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Technical Report HL-93-3
November 1993

US Army Corps
of Engineers
Waterways Experiment
Station

Demonstration Erosion Control Project Monitoring Program

Fiscal Year 1992 Report

Volume V: Appendix D
Stream Gauging Data Report

by *David D. Abraham, Steve Sutton*
Hydraulics Laboratory

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Prepared for U.S. Army Engineer District, Vicksburg

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U.S. Army Corps of Engineers
Waterways Experiment Station
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

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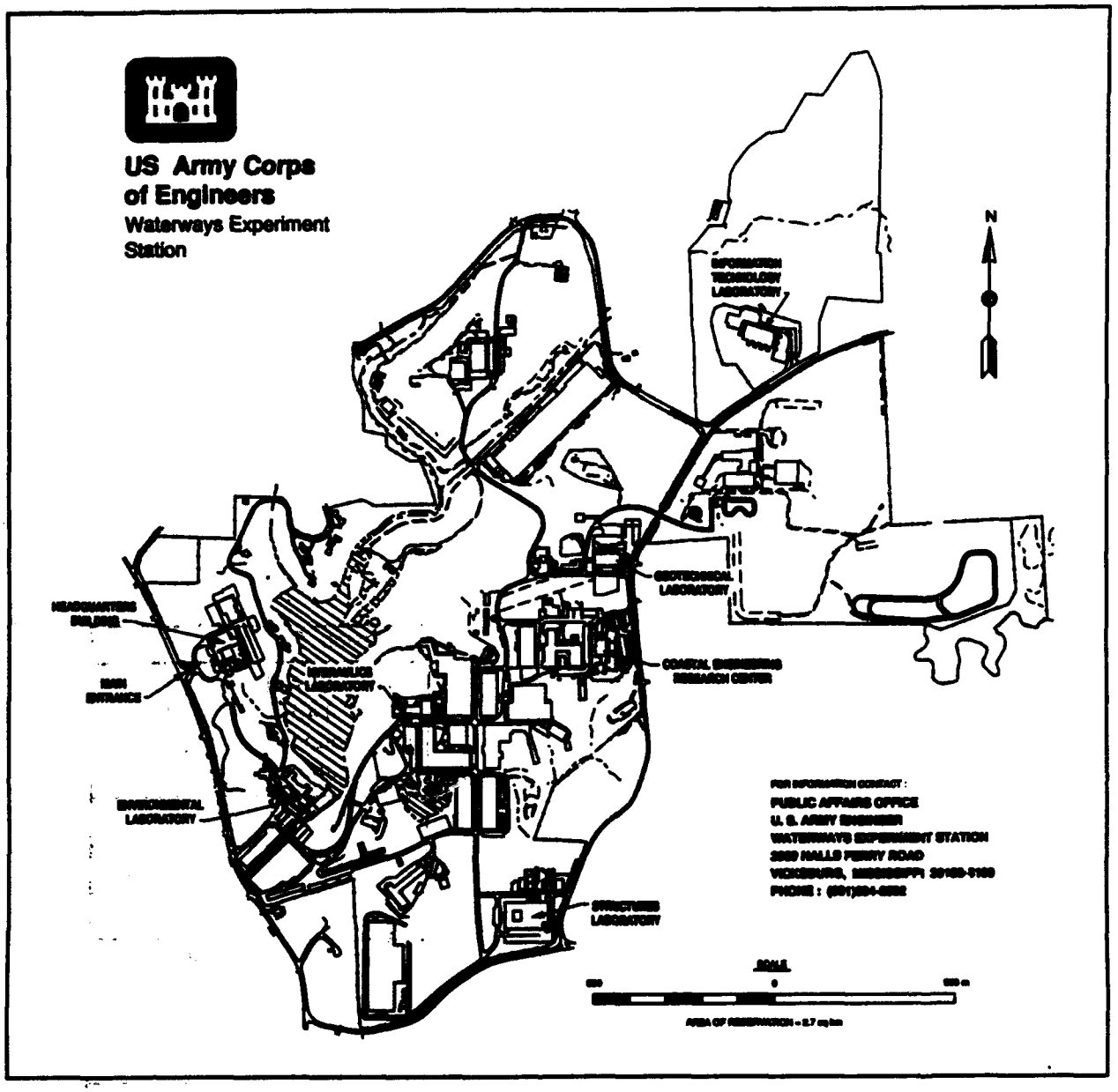

Waterways Experiment Station Cataloging-in-Publication Data

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TA7 W34 no.HL-93-3 v.5

Appendix D
Stream Gauging Data Report

Introduction

This appendix contains the following stage gauge information:

a. Location maps for selected stage gauging stations.

b. Stage data plots from the selected stations.

c. Stage data collection instrumentation specifications.

Location Maps

Location maps for the selected gages are given as follow:

Gauge	Watershed	Plate
061120 061130	Hickahala-Senatobia	D1
061920 061930		D2 D2
021611 021623 021631 021633	Batupan Bogue	D3
082020 082030	Long	D4
071330 071340	Hotophia	D5
050620	Coldwater	D6
010320	Ablaca	D7
091520	Otoucalofa	D8

Stage Data Plots from Selected Gauges

Stage data collected at the 16 gauges listed in the following tabulation are presented in Plates D9-D49. (All gauge data presented are referenced to the National Geodetic Vertical Datum (NGVD).) For each gauge presented, the period of record is from the time of installation to 30 June 1992. The remaining gauges are not presented here because the NGVD datum was not established in time for the Fiscal Year 1992 reporting period. The complete set of data is available from the U.S. Army Engineer Waterways Experiment Station in HECDSS format.

Watershed	Creek	Gauge	Plate
Hickahala-Senatobia	Hickahala	061120	D 9-D11
		061130	D12-D14
	James Wolf	061920	D15-D17
		061930	D18-D20
Batupan-Bogue	Worsham	021811	D21,D22
		021823	D23-D25
		021831	D26-D28
		021833	D29-D31
Long	Long	062020	D32-D34
		062030	D35-D37
Hotophia	Hotophia	071330	D38-D40
		071340	D41-D43
Coldwater	Lick	050820	D44,D45
Abiaca	Abiaca	010320	D46,D47
Otoucalofa	Sarter	091520	D48,D49

Instrument Specifications

Specifications for the instrumentation used in data collection are given as follow:

Instrument	Table
Lundahl DCU-10 Ultrasonic Sensor	D1
Sutron 8200 Data Logger	D2
Stevens Submersible Depth Transmitter II	D3
Leopold and Stevens Model 420 Level Logger	D4
Data Card for Level Logger	D5

Table D1
Lundahl DCU-10 Ultrasonic Sensor Specifications

supply voltage	11-30 VDC
total current draw	175 mA (67 mA without display or LEDs on)
transducer operating range	
electrostatic	0.3-70 ft.
ceramic environmental	1.5-70 ft.
outputs	4-20 mA 1-5 volts with external resistor (249Ω)
digital outputs	dual NPN PNP outputs for trip point/gating function
resolution	0.01 ft. over full range
accuracy using temperature	electrostatic: ±0.1% of range with no gradient ceramic: ±0.2% of range with no gradient

Table D2
Sutron 8200 Data Logger Specifications

Processor	NEC V25	Operates at a clock speed of 5 MHz
Memory	RAM EPROM E²PROM	Up to 6 (32k by 8) chips - data storage 2 (32k or 64k by 8) chips - operating system 1 (2k by 8) chip - system setup, password
Battery back-up	Lithium Battery for long storage life Backup life	2 years minimum (actual life will depend upon environment). 1 year minimum.
Real-time clock	Accuracy	1 minute per month
Watch-dog timer	Provides system reset upon microprocessor failure	
Sample Intervals	1 second to 24 hours in 1 second increments	
Data Retrieval	Portable computer RAM Pack modules RS-232 Port	Data extracted via the serial port Retrieval time 15 seconds maximum RAM Pack is connected through terminal on front panel Data may be extracted into any PC through the serial port
Visual Display	16-character LED display	
Serial Sensor	Connection may be made through the RS-232 jack on the front panel	Possible to program unit through serial port even when it is used for sensor input.
SDI-12	The 8200 supports the USGS SDI-12 Interface through a second serial port on the front panel.	
Communications	GOES Satellite, LOS Radio, and voice-synthesized telephone options available.	See separate data sheets for specifications.
Shaft Encoders (2)	Switch closure with quadrature inputs	3-wire interface
Tipping bucket rain gage (1)	Input Levels	Switch closure 0 to 5 volts
Counter Inputs (5 max)	Counter Resolution Maximum input frequency	12 bits 1 KHz
Analog Inputs	4 standard Resolution Accuracy Input Range DC excitation output Conversion period Power consumption of A/D	Up to 16 available as option, external multiplexer extends number even higher 12 bits + or - 0.25% of full scale 0 to 5v standard 0 to 5v differential with programmable gain available with expanded input option + 5 volts , +12 volts 16 milliseconds 30 milliwatts active
Pressure transducer (1)	DC Excitation Differential input range	+/- 5 volts interface (1) -5 to +100 mv
Power Supply	Internal Battery Operation with no charging Operation with charging Maximum Current Quiescent current Maximum average current	6.5 amp hours at 12 volts 90 days at a shaft encoder sample rate of once per 15 min External AC or solar power input (internally regulated) 750 mA (with full display) 500 microA 2 mA at a shaft encoder sample rate of once per 15 min

Table D3
Stevens Submersible Depth Transmitter II Specifications

Power:	12-35 VDC
Output:	4-20 mA current signal, linearly corresponding to range
Operating temperature:	33 to 122° F. +1 to 50° C, calibrated for fresh water at 72° F (22° C). **NOTE: SDT-II SHOULD NOT BE SUBJECTED TO FREEZING WATER CONDITIONS.**
Media:	Water, contaminated with any media compatible with 316 stainless steel, PVC, nylon, and polyurethane.
Accuracy:	Linearity: 1% of full scale or better Zero: 4.0 ±0.2 mA at 22° C Span: 20.0 ± 0.5 mA at 22° C Thermal zero drift typical: 0.1% of span per degree C

Table D4
Leopold and Stevens Model 420 Level Logger Specifications

Serial Channel:	Serial ASCII through RS-232 interface at a minimum ± 5 volt levels. Supports both hardware and software (XON/XOFF) handshaking. Provides telemetry of current level, total memory readout of the Data Card, and Data Card erasure.
Format (fixed):	7 data bits, 1 stop bit, even parity
Baud rate (selectable):	300, 1200, 2400, or 9600
Power:	10-17 VDC
Current:	Less than 1 mA DC, during normal recording. Data Logger in "Data Logger" mode enters a low current "sleep" mode when no activity is required.

Table D5
Data Card for Level Logger Specifications

Capacity:	64K bytes. Sufficient storage for approximately 30,000 readings, non-circulating.
Power:	CR2016 type battery, 3V Lithium (NEDA #5000L), readily available in local stores.
Battery replacement interval:	6 months at 25° C operating temperature. 3 months at 45° C operating temperature.
Operating temperature:	-20 to +50° C
Relative humidity:	0-95%, non-condensing
Size:	3-1/2 x 2-1/4 x 1/8 inches (8.75 x 5.75 x 0.5 cm)
Recording intervals:	1 second; 1, 5, 6, 10, 15, and 30 minutes; 1, 2, and 4 hours

HICKAHALA-SENATOBIA WATERSHED
HICKAHALA CREEK

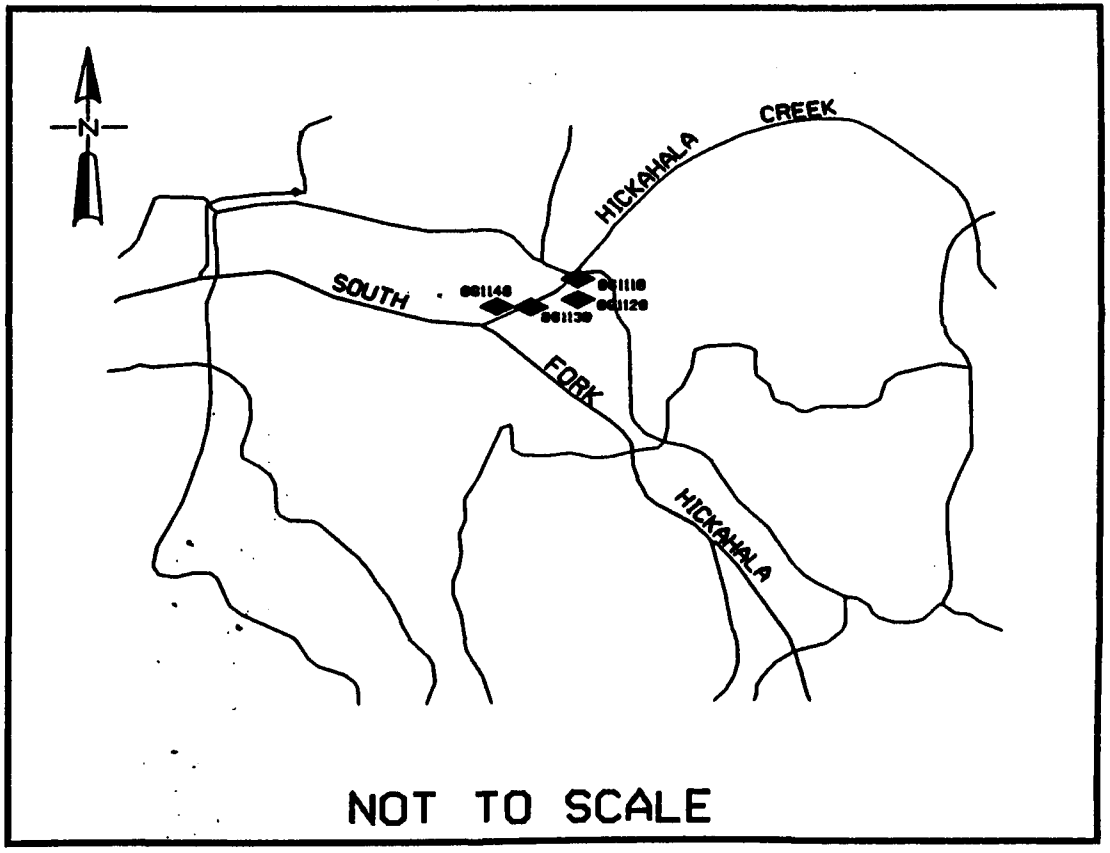
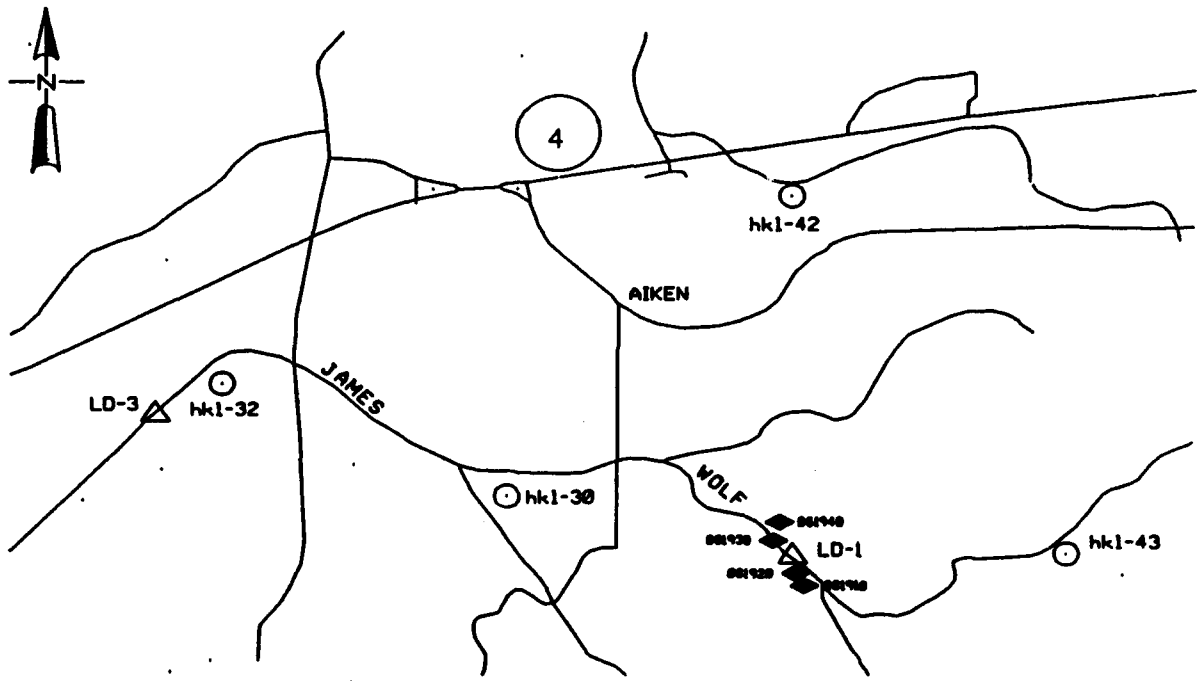


Plate D1

Plate D2

HICKAHALA-SENATOBIA WATERSHED
JAMES WOLF CREEK



NOT TO SCALE

BATUPAN BOGUE WATERSHED
WORSHAM CREEK

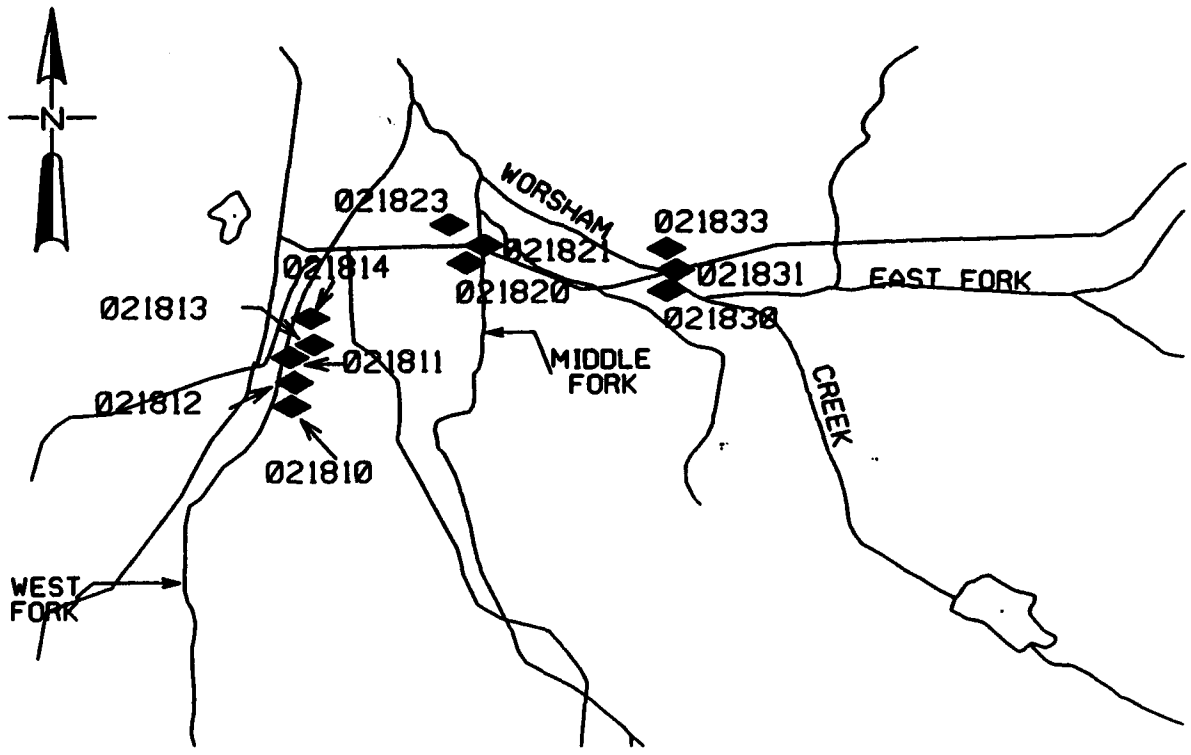


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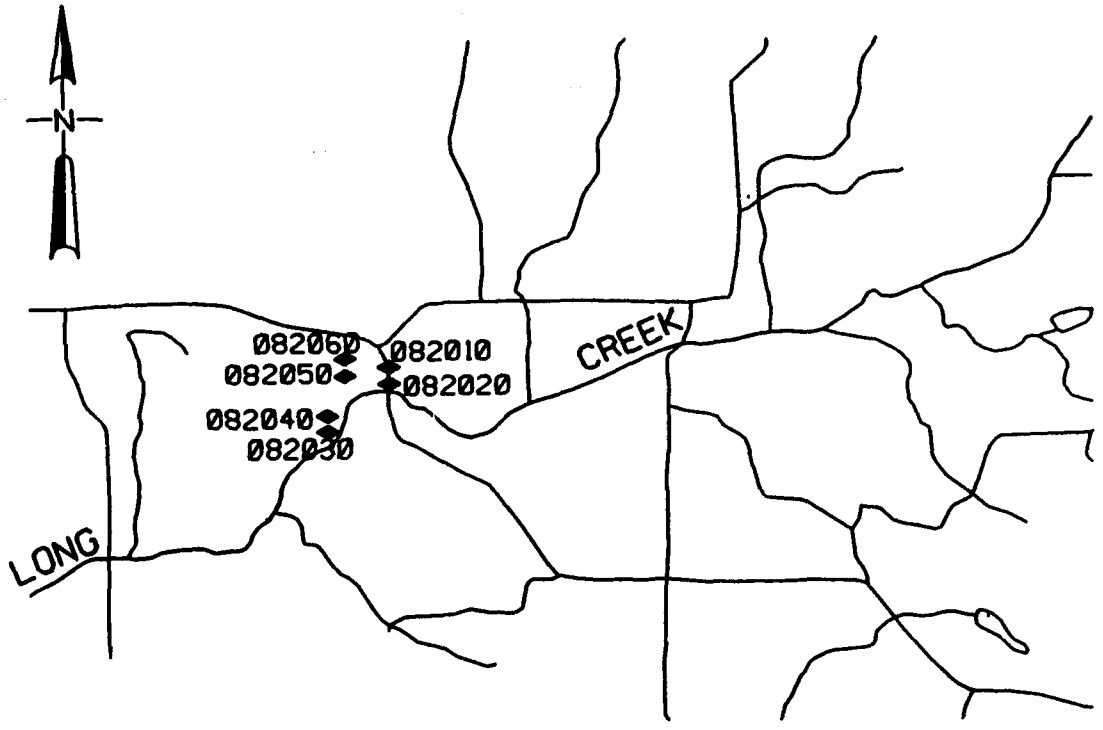
Plate D3

