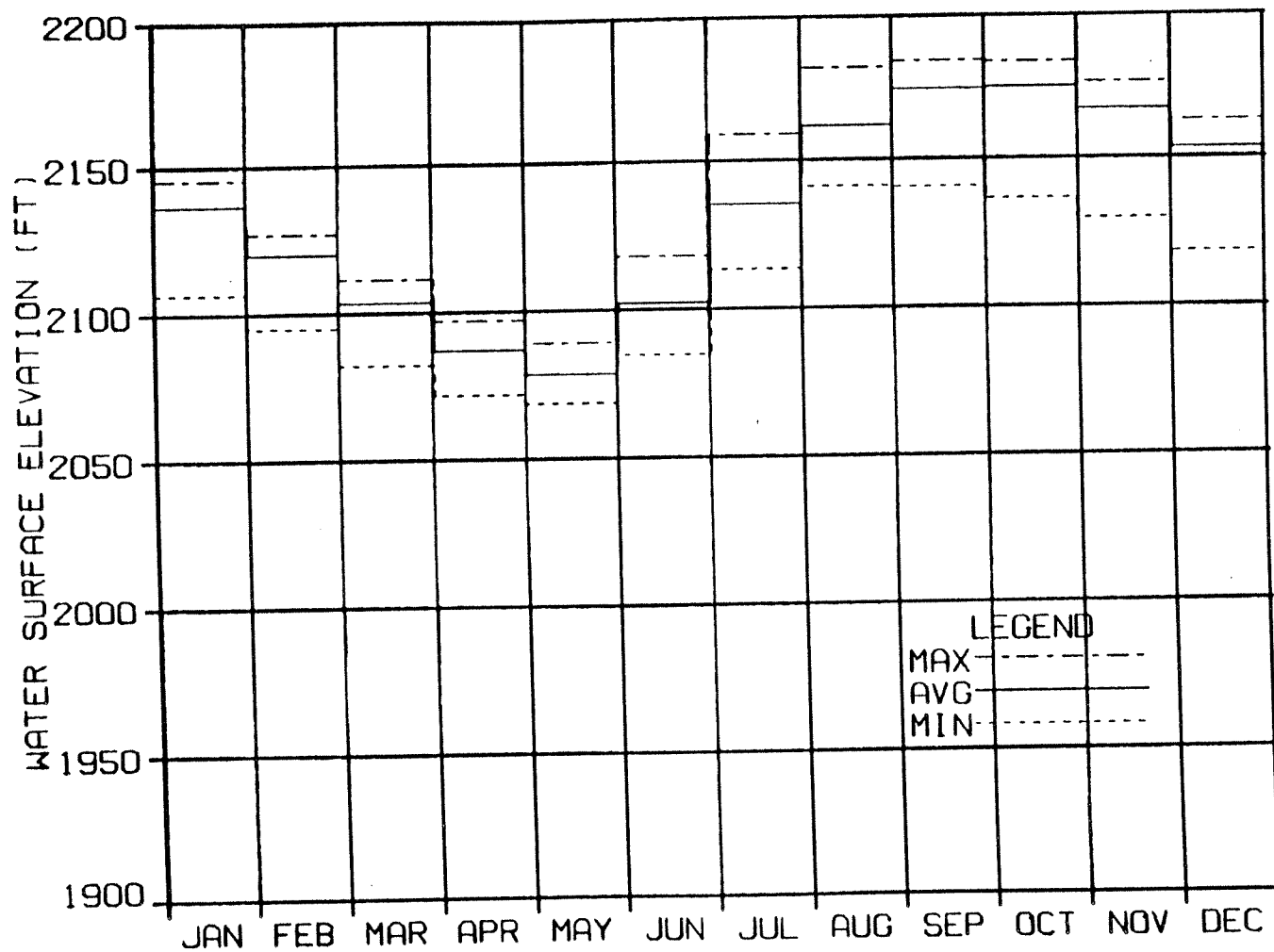
DEVIL CANYON RESERVOIR INFLOW, EARLY STAGE III



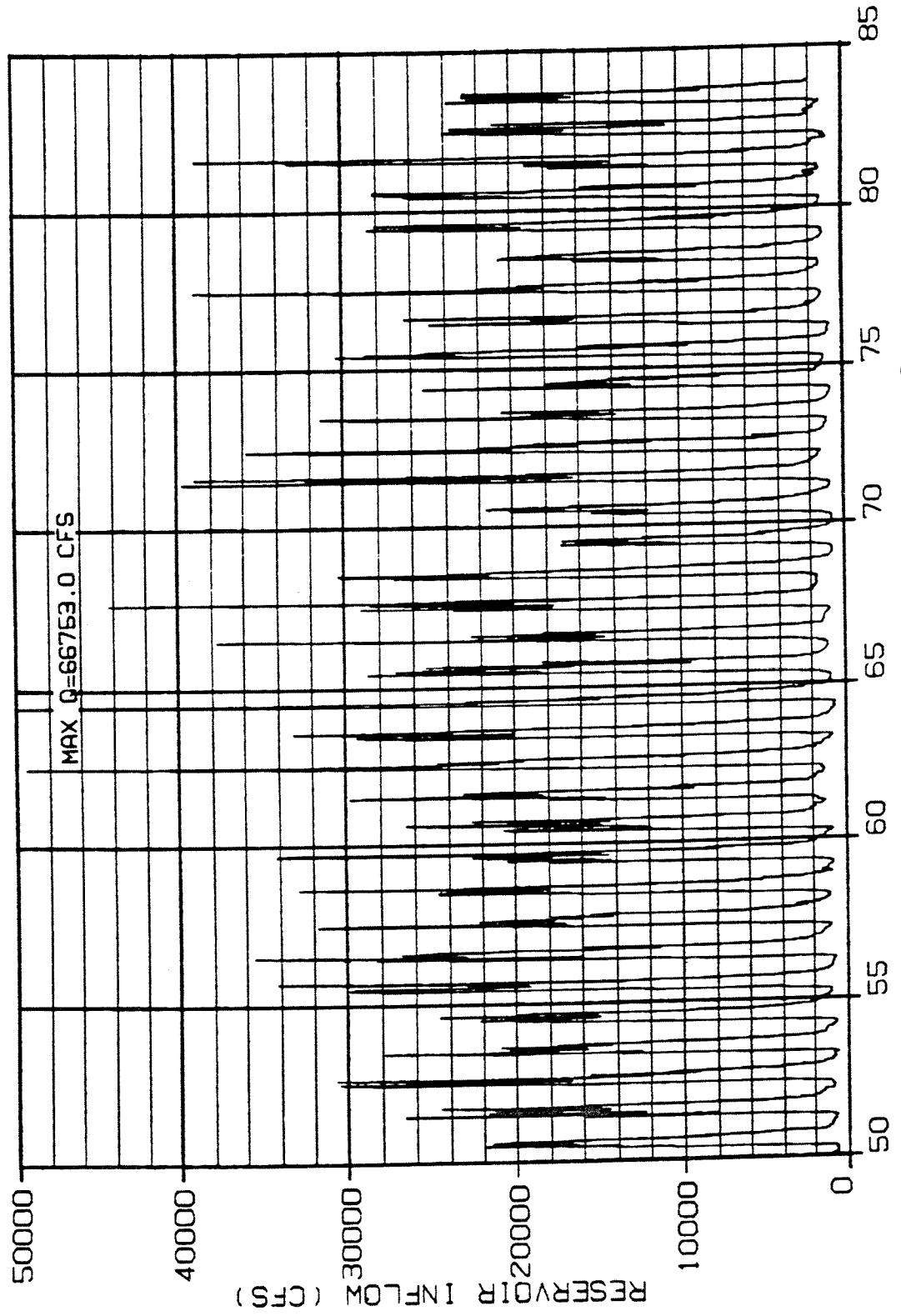
DEVIL CANYON RESERVOIR OUTFLOW, EARLY STAGE III



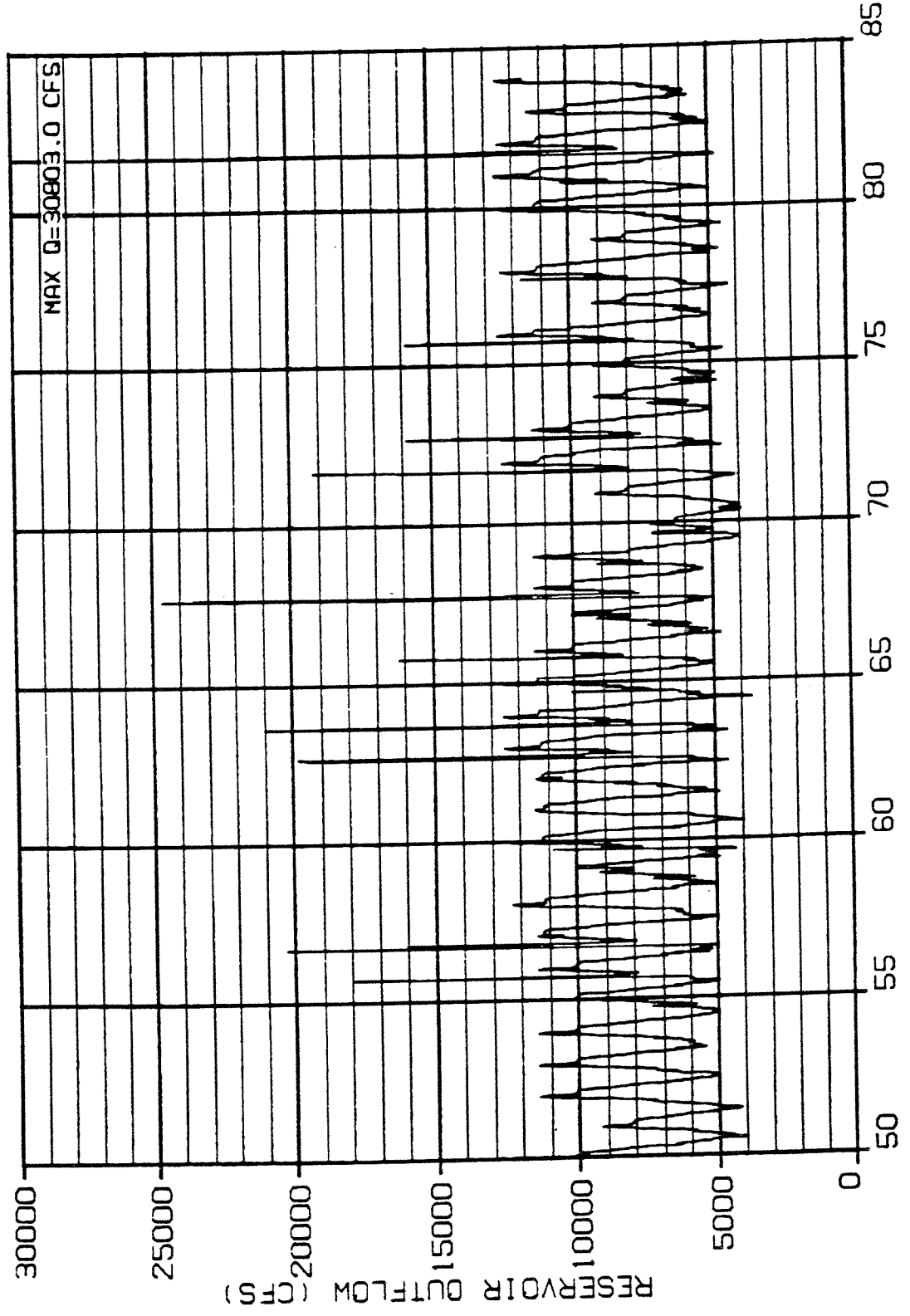
WATANA WATER SURFACE ELEVATION  
LATE STAGE III



WATANA WATER SURFACE ELEVATION  
 MONTHLY SUMMARY LATE STAGE III



WATANA RESERVOIR INFLOW  
LATE STAGE III



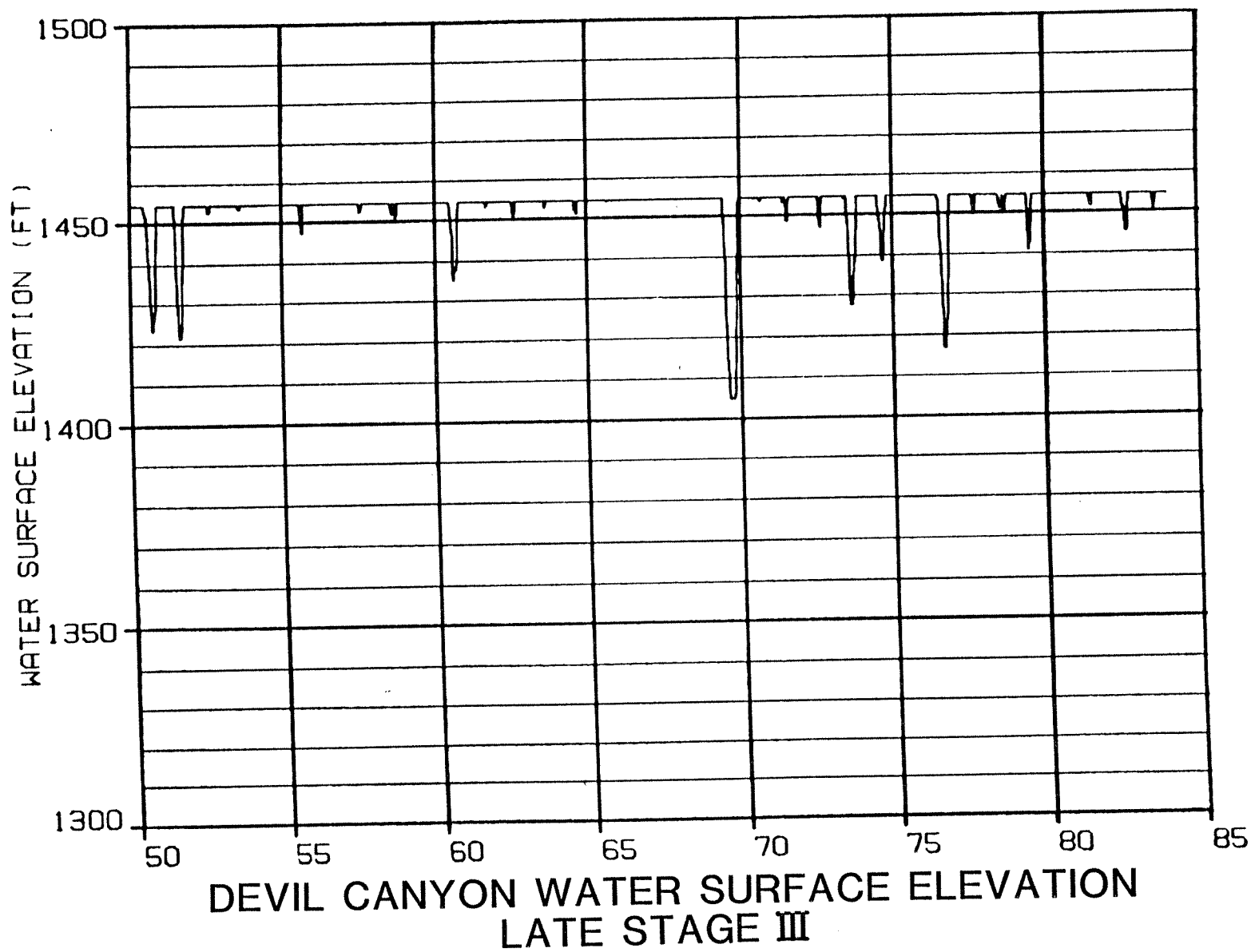
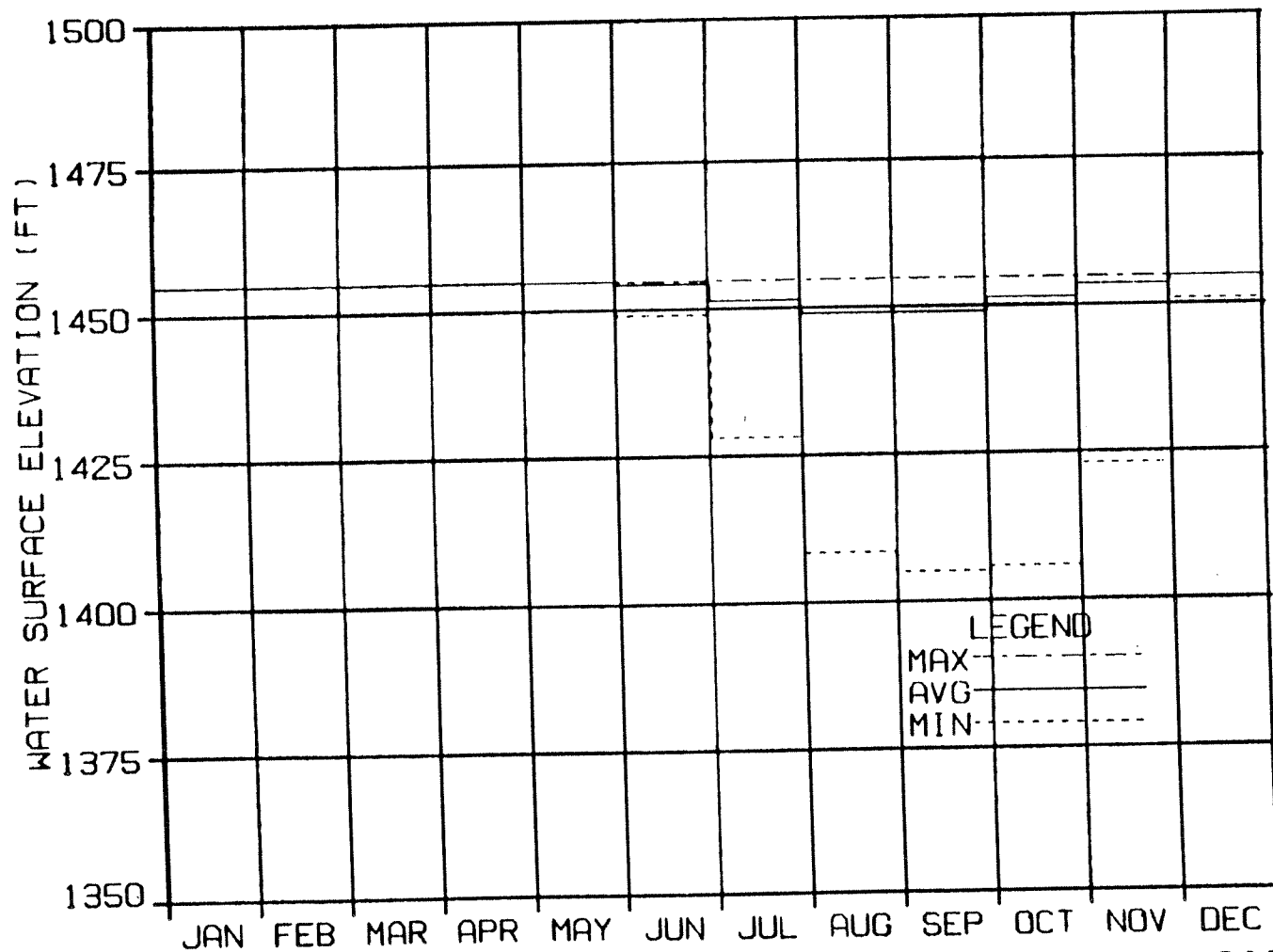


FIGURE E.2.4. 20



DEVIL CANYON WATER SURFACE ELEVATION  
MONTHLY SUMMARY  
LATE STAGE III



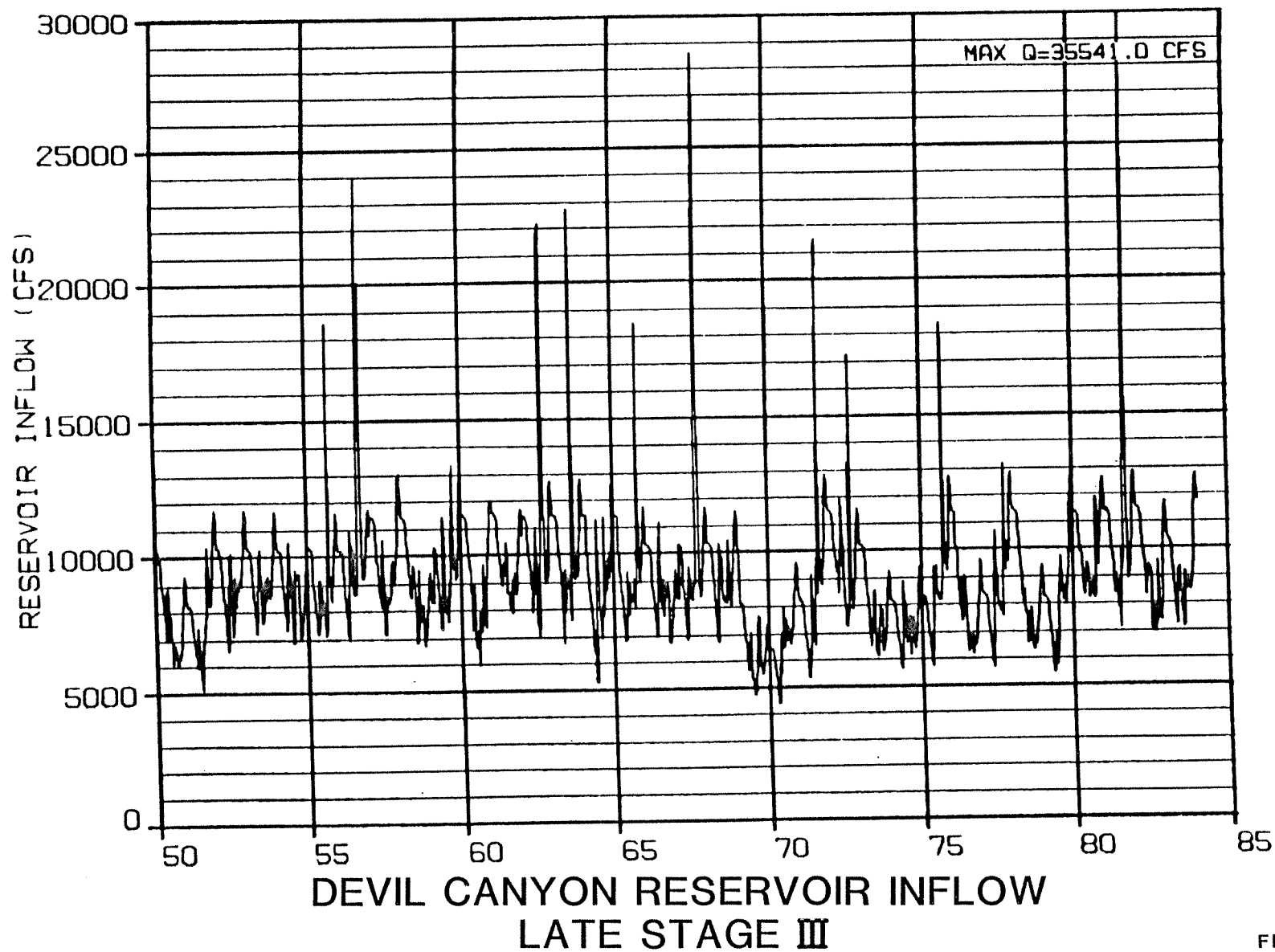
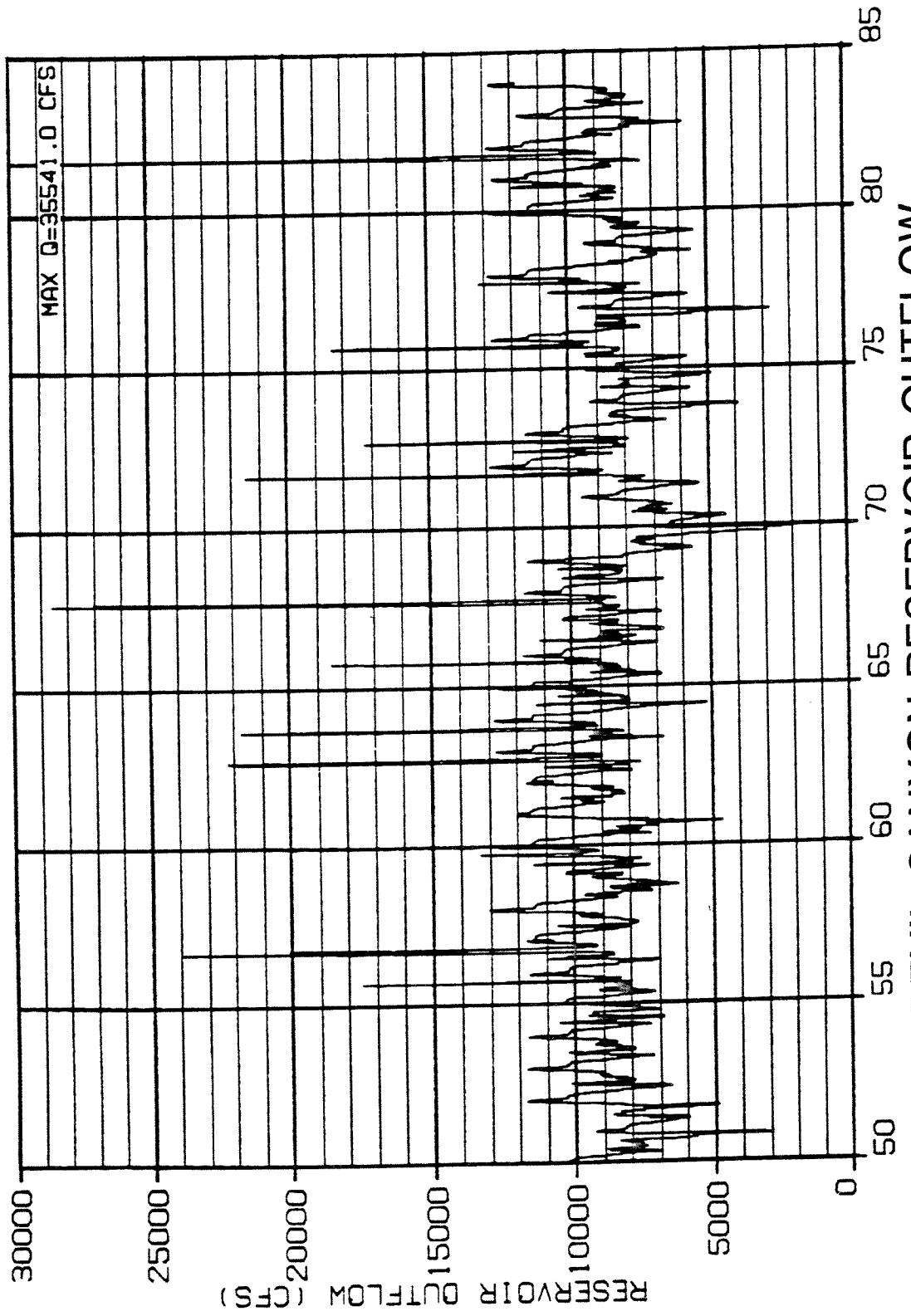
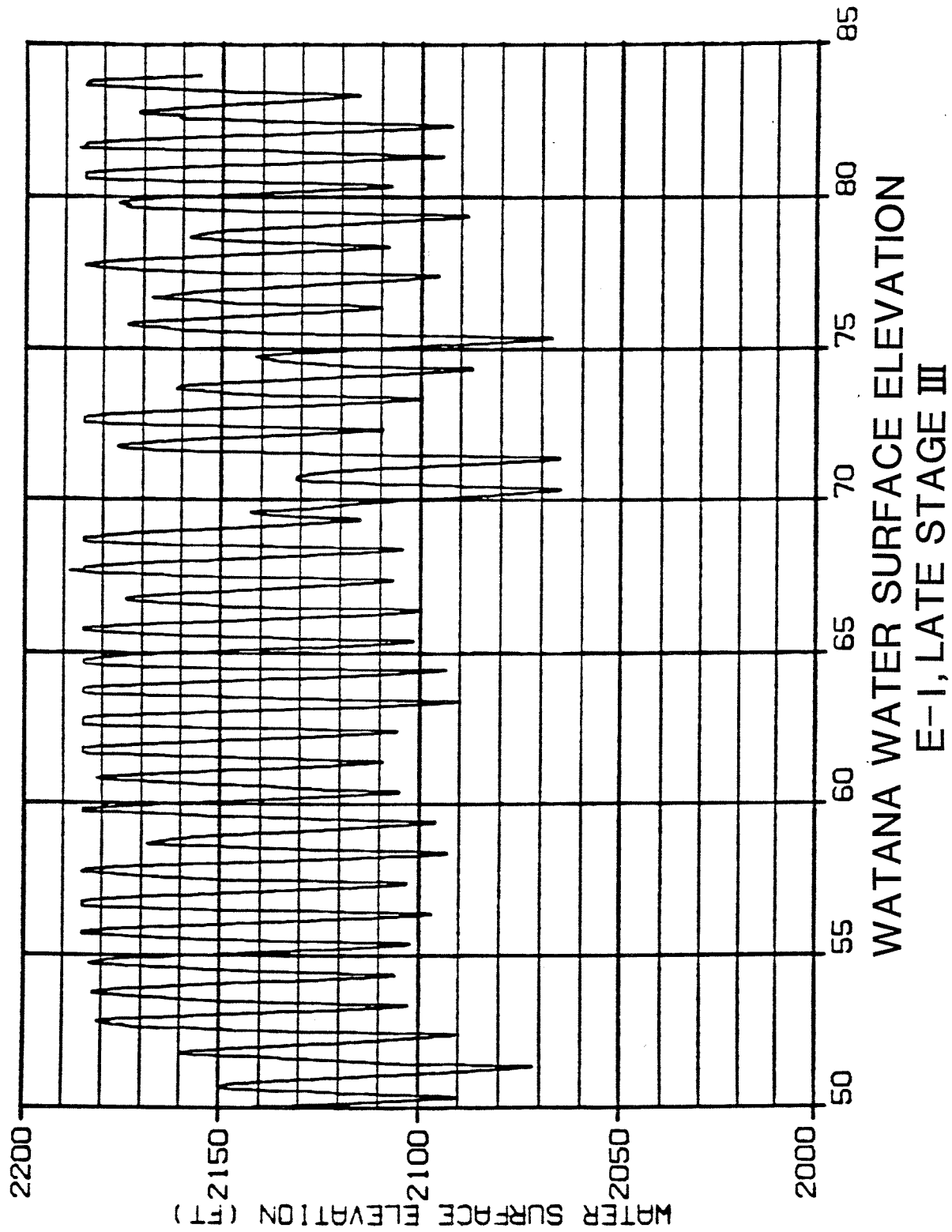
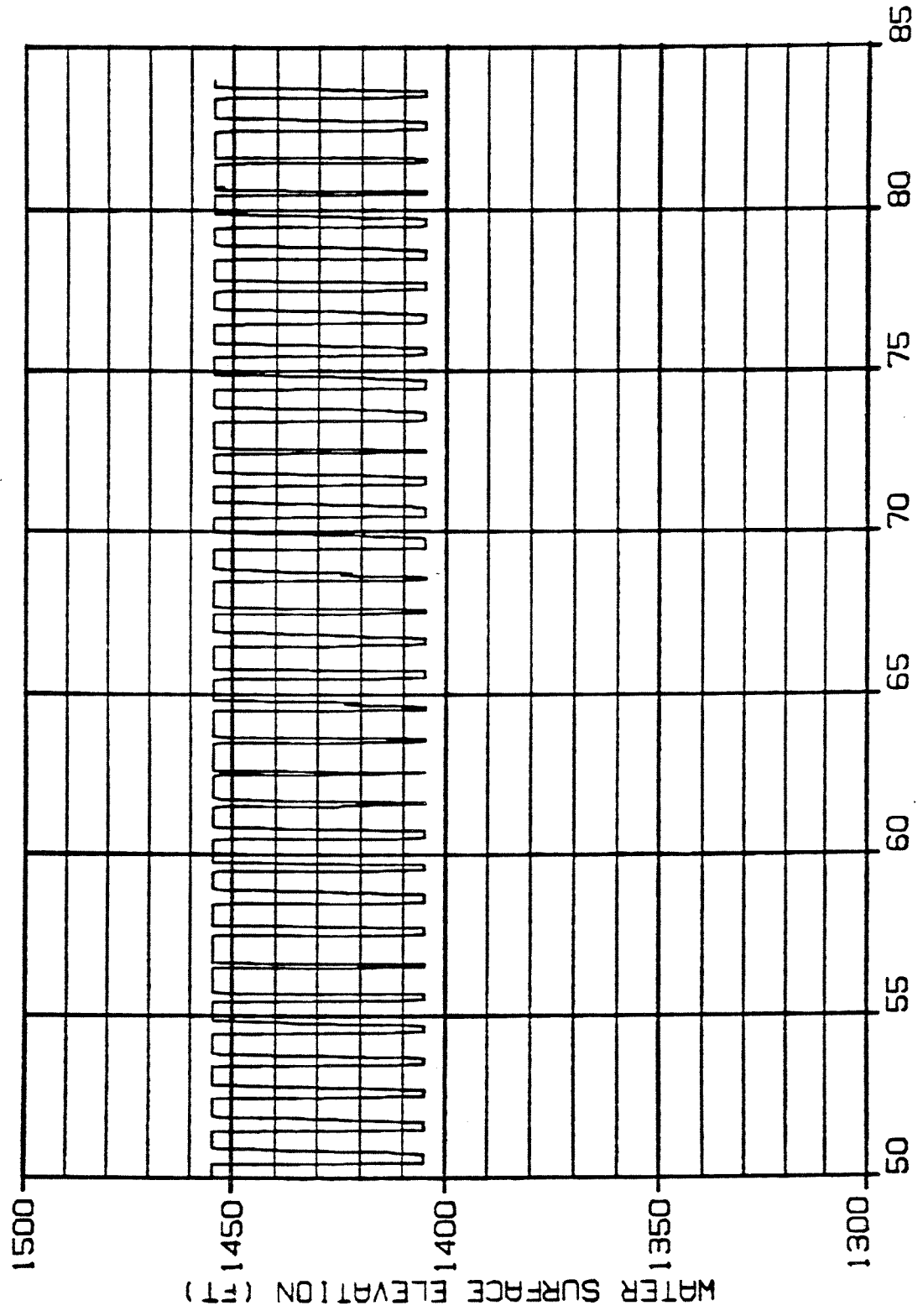


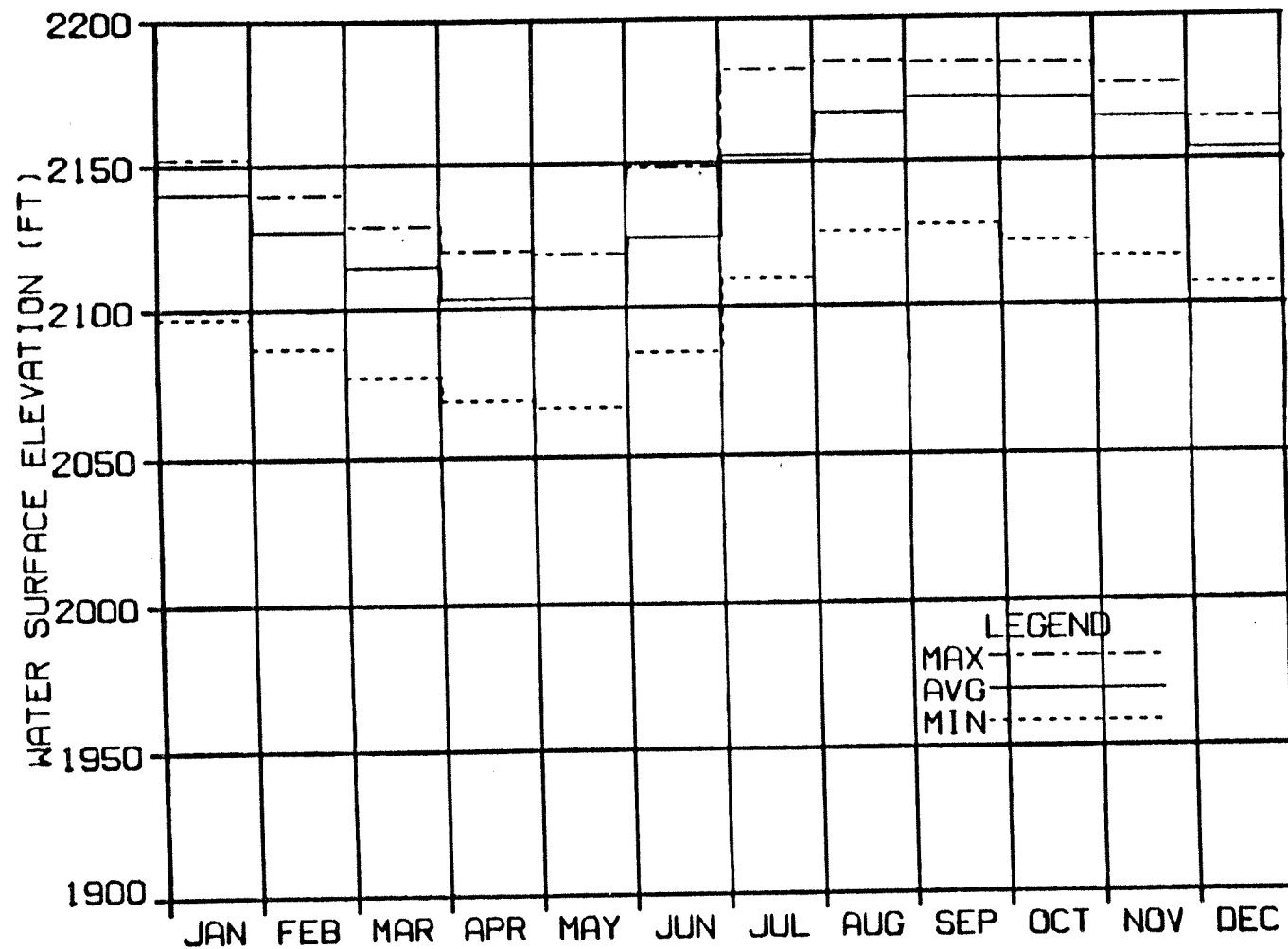
FIGURE E.2.4.203



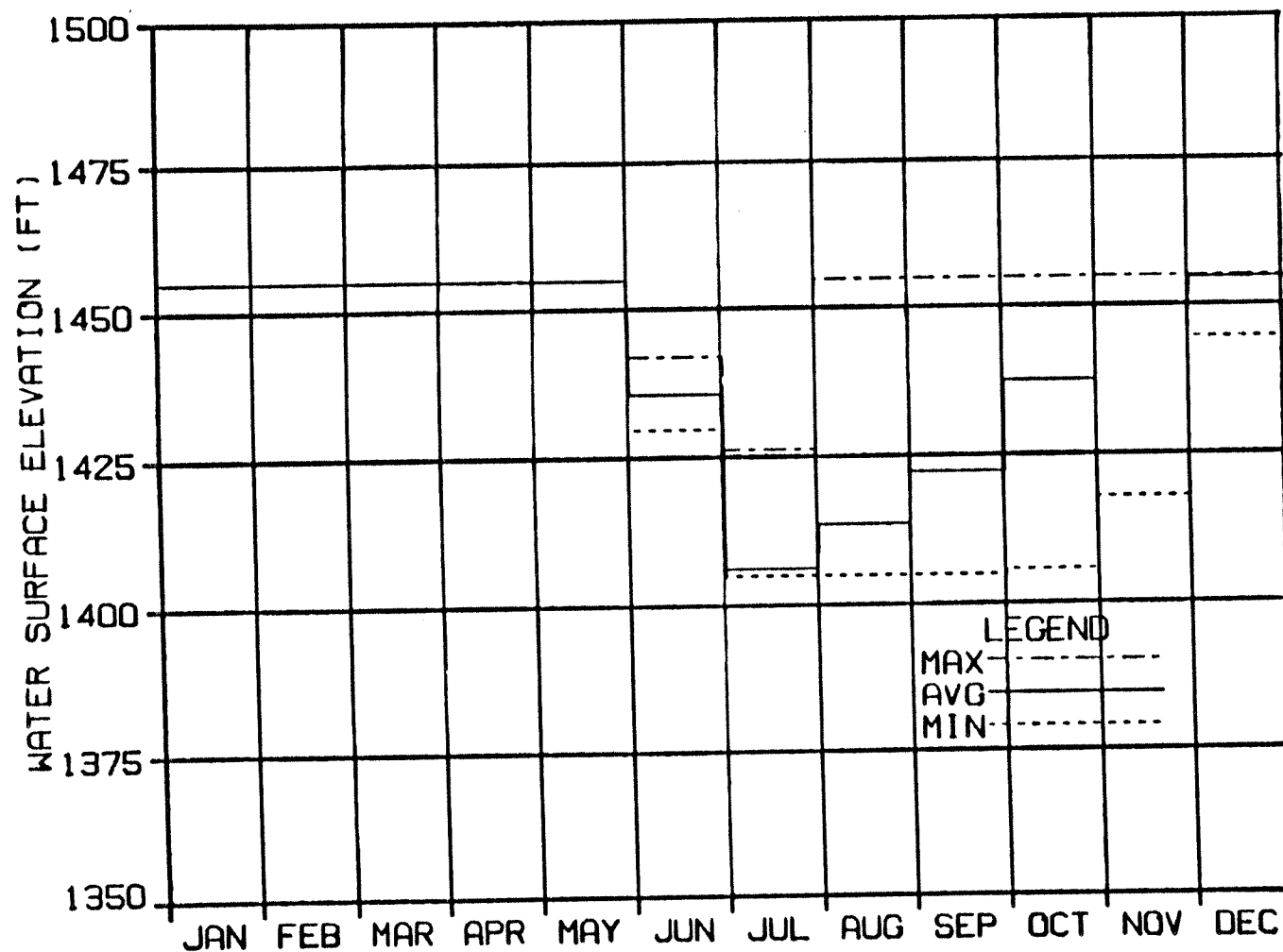




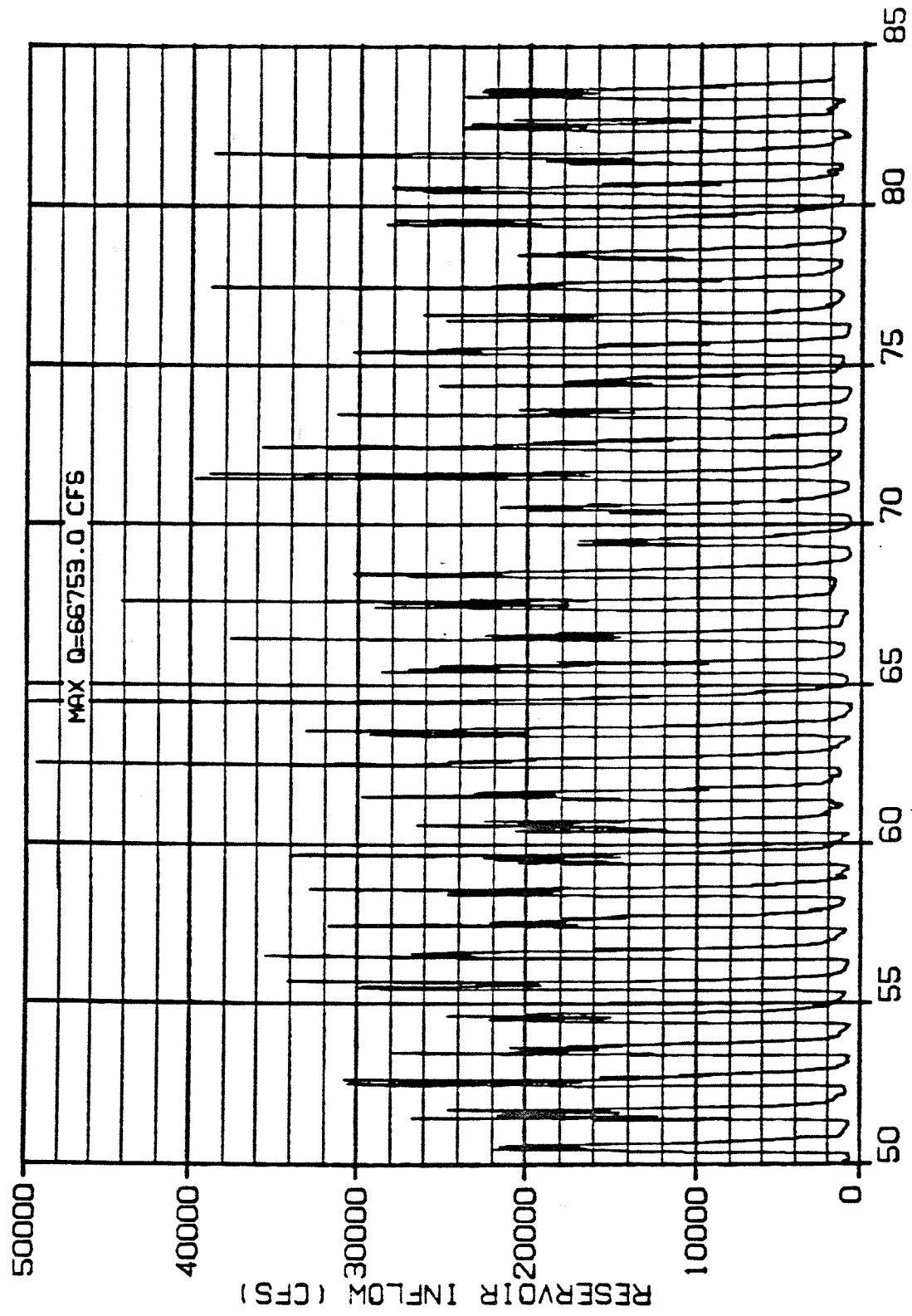
DEVIL CANYON WATER SURFACE ELEVATION  
E-1, LATE STAGE III



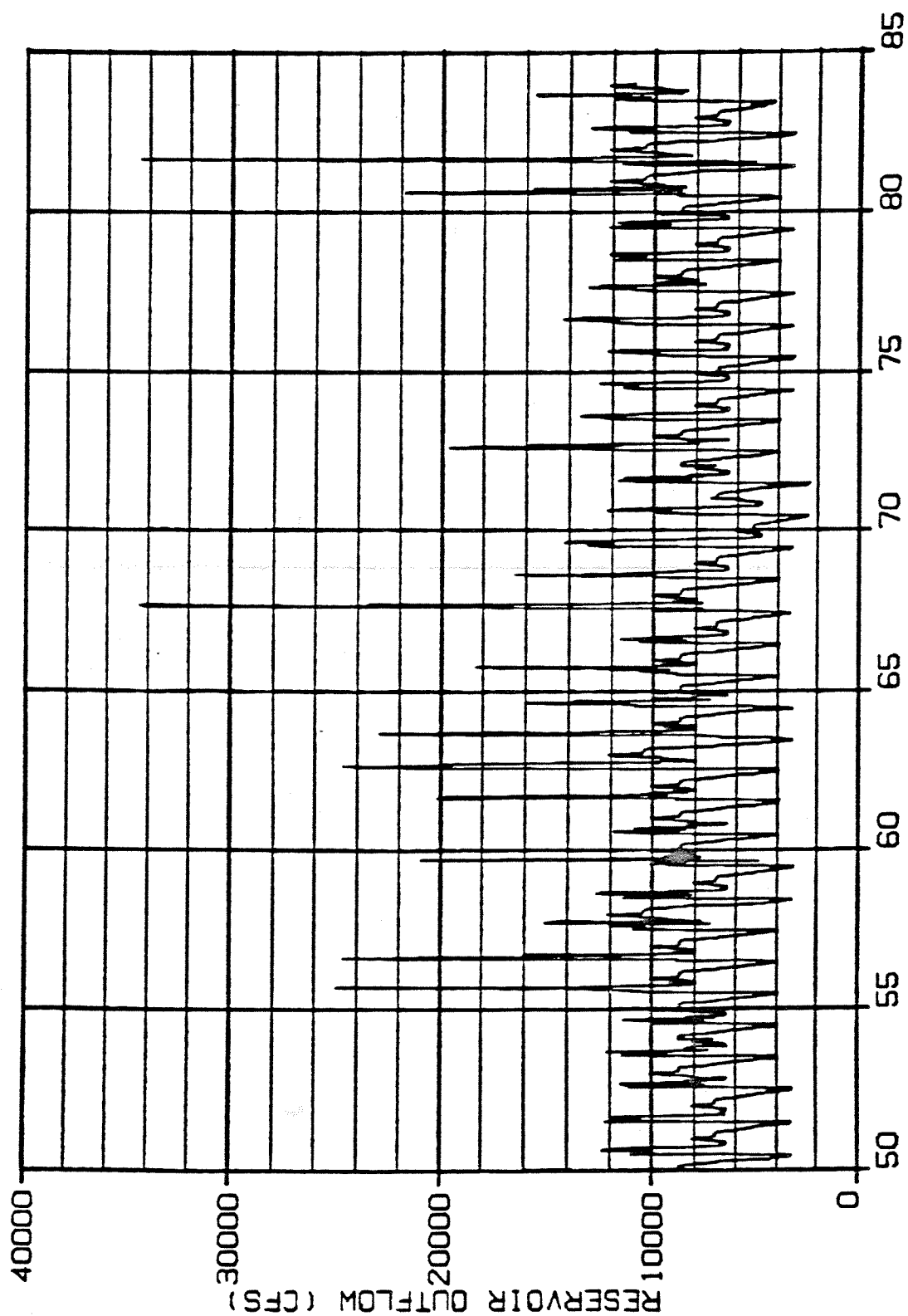
WATANA WATER SURFACE ELEVATION  
MONTHLY SUMMARY  
E-I, LATE STAGE III



