PHYSICAL AND CHEMICAL DATA FOR NORTHERN SAN FRANCISCO BAY, CALIFORNIA, SEPTEMBER THROUGH NOVEMBER, 1984

Allan Y. Ota, Laurence E. Schemel, and Stephen W. Hager

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ABSTRACT

This report presents physical and chemical data for northern San Francisco Bay waters. Samples were collected during the late summer and fall of 1984 during six cruises at near-two-week intervals. Bay waters were sampled at designated (historical) stations and selected salinities along the deep channel of northern San Francisco Bay. Measurements included temperature, salinity, turbidity, *in vivo* fluorescence, chlorophyll *a*, alkalinity, suspended particulate matter, dissolved organic carbon, and dissolved inorganic nutrients: nitrite, nitrate + nitrite, ammonium, dissolved silica, and ortho-phosphate. Numerical results are tabulated and methods are described.

INTRODUCTION

In the late summer and fall of 1984 (12 September through 29 November), six cruises were conducted at near-two-week intervals in Northern San Francisco Bay and Sacramento River delta (fig. 1). In conjunction with these cruises, daily samples were collected at Rio Vista, upstream on the Sacramento River (Ota et al., 1986). Our goal was to observe the influence of variability in the freshwater input (flow and chemical composition) from the delta on physical state and chemical composition of the estuary. Temperature, salinity, turbidity, *in vivo* fluorescence, chlorophyll *a*, alkalinity, suspended particulate matter, dissolved organic carbon, and dissolved inorganic nutrients: nitrite, nitrate + nitrite, ammonium, dissolved silica, and ortho-phosphate were measured. This report presents numerical values for these measurements and describes the methods of analysis. The scientific personnel and their primary areas of responsibility are listed in Table A.

METHODS

This study utilized a sampling system on the RV Polaris which has evolved since 1969 (Schemel and Dedini, 1979; Dedini and Schemel, 1980). The present system operates with two continuous-flow pumps, one in the bow and the other off a stern winch, and can accommodate both continuous longitudinal subsurface (approximately 1 meter depth) sampling and vertical sampling of the water column. Sample water provided by either the bow or stern pump is split into two fractions. One fraction is piped through on-line instrumentation for instantaneous measurements of temperature, salinity, depth, turbidity, and fluorescence. The remaining fraction is available for collection of discrete samples used for calibration of these instantaneous measurements and analyses of other properties such as alkalinity, chlorophyll a, suspended particulate matter, dissolved inorganic nutrients and dissolved organic carbon.

Position

Station position (fig. 1) was determined by radar and visual sightings of navigational aids (Smith and Herndon, 1983). As in previous reports, they are reported to the nearest 0.1 kilometer, in the Universal Transverse Mercator system (UTM), a metric coordinate system that allows direct computation of distances (Richardus and Adler, 1972). Discrete subsurface samples were taken from the bow pump without anchoring the vessel, while on a station selected geographically or by salinity (designated as nominal salinity or NS). This procedure required 3-5 minutes of pumping to equilibrate the system before samples were collected and instrument readings were recorded. Vertical profiles of water properties were taken at selected stations after the vessel was

anchored. The stern pump was lowered to selected depths (usually 0, 2, 5, 10, 15, and 20 m, wherever possible) and allowed to equilibrate for 3-5 minutes before sampling. At that time, instrument readings were recorded and discrete samples collected. This procedure was repeated for all selected depths.

Time

All times were recorded as local time to the nearest minute, either Pacific Daylight or Pacific Standard Time.

Depth

The pump depth was measured with a pressure transducer having an accuracy equivalent to + or -1 m. Readings listed as zero meters are actually representative of a pump-intake depth of about 0.2 m. Samples taken through the subsurface profiling intake (bow) are listed at a depth of 1 m.

Temperature

Temperature was measured with linearized thermistors mounted at the through-hull fitting of the bow pump (Schemel and Dedini, 1979). The recorded values have a precision of + or -0.1 degrees Celsius (C).

Salinity

Salinity was measured with a flow-through induction salinometer connected to the pump system. Discrete samples were collected at intervals of approximately 2 salinity units for calibration of the

shipboard instrument. Laboratory analysis was performed at 25°C with a Beckman Model RS7-B* salinometer using standard seawater (I.A.P.S.O. P92) as reference. The precision of the laboratory analysis is + or -0.005. Continuous measurements are precise to + or -0.05. Salinity is referenced to the Practical Salinity Scale (Lewis, 1980).

Turbidity

Turbidity was estimated continuously with an in-line connection from pump system to a Turner Designs nephelometer (Schemel and Dedini, 1979). Values have been normalized to the same sensitivity scale.

Fluorescence

In vivo fluorescence was measured continuously using a Turner Designs model 10 fluorometer equipped with a flow-through cell. All reported values are normalized to the same scale. Discrete chlorophyll a samples were analyzed so that the fluorometer readings could be converted to estimates of chlorophyll a.

Chlorophyll a

Discrete samples for chlolphyll a analysis were collected from the pumped sample stream as it exited the fluorometer. The sample was filtered through a Gelman glass fiber filter (coated with $MgCO_3$ solution) under 69 kPa of vacuum. The filter was pulverized in 6-8 mL of 90 percent acetone while immersed in an ice bath. The chlorophyll-filter

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(*) The mention of brand names is for identification purposes and does not constitute endorsement by the U. S. Geological Survey.

suspension was refrigerated for 2-8 hours prior to centrifugation and analysis. A Varian model 635D spectrophotometer measured the absorbances of the supernatant. Chlorophyll a with correction for phaeopigments were calculated from the equations of Lorenzen (1967). Based on replicates, the precision of the analysis was 10 percent.

Alkalinity

Alkalinity of discrete samples was determined in the laboratory by Gran titration at 25°C. The method and apparatus were the same as that described by Schemel (1984) with the addition of a Brinkman semi-automated buret, which was used to add 0.010 mL aliquots of 0.5N HCl to the samples. Bicarbonate end points were usually attained with 0.3-0.4 mL of titrant. The largest error in the analysis is in the determination of the titrant concentration; we estimate this uncertainty to be + or -0.0001 meq. L^{-1}. Other errors are the same as those described by Schemel (1984).

Suspended Particulate Matter

The concentration of suspended particulate matter (SPM) was determined gravimetrically. An aliquot of sample water was vacuum filtered through a preweighed 47 mm, 0.45 um pore-size Flotronics silver filter. The filter was air dried for a minimum of 4 weeks and reweighed. Typical standard deviations of the SPM analysis are discussed in Hager and Harmon (1984).

