# Water Quality Report for Lake Campbell

Prepared by the
South Dakota Department of Water and Natural Resources
Water Quality Management Section

August 1985

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# INTRODUCTION

Lake Campbell is located in Brookings County (latitude 44° 12' 36" north, longitude 96° 50' 42" west, T109N, R50W, Sections 28, 29, 32, 33). The major inflow is Battle Creek. Basic morphological characteristics are given below:

| | |
|---|---|
| Area | 1,000 A (404.7 ha) |
| Shoreline Length | N/A |
| Maximum Depth | 7 feet (2.1 m) |
| Mean Depth | 4 feet (1.2 m) |
| Volume | 4,000 acre-feet ($4.934 \times 10^6 m^3$) |
| Watershed/Lake Surface Area Ratio | 104 |
| Origin of Lake Basin | Natural |
| Thermal Stratification | No |

The State of South Dakota has assigned the following beneficial uses to Lake Campbell:

° Warmwater marginal fish life propagation;

° Immersion recreation;

° Limited contact recreation; and

° Wildlife propagation and stock watering.

## SAMPLING SITES AND PARAMETERS

Six sampling sites were chosen to monitor the Lake Campbell system (Figure 1). Three of the sites (Sites 4, 5, and 6) were in-lake sites and the remaining sites were located either on the inflowing stream or the outlet to Lake Campbell (Table IV-1).

Sampling occurred from March 2, 1983, to November 13, 1983, and the most frequent sampling occurred during the spring and summer. Water samples were analyzed for the following parameters: dissolved oxygen; pH; fecal coliforms; total solids; total suspended solids; total dissolved solids; nitrate; nitrite; ammonia; total Kjeldahl nitrogen; total phosphorus; and orthophosphate. In addition; trophic state indices, total nitrogen:total phosphorus ratios, and total nitrogen and total phosphorus loadings were calculated.

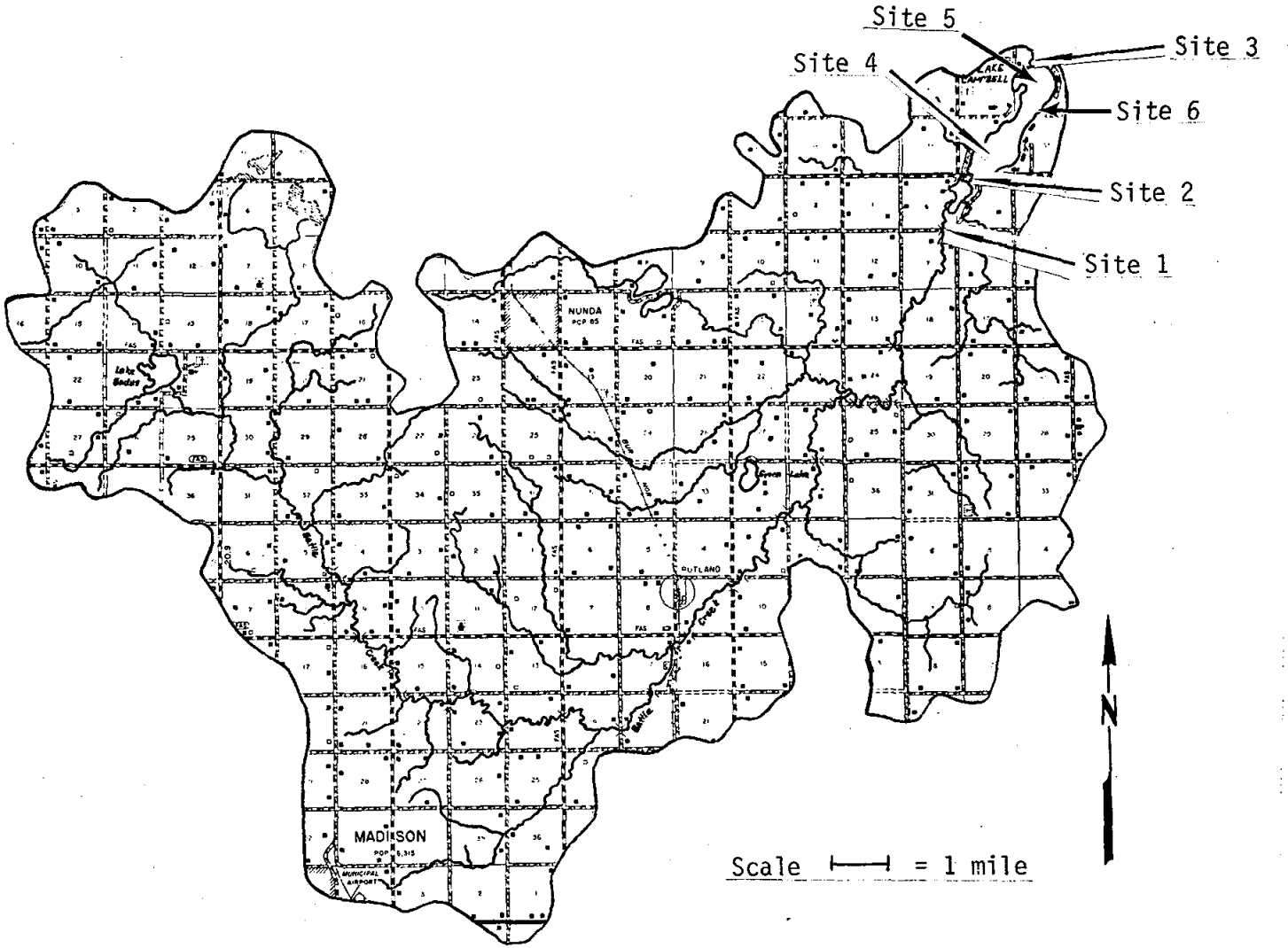


Figure 1. The Lake Campbell watershed and the water quality sampling sites.

| Sampling Site | Description |
|---|---|
| 1 | Latitude 44° 10' 54", longitude 96° 52' 01", T108N, R50W, S6. This site is located on the "Nunda" bridge over Battle Creek. |
| 2 | Latitude 44° 11' 38", longitude 96° 50' 19", T109N, R50W, S5. This site is located at the bridge across the south end of the lake. |
| 3 | Latitude 44° 11' 40" , longitude 96° 51' 48", T109N, R51W, S28. This site is located at the outlet of Lake Campbell. |
| 4 | Latitude 44° 11' 59", longitude 96° 48' 48", T108N, R50W, S32. This in-lake site is located near the middle of the south end of the lake. |
| 5 | Latitude 44° 13' 03", longitude 96° 46' 13", T109N, R50W, S28. This in-lake site is located at the middle of the north end of the lake. |
| 6 | Latitude 44° 12' 37", longitude 96° 46' 09", T109N, R50W, S33. This site is located offshore of the county club on the east shore of the lake. |

Table IV-1. Study site locations for Lake Campbell and its tributary.

## RESULTS AND DISCUSSION

### Dissolved Oxygen (DO)

The State of South Dakota criterion for surface waters used for warm water marginal fish life propagation is 4.0 mg/l. This criterion was exceeded once during the study at Site 5 on June 24, 1983, with a DO concentration of 3.5 mg/l (Table IV-18). The DO concentrations ranged from 3.5 to 16.4 mg/l and the annual mean concentrations ranged from 9.4 to 10.2 mg/l (Tables IV-3 to IV-8). These data indicate that Lake Campbell and its major tributary are well oxygenated.

### pH

For the beneficial use of immersion recreation, pH values should be between 6.5 and 8.3 units. Three water samples were outside of this range. The pH values ranged from 7.9 to 8.6 units and the annual mean values ranged from 8.1 to 8.3 units (Tables IV-3 to IV-8).

### Fecal Coliform

For South Dakota surface waters used for immersion recreation, fecal coliform counts should not exceed 400/100 ml in any one sample from May 1 to September 30.

Fecal coliform counts ranged from 10 to 3,500/100 ml and mean values ranged from 51 to 375/100 ml (Tables IV-3 to IV-8). About 10% of the samples had counts greater than 400/100 ml (Tables IV-9 to IV-18). Of the five exceedences, one was from an in-lake site and four were from stream sites.

At this time, the specific fecal coliform sources are not known. However, livestock and their wastes present along Battle Creek could be a possibility.

Total Solids, Total Suspended Solids, Total Dissolved Solids

There is no criterion for total solids in South Dakota surface waters. The total solids concentrations ranged from 288 to 1,204 mg/l and the mean concentrations ranged from 688 to 936 mg/l (Tables IV-2 to IV-8).

For the beneficial use of warmwater marginal fish life propagation, total suspended solids concentrations should not be greater than 150 mg/l. This criterion was exceeded in only about 3% of the samples (two exceedences at Site 3, the Lake Campbell outflow (Table IV-13)). Therefore, total suspended solids does not seem to be a major problem in Lake Campbell or Battle Creek. The mean concentrations of total suspended solids for Sites 1-6 were 38, 42, 53, 41, 53, and 74 mg/l, respectively (Tables IV-3 to IV-8).

Lake Campbell is used for wildlife propagation and stock watering and therefore, total dissolved solids concentrations should not be greater than 2,500 mg/l. This criterion was never exceeded during the study. The mean concentrations ranged from 635 to 883 mg/l (Tables IV-3 to IV-7) and were far below the given criterion.

Nitrate

Since Lake Campbell is used for wildlife propagation and stock watering, nitrate-nitrogen concentrations should not be greater than 50 mg/l. In addition, Wetzel (1975) reported that nitrates in natural waters generally range from 0 to 10 mg/l.

The nitrate-nitrogen concentrations ranged from <0.10 to 2.10 mg/l and were well below the 50 mg/l limit (Table IV-2). At least 50% of the samples had nitrate-nitrogen concentrations below the 0.10 mg/l analytical detection limit.

The mean nitrate-nitrogen concentrations generally decreased from Battle Creek to Lake Campbell (compare Sites 1 and 2 to Sites 4 and 5, Tables IV-3 to IV-7). This phenomenon was accompanied by a general increase in mean total ammonia concentrations in Lake Campbell.

Nitrite

Although no South Dakota criterion exists, Wetzel (1975) reported that nitrite levels in natural unpolluted waters range from 0 to .01 mg/l.

A few samples contained nitrite in concentrations greater than .01 mg/l (e.g., .06 mg/l at Sites 1 and 2, .10 mg/l at Site 3, and .03 mg/l at Sites 4 and 5) but most samples had concentrations below the .01 mg/l analytical detection limit (Tables IV-3 to IV-8). Approximately 85% of the samples had nitrite concentrations below .01 mg/l. Therefore, nitrite pollution is most likely not a major problem in Lake Campbell.

Ammonia

For surface waters used for warmwater marginal fish life propagation, un-ionized ammonia concentrations should not be greater than 0.05 mg/l. This criterion was never exceeded during the study. Therefore, un-ionized ammonia is probably not a major problem in Lake Campbell.

Total ammonia concentrations ranged from 0.02 to 3.86 mg/l and mean concentrations ranged from 0.04 to 1.08 mg/l (Tables IV-2 to IV-8). In addition, ammonia concentrations were generally greater in Lake Campbell than in

Battle Creek. This may be due to decomposition of organic matter by heterotrophic bacteria.

Inorganic and Organic Nitrogen

Inorganic nitrogen concentrations were determined by adding together nitrite, nitrate, and ammonia nitrogen. In these calculations, any nitrite or nitrate-nitrogen concentration reported as being below a detection limit was assumed to be equal in concentration to that detection limit. The State of South Dakota has not established a criterion for inorganic nitrogen, but Wetzel (1975) presented a general relationship between trophic state and inorganic nitrogen concentrations and this is used as a general guideline in this report.

Inorganic nitrogen concentrations varied greatly and ranged from 0.13 to 3.98 mg/l (Table IV-19). The mean concentrations of Sites 1-5 were .796, .827, 1.54, 1.12, and 1.14 mg/l, respectively. These data, according to Wetzel's guidelines, are indicative of a eutrophic to hypereutrophic system.

Organic nitrogen concentrations were calculated by subtracting ammonia from total Kjeldahl nitrogen. Wetzel (1975) presented a guideline with organic nitrogen and this is used below. The organic nitrogen concentrations ranged from 0.56 to 6.70 mg/l (Table IV-19). The mean concentrations of organic nitrogen for Sites 1-5 were 1.04, 1.18, 1.49, 1.32, and 1.28 mg/l. These data indicate a eutrophic to hypereutrophic system.

Phosphorus

Two forms of phosphorus were measured, total orthophosphate and total phosphorus. Although the State of South Dakota has not assigned criteria to these parameters, Reckhow, et al. (1980) presented a general relationship

between total phosphorus concentration and trophic state and this guideline is used below.

Total orthophosphate concentrations ranged from .005 to .669 mg/l and mean concentrations ranged from .112 to .281 mg/l (Tables IV-2 to IV-8).

Total phosphorus concentrations ranged from .041 to 2.21 mg/l and the mean concentrations ranged from .305 to .506 mg/l (Tables IV-2 to IV-8). According to the criteria of Reckhow, et al. (1980), these data are indicative of hypereutrophy.

Trophic State

Carlson's (1977) total phosphorus based trophic state was used to estimate the trophic status of Lake Campbell. In this index, values greater than 50 indicate eutrophy (Carlson, 1979).

The total phosphorus data of in-lake Sites 4 and 5 yielded trophic state index values ranging from 78.0 to 97.6 and means of 86.1 and 86.7, respectively (Table IV-20). These values indicate eutrophy.

Nutrient Limitation

Total nitrogen:total phosphorus weight ratios were used to determine the limiting nutrient in Lake Campbell. In these calculations any nitrite, nitrate or ammonia nitrogen concentration which was reported as being below a detection limit was assumed to be equal to that detection limit.

The nutrient ratios of in-lake water samples ranged from 3.36 to 12.1 and the mean values for Sites 4 and 5 were 7.76 and 7.48, respectively (Table IV-21). These ratios suggest that Lake Campbell is nitrogen limited.

Nutrient Loading

Although no South Dakota-imposed criteria for nutrient loading exists, a general guideline for permissible and dangerous nutrient loadings was presented by Vollenweider (1968) and his criteria are used below. According to his criteria, for a lake with a mean depth of 5 meters, the dangerous nitrogen and phosphorus areal loading levels are 2.0 $g/m^2/yr$ and 0.13 $g/m^2/yr$, respectively.

Total nitrogen and total phosphorus loads for Lake Campbell were based on available data (March 2-November 13, 1983) and the loads were 17.09 and 3.33 $g/m^2$, respectively. These loadings exceed the dangerous loading levels proposed by Vollenweider.

## SUMMARY

1. Dissolved oxygen concentrations ranged from 3.5 to 16.4 mg/l and only one sample was below the 4.0 mg/l criterion. Lake Campbell was generally well oxygenated.

2. Values of pH ranged from 7.9 to 8.6 units.

3. Fecal coliform counts ranged from 10 to 3,500/100 ml and about 10% of the samples exceeded the 400/100 ml criterion. All but one of the exceedences occurred at stream sites.

4. Total solids concentrations ranged from 288 to 1,204 mg/l and the mean concentrations ranged from 688 to 936 mg/l.

5. Mean total suspended solids concentrations ranged from 38 to 53 mg/l and about 3% of the samples exceeded the 150 mg/l criterion. Lake Campbell water did not exceed the criterion.

6. The mean concentrations of total dissolved solids ranged from 635 to 883 mg/l and the 2,500 mg/l criterion was never exceeded during the study.

7. Nitrate-nitrogen concentrations ranged from <0.10 to 2.10 mg/l and were well below the 50 mg/l criterion. At least 50% of the samples had concentrations below the 0.10 mg/l detection limit. Nitrate levels are not considered excessive.

8. Nitrite-nitrogen concentrations ranged from <0.01 to 0.10 mg/l and about 85% of the samples were below the 0.01 mg/l detection limit. Nitrites are generally not a problem in Lake Campbell or Battle Creek.

9. Un-ionized ammonia concentrations never exceeded the 0.05 mg/l criterion.

10. Inorganic nitrogen levels ranged from 0.13 to 3.98 mg/l. The mean concentrations were about 0.80 mg/l or greater and indicated that Lake Campbell is eutrophic to hypereutrophic.

11. Organic nitrogen concentrations ranged from 0.56 to 6.70 mg/l. The mean concentrations were greater than 1.00 mg/l and indicated a eutrophic to hypereutrophic system.

12. The mean concentrations of orthophosphate ranged from .112 to 2.81 mg/l. These concentrations are considered excessive.

13. The mean concentrations of total phosphorus ranged from .305 to .506 mg/l. These data are indicative of hypereutrohy.

14. The trophic state index values ranged from 78.0 to 97.6. These data suggest a eutrophic system.

15. Total nitrogen:total phosphorus ratios ranged from 3.36 to 12.1 and these data indicate a nitrogen limited system.

16. The total phosphorus and total nitrogen loadings to Lake Campbell from Battle Creek were 3.33 and 17.09 $g/m^2$, respectively. These loadings exceed the dangerous loading levels presented by Vollenweider (1968).

## RECOMMENDATIONS

The major problem of Lake Campbell is an excess of nitrogen and phosphorus. The specific sources of these nutrients should be located and mitigative measures should be oriented towards eliminating or reducing these nutrient sources.

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Vollenweider, R.A., 1968. Scientific fundamentals of the eutrophication of lakes and flowing waters with particular reference to nitrogen and phosphorus as factors in eutrophication. Report to OECD, Paris. DAS/CSI/68. 27:1-182.

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# APPENDIX

## Water Quality Data for Lake Campbell

| DATE | SITE 4 | SITE 5 |
|---|---|---|
| 6-24-83 | 91.3 | 92.2 |
| 6-29-83 | 90.7 | 90.1 |
| 7-8-83 | 90.8 | 94.3 |
| 7-15-83 | 89.0 | 88.6 |
| 8-4-83 | 85.1 | 82.1 |
| 8-23-83 | 90.4 | 97.6 |
| 8-31-83 | 81.7 | 78.2 |
| 9-15-83 | 80.5 | 83.0 |
| 10-11-83 | 82.7 | 82.5 |
| 11-13-83 | 78.6 | 78.0 |
| x | 86.1 | 86.7 |
| s.d. | 4.91 | 6.85 |
| n | 10 | 10 |
| R | 78.6-91.3 | 78.0-97.6 |

Table IV-20. Total phosphorus based trophic state index values for Lake Campbell.

STORET RETRIEVAL DATE 84/10/01 - INVENT - VERSION OF SEP. 1981
GROSS

6 TOTAL STATIONS PROCESSED

| PARAMETER | | | | RMK | NUMBER | MEAN | VARIANCE | STAN DEV | MAXIMUM | MINIMUM | BEG DATE | END DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00010 | WATER | TEMP | CENT | | 63 | 15.1638 | 95.9932 | 9.79761 | 27.8000 | -.110E+01 | 83/03/10 | 83/11/13 |
| 00011 | WATER | TEMP | FAHN | | 63 | 58.9682 | 323.064 | 17.9740 | 82.0000 | 30.0000 | 83/03/10 | 83/11/13 |
| 00020 | AIR | TEMP | CENT | | 62 | 17.1579 | 125.926 | 11.2217 | 31.7000 | -.555E+01 | 83/03/10 | 83/11/13 |
| 00021 | AIR | TEMP | FAHN | | 63 | 63.1587 | 406.782 | 20.1688 | 89.0000 | 22.0000 | 83/03/10 | 83/11/13 |
| 00061 | STREAM | FLOW, | INST-CFS | | 8 | .000000 | .000000 | .000000 | .000000 | .000000 | 83/08/04 | 83/11/13 |
| 00300 | DO | | MG/L | | 62 | 9.80966 | 14.1069 | 3.75592 | 16.4000 | 3.50000 | 83/03/10 | 83/11/13 |
| 00403 | LAB | PH | SU | | 11 | 8.19909 | .055469 | .235518 | 8.59000 | 7.89000 | 83/09/15 | 83/11/13 |
| 00445 | CO3 ION | CO3 | MG/L | | 1 | 340.000 | | | 340.000 | 340.000 | 83/03/02 | 83/03/02 |
| 00500 | RESIDUE | TOTAL | MG/L | | 72 | 836.916 | 59369.2 | 243.658 | 1204.00 | 228.000 | 83/02/28 | 83/11/13 |
| 00530 | RESIDUE | TOT NFLT | MG/L | | 73 | 44.8630 | 1421.87 | 37.7077 | 192.000 | 2.00000 | 83/02/28 | 83/11/13 |
| 00610 | NH3+NH4- | N TOTAL | MG/L | | 70 | .658714 | .965693 | .982697 | 3.86000 | .020000 | 83/02/28 | 83/11/13 |
| | | | | K | 4 | .020000 | .000000 | .000000 | .020000 | .020000 | 83/08/24 | 83/08/31 |
| 00613 | NO2-N | DISS | MG/L | TOT | 74 | .624188 | .933924 | .966397 | 3.86000 | .020000 | 83/02/28 | 83/11/13 |
| | | | | | 12 | .035000 | .000682 | .026112 | .100000 | .010000 | 83/04/11 | 83/07/15 |
| | | | | K | 62 | .010000 | .000000 | .000000 | .010000 | .010000 | 83/02/28 | 83/11/13 |
| 00620 | NO3-N | TOTAL | MG/L | TOT | 74 | .014054 | .000189 | .013741 | .100000 | .010000 | 83/02/28 | 83/11/13 |
| | | | | | 37 | .716215 | .358619 | .598848 | 2.10000 | .100000 | 83/02/28 | 83/11/13 |
| | | | | K | 37 | .100000 | .231E-07 | .000152 | .100000 | .100000 | 83/04/11 | 83/11/13 |
| 00625 | TOT KJEL | N | MG/L | TOT | 74 | .408107 | .273084 | .522574 | 2.10000 | .100000 | 83/02/28 | 83/11/13 |
| 00671 | PHOS-DIS | ORTHO | MG/L P | | 74 | 1.86824 | 1.78726 | 1.33688 | 8.70000 | .590000 | 83/02/28 | 83/11/13 |
| 31616 | FEC COLI | MFM-FCBR | /100ML | | 1 | .006000 | | | .006000 | .006000 | 83/08/24 | 83/08/24 |
| | | | | | 34 | 255.618 | 430659 | 656.246 | 3500.00 | 10.0000 | 83/03/10 | 83/11/13 |
| | | | | K | 14 | 10.0000 | .000000 | .000000 | 10.0000 | 10.0000 | 83/03/12 | 83/11/13 |
| 70300 | RESIDUE | DISS-180 | C MG/L | TOT | 48 | 183.979 | 315106 | 561.343 | 3500.00 | 10.0000 | 83/03/10 | 83/11/13 |
| 70505 | T PO4 | P-COL | MG/L | | 73 | 785.246 | 57575.8 | 239.950 | 1136.00 | 196.000 | 83/02/28 | 83/11/13 |
| 70507 | PHOS-T | ORTHO | MG/L P | | 74 | .390202 | .068431 | .261592 | 2.21000 | .041000 | 83/02/28 | 83/11/13 |
| | | | | | 73 | .200753 | .024047 | .155070 | .669000 | .005000 | 83/02/28 | 83/11/13 |

Table IV-2.

STORET RETRIEVAL DATE 84/10/01 - INVENT - VERSION OF SEP. 1981

46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 CLASS 00 CSN-RSP 0741347-0824210

/TYPA/AMBNT/STREAM/RUNOFF

| PARAMETER | | | | RMK | NUMBER | MEAN | VARIANCE | STAN DEV | MAXIMUM | MINIMUM | BEG DATE | END DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00010 | WATER | TEMP | CENT | | 15 | 13.0773 | 105.936 | 10.2925 | 26.7000-.110E+01 | | 83/03/10 | 83/11/13 |
| 00011 | WATER | TEMP | FAHN | | 15 | 55.5333 | 342.982 | 18.5198 | 80.0000 | 30.0000 | 83/03/10 | 83/11/13 |
| 00020 | AIR | TEMP | CENT | | 15 | 15.4240 | 147.595 | 12.1489 | 31.1000-.555E+01 | | 83/03/10 | 83/11/13 |
| 00021 | AIR | TEMP | FAHN | | 15 | 59.7333 | 477.497 | 21.8517 | 88.0000 | 22.0000 | 83/03/10 | 83/11/13 |
| 00061 | STREAM | FLOW, | INST-CFS | | 1 | .000000 | | | .000000 | .000000 | 83/08/24 | 83/08/24 |
| 00300 | DO | | MG/L | | 15 | 9.38666 | 13.0755 | 3.61601 | 15.4000 | 4.40000 | 83/03/10 | 83/11/13 |
| 00403 | LAB | PH | SU | | 2 | 8.07000 | .064789 | .254536 | 8.25000 | 7.89000 | 83/09/25 | 83/11/13 |
| 00445 | CO3 ION | CO3 | MG/L | | 1 | 340.000 | | | 340.000 | 340.000 | 83/03/02 | 83/03/02 |
| 00500 | RESIDUE | TOTAL | MG/L | | 17 | 900.706 | 76532.5 | 276.645 | 1204.00 | 290.000 | 83/02/28 | 83/11/13 |
| 00530 | RESIDUE | TOT NFLT | MG/L | | 18 | 38.2222 | 713.243 | 26.7066 | 80.0000 | 4.00000 | 83/02/28 | 83/11/13 |
| 00610 | NH3+NH4- | N TOTAL | MG/L | | 18 | .216111 | .046542 | .215737 | .810000 | .020000 | 83/02/28 | 83/11/13 |
| 00613 | NO2-N | DISS | MG/L | | 2 | .040000 | .000800 | .028284 | .060000 | .020000 | 83/04/11 | 83/06/29 |
| | | | | K | 16 | .010000 | .465E-10 | .000007 | .010000 | .010000 | 83/02/28 | 83/11/13 |
| | | | | TOT | 18 | .013333 | .000141 | .011882 | .060000 | .010000 | 83/02/28 | 83/11/13 |
| 00620 | NO3-N | TOTAL | MG/L | | 13 | .746153 | .486025 | .697155 | 2.10000 | .100000 | 83/02/28 | 83/11/13 |
| | | | | K | 5 | .100000-.279E-08 | | .000000 | .100000 | .100000 | 83/04/11 | 83/08/31 |
| | | | | TOT | 18 | .566666 | .431764 | .657088 | 2.10000 | .100000 | 83/02/28 | 83/11/13 |
| 00625 | TOT KJEL | N | MG/L | | 18 | 1.25444 | .235986 | .485784 | 2.48000 | .590000 | 83/02/28 | 83/11/13 |
| 31616 | FEC COLI | MFM-FCBR | /100ML | | 7 | 447.143 | 399691 | 632.211 | 1800.00 | 10.0000 | 83/03/10 | 83/11/13 |
| | | | | K | 4 | 10.0000 | .000000 | .000000 | 10.0000 | 10.0000 | 83/03/12 | 83/05/06 |
| | | | | TOT | 11 | 288.182 | 288456 | 537.081 | 1800.00 | 10.0000 | 83/03/10 | 83/11/13 |
| 70300 | RESIDUE | DISS-180 | C MG/L | | 18 | 831.333 | 89509.4 | 299.181 | 1136.00 | 242.000 | 83/02/28 | 83/11/13 |
| 70505 | T PO4 | P-COL | MG/L | | 18 | .415666 | .035100 | .187349 | .798000 | .139000 | 83/02/28 | 83/11/13 |
| 70507 | PHOS-T | ORTHO | MG/L P | | 18 | .280888 | .035941 | .189582 | .669000 | .015000 | 83/02/28 | 83/11/13 |

Table IV-3.

STORET RETRIEVAL DATE 84/10/01 - INVENT - VERSION OF SEP. 1981

46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 CLASS 00 CSN-RSP 0741348-0824211

/TYPA/AMBNT/STREAM/RUNOFF

| PARAMETER | | | | RMK | NUMBER | MEAN | VARIANCE | STAN DEV | MAXIMUM | MINIMUM | BEG DATE | END DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00010 | WATER | TEMP | CENT | | 16 | 13.2700 | 99.9385 | 9.99693 | 26.7000 | -.110E+01 | 83/03/10 | 83/11/13 |
| 00011 | WATER | TEMP | FAHN | | 16 | 54.6250 | 364.116 | 19.0818 | 80.0000 | 30.0000 | 83/03/10 | 83/11/13 |
| 00020 | AIR | TEMP | CENT | | 15 | 14.2680 | 133.483 | 11.5535 | 30.6000 | -.500E+01 | 83/03/10 | 83/11/13 |
| 00021 | AIR | TEMP | FAHN | | 16 | 59.1875 | 440.029 | 20.9769 | 87.0000 | 23.0000 | 83/03/10 | 83/11/13 |
| 00061 | STREAM | FLOW, | INST-CFS | | 2 | .000000 | .000000 | .000000 | .000000 | .000000 | 83/08/04 | 83/08/24 |
| 00300 | DO | | MG/L | | 16 | 9.93749 | 13.8919 | 3.72718 | 16.4000 | 4.40000 | 83/03/10 | 83/11/13 |
| 00403 | LAB | PH | SU | | 3 | 8.20666 | .046654 | .215995 | 8.43000 | 8.00000 | 83/09/15 | 83/11/13 |
| 00500 | RESIDUE | TOTAL | MG/L | | 19 | 792.842 | 75283.5 | 274.378 | 1160.00 | 228.000 | 83/02/28 | 83/11/13 |
| 00530 | RESIDUE | TOT NFLT | MG/L | | 19 | 41.5789 | 1036.37 | 32.1927 | 132.000 | 7.00000 | 83/02/28 | 83/11/13 |
| 00610 | NH3+NH4- | N TOTAL | MG/L | | 17 | .311764 | .076278 | .276184 | 1.05000 | .040000 | 83/02/28 | 83/11/13 |
| | | | | K | 2 | .020000 | -.232E-09 | .000000 | .020000 | .020000 | 83/08/24 | 83/08/31 |
| | | | | TOT | 19 | .281052 | .076265 | .276162 | 1.05000 | .020000 | 83/02/28 | 83/11/13 |
| 00613 | NO2-N | DISS | MG/L | | 3 | .040000 | .000300 | .017321 | .060000 | .030000 | 83/06/24 | 83/07/08 |
| | | | | K | 16 | .010000 | .465E-10 | .000007 | .010000 | .010000 | 83/02/28 | 83/11/13 |
| | | | | TOT | 19 | .014737 | .000160 | .012635 | .060000 | .010000 | 83/02/28 | 83/11/13 |
| 00620 | NO3-N | TOTAL | MG/L | | 11 | .845454 | .482727 | .694786 | 2.00000 | .100000 | 83/02/28 | 83/11/13 |
| | | | | K | 8 | .100000 | .000000 | .000000 | .100000 | .100000 | 83/04/11 | 83/10/11 |
| | | | | TOT | 19 | .531579 | .411169 | .641225 | 2.00000 | .100000 | 83/02/28 | 83/11/13 |
| 00625 | TOT KJEL | N | MG/L | | 19 | 1.46158 | .431297 | .656732 | 3.25000 | .670000 | 83/02/28 | 83/11/13 |
| 31616 | FEC COLI | MFM-FCBR | /100ML | | 9 | 64.4444 | 1852.78 | 43.0439 | 130.000 | 10.0000 | 83/03/10 | 83/11/13 |
| | | | | K | 3 | 10.0000 | .000000 | .000000 | 10.0000 | 10.0000 | 83/03/12 | 83/04/11 |
| | | | | TOT | 12 | 50.8333 | 1953.79 | 44.2017 | 130.000 | 10.0000 | 83/03/10 | 83/11/13 |
| 70300 | RESIDUE | DISS-180 | C MG/L | | 19 | 751.263 | 69063.1 | 262.799 | 1112.00 | 196.000 | 83/02/28 | 83/11/13 |
| 70505 | T PO4 | P-COL | MG/L | | 19 | .350736 | .019148 | .138375 | .532000 | .041000 | 83/02/28 | 83/11/13 |
| 70507 | PHOS-T | ORTHO | MG/L P | | 19 | .209421 | .020869 | .144462 | .452000 | .014000 | 83/02/28 | 83/11/13 |

Table IV-4.

STORET RETRIEVAL DATE 84/10/01 - INVENT - VERSION OF SEP. 1981

46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 CLASS 00 CSN-RSP 0741349-0824212

/TYPA/AMBNT/STREAM/RUNOFF

| PARAMETER | | | | RMK | NUMBER | MEAN | VARIANCE | STAN DEV | MAXIMUM | MINIMUM | BEG DATE | END DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00010 | WATER | TEMP | CENT | | 12 | 14.9200 | 124.635 | 11.1640 | 27.8000 | -.110E+01 | 83/03/10 | 83/08/31 |
| 00011 | WATER | TEMP | FAHN | | 12 | 58.8333 | 403.426 | 20.0855 | 82.0000 | 30.0000 | 83/03/10 | 83/08/31 |
| 00020 | AIR | TEMP | CENT | | 12 | 17.2342 | 159.037 | 12.6110 | 31.7000 | -.221E+01 | 83/03/10 | 83/08/31 |
| 00021 | AIR | TEMP | FAHN | | 12 | 63.0000 | 514.909 | 22.6916 | 89.0000 | 28.0000 | 83/03/10 | 83/08/31 |
| 00061 | STREAM | FLOW, | INST-CFS | | 4 | .000000 | .000000 | .000000 | .000000 | .000000 | 83/08/24 | 83/11/13 |
| 00300 | DO | | MG/L | | 12 | 9.59166 | 13.4700 | 3.67015 | 15.0000 | 4.70000 | 83/03/10 | 83/08/31 |
| 00500 | RESIDUE | TOTAL | MG/L | | 15 | 688.133 | 68513.0 | 261.750 | 1083.00 | 318.000 | 83/02/28 | 83/08/31 |
| 00530 | RESIDUE | TOT NFLT | MG/L | | 15 | 52.8000 | 3364.46 | 58.0039 | 192.000 | 8.00000 | 83/02/28 | 83/08/31 |
| 00610 | NH3+NH4- | N TOTAL | MG/L | | 16 | 1.07750 | 1.34325 | 1.15898 | 3.86000 | .040000 | 83/02/28 | 83/08/31 |
| 00613 | NO2-N | DISS | MG/L | | 2 | .060000 | .003200 | .056569 | .100000 | .020000 | 83/06/30 | 83/07/15 |
| | | | | K | 14 | .010000 | .537E-10 | .000007 | .010000 | .010000 | 83/02/28 | 83/08/31 |
| | | | | TOT | 16 | .016250 | .000505 | .022472 | .100000 | .010000 | 83/02/28 | 83/08/31 |
| 00620 | NO3-N | TOTAL | MG/L | | 8 | .799999 | .108571 | .329502 | 1.30000 | .300000 | 83/02/28 | 83/07/15 |
| | | | | K | 8 | .100000 | .000000 | .000000 | .100000 | .100000 | 83/04/11 | 83/08/31 |
| | | | | TOT | 16 | .450000 | .181333 | .425832 | 1.30000 | .100000 | 83/02/28 | 83/08/31 |
| 00625 | TOT KJEL | N | MG/L | | 16 | 2.56625 | 4.10283 | 2.02554 | 8.70000 | .620000 | 83/02/28 | 83/08/31 |
| 31616 | FEC COLI | MFM-FCBR | /100ML | | 7 | 531.428 | 1713881 | 1309.15 | 3500.00 | 10.0000 | 83/03/10 | 83/08/31 |
| | | | | K | 3 | 10.0000 | .000000 | .000000 | 10.0000 | 10.0000 | 83/03/27 | 83/06/16 |
| | | | | TOT | 10 | 375.000 | 1206027 | 1098.19 | 3500.00 | 10.0000 | 83/03/10 | 83/08/31 |
| 70300 | RESIDUE | DISS-180 | C MG/L | | 15 | 635.333 | 53788.4 | 231.923 | 923.000 | 298.000 | 83/02/28 | 83/08/31 |
| 70505 | T PO4 | P-COL | MG/L | | 16 | .506437 | .223331 | .472579 | 2.21000 | .115000 | 83/02/28 | 83/08/31 |
| 70507 | PHOS-T | ORTHO | MG/L P | | 16 | .210187 | .010023 | .100116 | .342000 | .005000 | 83/02/28 | 83/08/31 |

Table IV-5.

