UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

May 17, 1988

Docket Nos.: 50-528/529/530

Licensee: Arizona Public Service Company

Facility: Palo Verde, Units 1, 2 and 3

SUBJECT: SUMMARY OF MEETING TO DISCUSS MONITORING PROGRAM FOR REACTOR COOLANT PUMP SHAFTS

A meeting was held on April 14, 1988 in Rockville, Maryland between representatives of the licensee and the staff. The purpose of the meeting was to: (1) discuss the RCP vibration monitoring program; (2) provide information regarding the current inspection of the Palo Verde Unit 2 RCP shafts; and (3) discuss proposed changes to the RCP vibration monitoring program. Enclosure 1 provides the list of attendees and the meeting is summarized as follows.

SUMMARY

The licensee briefly discussed the development of the vibration monitoring program for the RCP shafts. The licensee also provided vibration monitoring data for Palo Verde, Units 1 and 2, which are included as Enclosure 2. To date none of the Palo Verde data have correlated with positive indications of the presence of any shaft cracks. This result is expected since all of the cracks discovered on Palo Verde, Units 1 and 2 have been much smaller in depth than the size that can be picked up by vibration monitoring (i.e., all were much smaller than 40% of the shaft diameter).

The licensee also provided the status of the shaft inspections currently in progress for Palo Verde, Unit 2. Cracks have been found on 3 of the 4 shafts. Pump 1B has no indications of a crack. Both pumps 1A and 2B have two cracks with depths of 1.6 mm or less. Pump 2A has one crack which is estimated to be about 12.7 mm deep. This latter depth is equivalent to the largest depth reported on the Palo Verde, Unit 1 shafts.

All four shafts in Unit 2 will be replaced with new modified shafts. The modified shafts will be the same as those installed in Unit 1, except that the Unit 2 shafts will also have a center hole drilled to facilitate ultrasonic inspections during shutdowns.

The licensee also discussed proposed changes to the vibration monitoring program which are included as Enclosure 3. The staff expressed the following concerns with the proposed changes.

(1) The changes would eliminate the requirements for orbital monitoring which is considered to be an important element for earlier detection of large cracks (Items a and d of Enclosure 3).

(2) The changes would allow continued plant operation with pump shaft vibrations up to 15 mils which are significantly greater than baseline values for the pumps (Item e).

(3) The changes would allow continued plant operation by monitoring with other undefined "equivalent" external equipment in lieu of the established monitoring equipment (Item a).

(4) The changes would allow the plant to stay in hot standby indefinitely even with a large shaft vibration suspected to be due to a cracked shaft (Items a and f).

The licensee stated that it appreciated the staff's comments and would take them into account in determining to what extent it would formally propose changes.

/s/ original signed by E.A. Licitra

E. A. Licitra, Senior Project Manager
Project Directorate V
Division of Reactor Projects - III,
IV, V and Special Projects

Enclosures:
As stated

cc: See next page.

DISTRIBUTION

Docket File	ELicitra
NRC & LPDR's	MDavis
PDV Reading	OGC
EJordan	JPartlow
ACRS (10)	NRC Participants

OFC	:DRSP/PDV/PDV	DRSP/D:PDV	:	:	:	:	:
NAME	:EALicitra:cw	:GWHolahan	:	:	:	:	:
DATE	:05/17/88	:05/17/88	:	:	:	:	:

OFFICIAL RECORD COPY

(2) The changes would allow continued plant operation with pump shaft vibrations up to 15 mils which are significantly greater than baseline values for the pumps (Item e).

(3) The changes would allow continued plant operation by monitoring with other undefined "equivalent" external equipment in lieu of the established monitoring equipment (Item a).

(4) The changes would allow the plant to stay in hot standby indefinitely even with a large shaft vibration suspected to be due to a cracked shaft (Items a and f).

The licensee stated that it appreciated the staff's comments and would take them into account in determining to what extent it would formally propose changes.

E. A. Licitra, Senior Project Manager
Project Directorate V
Division of Reactor Projects - III,
IV, V and Special Projects

Enclosures:
As stated

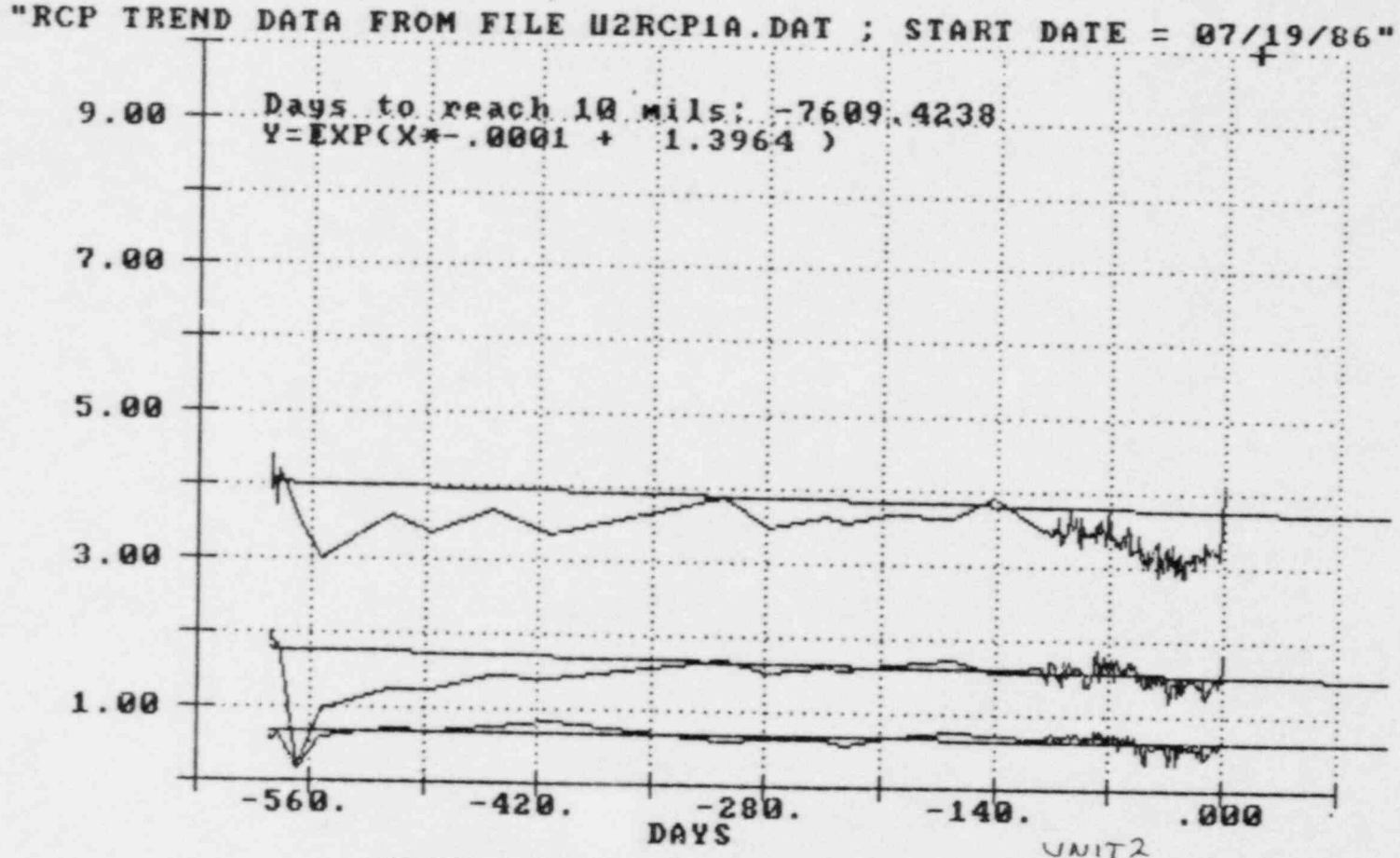
cc: See next page.

ENCLOSURE 1

PALO VERDE MEETING ATTENDEES ON

VIBRATION MONITORING PROGRAM

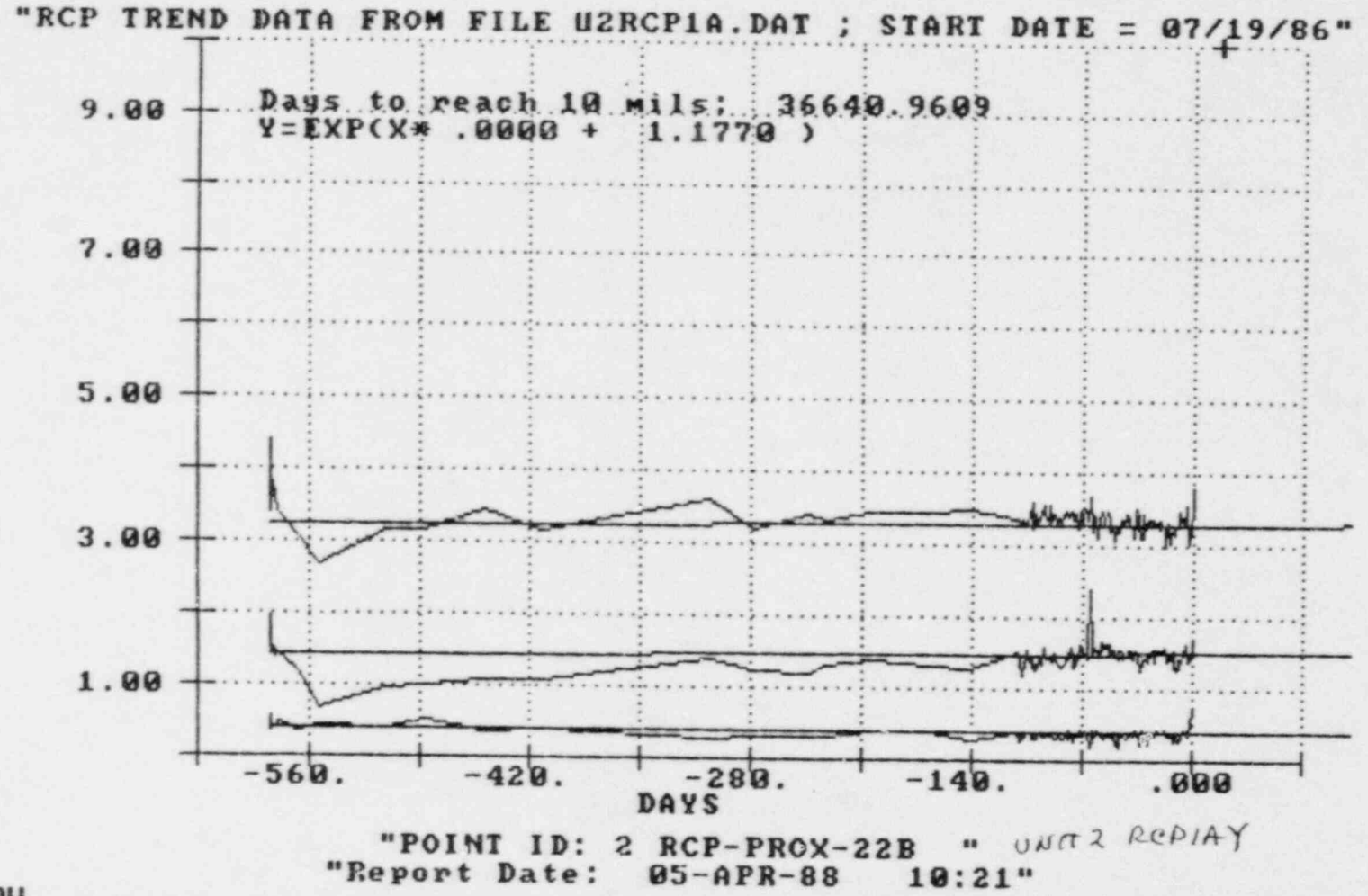
Name	Affiliation
Manny Licitra	NRC/NRR/PDV
Mike Davis	NRC/NRR/PDV
C. Y. Cheng	NRC/NRR/EMTB
Joseph R. Provasoli	APS - Licensing
Carter Rogers	APS - Licensing
Kerry Johnson	APS - Unit 2 Lead STA
Howard Maxwell	APS - Vibration Engineer
L. B. Marsh	NRC/NRR/EMEB
P. T. Kuo	NRC/NRR/EMEB
Kamal Bandyopadhyay	BNL
Paul Bezler	BNL



