DATA FROM A SOLUTE TRANSPORT EXPERIMENT IN THE LEVIATHAN MINE DRAINAGE, ALPINE COUNTY, CALIFORNIA, OCTOBER 1982

By Mary R. Flint, Kenneth E. Bencala, Gary W. Zellweger
and Dale P. Hammermeister

U.S. GEOLOGICAL SURVEY

Open-File Report 85-85

Menlo Park, California

1985

UNITED STATES DEPARTMENT OF THE INTERIOR

William P. Clark, Secretary

GEOLOGICAL SURVEY
Dallas Peck, Director

For additional information write to:

Regional Research Hydrologist
Water Resources Division
U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025

CONTENTS

ILLUSTRATIONS

TABLES

APPENDICES

Conversion Factors and Abbreviations

For use of readers who prefer to use inch-pound units, conversion factors for terms used in this report are listed below:

Multiply	By	To obtain
centimeter (cm)	0.3937	inch (in)
meter (m)	3.2808	feet (ft)
kilometer (km)	0.6214	mile (mi)
square kilometer (km^2)	0.3861	square mile (mi^2)
square hectometer (hm^2)	2.4710	acre
gram (g)	0.0022	pound (lb)
megagram (Mg)	1.1025	ton, short
liter (L)	0.2642	gallon (gal)
cubic meter per second (m^3/s)	35.3107	cubic foot per second (ft^3/s)

DATA FROM A SOLUTE TRANSPORT EXPERIMENT IN THE LEVIATHAN MINE DRAINAGE, ALPINE COUNTY, CALIFORNIA, OCTOBER 1982

By Mary R. Flint, Kenneth E. Bencala, Gary W. Zellweger and Dale P. Hammermeister

ABSTRACT

A twenty-four hour injection of chloride and sodium was made into Leviathan Creek, Alpine County, California to aid interpretation of the coupled interactions between physical transport processes and geochemical reactions. Leviathan Creek was chosen because it receives acid mine drainage from Leviathan Mine, an abandoned open-pit sulfur mine. Water samples were collected at 15 sites along a 4.39 kilometer reach and analyzed for chloride, sodium, sulfate and fluoride. Dissolved concentrations are presented in tabular format and time-series plots. Duplicate chloride samples were analyzed by two laboratories; the Central Laboratory, Denver, Colorado and a research laboratory in Menlo Park, California. A tabular comparison of the analyses and plots of the differences between the two laboratories is presented. Hydrographs and instantaneous discharge measurements are included.

INTRODUCTION

A solute transport experiment was made at Leviathan Creek, Alpine County, Calif. in October of 1982. For 24 hours, beginning on October 7 at 0917 hours, a solution of chloride and sodium was continuously injected into the stream. Water samples were collected at 15 sites, beginning 20 minutes before the injection and continuing for two days. The samples were analyzed for chloride, sodium, sulfate and fluoride. Concentrations of these constituents are presented in this report in tabular format and in time-series plots. Discharge data are also presented.

Leviathan Creek (see figure 1 for location) flows through parts of Leviathan Mine, an abandoned open-pit sulfur mine. Water quality in the creek is degraded by direct contact with mine waste material, inflow into the creek from polluted seeps, and surface discharge from the open pit. Between 1981 and 1983, Leviathan Mine was the site of an extensive hydrologic study by the U.S. Geological Survey in cooperation with the California Regional Water Quality Control Board, Lahontan Region (Hammermeister and Walmsley, written commun., 1984). The solute transport experiment was done as part of this hydrologic study and to further the understanding of solute transport processes in mountain watersheds.

The Leviathan Creek experiment is part of a continuing effort to formulate a quantitative interpretation of the coupled interactions between physical transport processes and geochemical reactions. Over the past several years a spectrum of reactive stream-transport problems has been studied by various investigators. Onishi (1981) formulated a sophisticated model of

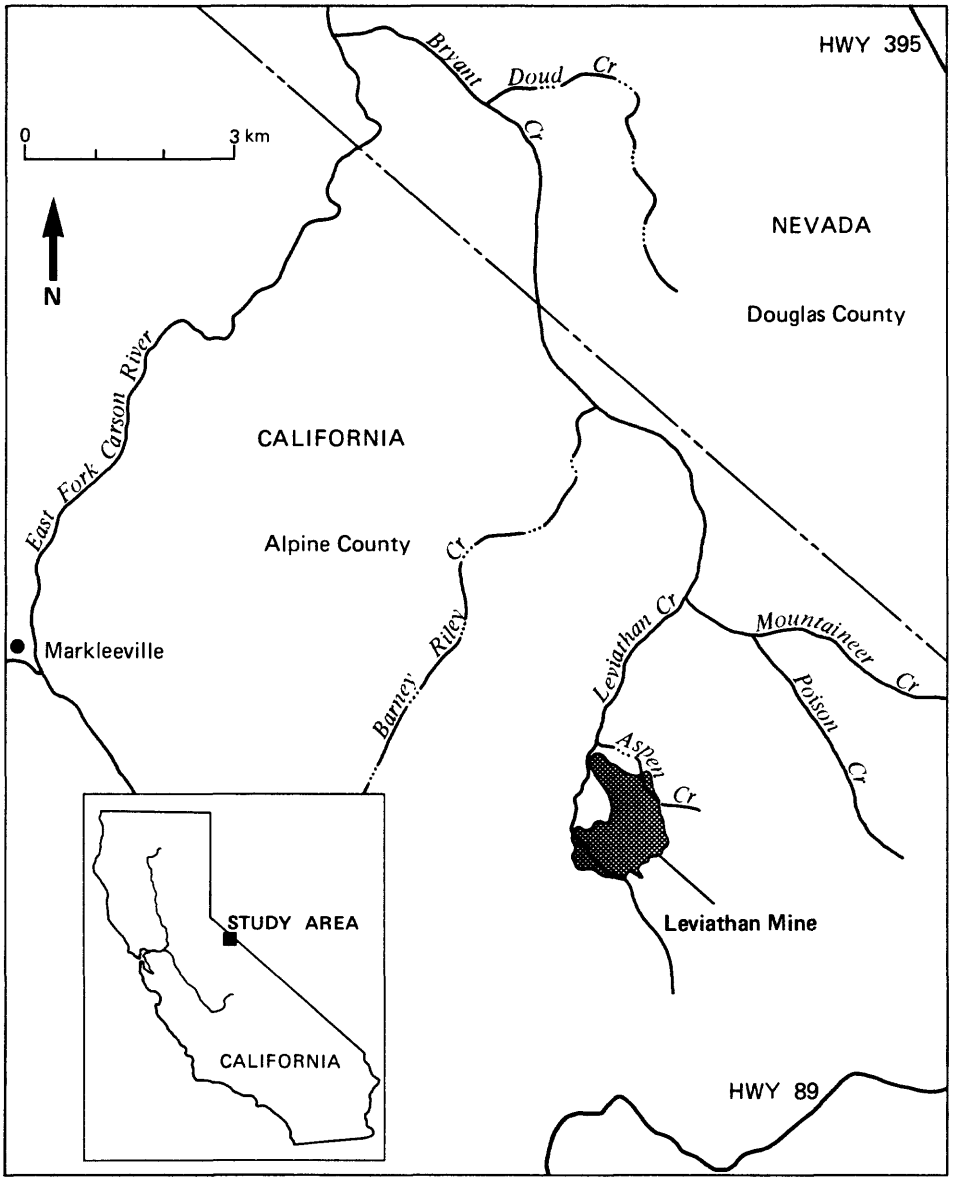


Figure 1.--Location of Leviathan Mine.
(from Hammermeister and Walmsley, written commun. 1984)

sediment-bound solute transport in large rivers. This model has been evaluated with relatively sparse data sets from actual contamination events. Chapman (1982) developed a detailed geochemical equilibrium model coupled with a transport model of acid mine drainage. A slug injection of NaOH was used in an experimental situation to test the coupled model's response to large changes in pH and consequent trace metal concentration variations. Bencala (1983) and Jackman and others (1984/1985) studied the sorption of cations to streambed sediment and developed formulations of the processes for coupled transport and cation sorption. These formulations have been used with the detailed results of steady tracer injection experiments to interpret the relative roles of physical transport and chemical sorption in determining solute concentrations. The Leviathan Mine experiment is a further step in an effort to build upon all of the above studies.

FIELD EXPERIMENT

Site Description

The drainage area of the Leviathan Creek watershed, on the eastern slopes of the Sierra Nevada near Markleeville, Calif., is 27.18 km^2. Elevation ranges from 1950 to 2732 meters. Leviathan Creek is a major tributary of Bryant Creek which flows into the East Fork Carson River. Annual precipitation estimated by Brown and Caldwell (1983) is 38.1 cm. Precipitation is low from July to October and occurs mainly as snow from

November to January. Runoff increases from February to May due to snowmelt.

A main feature of the watershed that has significant impact on the water quality of Leviathan Creek is the Leviathan Mine (Hammermeister and Walmsley, written commun., 1984). The mine, now abandoned, covers 107 hm^2. It was first operated in 1863 to supply copper sulfate to process silver ore in Virginia City, Nev. Sporadic mining activity continued until 1951 when the mine was purchased by Anaconda Company to mine sulfur by open-pit methods. The sulfur was used to process copper ore at Anaconda's Weed Heights Mine in Yerington, Nev. To access the sulfur, nearly 20 million megagrams of waste was removed from above the ore body and dumped onto the surrounding area, along both Leviathan Creek and its main tributary, Aspen Creek. Mining operations ceased in 1962. The main features of the mine (fig. 2) are the open-pit (20 hm^2), the spoil tailings (61 hm^2) and the waste dump areas (10.5 hm^2). There is a large active landslide (40.5 hm^2) north of the mine pit. The waste and spoil areas contain sulfur bearing minerals. Leviathan Creek has eroded across a spoil area and springs are found along the toe of the north slope of the waste dump. A spring on the west exterior wall of the pit discharges water year round. It is the site of a collapsed portal of one of the original underground mining tunnels. Leviathan and Bryant Creeks supported a substantial trout population prior to mining activity. Today, fish are found above but not below the mine. A more detailed account of the mining and its effects on Leviathan Creek was given by Brown and Caldwell (1983).

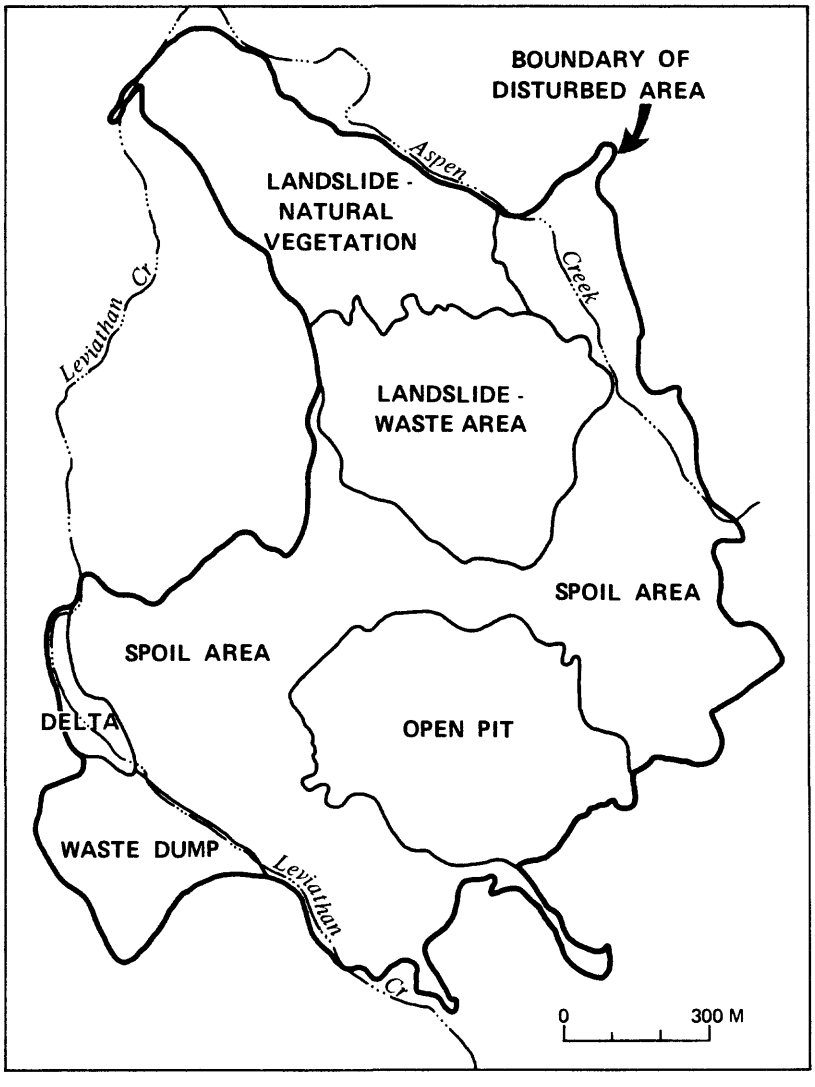


Figure 2.--Major features of Leviathan Mine.
(from Hammermeister and Walmsley, written commun., 1984)

Sampling Locations

The experimental reach sampled during the injection was 4.39 km long. Stream width at the injection site was 0.5 m. At the bottom of the experimental reach the width was 2.0 m. The sample locations and their distances downstream from the injection site are shown in figure 3. Fifteen sites were sampled. Three of the sites are tributaries; 4L Creek, Aspen Creek, and Mountaineer Creek. 4L Creek is an intermittent tributary flowing in from the west side of the basin. Aspen Creek flows in from the east across the mine property. Mountaineer Creek joins Leviathan Creek to become Bryant Creek. In the main stem, samples were collected above and below each tributary. Of the 15 sites, 11 were sampled by hand, 3 were sampled using automatic samplers and 1 site was sampled by both methods. Discharge was measured at 2 sites with stage recorders. Instantaneous discharge measurements were made at sites along the experimental reach. Hydrographs and instantaneous discharge measurements are presented in Appendix III.

Water Quality

Background water quality data, taken from Hammermeister and Walmsley (written commun., 1984) is shown in table 1. The data are from samples collected in August 1982. Data from the summers of 1981 and 1982 indicated no significant changes in water quality from August to October. Therefore, it is assumed that the water quality in August 1982 is representative of the water quality when the experiment was made in October 1982. Specific conductance and sulfate concentration increased substantially at sites downstream of Leviathan Mine, and pH decreased. Four samples were

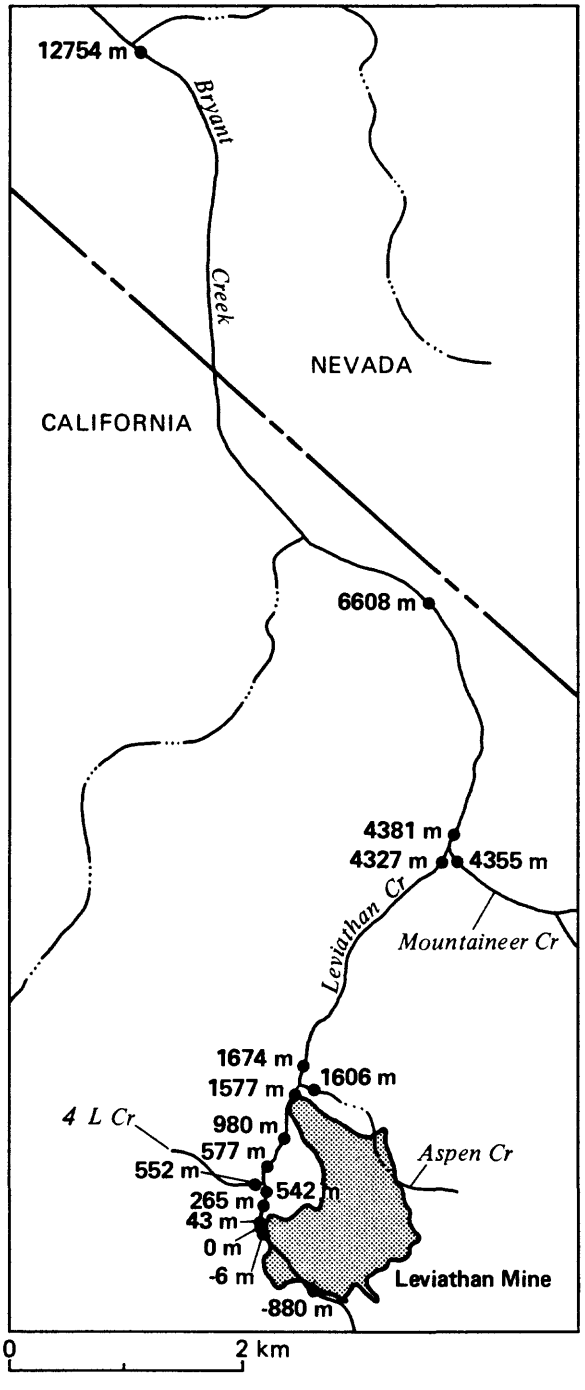


Figure 3.--Location of sampling sites.

TABLE 1. -- Leviathan Creek - Background water quality concentrations of dissolved constituents

[Data from Hammermeister and Walsmley, written commun., 1984]

STATION	-880 m	43 m	265 m	1606 m[1]
DATE	08-11-82	08-11-82	08-12-82	08-11-82
ACIDITY AS H mg/L	---	---	15	---
pH(field) units	8.0	3.2	3.3	8.0
SP. CONDUCTANCE (field) umhos	143	2200	2000	540
DISCHARGE m^3/s	.004	.007	.01	.008
TEMPERATURE C	11.0	20.0	18.0	21.5
CHLORIDE mg/L	1.1	15	1.6	1.3
CALCIUM mg/L	---	---	---	74
MAGNESIUM mg/L	---	---	---	17
POTASSIUM mg/L	<5	---	---	---
SILICA mg/L	---	---	---	23
SODIUM mg/L	---	---	---	12
SULFATE mg/L	8.0	1600	1500	240

STATION	1674 m	4381 m	12754 m
DATE	08-11-82	08-12-82	08-20-82
ACIDITY AS H mg/L	---	0.8	1.8
pH(field) units	3.2	4.6	4.5
SP. CONDUCTANCE (field) umhos	1350	470	560
DISCHARGE m^3/s	.02	.07	.11
TEMPERATURE C	---	18.0	14.5
CHLORIDE mg/L	1.4	1.2	1.7
CALCIUM mg/L	---	52	51
MAGNESIUM mg/L	---	15	16
POTASSIUM mg/L	---	---	---
SILICA mg/L	---	36	45
SODIUM mg/L	---	9.2	10
SULFATE mg/L	770	240	300

1 Aspen Creek

collected during the experiment and analyzed for trace metals. The data are presented in table 2. Station 577 m was sampled during the plateau of the solute pulse. Samples from station 4381 m were collected before the leading edge of the pulse reached the site and again during the plateau. Figure 4 shows the time of travel relations of the solute pulse as it traveled downstream. Additional trace metal concentrations can be found in Hammermeister and Walmsley (written commun., 1984).

Injection Solution and Methods

The injection solution was made by dissolving NaCl in water from Mountaineer Creek. Mountaineer Creek has very low background levels of sodium and chloride; a table of concentrations is given in Appendix I. The injection solution contained 160 g/L of Cl, and 105 g/L of Na, as analyzed by the Central Laboratory.

To insure good mixing, the injection solution was pumped into the center of the creek at a constriction point above a mixing reach. Two 12-volt, battery operated metering pumps were used to pump the solution from a 0.21 m^3 container (55 gallon drum) into the creek. The flow rate of the injection solution was measured every two hours during the experiment. The values ranged from 1.28 mL/s to 1.32 mL/s. The average flow rate was 1.31 mL/s.

The injection was started at 0917 hours on October 7 and turned off at 0917 hours October 8. The pumps failed for about an hour between 1500 and 1700 hours; the resulting drop in the concentration of measured constituents can be followed downstream.

TABLE 2. -- Leviathan Creek - Trace metal concentrations
(dissolved constituents)

STATION	577 m	577 m	4381 m	4381 m
DATE	10-07-82	10-07-82	10-07-82	10-07-82
TIME	1150	1405	1140	1800
ACIDITY as H mg/L	15	14	<0.1	0.7
ACIDITY TOTAL as $CaCO_3$ mg/L	239	223	---	11
pH (LAB)	2.7	2.7	4.9	5.3
SP. COND. (LAB)	2590	2470	444	451
CHLORIDE mg/L	22	22	1.2	2.5
CALCIUM mg/L	210	200	50	50
MAGNESIUM mg/L	59	56	14	14
HARDNESS as $CaCO_3$ mg/L	770	730	180	180
SILICA mg/L	49	48	34	35
SODIUM mg/L	33	32	9.4	10
SULFATE mg/L	1500	1500	200	200
ALUMINUM ug/L	50000	46000	500	1100
ARSENIC ug/L	50	32	3	4
BARIUM ug/L	40	43	42	46
BERYLLIUM ug/L	8.0	6.0	1.0	<0.5
CADMIUM ug/L	10	9	2	1
CHROMIUM ug/L	100	90	<10	<10
COBALT ug/L	870	800	89	94
COPPER ug/L	270	260	20	30
IRON ug/L	210000	200000	6200	4000
LEAD ug/L	<30	<30	<10	<10
LITHIUM ug/L	88	85	20	21
MANGANESE ug/L	12000	11000	1500	1500
MOLYBDENUM ug/L	<30	<30	<10	<10
NICKEL ug/L	2400	2300	200	200
STRONTIUM ug/L	1300	1200	420	430
THALLIUM ug/L	50	40	4	7
VANADIUM ug/L	69	54	<6	<6
ZINC ug/L	320	300	49	45

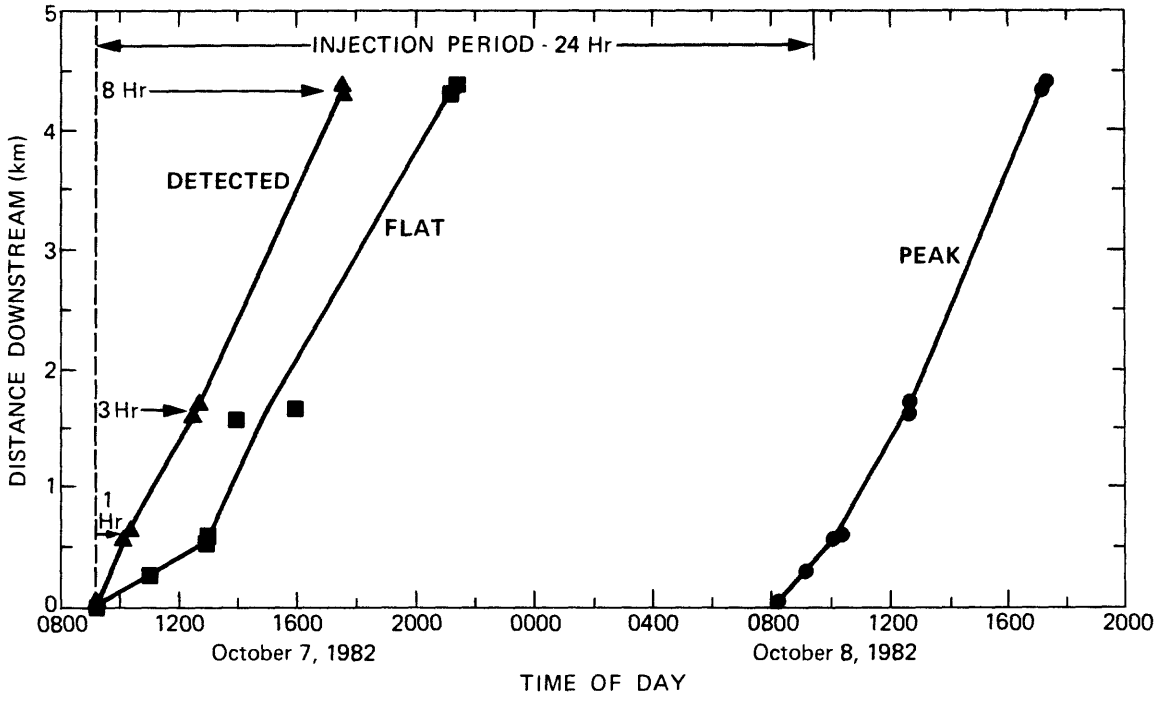


Figure 4.--Solute time of travel relationships.

Water Samples

Water samples were collected from the center of the creek using scoops made from 1.89 L (0.5 gal.) polyethylene bottles. The samples were then poured into pre-rinsed 250 mL polyethylene bottles. The bottles were transported to the Survey's Carson City, Nev. office, where they were decanted to remove any iron precipitates. The samples were then sent to the Survey's Central Laboratory where 808 samples were analyzed. One hundred sixty-seven duplicate samples were collected and sent to the Survey's research laboratory in Menlo Park, Calif. for analysis of chloride.

Of the 15 sampling sites, 12 were analyzed for chloride, sodium, sulfate and fluoride. The remaining 3 were sampled using automatic samplers and were analyzed for chloride. At 2 of the sites, 577 m and 4381 m additional samples were collected and analyzed for trace metals. The data are presented in table 2. Sampling began 20 minutes prior to the injection and continued for at least 34 hours. Stations at the bottom of the reach were sampled for 48 hours. The sampling schedule was designed to detect the arrival and peak of the solute pulse at each station.

LABORATORY ANALYSIS

Most of the samples collected were analyzed by the Survey's Central Laboratory, Denver, Colo. The analytic methods used were described by Skougstad and others (1979). Precisions can be calculated from equations listed in table 3.

Duplicate samples were analyzed for chloride in the Survey's research laboratory in Menlo Park, Calif. Chloride was analyzed by an automated mercuric thiocyanate method adapted from O'Brien (1962). All samples were run in

TABLE 3. -- Precision equations for Central Laboratory analyses

[Data taken from Skougstad and others, 1979]

Constituent	Range	Equation
Chloride	1.0 - 100 mg/L	ST = 0.057X - 0.25
Sodium	3.0 - 80 mg/L	ST = 0.039X + 0.448
Sulfate	10.0 - 100 mg/L	ST = 0.001X + 2.02
Fluoride	0.1 - 2 mg/L	ST = 0.109X + 0.014

ST = overall precision mg/L

X = concentration of constituent mg/L

duplicate. Precision was determined to be $\pm$0.05 mg/L for chloride concentration of 5 mg/L and $\pm$0.5 mg/L for chloride concentration of 50 mg/L.

Data from the two laboratories are compared in Appendix II. Chloride concentrations from each laboratory and their differences are presented in tabular format for each station. Two time-series plots are included; one for a station where agreement between the two laboratories is good and a second where the two laboratories differ. There is also a graph comparing Menlo Park laboratory values to the difference between Menlo Park laboratory and Central Laboratory values. The difference for values less than 5 mg/L ranged from 0.00 to 0.21 mg/L; the average was 0.07 mg/L. For values of 5 to 50 mg/L, differences ranged from 0.00 to 3.5 mg/L; the average was 1.52 mg/L. The precision for the Central Laboratory for chloride concentration of 5 mg/L is $\pm$0.04 mg/L; it is $\pm$2.6 mg/L for chloride concentration of 50 mg/L.

DATA

Dissolved concentrations of chloride, sodium, sulfate and fluoride are presented in Appendix I in tabular format and time-series plots. Station numbers correspond to distances downstream from the injection site. Elapsed time is the duration of time from the start of the experiment at 0917 hours October 7. Dashes indicate the constituent was not analyzed. An 'I' in the station number indicates samples were collected using an automatic sampler. Time-series plots start at 0800 hours October 7 and end at 0800 hours October 9. Not all stations have a full two days of data. Station 12754 m is downstream from the experimental reach, above the confluence of Bryant Creek with Doud Creek. It is included to show that the chloride pulse is evident more than 12 km downstream from the injection site.

Appendix II contains data comparing chloride analyses made by the Menlo Park laboratory to those made by the Central Laboratory.

Hydrographs are in Appendix III. The first site is on Leviathan Creek above the mine, upstream of the experimental reach. The second is on Bryant Creek above Doud Creek. Discharge data start at 0000 hours October 7 and continue until 0000 hours October 10. Measurements were recorded every 15 minutes. Instantaneous discharge measurements are also listed.

ACKNOWLEDGMENTS

Transport experiments of this scale require the dedicated assistance of many individuals particularly for the field work and also in the planning and analysis stages. Stephen J. Walmsley (Nevada District Office, U.S. Geological Survey) and James W. Ball (National Research Program, U.S. Geological Survey) assisted in running the experiment. John H. Duff and Kent Stanley (National Research Program, U.S. Geological Survey) helped with all of the field work. Kerry T. Garcia, Richard J. LaCamera, Sherwood B. Browning, and Robert R. Squires (Nevada District Office, U.S. Geological Survey) worked on obtaining the water samples.

The duplicate chloride samples were analyzed by Ronald J. Avanzino (National Research Program, U.S. Geological Survey). All other chemical analyses were completed at the Geological Survey's Central Laboratory, Denver, Colo.

REFERENCES

Bencala, K. E., 1983, Simulation of solute transport in a mountain pool-and-riffle stream with kinetic mass transfer model for sorption: Water Resources Research, v. 19, no. 3, p. 732-738.

Brown and Caldwell, 1983, Leviathan Mine pollution abatement project: Design report and draft environmental impact report, 189 p.

Chapman, B. M., 1982, Numerical simulation of the transport and speciation of nonconservative chemical reactants in rivers: Water Resources Research, v. 18, no. 1, p. 155-167.

Clark, W. B., 1977, Mines and mineral resources of Alpine County, California with sections on the Zaca gold-silver mine and the Leviathan sulfur mine, by James R. Evans: California Division of Mines and Geology, County Report 8, 48 p.

Jackman, A. P., Walters, R. A., and Kennedy, V. C., 1984/1985, Transport and concentration controls for chloride, strontium, potassium and lead in Uvas Creek, a small cobble-bed stream in Santa Clara County, California, Part 2: Mathematical modeling: Journal of Hydrology, v. 75, p. 111-141.

O'Brien, J. E., 1962, Automation in sanitary chemistry. IV, Automatic analysis of chlorides in sewage: Wastes Engineering , v. 33, no. 12, p. 670-672.

Onishi, Y., 1981, Sediment-contaminant transport model: Journal of Hydraulic Division American Society of Civil Engineers, v. 107(HY9), p. 1089-1107.

Skougstad, M. W., Fishman, M. J., Friedman, L. C., Erdmann, D. E., and Duncan, S. S., Eds., 1979, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chapter A1, 626 p.

Appendix I

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: -6m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0851	-0.433	1.69	17.4	1800.0	1.20
OCT 07	0944	0.450	1.73	17.6	1740.0	1.25
OCT 07	1008	0.850	1.66	18.3	1820.0	1.20
OCT 07	1100	1.717	1.73	---	---	1.25
OCT 07	1203	2.767	1.62	16.8	1700.0	1.25
OCT 07	1300	3.717	1.64	---	---	1.22
OCT 07	1400	4.717	1.68	17.4	1700.0	1.23
OCT 07	1500	5.717	1.67	---	---	1.21
OCT 07	1600	6.717	1.70	17.5	1730.0	1.25
OCT 07	1700	7.717	1.66	---	---	1.26
OCT 07	1800	8.717	1.65	17.5	1790.0	1.24
OCT 07	1900	9.717	1.64	---	---	1.33
OCT 07	2000	10.717	1.67	17.9	1890.0	1.27
OCT 07	2103	11.767	1.65	---	---	1.24
OCT 07	2204	12.783	1.67	18.2	1840.0	1.25
OCT 07	2300	13.717	1.62	---	---	1.24
OCT 08	0000	14.717	1.64	18.5	1850.0	1.30
OCT 08	0058	15.683	1.65	---	---	1.24
OCT 08	0158	16.683	1.65	18.8	1900.0	1.26
OCT 08	0259	17.700	1.66	---	---	1.25
OCT 08	0403	18.767	1.68	19.6	2180.0	1.27
OCT 08	0502	19.750	1.71	---	---	1.27
OCT 08	0601	20.733	1.83	20.7	2420.0	1.27
OCT 08	0700	21.717	1.84	---	---	1.26
OCT 08	0800	22.717	1.89	21.8	2640.0	0.95
OCT 08	0900	23.717	1.82	21.6	2570.0	1.18
OCT 08	0958	24.683	1.58	16.9	1670.0	1.22
OCT 08	1100	25.717	1.69	18.6	1880.0	1.30
OCT 08	1210	26.883	1.60	---	---	1.23
OCT 08	1307	27.833	1.62	16.9	1690.0	1.25
OCT 08	1407	28.833	1.60	---	---	1.22
OCT 08	1507	29.833	1.59	---	---	1.21
OCT 08	1607	30.833	1.64	17.3	1750.0	1.10
OCT 08	1707	31.833	1.63	---	---	---
OCT 08	1807	32.833	1.64	---	---	1.22
OCT 08	1907	33.833	1.61	17.7	1780.0	1.30

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 43m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0856	-0.350	1.60	18.0	1790.0	1.30
OCT 07	0935	0.300	32.90	36.5	1830.0	1.22
OCT 07	1001	0.733	33.20	36.1	1800.0	1.23
OCT 07	1105	1.800	35.10	37.6	1930.0	1.30
OCT 07	1204	2.783	32.70	34.3	1700.0	1.24
OCT 07	1304	3.783	34.00	37.8	1750.0	1.26
OCT 07	1402	4.750	35.00	35.8	1810.0	1.30
OCT 07	1502	5.750	34.20	36.8	1750.0	1.24
OCT 07	1602	6.750	35.30	38.2	1800.0	1.26
OCT 07	1702	7.750	16.40	27.2	1830.0	1.27
OCT 07	1802	8.750	31.80	37.3	1790.0	1.26
OCT 07	1902	9.750	32.60	36.5	1830.0	1.25
OCT 07	2003	10.767	30.40	37.5	1860.0	1.22
OCT 07	2055	11.633	30.80	---	---	1.22
OCT 07	2209	12.867	30.80	37.8	1840.0	1.26
OCT 07	2310	13.883	30.80	---	---	1.23
OCT 08	0007	14.833	30.80	37.5	1830.0	1.27
OCT 08	0102	15.750	31.10	---	---	1.24
OCT 08	0203	16.767	32.40	39.4	1880.0	1.27
OCT 08	0302	17.750	33.50	40.2	1980.0	1.27
OCT 08	0407	18.833	35.60	41.5	2100.0	1.30
OCT 08	0506	19.817	39.00	44.7	2150.0	1.22
OCT 08	0604	20.783	41.40	46.9	2370.0	1.30
OCT 08	0700	21.717	45.80	49.3	2380.0	1.16
OCT 08	0812	22.917	47.50	51.0	2710.0	0.96
OCT 08	0903	23.767	44.90	48.8	2600.0	0.99
OCT 08	1000	24.717	1.78	18.0	1890.0	1.30
OCT 08	1103	25.767	1.60	17.2	1650.0	1.30

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 265m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0900	-0.283	2.42	---	---	---
OCT 07	0905	-0.200	1.99	---	---	---
OCT 07	0910	-0.117	1.74	---	---	---
OCT 07	0915	-0.033	1.70	---	---	---
OCT 07	0920	0.050	1.69	---	---	---
OCT 07	0925	0.133	1.69	---	---	---
OCT 07	0930	0.217	1.68	---	---	---
OCT 07	0935	0.300	1.71	---	---	---
OCT 07	0940	0.383	1.94	---	---	---
OCT 07	0945	0.467	13.60	---	---	---
OCT 07	0950	0.550	21.00	---	---	---
OCT 07	0955	0.633	21.70	---	---	---
OCT 07	1000	0.717	21.80	---	---	---
OCT 07	1010	0.883	21.10	---	---	---
OCT 07	1020	1.050	20.60	---	---	---
OCT 07	1030	1.217	20.50	---	---	---
OCT 07	1040	1.383	20.90	---	---	---
OCT 07	1050	1.550	23.40	---	---	---
OCT 07	1100	1.717	22.70	---	---	---
OCT 07	1200	2.717	24.70	---	---	---
OCT 07	1300	3.717	23.50	---	---	---
OCT 07	1400	4.717	30.00	---	---	---
OCT 07	1500	5.717	24.00	---	---	---
OCT 07	1600	6.717	24.10	---	---	---
OCT 07	1700	7.717	2.53	---	---	---
OCT 07	1800	8.717	29.20	---	---	---
OCT 07	1900	9.717	28.70	---	---	---
OCT 08	0900	23.717	35.50	---	---	---
OCT 08	0905	23.800	39.30	---	---	---
OCT 08	0910	23.883	35.40	---	---	---
OCT 08	0915	23.967	37.90	---	---	---
OCT 08	0920	24.050	34.50	---	---	---
OCT 08	0925	24.133	33.60	---	---	---
OCT 08	0930	24.217	33.40	---	---	---
OCT 08	0935	24.300	34.10	---	---	---
OCT 08	0940	24.383	32.60	---	---	---
OCT 08	0945	24.467	29.20	---	---	---
OCT 08	0950	24.550	7.08	---	---	---
OCT 08	0955	24.633	3.12	---	---	---
OCT 08	1000	24.717	2.80	---	---	---
OCT 08	1010	24.883	2.58	---	---	---
OCT 08	1020	25.050	2.42	---	---	---
OCT 08	1030	25.217	2.25	---	---	---

OCT 08	1040	25.383	2.12	---	---	---
OCT 08	1050	25.550	2.10	---	---	---
OCT 08	1100	25.717	2.00	---	---	---
OCT 08	1200	26.717	1.86	---	---	---
OCT 08	1300	27.717	1.86	---	---	---
OCT 08	1400	28.717	1.80	---	---	---
OCT 08	1500	29.717	1.79	---	---	---
OCT 08	1600	30.717	1.80	---	---	---
OCT 08	1700	31.717	1.75	---	---	---
OCT 08	1800	32.717	1.83	---	---	---
OCT 08	1900	33.717	1.83	---	---	---