STORET RETRIEVAL DATE 84/10/01 - INVENT - VERSION OF SEP. 1981

46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 CLASS 00 CSN-RSP 0744628-0828463

/TYPA/AMBNT/LAKE

| PARAMETER | | | | RMK | NUMBER | MEAN | VARIANCE | STAN DEV | MAXIMUM | MINIMUM | BEG DATE | END DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00010 | WATER | TEMP | CENT | | 10 | 18.5000 | 71.5670 | 8.45973 | 26.7000 | .000000 | 83/06/24 | 83/11/13 |
| 00011 | WATER | TEMP | FAHN | | 10 | 65.3000 | 231.569 | 15.2174 | 80.0000 | 32.0000 | 83/06/24 | 83/11/13 |
| 00020 | AIR | TEMP | CENT | | 10 | 20.8000 | 91.9379 | 9.58843 | 30.0000 | .000000 | 83/06/24 | 83/11/13 |
| 00021 | AIR | TEMP | FAHN | | 10 | 69.4000 | 298.047 | 17.2640 | 86.0000 | 32.0000 | 83/06/24 | 83/11/13 |
| 00300 | DO | | MG/L | | 9 | 10.1444 | 18.9403 | 4.35205 | 15.6000 | 4.60000 | 83/06/24 | 83/11/13 |
| 00403 | LAB | PH | SU | | 3 | 8.21333 | .075607 | .274968 | 8.52000 | 7.99000 | 83/09/15 | 83/11/13 |
| 00500 | RESIDUE | TOTAL | MG/L | | 10 | 921.100 | 2188.67 | 46.7832 | 974.000 | 822.000 | 83/06/24 | 83/11/13 |
| 00530 | RESIDUE | TOT NFLT | MG/L | | 10 | 40.6000 | 770.713 | 27.7617 | 98.0000 | 2.00000 | 83/06/24 | 83/11/13 |
| 00610 | NH3+NH4- | N TOTAL | MG/L | | 9 | 1.07889 | 1.90988 | 1.38198 | 3.53000 | .030000 | 83/06/24 | 83/11/13 |
| | | | | K | 1 | .020000 | | | .020000 | .020000 | 83/08/31 | 83/08/31 |
| | | | | TOT | 10 | .973000 | 1.80979 | 1.34529 | 3.53000 | .020000 | 83/06/24 | 83/11/13 |
| 00613 | NO2-N | DISS | MG/L | | 2 | .020000 | .000200 | .014142 | .030000 | .010000 | 83/06/29 | 83/07/15 |
| | | | | K | 8 | .010000 | .665E-10 | .000008 | .010000 | .010000 | 83/06/24 | 83/11/13 |
| | | | | TOT | 10 | .012000 | .000040 | .006325 | .030000 | .010000 | 83/06/24 | 83/11/13 |
| 00620 | NO3-N | TOTAL | MG/L | | 3 | .200000 | .000000 | .000000 | .200000 | .200000 | 83/07/08 | 83/08/24 |
| | | | | K | 7 | .100000 | .000000 | .000000 | .100000 | .100000 | 83/06/24 | 83/11/13 |
| | | | | TOT | 10 | .130000 | .002333 | .048305 | .200000 | .100000 | 83/06/24 | 83/11/13 |
| 09625 | TOT KJEL | N | MG/L | | 10 | 2.29399 | 2.11900 | 1.45568 | 4.92000 | 1.02000 | 83/06/24 | 83/11/13 |
| 31616 | FEC COLI | MFM-FCBR | /100ML | | 5 | 166.000 | 32880.0 | 181.328 | 480.000 | 10.0000 | 83/06/29 | 83/11/13 |
| | | | | K | 2 | 10.0000 | .000000 | .000000 | 10.0000 | 10.0000 | 83/08/04 | 83/08/31 |
| | | | | TOT | 7 | 121.429 | 27714.3 | 166.476 | 480.000 | 10.0000 | 83/06/29 | 83/11/13 |
| 70300 | RESIDUE | DISS-180 | C MG/L | | 10 | 880.500 | 1817.22 | 42.6289 | 939.000 | 804.000 | 83/06/24 | 83/11/13 |
| 70505 | T PO4 | P-COL | MG/L | | 10 | .305200 | .009441 | .097165 | .417000 | .173000 | 83/06/24 | 83/11/13 |
| 70507 | PHOS-T | ORTHO | MG/L P | | 10 | .111500 | .017524 | .132379 | .350000 | .009000 | 83/06/24 | 83/11/13 |

Table IV-6.

STORET RETRIEVAL DATE 84/10/01 - INVENT - VERSION OF SEP. 1981

46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 CLASS 00 CSN-RSP 0744629-0828464

/TYPA/AMBNT/LAKE

| PARAMETER | | | | RMK | NUMBER | MEAN | VARIANCE | STAN DEV | MAXIMUM | MINIMUM | BEG DATE | END DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00010 | WATER | TEMP | CENT | | 9 | 17.8444 | 75.6778 | 8.69930 | 26.7000 | .000000 | 83/06/29 | 83/11/13 |
| 00011 | WATER | TEMP | FAHN | | 9 | 64.1111 | 244.614 | 15.6401 | 80.0000 | 32.0000 | 83/06/29 | 83/11/13 |
| 00020 | AIR | TEMP | CENT | | 9 | 19.7778 | 91.6749 | 9.57470 | 29.4000 | .000000 | 83/06/29 | 83/11/13 |
| 00021 | AIR | TEMP | FAHN | | 9 | 67.5555 | 297.031 | 17.2346 | 85.0000 | 32.0000 | 83/06/29 | 83/11/13 |
| 00300 | DO | | MG/L | | 10 | 10.2000 | 18.1489 | 4.26016 | 15.6000 | 3.50000 | 83/06/24 | 83/11/13 |
| 00403 | LAB | PH | SU | | 3 | 8.26333 | .099731 | .315803 | 8.59000 | 7.96000 | 83/09/15 | 83/11/13 |
| 00500 | RESIDUE | TOTAL | MG/L | | 10 | 935.700 | 2901.00 | 53.8609 | 1021.00 | 845.000 | 83/06/24 | 83/11/13 |
| 00530 | RESIDUE | TOT NFLT | MG/L | | 10 | 52.5000 | 1555.39 | 39.4384 | 120.000 | 8.00000 | 83/06/24 | 83/11/13 |
| 00610 | NH3+NH4- | N TOTAL | MG/L | | 9 | 1.10333 | 2.13299 | 1.46048 | 3.64000 | .020000 | 83/06/24 | 83/11/13 |
| | | | | K | 1 | .020000 | | | .020000 | .020000 | 83/08/31 | 83/08/31 |
| | | | | TOT | 10 | .994999 | 2.01335 | 1.41893 | 3.64000 | .020000 | 83/06/24 | 83/11/13 |
| 00613 | NO2-N | DISS | MG/L | | 3 | .020000 | .000100 | .010000 | .030000 | .010000 | 83/06/29 | 83/07/15 |
| | | | | K | 7 | .010000 | .776E-10 | .000009 | .010000 | .010000 | 83/06/24 | 83/11/13 |
| | | | | TOT | 10 | .013000 | .000046 | .006750 | .030000 | .010000 | 83/06/24 | 83/11/13 |
| 00620 | NO3-N | TOTAL | MG/L | | 2 | .250000 | .005000 | .070710 | .300000 | .200000 | 83/07/08 | 83/07/15 |
| | | | | K | 8 | .100000 | .000000 | .000000 | .100000 | .100000 | 83/06/24 | 83/11/13 |
| | | | | TOT | 10 | .130000 | .004556 | .067495 | .300000 | .100000 | 83/06/24 | 83/11/13 |
| 00625 | TOT KJEL | N | MG/L | | 10 | 2.27599 | 1.81740 | 1.34811 | 4.96000 | .980000 | 83/06/24 | 83/11/13 |
| 00671 | PHOS-DIS | ORTHO | MG/L P | | 1 | .006000 | | | .006000 | .006000 | 83/08/24 | 83/08/24 |
| 31616 | FEC COLI | MFM-FCBR | /100ML | | 5 | 84.2000 | 4593.20 | 67.7732 | 170.000 | 10.0000 | 83/06/29 | 83/10/11 |
| | | | | K | 2 | 10.0000 | .000000 | .000000 | 10.0000 | 10.0000 | 83/08/31 | 83/11/13 |
| | | | | TOT | 7 | 63.0000 | 4373.00 | 66.1287 | 170.000 | 10.0000 | 83/06/29 | 83/11/13 |
| 70300 | RESIDUE | DISS-180 | C MG/L | | 10 | 883.200 | 1075.33 | 32.7923 | 924.000 | 823.000 | 83/06/24 | 83/11/13 |
| 70505 | T PO4 | P-COL | MG/L | | 10 | .334399 | .025851 | .160781 | .644000 | .166000 | 83/06/24 | 83/11/13 |
| 70507 | PHOS-T | ORTHO | MG/L P | | 9 | .124555 | .019246 | .138730 | .369000 | .007000 | 83/06/24 | 83/11/13 |

Table IV-7.

STORET RETRIEVAL DATE 84/10/01 - INVENT - VERSION OF SEP. 1981

46CA06
44 12 37.0 096 46 09.0 2
OFFSHORE FROM COUNTRY CLUB 109N-50W-S33 ABBB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 CLASS 00 CSN-RSP 0741350-0824213

/TYPA/AMBNT/STREAM/RUNOFF

| PARAMETER | | | | RMK | NUMBER | MEAN | VARIANCE | STAN DEV | MAXIMUM | MINIMUM | BEG DATE | END DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00010 | WATER | TEMP | CENT | | 1 | 22.2000 | | | 22.2000 | 22.2000 | 83/08/25 | 83/08/25 |
| 00011 | WATER | TEMP | FAHN | | 1 | 72.0000 | | | 72.0000 | 72.0000 | 83/08/25 | 83/08/25 |
| 00020 | AIR | TEMP | CENT | | 1 | 25.6000 | | | 25.6000 | 25.6000 | 83/08/25 | 83/08/25 |
| 00021 | AIR | TEMP | FAHN | | 1 | 78.0000 | | | 78.0000 | 78.0000 | 83/08/25 | 83/08/25 |
| 00061 | STREAM | FLOW, | INST-CFS | | 1 | .000000 | | | .000000 | .000000 | 83/08/25 | 83/08/25 |
| 00500 | RESIDUE | TOTAL | MG/L | | 1 | 992.000 | | | 992.000 | 992.000 | 83/08/25 | 83/08/25 |
| 00530 | RESIDUE | TOT NFLT | MG/L | | 1 | 74.0000 | | | 74.0000 | 74.0000 | 83/08/25 | 83/08/25 |
| 00610 | NH3+NH4- | N TOTAL | MG/L | | 1 | .040000 | | | .040000 | .040000 | 83/08/25 | 83/08/25 |
| 00613 | NO2-N | DISS | MG/L | K | 1 | .010000 | | | .010000 | .010000 | 83/08/25 | 83/08/25 |
| 00620 | NO3-N | TOTAL | MG/L | K | 1 | .100000 | | | .100000 | .100000 | 83/08/25 | 83/08/25 |
| 00625 | TOT KJEL | N | MG/L | | 1 | 1.14000 | | | 1.14000 | 1.14000 | 83/08/25 | 83/08/25 |
| 31616 | FEC COLI | MFM-FCBR | /100ML | | 1 | 10.0000 | | | 10.0000 | 10.0000 | 83/08/25 | 83/08/25 |
| 70300 | RESIDUE | DISS-180 | C MG/L | | 1 | 918.000 | | | 918.000 | 918.000 | 83/08/25 | 83/08/25 |
| 70505 | T PO4 | P-COL | MG/L | | 1 | .230000 | | | .230000 | .230000 | 83/08/25 | 83/08/25 |
| 70507 | PHOS-T | ORTHO | MG/L P | | 1 | .021000 | | | .021000 | .021000 | 83/08/25 | 83/08/25 |

Table IV-8.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 1.SUMMARY.1

46CA01
44 10 54.0 096 52 10.0 2 ·
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
/TYPA/AMBNT/STREAM/RUNOFF 21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

SUMMARY OF VIOLATIONS ON SAMPLES COLLECTED FROM 83/02/28 TO 83/11/13

| | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|
| NO OF VALUES | 15 | 11 | 2 | 18 | 18 | 18 | 2 | 18 | 15 |
| MEAN | 9.387 | 288.2 | 8.070 | 831. | 38.2 | 0.216 | 0.0017 | 0.57 | 55.53 |
| MEDIAN | 9.600 | 10.0 | 8.070 | 945. | 36.0 | 0.165 | 0.0017 | 0.20 | 60.00 |
| NO OF VIOLS | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENT VIOL | 0. | 36. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| MINIMUM VIOL | 0.0 | 250.0 | 0.0 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEAN VIOL | 0.0 | 760.0 | 0.0 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MAXIMUM VIOL | 0.0 | 1800.0 | 0.0 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MIN CRITERIA | 4.000 | ********* | 6.500 | ********* | ********* | ********* | ********* | ********* | ********* |
| MAX CRITERIA | ********* | 200.0 | 8.300 | 2500. | 150.0 | ********* | 0.0500 | 50.00 | 90.00 |

Table IV-9.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 1 PAGE 1.1
VIOLATIONS ONLY

46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

/TYPA/AMBNT/STREAM/RUNOFF

| DATE | TIME | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C | 70300 RESIDUE DISS-180 MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 83/06/29 | 1300 | | 1800.0* | | | | | | | | |
| 83/07/08 | 0800 | | 490.0* | | | | | | | | |
| 83/08/04 | 1030 | | 500.0* | | | | | | | | |
| 83/08/24 | 1030 | | 250.0* | | | | | | | | |

Table IV-10.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 2.SUMMARY.1

46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
/TYPA/AMBNT/STREAM/RUNOFF 21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

SUMMARY OF VIOLATIONS ON SAMPLES COLLECTED FROM 83/02/28 TO 83/11/13

| | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|
| NO OF VALUES | 16 | 12 | 3 | 19 | 19 | 19 | 3 | 19 | 16 |
| MEAN | 9.937 | 50.8 | 8.207 | 751. | 41.6 | 0.281 | 0.0038 | 0.53 | 54.63 |
| MEDIAN | 10.050 | 45.0 | 8.190 | 848. | 32.0 | 0.250 | 0.0012 | 0.10 | 60.00 |
| NO OF VIOLS | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENT VIOL | 0. | 0. | 33. | 0. | 0. | 0. | 0. | 0. | 0. |
| MINIMUM VIOL | 0.0 | 0.0 | 8.430 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEAN VIOL | 0.0 | 0.0 | 8.430 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MAXIMUM VIOL | 0.0 | 0.0 | 8.430 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MIN CRITERIA | 4.000 ********* | | 6.500 | ********* | ********* | ********* | ********* | ********* | ********* |
| MAX CRITERIA | ********* | 200.0 | 8.300 | 2500. | 150.0 | ********* | 0.0500 | 50.00 | 90.00 |

Table IV-11.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 2 PAGE 1.1
VIOLATIONS ONLY

46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

/TYPA/AMBNT/STREAM/RUNOFF

| DATE | TIME | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|---|
| 83/11/13 | 1500 | | | 8.430* | | | | | | |

Table IV-12.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 3.SUMMARY.1

46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
/TYPA/AMBNT/STREAM/RUNOFF 21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741349-0824212

SUMMARY OF VIOLATIONS ON SAMPLES COLLECTED FROM 83/02/28 TO 83/08/31

| | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|
| NO OF VALUES | 12 | 10 | 0 | 15 | 15 | 16 | 0 | 16 | 12 |
| MEAN | 9.592 | 375.0 | 0.0 | 635. | 52.8 | 1.077 | 0.0 | 0.45 | 58.83 |
| MEDIAN | 9.850 | 25.0 | ********* | 567. | 20.0 | 0.640 | ********* | 0.20 | 63.00 |
| NO OF VIOLS | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| PERCENT VIOL | 0. | 10. | 0. | 0. | 13. | 0. | 0. | 0. | 0. |
| MINIMUM VIOL | 0.0 | 3500.0 | 0.0 | 0. | 156.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEAN VIOL | 0.0 | 3500.0 | 0.0 | 0. | 174.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MAXIMUM VIOL | 0.0 | 3500.0 | 0.0 | 0. | 192.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MIN CRITERIA | 4.000 | ********* | 6.500 | ********* | ********* | ********* | ********* | ********* | ********* |
| MAX CRITERIA | ********* | 200.0 | 8.300 | 2500. | 150.0 | ********* | 0.0500 | 50.00 | 90.00 |



Table IV-13.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 3 PAGE 1.1
VIOLATIONS ONLY

46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741349-0824212

/TYPA/AMBNT/STREAM/RUNOFF

| DATE | TIME | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C | 70300 RESIDUE DISS-180 MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 83/04/11 | 1030 | | | | | | 156.0* | | | | |
| 83/07/08 | 1200 | | | | | | 192.0* | | | | |
| 83/08/31 | 1530 | | 3500.0* | | | | | | | | |

Table IV-14.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 4.SUMMARY.1

46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

/TYPA/AMBNT/LAKE

SUMMARY OF VIOLATIONS ON SAMPLES COLLECTED FROM 83/06/24 TO 83/11/13

| | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|
| NO OF VALUES | 9 | 7 | 3 | 10 | 10 | 10 | 3 | 10 | 10 |
| MEAN | 10.144 | 121.4 | 8.213 | 881. | 40.6 | 0.973 | 0.0057 | 0.13 | 65.30 |
| MEDIAN | 10.000 | 100.0 | 8.130 | 875. | 42.0 | 0.250 | 0.0024 | 0.10 | 69.00 |
| NO OF VIOLS | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENT VIOL | 0. | 14. | 33. | 0. | 0. | 0. | 0. | 0. | 0. |
| MINIMUM VIOL | 0.0 | 480.0 | 8.520 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEAN VIOL | 0.0 | 480.0 | 8.520 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MAXIMUM VIOL | 0.0 | 480.0 | 8.520 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MIN CRITERIA | 4.000 | ********* | 6.500 | ********* | ********* | ********* | ********* | ********* | ********* |
| MAX CRITERIA | ********* | 200.0 | 8.300 | 2500. | 150.0 | ********* | 0.0500 | 50.00 | 90.00 |

Table IV-15.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 4 PAGE 1.1
VIOLATIONS ONLY

46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBCB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

/TYPA/AMBNT/LAKE

| DATE | TIME | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|---|
| 83/11/13 | 1400 | | 480.0* | 8.520* | | | | | | |

Table IV-16.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 5.SUMMARY.1

46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

/TYPA/AMBNT/LAKE

SUMMARY OF VIOLATIONS ON SAMPLES COLLECTED FROM 83/06/24 TO 83/11/13

| | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|
| NO OF VALUES | 10 | 7 | 3 | 10 | 10 | 10 | 3 | 10 | 9 |
| MEAN | 10.200 | 63.0 | 8.263 | 883. | 52.5 | 0.995 | 0.0059 | 0.13 | 64.11 |
| MEDIAN | 10.000 | 20.0 | 8.240 | 887. | 42.0 | 0.295 | 0.0011 | 0.10 | 66.00 |
| NO OF VIOLS | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERCENT VIOL | 10. | 0. | 33. | 0. | 0. | 0. | 0. | 0. | 0. |
| MINIMUM VIOL | 3.500 | 0.0 | 8.590 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MEAN VIOL | 3.500 | 0.0 | 8.590 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MAXIMUM VIOL | 3.500 | 0.0 | 8.590 | 0. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MIN CRITERIA | 4.000 | ********* | 6.500 | ********* | ********* | ********* | ********* | ********* | ********* |
| MAX CRITERIA | ********* | 200.0 | 8.300 | 2500. | 150.0 | ********* | 0.0500 | 50.00 | 90.00 |

Table IV-17.

STORET RETRIEVAL DATE 84/10/02 - STAND - VERSION OF APR. 1983 STN 5 PAGE 1.1
VIOLATIONS ONLY

46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

/TYPA/AMBNT/LAKE

| DATE | TIME | 00300 DO MG/L | 31616 FEC COLI MFM-FCBR /100ML | 00403 LAB PH SU | 70300 RESIDUE DISS-180 C MG/L | 00530 RESIDUE TOT NFLT MG/L | 00610 NH3+NH4- N TOTAL MG/L | 00619 UN-IONZD NH3-NH3 MG/L | 00620 NO3-N TOTAL MG/L | 00011 WATER TEMP FAHN |
|---|---|---|---|---|---|---|---|---|---|---|
| 83/06/24 | 1330 | 3.500* | | | | | | | | |
| 83/11/13 | 1430 | | | 8.590* | | | | | | |

Table IV-18.

| VARIABLE | N | MEAN | STANDARD DEVIATION | MINIMUM VALUE | MAXIMUM VALUE |
|---|---|---|---|---|---|
| STATION=21SDLAKE 46CA01 | | | | | |
| ORGN | 18 | 1.038 | 0.401 | 0.560 | 2.250 |
| INORGN | 18 | 0.796 | 0.792 | 0.130 | 2.440 |
| STATION=21SDLAKE 46CA02 | | | | | |
| ORGN | 19 | 1.181 | 0.498 | 0.580 | 2.870 |
| INORGN | 19 | 0.827 | 0.765 | 0.130 | 2.320 |
| STATION=21SDLAKE 46CA03 | | | | | |
| ORGN | 16 | 1.489 | 1.434 | 0.560 | 6.700 |
| INORGN | 16 | 1.544 | 1.047 | 0.150 | 3.980 |
| STATION=21SDLAKE 46CA04 | | | | | |
| ORGN | 10 | 1.321 | 0.544 | 0.560 | 2.440 |
| INORGN | 10 | 1.115 | 1.343 | 0.130 | 3.640 |
| STATION=21SDLAKE 46CA05 | | | | | |
| ORGN | 10 | 1.281 | 0.542 | 0.580 | 2.400 |
| INORGN | 10 | 1.138 | 1.420 | 0.130 | 3.750 |
| STATION=21SDLAKE 46CA06 | | | | | |
| ORGN | 1 | 1.100 | . | 1.100 | 1.100 |
| INORGN | 1 | 0.150 | . | 0.150 | 0.150 |

Table IV-19.

| DATE | SITE 4 | SITE 5 |
|---|---|---|
| 6-24-83 | 91.3 | 92.2 |
| 6-29-83 | 90.7 | 90.1 |
| 7-8-83 | 90.8 | 94.3 |
| 7-15-83 | 89.0 | 88.6 |
| 8-4-83 | 85.1 | 82.1 |
| 8-23-83 | 90.4 | 97.6 |
| 8-31-83 | 81.7 | 78.2 |
| 9-15-83 | 80.5 | 83.0 |
| 10-11-83 | 82.7 | 82.5 |
| 11-13-83 | 78.6 | 78.0 |
| x | 86.1 | 86.7 |
| s.d. | 4.91 | 6.85 |
| n | 10 | 10 |
| R | 78.6-91.3 | 78.0-97.6 |

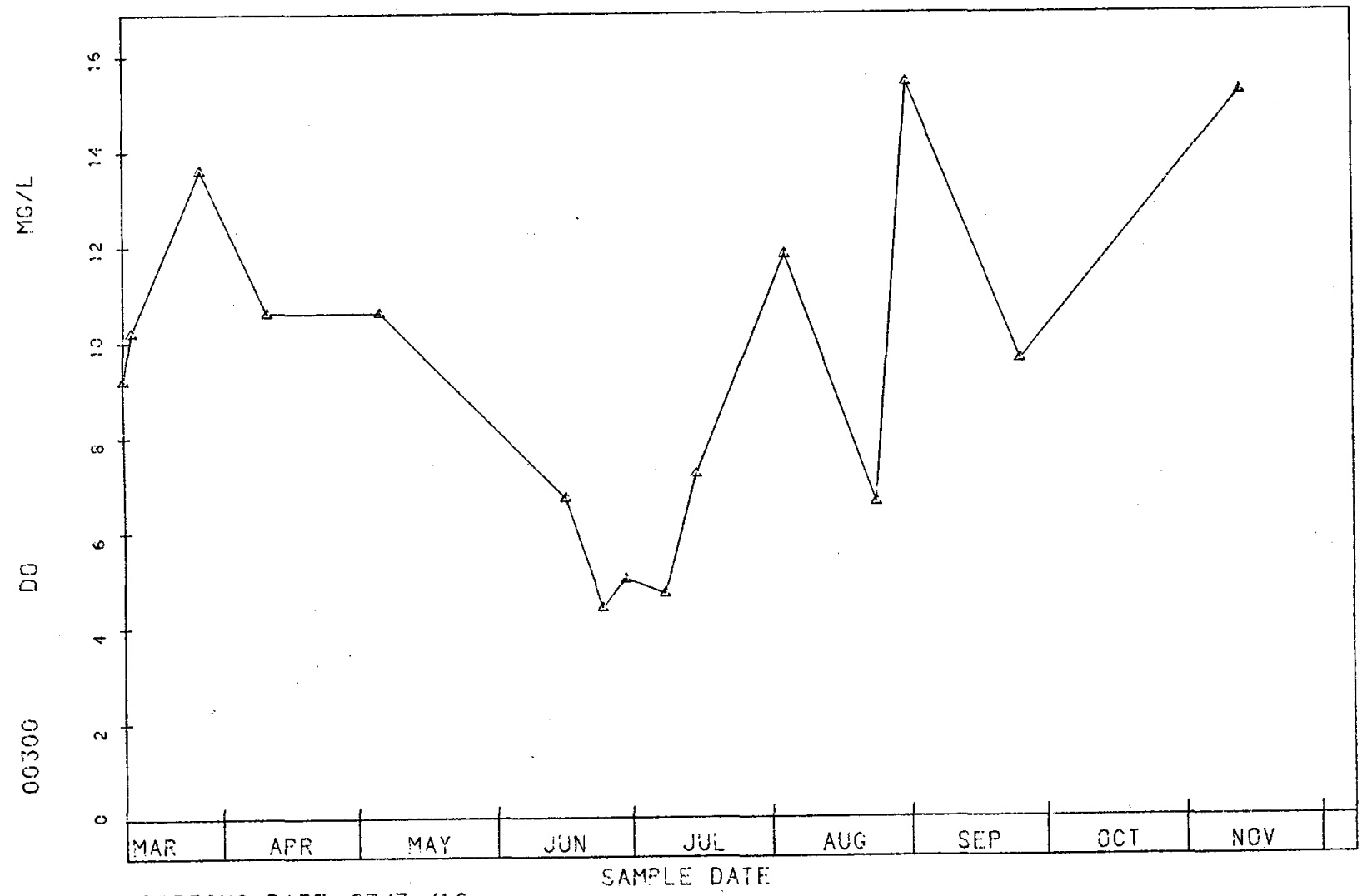
Table IV-20. Total phosphorus based trophic state index values for Lake Campbell.

| DATE | SITE 4 | SITE 5 |
|---|---|---|
| 6-24-83 | 12.1 | 11.4 |
| 6-29-83 | 10.5 | 11.3 |
| 7-8-83 | 9.01 | 5.59 |
| 7-15-83 | 9.24 | 7.17 |
| 8-4-83 | 4.17 | 6.32 |
| 8-23-83 | 3.36 | 3.93 |
| 8-31-83 | 5.26 | 8.21 |
| 9-15-83 | 8.32 | 5.77 |
| 10-11-83 | 5.13 | 4.80 |
| 11-13-83 | 10.5 | 10.3 |
| | | |
| x | 7.76 | 7.48 |
| s.d. | 3.04 | 2.71 |
| n | 10 | 10 |
| R | 3.36-12.1 | 3.93-11.4 |

Table IV-21. Total nitrogen:total phosphorus weight ratios for Sites 4 5 of Lake Campbell.

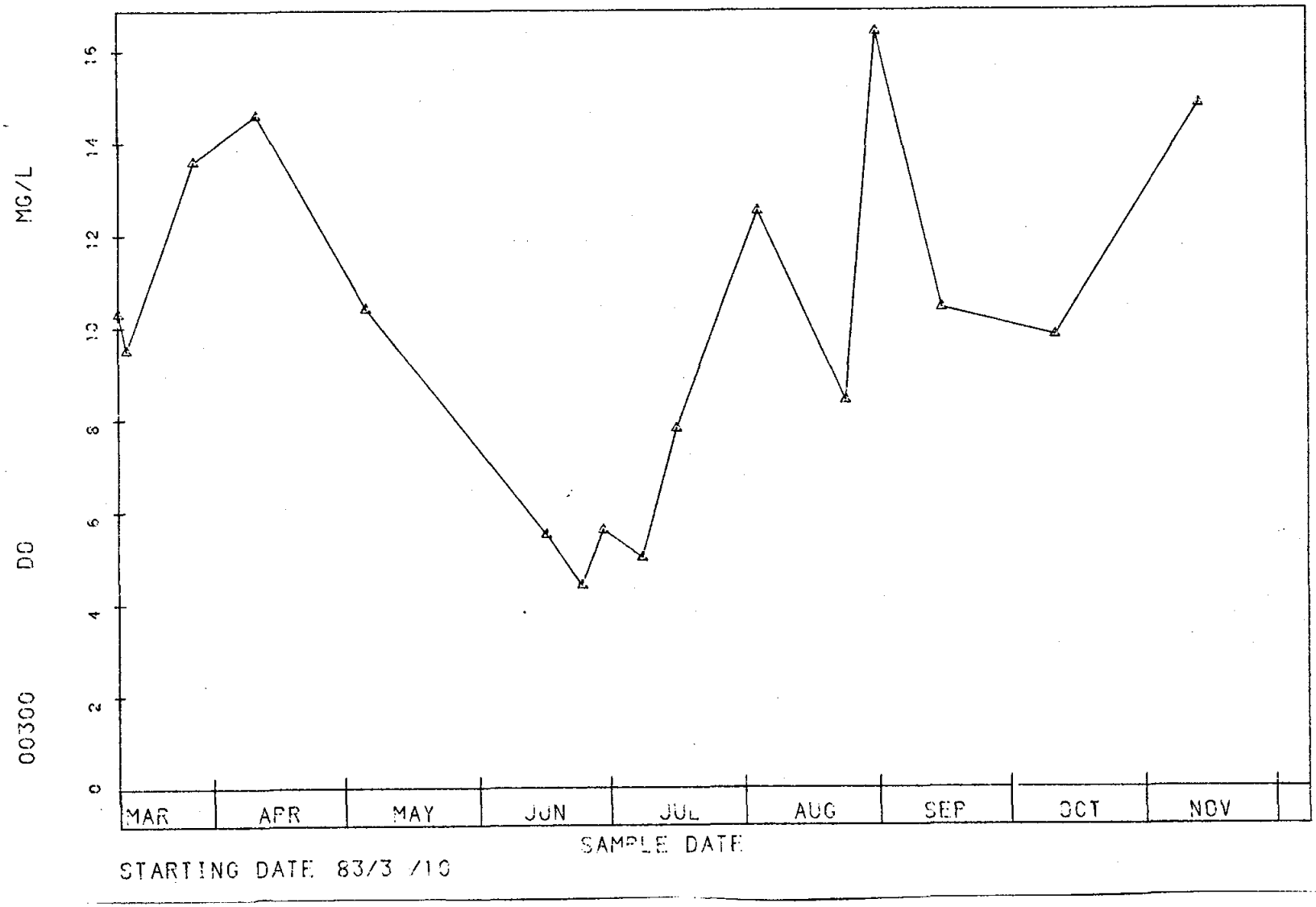
46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

Figure IV-1.



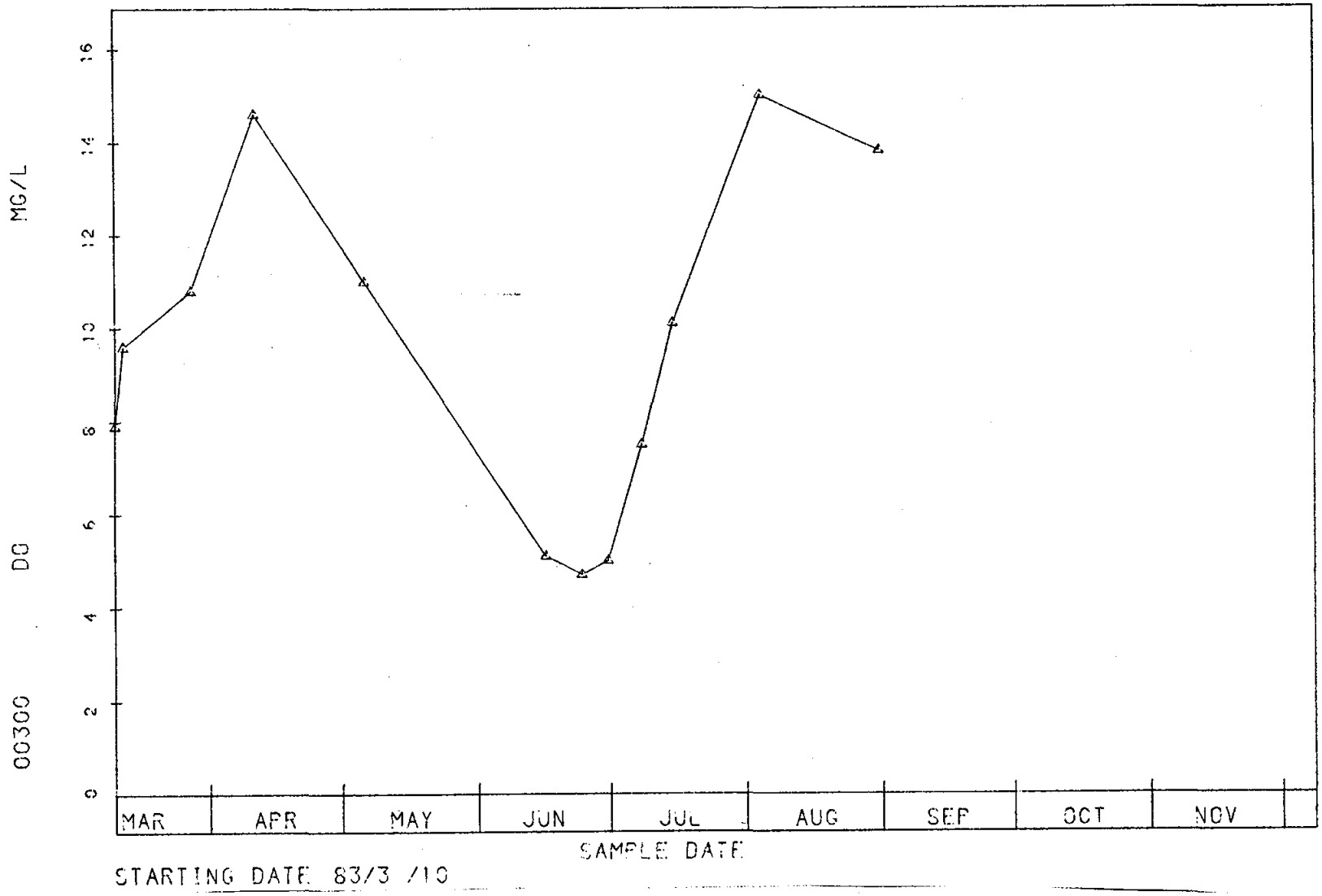
46CAC2
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-2.



46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 OSN-RSP 0741349-0824212

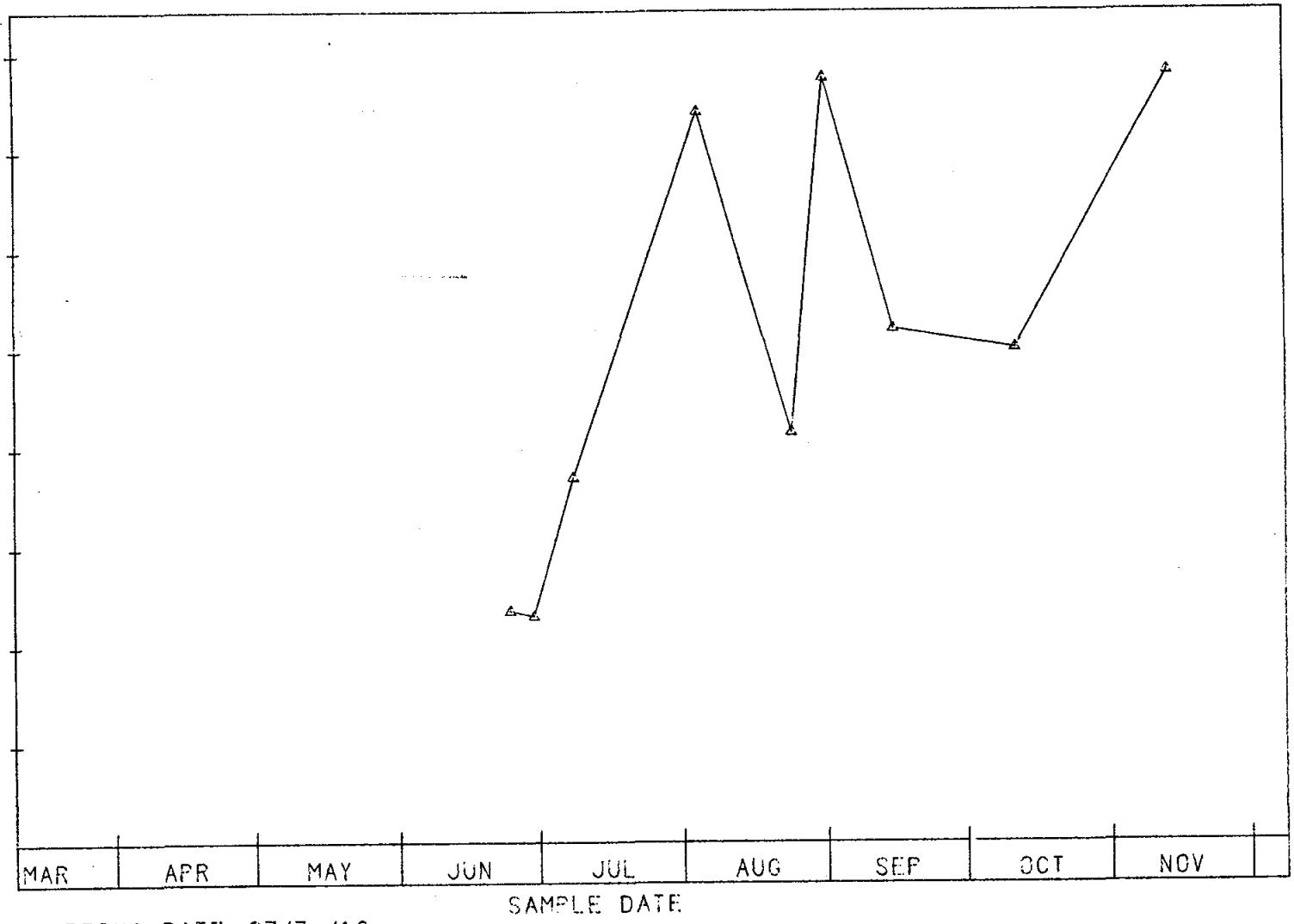
Figure IV-3.




