PDR 40-8380

ROCKY MOUNTAIN
ENERGY COMPANY

June 30, 1980

RECEIVED JUL 7 1980 U.S. Nuclear Regulatory Commission NMSS Mail Section

RECEIVED JUL 08 1980 U.S. Nuclear Regulatory Commission NMSS Mail Section

DOCKETED USNRC JUL 10 1980 NMSS MAIL SECTION DOCKET CLERK

Mr. J. E. Rothfleisch
U. S. NUCLEAR REGULATORY COMMISSION
Uranium Recovery Licensing Branch
Willste Building
7915 Eastern Avenue
Silver Springs, MD 20910

Dear Mr. Rothfleisch:

RE: License No. SUA-1228
Docket No. 40-8380
R & D License Renewal

This letter is intended to clarify information presented in the Nine Mile Lake Review of Operations which was submitted April 16, 1980. The Review of Operations was prepared in accordance with your instructions to accompany RMEC's license renewal request.

Several questions concerning radiological data contained in the Review of Operations were raised during our meeting of April 25, 1980. Specifically, you expressed concern about the values presented in Table 1 (Preoperational Radiometric Analysis), Table 2 (Radon Gas), the graphs depicting radon levels adjacent to the pregnant liquor tank, and Table 4 (Baseline Water Quality Ranges).

C

Although the soils data contained in Table 1 would appear to describe a trend, especially in uranium values, from higher to lower concentrations, the difference in values is probably attributable to differences in sampling and analytical techniques. The data for 1978 was collected by a consultant and analyzed by CDM Acculabs. The 1979 data was collected by Nine Mile personnel and analyzed by Ecology Audits, Inc. Slight variations in sampling methodology and/or analytical error would easily account for the different results. It should also be noted that we are dealing with extremely low levels of radionuclides and many of the values approach the limits of detection. The same reasoning applies to the apparent yearly variation in vegetation and animal tissue sample results. Sample selection could also contribute to the slight variations as one would not expect to find identical low level radionuclide levels over time in different individuals, whether plant or animal.

FEE EXEMPT

8007210224

16746

Table 2, which describes radon gas concentrations at various locations adjacent to the plant, as well as within the plant, is somewhat misleading. The items of concern are the values collected adjacent to the pregnant liquor tank, several of which apparently exceed the maximum permissible concentration (MPC) of 75 µCi of inhaled Rn-222 as specified in 10 CFR, Section 20.103 (a) (1). Following the instructions given in Footnotes 2 and 3 yields the following analysis:

> "For Radon-222, the limiting quantity is that inhaled in a period of one calendar year. Multiply the concentration values specified in Appendix B, Table I, Column 1, by 2.5×10^9 ml to obtain the annual quantity limit for Rn-222."

<u>Appendix B, Table I, Column 1</u>

$$3 \times 10^{-8}\ \mu Ci/ml \times 2.5 \times 10^{9}\ ml = 75\ \mu Ci$$

Therefore, 75 µCi is the maximum allowable inhaled Radon-222 activity for one calendar year.

Although several of the values in Table 2 of the Review of Operations exceed the MPC, a limit of 3×10^{-8} µCi/ml, it must be emphasized that these readings were taken solely adjacent to the pregnant liquor tank. Table 2A presents average concentration values for the entire process plant as determined by averaging the measurements taken from the following locations:

1) Assay station
2) Upper working deck
3) Storage loft
4) Adjacent to IX columns
5) Lunch room
6) Plant office
7) Adjacent to pregnant liquor tank

Analysis of the average monthly and yearly radioactivity levels of Radon-222 shows that annual quantities are all below the 75 µCi limits; therefore, it is unlikely that radon over-exposures have occurred. Use of the calculated average activity concentrations in determining inhaled Radon-222 is based on the assumption that an individual inhales the average amount of radon detected in the plant building for eight hours/day, five days/week, over a 52 week period, which is a worst case assumption. The average activity levels presented in Tabel 2A do not reflect the length of time which an individual spends at a given location; therefore, calculations based on these data may not represent actual quantities inhaled.

TABLE 2A

RADON GAS
NINE MILE LAKE
AVERAGE MILL VALUES

Month	Rn-222 Mill Average 10^{-9} µCi/ml	Annual Quantity Limit [1] 2.5 x 10^9 ml	=	Annual Mill Concentrations Operator Exposure
April, 1977	0.6			
May	3.5			
June	6.0			
July	36.36			
August	1.43			
September	7.19			
October	6.26			
November	16.47			
December	67.13			
	($\bar{x}$) 16.10	x 2.5 x 10^9 ml	=	40.25 µCi/yr
January, 1978	85.56			
February	18.87			
March	10.72			
April	7.81			
May	4.65			
June	7.03			
July	3.02			
August	1.87			
September	8.76			
October	5.43			
November	10.91			
December	1.23			
	($\bar{x}$) 13.82	x 2.5 x 10^9 ml	=	34.55 µCi/yr
January, 1979	14.10			
February	17.92			
March	17.80			
April	19.10			
May	68.20			
June	25.72			
July	98.00			
August	*			
September	6.09			
October	6.13			
November	3.98			
December	8.36			
	($\bar{x}$) 25.95	x 2.5 x 10^9 ml	=	64.87 µCi/yr
January, 1980	3.42			
February	7.16			
March	5.42			

1 Annual quantity limit for inhaled Rn-222 (10 CFR, 20.13 (a) (1)

* No sample due to equipment failure.

We also feel that the use of radon quantities to determine actual employee exposure rates is extremely misleading. This method assumes that radon is in equilibrium with radon progeny within the process building, which is an erroneous assumption. Because radon is vented from the plant, little or no radon decay occurs within the building, and there is negligible build-up of radon daughter products. Based upon data collected at Nine Mile Lake, there is no correlation between radon gas concentrations and actual working level (WL) exposures. Repeated radon daughter analysis tests conducted at the site by RMEC, the State of Wyoming, and an EPA-sponsored program, have all resulted in values well below the 0.3 WL limit, indicating that Rn-222 is sufficiently vented from the building.

We are currently in the process of conducting a time/motion study to determine the average number of hours/day which an employee spends at a given location. When the analysis is complete, sample station readings will be weighted to reflect the exposure duration (to individuals) at various plant locations. It is not known at this time if the weighted averages will vary significantly from the plant average, but it will allow more accurate tracking of actual exposure levels.

Another point worthy of note is the fact that whenever abnormally high levels of Rn-222 have been recorded, corrective action has been taken. For example, when high radon levels were observed during start-up and initial operation of Pattern II (December - January of 1977) the pregnant liquor and raffinate tanks were covered with lids and equipped with power vents which significantly reduced radon concentrations in the plant. In July of 1979, abnormally high radon levels were again recorded, which prompted expansion of the vent system to cover the injection and eluant tanks, resulting in lower plant radon concentrations.

Another item of concern which you noted were the extreme ranges in radiochemistry values for the regional monitor wells which were presented in Table 4. I failed to note in the Review of Operations that the data presented in Table 4 was preliminary data. Revised Table 4 has been compiled following statistical removal of outliers, according to Chauvenet's criterion. Removal of outliers significantly reduced most of the extremely wide ranges to a more acceptable level. However, a relatively large range for certain parameters in some wells still exists following outlier removal. For example, Ra-226 levels in Well BM-2 range from 6.1 to 111.3 pCi/l, and in Well E-P29 from 3.5 to 213 pCi/l. Certainly some of the variation is attributable to natural variations in the actual samples collected with respect to change over time and point of origin of the sample. Perhaps the most likely explanation involves sample contamination or analytical error. Numerous possibilities exist for error in either the sampling or analytical procedure, both of which are cr[illegible]l to obtaining valid data.

TABLE 4 (REVISED)

REGIONAL BASELINE WATER QUALITY RANGES

Radiochemical Analysis

August 1978 - August 1979

Well Number	Lead-210 pCi/l	Polonium-210 pCi/l	Radium-226 pCi/l	Thorium-230 pCi/l
NML-BM1	3.0-12.0	6.0-12.0	17.0-51.0	0.6-4.8
NML-BM2	4.8-13.0	2.0-11.0	6.1-111.3*	0.6-2.8
NML-BM3	2.0-10.4	2.0-13.0	9.5-23.0	0.6-3.6
NML-BM4	1.5-5.1*	1.0-15.0	6.0-51.3	0.6-1.9
NML-BM5	0.1-11.5*	4.7-36.0	31.7-130*	0.6-7.0*
NML-BM8	1.0-2.4	1.0-7.0	0.5-18.7	0.6-3.3
NML-BM9	0.7-4.0	1.0-17.0	1.2-13.8	0.6-6.3
NML-BM10	2.5-3.0	2.0-7.0	1.9-5.5	0.6-4.6
NML-BM11	0.6-18.4	2.0-20.0	11.9-24.6*	0.4-4.0
NML-BM12	2.3-18.0*	1.0-24.0	2.5-51.0	0.7-7.0
NML-BM13	5.9-10.1	2.1-5.6	144-181	2.8-5.1
NML-BM14	1.4-2.6	11.4-17.0	11.4-17.0	1.9-4.7
NML-E-P29	16-21.0	1.5-30.0*	3.5-213	2.4-24.6*
Robb Well	1.8-18.0	0.3-15.0*	0.2-5.1	0.6-13.0

* Ranges have been revised by outlier removal

For instance, of the four assay results for Ra-226 in Well E-P29, both the low (3.5 pCi/l) and the high (213 pCi/l) values seem suspect. Each value was reported by a different commercial lab, while the two remaining values (29 and 35 μCi/l) came from the same lab. These data suggest that two out of four of the commercial lab results probably involve analytical error. This is not a rare phenomenon with commercial radiochemistry lab results. Our basic dissatisfaction with commercial radiochemistry laboratories is the primary reason that we are implementing an in-house radiochemistry lab at Nine Mile Lake. We believe that this will allow us to obtain accurate, timely results, and exercise the degree of quality control required to insure consistency in radiochemistry analysis. Once the program is instituted, selected commercial laboratories will be used for cross-checking so that quality assurance is maintained.

With respect to the water quality ranges presented in Table 4 (Revised), it should also be emphasized that this is an ongoing baseline sampling program. As the previous paragraph mentioned, we are aware of problems with questionable data and are attempting to alleviate this problem. As additional data are collected, parameter ranges will be refined, and we would expect the ranges to become narrower.

Page 9 of the Review of Operations discusses, in Paragraph 2, a test conducted to determine approximate radon gas levels emanating from the plant venting system. The values given on Page 9 are expressed as pCi/minute.

Another question which was raised during the meeting concerned the source of the process water. The primary source is the west water well which is located one-quarter mile due west of the existing project boundary. Backup process water can also be obtained from the east water well located immediately east of the existing boundary. Both wells are completed in the Teapot Sandstone at depths of 440 feet for the west well, and 550 feet for the east well. The wells are both capable of producing up to 50 gallons per minute. Water quality of the two wells is summarized in Table 4A.

Also, enclosed with this letter is a separate discussion of the Pattern III excursion which occurred during November of 1979. As you are aware, the excursion has been controlled, officially since January 21, 1980, although, by Wyoming DEQ definition, the excursion was actually controlled within two weeks of confirmation. At the present time, Pattern III monitor wells have been returned to background levels for the excursion parameters with the exception of Well M-40 and M-43, which contain slightly elevated uranium levels. Both wells continue to show uranium levels below 1 mg/l. Production from the Pattern continues at 5 gpm from both the upper and lower ore zones, a mode of operation which will be maintained until restoration of the Pattern begins.

TABLE 4A

ROCKY MOUNTAIN ENERGY
NINE MILE LAKE WATER QUALITY
PROCESS WATER SOURCES

		WEST WATER	EAST WATER
pH		6.5 - 6.7	6.5 - 7.2
Eh	mv	220 - 345	168 - 407
Conductivity	µmhos/cm	2300 - 2500	3750 - 5900
Alkalinity as $CaCO_3$	mg/l	168 - 231	220 - 298
Bicarbonate	mg/l	205 - 290	268 - 363
Carbonate	mg/l	0	0
Calcium	mg/l	80 - 100	148 - 203
Chloride	mg/l	28 - 34	46 - 55
Hardness as $CaCO_3$	mg/l	436 - 488	834 - 900
Magnesium	mg/l	52 - 63	97 - 120
Manganese	mg/l	0.13 - 0.22	0.17 - 0.35
Potassium	mg/l	9 - 12	13 - 17
Sodium	mg/l	480 - 507	975 - 1405
Sulfate	mg/l	1178 - 1210	2580 - 3500
Uranium as U_3O_8	mg/l	0.05 - 0.06	0.06 - 0.09
Total Dissolved Solids	mg/l	1960 - 2036	4400 - 5417
Iron	mg/l	0.04 - 0.14	0.50 - 1.18
Vanadium	mg/l	0.05 - 0.08	0.10 - 2.99
Silicon as SiO_2	mg/l	6.0 - 7.4	7.2 - 7.7
Lead - 210	pCi/l	1.0 - 2.8	2.0 - 10.1
Polonium - 210	pCi/l	1.0 - 53.0	0.2 - 12.0
Radium - 226	pCi/l	9.7 - 32.0	8.7 - 14.9
Thorium - 230	pCi/l	0.2 - 3.7	0.1 $\pm$ 22.3

This supplement should provide all the information requested to accompany the Review of Operations. Should any questions remain, please let me know.