Dissolved Organic Carbon

The method used to determine dissolved organic carbon (DOC) concentrations was modified from Menzel and Vaccarro (1964). Sample water was filtered through a precombusted (at 450°C) 25 mm glass fiber filter. A 10 mL aliquot was injected into a precombusted (at 450°C) glass ampule which had been previously loaded with 0.2 g potassium persulfate. Then 20 uL of concentrated phosphoric acid was added and the mixture was bubbled 3-5 minutes with nitrogen gas to purge inorganic carbon; afterwards the ampule was sealed with a torch. Duplicate ampules were prepared for each sample. The sealed ampules were then heated at 130°C in an autoclave for 8 hours to oxidize the organic carbon to CO_2. The CO_2 content of each ampule was determined with a Beckman Model 864 infrared analyzer. Sucrose solutions processed in a similar manner were used to prepare standard curves. The precision of the analysis is + or -0.2 mg L^{-1}.

Dissolved Inorganic Nutrients

Discrete samples were filtered through a 47 mm, 0.4 um pore size Nucleopore polycarbonate membrane filter under vacuum of less than 17 kPa. Filtered samples were stored in 30 mL amber Nalgene linear polyethylene bottles that had been preconditioned with 2.5 meq. bicarbonate water. The samples were frozen until 12 hours before analysis when they were allowed to thaw at room temperature. After thawing and before analysis, each sample was vigorously shaken. The dissolved inorganic nutrient measurements included ammonium, nitrite, nitrate + nitrite, orthophosphate, and dissolved silica. Samples were analyzed with a Technicon Auto Analyzer II system modified so that

analyses would be linear over the concentration ranges and salinities measured in the San Francisco Bay and Delta system. The samples were referenced to upscale standards and blanks which were introduced at two- to four-hour intervals. Artificial river water (1.0 meq. L^{-1} $NaHCO_3$) and artificial seawater (Strickland and Parsons, 1968) were used as standards. The five analyses were maintained at 37°C by using a Tecam Circulator C-40 which continuously pumped 37°C water through specially designed heating tubes that insert into the glass mixing coils of each manifold.

Ammonium

The ammonium method is an automated adaptation of the phenolhypochlorite method of Solorzano (1969), similar to that of Head (1971). By using a heating bath temperature of 37°C, as recommended by Berg and Abdullah (1977), and by increasing reaction time with the addition of mixing coils, the method gives maximum color development, low blanks and a high degree of reproducibility. The effect of salinity was minimized by reducing the amount of hypochlorite in the oxidizing reagent. Estimated precision for the range of concentrations measured was + or -0.2 ug-at L^{-1}.

Nitrate + Nitrite

The nitrate + nitrite method was adapted from Technicon (1973) method number AII-100-70W with one additional mixing coil added to increase reaction time for better color stability. Furthermore, 0.121 g copper sulfate was added to 200 g ammonium chloride in 18 L of deionized distilled water, as suggested by Connors and Beland (1976). The pH of

this reagent was not adjusted. The copper sulfate reduced cadmium column deterioration. Estimated precision for the range of concentrations measured was + or -0.1 ug-at L^{-1}.

Nitrite

The nitrite method was an adaptation of Technicon (1973) method number AII-100-70W with the cadmium column removed. In order to fit all five analyses on a single Technicon proportioning pump, the nitrite sample-ammonium chloride mixture was drawn from the debubbler, which precedes the cadmium column in the nitrate + nitrite analysis. Estimated precision for the range of concentrations measured was + or -0.05 ug-at L^{-1}.

Nitrate and DIN

Nitrate was calculated by subtracting the nitrite value from the N+N value. Dissolved inorganic nitrogen (DIN) was calculated as the sum of nitrate + nitrite and ammonium concentrations.

Dissolved Silica

The dissolved silica method was an adapted from Technicon (1976) method AII-105-71W. A sample tube with half of the original delivery rate was used to extend the linear range to 320 ug-at L^{-1}. To increase reaction time for maximum color development, mixing coils were added before the addition of the oxalic acid and after the addition of ascorbic acid. Estimated precision for the range of concentrations measured was + or -1 ug-at L^{-1}.

Orthophosphate

The orthophosphate method was a modification of Atlas et al. (1971), using ascorbic acid (70 g L^{-1} with 50 ml acetone L^{-1}) as a reductant. This modification allows analysis of samples predigested with hydrogen peroxide and ultraviolet light. To increase reaction time for maximum color development, mixing coil lengths were increased by a factor of 2. Estimated precision for the range of concentrations measured was + or -0.05 ug-at L^{-1}.

DATA

Data are presented in chronological order in Table D.

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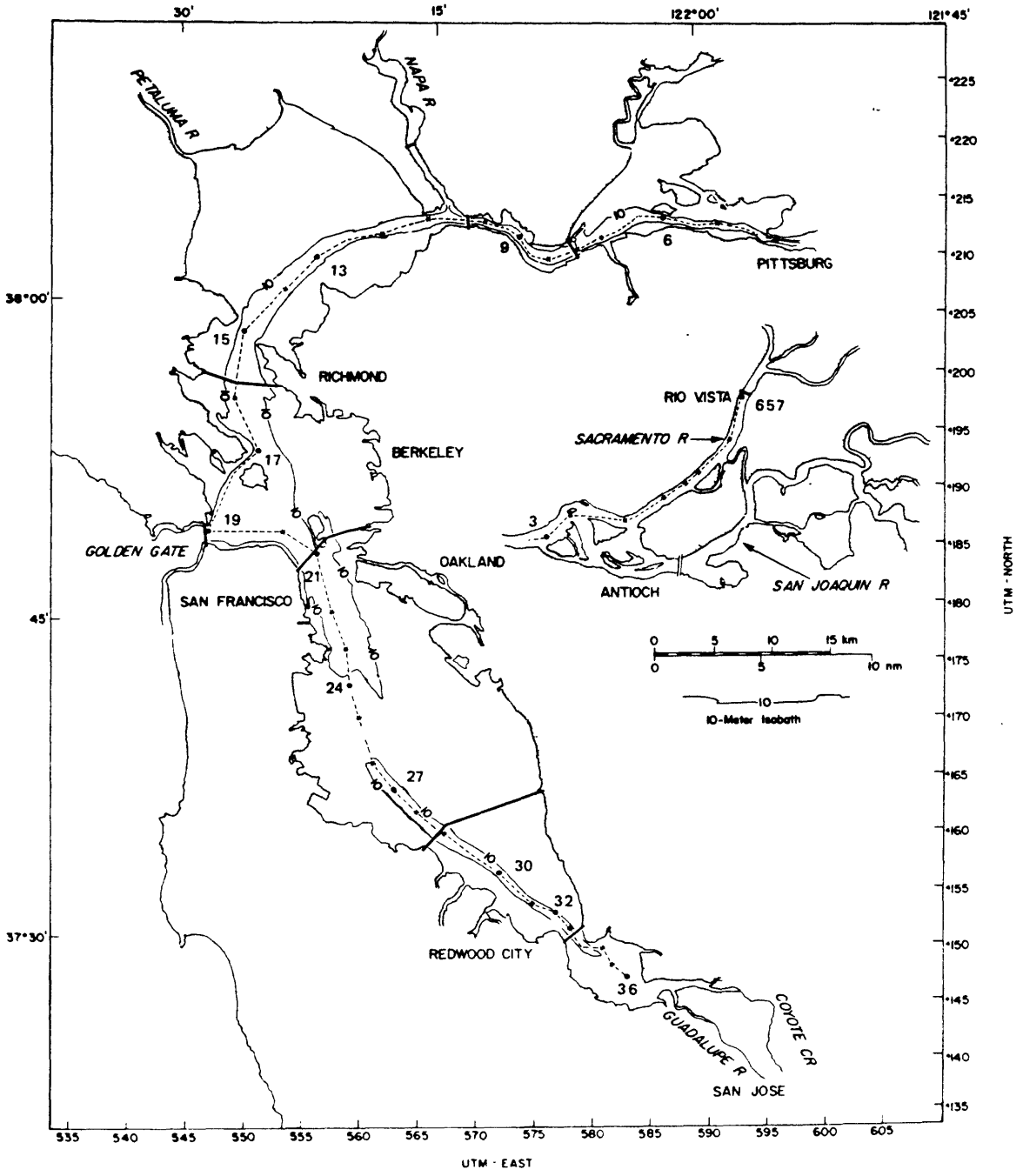

