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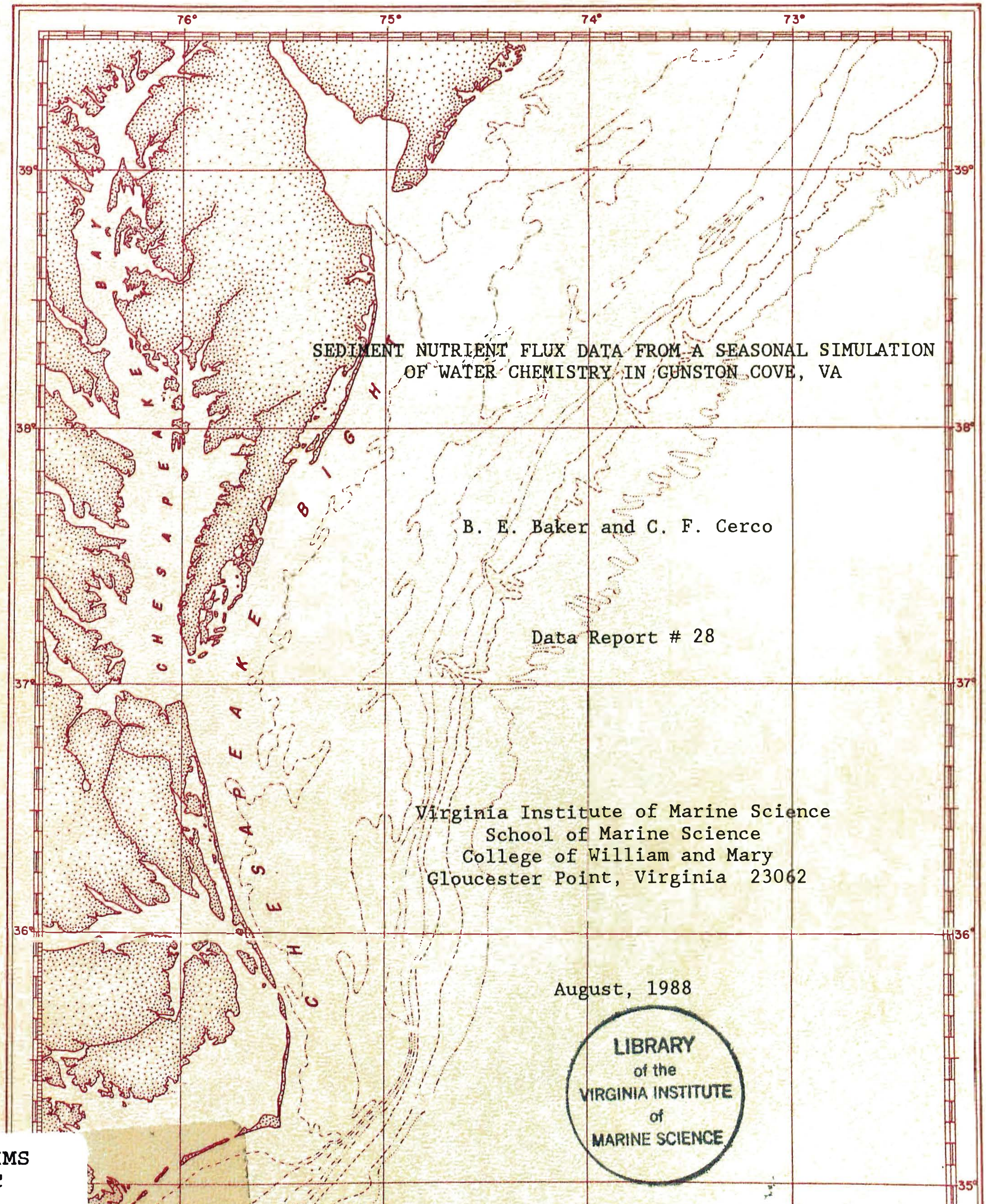

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Data Report # 28

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I. INTRODUCTION

The flux of nutrients between the sediments and overlying water has long been an area of inquiry for scientists, engineers, and environmental managers. Mathematical models are being developed to predict the effect of alterations in water chemistry on sediment nutrient fluxes but parameters in the models are difficult to evaluate and comprehensive data sets which allow comparisons of model predictions to observations are sparse. The purpose of this study was to create a data base of nutrient fluxes and sediment oxygen demand for freshwater sediments under various conditions of pH and water column nitrate concentrations.

A. Gunston Cove

Gunston Cove is a tidal freshwater embayment located on the Virginia shore of the Potomac River, 26 km downstream from Washington, D. C. It is formed by the confluence of two smaller embayments, Pohick Bay and Accotink Bay (Figure 1). Areal extent of the Cove is approximately 5 km^2 and mean depth is typically 1 to 2 m. The mean tidal range is 60 cm and maximum currents average less than 10 cm/sec. The Lower Potomac Water Pollution Control Plant with a capacity of 1.6 m^3/sec discharges into the headwaters of the cove (via Pohick Creek) and provides much of the freshwater input during dry weather.

Gunston Cove was selected as the subject of this experiment because it is highly eutrophic and subject to recurrent blue-green algal blooms despite point source control of phosphorus. Studies in the cove have been conducted by numerous investigators (Broderick, 1986; Cerco, 1985a, 1985b; Lovely and Phillip, 1986; Seitzinger, 1985, 1986; Thomann et al., 1985) and an extensive data base of water chemistry, sediment-water fluxes and sediment properties exists. Relevant to this examination were two sets of observations collected by VIMS in 1984 and 1985 (Cerco, 1985a, 1985b). The 1985 observations consisted of weekly <u>in-situ</u> measures of ammonium, nitrate, ortho-phosphate, total phosphorus, and dissolved oxygen from June through

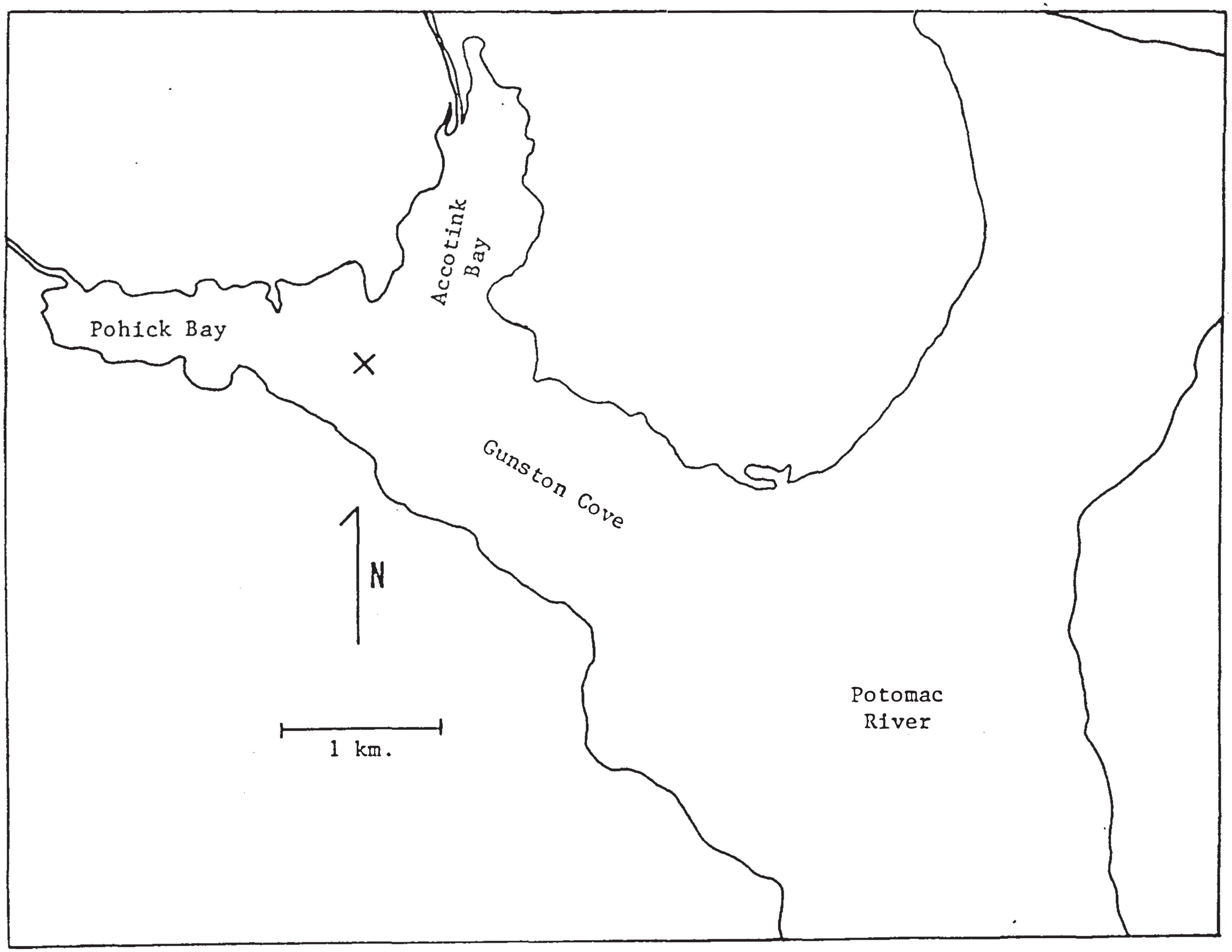

Figure 1. Gunston Cove. (X) indicates sample site.

August during a significant algal bloom. During this period, nitrate concentration in the water decreased from 1.2 mg/l in June to 0 mg/l in August, total phosphorus ranged from 0.1 mg/l to 0.4 mg/l, pH increased from 8 to 10, and dissolved oxygen was at saturation concentrations or above.

B. Study Design

Four sediment cores were monitored in a 90 day laboratory experiment intended to simulate the 1985 summer season. Nutrient (nitrate and orthophosphate) concentrations and pH in the water overlying one core were maintained at roughly the levels observed in 1985. Detritus, in the form of dried hydrilla, was supplied to the sediments at the rate estimated to have taken place in Gunston Cove as back calculated from sediment oxygen demand by Cerco in 1985. Sediment nutrient fluxes in this column were expected to replicate fluxes calculated from the 1985 observations. In the three additional columns, the water chemistry was altered in a manner expected to influence sediment nutrient fluxes and sediment oxygen demand:

Column 1	pH increased from 8 to 10 Nitrate decreased from 1.5 mg/l to 0 mg/l Phosphate constant at 0.05 mg/l Detritus added (0.2 g/week)
Column 2	pH constant at 8 Nitrate decreased from 1.5 mg/l to 0 mg/l Phosphate constant at 0.05 mg/l Detritus added (0.2 g/week)
Column 3	pH increased from 8 to 10 Nitrate constant at 1.5 mg/l Phosphate constant at 0.05 mg/l Detritus added (0.2 g/week)
Column 4	pH constant at 8 Nitrate constant at 0 mg/l Phosphate constant at 0.05 mg/l No detritus added

Dissolved oxygen was maintained from 7 to 9 mg/l in all columns. Water samples were collected from each column twice weekly and analyzed for ammonium (NH_4), nitrite + nitrate (NO_2+ NO_3), ortho-phosphate (PO_4), and total phosphorus (TP). Additionally, weekly measures of sediment oxygen demand and oxidation-reduction potential were performed.

C. Core Collection

Ten intact sediment cores with overlying water were collected at high tide by a diver on May 29, 1987. The cores were collected within a 3 m radius near the center of the cove (Figure 1) in transparent acrylic columns 60 cm long and 10 cm in diameter. Sediment occupied roughly a third of the length of each column. The cores were iced, transported back to the lab, and kept in an ice bath for two days until the beginning of the experiment. A description of the cores selected for the experiment is given in Table 1.

Observations of water quality were collected at the time of core collection and are reported in Table 2. Water was pumped from 30 cm below the surface, mid depth (approximately 1 m), and 30 cm above the bottom into individual 300 ml bottles for subsequent analysis of total suspended solids. The pH was measured by inserting a Beckman Phi 21 probe into each bottle. Samples for analysis of dissolved oxygen were also collected at these depths and preserved for subsequent Winkler titration. Temperature was measured in-situ with an Applied Research Austin ET 100 probe. Two samples were pumped from mid depth and filtered through 0.45 micron millipore filters for subsequent analysis of ammonium, nitrite + nitrate, and ortho-phosphate. Samples for analysis of chlorophyll 'a' were also collected at mid depth and filtered on board.

II. APPARATUS & METHODOLOGY

A. Description of Apparatus

The laboratory apparatus consisted of four of the ten columns collected in the field, each capped with an air tight cap and placed in a holder constructed for the experiment. A fifth column was run as a control with water only; water was taken from each sediment column in rotational order. Each cap was fitted with a 2.9 cm diameter propeller, a Yellow Springs Instrument Model 5739 dissolved oxygen (DO) probe, and an inlet valve for compressed oxygen gas (Figure 2). Passages were placed in the cap for withdrawal of water samples. A stirring rate of 800 rpm was selected to generate sufficient water motion for the DO probe to read accurately but not to resuspend bottom sediments. The experimental apparatus was controlled by a Hewlett Packard Vectra mini-computer. The computer continuously monitored DO within each column, bubbling gaseous oxygen through the column by a relay-operated valve when DO fell below 7 mg/l. When the desired DO concentration was reached, the valve closed. This system regulated DO to within + or - 1 mg/l of the 8 mg/l concentration specified for the experiment. DO concentrations within each column and a record of valve operations were printed on an accessory printer.

Temperature in the laboratory was maintained at 24^{o}C + or - 2^{o}C and fluorescent lighting was on for approximately 9 hours each weekday.

B. Experimental Procedures

1. Equilibration Procedures

June 2, 1987: Five of the ten sediment cores were selected and set up in the apparatus. Each column was siphoned twice and refilled to 2.6 l with deionized water. After the first refill, 0.2 gm of hydrilla was added to each column. During the second refill, a nutrient-pH solution was added to bring each column to the desired initial nutrient-pH specifications. Each column was then resampled (approximately 150 ml) and siphoned down 2.3 l. These samples were discarded.

June 8, 1987: A sample was collected from all five columns and discarded. Water from sediment columns 1 through 4 was siphoned off and refilled twice with deionized water. The nutrient-pH solution was added

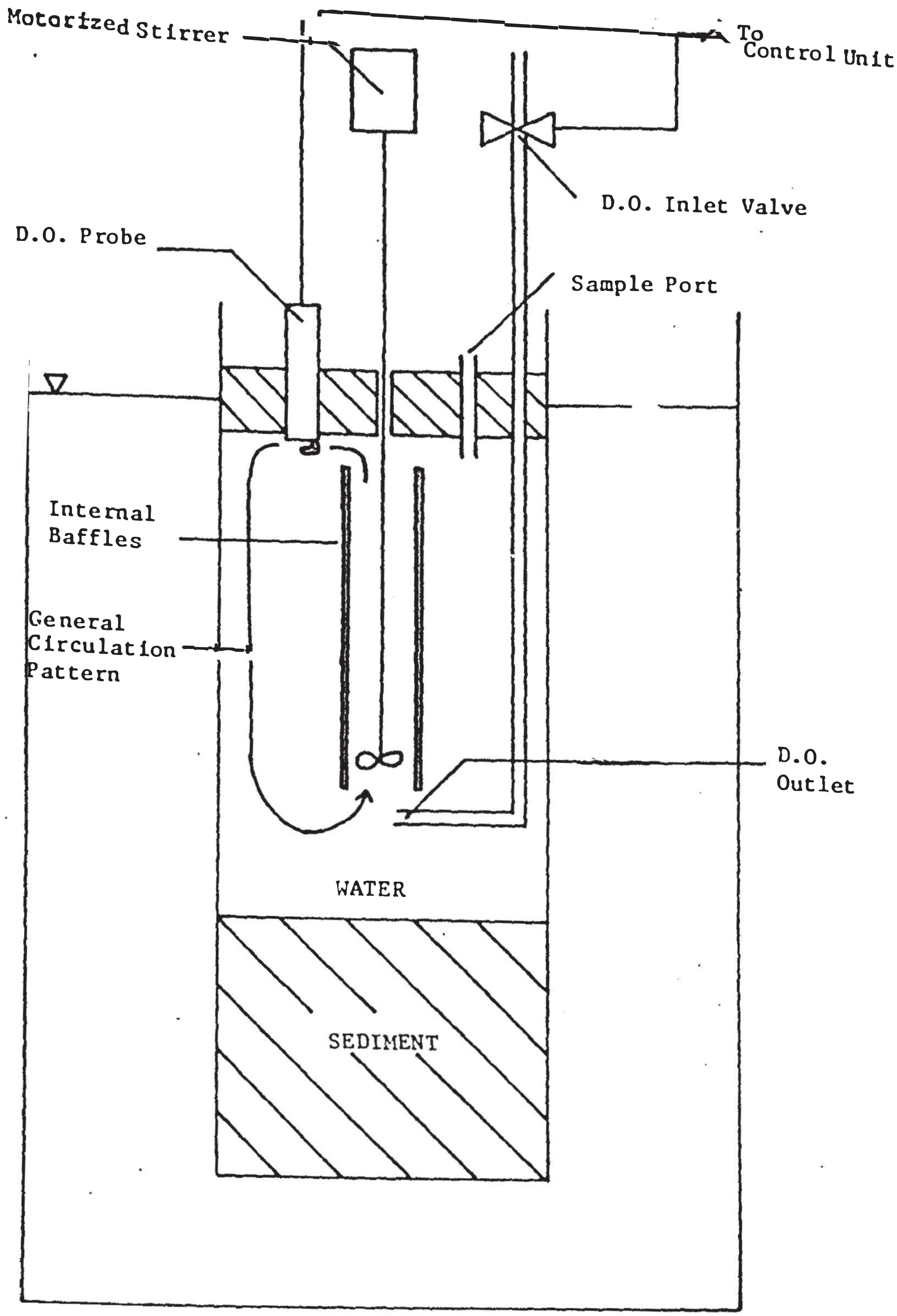

Figure 2. Schematic of a Sediment Column.

during the second refill. Samples were collected from columns 1 through 4 and the columns siphoned down to 2.3 l. These samples were filtered and the filtrate frozen for subsequent nutrient analysis.

June 9, 1987: The fifth column selected on June 2 was "sacrificed" to determine initial sediment conditions. Water was siphoned from the column and sediment was suctioned from the top 5 cm and at a depth of 10 cm. A small sample was reserved from each depth for analysis of total solids. The remainder was centrifuged and the interstitial water analyzed for nutrients. Ten grams of centrifuged material were again analyzed for total solids and the remainder was dried and analyzed for carbon, nitrogen and total phosphorus. Results from the analysis of the "sacrificed" core are reported in Tables 3 and 4. Additionally, sediment from the "sacrificed" core was analyzed for 60 day suppressed BOD (Biochemical Oxygen Demand). One gram of centrifuged wet sediment was placed in a 300 ml BOD bottle and filled with water buffered with a 0.1 M solution of Na_2HCO_3 to pH 8. A nitrification inhibitor was added and the resulting 60 day carbonaceous BOD is reported in Table 4. At the end of 60 days, the water in the BOD bottle was analyzed for ammonium and nitrate also reported in Table 4.

June 12, 1987: All columns were sampled. The remainder of the water in column 1 was siphoned into a control column (column 5) and filled to 2.6 l with deionized water buffered to pH 8. Subsequently, every Monday and Friday the water in the control was replaced with water from one of the sediment columns in rotational order and filled to 2.6 l with deionized water buffered to the pH of the source water. Sediment columns were siphoned and refilled twice to 2.6 l with deionized water buffered to the pH specified for each column. During the second refill, the nutrient-pH solution was added. Each column was sampled and siphoned down to 2.3 l.

2. Buffering Procedures

Beginning June 18, pH was regulated independently of the nutrient solution. To maintain pH between 8 and 8.5, 0.1N sodium bicarbonate (Na_2HCO_3) was added directly to the water column above the stirrer to ensure proper mixing. To maintain pH between 9 and 9.5, 0.1N sodium borate ($Na_2B_4O_7$) was added to the deionized water used in column water replacement/refill. To maintain pH between 9.5 and 10, 0.1N sodium hydroxide (NaOH) was added directly to column water buffered with sodium borate. The pH was monitored regularly with an Orion Research model SA250 pH meter. The pH and temperature of each core are reported in Appendix A.

3. Standard Weekly Procedures

For the remaining 9 weeks of the experiment beginning June 15, the standard weekly procedures were:

Monday	Monitor temperature Monitor and adjust pH Sample water in each column Replace water Add detritus Set up control column
Tuesday	Monitor temperature Monitor and adjust pH
Wednesday	Monitor temperature Monitor and adjust pH Measure SOD
Thursday	Monitor temperature Monitor and adjust pH Measure redox potential
Friday	Monitor temperature Monitor and adjust pH Sample water in each column Replace water Set up control column

4. Sediment Oxygen Demand

Sediment oxygen demand is the rate at which dissolved oxygen is removed from the water column due to the decomposition of organic material in bottom sediments (Hatcher, 1986). Dissolved oxygen concentration was regulated by the automated system described previously and a record of DO concentrations and valve operations was printed continuously. Every Wednesday beginning June 10, 1987, all passages into each column were sealed. When the DO in a column fell below 7 mg/l, gaseous oxygen was bubbled through the column until the desired DO concentration was reached and the valve closed. After a valve closing, the column was examined and any air bubbles expelled. Sediment oxygen demand was indicated by the quantity of DO removed between reaeration events.

5. Oxidation-reduction potential

Oxidation-reduction potential (ORP) of a system is a measure of the oxidation state of the system. It is defined as the electromotive force between a noble metal electrode and a reference electrode when immersed in a solution (ASTM, 1976). ORP was measured weekly in each sediment column using an Orion EA940 Selective Ion Analyzer with a platinum redox electrode and a hydrogen reference electrode. The reference electrode was suspended in the water column and redox potential (mV) was read after 1 minute and 10 minutes at 0.5 cm above the sediment surface and at 0.5 and 1 cm depth in the sediments. The platinum electrode was inserted approximately 5 cm through holes drilled into each column covered with a self- sealing silicon rubber compound (RTV). Additionally, once during the tenth week of the experiment, redox potential was measured down to 10 cm depth in the sediments at 1 cm intervals.

6. Shut-down Procedures

Final water samples were collected from each column on August 24, 1987. A description of each sediment core at the conclusion of the experiment is given in Table 5. Water was siphoned off of each of the four cores and sediment was suctioned from the top 5 cm and at a depth of 10 cm. Two samples were reserved from each depth; one for analysis of total solids and one for sediment TP and NH_4 analysis. The remainder was centrifuged and the centrifugate analyzed for ortho-phosphate, nitrite + nitrate, and ammonium. The results are presented in Tables 6 and 7. The pH of the centrifugate was also measured and results are presented in Table 8. Approximately 1 g of centrifuged wet sediment from 1, 3, and 5 cm from each core was analyzed for 60 day BOD and results are presented in Table 9.

C. Sample Treatment and Analysis

Following collection, samples for analysis of ammonium, nitrite + nitrate, and ortho-phosphate were filtered through 0.45 millipore filters and the filtrate frozen until the time of analysis.

Ammonium Analysis

Samples for analysis of ammonium were analyzed by an automated phenate method on a Technicon AAII autoanalyzer (U.S. E.P.A., 1974). Samples were measured against standards of the same pH buffer. A top standard of 0.8 mg/l was used and dilutions ranged from 3 to 20 times.

Nitrate Analysis

Samples for analysis of nitrite + nitrate were analyzed by the cadmium reduction method on a Technicon AAII autoanalyzer (Technicon Industrial Systems, 1972; U.S. E.P.A., 1974).

Orthophosphate Analysis

Samples for analysis of orthophosphate were analyzed by an automated ascorbic acid method on an Orion continuous flow analyzer (Technicon Industrial Systems, 1972; U.S. E.P.A., 1979).

Total Phosphorus

Unfiltered water samples for analysis of total phosphorus were analyzed using the acid persulfate digestion method and read on a Bausch and Lomb Spectronic 20 spectrophotometer (U.S. E.P.A., 1979). Sediment samples for analysis of total phosphorus were collected from the "sacrificed" core at the beginning of the experiment and from each study core at the end. Samples were collected at depths of 1, 3, 5 and 10 cm, centrifuged, and dried at approximately 95^{o}C. For analysis, they were combusted in a muffle furnace at

500^{o}C, extracted in a 1N HCl solution, and analyzed by an automated ascorbic acid method on an Orion continuous flow analyzer.