UNIT2
RCP1AX

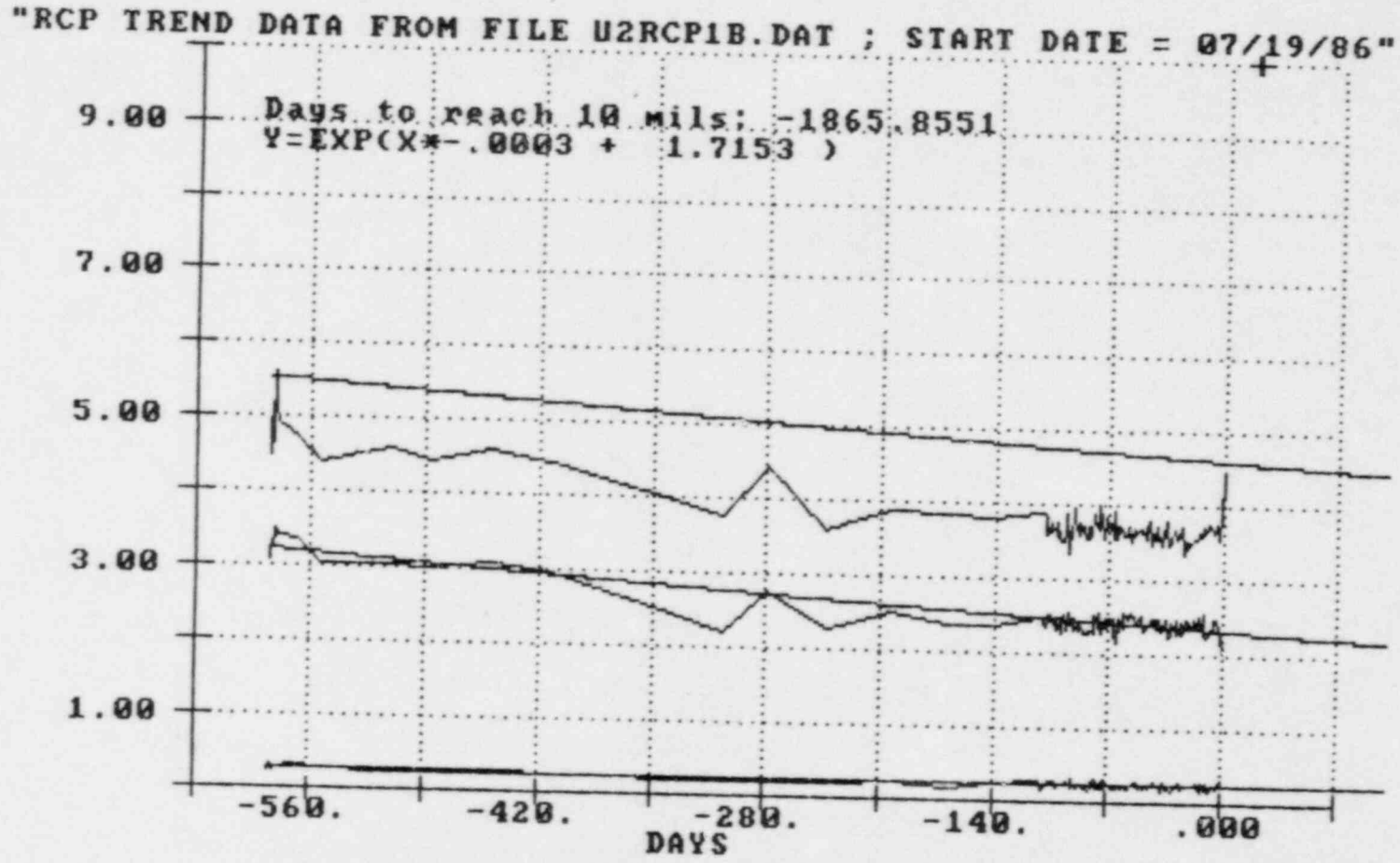
F10:hrdcpy
OK

ENCLOSURE 2



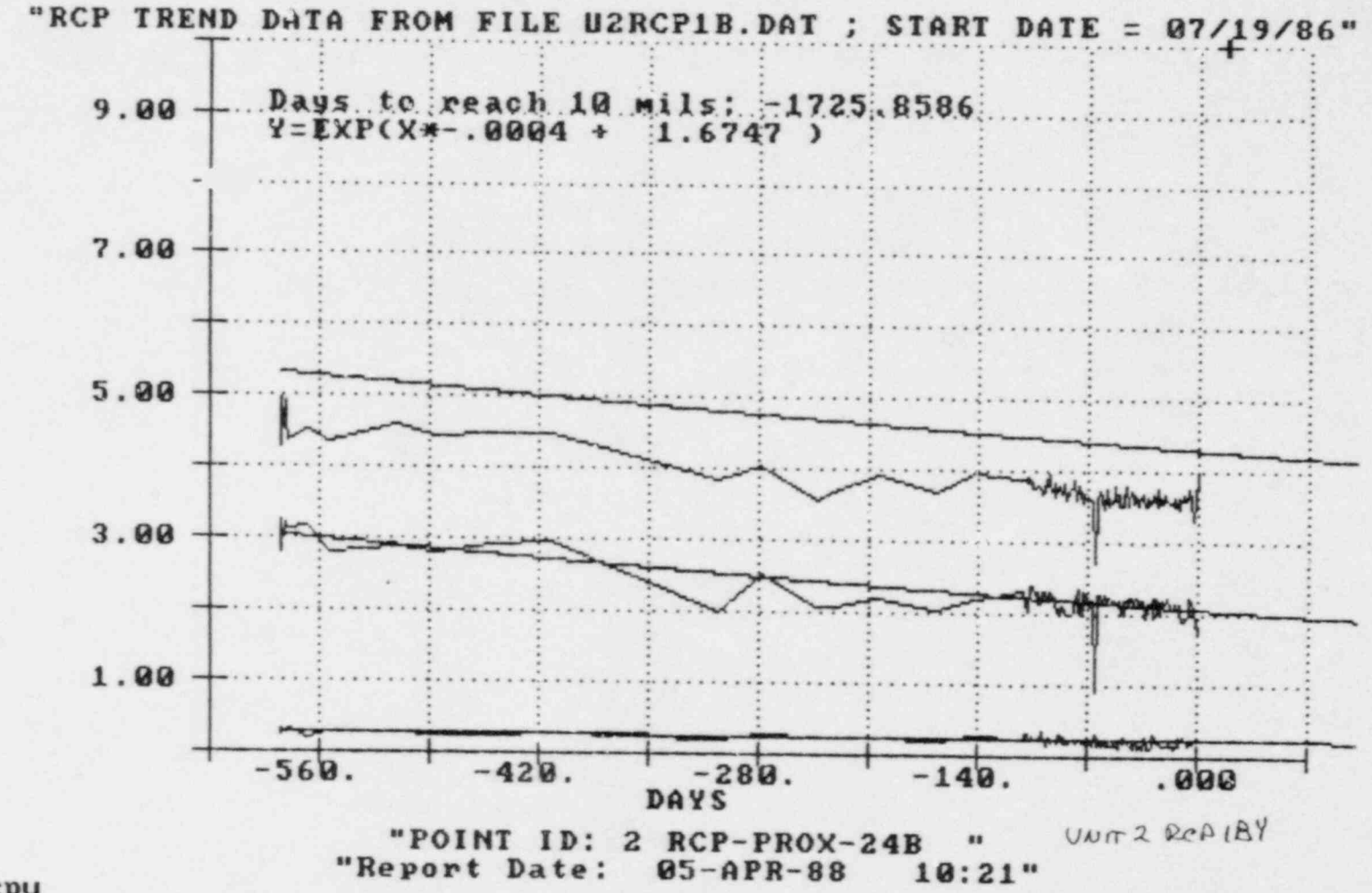
UNIT 2 RCPIAY

F10:hrdcpy
OK

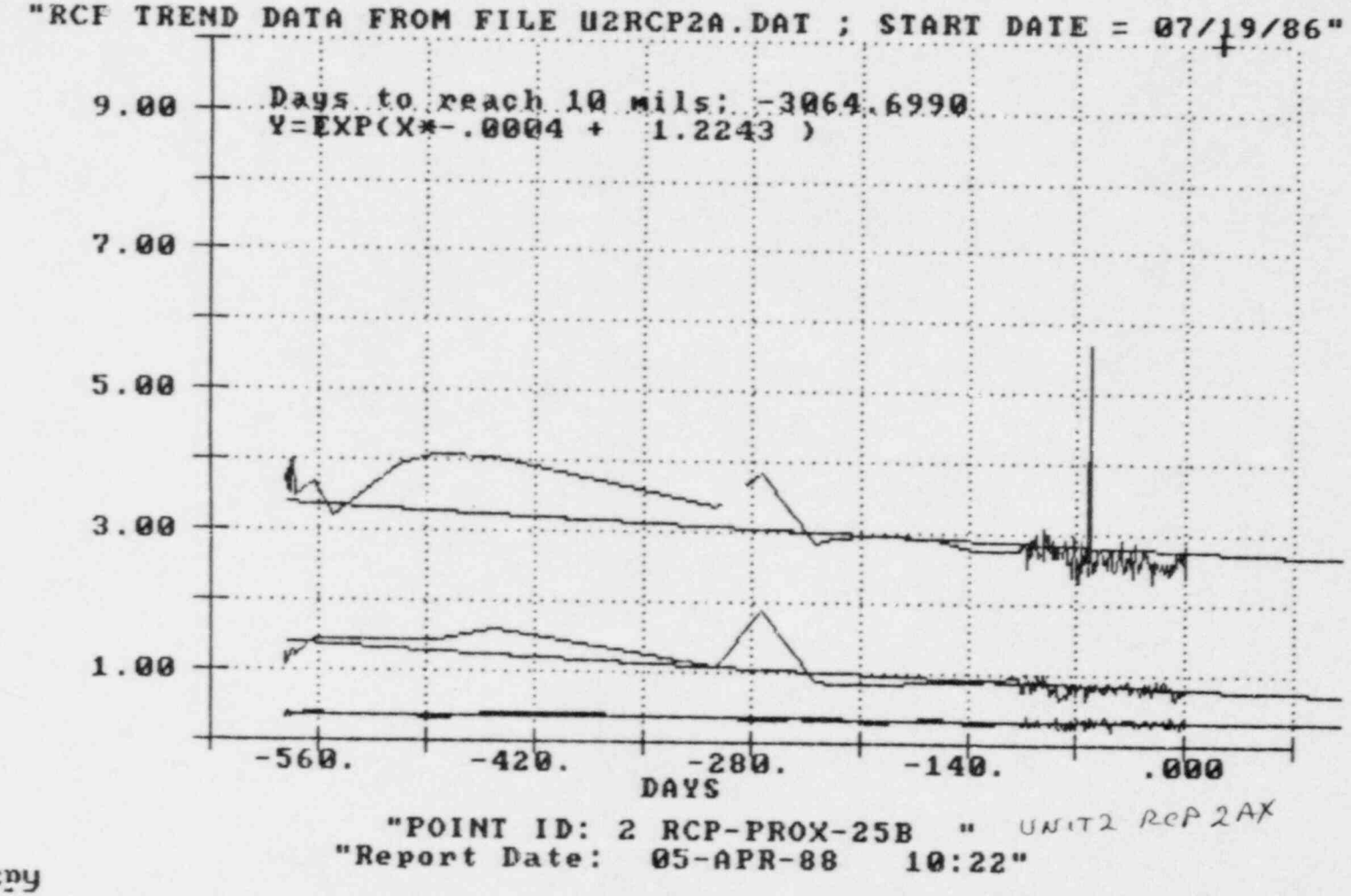


UNIT 2 RCP:AX

F10:hrdcpy
OK

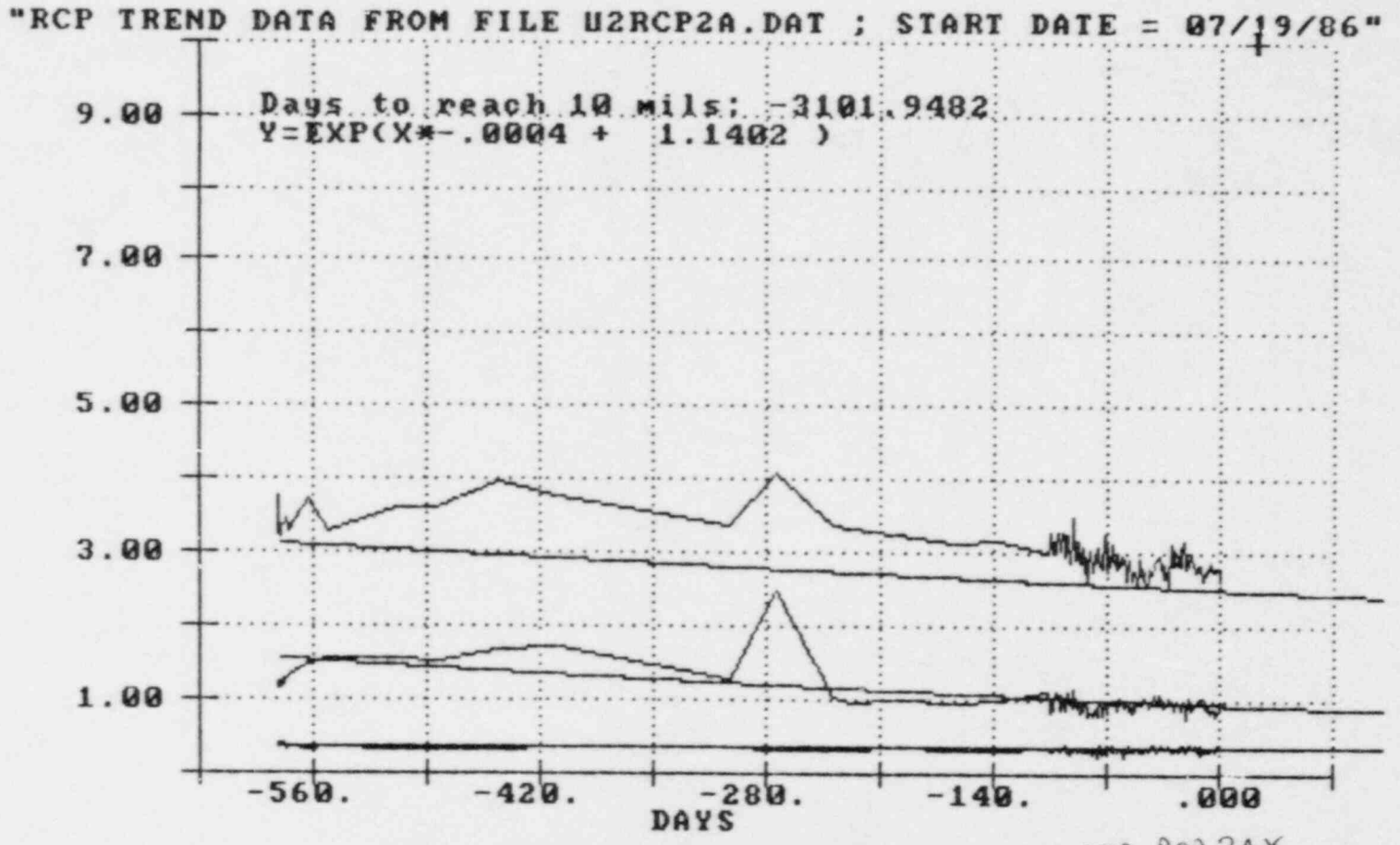


F10:hrdcpy
OK



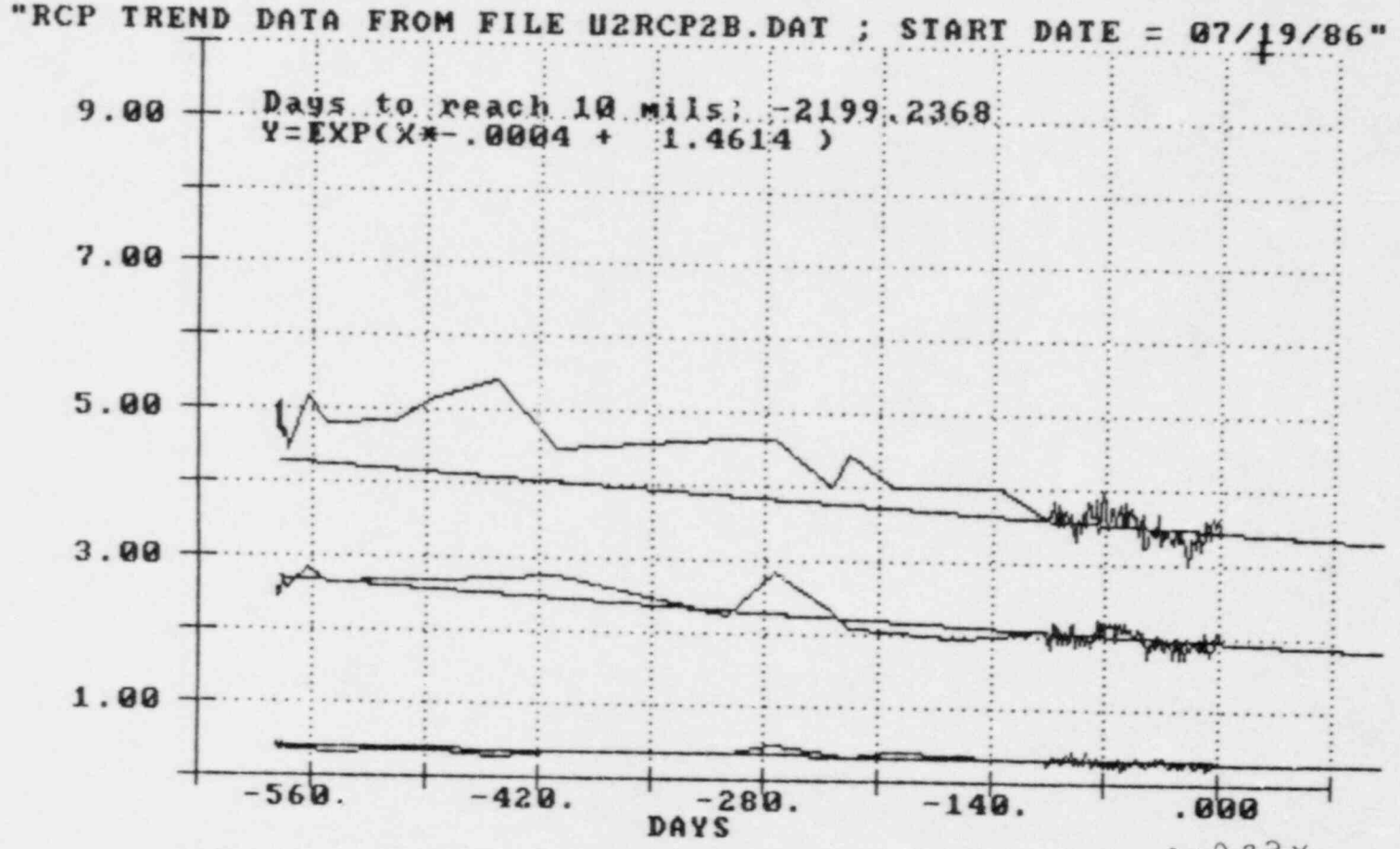