Figure 1. Sampling locations in San Francisco Bay and the Sacramento-San Joaquin Delta.

TABLE A
List of Scientific Personnel

Stephen W. Hager	Dissolved Inorganic Nutrients Suspended Particulate Matter
Andrea Alpine	Chlorophyll-a
Brian Swarthout	Sample processing Data entry
Allan Y. Ota	Dissolved Organic Carbon Suspended Particulate Matter Alkalinity
Laurence E. Schemel	Chief Scientist Specific conductance Alkalinity Dissolved Organic Carbon

TABLE B
Abbreviations Table

Column Title	Definition	Units
TIME	Standard Time	Hours and Minutes
STATION	Sampling Location	
UTM NORTH	Universal Transverse Mercator	Meters
UTM EAST	Universal Transverse Mercator	Meters
DEPTH	Sampling Depth	Meters
TEMP	Temperature	Degrees Celsius
SALIN	Salinity	Parts per Thousand
ALKALIN	Alkalinity	meq L^{-1}
TURBID	Turbidity	
FLUOR	Fluorometer	
CHLOROPHYLL-A	Chlorophyll-a	ug L^{-1}
NO2	Nitrite	uM 1/
NO3+NO2	Nitrate + Nitrite	uM
NITRATE	Nitrate	uM
NH3	Ammonium	uM
PO4	Ortho-Phosphate	uM
SIO2	Dissolved Silica	uM
DIS INO NITROG	Dissolved Inorganic Nitrogen	uM
DIS ORG CARBON	Dissolved Organic Carbon	uM
SUS PAR MATTER	Suspended Particulate Matter	mg L^{-1}

1/ uM = micromolar = umoles L^{-1}. For these nutrients, uM (N,P,Si) = ug-at (N,P,Si) L^{-1} = microgram-atom per liter.

TABLE C

CONVERSION FACTORS

	From	To	Factor
Nitrite	uM[1/]	mg L^{-1}(N)	0.0140
Nitrate + nitrite	uM	mg L^{-1}(N)	0.0140
Ammonium	uM	mg L^{-1}(N)	0.0140
Ortho-phosphate	uM	mg L^{-1}(P)	0.0310
Dissolved silica	uM	mg L^{-1}(Si)	0.0281
Alkalinity	meq L^{-1}	mg L^{-1}($CaCO_3$)	100.

[1/] uM = micromolar = umoles L^{-1}. For these nutrients, uM (N,P,Si) = ug-at (N,P,Si) L^{-1} = microgram-atom per liter.

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
12 SEP 84	84256	1	S F BAY	POLARIS

TIME	STATION	UTM NORTH	UTM EAST	DEPTH M	TEMP DEG C	SALIN PPT	ALKALIN MEQ/L	MOD 10 TURBID	FLUOR	CHLORO PHYLL-A UG/L	NO2 UM	NO3+NO2 UM
729	17	192.6	550.6	0	-	27.03	2.045	0.290	0.089	-	0.49	11.8
736	17	192.6	550.6	2	-	27.05	-	0.320	0.085	-	0.52	11.8
742	17	192.6	550.6	5	-	27.58	-	0.340	0.085	-	-	-
748	17	192.6	550.6	10	-	27.82	2.084	0.340	0.085	-	0.53	12.0
824	16	196.3	548.3	1	19.1	24.44	1.951	0.270	0.098	-	0.51	11.1
908	15	202.4	549.5	0	-	20.86	1.871	0.330	0.082	-	0.45	9.9
914	15	202.4	549.5	2	-	21.43	-	0.390	0.082	-	0.45	10.0
921	15	202.4	549.5	5	-	23.99	-	0.400	0.082	-	-	-
929	15	202.4	549.5	10	-	25.05	-	0.410	0.085	-	-	-
935	15	202.4	549.5	15	-	25.63	-	0.400	0.085	-	-	-
950	-	204.0	550.4	1	19.6	22.20	1.866	0.380	0.092	-	0.41	10.3
1010	14	206.7	552.5	1	19.3	23.96	-	0.270	0.108	-	-	-
1031	13	209.3	555.7	0	-	19.81	-	0.210	0.082	-	-	-
1037	13	209.3	555.7	2	-	20.42	-	0.240	0.104	-	0.38	9.5
1044	13	209.3	555.7	5	-	22.32	-	0.280	0.076	-	-	-
1102	-	210.5	557.9	1	20.7	17.73	1.719	0.270	0.101	-	0.35	8.3
1112	12	211.6	560.4	1	20.9	15.18	1.630	0.360	0.098	-	0.35	7.2
1134	11	212.7	564.6	1	21.0	12.79	1.559	0.560	0.104	-	0.34	6.1
1156	10	212.5	569.5	1	21.1	9.04	-	1.108	0.168	-	-	-
1215	9	211.4	572.5	0	-	8.03	1.418	1.044	0.190	-	0.19	3.4
1221	9	211.4	572.5	2	-	8.25	-	1.171	0.190	-	0.13	3.4
1226	9	211.4	572.5	5	-	9.02	-	1.582	0.180	-	-	-
1231	9	211.4	572.5	10	-	10.71	1.497	1.266	0.149	-	0.29	4.8
1237	9	211.4	572.5	20	-	13.34	-	1.772	0.127	-	-	-
1327	8	209.3	574.5	1	21.5	7.69	-	1.076	0.228	-	-	-
1342	7	211.3	579.3	1	21.7	5.68	1.351	1.171	0.247	-	0.20	2.4
1412	6	213.3	584.7	0	-	2.78	-	1.297	0.210	-	-	-
1416	6	213.3	584.7	2	-	3.37	1.318	2.563	0.240	-	0.13	4.0
1424	6	213.3	584.7	5	-	3.89	-	2.690	0.250	-	-	-
1446	-	212.7	588.3	1	22.7	1.52	1.314	1.930	0.220	-	0.18	3.8
1450	5	212.8	589.5	1	22.5	1.32	-	1.582	0.210	-	-	-
1504	-	211.8	592.7	1	22.7	0.52	1.327	1.962	0.240	-	0.18	3.2
1541	3	211.8	598.4	0	-	0.35	-	1.392	0.230	-	-	-
1545	3	211.8	598.4	2	-	0.38	1.328	1.677	0.250	-	0.20	2.5
1550	3	211.8	598.4	5	-	0.37	-	1.835	0.260	-	-	-
1604	2	213.2	600.4	1	-	0.29	-	1.487	0.250	-	-	-
1634	651	215.0	608.5	1	22.5	0.05	-	0.696	0.170	-	-	-
1644	653	217.1	612.1	1	22.6	0.05	-	0.253	0.130	-	-	-
1725	657	222.9	614.9	1	22.8	0.09	1.376	0.506	0.120	-	0.35	6.8