STARTING DATE 83/3 /10

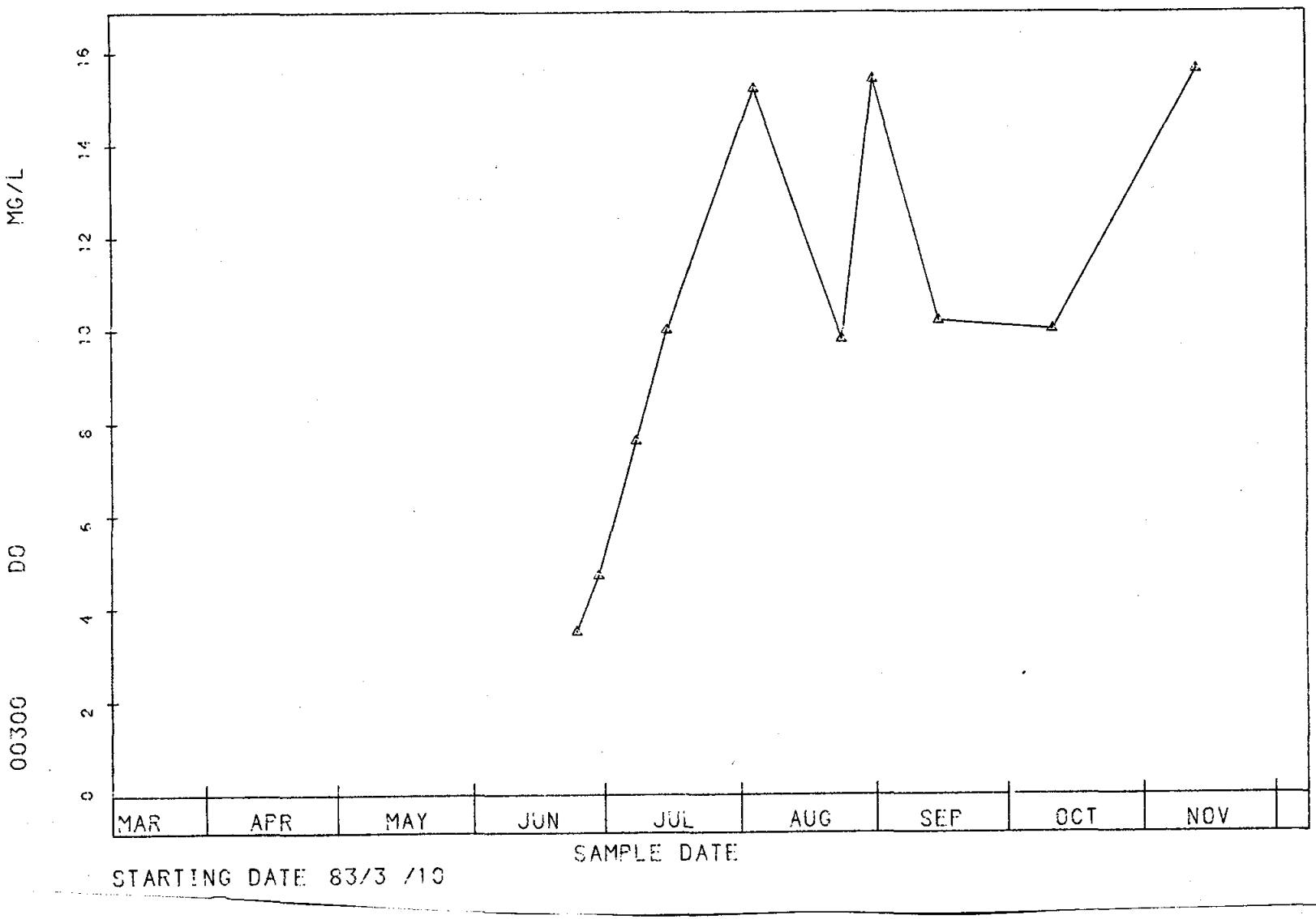
46CAC4
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

Figure IV-4.



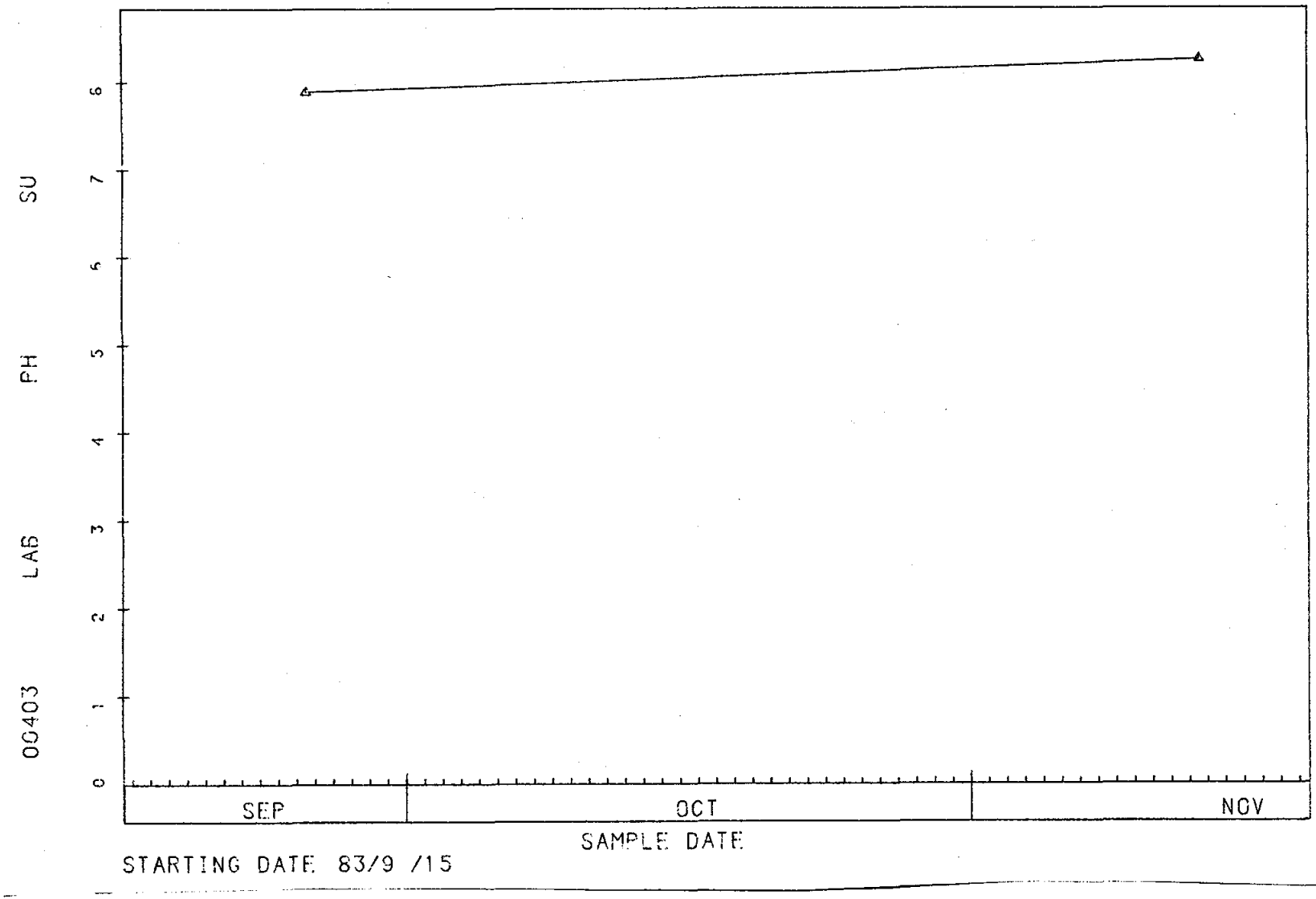

STARTING DATE 83/3 /10

Figure IV-5.


46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464
00300 DO
MG/L
0
2
4
6
8
10
12
14
16
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
SAMPLE DATE
STARTING DATE 83/3 /10

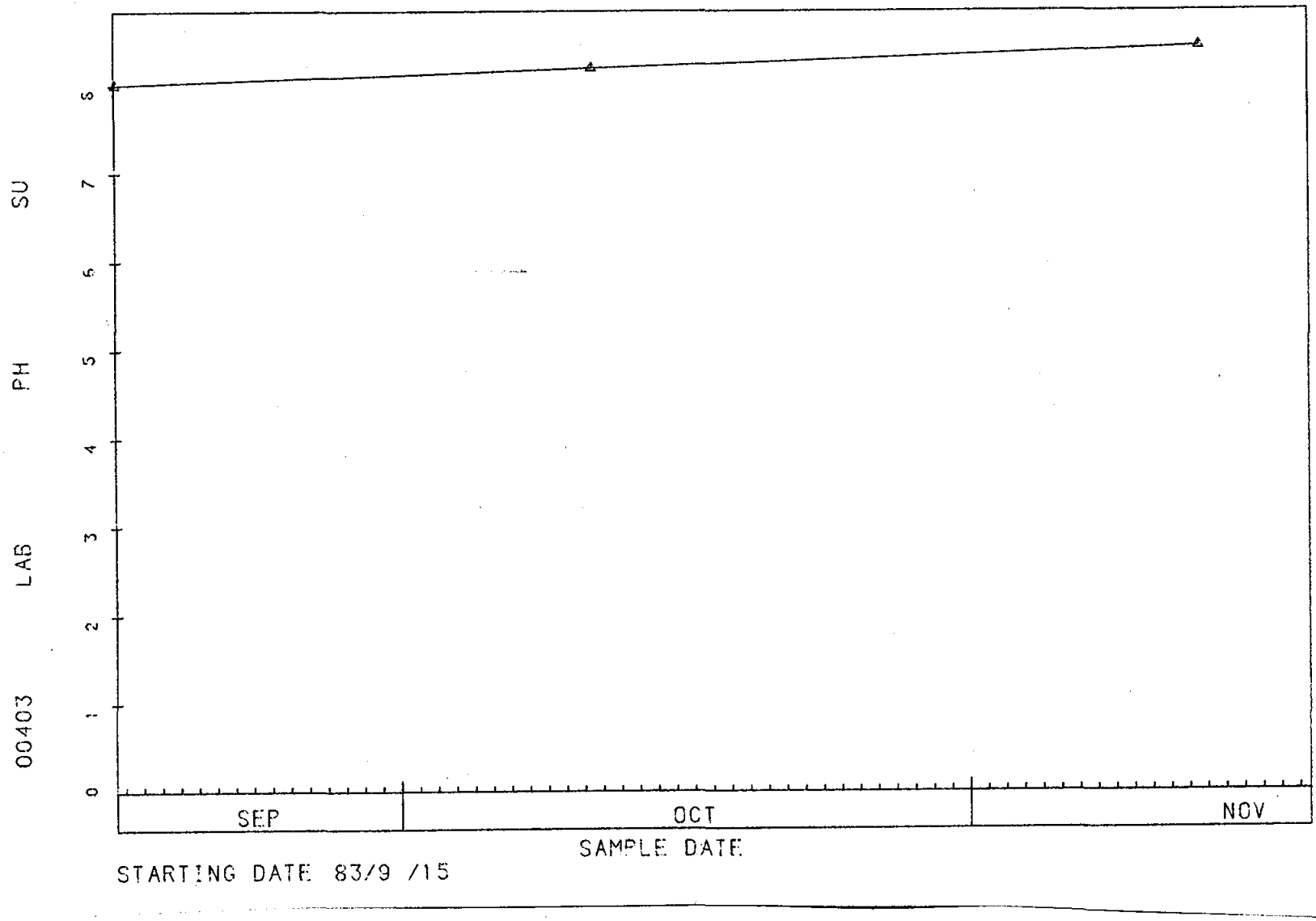
46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

Figure IV-6.



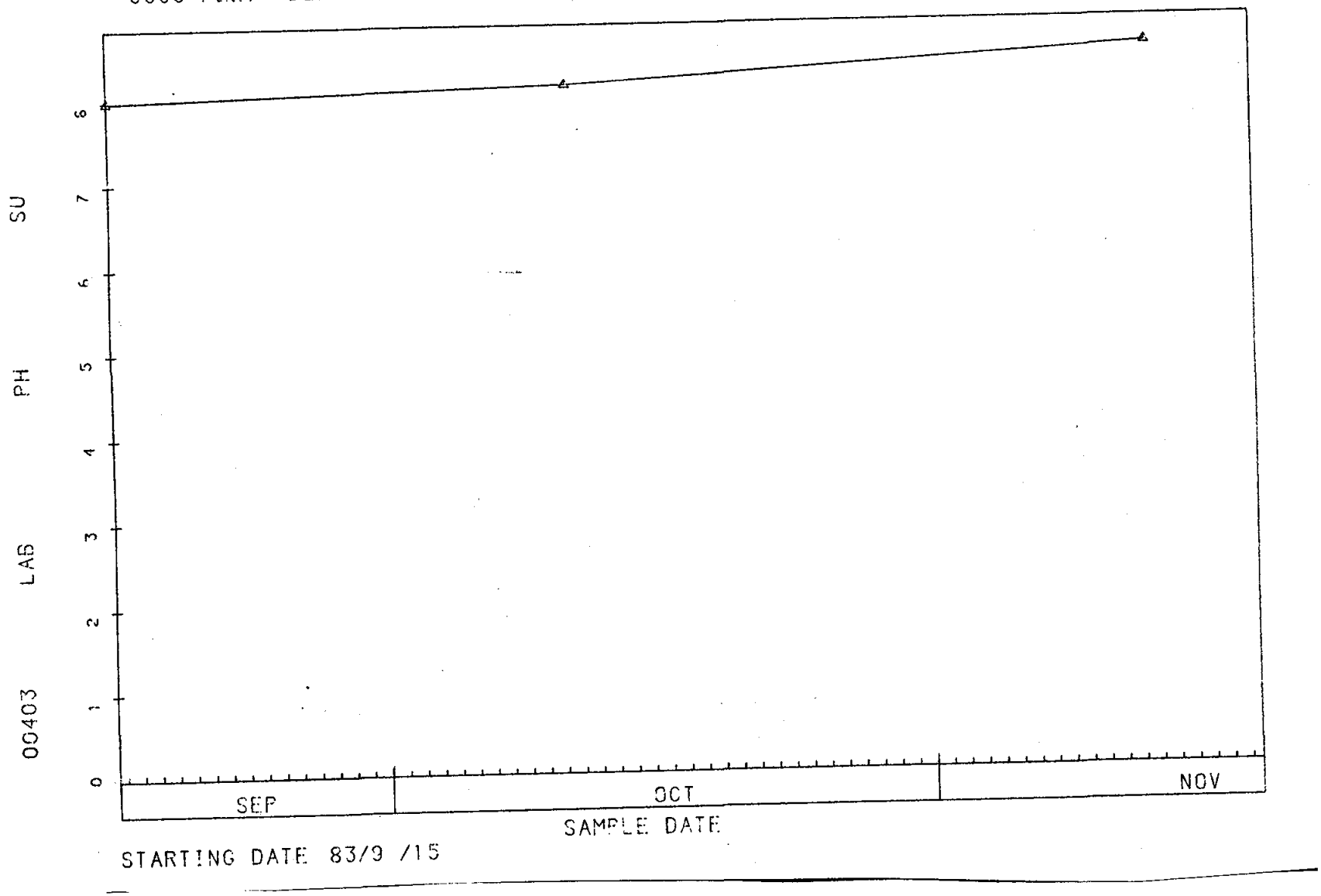
46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-7.



46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

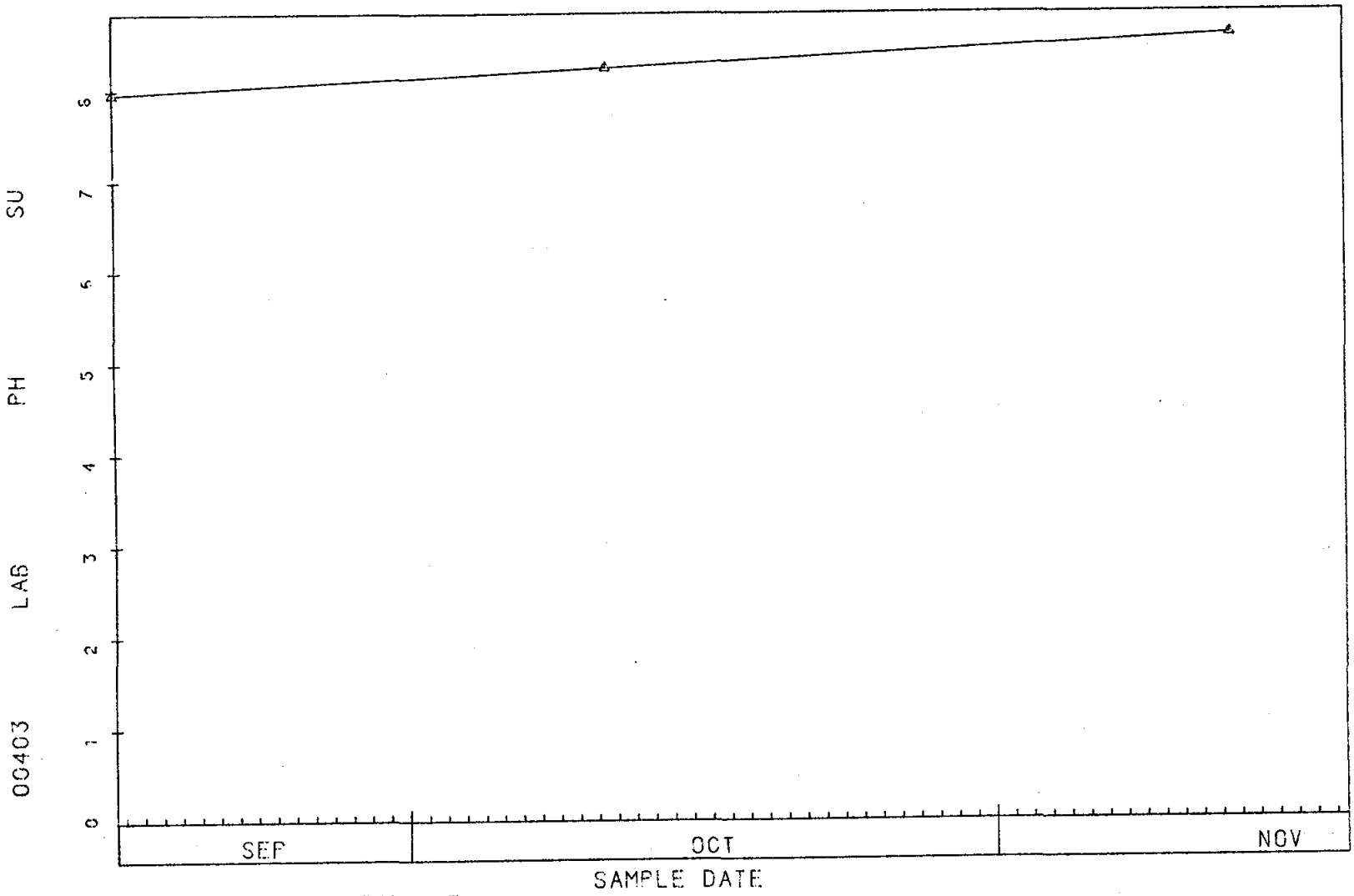
Figure IV-8.




STARTING DATE 83/9 /15

46CAC5
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

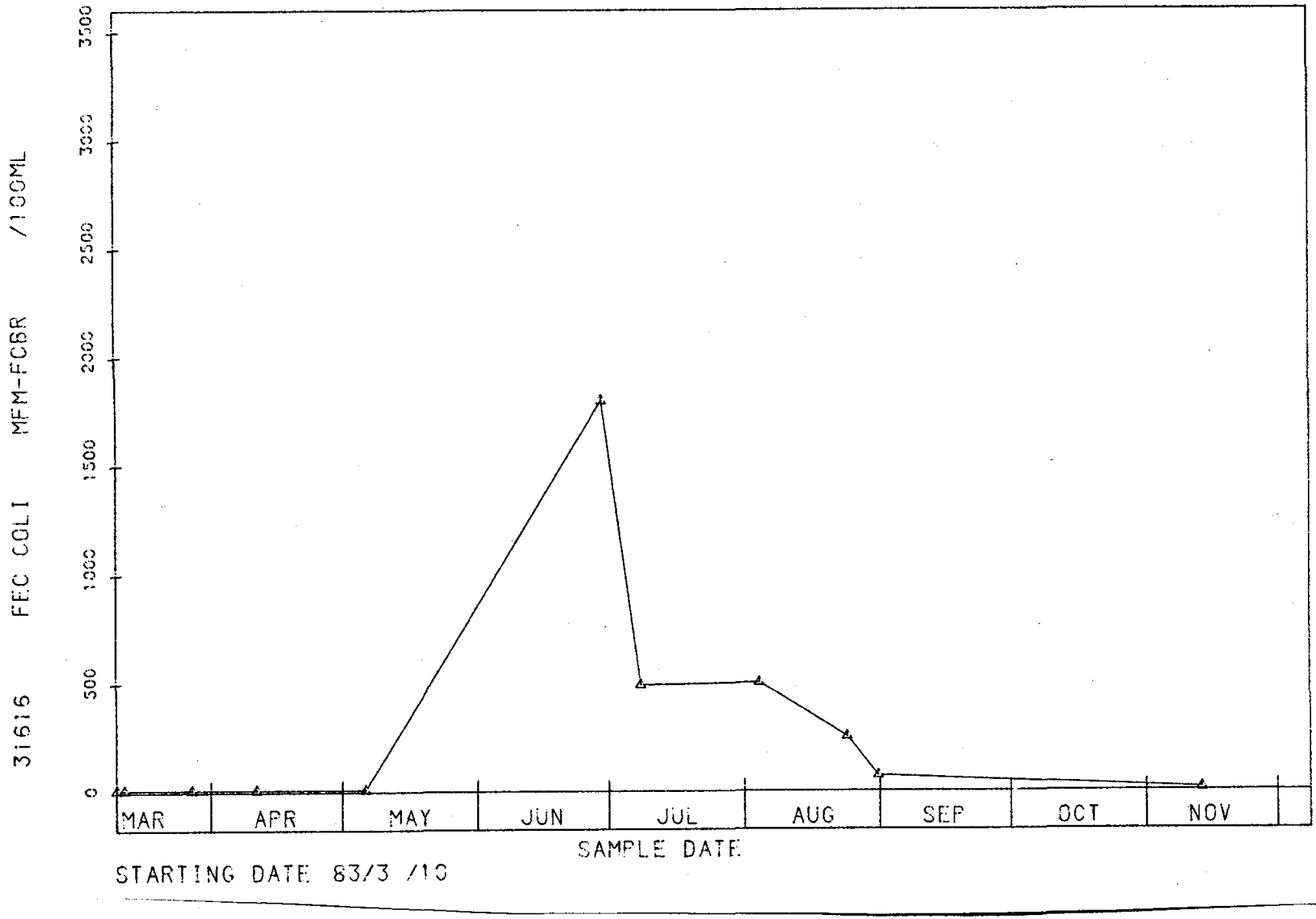
Figure IV-9.




STARTING DATE 83/9 /15

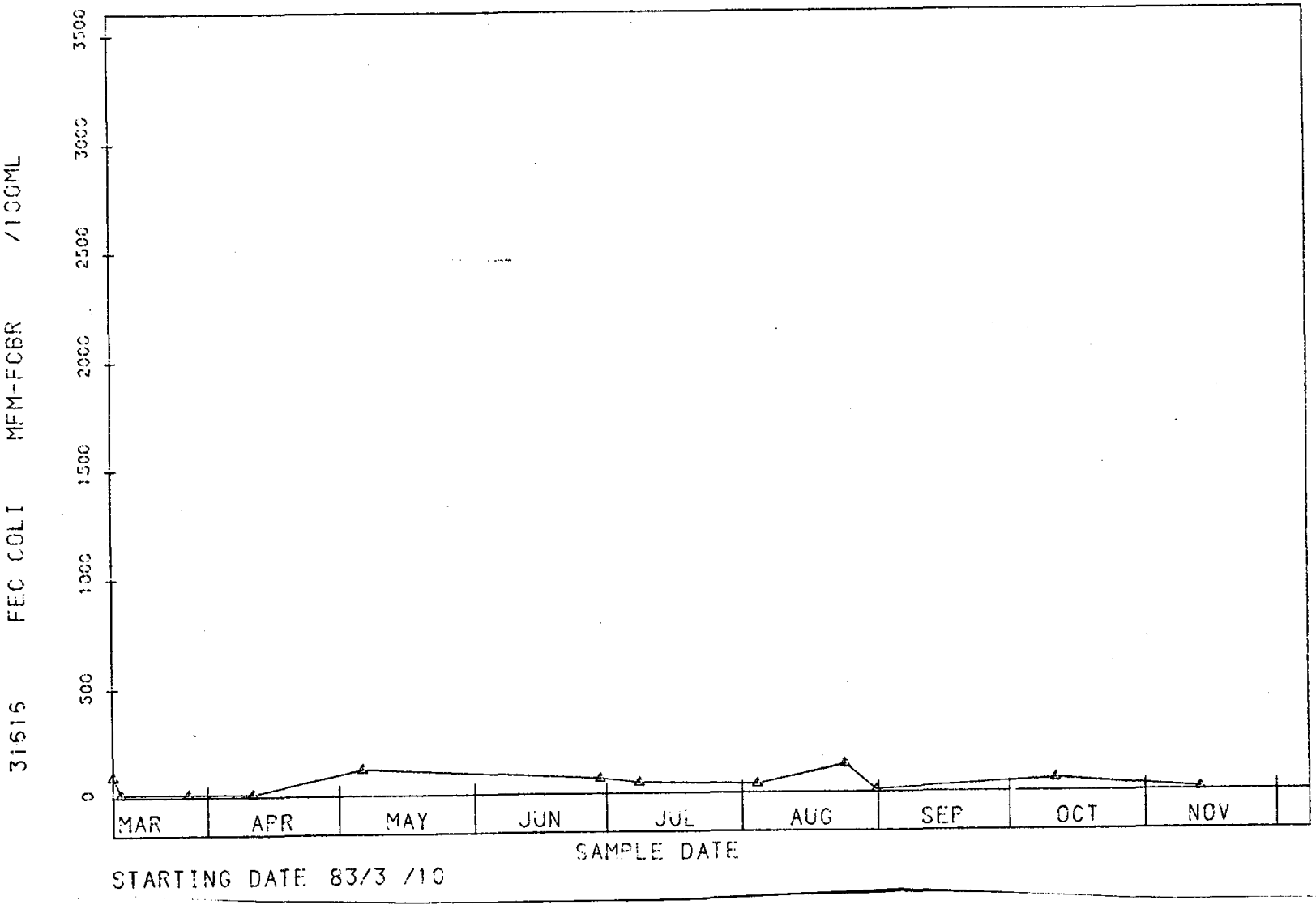
46CA01
44 10 54.0 096 52 10.0 2
CN NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

Figure IV-10.



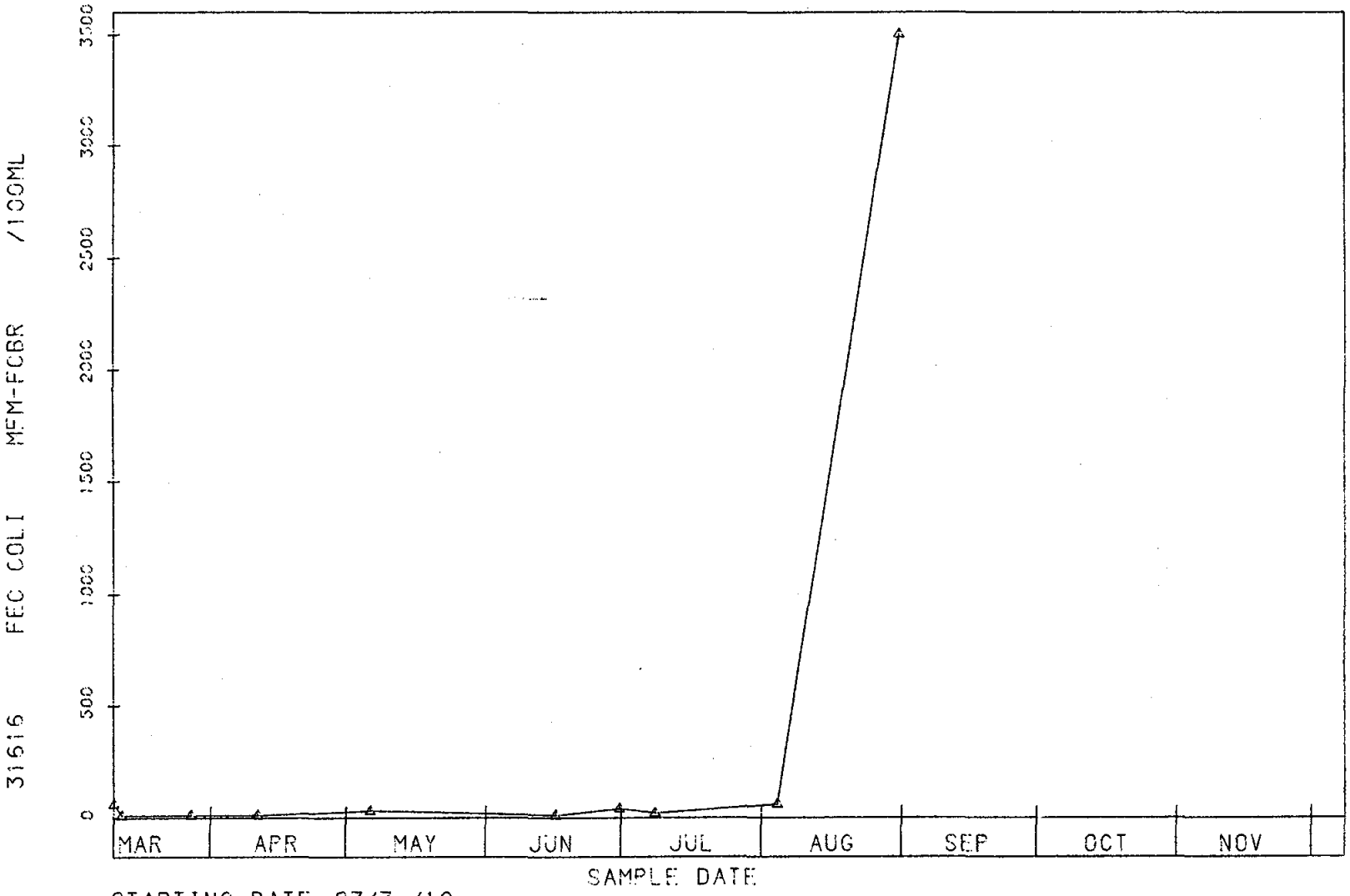
46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-11.



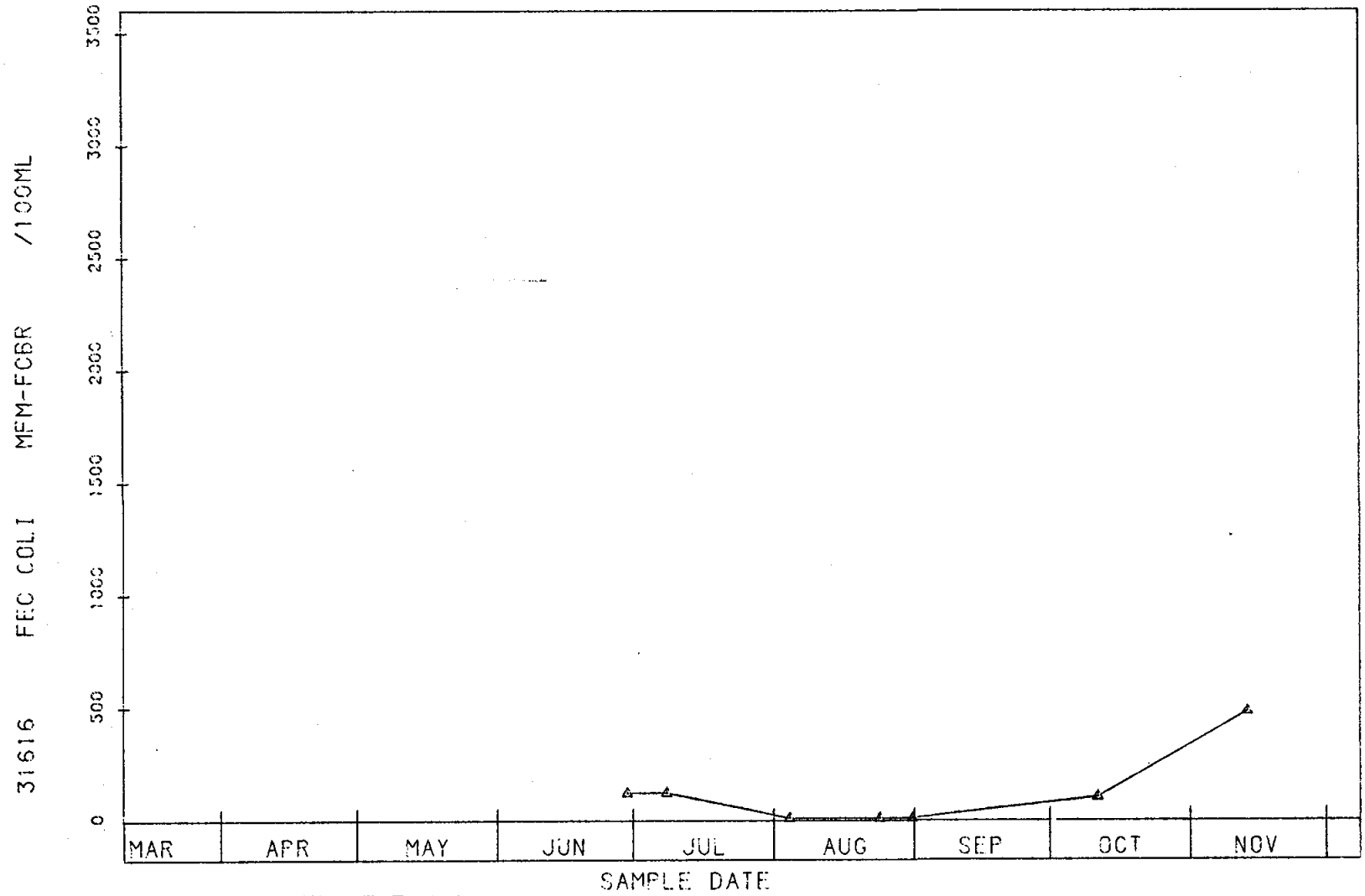
46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741349-0824212

Figure IV-12.



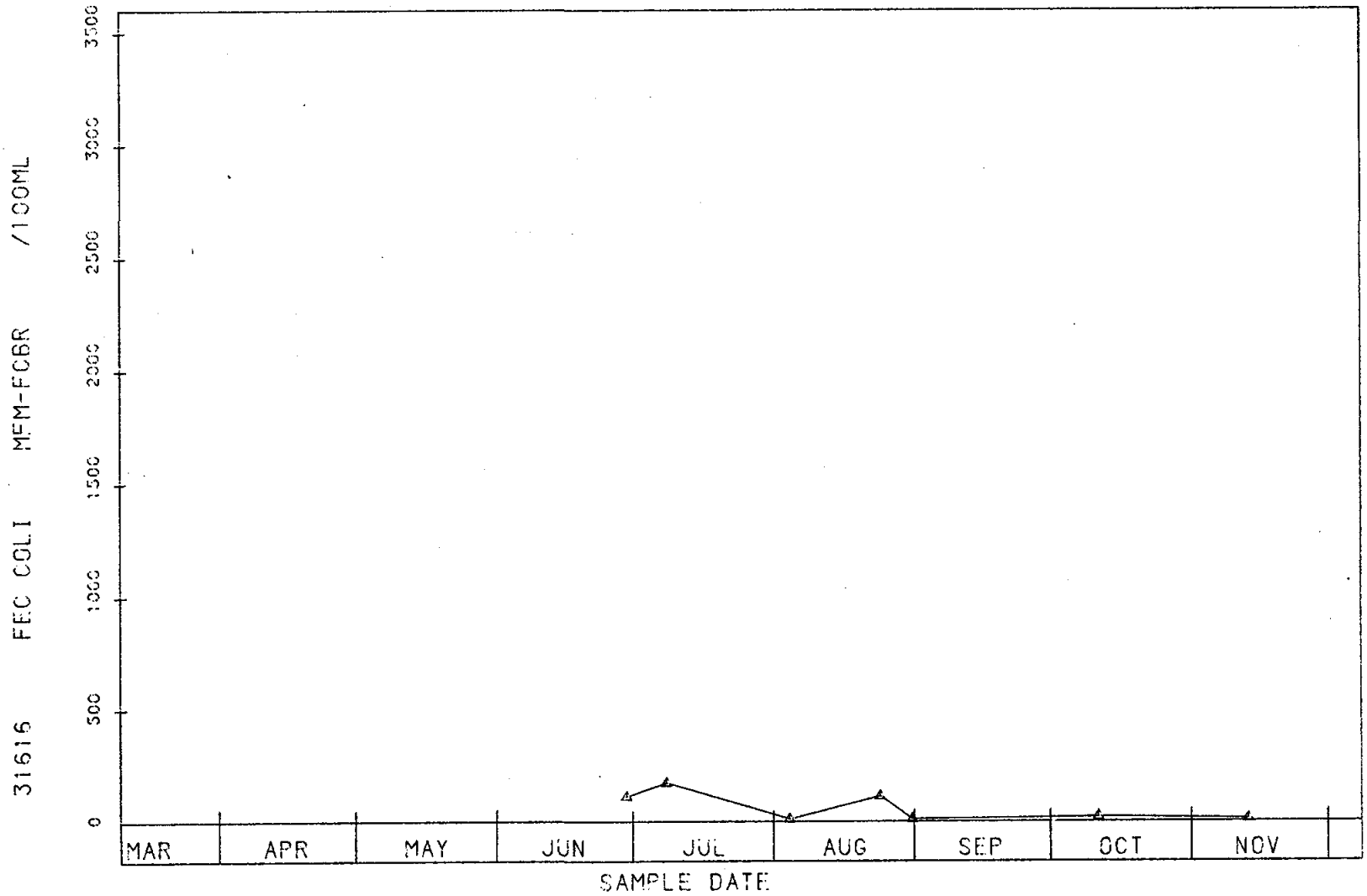
46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

Figure IV-13.