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

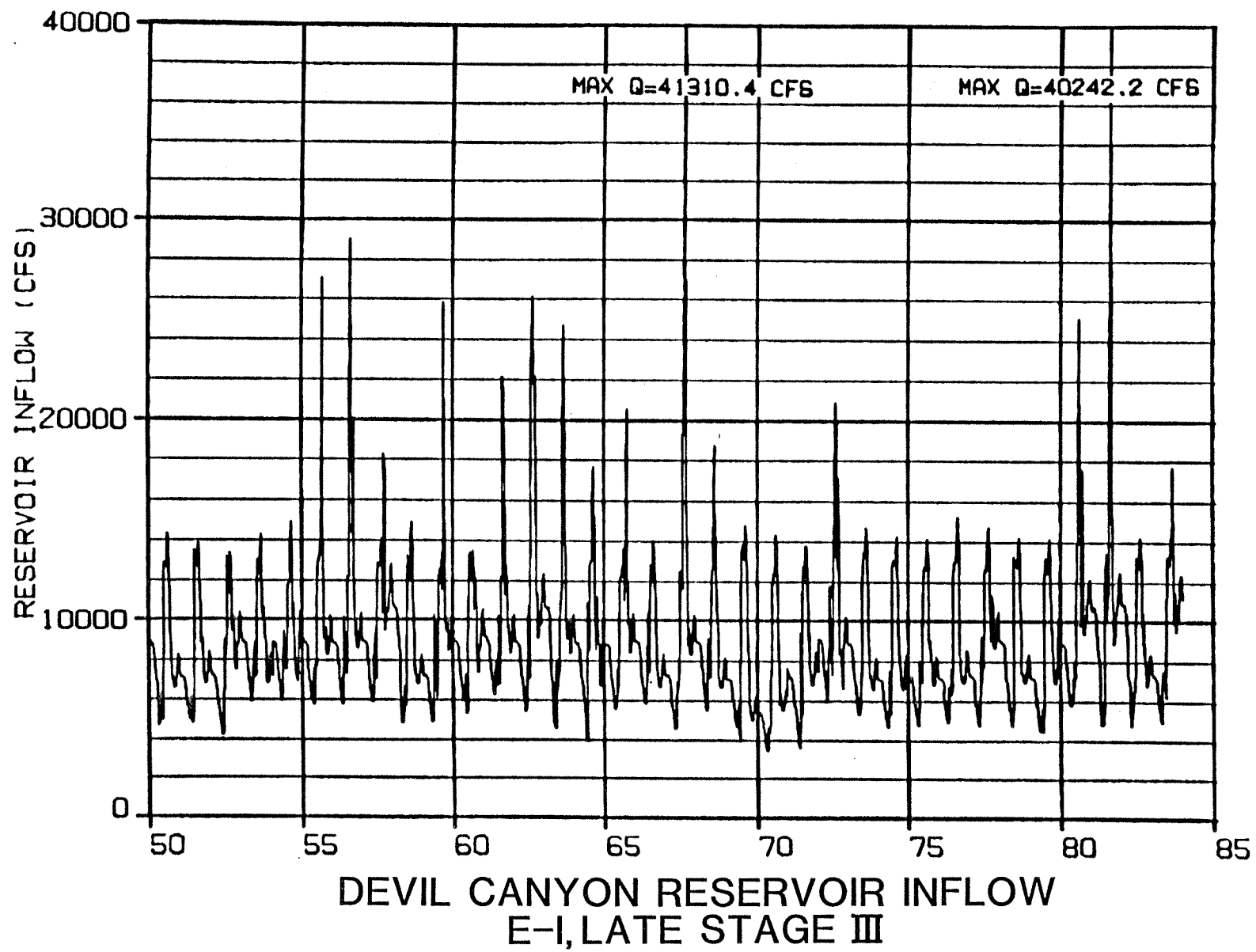


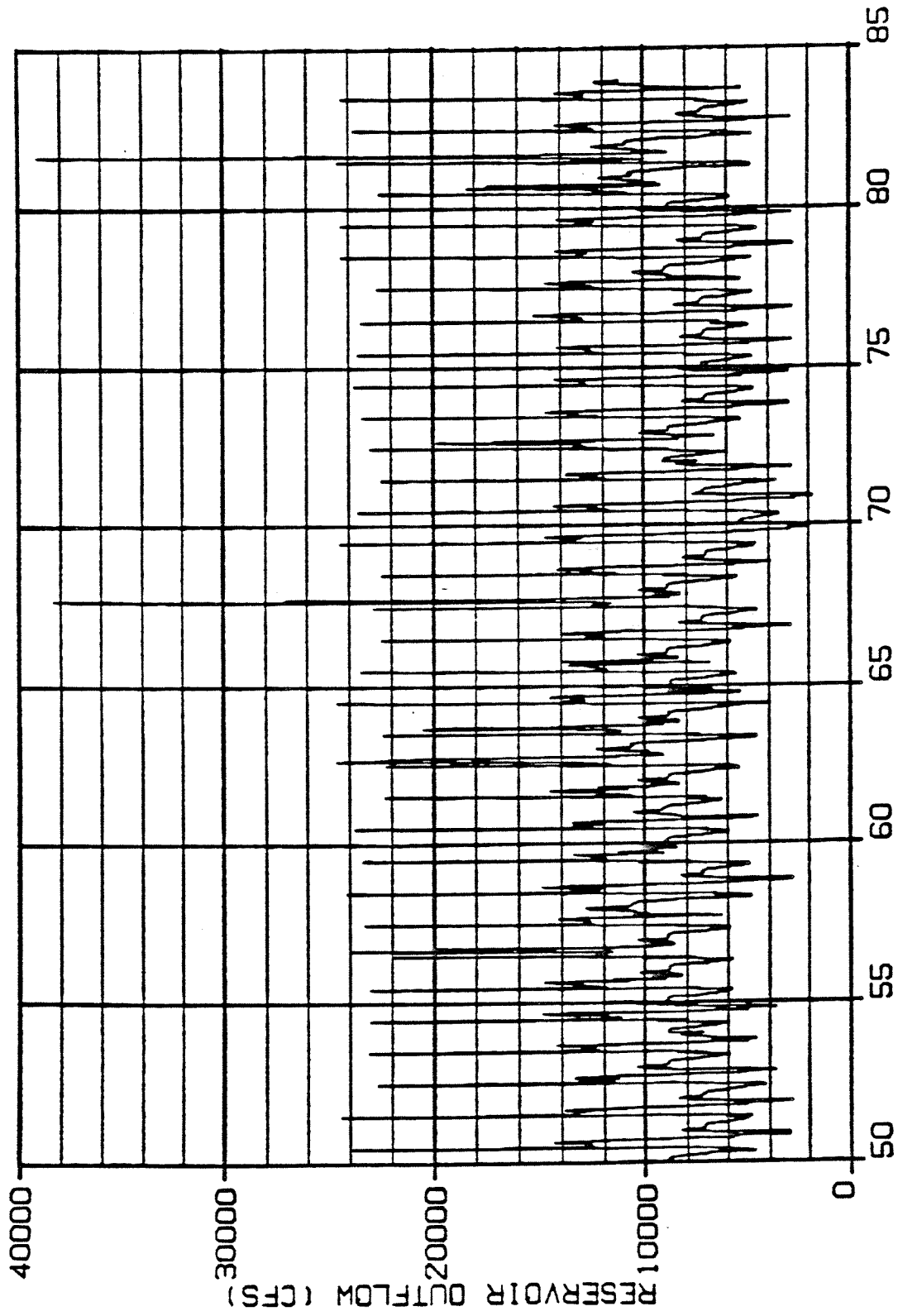
WATANA RESERVOIR INFLOW  
E-I, LATE STAGE III



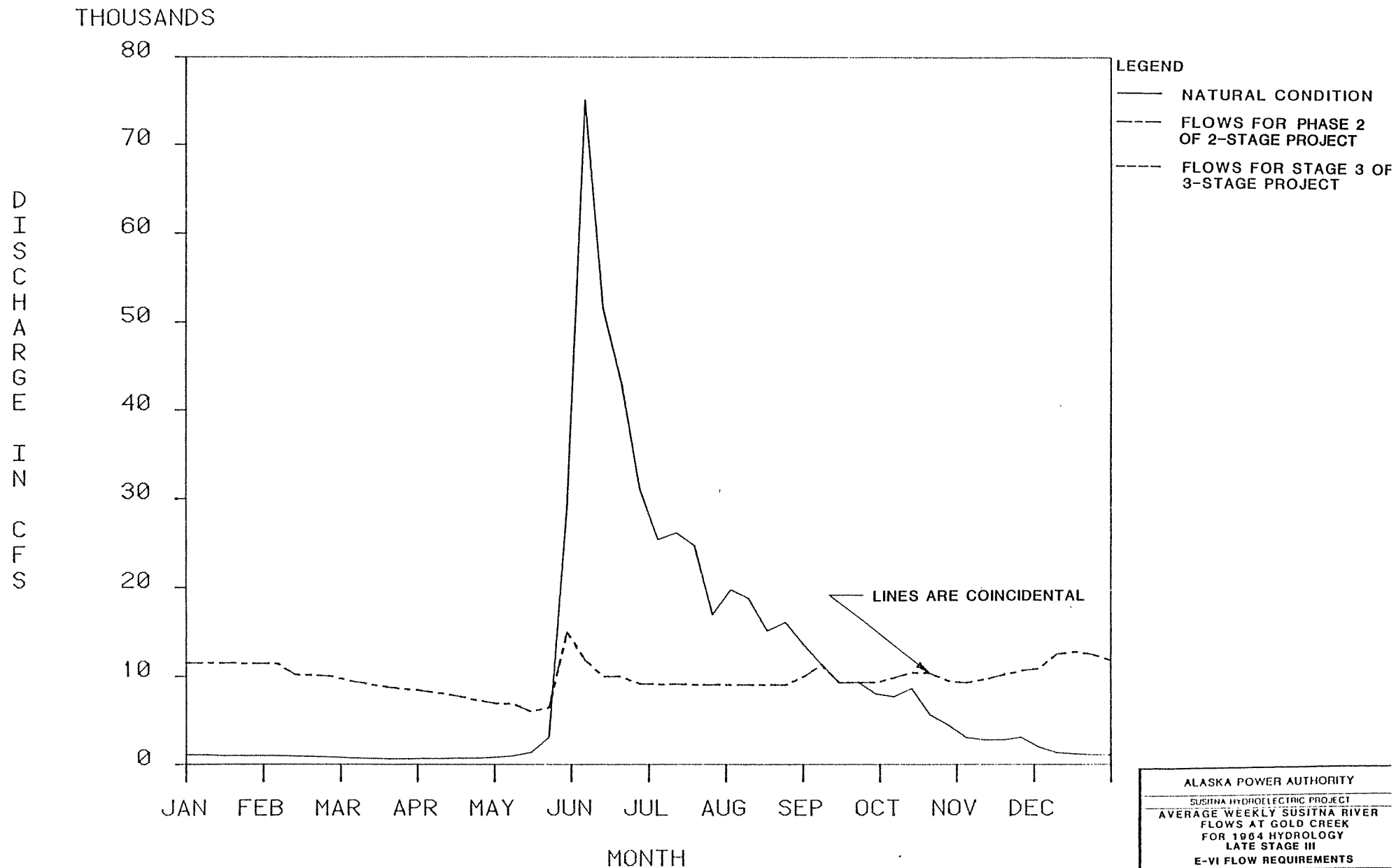
WATANA RESERVOIR OUTFLOW  
E-I, LATE STAGE III







DEVIL CANYON RESERVOIR OUTFLOW  
E-I, LATE STAGE III



|                               |          |
|-------------------------------|----------|
| ALASKA POWER AUTHORITY        |          |
| SUSITNA HYDROELECTRIC PROJECT |          |
| AVERAGE WEEKLY SUSITNA RIVER  |          |
| FLOWS AT GOLD CREEK           |          |
| FOR 1964 HYDROLOGY            |          |
| LATE STAGE III                |          |
| E-VI FLOW REQUIREMENTS        |          |
| DATE                          | APPROVED |
| DATE                          | APPROVED |

FIGURE E.2.4. 213

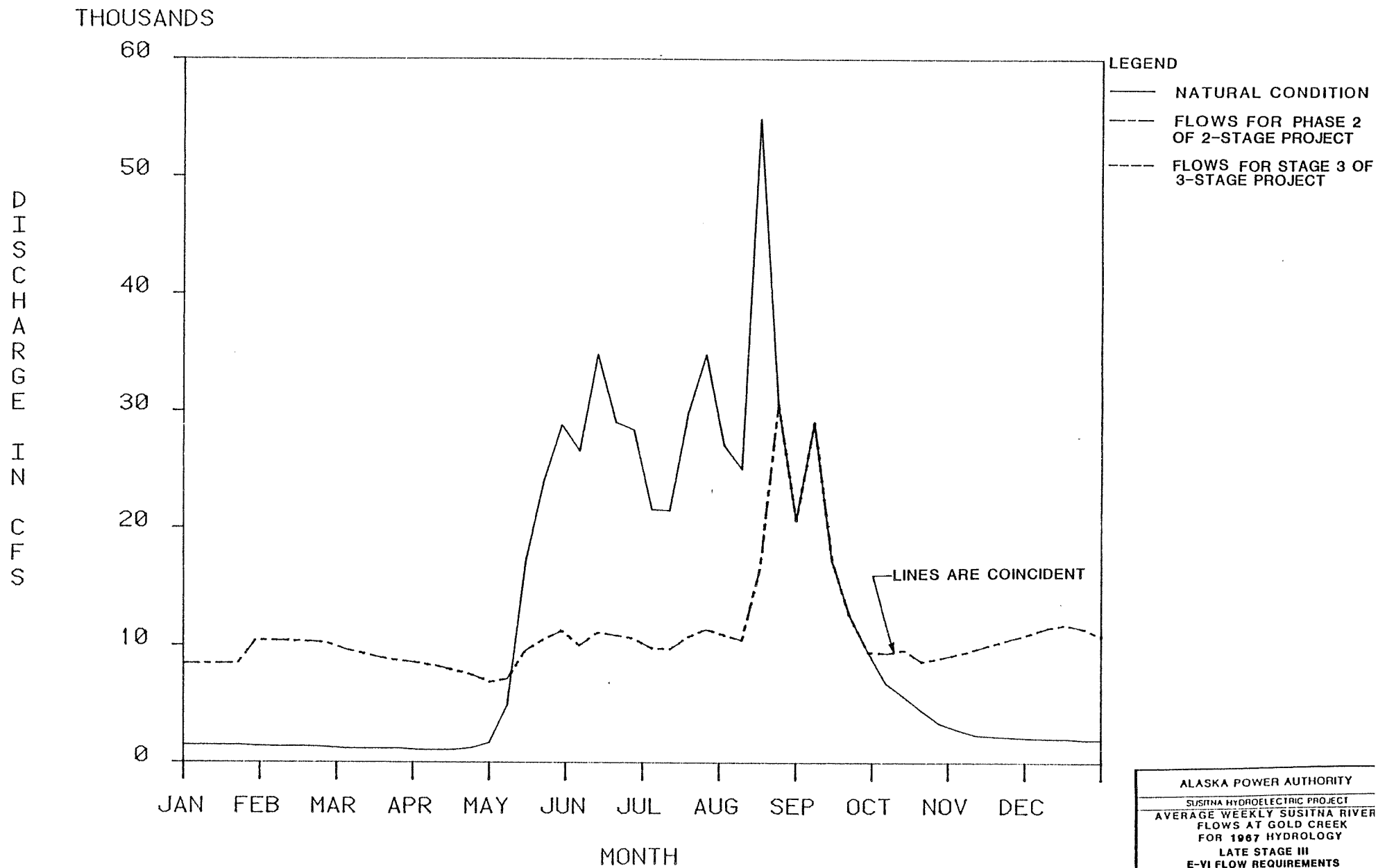


FIGURE E.2.4.214

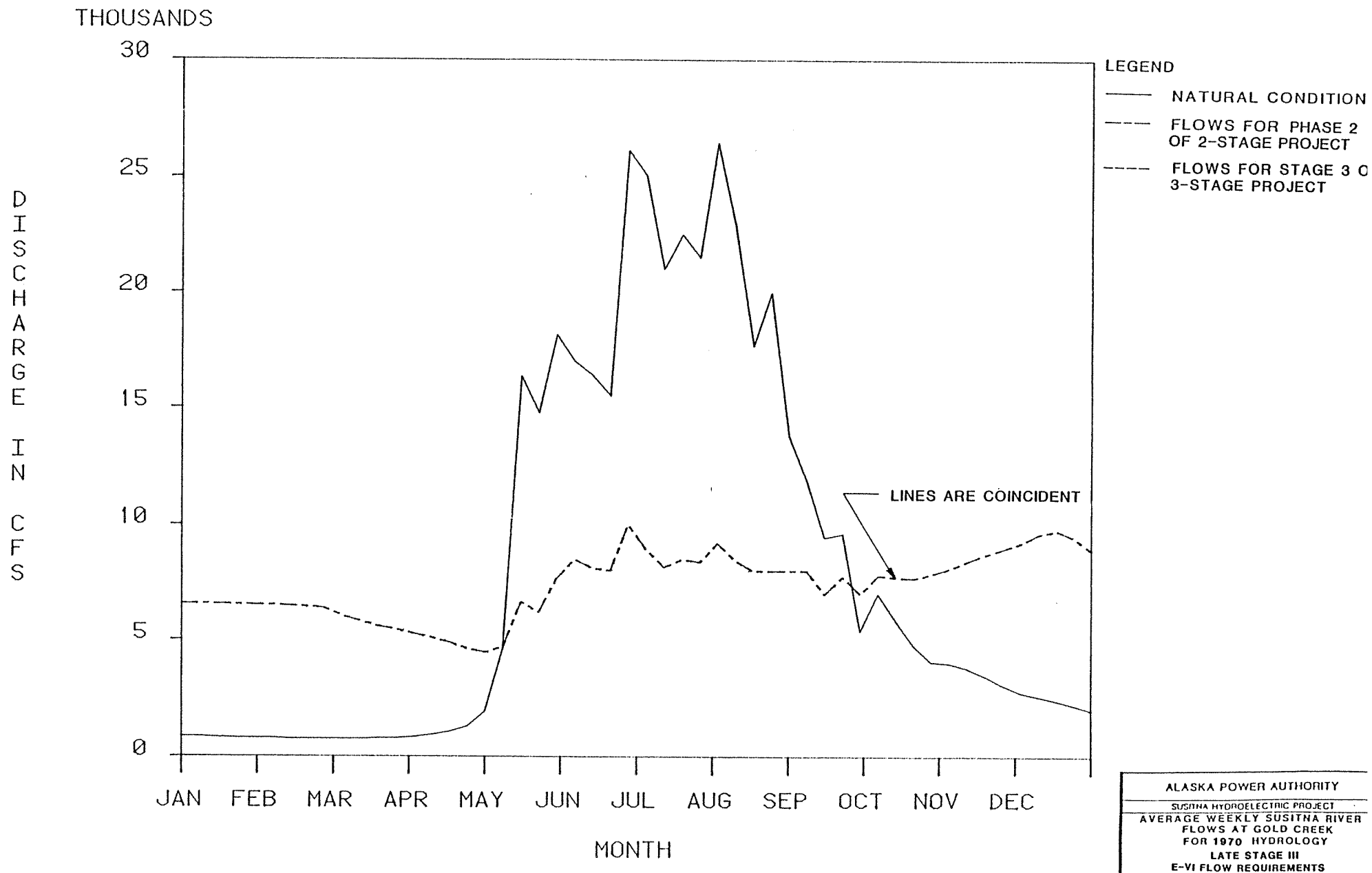


FIGURE E.2.4. 216

|                               |    |             |
|-------------------------------|----|-------------|
| 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 | REVIEWED BY |
|                               |    |             |

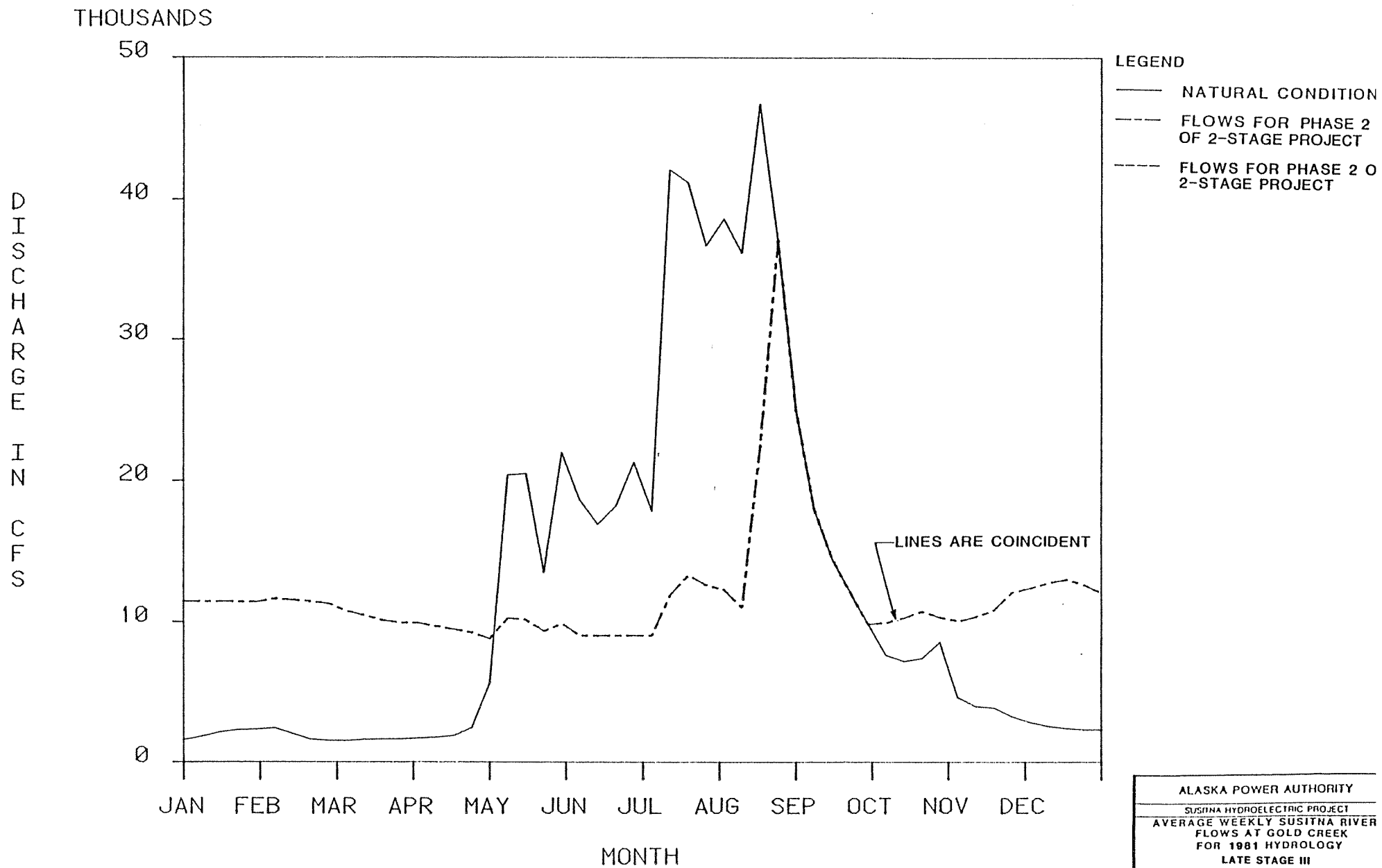
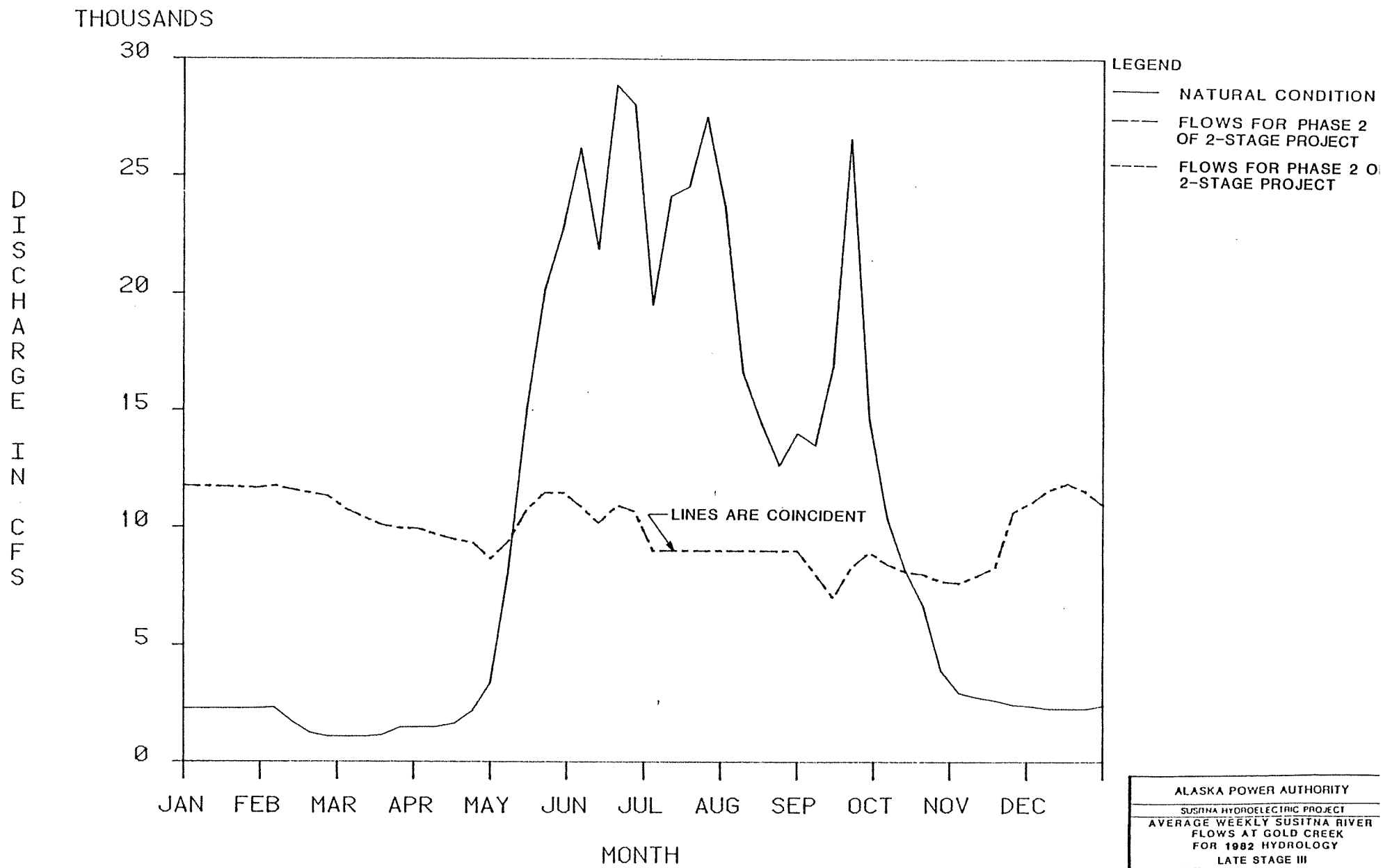
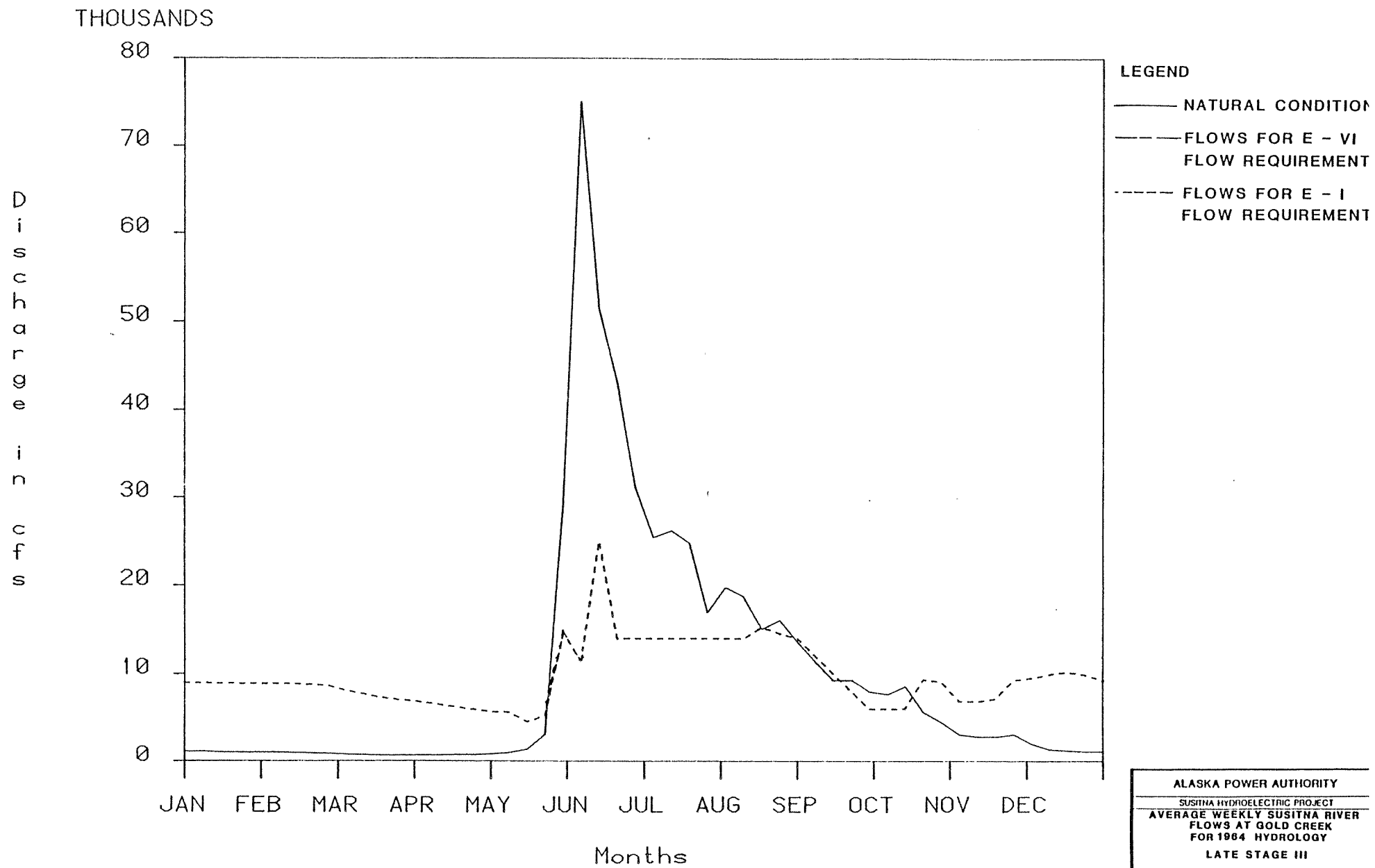


FIGURE E.2.4.216



|                               |                  |                           |
|-------------------------------|------------------|---------------------------|
| 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: J. H. HARRIS | REVIEWED BY: J. H. HARRIS |
| DATE: 10/1/82                 | BY: J. H. HARRIS | REVIEWED BY: J. H. HARRIS |

FIGURE E.2.4.217



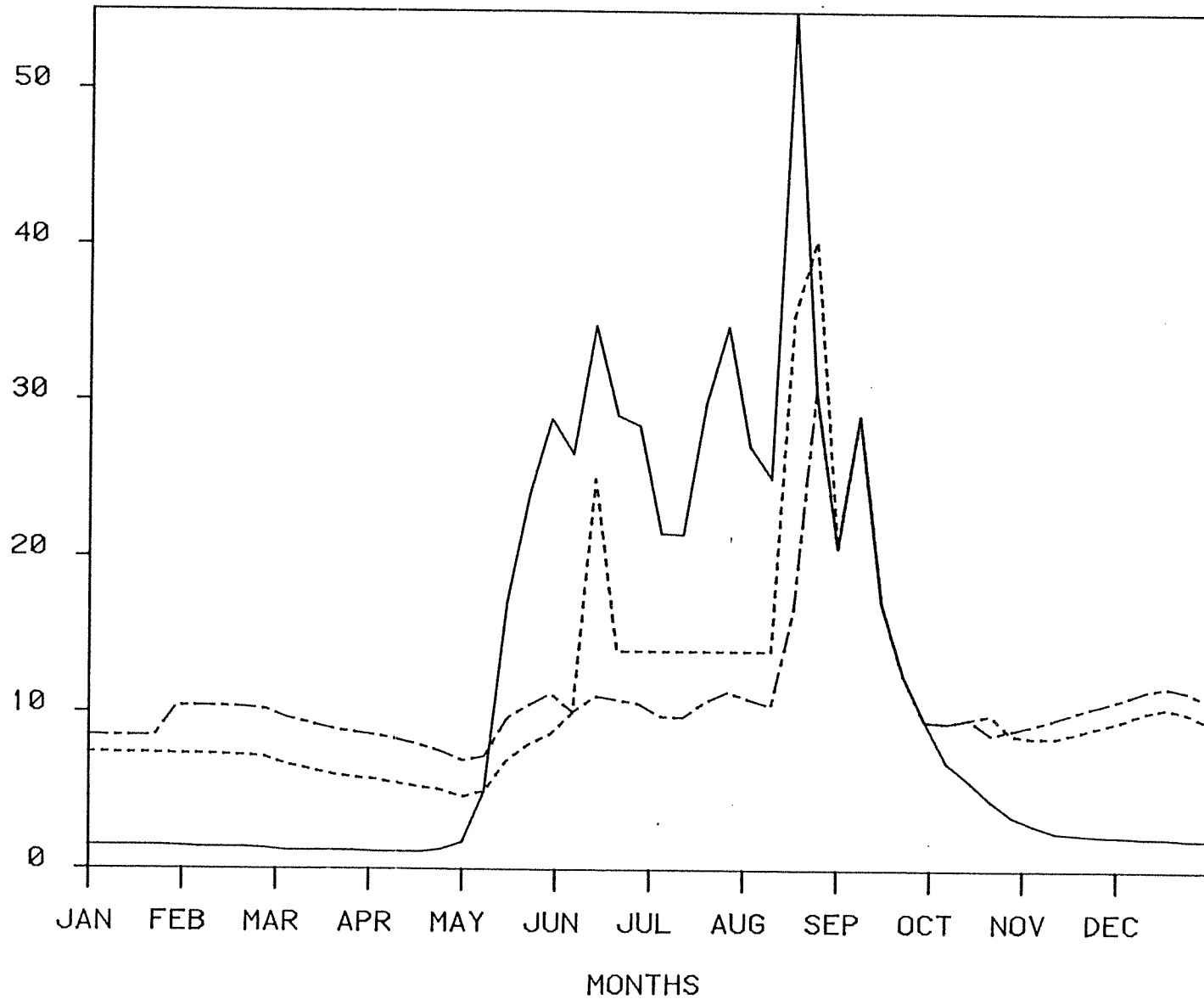
|                               |      |
|-------------------------------|------|
| ALASKA POWER AUTHORITY        |      |
| SUSITNA HYDROELECTRIC PROJECT |      |
| AVERAGE WEEKLY SUSITNA RIVER  |      |
| FLOWS AT GOLD CREEK           |      |
| FOR 1964 HYDROLOGY            |      |
| LATE STAGE III                |      |
| HALEA-IPRADO                  | DATE |
| ANCHORAGE, ALASKA             | DATE |

FIGURE E.2.4. 218



THOUSANDS

DISCHARGE  
IN  
CFS



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<br>FLOWS AT GOLD CREEK<br>FOR 1987 HYDROLOGY<br>LATE STAGE III |                  |
| HAREL/BRADDO<br>DATE                                                                        | APPROVED<br>DATE |

FIGURE E.2.4.219

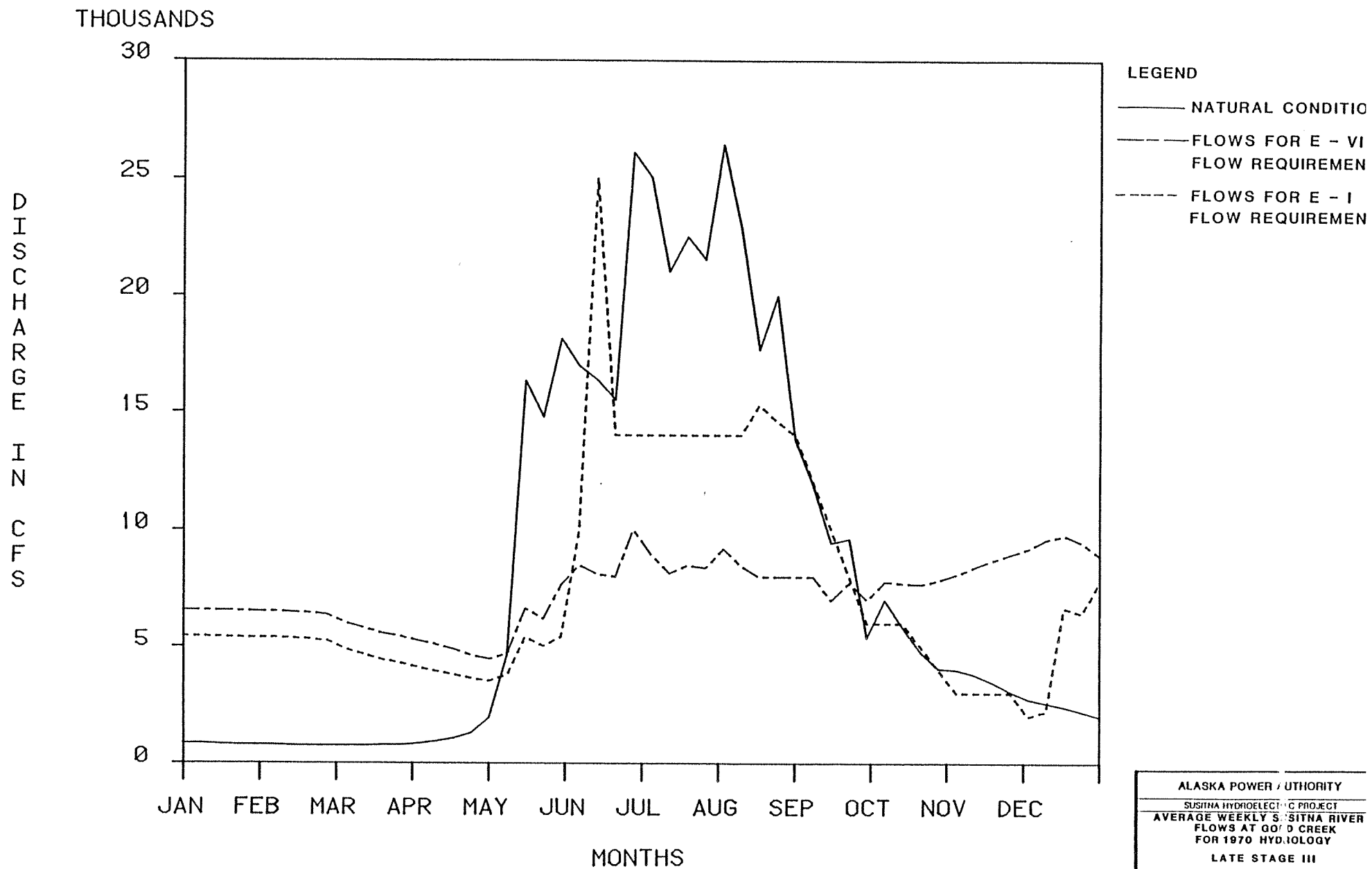


FIGURE E.2.4.220

|                               |               |                   |
|-------------------------------|---------------|-------------------|
| ALASKA POWER AUTHORITY        |               |                   |
| SUSITNA HYDROELECTRIC PROJECT |               |                   |
| AVERAGE WEEKLY SUSITNA RIVER  |               |                   |
| FLOWS AT GOD CREEK            |               |                   |
| FOR 1970 HYDROLOGY            |               |                   |
| LATE STAGE III                |               |                   |
| MADE BY: MRS. J. M. BROWN     | DATE: 10/1/70 | PROJECT NO: 10000 |

