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Washington State Marine Water Quality in 1994 and 1995

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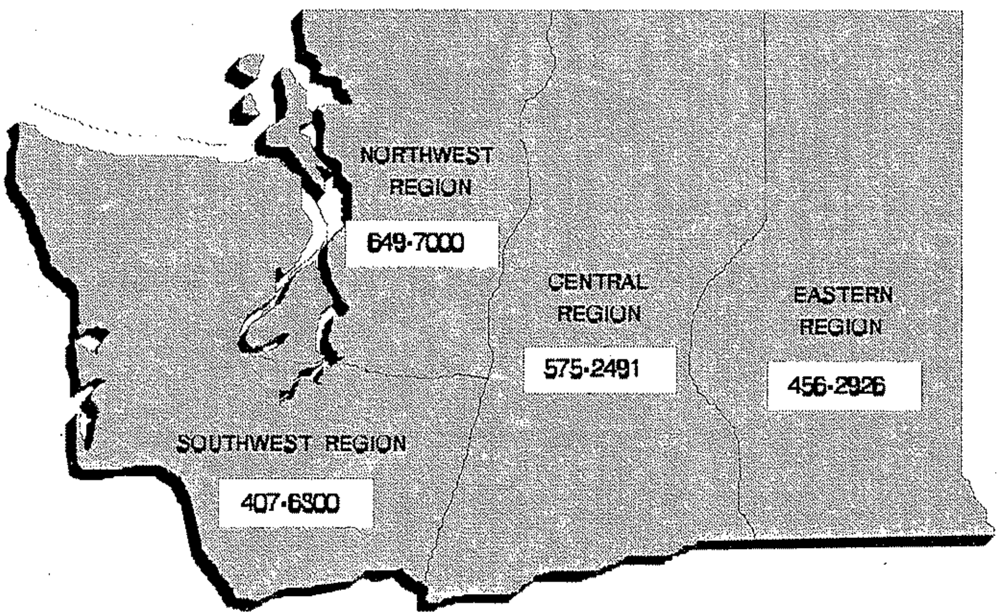

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Washington State Marine Water Quality in 1994 and 1995

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Abstract

Monitoring of marine waters was initiated in 1967 by the Washington State Department of Ecology in order to assess water quality in Puget Sound, Grays Harbor, and Willapa Bay. Data are currently collected monthly for this ongoing, long-term monitoring effort by the Marine Waters Monitoring Program. Monitoring of various water quality parameters during wateryears 1994 and 1995 occurred at 24 and 30 stations, respectively, in Puget Sound and at five stations each year in both Grays Harbor and Willapa Bay (WY 1994 = October 1993 through September 1994). In this report, along with the WY data, five indicators of marine water column environmental condition are presented and discussed.

Climatic conditions of WY 1994-95 were characterized by lower than normal precipitation in WY 1994, particularly in the fall and winter. Air temperatures were generally slightly above average throughout the 2-year period. Runoff of two major rivers (Skykomish and Chehalis) was approximately 70% of the median flow in WY 1994 and approximately 110% of the median flow in WY 1995. Many features of these weather and flow conditions were evident in the sea-surface temperatures and salinities of Puget Sound stations. Grays Harbor and Willapa Bay stations showed less correlation and may be more influenced by oceanic input.

The stratification characteristics of stations were classified into four groups: persistent, seasonal, episodic, and weak. The majority of the Puget Sound monitoring stations were either persistently (18 out of 35 stations) or seasonally (10 out of 35 stations) stratified. The degree of stratification has implications for water column dissolved oxygen (DO) concentrations.

DO concentrations <5 mg/L were measured at 16 stations during WYs 1994-95. In southern Hood Canal, East Sound, Penn Cove, and Budd Inlet DO concentrations were <3 mg/L. Observations of low DO primarily occurred in late summer to early fall but in southern Hood Canal occurred year-round. Similar DO concentrations have been exhibited at these stations in previous wateryears, but conditions at some stations were not as severe.

Very high ammonium-N concentrations (>0.14 mg/L) were seen in East Sound and Elliott Bay, with ten other stations showing high concentrations (>0.07 mg/L). Consecutive months of <0.01 mg/L surface nitrate+nitrite-N are used to indicate stations likely to be affected by eutrophication.

Fecal coliform bacteria counts >14 organisms/100 mL were found at twelve Puget Sound stations and four coastal stations during WY 1994-95. Of these, contamination in Grays Harbor, Willapa Bay (near the Willapa River), and Commencement Bay appeared chronically persistent. The highest (1000's orgs./100 mL) and most persistent counts were in Grays Harbor.

Summary

Water-quality sensitive areas are typically stations near urbanization and where persistent or seasonal density stratification of the water column exists. Well-mixed areas will show less water quality impacts than persistently stratified areas. Water-column stratification in estuaries is predominately maintained by freshwater input from rivers. Rivers or other runoff can also input nutrients that support organic production which will, in turn, deplete oxygen concentrations at stations where physical mixing of the water column is low. Fecal coliform bacteria (fcb) enter marine waters where runoff is high. Thus, areas most sensitive to these water quality problems will be areas with high runoff, low mixing, and anthropogenic inputs of nutrients and sewage.

Climate forcing also plays a large role in affecting water quality. In view of interannual variation due to weather, the impact of humans on water quality is not straightforward to assess. This highlights the importance of long, consistent, time-series databases and the need to incorporate existing historical data.

For the Puget Sound region in general, water quality as indicated by DO, nutrients, and fcb appears to be reasonably good. However, there are individual places within the Puget Sound region where water quality appears reduced. Note, this assessment of water quality does not include chemical contamination, plankton species assemblages, or changes in flushing characteristics. Also, the representativeness of mid-bay stations can be questioned, and definite undersampling of areas within Puget Sound is acknowledged.

Hypoxic DO concentrations (<3 mg/L) were found at relatively few (6 out of 35) Puget Sound stations monitored; however, conditions in southern Hood Canal, East Sound, and Penn Cove appeared to be especially severe and approached anoxia. Low DO concentrations in Hood Canal were evident year-round. Whether anthropogenic processes are responsible for the severity of these conditions needs evaluation. Low DO concentrations (<5 mg/L) were found at 10†additional stations, including Budd Inlet, central Hood Canal, Possession Sound, Saratoga Passage, and Port Susan.

High fcb counts were found at 7 out of 35 Puget Sound stations; conditions in Commencement Bay showed seasonally chronic contamination. Based on all data collected, several other areas showed a distinct sensitivity and propensity towards lower water quality: Budd Inlet, Possession Sound, Sinclair Inlet, and Oakland Bay.

For Grays Harbor and Willapa Bay, water quality appears to be good except for chronic fcb contamination primarily in Grays Harbor. Counts were extremely high in Grays Harbor during the summer of WY 1995. Low DO was not observed in either coastal estuary.

Introduction

This data report of the Washington State Department of Ecology (Ecology) Ambient Monitoring Section (AMS) consists of water quality data for marine waters in Puget Sound, Willapa Bay, and Grays Harbor collected monthly during wateryears 1994 and 1995 (WY 1994 = October 1993 through September 1994). Collection of these data comprises the long-term monitoring component of Ecology's Marine Waters Monitoring Program. Data from the program's other monitoring efforts (focused monitoring in Hood Canal, Snohomish River Estuary, and Whidbey Basin) during WY 1994-95 are not included here.

Marine Waters Monitoring Program Statement of Purpose

The Marine Waters Monitoring Program is designed to measure ambient water quality conditions in Puget Sound and the coastal estuaries (Janzen, 1992a). Long-term ambient monitoring data is required for establishing baseline conditions and can be used to detect effects of contamination and/or habitat degradation resulting from human activities. Ecology has maintained a database of marine water quality data since 1973. Access to the database is provided to the public, either through hard copy or electronic transmission. The long-term database can be used to assess marine water quality throughout Puget Sound, Willapa Bay, and Grays Harbor, seasonal patterns, and the degree of non-seasonal variation at a specific location. The data are also used for the maintenance of regulatory listings of various waterbodies throughout the state. Implementation of marine water quality management activities for Puget Sound and the outer coastal estuaries can be based, in part, on quantitative water quality data such as was gathered by this monitoring program.

Program Objectives

Objectives of Ecology's Marine Waters Monitoring Program in Puget Sound, Willapa Bay, and Grays Harbor are to:

1) Characterize spatial and temporal patterns of basic water quality parameters (e.g., temperature, salinity, density, dissolved oxygen, pH, chlorophyll *a*, transmissometry, nutrients, etc.);

2) Identify significant changes in these parameters that may indicate environmental changes and emerging problems;

3) Collect data that can be used to assess compliance with state and federal water quality regulations and to determine the effectiveness of regulatory actions designed to improve marine water quality;

4) Provide water quality information to support specific programs within Ecology, at the Environmental Protection Agency and other agencies, and those programs identified in the Puget Sound Water Quality Management Plan;

5) Support environmental science research activities through the availability of consistent, scientifically and statistically valid data; and

6) Provide baseline water quality data as a service to the public and any other data requesters.

Program Background

Ecology initiated its statewide Marine Water Column Ambient Monitoring Program in 1967. The original purpose of the program was to determine the water quality of numerous areas on a regular basis and to identify spatial patterns and temporal trends from the results. Many of the original sampling sites were located near municipal and industrial discharges in order to measure the effectiveness of agency regulatory programs. During the program's long history, changes have been made to the original program to meet growing information needs and to incorporate technological advancements in environmental sampling.

In 1986, the Puget Sound Water Quality Authority (PSWQA) appointed an interdisciplinary committee to design the Puget Sound Ambient Monitoring Program (PSAMP) with the objective of coordinating various monitoring efforts within Puget Sound conducted by different government agencies into a comprehensive long-term monitoring program (PSWQA, 1988). Ecology's existing Marine Water Column Ambient Monitoring Program joined PSAMP in 1989. In accordance with PSAMP objectives, many of the near-shore marine water monitoring stations were discontinued in an attempt to focus on background rather than point-source affected conditions. Ecology's marine water column monitoring effort in Puget Sound and its coordination with PSAMP are described in the Marine Water Column Ambient Monitoring Plan (Janzen, 1992a), along with the design for Ecology's monitoring in the coastal estuaries of Willapa Bay and Grays Harbor. The present Marine Waters Monitoring Program continues to follow the design presented in Janzen (1992a), as annually appended (e.g., Newton, 1995a).

Since 1992, Ecology's Marine Waters Monitoring Program has taken two approaches: long-term monitoring and focused monitoring. Long-term monitoring consists of visiting numerous selected stations once per month, with the goal of establishing and maintaining consistent baseline environmental data. Focused monitoring entails sampling an individual estuary with increased spatial and temporal resolution than afforded with long-term monitoring, thus allowing specific hypotheses relevant to environmental status of the specific location to be addressed. Focused monitoring projects conducted in Hood Canal and Whidbey Basin in 1994 and in Snohomish estuary in 1995 are not described in this report.

During 1995, PSAMP underwent external program review. A five-year summary of marine water column monitoring data from Puget Sound collected by Ecology since the implementation of PSAMP is presented in Newton (1995b). Discussion of marine water monitoring issues and recommendations and review panel comments can be found in Newton (1995b) and Shen (1995), respectively.

Methods

Wateryear 1994-95 Long-Term Ambient Monitoring Approach

Ecology's long-term ambient monitoring strategy (Janzen, 1992a) identifies stations as core, rotating, or floating stations. Twenty-six core stations (16 in Puget Sound, 10 in the coastal estuaries) are sampled monthly every wateryear. In Puget Sound, rotating stations are sampled monthly for one wateryear on a three-year rotating schedule. There are 30 rotating stations that are incorporated into the rotation schedule. Floating stations are sampled monthly when specific interest arises (e.g., to augment focused monitoring).

Twenty-four stations were sampled monthly in Puget Sound during WY 1994, and thirty during WY 1995 (Figure 1). One station, JDF007, was monitored for two months only during WY 1994. Five stations were sampled in Grays Harbor and five in Willapa Bay during both years (Figure 2). Station information and the parameters sampled are listed in Table 1.

Materials and Procedures

Field Procedures

Long-term monitoring was conducted from a DeHavilland Beaver floatplane which allowed a large geographic area to be sampled in a short amount of time. Four surveys were scheduled in separate weeks each month to complete sampling throughout the Puget Sound and coastal station networks. Approximately eight to ten stations were sampled per survey. Sample collection methods were in compliance with the Recommended Guidelines for Measuring Conventional Marine Water Column Variables in Puget Sound (Puget Sound Estuary Program (PSEP), 1991a) and are described in detail by Janzen (1992a). Major features are summarized below.

A Sea-Bird Electronics, Inc. Seacat® model SBE-19 conductivity-temperature-depth profiler (CTD) was used for collecting continuous water column profile data. In addition to measuring conductivity (used to compute salinity and density), temperature, and pressure, the CTD was equipped with sensors to measure pH, dissolved oxygen (DO), and light transmission. Both the conductivity and DO sensors were flushed continuously with sample water by a pump attached to and powered by the CTD. In WY 1994-95, profiles at each station were conducted from the sea surface to 100 m depth, or the sea bottom when shallower.

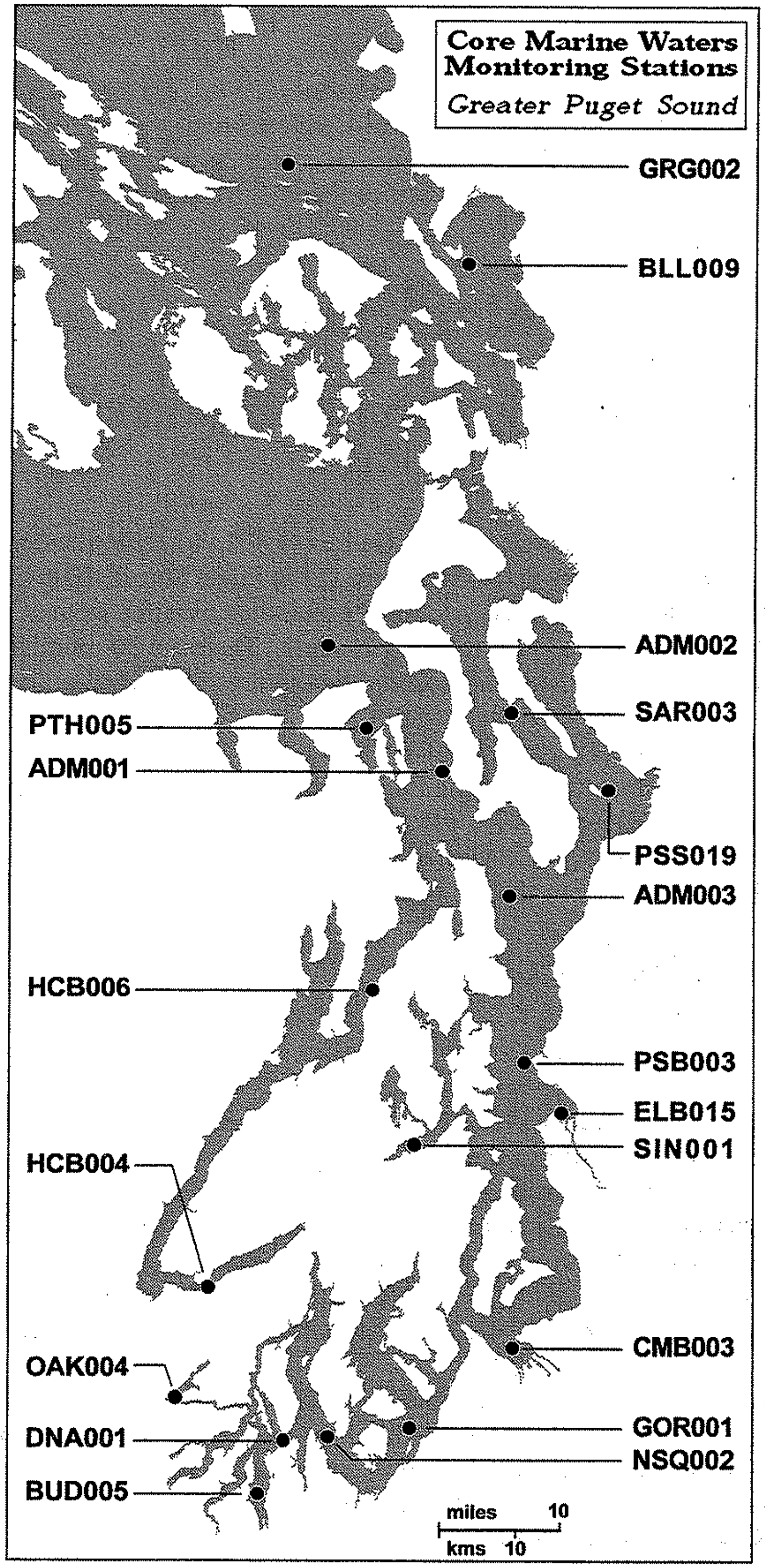

Figure 1A. Long-term Marine Waters Monitoring core stations in Puget Sound.

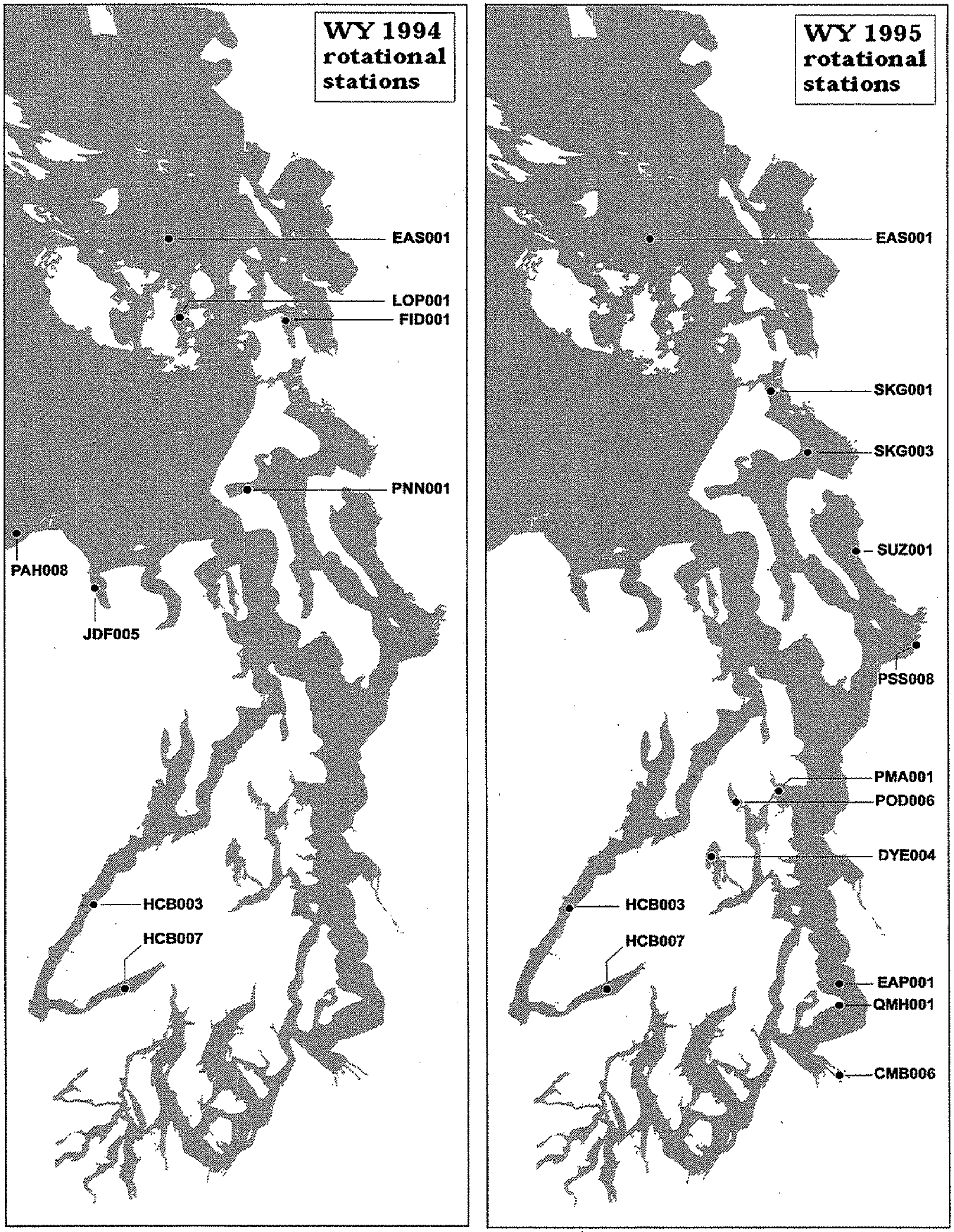

Figure 1B. Marine Waters Monitoring rotational stations for WY 1994-95 in Puget Sound.

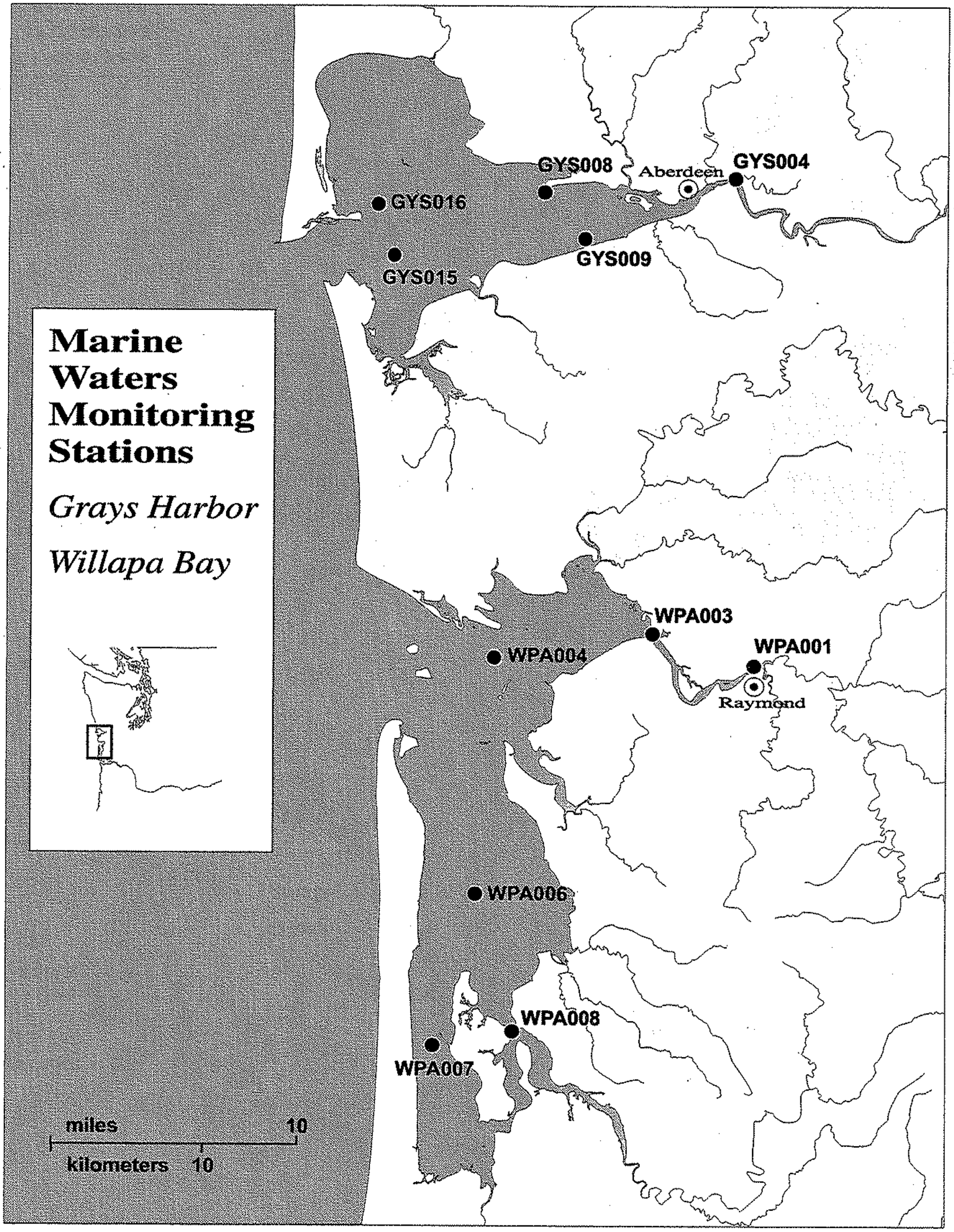

Figure 2. Long-term Marine Waters Monitoring stations for WY 1994-95 in Grays Harbor and Willapa Bay.

Table 1. Marine Waters Monitoring stations sampled during WY 1994-95. Station type notation is C = core station, R = rotating station, and F = floating station. Samples listed as from 0 m were taken from 0.5 m, except the fecal coliform bacteria sample which was from 0.1 m.

Station	Type	WY sampled	Basin	Parameters sampled*	Sample depths (m)
Puget Sound:					
ADM001	C	94, 95	Admiralty Inlet	All Parameters	0, 10, 30
ADM002	C	94, 95	Strait of Juan de Fuca	All Parameters	0, 10, 30
BLL009	C	94, 95	San Juan Basin	All Parameters	0, 10
BUD002	F	95	Southern Basin	CTD and Secchi	0, 10
BUD005	C	94, 95	Southern Basin	All Parameters	0, 10
CMB003	C	94, 95	PS Main Basin	All Parameters	0, 10, 30
CMB006	R	95	PS Main Basin	All Parameters	0, 10
DNA001	C	94, 95	Southern Basin	All Parameters	0, 10, 30
DYE004	R	95	PS Main Basin	All Parameters	0, 10, 30
EAP001	R	95	PS Main Basin	All Parameters	0, 10, 30
EAS001	R	94, 95	San Juan Basin	CTD and S 94 / All 95	0, 10, 30
ELB015	C	94, 95	PS Main Basin	All Parameters	0, 10, 30
FID001	R	94	San Juan Basin	All Parameters	0, 10
GRG002	C	94, 95	Strait of Georgia	All Parameters	0, 10, 30
HCB003	F	94, 95	Hood Canal Basin	CTD and Secchi	0, 10, 30
HCB004	C	94, 95	Hood Canal Basin	All Parameters	0, 10, 30
HCB006	C	94, 95	Hood Canal Basin	All Parameters	0, 10, 30
HCB007	F	94, 95	Hood Canal Basin	CTD and Secchi	0, 10
JDF005	R	94	Strait of Juan de Fuca	All Parameters	0, 10, 30
JDF007	R	94 (2 mo.)	Strait of Juan de Fuca	CTD and Secchi	0, 10
LOP001	R	94	San Juan Basin	CTD and Secchi	0, 10
OAK004	C	94, 95	Southern Basin	All Parameters	0, 10
PAH008	R	94	Strait of Juan de Fuca	All Parameters	0, 10
PMA001	R	95	PS Main Basin	All Parameters	0, 10, 30
PNN001	R	94	Whidbey Basin	All Parameters	0, 10
POD006	R	95	PS Main Basin	All Parameters	0, 10
PSB003	C	94, 95	PS Main Basin	All Parameters	0, 10, 30
PSS008	R	95	Whidbey Basin	All Parameters	0, 10
PSS019	C	94, 95	Whidbey Basin	All Parameters	0, 10, 30
PTH005	C	94, 95	Admiralty Inlet	All Parameters	0, 10, 30
QMH001	R	95	PS Main Basin	All Parameters	0, 10
SAR003	C	94, 95	Whidbey Basin	All Parameters	0, 10, 30
SIN001	C	94, 95	PS Main Basin	All Parameters	0, 10
SKG001	R	95	Whidbey Basin	All Parameters	0, 10
SKG003	R	95	Whidbey Basin	All Parameters	0, 10
SUZ001	R	95	Whidbey Basin	All Parameters	0, 10, 30
Coastal Estuaries:					
GYS004	C	94, 95	Grays Harbor	All except pigments	0, 10
GYS008	C	94, 95	Grays Harbor	All Parameters	0, 10
GYS009	C	94, 95	Grays Harbor	CTD and Secchi	0, 10
GYS015	C	94, 95	Grays Harbor	CTD and Secchi	0, 10
GYS016	C	94, 95	Grays Harbor	All Parameters	0, 10
WPA001	C	94, 95	Willapa Bay	All except pigments	0, 10
WPA003	C	94, 95	Willapa Bay	All Parameters	0, 10
WPA004	C	94, 95	Willapa Bay	All Parameters	0, 10
WPA006	C	94, 95	Willapa Bay	All Parameters	0, 10
WPA007	C	94, 95	Willapa Bay	All Parameters	0, 10

*All parameters refers to: CTD profile, Secchi depth, dissolved nutrients (see text), pigments (0.5 m, 10 m only), and fecal coliform bacteria (0.1 m only).

Secchi disk depths were used to indicate water clarity and derive the extinction coefficient of incident light penetration through the water column. Secchi depths (to the nearest 0.1 m) were taken at each station using a solid white, 30-cm disk. Surface water conditions (glare and waves) are the main source of inaccuracy in Secchi depth readings. To help reduce sources of error, all field crew were trained to conduct Secchi depth readings using the same procedure. If surface conditions were not optimal, the reading was not recorded or was recorded as an estimate.

A 1.2-L Niskin® bottle was used to collect water at 0.5, 10, and 30 m. For stations shallower than either 10 or 30 m, a sample at the near-bottom depth (0.5-1 m off sea bed) was taken. Ideally, discrete water-column sampling would be done above and below the pycnocline (the layer of rapidly changing density); however, lack of real-time CTD data display capability from the present sampling platform precluded this. Data for these fixed depths must be interpreted with knowledge of the CTD profile made at the time. Discrete water samples were taken from the Niskin bottle for dissolved nutrients (ammonium-N, nitrite-N, nitrate+nitrite-N, and orthophosphate-P), and pigments (chlorophyll *a* and phaeopigment). Analysis of nitrite-N has been conducted in three urban bay stations only (BUD005, CMB003, and BLL009) since May 1992, due to the preponderance of nitrite concentrations below the reporting limit in the preceding years. Discrete samples for DO and salinity were drawn periodically for comparison with the *in situ* sensor values. Samples for fecal coliform bacteria were collected just below the surface (0.1-m) using sterile glass sample bottles.

Laboratory Procedures

Analyses for dissolved nutrients, pigments, and fecal coliform bacteria were conducted at the Manchester Environmental Laboratory (MEL) using methods described in Ecology (1992).

All nutrient samples were maintained at 4°C and then filtered through Nalgene® 0.45 µm pore cellulose acetate filters at MEL within 24 hours of collection. Nutrient samples were analyzed for ammonium-N, nitrite-N, nitrate+nitrite-N, and orthophosphate-P using an Alpkem® series 300 autoanalyzer at MEL. If immediate analysis was not possible, samples were frozen after being filtered.

Samples for chlorophyll *a* (chl *a*) and phaeopigment (phaeo) were filtered through Whatman® GF/F glass fiber filters (0.70 µm nominal pore size) at the end of the sampling day by AMS staff. The filters were stored in 90% acetone (Eisner, 1994) and frozen in glass centrifuge tubes for transfer to MEL. Prior to WY 1994, filters had been stored in air, which was shown by AMS staff to result in loss of up to 22% of the chlorophyll *a* compared with filter storage in acetone. This difference should be noted in comparisons with pre-WY 1994 data. Determination of chl *a* and phaeopigment concentrations was made by MEL using fluorometric detection with a Sequoia-Turner model 112 fluorometer and the APHA *et al.* (1989) protocol.

Fecal coliform bacteria samples were stored refrigerated and transferred to MEL within 24 hours of collection. Upon arrival, samples were incubated and analyzed using the membrane filter method (APHA *et al.*, 1989).

The discrete samples for DO analysis were analyzed by AMS staff using the azide-modified Winkler method (APHA *et al.*, 1989). Since liquid chemicals were not allowed on the seaplane for safety reasons, powdered forms of the reagents were used. These powdered reagents have the capability to accurately bind oxygen for DO concentrations up to 10 mg/L (Hach, 1989). Results from the Winkler DO analyses were compared with the *in situ* DO results obtained with the CTD's Beckman oxygen sensor to monitor for calibration drift or sensor failure. Only discrete sample results <10 mg/L were used for comparison with the *in situ* sensor. Discrete analyses were not reported in the database.

Discrete salinity samples were analyzed by University of Washington Marine Chemistry Laboratory using a Guildline Instruments, Inc. Autosal® salinometer, using standard seawater as a reference.

Data Management

Results from discrete water sample analyses for all WY 1994-95 stations were entered into Ecology's AMS database (Dbase 4®). Following quality assurance checks, these data were then uploaded into STORET, a national environmental database managed by the United States Environmental Protection Agency.

The CTD data files were processed using Sea-Bird Electronics, Inc. SEASOFT© software (either version 4.024 or 4.207). The CTD data, with the proper calibration coefficients applied, were bin-averaged (an interpolation process that averages sub-groups of data) into half-meter bins. Profiles of salinity and density with depth were derived from measured values of temperature, conductivity, and pressure. Further details on WY 1994-95 CTD processing procedures can be found in the CTD Data Acquisition Software Manual (Sea-Bird Electronics, Inc., 1994; 1995).

All data from the CTD for 0.5, 10, and 30 m depths were entered into the AMS database and uploaded into STORET. If the bottom depth was less than 10 or 30 m, the values at 0.5 m from the bottom were used. The complete CTD profiles were archived in hard-copy and on computer diskettes for subsequent data analysis and retrieval.

Quality Assurance/Quality Control

Data Quality Objectives

Table 2 lists the WY 1994-95 data quality objectives for Ecology's Marine Waters Monitoring Program. These objectives were different from PSAMP quality assurance (QA) objectives (PSWQA, 1988) in the following cases because of laboratory capabilities:

1) Ecology's reporting limits for nitrite-N were 0.01 milligrams per liter (mg/L) whereas PSAMP requests 0.005 mg/L,
2) Ecology's reporting limits for orthophosphate-P were 0.01 mg/L whereas PSAMP requests 0.002 mg/L, and
3) Ecology's precision (relative standard deviation (RSD)) target for chl *a* and phaeopigment was 20% whereas PSAMP requests precision within 10%.

Table 2. Marine Waters Monitoring data quality objectives.

Analytical parameters	Ecology's reporting units[1]	Ecology's reporting limit	Relative standard deviation (RSD)
laboratory analysis parameters:			
ammonium-N	mg/L	0.01	10%
nitrite-N	mg/L	0.01	10%
nitrate+nitrite-N	mg/L	0.01	10%
orthophosphate-P	mg/L	0.01	10%
chlorophyll *a* and phaeopigment	µg/L	0.05	20%
fecal coliform bacteria	#/100 mL	1	20%
salinity	PSU (~ppt)	0.01	8%
CTD parameters:			
salinity	PSU (~ppt)	0.01	8%
temperature	degrees C	0.1	5%
pH	pH units	0.1	0.1 pH unit
dissolved oxygen	mg/L	0.1	8%
light transmission	% light	0.1	5%

[1]Conversion to µg-at/L can be computed as follows:
((mg/L*1000)/16.00) for oxygen; ((mg/L*1000)/14.01) for nitrogen;
((mg/L*1000)/30.97) for phosphorus.

All other target objectives met or exceeded those listed in the PSAMP document. The QA standards and procedures for MEL are described in Ecology (1988).

Additional quality assurance procedures for other laboratory analyses and equipment calibration are in Ecology (1988) and Janzen (1992a). Data qualifiers for laboratory results are given with the station data reports in Appendix A.

Quality Control Procedures

Quality control (QC) for Wateryear 1994-95 (WY 1994 = October 1993 through September 1994) included field replicate samples, laboratory replicate samples, blind split samples, field and laboratory method blanks, laboratory check standards, and matrix spike samples.

Parameters evaluated were: fecal coliform bacteria; pigments (chlorophyll *a* (chl *a*) and phaeopigment (phaeo)); and nutrients (dissolved ammonium-N (NH_4^+-N), dissolved nitrite (NO_2-N) dissolved nitrate+nitrite-N (NO_3^-+NO_2-N), and dissolved orthophosphate ($o PO_4^{-3}$-P)).

During WY 1994-95, one station per survey was selected for field QC procedures. Replicate surface water samples were collected at these same stations each month. A station was selected from each survey where positive results (above reporting limits) were expected. Field replicate results provide an estimate of the total variability (sampling and analytical) in the results for nutrients, pigments, and fecal coliform bacteria. The procedure entailed the collection of triplicate water samples using three separate surface (0.5-m) bottle casts at each selected QA station. The field replicates were sent to the laboratory as blind samples and analyzed for dissolved nutrients and for pigments. Duplicate surface water samples (at 0.1 m) for fecal coliform bacteria analysis were also collected at these pre-selected stations.

The laboratory conducted analysis of splits of the individual QC samples, which provides an estimate of variability due to analytical procedures. Select field samples were split at the laboratory for separate analysis of nutrients and fecal coliform bacteria. A select number of pigment samples were split before filtering and sent to the laboratory as blind samples.

Field blanks for pigments were made from pre-filtered seawater and were sent to the lab as blind samples. Laboratory method blanks for pigments were determined with 90% acetone and fluorometer readings were taken before (pre) and after (post) batch analysis of pigment samples.

Nutrient samples were analyzed in batches. Each batch run included analysis of two blanks, five known concentration check standards (analyzed once before the batch run, and once after), and one spiked sample. Check standards are samples with a known concentration that are analyzed along with the other samples. Check standards are prepared independently of the calibration standards and are used to estimate analytical precision and check for bias due to calibration errors. Matrix spikes for nutrients were prepared in the laboratory by adding a known quantity of analyte (a spike) to an aliquot.

Matrix spike samples indicate the bias in laboratory procedures and instrumentation used in nutrient analysis. If the spike recovery is between 70% and 130%, no interference from the sample matrix is judged to be present, since recoveries will be randomly distributed about a mean of 100%. The acceptance range for spike recovery is wide because the random error in the difference between two measurements is relatively large.

CTD Calibration Procedures

An annual calibration was performed by the Northwest Regional Calibration Center on the CTD's temperature, conductivity and DO sensors, and a biennial calibration was done for the CTD's pressure sensor. In-house calibrations were conducted monthly on the DO and pH sensors, and on the light transmissometer. Calibration procedures for the CTD followed Sea-Bird Electronics, Inc. (1990) and Janzen (1992a). The most recent calibration coefficients were used in processing data, thus maintaining accuracy by correcting for drift in sensor performance.

Results from the discrete DO and salinity analyses were used only to verify that the *in situ* sensors were performing. These discrete samples were obtained following (not at the same time as) the CTD cast and thus cannot be used to correct the *in situ* sensors due to unknown field variation.

Results and Discussion

In WY 1994, 41 of the 48 scheduled weekly monitoring surveys were completed. Of these, 32 of 36 were conducted in Puget Sound, and 9 of 12 in Grays Harbor and Willapa Bay. In WY 1995, 42 of the 48 scheduled weekly monitoring surveys were completed. Of these, 32 of 36 were conducted in Puget Sound, and 10 of 12 in Grays Harbor and Willapa Bay. High winds, fog, and low cloud cover were among the reasons for failure to conduct planned surveys.

Station data, presented in Appendix A, include the 0.5, 10, and 30 m values from the CTD profiles for temperature (°C), salinity (parts per thousand), pH (standard units), DO (both mg/L and percent saturation), and light transmission (percent transmission). Also shown are the Secchi disk depths (m), and laboratory results of discrete water sample analyses for fecal coliform bacteria at 0.1 m (number per 100 mL), dissolved nutrients (mg/L) at 0.5, 10, and 30 m, and pigments (µg/L) at 0.5, and 10 m. All appendices in this report, are divided into two sections: (1) data for Puget Sound stations, and (2) data for the coastal estuary stations (Grays Harbor and Willapa Bay).

Climate

Local weather can influence the water column parameters of Washington inland marine waters noticeably (e.g., Newton, 1995c). Thus it is important to gain an understanding of forcing by weather in a given year. In order to detect how weather (air temperature and precipitation) data for WY 1994 and WY 1995 varied from the long-term mean, anomalies were calculated by subtracting 48-y monthly means from the WY 1994-95 monthly mean values. Both data sets were Sea-Tac Airport data obtained from the National Climate Data Center (NOAA, 1996).

The long-term means of air temperature and precipitation are shown in Figure 3A. Comparisons with anomalies for 1994 (Figure 3B) show a notably dry-period at the beginning of WY 1994, with substantially lower than normal precipitation lasting from October 1993 through January 1994. The balance of WY 1994 continued to be somewhat drier than normal. Precipitation in WY 1995 deviated only slightly from normal (Figure 3C), with heavier amounts in December 1994, followed by a drier than normal January. Temperatures throughout the two-year period tended to be a little above normal, with a warm January occurring during both years.

Fresh water flow during WY 1994 was less than normal, with runoff of the Skykomish and Chehalis Rivers was 77% and 68% of the median flow, respectively (USGS, 1994). These two river systems are considered representative of western Washington. In contrast, fresh water flow during WY 1995 was slightly above normal, with runoff from the Skykomish and Chehalis Rivers at 110% and 113% of the median flow, respectively (USGS, 1995). These river flows do appear to correlate somewhat with precipitation: WY 1994 was drier and had less river flow.

Temperature, Salinity, and Density

Individual profiles of temperature (°C), salinity (PSU = practical salinity units; equivalent to parts per thousand), and density (sigma-*t*) with depth (m) obtained from the CTD casts for the Puget Sound stations monitored during WY 1994-95 are in Appendix B.1; those for Grays Harbor and Willapa Bay are in Appendix B.2. At most stations, profiles were conducted from the sea surface to the sea bed or 100 m, whichever came first.

Temperature and Salinity Anomalies

A seasonal pattern in both weather variables and marine water temperature and salinity is strong in this region (Figure 3; Appendices A and B). In order to see the influence of weather on the physical character of the marine waters, monthly anomalies for both were compared. As with air temperature and precipitation, anomalies (WY monthly value minus the long-term monthly mean value) were calculated for monthly values of sea surface temperature and sea surface salinity.

Five stations from Puget Sound and one each from Willapa Bay and Grays Harbor were selected for calculation of sea-surface temperature and salinity anomalies. The selected stations in Puget Sound were: GRG002, in open waters of the Strait of Georgia, but potentially influenced by the plume of the Fraser River; ADM002, in open waters at the entrance to Admiralty Inlet, over the sill, in an often well-mixed regime that is not near riverine influence; PSB003, in open waters of the Puget Sound main basin off West Point where freshwater input from the Lake Washington ship canal and Elliott Bay (Duwamish River) would be evident; DNA001, in Dana Passage, a thoroughly mixed channel in southern Puget Sound where waters from several estuaries

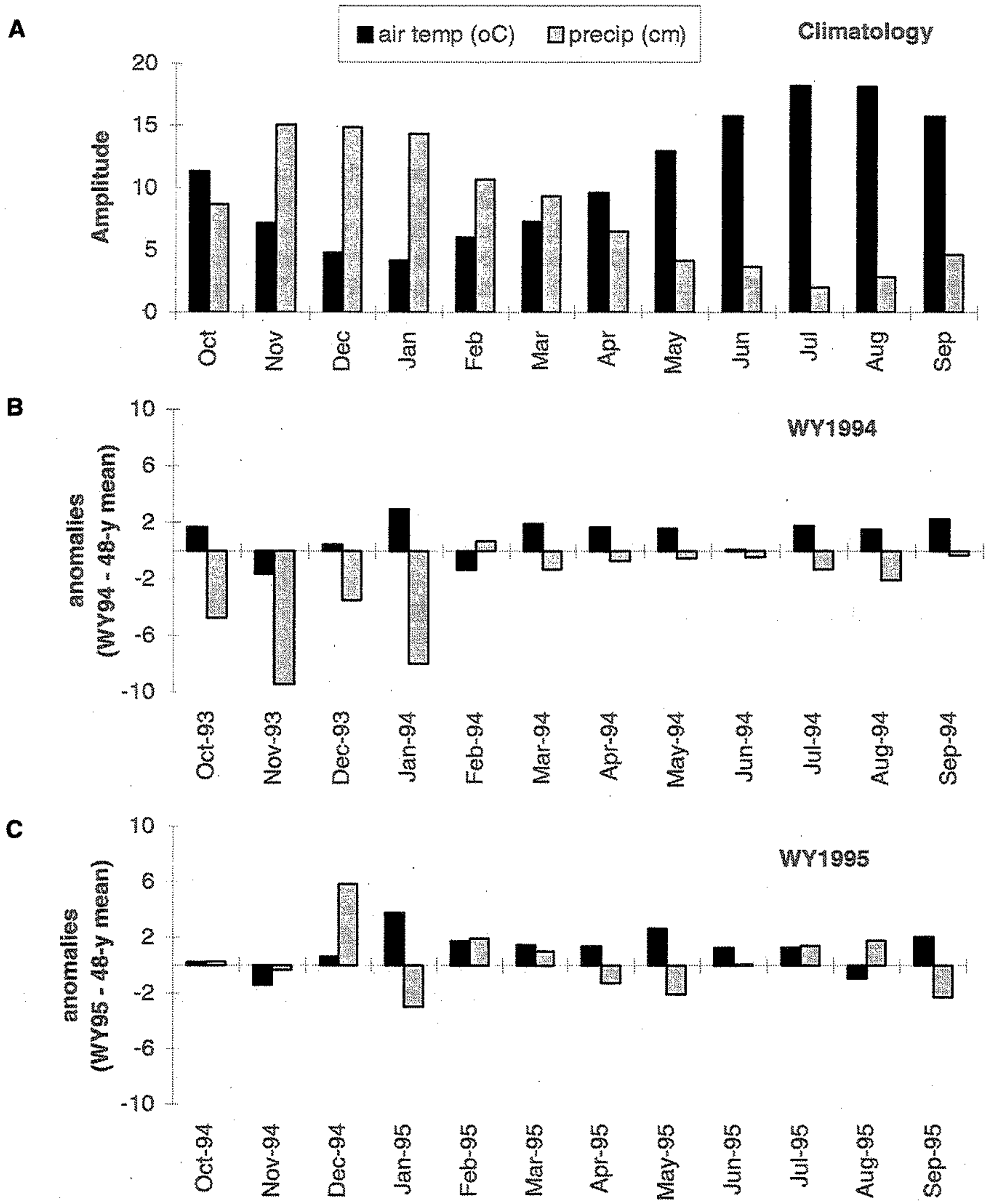

Figure 3. Climate data for WY 1994-95. (A) Climatology (48-year mean, June 1948-May 1996). (B) Anomallies for WY 1994 air temperatures and percipitation compared to 48-year average. Data obtained from National Climate Data Center (NOAA, 1994) for Sea-Tac Airport. (C) Anomalies for WY 1995, as above.

communicate with the main basin waters; and BUD005, a representative southern Puget Sound estuary with riverine input (Deschutes River), and relatively low mixing due to density stratification.

The stations selected in Grays Harbor, GYS009, and Willapa Bay, WPA004, are located intermediate in these estuaries, and thus would be influenced by both riverine input and communication with Pacific Ocean waters. In these coastal estuaries, tidal stage is a strong determinant in the degree of marine versus riverine influence at a given sampling event in these coastal embayments. However, it was not logistically feasible to control for tidal stage in collecting these data.

The anomalies for sea-surface temperature (SST) and salinity must be interpreted with caution, since the long-term means used were only 6-y means (WY 1989 to WY 1995). Adequate data do not exist for calculating monthly means over a longer time period since prior to WY 1989 monitoring did not occur during winter months. Also, unlike the weather anomalies, the sea-surface anomalies are based on a single day's value obtained within the month, as opposed to monthly means.

The SST data for WY 1994-95 showed generally positive SST anomalies throughout the period at most stations (Figures 4A, C). This tendency toward positive SST anomalies is consistent with the overall modest positive anomalies in air temperature (Figure 3).

Anomalies of sea-surface salinity (SSS) were predominantly positive at all Puget Sound stations during WY 1994 (Figure 4B). This might be expected given lower than normal precipitation at Sea-Tac and lower river flow. The fresher salinities in June 1994 occurred during a month of more normal precipitation, relative to the preceding months. Sea-surface salinity anomalies during WY 1995 were generally negative, which correlates with the higher precipitation and river flow during WY 1995 relative to that of WY 1994 (Figures 3, 4D). The low SSS at GRG002 seen occasionally is likely evidence of the Fraser River plume.

Similar plots were made for the coastal estuaries (Figures 5A-D). In both years a transition between colder, fresher anomalies to warmer, saltier anomalies occurred around May to June. This distinct pattern that was observed in WY 1994-95 but not in the long-term mean may be associated with upwelling intensity or entrainment of Columbia River waters. The drier fall through winter of WY 1994 is clearly seen in the lower salinities at both stations during the same time period, but lower salinities are also seen in WY 1995 when precipitation anomalies were normal to positive (Figure 3). Although the applicability of Sea-Tac weather data to these coastal sites is uncertain, the water column conditions in these smaller coastal estuaries are more likely most affected by oceanic inputs. This is indicated by the similarity in the salinity anomaly patterns in WY 1994 and 1995 despite very different Chehalis River runoff in these two years (67% vs. 113% of median flow; USGS, 1994; 1995).

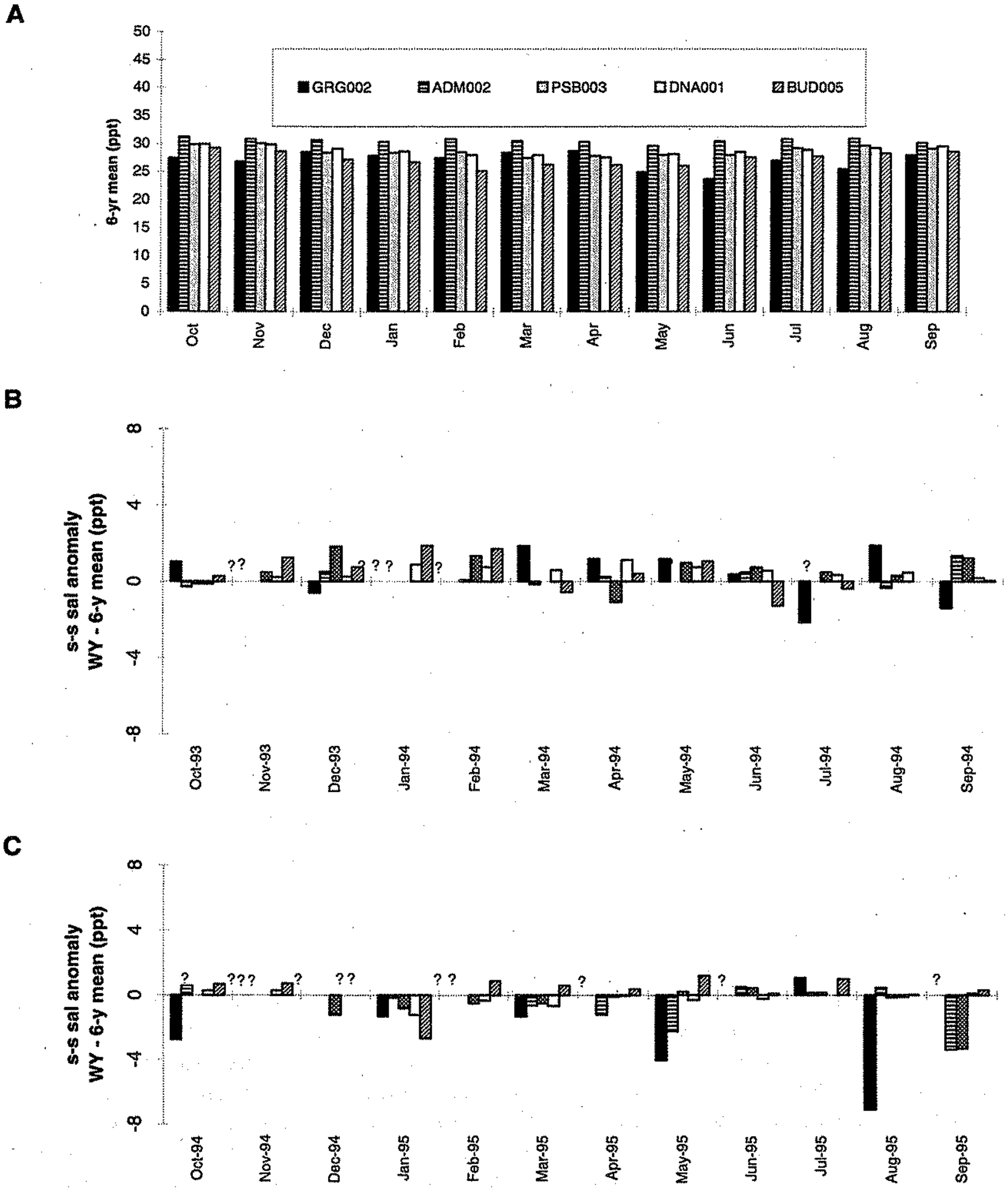

Figure 4. Sea-surface salinity and temperature means and anomalies for several stations in Puget Sound. (A) Six-year sea-surface salinity means (WY 1990-95); (B) WY 1994 sea-surface salinity anomalies; (C) WY 1995 sea-surface anomalies. A "?" denotes no data.

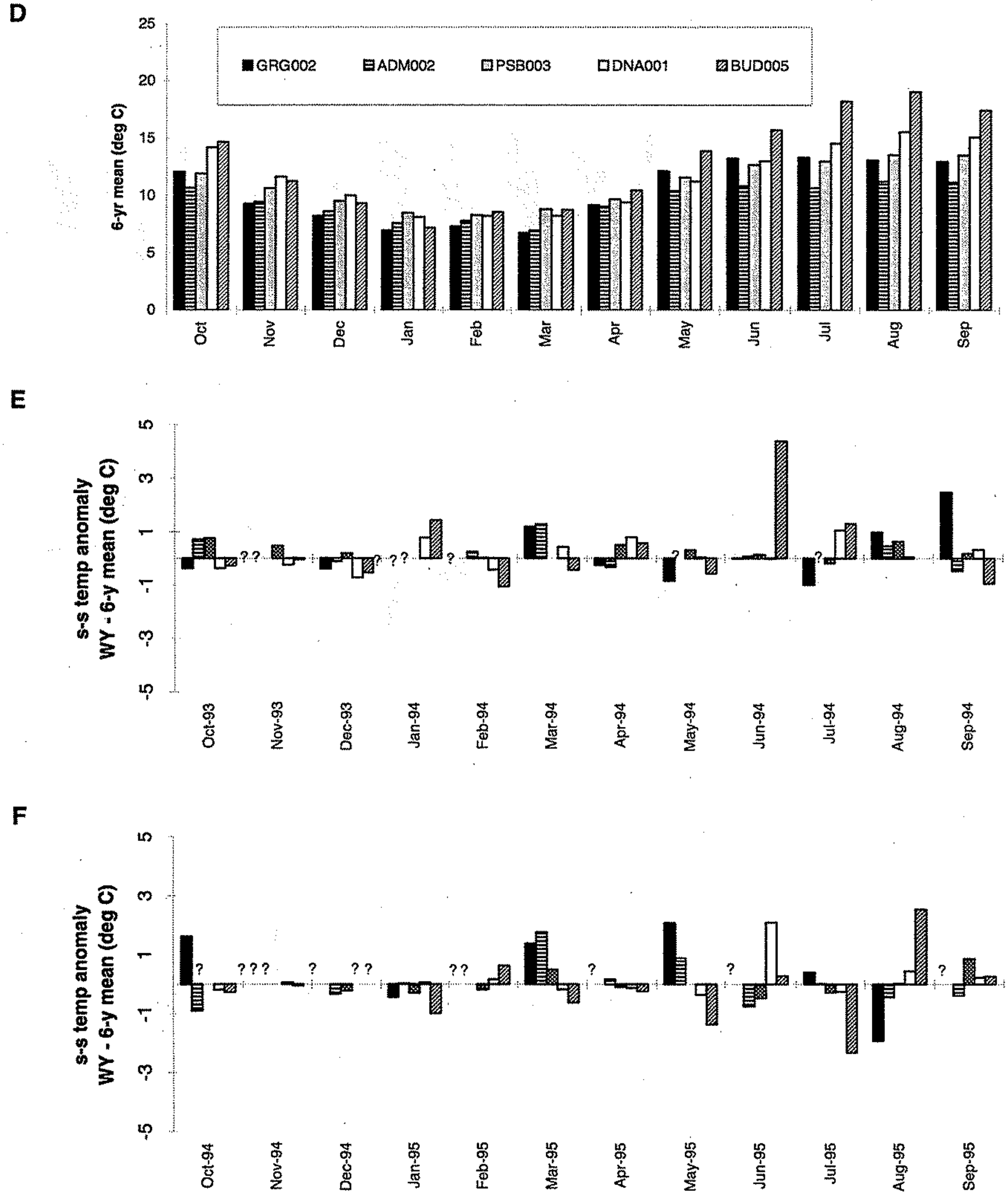

Figure 4. Continued. (D) Six-year sea-surface temperature means (WY 1990-95); (E) WY 1994 sea-surface temperature anomalies; (F) WY 1995 sea-surface temperature anomalies. A "?" denotes no data.

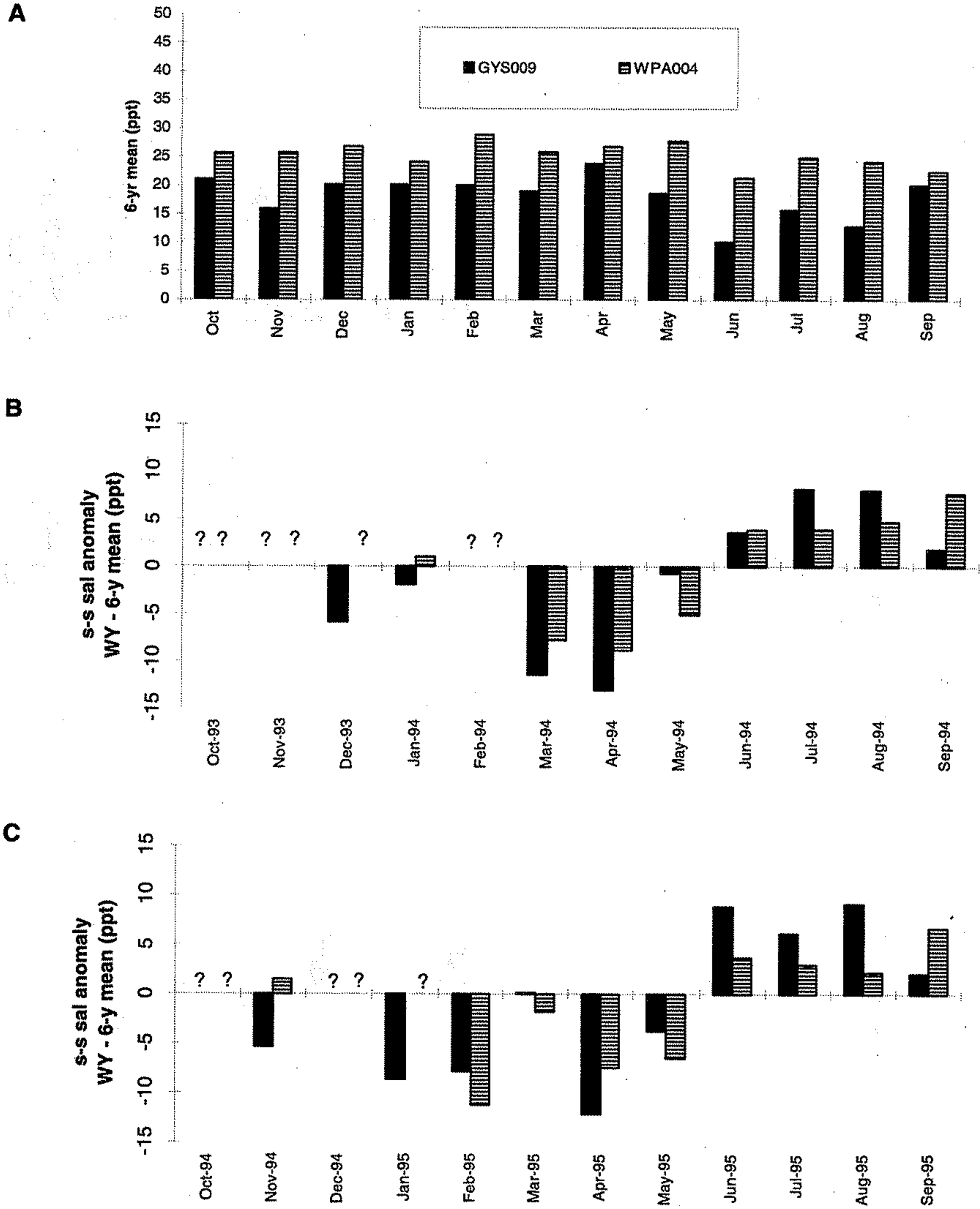

Figure 5. Sea-surface salinity and temperature means and anomalies for one station in each of Willapa Bay and Grays Harbor. (A) Six-year sea-surface salinity means (WY 1990-95); (B) WY 1994 sea-surface salinity anomalies; (C) WY 1995 sea-surface salinity anomalies. A "?" denotes no data.

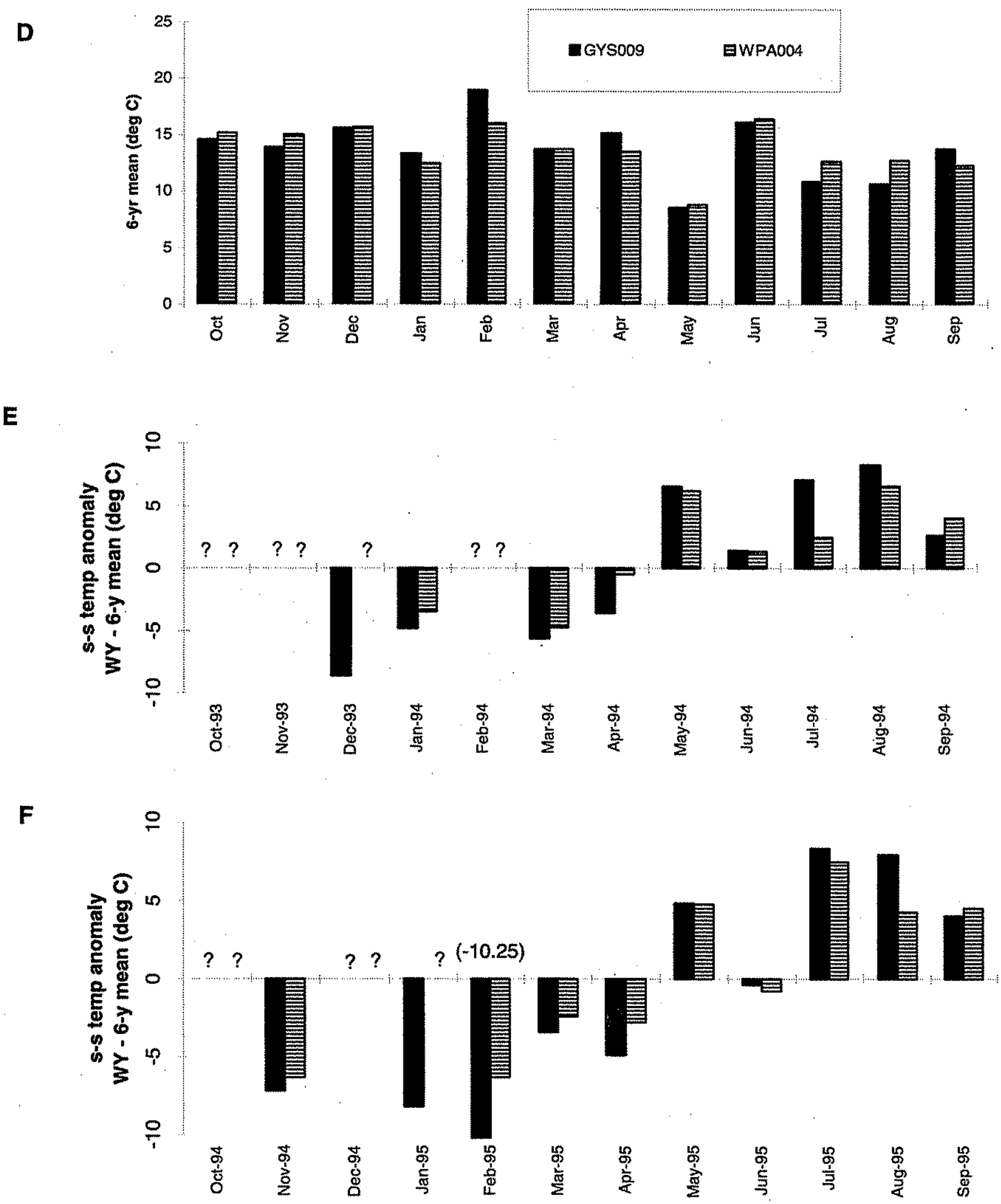

Figure 5. Continued. (D) Six-year sea-surface temperature means (WY 1990-95); (E) WY 1994 sea-surface temperature anomalies; (F) WY 1995 sea-surface temperature anomalies. A "?" denotes no data.

Density Stratification

Stratification refers to the horizontal layering of water masses within the water column due to density differences. Water density is affected by temperature and salinity, increasing with decreasing temperature or with increasing salinity. A change in density of 1 kg m^{-3} can be effected either by a 5°C change in temperature or 1 PSU change in salinity, or a combination of changes in both parameters (Pond and Pickard, 1983).

The vertical profiles of density in Appendix B are plotted in terms of "sigma-*t*," an oceanographic convention used to represent density. Millero and Poisson (1981) have most recently defined sigma-*t* as the density (kg m^3) minus 1000 (kg m^3). Therefore, a density of 1026.95 kg m^3 converts to a sigma-*t* of 26.95 (the units are typically left off). Temperature, salinity, and pressure each contribute to water density. *In situ* temperature and salinity, and atmospheric pressure are used to derive sigma-*t*. Pressure affects the *in situ* temperature, raising it slightly; however this is not a factor in the shallow inland and coastal marine waters monitored here.

Density gradients within the water column indicate stratification and the layer where density increases rapidly with depth is known as the "pycnocline." Ambient air temperature, solar radiation, fresh water input from both precipitation and river flow, surface winds, internal waves, and tidal circulation are some of the factors that influence stratification in the water column. Any factor that mixes water masses (e.g., winds, tidal circulation) will decrease stratification, and factors that increase density differences (e.g., fresh water input to the surface, high solar radiation) produce or maintain stratification. A typical model of estuarine stratification is of two layers: relatively warm, fresh water overlying colder, more saline water with separation marked by a distinct pycnocline.

In the coastal estuaries and most areas of Puget Sound (e.g., ELB015, BLL009), differences in salinity are a stronger influence on density stratification than differences in temperature (Appendix B). The large variation in salinity is primarily due to the large amount of riverine input to these areas. Thus, salinity-driven stratification is typical of estuarine environments. Another general feature of the Puget Sound data is the lack of a classic "mixed layer" above the pycnocline. Instead, the pycnocline typically extends to the surface. Thus in this situation, the density change with depth is relatively constant from the water surface to the bottom of the pycnocline.

Most stations sampled in Puget Sound during WY 1994-95 exhibited distinct stratification, shown by a change in sigma-*t* (delta sigma-*t*) over the pycnocline of >2, although intensity and duration of the stratification varied over time (Appendix B.1). Although much variation was evident, general stratification patterns can be identified for the Puget Sound stations visited in WY 1994-95 (Table 3).

Four patterns are differentiated and defined as indicators of stratification intensity: persistent, seasonal, episodic, and weak. "Persistent" stratification refers to stratification with a delta sigma-*t* of >2 evident within the water column that is observed throughout the wateryear.

"Seasonal" stratification is when such stratification is observed only between April and September. "Episodic" stratification is when stratification occurs as isolated events or is seasonally random. "Weak" stratification refers to water columns that were relatively well-mixed during all observations (delta sigma-$t \leq 2$).

Persistent and seasonal stratification patterns were most common and reflect the importance of freshwater input to the region's marine waters. The stratification patterns shown in Table 3 were derived from analysis of the WY 1994-95 data, but are also consistent for data collected during WY 1993 (Newton *et al.*, 1994), WY 1992 and WY 1991 (Janzen and Eisner, 1993a; b).

Table 3. Classification of Puget Sound stations according to stratification pattern observed during WY 1994-95.

Persistent	Seasonal	Episodic	Weak
BLL009	ADM001	FID001	DNA001
BUD002	ADM002	OAK004	LOP001
BUD005	DYE004	PAH008	PTH005
CMB003	EAP001	POD006	
CMB006	EAS001		
ELB015	GRG002		
HCB003	JDF005		
HCB004	PMA001		
HCB006	PSB003		
HCB007	QMH001		
PNN001			
PSS008			
PSS019			
SAR003			
SIN001			
SKG001			
SKG003			
SUZ001			

The patterns defined are general categorizations; for example, seasonal influences can be seen in data from stations exhibiting persistent stratification (Appendix B). Also, the gradient (magnitude of delta sigma-*t*) as well as the depth of the pycnocline varied from station to station. Station ADM002, which showed seasonal stratification had a very deep (40-50 m) pycnocline whereas station GRG002, also a deep station, had a much shallower (<20 m) pycnocline.

Most of the Grays Harbor stations sampled during WY 1994-95 exhibited persistent stratification, as did two of the stations in Willapa Bay (WPA001 and WPA003; Appendix B).

Stations WPA004 and WPA006 appear to have a more episodic pattern of stratification. Tidal mixing at these two relatively shallow stations (10 m or less) plus mixing effected by wind stress may overcome stratification at these stations. Station WPA007 has weak stratification and is the most consistently well-mixed.

Both Grays Harbor and Willapa Bay have significant river inputs. USGS gauged rivers include the Chehalis River, which flows into the head of Grays Harbor, and the Willapa and Naselle Rivers, which flow into the northern and southern portions of Willapa Bay, respectively. During WYs 1994 and 1995, the freshwater flow into Willapa Bay from the Naselle River was 78% and 69% of the Willapa River flow, respectively (USGS, 1994; 1995). In both estuaries, there are also numerous other rivers with significant flows that are not currently gauged (e.g., Humptulips, Hoquiam, Pallix, and North Rivers). Both estuaries are partially enclosed water bodies resulting in some restriction of water exchange with the Pacific Ocean. Grays Harbor has a bar at the mouth of the harbor extending between two peninsulas that form the western shore of the embayment. Long Beach Peninsula forms a barrier between the Pacific Ocean and the southern waters of Willapa Bay.

The coastal estuary stations showed a gradient in stratification intensity from the head to mouth of the estuary. River stations GYS004 and WPA001 showed the most pronounced stratification (Appendix B.2), as might be expected. With further distance away from the river and its channels, the pycnocline was less-pronounced and shallower. This pattern in Grays Harbor and Willapa Bay is suggestive of circulation where a saline layer flows inland under an outflowing fresh water lens. Tidal mixing will break-down this stratification and result in a partially mixed estuary. Circulation and stratification will be dependent on river flow, tides, water depth, and mixing processes in these estuaries.

The gradient in stratification intensity along the head-to-mouth axis of the coastal estuaries was highly variable with respect to month sampled, although not apparently linked to a seasonal pattern. This suggests that tidal stage may have been a strong determinant of the stratification encountered at a station. Variability in tidal stage at the time of sampling could not be controlled for due to sampling logistics. Sampling with respect to tidal stage would be necessary to accurately determine any seasonal patterns and to further understand the dynamics of stratification in these areas.

Dissolved Oxygen and Light Transmission

Individual profiles of *in situ* dissolved oxygen concentration (mg/L) and light transmission (percent light transmission) with depth (m) obtained from the CTD casts for the Puget Sound stations monitored during WY 1994-95 are in Appendix C.1; those for Grays Harbor and Willapa Bay are in Appendix B. Profiles were obtained from the sea surface to the sea bed at most stations.

Dissolved Oxygen

Low DO concentrations result when organic material is degraded (oxidized) in waters that do not mix to the surface, where aeration with atmospheric oxygen can occur. Upwelled deep waters and deep waters with overlying high organic production can have naturally low DO concentrations. Human input of nutrients that stimulate organic production can drive naturally low DO concentrations to even lower values. Depressed levels of DO available in the water column can have a serious impact on marine organisms. Effects of DO depletion are both organism- and habitat-specific (Harding *et al.*, 1992). The degree of impact is dependent upon the temporal and spatial stability of the depressed DO levels. The exact DO concentration where deleterious effects occur is not well explored for local waters. It also should be considered that DO concentrations in the water column may not reflect hypoxic or anoxic conditions experienced by benthic organisms. Jørgensen (1980) found that significant DO gradients can exist between 0.5 to 0.05 m above the sediment in a fjord.

Hypoxia, meaning low oxygen concentrations, is generally regarded as the level where stress to organisms can occur. Although hypoxia has been commonly defined in the literature as occurring at concentrations between 0.5-3.0 mg/L (e.g., Harding *et al.*, 1992; PSEP, 1988) or between 0.2-2.0 mg/L (e.g., Pihl *et al.*, 1992; Llanso, 1992), there is evidence that the behavior of some organisms (e.g., fish, larvae) can be negatively affected at DO concentrations as high as 4-4.5 mg/L (Whitmore, *et al.*, 1960; Kramer, 1987; Breitburg *et al.*, 1994). Anoxic waters, where no oxygen is available, are environment habitable only by anaerobic organisms, primarily bacteria.

All observations of water column DO concentrations <5 mg/L are reported in this section. The value of 5 mg/L was chosen as an indicator of low DO concentrations that may be impactive, based on literature review of the upper limit of effects to organisms. The value of 3 mg/L was conservatively chosen as an indicator of hypoxia.

Depressed levels of DO were seen at several Puget Sound stations during WY 1994-95 (Table 4). Some of these reflect natural conditions and some may indicate anthropogenic effects, which will be discussed below. Note that upwelled Pacific Ocean waters with naturally low DO concentrations enter Puget Sound seasonally through the Strait of Juan de Fuca (e.g., as seen at ADM002 and PAH008). Dissolved oxygen concentrations <5 mg/L were not observed at any of the stations in Grays Harbor and Willapa Bay during WY 1994-95. The shallow depths of these estuaries plus active mixing forces such as tides and winds likely contribute to the lack of low DO in these coastal estuaries.

In total, sixteen stations exhibited DO concentrations <5 mg/L. At five of the locations, East Sound (Orcas Island), Budd Inlet, Hood Canal, Penn Cove, and Port Susan, DO concentrations <3 mg/L were evident during at least one month. Similar results were found in previous years (Newton, *et al.*, 1994, Janzen and Eisner, 1993a; b) for East Sound and Hood Canal, though perhaps not as severe. The Budd Inlet station (BUD002) was last sampled in WY 1990, when it also showed DO concentrations below 5 mg/L. The stations in Penn Cove and Port Susan were sampled for the first time in WY 1994 and WY 1995, respectively. Refer to Table 8 in Newton (1995b) for a compilation of DO data for stations monitored since 1990.

The Washington State marine water quality standards for DO vary according to the classification of the waterbody (WAC 173-201, 1991), which is governed by the intended maximum beneficial use of those waters. Some of the state's minimum numeric DO concentration standards exceed 5 mg/L (Table 4). The state standards are intended to reflect minimum DO concentrations for naturally occurring marine waters and, thus, concentrations below these standards are assumed to be resulting from anthropogenic influence. This assumption may not be valid, however. First, data to rigorously establish the pre-anthropogenic DO concentrations for local marine waters are not available. Second, naturally occurring conditions can cause DO concentrations to be lower than the state standard in some areas of Puget Sound because of individual station features.

Table 4. Stations with low DO concentrations during WY 1994-95.

Station	State waterbody class, state minimum DO standard	# observations DO ≤ 5 mg/L	# observations DO ≤ 3 mg/L
BUD002*	B, 5 mg/L	2 in 1995	1 in 1995
EAS001	AA, 7 mg/L	5 in 1994, 2 in 1995	1 in 1995
HCB007	AA, 7 mg/L	7 in 1994, 11 in 1995	3 in 1994, 10 in 1995
HCB004	AA, 7 mg/L	10 in 1994, 11 in 1995	4 in 1994, 9 in 1995
HCB003	AA, 7 mg/L	2 in 1994, 6 in 1995	1 in 1994, 4 in 1995
PNN001†	A, 6 mg/L	3 in 1994	1 in 1994
ADM002	AA, 7 mg/L	2 in 1994, 3 in 1995	
BUD005	A, 6 mg/L	1 in 1994	
ELB015	A, 6 mg/L	1 in 1995	
GRG002	AA, 7 mg/L	1 in 1995	
HCB006	AA, 7 mg/L	1 in 1994, 1 in 1995	
PAH008†	A, 6 mg/L	1 in 1994	
PSS019	A, 6 mg/L	3 in 1994, 2 in 1995	
SAR003	A, 6 mg/L	2 in 1994	
SKG003*	A, 6 mg/L	1 in 1995	
SUZ001*	A, 6 mg/L	3 in 1995	

* not monitored in WY 1994
† not monitored in WY 1995

Understanding the natural processes affecting DO is important if human impacts are to be detected. Local physical processes such as the input of low-oxygenated fresh or oceanic water, stratification intensity, circulation patterns and mixing regimes, in addition to biological activity (e.g., primary production, respiration, oxidative reactions), will affect ambient levels of DO and its distribution both vertically and horizontally. Other factors affecting DO include sediment oxygen demand and chemical oxidation processes.

A site-specific physical condition, such as sluggish circulation or proximity to oceanic deep water, may cause one station to have lower DO concentrations than another station of the same waterbody classification for reasons that are not due to anthropogenic impact. Alternatively, the same anthropogenic impact, such as a certain amount of nutrient input, may have a much more profound impact on the DO concentration of one station than that of another within the same waterbody classification. Thus, each case must be evaluated with respect to the natural characteristics of the location.

Low DO concentrations were largely constrained to near-bottom depths, where waters are not in contact with the sea-air interface. Density stratification of the water column favors the occurrence of low DO in bottom water, as it impedes mixing. Each of the sixteen Puget Sound stations where DO concentrations fell below 5 mg/L experienced persistent or seasonal stratification (Table 3), with the exception of PAH008. Further implications of density stratification are included in the General Discussion.

In the following section, the severity and persistence of the low DO concentrations for the stations listed in Table 4, as well as their physical characteristics (Appendix B) and potential causes are discussed.

Stations with DO Concentrations less than 3 mg/L

<u>Budd Inlet</u>

BUD002:

WY 1995 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	DO <3 mg/L depth range (m)	Cast depth (m)
Aug 95	4.78	10.5	-	10.5
Sep 95	2.43	0.5 - 10	2 - 10	10

BUD005:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	DO <3 mg/L depth range (m)	Cast depth (m)
Jul 94	3.80	7 - 11	-	11

Stratification is persistent in Budd Inlet, with freshwater input from the Deschutes River/Capitol Lake system. The DO and other water column characteristics of Budd Inlet have been well-studied by Ecology (e.g., Eisner *et al.*, 1994; Eisner and Newton, in prep.). Water quality varied considerably depending on location in the inlet during these studies, with lowest DO concentrations found towards the head of the inlet (e.g., near BUD002 and farther south). Dissolved oxygen concentrations at BUD002 and other inner inlet stations monitored by Ecology (Eisner *et al.*, 1994) are often recorded below 5 mg/L, whereas DO at the mid-inlet station, BUD005, seldom is. For the years BUD002 was previously monitored (WY 1977 through 1987 and 1990), observations of DO at or below 5 mg/L were recorded in every WY except 1986 with many of the observations well below 3 mg/L. In contrast, since WY 1973, WYs 1979 and 1994 were the only years that had similarly low DO concentrations recorded at BUD005. These results show the danger of using mid-bay locations to assess low DO conditions.

Input of nitrogenous nutrients from a wastewater treatment plant was substantial until early 1994, when nitrogen removal from the effluent (up to 90%) was implemented. Ecology's focused monitoring in Budd Inlet was conducted in 1992-1994 (Eisner *et al.*, 1994; Eisner and Newton, in prep.). The effect of the reduction of an exogenous nitrogen source on the Inlet's DO is unclear at this time; sunlight and other weather-related variables where seen to influence chlorophyll *a*, stratification and DO dramatically and these varied over the three years compared (Eisner and Newton, in prep.). Sunlight (which drives organic production) was quite strong in 1994. In late 1996, the City of Olympia commissioned a detailed sampling and modeling effort for Budd Inlet aimed at assessing DO and the Inlet's capacity for effluent. Continued monitoring of this sensitive area is recommended.

<u>East Sound, Orcas Island</u>

EAS001:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	DO <3 mg/L depth range (m)	Cast depth (m)
May 94	3.26	28 - 31.5	-	31.5
Jun 94	3.43	25.5 - 31	-	31
Jul 94	3.18	25 - 32.5	-	32.5
Aug 94	4.91	32.5 - 33.5	-	33.5
Sep 94	4.95	26.5 - 27	-	32
May 95	4.84	32	-	32
Jul 95	2.17	27.5 - 32	29 - 32	32

Station EAS001, located in Orcas Island's East Sound in roughly 30-35 m deep water, is seasonally stratified. A weak pycnocline (delta sigma-$t \leq 2$) develops over the months of May through September, from the surface to typically 10 m or less. Low DO concentrations were observed during most of the summer in WY 1994 and in early summer in WY 1995. Since monitoring at EAS001 began in WY 1991, the occurrence of low DO has been: two observations in WY 1992, one in WY 1993, five in WY 1994 and two in WY 1995. The annual minimum DO consistently has been observed in July (except once in June), with concentrations below 3 mg/L observed in WYs 1992, 1993 and 1995.

The early timing of the minimum DO concentration (July) at EAS001 is unique compared to all other sites monitored. Minima in late summer/early fall are more typically found in Puget Sound and reflect the accumulated effect of stratification during summer and oxidation at depth of organic material produced during summer. Organic production is high at this station, as indicated by high levels of chlorophyll *a* (~30 µg/L) during April-July in WY 1995, but this is not unique to East Sound. The driving mechanism(s) behind the early timing of the low DO event at EAS001 cannot be determined from the data in this report. Any nutrient point or non-point sources to the Sound should be considered for a possible role in eutrophication.

The uncharacteristic persistence (five months) of the low DO in WY 1994 and its very low concentration (2 mg/L) in WY 1995 show the sensitivity of this area. This station has been monitored for five years (WYs 1991-1995). Hypoxic DO concentrations were observed in July 1992 and June 1993. Comparative analysis with historical data is highly recommended. These recent data are somewhat suggestive of low DO problems; however, more intensive information regarding this area and its dynamics is necessary to draw conclusions.

Hood Canal

HCB007:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	DO <3 mg/L depth range (m)	Cast depth (m)
Feb 94	4.06	13.5 - 16	-	16
Mar 94	2.97	10 - 21.5	19.5 - 21.5	21.5
May 94	3.62	10.5 - 17	-	17
Jun 94	3.49	7 - 21	-	21
Jul 94	3.43	12 - 17	-	17
Aug 94	1.37	14 - 21	16 - 21	21
Sep 94	0.65	11.5 - 19.5	12.5 - 19.5	19.5
Oct 94	0.18	7.5 - 17.5	8.5 - 17.5	17.5
Nov 94	0.71	4.5 - 17	6.5 - 17	17
Jan 95	1.31	11.5 - 16.5	14 - 16.5	16.5
Feb 95	1.17	11 - 31.5	16 - 31.5	31.5
Mar 95	2.01	8.5 - 19.5	17.5 - 19.5	19.5
Apr 95	2.26	12.5 - 20.5	17.5 - 20.5	20.5
May 95	2.38	10 - 15	13 - 15	15
Jun 95	4.37	16.5 - 17	-	17
Jul 95	1.91	8 - 16.5	12 - 16.5	16.5
Aug 95	1.14	10 - 15.5	11.5 - 15.5	15.5
Sep 95	0.99	5 - 34	8 - 34	34

HCB004:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	DO <3 mg/L depth range (m)	Cast depth (m)
Oct 93	2.23	7.5 - 53.5	9.5 - 53.5	53.5
Dec 93	4.62	7 - 38	-	38
Feb 94	3.01	19 - 50.5	-	50.5
Mar 94	3.61	18 - 50	-	50
Apr 94	3.60	24.5 - 51.5	-	51.5
May 94	4.11	20 - 50.5	-	50.5
Jun 94	4.04	7 - 52	-	52
Jul 94	3.45	15 - 45.5	-	45.5
Aug 94	2.63	15 - 53	30.5 - 53	53
Sep 94	1.48	9 - 46.5	11 - 46.5	46.5
Oct 94	0.99	5.5 - 49	7 - 49	49
Nov 94	3.14	3 - 45	-	45
Jan 95	2.46	12 - 52	34 - 52	52
Feb 95	2.10	12.5 - 36.5	27.5 - 36.5	36.5
Mar 95	1.84	16 - 49.5	33 - 49.5	49.5
Apr 95	2.20	17.5 - 49.5	25.5 - 49.5	49.5
May 95	3.15	11 - 48	-	48
Jun 95	2.82	17.5 - 50.5	38 - 50.5	50.5
Jul 95	2.27	16.5 - 51	24.5 - 51	51
Aug 95	1.91	11 - 47.5	14.5 - 47.5	47.5
Sep 95	1.13	6 - 39	8.5 - 39	39

HCB003:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	DO <3 mg/L depth range (m)	Cast depth (m)
Jun 94	3.08	89.5 - 121	-	121
Jul 94	2.76	79 - 122.5	113.5 - 122.5	122.5
Oct 94	2.85	10.5 - 78	25.5 - 44.5	78
Mar 95	4.98	96 - 98	-	98
May 95	2.97	85 - 120.5	117.5 - 120.5	120.5
Jul 95	2.90	21.5 - 119.5	116.5 - 119.5	119.5
Aug 95	3.51	15 - 107	-	107
Sep 95	2.15	9 - 101.5	12.5 - 38.5	101.5

Core station HCB004 is located east of the Great Bend of Hood Canal, just inside the sill located at Sister's Point, in approximately 50 m water depth. This station is persistently stratified, with a strong pycnocline (delta sigma-*t* ranged 4 to 7) typically located in the upper 15 m. Dissolved oxygen concentrations below 5 mg/L were recorded year-round: 10 out of 10 months in WY 1994 and 11 out of 11 months in WY 1995. This is consistent with recent data: 7 out of

10 months during WY 1993, 9 out of 12 months during WY 1992 and 10 out of 10 months during WY 1991. Hypoxic conditions (≤3 mg/L), however, were recorded especially frequently in WY 1995 (nine months), as compared to four, two, five, and four months in WYs 1994 through 1991, respectively. Station HCB007, located at the head of the canal in Lynch Cove, showed even more severe DO conditions, with concentrations approaching anoxia in the fall of both years. Station HCB003, located north of the Great Bend, exhibited less severe but still significant hypoxia.

Statistical trend analysis should be conducted on the historical and current DO data from S. Hood Canal. Historical data from the 1950s and 60s (Collias *et al.*, 1974) show that low DO was annually common in southern Hood Canal in late summer and fall. Southern Hood Canal has a naturally high primary production of organic material, due to the water-column stability and nutrient supply afforded by the riverine input (Skokomish and Tahuya Rivers) and the lack of disruptive mixing due to the sill's protection. The highest chl *a* concentrations recorded from all stations monitored in WY 1994-95 were at HCB004 (39 µg/L in 1994 and 55 µg/L in 1995). Decomposition of this large amount of organic matter, strong and persistent stratification, and slow circulation due to the deep basin and an entrance sill are optimal conditions for a natural depletion of DO. However, the influence of anthropogenic input of nutrients (*e.g.*, via rivers, leaking septic tanks, terrestrial runoff) on the phytoplankton production cycle and DO content of these isolated waters is not established.

Three observations indicate the possibility that DO conditions may be deteriorating in southern Hood Canal and that this change could be due to eutrophication:

1) Although thorough analysis of historical data needs to be conducted, there is an alarmingly high frequency of hypoxic DO concentrations in recent data, including occurrences even during winter months. Notably severe is that DO concentrations ≤3†mg/L at HCB004 were observed 9 of 11 months in WY 1995. During WY 1994-1995, minimum DO values never exceeded 5 mg/L year-round at HCB004 or HCB007 and remained below 3 mg/L for all but a few months in WY 1995.
2) Over the period of WY 1991 to 1995, very high chl *a* concentrations (>30 µg/L) have been observed in summer months at HCB004, when nutrient limitation of phytoplankton growth in stratified waters such as these would be expected.
3) Experiments conducted to test whether anthropogenic input of nutrients could influence the amount of phytoplankton in southern Hood Canal showed that primary productivity was increased as much as three-fold when nutrients were added to ambient water samples (Newton *et al.*, 1994).

In light of the severely low DO concentrations recorded in southern Hood Canal even in wintertime, further monitoring and study of southern Hood Canal are highly recommended. In addition to historical trends, nutrient loading also should be assessed. Possible changes in the flushing characteristics of Hood Canal (e.g., due to freshwater diversion) should also be addressed.

HCB006:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	DO <3 mg/L depth range (m)	Cast depth (m)
Jul 94	4.76	87 - 100	-	100.5
Sep 95	4.36	14 - 34	-	52.5

Station HCB006, a deep (~100 m) station located in Hood Canal near Bangor, was persistently stratified with a typically weak pycnocline (delta sigma-*t* $\leq$2) in the upper 15 m, that became stronger seasonally (delta sigma-*t* >3 in May-Aug.). This station is the farthest seaward of the stations monitored in the long, narrow Hood Canal. The seasonally occurring low DO conditions recorded in Hood Canal in the 1950s appeared to originate at the head of the Canal, at Lynch Cove, and spread seaward along the canal (Collias *et al.*, 1974; Curl and Paulson, 1991) along a density surface. Although the low DO concentrations observed during WY 1994-95 are not at all severe, the horizontal extent of the spread of low DO concentrations may be increasing since the 1950s when it rarely was observed past Hoodsport (Collias *et al.*, 1974). In addition to the single observations in WY 1994 and 1995, low DO concentrations were also recorded in October of WY 1992 and of 1993. The severity and extent of low DO concentrations in Hood Canal should be assessed from comparative historical data analysis.

Penn Cove

PNN001:

WY 1994 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	DO <3 mg/L depth range (m)	Cast depth (m)
Oct 93	0.25	7 - 15.5	11.5 - 15.5	15.5
Jul 94	4.25	17.5 - 21	-	21
Sep 94	3.12	10 - 20.5	-	20.5

WY 1994 was the first year that Penn Cove has been monitored by Ecology. Conditions in October 1993 were nearly anoxic. Penn Cove exhibits persistent stratification with a strong pycnocline (delta sigma-*t* ranged 2 to 7). Because of the lack of monitoring data for this station, it is not possible to evaluate trends. This station is recommended for further monitoring and anthropogenic impacts on the Cove should be carefully considered.

Stations with DO Concentrations less than 5 mg/L

Strait of Juan de Fuca

ADM002:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	Cast depth (m)
Oct 93	4.64	37 - 57	57
Aug 94	4.81	44.5 - 51	51
Oct 94	4.46	37.5 - 58.5	58.5
Jul 95	4.85	56 - 59	59
Sep 95	4.66	49 - 61.5	61.5

PAH008:

WY 1994 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	Cast depth (m)
Oct 93	4.95	7.5 - 12	12

Station ADM002 is a moderately deep station (~ 70 m) located in the Strait of Juan de Fuca off the Quimper Peninsula. Seasonal stratification is typically evident from May through September but is not strongly developed, with delta sigma-*t* around 2. The pycnocline is much deeper than most of the other stations sampled, not appearing until 40 m or more, and is usually relatively compressed. Low concentrations of DO were not substantially below 5 mg/L, were observed July through October only, and were limited to the depths below 35 m (*i.e.*, below the pycnocline). Station PAH008, is off Port Angeles, but receives waters from the Strait of Juan de Fuca. It is stratified only episodically, with a very thin surface freshwater lens appearing sporadically (December 1993 and July 1994).

The low DO concentrations at these stations are natural and reflect the influx of upwelled, naturally low-oxygenated Pacific Ocean waters that flow eastwards in through the Strait of Juan de Fuca beneath a less-saline surface layer flowing westwards. Deep oceanic waters naturally have low DO content due to an extended isolation from the surface and from respiration. Deep Pacific Ocean waters off the Washington shelf at Copalis have DO concentrations as low as 3 mg/L (Landry *et al.*, 1989). When upwelling winds are favorable (late summer-fall), deep waters flowing in through the Strait of Juan de Fuca will have low DO concentrations. This deep water will shoal when passing over the sill at Admiralty Inlet and mix with higher oxygenated waters as it enters Puget Sound. Note that low DO was not found at ADM001, south of the entrance sill to Puget Sound, where the lowest DO recorded during WY 1994-95 was 6 mg/L. The minimum DO observed seasonally at ADM002 has varied between 4.6 and 5.3 mg/L from WY 1990 through 1995.

Elliott Bay

ELB015:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	Cast depth (m)
August 95	4.95	86	88

This is the only observation of DO <5 mg/L at this station since Ecology's monitoring began measuring depths below 30 m (June 1992) and the concentration observed is barely below 5 mg/L. There is much anthropogenic impact on Elliott Bay, however. Continued monitoring of this long-term core station is warranted though no problem is perceived.

Strait of Georgia

GRG002:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	Cast depth (m)
Oct 94	4.89	89.5 - 96.5	96.5

This is the only observation of DO <5 mg/L at this station since Ecology's monitoring began measuring depths below 30 m (June 1992) and the concentration observed is barely below 5 mg/L. This low DO observation likely reflects the signature of upwelled low DO waters from the Strait of Juan de Fuca. The station is sometimes affected by the plume of the Fraser River, which has a high organic load. Continued monitoring of this long-term core station is warranted though no problem is perceived.

Possession Sound

PSS019:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	Cast depth (m)
Oct 93	4.94	59.5	102
Jul 94	3.65	82 - 86.5	86.5
Sep 94	4.60	56.5 - 76.5	76.5
Oct 94	4.37	24.5 - 39.5	39.5
Jul 95	4.71	84.5 - 95.5	105.5

Station PSS019, located off Gedney Island in the deep waters (~105 m) of Possession Sound, is persistently stratified. A strong pycnocline (delta sigma-*t* ranged 3 to 10) was common in the upper 10-15 m, the result of a major freshwater source, the nearby Snohomish River. Ambient

DO concentrations below 5 mg/L were observed in summer and fall, as were observed previously (Newton *et al.*, 1994); however, DO concentrations in July 1994 were lower than the previous minimum DO observed (4.4 mg/L in November 1992).

The strong and persistent stratification observed reduces this area's ability for mixing and therefore increases the potential for low DO conditions to develop. It is not known whether the high chlorophyll *a* concentrations observed here (Appendix C) are stimulated by anthropogenic input of nutrients, but this would be possible in these persistently stratified waters. An experiment conducted by Ecology during August 1995 in the Snohomish Estuary just east of PSS019 showed that nutrient addition stimulated primary production significantly (JN, unpublished data). That experiment was conducted in support of a total maximum daily load assessment for the Snohomish River (Cusimano, 1995; Newton, 1995d) that is presently being analyzed. Historical data from the area as well as organic material and nutrient input from the river and other sources in Everett Harbor should be assessed to evaluate this condition.

Saratoga Passage

SAR003:

WY 1994-95 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	Cast depth (m)
Oct 93	5.00	17.5	119.5
Sep 94	4.78	37.5-62, 63-63.5, 64.5-65.5, 67.5-68, 70, 97.5	106

Station SAR003, a deep-water (~122 m) station located in Saratoga Passage, was persistently stratified (delta sigma-*t* ranged 3 to 10) with the pycnocline typically comprising the upper 10-20 m. This station is influenced by several rivers. Saratoga Passage has consistently had one to two low DO occurrences per year since WY 1990, with minimum concentrations ranging 4.4 to 5.0 mg/L. For the time period from WY 1978 through 1990, when measurements only went to 30 m maximum depth, values between 4.2 and 4.8 mg/L were observed in WYs 1979, 1980, and 1987. Depressed DO concentrations are typically observed in September/October. Layering of low DO waters interleaved with higher DO concentration waters, as seen in September 1994, also has been evident during previous wateryears.

The low DO concentrations observed may reflect a response to phytoplankton blooms, as chlorophyll *a* was occasionally quite high (e.g., 50 µg/L in April 1994). Waters with DO below 5 mg/L were occasionally measured in Possession Sound or in Skagit Bay in the 1950-1960s database of Collias *et al.* (1974) during fall, but were not seen in Saratoga Passage. Whether phytoplankton blooms are unnaturally high should be evaluated, as well as whether advection of low DO waters from PSS019 northward occurs. The influence of offshore upwelling events on this area may also be a factor.

Skagit Bay

SKG003:

WY 1995 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	Cast depth (m)
Oct 94	4.15	3.5 - 20.5	20.5

Skagit Bay was monitored previously in WY 1991 without observed low DO concentrations. SKG003 is located in the Skagit River delta area in persistently stratified waters with high particulate loads. This single observation of moderate concentration in WY 1995 is most plausibly natural, of high-production, high-stratification origin.

Port Susan

SUZ001:

WY 1995 month	Minimum DO conc. (mg/L)	DO <5 mg/L depth range (m)	Cast depth (m)
Oct 94	3.03	17 - 90.5	90.5
Dec 94	4.72	45.5 - 57	57
Aug 95	3.38	31.5 - 86	86

Port Susan is persistently stratified, with a strong pycnocline in the top 20 m. Freshwater input from the Stillaguamish River maintains strong stratification with delta sigma-*t* ranging ~3 to 18. This is the first time SUZ001 was monitored since WY 1988. Using different measurement technology, monitoring occurred continuously at this station from WY 1973-1987 with DO concentrations below 5 mg/L observed in October 1973 (4.8 mg/L), October 1974 (4.7 mg/L) and August, October, and November 1987 (3.9, 3.9, and 4.3 mg/L). Although these DO concentrations were not as low as currently observed, measurements were made to 10 m depth only during years prior to WY 1989. The WY 1995 values approaching hypoxia could be natural given the stratification and production of the area, but historical data should be consulted for interpretation. This is a sensitive area with respect to inputs of nutrients or organic loading.

Light Transmission

The profiles in Appendix C show % light transmission (transmissivity) with depth (m), as measured with an *in situ* transmissometer. The % light transmission at a certain depth indicates the particulate load suspended in that water. The light transmissometer measures the instantaneous light transmission over a 25-cm path of the ambient water column. The % light transmission decreases in response to increases in turbidity, since particles absorb and deflect light. Suspended sediments and phytoplankton cells are the most common causes of increased turbidity and are not differentiated by this measurement.

In areas known to have strong bottom currents, low % light transmission values near the bottom are caused by particles suspended from the sea bed. However, a particularly severe decrease in the % light transmission at the bottom of a profile (*e.g.*, WPA007 in June 1994) is probably an artifact, caused by contact of the CTD with the bottom sediments.

Within the water column, low % light transmission values are harder to interpret, since both phytoplankton blooms and sediment plumes (*e.g.*, associated with river runoff) cause a decrease in light transmission. Profiles of % light transmission can be used as another indicator of stratification, since robust mixing will homogeneously distribute particles. Well-mixed stations, such as DNA001, exhibit few variations of this parameter with depth. Thin layers of reduced light transmission at the surface can indicate particle load from river water, and this conclusion can be confirmed by observation of the companion salinity profile (*e.g.*, GRG002 in June 1994). The dramatic reduction in light transmission in typical river water is shown by river stations GYS004 and WPA001, where light transmission is rarely greater than 20%. Low light transmission also indicates high concentrations of phytoplankton, *i.e.*, blooms. The high phytoplankton concentration at HCB004 during August 1994 indicated by the 10 m chl *a* concentration (36.9 µg/L, Appendix A), shows up as a distinct minimum in light transmission (60%, Appendix B).

Light transmissometer data are best interpreted in concert with other measured parameters, to confirm observations regarding stratification, river input, bottom currents and phytoplankton concentrations.

Secchi Disk Depths

Light Extinction and the Euphotic Zone Depth

Secchi disk readings (depth of the disk's disappearance) provide an indication of the penetration of incident radiation (sunlight striking the sea surface) into the water column. The readings are used to calculate an estimate of the euphotic zone depth, the portion of the water column where there is sufficient light for photosynthesis. Therefore, a shallow euphotic zone means less of the water column is available for growing phytoplankton. By convention, the depth of the euphotic zone has been defined as the depth at which 1% of the incident radiation (I_o) is available (e.g., Steemann Nielsen, 1975). Some investigators have used the 0.1% light level as the lower limit; however, in temperate regions where incident radiation is not strong the 1% light level is an appropriate delimiter.

Individual Secchi readings, recorded to the nearest 0.1 m, are listed in Appendix A for all stations monitored in WY 1994-95. These readings were used to calculate estimates of k, the extinction coefficient of light, and of the euphotic zone depth.

The extinction coefficient, k, was first determined from the equation:

$$k\ (m^{-1}) = 1.6 / \text{Secchi disk reading (m)} \qquad (1)$$

Equation (1) was originally derived by Poole and Atkins (1929) for the English Channel with a value of 1.7, instead of 1.6. The value of 1.6 used here is based on empirical observations for local Puget Sound waters and the work of Holmes (1970) who found this constant to be lower in coastal waters.

The euphotic zone depth, or 1% I_o depth, is derived using the formula for light extinction in water:

$$I_z/I_o = e^{-kz} \qquad (2),$$

substituting 0.01 (*i.e.*, 1%) for I_z/I_o, and solving for z, the depth (m) at which 1% of I_o is found.

Plots of 1% I_o depths versus month for each station occupied during WY 1994-95 are found in the top panel of Appendix C.1 for Puget Sound and of C.2 for the coastal estuaries. Deep euphotic zones indicate the absence of particles. Shallower euphotic zones reflect suspended particulates, but this can be caused either from sedimentary load or high phytoplankton concentrations. Shown in the second panel of Appendix C are plots of chlorophyll *a* concentrations (chl *a*, µg/L) versus month. Comparisons of the euphotic zone depths with the chl *a* data and salinity profiles (Appendix B) are necessary to aid in the interpretation of shallow euphotic zones. Regardless of their cause, shallow euphotic zones restrict the distribution of phytoplankton production, since adequate light for photosynthesis is available only in the euphotic zone.

Euphotic zone depths were generally very shallow at the coastal stations. Many of the coastal stations are located in rivers or in shallow embayments heavily influenced by riverine inputs with high particle loads.

Some of the Puget Sound stations (e.g., BLL009, CMB003, HCB003) show decreased 1% I_o depths during late fall through early spring. These shallow euphotic zone depths are likely caused by large quantities of suspended sediment associated with increased river runoff. The presence of low salinities in the surface waters can be used to confirm this explanation. Many Puget Sound stations (e.g., BUD005, HCB004) exhibit shallow euphotic zone depths during late spring to early fall. These shallow euphotic zones are likely caused by algal blooms which are often observed during this time. The presence of high chl *a* concentrations can be used to confirm this explanation. Many Puget Sound stations exhibit increased chl *a* concentrations corresponding to periods of shallow euphotic zone depths (Appendix C).

Light Extinction Coefficient versus Surface Chlorophyll a Concentration

To identify the source of light extinction for a particular station, regressions of k versus surface (0.5 m) chl *a* concentration were made. The regression results are shown in the bottom panels of Appendix C. If light extinction was only due to phytoplankton and not suspended sedimentary particles, then the regression slope would be positive and the fit would be tight (r^2 approaching 1). An outlier above the regression line (a higher value of k than the regression) would indicate non-chlorophyll containing particles which extinguish light. Lack of a positive slope implies surface chl *a* concentration is not a determinant of the light extinction coefficient.