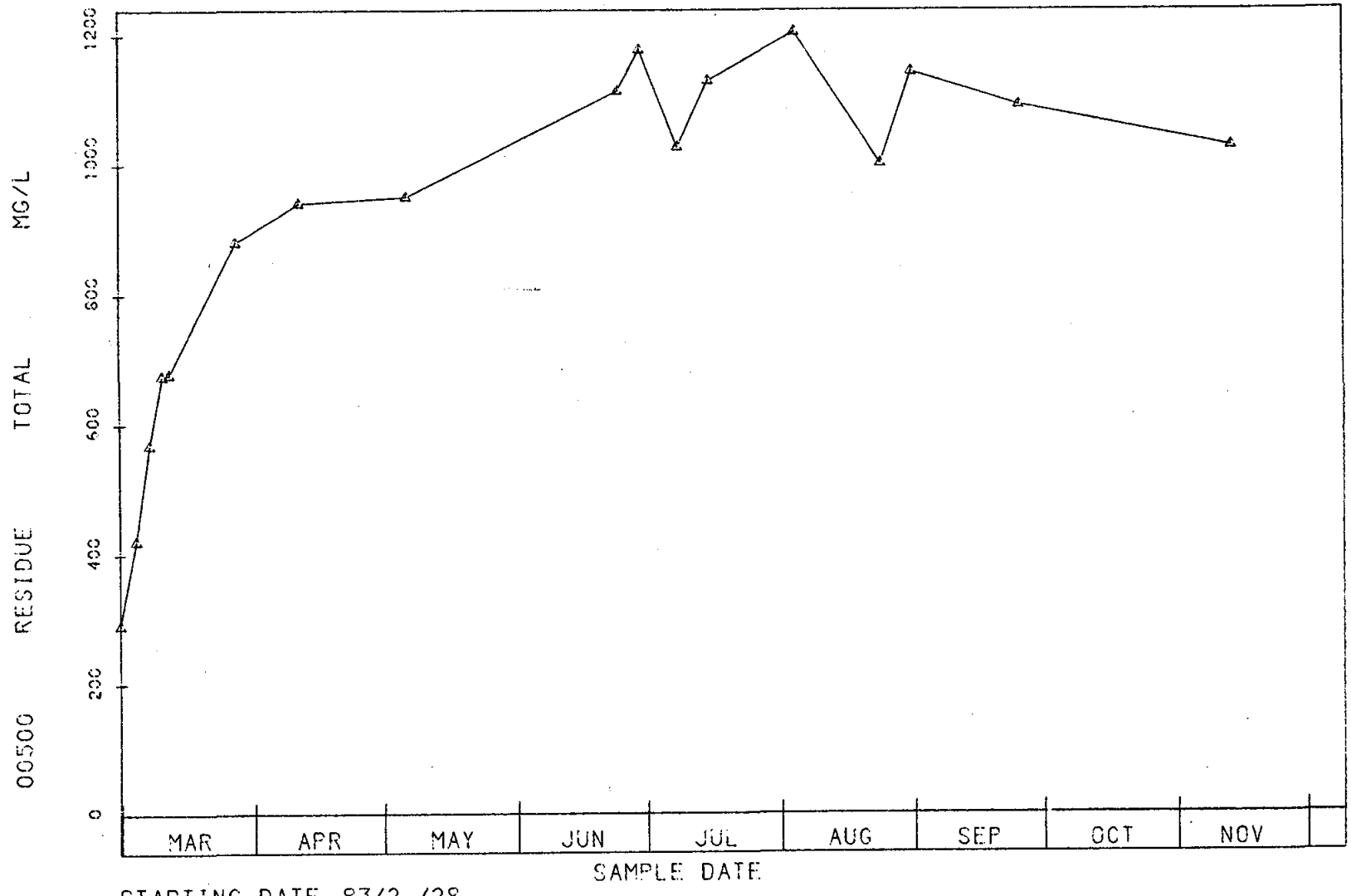
46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

Figure IV-14.



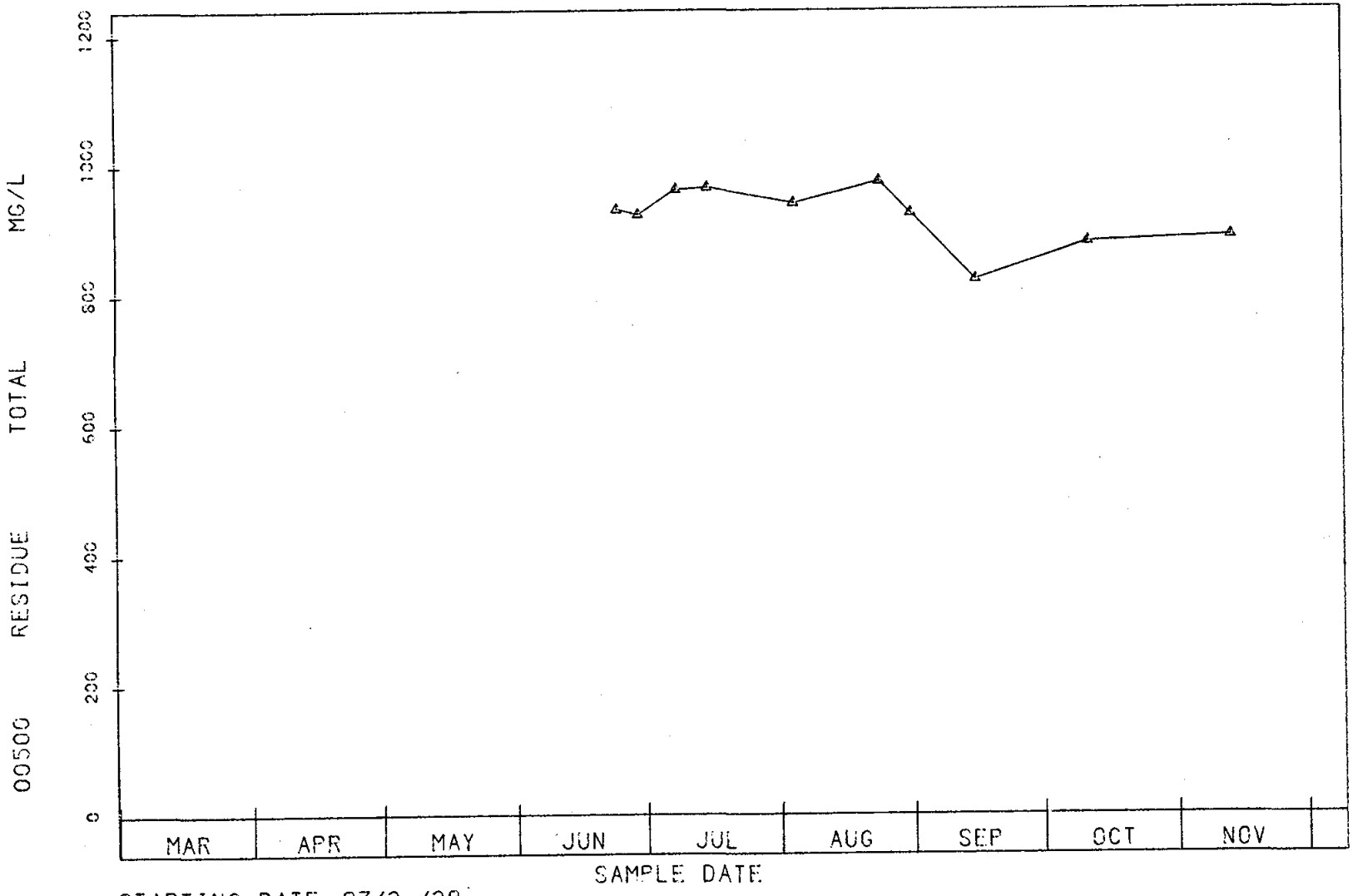
46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

Figure IV-15.



46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 09C700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

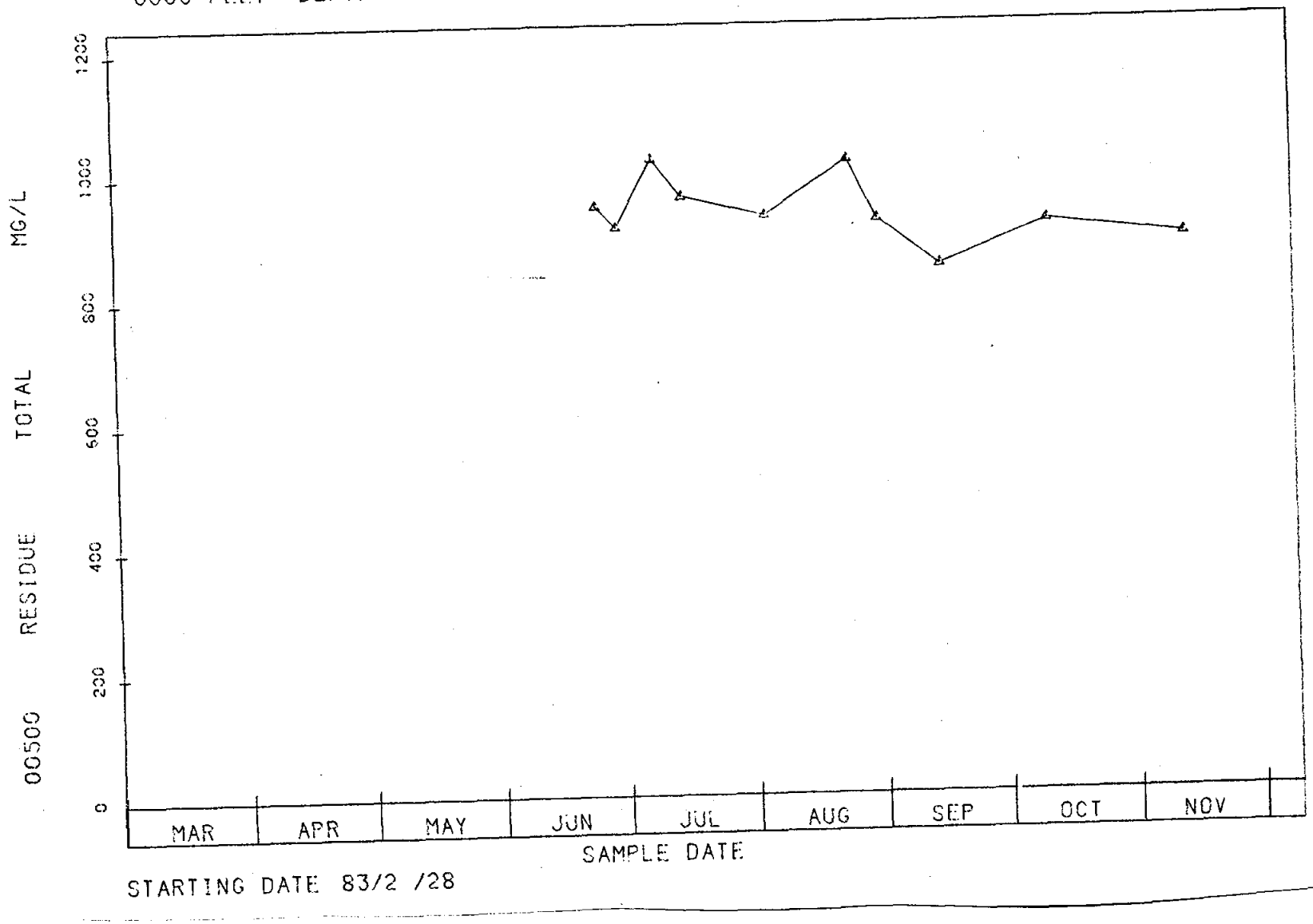
Figure IV-18.




STARTING DATE 83/2 /28

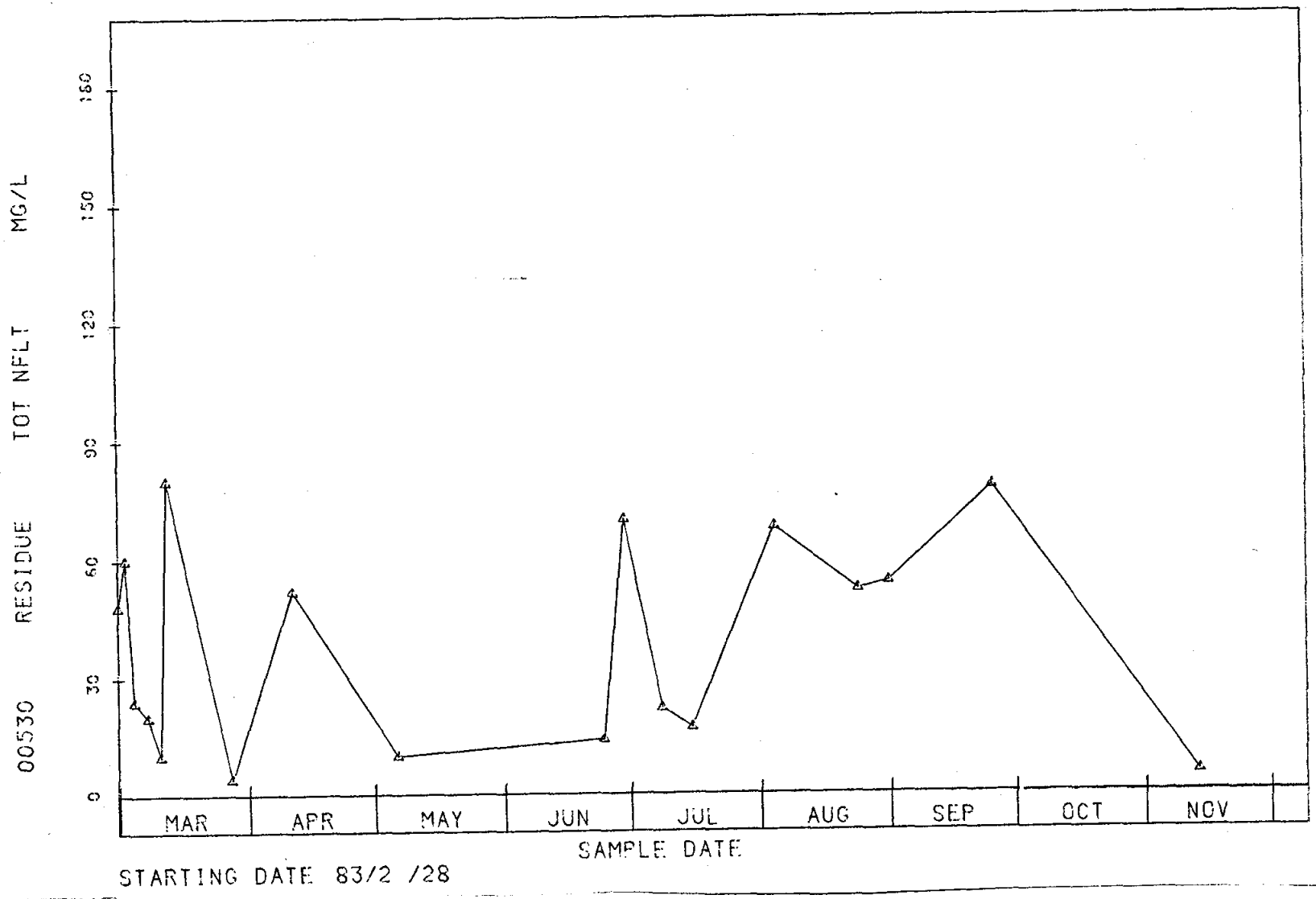
46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

Figure IV-19.



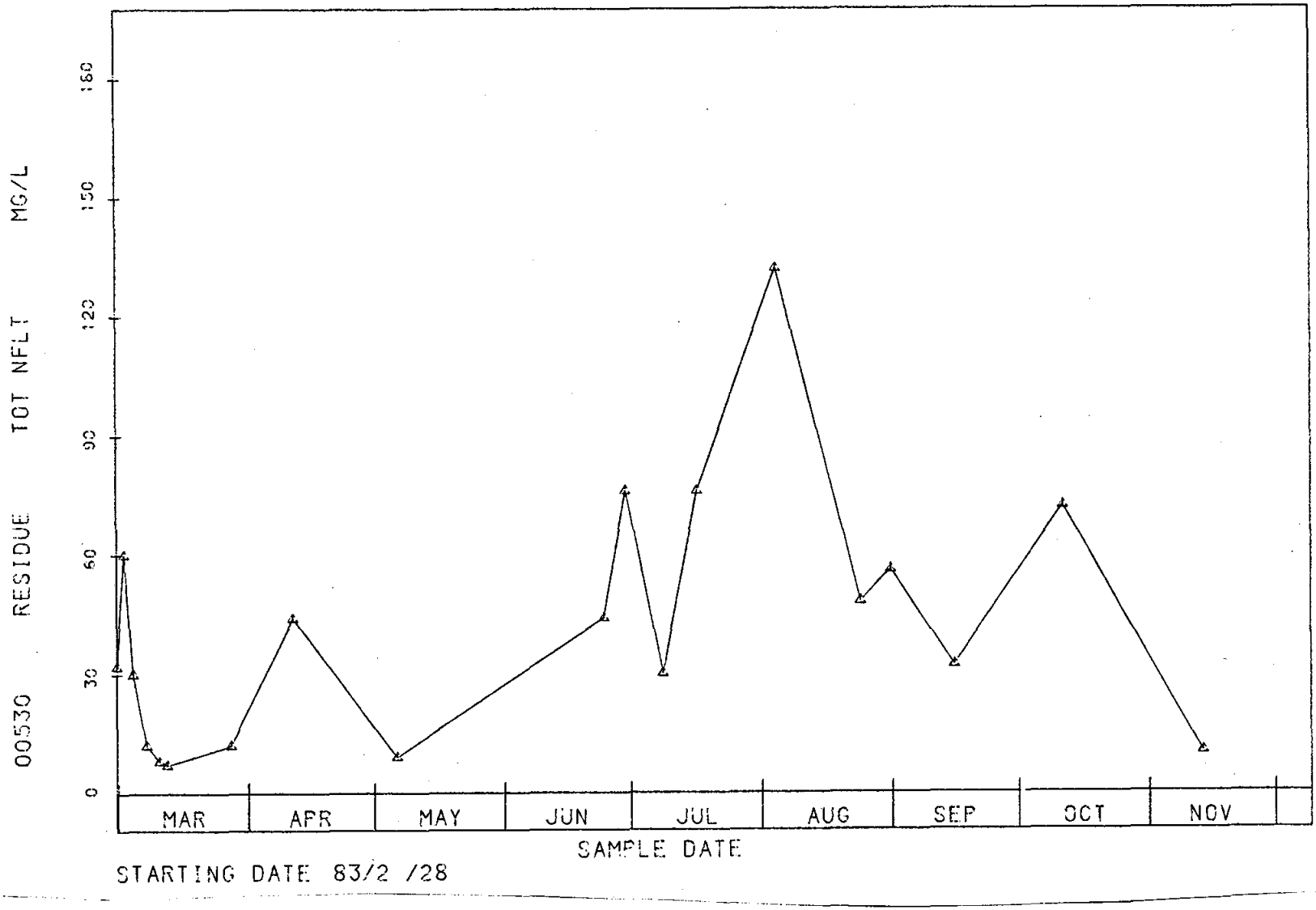
46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

Figure IV-20.



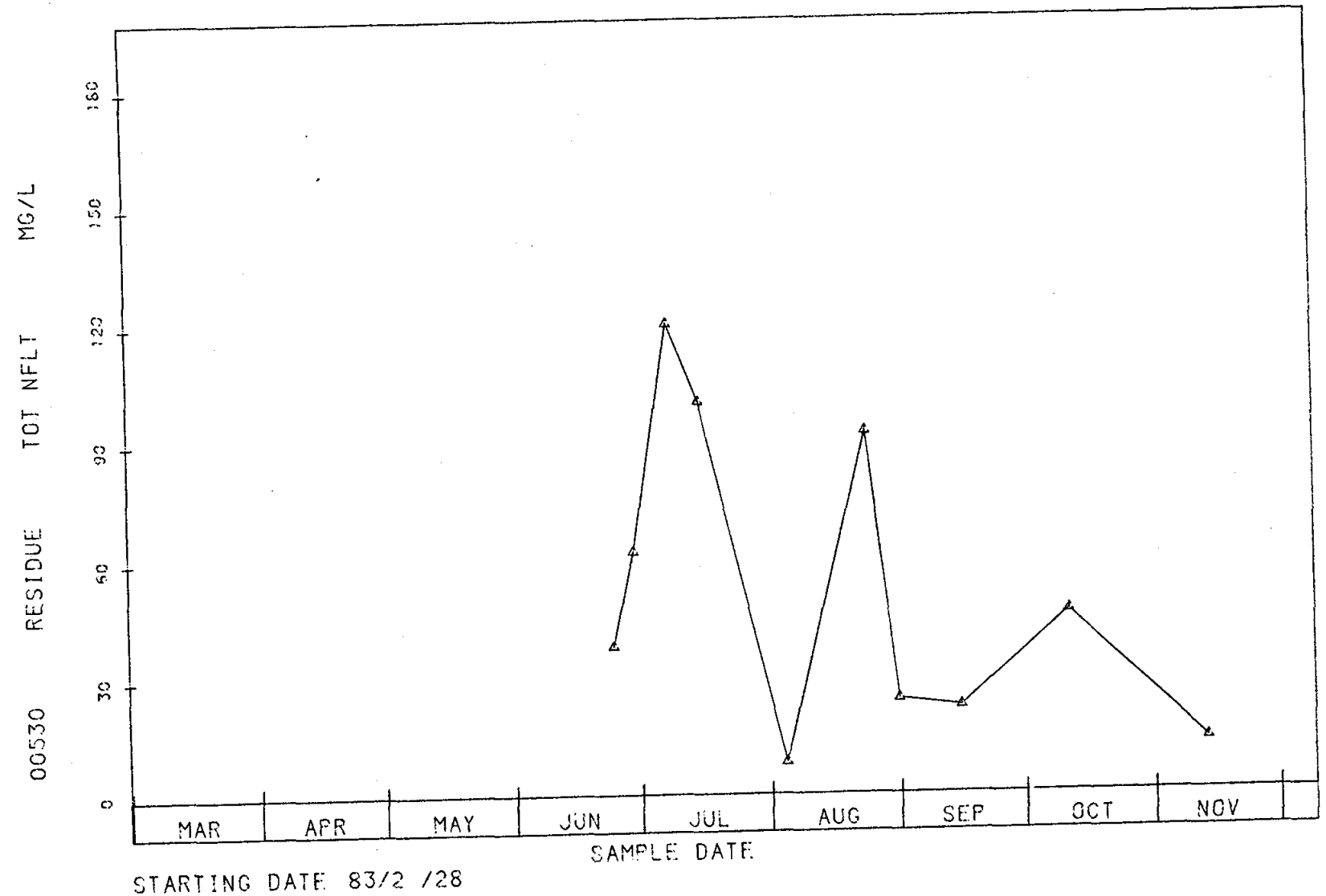
46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-21.



46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

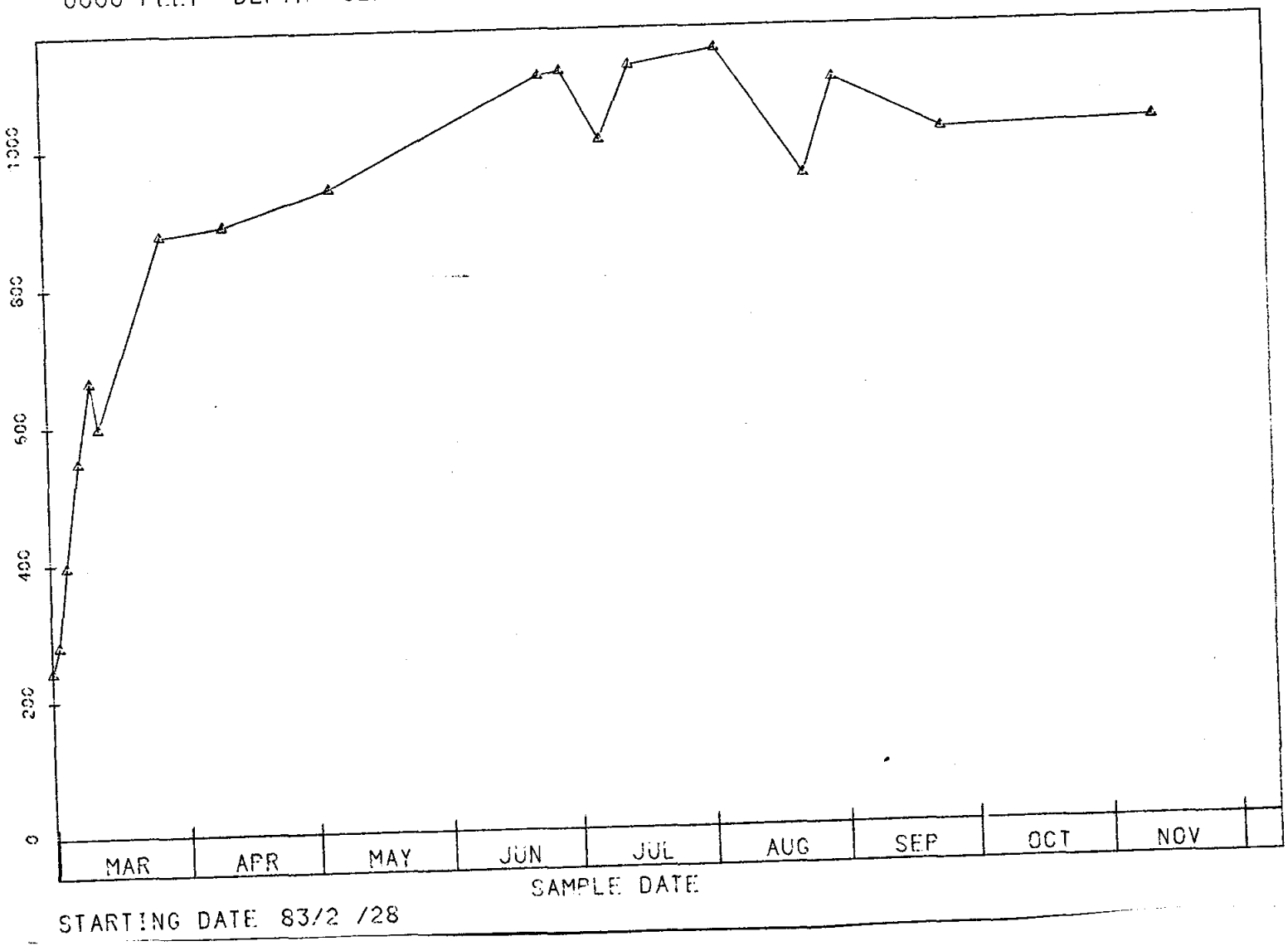
Figure IV-24.




STARTING DATE 83/2 /28

46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

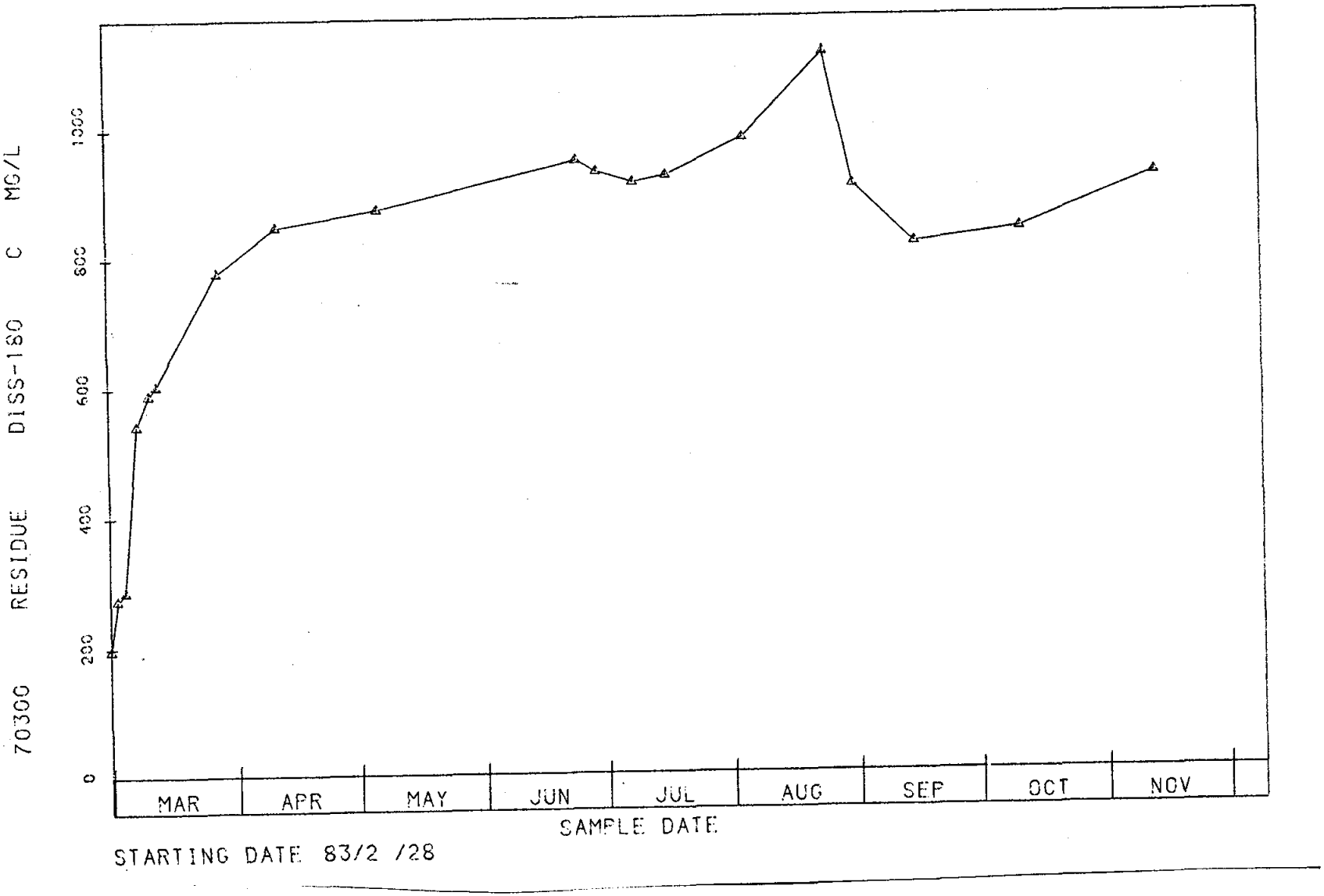
Figure IV-25.




09

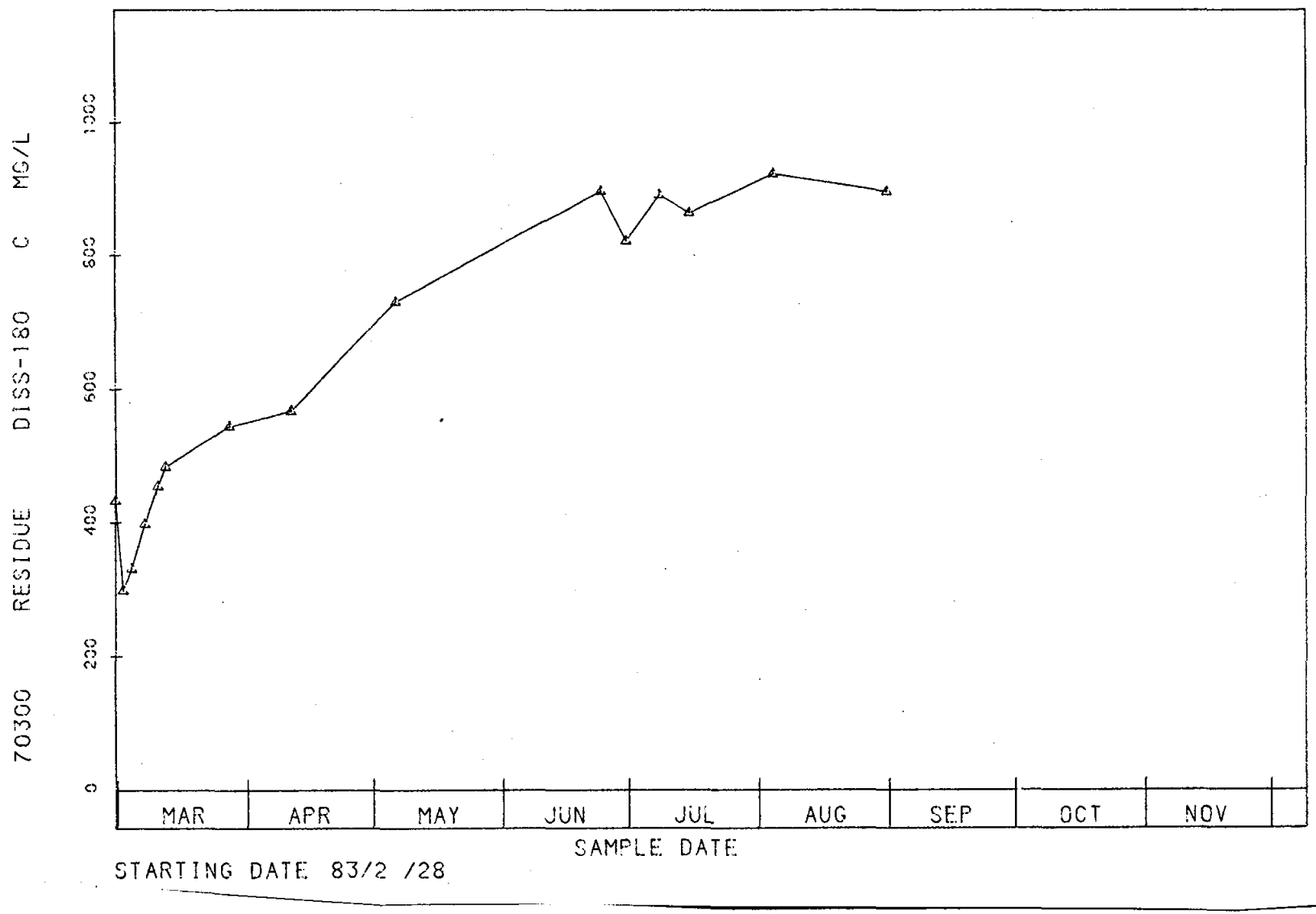
46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-26.