LONG CREEK WATERSHED

LONG CREEK



NOT TO SCALE

Plate D4

HOTOPHIA CREEK WATERSHED
HOTOPHIA CREEK

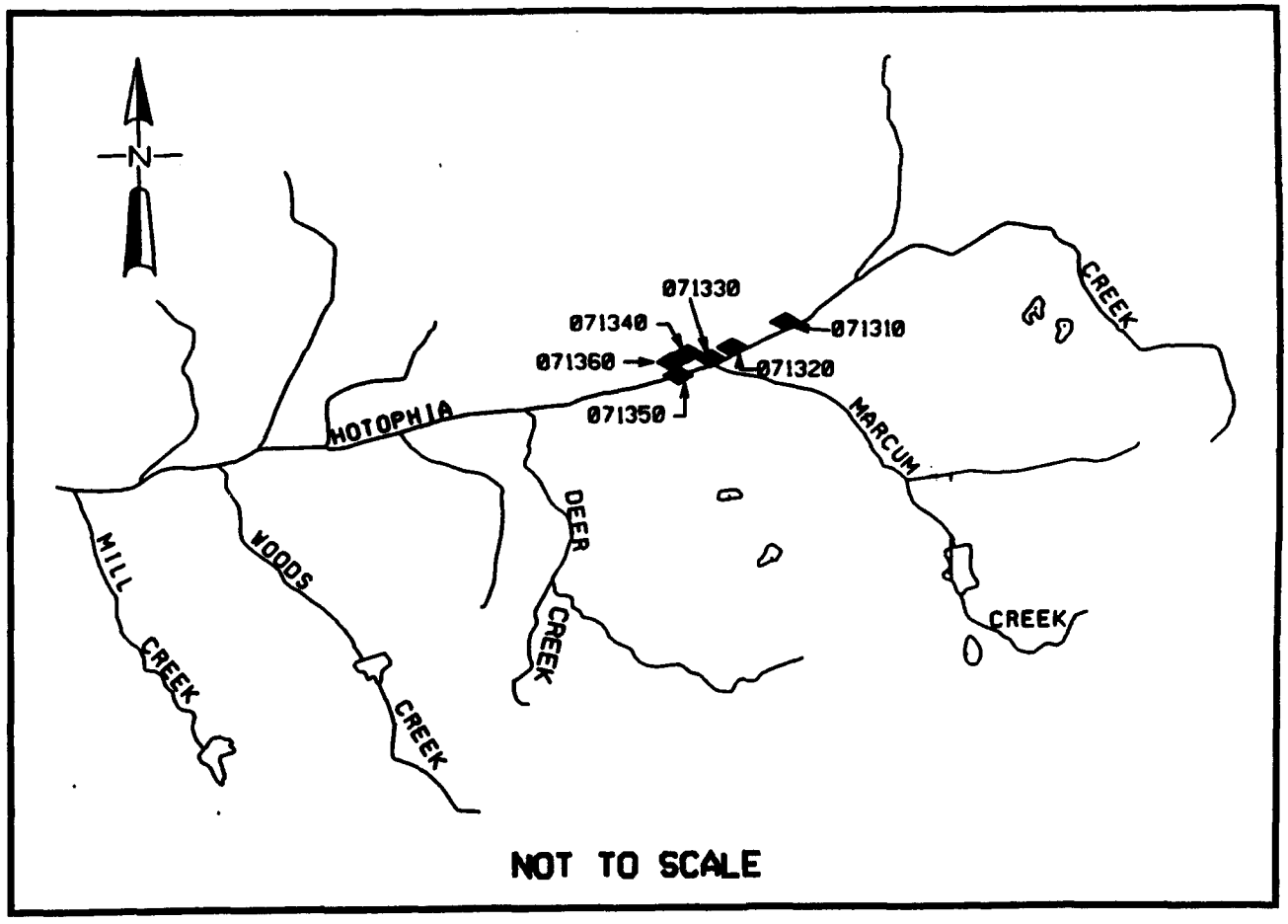


Plate D5

COLDWATER RIVER WATERSHED
LICK CREEK

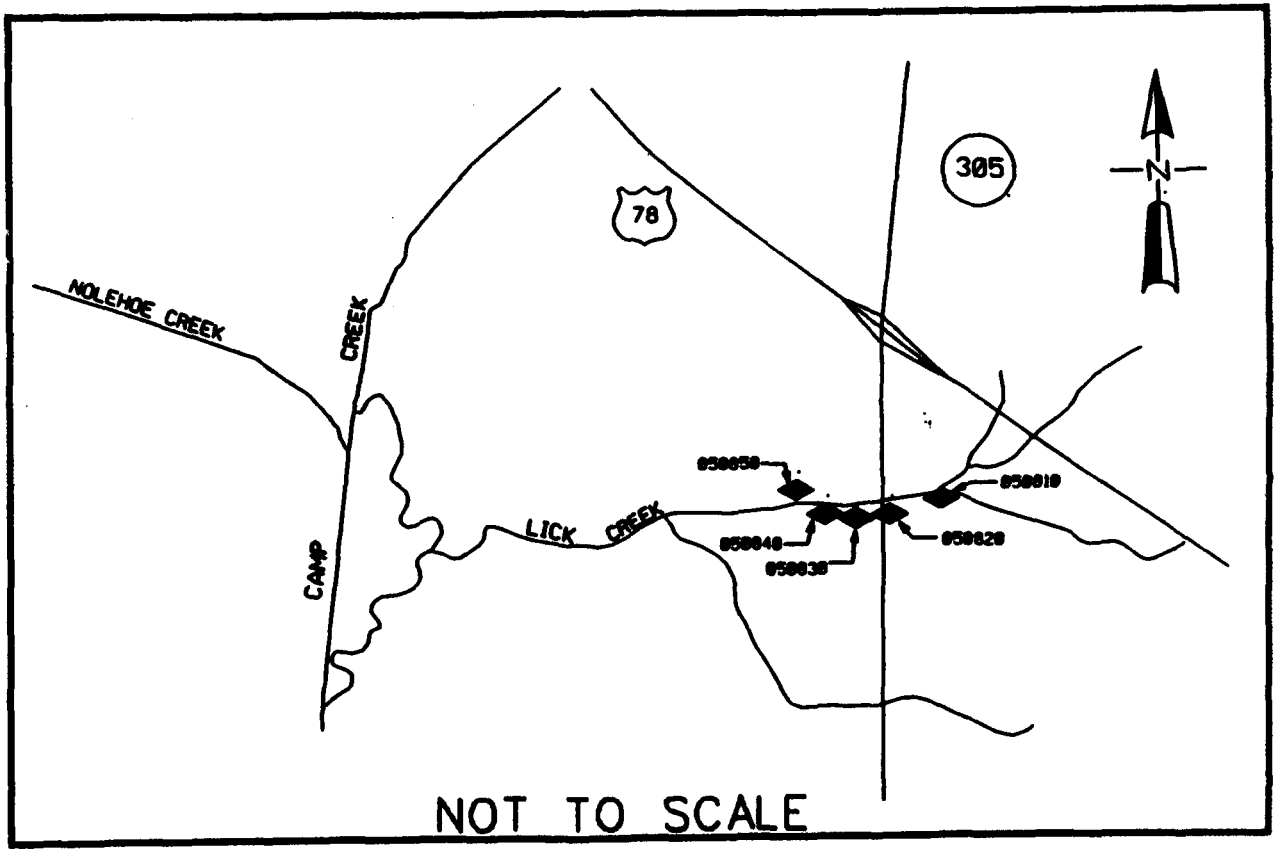


Plate D6

ABIACA CREEK WATERSHED
ABIACA CREEK

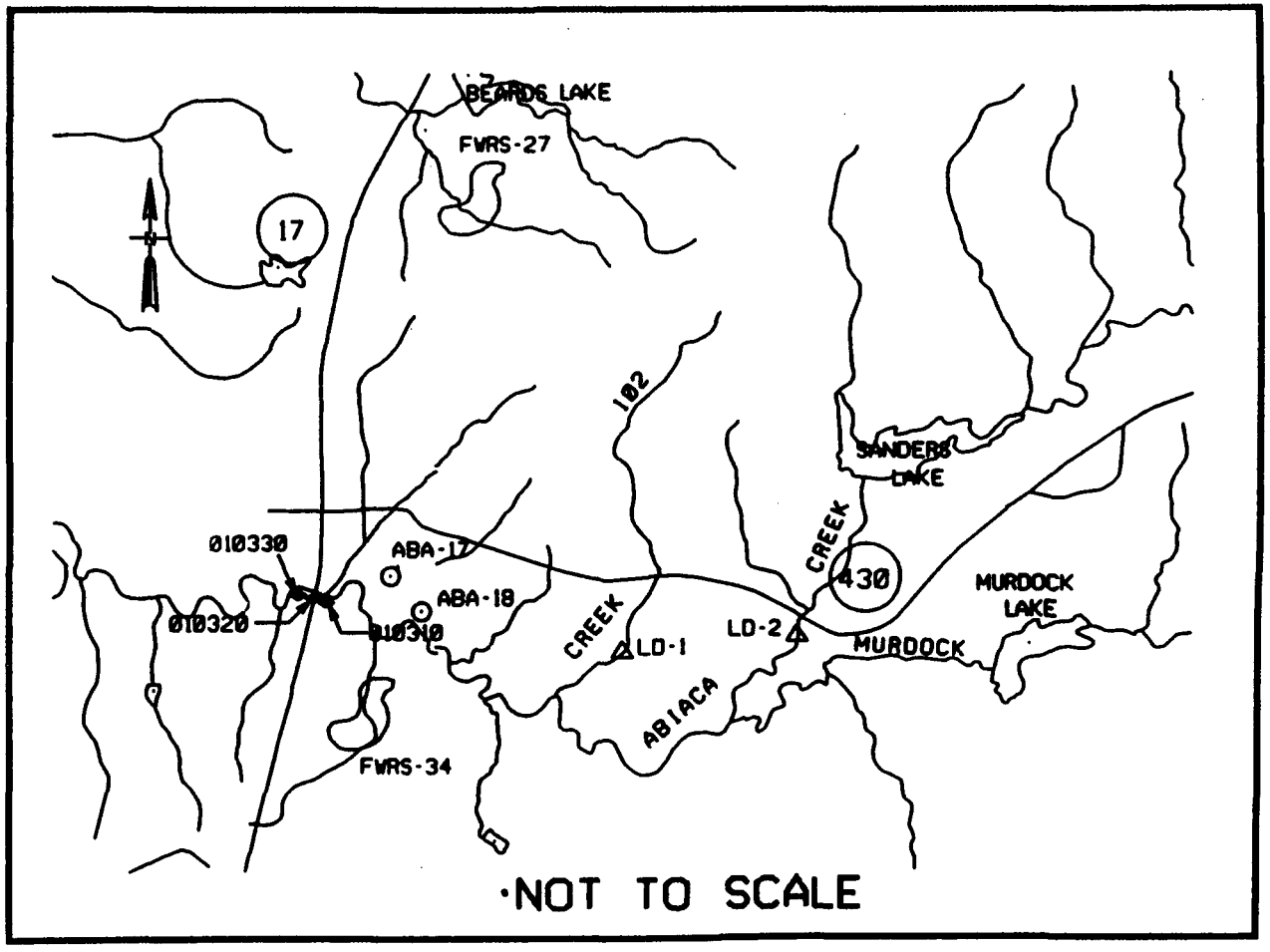
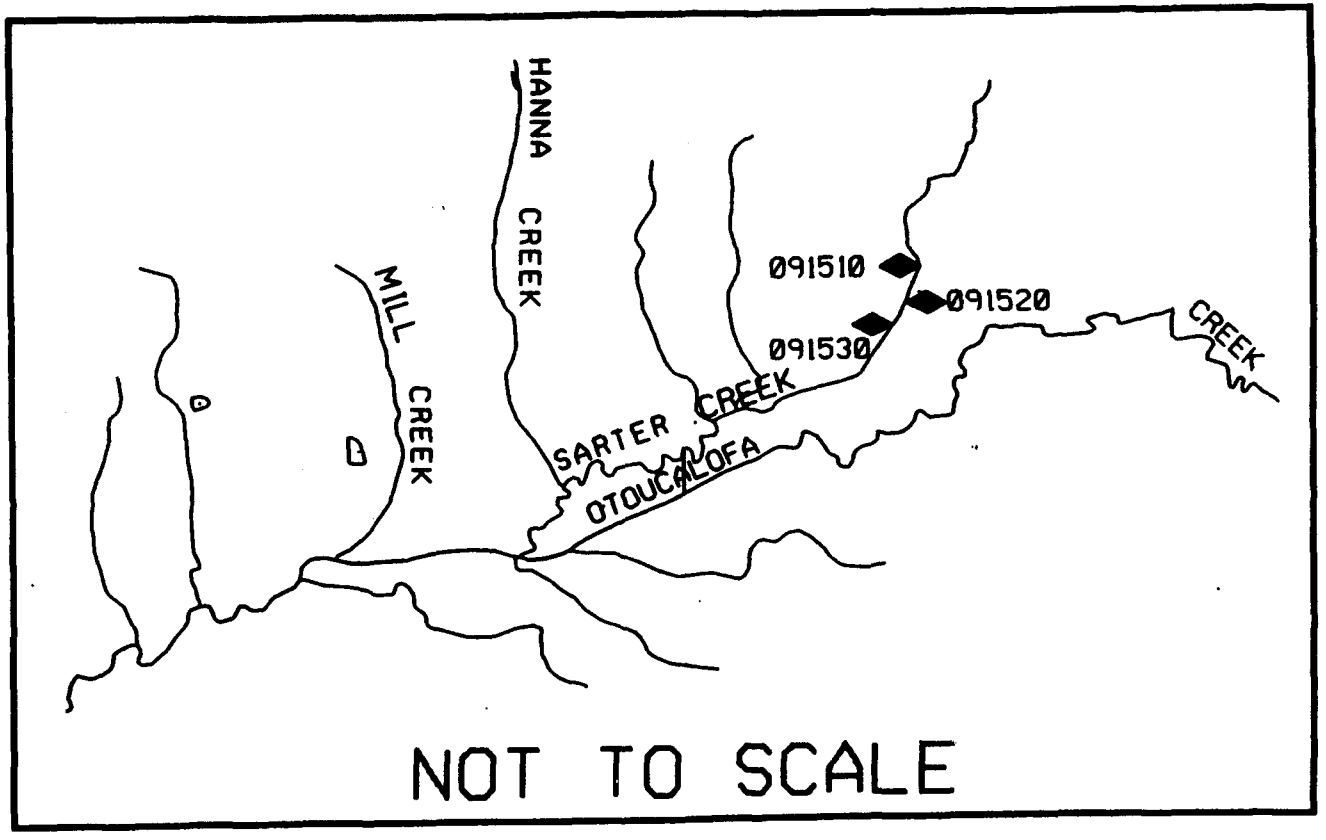


Plate D7

OTOUCALOFA CREEK WATERSHED
SARTER CREEK



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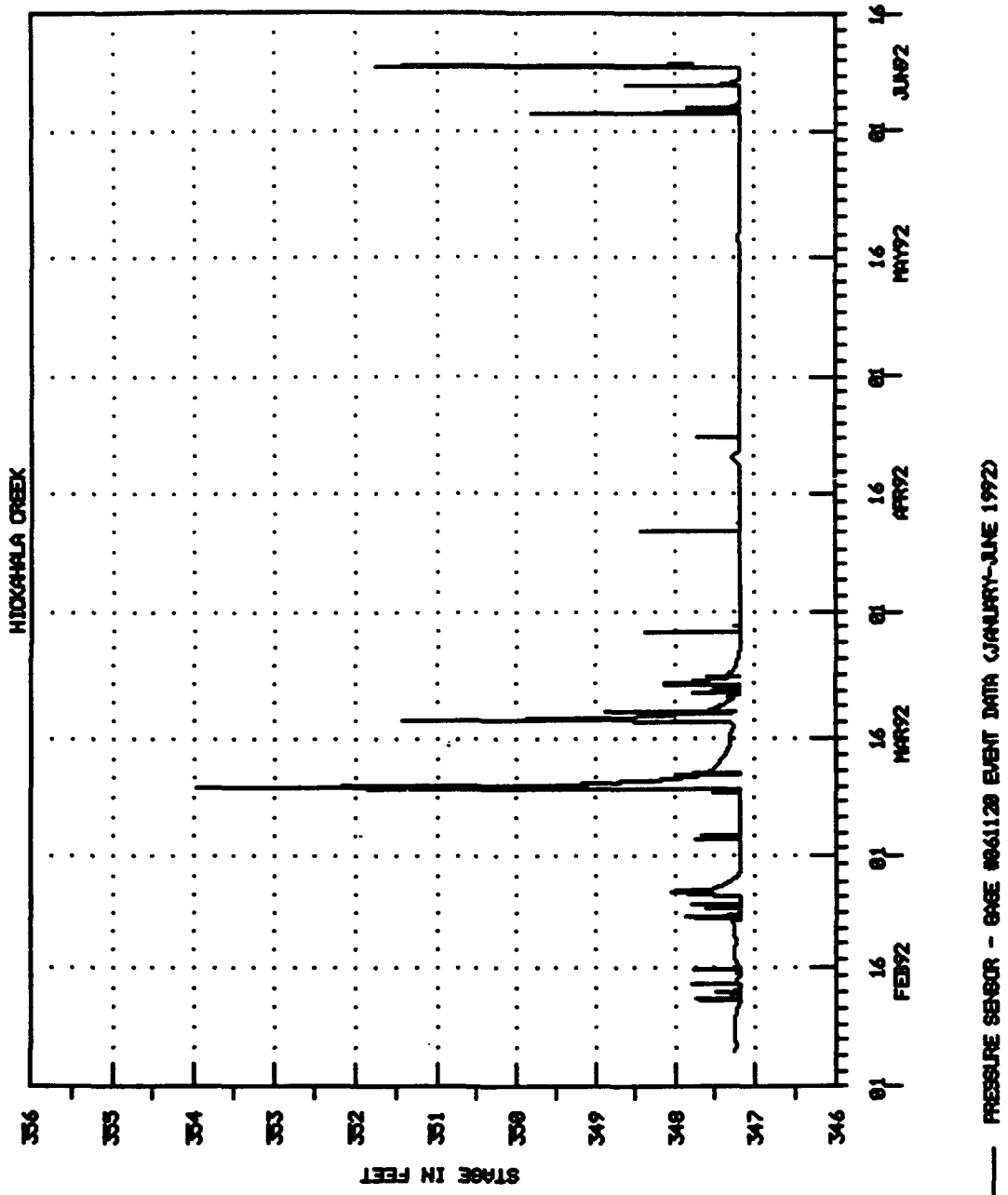
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16 MAR92
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16 MAY92
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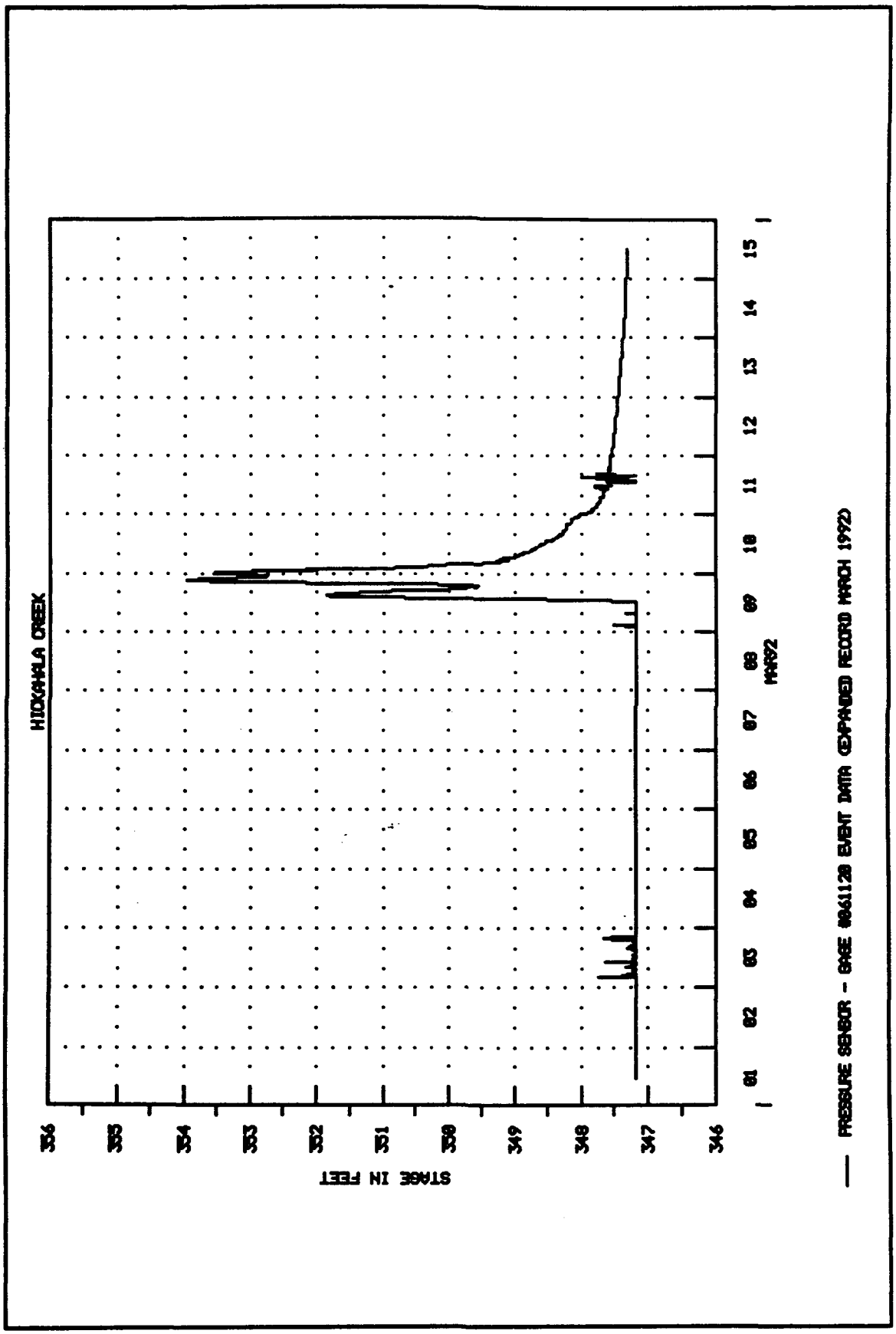
PRESSURE SENSOR - GAGE #061120 EVENT DATA (JANUARY-JUNE 1992)

Plate D9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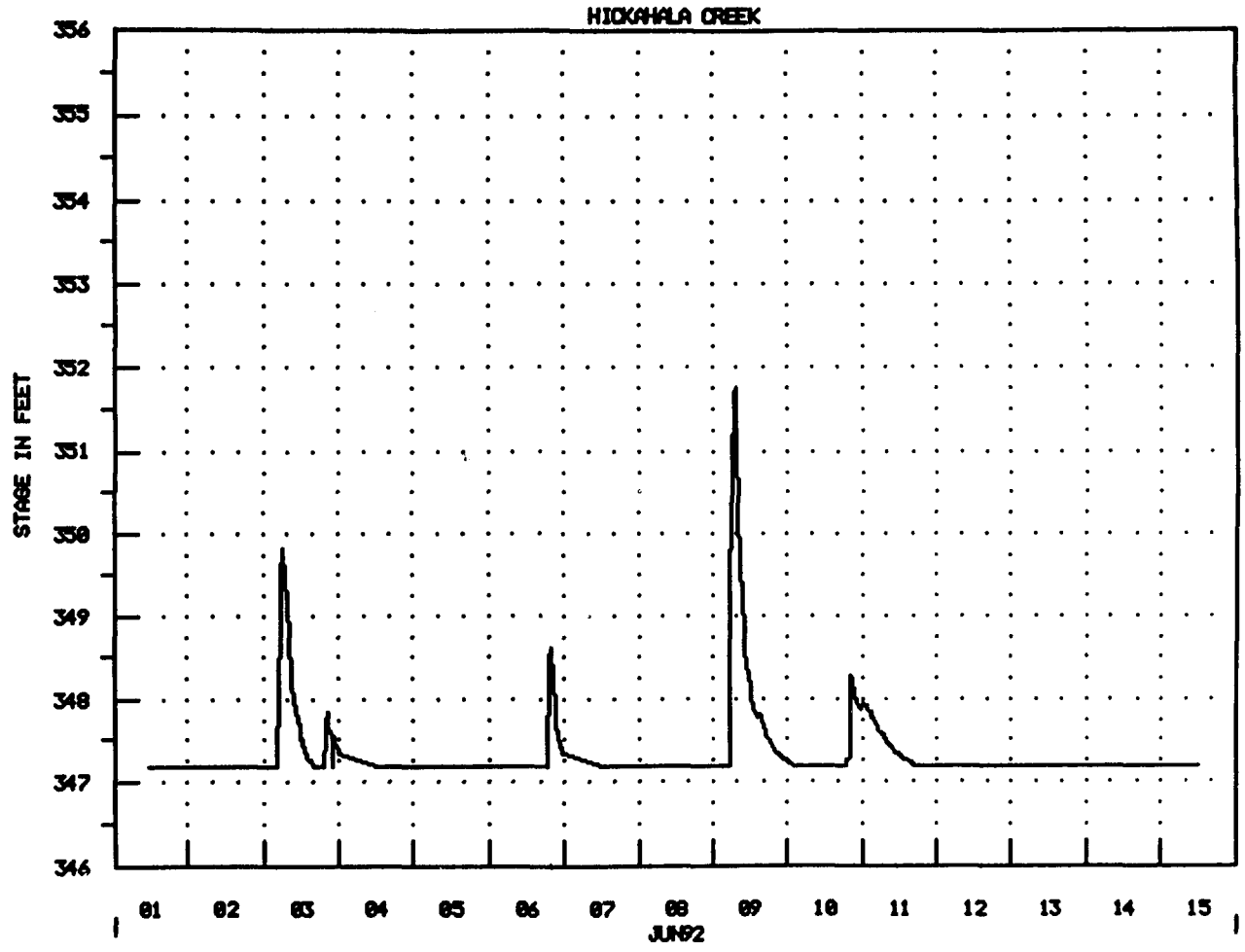
PRESSURE SENSOR - GAGE #061120 EVENT DATA (EXPANDED RECORD MARCH 1992)