D. Calculation of Sediment Oxygen Demand

The rate of sediment oxygen demand was indicated by the quantity of dissolved oxygen removed form the water column between reaeration events. It was computed as:

$$SOD = \frac{\sum_{1}^{n} C_b - C_e}{\sum_{1}^{n} \Delta t_i} \cdot H$$

SOD = mean sediment oxygen demand (g/m^2/day)

C_b = DO concentration at which reaeration begins (mg/l)

C_e = DO concentration at which reaeration ends (mg/l)

t_i = time elapsed during interval i

n = number of reaeration events

H = height of water in column (m)

Corrected sediment oxygen demand (CSOD) was calculated by subtracting the average respiration over a given treatment as measured in the control column from the measured sediment column oxygen demand.

E. Calculation of Nutrient Fluxes

The principle data from the experiment was a series of nutrient concentrations in each column. Nutrient fluxes were obtained from these by the relationship:

$$F = \frac{C_f - C_i}{\Delta T} \cdot H$$

F mean flux rate (g/m^2/day)

C_f nutrient concentration at the end of the sample interval (g/m^3)

C_i nutrient concentration at the beginning of the sample interval (g/m^3)

H height of water in column (m)

T length of sample interval (days)

For each week, two flux values were calculated; one for the sample interval from Monday to Friday and one for the interval from Friday to the following Monday.

F. Calculation of Net Sediment-Water Fluxes

The total fluxes calculated by the above equation may include transformations in the water column as well as sediment-water fluxes. In order to isolate the sediment-water fluxes, water column transformations represented by the apparent flux in the control column, were subtracted from the total fluxes. Net sediment-water flux rates were calculated by taking the average of two weekly sediment core flux values and subtracting the average value of the control column (with corresponding water) over a treatment period.

III. RESULTS

Sediment nutrient fluxes and SOD for each core are presented in Tables 10 to 18. Positive nutrient fluxes indicate release from the sediment to the water column. Positive SOD indicates transfer of oxygen from the water to the sediments.

Redox potential data is presented in Table 19.

Graphical representation of the results is presented in Appendix E.

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TABLE 1. DESCRIPTION OF SEDIMENT CORES SELECTED FOR THE EXPERIMENT

Core 1	- Top layer (1 - 2 mm) of medium brown sediment followed by a second layer (1 - 2 mm) of light brown sediment. Upper 10 cm medium brown gradating to a marblized mixture of brown and black. Sediment consisted of very fine particles. No organisms visible.
Core 2	- Top layer (1 - 2 mm) of medium brown sediment followed by a second layer (1 - 2 mm) of light brown sediment. Upper 4 cm medium brown gradating to a marblized mixture of brown and black. Sediment consisted of very fine particles. Worms visible.
Core 3	- Top layer (1 - 2 mm) of medium brown sediment followed by a second layer (1 - 2 mm) of light brown sediment. Upper 3 - 4 cm medium brown gradating to a marblized mixture of brown and black. Sediment consisted of very fine particles. No organisms visible.
Core 4	- Top layer (1 - 2 mm) of medium brown sediment followed by a second layer (1 - 2 mm) of light brown sediment. Upper 8 - 10 cm medium brown gradating to a marblized mixture of brown and black. Sediment consisted of very fine particles. Worms visible.

TABLE 2. CONDITIONS AT TIME OF CORE COLLECTION

	pH	Temp (^{o}C)	DO (mg/l)	TSS (mg/l)
Surface	7.75	24.8	8.97	8
Mid-depth	7.60	24.4	8.24	10
Bottom	7.31	23.6	5.33	-

	chl-a (mg/l)	TP* (mg/l)	OP (mg/l)	NO2+NO3 (mg/l)	NH4 (mg/l)
Mid-depth 1	29.69	0.082	0.0065	0.7609	2.066
Mid-depth 2	20.86	0.078	0.0065	0.7856	1.931

* TP unfiltered

TABLE 3. INTERSTITIAL NUTRIENTS AND % TOTAL SOLIDS OF "SACRIFICED" CORE

INTERSTITIAL WATER

	OP (mg/1)	NO2+NO3 (mg/1)	NH4 (mg/1)	% TOTAL SOLIDS before centrifuge	% TOTAL SOLIDS after centrifuge
1cm	0.38	0.02	1.85	18	38
2cm	0.45	0.02	3.84	23	37
3cm	0.19	0.02	6.74	25	38
4cm	0.28	0.02	7.33	25	38
5cm	0.16	0.02	10.53	26	39
10cm	0.02	0.04	10.00	31	40

TABLE 4. SEDIMENT TP AND CHN OF "SACRIFICED" CORE

	TP (mg/g) (dry weight)	%C	%H	%N
1 cm	1.3	16	7	2
2 cm	1.3	10	4	1
3 cm	1.3	13	5	2
4 cm	1.3	14	6	2
5 cm	1.3	10	4	1
10cm	1.4	15	7	2

60 DAY CBOD AND AMMONIUM AND NITRATE ANALYSIS OF OVERLYING WATER

	CBOD (mg/l)	NH4 (mg/l)	NO3 (mg/l)
1 cm	13.35	0.6845	0.0192
2 cm	14.95	0.6032	0.0146
3 cm	11.75	0.6013	0.0146
4 cm	11.60	0.6178	0.0146
5 cm	10.40	0.5643	0.0118
10cm	10.40	0.4669	0.0174

TABLE 5. DESCRIPTION OF SEDIMENT CORES AT THE END OF THE EXPERIMENT

Core 1	- Top layer (1 cm) of hydrilla followed by a second layer (5 cm) of medium brown sediment. Methane bubbles present between 2 and 3 cm. Marblized brown and black mixture from 6 cm to 16 cm followed by all black layer. A few old worm burrows filled with hydrilla noted. No organisms visible.
Core 2	- Top layer (1.5 cm) of hydrilla followed by a second layer (4 cm) of medium brown sediment. Methane bubbles present between 2 and 4 cm. Marblized brown and black mixture from 5.5 cm to 8 cm followed by all black layer. Worm actively burrowing through hydrilla layer. Many worm burrows noted in top 10 cm.
Core 3	- Top layer (1.0 cm) of hydrilla followed by a second layer (2 cm) of medium brown sediment. Methane bubbles present between 2.5 and 4 cm. Marblized brown and black mixture from 3 cm to 10 cm followed by all black layer. Distinct reddish hue to thin layer below hydrilla. No organisms noted.
Core 4	- Top layer (0.5 cm) of a distinct reddish hue followed by a second layer (2.5 cm) of medium brown sediment. Methane bubbles present between 2.5 and 4.5 cm. Marblized brown and black mixture from 3 cm to 12 cm followed by all black layer. Many worms visible in top 10 cm.

TABLE 6. INTERSTITIAL NUTRIENTS and % TOTAL SOLIDS AT END OF EXPERIMENT

CORE	DEPTH (cm)	OP (mg/l)	NO2 + NO3 (mg/l)	NH4 (mg/l)	% TOTAL SOLIDS
1	1	3.77	0.03	1.04	20
1	2	4.80	0.02	2.69	24
1	3	7.00	0.03	6.34	26
1	4	6.88	0.02	8.61	27
1	5	7.06	0.02	10.06	--
1	10	0.16	0.01	12.97	32
2	1	0.38	0.00	1.62	16
2	2	0.54	0.02	2.79	24
2	3	0.82	0.01	4.53	--
2	4	0.56	0.01	5.99	--
2	5	0.44	0.00	6.76	--
2	10	0.04	0.01	7.83	31
3	1	3.80	0.04	1.33	14
3	2	3.80	0.03	----	26
3	3	8.71	0.05	4.63	27
3	4	7.53	0.04	6.86	--
3	5	7.00	0.03	7.06	--
3	10	0.78	0.01	6.96	32
4	1	0.38	0.01	0.85	18
4	2	0.64	0.01	2.98	22
4	3	0.31	0.02	2.98	--
4	4	0.42	0.01	4.92	--
4	5	0.29	0.01	7.11	--
4	10	0.02	0.01	12.62	30

TABLE 7. SEDIMENT TP AND NH4 AT END OF EXPERIMENT

CORE	DEPTH (cm)	%TOTAL SOLIDS after centrifuge	SEDIMENT TP (mg/g) (dry weight)	SEDIMENT NH4 (mg/g) (dry weight)
1	1	43	1.0	0.06
1	3	42	1.7	0.28
1	5	38	1.4	0.45
1	10	42	1.6	0.27
2	1	38	1.3	0.09
2	3	51	1.5	0.16
2	5	46	1.4	0.15
2	10	47	1.9	0.19
3	1	42	0.9	0.04
3	3	44	1.2	0.17
3	5	37	1.2	0.30
3	10	42	1.5	0.21
4	1	30	1.3	0.08
4	3	38	1.4	0.18
4	5	38	1.6	0.21
4	10	42	1.5	0.22

TABLE 8. pH OF INTERSTITIAL WATER AT END OF EXPERIMENT

CORE	DEPTH (cm)	pH
1	1	9.67
1	2	9.45
1	3	9.21
1	4	9.01
1	5	8.79
1	10	7.44
2	1	7.81
2	2	7.80
2	3	7.82
2	4	7.73
2	5	7.65
2	10	7.40
3	1	9.72
3	2	9.49
3	3	9.27
3	4	9.06
3	5	8.87
3	10	7.55
4	1	7.66
4	2	7.55
4	3	7.49
4	4	7.46
4	5	7.42
4	10	7.29

TABLE 9. 60 DAY CBOD AND AMMONIUM AND NITRATE ANALYSIS OF OVERLYING WATER

CORE	DEPTH (cm)	CBOD (mg/l)	NH4 (mg/l)	NO3 (mg/l)
1	1	25.65	0.4527	0.0121
1	3	11.80	0.6122	0.0109
1	5	12.00	0.8894	0.0097
2	1	21.60	0.8963	0.0121
2	3	11.85	0.5345	0.0073
2	5	11.95	0.4991	0.0136
3	1	31.15	0.4248	0.0080
3	3	10.40	0.4677	0.0061
3	5	11.85	0.5923	0.0088
4	1	6.90	0.4208	0.0073
4	3	9.50	0.5375	0.0064
4	5	8.55	0.5000	0.0069

TABLE 10. COLUMN 1 SEDIMENT NUTRIENT FLUXES (mg/m**2/day)
AND SEDIMENT OXYGEN DEMAND (g/m**2/day)

WEEK	TP	OP	NO2+NO3	NH4	SOD
1	12.1	12.1	-11.4	12.1	2.0
1	20.3	20.3	-7.1	6.1	
2	16.7	14.4	-50.8	10.6	1.8
2	21.3	20.3	-16.2	21.3	
3	22.7	22.0	-56.8	16.7	3.0
3	27.4	27.4	-33.4	15.2	
4	29.4	27.4	-58.8	24.3	3.0
4	25.8	26.5	-25.0	22.0	
5	75.8	65.9	-21.2	-0.8	1.9
5	66.9	56.8	-31.4	107.4	
6	59.1	50.8	-28.8	94.7	1.4
6	53.7	46.6	-30.4	101.4	
7	47.0	42.4	-12.1	82.6	1.2
7	49.7	41.6	-12.2	83.1	
8	45.5	37.9	-10.6	84.1	1.3
8	48.6	39.5	-11.2	96.3	
9	47.0	40.9	0.0	79.5	1.7
9	49.7	62.8	3.0	87.2	
10	51.5	29.5	0.8	80.3	1.3
10	61.8	51.7	-6.1	67.9	
11	55.3	44.7	0.0	86.4	1.3
11	50.7	46.6	1.0	65.9	

TABLE 11. COLUMN 2 SEDIMENT NUTRIENT FLUXES (mg/m**2/day)
AND SEDIMENT OXYGEN DEMAND (g/m**2/day)

WEEK	TP	OP	NO2+NO3	NH4	SOD
1	17.4	15.2	-27.3	4.5	1.7
1	16.2	16.2	-5.1	1.0	
2	16.7	13.6	-69.7	9.1	2.3
	20.3	16.2	12.2	6.1	
3	19.7	18.9	-9.1	14.4	2.3
3	20.3	21.3	0.0	15.2	
4	27.4	24.3	-28.4	18.2	2.3
	23.5	23.5	-31.1	12.9	
5	19.7	15.2	-29.6	12.1	2.4
5	23.3	12.2	-22.3	10.1	
6	18.2	12.1	-28.0	8.3	2.2
6	21.3	15.2	-29.4	13.2	
7	15.2	10.6	-14.4	6.8	2.6
7	23.3	19.3	-8.1	11.2	
8	16.7	11.4	-17.4	6.1	2.6
8	21.3	18.2	-6.1	18.2	
9	13.6	10.6	3.8	8.3	2.9
9	18.2	14.2	15.2	12.2	
10	16.7	10.6	14.4	16.7	2.7
10	18.2	13.2	29.4	8.1	
11	10.6	9.1	15.2	7.6	3.0
11	10.1	8.1	20.3	5.1	

TABLE 12. COLUMN 3 SEDIMENT NUTRIENT FLUXES (mg/m**2/day)
AND SEDIMENT OXYGEN DEMAND (g/m**2/day)

WEEK	TP	OP	NO2+NO3	NH4	SOD
1	15.9	16.7	-12.1	7.6	1.7
1	17.2	16.2	-11.2	4.0	
2	10.6	9.1	-40.9	6.1	2.3
2	12.2	11.2	-22.3	0.0	
3	9.8	8.3	-63.6	9.8	2.8
3	22.3	23.3	-16.2	10.1	
4	26.4	23.3	-54.7	20.3	2.7
4	22.7	24.2	-41.7	7.6	
5	82.6	78.8	-42.4	0.0	2.3
5	78.0	66.9	-56.8	91.2	
6	59.1	53.8	-56.8	74.2	1.4
6	54.7	50.7	-58.8	88.2	
7	50.0	44.7	-58.3	38.6	0.9
7	49.7	44.6	-58.8	77.0	
8	45.5	39.4	-50.0	75.8	1.1
8	49.7	41.6	-18.2	67.9	
9	50.8	38.6	-22.0	107.6	1.6
9	59.8	49.7	-48.6	122.6	
10	63.6	53.0	-45.4	100.0	1.7
10	67.9	54.7	-62.8	68.9	
11	50.0	43.2	-33.3	60.6	1.2
11	60.8	54.7	-40.5	83.1	

TABLE 13. COLUMN 4 SEDIMENT NUTRIENT FLUXES (mg/m**2/day)
AND SEDIMENT OXYGEN DEMAND (g/m**2/day)

WEEK	TP	OP	NO2+NO3	NH4	SOD
1	16.7	15.9	39.4	9.1	1.5
1	19.3	18.2	39.5	8.1	
2	15.9	15.9	32.6	6.8	1.4
2	16.2	16.2	25.3	7.1	
3	12.9	12.1	28.0	3.0	1.4
3	11.2	12.2	22.3	9.1	
4	12.2	11.2	24.3	0.0	1.2
4	9.1	9.1	18.9	0.8	
5	8.3	5.3	19.7	2.3	1.4
5	10.1	7.1	24.3	-2.0	
6	7.6	4.5	22.7	0.8	1.2
6	7.1	9.1	22.3	0.0	
7	6.1	5.3	25.0	2.3	1.2
7	8.1	5.1	12.2	21.3	
8	7.6	6.1	26.5	1.5	1.4
8	10.1	8.1	10.1	20.3	
9	6.8	5.3	34.8	3.8	1.3
9	12.2	10.1	24.3	6.1	
10	10.6	8.3	32.6	9.8	1.7
10	15.2	10.1	31.4	7.1	
11	8.3	7.6	33.3	5.3	1.3
11	10.1	10.1	33.4	6.1	

TABLE 14. COLUMN 5 (CONTROL) NUTRIENT FLUXES (mg/m**2/day)

WEEK	TP	OP	NO2+NO3	NH4	SOURCE COLUMN
2	14.4	13.6	-15.2	-2.3	1
2	6.1	5.1	-4.0	-8.1	2
3	9.8	9.1	-6.8	-7.6	3
3	4.0	6.1	-12.2	1.0	4
4	9.1	7.1	-7.1	-4.0	1
4	6.1	6.1	-0.8	-5.3	2
5	6.1	3.0	-1.5	-4.5	3
5	7.1	0.0	-4.1	-7.1	4
6	3.0	0.0	3.0	-0.8	1
6	3.0	0.0	1.0	-7.1	2
7	3.0	0.0	-2.3	-3.8	3
7	2.0	0.0	-2.0	0.0	4
8	0.8	3.0	1.5	3.8	1
8	2.0	0.0	-1.0	-5.1	2
9	2.3	0.8	1.5	0.0	3
9	1.0	8.1	-2.0	-10.1	4
10	1.5	3.0	0.0	0.0	1
10	3.0	-1.0	2.0	-9.1	2
11	0.8	0.8	-1.5	-6.1	3
11	0.0	0.0	-2.1	-6.1	4

TABLE 15. COLUMN 1 CORRECTED SEDIMENT NUTRIENT FLUXES (mg/m**2/day) AND CORRECTED SEDIMENT OXYGEN DEMAND (g/m**2/day)

WEEK	TP	OP	NO2+NO3	NH4	CSOD
1	--	--	---	-	1.3
2	4.6	3.7	-18.3	18.2	1.2
3	15.9	17.6	-38.0	20.0	2.4
4	18.5	19.8	-34.8	27.2	2.3
5	68.3	61.3	-29.4	54.1	1.8
6	53.4	48.7	-32.6	98.8	1.3
7	47.6	39.0	-13.7	79.0	1.0
8	46.3	35.7	-12.4	86.4	1.1
9	46.8	48.8	1.5	83.4	1.7
10	55.2	37.6	-2.7	74.1	1.3
11	51.5	42.6	0.5	76.1	1.3

TABLE 16. COLUMN 2 CORRECTED SEDIMENT NUTRIENT FLUXES (mg/m**2/day)
AND CORRECTED SEDIMENT OXYGEN DEMAND (g/m**2/day)

WEEK	TP	OP	NO2+NO3	NH4	CSOD
1	--	--	---	-	0.8
2	12.4	9.9	-24.7	15.7	1.5
3	13.9	14.0	-3.8	20.1	1.5
4	19.4	17.8	-29.0	20.9	1.5
5	18.5	13.7	-26.9	18.2	1.2
6	16.7	13.7	-29.7	17.9	1.1
7	17.2	14.9	-10.2	14.0	1.4
8	17.0	14.8	-10.7	17.2	1.4
9	12.9	13.4	7.5	19.4	2.5
10	14.4	12.9	19.9	21.5	2.4
11	7.3	9.6	15.7	15.4	2.7

TABLE 17. COLUMN 3 CORRECTED SEDIMENT NUTRIENT FLUXES (mg/m**2/day) AND CORRECTED SEDIMENT OXYGEN DEMAND (g/m**2/day)

WEEK	TP	OP	NO2+NO3	NH4	CSOD
1	--	--	---	-	1.2
2	--	--	---	-	1.7
3	6.2	6.7	-33.1	17.6	2.2
4	14.7	14.7	-41.4	21.5	2.2
5	74.2	69.8	-48.1	50.2	1.9
6	50.8	49.2	-56.3	85.8	1.1
7	46.8	44.6	-56.3	61.6	0.5
8	44.5	40.5	-31.8	75.6	0.7
9	53.0	43.4	-36.8	115.1	1.4
10	63.5	53.1	-55.7	84.5	1.5
11	55.4	48.2	-35.4	77.9	1.0

TABLE 18. COLUMN 4 CORRECTED SEDIMENT NUTRIENT FLUXES (mg/m**2/day)
AND CORRECTED SEDIMENT OXYGEN DEMAND (g/m**2/day)

WEEK	TP	OP	NO2+NO3	NH4	CSOD
1	--	--	---	-	0.6
2	--	--	---	-	0.5
3	8.0	6.1	37.3	5.1	0.4
4	6.6	4.0	33.8	-0.6	0.3
5	2.1	6.2	26.1	7.2	0.8
6	0.3	6.8	26.6	7.5	0.6
7	5.0	5.2	20.6	11.8	0.6
8	6.8	7.1	20.4	10.9	0.8
9	8.5	-0.4	31.6	15.1	1.0
10	11.9	1.1	34.0	18.6	1.4
11	9.2	8.9	35.4	11.8	1.0

TABLE 19. REDOX POTENTIAL (mV)

CORE	WEEK	WATER	0.5 cm	1.0 cm	ELAPSED TIME
1	1	---	337.8	67.4	1
1	1	---	310.7	-38.0	10
1	2	448.9	353.1	46.9	1
1	2	464.2	358.0	18.4	10
1	3	432.3	385.9	29.4	1
1	3	450.3	403.4	-1.2	10
1	4	452.0	366.0	-11.6	1
1	4	465.9	299.0	-27.6	10
1	5	358.6	253.9	-10.4	1
1	5	374.8	254.0	-42.5	10
1	6	351.3	323.3	39.2	1
1	6	368.1	333.7	5.8	10
1	7	348.9	336.9	28.0	1
1	7	366.7	360.8	-0.6	10
1	8	333.5	304.3	25.1	1
1	8	357.1	323.6	-2.3	10
1	9	295.8	206.0	153.8	1
1	9	321.4	311.1	211.7	10
1	10	293.1	-15.6	-110.2	1
1	10	309.8	-20.3	-108.2	10
1	11	253.9	-20.2	-120.9	1
1	11	285.2	-54.6	-110.1	10
2	1		75.3	-10.6	1
2	1		33.8	-49.0	10
2	2	454.2	383.0	82.3	1
2	2	462.8	394.1	26.2	10
2	3	444.0	338.0	27.2	1
2	3	456.9	315.7	-11.2	10
2	4	448.3	-17.6	-29.0	1
2	4	465.5	-45.5	-53.8	10
2	5	439.8	-16.5	-39.2	1
2	5	444.8	-35.9	-57.6	10
2	6	429.7	-8.8	-35.2	1
2	6	445.9	-32.1	-44.1	10
2	7	426.8	2.5	-34.2	1
2	7	458.3	-21.6	-42.8	10
2	8	438.2	2.0	-12.5	1
2	8	460.8	-1.7	-18.5	10
2	9	434.4	-13.3	-68.0	1
2	9	455.3	-16.2	-63.2	10

REDOX POTENTIAL (mV)

CORE	WEEK	WATER	0.5 cm	1.0 cm	ELAPSED TIME
2	10	384.2	-22.6	-6.9	1
2	10	403.6	-19.2	-21.0	10
2	11	354.8	13.1	-24.6	1
2	11	368.7	15.7	-30.8	10
3	1		24.0	-5.1	1
3	1		-10.0	-27.5	10
3	2	455.1	21.9	3.9	1
3	2	465.5	2.2	-24.6	10
3	3	445.5	3.7	-25.6	1
3	3	448.0	-13.2	-60.0	10
3	4	449.0	17.5	-54.4	1
3	4	463.8	-6.2	-61.6	10
3	5	333.0	-51.0	-93.6	1
3	5	352.9	-61.1	-101.1	10
3	6	329.6	-40.8	-92.8	1
3	6	355.4	-73.6	-109.0	10
3	7	339.3	-33.3	-119.0	1
3	7	365.5	-70.2	-135.5	10
3	8	350.2	-46.3	-95.8	1
3	8	367.1	-75.8	-101.5	10
3	9	305.9	-68.3	-105.0	1
3	9	338.5	-109.6	-103.3	10
3	10	290.5	-19.0	-127.4	1
3	10	319.1	-50.1	-139.1	10
3	11	284.7	0.1	-71.0	1
3	11	311.0	-8.1	-66.1	10
4	1		93.5	3.3	1
4	1		46.2	-23.5	10
4	2	466.4	109.1	42.0	1
4	2	466.4	55.4	9.4	10
4	3	437.4	68.7	-12.5	1
4	3	451.5	28.8	-21.3	10
4	4	453.0	311.2	8.0	1
4	4	479.6	294.2	-12.4	10
4	5	429.1	294.0	16.8	1
4	5	466.6	284.0	-1.4	10
4	6	422.1	73.6	-10.6	1
4	6	443.8	40.4	-14.3	10
4	7	470.6	217.3	9.7	1
4	7	472.1	187.9	-8.6	10
4	8	453.5	276.0	29.5	1
4	8	467.1	326.2	4.2	10
4	9	428.5	249.3	10.5	1

REDOX POTENTIAL (mV)

CORE	WEEK	WATER	0.5 cm	1.0 cm	ELAPSED TIME
4	9	436.9	270.2	-9.8	10
4	10	439.8	321.4	169.8	1
4	10	451.1	289.4	134.3	10
4	11	410.7	298.6	131.2	1
4	11	415.6	326.0	106.5	10