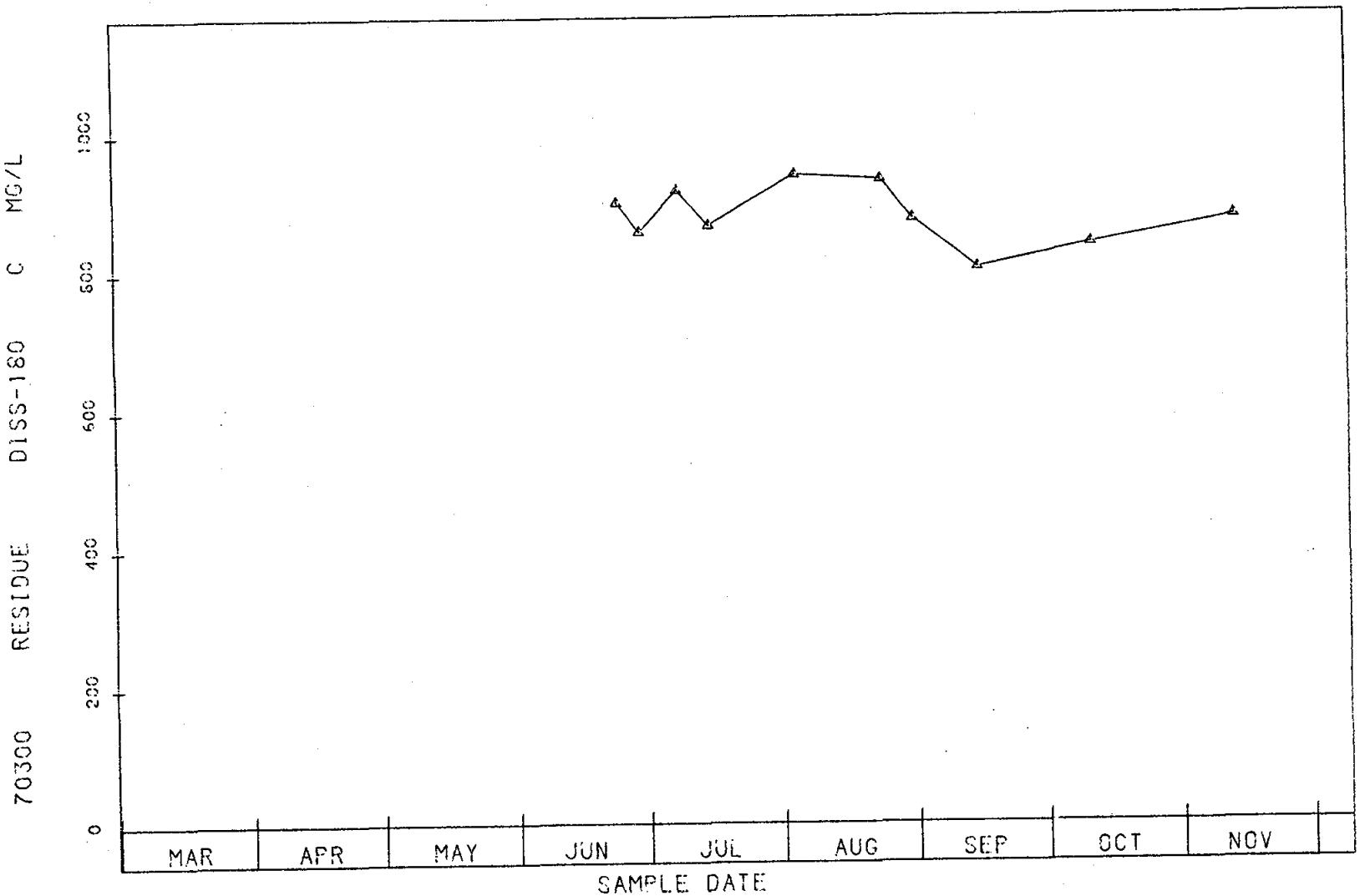

L9

Figure IV-27.


46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741349-0824212
70300 RESIDUE DISS-180 C MG/L
0
200
400
600
800
1000
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
SAMPLE DATE
STARTING DATE 83/2 /28

46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

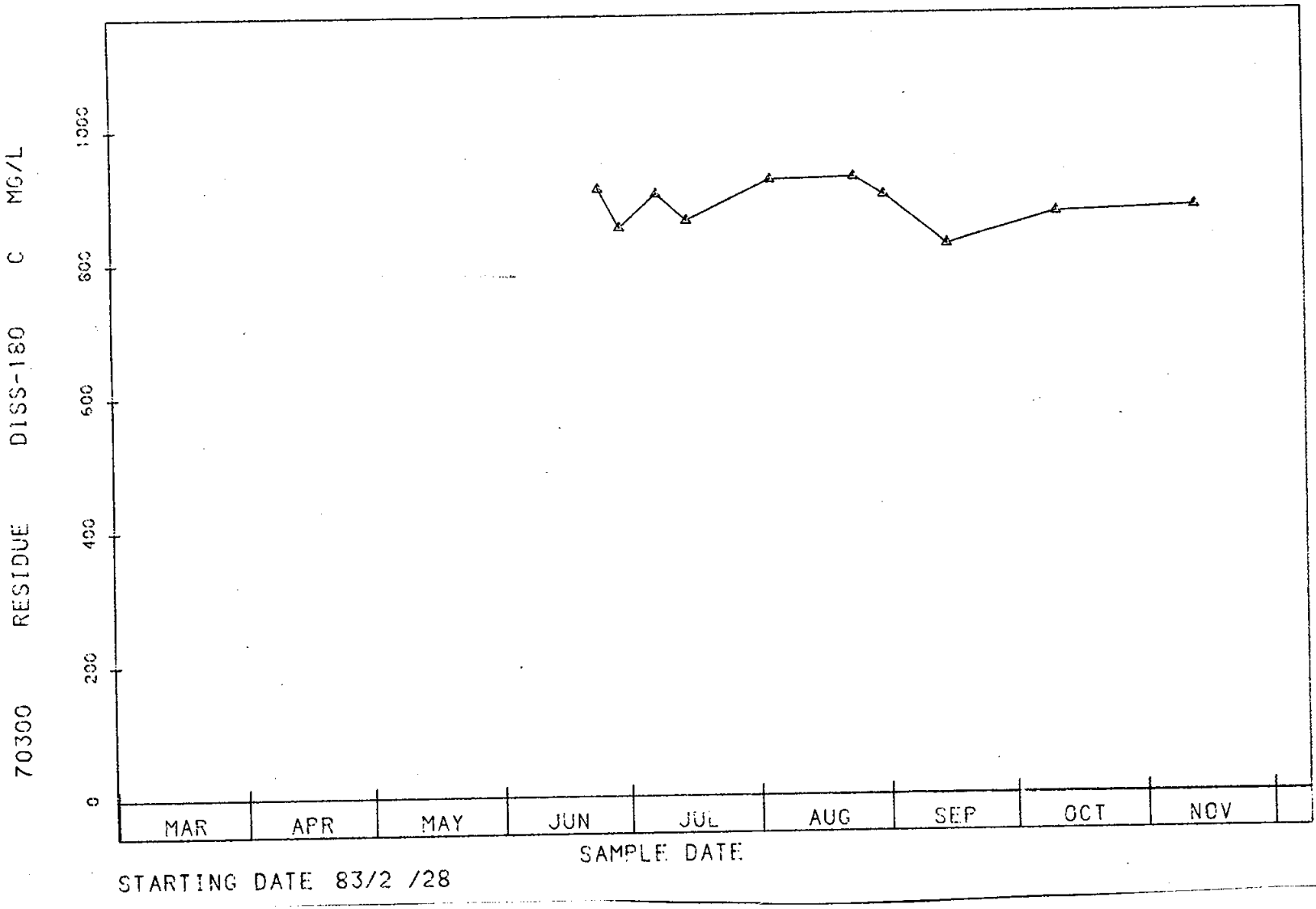
Figure IV-28.




STARTING DATE 83/2 /28

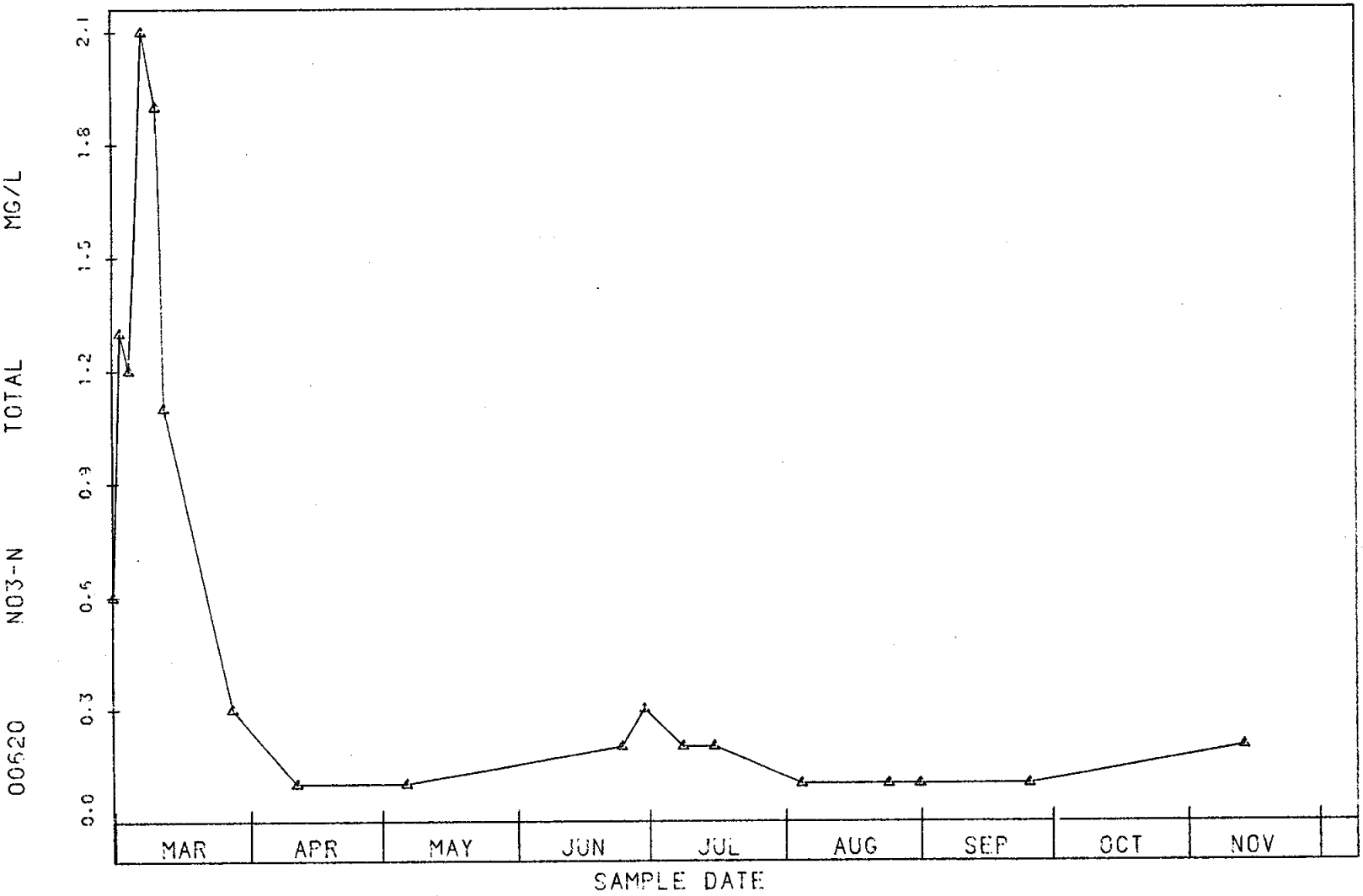
46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

Figure IV-29.



46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

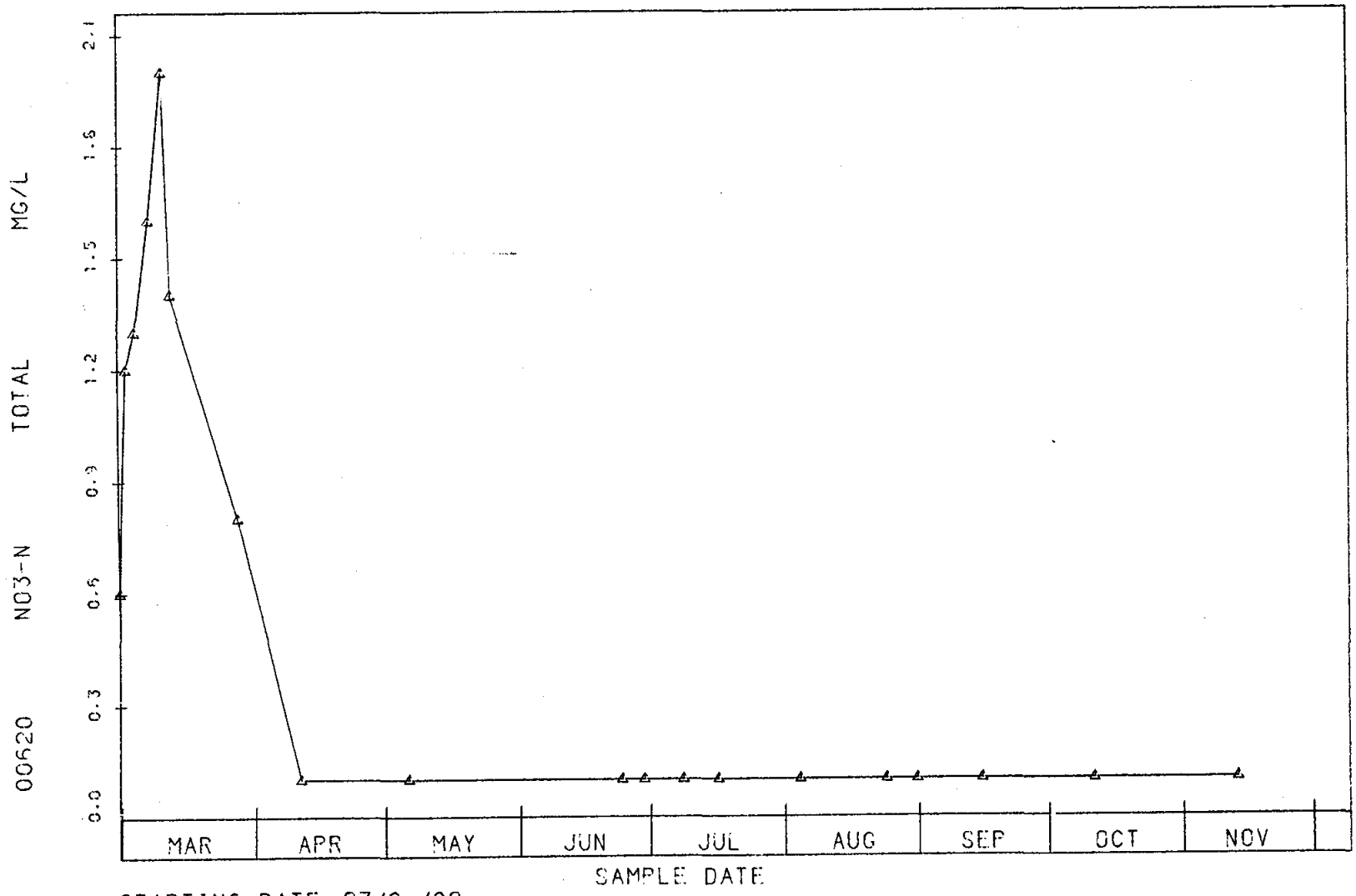
Figure IV-30.




STARTING DATE 83/2 /28

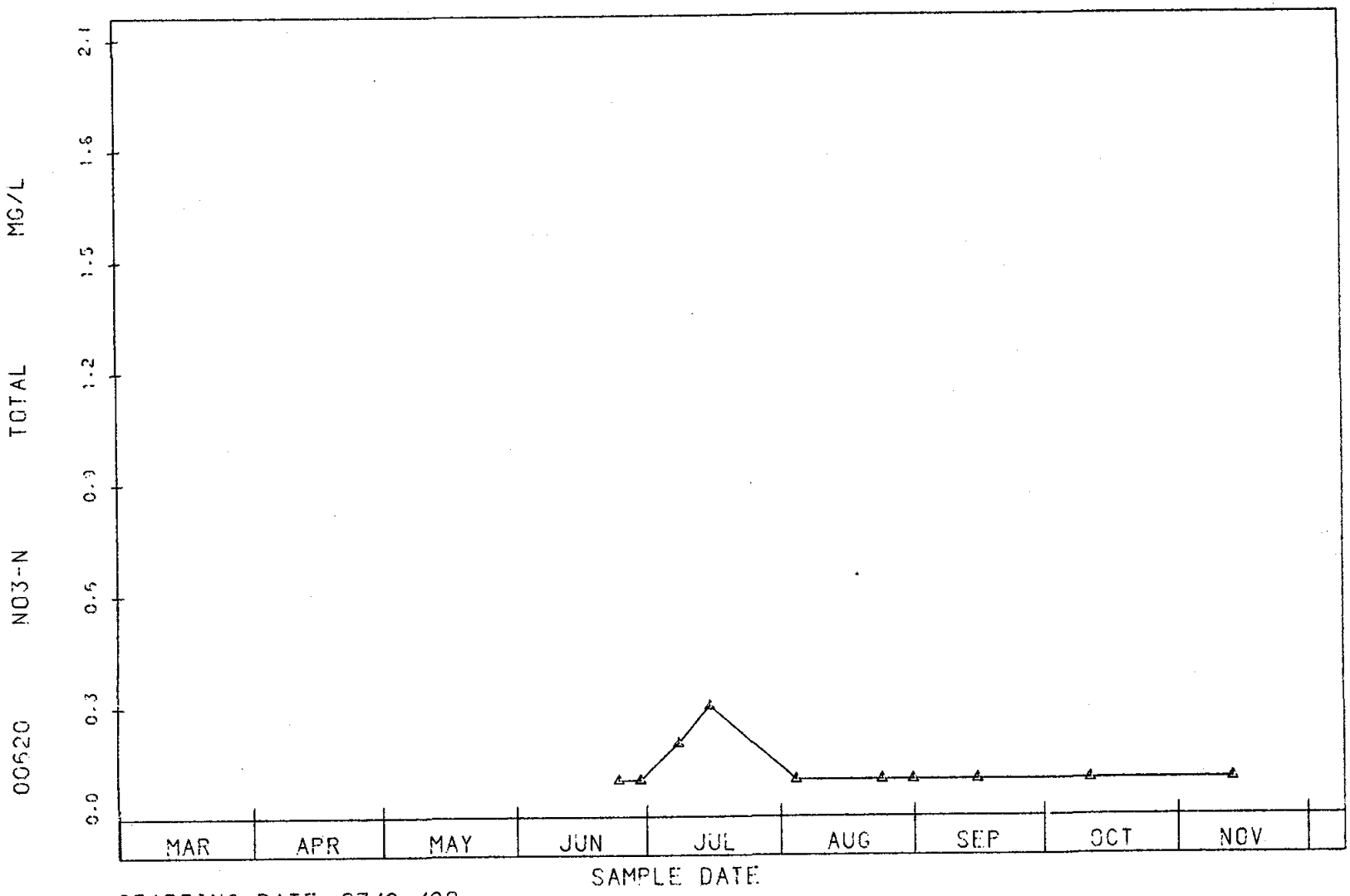
46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-31.



46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

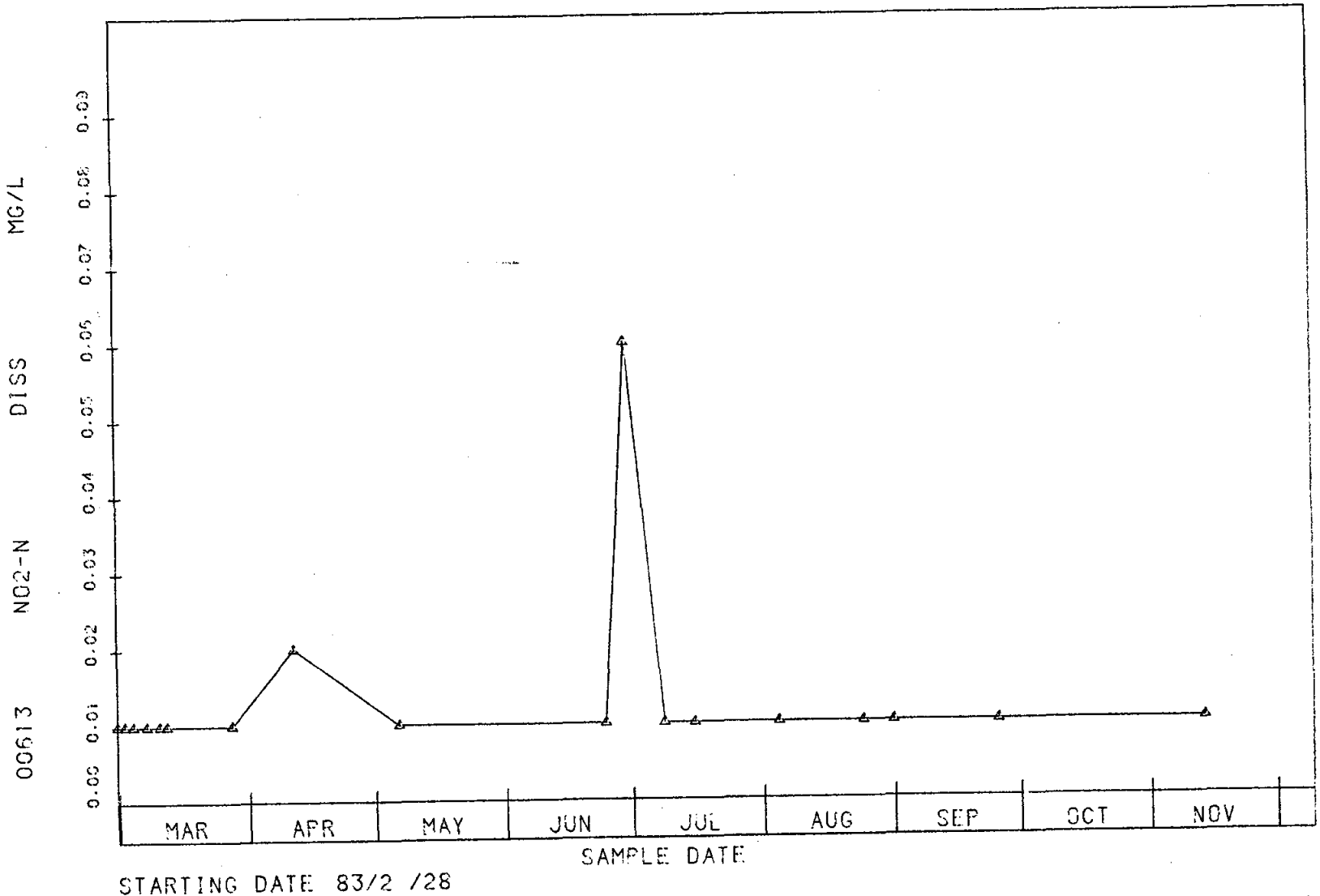
Figure IV-34.




STARTING DATE 83/2 /28

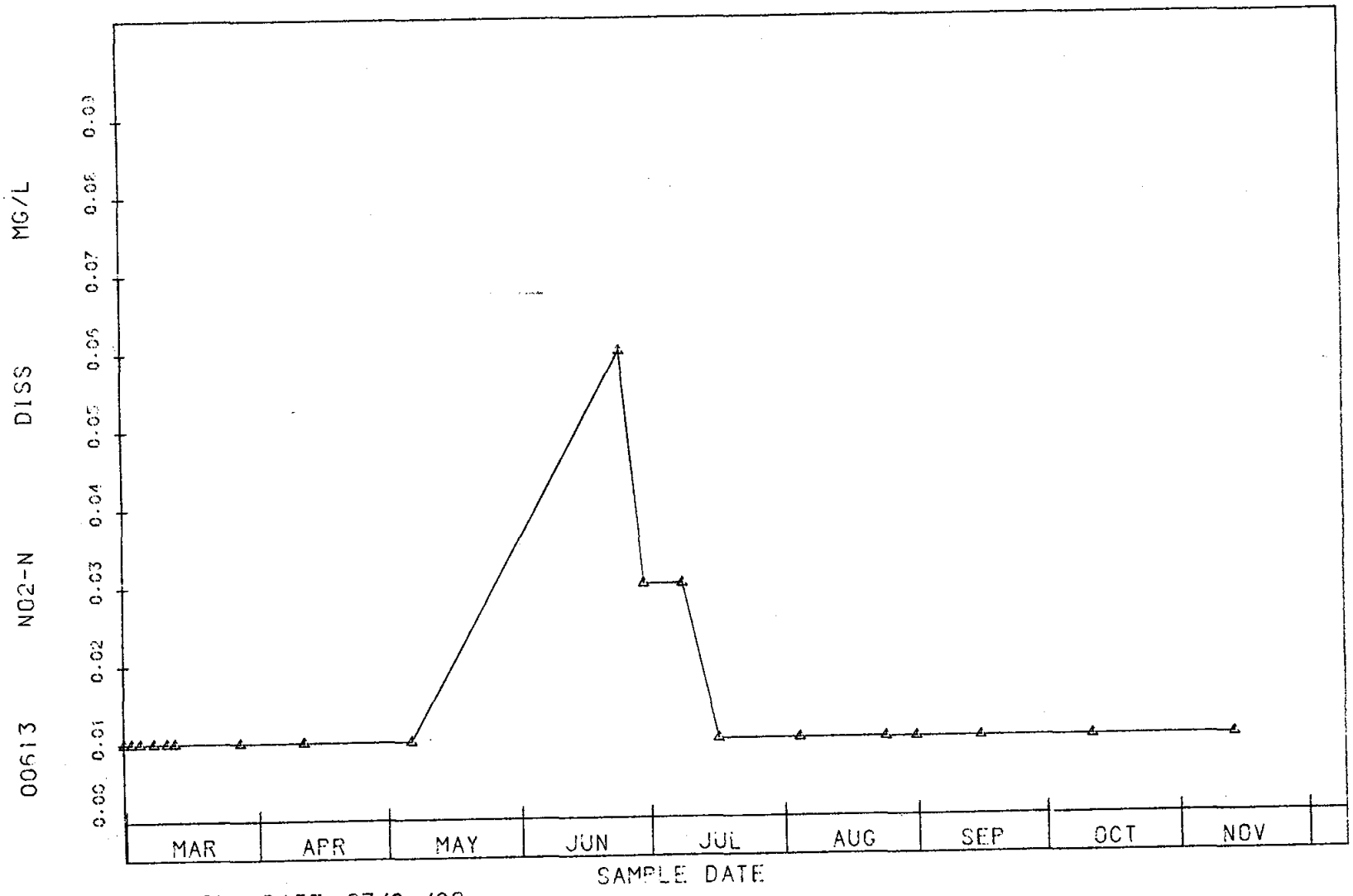
46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

Figure IV-35.



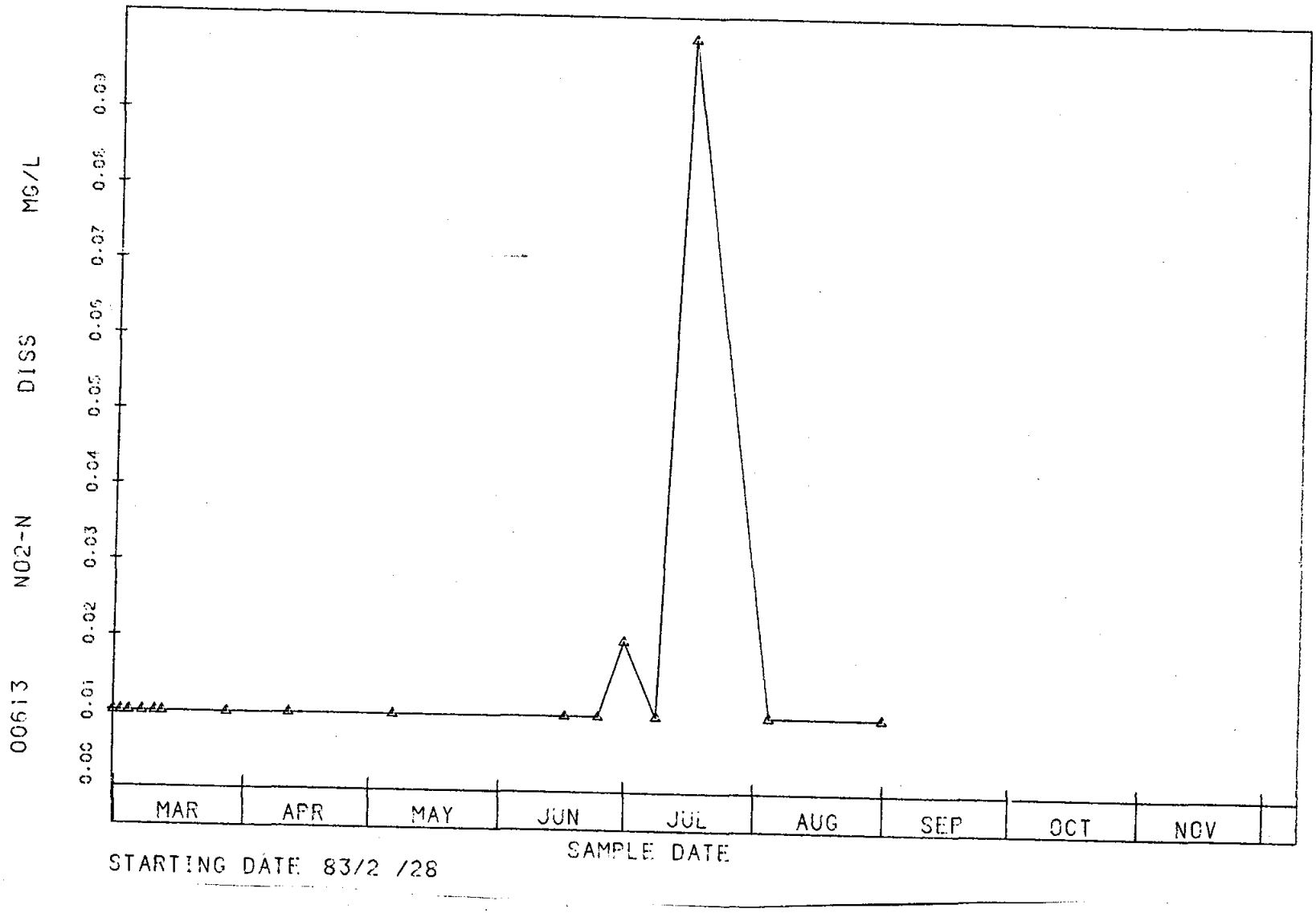
46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-36.



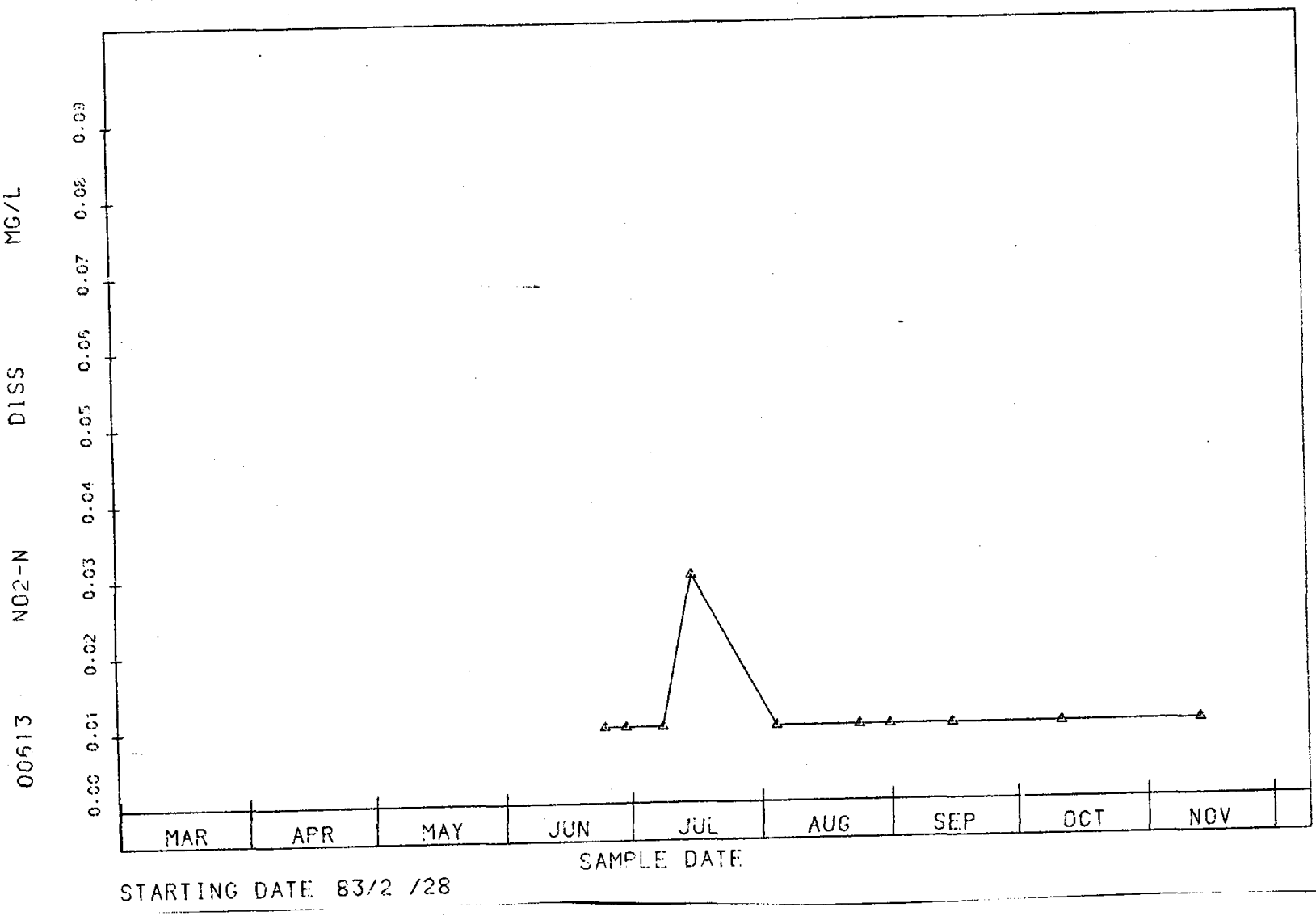

STARTING DATE 83/2 /28

Figure IV-37.


46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741349-0824212
00613 NO2-N DISS MG/L
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
SAMPLE DATE
STARTING DATE 83/2 /28

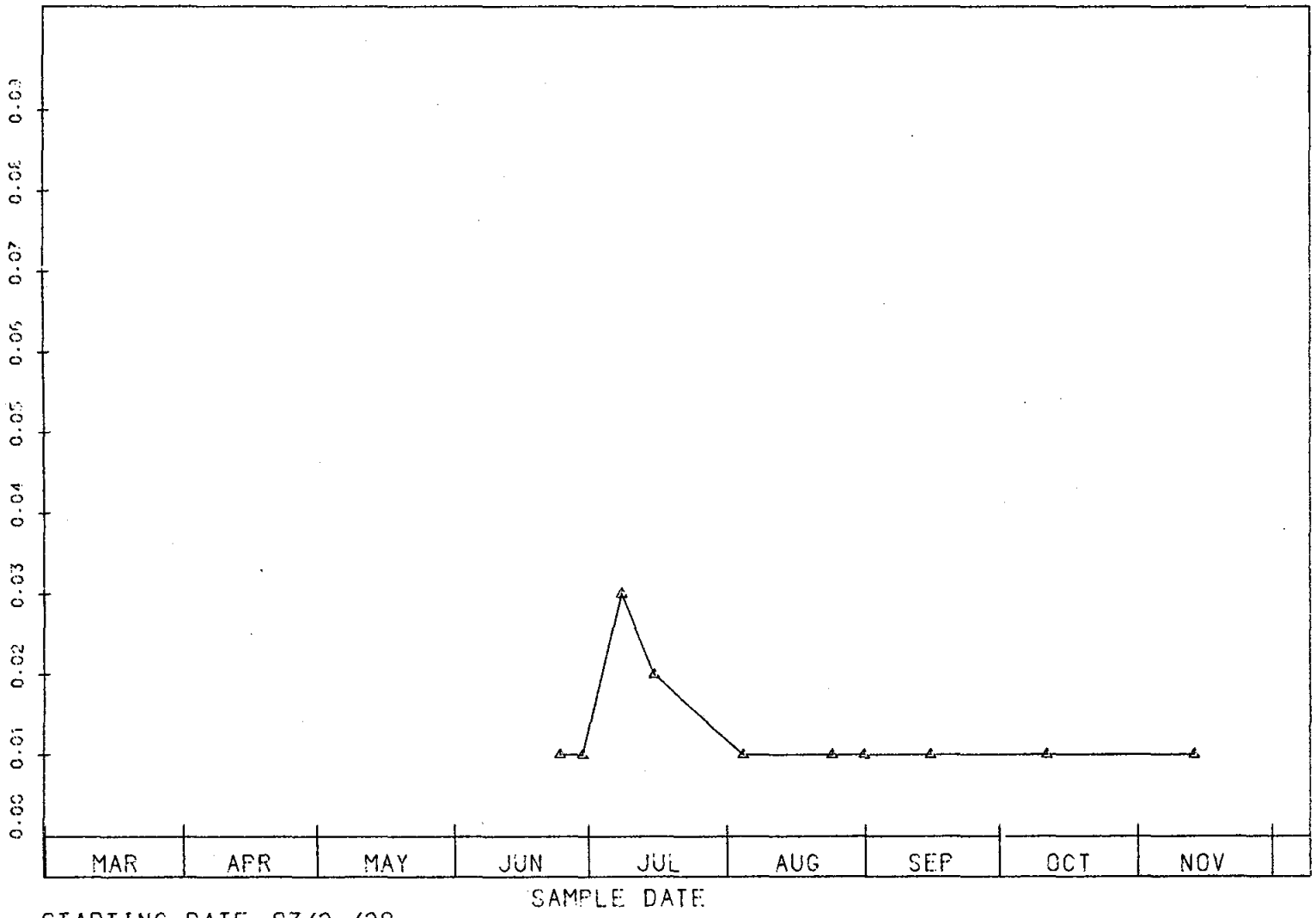
46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

Figure IV-38.