Plate D10



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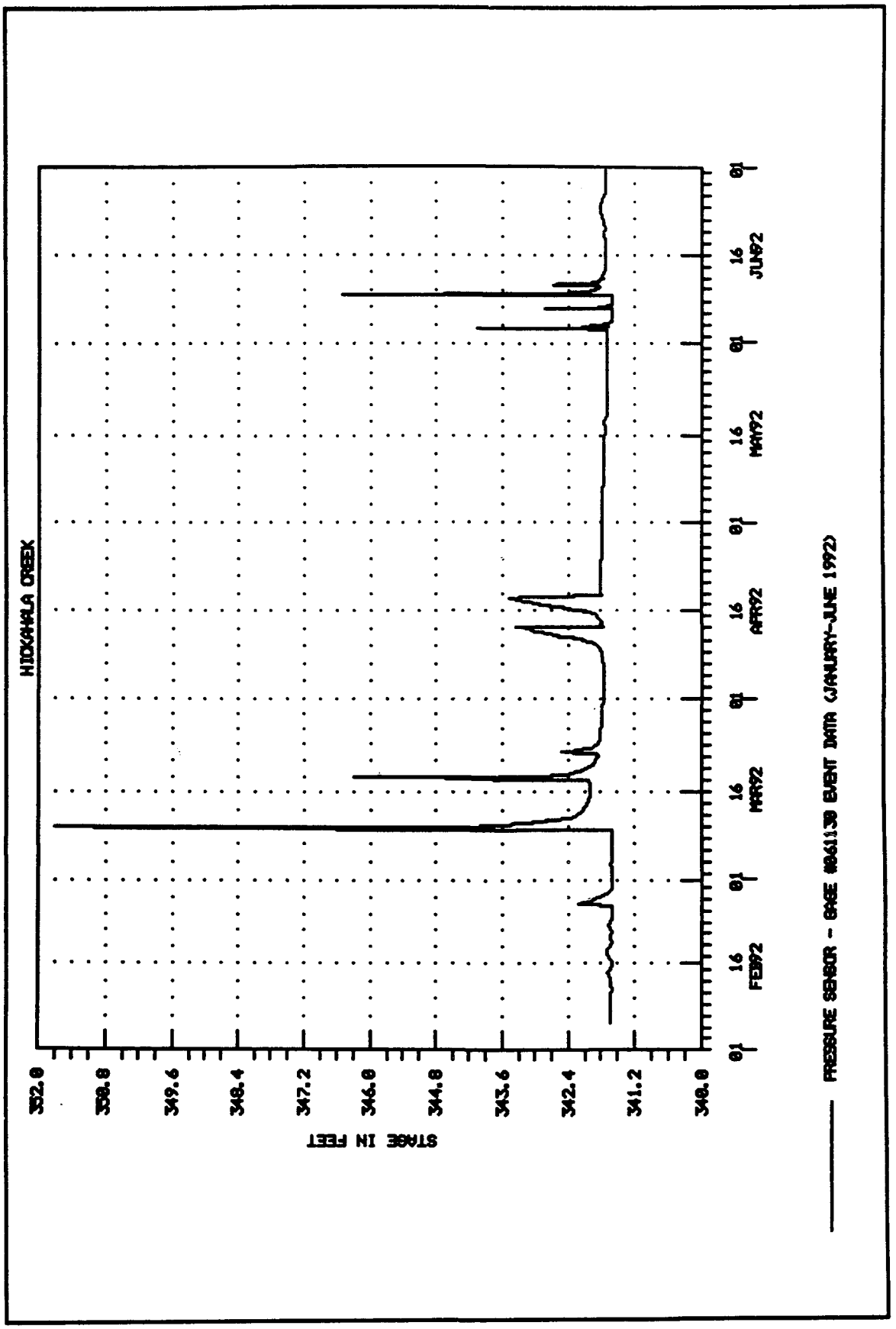
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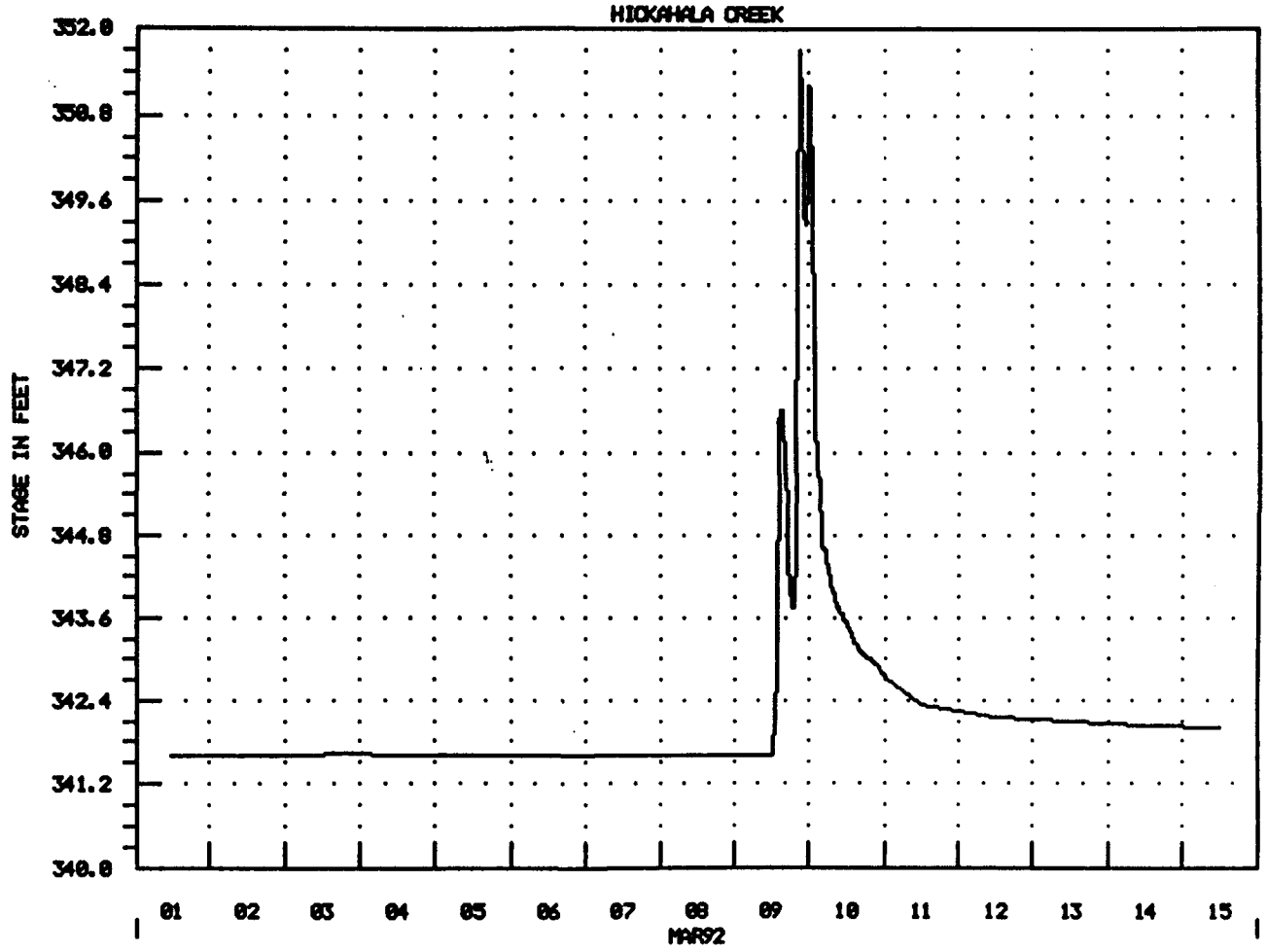

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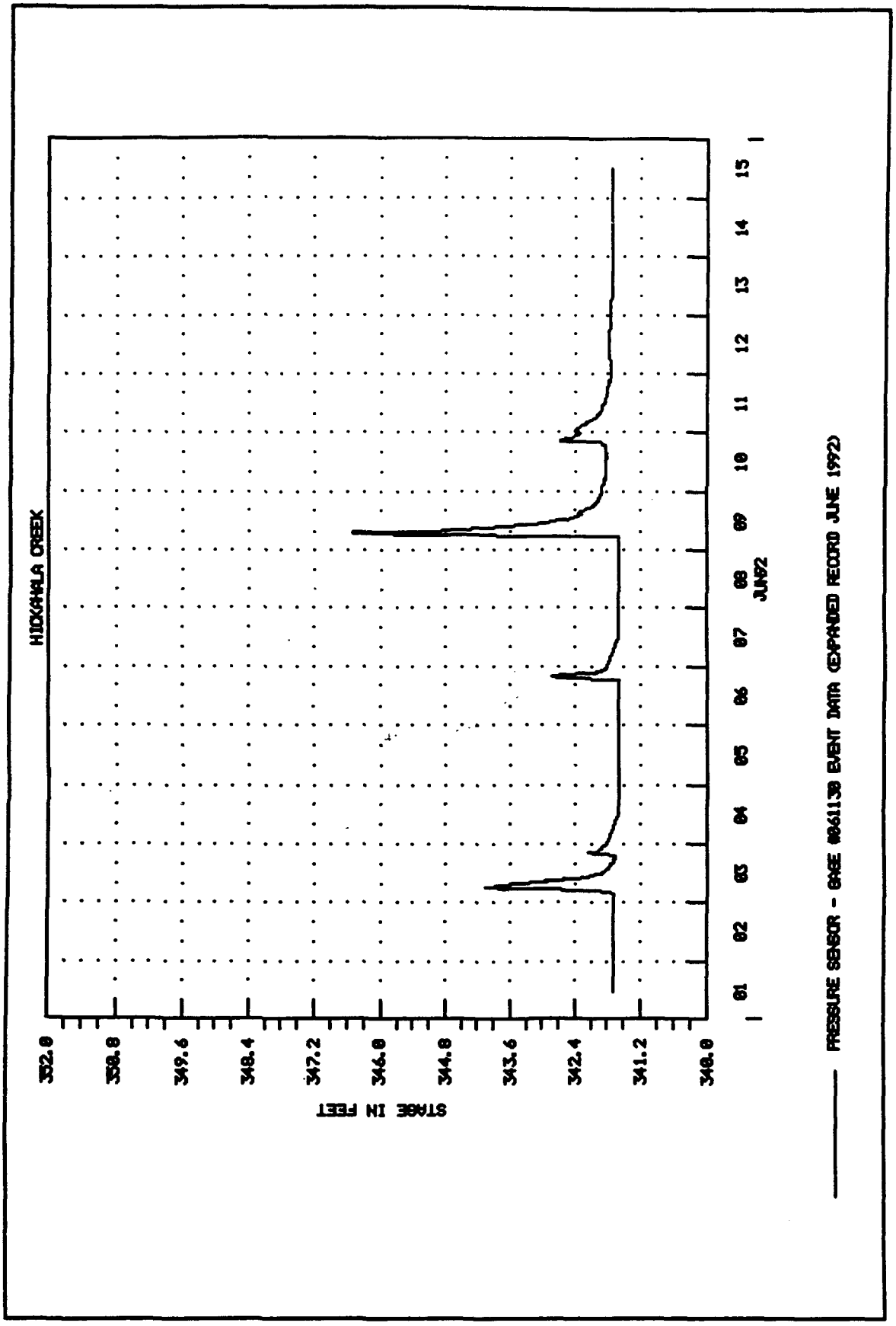
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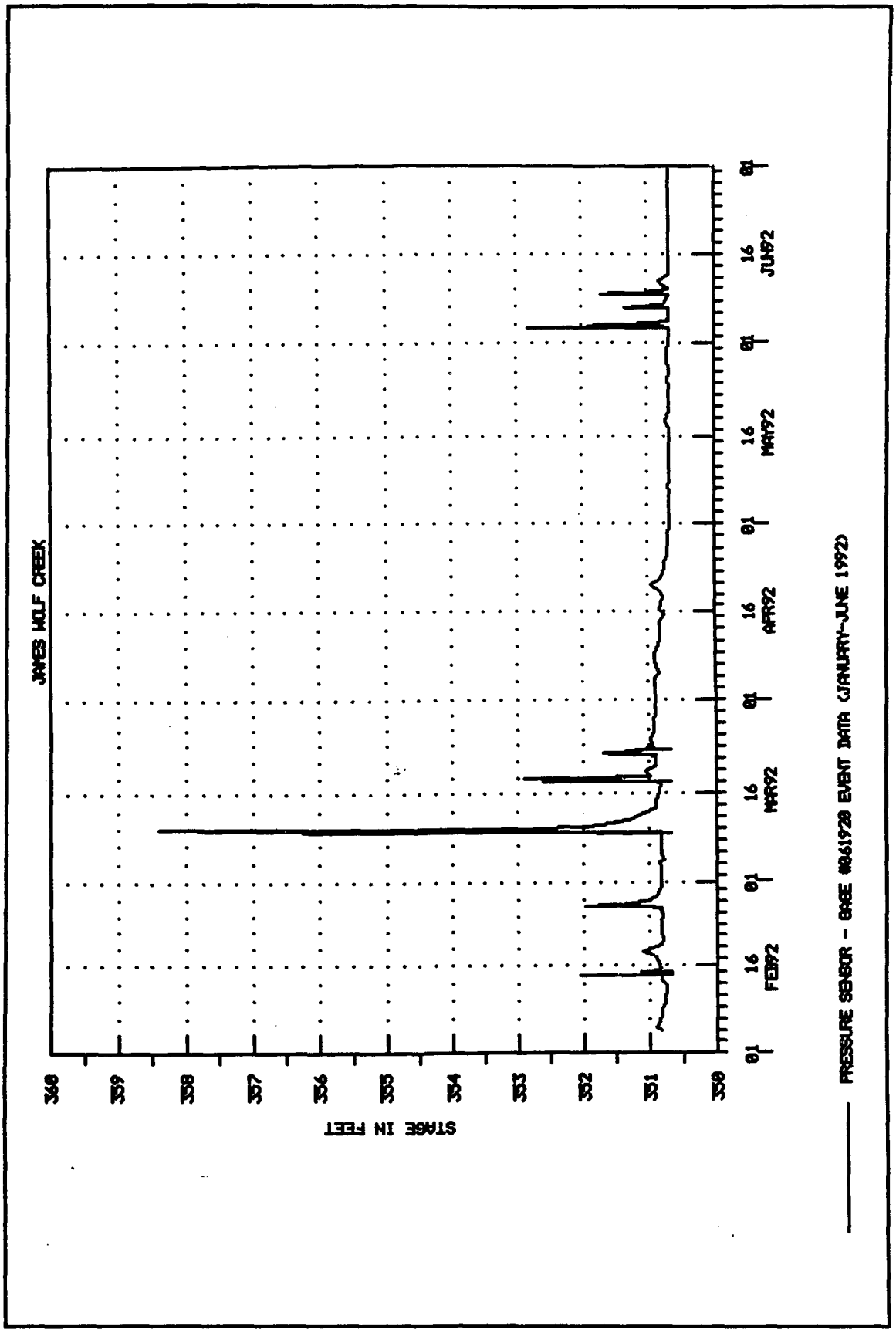
Plate D14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MAR92
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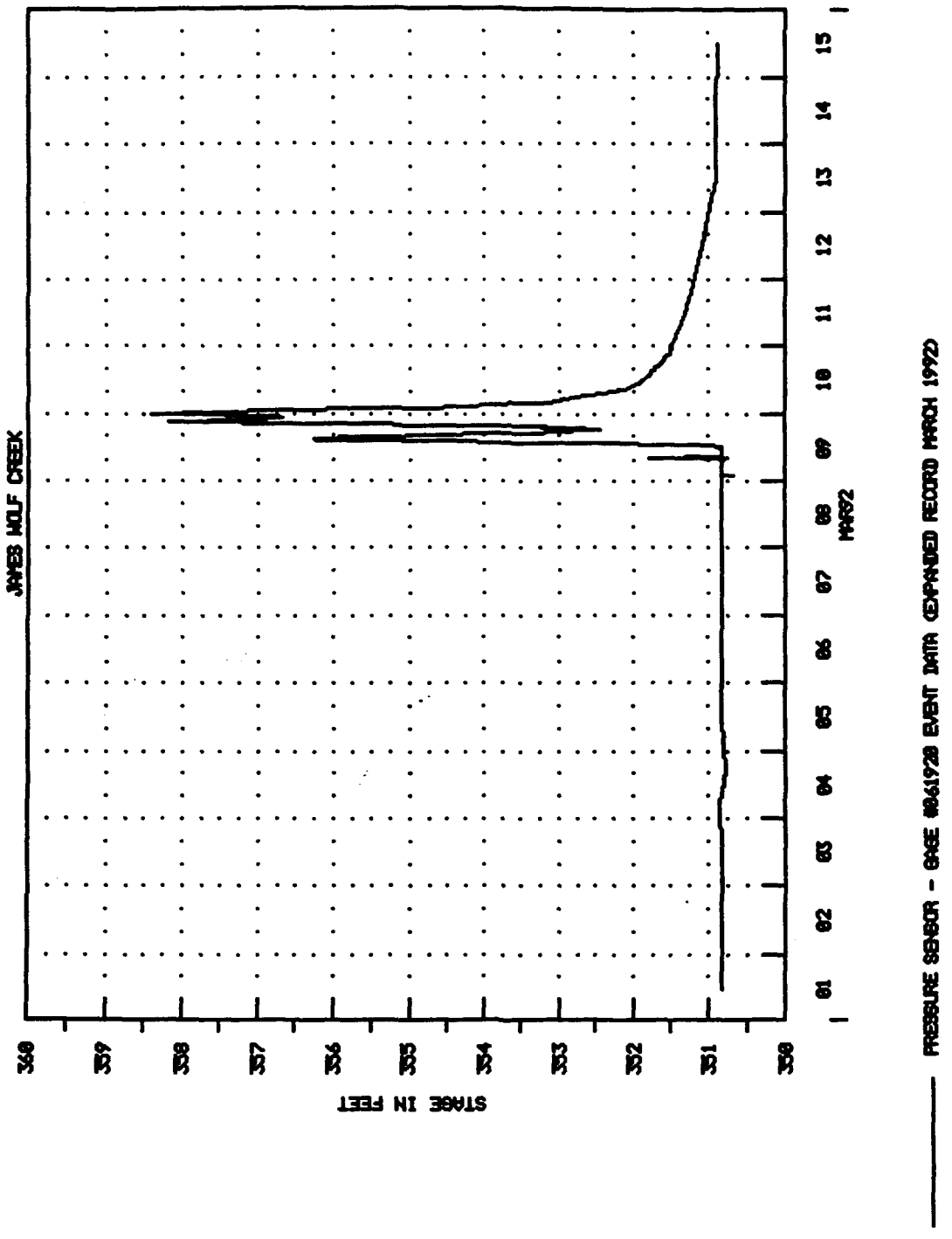
Plate D15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MARS2
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Plate D16

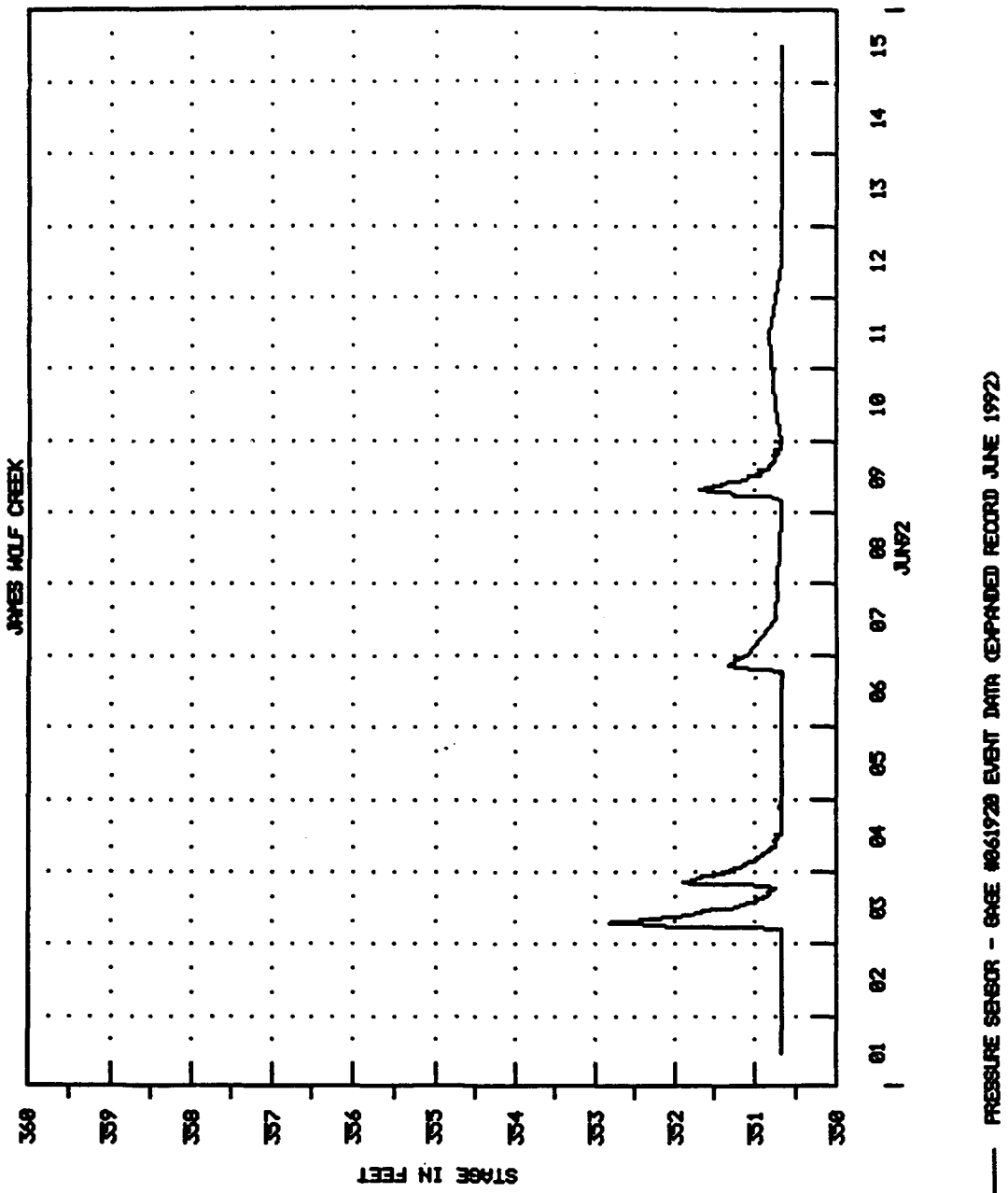
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Plate D17