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 542m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0900	-0.283	1.75	19.3	1720.0	1.30
OCT 07	0912	-0.083	1.71	---	---	1.23
OCT 07	0925	0.133	1.70	19.4	1700.0	1.24
OCT 07	0931	0.233	1.73	---	---	---
OCT 07	0940	0.383	1.80	19.3	1770.0	1.26
OCT 07	0952	0.583	1.75	---	---	---
OCT 07	1000	0.717	1.72	18.8	1740.0	1.24
OCT 07	1010	0.883	1.82	19.4	1720.0	1.25
OCT 07	1020	1.050	7.29	23.0	1760.0	1.25
OCT 07	1030	1.217	17.40	30.2	1670.0	1.30
OCT 07	1040	1.383	21.30	32.9	1710.0	1.25
OCT 07	1050	1.550	23.10	---	---	1.23
OCT 07	1100	1.550	23.60	34.4	1720.0	1.24
OCT 07	1130	2.217	25.10	---	---	---
OCT 07	1200	2.717	25.40	36.2	1810.0	1.30
OCT 07	1231	3.233	23.10	---	---	1.25
OCT 07	1259	3.700	25.80	---	---	1.27
OCT 07	1400	4.717	27.50	---	---	1.15
OCT 07	1459	5.700	27.20	---	---	1.25
OCT 07	1607	6.833	27.70	---	---	1.24
OCT 07	1655	7.633	27.90	34.8	1700.0	1.26
OCT 07	1800	8.717	5.76	21.7	1730.0	---
OCT 07	1900	9.717	28.10	35.4	1740.0	1.30
OCT 08	0900	23.717	36.50	44.2	2320.0	1.30
OCT 08	0910	23.883	36.10	---	---	---
OCT 08	0920	24.050	35.90	---	---	1.30
OCT 08	0930	24.217	36.30	---	---	---
OCT 08	0940	24.383	35.70	---	---	1.28
OCT 08	0950	24.550	36.40	---	---	---
OCT 08	1000	24.717	36.60	44.6	2320.0	1.26
OCT 08	1010	24.883	36.30	---	---	---
OCT 08	1020	25.050	35.30	42.9	2360.0	1.40
OCT 08	1030	25.217	27.90	37.9	2310.0	1.28
OCT 08	1040	25.383	9.95	27.4	2250.0	1.30
OCT 08	1050	25.550	5.30	24.0	2130.0	1.30
OCT 08	1100	25.717	3.86	21.6	1930.0	1.40
OCT 08	1130	26.217	2.82	19.2	1760.0	1.30
OCT 08	1200	26.717	2.48	---	---	---
OCT 08	1230	27.217	2.24	18.1	1700.0	---
OCT 08	1300	27.717	2.13	---	---	---
OCT 08	1400	28.717	2.06	18.2	1730.0	1.30
OCT 08	1500	29.717	1.95	---	---	---
OCT 08	1600	30.717	1.88	17.6	1650.0	1.22

OCT 08	1700	31.717	1.87	---	---	---
OCT 08	1800	32.717	1.86	17.9	1740.0	1.30
OCT 08	1830	33.217	1.81	---	---	---

SOLUTE CONCENTRATIONS
4L CREEK -- OCTOBER 1982
STATION: 552m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L)			
			CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0918	0.017	1.16	14.6	131.0	0.29
OCT 07	0959	0.700	1.13	14.8	128.0	0.27
OCT 07	1101	1.733	1.13	14.7	130.0	0.27
OCT 07	1202	2.750	1.12	14.7	131.0	0.28
OCT 07	1258	3.683	1.12	14.8	130.0	0.27
OCT 07	1400	4.717	1.14	---	---	---
OCT 07	1500	5.717	1.12	14.7	131.0	---
OCT 07	1610	6.883	1.13	---	---	0.27
OCT 07	1657	7.667	1.14	14.9	127.0	0.28
OCT 07	1801	8.733	1.14	14.9	131.0	0.27
OCT 07	1903	9.767	1.13	14.8	129.0	0.29
OCT 08	0900	23.717	1.14	14.2	127.0	0.32
OCT 08	1000	24.717	1.14	14.4	131.0	0.28
OCT 08	1100	25.717	1.14	14.4	128.0	0.29
OCT 08	1200	26.717	1.11	---	---	0.27
OCT 08	1300	27.717	1.09	---	---	0.26
OCT 08	1400	28.717	1.09	14.8	134.0	0.30
OCT 08	1500	29.717	1.12	---	---	0.27
OCT 08	1600	30.717	1.14	14.8	128.0	0.30
OCT 08	1700	31.717	1.12	---	---	0.28
OCT 08	1800	32.717	1.12	14.8	132.0	0.30
OCT 08	1830	33.217	1.13	---	---	0.27

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 577m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0905	-0.200	1.59	17.6	1480.0	1.20
OCT 07	0922	0.083	1.60	17.7	1460.0	1.18
OCT 07	0930	0.217	1.64	---	---	---
OCT 07	0941	0.400	1.62	18.2	1420.0	1.15
OCT 07	0950	0.550	1.64	18.5	1400.0	---
OCT 07	1003	0.767	1.67	18.5	1440.0	1.18
OCT 07	1012	0.917	1.64	18.1	1430.0	1.17
OCT 07	1022	1.083	4.33	20.4	1440.0	1.18
OCT 07	1031	1.233	12.10	26.5	1460.0	1.18
OCT 07	1042	1.417	16.10	30.0	1440.0	1.18
OCT 07	1051	1.567	17.90	29.9	1430.0	1.16
OCT 07	1102	1.750	19.10	30.7	1440.0	1.19
OCT 07	1132	2.250	19.40	---	---	---
OCT 07	1204	2.783	20.50	32.4	1520.0	1.19
OCT 07	1232	3.250	18.40	---	---	---
OCT 07	1302	3.750	19.40	30.2	1400.0	1.19
OCT 07	1402	4.750	20.40	---	---	---
OCT 07	1502	5.750	20.80	31.5	1400.0	1.19
OCT 07	1602	6.750	20.50	---	---	---
OCT 07	1700	7.717	21.20	31.7	1460.0	1.25
OCT 07	1806	8.817	7.33	21.7	1410.0	1.21
OCT 07	1857	9.667	21.40	31.5	1460.0	1.20
OCT 08	0900	23.717	28.00	36.8	1780.0	1.30
OCT 08	0910	23.883	28.00	---	---	---
OCT 08	0920	24.050	28.30	---	---	---
OCT 08	0930	24.217	28.20	37.9	1910.0	1.27
OCT 08	0940	24.383	28.50	---	---	---
OCT 08	0950	24.550	28.30	37.4	1870.0	1.25
OCT 08	1000	24.717	28.80	37.9	1940.0	1.27
OCT 08	1010	24.883	29.10	---	---	---
OCT 08	1020	25.050	29.50	38.0	2000.0	1.30
OCT 08	1030	25.217	25.80	35.4	1920.0	1.28
OCT 08	1040	25.383	9.90	24.9	1930.0	1.29
OCT 08	1050	25.550	5.07	21.7	1880.0	1.28
OCT 08	1100	25.717	3.59	20.2	1640.0	1.30
OCT 08	1130	26.217	2.57	18.0	1460.0	1.23
OCT 08	1200	26.717	2.30	18.3	1440.0	1.20
OCT 08	1230	27.217	2.16	18.4	1440.0	1.14
OCT 08	1300	27.717	1.98	17.9	1400.0	1.20
OCT 08	1400	28.717	1.96	18.1	1450.0	1.18
OCT 08	1500	29.717	1.81	17.2	1330.0	1.15
OCT 08	1600	30.717	1.78	17.8	1380.0	1.15
OCT 08	1700	31.717	1.75	---	---	---

OCT 08	1800	32.717	1.72	18.1	1410.0	---
OCT 08	1830	33.217	1.72	18.1	1430.0	1.15

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 980Im

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0900	-0.283	1.64	---	---	---
OCT 07	0930	0.217	1.60	---	---	---
OCT 07	1000	0.717	1.58	---	---	---
OCT 07	1030	1.217	1.58	---	---	---
OCT 07	1100	1.717	1.62	---	---	---
OCT 07	1130	2.217	24.00	---	---	---
OCT 07	1200	2.717	14.10	---	---	---
OCT 07	1230	3.217	19.30	---	---	---
OCT 07	1300	3.717	18.10	---	---	---
OCT 07	1330	4.217	18.70	---	---	---
OCT 07	1400	4.717	16.60	---	---	---
OCT 07	1430	5.217	18.00	---	---	---
OCT 07	1500	5.717	18.80	---	---	---
OCT 07	1530	6.217	21.50	---	---	---
OCT 07	1600	6.717	21.30	---	---	---
OCT 07	1630	7.217	21.50	---	---	---
OCT 07	1700	7.717	21.40	---	---	---
OCT 07	1730	8.217	20.80	---	---	---
OCT 07	1800	8.717	21.40	---	---	---
OCT 07	1830	9.217	16.60	---	---	---
OCT 07	1900	9.717	5.39	---	---	---
OCT 07	1930	10.217	15.50	---	---	---
OCT 07	2000	10.717	21.40	---	---	---
OCT 07	2030	11.217	22.10	---	---	---
OCT 07	2100	11.717	22.60	---	---	---
OCT 07	2130	12.217	22.20	---	---	---
OCT 07	2200	12.717	22.70	---	---	---
OCT 07	2230	13.217	22.40	---	---	---
OCT 07	2300	13.717	22.80	---	---	---
OCT 07	2330	14.217	22.30	---	---	---
OCT 08	0000	14.717	23.20	---	---	---
OCT 08	0030	15.217	22.90	---	---	---
OCT 08	0100	15.717	23.10	---	---	---
OCT 08	0130	16.217	22.40	---	---	---
OCT 08	0200	16.717	23.00	---	---	---
OCT 08	0230	17.217	22.20	---	---	---
OCT 08	0300	17.717	23.40	---	---	---
OCT 08	0330	18.217	22.30	---	---	---
OCT 08	0400	18.717	23.90	---	---	---
OCT 08	0430	19.217	23.90	---	---	---
OCT 08	0500	19.717	24.50	---	---	---
OCT 08	0530	20.217	24.50	---	---	---
OCT 08	0830	23.217	25.20	---	---	---

OCT 08	0900	23.717	25.80	---	---	---
OCT 08	0930	24.217	25.90	---	---	---
OCT 08	1000	24.717	26.30	---	---	---
OCT 08	1030	25.217	27.40	---	---	---
OCT 08	1100	25.717	28.10	---	---	---
OCT 08	1130	26.217	4.61	---	---	---
OCT 08	1200	26.717	6.93	---	---	---
OCT 08	1230	27.217	3.24	---	---	---
OCT 08	1300	27.717	2.69	---	---	---
OCT 08	1330	28.217	2.45	---	---	---
OCT 08	1400	28.717	2.28	---	---	---
OCT 08	1430	29.217	2.20	---	---	---
OCT 08	1500	29.717	2.24	---	---	---
OCT 08	1530	30.217	2.09	---	---	---
OCT 08	1600	30.717	2.04	---	---	---
OCT 08	1630	31.217	1.97	---	---	---
OCT 08	1700	31.717	1.92	---	---	---
OCT 08	1730	32.217	1.89	---	---	---
OCT 08	1800	32.717	1.87	---	---	---
OCT 08	1830	33.217	1.85	---	---	---
OCT 08	1900	33.717	1.75	---	---	---
OCT 08	1930	34.217	1.81	---	---	---
OCT 08	2000	34.717	1.79	---	---	---
OCT 08	2030	35.217	1.66	---	---	---
OCT 08	2100	35.717	1.65	---	---	---
OCT 08	2130	36.217	1.69	---	---	---
OCT 08	2200	36.717	1.75	---	---	---
OCT 08	2230	37.217	1.89	---	---	---
OCT 08	2300	37.717	1.74	---	---	---
OCT 08	2330	38.217	1.73	---	---	---
OCT 09	0000	38.717	1.74	---	---	---
OCT 09	0030	39.217	1.73	---	---	---
OCT 09	0100	39.717	1.70	---	---	---
OCT 09	0130	40.217	1.71	---	---	---
OCT 09	0200	40.717	1.70	---	---	---
OCT 09	0230	41.217	1.71	---	---	---
OCT 09	0300	41.717	1.72	---	---	---
OCT 09	0330	42.217	1.73	---	---	---
OCT 09	0400	42.717	1.72	---	---	---
OCT 09	0430	43.217	1.59	---	---	---
OCT 09	0500	43.717	1.58	---	---	---
OCT 09	0530	44.217	1.71	---	---	---
OCT 09	0600	44.717	1.69	---	---	---
OCT 09	0630	45.217	1.70	---	---	---
OCT 09	0700	45.717	1.72	---	---	---
OCT 09	0730	46.217	1.70	---	---	---
OCT 09	0800	46.717	1.71	---	---	---
OCT 09	0830	47.217	1.70	---	---	---

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 1577m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0900	-0.283	1.57	18.4	1430.0	1.30
OCT 07	0915	-0.033	1.52	---	---	---
OCT 07	0930	0.217	1.53	---	---	---
OCT 07	0945	0.467	1.54	---	---	---
OCT 07	1000	0.717	1.51	18.9	1410.0	1.14
OCT 07	1010	0.883	1.61	---	---	---
OCT 07	1020	1.050	1.58	---	---	---
OCT 07	1030	1.217	1.63	---	---	---
OCT 07	1040	1.383	1.81	---	---	---
OCT 07	1050	1.550	1.64	---	---	---
OCT 07	1100	1.717	1.60	18.3	1390.0	1.14
OCT 07	1110	1.883	1.58	---	---	---
OCT 07	1120	2.050	1.60	---	---	---
OCT 07	1130	2.217	1.60	---	---	---
OCT 07	1140	2.383	1.58	---	---	---
OCT 07	1150	2.550	1.59	---	---	---
OCT 07	1200	2.717	1.59	18.3	1460.0	1.03
OCT 07	1210	2.883	1.61	---	---	---
OCT 07	1220	3.050	1.62	---	---	---
OCT 07	1230	3.217	1.91	18.3	1480.0	0.98
OCT 07	1240	3.383	4.63	20.4	1480.0	1.06
OCT 07	1250	3.550	9.61	23.8	1520.0	0.96
OCT 07	1300	3.717	13.70	27.4	1420.0	1.06
OCT 07	1310	3.883	15.90	27.3	1490.0	1.06
OCT 07	1320	4.050	17.20	---	---	---
OCT 07	1330	4.217	17.30	28.4	1430.0	---
OCT 07	1340	4.383	17.20	---	---	---
OCT 07	1350	4.550	17.90	---	---	---
OCT 07	1400	4.717	18.10	29.7	1450.0	1.15
OCT 07	1430	5.217	19.50	---	---	---
OCT 07	1500	5.717	18.20	28.2	1450.0	1.11
OCT 07	1530	6.217	18.50	---	---	---
OCT 07	1600	6.717	19.60	---	---	---
OCT 07	1630	7.217	19.70	---	---	---
OCT 07	1700	7.717	19.40	29.1	1420.0	1.20
OCT 07	1800	8.717	19.80	---	---	---
OCT 07	1900	9.717	18.20	29.5	1370.0	1.18
OCT 08	0900	23.717	19.00	30.5	1470.0	1.20
OCT 08	0915	23.967	18.70	---	---	---
OCT 08	0930	24.217	19.40	---	---	---
OCT 08	0945	24.467	19.10	---	---	---
OCT 08	1010	24.883	19.50	---	---	---
OCT 08	1020	25.050	19.30	---	---	---

OCT 08	1030	25.217	20.20	---	---	---
OCT 08	1040	25.383	19.90	---	---	---
OCT 08	1050	25.550	19.70	---	---	---
OCT 08	1100	25.717	20.40	33.6	1330.0	1.20
OCT 08	1110	25.883	20.00	---	---	---
OCT 08	1120	26.050	21.40	---	---	---
OCT 08	1130	26.217	22.10	---	---	---
OCT 08	1140	26.383	22.20	---	---	---
OCT 08	1150	26.550	27.00	---	---	---
OCT 08	1200	26.717	22.90	33.6	1680.0	1.18
OCT 08	1210	26.883	22.20	---	---	---
OCT 08	1220	27.050	22.30	---	---	---
OCT 08	1230	27.217	23.80	35.2	1750.0	1.25
OCT 08	1240	27.383	19.30	---	---	---
OCT 08	1250	27.550	10.00	27.4	1730.0	1.20
OCT 08	1300	27.717	7.56	23.3	1680.0	1.18
OCT 08	1310	27.883	5.22	21.5	1600.0	1.20
OCT 08	1320	28.050	4.18	---	---	---
OCT 08	1340	28.383	3.43	19.1	1600.0	1.00
OCT 08	1350	28.550	3.27	---	---	---
OCT 08	1400	28.717	3.03	---	---	---
OCT 08	1430	29.217	2.78	18.6	1420.0	1.10
OCT 08	1500	29.717	2.54	---	---	---
OCT 08	1530	30.217	2.41	---	---	---
OCT 08	1600	30.717	2.35	17.8	1320.0	1.12
OCT 08	1630	31.217	2.25	---	---	---
OCT 08	1700	31.717	2.18	---	---	---
OCT 08	1800	32.717	2.05	---	---	---
OCT 08	1900	33.717	1.98	17.6	1300.0	1.12

SOLUTE CONCENTRATIONS
ASPEN CREEK -- OCTOBER 1982
STATION: 1606m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L)			
			CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0900	-0.283	1.32	12.6	251.0	0.34
OCT 07	1000	0.717	1.32	12.5	249.0	0.33
OCT 07	1100	1.717	1.40	---	---	0.33
OCT 07	1200	2.717	1.44	12.6	243.0	0.35
OCT 07	1300	3.717	1.35	12.5	234.0	0.35
OCT 07	1400	4.717	1.32	---	---	0.36
OCT 07	1500	5.717	1.40	12.6	239.0	0.38
OCT 07	1600	6.717	1.31	---	---	0.35
OCT 07	1700	7.717	1.30	---	---	0.35
OCT 07	1800	8.717	1.31	---	---	0.34
OCT 07	1900	9.717	1.32	12.6	232.0	0.35
OCT 08	0900	23.717	1.41	12.6	236.0	---
OCT 08	1000	24.717	1.38	---	---	---
OCT 08	1100	25.717	1.41	---	---	0.34
OCT 08	1200	26.717	1.34	12.6	249.0	0.30
OCT 08	1300	27.717	1.31	12.6	240.0	0.33
OCT 08	1400	28.717	1.42	---	---	0.36
OCT 08	1500	29.717	1.35	---	---	---
OCT 08	1600	30.717	1.32	12.6	236.0	0.36
OCT 08	1700	31.717	1.42	---	---	0.35
OCT 08	1800	32.717	1.35	---	---	0.34
OCT 08	1900	33.717	1.55	---	---	0.33

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 1674m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0900	-0.283	1.81	14.9	772.0	0.84
OCT 07	0915	-0.033	1.36	---	---	---
OCT 07	0930	0.217	1.37	15.2	754.0	0.83
OCT 07	0945	0.467	1.31	---	---	---
OCT 07	1000	0.717	1.66	15.1	754.0	0.88
OCT 07	1010	0.883	1.41	---	---	---
OCT 07	1020	1.050	1.34	---	---	---
OCT 07	1030	1.217	1.40	14.9	764.0	0.81
OCT 07	1040	1.383	1.41	---	---	---
OCT 07	1050	1.550	1.40	---	---	---
OCT 07	1100	1.717	1.39	15.2	746.0	0.86
OCT 07	1110	1.883	1.33	---	---	---
OCT 07	1120	2.050	1.35	---	---	---
OCT 07	1130	2.217	1.39	---	---	---
OCT 07	1140	2.383	1.40	---	---	---
OCT 07	1150	2.550	1.44	---	---	---
OCT 07	1200	2.717	1.43	15.3	788.0	0.82
OCT 07	1210	2.883	1.40	---	---	---
OCT 07	1220	3.050	1.42	---	---	---
OCT 07	1230	3.217	1.44	15.2	765.0	0.80
OCT 07	1240	3.383	1.90	15.7	801.0	0.82
OCT 07	1250	3.550	3.87	17.0	803.0	0.81
OCT 07	1300	3.717	6.45	18.8	785.0	0.85
OCT 07	1310	3.883	7.60	19.3	802.0	0.76
OCT 07	1320	4.050	8.31	19.7	788.0	0.81
OCT 07	1330	4.217	8.55	19.7	782.0	0.85
OCT 07	1340	4.383	8.77	---	---	---
OCT 07	1350	4.550	9.01	---	---	---
OCT 07	1400	4.717	9.25	20.3	795.0	0.84
OCT 07	1430	5.217	9.46	---	---	---
OCT 07	1500	5.717	8.81	19.8	792.0	0.88
OCT 07	1530	6.217	9.05	---	---	---
OCT 07	1600	6.717	9.35	20.2	752.0	0.87
OCT 07	1630	7.217	9.51	---	---	---
OCT 07	1700	7.717	9.54	20.4	772.0	0.86
OCT 07	1800	8.717	9.59	---	---	---
OCT 07	1900	9.717	10.00	20.2	755.0	0.88
OCT 08	0900	23.717	9.59	18.9	701.0	0.81
OCT 08	0915	23.967	9.06	---	---	---
OCT 08	0930	24.217	9.14	---	---	---
OCT 08	0945	24.467	9.23	---	---	---
OCT 08	1000	24.717	9.32	19.2	712.0	0.80
OCT 08	1010	24.883	9.35	---	---	---

OCT 08	1020	25.050	9.45	---	---	---
OCT 08	1030	25.217	9.50	19.3	710.0	0.78
OCT 08	1040	25.383	9.56	---	---	---
OCT 08	1050	25.550	9.65	---	---	---
OCT 08	1101	25.733	10.20	21.1	772.0	0.89
OCT 08	1110	25.883	10.10	---	---	---
OCT 08	1120	26.050	10.00	---	---	---
OCT 08	1130	26.217	10.00	21.5	855.0	0.88
OCT 08	1140	26.383	10.00	---	---	---
OCT 08	1150	26.550	10.00	---	---	---
OCT 08	1200	26.717	10.30	22.0	887.0	0.87
OCT 08	1210	26.883	10.40	---	---	---
OCT 08	1220	27.050	10.40	---	---	---
OCT 08	1230	27.217	10.50	22.4	933.0	0.91
OCT 08	1240	27.383	10.00	22.3	932.0	---
OCT 08	1250	27.550	8.90	21.2	950.0	0.97
OCT 08	1300	27.717	5.35	18.3	878.0	0.96
OCT 08	1310	27.933	3.73	16.9	877.0	---
OCT 08	1320	28.050	3.06	16.2	847.0	0.88
OCT 08	1330	28.217	2.67	15.7	836.0	0.81
OCT 08	1340	28.383	2.43	15.7	809.0	0.81
OCT 08	1350	28.550	2.23	---	---	---
OCT 08	1430	29.217	2.06	15.5	763.0	0.81
OCT 08	1530	30.217	1.83	---	---	---
OCT 08	1600	30.717	1.75	15.3	760.0	0.87
OCT 08	1630	31.217	1.90	---	---	---
OCT 08	1700	31.717	1.74	---	---	---
OCT 08	1800	32.717	1.63	---	---	---
OCT 08	1900	33.717	1.59	15.0	715.0	0.81

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 1674Im

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	1800	8.717	9.70	20.0	726.0	0.85
OCT 07	1900	9.717	9.91	20.7	760.0	---
OCT 07	2000	10.717	4.80	16.8	733.0	---
OCT 07	2100	11.717	8.66	19.6	771.0	---
OCT 07	2200	12.717	9.49	20.4	749.0	---
OCT 07	2300	13.717	9.67	20.5	762.0	---
OCT 08	0000	14.717	9.56	20.1	743.0	---
OCT 08	0100	15.717	9.56	20.2	734.0	---
OCT 08	0100	15.717	1.54	15.0	774.0	---
OCT 08	0200	16.717	9.57	20.2	727.0	---
OCT 08	0400	18.717	9.40	20.0	706.0	0.85
OCT 08	1100	25.717	10.10	20.7	755.0	---
OCT 08	1200	26.717	8.77	18.3	664.0	---
OCT 08	1400	28.717	2.11	15.3	817.0	---
OCT 08	1500	29.717	1.88	15.1	788.0	---
OCT 08	1600	30.717	1.90	15.3	839.0	0.85
OCT 08	1700	31.717	1.70	14.7	738.0	0.81
OCT 08	1800	32.717	1.62	14.9	692.0	---
OCT 08	1900	33.717	1.57	14.8	790.0	---
OCT 08	2000	34.717	1.58	15.0	804.0	---
OCT 08	2100	35.717	1.55	15.4	793.0	---
OCT 08	2200	36.717	1.55	15.0	803.0	---
OCT 08	2300	37.717	1.50	15.2	787.0	---
OCT 09	0100	39.717	1.52	15.1	723.0	---
OCT 09	0200	40.717	1.49	15.1	712.0	---
OCT 09	0300	41.717	1.49	---	---	---
OCT 09	0400	42.717	1.49	---	---	---
OCT 09	0500	43.717	1.50	15.3	756.0	---
OCT 09	0600	44.717	1.46	14.7	725.0	---
OCT 09	0700	45.717	1.49	15.2	727.0	---
OCT 09	0800	46.717	1.50	14.7	713.0	---
OCT 09	0900	47.717	1.48	15.1	738.0	---
OCT 09	1000	48.717	1.47	---	---	---
OCT 09	1100	49.717	1.51	---	---	---
OCT 09	1300	51.717	1.55	---	---	---
OCT 09	1400	52.717	1.51	---	---	---
OCT 09	1500	53.717	1.54	---	---	---
OCT 09	1600	54.717	1.48	---	---	---
OCT 09	1700	55.717	1.49	---	---	---
OCT 09	1800	56.717	1.47	---	---	---
OCT 09	1900	57.717	1.48	---	---	---
OCT 09	2000	58.717	1.46	---	---	---
OCT 09	2100	59.717	1.46	---	---	---

OCT 09	2200	60.717	1.45	---	---	---
OCT 09	2300	61.717	1.46	---	---	---
OCT 10	0000	62.717	1.45	---	---	---
OCT 10	0100	63.717	1.46	---	---	---
OCT 10	0200	64.717	1.43	---	---	---
OCT 10	0300	65.717	1.45	---	---	---
OCT 10	0400	66.717	1.45	---	---	---
OCT 10	0500	67.717	1.48	---	---	---
OCT 10	0600	68.717	1.43	---	---	---
OCT 10	0700	69.717	3.34	---	---	---
OCT 10	0800	70.717	1.45	---	---	---
OCT 10	0900	71.717	1.47	---	---	---
OCT 10	1000	72.717	1.45	---	---	---
OCT 10	1100	73.717	1.45	---	---	---
OCT 10	1200	74.717	1.47	---	---	---
OCT 10	1300	75.717	1.49	---	---	0.84

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 4327m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0900	-0.283	1.34	14.9	782.0	0.80
OCT 07	1000	0.717	1.36	---	---	0.80
OCT 07	1100	1.717	1.35	15.0	774.0	0.80
OCT 07	1200	2.717	1.37	---	---	---
OCT 07	1230	3.217	1.36	---	---	---
OCT 07	1300	3.717	1.60	14.7	742.0	0.85
OCT 07	1330	4.217	1.54	---	---	---
OCT 07	1400	4.717	1.44	---	---	---
OCT 07	1430	5.217	1.45	---	---	---
OCT 07	1500	5.717	1.43	15.2	716.0	0.81
OCT 07	1530	6.217	1.44	---	---	---
OCT 07	1600	6.717	1.53	---	---	---
OCT 07	1600	6.717	1.47	15.0	731.0	0.78
OCT 07	1630	7.217	1.43	---	---	---
OCT 07	1700	7.717	1.44	15.3	745.0	---
OCT 07	1730	8.217	2.36	15.7	799.0	0.78
OCT 07	1800	8.717	6.04	18.4	763.0	0.80
OCT 07	1830	9.217	7.51	19.4	736.0	0.82
OCT 07	1900	9.717	8.19	19.8	734.0	0.83
OCT 07	1930	10.217	8.57	---	---	---
OCT 07	2022	11.083	8.21	19.4	716.0	0.79
OCT 07	2106	11.817	8.60	19.7	701.0	0.83
OCT 07	2200	12.717	8.80	---	---	---
OCT 07	2300	13.717	8.90	19.8	699.0	0.84
OCT 08	0000	14.717	8.83	19.5	701.0	0.84
OCT 08	0101	15.733	3.87	17.4	722.0	0.93
OCT 08	0202	16.750	8.16	20.2	719.0	---
OCT 08	0300	17.717	8.87	---	---	---
OCT 08	0402	18.750	8.84	20.1	729.0	0.84
OCT 08	0501	19.733	8.88	---	---	---
OCT 08	0600	20.717	8.87	19.6	703.0	0.80
OCT 08	0700	21.717	8.92	---	---	---
OCT 08	0802	22.750	8.80	19.8	736.0	0.82
OCT 08	0903	23.767	8.83	---	---	---
OCT 08	1005	24.800	8.61	19.5	679.0	0.80
OCT 08	1100	25.717	8.60	---	---	---
OCT 08	1201	26.733	8.60	19.2	676.0	0.80
OCT 08	1230	27.217	8.56	---	---	---
OCT 08	1301	27.733	8.57	---	---	---
OCT 08	1331	28.233	8.60	---	---	---
OCT 08	1402	28.750	8.56	19.1	688.0	0.82
OCT 08	1431	29.233	8.54	---	---	---
OCT 08	1501	29.733	8.79	19.5	697.0	0.82

OCT 08	1530	30.217	9.09	---	---	---
OCT 08	1601	30.733	9.90	21.2	765.0	0.85
OCT 08	1632	31.250	10.00	---	---	---
OCT 08	1702	31.750	10.00	21.7	843.0	0.90
OCT 08	1731	32.233	9.12	20.6	881.0	0.91
OCT 08	1801	32.733	4.23	16.5	791.0	0.87
OCT 08	1832	33.250	3.06	16.0	769.0	0.80
OCT 08	1900	33.717	2.46	15.8	754.0	0.80
OCT 08	1931	34.233	2.33	15.4	743.0	---
OCT 08	1958	34.683	2.12	15.2	723.0	0.84
OCT 08	2030	35.217	2.01	---	---	---
OCT 08	2100	35.717	1.94	15.7	738.0	0.81
OCT 08	2158	36.683	1.81	15.4	676.0	0.82
OCT 08	2258	37.683	1.84	15.1	705.0	0.82
OCT 08	2358	38.683	1.69	15.9	717.0	0.78
OCT 09	0057	39.667	1.63	15.2	714.0	---
OCT 09	0159	40.700	1.66	15.5	714.0	0.88
OCT 09	0257	41.667	1.59	---	---	---
OCT 09	0357	42.667	1.58	14.7	702.0	0.81
OCT 09	0455	43.633	1.55	---	---	---
OCT 09	0555	44.633	1.54	14.9	736.0	0.79
OCT 09	0658	45.683	1.54	---	---	---
OCT 09	0758	46.683	1.55	15.7	740.0	0.80
OCT 09	0912	47.917	1.55	---	---	---

SOLUTE CONCENTRATIONS
MOUNTAINEER CREEK --OCTOBER 1982
STATION: 4355m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0900	-0.283	1.03	7.4	1.8	0.00
OCT 07	1000	0.717	1.01	---	---	---
OCT 07	1100	1.717	1.01	---	---	---
OCT 07	1200	2.717	1.02	---	---	---
OCT 07	1300	3.717	1.01	7.6	1.6	0.06
OCT 07	1400	4.717	1.02	---	---	---
OCT 07	1500	5.717	1.01	---	---	---
OCT 07	1600	6.717	1.00	---	---	---
OCT 07	1700	7.717	1.02	7.5	1.9	0.00
OCT 07	1800	8.717	1.13	---	---	---
OCT 07	1900	9.717	1.12	7.4	1.7	0.00
OCT 07	2026	11.150	1.15	---	---	---
OCT 07	2111	11.900	1.08	7.6	2.0	0.00
OCT 07	2204	12.783	1.12	---	---	---
OCT 07	2302	13.750	1.11	---	---	---
OCT 08	0002	14.750	1.08	7.6	1.6	0.00
OCT 08	0105	15.800	1.13	7.4	1.9	0.00
OCT 08	0204	16.783	1.07	7.5	1.7	---
OCT 08	0306	17.817	1.11	---	---	---
OCT 08	0404	18.783	1.10	7.5	1.8	0.00
OCT 08	0503	19.767	1.08	---	---	---
OCT 08	0605	20.800	1.09	7.5	1.8	0.00
OCT 08	0703	21.767	1.08	---	---	---
OCT 08	0805	22.800	1.08	---	---	---
OCT 08	0907	23.833	1.08	---	---	---
OCT 08	1007	24.833	1.06	7.3	1.8	0.08
OCT 08	1102	25.750	1.15	---	---	---
OCT 08	1203	26.767	1.08	---	---	---
OCT 08	1232	27.250	1.08	---	---	---
OCT 08	1304	27.783	1.07	---	---	---
OCT 08	1333	28.267	1.06	---	---	---
OCT 08	1405	28.800	1.06	7.3	1.6	0.08
OCT 08	1433	29.267	1.07	---	---	---
OCT 08	1504	29.783	1.07	7.4	1.9	0.00
OCT 08	1532	30.250	1.16	---	---	---
OCT 08	1604	30.783	1.13	7.5	1.5	0.00
OCT 08	1633	31.267	1.12	---	---	---
OCT 08	1704	31.783	1.10	---	---	---
OCT 08	1732	32.250	1.07	---	---	---
OCT 08	1804	32.783	1.06	7.5	1.8	0.00
OCT 08	1833	33.267	1.07	---	---	---
OCT 08	1903	33.767	1.15	---	---	---
OCT 08	1933	34.267	1.10	---	---	---

OCT 08	2000	34.717	1.09	7.5	1.6	0.06
OCT 08	2103	35.767	1.16	---	---	---
OCT 08	2200	36.717	1.12	7.5	2.0	0.00
OCT 08	2300	37.717	1.11	---	---	---
OCT 09	0001	38.733	1.10	7.5	1.8	0.00
OCT 09	0059	39.700	1.12	---	---	---
OCT 09	0206	40.817	1.15	---	---	---
OCT 09	0259	41.700	1.12	---	---	---
OCT 09	0359	42.700	1.14	7.6	1.8	---
OCT 09	0457	43.667	1.07	---	---	---
OCT 09	0557	44.667	1.07	---	---	---
OCT 09	0700	45.717	1.11	---	---	---
OCT 09	0800	46.717	1.14	7.5	1.7	0.00
OCT 09	0916	47.983	1.11	---	---	---

SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 4381m

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	0900	-0.283	1.07	9.5	214.0	0.37
OCT 07	1000	0.717	1.15	---	---	---
OCT 07	1100	1.717	1.08	9.6	201.0	0.27
OCT 07	1200	2.717	1.09	---	---	---
OCT 07	1230	3.217	1.08	---	---	---
OCT 07	1300	3.717	1.08	9.6	201.0	0.29
OCT 07	1330	4.217	1.08	---	---	---
OCT 07	1400	4.717	1.09	---	---	---
OCT 07	1430	5.217	1.07	---	---	---
OCT 07	1500	5.717	1.09	9.9	202.0	0.32
OCT 07	1530	6.217	1.09	---	---	---
OCT 07	1600	6.717	1.06	9.8	201.0	0.30
OCT 07	1630	7.217	1.07	---	---	---
OCT 07	1700	7.717	1.09	9.8	203.0	0.32
OCT 07	1730	8.217	1.25	---	---	---
OCT 07	1800	8.717	2.53	10.8	196.0	0.36
OCT 07	1830	9.217	2.97	---	---	---
OCT 07	1900	9.717	3.12	11.2	204.0	0.33
OCT 07	1930	10.217	3.17	---	---	---
OCT 07	2029	11.200	3.11	11.2	193.0	0.25
OCT 07	2114	11.950	3.30	11.3	201.0	0.26
OCT 07	2207	12.833	3.30	---	---	---
OCT 07	2306	13.817	3.67	11.2	203.0	0.28
OCT 08	0006	14.817	3.34	10.7	201.0	0.30
OCT 08	0108	15.850	1.89	9.8	205.0	0.27
OCT 08	0207	16.833	3.25	11.1	202.0	0.31
OCT 08	0309	17.867	3.36	---	---	---
OCT 08	0406	18.817	3.34	11.0	206.0	0.32
OCT 08	0505	19.800	3.42	---	---	---
OCT 08	0605	20.800	3.35	11.0	196.0	0.27
OCT 08	0706	21.817	3.30	---	---	---
OCT 08	0803	22.767	3.22	11.1	194.0	0.28
OCT 08	0914	23.950	3.20	---	---	---
OCT 08	1009	24.867	3.14	10.5	188.0	0.25
OCT 08	1105	25.800	3.15	---	---	---
OCT 08	1205	26.800	3.22	10.9	188.0	0.27
OCT 08	1307	27.833	3.19	---	---	0.22
OCT 08	1408	28.850	3.28	11.2	204.0	0.27
OCT 08	1507	29.833	3.40	11.3	204.0	0.26
OCT 08	1607	30.833	3.68	11.4	210.0	0.37
OCT 08	1708	31.850	4.07	12.0	243.0	0.47
OCT 08	1807	32.833	2.00	10.4	215.0	0.80
OCT 08	1906	33.817	1.44	10.0	206.0	0.40

OCT 08	2003	34.767	1.35	9.8	205.0	0.33
OCT 08	2033	35.267	1.32	---	---	---
OCT 08	2106	35.817	1.30	9.9	205.0	0.31
OCT 08	2202	36.750	1.33	9.8	197.0	---
OCT 08	2302	37.750	1.33	9.8	193.0	0.27
OCT 09	0003	38.767	1.23	9.3	197.0	---
OCT 09	0102	39.750	1.20	9.7	193.0	---
OCT 09	0206	40.817	1.19	9.8	196.0	0.27
OCT 09	0302	41.750	1.18	---	---	---
OCT 09	0401	42.733	1.17	9.7	203.0	0.31
OCT 09	0459	43.700	1.18	---	---	---
OCT 09	0559	44.700	1.17	9.6	199.0	0.26
OCT 09	0702	45.750	1.17	---	---	---
OCT 09	0803	46.767	1.15	9.6	196.0	0.28
OCT 09	0918	48.017	1.19	---	---	---