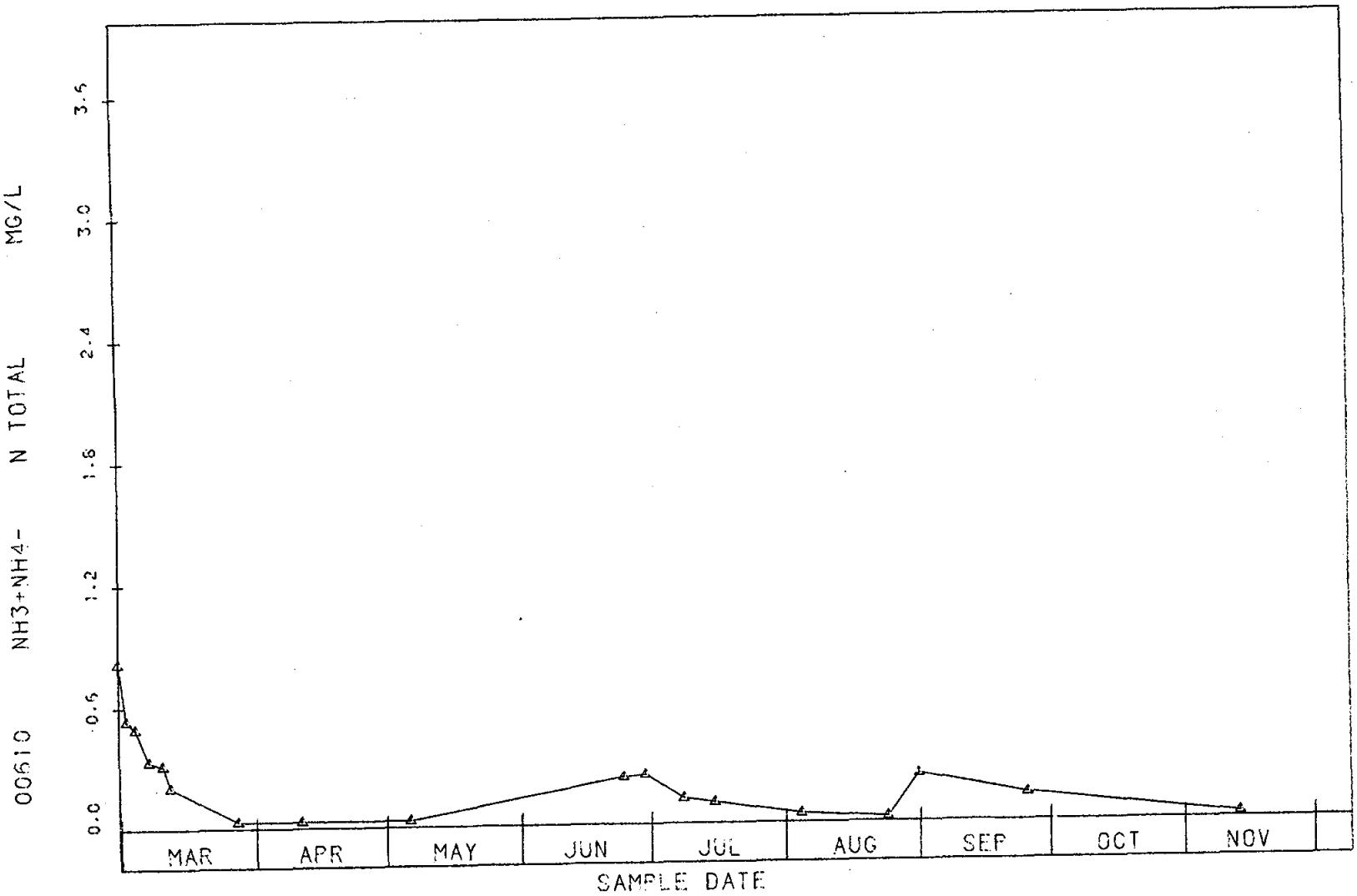
46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

Figure IV-39.



46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

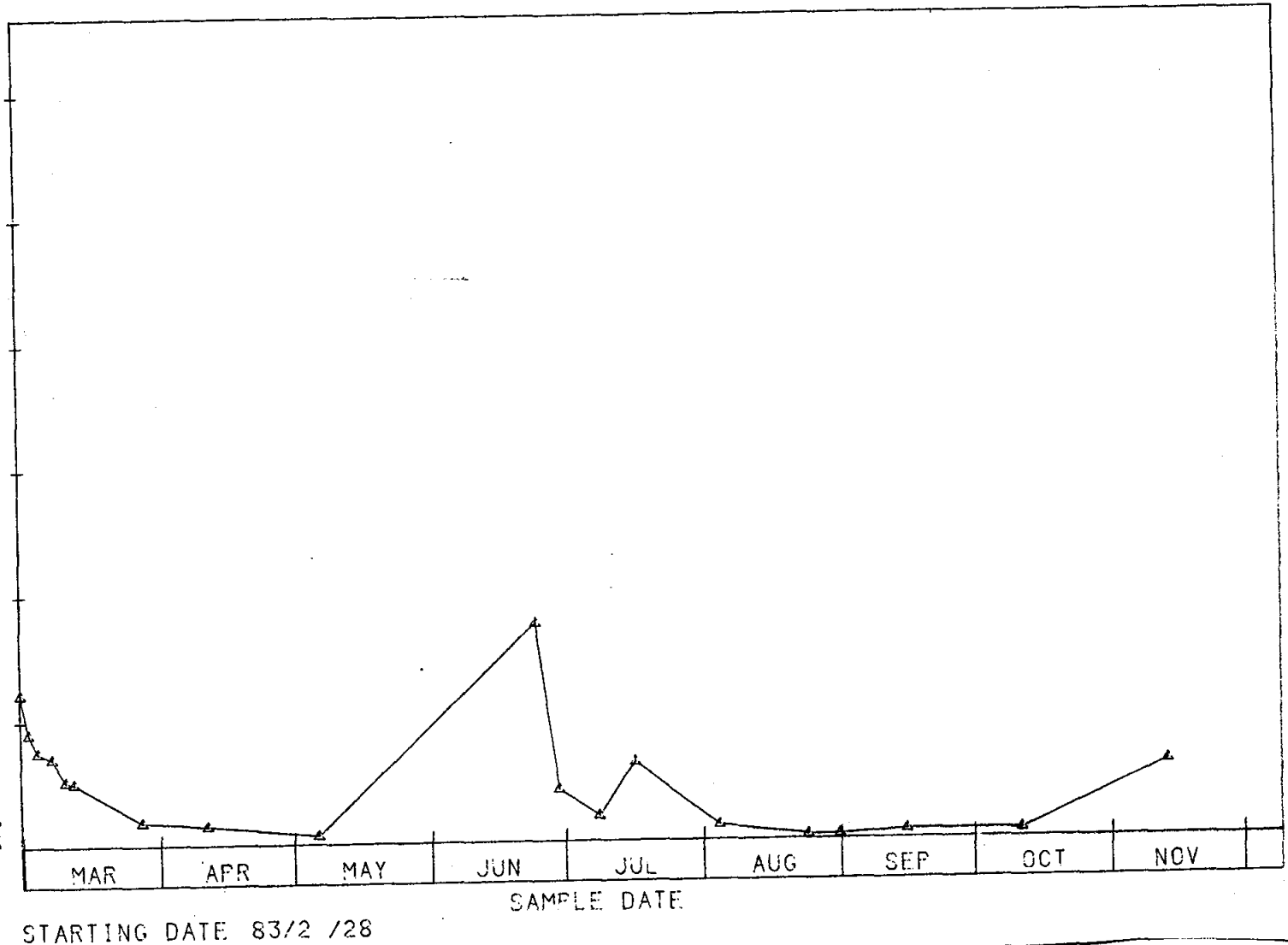
Figure IV-40.




STARTING DATE 83/2 /28

46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSF 0741348-0824211

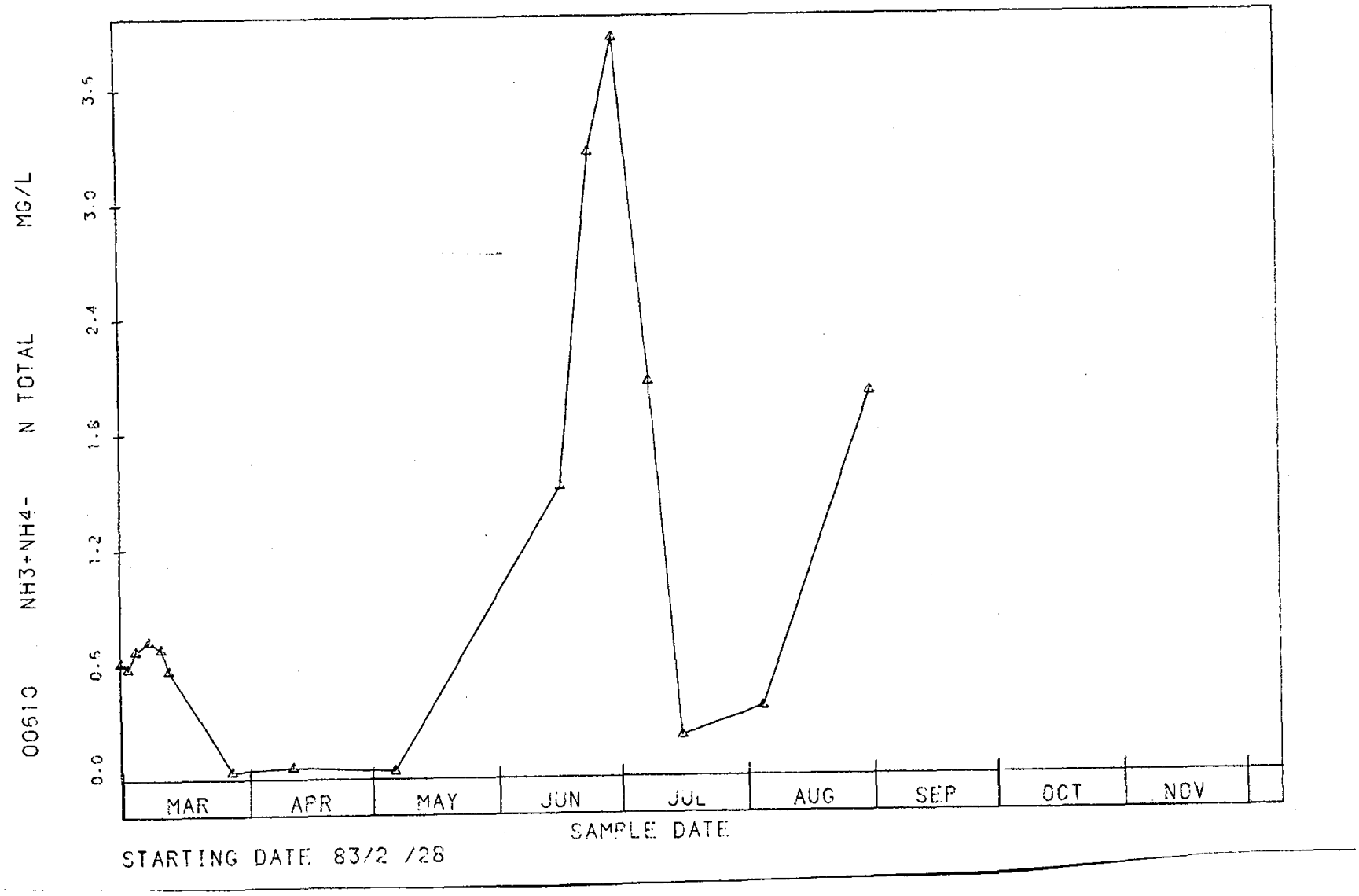
Figure IV-41.




STARTING DATE 83/2 /28

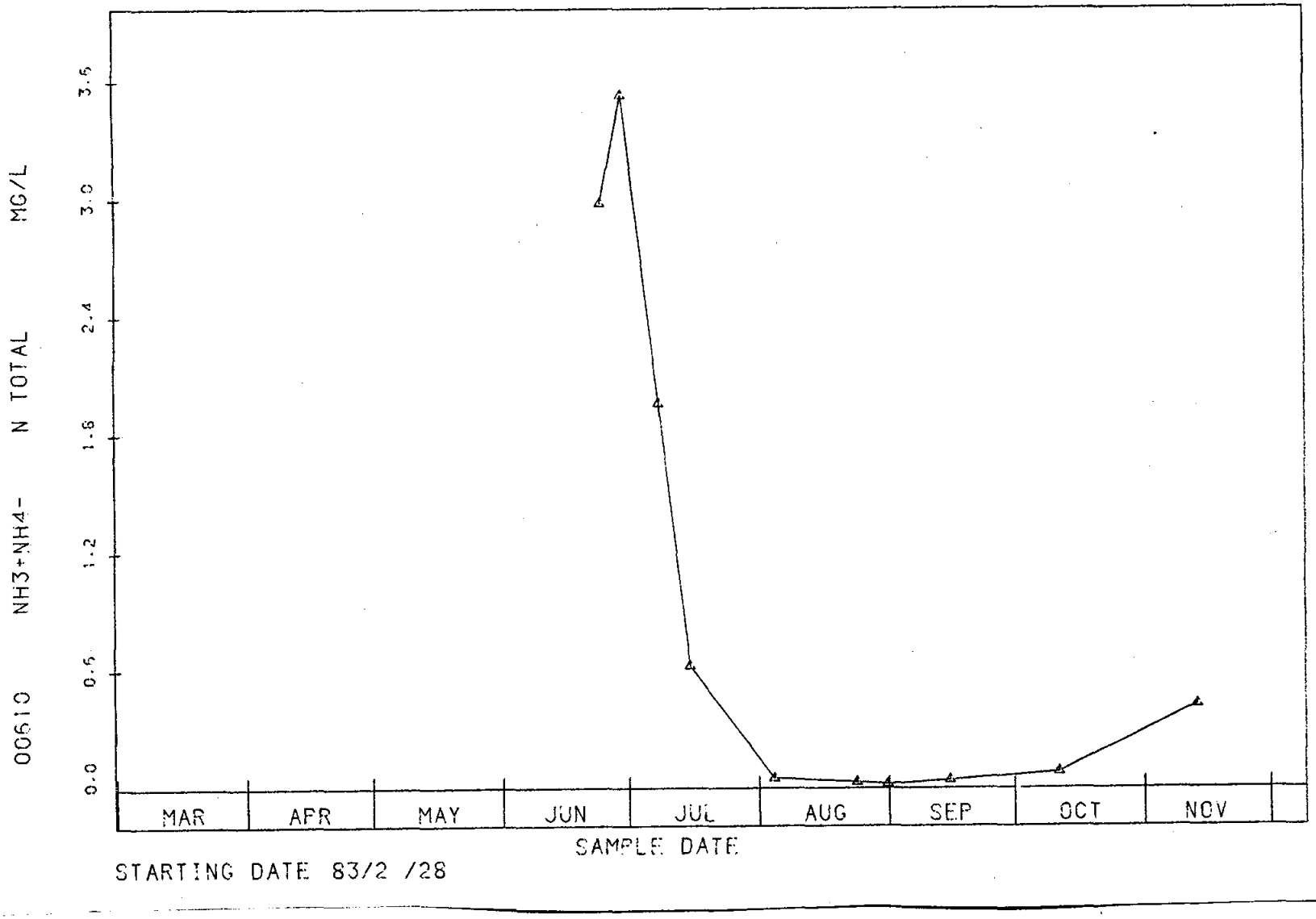
46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 OSN-RSP 0741349-0824212

Figure IV-42.



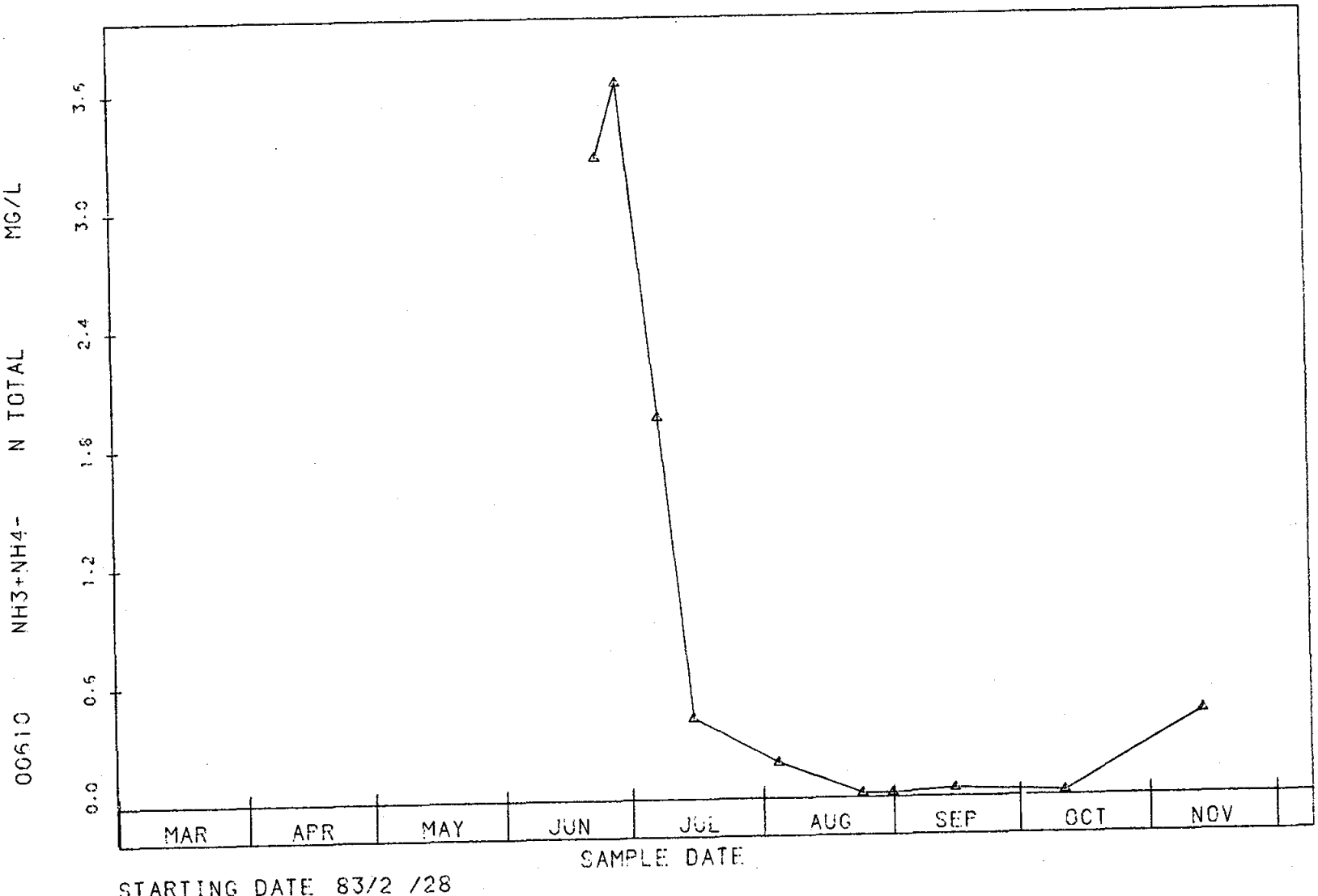
46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

Figure IV-43.



46CAUS
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

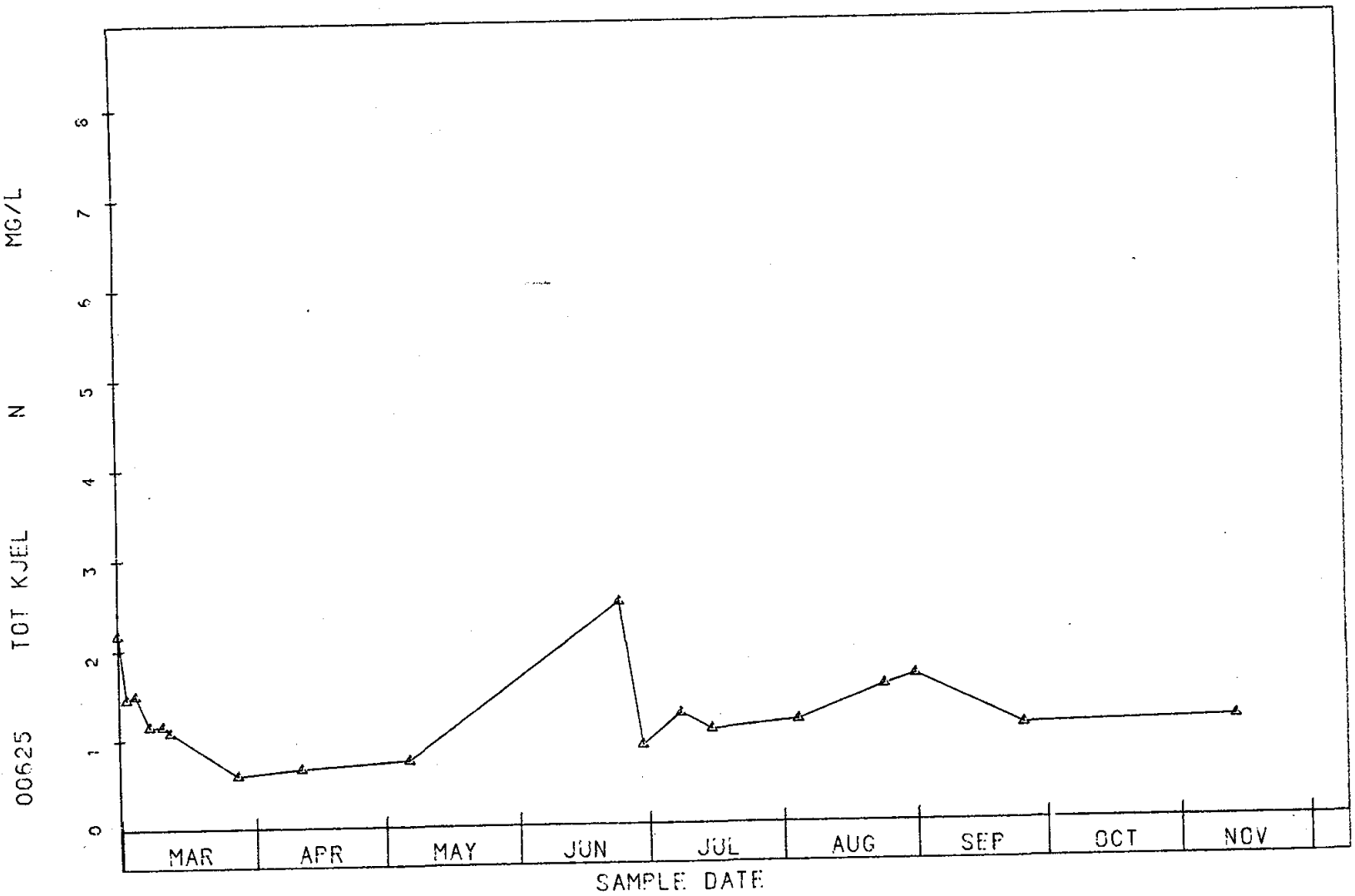
Figure IV-44.




STARTING DATE 83/2 /28

46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CCDC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

Figure IV-45.




STARTING DATE 83/2 /28

46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-46.

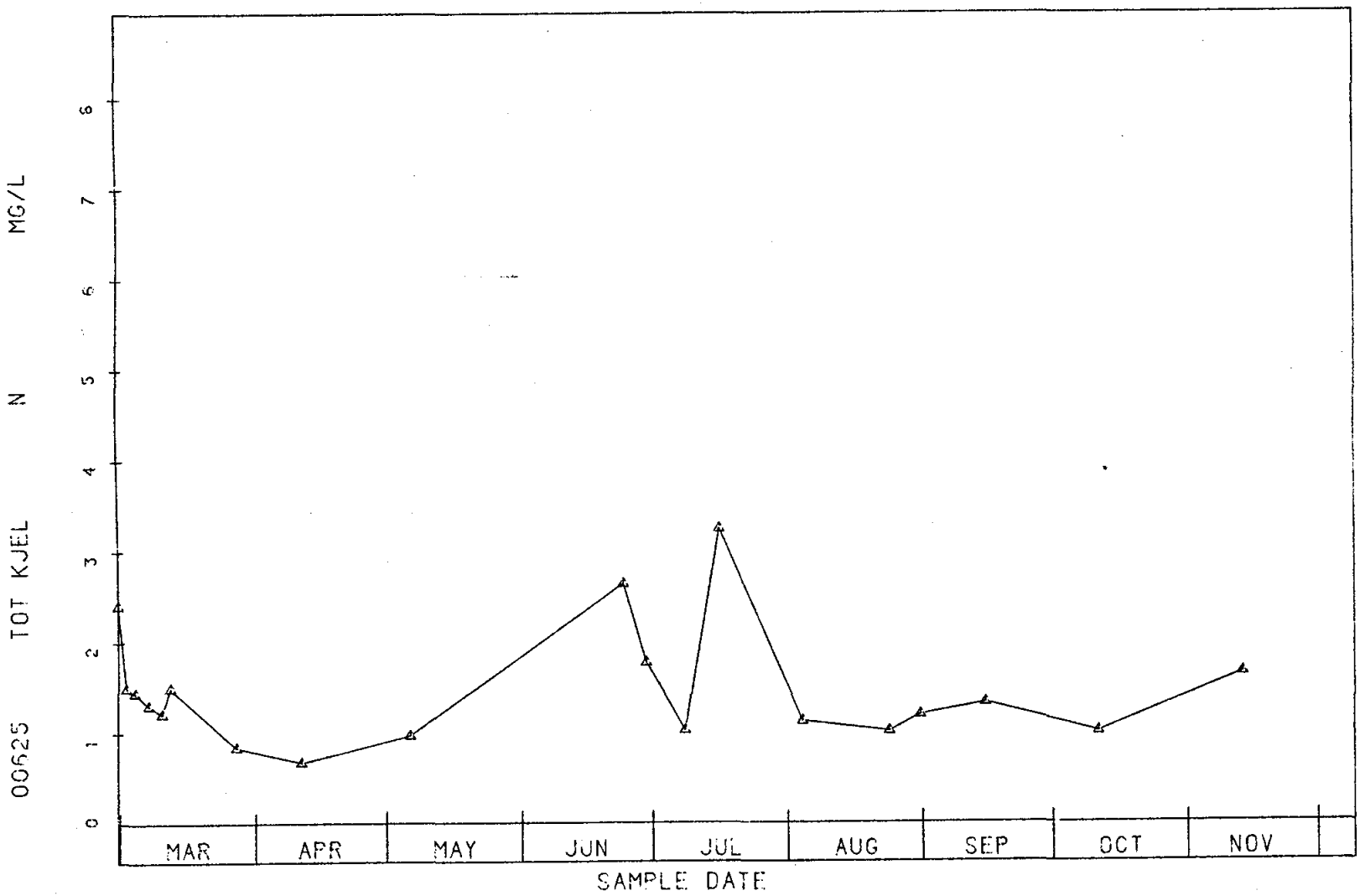
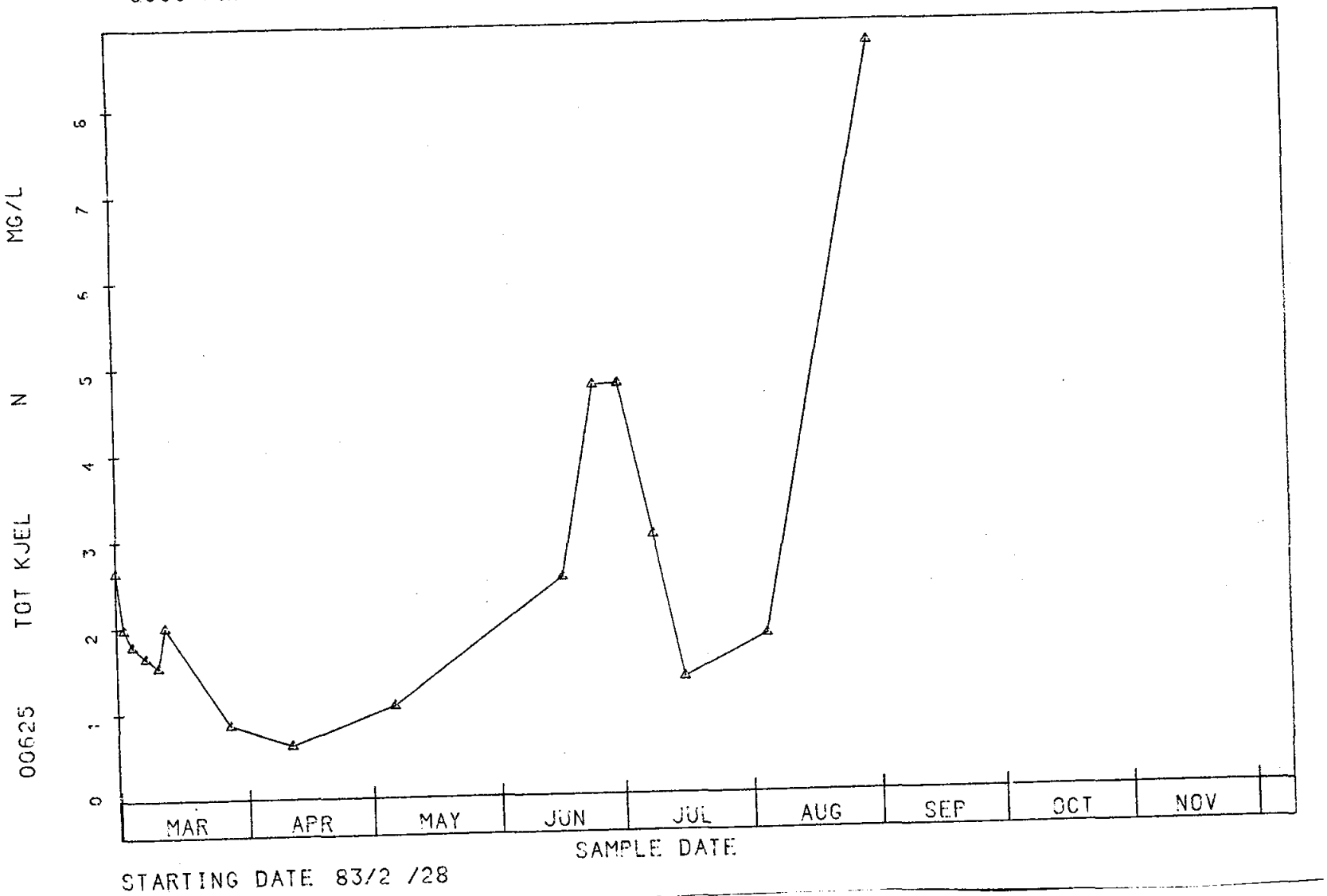


Figure IV-47.

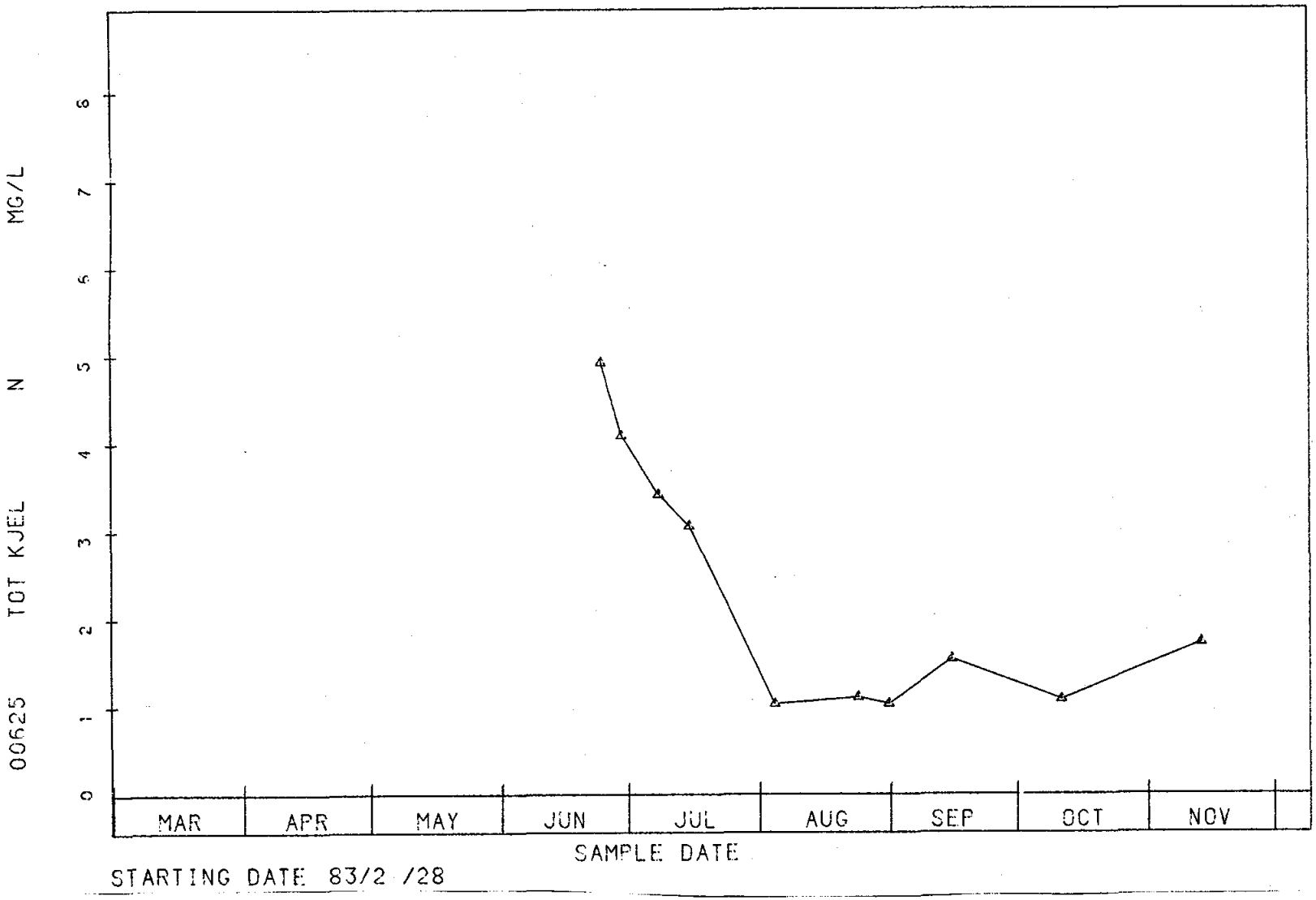
46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741349-0824212




STARTING DATE 83/2 /28

46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

Figure IV-48.



46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BOOD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

Figure IV-49.

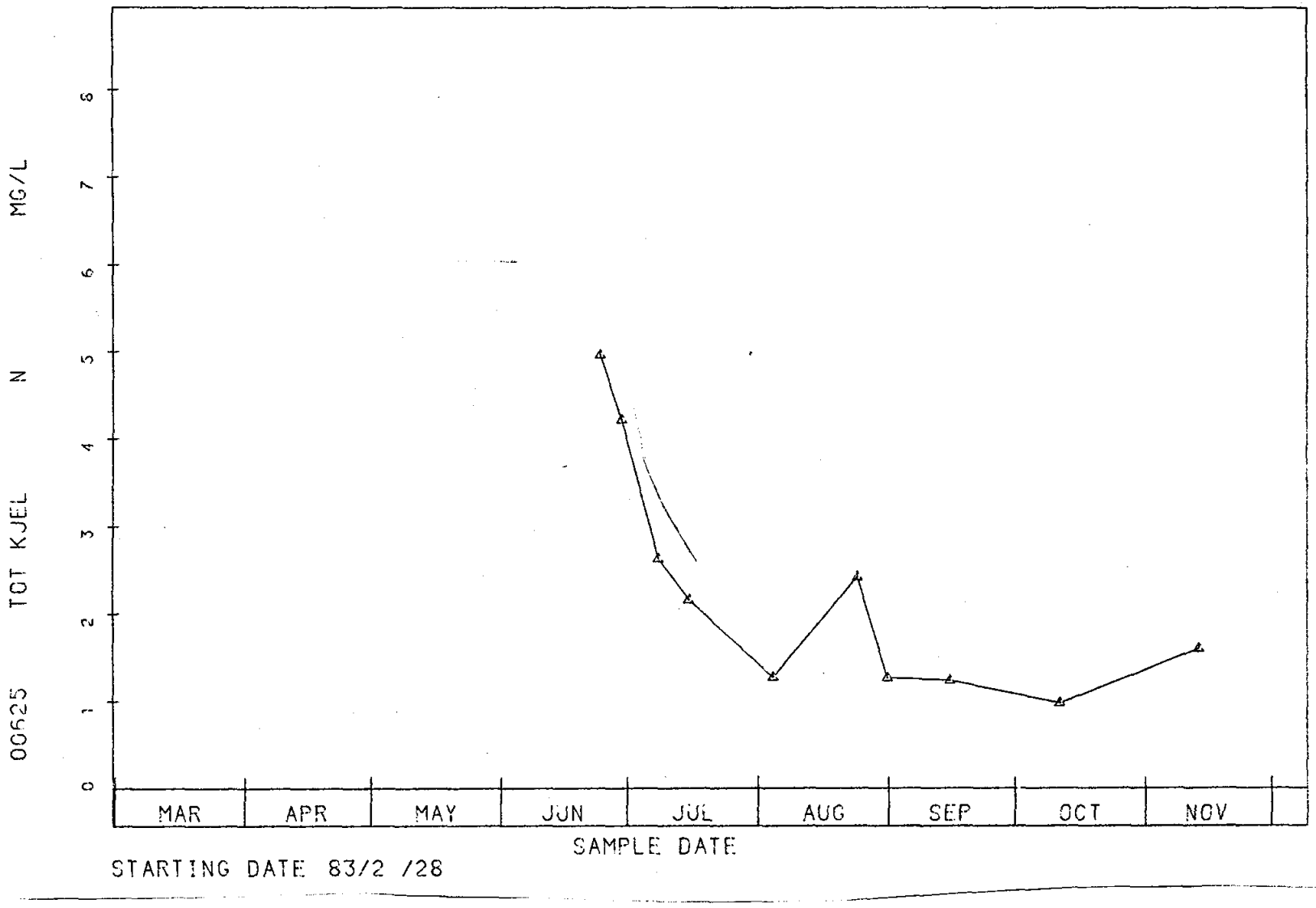


Figure IV-50.