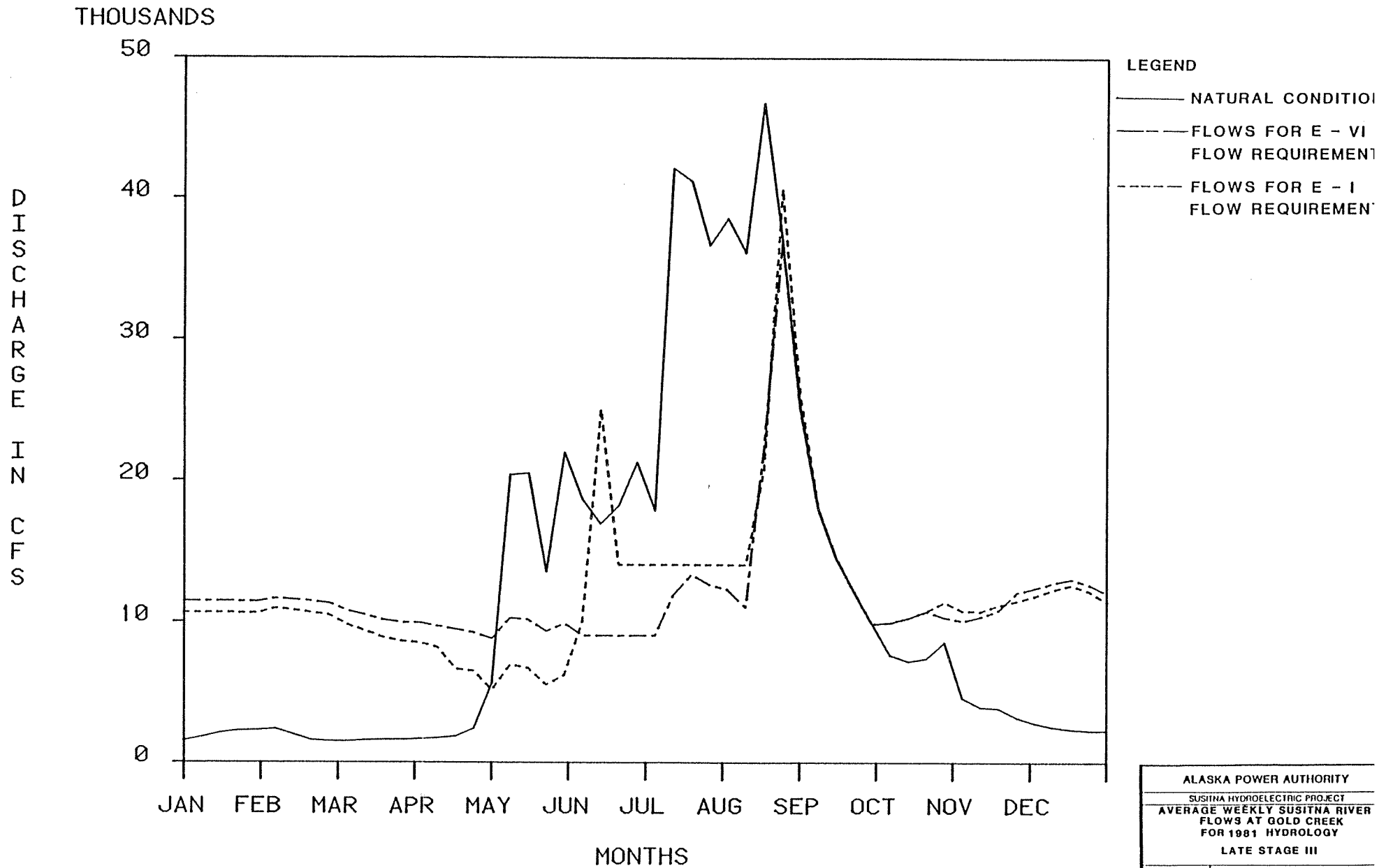


FIGURE E.2.4. 221

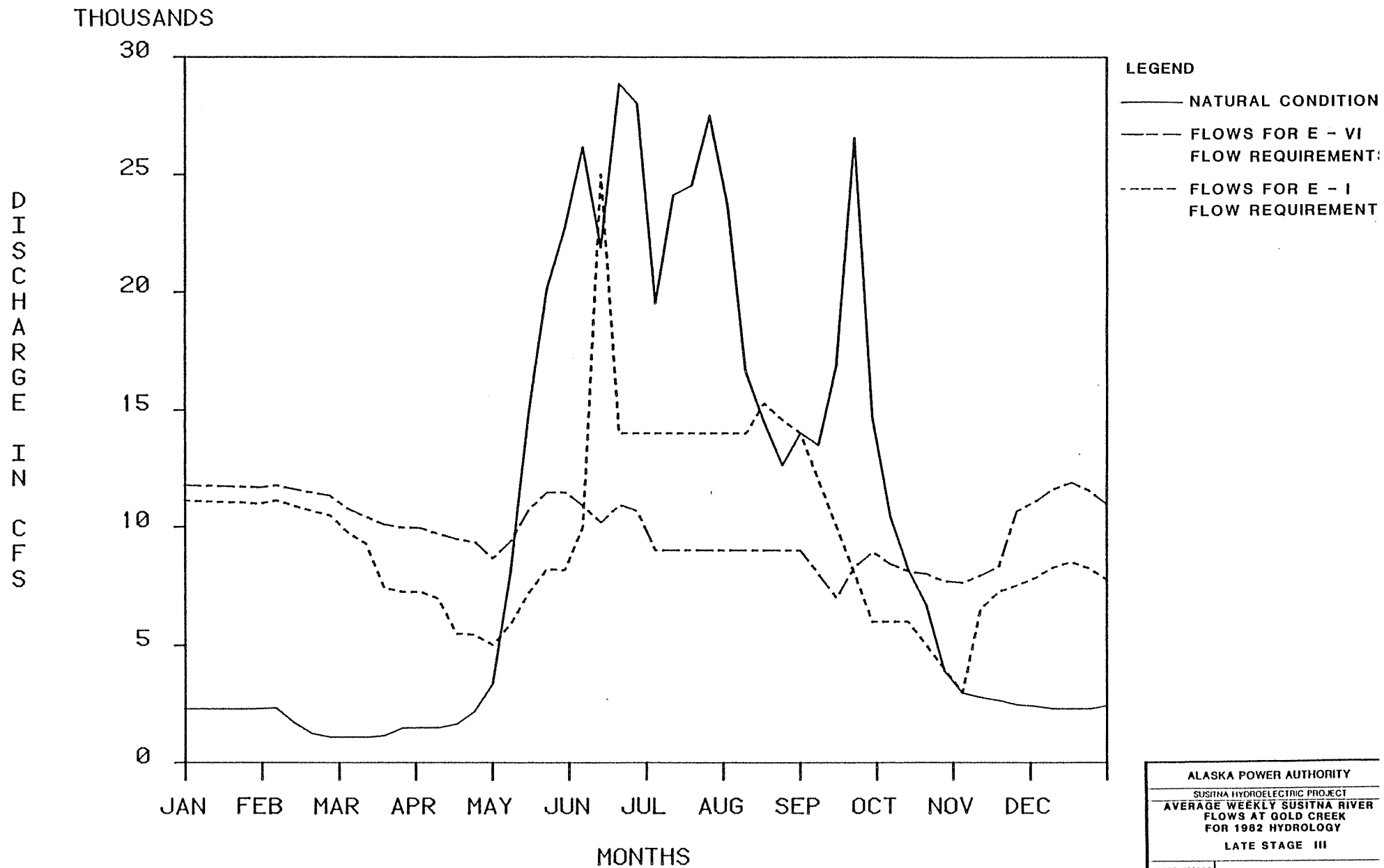


FIGURE E.2.4.222

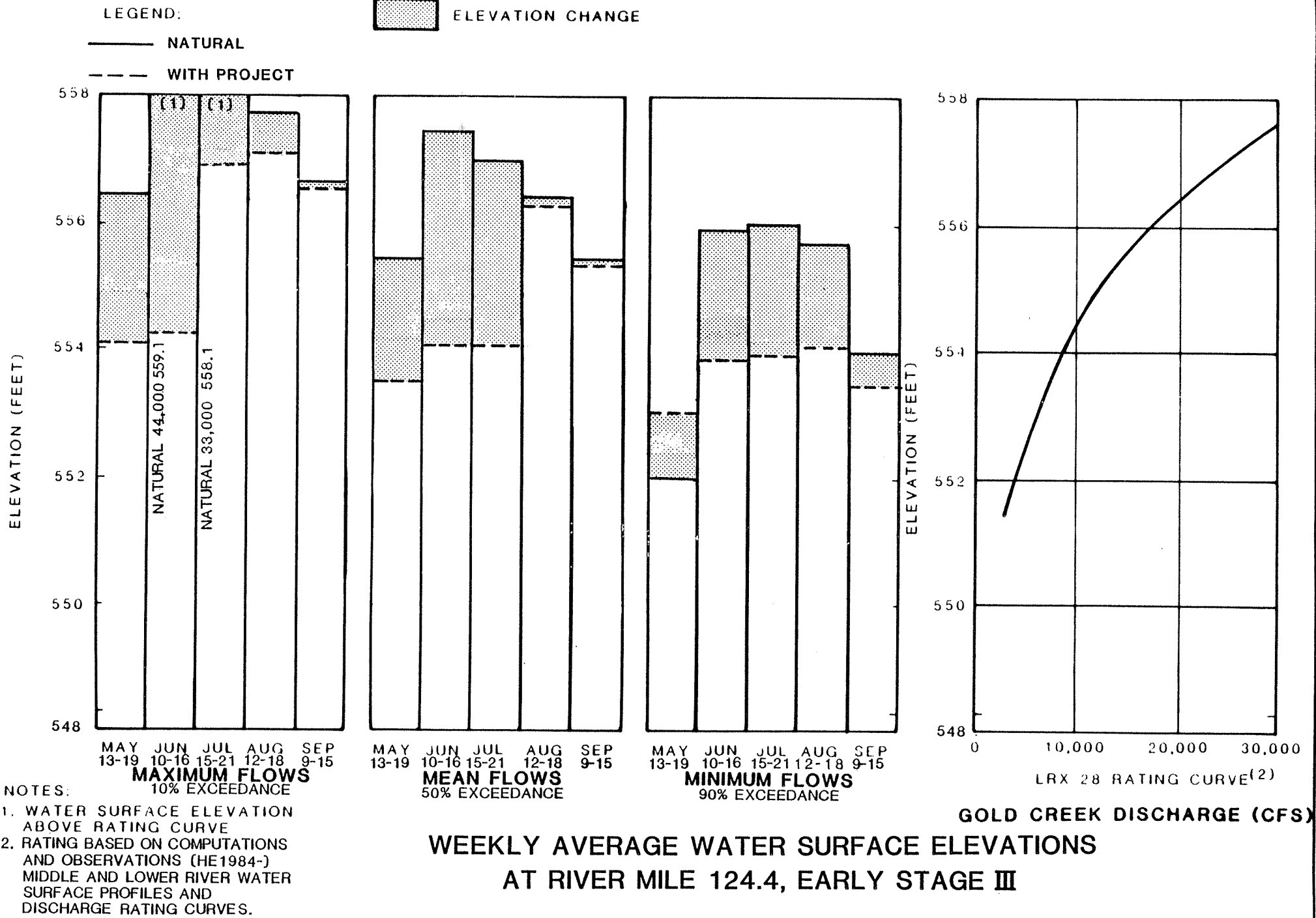
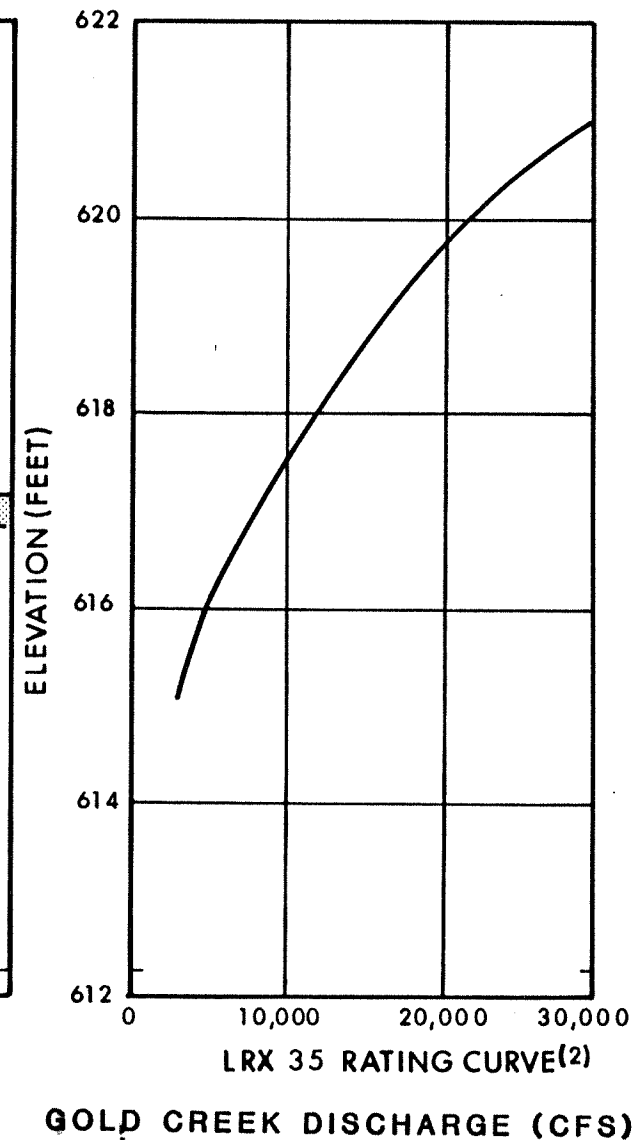
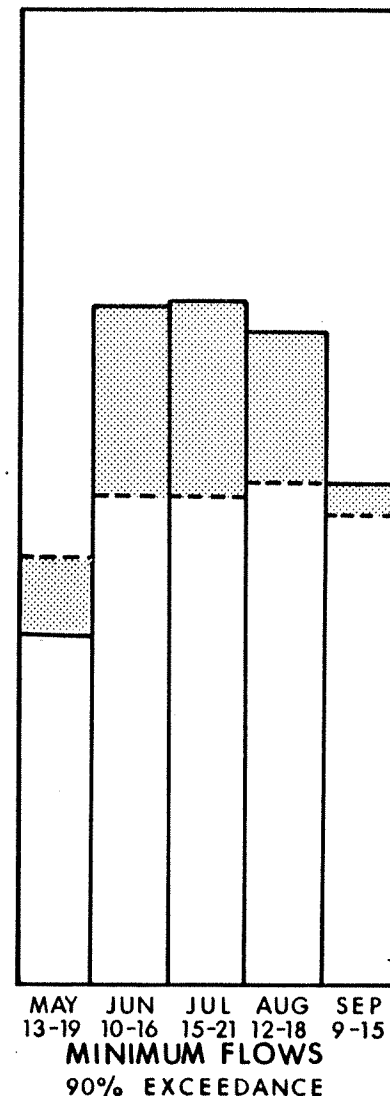
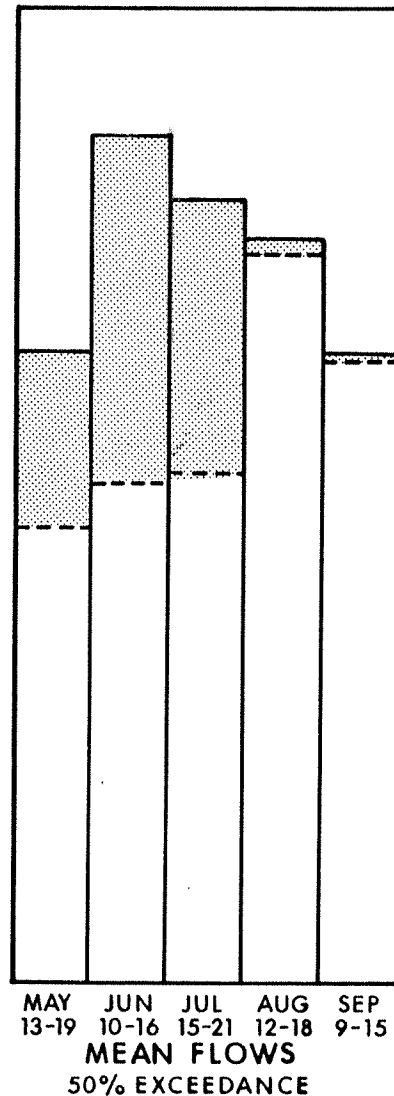
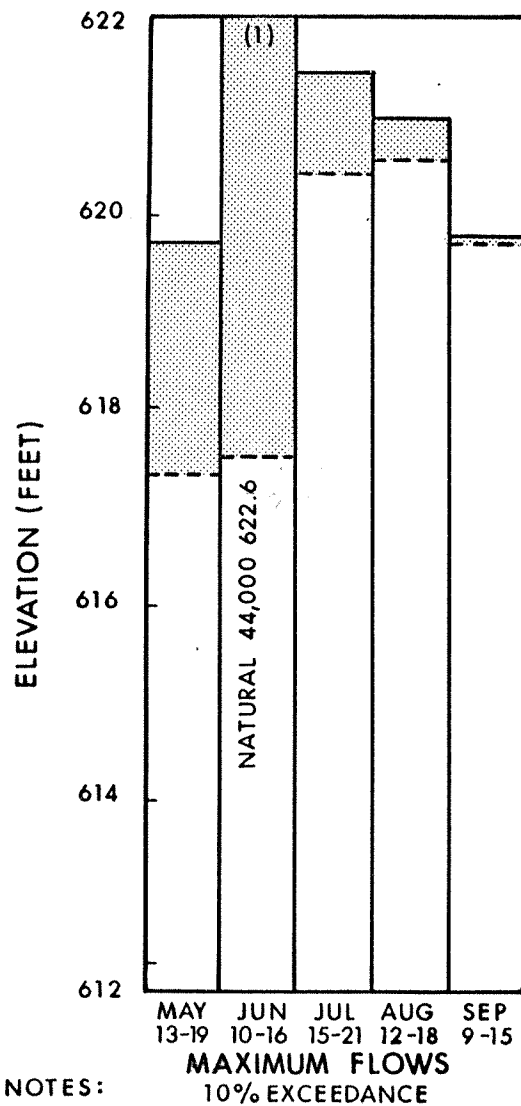


FIGURE E.2.4.223

LEGEND:

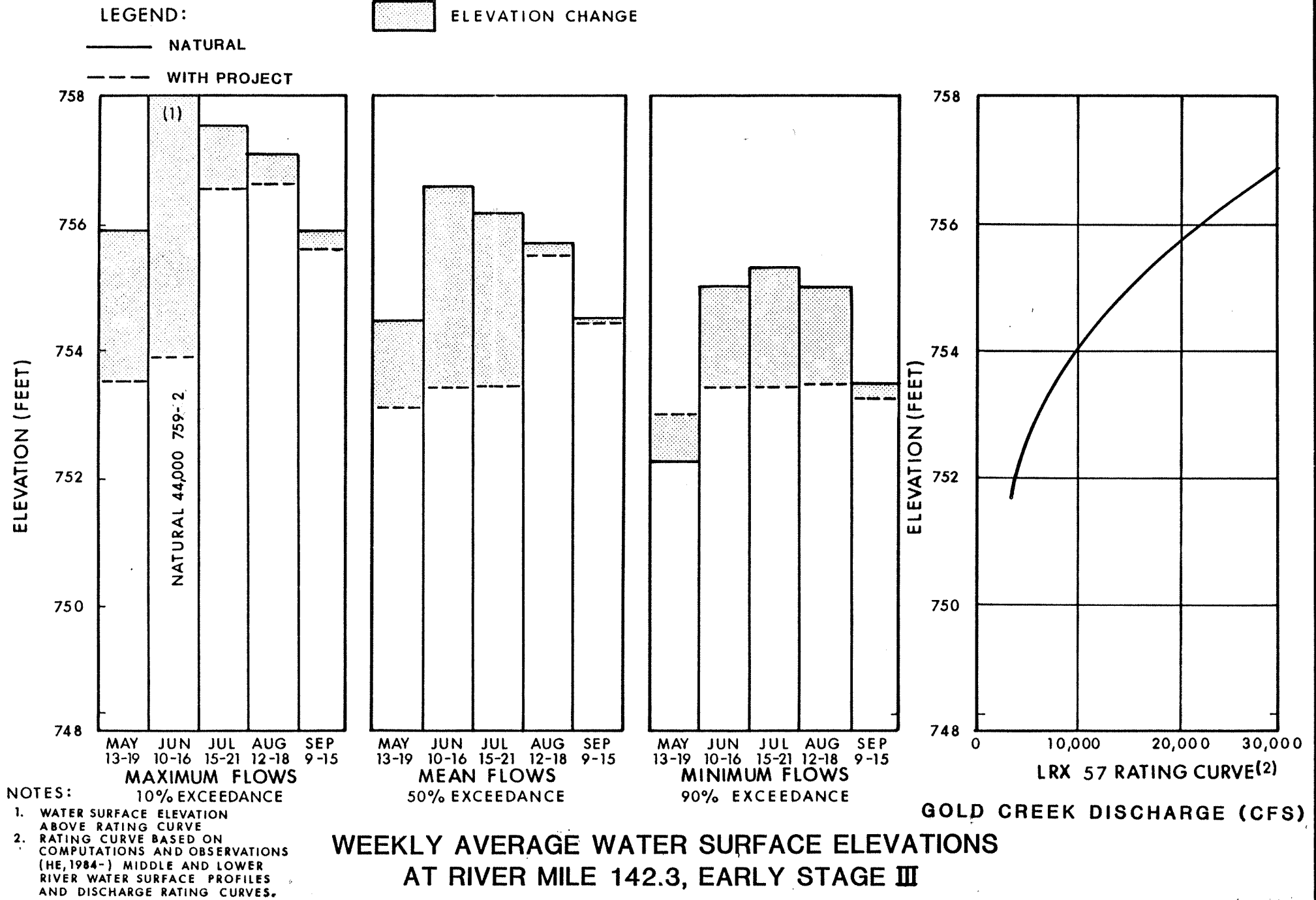
— NATURAL  
 --- WITH PROJECT

 ELEVATION CHANGE

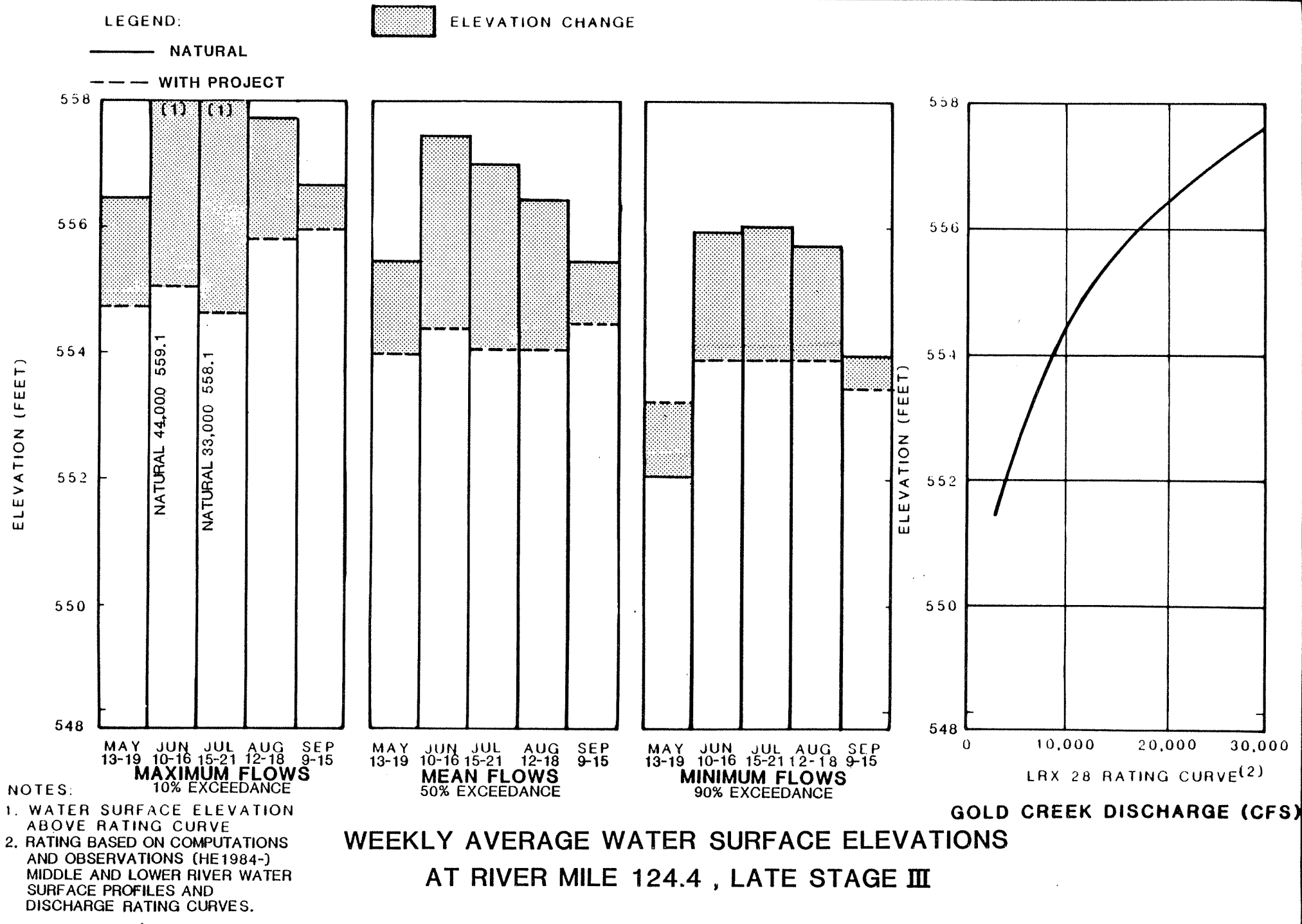


- NOTES:
1. WATER SURFACE ELEVATION ABOVE RATING CURVE
  2. RATING CURVE BASED ON COMPUTATIONS AND OBSERVATIONS (HE, 1984-) MIDDLE AND LOWER RIVER WATER SURFACE PROFILES AND DISCHARGE RATING CURVES.

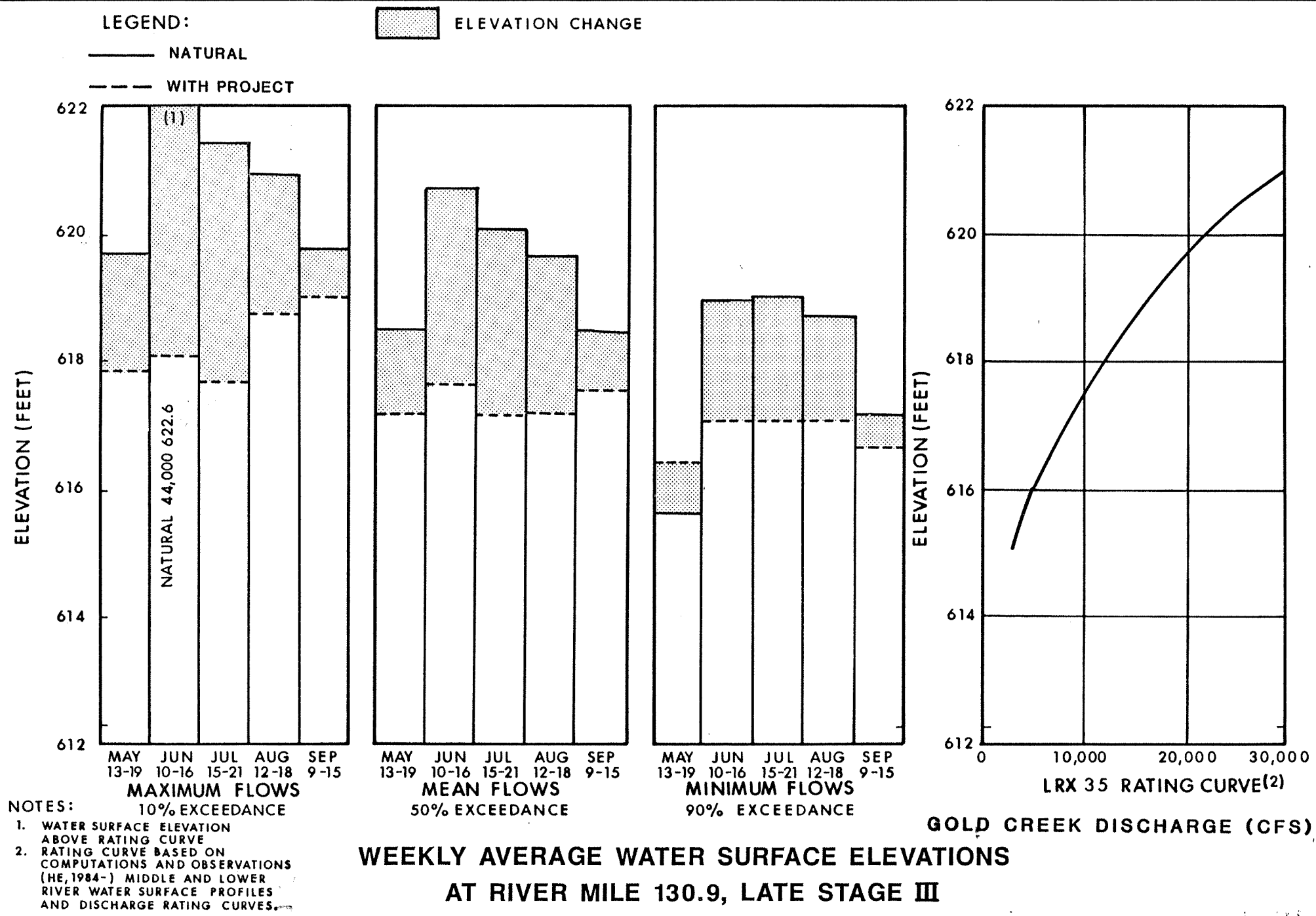
**WEEKLY AVERAGE WATER SURFACE ELEVATIONS  
 AT RIVER MILE 130.9, EARLY STAGE III**



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





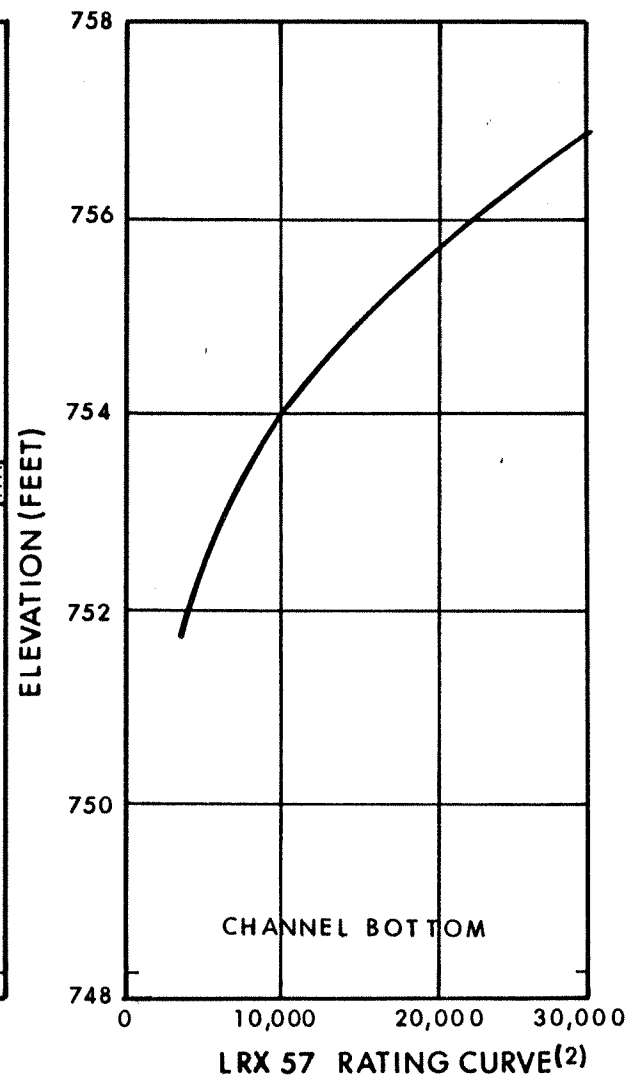
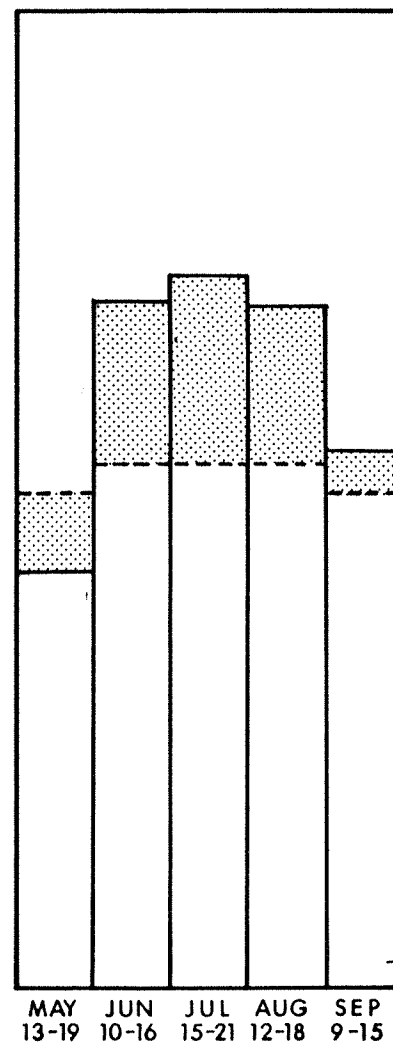
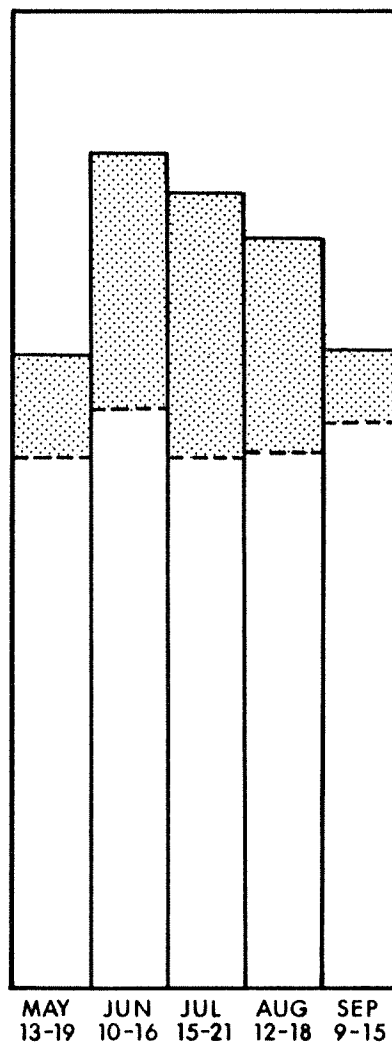
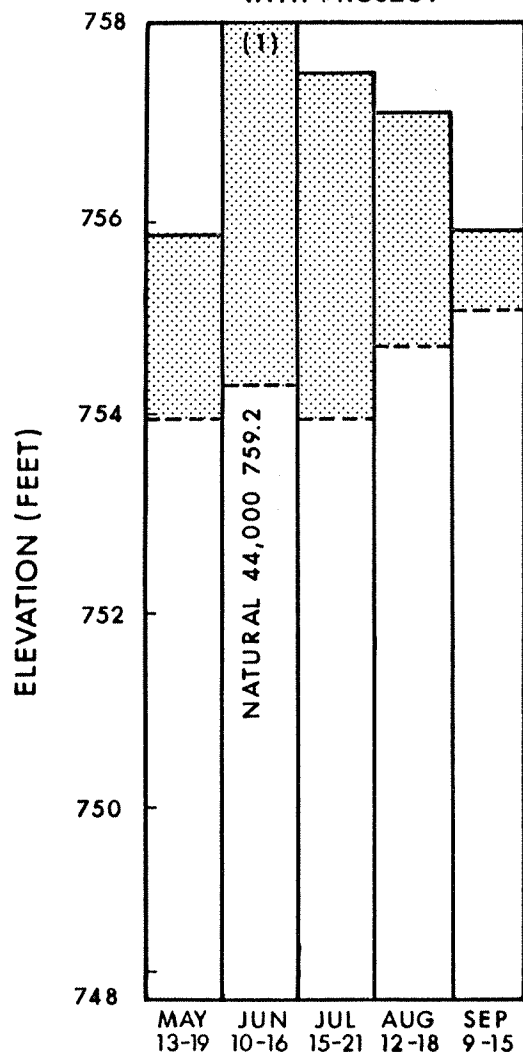


**WEEKLY AVERAGE WATER SURFACE ELEVATIONS  
AT RIVER MILE 130.9, LATE STAGE III**

LEGEND:

— NATURAL  
 --- WITH PROJECT

 ELEVATION CHANGE

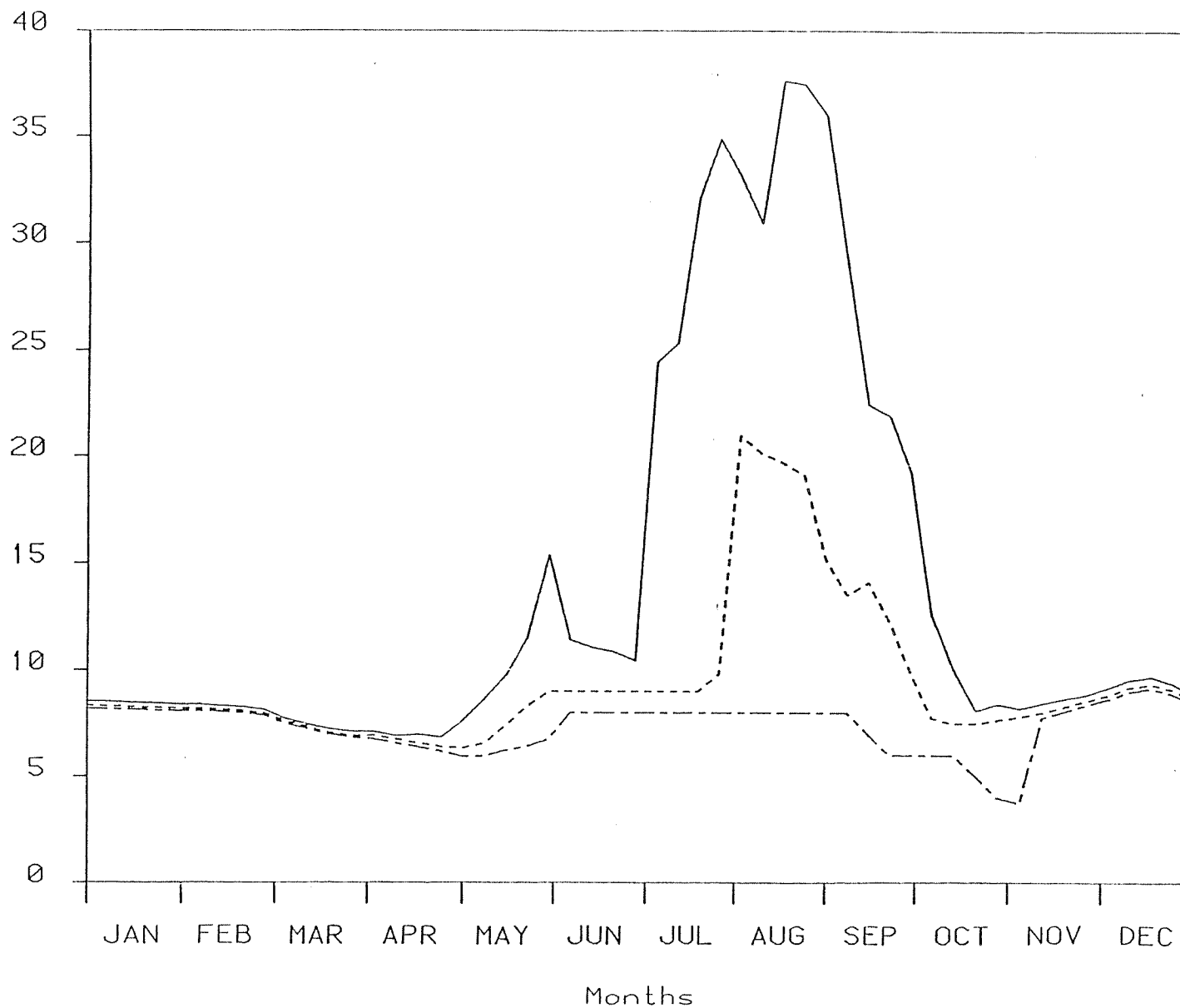


- NOTES:
1. WATER SURFACE ELEVATION ABOVE RATING CURVE
  2. RATING CURVE BASED ON COMPUTATIONS AND OBSERVATIONS (HE, 1984-) MIDDLE AND LOWER RIVER WATER SURFACE PROFILES AND DISCHARGE RATING CURVES.

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

GOLD CREEK DISCHARGE (CFS)

Discharge in cfs



NOTES:

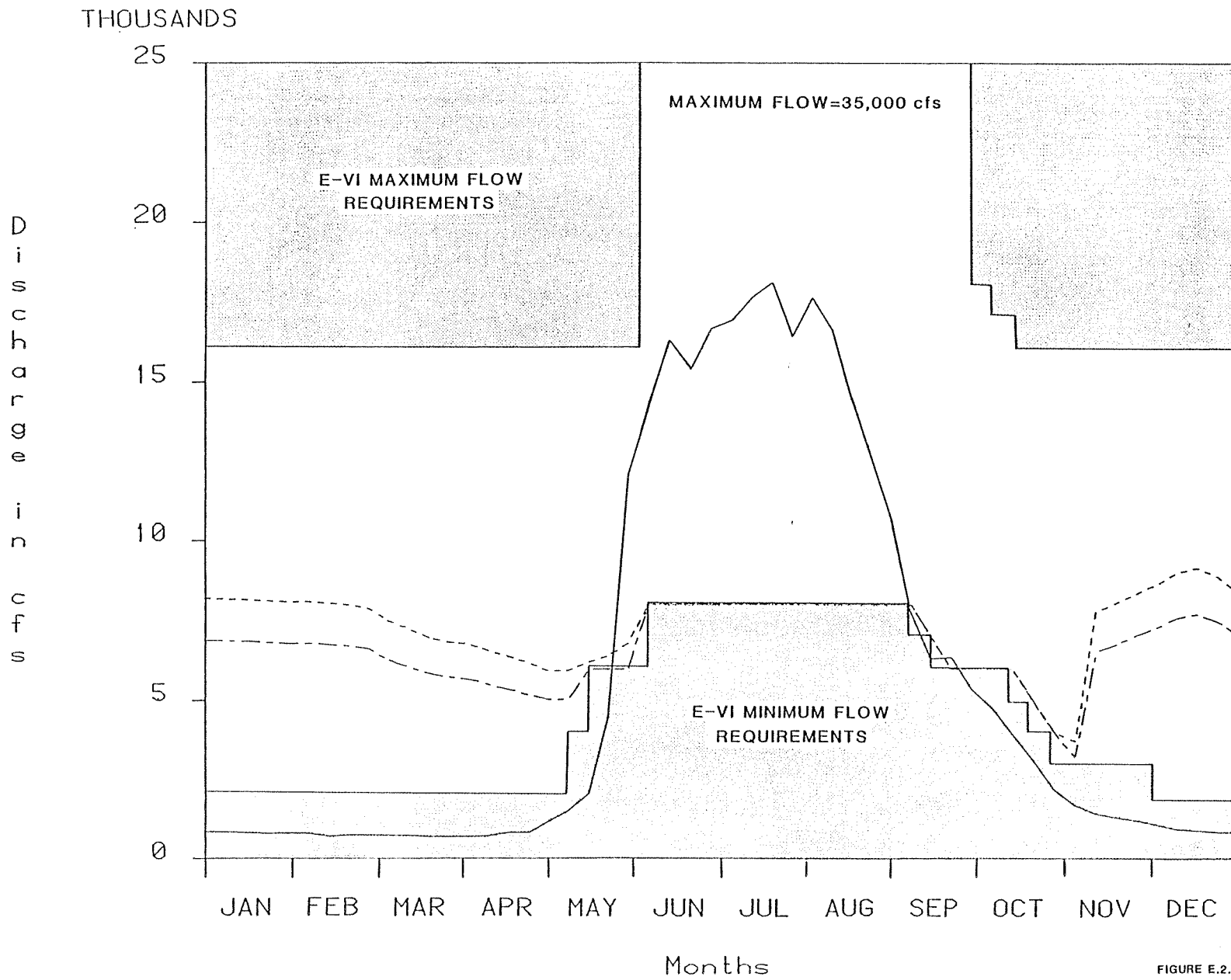
1. HYDROLOGICAL DATA FROM PERIOD 1950-1981
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENT

LEGEND

- 6% EXCEEDENCE FLOW
- - - 50% EXCEEDENCE FLC
- · - 97% EXCEEDENCE FLC

|                                                                                              |                  |
|----------------------------------------------------------------------------------------------|------------------|
| ALASKA POWER AUTHORITY                                                                       |                  |
| SUSITNA HYDROELECTRIC PROJECT                                                                |                  |
| SUSITNA RIVER STREAMFLOWS EXCEEDED 6%, 50% AND 97% OF THE TIME AT GOLD CREEK EARLY STAGE III |                  |
| DATE: 10/1/81                                                                                | BY: J. H. HARRIS |
| REVISION: 10/1/81                                                                            | BY: J. H. HARRIS |

FIGURE E.2.4.229



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-1981
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

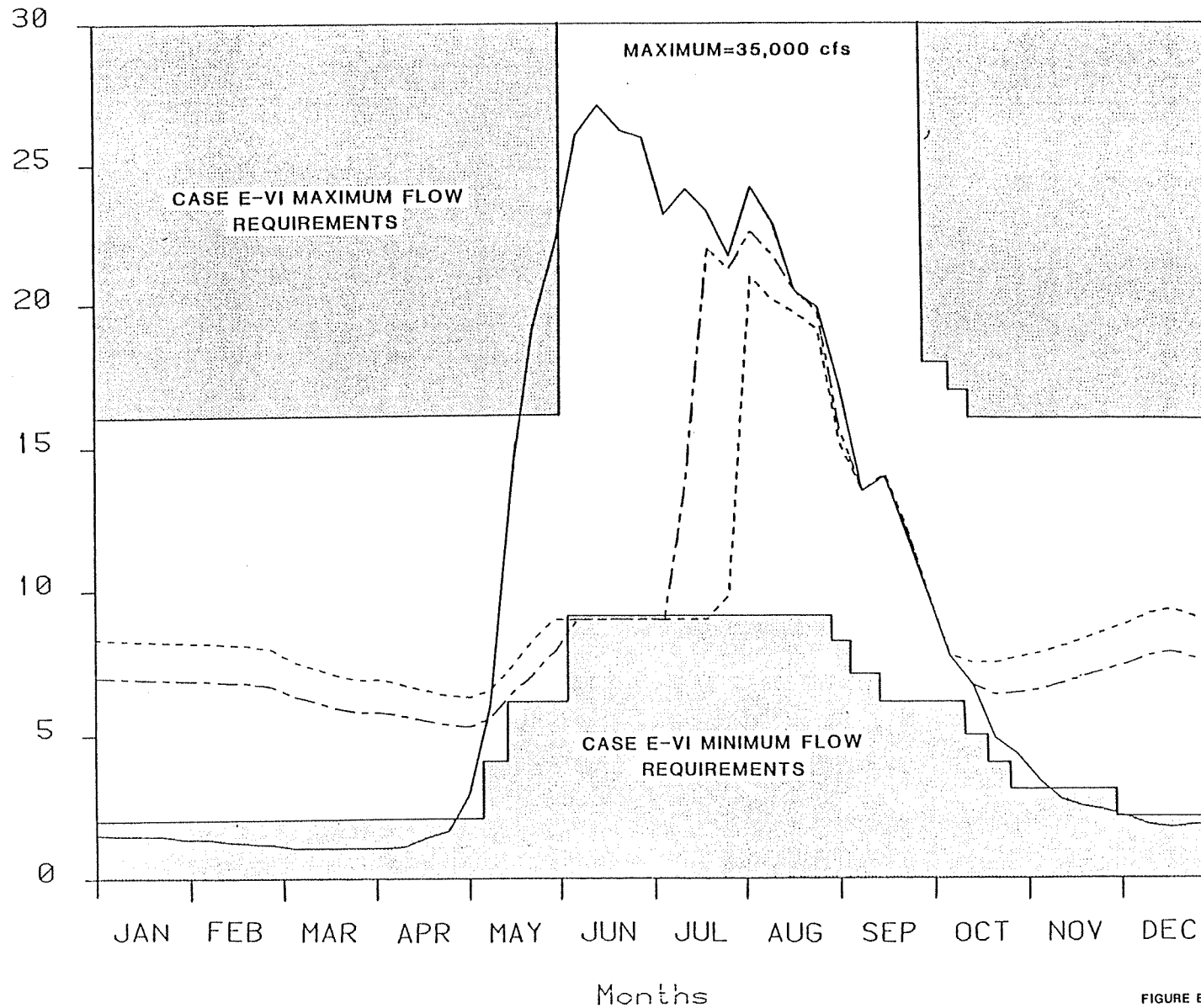
COMPARISON INDICATES FLOWS FOR EARLY STAGE ARE MORE STABLE THAN FOR EARLY PHASE II BECAUSE EARLY STAGE III ENERGY PRODUCTION IS HIGHER THAN FOR EARLY PHASE II

|                                               |            |
|-----------------------------------------------|------------|
| ALASKA POWER AUTHORITY                        |            |
| SUSITNA RIVER STREAMFLOW EXCEEDED             |            |
| 97% OF THE TIME EARLY STAGE III AT GOLD CREEK |            |
| TOTAL FLOW                                    | 35,000 cfs |
| MINIMUM FLOW                                  | 0 cfs      |

FIGURE E.2.4.230

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 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 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. H. HARRIS |
| REVISION: 1.0                                                                    | DATE: 10/1/83    |