APPENDIX A

Daily Temperature and pH

CORE 1 pH and Temperature

1	08JUN87	0821	7.96	19.5
1	09JUN87	0819	8.22	23.5
1	10JUN87	0813	8.02	24.6
1	11JUN87	0818	7.85	25.5
1	12JUN87	0802	7.76	23.3
1	15JUN87	0810	7.73	24.3
1	16JUN87	0818	8.08	24.9
1	17JUN87	0805	7.85	24.8
1	17JUN87	0827	8.06	24.8
1	18JUN87	0840	7.92	25.5
1	18JUN87	0945	7.99	25.5
1	18JUN87	0952	8.03	25.5
1	19JUN87	0813	8.07	25.6
1	19JUN87	1033	8.38	25.4
1	22JUN87	0809	7.95	24.4
1	22JUN87	1010	8.36	25.9
1	23JUN87	0807	8.07	24.4
1	23JUN87	0833	8.18	24.5
1	24JUN87	0809	8.11	24.8
1	25JUN87	0804	8.01	25.1
1	25JUN87	0831	8.10	25.1
1	26JUN87	0815	8.07	24.5
1	26JUN87	1033	8.31	25.4
1	29JUN87	0813	7.83	24.7
1	29JUN87	1045	8.33	27.2
1	30JUN87	0811	7.97	24.4
1	30JUN87	0830	8.13	24.4
1	01JUL87	0753	8.01	24.5
1	01JUL87	0828	8.09	24.6
1	02JUL87	0800	8.02	25.1
1	02JUL87	1019	8.34	25.8
1	03JUL87	1927	7.99	24.5
1	03JUL87	1950	8.12	24.6
1	04JUL87	1123	8.06	24.5
1	04JUL87	1135	8.12	24.4
1	06JUL87	0830	8.14	25.4
1	06JUL87	1123	9.17	26.8
1	06JUL87	1600	9.16	25.6
1	07JUL87	0810	9.17	24.6
1	07JUL87	1630	9.16	25.2
1	08JUL87	0755	9.16	24.5
1	09JUL87	0817	9.11	24.3

CORE 1 pH and Temperature

1	10JUL87	0806	9.10	24.3
1	10JUL87	1016	9.16	25.3
1	12JUL87	1348	9.18	24.2
1	13JUL87	0809	9.15	24.7
1	13JUL87	0959	9.15	26.9
1	14JUL87	0804	9.17	24.5
1	15JUL87	0751	9.17	24.8
1	16JUL87	0807	9.18	24.4
1	17JUL87	0805	9.16	24.6
1	17JUL87	1007	9.18	25.6
1	17JUL87	1626	9.19	25.0
1	19JUL87	1444	9.20	23.9
1	20JUL87	0815	9.18	24.4
1	20JUL87	1143	9.19	25.9
1	21JUL87	0840	9.19	24.0
1	22JUL87	0813	9.19	24.9
1	23JUL87	0748	9.19	24.9
1	24JUL87	0804	9.19	24.0
1	24JUL87	1102	9.22	24.6
1	26JUL87	0854	9.22	23.5
1	27JUL87	0759	9.19	23.5
1	27JUL87	1043	9.19	24.8
1	28JUL87	0739	9.19	23.6
1	29JUL87	0800	9.20	23.4
1	30JUL87	0757	9.19	24.7
1	30JUL87	1853	9.15	25.5
1	31JUL87	0808	9.17	24.3
1	31JUL87	1405	9.18	24.8
1	02AUG87	0920	9.05	24.6
1	03AUG87	0821	9.15	24.5
1	03AUG87	1117	10.01	25.5
1	03AUG87	1400	10.02	24.5
1	04AUG87	0803	10.02	23.5
1	05AUG87	1620	9.98	24.5
1	06AUG87	0828	9.95	24.7
1	07AUG87	0851	9.93	24.1
1	08AUG87	1710	9.99	24.9
1	09AUG87	1812	9.99	24.7
1	10AUG87	0813	9.95	25.1
1	10AUG87	1020	10.05	28.0
1	11AUG87	0844	10.03	25.0
1	12AUG87	0813	10.00	25.1
1	13AUG87	0906	10.01	25.3
1	14AUG87	0812	10.00	25.5
1	14AUG87	0955	9.98	24.8

CORE 1 pH and Temperature

1	16AUG87	1231	9.94	24.7
1	17AUG87	0827	9.93	25.0
1	17AUG87	1015	9.99	27.0
1	18AUG87	0739	10.00	24.6
1	19AUG87	0839	9.99	24.7
1	20AUG87	0822	9.97	24.8
1	21AUG87	0818	9.95	25.0
1	21AUG87	0943	9.98	24.9
1	23AUG87	1042	9.96	25.4
1	24AUG87	0759	9.95	25.6

CORE 2 pH and Temperature

2	08JUN87	0827	8.01	19.5
2	09JUN87	0824	8.20	23.6
2	10JUN87	0814	8.02	24.6
2	11JUN87	0819	7.88	25.6
2	12JUN87	0806	7.81	23.3
2	15JUN87	0813	7.86	24.3
2	16JUN87	0820	8.11	24.8
2	17JUN87	0806	8.00	24.7
2	18JUN87	0842	7.95	25.5
2	18JUN87	0946	8.04	25.5
2	18JUN87	1002	8.09	25.3
2	19JUN87	0814	8.04	25.6
2	19JUN87	1034	8.36	25.5
2	22JUN87	0810	8.18	24.2
2	22JUN87	1012	8.39	25.9
2	23JUN87	0808	8.19	24.3
2	24JUN87	0812	8.02	24.7
2	24JUN87	0830	8.14	24.7
2	25JUN87	0807	8.07	25.1
2	25JUN87	0833	8.14	25.1
2	26JUN87	0817	8.15	24.4
2	26JUN87	1034	8.35	25.3
2	29JUN87	0814	7.99	24.7
2	29JUN87	1046	8.36	27.3
2	30JUN87	0812	8.05	24.4
2	30JUN87	0831	8.18	24.4
2	01JUL87	0756	8.10	24.5
2	01JUL87	0829	8.16	24.6
2	02JUL87	0802	8.11	25.2
2	02JUL87	1020	8.34	25.8
2	03JUL87	1929	8.13	24.5
2	03JUL87	1951	8.21	24.7
2	04JUL87	1124	8.19	24.4
2	06JUL87	1209	8.39	27.0
2	07JUL87	0811	8.17	24.6
2	08JUL87	0756	8.01	24.4
2	09JUL87	0819	8.08	24.2
2	09JUL87	0842	8.12	24.3
2	10JUL87	0808	8.16	24.2
2	10JUL87	1045	8.37	26.0
2	12JUL87	1349	8.02	24.1
2	12JUL87	1357	8.17	24.1
2	13JUL87	0811	8.11	24.7

CORE 2 pH and Temperature

2	13JUL87	1050	8.38	27.6
2	14JUL87	0806	8.13	24.4
2	15JUL87	0752	8.04	24.8
2	15JUL87	0811	8.17	24.8
2	16JUL87	0808	8.08	24.4
2	16JUL87	0823	8.14	24.4
2	17JUL87	0806	8.19	24.6
2	17JUL87	1201	8.48	25.1
2	19JUL87	1445	8.07	23.9
2	19JUL87	1455	8.19	23.9
2	20JUL87	0816	8.14	24.5
2	20JUL87	1145	8.40	26.5
2	21JUL87	0842	8.17	23.9
2	22JUL87	0814	7.96	24.9
2	23JUL87	0749	8.03	24.8
2	23JUL87	0820	8.12	24.7
2	24JUL87	0805	8.12	23.9
2	24JUL87	1104	8.44	25.2
2	26JUL87	0856	8.04	23.5
2	26JUL87	0914	8.16	23.5
2	27JUL87	0800	8.11	23.4
2	27JUL87	1045	8.41	25.7
2	28JUL87	0740	8.13	23.6
2	28JUL87	1600	8.01	24.0
2	28JUL87	1621	8.14	24.1
2	29JUL87	0801	8.23	23.2
2	30JUL87	0758	8.11	24.7
2	30JUL87	1857	8.01	25.6
2	30JUL87	1948	8.08	25.6
2	31JUL87	0810	8.07	24.3
2	31JUL87	1407	8.43	25.3
2	02AUG87	0922	7.85	24.6
2	02AUG87	0940	8.11	24.6
2	03AUG87	0822	8.05	24.6
2	03AUG87	1113	8.38	26.1
2	04AUG87	1555	8.04	24.4
2	05AUG87	0748	8.08	24.7
2	05AUG87	0945	8.14	24.7
2	06AUG87	0826	8.31	24.8
2	06AUG87	1205	8.28	25.0
2	07AUG87	0853	8.18	24.2
2	07AUG87	1142	8.41	25.8
2	08AUG87	1711	8.11	24.9
2	09AUG87	1814	7.92	24.9
2	09AUG87	1948	8.09	24.9

CORE 2 pH and Temperature

2	10AUG87	0815	8.19	25.1
2	10AUG87	1100	8.37	28.5
2	11AUG87	0845	8.10	25.0
2	11AUG87	0945	8.17	25.0
2	11AUG87	2026	8.12	24.7
2	12AUG87	0814	8.09	25.1
2	13AUG87	0910	7.97	25.3
2	13AUG87	0928	8.06	25.3
2	13AUG87	1650	8.12	25.0
2	14AUG87	0813	8.12	25.5
2	14AUG87	1109	8.38	25.0
2	16AUG87	1234	8.03	24.7
2	17AUG87	0828	8.09	25.1
2	17AUG87	1046	8.35	27.0
2	18AUG87	0747	8.03	24.5
2	19AUG87	0840	8.20	24.6
2	20AUG87	0823	8.12	24.8
2	20AUG87	1638	8.12	24.9
2	21AUG87	0817	8.10	24.9
2	23AUG87	1043	7.98	25.4
2	24AUG87	0800	8.15	25.5

CORE 3 pH and Temperature

3	08JUN87	0832	8.06	19.7
3	09JUN87	0828	8.18	23.6
3	10JUN87	0817	7.96	24.5
3	11JUN87	0821	7.80	25.7
3	12JUN87	0810	7.75	23.3
3	15JUN87	0820	7.89	24.3
3	16JUN87	0821	8.09	24.7
3	17JUN87	0807	7.93	24.6
3	18JUN87	0843	7.91	25.3
3	18JUN87	0947	7.99	25.4
3	19JUN87	0815	8.01	25.5
3	19JUN87	1035	8.37	25.0
3	22JUN87	0811	7.88	24.2
3	22JUN87	1015	8.35	25.8
3	23JUN87	0809	8.19	24.2
3	24JUN87	0813	7.91	24.6
3	24JUN87	0832	8.09	24.6
3	25JUN87	0810	8.12	24.9
3	26JUN87	0818	8.08	24.3
3	26JUN87	1035	8.34	25.4
3	29JUN87	0815	7.87	24.7
3	29JUN87	1047	8.35	27.3
3	30JUN87	0813	7.94	24.4
3	30JUN87	0832	8.13	24.4
3	01JUL87	0757	8.07	24.5
3	01JUL87	0829	8.14	24.6
3	02JUL87	0804	8.11	25.2
3	02JUL87	1021	8.36	25.9
3	03JUL87	1931	8.11	24.7
3	03JUL87	1952	8.19	24.7
3	04JUL87	1126	8.16	24.5
3	06JUL87	0832	8.27	25.8
3	06JUL87	1124	9.16	26.6
3	06JUL87	1604	9.16	25.6
3	07JUL87	0807	9.18	24.5
3	07JUL87	1631	9.16	25.2
3	08JUL87	0758	9.16	24.4
3	09JUL87	0820	9.15	24.2
3	10JUL87	0814	9.15	24.2
3	10JUL87	1019	9.17	25.5
3	12JUL87	1351	9.19	24.1
3	13JUL87	0813	9.15	24.7
3	13JUL87	0957	9.15	27.0

CORE 3 pH and Temperature

3	14JUL87	0807	9.17	24.3
3	15JUL87	0753	9.17	24.8
3	16JUL87	0810	9.18	24.4
3	17JUL87	0807	9.15	24.6
3	17JUL87	1010	9.18	25.5
3	17JUL87	1630	9.19	25.2
3	19JUL87	1446	9.18	23.9
3	20JUL87	0817	9.19	24.4
3	20JUL87	1147	9.18	26.0
3	21JUL87	0843	9.19	23.9
3	22JUL87	0815	9.18	24.8
3	23JUL87	0750	9.19	24.7
3	24JUL87	0806	9.19	23.8
3	24JUL87	1105	9.21	24.7
3	26JUL87	0858	9.21	23.4
3	27JUL87	0801	9.18	23.4
3	27JUL87	1046	9.19	24.9
3	28JUL87	0741	9.19	23.5
3	29JUL87	0802	9.18	23.3
3	30JUL87	0759	9.18	24.7
3	30JUL87	1858	9.16	25.6
3	31JUL87	0812	9.17	24.3
3	31JUL87	1412	9.18	25.1
3	02AUG87	0924	9.13	24.6
3	03AUG87	0824	9.15	24.6
3	03AUG87	1119	10.01	25.9
3	03AUG87	1408	10.02	24.9
3	04AUG87	0807	10.02	23.6
3	05AUG87	1624	9.98	24.9
3	06AUG87	0825	9.95	24.8
3	07AUG87	0854	9.94	24.3
3	07AUG87	1015	9.18	25.5
3	07AUG87	1054	10.03	25.7
3	08AUG87	1712	10.06	24.9
3	09AUG87	1816	10.04	24.9
3	10AUG87	0816	10.01	25.2
3	10AUG87	1031	10.00	28.1
3	11AUG87	0846	9.99	25.0
3	12AUG87	0815	9.98	25.0
3	13AUG87	0908	9.99	25.2
3	14AUG87	0814	9.97	25.4
3	14AUG87	1005	9.95	24.9
3	16AUG87	1236	9.93	24.7
3	17AUG87	0829	9.92	25.0
3	17AUG87	1030	9.98	27.1

CORE 3 pH and Temperature

3	18AUG87	0742	9.99	24.5
3	19AUG87	0841	9.98	24.6
3	20AUG87	0824	9.95	24.8
3	21AUG87	0816	9.95	24.9
3	21AUG87	0956	9.99	25.4
3	23AUG87	1044	9.97	25.2
3	24AUG87	0801	9.95	25.2

CORE 4 pH and Temperature

4	08JUN87	0840	8.17	19.8
4	09JUN87	0830	8.20	23.7
4	10JUN87	0818	8.00	24.6
4	11JUN87	0824	7.90	25.7
4	12JUN87	0812	7.82	23.3
4	15JUN87	0822	7.90	24.3
4	16JUN87	0823	8.19	24.8
4	17JUN87	0808	8.05	24.6
4	18JUN87	0844	8.04	25.4
4	18JUN87	0948	8.10	25.4
4	19JUN87	0816	8.11	25.5
4	19JUN87	1036	8.40	25.9
4	22JUN87	0812	8.09	24.3
4	22JUN87	1016	8.38	25.8
4	23JUN87	0810	8.29	24.3
4	24JUN87	0814	8.20	24.6
4	25JUN87	0813	8.22	25.0
4	26JUN87	0819	8.16	24.4
4	26JUN87	1036	8.36	25.5
4	29JUN87	0816	8.03	24.7
4	29JUN87	1048	8.36	27.3
4	30JUN87	0814	8.14	24.5
4	01JUL87	0758	8.23	24.6
4	02JUL87	0806	8.10	25.2
4	02JUL87	1022	8.34	25.9
4	03JUL87	1933	8.21	24.6
4	04JUL87	1127	8.12	24.6
4	06JUL87	1204	8.39	27.1
4	07JUL87	0808	8.28	24.5
4	08JUL87	0759	8.20	24.4
4	09JUL87	0822	8.08	24.2
4	09JUL87	0844	8.19	24.3
4	10JUL87	0815	8.28	24.3
4	10JUL87	1048	8.38	26.1
4	12JUL87	1352	8.13	24.2
4	13JUL87	0815	8.06	24.7
4	13JUL87	1048	8.38	27.7
4	14JUL87	0808	8.28	24.4
4	15JUL87	0754	8.17	24.8
4	16JUL87	0811	8.11	24.4
4	17JUL87	0808	8.01	24.7]
4	17JUL87	1200	8.40	25.3
4	17JUL87	1631	8.40	25.2

CORE 4 pH and Temperature

4	19JUL87	1447	8.14	24.0
4	20JUL87	0818	8.09	24.5
4	20JUL87	1149	8.42	26.6
4	21JUL87	0845	8.30	24.0
4	22JUL87	0816	8.22	24.9
4	23JUL87	0751	8.14	24.7
4	24JUL87	0807	8.16	23.8
4	24JUL87	1106	8.44	25.0
4	26JUL87	0900	8.17	23.5
4	27JUL87	0802	8.09	23.5
4	27JUL87	1047	8.43	25.7
4	28JUL87	0742	8.31	23.5
4	29JUL87	0803	8.18	23.3
4	30JUL87	0800	8.09	24.8
4	30JUL87	1901	8.09	25.6
4	30JUL87	1949	8.20	25.6
4	31JUL87	0813	8.17	24.3
4	31JUL87	1413	8.40	25.2
4	02AUG87	0926	8.15	24.6
4	02AUG87	0941	8.24	24.6
4	03AUG87	0825	8.28	24.7
4	03AUG87	1115	8.38	26.1
4	04AUG87	0808	8.32	23.6
4	05AUG87	0750	8.20	24.8
4	06AUG87	0824	8.25	24.8
4	07AUG87	0856	8.16	24.3
4	07AUG87	1139	8.41	25.9
4	08AUG87	1713	8.19	25.0
4	09AUG87	1818	8.06	25.0
4	09AUG87	1949	8.18	25.0
4	10AUG87	0817	8.15	25.1
4	10AUG87	1056	8.35	28.6
4	11AUG87	0847	8.31	25.0
4	12AUG87	0816	8.20	25.0
4	13AUG87	0909	8.04	25.1
4	13AUG87	0930	8.17	25.1
4	14AUG87	0815	8.17	25.3
4	14AUG87	1110	8.39	25.0
4	16AUG87	1237	8.08	24.8
4	17AUG87	0830	8.31	25.1
4	17AUG87	1047	8.41	27.3
4	18AUG87	0745	8.41	24.5
4	19AUG87	0842	8.32	24.6
4	20AUG87	0825	8.16	24.8
4	20AUG87	1643	8.12	25.0

CORE 4 pH and Temperature

4	21AUG87	0814	8.06	24.9
4	21AUG87	1108	8.36	25.4
4	23AUG87	1045	8.17	25.2
4	24AUG87	0802	8.09	25.4

COLUMN 5 pH and Temperature

5	15JUN87	0824	8.34	24.3	1
5	16JUN87	0825	8.27	24.9	1
5	17JUN87	0809	8.26	24.8	1
5	18JUN87	0845	8.24	25.4	1
5	19JUN87	0819	8.25	25.6	1
5	19JUN87	1040	8.22	24.9	2
5	22JUN87	0813	8.21	24.3	2
5	22JUN87	1018	8.06	24.7	3
5	23JUN87	0811	8.07	24.4	3
5	24JUN87	0816	8.07	24.7	3
5	25JUN87	0814	8.06	25.1	3
5	26JUN87	0820	8.04	24.5	3
5	26JUN87	1036	8.26	24.6	4
5	29JUN87	0817	8.25	24.7	4
5	29JUN87	1049	8.06	25.1	1
5	30JUN87	0815	8.05	24.5	1
5	01JUL87	0804	8.07	24.6	1
5	02JUL87	0808	8.05	25.2	1
5	02JUL87	1024	8.24	25.2	2
5	03JUL87	1935	8.28	24.6	2
5	04JUL87	1129	8.27	24.6	2
5	06JUL87	0834	8.32		2
5	06JUL87	1208	8.22	24.6	3
5	07JUL87	0809	8.26	24.6	3
5	08JUL87	0800	8.29	24.5	3
5	09JUL87	0823	8.29	24.3	3
5	10JUL87	0816	8.30	24.3	3
5	10JUL87	1021	8.34	24.7	4
5	12JUL87	1354	8.37	24.2	4
5	13JUL87	0817	8.36	24.7	4
5	13JUL87	1045	9.15	25.1	1
5	14JUL87	0810	9.15	24.4	1
5	15JUL87	0755	9.16	24.8	1
5	16JUL87	0812	9.18	24.4	1
5	17JUL87	0809	9.17	24.7	1
5	17JUL87	1023	8.27	24.7	2
5	17JUL87	1632	8.31	25.1	2
5	19JUL87	1448	8.36	24.0	2
5	20JUL87	0819	8.36	24.5	2
5	20JUL87	1150	9.19	24.6	3
5	21JUL87	0846	9.18	23.9	3
5	22JUL87	0817	9.19	24.9	3
5	23JUL87	0752	9.20	24.8	3

COLUMN 5 pH and Temperature

5	24JUL87	0808	9.21	23.9	3
5	24JUL87	1107	8.31	24.2	4
5	26JUL87	0902	8.35	23.6	4
5	27JUL87	0803	8.36	23.5	4
5	27JUL87	1048	9.17	24.0	1
5	28JUL87	0743	9.18	23.6	1
5	29JUL87	0804	9.19	23.4	1
5	30JUL87	0801	9.18	24.8	1
5	30JUL87	1903	9.15	25.6	1
5	31JUL87	0814	9.17	24.3	1
5	31JUL87	1414	8.25	24.4	2
5	02AUG87	0928	8.37	24.6	2
5	03AUG87	0827	8.35	24.6	2
5	03AUG87	1116	9.14	23.8	3
5	04AUG87	0810	9.19	23.5	3
5	05AUG87	0751	9.16	24.7	3
5	06AUG87	0827	9.17	24.8	3
5	07AUG87	0857	9.17	24.2	3
5	07AUG87	1140	8.35	25.0	4
5	08AUG87	1716	8.38	25.0	4
5	09AUG87	1819	8.36	24.9	4
5	10AUG87	0818	8.36	25.2	4
5	10AUG87	0951	9.94	25.6	1
5	11AUG87	0848	9.92	25.0	1
5	12AUG87	0817	9.92	25.1	1
5	13AUG87	0911	9.96	25.2	1
5	14AUG87	0816	9.95	25.5	1
5	14AUG87	1112	8.27	25.0	2
5	16AUG87	1238	8.38	24.7	2
5	17AUG87	0831	8.37	25.1	2
5	17AUG87	0930	9.98	25.3	3
5	18AUG87	0749	9.97	24.5	3
5	19AUG87	0843	9.98	24.7	3
5	20AUG87	0826	9.97	24.8	3
5	21AUG87	0813	9.96	25.0	3
5	21AUG87	1110	8.32	24.8	4
5	23AUG87	1046	8.37	25.3	4
5	24AUG87	0803	8.38	25.5	4

APPENDIX B

RAW NUTRIENT DATA

TIME (day)	TP (mg/1)	OP (mg/1)	NOX (mg/1)	NH4 (mg/1)	CORE
0.04	0.06	0.05	1.40	0.03	1
4.0	0.22	0.21	1.25	0.19	1
4.04	0.06	0.05	1.30	0.02	1
7	0.26	0.25	1.23	0.08	1
7.04	0.07	0.07	1.45	0.04	1
11	0.29	0.26	0.78	0.18	1
11.04	0.05	0.04	0.99	0.02	1
14	0.26	0.24	0.83	0.23	1
14.04	0.08	0.07	1.08	0.04	1
18	0.38	0.36	0.33	0.26	1
18.04	0.08	0.08	1.10	0.04	1
21	0.35	0.35	0.77	0.19	1
21.04	0.07	0.07	1.02	0.07	1
24	0.36	0.34	0.44	0.31	1
24.04	0.07	0.06	1.05	0.07	1
28	0.41	0.41	0.72	0.36	1
28.04	0.15	0.16	0.73	0.01	1
32	1.15	1.03	0.45	0.00	1
32.04	0.12	0.10	0.70	0.00	1
35	0.78	0.66	0.39	1.06	1
35.04	0.11	0.01	0.68	0.05	1
39	0.89	0.68	0.30	1.30	1
39.04	0.07	0.04	0.70	0.04	1
42	0.60	0.50	0.40	1.04	1
42.04	0.09	0.04	0.31	0.03	1
46	0.71	0.60	0.15	1.12	1
46.04	0.07	0.05	0.31	0.02	1
49	0.56	0.46	0.19	0.84	1
49.04	0.08	0.05	0.30	0.03	1
53	0.68	0.55	0.16	1.14	1
53.04	0.06	0.05	0.29	0.02	1
56	0.54	0.44	0.18	0.97	1
56.04	0.10	0.01	0.01	0.05	1
60	0.72	0.55	0.01	1.10	1
60.04	0.12	0.07	0.01	0.05	1
63	0.61	0.69	0.04	0.91	1
63.04	0.14	0.09	0.01	0.04	1
67	0.82	0.48	0.02	1.10	1
67.04	0.09	0.06	0.07	0.02	1
70	0.70	0.57	0.01	0.69	1
70.04	0.14	0.07	0.02	0.04	1
74	0.87	0.66	0.02	1.18	1