A shortcoming of this approach is that the surface chl *a* concentration was used instead of the integrated value for the whole water-column. This can be a problem since chl *a* may not be homogeneously distributed. For instance, if surface chl *a* concentrations are low (e.g., due to nutrient limitation in the surface layer) yet a substantial concentration exists subsurface, the wrong inference could be made about the cause of light extinction based on the regressions of k vs. surface chl *a*. Continuous profiles of chl *a* are not presently measured, therefore integrated values are not available. Chlorophyll *a* concentrations at 10 m can be checked for indication of a subsurface population; however without better vertical resolution, light extinction by a subsurface population at a depth other than 10 m can not be ruled out as the cause of poor fit.

In spite of this crude treatment, some patterns are found that are informative. A positive slope with a good fit indicates that phytoplankton biomass was a strong determinant of the light extinction coefficient. This was observed in both wateryears at BUD005, PTH005 and SAR003. Outliers with particularly high light extinction and low surface chl *a* were seen most frequently in the high runoff months of November through April at stations where riverine input occurs, e.g., PSS019, BLL009 during WY 1994 (Appendix C).

Generally flat slopes can be observed for three main reasons. First, as mentioned, surface chl a may not represent the total phytoplankton population. Second, chl *a* concentrations may be consistently low throughout the year, e.g., ADM002 and PAH008 (1994). Third, non-chlorophyll containing particulates (sediments) are determining the light extinction, particularly when chl *a* is low, thus resulting in a consistently high value of k, e.g., SKG001.
In the coastal estuaries at stations where chl *a* data were collected (GYS008, GYS016, WPA004 and WPA006) the slopes are flat or negative and k is consistently high, demonstrating the profound influence of river water sedimentary load in these estuaries.

Pigments

Chlorophyll a and Phaeopigment

The pigment chlorophyll *a* (chl *a*) is common to all organisms capable of photosynthesis. In the marine water column, chl *a* indicates phytoplankton biomass. Note that since the cellular quota of chl *a* can vary widely with light adaptation or nutrient level, chl *a* cannot be directly converted to cell number or phytoplankton carbon, yet chl *a* remains the best indicator of phytoplankton populations in common use. Phaeopigment (phaeo) refers to numerous degradation products of chl *a*, including phaeophorbides and phaeophytins. In marine systems, these pigments are primarily the product of zooplankton herbivory and less commonly from cellular processes. Thus, marine water column phaeo concentrations indicate chl *a* that has been degraded and are typically indicative of zooplankton grazing.

Phytoplankton blooms (an accumulated high concentration of phytoplankton) require conditions conducive to high growth rates in order to occur. Low incident radiation, lack of stratification (mixing out of euphotic zone), high levels of turbidity (light limitation), nutrient limitation, and zooplankton grazing all prevent phytoplankton biomass accumulation and thus can lead to low chl *a* concentrations. It must be recognized that chl *a* concentrations (phytoplankton biomass) are not a proxy for phytoplankton growth. The phytoplankton concentration is the net result of growth and loss processes. Thus, the same concentration could exist with high phytoplankton growth and high loss through grazing or mixing, as could exist with low growth and low losses. Blooms occur when high growth is sustained in the absence of substantial loss processes (e.g., before grazing zooplankton are numerous, before nutrients or light limit phytoplankton growth, before mixing washes cells out of the euphotic zone).

Results of the MEL fluorometric analyses of extracted chl *a* and phaeo concentrations (µg/L) are tabulated in Appendix A. Plots of the 0.5-m and 10-m chl *a* concentrations (µg/L) versus WY month sampled are shown in the second panel of Appendix C. If comparing these data to historical Ecology data note that chl *a* concentrations from samples analyzed prior to WY 1994 may be low by up to 22% because of the filter storage procedure (see Methods).

The plots of chl *a* concentration with time show seasonal patterns (Appendix C) which can reflect the balance of growth and loss processes at each station. It must be noted that chl *a* can change on time-scales much faster than monthly, thus understanding seasonal patterns from monthly data is not feasible. In comparing the monthly data, however, some trends emerge.

For most Puget Sound stations, chl *a* concentrations were higher from late spring through early fall than in winter, e.g., ELB015, PSB003. In winter, light limitation and strong mixing (from winds or lack of thermal heating) prevent phytoplankton accumulation. High chl *a* concentrations, indicating blooms, tend to occur in spring (April- May) and fall (September-October). Often the summertime chl *a* concentrations are of an intermediate to low value, possibly reflecting nutrient limitation due to stratification. Some stations exhibited the typical temperate phytoplankton pattern of spring and fall blooms, with relatively low concentrations in summer, and lowest concentrations in winter e.g., DYE004, ELB015.

Some stations showed elevated chl *a* concentrations and even blooms in summertime, and therefore indicate that nutrients were not limiting. This can be natural, due to a lack of stratification allowing nutrients to be injected into the euphotic zone from depth, or anthropogenic, due to an additional supply of nutrients (runoff, septic tanks, agricultural wastes) to the euphotic zone. Blooms in summer as well as spring and fall were observed in BUD005, EAS001, HCB004.

Stations with deep mixed layers (e.g., ADM002) showed chl *a* concentrations that were low throughout the growing season, reflecting a phytoplankton population with higher loss (mixed out of the euphotic zone due to strong tidal or current dynamics) than growth.

The chl *a* data for the coastal estuaries have large gaps that make interpretations of seasonal pattern difficult. However, the dominance of the spring bloom is evident. The pattern appears somewhat different than that observed in most of Puget Sound.

Nutrients

Dissolved inorganic nutrients, primarily forms of nitrogen and phosphorus, are an important component of marine ecosystems since nutrients are required for the growth of phytoplankton, the first trophic level of the marine environment. In seawater, several forms of dissolved nutrients exist. Common dissolved inorganic forms of nitrogen in seawater include ammonium (NH_4^+), nitrate (NO_3^-), and nitrite (NO_2^-). Dissolved organic forms of nitrogen (e.g., amino acids, urea), not measured, also exist in seawater and the role of these forms in phytoplankton nutrition is gaining attention (Antia *et al.*, 1991; Paul, 1983). Phosphorus also is found in seawater in both organic and inorganic forms. The primary phosphorus form in seawater is orthophosphate (oPO_4^{-3}), which is the form that is most easily taken up by phytoplankton.

"Ammonium-N" is used here to refer to all ammonia-based nitrogen. This is common for marine systems, as the pH range of seawater drives the hydrolyzation reaction of ammonia such that less than 2% of the ammonia-based nitrogen is in its un-ionized form, NH_3, (Grasshoff *et al.*, 1983), with 98% as ammonium, NH_4^+. Since dissolved ammonia, but not ammonium, is toxic to fish and other organisms, this distinction is important. The amount of un-ionized ammonia can be calculated from the ammonium concentration and the pH, salinity, and temperature of a water sample.

The summed concentration of nitrate and nitrite is reported here. Chemical analysis of nitrate requires a step to separate nitrate-N from nitrite-N. Since nitrite-N concentrations are usually quite low, this step is often eliminated and both nutrients are recorded together as "nitrate+nitrite-N," with the assumption that this approximates the nitrate-N concentration. If ammonium is abundant, nitrite-N (an intermediary product of bacterial nitrification) can be at detectable levels. Previous Ecology data (Janzen and Eisner, 1993a, b) directed the analysis of this nutrient to three urban bays only, where nitrite had been detected.

Ammonium-N, nitrate+nitrite-N, and othophosphate-P data for WY 1994-95 are tabulated in Appendix A. Because nutrient samples are relatively expensive, sampling was not comprehensive (Table 1). Plots of the 0.5-m and 10-m nitrate+nitrite-N concentration (mg/L) versus month for WY 1994 and WY 1995 are in the third panel of Appendix C.

Low Nutrient Concentrations

Dissolved inorganic nitrogen, as opposed to phosphorus, is generally considered to be the limiting nutrient in marine systems (e.g., Valiela, 1984). The opposite is generally true for freshwater systems. While low ambient nitrogen concentrations can be associated with limited marine phytoplankton production, this is not exclusively true. First, nutrients may not be the growth-limiting factor. Light, which is often in short supply in local waters due to high latitude and suspended particulates, may limit growth. Also, losses due to mixing or grazing may reduce phytoplankton biomass such that the population production is low. Second, a nutrient concentration may be low or undetectable, yet its uptake rate by phytoplankton and its resupply rate to phytoplankton may be large but equivalent. In such a case, significant growth can occur, yet because uptake and supply rates are balanced no accumulation of nutrients occurs.

Experiments designed to determine phytoplankton production with and without added nutrients are necessary to determine whether nutrient limitation of phytoplankton growth is occurring at a given station.

Because low nutrient concentrations can be related to limited phytoplankton production, some measure of the potential for this condition is useful. In previous WY reports (Janzen, 1992b; Janzen and Eisner, 1993a; b), nitrate+nitrite-N "depletion" was defined as concentrations below 0.04 mg/L (2.86 µmol/L). This concentration cut-off was based on a model derived in a study conducted by URS (1986) in Budd Inlet, and was applied to stations throughout Puget Sound. However, several studies have shown significant uptake for coastal phytoplankton species at this concentration (Kokkinakis and Wheeler, 1987; Raymont, 1980; Parsons and Harrison, 1983). In addition, it is not possible to document nutrient "depletion" from concentration data because some phytoplankton have such high affinities for dissolved nutrients that uptake occurs at analytically undetectable concentrations (Hecky and Kilham, 1988).

Threshold concentrations for nutrient limitation of phytoplankton growth vary with species, light and temperature conditions (Parsons *et al.*, 1984). Although the range for different species is quite wide, a common guideline for where nitrate concentrations ***may*** be limiting to the phytoplankton population is 0.014 mg/L (1.0 µmol/L) (see Goldman and Glibert, 1983), which is at the MEL reporting limit (0.01 mg/L). Using the range of minimum nitrogen to phosphorus (N:P) molar ratios necessary for algal growth in coastal waters, (between 5:1 and 15:1; Ryther and Dunstan, 1971; McCarthy, 1980), the similar cut-off concentration for orthophosphate can be calculated to be from 0.0028 to 0.0009 mg/L. These concentrations fall well below the MEL reporting limit of 0.01 mg/L for orthophosphate-P.

In summary, several points regarding low nutrient levels should be noted: (1) a concentration of 0.04 mg/L nitrate-nitrite-N is not deplete and is unlikely to cause limitation of phytoplankton growth; (2) nutrient limitation cannot be assumed even when nutrients concentrations are below reporting limits; (3) phytoplankton with high affinities for dissolved nutrients can take up nutrients at analytically undetectable concentrations (Hecky and Kilham, 1988); and (4) photosynthetic dinoflagellates can undergo diel vertical migrations spanning the nitricline, thus producing high biomass during times of undetectable surface nutrients.

A thorough discussion of nutrient limitation in Puget Sound is found in PSEP (1991b), which concludes that the few nutrient-addition bioassay studies conducted in this region have failed to show nutrient limitation in the main basins and channels of Puget Sound. This would be expected, however, since these areas are well-mixed and thus typically show adequate nutrients. In contrast, some areas of Puget Sound have persistent stratification, restricted circulation and can show nutrient levels below reporting limit for extended periods (e.g., small, narrow estuaries). Nutrient limitation has not been investigated in most of these areas. Nutrient-addition experiments conducted as part of focused monitoring by Ecology showed a substantial increase in phytoplankton production with added nutrients in Hood Canal but not in the main basin of Puget Sound (Newton *et al.*, 1994). Nutrient limitation has not been thoroughly studied in Washington State waters, but stratified waters are the most likely to respond to nutrient addition.

In conclusion, while it is inappropriate to conclude either nutrient limitation or nutrient depletion from nutrient concentration data, low nutrient concentrations for extended periods of time ***may*** be indicative of nutrient limitation of the growth of the phytoplankton population. Other information (e.g., results from nutrient-addition experiments) would be required for confirmation. Nutrient concentrations at or below the reporting limit of MEL (0.01 mg/L for all nutrients) are referred to as "BRL." In this report, the occurrence of consecutive months of BRL surface nitrate+nitrite-N is used as an indicator of potential nutrient-limitation.

Nitrite-N (NO_2^--N)

Historically, a very large percentage of samples from Puget Sound analyzed for nitrite-N have shown BRL concentrations (Janzen and Eisner, 1993a; b). To adequately assess nitrite-N concentrations, a detection level of 0.005 mg/L should be achieved (PSWQA, 1988). Thus, in 1992 Ecology discontinued nitrite sample collection at all but a few urban bays until lower reporting limits are available.

During WY 1994-95, Ecology sampled three urban embayments, stations BLL009, BUD005, and CMB003, for dissolved nitrite-N because historical data showed some concentrations above 0.01 mg/L. Dissolved nitrite-N concentrations were BRL in 53 of 57 (93%) samples analyzed in WY 1994 and in 56 of 56 samples from WY 1995. The few times nitrite-N was detected, the values were only slightly above 0.01 mg/L.

Ammonium-N (NH_4^+-N)

Ammonium-N concentrations in Puget Sound and the coastal estuaries were generally lower than nitrate+nitrite-N concentrations (Appendix A). BRL concentrations of ammonium-N were relatively frequent 52% and 48%. These observations have been consistent in the Ecology data and are typical of marine waters. Ammonium-N is the regenerated form of N and is excreted by zooplankton (Dugdale and Goering, 1967; Valiela, 1984). Most phytoplankton assimilate ammonium-N much more rapidly than other sources of nitrogen since it is the reduced form (Parsons *et al.*, 1984), and so it is rarely observed in substantial quantities in seawater. Its natural sources include the degradation of organic nitrogen and denitrification. Because ammonium-N is a by-product of degradation, it is found in high amounts in sewage or other anthropogenic inputs.

Stations with high ammonium-N concentrations could indicate the presence of an anthropogenic ammonia source (e.g., sewage input). To facilitate evaluation, ammonium-N concentrations of 0.07 mg/L (5 µmol/L) and 0.14 mg/L (10 µmol/L) were arbitrarily selected (Newton, 1995b), based relative to the historical maximum Admiralty Inlet concentration of 0.03 mg/L (2 µmol/L). Thus, ammonium-N concentrations >0.07 and >0.14 mg/L are used as indicators of high and very high ammonium, respectively. Stations with high ammonium-N concentrations during WY 1994-95 were: BUD005, CMB003, DNA001, EAS001, ELB015, OAK004, PNN001, PSS008, PSS019, SIN001, and WPA001. Of these, only EAS001 and ELB015 had very high concentrations.

Station EAS001 (East Sound, Orcas Island) had the highest ammonium-N concentrations recorded during WY 1994-95. In May and July 1995, concentrations recorded were 0.117 and 0.279 mg/L (8 µmol/L and 20 µmol/L) at 30 m, higher than the nitrate+nitrite-N concentrations at the same depth on both occasions. The source for this high ammonium-N concentration is not known. It could be from the natural degradation of organic material at depth, though the concentration is quite high. The Orcas Watershed Education Alliance reported evidence of fecal coliform bacteria contamination in East Sound via Eastsound Village's storm water system (OWEA, 1995). In light of the significantly low DO concentrations (as low as 2 mg/L) observed at EAS001, both natural and anthropogenic sources of ammonium-N to East Sound should be investigated.

The other station with a very high ammonium-N concentration was ELB015, with 0.151 mg/L at 0.5 m depth in September 1995. Ammonium-N concentrations at station ELB015 have never been over 0.05 mg/L since monitoring of this core station began in WY 1992.

During WY 1993, station BUD005 in Budd Inlet exhibited the most consistently high concentrations of ammonium-N of all stations monitored that year. Values >0.07 mg/L were recorded five out of twelve months, with a maximum of 0.148 mg/L in May 1993 (Newton *et al.*, 1994). In early 1994, the LOTT wastewater treatment plant implemented N-removal during April to October for their effluent which is discharged into Budd Inlet. Water-column concentrations of ammonium-N in WYs 1994-5 are much lower than those from WY 1993, with only one occurrence annually of ammonium-N >0.07 mg/L (0.85 mg/L in May 1994; 0.78 mg/L in May 1995). Substantial differences in the water column nutrient levels before versus after the change in N input by LOTT were observed throughout Budd Inlet during Ecology's focused monitoring (Eisner and Newton, in prep.).

Nitrate+Nitrite-N (NO_3^-+NO_2^--N)

Detectable nitrate+nitrite-N concentrations were generally observed at all stations from October through March (Appendix C). Processes which promote detectable nitrate+nitrite-N concentrations in surface waters are increased river runoff, low phytoplankton concentrations, and reduced water column stratification which allows for greater mixing between nutrient-rich deep waters and surface waters. Removal of nitrate+nitrite-N from surface waters is through uptake by phytoplankton.

Months with low nitrate+nitrite-N concentrations (late spring through early fall) often correspond with increased chl *a* concentrations (Appendix C), indicating nutrient uptake by phytoplankton. Other factors that may contribute to lower nitrate+nitrite-N levels during this time period are decreased river runoff and increased stratification. An inverse correlation of nitrate with chl *a* is typical of marine systems (e.g., PSEP, 1991b). A correlation analysis of these two parameters would require integrated values over the euphotic zone; the two to three data points (0.5, 10, and 30 m) in this database are not adequate for statistical purposes to infer nutrient-chlorophyll relations.

Of the 633 samples collected for nitrate+nitrite-N analysis in WY 1994, 16% had BRL concentrations (<0.01 mg/L). In WY 1995, 17% of the 817 samples were BRL. The locations of these samples are in Table 5. Temporal and spatial characteristics of these samples show that nitrate+nitrite-N concentrations were BRL most commonly during May through August and at the 0.5 m depth. As has been found previously, BRL nitrate+nitrite-N concentrations throughout the water column to the sea bed (0.5 m through the station's deepest depth) were found in Southern Puget Sound (OAK004, BUD005) and in both coastal estuaries.

Nitrate+nitrite-N concentrations that are BRL for consecutive months are an indicator that phytoplankton populations may be nutrient limited. Nutrient-limited populations are those that would be most sensitive to anthropogenic nutrient inputs. That is, adding nutrients to these locations would result in increased organic production that could subsequently lead to lower DO concentrations. Thus it is useful to know where these locations are and how these nutrient patterns may change with time.

The occurrence of consecutive months of BRL nitrate+nitrite-N can be from natural causes, when large spring blooms exhaust nutrients and stratified water-columns prevent re-injection of nutrients from deep waters throughout the summer. Alternatively the same pattern can result when eutrophication produces a very large phytoplankton bloom, part of which survives and keeps nitrate+nitrite-N concentrations low (BRL) with time. One certainty is that in order to have brought nutrients to BRL levels, the phytoplankton production must have been high. In summary, although it is not possible to definitively interpret the cause of consecutive months of BRL nitrate+nitrite-N, this occurrence indicates areas that would be sensitive to eutrophication.

Stations with the highest number (5-6) of consecutive months of BRL surface nitrate+nitrite-N in Puget Sound are EAS001, PNN001, PSS019, SAR003, SUZ001, QMH001, BUD005, OAK004, and HCB004. All except QMH001 and OAK004 are stations showing low (PSS019, SAR003, SUZ001, BUD005) or hypoxic DO concentrations (EAS001, PNN001, HCB004). Willapa Bay but not Grays Harbor shows several months of BRL surface nitrate+nitrite-N; the reason for the difference in these two similar estuaries is not clear, but freshwater nutrient loads should be evaluated. Neither estuary had low DO concentrations.

Samples with BRL nitrate+nitrite-N concentrations but detectable levels of ammonium-N are typically rare in marine systems. Such a pattern would be suggestive of eutrophication, since ammonium is the usual nitrogen form added from anthropogenic sources. About 5% of the WY 1994-95 samples (82/1450) showed this pattern ("N" in Table 5). The locations for these samples were evenly distributed geographically. Because of uncertainties with nutrient analysis during this period (see Quality Control results), conclusions are not warranted. More typically (103/1450) both nitrogenous nutrients were BRL ("NA" in Table 5), and in some cases all three nutrients ("NAP" in Table 5) were BRL (57/1450).

Table 5. Stations with below reporting limit (< 0.01 mg/L) nitrate+nitrite-N concentrations 1994-95. Occurences indicated by "N" at a particular depth and month. Also shown are the accompanying BRL observations for ammonium ("A") and ortho-phosphate ("P").

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Z
North Puget Sound:													
BLL009 - '94							NAP		N	NAP	N		0.5 m
													10 m
BLL009 - '95								NAP	NA	NAP			0.5 m
													10 m
EAS001 - '95						NAP	N	N	N	NAP	N		0.5 m
(only)								N		NA			10 m
													30 m
JDF005 - '94								NA		NA			0.5 m
(only)													10 m
LOP001 - '94										NAP	NA		0.5 m
(only)													10 m
PNN001 - '94							N	NA	NAP	NAP	NAP	N	0.5 m
(only)								NA					10 m
PSS008 - '95							N		N	N	NAP		0.5 m
(only)													10 m
PSS019 - '94								NAP			NA	NAP	0.5 m
													10 m
													30 m
PSS019 - '95	NA						N	NAP	NA	NAP	NAP		0.5 m
													10 m
													30 m
SAR003 - '94							NAP	N	N	NAP	N	N	0.5 m
													10 m
													30 m
SAR003 - '95						N	N	NAP	N	NA	NAP		0.5 m
													10 m
													30 m
SUZ001 - '95							N	N	NA	NA	NAP		0.5 m
(only)													10 m
													30 m

Table 5. Continued.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Z
Central Puget Sound:													
CMB003 - '94											NA		0.5 m
													10 m
													30 m
CMB003 - '95									N	NA	NA		0.5 m
													10 m
													30 m
DYE004 - '95								NAP	NA	N	NA		0.5 m
(only)									NA	N	NA		10 m
													30 m
EAP001 - '95										NA	N		0.5 m
(only)													10 m
													30 m
PMA001 - '95						NAP		NAP		NA	N		0.5 m
(only)													10 m
													30 m
POD006 - '95									NA	N	NA		0.5 m
(only)										N	N		10 m
QMH001 - '95							NAP	NAP	N	NA	NA	NP	0.5 m
(only)													10 m
SIN001 - '94									NA	NA	NA		0.5 m
													10 m
SIN001 - '95									NA	N	NAP		0.5 m
													10 m
South Puget Sound:													
BUD005 - '94							NA	NA	NAP	NA	NA	NA	0.5 m
										NA	N		10 m
BUD005 - '95								NAP	NA	N	NA	N	0.5 m
									NA	N	N		10 m
DNA001 - '94											NA		0.5 m
													10 m
													30 m
DNA001 - '95									N	N	N		0.5 m
										N	N		10 m
													30 m
OAK004 - '94							NA	NA	N	NA	NA	NA	0.5 m
							NA	NA	NA	NA	NA	NA	10 m
OAK004 - '95								NAP	NA	N	NA	NA	0.5 m
								NAP	NA	NA	NA	N	10 m

Table 5. Continued.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Z
Hood Canal:													
HCB004 - '94	NA					NAP		NA	NAP	NA	NA	NA	0.5 m
													10 m
							N						30 m
HCB004 - '95	NA				NAP	N	NAP	NAP	NAP	NA	NA	N	0.5 m
									N		NA		10 m
													30 m
HCB006 - '94							NAP	NA		NA			0.5 m
													10 m
													30 m
HCB006 - '95					NAP	NAP		NAP	NA	NA	NAP		0.5 m
													10 m
													30 m
Coastal Estuaries:													
GYS016 - '94								NAP	NAP	N	NA		0.5 m
								NA	N	NAP			10 m
WPA001 - '94										N			0.5 m
								N		N			10 m
WPA001 - '95											NA		0.5 m
											N		10 m
WPA003 - '94								NAP	N	NAP			0.5 m
								N	N	NAP			10 m
WPA003 - '95								N			N		0.5 m
								N	N	N	N		10 m
WPA004 - '94								NAP	NAP	NAP	N		0.5 m
							N	N	NAP	NAP	NA		10 m
WPA004 - '95							N	N	N	NA	NA		0.5 m
							N	N	N	NA	NA		10 m
WPA006 - '94							N	NA		NAP			0.5 m
								NAP					10 m
WPA006 - '95							NA	NA	NA	NA	NA		0.5 m
							NA	N	NA	NA	N		10 m
WPA007 - '94							N	NA	NAP	NA	NA	NA	0.5 m
							N	NA	NA	NAP	NA	N	10 m
WPA007 - '95							NA	NA	NA	NA	NA	NA	0.5 m
							NA	N	NA	NA	N	N	10 m

Orthophosphate-P (oPO_4^{-3}-P)

Orthophosphate-P concentrations followed the same general pattern as nitrate-nitrite-N, with lower concentrations at 0.5 m than at either 10 or 30 m, and lowest concentrations from late spring to early fall (Appendix A). Orthophosphate-P was BRL less frequently than the nitrogenous nutrients, in keeping with its non-limiting role in marine systems. BRL orthophosphate-P concentrations were observed in 14% of the nutrient samples during WY 1994 and in 10% during WY 1995.

A notable difference is evident in the nutrient dynamics of Puget Sound stations versus the coastal estuary stations. BRL orthophosphate was observed in 6% and 7% of the Puget Sound samples and in 47% and 23% of the coastal estuaries samples during WY 1994 and WY 1995, respectively. Samples with BRL orthophosphate but detectable nitrate+nitrite-N and ammonium-N were exceedingly rare in Puget Sound (<1%) yet were relatively common (10-20%) in the coastal estuaries. Nutrient limitation due to N versus P is sometimes variable in estuaries with significant freshwater input. Samples with BRL P but detectable N generally had salinities less than 20 PSU. Although, this observation cannot be used to draw conclusions regarding nutrient limitation, a difference in the nutrient dynamics (linked with the significance of freshwater input) for Puget Sound phytoplankton versus that for Grays Harbor and Willapa Bay is clearly indicated.

Fecal Coliform Bacteria

Coliform bacteria are present in human and animal fecal wastes. Most coliform bacteria are not harmful to humans, however, some strains are pathogenic, causing severe complications and/or death. Even though most fecal coliform bacteria (fcb) are not harmful themselves, their presence can serve as an indicator for pathogenic bacteria and viruses that also are in feces. Both point (e.g., combined sewer overflows, direct marine discharge) and non-point (e.g., surface water runoff from dairy farms) sources of fcb enter streams and rivers, and thus fresh water input is a major source of fcb to the marine environment. Increased river discharge and runoff caused by heavy rains often corresponds with elevated bacterial counts in marine waters.

The Washington State criterion for class A and AA marine waters states that the bacteria count shall not exceed a geometric mean value of 14 organisms/100 mL, with no more than 10 percent of samples exceeding 43 orgs./100 mL (WAC 173-201, 1991). This criterion is better applied to more intensive survey data, where multiple samples are collected over smaller areas, instead of the once per month point sample for each station that is presented here. Monthly data at a single station are not well-suited for calculating "exceedances" since variation is inherently high with fcb samples.

In this report the level of 14 orgs./100 mL is used as an indicator of where contamination may be of concern and is termed a high count. A second level of 50 orgs./100 mL is used to indicate very high counts, where contamination may be serious. However, observations of high fcb counts in marine waters may be quite erratic due to the short lifetime of fcb in seawater (1-2 d;

Lessard and Sieburth, 1983). Further, the episodic nature of runoff events which can transport fcb to marine waters implies that sampling these events will be improbable. The proximity of sampling date to the runoff event will have a major impact on whether high fcb counts were recorded. Thus, these stations are severely under-sampled with respect to identifying fcb contamination and establishing interannual trends.

During WY 1994-95, samples from 16 stations had high fcb counts during at least one month (Figure 6). Twelve of these stations are in Puget Sound, two are in Grays Harbor and two in Willapa Bay. Very high counts were observed at 7 of the 12 Puget Sound stations; however in all but one case (CMB006), these were single events. Station CMB006, at the mouth of the City Waterway, is the only Puget Sound station monitored that had pervasive or chronic fcb contamination during WY 1994-95. Both Grays Harbor and Willapa Bay appear to have strong fcb contamination. Very high counts were observed at three of the four coastal estuary stations and all four stations showed chronic fcb contamination.

Many of the stations with high fcb counts in WY 1994-95 have also shown high fcb counts in previous wateryears (Newton, 1995b). Samples from Budd Inlet (BUD005), Commencement Bay (CMB003, CMB006), Oakland Bay (OAK004), Possession Sound (PSS008/PSS019), Grays Harbor (GYS004, GYS008), and Willapa Bay (WPA001) have all had counts over 14 orgs./100 mL during at least one month in each wateryear from 1990 through 1995.

Figure 6 also shows the seasonal pattern of when fcb counts were high. In Puget Sound, high counts mostly occurred October through March, with the majority in November through January. Wintertime high fcb counts have been common in Puget Sound and are associated with high runoff, which transports fcb to marine waters. Summertime high counts are not typically observed in Puget Sound and except for CMB006 were not observed in WY 1994-95. Summertime high fcb counts were not observed at any of the stations monitored during WY 1990-92, though high counts were observed during WY 1993 (PSS019, CMB003, ELB015, SIN001 in July; OAK004 in June). These occurrences may have been linked to freshwater runoff events that summer (Newton *et al.*, 1994).

Fecal coliform bacteria counts were generally higher in WY 1995 than 1994 (Figure 6). This correlates with the increased mean flow of rivers in 1995 versus 1994 (USGS, 1994; 1995) and suggests the importance of runoff in transporting fcb to the marine environment. The SSS values recorded in WY 1995 were generally lower than those of WY 1994 (Figure 4).

The coastal estuary stations have consistently higher and more persistent fcb counts than are found at the Puget Sound stations (Figure 6). The high fcb counts were observed primarily in the freshwater-influenced stations in both Grays Harbor and Willapa Bay except for GYS008. Although both Grays Harbor and Willapa Bay stations showed high counts throughout the year, counts were often even higher in summer. In WY 1995 the occurrence of very high counts was common, ranging three to five months of the year in both estuaries. Counts in Grays Harbor were most extreme (>1000 orgs./100 mL). The fcb conditions at mid Grays Harbor (GYS008) were particularly severe. These results are consistent with Department of Health's classification

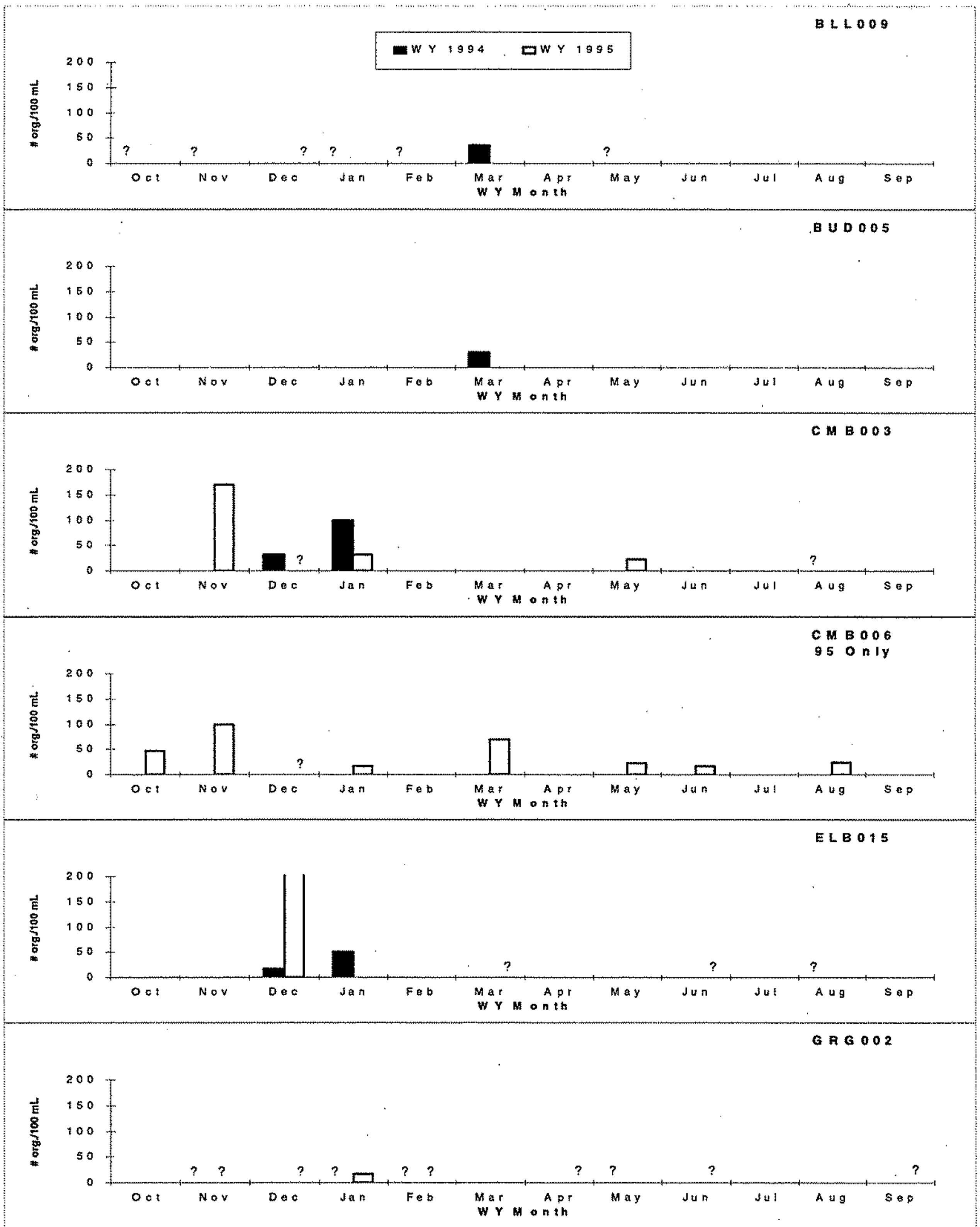

Figure 6. Fecal coliform bacteria counts versus wateryear month for stations with high counts (> 14 organisms/100 mL) during WY 1994-95. The "?" indicates a sample was not obtained.

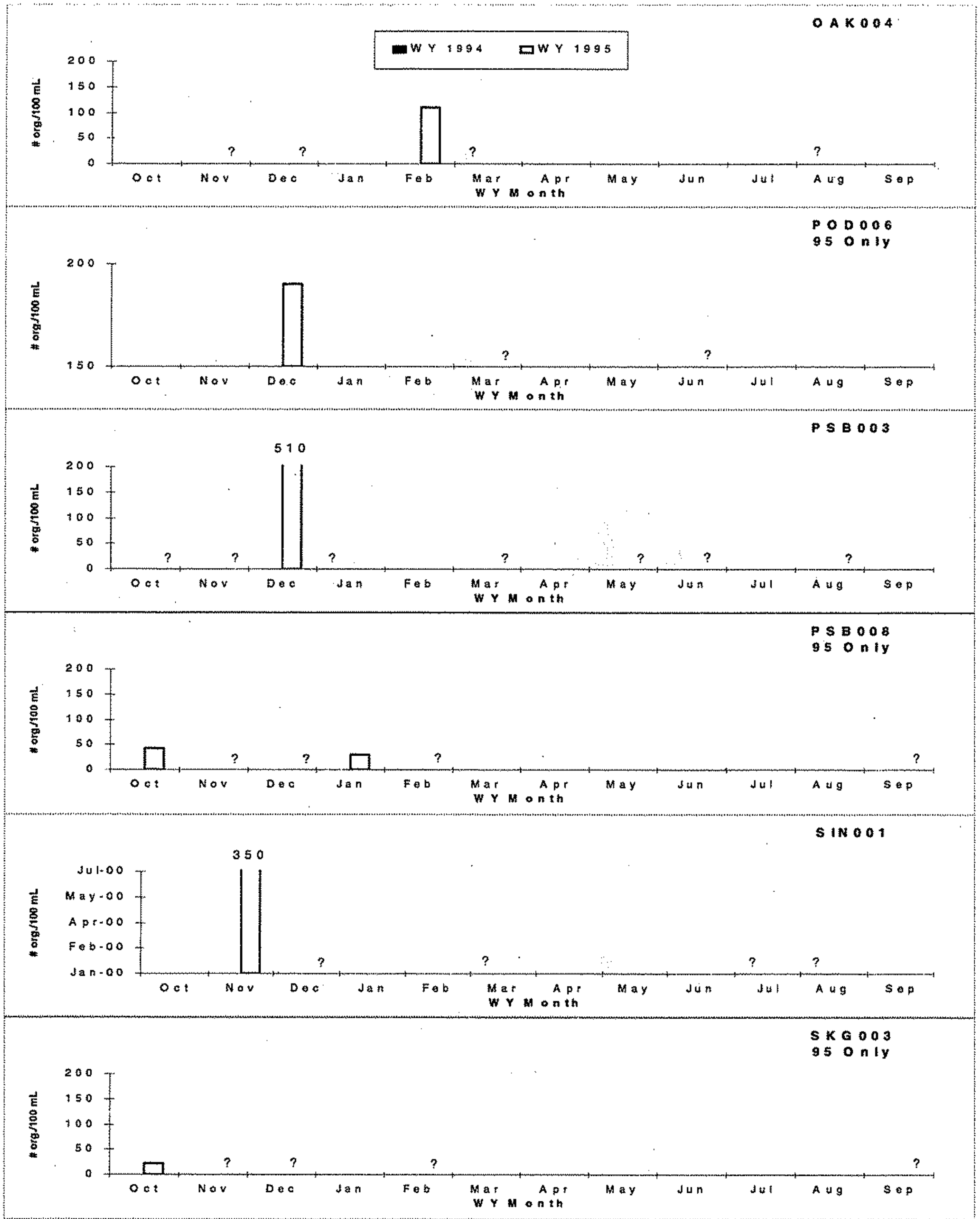

Figure 6. Continued.

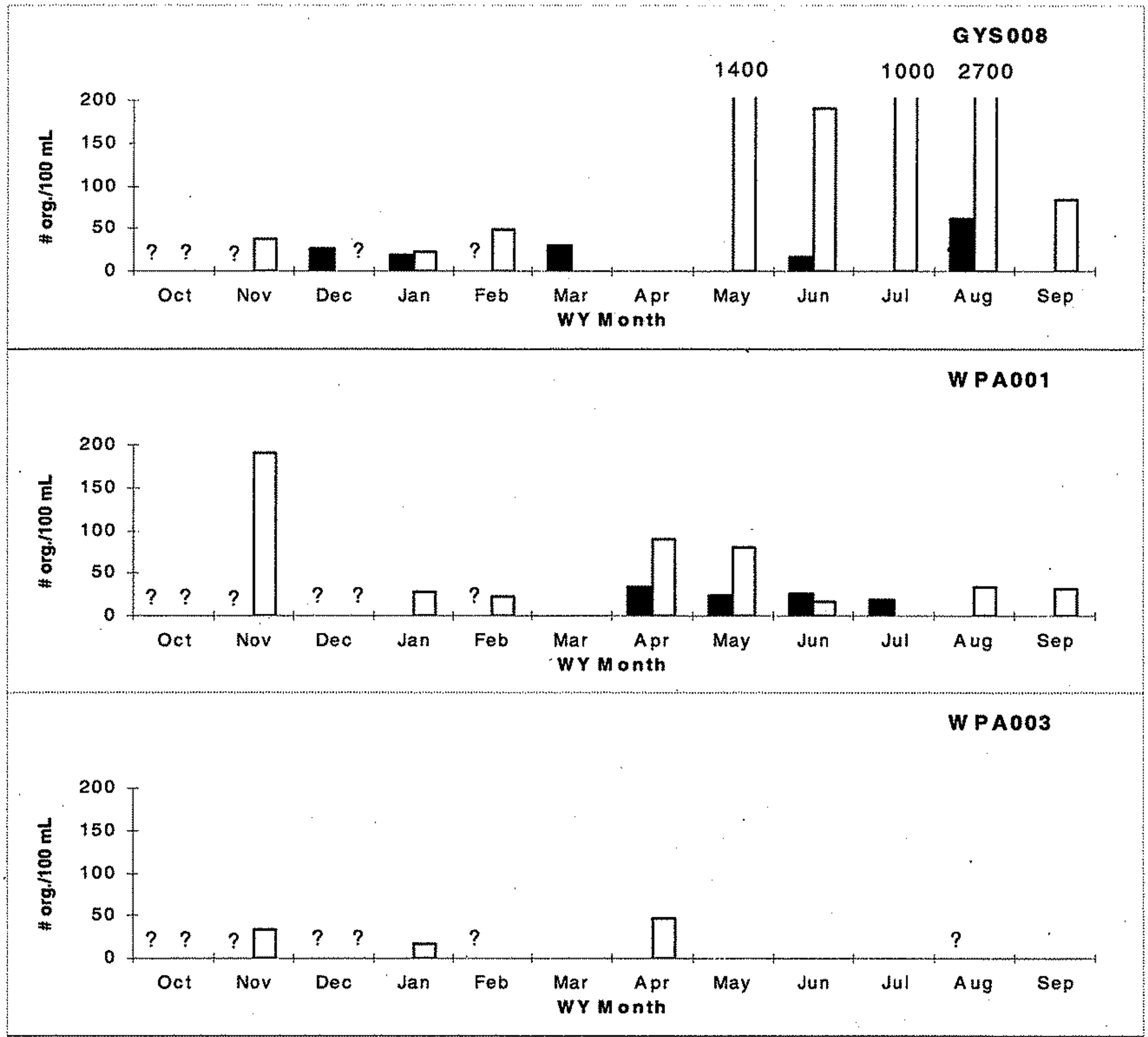

Figure 6. Continued.

of "prohibited" status for shellfish growing areas in the west half of Grays Harbor (Health, 1993). This area includes numerous industrial and sewer outfalls. Further study should be made to determine the source(s) of contamination.

Based on review of Ecology's fcb data from WYs 1990 through 1995, areas with chronically high fcb counts are Grays Harbor, Willapa Bay, and Commencement Bay. Presence of fecal bacteria associated with wood (*Klebsiella*) may contribute to the high counts in these areas, but the significance of the contribution needs investigation. Areas with high counts but with a lesser extent of persistence are Possession Sound, Budd Inlet and Oakland Bay. These later areas did not show significant contamination in WY 1994-95 but have in other years (Newton, 1995b). Because of the inherent undersampling in these fcb data, more intensive sampling of these areas would be required to assess conditions.

Quality Control

Quality control results for WY 1994-95 are summarized in Tables 6 through 8. In general data quality was acceptable except for the nutrient analyses which showed poor precision and accuracy. Two corrective measures have been implemented since WY 1995 which have resulted in improved quality to acceptable ranges.

Precision

The precision of both replicate laboratory analyses (lab variation) and replicate field sample analyses (field+lab variation) was estimated by the relative standard deviation of these replicates (%RSD = (sample standard deviation / sample mean) * 100), as shown in Table 6. Below reporting limit (BRL) results were not included in the RSD calculations. In all cases field+lab variation exceeded lab variation, as would be expected. The objective of 75% of the data within the target RSD range for lab replicates was not met for any of the nutrients, but was for the fcb and pigment analyses. The target RSD ranges of 10% for nutrients and 20% for fecal coliform bacteria, chl *a,* and phaeo are those established in the Ambient Marine Water Column Monitoring Plan (Janzen, 1992a).

As with the previous three wateryears (Janzen and Eisner, 1993a,b; Newton *et al.*, 1994), dissolved ammonium-N laboratory replicates had the lowest percentage of samples that fell within the target RSD range of all of the parameters (Table 6). Note that field+lab variation is also high. However, unlike previous years, less than 75% of the other nutrients meet the data quality objective. Precision in nutrient concentration in both lab and field replicates was unacceptably poor. Subsequent to these findings two improvements have been made. To improve field sampling variation, nutrient samples are filtered immediately after sampling instead of several hours later. This will eliminate random changes in nutrient concentrations due to biological processes in the bottle (e.g., grazing, cell lysis). To minimize laboratory analysis variation, MEL is running nutrient analyses with seawater standards instead of distilled water standards. Changes in the refractive index due to salinity warrant using this procedure for marine samples.

Table 6. Relative standard deviations (RSD%) for various parameters. Shown in parentheses is how field+lab and lab only variation was estimated. Shading indicates target range for RSD%. Data below reporting limits were excluded. Only data from WY 1995 are shown.

	$NO_3 + NO_2$		NH_4		oPO_4	
	FIELD+LAB (3 reps.)	LAB (2 splits)	FIELD+LAB (3 reps.)	LAB (2 splits)	FIELD+LAB (3 reps.)	LAB (2 splits)
n:	30	25	21	22	36	31
RSD%[1]						
0-10	47%	72%	24%	27%	36%	68%
>10-20	40%	8%	29%	23%	44%	10%
>20-30	7%	12%	14%	18%	8%	6%
>30-40	-	4%	14%	14%	6%	10%
>40-50	3%	-	5%	9%	-	3%
>50-60	-	-	5%	-	3%	3%
>60-70	-	-	5%	-	-	-
>70-80	3%	-	-	9%	-	-
>80-90	-	-	-	-	3%	-
>90-100	-	-	-	-	-	-
>100	-	4%	5%	-	-	-
mean RSD:	30%	13%	21%	24%	36%	13%

	FCB		CHL *a*		PHAEO	
	FIELD+LAB (2 reps.)	LAB (2 splits)	FIELD+LAB (3 reps.)	LAB (2 blind splits)	FIELD+LAB (3 reps.)	LAB (2 blind splits)
n:	30	30	22	22	22	22
RSD%[1]						
0-10	50%	67%	36%	50%	23%	55%
>10-20	7%	10%	45%	36%	36%	27%
>20-30	3%	10%	9%	-	9%	5%
>30-40	7%	-	5%	-	9%	5%
>40-50	10%	3%	5%	5%	9%	5%
>50-60	3%	-	-	5%	5%	-
>60-70	-	-	-	-	5%	-
>70-80	10%	10%	-	-	5%	-
>80-90	3%	-	-	-	-	-
>90-100	-	-	-	-	-	-
>100	7%	-	-	5%	-	5%
mean RSD:	29%	14%	15%	16%	26%	16%

[1]RSD% was calculated as:

= (sample standard deviation / sample mean) * 100

Table 7. Nutrient analysis check standard results for WY 1994 and 1995.

Parameter	n	Standard conc. (mg/L)	Determined conc. (mg/L)			% error[1]	
			mean	RSD	range	mean	range
1994:							
NH_4^+-N	36	0.500	0.496	4%	0.469 -- 0.548	-1%	-6% -- 10%
	35	0.075	0.077	10%	0.060 -- 0.105	3%	-20% -- 40%
NO_3^-+NO_2^--N	36	0.500	0.502	3%	0.478 -- 0.523	0%	-4% -- 5%
	35	0.075	0.075	8%	0.058 -- 0.088	0%	-23% -- 17%
oPO_4^{-3}-P	37	0.500	0.497	3%	0.467 -- 0.521	-1%	-7% -- 4%
	36	0.075	0.072	15%	0.021 -- 0.089	-4%	-72% -- 19%
1995:							
NH_4^+-N	38	0.500	0.506	4%	0.460 -- 0.546	1%	-8% -- 9%
	31	0.075	0.079	8%	0.063 -- 0.092	5%	-17% -- 23%
NO_3^-+NO_2^--N	38	0.500	0.515	4%	0.472 -- 0.577	3%	-6% -- 15%
	31	0.075	0.079	7%	0.069 -- 0.090	5%	-8% -- 20%
oPO_4^{-3}-P	37	0.500	0.510	4%	0.483 -- 0.575	2%	-3% -- 15%
	31	0.075	0.073	6%	0.066 -- 0.081	-2%	-12% -- 9%

[1]Percent error was calculated as:

= [(mean determined conc. - standard conc.) / standard conc.] x 100

Table 8. Nutrient spiked sample recovery results for WY 1994 and 1995. The range of acceptable recovery is 70% -- 130%.

			% spike recovery[1]		
Parameter	Year	n	mean	RSD	range
NH_4^+-N	1994	36	86.7%	15.7%	62.3% - 126.1%
	1995	39	85.8%	14.2%	56.6% - 126.6%
NO_3^-+NO_2^--N	1994	33	91.8%	16.3%	67.9% - 129.3%
	1995	36	92.4%	23.7%	49.4% - 163.6%
oPO_4^{-3}-P	1994	37	95.2%	17.2%	66.7% - 136.5%
	1995	39	94.3%	22.6%	53.7% - 168.1%

[1]Percent spike recovery was calculated as:
= [(measured spike+sample conc.) - measured sample conc.] / known spike conc.

The chl *a* and phaeo results show marked improvement over previous wateryears, with over 80% of the RSD's in the target range for all (except phaeo field + lab, which are inherently variable) as compared with 60-70% recorded in previous years. Changes in sample preservation and fluorometer calibration procedures implemented at the beginning of WY 1994 likely account for this improvement.

Fecal coliform bacteria displayed acceptable precision, with higher precision for laboratory replicates (77% in target range) than for field replicates (57% in target range; Table 6). High RSD values can be expected for fecal coliform bacteria data due to the frequency of samples with low numbers of organisms. A difference in one organism count has greater impact when total organism counts are low.

Accuracy

The accuracy of the laboratory nutrient analyses was indicated by the results of the check standards of high (0.5 mg/L) and low (0.075 mg/L) known concentrations analyzed with each batch of nutrient samples processed (Table 7). The check standard results indicate good accuracy ($\leq$5% error) for all nutrients when mean values of the % error are considered. However, the range in the % error for most of the nutrients is quite broad and many include errors over 20%. These results show a decline over previous wateryear results.

Note that check standards were not in the concentration range of the bulk of the marine data presented in this report. The range of the percent error was larger for the low check standard than for the high check standard. The bulk of the marine water ammonium-N and orthophosphate-P concentrations are below 0.075 mg/L, and it is not uncommon for nitrate+nitrite-N concentrations to be below this level. The accuracy of samples with concentrations lower than 0.075 mg/L is impossible to determine from these data.

Perhaps a better indication of analytical accuracy within the range of the sample concentrations measured is obtained from spiked sample recoveries. The mean, RSD, and range of the percent recovery of nutrient spiked samples also indicate poor accuracy (Table 8). None of the spiked sample percent recovery ranges were entirely within the acceptable range of 70% - 130% (S. Lombard, Ecology, pers. comm.). These results also show a decline over previous wateryear results.

Blanks

Blank values consistently fell below the reporting limits for nutrients and pigments, as anticipated.

Sensor Verification Samples

Results of the verification samples for the *in situ* DO sensor ran by modified Winkler titration as shown in Figure 7 are quite good for most samples. When the titration value was above 2 mg/L (n=72) the percent difference in the two methods was always less than 7%, but when it was below 2 mg/L (n=2) the percent difference was 21-71%. For all 74 samples there was a mean difference of -1.6%. When the <2 mg/L values were eliminated, the mean difference was 0.0%. These results confirm that the *in situ* DO sensor operates with a low and random error when concentrations are above 2 mg/L. When samples are under this value, the DO sensor gives substantial overestimates of the true DO concentration, as determined by titration. This result, shown by only two samples in these data, has been found consistently in other Marine Waters Monitoring data. Manufacturers acknowledge this limitation is due to the slowness of the *in situ* sensor to respond to gradients in both DO and temperature. Thus, the accuracy of the *in situ* DO data was confirmed, with the exception that the hypoxic DO concentrations in this report are possibly overestimates of the true value.

Verification samples for the *in situ* salinity sensor ran using a salinometer showed excellent agreement, with the percent difference for all 39 paired samples less than or equal to 1%. The mean was 0.09% and there was no directional variation at any salinity. Thus, the accuracy of the *in situ* salinity data is extremely high.

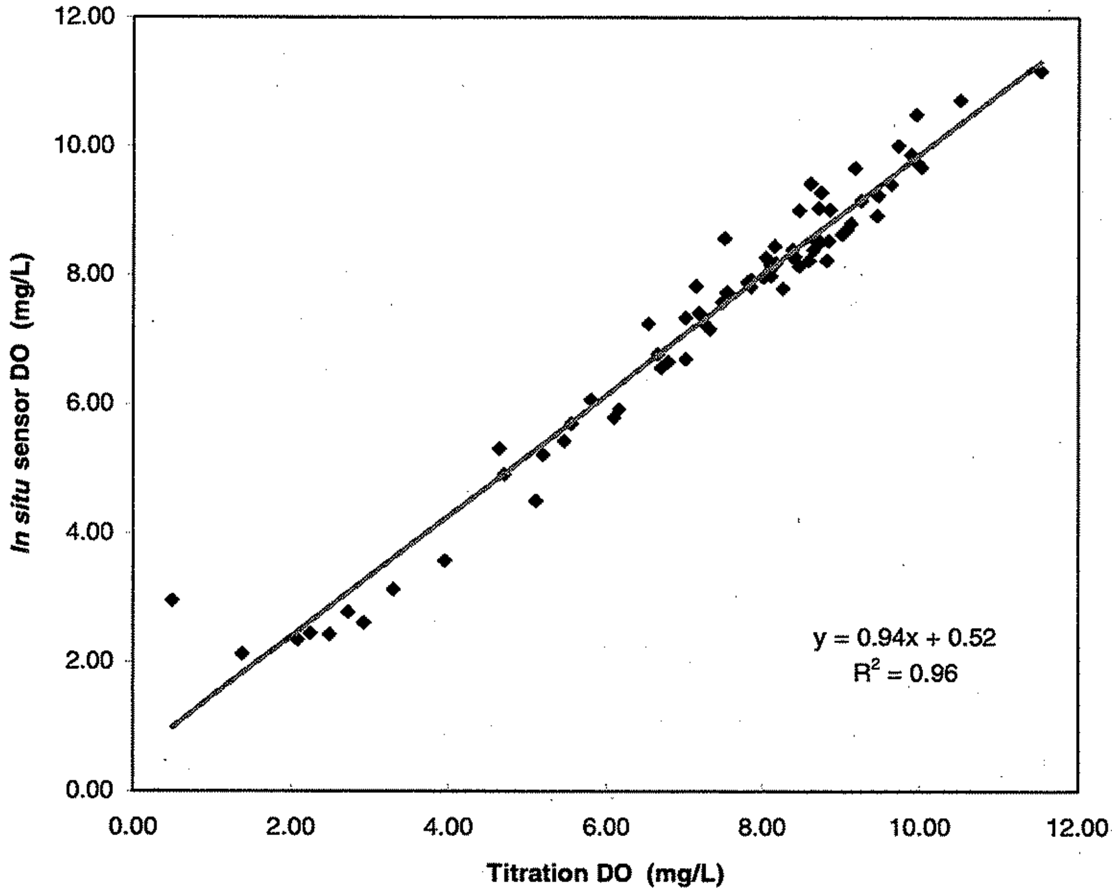

Figure 7. Regression of sensor versus titration results for DO sensor verification samples during WY 1994-95.

General Discussion

The data presented within this report can by no means be consolidated to a general conclusion. One impression that the user of this report will hopefully obtain is the complexity and interconnectedness of the data. Stratification, chlorophyll, nutrients, light penetration, and dissolved oxygen data are all interrelated variables. With monitoring data that is collected over large spatial and temporal scales, only gross patterns or differences can be determined. This discussion is focused on stratification and its implications for water quality in Puget Sound and the coastal estuaries.

Implications of Stratification for Water Quality

A thorough discussion of stratification and its impacts on DO and nutrients was included in Newton *et al.* (1994). An edited summary is included here.

The development of stratification within the water column is significant because of the physical barrier it presents with respect to vertical water movement. Turbulent eddies, driven by winds and tides, cause vertical mixing of phytoplankton, DO, nutrients, etc. If, however, the water is stratified, that is, its density increases significantly with depth, then the ability of turbulent eddies to accomplish vertical mixing will be greatly decreased. This is particularly true at the pycnocline, the region of greatest density increase, which is often observed in the top several meters of the water column. Thus, stratification effectively isolates the surface water from the deep water. When stratification is intense, two environmental conditions can be affected: surface waters can become depleted of nutrients (dissolved nitrogen and phosphorus) and bottom waters can become depleted of oxygen. This is due to phytoplankton growth in the surface water that will deplete ambient nutrients, with no resupply from nutrient-rich deep waters, and to the decomposition of the organic material in the bottom water that will consume oxygen, with no resupply from oxygen-rich surface water.

The concentrations of both DO and nutrients in the water column are the net result of many dynamic input and uptake processes. The relative magnitude of the transfer rates from sources and sinks must be considered . Also, sources and sinks of these compounds can be from either natural or anthropogenic processes. Examples of oxygen sources are photosynthetic production, diffusion of oxygen from the atmosphere through the water column, and advection or mixing of highly oxygenated waters into lower saturated waters (e.g., downward mixing of surface waters). Examples of oxygen sinks are respiration (especially by bacteria which decay organic matter), chemical oxidation-reduction reactions such as the oxidation of metals (e.g., rusting of iron) or sulfides, and advection/mixing of lower oxygenated waters into higher saturated waters (e.g., upwelling of deep waters). Nutrient inputs into marine waters include dissolved and particulate matter carried by rivers, effluent from sewage treatment plants, agricultural runoff, failing septic tanks, bacterial nutrient processing (e.g., nitrification), and upwelled deep waters. Nutrient uptake processes include consumption by phytoplankton, bacterial uptake, and possibly the adsorption of nutrients to particulates that eventually settle out.

Although stratification is necessary for phytoplankton growth it also optimizes the chances for low DO concentrations. Conditions favorable for phytoplankton growth are sufficient light and nutrients and some degree of stratification (*i.e.,* to prevent mixing out of the euphotic zone. Under such conditions, phytoplankton biomass increases in the upper layer of the water column and nutrients are consumed as growth continues. Without a replenishing source, surface nutrient concentrations decrease and can limit phytoplankton growth, causing a decrease in their biomass. When a nutrient source is available to surface waters, however, phytoplankton production will never reach a nutrient-limited state. Nutrient input can occur naturally through mixing, but the mixing also causes light limitation thus preventing significant population increase. Eutrophication (external increase in nutrient supply to system) of nutrient-limited stratified waters can result in very large algal blooms and, after these sink, a correspondingly large DO debt in bottom waters. However, the physical stratification of the water receiving the nutrient input is important, since inputs to well-mixed water columns have no immediate effect.

Depletion of DO in the water column can have a serious impact on marine ecosystems. The degree of impact upon any given ecosystem may be dependent upon the intensity of the DO depletion as well as the temporal and spatial stability/persistence of the depressed DO levels (Llansó, 1992). In addition, the effects of DO depletion are both organism- and habitat-specific (Harding *et al.*, 1992). Certain species of fish are stressed by environmental conditions of DO concentrations just under 5 mg/L (Kramer, 1987; Whitmore *et al.*, 1960). Other species may not exhibit stress at 2.0 mg/L (Pihl *et al.*, 1992). Benthic infauna and, particularly, molluscs are more resistant to hypoxia (Theede *et al.*, 1969).

Continual, or even intermittent hypoxic events, may result in a shift in species composition. Fish may move away from the depleted area, or have higher susceptibility to disease (Smith *et al.*, 1992). Motile species that are affected will attempt to leave the hypoxic area. Sedentary species may be killed outright, or exhibit significant changes in reproductive rates and larval recruitment (Llanso, 1992). The species composition of a given area may also shift in response to changes in predator-prey relationships. Hypoxic conditions can initiate behavioral changes and physiological stresses (Roman *et al.*, 1993). The diel pattern of vertical migration exhibited by some zooplankton to avoid predation can be interrupted. Copepods have been found to remain in the pycnocline in an attempt to avoid a bottom layer of low-oxygenated water (Olson, 1989). Hypoxia may also inhibit the hatching of zooplankton eggs, thereby reducing larval recruitment, and suppress metabolic rates (Roman *et al.*, 1993).

Thus, the net effect of oxygen depletion in marine waters may be a shift in species composition, a decrease in population numbers and species diversity with a resulting decrease in amount and type of biomass, a disruption of the usual predator-prey interaction, and a shift in the expected trophic pathways. These combined effects can result in reduced availability and subsequent harvest of marine resources. Because the consequences of eutrophication are large, understanding its potential in local waters is important. The stratification index and other indicators presented in this report are useful in increasing that understanding.

Indicators of Puget Sound and Coastal Estuary Water Quality

Five indicators of environmental condition were introduced in the Results and Discussion section: (1) degree of stratification (persistent, seasonal, episodic, weak), (2) low DO concentrations (<3 mg/L, <5 mg/L), (3) high ammonium-N concentrations (>0.07 mg/L, >0.14 mg/L), (4) consecutive months of BRL surface nitrate+nitrite-N concentrations (three months, six months), and (5) high fecal coliform bacteria concentrations (>14 orgs./100 mL, >50 orgs./100 mL). A summary of the indicators is in Table 9; their co-occurence at stations is discussed in this section.

Table 9. Indicators of environmental condition at Marine Waters Monitoring stations during WY 1994-95. Additional information on indicators is in text. No data collected is indicated by a "-".

Station	stratification[1]	low DO[2]	consecutive BRL NO_3 [3]	hi NH_4 [4]	hi FCB[5]
Puget Sound stations:					
BLL009	P		x		x
BUD002	P	X	-	-	-
BUD005	P	x	X	x	x
CMB003	P		x	x	X
CMB006	P				X
ELB015	P	x		X	X
HCB006	P	x	x		
HCB007	P	X	-	-	-
HCB004	P	X	X		
HCB003	P	X	-	-	-
PNN001	P	X	X	x	
PSS008	P		x	x	x
PSS019	P	x	X	x	
SAR003	P	x	X		
SIN001	P		x	x	X
SKG003	P	x			x
SUZ001	P	x	X		
DYE004	S		x		
EAS001	S	X	X	X	
GRG002	S	x			x
PSB003	S				X
QMH001	S		X		
OAK004	E		X	x	X
POD006	E				X
DNA001	W		x	x	

[1] Stratification: P = persistent; S = seasonal; E = episodic; W = weak
[2] Low DO: X = <3 mg/L; x = <5 mg/L
[3] BRL NO_3: X = $\geq$5 consecutive months; x = $\geq$3 consecutive months
[4] High NH_4: X = >0.14 mg/L; x = >0.07 mg/L
[5] High FCB: X = >50 orgs/100 mL; x = >14 orgs/100 mL

Table 9. Continued.

Station	stratification[1]	low DO[2]	consecutive BRL NO_3[3]	hi NH_4[4]	hi FCB[5]
Coastal Estuary stations:					
Willapa Bay:					
WPA001	P			x	X
WPA003	P		x		X
WPA004	E		X		
WPA006	E		X		
WPA007	W		X		
Grays Harbor:					
GYS004	P				X
GYS008	P				X
GYS009	P		-	-	-
GYS015	P		-	-	-
GYS016	P		x		

Several Puget Sound stations exhibited hypoxic (<3 mg/L) DO concentrations (BUD002, EAS001, HCB007, HCB004, HCB003, and PNN001; Table 9). All of these stations except EAS001 showed persistent stratification, with EAS001 exhibiting seasonal stratification. Likewise, for stations with two or more observations of low DO concentrations (ADM002, HCB006, PSS019, SAR003, SUZ001) all showed persistent stratification except ADM002. As previously stated, the cause for the low DO concentrations at ADM002 is the natural seasonal influx of low-oxygenated upwelled Pacific oceanic water. Thus, observing stratification patterns is a good indicator of areas that may be sensitive to developing low DO conditions.

Using stratification as an indicator, the other stations where persistent stratification was observed (BLL009, BUD005, CMB003/006, ELB015, SIN001, and SKG003; Table 3) should be regarded as areas where significant nutrient loading could cause low DO concentrations. Most of these stations are bays near urban areas where development could increase. Single observations of low DO concentrations were seen at BUD005, ELB015 and SKG003.

Regarding low DO, it must be stressed Ecology monitoring stations represent a single typically mid-bay location in most bays. Conditions within the bay can be quite variable. Typically, DO concentrations are lower at the heads of bays than in the middle or outer portions. For example, observe the difference between conditions at BUD002 versus BUD005, located ~ 4 km apart (Table 4, 9). This pattern has been evident at other areas more intensively monitored e.g., Sinclair Inlet (Albertson *et al.*, 1995), Hood Canal (Newton *et al.*, 1995). The DO data presented here are high estimates for this reason and also because of inherent sensor time-lags (see Quality Control in Results and Discussion).

Further information on nutrient sensitivity (*i.e.,* where nutrient loading could lead to low DO) may be obtained from the patterns of consecutive months with BRL nitrate+nitrite-N concentrations. In Puget Sound, the stations with three or more consecutive months of BRL nitrate+nitrite-N nearly all had persistent or seasonal stratification (Table 9). Stations exhibiting 5-6 consecutive months included all but one of the stations with hypoxia and many of the stations with low DO. In Willapa Bay this indicator is observed but it is not associated with low DO. The mechanism for this is not clear. In Grays Harbor there are few stations with nutrient data; at these stations surface nitrate+nitrite-N is seldom BRL for consecutive months and low DO does not occur.

A sub-set of the stations with BRL nitrate+nitrite-N for consecutive months (BUD005, CMB003, DNA001, EAS001, ELB015, OAK004, PNN001, PSS008/019, and SIN001) exhibited high ammonium-N concentrations. With a few exceptions, these are the stations where high fcb counts were observed (BLL009, BUD005, CMB003/006, ELB015, GRG002, OAK004, POD006, PSB003, PSS008, SIN001, SKG003). Many of these stations are in areas with significant freshwater runoff. Freshwater runoff can be a source of both ammonium-N and fcb contamination.

In Puget Sound, physical forcing of biological response in a given area is strong, as was evident from the correlation of stratification index with low DO occurrence. Similarly, climate forcing of interannual variation is also evident. Freshwater runoff was higher in WY 1995 than

WY 1994 and this impact was shown by the lower SSS recorded throughout Puget Sound (Figure 4). Higher fcb counts in WY 1995 were evident and many correlated with precipitation events (Figures 3, 6; note December 1995). The increased stratification afforded from the increase in freshwater input could be hypothesized to affect the severity of the low DO conditions. The occurrence of low DO in Hood Canal, a location with substantial freshwater input, appears to fit this pattern, with 19 occurrences in WY 1994 versus 28 in WY 1995. In contrast, East Sound which has no major freshwater input does not fit this pattern, with five occurrences in WY 1994 versus two in WY 1995. At the other stations with low DO that were monitored in both years occurrences were roughly equal. Other climatic variables (e.g., incident radiation, wind stress) not regarded in this report may also contribute to the inter-annual patterns observed.

The coastal estuary stations show different dynamics than the Puget Sound stations (Table 9). The lack of low DO concentrations in the coastal estuaries is significant, especially since the river input maintains intense stratification at times. Tidal action in these estuaries is strong and likely keeps DO concentrations well-mixed. Also, episodic wind mixing would be more effective in these relatively shallow estuaries. Interestingly, the extremely high fcb counts (>1000 orgs./100 mL) in these estuaries (GYS004/008, WPA001/003), which far exceed those seen in Puget Sound, suggest that flushing is not completely effective or that the input of fcb in the coastal estuaries is exceptionally large. High ammonium-N concentrations were seen at only one of these stations (WPA001). Consecutive months of BRL nitrate+nitrite-N were observed at different stations (GYS016, WPA003 and WPA004). Understanding the dynamics of the coastal estuary stations will likely be difficult to resolve without conducting sampling according to tidal stage.

Conclusions

- For the Puget Sound region in general, water quality as indicated by DO, nutrients, and fcb appears to be reasonably good. However, there are individual places within the Puget Sound region where water quality appears reduced (see below). Note, this assessment of water quality does not include chemical contamination, plankton species assemblages, or changes in flushing characteristics. Also, the representativeness of mid-bay stations can be questioned, and definite undersampling of locations within Puget Sound is acknowledged.

- DO concentrations less than 3 mg/L were found at 6 out of 35 stations monitored. Hypoxic conditions in southern Hood Canal, East Sound, and Penn Cove appeared to be especially severe and approached anoxia. East Sound also showed high ammonium-N concentrations at depth. Whether anthropogenic processes are responsible for the severity of these conditions needs evaluation. Dissolved oxygen concentrations less than 5 mg/L were found at 10 additional stations, including Budd Inlet, central Hood Canal, Possession Sound, Saratoga Passage, and Port Susan.

- High fcb counts were found at 7 out of 35 stations. Conditions at two of the stations, both located in Commencement Bay, appeared to be seasonally chronic.

- Based on the various types of data collected, several other stations showed a distinct sensitivity and propensity towards lower water quality: Budd Inlet, Possession Sound, Sinclair Inlet, Oakland Bay.

- For the coastal estuaries, the water quality issue apparent is chronic fcb contamination. Conditions are severe in Grays Harbor and somewhat poor in Willapa Bay near the Willapa River. Low DO was not observed in either coastal estuary.

- Both the physical stratification and climate forcing play a large role in affecting water quality. Well-mixed areas will show less water quality impacts than persistently stratified areas. In view of interannual variation due to weather, the impact of humans on water quality is difficult to assess. This highlights the importance of long, consistent time-series databases and the need to incorporate existing historical data.

Recommendations

- **Low DO in Hood Canal:** In light of the severely low DO concentrations recorded in southern Hood Canal even in wintertime, further monitoring and investigative study of southern Hood Canal are highly recommended. Study should include: analysis of historical and present data to assess changes in the severity and extent of low DO concentrations in all of Hood Canal; identification of sources and magnitude of nutrient loading; and assessment of possible changes in the flushing characteristics of Hood Canal (e.g., due to freshwater diversion).

- **Low DO and high NH_4^+ in East Sound:** Historical data should be assessed, if possible, to identify any changes in the duration or severity of low DO in East Sound. Five years of monitoring data suggest an increase in the severity of the low DO and the WY 1995 high NH_4^+ is intriguing. Investigative study should be conducted in East Sound to thoroughly assess nutrient sources and DO dynamics, which cannot be done with monthly data.

- **Low DO in Penn Cove:** Because this station has been monitored one year only and such low DO concentrations were observed, this station is recommended for further monitoring. Anthropogenic impacts on the Cove should be carefully considered.

- **Fecal coliform bacteria contamination in Grays Harbor, Willapa Bay, Commencement Bay:** Six years of monitoring data show chronically high fcb counts in Grays Harbor, Willapa Bay, and Commencement Bay. The presence of fecal bacteria associated with wood

(*Klebsiella*) may contribute to the high counts, but the significance of this contribution needs investigation. Investigation should be conducted for all sources of fecal contamination in these areas.

- **Sensitive urbanized bays**: Persistently stratified, urbanized bay are particularly sensitive to degraded water quality and should be continued to be monitored. These include Budd Inlet (DO, fcb, NH_4^+), Possession Sound (DO, NH_4^+, fcb), Oakland Bay (fcb, NH_4^+), Sinclair Inlet (fcb, NH_4^+) and Elliott Bay (fcb, DO). All stations in this group are existing core stations and will be monitored indefinitely. Conditions elsewhere in these bays and inlets are recommended for study, since the monitoring stations often miss the more severe conditions. Other non-urbanized areas with less incidence of poor water quality indicators include Skagit Bay (DO, fcb), Port Susan (DO), Port Orchard (fcb), and Saratoga Passage (DO). The degree to which this second group of stations is affected by anthropogenic stressors is not known.

- **Marine Waters Monitoring Program:** Monitoring of physical parameters (temperature and salinity) that allow assessment of the influence of climate patterns on marine waters and their stratification should be continued.

Priority should be placed on entering historical data (e.g., Collias *et al.*, 1974) into Ecology database in order to facilitate evaluation of changing conditions.

The adherence of nutrient analyses to data quality objectives should be closely monitored to assess the effectiveness of the corrective actions taken at the end of WY 1995.

The depth resolution of chl *a* measurements should be increased via *in situ* detection since phytoplankton populations are quite heterogenously distributed. This would also allow integrated values of chl *a* over the euphotic zone to be determined.

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Appendix A

Water quality data for WY 1994-95 at:

1) Puget Sound stations

2) Grays Harbor and Willapa Bay stations

Data remark codes used during Wateryears 1994-95:

Remark Code	Definition
J	Estimated value; compound was positively identified, but numerical result is an estimate.
U or K	Compound was analyzed for but not detected at or above the report value. The number reported is reporting limit.
S	High background of non-coliform growth: motile, spreading colony which may overlap and mask *E. coli* colonies.
X	High background of non-coliform growth: non-motile, discrete colonies that may overlap and mask *E. coli* colonies.

Puget Sound stations

Station:
ADM001 Admiralty Inlet - Bush Point LAT (deg min N): 48 01.8 LONG (deg min W): 122 37.0

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/11	1315	0	12.1	30.33	22.95	7.8	1	6.9	78.6	11.5	86.0	0.77	0.74	0.259		0.010 K	0.053
93/10/11	1320	10	11.6	30.60	23.25	7.8		6.7	75.2		85.6	0.71	0.61	0.268		0.010 K	0.052
93/10/11	1325	30	11.5	30.72	23.36	7.8		6.5	73.0		85.2			0.265		0.010 K	0.052
93/12/14	1315	0	9.2	30.54	23.60	7.7	1 K	7.7	81.5	7.4	80.7	0.17	0.22	0.358		0.010 K	0.069
93/12/14	1320	10	9.1	30.62	23.68	7.7		7.7	81.3		79.2	0.15	0.20	0.358		0.010 K	0.071
93/12/14	1325	30	9.1	30.59	23.65	7.7		7.8	81.1		79.8			0.350		0.010 K	0.072
94/02/08	1310	0	8.2	30.14	23.43	7.8	1 K	8.2	85.1	9.5	81.8	0.54	0.27	0.374		0.010 K	0.074
94/02/08	1315	10	8.2	30.13	23.42	7.8		8.0	83.1		82.0	0.42	0.27	0.361		0.010 K	0.075
94/02/08	1320	30	8.2	30.09	23.39	7.8		8.0	82.7		83.5			0.349		0.010 K	0.071
94/03/14	1300	0	8.6	28.87	22.38	7.9	1 K	8.9	92.7	8.8	83.7	0.68	0.23	0.328		0.010 K	0.064
94/03/14	1305	10	8.5	29.34	22.76	7.9		8.9	91.9		83.5	0.59	0.28	0.335		0.010 K	0.064
94/03/14	1310	30	8.5	28.99	22.49	7.9		8.8	90.8		83.6			0.326		0.010 K	0.063
94/04/14	1335	0	9.2	27.70	21.38	8.0	1 K	9.9	103.5	7.4	81.9	6.40	0.23	0.176		0.010 K	0.029
94/04/14	1340	10	9.0	28.63	22.14	8.0		9.2	96.2		82.9	6.00	0.21	0.173		0.010 K	0.027
94/04/14	1345	30	8.9	29.66	22.96	7.9		8.3	87.2		83.8						
94/05/09	1225	0	10.9	28.84	22.00	8.1	1 K	10.8	118.5	6.3	67.0	8.00	10.80	0.131		0.017	0.035
94/05/09	1230	10	10.2	29.43	22.58	8.0		9.7	104.3		72.7	6.20	8.30	0.117		0.013	0.030
94/05/09	1235	30	9.8	29.71	22.84	7.9		9.2	98.9		74.8			0.117		0.012	0.031
94/06/20	1255	0	11.7	29.50	22.38	7.9	1 K	9.1	101.3	9.0	78.4	4.70	0.51	0.097		0.013	0.015
94/06/20	1300	10	11.1	29.82	22.73	7.9		8.5	93.6		80.1	0.43	0.29	0.086		0.015	0.013
94/06/20	1305	30	10.9	30.08	22.96	7.8		8.0	87.6		80.5			0.114		0.016	0.013
94/07/11	1200	0	12.9	28.89	21.76	8.0	1 U	8.9	101.4	7.5	76.0	4.80	0.31	0.097		0.010 K	0.041
94/07/11	1205	10	12.2	29.57	22.34	7.9		8.1	91.4		78.0	3.00	0.51	0.142		0.014	0.073
94/07/11	1210	30	11.7	29.94	22.72	7.9		7.8	87.8		78.8			0.140		0.017	0.040
94/08/15	1410	0	12.5	30.45	22.97	7.8	1 U	7.4	85.0	9.7	83.1	4.50	0.89	0.135		0.010 K	0.029
94/08/15	1415	10	12.5	30.45	22.97	7.8		7.5	85.8		83.2	4.00	0.62	0.148		0.010 K	0.032
94/08/15	1420	30	12.1	30.64	23.19	7.8		7.3	82.5		83.6			0.168		0.010	0.040
94/09/21	1255	0	12.9	30.32	22.79	7.9	1 U	7.4	85.1	8.4	78.0	5.60	1.10	0.214		0.011	0.051
94/09/21	1300	10	12.3	30.64	23.15	7.9		6.8	77.9		83.1	3.80	1.40	0.155		0.010 K	0.033
94/09/21	1305	30	12.2	30.72	23.23	7.8		6.8	77.3		83.5			0.249		0.010 K	0.053

Station:
ADM002 North Admiralty Inlet - Quimper Peninsula LAT (deg min N): 48 11.3 LONG (deg min W): 122 50.5

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/11	1150	0	11.4	30.88	23.50	7.8	3	8.7	75.1	13.5	87.0	0.77	0.35	0.285		0.010 K	0.055
93/10/11	1155	10	10.3	31.54	24.20	7.8		6.0	65.5		86.5	0.72	0.49	0.313		0.010 K	0.058
93/10/11	1200	30	9.4	32.07	24.76	7.7		5.3	57.3		86.2			0.312		0.012	0.056
93/12/14	1150	0	8.5	31.13	24.16	7.7	1 K	7.9	82.8	6.5	75.8	0.27	0.41	0.354		0.010 K	0.068
93/12/14	1155	10	8.5	31.13	24.16	7.7		8.0	83.7		75.9	0.21	0.50	0.349		0.010 K	0.070
93/12/14	1200	30	8.5	31.18	24.20	7.7		7.9	82.7		74.3			0.333		0.010 K	0.067
94/02/08	1145	0	8.0	30.85	24.02	7.8	1 K	7.9	81.5		80.6						
94/02/08	1150	10	8.0	30.88	24.04	7.8		7.7	80.0		80.3						
94/02/08	1155	30	8.1	30.98	24.09	7.8		7.5	78.1		78.9						
94/03/14	1140	0	8.2	30.34	23.59	7.9	1 K	8.6	89.2	8.6	76.1	0.41	0.26	0.322		0.010 K	0.062
94/03/14	1145	10	8.2	30.35	23.60	7.9		8.4	87.6		82.1	0.43	0.31	0.322		0.010 K	0.062
94/03/14	1150	30	8.2	30.34	23.59	7.9		8.4	87.1		82.3			0.331		0.010 K	0.062
94/04/14	1210	0	8.7	30.56	23.69	7.8	1 K	8.0	84.2	7.5	81.2	1.40	0.85	0.148		0.010 K	0.023
94/04/14	1215	10	8.7	30.56	23.69	7.8		7.9	82.8		81.4	1.20	1.10	0.134		0.010 K	0.020
94/04/14	1220	30	8.7	30.56	23.69	7.8		7.9	82.9		80.9			0.123		0.010 K	0.010 K
94/06/20	1140	0	10.9	30.89	23.59	7.7	1 K	7.3	80.8	8.0	79.7	0.39	0.26	0.356		0.013	0.020
94/06/20	1145	10	10.5	30.95	23.71	7.7		7.1	78.4		79.0	3.20	0.29	0.110		0.016	0.013
94/06/20	1150	30	10.1	31.06	23.86	7.7		6.8	74.1		78.7			0.133		0.016	0.016
94/08/15	1230	0	11.7	30.52	23.17	7.7	1 U	6.9	78.1	13.0	89.0	0.86	0.40	0.298		0.010 K	0.051
94/08/15	1235	10	11.2	30.90	23.55	7.7		6.6	74.1		88.2	2.30	0.47	0.215		0.010	0.043
94/08/15	1240	30	10.5	31.46	24.11	7.7		6.1	67.5		85.4			0.271		0.014	0.053
94/09/21	1150	0	10.7	31.47	24.09	7.7	1 U	6.2	68.1	10.2	81.2	1.70	1.00	0.319		0.035	0.062
94/09/21	1155	10	10.5	31.51	24.15	7.7		6.0	65.9		84.9	1.80	1.20	0.229		0.058	0.043
94/09/21	1200	30	10.4	31.56	24.20	7.7		5.8	63.7		84.8			0.302		0.042	0.056

Station:
BLL009 Bellingham Bay - Point Frances LAT (deg min N): 48 41.2 LONG (deg min W): 122 35.9

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS (%)	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/12/21	1325	0	7.0	29.15	22.81	7.8	1	8.8	88.2	4.7	74.3	0.30	0.16	0.404	0.010 K	0.019	0.063
93/12/21	1330	10	8.3	30.38	23.59	7.7		7.5	77.5		78.2	0.18	0.25	0.384	0.010 K	0.010 K	0.070
94/03/03	1040	0	8.1	21.80	16.92	7.8	36	10.3	100.6	0.8	17.3	1.20	0.63	0.461		0.016	0.049
94/03/03	1045	7	7.8	30.18	23.52	7.8		9.0	93.1		73.2	0.39	0.48	0.369		0.010 K	0.071
94/04/11	1220	0	10.9	24.43	18.58	8.5	1 K	13.2	140.1	3.6	59.9	12.10	0.47	0.010 K		0.010 K	0.010 K
94/04/11	1225	7	8.8	29.53	22.87	8.0		9.3	97.2		75.4	7.70	0.45	0.133		0.016	0.021
94/05/02	1250	0	10.6	29.11	22.26	8.3		11.7	127.8	3.5	47.8	27.70	0.05 K	0.037	0.010 K	0.010 K	0.018
94/05/02	1255	8	9.3	29.77	22.98	8.0		8.4	89.6		69.5	14.50	1.10	0.177	0.010 K	0.013	0.039
94/06/08	1435	0	14.9	28.61	21.07	8.3	1 K	10.1	120.6	6.5	75.3	4.40	0.09	0.010 K	0.010 K	0.015	0.010 K
94/06/08	1440	10	10.1	30.00	23.04	7.9		7.8	84.6		66.4	3.80	2.60	0.141	0.010 K	0.033	0.029
94/07/05	1225	0	16.0	17.04	11.98	8.5	1 U	10.3	116.9	2.1	28.5	6.40	1.30	0.010 K		0.010 K	0.010 K
94/07/05	1230	10	10.8	29.80	22.76	7.8		7.3	79.6		71.2	3.60	1.00	0.168		0.020	0.031
94/08/01	1245	0	15.2	29.41	21.63	8.4	1 U	12.7	152.8	4.0	56.3	23.80	1.90	0.010 K	0.010	0.031	0.016
94/08/01	1250	10	11.1	30.13	22.97	7.8		6.8	74.9		70.5	4.20	1.50	0.197		0.017	0.040
94/09/06	1340	0	13.9	28.35	21.08	8.0	1 U	8.2	94.7	4.5	69.9	4.60	1.80	0.073	0.010 K	0.016	0.020
94/09/06	1345	8	12.3	29.37	22.17	7.8		6.8	76.8		74.8	2.60	2.00	0.175	0.012	0.025	0.040

Station:
BUD005 Budd Inlet - Olympia Shoal LAT (deg min N): 47 05.5 LONG (deg min W): 122 55.0

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS (%)	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2 DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/06	1005	0	14.4	29.56	21.91	7.9	1	7.6	89.5	2.7	67.0	18.30	1.60	0.077	0.010 K	0.046	0.062
93/10/06	1010	10	14.1	29.73	22.10	7.9		7.8	91.7		67.8	17.40	0.81	0.073	0.010 K	0.049	0.064
93/11/16	1515	0	11.2	29.89	22.77	7.8	6	8.0	88.1	5.7	73.2	4.60	1.10	0.227		0.041	0.071
93/11/16	1520	10	11.2	29.89	22.77	7.8		7.7	85.3		72.8	5.40	0.84	0.228		0.042	0.070
93/12/15	1030	0	8.8	27.95	21.65	7.7	11	9.5	87.7	6.0	74.3	0.80	0.21	0.312	0.010	0.049	0.065
93/12/15	1035	10	9.4	29.59	22.82	7.7		7.5	79.2		71.6	2.40	0.64	0.293	0.010 K	0.054	0.074
94/01/27	1000	0	8.6	28.53	22.11	7.6	4	8.3	85.6	8.0	81.1	1.50	0.22	0.391	0.010 K	0.032	0.077
94/01/27	1005	10	8.9	29.43	22.78	7.6		7.6	79.6		71.3	1.40	0.39	0.378	0.010 K	0.011	0.078
94/02/24	1010	0	7.5	26.79	20.90	7.9	7	9.6	95.9	4.5	69.0	2.80	1.10	0.418		0.027	0.069
94/02/24	1015	10	8.0	29.13	22.67	7.8		8.7	89.3		76.9	3.40	0.87	0.368		0.011	0.075
94/03/23	1015	0	8.3	25.69	19.93	7.7	3 0	7.7	77.6	9.5	75.7	0.72	0.21	0.358	0.010 K	0.040	0.078
94/03/23	1020	7	8.5	28.45	22.07	7.8		8.4	88.8		85.0	1.00	0.45	0.367	0.010 K	0.020	0.088
94/04/25	940	0	11.0	26.57	20.22	8.4	1 K	14.8	160.1	4.7	70.3	2.50	1.90	0.010 K	0.010 K	0.010 K	0.015
94/04/25	945	9	10.0	28.65	22.00	8.0		9.4	100.7		66.4	12.80	2.50	0.142	0.010 K	0.054	0.045
94/05/18	935	0	13.3	27.10	20.23	8.1	3	12.3	140.6	4.8	66.4	9.10	0.05 K	0.010 K	0.010 K	0.010 K	0.025
94/05/18	940	10	11.3	28.87	21.96	8.0		9.5	104.3		73.6	12.40	0.05 K	0.090	0.010 K	0.085	0.070
94/06/20	1815	0	20.1	26.27	18.09	8.3	1 K	12.1	156.6	6.4	62.8	1.30	0.35	0.010 K	0.010 K	0.010 K	0.010 K
94/06/20	1820	10	13.0	29.03	21.77	8.2		10.2	116.2		67.9	12.60	0.21	0.015	0.010 K	0.017	0.014
94/07/18	950	0	19.5	27.30	19.03	8.3	1 U	10.4	134.7	4.9	79.9	4.30	0.05	0.010 K	0.010 K	0.010 K	0.026
94/07/18	955	10	14.2	29.30	21.75	7.4		3.8	44.6		46.8	30.90	0.05 K	0.010 K	0.010 K	0.010 K	0.074
94/08/16	955	0					1 U			3.1		7.90	0.05 K	0.010 K	0.010 K	0.010 K	0.046
94/08/16	1000	10										3.24	0.05 K	0.010 K	0.010 K	0.012	0.060
94/09/13	950	0	16.5	28.66	20.77	8.1	3	10.7	131.6	5.5	60.9	10.80	1.60	0.010 K	0.010 K	0.010 K	0.050
94/09/13	955	10	15.1	29.79	21.94	7.9		6.0	72.2		72.3	5.00	1.30	0.041	0.010 K	0.064	0.056

Station:
CMB003 Commencement Bay - Browns Point LAT (deg min N): 47 17.4 LONG (deg min W): 122 26.9

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS (%)	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/06	1445	0	13.2	27.96	20.91	7.9	1	9.2	104.6		57.9	6.10	0.68	0.206	0.010 K	0.026	0.052
93/10/06	1450	10	12.7	30.19	22.73	8.0		8.7	99.1		79.7	11.10	1.60	0.197	0.010 K	0.010 K	0.049
93/10/06	1455	30	12.1	30.40	23.00	7.8		6.5	73.6		81.6			0.272	0.010 K	0.010 K	0.058
93/11/16	1325	0	11.0	28.83	21.98	7.7	2	7.1	77.3	8.2	73.9	1.50	0.25	0.301		0.040	0.072
93/11/16	1330	10	11.1	30.25	23.06	7.8		7.0	77.1		81.9	0.61	0.24	0.314		0.010 K	0.070
93/11/16	1335	30	11.2	30.59	23.31	7.7		6.5	72.0		83.4	1.10	0.29	0.318		0.010 K	0.070
93/12/15	1455	0	9.6	26.28	20.21	7.7	31	7.3	76.1	6.7	62.2	0.32	0.29	0.349	0.010 K	0.022	0.067
93/12/15	1500	10	9.8	30.28	23.30	7.7		7.0	75.4		81.6	0.12	0.16	0.339	0.010 K	0.010 K	0.068
93/12/15	1505	30	9.8	30.53	23.50	7.7		6.9	74.7		82.0			0.347	0.010 K	0.010 K	0.069
94/01/27	1105	0	8.8	27.21	21.05	7.6	100	8.2	84.6	3.0	63.1	1.10	0.35	0.395	0.010 K	0.061	0.074
94/01/27	1110	10	9.0	29.91	23.14	7.6		7.9	83.1		83.1	0.36	0.22	0.387	0.010 K	0.010 K	0.075
94/01/27	1115	30	9.1	30.12	23.29	7.6		7.6	80.2		83.6			0.382	0.010 K	0.010 K	0.072
94/02/24	1440	0	8.3	29.33	22.78	7.8	1	8.4	86.6	5.6	78.4	0.35	0.22	0.398		0.010 K	0.074
94/02/24	1445	10	8.4	29.88	23.20	7.8		8.2	84.9		81.5	0.45	0.21	0.387		0.010 K	0.074
94/02/24	1450	30	8.5	30.06	23.33	7.8		7.7	80.9		81.4			0.377		0.010 K	0.072
94/03/23	1640	0					6			7.0		0.94	0.41	0.406	0.010 K	0.013	0.069
94/03/23	1645	10	8.5	27.88	21.62	7.8		7.7 J	79.5 J		84.8						
94/03/23	1650	30	8.4	28.24	21.92	7.8		7.2	73.9		86.4						
94/04/25	1415	0	10.7	25.21	19.21	8.1	3	11.1	117.8	3.0	63.8	11.30	1.50	0.154	0.010 K	0.010 K	0.032
94/04/25	1420	10	9.2	29.26	22.60	7.9		9.1	96.1		80.3	10.00	1.20	0.219	0.010 K	0.010 K	0.046
94/04/25	1425	30	9.0	29.43	22.76	7.8		8.6	90.8		83.9			0.286	0.010 K	0.010 K	0.061
94/05/18	1355	0	13.2	19.69	14.53	7.9	2	9.9	107.6	5.1	80.2	1.30	0.44	0.175	0.010 K	0.051	0.043
94/05/18	1400	10	9.9	29.34	22.55	7.9		9.4	100.9		86.4	0.57	2.40	0.207	0.010 K	0.036	0.058
94/05/18	1405	30	9.8	29.45	22.65	7.9		9.2	98.1		89.5			0.218	0.010 K	0.021	0.058
94/06/20	1620	0	12.5	28.77	21.67	8.2	1 K	11.2	127.0	4.8	56.7	4.20	0.55	0.078	0.010 K	0.017	0.010 K
94/06/20	1625	10	11.1	29.43	22.43	7.9		9.1	100.5		77.7	2.40	0.67	0.114	0.010 K	0.030	0.015
94/06/20	1630	30	10.9	29.65	22.63	7.9		8.7	95.2		81.6			0.116	0.010 K	0.029	0.011
94/07/18	1420	0	15.5	27.63	20.20	8.2	1 U	10.8	129.1	6.0	62.0	13.10	0.05 K	0.078	0.010 K	0.010 K	0.012
94/07/18	1425	10	12.5	29.57	22.29	8.0		8.6	97.5		87.6	2.10	0.26	0.191	0.010 K	0.021	0.047
94/07/18	1430	30	12.0	29.78	22.54	7.9		7.9	89.3		88.9			0.127	0.010 K	0.010 K	0.025
94/08/16	1120	0								0.6		28.80	0.05 K	0.010 K	0.010 K	0.010 K	0.013
94/08/16	1125	10										17.30	0.05 K	0.075	0.010 K	0.010 K	0.027
94/08/16	1130	30												0.104	0.010 K	0.010 K	0.032
94/08/29	1035	0	14.6	27.22	20.07	8.1		10.7	125.0	2.5	50.8						
94/08/29	1040	10	13.7	29.98	22.37	8.1		9.5	110.7		74.5						
94/08/29	1045	30	12.9	30.12	22.64	7.9		7.3	84.2		87.7						
94/09/13	1400	0	13.9	29.49	21.95	8.0	3	9.5	111.1	6.3	74.1	10.50	1.40	0.079	0.011	0.010 K	0.032
94/09/13	1405	10	13.1	30.23	22.68	7.9		7.5	88.2		84.9	7.30	0.51	0.121	0.010 K	0.010 K	0.038
94/09/13	1425	30	12.9	30.37	22.83	7.9		7.0	80.2		87.1			0.133	0.010 K	0.010 K	0.037

Station:
DNA001 Dana Passage - S. of Brisco Point LAT (deg min N): 47 09.7 LONG (deg min W): 122 52.2

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/06	1040	0	13.8	29.79	22.21	7.9	1 K	8.3	97.0	4.0	80.9	4.20	1.00	0.143		0.035	0.051
93/10/06	1045	10	13.6	29.83	22.28	7.9		7.9	92.6		81.1	3.00	0.69	0.154		0.037	0.052
93/10/06	1050	30	13.4	29.90	22.37	7.9		7.7	89.3		80.3			0.172		0.036	0.054
93/11/16	1450	0	11.4	30.02	22.83	7.8	1 K	7.4	82.6	5.6	75.4	3.20	1.00	0.233		0.037	0.072
93/11/16	1455	10	11.4	30.03	22.84	7.8		7.4	82.0		74.8	3.70	1.30	0.233		0.038	0.071
93/11/16	1505	27	11.4	30.03	22.84	7.8		7.3	81.8		73.6			0.247		0.045	0.072
93/12/15	1110	0	9.3	29.38	22.68	7.7	1	7.9	83.5	5.6	74.0	0.82	0.40	0.298		0.036	0.074
93/12/15	1115	10	9.4	29.57	22.81	7.7		7.7	82.1		73.4	0.44	0.30	0.305		0.034	0.072
93/12/15	1120	30	9.4	29.71	22.92	7.7		7.6	81.3		73.3			0.311		0.033	0.070
94/01/27	1030	0	8.9	29.49	22.82	7.6	1 K	7.7	81.1	5.6	76.7	1.50	0.35	0.394		0.010 K	0.079
94/01/27	1035	10	8.9	29.50	22.83	7.6		7.7	81.1		76.6	1.00	0.32	0.392		0.010 K	0.077
94/01/27	1040	30	8.9	29.49	22.82	7.6		7.7	80.4		76.9			0.391		0.010 K	0.079
94/02/24	1045	0	7.8	28.77	22.41	7.9	1 K	9.1	92.4	6.3	77.7	2.60	0.47	0.356		0.010 K	0.075
94/02/24	1050	10	7.8	28.92	22.53	7.9		8.8	90.2		78.0	2.20	0.57	0.357		0.010 K	0.074
94/02/24	1055	30	8.0	29.15	22.68	7.9		8.6	87.7		78.6			0.385		0.010 K	0.076
94/03/23	1200	0	8.7	28.55	22.12	7.8	1 K	7.9	82.4	10.5	84.5	0.89	0.20	0.346		0.010	0.072
94/03/23	1205	10	8.5	28.86	22.39	7.8		8.3	86.0		84.2	0.86	0.38	0.371		0.010 K	0.073
94/03/23	1210	30	8.5	28.99	22.49	7.8		8.2	84.6		83.2			0.360		0.010 K	0.074
94/04/25	1025	0	10.2	28.65	21.97	8.1	1	11.1	119.7	4.5	64.8	11.00	2.70	0.133		0.010 K	0.038
94/04/25	1030	10	10.1	28.70	22.02	8.1		11.0	118.3		66.6	14.90	2.60	0.117		0.010 K	0.034
94/04/25	1035	30	10.1	28.72	22.04	8.1		10.8	115.4		68.1			0.133		0.010 K	0.037
94/05/18	1010	0	11.3	28.89	21.97	8.1	1 K	11.0	121.7	7.3	77.6	5.60	3.20	0.095		0.010 K	0.048
94/05/18	1015	10	11.1	28.97	22.07	8.1		10.5	115.4		80.5	4.60	4.80	0.107		0.010 K	0.043
94/05/18	1020	30	10.6	29.10	22.25	8.0		9.7	105.1		76.3			0.141		0.015	0.050
94/06/20	1715	0	13.0	29.12	21.84	8.1	1 K	10.5	120.3	6.0	74.0	1.40	0.77	0.036		0.020	0.010 K
94/06/20	1720	10	12.9	29.14	21.88	8.1		10.5	120.5		76.6	10.40	0.05 K	0.046		0.025	0.012
94/06/20	1725	30	12.0	29.28	22.15	8.0		9.4	105.8		77.7			0.068		0.033	0.013
94/07/18	1030	0	15.6	29.20	21.38	8.2	1 U	10.3	124.9	6.6	75.0	14.60	0.60	0.030		0.010 K	0.036
94/07/18	1035	10	14.4	29.29	21.70	8.1		9.7	114.1		79.3	14.20	0.05 K	0.018		0.010 K	0.022
94/07/18	1040	30	13.0	29.43	22.08	7.9		8.2	93.8		74.2			0.064		0.017	0.028
94/08/16	1035	0					1 U			3.9		21.30	0.05 K	0.010 K		0.010 K	0.033
94/08/16	1040	10										22.00	0.05 K	0.015		0.010 K	0.033
94/08/16	1045	30												0.017		0.010 K	0.029
94/08/29	1000	0	15.6	28.70	21.76	8.1		9.7	117.2	4.5	15.1						
94/08/29	1005	10	14.9	29.77	21.97	8.1		9.3	111		76.9						
94/08/29	1010	30	14.2	29.85	22.17	8.0		8.0	94.3		79.2						
94/09/13	1025	0	16.4	29.77	21.86	8.0	1 U	8.4	101.8	9.5	78.7	5.60	1.00	0.037		0.010 K	0.040
94/09/13	1030	10	15.1	29.83	21.97	8.0		8.2	98.1		82.4	5.00	0.85	0.050		0.010 K	0.041
94/09/13	1035	30	14.2	30.02	22.30	8.0		7.3	86.6		76.3			0.078		0.010 K	0.042

Station:
EAS001 East Sound - Orcas Island at Rosario Point LAT (deg min N): 48 38.6 LONG (deg min W): 122 52.9

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78.0 SECCHI Transm. (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/18	1150	0	11.1	30.59	23.33	8.0		8.3	91.9	4.5	70.4						
93/10/18	1155	10	10.8	30.70	23.46	7.8		6.5	71.2		78.6						
93/10/18	1200	30	10.5	30.78	23.58	7.8		6.2	67.9		87.4						
93/12/21	1215	0	8.0	30.64	23.77	7.7		8.0	82.8	9.6	83.9						
93/12/21	1220	10	8.0	30.65	23.86	7.8		8.1	83.8		84.8						
93/12/21	1225	30	7.1	30.70	24.02	7.9		8.8	89.8		87.1						
94/03/03	1215	0	7.4	30.22	23.60	7.9		9.9	100.7	12.8	85.5						
94/03/03	1220	10	7.4	30.33	23.69	7.9		9.5	96.2		85.2						
94/03/03	1225	30	7.3	30.37	23.74	7.9		9.2	93.6		81.5						
94/04/11	1400	0	10.3	30.05	23.04	8.4		11.9	127.9	5.5	73.4						
94/04/11	1405	10	9.3	30.11	23.25	8.2		11.1	118.0		76.0						
94/04/11	1410	29	8.5	30.23	23.46	7.8		7.5	77.8		66.1						
94/05/02	1435	0	11.2	30.18	22.99	8.3		11.2	124.2	4.1	59.4						
94/05/02	1440	10	9.9	30.18	23.21	8.1		10.1	109.3		72.2						
94/05/02	1445	30	8.8	30.27	23.46	7.6		3.3	34.3		65.0						
94/06/08	1240	0	12.9	30.23	22.72	8.3		12.0	137.7	5.1	57.0						
94/06/08	1245	10	11.0	30.28	23.10	8.2		10.4	114.6		46.5						
94/06/08	1250	30	10.0	30.49	23.43	7.4		3.7	40.6		43.9						
94/07/05	1450	0	15.7	29.80	21.82	8.2		10.1	122.7	9.0	80.1						
94/07/05	1455	10	11.2	30.10	22.93	7.9		7.8	86.4		84.8						
94/07/05	1500	30	10.6	30.27	23.16	7.5		3.5	38.3		74.0						
94/08/01	1520	0	15.9	29.87	21.83	8.2		10.7	130.4	6.1	66.3						
94/08/01	1525	10	11.3	30.19	22.88	7.7		6.6	72.8		78.5						
94/08/01	1530	30	11.1	30.45	23.22	7.7		5.5	60.5		59.9						
94/09/06	1545	0	13.7	29.77	22.21	8.0		7.7	90.1	13.0	85.5						
94/09/06	1550	10	11.6	29.97	22.76	7.8		6.6	74.1		85.7						
94/09/06	1555	30	11.2	30.26	23.05	7.7		5.7	63.5		69.2						

Station:
ELB015 Elliott Bay - East of Duwamish Head LAT (deg min N): 47 35.8 LONG (deg min W): 122 22.1