FIGURE E.2.4.231

Discharge in cfs

THOUSANDS

60

50

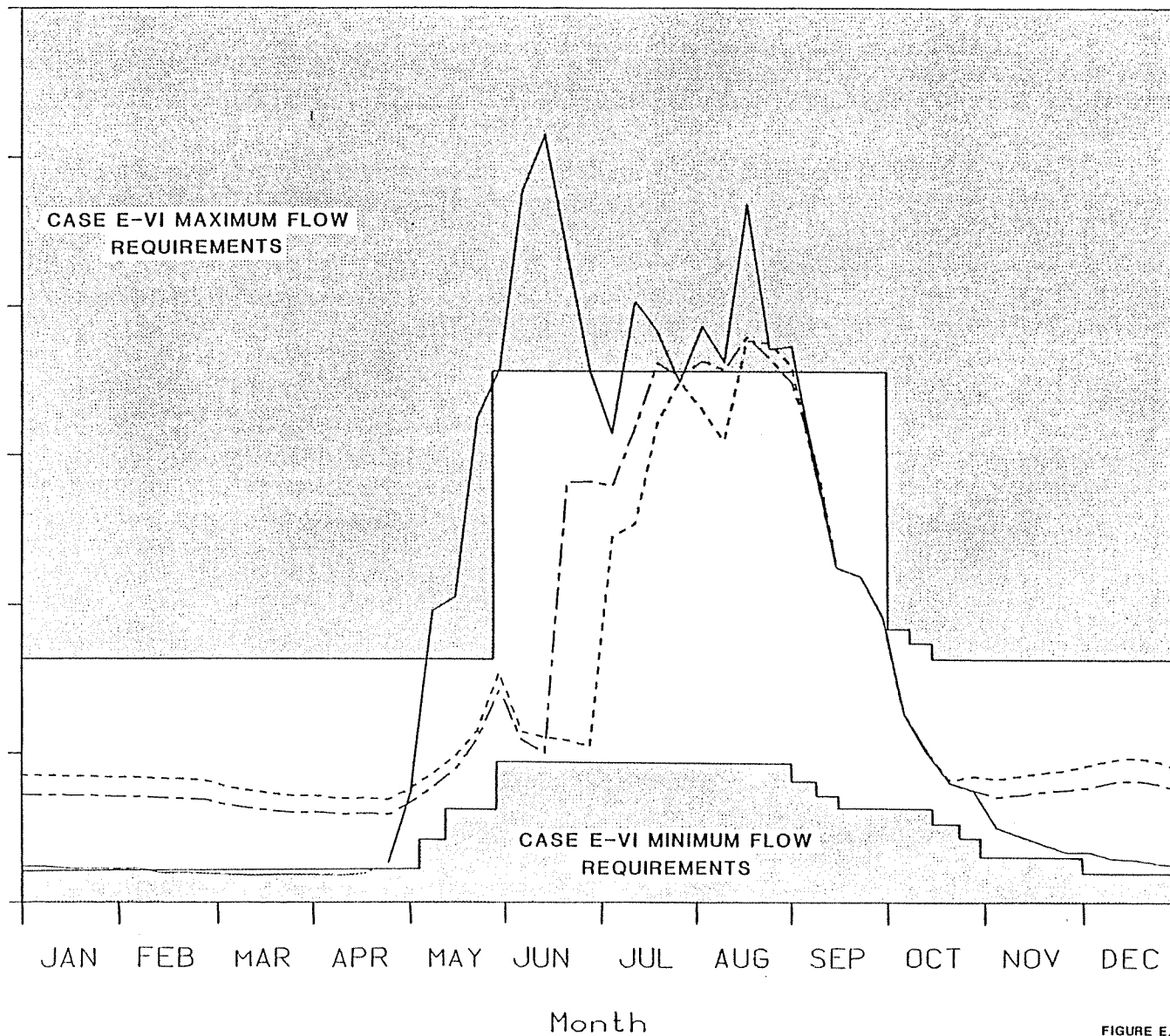
40

30

20

10

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

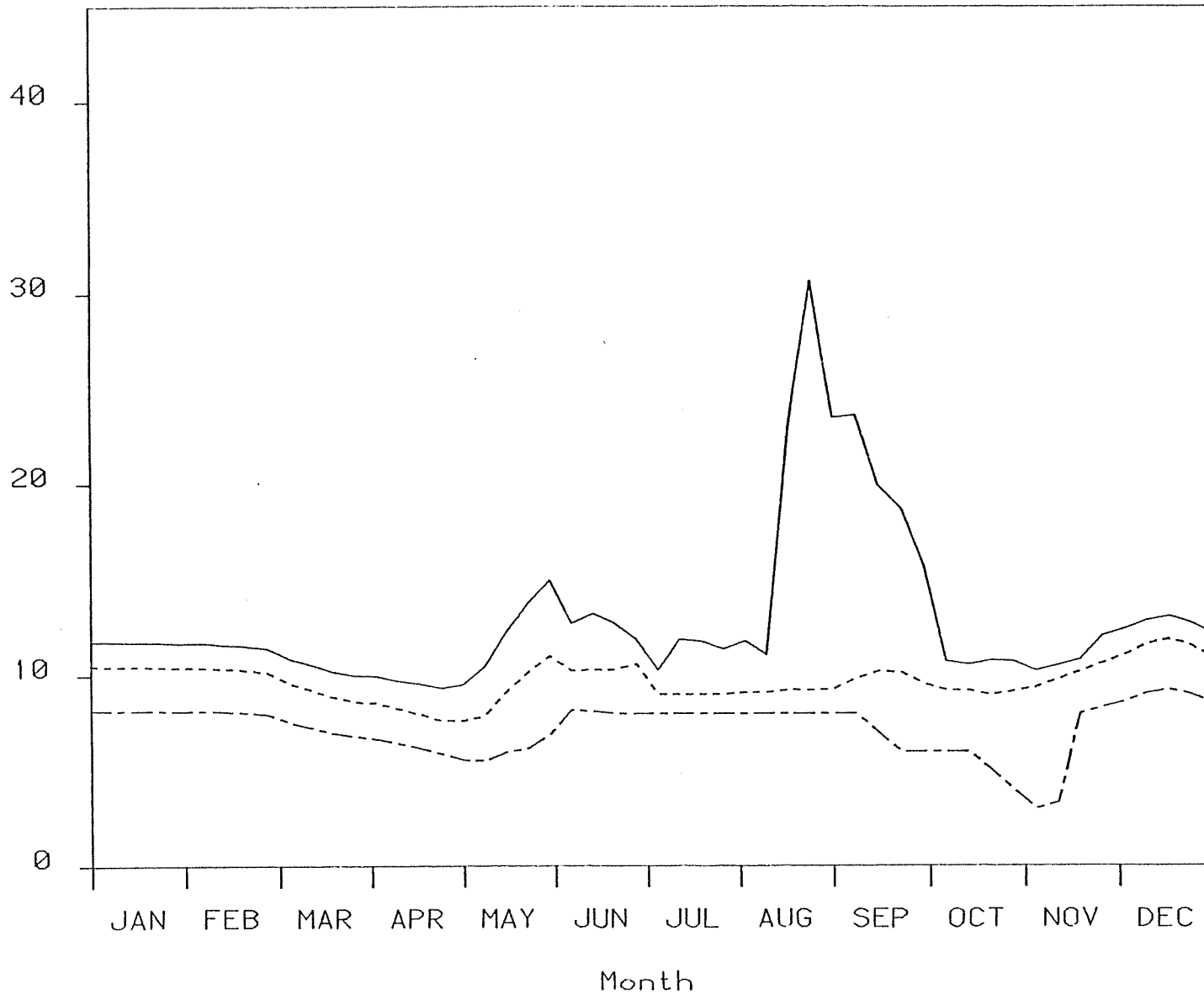
COMPARISON INDICATES FLOWS FOR EARLY STAGE I ARE MORE STABLE THAN FOR EARLY PHASE II BECAUSE EARLY STAGE III ENERGY PRODUCTION IS HIGHER THAN FOR EARLY PHASE II

|                                |                      |
|--------------------------------|----------------------|
| ALASKA POWER AUTHORITY         |                      |
| SUSITNA RIVER PROJECT          |                      |
| SUSITNA RIVER STREAMFLOW       |                      |
| EXCEEDED                       |                      |
| 6% OF THE TIME EARLY STAGE III |                      |
| AT GOLD CREEK                  |                      |
| DATE: 1983-08-01               | BY: J. E. HARRIS     |
| PROJECT: SUSITNA RIVER PROJECT | 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 REQUIREMENT

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 |
| REVISION: 10/1/83                                                                           | BY: J. H. HARRIS |

FIGURE E.2.4.233

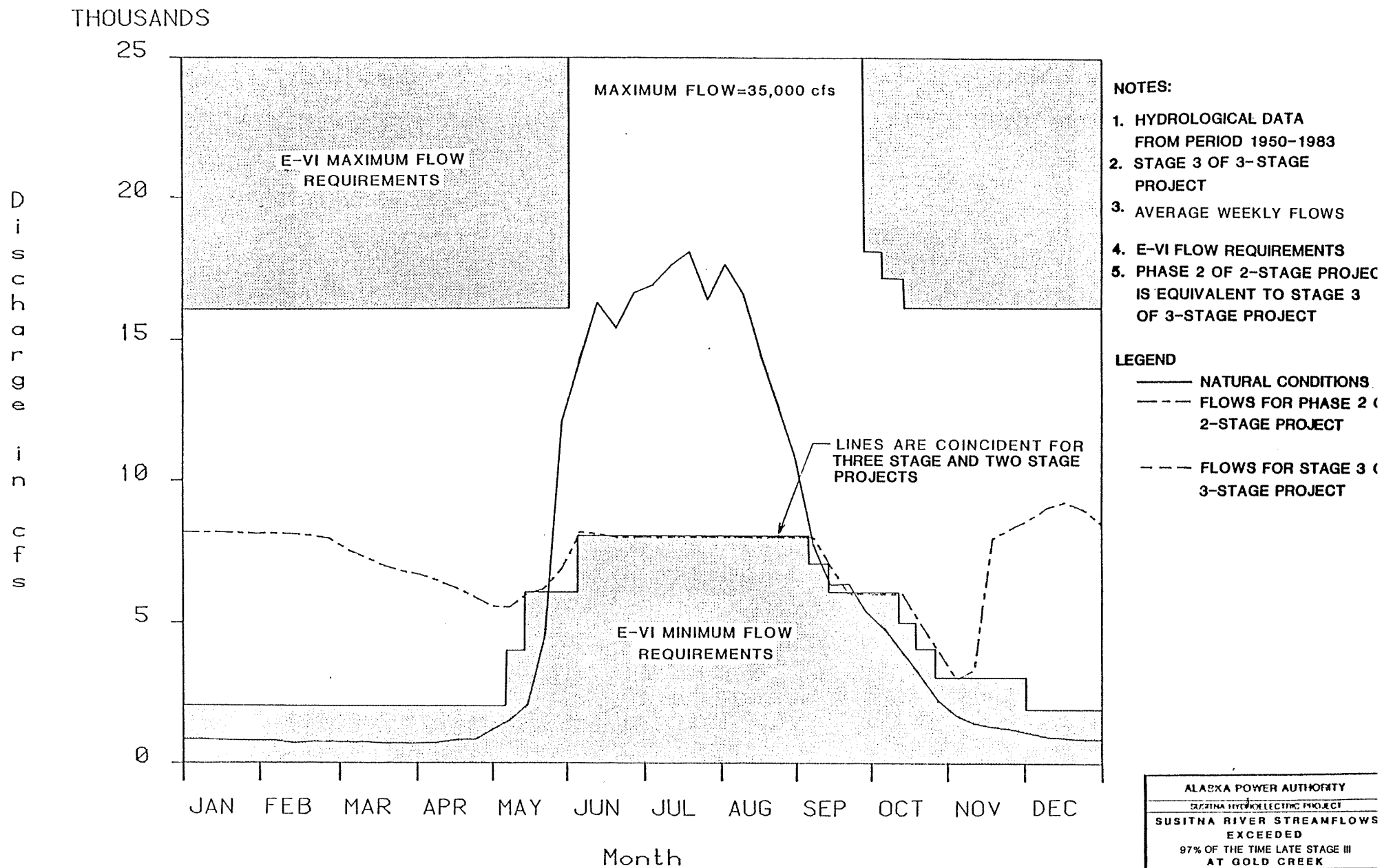


FIGURE E.2.4.234

|                                              |  |
|----------------------------------------------|--|
| ALASKA POWER AUTHORITY                       |  |
| SUSITNA HYDROELECTRIC PROJECT                |  |
| SUSITNA RIVER STREAMFLOWS EXCEEDED           |  |
| 97% OF THE TIME LATE STAGE III AT GOLD CREEK |  |
| DATE - 8/24/88                               |  |
| BY - J. M. H. / J. M. H.                     |  |





THOUSANDS

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

30

25

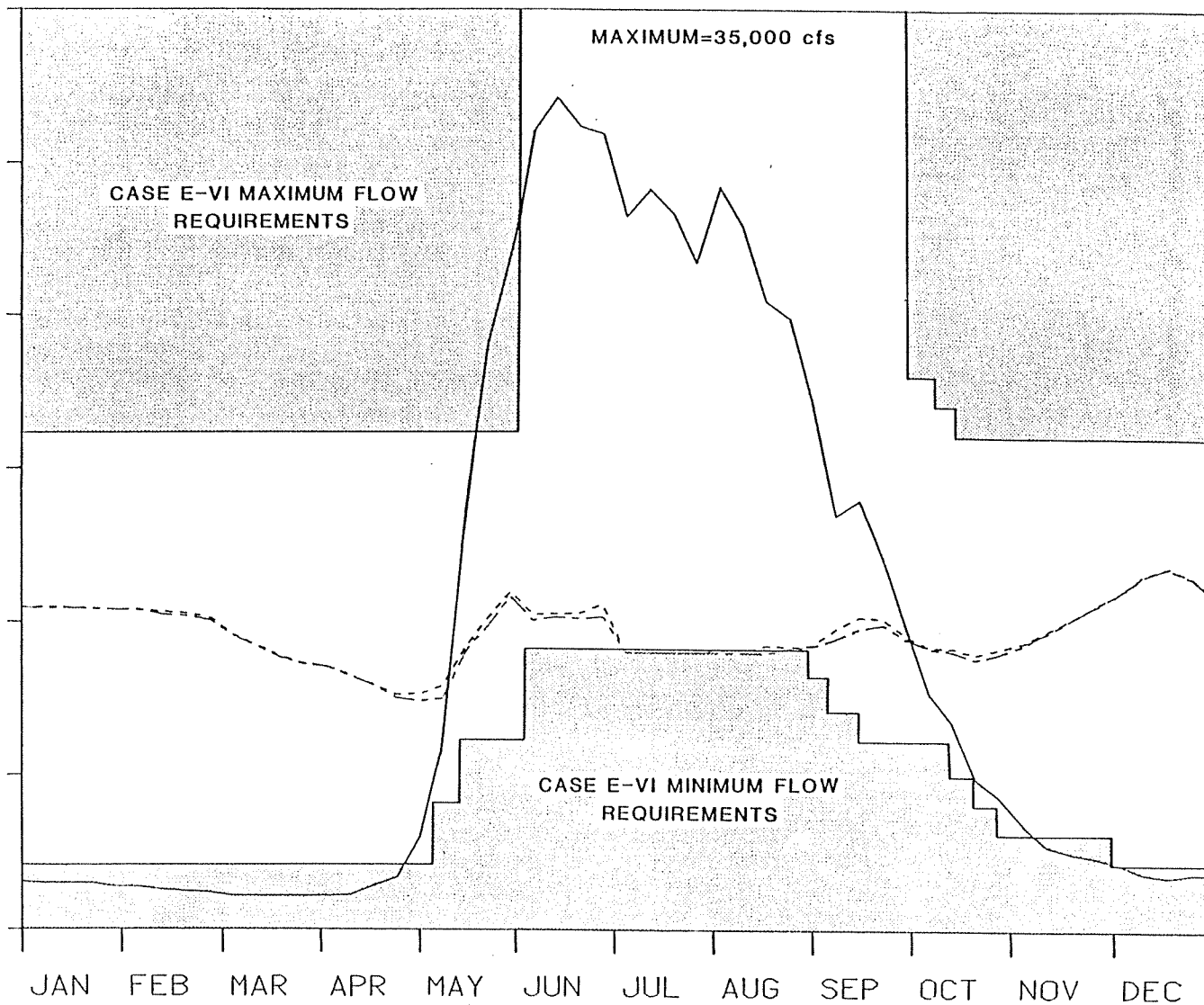
20

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

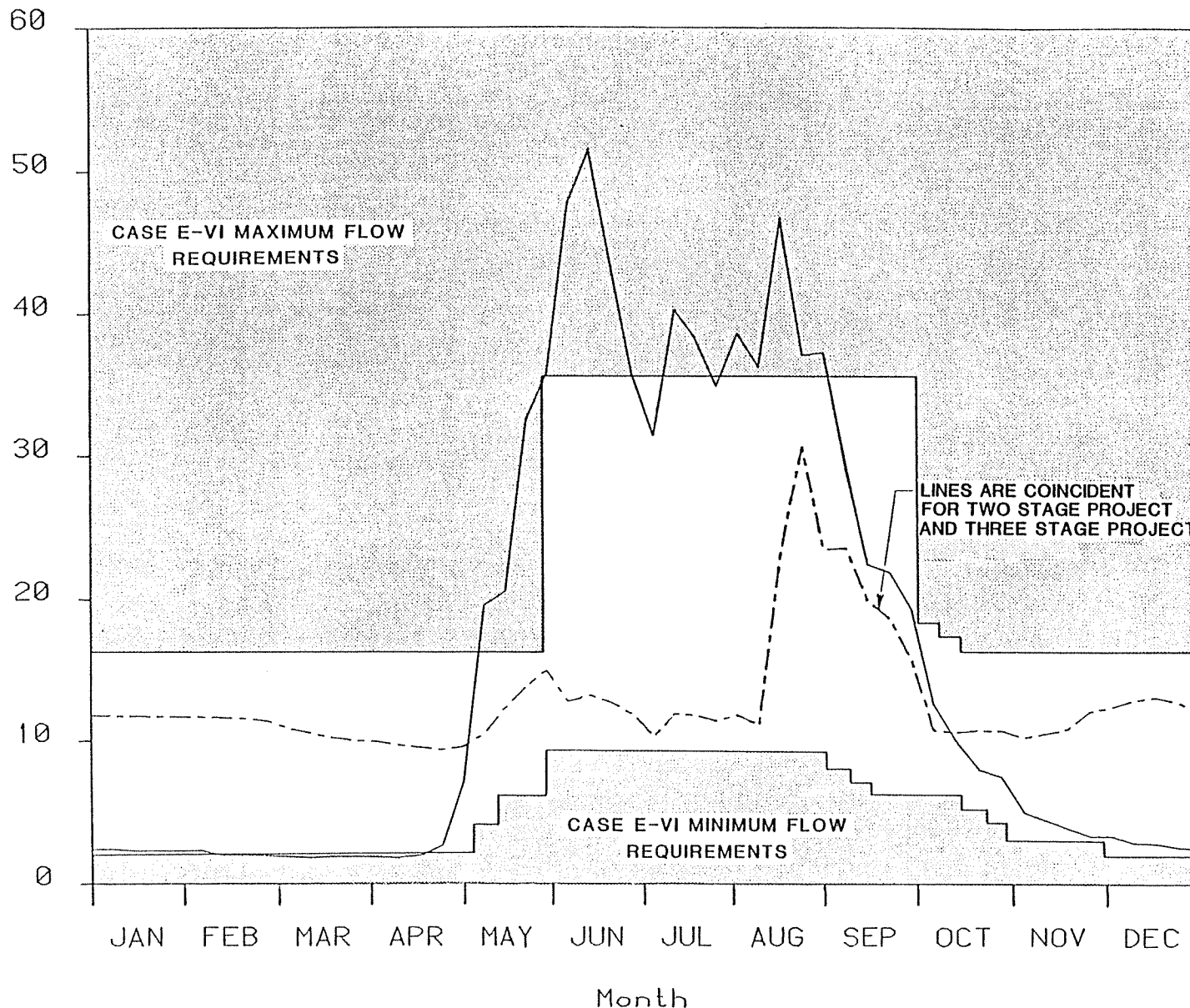
- NATURAL CONDITIONS
- - - FLOWS FOR PHASE 2 OF 2-STAGE PROJECT
- ... FLOWS FOR STAGE 3 OF 3-STAGE PROJECT CONSTRUCTION

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

FIGURE E.2.4.235

THOUSANDS

Discharge in cfs



NOTES:

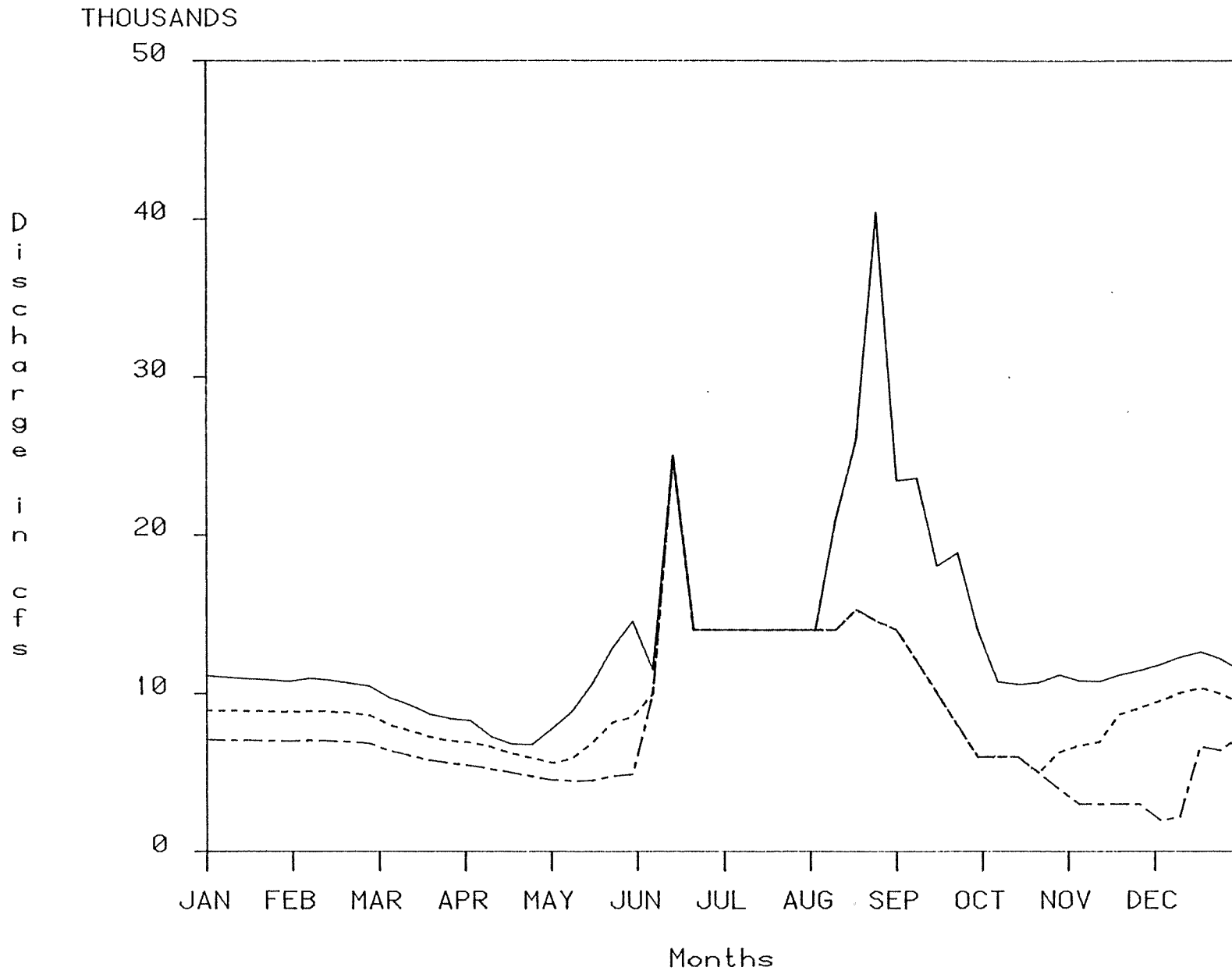
1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-VI FLOW REQUIREMENTS
5. PHASE 2 OF 2-STAGE PROJECT IS EQUIVALENT TO STAGE 3 OF 3-STAGE PROJECT

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: 10/1/83                                                                  | BY: J. H. HARRIS |
| REVISION: 0.0000                                                               | REVISION: 0.0000 |

FIGURE E.2.4.236



NOTES:

1. HYDROLOGICAL DATA FROM PERIOD 1950-198
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. E-I FLOW REQUIREMEN

LEGEND

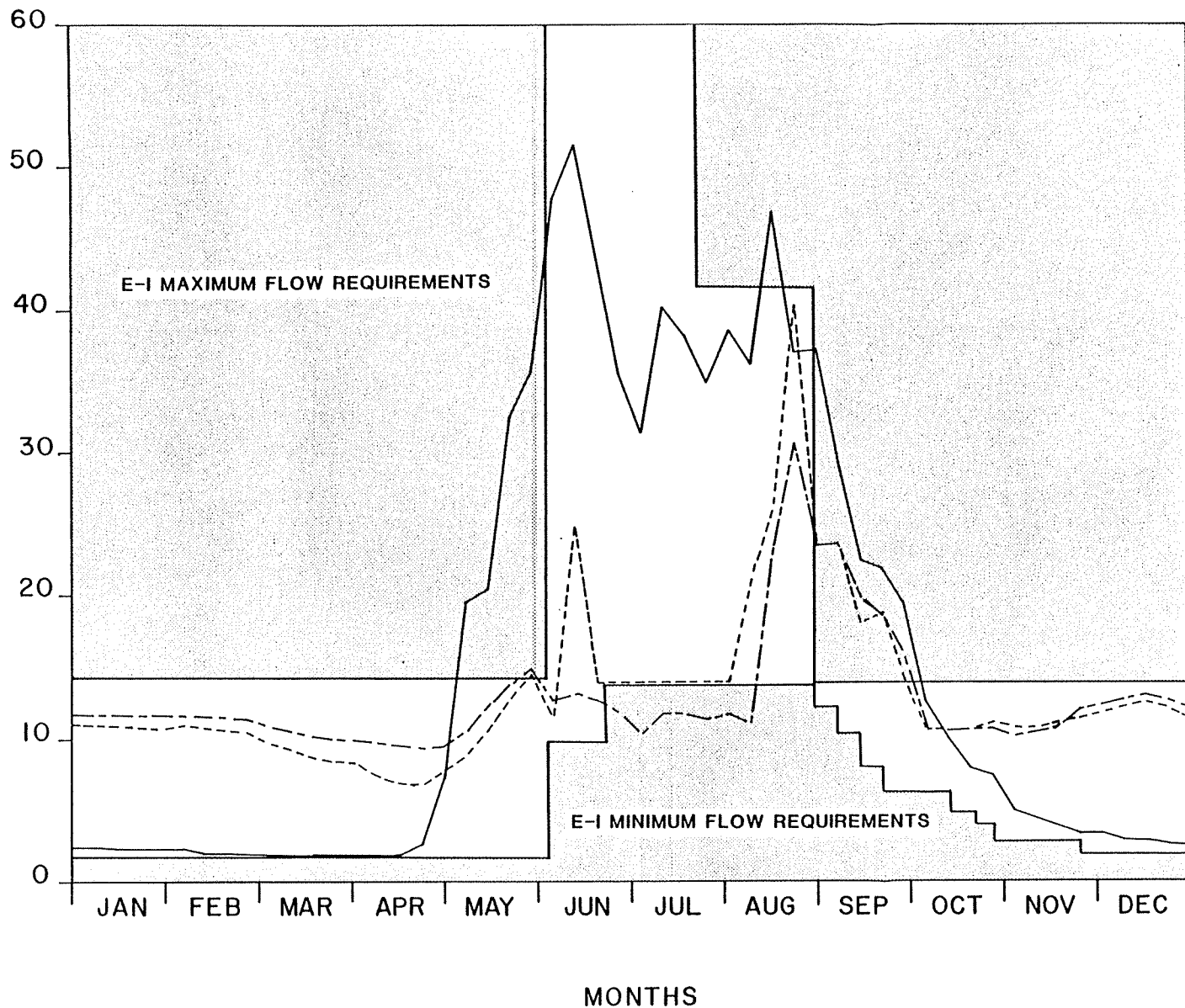
- 6% EXCEEDENCE FLOW
- - - 50% EXCEEDENCE FLOW
- . - 97% EXCEEDENCE FLOW

FIGURE E.2.4.237

|                                                                                                      |                 |                   |
|------------------------------------------------------------------------------------------------------|-----------------|-------------------|
| ALASKA POWER AUTHORITY                                                                               |                 |                   |
| SUSITNA HYDROELECTRIC PROJECT                                                                        |                 |                   |
| SUSITNA RIVER STREAMFLOWS<br>EXCEEDED 6%, 50% AND 97%<br>OF THE TIME AT GOLD CREEK<br>LATE STAGE III |                 |                   |
| DATE: 10/1/80                                                                                        | BY: J. W. BROWN | PROJECT NO. 10000 |

THOUSANDS

DISCHARGE  
IN  
CFS



NOTES:

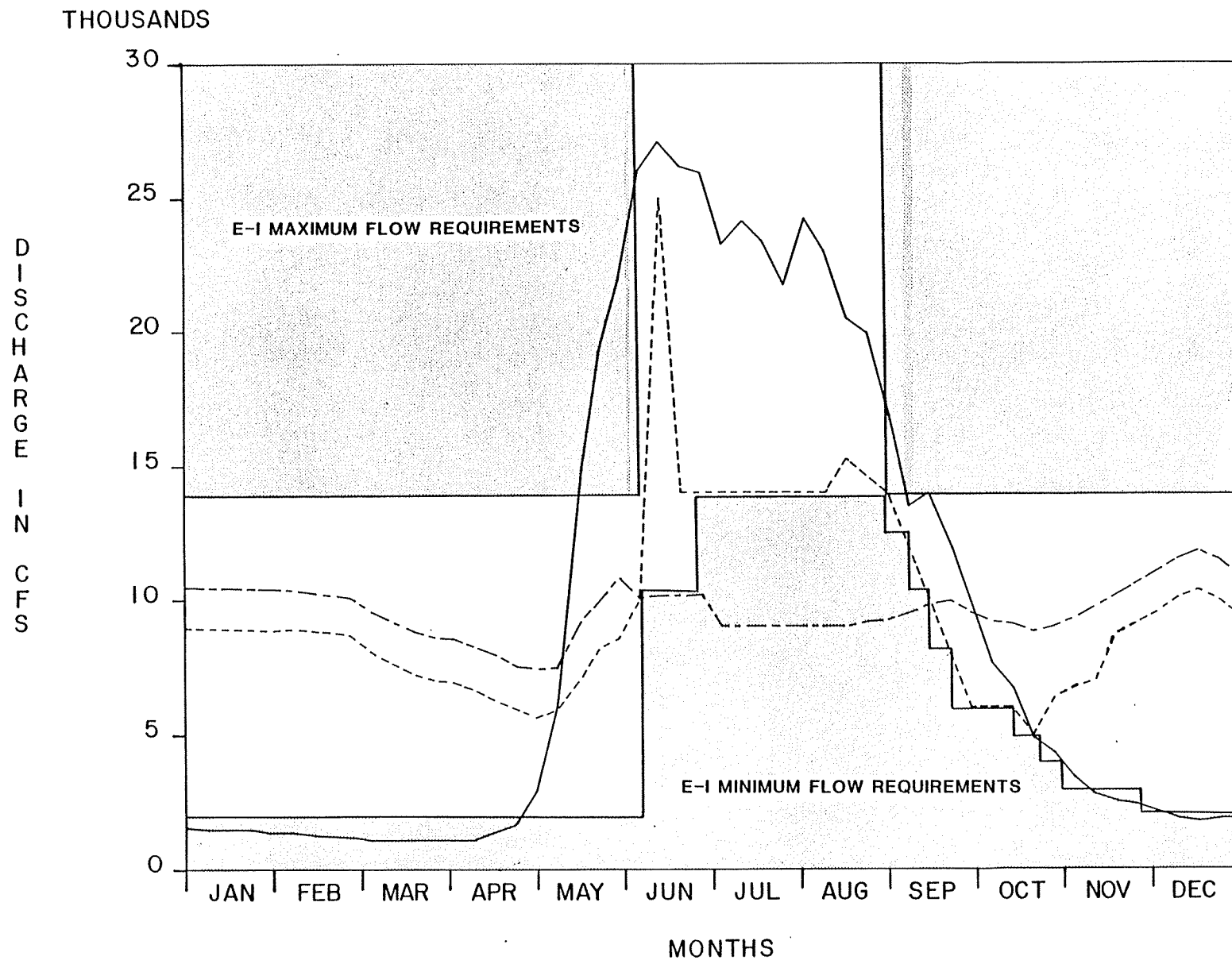
1. HYDROLOGICAL DATA FROM PERIOD 1950-1983
2. STAGE 3 OF 3-STAGE PROJECT
3. AVERAGE WEEKLY FLOWS
4. BETWEEN JUNE 10 AND JUNE 16 THERE IS A SPIKE TO 45,000 CFS
5. BETWEEN AUG 12 AND AUG 18 THERE IS A SPIKE TO 23,000 CFS
6. BETWEEN AUG 19 AND AUG 25 THERE IS A SPIKE TO 18,000 CFS

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                      |               |
| ANALYST: FRANK                     | DATE: 10/1/83 |
| APPROVED: [Signature]              | DATE: 10/1/83 |

FIGURE E.2.4.238



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 |      |          |
| 50% OF THE TIME LATE STAGE III     |      |          |
| AT GOLD CREEK                      |      |          |
| NAME - GRADE                       | DATE | REVISION |
|                                    |      |          |
|                                    |      |          |

FIGURE E.2.4.239

THOUSANDS

Discharge in cfs

25

20

15

10

5

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-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 REQUIREMENT
- - - FLOWS FOR E - I FLOW REQUIREMENT

|                                |    |             |
|--------------------------------|----|-------------|
| ALASKA POWER AUTHORITY         |    |             |
| SUSITNA HYDROELECTRIC PROJECT  |    |             |
| SUSITNA RIVER STREAMFLOW:      |    |             |
| EXCEEDED                       |    |             |
| 97% OF THE TIME LATE STAGE III |    |             |
| AT GOLD CREEK                  |    |             |
| DATE                           | BY | REVIEWED BY |
|                                |    |             |