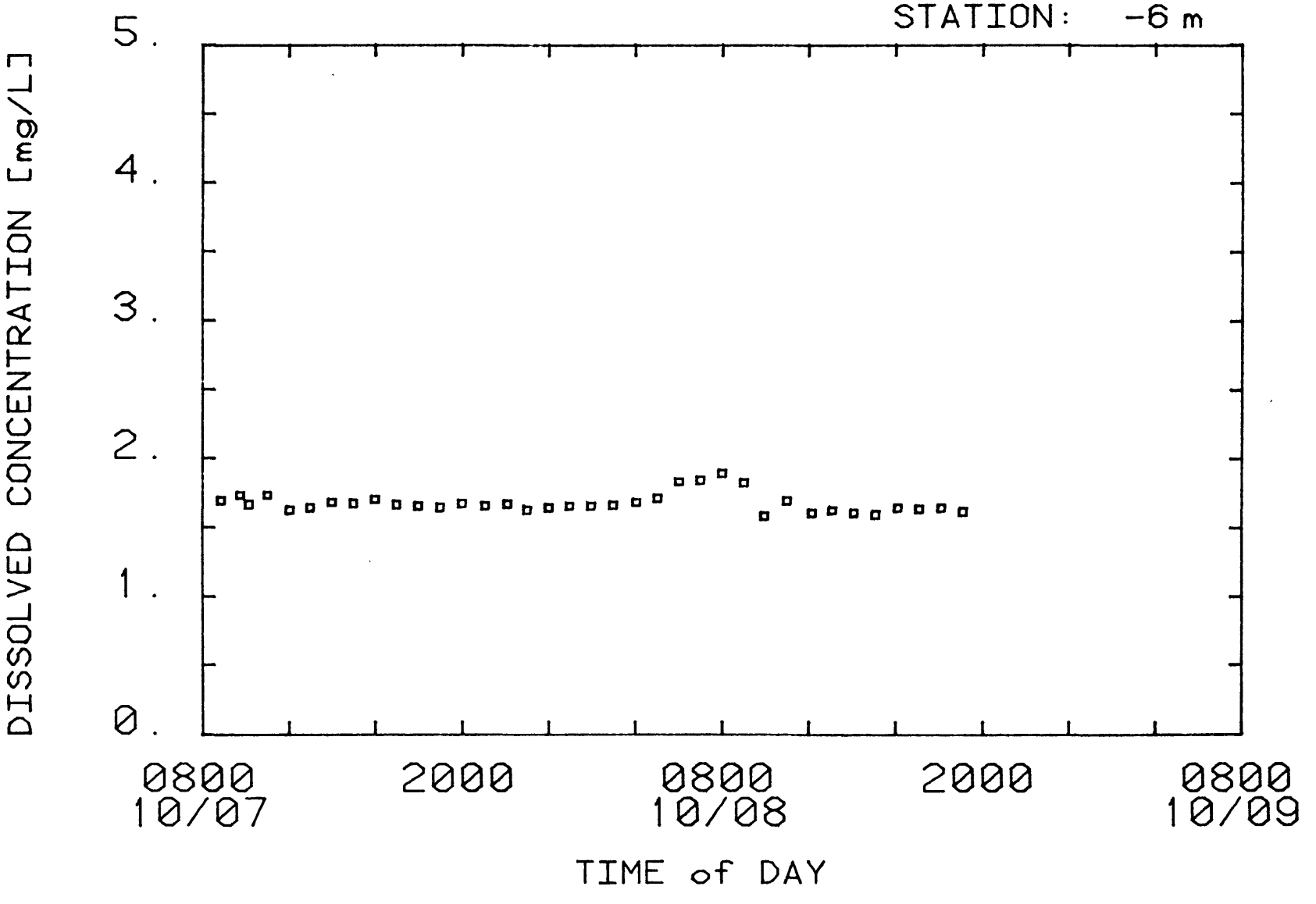
SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 6608Im

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	1200	2.717	1.32	---	---	---
OCT 07	1400	4.717	1.24	---	---	---
OCT 07	1600	6.717	1.50	---	---	---
OCT 07	1800	8.717	1.29	---	---	---
OCT 07	2000	10.717	1.42	---	---	---
OCT 07	2200	12.717	3.06	---	---	---
OCT 08	0000	14.717	3.18	---	---	---
OCT 08	0100	15.717	2.49	---	---	---
OCT 08	0200	16.717	3.25	---	---	---
OCT 08	0600	20.717	3.22	---	---	---
OCT 08	0800	22.717	3.23	---	---	---
OCT 08	1000	24.717	3.19	---	---	---
OCT 08	1200	26.717	3.10	---	---	---
OCT 08	1400	28.717	3.08	---	---	---
OCT 08	1600	30.717	3.21	---	---	---
OCT 08	1800	32.717	3.39	---	---	---
OCT 08	2000	34.717	3.42	---	---	---
OCT 08	2200	36.717	1.48	---	---	---
OCT 09	0000	38.717	1.33	---	---	---
OCT 09	0200	40.717	1.23	---	---	---
OCT 09	0400	42.717	1.23	---	---	---
OCT 09	0600	44.717	1.21	---	---	---
OCT 09	0800	46.717	1.18	---	---	---
OCT 09	1000	48.717	1.19	---	---	---
OCT 09	1200	50.717	1.22	---	---	---
OCT 09	1400	52.717	1.23	---	---	---
OCT 09	1600	54.717	1.22	---	---	---
OCT 09	1800	56.717	1.22	---	---	---
OCT 09	2000	58.717	1.21	---	---	---
OCT 09	2200	60.717	1.21	---	---	---
OCT 10	0000	62.717	1.19	---	---	---
OCT 10	0200	64.717	1.20	---	---	---
OCT 10	0400	66.717	1.19	---	---	---
OCT 10	0600	68.717	1.19	---	---	---
OCT 10	0800	70.717	1.16	---	---	---
OCT 10	1000	72.717	1.21	---	---	---
OCT 10	1200	74.717	1.20	---	---	---
OCT 10	1400	76.717	1.16	---	---	---
OCT 10	1600	78.717	1.19	---	---	---
OCT 10	1800	80.717	1.19	---	---	---
OCT 10	2000	82.717	1.19	---	---	---
OCT 10	2200	84.717	1.19	---	---	---

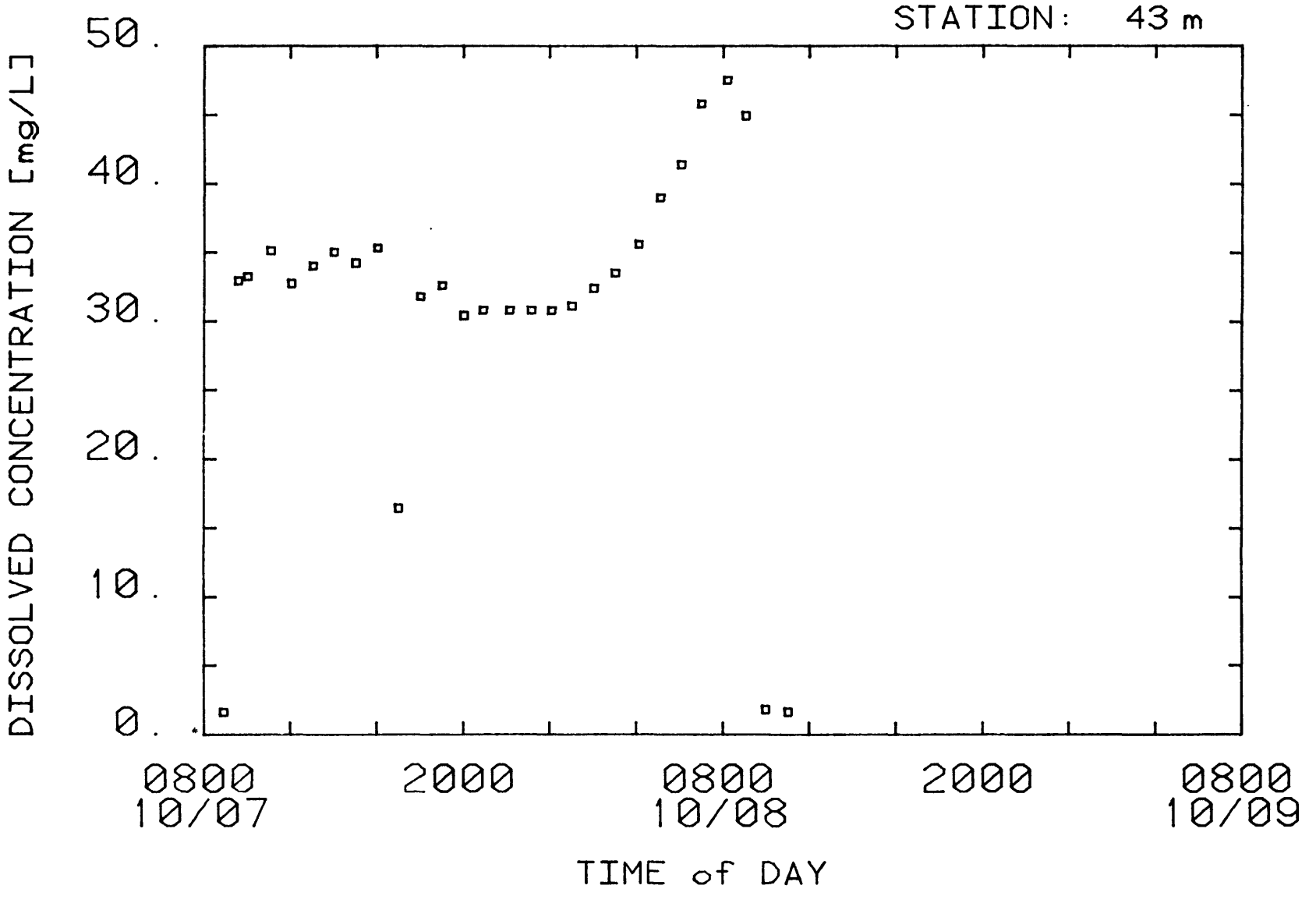
SOLUTE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 12754Im

DATE	TIME	ELAPSED TIME(h)	CONCENTRATION (mg/L) CHLORIDE	SODIUM	SULFATE	FLUORIDE
OCT 07	1300	3.717	1.44	---	---	---
OCT 07	1500	5.717	1.46	---	---	---
OCT 07	1700	7.717	1.43	---	---	---
OCT 07	1900	9.717	1.46	---	---	---
OCT 07	2100	11.717	1.44	---	---	---
OCT 07	2300	13.717	1.45	---	---	---
OCT 08	0100	15.717	1.43	---	---	---
OCT 08	0300	17.717	1.51	---	---	---
OCT 08	1100	25.717	2.13	---	---	---
OCT 08	1300	27.717	2.71	---	---	---
OCT 08	1500	29.717	2.81	---	---	---
OCT 08	1700	31.717	2.81	---	---	---
OCT 08	1900	33.717	2.80	---	---	---
OCT 08	2100	35.717	2.69	---	---	---
OCT 08	2300	37.717	2.80	---	---	---
OCT 09	0100	39.717	2.89	---	---	---
OCT 09	0300	41.717	3.12	---	---	---
OCT 09	0500	43.717	1.74	---	---	---
OCT 09	0900	47.717	1.54	---	---	---
OCT 09	1100	49.717	1.49	---	---	---
OCT 09	1300	51.717	1.49	---	---	---
OCT 09	1500	53.717	1.49	---	---	---
OCT 09	1700	55.717	1.48	---	---	---
OCT 09	1900	57.717	1.52	---	---	---
OCT 09	2100	59.717	1.50	---	---	---
OCT 09	2300	61.717	1.50	---	---	---
OCT 10	0100	63.717	1.54	---	---	---
OCT 10	0300	65.717	1.48	---	---	---
OCT 10	0500	67.717	1.51	---	---	---
OCT 10	0900	71.717	1.47	---	---	---
OCT 10	1100	73.717	1.48	---	---	---
OCT 10	1300	75.717	1.47	---	---	---
OCT 10	1500	77.717	1.50	---	---	---
OCT 10	1700	79.717	1.45	---	---	---
OCT 10	1900	81.717	1.47	---	---	---
OCT 10	2100	83.717	1.47	---	---	---
OCT 10	2300	85.717	1.49	---	---	---

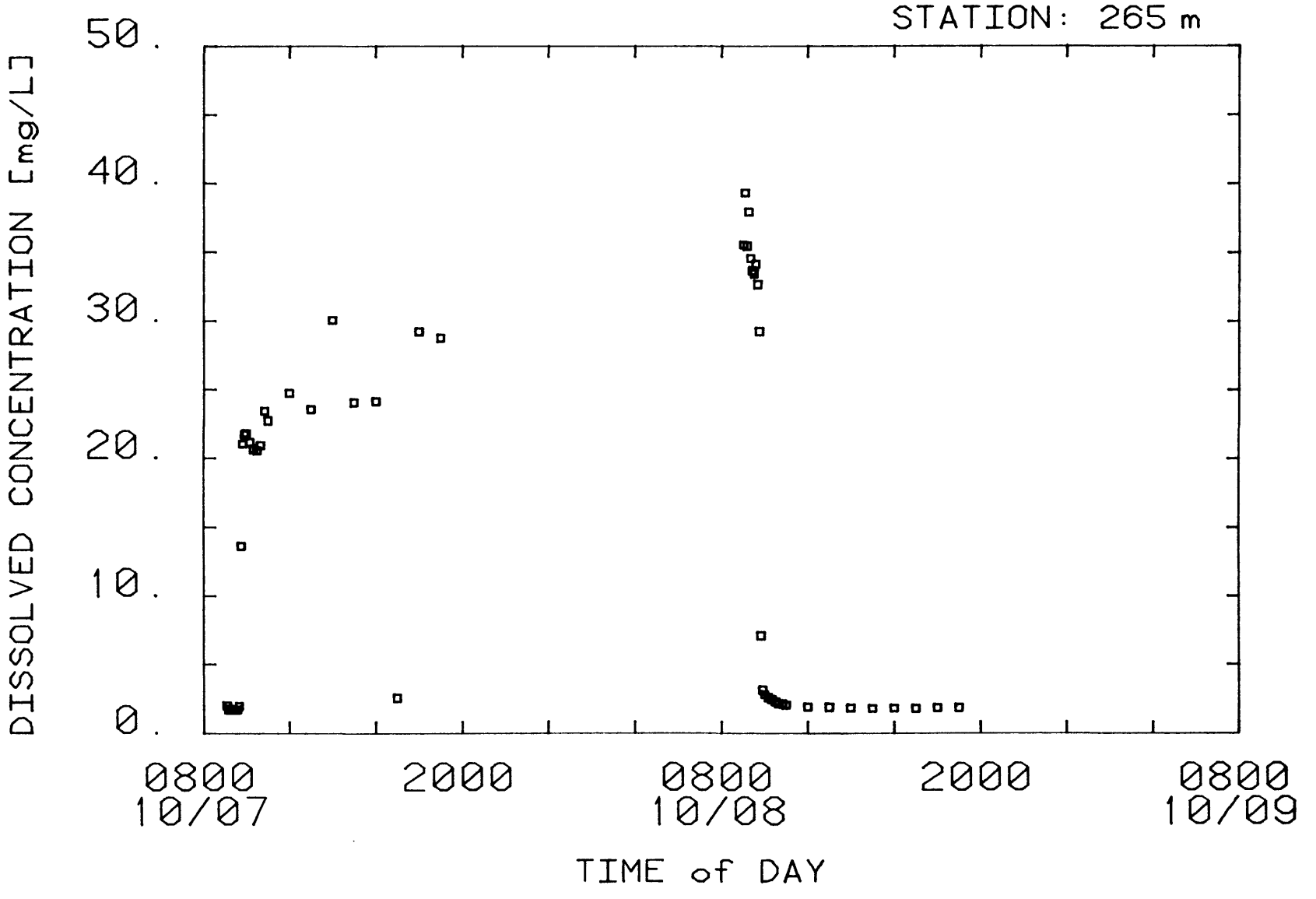
LEVIATHAN CREEK_82 CHLØRIDE



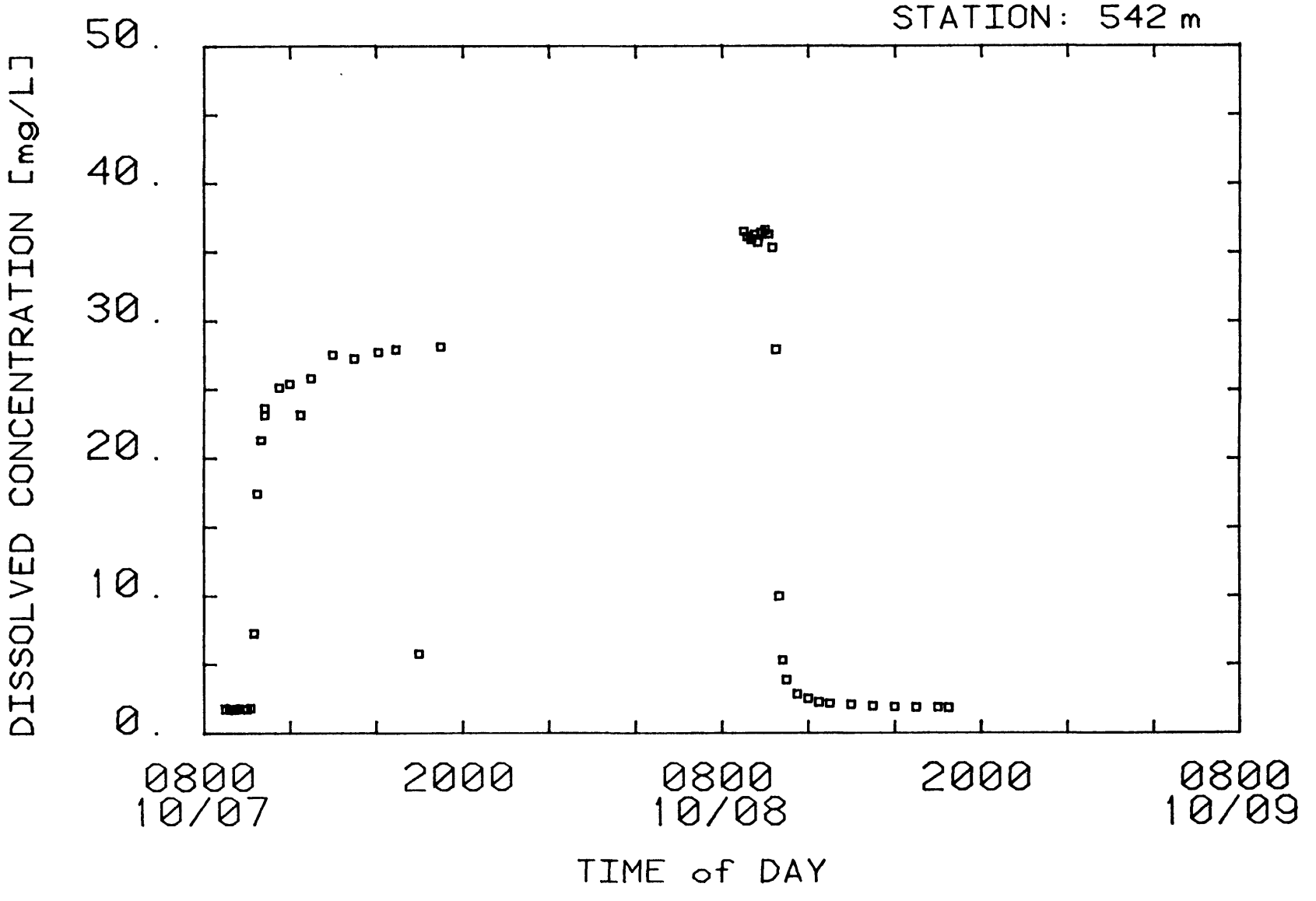
LEVIATHAN CREEK_82 CHLORIDE

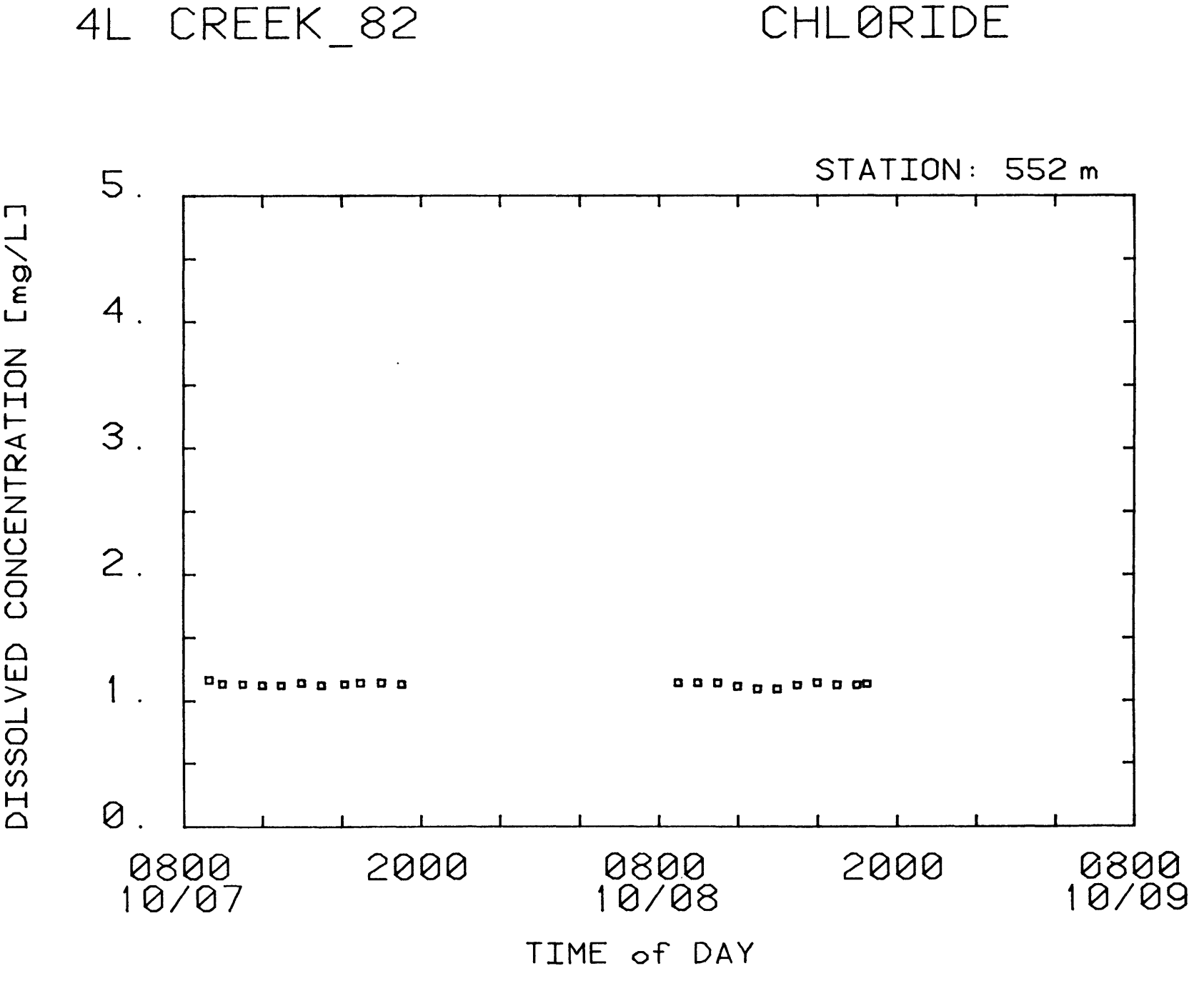


LEVIATHAN CREEK_82 CHLORIDE

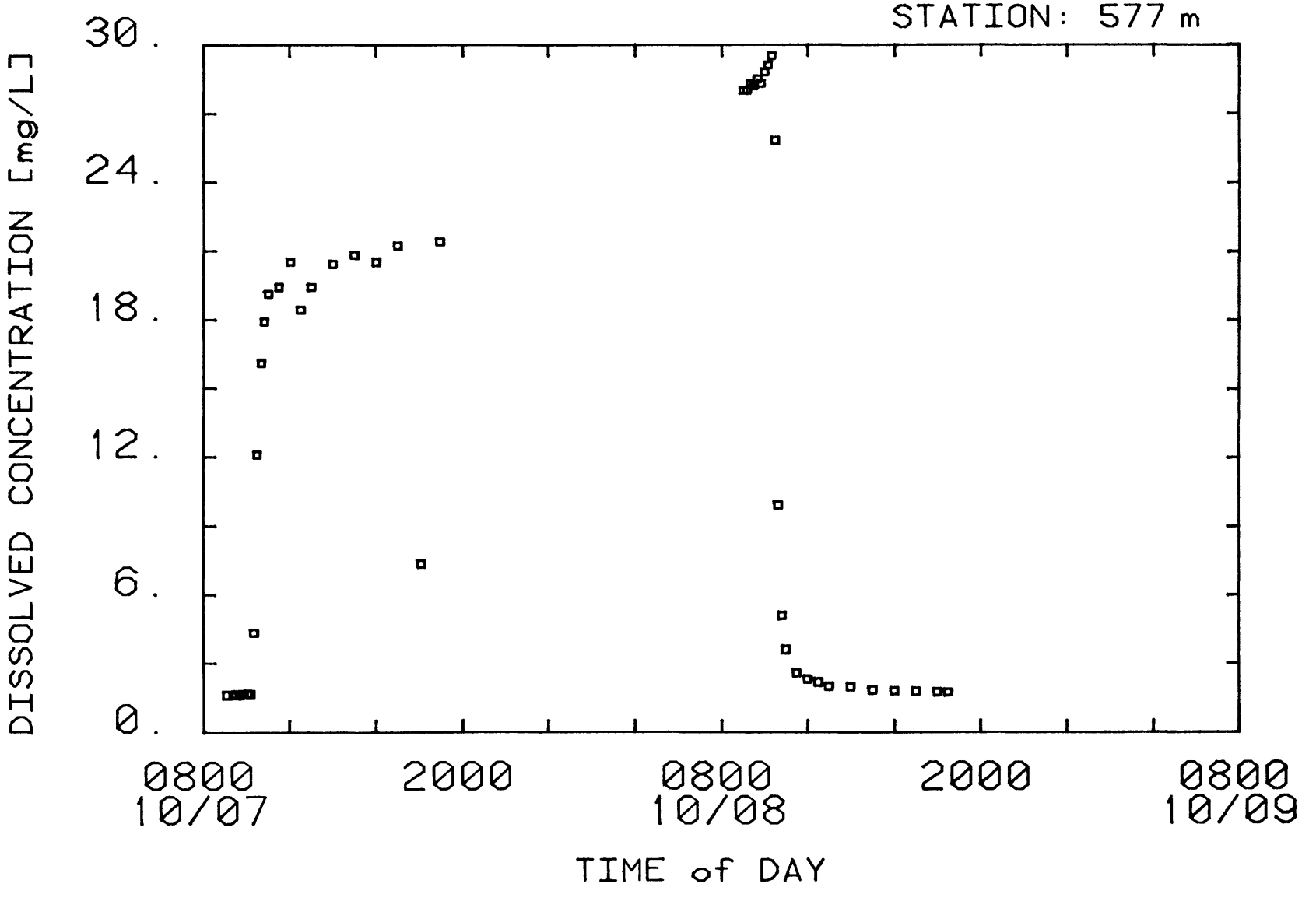


LEVIATHAN CREEK_82 CHLORIDE

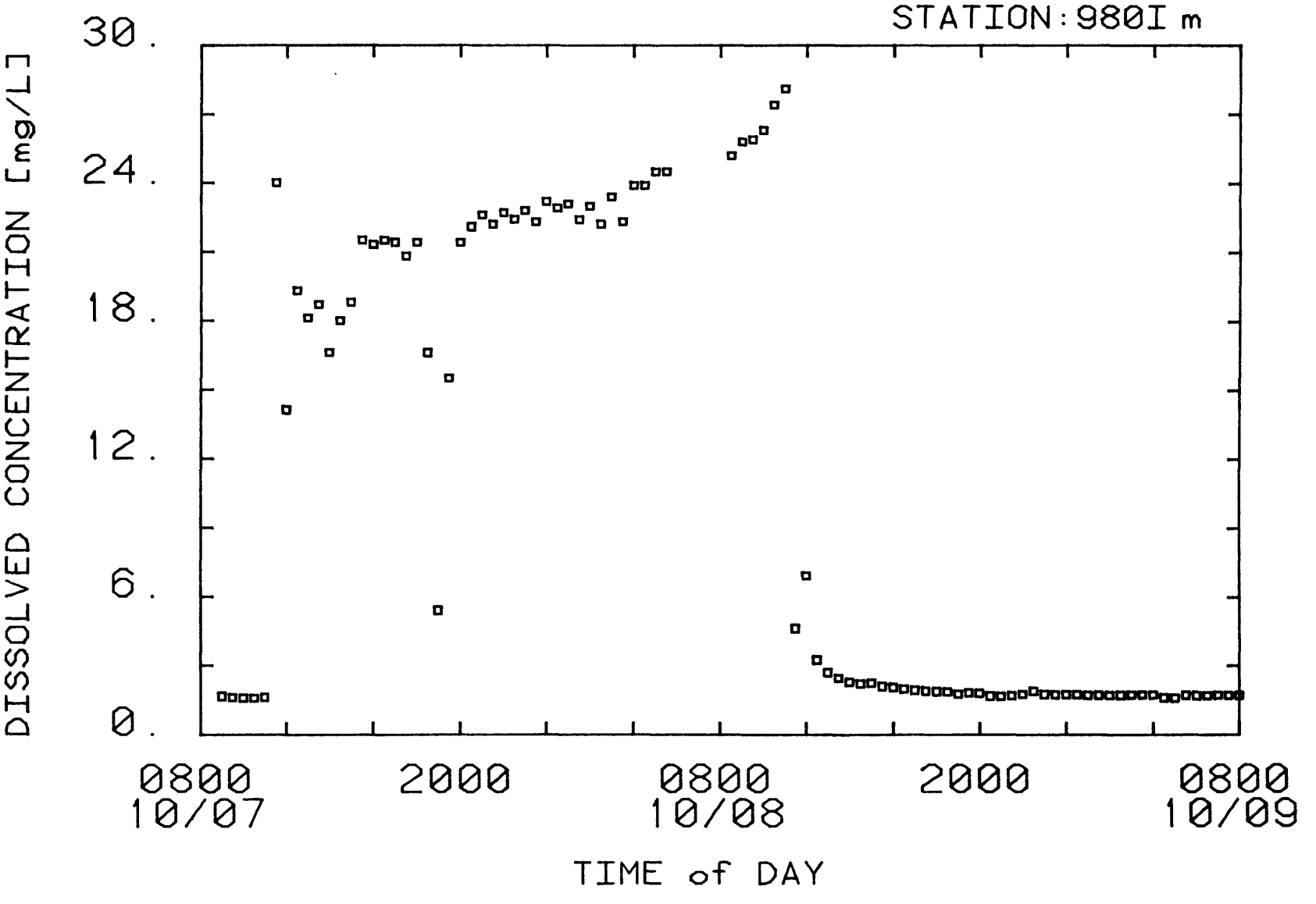



4L CREEK_82
CHLØRIDE
STATION: 552 m
DISSOLVED CONCENTRATION [mg/L]
5.
4.
3.
2.
1.
0.
0800
10/07
2000
0800
10/08
2000
0800
10/09
TIME of DAY