- DATA NOT AVAILABLE

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ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
12 SEP 84	84256	1	S F BAY	POLARIS

TIME	STATION	DEPTH M	NITRATE UM	NH3 UM	PO4 UM	SIO2 UM	DIS INO NITROG UM	DIS ORG CARBON MG/L	SUS PAR MATER MG/L
729	17	0	11.3	4.6	2.34	60	16.4	1.6	-
736	17	2	11.2	4.5	2.36	61	16.3	-	11.5
742	17	5	-	-	-	-	-	-	-
748	17	10	11.4	4.9	2.32	57	16.8	1.0	-
824	16	1	10.6	3.3	2.31	70	14.9	4.1	-
908	15	0	9.5	3.7	2.27	80	13.7	1.6	-
914	15	2	9.6	4.0	2.32	81	14.0	-	12.5
921	15	5	-	-	-	-	-	-	-
929	15	10	-	-	-	-	-	-	-
935	15	15	-	-	-	-	-	-	-
950	-	1	9.9	4.0	2.28	77	14.3	2.3	-
1010	14	1	-	-	-	-	-	-	-
1031	13	0	-	-	-	-	-	-	-
1037	13	2	9.1	3.1	2.24	80	12.6	-	6.7
1044	13	5	-	-	-	-	-	-	-
1102	-	1	8.0	3.2	2.23	85	11.5	2.6	-
1112	12	1	6.9	3.2	2.18	90	10.4	3.0	-
1134	11	1	5.8	2.7	2.08	95	8.8	3.2	-
1156	10	1	-	-	-	-	-	-	-
1215	9	0	3.2	0.6	1.77	104	4.0	3.6	-
1221	9	2	3.3	1.0	1.84	105	4.4	-	43.6
1226	9	5	-	-	-	-	-	-	-
1231	9	10	4.5	2.1	2.03	99	7.0	-	-
1237	9	20	-	-	-	-	-	-	-
1327	8	1	-	-	-	-	-	-	-
1342	7	1	2.2	0.4	1.80	117	2.8	3.1	51.2
1412	6	0	-	-	-	-	-	-	-
1416	6	2	3.9	0.5	1.86	142	4.5	5.8	99.1
1424	6	5	-	-	-	-	-	-	-
1446	-	1	3.6	0.4	1.91	165	4.2	1.9	86.0
1450	5	1	-	-	-	-	-	1.9	-
1504	-	1	3.0	0.2	1.92	177	3.3	-	96.4
1541	3	0	-	-	-	-	-	-	-
1545	3	2	2.3	0.2	1.95	176	2.8	5.4	64.2
1550	3	5	-	-	-	-	-	-	-
1604	2	1	-	-	-	-	-	-	-
1634	651	1	-	-	-	-	-	-	-
1644	653	1	-	-	-	-	-	-	-
1725	657	1	6.5	5.4	2.18	254	12.3	1.6	14.9

- DATA NOT AVAILABLE

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ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
28 SEP 84	84273	2	S F BAY	POLARIS

TIME	STATION	UTM NORTH	UTM EAST	DEPTH M	TEMP DEG C	SALIN PPT	ALKALIN MEQ/L	MOD 10 TURBID	FLUOR	CHLORO PHYLL-A UG/L	NO2 UM	NO3+NO2 UM
649	657	222.9	614.9	1	19.2	0.08	1.117	0.601	0.066	-	0.61	11.0
729	652	216.0	610.0	1	19.6	0.09	1.130	0.728	0.082	-	0.66	10.3
804	2	213.2	600.4	1	21.0	0.33	1.267	1.171	0.108	-	0.31	7.8
817	3	211.8	598.4	1	21.1	0.47	-	1.171	0.127	-	-	-
822	-	211.4	597.9	1	20.9	0.62	1.272	1.456	0.123	-	0.32	8.3
836	4	211.5	593.4	1	21.1	1.34	-	1.519	0.117	-	0.35	8.3
928	-	212.9	591.4	1	21.1	1.33	1.302	1.297	0.117	-	0.38	8.2
941	5	212.8	589.5	1	21.1	1.60	-	1.361	0.120	-	0.36	8.2
950	-	213.0	586.1	1	21.0	3.25	1.357	1.234	0.123	-	0.33	8.2
955	6	213.3	584.7	1	20.8	3.30	-	1.424	0.120	-	-	-
1010	-	211.4	579.8	1	20.8	6.30	1.457	1.899	0.136	-	0.44	8.2
1028	8	209.3	574.5	1	20.7	7.89	-	2.405	0.142	-	-	-
1031	-	210.5	573.3	1	20.6	9.39	1.545	2.405	0.130	-	0.54	8.5
1040	9	211.4	572.5	1	20.6	8.50	-	1.139	0.104	-	-	-
1047	10	212.5	569.5	1	20.5	10.06	-	1.076	0.089	-	-	-
1100	11	212.7	564.6	1	20.4	12.85	1.631	0.728	0.079	-	0.58	9.0
1114	12	211.6	560.4	1	20.3	14.35	-	0.854	0.079	-	-	-
1117	-	211.7	559.1	1	20.1	16.09	1.729	0.728	0.076	-	0.60	9.5
1134	13	209.3	555.7	1	20.1	17.90	-	0.390	0.099	-	-	-
1137	-	209.2	554.9	1	19.8	20.66	1.854	0.400	0.109	-	0.60	10.1
1151	14	206.7	552.5	1	19.6	21.21	-	0.380	0.111	-	-	-
1209	15	202.4	549.5	1	19.5	21.88	1.897	0.300	0.117	-	0.69	10.0
1234	-	203.0	549.3	1	18.7	25.42	2.006	0.230	0.133	-	0.68	10.4
1242	16	196.3	548.3	1	18.1	27.09	-	0.210	0.111	-	-	-
1301	17	192.6	550.6	1	16.9	29.88	2.156	0.190	0.082	-	0.64	10.2