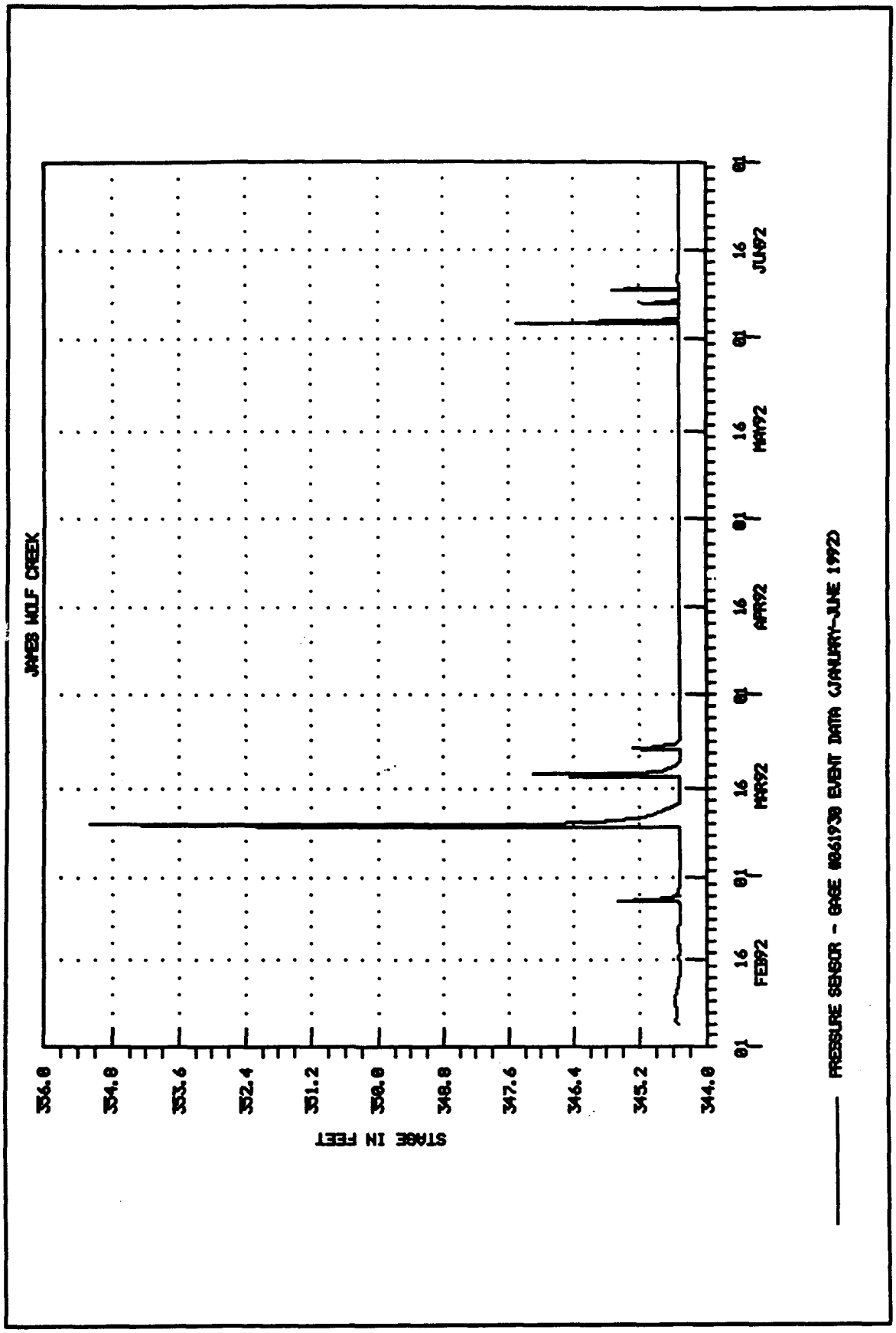
JAMES WOLF CREEK
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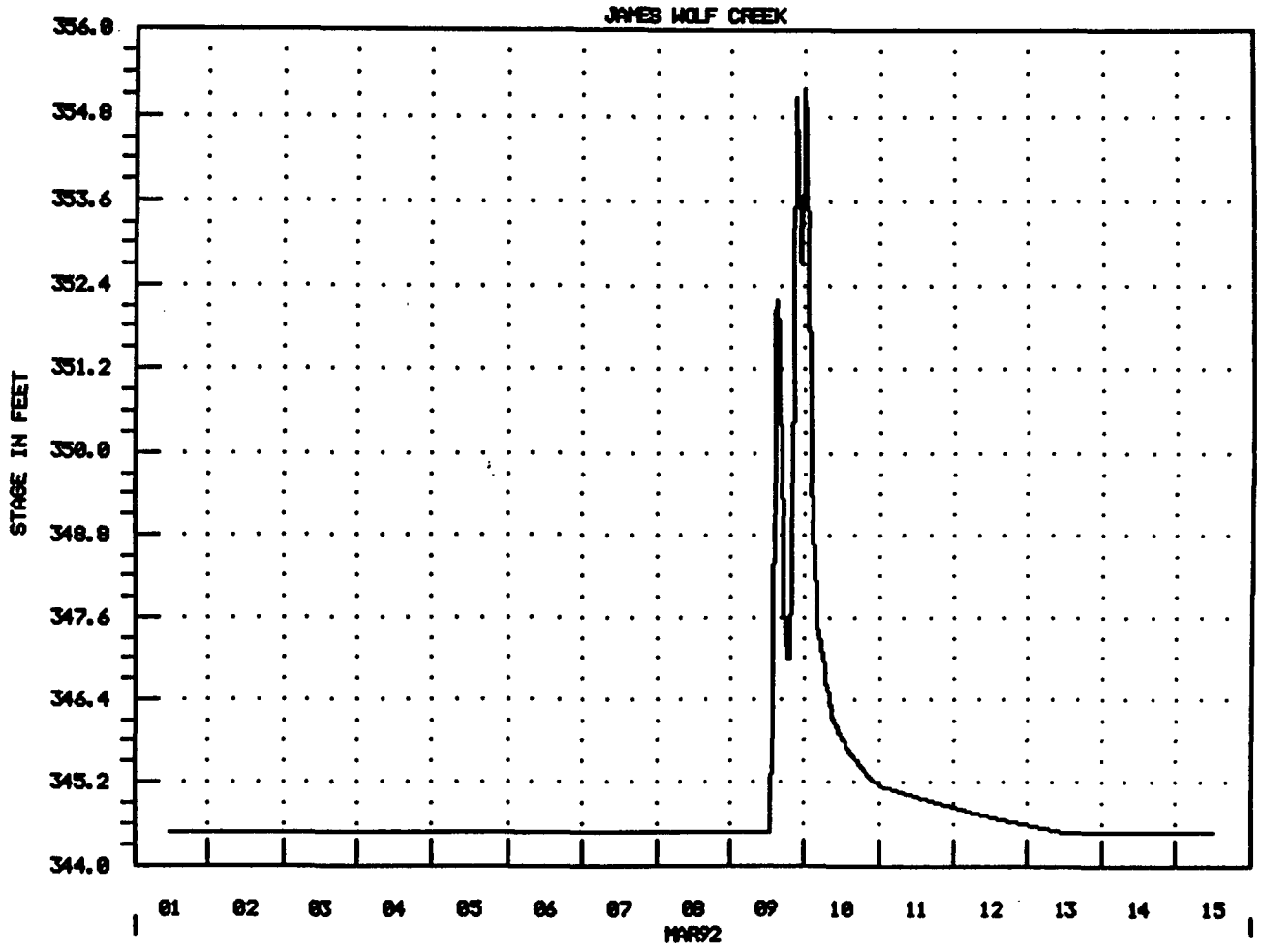
Plate D18



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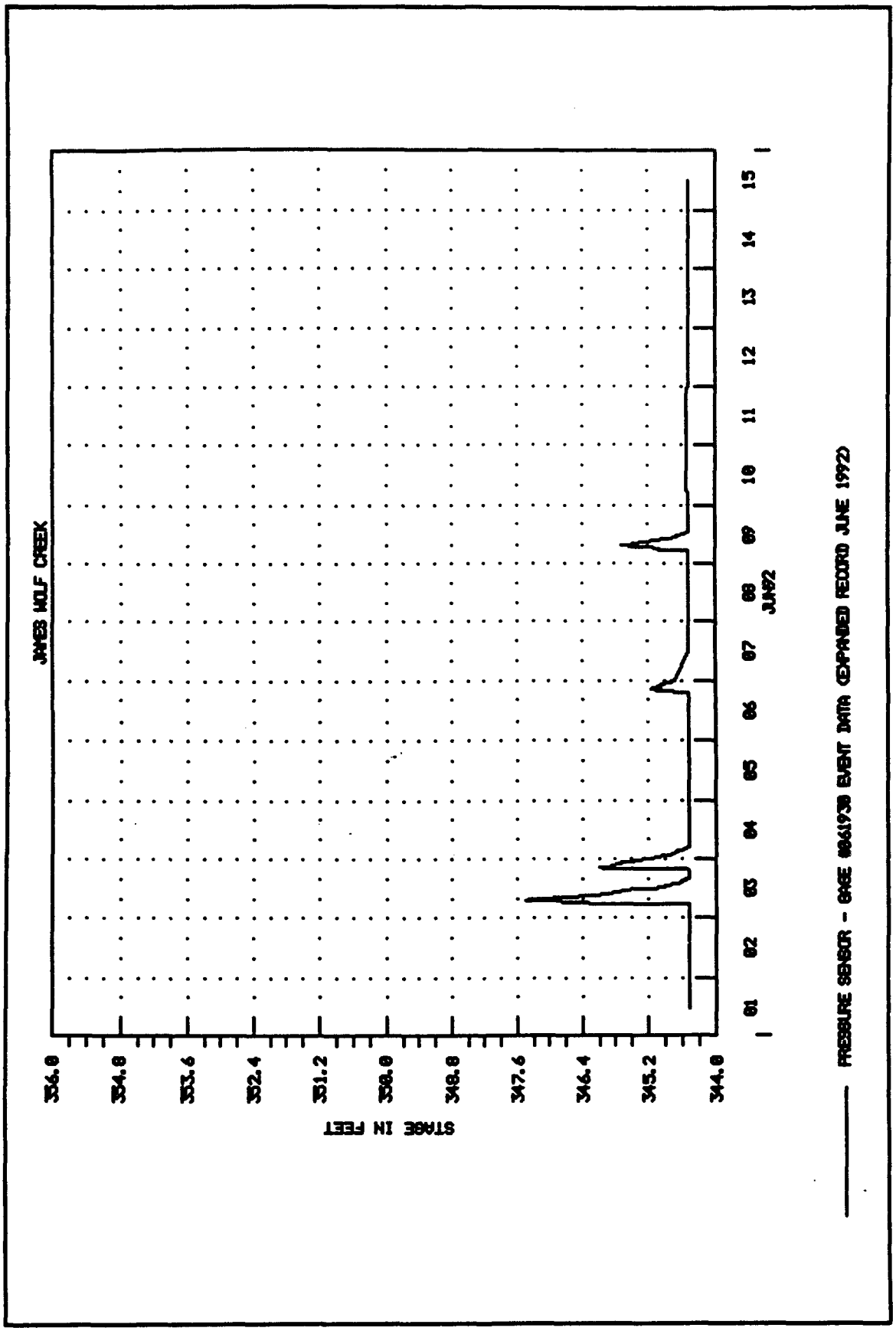
JAMES WOLF CREEK
STAGE IN FEET
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Plate D20

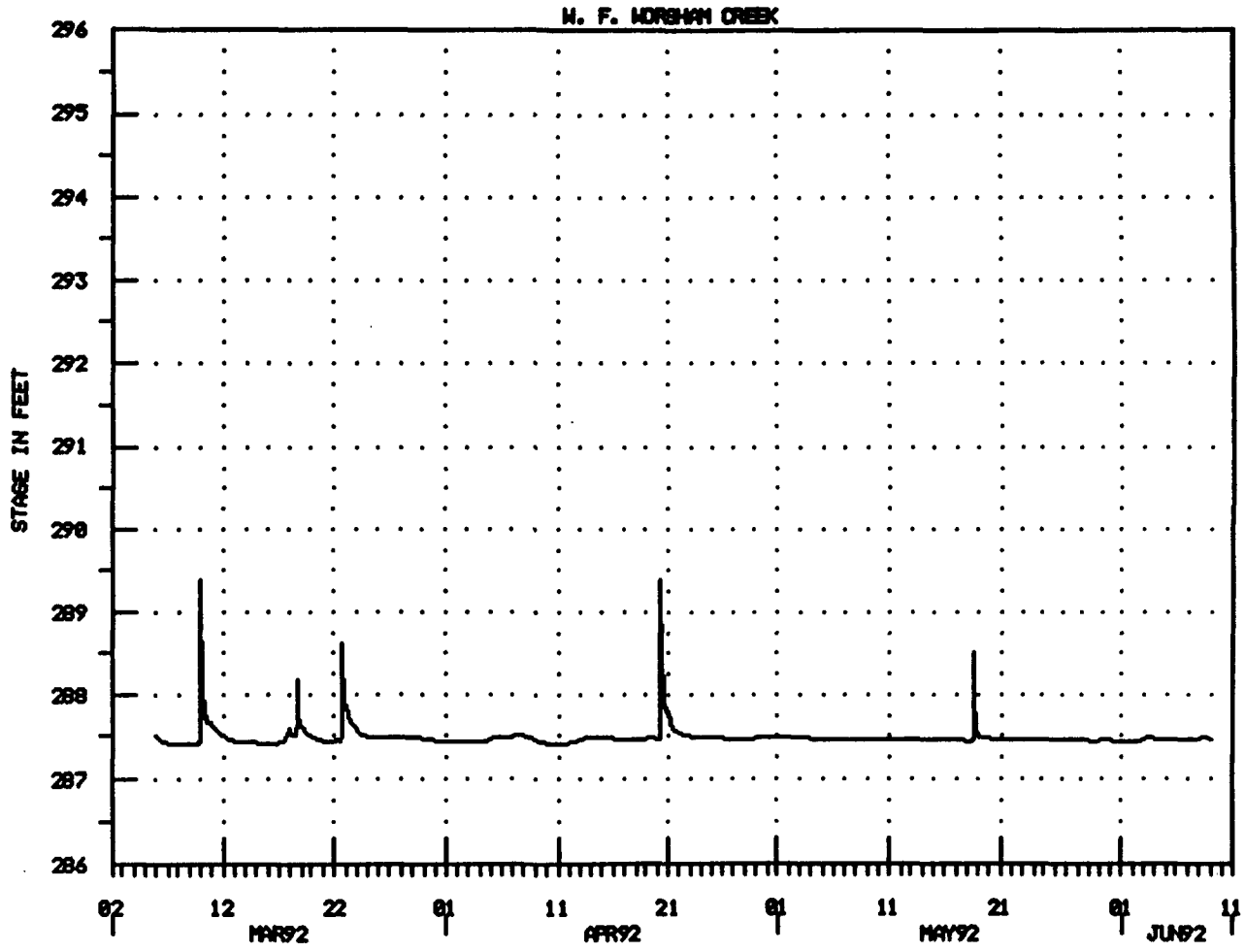

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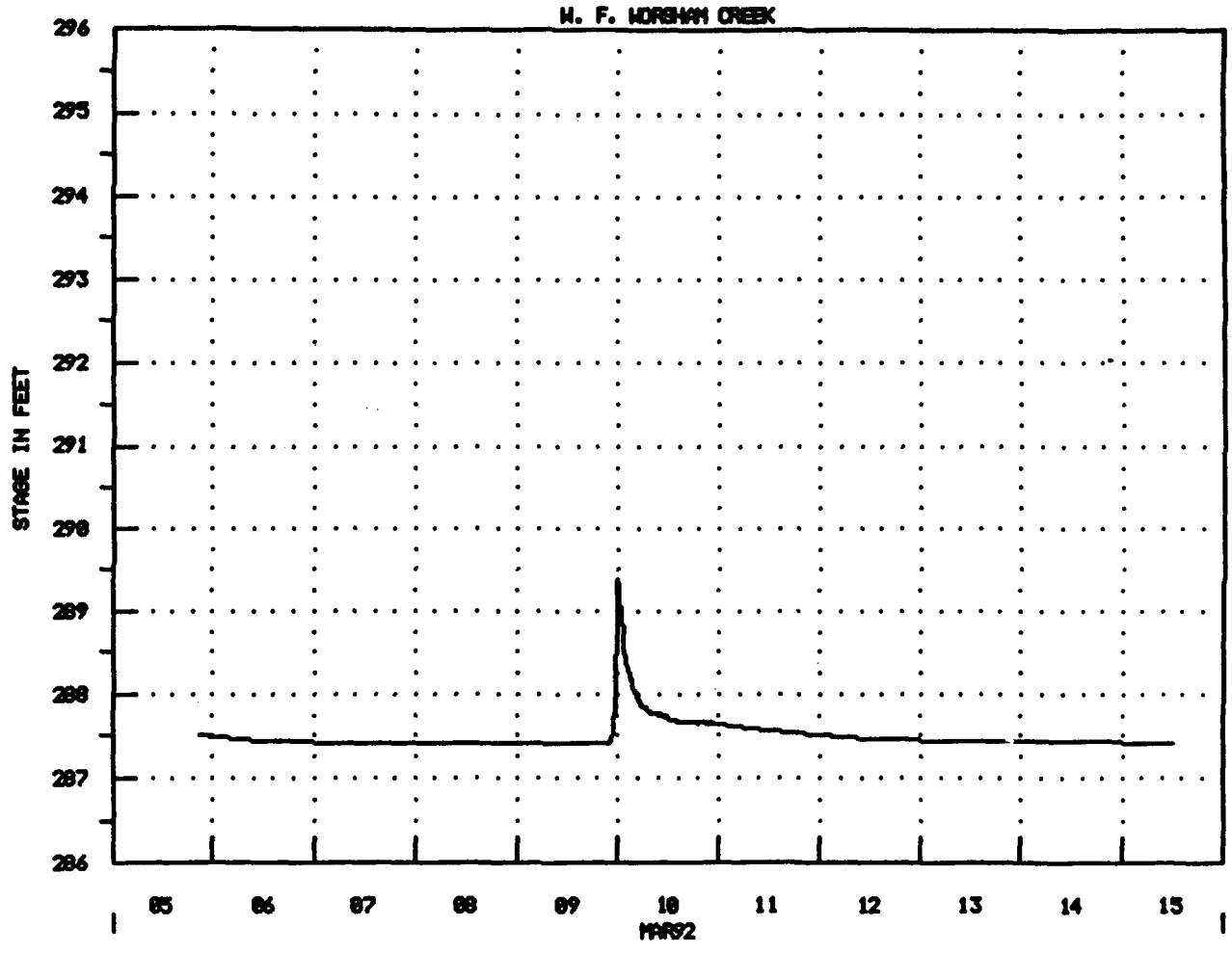
Plate D22



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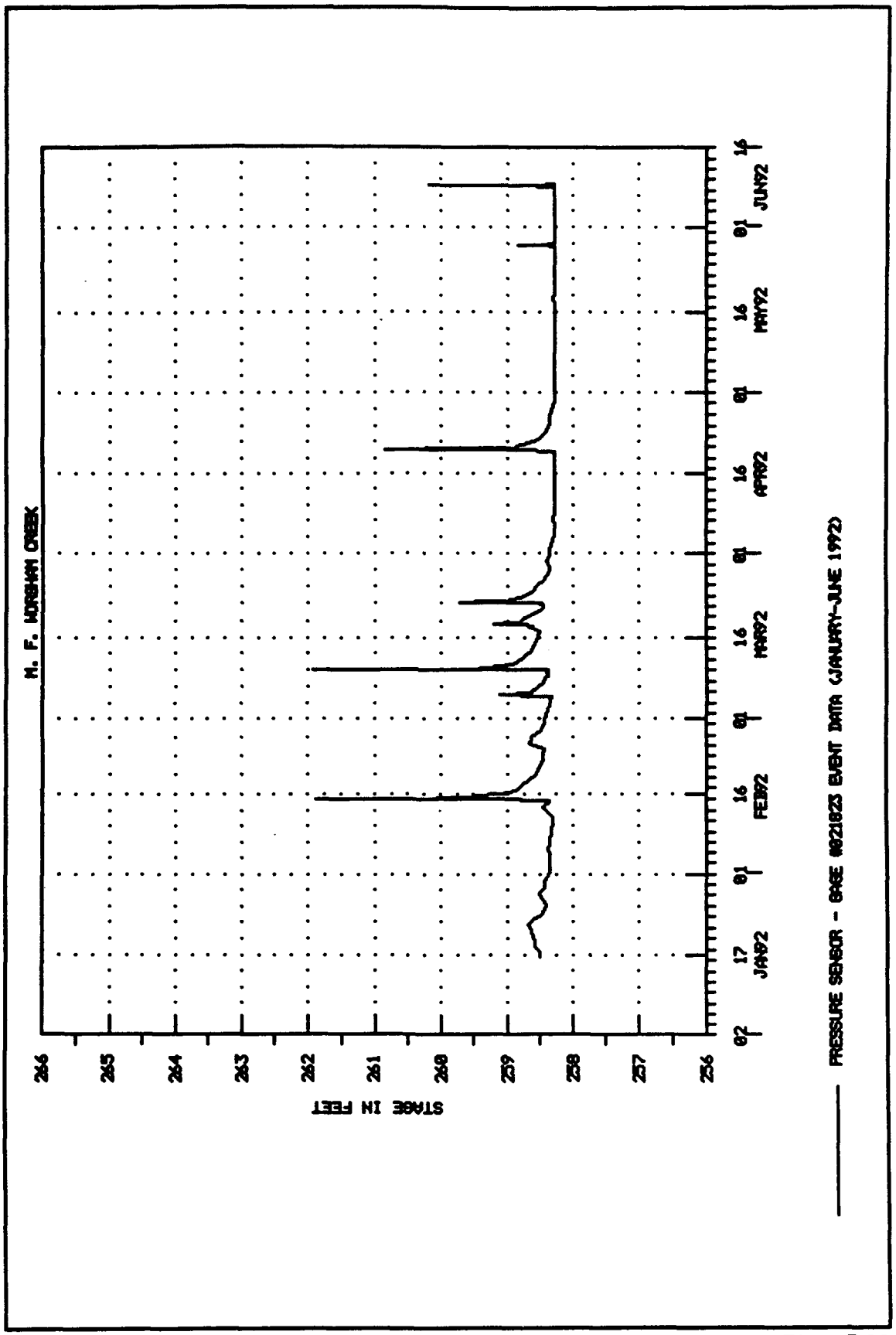
M. F. MORGAN CREEK
STAGE IN FEET
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16 FEB92
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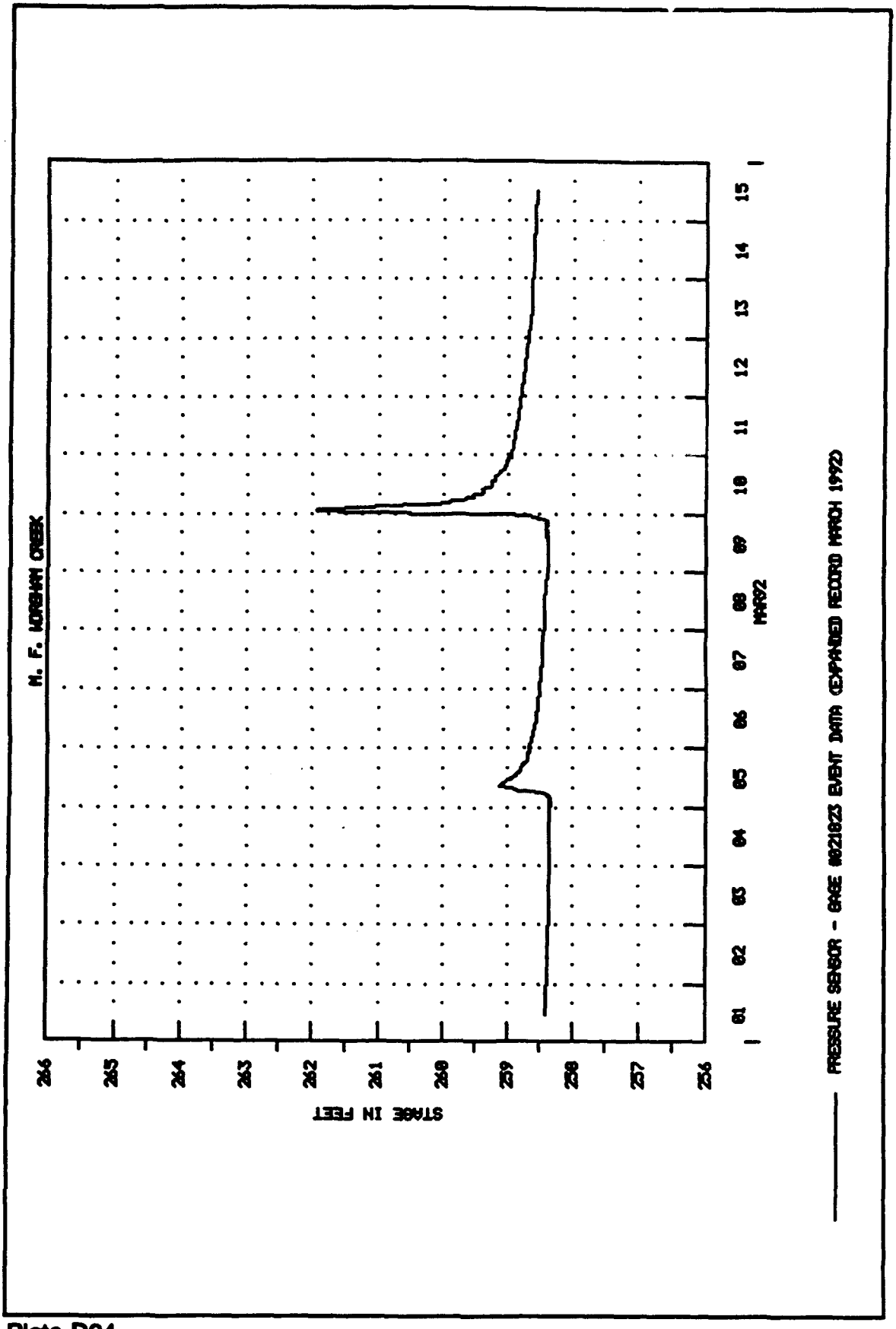
Plate D23