TIME (day)	TP (mg/l)	OP (mg/l)	NOX (mg/l)	NH4 (mg/l)	CORE
74.04	0.12	0.05	0.00	0.13	1
77	0.62	0.51	0.01	0.78	1
0.04	0.06	0.06	1.44	0.03	2
4	0.29	0.26	1.08	0.09	2
4.04	0.07	0.06	1.40	0.04	2
7	0.23	0.22	1.35	0.05	2
7.04	0.08	0.08	1.64	0.04	2
11	0.30	0.26	0.72	0.16	2
11.04	0.04	0.04	0.83	0.03	2
14	0.24	0.20	0.95	0.09	2
14.04	0.05	0.05	0.72	0.04	2
18	0.31	0.30	0.60	0.23	2
18.04	0.06	0.05	0.75	0.03	2
21	0.26	0.26	0.75	0.18	2
21.04	0.06	0.06	0.86	0.09	2
24	0.33	0.30	0.58	0.27	2
24.04	0.07	0.06	1.05	0.07	2
28	0.38	0.37	0.64	0.24	2
28.04	0.07	0.07	0.69	0.08	2
32	0.33	0.27	0.30	0.24	2
32.04	0.06	0.05	0.68	0.04	2
35	0.29	0.17	0.46	0.14	2
35.04	0.07	0.04	0.68	0.05	2
39	0.31	0.20	0.31	0.16	2
39.04	0.06	0.04	0.73	0.02	2
42	0.27	0.19	0.44	0.15	2
42.04	0.08	0.06	0.34	0.04	2
46	0.28	0.20	0.15	0.13	2
46.04	0.07	0.05	0.32	0.03	2
49	0.30	0.24	0.24	0.14	2
49.04	0.08	0.08	0.34	0.02	2
53	0.30	0.23	0.11	0.10	2
53.04	0.06	0.04	0.28	0.02	2
56	0.27	0.22	0.22	0.20	2
56.04	0.08	0.06	0.04	0.03	2
60	0.26	0.20	0.09	0.14	2
60.04	0.07	0.04	0.00	0.01	2
63	0.25	0.18	0.15	0.13	2
63.04	0.08	0.04	0.00	0.02	2
67	0.30	0.18	0.19	0.24	2
67.04	0.08	0.05	0.00	0.02	2
70	0.26	0.18	0.29	0.10	2
70.04	0.12	0.07	0.02	0.03	2
74	0.26	0.19	0.22	0.13	2
74.04	0.08	0.04	0.00	0.02	2

TIME (day)	TP (mg/l)	OP (mg/l)	NOX (mg/l)	NH4 (mg/l)	CORE
77	0.18	0.12	0.20	0.07	2
0.04	0.06	0.04	1.20	0.03	3
4	0.27	0.26	1.04	0.13	3
4.04	0.05	0.05	1.31	0.03	3
7	0.22	0.21	1.20	0.07	3
7.04	0.07	0.06	1.29	0.03	3
11	0.21	0.18	0.75	0.11	3
11.04	0.06	0.05	1.27		3
14	0.18	0.16	1.05	0.11	3
14.04	0.07	0.07	1.46	0.03	3
18	0.20	0.18	0.62	0.16	3
18.04	0.05	0.05	1.12	0.06	3
21	0.27	0.28	0.96	0.16	3
21.04	0.06	0.06	1.23	0.06	3
24	0.32	0.29	0.69	0.26	3
24.04	0.06	0.06	1.43	0.10	3
28	0.36	0.38	0.88	0.20	3
28.04	0.15	0.14	1.46	0.00	3
32	1.24	1.18	0.90	0.00	3
32.04	0.13	0.12	1.44	0.00	3
35	0.90	0.78	0.88	0.90	3
35.04	0.11	0.03	1.44	0.25	3
39	0.89	0.74	0.69	1.23	3
39.04	0.08	0.04	1.42	0.03	3
42	0.62	0.54	0.84	0.90	3
42.04	0.08	0.06	1.49	0.06	3
46	0.74	0.65	0.72	0.57	3
46.04	0.07	0.05	1.49	0.06	3
49	0.56	0.49	0.91	0.82	3
49.04	0.09	0.06	1.38	0.04	3
53	0.69	0.58	0.72	1.04	3
53.04	0.06	0.05	0.57	0.03	3
56	0.55	0.46	0.39	0.70	3
56.04	0.11	0.08	0.56	0.06	3
60	0.78	0.59	0.27	1.48	3
60.04	0.10	0.07	1.38	0.05	3
63	0.69	0.56	0.90	1.26	3
63.04	0.13	0.08	1.42	0.06	3
67	0.97	0.78	0.82	1.38	3
67.04	0.12	0.09	1.51	0.04	3
70	0.79	0.63	0.89	0.72	3
70.04	0.12	0.06	1.18	0.04	3
74	0.78	0.63	0.74	0.84	3
74.04	0.12	0.06	1.27	0.04	3
77	0.72	0.60	0.87	0.86	3

TIME (day)	TP (mg/l)	OP (mg/l)	NOX (mg/l)	NH4 (mg/l)	CORE
0.04	0.04	0.03	0.02	0.02	4
4	0.26	0.24	0.54	0.14	4
4.04	0.06	0.06	0.01	0.02	4
7	0.25	0.24	0.40	0.10	4
7.04	0.07	0.05	0.01	0.01	4
11	0.28	0.26	0.44	0.10	4
11.04	0.06	0.06	0.03	0.01	4
14	0.22	0.22	0.28	0.08	4
14.04	0.06	0.06	0.01	0.01	4
18	0.23	0.22	0.38	0.05	4
18.04	0.06	0.05	0.01	0.02	4
21	0.17	0.17	0.23	0.11	4
21.04	0.06	0.06	0.01	0.07	4
24	0.18	0.17	0.25	0.07	4
24.04	0.06	0.06	0.01	0.08	4
28	0.18	0.18	0.26	0.09	4
28.04	0.05	0.06	0.00	0.05	4
32	0.16	0.13	0.26	0.08	4
32.04	0.05	0.04	0.00	0.05	4
35	0.15	0.11	0.24	0.03	4
35.04	0.06	0.04	0.00	0.02	4
39	0.16	0.10	0.30	0.03	4
39.04	0.06	0.03	0.01	0.03	4
42	0.13	0.12	0.23	0.03	4
42.04	0.06	0.04	0.00	0.02	4
46	0.14	0.11	0.33	0.05	4
46.04	0.06	0.05	0.00	0.01	4
49	0.14	0.10	0.12	0.22	4
49.04	0.06	0.04	0.01	0.02	4
53	0.16	0.12	0.36	0.04	4
53.04	0.06	0.04	0.00	0.01	4
56	0.16	0.12	0.10	0.21	4
56.04	0.08	0.05	0.02	0.01	4
60	0.17	0.12	0.48	0.06	4
60.04	0.06	0.03	0.01	0.01	4
63	0.18	0.13	0.25	0.07	4
63.04	0.07	0.04	0.00	0.01	4
67	0.21	0.15	0.43	0.14	4
67.04	0.06	0.04	0.01	0.00	4
70	0.21	0.14	0.32	0.07	4
70.04	0.09	0.04	0.01	0.01	4
74	0.20	0.14	0.45	0.08	4
74.04	0.08	0.03	0.00	0.00	4
77	0.18	0.13	0.33	0.06	4
0.04					5

TIME (day)	TP (mg/l)	OP (mg/l)	NOX (mg/l)	NH4 (mg/l)	CORE
4	0.25	0.21	1.10	0.08	5
4.04	0.18	0.16	0.96	0.17	5
7	0.24	0.21	0.91	0.04	5
7.04	0.16	0.14	0.86	0.07	5
11	0.35	0.32	0.66	0.04	5
11.04	0.24	0.20	0.55	0.14	5
14	0.30	0.25	0.51	0.06	5
14.04	0.14	0.12	0.81	0.12	5
18	0.27	0.24	0.72	0.02	5
18.04	0.18	0.16	0.28	0.05	5
21	0.22	0.22	0.16	0.06	5
21.04	0.28	0.28	0.61	0.15	5
24	0.37	0.35	0.54	0.11	5
24.04	0.24	0.22	0.44	0.21	5
28	0.32	0.30	0.43	0.14	5
28.04	0.26	0.27	0.66	0.15	5
32	0.34	0.31	0.64	0.09	5
32.04	0.11	0.09	0.20	0.09	5
35	0.18		0.16	0.02	5
35.04	0.64	0.50	0.28	0.85	5
39	0.68		0.32	0.84	5
39.04	0.25		0.24	0.18	5
42	0.28		0.25	0.11	5
42.04	0.50	0.43	0.73	0.73	5
46	0.54		0.70	0.68	5
46.04	0.10		0.24	0.00	5
49	0.12	0.08	0.22	0.00	5
49.04	0.48	0.38	0.17	0.69	5
53	0.49	0.42	0.19	0.74	5
53.04	0.22	0.17	0.07	0.06	5
56	0.24	0.17	0.06	0.01	5
56.04	0.43	0.34	0.29	0.53	5
60	0.46	0.35	0.31	0.53	5
60.04	0.12	0.09	0.34	0.10	5
63	0.13	0.17	0.32	0.00	5
63.04	0.47	0.34	0.01	0.62	5
67	0.49	0.38	0.01	0.62	5
67.04	0.22	0.18	0.14	0.18	5
70	0.25	0.17	0.16	0.09	5
70.04	0.64	0.49	0.78	0.60	5
74	0.65	0.50	0.76	0.52	5
74.07	0.17	0.11	0.35	0.06	5
77	0.17	0.11	0.33	0.00	5

APPENDIX C

HYDRILLA ANALYSIS

C N ANALYSIS OF HYDRILLA

% C	% N	% ASH
42	4	0.7
41	4	1.7

TOTAL PHOSPHORUS ANALYSIS OF HYDRILLA

		% P
Sample A	1.349 mg/gm	0.13
Sample B	1.379 mg/gm	0.14
Sample C	1.394 mg/gm	0.14
Sample D	1.426 mg/gm	0.14

APPENDIX D

LAB NOTEBOOK

LAB NOTEBOOK

03 June:	Column 5 stirrer dropped into column. Sediments disturbed.
04 June:	Hunt clip dropped into Column 3. Sediments slightly agitated. Column 5 not settled out from 3 June mishap; stirrer RPMs reduced.
08 June:	Columns 1 & 4 overshot during 1st refill. Column 4 spiked with NO3 by mistake. Col. siphoned twice and spiked as per instructions.
15 June:	Column 3 overshot to 35.5 cm during 1st refill. Column 4 overshot by 1 cm during 2nd refill.
16 June:	Brownish, oily substance noticed on Col. 2 DO probe membrane; probe replaced.
19 June:	Wrong nutrient spike added to column 4; col. siphoned three times and correct spike added. Column 2 overshot by 1 cm during 2nd refill. Column 3 overshot by 3.5 cm during 2nd refill.
20 June:	Noticed column 3 stirrer disconnected. Stirrer was reconnected and set to 814 RPMs.
22 June:	No reaeration since power outage at 1500 June 20. DO readings - Col.1, 0.18 mg/l; Col.2, 2.97 mg/l; Col.3, 3.87 mg/l; Col.4, 2.42 mg/l; Col.5, 6.29 mg/l. Shaft fell off Column 3 stirrer again; tube shaft coupling replaced. All columns aerated to 9 mg/l DO in case of thunderstorms/power outage.
23 June:	Noticed aeration tube to Column 1 disconnected; DO dropped to 3.69 mg/l. All columns aerated to 9 mg/l.
26 June:	All columns aerated to 9 mg/l for the weekend.
29 June:	All columns aerated for the night.
30 June:	Experiment designed and set up to test if phosphorus is leached from column cap O-rings.
02 July:	Columns 1, 2, 3, and 4 aerated to 9 mg/l.
03 July:	DOs dropped to below 7 mg/l in columns 1 through 4; aerated up to 9 mg/l. Computer malfunction; fuse replaced.
06 July:	Columns 1 through 3 and 5 aerated for the night. Continuing computer malfunction; screen displays all zeroes at times.
07 July:	Computer system troubleshot; A/D converter replaced.
08 July:	Sodium bicarbonate added to column 1 instead of col. 3. Mistake was corrected and pH readjusted.
10 July:	Lead weight the size of a nickle dropped into column 4. Attempts at retrieval futile.
12 July:	All columns aerated to 9 mg/l in case of thunderstorms.
15 July:	Noticed column 1 kicking up sediment into water column; stirrer disconnected until sediment settled.
17 July:	Switch from using store bought Borax for pH adjustment to reagant grade Borax. All stirrers checked and reset; no more trouble with sediments being picked up. All columns aerated for the weekend.

20 July: Hole in membrane of col. 1 DO probe. Membrane and O-ring replaced.
Nutrient spike not added in time for proper dilution during 2nd refill in columns 1 and 3. Cols. siphoned a 3rd time.
All columns aerated for the night.

22 July: Computer went down at 2200 on July 21. DO readings all above 5 mg/l; computer reset.

24 July: TP leaching experiment concluded.
All columns aerated for the night.

27 July: All columns aerated for the night.

28 July: All columns aerated for the night.

29 July: All columns aerated for the night.

30 July: Aeration overshot to 10 to 11 mg/l.

03 Aug : Batteries replaced in channel 3 (DO probe).
All DO probe membranes changed.
Columns 2 & 4 received only 1 siphon/refill.
All columns aerated for the night.

04 Aug : All columns aerated for the night.
All zeroes noticed on screen; computer reset.

05 Aug : Membranes replaced on cols 1 & 4 DO probes.
New batteries put in all channels (DO probes).
Column 5 DO readings incorrect; set on wrong scale; problem corrected.

06 Aug : Computer all zeroes. Turned off via surge protector. Problem trouble-shot and computer chips replaced.
Weight dropped into column 2.
Membranes changed on cols. 1 & 3 DO probes.

07 Aug : For column 3 spike prepared on 31 July, uncertain whether 1.5 ml or 1.5 mg nitrate used.
Columns 1 through 4 aerated for the weekend.

11 Aug : All DO probe membranes changed.

13 Aug : Columns 1, 3, & 5 DO probe membranes changed.
New ORP holes marked.

14 Aug : Hunt clip fell into column 3.
O-ring replaced on column 5 stirrer.
Columns 1 through 4 aerated for the weekend.

17 Aug : Clumps of hydrilla suspended in column 3.
Hydrilla added during 1st refill of column 2. Will do only 1 refill.
DO probe membranes changed on columns 1 through 4.

18 Aug : Membrane changed on column 3 DO probe.
Columns 1 & 2 DO probes changed. New membranes placed on new probes.
Computer screen displays zeroes; computer reset twice before problem corrected.

21 Aug : Column 5 DO probe membrane changed.
New reagant grade Borax used for pH buffering. From Biol. Oc.; 9 yrs. old.
Column 5 DO probe changed; new membrane.

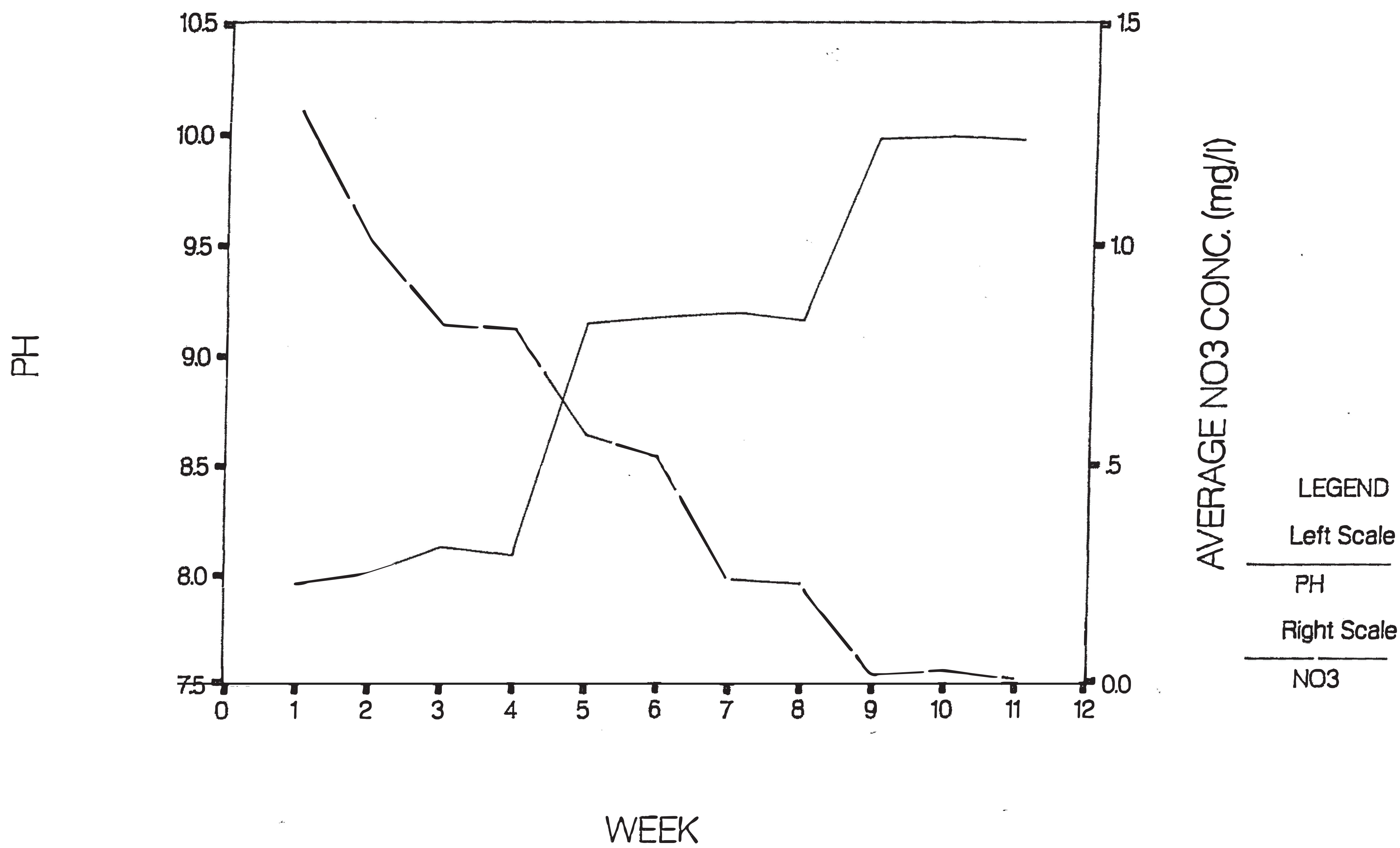
24 Aug : Shut down day.
Live worms visible in all columns.

30 Sep : Interstitial water samples thawed; particles and/or rust color present.
Samples were refiltered.

APPENDIX E

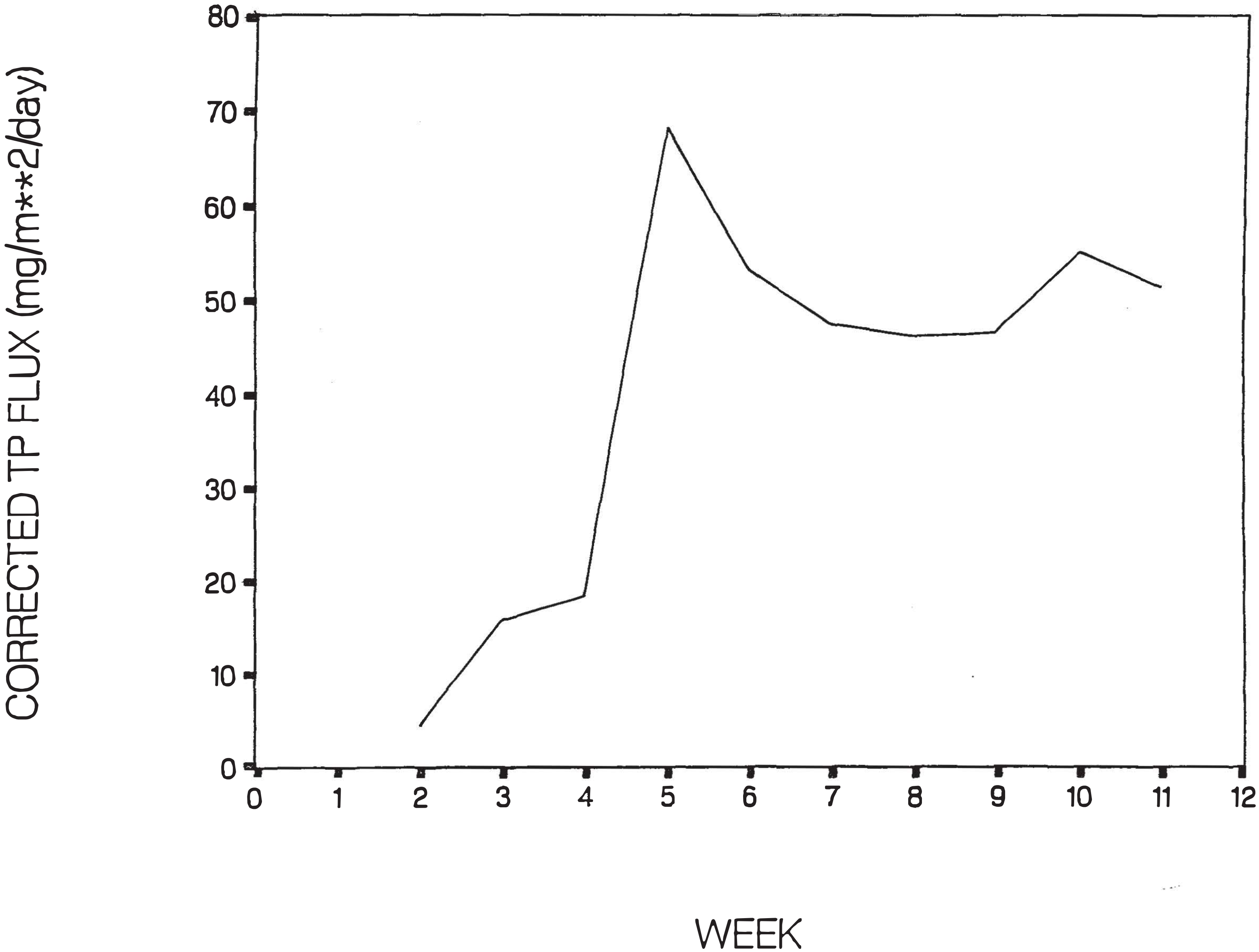
GRAPHS

CORE 1

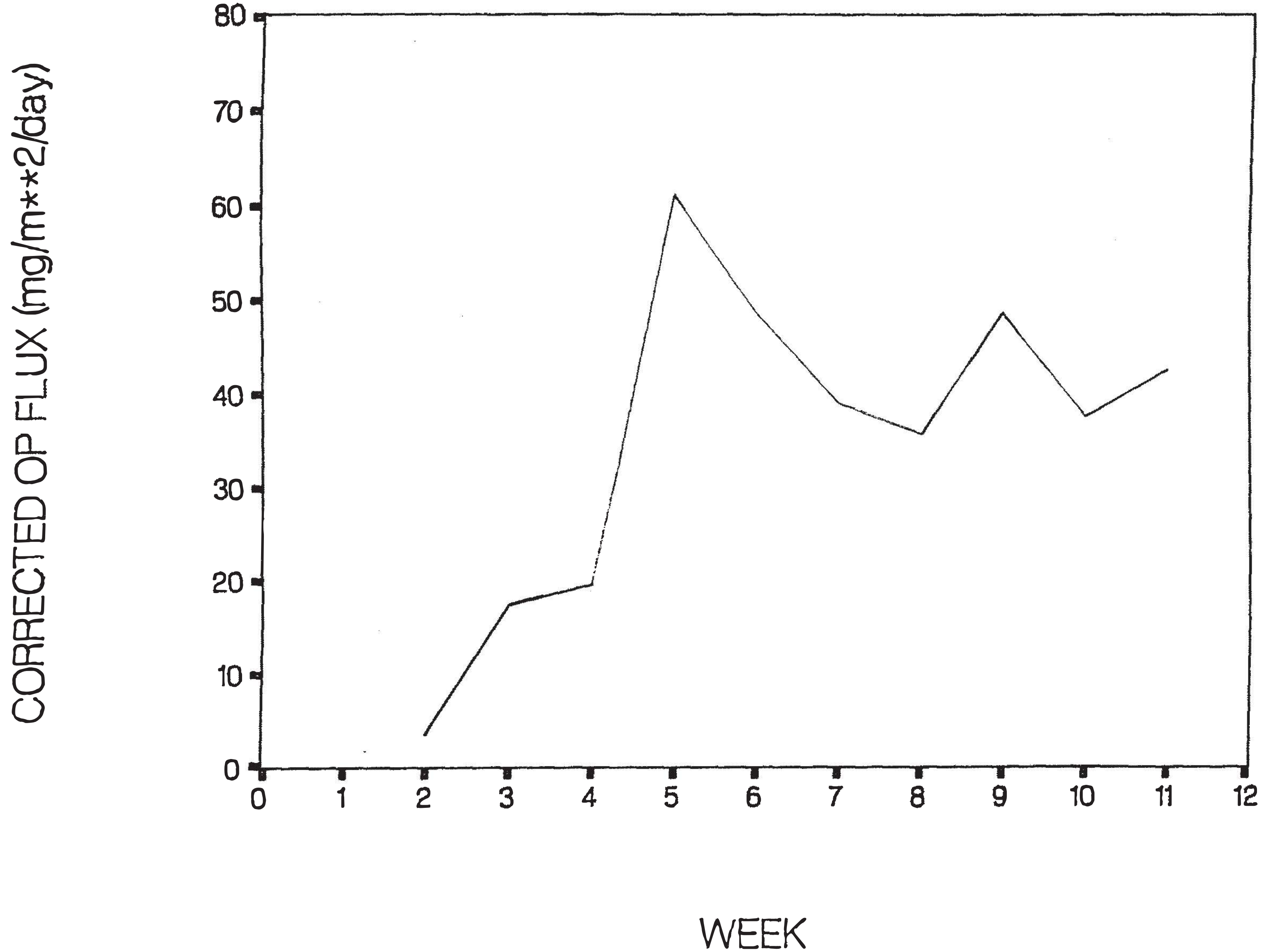


PH
10.5
10.0
9.5
9.0
8.5
8.0
7.5
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK
1.5
1.0
.5
0.0
AVERAGE NO3 CONC. (mg/l)
LEGEND
Left Scale
PH
Right Scale
NO3