Sincerely,

Michael R. Neumann

M. R. Neumann
Environmental Field Coordinator
ISL Development

MRN/ph
Enclosures

cc: NRC - Region IV
Dr. M. J. Kelley (ORNL)
Mr. Dennis Morrow (DEQ)
Ms. Margery Hulburt (DEQ)
Clark Boiser
Lyda Hersloff
Rick Iwanicki
Russ Hynes
Kent Loest
Adolph Mitterer
Peter Bosse
Doug Gray
Larry Earnshaw
Pat Spieles

PATTERN III EXCURSION DISCUSSION

One of the basic reasons for the operation of Test Pattern III was to test the principle of dual ore zone open injection wells. All six injection wells were perforated in the upper and lower ore zones with one flow and pressure monitoring system per injection well. The concept was: since upper and lower ore zone permeabilities were nearly identical, the injection flow should split evenly between upper and lower ore zones.

Vertical flow profile tests were planned before leaching and uranium recovery began, but could not be done because the highly specialized equipment was not ready. Full flow uranium recovery from Pattern III began in September of 1979.

The vertical flow profile equipment was not ready until late September and the profiles were not run until the end of the first week in October. Test results indicated that flows were not balanced between upper and lower ore zones in all injection wells, and that flow into the upper ore zone was significantly greater than that into the lower ore zone.

Plans were made to begin packing off and isolating the upper and lower ore zones and orders were placed for packers and flow measuring equipment. Meanwhile, Pattern III operation continued as before, that is, with dual zone injection. Packing efforts began on October 24, 1979, with a two inch, heavy-duty PVC string and packer for lower zone injection, and upper zone injection into the five inch, heavy-duty PVC casing annulus.

After initial packing, the upper and lower ore zone injection ports were plumbed together because the flow measuring devices had not yet arrived by late November. It was noted that the packed injection wells were pressuring up almost as soon as they were packed and brought on-line. After a few days' operation (in early November), the packers were pulled and the wells airlifted. Airlift product indicated that while inserting the packers, fungus sludge had been wiped off the casing walls and pushed to the lower ore zone. When the wells were started up, the loose sludge plugged off the lower ore zone, causing the wells to pressure up and probably almost all the flow to be directed to the upper ore zone perforations. These last few days of unbalanced injection flow probably reinforced the excursion flow nets, resulting in contamination of Monitor Wells M-40 and M-43. The excursion was detected during the monthly sampling of the wells on November 13th.

After analysis on November 15, 1979, injection rates into the three wells closest to the affected monitor wells were reduced while production contined at 42 gpm. Sampling of all four monitor wells the following day again showed elevated levels of uranium, conductivity, and sulfate with low pH values for Monitor Wells M-40 and M-43. At this time, injection into all wells was discontinued, and production from the Pattern was increased to about 50 gpm.

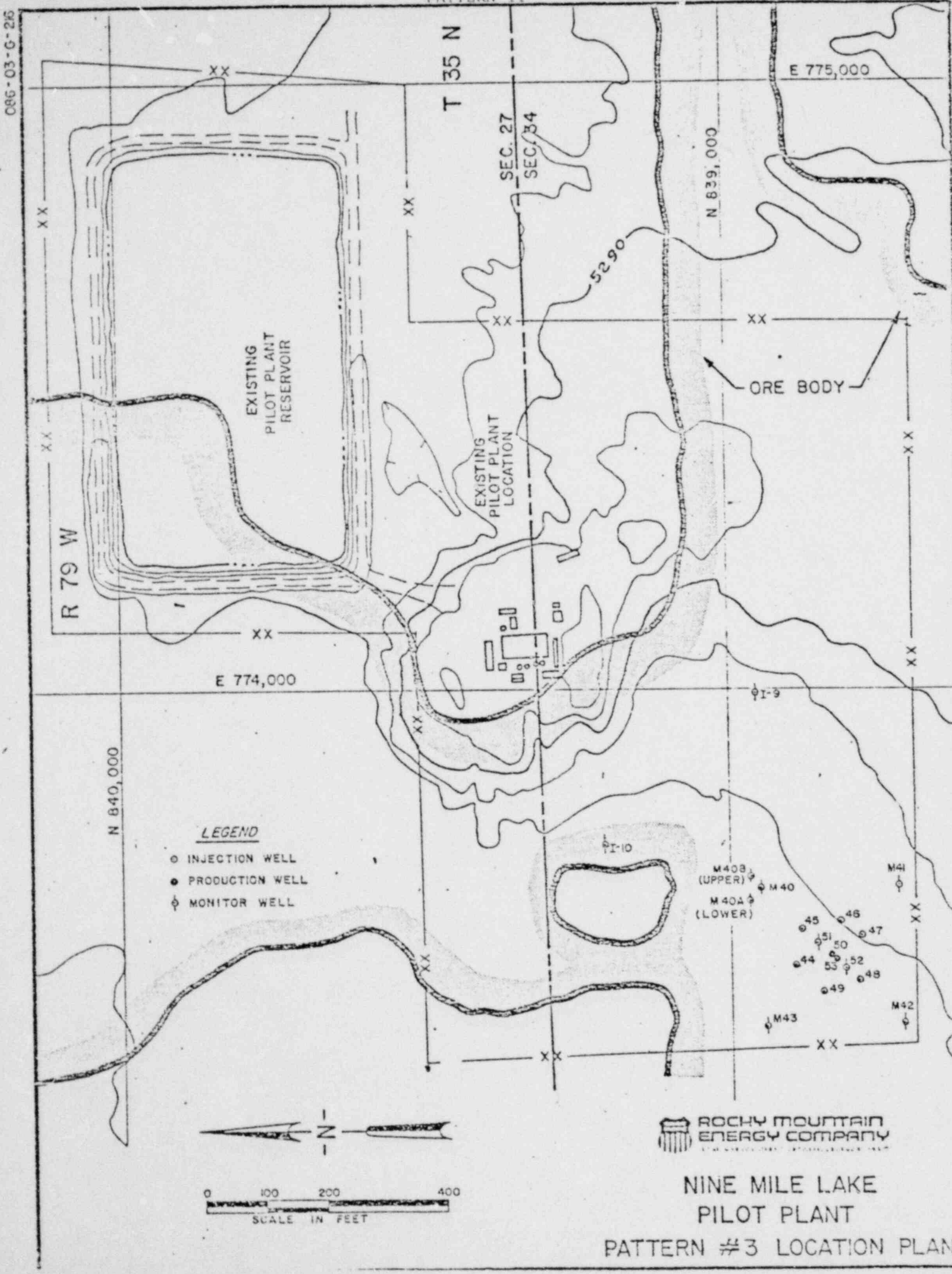
On November 16th, all Pattern III monitor wells were sampled again, and excursion status was confirmed for Wells M-40 and M-43. Verbal notification of the confirmed excursion was given immediately to the proper NRC and Wyoming DEQ authorities. Monitor Wells M-41 and M-42 were found to be within upper control limits for excursion control parameters, and selective sampling of the upper and lower ore zones in Wells M-40 and M-43 indicated that the excursion was confined to the upper ore zone. Installation of the packers on all injection wells was completed in order to allow independent control of flows into the upper and lower ore zones. In addition, plans were made to install a packer in Well M-40 for the purpose of determining which ore zone(s) was in excursion status.

As of November 17th, the production rate from Well M-50 (lower ore zone) was reduced to 5 gpm, and installation of two new monitor wells began. It was decided to install the wells about 25 feet out from Well M-40, with one well to be completed in the upper ore zone and one in the lower ore zone. Two days later, production from the upper ore zone (Well P-53) was also cut back to 5 gpm after a six day period of over-production.

Sampling of Well M-40 on November 21, 1979, indicated that the Pattern was responsive to the period of over-production, as values for pH, conductivity, sulfate, and uranium were beginning to return toward baseline (background) levels.

The following week, installation of the new monitor wells continued, as did production from the upper and lower ore zones at 5 gpm each, for a total production rate of 10 gpm. During the week, Well M-43 was again sampled and found to be within baseline ranges for pH, conductivity, and sulfate, although uranium and other metals remained at slightly elevated levels. This confirmed that the net withdrawal of 10 gpm was effectively drawing lixiviant back to the pattern interior. By November 27, 1979, a packer had been installed in Well M-40 to allow selective sampling of the upper and lower ore zones, and the new lower ore zone monitor well (M-40A) had been completed. Sampling of Well M-40 indicated that the excursion was confined to the upper ore zone, which was confirmed by sampling of the new lower zone monitor well (M-40A) on November 29, 1979. Results of the M-40A sampling showed essentially background levels for pH, conductivity, sulfate, uranium, and vanadium. Figure II shows the location of Pattern III monitor wells.

On December 4, 1979, all Pattern III monitor wells were sampled, and Wells M-41, M-42, and M-40A showed values within baseline ranges. Well M-43 was also back to baseline ranges with the exception of slightly elevated values for metals, including uranium. Well M-43 showed considerable improvement with the excursion parameters beginning to return to the upper control limits (UCL).



NINE MILE LAKE
PILOT PLANT
PATTERN #3 LOCATION PLAN

The following day, selective injection into the lower ore zone was resumed at a rate of 20 gpm, while production was maintained at 21 gpm for an injection/production ratio of 1:1.05. Production from the upper ore zone continued at 5 gpm with no injection.

On December 7th, the new upper ore zone monitor well (M-40B) was completed and sampled. Sample results revealed slightly elevated (with respect to Pattern background ranges) values for conductivity, sulfate, and metals which, again, indicated that the excursion was confined to the upper ore zone. All M-40B parameters were below upper control levels.

Sampling of the monitor wells on December 10th showed an appreciable deterioration of water quality in Well M-40. In order to increase the water withdrawal ratio from the M-40 side of the Pattern, Injection Well I-45 was put into production. The intent was to sweep M-40 with unaffected water drawn toward the Pattern interior. Problems with pump failures hindered these efforts, but, by December 31st, this action was showing positive results. M-40 was sampled and revealed significant improvement for all excursion parameters with values again approaching baseline ranges. The January 2nd sampling confirmed that M-40 was greatly improved. Values for pH, conductivity, and sulfate had returned to baseline ranges for all wells, including M-40.

Believing that the upper zone excursion had been effectively retrieved and stabilized, production from Well I-45 was terminated and injection into the lower ore zone resumed on January 4th. Sampling of Well M-40 the following week (January 11, 1980) again showed substantial deterioration of water quality, indicating that hydraulic communication between the upper and lower ore zones was occurring. The "pressuring up" of the lower ore zone probably caused recontamination of M-40. Injection into Well I-45 was curtailed. A potassium chloride solution was injected into Well M-40B (upper ore zone) in order to prepare a tracer test.

The following day, injection of process water into Well M-40B at 5 gpm was initiated, and I-45 was put back into production at 18 gpm. This action was taken to introduce "clean" water into the affected area, while simultaneously producing from the nearest injection well. The purpose of this action was to force the affected groundwater in the vicinity of M-40 toward the Pattern interior. Sampling of M-40 two days later (January 14th), indicated that the corrective action was producing the desired effect, as considerable improvement for the M-40 excursion parameters were noted.

Throughout the rest of January and February, this mode of operation, with occasional modification, continued. The basic strategy was to maintain production from the lower ore zone while producing, without any injection, from the upper ore zone to maintain a hydraulic gradient toward the Pattern interior. Repeated sampling of all monitor wells during January confirmed the effectiveness of this approach. On January 21st, sampling of Well M-40 resulted in baseline range values for all excursion parameters except uranium, which was less than 0.5 mg/l. This was the fourth consecutive sampling indicating improvement, and the excursion was officially termed controlled. The attached graphs display excursion parameter values for the Pattern III monitor wells during the period prior to excursion confirmation through June, 1980.

Production from the lower ore zone continued until the end of March, at which time all injection into the Pattern was halted. On March 31, 1980, both the upper (P-53) and lower (P-50) ore zone production wells were set to produce at 5 gpm for a net production of 10 gpm from the Pattern. This mode of operation is continuing, and will be maintained until restoration of the Pattern begins.

Summary and Conclusions

As was stated earlier, one of the primary goals of the Pattern III test program was to evaluate the feasibility of dual ore zone production by means of open injection wells and selectively completed recovery wells. Because of a difference in ore sand permeabilities and well completion efficiencies, injection rates into the upper and lower ore zones became unbalanced, resulting in an upper zone horizontal excursion.

A factor which indirectly, but strongly, contributed to the excursion problem was the placement of monitor wells only 100 feet from the Pattern perimeter. Balanced flow in a 60-foot radius pattern would have produced normal flow nets closely approaching the monitor wells. A slight injection imbalance was apparently enough to push lixiviant an extra few feet and cause the excursion.

The excursion proved to be a valuable learning experience, as the situation presented an opportunity to evaluate theoretical corrective procedures in an operational environment. The following conclusions can be drawn as a direct result of Pattern III experience.

1. The principle of open well, dual zone injection may still be valid; however, injection/production ratios should be closely monitored for both ore zones.