FIGURE E.2.4.240

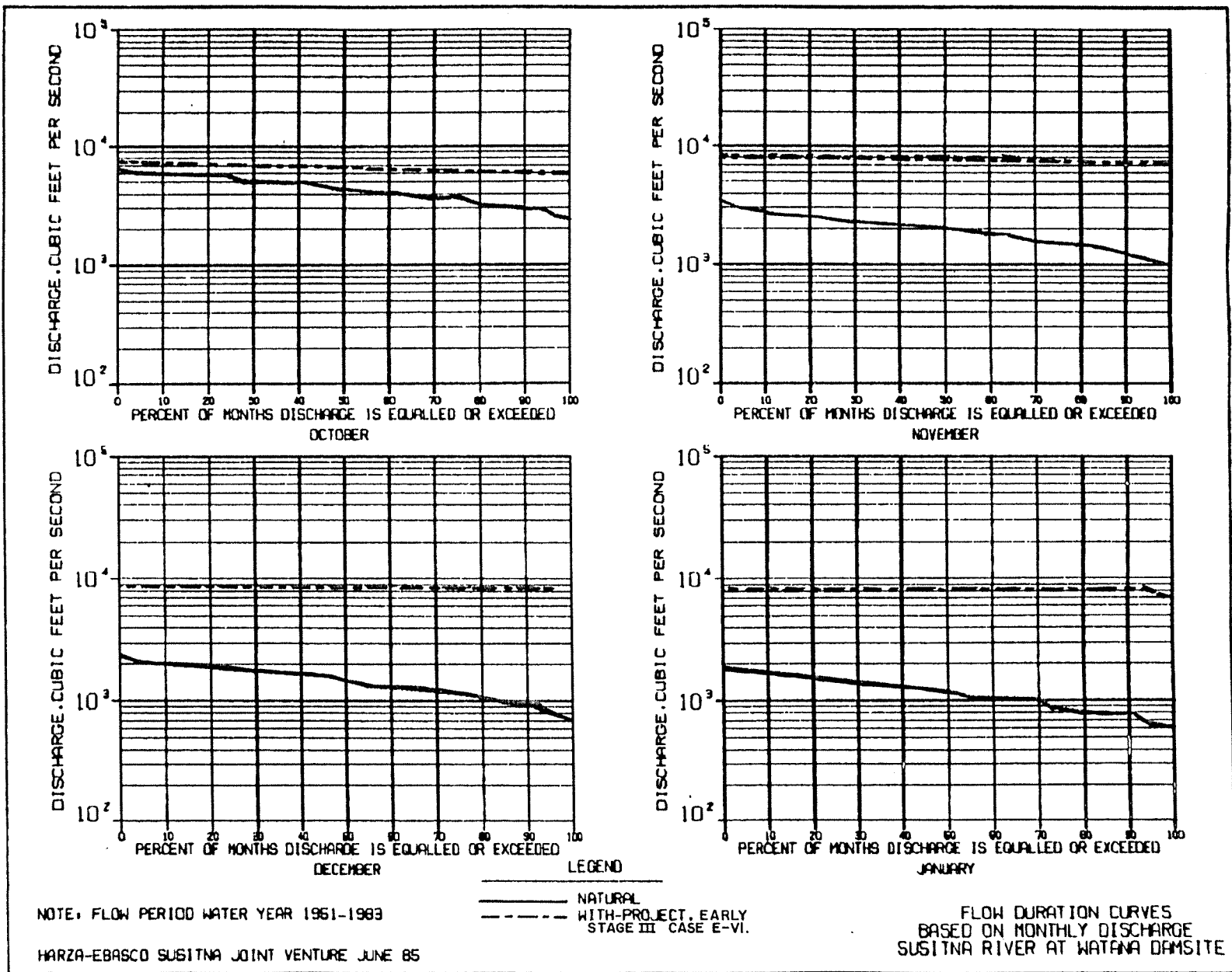


FIGURE E.2.4.241





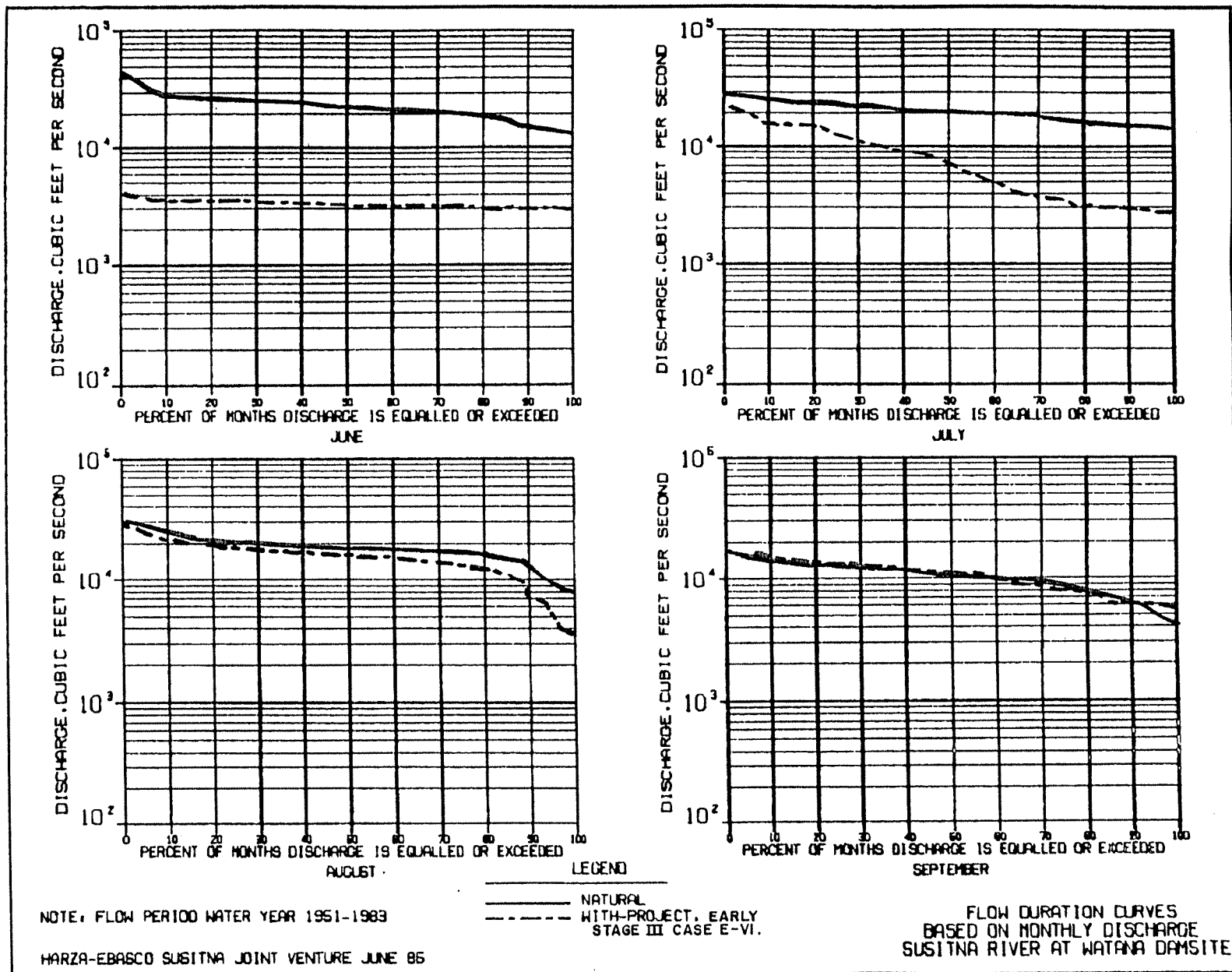


FIGURE E.2.4.241

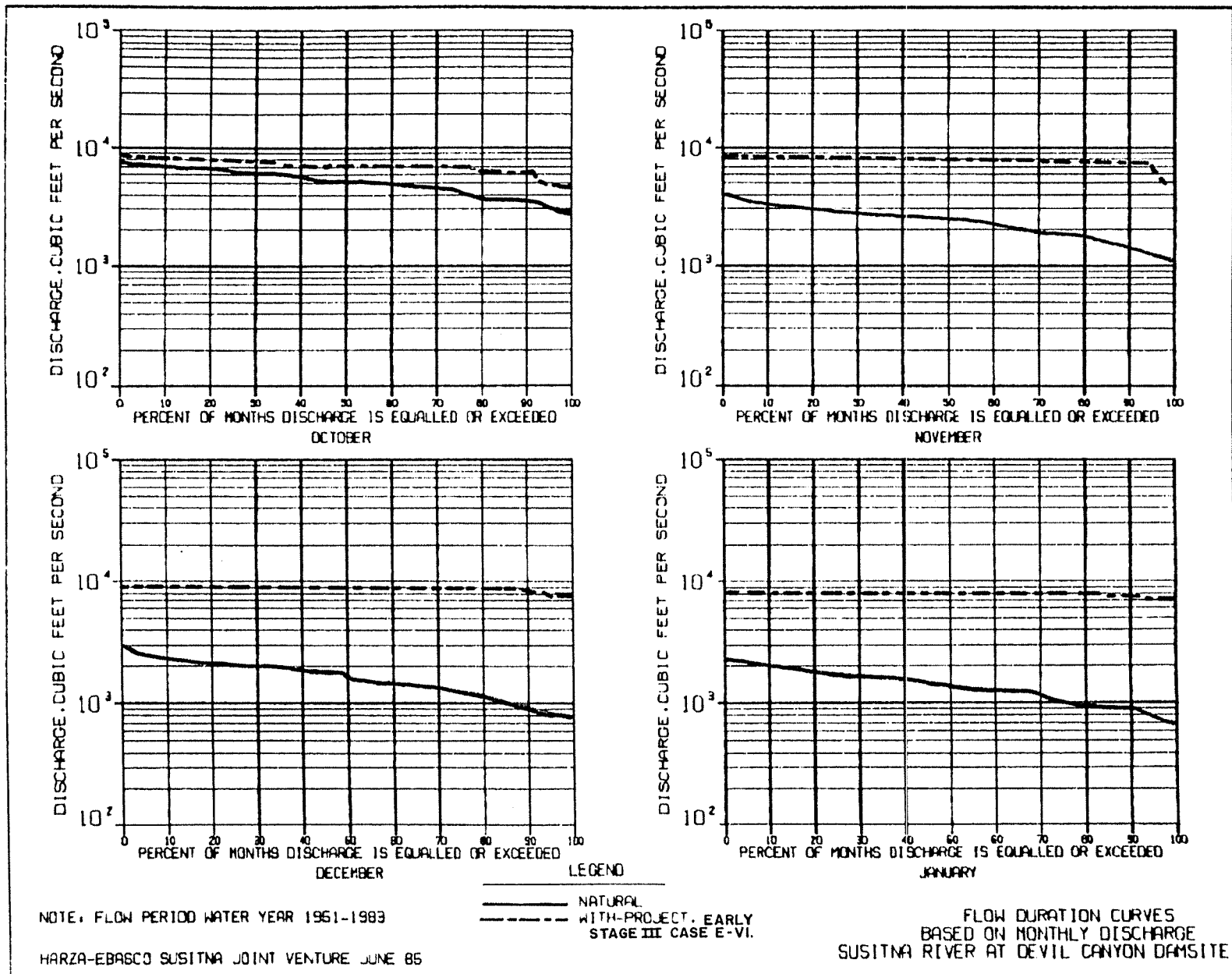


FIGURE E.2.4.242

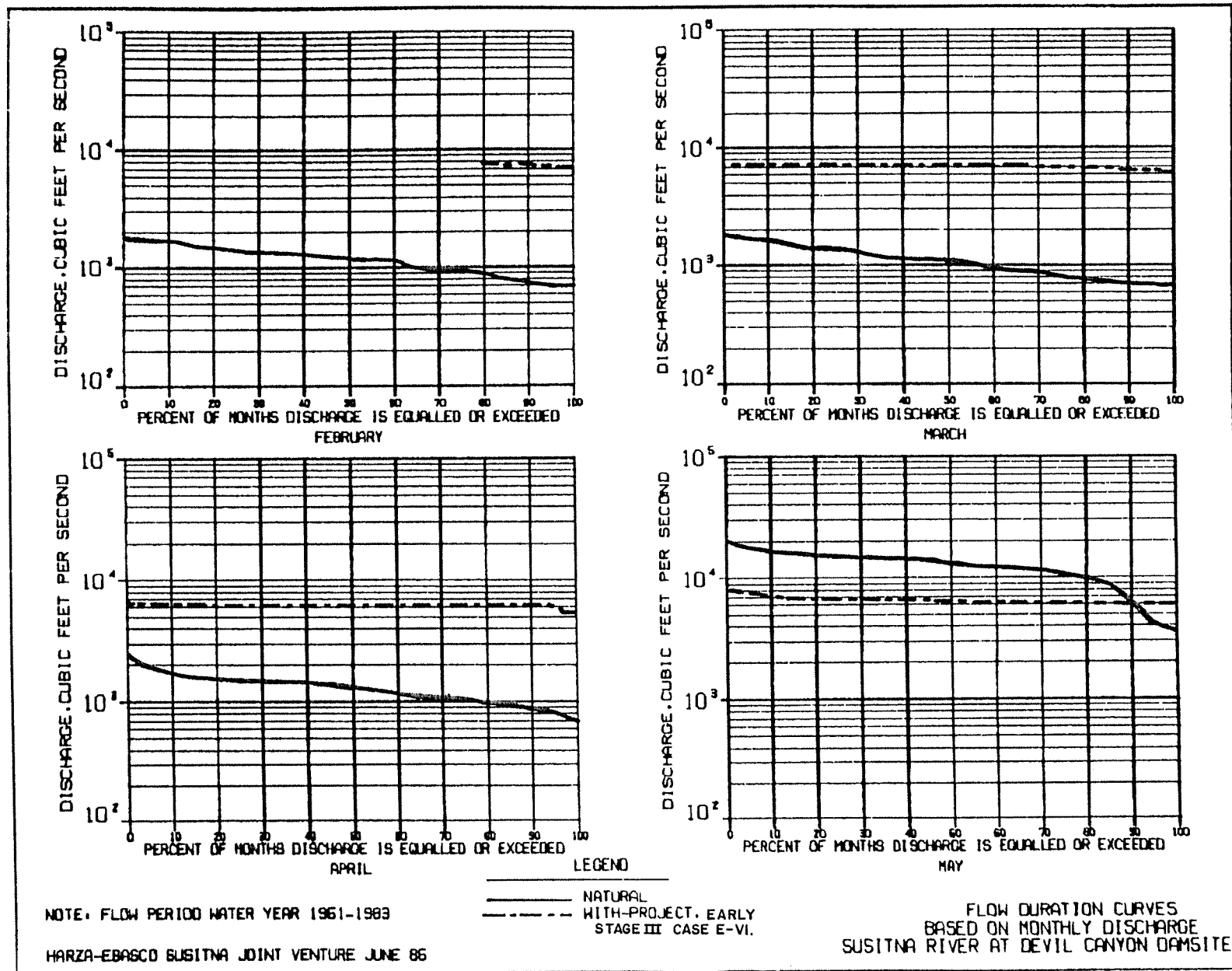


FIGURE E.2.4.242

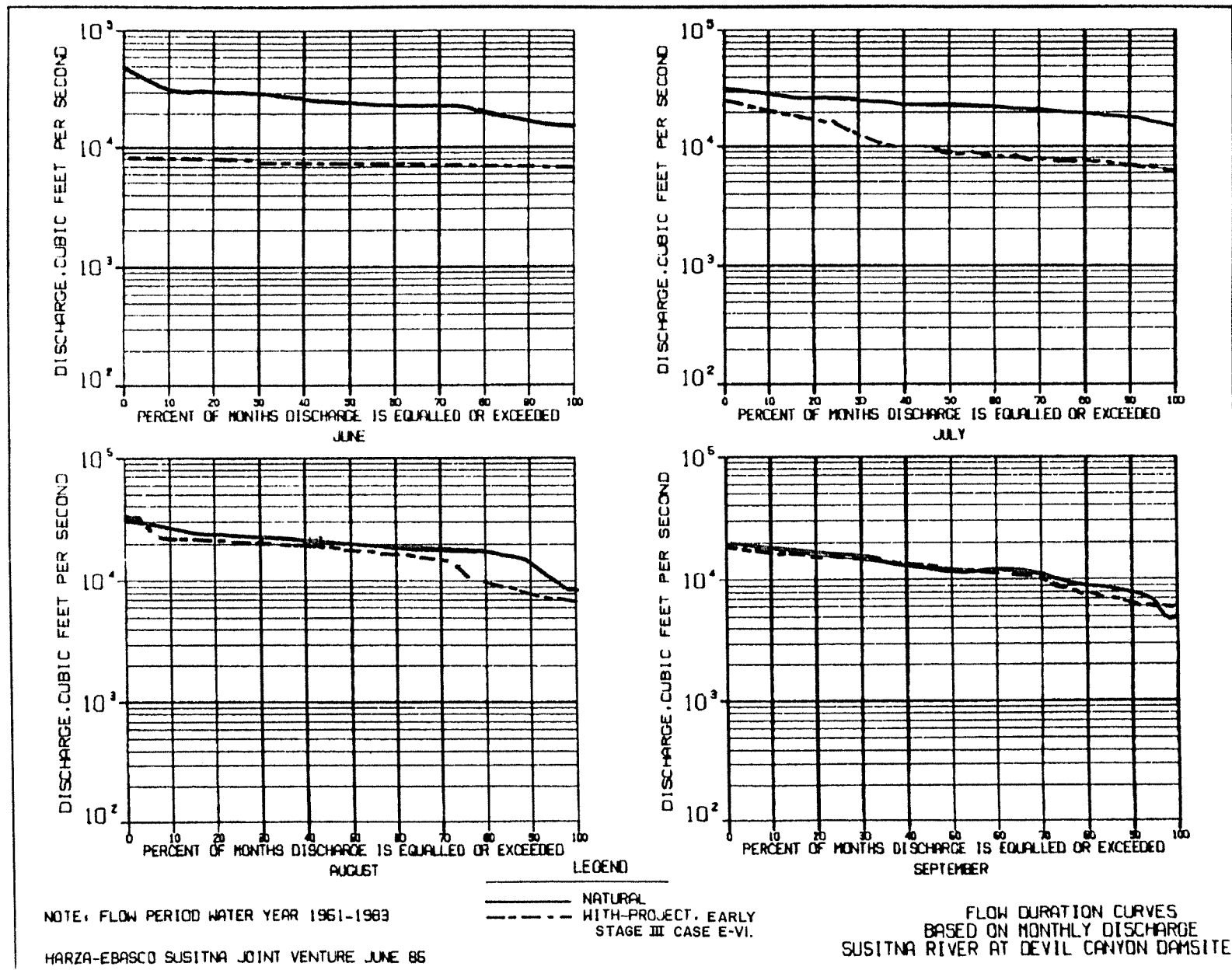


FIGURE E.2.4.242

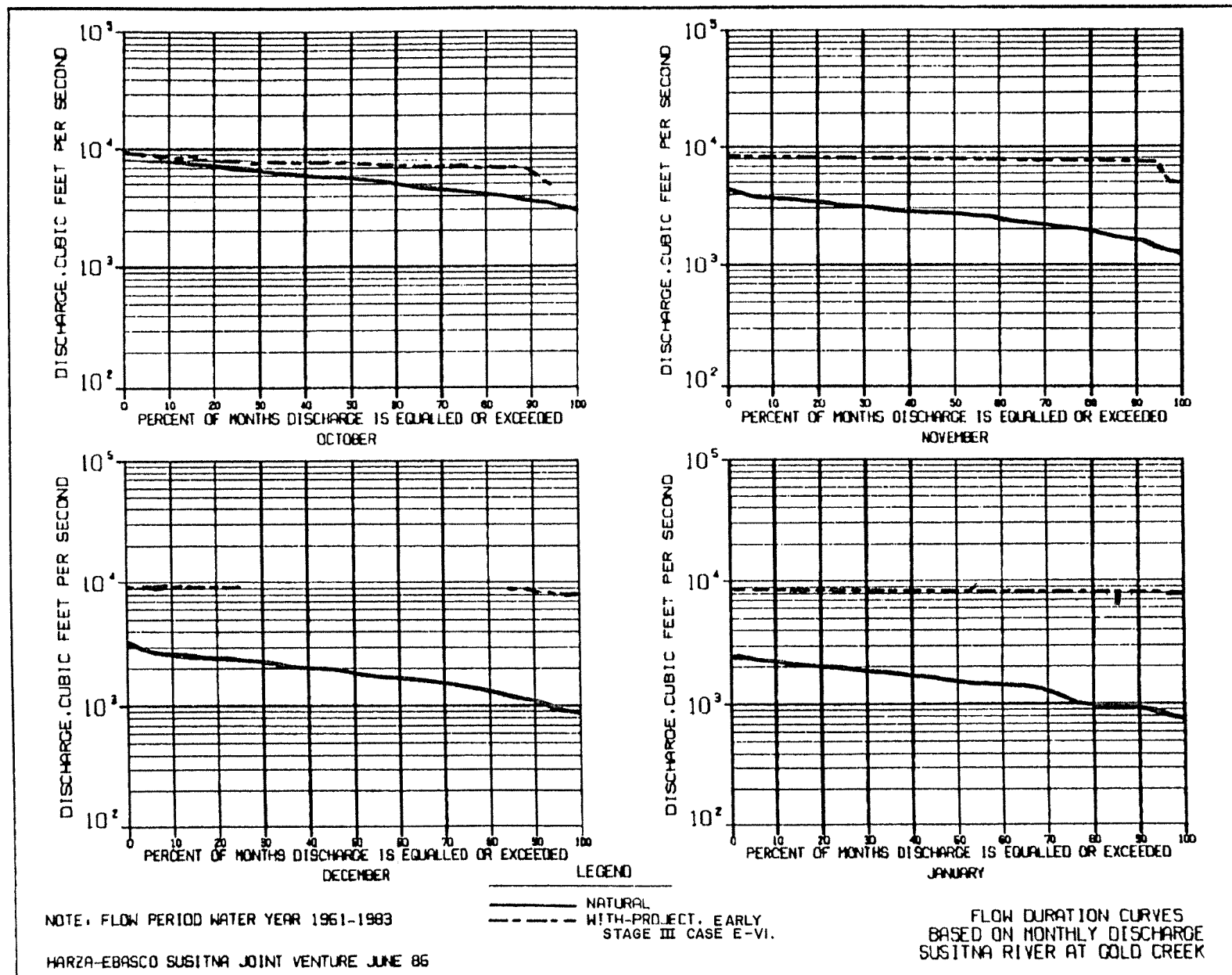


FIGURE E.2.4. 243

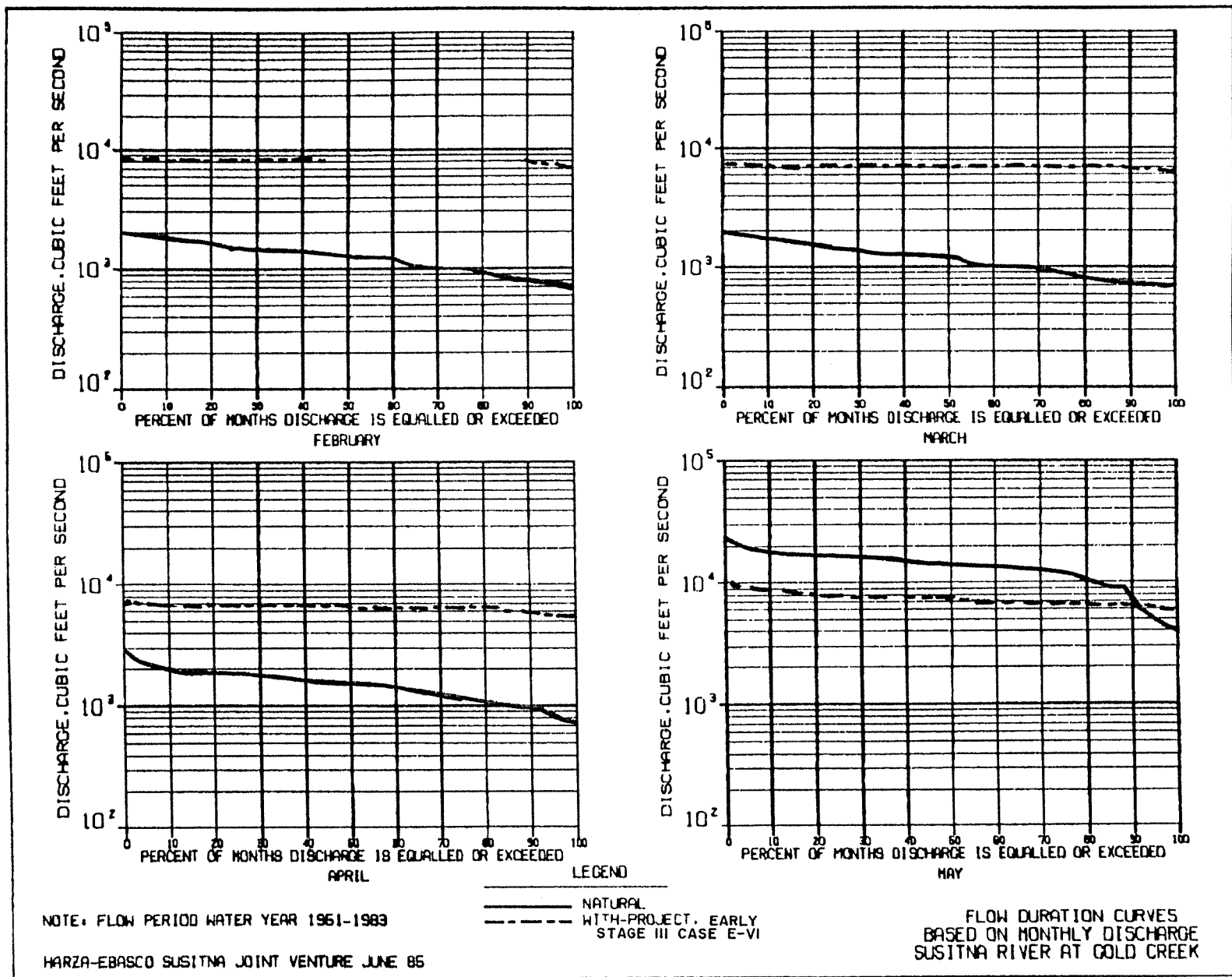


FIGURE E.2.4.243

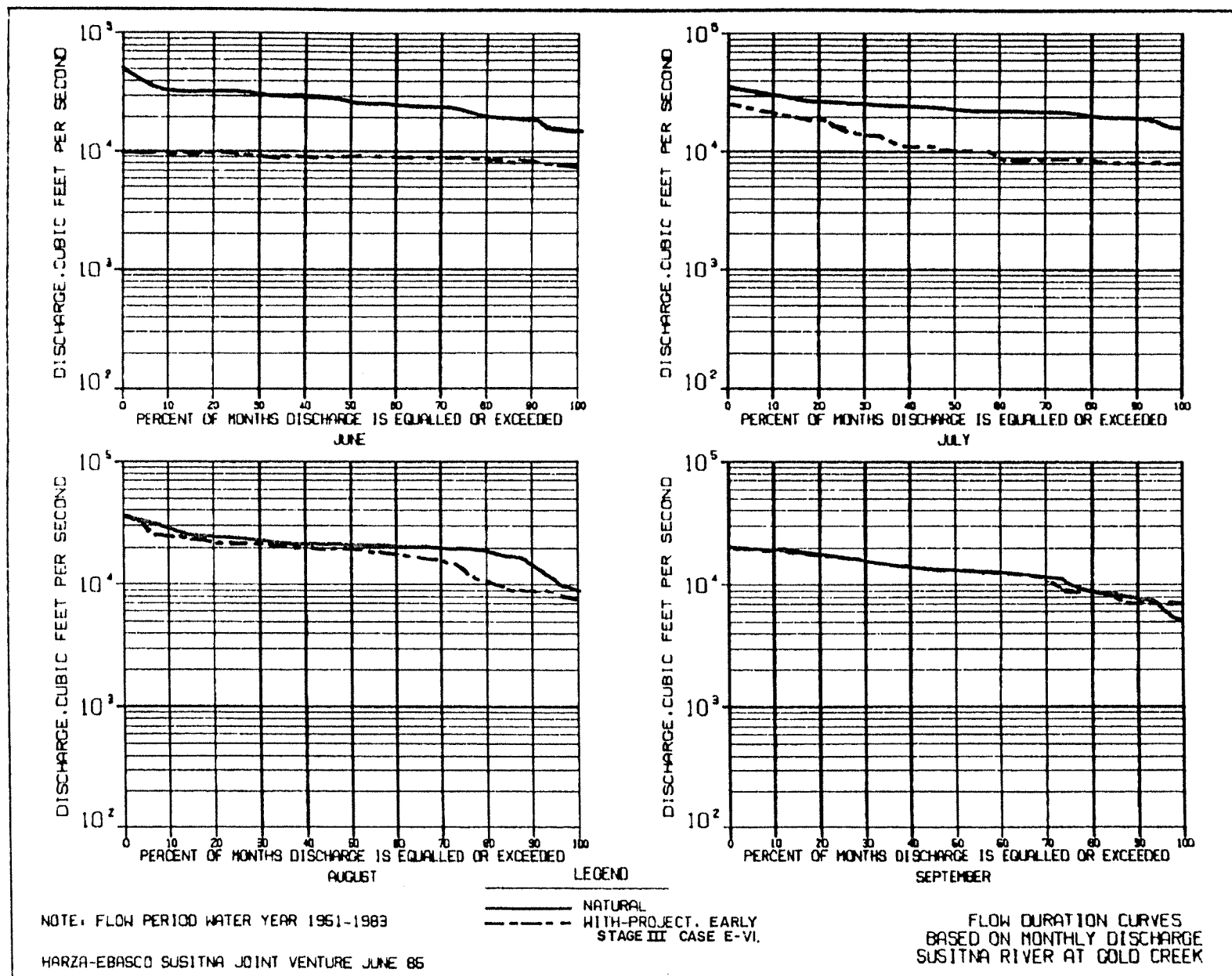


FIGURE E.2.4.243

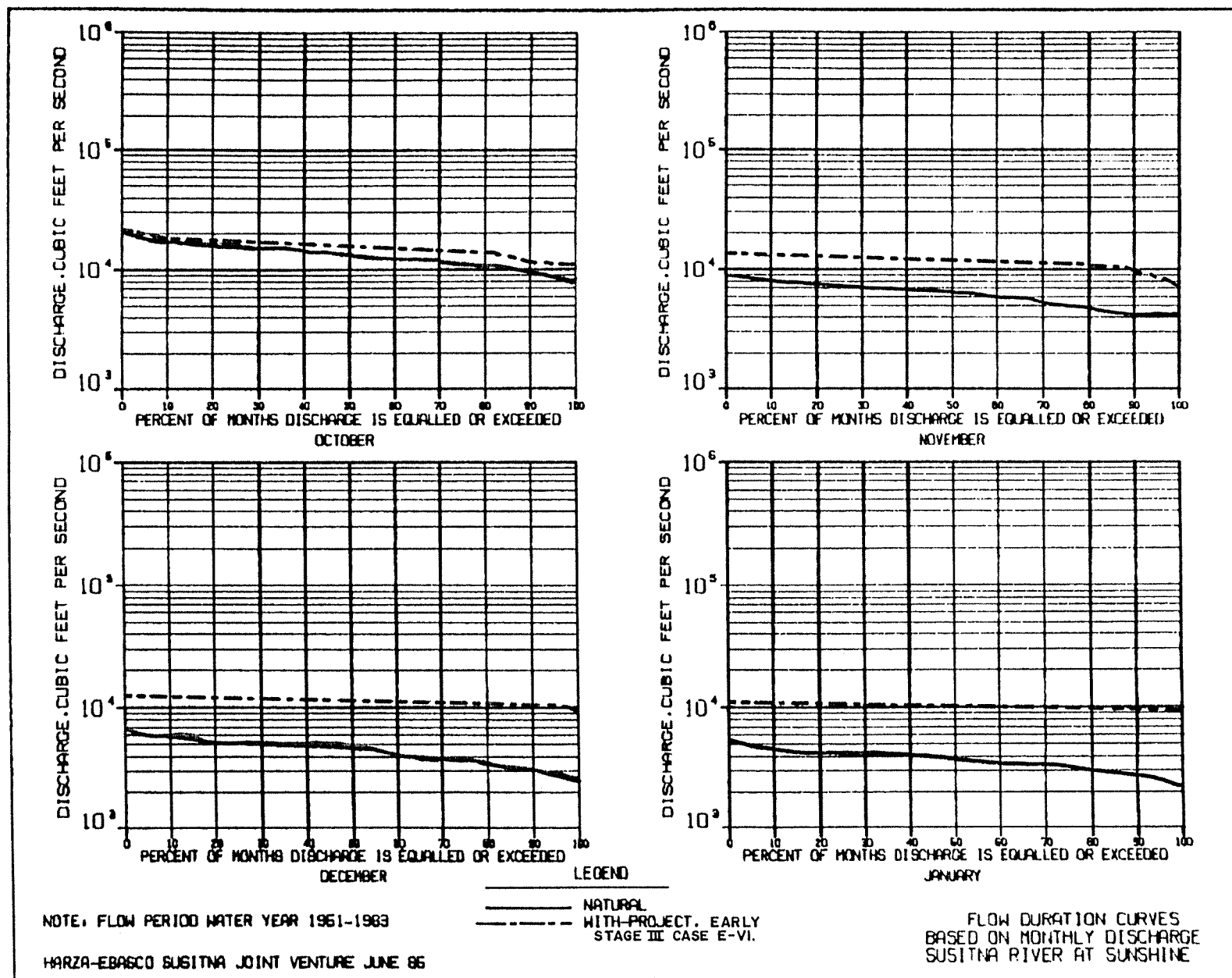


FIGURE E.2.4.244



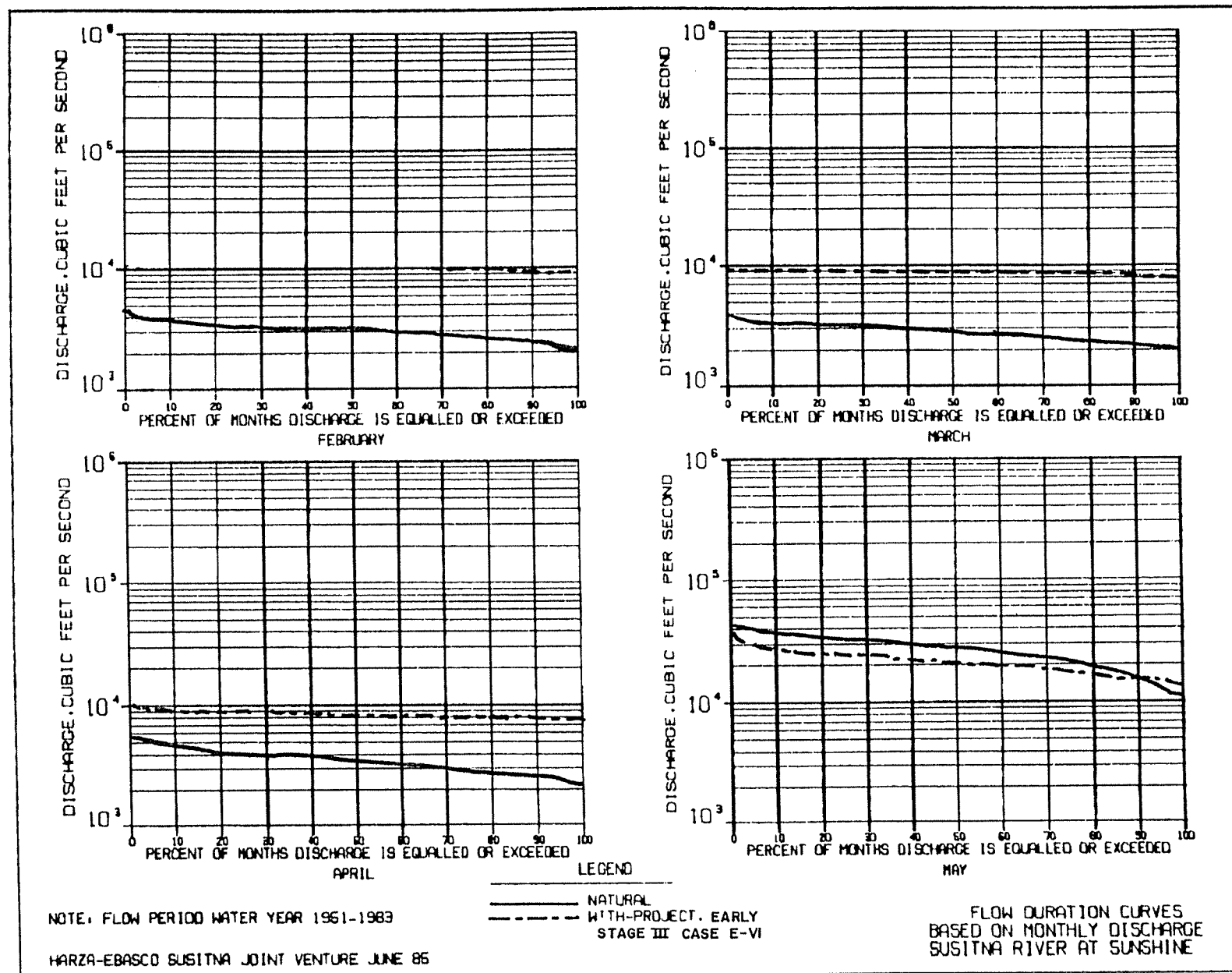


FIGURE E.2.4.244

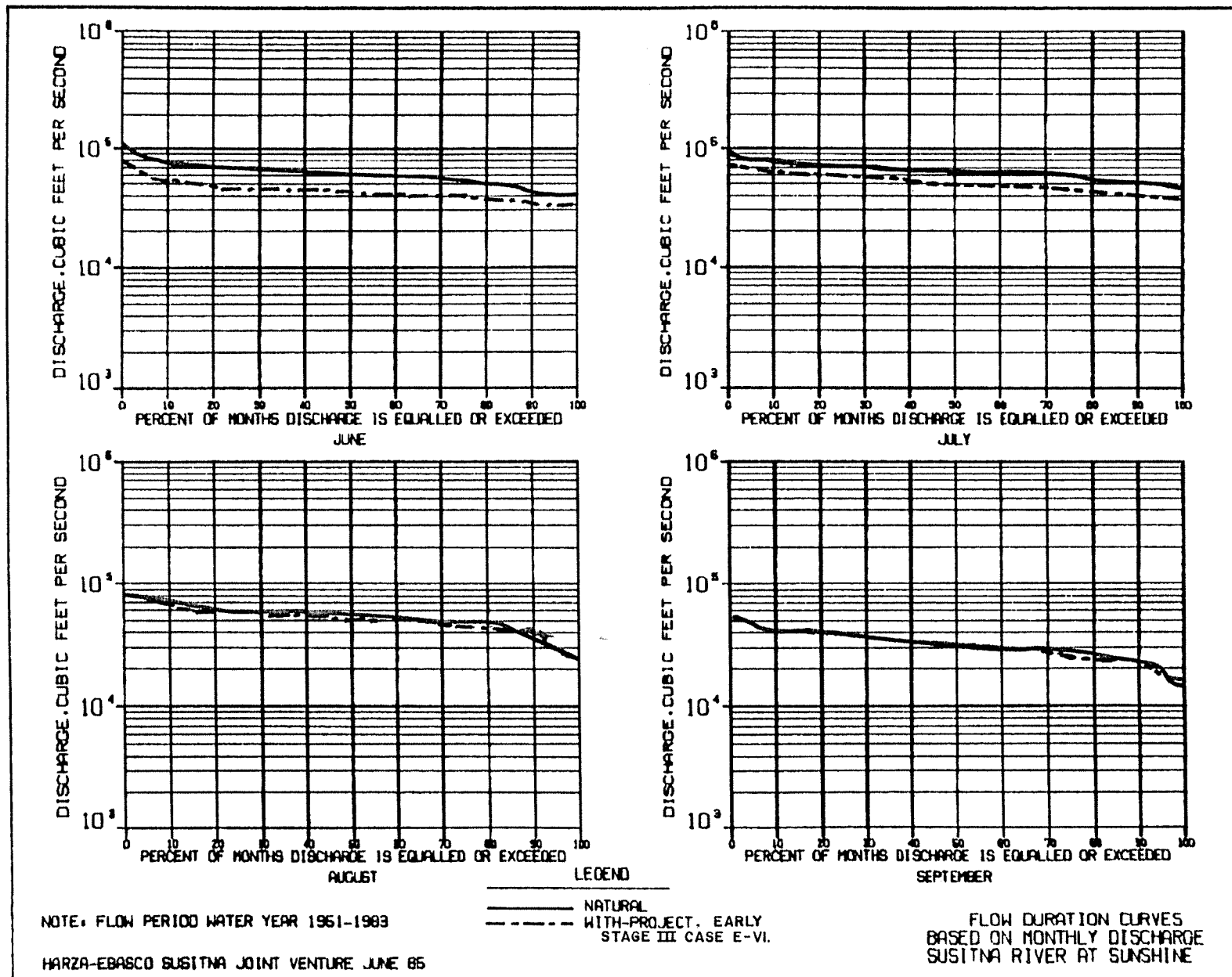


FIGURE 2.4.244

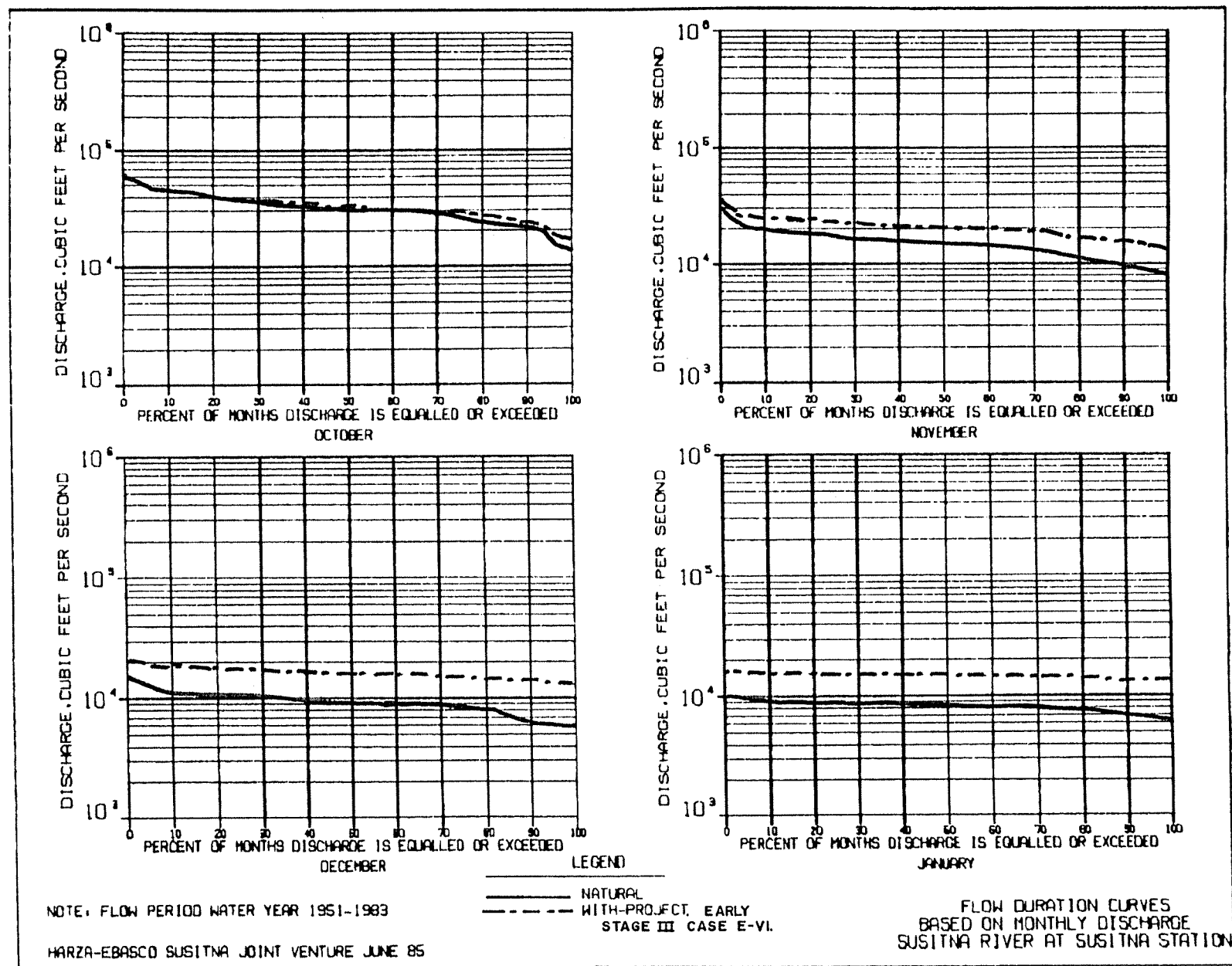


FIGURE E.2.4.245

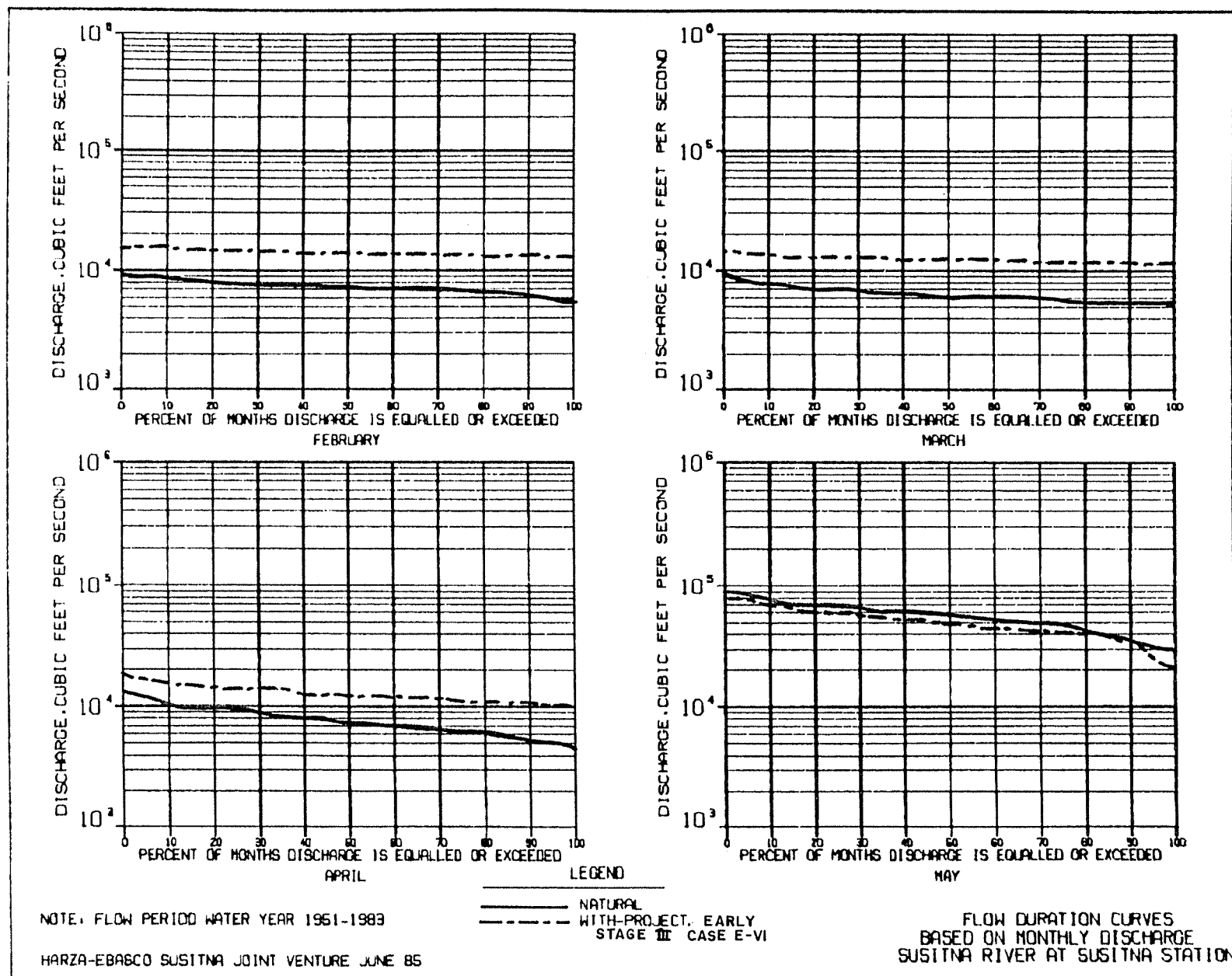


FIGURE E.2.4.245

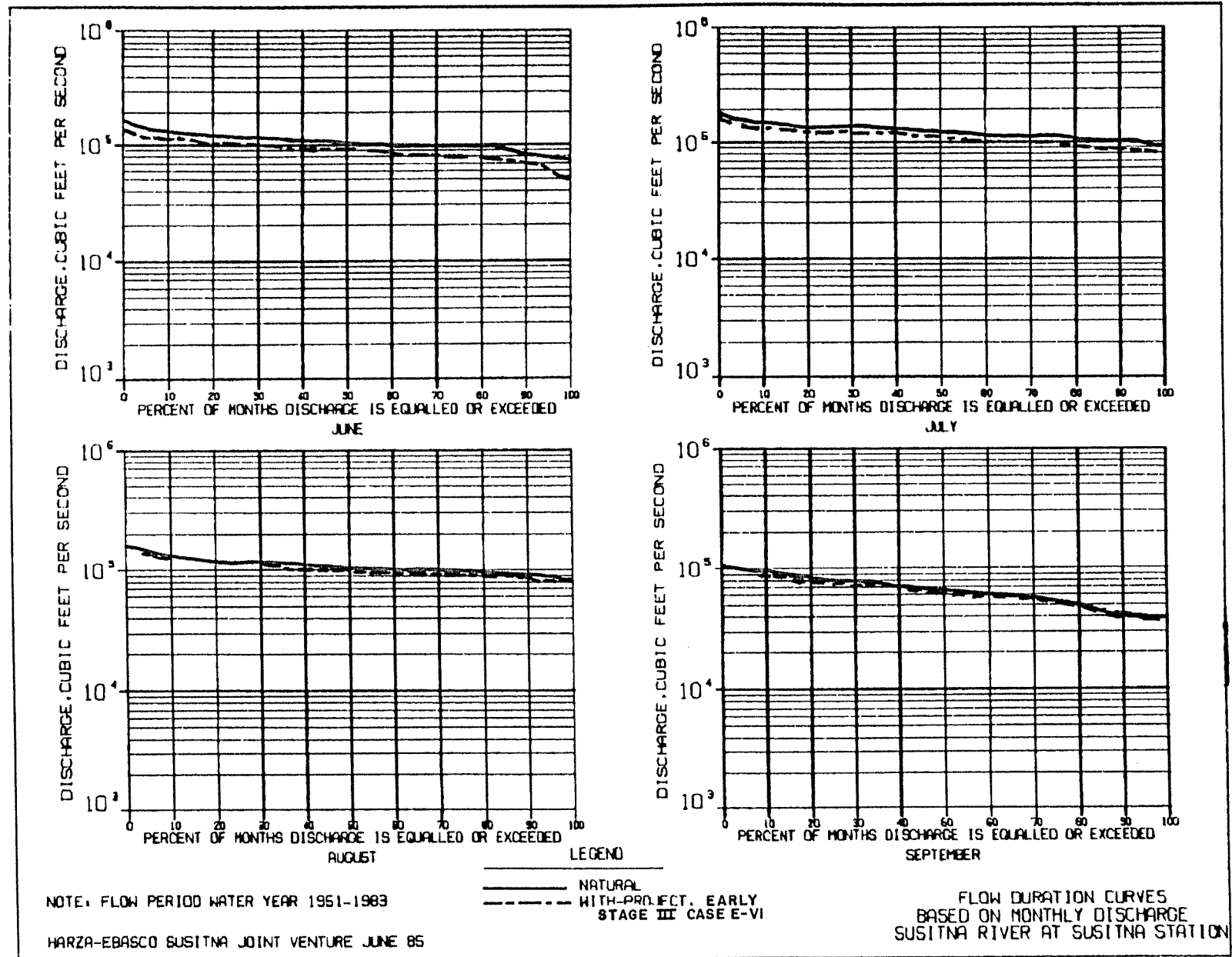


FIGURE E.2.4.245

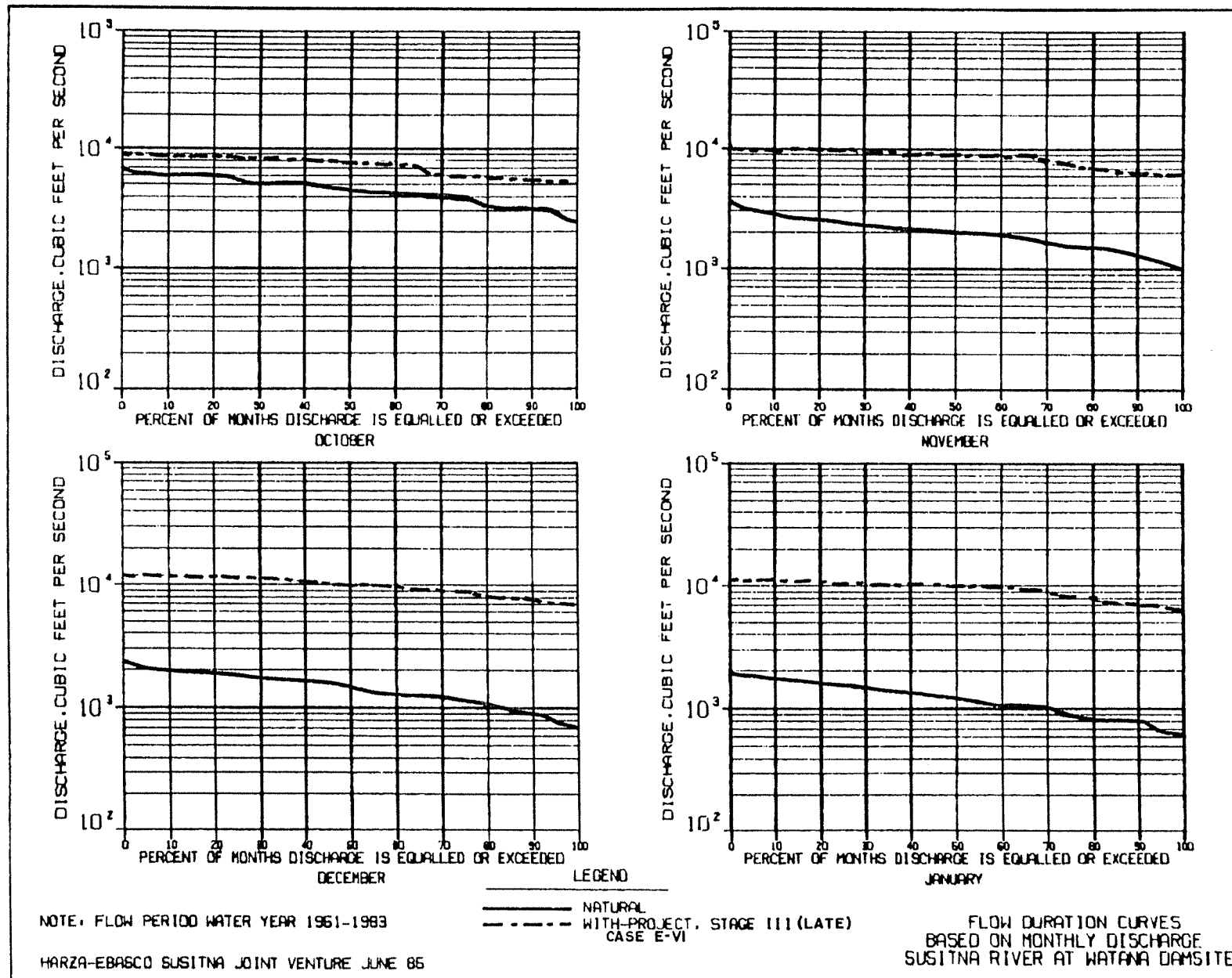


FIGURE E.2.4.246

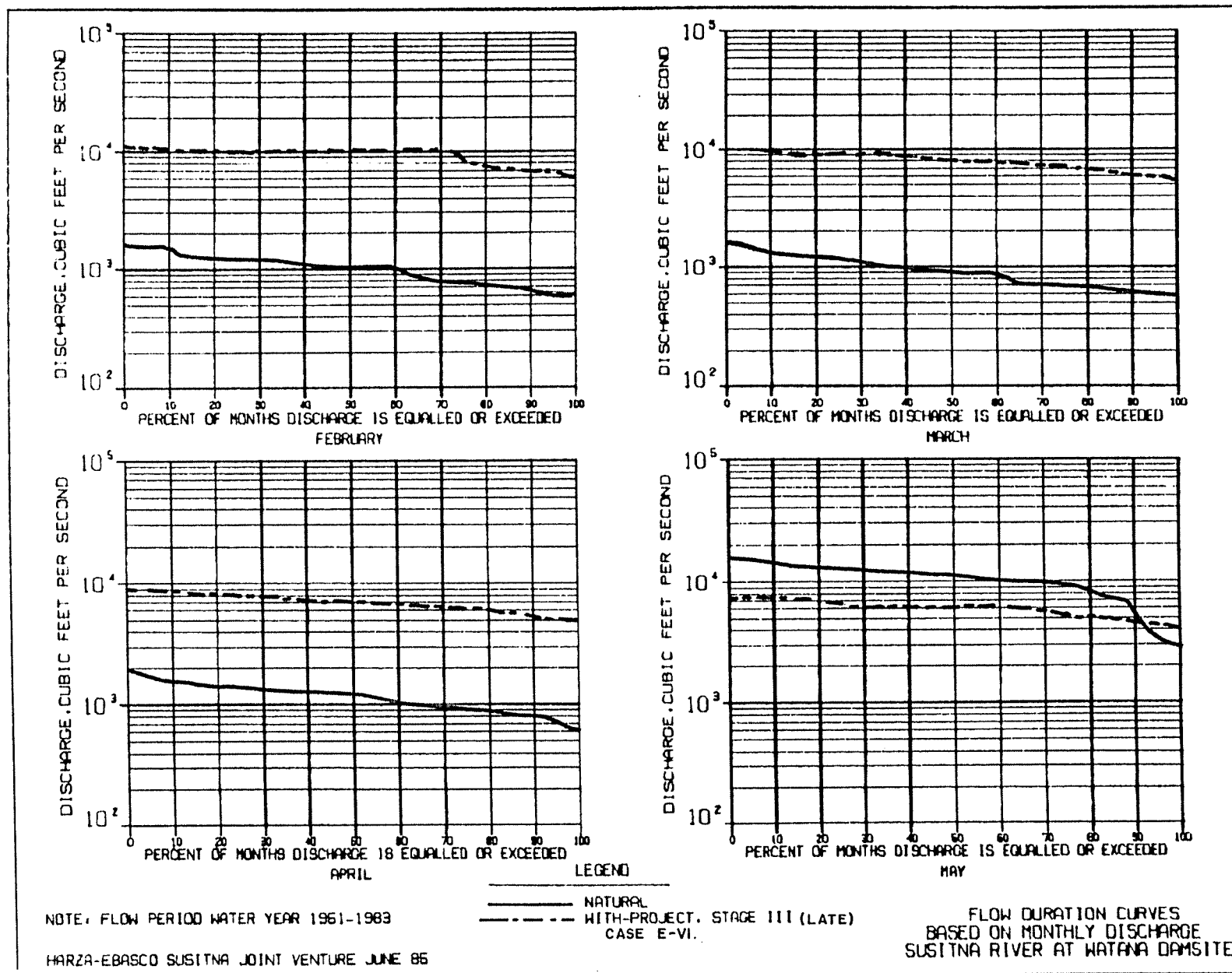


FIGURE E.2.4.246

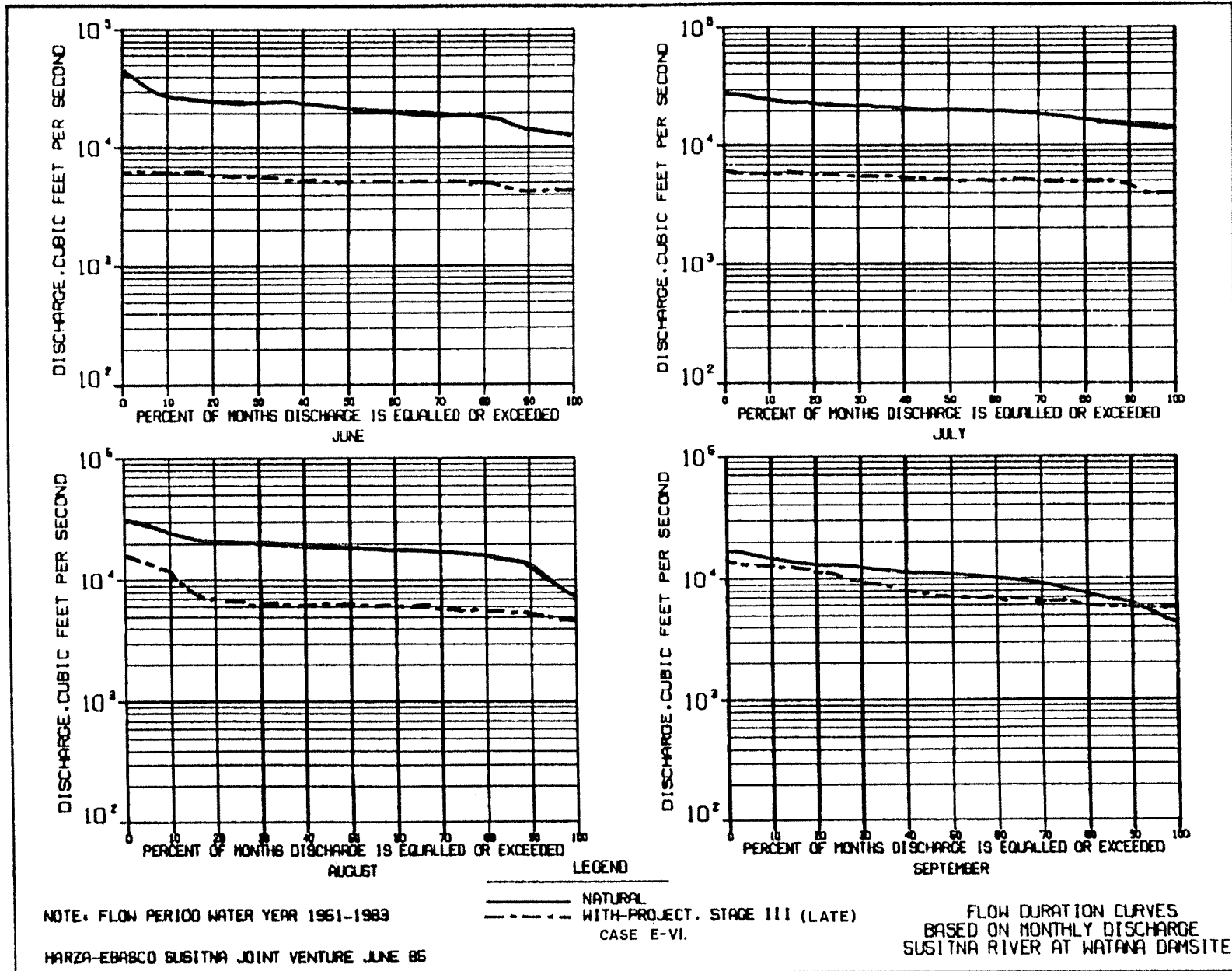


FIGURE E.2.4.246



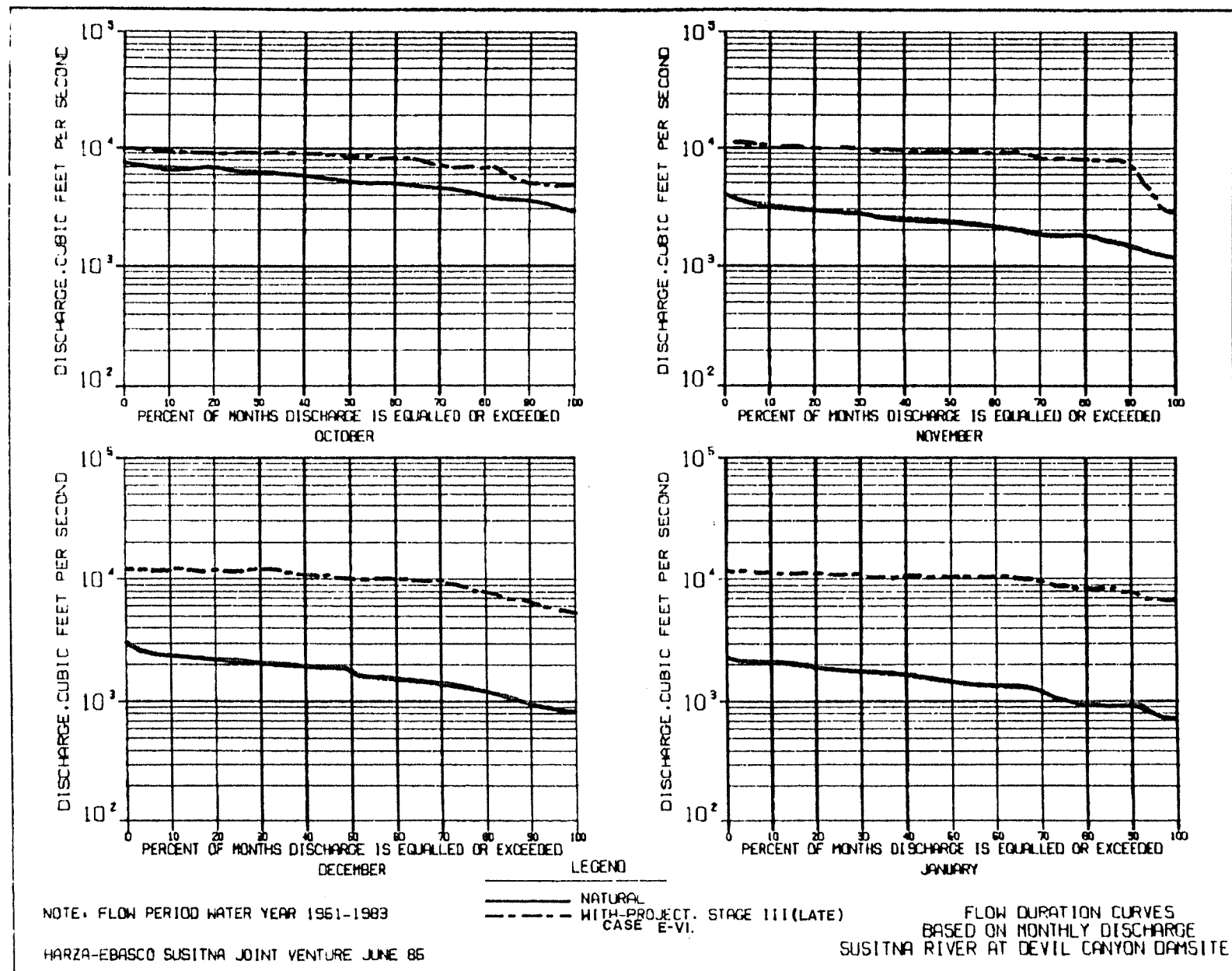


FIGURE E.2.4.247