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/06	1350	0	13.0	28.17	21.11	7.8	10	7.7	87.4	9.5	81.2	1.30	0.50	0.249		0.017	0.052
93/10/06	1355	10	12.5	30.29	22.84	7.9		7.5	85.8		86.8	3.10	0.45	0.251		0.010 K	0.053
93/10/06	1400	30	12.4	30.33	22.89	7.8		7.2	82.1		86.9			0.269		0.010 K	0.058
93/11/16	1130	0	11.2	30.53	23.26	7.8	1 K	6.8	75.9	11.0	86.4	0.87	0.15	0.312		0.010 K	0.069
93/11/16	1135	10	11.2	30.54	23.27	7.8		6.8	75.5		87.1	0.99	0.20	0.313		0.010 K	0.068
93/11/16	1140	30	11.2	30.58	23.30	7.8		6.7	74.1		85.5			0.303		0.010 K	0.069
93/12/15	1415	0	9.3	26.53	20.45	7.7	16	7.6	78.1	9.8	76.9	0.26	0.26	0.374		0.013	0.059
93/12/15	1420	10	9.8	30.58	23.54	7.7		7.0	75.9		84.6	0.12	0.16	0.354		0.010 K	0.065
93/12/15	1425	30	9.8	30.59	23.54	7.7		6.9	74.5		82.7			0.348		0.010 K	0.065
94/01/27	1150	0	8.5	23.27	18.02	7.6	50 S	8.7	87.0	8.2	70.1	0.79	0.25	0.432		0.022	0.064
94/01/27	1155	10	9.0	30.07	23.26	7.7		7.7	81.7		85.3	0.37	0.19	0.380		0.010 K	0.074
94/01/27	1200	30	9.0	30.10	23.28	7.6		7.5	79.7		84.7			0.375		0.010 K	0.075
94/02/24	1255	0	8.3	27.87	21.64	7.8	3	8.7	89.1	9.2	81.7	0.46	0.30	0.421		0.010 K	0.068
94/02/24	1300	10	8.5	29.88	23.19	7.8		8.3	86.9		86.3	0.41	0.32	0.370		0.010 K	0.076
94/02/24	1305	30	8.5	29.96	23.25	7.8		8.2	85.1		86.8			0.370		0.010 K	0.076
94/03/23	1540	0	8.9	24.65	19.04	7.8	1 K	8.4	85.3	9.0	76.9	0.31	0.27	0.371		0.010 K	0.052
94/03/23	1545	10	8.5	27.92	21.65	7.8		8.2	84.7		88.0	0.78	0.47	0.369		0.010 K	0.066
94/03/23	1550	30	8.5	28.17	21.85	7.8		7.7	79.1		86.0			0.398		0.010 K	0.074
94/04/25	1330	0	10.6	24.13	18.39	8.0	3	11.3	119.1	5.5	74.5	12.80	0.29	0.177		0.010 K	0.034
94/04/25	1335	10	9.6	28.32	22.58	8.0		10.3	109.6		80.2	10.00	3.20	0.217		0.010 K	0.048
94/04/25	1340	30	9.1	28.47	22.78	7.9		8.7	92.2		85.6			0.248		0.010 K	0.049
94/05/18	1315	0	11.9	27.14	20.51	8.0	1 K	10.4	114.6	7.5	81.2	1.90	0.34	0.190		0.025	0.044
94/05/18	1320	10	10.5	29.27	22.40	8.1		10.1	110.1		77.7	3.50	0.71	0.196		0.010 K	0.050
94/05/18	1325	30	9.8	29.49	22.89	7.9		9.0	96.7		88.1			0.230		0.031	0.062
94/06/20	1500	0	13.6	26.53	19.73	8.0	1 K	10.7	122.1	6.5	78.2	1.00	0.43	0.067		0.018	0.010 K
94/06/20	1505	10	11.6	29.47	22.37	8.1		10.5	116.9		76.0	2.70	0.64	0.067		0.018	0.016
94/06/20	1510	30	10.9	29.69	22.66	7.9		8.8	96.7		86.6			0.121		0.028	0.011
94/07/18	1335	0	14.5	28.66	21.19	8.2	1 U	10.4	122.3	7.7	69.2	10.60	0.82	0.063		0.010 K	0.010 K
94/07/18	1340	10	12.3	29.78	22.49	7.9		8.4	95.3		88.2	3.70	0.28	0.103		0.010 K	0.018
94/07/18	1345	30	12.0	29.80	22.55	7.9		7.9	88.4		89.7			0.206		0.010 K	0.047
94/08/16	1200	0					1 U			5.8		10.30	0.52	0.083		0.010 K	0.029
94/08/16	1205	10										9.70	0.73	0.087		0.010 K	0.029
94/08/16	1210	30												0.145		0.032	0.045
94/08/29	1115	0	14.2	28.82	21.38	7.9		8.4	98.3	6.8	79.1						
94/08/29	1120	10	13.3	30.17	22.60	7.9		7.7	89.6		85.6						
94/08/29	1125	30	12.8	30.25	22.76	7.8		6.7	77.4		91.0						
94/09/13	1315	0	14.4	28.96	21.45	7.9	1	8.3	97.5	13.5	81.9	2.60	0.72	0.096		0.010 K	0.032
94/09/13	1320	10	13.2	30.35	22.76	7.9		7.3	84.3		89.6	1.10	0.58	0.128		0.010 K	0.040
94/09/13	1325	30	13.0	30.40	22.83	7.9		6.8	78.0		80.3			0.123		0.010 K	0.035

Station:
FID001 Fidalgo Bay - East of Anacortes LAT (deg min N): 48 30.8 LONG (deg min W): 122 35.6

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/18	1400	0	11.0	30.42	23.21	7.8	2	6.8	75.5	4.1	59.5	1.40	1.10	0.251		0.054	0.061
93/10/18	1405	10	10.6	30.59	23.41	7.8		6.4	70.0		69.4	1.10	1.10	0.298		0.028	0.064
93/12/21	1120	0	7.7	30.26	23.60	7.7	1	8.0	81.6	4.0	65.8	0.25	0.35	0.380		0.019	0.067
93/12/21	1125	8	7.6	30.26	23.61	7.7		8.0	81.8		68.5	0.27	0.41	0.363		0.018	0.074
94/03/03	1310	0	8.4	29.91	23.22	7.9	4	9.1	95.1	3.6	62.5	0.61	0.86	0.353		0.012	0.070
94/03/03	1315	7	8.3	29.95	23.27	7.9		9.0	93.1		62.6	0.62	1.10	0.353		0.012	0.087
94/04/11	1155	0	9.5	29.71	22.90	8.0	2	9.5	101.7	3.8	67.4	1.70	0.57	0.145		0.017	0.027
94/04/11	1200	9	8.8	29.83	23.10	7.9		8.9	92.8		74.5	1.30	0.50	0.158		0.014	0.022
94/05/02	1225	0	11.3	29.83	22.70	8.1		9.8	108.9	2.6	56.9	3.20	0.43	0.134		0.010	0.041
94/05/02	1230	9	9.4	29.94	23.10	7.9		8.5	90.8		65.9	3.30	1.20	0.261		0.020	0.055
94/06/08	1515	0	11.0	29.76	22.70	7.9	1 K	8.8	95.1	5.1	68.9	9.00	0.27	0.094		0.018	0.023
94/06/08	1520	10	10.8	29.84	22.80	7.9		8.7	84.9		63.9	8.20	0.85	0.102		0.019	0.025
94/07/05	1200	0	13.0	28.98	21.74	8.0	1 U	9.0	102.5	4.0	62.8	8.20	0.52	0.072		0.014	0.019
94/07/05	1205	8	12.1	29.44	22.28	8.0		8.7	97.5		59.3	7.70	0.98	0.098		0.021	0.023
94/08/01	1225	0	13.3	29.70	22.23	8.0	1 U	8.2	95.4	6.0	65.9	5.20	2.10	0.102		0.010 K	0.030
94/08/01	1230	9	12.4	29.85	22.52	7.9		8.0	90.4		66.1	8.00	6.80	0.140		0.010 K	0.033
94/09/06	1240	0	13.0	29.47	22.11	7.9	1 U	7.3	83.3	6.4	62.1	4.10	2.40	0.142		0.026	0.037
94/09/06	1245	9	11.9	29.73	22.52	7.8		6.6	74.0		75.7	3.70	1.30	0.176		0.045	0.039

Station:
GRG002

Georgia Strait - North of Patos Island

LAT (deg min N): 48 48.5

LONG (deg min W): 122 57.2

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/18	1100	0	11.7	28.44	21.55	7.9	1 K	7.1	78.5	9.1	85.1	1.20	0.72	0.222		0.010 K	0.048
93/10/18	1105	10	10.5	29.86	22.86	7.7		6.1	66.7		85.4	0.71	0.68	0.271		0.010 K	0.057
93/10/18	1110	30	10.3	30.30	23.24	7.7		6.0	65.8		82.7			0.332		0.010 K	0.065
93/12/21	1400	0	7.8	27.91	21.74	7.8	1 K	8.2	83.5	10.0	83.3	0.28	0.11	0.373		0.010 K	0.070
93/12/21	1405	10	8.5	29.55	22.93	7.7		7.3	78.2		85.4	0.26	0.19	0.376		0.010 K	0.071
93/12/21	1410	30	8.7	30.09	23.32	7.7		7.0	73.4		85.4			0.383		0.010 K	0.076
94/03/03	1125	0	7.9	30.22	23.54	7.8	1 K	8.6	88.4	9.0	82.8	0.82	0.57	0.372		0.010 K	0.075
94/03/03	1130	10	7.9	30.28	23.58	7.8		8.4	87.0		81.2	0.32	0.43	0.373		0.010 K	0.070
94/03/03	1135	30	7.9	30.31	23.61	7.8		8.3	85.4		81.1			0.369		0.010 K	0.070
94/04/11	1255	0	8.9	29.91	23.15	7.9	1 K	9.0	94.4	11.5	84.8	1.50	0.48	0.182		0.012	0.030
94/04/11	1300	10	8.6	29.97	23.24	7.9		8.8	91.8		84.1	0.92	0.27	0.150		0.012	0.023
94/04/11	1305	30	8.6	30.05	23.30	7.9		8.8	92.0		84.4			0.136		0.014	0.020
94/05/02	1330	0	11.3	26.05	19.77	8.2		9.1	98.4	5.5	71.7	5.40	0.33	0.169		0.010 K	0.042
94/05/02	1335	10	9.1	29.59	22.87	7.9		8.3	87.1		79.9	1.90	0.60	0.326		0.013	0.072
94/05/02	1340	30	9.0	29.78	23.03	7.9		7.9	83.1		80.4			0.321		0.018	0.071
94/06/08	1350	0	13.2	24.06	17.80	8.2	1 K	9.9	110.0	6.6	76.5	5.80	0.93	0.039		0.017	0.021
94/06/08	1355	10	11.9	27.13	20.52	8.1		9.3	102.3		75.3	6.50	1.40	0.083		0.010 K	0.020
94/06/08	1400	30	9.6	29.67	22.86	7.8		7.2	76.9		85.3			0.235		0.015	0.046
94/07/05	1305	0	12.3	24.85	18.67	7.9	2	8.0	87.9	4.3	70.3	2.30	0.42	0.073		0.010 K	0.010 K
94/07/05	1310	10	11.0	27.86	21.22	7.8		7.3	79.7		82.8	0.05 K	0.13	0.139		0.010 K	0.016
94/07/05	1315	30	10.5	28.92	22.13	7.8		6.9	74.5		84.1			0.210		0.010 K	0.029
94/08/01	1330	0	14.1	27.33	20.25	8.0	1 U	7.5	86.7	13.0	82.6	1.50	0.45	0.129		0.010 K	0.027
94/08/01	1335	10	10.7	29.35	22.43	7.8		6.6	71.5		87.0	1.20	0.76	0.197		0.010 K	0.037
94/08/01	1340	30	10.6	29.59	22.63	7.7		6.3	68.6		88.4			0.186		0.010 K	0.036
94/09/06	1415	0	15.4	26.61	19.43	8.1	1 U	9.1	107.6	6.6	71.7	2.30	2.00	0.095		0.010 K	0.023
94/09/06	1420	10	12.6	28.42	21.38	7.9		7.2	80.6		83.4	0.92	0.92	0.162		0.010 K	0.031
94/09/06	1425	30	11.1	28.51	22.49	7.7		6.0	66.5		88.9			0.258		0.014	0.050

Station:
HCB003

Hood Canal - Hamma Hamma River at Eldon

LAT (deg min N): 47 32.3

LONG (deg min W): 123 00.5

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI Transm. (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
94/02/08	1500	0	6.6	22.38	17.54	8.0		11.0	104.0	8.6	70.6						
94/02/08	1505	10	8.1	28.65	22.28	7.8		8.5	86.8		82.7						
94/02/08	1510	30	9.1	30.21	23.36	7.7		6.6	69.6		87.7						
94/03/14	1510	0	10.8	18.14	13.71	8.2		11.4	116.6	4.1	75.6						
94/03/14	1515	10	8.7	28.71	22.24	7.9		8.5	88.3		82.8						
94/03/14	1520	23	8.6	30.03	23.28	7.7		7.2	76.2		86.1						
94/05/09	1455	0	16.0	24.03	17.33	8.3		10.4	123.2	7.7	84.2						
94/05/09	1500	10	9.9	29.38	22.58	7.9		8.1	86.8		84.2						
94/05/09	1505	30	9.1	29.75	23.00	7.7		6.8	72.2		87.3						
94/06/15	1240	0	11.7	28.81	21.84	7.8		8.7	96.8	8.0	78.3						
94/06/15	1245	10	10.6	29.25	22.37	7.7		7.9	85.7		79.5						
94/06/15	1250	30	9.8	29.89	23.00	7.8		6.5	69.4		87.0						
94/07/11	1510	0	19.2	26.30	18.34	8.2		9.0	114.6	6.5	77.4						
94/07/11	1515	10	12.4	29.55	22.29	8.1		9.6	109.5		58.6						
94/07/11	1520	30	10.2	29.98	22.99	7.7		6.0	65.1		87.7						

Station:
HCB004 Hood Canal - Great Bend at Sisters Point LAT (deg min N): 47 21.4 LONG (deg min W): 123 01.4

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/11	1600	0	14.3	24.34	17.91	8.2	1	10.5	119.9	5.5	73.6	1.50	0.27	0.010 K		0.010 K	0.019
93/10/11	1605	10	9.9	29.60	22.76	7.4		2.6	28.0		84.5	1.20	1.10	0.368		0.021	0.097
93/10/11	1610	30	9.4	30.02	23.16	7.3		2.6	27.5		82.7			0.459		0.010 K	0.089
93/12/08	1225	0	7.6	22.80	17.76	7.7	3	9.1	88.4	4.6	58.5	2.50	1.00	0.215		0.025	0.059
93/12/08	1230	10	10.4	30.50	23.38	7.5		4.6	50.8		74.8	1.20	0.56	0.352		0.010 K	0.084
93/12/08	1235	30	10.4	30.71	23.54	7.6		4.9	53.9		70.6			0.343		0.010 K	0.079
94/02/08	1545	0	7.5	22.90	17.85	8.1	1 K	11.2	109.0	5.0	65.1	14.30	0.08	0.156		0.010 K	0.042
94/02/08	1550	10	9.5	28.27	21.78	7.7		7.0	74.1		72.2	5.60	0.30	0.307		0.010 K	0.065
94/02/08	1555	30	10.0	30.27	23.26	7.6		4.1	44.1		84.6			0.398		0.010 K	0.094
94/03/14	1540	0	11.4	14.28	10.64	8.6	1 K	14.5	148.3	2.9	61.9			0.010 K		0.010 K	0.010 K
94/03/14	1545	10	9.4	28.96	22.33	7.7		6.5	68.4		81.4	3.60	0.43	0.334		0.010 K	0.074
94/03/14	1550	30	9.8	30.28	23.30	7.5		4.0	43.1		78.9			0.377		0.010 K	0.088
94/04/14	1600	0	11.0	7.09	5.13	8.3	1 K	13.1	125.2	3.6	63.9	8.40	0.17	0.154		0.010 K	0.022
94/04/14	1605	10	9.4	29.22	22.54	7.8		9.3	98.3		77.5	9.80	0.63	0.079		0.014	0.015
94/04/14	1610	30	9.4	30.03	23.17	7.5		3.7	39.1		73.8			0.010 K		0.013	0.010 K
94/05/09	1525	0	17.9	23.00	16.13	8.3	1 K	9.7	118.4	4.7	67.8	1.70	0.08	0.010 K		0.010 K	0.015
94/05/09	1530	10	9.8	29.42	22.63	7.9		6.9	74.3		72.7	5.80	11.10	0.173		0.022	0.059
94/05/09	1535	30	9.3	29.88	23.07	7.4		4.2	44.5		69.6			0.237		0.036	0.065
94/06/15	1050	0	15.6	25.95	18.89	8.1	1 K	9.1	108.2	4.6	69.2	0.29	0.22	0.010 K		0.010 K	0.010 K
94/06/15	1055	10	9.5	29.60	22.97	7.4		4.6	48.7		80.8	3.10	1.10	0.311		0.020	0.079
94/06/15	1100	30	9.1	29.94	23.14	7.4		4.5	47.5		83.3			0.315		0.010 K	0.067
94/07/11	1535	0	20.0	26.39	18.21	8.2	1 U	9.0	116.9	4.0	68.1	0.93	0.24	0.010 K		0.010 K	0.020
94/07/11	1540	10	10.5	29.60	22.66	7.7		7.0	76.4		76.8	21.80	0.40	0.161		0.015	0.059
94/07/11	1545	30	9.6	29.81	22.97	7.4		3.7	39.6		77.5			0.255		0.023	0.084
94/08/15	1650	0	20.4	27.23	18.75	8.2	1 U	9.1	119.7	6.0	76.5	0.73	0.12	0.010 K		0.010 K	0.018
94/08/15	1655	10	11.3	29.70	22.60	7.8		6.8	75.2		72.4	36.80	0.05 K	0.119		0.010 K	0.046
94/08/15	1700	30	9.7	29.85	22.98	7.3		3.0	32.4		72.1			0.310		0.010 K	0.074
94/09/21	1500	0	17.8	24.47	17.27	8.2	1 U	9.9	121.9	6.7	80.2			0.010 K		0.010 K	0.025
94/09/21	1505	10	10.6	29.75	22.78	7.5		4.1	45.1		72.1	38.50	1.70	0.251		0.018	0.094
94/09/21	1510	30	9.6	29.88	23.11	7.2		1.7	18.4		78.6			0.485		0.013	0.113

Station:
HCB006 Hood Canal - King Spit at Bangor LAT (deg min N): 47 44.9 LONG (deg min W): 122 43.8

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/11	1505	0	12.8	29.27	22.00	8.0	1 K	8.3	95.0	6.0	74.5	3.30	0.64	0.157		0.010 K	0.039
93/10/11	1510	10	11.5	29.67	22.54	7.8		7.1	78.8		78.0	1.30	0.49	0.308		0.010 K	0.063
93/10/11	1515	30	10.8	30.26	23.10	7.7		5.2	57.8		84.4			0.340		0.010 K	0.069
93/12/14	1435	0	8.9	27.10	20.95	7.7	1	8.3	88.1	4.6	69.0	0.26	0.18	0.351		0.010 K	0.070
93/12/14	1440	10	9.4	30.26	23.35	7.7		6.6	70.8		77.7	0.19	0.23	0.352		0.010 K	0.074
93/12/14	1445	30	9.3	30.57	23.61	7.7		6.7	71.5		75.9			0.350		0.010 K	0.075
94/02/08	1430	0	8.0	29.84	23.22	7.7	1	7.8	80.5	7.3	77.6	0.79	0.38	0.370		0.010 K	0.076
94/02/08	1435	10	8.2	29.87	23.22	7.7		7.6	78.9		77.8	0.82	0.17	0.356		0.010 K	0.077
94/02/08	1440	30	8.5	30.10	23.36	7.7		7.2	74.7		76.5			0.366		0.010 K	0.078
94/03/14	1425	0	9.5	26.04	20.04	8.0	1 K	9.8	102.1	6.4	82.7	1.40	0.50	0.245		0.010 K	0.052
94/03/14	1430	10	8.6	29.56	22.92	7.8		8.3	86.1		80.4	0.99	0.41	0.332		0.010 K	0.066
94/03/14	1435	30	8.8	30.07	23.32	7.8		7.4	77.1		80.4			0.361		0.010 K	0.072
94/04/14	1450	0	9.8	27.95	21.48	8.0	1 K	9.2	97.0		82.0	1.80	0.13	0.010 K		0.010	0.010 K
94/04/14	1455	10	9.2	29.15	22.51	7.9		8.2	86.1		84.0	0.69	0.40	0.132		0.014	0.021
94/04/14	1600	30	8.9	30.05	23.26	7.8		6.9	72.7		79.6			0.143		0.014	0.027
94/05/09	1410	0	13.5	27.59	20.57	8.2	1 K	10.7	123.0	7.5	73.0	0.55	11.00	0.010 K		0.010 K	0.017
94/05/09	1415	10	9.8	29.88	22.99	7.9		7.8	83.2		82.7	1.20	5.10	0.173		0.025	0.047
94/05/09	1420	30	9.4	30.08	23.19	7.7		6.9	74.0		80.2			0.208		0.029	0.050
94/06/15	1320	0	12.7	29.07	21.86	7.9	1 K	8.6	98.1	7.5	76.7	0.33	0.17	0.214		0.023	0.038
94/06/15	1325	10	11.5	29.30	22.26	7.9		8.4	93.5		75.2	3.80	0.81	0.142		0.016	0.027
94/06/15	1335	30	10.9	30.11	22.99	7.8		7.7	85.3		74.5			0.136		0.044	0.043
94/07/11	1405	0	17.8	28.12	20.06	8.2	1 U	9.0	112.8	6.1	79.3	1.50	0.20	0.010 K		0.010 K	0.024
94/07/11	1410	10	12.3	29.98	22.62	7.9		7.3	83.0		82.4	2.30	0.35	0.126		0.010 K	0.046
94/07/11	1415	30	11.1	30.13	22.97	7.7		6.1	67.1		81.4			0.206		0.013	0.062
94/08/15	1550	0	18.2	29.15	20.75	8.2	1 U	8.9	113.6	6.4	74.5	2.20	0.39	0.020		0.010 K	0.015
94/08/15	1555	10	14.1	29.95	22.27	8.0		7.7	90.7		76.9	3.80	0.48	0.119		0.010 K	0.031
94/08/15	1600	30	12.0	30.43	23.04	7.7		6.1	69.3		81.0			0.172		0.018	0.041

Station:
HCB007 Hood Canal - Lynch Cove LAT (deg min N): 47 23.9 LONG (deg min W): 122 55.7

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI Transm. (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2- DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
94/02/08	1605	0	8.3	20.34	15.98	8.1		12.8	117.0	4.0	44.2						
94/02/08	1610	10	8.5	26.97	20.91	7.8		7.9	80.5		68.9						
94/03/14	1610	0	11.9	14.03	10.38	8.8		10.8	109.7	3.1	68.1						
94/03/14	1615	10	9.7	29.37	22.61	7.6		4.9	52.6		83.1						
94/05/09	1555	0	18.2	22.67	15.81	8.3		9.3	113.4	4.7	68.0						
94/05/09	1600	10	9.9	29.49	22.67	7.7		5.2	56.0		78.9						
94/06/15	1025	0	15.9	25.70	18.65			9.3	110.9	3.9	64.6						
94/06/15	1030	10	9.8	29.78	22.94			3.5	37.2		82.3						
94/07/11	1605	0	21.7	26.08	17.54	8.2		8.5	113.8	3.4	61.3						
94/07/11	1610	10	11.2	29.41	22.39	8.1		10.2	112.4		44.6						
94/08/16	1715	0	22.0	26.81	18.01	8.2		8.1	109.2	5.5	74.5						
94/08/15	1720	10	11.8	29.51	22.37	8.2		11.8	131.7		65.0						
94/09/21	1445	0	19.0	26.17	18.29	8.2		8.6	109.3	6.6	78.6						
94/09/21	1450	10	11.4	29.49	22.41	7.9		7.1	78.4		65.9						

Station:
JDF005 Sequim Bay - Pitship Point LAT (deg min N): 48 03.7 LONG (deg min W): 123 01.8

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/11	1100	0	11.3	31.85	24.27	8.1	1 K	8.8	98.4	10.3	70.6	15.40	1.40	0.091		0.010 K	0.030
93/10/11	1105	10	10.2	31.97	24.55	7.8		6.6	72.1		84.4	2.00	1.00	0.272		0.034	0.058
93/10/11	1110	30	10.1	31.99	24.59	7.8		6.6	72.7		83.9						
93/12/14	1115	0	7.8	31.75	24.75	7.7	1 K	8.4	87.2	5.6	75.6	0.75	0.80	0.339		0.019	0.070
93/12/14	1120	10	7.7	31.76	24.77	7.7		8.4	87.1		75.4	0.69	0.66	0.352		0.018	0.068
93/12/14	1125	30	7.7	31.78	24.79	7.7		8.4	86.5		77.0						
94/02/08	1115	0	7.5	31.25	24.40	7.8	1 K	8.3	85.6	9.5	84.0	0.82	0.18	0.332		0.010 K	0.070
94/02/08	1120	10	7.5	31.26	24.41	7.8		8.2	84.4		81.8	0.75	0.50	0.334		0.010 K	0.068
94/02/08	1125	30	7.5	31.27	24.42	7.8		8.0	82.4		77.5						
94/03/14	1110	0	8.7	30.65	23.76	8.0	1 K	9.2	97.1	8.0	82.1	1.70	0.60	0.232		0.010 K	0.048
94/03/14	1115	10	8.3	30.85	23.97	7.9		8.8	92.0		82.2	1.80	0.60	0.255		0.010 K	0.052
94/03/14	1120	29	8.1	31.03	24.14	7.8		7.5	78.4		76.0						
94/04/14	1130	0	9.3	31.16	24.07	8.1	1 K	10.9	117.1	5.5	70.5	11.80	2.20	0.224		0.010 K	0.039
94/04/14	1135	10	9.0	31.21	24.15	8.0		9.6	102.0		78.6	10.10	2.50	0.180		0.014	0.030
94/04/14	1140	30	8.8	31.30	24.25	7.9		7.9	83.6		75.3						
94/05/09	1105	0	13.2	31.11	23.34	8.4	1 K	13.6	158.8	3.2	48.9	3.10	4.00	0.010 K		0.010 K	0.016
94/05/09	1110	10	10.3	31.17	23.91	8.2		10.2	111.4		45.7	7.10	15.80	0.040		0.010	0.022
94/05/09	1115	30	9.7	31.25	24.07	7.8		7.4	78.7		64.4						
94/06/20	1055	0	13.8	31.17	23.27	8.1	1 K	10.2	119.9	8.7	77.8	1.50	0.46	0.063		0.015	0.013
94/06/20	1100	10	11.0	31.47	24.03	7.9		8.0	88.6		85.2	0.34	0.28	0.145		0.026	0.026
94/06/20	1105	30	10.7	31.60	24.18	7.8		6.3	69.1		81.8						
94/07/11	1050	0	15.4	31.01	22.81	8.3	1 U	12.1	146.7	4.3	58.2	12.80	0.05 K	0.010 K		0.010 K	0.017
94/07/11	1055	10	12.1	31.09	23.54	8.0		8.7	99.2		81.9	6.30	1.60	0.088		0.036	0.056
94/07/11	1100	25	11.9	31.13	23.60	7.9		8.6	97.4		79.8						
94/08/15	1150	0	14.3	31.42	23.36	8.2	1 U	10.8	129.0	5.4	62.8	11.40	0.35	0.017		0.010 K	0.021
94/08/15	1155	10	12.1	31.59	23.92	8.0		8.7	98.9		84.7	9.90	0.05 K	0.120		0.010 K	0.028
94/08/15	1200	30	11.3	31.75	24.19	7.8		6.4	72.3		86.5						
94/09/21	1115	0	12.5	31.88	24.07	8.1	1 U	10.4	120.0	7.5	67.9	8.30	1.10	0.115		0.051	0.040
94/09/21	1120	10	10.9	31.94	24.41	7.9		7.6	85.0		84.9	5.50	0.69	0.223		0.066	0.058
94/09/21	1125	19	10.7	31.94	24.45	7.8		7.0	78.0		87.4						

Station:
JDF007 Sequim Bay - Goose Point LAT (deg min N): 48 02.9 LONG (deg min W): 123 00.5

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI Transm. (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2- DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/11	1130	0	12.1	31.77	24.06	8.2		12.9	146.6	4.6	63.0						
93/10/11	1135	10	10.3	31.93	24.51	7.8		6.3	69.5		87.1						
93/12/14	1135	0	7.5	31.53	24.62	7.7		8.6	88.8	4.3	70.0						
93/12/14	1140	10	7.6	31.80	24.82	7.7		8.4	86.5		73.4						

Station:
LOP001 Lopez Sound - Decatur Island LAT (deg min N): 48 30.8 LONG (deg min W): 122 51.0

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/18	1325	0	10.4	30.69	23.52	7.8	1	6.5	71.1	5.8	74.1	1.40	0.85	0.303		0.011	0.064
93/10/18	1330	10	10.3	30.76	23.59	7.8		6.3	68.5		72.1	2.40	1.20	0.312		0.013	0.063
93/12/21	1150	0	8.3	30.43	23.65	7.7	1 K	7.6	78.7	8.0	82.7	0.15	0.16	0.379		0.010 K	0.072
93/12/21	1155	10	8.2	30.55	23.75	7.7		7.6	78.4		79.7	0.19	0.23	0.385		0.010 K	0.073
94/03/03	1245	0	8.0	30.34	23.62	7.8	1 K	8.9	91.8	7.0	80.3	2.40	0.84	0.365		0.010 K	0.070
94/03/03	1250	9	7.9	30.34	23.63	7.8		8.9	92.0		75.2	0.64	0.62	0.361		0.010 K	0.069
94/04/11	1415	0	9.2	30.11	23.26	7.9	1 K	8.9	93.9	7.7	78.5	3.20	0.05 K	0.178		0.011	0.028
94/04/11	1420	10	8.7	30.13	23.35	7.9		8.6	90.2		75.9	2.60	0.29	0.175		0.022	0.028
94/05/02	1455	0	10.3	30.01	23.01	7.9		7.5	81.3	5.9	77.0	1.70	0.18	0.333		0.026	0.072
94/05/02	1500	10	9.3	30.07	23.22	7.9		7.8	82.7		75.8	1.40	0.48	0.271		0.018	0.056
94/06/08	1210	0	10.7	30.19	23.08	7.9	1 K	8.5	93.8	7.5	77.9	6.40	0.72	0.138		0.027	0.032
94/06/08	1215	10	10.2	30.25	23.21	7.9		8.3	90.0		70.0	8.50	1.00	0.139		0.031	0.032
94/07/05	1510	0	12.7	30.08	22.63	8.2	1 U	12.3	141.2	3.7	53.6	25.70	0.64	0.010 K		0.010 K	0.010 K
94/07/05	1515	10	11.0	30.10	22.96	7.9		8.6	95.0		65.3	16.00	0.37	0.134		0.010 K	0.021
94/08/01	1540	0	13.8	30.29	22.59	8.2	1 U	12.1	141.3	3.4	50.0	25.30	0.91	0.010 K		0.010 K	0.014
94/08/01	1545	10	11.2	30.40	23.16	7.9		7.1	79.2		63.2	11.50	0.98	0.168		0.010	0.034
94/09/06	1610	0	12.6	29.81	22.45	8.0	1 U	9.9	112.5	5.9	68.9	15.70	3.20	0.100		0.010 K	0.024
94/09/06	1615	10	11.6	29.97	22.76	7.8		6.8	75.8		70.3	4.90	2.10	0.192		0.017	0.041

Station:
OAK004 Oakland Bay - Near Eagle Point LAT (deg min N): 47 12.8 LONG (deg min W): 123 04.6

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/06	1120	0	15.6	28.46	20.81	7.8	1	7.5	90.1		69.7	3.00	1.90	0.087		0.066	0.061
93/10/06	1125	10	15.0	29.13	21.45	7.9		7.8	93.5		72.8	3.40	2.70	0.085		0.045	0.055
93/11/16	1425	0	10.3	28.17	21.58	7.7	1	7.9	85.3	3.0	59.8	1.20	0.58	0.225		0.082	0.083
93/11/16	1430	4	10.7	29.05	22.20	7.7		7.7	83.7		59.0	3.20	1.30	0.223		0.063	0.077
93/12/15	1155	0	8.1	23.72	18.42	7.7	2	8.5	84.1	3.1	61.3	0.57	0.68	0.309		0.074	0.088
93/12/15	1200	10	8.4	25.85	20.05	7.7		8.3	83.9		54.2	0.60	0.95	0.319		0.066	0.089
94/01/27	1340	0	8.5	23.97	18.56	7.6	3	8.2	82.6	3.5	70.4	0.64	0.28	0.381		0.038	0.069
94/01/27	1345	10	8.5	27.10	21.01	7.6		7.9	80.9		65.0	1.00	0.71	0.394		0.027	0.076
94/02/24	1120	0	6.9	21.48	16.81	7.8	1	10.0	95.4	3.1	64.1	1.40	0.63	0.334		0.032	0.081
94/02/24	1125	6	7.1	25.27	19.75	7.8		9.5	93.0		56.4	1.70	1.20	0.344		0.032	0.087
94/04/25	1115	0	13.1	24.75	18.45	8.3	1 K	11.5	128.3	3.6	60.1	10.60	2.10	0.010 K		0.010 K	0.020
94/04/25	1120	4	12.4	25.65	19.27	8.3		12.9	142.3		58.9	14.00	2.60	0.010 K		0.010 K	0.017
94/05/18	1055	0	14.8	25.87	18.99	8.1	1 K	9.7	112.7	3.7	63.0	5.10	0.83	0.010 K		0.010 K	0.033
94/05/18	1100	5	13.8	27.11	20.14	8.2		10.3	118.8		62.9	7.70	0.05 K	0.010 K		0.010 K	0.027
94/06/20	1750	0	17.3	27.11	19.40	8.1	1 K	10.1	125.1	3.0	57.9	1.10	0.37	0.010 K		0.012	0.016
94/06/20	1755	10	15.6	28.21	20.62	8.1		10.7	128.7		61.6	1.60	0.61	0.010 K		0.010 K	0.013
94/07/18	1120	0	19.9	27.52	19.09	8.0	1 U	8.3	107.8	4.2	71.2	5.80	0.83	0.010 K		0.010 K	0.020
94/07/18	1125	4	19.0	28.01	19.69	8.1		8.5	109.6		65.6	10.90	0.78	0.010 K		0.010 K	0.029
94/08/16	1515	0								2.0		11.70	1.10	0.010 K		0.010 K	0.031
94/08/16	1520	10										7.10	0.13	0.010 K		0.010 K	0.025
94/08/29	1235	0	18.2	28.69	20.40	8.1		8.9	112.6	3.0	58.5						
94/08/29	1240	9	17.8	28.97	20.71	8.1		9.2	116.3		59.6						
94/09/13	1055	0	17.3	28.46	20.43	8.0	2	8.0	99.6	3.3	61.1	12.40	2.80	0.010 K		0.010 K	0.038
94/09/13	1100	9	17.3	28.49	20.46	8.0		7.9	98.7		59.8	11.10	2.60	0.010 K		0.010 K	0.036

Station:
PAH008 Port Angeles Harbor - Morse Creek LAT (deg min N): 47 07.3 LONG (deg min W): 123 21.0

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/11	1030	0	10.0	31.90	24.53	7.8	3	6.4	70.3		82.2	4.10	1.10	0.282		0.010 K	0.052
93/10/11	1035	10	8.6	32.77	25.43	7.7		5.0	52.8		86.1	0.38	0.38	0.369		0.010 K	0.083
93/12/14	1045	0	8.3	30.17	23.44	7.9	5	8.9	92.4	5.5	72.3	0.32	0.44	0.374		0.010 K	0.070
93/12/14	1050	10	8.5	30.94	24.02	7.9		8.7	91.2		74.3	0.21	0.33	0.349		0.010 K	0.071
94/02/08	1040	0	7.7	31.75	24.77	7.7	9	7.8	80.6	4.4	74.7	0.70	0.28	0.343		0.010 K	0.064
94/02/08	1045	9	7.6	31.79	24.81	7.7		7.7	79.6		69.8	0.70	0.44	0.339		0.010 K	0.067
94/03/14	1030	0	8.6	30.86	23.94	7.9	1 K	8.6	90.3	4.4	67.7	1.00	0.51	0.268		0.010 K	0.055
94/03/14	1035	10	8.3	31.21	24.26	7.9		8.1	84.6		75.7	0.62	0.31	0.298		0.010 K	0.058
94/04/14	1055	0	8.9	30.66	23.74	7.9	1 K	8.8	93.2	4.3	62.8	2.00	0.87	0.010 K		0.010 K	0.010 K
94/04/14	1100	10	8.7	31.09	24.10	7.9		8.6	90.4		72.0	2.40	0.75	0.028		0.010 K	0.010 K
94/05/09	1025	0	10.2	30.96	23.77	7.9	2 X	9.7	106.1	4.0	66.1	5.30	13.40	0.124		0.017	0.033
94/05/09	1030	7	10.0	31.08	23.89	7.9		9.2	100.5		65.9	2.60	16.00	0.127		0.018	0.034
94/06/20	1015	0	10.9	31.29	23.91	7.8	1 K	7.8	86.7	8.4	79.0	0.38	0.26	0.156		0.013	0.018
94/06/20	1020	10	10.1	31.52	24.22	7.7		7.1	77.8		78.3	0.24	0.24	0.145		0.011	0.013
94/07/11	1020	0	11.9	30.29	22.95	7.9	1 U	8.8	99.1	5.3	65.3	10.90	0.50	0.131		0.010 K	0.030
94/07/11	1025	8	10.2	31.62	24.28	7.8		7.7	84.1		78.7	6.40	0.91	0.174		0.010 K	0.040
94/08/15	1045	0	11.3	31.33	23.87	7.7	1 U	7.5	84.3	7.1	65.3	3.30	0.05 K	0.209		0.010 K	0.042
94/08/15	1050	8	10.7	31.60	24.18	7.7		7.3	81.1		85.2	3.60	0.28	0.203		0.016	0.039
94/09/21	1045	0	10.6	31.78	24.34	7.8	1	6.9	76.4	5.1	70.3	3.20	2.10	0.302		0.030	0.056
94/09/21	1050	9	9.8	32.18	24.78	7.7		6.0	65.1		77.4	3.00	1.70	0.450		0.023	0.081

Station:
PNN001 Penn Cove - Whidbey Island at Penn Cove Park LAT (deg min N): 48 13.9 LONG (deg min W): 122 40.5

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/18	1430	0	12.9	28.11	21.08	8.0	1	8.9	101.5	8.3	84.1	1.40	0.63	0.037		0.027	0.055
93/10/18	1435	10	12.0	29.14	22.04	7.5		3.8	42.1		82.2	3.90	1.90	0.201		0.058	0.102
94/03/03	1340	0	8.7	25.27	19.55	7.9	1 K	10.0	101.5	9.0	83.6	0.52	0.37	0.258		0.032	0.058
94/03/03	1345	10	7.4	26.75	20.89	7.9		9.4	93.6		83.6	0.58	0.35	0.258		0.022	0.060
94/04/11	1120	0	10.4	24.09	18.39	8.6	1 K	12.0	125.7	11.5	85.8	2.30	0.12	0.010 K		0.012	0.010 K
94/04/11	1125	10	9.2	27.79	21.45	8.1		8.9	92.6		72.2	38.30	0.05 K	0.081		0.019	0.015
94/05/02	1155	0	12.1	22.18	16.84	8.6		15.6	167.4	2.0	32.6	28.10	1.20	0.010 K		0.010 K	0.011
94/05/02	1200	10	10.1	26.40	20.23	8.2		10.1	106.6		53.5	54.00	0.05 K	0.010 K		0.010 K	0.028
94/06/08	1135	0	13.5	24.26	18.00	8.2	1 K	10.4	116.9	9.0	74.8	4.30	0.99	0.010 K		0.010 K	0.010 K
94/06/08	1140	10	10.0	28.49	21.87	7.7		5.9	63.4		86.6	1.40	0.43	0.161		0.056	0.045
94/07/05	1135	0	13.7	21.45	15.80	8.3	1 U	11.2	124.2	3.5	44.4	9.80	0.24	0.010 K		0.010 K	0.010 K
94/07/05	1140	10	10.0	29.14	22.38	7.8		5.8	62.8		76.9	12.70	1.80	0.226		0.028	0.046
94/08/01	1150	0	15.7	25.15	18.25	8.3	1 U	12.3	144.9	3.8	48.0	10.80	0.77	0.010 K		0.010 K	0.010 K
94/08/01	1155	10	11.3	29.27	22.27	7.7		6.0	66.2		83.9	6.40	0.93	0.145		0.072	0.054
94/09/06	1210	0	15.9	27.72	20.18	8.4	1 U	13.3	169.9	3.6	48.5	6.20	2.10	0.010 K		0.011	0.010
94/09/06	1215	10	11.7	29.48	22.36	7.7		4.9	55.2		71.1	9.10	2.70	0.202		0.050	0.067

Station:
PSB003 Puget Sound Main Basin - West Point LAT (deg min N): 47 39.6 LONG (deg min W): 122 28.5

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/06	1220	0	12.7	29.73	22.37	7.9	4	8.0	91.5	8.4	84.1	2.80	0.39	0.232		0.010 K	0.050
93/10/06	1225	10	12.5	30.25	22.81	7.9		7.6	87.1		85.0	2.30	0.59	0.235		0.010 K	0.053
93/10/06	1230	30	12.4	30.31	22.88	7.8		7.4	84.2		85.1			0.262		0.025	0.058
93/11/16	1045	0	11.1	30.52	23.27	7.7	1 K	7.2	80.2	10.0	85.0	0.88	0.49	0.304		0.010 K	0.070
93/11/16	1050	10	11.2	30.58	23.30	7.7		6.9	76.4		83.4	0.87	0.43	0.303		0.010 K	0.070
93/11/16	1055	30	11.2	30.58	23.30	7.7		6.9	76.3		83.7			0.317		0.010 K	0.070
93/12/15	1330	0	9.7	30.21	23.28	7.7	3	7.1	76.6	9.1	88.3	0.21	0.19	0.346		0.010 K	0.089
93/12/15	1335	10	9.8	30.45	23.43	7.7		7.0	75.4		82.1	0.08	0.14	0.331		0.010 K	0.082
93/12/15	1340	30	9.8	30.53	23.50	7.7		7.0	75.5		82.3			0.357		0.010 K	0.086
94/02/24	1220	0	8.3	29.78	23.14	7.8	1 K	8.7	89.7	9.0	85.8	0.29	0.34	0.389		0.010 K	0.075
94/02/24	1225	10	8.4	29.99	23.29	7.8		8.2	85.6		85.3	0.33	0.24	0.389		0.010 K	0.075
94/02/24	1230	27	8.4	30.01	23.30	7.8		7.9	82.6		88.1			0.391		0.010 K	0.078
94/03/23	1440	0					1 U			11.5		0.60	0.22	0.345		0.010 K	0.067
94/03/23	1445	10	8.4	27.71	21.50	7.9		8.1 J	82.5 J		86.8	0.96	0.40	0.363		0.010 K	0.069
94/03/23	1450	30	8.3	27.98	21.73	7.8		8.1	83.4		87.0			0.389		0.010	0.073
94/04/25	1215	0	10.2	26.76	20.50	8.1	1	10.6	112.4	6.5	72.9	11.20	2.50	0.155		0.010 K	0.037
94/04/25	1220	10	9.5	28.14	22.46	8.0		10.1	106.7		78.3	17.70	0.05 K	0.184		0.010 K	0.042
94/04/25	1225	23	9.3	28.31	22.62	7.9		9.1	96.5		79.4						
94/05/18	1155	0	11.9	28.95	21.91	8.2	1 K	12.9	144.0	5.0	67.1	7.70	3.30	0.032		0.010 K	0.026
94/05/18	1200	10	11.1	29.16	22.22	8.2		12.6	138.6		67.0	5.20	2.60	0.134		0.013	0.043
94/05/18	1205	22	10.1	29.44	22.60	8.0		9.6	103.2		83.0			0.197		0.028	0.055
94/06/20	1345	0	12.8	28.70	21.58	8.1	2	11.0	125.2	6.8	70.7	1.50	0.58	0.049		0.018	0.010 K
94/06/20	1350	10	11.7	29.36	22.27	8.0		9.9	110.2		77.3	1.10	0.36	0.080		0.025	0.014
94/06/20	1355	13	11.3	29.56	22.49	7.9		9.5	105.2		79.9			0.086		0.027	0.011
94/07/18	1225	0	12.8	29.84	22.28	8.0	1 U	8.8	100.5	10.5	83.0	5.10	0.19	0.122		0.010 K	0.029
94/07/18	1230	10	12.2	29.81	22.53	7.9		8.1	92.1		86.4	4.50	0.76	0.086		0.010 K	0.014
94/07/18	1235	12	12.2	29.81	22.53	7.9		8.1	91.9		86.4			0.108		0.010 K	0.021
94/08/16	1235	0					1 U			5.8		22.00	0.43	0.023		0.010 K	0.024
94/08/16	1240	10										21.40	0.05 K	0.047		0.011	0.027
94/08/16	1245	30												0.072		0.010 K	0.030
94/08/29	1140	0	14.2	29.96	22.26	8.1		10.3	121.5	6.5	56.9						
94/08/29	1145	10	13.5	30.07	22.48	8.0		8.8	102.2		79.8						
94/08/29	1150	19	13.4	30.16	22.57	8.0		8.5	98.6		82.2						
94/09/13	1235	0	13.7	30.29	22.61	8.0	1 U	8.5	99.4	12.5	85.1	5.90	0.87	0.097		0.010 K	0.033
94/09/13	1240	10	13.4	30.33	22.70	8.0		8.2	95.0		86.3	8.60	0.88	0.119		0.010 K	0.036

Station:
PSS019 Possession Sound - Gedney Island LAT (deg min N): 48 00.7 LONG (deg min W): 122 18.0

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/18	1550	0	12.4	28.81	21.72	7.9	1 K	7.3	82.7	12.1	81.9	1.90	1.00	0.212		0.011	0.057
93/10/18	1555	10	12.0	29.58	22.38	7.8		5.8	63.3		85.7	0.80	0.55	0.288		0.010 K	0.066
93/10/18	1600	30	11.6	30.23	22.98	7.7		5.1	56.7		88.7			0.333		0.010 K	0.074
94/03/03	1445	0	8.0	13.53	10.46	7.8	4	10.7	99.3	2.0	39.4	0.87	0.76	0.391		0.022	0.036
94/03/03	1450	10	8.6	28.47	22.08	7.8		8.5	87.8		85.6	0.40	0.26	0.368		0.010 K	0.071
94/03/03	1455	30	8.5	29.67	23.02	7.8		8.1	84.5		85.8			0.382		0.010 K	0.076
94/04/11	1005	0	8.3	15.35	11.74	8.2	6 S	12.8	123.6	3.8	60.5	16.10	0.05 K	0.124		0.022	
94/04/11	1010	10	9.0	28.33	21.90	8.0		9.4	97.6		77.8	22.40	0.69	0.145		0.018	
94/04/11	1015	18	8.8	29.12	22.55	7.8		8.7	91.4		85.2			0.204		0.013	
94/05/02	1010	0	11.5	24.01	18.15	8.6		14.9	160.2	2.8	43.3	23.70	0.99	0.010 K		0.010 K	0.010 K
94/05/02	1015	10	9.4	29.12	22.46	7.9		9.2	97.6		87.9	2.10	0.75	0.300		0.026	0.067
94/05/02	1020	30	9.0	29.43	22.76	7.8		8.1	85.6		88.0			0.332		0.018	0.067
94/06/08	1010	0	14.9	20.83	15.10	8.2	1 K	9.6	109.2	9.6	72.1	2.20	0.39	0.035		0.023	0.012
94/06/08	1015	10	11.9	28.47	21.54	8.0		9.2	102.9		84.4	2.70	0.36	0.106		0.031	0.049
94/06/08	1020	30	10.0	29.43	22.81	7.8		8.0	88.0		88.0			0.187		0.033	0.042
94/07/05	1015	0	13.9	21.26	15.62	8.2	9	10.6	118.0	4.7	64.4	8.20	0.05 K	0.012		0.010 K	0.025
94/07/05	1020	10	12.6	28.30	21.28	8.0		9.8	110.5		80.6	4.40	1.00	0.059		0.013	0.016
94/07/05	1025	30	11.2	29.72	22.63	7.8		7.9	87.3		88.7			0.184		0.028	0.042
94/08/01	1010	0	16.0	25.49	18.45		1	10.3	122.8	5.0	65.2	6.60	1.20	0.010 K		0.010 K	0.011
94/08/01	1015	10	12.3	29.71	22.43			7.6	86.2		88.0	0.66	0.41	0.175		0.010 K	0.039
94/08/01	1020	30	11.2	29.77	22.67			6.7	74.4		86.5			0.192		0.010 K	0.039
94/09/06	1020	0	15.3	28.28	20.72	8.1	1	11.8	141.2	3.9	67.9	8.20	3.80	0.010 K		0.010 K	0.010 K
94/09/06	1025	10	13.5	29.34	21.92	8.0		9.1	105.5		78.7	7.60	4.30	0.107		0.018	0.033
94/09/06	1030	30	11.2	29.93	22.80	7.8		5.7	63.1		89.9			0.230		0.013	0.047

Station:
PTH005 Port Townsend - Walan Point LAT (deg min N): 48 05.0 LONG (deg min W): 122 45.8

DATE	TIME	WATER DEPTH	10 TEMP	480 SALINITY	DENSITY	400 pH	31616 FEC COLI MF	300 DO	301 DO SATUR	78 SECCHI	74 LIGHT TRANS	32211 CHLRPHL a	32218 PHEOPIG	631 NO3 & NO2-DISS	613 NO2-N DISS	608 NH4 & NH3-N DISS	671 ORTHO PO4-P DISS
(YY/MM/DD)	(LOCAL)	(M)	(DEG C)	(PSU)	(SIGMA-T)		(#/100ML)	(MG/L)	(%)	(M)		(UG/L)	(UG/L)	(MG/L)	(MG/L)	(MG/L)	(MG/L)
93/10/11	1240	0	11.5	31.01	23.58	8.0	1 K	9.4	105.5	2.9	68.2	7.10	1.70	0.153		0.010 K	0.037
93/10/11	1245	10	10.7	31.33	23.97	7.8		6.6	72.6		81.2	2.50	0.82	0.288		0.011	0.055
93/12/14	1235	0	8.5	30.79	23.80	7.7	4	9.2	86.2	6.6	76.6	0.80	0.48	0.158		0.017	0.038
93/12/14	1240	10	8.4	31.15	24.19	7.7		9.1	85.1		75.5	0.59	0.47	0.164		0.017	0.042
94/02/08	1215	0	7.6	30.68	23.84	7.8	2	9.4	85.8	6.9	76.5	0.89	0.47	0.349		0.010 K	0.073
94/02/08	1220	10	7.6	30.68	23.84	7.8		9.2	84.4		76.4	0.79	0.50	0.369		0.010 K	0.073
94/03/14	1220	0	8.8	30.22	23.41	7.9	1 K	9.3	97.8	8.2	68.3	1.40	0.53	0.297		0.010 K	0.080
94/03/14	1225	10	8.4	30.34	23.56	7.9		8.9	93.2		78.9	1.40	0.65	0.297		0.010 K	0.080
94/04/14	1250	0	9.0	30.36	23.49	7.9	1 K	8.8	92.7	8.4	81.4	3.30	0.44	0.144		0.010 K	0.029
94/04/14	1255	10	9.0	30.60	23.68	7.9		8.7	91.8		72.2	3.70	0.50	0.202		0.010 K	0.033 J
94/05/09	1150	0	10.6	30.17	23.09	8.0	1 K	10.1	110.6	5.0	67.9	2.30	23.00	0.087		0.010 K	0.029 J
94/05/09	1155	10	10.1	30.66	23.65	7.9		8.7	95.0		69.2	4.60	12.20	0.111		0.014	0.032
94/06/20	1220	0	12.2	30.39	22.98	8.1	1 K	11.9	134.9	3.9	54.1	22.30	0.05 K	0.018		0.010 K	0.010 K
94/06/20	1225	10	11.4	30.74	23.39	8.0		9.6	106.7		61.7	20.00	2.00	0.076		0.010 K	0.010 K
94/07/11	1125	0	12.3	30.69	23.19	8.0	1 U	9.1	104.1	4.0	64.6	3.40	0.05 K	0.047		0.010 K	0.052
94/07/11	1130	10	11.9	30.78	23.33	8.0		8.5	98.0		70.3	13.30	1.80	0.116		0.013	0.052
94/08/15	1330	0	14.8	30.91	22.86	8.3	1 U	14.3	171.8	2.9	35.9	45.00	0.05 K	0.010 K		0.010 K	0.010 K
94/08/15	1335	10	11.8	31.09	23.59	7.9		8.6	97.2		70.1	18.10	0.05 K	0.124		0.010 K	0.026
94/09/21	1230	0	12.5	31.17	23.52	8.0	1 U	9.5	108.6	5.6	69.6	21.30	0.97	0.133		0.010 K	0.040
94/09/21	1235	10	11.6	31.29	23.78	7.9		7.8	88.2		77.0	15.30	0.70	0.231		0.020	0.053

Station:
SAR003 Saratoga Passage - East Point LAT (deg min N): 48 08.5 LONG (deg min W): 122 29.4

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/18	1515	0	12.5	28.15	21.19	8.1	1 K	9.6	108.2	6.5	77.8	8.70	2.40	0.085		0.010 K	0.045
93/10/18	1520	10	12.1	29.15	22.03	7.9		6.2	69.9		82.5	1.50	0.85	0.288		0.010 K	0.071
93/10/18	1525	30	11.7	30.41	23.08	7.7		5.1	57.0		81.1			0.328		0.010 K	0.076
94/03/03	1405	0	8.5	26.29	20.38	7.9	1 K	9.9	100.5	8.9	79.6	0.61	0.26	0.301		0.017	0.081
94/03/03	1410	10	8.4	27.92	21.67	7.9		9.2	94.7		86.3	0.52	0.30	0.342		0.011	0.068
94/03/03	1415	30	8.9	29.61	22.92	7.7		6.9	72.1		82.7			0.365		0.010 K	0.081
94/04/11	1050	0	10.0	25.20	19.31	8.5	1 K	13.7	143.5	5.8	78.9	13.30	0.08	0.010 K		0.010 K	0.010 K
94/04/11	1055	10	9.4	27.13	20.91	8.2		12.3	128.5		88.0	50.20	0.05 K	0.030		0.013	0.010 K
94/04/11	1100	30	8.6	29.51	22.88	7.7		7.4	77.6		86.2			0.226		0.010 K	0.039
94/05/02	1110	0	11.7	24.68	18.64	8.7		15.2	164.7	2.3	43.4	28.00	0.35	0.010 K		0.045	0.011
94/05/02	1115	10	9.0	29.16	22.55	7.8		8.2	85.7		86.1	1.10	0.58	0.313		0.011	0.064
94/05/02	1120	30	8.8	29.42	22.78	7.8		7.6	79.5		86.6			0.384		0.010 K	0.080
94/06/08	1055	0	14.0	24.95	18.44	8.2	1 K	9.6	109.7	10.3	75.3	4.70	1.70	0.010 K		0.022	0.010
94/06/08	1100	10	11.3	27.57	20.95	7.9		8.1	88.1		87.8	1.00	0.23	0.119		0.037	0.037
94/06/08	1105	30	9.7	29.44	22.66	7.8		7.2	77.3		88.0			0.226		0.015	0.044
94/07/05	1055	0	13.3	24.69	18.37	8.2	1 U	11.6	130.1	4.2	55.5	8.30	0.17	0.010 K		0.010 K	0.010 K
94/07/05	1100	10	10.9	29.38	22.42	7.8		7.8	86.0		89.6	0.61	0.49	0.181		0.017	0.037
94/07/05	1105	30	10.5	29.67	22.71	7.7		7.0	75.9		87.9			0.200		0.014	0.038
94/08/01	1055	0	15.2	27.55	20.20	8.2	1 U	10.0	118.7	5.1	60.7	5.70	0.99	0.010 K		0.015	0.017
94/08/01	1100	10	12.4	28.89	21.85	7.8		7.5	85.2		81.7	6.20	1.40	0.114		0.011	0.033
94/08/01	1105	30	11.1	29.74	22.67	7.7		6.2	68.6		88.9			0.195		0.010 K	0.038
94/09/06	1110	0	15.6	27.13	19.79	8.4	1 U	14.0	167.4	3.5	45.4	8.40	3.30	0.010 K		0.013	0.010 K
94/09/06	1115	10	12.9	29.14	21.89	8.0		8.8	101.1		59.7	3.40	1.80	0.275		0.014	0.082
94/09/06	1120	30	11.5	30.05	22.84	7.6		5.2	58.2		86.8			0.233		0.010 K	0.046

Station:
SIN001 Sinclair Inlet - Naval Shipyards LAT (deg min N): 47 33.0 LONG (deg min W): 122 38.5

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/10/06	1200	0	14.0	29.82	22.19	7.9	1 K	8.5	100.2	5.4	74.8	5.20	1.40	0.076		0.024	0.048
93/10/06	1205	10	13.5	30.10	22.50	7.9		8.2	95.1		79.2	6.80	1.30	0.142		0.032	0.050
93/11/16	1250	0	10.7	30.15	23.05	7.8	1 K	8.0	87.5	8.0	74.8	4.70	0.94	0.235		0.088	0.077
93/11/16	1255	10	10.8	30.28	23.14	7.8		7.5	82.7		76.0	3.30	0.92	0.245		0.041	0.070
93/12/15	1235	0	8.8	29.08	22.52	7.7	10	7.5	78.6	8.1	74.5	0.50	0.37	0.352		0.083	0.079
93/12/15	1240	10	9.4	30.10	23.22	7.7		7.0	74.7		74.8	0.34	0.53	0.341		0.028	0.074
94/01/27	1305	0	8.7	29.66	22.98	7.8	1	8.1	84.6	7.3	80.5	0.87	0.52	0.383		0.044	0.081
94/01/27	1310	10	8.9	29.84	23.10	7.8		7.8	80.1		79.7	0.93	0.42	0.389		0.016	0.076
94/02/24	1200	0	7.8	29.24	22.78	7.8	2	8.9	91.4	7.3	80.3	1.00	0.65	0.371		0.024	0.079
94/02/24	1205	10	8.1	29.59	23.02	7.8		8.4	88.3		79.8	0.89	0.65	0.392		0.016	0.078
94/04/25	1150	0	11.3	28.97	22.03	8.1	1	12.0	132.5	4.4	71.3	17.00	0.05 K	0.114		0.010 K	0.032
94/04/25	1155	10	10.2	29.22	22.41	7.9		8.7	93.4		66.0	3.90	1.40	0.298		0.024	0.070
94/05/18	1125	0	13.2	28.81	21.57	8.2	1 K	12.5	143.7	7.0	77.4	5.00	0.53	0.032		0.010 K	0.027
94/05/18	1130	10	11.2	29.31	22.32	8.0		9.5	105.0		79.5	5.50	0.32	0.157		0.037	0.050
94/06/20	1535	0	15.3	29.09	21.36	8.4	1 K	13.3	160.1	6.2	72.8	9.60	0.05 K	0.010 K		0.010 K	0.016
94/06/20	1540	10	12.7	29.47	22.17	8.1		10.0	114.2		60.2	1.60	0.67	0.033		0.031	0.018
94/07/18	1155	0	17.8	29.28	20.95	8.4		12.5	158.1	4.8	83.0	9.50	0.05 K	0.010 K		0.010 K	0.017
94/07/18	1200	10	14.1	29.68	22.08	8.0		7.8	91.3		60.4	9.50	0.71	0.108		0.085	0.087
94/08/16	1435	0					1 U			4.9		10.40	0.05 K	0.010 K		0.010 K	0.025
94/08/16	1440	10										12.60	0.82	0.063		0.010 K	0.035
94/08/29	1155	0	15.8	29.87	21.85	8.2		10.8	132.1	4.2	66.9						
94/08/29	1200	10	14.6	30.05	22.24	8.0		9.0	95.6		72.6						
94/09/13	1130	0	15.3	29.65	21.79	8.3	1 U	11.5	139.2	8.0	87.4	11.70	1.30	0.012		0.010 K	0.027
94/09/13	1135	10	14.2	30.21	22.45	8.0		8.1	95.8		75.5	12.40	1.60	0.069		0.010 K	0.035

Station:
*** ADM001** Admiralty Inlet-Bush Pt. 48 Deg 01.8' N 122 Deg 37.0' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)		PHEOPIG (UG/L)		NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)	
94/12/21	1130	0	9.1	30.21	23.36	7.6	1		8.1	85.4	8.5	85.7	0.25		0.30		0.228		0.010	U	0.052	
94/12/21	1135	10	9.0	30.28	23.42	7.6			8.1	85.2		85.3	0.25		0.34		0.257		0.010	U	0.059	
94/12/21	1140	30	8.9	30.32	23.47	7.6			8.0	84.7		85.2					0.266		0.010	U	0.060	
95/01/24	1125	0	8.0	29.22	22.74	7.8	1	U	8.4	86.2	9.4	85.3	0.44		0.33		0.374		0.010	U	0.066	
95/01/24	1130	10	8.0	29.32	22.82	7.8			8.4	86.0		85.5	0.40		0.47		0.374		0.010	U	0.066	
95/01/24	1135	30	8.0	29.54	22.99	7.8			8.3	85.8		85.5					0.368		0.010	U	0.063	
95/02/13	1050	0	8.1	28.96	22.52	7.8	1	U	8.7	89.7	9.7	84.7	0.60	J	0.38	J	0.184		0.010	U	0.027	
95/02/13	1055	10	8.1	29.07	22.61	7.8			9.3	95.3		84.5	0.51	J	0.42	J	0.191		0.010	U	0.028	
95/02/13	1100	30	8.1	29.13	22.65	7.8			9.0	92.9		84.6					0.189		0.010	U	0.029	
95/03/29	1115	0	8.8	29.05	22.49	8.0			9.7	100.8	8.7	69.3	2.00		0.75		0.257		0.013		0.048	
95/03/29	1120	10	8.7	29.15	22.59	8.0			9.6	100.2		84.5	2.60		0.85		0.253		0.014		0.048	
95/03/29	1125	30	8.7	29.14	22.58	8.0			9.5	99.6		84.8					0.260		0.012		0.049	
95/04/19	1040	0	9.2	29.10	22.47	7.8	1	U	6.8	71.4	10.0	86.2	1.30		0.90		0.237		0.026		0.048	
95/04/19	1045	10	9.1	29.24	22.60	7.8			8.3	87.5		85.2	1.20		0.64		0.239		0.027		0.048	
95/04/19	1050	30	9.1	29.25	22.61	7.8			8.4	88.4		85.0					0.241		0.022		0.048	
95/05/15	1040	0	11.3	27.34	20.77	8.1	1	U	9.4	102.2	8.5	80.7	8.80		0.05	U	0.088		0.010	U	0.010	U
95/05/15	1045	10	10.4	28.80	22.05	8.0			8.9	96.5		81.5	6.50		0.05	U	0.178		0.021		0.024	
95/05/15	1050	30	10.0	29.72	22.83	7.9			8.4	90.7		81.1					0.206		0.021		0.030	
95/08/08	1205	0	12.4	30.14	22.74	7.9	1	U	7.3	83.5	12.5	88.2	3.20		1.10		0.039		0.016		0.018	
95/08/08	1210	10	12.4	30.16	22.76	7.9			7.4	83.7		87.9	2.30		1.20		0.082		0.024		0.031	
95/08/08	1215	30	12.1	30.31	22.93	7.9			7.2	81.7		87.6					0.060		0.017		0.023	
95/09/14	1255	0	13.1	26.77	20.01	7.8	1	U	10.2	115.5	8.0	82.8	3.60		1.10		0.103		0.011		0.023	
95/09/14	1300	10	12.4	30.48	23.01	7.8			7.3	83.0		84.3	4.00		1.30		0.139		0.018		0.031	
95/09/14	1305	30	11.7	30.81	23.39	7.7			6.4	72.2		86.9					0.150		0.041		0.036	

Station:
*** ADM002** N. Adm. Inlet-Quimper Pen. 48 Deg 11.3' N 122 Deg 50.5' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)
94/10/25	1005	0	9.8	31.72	24.42	7.7	1	U	5.8	62.7	13.0	87.4	1.10	0.64	0.176		0.010	U	0.025
94/10/25	1010	10	9.7	31.77	24.48	7.7			5.6	60.9		87.5	1.00	0.61	0.217		0.010	U	0.034
94/10/25	1015	30	9.7	31.79	24.50	7.7			5.4	58.8		87.5			0.202		0.010	U	0.029
94/12/21	1015	0	8.3	30.61	23.79	7.7	1	U	8.6	89.7	8.6	85.1	0.26	0.38	0.284		0.010	U	0.063
94/12/21	1020	10	8.3	30.64	23.81	7.7			8.6	89.3		85.7	0.25	0.34	0.253		0.010		0.056
94/12/21	1025	30	8.2	30.73	23.89	7.7			8.5	88.4		86.8			0.272		0.010	U	0.062
95/01/24	1020	0	7.6	30.16	23.53	7.8	1	U	8.6	87.9	8.6	83.3	0.41	0.22	0.364		0.010	U	0.069
95/01/24	1025	10	7.7	30.22	23.56	7.8			8.5	87.5		83.7	0.34	0.29	0.361		0.010	U	0.067
95/01/24	1030	30	7.8	30.40	23.69	7.8			8.4	86.5		82.2			0.364		0.010	U	0.067
95/03/29	1020	0	8.7	29.82	23.11	7.9			9.5	99.1	9.5	58.4	0.94	0.72	0.267		0.011		0.051
95/03/29	1025	10	8.7	29.84	23.13	7.9			9.4	98.7		83.9	0.90	0.70	0.269		0.011		0.050
95/03/29	1030	30	8.7	29.83	23.12	7.9			9.4	98.6		84.0			0.244		0.010	U	0.046
95/04/24	1015	0	9.2	29.10	22.47	7.8	1	U	6.8	71.4	9.1	86.2	1.40	0.90	0.198		0.024		0.035
95/04/24	1020	10	9.1	29.24	22.60	7.8			8.3	87.5		85.2	1.40	0.55	0.203		0.026		0.038
95/04/24	1025	30	9.1	29.25	22.61	7.8			8.4	88.4		85.0			0.199		0.022		0.035
95/05/22	1055	0	11.3	27.34	20.77	8.1	1	U	9.4	102.2	9.5	80.7	1.20	0.60	0.169		0.025		0.038
95/05/22	1100	10	10.4	28.80	22.05	8.0			8.9	96.5		81.5	1.70	1.10	0.131		0.018		0.030
95/05/22	1105	30	10.0	29.72	22.83	7.9			8.4	90.7		81.1			0.224		0.025		0.047
95/06/14	1130	0	10.1	30.89	23.73	7.7	1	U	7.3	79.3	6.0	73.2	2.00	2.10	0.263		0.015		0.058
95/06/14	1135	10	10.2	30.82	23.66	7.7			7.3	79.5		74.5	1.90	2.40	0.265		0.018		0.060
95/06/14	1140	30	10.1	30.92	23.75	7.7			7.1	76.9		72.6			0.294		0.016		0.064
95/07/10	1020	0	10.7	30.92	23.65	7.8	1	U	6.5	72.2	6.7	81.6	3.80	1.80	0.253		0.022		0.054
95/07/10	1025	10	10.4	30.99	23.76	7.8			6.4	69.6		80.4	3.40	2.70	0.266		0.018		0.055
95/07/10	1030	30	10.3	31.06	23.83	7.8			6.1	66.6		80.4			0.316		0.018		0.059
95/08/08	1030	0	10.8	31.27	23.91	7.8	1	U	6.6	72.7	10.4	84.4	2.80	1.90	0.070		0.012		0.021
95/08/08	1035	10	10.4	31.43	24.10	7.8			6.3	68.9		83.7	2.80	2.10	0.066		0.012		0.019
95/08/08	1040	30	9.8	31.86	24.53	7.7			5.6	61.4		81.2			0.087		0.013		0.022
95/09/14	1140	0	10.8	26.76	20.40	7.6	1	U	11.6	124.9	12.9	56.4	0.94	0.54	0.203		0.018		0.040
95/09/14	1145	10	10.8	31.24	23.88	7.6			6.9	76.2		77.8	1.50	0.71	0.219		0.016		0.042
95/09/14	1150	30	10.3	31.64	24.28	7.6			5.8	63.4		80.6			0.236		0.015		0.043

Station:
* **BLL009** Bellingham Bay - Pt. Frances   48 Deg 41.2' N 122 Deg 35.9' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)		NO2-N DISS (MG/L)		NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)	
94/10/03	1135	1	12.7	28.90	21.73	8.1	1	U	8.9	92.0	4.6	69.9	8.90	1.50	0.038		0.010	U	0.010	U	0.020	
94/10/03	1140	7	12.3	29.27	22.09	8.0			8.0	89.9		72.7	7.10	1.90	0.095		0.010	U	0.010	U	0.029	
94/12/05	1145	0	7.2	29.90	23.38	7.6			9.0	90.8	4.5	73.7	0.46	0.49	0.152		0.010	U	0.010	U	0.023	
94/12/05	1150	10	7.4	29.98	23.42	7.6			8.8	89.5		74.0	0.43	0.46	0.157		0.010	U	0.010	U	0.024	
95/01/23	1200	0	6.7	28.56	22.39	7.8	2		9.3	91.9	4.5	74.5	0.55	0.33	0.220		0.010	U	0.010	U	0.029	
95/01/23	1205	10	7.7	29.94	23.34	7.8			8.4	85.7		79.6	0.43	0.28	0.196		0.010	U	0.010	U	0.026	
95/03/27	1225	0	9.1	25.30	19.52	8.0	1	U	9.8	101.0	5.2	76.7	0.89	0.19	0.362		0.010	U	0.019		0.043	
95/03/27	1230	10	8.2	29.62	23.02	7.9			9.2	95.4		74.6	1.10	1.20	0.327		0.010	U	0.022		0.053	
95/04/24	1145	0	10.1	29.27	22.47	8.0	1	U	9.3	100.3	6.0	77.0	1.50	0.60	0.144		0.010	U	0.014		0.025	
95/04/24	1150	8	9.2	29.55	22.82	7.9			9.1	95.8		73.3	2.30	1.40	0.168		0.010	U	0.016		0.029	
95/05/22	1425	0	14.0	27.58	20.46	8.4	1	U	10.7	124.1	4.7	61.3	5.90	1.20	0.010	U	0.010	U	0.010	U	0.010	U
95/05/22	1430	10	10.3	29.47	22.59	7.9			8.2	88.4		78.0	3.60	1.30	0.146		0.010	U	0.027		0.035	
95/06/26	1145	0	16.4	25.09	18.06	8.4	1	U	11.2	133.9	2.5	55.1			0.010	U	0.010	U	0.010	U	0.014	
95/06/26	1150	10	11.4	29.71	22.59	7.9			8.6	95.8		60.2	9.70	2.50	0.095		0.010	U	0.020		0.039	
95/07/24	1310	0	16.9	26.80	19.26	8.5	1	U	10.5	127.9	5.8	75.0	6.20	1.10	0.010	U	0.010	U	0.010	U	0.010	
95/07/24	1315	9	12.3	29.09	21.95	8.0			7.8	87.6		64.8	7.30	2.00	0.126		0.010	U	0.028		0.036	
95/08/22	1410	0	15.1	11.84	8.18	8.2	1	U	9.0	97.0	4.0	75.5	4.20	1.30	0.028		0.010	U	0.010	U	0.013	
95/08/22	1415	10	11.3	30.40	23.14	7.8			9.1	101.0		72.3	2.90	1.60	0.148		0.010	U	0.036		0.029	

Station:
*** BUD002** Budd Inlet - S. End Oly Port 47 Deg 03.1' N 122 Deg 54.3' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4- DISS (MG/L)
94/11/09	1325	0	11.5	29.56	22.46	7.6		7.0	77.4	4.5	68.9						
94/11/09	1330	10	11.5	29.77	22.62	7.6		7.0	77.5		66.4						
94/11/17	1020	0	10.2	24.01	18.36	7.5		6.9	72.3	3.3	35.2						
94/11/17	1025	10	11.1	29.56	22.53	7.5		6.2	68.7		61.4						
95/02/09	1500	0	8.6	19.87	15.35	7.7		9.0	88.5	3.2	62.1						
95/02/09	1505	10	8.6	27.86	21.59	7.6		7.1	73.7		47.8						
95/03/06	1540	0	8.6	25.26	19.56	7.8		8.7	88.0	3.5	56.6						
95/03/06	1545	10	8.3	27.32	21.21	7.7		8.1	82.4		52.9						
95/04/03	1440	0	12.0	16.73	12.45	8.0		10.1	104.5	4.5	66.6						
95/04/03	1445	9	9.1	27.40	21.16	7.9		9.2	95.6		51.7						
95/05/03	1405	1	12.2	25.39	19.10	8.0		10.8	118.8	3.0	53.8						
95/05/03	1410	9	10.3	27.87	21.34	7.9		8.8	94.7		53.9						
95/06/08	0935	0	15.1	20.58	14.87	7.8		9.7	110.6	2.3	58.2						
95/06/08	0940	6	12.8	28.82	21.65	7.7		9.0	102.5		55.9						
95/07/05	1005	0	16.8	24.83	17.77	8.0		9.6	116.2	4.3	41.3						
95/07/05	1010	10	13.9	28.74	21.38	7.6		6.1	70.6		72.8						
95/07/17	1525	0	19.8	20.50	13.79	7.9		9.4	117.6	2.8	69.3						
95/07/17	1530	10	14.6	28.83	21.30	7.7		4.9	57.5		29.9						
95/08/02	1745	0	21.3	26.85	18.23	8.2		10.5	139.4	3.0	42.5						
95/08/02	1750	10	15.0	29.05	21.39	7.7		5.3	63.3		35.2						
95/09/19	1015	0	16.9	25.40	18.18	7.5		3.7	45.3	3.6	62.0						
95/09/19	1020	10	15.0	29.61	21.82	7.5		3.0	35.6		73.6						

Station:
*** BUD005** Budd Inlet - Olympia Shoal 47 Deg 05.5' N 122 Deg 55.0' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/11	0910	0	14.4	29.93	22.19	7.9	1	6.8	80.8	4.9	70.6	22.10	3.90	0.053	0.010 U	0.031	0.070
94/10/11	0915	10	14.5	30.04	22.26	7.9		6.7	79.5		69.4	9.70	1.30	0.033	0.010 U	0.015	0.024
94/11/09	0940	0	11.2	29.34	22.34	7.6	13	7.4	81.6	5.9	75.5	3.00 J	0.53 J	0.213	0.010 U	0.051	0.067
94/11/09	0945	10	11.4	29.82	22.68	7.6		7.2	79.8		72.2	1.80 J	0.65 J	0.167	0.010 U	0.030	0.049
94/11/17	1040	0	10.7	29.45	22.51	7.6		7.1	77.6	6.4	79.0						
94/11/17	1045	10	10.8	29.80	22.76	7.6		7.1	77.6		77.2						
95/01/03	0935	0	6.2	24.00	18.85	7.5	7	8.8	83.9	4.0	69.9	0.62	0.27	0.394 J	0.010 U	0.022	0.069 J
95/01/03	0940	10	8.7	27.98	21.67	7.5		7.5	77.6		63.3	0.39	0.52	0.253	0.010 U	0.014	0.052
95/02/09	0945	0	9.2	25.95	20.01	7.7	12	8.7	89.7	5.3	63.9	1.90 J	0.91 J	0.214	0.010 U	0.010 U	0.033
95/02/09	0950	10	8.7	27.85	21.57	7.6		7.9	82.0		72.3	1.00 J	0.67 J	0.212	0.010 U	0.023	0.034
95/03/06	0935	0	8.1	26.81	20.84	7.8	1 U	9.1	92.1	6.2	79.8	1.50	0.79	0.400	0.010 U	0.032	0.068
95/03/06	0950	10	8.3	27.48	21.33	7.7		8.4	86.0		66.2	1.10	0.65	0.372	0.010 U	0.018	0.069
95/04/03	0935	0	10.2	26.51	20.30	8.0	5 X	10.5	111.3	6.4	86.7	1.60	0.54	0.271	0.010 U	0.012	0.049
95/04/03	0940	10	9.1	27.56	21.29	7.9		9.5	99.1		65.0	8.00	1.90	0.316	0.010 U	0.015	0.056
95/05/03	1540	0	12.5	27.21	20.46	8.2	1	12.0	134.2	4.9	71.3	7.10	0.97	0.010 U	0.010 U	0.010 U	0.010 U
95/05/03	1545	10	10.3	27.97	21.42	7.9		9.1	98.1		58.9	15.30	4.10	0.120	0.010 U	0.078	0.037
95/06/08	0945	0	16.0	27.59	20.06	8.1	1 U	10.3	124.8	6.1	78.3	5.60	1.00	0.010 U	0.010 U	0.010 U	0.039
95/06/08	0950	10	12.7	28.53	21.44	7.8		8.9	101.4		71.7	29.90	6.40	0.010 U	0.010 U	0.010 U	0.027
95/07/05	1015	0	15.9	28.64	20.88	8.2	1	11.6	140.4	7.1	88.4	0.89	0.50	0.010 U	0.010 U	0.016	0.032
95/07/05	1020	10	14.0	28.83	21.43	8.0		10.1	117.9		51.6	24.80	4.90	0.010 U	0.010 U	0.014	0.036
95/08/02	1720	0	21.6	28.25	19.21	8.3	1 U	11.7	158.1	4.0	62.9	4.70	1.20	0.010 U	0.010 U	0.010 U	0.046
95/08/02	1725	10	14.8	29.13	21.49	7.8		7.1	83.8		54.0	27.40	4.70	0.010 U	0.010 U	0.015	0.056
95/09/19	1030	0	17.7	28.91	20.69	8.6	9	10.7	134.8	2.0	38.5	37.10	4.40	0.010	0.010 U	0.016	0.061
95/09/19	1035	10	14.8	29.70	21.93	7.8		6.2	73.9		76.1	4.30	0.97	0.037	0.010 U	0.112	0.050

Station:
*** CMB003** Commencement Bay - Browns Point 47 Deg 17.4' N 122 Deg 26.9' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4- DISS (MG/L)
94/10/11	1040	0	12.4	27.95	21.05	7.9	7	7.3	81.8	6.9	70.2	2.70	0.67	0.078	0.010 U	0.010 U	0.017
94/10/11	1045	10	12.9	30.44	22.88	7.9		7.1	82.2		87.5			0.080	0.010 U	0.010 U	0.017
94/10/11	1050	30	12.8	30.55	22.99	7.9		6.6	75.6		88.8			0.102	0.010 U	0.010 U	0.021
94/11/09	1100	0	11.0	29.07	22.16	7.6	170 J	7.2	78.8	5.5	75.0	3.80 J	0.33 J	0.192	0.010 U	0.010 U	0.042
94/11/09	1105	10	11.5	30.57	23.24	7.6		6.3	70.8		85.0	1.90 J	0.41 J	0.185	0.010 U	0.010 U	0.038
94/11/09	1110	30	11.5	30.72	23.36	7.6		6.0	67.4		85.1			0.195	0.010 U	0.010 U	0.043
95/01/03	1325	0	6.8	19.78	15.48	7.6	31	9.5	89.6	2.3	50.2	0.29	0.24	0.316	0.010 U	0.024	0.049
95/01/03	1330	10	8.9	29.33	22.70	7.6		7.8	82.3		82.3	0.29	0.20	0.284	0.010 U	0.010 U	0.062
95/01/03	1335	30	8.9	29.53	22.85	7.7		8.1	84.8		83.9			0.275	0.010 U	0.010 U	0.055
95/02/09	1350	0	7.9	17.65	13.69	7.7	6	10.5	100.1	3.4	55.4	1.90 J	0.62 J	0.312	0.010 U	0.016	0.041
95/02/09	1355	10	8.7	28.16	21.81	7.8		10.5	108.3		81.9	0.74 J	0.46 J	0.159	0.010 U	0.010 U	0.025
95/02/09	1400	30	8.7	28.90	22.39	7.7		8.9	92.8		84.4			0.324	0.010 U	0.010 U	0.059
95/03/06	1105	0	6.7	17.40	13.62	7.8	10	10.4	95.7	6.2	44.5	1.20	0.48	0.280	0.010 U	0.019	0.040
95/03/06	1110	10	8.3	28.37	22.03	7.8		8.7	89.3		86.0	0.34	0.39	0.374	0.010 U	0.015	0.066
95/03/06	1115	30	8.4	28.67	22.25	7.8		8.4	87.1		85.7			0.385	0.010 U	0.030	0.070
95/04/03	1050	0	10.4	14.42	10.88	7.9	2	10.3	101.9	7.0	64.1	2.00	0.77	0.327	0.010 U	0.024	0.045
95/04/03	1055	10	8.7	28.59	22.15	7.9		9.2	95.7		90.4	2.00	0.75	0.349	0.010 U	0.010 U	0.061
95/04/03	1100	30	8.6	28.77	22.30	7.9		9.0	93.4		91.3			0.374	0.010 U	0.010 U	0.064
95/05/03	1030	0	10.3	19.80	15.07	7.9	23 X	10.1	102.3	4.5	45.5	9.40	2.50	0.208	0.010 U	0.026	0.010
95/05/03	1035	10	9.4	28.79	22.20	7.9		9.0	94.7		85.3	3.30	1.70	0.263	0.010 U	0.031	0.048
95/05/03	1040	30	9.3	28.93	22.33	7.8		8.4	89.0		86.4			0.271	0.010 U	0.025	0.041
95/06/08	1120	0	13.9	22.80	16.80	8.0	2	12.2	137.2	3.6	61.9	13.60	3.20	0.010 U	0.010 U	0.055	0.062
95/06/08	1125	10	11.8	28.87	21.87	8.0		11.2	125.0		77.9	11.40	3.80	0.053	0.010 U	0.035	0.040
95/06/08	1130	30	11.0	29.09	22.18	7.8		9.7	105.9		92.1			0.150	0.010 U	0.053	0.051
95/07/05	1130	0	14.2	26.14	19.31	8.0	2	12.3	141.5	3.5	58.2	20.40	2.30	0.010 U	0.010 U	0.010 U	0.014
95/07/05	1135	10	12.0	29.25	22.13	7.9		9.6	107.6		87.9	5.10	1.30	0.077	0.010 U	0.073	0.036
95/07/05	1140	30	11.6	29.41	22.32	7.9		8.8	98.4		92.6			0.066	0.010 U	0.047	0.026
95/08/02	1235	0	16.0	25.38	18.36	8.2	3	10.7	127.2	4.9	52.0	8.00	1.70	0.010 U	0.010 U	0.010 U	0.016
95/08/02	1240	10	12.5	29.57	22.28	7.9		8.2	93.8		83.0	8.20	1.80	0.059	0.010 U	0.048	0.027
95/08/02	1245	30	12.4	29.75	22.44	7.9		7.6	86.1		91.1			0.089	0.010 U	0.037	0.036
95/09/19	1210	0	14.6	27.62	20.37	8.1	7	11.6	136	2.4	54.2	17.70	3.20	0.014	0.010 U	0.013	0.011
95/09/19	1215	10	13.1	30.10	22.58	7.9		8	92.4		86.3	6.40	1.00	0.120	0.010 U	0.019	0.030
95/09/19	1220	30	12.8	30.19	22.71	7.8		6.5	74.7		90.0			0.142	0.010 U	0.019	0.033

Station:
* **CMB006** Commencement Bay - Mouth of City WW   47 Deg 15.7' N 122 Deg 26.2' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/11	1025	0	12.9	29.34	22.03	7.8	47	6.8	77.5	6.0	78.3	2.50	0.63	0.138		0.014	0.035
94/10/11	1030	10	12.9	30.42	22.87	7.9		6.6	75.5		82.9	3.00	0.68	0.074		0.010 U	0.014
94/11/09	1045	0	11.0	27.55	20.98	7.6	100 J	6.7	73.3	6.2	65.6	1.80 J	0.27 J	0.207		0.013	0.036
94/11/09	1050	10	11.5	30.62	23.28	7.6		6.1	68.7		76.4	1.90 J	0.54 J	0.204		0.010 U	0.044
95/01/03	1400	0	7.5	25.71	20.05	7.7	16	8.9	88.4	3.0	68.6	0.23	0.17	0.281		0.020	0.054
95/01/03	1405	10	8.9	29.39	22.74	7.6		7.8	82.3		81.0	0.17	0.20	0.255		0.010 U	0.054
95/02/09	1430	0	8.6	26.45	20.49	7.8	1	9.2	94.3	6.0	77.9	1.50 J	0.41 J	0.326		0.012	0.053
95/02/09	1435	10	8.7	27.98	21.67	7.7		8.3	85.8		77.6	0.73 J	0.51 J	0.345		0.010 U	0.061
95/03/06	1050	0	7.9	26.41	20.55	7.8	70	9.2	92.3	7.3	80.8	0.62	0.41	0.391		0.021	0.065
95/03/06	1055	10	8.3	28.57	22.19	7.8		8.7	89.1		85.9	0.47	0.27	0.390		0.010 U	0.063
95/04/03	1035	0	9.8	21.13	16.18	7.9	12	10.2	103.7	5.6	76.6	1.50	0.59	0.355		0.024	0.054
95/04/03	1040	10	8.7	28.66	22.20	7.9		9.2	95.3		88.7	0.72	0.48	0.363		0.010	0.063
95/05/03	1015	0	10.5	26.47	20.22	7.9	22	9.6	102.3	5.5	75.6	5.70	1.10	0.260		0.024	0.027
95/05/03	1020	10	9.3	28.85	22.26	7.8		8.8	92.5		77.2	3.30	1.30	0.259		0.037	0.046
95/06/08	1100	0	14.3	23.98	17.63	7.9	16	11.3	129.0	4.0	67.4	10.20	3.10	0.031		0.013	0.013
95/06/08	1105	10	11.2	28.91	22.00	7.9		9.9	108.8		85.7	3.90	1.40	0.139		0.067	0.052
95/07/05	1115	0	15.0	21.19	15.36	8.0	10	10.2	115.6	2.3	34.3	2.90	1.00	0.029		0.019	0.019
95/07/05	1120	10	11.7	29.43	22.32	7.9		8.9	99.8		85.0	5.90	1.60	0.092		0.035	0.035
95/08/02	1220	0	17.8	14.01	9.31	8.2	25	10.2	117.6	0.8	11.2	10.10	1.80	0.020		0.010 U	0.010 U
95/08/02	1225	10	12.8	29.64	22.28	8.0		8.3	95.0		80.0	10.70	2.20	0.064		0.038	0.033
95/09/19	1150	0	14.3	28.44	21.06	8.1	4	9.9	115.6	3.0	62.9	15.90	1.40	0.079		0.018	0.039
95/09/19	1155	10	13.1	29.85	22.39	7.8		7.3	84.0		75.9	5.10	1.00	0.163		0.043	0.051

Station:
*** DNA001** Dana Passage - S. of Brisco Point 47 Deg 09.7' N 122 Deg 52.2' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)		PHEOPIG (UG/L)		NO3 & NO2-N DISS (MG/L)		NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)	
94/10/11	0945	0	14.0	30.16	22.45	8.0	1	U	7.2	85.1	7.4	80.6					0.053			0.010	U	0.022	
94/10/11	0950	10	14.0	30.17	22.46	8.0			7.2	84.3		80.6	6.20		0.46		0.052			0.010	U	0.021	
94/10/11	0955	30	13.8	30.24	22.55	7.9			6.8	79.5		78.4					0.104			0.010	U	0.022	
94/11/09	1005	0	11.7	30.07	22.82	7.6	1	U	7.0	78.4	8.1	79.9	2.20	J	0.60	J	0.148			0.010	U	0.042	
94/11/09	1010	10	11.7	30.09	22.83	7.6			6.9	77.5		80.4	1.60	J	0.29	J	0.169			0.010	U	0.043	
94/11/09	1015	30	11.8	30.23	22.92	7.6			6.6	73.8		79.6					0.166			0.010	U	0.043	
95/01/03	1435	0	8.2	27.36	21.25	7.7	1		8.3	84.2	4.0	72.2	0.41		0.42		0.277			0.017		0.054	
95/01/03	1440	10	8.4	27.87	21.63	7.7			8.0	82.3		71.3	0.38		0.52		0.275			0.013		0.056	
95/01/03	1445	30	8.7	28.57	22.13	7.6			7.8	81.0		73.0					0.290			0.010		0.059	
95/02/09	1005	0	8.4	27.66	21.46	7.7	1	U	8.5	87.1	6.6	79.2	0.99	J	0.50	J	0.219			0.016		0.034	
95/02/09	1010	10	8.6	28.36	21.98	7.7			8.3	85.9		79.9	1.10	J	0.56	J	0.204			0.010	U	0.031	
95/02/09	1015	30	8.7	28.83	22.34	7.7			7.9	82.4		77.4					0.221			0.010		0.035	
95/03/06	1010	0	8.1	27.27	21.20	7.8	1	U	8.8	89.4	7.0		0.67		0.45		0.396			0.010	U	0.069	
95/03/06	1015	10	8.1	27.28	21.21	7.8			8.8	89.5		80.2	0.53		0.50		0.410			0.010		0.070	
95/03/06	1020	30	8.2	27.57	21.42	7.8			8.7	88.5		79.9					0.345			0.010		0.059	
95/04/03	1000	0	9.3	27.47	21.19	8.0			10.0	104.3	8.0	78.2	4.40		0.93		0.296			0.010	U	0.052	
95/04/03	1005	10	9.2	27.56	21.27	8.0			10.0	104.5		78.6	4.10		0.79		0.290			0.010	U	0.050	
95/04/03	1010	30	9.1	27.75	21.43	8.0			9.8	101.9		77.9					0.299			0.010		0.050	
95/05/03	0925	0	10.9	27.82	21.21	8.1	1	U	10.1	109.6	6.4	75.8	11.80		3.40		0.109			0.027		0.050	
95/05/03	0930	10	10.3	28.04	21.48	8.0			9.8	105.1		77.0	9.90		3.30		0.147			0.031		0.025	
95/05/03	0935	30	10.0	28.23	21.67	7.9			9.5	101.7		77.3					0.164			0.032		0.035	
95/06/08	1020	0	15.1	28.30	20.79	8.2	1	U	11.7	138.8	8.8	78.3	4.90		1.10		0.010	U		0.013		0.023	
95/06/08	1025	10	13.4	28.48	21.27	8.1			11.0	126.4		76.5	9.00		1.80		0.021			0.014		0.022	
95/06/08	1030	30	11.6	28.82	21.87	7.8			9.2	101.7		78.2					0.076	J		0.038		0.028	J
95/07/05	1040	0	14.3	28.86	21.39	8.1	1	U	10.1	118.8	6.0	76.1	15.60		2.00		0.010	U		0.082		0.030	
95/07/05	1045	10	12.9	29.08	21.83	8.0			9.5	108.9		78.3	16.70		1.20		0.010	U		0.032		0.025	
95/07/05	1050	30	12.6	29.12	21.92	7.9			9.1	103.0		74.0					0.038			0.064		0.028	
95/08/02	1145	0	16.0	29.10	21.22	8.2	1	U	9.9	120.7	4.5	69.1	15.10		2.80		0.010	U		0.011		0.024	
95/08/02	1150	10	15.0	29.19	21.50	8.1			9.3	111		69.8	16.60		2.20		0.010	U		0.017		0.027	
95/08/02	1155	30	14.1	29.32	21.78	8.0			8.6	101		74.9					0.019			0.023		0.029	
95/09/19	1110	0	15.3	29.68	21.81	8.1	1		8.3	100	5.6	76.1	5.90		1.20		0.023			0.013		0.018	
95/09/19	1115	10	14.7	29.79	22.02	8.0			7.4	88.5		80.4	5.60		1.70		0.061			0.019		0.034	
95/09/19	1120	30	13.8	29.97	22.34	7.9			6.5	75.9		74.2					0.093			0.019		0.031	

Station:
*** DYE004** Dyes Inlet - NE of Chico Bay 47 Deg 37.4' N 122 Deg 41.3' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)		PHEOPIG (UG/L)		NO3 & NO2-N DISS (MG/L)		NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)	
94/10/11	1235	0	14.0	30.36	22.61	8.0	1	U	8.0	94.5	5.4	77.1	9.50		1.50		0.032			0.010	U	0.016	
94/10/11	1240	10	13.9	30.36	22.63	8.0			8.1	95.4		75.4	11.20		1.20		0.029			0.010	U	0.013	
94/10/11	1245	28	13.8	30.37	22.65	8.0			7.9	92.3		69.8											
94/11/09	1225	0	11.0	30.18	23.03	7.7	2		7.7	85.0	5.8	75.5	7.80	J	1.00	J	0.131			0.010	U	0.035	
94/11/09	1230	10	11.0	30.26	23.09	7.7			7.5	82.7		75.1	6.60	J	1.10	J	0.132			0.010	U	0.036	
94/11/09	1235	30	11.1	30.31	23.11	7.7			7.5	82.7		72.9											
95/01/03	1220	0	8.0	28.48	22.16	7.6	9		8.0	81.6	4.4	72.4	0.46		0.67		0.262			0.030		0.054	
95/01/03	1225	10	8.0	28.53	22.20	7.6			8.0	81.5		70.8	0.60		0.64		0.256			0.031		0.052	
95/01/03	1230	30	8.0	28.62	22.27	7.6			8.1	83.3		68.8											
95/02/09	1250	0					1	U			7.0		1.40	J	0.51	J	0.338			0.015		0.057	
95/02/09	1255	10	8.7	28.24	21.87	7.7			8.6	89.3		79.2	1.30	J	0.69	J	0.293			0.010	U	0.048	
95/02/09	1300	30	8.7	28.33	21.94	7.7			8.3	86.2		74.3											
95/03/06	1300	0	8.0	27.37	21.29	7.9	1	U	9.7	97.9	8.0	82.5	1.30		0.57		0.375			0.026		0.067	
95/03/06	1305	10	8.0	27.44	21.34	7.9			9.5	96.0		83.3	1.30		1.00		0.376			0.031		0.065	
95/03/06	1310	21	7.9	27.54	21.44	7.9			8.9	89.7		83.0											
95/04/03	1210	0	11.2	27.53	20.93	8.5	1		12.5	136.6	5.0	52.2	38.10		3.80		0.138			0.010	U	0.017	
95/04/03	1215	10	9.7	27.96	21.51	8.0			10.2	108.2		76.2	5.20		2.00		0.315			0.010	U	0.052	
95/04/03	1220	29	9.7	28.01	21.55	8.0			10.2	107.8		79.5											
95/05/03	1140	0	11.8	28.20	21.35	8.3	1	U	13.1	145.0	5.1	70.4	11.10		2.50		0.010	U		0.010	U	0.010	U
95/05/03	1145	10	11.2	28.39	21.60	8.1			11.2	122.6		75.5	17.40		2.80		0.064			0.029		0.010	U
95/05/03	1150	30	11.2	28.41	21.62	8.1			10.5	115.5		49.9											
95/06/08	1335	0	16.8	28.39	20.49	8.2	1	U	10.6	130.6	3.4	54.4	4.50		0.98		0.010	U		0.010	U	0.024	
95/06/08	1340	10	14.7	28.69	21.18	8.1			10.8	127.6		64.3	2.40		1.10		0.010	U		0.010	U	0.025	
95/06/08	1345	30																					
95/07/05	1305	0	17.0	28.91	20.85	8.1	1	U	9.9	122.8	9.0	84.0	3.10		0.72		0.010	U		0.028		0.030	
95/07/05	1310	10	15.2	29.07	21.36	8.1			9.7	115.8		79.2	3.50		1.50		0.010	U		0.053		0.027	
95/07/05	1315	27	15.0	29.09	21.42	8.0			9.1	108.7		46.7											
95/08/02	1435	0	19.2	29.29	20.61	8.2	1	U	9.9	128.7	6.2	76.1	3.10		0.93		0.010	U		0.010	U	0.021	
95/08/02	1440	10	16.2	29.44	21.43	8.2			9.9	121.0		73.7	15.30		2.80		0.010	U		0.010	U	0.020	
95/08/02	1445	30																					
95/09/19	1345	0	15.7	29.94	21.93	8.0	1		8.5	103	5.9	80.0	6.20		1.60		0.043			0.023		0.045	
95/09/19	1350	10	15.3	29.95	22.02	8.0			8.3	99.7		75.7	6.60		2.50		0.033			0.024		0.027	
95/09/19	1355	30	15.2	29.96	22.05	8.0			7.9	95.2		62.3											

Station:
*** EAP001** East Passage - SW of Three Tree Point 47 Deg 25.0' N 122 Deg 22.8' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/25	1300	0	12.4	30.67	23.16	7.9	1 U	7.2	81.8	13.1	87.3	5.40	0.46	0.172		0.010 U	0.034
94/10/25	1305	10	12.3	30.69	23.19	7.8		6.8	77.3		87.1	4.70	0.33	0.145		0.010 U	0.026
94/10/25	1310	30	12.2	30.70	23.22	7.8		6.4	72.7		87.8			0.182		0.010 U	0.036
94/11/17	1205	0	10.8	30.40	23.23	7.7	1 U	8.0	88.4	9.4	85.2	9.10	0.19	0.311 J		0.010 U	0.073 J
94/11/17	1210	10	10.8	30.46	23.28	7.7		7.5	82.6		86.6						
94/11/17	1215	30	10.9	30.50	23.29	7.7		7.2	80.0		87.2			0.163		0.010 U	0.037
94/12/21	1415	0	9.5	29.79	22.97	7.7	1 U	8.4	89.1	10.0	86.9	0.73	0.14	0.374 J		0.010 U	0.084
94/12/21	1420	10	9.5	29.89	23.04	7.7		8.2	87.2		87.2	0.46	0.22	0.270		0.010 U	0.062
94/12/21	1425	30	9.5	30.25	23.33	7.6		7.6	81.3		86.5			0.237		0.010 U	0.056
95/01/24	1500	0	8.5	29.45	22.85	7.8	1	8.6	89.1	9.5	86.7	0.78	0.36	0.389		0.010 U	0.077
95/01/24	1505	10	8.5	29.46	22.86	7.8		8.4	86.9		87.1	0.53	0.42				
95/01/24	1510	30	8.7	29.57	22.91	7.7		8.0	83.7		87.2			0.399		0.010 U	0.080
95/02/13	1405	0	8.1	28.42	22.10	7.8	1 U	8.9	91.2	10.0	85.9	0.49 J	0.34 J	0.232		0.010 U	0.037
95/02/13	1410	10	8.1	28.46	22.13	7.8		8.8	90.6		85.9	0.38 J	0.40 J	0.367		0.010 U	0.066
95/02/13	1415	30	8.7	29.05	22.51	7.8		8.1	84.0		86.5			0.227		0.010 U	0.037
95/03/29	1340	0	9.9	28.20	21.66	8.0		10.5	112.1	10.0	85.7	3.00	0.66	0.296		0.010 U	0.057
95/03/29	1345	10	8.7	28.53	22.10	7.9		9.7	101.2		87.3	2.90	0.62	0.341		0.010 U	0.060
95/03/29	1350	30	8.6	28.67	22.22	7.9		9.3	96.0		90.1			0.367		0.010 U	0.068
95/04/19	1435	0	9.6	28.49	21.94	8.0	1 U	10.5	110.8	11.9	83.4	9.20	0.87	0.169		0.011	0.037
95/04/19	1440	10	9.0	28.77	22.24	7.9		9.0	94.7		88.7	3.20	0.94	0.271		0.019	0.052
95/04/19	1445	30	9.0	28.80	22.27	7.8		8.8	92.3		89.1			0.273		0.018	0.054
95/05/15	1430	0	11.2	28.89	21.99	8.1	1 U	11.0	121.5	6.7	73.6	15.80	0.05 U	0.102		0.010 U	0.016
95/05/15	1435	10	10.2	28.98	22.22	8.0		9.8	105.7		80.7	19.80	0.05 U	0.081		0.010 U	0.013
95/05/15	1440	30	9.8	29.08	22.37	7.9		8.8	94.0		86.5			0.223		0.028	0.037
95/06/14	1445	0	12.9	28.78	21.60	8.2	1 U	12.2	139.5	5.5	61.7	19.80	6.80				
95/06/14	1450	10	11.6	29.12	22.10	8.0		10.3	114.7		82.1	11.00	4.30				
95/06/14	1455	30	11.2	29.24	22.26	7.9		9.3	102.4		86.0						
95/07/10	1450	0	14.3	29.34	21.76	8.4	1 U	11.1	131.2	5.7	78.9	9.80	1.90	0.010 U		0.010 U	0.017
95/07/10	1455	10	12.5	29.42	22.17	8.2		9.7	110		80.4	20.20	1.40	0.016		0.010 U	0.027
95/07/10	1500	30	12.3	29.46	22.24	8.1		8.6	97.3		84.9			0.064		0.013	0.032
95/08/08	1635	0	13.9	29.51	21.97	8.3	1	10.5	123	9.0	77.0	19.50	2.90	0.010		0.012	0.038
95/08/08	1640	10	13.5	29.62	22.13	8.2		9.8	114		82.2	16.40	1.80	0.027		0.013	0.027
95/08/08	1645	30	12.7	29.87	22.48	8.0		8.3	94.9		86.4			0.038		0.018	0.020
95/09/14	1650	0	14.2	27.08	20.04	8.1	1 U	9.8	114	6.2	80.3	14.00	2.00	0.014		0.010 U	0.026
95/09/14	1655	10	13.7	30.31	22.63	8.1		8.9	104		80.1	17.70	5.50	0.011		0.010 U	0.018
95/09/14	1700	30	12.8	30.3	22.79	7.8		7.1	81.6		90.5			0.014		0.010 U	0.038

Station:
*** EAS001** East Sound (Orcas Island) - Rosario Point 48 Deg 38.6' N 122 Deg 52.9' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/12/05	1215	0	7.3	30.55	23.88	7.7		9.2	93.6	10.0	86.1	4.30	0.57	0.137		0.010 U	0.022
94/12/05	1220	10	7.3	30.55	23.88	7.7		9.2	93.1		86.6	4.80	0.82	0.117		0.010 U	0.018
94/12/05	1225	30	7.3	30.54	23.87	7.7		9.1	92.3		87.1			0.299		0.021	0.060
95/01/23	1035	0	7.0	30.03	23.51	7.8	1 U	9.4	94.7	12.3	87.4	0.74	0.33	0.145		0.010 U	0.018
95/01/23	1040	10	7.0	30.03	23.51	7.8		9.3	94.1		87.8	0.93	0.26	0.178		0.010	0.024
95/01/23	1045	30	7.5	30.24	23.61	7.8		8.7	88.7		79.8			0.368 J		0.010 U	0.062 J
95/03/27	1025	0	8.7	29.80	23.09	8.4	1 U	14.6	153.0	4.0	57.2	22.30	2.00	0.010 U		0.010 U	0.010 U
95/03/27	1030	10	8.0	29.95	23.31	8.0		11.1	114.3		76.6	24.20	3.00	0.138		0.010 U	0.033
95/03/27	1035	30	8.1	30.05	23.38	7.8		8.9	91.9		71.9			0.287		0.010 U	0.050
95/04/24	1100	0	10.3	29.92	22.94	8.4	1 U	13.4	144.8	3.9	61.3	29.40	1.40	0.010 U		0.012	0.010 U
95/04/24	1105	10	9.4	29.99	23.14	8.0		10.3	109.2		72.9	20.50	2.10	0.064		0.012	0.021
95/04/24	1110	30	8.9	30.07	23.28	7.7		7.2	76.1		72.0			0.179		0.060	0.045
95/05/22	1350	0	12.2	29.90	22.60	8.4	1 U	12.6	142.3	3.9	60.3	29.50	5.20	0.010 U		0.014	0.010
95/05/22	1355	10	10.6	30.00	22.95	8.0		9.7	105.7		74.9	31.90	4.50	0.010 U		0.012	0.019
95/05/22	1400	30	9.9	30.08	23.13	7.5		5.2	55.8		74.4			0.102		0.117	0.049
95/06/26	1215	0	16.4	29.81	21.67	8.6	1 U	12.1	149.1	4.5	79.9	3.00	0.70	0.010 U		0.020	0.035
95/06/26	1220	10	10.8	30.27	23.13	7.9		8.7	96.1		71.2	30.70	5.20	0.171		0.014	0.061
95/06/26	1225	30												0.221		0.027	0.061
95/07/24	1130	0	15.7	28.48	20.80	8.5	1 U	11.8	142.9	5.6	74.9	12.00	1.90	0.010 U		0.010 U	0.010 U
95/07/24	1135	10	12.5	29.37	22.13	8.0		8.4	94.9		76.7	16.60	2.90	0.098		0.015	0.027
95/07/24	1140	30	11.1	30.40	23.18	7.4		2.9	32.4		71.7			0.105		0.279	0.083
95/08/22	1155	0	14.6	10.31	7.09	8.3	1 U	11.5	121.6	3.5	64.4	14.80	2.40	0.010 U		0.030	0.010 U
95/08/22	1200	10	11.5	30.65	23.30	7.9		11.1	124.1		77.3	2.70	0.37	0.116		0.055	0.030
95/08/22	1205	30	11.1	30.62	23.35	7.6		5.3	58.8		47.3			0.146		0.088	0.044