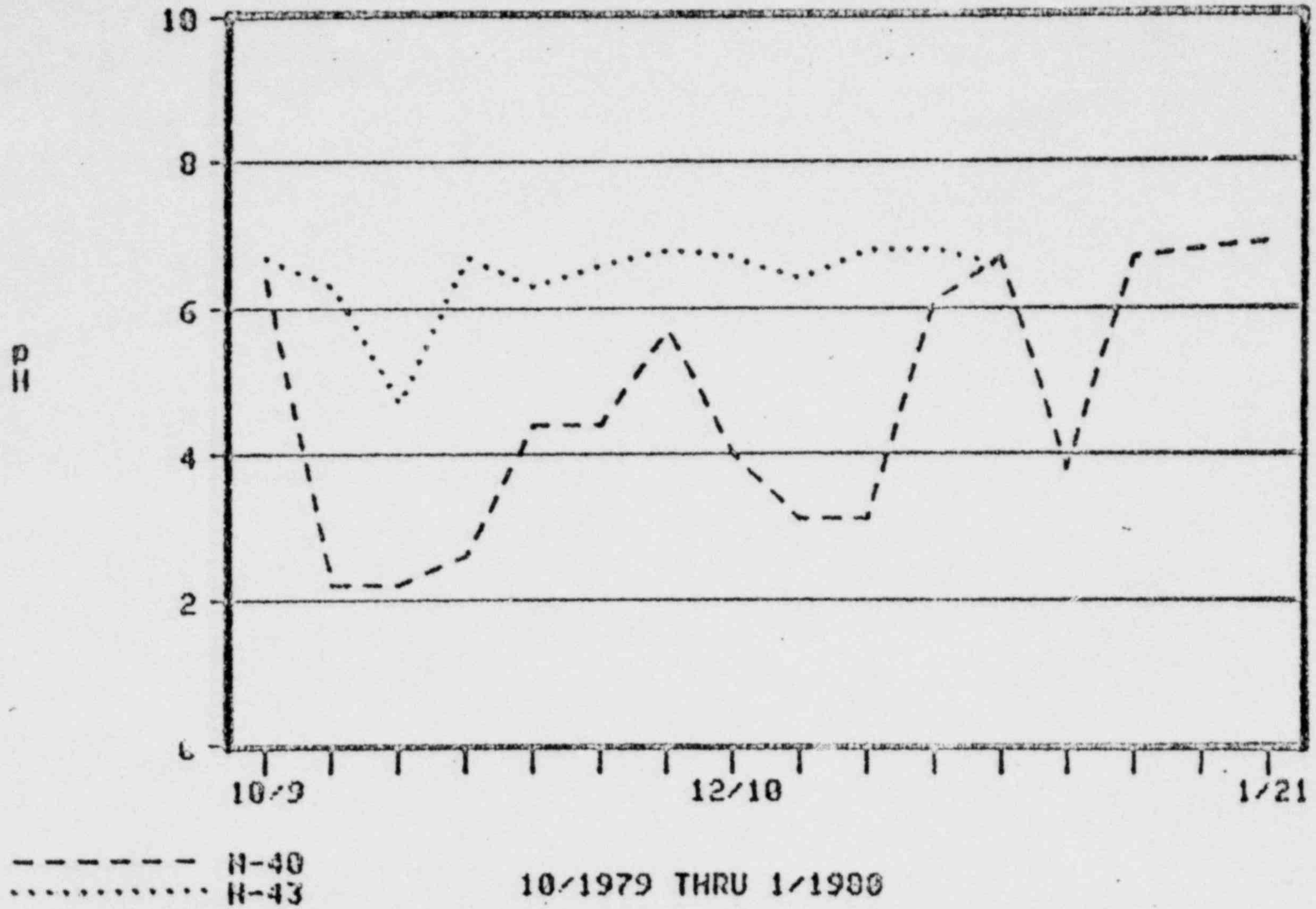
2. Monitor wells located at 100-feet with a 60-foot radius pattern are too close to serve as valid monitor wells, and should be more properly described as trend wells. For a 60-foot radius test facility pattern, monitor wells should be a minimum of 200-feet from the injection wells.

3. The method of determining upper control limits (UCL) for excursion parameters used at Nine Mile Lake ($UCL = \bar{x} + 2(s) + 10\%$) effectively allows detection of a pattern excursion. Although this method may need some refinement for commercial scale operations, it has been proven to be simple and effective to use.

4. When using an acid lixiviant, vanadium and iron are good early indicators of an excursion, and should be considered as potential excursion control parameters.

5. Over-production and selective conversion of injection wells to production wells can be considered demonstrated corrective procedures for controlling an excursion.