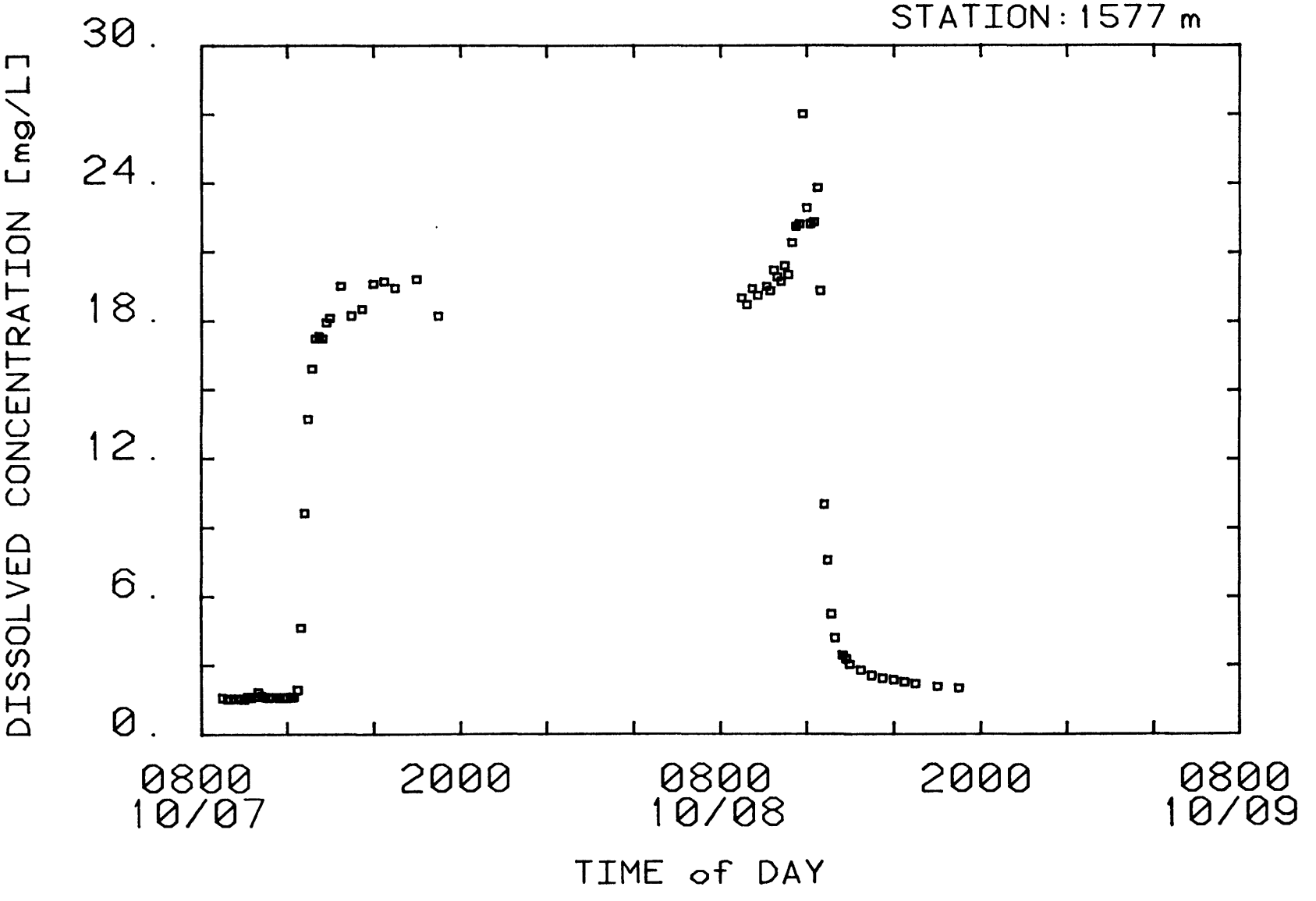
LEVIATHAN CREEK_82 CHLORIDE



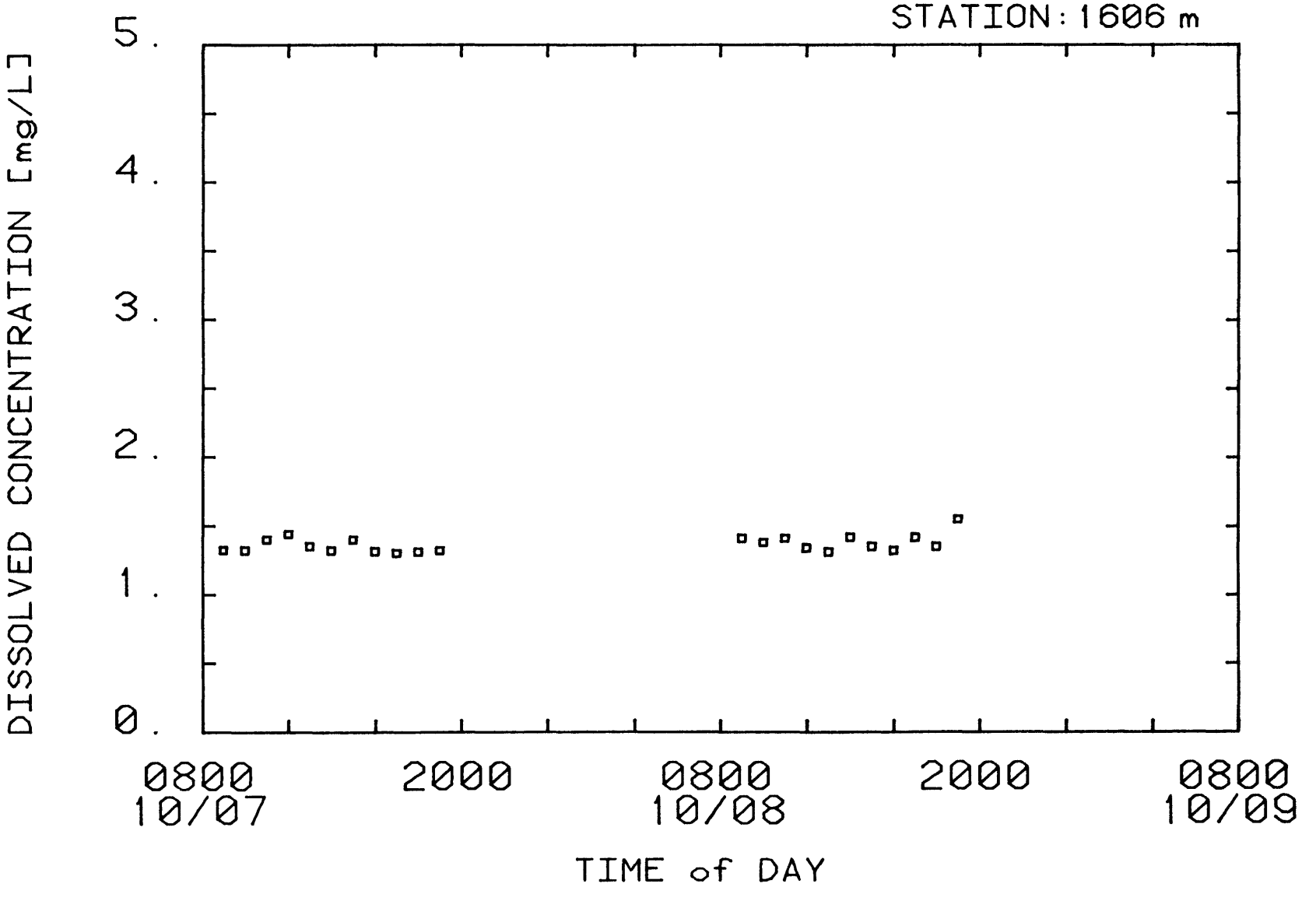
LEVIATHAN CREEK_82 CHLORIDE



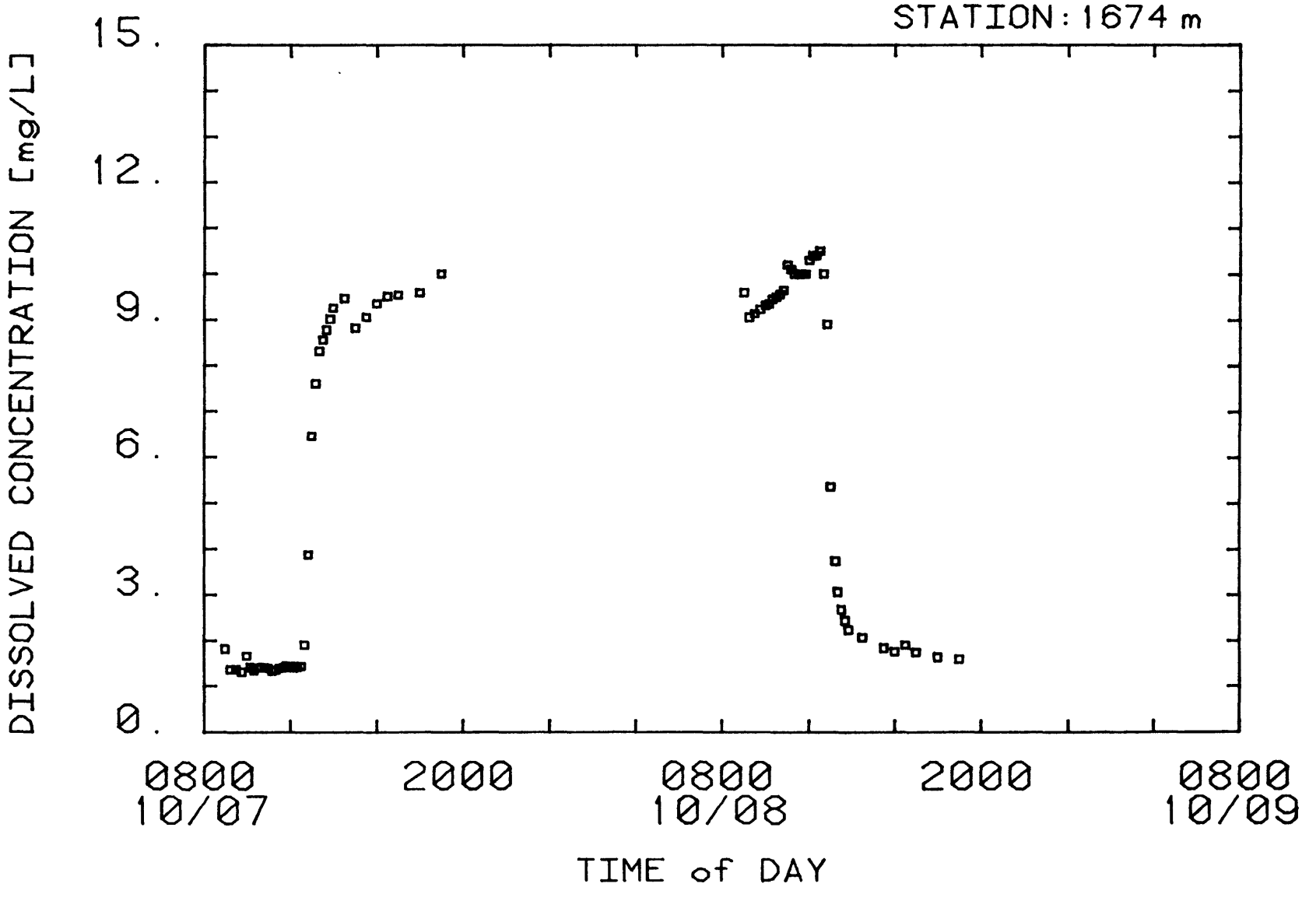
LEVIATHAN CREEK_82 CHLORIDE



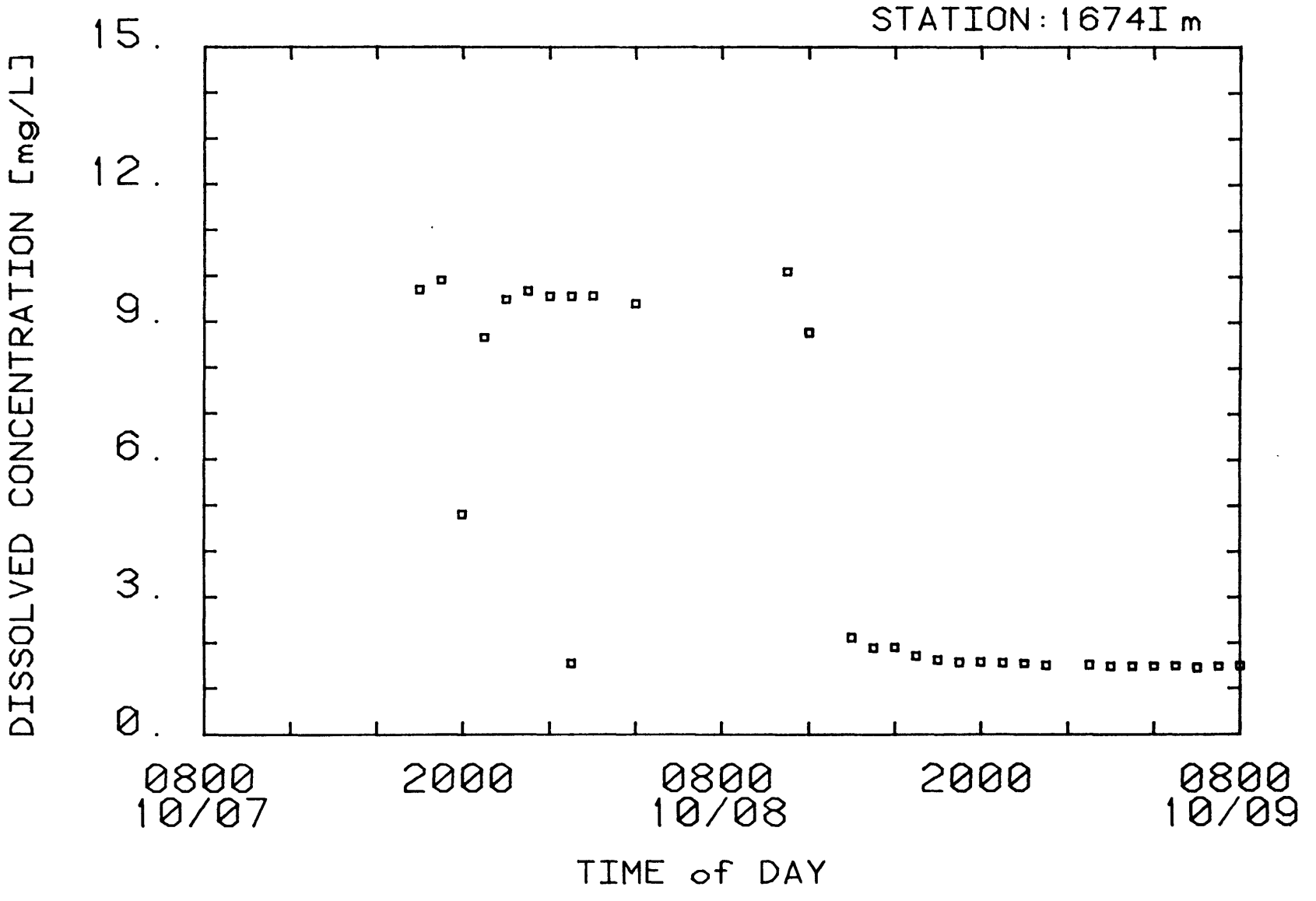
ASPEN CREEK_82 CHLØRIDE



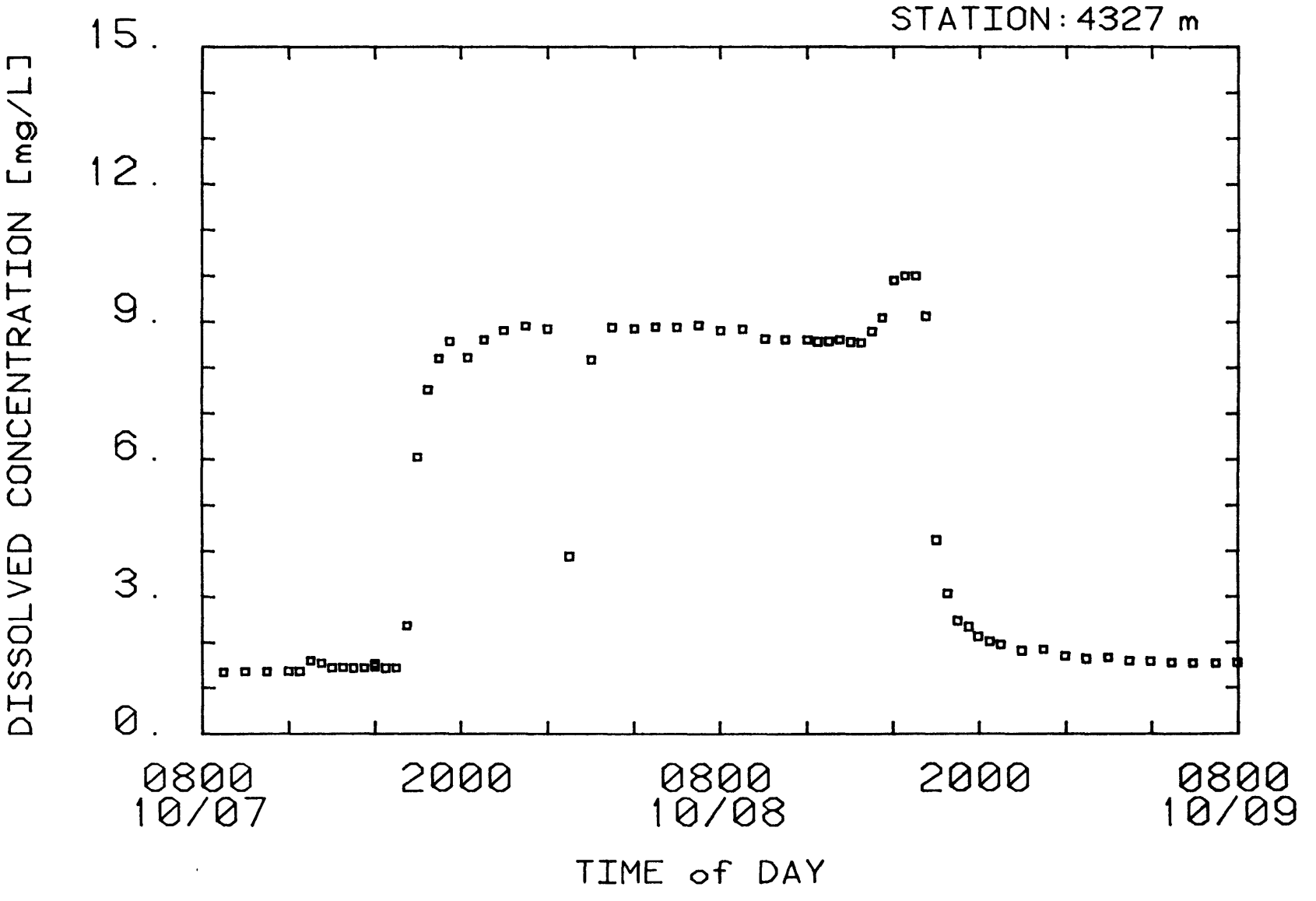
LEVIATHAN CREEK_82 CHLORIDE



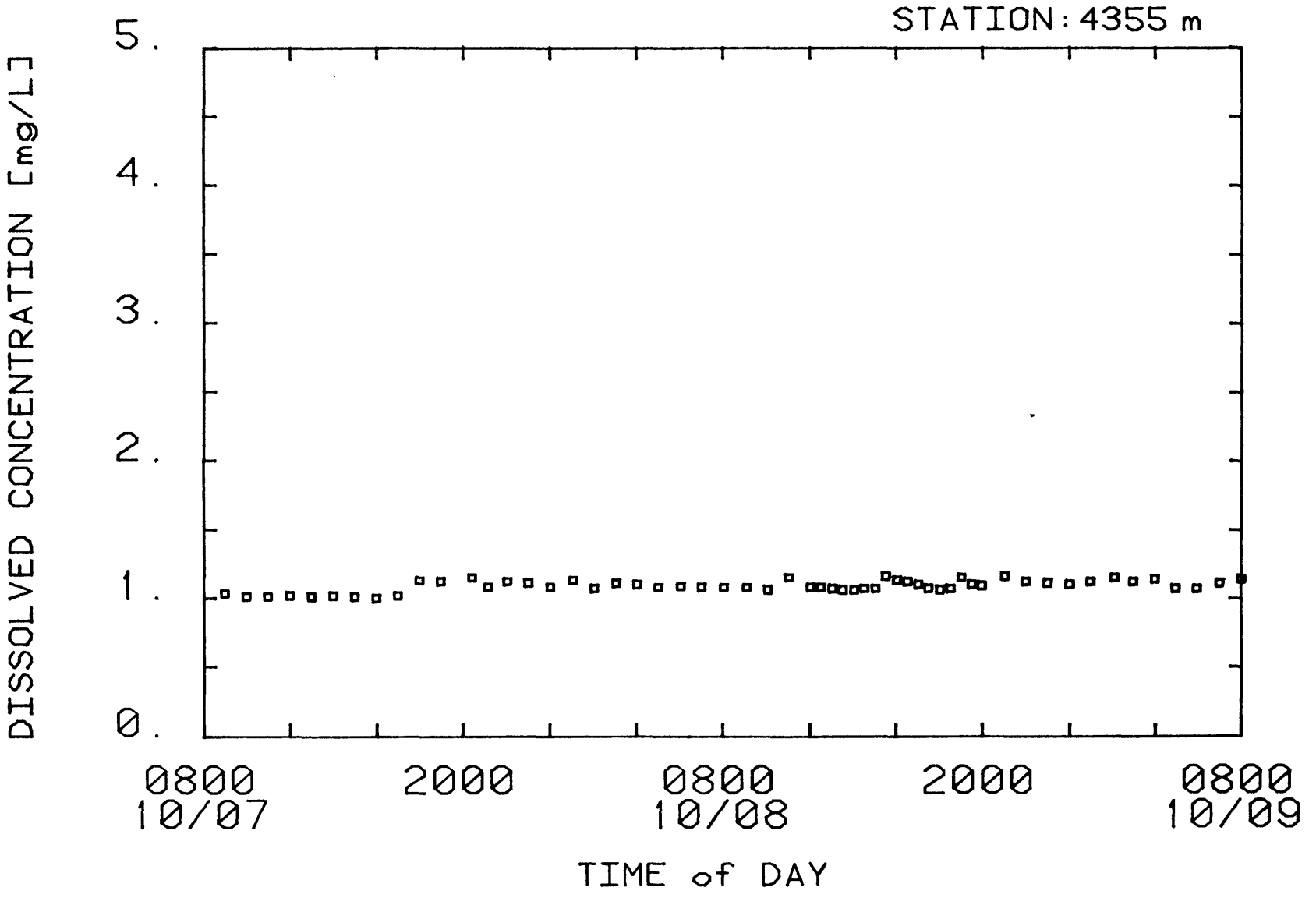
LEVIATHAN CREEK_82 CHLORIDE



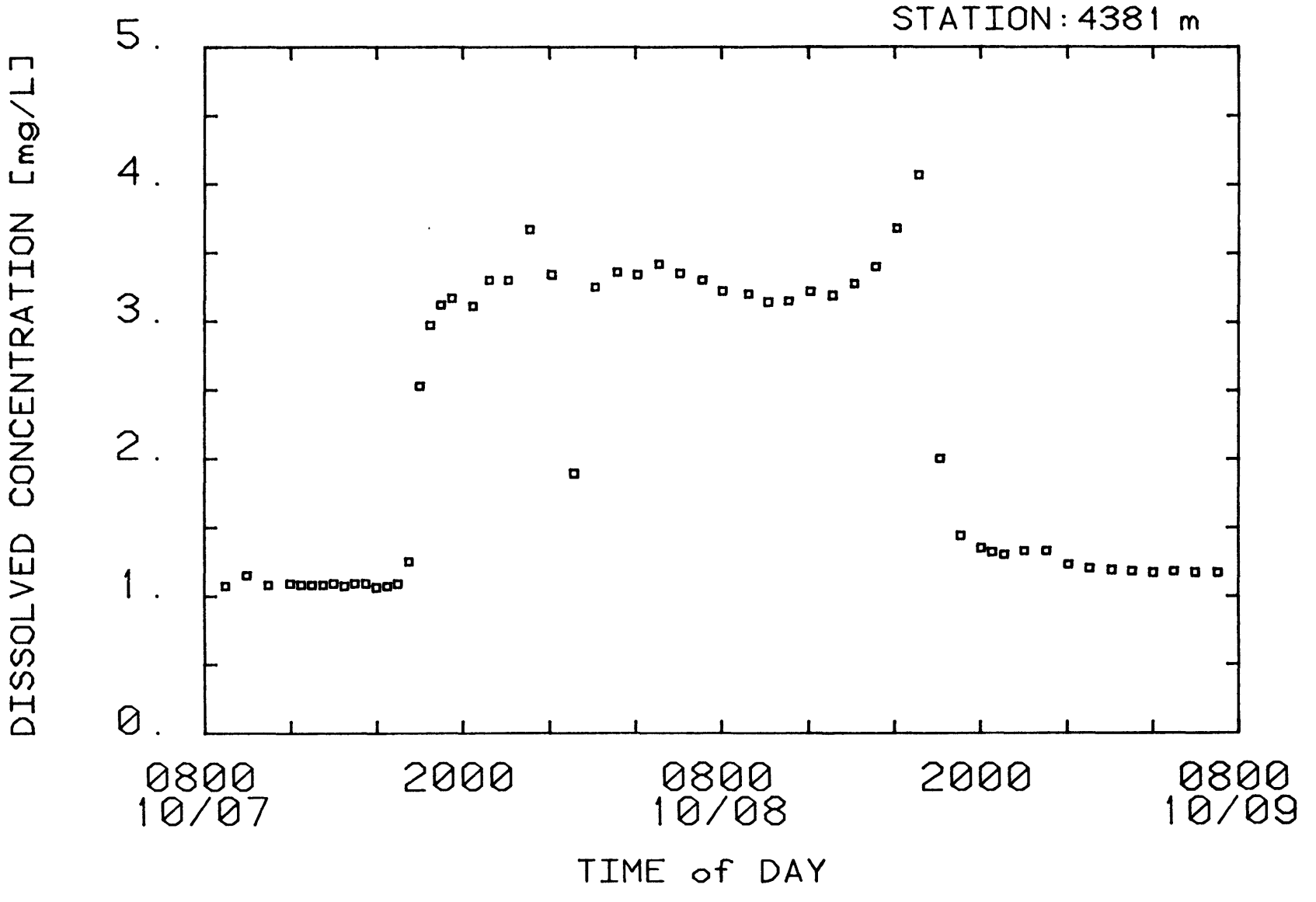
LEVIATHAN CREEK_82 CHLORIDE



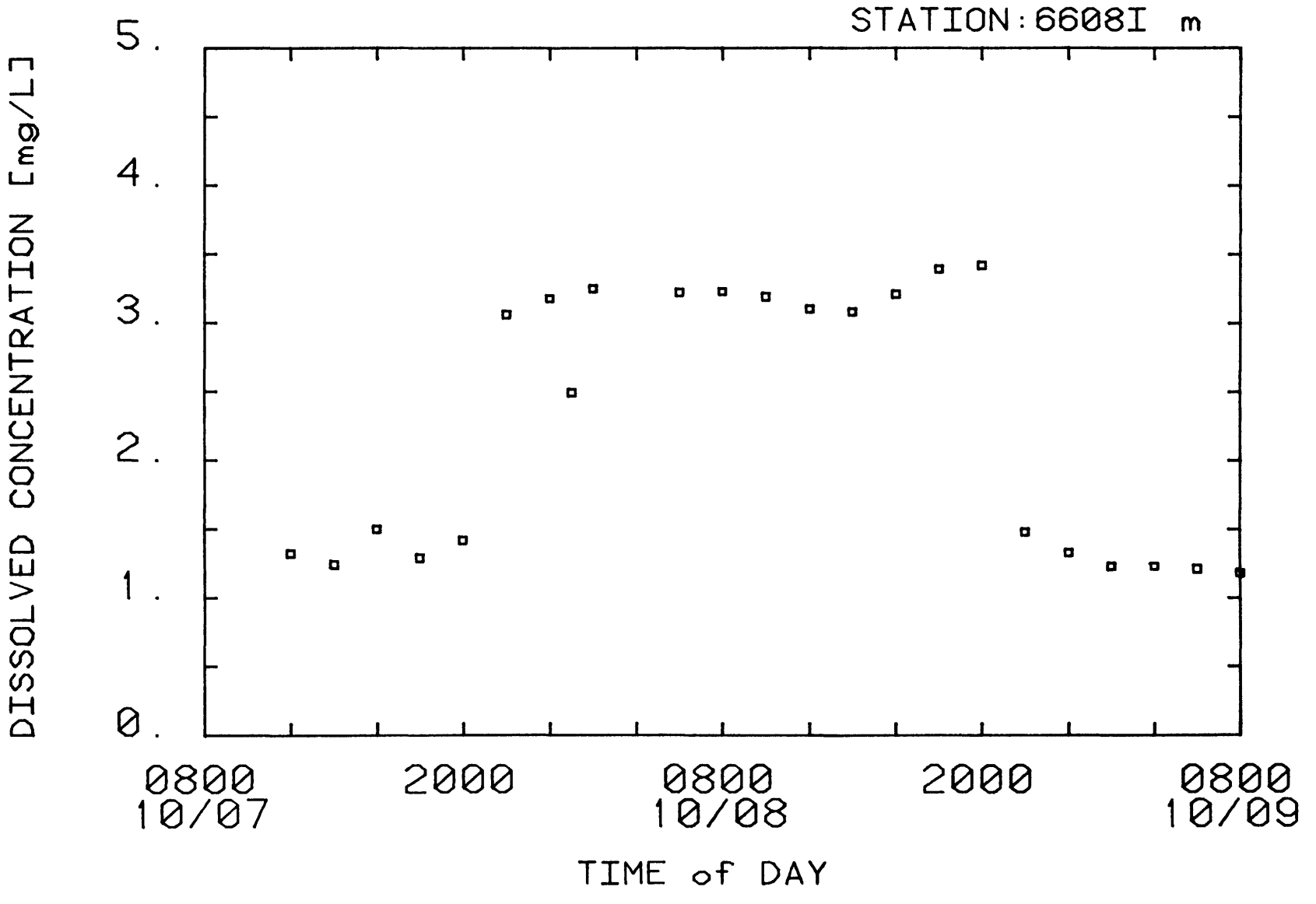
MOUNTAINEER CREEK_82 CHLØRIDE



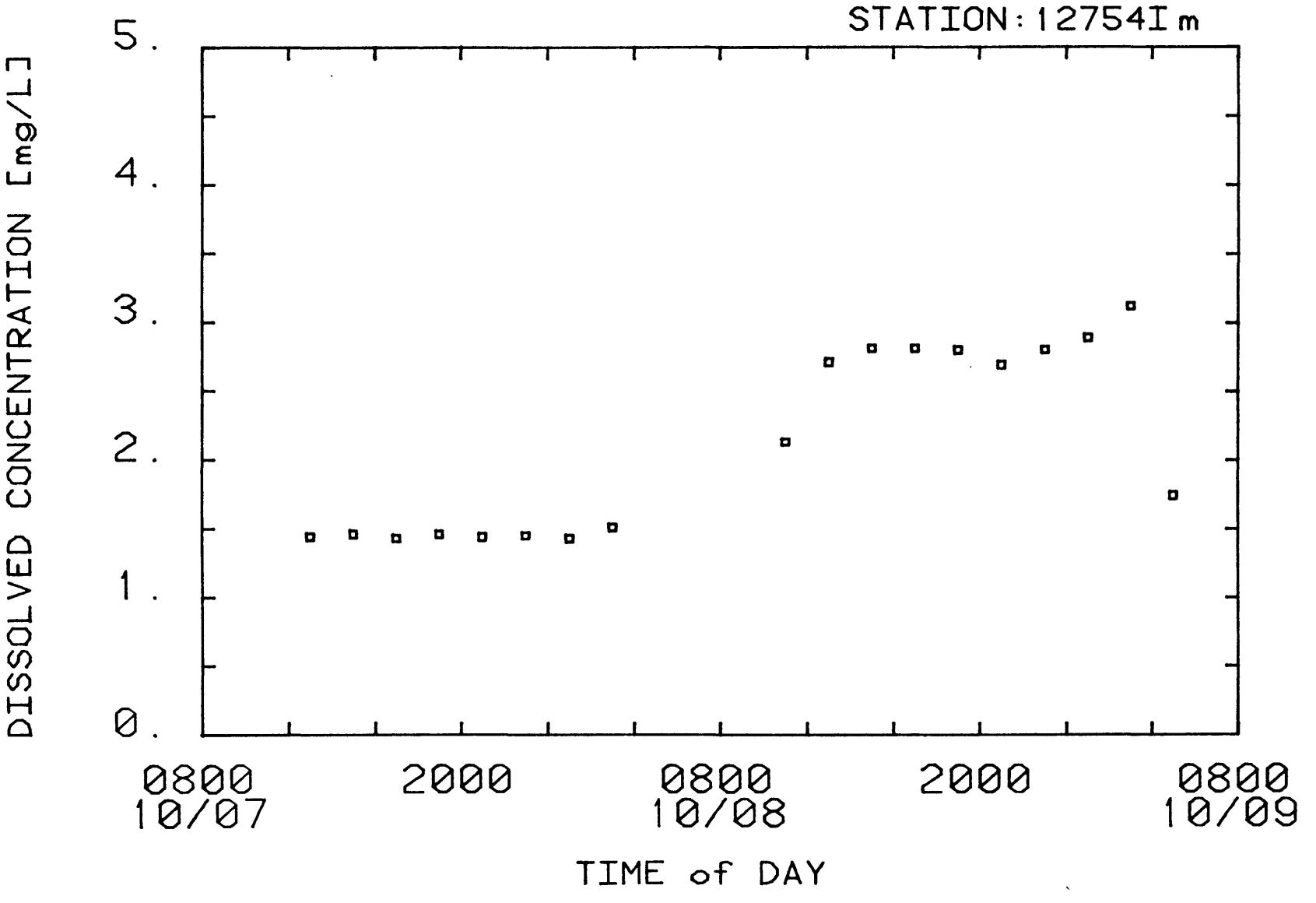
LEVIATHAN CREEK_82 CHL0RIDE



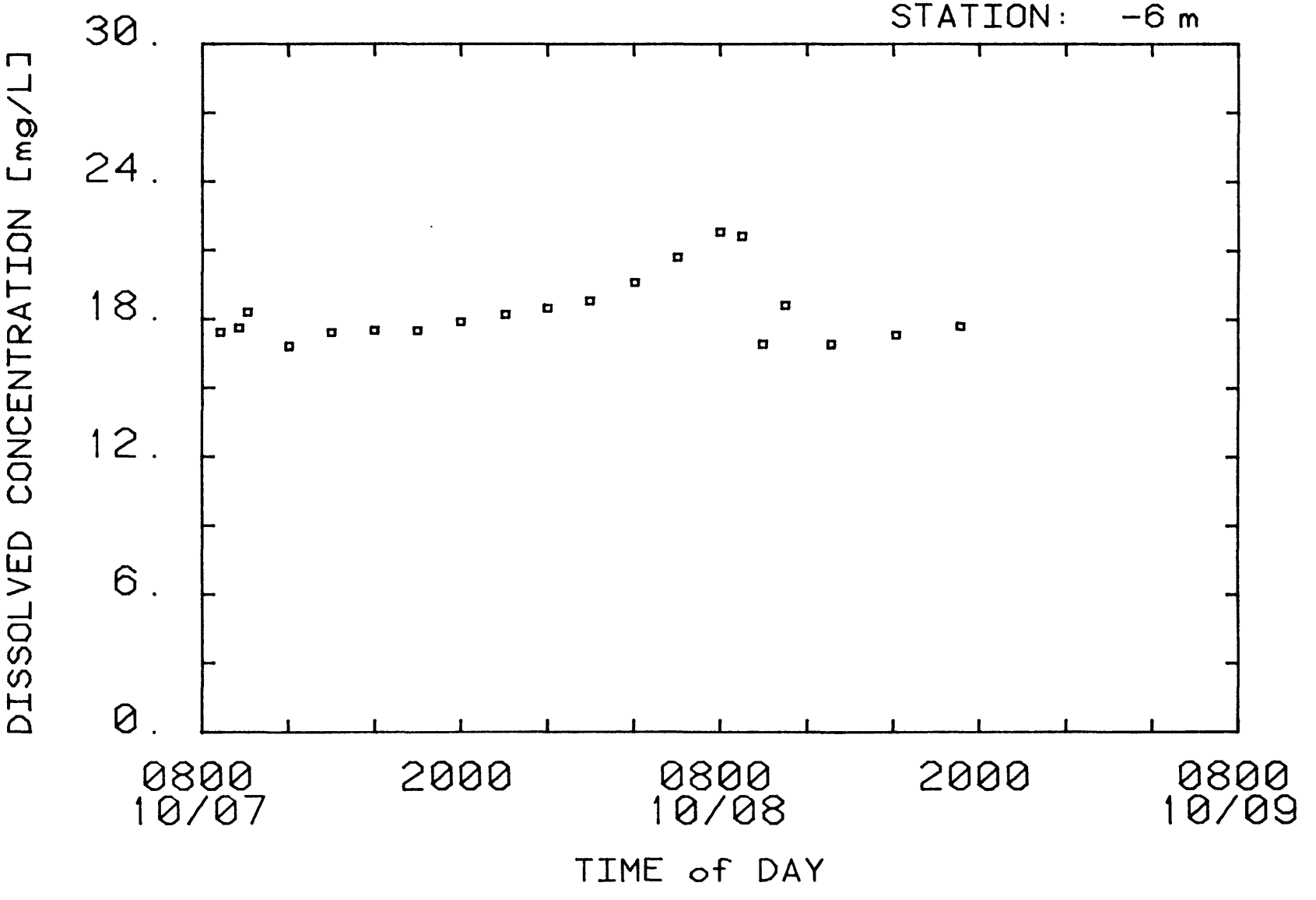
LEVIATHAN CREEK_82 CHLØRIDE