Station:
*** ELB015** Elliott Bay - E. of Duwamish Head 47 Deg 35.8' N 122 Deg 22.1' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4- DISS (MG/L)
94/10/25	1215	0	12.4	29.31	22.10	7.8	5	6.5	73.4	13.1	84.9	2.10	0.26	0.184		0.019	0.032
94/10/25	1220	10	12.3	30.67	23.17	7.8		6.4	72.5		88.2	3.00	0.32	0.188		0.010 U	0.033
94/10/25	1225	30	12.2	30.74	23.25	7.8		5.9	67.2		85.4			0.182		0.010 U	0.032
94/11/17	1235	0	10.3	26.40	20.20	7.6	10	7.5	79.3	9.3	75.0	1.00	0.37	0.238		0.010 U	0.049
94/11/17	1240	10	11.2	30.62	23.33	7.6		6.8	75.5		88.9	1.60	0.17	0.196		0.010 U	0.044
94/11/17	1245	30	11.2	30.65	23.36	7.6		6.6	73.8		90.8			0.205		0.010 U	0.046
94/12/21	1335	0	9.3	27.78	21.43	7.6	370 J	8.0	84.2	2.5	64.3	0.41	0.50	0.332		0.010 U	0.055
94/12/21	1340	10	9.6	30.07	23.17	7.6		7.8	83.5		86.8	0.34	0.22	0.243		0.010 U	0.057
94/12/21	1345	30	9.6	30.17	23.25	7.6		7.7	82.4		87.6			0.244		0.010 U	0.057
95/01/24	1415	0	7.8	24.92	19.40	7.7	1	10.1	100.5	8.5	82.5	0.42	0.15				
95/01/24	1420	10	8.6	29.37	22.77	7.7		10.7	112.0		86.0	0.37	0.23	0.416		0.010	0.075
95/01/24	1425	30	8.7	29.51	22.87	7.7		8.5	89.2		86.6			0.394		0.010 U	0.072
95/02/13	1330	0	8.5	27.46	21.29	7.8	6	8.8	90.7	8.6	84.1	0.43 J	0.41 J	0.269		0.010 U	0.040
95/02/13	1335	10	8.4	28.30	21.96	7.8		9.2	94.3		85.4	0.55 J	0.47 J	0.174		0.010 U	0.026
95/02/13	1340	30	8.7	29.04	22.50	7.8		8.2	85.0		86.4			0.245		0.010 U	0.040
95/03/29	1305	0	9.9	22.87	17.51	7.8		9.7	100.1	7.6	71.8	0.90	0.44	0.377		0.039	0.056
95/03/29	1310	10	8.7	28.39	21.99	7.9		9.7	101.0		86.9	1.70	0.90	0.342		0.010 U	0.063
95/03/29	1315	30	8.6	28.67	22.22	7.8		9.1	94.5		90.7			0.362		0.010 U	0.068
95/04/19	1300	0	9.3	25.65	19.77	7.8	4	8.9	92.1	11.4	82.0	1.10	0.45	0.290		0.027	0.048
95/04/19	1305	10	9.0	28.80	22.27	7.8		8.8	92.6		89.3	2.00	0.90	0.289		0.017	0.056
95/04/19	1310	30	8.9	28.84	22.31	7.8		8.5	88.9		89.5			0.297		0.018	0.057
95/05/15	1345	0	12.9	24.19	18.05	7.9	7	9.3	103.5	6.5	77.4	5.10	0.40	0.189		0.020	0.021
95/05/15	1350	10	10.2	28.79	22.08	8.0		10.3	110.4		78.8	15.80	0.05 U	0.170		0.013	0.023
95/05/15	1355	30	9.7	29.02	22.33	7.9		8.8	93.7		87.4			0.243		0.027	0.039
95/06/14	1405	0	12.7	28.33	21.29	8.0		10.5	119.6	7.4	78.1	6.40	1.60	0.082		0.011	0.039
95/06/14	1410	10	11.5	29.17	22.15	7.9		9.6	106.4		85.3	7.20	2.00	0.138		0.019	0.045
95/06/14	1415	30	11.2	29.22	22.25	7.9		9.0	99.3		88.8			0.167		0.037	0.067
95/07/10	1405	0	13.8	27.83	20.69	8.2	13	10.2	118.2	4.2	72.9	19.50	3.90	0.015		0.010 U	0.027
95/07/10	1410	10	12.8	29.27	22.00	8.2		10.2	116		74.8	27.90	5.60	0.010 U		0.010 U	0.024
95/07/10	1415	30	12.6	29.38	22.12	8.1		9.2	105		78.5			0.065		0.012	0.035
95/08/08	1545	0	13.8	29.57	22.04	8.1	1 U	9.3	108	11.2	85.5	9.60	2.10	0.029		0.012	0.021
95/08/08	1550	10	13.1	29.74	22.30	8.0		8.7	100		87.9	11.50	2.20	0.025		0.011	0.020
95/08/08	1555	30	13	29.77	22.35	8.0		8.2	94.5		89.9			0.023		0.013	0.016
95/09/14	1605	0	14.5	24.17	17.74	7.8	1 U	9.9	113	10.6	85.6	1.50	0.41	0.098		0.151	0.025
95/09/14	1610	10	13.1	30.46	22.86	7.8		7.5	86.8		88.9	3.40	1.10	0.106		0.073	0.025
95/09/14	1615	30	12.8	30.29	22.79	7.7		6.5	74.8		90.8			0.143		0.025	0.036

Station:
*** GRG002** Georgia Strait - N. of Patos Island 48 Deg 48.5' N 122 Deg 57.2' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/03	1045	0	13.7	24.64	18.25	8.1	1 U	9.1	102.9	4.7	71.9	4.30	1.10	0.067		0.010 U	0.022
94/10/03	1050	10	13.0	27.96	20.95	8.0		7.8	88.2		87.0			0.072		0.010 U	0.019
94/10/03	1055	30	11.1	29.49	22.47	7.8		6.2	68.8		89.2			0.166		0.010 U	0.035
95/01/23	1110	0	6.5	26.46	20.76	7.8	16	9.6	93.7	6.9	79.2	0.89	0.57	0.153		0.010 U	0.017
95/01/23	1115	10	7.7	29.27	22.82	7.7		8.4	85.2		85.1	0.51	0.40	0.186 J		0.010 U	0.024 J
95/01/23	1120	30	7.8	29.91	23.31	7.7		8.2	84.2		83.1			0.219		0.010 U	0.031
95/03/27	1100	0	8.1	27.02	21.00	8.3	1 U	11.9	120.5	4.3	48.3	31.50	4.20	0.168		0.020	0.028
95/03/27	1105	10	7.9	28.87	22.48	7.9		9.4	96.3		84.8	14.20	2.50	0.276		0.022	0.044
95/03/27	1110	30	8.1	29.79	23.17	7.9		8.9	92.0		83.2			0.317		0.020	0.051
95/05/22	1150	0	14.2	20.81	15.22	8.3	1 U	9.8	109.7	5.0	66.2	6.90	1.10	0.025		0.018	0.013
95/05/22	1155	10	11.2	27.51	20.92	8.0		8.6	94.2		80.5	2.30	1.00	0.199		0.058 J	0.048
95/05/22	1200	30	10.3	29.15	22.34	7.9		7.7	83.3		83.9			0.198		0.027	0.044
95/07/24	1045	0	13.7	28.04	20.88	8.0	1 U	7.9	91.5	10.9	87.6	4.00	0.96	0.095		0.010 U	0.026
95/07/24	1050	10	12.9	28.42	21.32	8.0		7.3	83.0		88.8	1.50	0.73	0.149		0.010 U	0.032
95/07/24	1055	30	11.3	29.61	22.53	7.8		6.5	71.5		90.5			0.178		0.010 U	0.037
95/08/22	1310	0	11.2	18.36	13.83	7.8	1 U	12.7	130.4	10.5	88.4	1.30	0.77	0.167		0.010 U	0.027
95/08/22	1315	10	10.4	30.23	23.17	7.7		7.4	80.6		90.8	1.60	0.86	0.147		0.010 U	0.024
95/08/22	1320	30	10.3	30.26	23.21	7.7		6.1	65.9		91.2	1.30	0.68	0.149		0.010 U	0.025

Station:
*** HCB003** Hood Canal - Eldon, Hamma Hamma R. 47 Deg 32.3' N 123 Deg 00.5' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4- DISS (MG/L)
94/10/11	1345	0	13.3	28.47	21.28	8.1		9.1	104.9	9.5	82.8						
94/10/11	1350	10	12.2	29.43	22.23	8.0		5.4	61.5		87.5						
94/10/11	1355	30	10.3	30.20	23.16	7.4		2.9	31.6		90.5						
95/01/03	1110	0	4.3	17.19	13.63	7.7		12.1	105.2	4.7	80.0						
95/01/03	1115	10	8.7	28.61	22.16	7.6		8.0	83.0		85.3						
95/01/03	1120	30	9.5	30.15	23.25	7.6		6.7	71.2		89.5						
95/02/09	1145	0	8.5	12.57	9.66	8.5		14.7	137.3	2.6	35.7						
95/02/09	1150	10	8.7	27.67	21.43	7.7		8.5	88.1		86.5						
95/02/09	1155	30	9.0	29.80	23.05	7.7		6.9	73.2		90.2						
95/03/06	1410	0	6.9	18.58	14.52	8.4		13.3	124.3	3.6	45.3						
95/03/06	1415	10	8.3	28.17	21.87	7.9		8.9	91.7		90.0						
95/03/06	1420	30	8.9	29.54	22.86	7.7		7.0	73.7		90.6						
95/04/03	1315	0	11.1	20.44	15.45	8.3		11.4	119.0	12.5	88.5						
95/04/03	1320	10	9.0	28.11	21.73	8.0		9.5	99.4		88.8						
95/04/03	1325	30	8.8	29.39	22.76	7.8		7.0	73.8		91.5						
95/05/03	1410	0	13.1	20.56	15.22	8.2		9.9	108.1	11.0	84.0						
95/05/03	1415	10	9.5	28.75	22.15	7.8		8.0	85.2		89.1						
95/05/03	1420	30	8.9	29.43	22.78	7.6		6.1	64.0		89.6						
95/06/08	1445	0	18.2	23.62	16.53	8.2		9.1	111.9	9.9	84.1						
95/06/08	1450	10	11.1	28.98	22.08	8.1		11.9	130.2		71.6						
95/06/08	1455	30	9.1	29.38	22.71	7.4		5.8	61.1		89.6						
95/07/05	1410	0	19.5	24.20	16.67	8.2		8.6	108.5	7.7	81.3						
95/07/05	1415	10	10.8	29.26	22.34	8.0		9.7	105.6		65.6						
95/07/05	1420	30	9.2	29.53	22.81	7.4		4.8	50.8		89.7						
95/08/02	1540	0	19.1	27.10	18.97	8.2		8.4	107.5	8.5	82.0						
95/08/02	1545	10	10.7	29.33	22.42	7.7		6.6	72.3		80.5						
95/08/02	1550	30	9.4	29.61	22.84	7.3		3.7	38.9		89.0						
95/09/19	1535	0	17.1	25.70	18.37	8.1		9.4	114.3	4.5	81.8						

Station:
*** HCB004** Hood Canal - Gt. Bend, Sisters Point 47 Deg 21.4' N 123 Deg 01.4' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/11	1410	0	13.5	27.63	20.60	8.2	1 U	10.0	114.5	5.1	72.2	7.50	1.90	0.010 U		0.010 U	0.016
94/10/11	1415	10	10.3	29.83	22.87	7.4		2.4	25.6		81.7	7.20	1.90	0.183		0.010 U	0.057
94/10/11	1420	30	9.8	30.13	23.18	7.3		1.2	12.5		81.6			0.170		0.010 U	0.043
94/11/17	1115	0	7.6	21.73	16.92	7.9	1 U	10.7	103.3	3.2	50.5	19.70	1.90	0.028		0.010 U	0.026
94/11/17	1120	10	11.0	30.57	23.33	7.3		3.2	35.1		82.7	1.60	1.00	0.290		0.010 U	0.073
94/11/17	1125	30	11.1	30.74	23.44	7.4		3.6	39.7		76.7			0.259		0.010 U	0.062
95/01/03	1035	0	3.6	8.33	6.63	7.5	2	12.1	97.3	2.8	62.9	0.50	0.15	0.080		0.013	0.012
95/01/03	1040	10	9.4	27.66	21.32	7.4		5.8	60.5		79.0	0.28	0.26	0.272		0.015	0.063
95/01/03	1045	30	10.7	30.55	23.36	7.4		3.1	34.3		70.7			0.242		0.010 U	0.059
95/02/09	1110	0	8.6	11.24	8.62	8.4	1 U	13.0	120.0	3.0	59.7	4.60 J	2.10 J	0.010 U		0.010 U	0.010 U
95/02/09	1115	10	9.5	27.73	21.36	7.5		5.7	59.4		83.3	1.10 J	0.56 J	0.244		0.010 U	0.043
95/02/09	1120	30	10.2	30.06	23.07	7.4		2.8	30.1		70.2			0.160		0.010 U	0.032
95/03/06	1435	1	7.5	15.69	12.20	8.5	1 U	12.2	113.4	3.0	42.1	8.20	2.60	0.010 U		0.022	0.010 U
95/03/06	1440	10	9.0	28.15	21.76	7.6		6.7	69.8		87.7	0.76	0.52	0.243		0.010 U	0.043
95/03/06	1445	30	9.7	29.47	22.69	7.5		3.5	37.7		82.0			0.256		0.010 U	0.051
95/04/03	1350	0	12.1	14.95	11.06	8.3	1 U	10.9	112.3	6.8	79.9	1.20	0.35	0.010 U		0.010 U	0.010 U
95/04/03	1355	10	9.4	28.42	21.91	7.9		7.4	77.8		83.8	10.00	2.10	0.267		0.010 U	0.050
95/04/03	1400	30	9.6	29.33	22.59	7.5		2.8	30.0		83.7			0.333		0.010 U	0.072
95/05/03	1435	0	14.4	21.37	15.61	8.1	1	9.1	101.8	7.5	81.8	3.80	1.40	0.010 U		0.010 U	0.010 U
95/05/03	1440	10	9.8	29.08	22.37	7.5		5.6	59.9		85.4	6.50	3.60	0.184		0.024	0.052
95/05/03	1445	30	9.4	29.55	22.79	7.3		3.4	36.1		73.5			0.386		0.016	0.081
95/06/08	1510	0	20.4	21.66	14.52	8.1	1 U	8.2	103.7	5.2	72.2	2.10	0.63	0.010 U		0.010 U	0.010 U
95/06/08	1515	10	11.3	28.62	21.76	7.9		10.3	113.0		53.2	55.40	11.50	0.010 U		0.014	0.039
95/06/08	1520	30	9.6	29.45	22.69	7.2		3.2	34.6		80.0			0.413		0.010 U	0.095
95/07/05	1450	0	20.5	24.36	16.54	8.1	1 U	8.6	111.3	5.4	69.1	1.60	0.68	0.010 U		0.010 U	0.020
95/07/05	1455	10	10.6	29.12	22.27	7.6		6.6	71.9		76.8	2.50	2.00	0.091		0.015	0.038
95/07/05	1500	30	9.6	29.49	22.72	7.2		2.6	27.6		73.0			0.220		0.010 U	0.052
95/08/02	1605	0	20.1	26.10	17.96	8.1	1 U	8.6	111.6	6.7	76.2	0.91	0.55	0.010 U		0.010 U	0.017
95/08/02	1610	10	12.1	28.77	21.74	7.8		5.6	62.8		74.4	466.00	25.20	0.010 U		0.010 U	0.065
95/08/02	1615	30	9.5	29.64	22.85	7.2		2.2	22.9		77.1			0.326		0.010 U	0.083
95/09/19	1605	0	18.6	22.83	15.84	8.1	1	8.5	105	3.7	74.4	2.10	0.57	0.010 U		0.011	0.010 U
95/09/19	1610	10	10.1	29.70	22.80	7.2		2.4	25.6		89.7	2.90	0.96	0.351		0.017	0.077
95/09/19	1615	30	9.8	29.96	23.05	7.2		1.2	13.3		75.7			0.348		0.014	0.072

Station:
*** HCB006** Hood Canal - King Spit, Bangor 47 Deg 44.9' N 122 Deg 43.8' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/11	1255	0	12.6	29.86	22.49	8.0	1 U	7.4	84.9	7.5	81.3	1.90	1.20	0.075		0.010 U	0.019
94/10/11	1300	10	12.1	30.21	22.85	7.9		6.6	75.1		81.2	1.50	1.50	0.097		0.010 U	0.022
94/10/11	1305	30	11.8	30.65	23.25	7.8		5.9	66.0		82.6			0.159		0.010 U	0.032
95/01/03	1135	0	7.1	26.06	20.37	7.7	1 U	8.9	87.4	6.9	80.9	0.49	0.19	0.241		0.010 U	0.050
95/01/03	1140	10	8.2	28.85	22.42	7.7		8.0	82.7		79.5	0.31	0.33	0.258		0.010 U	0.054
95/01/03	1145	30	8.8	29.91	23.17	7.6		7.4	77.8		78.0			0.257		0.010 U	0.055
95/02/09	1215	0	7.7	15.85	12.31	8.3	1 U	12.6	118.0	2.8	49.3	12.50 J	3.00 J	0.010 U		0.010 U	0.010 U
95/02/09	1220	10	8.3	28.50	22.13	7.8		9.1	94.1		81.3	0.98 J	0.65 J	0.257		0.010 U	0.042
95/02/09	1225	30	8.7	29.78	23.08	7.7		7.2	75.7		80.6						
95/03/06	1320	0	7.9	22.64	17.60	8.4	1 U	12.3	120.4	3.6	44.5	26.60	2.00	0.010 U		0.010 U	0.010 U
95/03/06	1325	10	8.3	27.31	21.20	8.0		9.1	92.9		78.6	1.30	1.10	0.261		0.010 U	0.048
95/03/06	1330	30	8.6	29.41	22.80	7.8		7.7	80.6		78.1			0.363		0.019	0.065
95/04/03	1230	0	10.5	25.12	19.17	8.3	1 U	10.6	112.4	13.5	91.0	0.77	0.36	0.095		0.010 U	0.012
95/04/03	1235	10	9.3	28.20	21.76	8.1		9.2	96.4		87.9	0.86	0.62	0.229		0.010 U	0.040
95/04/03	1240	30	9.0	29.40	22.74	7.9		7.6	79.6		83.2			0.309		0.010 U	0.055
95/05/03	1320	0	13.3	25.34	18.87	8.3	1 U	9.9	111.4	6.7	79.7			0.010 U		0.010 U	0.010 U
95/05/03	1325	10	11.1	27.92	21.25	8.2		9.8	106.7		63.6	17.80	2.40	0.112		0.014	0.012
95/05/03	1330	30	9.4	29.46	22.72	7.7		6.9	73.1		78.3			0.314		0.016	0.056
95/06/08	1400	0	15.7	26.94	19.62	8.1	1 U	9.9	118.6	9.2	84.0	6.70	1.90	0.010 U		0.010 U	0.015
95/06/08	1405	10	12.4	28.86	21.75	8.0		9.2	104.1		83.8	6.40	2.30	0.122		0.027	0.044
95/06/08	1410	30	10.3	29.77	22.82	7.6		7.0	75.7		80.2			0.264		0.028	0.064
95/07/05	1325	0	16.1	28.22	20.52	8.1	1 U	10.2	124.3	5.9	70.3	7.60	1.40	0.010 U		0.010 U	0.013
95/07/05	1330	10	12.3	29.30	22.11	7.9		8.7	98.8		80.3	8.90	1.60	0.074		0.014	0.027
95/07/05	1335	30	11.0	29.86	22.78	7.7		6.8	75.3		85.1			0.150		0.022	0.040
95/08/02	1455	0	16.7	28.47	20.58	8.2	1 U	9.5	116.6	4.8	68.0	1.50	0.83	0.010 U		0.010 U	0.010
95/08/02	1500	10	13.2	29.41	22.03	7.9		7.8	90.2		76.2	2.90	1.20	0.126		0.014	0.035
95/08/02	1505	30	11.6	30.06	22.83	7.7		6.0	66.9		84.3			0.143		0.017	0.036
95/09/19	1455	0	15.7	27.88	20.34	8.1	1 U	8.1	97.6	4.2	68.9	2.90	0.84	0.030		0.010	0.024
95/09/19	1500	10	11.6	29.86	22.67	7.6		5.3	59.6		85.3	2.30	1.30	0.229		0.016	0.045
95/09/19	1505	30	11.4	30.43	23.15	7.6		4.9	55.0		88.2			0.268		0.016	0.050

Station:
* **HCB007** Hood Canal - Lynch Cove 47 Deg 23.9' N 122 Deg 55.7' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4- DISS (MG/L)
94/10/11	1440	0	14.0	27.22	20.18	8.2		10.3	119.3	5.9	76.9						
94/10/11	1445	10	10.8	29.52	22.55	7.4		1.5	16.2		81.7						
94/11/17	1100	0	7.5	21.21	16.52	7.9		10.9	105.1	3.1	54.3						
94/11/17	1105	10	10.8	30.43	23.25	7.2		1.4	14.9		85.1						
95/01/03	1025	0	4.3	10.11	8.02	7.6		11.8	97.7	3.6	66.6						
95/01/03	1030	10	9.4	28.06	21.63	7.4		5.4	57.2		83.5						
95/02/09	1100	1	8.6	11.09	8.50	8.4		12.8	118.5	3.5	61.9						
95/02/09	1105	10	9.6	28.05	21.59	7.5		5.3	55.6		82.7						
95/03/06	1500	0	7.4	13.89	10.80	8.7		13.0	119.2	3.5	49.2						
95/03/06	1505	10	9.5	28.55	22.00	7.5		4.6	48.8		89.2						
95/04/03	1340	0	11.6	14.34	10.66	8.3		11.5	116.2	5.5	74.6						
95/04/03	1345	20	9.6	28.24	21.74	7.8		6.5	69.2		69.2						
95/05/03	1505	0	15.4	20.06	14.41	8.0		8.5	97.1	5.0	61.1						
95/05/03	1510	10	9.9	29.02	22.30	7.5		4.7	49.9		85.9						
95/06/08	1540	0	19.7	23.43	16.04	8.0		8.2	104.0	5.1	71.2						
95/06/08	1545	10	11.5	28.74	21.82	8.1		9.5	105.0		45.1						
95/07/05	1610	0	21.3	23.71	15.85	8.1		8.2	107.0	4.6	64.1						
95/07/05	1615	10	10.6	29.17	22.31	7.4		4.2	45.3		81.0						
95/08/02	1635	0	22.1	25.68	17.13	8.2		8.0	107.7	6.0	71.8						
95/08/02	1640	10	11.9	28.87	21.85	7.7		4.9	54.4		78.5						
95/09/19	1640	0	19.0	22.52	15.51	8.1		8.5	105.2	4.0	76.1						
95/09/19	1645	10	10.0	29.68	22.80	7.2		1.8	19.7		85.2						

Station:
*** OAK004** Oakland Bay - Near Eagle Point 47 Deg 12.8' N 123 Deg 04.6' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/11	1500	0	15.1	29.36	21.61	8.0	2	8.2	98.0	3.5	68.8	9.10	1.60	0.035		0.010 U	0.032
94/10/11	1505	10	15.1	29.36	21.61	8.0		8.1	97.4		68.6	12.50	1.70	0.028		0.010 U	0.025
95/01/03	1005	0	6.0	18.75	14.74	7.5	8	9.5	86.5	2.5	56.6	0.32	0.36	0.249		0.034	0.041
95/01/03	1010	10	7.0	22.96	17.95	7.6		8.7	83.9		48.8	0.46	0.94	0.249		0.027	0.049
95/02/09	1035	0	8.0	17.84	13.83	7.6	110	9.3	88.6	4.4	70.1	1.10 J	0.52 J	0.292		0.039	0.047
95/02/09	1040	9	8.7	23.50	18.17	7.6		8.4	84.3		72.7	0.80 J	0.62 J	0.192		0.017	0.029
95/03/06	1520	0	8.2	20.34	15.76	7.8	1	9.8	95.2	4.6	75.2	1.30	1.00	0.253		0.022	0.041
95/03/06	1525	7	7.9	23.46	18.24	7.8		9.5	94.0		62.7	1.30	1.00	0.280		0.023	0.042
95/04/03	1420	0	12.0	20.17	15.10	8.1	11 X	10.9	115.7	5.2	74.6	1.70	0.88	0.183		0.010 U	0.033
95/04/03	1425	8	10.5	23.67	18.05	8.1		10.9	113.9		61.6	8.10	1.90	0.219		0.010 U	0.038
95/05/03	1520	0	14.9	22.94	16.72	8.1	1 U	9.2	105.3	3.9	65.1	2.80	1.70	0.010 U		0.010 U	0.010 U
95/05/03	1525	6	13.5	24.24	17.98	8.2		10.2	114.2		61.5	8.70	1.70	0.010 U		0.010 U	0.010 U
95/06/08	1555	0	17.4	26.22	18.70	8.0	1 U	9.7	118.9	3.5	64.2	10.50	2.20	0.010 U		0.010 U	0.045
95/06/08	1600	10	16.3	26.99	19.53	8.0		9.8	118.9		66.6	8.60	3.30	0.010 U		0.010 U	0.025
95/07/05	1655	1	20.6	26.27	17.97	8.2	1	10.8	141.4	3.5	61.8	8.80	0.92	0.010 U		0.022	0.038
95/07/05	1700	9	18.1	27.62	19.61	8.2		9.6	120.4		60.3	18.30	2.10	0.010 U		0.010	0.025
95/08/02	1700	0	21.1	27.04	18.42	8.1	1 U	8.2	108.6	3.8	65.0	4.30	1.80	0.010 U		0.010 U	0.035
95/08/02	1705	6	19.8	27.52	19.12	8.2		9.1	118.7		56.7	7.80	2.60	0.010 U		0.010 U	0.026
95/09/19	1700	0	18.2	28.21	20.03	8.1	2	8.5	107.0	3.2	61.3	12.70	2.80	0.010 U		0.010 U	0.023
95/09/19	1705	10	17.3	28.87	20.75	8.1		8.4	105.2		69.6	9.40	2.10	0.010		0.015	0.050

Station:
*** PMA001** Port Madison - S. of Buoy 65 47 Deg 44.1' N 122 Deg 32.0' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)		PHEOPIG (UG/L)		NO3 & NO2-N DISS (MG/L)		NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)	
94/10/25	1140	0	12.3	30.70	23.20	7.9	1	U	6.3	71.8	7.9	82.1	8.30		1.30		0.143			0.010	U	0.032	
94/10/25	1145	10	12.1	30.73	23.26	7.8			6.6	74.9		83.2	6.40		0.74		0.148			0.010	U	0.031	
94/10/25	1150	28	12.0	30.77	23.31	7.8			6.0	67.7		85.2											
94/11/17	1330	0	10.4	30.50	23.38	7.7	1	U	7.6	82.5	6.4	81.8	3.80		0.50		0.178			0.010	U	0.042	
94/11/17	1335	10	10.4	30.50	23.38	7.7			7.4	81.4		81.7	3.60		0.59					0.010	U		
94/11/17	1340	28	10.6	30.58	23.40	7.7			7.1	77.8		80.3					0.241			0.010	U	0.054	
95/01/24	1215	0	7.6	26.66	20.78	7.8	1		9.1	90.8	8.5	83.5	1.40		0.44		0.386			0.010	U	0.069	
95/01/24	1220	10	7.9	28.07	21.85	7.8			8.6	87.1		83.6	0,60		0.56		0.392			0.010	U	0.074	
95/01/24	1225	30	8.5	29.51	22.90	7.7			7.9	82.3		81.3											
95/02/13	1145	0	7.7	27.27	21.25	7.8	1		9.3	93.2	8.2	83.7	0.79	J	0.62	J	0.185			0.010	U	0.027	
95/02/13	1150	10	8.2	28.18	21.90	7.8			8.6	88.1		83.2	0.32	J	0.53	J	0.211			0.010	U	0.032	
95/02/13	1155	30	8.6	29.27	22.69	7.7			8.0	82.8		82.1					0.205			0.010	U	0.031	
95/03/29	1155	0	9.9	25.84	19.83	8.5			15.9	167.2	3.7	67.8	33.30		3.20		0.010	U		0.010	U	0.010	U
95/03/29	1200	10	8.9	27.63	21.37	8.1			11.0	114.3		74.9	10.30		2.20		0.239			0.017		0.046	
95/03/29	1205	30	8.5	28.96	22.47	7.8			8.9	92.5		87.9					0.354			0.010	U	0.066	
95/04/19	1150	0	9.5	28.69	22.11	7.8	1	U	8.6	90.4	8.3	72.3	1.20		0.58		0.266			0.033		0.055	
95/04/19	1155	10	9.2	28.83	22.26	7.8			8.4	88.3		83.3	1.00		0.70		0.273			0.032		0.056	
95/04/19	1200	30	9.0	28.99	22.42	7.8			8.2	86.2		87.9					0.282			0.029		0.055	
95/05/15	1240	0	13.2	27.54	20.58	8.4	1	U	12.9	147.0	4.5	61.6	19.30		0.05	U	0.010	U		0.010	U	0.010	U
95/05/15	1245	10	11.2	28.53	21.71	8.1			11.1	121.8		70.2	19.70		1.70		0.042			0.010	U	0.010	U
95/05/15	1250	30	9.8	29.17	22.44	7.9			8.9	94.7		84.1					0.201			0.033		0.034	
95/06/14	1245	0	13.2	29.03	21.74	8.0	1	U	10.0	115.5	4.7	67.7	9.50		3.90		0.033			0.010	U	0.034	
95/06/14	1250	10	12.0	29.23	22.11	7.9			9.4	105.5		73.3	5.70		2.20		0.115			0.027		0.044	
95/06/14	1255	21	10.8	29.47	22.51	7.8			8.5	93.1		85.9											
95/07/10	1220	0	14.6	29.03	21.46	8.3	1	U	10.3	121.3	4.1	68.6	10.10		2.30		0.010	U		0.010	U	0.021	
95/07/10	1225	10	13.5	29.20	21.81	8.2			9.3	107.8		77.3	7.20		2.30		0.049			0.023		0.031	
95/07/10	1230	30	11.7	29.66	22.50	7.9			7.3	82.1		84.6					0.167			0.059		0.052	
95/08/08	1245	0	14.8	29.58	21.84	8.1	1	U	8.6	102.2	8.2	82.1	4.90		1.60		0.010	U		0.014		0.022	
95/08/08	1250	10	13.4	29.83	22.31	8.0			8.0	92.5		83.9	5.80		1.20		0.043			0.024		0.025	
95/08/08	1255	30	12.5	29.99	22.61	7.9			6.8	77.2		78.1					0.048			0.027		0.022	
95/09/14	1340	0	13.8	19.43	14.23	7.9	1	U	9.9	109	5.7	70.8	9.00		1.90		0.083			0.015		0.032	
95/09/14	1345	10	13.5	30.27	22.64	7.9			7.3	85.4		77.7	7.60		1.70		0.090			0.019		0.034	
95/09/14	1350	26	12.8	30.40	22.87	7.8			6.7	77.2		71.8					0.143			0.028		0.040	

Station:
*** POD006** Port Orchard - Liberty Bay, Virg. Point 47 Deg 42.9' N 122 Deg 38.0' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)		PHEOPIG (UG/L)		NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)
94/10/25	1120	0	12.5	30.40	22.93	7.9	1	U	7.9	90.7	3.7	65.2	14.10		1.40		0.064		0.038		0.027
94/10/25	1125	7	12.4	30.42	22.96	7.9			7.6	87.1		58.5	10.60		2.30		0.070		0.039		0.026
94/11/17	1400	0	9.6	30.00	23.11	7.7	1	U	8.2	88.1	3.1	66.6	7.70		0.96		0.129		0.037		0.039
94/11/17	1405	10	9.6	30.01	23.12	7.7			8.3	88.5		63.2	9.70		1.80		0.130		0.042		0.040
94/12/21	1230	0	7.9	19.64	15.25	7.6	190	J	9.8	94.0	0.7	12.4	1.40		1.30		0.484		0.045		0.039
94/12/21	1235	6	8.3	28.67	22.27	7.6			8.4	86.3		60.7	0.89		0.72		0.247		0.052		0.061
95/01/24	1245	0	7.9	28.72	22.36	7.7	1		8.4	85.3	3.5	71.1	1.30		0.80		0.406		0.031		0.083
95/01/24	1250	8	7.7	28.77	22.43	7.7			8.4	85.6		68.2	3.80		21.30		0.396		0.020		0.080
95/02/13	1210	0	7.8	27.35	21.30	7.8	1	U	9.0	91.1	4.7	70.3	1.50	J	0.74	J	0.185		0.010	U	0.028
95/02/13	1215	8	7.9	27.47	21.38	7.8			8.4	84.7		68.0	1.20	J	1.20	J	0.199		0.010	U	0.030
95/03/29	1220	0	10.3	27.58	21.12	7.9			9.8	105.3	4.6	70.1	1.80		0.65		0.321		0.010	U	0.060
95/03/29	1225	7	9.3	27.86	21.49	7.9			9.8	102.7		60.8	4.30		1.10		0.327		0.010	U	0.062
95/04/19	1130	0	11.0	27.94	21.28	7.9	1	U	9.0	97.8	3.5	56.6	4.90		1.70		0.204		0.034		0.049
95/04/19	1135	7	10.4	28.18	21.57	7.8			8.6	92.5		52.0	2.30		1.20		0.224		0.044		0.052
95/05/15	1140	0	13.2	28.56	21.37	8.1	1	U	9.5	109.4	3.6	58.0	4.90		0.94		0.034		0.035		0.014
95/05/15	1145	7	13.1	28.53	21.37	8.1			9.4	107.8			9.50		4.80		0.034		0.037		0.014
95/06/14	1305	0					1	U			3.7		9.40		4.30		0.010	U	0.010	U	0.030
95/06/14	1310	10																			
95/07/10	1200	0	15.8	28.96	21.15	8.1	3		8.6	104.7	3.2	64.0	5.40		1.20		0.010	U	0.013		0.035
95/07/10	1205	7	14.9	29.04	21.40	8.0			7.4	88.4		32.9	11.10		3.40		0.010	U	0.062		0.054
95/08/08	1325	0	15.9	29.33	21.41	8.1	1		8.2	99.8	3.1	56.2	7.60		1.80		0.010	U	0.010		0.024
95/08/08	1330	10	15.7	29.38	21.50	8.0			7.9	96.0		49.6	7.10		2.80		0.010	U	0.014		0.030
95/09/14	1405	0	16.0	18.93	13.43	8.0	1	U	9.2	105.5	3.6	66.7	8.00		1.50		0.018		0.024		0.032
95/09/14	1410	9	14.9	30.07	22.20	7.9			7.5	90.5		55.6	8.80		2.50		0.038		0.032		0.035

Station:
* **PSB003** Puget Sound Main Basin - West Point 47 Deg 39.6' N 122 Deg 26.5' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)		PHEOPIG (UG/L)		NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)
94/12/21	1250	0	9.3	27.15	20.94	7.6	510	J	8.4	87.5	5.0	71.0	0.53		0.88		0.283		0.010	U	0.051
94/12/21	1255	10	9.5	30.10	23.21	7.6			7.6	81.4		83.3	0.32		0.31		0.221		0.010	U	0.051
94/12/21	1300	30	9.5	30.26	23.33	7.6			7.6	80.7		85.2					0.239		0.010	U	0.053
95/01/24	1340	0	8.2	27.57	21.42	7.8	1	U	9.2	94.1	8.7	86.6	0.53		3.90		0.381		0.010	U	0.076
95/01/24	1345	10	8.5	29.10	22.57	7.7			8.7	90.6		86.6	0.29		0.26		0.386		0.010	U	0.083
95/01/24	1350	20	8.7	29.55	22.90	7.7			8.1	84.7		86.8					0.392		0.010	U	0.083
95/02/13	1300	0	8.1	27.95	21.73	7.8	1	U	9.1	92.6	9.2	84.6	0.62	J	0.59	J	0.194		0.010	U	0.031
95/02/13	1305	10	8.3	28.10	21.82	7.8			8.8	90.4		84.9	0.45	J	0.41	J	0.243		0.010	U	0.039
95/02/13	1310	30															0.215		0.010	U	0.035
95/03/29	1240	0	9.3	26.99	20.81	8.1			11.3	117.8	6.2	78.0	7.00		1.20		0.222		0.010	U	0.043
95/03/29	1245	10	8.8	28.13	21.77	8.0			10.4	108.2		81.0	4.60		1.20		0.328		0.010	U	0.061
95/03/29	1250	24	8.5	28.78	22.32	7.9			9.0	93.7		87.0					0.364		0.010	U	0.069
95/04/19	1355	0	9.6	27.70	21.32	7.9	1	U	9.2	96.7	10.5	86.1	1.40		0.75		0.276		0.019		0.054
95/04/19	1400	10	9.0	28.75	22.23	7.8			8.6	90.0		87.7	1.20		0.54		0.293		0.024		0.059
95/04/19	1405	30	8.9	28.84	22.31	7.8			8.4	87.5		87.9					0.297		0.027		0.060
95/05/03	1255	0	10.4	28.23	21.61	8.0			9.9	107.1	6.6	78.2	6.00		1.30						
95/05/03	1300	10	9.7	28.79	22.15	7.9			9.3	98.3		82.4	3.50		1.40						
95/05/03	1305	30																			
95/05/15	1310	0	11.6	28.15	21.35	8.1	2		10.1	111.8	6.5	75.4	10.90		0.05	U	0.123		0.014		0.018
95/05/15	1315	10	10.4	28.75	22.01	8.0			10.1	109.5		77.0	14.40		0.52		0.150		0.023		0.022
95/05/15	1320	30															0.184		0.027		0.029
95/06/14	1330	0	12.2	28.36	21.40	7.9	1		9.6	107.3	9.4	80.6	8.20		2.00		0.068		0.010	U	0.045
95/06/14	1335	10	11.4	29.19	22.19	7.9			9.4	104.3		82.9	7.10		1.90		0.138		0.018		0.050
95/06/14	1340	30	10.8	29.42	22.47	7.8			8.5	92.9		87.4					0.157		0.027		0.050
95/07/10	1340	0	12.7	29.29	22.03	8.1	1		9.2	104.4	4.4	79.8	16.00		2.30		0.030		0.010	U	0.029
95/07/10	1345	10	12.4	29.38	22.16	8.1			8.7	98.9		80.9	13.50		2.10		0.060		0.015		0.034
95/07/10	1350	30	12.2	29.46	22.25	8.0			8.4	95.1		82.1					0.130		0.031		0.046
95/08/08	1505	0	13.6	29.51	22.03	8.1	1	U	9.2	106.7	12.3	84.6	10.10		2.60		0.037		0.016		0.023
95/08/08	1510	10	13.1	29.76	22.32	8.0			8.5	97.4		87.1	8.70		2.60		0.036		0.020		0.022
95/08/08	1515	30	12.9	29.82	22.40	8.0			8.0	91.7		89.4					0.057		0.019		0.029
95/09/14	1530	0	14.4	25.77	18.99	7.8	1	U	10.3	119	11.1	85.6	2.80		0.57		0.129		0.040		0.034
95/09/14	1535	10	13.0	30.38	22.82	7.8			7.5	86.8		85.3	2.90		1.60		0.107		0.010	U	0.025
95/09/14	1540	30	12.7	30.29	22.80	7.7			6.6	75.8		85.9					0.156		0.014		0.038

Station:
*** PSS008** Possession Sound - PG Bay Pier 3 47 Deg 58.9' N 122 Deg 13.3' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/03	1455	0	14.6	28.38	20.96	7.8	43	X 6.2	72.6	2.6	63.2	3.30	1.20	0.109		0.013	0.047
94/10/03	1500	10	12.9	30.33	22.80	7.8		6.1	70.8		89.6	0.80	0.52	0.185		0.010 U	0.039
95/01/23	1300	0	6.3	17.18	13.48	7.7	30	X 10.5	95.6		73.3	1.10	0.46	0.258		0.020	0.020
95/01/23	1305	10	8.7	28.75	22.27	7.6		7.5	78.5		84.4	0.49	0.32	0.150		0.010 U	0.020
95/03/27	1555	0	10.6	19.66	14.92	8.4	2	11.3	115.9	3.0	62.7	14.70	2.00	0.129		0.010 U	0.015
95/03/27	1600	10	8.6	28.50	22.09	7.8		8.8	90.9		84.3	0.64	0.47	0.361		0.010 U	0.063
95/04/24	1435	0	13.4	21.58	15.95	8.4	2	12.3	135.5	3.0	64.4	15.90	2.30	0.010 U		0.011	0.010 U
95/04/24	1440	10	9.0	28.65	22.15	7.8		8.6	89.9		85.8	3.70	2.10	0.195		0.026	0.040
95/05/22	1745	0	15.8	12.45	8.52	8.3	2	10.2	112.2	4.1	65.9	2.20	0.62	0.032		0.042	0.013
95/05/22	1750	10	9.9	28.94	22.24	7.9		8.8	93.9		79.6	2.90	1.60	0.136		0.090	0.045
95/06/26	1510	0	17.5	22.03	15.48	8.1	6	9.9	119.0	2.8	56.1	15.00	3.60	0.010 U		0.013	0.027
95/06/26	1515	10	10.6	29.25	22.37	7.8		8.3	90.0		86.1	0.61	0.77	0.264		0.026	0.069
95/07/24	1700	0	19.2	24.43	16.92	8.2	7	8.6	108.6	4.0	60.6	6.90	0.89	0.010 U		0.022	0.015
95/07/24	1705	10	12.5	29.37	22.13	7.9		8.2	93.2		78.6	3.90	1.40	0.070		0.028	0.028
95/08/22	1755	0	18.2	10.13	6.28	8.3	1	7.8	88.5	3.5	62.0	8.00	1.70	0.010 U		0.010 U	0.010 U
95/08/22	1800	10	13.8	28.25	21.02	7.8		8.6	99.6		73.8	2.20	1.20	0.103		0.060	0.043

Station:
*** PSS019** Possession Sound - Gedney Island 48 Deg 00.7' N 122 Deg 18.0' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/03	1415	0	13.7	28.32	21.09	8.2	1 U	10.6	122.6	5.0	61.0	16.70	1.70	0.010 U		0.010 U	0.013
94/10/03	1420	10	12.9	29.55	22.19	8.0		7.3	83.4		83.1	5.90	0.87	0.117		0.010 U	0.032
94/10/03	1425	30	11.9	30.35	23.00	7.6		4.7	53.1		91.2			0.223		0.010 U	0.046
95/01/23	1430	0	6.0	19.23	15.12	7.8	1	10.5	96.2		69.8	0.93	0.36	0.225		0.074	0.017
95/01/23	1435	10	8.6	28.23	21.88	7.7		8.1	83.7		88.6	0.47	0.27	0.190		0.010 U	0.028
95/01/23	1440	30	8.8	29.49	22.84	7.7		7.6	79.3		89.0			0.304		0.010 U	0.046
95/03/27	1510	0	9.9	14.75	11.20	8.4	1 U	13.1	128.6	2.6	58.4	9.20	2.50	0.180		0.022	0.010 U
95/03/27	1515	10	8.5	28.42	22.04	7.8		8.9	92.1		89.6	1.70	0.74	0.367		0.015	0.060
95/03/27	1520	30	8.5	28.94	22.45	7.8		8.5	87.8		88.7			0.374		0.015	0.062
95/04/24	1400	0	12.7	21.36	15.91	8.6	1 U	14.6	158.4	5.0	63.4	10.90	1.80	0.010 U		0.014	0.010 U
95/04/24	1405	10	9.0	28.23	21.82	7.9		9.5	99.3		86.0	0.62	0.60	0.309		0.029	0.067
95/04/24	1410	30	8.8	28.86	22.34	7.8		8.2	85.7		89.3			0.343		0.028	0.067
95/05/22	1705	0	15.2	22.25	16.13	8.5	1 U	11.9	137.3	5.0	65.0	5.20	0.75	0.010 U		0.010 U	0.010 U
95/05/22	1710	10	9.9	28.37	21.80	8.0		10.3	109.8		73.0	30.20	5.00	0.133		0.015	0.036
95/05/22	1715	30	9.2	29.06	22.44	7.7		7.7	81.5		79.1			0.293		0.027	0.062
95/06/26	1435	0	16.1	22.89	16.44	8.2	1 U	10.8	127.1	2.4	56.6	5.90	1.20	0.010 U		0.010 U	0.019
95/06/26	1440	10	11.1	28.53	21.73	7.8		8.8	96.9		85.7	9.00	1.70	0.103		0.023	0.060
95/06/26	1445	30	10.0	29.20	22.43	7.7		7.6	81.8		90.6			0.326		0.010 U	0.074
95/07/24	1625	0	17.4	25.58	18.21	8.3	1 U	9.9	121.5	5.3	71.3	2.20	0.62	0.010 U		0.010 U	0.010
95/07/24	1630	10	12.4	29.19	22.01	8.0		8.7	98.3		78.1	3.90	2.30	0.089		0.028	0.031
95/07/24	1635	30	11.2	29.55	22.50	7.8		6.9	76.7		91.8			0.172		0.016	0.040
95/08/22	1655	0	17.7	14.47	9.68	8.3	1 U	7.3	84.7	4.5	66.1	3.80	1.30	0.010 U		0.010 U	0.010 U
95/08/22	1700	10	12.2	29.86	22.56	7.9		9.2	104.4		90.1	1.90	1.00	0.168		0.010 U	0.035
95/08/22	1705	28	11.9	29.82	22.59	7.8		6.2	70.1		92.8			0.149		0.010 U	0.026

Station:
*** PTH005** Port Townsend Harbor - Walan Point 48 Deg 05.0' N 122 Deg 45.8' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/25	1040	0	10.3	31.39	24.09	7.8	1 U	7.2	78.8	8.7	81.7	3.80	0.83	0.183		0.010 U	0.031
94/10/25	1045	10	10.1	31.49	24.20	7.7		6.3	68.4		84.9	2.20	0.52	0.199		0.010 U	0.032
94/12/21	1105	0	8.2	30.75	23.91	7.7	4	8.8	91.3	7.6	82.6	0.49	0.36	0.248		0.010 U	0.055
94/12/21	1110	10	8.2	30.79	23.94	7.7		8.7	91.0		82.5	0.58	0.36	0.262		0.010 U	0.056
95/01/24	1100	0	7.7	30.17	23.52	7.8	1	8.6	88.3	8.6	83.2	0.61	0.37	0.346		0.010 U	0.064
95/01/24	1105	10	7.8	30.27	23.59	7.8		8.5	87.7		83.4	0.35	0.49	0.353		0.010 U	0.064
95/02/13	1030	0	7.4	29.60	23.12	7.8	4	9.0	91.4	8.0	82.3	0.78 J	0.53 J	0.207		0.010 U	0.032
95/02/13	1035	10	7.8	29.86	23.27	7.8		8.9	91.3		81.5	0.77 J	0.61 J	0.172		0.010 U	0.028
95/03/29	1055	0	9.3	29.57	22.82	8.0		9.9	104.7	9.6	83.4	1.60	0.36	0.236		0.010 U	0.045
95/03/29	1100	10	8.8	29.80	23.08	8.0		9.6	101.2		82.4	1.50	0.89	0.249		0.013	0.049
95/04/19	1000	0	9.3	29.80	23.00	7.9	1	8.6	90.9	8.3	81.3	1.10	0.50	0.229		0.018	0.047
95/04/19	1005	10	9.1	30.18	23.33	7.8		8.2	86.9		83.6	0.86	0.60	0.251		0.022	0.049
95/05/15	1015	0	11.3	29.92	22.77	8.2	1 U	10.6	117.9	4.4	61.7	24.30	0.05 U	0.010 U		0.010 U	0.010 U
95/05/15	1020	10	10.0	30.43	23.39	7.9		9.0	97.1		77.6	7.00	0.93	0.191		0.014	0.027
95/06/14	1210	0	11.8	30.56	23.18	7.9		8.2	92.3	6.5	73.7	4.70	1.90	0.167		0.011	0.059
95/06/14	1215	10	10.3	30.94	23.73	7.8		7.4	80.4		76.2	1.80	2.90	0.247		0.014	0.062
95/07/10	1055	0	12.8	30.15	22.68	8.1	1 U	9.3	107.3	5.2	71.3	11.10	2.80	0.049		0.011	0.029
95/07/10	1100	10	11.9	30.58	23.18	8.0		7.7	86.5		74.6	7.50	3.50	0.158		0.032	0.046
95/08/08	1125	0	12.7	30.60	23.04	8.0	1 U	8.3	94.8	8.7	71.9	6.60	1.50	0.055		0.014	0.027
95/08/08	1130	10	12.1	30.83	23.33	8.0		7.6	86.3		79.6	6.80	2.30	0.051		0.015	0.021
95/09/14	1225	0	13.5	10.93	7.74	8.0	1 U	10.4	107.8	5.5	62.1	11.30	2.70	0.073		0.010 U	0.020
95/09/14	1230	10	11.4	31.37	23.88	7.7		8.8	99.0		80.7	6.60	1.40	0.165		0.019	0.036

Station:
* **QMH001** Quartermaster Harbor (Vashon Island) - Burton   47 Deg 22.8' N 122 Deg 27.9' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/11	1125	0	13.4	30.45	22.79	8.1	1 U	9.0	105.2	6.1	80.2	8.90	0.91	0.028		0.010 U	0.014
94/10/11	1130	10	13.0	30.53	22.93	7.9		6.5	75.0		76.4	3.70	1.10	0.081		0.010 U	0.021
94/11/09	1140	0	10.1	29.43	22.59	7.9	1 U	9.7	104.1	5.0	69.5	22.00 J	1.60 J	0.104		0.010 U	0.038
94/11/09	1145	10	11.4	30.46	23.17	7.6		6.6	73.7		77.7	4.30 J	0.42 J	0.238		0.010 U	0.057
95/01/03	1300	0	7.4	28.71	22.42	7.7	1 U	8.7	88.1	5.9	77.3	0.58	0.18	0.258		0.015	0.052
-95/01/03	1305	10	8.6	29.27	22.69	7.7		8.0	83.0		79.3	0.43	0.31	0.387		0.019	0.082
95/02/09	1335	0	8.8	26.44	20.45	7.8	1 U	9.5	97.7	7.5	81.2	1.10 J	0.44 J	0.292		0.010 U	0.046
95/02/09	1340	10	8.6	28.51	22.10	7.7		9.3	95.8		78.6	0.83 J	0.61 J	0.287		0.015	0.050
95/03/06	1150	0	7.8	27.64	21.53	7.9	1 U	10.1	101.8	10.5	84.9	1.50	0.56	0.327		0.023	0.053
95/03/06	1155	10	8.1	27.92	21.71	7.9		9.4	95.5		83.4	0.77	0.72	0.379		0.018	0.063
95/04/03	1130	0	11.5	27.92	21.18	8.7	1 U	15.7	172.2	6.9	60.9	5.90	0.73	0.010 U		0.010 U	0.010 U
95/04/03	1135	10	8.8	28.61	22.15	8.0		10.4	108.8		82.8	10.80	1.70	0.321		0.010 U	0.057
95/05/03	1110	0	12.6	28.37	21.34	8.2	1 U	10.8	122.1	5.1	71.4	8.50	2.50	0.010 U		0.010 U	0.010 U
95/05/03	1115	10	10.0	28.78	22.10	8.0		9.4	101.1		70.4	12.00	3.30	0.148		0.031	0.037
95/06/08	1205	0	16.1	28.34	20.61	8.2	1 U	11.2	136.6	3.7	64.7	3.20	1.70	0.010 U		0.040	0.037
95/06/08	1210	10	11.8	29.00	21.97	7.9		9.7	108.0		76.4	10.00	3.10	0.053		0.033	0.047
95/07/05	1205	0	18.1	28.21	20.06	8.3	1 U	9.5	120.3	8.5	81.1	3.60	1.00	0.010 U		0.010 U	0.018
95/07/05	1210	10	12.2	29.28	22.12	8.0		9.2	103.2		75.6	6.90	1.60	0.057		0.053	0.034
95/08/02	1315	0	17.7	29.21	20.92	8.2	1 U	9.6	121.0	9.5	83.3	1.80	0.66	0.010 U		0.010 U	0.026
95/08/02	1320	10	13.2	29.60	22.18	8.0		8.4	96.4		77.8	3.10	1.40	0.038		0.062	0.066
95/09/19	1240	0	16.7	29.41	21.30	8.4	1 U	12.3	152.3	5.3	85.4	2.80	0.37	0.010 U		0.017	0.010 U
95/09/19	1245	10	13.1	30.24	22.69	7.8		7.1	81.6		78.2	5.70	1.50	0.159		0.061	0.079

Station:
* **SAR003** Saratoga Passage - East Point 48 Deg 06.5' N 122 Deg 29.4' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/12/05	1440	0	6.7	24.81	19.44	7.7		9.6	92.6	4.2	74.0	1.20	0.58	0.149		0.010 U	0.024
94/12/05	1445	10	9.5	28.46	21.93	7.6		7.5	79.3		87.0	0.46	0.28	0.123		0.010 U	0.025
94/12/05	1450	30	11.0	30.52	23.29	7.6		5.8	64.2		85.0			0.147		0.010 U	0.022
95/01/23	1345	0	6.5	21.37	16.76	7.8	1 U	10.3	97.1		76.6	1.00	0.33	0.297 J		0.010 U	0.042 J
95/01/23	1350	10	7.9	25.43	19.78	7.8		9.0	89.5		87.1	0.54	0.42	0.188		0.010 U	0.026
95/01/23	1400	30	9.1	29.67	22.93	7.7		7.3	76.6		85.7			0.163		0.010 U	0.024
95/03/27	1415	0	9.6	21.02	16.12	8.6	1 U	15.5	156.8	4.2	67.9	14.40	2.00	0.010 U		0.013	0.010 U
95/03/27	1420	10	8.6	28.23	21.88	7.8		9.4	97.3		85.8	2.30	0.92	0.371		0.023	0.060
95/03/27	1425	30	8.5	28.89	22.41	7.8		8.6	88.8		89.4			0.370		0.026	0.061
95/04/24	1320	0	12.3	23.47	17.60	8.6	1 U	14.3	155.8	5.5	70.6	6.10	0.99	0.010 U		0.012	0.010 U
95/04/24	1325	10	8.9	28.31	21.90	7.8		9.2	95.4		86.6	1.00	0.68	0.338		0.024	0.068
95/04/24	1330	30	8.7	28.80	22.31	7.7		7.8	81.1		90.9			0.361		0.027	0.075
95/05/22	1620	0	16.4	20.65	14.66	8.6	1 U	11.8	137.3	5.8	72.0	3.20	0.36	0.010 U		0.010 U	0.010 U
95/05/22	1625	10	9.3	28.61	22.08	7.8		8.5	89.5		85.8	9.50	1.70	0.160		0.013	0.039
95/05/22	1630	30	9.0	28.98	22.41	7.7		7.0	73.2		90.3			0.365		0.040	0.073
95/06/26	1015	0	14.1	24.77	18.28	8.3	1 U	12.9	147.7	2.6	43.2	14.70	3.10	0.010 U		0.014	0.027
95/06/26	1020	10	10.3	28.87	22.12	7.7		7.8	84.5		89.7	1.10	0.64	0.189		0.010 U	0.044
95/06/26	1025	30	10.1	29.11	22.34	7.6		7.2	77.9		90.1			0.317		0.010 U	0.089
95/07/24	1525	0	17.4	25.53	18.17	8.4	1 U	9.8	120.0	4.9	63.4	4.20	0.72	0.010 U		0.010 U	0.017
95/07/24	1530	10	11.6	28.77	21.83	8.0		8.7	96.3		62.5	9.10	0.79	0.077		0.010 U	0.030
95/07/24	1535	30	10.7	29.50	22.55	7.7		6.2	67.5		89.1			0.187		0.010 U	0.038
95/08/22	1525	0	16.0	10.05	6.64	8.3	1 U	10.3	111.7	4.0	64.8	3.20	1.10	0.010 U		0.010 U	0.010 U
95/08/22	1530	10	12.3	28.80	21.73	7.9		10.1	114.2		83.3	1.90	1.20	0.185		0.010 U	0.038
95/08/22	1535	30	11.2	29.90	22.77	7.7		5.7	63.3		86.0			0.163		0.010 U	0.029

Station:
* **SIN001** Sinclair Inlet - Naval Shipyards 47 Deg 33.0' N 122 Deg 38.5' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)		PHEOPIG (UG/L)		NO3 & NO2-N DISS (MG/L)		NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)	
94/10/11	1145	0	13.6	30.25	22.60	8.1	4		8.6	100.6	6.5	79.2	13.70		2.80		0.035			0.010	U	0.019	
94/10/11	1150	10	13.5	30.43	22.76	8.0			7.5	87.8		81.0	10.50		1.40		0.061			0.010	U	0.022	
94/11/09	1205	0	10.9	29.69	22.66	7.7	350	J	7.7	84.7	6.5	78.2	4.90	J	1.00	J	0.141			0.010	U	0.040	
94/11/09	1210	10	11.2	30.41	23.17	7.7			7.1	79.0		77.7	5.50	J	1.40	J	0.148			0.010	U	0.037	
95/01/03	1240	0	7.4	22.94	17.89	7.6	2		8.4	81.9	4.8	74.5	0.66		0.38		0.418	J		0.051		0.086	J
95/01/03	1245	10	8.4	28.84	22.39	7.6			7.8	80.0		76.3	0.45		0.46		0.250			0.023		0.051	
95/02/09	1310	1	8.2	27.98	21.74	7.8	1	U	9.7	98.6	6.7	75.2	1.10	J	0.56	J	0.191			0.024		0.030	
95/02/09	1315	10	8.6	27.78	21.53	7.8			10.1	103.7		79.4	0.92	J	0.72	J	0.200			0.024		0.032	
95/03/06	1215	0	7.9	26.79	20.85	7.9	1	U	9.6	97.0	7.7	78.2	1.10		0.70		0.381			0.037		0.068	
95/03/06	1220	10	8.1	27.73	21.56	7.8			9.1	92.8		83.5	0.63		0.64		0.385			0.020		0.068	
95/04/03	1155	0	10.7	27.63	21.09	8.1	1	U	11.6	125.6	6.0	71.1	6.70		0.86		0.269			0.010	U	0.042	
95/04/03	1200	10	9.3	28.22	21.77	8.0			9.7	102.1		76.8	7.80		2.40		0.314			0.012		0.055	
95/05/03	1210	0	11.9	28.06	21.22	8.2	1	U	12.2	135.4	4.8	75.0	9.40		2.60		0.016			0.010	U	0.010	U
95/05/03	1215	10	10.4	28.63	21.92	8.0			10.0	107.7		73.2	14.00		2.80		0.161			0.036		0.031	
95/06/08	1235	0	16.1	28.34	20.61	8.3	1	U	13.9	169.4	2.4	45.9	8.10		1.50		0.010	U		0.010	U	0.030	
95/06/08	1240	10	13.6	28.78	21.47	8.0			9.7	111.7		70.7	9.50		2.50		0.040			0.054		0.049	
95/07/05	1230	1	15.9	28.78	20.99	8.1	2		9.8	118.9	7.7	82.5	1.60		0.74		0.010	U		0.039		0.026	
95/07/05	1235	10	13.9	29.19	21.72	8.0			9.3	109.0		76.4	4.00		2.00		0.024			0.039		0.029	
95/08/02	1340	0	19.4	28.91	20.28	8.5	1	U	12.4	160.6	4.3	60.1					0.010	U		0.010	U	0.010	U
95/08/02	1345	10	14.6	29.57	21.87	8.0			8.9	105.8		64.1	15.80		4.10		0.026			0.031		0.031	
95/09/19	1315	0	16.1	29.77	21.71	8.1	1		9.0	110.9	4.7	75.0	5.00		1.70		0.022			0.010	U	0.023	
95/09/19	1320	10	14.3	30.08	22.33	7.9			7.1	83.6		74.1	6.10		2.00		0.104			0.033		0.056	

Station:
*** SKG001** Skagit Bay - Hope Island 48 Deg 23.8' N 122 Deg 34.8' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)
94/10/03	1210	0	11.8	29.02	21.99	7.7	1		6.3	70.6	3.8	61.3	4.20	2.50	0.200		0.010	U	0.048
94/10/03	1215	10	11.8	29.08	22.03	7.7			6.4	71.6		65.7	4.20	1.60	0.167		0.010	U	0.039
94/12/05	1330	1	7.9	24.86	19.34	7.6			8.2	81.6	2.3	52.6	0.53	0.46	0.155		0.010	U	0.024
94/12/05	1335	9	9.1	28.93	22.36	7.6			6.9	72.5		35.4	0.57	1.60	0.204		0.010	U	0.033
95/01/23	1230	0	7.7	25.32	19.72	7.7	1		8.4	83.2	2.7	53.7	0.66	0.44	0.228		0.010	U	0.033
95/01/23	1235	7	8.7	28.25	21.88	7.7			7.3	76.1		45.8	0.31	0.94	0.164		0.010	U	0.024
95/03/27	1250	0	8.9	24.54	18.96	7.8	1	U	9.0	91.3	3.3	65.2	1.70	0.64	0.306		0.018		0.048
95/03/27	1255	9	8.4	27.64	21.45	7.9			9.0	92.2		68.0	1.30	0.61	0.308		0.023		0.051
95/04/24	1210	0	9.7	27.81	21.39	7.9	1	U	8.8	93.3	5.4	73.6	2.90	0.84	0.163		0.018		0.031
95/04/24	1215	10	9.3	28.63	22.09	7.9			8.6	90.8		74.6	2.60	0.91	0.167		0.019		0.034
95/05/22	1450	0	11.8	23.18	17.46	8.0	1	U	8.8	94.7	4.7	64.7	9.50	0.73	0.125		0.018		0.031
95/05/22	1455	7	10.4	27.75	21.24	7.8			8.2	88.2		76.0	8.10	1.10	0.183		0.021		0.042
95/06/26	1120	0	13.8	26.69	19.82	8.2	1	U	11.0	126.0	2.5	51.3	13.90	2.20	0.124		0.021		0.046
95/06/26	1125	10	11.5	27.90	21.17	7.9			9.0	98.9		57.5	10.30	3.20	0.138		0.019		0.040
95/07/24	1340	0	12.5	27.72	20.85	7.9	1	U	7.7	87.1		52.4	9.00	1.60	0.109		0.018		0.030
95/07/24	1345	10	11.8	28.66	21.71	7.9			7.3	81.2		61.1	8.10	2.60	0.142		0.017		0.038
95/08/22	1435	0	14.0	18.26	13.29	8.1	1	U	9.6	104.5	3.2	51.9	18.70	2.90	0.065		0.010	U	0.020
95/08/22	1440	8	11.3	29.25	22.25	7.9			8.3	92.1		70.4	7.90	2.90	0.115		0.010	U	0.023

Station:
* **SKG003** Skagit Bay - Str. Point Red Buoy 48 Deg 17.8' N 122 Deg 29.3' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/03	1245	0	12.3	24.52	18.41	7.7	22	5.9	65.2	3.4	52.4	3.70	1.30	0.115		0.010 K	0.031
94/10/03	1250	10	11.8	29.87	22.64	7.6		4.4	48.8		71.9	0.95	1.10	0.237		0.010 K	0.055
94/12/05	1355	0	8.4	26.26	20.37	7.6		7.7	77.9	2.2	53.1	0.54	0.66	0.099		0.010 U	0.015
94/12/05	1400	10	9.7	28.43	21.87	7.6		6.4	68.0		49.5	0.70	0.83	0.153		0.010 U	0.030
95/01/23	1245	0	7.0	21.81	17.05	7.8	1 U	9.6	91.3	3.4	71.6	0.49	0.23	0.147		0.010 U	0.015
95/01/23	1250	6	7.3	22.97	17.93	7.8		9.3	90.5		56.3						
95/03/27	1320	0	8.7	21.18	16.36	7.9	1 U	9.7	96.6	4.4	66.0	2.60	0.73	0.264		0.019	0.038
95/03/27	1325	7	8.6	27.57	21.36	7.7		8.0	82.2		72.8	2.10	0.90	0.356		0.021	0.059
95/04/24	1225	0	10.7	20.93	15.89	8.0	1 U	8.8	90.8	5.1	76.2	3.10	0.70	0.167		0.017	0.031
95/04/24	1230	7	8.9	28.05	21.70	7.7		7.3	75.8		73.1	1.80	0.96	0.219		0.017	0.040
95/05/22	1510	0	13.8	18.74	13.70	8.0	1	9.2	100.5	5.4	59.3	4.50	0.85	0.077		0.013	0.021
95/05/22	1515	9	8.9	28.87	22.34	7.6		6.4	67.1		82.4	2.90	0.73	0.381		0.030	0.081
95/06/26	1100	0					14			2.2		4.90	1.70	0.013		0.010 U	0.013
95/06/26	1105	10															
95/07/24	1400	0	15.2	19.13	13.74	8.3	1 U	7.5	85.1	2.4	40.1	8.30	1.40	0.060		0.010 U	0.028
95/07/24	1405	3	10.7	28.98	22.14	7.7		6.5	71.3		58.3						
95/08/22	1500	0	15.0	4.28	2.40	8.1	8	10.1	103.2	4.5	58.3	9.60	2.70	0.010 U		0.010 U	0.010 U
95/08/22	1505	5	10.9	29.76	22.72	7.6		12.3	135.5		72.6	3.40	1.90	0.169		0.010 U	0.035

Station:
*** SUZ001** Port Susan - Kayak Point 48 Deg 08.1' N 122 Deg 22.2' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/10/03	1335	0	13.0	29.19	21.90	7.8	1 U	7.2	82.9	12.7	48.7	0.79	0.40	0.136		0.010 U	0.032
94/10/03	1340	10	12.3	29.87	22.55	7.7		5.7	64.5		88.2	0.89	0.77	0.239		0.010 U	0.047
94/10/03	1345	30	11.0	30.08	22.95	7.5		4.0	43.6		88.4			0.286		0.010 U	0.054
94/12/05	1410	0	6.7	22.34	17.50	7.7		9.6	91.2	3.1	61.1	0.63	0.41	0.220		0.010 U	0.023
94/12/05	1415	10	9.6	28.43	21.89	7.6		7.5	79.9		80.0	0.21	0.27	0.198		0.010 U	0.033
94/12/05	1420	30	11.2	30.58	23.30	7.6		5.6	62.6		86.6			0.176		0.010 U	0.030
95/01/23	1310	0	7.0	22.50	17.59	7.8	1 U	9.8	94.4		78.0			0.241		0.010 U	0.031
95/01/23	1315	10	8.7	29.07	22.52	7.7		7.8	81.4		78.9	0.08	0.13	0.186		0.010 U	0.029
95/01/23	1320	30	9.0	29.58	22.88	7.7		7.5	79.2		60.2			0.169		0.010 U	0.024
95/03/27	1345	0	9.4	15.27	11.67	8.4	1 U	13.6	131.8	3.9	55.7	10.40	2.20	0.160		0.012	0.010 U
95/03/27	1350	10	8.4	28.03	21.75	7.8		9.0	92.8		85.4	0.52	0.34	0.392		0.010 U	0.065
95/03/27	1355	30	8.6	28.84	22.36	7.8		8.5	87.6		87.1			0.384		0.010 U	0.066
95/04/24	1250	0	13.0	21.31	15.82	8.5	1 U	13.2	144.5	3.7	64.0	10.70	1.30	0.010 U		0.013	0.012
95/04/24	1255	10	8.9	28.38	21.95	7.8		8.9	93.1		91.6	0.44	0.32	0.206		0.035	0.050
95/04/24	1300	30	8.6	28.83	22.35	7.7		7.9	81.9		85.9			0.261		0.017	0.048
95/05/22	1540	0	14.6	21.97	16.03	8.3	1 U	11.2	127.0	7.1	76.5	2.90	0.98	0.010 U		0.017	0.011
95/05/22	1545	10	9.5	28.65	22.08	7.9		9.2	96.9		79.2	5.10	1.40	0.316		0.030	0.066
95/05/22	1550	30	8.8	28.97	22.43	7.7		7.3	76.6		90.3			0.276		0.024	0.056
95/06/26	1400	0	16.1	23.46	16.87	8.1	1	10.5	123.9	3.4	65.3	4.30	1.20	0.010 U		0.010 U	0.013
95/06/26	1405	10	10.7	28.95	22.12	7.8		8.8	95.5		76.6	3.50	1.60	0.201		0.045	0.062
95/06/26	1410	30	9.2	29.00	22.39	7.5		7.1	74.2		89.3			0.403		0.018	0.097
95/07/24	1440	0	19.5	25.74	17.84	8.2	1 U	8.6	110.2	6.3	75.4	2.30	0.56	0.010 U		0.010 U	0.013
95/07/24	1445	10	12.3	29.13	21.98	8.1		8.6	96.7		72.1	4.60	1.80	0.119		0.012	0.034
95/07/24	1450	30	10.1	29.21	22.42	7.7		6.4	68.4		87.0			0.200		0.010 U	0.041
95/08/22	1610	0	19.2	9.00	5.21	8.3	1 U	8.6	98.6	4.0	60.6	5.50	1.40	0.010 U		0.010 U	0.010 U
95/08/22	1615	10	12.1	30.00	22.69	7.9		9.6	108.7		90.9	1.50	0.99	0.200		0.010 U	0.045
95/08/22	1620	30	9.8	29.49	22.69	7.5		5.1	55.0		86.2			0.247		0.010 U	0.050

Grays Harbor and Willapa Bay stations

Station:
GYS004 Grays Harbor - Chehalis River LAT (deg min N): 46 58.7 LONG (deg min W): 123 47.0

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/12/06	1030	0	6.5	2.77	2.12	6.8	56 S	12.3	102.4	0.9	4.5			0.838		0.026	0.012
93/12/06	1035	10	8.3	21.34	16.53	7.8		10.4	101.8		15.4			0.623		0.040	0.019
94/01/26	1000	0	7.8	3.08	2.28	7.1	44	11.0	95.2	1.9	38.5			0.538		0.025	0.010
94/01/26	1105	10	8.6	16.87	13.01	7.6		9.8	94.2		1.2			0.338		0.032	0.019
94/03/07	1020	0	7.4	0.09	-0.04	6.9	26	12.3	102.9	0.9	18.6	1.60	0.66	0.732		0.010 K	0.010 K
94/03/07	1025	10	9.4	20.47	15.72	7.7		9.8	97.8		15.4	0.77	1.30	0.243		0.038	0.019
94/04/18	1025	0	11.6	4.39	2.96	7.3	24	9.7	92.7		43.1			0.198		0.029	0.010 K
94/04/18	1030	10	11.3	11.60	8.58	7.5		8.9	88.1		25.4			0.139		0.035	0.010 K
94/05/17	855	0	15.0	6.65	4.22	7.5	3	8.6	89.9	2.7	54.5			0.124		0.019	0.010 K
94/05/17	1000	10	15.0	15.44	10.95	7.7		7.9	86.5		45.0			0.065		0.018	0.010 K
94/06/27	1015	0	17.4	0.38	-1.00	7.1	44	8.5	89.7	0.6	14.9			0.182		0.016	0.010 K
94/06/27	1020	10	17.2	4.00	1.81	7.0		8.1	86.8		0.2			0.123		0.014	0.010 K
94/07/25	1015	0	20.3	3.73	0.98	7.2	43	7.0	80.1	1.0	14.0			0.088		0.011	0.010 K
94/07/25	1020	8	20.1	4.58	1.67	7.2		7.0	79.8		8.3			0.075		0.010 K	0.010 K
94/08/30	1010	0	18.7	12.92	8.29	7.6	11	7.2	83.5	2.7	57.9			0.072		0.018	0.010 K
94/08/30	1015	10	17.6	26.92	19.19	7.8		6.1	75.6		43.4			0.050		0.051	0.023

Station:
GYS008 Grays Harbor - Mid South Channel LAT (deg min N): 46 56.3 LONG (deg min W): 123 54.7

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/12/06	1100	0	7.2	12.94	10.07	7.7	26	10.4	94.2	0.7	5.200	2.60	4.00	0.608		0.041	0.023
93/12/06	1105	1	7.2	12.94	10.07	7.7		10.4	94.7		-2.400						
94/01/26	1025	0	8.2	14.51	11.21	7.6	19	10.0	93.6	1.7	31.200	2.30	1.00	0.338		0.035	0.024
94/01/26	1030	1	8.3	14.80	11.50	7.5		10.0	93.7		25.900						
94/03/07	1045	0	8.2	6.75	5.14	7.3	30 S	10.8	96.4	1.1	16.000	0.50	0.65	0.641		0.020	0.013
94/03/07	1050	4	8.3	20.18	15.50	7.9		9.5	95.0		24.300						
94/04/18	1100	0	11.6	9.73	7.09	7.6	11 X	9.2	90.7	2.0	42.200	1.10	0.83	0.174		0.040	0.010 K
94/04/18	1105	5	11.5	14.88	11.17	7.8		8.7	88.4								
94/05/17	1015	0	15.1	15.83	11.23	7.8	1 X	8.1	89.4	2.0	41.000	2.50	1.30	0.052		0.010 K	0.014
94/05/17	1020	4	15.2	18.01	12.88	7.8		7.9	88.3		23.000	4.60	2.80	0.028		0.010 K	0.011
94/06/27	1040	0	17.3	16.48	11.29	7.7	17 X	7.5	86.5	0.7	18.500	3.90	2.00	0.074		0.020	0.010 K
94/06/27	1045	3	17.5	17.00	11.65	7.7		7.8	91.0		9.000	4.20	2.00	0.058		0.018	0.010 K
94/07/25	1045	0	17.4	25.17	17.90	7.7	3	6.7	81.4	0.6	7.800	4.80	3.00	0.046		0.024	0.010 K
94/07/25	1050	4	17.4	25.19	17.91	7.7		6.7	81.5		6.800	4.30	2.90	0.040		0.028	0.010 K
94/08/30	1040	0	19.2	23.17	15.96	7.9	61	7.0	88.0	1.4	32.600	3.10	2.40	0.031		0.011	0.020
94/08/30	1045	6	18.7	26.39	18.53	7.9		6.8	85.4		47.400	1.50	2.00	0.024		0.017	0.019
94/09/27	1025	0	16.5	20.87	14.66	7.8	6	7.0	82.4	1.6	32.300	3.80	1.60	0.163		0.038	0.030
94/09/27	1030	6	16.2	25.72	18.58	7.7		6.8	81.2		20.100	2.40	1.70	0.075		0.025	0.017

Station:
GYS009 Grays Harbor - Moon Island Reach LAT (deg min N): 46 57.9 LONG (deg min W): 123 58.9

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI Transm. (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/12/06	1115	0	7.0	14.33	11.18	7.7		10.8	98.6	1.3	16.0						
93/12/06	1120	9	8.6	24.76	19.17	7.9		9.7	98.2		15.6						
94/01/26	1045	0	8.5	18.24	14.09	7.8		10.0	98.8	2.3	42.0						
94/01/26	1050	10	9.0	24.57	18.97	7.9		9.6	98.0		29.8						
94/03/07	1115	0	8.1	7.68	5.88	7.6		11.1	99.8	1.1	20.6						
94/03/07	1120	10	9.7	27.04	20.79	8.1		9.3	97.5		22.1						
94/04/18	1125	0	11.5	10.85	7.97	7.7		9.3	92.2	2.1	46.6						
94/04/18	1130	10	11.5	23.73	17.94	8.0		8.2	87.5		18.2						
94/05/17	1040	0	15.1	18.02	12.91	7.9		8.3	93.0	2.7	52.3						
94/05/17	1045	10	14.5	24.32	17.86	8.0		7.8	89.3		40.6						
94/06/27	1110	0	17.5	13.82	9.23	7.6		7.6	87.4	1.2	28.0						
94/06/27	1115	10	16.8	22.74	16.17	7.8		7.5	89.0		21.4						
94/07/25	1120	0	17.9	24.04	16.92	7.7		6.9	85.1	1.2	26.9						
94/07/25	1125	10	16.5	28.20	20.42	7.8		7.0	86.2		1.4						
94/08/30	1105	0	18.9	21.09	14.45	7.9		7.6	93.4	3.0	26.8						
94/08/30	1110	10	16.9	29.74	21.51	8.0		7.0	87.0		67.2						
94/09/27	1110	0	16.4	22.06	15.74	7.7		7.4	87.4	2.4	54.6						
94/09/27	1115	10	13.8	30.07	22.42	7.8		6.9	80.4		60.4						

Station:
GYS015 Grays Harbor - North Whitcomb Flats LAT (deg min N): 46 55.4 LONG (deg min W): 124 04.5

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI Transm. (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
94/01/26	1120	0	9.1	25.69	19.83	8.0		10.0	103.2	5.3	76.9						
94/01/26	1125	10	9.3	27.16	20.94	8.0		9.7	101.0		67.5						
94/03/07	1200	0	8.6	11.58	8.88	7.9		10.8	100.3	1.6	28.5						
94/03/07	1205	10	9.7	28.70	22.08	8.1		9.2	97.4		32.3						
94/04/18	1155	0	12.3	16.76	11.65	8.0		8.7	90.7	3.0	64.8						
94/04/18	1200	10	11.4	26.31	19.95	8.1		8.3	90.1		58.9						
94/05/17	1115	0	14.7	23.97	17.55	8.0		8.1	92.6	3.4	55.9						
94/05/17	1120	10	14.3	24.77	18.24	8.1		8.0	91.2		51.4						
94/06/27	1145	0	17.4	23.34	16.50	7.9		7.7	93.6	1.8	33.1						
94/06/27	1150	10	16.0	26.83	19.48	8.0		7.9	94.5		43.1						
94/07/25	1200	0	14.7	31.09	23.02	8.1		8.7	104.5	1.9	38.9						
94/07/25	1205	10	14.7	31.20	23.11	8.0		8.4	100.9		46.7						
94/08/30	1135	0	18.4	27.80	19.67	8.0		7.6	95.7	3.8	57.9						
94/08/30	1140	9	16.3	31.26	22.80	8.1		7.9	97.7		70.2						
94/09/27	1140	0	14.4	28.48	21.85	7.8		7.3	86.2	3.6	69.3						
94/09/27	1145	9	10.6	32.37	24.80	7.8		6.6	73.7		61.9						

Station:
GYS016 Greys Harbor - Damon Point LAT (deg min N): 46 57.2 LONG (deg min W): 124 05.5

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2- DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
93/12/08	1135	0	6.5	20.13	15.78	7.9	7	10.6	99.5	1.4	18.7	1.20	2.20	0.217		0.043	0.028
93/12/08	1140	3	7.8	23.74	18.47	7.9		9.7	95.1		14.0						
94/01/26	1105	0	9.1	25.55	19.72	8.0	1	9.8	101.0	3.3	58.6	2.80	0.69	0.157		0.011	0.024
94/01/26	1110	2	9.1	25.61	19.76	8.0		9.9	101.4		57.7						
94/03/07	1135	0	8.6	16.61	12.81	8.0	3	10.1	96.4	1.5	38.8	0.58	0.88	0.268		0.023	0.015
94/03/07	1140	9	9.7	28.48	21.91	8.1		8.9	95.0		3.2	2.20	6.50	0.091		0.018	0.023
94/04/19	1135	0	12.4	21.85	16.33	8.0	1 K	7.9	85.9		54.7	1.60	0.54	0.034		0.030	0.010 K
94/04/18	1140	1	12.3	22.00	16.47	8.0		8.0	85.9		54.6						
94/05/17	1055	0	14.1	24.24	17.87	8.0	1 K	7.8	88.2	3.1	54.3	2.10	0.68	0.010 K		0.010 K	0.010 K
94/05/17	1100	6	13.9	25.44	18.83	8.0		7.7	88.2		54.7	2.50	0.67	0.010 K		0.010 K	0.012
94/06/27	1125	0	17.0	25.22	18.03	7.9	1 U	7.4	90.0	1.9	45.2	2.40	0.61	0.010 K		0.010 K	0.010 K
94/06/27	1130	8	16.4	27.18	19.66	7.9		7.1	85.8		43.0	1.90	0.81	0.010 K		0.016	0.010 K
94/07/26	1130	0	15.3	30.84	22.70	8.0	1 U	8.0	96.6	1.7	27.0	3.60	2.30	0.010 K		0.012	0.010 K
94/07/26	1135	8	15.3	30.79	22.67	8.0		7.9	85.9		1.3	4.70	9.60	0.010 K		0.010 K	0.010 K
94/08/30	1120	0	18.1	28.62	21.13	8.0	1 U	7.2	91.7	4.2	68.5	2.40	1.30	0.010 K		0.010 K	0.016
94/08/30	1125	8	15.8	31.57	23.16	8.1		7.6	94.1		69.5	3.10	1.80	0.014		0.015	0.017
94/09/27	1120	0	15.1	28.83	21.20	7.9	1 U	7.4	87.7	3.1	61.6	1.90	0.69	0.071		0.013	0.022
94/09/27	1125	7	12.8	31.10	23.39	7.8		7.5	86.9		68.1	1.50	1.30	0.220		0.023	0.040

Station:
WPA001 Willapa Bay - Willapa River at Raymond LAT (deg min N): 46 41.3 LONG (deg min W): 123 44.9

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
94/01/26	1355	0	8.2	12.62	9.73	7.5	6	10.3	95.5	1.4	20.3			0.412		0.042	0.016
94/01/26	1400	8	8.1	14.63	11.31	7.5		10.1	94.8					0.351		0.042	0.018
94/03/07	1535	0	7.6	1.67	1.20	7.3	8	12.0	101.7	1.2	31.4			1.020		0.014	0.010 K
94/03/07	1540	6	8.0	4.72	3.67	7.1		11.3	99.5		21.3			0.780		0.019	0.010 K
94/04/18	1500	0	12.7	3.66	2.26	7.4	33	9.7	94.6	2.7	51.1			0.224		0.033	0.010 K
94/04/18	1505	7	12.0	15.39	11.41	7.7		8.8	88.8		19.0			0.123		0.058	0.010 K
94/05/17	1405	0	15.8	7.68	4.87	7.7	24	9.7	103.2	1.2	32.6			0.012		0.012	0.010 K
94/05/17	1410	7	15.9	14.54	10.09	7.5		7.5	83.0		31.8			0.010 K		0.016	0.010 K
94/06/27	1450	0	19.8	9.95	5.80	7.6	27	7.4	86.3	0.9	17.0			0.058		0.021	0.010 K
94/06/27	1455	5	18.7	12.23	7.77	7.5		7.9	91.9		4.3						
94/07/25	1520	0	20.9	22.69	15.18	7.6	19	6.1	78.1	0.9	8.6			0.010 K		0.022	0.010 K
94/07/25	1525	8	20.4	23.87	16.20	7.6		5.9	76.2		1.0			0.010 K		0.012	0.010 K
94/08/30	1350	0	20.9	18.29	11.85	7.7	12	7.2	90.7	2.7	40.2			0.034		0.010 K	0.013
94/08/30	1355	7	20.2	23.65	16.08	7.6		5.5	69.8		35.5			0.031		0.043	0.025
94/09/27	1450	0	19.5	20.11	13.56	7.6	7	6.9	85.6	2.0	42.7			0.097		0.024	0.016
94/09/27	1455	7	18.5	26.14	18.38	7.6		5.8	73.2		29.3			0.032		0.037	0.013

Station:
WPA003 Willapa Bay - Willapa River at John Slough LAT (deg min N): 46 42.3 LONG (deg min W): 123 50.2

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
94/01/26	1335	0	8.4	18.91	14.62	7.8	1	10.3	100.0	1.7	25.9	2.90	0.48	0.253		0.025	0.022
94/01/26	1340	9	8.4	21.08	16.32	7.9		10.0	98.4		28.6	2.20	2.40	0.233		0.021	0.024
94/03/07	1455	0					3			1.0		1.10	2.00	0.575		0.028	0.011
94/03/07	1500	10										1.40	3.60	0.544		0.030	0.012
94/04/18	1440	0	12.9	12.49	9.04	7.9	1 K	9.4	96.6	2.7	47.6	6.50	0.05 K	0.145		0.024	0.010 K
94/04/18	1445	7	12.6	21.27	15.85	8.0		8.4	90.9		19.9			0.029		0.038	0.010 K
94/05/17	1345	0	16.4	16.80	11.80	7.9	2	8.2	93.1	2.0	36.7	4.30	1.90	0.010 K		0.010 K	0.010 K
94/05/17	1350	6	15.5	21.08	15.17	7.9		7.4	84.5		1.3	3.10	4.60	0.010 K		0.012	0.010 K
94/06/27	1425	0	19.2	19.49	13.16	7.9	2	6.5	78.9	1.1	28.9	4.90	2.40	0.010 K		0.012	0.010 K
94/06/27	1430	5	18.4	19.83	13.61	7.9		7.0	84.9		18.2	6.20	2.40	0.010 K		0.011	0.010 K
94/07/25	1500	0	17.6	29.56	21.21	8.0	1 U	7.3	91.4	1.4	34.0	3.30	3.00	0.010 K		0.010 K	0.010 K
94/07/25	1505	9	17.5	29.56	21.23	8.0		7.2	90.8		11.2	3.20	4.00	0.010 K		0.010 K	0.010 K
94/09/27	1435	0	19.2	24.90	17.27	7.8	2	7.1	90.3	1.7	42.5	4.20	1.50	0.052		0.023	0.016
94/09/27	1440	5	17.5	29.13	20.90	7.9		6.9	86.2		41.9	2.50	3.60	0.049		0.030	0.034

Station:
WPA004 Willapa Bay - Toke Point LAT (deg min N): 46 41.2 LONG (deg min W): 123 58.3

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
94/01/26	1210	0	9.0	25.15	19.42	8.0	1 K	10.3	105.8	4.4	68.3	3.10	0.38	0.175		0.010 K	0.026
94/01/26	1215	7	9.0	25.53	19.71	8.0		10.3	105.5		67.3	3.00	0.86	0.174		0.010 K	0.027
94/03/07	1300	0	9.0	18.17	13.97	8.0	1	10.2	100.2	2.0	52.1	0.97	0.57	0.298		0.018	0.016
94/03/07	1305	10	9.4	23.39	17.99	8.1		10.0	102.1		50.9	1.40	0.76	0.147		0.011	0.019
94/04/18	1300	0	13.0	18.08	13.33	8.1	1	8.9	95.5	3.5	59.4	3.50	0.44	0.037		0.020	0.010 K
94/04/18	1305	10	12.3	24.10	18.09	8.1		8.8	96.1		67.1	3.30	0.97	0.010 K		0.026	0.010 K
94/05/17	1220	0	15.0	22.71	16.52	7.9	1 K	7.7	88.4	2.5	43.3	3.30	1.30	0.010 K		0.010 K	0.010
94/05/17	1225	10	14.7	24.08	17.62	8.0		7.8	89.2		48.5	2.30	1.70	0.010 K		0.015	0.010
94/06/27	1315	0	17.7	25.28	17.91	8.0	1 U	8.1	100.1	1.5	50.4	4.30	0.89	0.010 K		0.010 K	0.010 K
94/06/27	1320	10	17.6	25.23	17.90	8.0		8.1	99.3		40.7	3.70	1.30	0.010 K		0.010 K	0.010 K
94/07/25	1340	0	15.1	28.97	21.31	8.2	1 U	9.3	111.6	2.2	46.7	13.60	1.50	0.010 K		0.010 K	0.010 K
94/07/25	1345	10	15.1	28.99	21.32	8.1		9.2	109.9		42.7	12.70	2.50	0.010 K		0.010 K	0.010 K
94/08/30	1250	0	18.3	28.01	20.38	8.1	1	7.6	98.8	4.1	68.6	2.20	1.10	0.010 K		0.033	0.025
94/08/30	1255	10	17.9	29.40	21.01	8.1		8.4	106.3		72.6	2.80	1.70	0.010 K		0.010 K	0.021
94/09/27	1305	0	16.3	30.37	22.12	7.9	1 U	7.6	94.0	4.1	65.8	2.30	1.20	0.039		0.026	0.029
94/09/27	1310	8	14.6	31.16	23.10	8.0		8.6	103.6		70.0	8.80	3.20	0.062		0.010 K	0.023

Station:
WPA006 Willapa Bay - Nahcotta Channel LAT (deg min N): 46 32.7 LONG (deg min W): 123 58.7

DATE Satur. (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (PSU)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2- DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
94/01/26	1235	0	8.8	22.18	17.15	7.9	2	10.1	100.5	4.6	71.4	2.50	0.39	0.208		0.019	0.026
94/01/26	1240	10	8.6	22.72	17.57	7.9		10.0	99.4		69.9	2.60	0.82	0.198		0.017	0.026
94/03/07	1350	0	9.4	15.32	11.71	8.1	1 K	10.7	104.1	2.0	55.9	1.20	0.76	0.167		0.018	0.014
94/03/07	1355	2	9.3	16.08	12.31	8.1		10.6	103.3		55.9	1.50	0.84	0.149		0.017	0.018
94/04/18	1340	0	13.0	20.81	15.43	8.0	1 K	9.2	99.7		67.2	2.60	0.40	.010 K		0.019	0.010 K
94/04/18	1345	3	12.7	22.33	16.65	8.0		9.0	98.3		74.7	1.60	0.59	.010 K		0.019	0.010 K
94/05/17	1315	0	15.5	24.26	17.61	8.0	1 K	8.1	95.2	4.6	74.6	2.80	0.43	.010 K		0.010 K	0.017
94/05/17	1320	4	15.6	24.37	17.69	8.0		8.1	94.9		75.2	1.90	0.81	.010 K		0.010 K	0.010 K
94/07/25	1415	0	17.0	29.57	21.35	8.1	1 U	8.7	109.4	2.9	56.2	8.00	0.54	.010 K		0.010 K	0.010 K
94/07/25	1420	3	16.9	29.59	21.38	8.1		8.7	107.9		53.8						
94/09/27	1340	0	17.5	29.74	21.37	7.9	1 U	7.5	94.3	4.7	75.2	2.40	1.10	0.016		0.010 K	0.029
94/09/27	1345	7	16.9	29.98	21.67	7.9		7.4	92.2		44.4	3.10	1.50	0.020		0.012	0.029

Station:
WPA007 Willapa Bay - Long Island at S. Jenson Point LAT (deg min N): 46 27.2 LONG (deg min W): 124 00.5

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (M)	10 TEMP (DEG C)	480 SALINITY (mg/L)	DENSITY (SIGMA-T)	400 pH	31616 FEC COLI MF (#/100ML)	300 DO (MG/L)	301 DO SATUR (%)	78 SECCHI (M)	74 LIGHT TRANS (ug/L)	32211 CHLRPHL a (UG/L)	32218 PHEOPIG (UG/L)	631 NO3 & NO2-DISS (MG/L)	613 NO2-N DISS (MG/L)	608 NH4 & NH3-N DISS (MG/L)	671 ORTHO PO4-P DISS (MG/L)
94/01/26	1255	0	8.6	20.31	15.69	7.8	1 K	10.1	98.9	3.3	59.1	1.20	0.92	0.201		0.028	0.025
94/01/26	1300	10	8.4	20.64	15.97	7.8		10.0	97.8		59.0	1.40	0.80	0.215		0.029	0.027
94/03/07	1420	0	9.0	15.89	12.20	8.2	1 K	11.8	113.3	2.0	59.5	1.90	0.87	0.059		0.010 K	0.014
94/03/07	1425	5	8.9	16.57	12.74	8.1		11.4	110.3		58.2	2.50	0.82	0.030		0.010 K	0.011
94/04/18	1415	0	13.4	20.40	15.04	8.0	1 K	9.0	99.0	3.5	59.1	3.40	0.55	0.010 K		0.022	0.010 K
94/04/18	1420	10	13.1	20.97	15.54	8.0		8.9	97.5		63.0	2.00	0.83	0.010 K		0.018	0.010 K
94/05/17	1250	0	15.1	22.52	16.36	7.9	3	8.2	93.8	2.3	38.0	2.90	0.74	0.010 K		0.010 K	0.013
94/05/17	1255	10	15.1	22.65	16.46	7.9		8.1	92.7		42.3	2.70	1.20	0.010 K		0.010 K	0.016
94/06/27	1350	0	18.6	23.63	16.45	8.0	1 U	8.0	98.8	0.9	46.5	2.50	0.84	0.010 K		0.010 K	0.010 K
94/06/27	1355	7	18.6	23.48	16.34	8.0		7.7	95.9		18.3	3.20	3.10	0.010 K		0.010 K	0.012
94/07/25	1430	0	18.8	28.01	19.74	8.0	1 U	7.4	94.1	1.6	48.3	3.00	0.91	0.010 K		0.010 K	0.013
94/07/25	1435	10	18.6	28.15	19.89	8.0		7.5	95.0		44.3	3.30	1.50	0.010 K		0.010 K	0.010
94/08/30	1320	0	20.5	28.42	19.62	8.1	1 U	7.4	97.8	3.2	59.9	1.20	0.74	0.010 K		0.010 K	0.034
94/08/30	1325	8	20.3	28.42	19.68	8.1		7.2	95.4		61.8	1.10	1.10	0.010 K		0.010 K	0.035
94/09/27	1400	0	17.9	28.99	20.70	7.9	1	7.2	91.5	2.6	54.8	1.90	1.60	0.010 K		0.010 K	0.033
94/09/27	1405	8	17.6	29.02	20.79	7.9		7.5	93.6		54.6	2.00	4.70	0.010 K		0.013	0.042

Station:
*** GYS004** Grays Harbor - Chehalis R. 46 Deg 58.7' N 123 Deg 47.0' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/11/21	1000	0	5.8	0.08	0.01	6.8	97 S	12.0	96.9	0.9	18.3			0.436		0.010 U	0.010 U
94/11/21	1005	9	7.2	10.93	8.50	6.6		10.7	95.7		6.9			0.221		0.030	0.015
95/01/04	1015	0	4.0	0.04	0.01	6.5	22 S	13.2	101.5	0.8	10.4			0.654		0.023	0.010 U
95/01/04	1020	10	4.0	0.04	0.01	6.2		12.5	96.0		9.5			0.639		0.029	0.010 U
95/02/08	0945	0	8.7	1.93	1.33	7.0	33	10.7	93.8	1.2	31.0			0.564		0.013	0.010 U
95/02/08	0950	10	9.7	16.70	12.74	7.1		9.5	93.7		26.9			0.383		0.022	0.013
95/03/28	1035	0	8.9	2.38	1.66	7.2	15	11.7	103.0	1.6	35.3			0.507		0.010 U	0.010 U
95/03/28	1040	8	9.5	15.79	12.06	7.7		10.1	98.8		5.3			0.246		0.028	0.012
95/04/10	1010	0	9.1	1.26	0.77	7.2	37 S	11.5	101.3	1.6	42.8			0.374		0.024	0.010 U
95/04/10	1015	10	10.6	12.04	9.01	7.3		9.9	97.0		30.1			0.143		0.047	0.022
95/05/09	0950	0	12.8	5.45	3.63	7.3	12	9.5	93.3	2.9	63.0			0.357		0.018	0.010 U
95/05/09	0955	10	12.5	24.91	18.68	7.9		7.5	82.6		32.3			0.097		0.028	0.010 U
95/06/21	1015	0	15.7	7.77	4.96	7.5	250 J	8.9	94.7	1.8	42.8			0.266		0.010 U	0.037
95/06/21	1020	10	15.6	18.96	13.53	7.6		7.7	88.1		27.1			0.114		0.041	0.033
95/07/17	0955	0	19.8	7.19	3.71	7.3	190 J	6.5	75.4	1.2	11.7			0.272		0.017	0.023
95/07/17	1000	10	19.4	15.02	9.73	7.4		6.1	73.1		5.0			0.228		0.030	0.025
95/08/14	1020	0	17.9	3.49	1.29	7.2	170 X	7.6	82.1	0.7	10.3			0.155 J		0.025 J	0.014
95/08/14	1025	9	17.9	7.54	4.37	7.2		7.2	80.5		4.9			0.135		0.024	0.014
95/09/18	1000	0	18.0	14.11	9.34	7.5	9	6.5	75.6	2.5	55.9			0.166		0.010 U	0.028
95/09/18	1005	10	16.2	27.83	20.20	7.7		5.4	65.2		35.0			0.093		0.050	0.041

Station:
*** GYS008** Grays Harbor - Mid-S. Channel 46 Deg 56.3' N 123 Deg 54.7' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/11/21	1035	1	6.6	9.77	7.63	7.4	37	S 11.1	97.1	1.5	23.4	1.30 J	1.60 J	0.240		0.024	0.012
94/11/21	1040	4	7.3	15.73	12.25	7.5		10.4	95.9		13.1	2.90 J	7.20 J	0.147		0.034	0.020
95/01/04	1030	0	5.0	12.95	10.24	7.5	22	X 11.2	95.7	0.8	10.3	0.44	0.92	0.314		0.024	0.012
95/01/04	1035	5	5.4	15.35	12.11	7.6		11.1	97.8		0.8						
95/02/08	1005	0	9.0	11.42	8.72	7.6	49	S 10.0	93.4	1.2	21.7	0.92	0.84	0.395		0.017	0.013
95/02/08	1010	7	10.0	19.63	14.98	7.9		9.1	91.7		20.5	1.20	0.84	0.237		0.010	0.018
95/03/28	1110	0					10			1.6		1.10	1.10	0.340		0.010 U	0.010 U
95/04/10	1035	0	10.0	9.50	7.11	7.8	9	S 10.4	98.7	1.4	33.8	2.40	1.10	0.292		0.020	0.013
95/04/10	1040	10	11.3	18.37	13.82	8.0		9.2	95.0		46.1	2.60	0.84	0.143		0.022	0.060
95/05/09	1010	0	13.8	16.85	12.24	7.9	1400	J 8.3	89.5	2.8	53.1	5.30	0.05 U	0.148		0.010 U	0.010 U
95/05/09	1015	6	13.1	23.68	17.63	7.9		7.6	84.1		63.0	1.70	0.52	0.078		0.010 U	0.010 U
95/06/21	1035	0					190			1.0		5.30	2.70	0.129		0.034	0.037
95/06/21	1040	10										4.00	3.50	0.051		0.025	0.023
95/07/17	1015	0	19.2	21.75	14.88	7.7	1000	6.2	76.8	1.2	9.4	3.10	2.70	0.110		0.036	0.033
95/07/17	1020	3	19.1	21.80	14.94	7.7		6.1	76.0		6.2	3.70	4.50	0.112		0.038	0.038
95/08/14	1045	0	16.9	22.69	16.11	7.6	280	X 6.7	80.1	1.1	15.4			0.111		0.039	0.028
95/08/14	1050	10	16.9	23.18	16.49	7.6		6.8	81.4		9.4						
95/08/21	1520	0	18.5	10.37	6.40	7.9	2700	J 9.9	112.7	1.2	24.3	4.40	2.30	0.075		0.010 U	0.020
95/08/21	1525	6	18.6	21.47	14.81	7.8		11.3	137.9		14.6	2.90	2.80	0.063		0.017	0.020
95/09/18	1030	0	17.7	23.84	16.82	7.6	84	5.8	70.8	1.7	31.6	2.40	2.40	0.083		0.043	0.034
95/09/18	1035	6	16.8	26.61	19.13	7.7		5.7	69.6		58.4	2.50	1.70	0.079		0.037	0.036

Station:
*** GYS009** Grays Harbor - Moon Island Reach 46 Deg 57.9' N 123 Deg 56.9' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4- DISS (MG/L)
94/11/21	1055	0	6.7	10.56	8.25	7.5		11.1	97.5	1.5	35.0						
94/11/21	1100	9	8.3	23.48	18.21	7.8		9.9	98.4		22.4						
95/01/04	1055	0	5.1	11.47	9.06	7.5		11.4	96.7	1.0	18.2						
95/01/04	1100	7	6.5	22.89	17.95	7.8		10.3	98.2		1.4						
95/02/08	1025	0	8.7	12.29	9.42	7.6		10.3	95.9	1.8	41.3						
95/02/08	1030	10	10.2	24.13	18.45	8.0		9.2	95.6		30.1						
95/03/28	1120	0	10.3	19.27	14.66	8.0		10.0	101.5	1.7	15.7						
95/03/28	1125	8	10.3	26.03	19.91	8.1		9.4	99.2		16.0						
95/04/10	1100	0	10.2	11.80	8.88	8.0		10.3	99.3	1.4	39.7						
95/04/10	1105	10	11.1	22.19	16.81	8.2		9.4	98.9		25.7						
95/05/09	1025	0	13.4	14.97	10.87	7.9		8.4	89.2	3.4	63.0						
95/05/09	1030	10	12.3	27.12	20.43	8.0		7.4	82.7		55.7						
95/06/21	1055	0	15.7	19.07	13.60	7.7		8.1	92.4	1.7	30.1						
95/06/21	1100	10	15.3	24.41	17.77	7.9		8.0	93.8		43.8						
95/07/17	1040	0	19.2	21.96	15.04	7.7		6.1	75.5	1.3	17.5						
95/07/17	1045	10	18.4	27.33	19.31	7.9		6.2	78.3		7.0						
95/08/14	1100	0	17.2	20.03	14.02	7.6		6.7	79.1	1.2	22.1						
95/08/14	1105	10	16.7	25.65	18.42	7.7		6.8	82.4		8.6						
95/08/21	1510	0	18.6	22.17	15.34	8.0		9.0	111.1	1.6	41.5						
95/08/21	1515	10	17.1	26.33	18.85	8.0		7.2	88.1		51.8						
95/09/18	1050	0	17.8	22.27	15.60	7.8		6.2	75.7	3.2	59.6						
95/09/18	1055	10	15.4	29.77	21.86	7.8		5.7	68.3		68.0						

Station:
* **GYS015** Grays Harbor - N. Whitcomb Flats 46 Deg 55.4' N 124 Deg 04.5' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-DISS (MG/L)
94/11/21	1135	0	8.1	24.21	18.80	7.9		10.0	99.5	1.8	41.8						
94/11/21	1140	9	9.2	28.17	21.75	7.9		9.4	98.8		32.5						
95/02/08	1055	0	9.1	12.71	9.71	7.8		10.1	95.5	1.7	39.8						
95/02/08	1100	10	10.3	25.92	19.83	8.0		9.2	97.4		55.1						
95/03/28	1200	0	10.8	31.38	23.99	8.2		9.2	101.5	2.5	44.6						
95/03/28	1205	10	10.6	31.47	24.10	8.2		9.1	100.8		52.7						
95/04/10	1130	0	10.5	20.95	15.94	8.2		9.6	99.3	2.5	57.0						
95/04/10	1135	10	10.9	26.78	20.40	8.3		9.4	101.8		66.6						
95/05/09	1055	0	13.3	23.12	17.16	8.0		8.1	90.4	4.5	69.5						
95/05/09	1100	10	12.4	28.52	21.49	8.1		8.1	91.1		73.6						
95/06/21	1140	0	14.7	25.91	19.04	8.0		8.4	98.0	3.8	55.8						
95/06/21	1145	10	13.4	28.68	21.43	8.1		8.5	98.0		69.9						
95/07/17	1120	0	18.6	27.72	19.56	7.9		6.3	79.5	2.0	30.4						
95/07/17	1125	10	16.6	30.01	21.78	7.9		6.4	79.2		45.1						
95/08/21	1425	0	16.8	27.62	19.91	8.1		7.9	96.2	4.3	69.9						
95/08/21	1430	9	14.2	29.34	21.78	8.1		7.6	89.0		83.0						
95/09/18	1145	0	16.1	30.36	22.16	8.1		7.6	93.7	6.5	74.3						
95/09/18	1150	10	15.1	30.91	22.80	8.2		8.3	100.7		83.6						