M. F. WORSHAM CREEK
STAGE IN FEET
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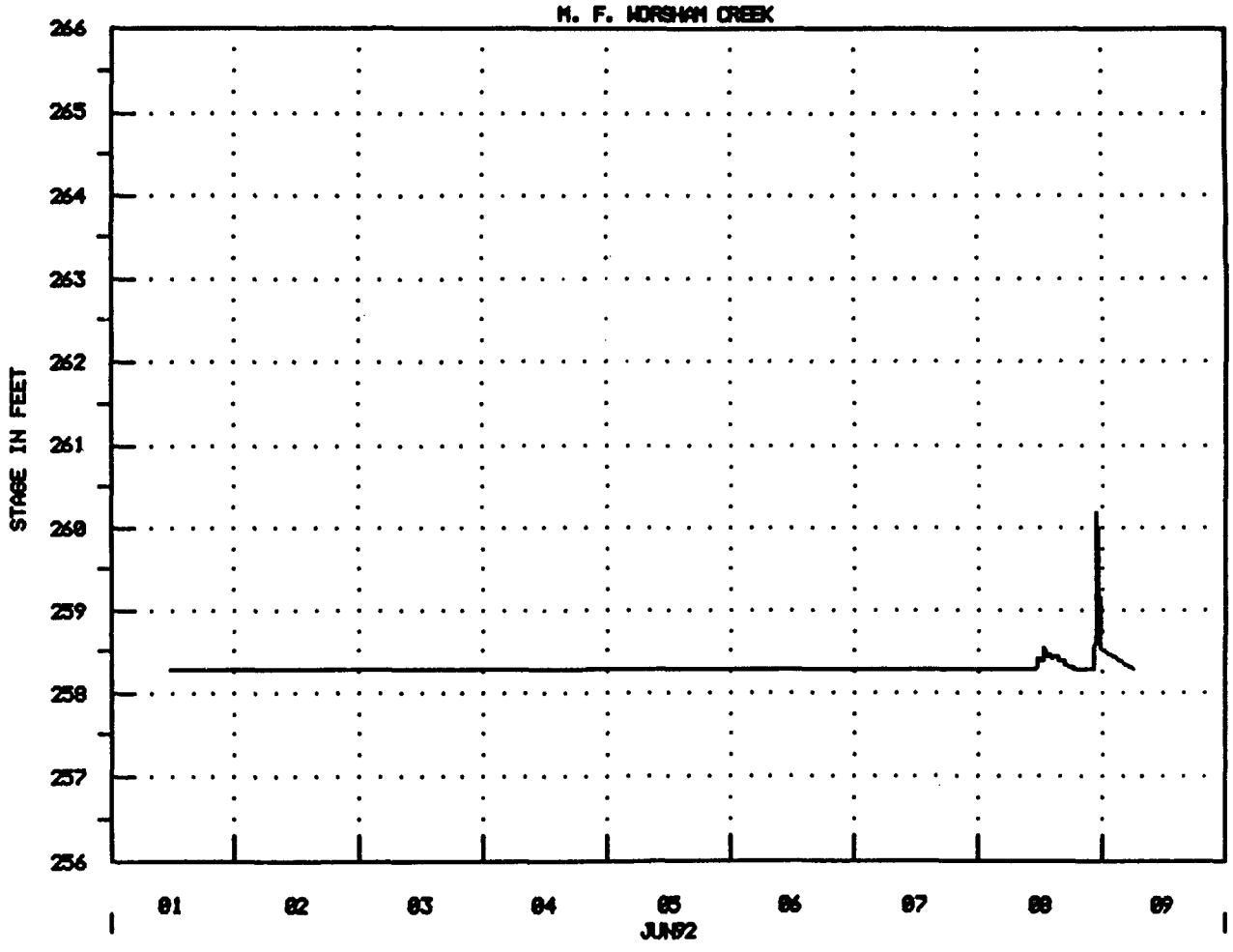
MAR92
PRESSURE SENSOR - GAGE #021823 EVENT DATA (EXPANDED RECORD MARCH 1992)

Plate D24



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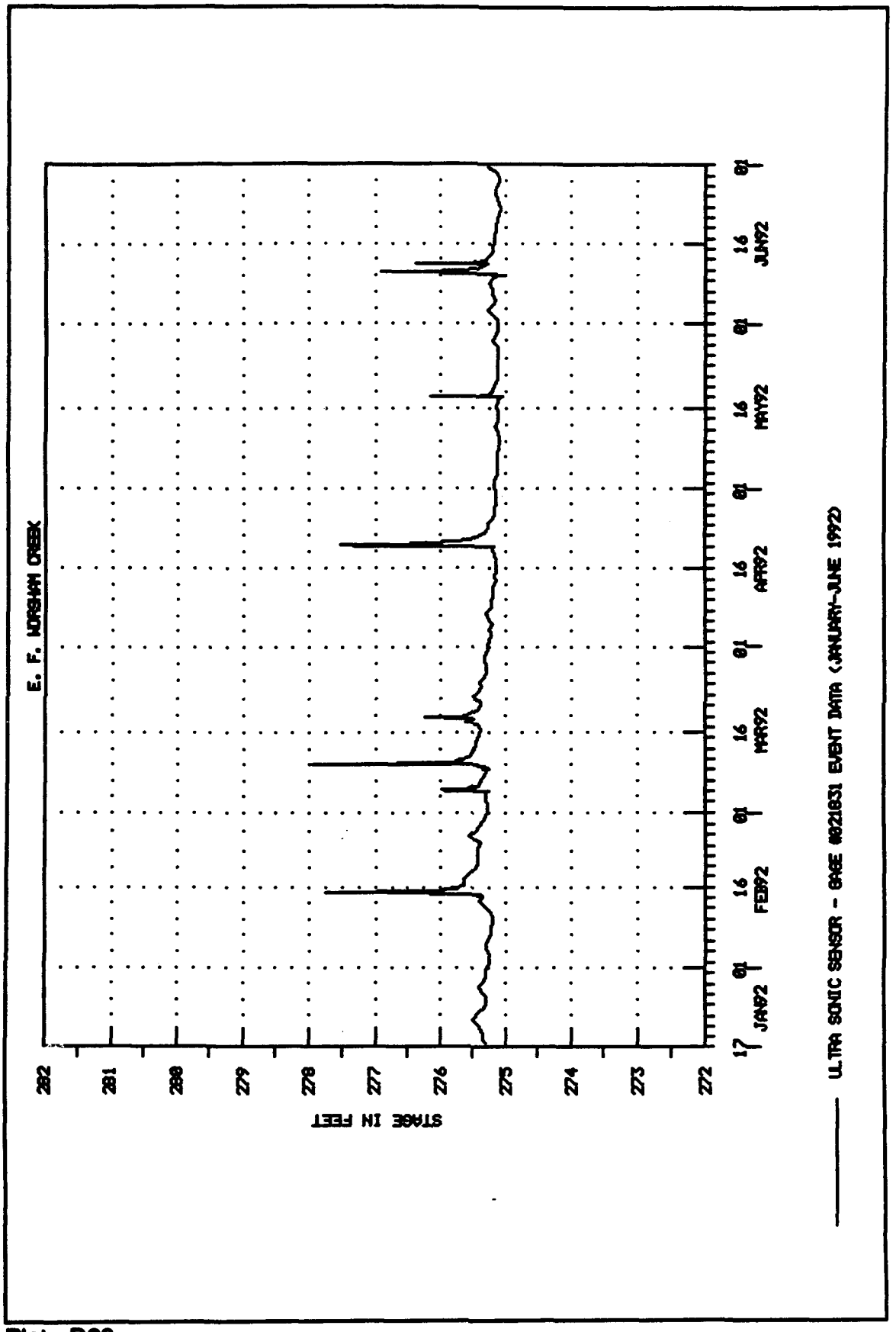
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STAGE IN FEET
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16 MAY92
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16 JUN92
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ULTRA SONIC SENSOR - GAGE #021831 EVENT DATA (JANUARY-JUNE 1992)

Plate D26

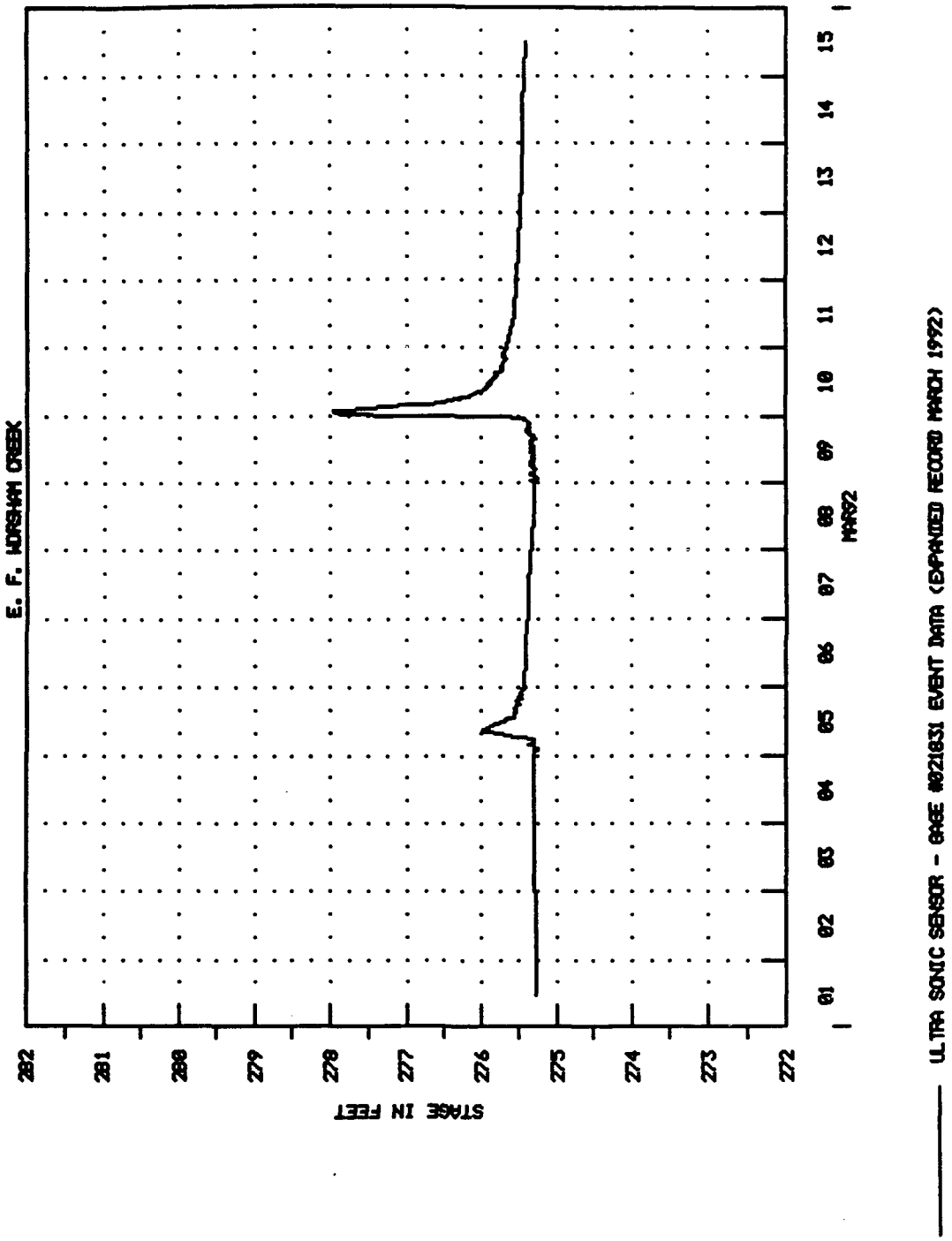

E. F. MORSHAM CREEK
STAGE IN FEET
282
281
280
279
278
277
276
275
274
273
272
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
MARCH 92
ULTRA SONIC SENSOR - GAGE #021831 EVENT DATA (EXPANDED RECORD MARCH 1992)

Plate D27

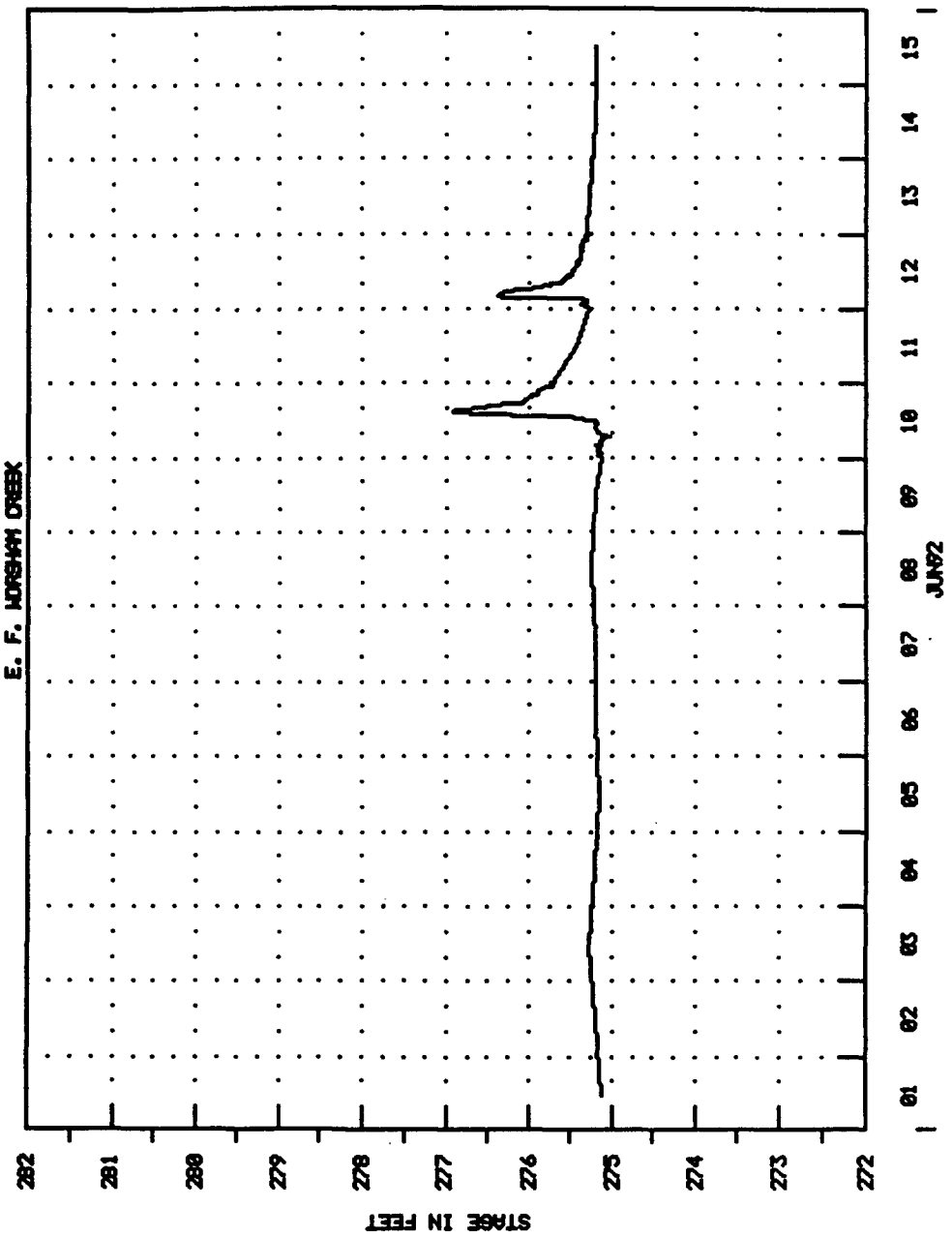
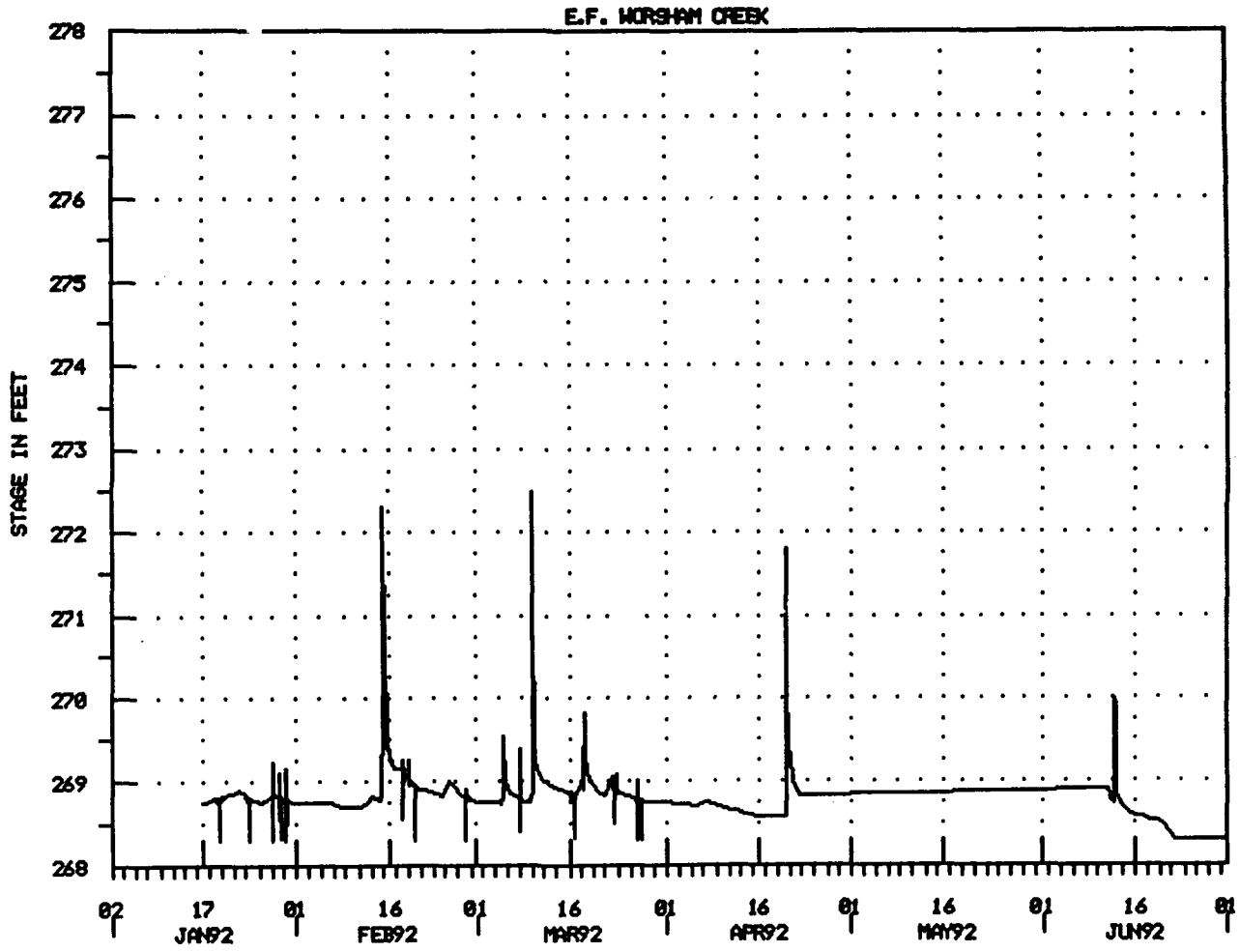

E. F. MORSHAM CREEK
STAGE IN FEET
282
281
280
279
278
277
276
275
274
273
272
01
02
03
04
05
06
07
08
JUN92
09
10
11
12
13
14
15
ULTRA SONIC SENSOR - GAGE #021831 EVENT DATA (EXPANDED RECORD JUNE 1992)

Plate D28


E.F. WORSHAM CREEK
STAGE IN FEET
278
277
276
275
274
273
272
271
270
269
268
02
17
JAN92
01
16
FEB92
01
16
MAR92
01
16
APR92
01
16
MAY92
01
16
JUN92
01
PRESSURE SENSOR - GAGE #021833 EVENT DATA (JANUARY-JUNE 1992)

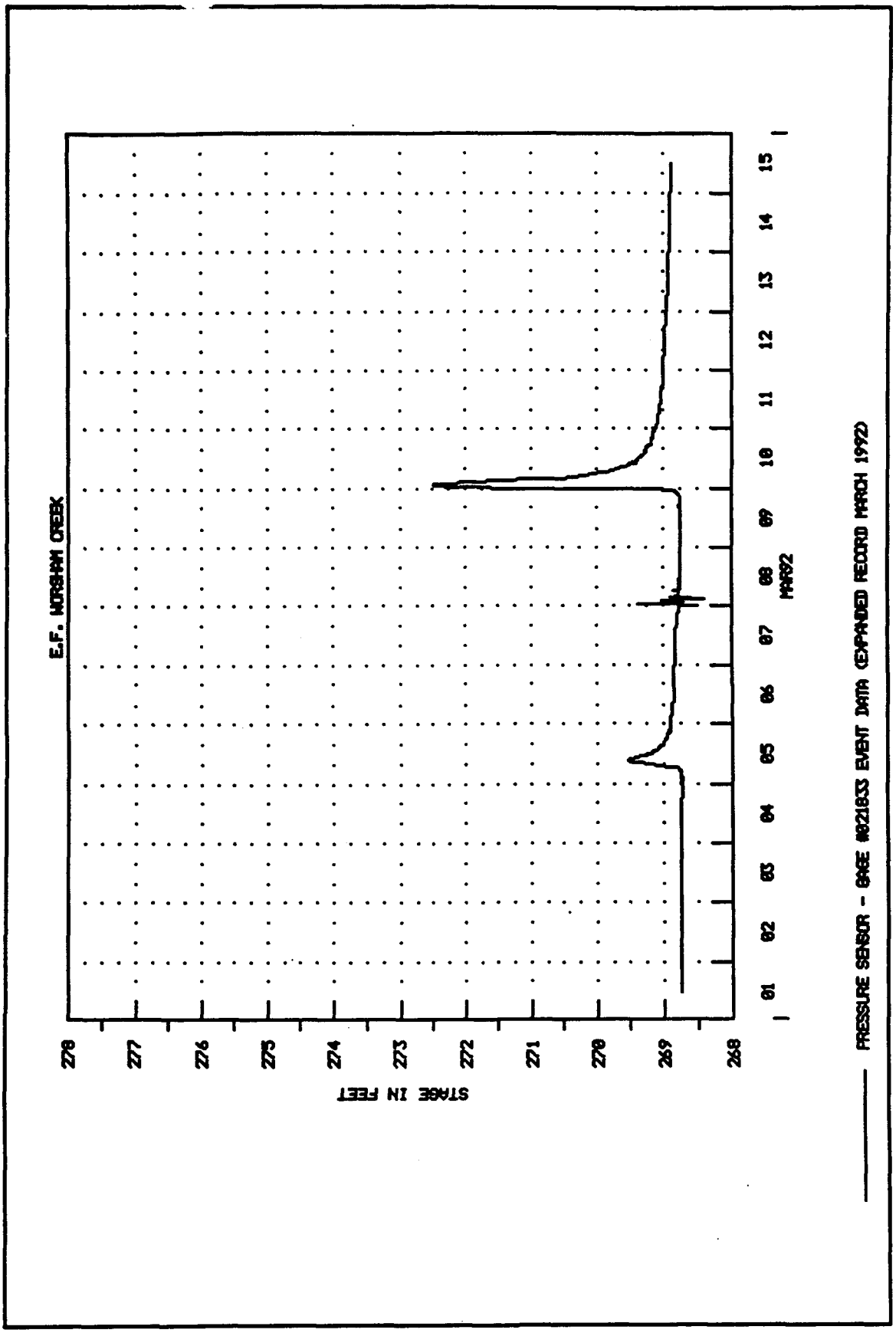

E.F. MORSHAM CREEK
STAGE IN FEET
278
277
276
275
274
273
272
271
270
269
268
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
MAR92
PRESSURE SENSOR - GAGE #021833 EVENT DATA (EXPANDED RECORD MARCH 1992)

Plate D30

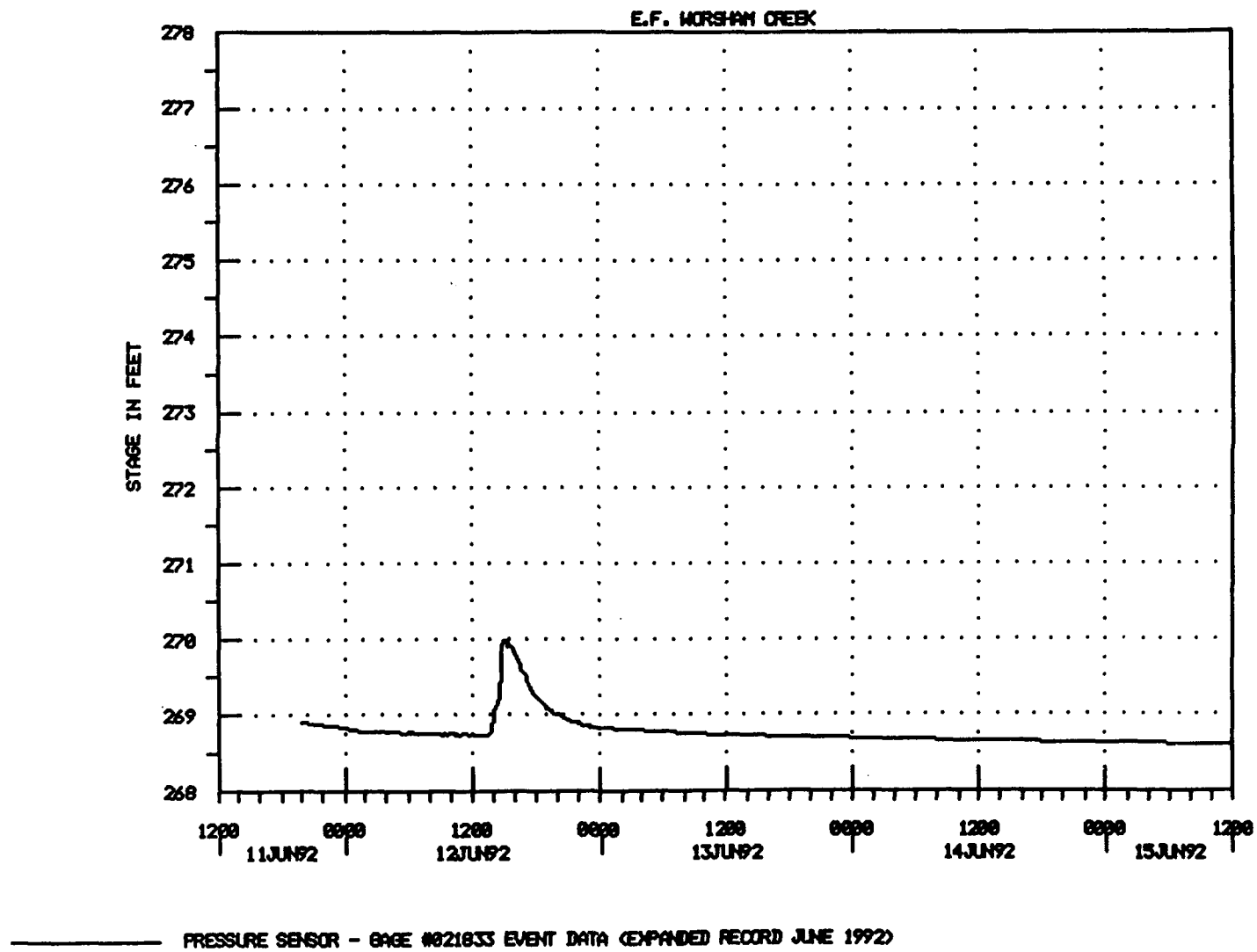

E.F. WORSHAM CREEK
STAGE IN FEET
278
277
276
275
274
273
272
271
270
269
268
1200
0000
1200
0000
1200
0000
1200
0000
1200
11JUN92
12JUN92
13JUN92
14JUN92
15JUN92
PRESSURE SENSOR - GAGE #021833 EVENT DATA (EXPANDED RECORD JUNE 1992)