CORE 1

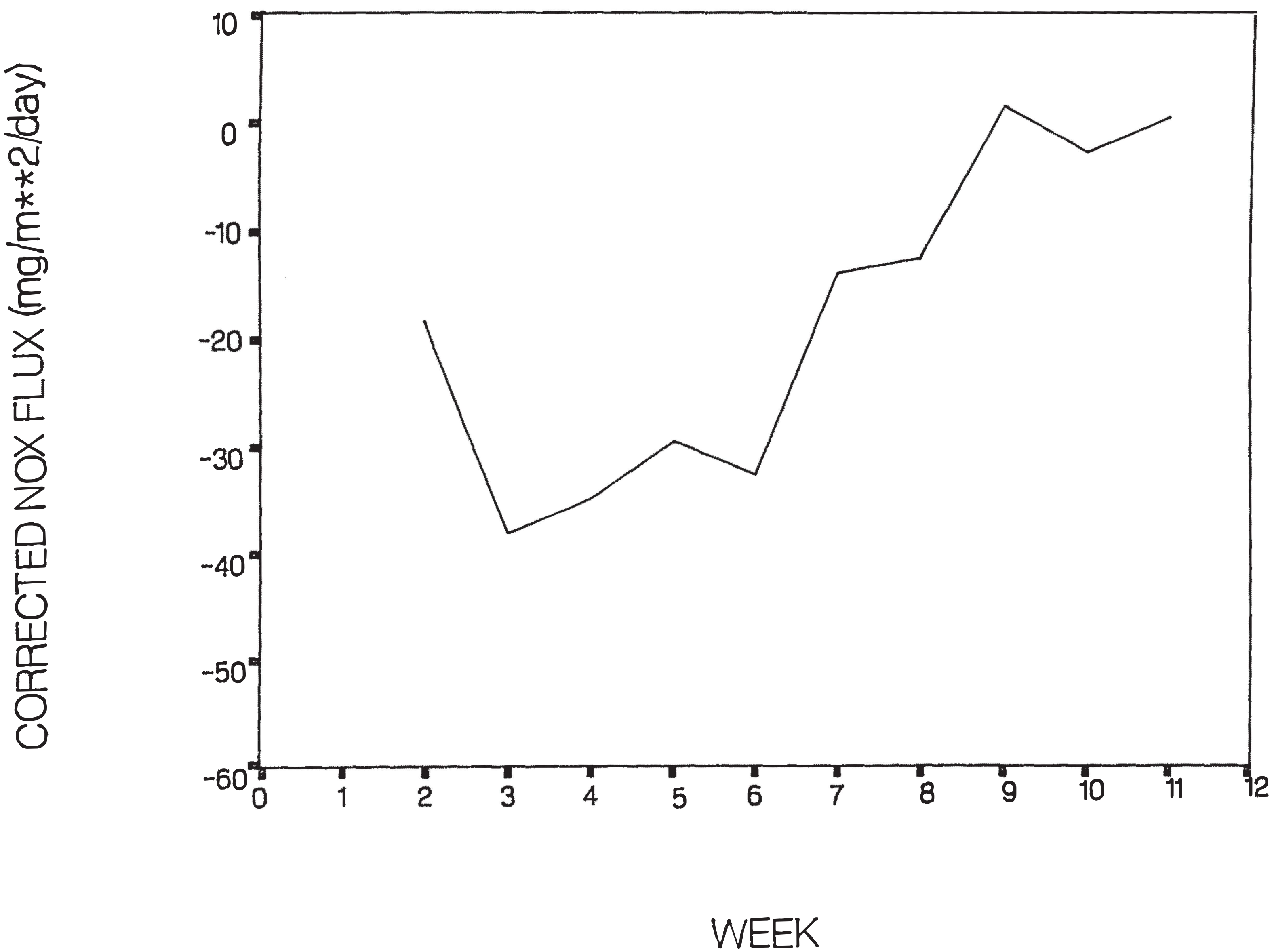

CORRECTED TP FLUX (mg/m**2/day)
0
10
20
30
40
50
60
70
80
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 1



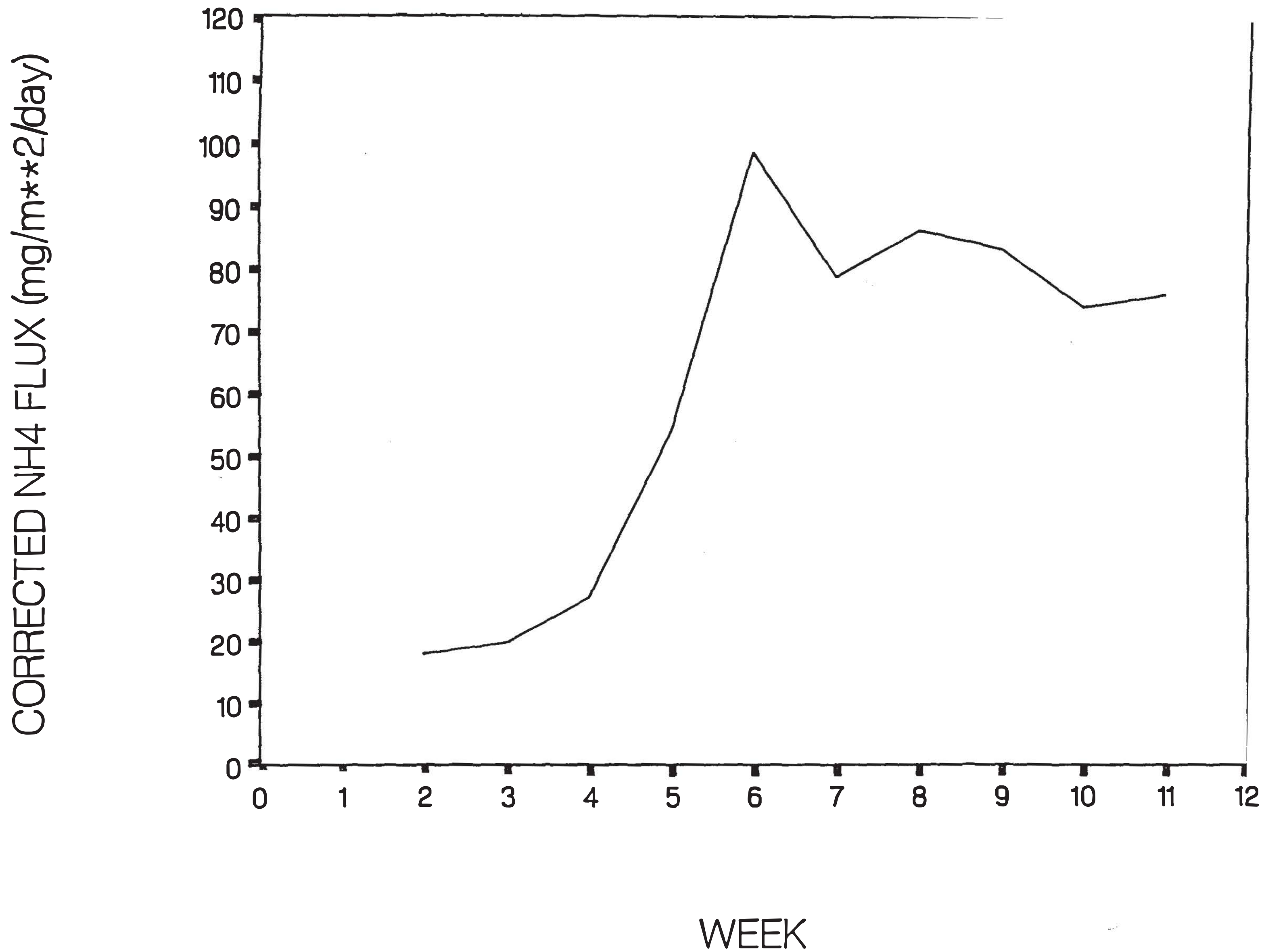
CORRECTED OP FLUX (mg/m**2/day)
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 1



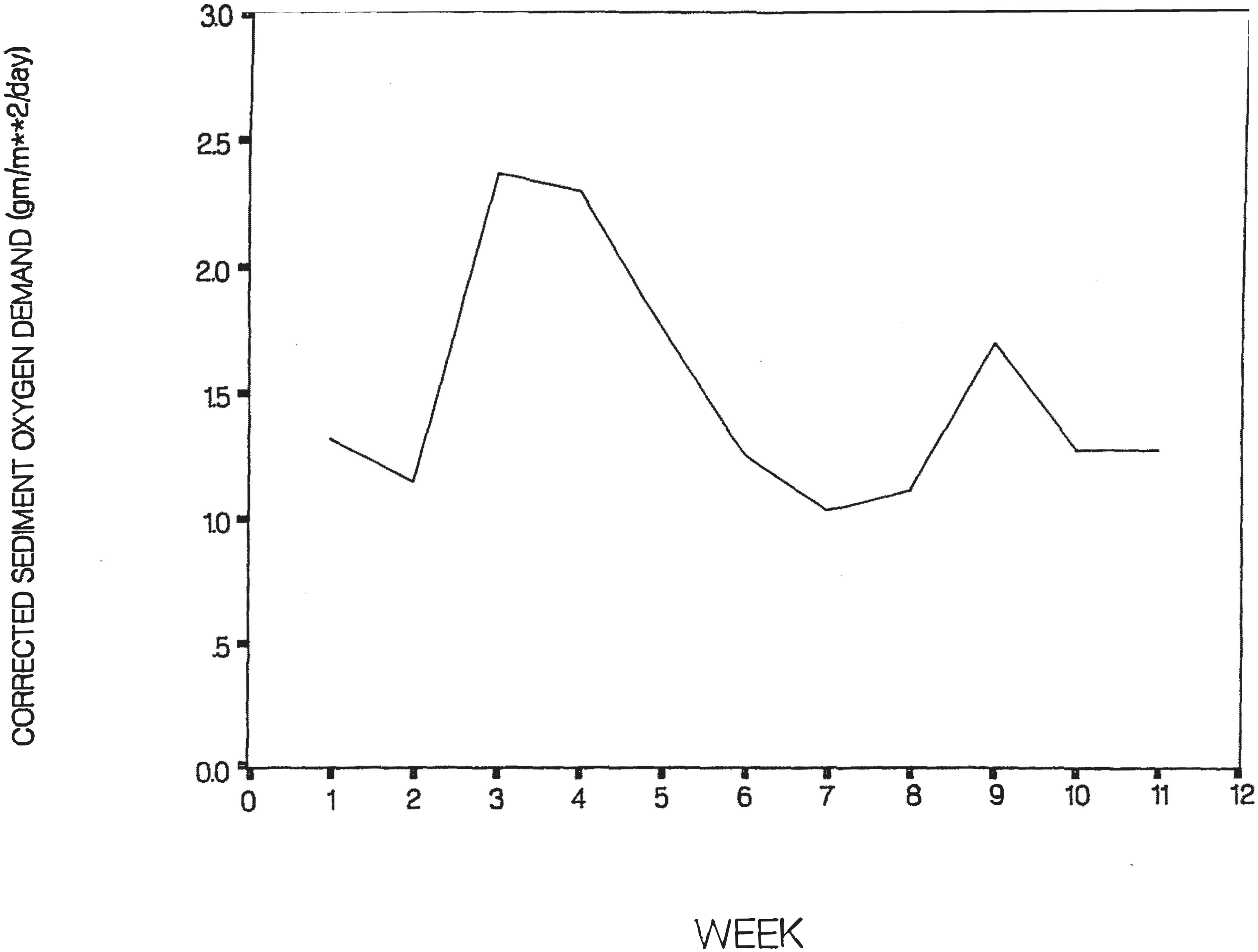
CORRECTED NOX FLUX (mg/m**2/day)
10
0
-10
-20
-30
-40
-50
-60
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 1



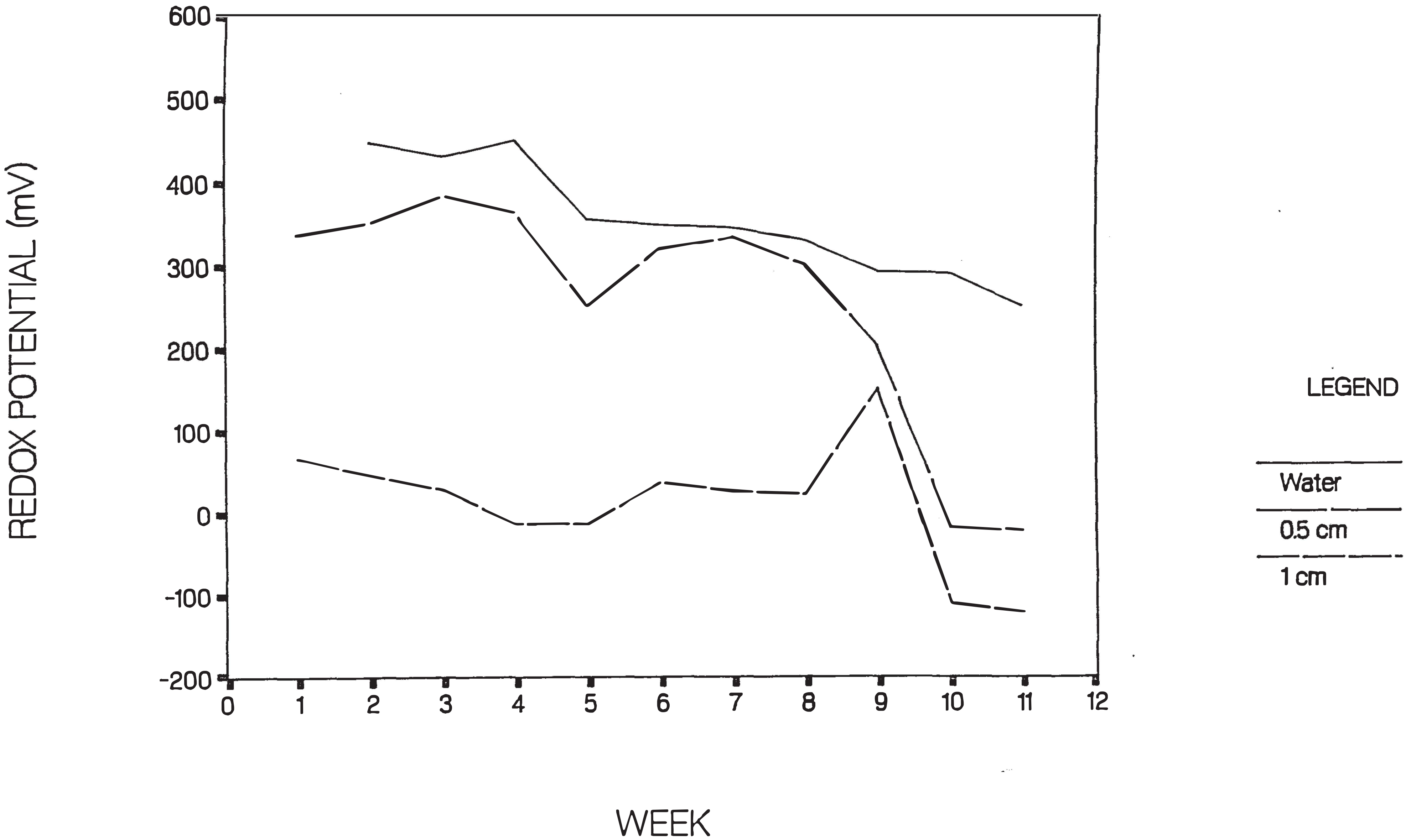
CORRECTED NH4 FLUX (mg/m**2/day)
120
110
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 1

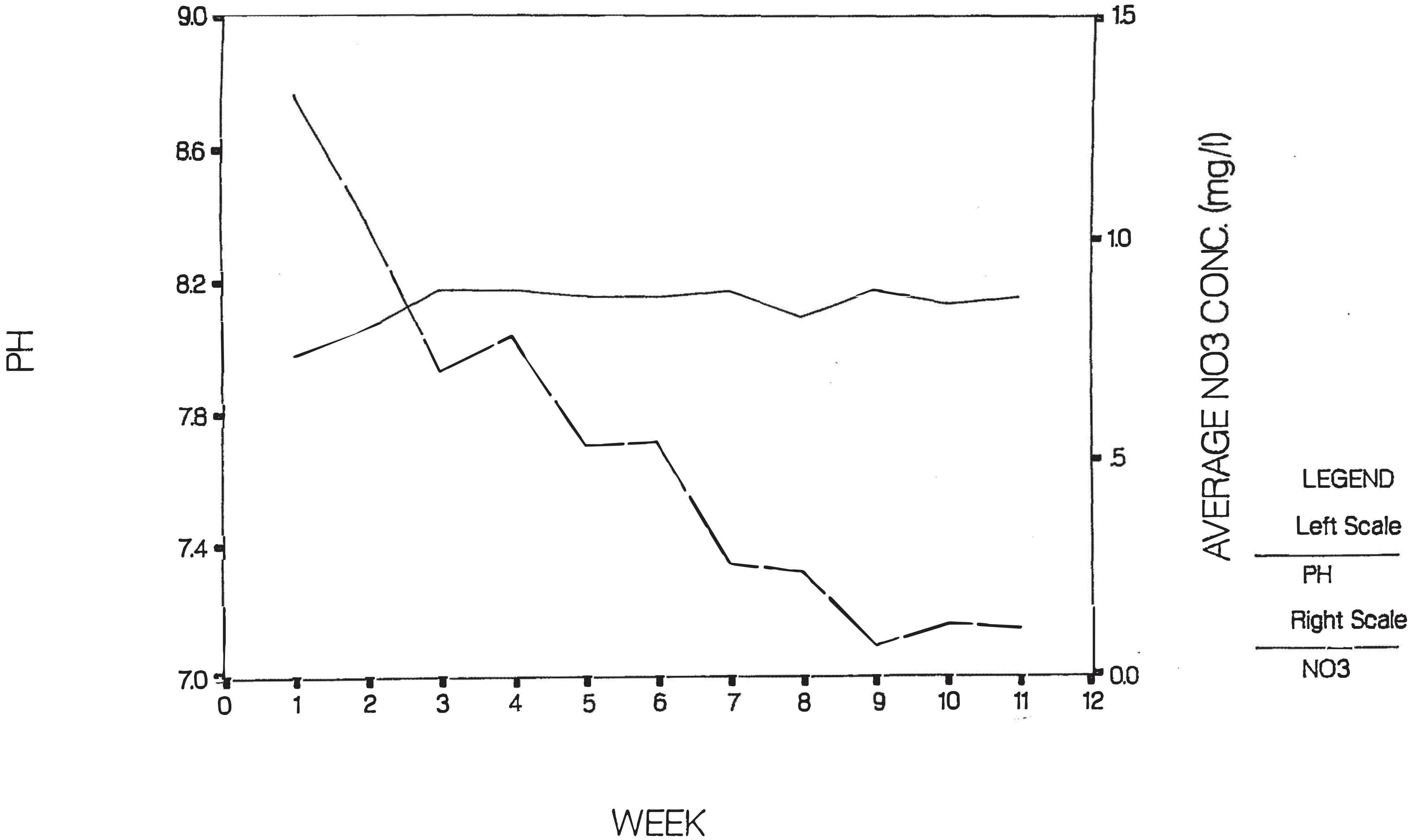


CORRECTED SEDIMENT OXYGEN DEMAND (gm/m**2/day)
3.0
2.5
2.0
1.5
1.0
.5
0.0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

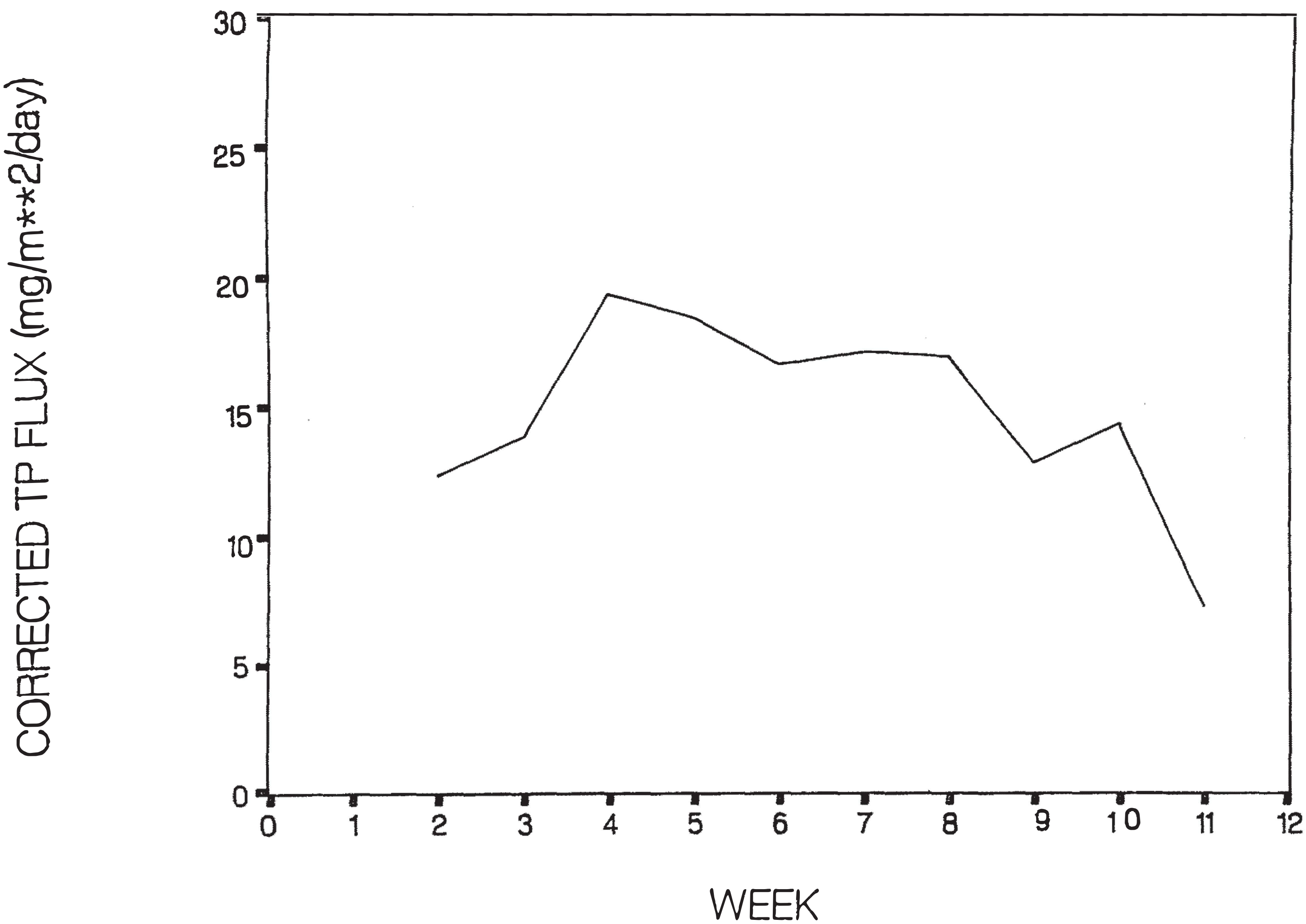
CORE 1


REDOX POTENTIAL (mV)
600
500
400
300
200
100
0
-100
-200
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK
LEGEND
Water
0.5 cm
1 cm