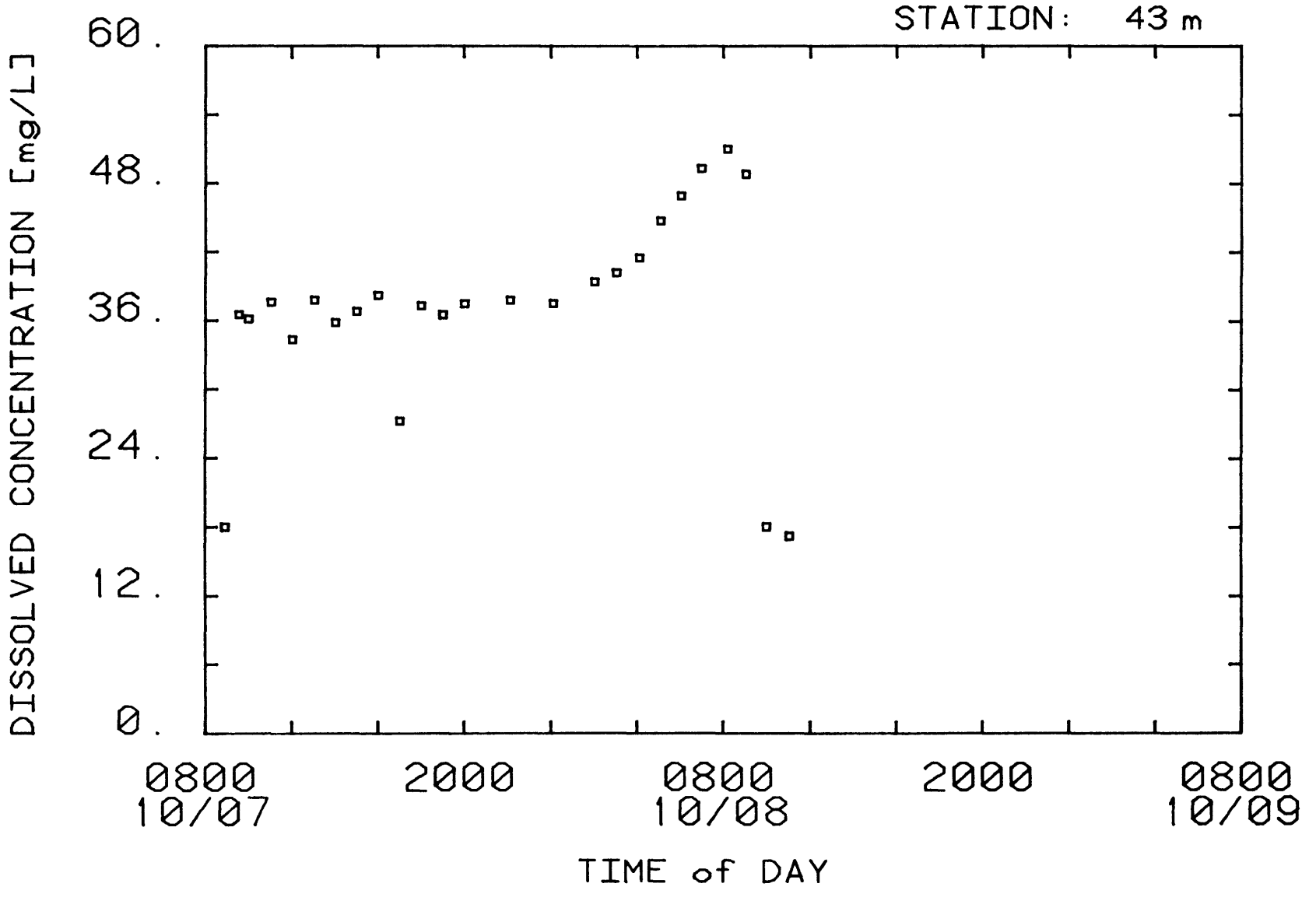
LEVIATHAN CREEK_82 CHLØRIDE



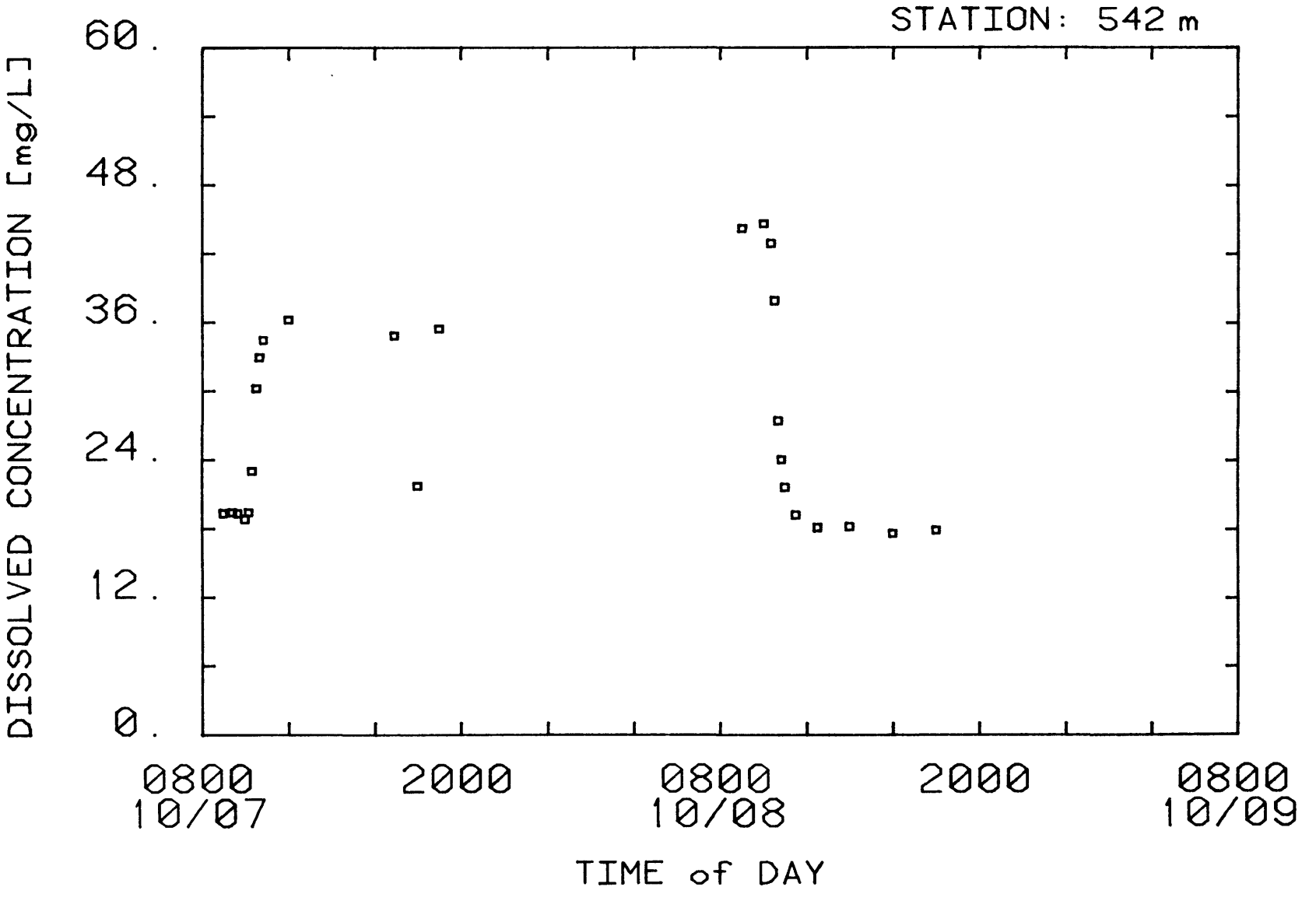
LEVIATHAN CREEK_82 SODIUM



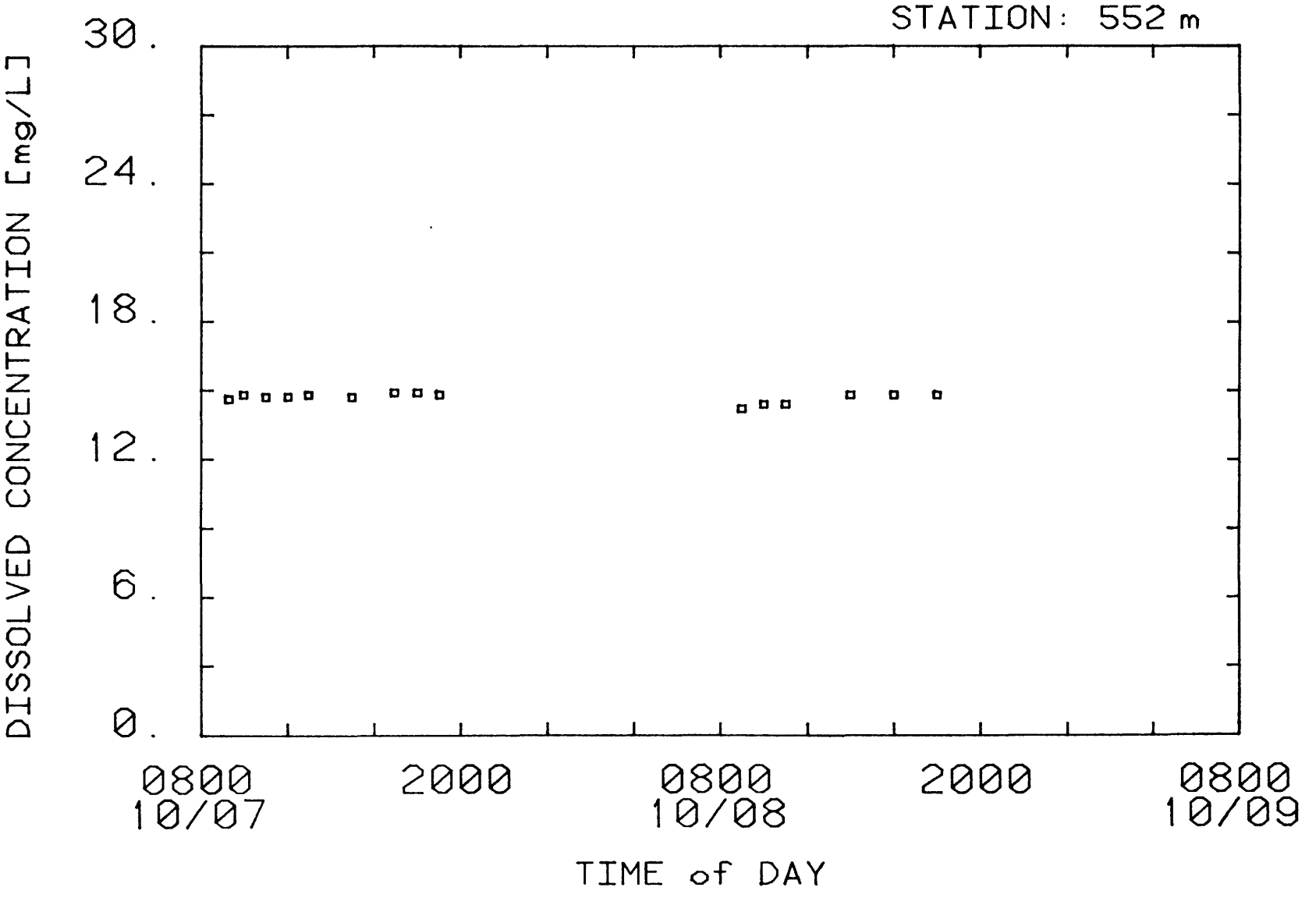
LEVIATHAN CREEK_82 SODIUM



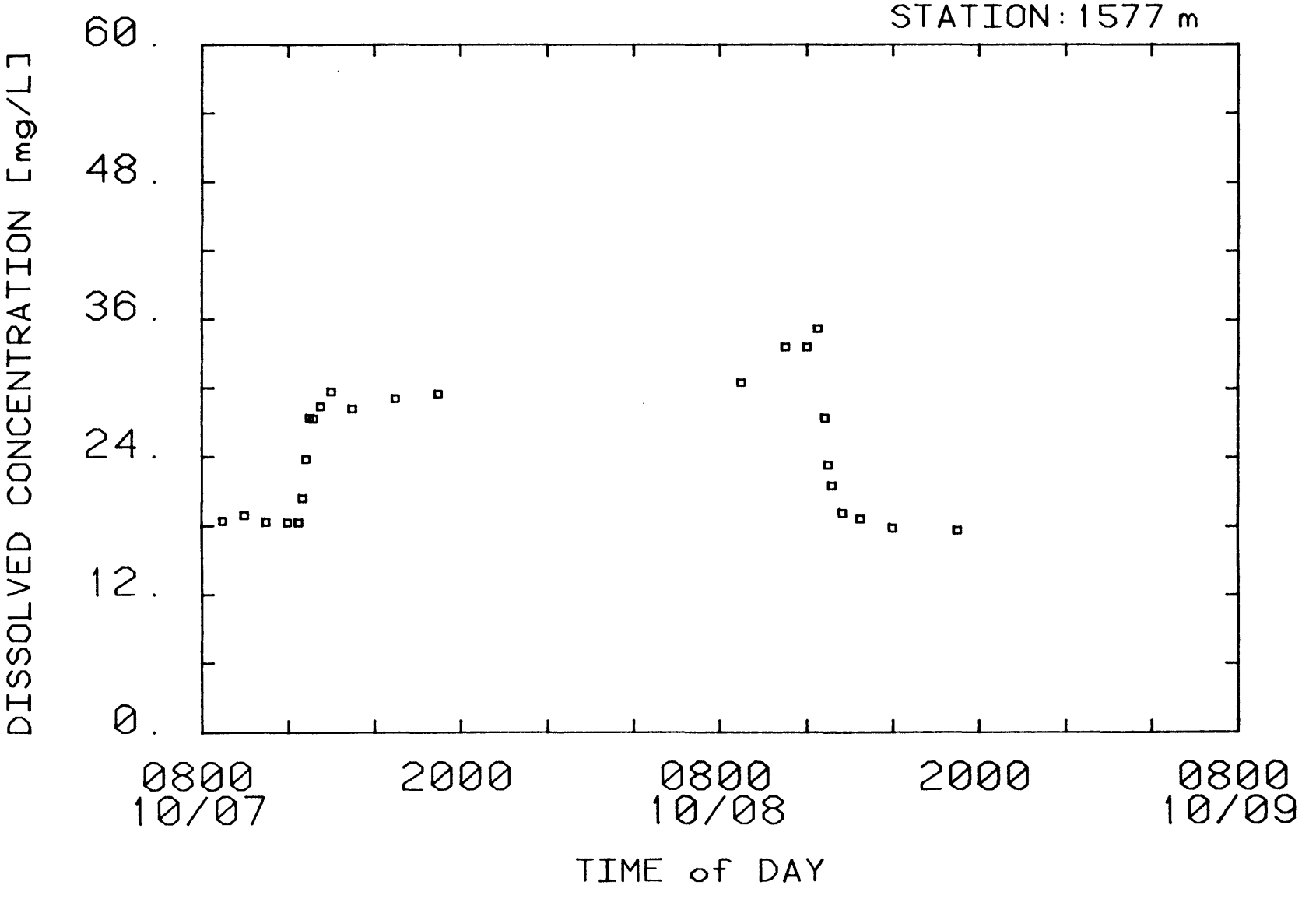
LEVIATHAN CREEK_82 SODIUM



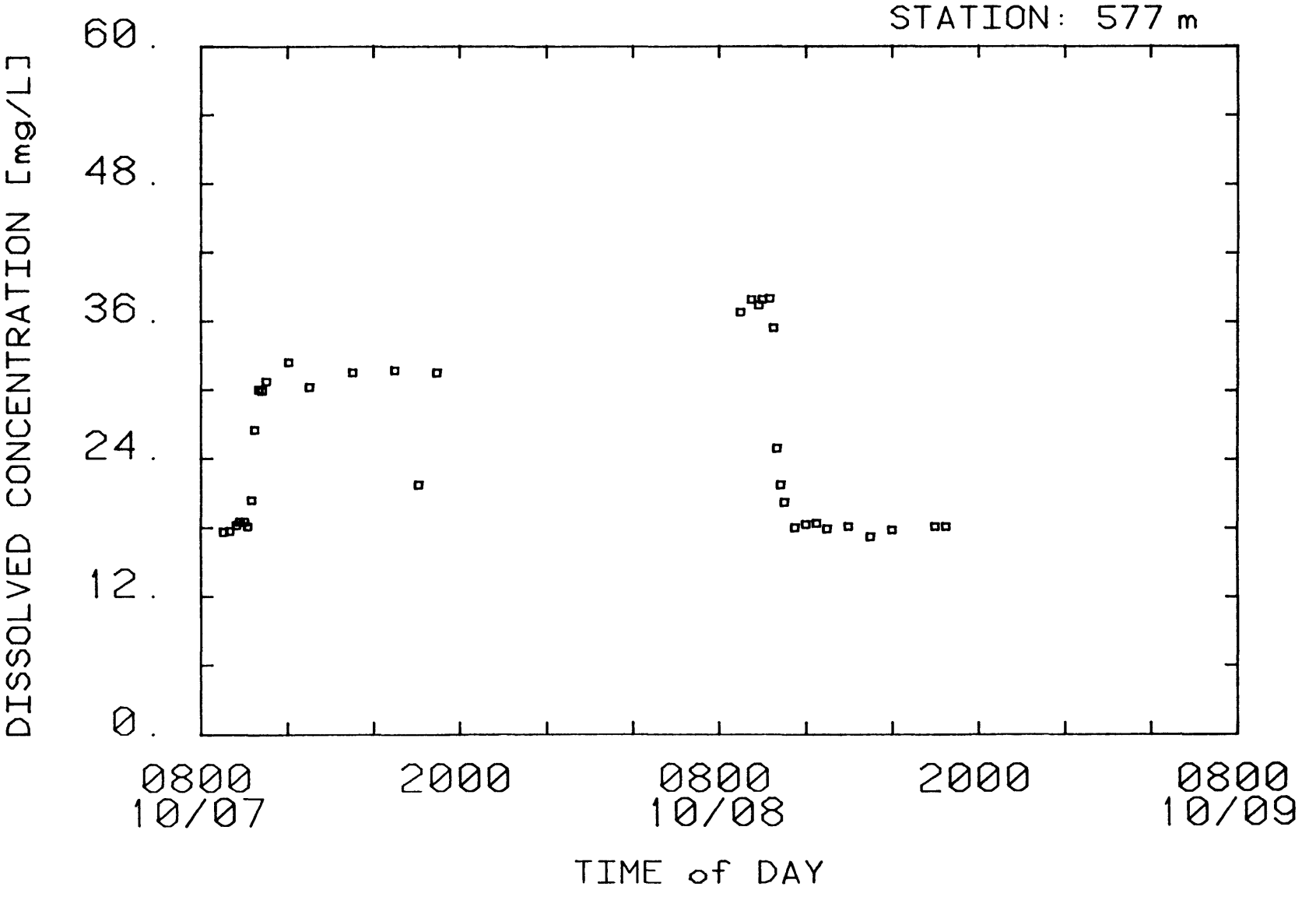
4L CREEK_82 SODIUM



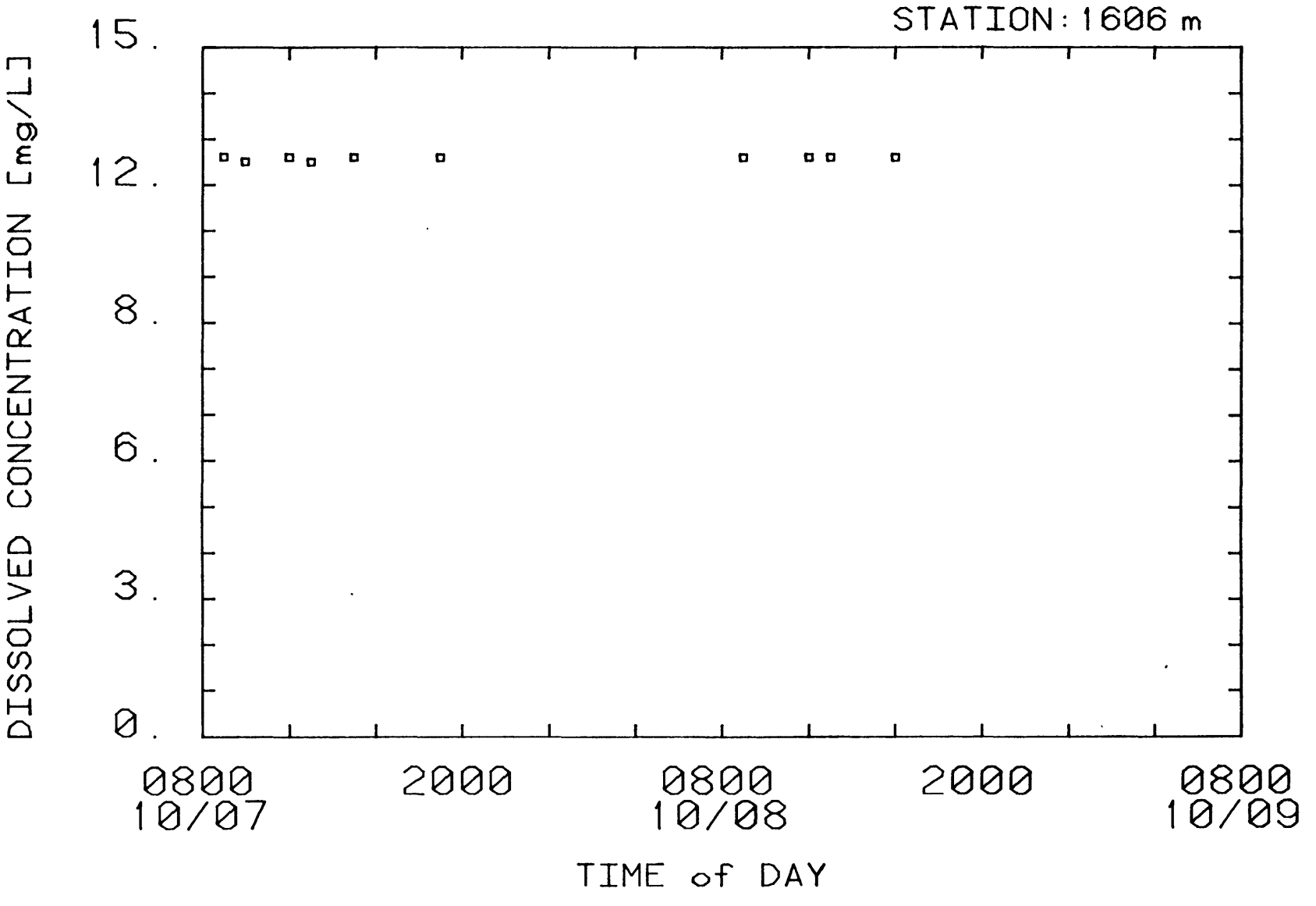
LEVIATHAN CREEK_82 SODIUM



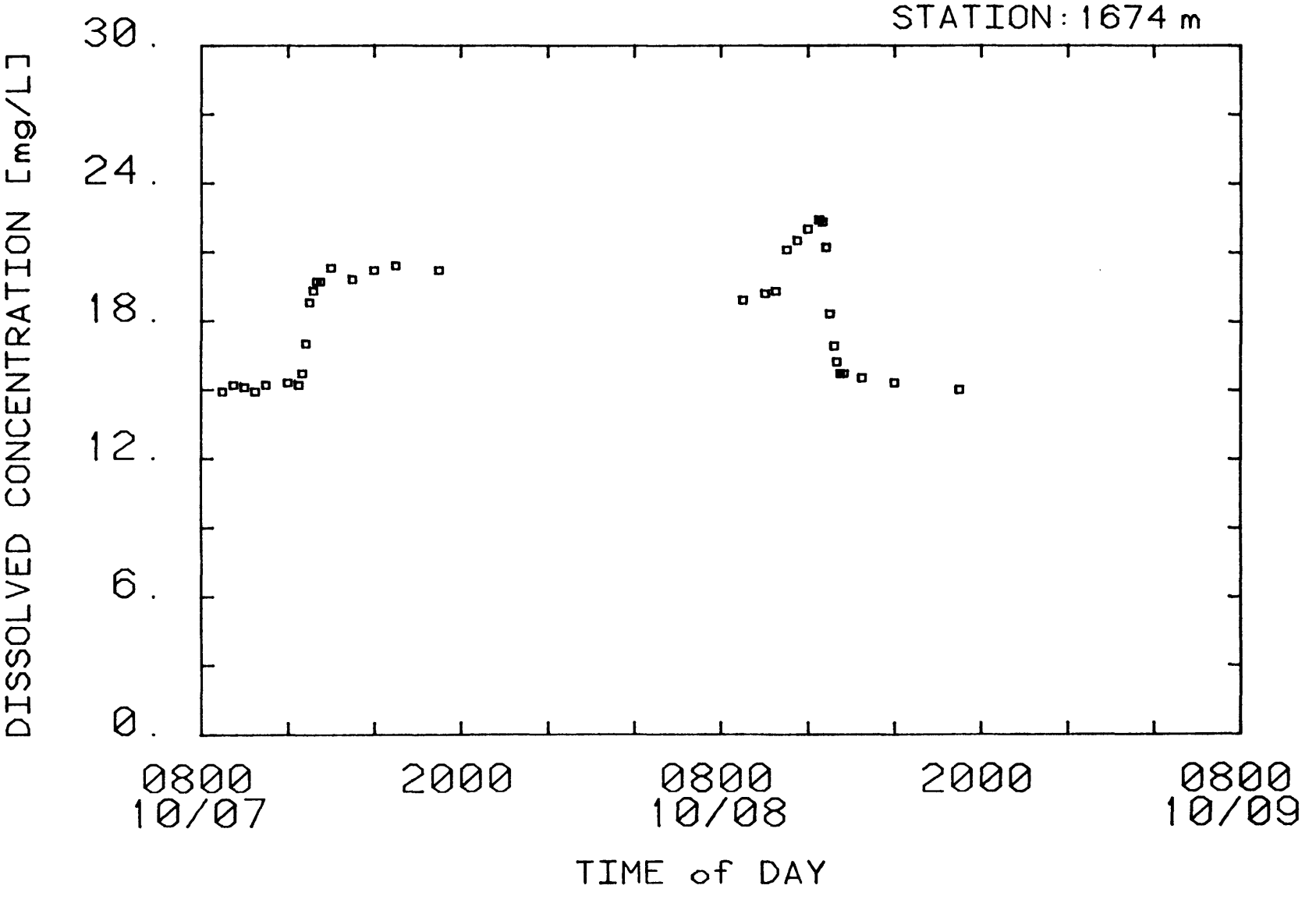
LEVIATHAN CREEK_82 SODIUM



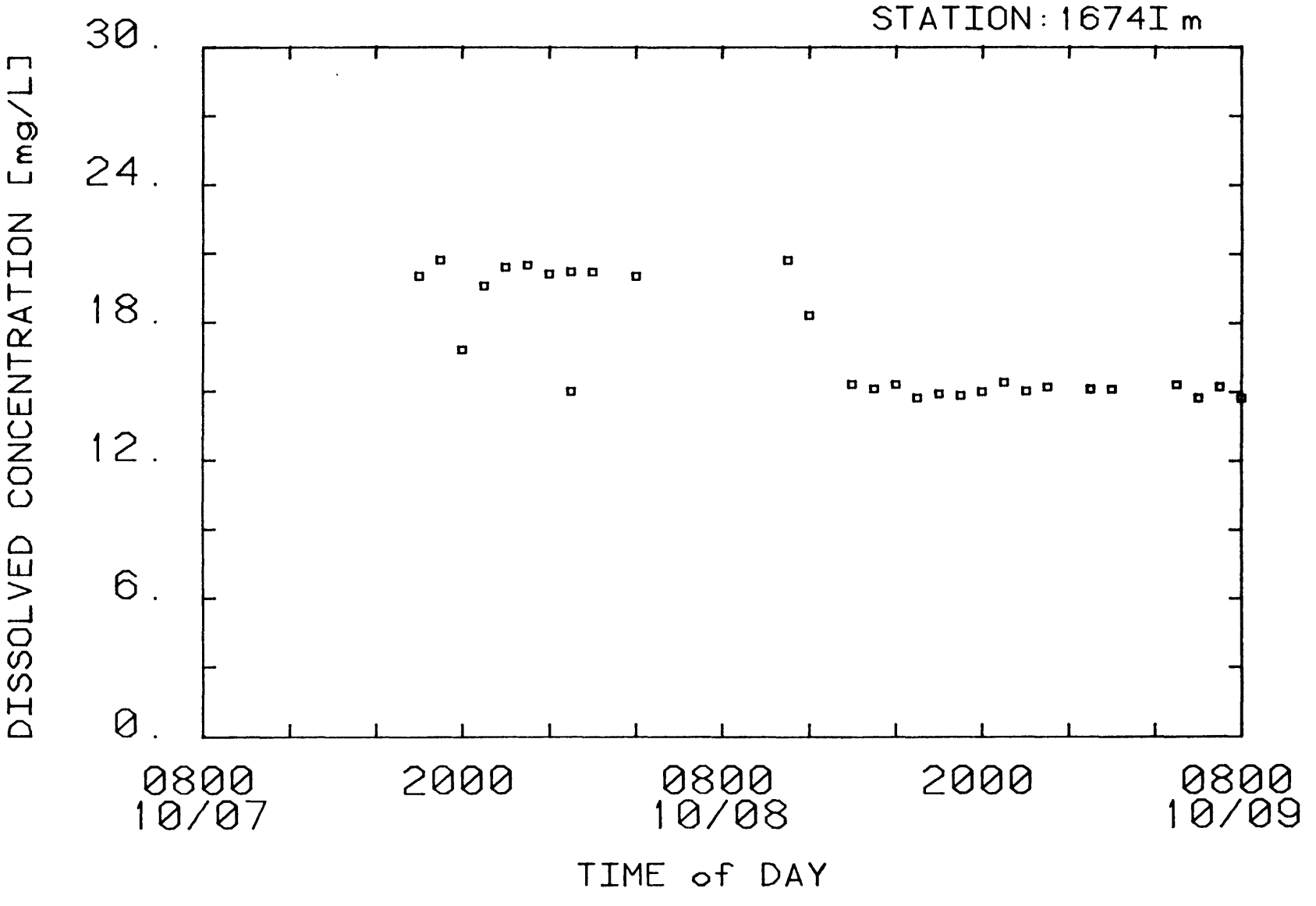
ASPEN CREEK_82 SODIUM



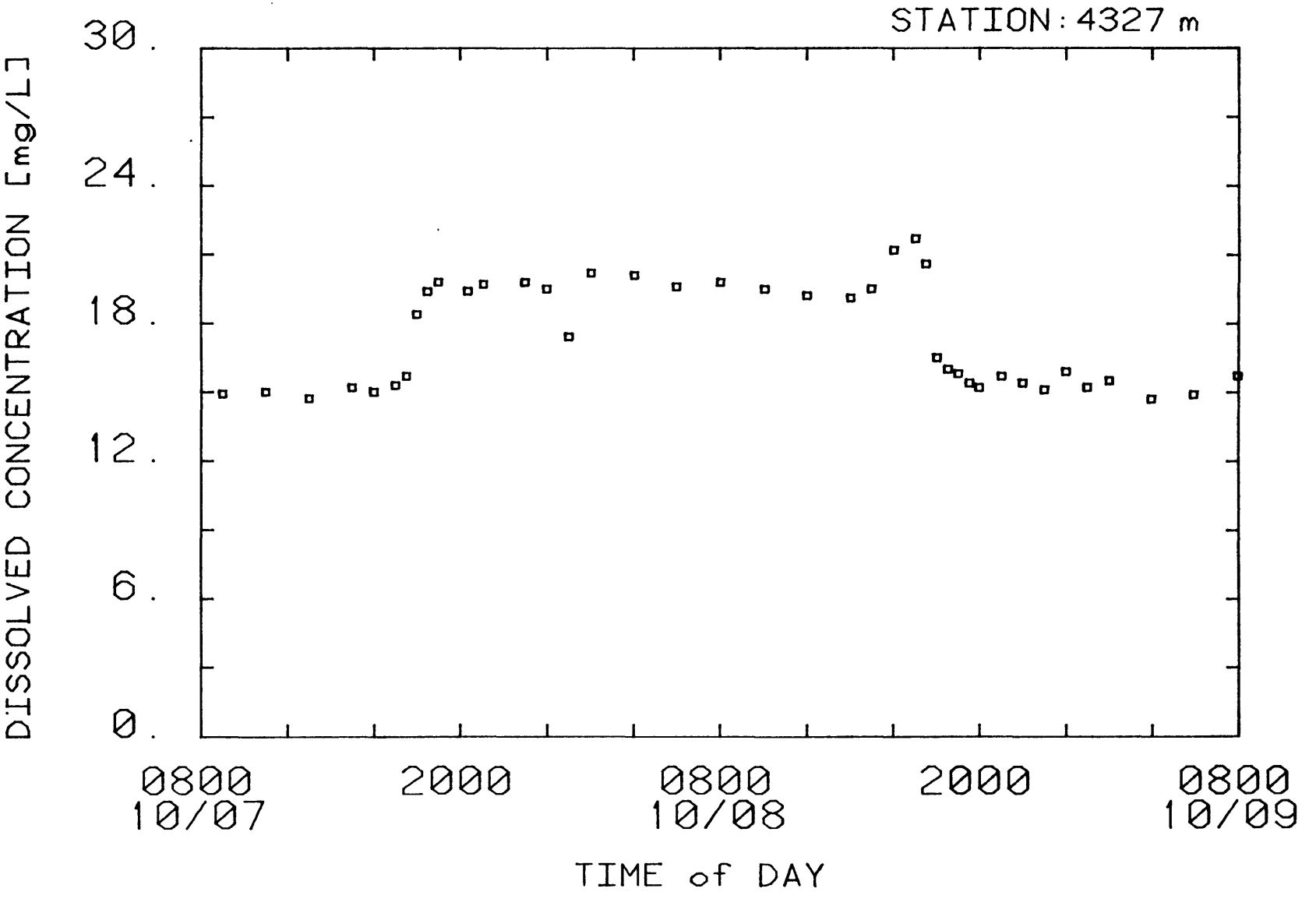
LEVIATHAN CREEK_82 SODIUM



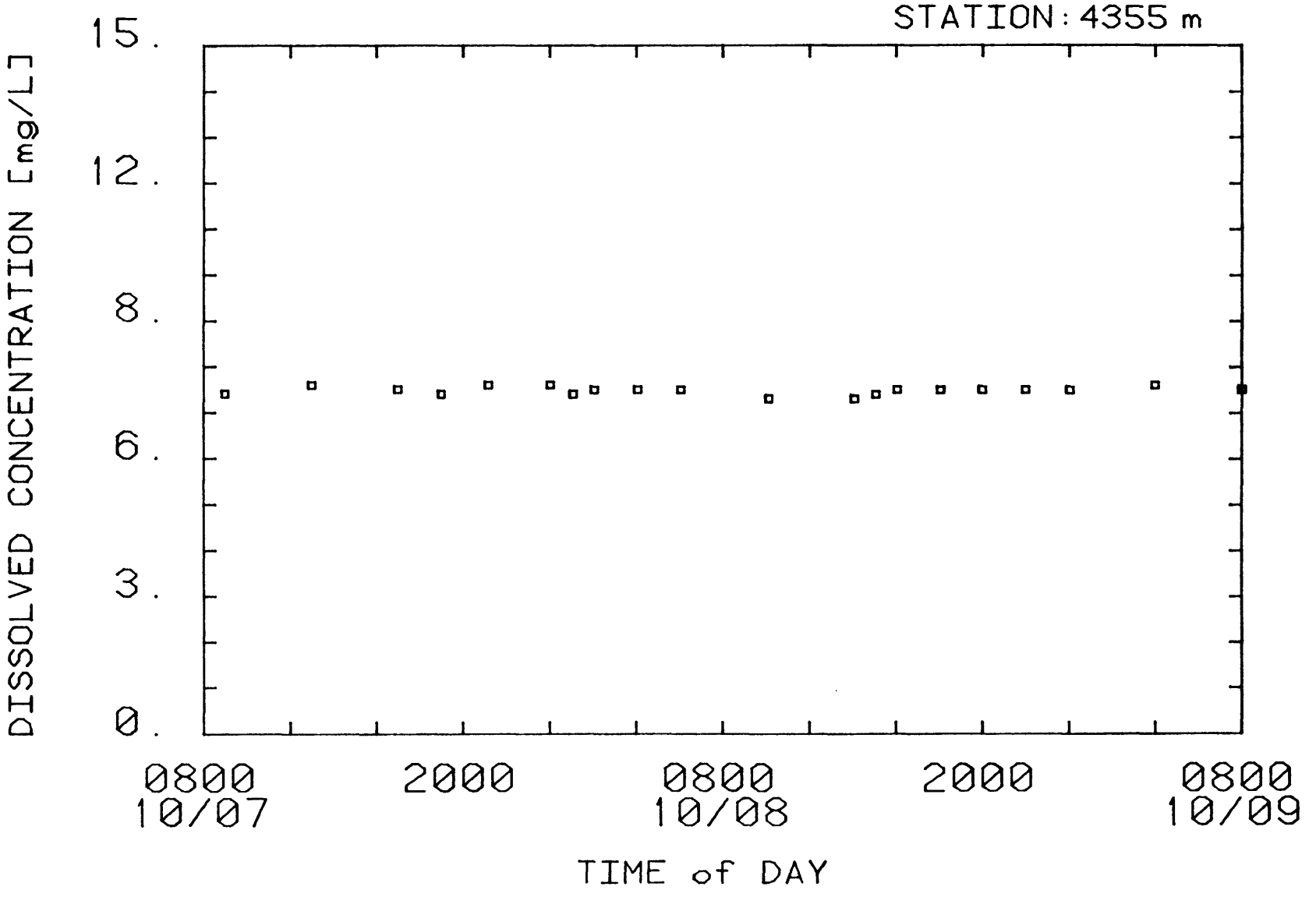
LEVIATHAN CREEK_82 SODIUM



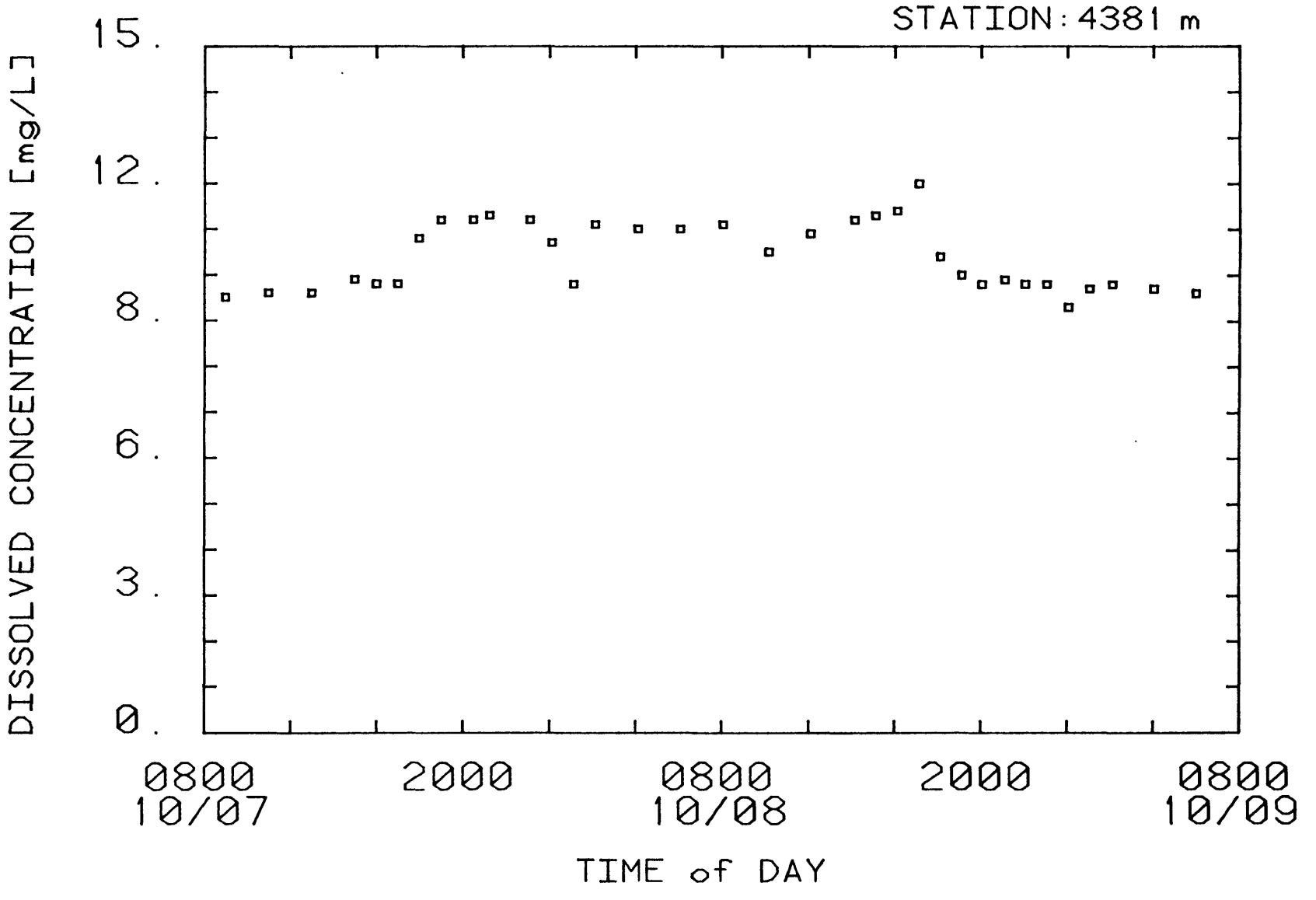