Plate D31

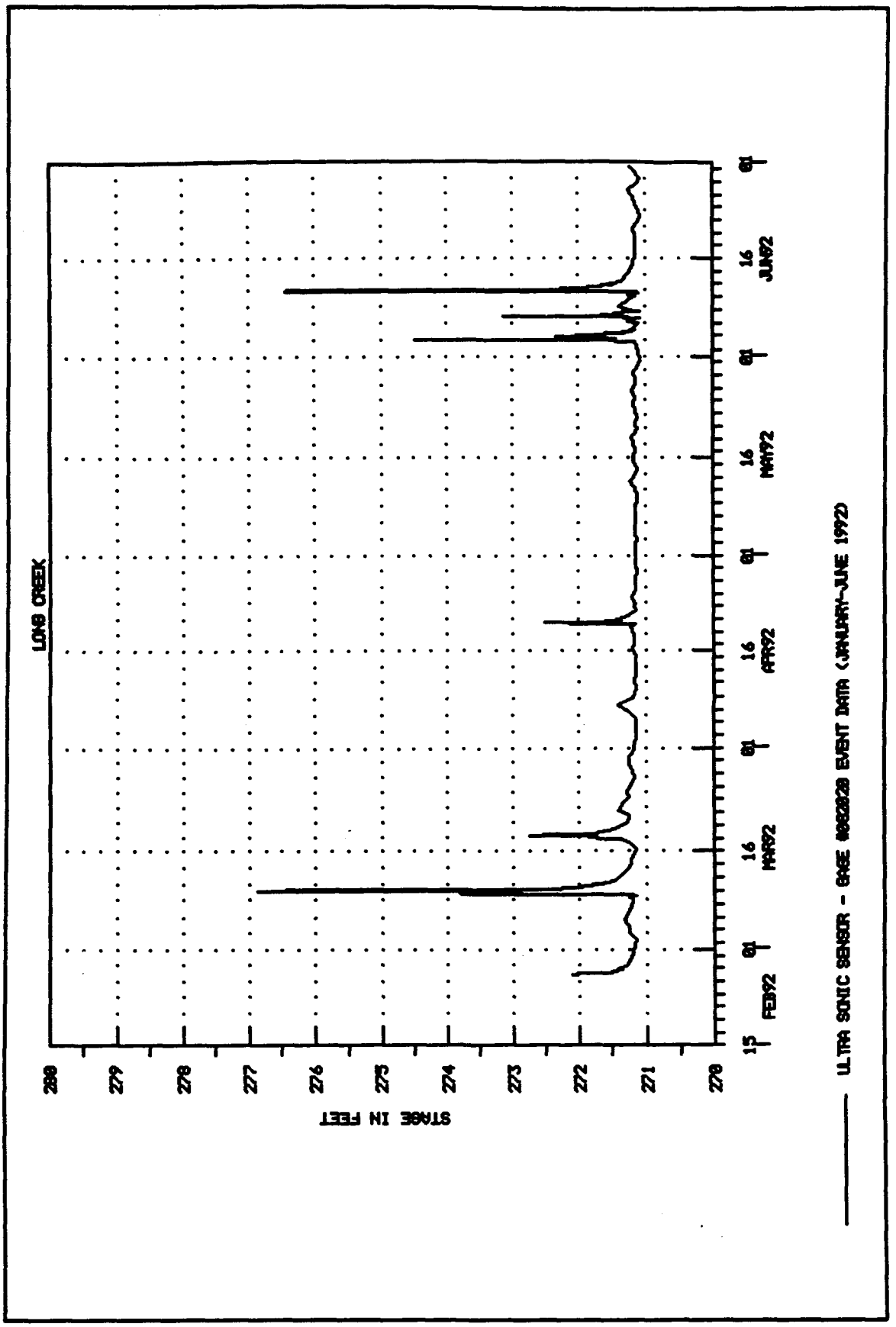
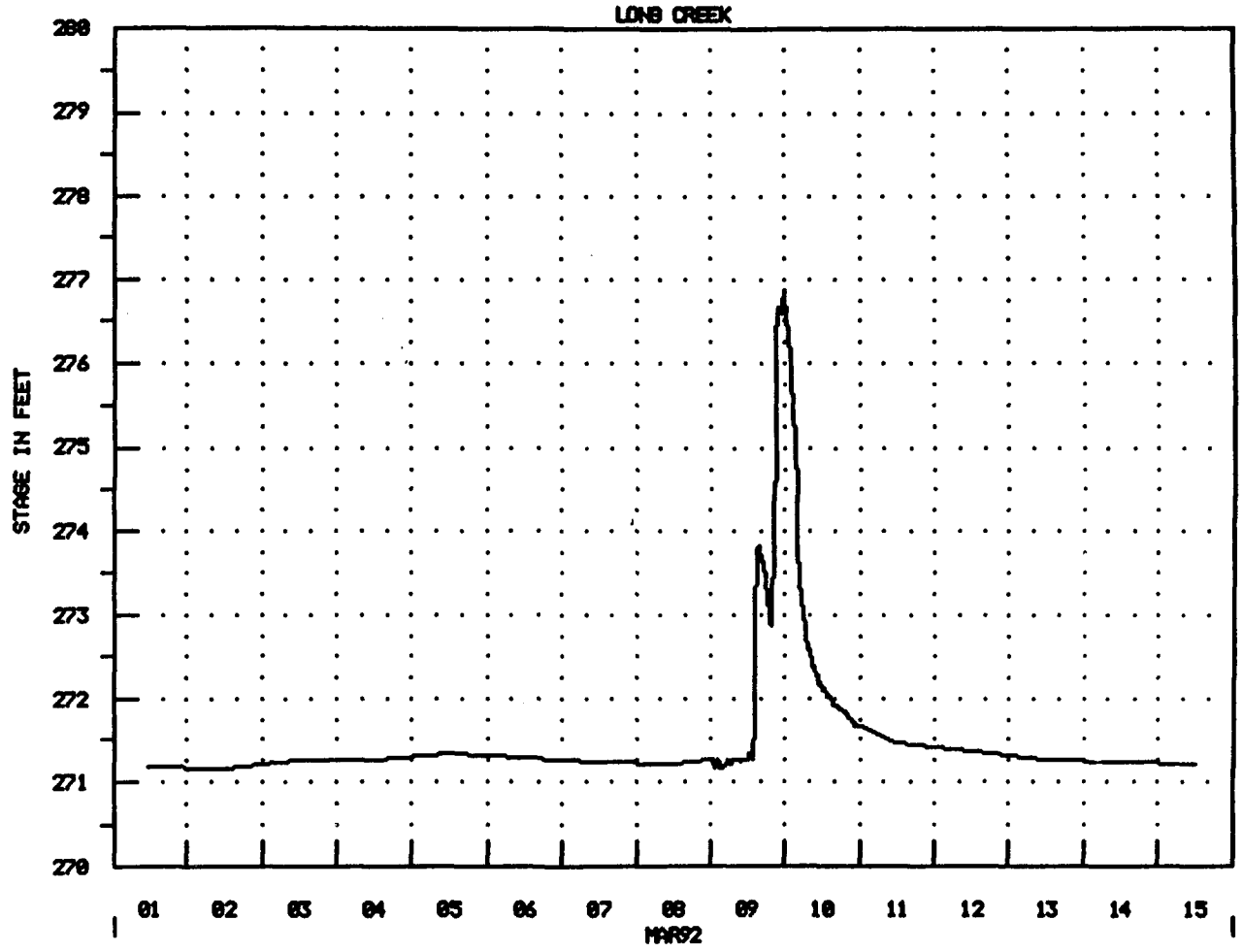

LONG CREEK
STAGE IN FEET
280
279
278
277
276
275
274
273
272
271
270
15
FEB92
01
16
MAR92
01
16
APR92
01
16
MAY92
01
16
JUN92
01
ULTRA SONIC SENSOR - GAGE #0020020 EVENT DATA (JANUARY-JUNE 1992)

Plate D32



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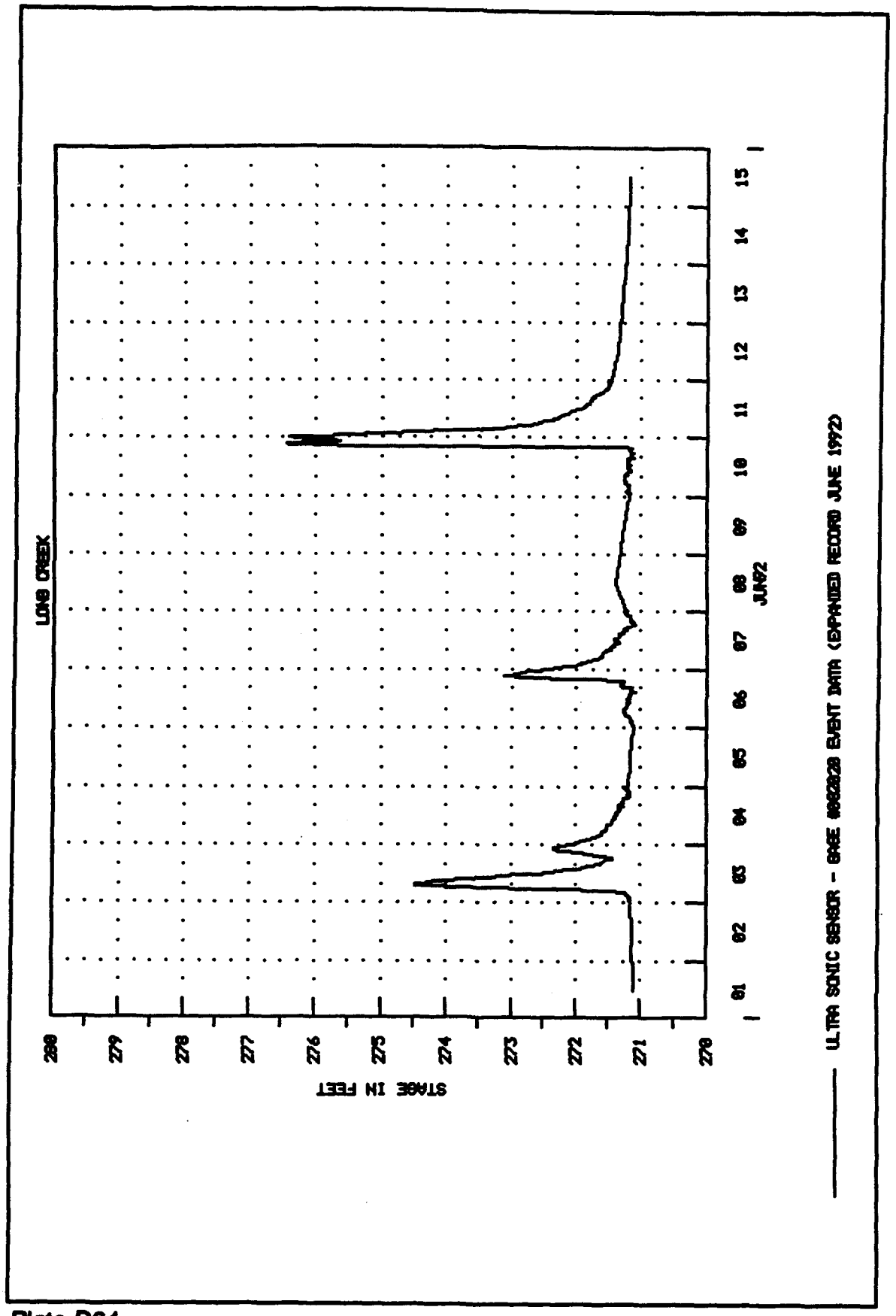
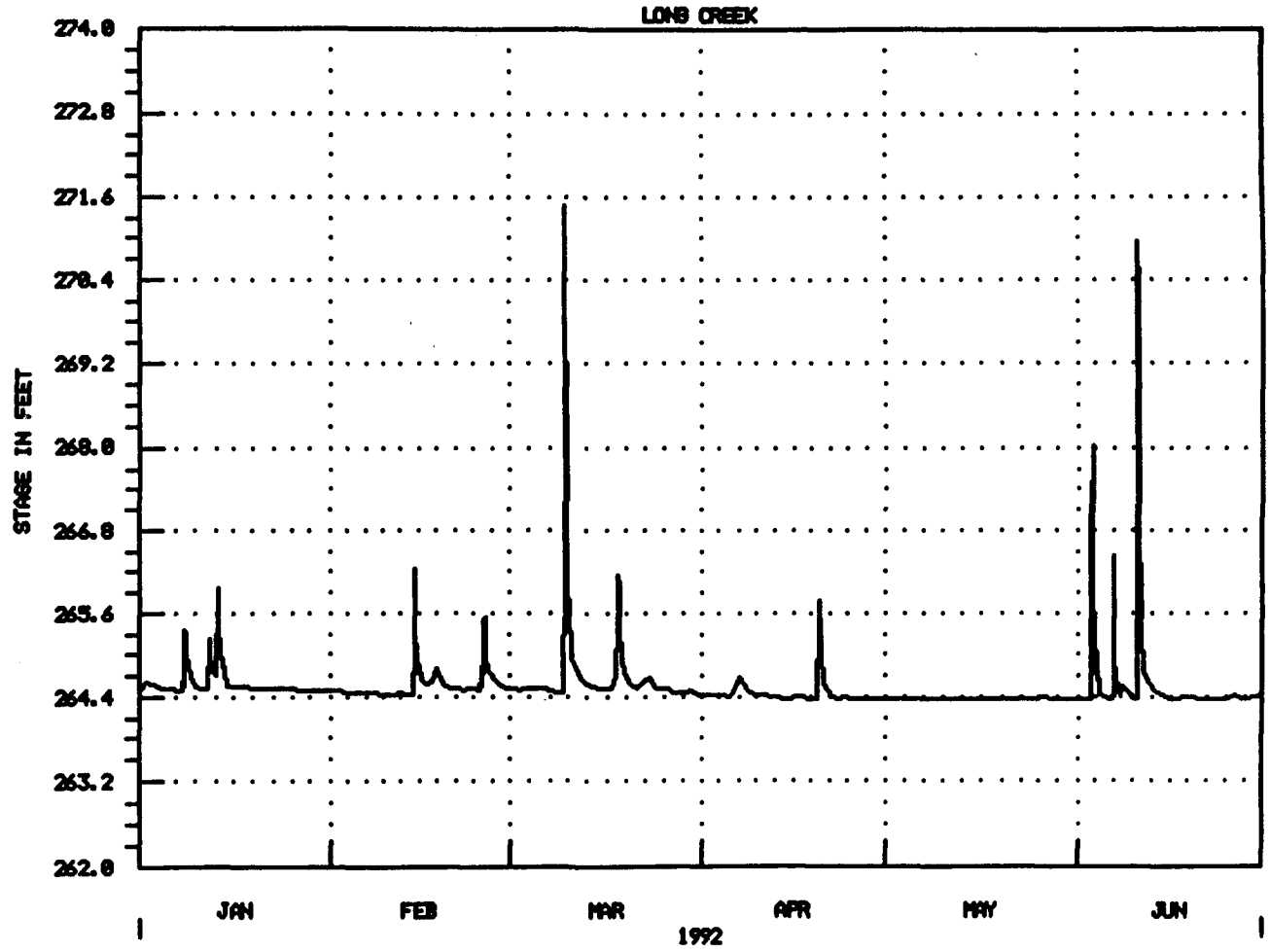

LONG CREEK
STAGE IN FEET
280
279
278
277
276
275
274
273
272
271
270
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
JUN92
ULTRA SONIC SENSOR - BASE #0020020 EVENT DATA (EXPANDED RECORD JUNE 1992)

Plate D34



PRESSURE SENSOR - GAGE #0062030 EVENT DATA (JANUARY-JUNE 1992)

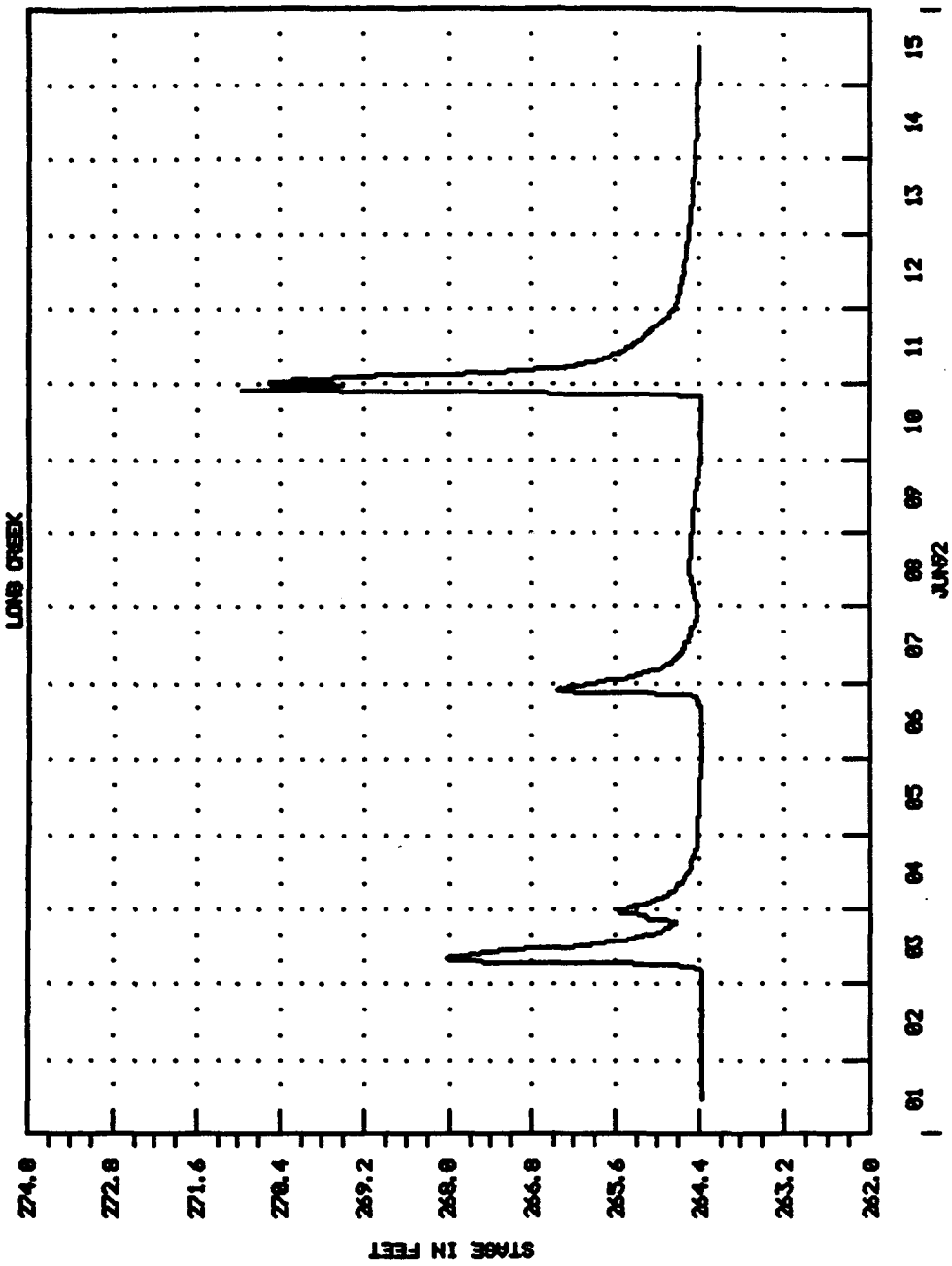
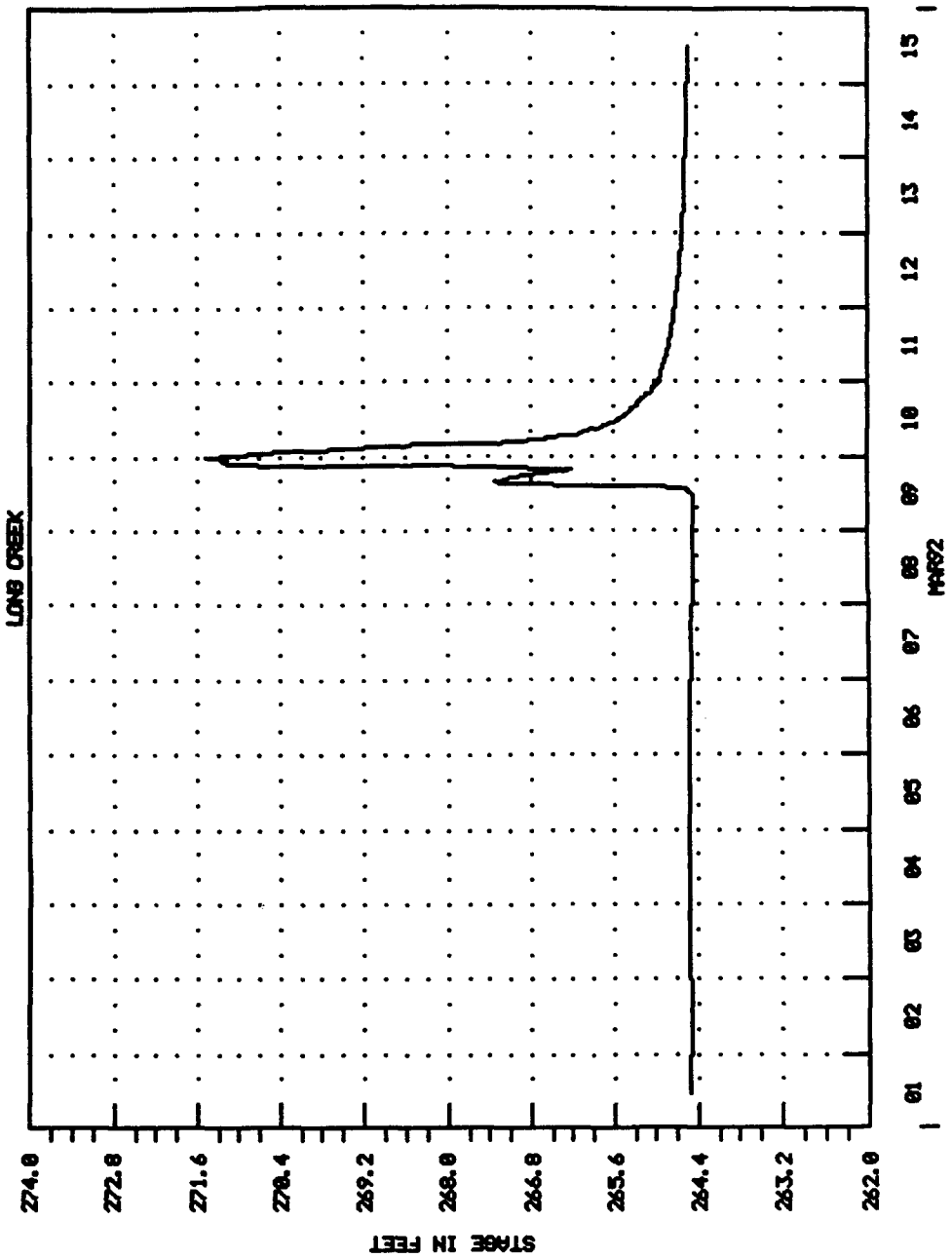