CORE 2

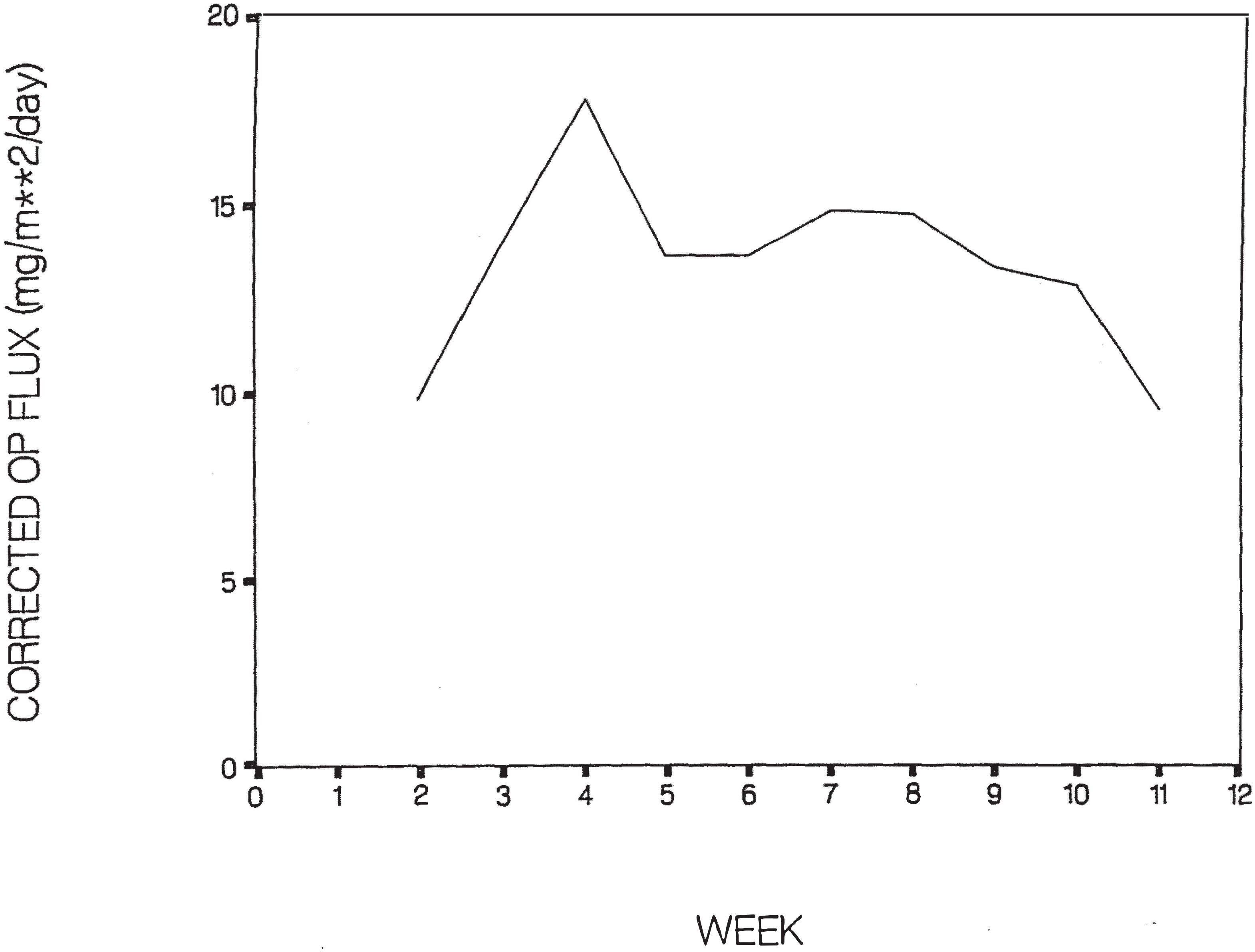

PH
9.0
8.6
8.2
7.8
7.4
7.0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK
1.5
1.0
.5
0.0
AVERAGE NO3 CONC. (mg/l)
LEGEND
Left Scale
PH
Right Scale
NO3

CORE 2

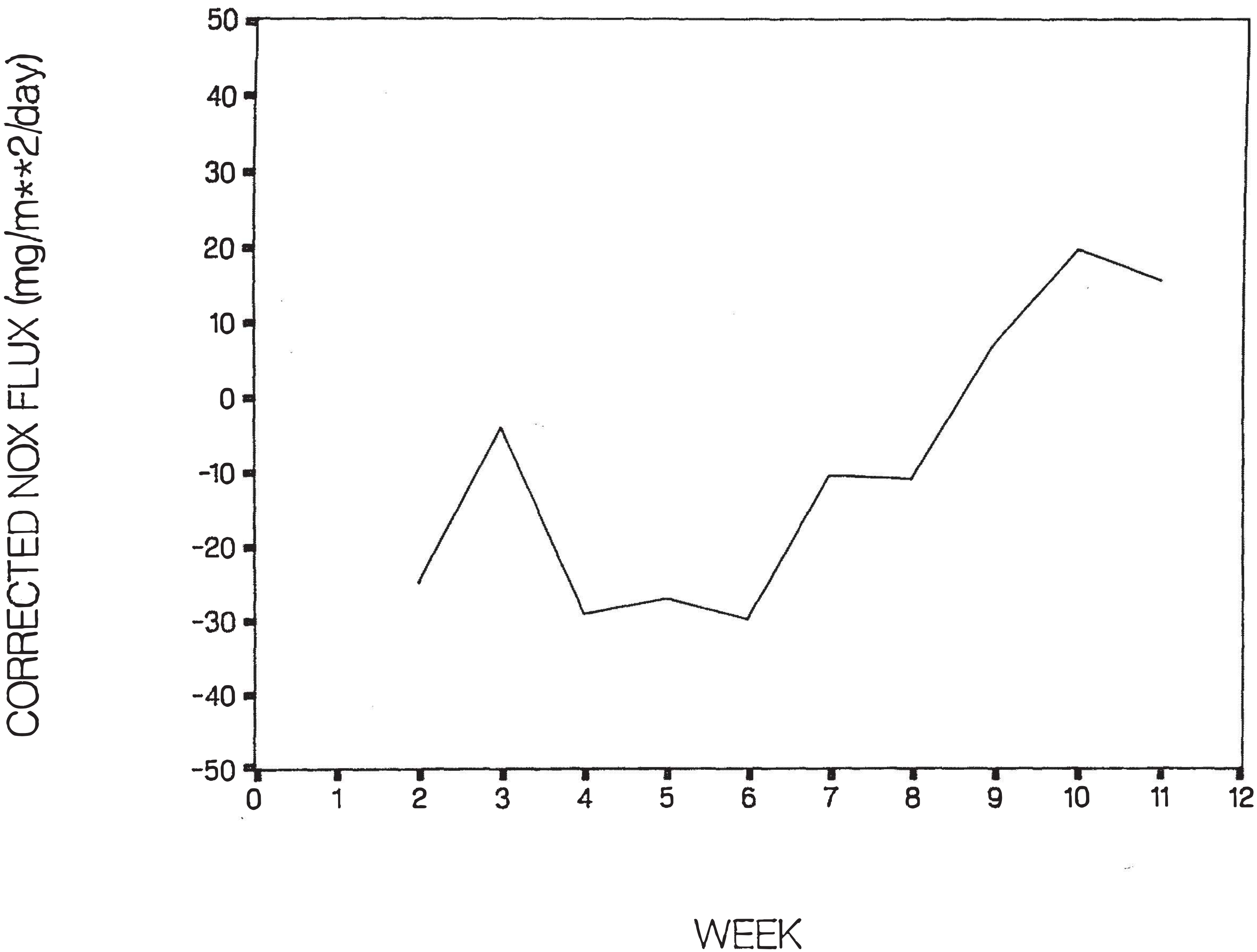


CORRECTED TP FLUX (mg/m**2/day)
30
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12
WEEK

CORE 2

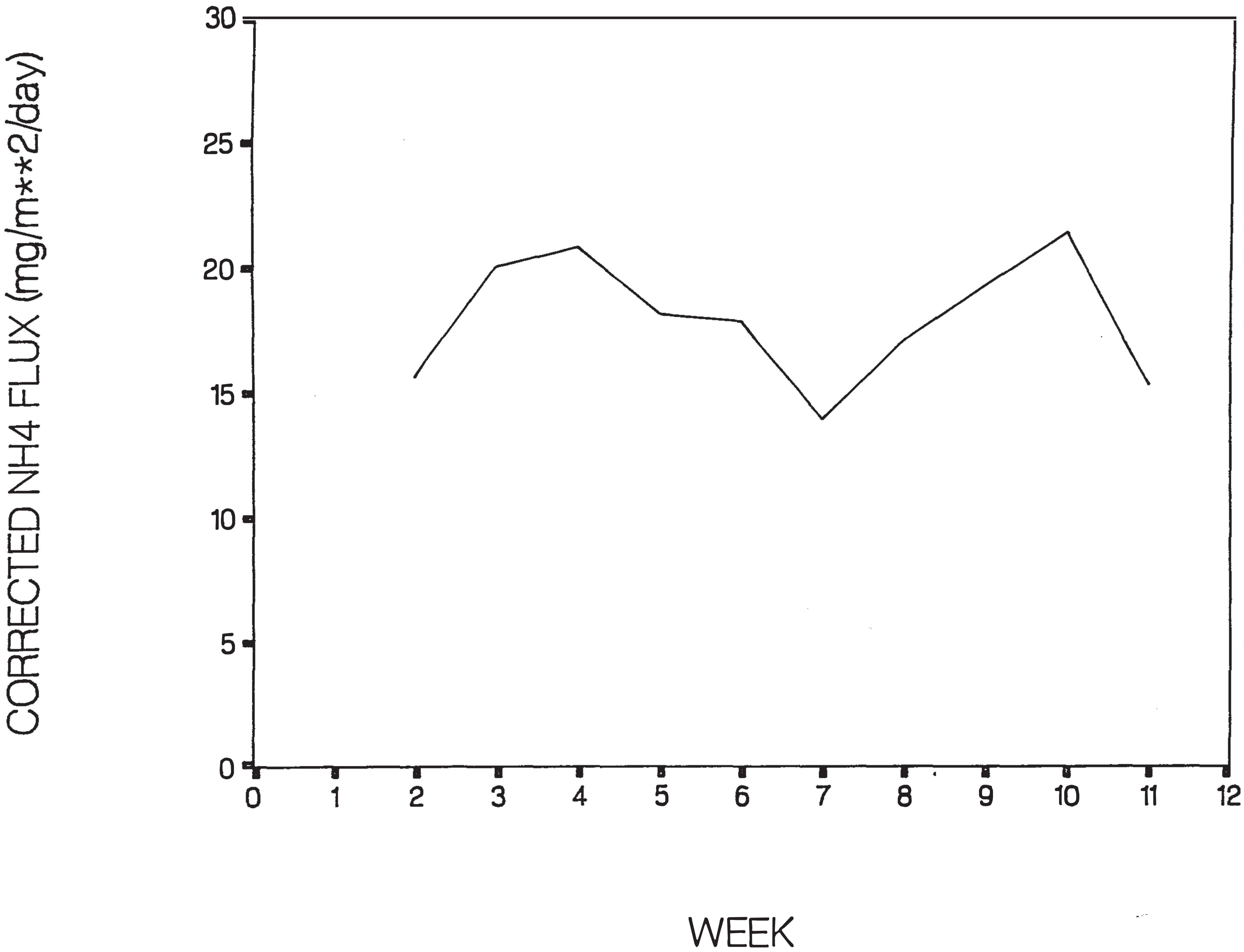

20
15
10
5
0
0
1
2
3
4
5
6
7
8
9
10
11
12
CORRECTED OP FLUX (mg/m**2/day)
WEEK

CORE 2

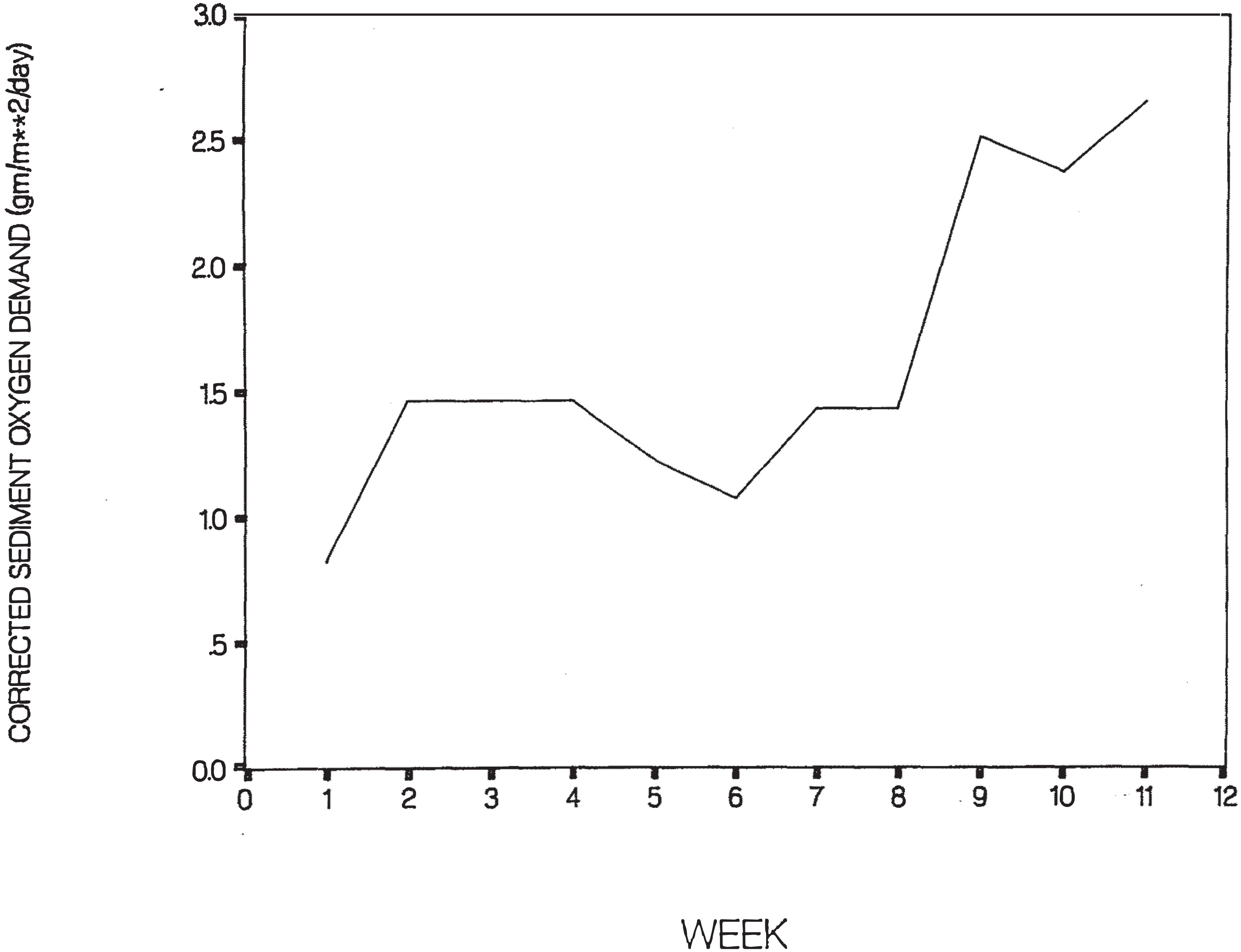


CORRECTED NOX FLUX (mg/m**2/day)
50
40
30
20
10
0
-10
-20
-30
-40
-50
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 2

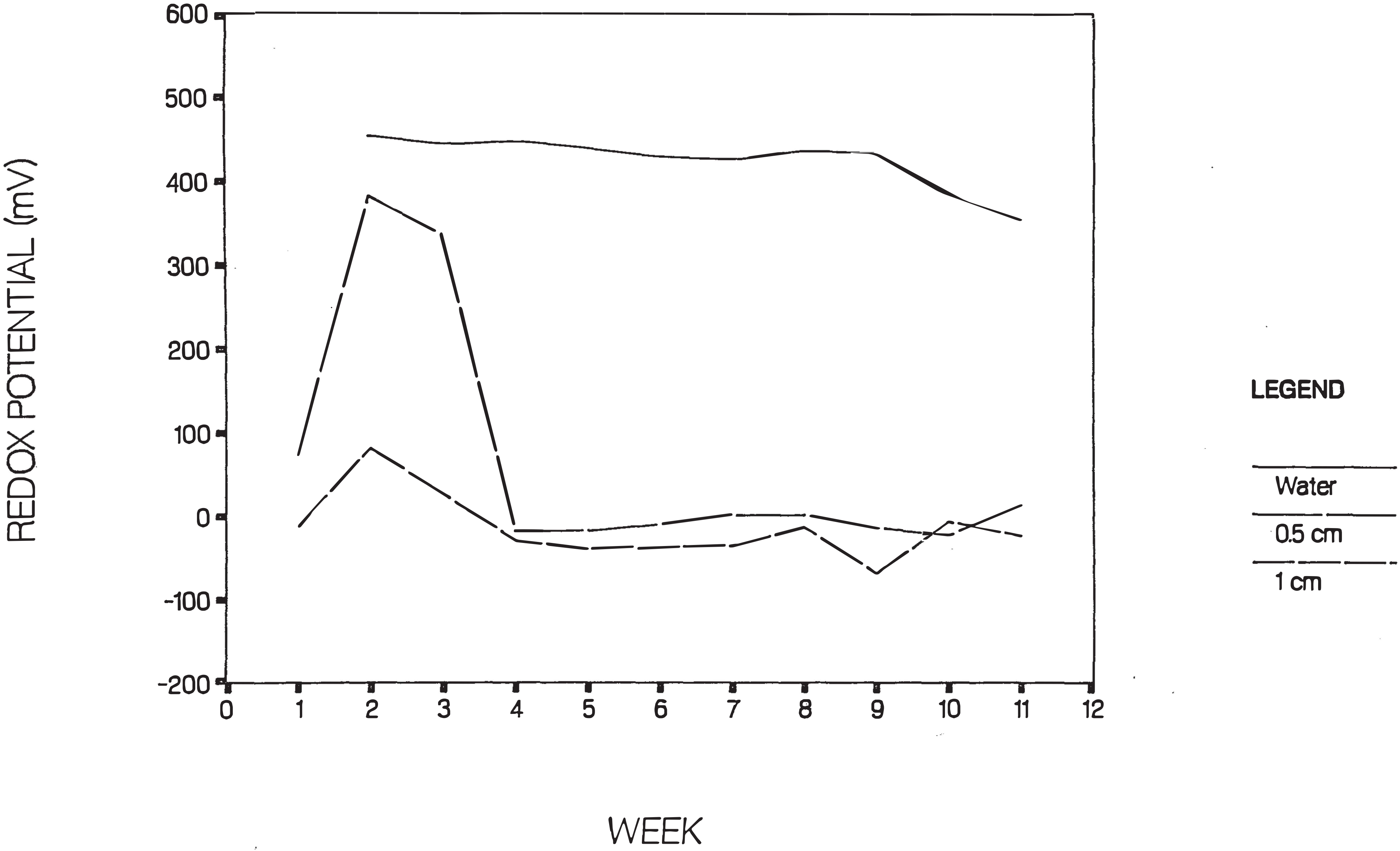

CORRECTED NH4 FLUX (mg/m**2/day)
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 2



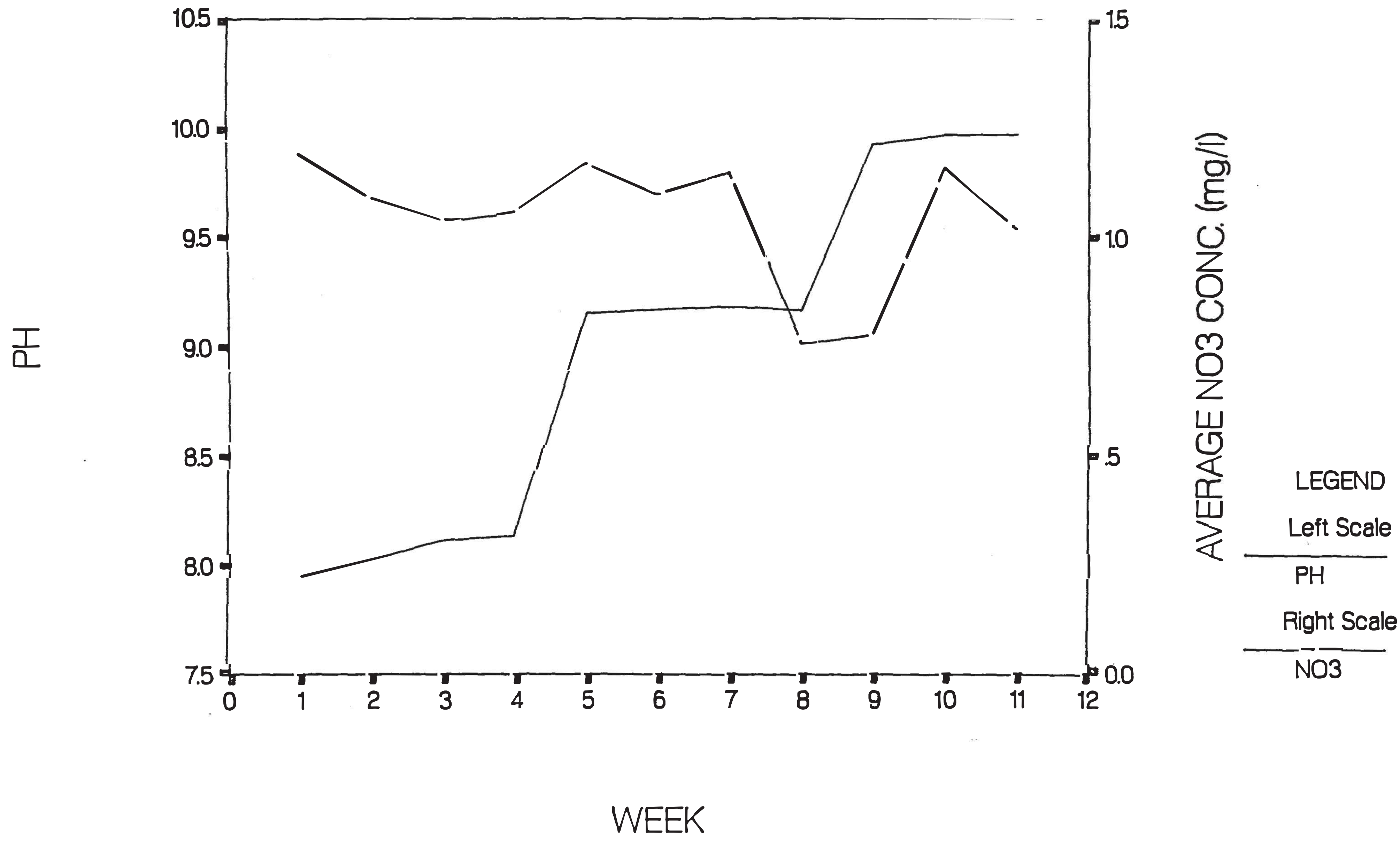
CORRECTED SEDIMENT OXYGEN DEMAND (gm/m**2/day)
3.0
2.5
2.0
1.5
1.0
.5
0.0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 2