- DATA NOT AVAILABLE

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
28 SEP 84	84273	2	S F BAY	POLARIS

TIME	STATION	DEPTH M	NITRATE UM	NH3 UM	PO4 UM	SIO2 UM	DIS INO NITROG UM	DIS ORG CARBON MG/L	SUS PAR MATER MG/L
649	657	1	10.4	5.7	2.51	242	16.7	5.1	-
729	652	1	9.7	3.7	2.27	234	14.0	8.5	-
804	2	1	7.5	0.9	2.28	184	8.8	7.6	-
817	3	1	-	-	-	-	-	-	-
822	-	1	8.0	1.1	2.27	181	9.4	3.5	-
836	4	1	7.9	1.9	2.24	167	10.2	-	-
928	-	1	7.8	1.7	2.38	169	9.9	3.4	-
941	5	1	7.8	1.9	2.68	166	10.1	-	-
950	-	1	7.9	3.2	2.23	147	11.4	4.2	-
955	6	1	-	-	-	-	-	-	-
1010	-	1	7.8	4.3	2.30	126	12.5	2.8	-
1028	8	1	-	-	-	-	-	-	-
1031	-	1	8.0	4.9	2.38	112	13.4	2.9	-
1040	9	1	-	-	-	-	-	-	-
1047	10	1	-	-	-	-	-	-	-
1100	11	1	8.4	5.9	2.24	102	14.9	3.1	-
1114	12	1	-	-	-	-	-	-	-
1117	-	1	8.9	6.9	2.37	93	16.3	1.9	-
1134	13	1	-	-	-	-	-	-	-
1137	-	1	9.5	5.9	2.17	79	16.0	2.8	-
1151	14	1	-	-	-	-	-	-	-
1209	15	1	9.3	5.6	2.28	77	15.6	7.2	-
1234	-	1	9.7	4.6	2.15	63	15.0	5.5	-
1242	16	1	-	-	-	-	-	-	-
1301	17	1	9.6	5.4	1.96	43	15.6	1.9	-

- DATA NOT AVAILABLE

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
10 OCT 84	84284	3	S F BAY	POLARIS

TIME	STATION	UTM NORTH	UTM EAST	DEPTH M	TEMP DEG C	SALIN PPT	ALKALIN MEQ/L	MOD 10 TURBID	FLUOR	CHLORO PHYLL-A UG/L	NO2 UM	NO3+NO2 UM
945	17	192.6	550.6	1	16.6	29.52	2.154	0.133	0.089	-	0.71	11.4
955	-	193.4	550.8	1	17.5	26.80	2.070	0.166	0.117	-	0.73	11.8
1009	16	196.3	548.3	1	17.7	25.22	-	0.196	0.123	-	-	-
1020	-	199.8	549.1	1	18.0	23.79	1.962	0.206	0.111	-	0.74	12.3
1030	15	202.4	549.5	1	18.1	23.99	-	0.225	0.095	-	-	-
1045	14	206.7	552.5	1	18.3	22.35	-	0.275	0.127	-	-	-
1056	13	209.3	555.7	1	18.5	21.02	1.885	0.270	0.120	-	0.65	11.2
1109	-	210.7	558.6	1	18.7	17.71	1.785	0.310	0.095	-	0.72	12.6
1117	12	211.6	560.4	1	18.8	16.42	-	0.330	0.082	-	-	-
1127	-	212.1	563.4	1	18.8	14.50	1.684	0.420	0.079	-	0.68	12.5
1133	11	212.7	564.6	1	18.9	13.69	-	0.410	0.082	-	-	-
1148	10	212.5	569.5	1	19.0	9.94	1.537	0.560	0.092	-	0.64	12.9
1155	9	211.4	572.5	1	18.9	10.47	-	0.180	0.082	-	-	-
1207	8	209.3	574.5	1	18.9	8.38	-	0.823	0.104	-	-	-
1217	-	210.7	577.0	1	19.0	6.79	1.443	0.886	0.127	-	0.56	12.6
1225	7	211.3	579.3	1	19.0	6.35	-	1.013	0.117	-	-	-
1240	-	213.3	583.8	1	19.2	4.61	1.364	1.171	0.133	-	0.53	12.8
1245	6	213.3	584.7	1	19.3	3.92	-	0.918	0.130	-	-	-
1250	-	212.9	586.0	1	19.8	1.97	1.261	1.297	0.133	-	0.37	12.0
1302	5	212.8	589.5	1	19.5	1.15	-	1.329	0.136	-	-	-
1304	5	212.8	589.5	1	19.7	0.91	1.208	1.329	0.136	-	0.36	11.5
1316	4	211.5	593.4	1	19.6	0.30	1.101	1.361	0.161	-	0.38	10.7
1333	3	211.8	598.4	1	19.4	0.16	-	1.266	0.174	-	-	-
1340	2	213.2	600.4	1	19.7	0.17	-	1.108	0.171	-	-	-
1356	649	212.9	605.6	1	19.1	0.06	-	0.854	0.161	-	-	-
1411	652	216.0	610.0	1	18.6	0.08	1.080	0.538	0.089	-	-	13.1
1443	657	222.9	614.9	1	18.8	0.01	1.077	0.538	0.057	-	-	-

- DATA NOT AVAILABLE

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
10 OCT 84	84284	3	S F BAY	POLARIS