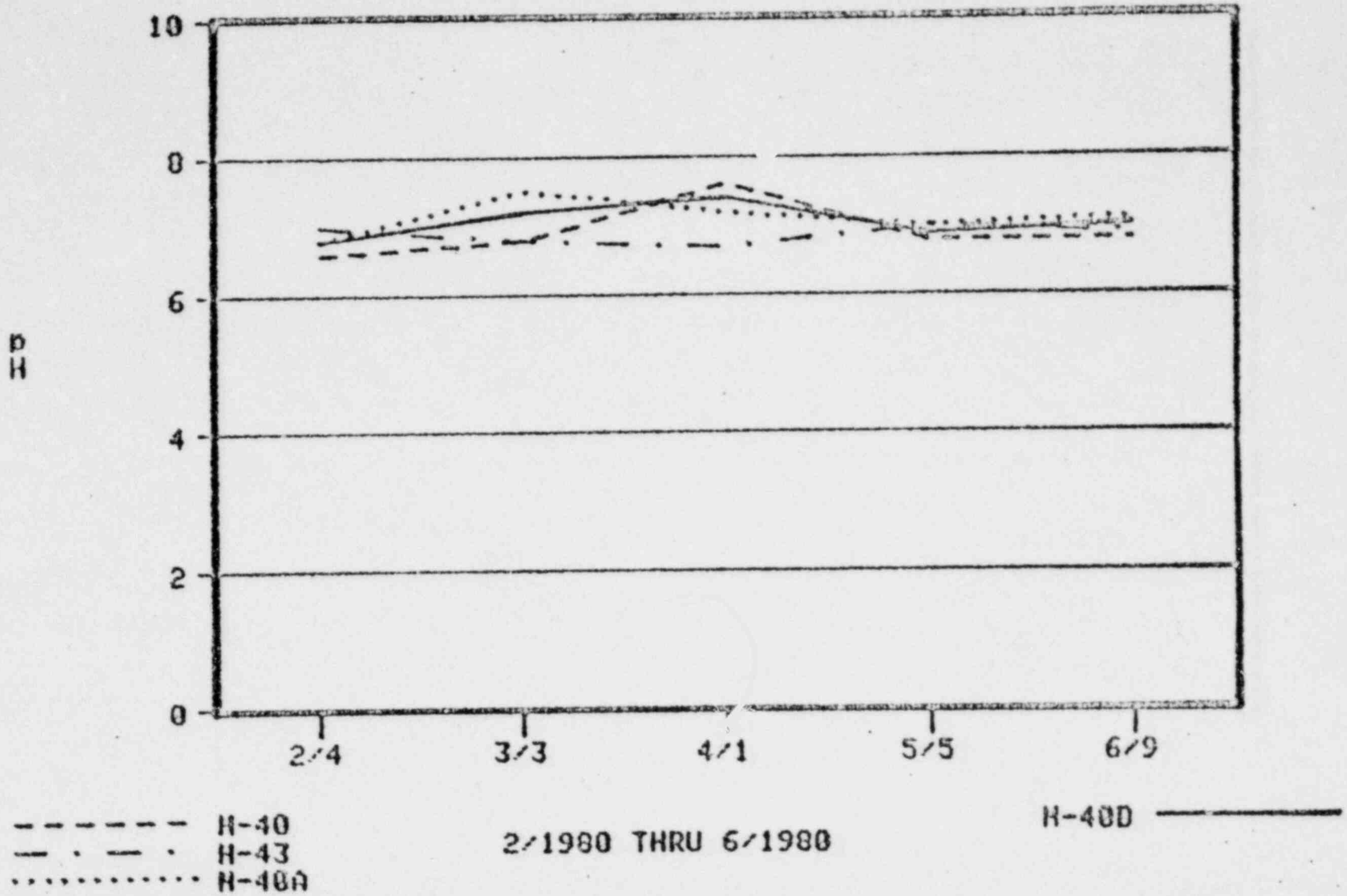
PATTERN 3 MONITOR WELLS



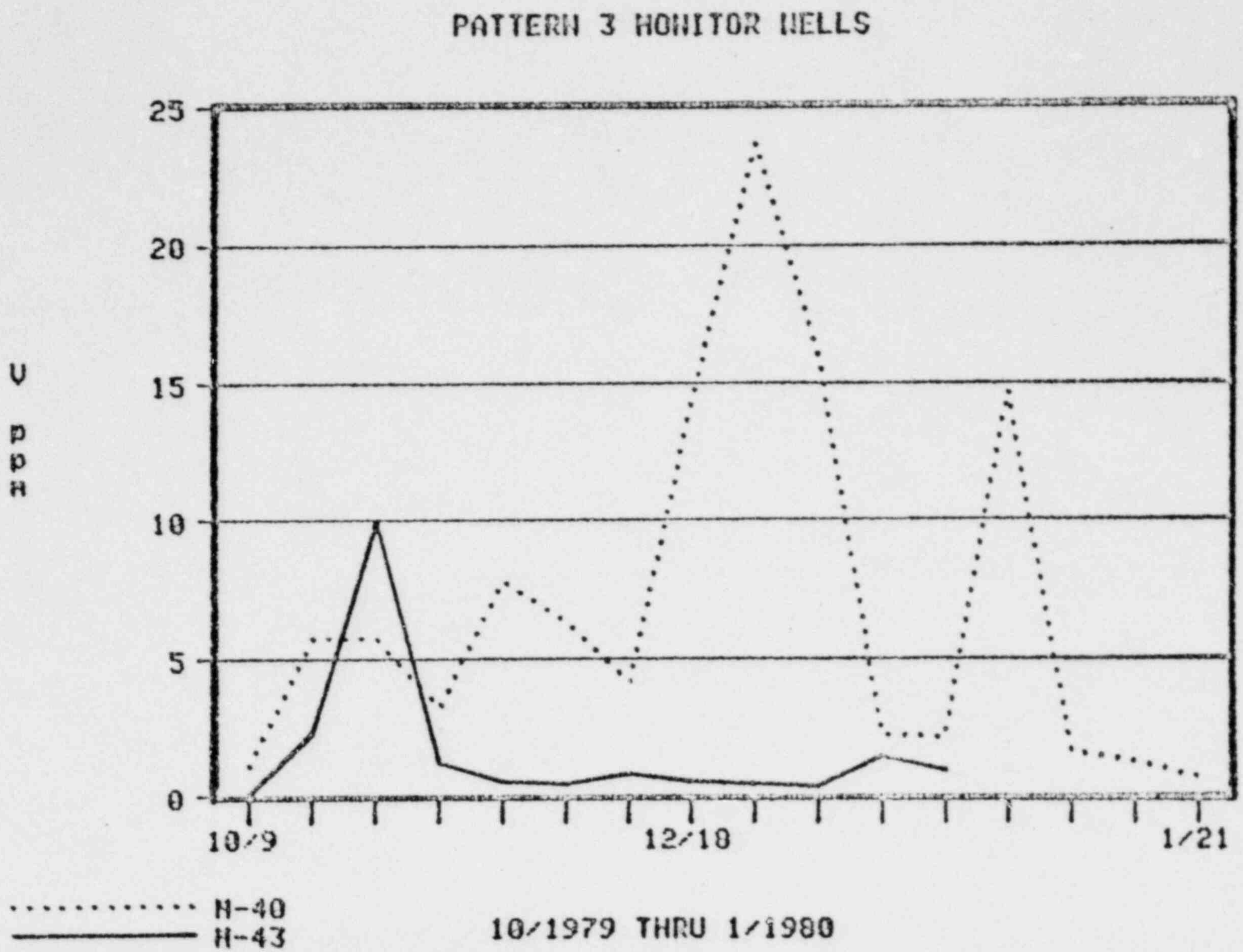
10/1979 THRU 1/1980

M-40 Control Limit - 6.3
M-43 Control Limit - 6.4

PATTERN 3 MONITOR WELLS

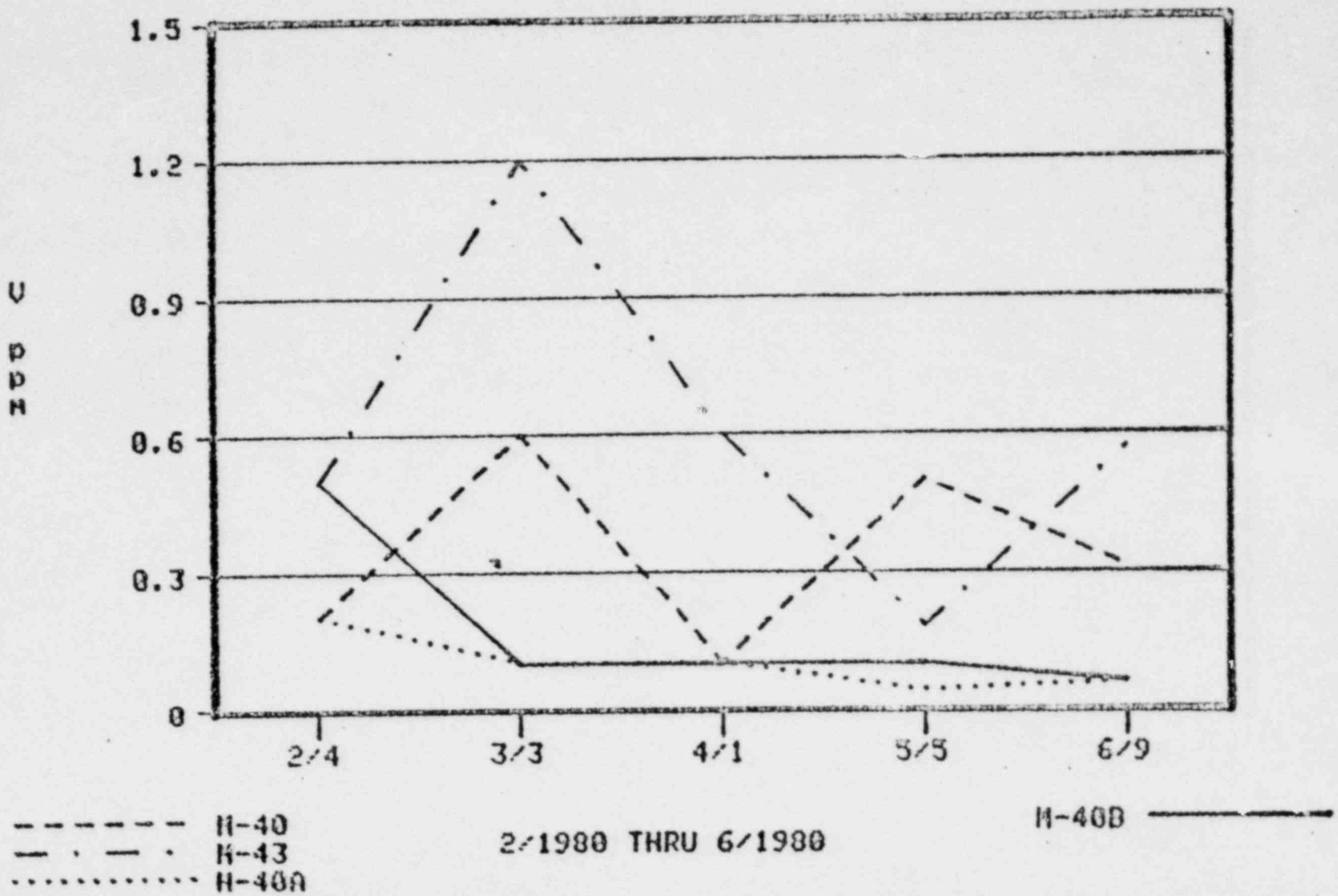


M-40 Control Limit - 6.3
M-43 Control Limit - 6.4



M-40 Control Limit - 0.42 ppm
M-43 Control Limit - 0.28 ppm

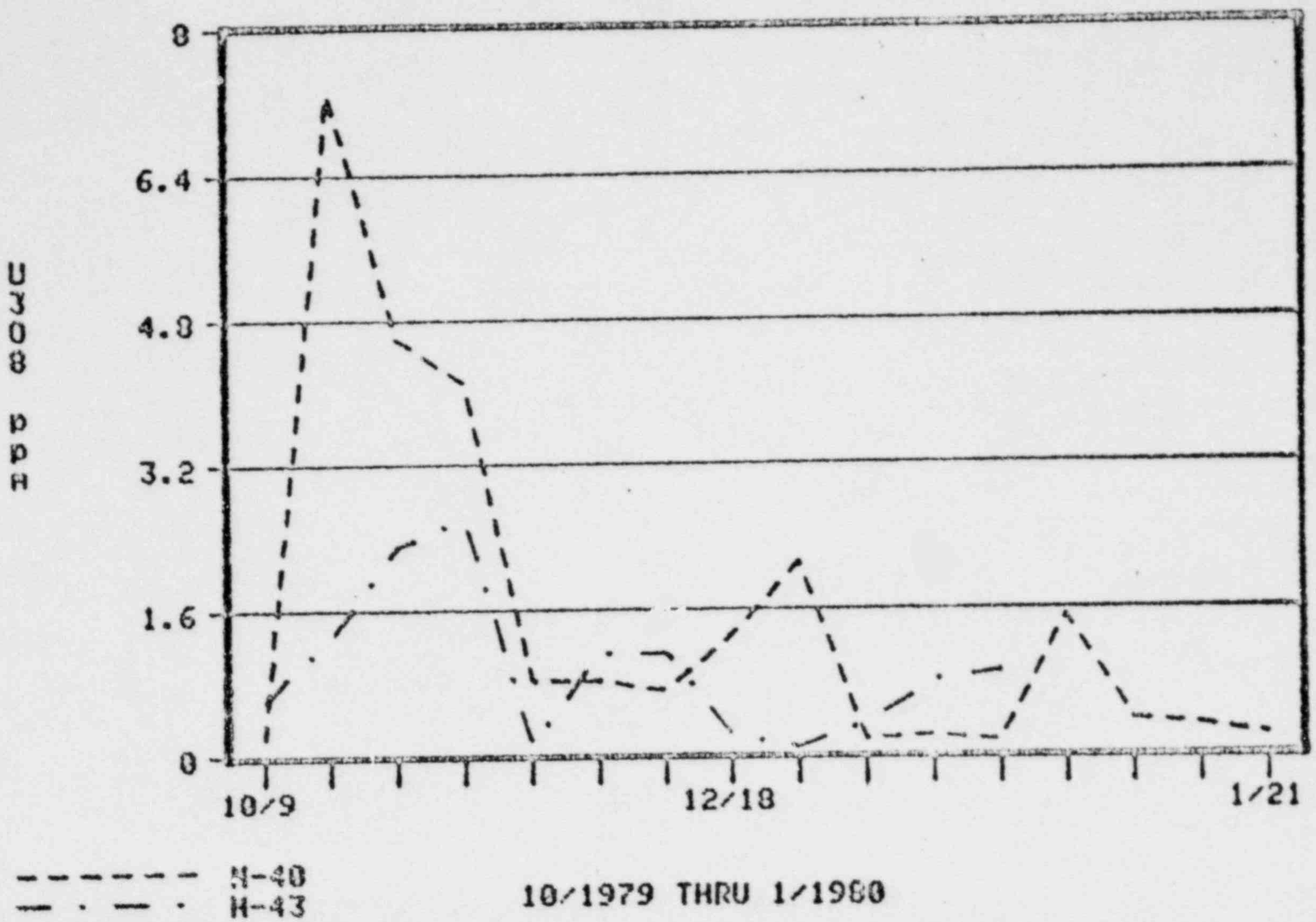
PATTERN 3 MONITOR WELLS



M-40 Control Limit - 0.42 ppm

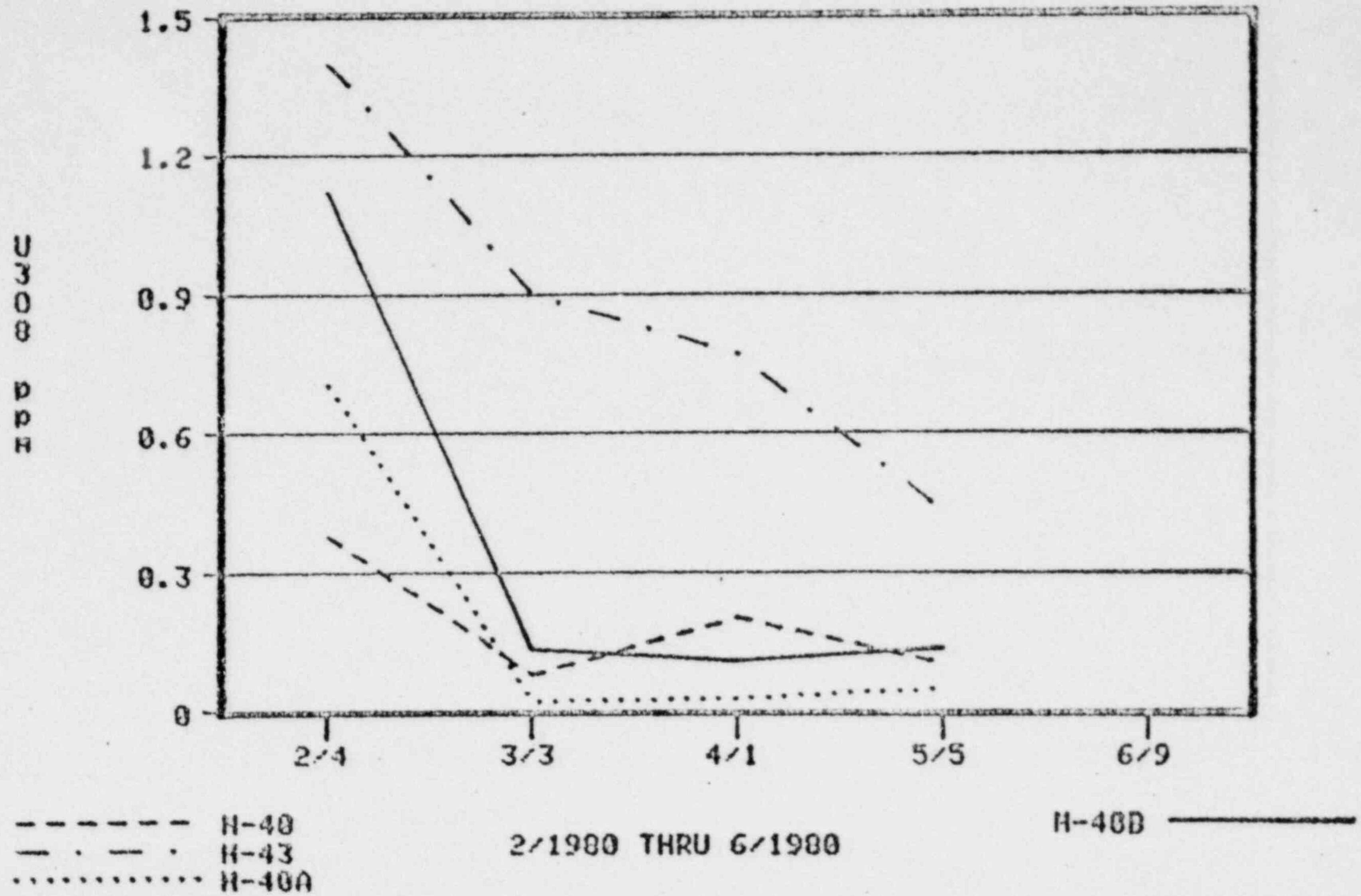
M-43 Control Limit - 0.28 ppm

PATTERN 3 MONITOR WELLS



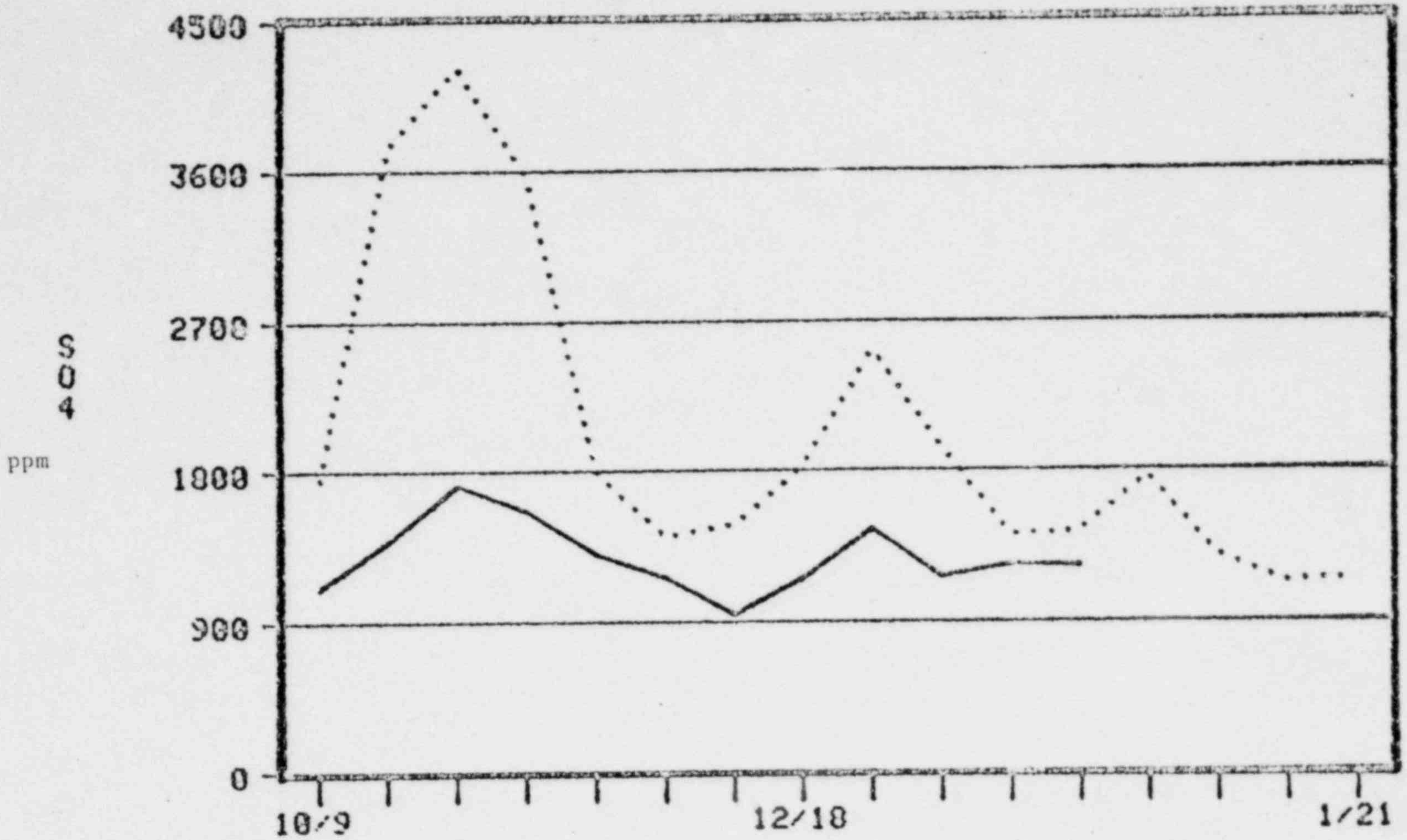
M-40 Control Limit - 0.055 ppm
M-43 Control Limit - 0.035 ppm