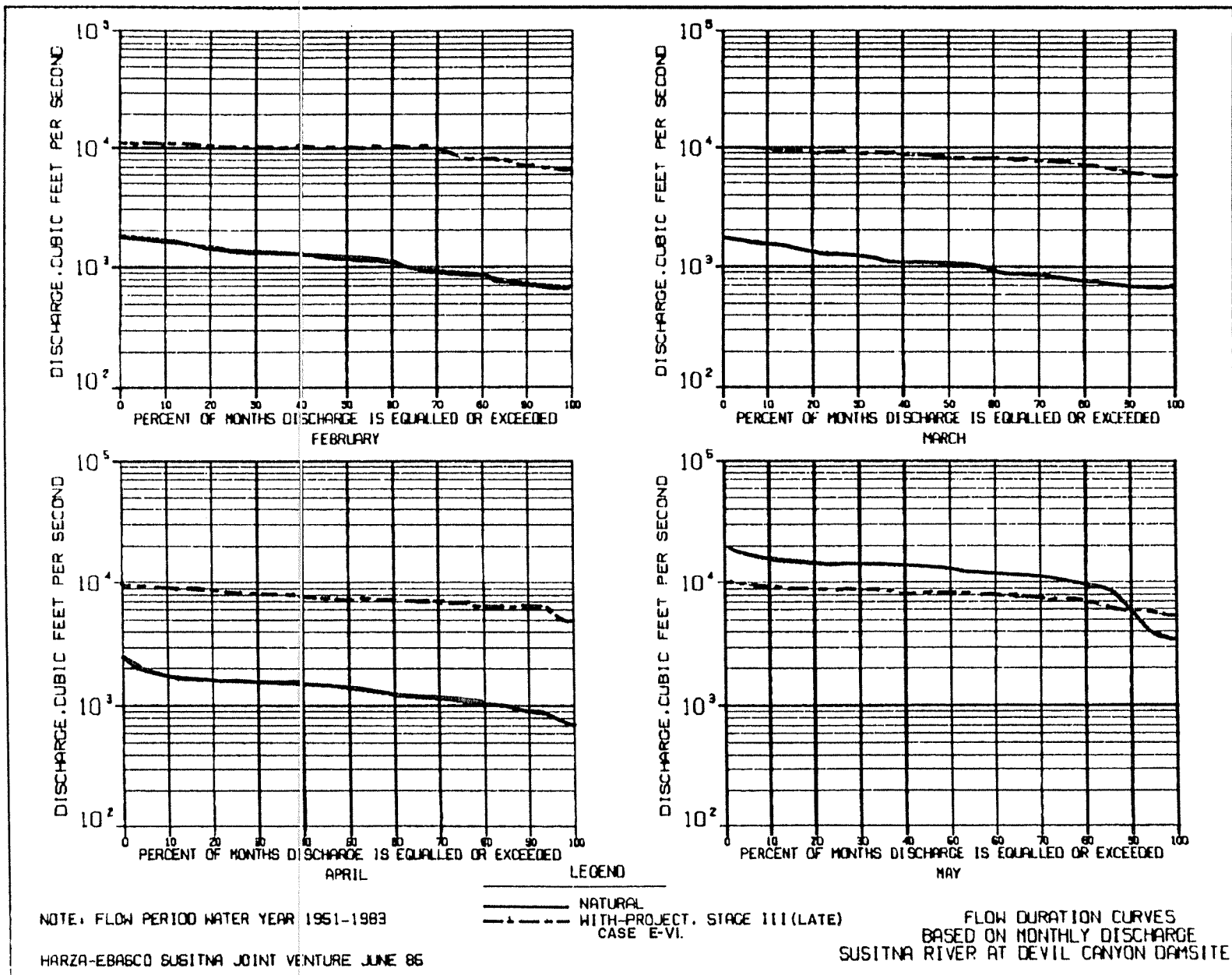


FIGURE E.2.4.247

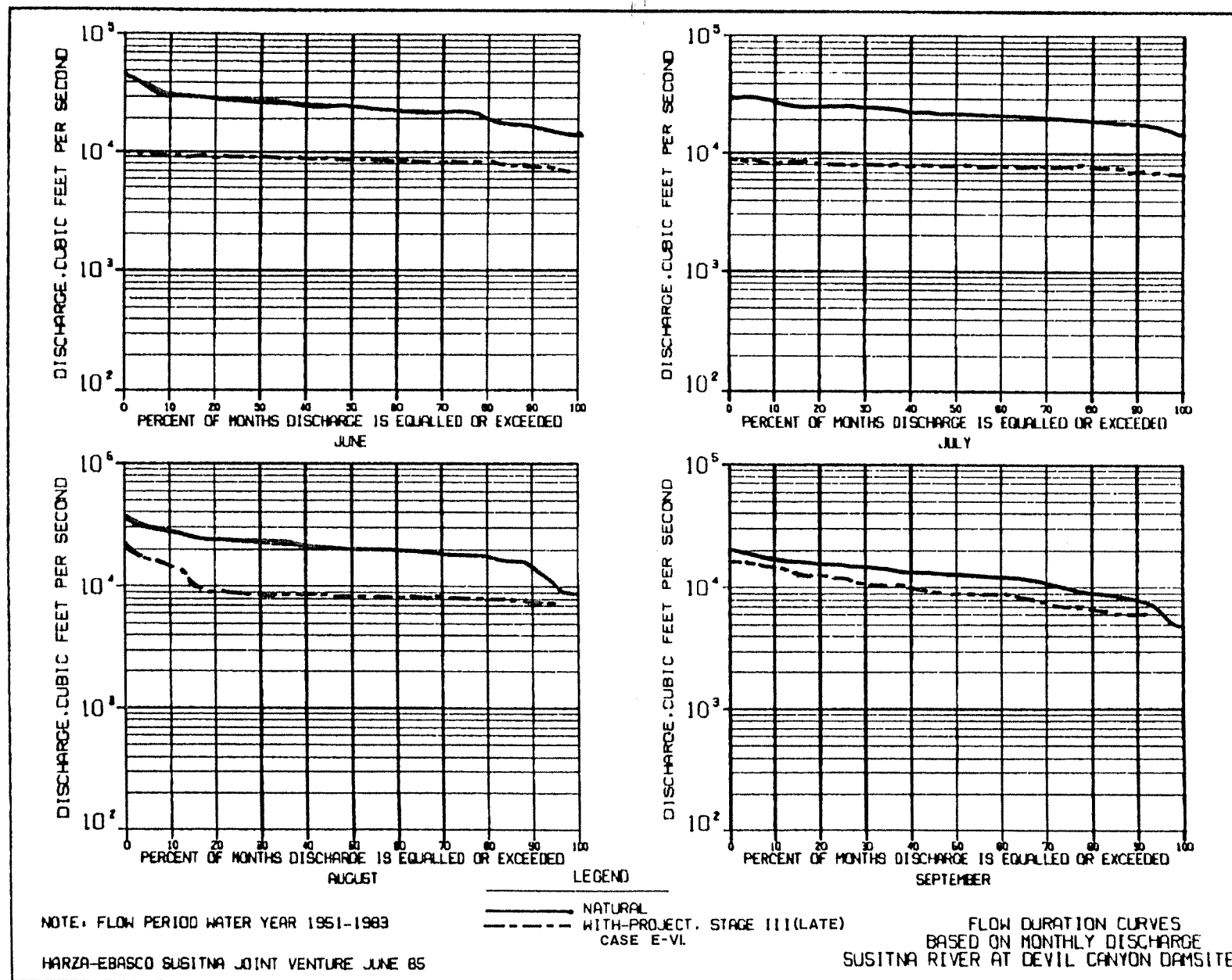


FIGURE E.2.4.247

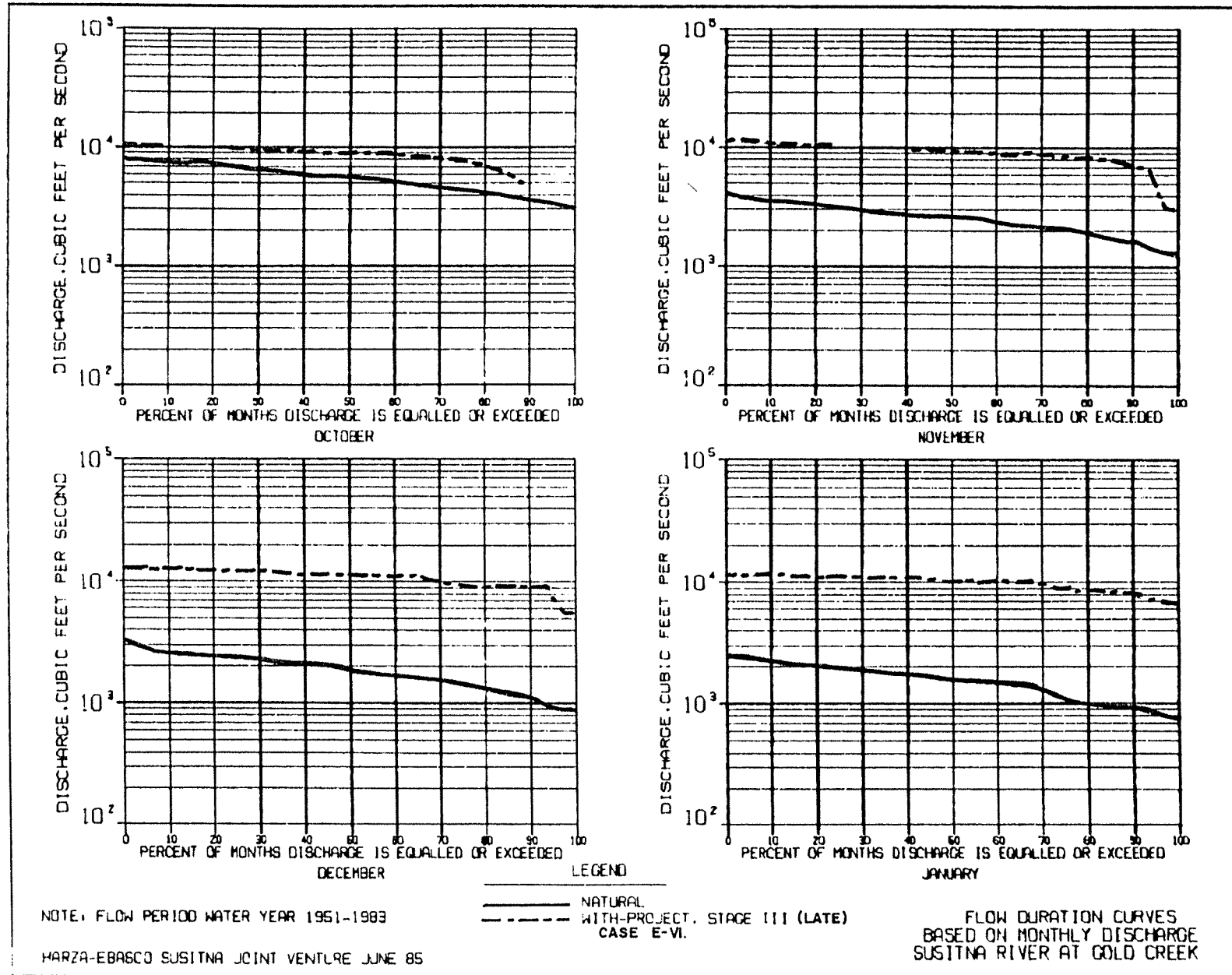


FIGURE E.2.4.248

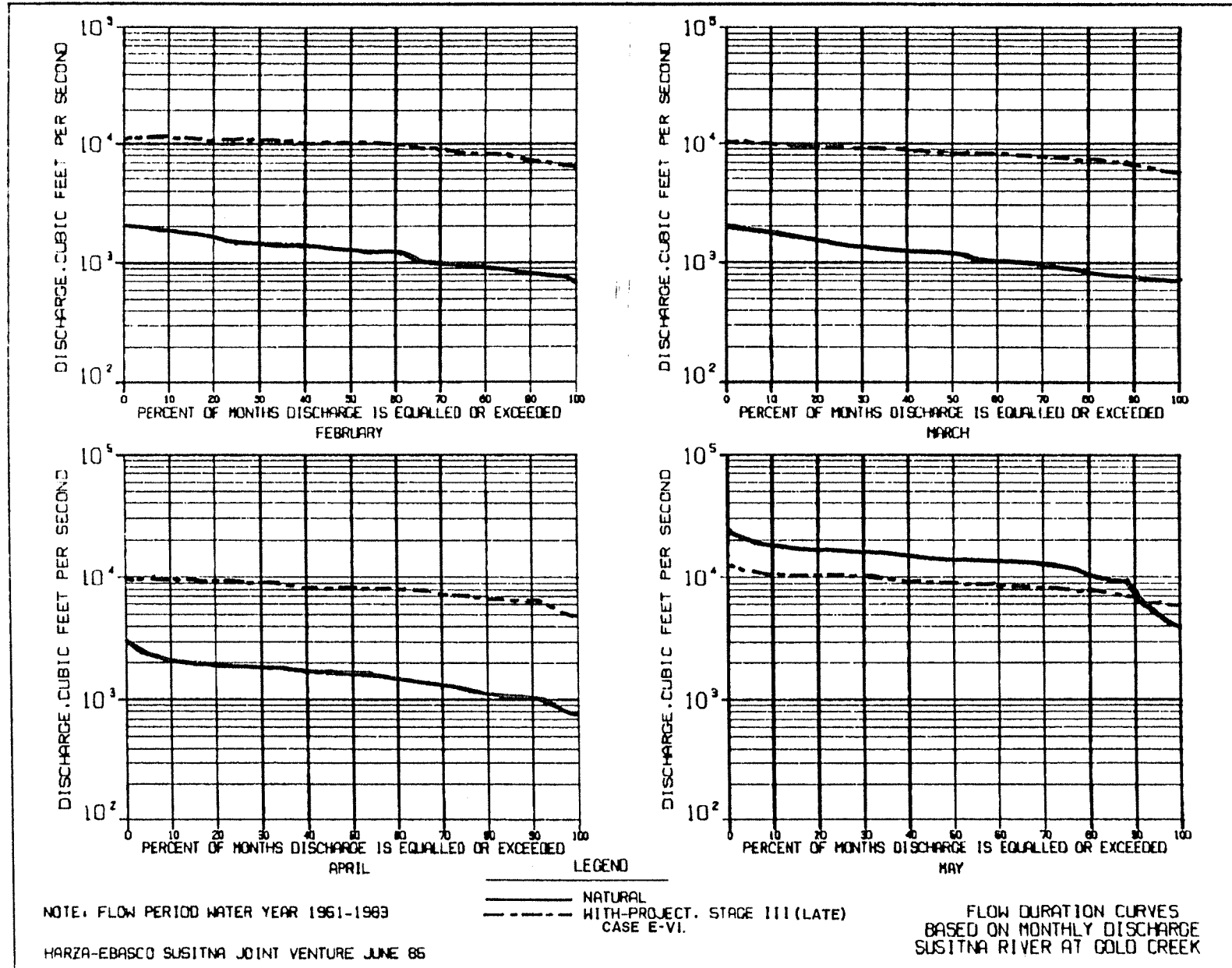


FIGURE E.2.4.248

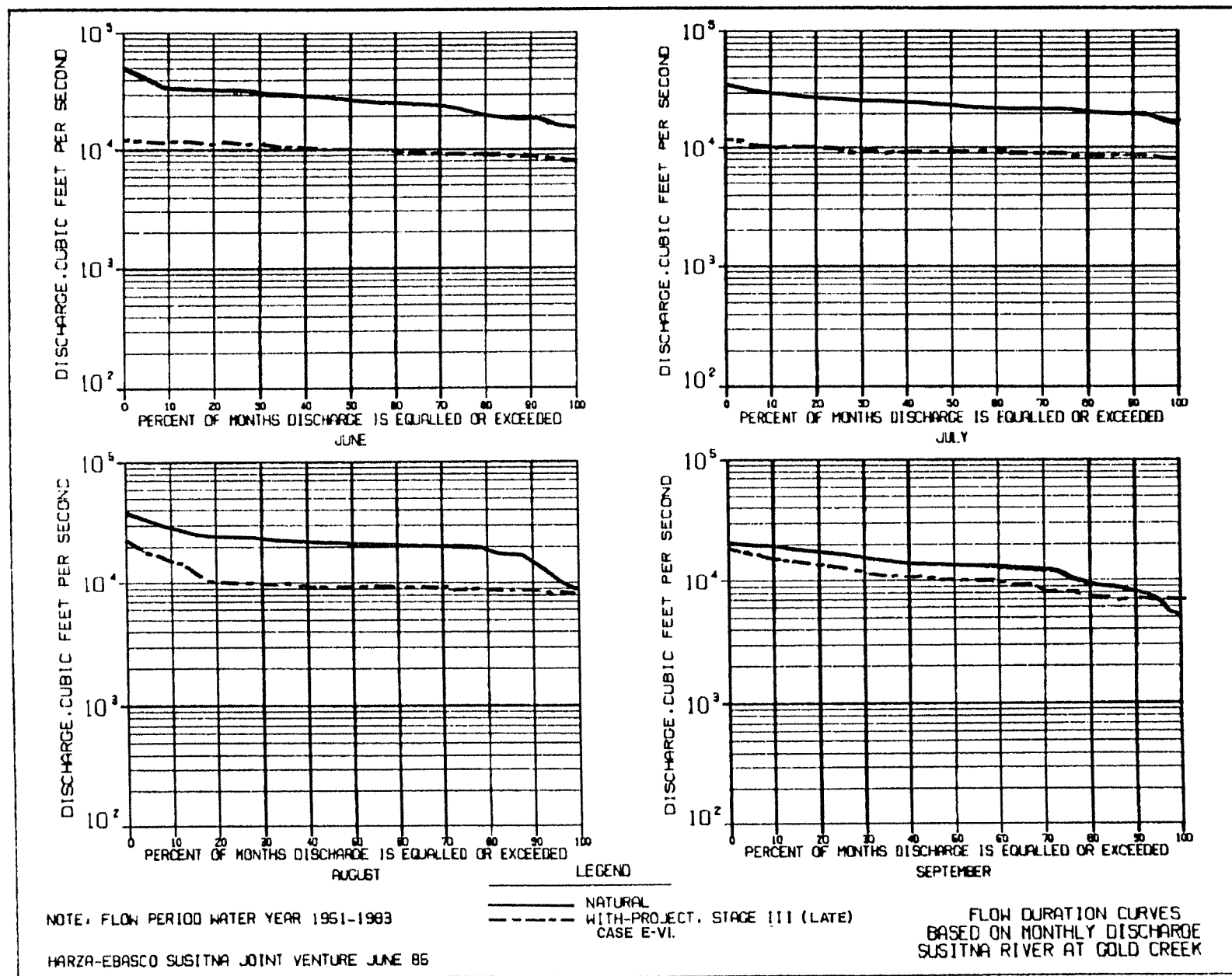


FIGURE E.2.4.248

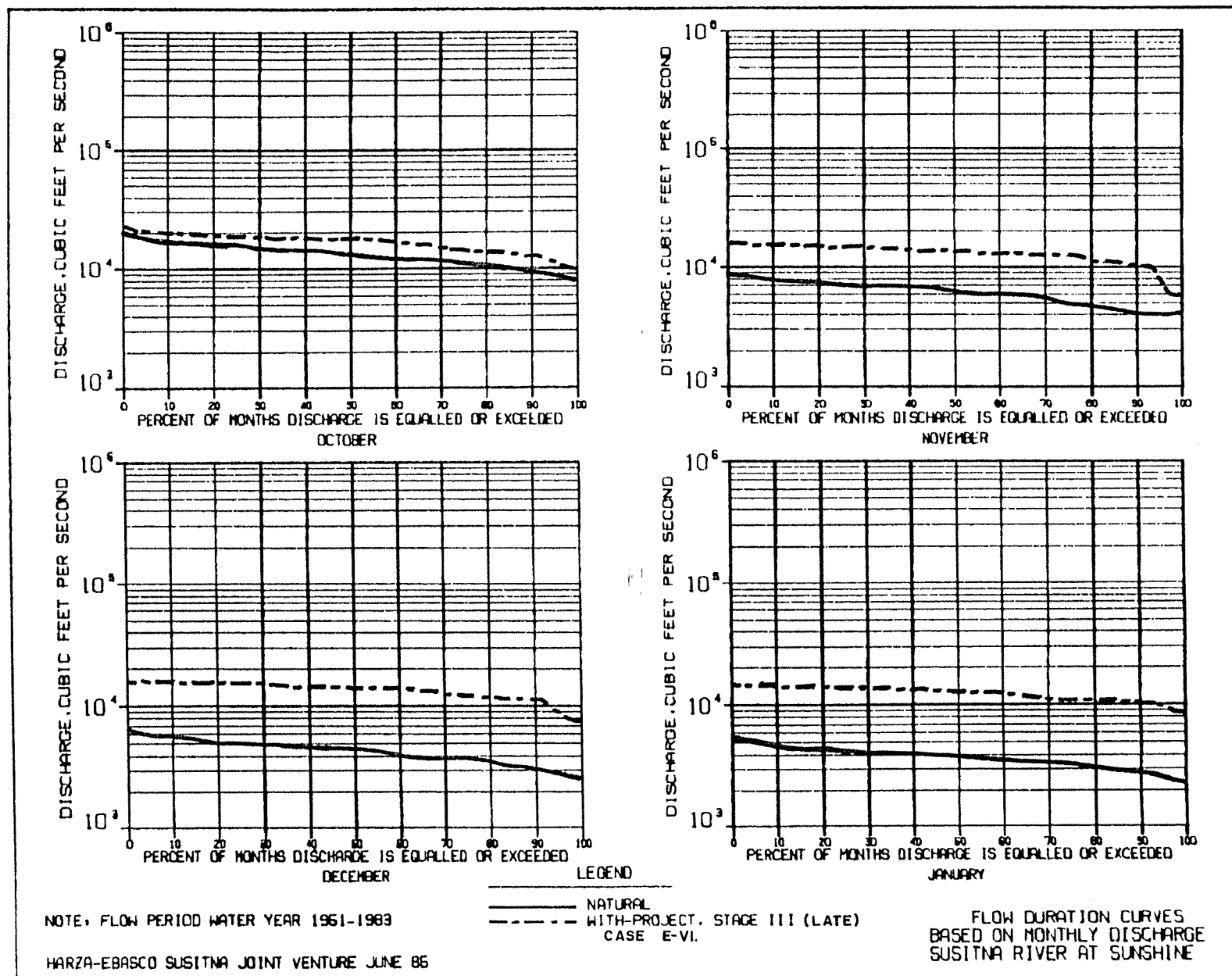


FIGURE E.2.4.249

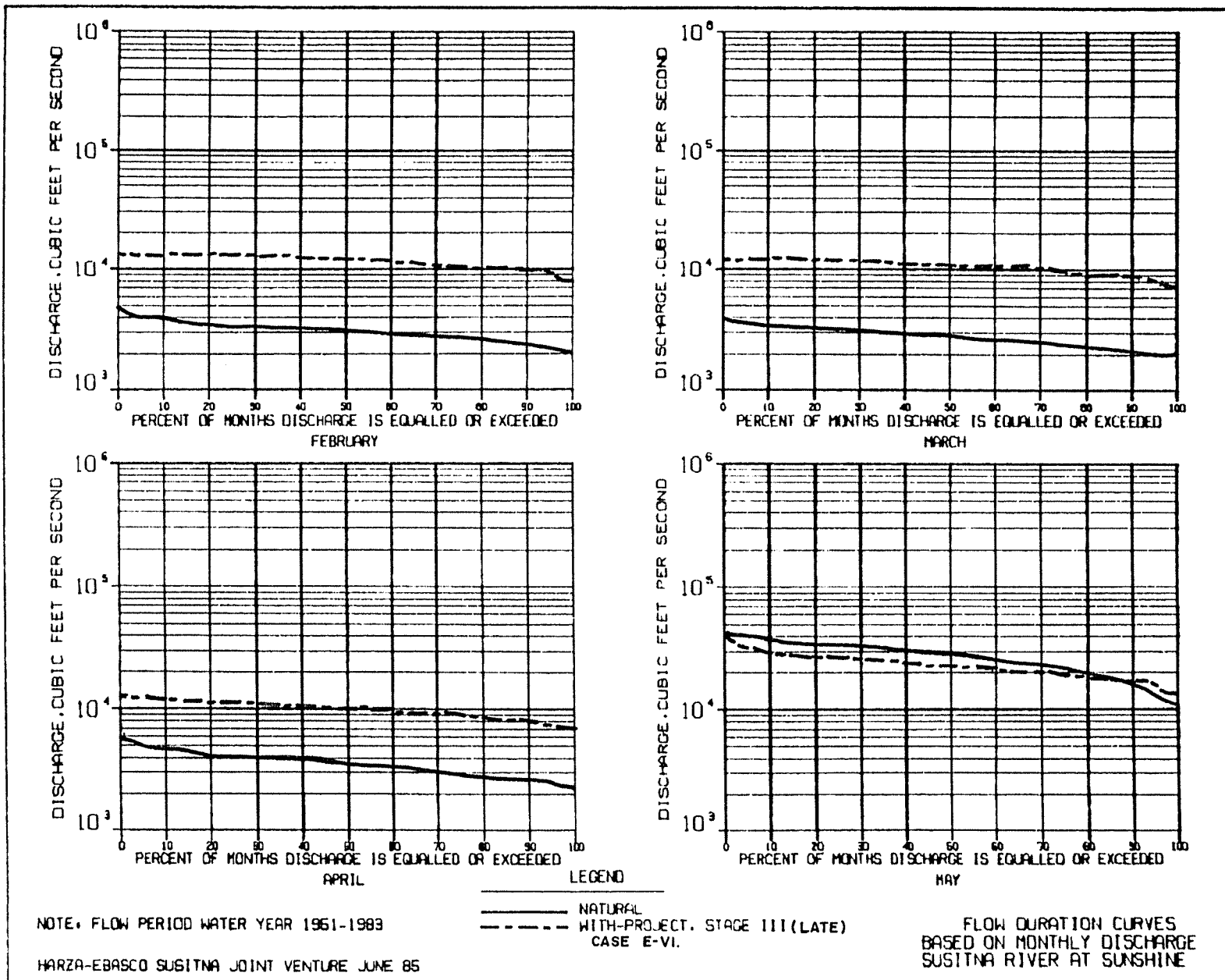


FIGURE E.2.4.249



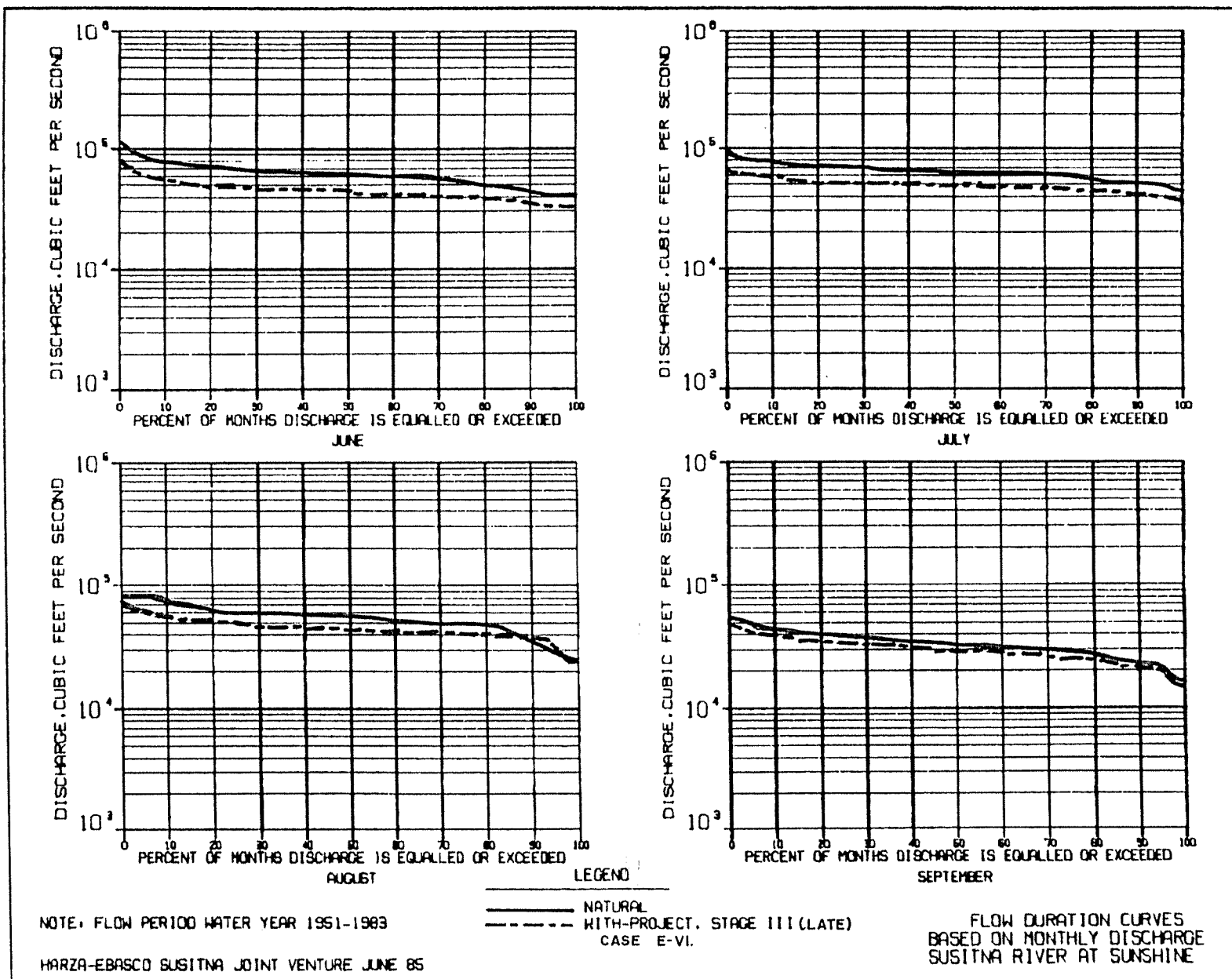


FIGURE E.2.4.249

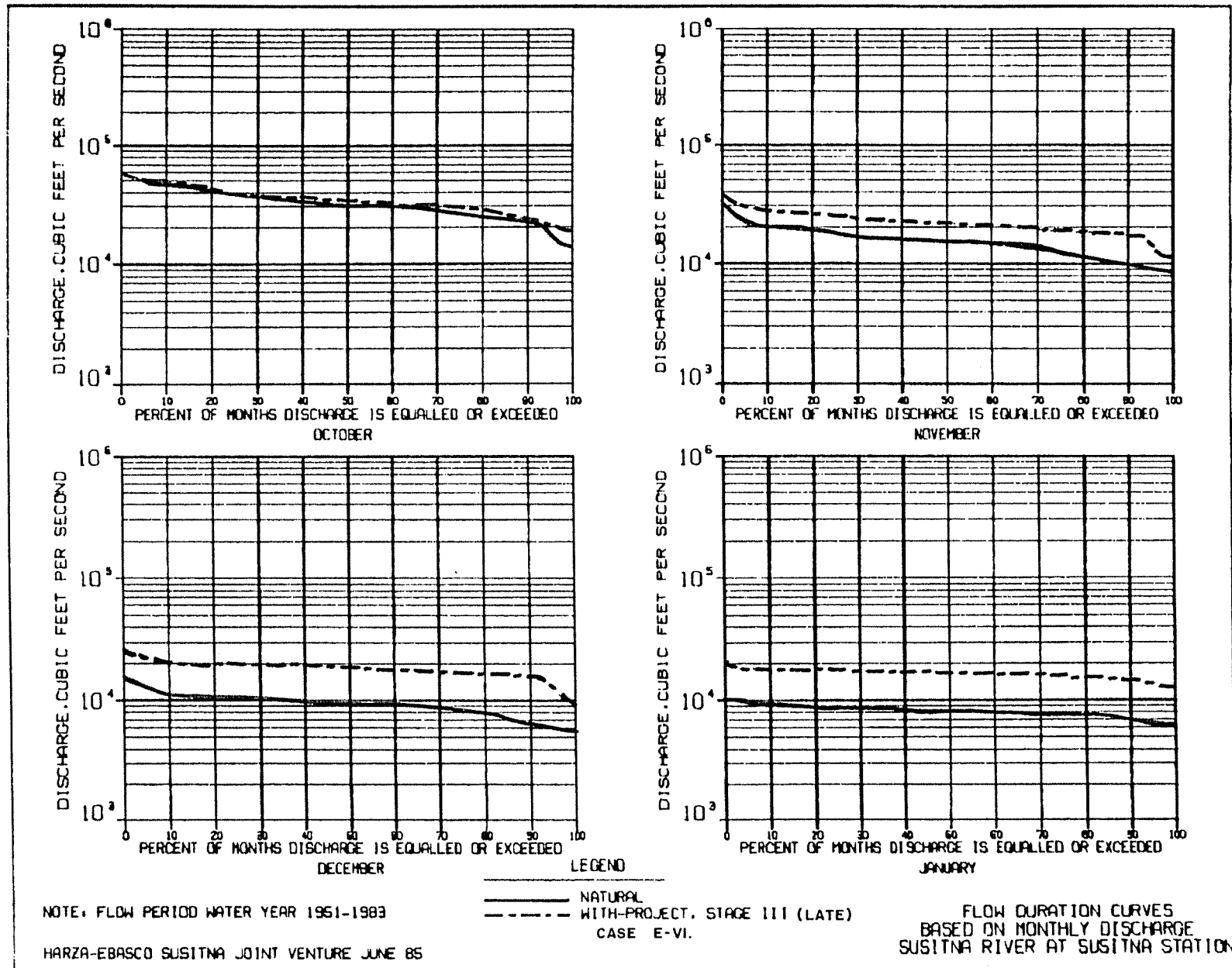


FIGURE E.2.4.250

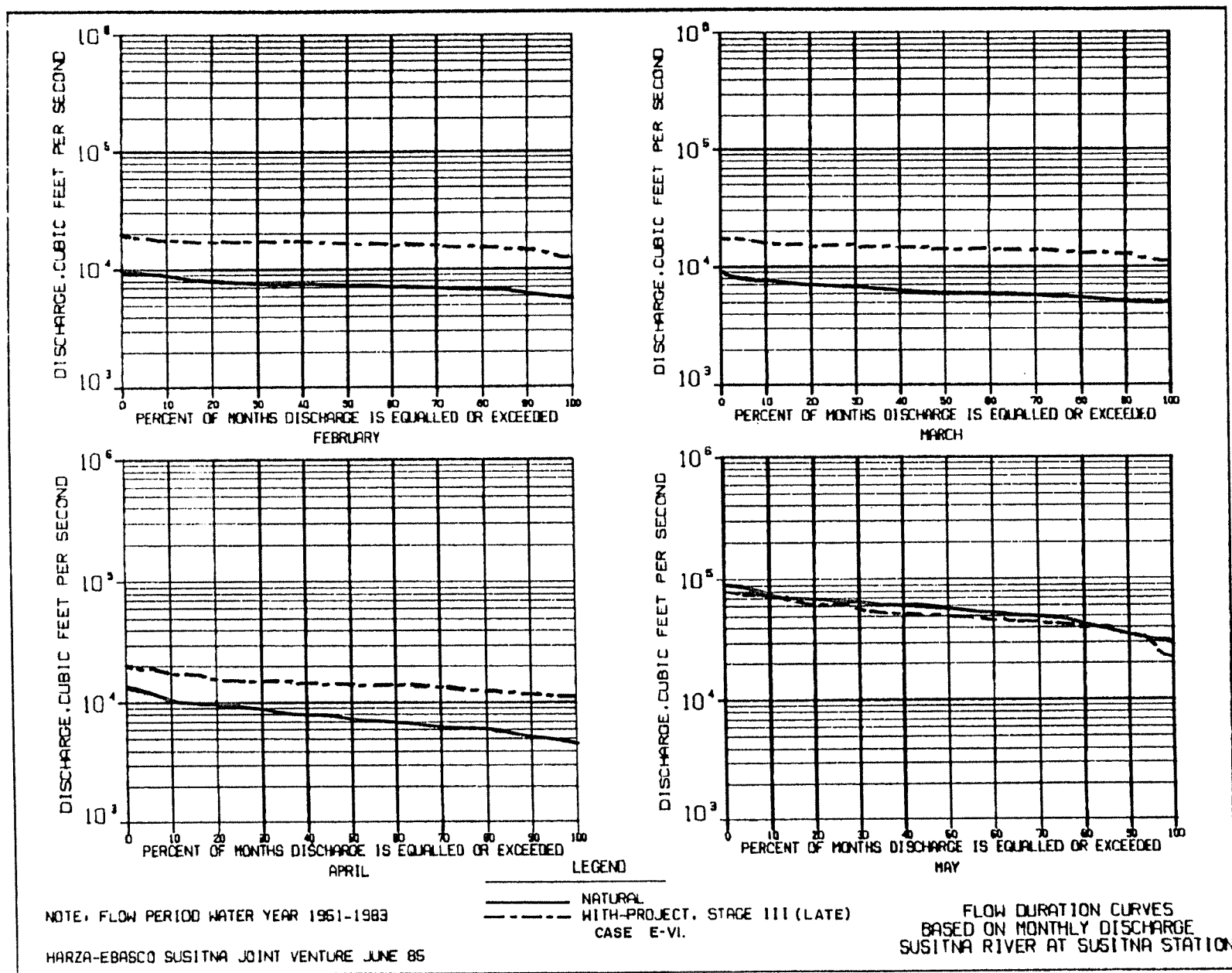


FIGURE E.2.4.250

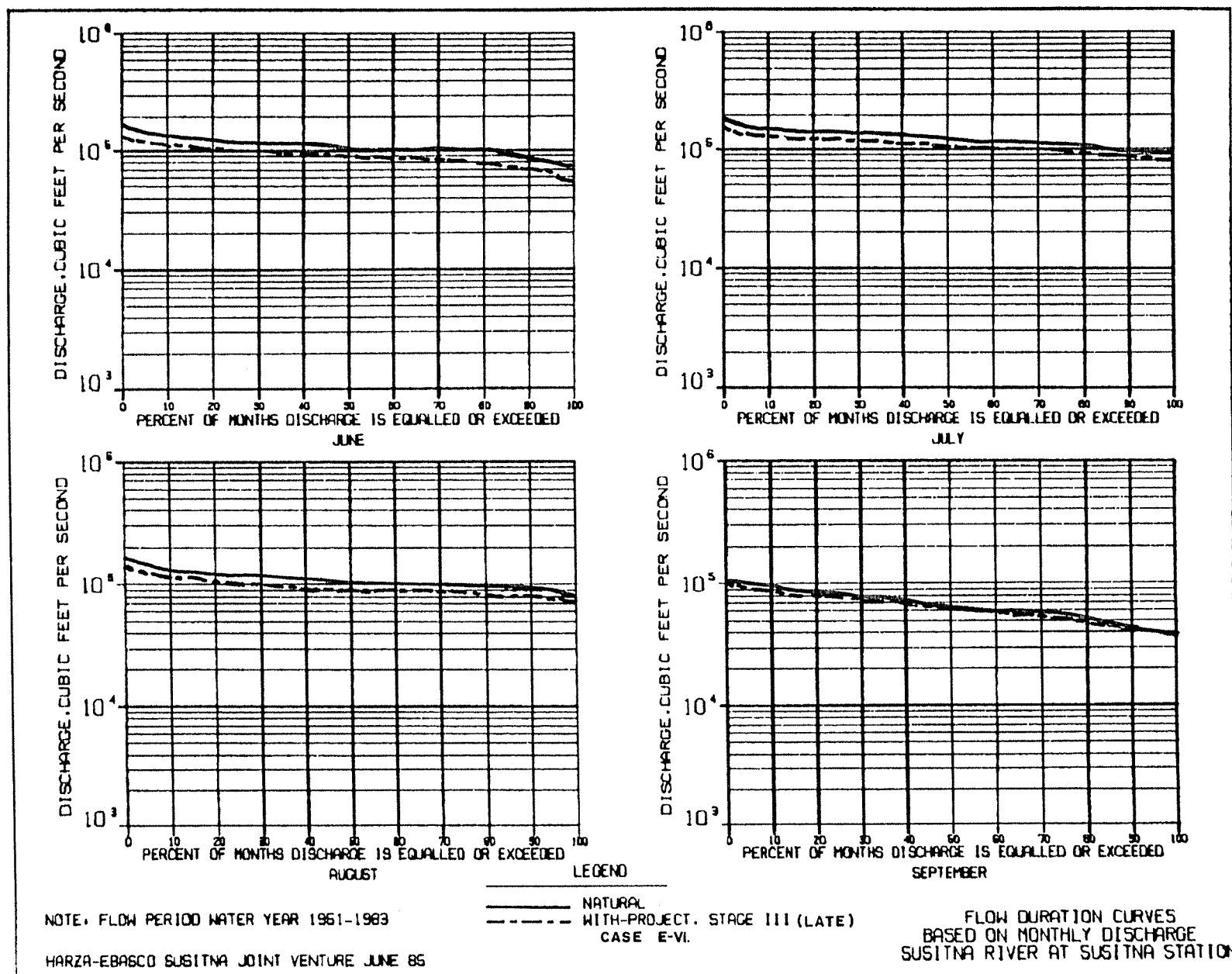
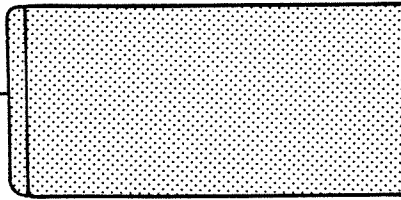
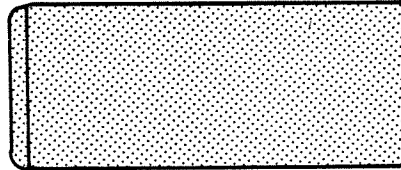


FIGURE E.2.4.250

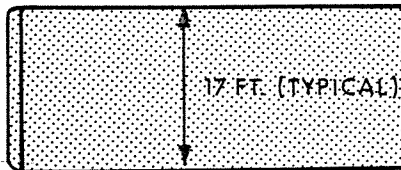
NORMAL MAXIMUM OPERATING  
RESERVOIR LEVEL (EL. 2185 FT.)



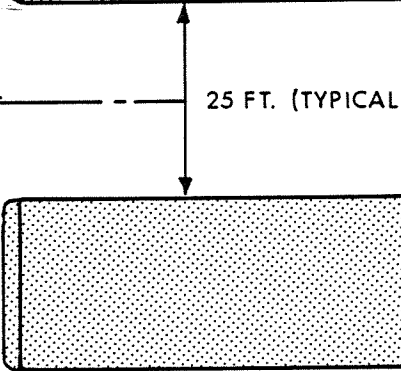
EL. 2150 FT. \_\_\_\_\_



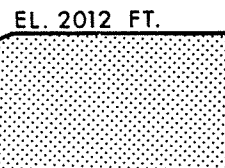
EL. 2108 FT. \_\_\_\_\_



MINIMUM OPERATING  
RESERVOIR LEVEL (EL. 2065 FT.) EL. 2066 FT. \_\_\_\_\_



EL. 2024 FT. \_\_\_\_\_

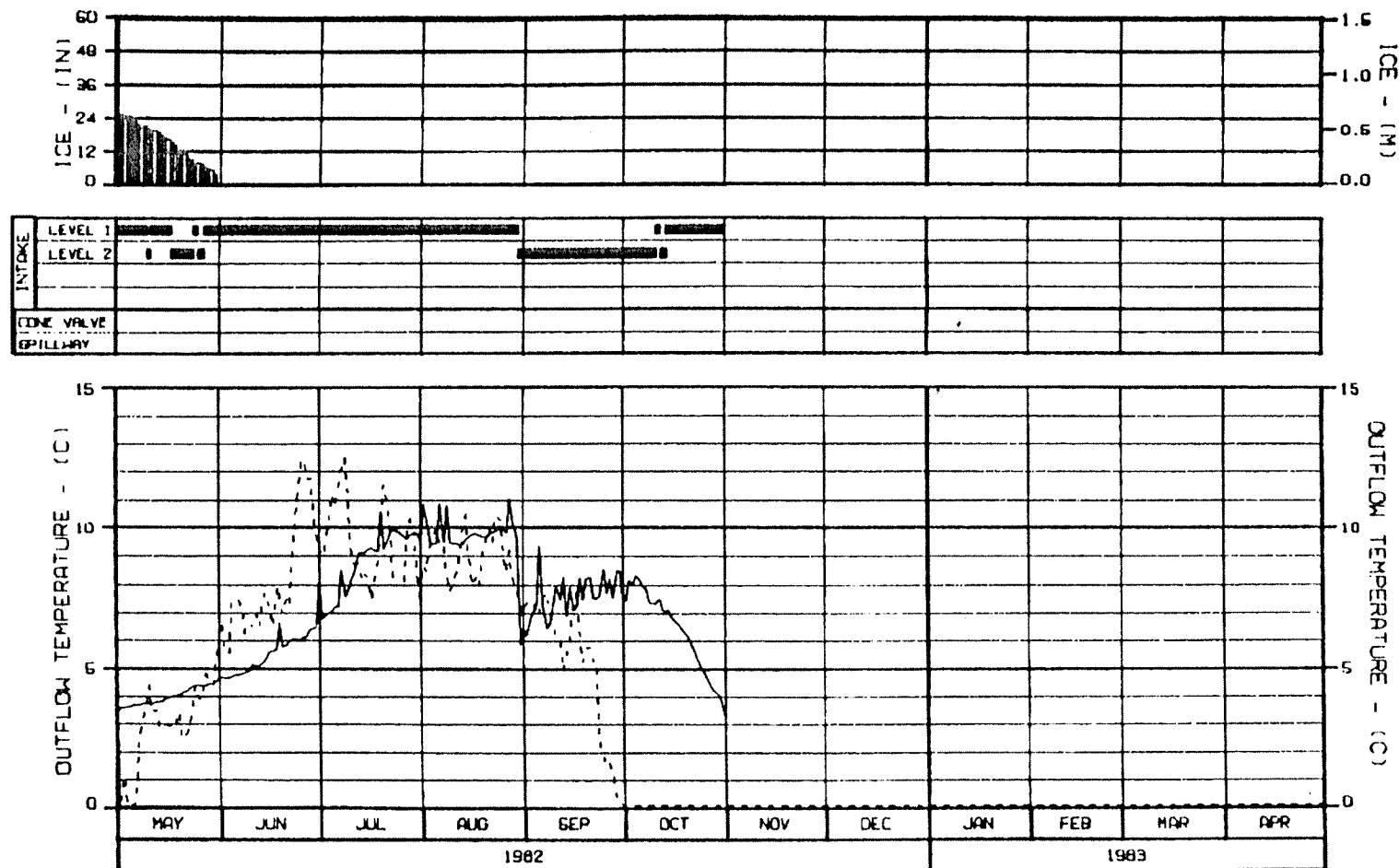


EL. 2012 FT.