Station:
*** GYS016** Grays Harbor - Damon Point 46 Deg 57.2' N 124 Deg 05.5' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/11/21	1110	0	8.6	26.19	20.29	7.9	4	9.8	99.5	1.2	22.1	1.60 J	1.70 J	0.037		0.024	0.023
94/11/21	1115	2	9.0	27.68	21.39	7.9		9.5	98.9		20.0						
95/02/08	1040	0	9.2	13.93	10.65	7.8	2	9.9	94.4	2.7	52.0	0.88	0.55	0.283		0.011	0.014
95/02/08	1045	8	10.2	25.61	19.60	8.0		9.0	95.2		51.8	1.20	1.20	0.142		0.010 U	0.023
95/03/28	1135	0	10.8	30.94	23.65	8.1	1	9.2	102.1	1.8	33.0	1.60	2.10	0.037		0.010 U	0.013
95/03/28	1140	9	10.5	31.23	23.93	8.1		9.1	100.0		25.2	2.50	5.40	0.034		0.010 U	0.013
95/04/10	1110	0	10.6	19.87	15.08	8.2	3	9.5	97.9	2.0	55.1	2.90	1.10	0.082 J		0.011	0.017 J
95/04/10	1115	6	10.7	21.76	16.54	8.2		9.5	98.3		52.9	3.50	1.70	0.041		0.019	0.018
95/05/09	1040	0	13.0	23.72	17.67	8.0	7	7.8	86.5	3.8	68.2	1.40	0.50	0.068		0.011	0.010 U
95/05/09	1045	9	12.1	28.65	21.65	8.0		7.9	88.0		66.5	2.00	0.67	0.040		0.010 U	0.010 U
95/06/21	1115	0	15.1	25.14	18.37	8.0	2	8.3	97.0	2.7	50.8	5.50	3.00	0.015		0.010 U	0.028
95/06/21	1120	8	12.8	29.96	22.53	8.0		7.8	89.4		69.5	2.10	1.50	0.018		0.013	0.027
95/07/17	1105	0	19.0	29.39	20.74	8.0	1 U	6.2	80.2	2.0	44.6	2.30	1.30	0.023		0.016	0.038
95/07/17	1110	7	17.7	30.44	21.86	8.0		6.0	76.2		45.5	2.10	1.20	0.037		0.024	0.040
95/08/21	1450	0	16.7	27.83	20.09	8.1	1 U	9.5	116.8	3.6	69.3	2.70	1.50	0.022		0.013	0.024
95/08/21	1455	7	16.0	28.20	20.53	8.1		7.0	84.4		69.2	2.90	1.60	0.029		0.023	0.024
95/09/18	1115	0	16.6	29.30	21.24	7.9	3 U	6.2	76.3	5.4	62.1	3.70	1.20	0.045		0.033	0.037
95/09/18	1120	7	15.8	30.26	22.15	8.0		6.2	75.5		75.0	2.60	0.99	0.046		0.033	0.036

Station:
* **WPA001** Willapa Bay - Willapa R., Raymond 46 Deg 41.3' N 123 Deg 44.9' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/11/21	1455	0	6.9	3.73	2.86	7.1	190 J	11.3	95.9	1.2	28.8			0.585		0.009	0.010 U
94/11/21	1500	10	7.1	16.63	12.98	7.6		10.3	95.5		18.1			0.177		0.031	0.016
95/01/04	1140	0	4.4	1.56	1.22	7.2	28 S	12.4	97.4	0.7	4.0			0.472		0.021	0.010 U
95/01/04	1145	7	4.9	7.29	5.77	7.0		12.2	100.4		4.0			0.387		0.030	0.010 U
95/02/08	1410	0	9.3	3.40	2.43	7.3	22	10.7	95.8	2.0	43.3			0.716		0.010	0.010 U
95/02/08	1415	8	9.9	15.70	11.94	7.7		9.5	93.7		14.6			0.351		0.028	0.019
95/03/28	1530	0	9.6	4.54	3.29	7.5	4	11.6	105.8	1.2	35.6			0.533		0.013	0.010 U
95/03/28	1535	9	9.5	10.08	7.62	7.6		11.1	104.1		12.6			0.467		0.018	0.010 U
95/04/10	1350	0	10.0	5.94	4.34	7.6	89	10.8	99.7		52.5	1.60	1.10	0.392		0.028	0.010 U
95/04/10	1355	9	11.6	17.23	12.89	8.0		9.1	93.8		34.6	7.10	1.80	0.134		0.039	0.015
95/05/18	1240	0	14.1	2.37	1.07	7.2	81	9.0	89.9	1.4	24.8			0.146		0.026	0.030
95/05/18	1245	7	14.1	3.78	2.15	7.1		8.3	83.4		6.5			0.069		0.012	0.010 U
95/06/21	1515	0	16.7	9.92	6.42	7.2	17	7.7	84.5	2.3	43.5			0.131		0.039	0.016
95/06/21	1520	8	16.6	18.33	12.85	7.4		7.0	81.0		14.3			0.062		0.067	0.026
95/07/17	1445	0	22.4	15.49	9.36	7.3	14	5.5	70.3	1.4	23.2			0.080		0.061	0.018
95/07/17	1450	7	21.2	19.88	12.98	7.4		5.1	65.2		23.2			0.054		0.085	0.026
95/08/21	1040	0	19.2	19.49	13.16	7.8	34	7.6	93.2	1.6	32.6			0.010 U		0.010 U	0.018
95/08/21	1045	6	19.0	22.24	15.30	7.7		7.1	88.3		40.8			0.010 U		0.014	0.019
95/09/18	1515	0	20.1	18.64	12.31	7.5	32	6.0	74.3	2.1	47.0			0.010		0.067	0.025
95/09/18	1520	8	18.8	25.11	17.53	7.6		5.2	65.0		27.1			0.058		0.082	0.038

Station:
* **WPA003** Willapa Bay - Willapa R., John. Slough 46 Deg 42.3' N 123 Deg 50.2' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/11/21	1435	0	6.8	12.58	9.83	7.6	34 S	11.1	99.6	2.0	43.4	2.00 J	0.88 J	0.269		0.021	0.010 U
94/11/21	1440	10	7.5	23.10	18.01	7.8		10.1	98.7		42.0	1.30 J	1.50 J	0.066		0.024	0.018
95/01/04	1125	0	5.0	13.92	11.00	7.6	16 S	11.4	98.3	0.9	7.4	0.57	0.87	0.381		0.031	0.011
95/01/04	1130	7	5.8	20.48	16.12	7.7		11.0	100.9		0.1	1.60	4.40	0.215		0.029	0.018
95/02/08	1350	0	10.0	11.88	8.96	7.7	4	10.0	95.9	1.7	39.3	0.67	0.66	0.486		0.014	0.010
95/02/08	1355	6	10.1	18.91	14.41	7.9		9.5	95.2		30.6	1.20	0.95	0.251		0.019	0.023
95/03/28	1510	0	10.6	12.83	9.63	8.0	1 U	11.2	110.2	1.3	28.9	2.00	1.20	0.343		0.010 U	0.010 U
95/03/28	1515	7	10.2	20.70	15.79	8.1		10.6	108.3		24.5	3.00	2.70	0.127		0.010 U	0.010 U
95/04/10	1320	0	10.8	11.57	8.62	8.1	46	10.8	105.5	1.7	44.5	7.50	1.80	0.215		0.010 U	0.010 U
95/04/10	1325	7	11.4	20.17	15.20	8.2		9.4	98.1		51.8			0.025		0.010 U	0.018
95/05/18	1220	0	14.8	12.75	8.93	7.9	10	9.1	97.8	1.2	13.1	36.70	5.00	0.010 U		0.012	0.036
95/05/18	1225	4	14.6	14.16	10.04	7.7		8.4	90.3		1.2	5.10	8.20	0.010 U		0.014	0.012
95/06/21	1445	0	16.7	17.54	12.23	7.6	8	8.1	93.2	1.5	25.7	4.40	1.40	0.056		0.022	0.020
95/06/21	1450	6	16.2	22.12	15.83	7.7		7.6	89.6		29.1	2.90	2.10	0.010		0.018	0.021
95/07/17	1425	0	22.4	24.51	16.16	7.8	2	6.2	83.1	1.5	28.6	5.70	1.80	0.024		0.028	0.029
95/07/17	1430	4	20.7	25.69	17.50	7.8		6.1	79.1		8.8	4.20	3.50	0.010 U		0.020	0.030
95/08/21	1100	0	19.4	25.29	17.52	8.0	1 U	7.2	91.6	1.5	48.3	2.30	1.80	0.010 U		0.012	0.022
95/08/21	1105	6	19.5	25.60	17.73	8.1		7.2	91.8		47.1	1.70	1.50	0.010 U		0.012	0.021
95/09/18	1450	0	19.7	23.12	15.80	7.6	3	6.1	77.1	2.1	42.9	4.00	1.90	0.072		0.069	0.032
95/09/18	1455	7	17.7	27.57	19.66	7.7		5.9	74.2		53.1	2.00	1.70	0.044		0.050	0.040

Station:
*** WPA004** Willapa Bay - Toke Point 46 Deg 41.2' N 123 Deg 58.3' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)		PHEOPIG (UG/L)		NO3 & NO2-N DISS (MG/L)		NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)	
94/11/21	1310	0	8.7	27.26	21.11	7.9	3		10.1	104.3	2.1	54.4	1.40	J	1.70	J	0.027			0.017		0.025	
94/11/21	1315	10	8.9	27.76	21.47	7.9			10.0	103.8		48.9	1.30	J	1.50	J	0.026			0.012		0.017	
95/02/08	1215	0	9.7	17.71	13.53	7.9	2		9.5	94.5	3.0	57.4	1.20		0.57		0.298			0.011		0.019	
95/02/08	1220	10	9.9	20.77	15.88	7.9			9.4	95.6		59.3	1.30		0.92		0.217			0.010	U	0.022	
95/03/28	1325	0	11.3	24.11	18.26	8.2	1	U	10.4	110.7	2.4	55.5	1.70		0.88		0.059			0.010	U	0.010	U
95/03/28	1330	7	10.5	27.84	21.29	8.2			10.1	108.6		57.1	4.00		1.10		0.036			0.010	U	0.010	U
95/04/10	1155	0	10.7	19.45	14.74	8.3	1	U	9.7	99.3	2.5	66.1					0.016			0.010	U	0.010	
95/04/10	1200	6	10.9	21.10	15.99	8.3			9.8	101.8		70.4					0.010	U		0.021		0.010	U
95/05/18	1100	0	13.6	21.32	15.72	7.9	1	U	8.1	89.1	1.6	29.0	3.20		1.50		0.010	U		0.013		0.014	
95/05/18	1105	8	13.2	23.83	17.72	7.9			7.9	87.8		24.6	2.30		1.80		0.010	U		0.013		0.017	
95/06/21	1235	0	15.6	25.11	18.24	8.0	9		8.1	95.0	2.9	52.1	4.40		2.10		0.010	U		0.012		0.026	
95/06/21	1240	10	15.3	25.35	18.49	8.0			8.1	94.4		60.0	3.90		2.00		0.010	U		0.012		0.027	
95/07/17	1235	0	20.1	28.03	19.43	8.0	1	U	6.6	86.5	2.7	44.8	3.80		1.70		0.010	U		0.010	U	0.031	
95/07/17	1240	7	18.8	28.73	20.29	8.0			6.5	84.0		56.1	4.70		2.30		0.010	U		0.010	U	0.029	
95/08/21	1220	0	17.0	26.49	19.00	8.3	1	U	8.6	104.6	3.4	73.2	5.90		1.50		0.010	U		0.010	U	0.017	
95/08/21	1225	10	16.5	26.50	19.11	8.3			8.6	103.6		73.4					0.010	U		0.010	U	0.017	
95/09/18	1310	0	16.8	29.29	21.18	7.9	1	U	7.6	94.0	4.8	69.9	10.70		3.00		0.033			0.010	U	0.037	
95/09/18	1315	10	15.9	29.56	21.59	8.0			8.0	97.8		76.7	6.50		1.60		0.029			0.010	U	0.035	

Station:
*** WPA006** Willapa Bay - Nahcotta Channel 46 Deg 32.7' N 123 Deg 58.7' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)		DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)		PHEOPIG (UG/L)		NO3 & NO2-N DISS (MG/L)		NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)		ORTHO PO4-P DISS (MG/L)	
94/11/21	1350	0	7.6	24.73	19.27	7.9	1		10.2	101.0	2.7	54.7	1.40	J	1.00	J	0.047			0.020		0.019	
94/11/21	1355	10	7.7	25.04	19.50	7.9			10.2	101.0		49.8	1.50	J	2.00	J	0.046			0.030		0.030	
95/02/08	1305	0	10.1	19.24	14.67	7.9	1		9.8	98.6	2.5	51.7	1.20		0.79		0.204			0.010		0.024	
95/02/08	1310	6	10.0	19.25	14.69	7.9			9.8	99.2		51.9	1.00		0.92		0.203			0.012		0.023	
95/03/28	1420	0	10.6	22.48	17.11	8.2	1	U	11.0	115.0	2.0	59.2	3.70		1.20		0.024			0.010	U	0.010	U
95/03/28	1425	9	10.2	23.72	18.13	8.2			10.6	110.3		39.7	5.70		3.60		0.023			0.010	U	0.010	U
95/04/10	1230	0	11.1	21.95	16.62	8.2	1		9.8	102.5	2.4	67.5	2.40		0.65		0.010	U		0.010	U	0.016	
95/04/10	1235	8	11.2	22.35	16.92	8.3			9.7	102.2		75.5	2.20		0.74		0.010	U		0.010	U	0.016	
95/05/18	1130	0	14.2	15.57	11.19	7.9	1	U	8.4	90.3	2.0	46.4	2.00		1.40		0.010	U		0.010	U	0.021	
95/05/18	1135	8	14.3	22.90	16.80	7.9			8.0	91.0		50.3	1.90		1.70		0.010	U		0.013		0.019	
95/06/21	1355	0	15.9	25.99	18.85	7.9	1		8.2	97.6	3.3	62.2	3.00		1.40		0.010	U		0.010	U	0.033	
95/06/21	1400	10	15.9	25.99	18.85	7.9			8.2	97.7		57.3	3.20		2.00		0.010	U		0.010	U	0.033	
95/07/17	1310	0	20.3	27.81	19.21	8.2	1	U	6.9	90.5	2.5	63.4	2.70		1.40		0.010	U		0.010	U	0.045	
95/07/17	1315	5	20.3	27.81	19.21	8.2			6.9	90.8		59.8	2.30		1.90		0.010	U		0.010	U	0.041	
95/08/21	1200	0	18.0	27.63	19.64	8.2	1	U	7.9	99.2	5.2	77.4	3.20		1.30		0.010	U		0.010	U	0.021	
95/08/21	1205	8	18.0	27.65	19.65	8.2			7.9	98.8		77.9	2.60		0.97		0.010	U		0.012		0.025	
95/09/18	1345	0	17.9	28.53	20.35	7.9	1	U	6.8	85.2	6.0	77.6	3.10		1.10		0.028			0.010	U	0.048	
95/09/18	1350	8	17.0	28.90	20.84	7.9			6.8	85.0		79.7	3.70		1.50		0.038			0.010	U	0.045	

Station:
*** WPA007** Willapa Bay - Long Isl., S. Jenson Point 46 Deg 27.2' N 124 Deg 00.5' W

DATE (YY/MM/DD)	TIME (LOCAL)	WATER DEPTH (m)	TEMP (DEG C)	SALINITY (PSU)	DENSITY (SIGMA-T)	pH	FEC COLI MF (#/100ML)	DO (MG/L)	DO SATUR (%)	SECCHI (m)	LIGHT TRANS (%)	CHLRPHL a (UG/L)	PHEOPIG (UG/L)	NO3 & NO2-N DISS (MG/L)	NO2-N DISS (MG/L)	NH4 & NH3-N DISS (MG/L)	ORTHO PO4-P DISS (MG/L)
94/11/21	1415	1	6.9	21.14	16.53	7.8	1 U	11.0	104.4	1.9	42.0	1.20 J	0.95 J	0.069		0.045	0.025
94/11/21	1420	2	6.8	21.24	16.62	7.8		10.9	103.0		43.5						
95/02/08	1325	0	10.3	16.87	12.80	7.9	1 U	10.2	101.9	1.4	23.1	1.20	0.82	0.171		0.010 U	0.022
95/02/08	1330	2	10.2	16.94	12.87	7.9		10.1	101.1		26.9						
95/03/28	1440	0	11.0	19.91	15.06	8.2	1 U	11.2	116.2	2.9	64.0	1.80	0.98	0.015		0.010 U	0.010 U
95/03/28	1445	9	10.6	20.33	15.44	8.2		11.1	113.7		54.1	2.00	1.20	0.019		0.010 U	0.010 U
95/04/10	1255	0	10.8	20.37	15.44	8.2	1 U	9.9	102.7	2.0	49.9	1.30	1.20	0.010 U		0.010 U	0.021
95/04/10	1300	10	11.3	21.77	16.45	8.2		9.6	101.4		70.3	1.70	0.79	0.010 U		0.010 U	0.018
95/05/18	1155	0	14.1	21.26	15.58	7.9	3	8.3	92.3	1.4	19.6	3.70	1.30	0.010 U		0.010 U	0.020
95/05/18	1200	7	14.2	21.42	15.68	7.9		8.2	91.4		17.7	2.40	2.10	0.010 U		0.011	0.023
95/06/21	1325	0	15.9	25.46	18.45	7.9	1	8.4	99.9	2.6	50.0	2.00	1.50	0.010 U		0.010 U	0.033
95/06/21	1330	10	15.9	25.57	18.53	7.9		8.3	98.4		49.6	1.90	1.70	0.010 U		0.010 U	0.038
95/07/17	1400	0	21.1	26.72	18.18	8.1	1 U	6.8	90.6	2.5	47.6	2.50	1.30	0.010 U		0.010 U	0.045
95/07/17	1405	8	20.7	26.80	18.34	8.1		7.0	91.9		43.6	2.70	1.80	0.010 U		0.010 U	0.044
95/08/21	1135	0	19.0	28.12	19.77	8.1	1 U	7.1	91.7	4.1	72.6	2.30	1.10	0.010 U		0.010 U	0.032
95/08/21	1140	10	19.0	28.12	19.77	8.1		7.2	92.7		72.9	1.90	1.40	0.010 U		0.012	0.034
95/09/18	1415	0	19.0	27.24	19.10	7.9	1 U	6.6	84.7	3.5	62.8	2.90	1.10	0.010 U		0.010 U	0.052
95/09/18	1420	10	18.8	27.31	19.20	7.9		6.5	83.4		67.4	1.40	1.20	0.010 U		0.037	0.051

Appendix B

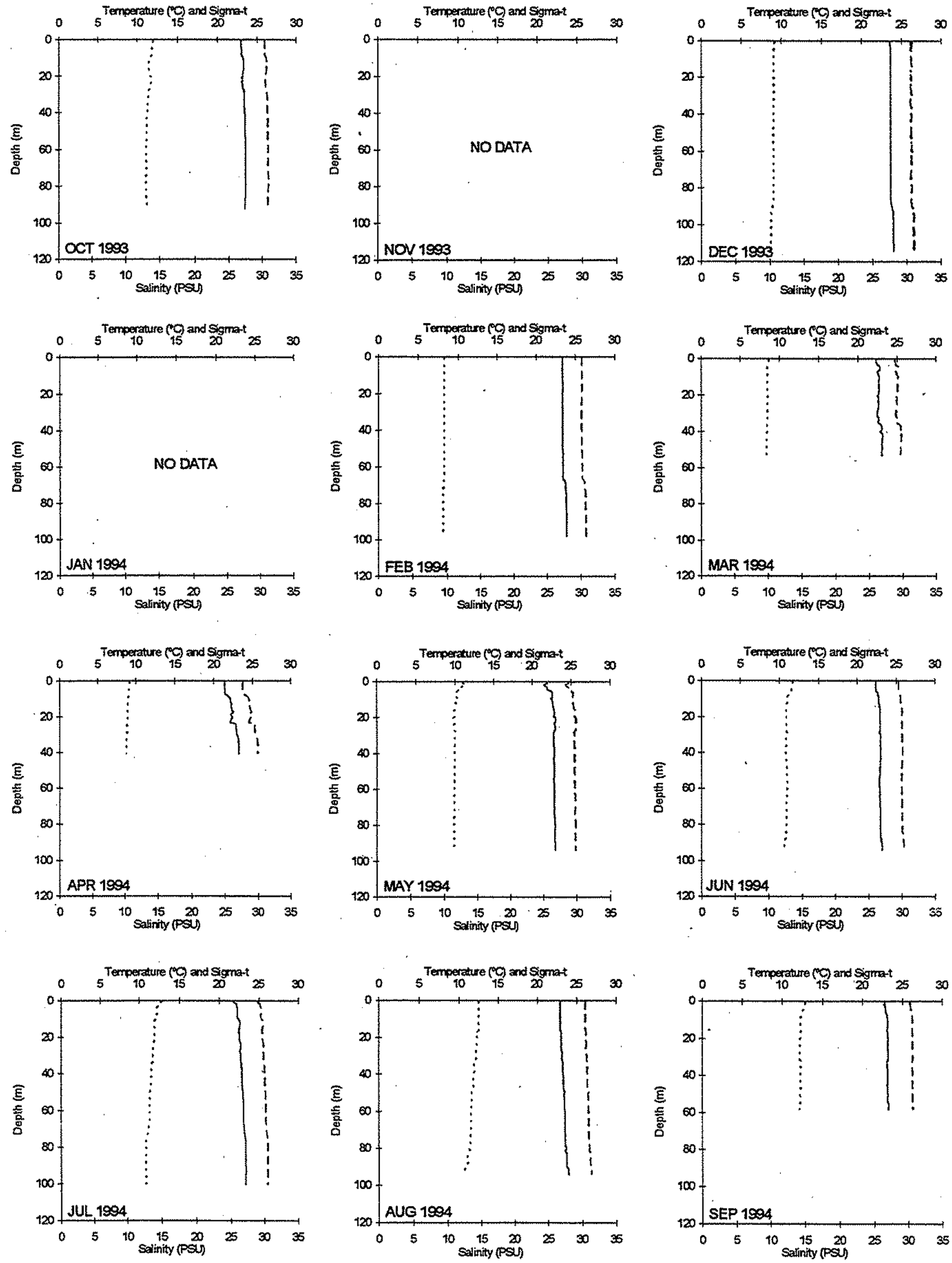
Depth profiles of temperature, salinity, density, dissolved oxygen, and light transmission for WY 1994-95 at:

1) Puget Sound stations

2) Grays Harbor and Willapa Bay stations

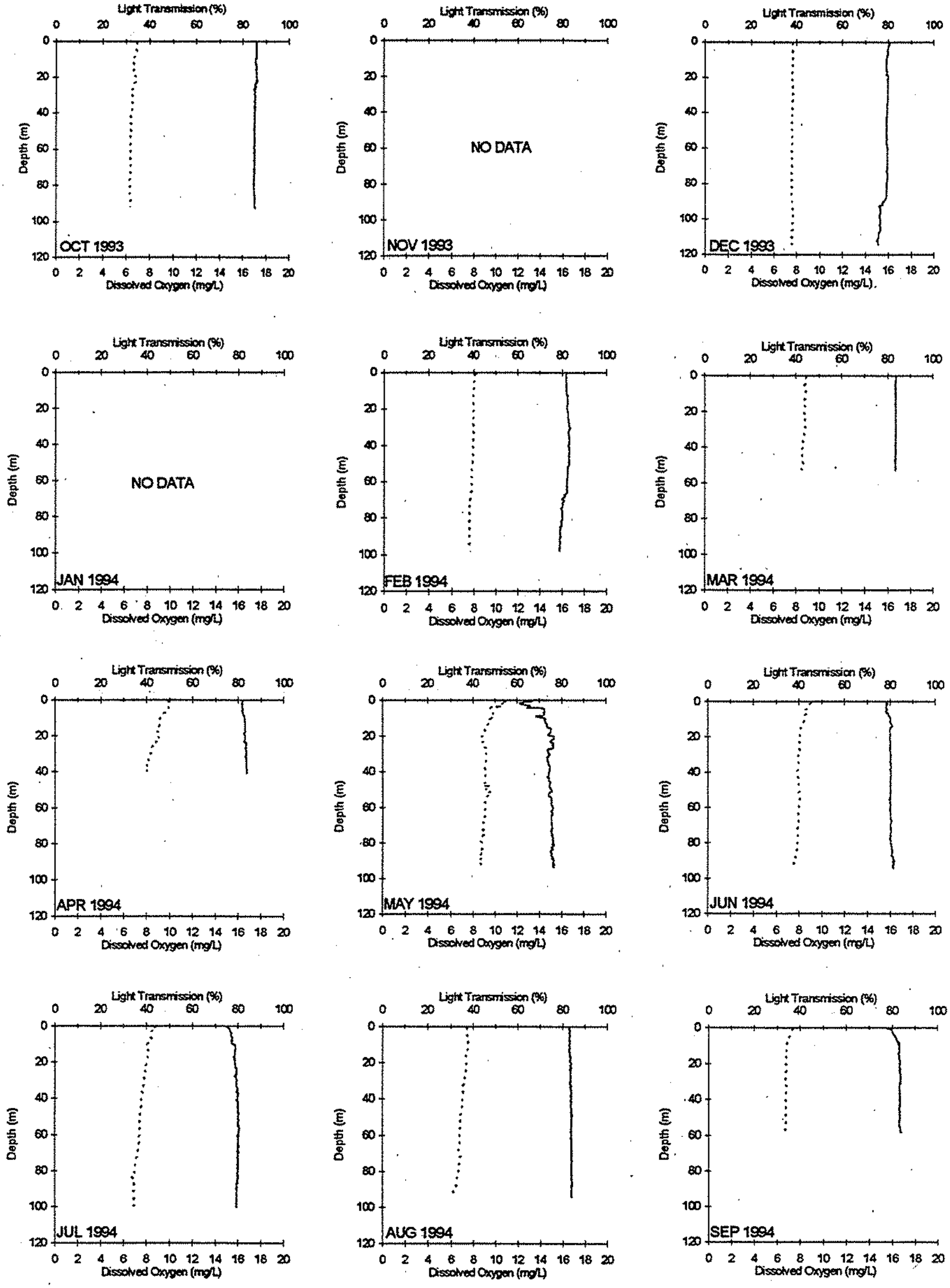
Puget Sound stations

ADM001 Admiralty Inlet - Bush Point



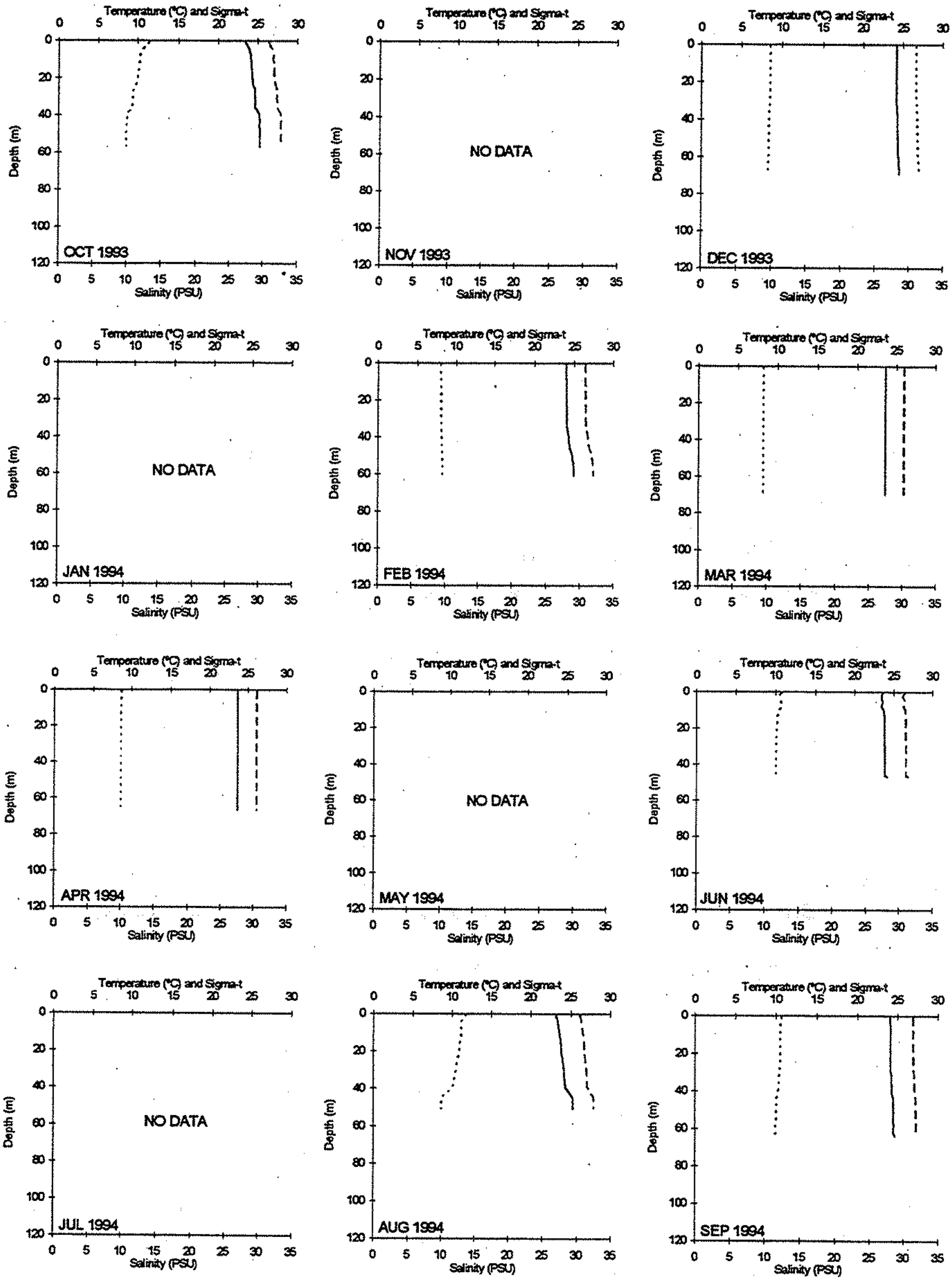
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Admiralty Inlet - Bush Point ADM001



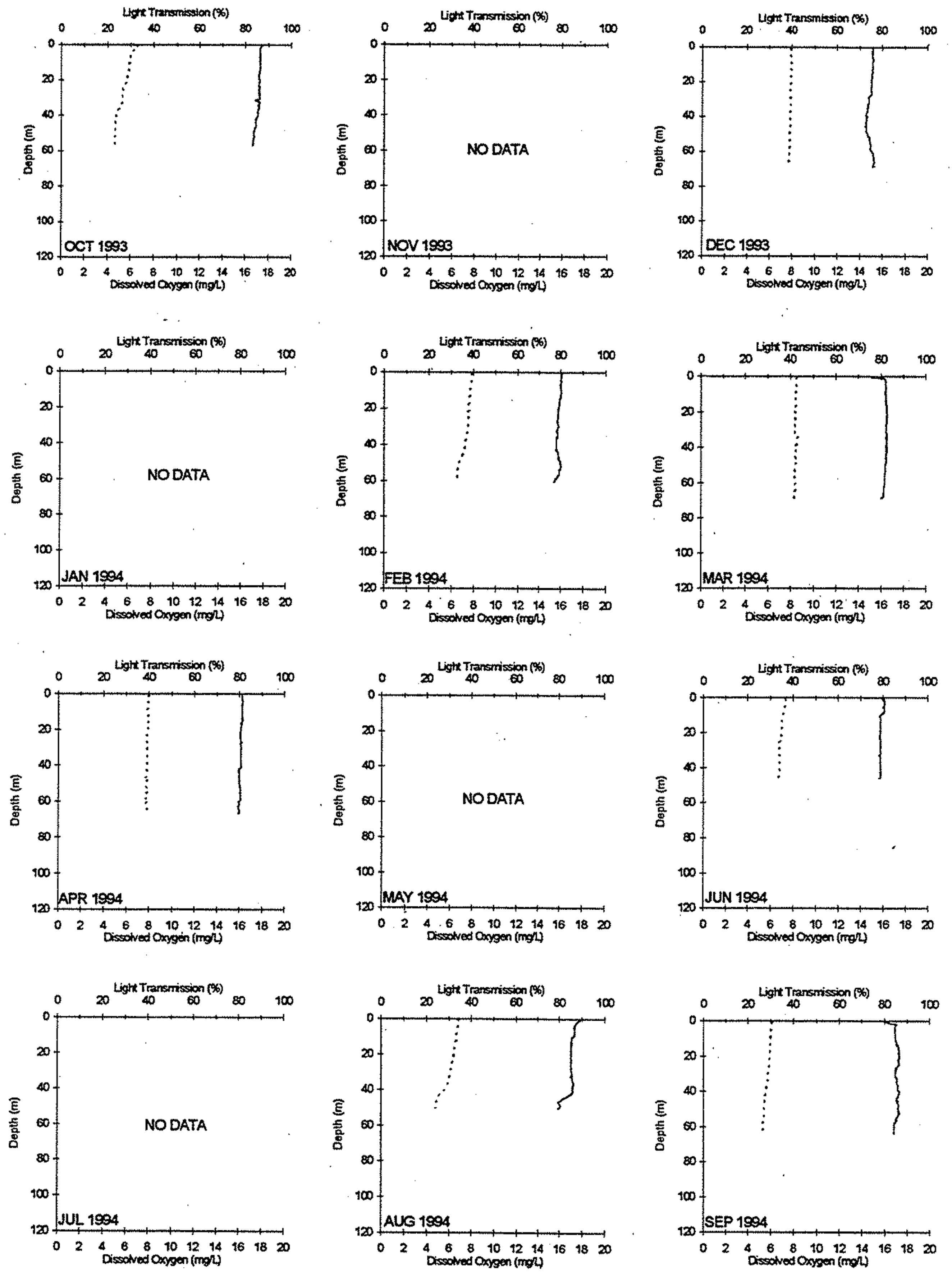
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

ADM002 North Admiralty Inlet - Quimper Peninsula



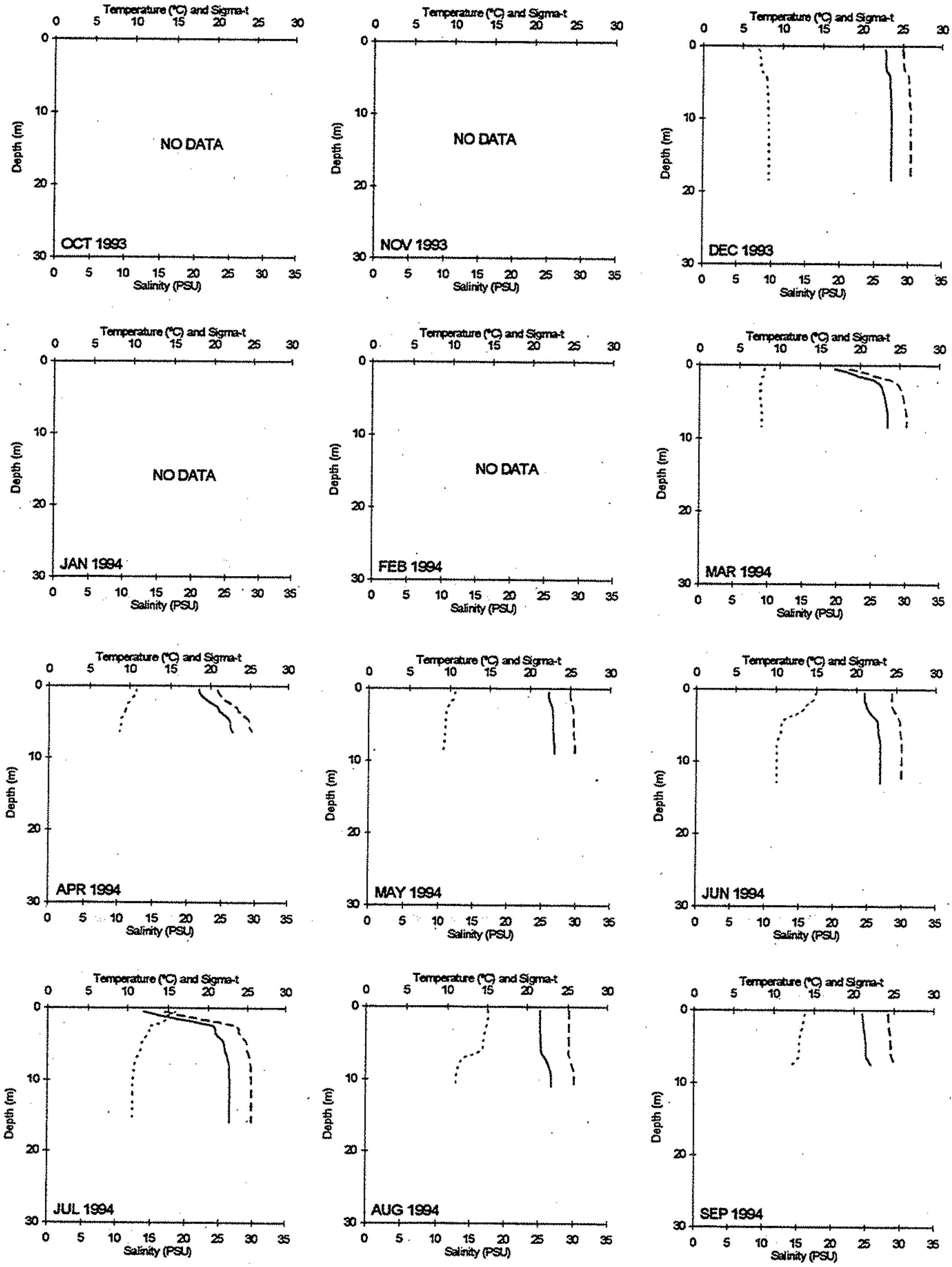
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

North Admiralty Inlet - Quimper Peninsula ADM002



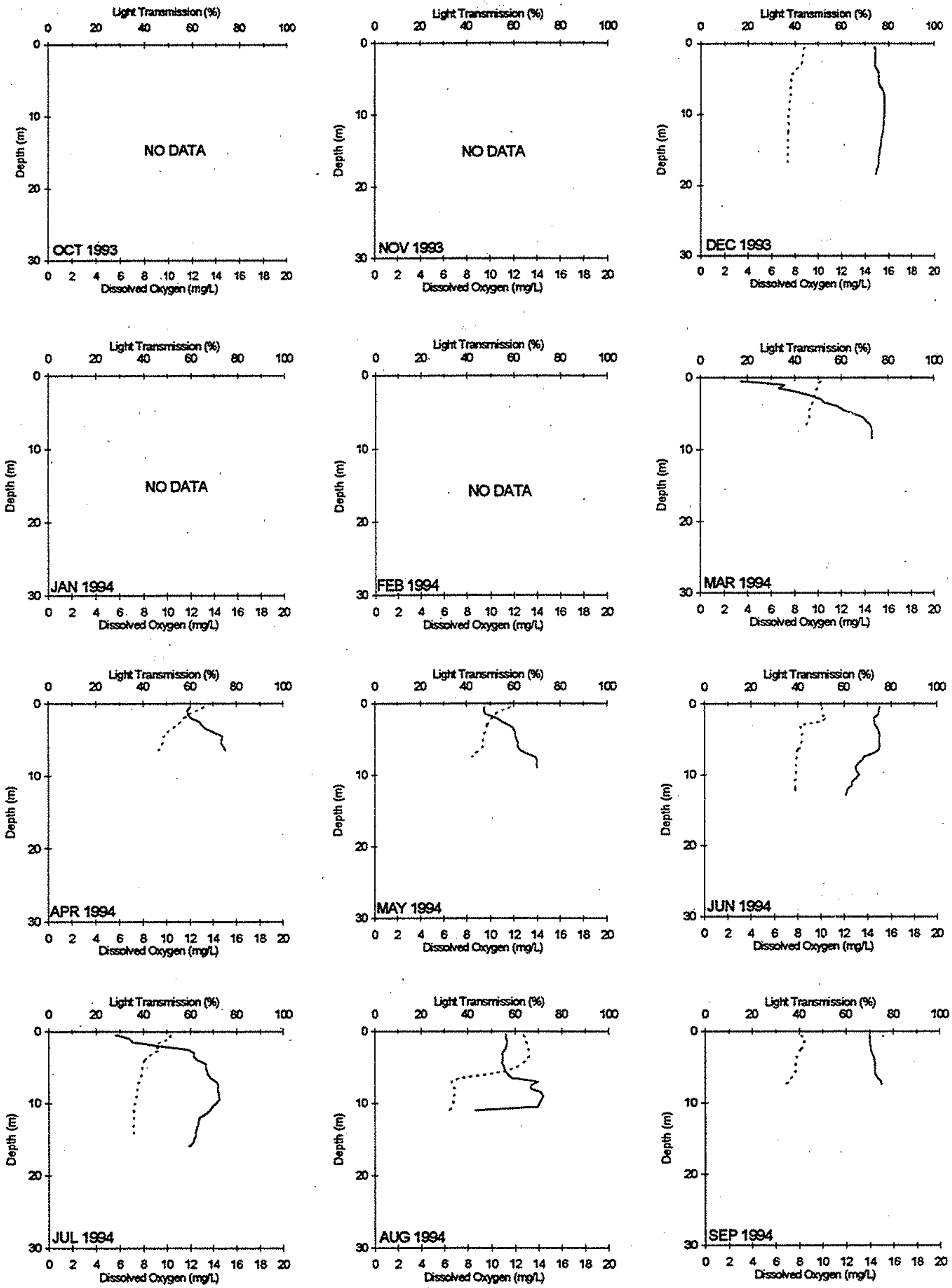
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

BLL009 Bellingham Bay - Point Frances



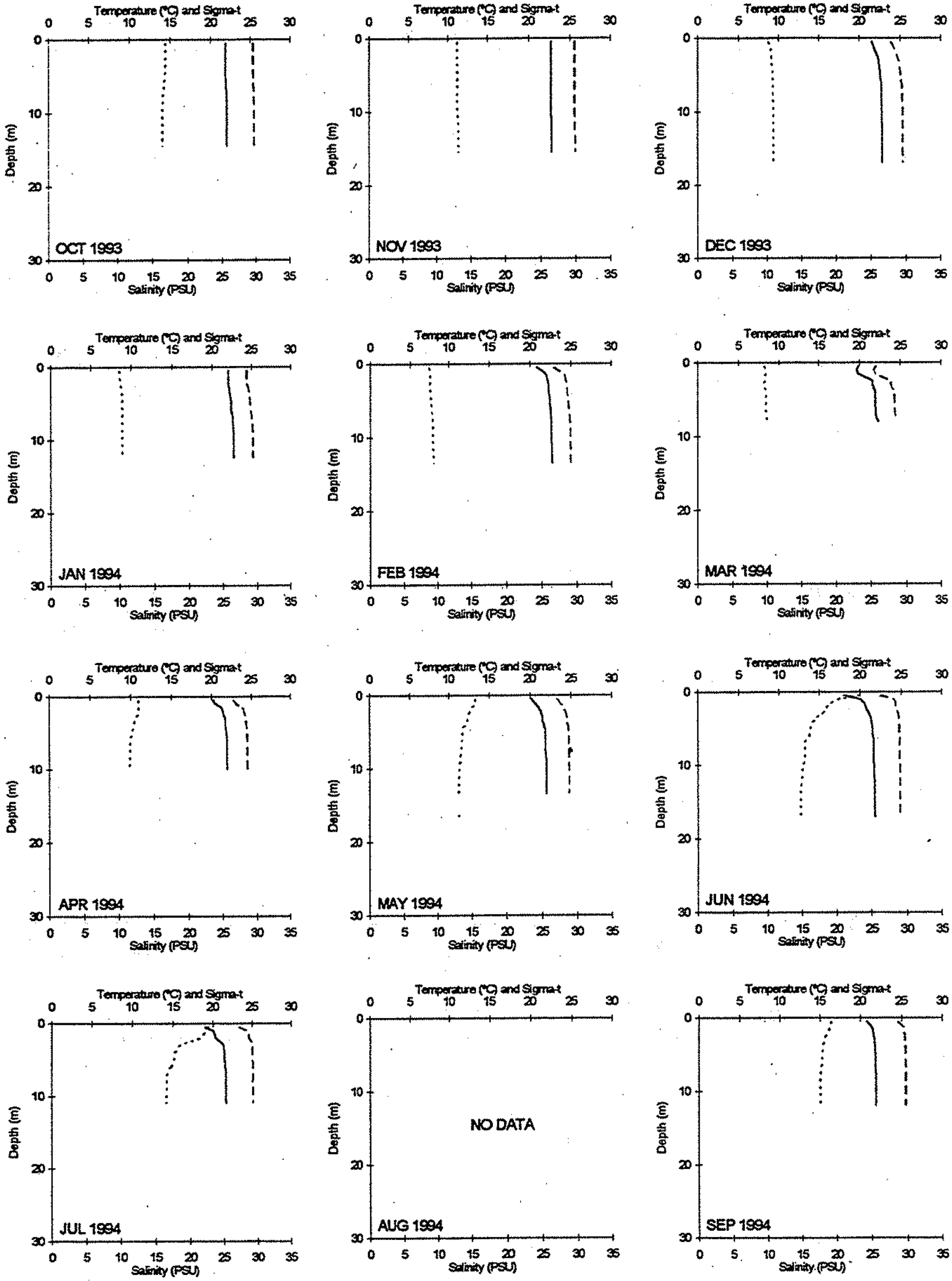
Legend: Temperature = Dotted Line   Salinity = Dashed Line   Sigma-t = Solid Line

Bellingham Bay - Point Frances BLL009



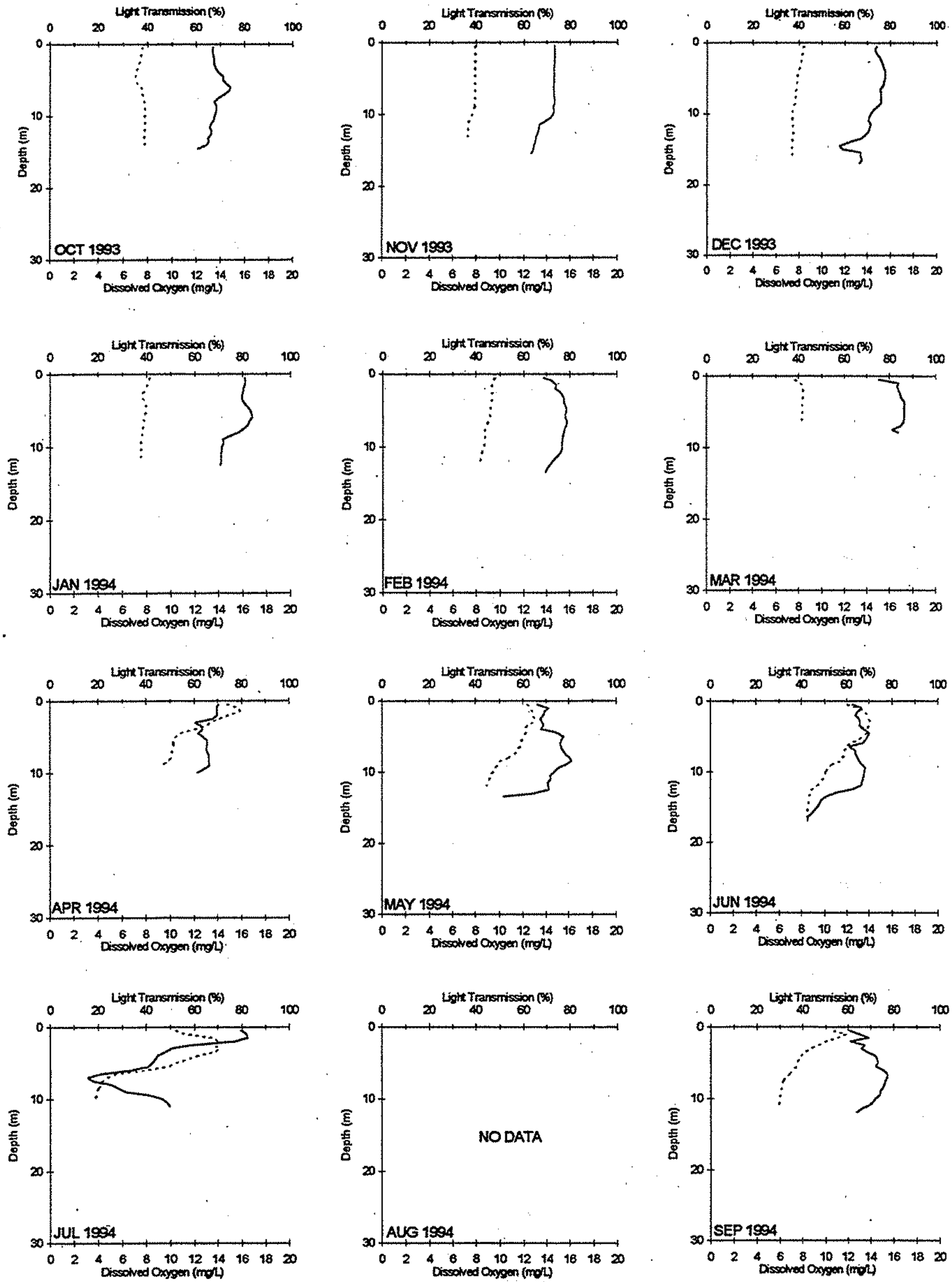
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

BUD005 Budd Inlet - Olympia Shoal



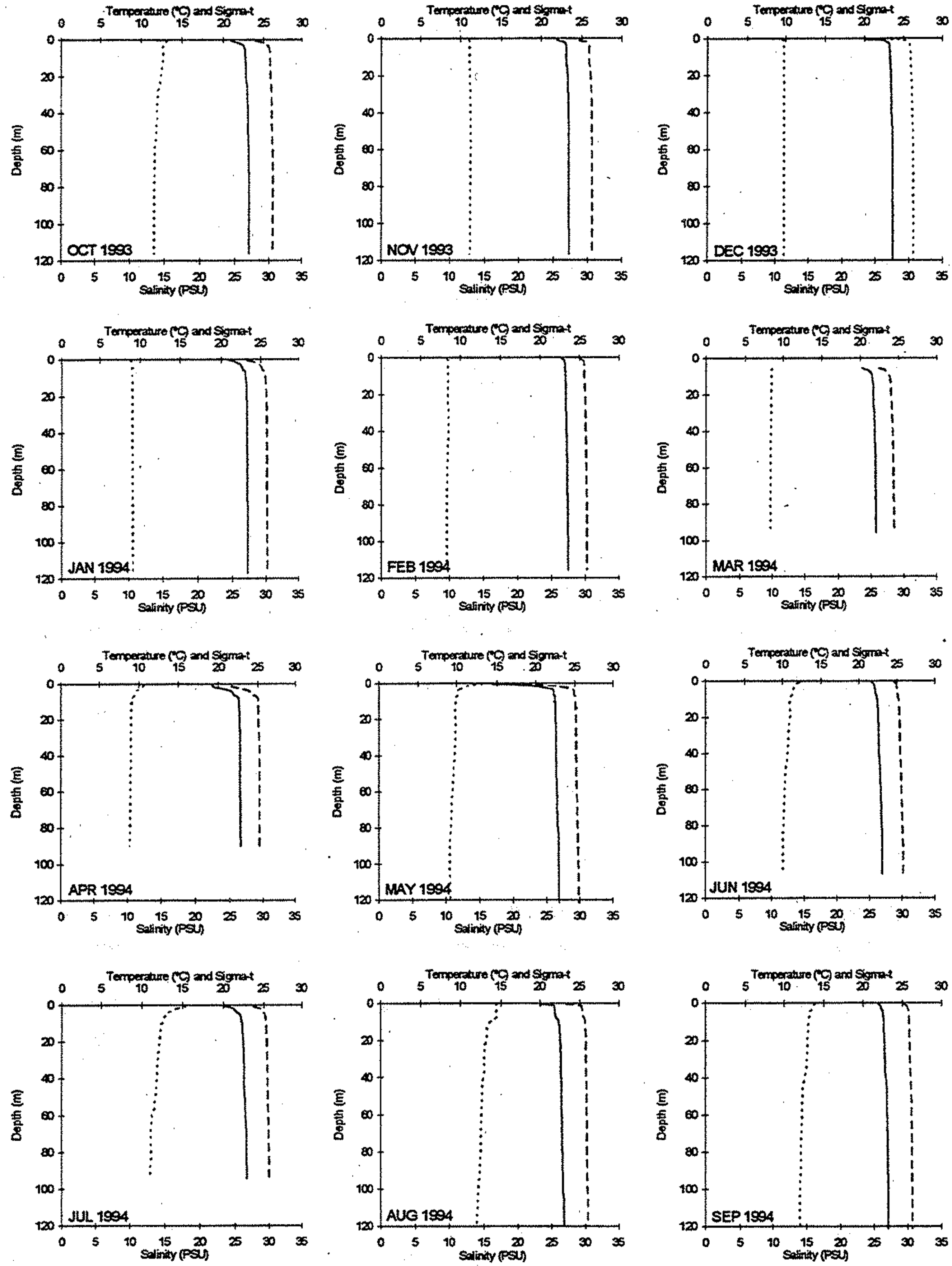
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Budd Inlet - Olympia Shoal BUD005



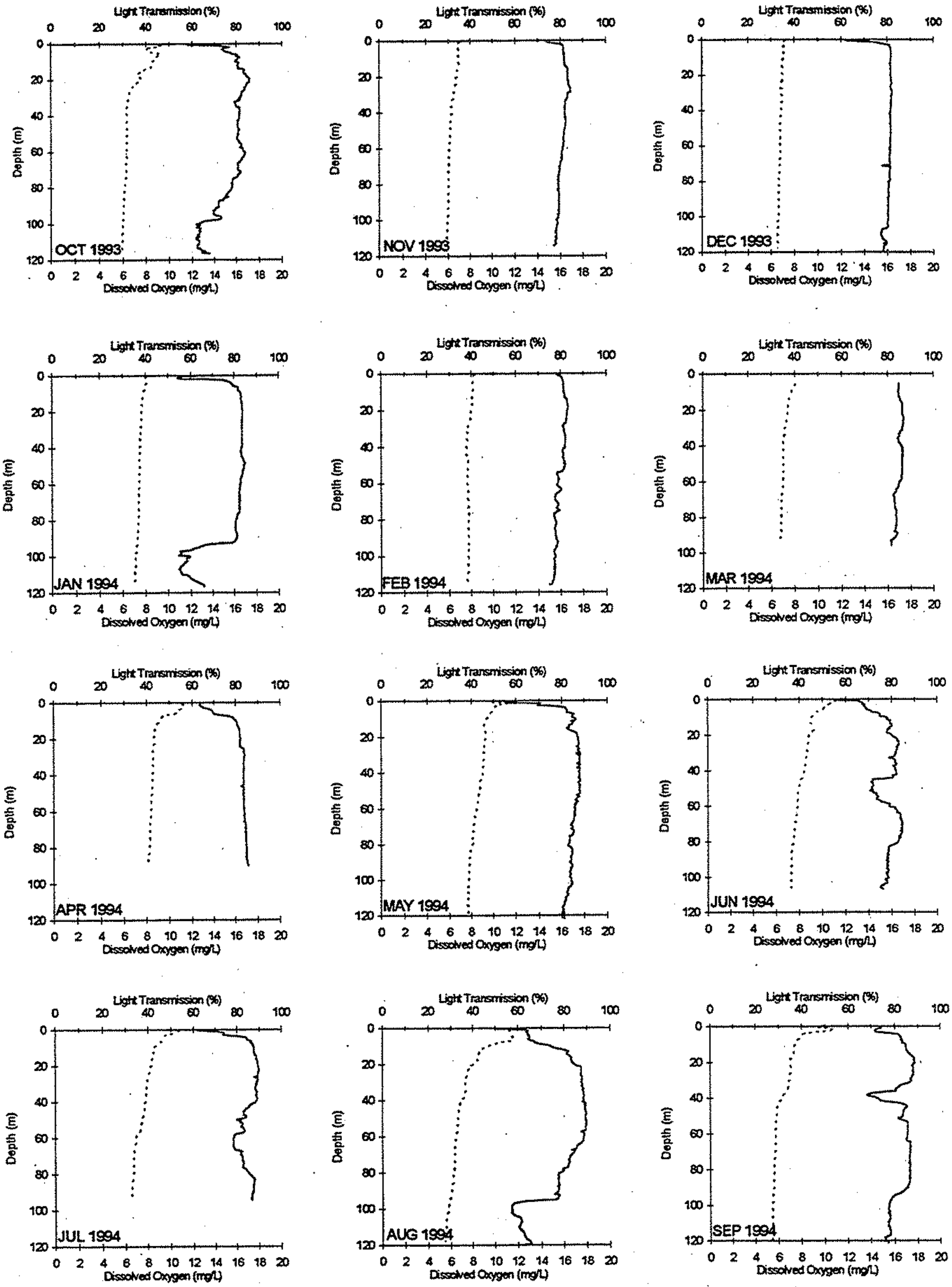
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

CMB003 Commencement Bay - Browns Point



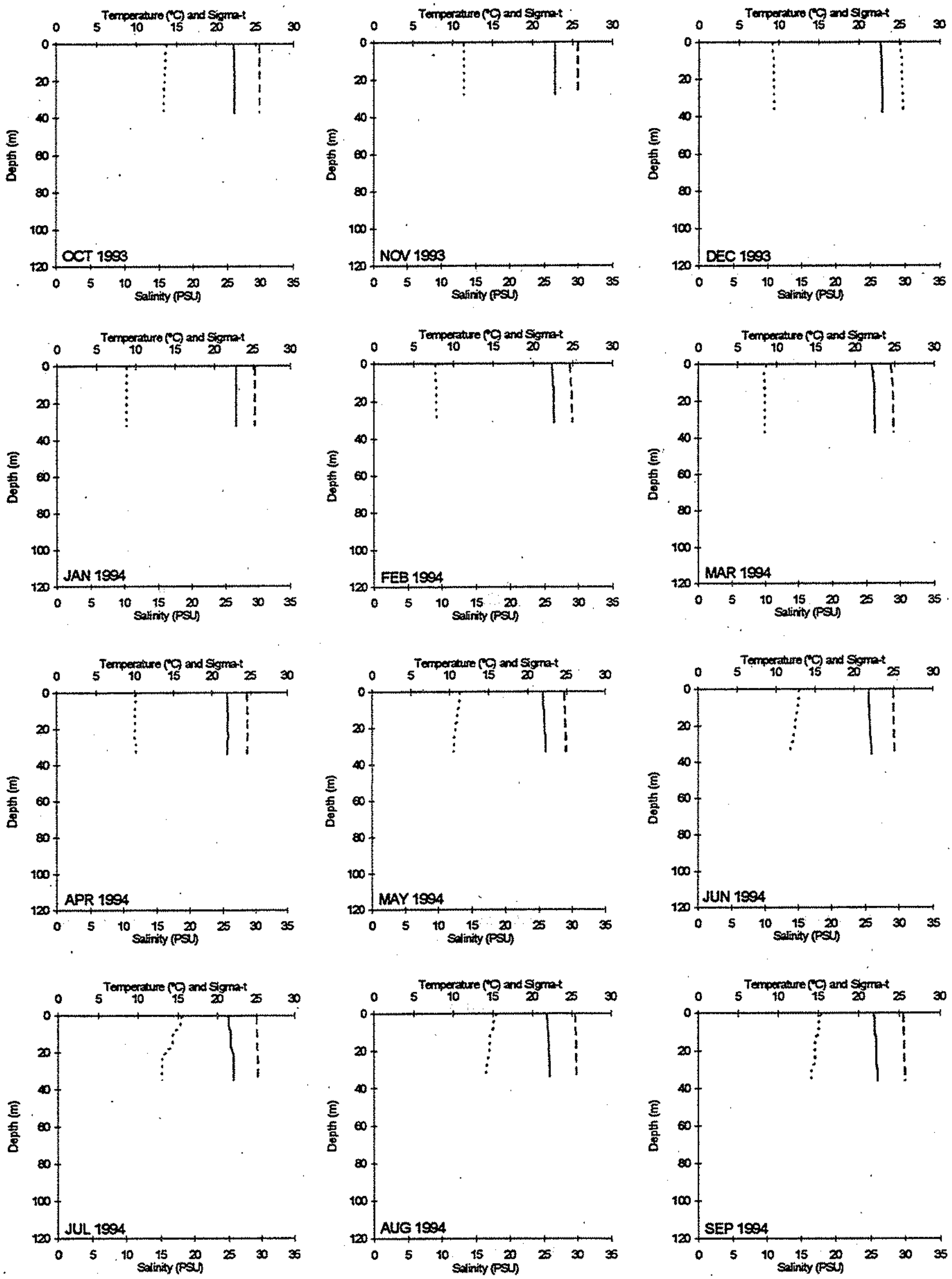
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Commencement Bay - Browns Point CMB003



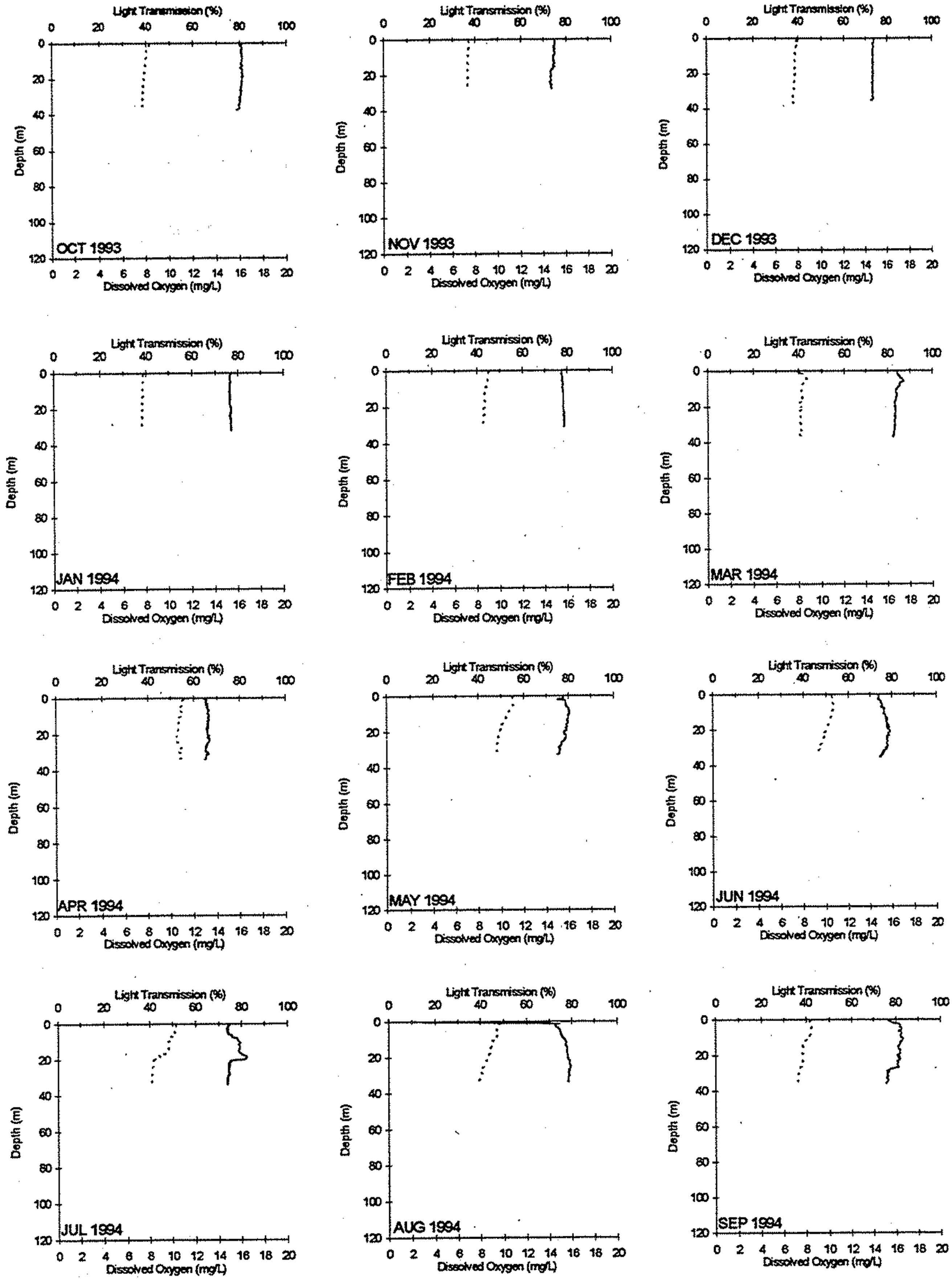
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

DNA001 Dana Passage - S. of Brisco Point



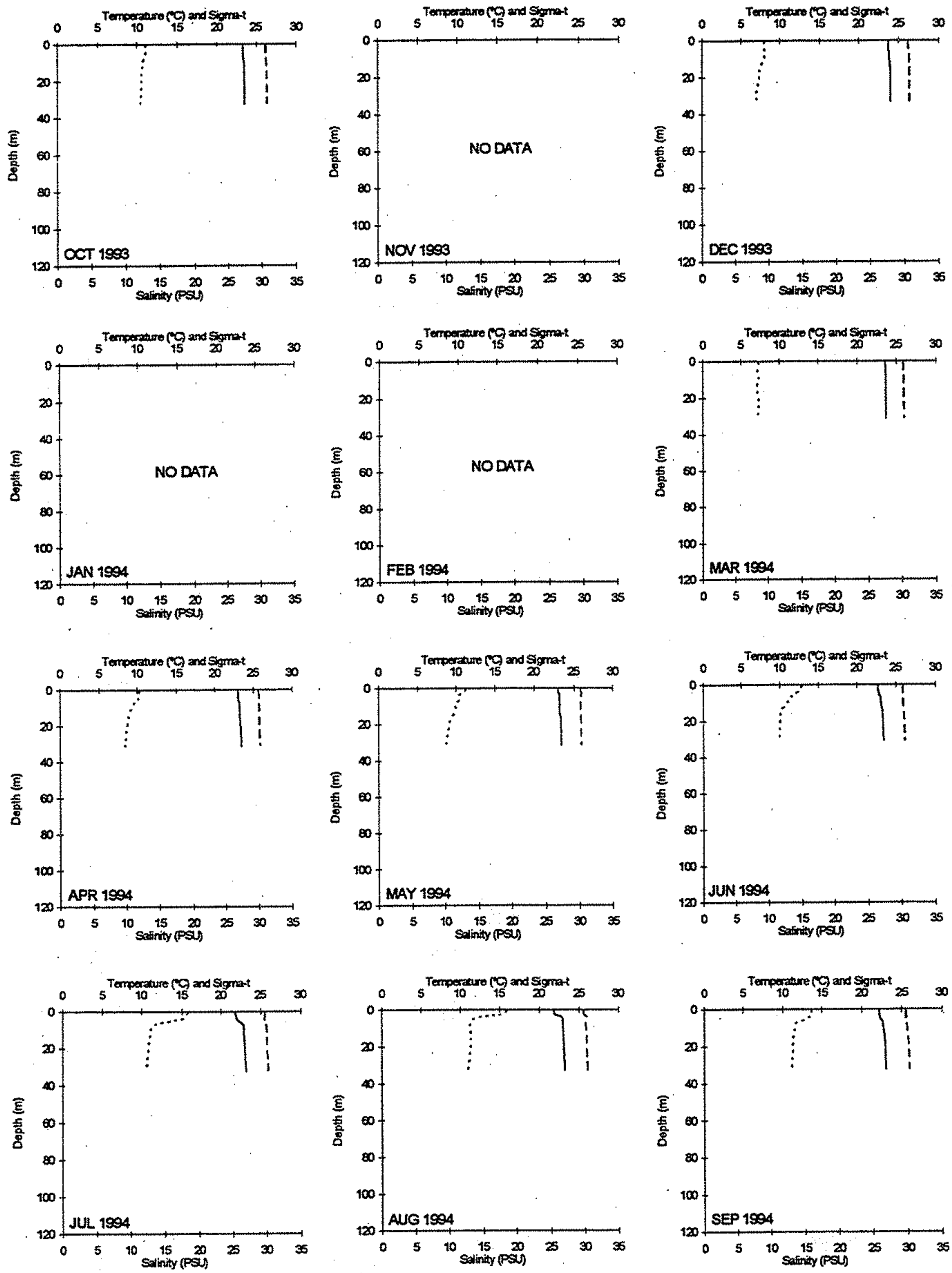
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Dana Passage - S. of Brisco Point DNA001



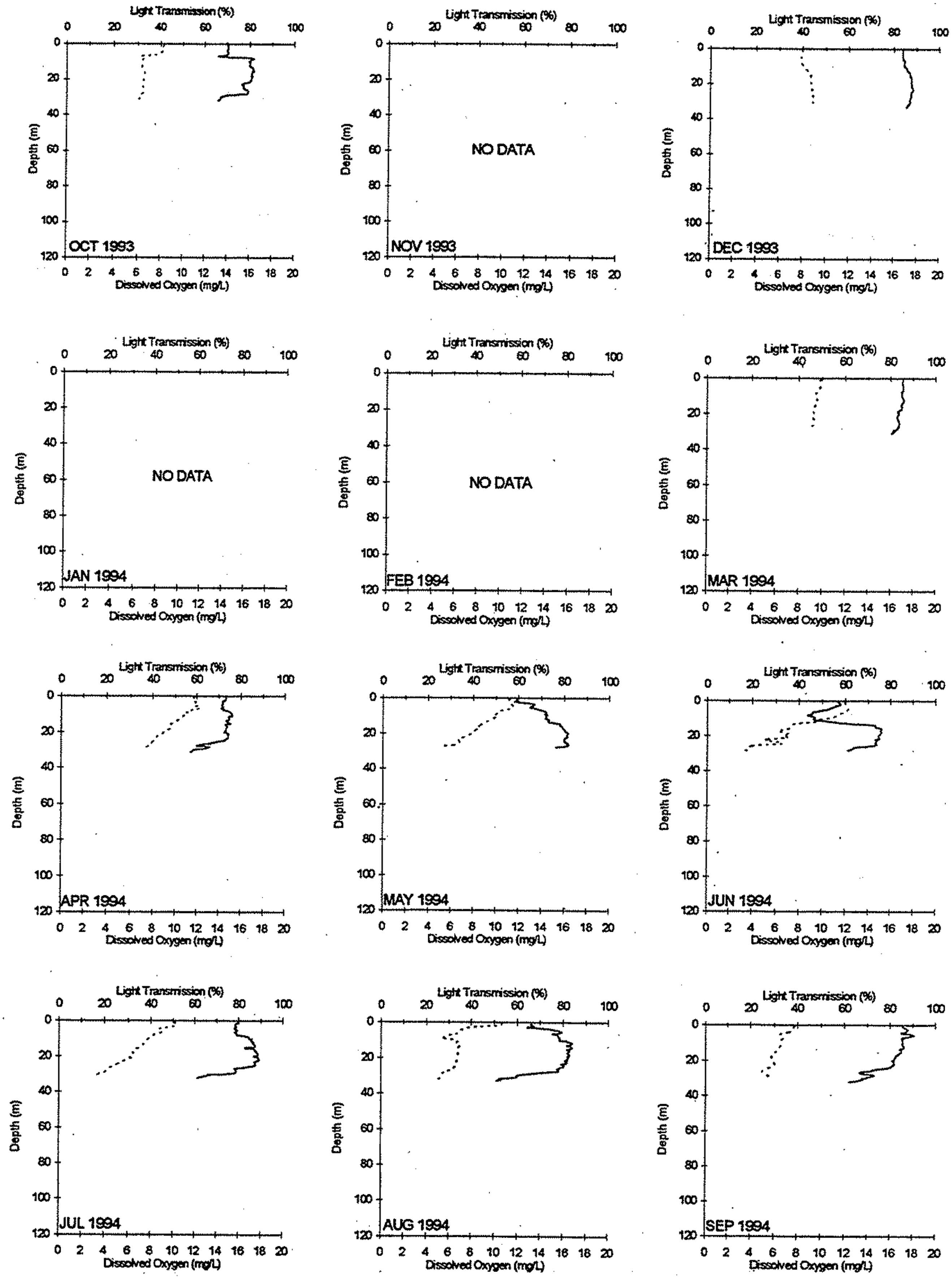
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

EAS001 East Sound - Rosario Point



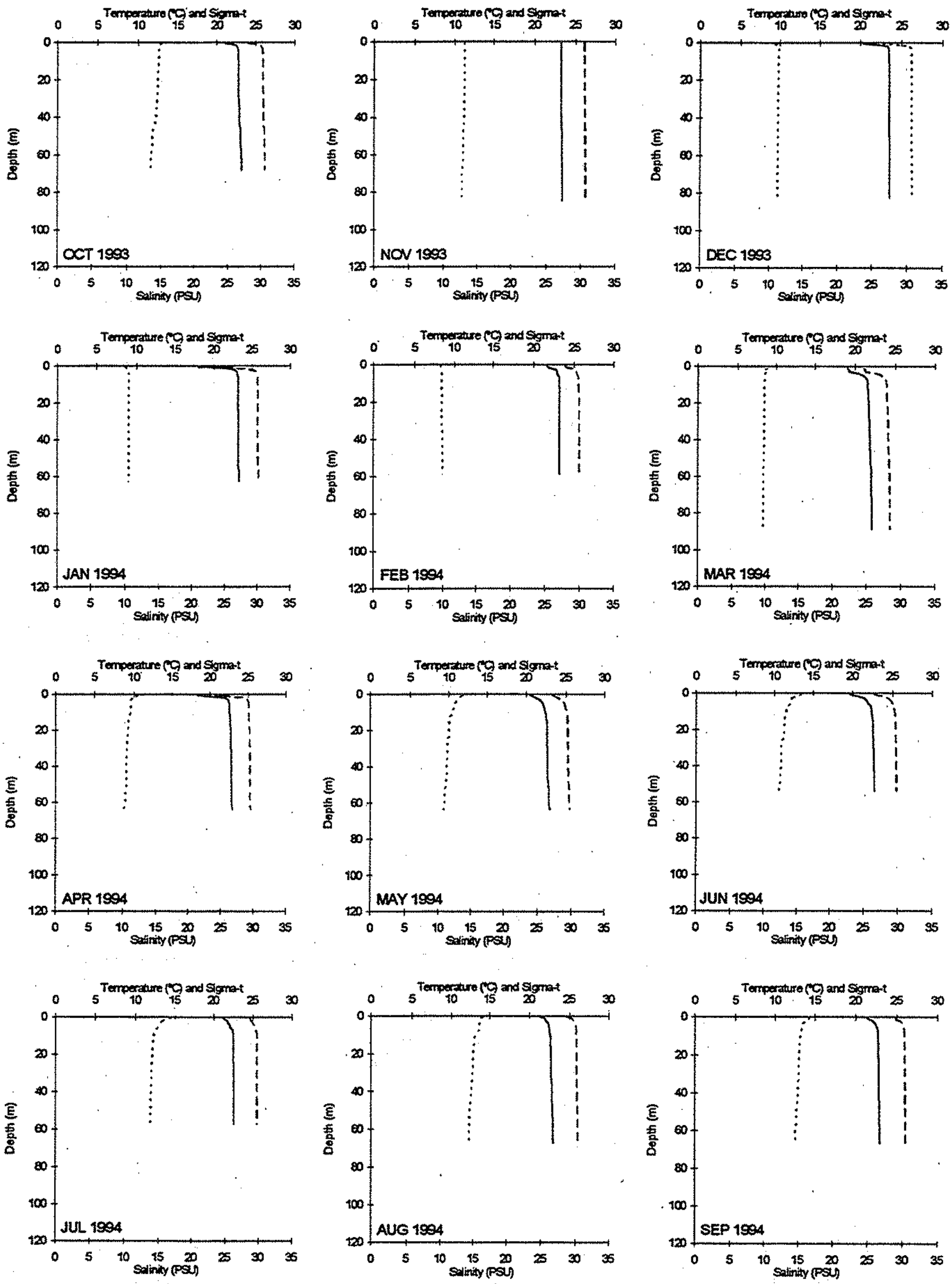
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

East Sound - Rosario Point EAS001



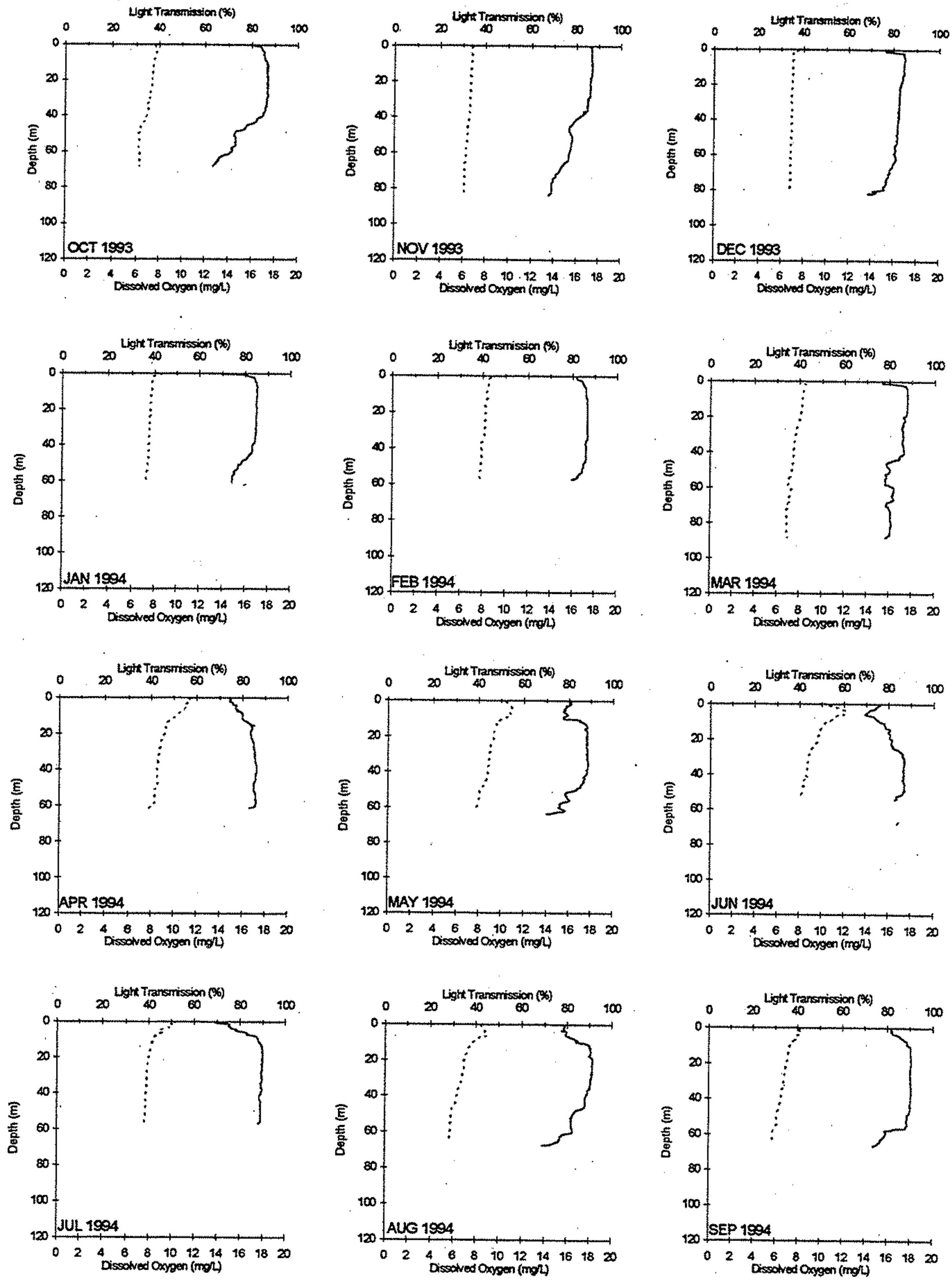
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

ELB015 Elliott Bay - E. of Duwamish Head



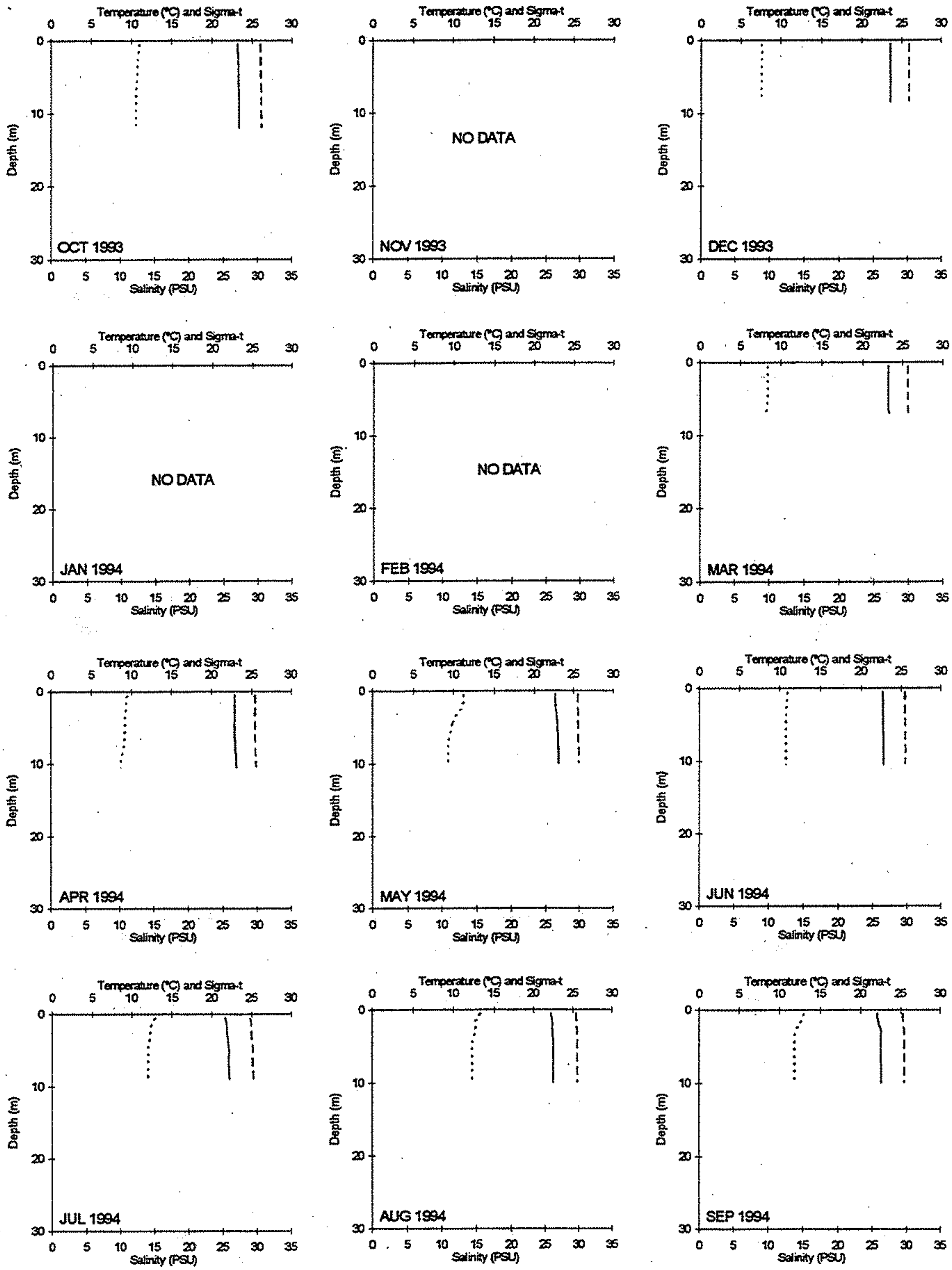
Legend: Temperature = Dotted Line   Salinity = Dashed Line   Sigma-t = Solid Line

Elliott Bay - E. of Duwamish Head   ELB015



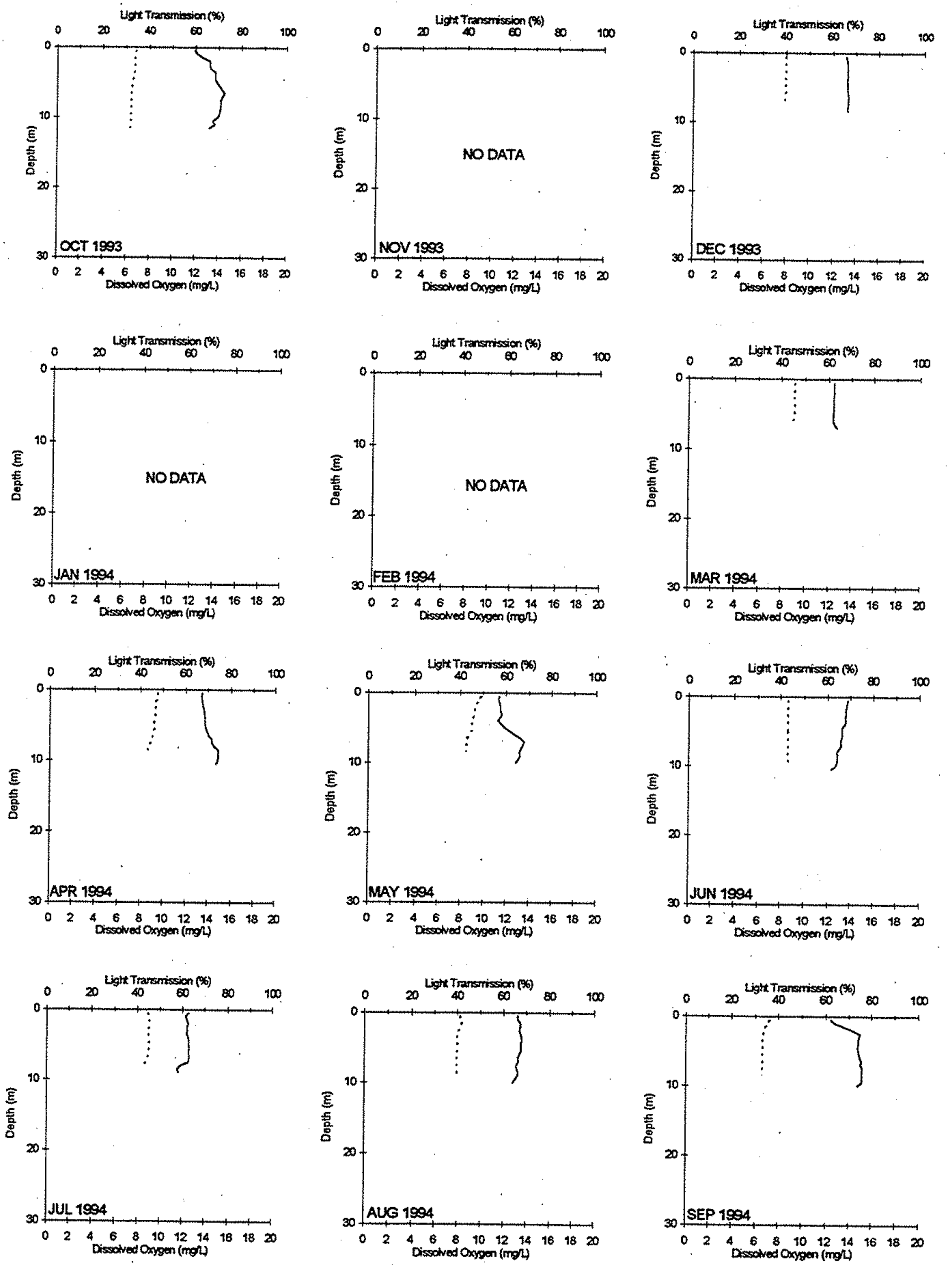
Legend: Light Transmission = Solid Line   Dissolved Oxygen = Dotted Line

FID001 Fidalgo Bay - E. of Anacortes



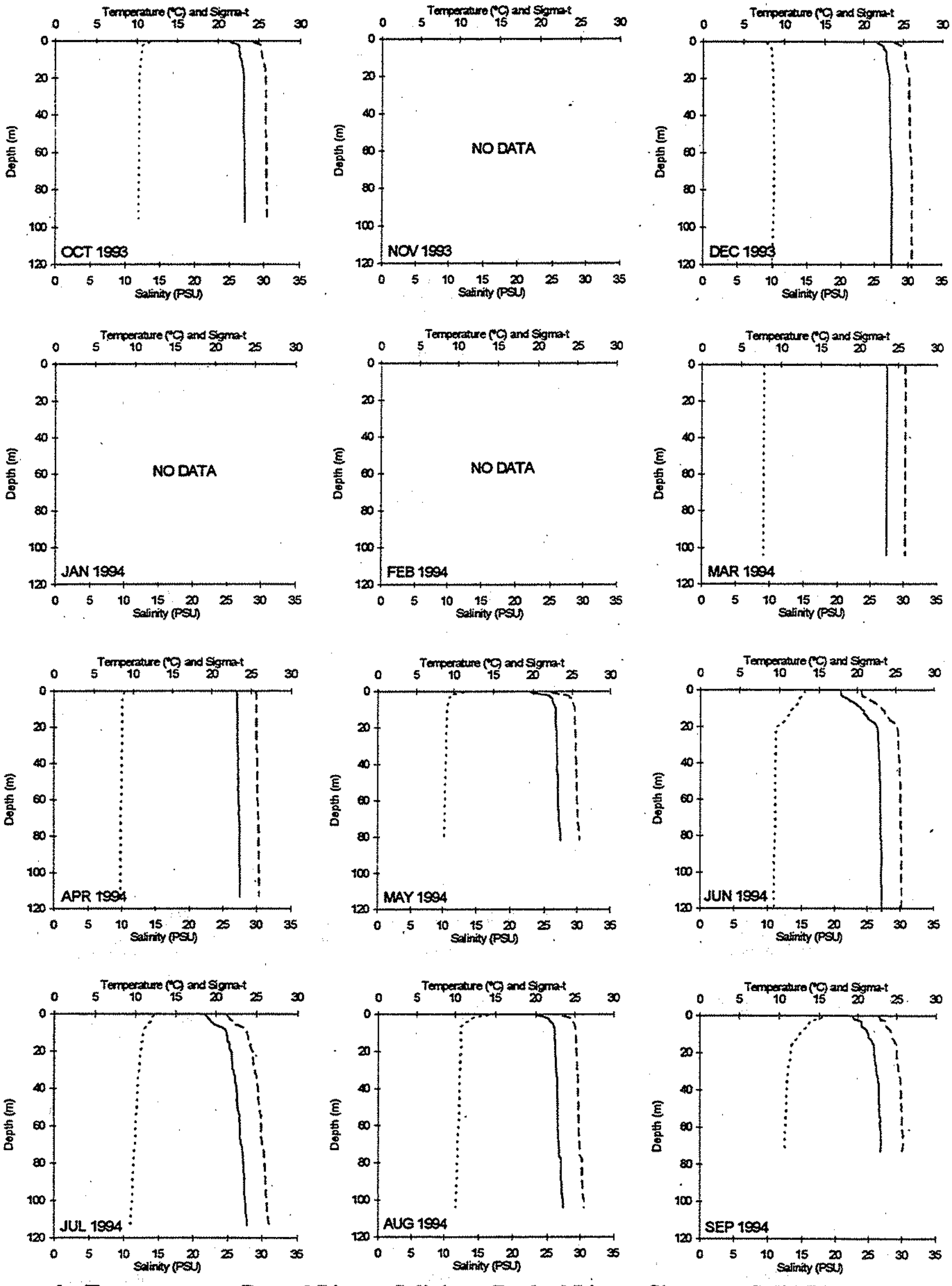
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Fidalgo Bay - E. of Anacortes FID001



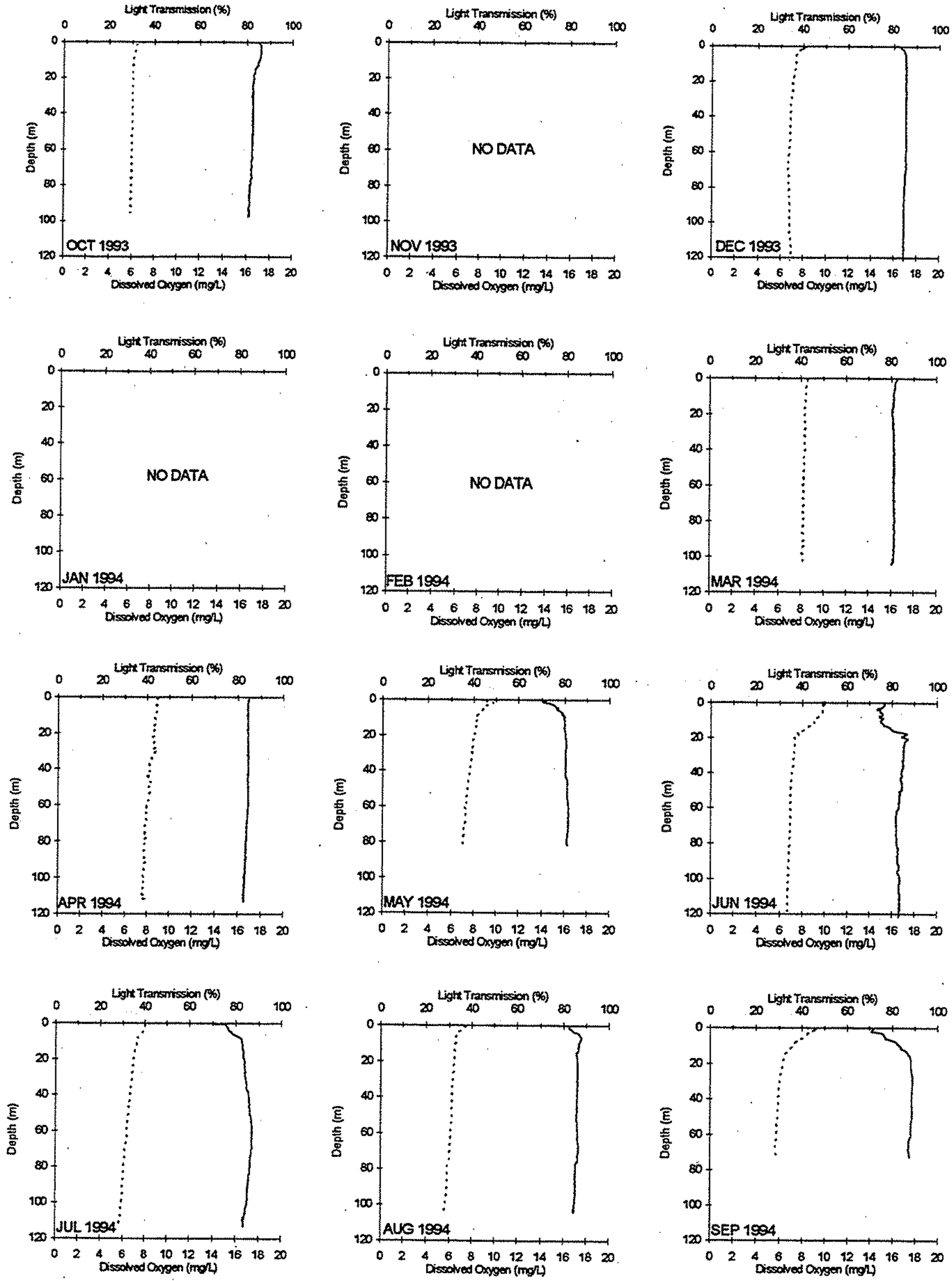
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GRG002 Strait of Georgia - N. of Patos Island



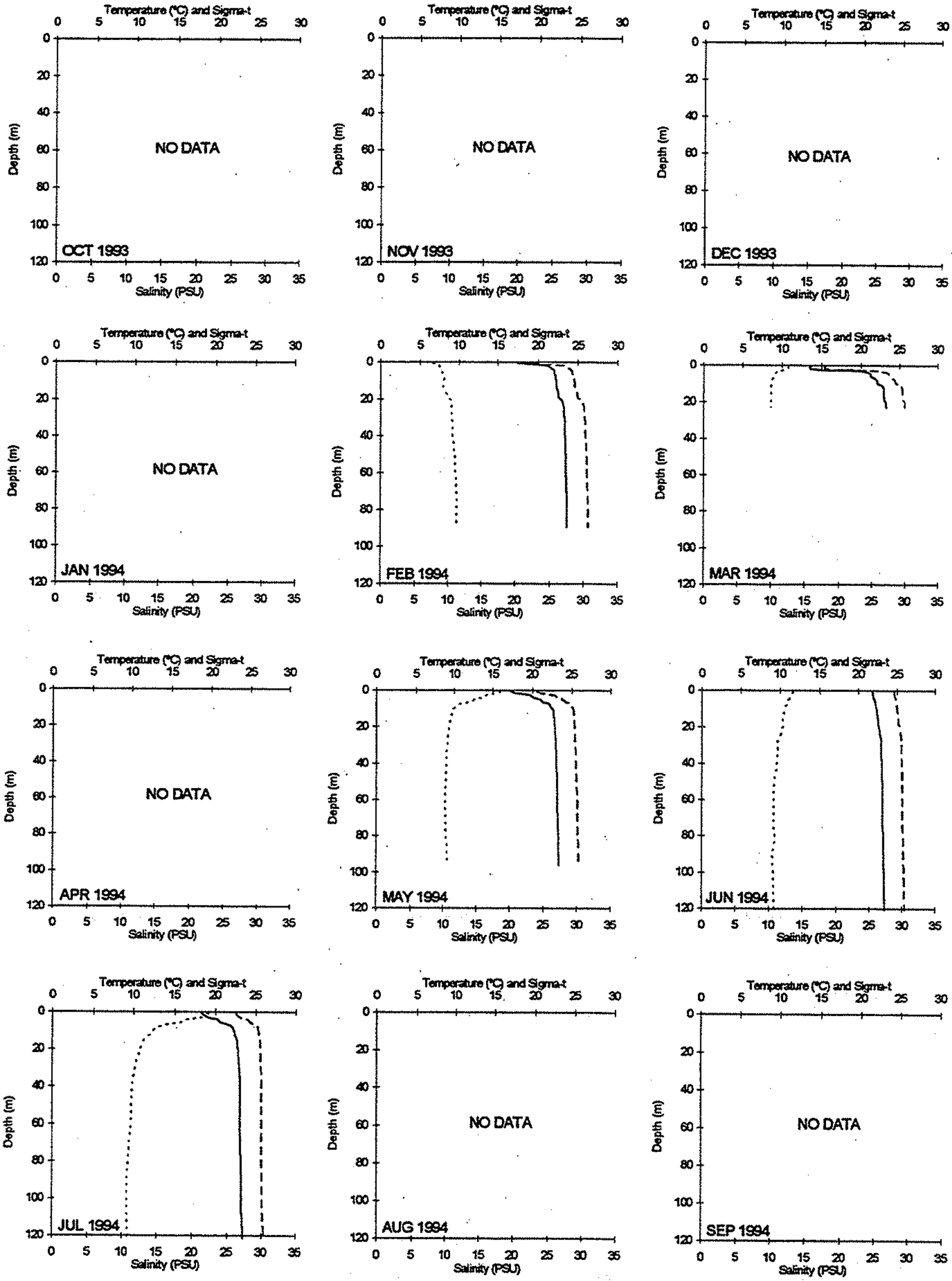
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Strait of Georgia - N. of Patos Island GRG002



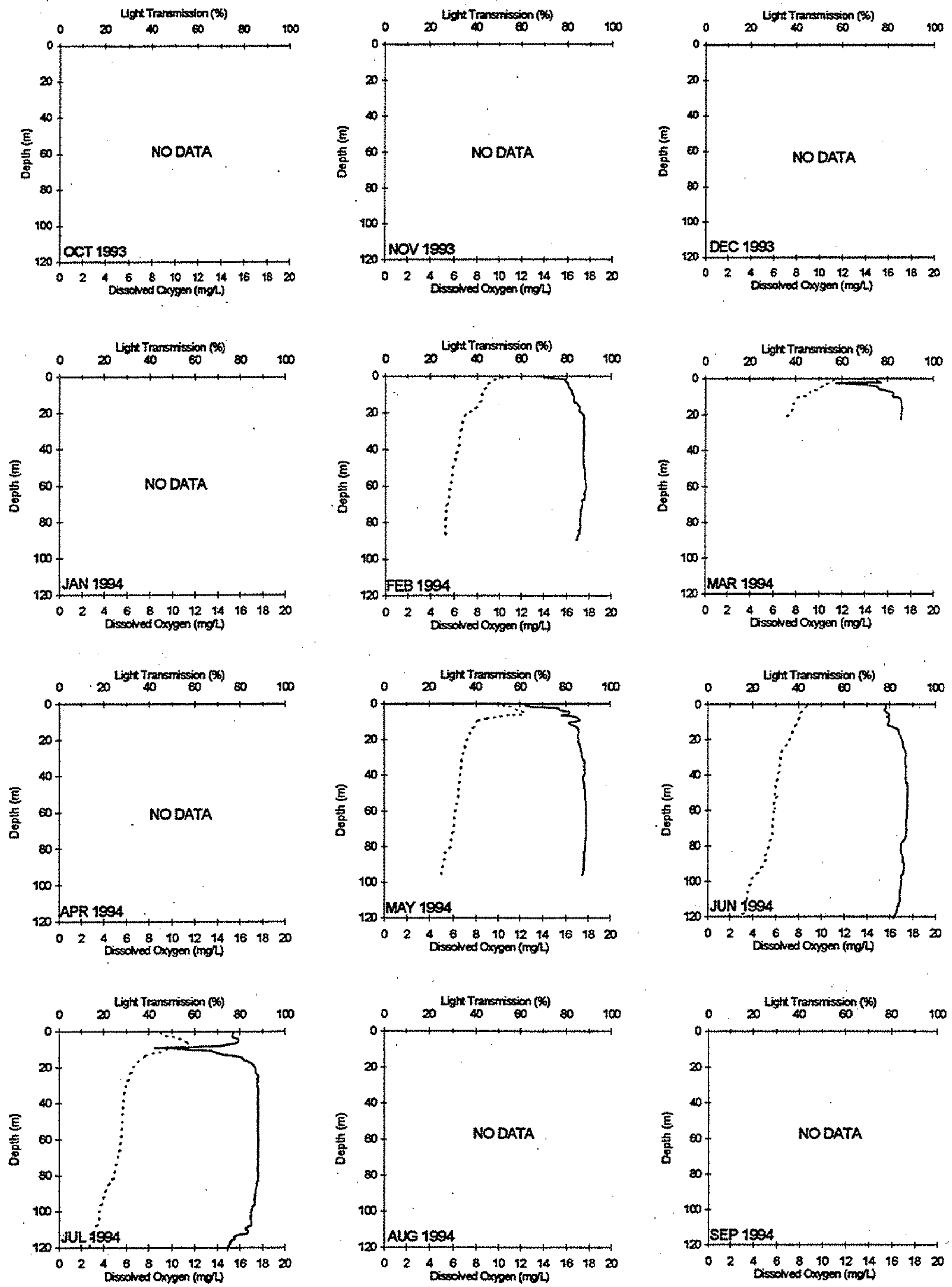
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