PATTERN 3 MONITOR WELLS



M-40 Control Limit - 0.055 ppm
M-43 Control Limit - 0.035 ppm

PATTERN 3 MONITOR WELLS

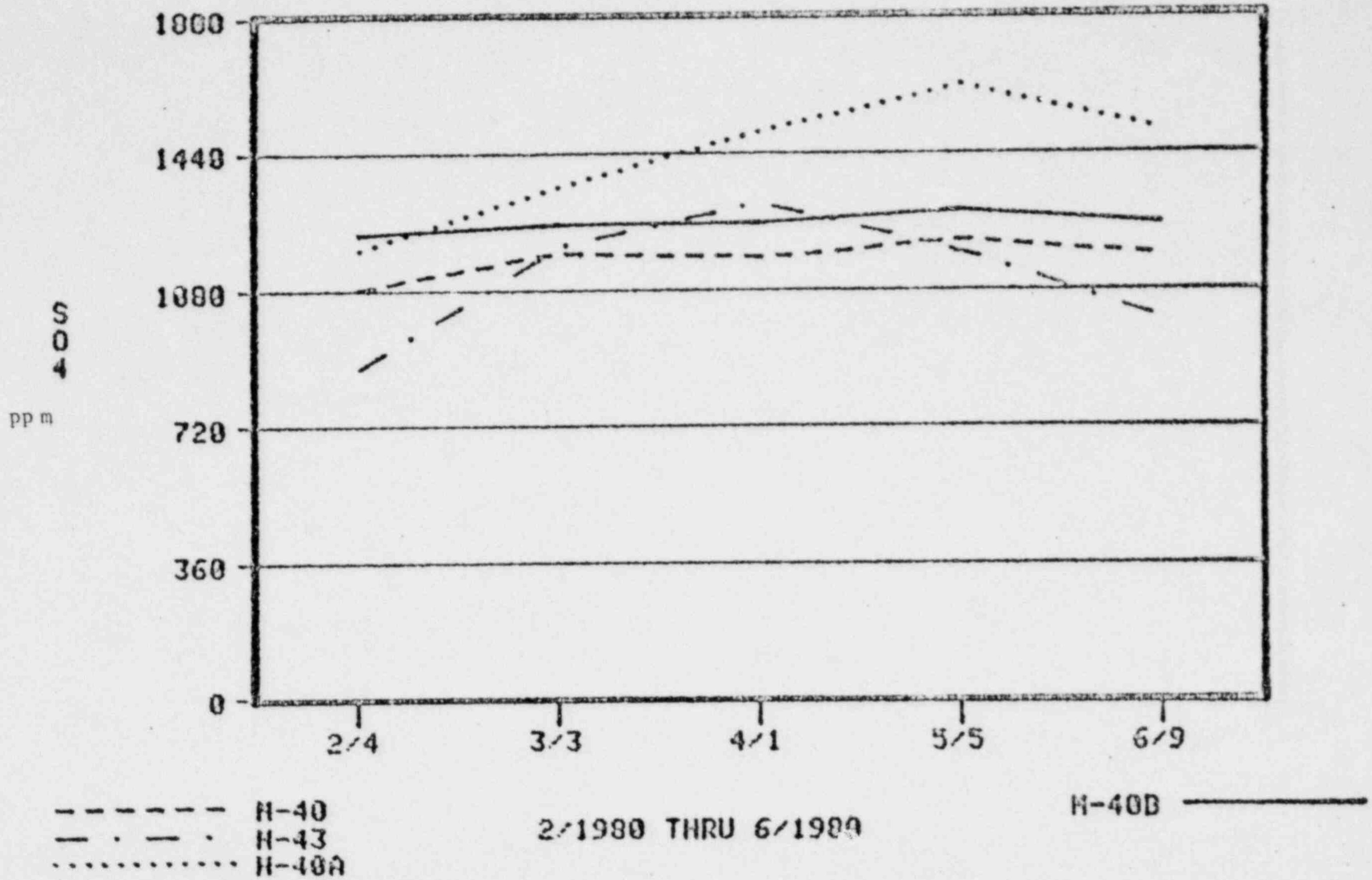


10/1979 THRU 1/1980

.... M-40
———— M-43

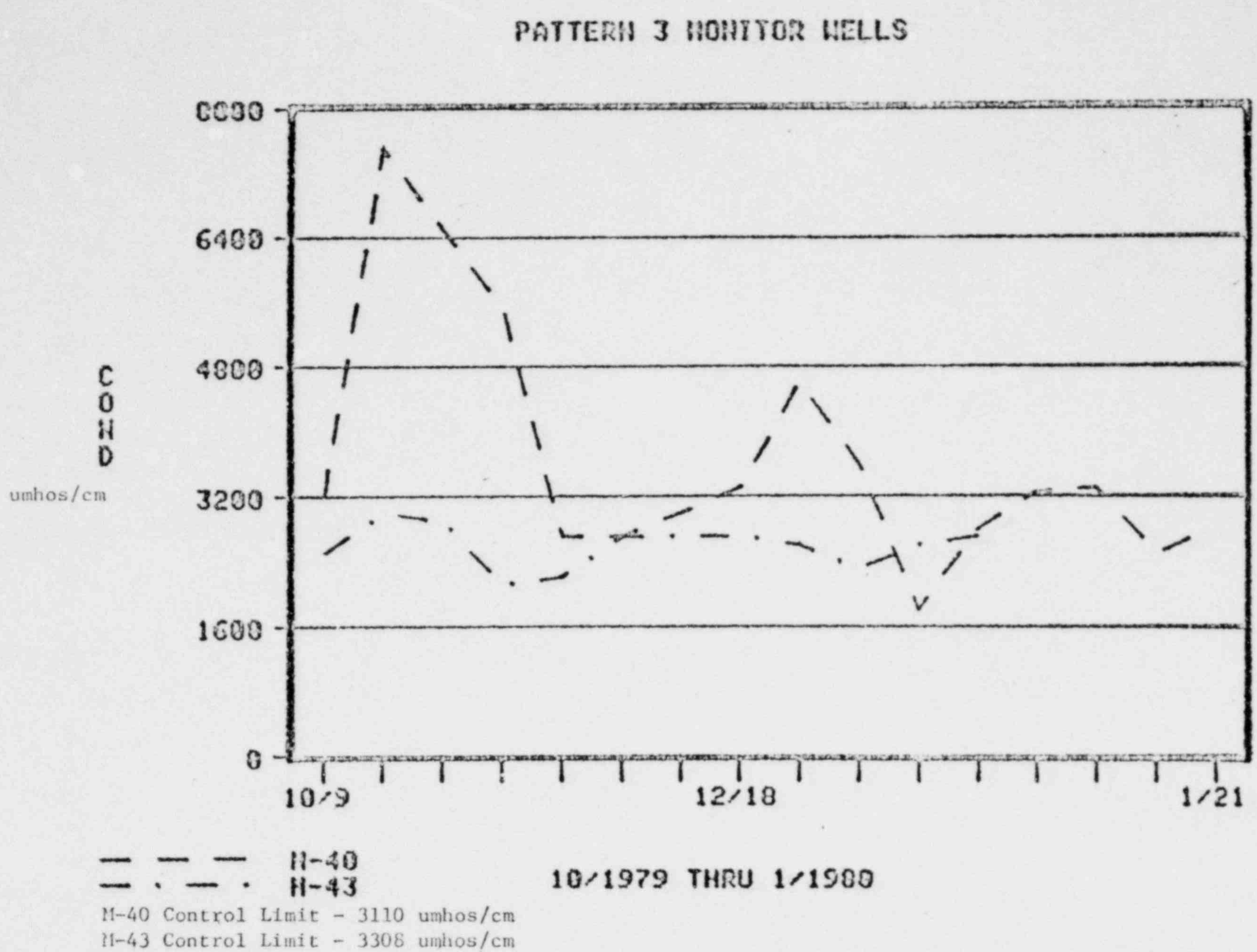
M-40 Control Limit - 2522 ppm
M-43 Control Limit - 1266 ppm