LEVIATHAN CREEK_82 SODIUM



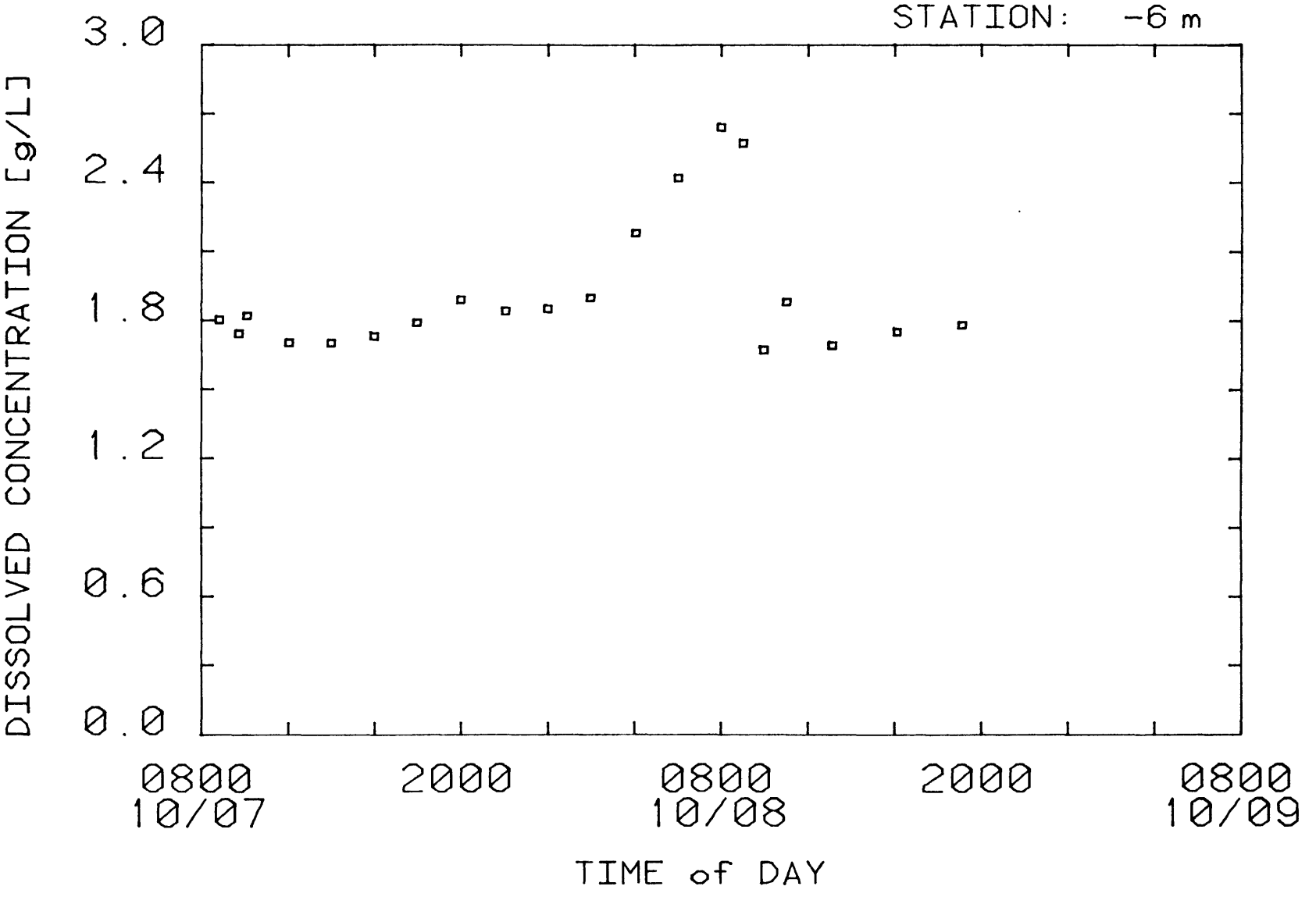
MOUNTAINEER CREEK_82 SODIUM



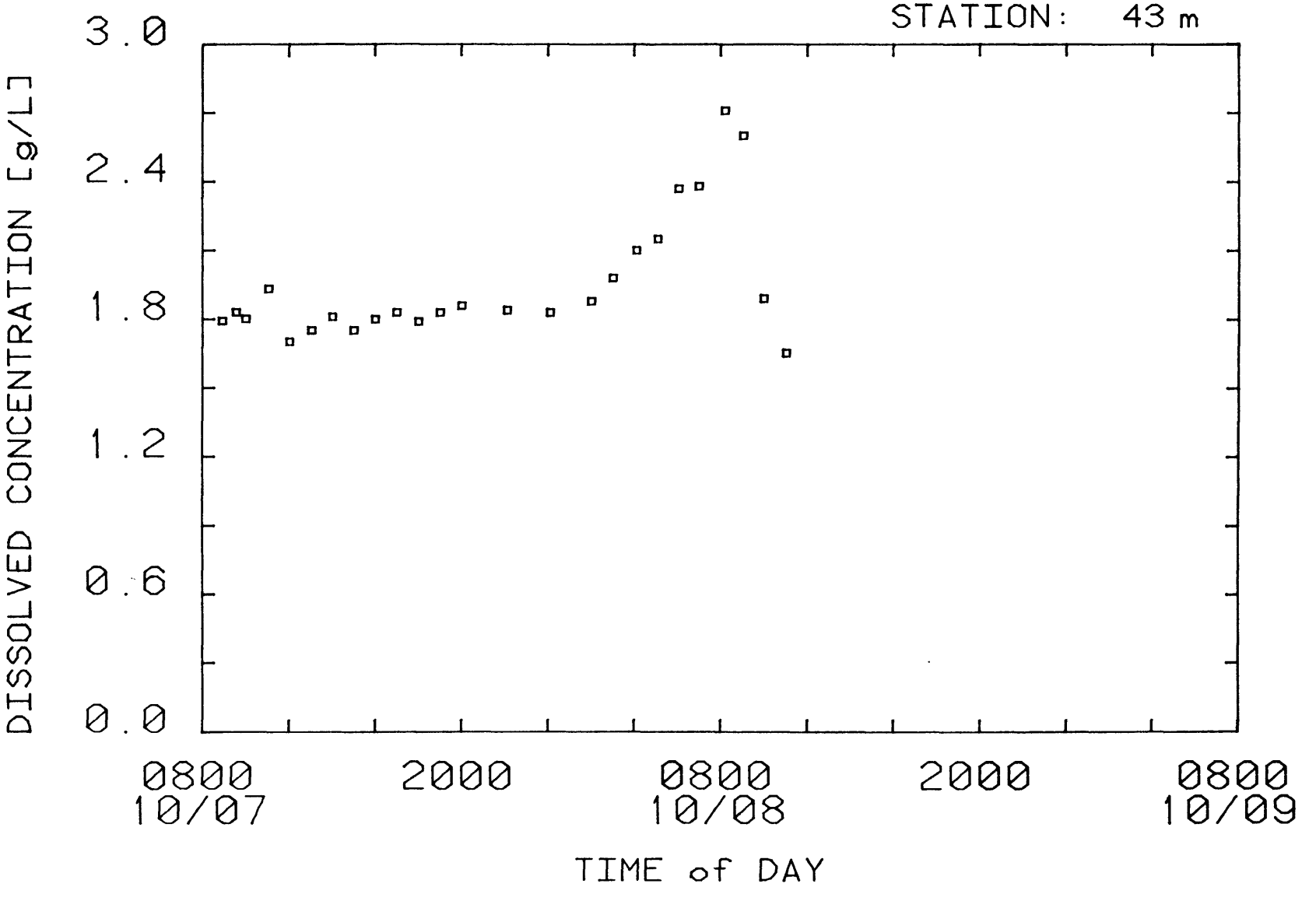
LEVIATHAN CREEK_82 SODIUM



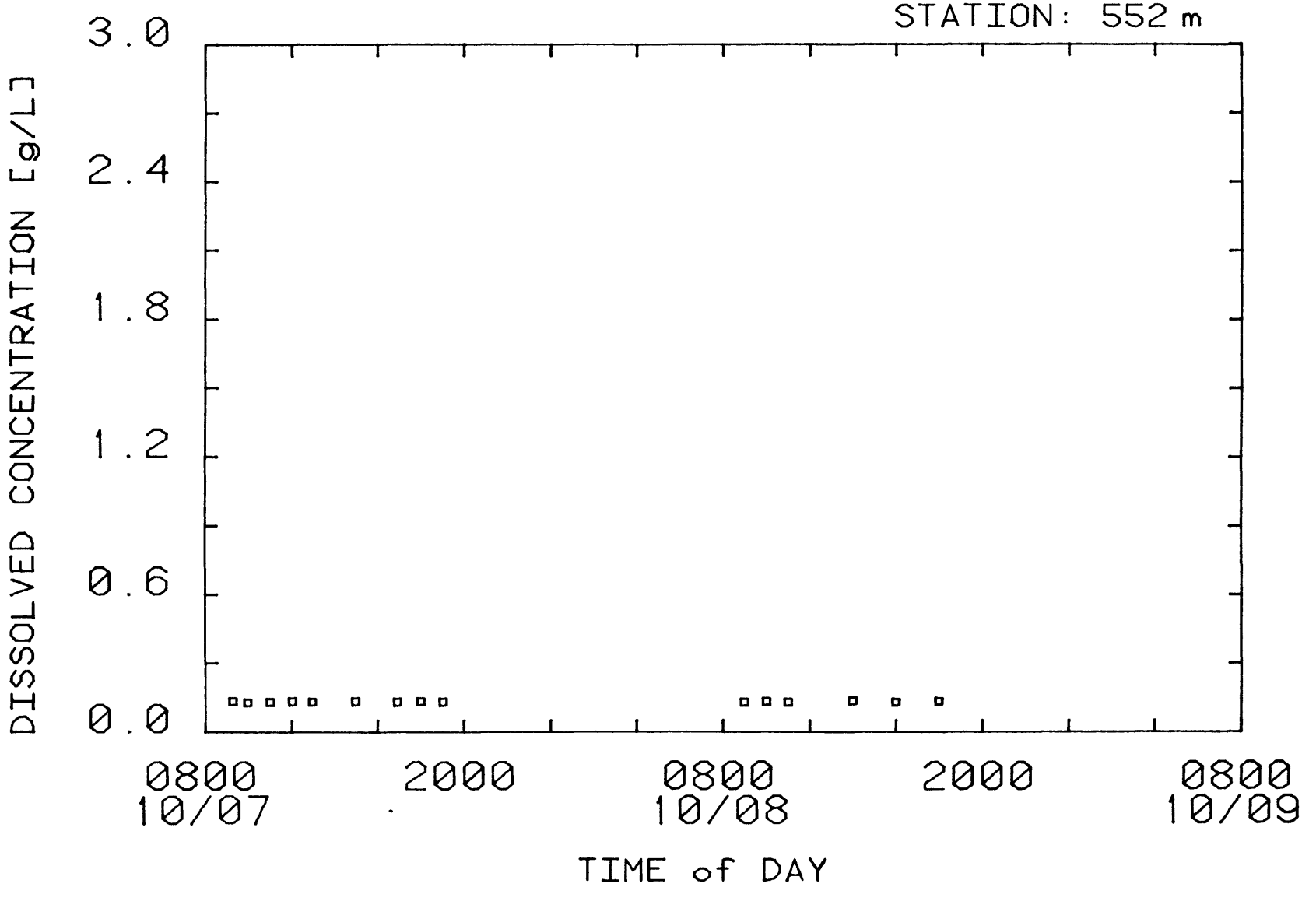
LEVIATHAN CREEK_82 SULFATE



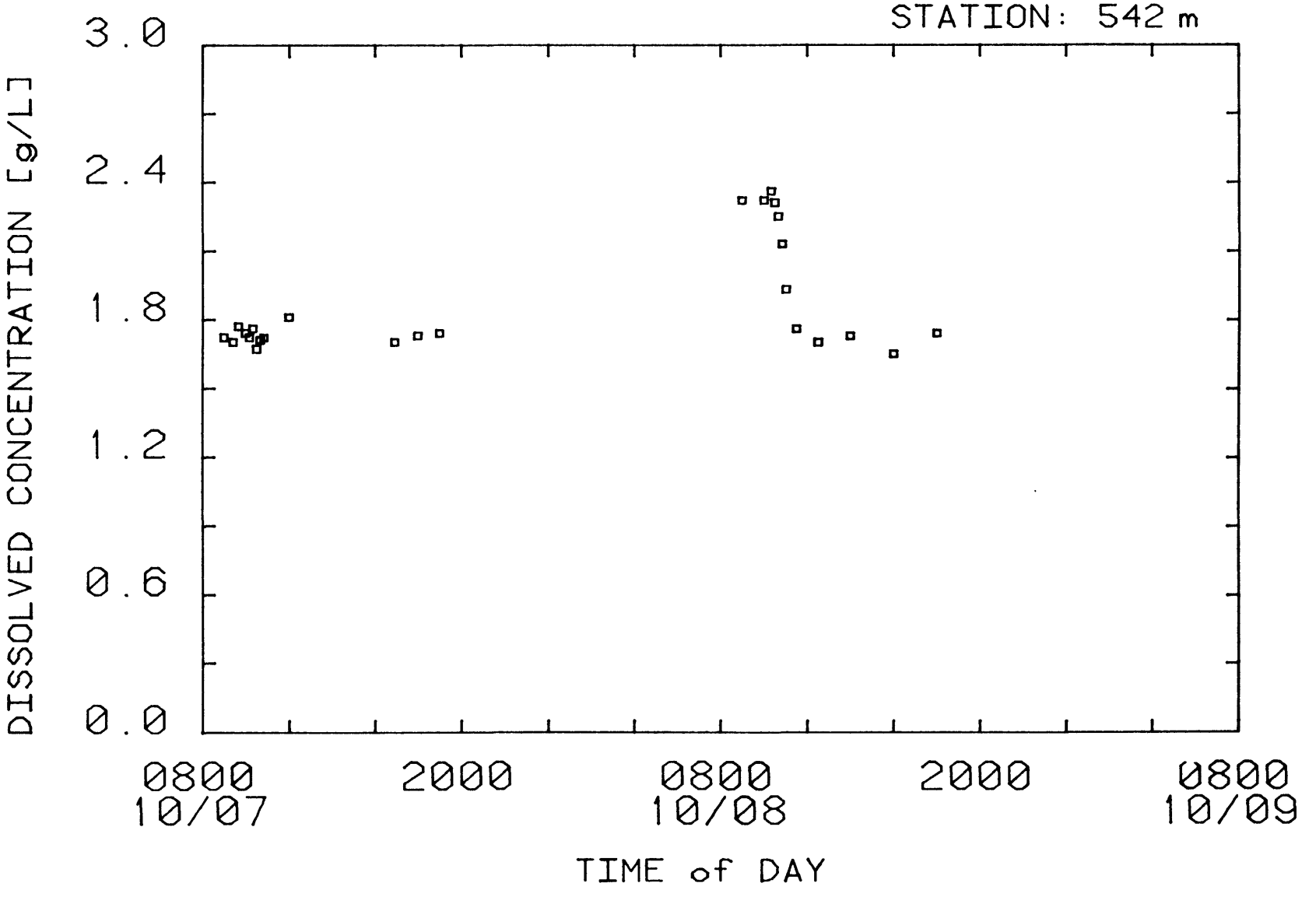
LEVIATHAN CREEK_82 SULFATE



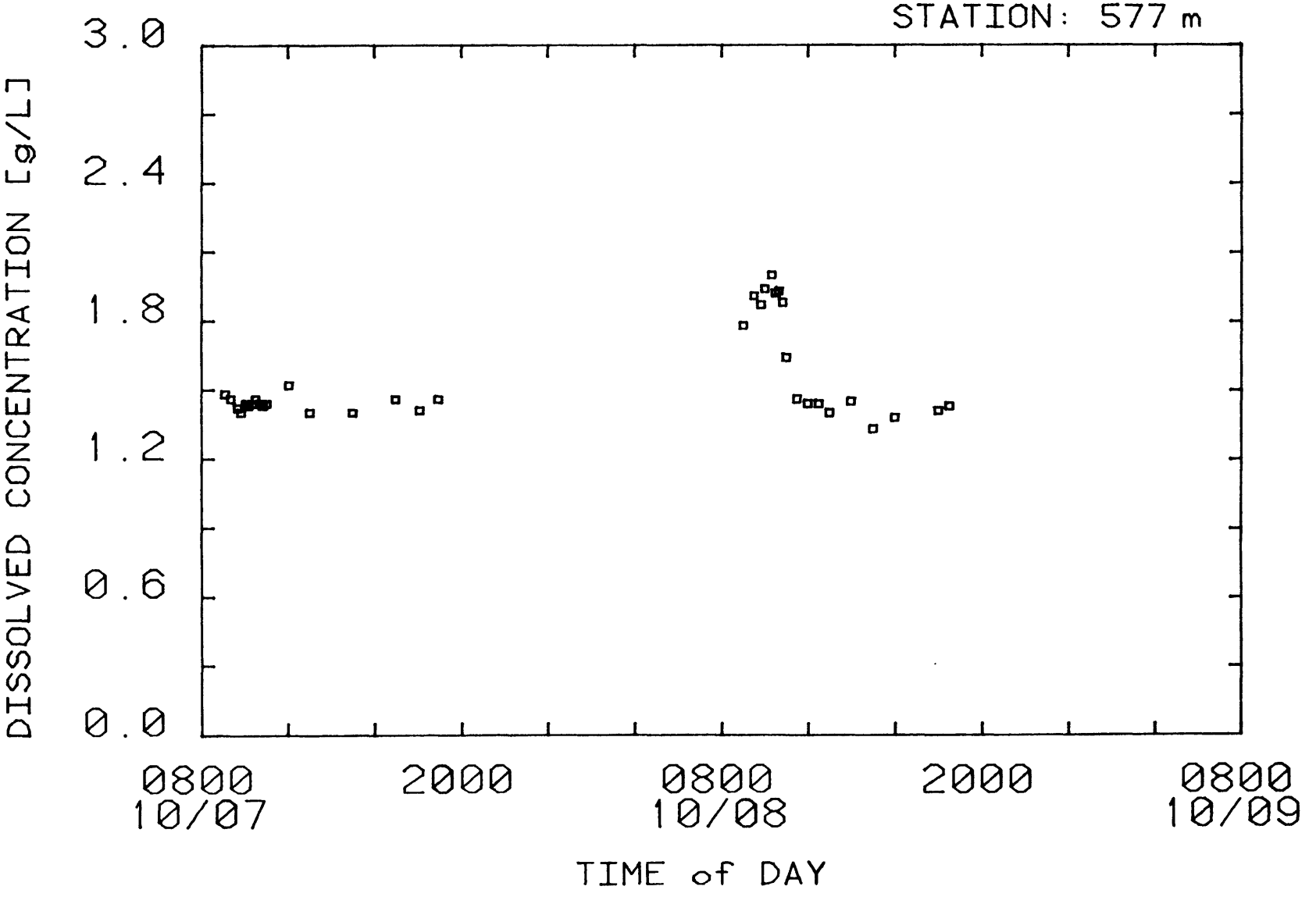
4L CREEK_82 SULFATE



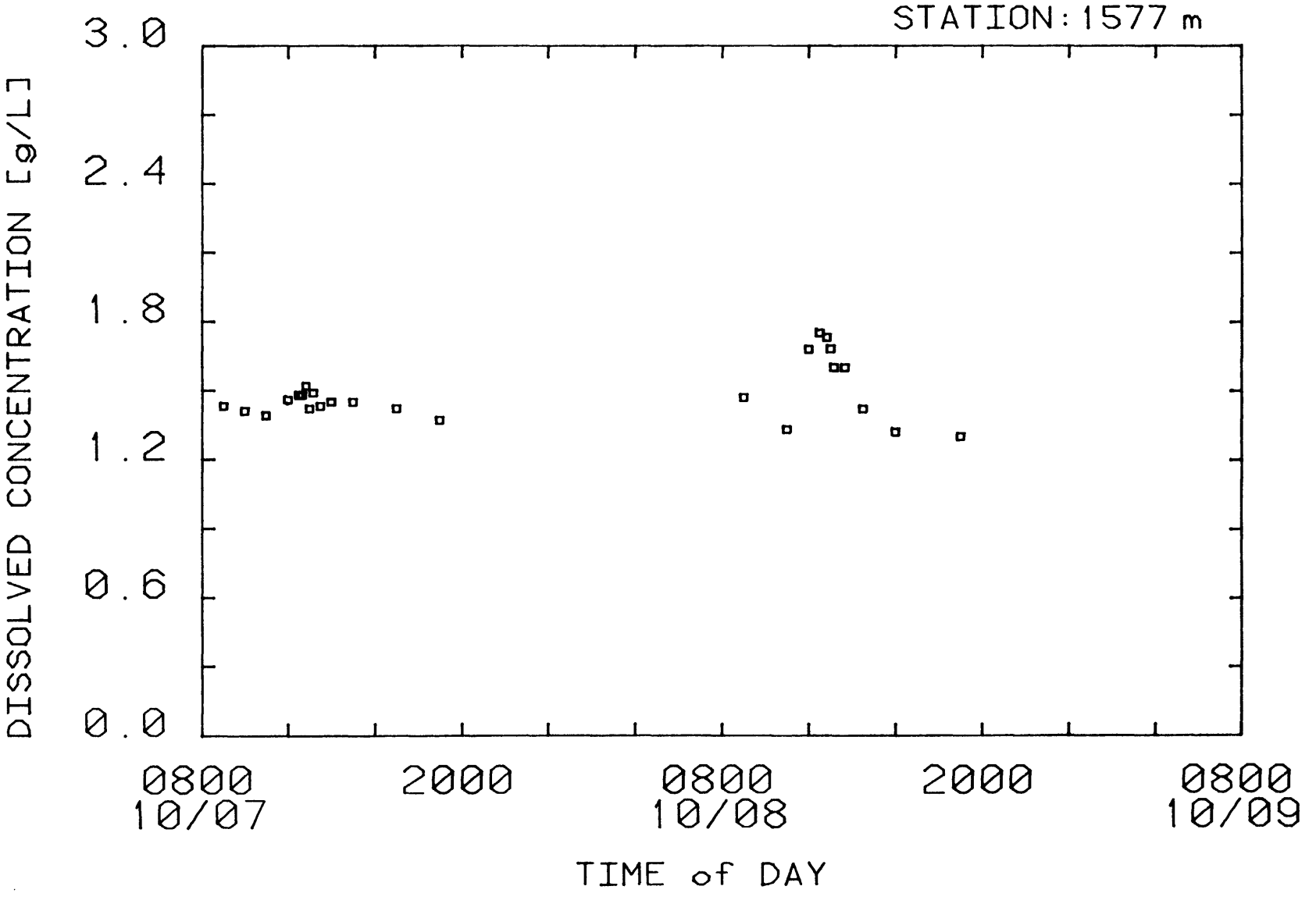
LEVIATHAN CREEK_82 SULFATE



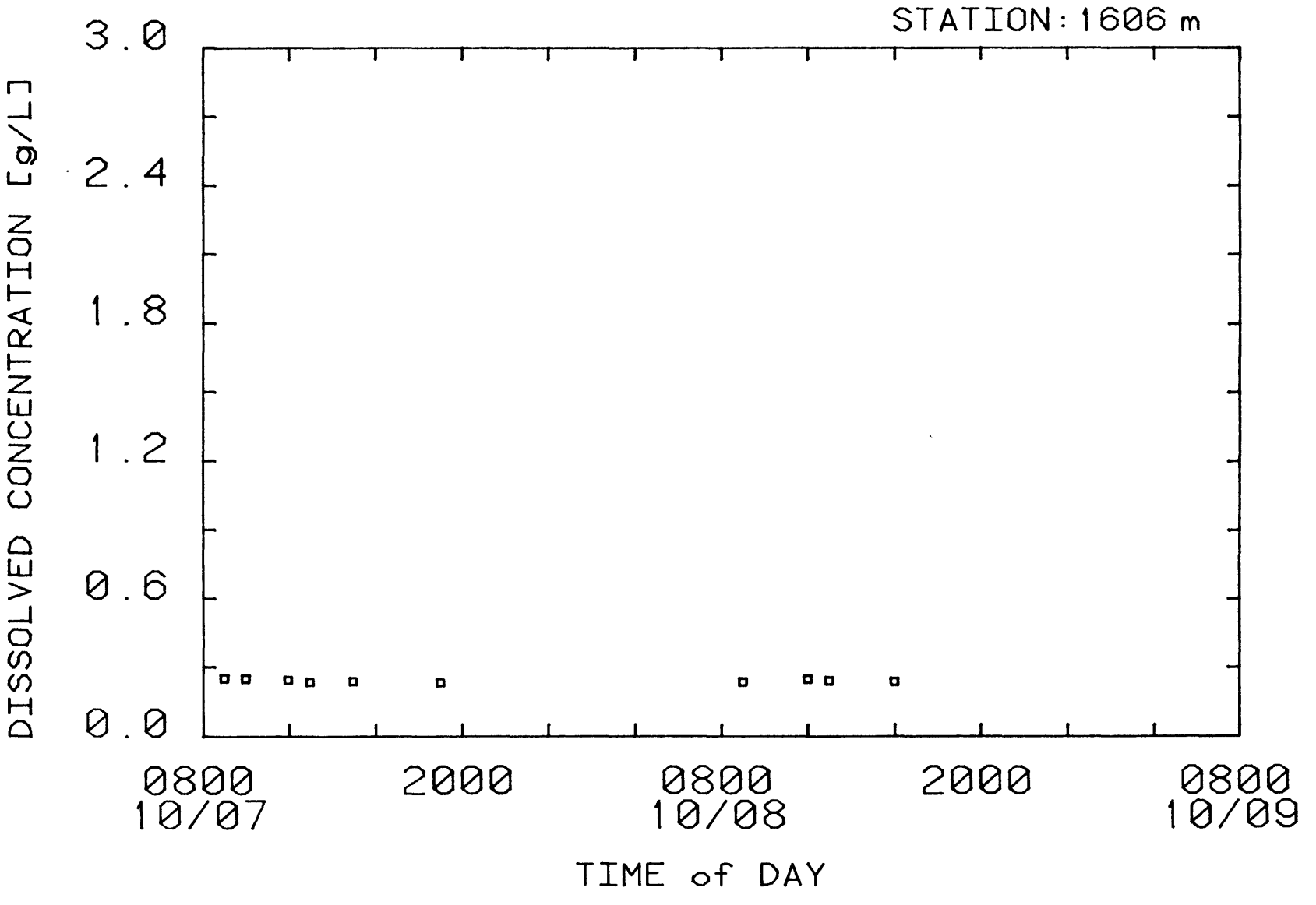
LEVIATHAN CREEK_82 SULFATE



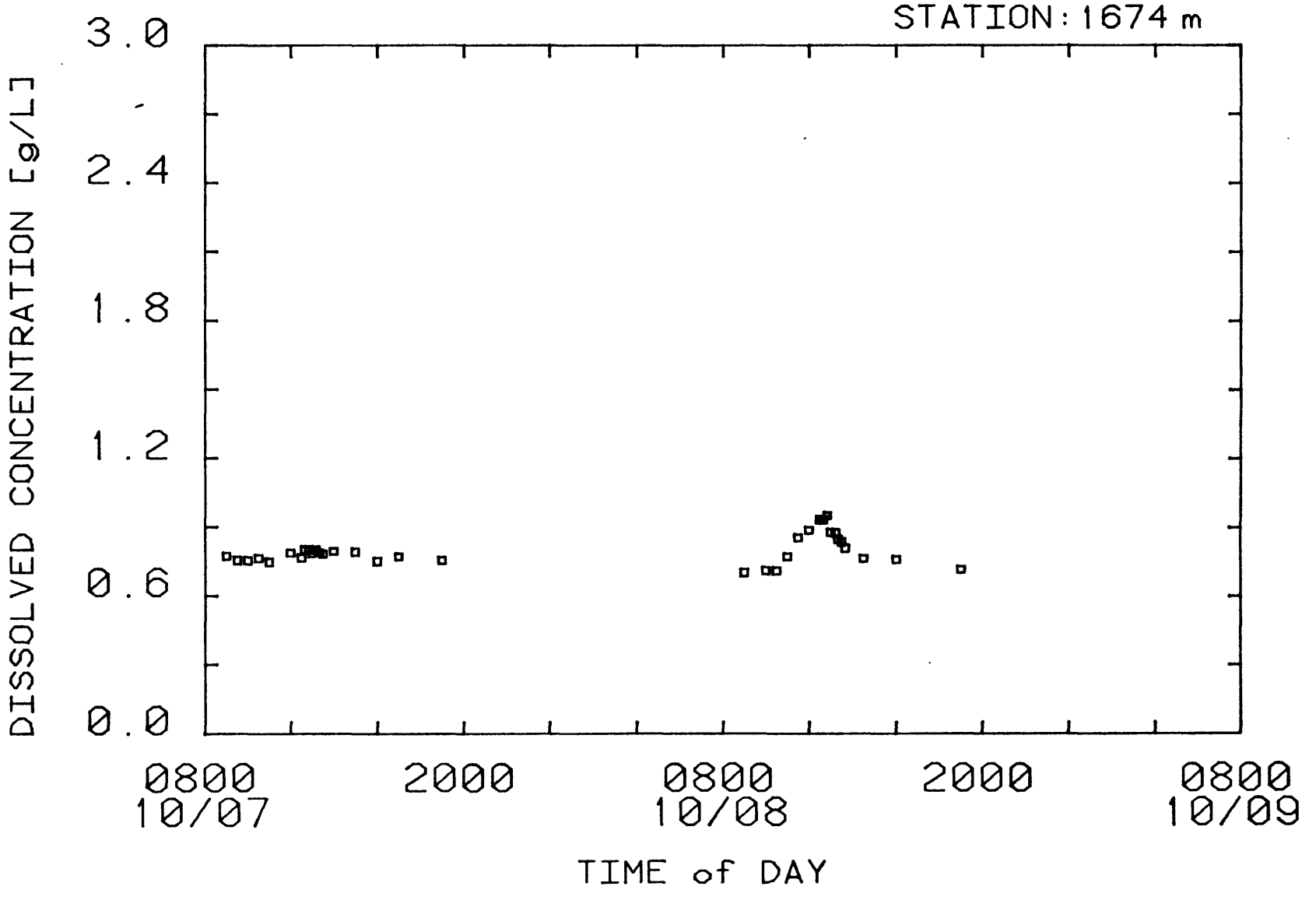
LEVIATHAN CREEK_82 SULFATE



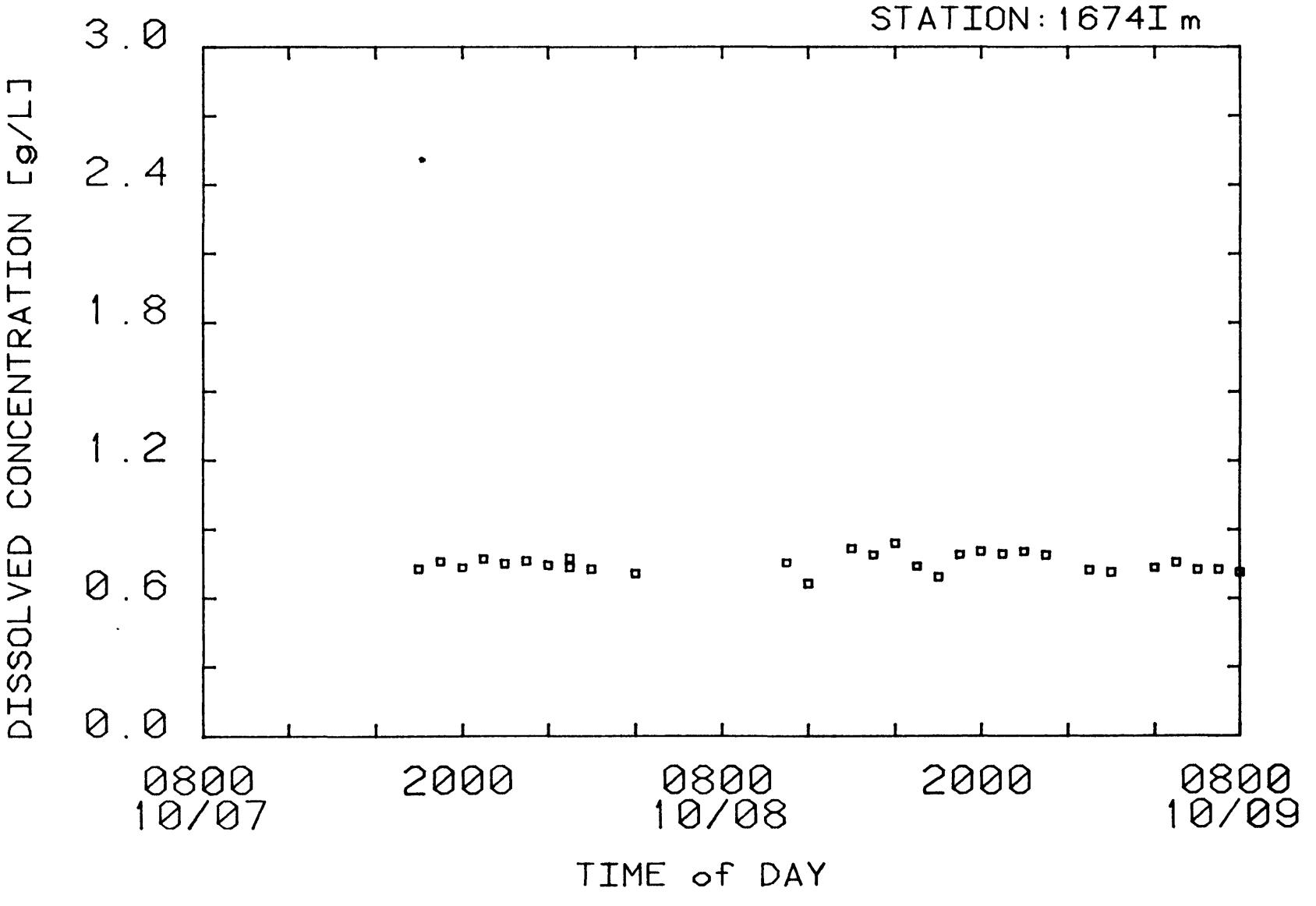
ASPEN CREEK_82 SULFATE



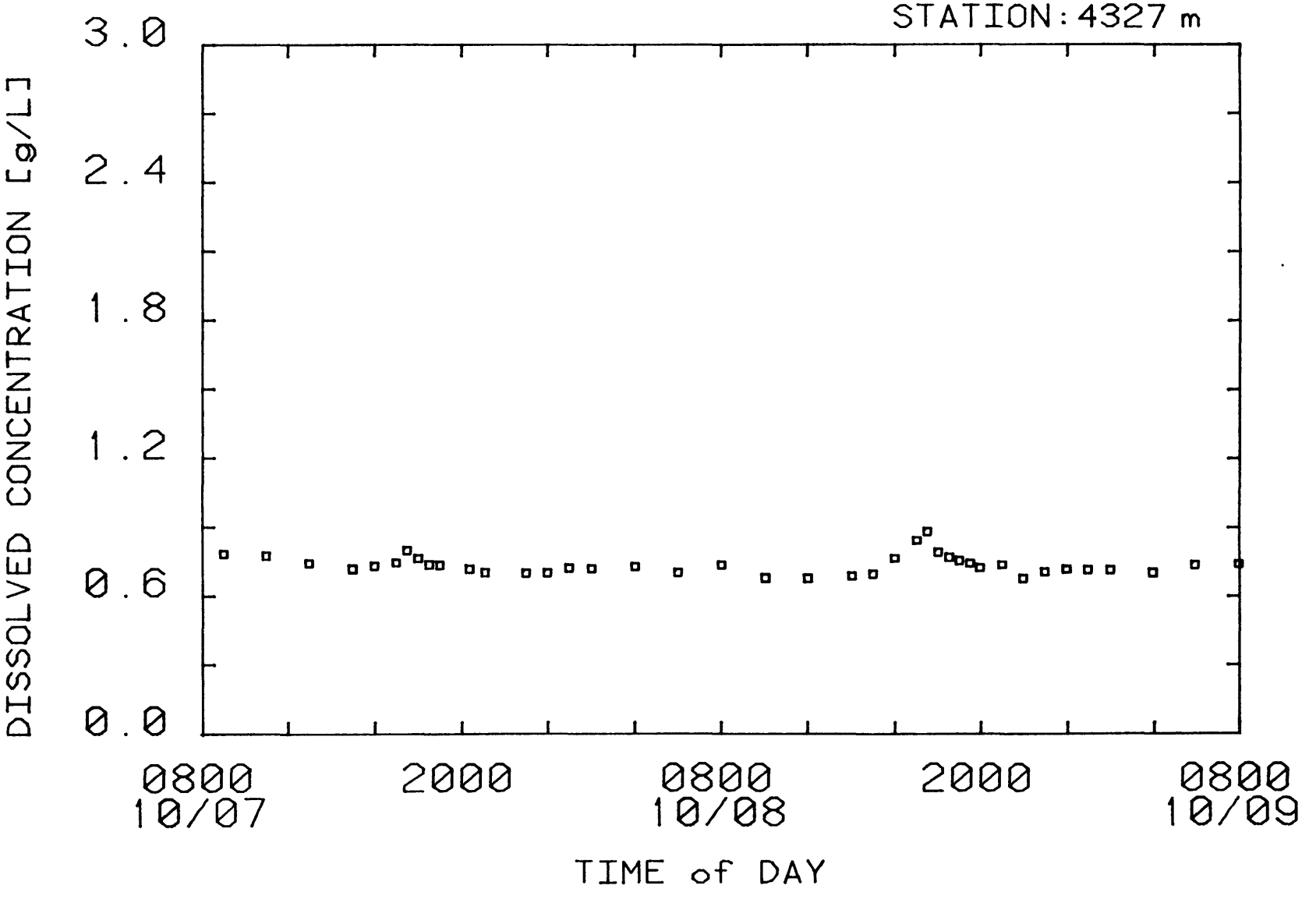