UNIT2 RCP 2AX

F10:hrdcpy
OK



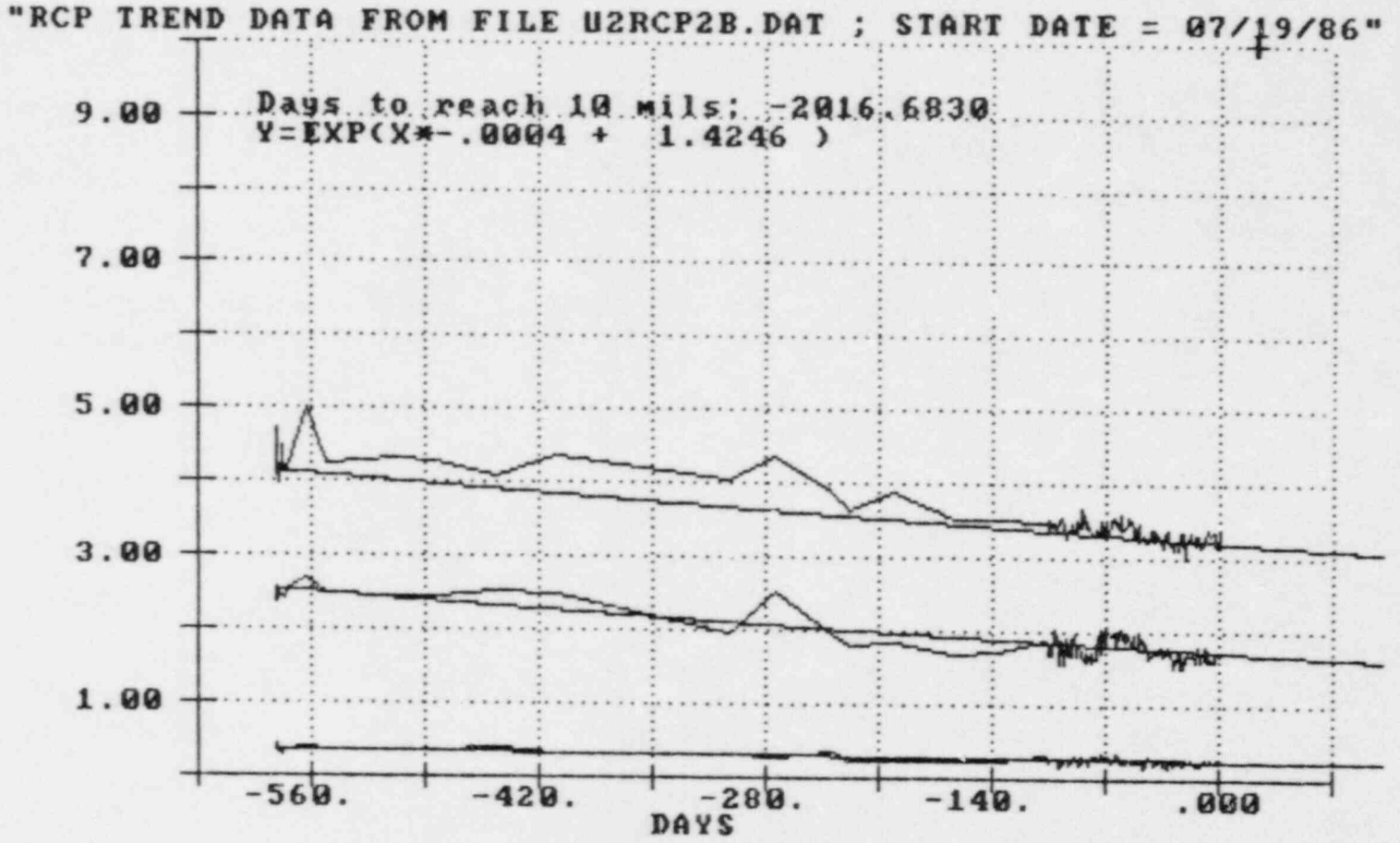
UNIT2 RCP 2AY

F10:hrdcpy
OK



UNIT 2 RCP 2B x

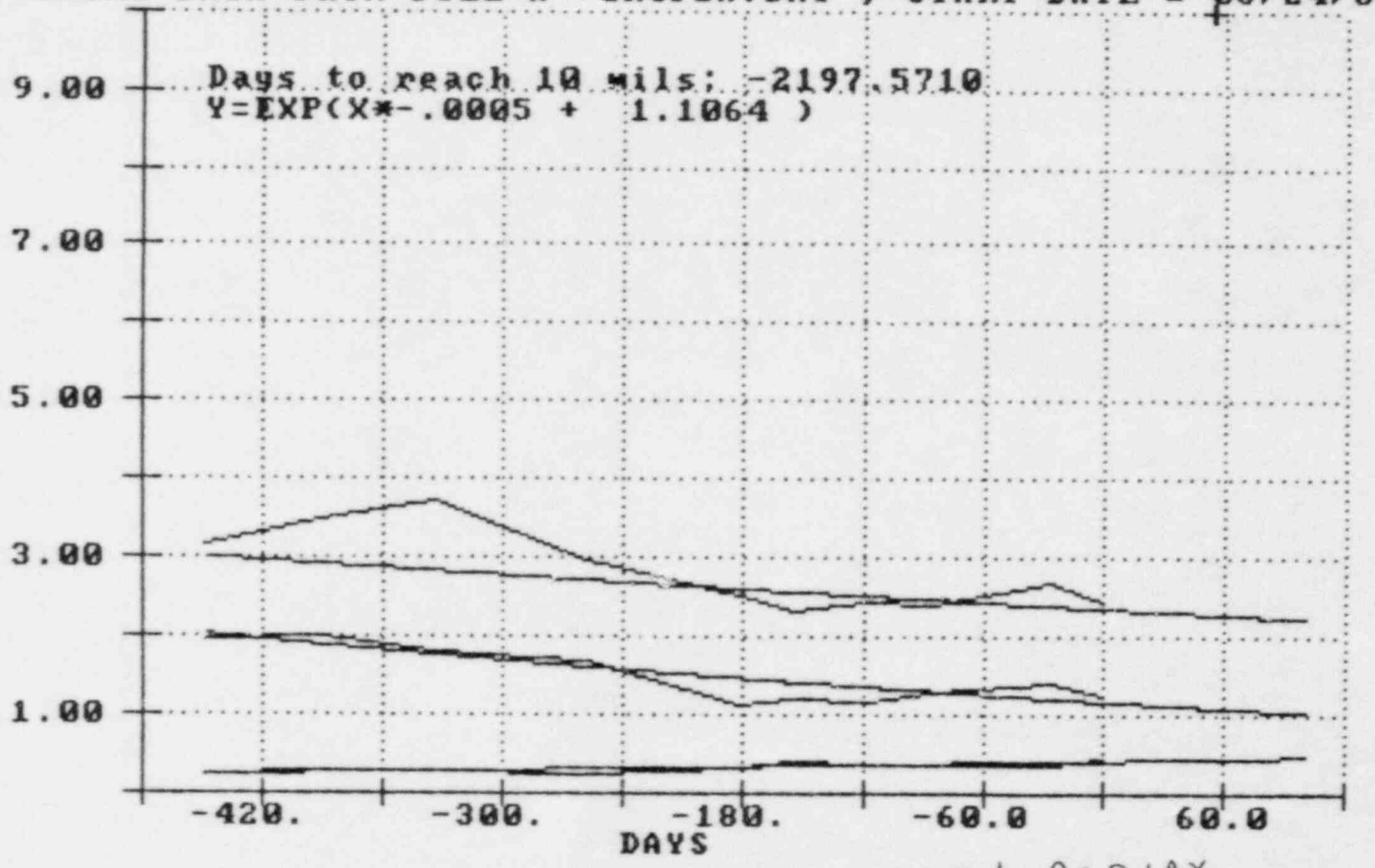
F10:hrdcpy
OK



RCP2BY

F10:hrdcpy
OK

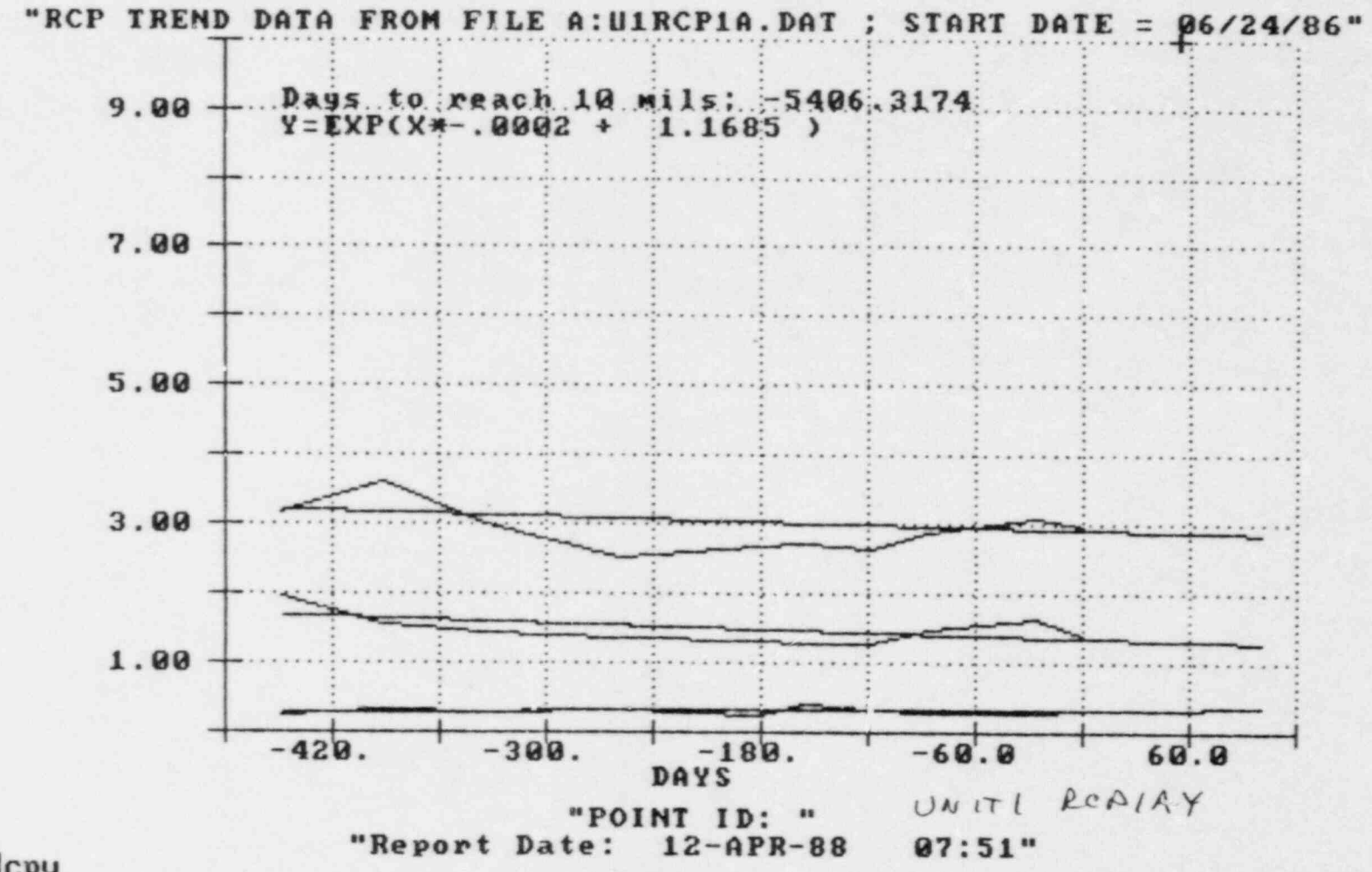
"RCP TREND DATA FROM FILE A:"1RCP1A.DAT ; START DATE = 06/24/86"