HCB003 Hood Canal - Eldon, Hamma Hamma River



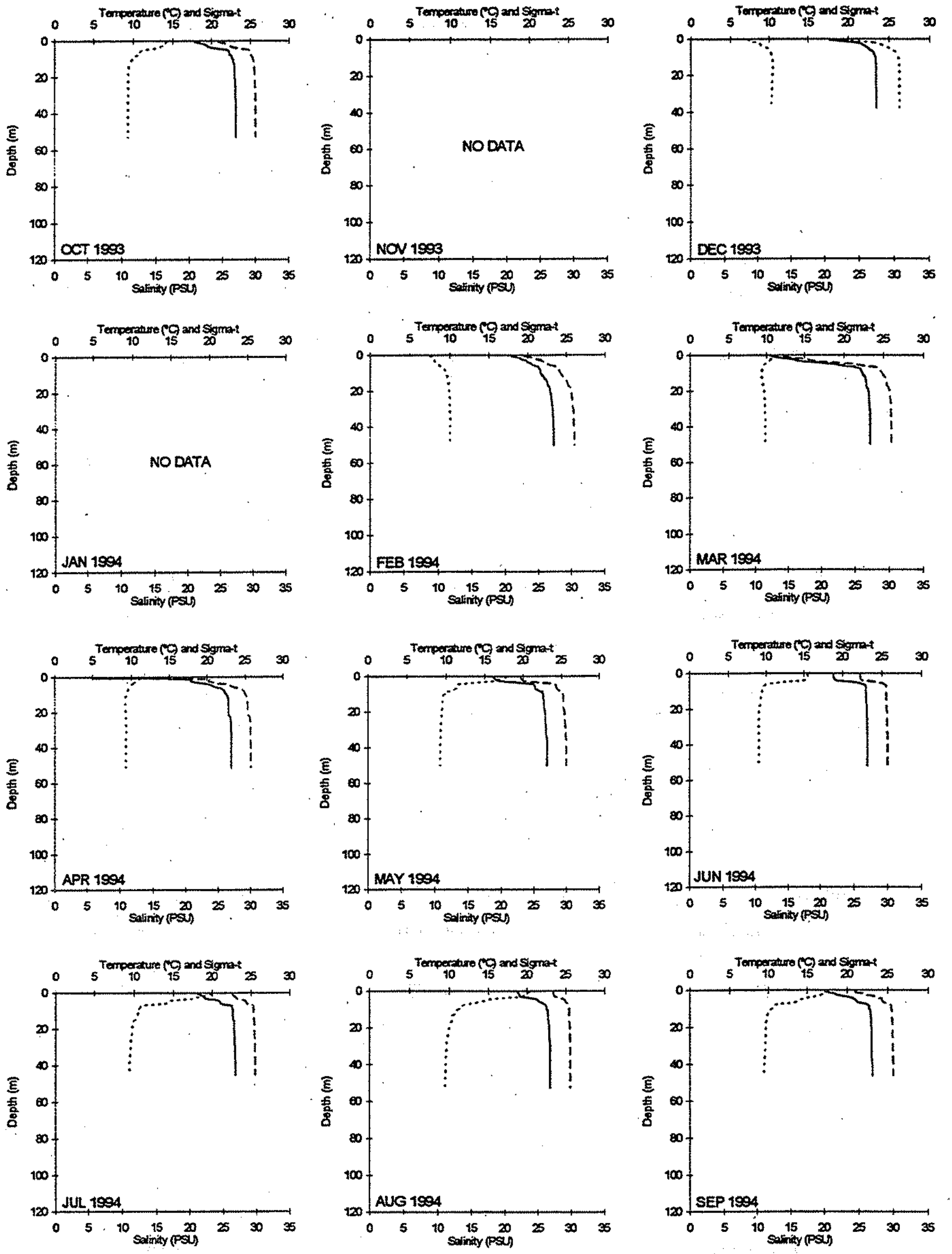
Legend: Temperature = Dotted Line   Salinity = Dashed Line   Sigma-t = Solid Line

Hood Canal - Eldon, Hamma Hamma River   HCB003



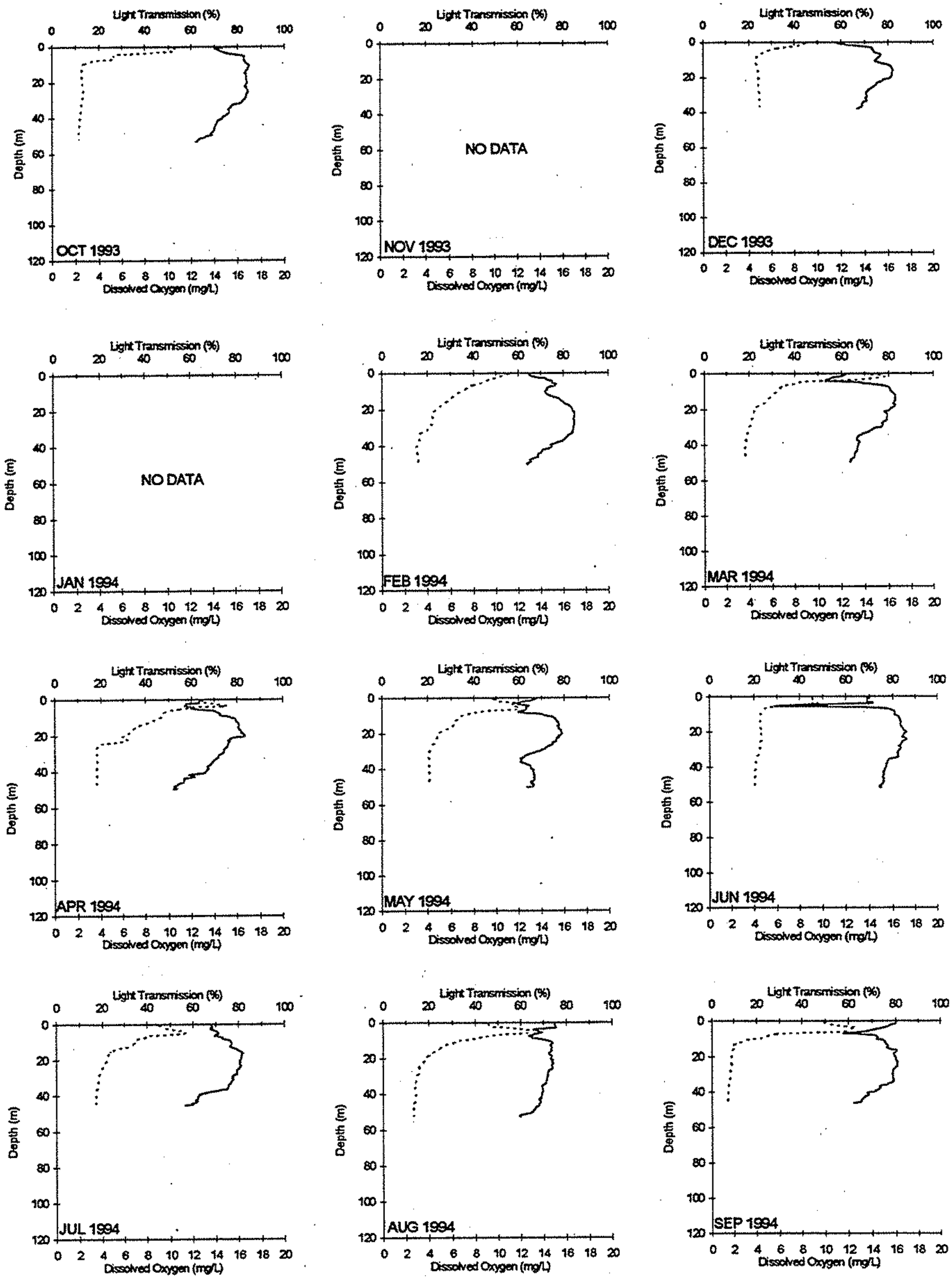
Legend: Light Transmission = Solid Line   Dissolved Oxygen = Dotted Line

HCB004 Hood Canal - Great Bend, Sisters Point



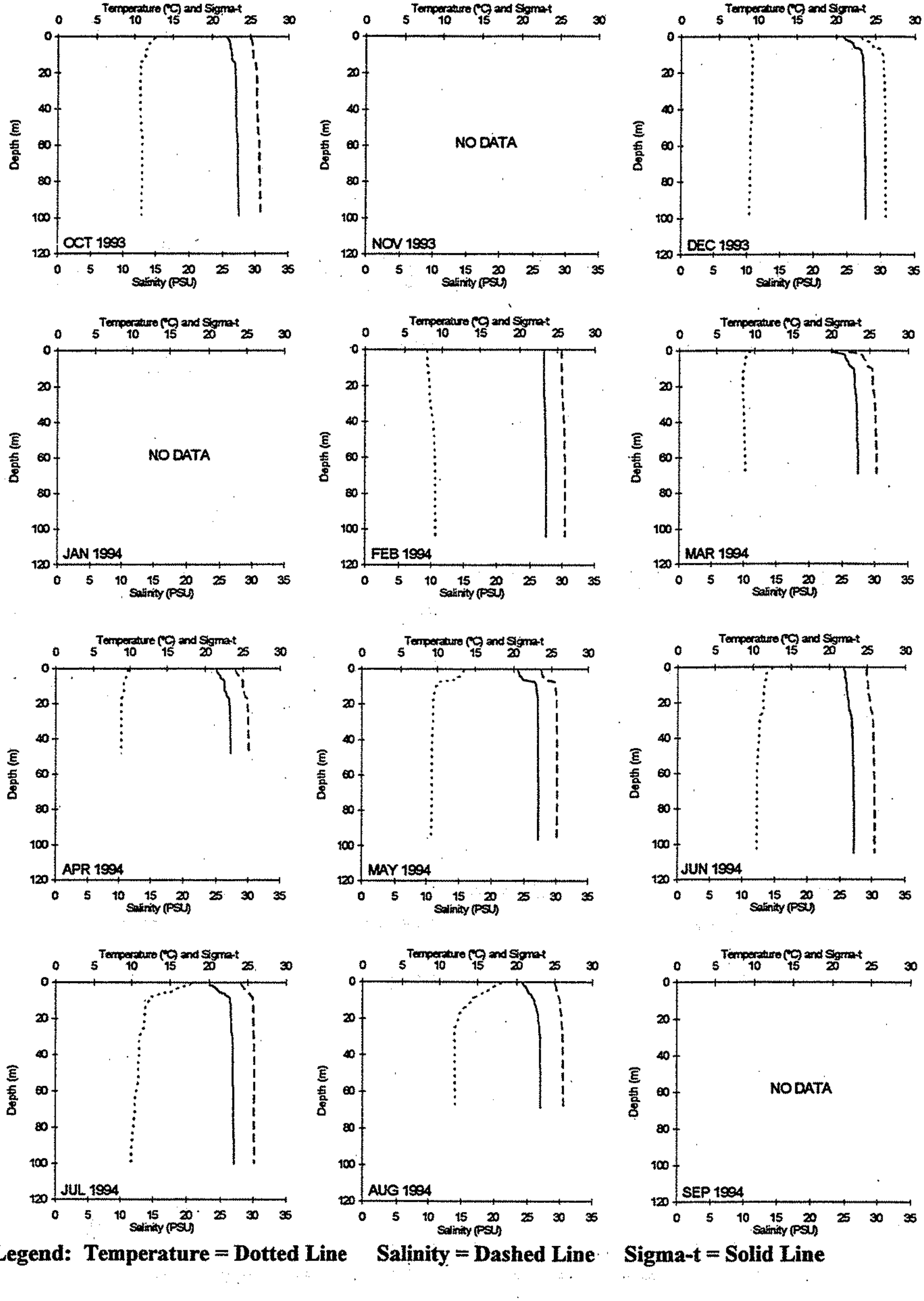
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Hood Canal - Great Bend, Sisters Point HCB004



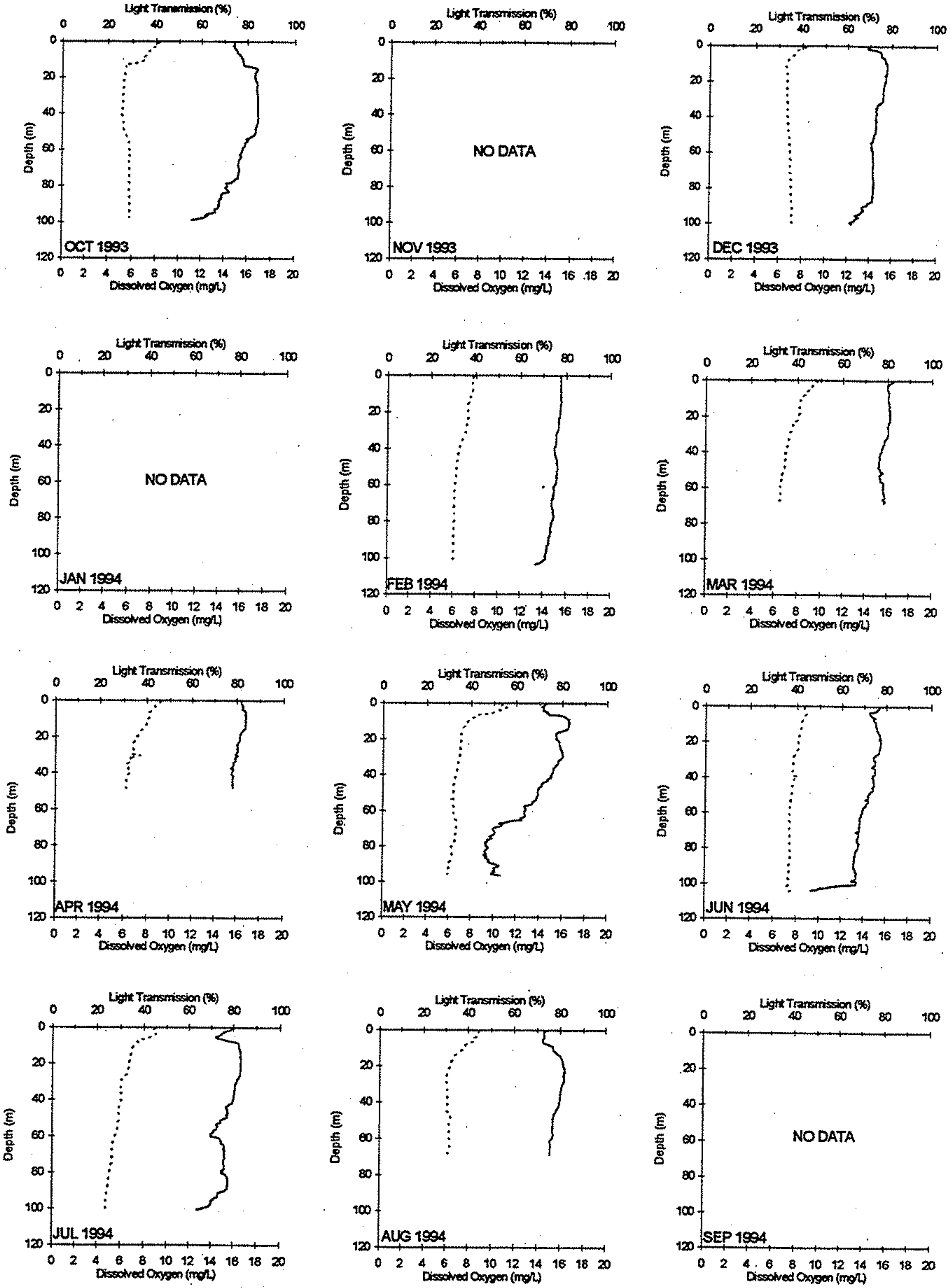
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

HCB006 Hood Canal - King Spit, Bangor



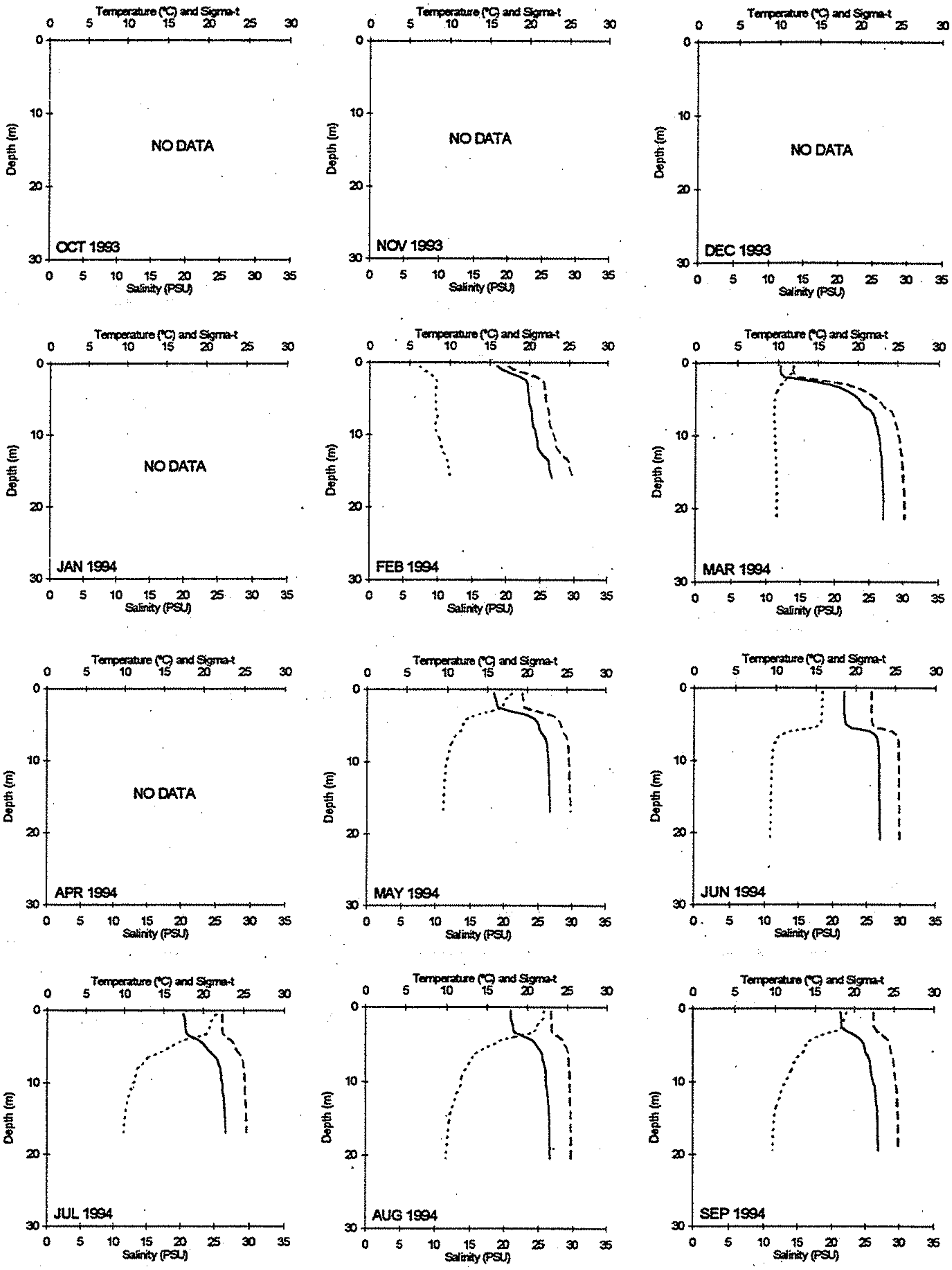
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Hood Canal - King Spit, Bangor HCB006



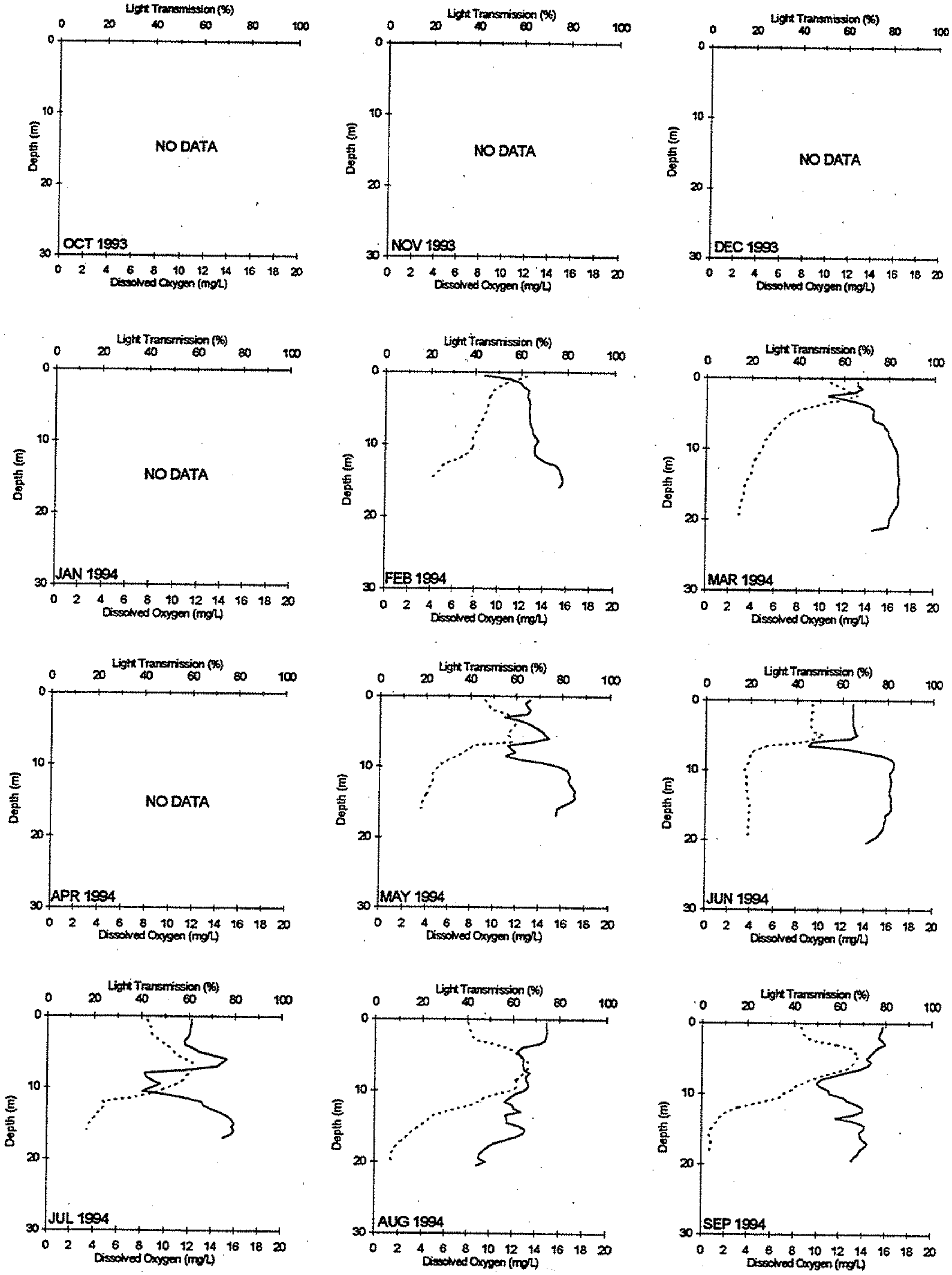
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

HCB007 Hood Canal - Lynch Cove



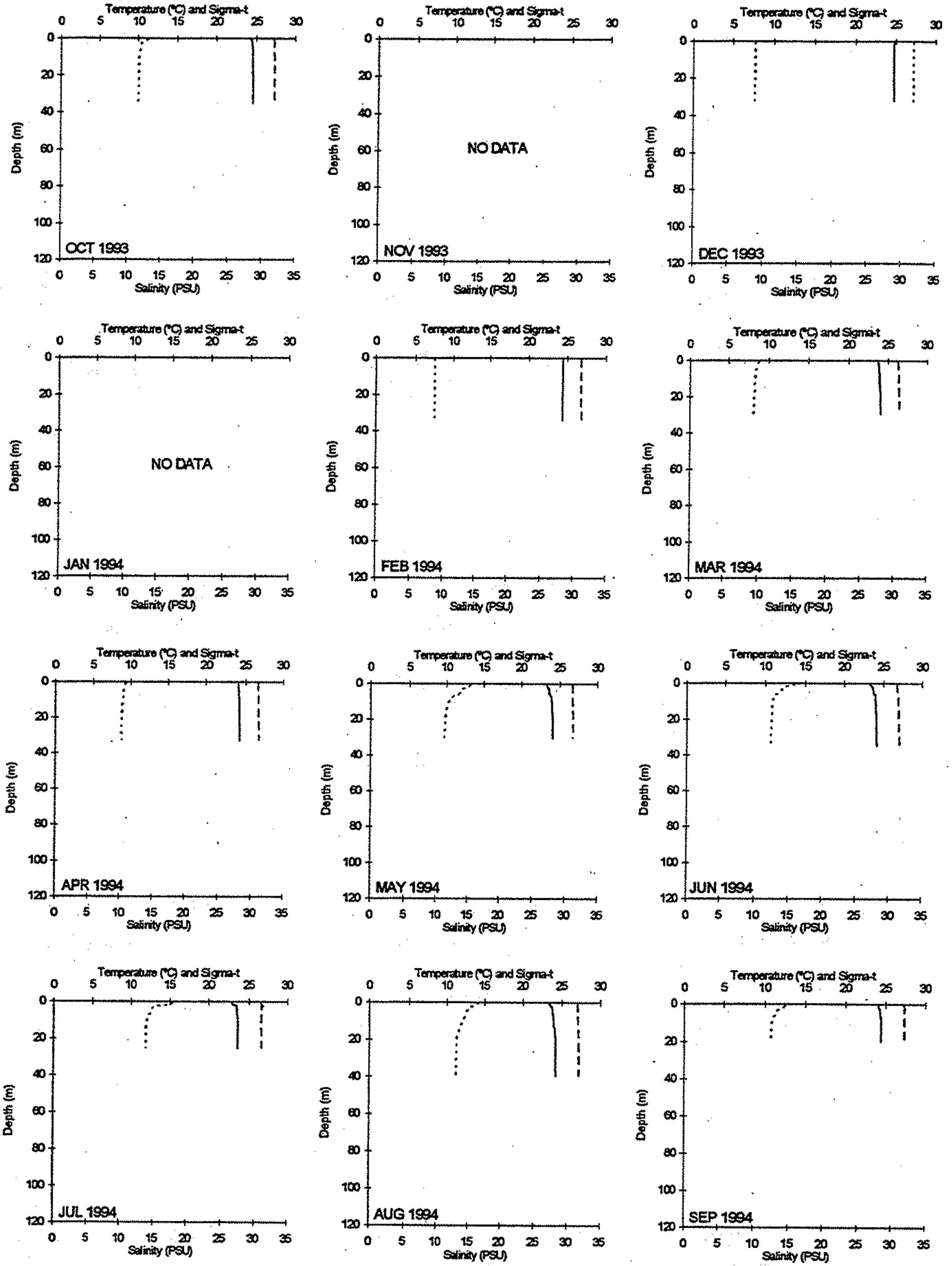
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Hood Canal - Lynch Cove HCB007



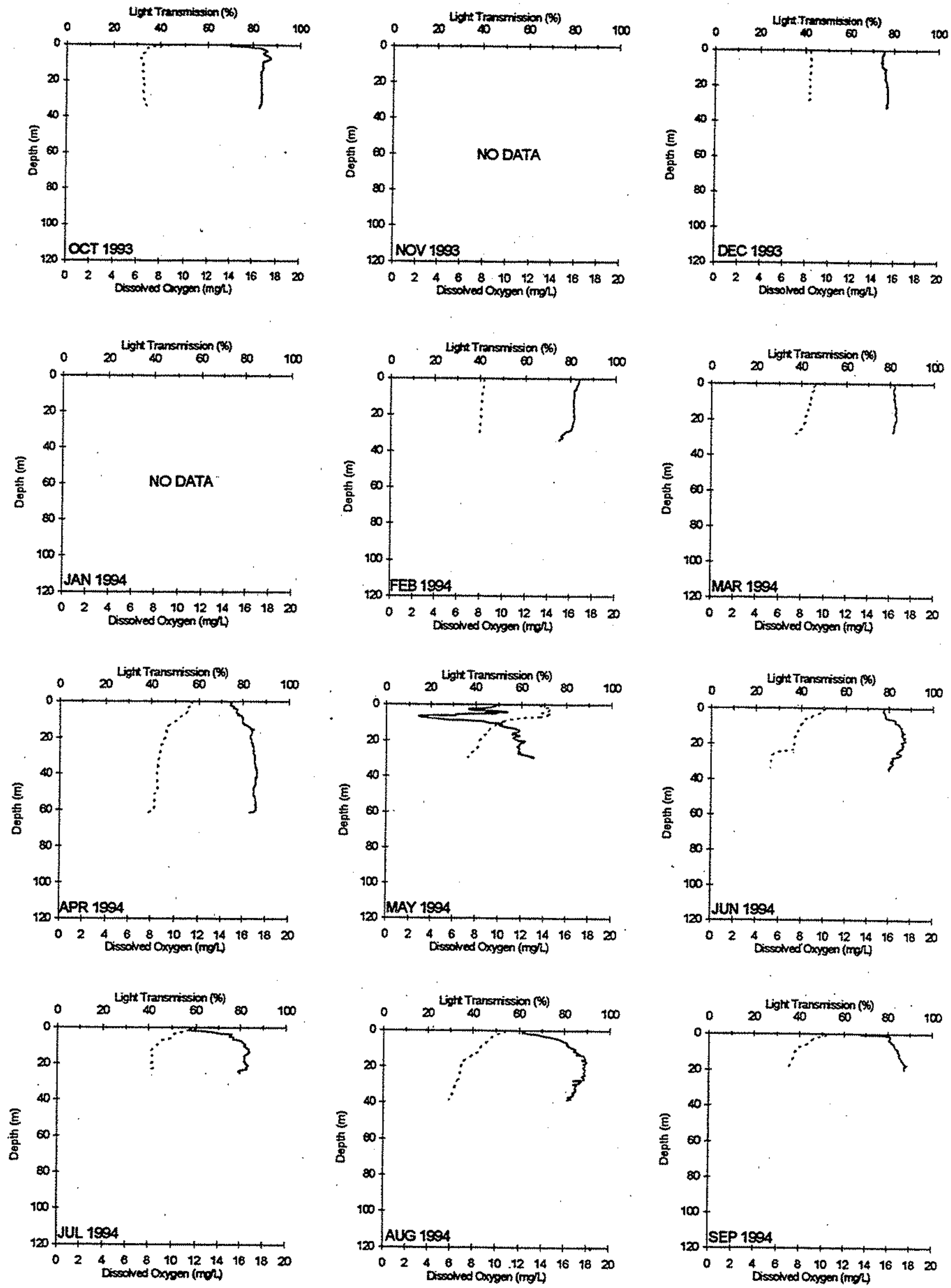
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

JDF005 Sequim Bay - Pitship Point



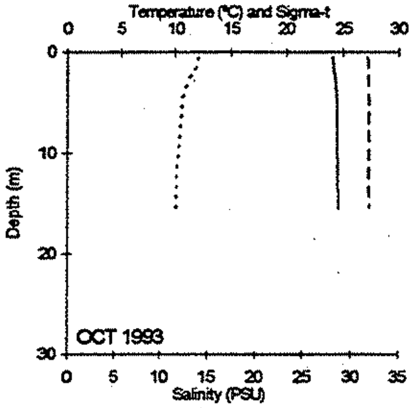
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

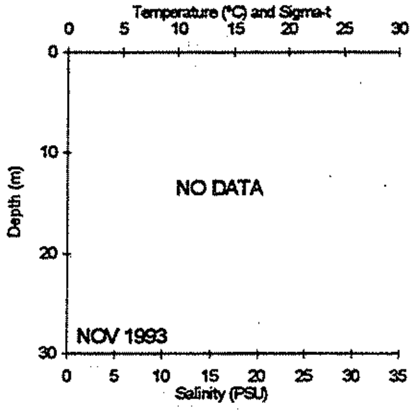
Sequim Bay - Pitship Point JDF005

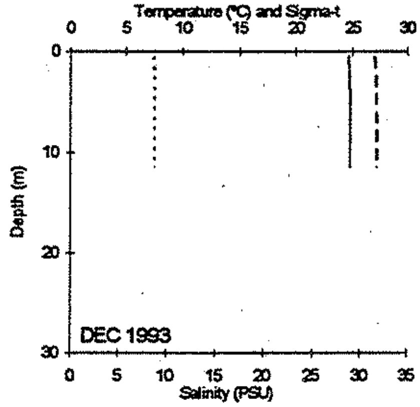


Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

JDF007 Sequim Bay - Goose Point

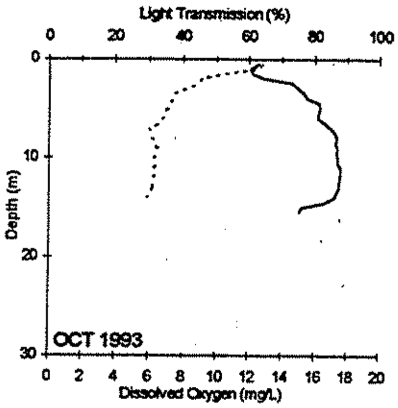


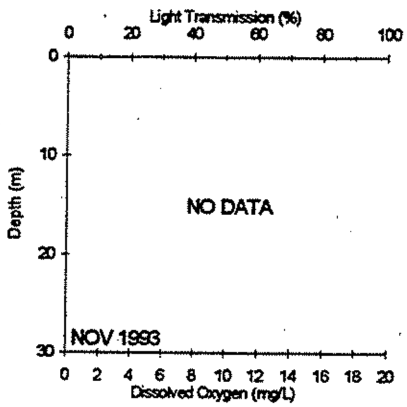


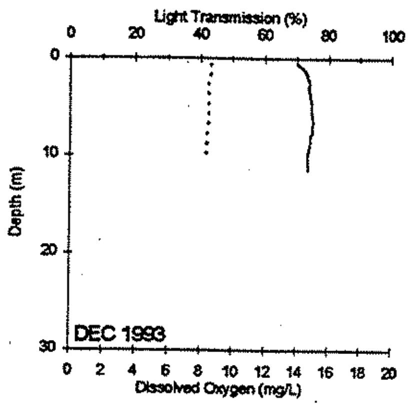


Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Sequim Bay - Goose Point JDF007

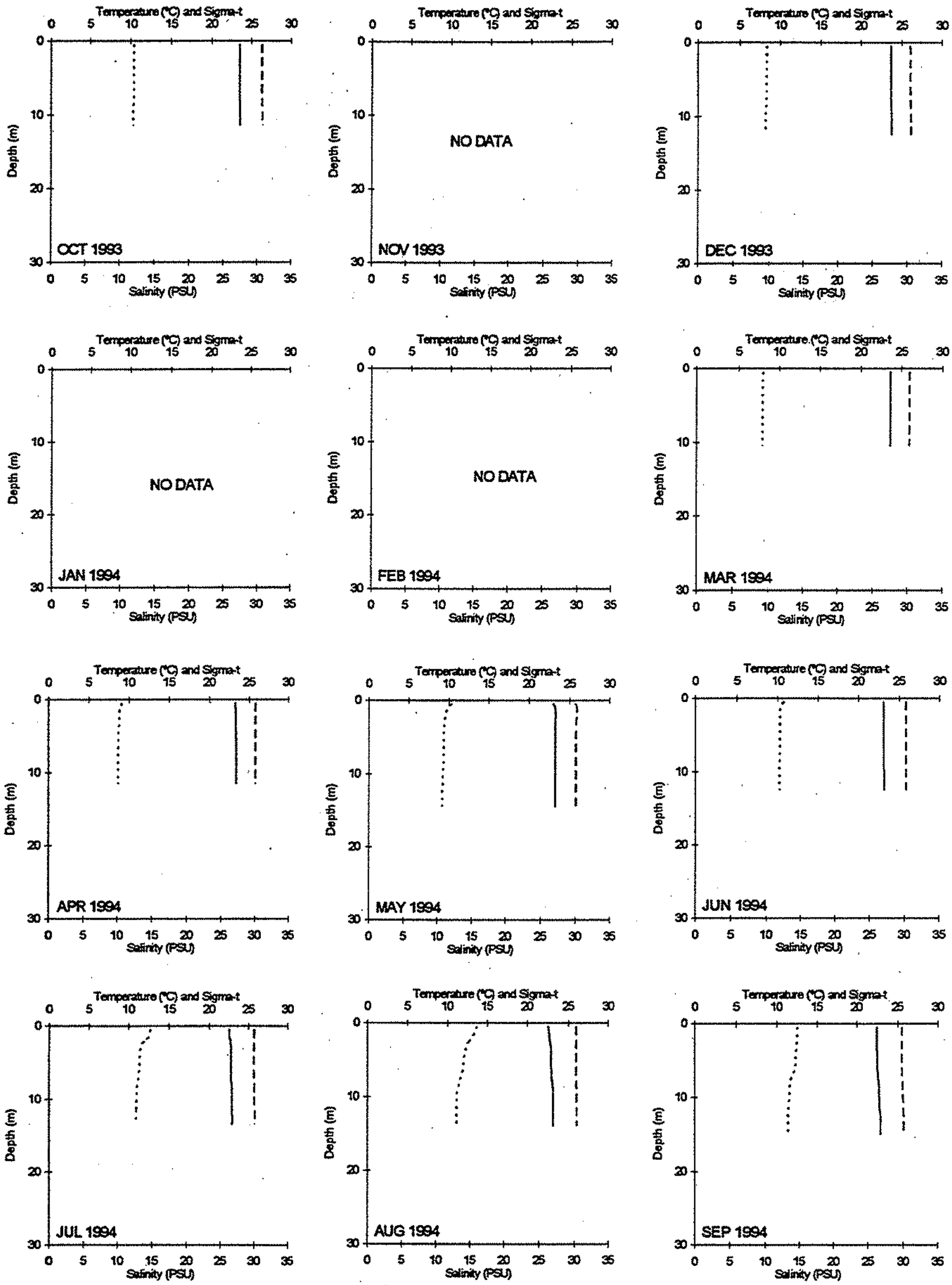






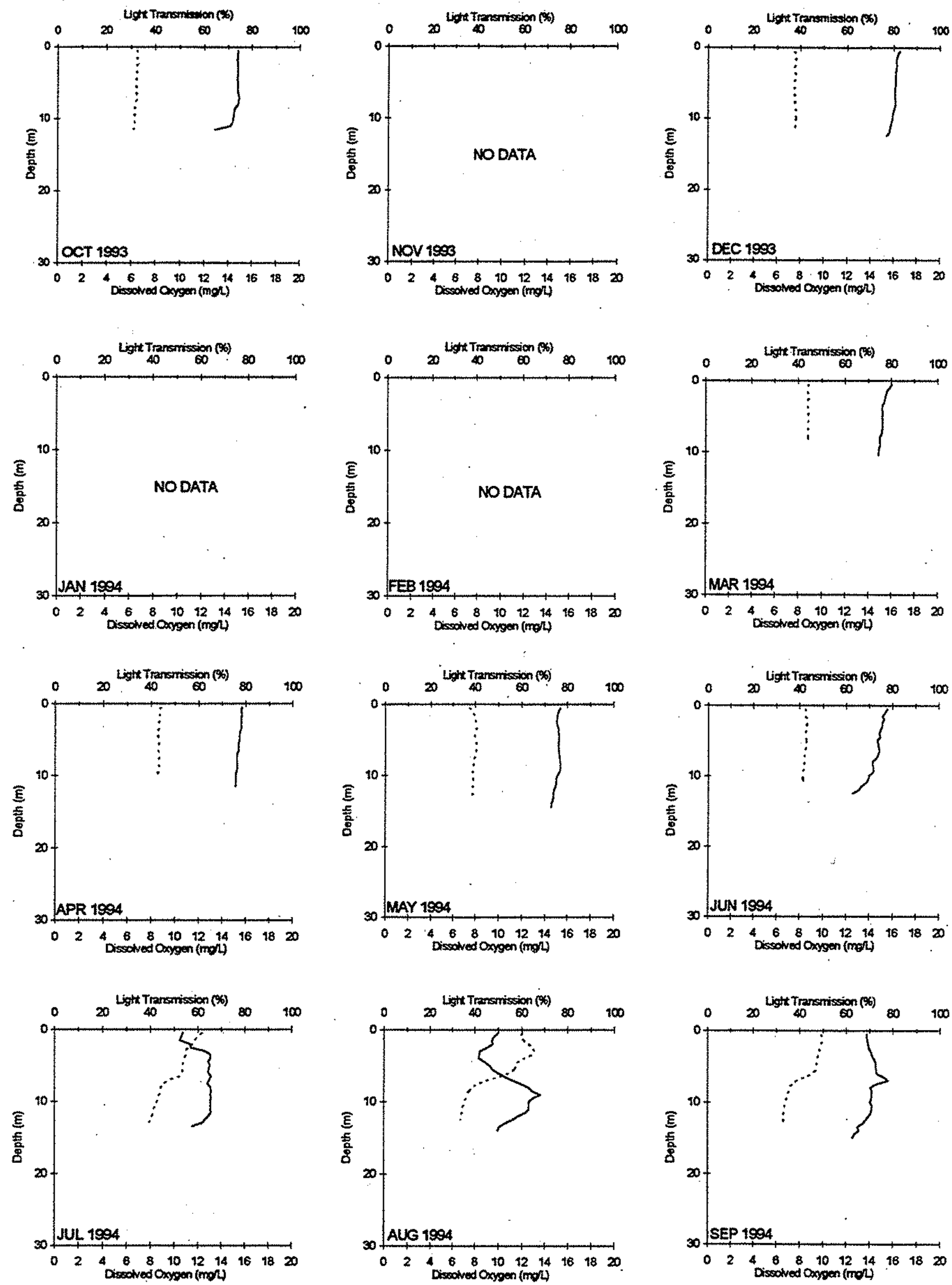
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

LOP001 Lopez Sound - Decatur Island



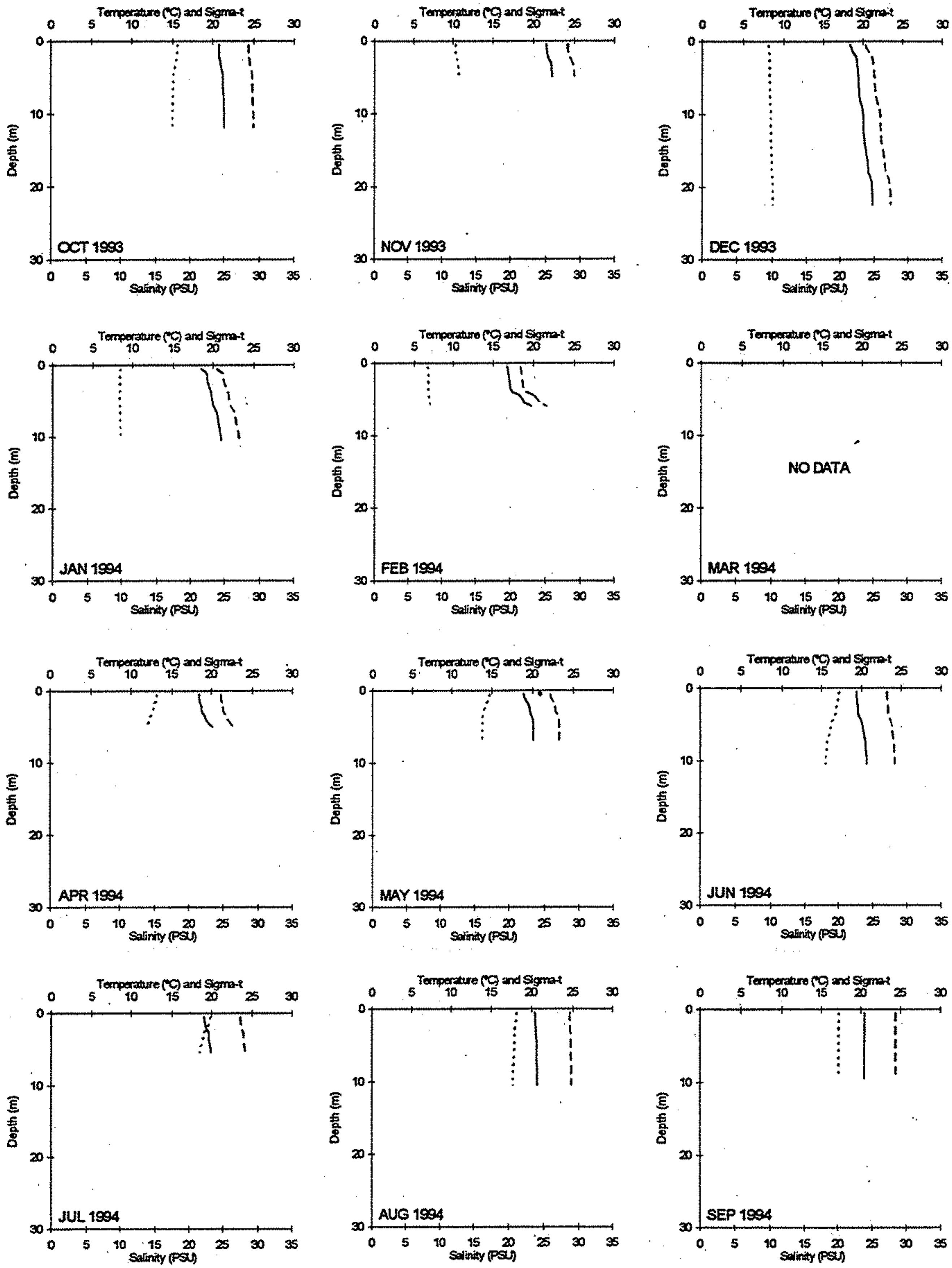
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Lopez Sound - Decatur Island LOP001



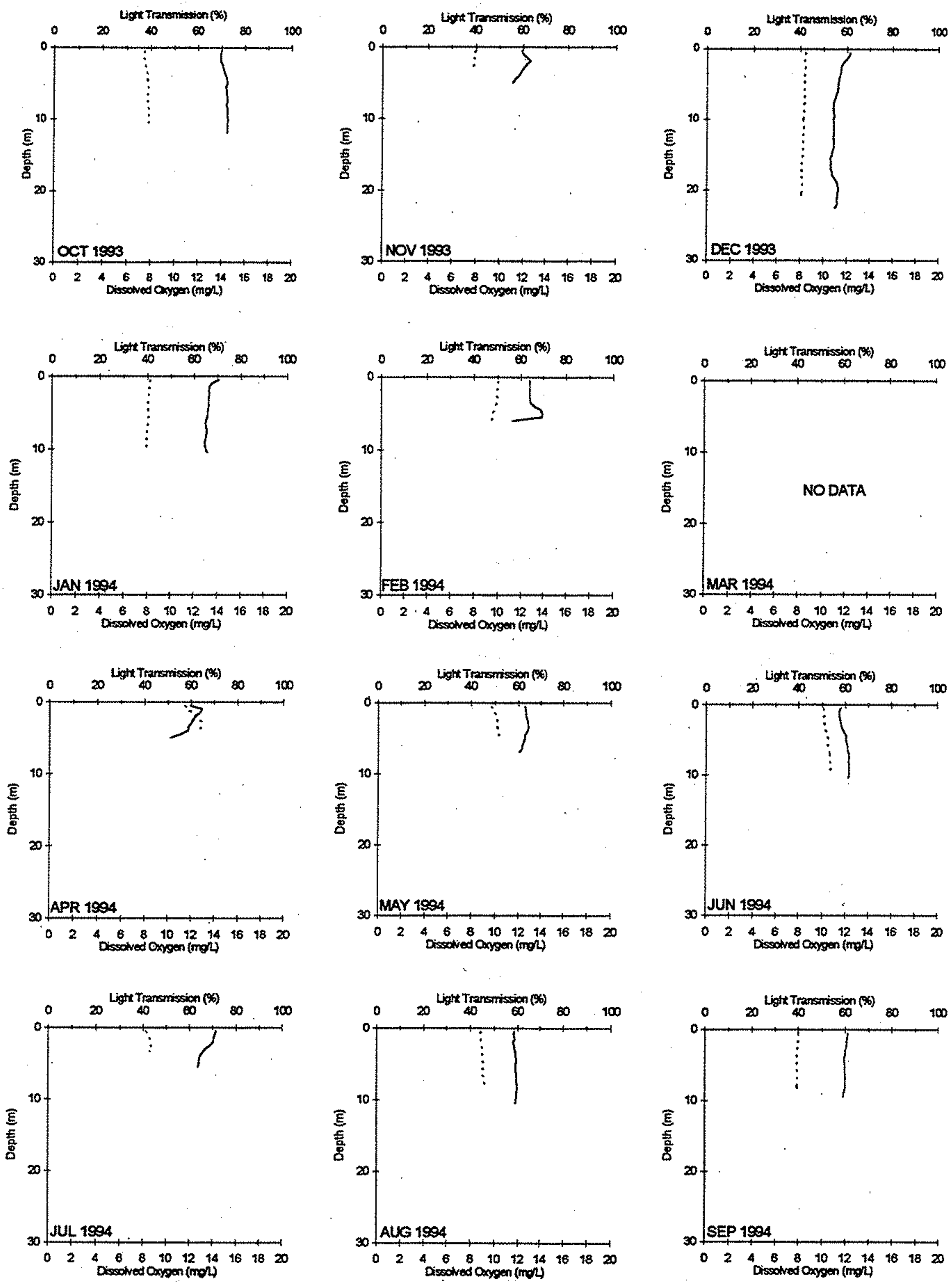
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

OAK004 Oakland Bay - Eagle Point



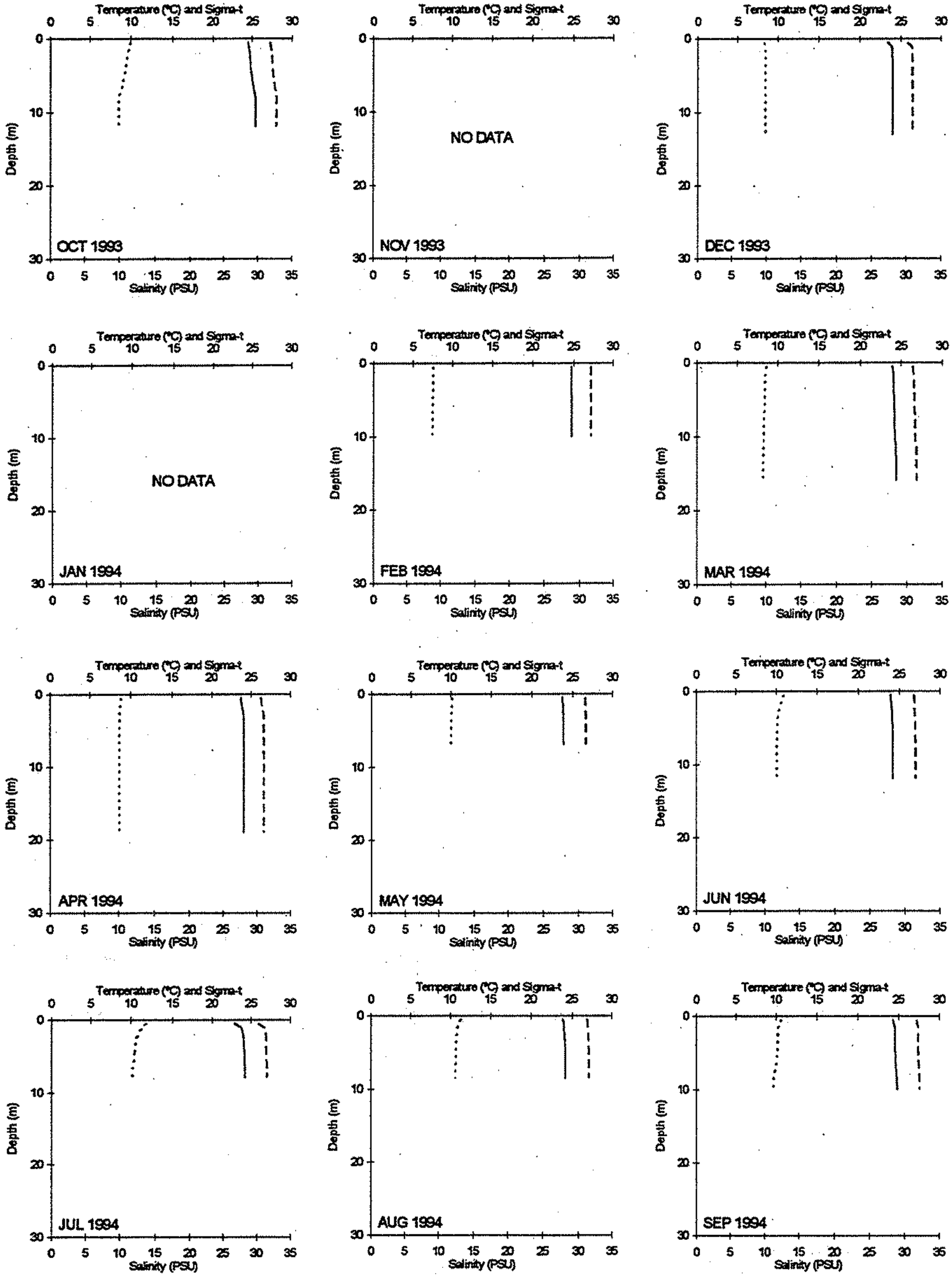
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Oakland Bay - Eagle Point OAK004



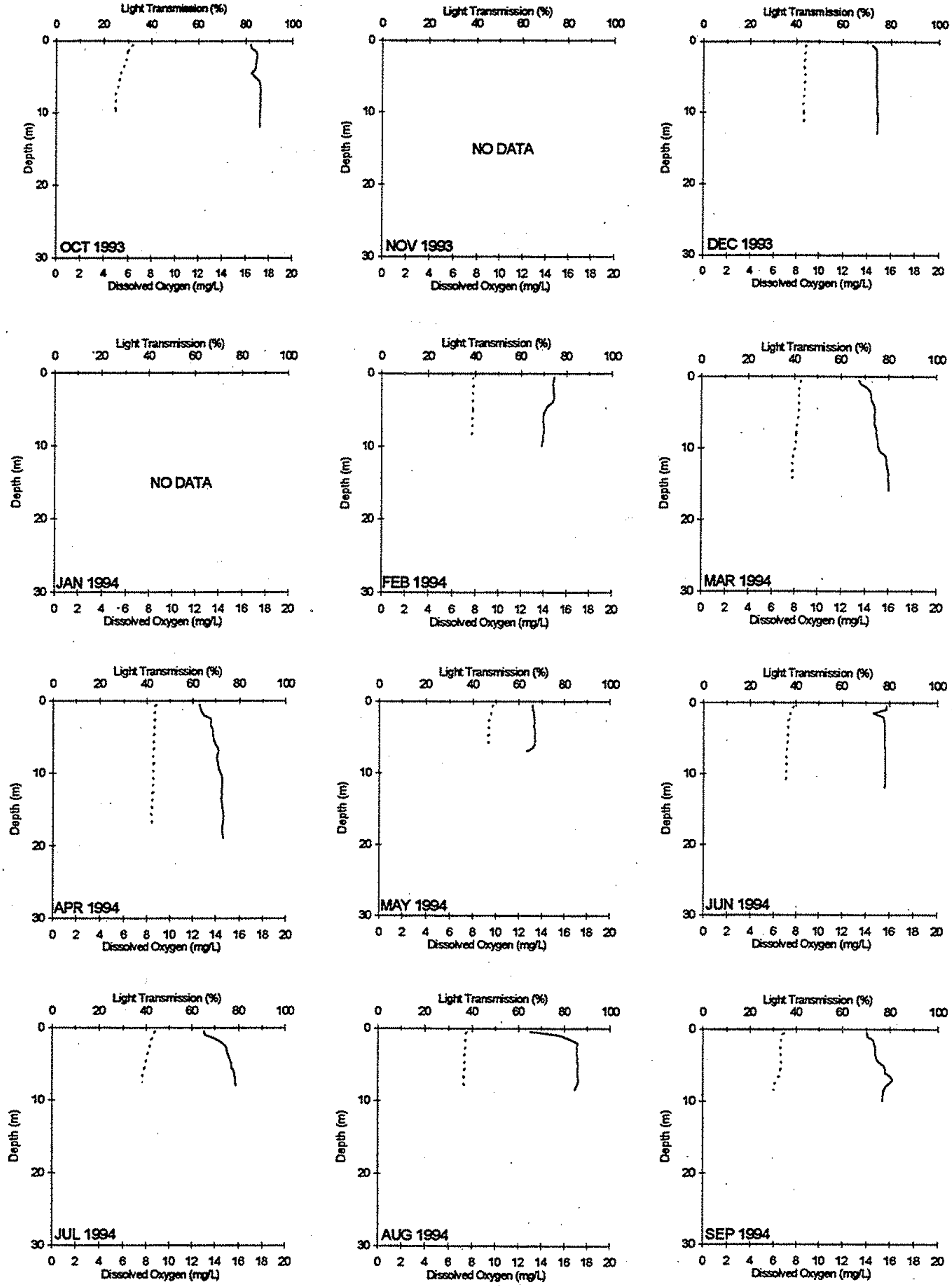
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PAH008 Port Angeles Harbor - Morse Creek



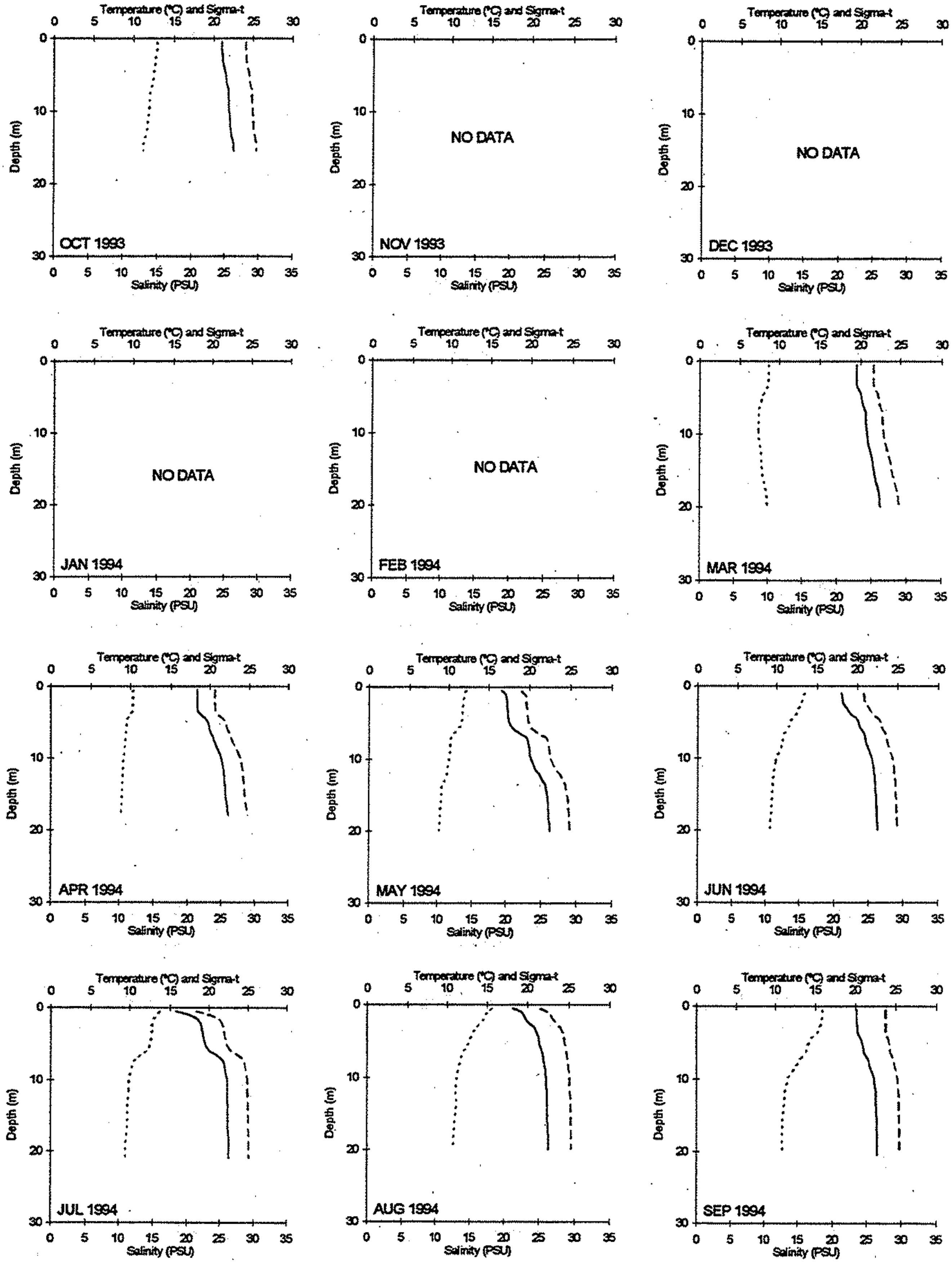
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Port Angeles Harbor - Morse Creek PAH008



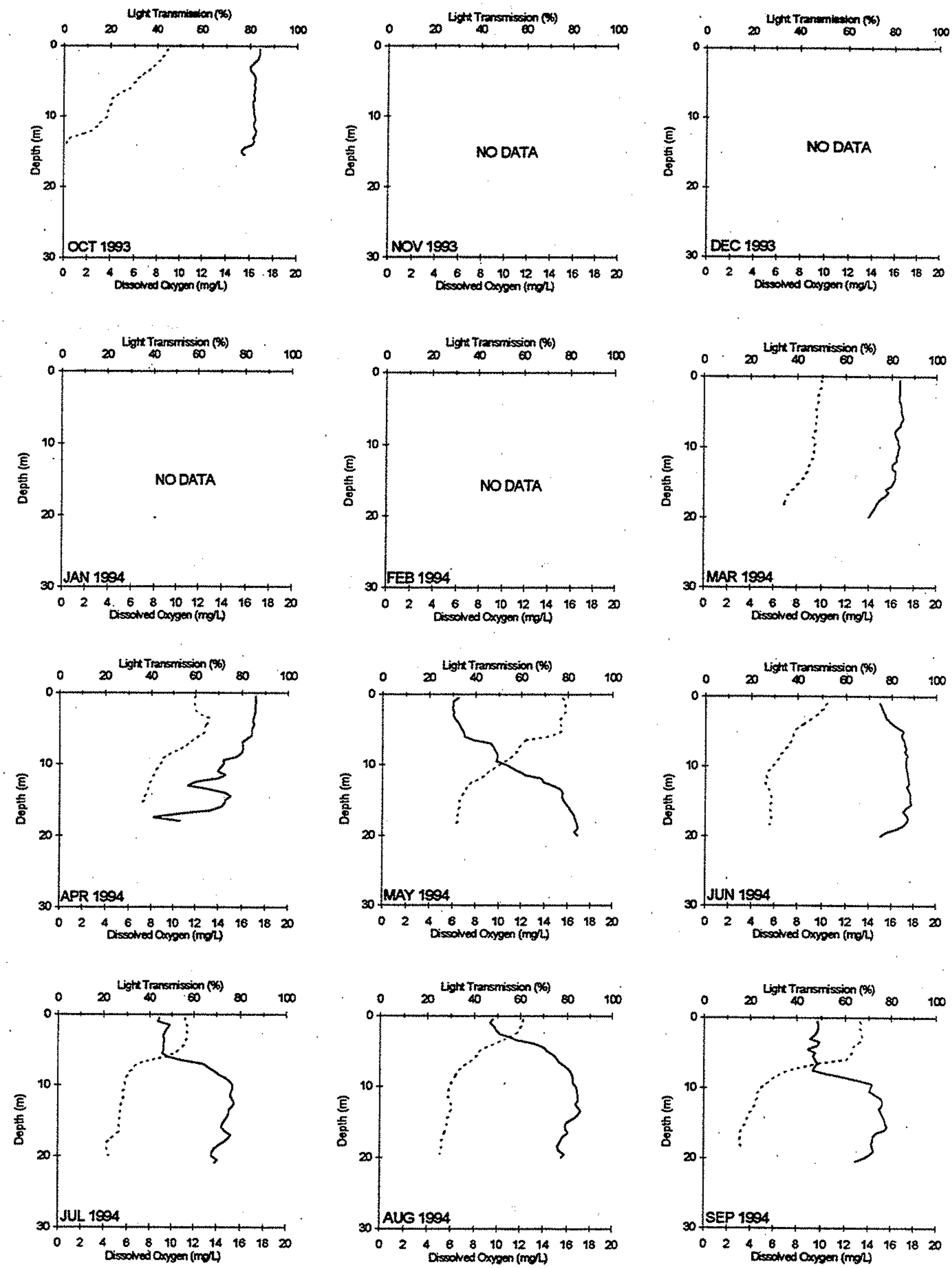
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PNN001 Penn Cove (Whidbey Island) - Penn Cove Park



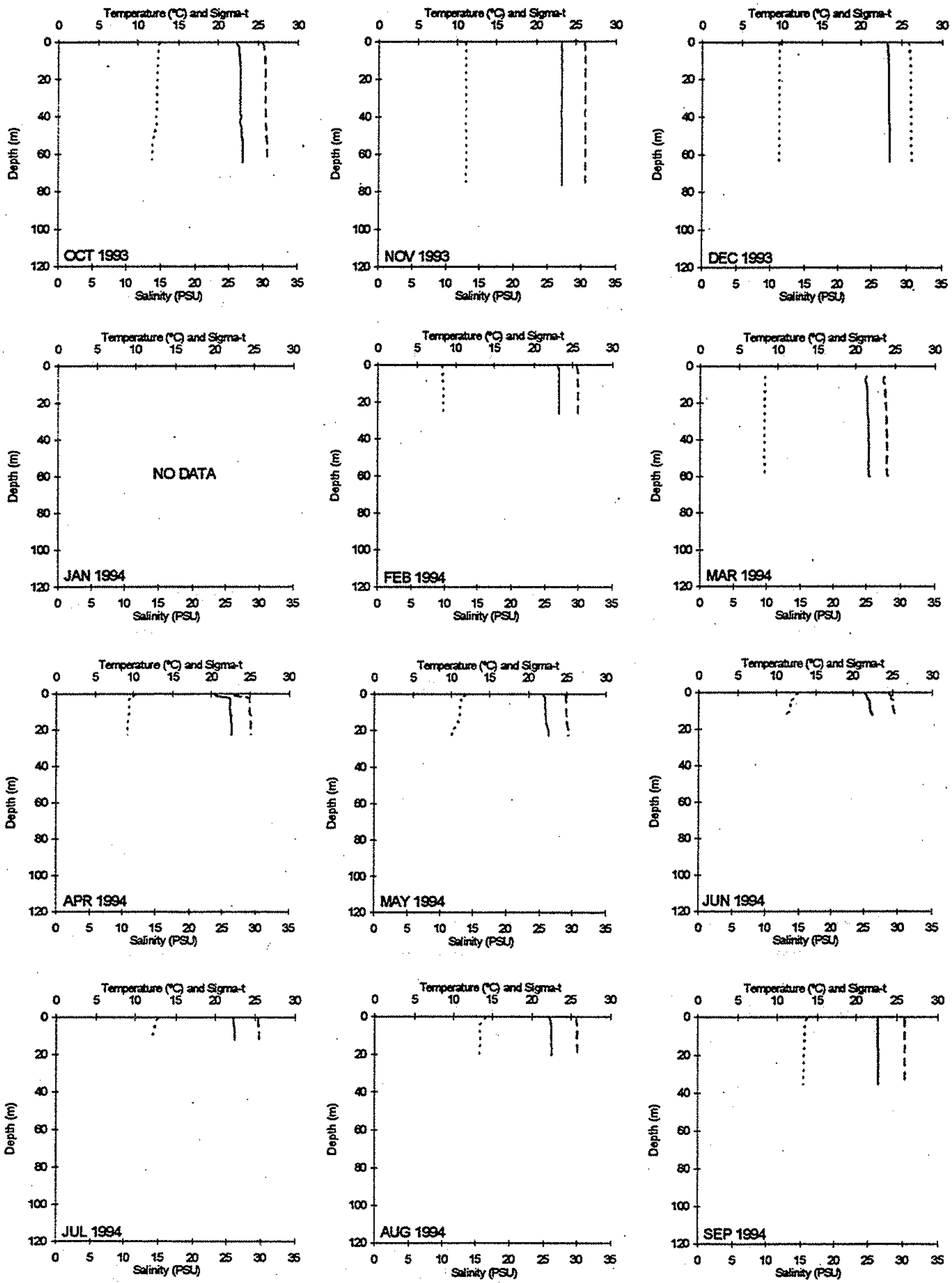
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Penn Cove (Whidbey Island) - Penn Cove Park PNN001



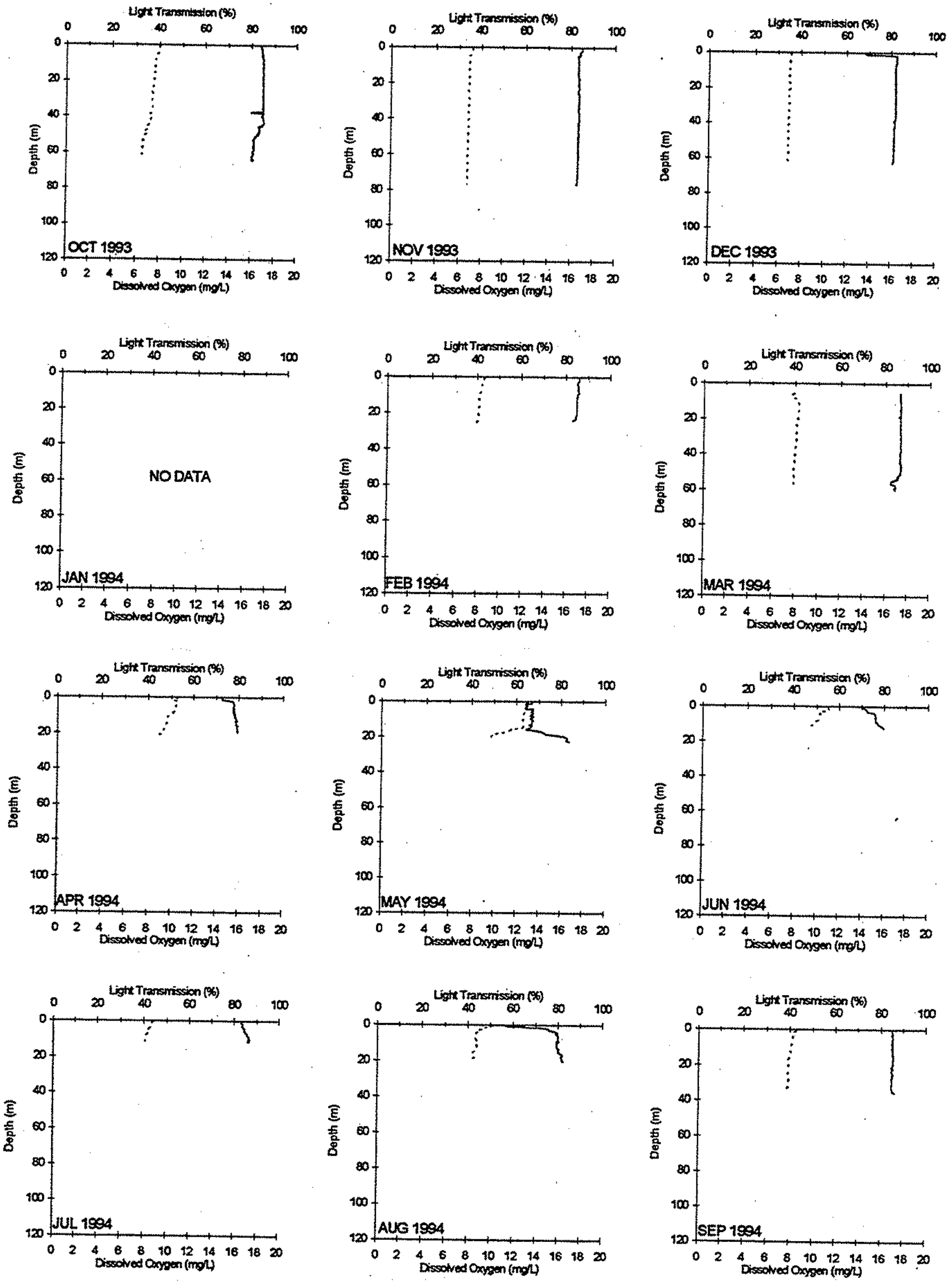
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PSB003 Puget Sound Main Basin - West Point



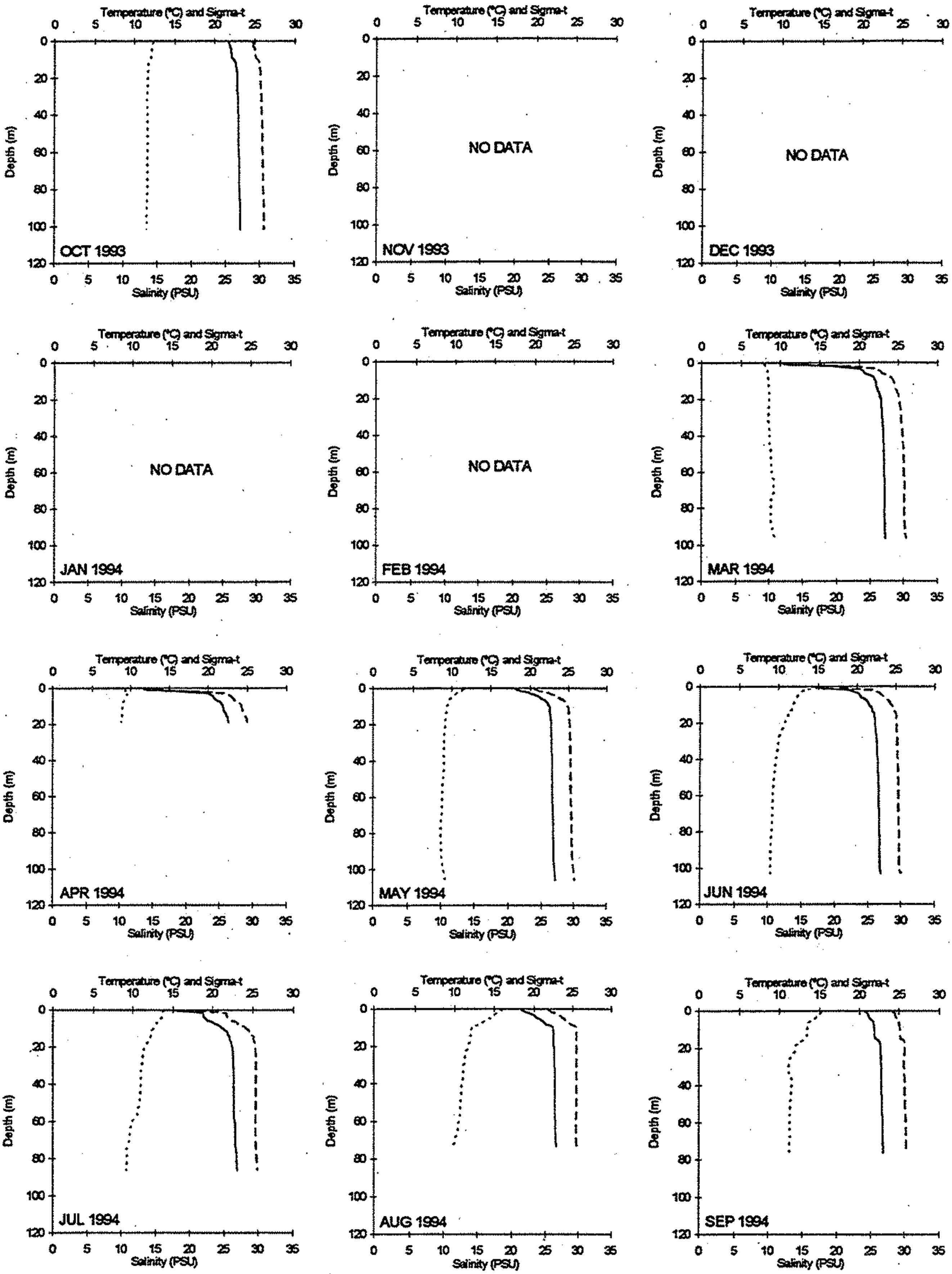
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Puget Sound Main Basin - West Point PSB003



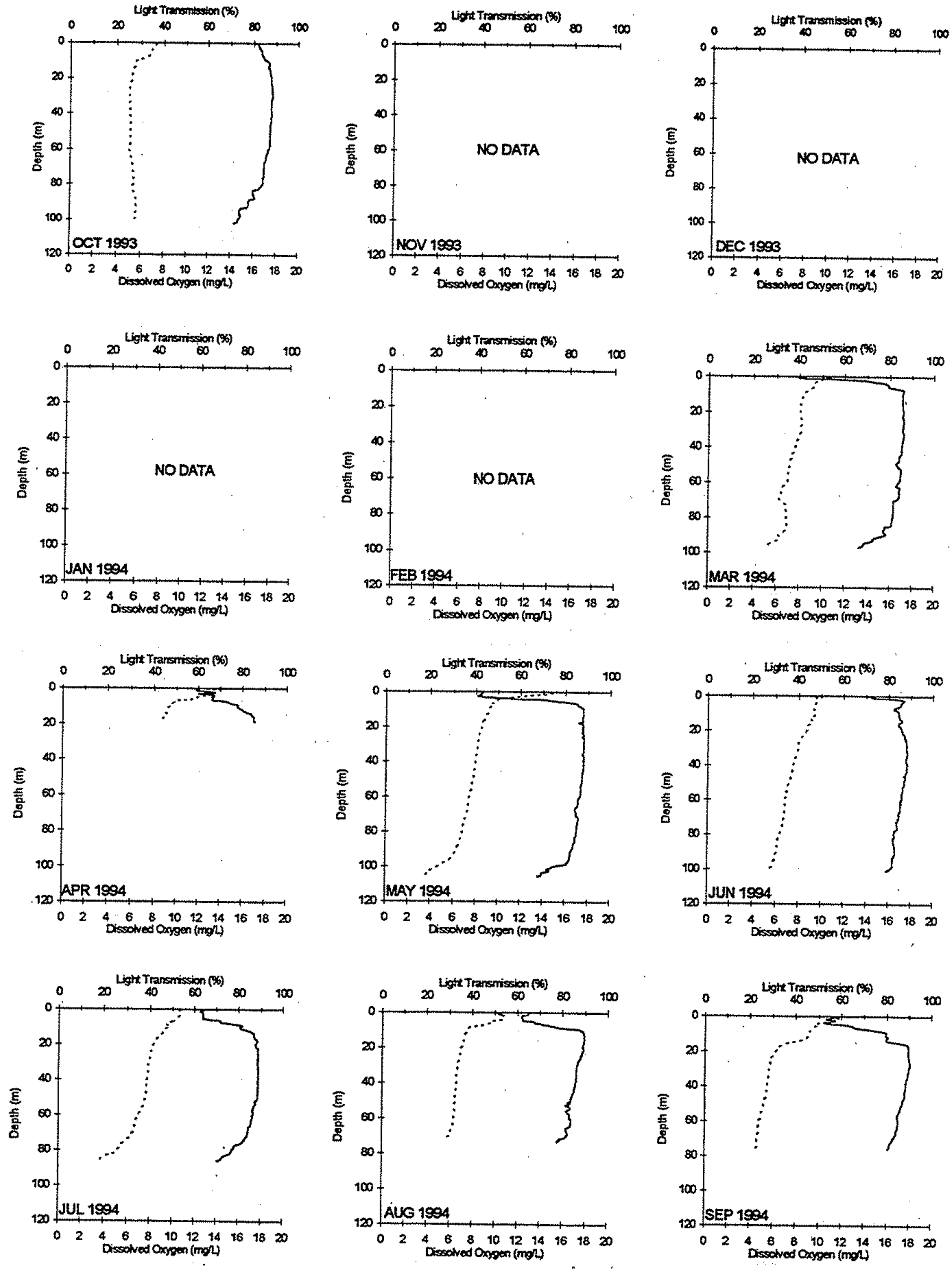
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PSS019 Possession Sound - Gedney Island



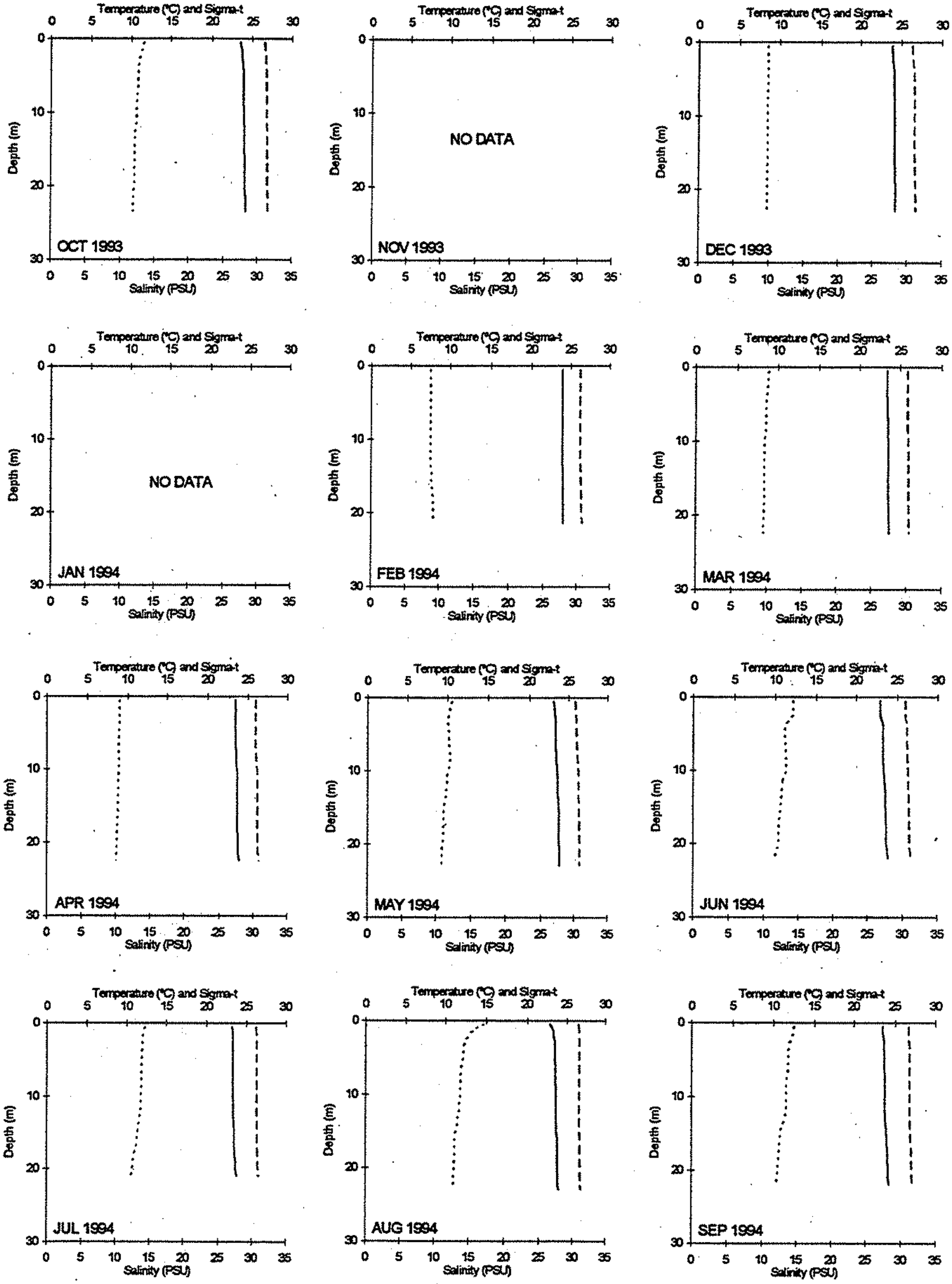
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Possession Sound - Gedney Island PSS019



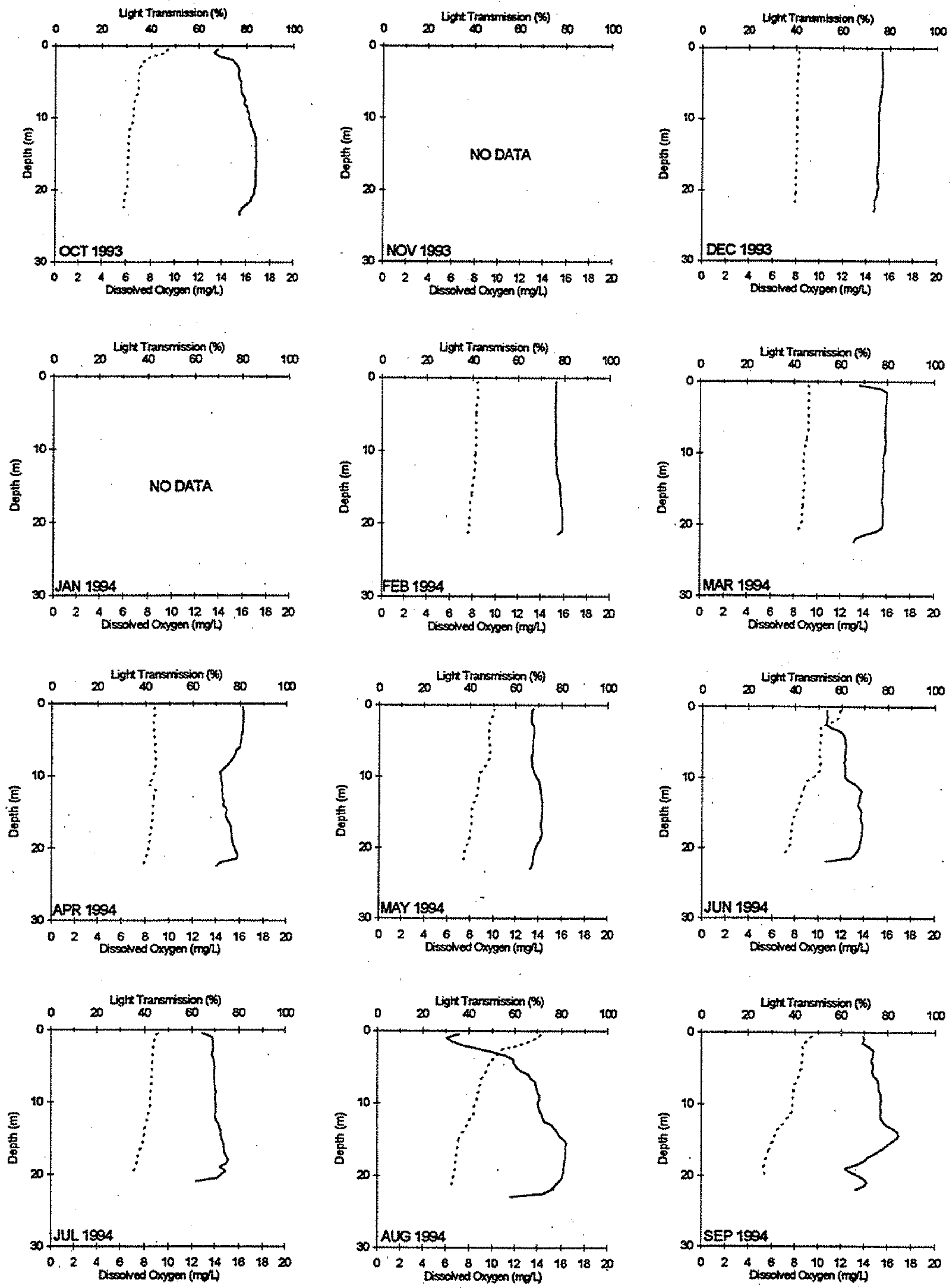
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PTH005 Port Townsend Harbor - Walan Point



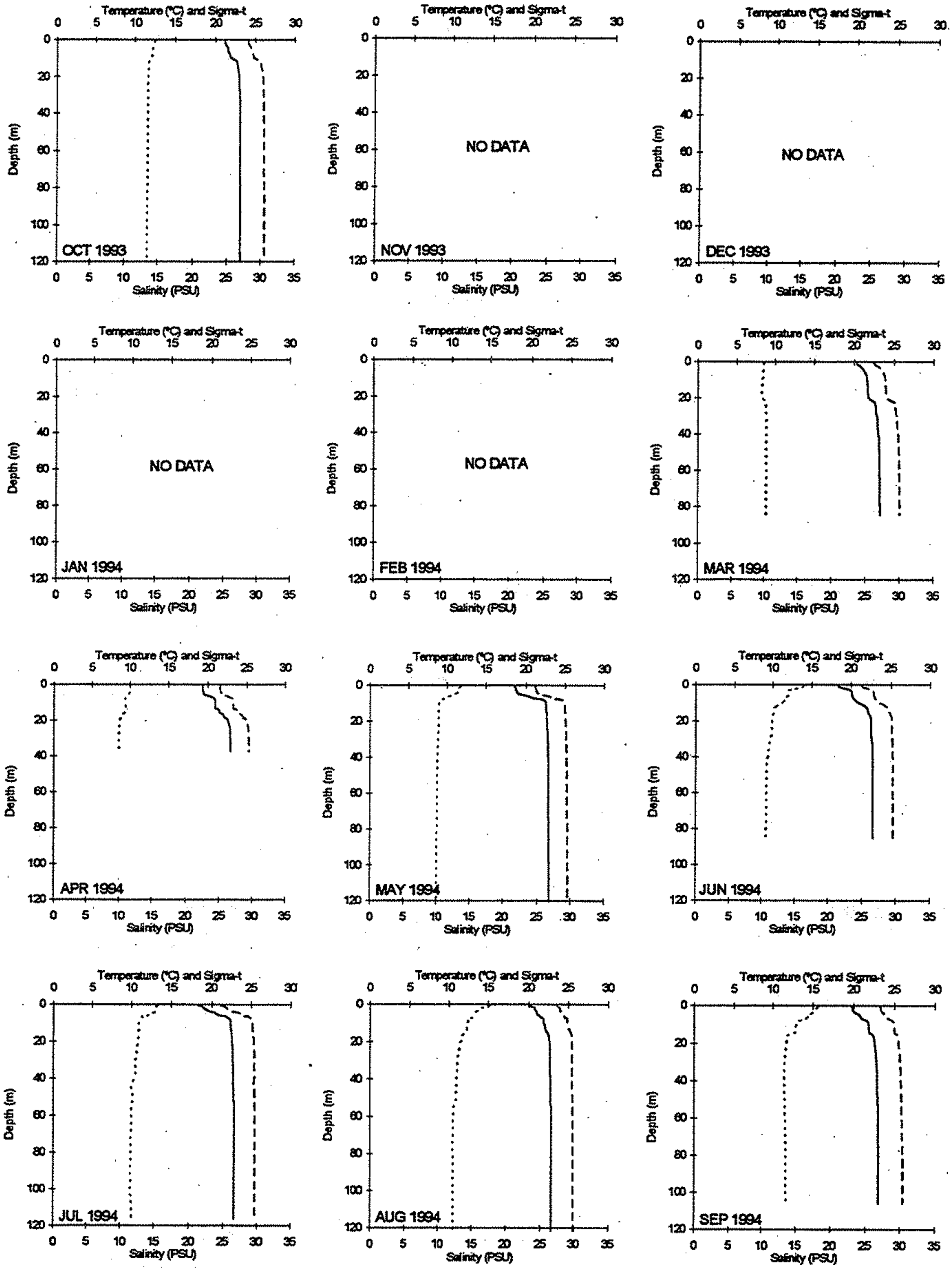
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Port Townsend Harbor - Walan Point PTH005



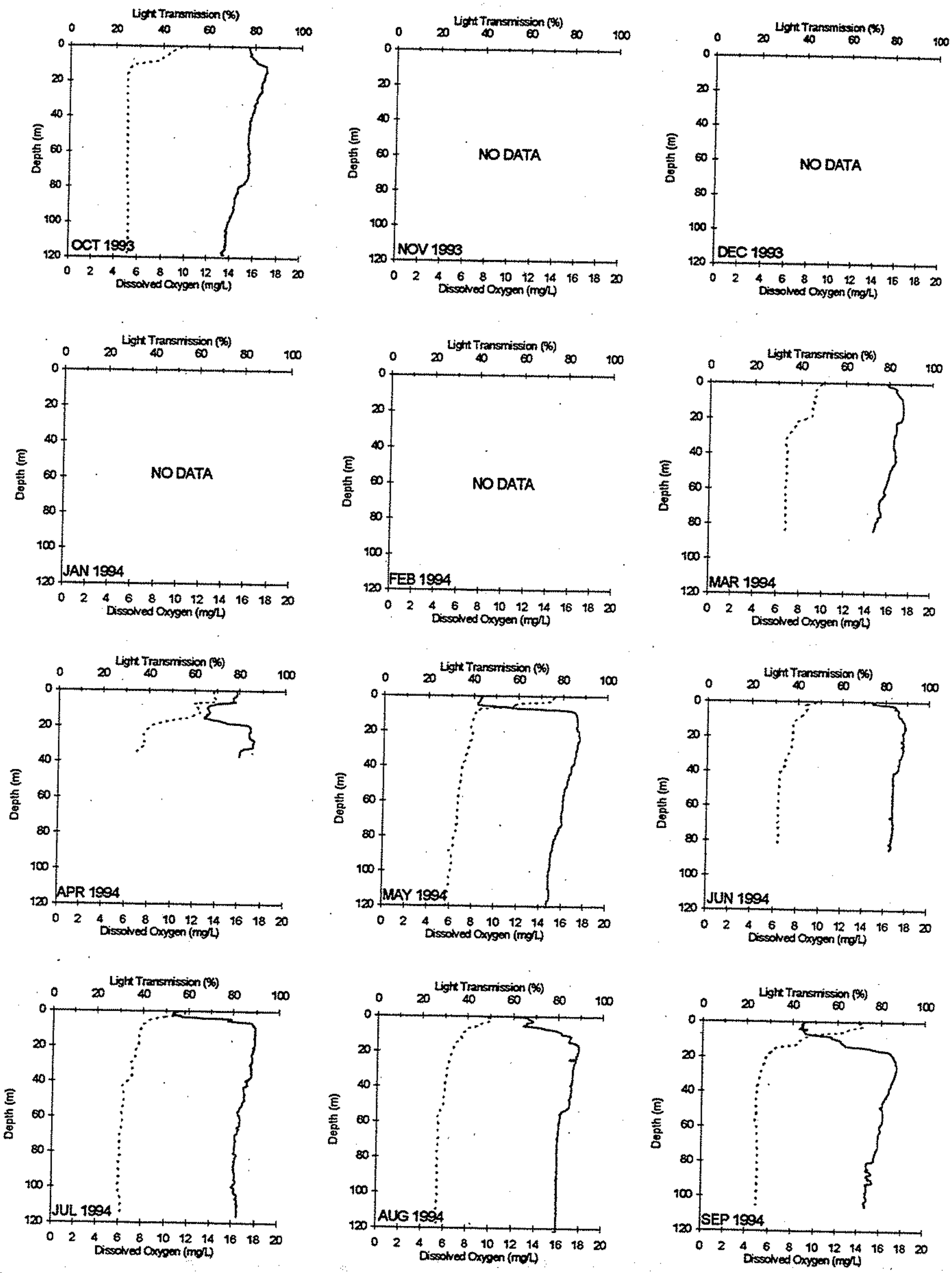
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

SAR003 Saratoga Passage - East Point



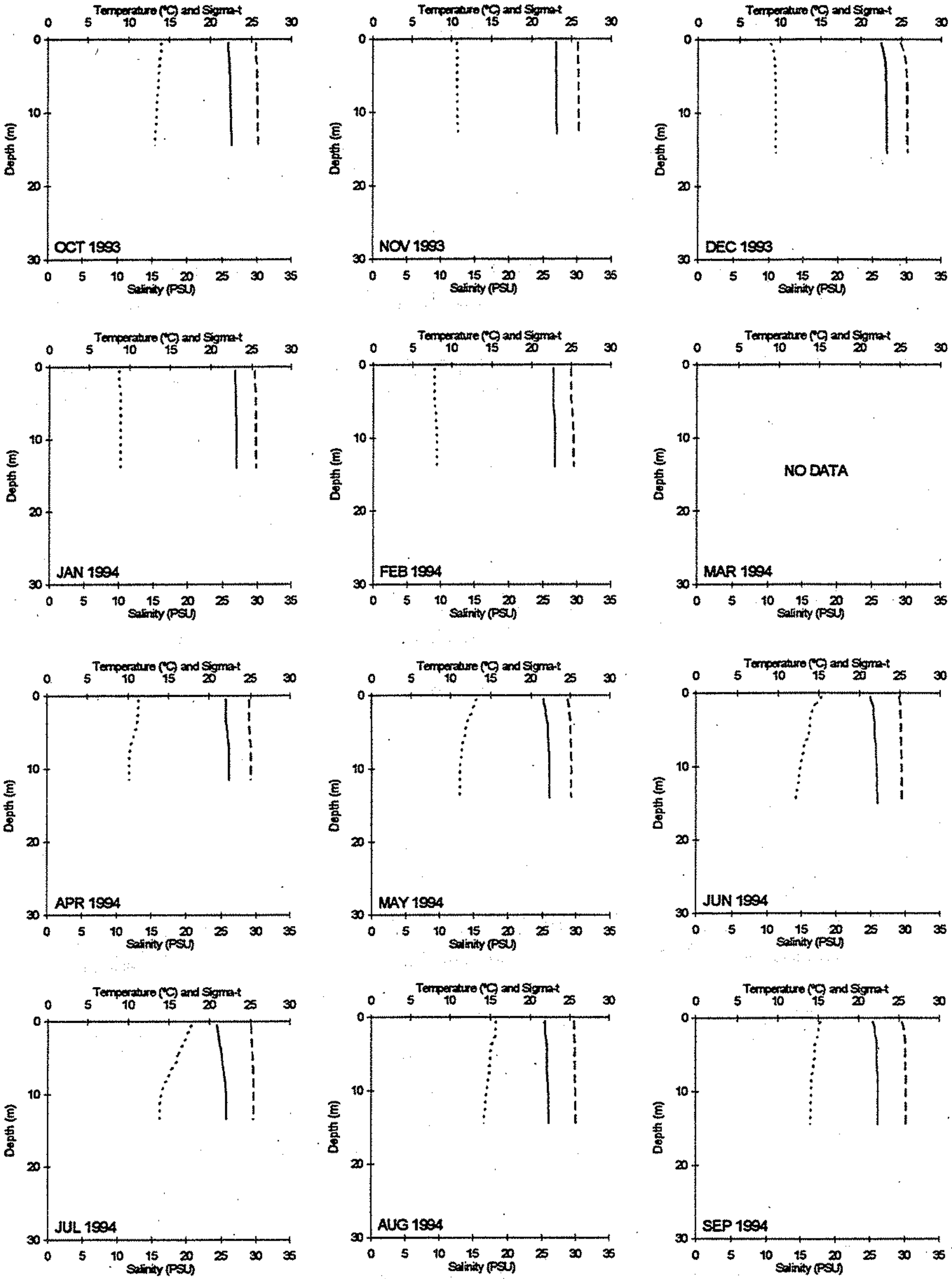
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Saratoga Passage - East Point SAR003



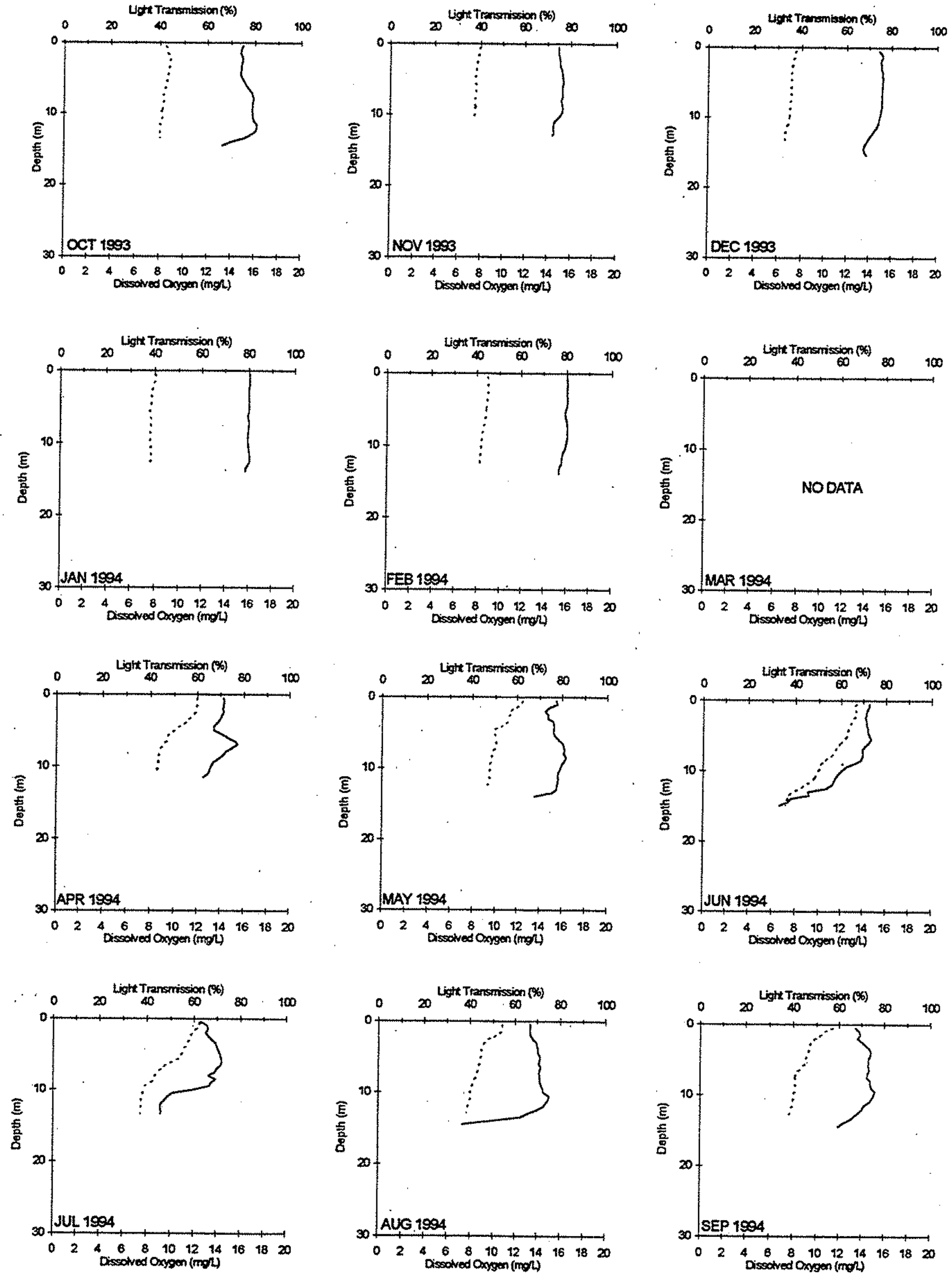
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