TIME	STATION	DEPTH M	NITRATE UM	NH3 UM	PO4 UM	SIO2 UM	DIS INO NITROG UM	DIS ORG CARBON MG/L	SUS PAR MATER MG/L
945	17	1	10.7	5.4	2.38	44	16.8	0.0	-
955	-	1	11.1	4.7	2.30	57	16.5	1.7	-
1009	16	1	-	-	-	-	-	-	-
1020	-	1	11.6	4.4	2.27	70	16.7	2.2	-
1030	15	1	-	-	-	-	-	-	-
1045	14	1	-	-	-	-	-	-	-
1056	13	1	10.5	4.9	2.19	76	16.1	0.2	-
1109	-	1	11.9	6.4	2.28	93	19.0	1.8	-
1117	12	1	-	-	-	-	-	-	-
1127	-	1	11.8	6.2	2.32	102	18.7	3.8	-
1133	11	1	-	-	-	-	-	-	-
1148	10	1	12.2	5.1	2.41	120	18.0	2.3	-
1155	9	1	-	-	-	-	-	-	-
1207	8	1	-	-	-	-	-	-	-
1217	-	1	12.0	4.2	2.45	132	16.8	2.1	-
1225	7	1	-	-	-	-	-	-	-
1240	-	1	12.3	4.2	2.49	148	17.1	2.5	-
1245	6	1	-	-	-	-	-	-	-
1250	-	1	11.6	1.7	2.30	170	13.7	1.9	-
1302	5	1	-	-	-	-	-	-	-
1304	5	1	11.1	1.2	2.16	181	12.7	4.0	-
1316	4	1	10.3	0.5	2.16	190	11.2	1.7	-
1333	3	1	-	-	-	-	(-	-	-
1340	2	1	-	-	-	-	-	-	-
1356	649	1	-	-	-	-	-	-	-
1411	652	1	-	5.9	2.37	258	18.9	1.3	-
1443	657	1	-	-	-	-	-	-	-

- DATA NOT AVAILABLE

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
24 OCT 84	84298	4	S F BAY	POLARIS

TIME	STATION	UTM NORTH	UTM EAST	DEPTH M	TEMP DEG C	SALIN PPT	ALKALIN MEQ/L	MOD 10 TURBID	FLUOR	CHLORO PHYLL-A UG/L	NO2 UM	NO3+NO2 UM
1014	17	192.6	550.6	1	14.3	28.30	2.107	0.190	0.096	-	0.70	14.9
1030	16	196.3	548.3	1	14.0	29.41	-	0.300	0.082	-	-	-
1048	15	202.4	549.5	1	14.9	24.69	1.983	0.320	0.111	-	0.76	14.6
1102	14	206.7	552.5	1	14.8	25.19	-	0.340	0.095	-	-	-
1113	13	209.3	555.7	1	15.0	24.09	-	0.500	0.098	-	-	-
1124	-	210.5	558.5	1	15.4	22.23	1.902	0.500	0.092	-	0.69	14.4
1130	12	211.6	560.4	1	15.4	20.70	-	0.300	0.095	-	-	-
1135	-	211.8	561.2	1	15.5	18.50	1.776	0.270	0.095	-	0.65	14.2
1145	11	212.7	564.6	1	15.8	16.42	1.706	0.300	0.092	-	0.68	14.2
1159	10	212.5	569.5	1	15.7	14.94	-	0.400	0.073	-	-	-
1205	-	212.1	570.5	1	15.7	13.90	1.621	0.390	0.073	-	0.65	14.2
1207	9	211.4	572.5	1	15.7	13.76	-	0.380	0.070	-	-	-
1220	8	209.3	574.5	1	15.6	12.20	1.560	0.696	0.066	-	0.55	14.2
1236	7	211.3	579.3	1	15.7	10.09	-	1.203	0.082	-	-	-
1241	-	211.5	580.0	1	15.6	9.54	1.472	2.310	0.101	-	0.60	14.3
1252	-	213.3	583.2	1	15.7	7.03	1.377	1.962	0.101	-	0.53	13.9
1257	6	213.3	584.7	1	15.7	6.67	-	1.456	0.098	-	-	-
1310	-	212.8	588.7	1	16.0	3.23	1.234	1.614	0.108	-	0.33	12.9
1320	-	212.7	587.6	1	15.8	5.37	1.314	1.899	0.108	-	0.47	13.8
1327	5	212.8	589.5	1	16.2	2.83	-	1.772	0.123	-	-	-
1340	4	211.5	593.4	1	16.0	1.97	1.181	1.899	0.139	-	0.34	12.3
1355	3	211.8	598.4	1	15.9	0.51	1.113	2.057	0.206	-	0.35	10.7
1402	2	213.2	600.4	1	16.0	0.34	-	1.392	0.196	-	-	-
1421	649	212.9	605.6	1	15.8	0.15	-	0.981	0.215	-	-	-
1432	651	215.0	608.5	1	14.9	0.07	-	0.823	0.149	-	-	-
1437	652	216.0	610.0	1	14.6	0.08	1.045	0.759	0.139	-	0.67	15.1
1446	653	217.1	612.1	1	14.7	0.07	-	0.854	0.130	-	-	-
1457	655	219.7	613.9	1	14.5	0.04	-	0.696	0.123	-	-	-
1507	657	222.9	614.9	1	14.3	0.08	1.062	0.665	0.099	-	0.60	15.8

- DATA NOT AVAILABLE

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
24 OCT 84	84298	4	S F BAY	POLARIS

TIME	STATION	DEPTH M	NITRATE UM	NH3 UM	PO4 UM	SIO2 UM	DIS INO NITROG UM	DIS ORG CARBON MG/L	SUS PAR MATER MG/L
1014	17	1	14.2	4.4	2.43	55	19.3	1.8	5.1
1030	16	1	-	-	-	-	-	-	-
1048	15	1	13.8	4.9	2.34	72	19.5	2.1	-
1102	14	1	-	-	-	-	-	-	-
1113	13	1	-	-	-	-	-	-	-
1124	-	1	13.7	5.7	2.39	82	20.1	1.6	20.2
1130	12	1	-	-	-	-	-	-	-
1135	-	1	13.6	6.0	2.45	96	20.2	1.9	-
1145	11	1	13.5	6.3	2.48	106	20.5	1.4	-
1159	10	1	-	-	-	-	-	-	-
1205	-	1	13.5	6.3	2.47	117	20.5	3.0	-
1207	9	1	-	-	-	-	-	-	-
1220	8	1	13.7	6.2	2.44	124	20.5	1.6	21.5
1236	7	1	-	-	-	-	-	-	-
1241	-	1	13.7	6.6	2.94	136	20.8	1.8	82.8
1252	-	1	13.4	6.0	2.48	145	19.9	1.8	-
1257	6	1	-	-	-	-	-	-	-
1310	-	1	12.6	3.7	2.39	162	16.7	2.2	-
1320	-	1	13.4	5.8	2.55	153	19.7	2.2	72.4
1327	5	1	-	-	-	-	-	-	-
1340	4	1	11.9	2.5	2.27	167	14.7	2.5	69.2
1355	3	1	10.4	0.7	2.10	171	11.5	2.1	72.5
1402	2	1	-	-	-	-	-	-	-
1421	649	1	-	-	-	-	-	-	-
1432	651	1	-	-	-	-	-	-	-
1437	652	1	14.4	4.4	2.62	241	19.5	1.9	-
1446	653	1	-	-	-	-	-	-	-
1457	655	1	-	-	-	-	-	-	-
1507	657	1	15.2	7.4	2.96	266	23.2	1.7	-