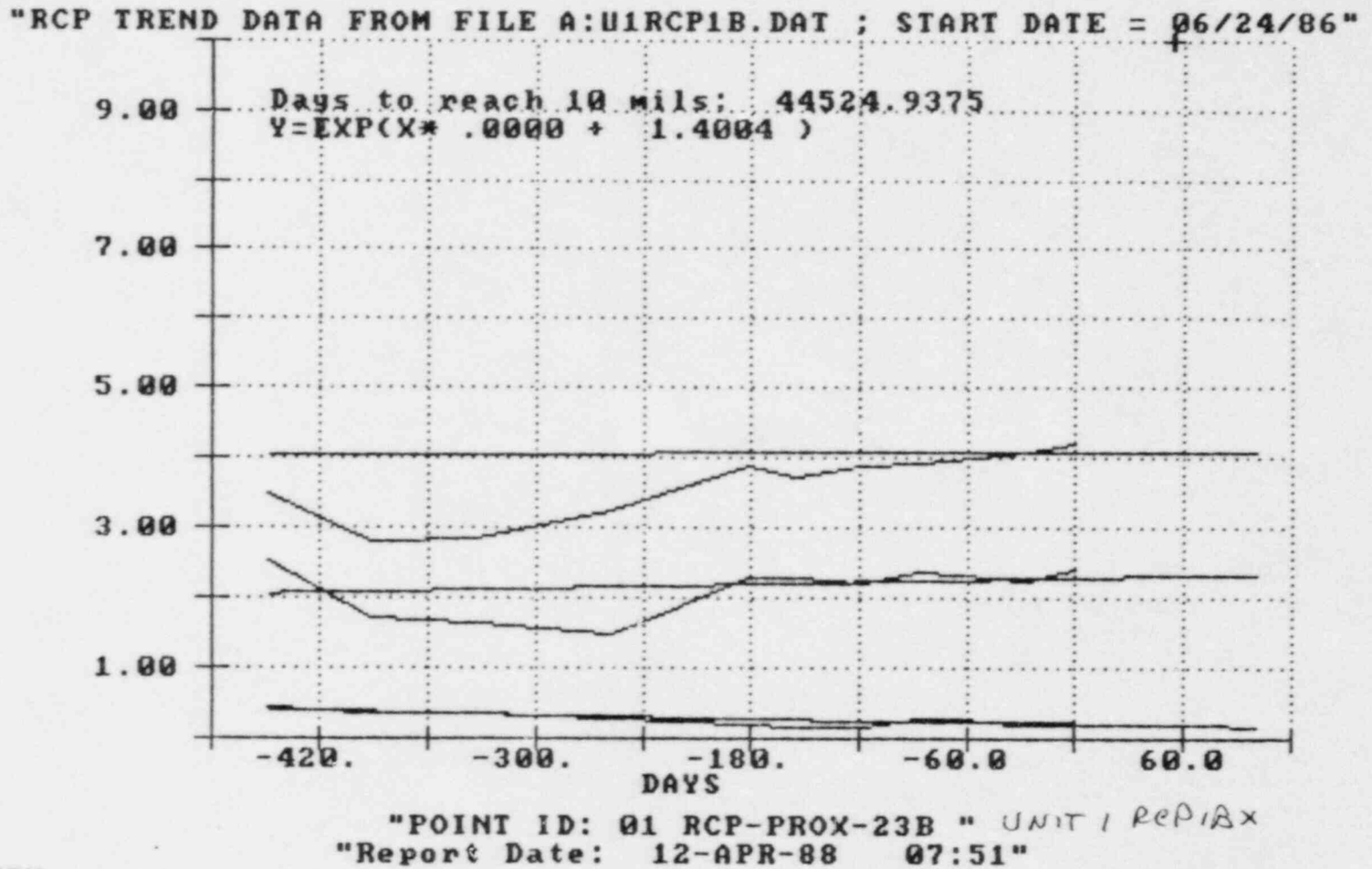
"POINT ID: " UNIT 1 RCP1A7

"Report Date: 12-APR-88 07:51"

F10:hrdcpy
OK



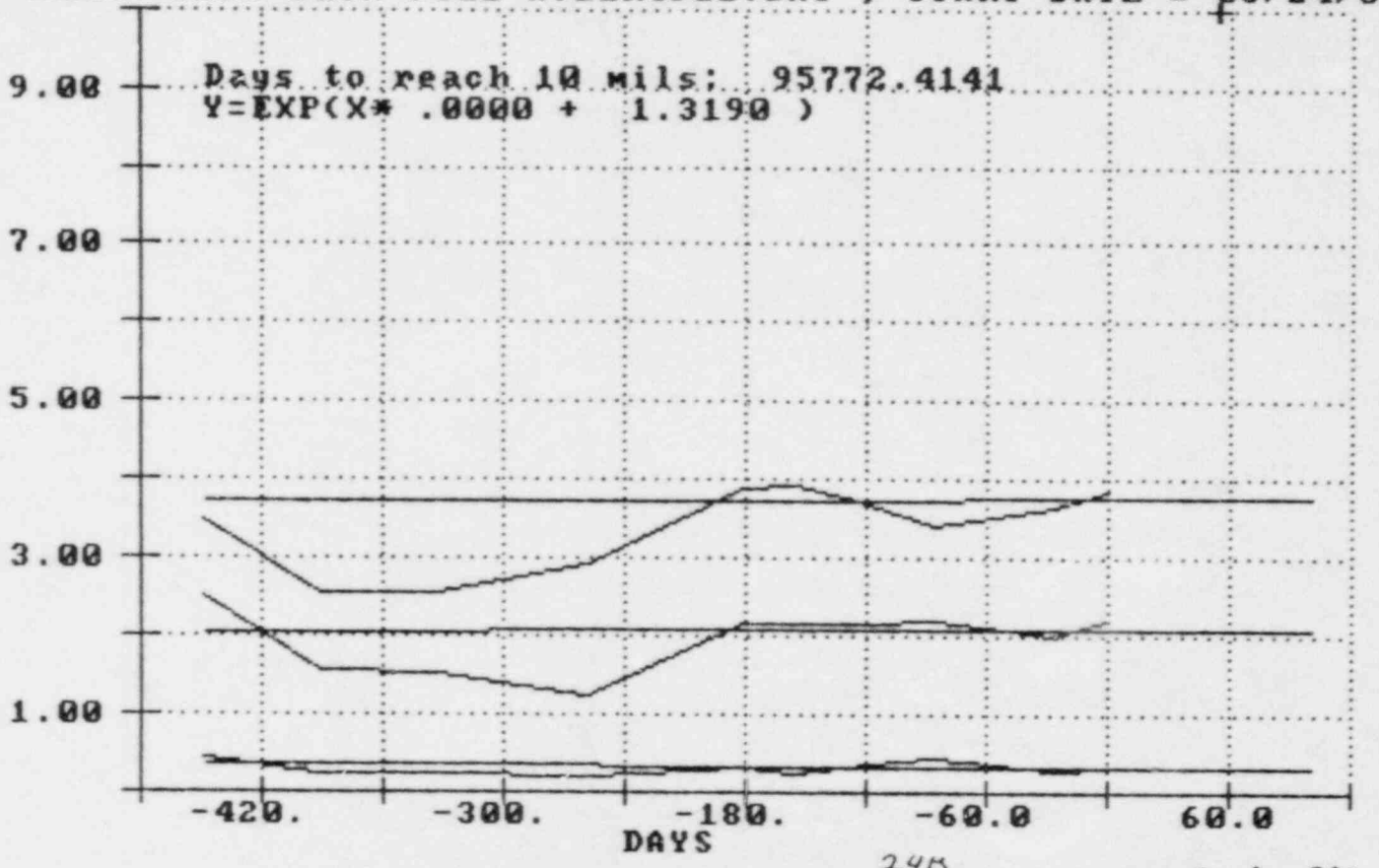
F10:hrdcpy
OK



UNIT 1 RCP1BX

F10:hrdcpy
OK

"RCP TREND DATA FROM FILE A:U1RCP1B.DAT ; START DATE = 06/24/86"



"POINT ID: 01 RCP-PROX-~~23B~~ 245 "

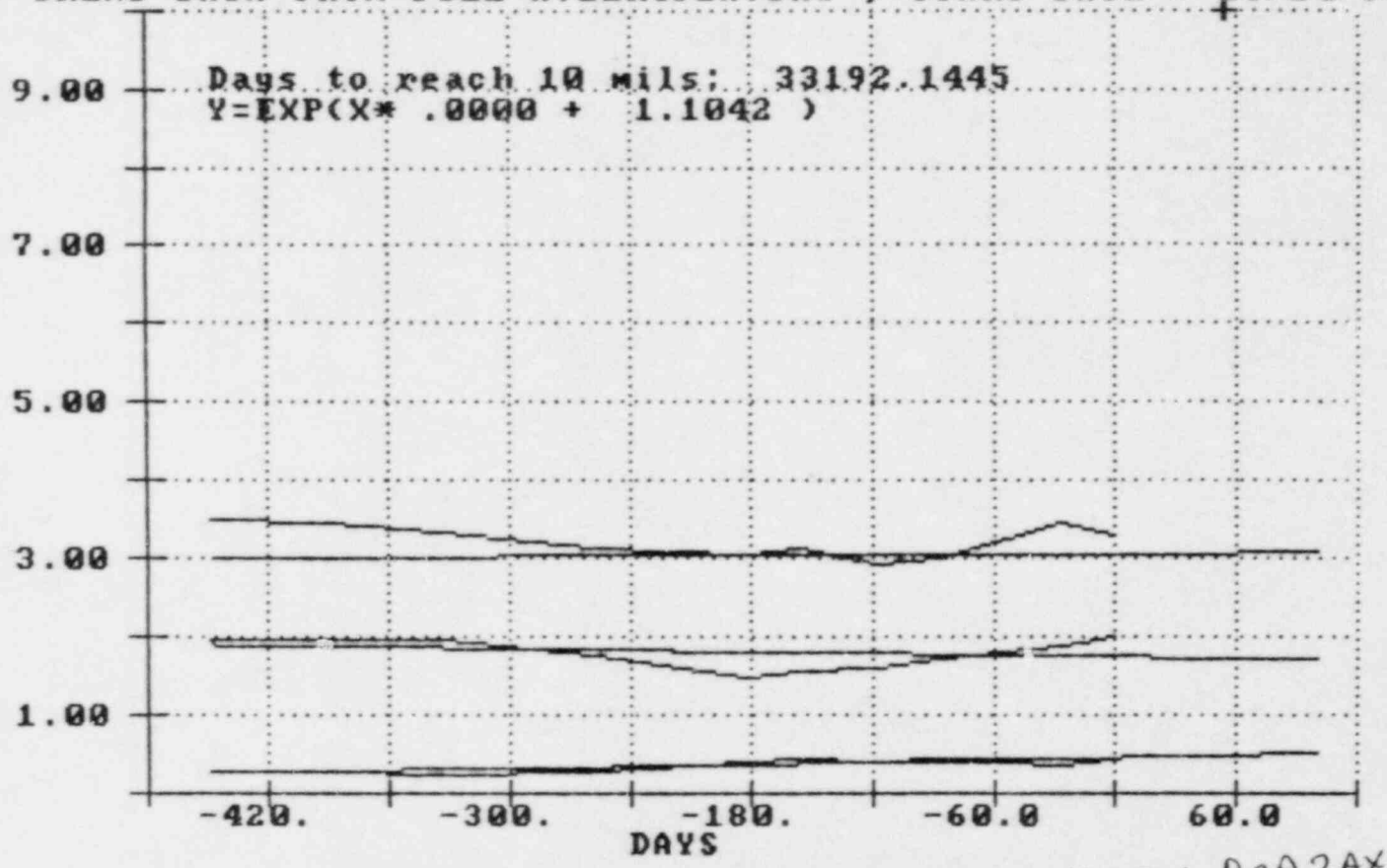
"Report Date: 12-APR-88 07:51"

UNIT 1 REAP 1BY

F10:hrdcpy

OK

"RCP TREND DATA FROM FILE A:U1RCP2A.DAT ; START DATE = 06/24/86"



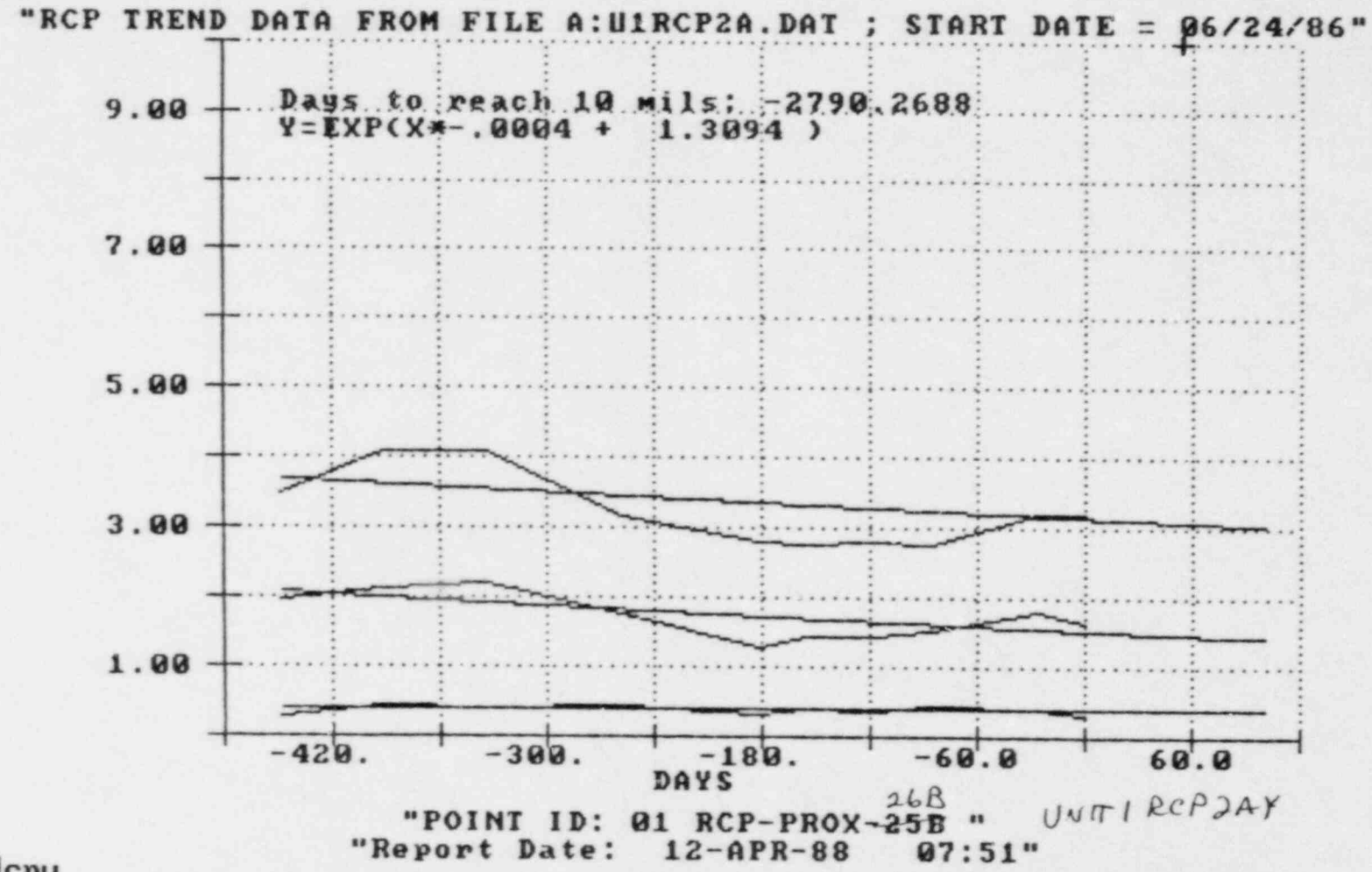
"POINT ID: 01 RCP-PROX-25B "

"Report Date: 12-APR-88 07:51"