SIN001 Sinclair Inlet - Naval Shipyards



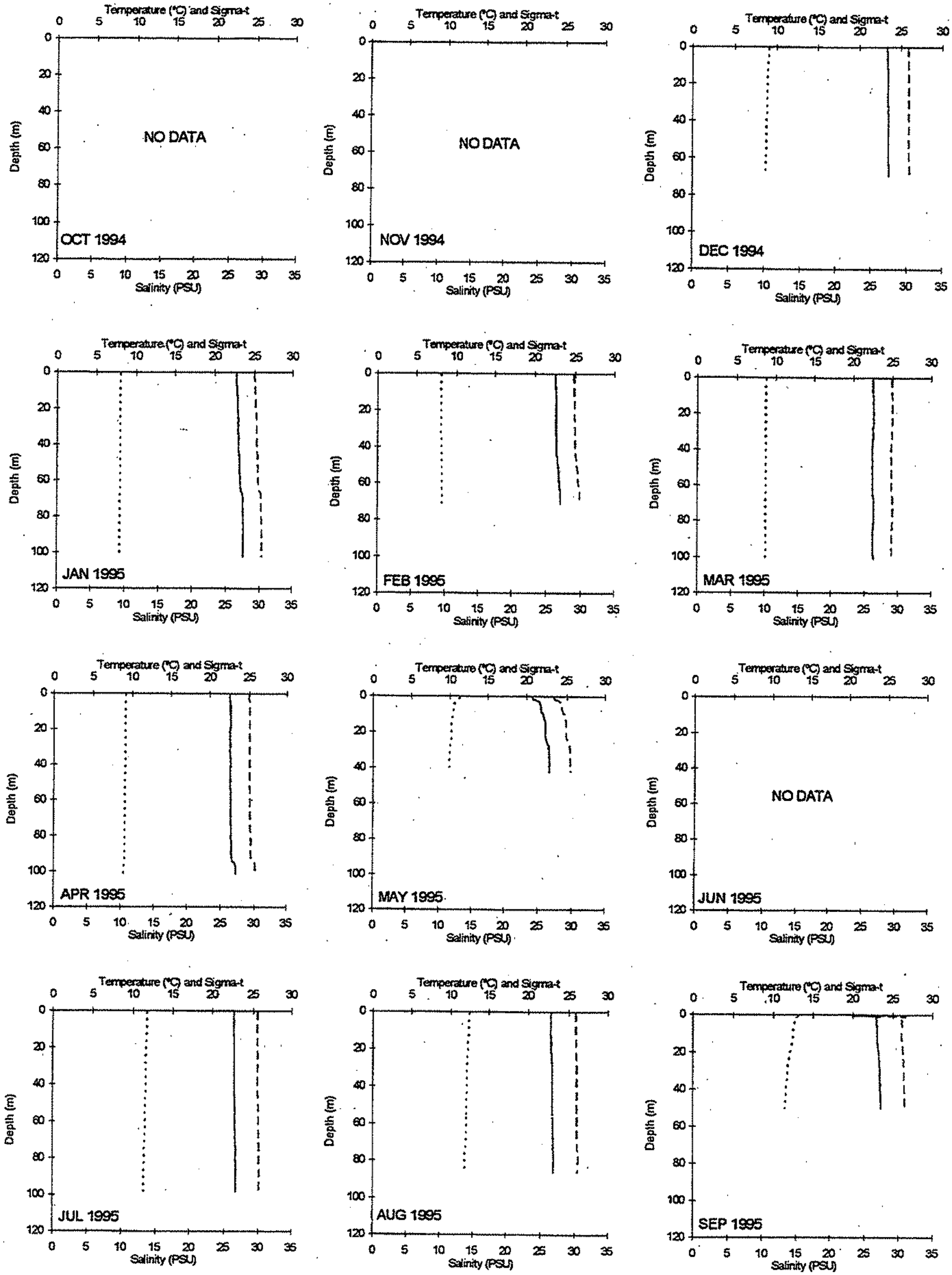
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Sinclair Inlet - Naval Shipyards SIN001



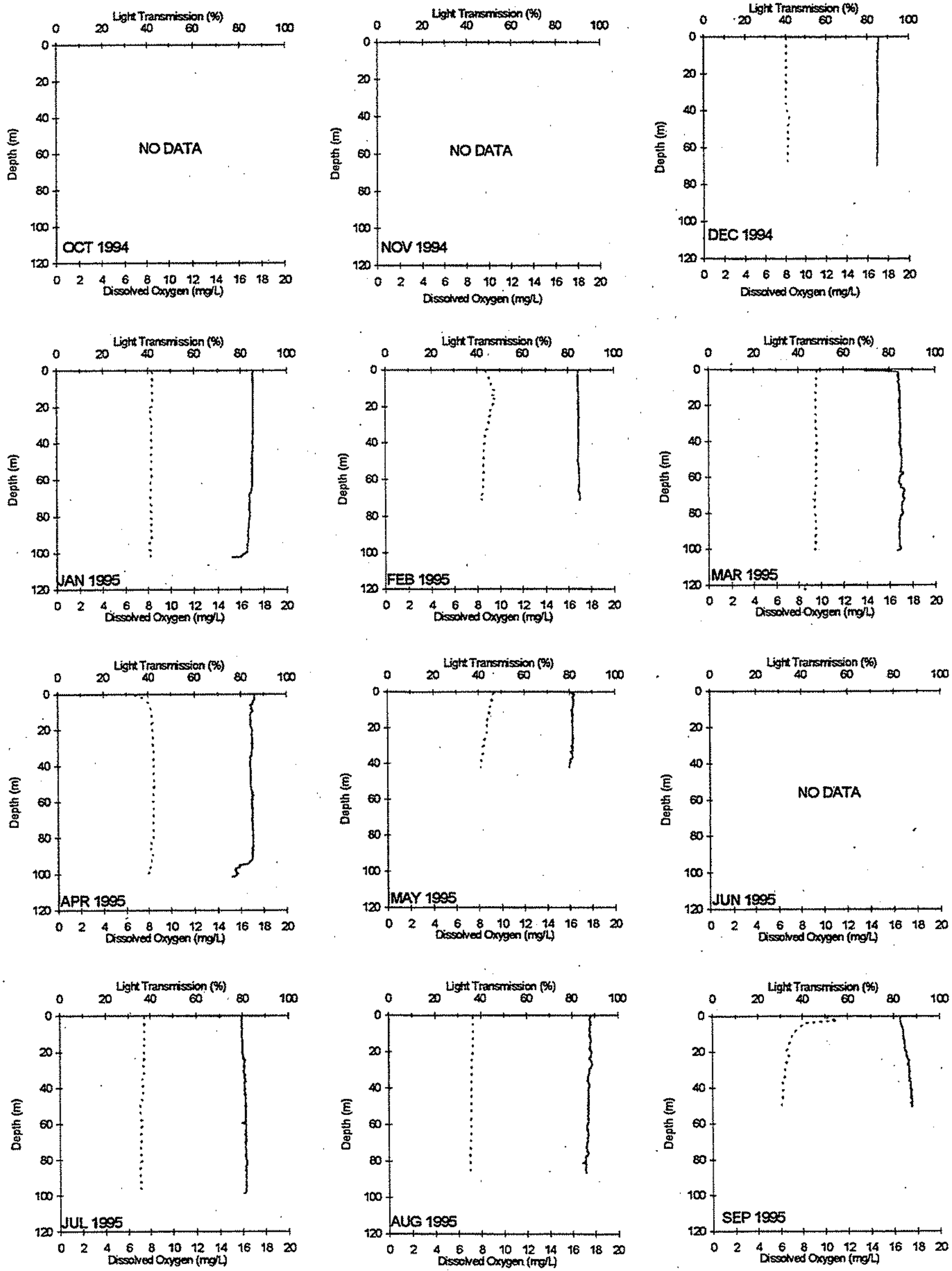
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

ADM001 Admiralty Inlet - Bush Point



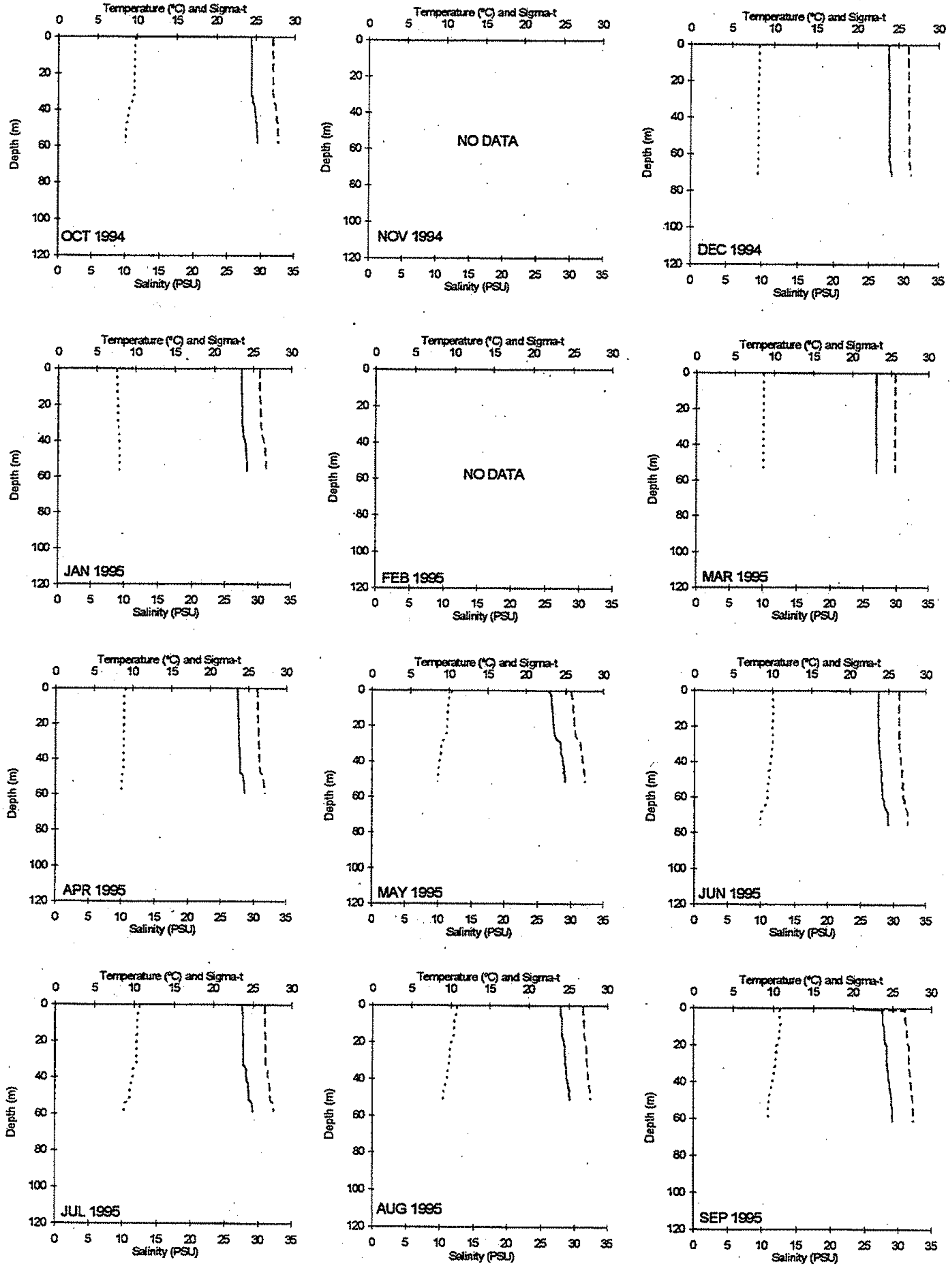
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Admiralty Inlet - Bush Point ADM001



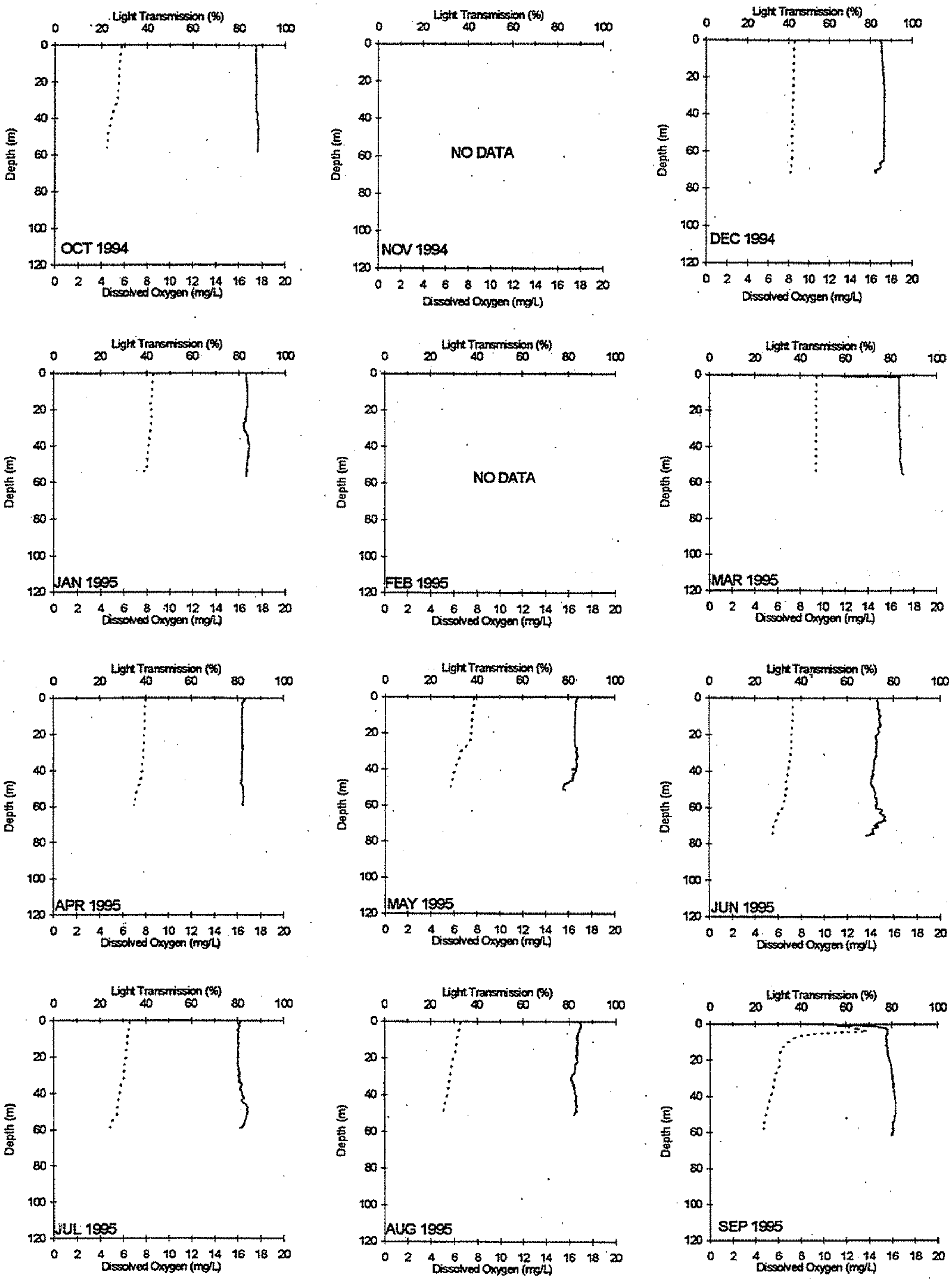
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

ADM002 North Admiralty Inlet - Quimper Peninsula



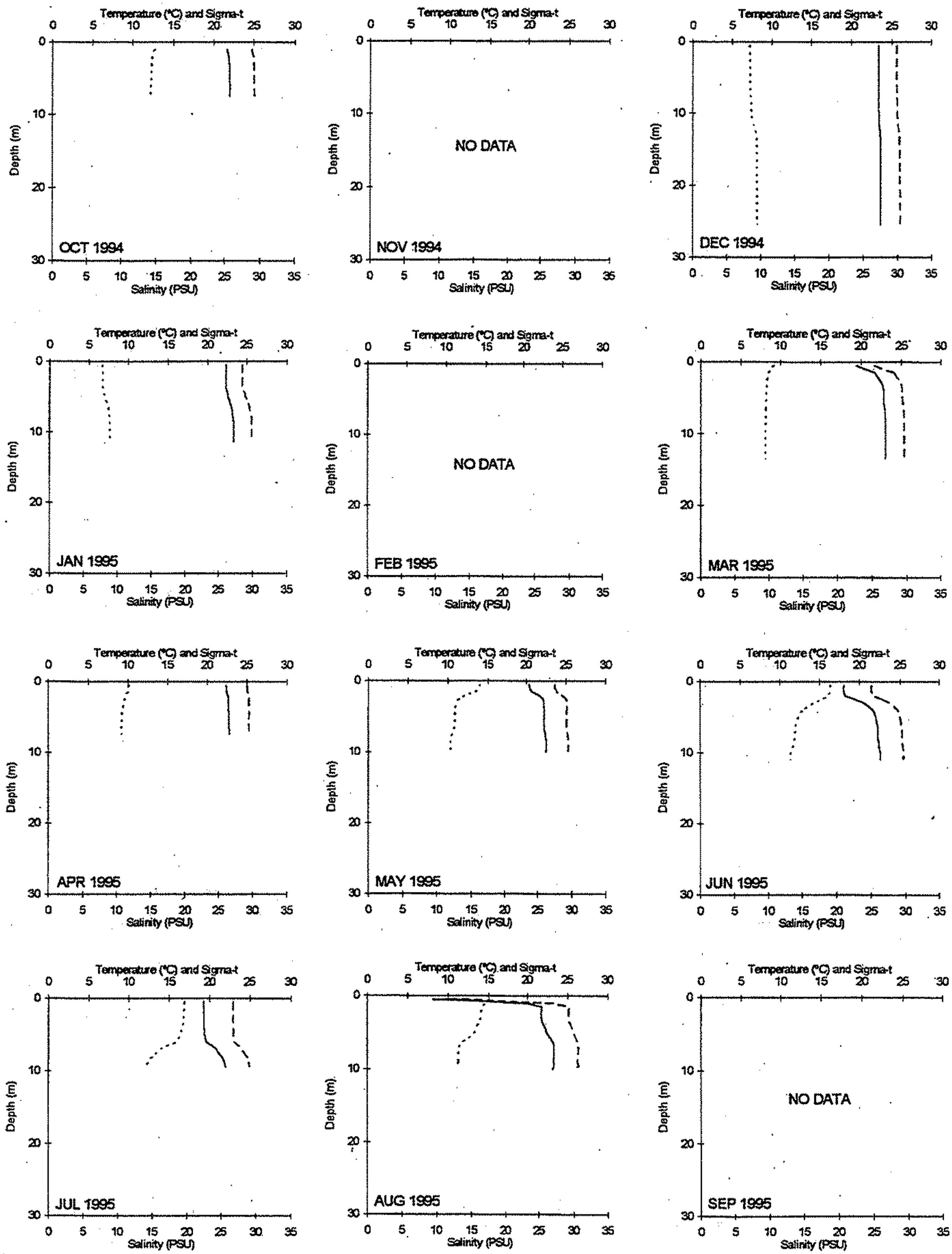
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

North Admiralty Inlet - Quimper Peninsula ADM002



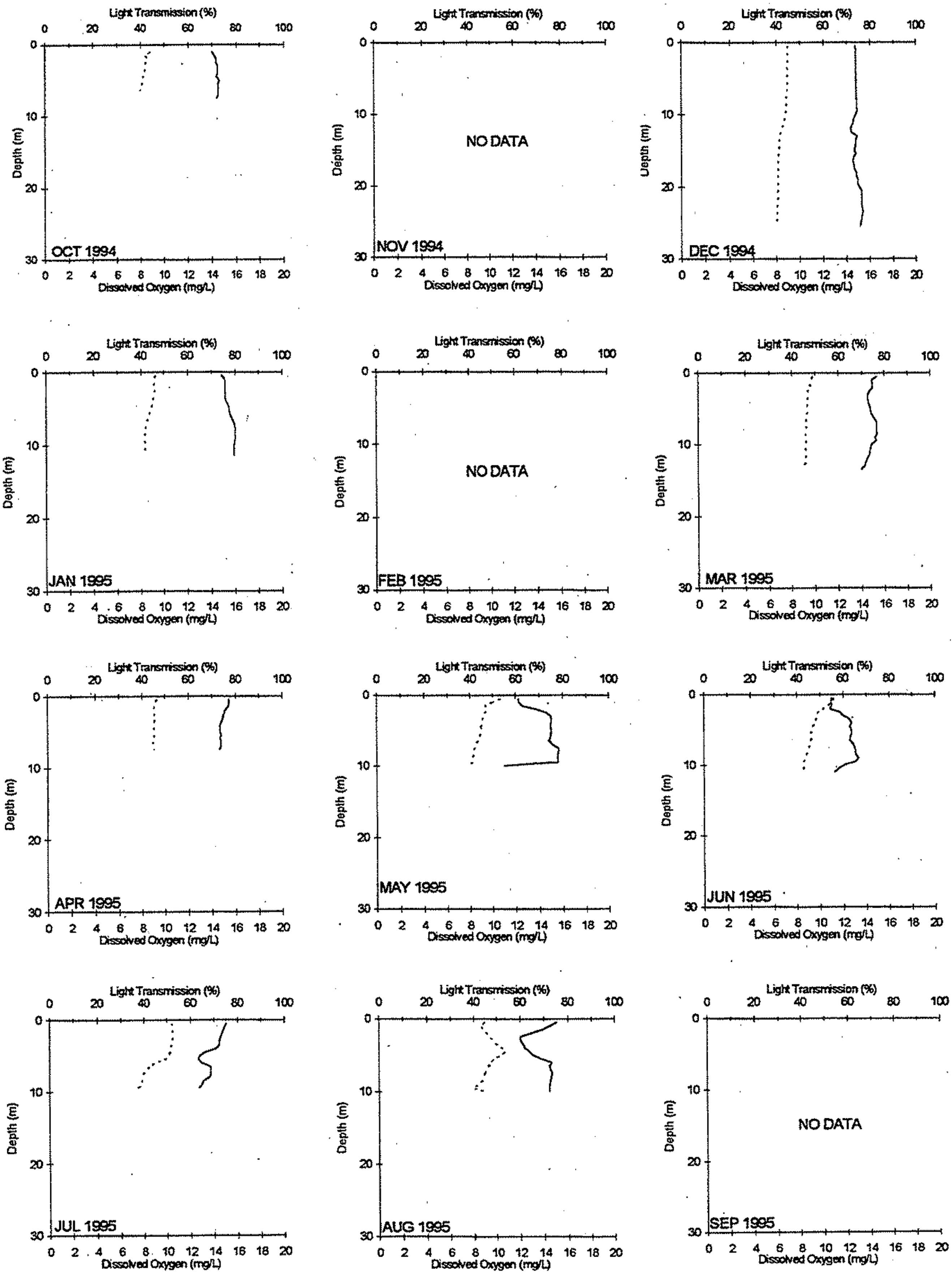
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

BLL009 Bellingham Bay - Point Frances



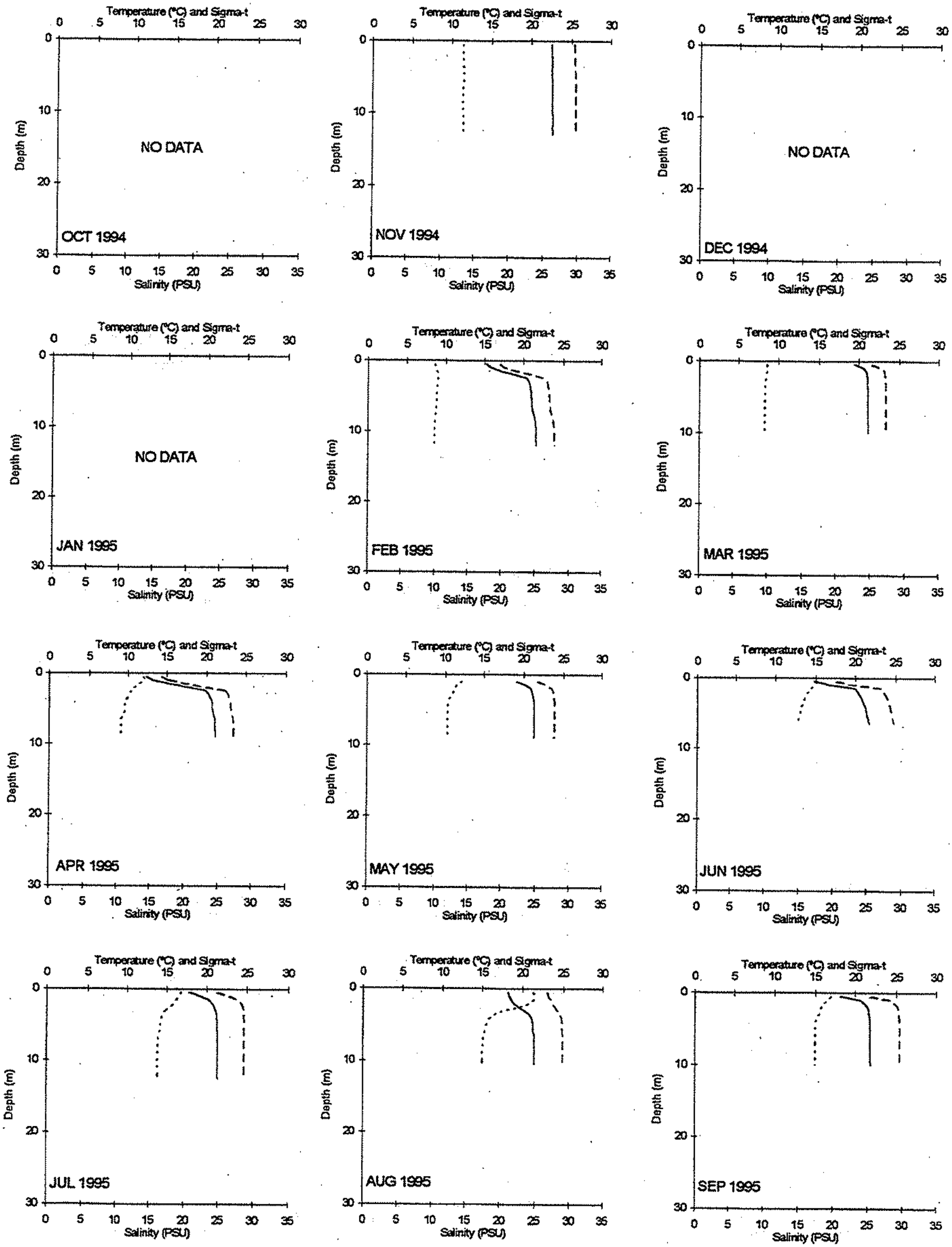
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Bellingham Bay - Point Frances BLL009



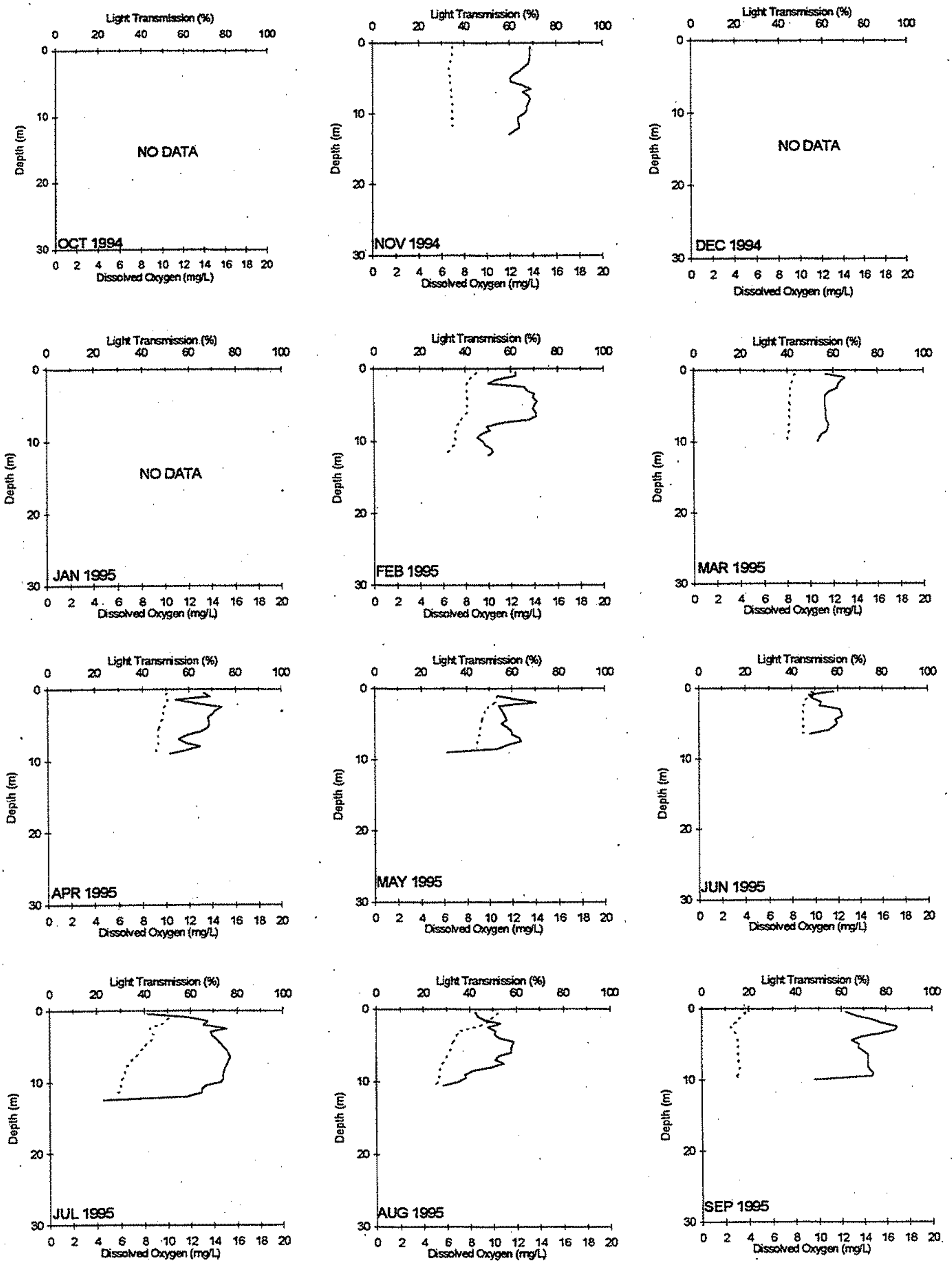
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

BUD002 Budd Inlet - S. End Oly. Port



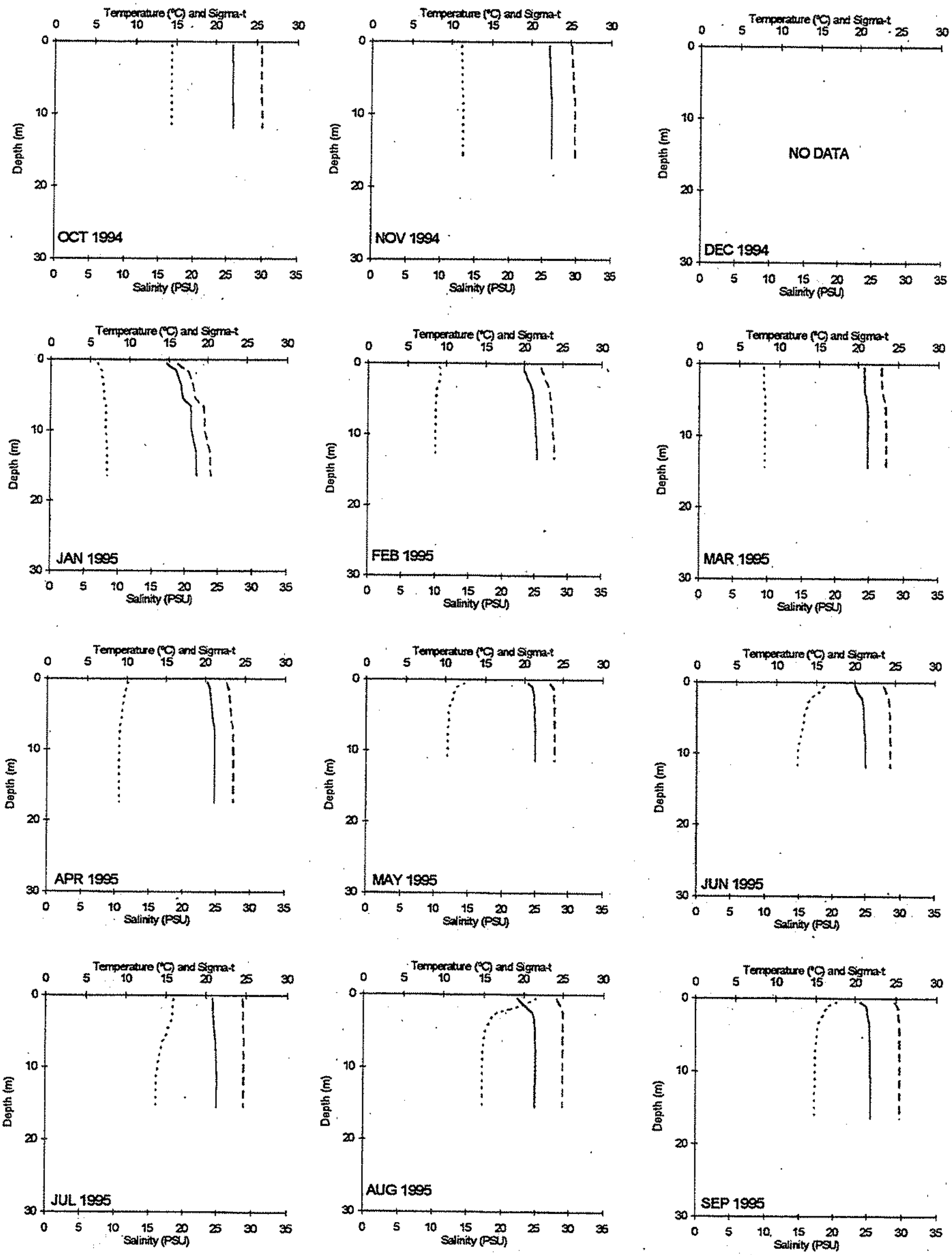
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Budd Inlet - S. End Oly. Port BUD002



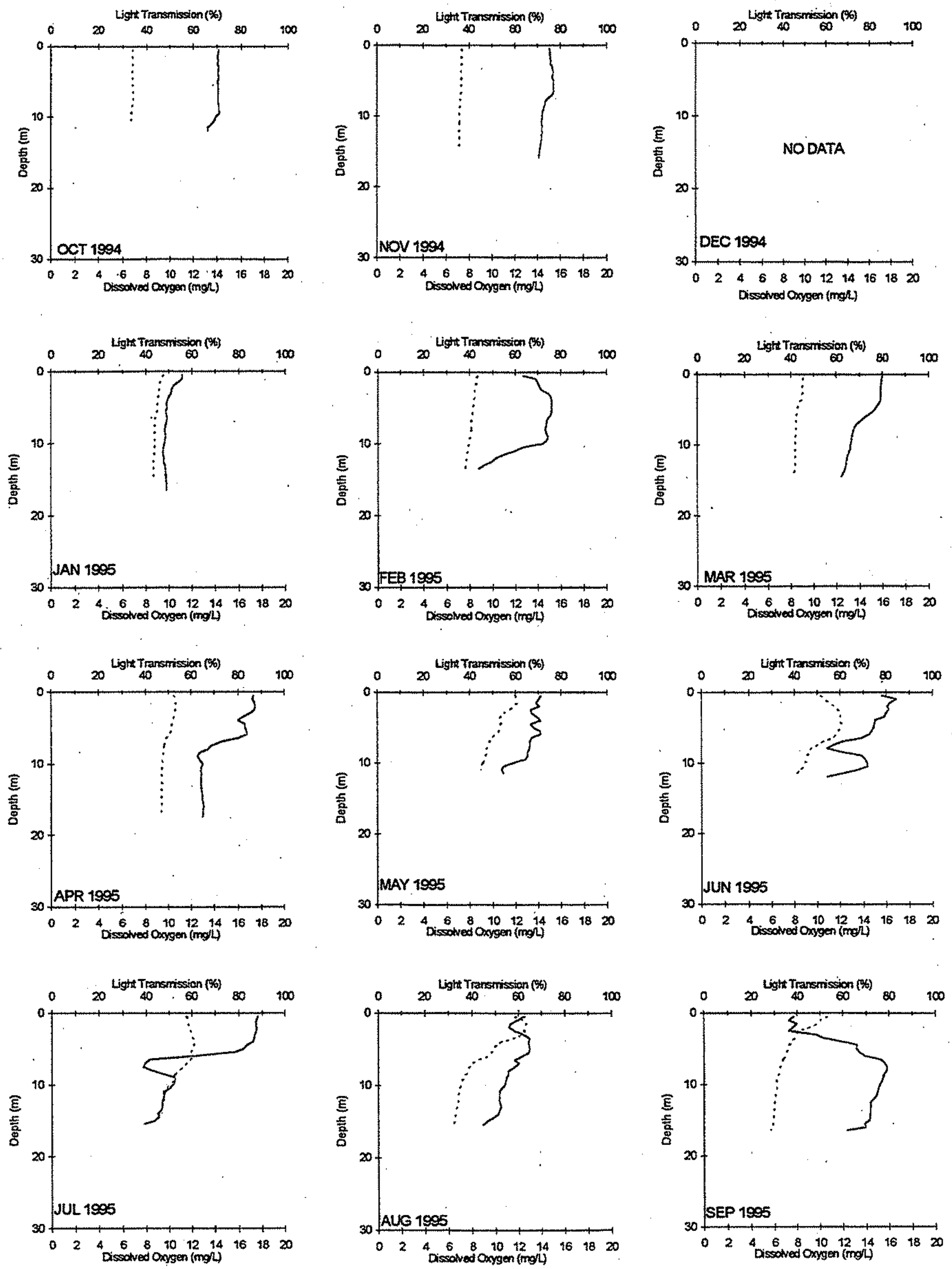
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

BUD005 Budd Inlet - Olympia Shoal



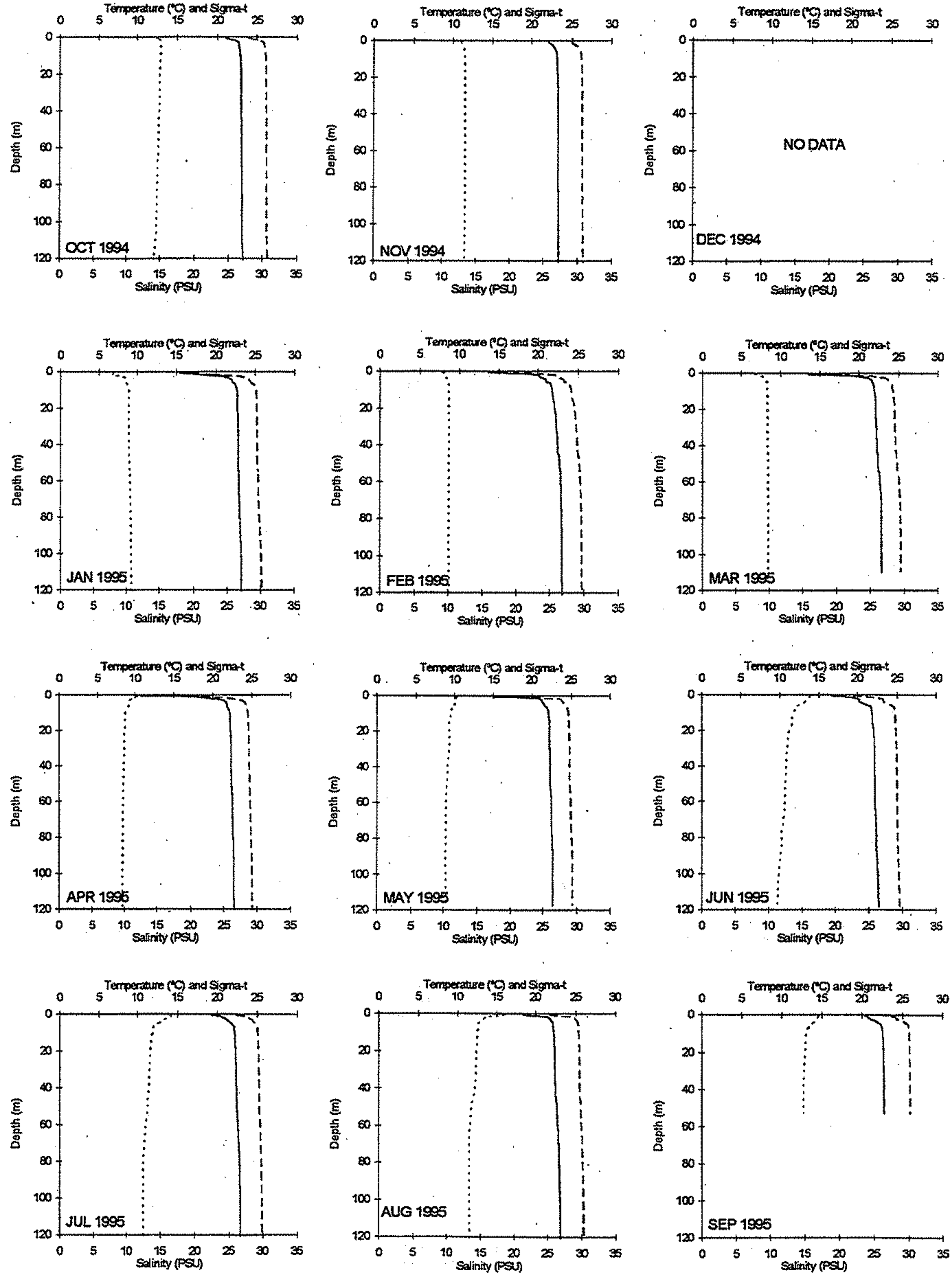
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Budd Inlet - Olympia Shoal   BUD005



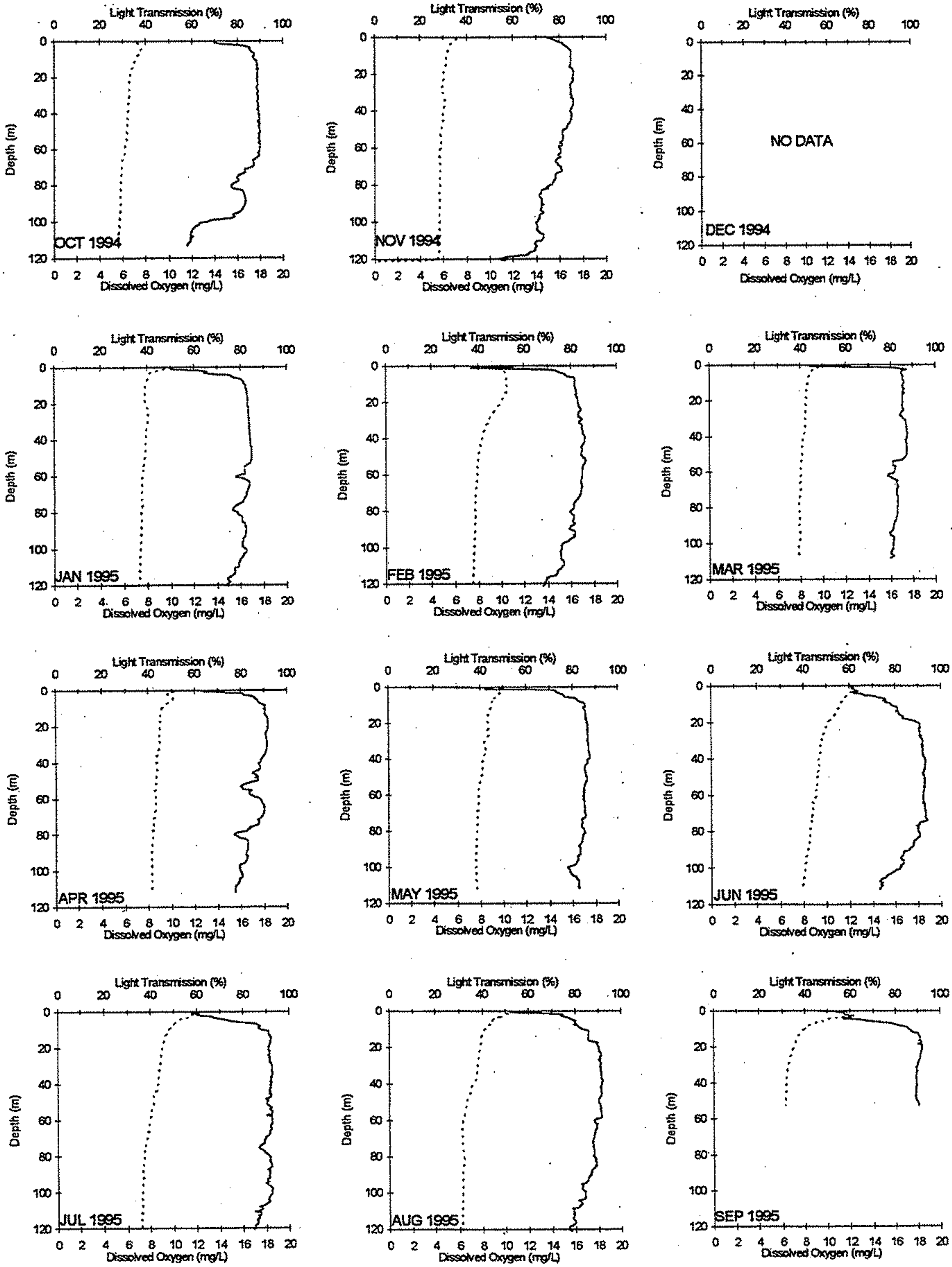
Legend: Light Transmission = Solid Line   Dissolved Oxygen = Dotted Line

CMB003 Commencement Bay - Browns Point



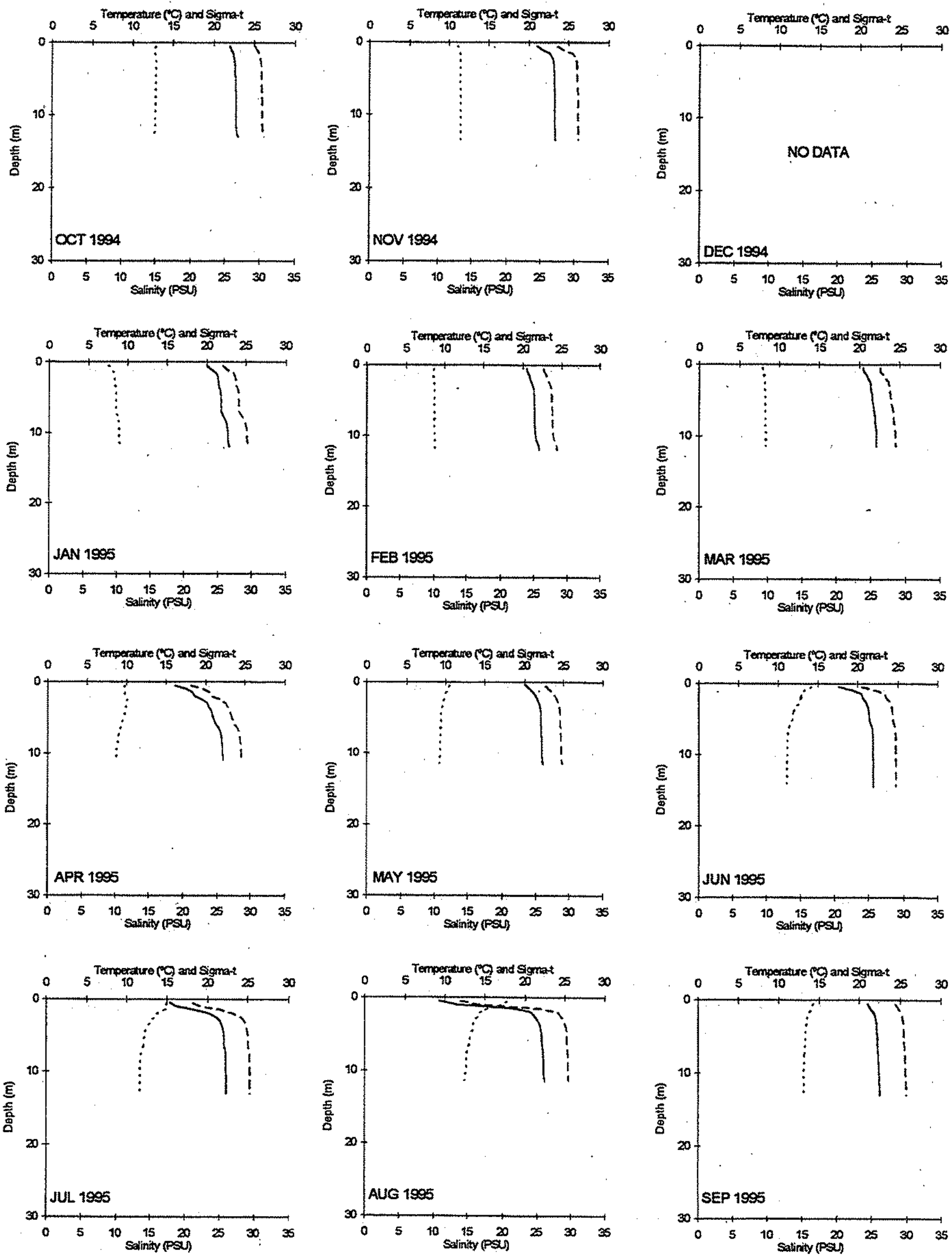
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Commencement Bay - Browns Point CMB003



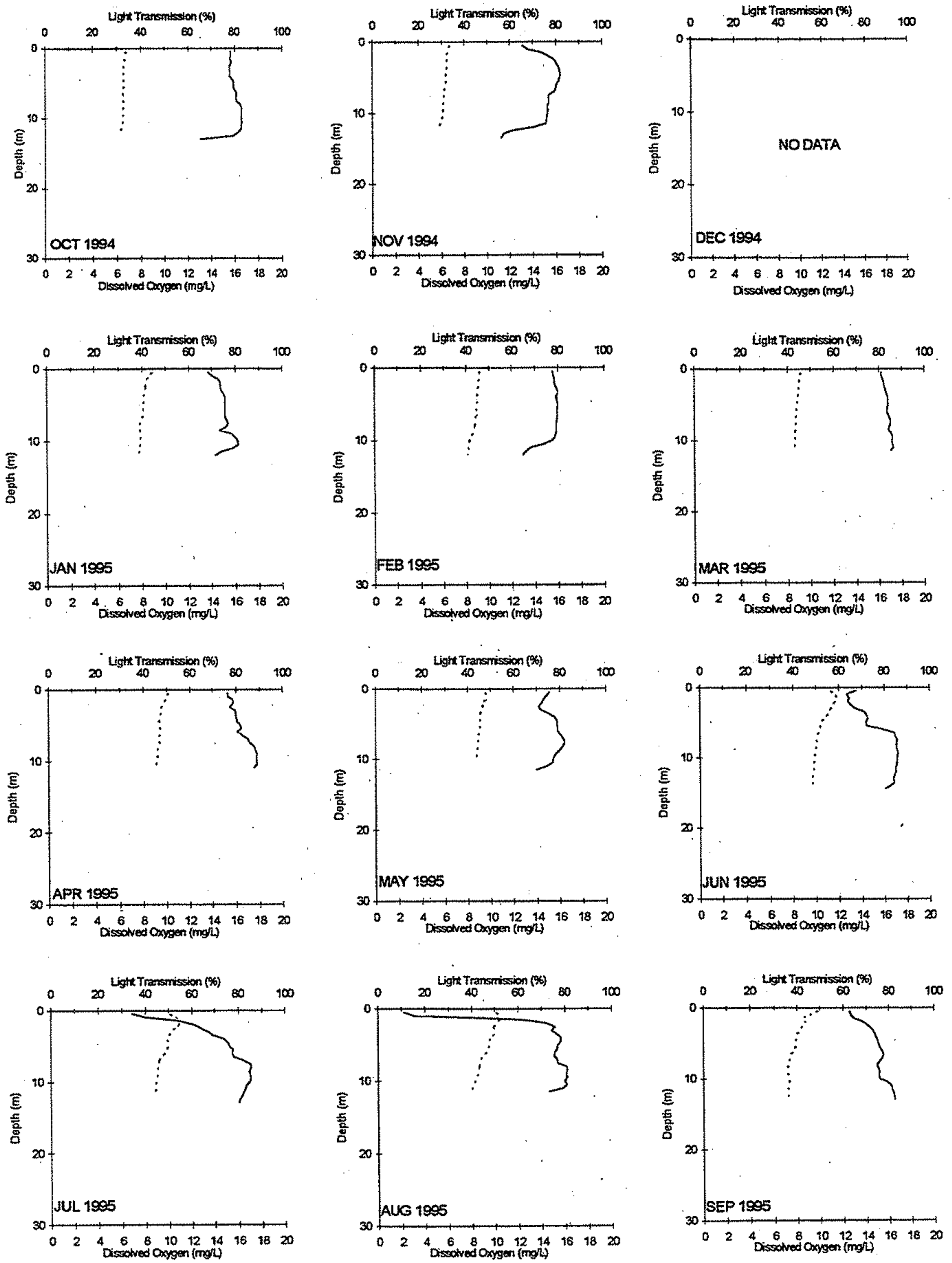
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

CMB006 Commencement Bay - Mouth of City Water Way



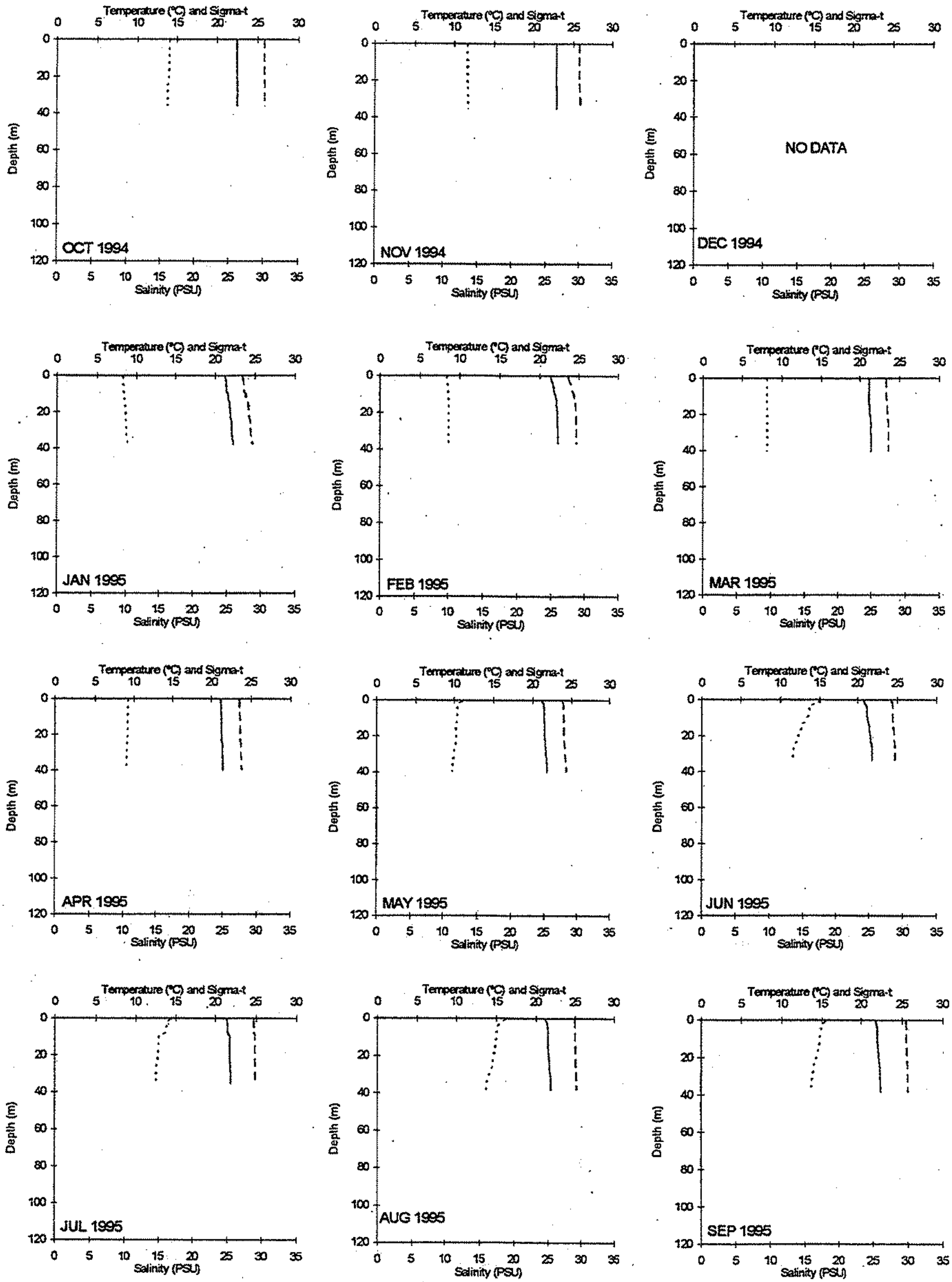
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Commencement Bay - Mouth of City Water Way CMB006



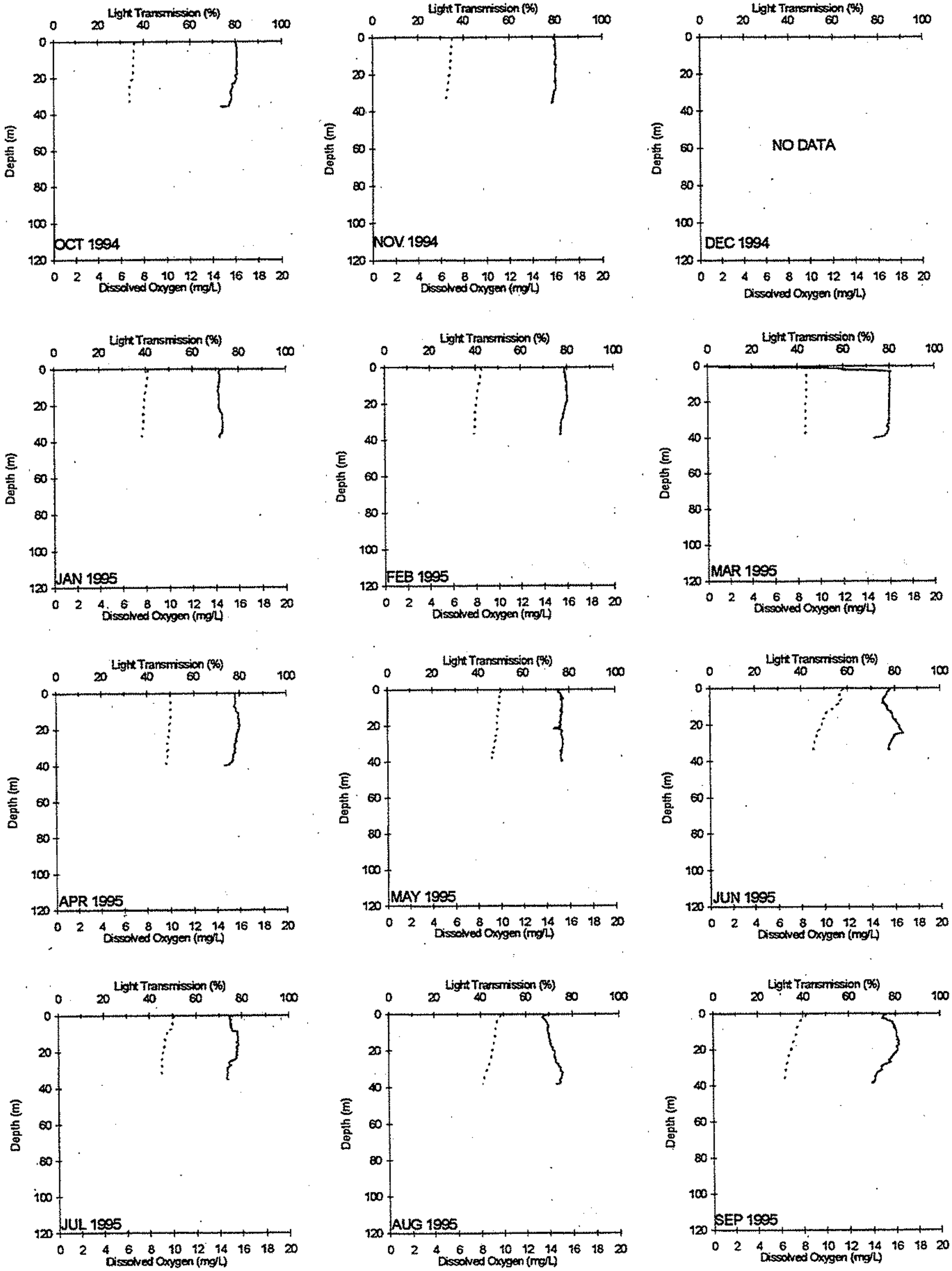
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

DNA001 Dana Passage - S. of Brisco Point



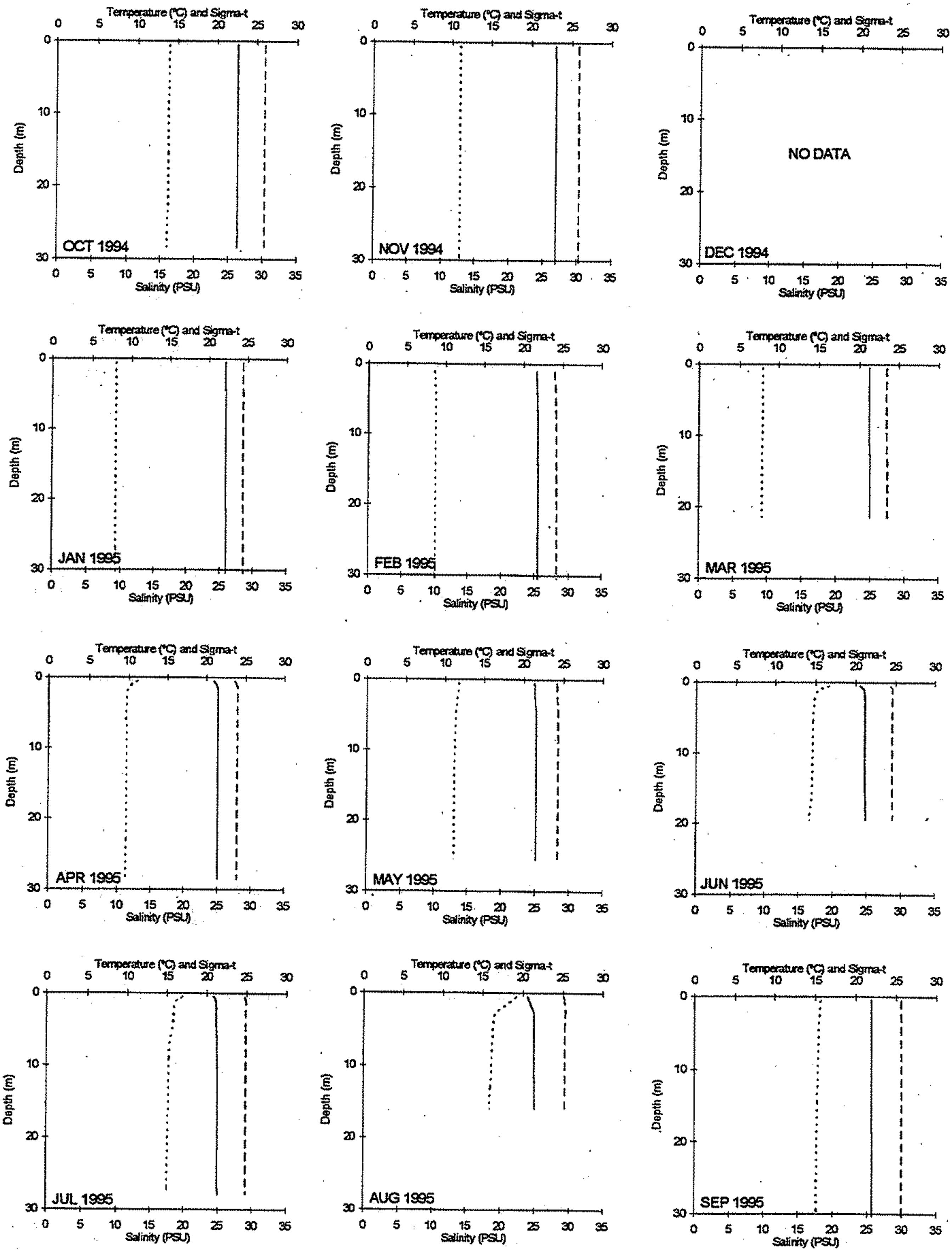
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Dana Passage - S. of Brisco Point DNA001



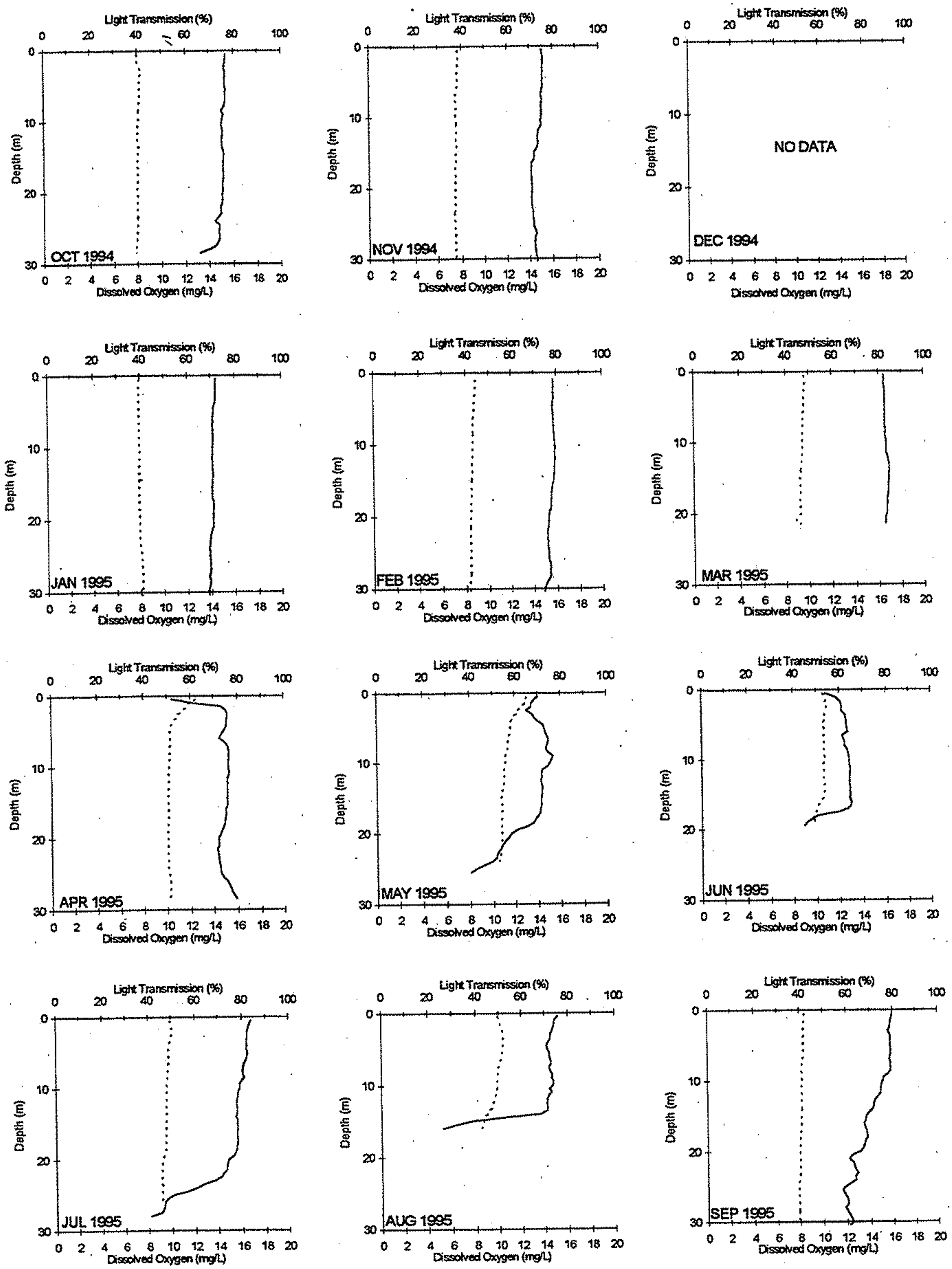
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

DYE004 Dyes Inlet - NE of Chico Bay



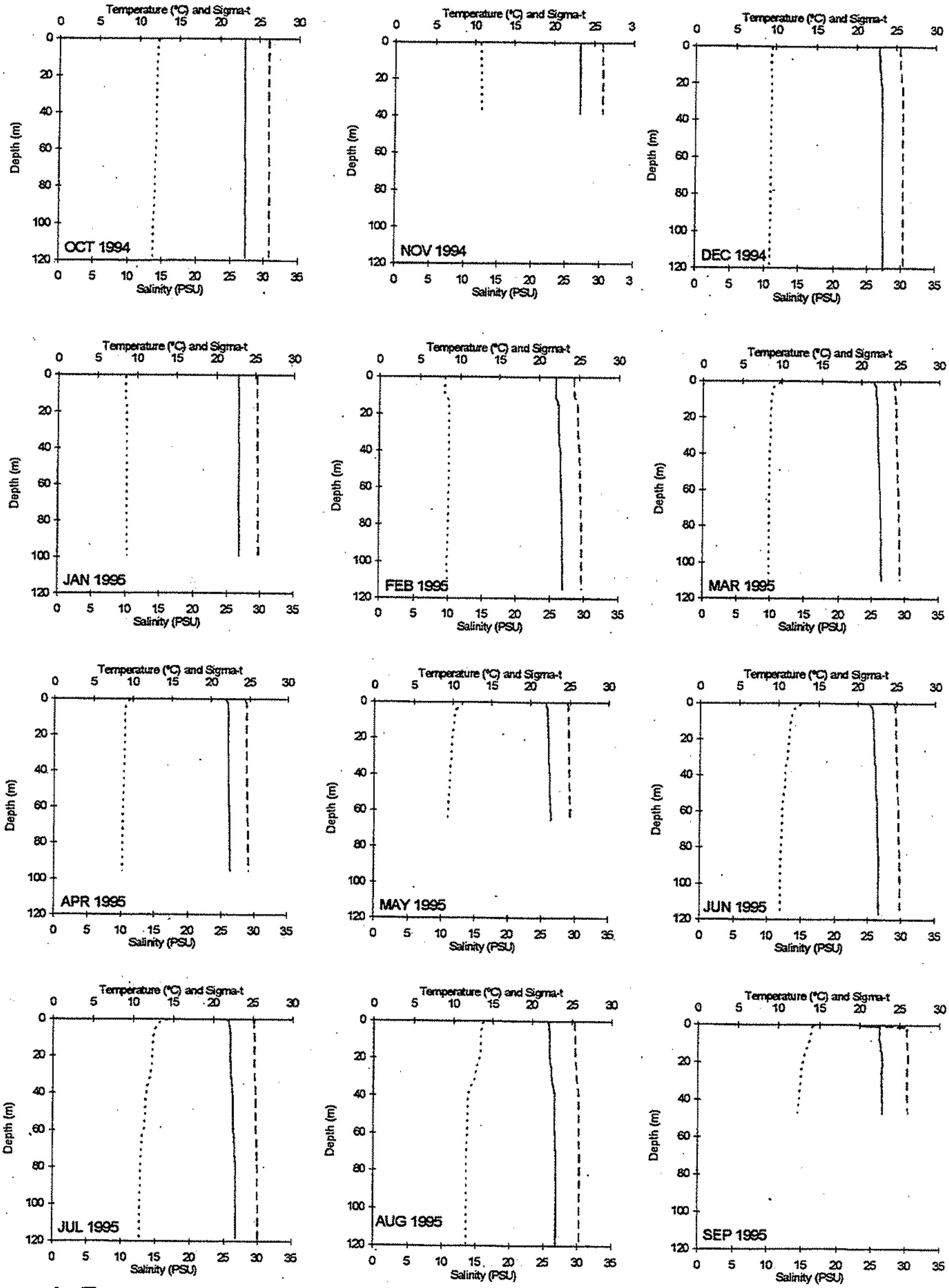
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Dyes Inlet - NE of Chico Bay DYE004



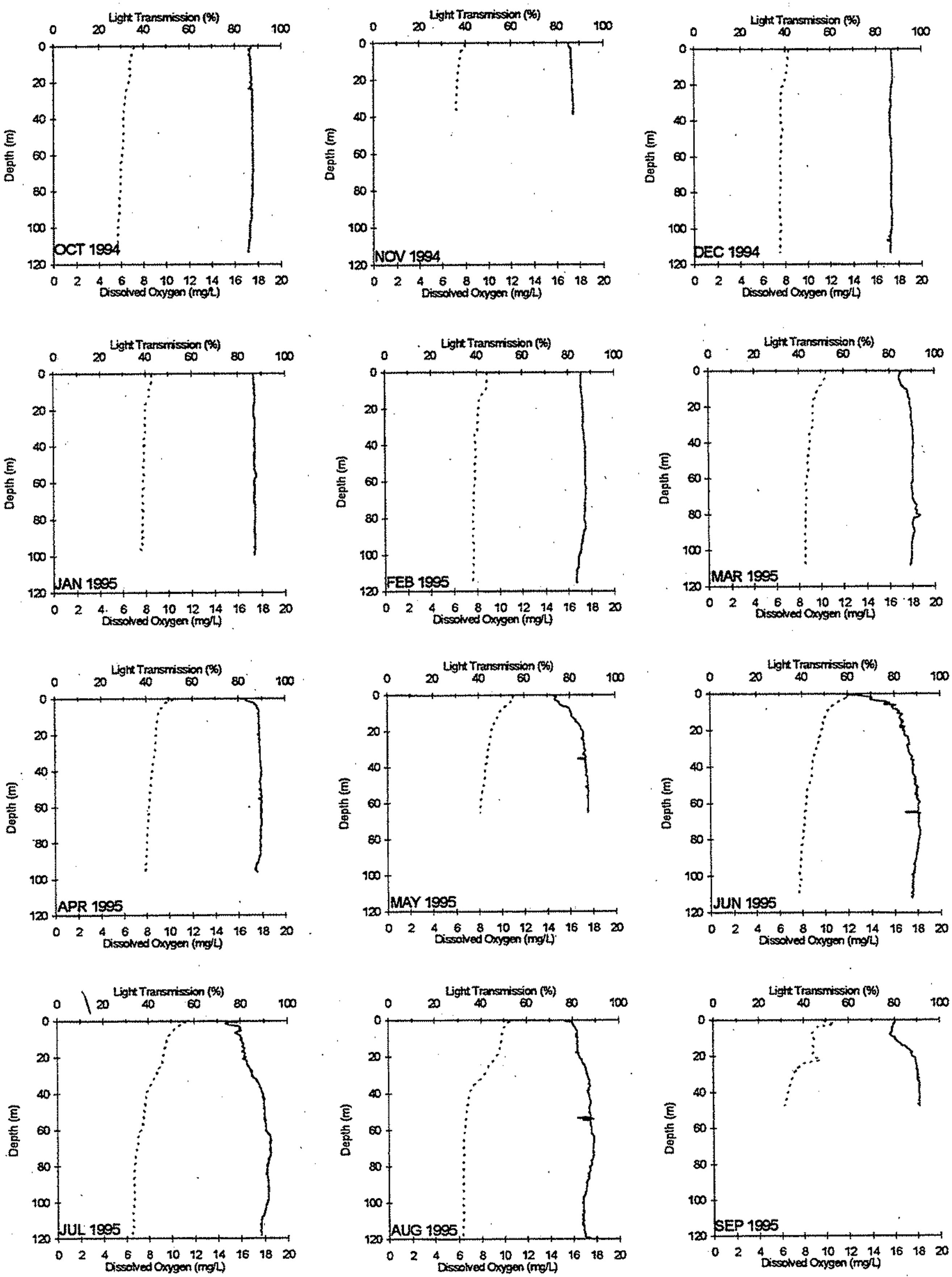
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

EAP001 East Passage - SW of Three Tree Point



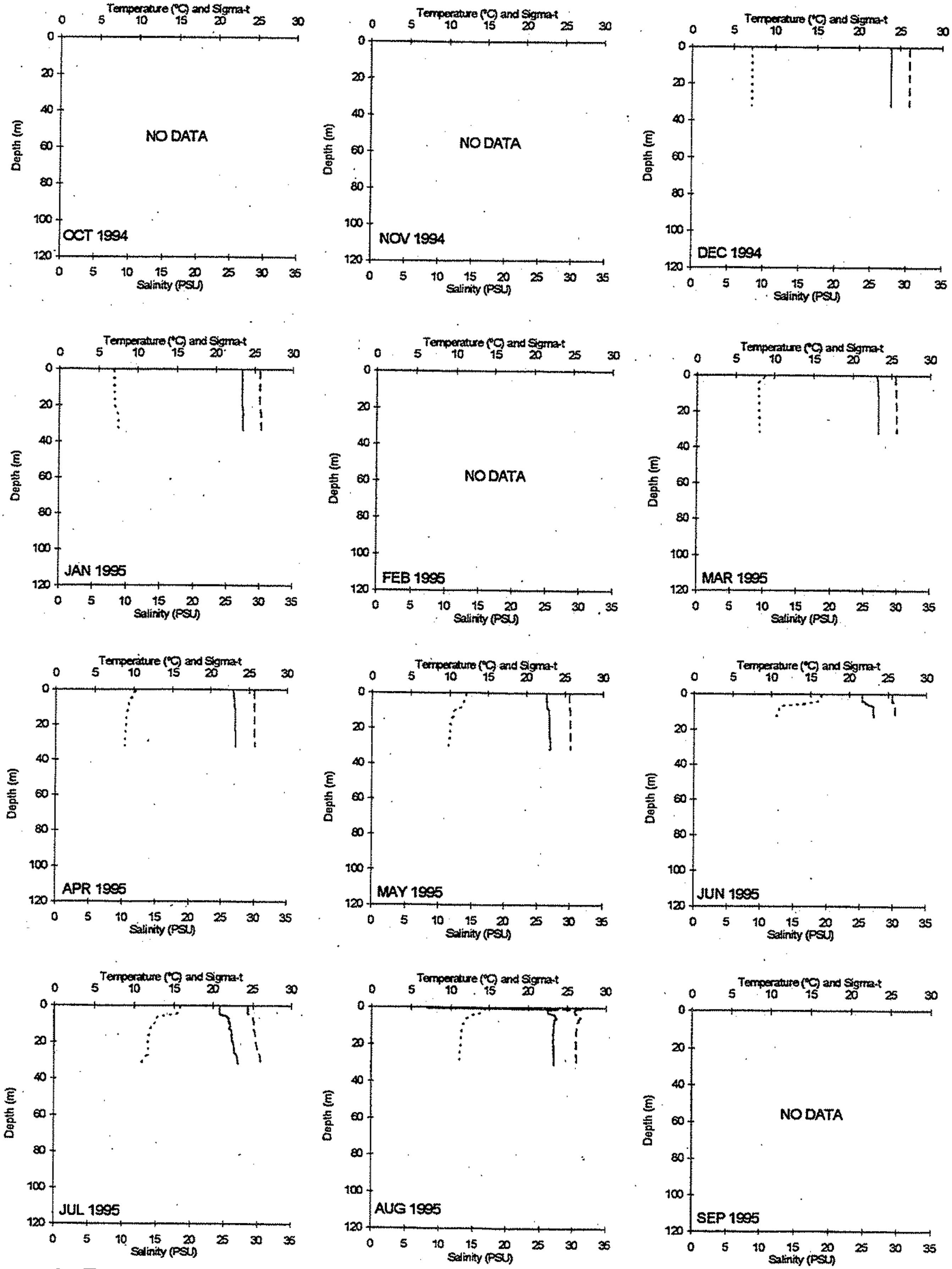
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

East Passage - SW of Three Tree Point EAP001



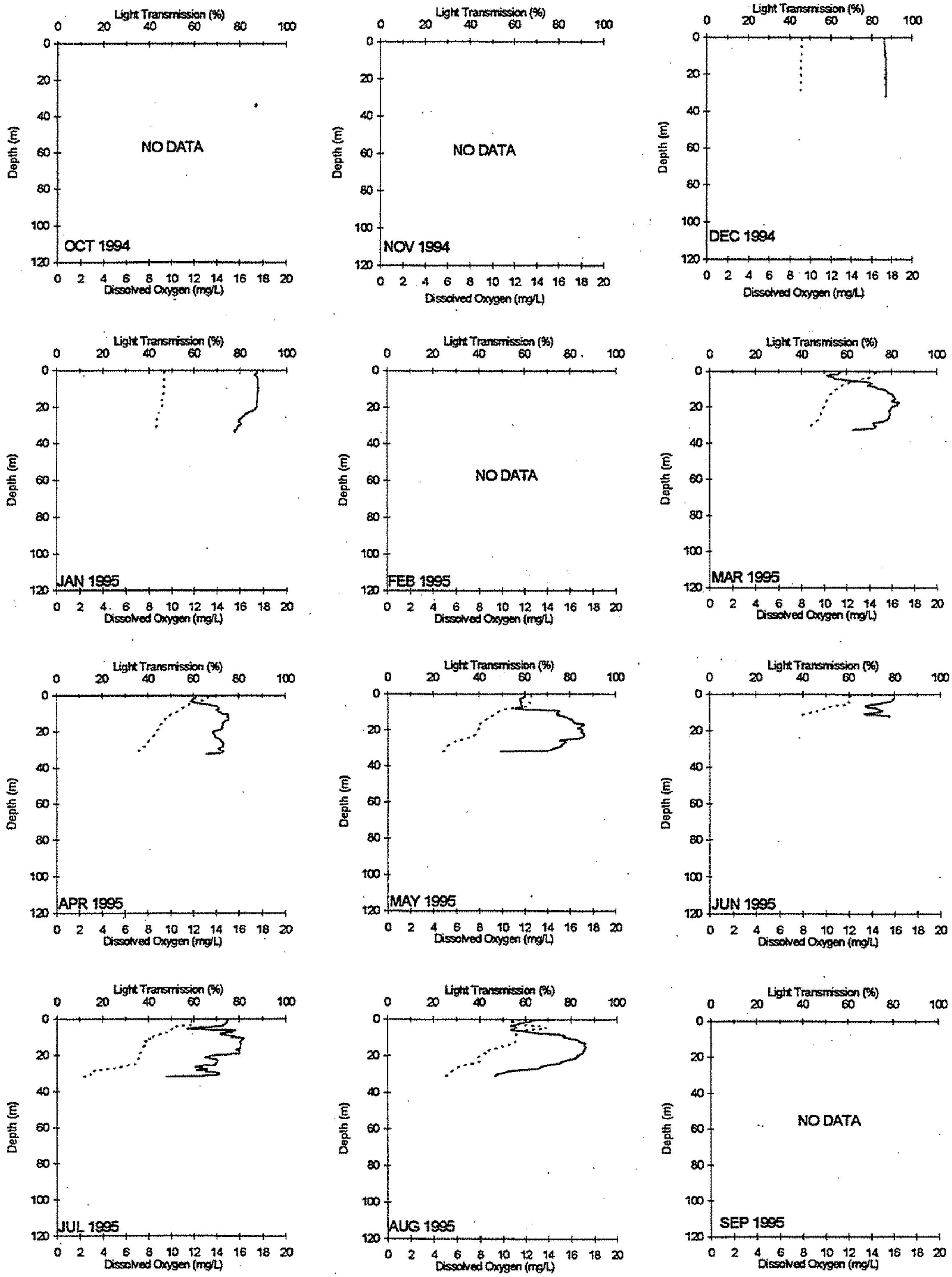
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

EAS001 East Sound - Rosario Point



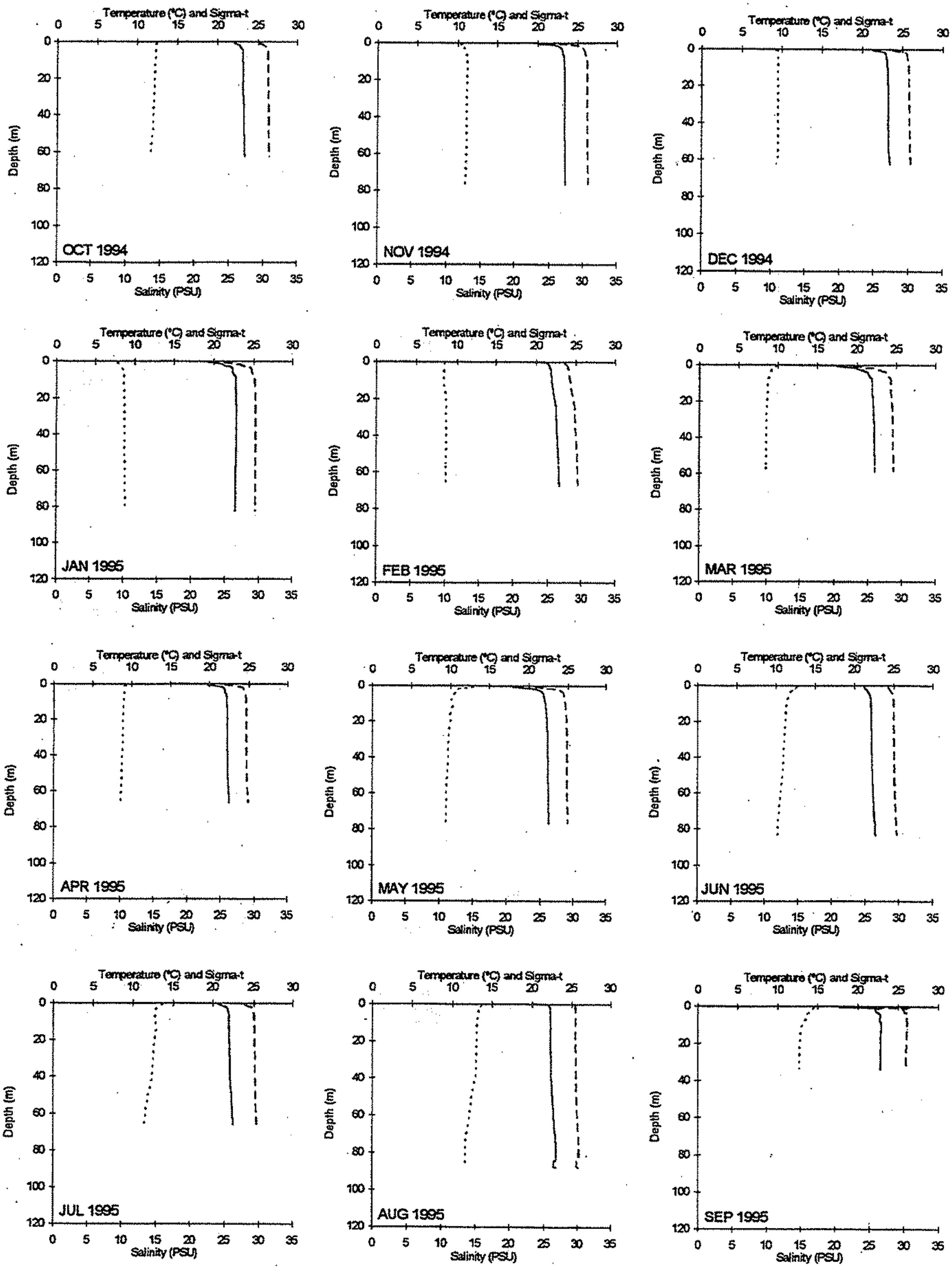
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

East Sound - Rosario Point EAS001



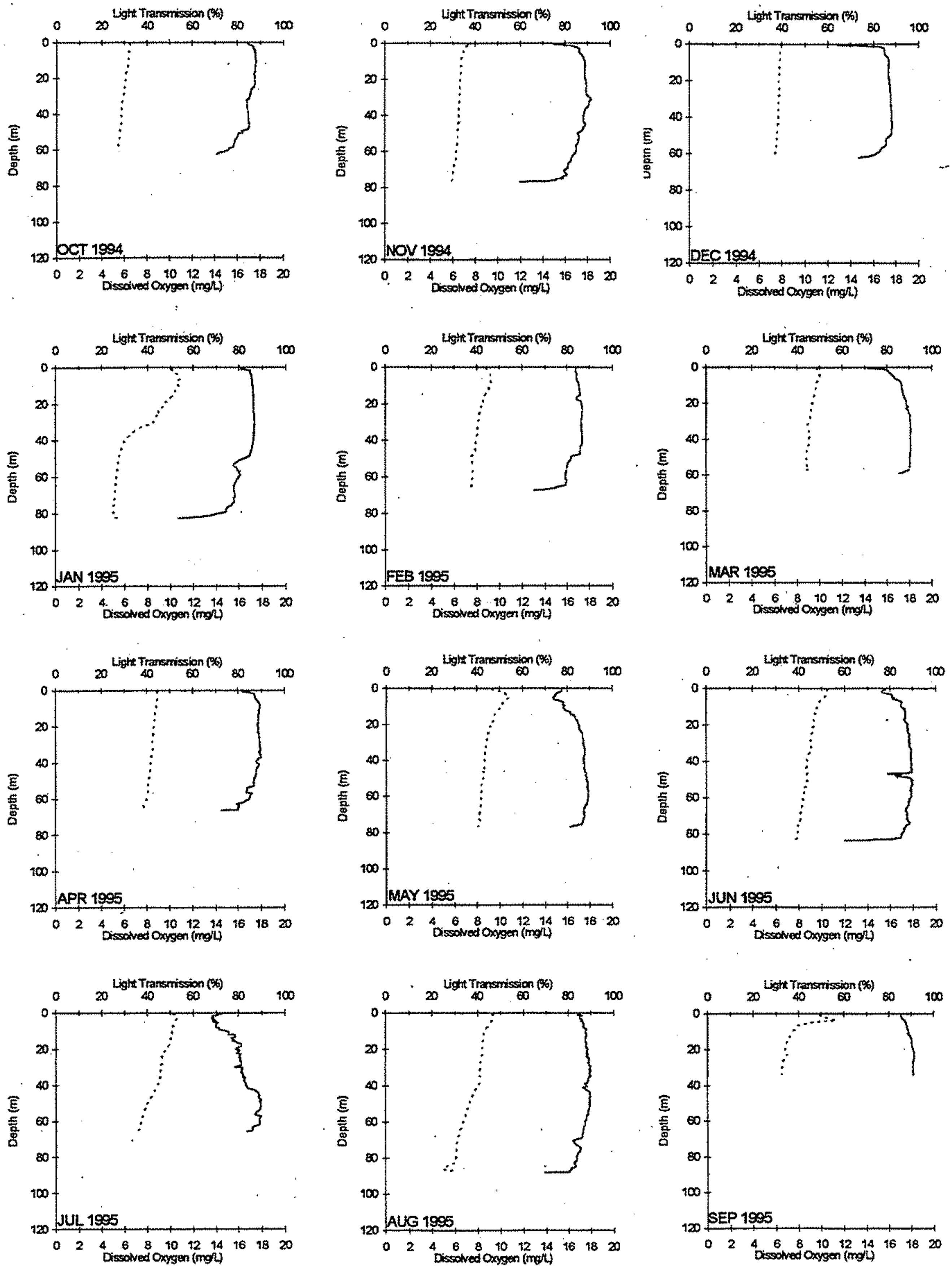
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

ELB015 Elliott Bay - E. of Duwamish Head



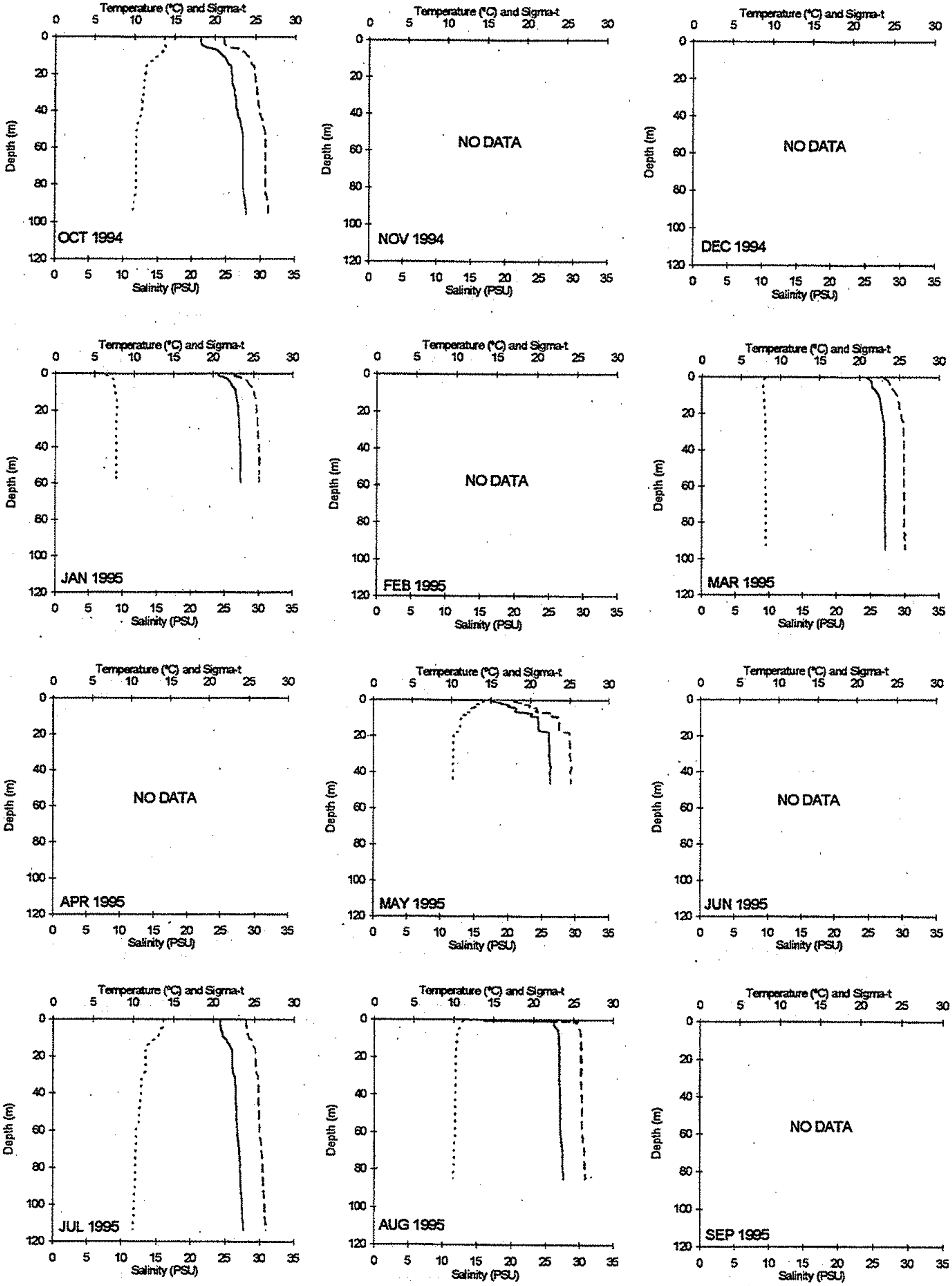
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Elliott Bay - E. of Duwamish Head ELB015



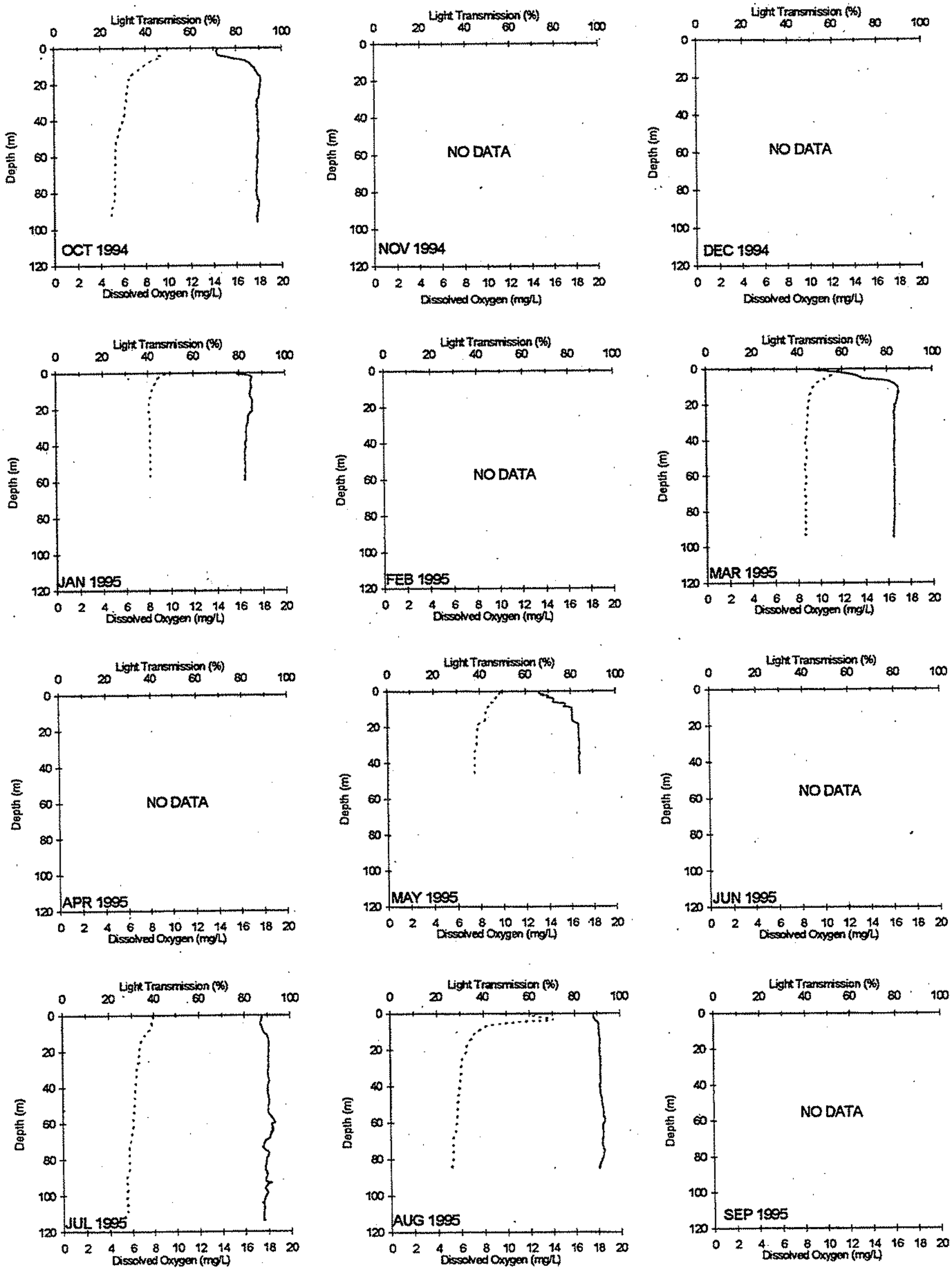
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GRG002 Georgia Strait - N. of Patos Island



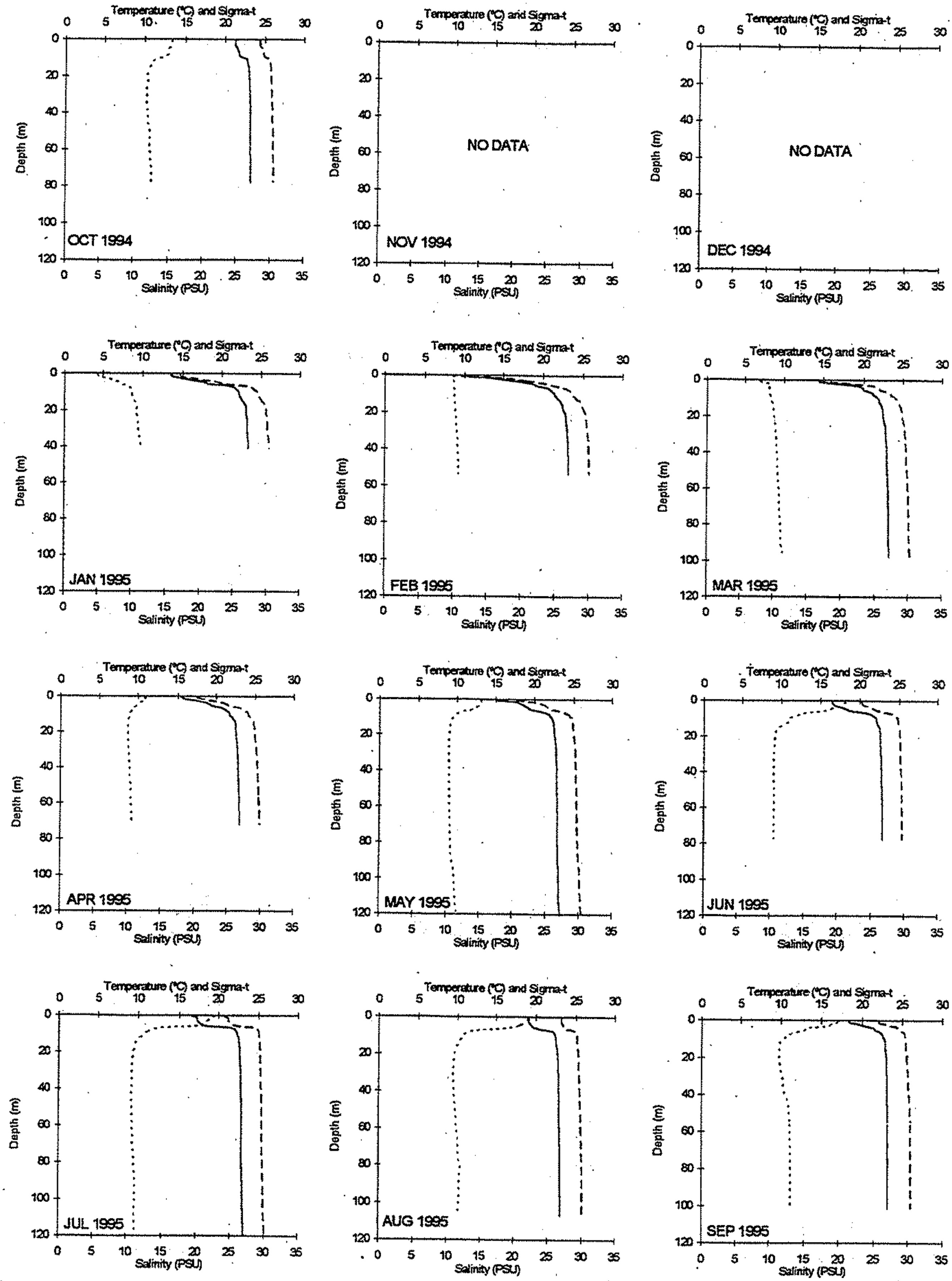
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Georgia Strait - N. of Patos Island GRG002