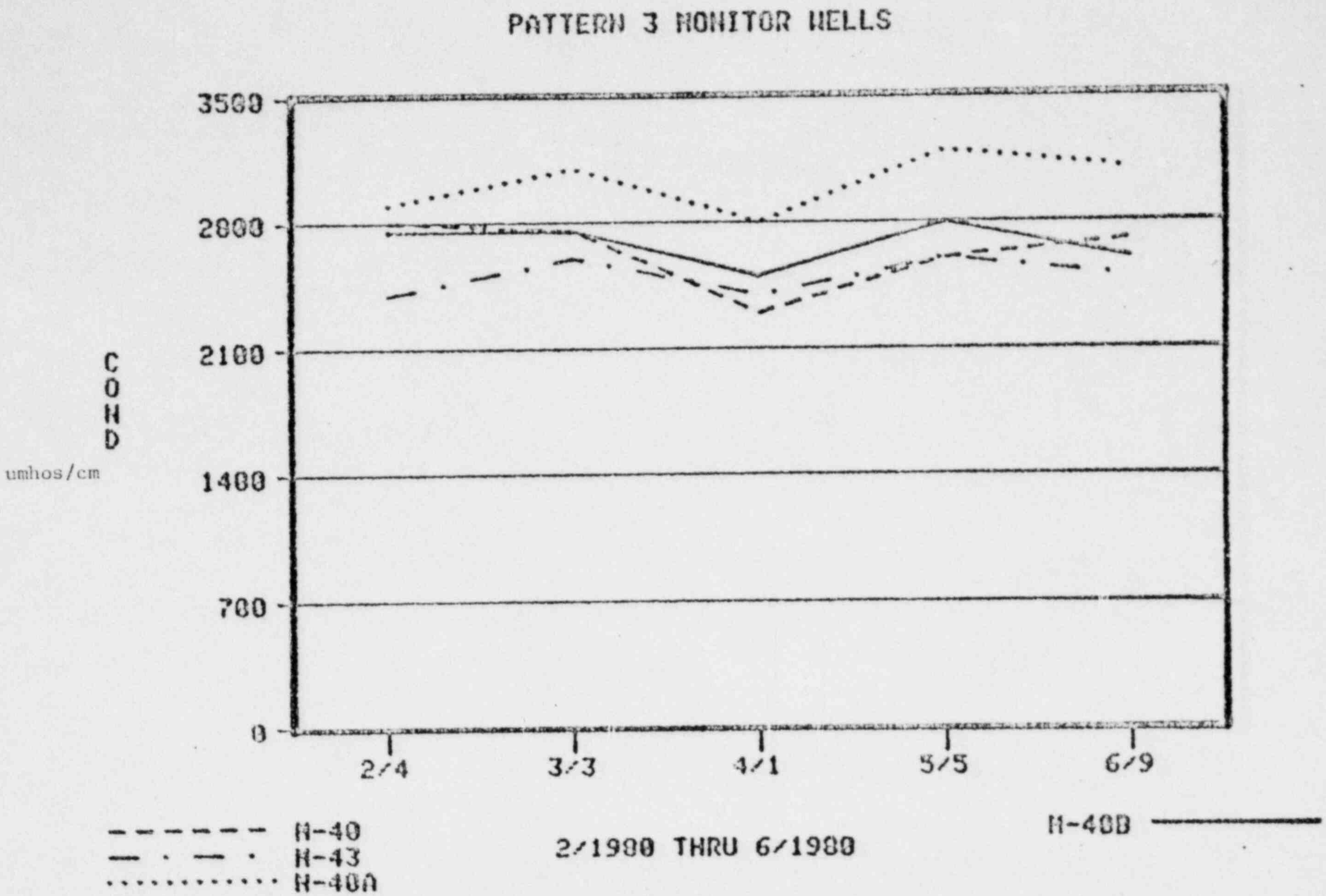
PATTERN 3 MONITOR WELLS



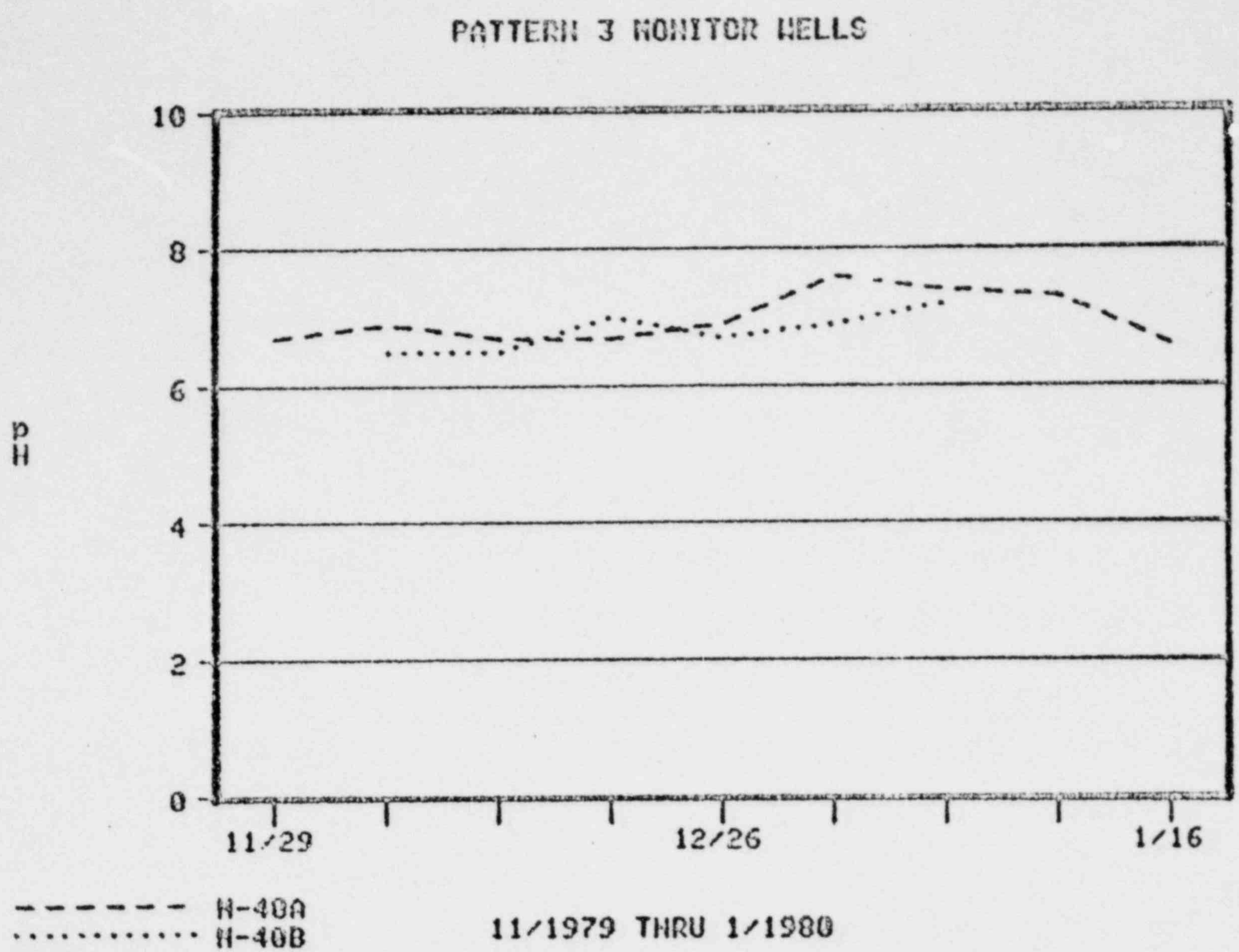
2/1980 THRU 6/1980

M-40 Control Limit - 2522 ppm
M-43 Control Limit - 1266 ppm

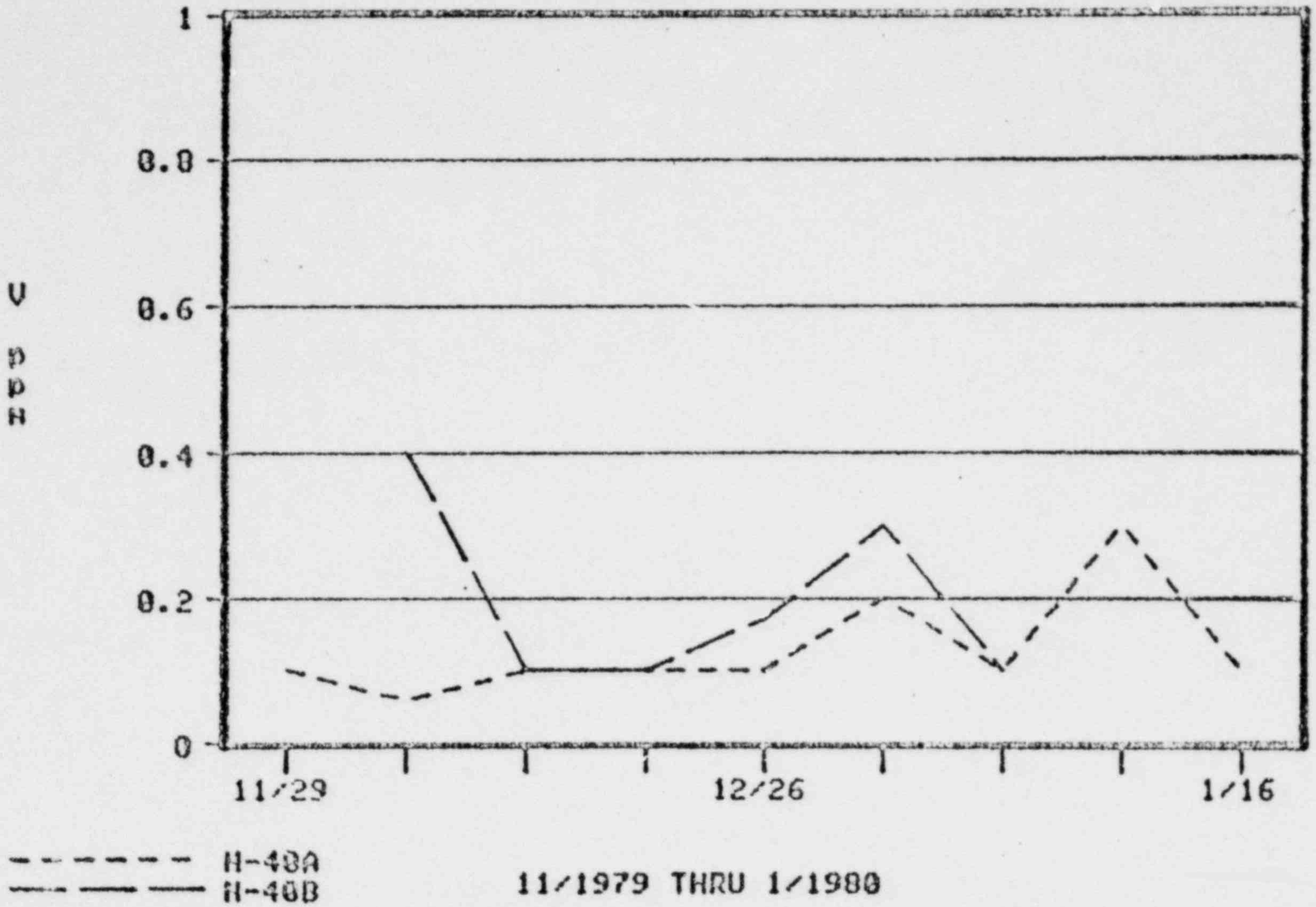

PATTERN 3 MONITOR WELLS
8000
6400
4800
3200
1600
0
COND
umhos/cm
10/9
12/18
1/21
M-40
M-43
10/1979 THRU 1/1980
M-40 Control Limit - 3110 umhos/cm
M-43 Control Limit - 3308 umhos/cm



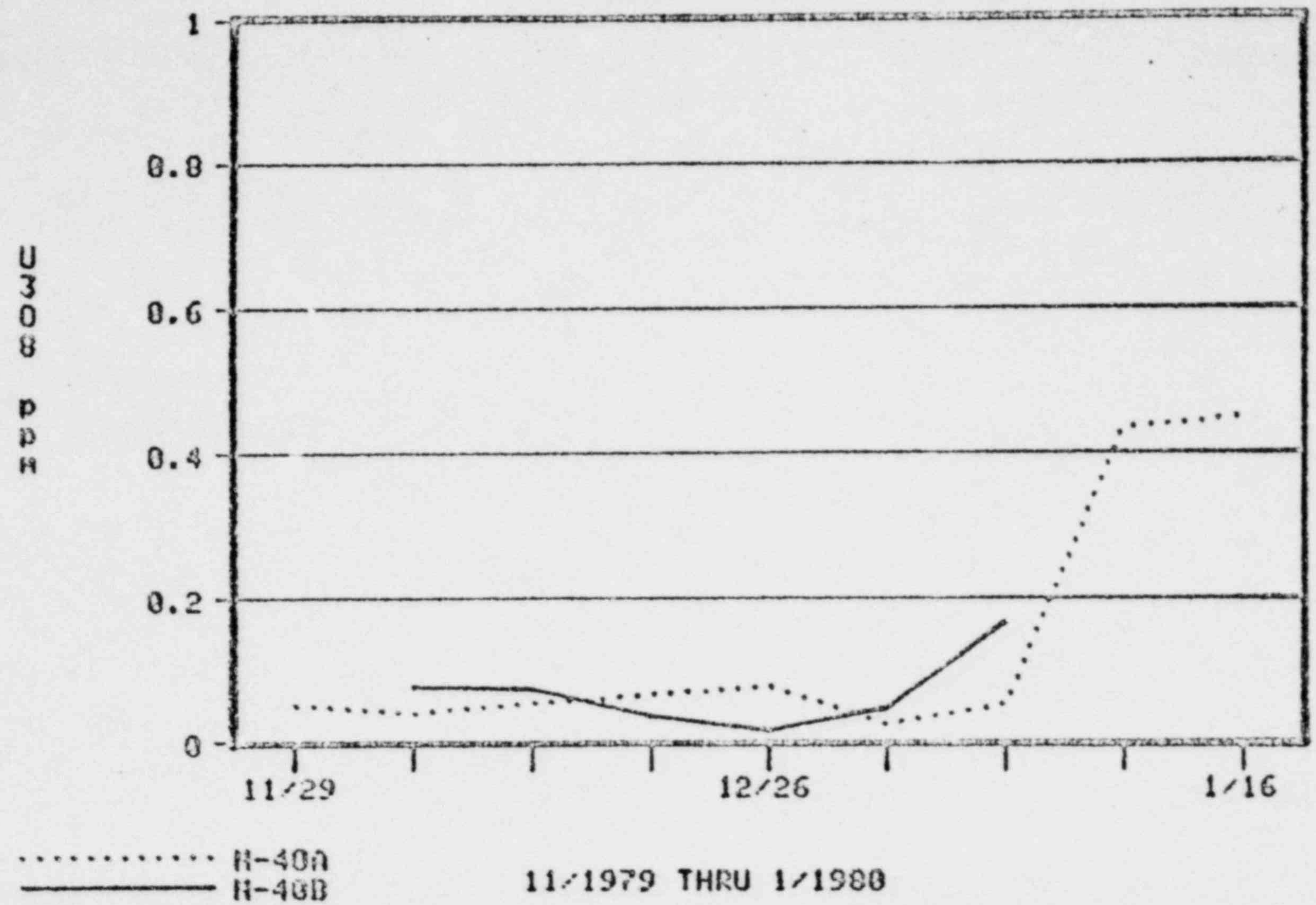
M-40 Control Limit - 3110 umhos/cm
M-43 Control Limit - 3308 umhos/cm