UNIT 1 RCP 2AX

F10:hrdcpy

OK

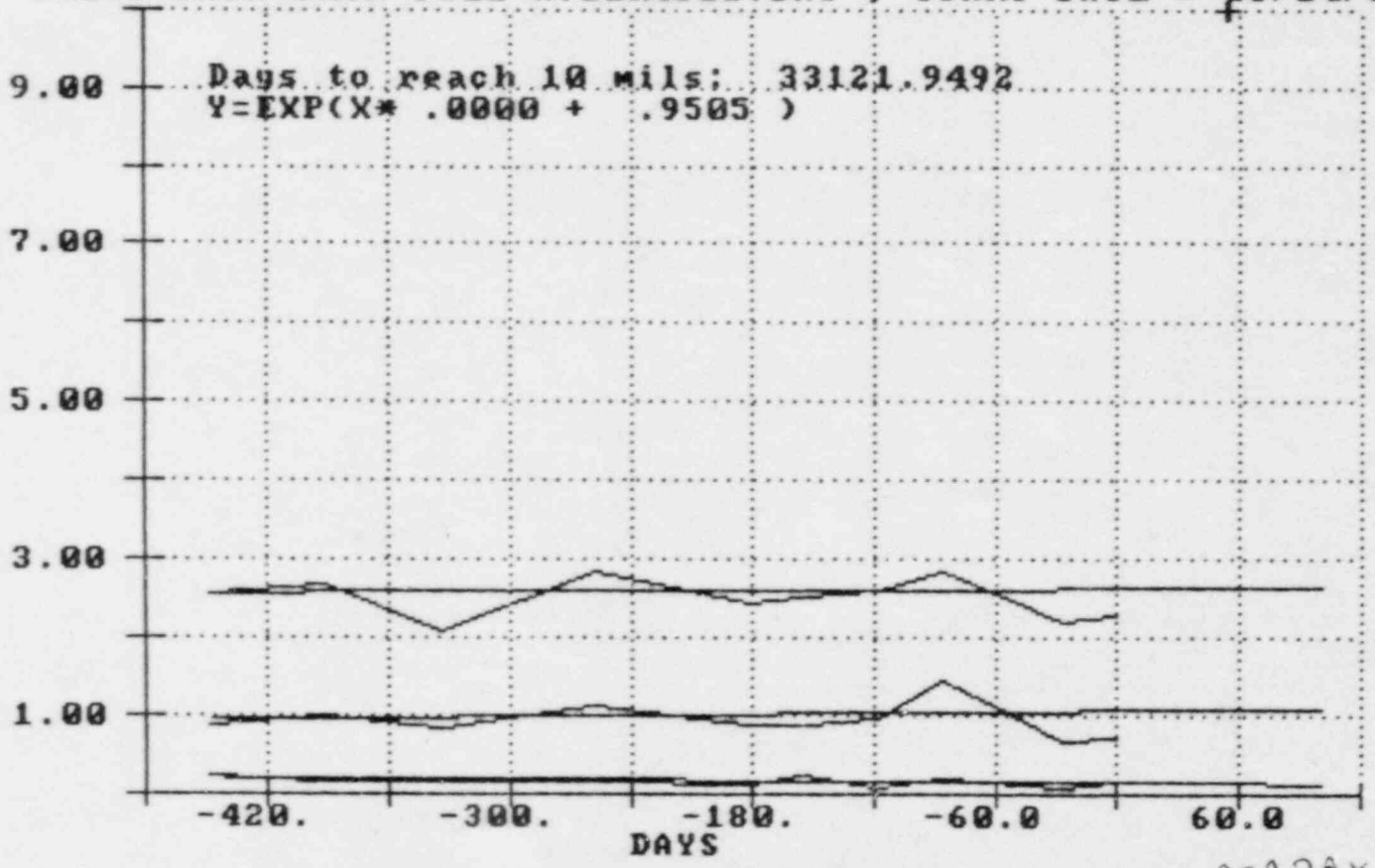


26B

UNIT 1 RCP 2A Y

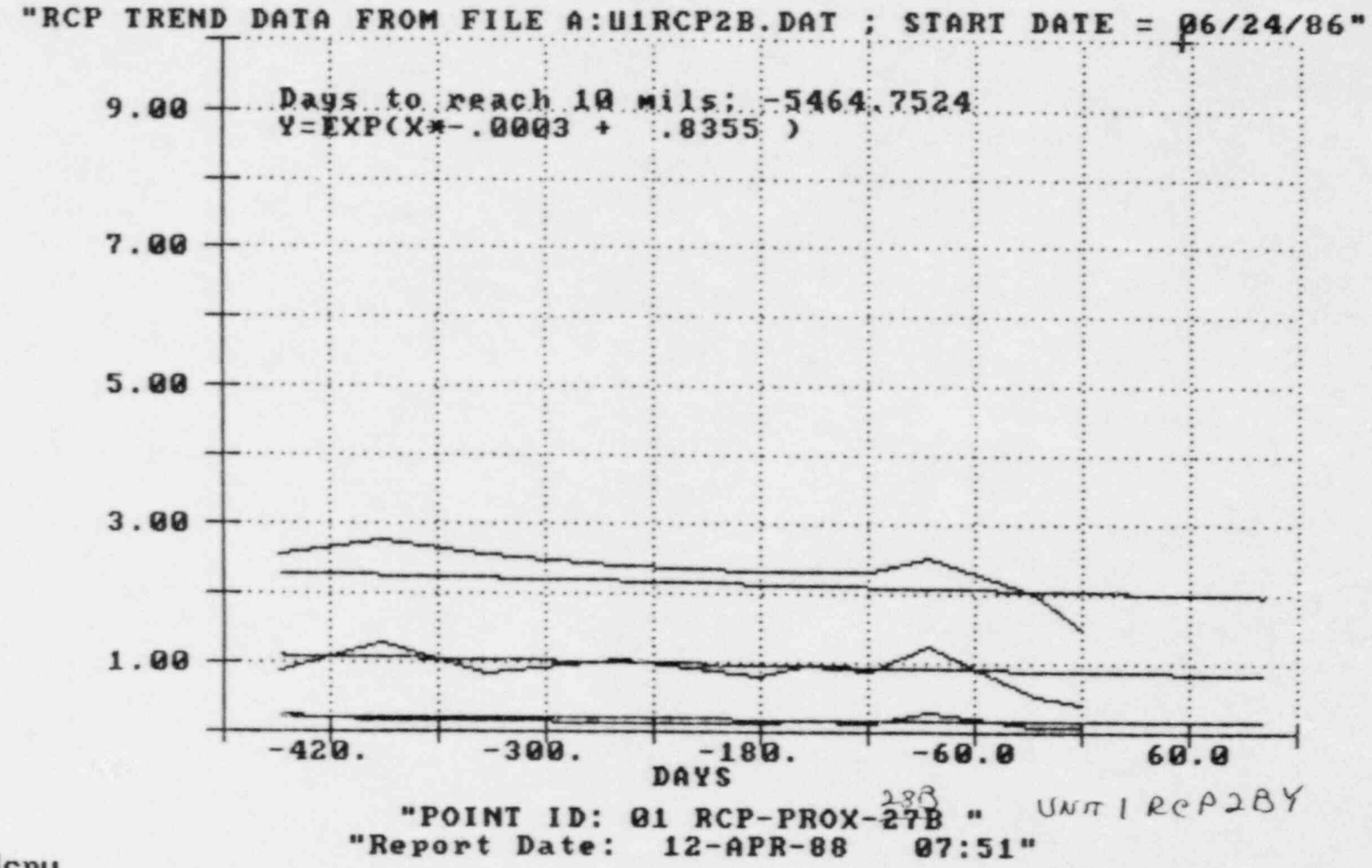
F10:hrdcpy
OK

"RCP TREND DATA FROM FILE A:U1RCP2B.DAT ; START DATE = 06/24/86"



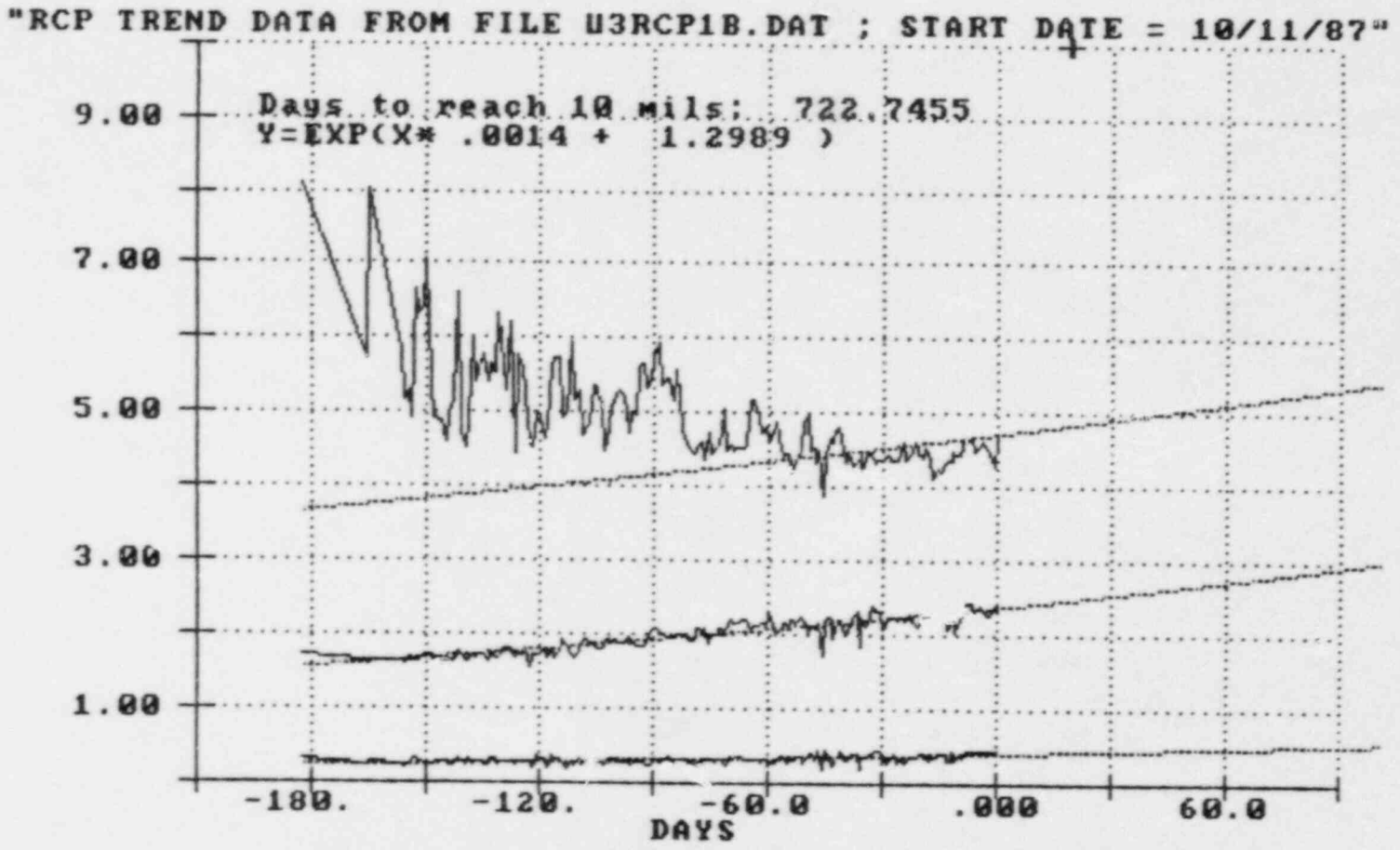
"POINT ID: 01 RCP-PROX-27B " UNIT 1 RCP 2BX
"Report Date: 12-APR-88 07:51"

F10:hrdcpy
OK



28B UNIT 1 RCP 2BY

F10:hrdcpy
OK



F10:hrdcpy
OK

ANALYSIS OF UNIT 1 AND 2 RCP SHAFT CRACK SIZE VS VIBRATION

load: U12CRACK

i := 0 ..7

A := READPRN(U12CRACK)

C :=

i	RCP	C i
0	1-1A	15.7
1	1-1B	0
2	1-2A	22.9
3	1-2B	7.5
4	2-1A	.794
5	2-1B	0
6	2-2A	12.7
7	2-2B	3.175

Oxi := A(0) Oxf := A(1) Oyi := A(2) Oyf := A(3)

Xli := A(4) Xlf := A(5) Ylf := A(6) Ylf := A(7)

X2i := A(8) X2f := A(9) Y2i := A(10) Y2f := A(11)

Note C_i is sum of crack depths of all cracks in one shaft

i	Overall-X initial Oxi	Overall-X final Oxf	Overall-Y initial Oyi	Overall-Y final Oyf
0	3.513	2.449	3.181	2.973
1	3.292	4.213	3.513	3.873
2	3.513	3.307	4.087	3.213
3	2.684	2.277	2.662	1.505
4	4.397	4.049	3.712	3.818
5	4.993	4.491	4.551	4.031
6	3.778	2.869	3.226	2.62
7	4.728	3.455	4.043	3.161

i	1/rev-X initial Xli	1/rev-X final Xlf	1/rev-Y initial Yli	1/rev-Y final Ylf
0	1.602	1.237	1.988	1.408
1	2.287	2.397	2.541	2.209
2	1.966	1.999	2.176	1.668
3	1.027	0.718	1.165	0.423
4	1.95	1.823	1.69	1.679
5	3.249	2.143	3.027	1.745
6	1.248	0.823	1.37	0.983
7	2.563	1.977	2.419	1.701

i	2/rev-X initial X2i	2/rev-X final X2f	2/rev-Y initial Y2i	2/rev-Y final Y2f
0	0.362	0.436	0.251	0.344
1	0.381	0.231	0.45	0.341
2	0.301	0.464	0.425	0.319
3	0.181	0.155	0.26	0.098
4	0.524	0.655	0.527	0.746
5	0.302	0.301	0.289	0.282
6	0.384	0.406	0.478	0.425
7	0.431	0.282	0.338	0.224

$dOx_i := |Oxi_i - Oxf_i|$ $dOy_i := |Oyi_i - Oyf_i|$ corr(C, dOx) = -0.167
corr(C, dOy) = 0.257

$aOx_i := .5\,[Oxi_i + Oxf_i]$ $aOy_i := .5\,[Oyi_i + Oyf_i]$ corr(C, aOx) = -0.589
corr(C, aOy) = -0.335

$dX1_i := |X1i_i - X1f_i|$ $dY1_i := |Y1i_i - Y1f_i|$ corr(C, dX1) = -0.382
corr(C, dY1) = -0.103

$aX1_i := .5\,[X1i_i + X1f_i]$ $aY1_i := .5\,[Y1i_i + Y1f_i]$ corr(C, aX1) = -0.459
corr(C, aY1) = -0.336

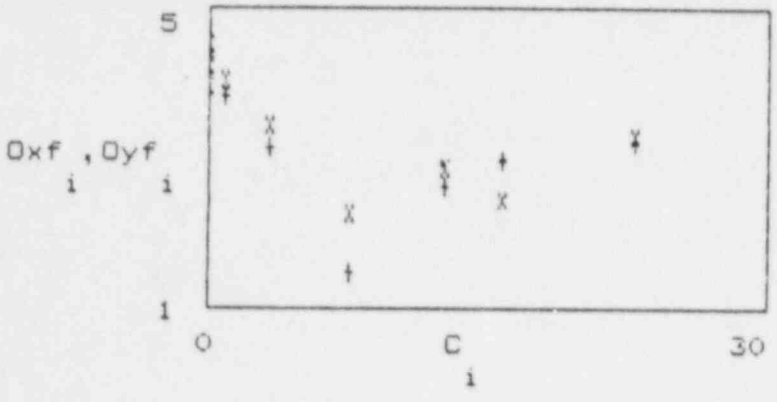
$dX2_i := |X2i_i - X2f_i|$ $dY2_i := |Y2i_i - Y2f_i|$ corr(C, dX2) = 0.083
corr(C, dY2) = -0.121