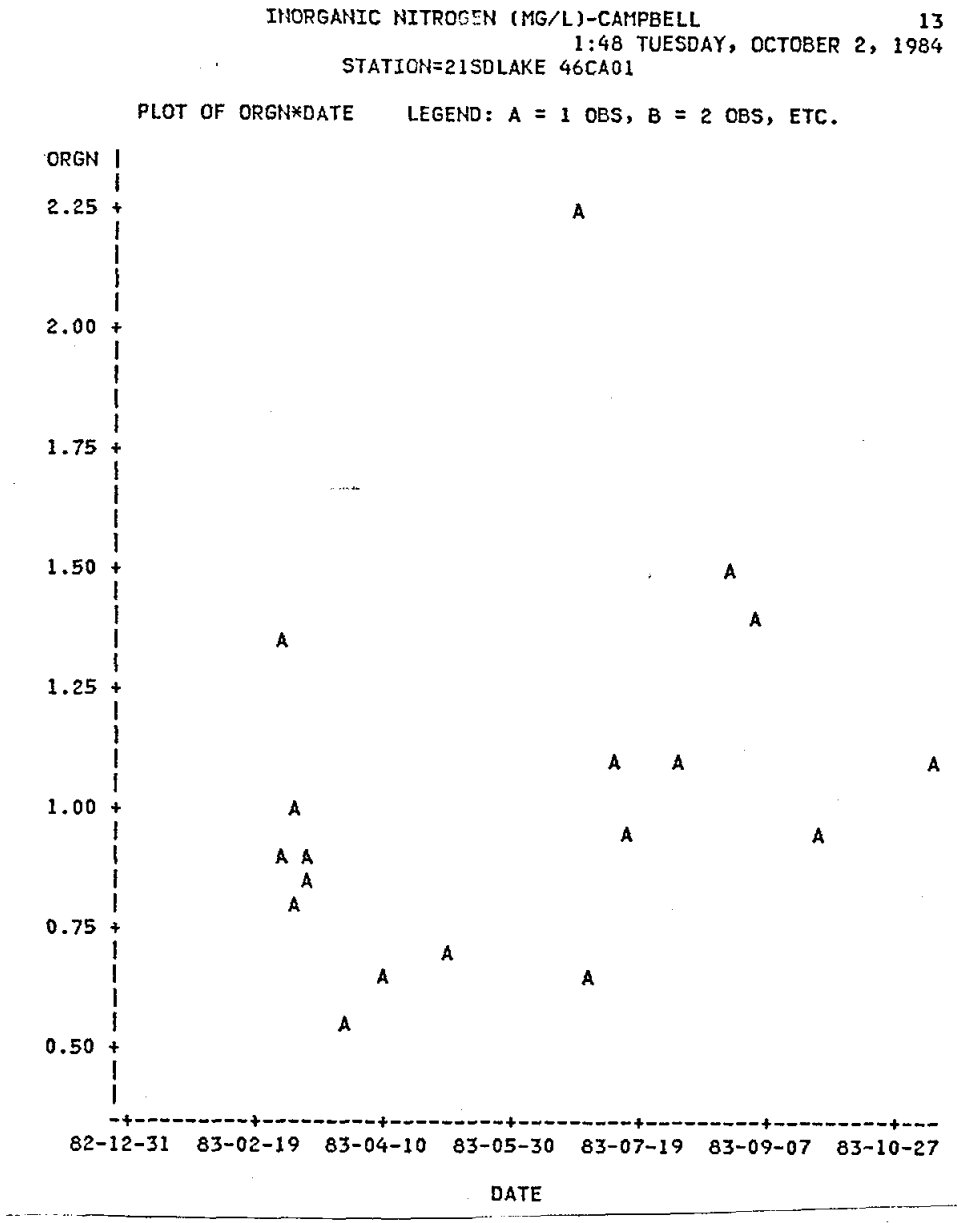

INORGANIC NITROGEN (MG/L)-CAMPBELL 13
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA01
PLOT OF ORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
ORGN
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
82-12-31
83-02-19
83-04-10
83-05-30
83-07-19
83-09-07
83-10-27
DATE

Figure IV-51.

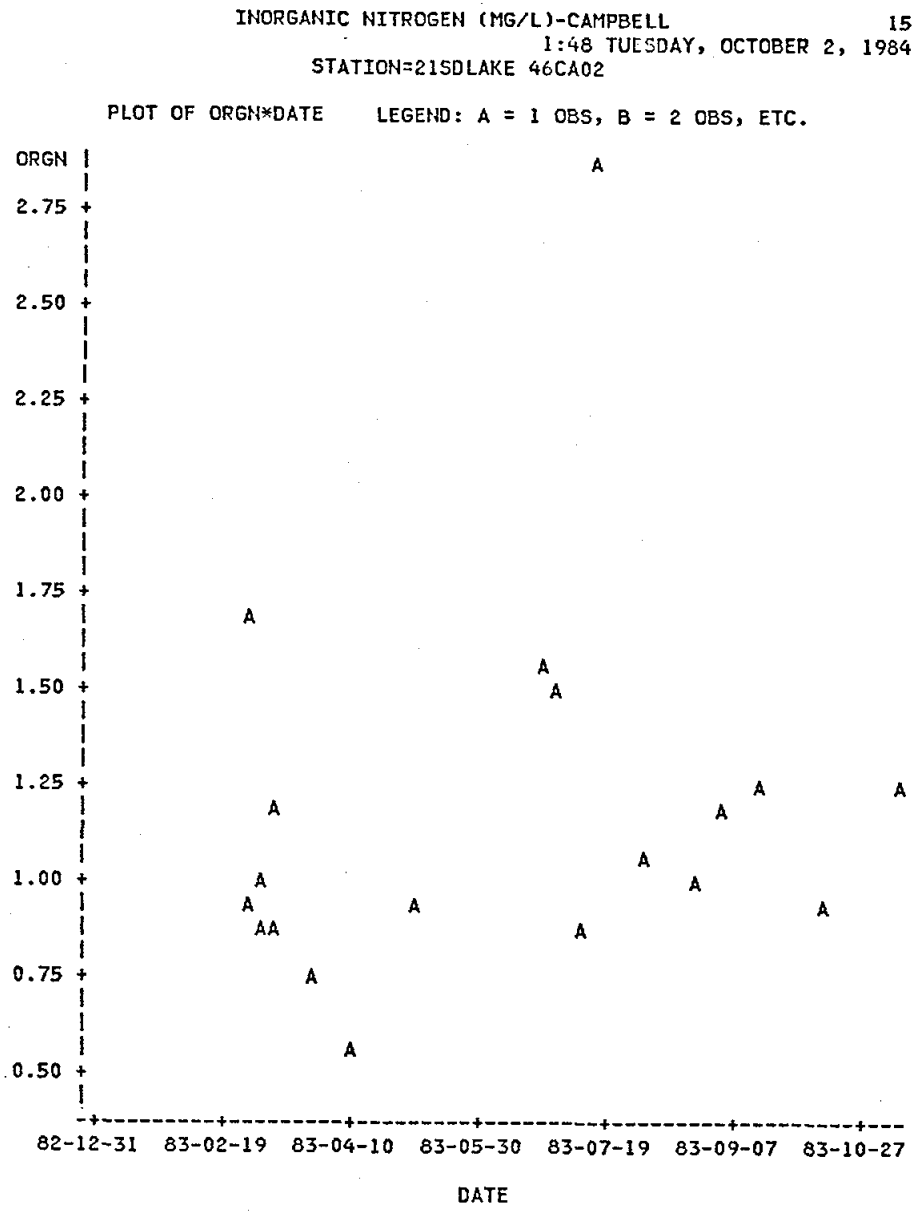

INORGANIC NITROGEN (MG/L)-CAMPBELL 15
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA02
PLOT OF ORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
ORGN
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
82-12-31 83-02-19 83-04-10 83-05-30 83-07-19 83-09-07 83-10-27
DATE

Figure IV-52.

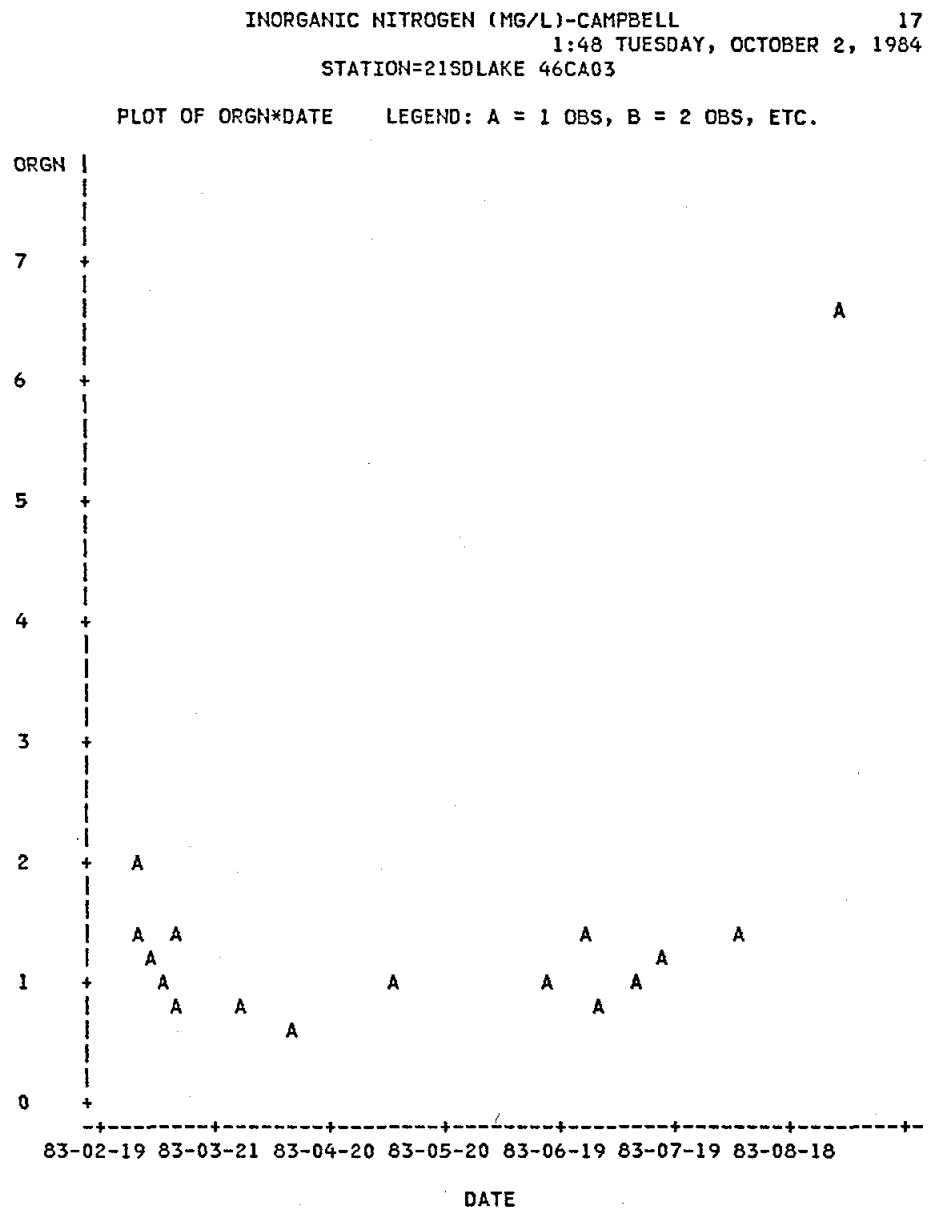

INORGANIC NITROGEN (MG/L)-CAMPBELL 17
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA03
PLOT OF ORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
ORGN
7
6
5
4
3
2
1
0
83-02-19 83-03-21 83-04-20 83-05-20 83-06-19 83-07-19 83-08-18
DATE

Figure IV-53.

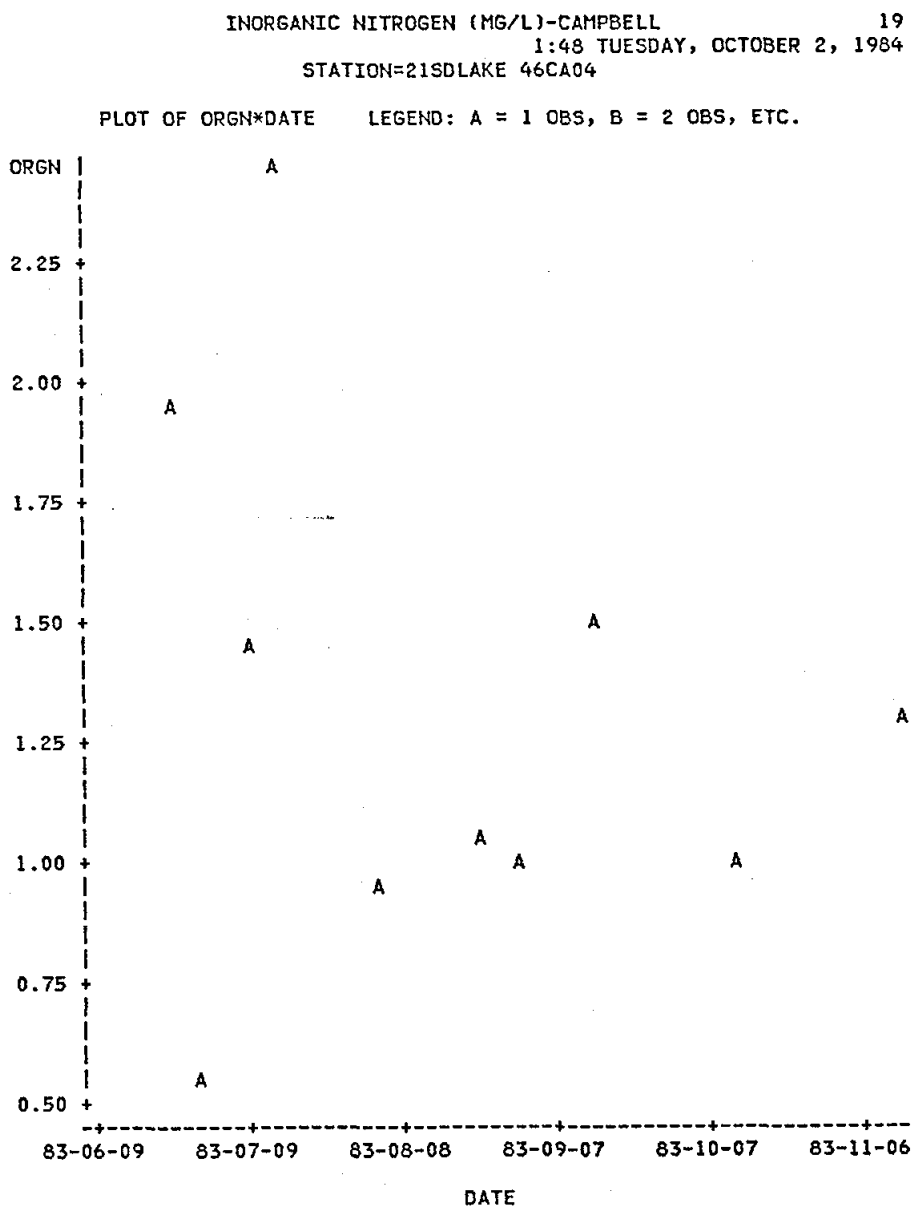

INORGANIC NITROGEN (MG/L)-CAMPBELL 19
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA04
PLOT OF ORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
ORGN
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
83-06-09
83-07-09
83-08-08
83-09-07
83-10-07
83-11-06
DATE

Figure IV-54.

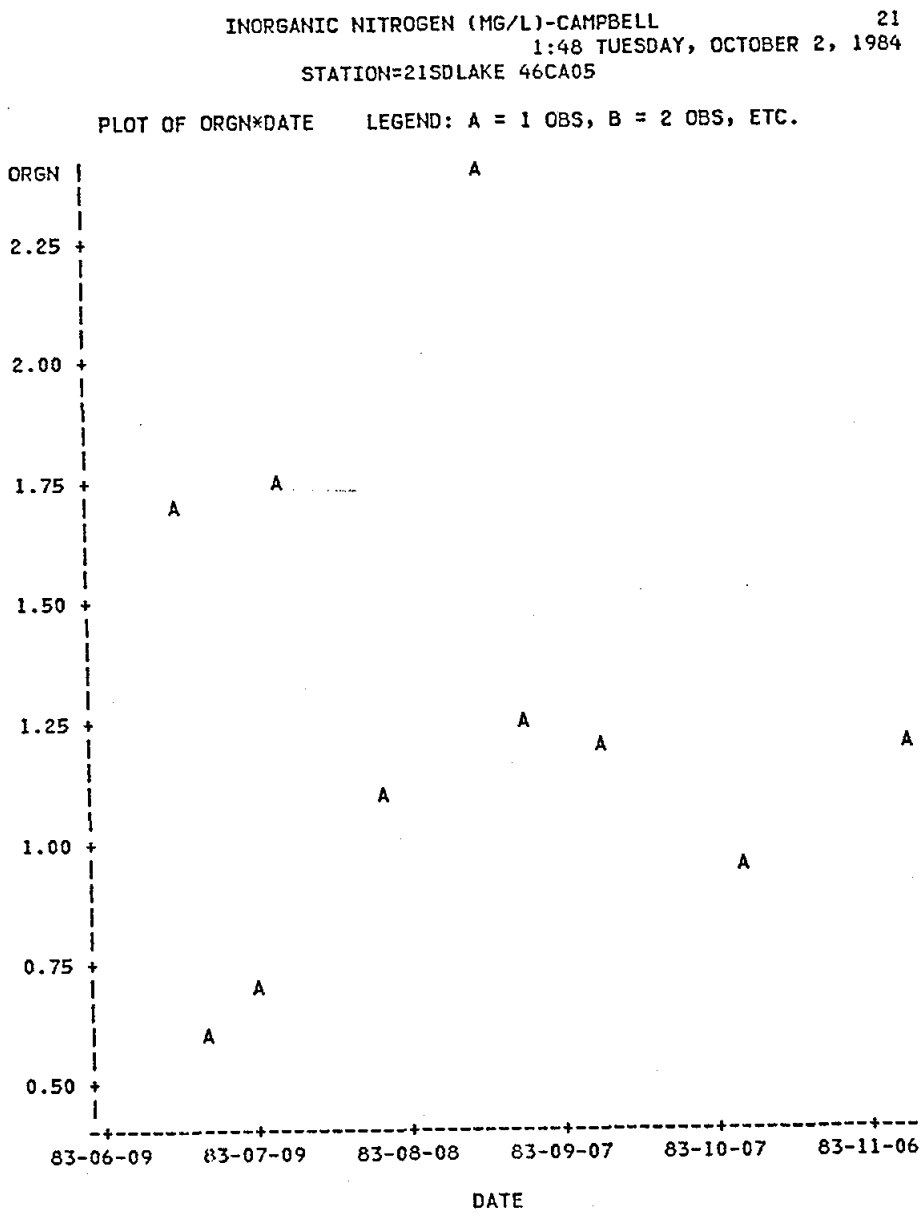

INORGANIC NITROGEN (MG/L)-CAMPBELL 21
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA05
PLOT OF ORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
ORGN
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
83-06-09
83-07-09
83-08-08
83-09-07
83-10-07
83-11-06
DATE

Figure IV-55.

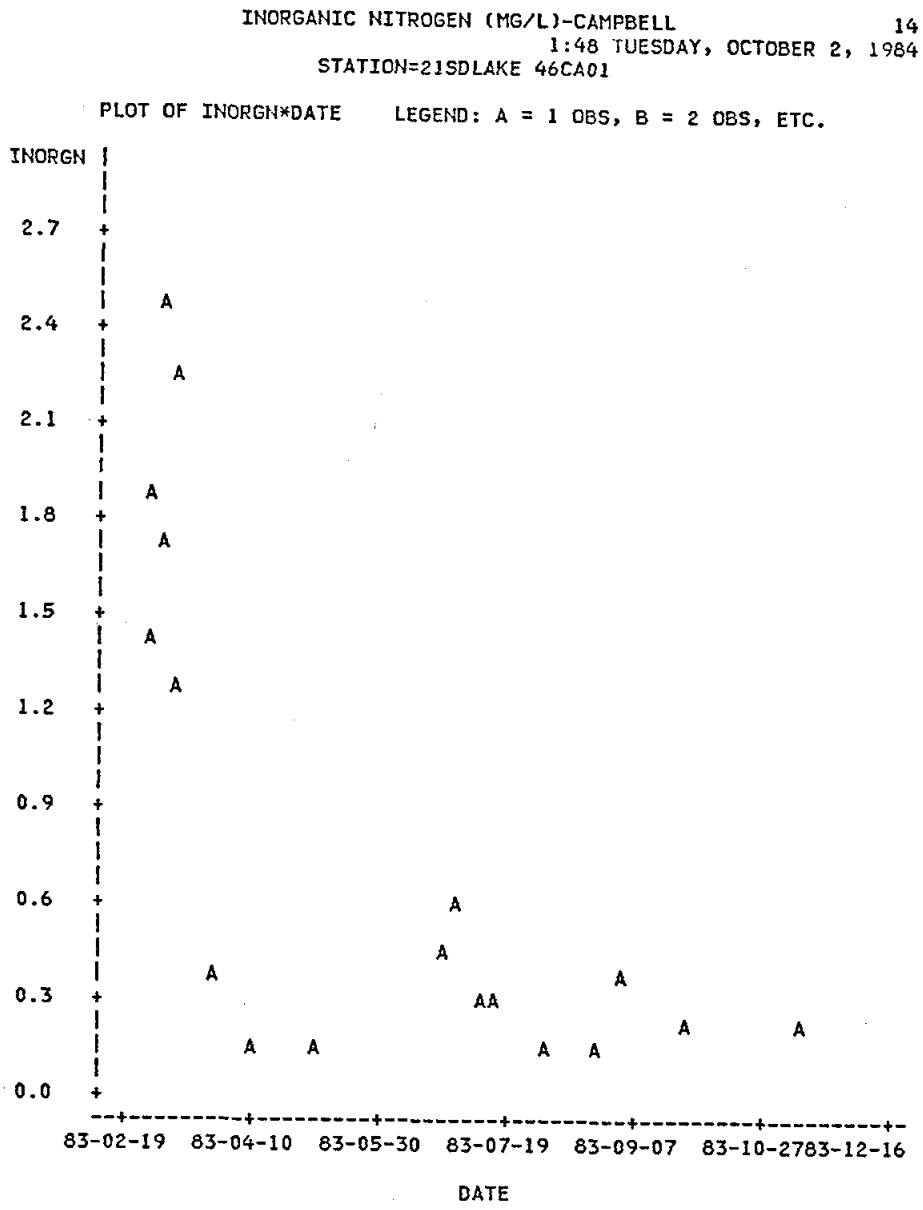

INORGANIC NITROGEN (MG/L)-CAMPBELL 14
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA01
PLOT OF INORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
INORGN
2.7
2.4
2.1
1.8
1.5
1.2
0.9
0.6
0.3
0.0
83-02-19
83-04-10
83-05-30
83-07-19
83-09-07
83-10-27
83-12-16
DATE

Figure IV-56.

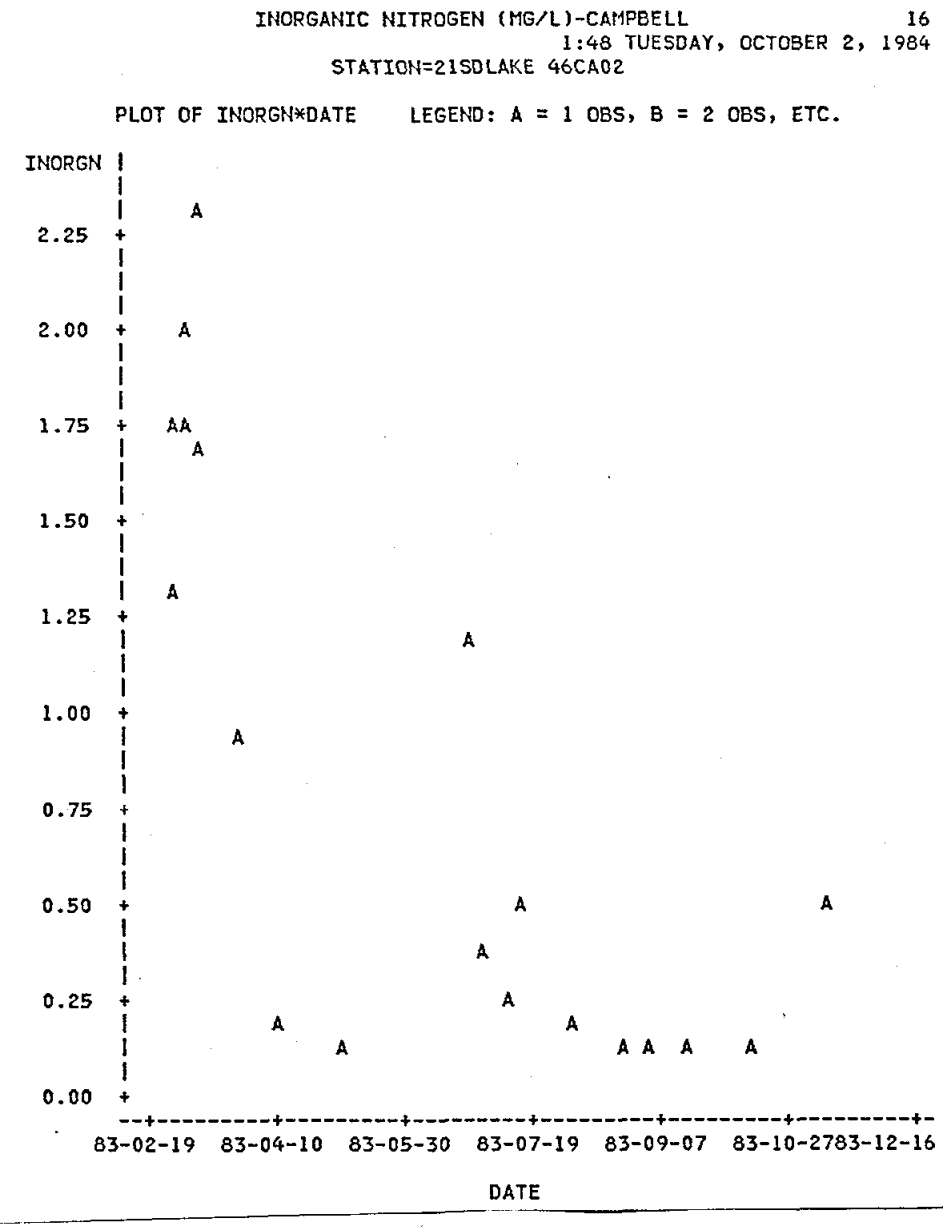

INORGANIC NITROGEN (MG/L)-CAMPBELL 16
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA02
PLOT OF INORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
INORGN
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
83-02-19 83-04-10 83-05-30 83-07-19 83-09-07 83-10-2783-12-16
DATE

Figure IV-57.

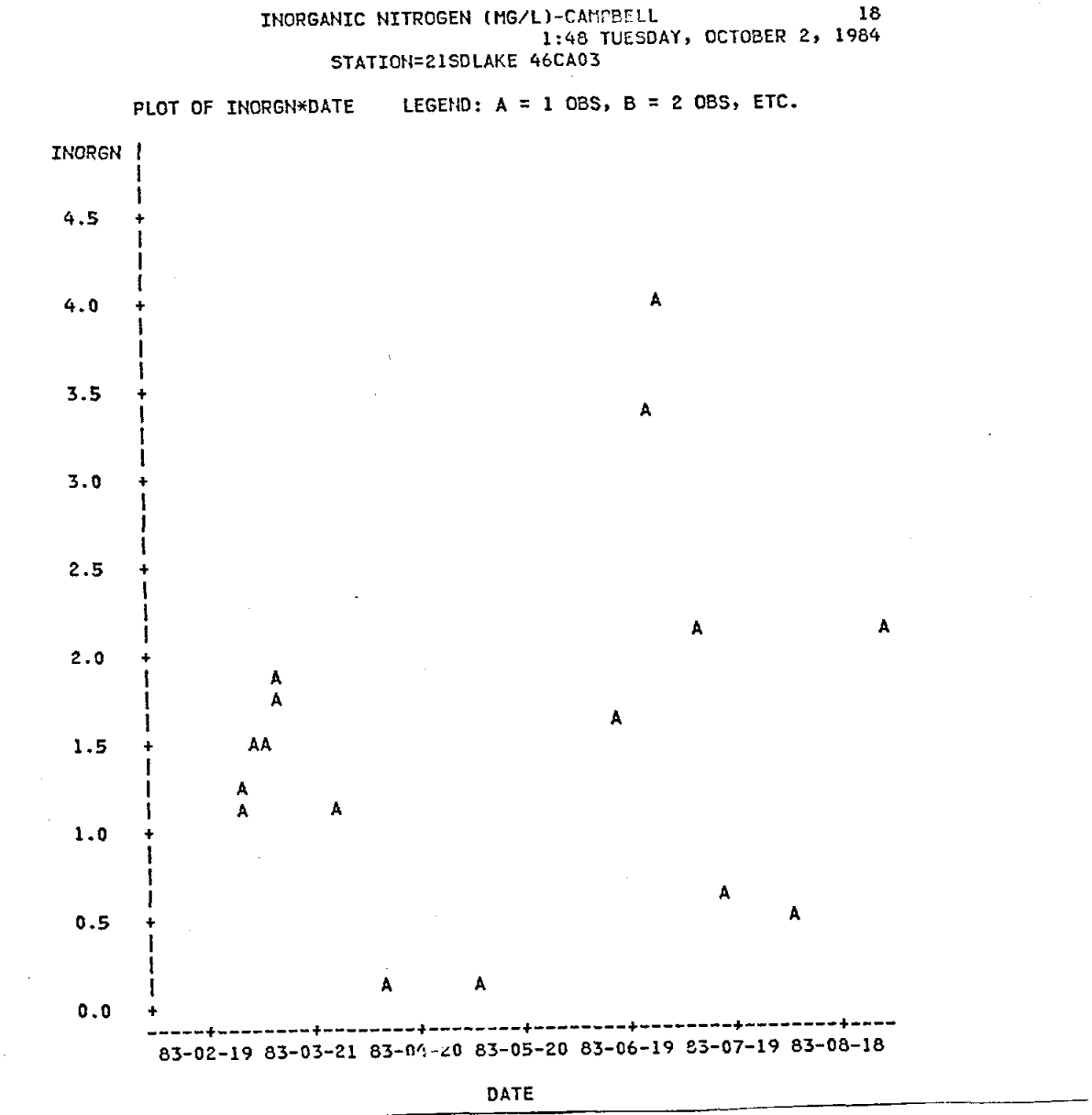

INORGANIC NITROGEN (MG/L)-CAMPBELL 18
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA03
PLOT OF INORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
INORGN
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
83-02-19 83-03-21 83-04-20 83-05-20 83-06-19 83-07-19 83-08-18
DATE

Figure IV-58.

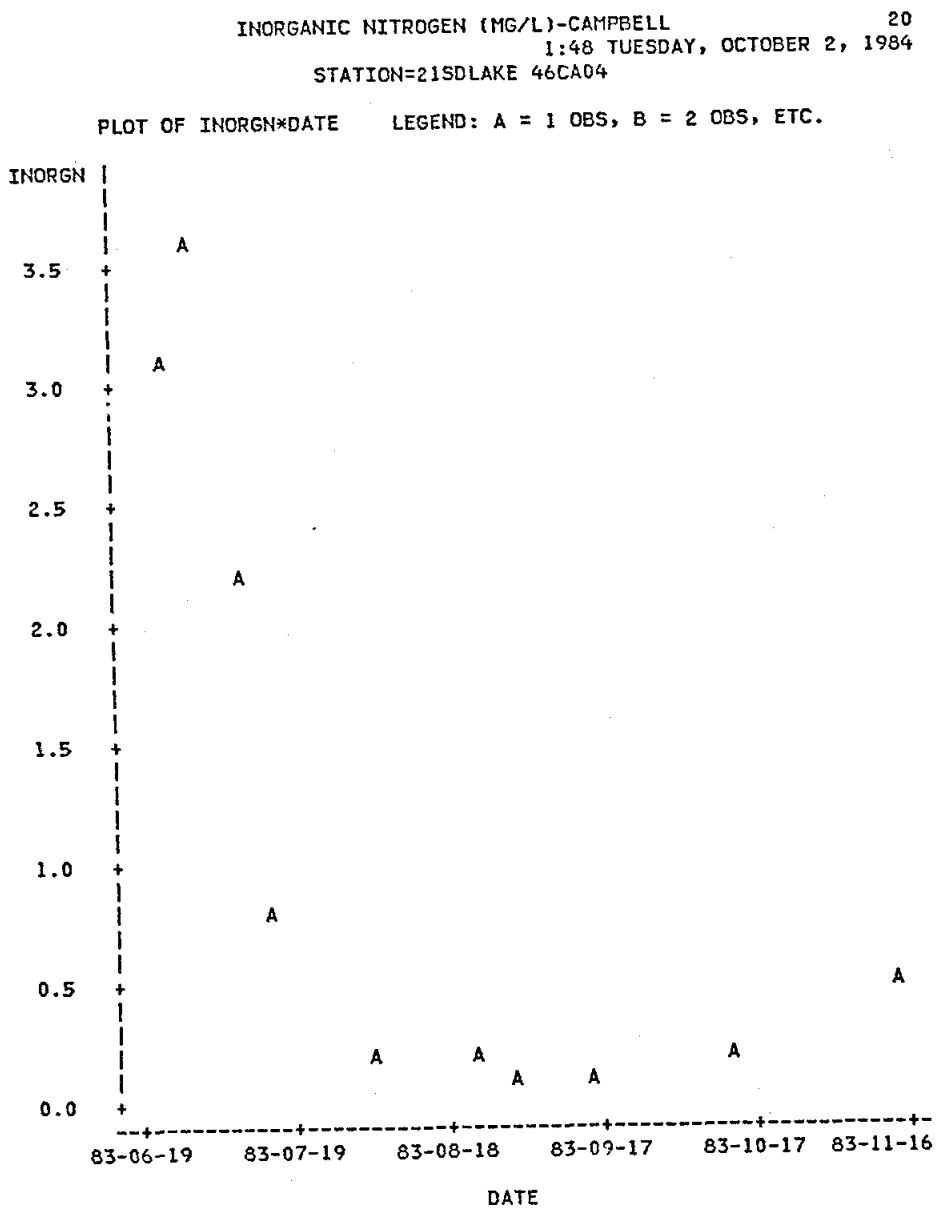
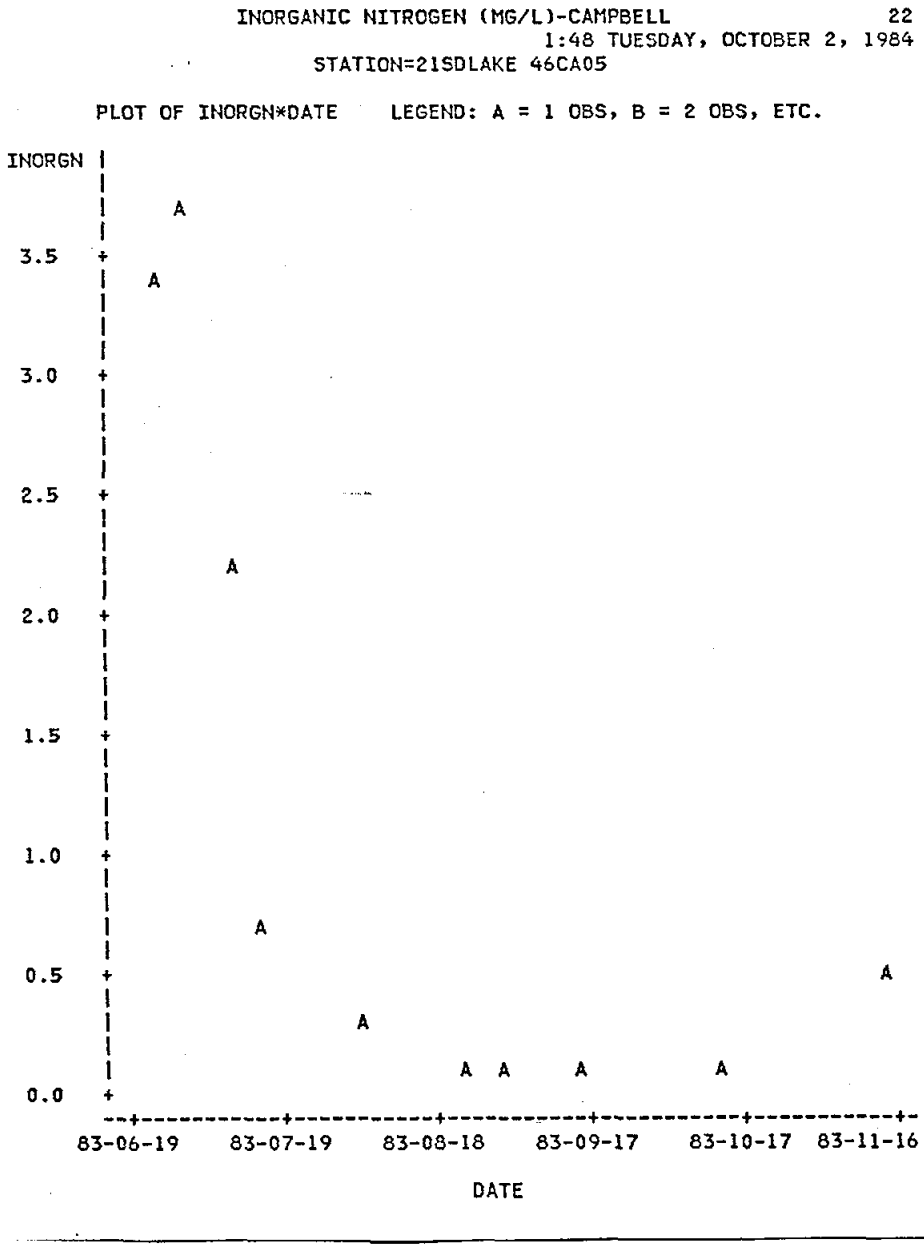
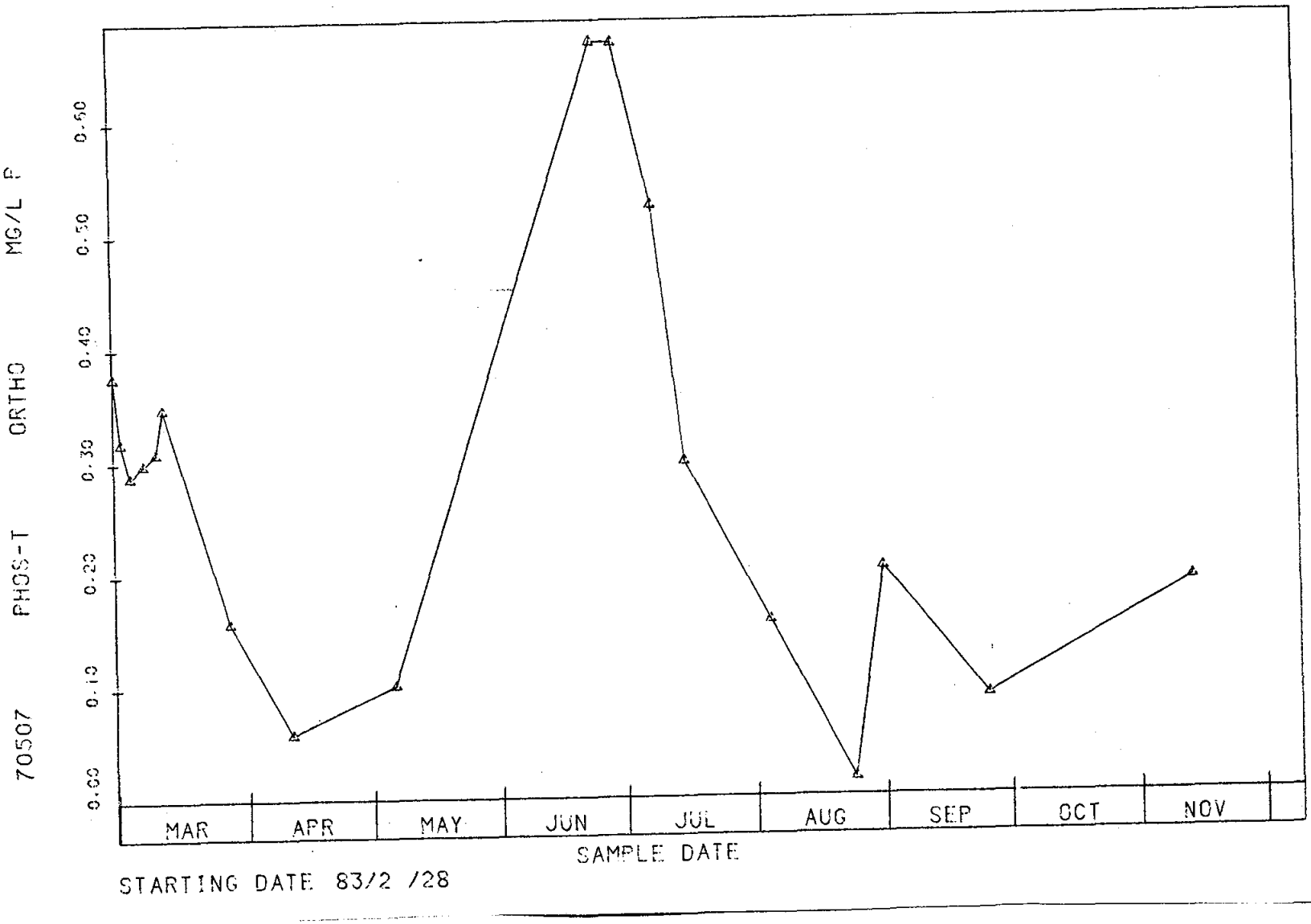

INORGANIC NITROGEN (MG/L)-CAMPBELL 20
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA04
PLOT OF INORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
INORGN
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
83-06-19
83-07-19
83-08-18
83-09-17
83-10-17
83-11-16
DATE

Figure IV-59.