LEVIATHAN CREEK_82 SULFATE



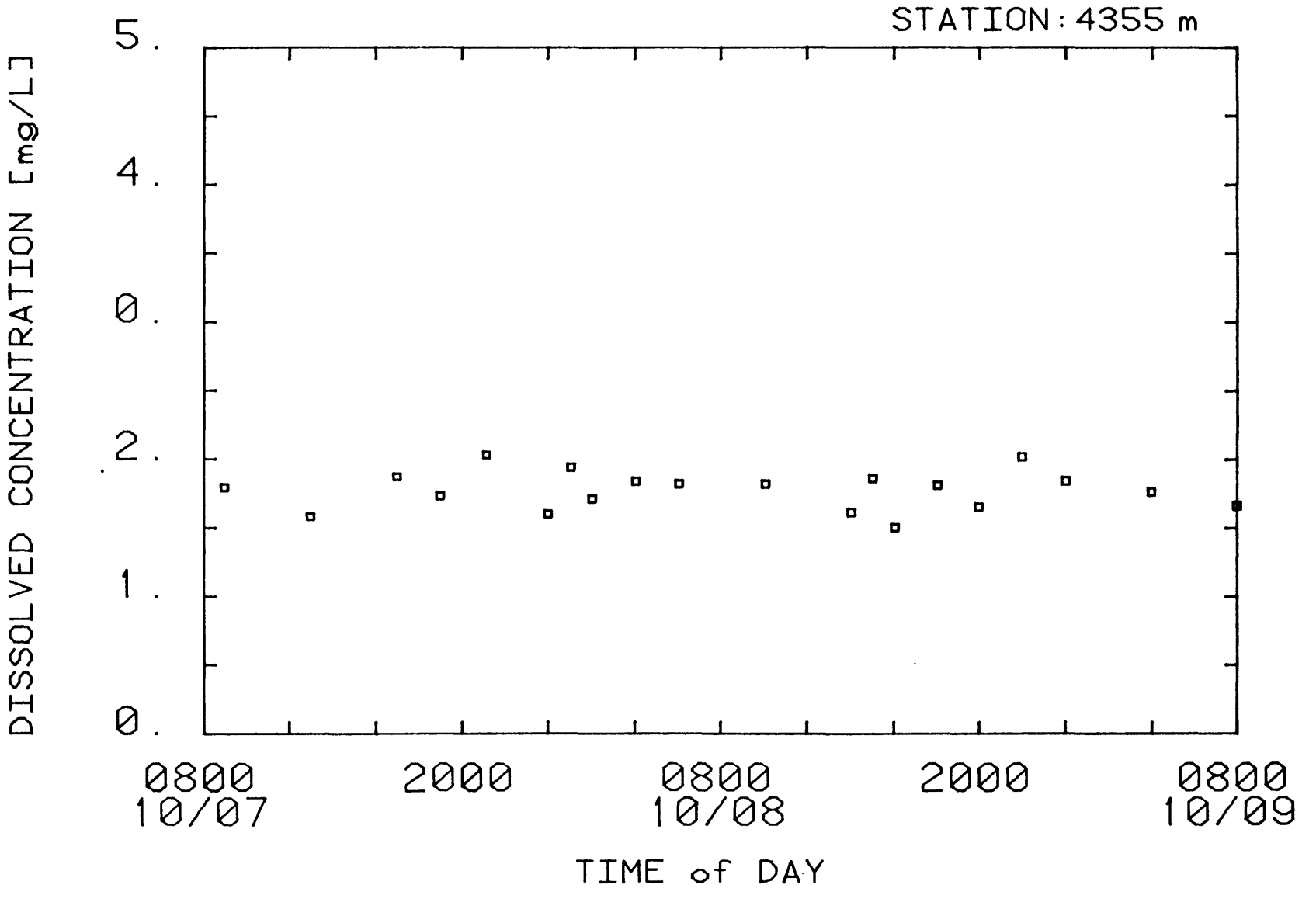
LEVIATHAN CREEK_82 SULFATE



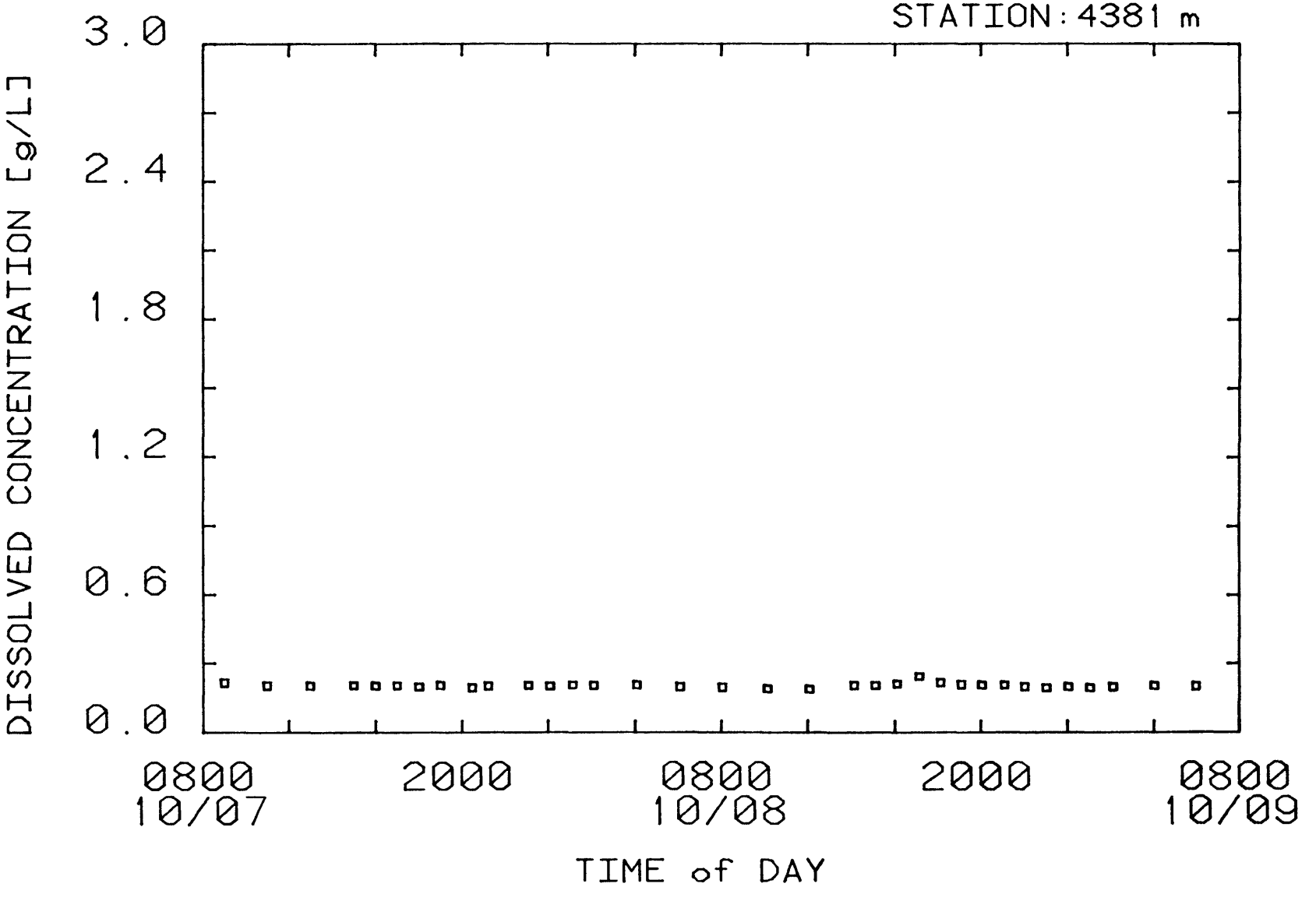
LEVIATHAN CREEK_82 SULFATE



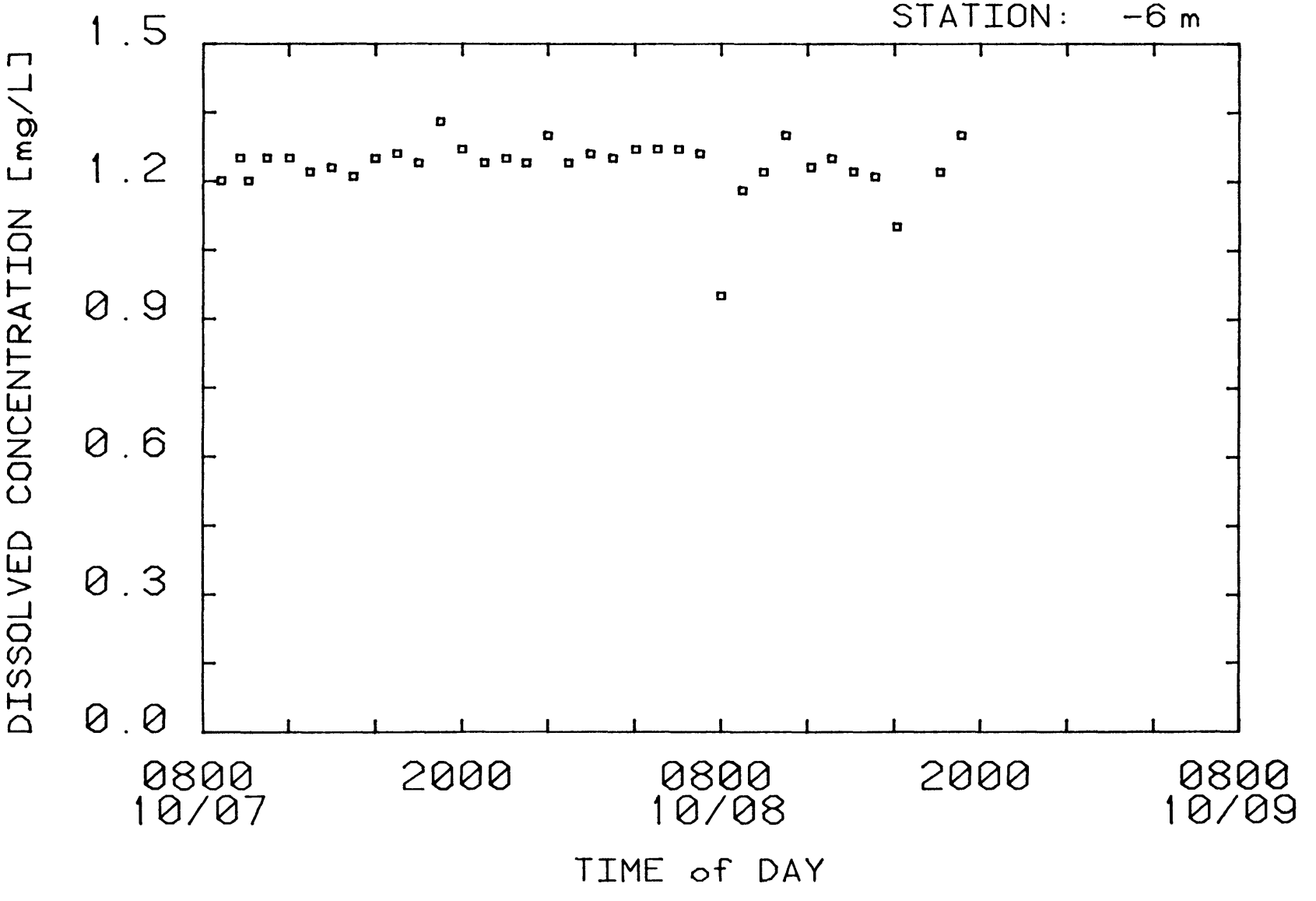
MOUNTAINEER CREEK_82 SULFATE



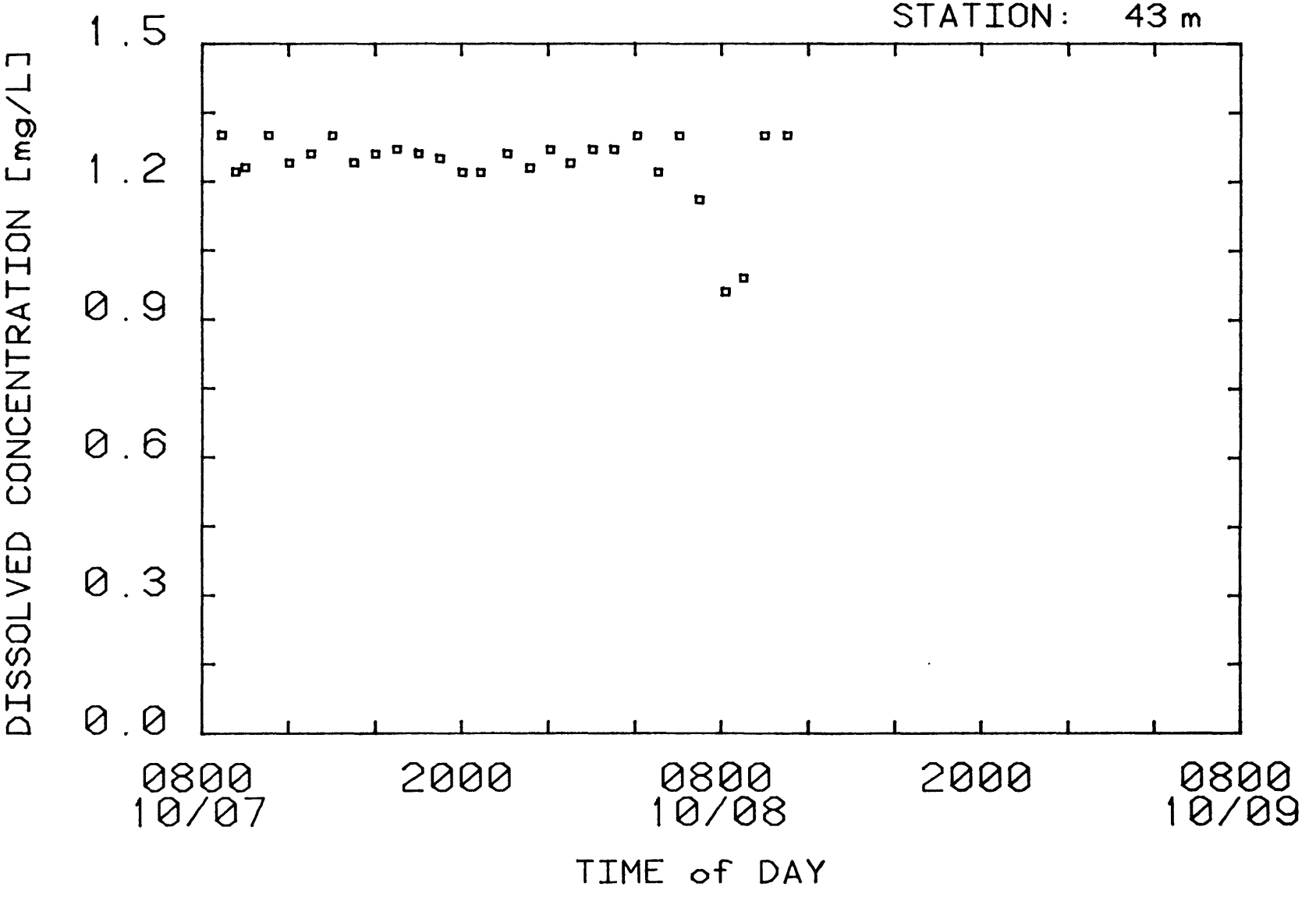
LEVIATHAN CREEK_82 SULFATE



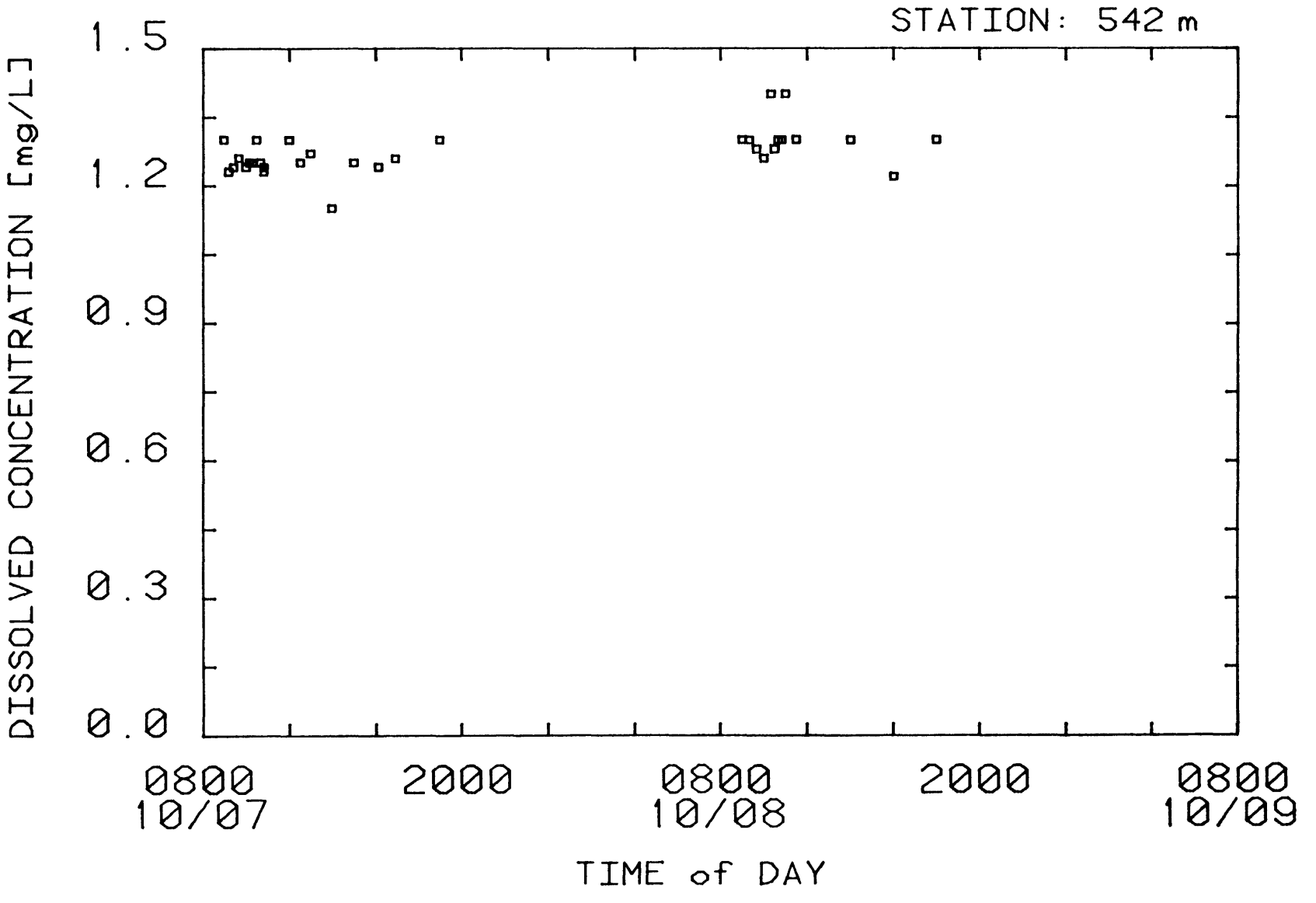
LEVIATHAN CREEK_82 FLUORIDE

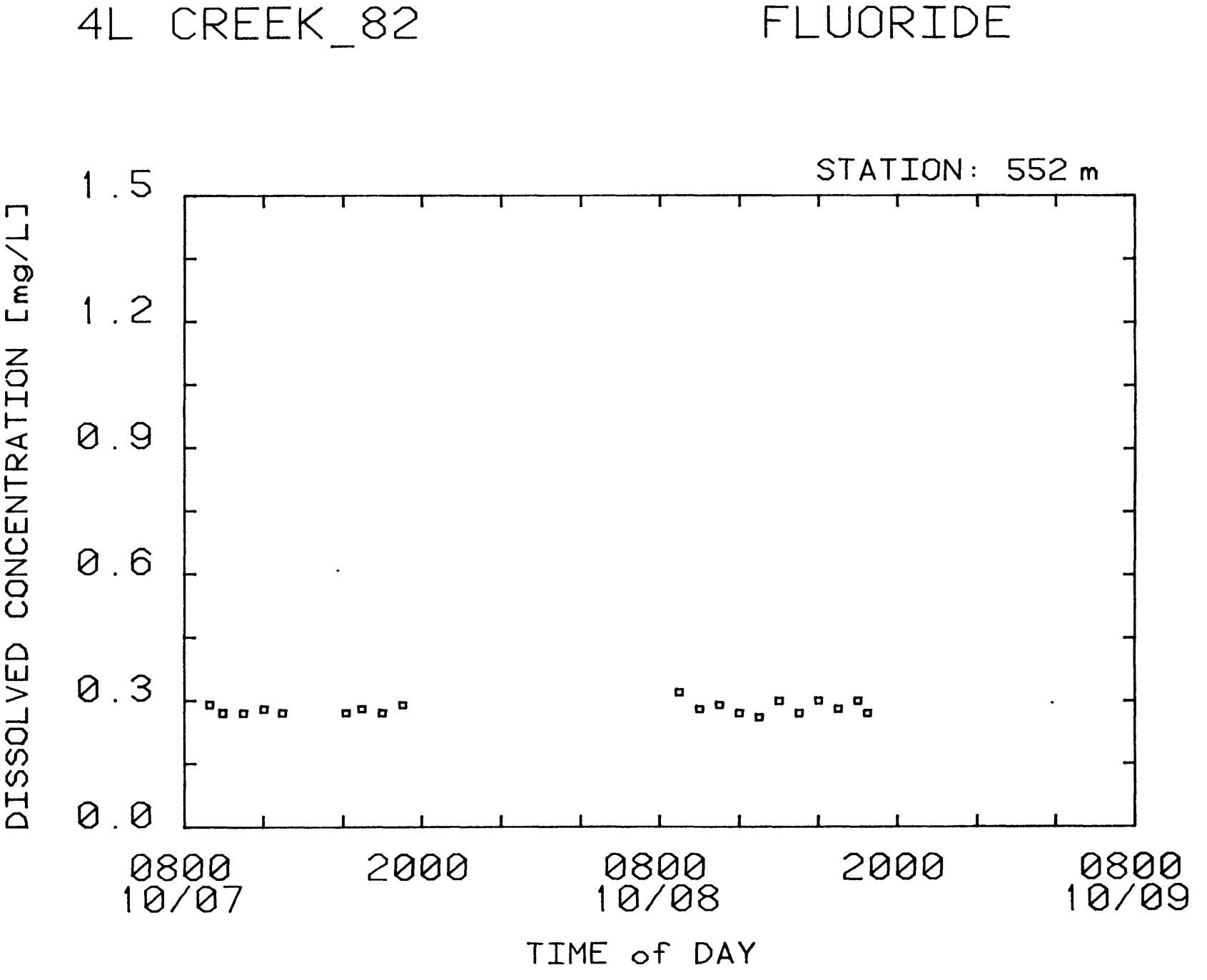


LEVIATHAN CREEK_82 FLUORIDE

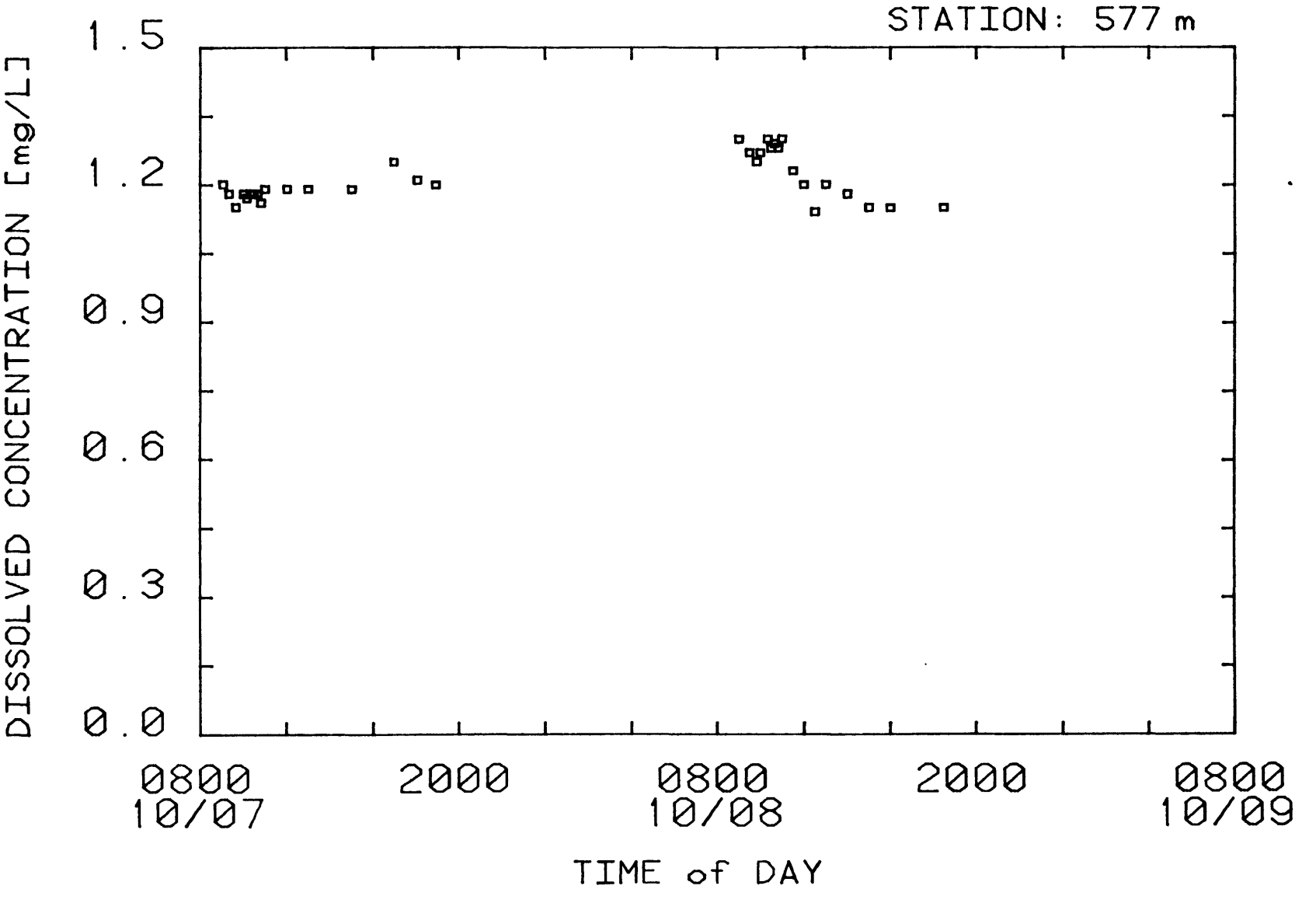


LEVIATHAN CREEK_82 FLUORIDE

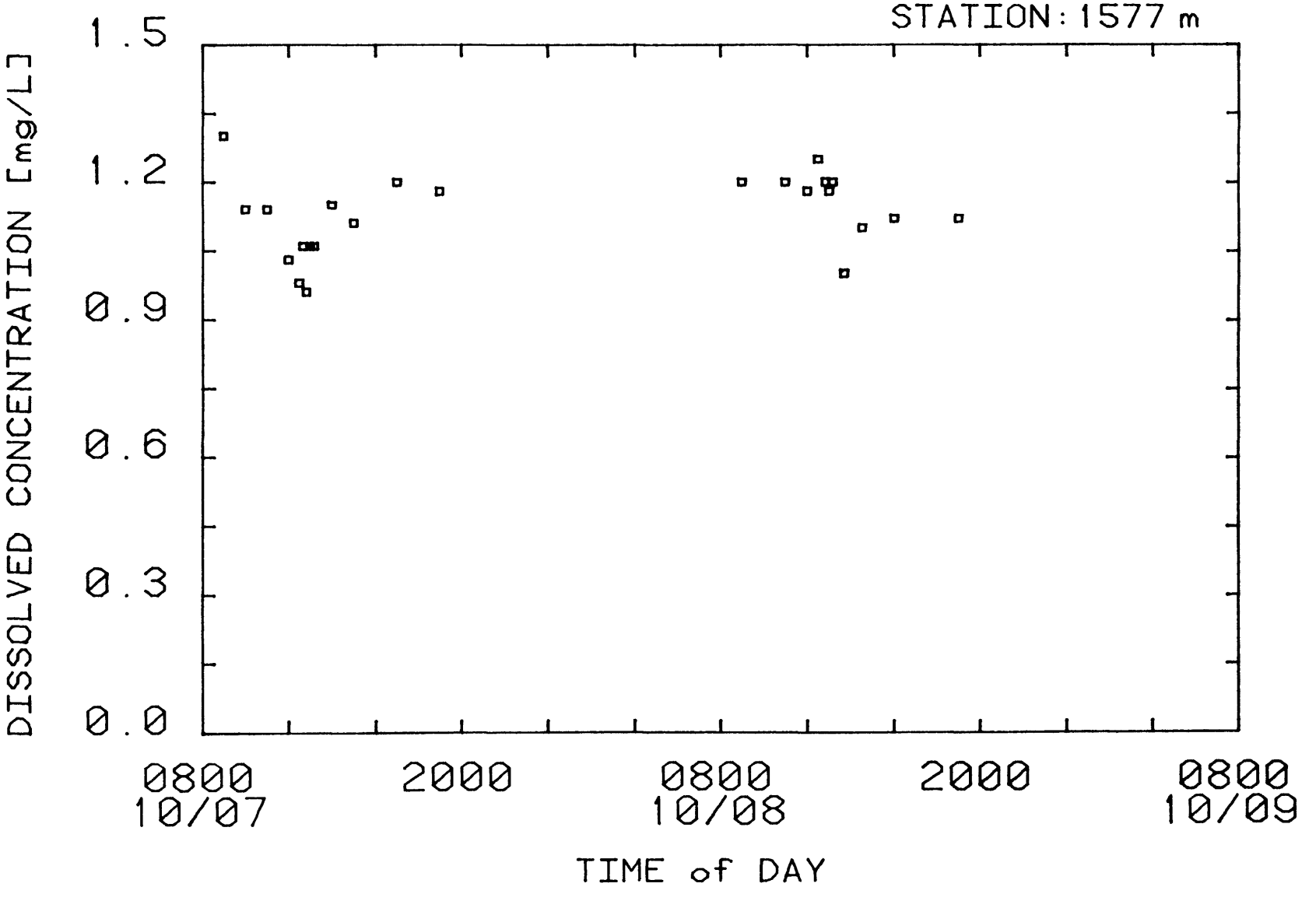



4L CREEK_82
FLUORIDE
STATION: 552 m
DISSOLVED CONCENTRATION [mg/L]
1.5
1.2
0.9
0.6
0.3
0.0
0800
10/07
2000
0800
10/08
2000
0800
10/09
TIME of DAY