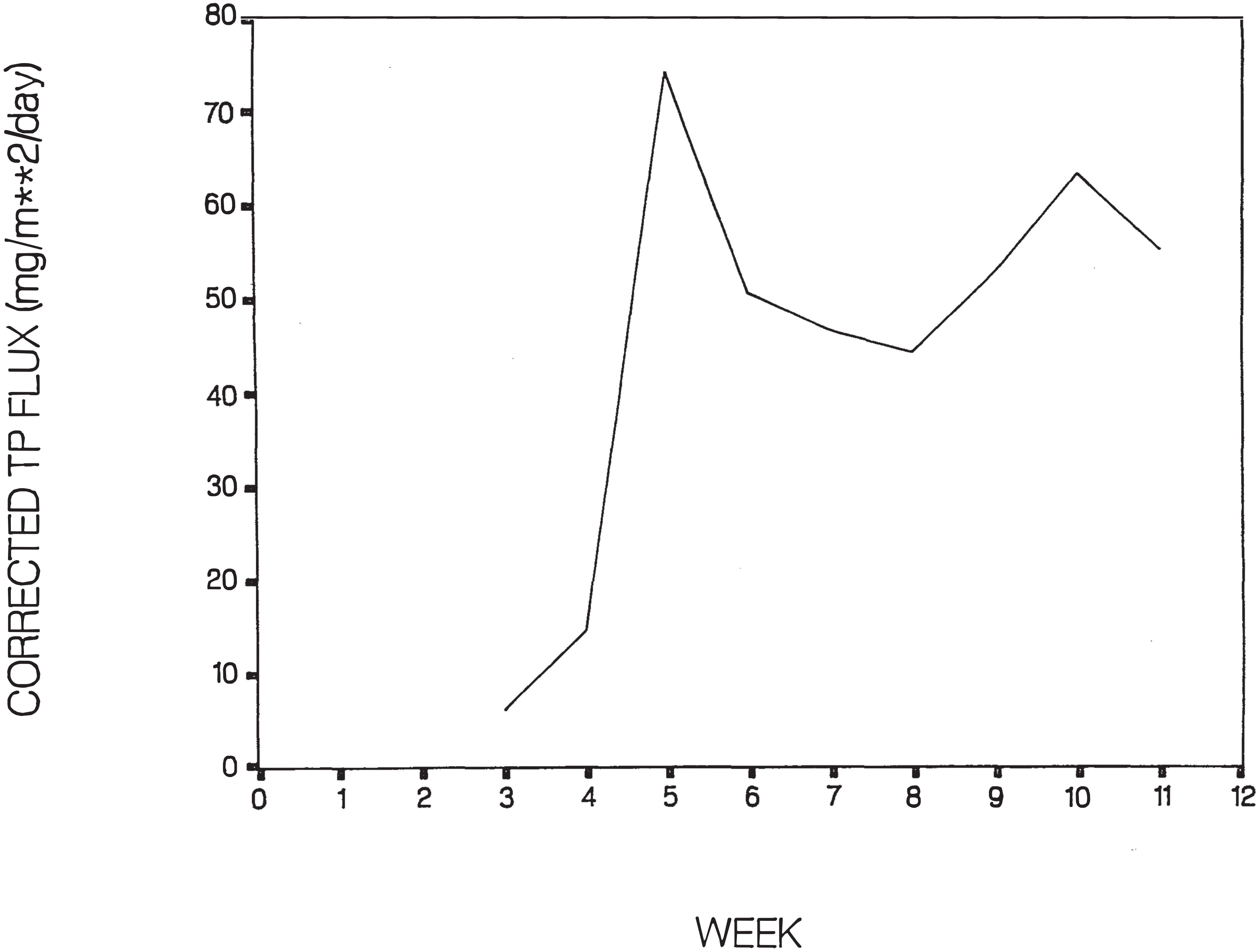
REDOX POTENTIAL (mV)
600
500
400
300
200
100
0
-100
-200
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK
LEGEND
Water
0.5 cm
1 cm

CORE 3



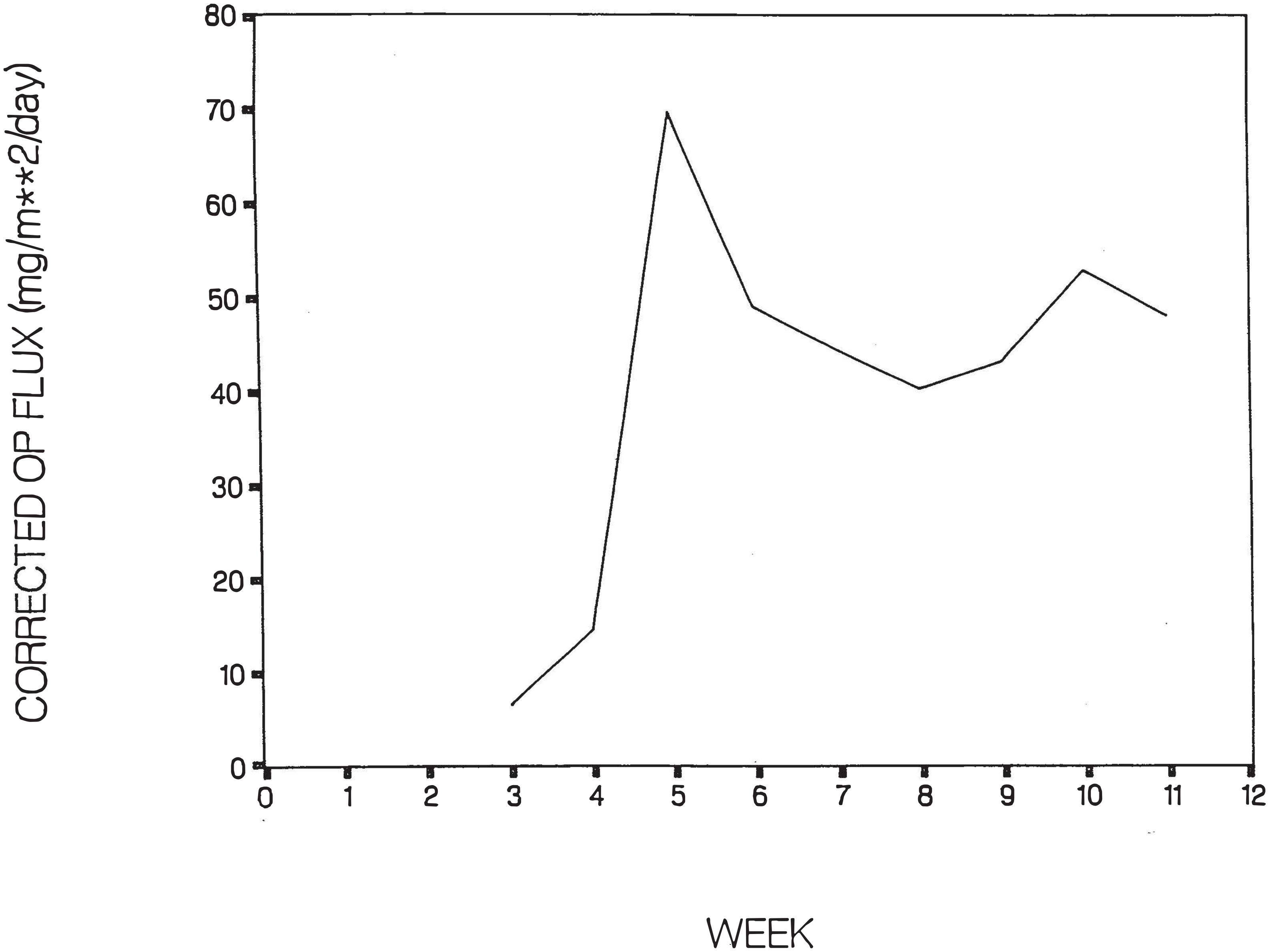
PH
10.5
10.0
9.5
9.0
8.5
8.0
7.5
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK
1.5
1.0
.5
0.0
AVERAGE NO3 CONC. (mg/l)
LEGEND
Left Scale
PH
Right Scale
NO3

CORE 3



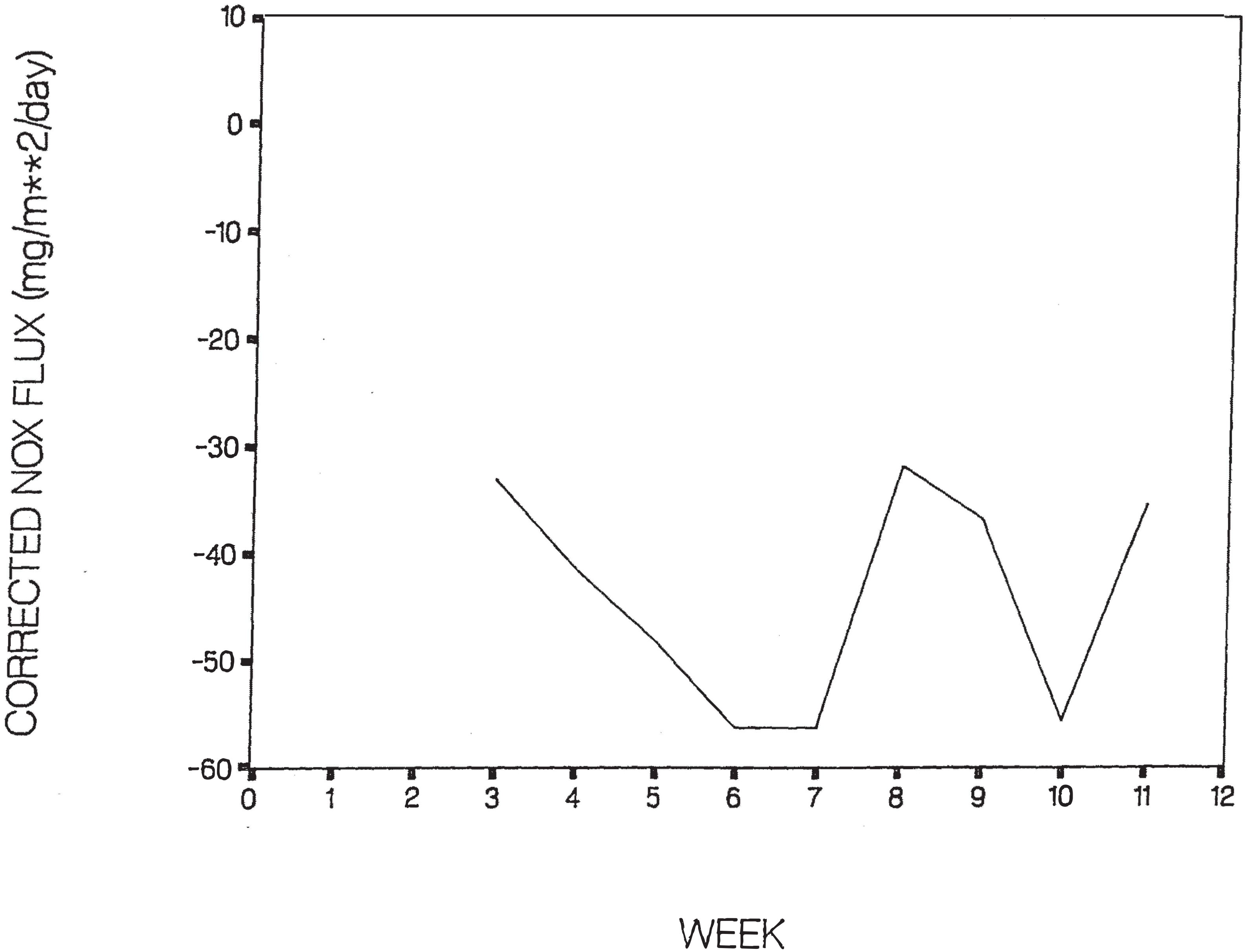
CORRECTED TP FLUX (mg/m**2/day)
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 3



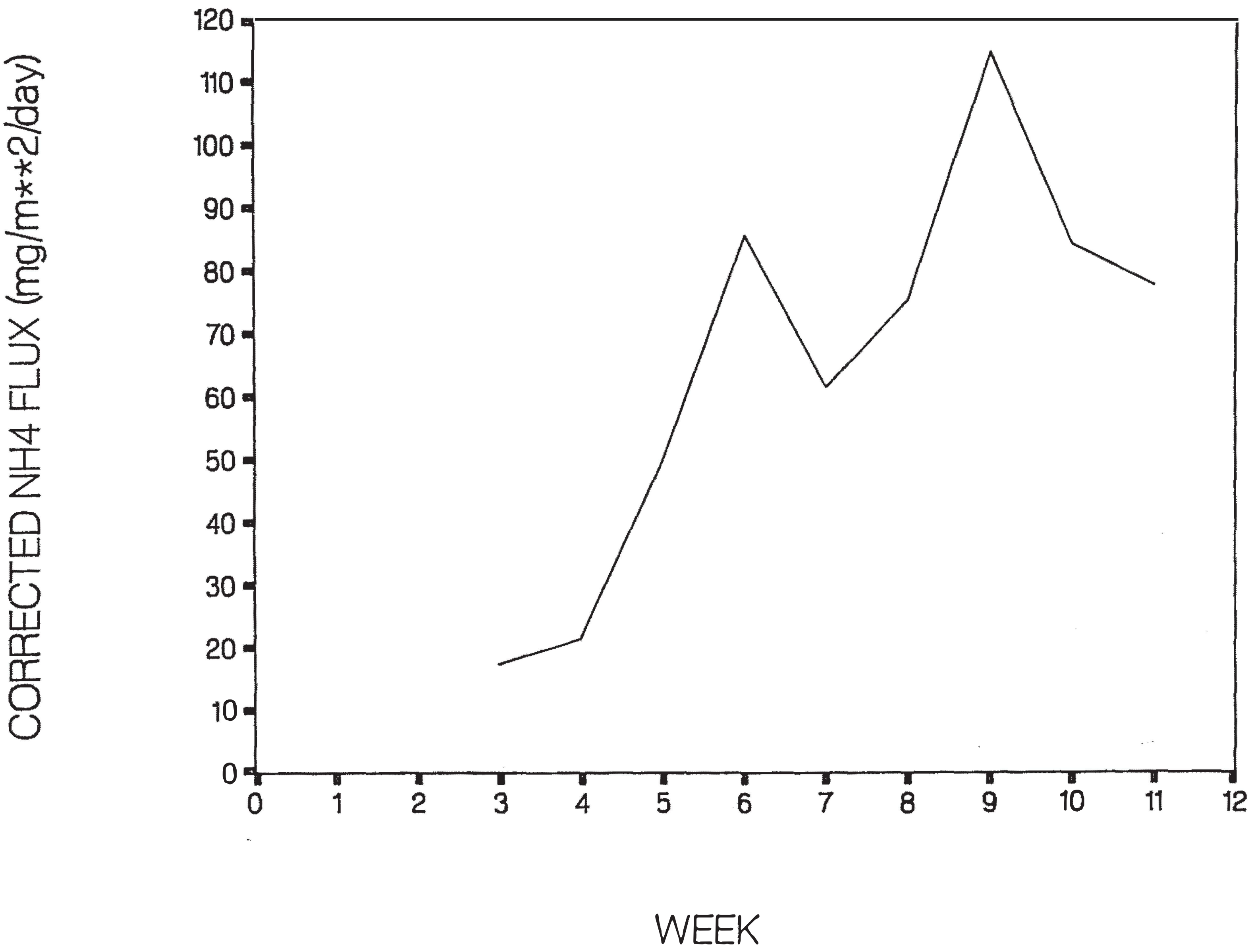
CORRECTED OP FLUX (mg/m**2/day)
0
10
20
30
40
50
60
70
80
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 3

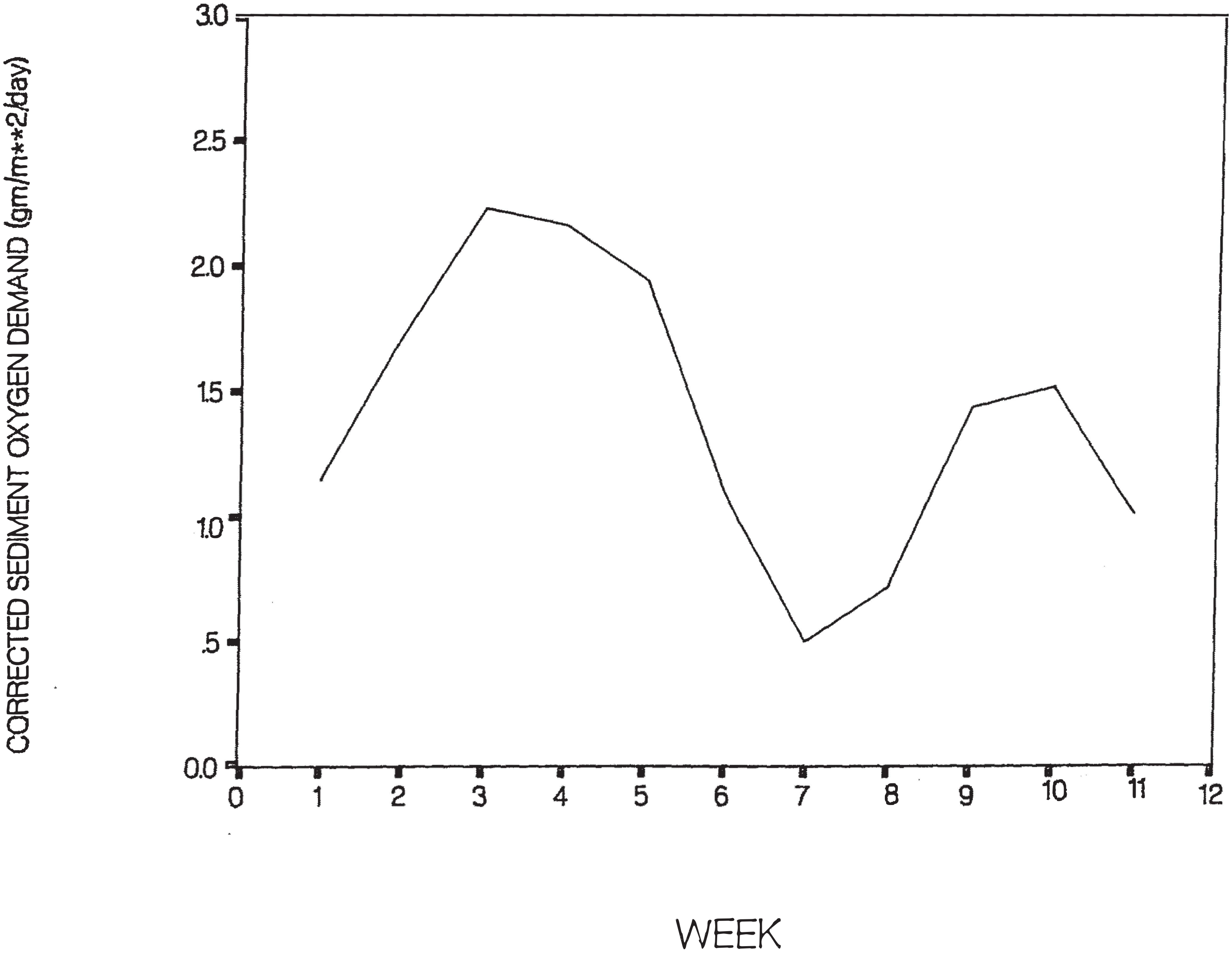


CORRECTED NOX FLUX (mg/m**2/day)
10
0
-10
-20
-30
-40
-50
-60
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 3

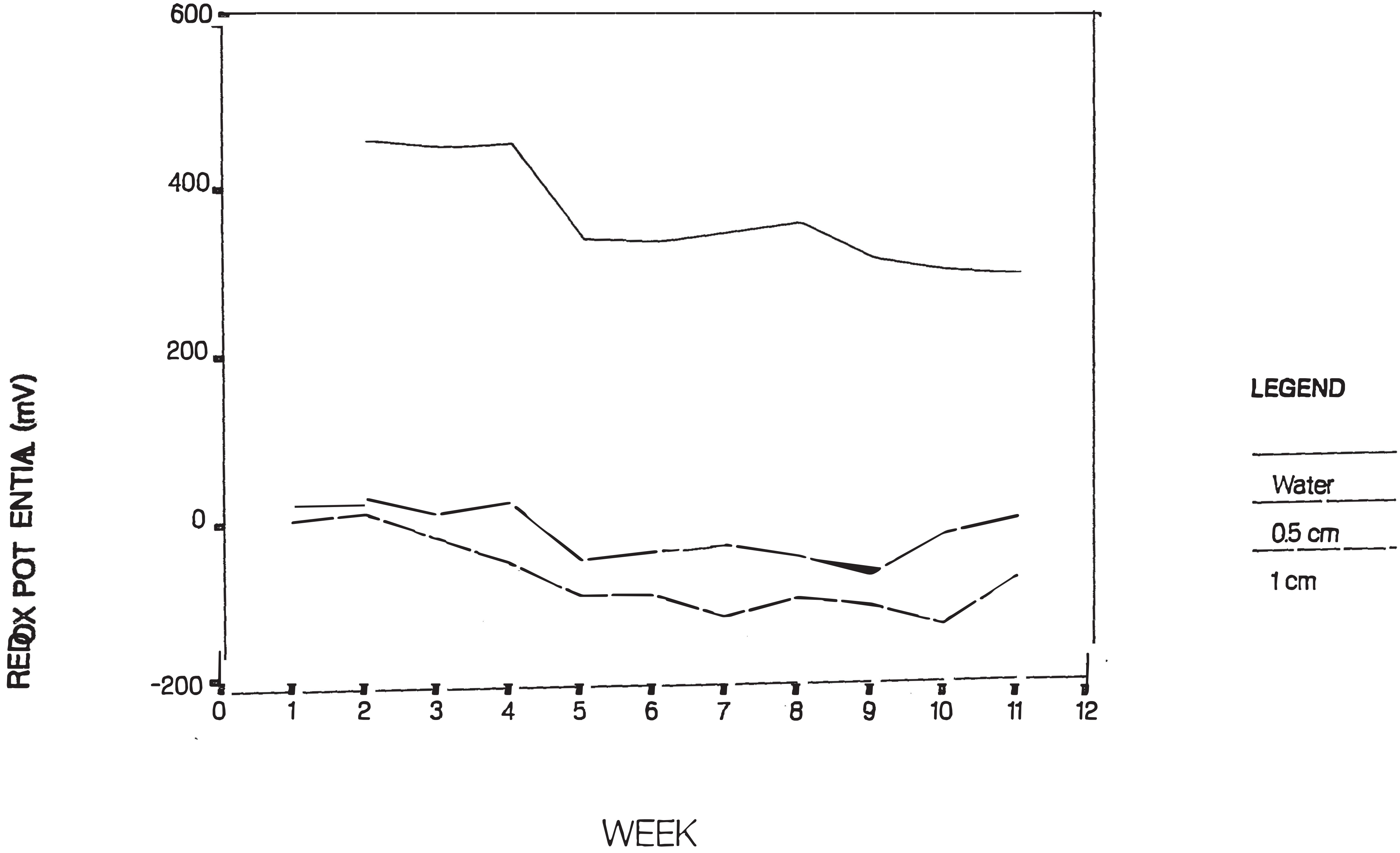

CORRECTED NH4 FLUX (mg/m**2/day)
120
110
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 3



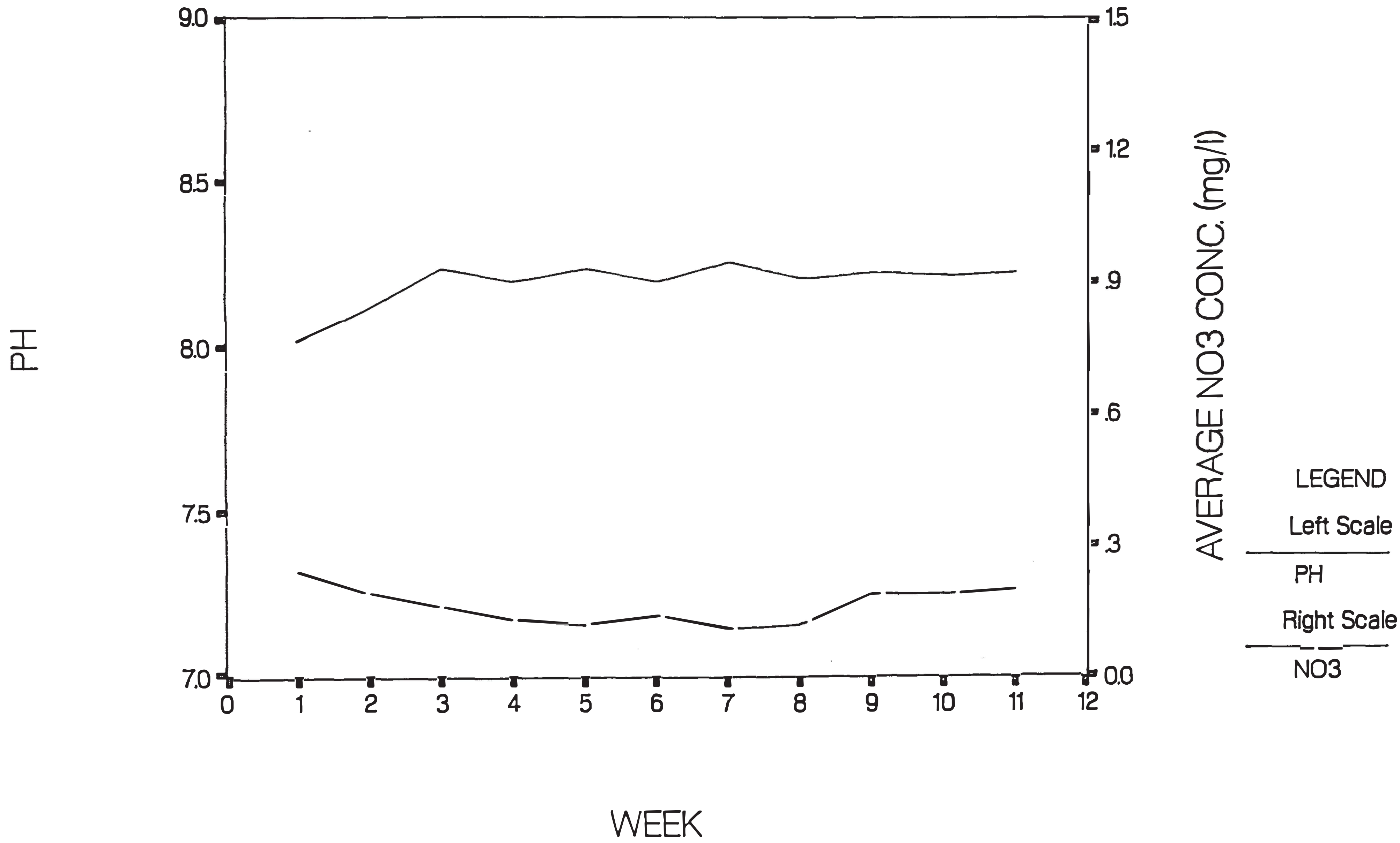
CORRECTED SEDIMENT OXYGEN DEMAND (gm/m**2/day)
3.0
2.5
2.0
1.5
1.0
.5
0.0
0 1 2 3 4 5 6 7 8 9 10 11 12
WEEK