- DATA NOT AVAILABLE

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
7 NOV 84	84312	5	S F BAY	POLARIS

TIME	STATION	UTM NORTH	UTM EAST	DEPTH M	TEMP DEG C	SALIN PPT	ALKALIN MEQ/L	MOD 10 TURBID	FLUOR	CHLORO PHYLL-A UG/L	NO2 UM	NO3+NO2 UM
1007	19	185.6	546.5	1	12.5	31.45	2.226	0.158	0.070	2.5	0.87	16.0
1025	17	192.6	550.6	1	12.7	30.51	-	0.237	0.066	-	-	-
1040	16	196.3	548.3	1	12.8	30.25	-	0.253	0.066	-	-	-
1056	-	200.9	549.0	1	13.4	26.29	2.059	0.400	0.076	-	0.87	18.1
1101	15	202.4	549.5	1	13.4	26.28	-	0.300	0.085	-	-	-
1116	14	206.7	552.5	1	13.4	26.70	-	0.300	0.070	-	-	-
1130	13	209.3	555.7	1	13.5	26.18	-	0.400	0.076	-	-	-
1145	12	211.6	560.4	1	13.8	22.04	1.918	0.300	0.114	-	0.78	18.4
1155	-	212.0	562.9	1	14.0	19.51	1.836	0.600	0.073	-	0.72	16.2
1201	11	212.7	564.6	1	13.9	20.51	-	0.520	0.082	-	-	-
1216	10	212.5	569.5	1	14.0	19.79	-	0.480	0.082	-	-	-
1222	9	211.4	572.5	1	14.1	18.04	-	0.570	0.073	-	-	-
1233	8	209.3	574.5	1	14.0	17.36	1.750	0.450	0.070	-	0.69	15.5
1253	7	211.3	579.3	1	14.2	14.32	1.641	0.830	0.073	-	0.75	17.9
1308	-	213.2	582.6	1	14.4	11.53	1.553	0.770	0.076	-	0.57	13.7
1316	6	213.3	584.7	1	14.4	10.72	-	0.800	0.076	-	-	-
1338	-	214.1	674.3	1	14.4	9.23	1.468	0.633	0.092	-	0.74	16.7
1347	-	213.2	575.2	1	14.5	5.68	1.344	1.297	0.079	-	0.43	16.4
1352	5	212.8	589.5	1	14.5	7.41	-	0.981	0.079	-	-	-
1406	4	211.5	593.4	1	14.6	3.75	1.275	1.994	0.098	3.3	0.29	13.3
1424	3	211.8	598.4	1	14.8	2.41	1.229	1.203	0.101	-	0.28	14.7
1433	2	213.2	600.4	1	14.8	2.23	-	1.709	0.127	-	-	-
1439	-	213.4	602.3	1	14.7	0.90	1.177	1.203	0.146	11.8	0.32	14.6
1506	649	212.9	605.6	1	14.6	0.59	-	1.203	0.155	-	-	-
1512	650	214.0	607.0	1	14.4	0.41	-	1.044	0.146	-	-	-
1518	651	215.0	608.5	1	14.2	0.30	-	0.918	0.127	-	-	-
1523	652	216.0	610.0	1	14.0	0.15	1.168	0.823	0.120	-	0.54	15.9
1534	653	217.1	612.1	1	13.7	0.07	-	0.570	0.082	-	-	-
1540	654	218.5	612.7	1	13.7	0.09	1.154	0.506	0.085	-	0.54	14.8
1615	758	217.2	616.9	1	14.4	0.12	1.134	0.696	0.217	18.4	0.33	13.6
1623	759	216.8	616.0	1	14.2	0.08	-	0.696	0.215	-	-	-
1630	760	216.9	620.1	1	14.1	0.07	-	0.601	0.199	-	-	-
1636	761	217.8	621.4	1	14.0	0.07	-	0.589	0.187	-	-	-
1649	763	217.0	625.0	1	13.8	0.05	-	0.443	0.123	-	-	-
1656	764	215.2	625.6	1	13.6	0.08	1.095	0.411	0.095	-	0.35	15.3
1828	657	222.9	614.9	1	13.3	0.08	1.149	0.475	0.051	-	0.49	14.0

- DATA NOT AVAILABLE

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
7 NOV 84	84312	5	S F BAY	POLARIS

TIME	STATION	DEPTH M	NITRATE UM	NH3 UM	PO4 UM	SIO2 UM	DIS INO NITROG UM	DIS ORG CARBON MG/L	SUS PAR MATER MG/L
1007	19	1	15.1	2.9	1.98	36	18.9	0.9	-
1025	17	1	-	-	-	-	-	-	-
1040	16	1	-	-	-	-	-	-	-
1056	-	1	17.2	5.9	2.45	66	24.0	1.6	-
1101	15	1	-	-	-	-	-	-	-
1116	14	1	-	-	-	-	-	-	-
1130	13	1	-	-	-	-	-	-	-
1145	12	1	17.6	6.6	2.51	87	24.9	1.3	-
1155	-	1	15.5	7.0	2.38	94	23.2	1.3	-
1201	11	1	-	-	-	-	-	-	-
1216	10	1	-	-	-	-	-	-	-
1222	9	1	-	-	-	-	-	-	-
1233	8	1	14.8	6.9	2.30	101	22.3	1.8	-
1253	7	1	17.1	7.8	2.55	114	25.6	2.6	-
1308	-	1	13.1	6.4	2.24	121	20.1	1.9	-
1316	6	1	-	-	-	-	-	-	-
1338	-	1	15.9	7.4	2.56	131	24.0	1.7	-
1347	-	1	16.0	5.5	2.36	141	21.9	1.7	-
1352	5	1	-	-	-	-	-	-	-
1406	4	1	13.1	4.0	2.04	149	17.3	2.5	-
1424	3	1	14.4	3.4	2.26	152	18.1	2.1	-
1433	2	1	-	-	-	-	-	-	-
1439	-	1	14.2	2.4	2.30	165	17.0	1.8	-
1506	649	1	-	-	-	-	-	-	-
1512	650	1	-	-	-	-	-	-	-
1518	651	1	-	-	-	-	-	-	-
1523	652	1	15.4	6.5	2.76	239	22.4	1.4	-
1534	653	1	-	-	-	-	-	-	-
1540	654	1	14.3	7.0	2.78	261	21.9	1.5	-
1615	758	1	13.3	1.0	1.96	150	14.6	2.4	-
1623	759	1	-	-	-	-	-	-	-
1630	760	1	-	-	-	-	-	-	-
1636	761	1	-	-	-	-	-	0.9	-
1649	763	1	-	-	-	-	-	-	-
1656	764	1	15.0	5.9	2.39	245	21.2	1.5	-
1828	657	1	13.5	9.6	2.91	291	23.7	1.0	-