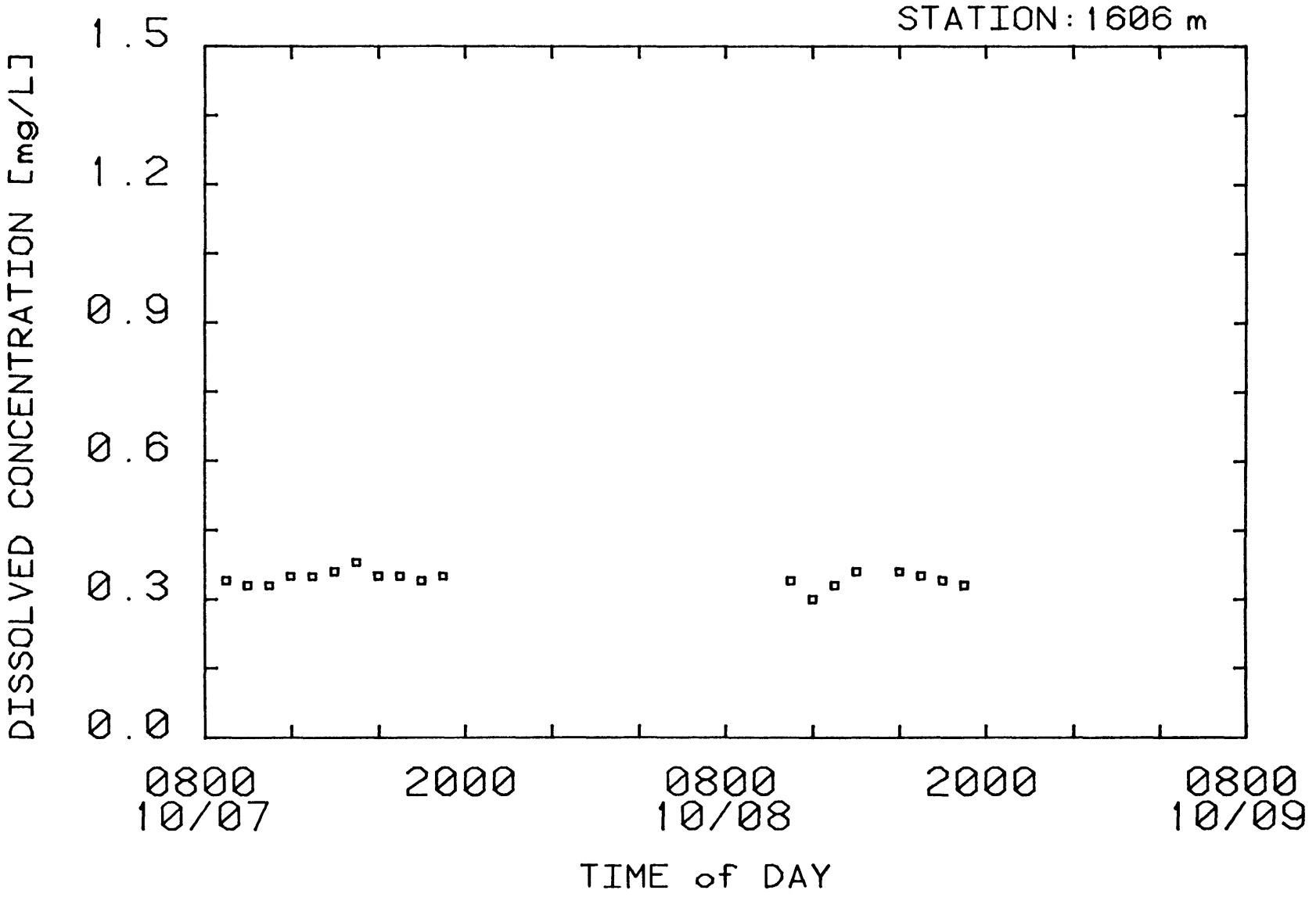
LEVIATHAN CREEK_82 FLUORIDE



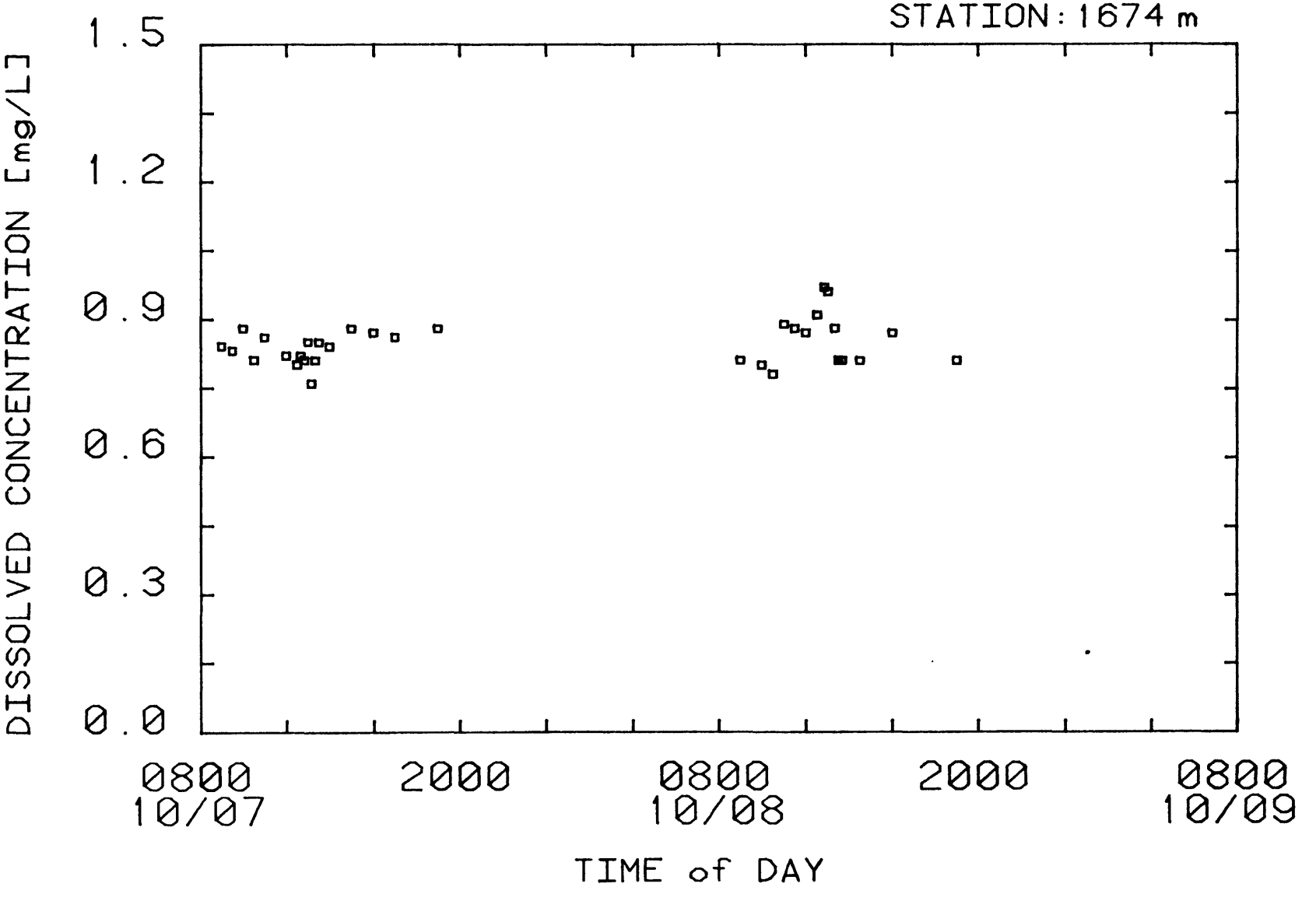
LEVIATHAN CREEK_82 FLUORIDE



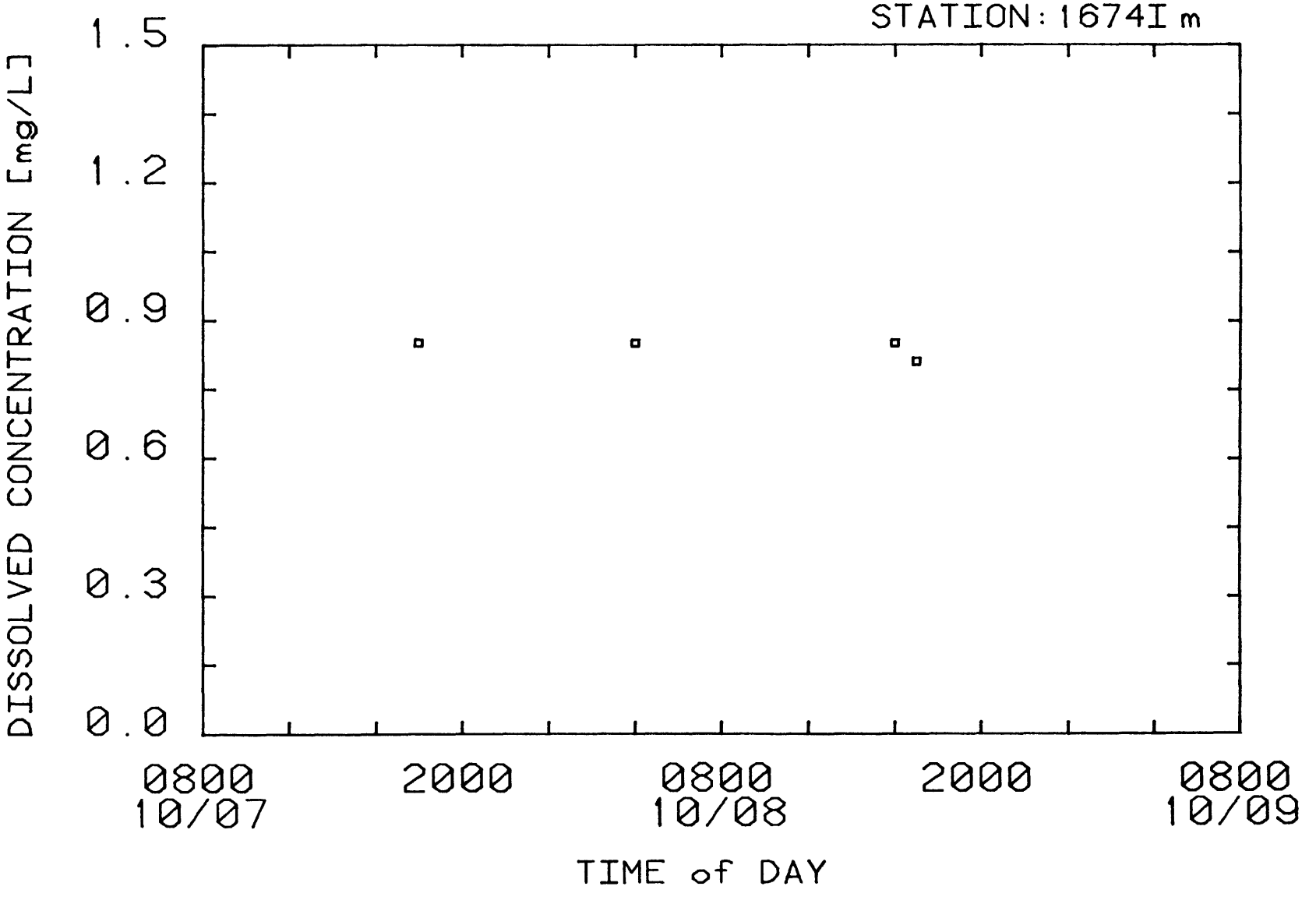
ASPEN CREEK_82 FLUORIDE



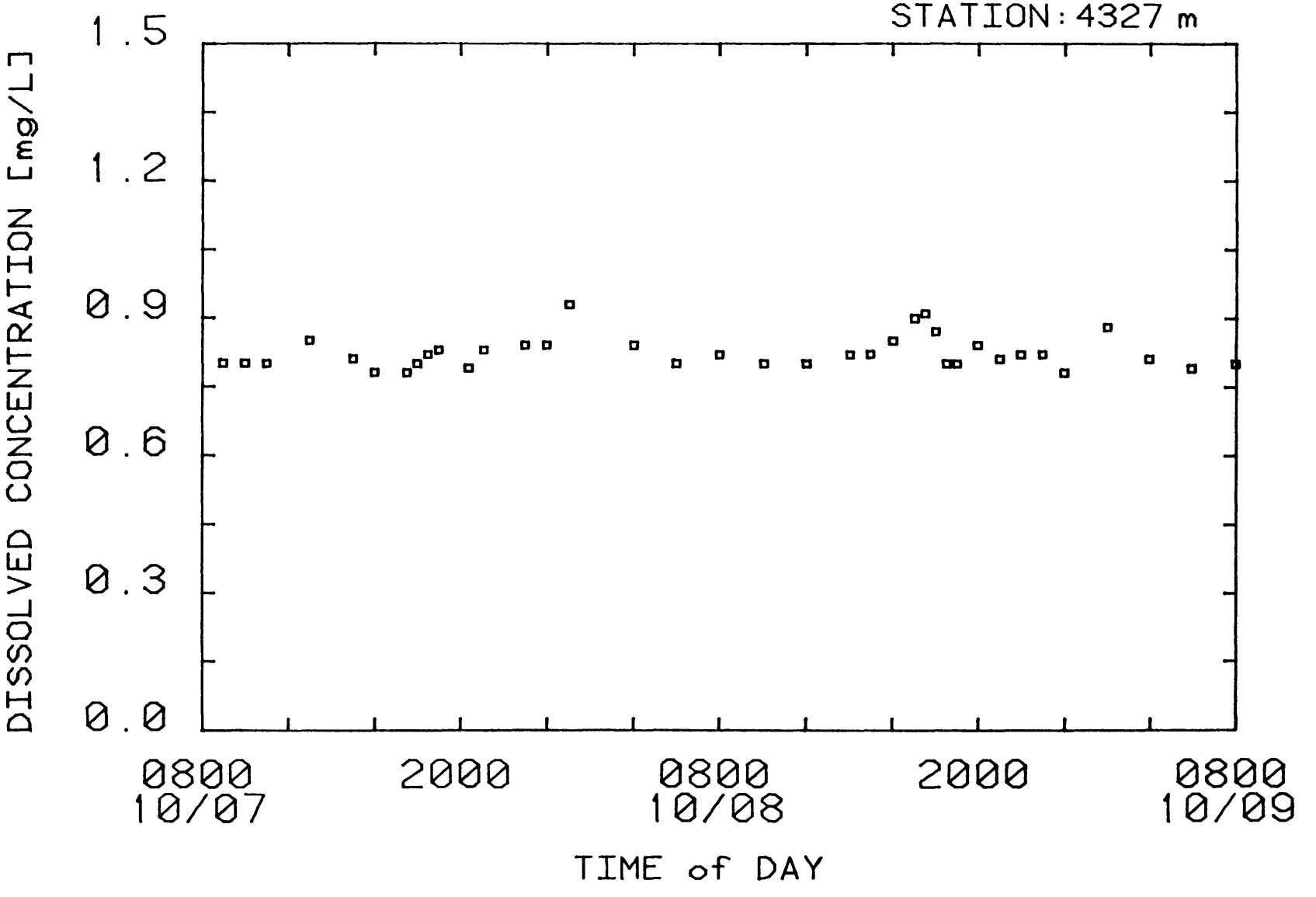
LEVIATHAN CREEK_82 FLUORIDE



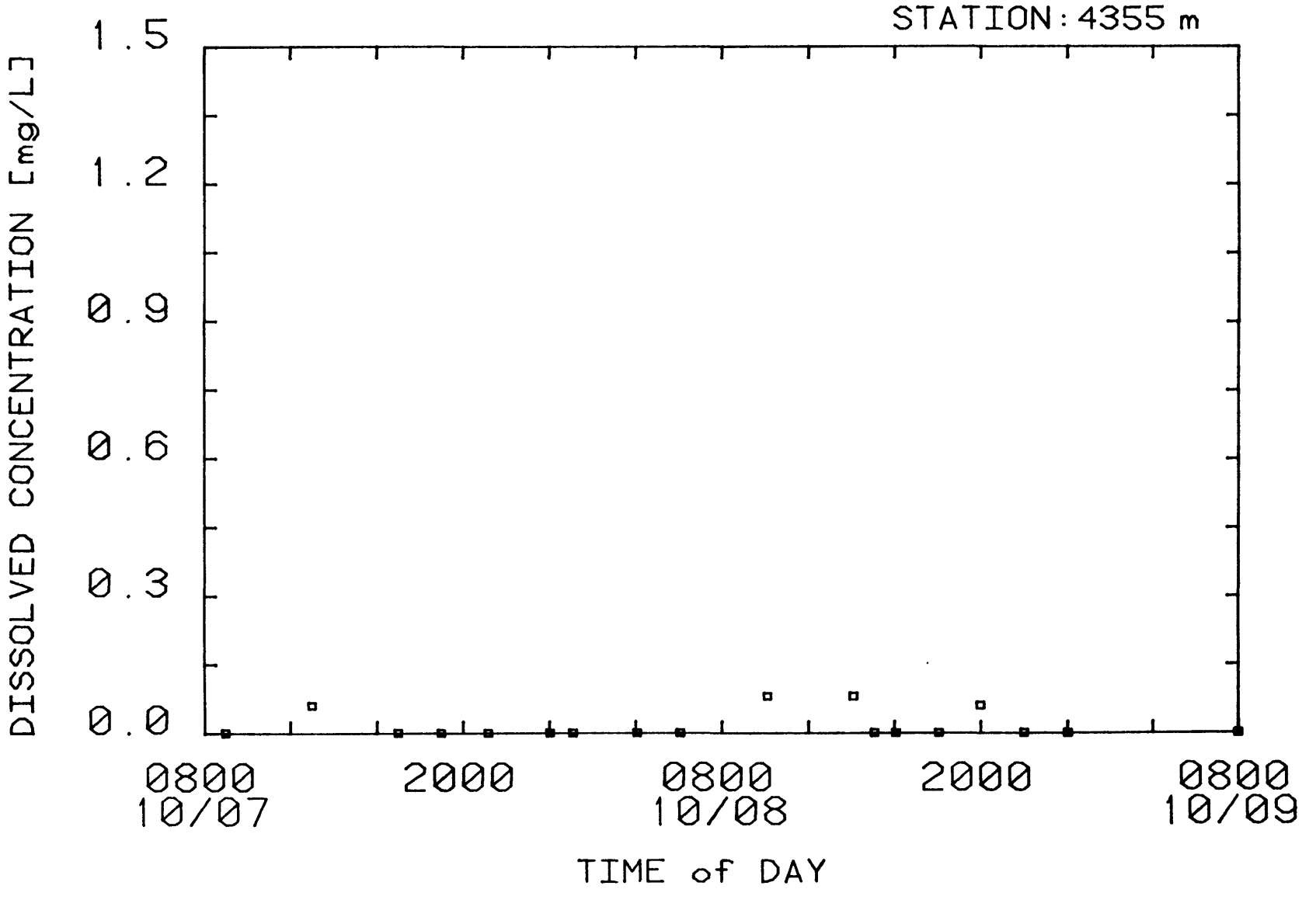
LEVIATHAN CREEK_82 FLUORIDE



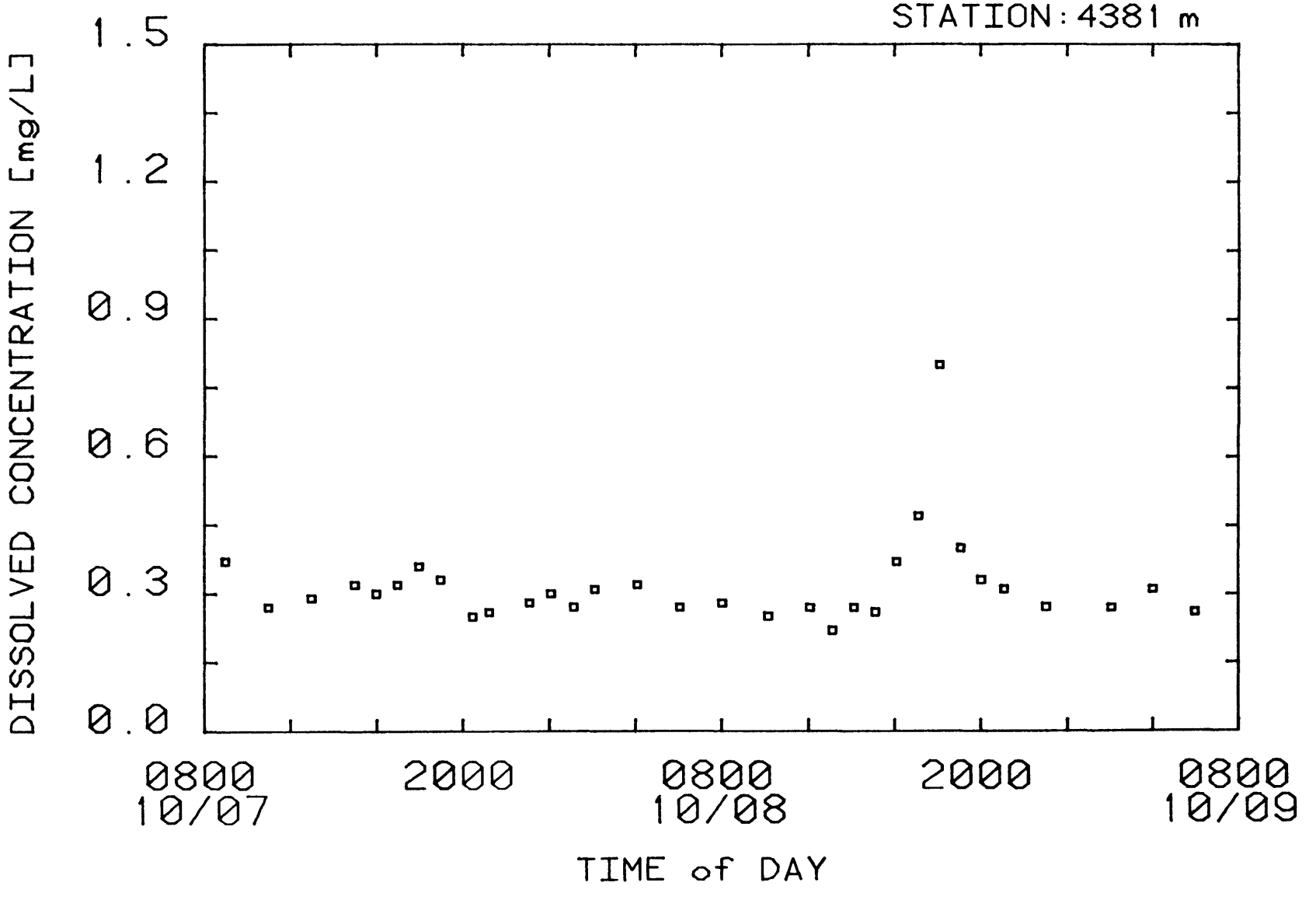
LEVIATHAN CREEK_82 FLUORIDE



MOUNTAINEER CREEK_82 FLUORIDE



LEVIATHAN CREEK_82 FLUORIDE



Appendix II

CHLORIDE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: -6 m

DATE	TIME	CONCENTRATION (mg/L) LABORATORY MENLO	CENTRAL	DIFFERENCE mg/L	PERCENT
OCT 07	0944	1.62	1.73	-0.11	-6.79
OCT 07	1008	1.62	1.66	-0.04	-2.47
OCT 07	1300	1.60	1.64	-0.04	-2.50
OCT 07	1600	1.60	1.70	-0.10	-6.25
OCT 07	1900	1.62	1.64	-0.02	-1.23
OCT 07	2103	1.61	1.65	-0.04	-2.48
OCT 08	0000	1.61	1.64	-0.03	-1.86
OCT 08	0259	1.66	1.66	0.00	0.00
OCT 08	0601	1.78	1.83	-0.05	-2.81

MEAN DIFFERENCE mg/L -0.05
MEAN DIFFERENCE PERCENT -2.93

CHLORIDE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 43 m

		CONCENTRATION (mg/L)			
		LABORATORY		DIFFERENCE	
DATE	TIME	MENLO	CENTRAL	mg/L	PERCENT
OCT 07	0935	32.10	32.90	-0.80	-2.49
OCT 07	1001	32.00	33.20	-1.20	-3.75
OCT 07	1105	33.90	35.10	-1.20	-3.54
OCT 07	1204	31.40	32.70	-1.30	-4.14
OCT 07	1304	33.40	34.00	-0.60	-1.80
OCT 07	1402	33.50	35.00	-1.50	-4.48
OCT 07	1602	34.00	35.30	-1.30	-3.82
OCT 07	1702	18.40	16.40	2.00	10.87
OCT 07	1802	33.70	31.80	1.90	5.64
OCT 07	1902	33.70	32.60	1.10	3.26
OCT 07	2003	33.90	30.40	3.50	10.32
OCT 07	2055	33.70	30.80	2.90	8.61
OCT 07	2209	33.60	30.80	2.80	8.33
OCT 07	2310	33.70	30.80	2.90	8.61
OCT 08	0007	33.80	30.80	3.00	8.88
OCT 08	0102	34.30	31.10	3.20	9.33
OCT 08	0203	35.40	32.40	3.00	8.47
OCT 08	0302	36.40	33.50	2.90	7.97
OCT 08	0407	38.60	35.60	3.00	7.77
OCT 08	0506	41.20	39.00	2.20	5.34
OCT 08	0604	43.70	41.40	2.30	5.26
OCT 08	0700	47.20	45.80	1.40	2.97

MEAN DIFFERENCE mg/L 1.37
MEAN DIFFERENCE PERCENT 3.98

CHLORIDE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 542 m

		CONCENTRATION (mg/L)			
		LABORATORY		DIFFERENCE	
DATE	TIME	MENLO	CENTRAL	mg/L	PERCENT
OCT 07	0925	1.69	1.70	-0.01	-0.59
OCT 07	0940	1.70	1.80	-0.10	-5.88
OCT 07	1000	1.70	1.72	-0.02	-1.18
OCT 07	1020	7.58	7.29	0.29	3.83
OCT 07	1040	23.60	21.30	2.30	9.75
OCT 07	1100	25.50	23.60	1.90	7.45
OCT 07	1200	28.10	25.40	2.70	9.61
OCT 07	1259	25.80	25.80	0.00	0.00
OCT 07	1607	28.00	27.70	0.30	1.07
OCT 07	1900	28.00	28.10	-0.10	-0.36
OCT 08	0930	37.90	36.30	1.60	4.22
OCT 08	1000	37.70	36.60	1.10	2.92
OCT 08	1030	29.50	27.90	1.60	5.42
OCT 08	1100	3.91	3.86	0.05	1.28
OCT 08	1200	2.53	2.48	0.05	1.98
OCT 08	1230	2.32	2.24	0.08	3.45
OCT 08	1300	2.13	2.13	0.00	0.00
OCT 08	1400	2.09	2.06	0.03	1.44
OCT 08	1500	1.96	1.95	0.01	0.51
OCT 08	1600	1.89	1.88	0.01	0.53
OCT 08	1700	1.88	1.87	0.01	0.53
OCT 08	1800	1.85	1.86	-0.01	-0.54

MEAN DIFFERENCE mg/L 0.54
MEAN DIFFERENCE PERCENT 2.06

CHLORIDE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 4L CREEK

		CONCENTRATION (mg/L)			
		LABORATORY		DIFFERENCE	
DATE	TIME	MENLO	CENTRAL	mg/L	PERCENT
OCT 07	0918	1.03	1.16	-0.13	-12.6
OCT 07	1101	1.02	1.13	-0.11	-10.8
OCT 07	1500	1.02	1.12	-0.10	-9.80
OCT 07	1801	1.04	1.14	-0.10	-9.62
OCT 08	1000	1.01	1.14	-0.13	-12.9
OCT 08	1100	1.02	1.14	-0.12	-11.8
OCT 08	1200	1.01	1.11	-0.10	-9.90
OCT 08	1300	1.01	1.09	-0.08	-7.92
OCT 08	1400	1.02	1.09	-0.07	-6.86
OCT 08	1500	1.02	1.12	-0.10	-9.80
OCT 08	1600	1.02	1.14	-0.12	-11.8
OCT 08	1700	1.02	1.12	-0.10	-9.80
OCT 08	1800	1.03	1.12	-0.09	-8.74

MEAN DIFFERENCE mg/L -0.10
MEAN DIFFERENCE PERCENT -10.17

CHLORIDE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 577 m

		CONCENTRATION (mg/L)			
		LABORATORY		DIFFERENCE	
DATE	TIME	MENLO	CENTRAL	mg/L	PERCENT
OCT 07	0905	1.59	1.59	0.00	0.00
OCT 07	0922	1.59	1.60	-0.01	-0.63
OCT 07	0941	1.58	1.62	-0.04	-2.53
OCT 07	1003	1.59	1.67	-0.08	-5.03
OCT 07	1022	4.35	4.33	0.02	0.46
OCT 07	1042	19.40	16.10	3.30	17.01
OCT 07	1102	21.30	19.10	2.20	10.33
OCT 07	1204	23.80	20.50	3.30	13.87
OCT 07	1302	21.80	19.40	2.40	11.01
OCT 07	1602	23.70	20.50	3.20	13.50
OCT 07	1857	23.50	21.40	2.10	8.94
OCT 08	0930	30.00	28.20	1.80	6.00
OCT 08	1000	30.70	28.80	1.90	6.19
OCT 08	1030	27.60	25.80	1.80	6.52
OCT 08	1100	3.66	3.59	0.07	1.91
OCT 08	1200	2.34	2.30	0.04	1.71
OCT 08	1230	2.19	2.16	0.03	1.37
OCT 08	1300	1.96	1.98	-0.02	-1.02
OCT 08	1400	1.94	1.96	-0.02	-1.03
OCT 08	1500	1.81	1.81	0.00	0.00
OCT 08	1600	1.76	1.78	-0.02	-1.14
OCT 08	1700	1.74	1.75	-0.01	-0.57
OCT 08	1800	1.73	1.72	0.01	0.58

MEAN DIFFERENCE mg/L 0.96
MEAN DIFFERENCE PERCENT 3.80

CHLORIDE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 4327 m

		CONCENTRATION (mg/L)			
		LABORATORY		DIFFERENCE	
DATE	TIME	MENLO	CENTRAL	mg/L	PERCENT
OCT 07	0900	1.39	1.34	0.05	3.60
OCT 07	1200	1.39	1.37	0.02	1.44
OCT 07	1300	1.39	1.60	-0.21	-15.1
OCT 07	1400	1.40	1.44	-0.04	-2.86
OCT 07	1500	1.40	1.43	-0.03	-2.14
OCT 07	1700	1.41	1.44	-0.03	-2.13
OCT 07	1900	8.15	8.19	-0.04	-0.49
OCT 07	2022	8.20	8.21	-0.01	-0.12
OCT 07	2106	8.70	8.60	0.10	1.15
OCT 07	2200	8.79	8.80	-0.01	-0.11
OCT 08	0101	3.80	3.87	-0.07	-1.84
OCT 08	0300	8.82	8.87	-0.05	-0.57
OCT 08	0505	8.86	8.88	-0.02	-0.23
OCT 08	0700	8.88	8.92	-0.04	-0.45
OCT 08	0903	8.66	8.83	-0.17	-1.96
OCT 08	1301	8.52	8.57	-0.05	-0.59
OCT 08	1402	8.44	8.56	-0.12	-1.42
OCT 08	1501	8.79	8.79	0.00	0.00
OCT 08	1601	10.02	9.90	0.12	1.20
OCT 08	1702	11.41	10.00	1.41	12.36
OCT 08	1801	4.25	4.23	0.02	0.47
OCT 08	1900	2.43	2.46	-0.03	-1.23
OCT 08	2030	1.95	2.01	-0.06	-3.08
OCT 08	2158	1.78	1.81	-0.03	-1.69
OCT 08	2358	1.64	1.69	-0.05	-3.05
OCT 09	0159	1.58	1.66	-0.08	-5.06
OCT 09	0357	1.54	1.58	-0.04	-2.60
OCT 09	0555	1.52	1.54	-0.02	-1.32
OCT 09	0758	1.50	1.55	-0.05	-3.33
OCT 09	0912	1.49	1.55	-0.06	-4.03

MEAN DIFFERENCE mg/L 0.01
MEAN DIFFERENCE PERCENT -1.17

CHLORIDE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: MOUNTAINEER CREEK

		CONCENTRATION (mg/L)			
		LABORATORY		DIFFERENCE	
DATE	TIME	MENLO	CENTRAL	mg/L	PERCENT
OCT 07	0900	0.98	1.03	-0.05	-5.10
OCT 07	1200	0.98	1.02	-0.04	-4.08
OCT 07	1300	0.97	1.01	-0.04	-4.12
OCT 07	1800	0.97	1.13	-0.16	-16.5
OCT 07	2026	0.99	1.15	-0.16	-16.2
OCT 07	2204	0.98	1.12	-0.14	-14.3
OCT 08	0306	0.97	1.11	-0.14	-14.4
OCT 08	0703	0.97	1.08	-0.11	-11.3
OCT 08	1304	0.97	1.07	-0.10	-10.3
OCT 08	1405	0.97	1.06	-0.09	-9.28
OCT 08	1504	0.97	1.07	-0.10	-10.3
OCT 08	1604	0.97	1.13	-0.16	-16.5
OCT 08	1704	0.97	1.10	-0.13	-13.4
OCT 08	1804	0.97	1.06	-0.09	-9.28
OCT 08	1903	0.97	1.15	-0.18	-18.6
OCT 08	2103	0.97	1.16	-0.19	-19.6
OCT 09	0001	0.98	1.10	-0.12	-12.2
OCT 09	0259	0.98	1.12	-0.14	-14.3
OCT 09	0557	0.97	1.07	-0.10	-10.3
OCT 09	0916	0.97	1.11	-0.14	-14.4

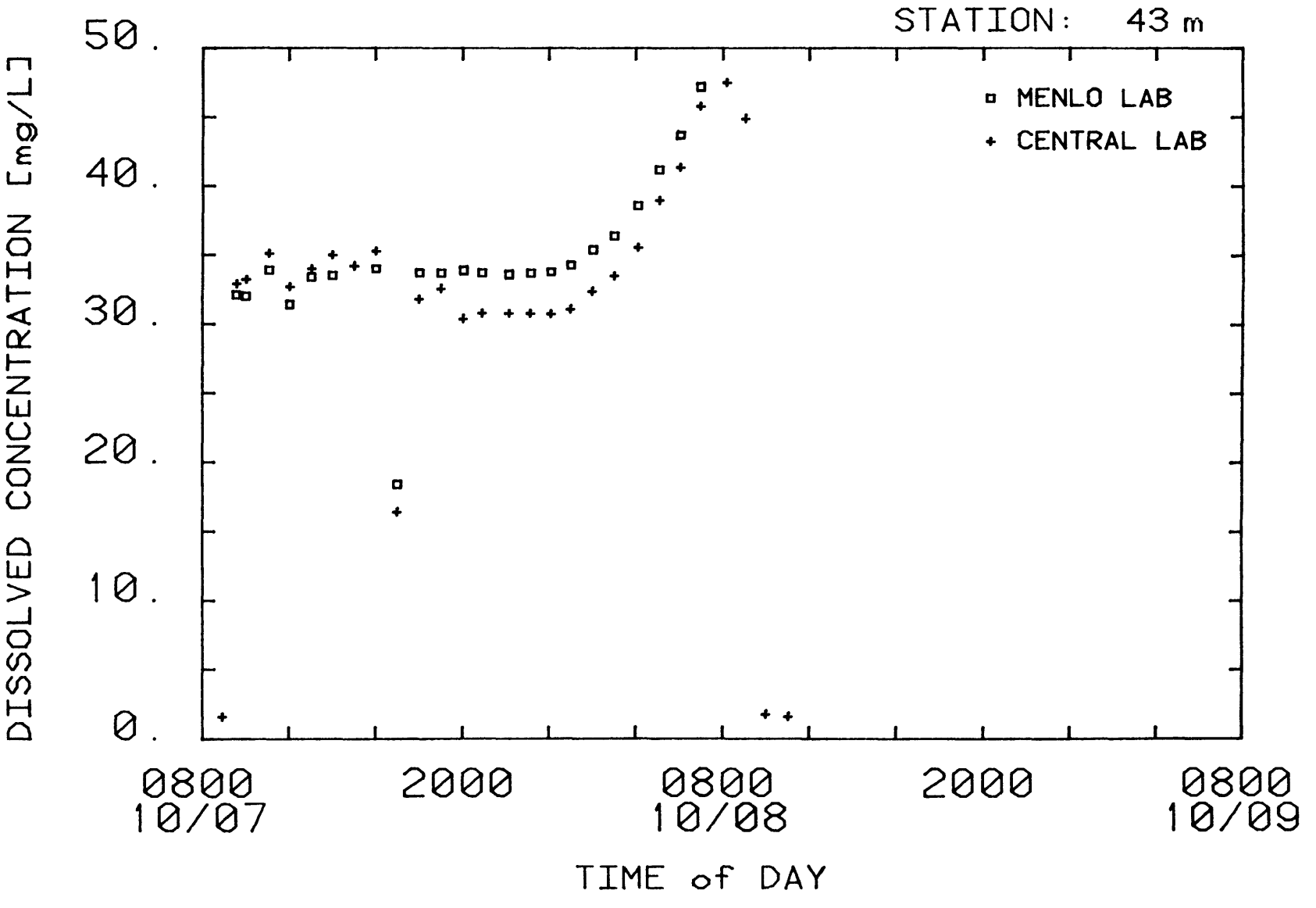
MEAN DIFFERENCE mg/L -0.12
MEAN DIFFERENCE PERCENT -12.23

CHLORIDE CONCENTRATIONS
LEVIATHAN CREEK -- OCTOBER 1982
STATION: 4381 m

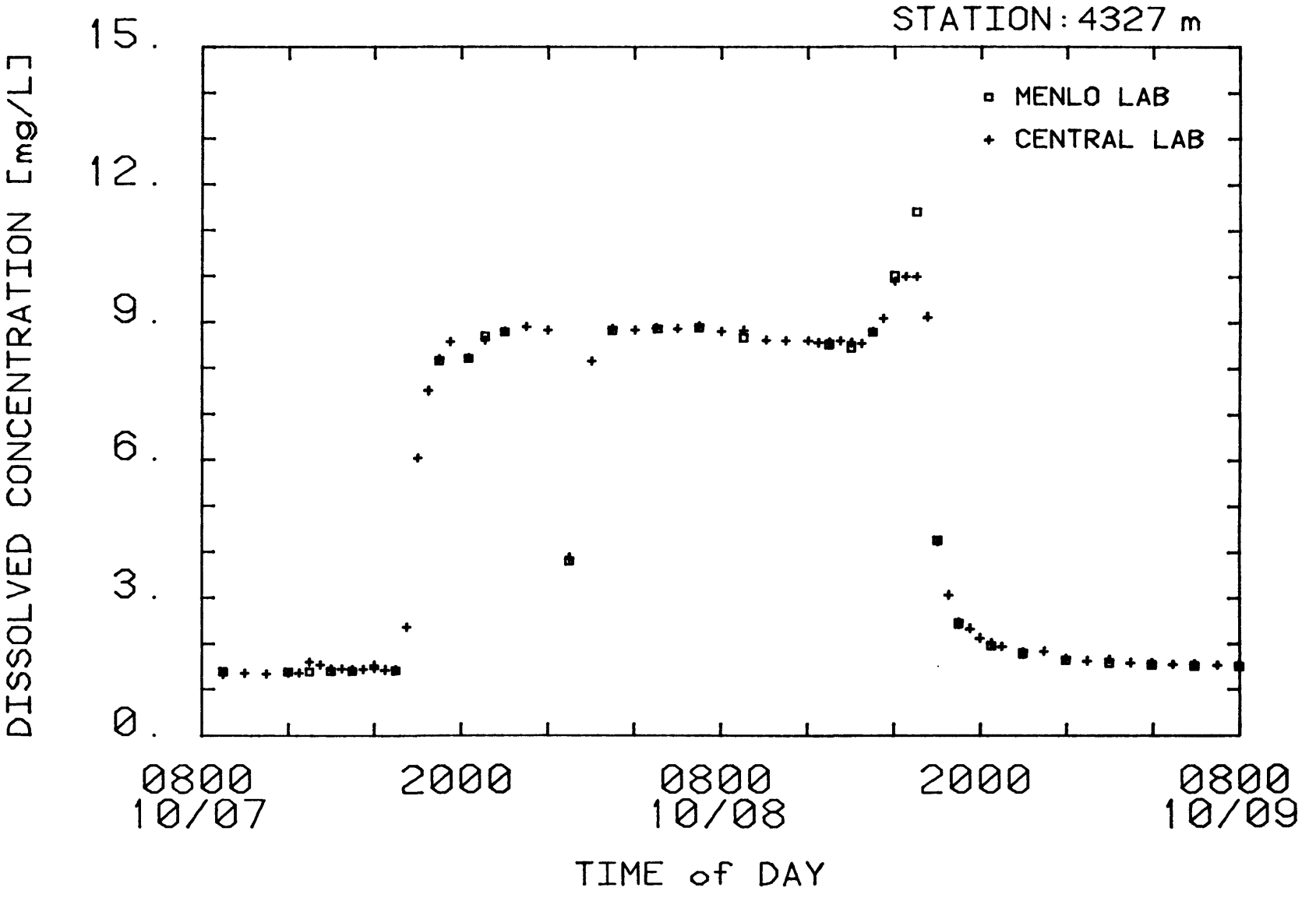
		CONCENTRATION (mg/L)			
		LABORATORY		DIFFERENCE	
DATE	TIME	MENLO	CENTRAL	mg/L	PERCENT
OCT 07	0900	1.09	1.07	0.02	1.83
OCT 07	1200	1.09	1.09	0.00	0.00
OCT 07	1300	1.09	1.08	0.01	0.92
OCT 07	1400	1.10	1.09	0.01	0.91
OCT 07	1500	1.09	1.09	0.00	0.00
OCT 07	1600	1.09	1.06	0.03	2.75
OCT 07	1700	1.09	1.09	0.00	0.00
OCT 07	1900	2.96	3.12	-0.16	-5.41
OCT 07	2029	3.01	3.11	-0.10	-3.32
OCT 07	2114	3.14	3.30	-0.16	-5.10
OCT 07	2207	3.17	3.30	-0.13	-4.10
OCT 08	0108	1.82	1.89	-0.07	-3.85
OCT 08	0309	3.20	3.36	-0.16	-5.00
OCT 08	0501	3.21	3.42	-0.21	-6.54
OCT 08	0706	3.18	3.30	-0.12	-3.77
OCT 08	0914	3.06	3.20	-0.14	-4.58
OCT 08	1307	3.05	3.19	-0.14	-4.59
OCT 08	1507	3.25	3.40	-0.15	-4.62
OCT 08	1708	3.96	4.07	-0.11	-2.78
OCT 08	1906	1.38	1.44	-0.06	-4.35
OCT 08	2033	1.26	1.32	-0.06	-4.76
OCT 08	2202	1.20	1.33	-0.13	-10.8
OCT 09	0003	1.17	1.23	-0.06	-5.13
OCT 09	0206	1.15	1.19	-0.04	-3.48
OCT 09	0401	1.13	1.17	-0.04	-3.54
OCT 09	0559	1.12	1.17	-0.05	-4.46
OCT 09	0803	1.12	1.15	-0.03	-2.68
OCT 09	0918	1.12	1.19	-0.17	-6.25

MEAN DIFFERENCE mg/L -0.08
MEAN DIFFERENCE PERCENT -3.31

LEVIATHAN CREEK_82 CHLORIDE



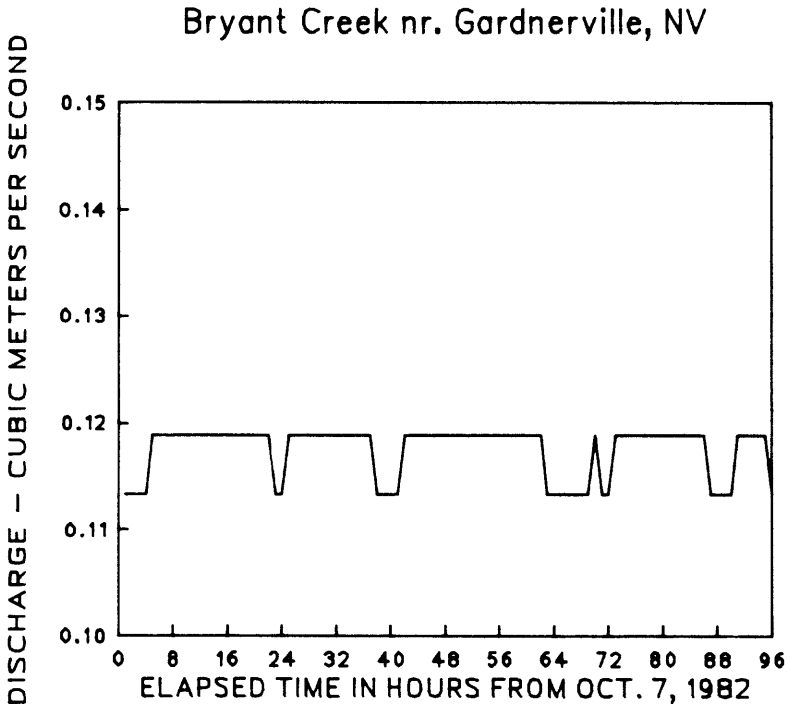
LEVIATHAN CREEK_82 CHLORIDE

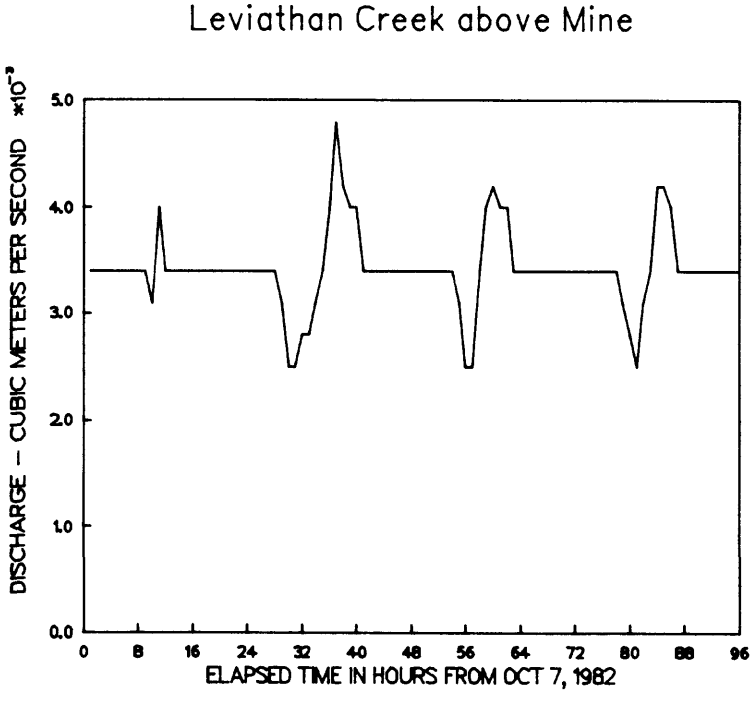


Appendix III

INSTANTANEOUS DISCHARGE MEASUREMENTS
LEVIATHAN CREEK -- OCTOBER 1982

STATION	DISCHARGE m^3/s 10-04-82	10-05-82	10-07-82
43 m	---	0.0082	0.0048
265 m	---	---	0.0062
542 m	---	0.0079	---
552 m (4L C)	---	0.0020	---
577 m	---	0.0113	0.0048
1577 m	---	0.0074	---
1606 m (Aspen C)	0.0136	---	---
1674 m	0.0238	---	---
4327 m	0.0405	---	---
4355 m (Mountaineer C)	0.0575	---	0.0663
4381 m	0.0898	---	---
12754 m	0.1124	---	0.1087


Bryant Creek nr. Gardnerville, NV
DISCHARGE – CUBIC METERS PER SECOND
0.15
0.14
0.13
0.12
0.11
0.10
0 8 16 24 32 40 48 56 64 72 80 88 96
ELAPSED TIME IN HOURS FROM OCT. 7, 1982


Leviathan Creek above Mine
DISCHARGE – CUBIC METERS PER SECOND *10⁻³
5.0
4.0
3.0
2.0
1.0
0.0
0 8 16 24 32 40 48 56 64 72 80 88 96
ELAPSED TIME IN HOURS FROM OCT 7, 1982