LONG CREEK
STAGE IN FEET
274.0
272.8
271.6
270.4
269.2
268.0
266.8
265.6
264.4
263.2
262.0
01
02
03
04
05
06
07
08
JUN92
09
10
11
12
13
14
15
PRESSURE SENSOR - BASE
EVENT DATA (EXPANDED RECORD JUNE 1992)

Plate D36


LONG CREEK
STAGE IN FEET
274.0
272.8
271.6
270.4
269.2
268.0
266.8
265.6
264.4
263.2
262.0
01
02
03
04
05
06
07
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MAR92
09
10
11
12
13
14
15
PRESSURE SENSOR - GAGE #0802030 EVENT DATA (EXPANDED RECORD MARCH 1992)

Plate D37

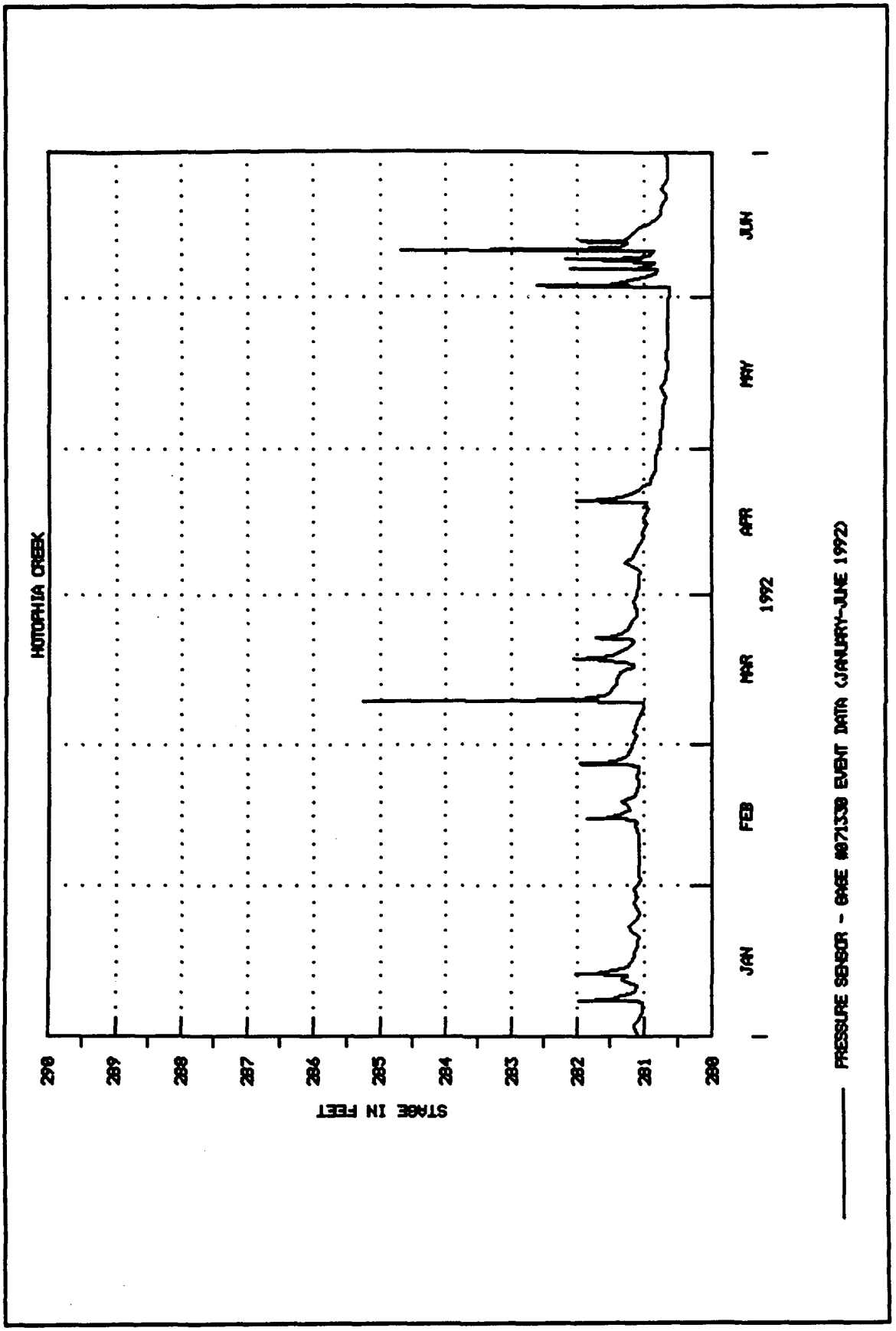
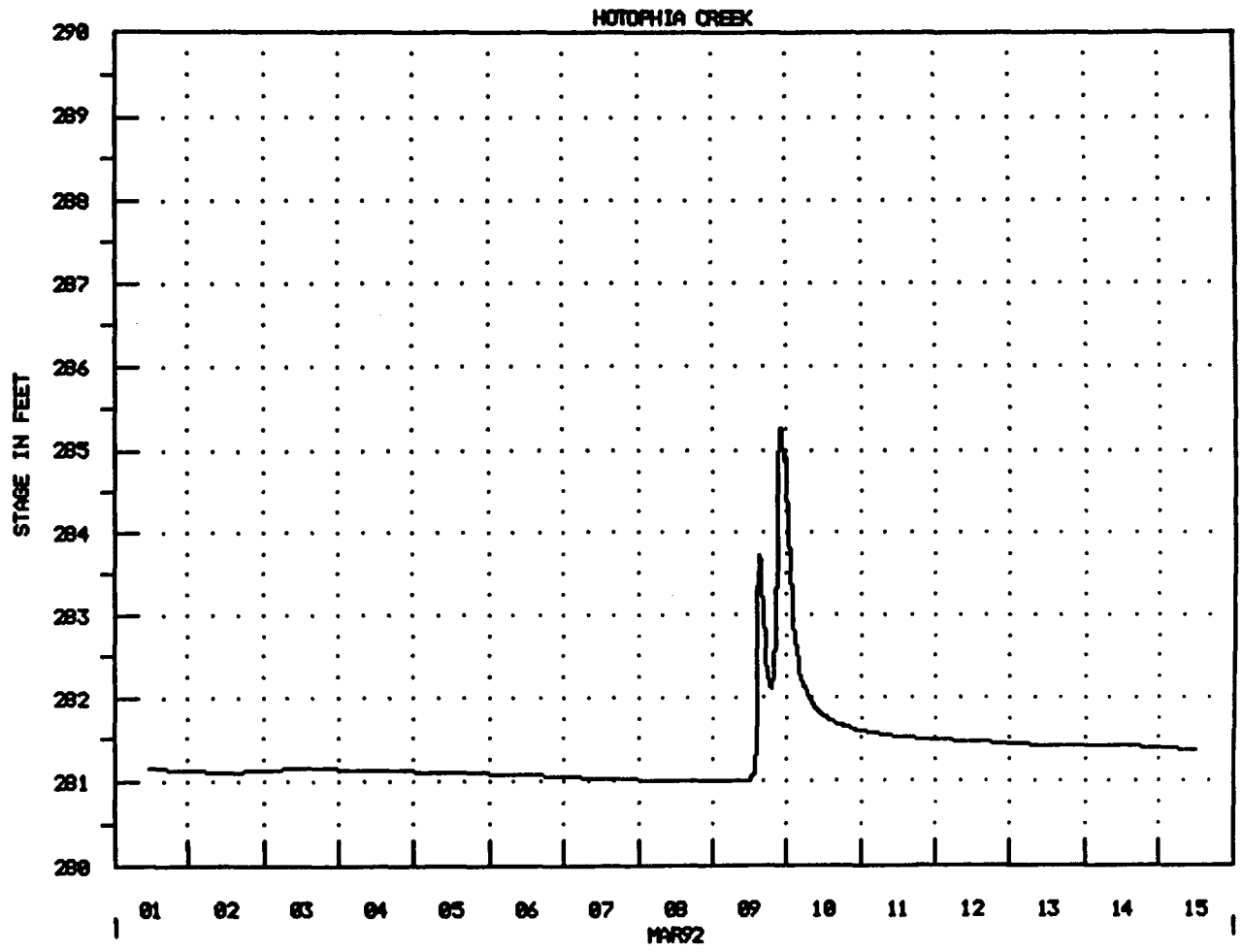

HOTOPAHIA CREEK
STAGE IN FEET
290
289
288
287
286
285
284
283
282
281
280
JAN
FEB
MAR
APR
MAY
JUN
1992
PRESSURE SENSOR - GAGE #071330 EVENT DATA (JANUARY-JUNE 1992)

Plate D38



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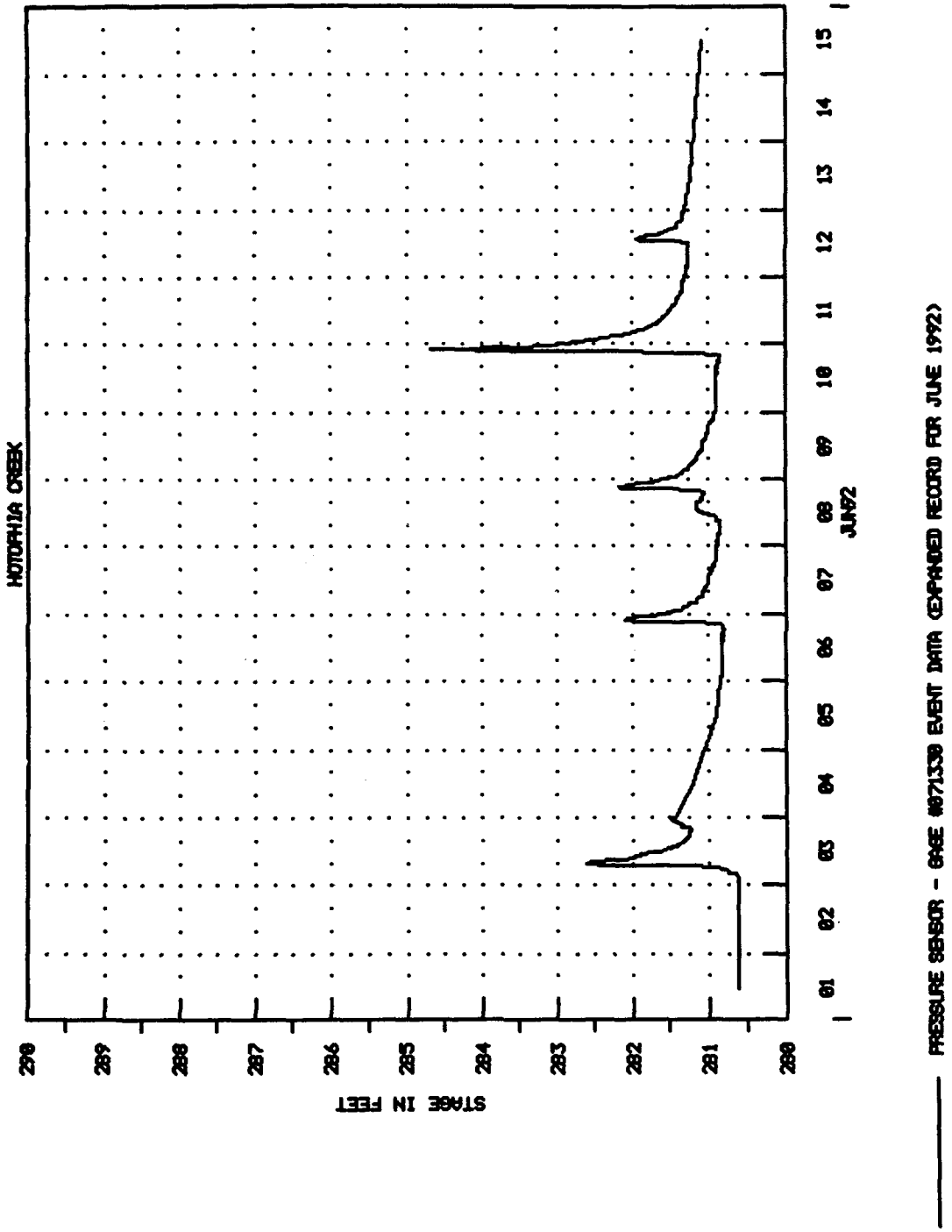
HOTURAHIA CREEK
STAGE IN FEET
290
289
288
287
286
285
284
283
282
281
280
01
02
03
04
05
06
07
08
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13
14
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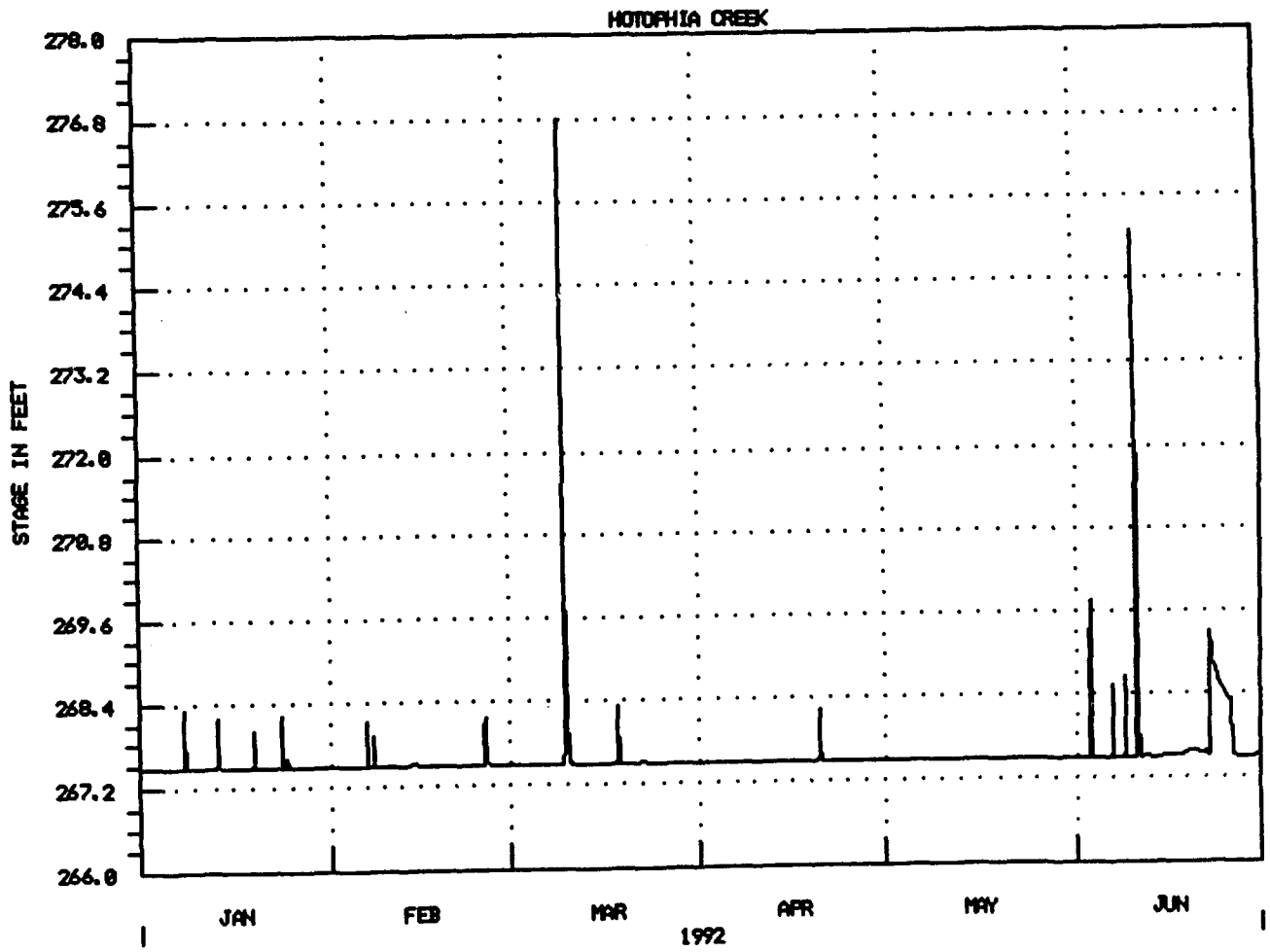
JUN92
PRESSURE SENSOR - GAGE #071330 EVENT DATA (EXPANDED RECORD FOR JUNE 1992)

Plate D40



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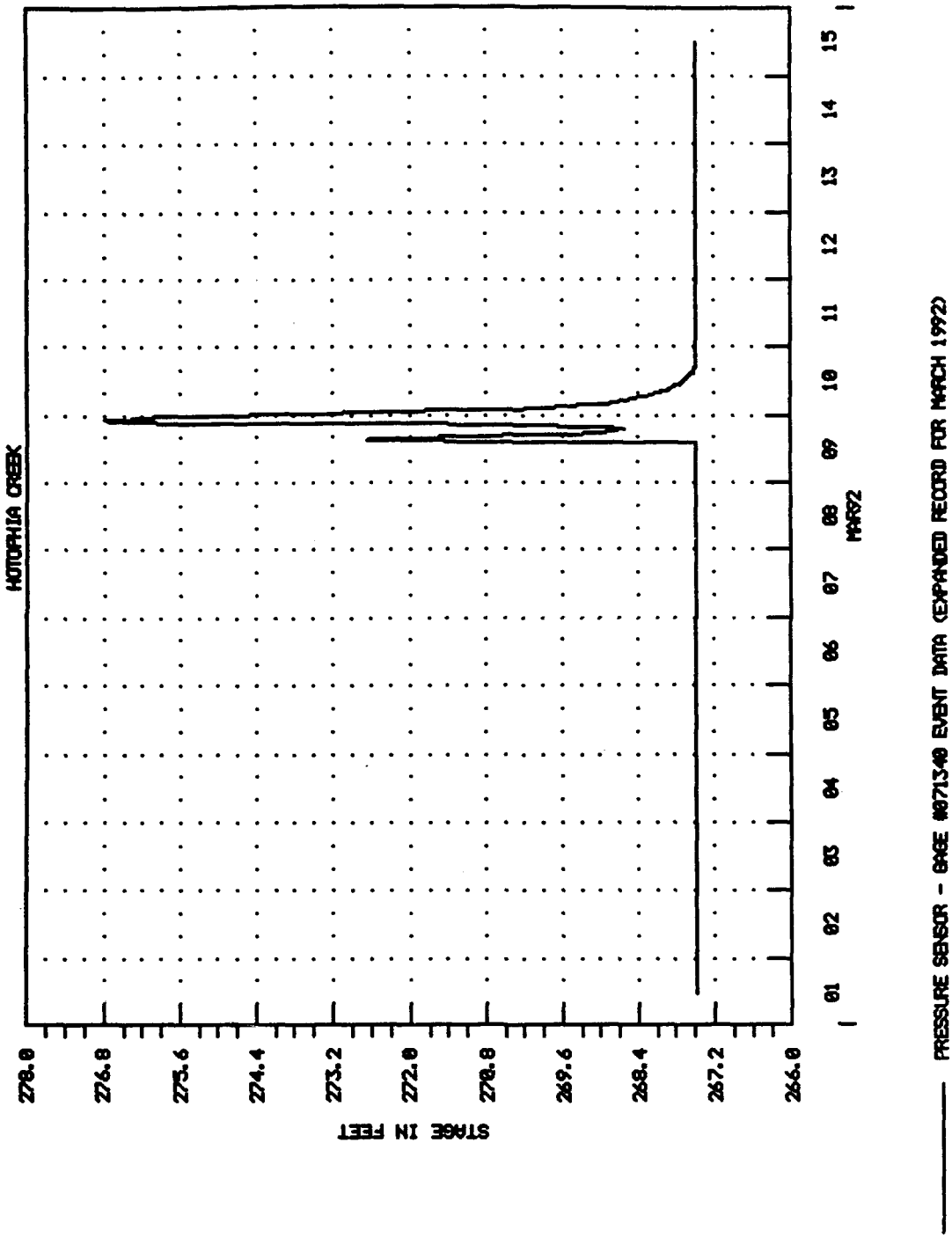
HUTCHINA CREEK
STAGE IN FEET
278.0
276.8
275.6
274.4
273.2
272.0
270.8
269.6
268.4
267.2
266.0
01
02
03
04
05
06
07
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MAR92
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12
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14
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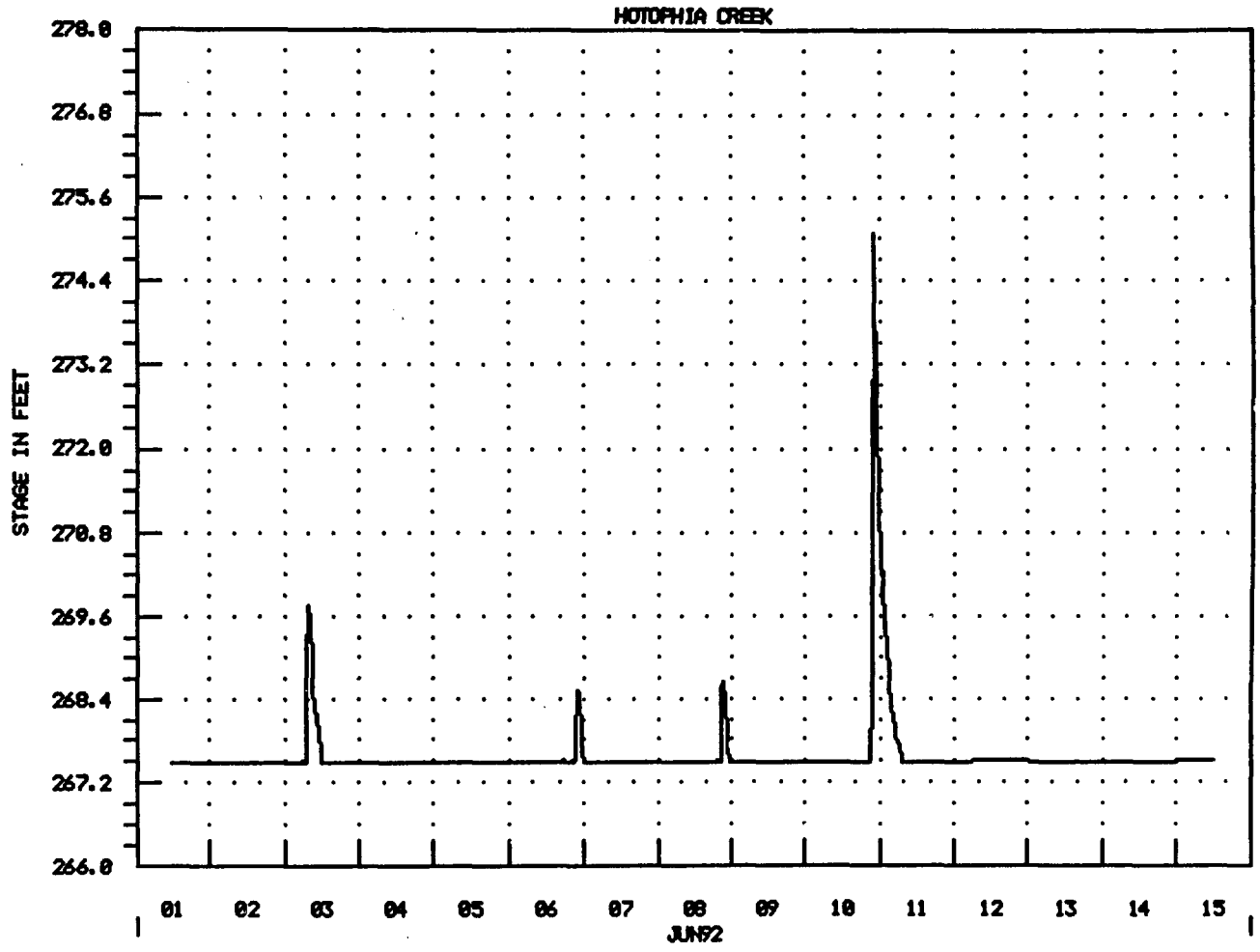
PRESSURE SENSOR - GAGE #0071340 EVENT DATA (EXPANDED RECORD FOR MARCH 1992)