# WATANA MULTILEVEL INTAKE STAGE III





LEGEND: CASE: MM DC8120E - DEVIL CANYON OPERATION W/HATANA 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 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

SUGITNA PROJECT

GYRASH MODEL

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

HARZA-EBASCO JOINT VENTURE

CHECKED: ELLIOTT

28 MAY 83

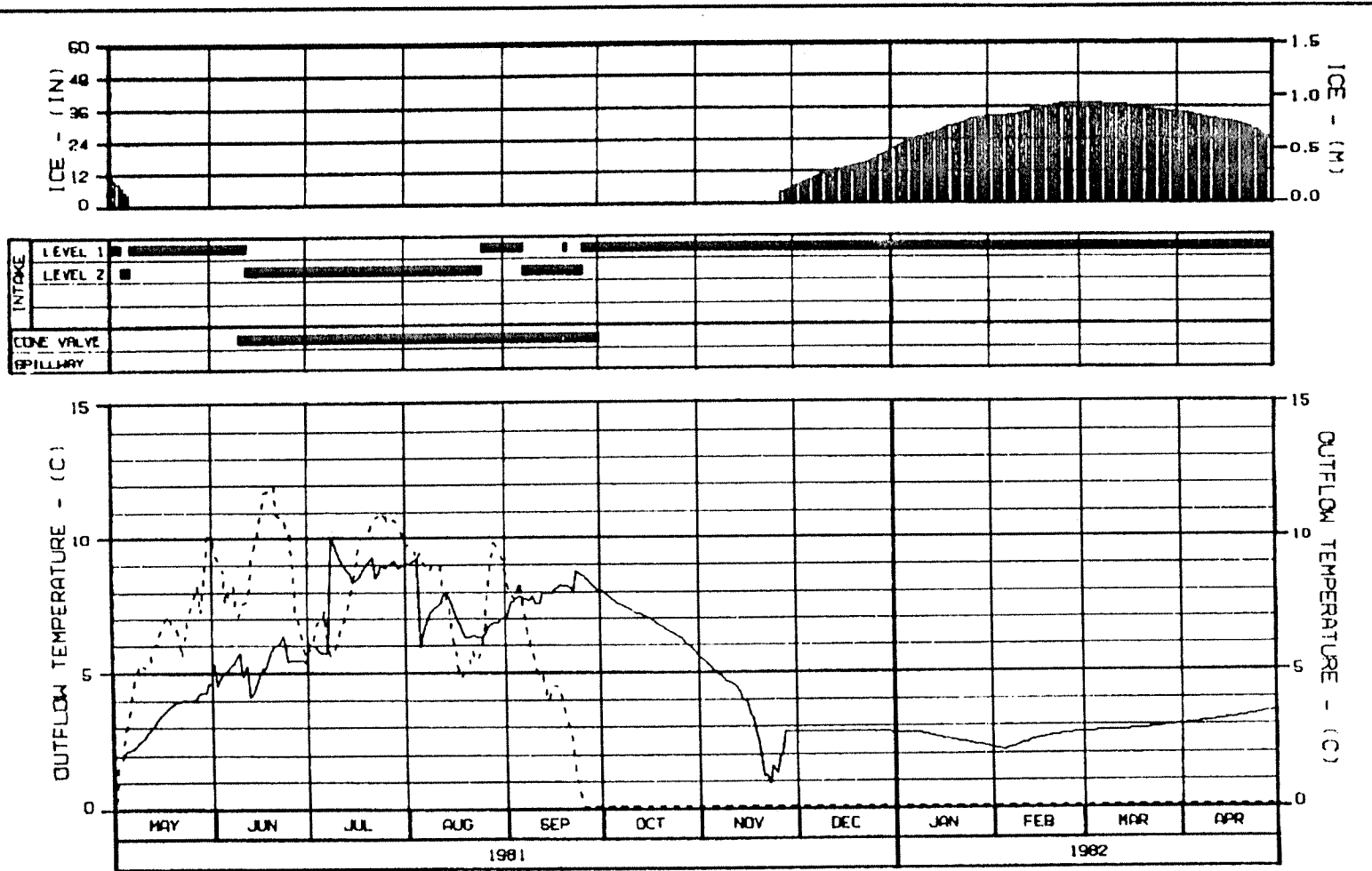
42-010-04

FIGURE E.2.4.253









LEGEND: CASE: DC81200 - DEVIL CANYON OPERATION W/HATANA 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 1376 FT (419.10 M)
  3. CONE VALVE AT ELEVATION 990 FT (301.76 M)
  4. SPILLWAY CREST AT ELEVATION 1404 FT (427.94 M)
  5. FOR COMPARISON WITH PROPOSED PROJECT.

|                                                                               |              |
|-------------------------------------------------------------------------------|--------------|
| ALASKA POWER AUTHORITY                                                        |              |
| GUSTINA PROJECT                                                               | DYRESA MODEL |
| DEVIL CANYON<br>LATE STAGE III<br>OUTFLOW TEMPERATURE<br>AND ICE GROWTH (E-I) |              |
| HARZA-EBASCO JOINT VENTURE                                                    |              |
| CHICAGO, ILLINOIS                                                             | 42-010-04    |

FIGURE E.2.4.256

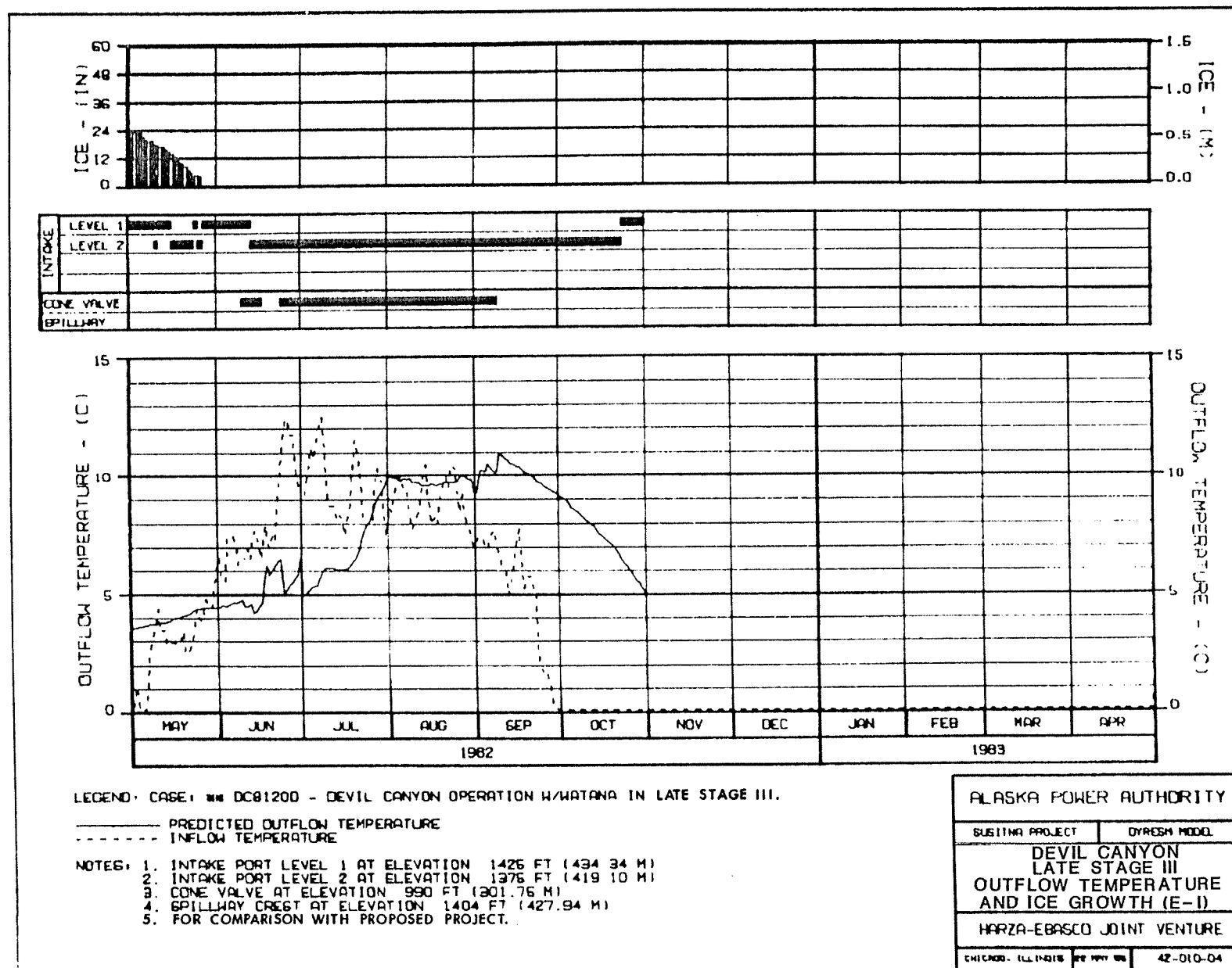


FIGURE E.2.4.257

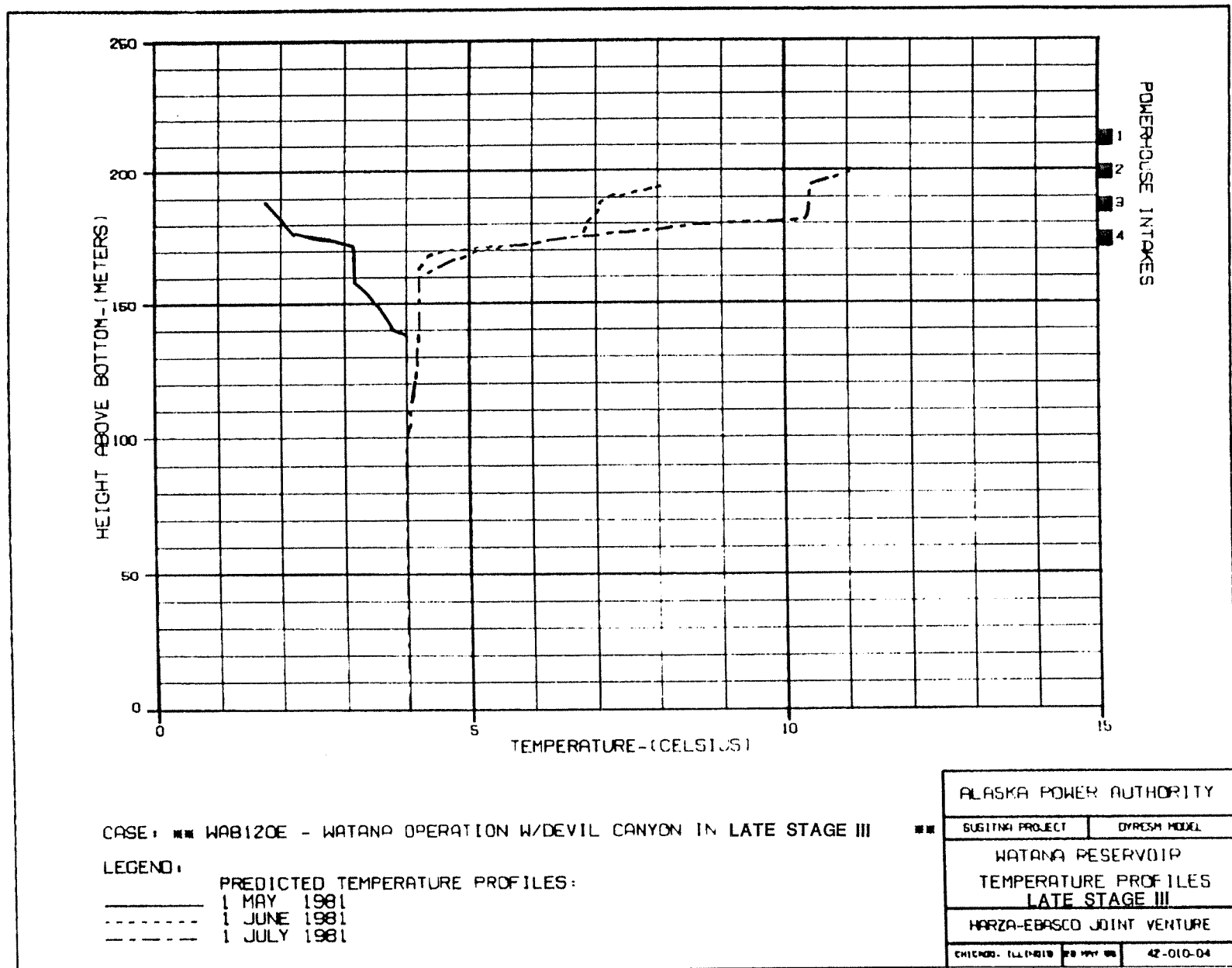
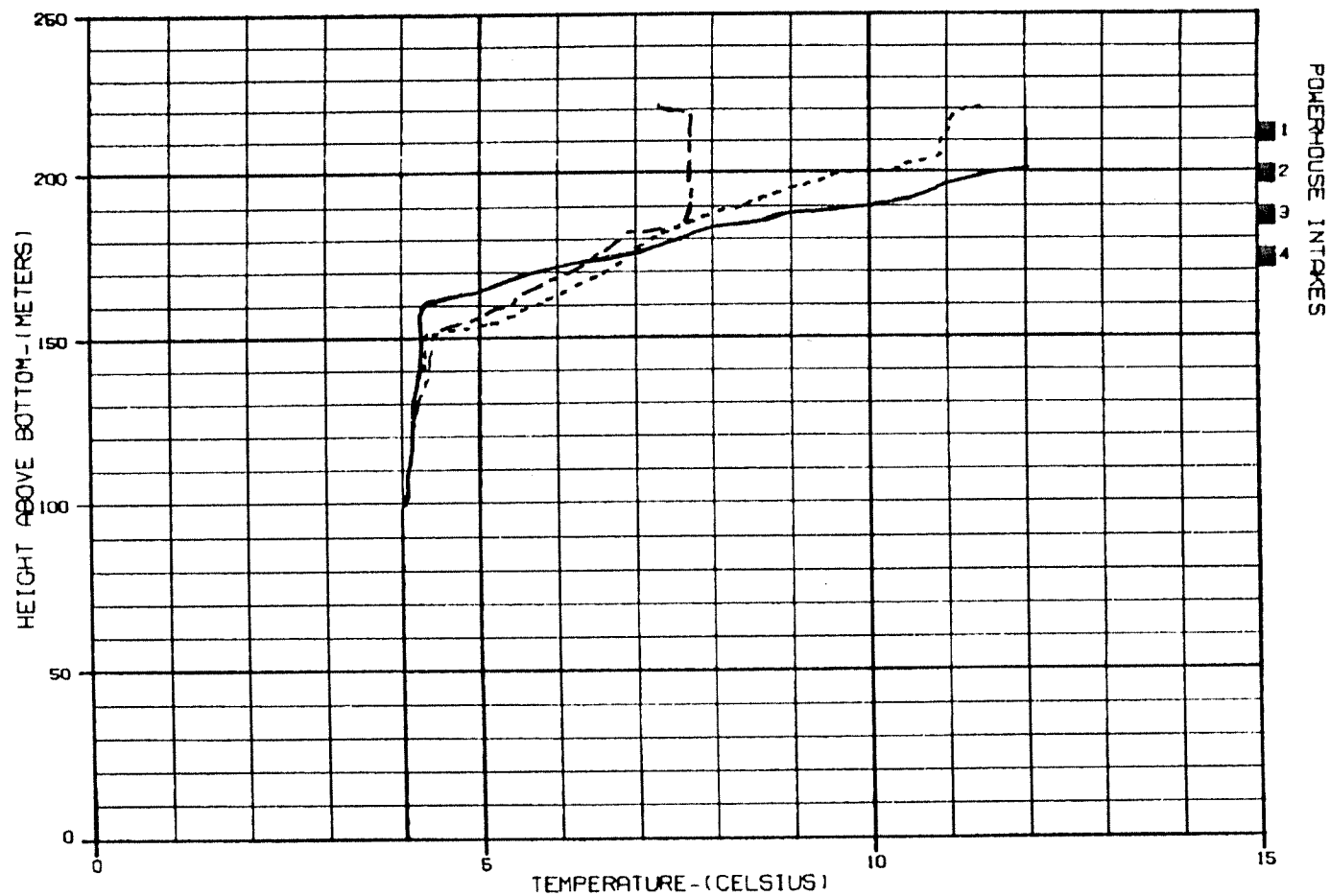


FIGURE E.2.4.258



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

SUSTAINA PROJECT

DEVRESH MODEL

WATANA RESERVOIR  
 TEMPERATURE PROFILES  
 LATE STAGE III

WARZA-EBASCO JOINT VENTURE

CHICAGO, ILLINOIS

7/8 1981

42-010-04

FIGURE E.2.4.259

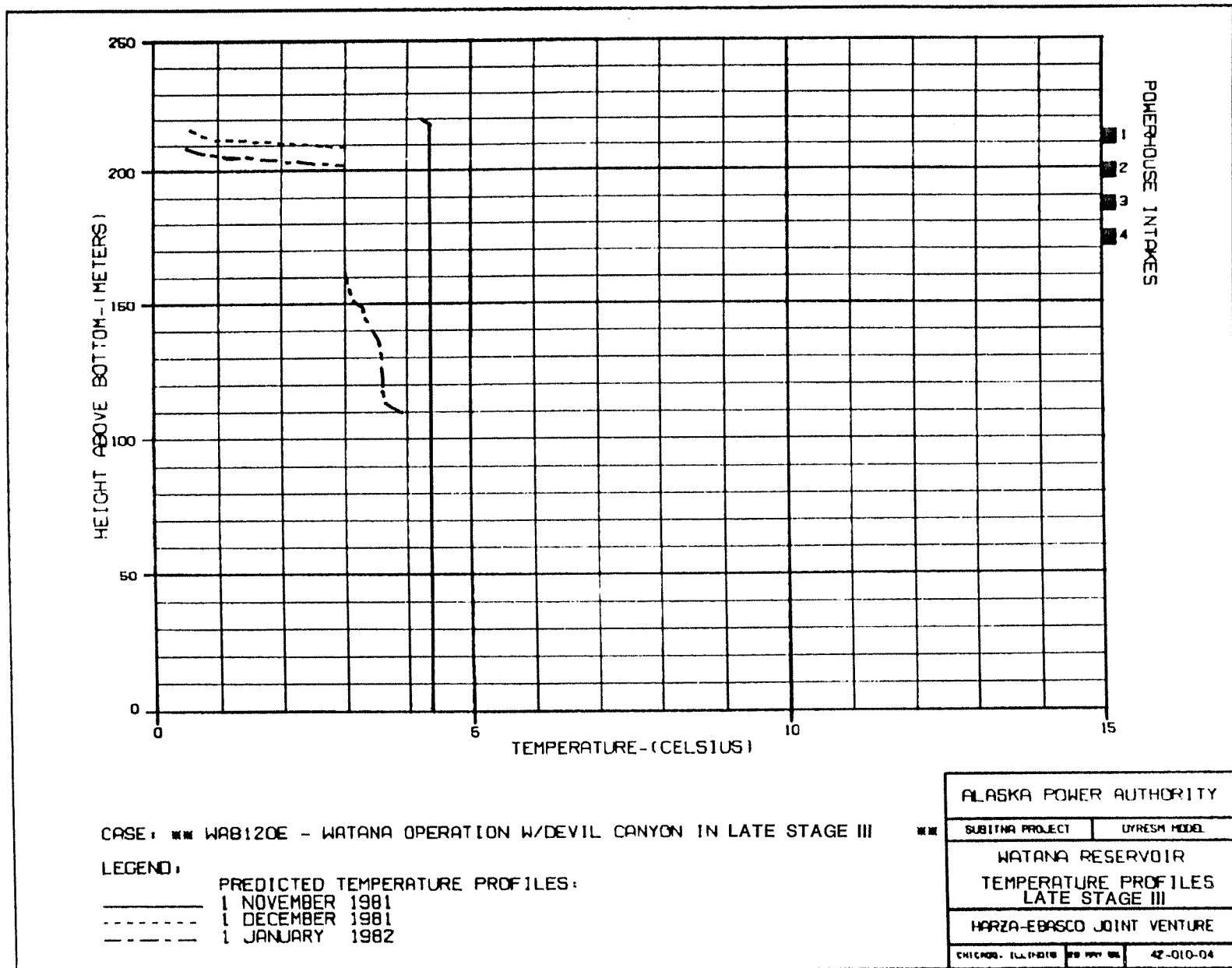


FIGURE E.2.4.260

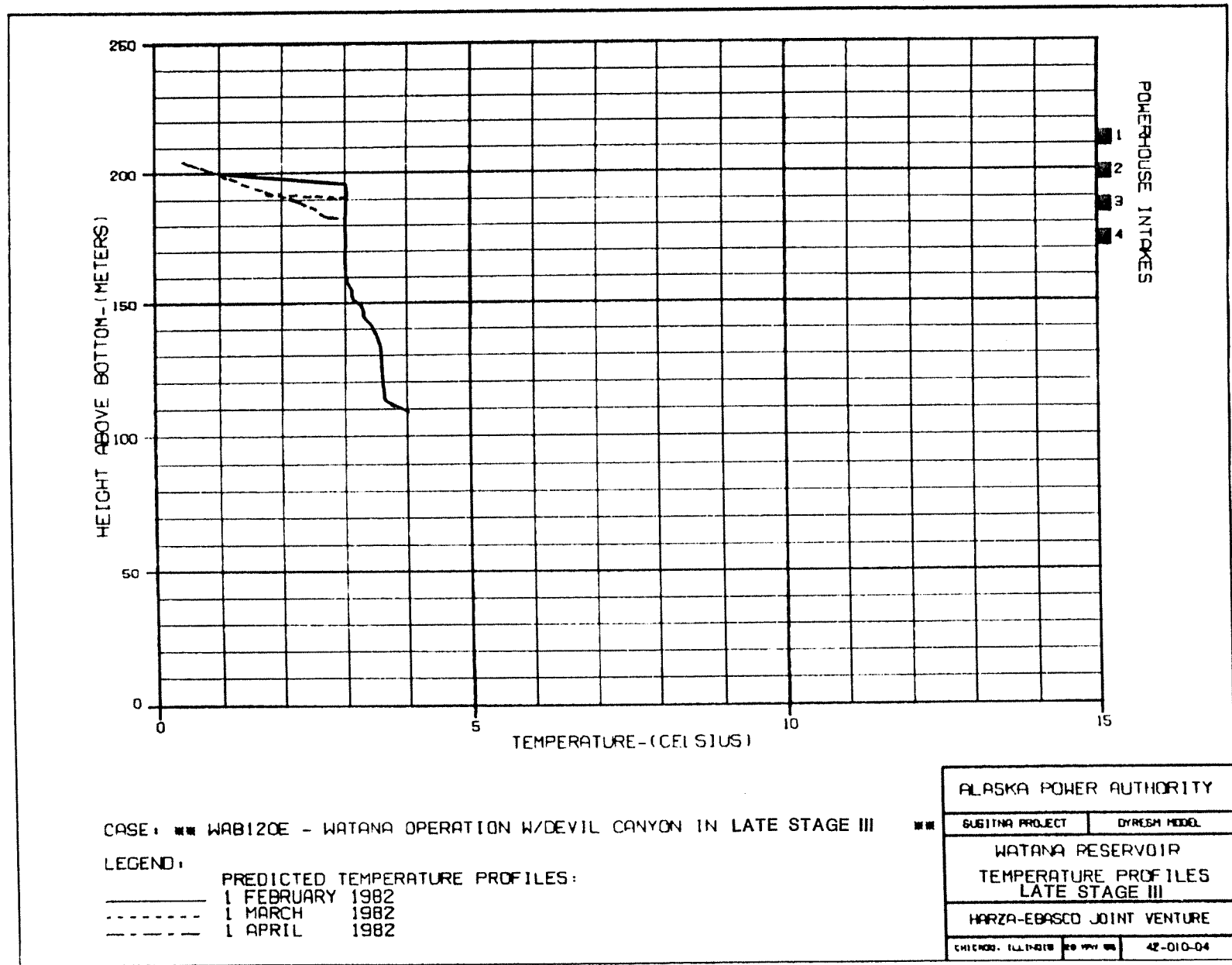


FIGURE E.2.4.261

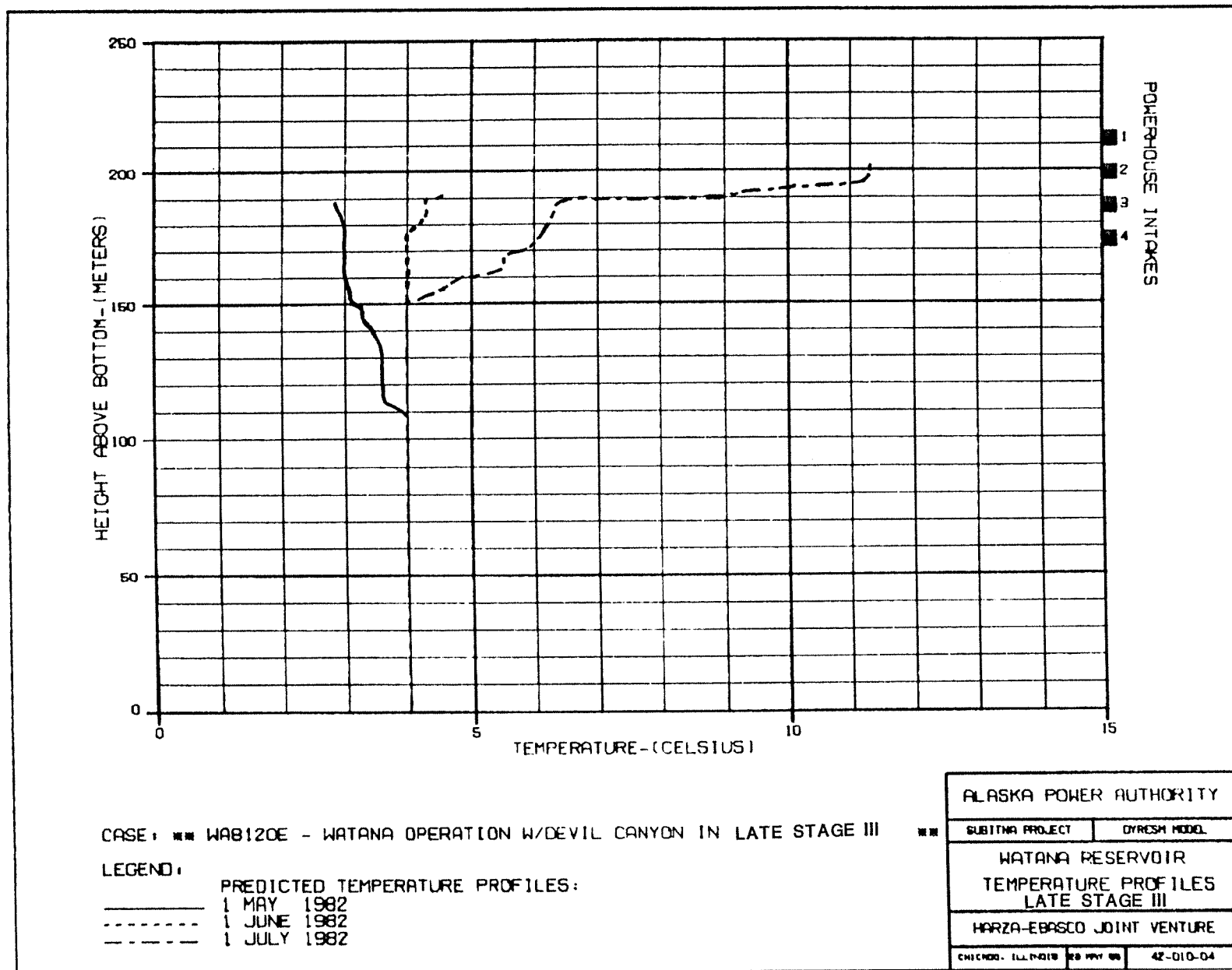


FIGURE E.2.4.262



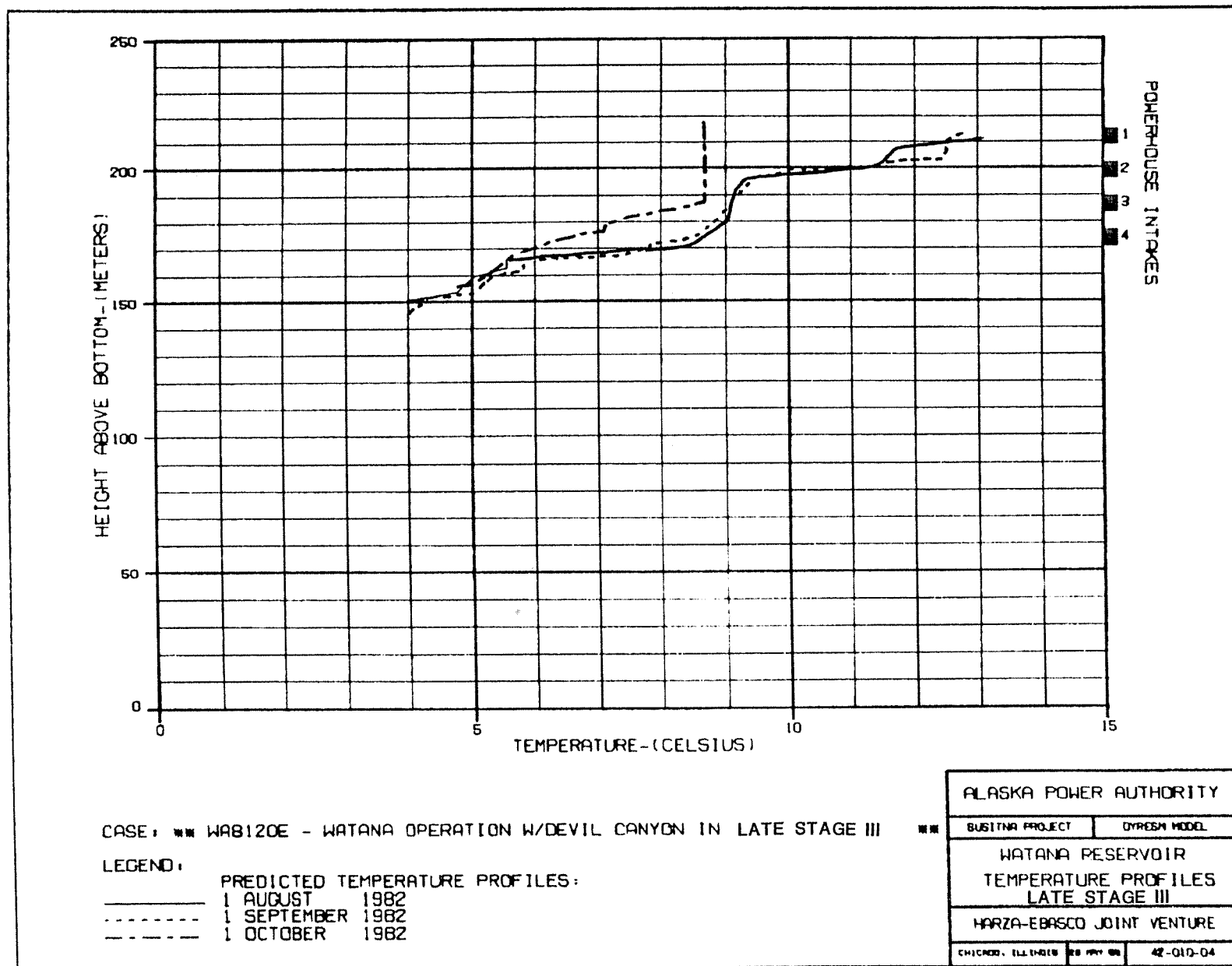
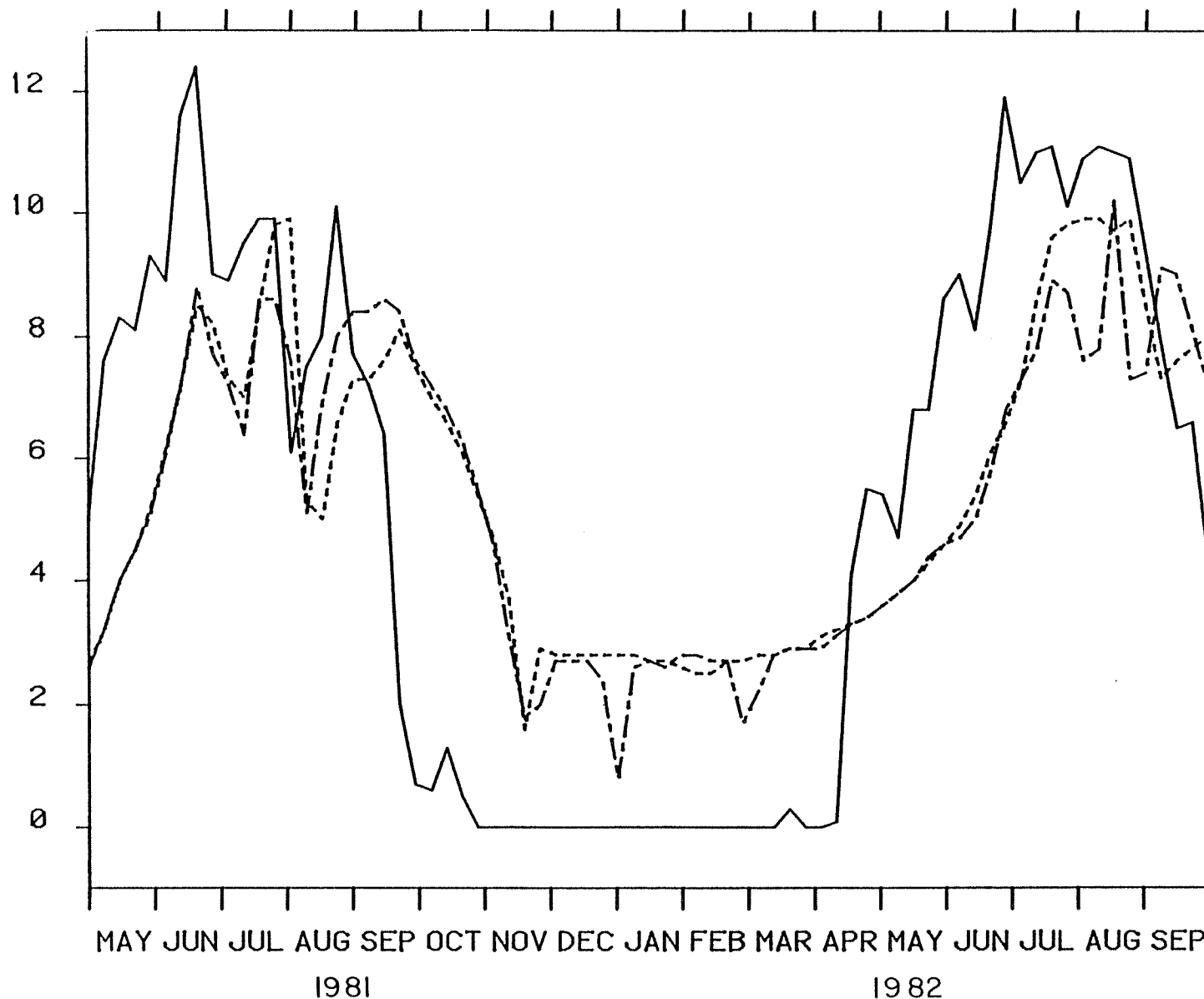


FIGURE E.2.4.263

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

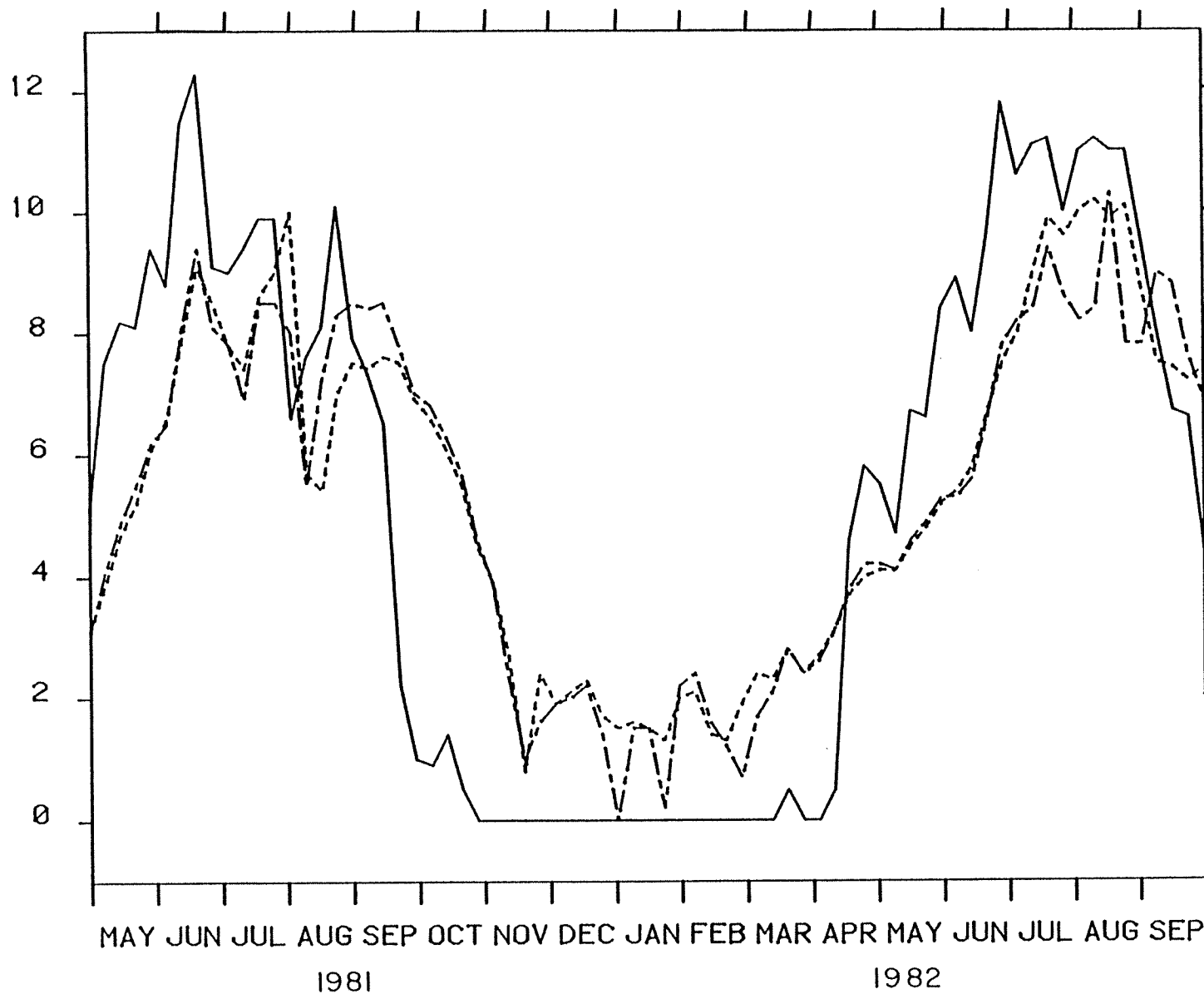
LEGEND

- SIMULATED NATURAL TEMPERATURES
- - - SIMULATED TEMPERATURE STAGE 3 OF PROPOSED PROJECT
- · · SIMULATED TEMPERATURE 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: _____                          | BY: _____   |
| APPROVED: _____                      | DATE: _____ |

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

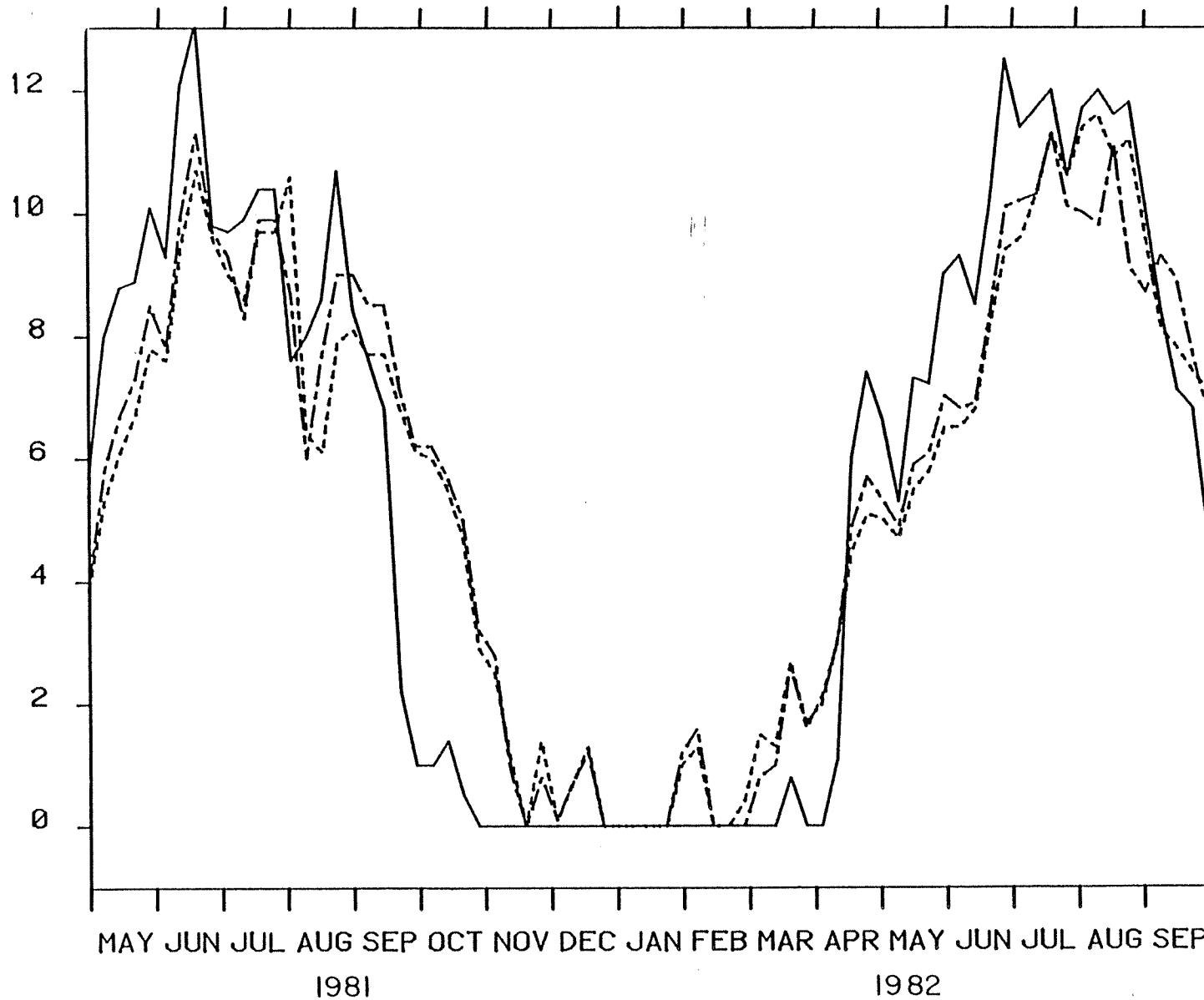
LEGEND

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

|                                      |              |
|--------------------------------------|--------------|
| ALASKA POWER AUTHORITY               |              |
| SUSITNA HYDROELECTRIC PROJECT        |              |
| SIMULATED SUSITNA RIVER TEMPERATURES |              |
| RIVER MILE 130                       |              |
| LATE STAGE III                       |              |
| TABLE E-2.4.265                      |              |
| DATE: 10/1/82                        | BY: J. H. H. |
| APPROVED: 10/1/82                    |              |

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

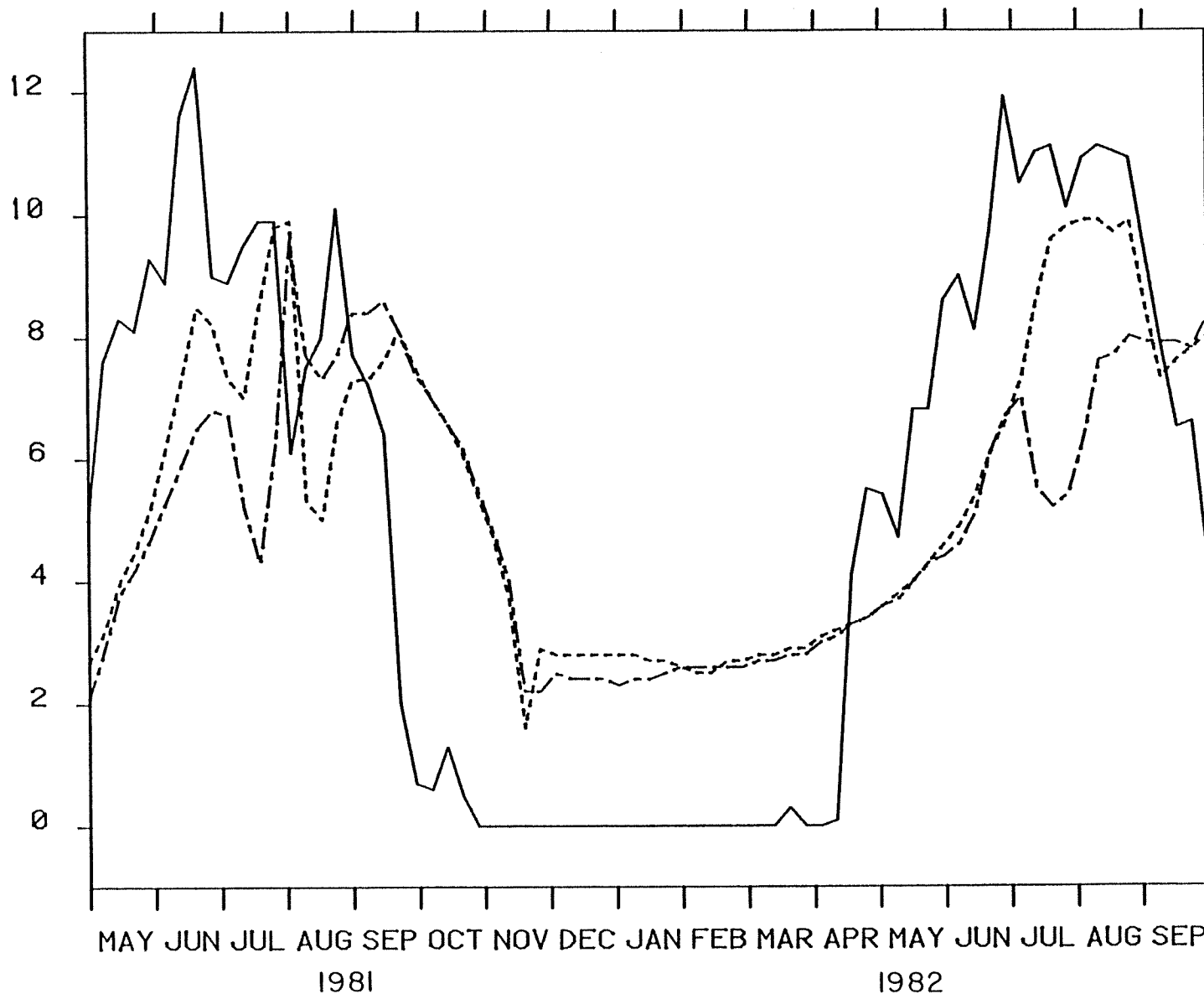
LEGEND

- 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               |                 |
| SUSITNA INTERCONNECTING PROJECT      |                 |
| SIMULATED SUSITNA RIVER TEMPERATURES |                 |
| RIVER MILE 100                       |                 |
| LATE STAGE III                       |                 |
| DATE: MAY 1982                       | BY: [Signature] |
| APPROVED: [Signature]                | DATE: [Blank]   |