INORGANIC NITROGEN (MG/L)-CAMPBELL 22
1:48 TUESDAY, OCTOBER 2, 1984
STATION=21SDLAKE 46CA05
PLOT OF INORGN*DATE LEGEND: A = 1 OBS, B = 2 OBS, ETC.
INORGN
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
83-06-19
83-07-19
83-08-18
83-09-17
83-10-17
83-11-16
DATE

46CA01
44 10 54.0 096 52 10.0 2
ON NUNDA BRIDGE 108N-50W-S6 CODC
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

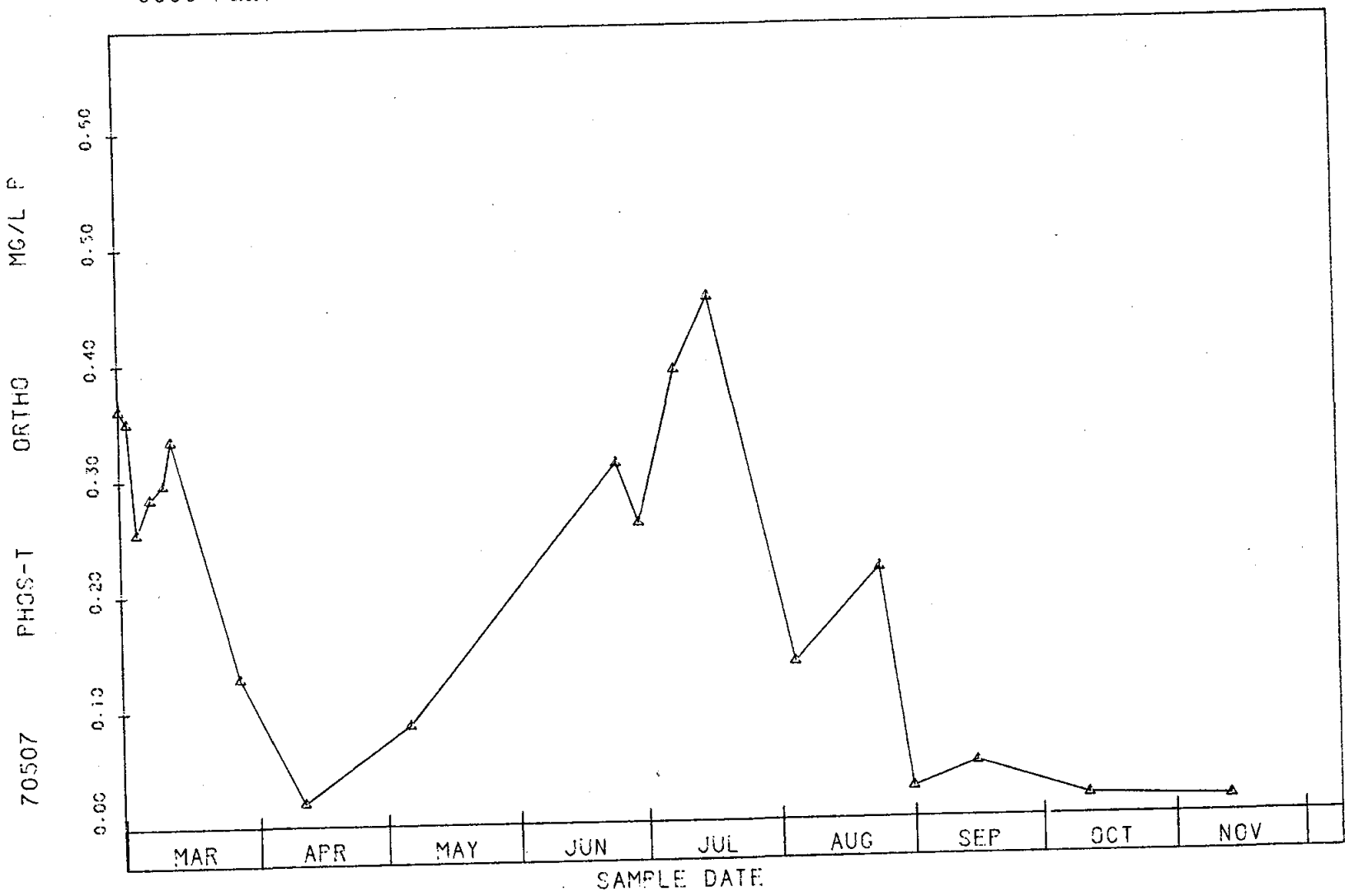
Figure IV-60.




STARTING DATE 83/2 /28

46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-61.




STARTING DATE 83/2 /28

46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BABB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741349-0824212

Figure IV-62.

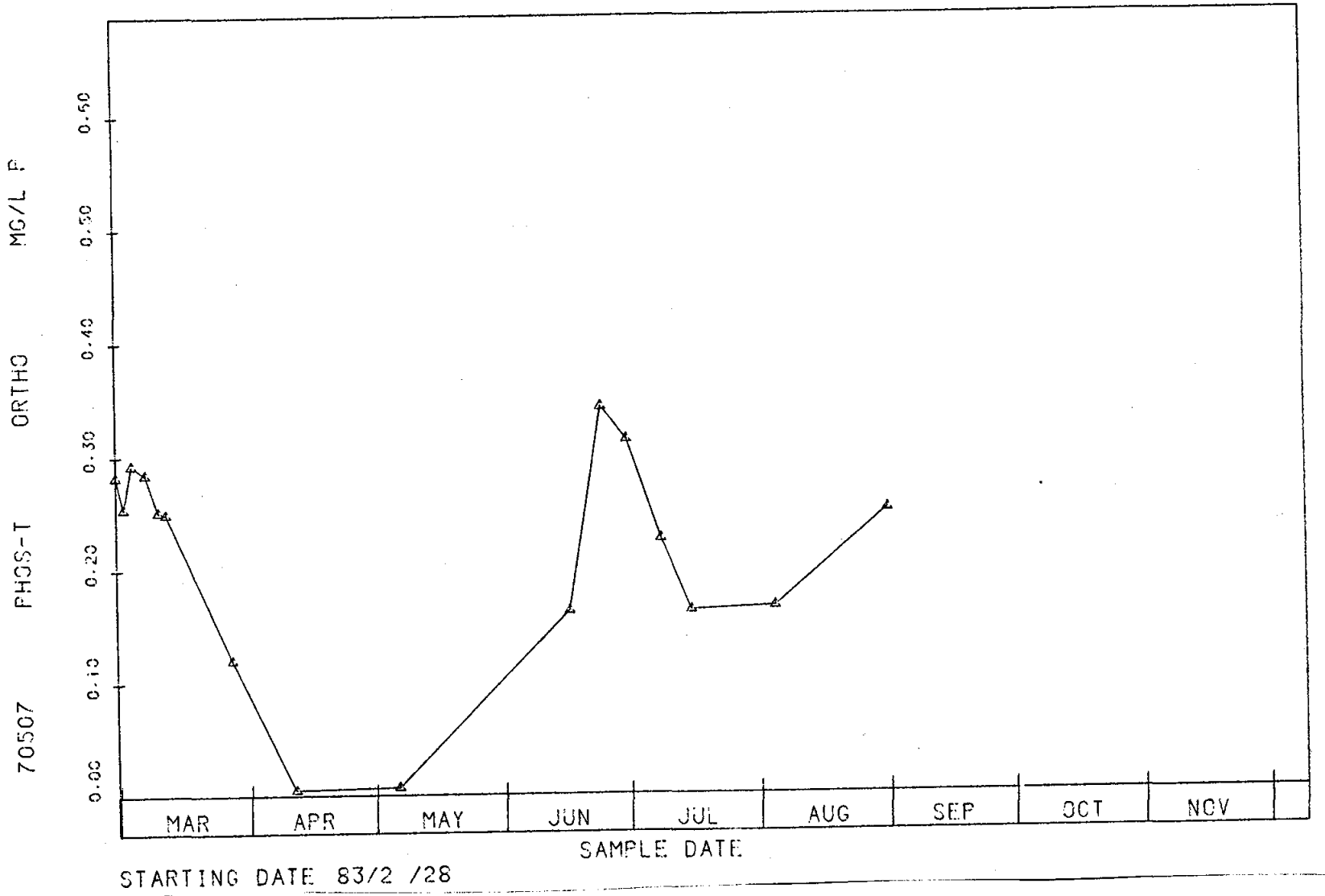
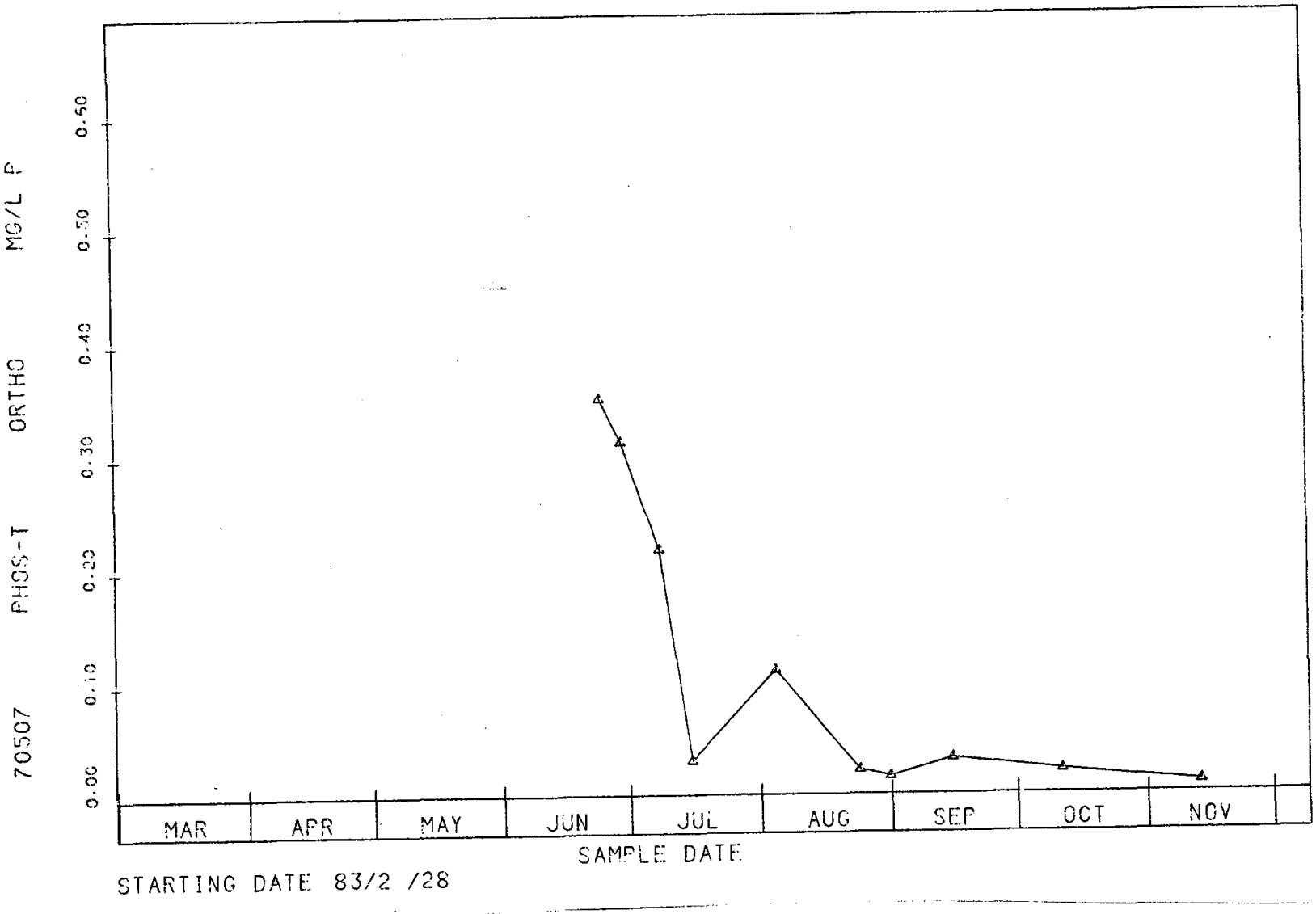


Figure IV-63.

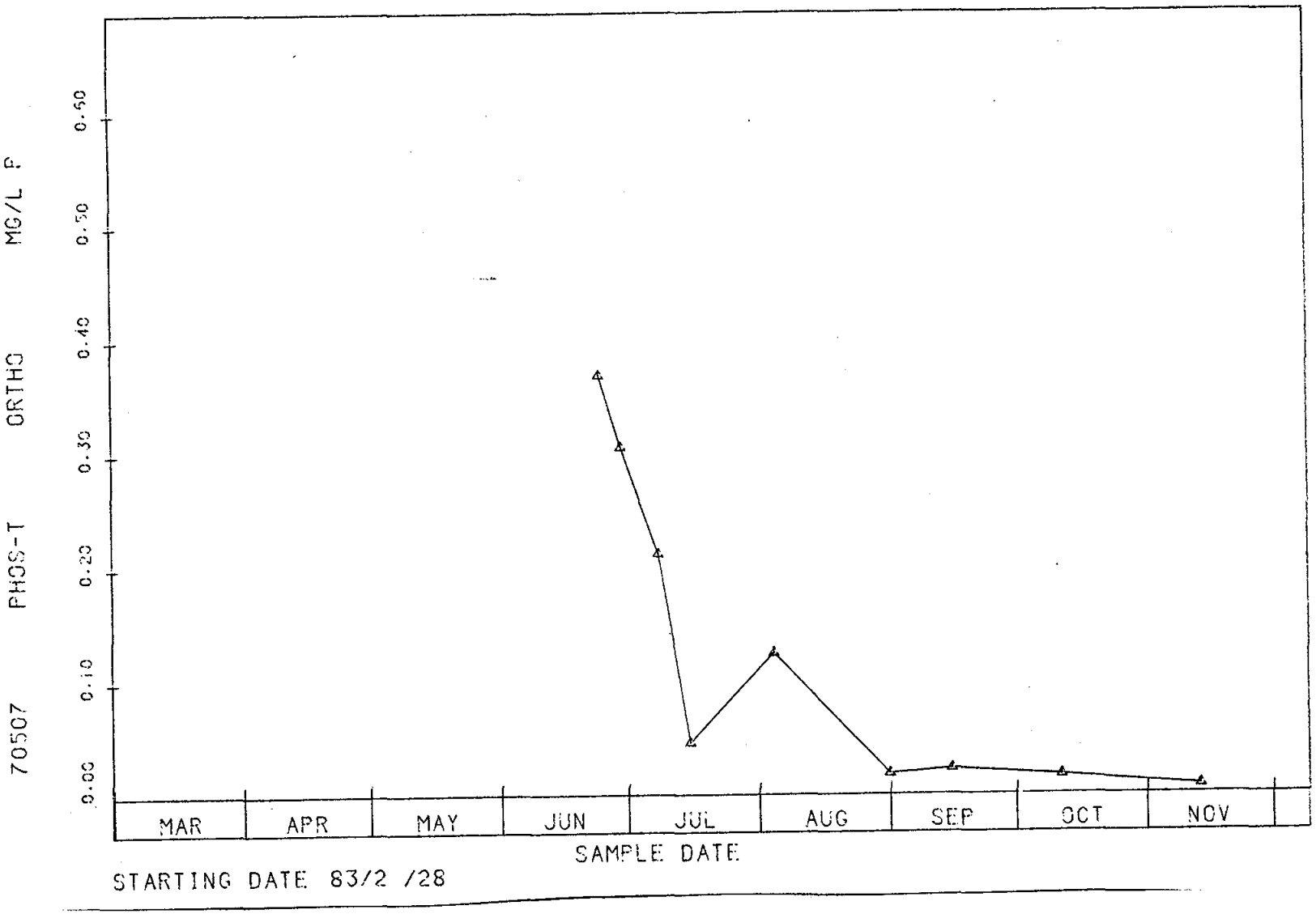
46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744528-0828463




STARTING DATE 83/2 /28

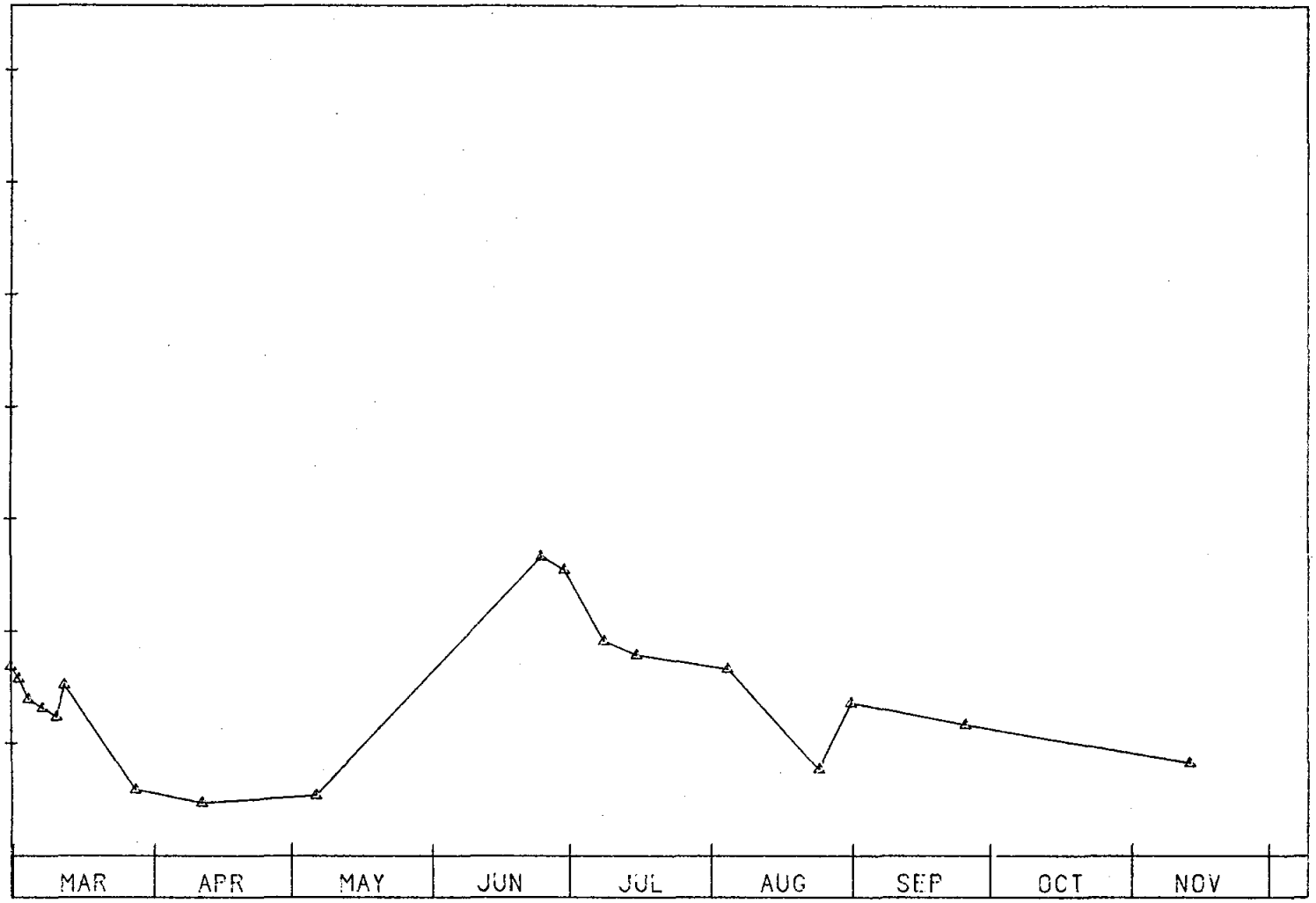
46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

Figure IV-64.



46CA01
44 10 54.0 096 52 10.0 2
ON NONDA BRIDGE 108N-50W-S6 COOP
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741347-0824210

Figure IV-65.



46CA02
44 11 38.0 096 50 19.0 2
S END OF LK AT BRDG 109N-50W-S5 ABCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741348-0824211

Figure IV-66.

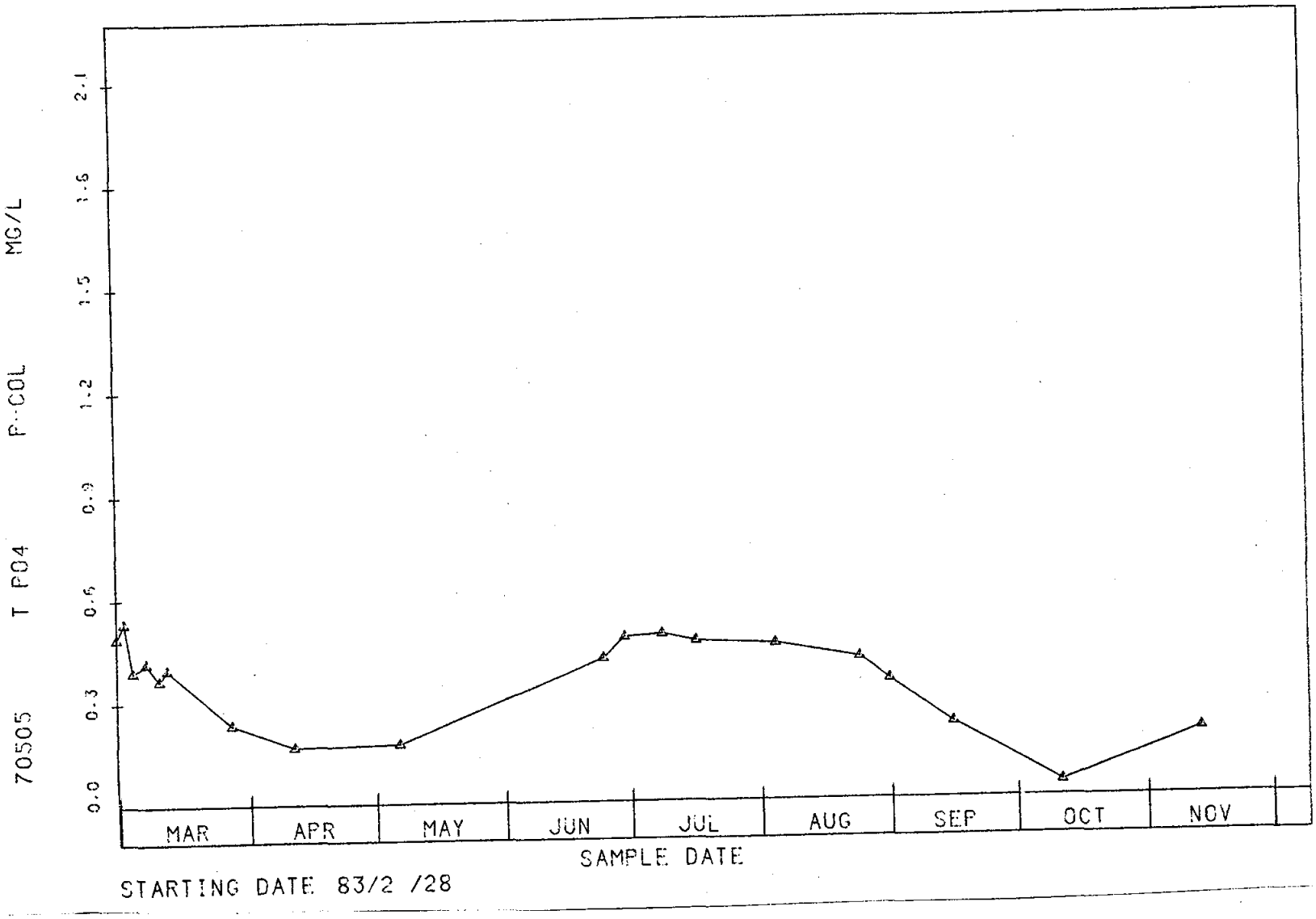
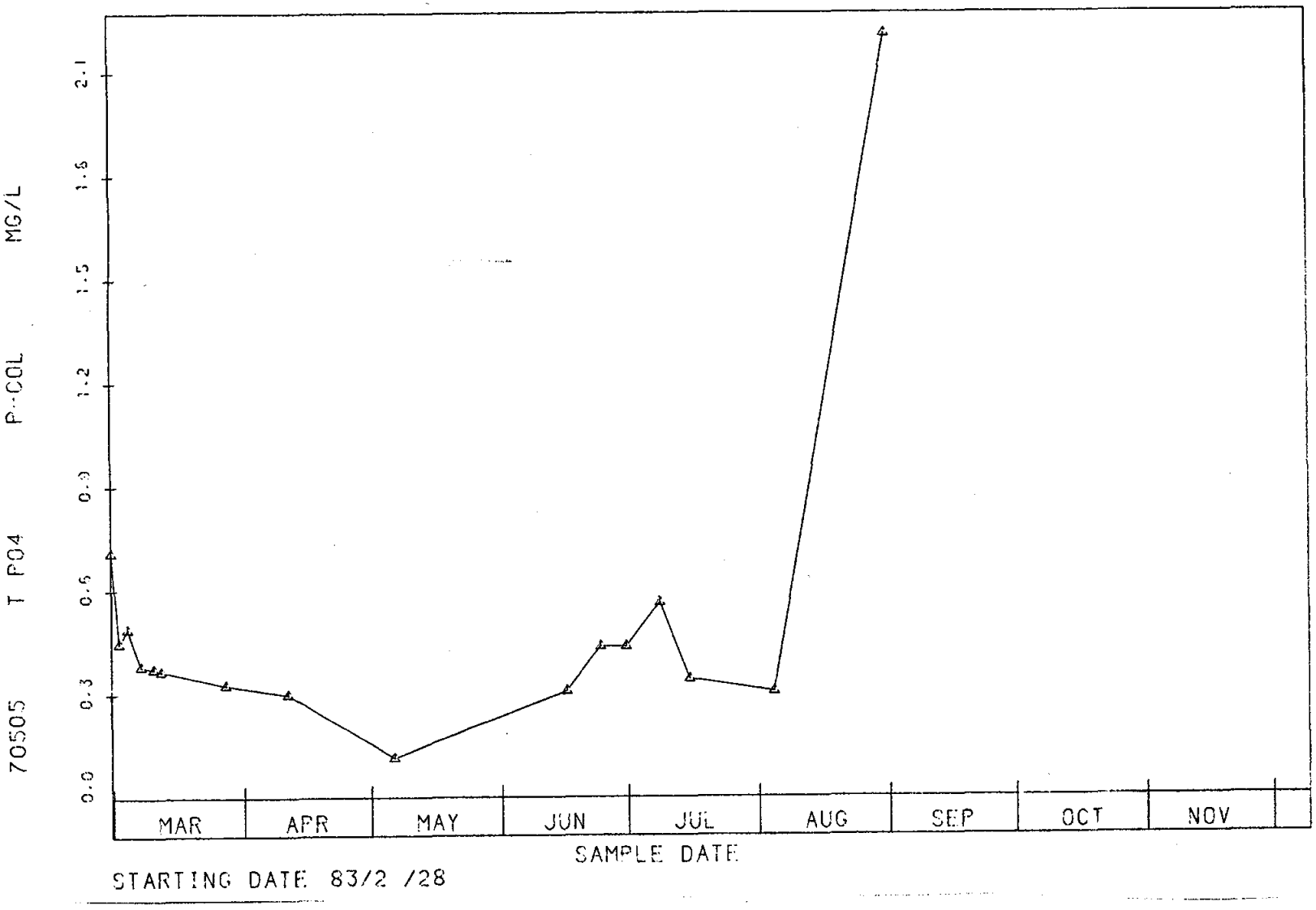
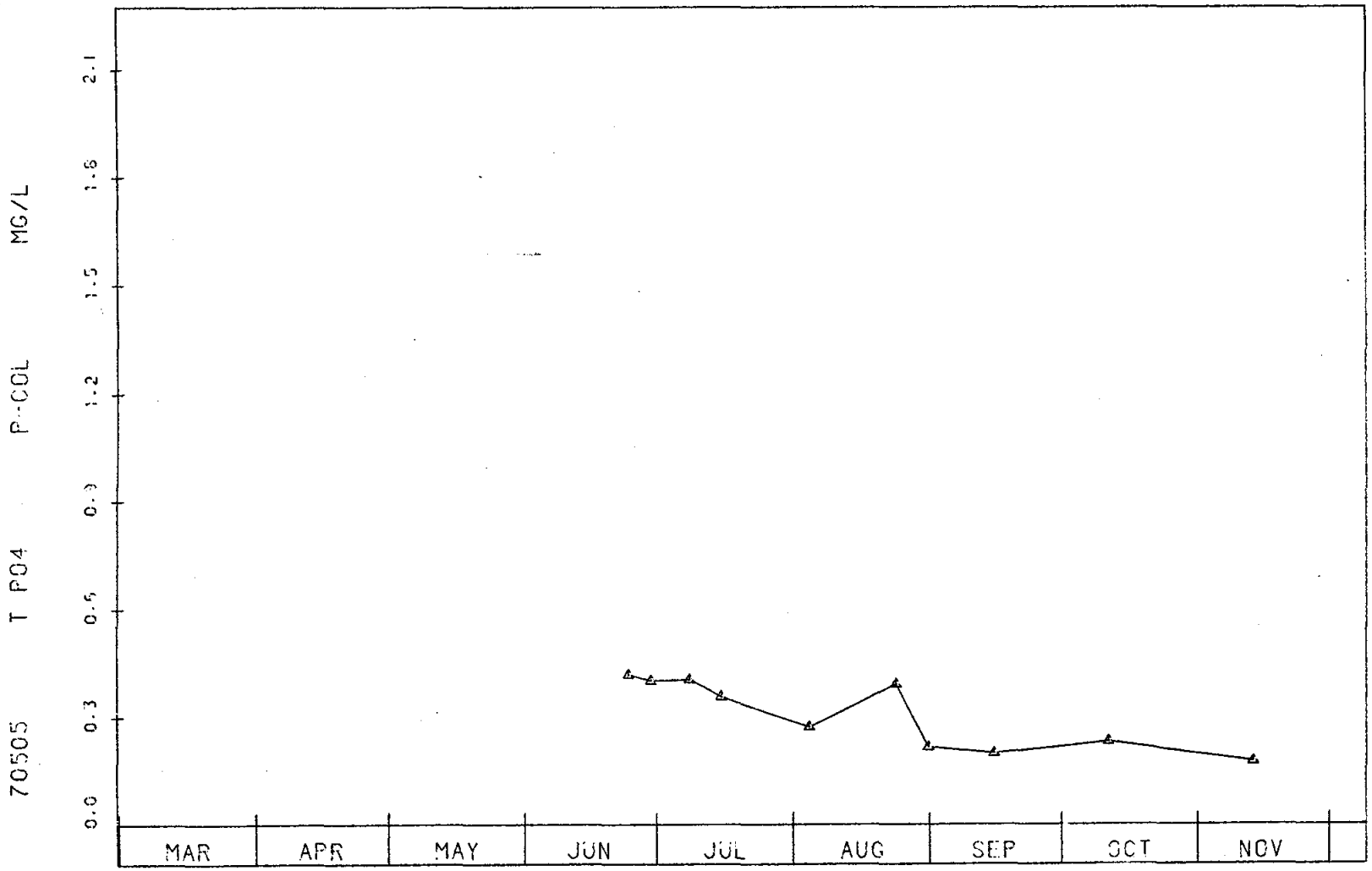


Figure IV-67.


46CA03
44 13 03.0 096 46 13.0 2
OUTFLOW BELOW DAM 109N-50W-S28 BASS
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840817
0000 FEET DEPTH CLASS 00 CSN-RSP 0741349-0824212
70505 T PO4 P--COL MG/L
0.0
0.3
0.6
0.9
1.2
1.5
1.8
2.1
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
SAMPLE DATE
STARTING DATE 83/2 /28

46CA04
44 11 59.0 096 48 48.0 2
S INLAKE 108N-50W-S8 DBDB
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744628-0828463

Figure IV-68.



46CA05
44 13 03.0 096 46 13.0 2
NE INLAKE 109N-50W-S28 BDCD
46011 SOUTH DAKOTA BROOKINGS
MISSOURI RIVER BASIN 090700
BIG SIOUX RIVER BASIN
21SDLAKE 840922
0000 FEET DEPTH CLASS 00 CSN-RSP 0744629-0828464

Figure IV-69.