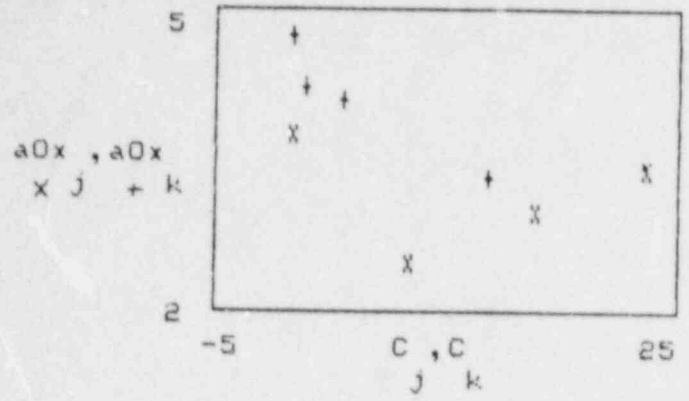
$aX2_i := .5\,[X2i_i + X2f_i]$ $aY2_i := .5\,[Y2i_i + Y2f_i]$ corr(C, aX2) = 0.023
corr(C, aY2) = -0.131

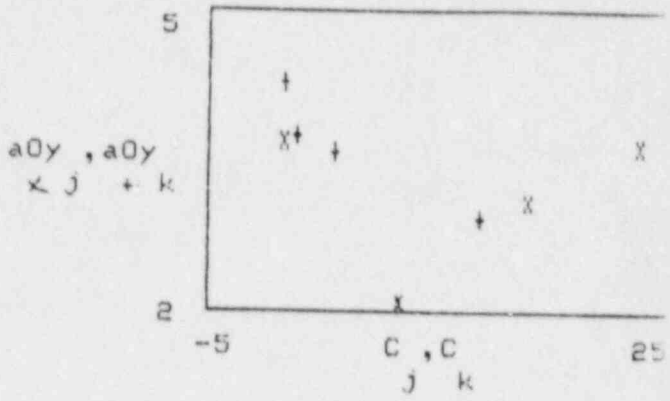
corr(C, X2f) = 0.236 corr(C, X2i) = -0.314
corr(C, Y2f) = -0.148 corr(C, Y2i) = -0.078

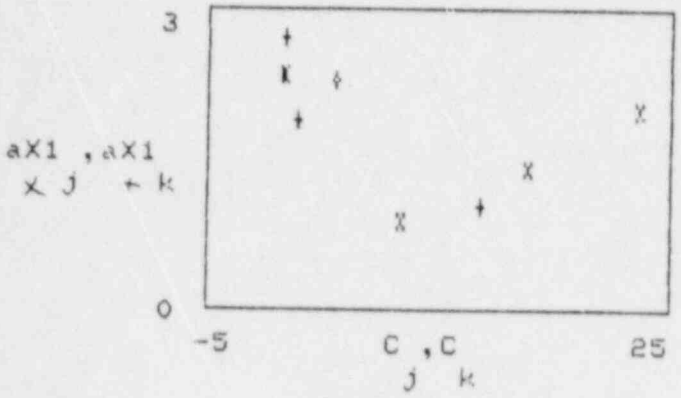
corr(C, Oxf) = -0.63 corr(C, Oxi) = -0.434
corr(C, Oyf) = -0.403 corr(C, Oyi) = -0.197

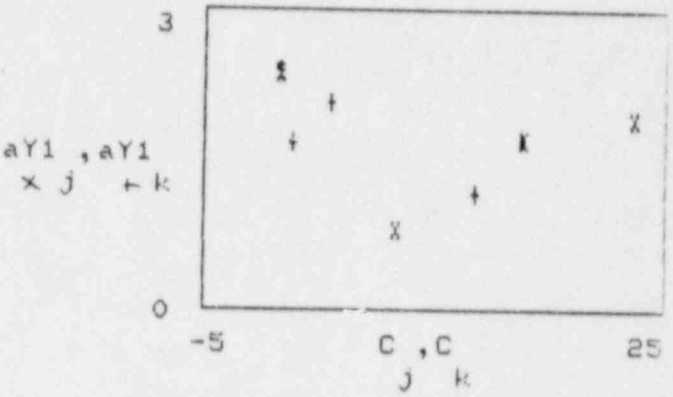
corr(C, X1f) = -0.377 corr(C, X1i) = -0.496
corr(C, Y1f) = -0.307 corr(C, Y1i) = -0.331

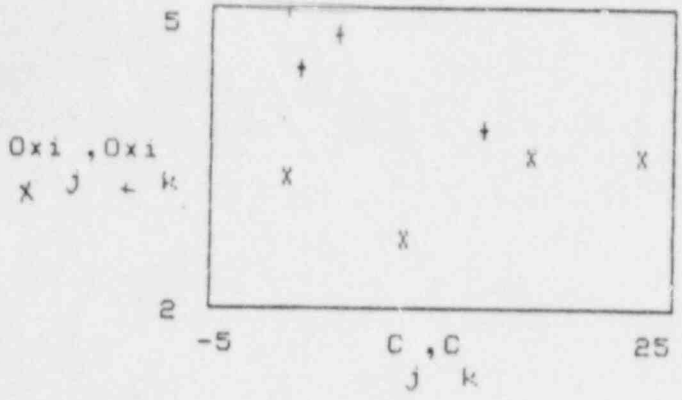


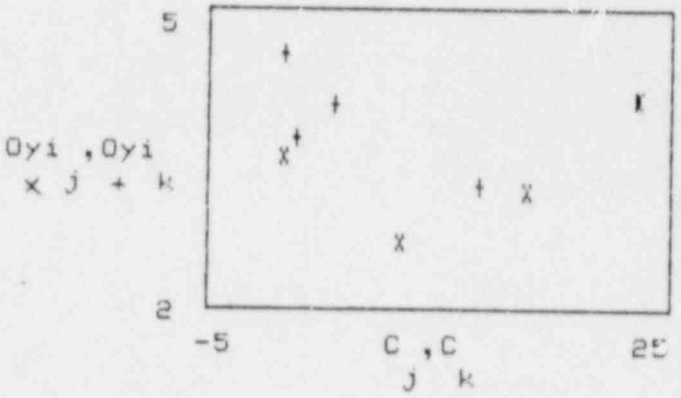












X - UNIT 1
+ - UNIT 2

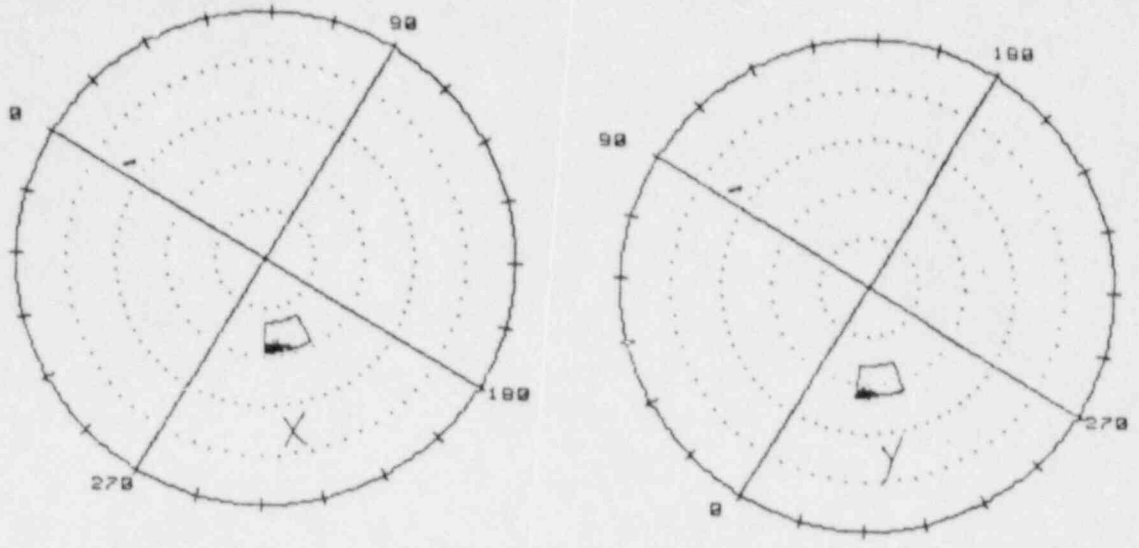
UNIT 1 AND 2 RCP CRACK DATA - CORRELATIONS FROM MATHCAD ANALYSIS

	UNIT 1	UNIT 2	BOTH 1&2
dOx	-0.449	0.441	-0.167
dOy	0.152	0.314	0.257
aOx	-0.122	-0.945	-0.589
aOy	0.153	-0.931	-0.335
dX1	-0.13	-0.277	-0.382
dY1	0.274	-0.295	-0.103
aX1	-0.105	-0.889	-0.459
aY1	-0.082	-0.837	-0.336
dX2	0.171	-0.309	0.083
dY2	-0.346	-0.267	-0.121
aX2	0.578	-0.104	0.023
aY2	0.067	0.08	-0.131
Oxi	0.504	-0.88	-0.434
Oyi	0.481	-0.815	-0.197
Oxf	-0.373	-0.914	-0.63
Oyf	-0.058	-0.928	-0.403
X1i	-0.089	-0.802	-0.496
Y1i	-0.053	-0.692	-0.331
X1f	-0.116	-0.962	-0.377
Y1f	-0.104	-0.978	-0.307
X2i	-0.069	-0.109	-0.314
Y2i	-0.111	0.385	-0.078
X2f	0.842	-0.093	0.236
Y2f	0.209	-0.07	-0.148