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 TEMPERATURE  
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

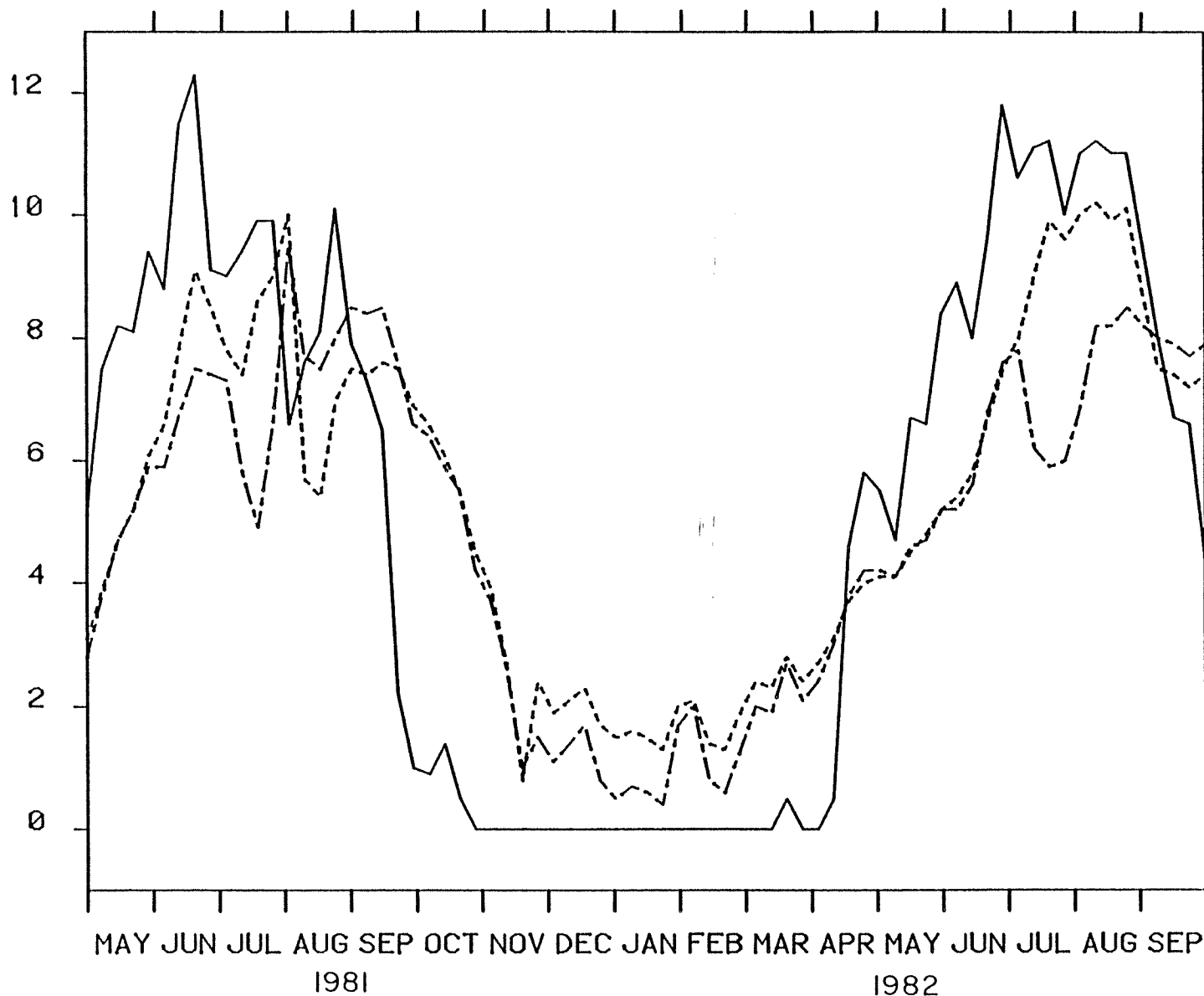
LEGEND

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

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

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

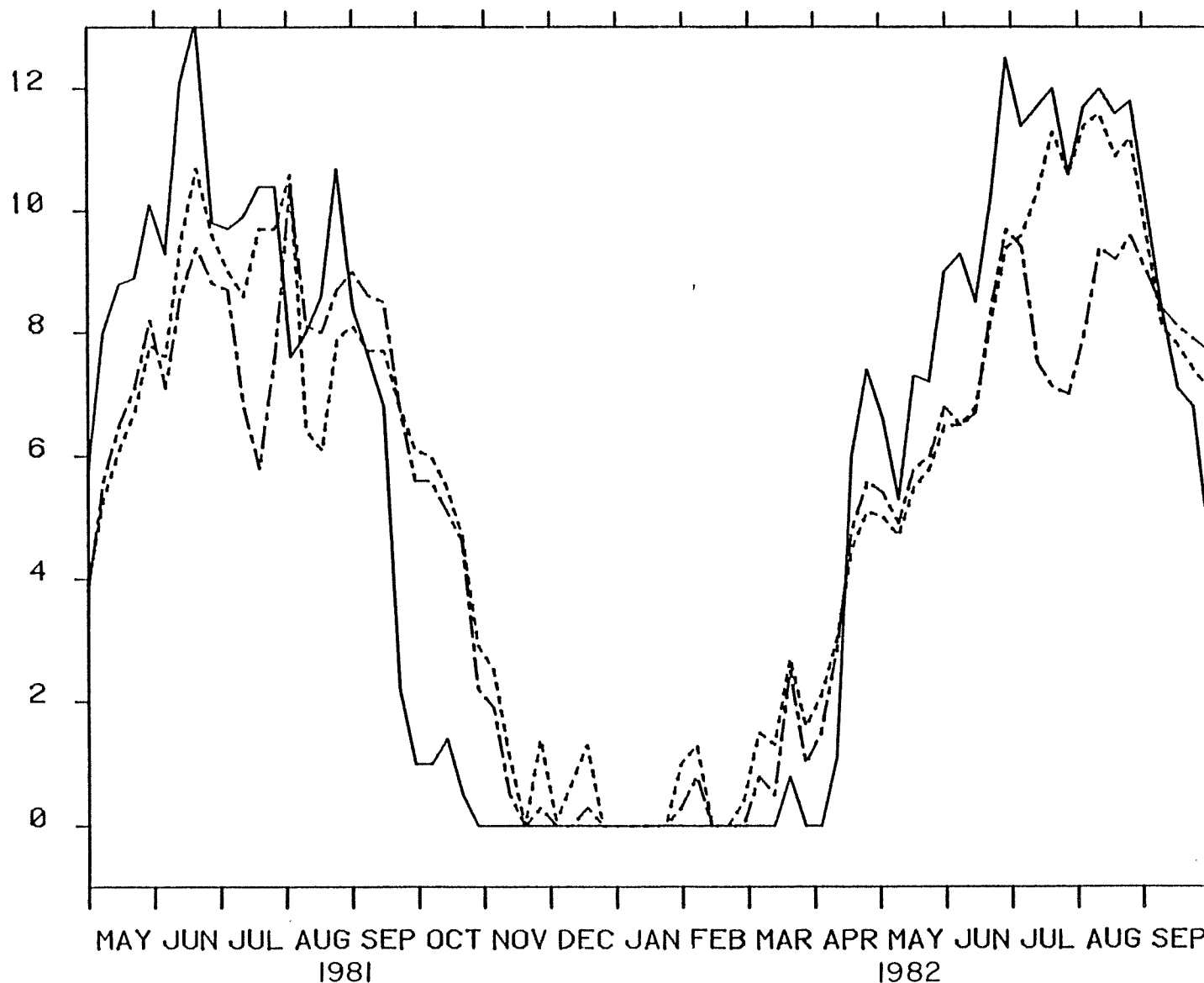
LEGEND

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

|                                      |  |
|--------------------------------------|--|
| ALASKA POWER AUTHORITY               |  |
| BUSITNA HYDROELECTRIC PROJECT        |  |
| SIMULATED BUSITNA RIVER TEMPERATURES |  |
| RIVER MILE 130                       |  |
| STAGE III                            |  |
| DATE PLOTTED                         |  |
| BY                                   |  |

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 TEMPERATURE 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 100 STAGE III |                 |
| DATE: _____                                                   | BY: _____       |
| REVISION: _____                                               | APPROVED: _____ |

FIGURE E.2.4.269

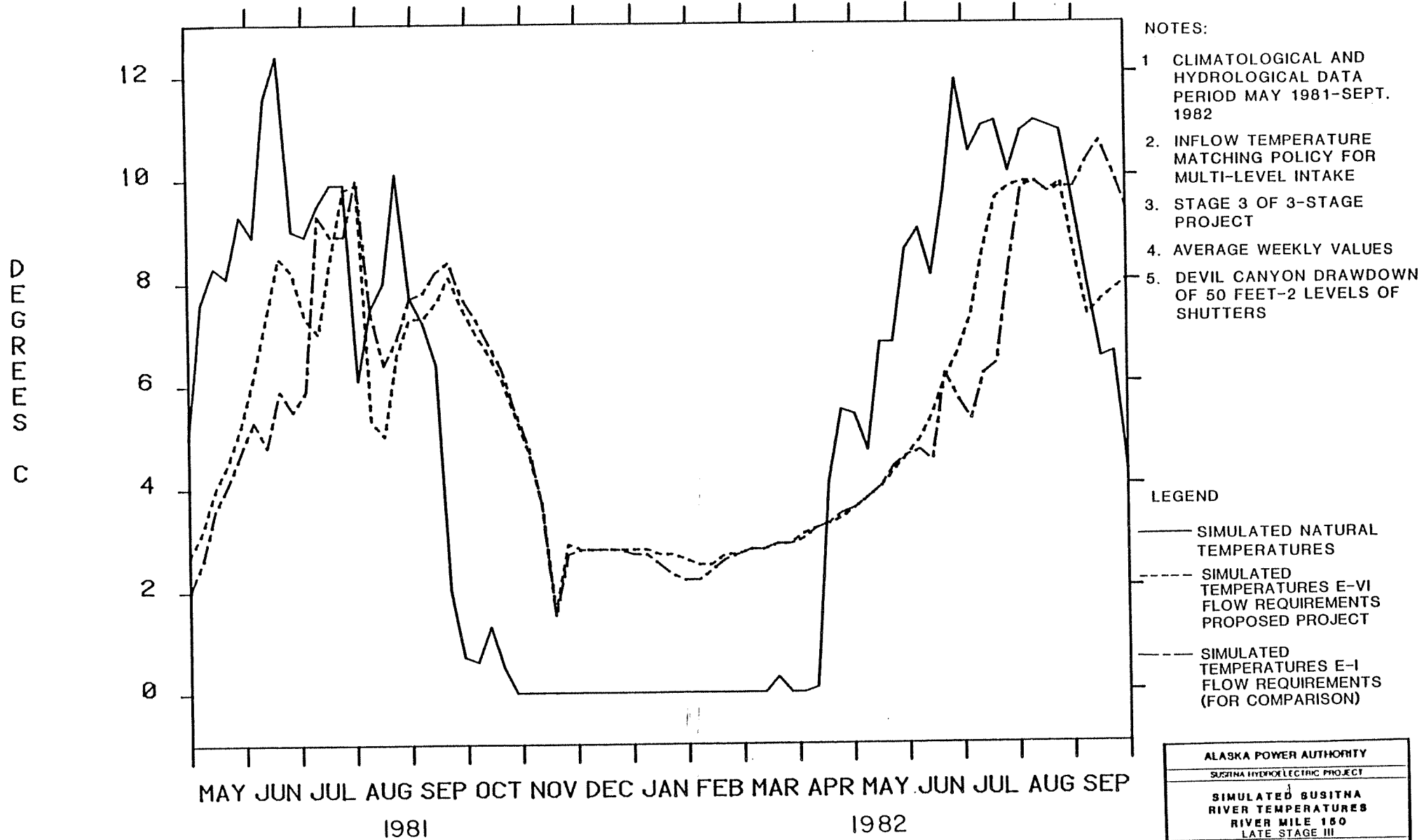
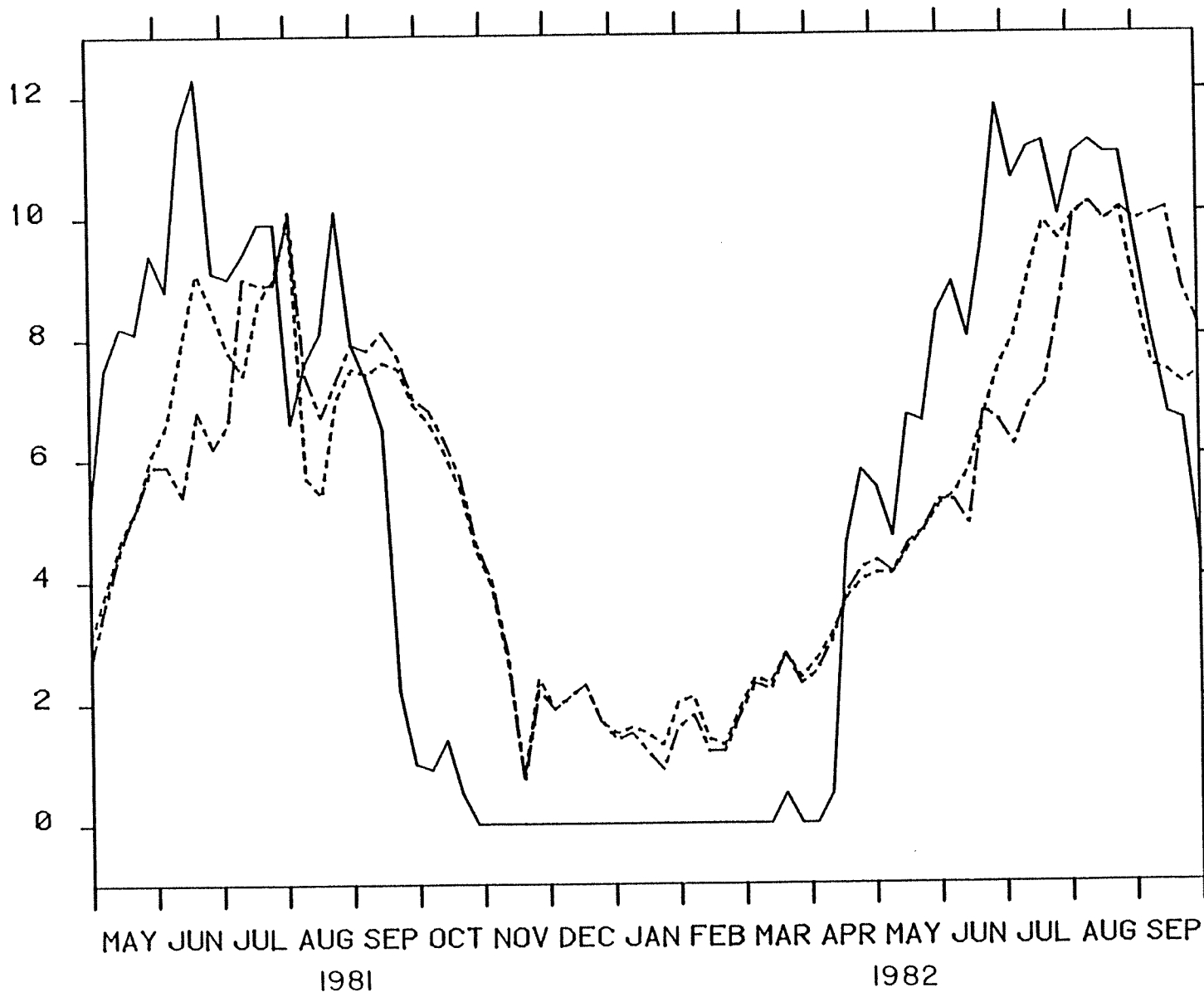


FIGURE E.2.4.270



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

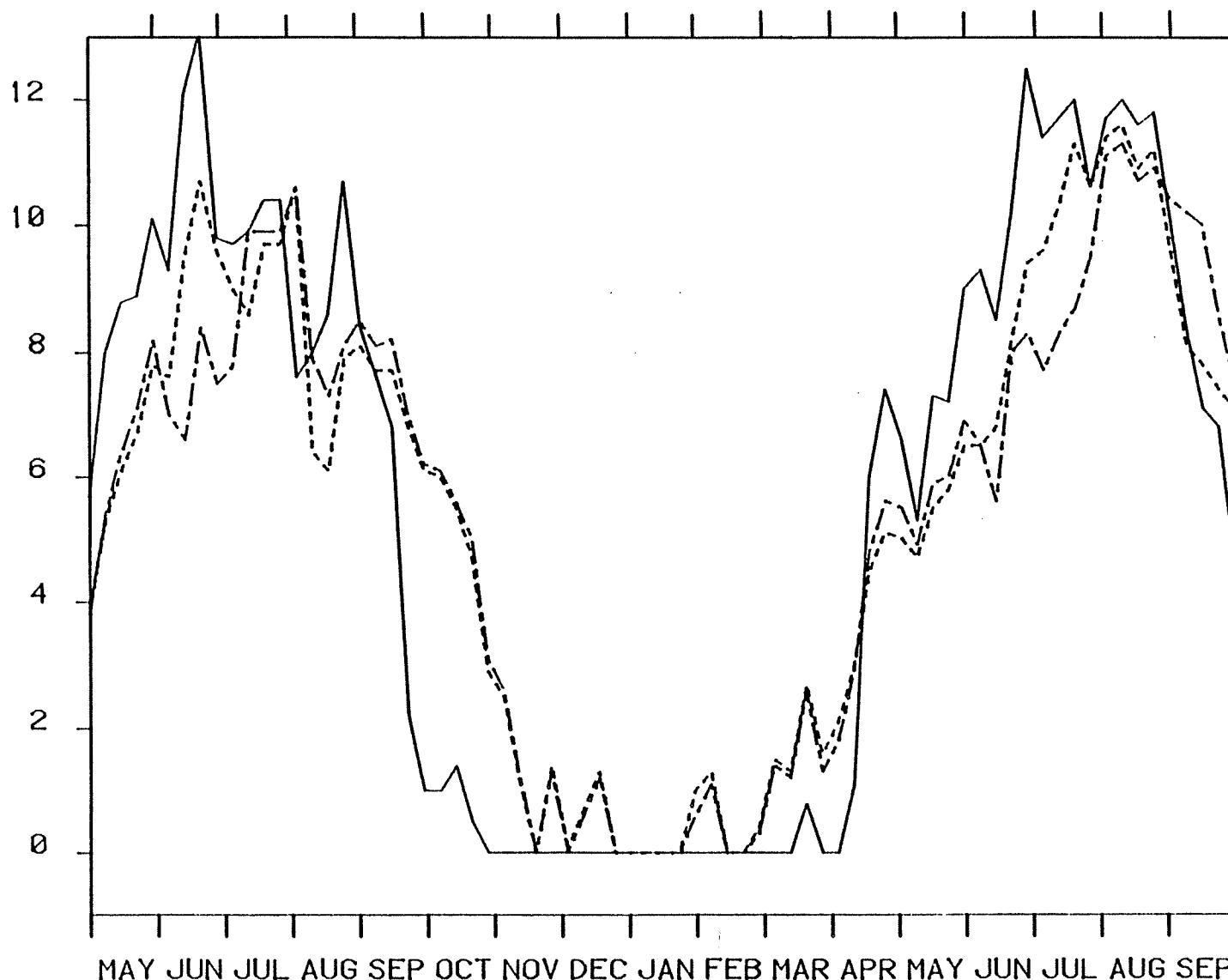
LEGEND

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

|                                      |                  |
|--------------------------------------|------------------|
| ALASKA POWER AUTHORITY               |                  |
| BUSITNA HYDROELECTRIC PROJECT        |                  |
| SIMULATED BUSITNA RIVER TEMPERATURES |                  |
| RIVER MILE 130                       |                  |
| LATE STAGE III                       |                  |
| DATE: 10/1/82                        | BY: J. H. HARRIS |
| APPROVED: 10/1/82                    | BY: J. H. HARRIS |

FIGURE E.2.4.271

DEGREES C



NOTES:

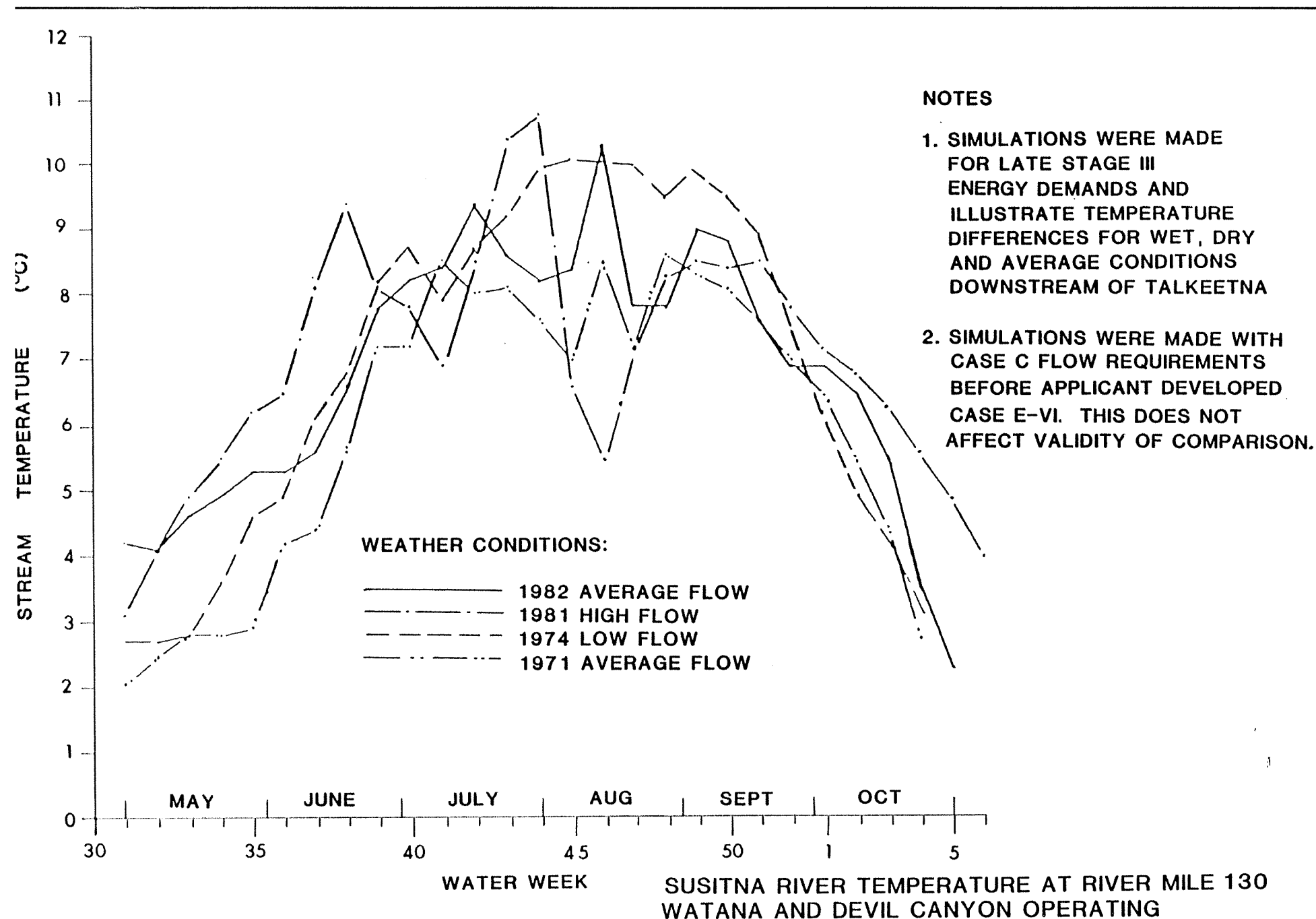
1. CLIMATOLOGICAL AND HYDROLOGICAL DATA PERIOD MAY 1981-SEPT. 1982
2. INFLOW TEMPERATURE MATCHING POLICY FOR MULTI-LEVEL INTAKE
3. STAGE 3 OF 3 STAGE PROJECT
4. AVERAGE WEEKLY VALUES
5. TEMPERATURES SIMULATED BY SNTMP FOR PERIOD NOVEMBER-MARCH SHOULD BE USED WITH CAUTION AS AN ICE COVER MAY EXIST ON 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

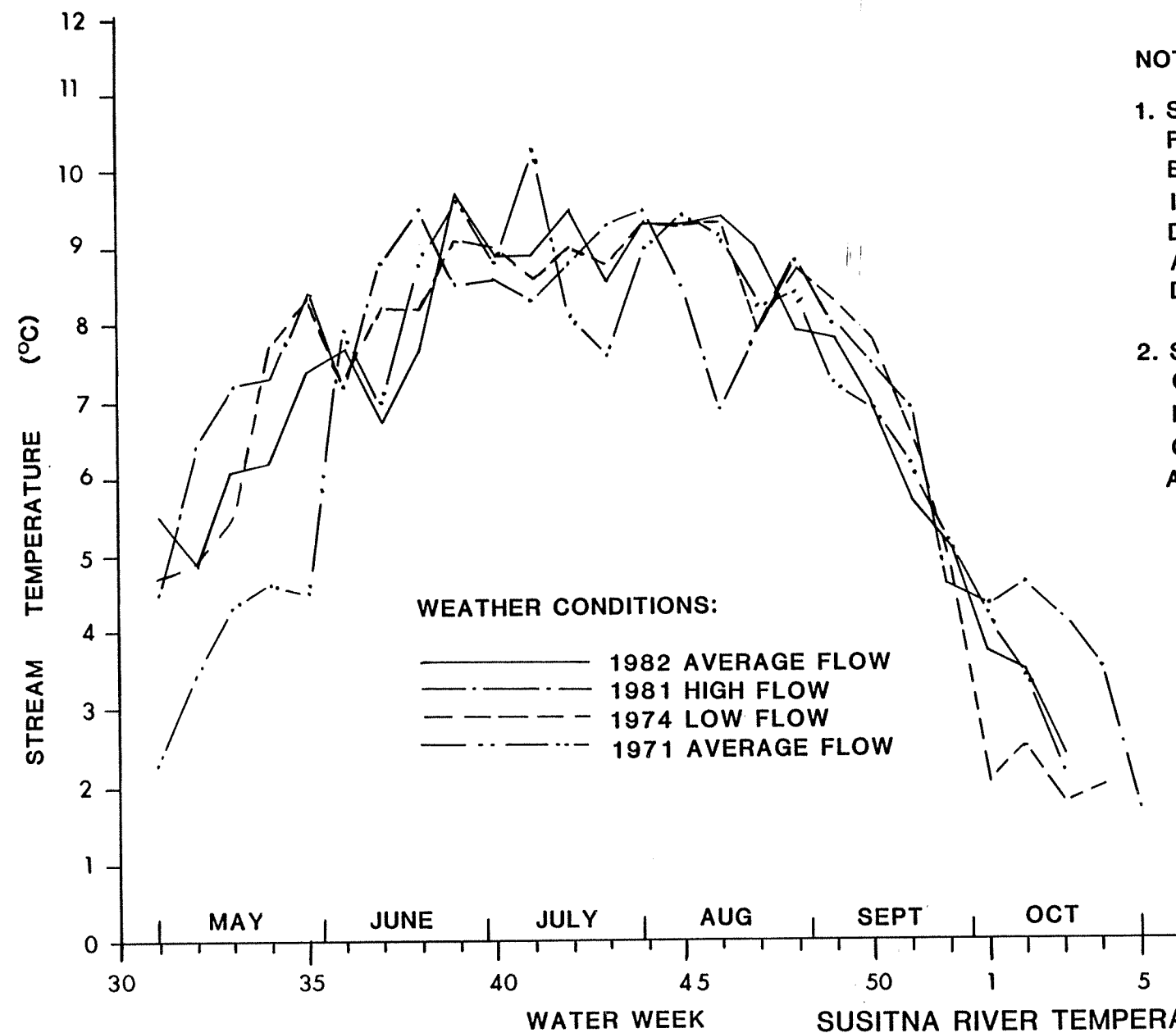
LEGEND

- 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. A. B. |
| FIGURE E.2.4.272                     |              |

FIGURE E.2.4.272





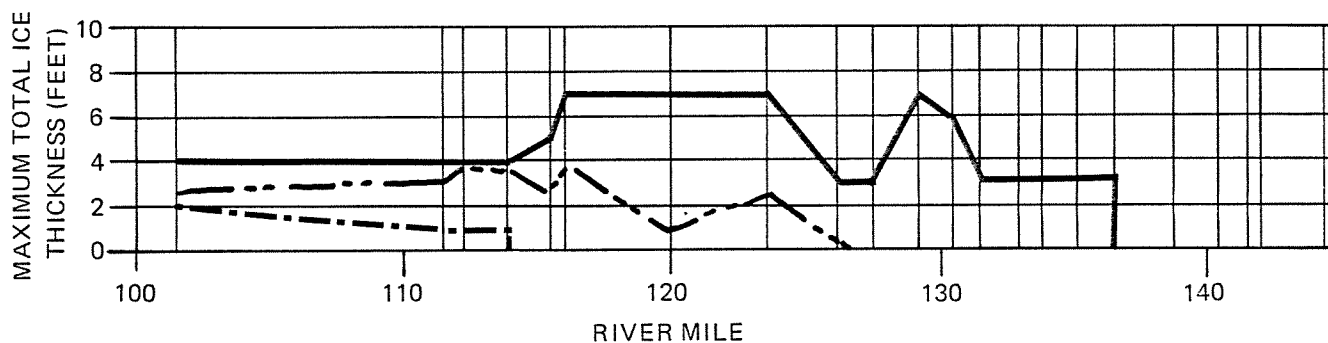
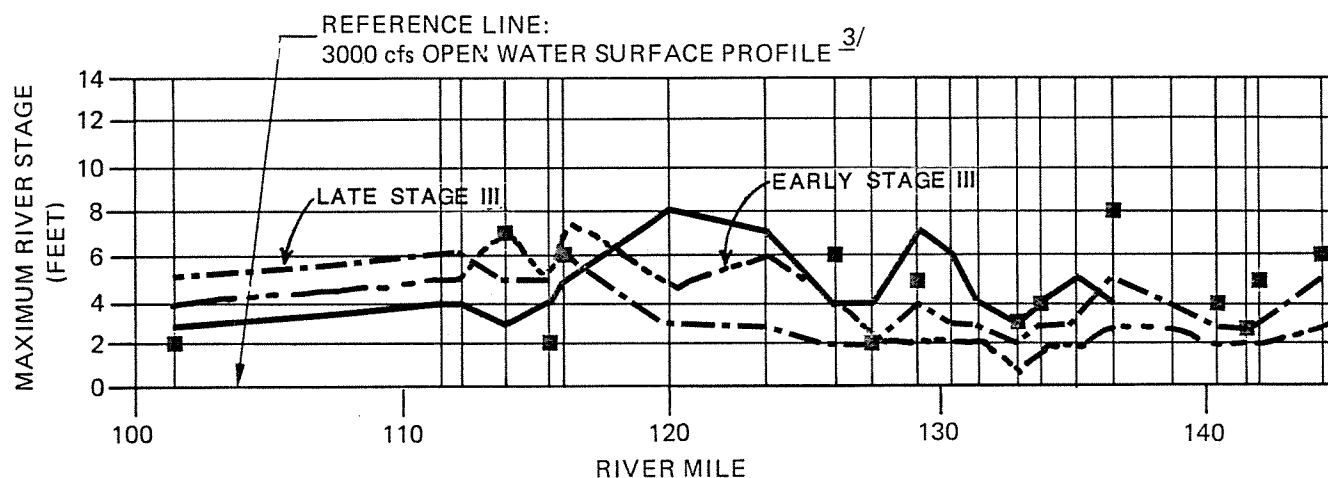
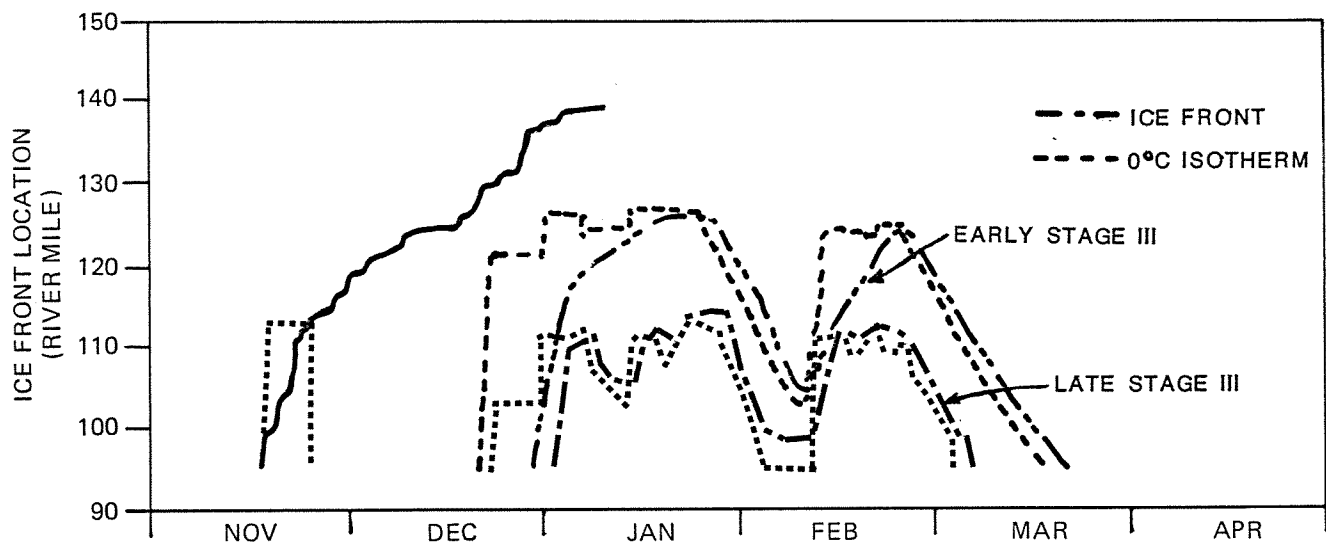
#### NOTES

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.

#### WEATHER CONDITIONS:

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

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



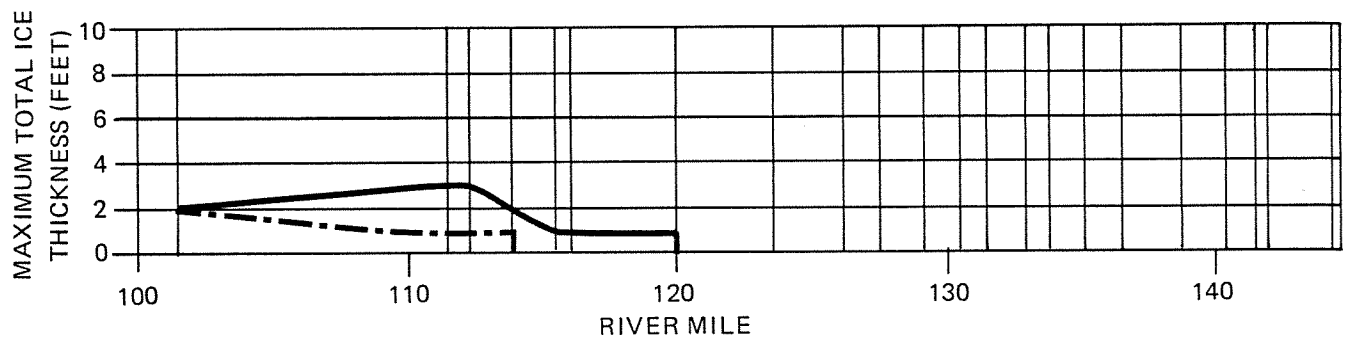
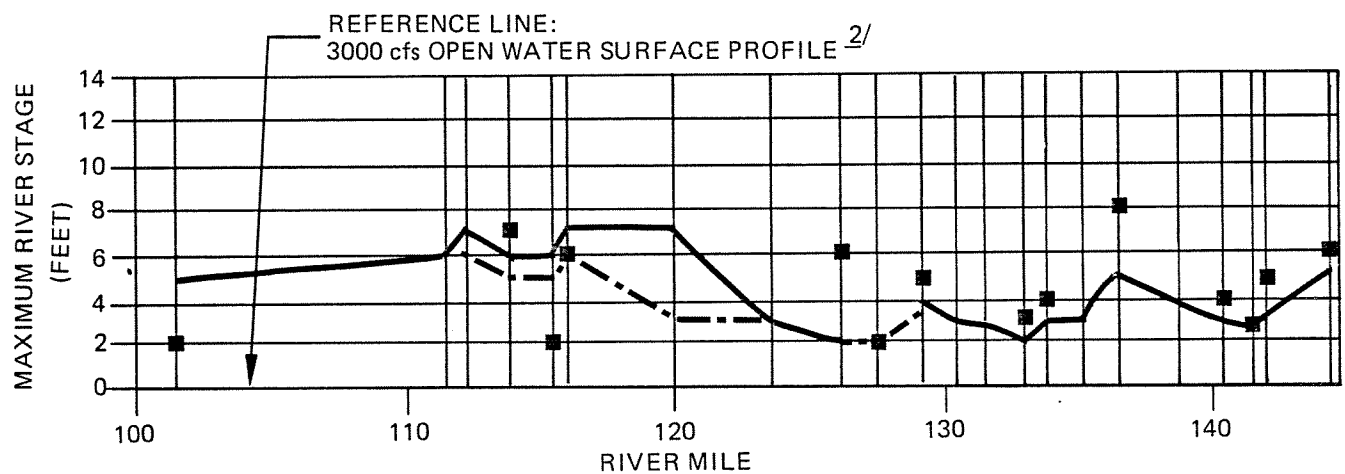
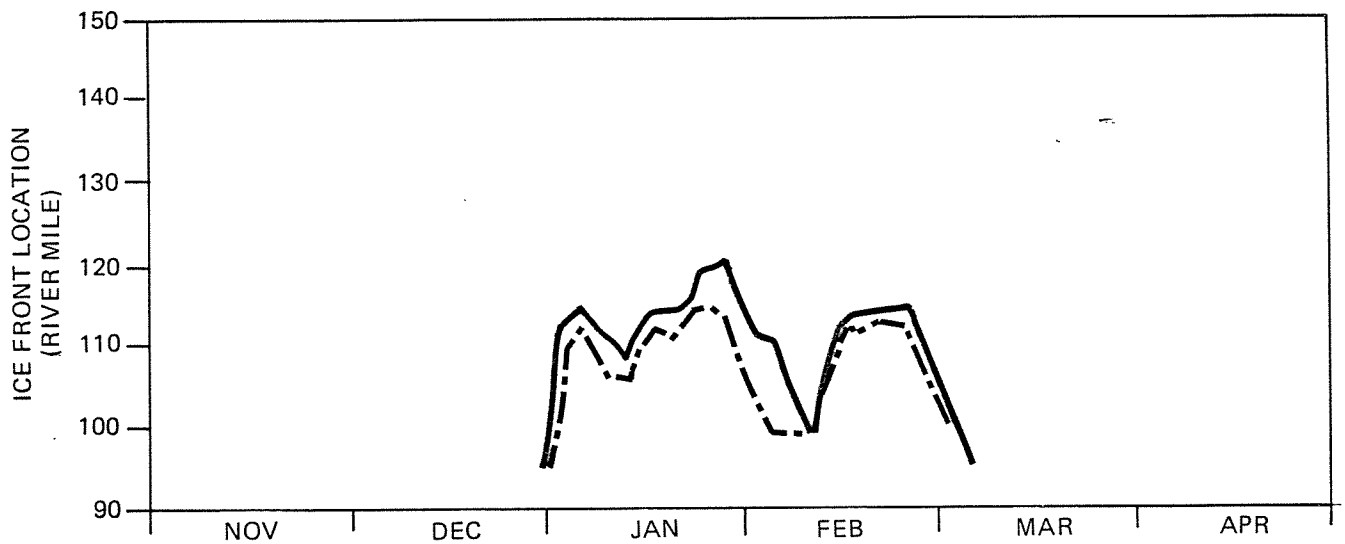
NOTES:

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**









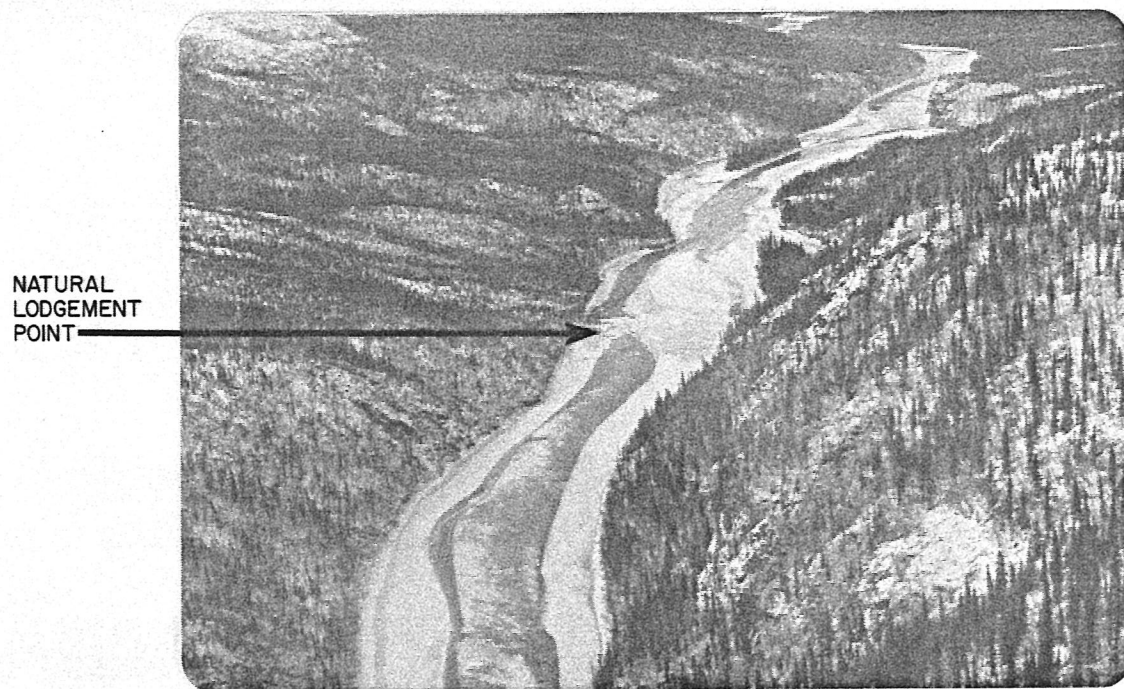


# PHOTOGRAPHS



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

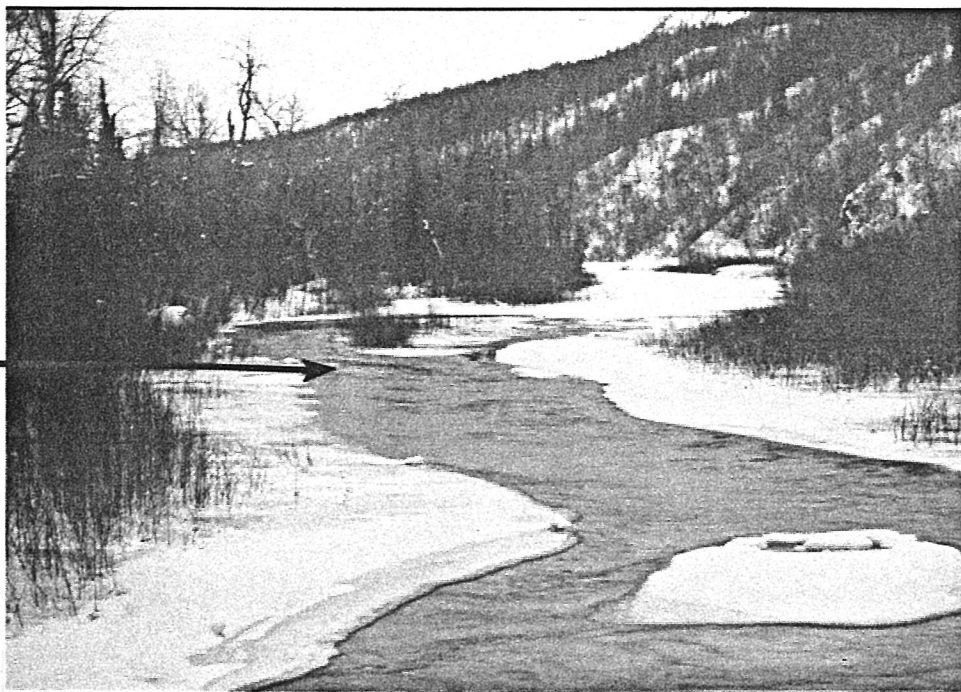


PHOTO E.2.2.5 SLOUGH 8A NEAR LRX-29 LOOKING UPSTREAM

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

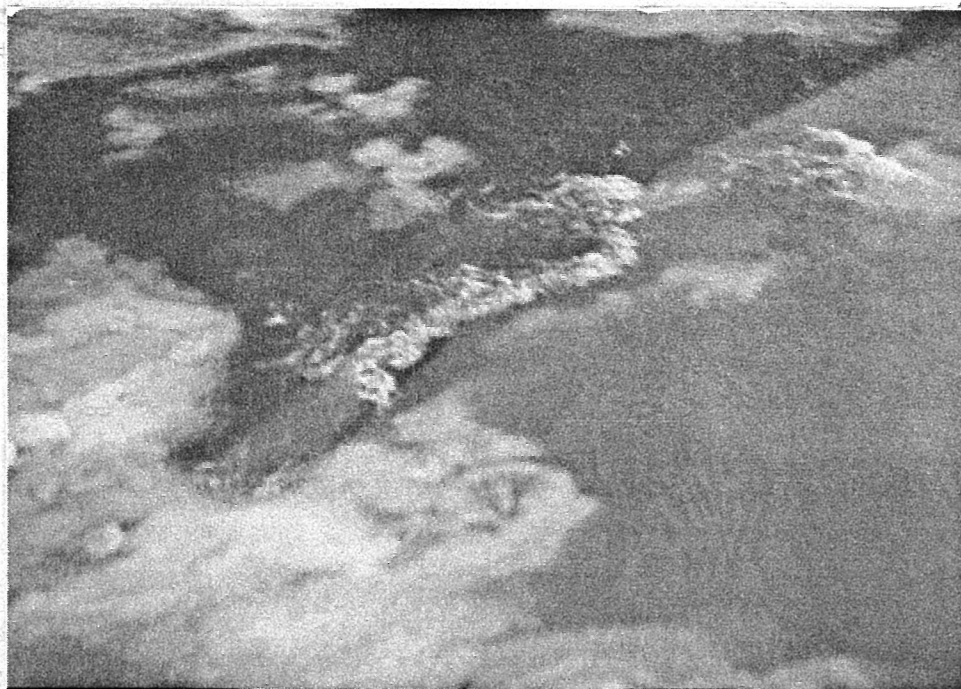


PHOTO E.2.2.8 ENLARGEMENT OF PHOTO E.2.2.7 SHOWING  
TURBULENT FLOW