Plate D42



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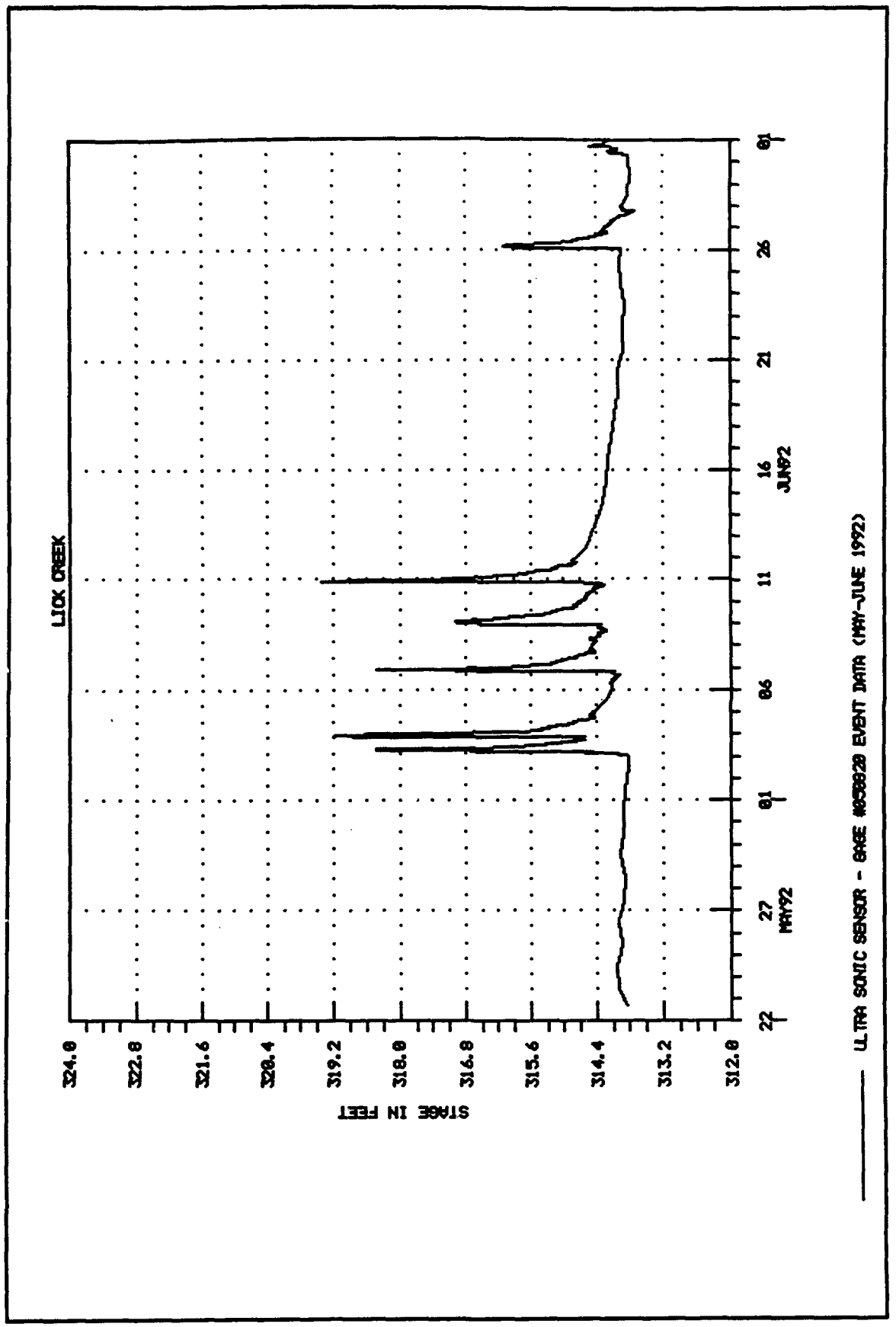
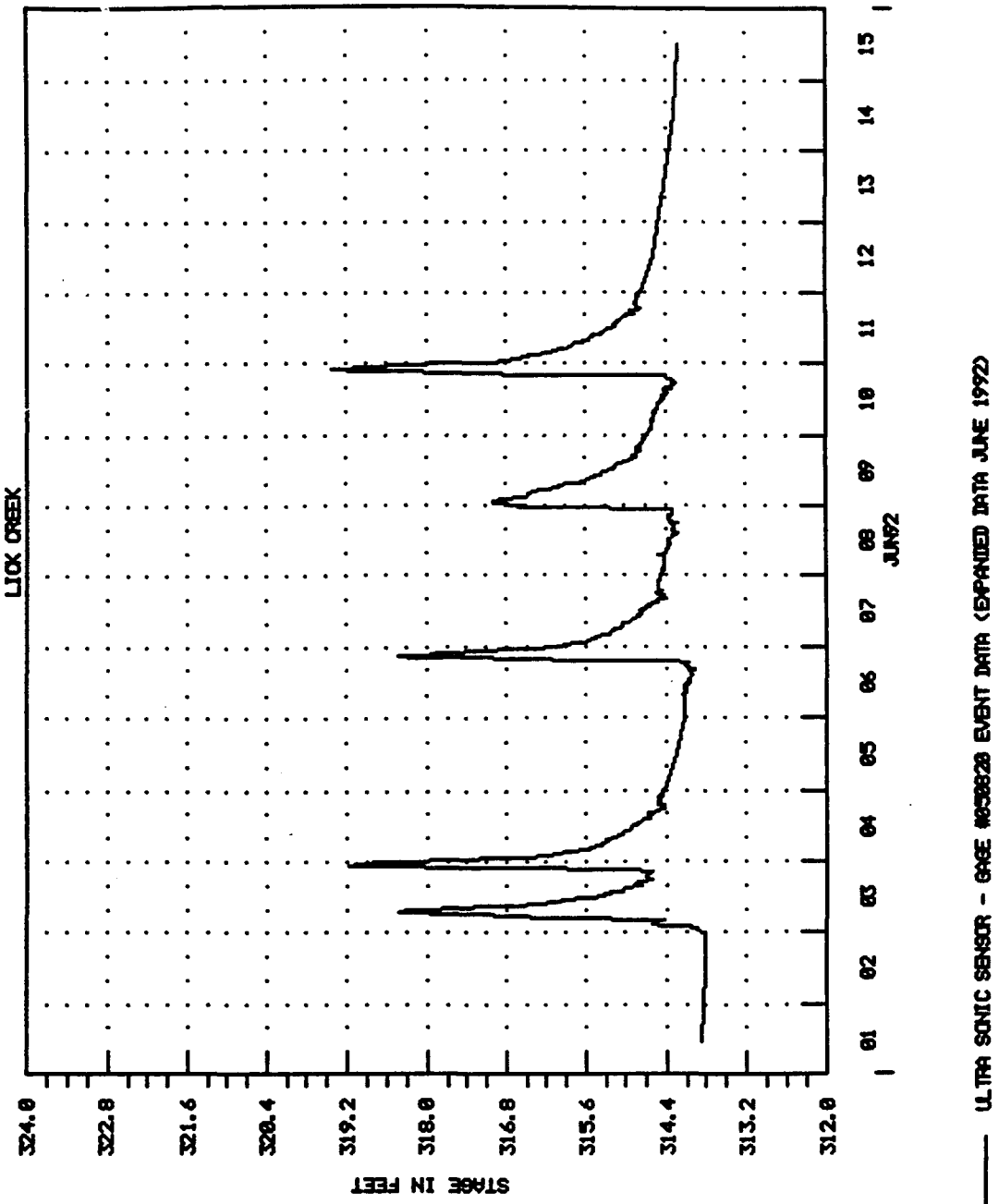

LICK CREEK
STAGE IN FEET
324.0
322.8
321.6
320.4
319.2
318.0
316.8
315.6
314.4
313.2
312.0
22
27
MAY92
01
06
11
16
JUN92
21
26
01
ULTRA SONIC SENSOR - GAGE #0358020 EVENT DATA (MAY-JUNE 1992)

Plate D44


LICK CREEK
STAGE IN FEET
324.0
322.8
321.6
320.4
319.2
318.0
316.8
315.6
314.4
313.2
312.0
01
02
03
04
05
06
07
08
JUN92
09
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11
12
13
14
15
ULTRA SONIC SENSOR - GAGE #030828 EVENT DATA (EXPANDED DATA JUNE 1992)

Plate D45

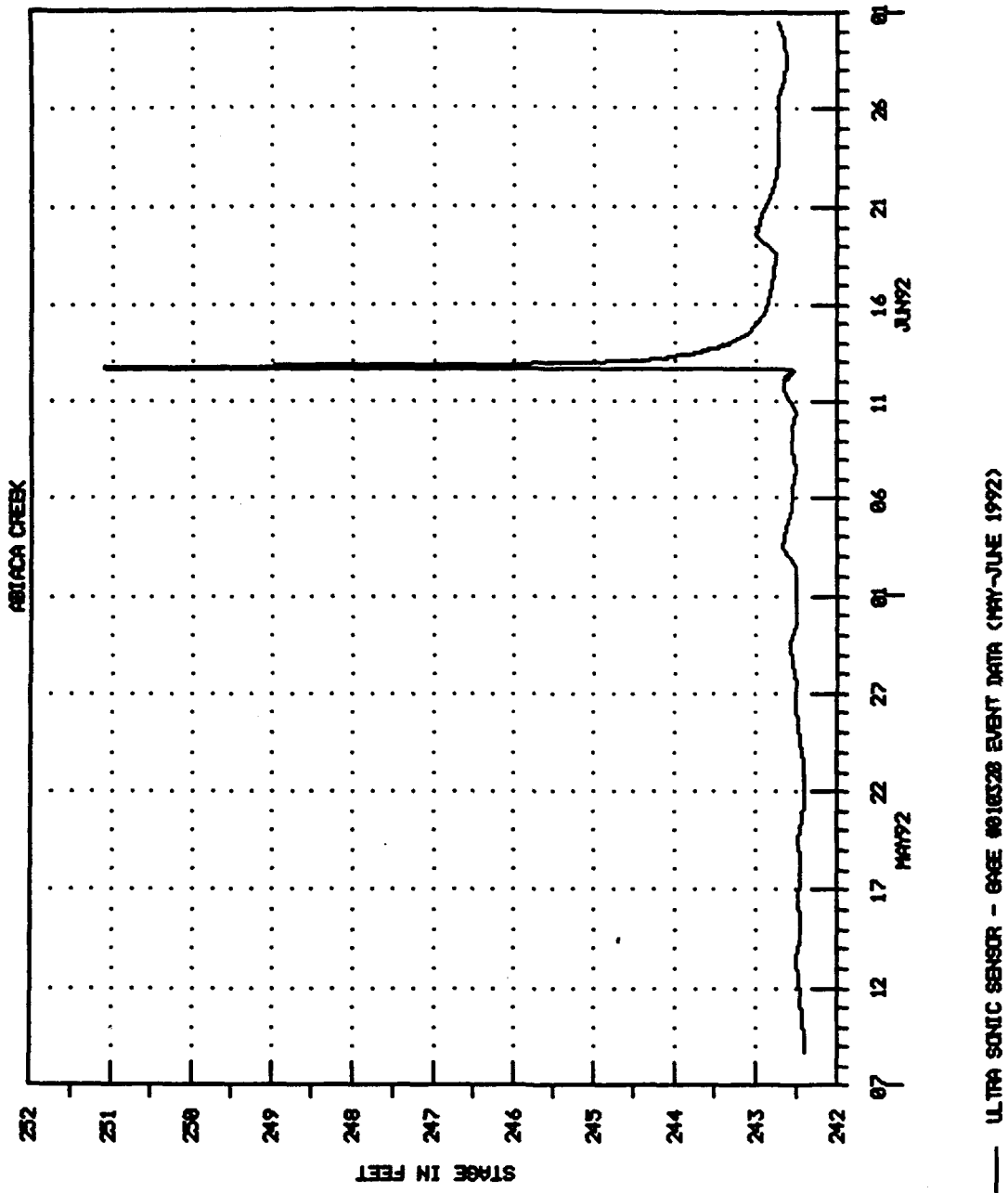
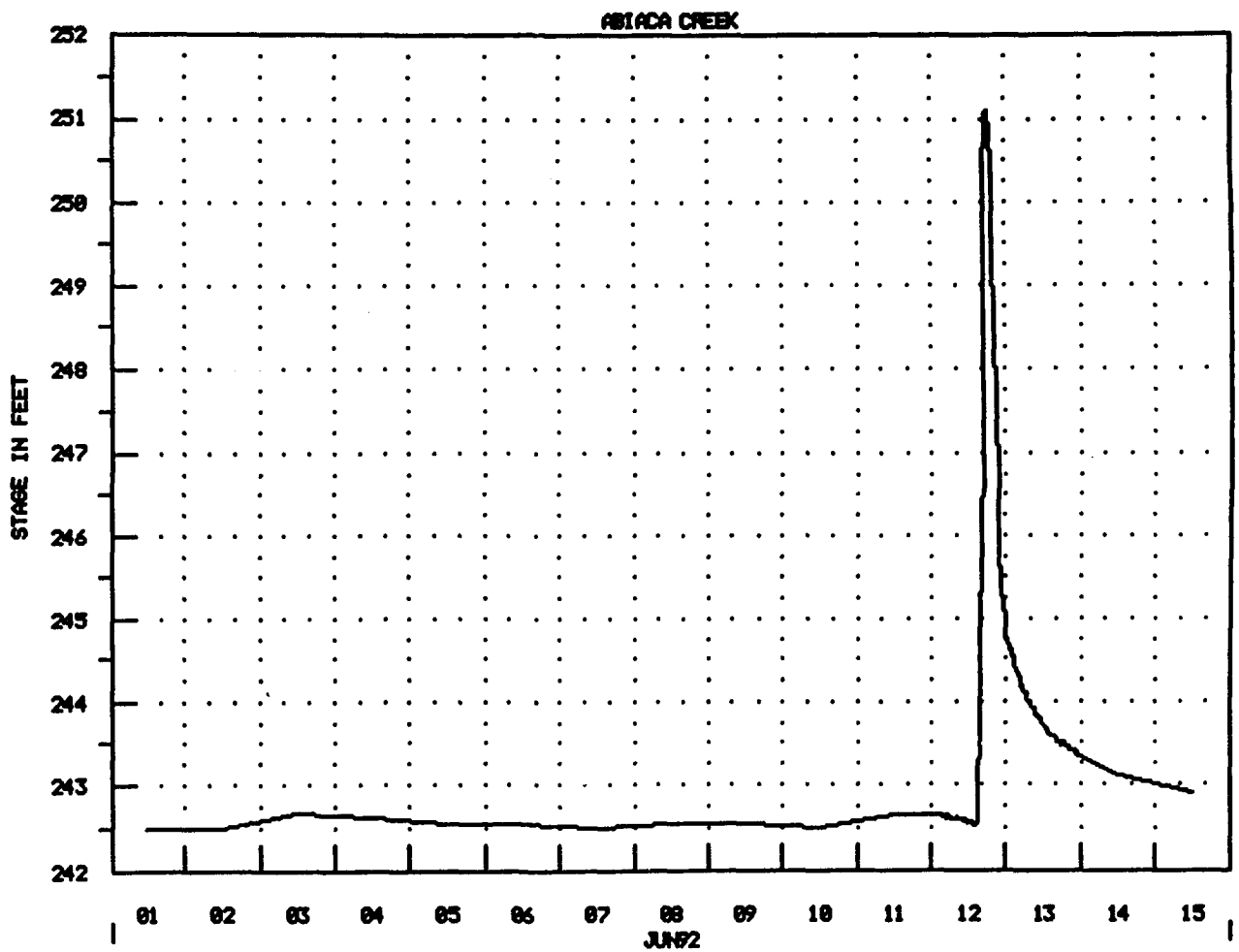

ABIAQA CREEK
STAGE IN FEET
252
251
250
249
248
247
246
245
244
243
242
07
12
17
22
27
01
06
11
16
21
26
01
MAY92
JUN92
ULTRA SONIC SENSOR - GAGE 0010328 EVENT DATA (MAY-JUNE 1992)

Plate D46



ULTRA SONIC SENSOR - GAGE #010320 EVENT DATA (EXPANDED RECORD JUNE 1992)

Plate D47

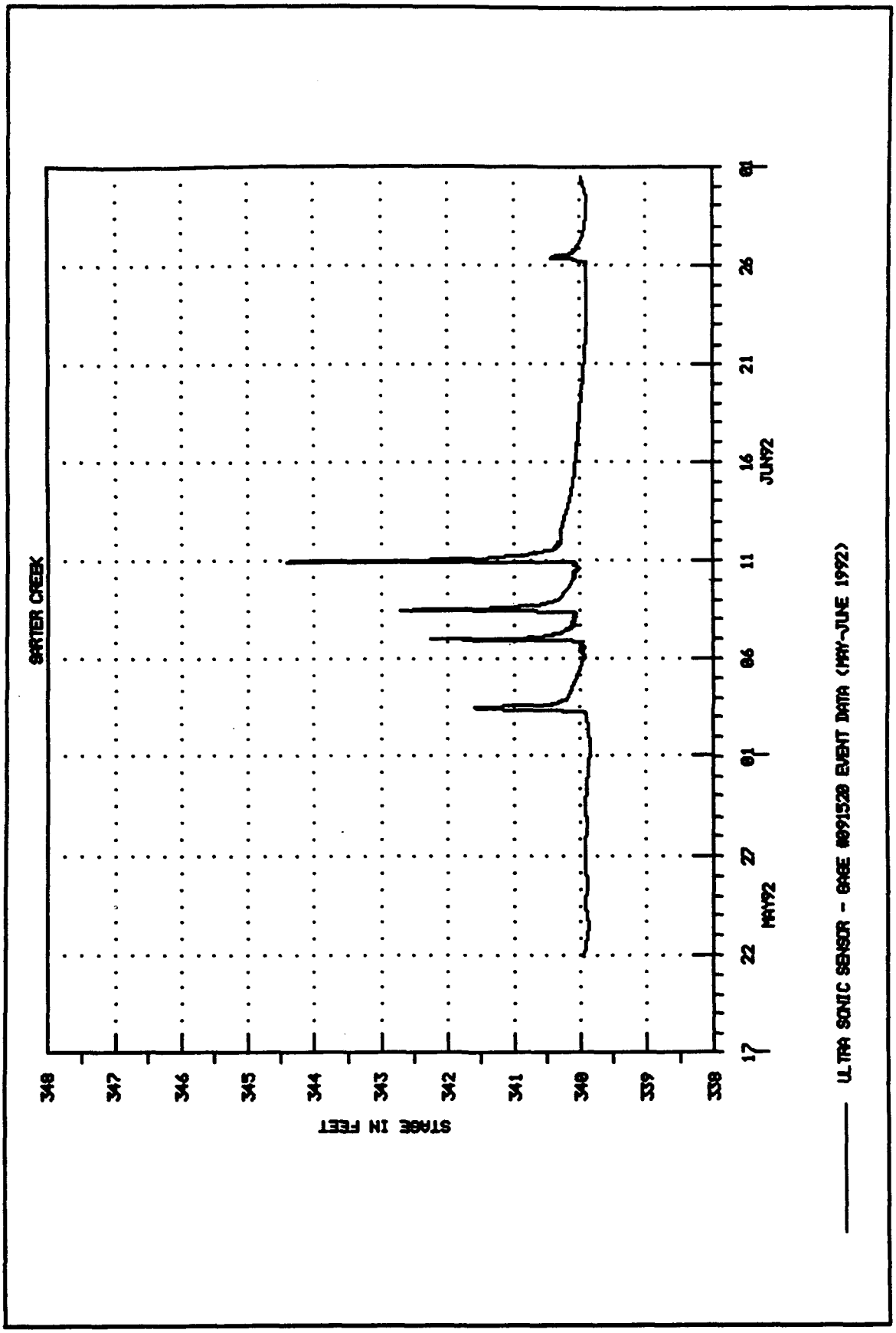
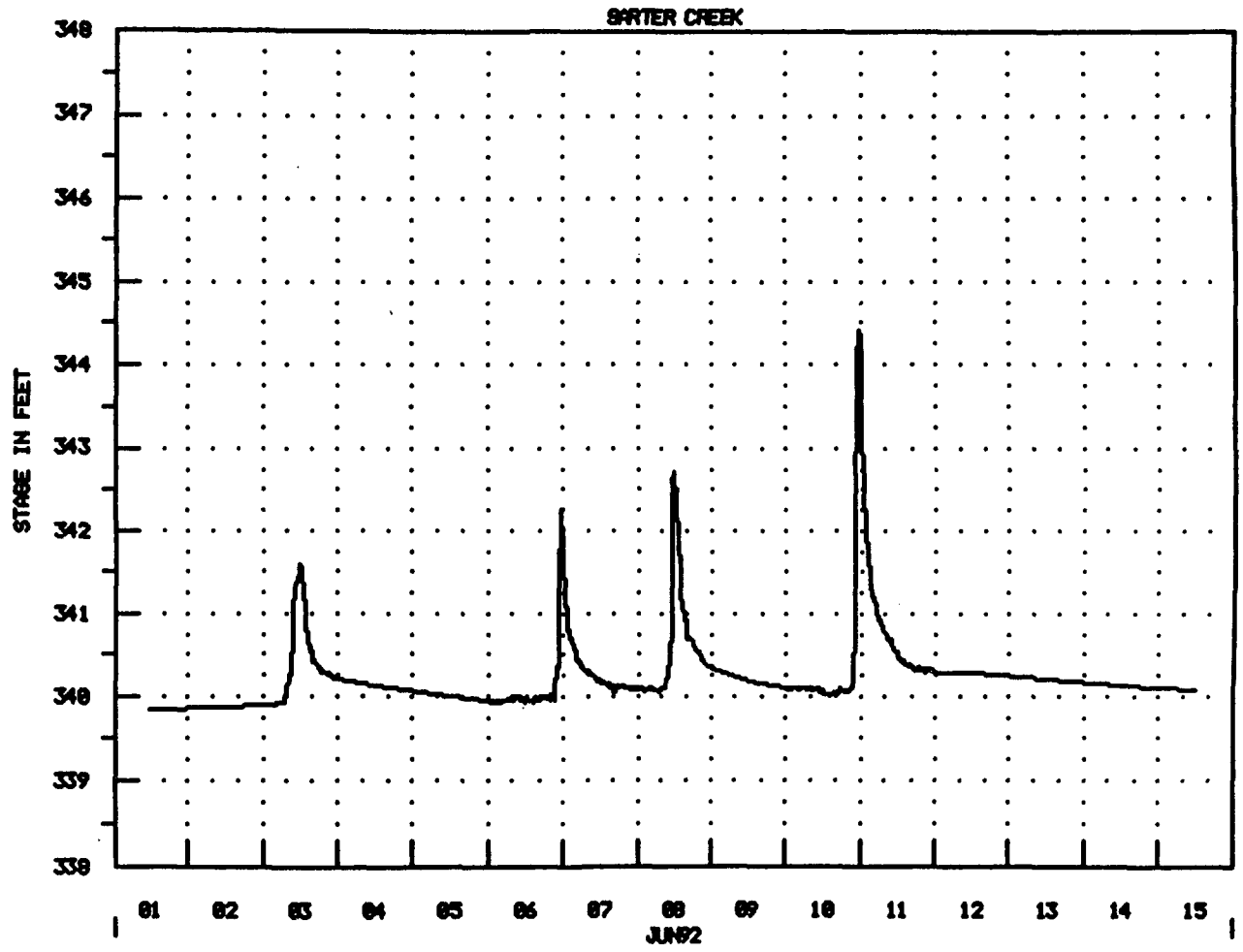

BARTER CREEK
STAGE IN FEET
348
347
346
345
344
343
342
341
340
339
338
17
22
27
01
06
11
16
21
26
01
MAY92
JUN92
ULTRA SONIC SENSOR - GAGE #091520 EVENT DATA (MAY-JUNE 1992)

Plate D48



ULTRA SONIC SENSOR - GAGE #091520 EVENT DATA (EXPANDED RECORD JUNE 1992)

Plate D49

REPORT DOCUMENTATION PAGE

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3909 Halls Ferry Road, Vicksburg, MS 39180-6199

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13. ABSTRACT *(Maximum 200 words)*

The purpose of monitoring the Demonstration Erosion Control (DEC) Project is to evaluate and document watershed response to the implemented DEC Project. Documentation of watershed responses to DEC Project features will allow the participating agencies a unique opportunity to determine the effectiveness of existing design guidance for erosion and flood control in small watersheds. The monitoring program includes 11 technical areas: stream gaging, data collection and data management, hydraulic performance of structures, channel response, hydrology, upland watersheds, reservoir sedimentation, environmental aspects, bank stability, design tools, and technology transfer.

Appendix D presents stage hydrographs for 16 gauge sites located in seven DEC watersheds (Hickahala-Senatobia, Batupan Bogue, Long, Hotophia, Coldwater, Abiaca, and Otoucalofa). The period of record for each gauge is from the time of installation through June 1992. Also included in Appendix D are specifications for each type of water level sensor and data logger used in the data collection program.

14. SUBJECT TERMS
Abiaca Watershed
Batupan Bogue Watershed
Coldwater Watershed
Hickahala-Senatobia Watershed
Hotophia Watershed
Long Watershed
Otoucalofa Watershed
Stage hydrographs

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