NONE
SYSTEM

U-3 RCP 1A 1A RCP PMP TREND 21 day

BEGIN: 22MAR88 15:48
POINT: 1A RCP 1A-[redacted]
END: 12APR88 9:48
TYPE: 1X AMPLITUDE

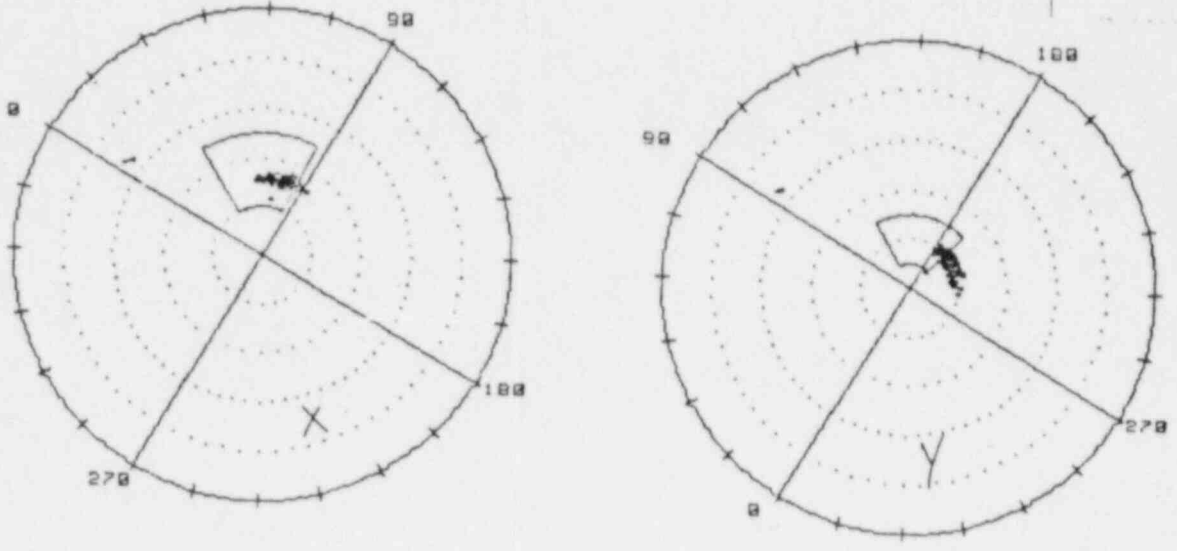


FULL SCALE
10.0 mil pp

NONE
SYSTEM

U-3 RCP 1A 1A RCP PMP TREND 21 day

BEGIN: 22MAR88 15:48
POINT: 1A RCP 1A-[redacted]
END: 12APR88 9:48
TYPE: 2X AMPLITUDE



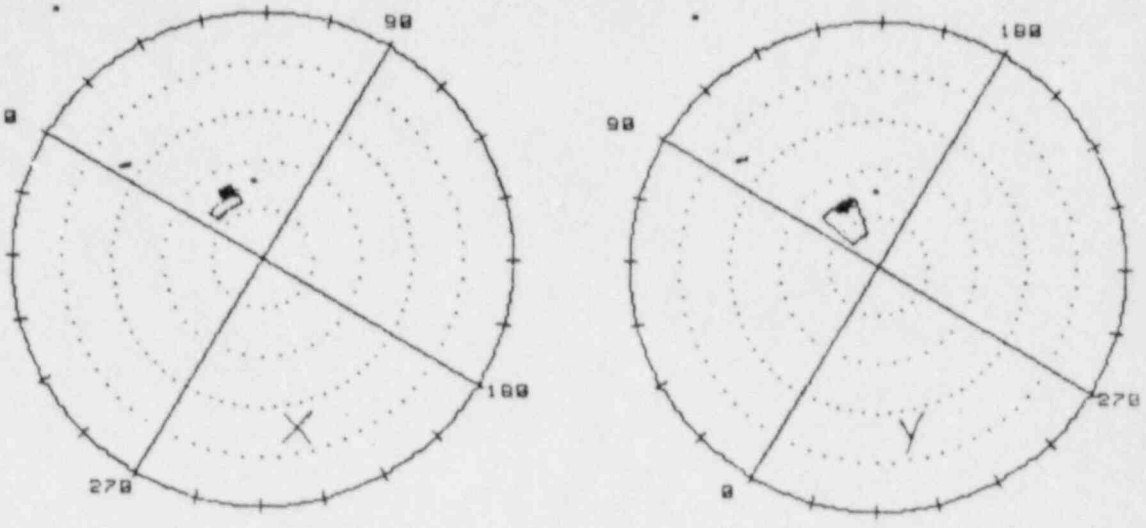
FULL SCALE
2.0 mil pp

NONE
SYSTEM

U-3 RCP 1B 1B RCP PMP TREND 21 day

BEGIN: 22MAR88 15:48
POINT: 1B RCP 1B-●

END: 12APR88 9:48
TYPE: 1X AMPLITUDE



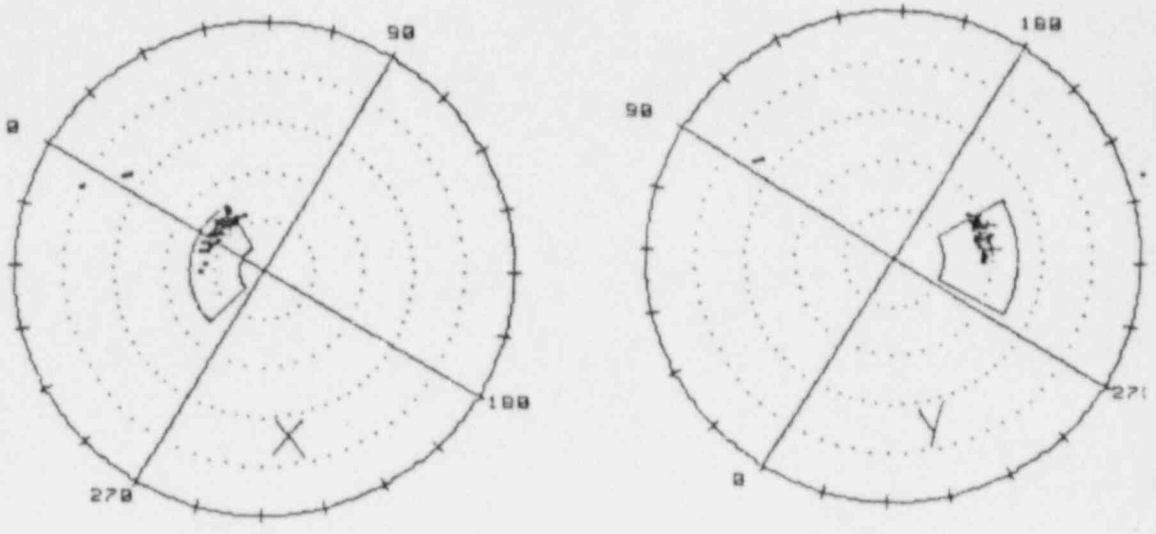
FULL SCALE
18.8 mil pp

NONE
SYSTEM

U-3 RCP 1B 1B RCP PMP TREND 21 day

BEGIN: 22MAR88 15:48
POINT: 1B RCP 1B-●

END: 12APR88 9:48
TYPE: 2X AMPLITUDE



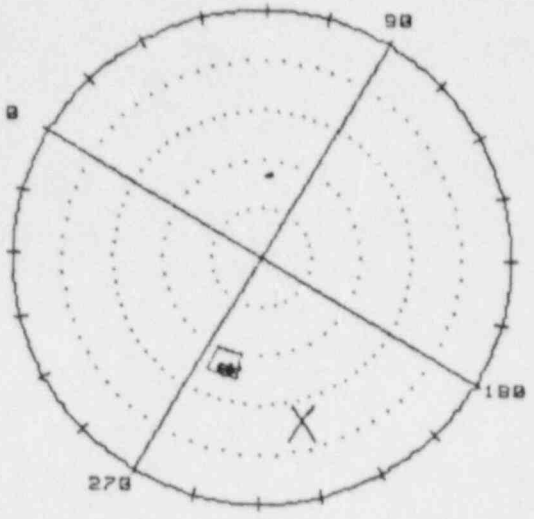
FULL SCALE
2.8 mil pp

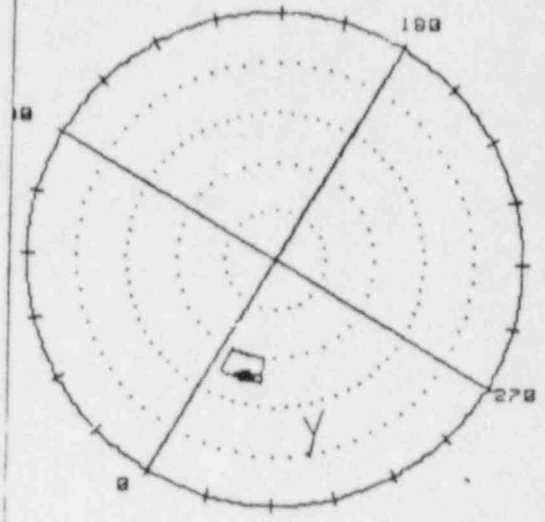
NONE
SYSTEM

U-3 RCP 2A 2A RCP PMP TREND 21 day

BEGIN: 22MAR88 15:48
POINT: 2A RCP 2A-

END: 12APR88 9:48
TYPE: 1X AMPLITUDE





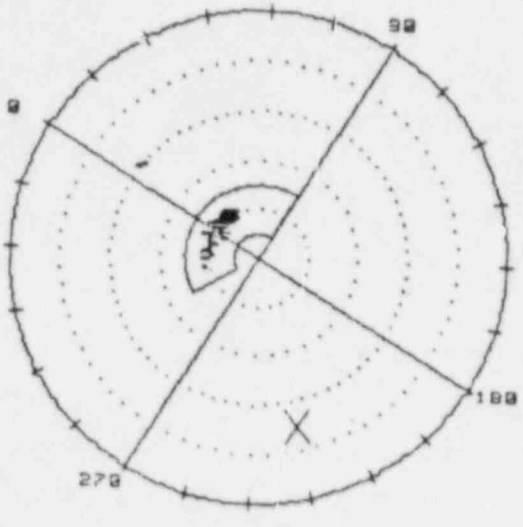
FULL SCALE
10.0 mil pp

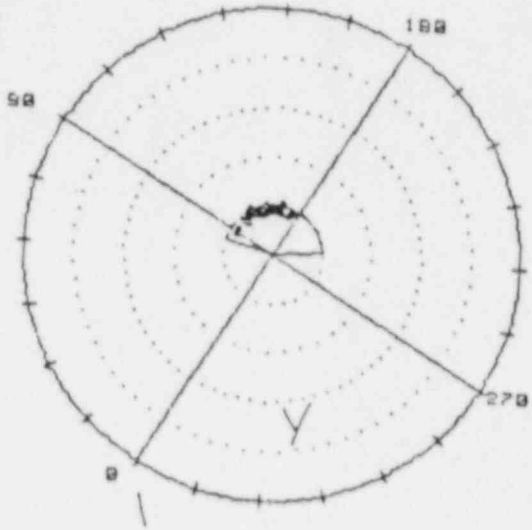
NONE
SYSTEM

U-3 RCP 2A 2A RCP PMP TREND 21 day

BEGIN: 22MAR88 15:48
POINT: 2A RCP 2A-

END: 12APR88 9:48
TYPE: 2X AMPLITUDE



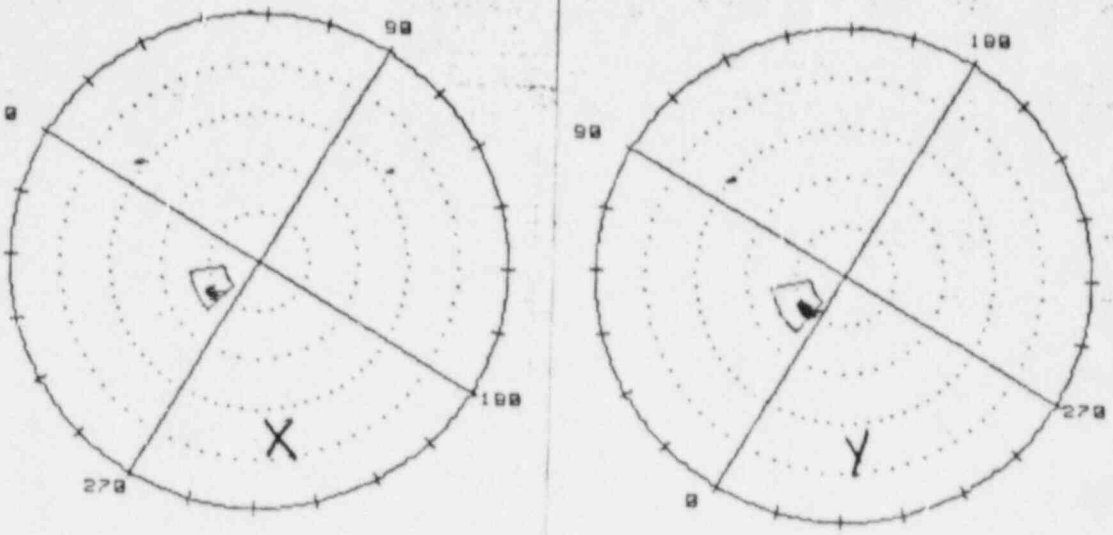


FULL SCALE
2.0 mil pp

NONE
SYSTEM

U-3 RCP 2B 2B RCP PMP TREND 21 day

BEGIN: 22MAR88 15:48
POINT: 2B RCP 2B-[redacted]
END: 12APR88 9:48
TYPE: 1X AMPLITUDE



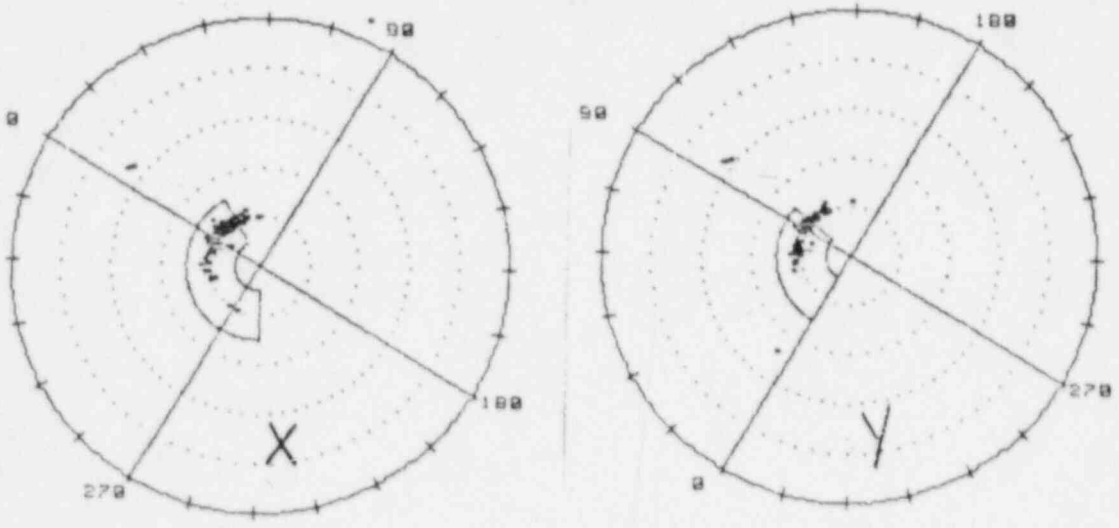
FULL SCALE
18.8 mil pp

CCW

NONE
SYSTEM

U-3 RCP 2B 2B RCP PMP TREND 21 day

BEGIN: 2[redacted]MAR88 15:48
POINT: 2[redacted] RCP 2[redacted]
END: 12APR88 9:48
TYPE: 2[redacted] AMPLITUDE



FULL SCALE
2.8 mil pp

CCW

INSERT

APS shall implement an augmented monitoring program for each of the four reactor coolant pumps that includes the following elements:

a. Each pump will be continuously monitored with at least one of the two channels with associated shaft proximity vibration transducer and a control room alarm. No additional equipment or monitoring is required for the failure of a single channel.

Should a channel fail, a channel check shall be performed within one hour, to verify the failure of the channel. Within 48 hours of the channel failure, excluding equipment inside containment, steps will be completed to correct the failed channel. If a single channel inside containment has failed but spectrum analysis is still obtainable on the other channel, the failed channel will be repaired/replaced at the next outage of sufficient duration.

When the ability to monitor both channels is lost, monitoring will be restored within 24 hours by repair or monitoring with equivalent external equipment. If monitoring capability is not restored within 24 hours, within one hour initiate action to place the unit in at least HOT STANDBY within the next 6 hours. The affected reactor coolant pump(s) (RCP) will be secured (unless more than two pumps are affected) except for testing until corrective action is completed which would allow monitoring on at least one channel.

The Nuclear Regulatory Commission shall be notified, via the Emergency Notification System within four hours, of the time capability to monitor all channels is lost and again within four hours of commencement of a plant shutdown, should one be required.

b. Every four hours, vibration data on each pump will be monitored and recorded.

c. On a daily basis, an evaluation of the pump vibration data obtained per b. above will be performed by an appropriately qualified individual.

d. When vibration of any reactor coolant pump reaches a level of 8 mils or greater the Nuclear Regulatory Commission shall be notified within four hours via the Emergency Notification System.

In addition, when the vibration on any pump exceeds 8 mils or greater due to a shaft crack or unknown cause, within four hours the affected pump shall have its orbit (if available) and spectrums continuously monitored and evaluated by an appropriately qualified individual. If the vibration is confirmed to be caused by pump conditions other than a crack or instrumentation malfunctions, appropriate actions commensurate with the cause will be taken per approved plant abnormal operating procedures. Monitoring shall continue on a frequency determined by an individual appropriately qualified in vibrational analysis until the vibration decreases below 8 mils.

e. When vibration of any reactor coolant pump reaches a level of 10 mils or greater due to a cracked shaft, or other unknown cause, or 15 mils for any combination of causes, within one hour action shall be initiated to place the unit in at least HOT STANDBY within the following six hours. In addition, the affected pump will be secured following entry into Mode 3 (HOT STANDBY) and it will remain secured, except for the purpose of testing, until corrective action has been completed.

f. On a daily basis, a spectrum analysis shall be performed on the RCP shaft vibration and shall be evaluated for trends by using an individual qualified in that technique. The evaluation shall consist of comparing the running speed and twice running speed components to limits computed from the baseline vibration. The current method used is to compute the lowest of: i) 1.6 times the baseline value; ii) the mean plus three standard deviations of the baseline value; iii) 2 mils for the twice speed component, or iv) 6 mils for the running speed component. In the event new limits or methods are chosen, prior to their implementation they will be evaluated to assure that quality of results will be equal to or better than those for the current method. The Nuclear Regulatory Commission shall be notified 10 days prior to the implementation of a new spectral analysis method. When the amplitude exceeds any limit, further analysis shall be performed. This analysis shall consist of inspecting the amplitude versus time plots for a steadily increasing trend, and review of other plant data which might explain the change. If a trend is confirmed to indicate the presence of a shaft crack, or unknown cause, the trend will be extrapolated to predict the time at which vibration is expected to reach 10 mils. The unit will be brought to HOT STANDBY and the affected pump will be secured per e. above at least one week prior to the extrapolated time unless the projected time is within a week in which case the unit will be shutdown per e. above. The affected reactor coolant pump will remain secured, except for the purpose of testing, until corrective action has been completed.

Attachment

A. DESCRIPTION OF THE PROPOSED AMENDMENT

ANPP will implement an augmented vibration monitoring program for each of the four reactor coolant pumps for all three units that includes the following elements.

a) Each pump will be continuously monitored with at least one of the two shaft proximity vibration transducers each with a control room alarm.

This section is new and has been added for clarification which allows the unit to remain at power while the operability of the affected channel is reviewed. The characteristics of an instrument failure are easily distinguishable from those of a cracked shaft by an appropriately qualified individual, e.g., rapid rise time pulses (spiking), 60 Hz frequencies and/or 120 Hz frequencies, gap voltage variations not confirmed by other sensors. If a channel becomes inoperable, a channel check shall be performed within one hour, to verify the failure of the channel. Within 48 hours of the channel failure, excluding equipment inside containment, action will be completed to correct the failed channel. If a single channel has failed inside containment but spectrum monitoring is still possible on the other channel, the failed channel will be repaired/replaced at the next outage of suffient duration. In the unlikely event that both channels become inoperable, corrective action shall be implemented to restore monitoring capability within 24 hours. During the period vibration monitoring is unavailable, the loose parts vibration monitoring system audio channels and reactor coolant pump seal stage pressures will be monitored every four hours. The NRC shall be notified within four hours if the capability to monitor both channels is lost.

b) Monitoring and recording of reactor coolant pump vibration data every four hours.