PATTERN 3 MONITOR WELLS
10
8
6
4
2
0
pH
11/29
12/26
1/16
H-40A
H-40B
11/1979 THRU 1/1980

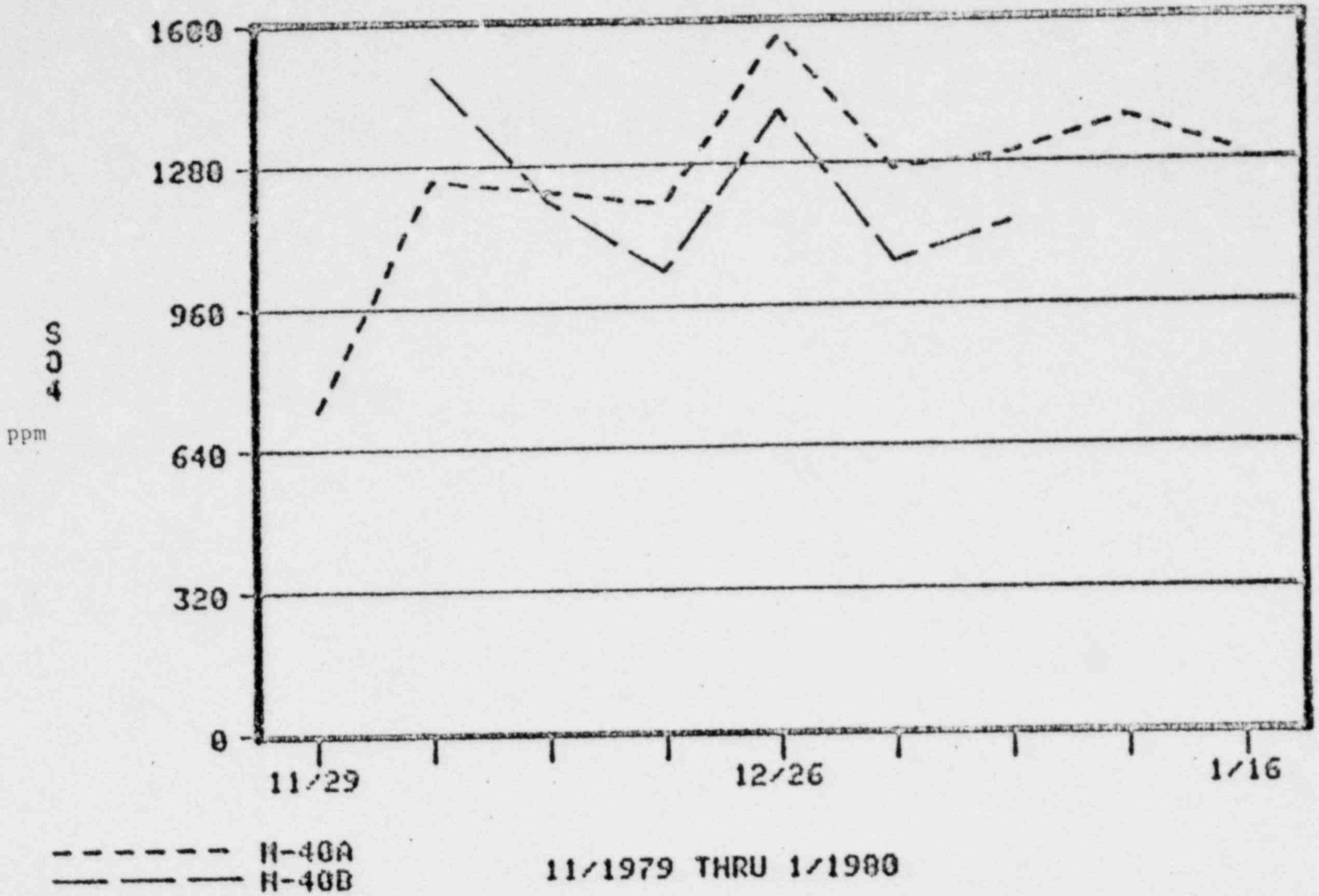
PATTERN 3 MONITOR WELLS

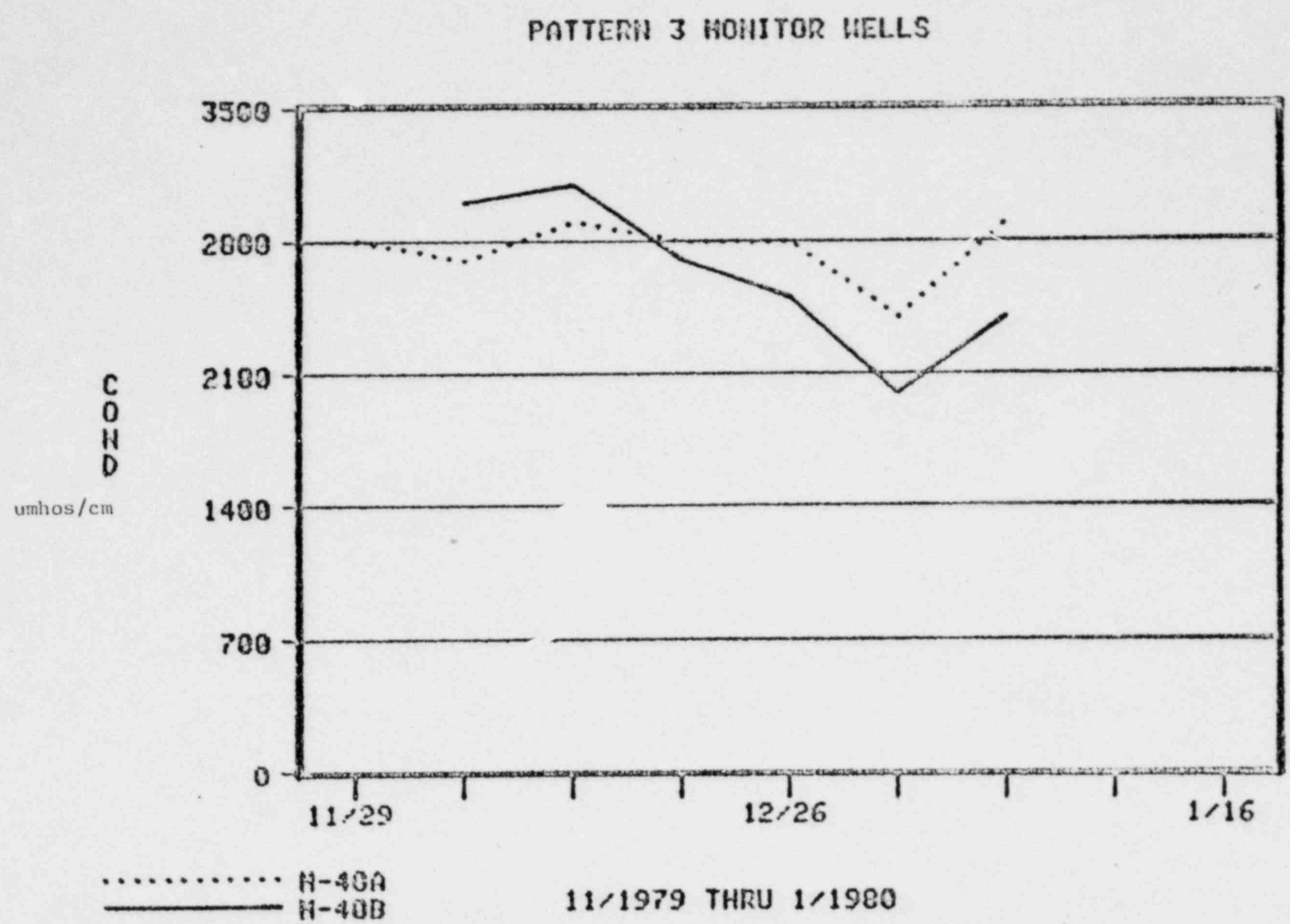


PATTERN 3 MONITOR WELLS

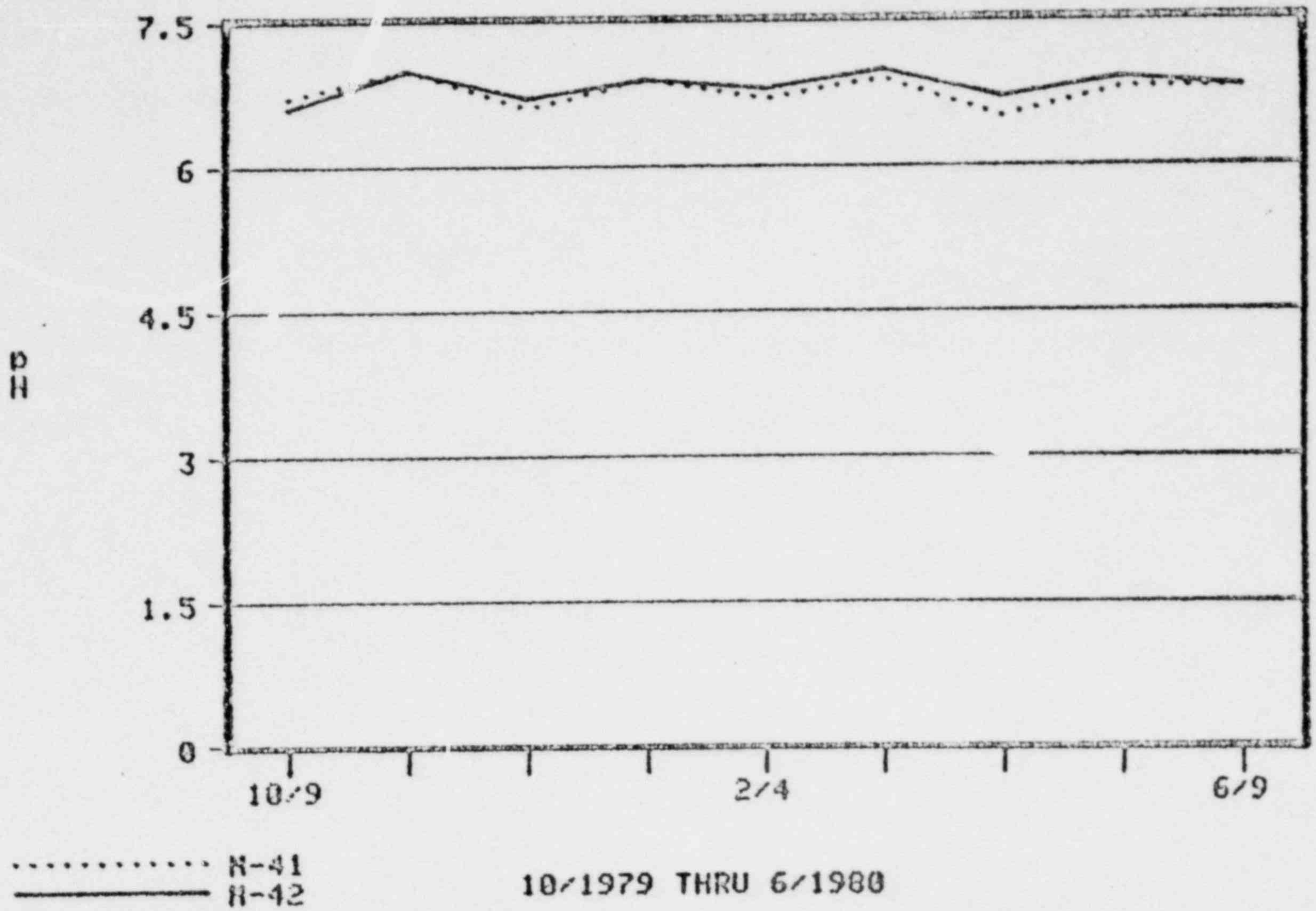


PATTERN 3 MONITOR WELLS




PATTERN 3 MONITOR WELLS
3500
2800
2100
1400
700
0
C
O
N
D
umhos/cm
11/29
12/26
1/16
H-40A
H-40B
11/1979 THRU 1/1980

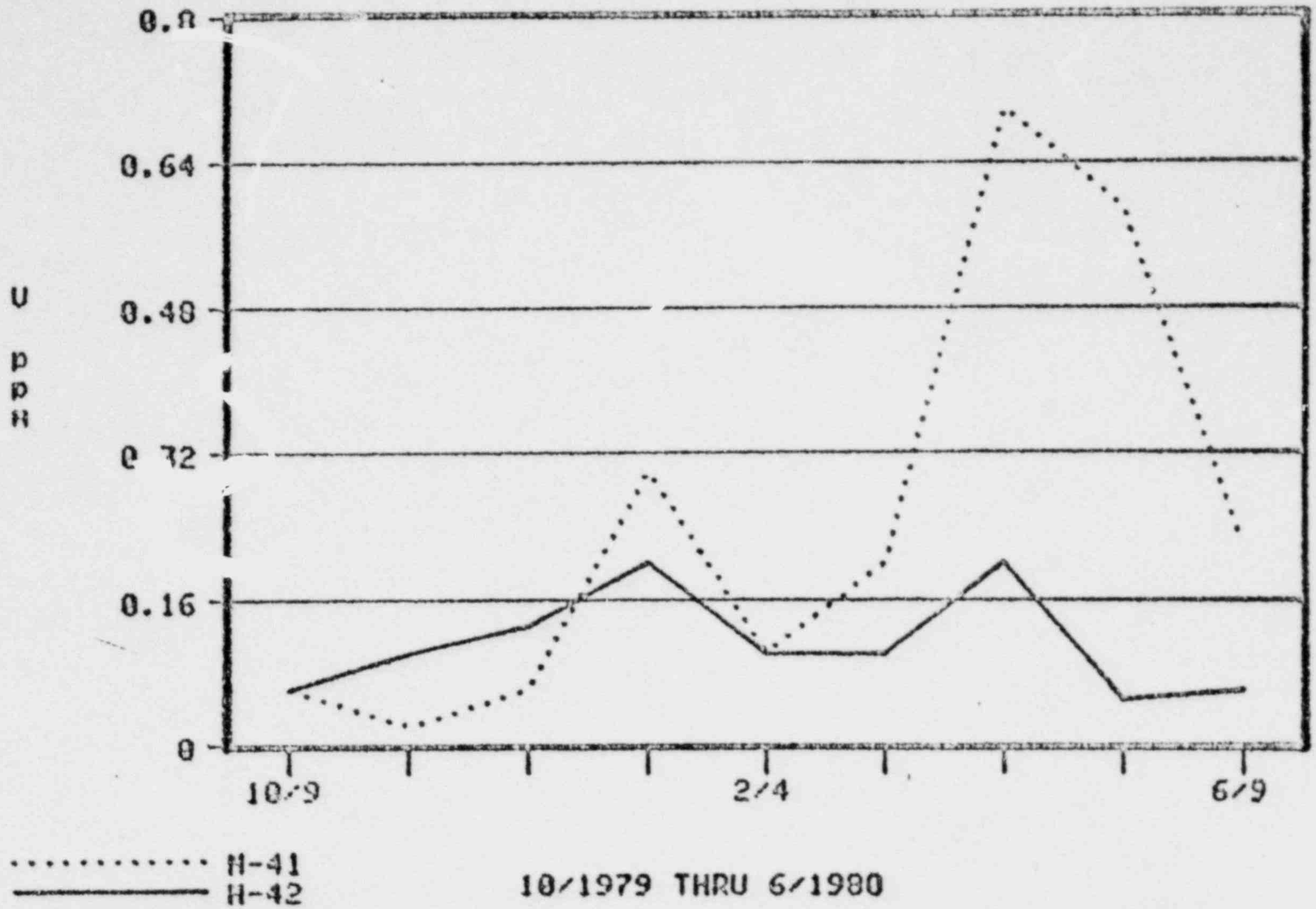
PATTERN 3 MONITOR WELLS



10/1979 THRU 6/1980