- DATA NOT AVAILABLE

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
29 NOV 84	84334	6	S F BAY	POLARIS

TIME	STATION	UTM NORTH	UTM EAST	DEPTH M	TEMP DEG C	SALIN PPT	ALKALIN MEQ/L	MOD 10 TURBID	FLUOR	CHLORO PHYLL-A UG/L	NO2 UM	NO3+NO2 UM
927	19	185.6	546.5	1	12.1	26.94	2.076	0.260	0.063	1.9	0.63	14.6
950	-	193.1	550.0	1	11.3	20.25	1.827	0.350	0.071	-	0.60	18.0
1001	-	195.0	549.0	1	11.6	21.75	1.890	0.400	0.083	2.7	0.69	17.7
1008	16	196.3	548.3	1	11.8	22.73	-	0.440	0.071	-	-	-
1015	-	197.7	549.0	1	11.9	23.40	1.947	0.430	0.068	-	0.66	16.5
1032	-	201.4	549.2	1	11.1	17.08	1.730	0.560	0.073	-	0.61	19.8
1039	15	202.4	549.5	1	11.1	16.59	-	0.460	0.065	-	-	-
1058	14	206.7	552.5	1	11.5	18.77	-	0.420	0.079	-	-	-
1112	13	209.3	555.7	1	11.3	13.73	1.624	0.420	0.089	2.7	0.63	20.7
1136	-	211.5	559.0	1	11.0	8.79	1.453	0.590	0.076	-	0.57	21.9
1142	12	211.6	560.4	1	11.2	10.89	-	0.730	0.066	-	-	-
1149	-	211.8	561.2	1	11.2	10.72	1.507	0.670	0.066	-	0.61	21.7
1205	11	212.7	564.6	1	11.2	8.09	-	1.139	0.073	-	-	-
1219	-	212.7	567.6	1	11.1	6.32	1.365	0.161	0.082	1.9	0.53	22.7
1230	10	212.5	569.5	1	11.1	4.58	-	0.117	0.076	-	-	-
1238	9	211.4	572.5	1	11.1	5.39	-	0.098	0.073	-	-	-
1244	-	211.1	572.0	1	11.1	4.00	1.287	0.142	0.082	-	0.48	22.8
1258	8	209.3	574.5	1	11.1	2.30	-	0.174	0.085	-	-	-
1302	-	209.5	574.6	1	11.1	1.81	1.202	0.203	0.092	2.5	0.35	18.3
1322	7	211.3	579.3	1	11.0	0.60	1.179	0.203	0.089	-	0.36	23.1
1348	6	213.3	584.7	1	10.7	0.10	-	0.139	0.079	-	-	-
1407	5	212.8	589.5	1	10.7	0.06	-	0.127	0.076	-	-	-
1425	4	211.5	593.4	1	10.5	0.11	1.180	0.098	0.070	-	0.34	19.8
1446	3	211.8	598.4	1	10.4	0.02	-	0.139	0.073	-	-	-
1456	2	213.2	600.4	1	10.7	0.03	-	0.101	0.066	-	-	-
1512	649	212.9	605.6	1	9.9	0.01	-	0.241	0.095	-	-	-
1519	650	214.0	607.0	1	9.7	0.00	-	0.278	0.101	-	-	-
1527	651	215.0	608.5	1	9.8	0.01	-	0.234	0.095	-	-	-
1534	652	216.0	610.0	1	9.8	0.11	1.369	0.190	0.092	-	0.46	24.6
1544	653	217.1	612.1	1	9.7	0.04	-	0.187	0.092	-	-	-
1612	657	222.9	614.9	1	9.5	0.09	1.183	0.212	0.092	1.3	0.32	20.8

- DATA NOT AVAILABLE

U S GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

ESTUARINE RESEARCH GROUP

DATE	JULIAN DATE	CRUISE #	LOCATION	VESSEL
29 NOV 84	84334	6	S F BAY	POLARIS

TIME	STATION	DEPTH M	NITRATE UM	NH3 UM	PO4 UM	SIO2 UM	DIS INO NITROG UM	DIS ORG CARBON MG/L	SUS PAR MATER MG/L
927	19	1	14.0	6.4	2.65	58	21.0	1.0	7.8
950	-	1	17.4	8.3	2.66	98	26.4	2.1	-
1001	-	1	17.0	8.3	2.75	90	26.0	2.8	-
1008	16	1	-	-	-	-	-	-	-
1015	-	1	15.8	7.9	2.66	80	24.4	5.0	-
1032	-	1	19.2	9.5	2.79	118	29.3	1.3	19.2
1039	15	1	-	-	-	-	-	-	-
1058	14	1	-	-	-	-	-	-	-
1112	13	1	20.1	9.2	2.72	127	30.0	7.2	12.4
1136	-	1	21.3	9.1	2.69	170	31.0	2.0	-
1142	12	1	-	-	-	-	-	-	-
1149	-	1	21.1	9.5	2.68	150	31.2	2.1	-
1205	11	1	-	-	-	-	-	-	-
1219	-	1	22.2	8.6	2.54	195	31.3	2.7	43.2
1230	10	1	-	-	-	-	-	-	-
1238	9	1	-	-	-	-	-	-	-
1244	-	1	22.3	8.2	2.46	211	31.0	2.6	-
1258	8	1	-	-	-	-	-	-	-
1302	-	1	17.9	6.7	2.55	237	25.0	2.5	51.9
1322	7	1	22.7	7.1	2.34	244	30.1	2.6	62.0
1348	6	1	-	-	-	-	-	-	-
1407	5	1	-	-	-	-	-	-	-
1425	4	1	19.5	5.3	2.07	288	25.1	2.4	30.5
1446	3	1	-	-	-	-	-	-	-
1456	2	1	-	-	-	-	-	-	-
1512	649	1	-	-	-	-	-	-	-
1519	650	1	-	-	-	-	31.2	-	-
1527	651	1	-	-	-	-	26.4	-	-
1534	652	1	24.2	6.6	2.62	284	31.2	3.7	48.0
1544	653	1	-	-	-	-	-	-	-
1612	657	1	20.5	5.6	1.97	287	26.4	4.0	52.0

- DATA NOT AVAILABLE