CORE 3



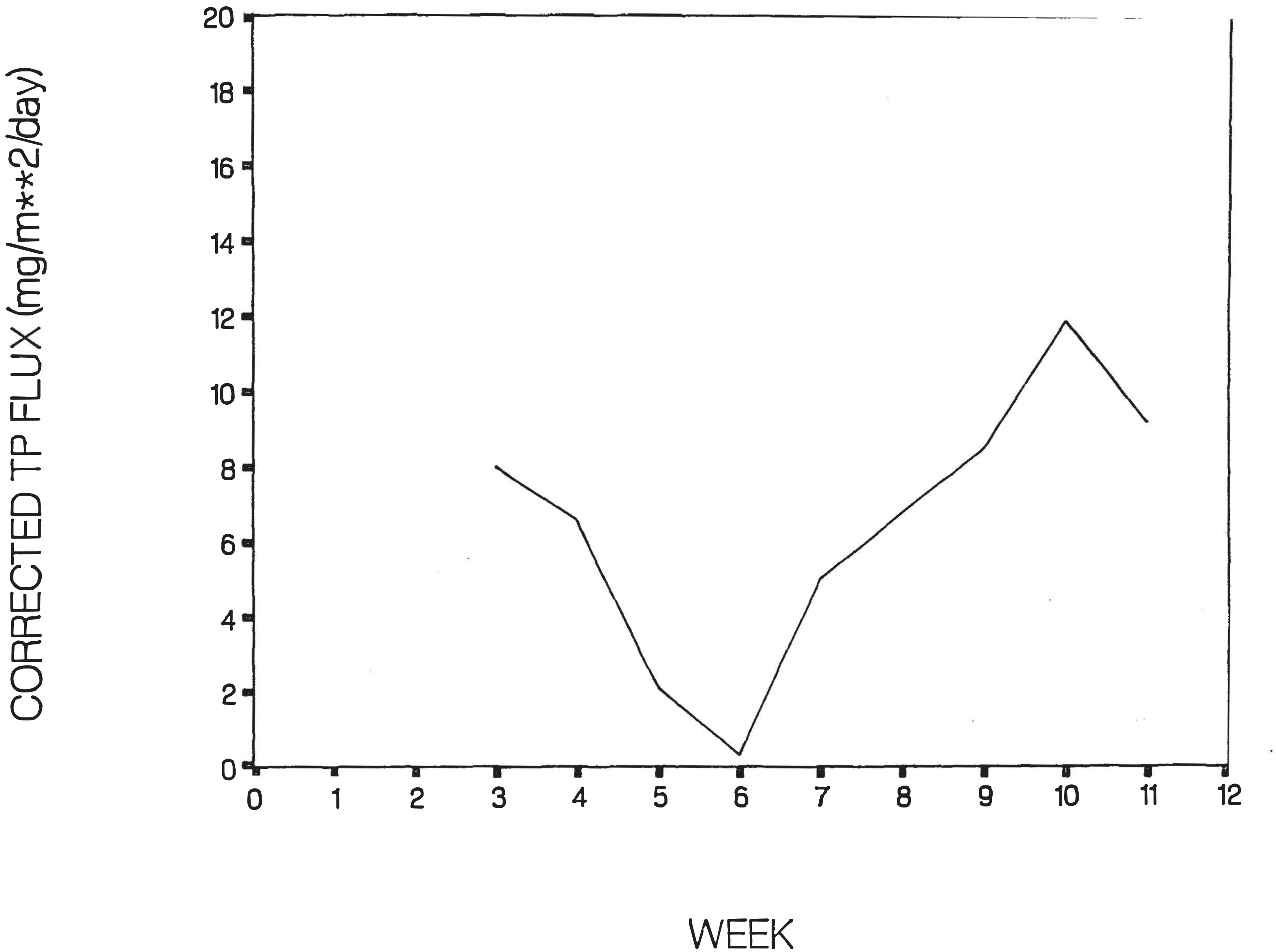
600
400
200
0
-200
0
1
2
3
4
5
6
7
8
9
10
11
12
REDOX POT ENTIAL (mV)
WEEK
LEGEND
Water
0.5 cm
1 cm

CORE 4

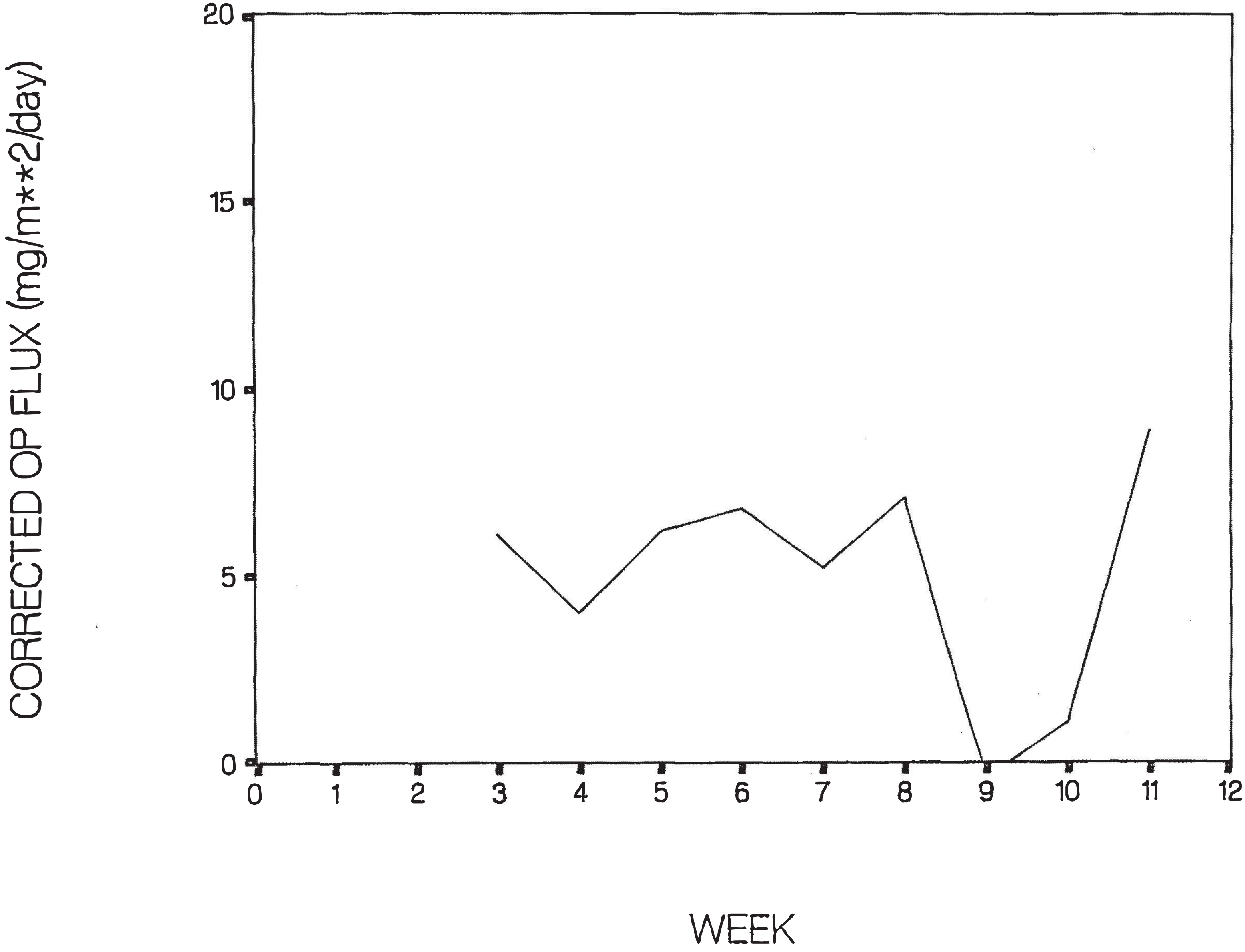


PH
9.0
8.5
8.0
7.5
7.0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK
1.5
1.2
.9
.6
.3
0.0
AVERAGE NO3 CONC. (mg/l)
LEGEND
Left Scale
PH
Right Scale
NO3

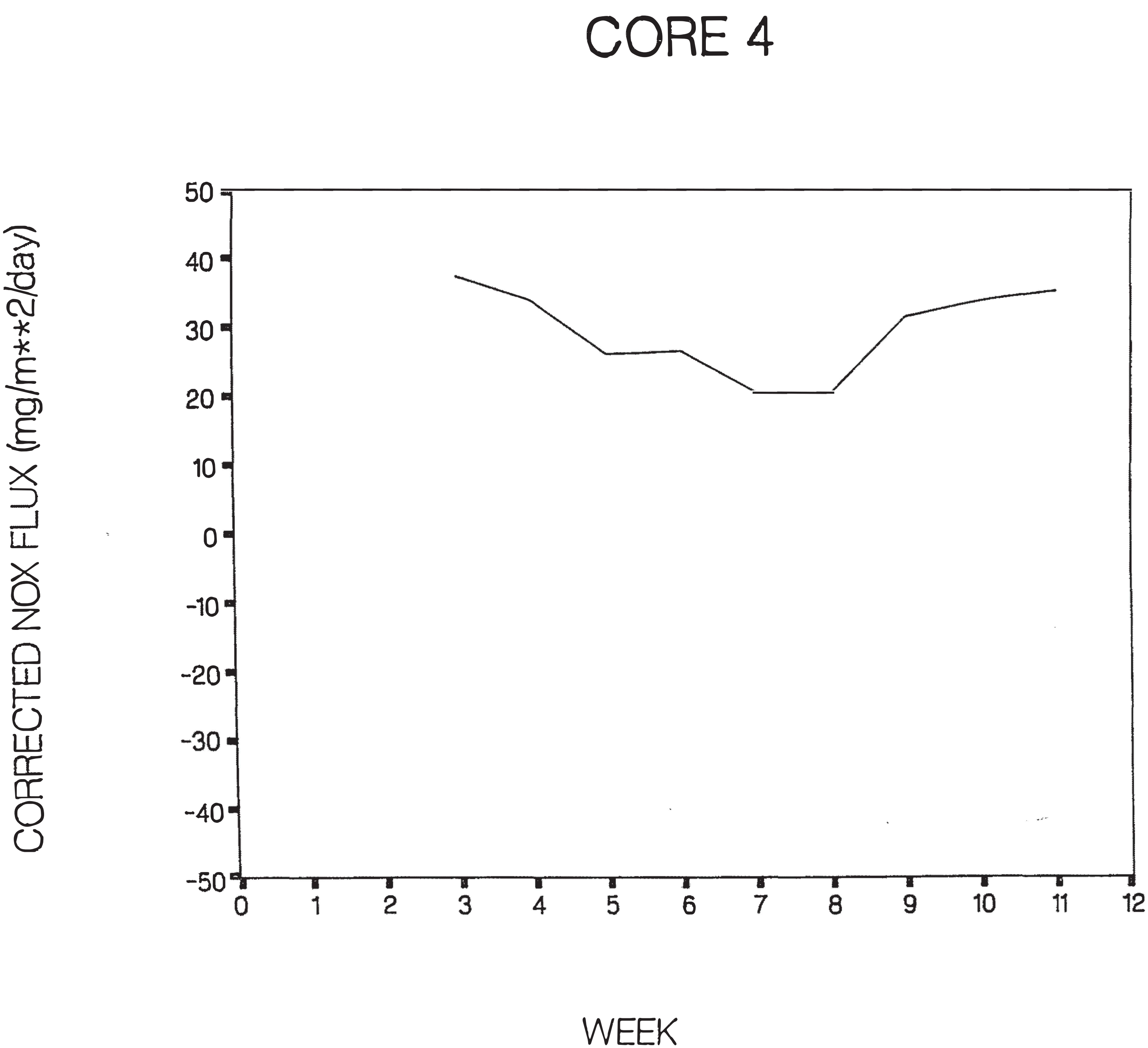
CORE 4


CORRECTED TP FLUX (mg/m**2/day)
0
2
4
6
8
10
12
14
16
18
20
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

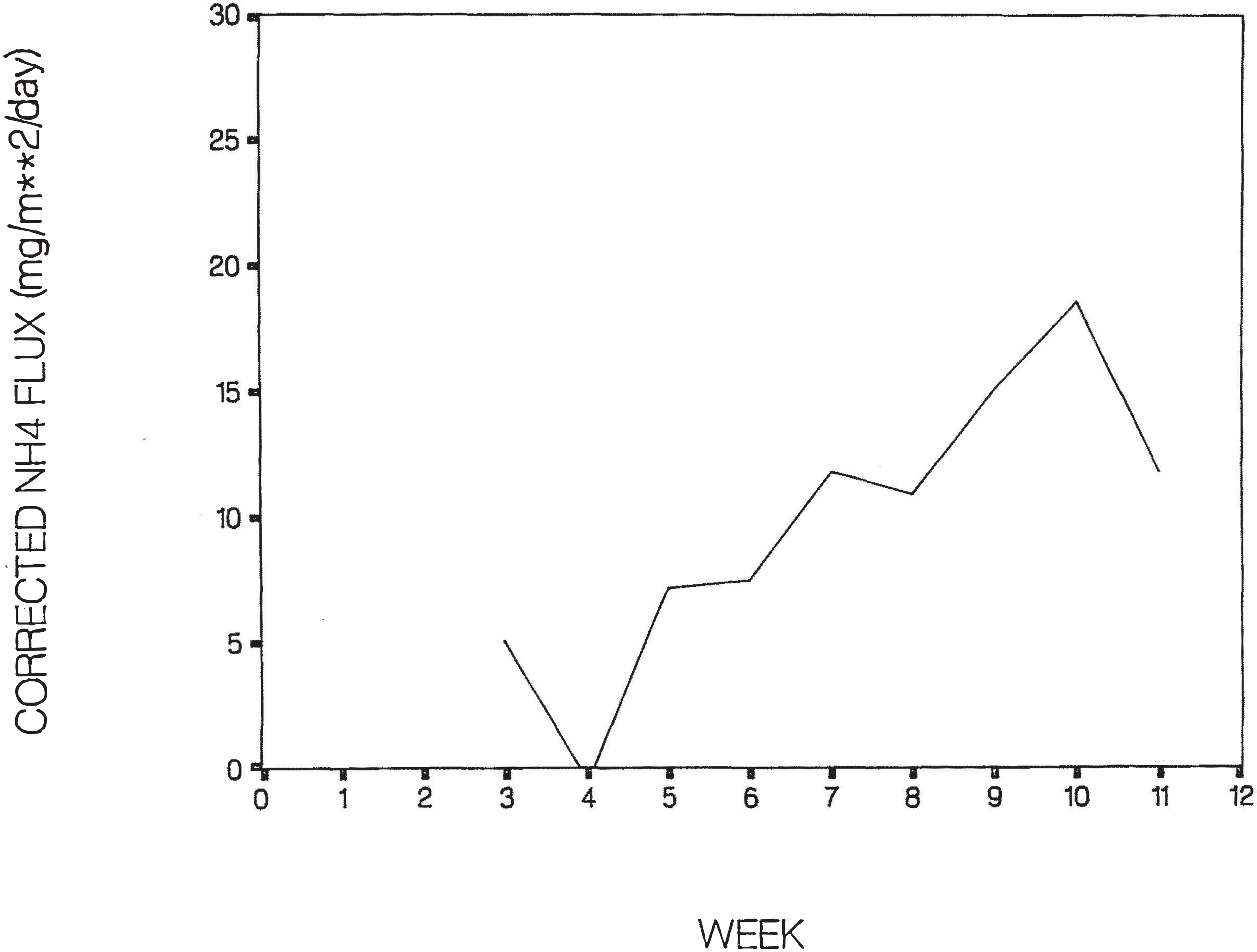
CORE 4



CORRECTED OP FLUX (mg/m**2/day)
20
15
10
5
0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

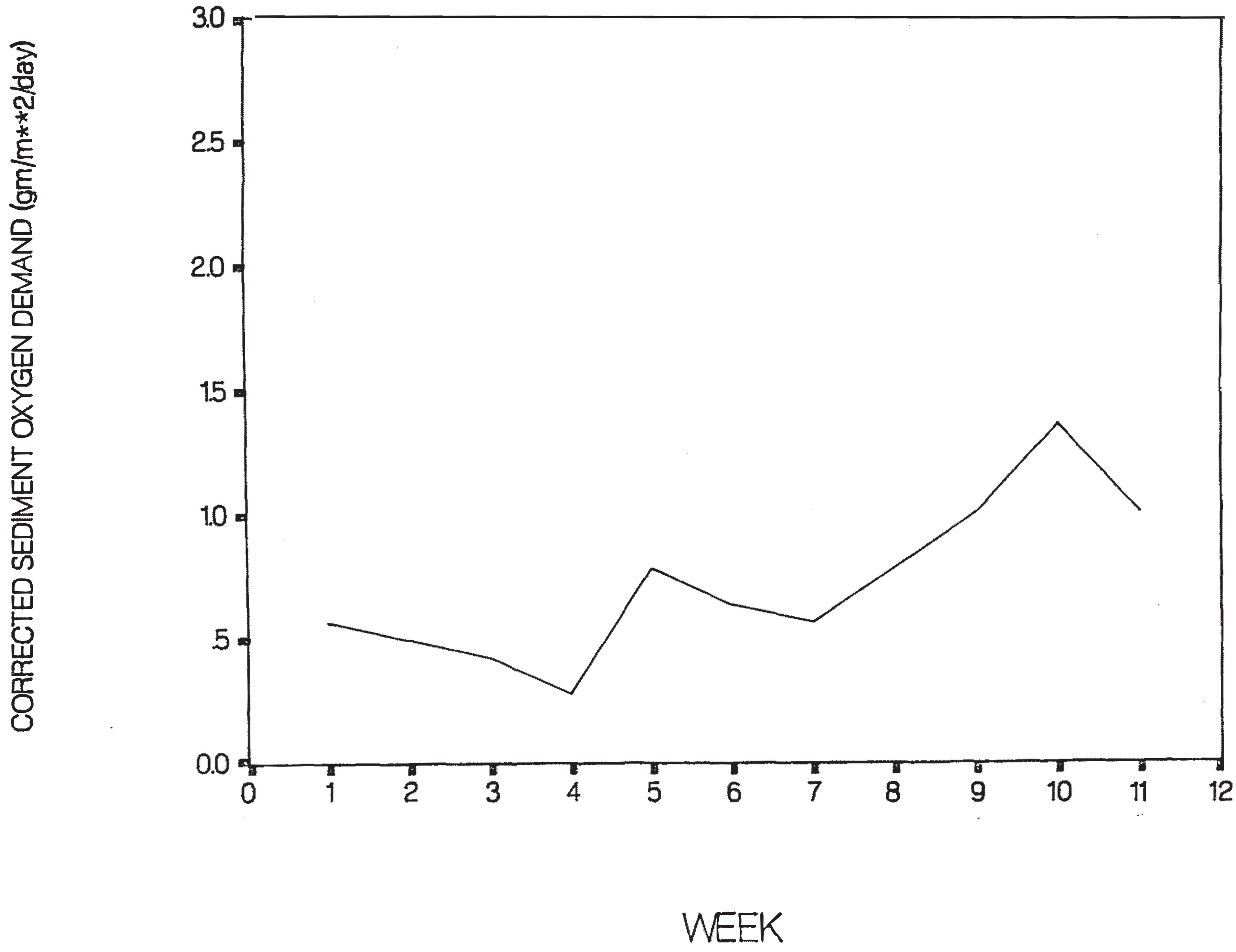

CORE 4
CORRECTED NOX FLUX (mg/m**2/day)
50
40
30
20
10
0
-10
-20
-30
-40
-50
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 4



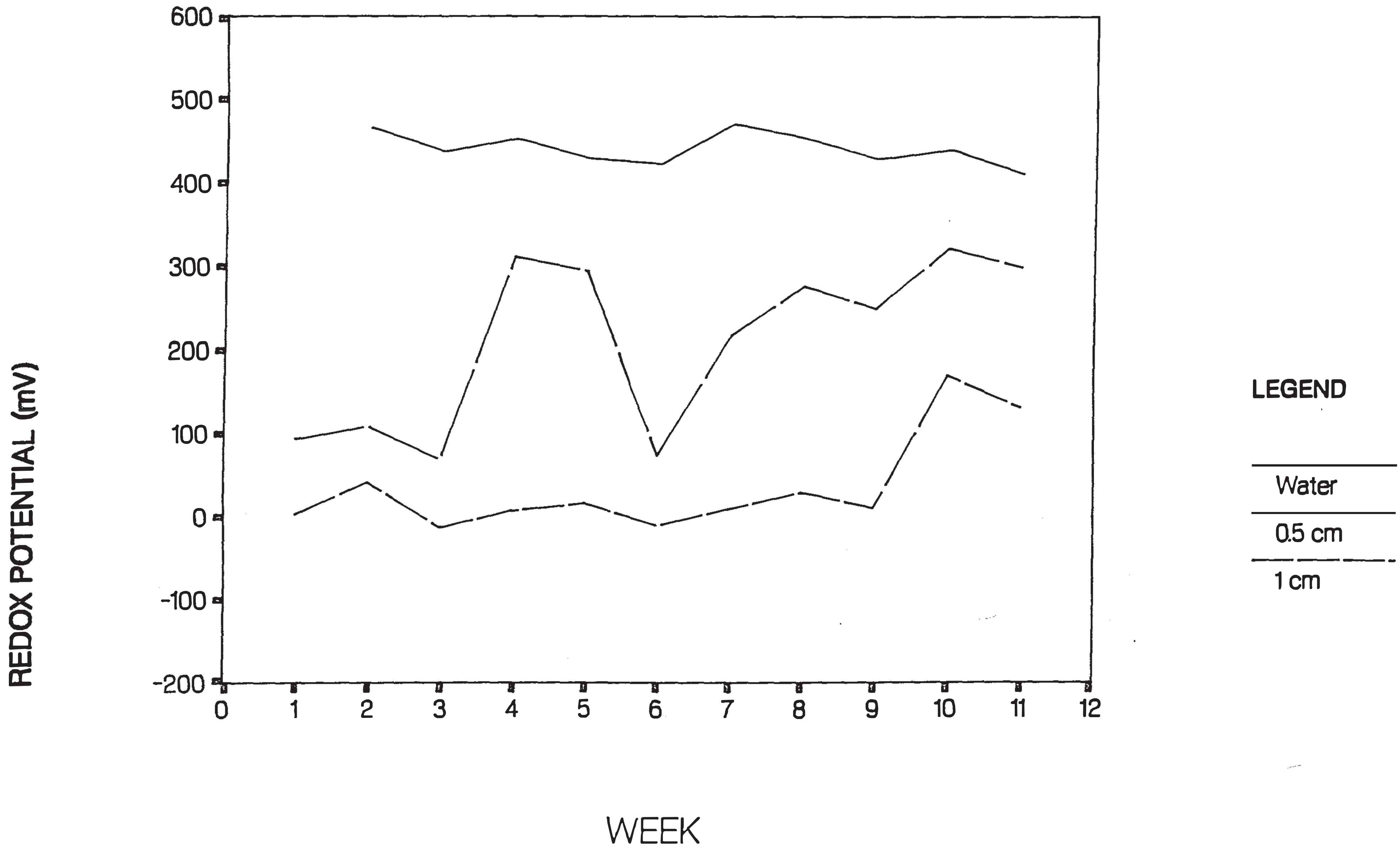
CORRECTED NH4 FLUX (mg/m**2/day)
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 4



CORRECTED SEDIMENT OXYGEN DEMAND (gm/m**2/day)
3.0
2.5
2.0
1.5
1.0
.5
0.0
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK

CORE 4



600
500
400
300
200
100
0
-100
-200
REDOX POTENTIAL (mV)
0
1
2
3
4
5
6
7
8
9
10
11
12
WEEK
LEGEND
Water
0.5 cm
1 cm