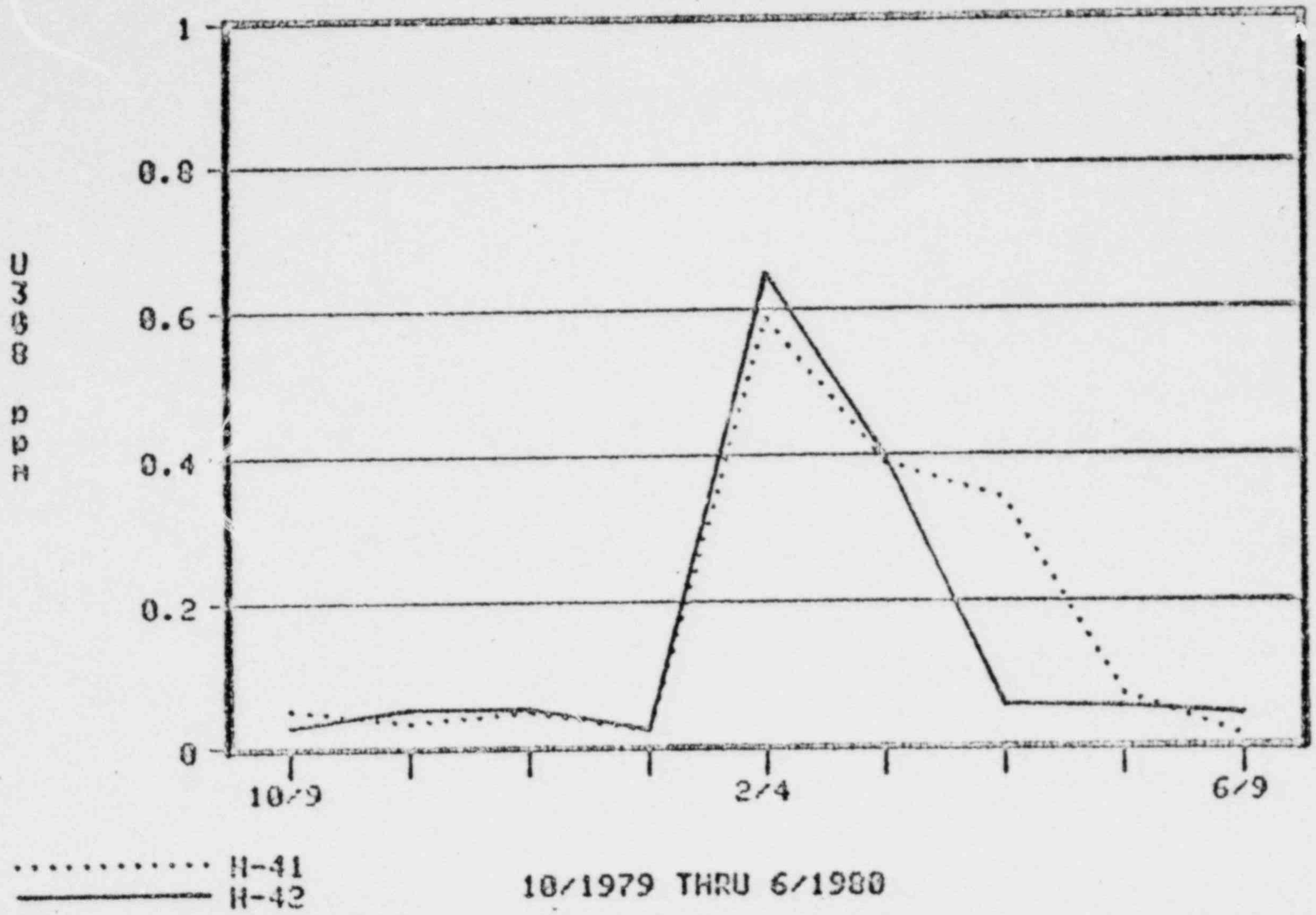
M-41 Control Limit - 6.3
M-42 Control Limit - 6.4

PATTERN 3 MONITOR WELLS



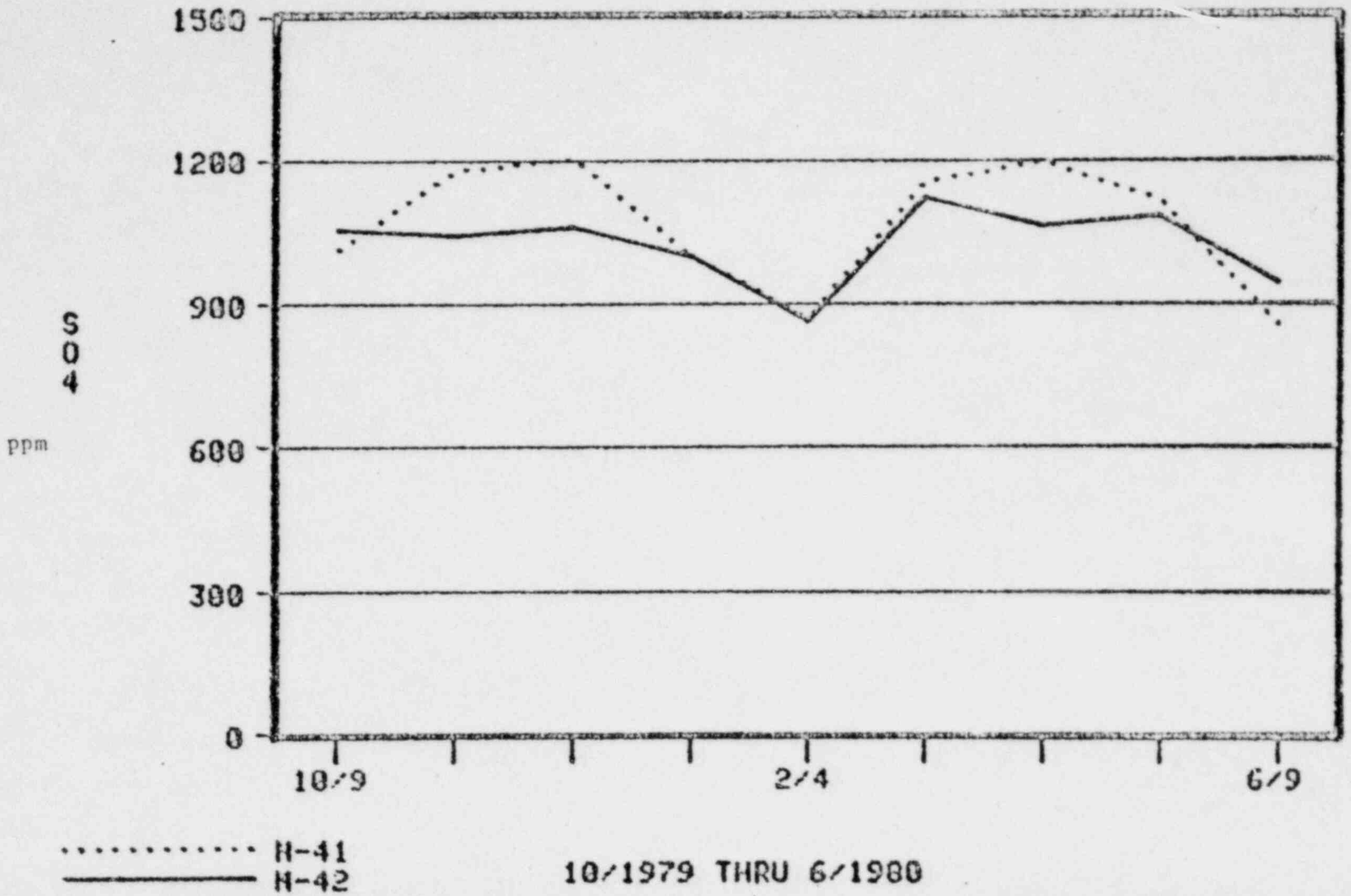
M-41 Control Limit - 0.33 ppm
M-42 Control Limit - 0.35 ppm

PATTERN 3 MONITOR WELLS

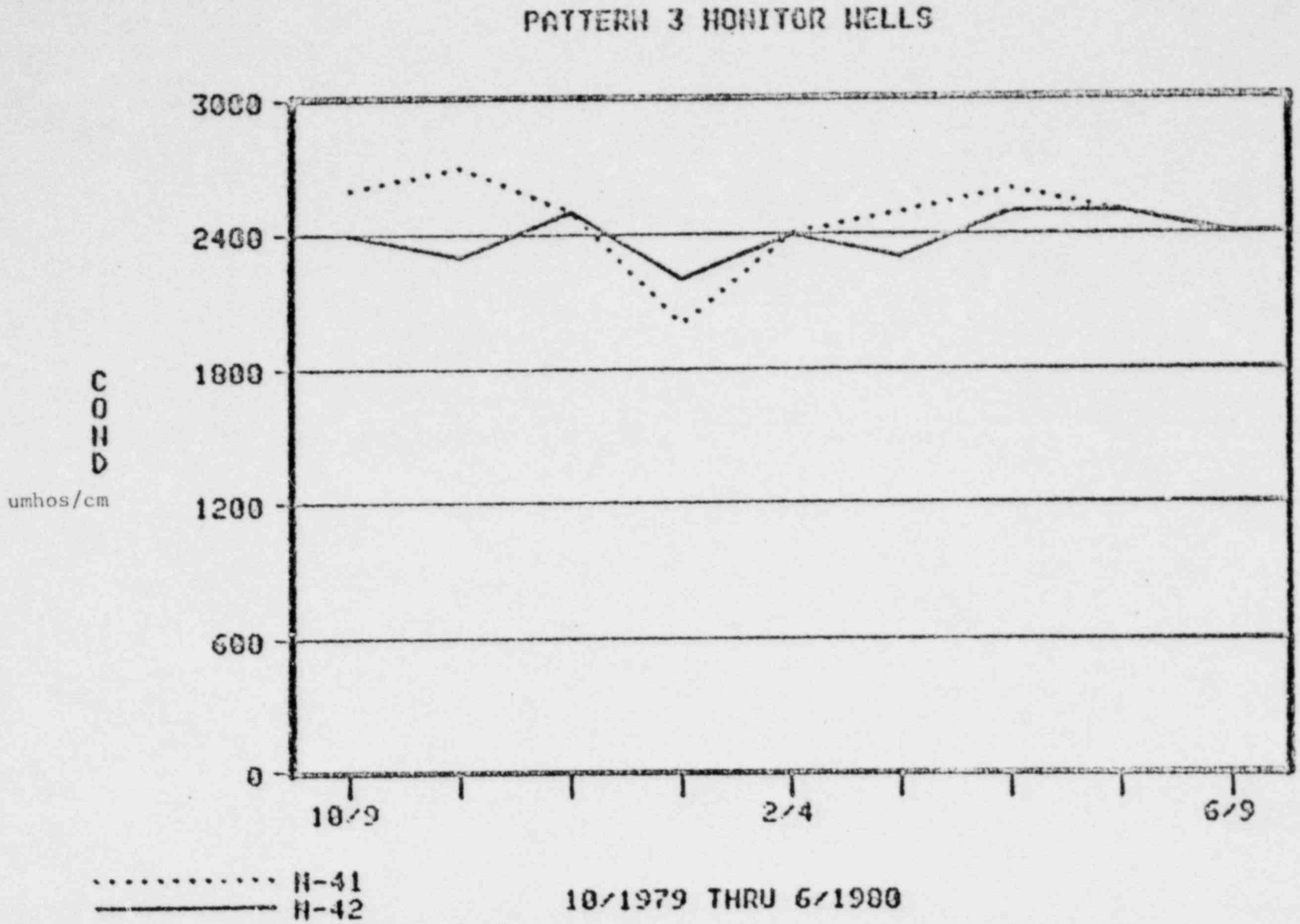


M-41 C trol Limit - 0.069 ppm
M-42 Control Limit - 0.049 ppm

PATTERN 3 MONITOR WELLS



M-41 Control Limit - 1582 ppm
M-42 Control Limit - 1716 ppm



M-41 Control Limit - 3404 umhos/cm
M-42 Control Limit - 3002 umhos/cm