This section has not been changed.

c) Evaluation of reactor coolant pump vibration data on a daily basis by an appropriately qualified individual.

A change to this section deleted the term "engineering" as it relates to an appropriately qualified individual. Some of the individuals who perform an evaluation of the data are technicians which are appropriately qualified. This is in accordance with dicussions in our November 22, 1987 meeting and is for clarification purposes.

d) Reporting requirements when the vibration level on any reactor coolant pump is equal to or exceeds 8 mils.

By adding the term "if available," clarification is made. If one channel is inoperable, monitoring of the orbit is not possible. The orbital analysis is not required to detect a cracked shaft, its primary use is to confirm conditions other than a cracked shaft to allow continued operation. Also, a statement is added on actions to be taken if other conditions exist causing vibration.

e) Reactor shutdown requirements when the vibration level on any reactor coolant pump reaches 10 mils or greater due to a cracked shaft or other unknown cause or 15 mils for any combination of causes.

Combustion Engineering guidelines for shutdown due to excessive vibration on the Reactor Coolant Pumps is 15 mils. Industry data has shown that vibration readings of 20 mils or higher were achieved prior to shaft failures.

If the unit has to be shutdown, entry into Mode 3 (HOT STANDBY) should be sufficient. The reactor is stable and there is no chance of being in an unanalyzed condition. If further testing is needed it can be accomplished, in Mode 5 it cannot.

Entry into lower modes (4 or 5) unless required to affect repairs or maintain compliance with LCO's, is contrary to plant and federal policies which require maintenance of personnel radiation exposure ALARA and minimizing generation of radwaste.

In addition, the plant would be put through an unnecessary cooldown/heatup cycle. Finally, further meaningful testing/troubleshooting cannot be accomplished with the plant in Mode 5.

f) Spectrum analysis of the vibration data on a daily basis with associated reactor shutdown requirements based on the results of the analysis.

This section has been reworded basically for clarification. Part of this classification is in accordance with NRC's request at the November 23, 1987 meeting. Also, the footnote is now incorporated into this section which allows the NRC staff ten days instead of five to review new limits or methods of monitoring prior to their implementation. As in section e. above, the unit will be shutdown and remain in Mode 3 (HOT STANDBY) for the same reasons.

B. PURPOSE OF THE LICENSE CONDITION

The augmented RCP vibration monitoring program has been previously incorporated into the Unit 2 and 3 Operating License(s). The NRC staff's reasons for imposing the license conditions are summarized in a letter from G. W. Knighton, of the NRC Staff, to E. E. Van Brunt, Jr., of ANPP, dated October 25, 1987. In this letter the NRC Staff states that, "...the European data, as well as the information obtained from Palo Verde Unit 1, indicate an increased probability of a reactor coolant pump shaft failure, as well as a potential failure mode which could involve the failure of more than one reactor coolant pump. The failure of more

than one pump is an unanalyzed condition and thus beyond the current license design basis.... This (vibration monitoring) program, which is based upon documented European experience, should provide evidence of impending pump shaft failure approximately two days prior to failure, which is sufficient time to place the unit in safe shutdown condition in an orderly manner."

C. NEED FOR THE OPERATING LICENSE AMENDMENT

The need for the requested Operating License amendment is the change will mitigate unnecessary plant shutdowns and clarify elements of the augmented vibration monitoring program.

To more fully explain unnecessary plant shutdowns, on March 6, 1988 Unit 1 was in Mode 2 ascending to Mode 1 after its first refueling outage. At 1950 hours an RCP shaft displacement alarm was received on RCP 1B. Readings taken on the loose parts vibration monitoring system (LPVMS) cabinet indicated (x) channel to be stable at 2-3 mils, whereas (Y) channel appeared erratic with general readings at 3-5 mils with spiking up to approximately 12 mils, strongly indicating instrument failure. It was at this time Unit 1 Management, Instrument and Controls Engineering (I&C) and the vibration group was notified. After consultation, Unit 1 operators initiated action to place the Unit in Mode 3 which was accomplished at 0147 on March 7, 1988. RCP 1B was then secured at 0226. Pursuant to the augmented vibration monitoring program the NRC was notified within the prescribed time via the Emergency Notification System.

After securing the pump, investigation by I&C found the output lead from the amplifier module for the RCP 1B (Y) channel to be loose. It was tightened and all other accessible connections were checked. After further discussions with Unit 1 management and the Resident Inspector, concurrence was given to restart RCP 1B to retest the (Y) channel vibration circuit. The pump was restarted at 0605 and the (Y) channel vibration readings all appeared normal.

D. BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION

1. The Commission has provided standards for determining whether a significant hazards consideration exists as stated in 10CFR50.92. A proposed amendment to an Operating License for a facility involves no significant hazards consideration if operation of the facility in accordance with a proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. A discussion of these standards as they relate to the amendment request follows:

Standard 1 -- Involve a significant increase in the probability or the consequences of an accident previously evaluated.

Basis -- The proposed Operating License amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated. This amendment will impose an additional restriction on Unit 1 operations by adding a license condition requiring RCP vibration monitoring. The additional RCP vibration monitoring will not increase the probability of occurrence of any of the previously analyzed accidents. This amendment would also clear up ambiguity in the program.

The additional RCP vibration monitoring program imposed by this amendment and the clarification afforded will not affect the consequences of the previously analyzed RCP sheared shaft event.

Standard 2 -- Create the possibility of a new or different kind of accident from any accident previously evaluated.

Basis -- This proposed Operating License amendment does not create the possibility of a new or different kind of accident from any accident previously analyzed. The design and operation of PVNGS Units 1, 2 and 3 is not changed by this proposed amendment. The amendment involves the addition of a augmented vibration monitoring program for Unit 1 and a change to Units 2 and 3 programs which clarifies the existing criteria.

Standard 3 -- Involve a significant reduction in a margin of safety.

Basis -- This proposed Operating License amendment does not involve a significant reduction in a margin of safety. The proposed change involves the imposition of additional restrictions on Unit 1 operations and additional clarification for Units 2 and 3. The augmented RCP vibration monitoring program is designed to provide advance warning of RCP shaft failure. This early warning will allow the reactor to be safely shutdown prior to the occurrence of a RCP sheared shaft event.

2. The Commission has provided guidance concerning the determination of whether a significant hazards consideration exists by providing certain examples (51FR7751) of amendments that are considered least likely to involve a significant hazards consideration. This proposed Operating License amendment matches example(s) (i) and (ii) of 51FR7751 in that, (i) a purely administrative change in that certain statements are clarified and (ii) a change that constitutes an additional limitation, restriction or control not presently included in the Operating License.

E. SAFETY EVALUATION FOR THE PROPOSED AMENDMENT

This proposed Operating License amendment will not increase the probability or the consequences of previously evaluated accidents nor will it create the possibility of a new or different kind of accident. The proposed amendment will impose an additional restriction on Unit 1 operations by adding a license condition requiring RCP vibration monitoring. The augmented RCP vibration monitoring program has already been incorporated into the Unit 2 License by Confirmatory Order an into the Unit 3 Operating License. This amendment will also provide clarification to ambiguous terminology in the program. The RCP vibration monitoring program is being added to provide an early warning of impending RCP shaft failure due to the shaft cracking phenomenon found at Unit 1 as well as at several European facilities. The accident analysis of primary concern in this case is the RCP sheared shaft event. The vibration monitoring program imposed on the units will decrease the probability of experiencing a sheared shaft event. Additionally, this proposed amendment will not affect the operation of the units. Therefore, the change will not increase the consequences of previously analyzed accidents nor will it create the potential for a new or different kind of accident.

This proposed Operating License amendment will not reduce the margin of safety as defined in the basis for any Technical Specification. This change adds a license condition to the Unit 1 Operating License and clarifies the Unit 2 and 3 Operating License condition. There are no existing Technical Specifications impacted by the addition of the RCP vibration monitoring program.

F. ENVIRONMENTAL IMPACT CONSIDERATION DETERMINATION

The proposed change request does not involve an unreviewed environmental question because operation of PVNGS Units 1, 2 and 3 in accordance with this change would not:

1. Result in a significant increase in any adverse environmental impact previously evaluated in the Final Environmental Statement (FES) as modified by the staff's testimony to the Atomic Safety and Licensing Board (ASLB), Supplements to the FES, Environmental Impact Appraisals, or in any decisions of the ASLB; or

2. Result in a significant change in effluents or power levels; or

3. Result in matters not previously reviewed in the licensing basis for PVNGS which may have a significant environmental impact.

G. MARKED-UP OPERATING LICENSE CHANGE PAGES

See revised Attachment 1 of the Unit 1, 2 and 3 Operating License(s); NPF-41, NPF-51, and NPF-74.

 June 1, 1985

ATTACHMENT 1

PALO VERDE NUCLEAR GENERATING STATION, UNIT 1
OPERATING LICENSE NPF-41

This attachment identifies items which must be completed to the NRC staff's satisfaction in accordance with the schedule identified below.

~~Surveillance Program~~

1. Prior to entering Mode 1 for the first time, APS shall

   a. Have completed a review of the surveillance procedures applicable to the change of mode, and determined that the procedures demonstrate the operability of the required systems with respect to all acceptance criteria defined in the Technical Specifications.

   b. Have dispatched written notification to the NRC Regional Administrator, Region V, that the action defined in (a), above, has been completed for Mode 1.

2. Add Insert

The Regional Administrator, Region V may relax or rescind in writing, any of the above vibration monitoring conditions upon showing by the licensee of good cause

ATTACHMENT 1

PALO VERDE NUCLEAR GENERATING STATION, UNIT 2
OPERATING LICENSE NPF-51

This attachment identifies items which must be completed to the NRC staff's satisfaction in accordance with the schedule identified below.

1. Prior to entering Mode 1 for the first time, APS shall

   a. Have installed and operable a Post Accident Sampling System which meets the provisions of NUREG-0737 (II.B.3).

   b. Have completed a review of the surveillance procedures applicable to the change of mode, and determined that the procedures demonstrate the operability of the required systems with respect to all acceptance criteria defined in the Technical Specifications.

   c. Have dispatched written notification to the NRC Regional Administrator, Region V, that the action defined in (a) and (b) above, has been completed for Mode 1 entry.

2. APS shall perform compensatory measures, complete testing and make operable all elements of the Radiation Monitoring System in accordance with the schedule and commitments presented in ANPP letters 34129 and 36152, dated November 29, 1985 and April 15, 1986, respectively.

3. APS shall submit the following information concerning the charging pumps to the Office of Nuclear Reactor Regulation in accordance with the schedules and commitments presented in ANPP Letters 34127 and 34174, dated November 29, 1985 and December 5, 1985, respectively:

   a. An evaluation of the effects of gas binding an operating charging pump assuming that the pump has a preexisting crack in the block. If this postulated condition will lead to a failure of the pump to deliver the required flow, APS shall also include with the evaluation a proposed course of action regarding this outcome.

   b. An evaluation and implementation schedule, for staff approval, regarding the long-term solution which considers alternative hardware changes that may be necessary to eliminate the need for venting hydrogen from the suction of the charging pumps.

4. APS shall implement the resolution of the design adequacy of masonry walls in accordance with the commitments provided in ANPP letter 36301, dated April 18, 1986.

5. Add Insert

The Regional Administrator, Region V may relax or rescind in writing, any of the above vibration monitoring conditions upon showing by the licensee of good cause.

ATTACHMENT 1

PALO VERDE NUCLEAR GENERATING STATION, UNIT 3
OPERATING LICENSE NPF-74

This attachment identifies items that must be completed to the NRC staff's satisfaction in accordance with the schedule identified below.

1. Prior to entering Mode 1 for the first time, APS shall:

   a. Have completed a review of the surveillance procedures applicable to the change of mode and determined that the procedures demonstrate the operability of the required systems with the respect to all acceptance criteria defined in the Technical Specifications.

   b. Have dispatched written notification to the NRC Regional Administrator, Region V, that the action defined in (a), above, has been completed for Mode 1.

2. The post accident sampling system shall be operable prior to exceeding 5% power.

3. ~~APS shall implement an augmented vibration monitoring program for each of the four reactor coolant pumps that includes the following elements:~~

   a. Every four hours, monitor and record vibration data on each of the four reactor coolant pumps.

   b. On a daily basis, perform an evaluation of the pump vibration data obtained in a above, by using an appropriately qualified engineering individual.

   c. When any one vibration monitor on the reactor coolant pumps indicates a vibration level of 8 mils or greater, the Nuclear Regulatory Commission shall be notified within four hours via the Emergency Notification System. In addition, when the vibration on any pump exceeds 8 mils due to a shaft crack or unknown cause, within four hours the affected pump shall have its orbit and spectra continuously monitored and evaluated by an appropriately qualified individual.

   d. When any one vibration monitor on the reactor coolant pumps indicates a vibration level of 10 mils or greater, within one hour, initiate action to place the unit in at least HOT STANDBY within the next six hours, and at least COLD SHUTDOWN within the following 30 hours. In addition the affected pump shall be secured after entering HOT STANDBY.

Add Insert

e. On a daily basis a spectrum analysis shall be performed on the reactor coolant pump shaft vibration data and shall be evaluated for trends by using an individual qualified in that technique. The evaluation shall consist of comparing the running speed (1xRPM) and twice running speed (2xRPM) spectral components to limits computed from the baseline vibration. The limits shall be based on the lowest of: (a) 1.6 times the baseline value, (b) the mean plus three standard deviations, (c) 2 mils for the 2xRPM component, or (d) 6 mils for 1xRPM component.[1/] When the amplitude exceeds any limit, further analysis shall be performed. This analysis shall consist of an inspection of the amplitude versus time plots for a steadily increasing trend, and a review of other plant data which might explain the change in amplitude. If it is confirmed that the trend is not caused by plant or pump conditions unrelated to a shaft crack, the trend shall be extrapolated manually and/or by computer to predict the time at which the vibration is expected to reach 10 mils. If the projected time for reaching 10 mils is one week or less, within one hour, initiate action to place the Unit in at least HOT STANDBY within the next six hours and at least COLD SHUTDOWN within the following 30 hours. In addition the affected pump shall be secured after entering HOT STANDBY.

The Regional Administrator, Region V may relax or rescind, in writing, any of the above vibration monitoring conditions upon a showing by the licensees of good cause.

4. Within 90 days of the commencement of the Palo Verde Unit 2 first refueling outage, the licensee shall submit a report to the NRC concerning the inspection of the Unit 2 reactor coolant pumps. This report shall include inspection results, an evaluation of the Unit 1 and Unit 2 pump shaft degradation findings and proposed actions to be taken with respect to Unit 3 continued operation.

5. APS shall install modified reactor coolant pump shafts during the first refueling outage which include the modifications described in Figure DES-3 of the attachments to the licensees' November 5, 1987 letter.

Delete

1/ In the event new limit methods are chosen, they shall be evaluated by the licensee to assure that the new methods are equal to or better than the above method. The Commission shall be advised within one week if new methods are chosen.