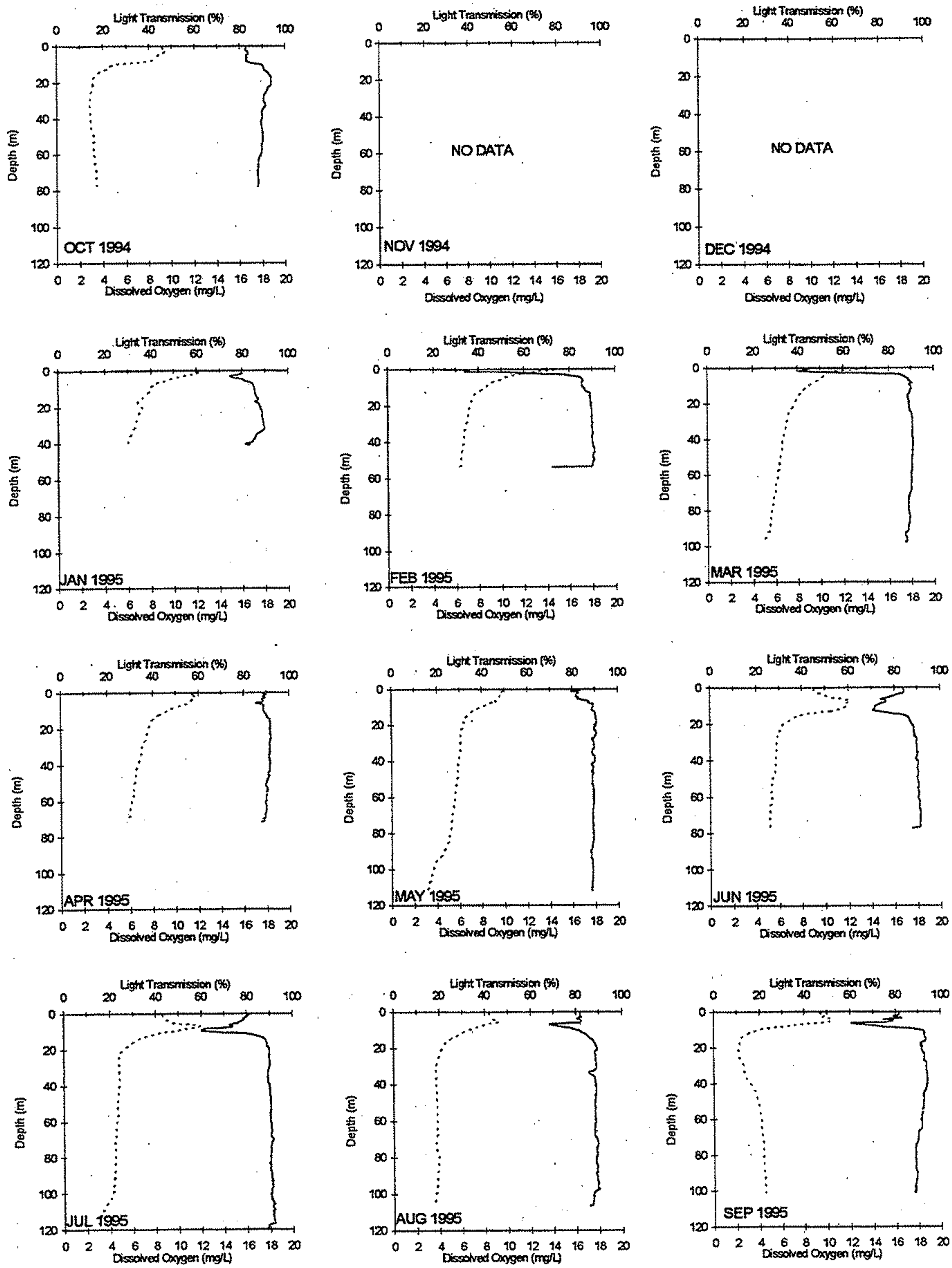
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

HCB003 Hood Canal - Eldon, Hamma Hamma River



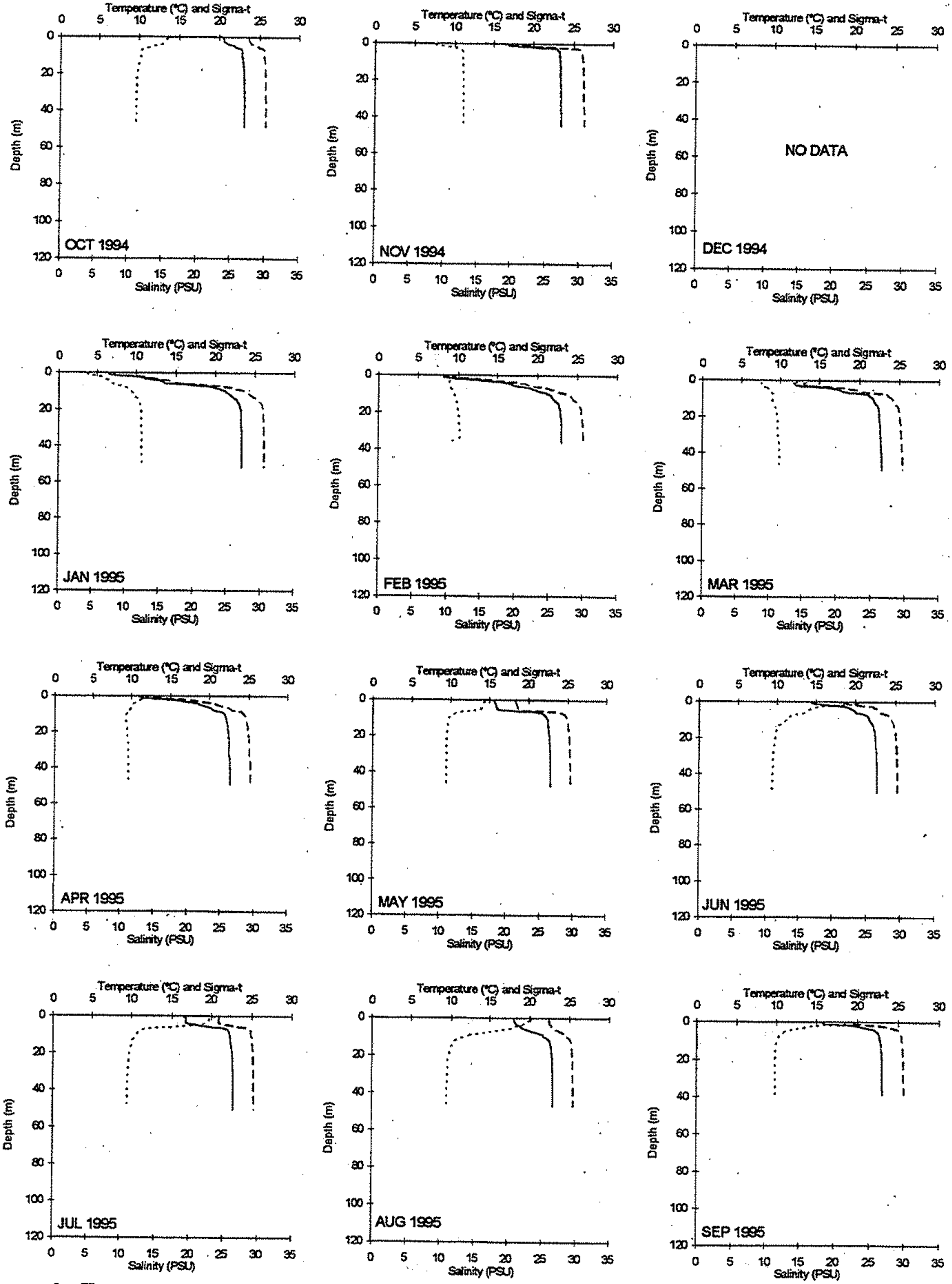
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Hood Canal - Eldon, Hamma Hamma River HCB003



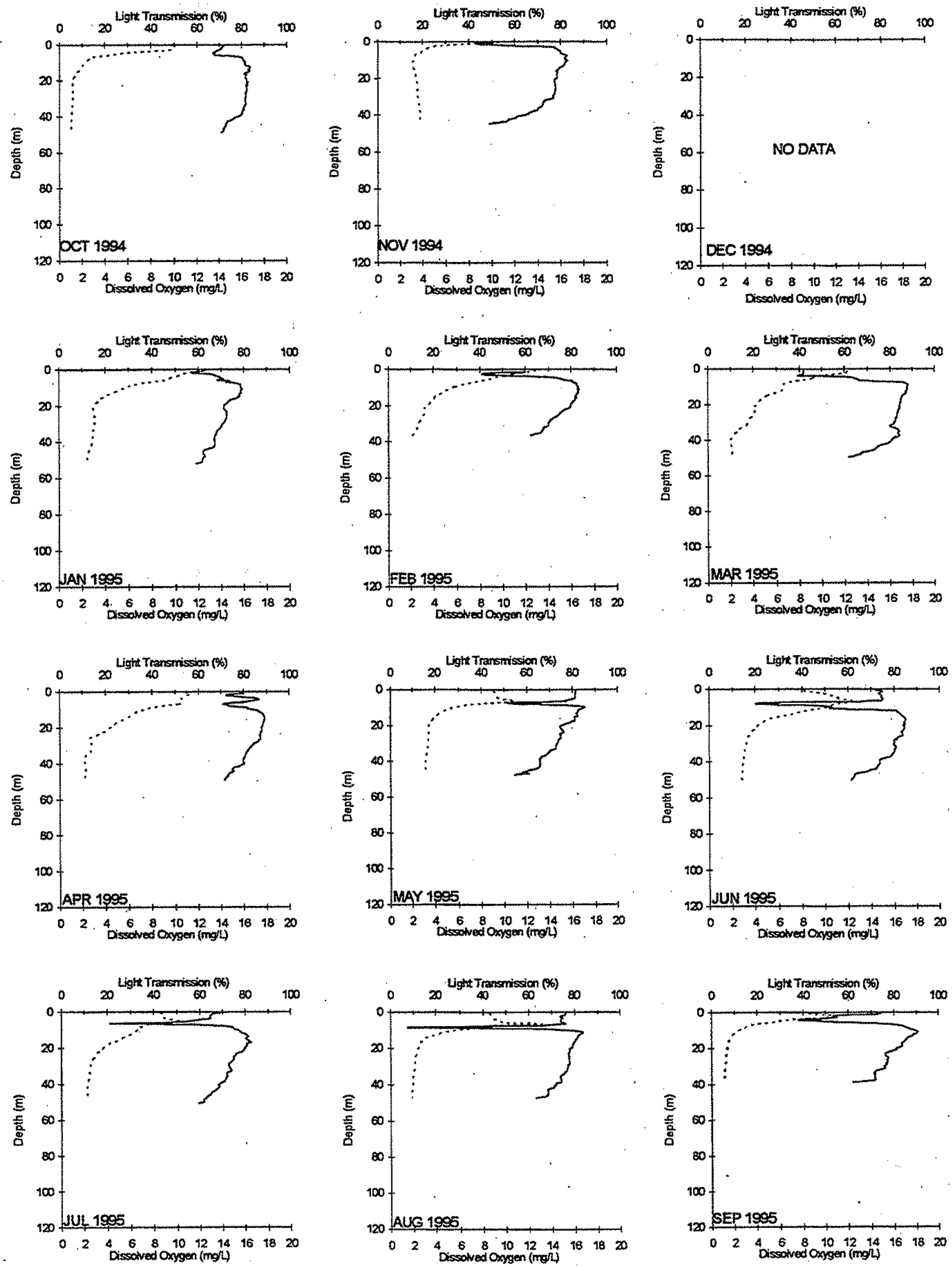
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

HCB004 Hood Canal - Great Bend, Sisters Point



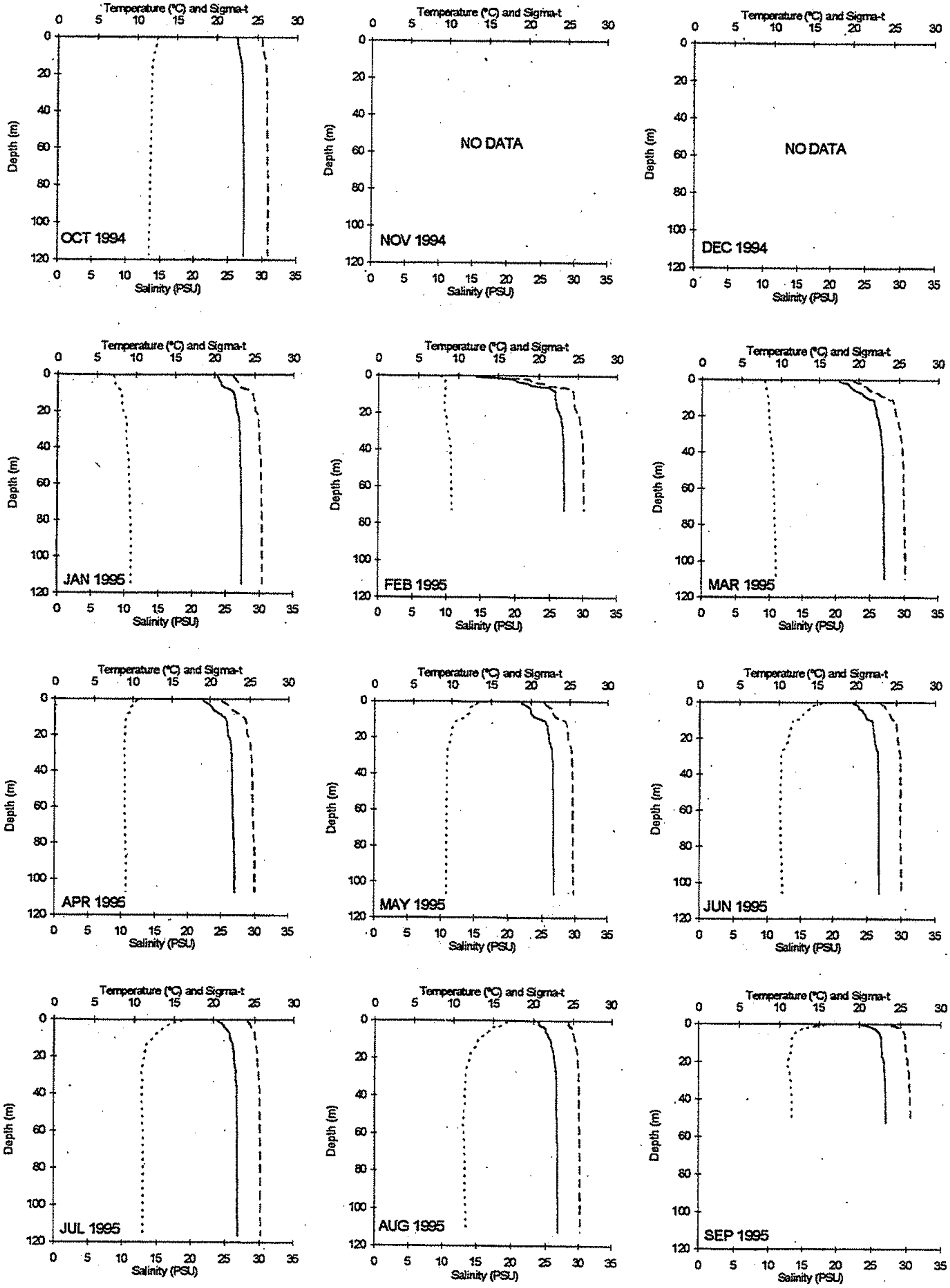
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Hood Canal - Great Bend, Sisters Point   HCB004



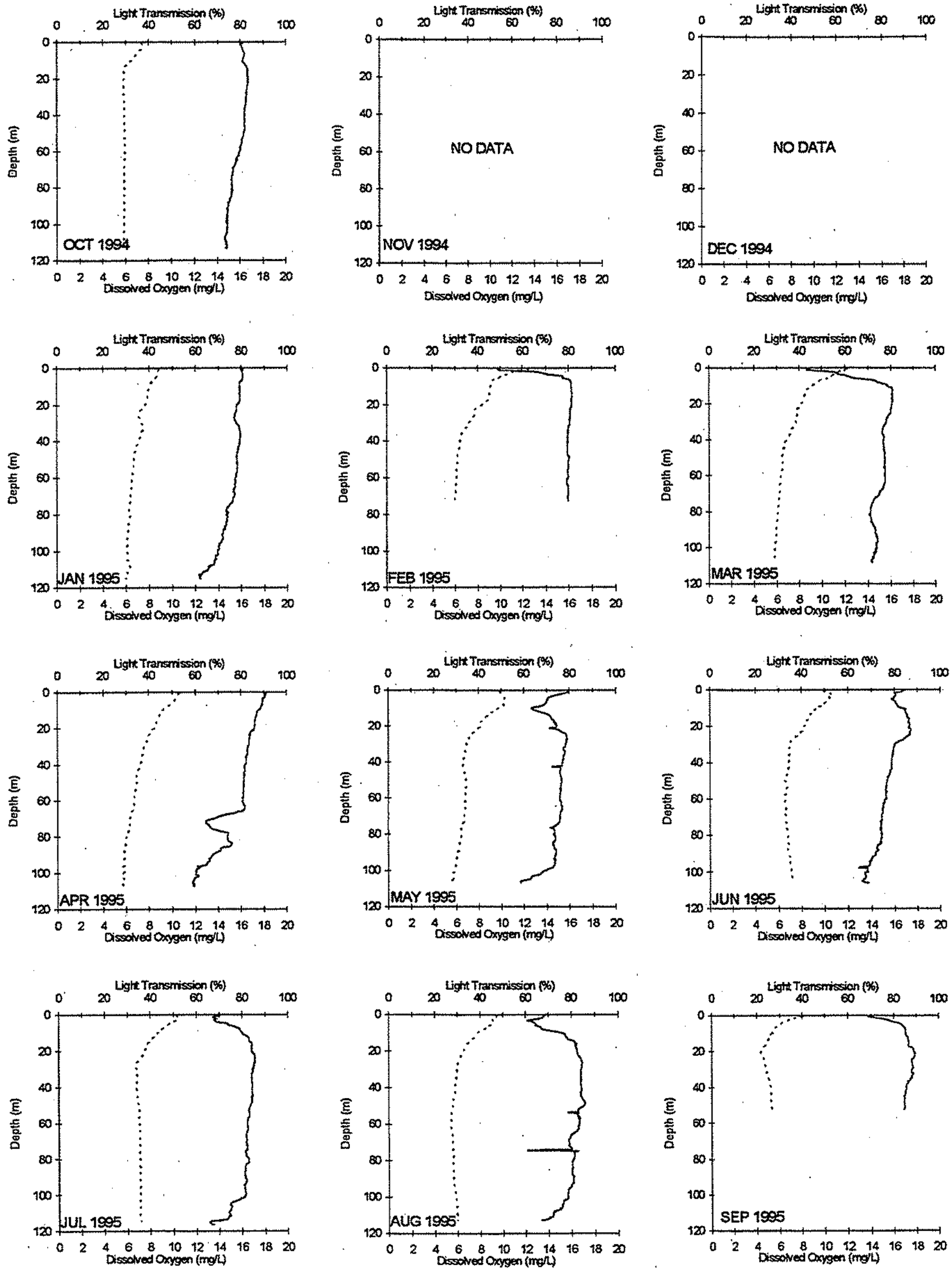
Legend: Light Transmission = Solid Line   Dissolved Oxygen = Dotted Line

HCB006 Hood Canal - King Spit, Bangor



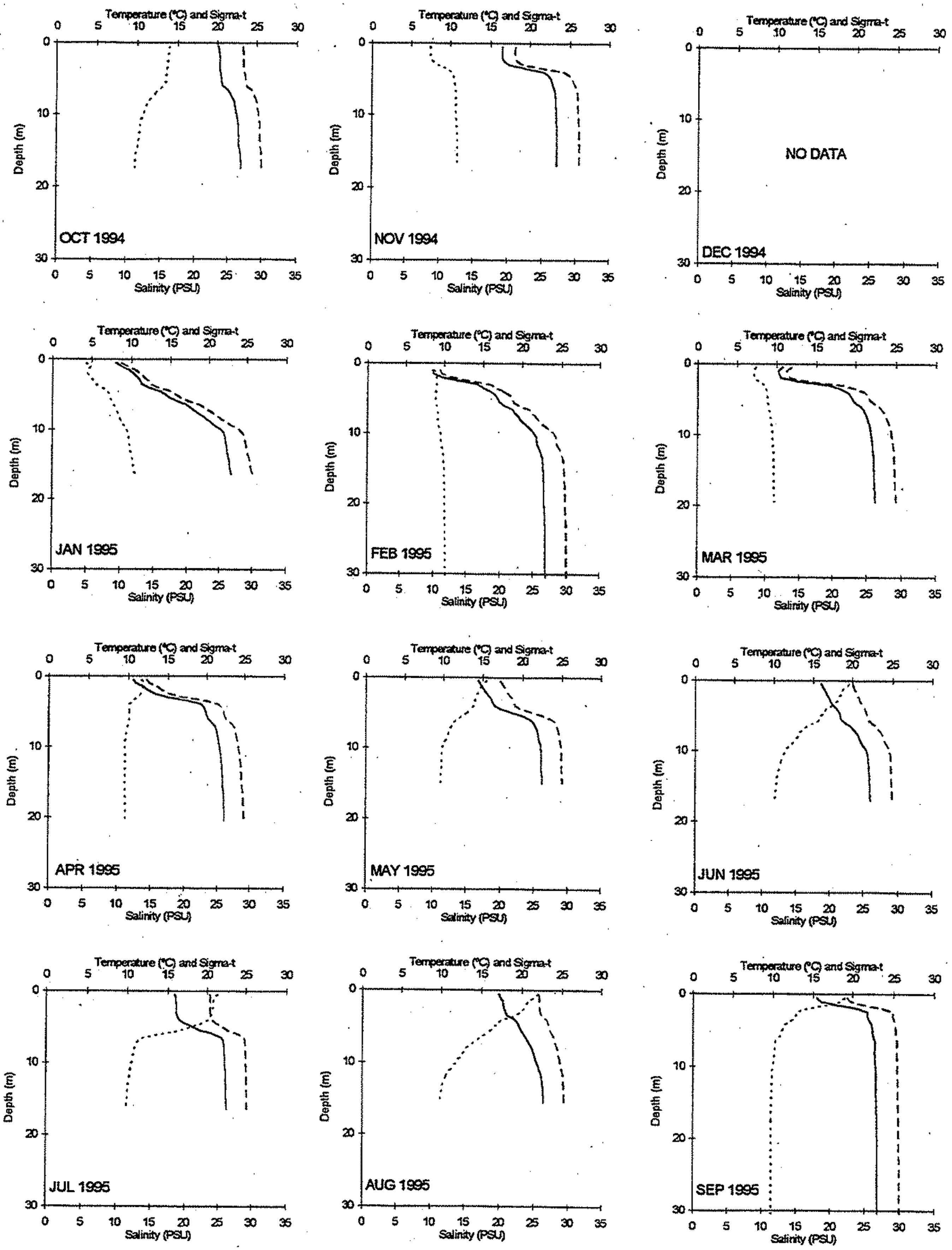
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Hood Canal - King Spit, Bangor HCB006



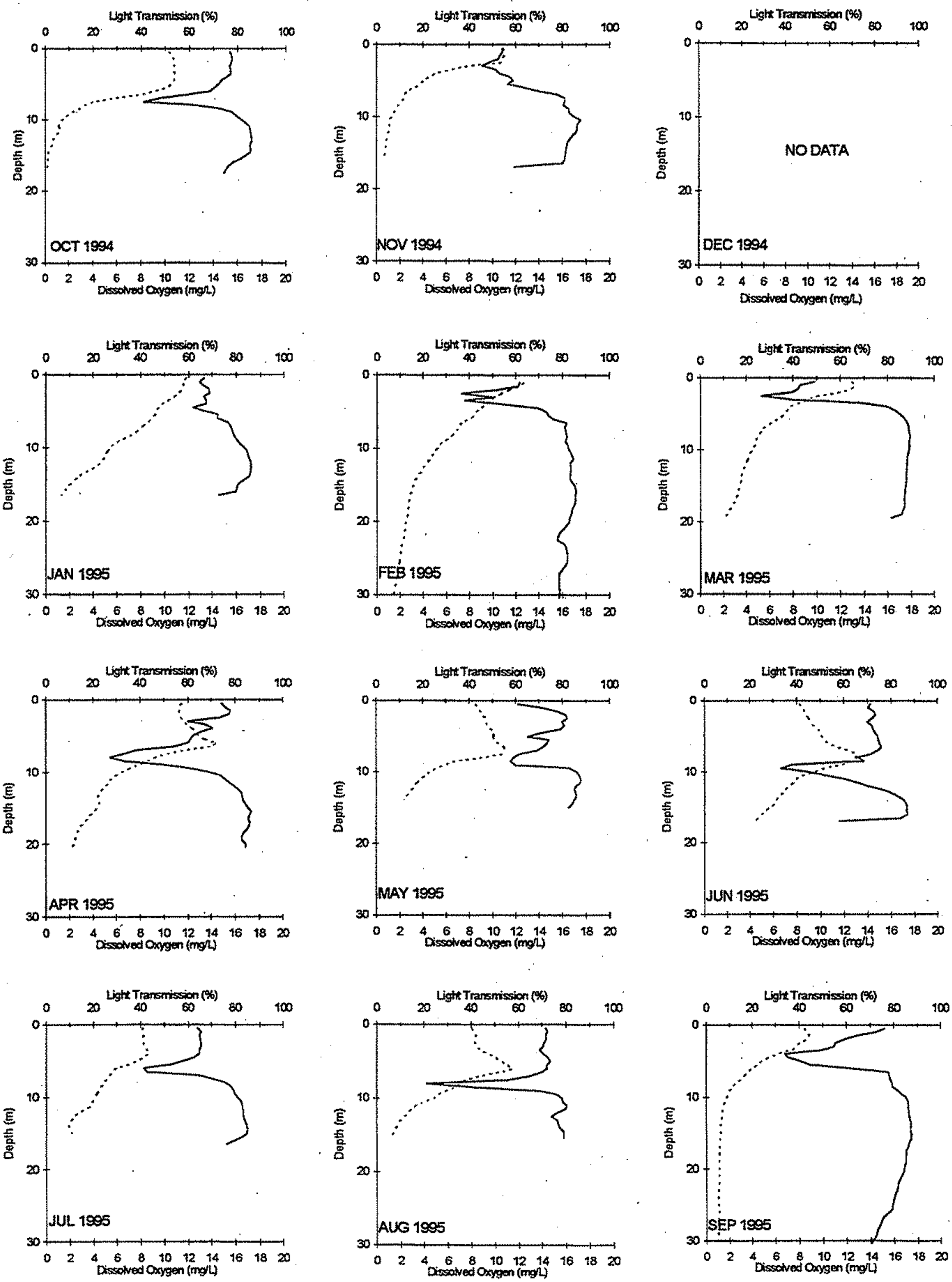
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

HCB007 Hood Canal - Lynch Cove



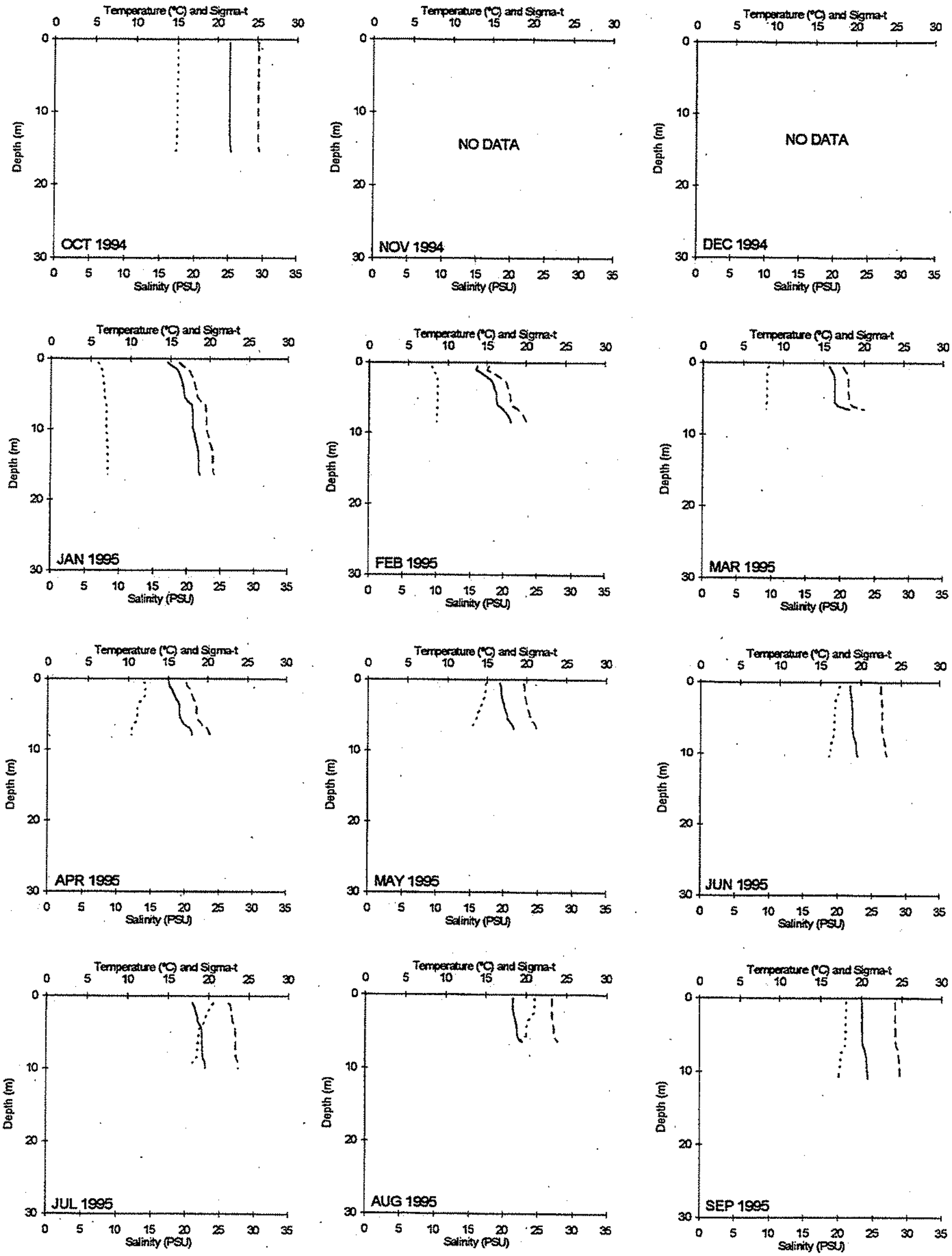
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Hood Canal - Lynch Cove HCB007



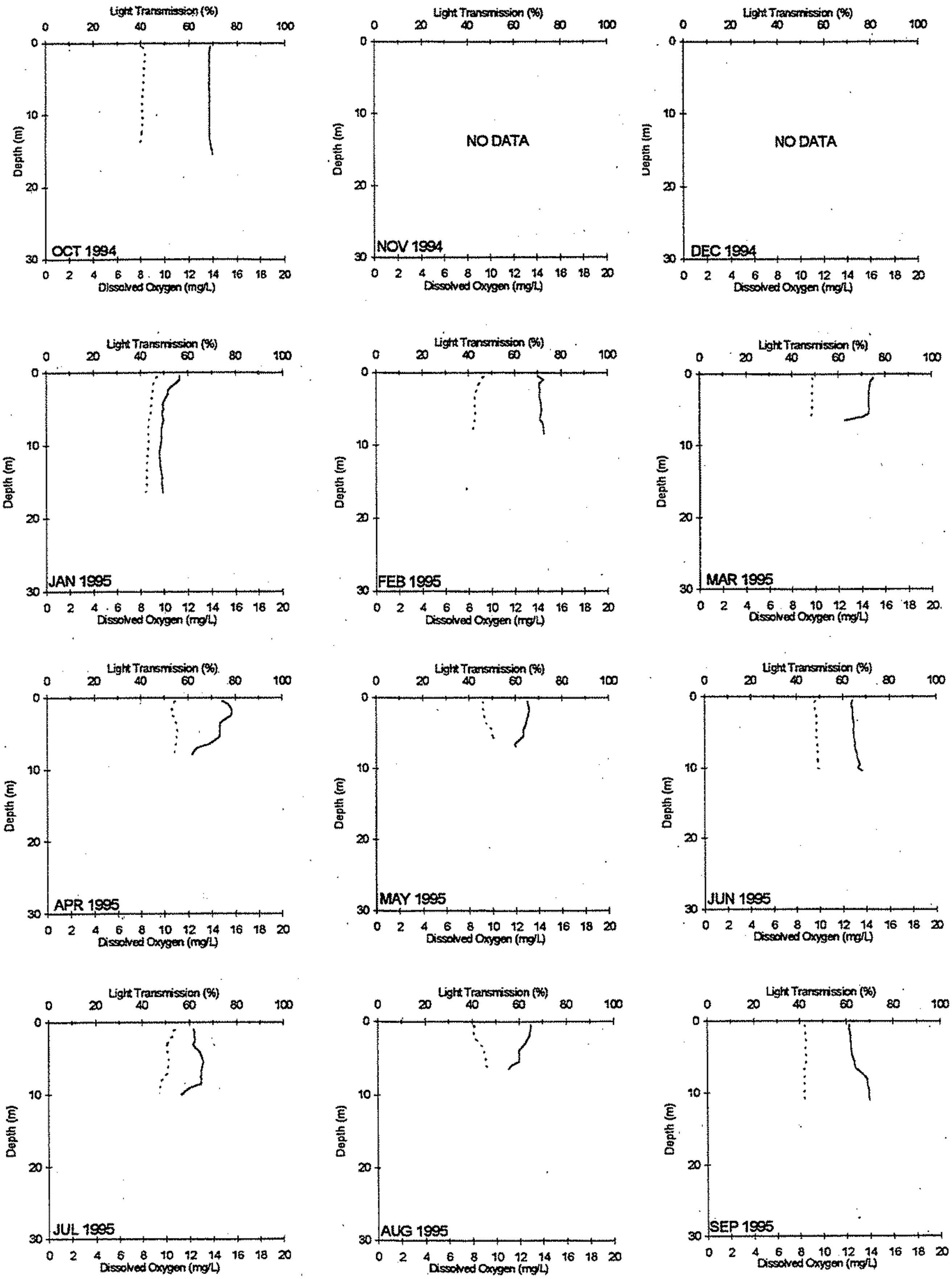
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

OAK004 Oakland Bay - Eagle Point



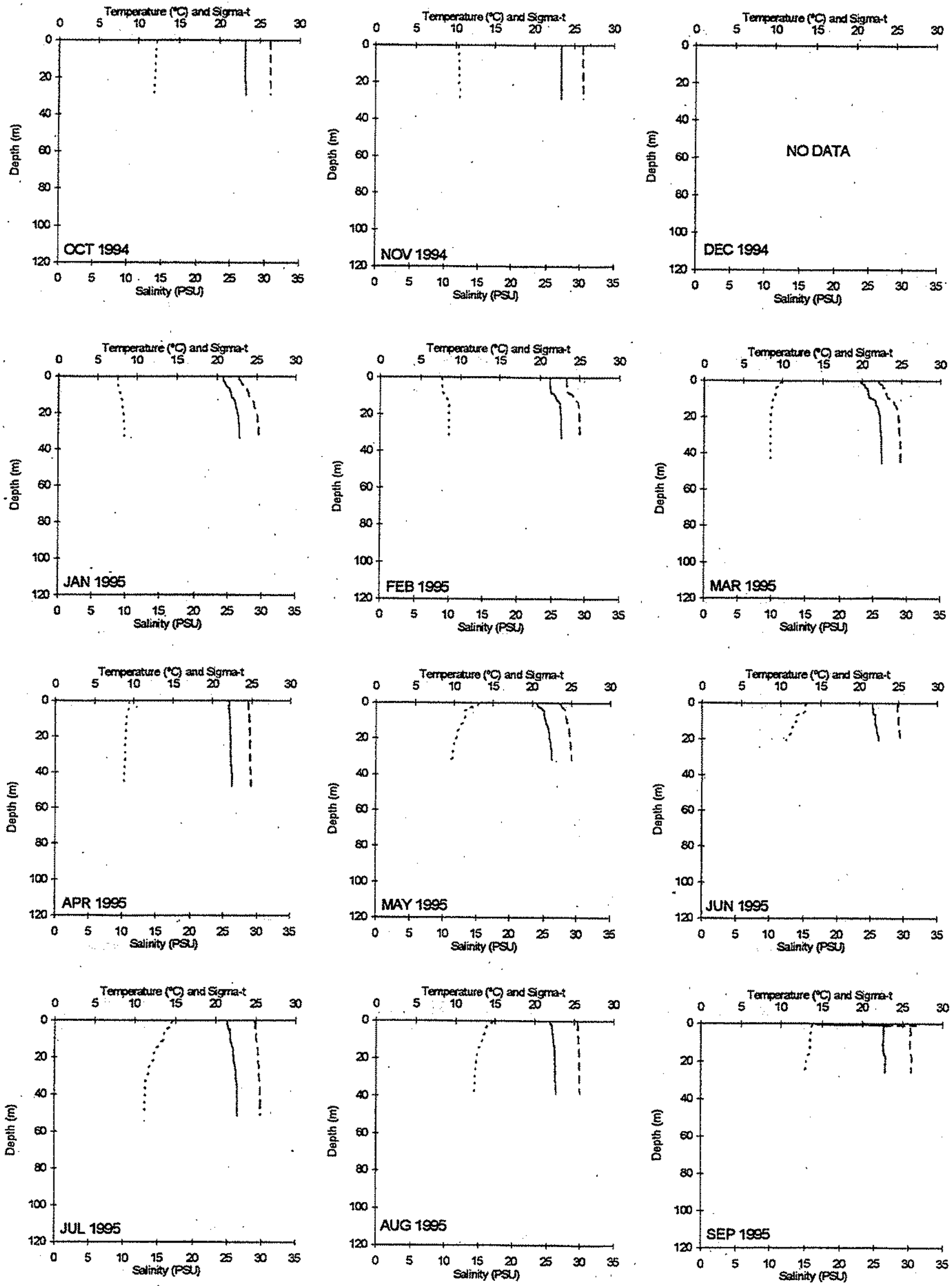
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Oakland Bay - Eagle Point OAK004



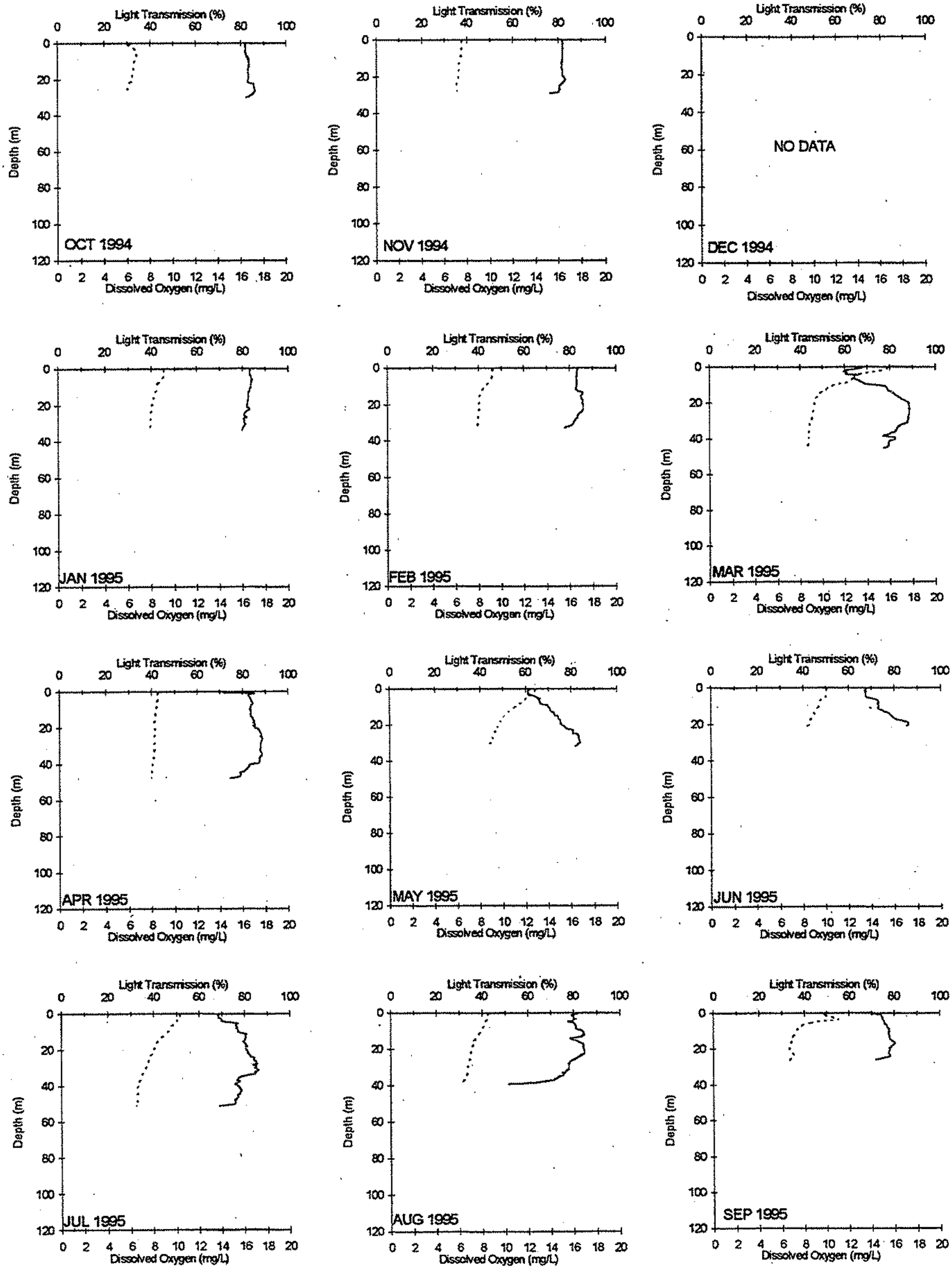
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PMA001 Port Madison - S. of Buoy 65



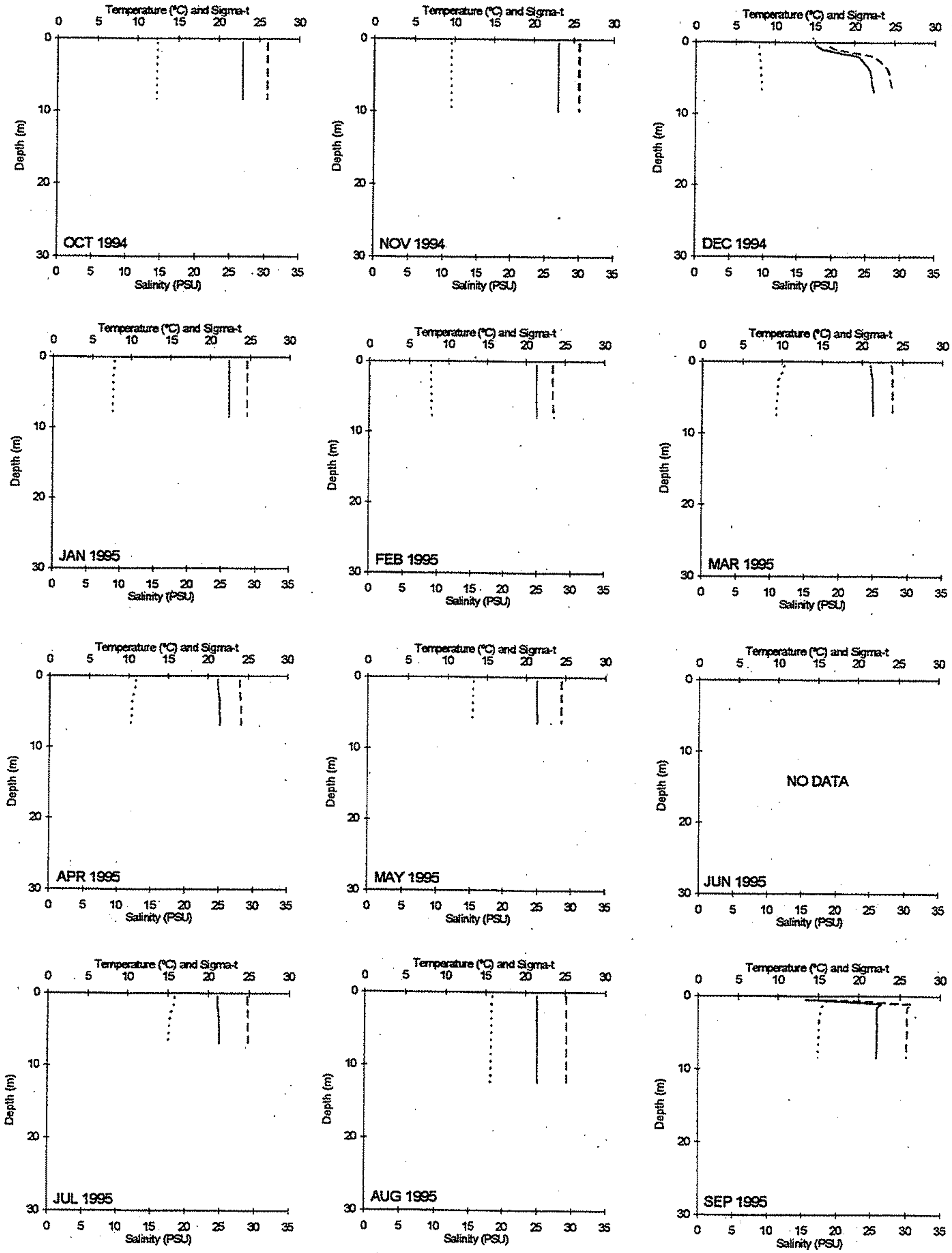
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Port Madison - S. of Buoy 65   PMA001



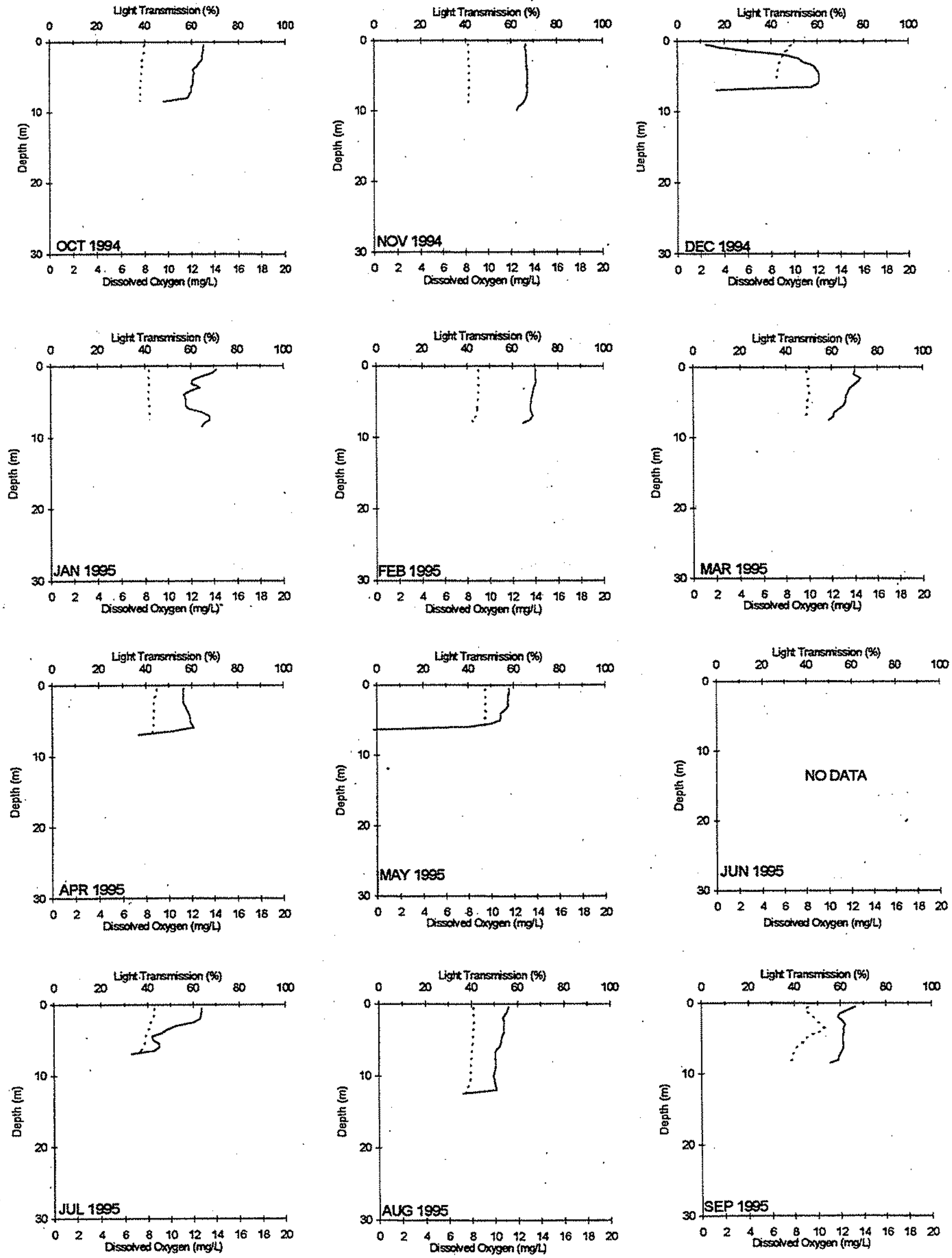
Legend: Light Transmission = Solid Line   Dissolved Oxygen = Dotted Line

POD006 Port Orchard - Liberty Bay, Virg. Point



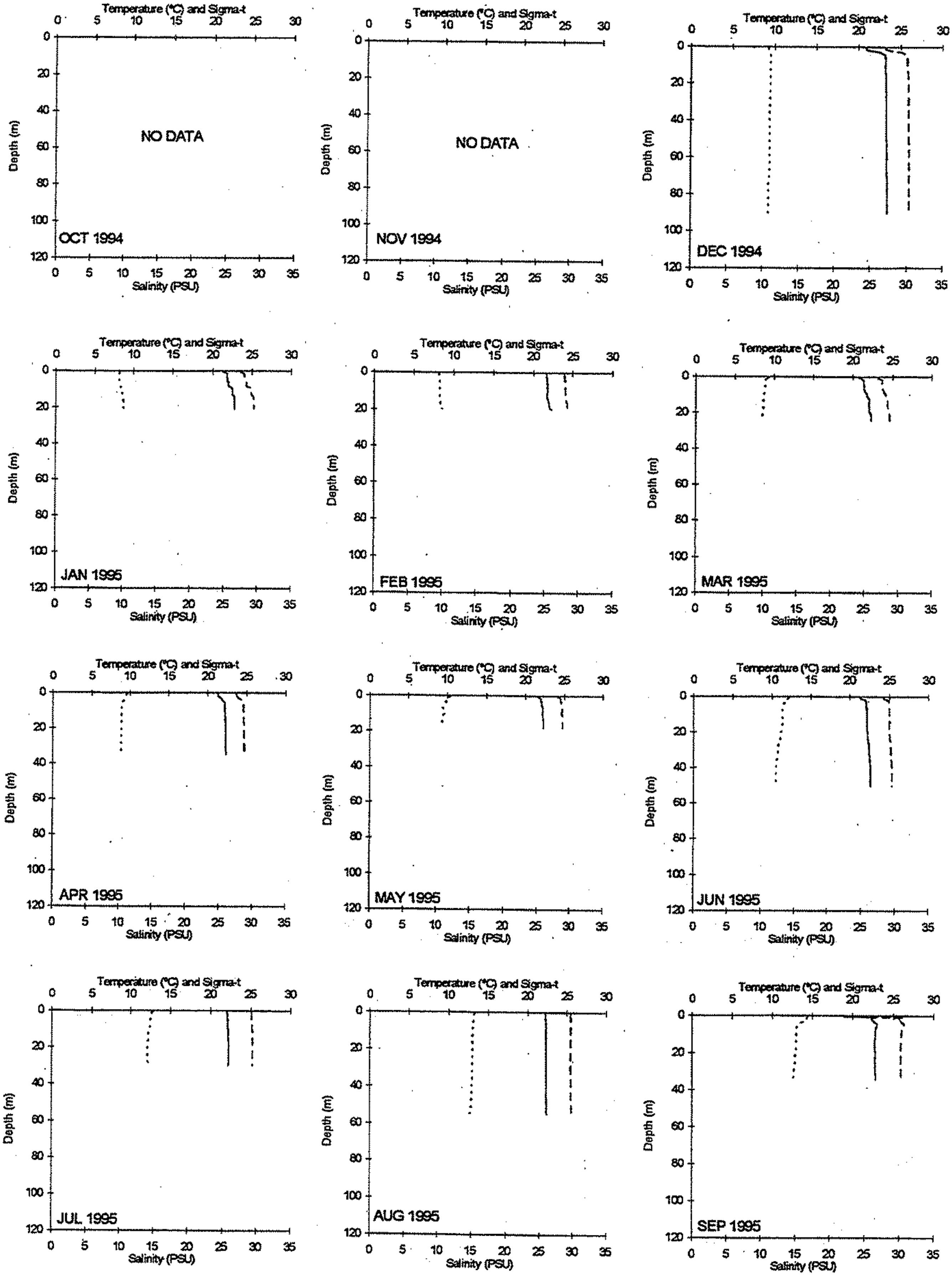
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Port Orchard - Liberty Bay, Virg. Point POD006



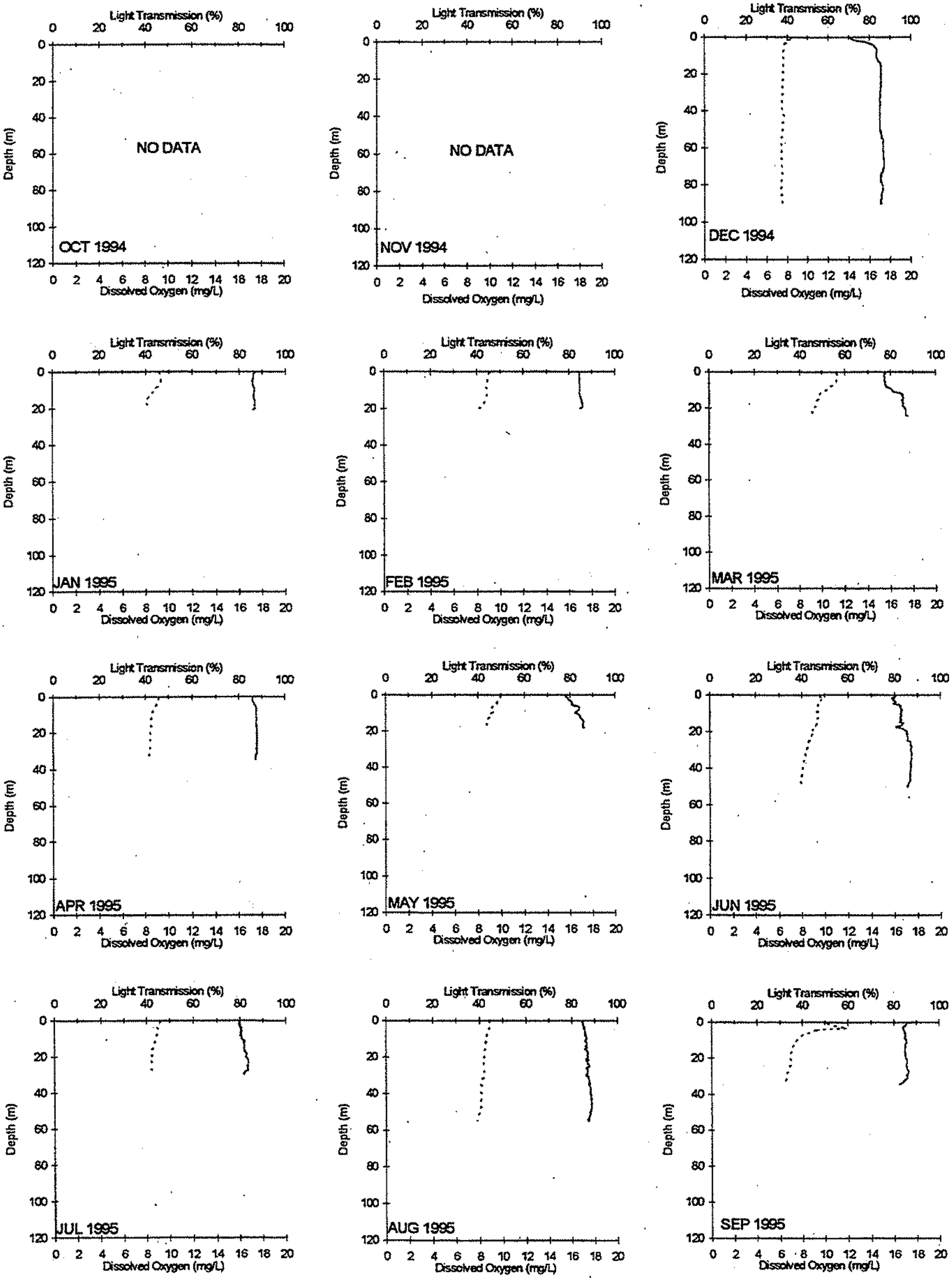
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PSB003 Puget Sound Main Basin - West Point



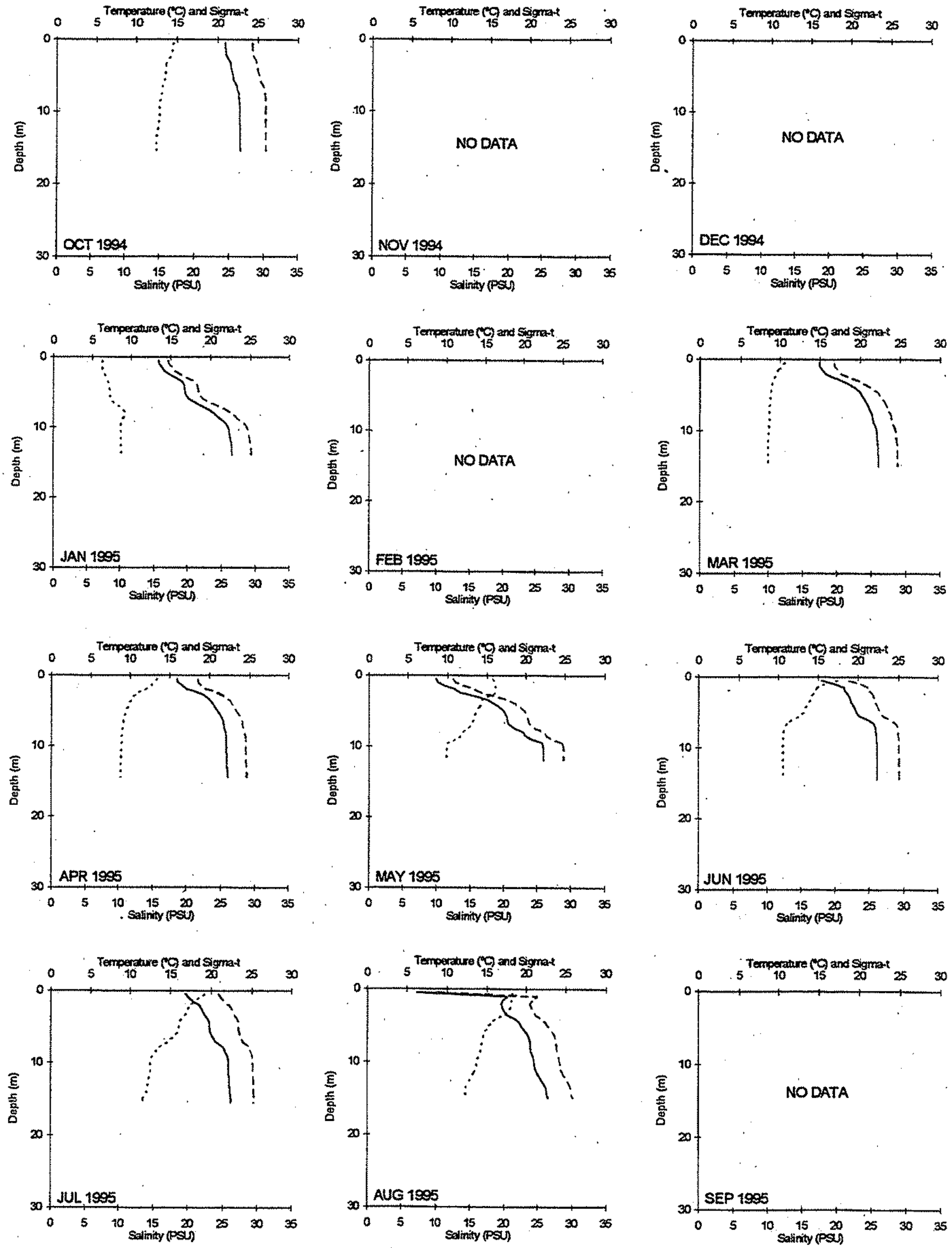
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Puget Sound Main Basin - West Point PSB003



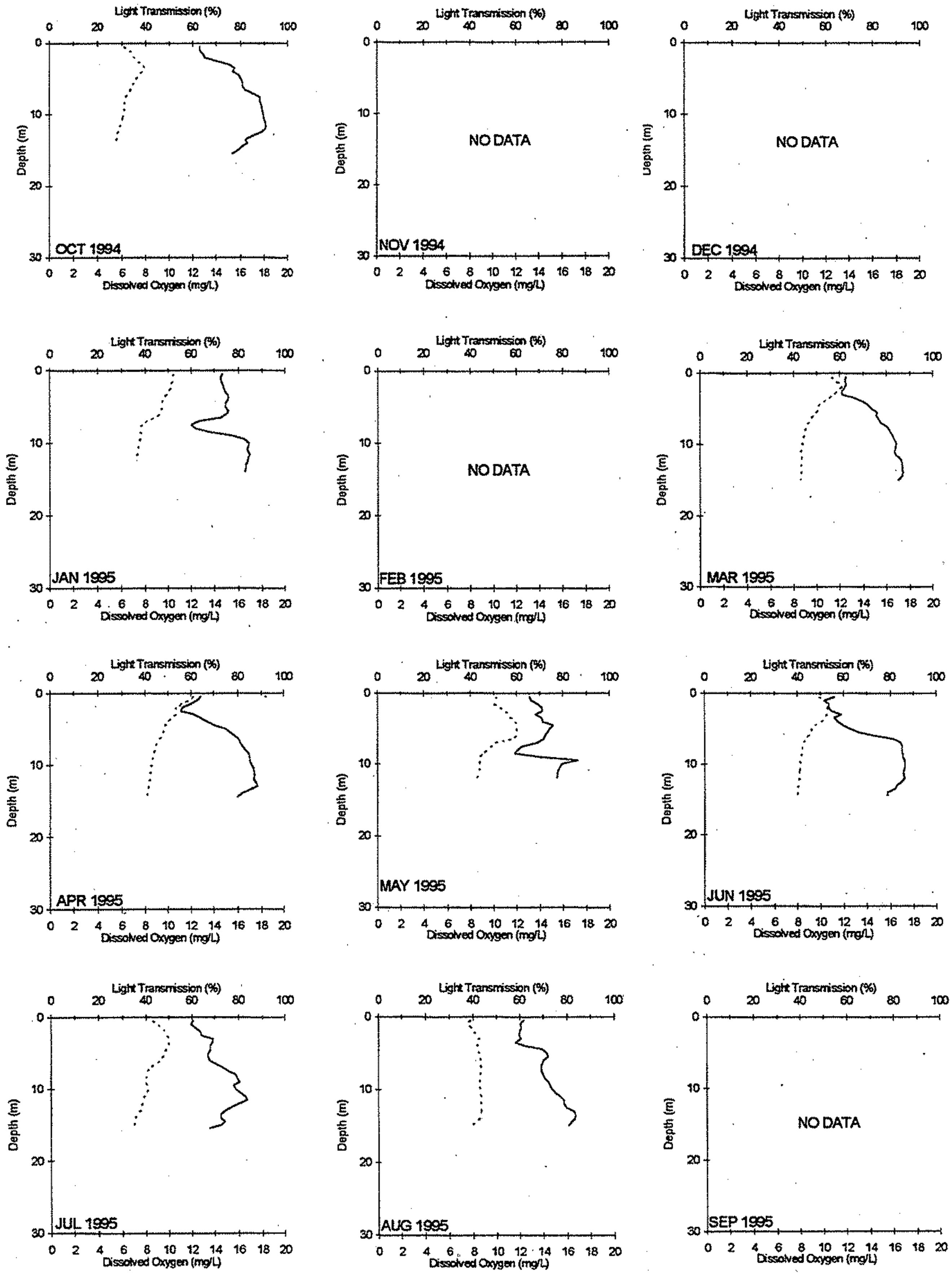
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PSS008 Possession Sound - Port Gardner Bay, Pier 3



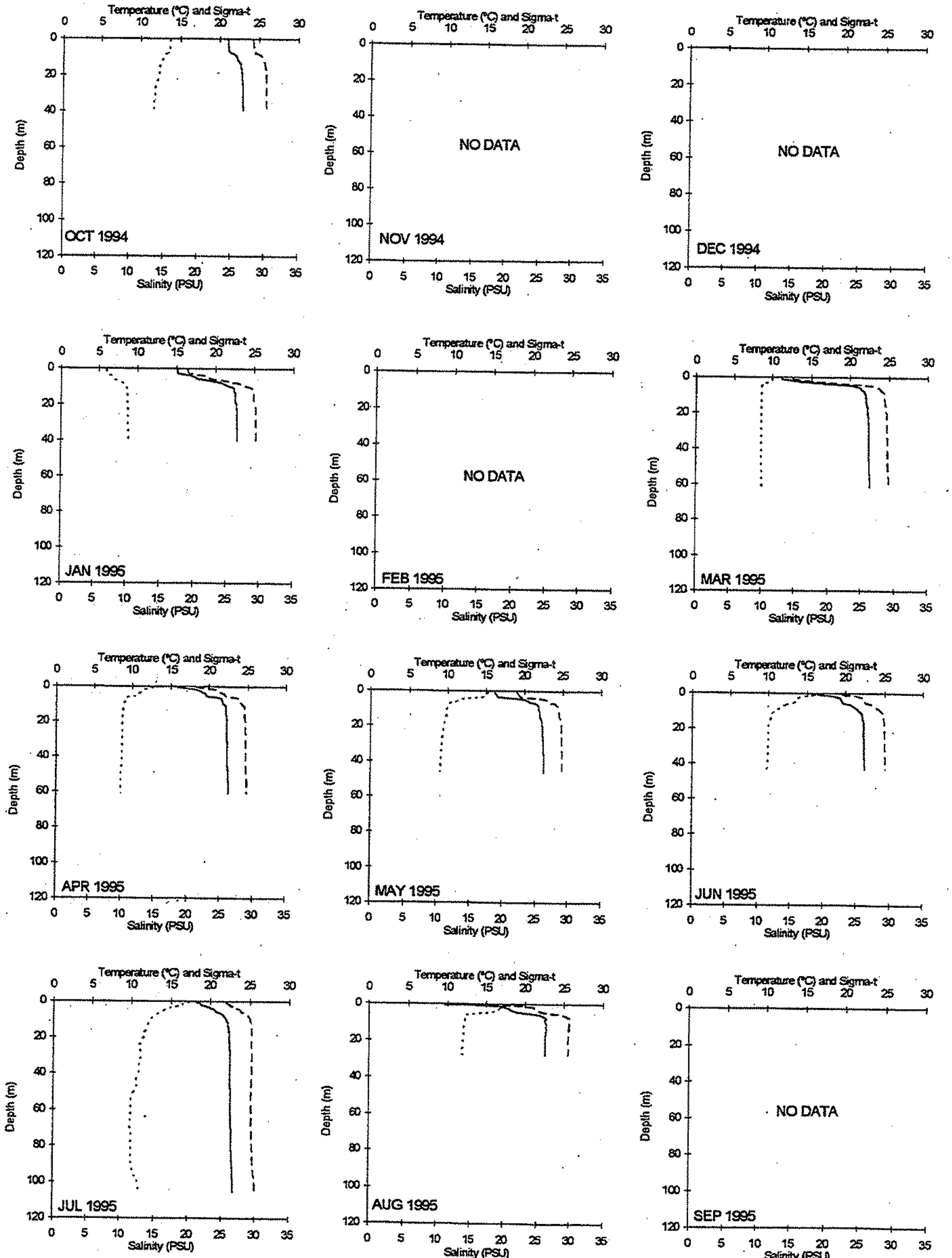
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Possession Sound - Port Gardner Bay, Pier 3 PSS008



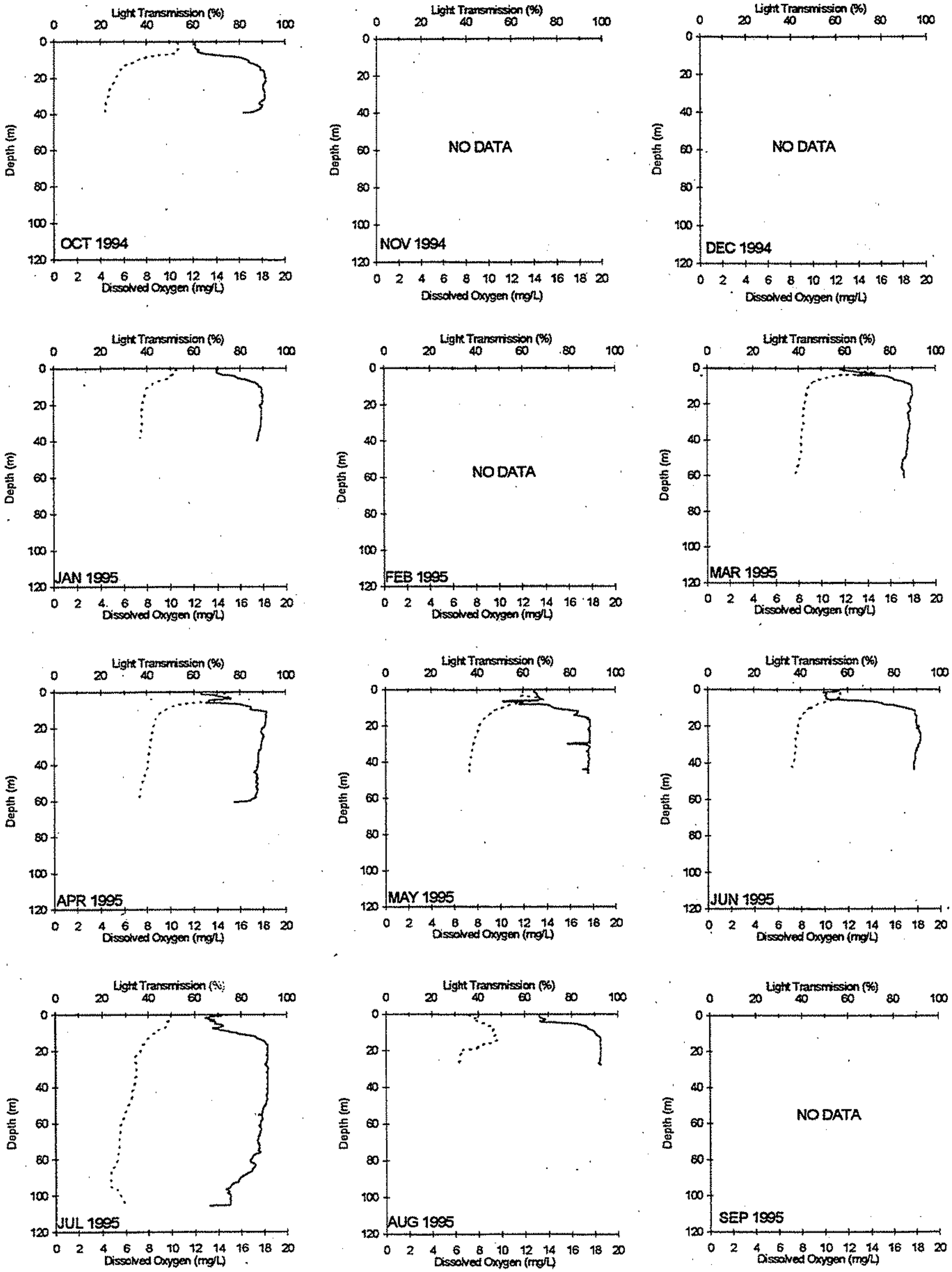
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PSS019 Possession Sound - Gedney Island



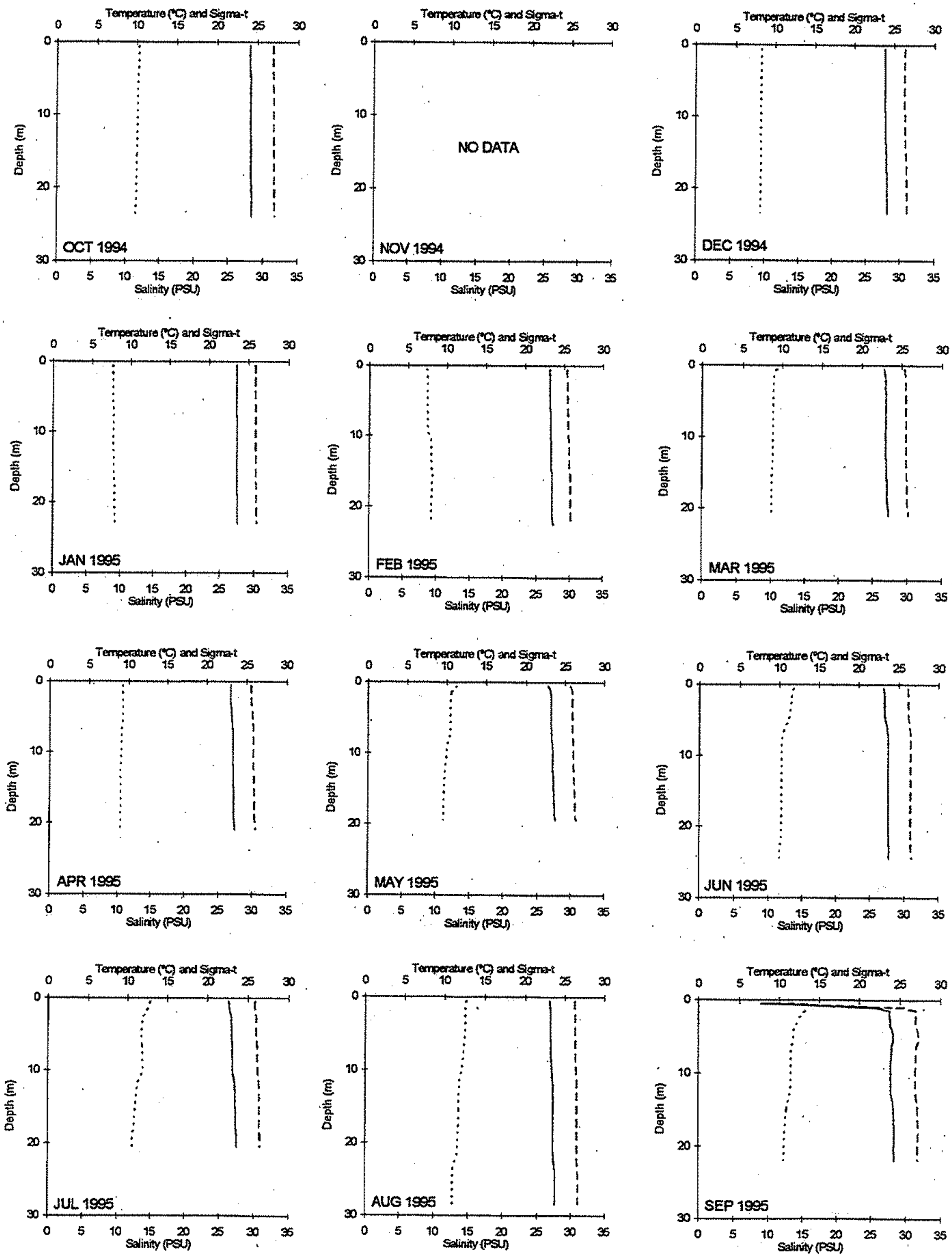
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Possession Sound - Gedney Island PSS019



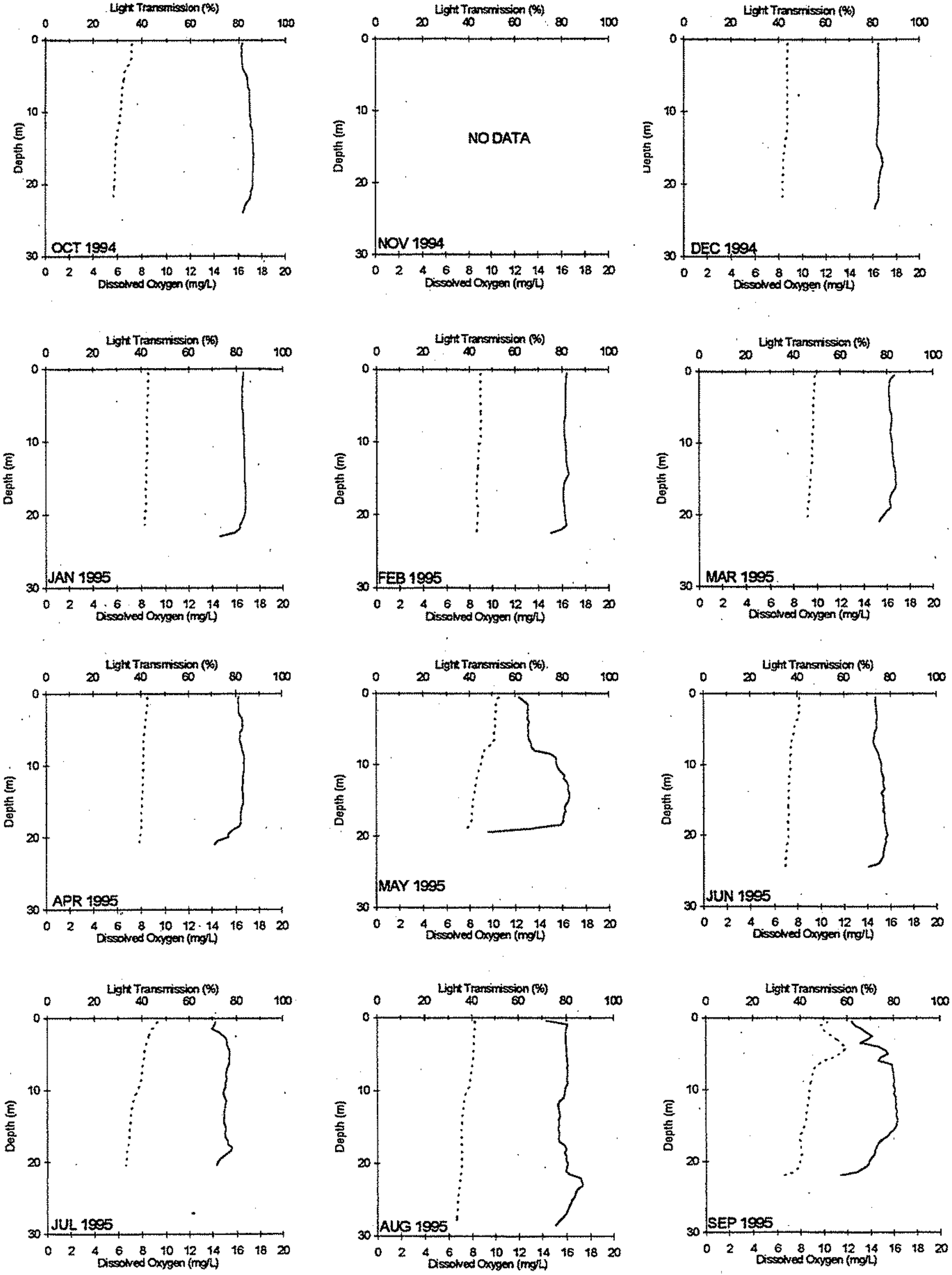
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

PTH005 Port Townsend Harbor - Walan Point



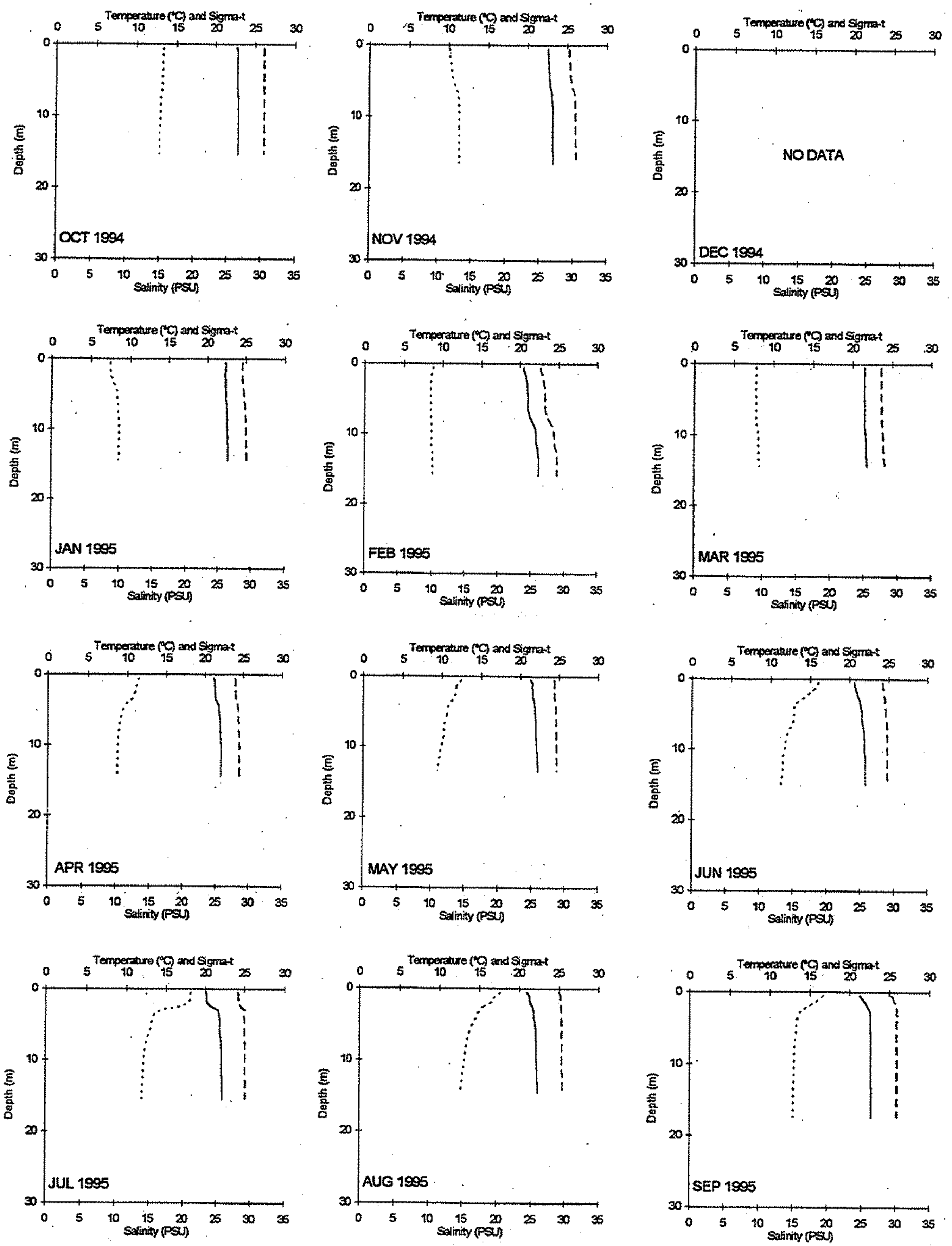
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Port Townsend Harbor - Walan Point PTH005



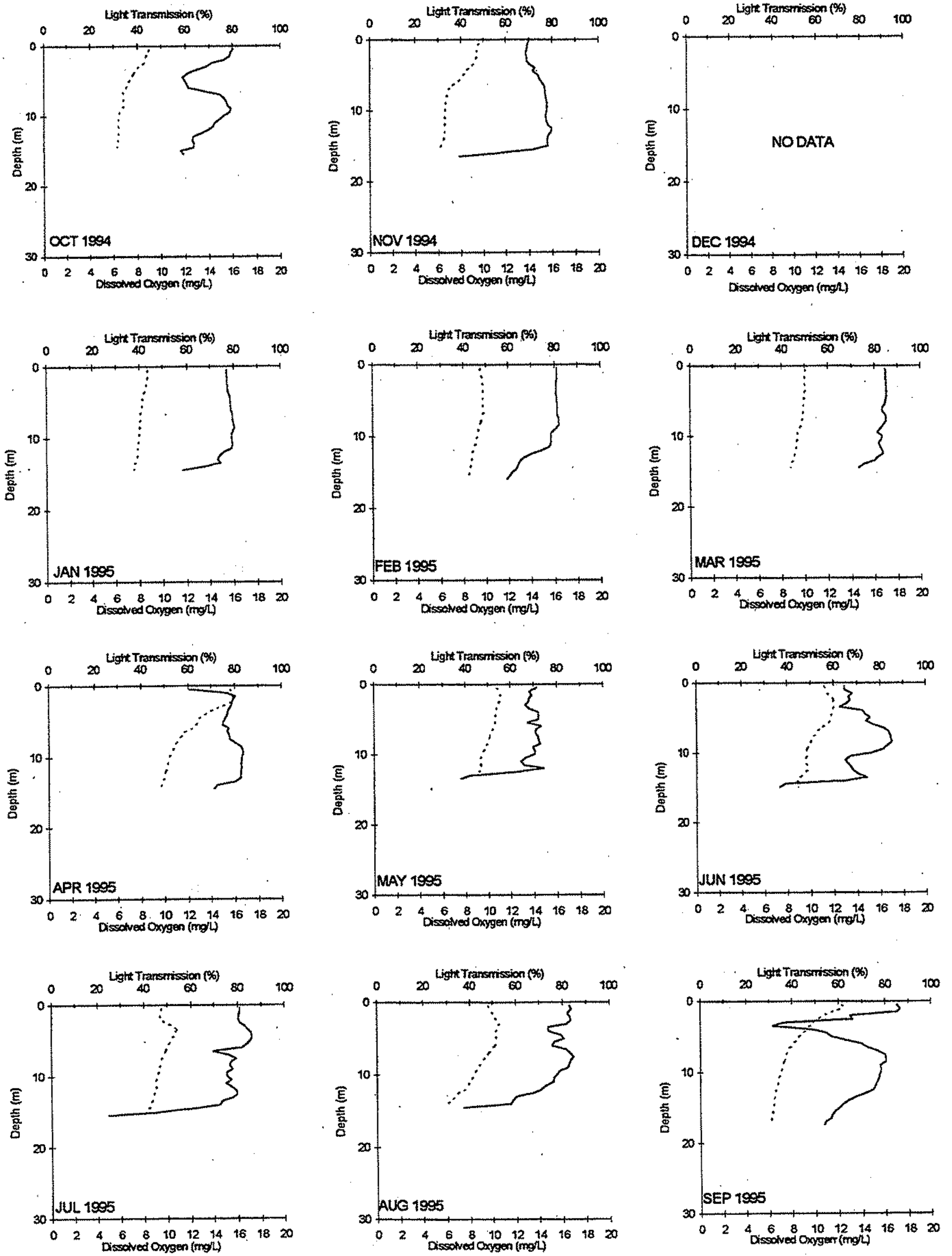
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

QMH001 Quartermaster Harbor - Burton



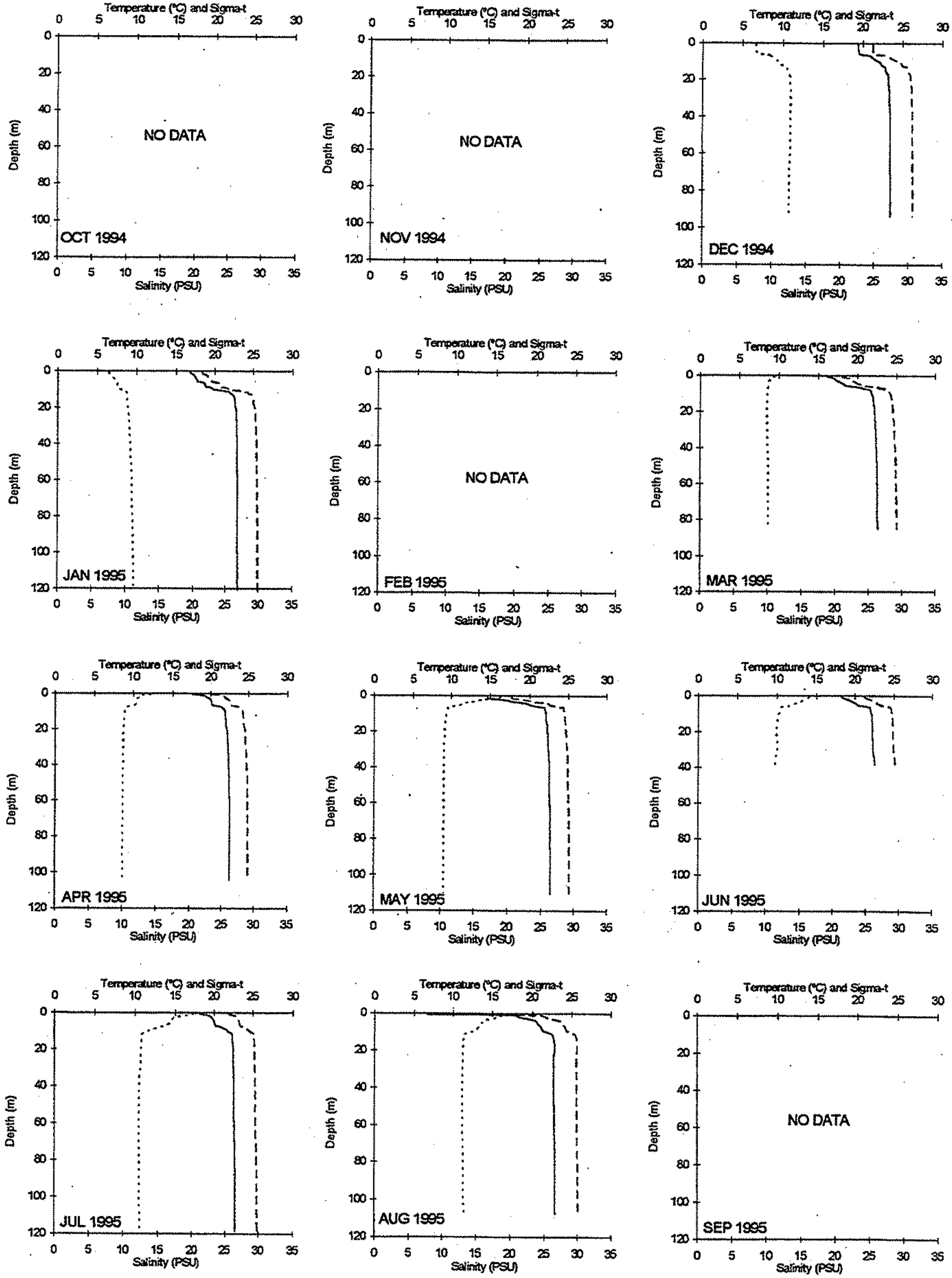
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Quartermaster Harbor - Burton QMH001



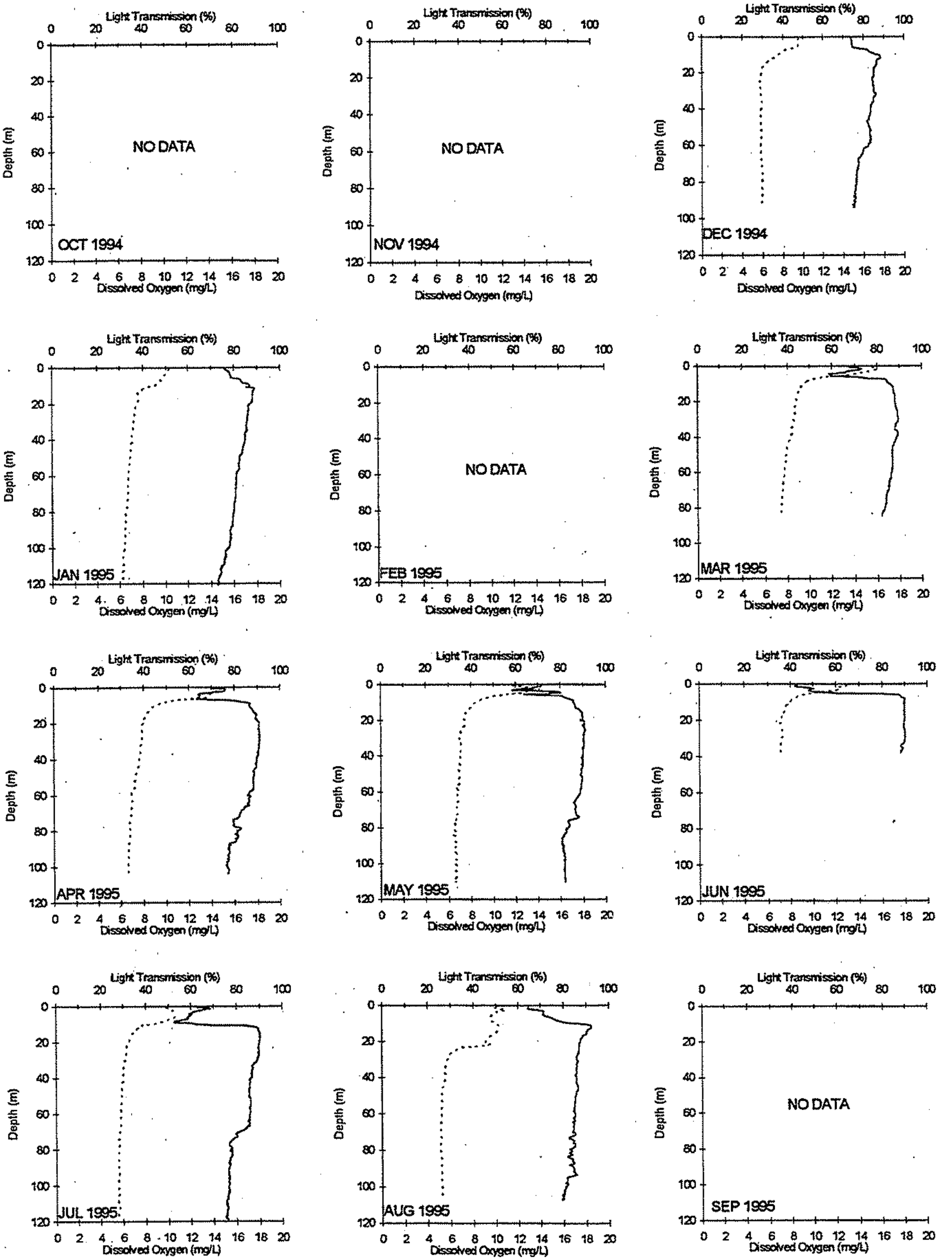
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

SAR003 Saratoga Passage - East Point



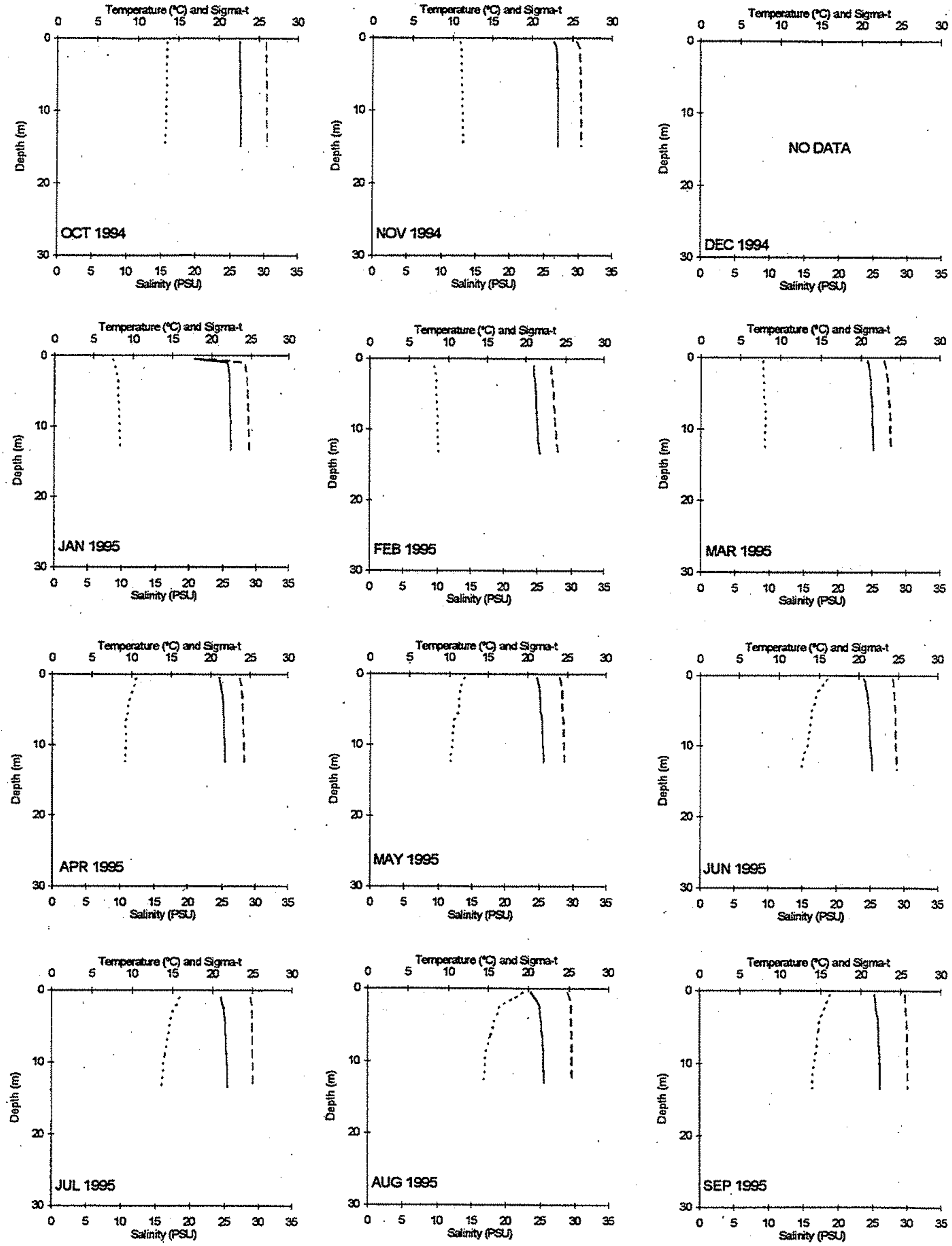
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Saratoga Passage - East Point SAR003



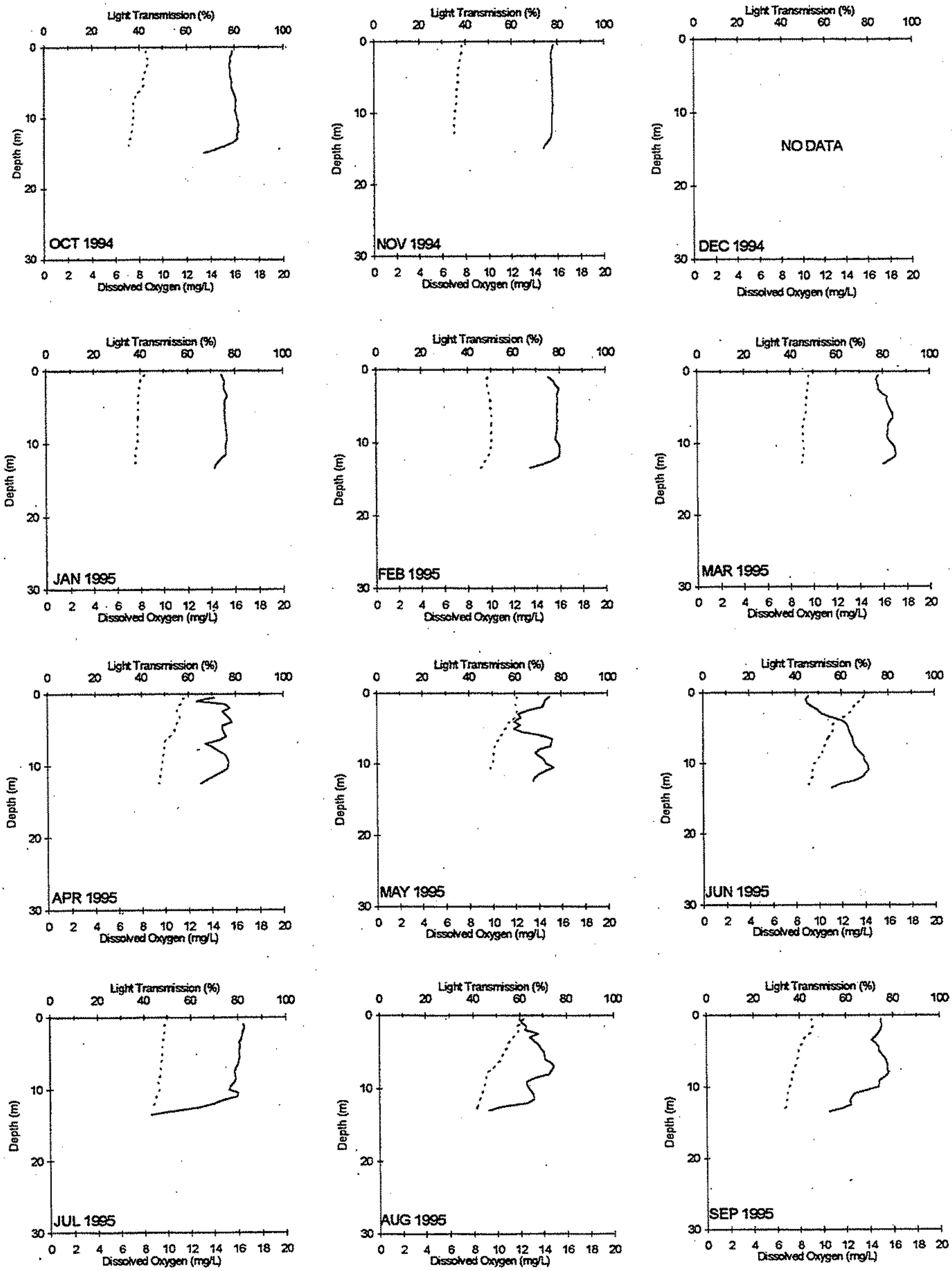
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

SIN001 Sinclair Inlet - Naval Shipyards



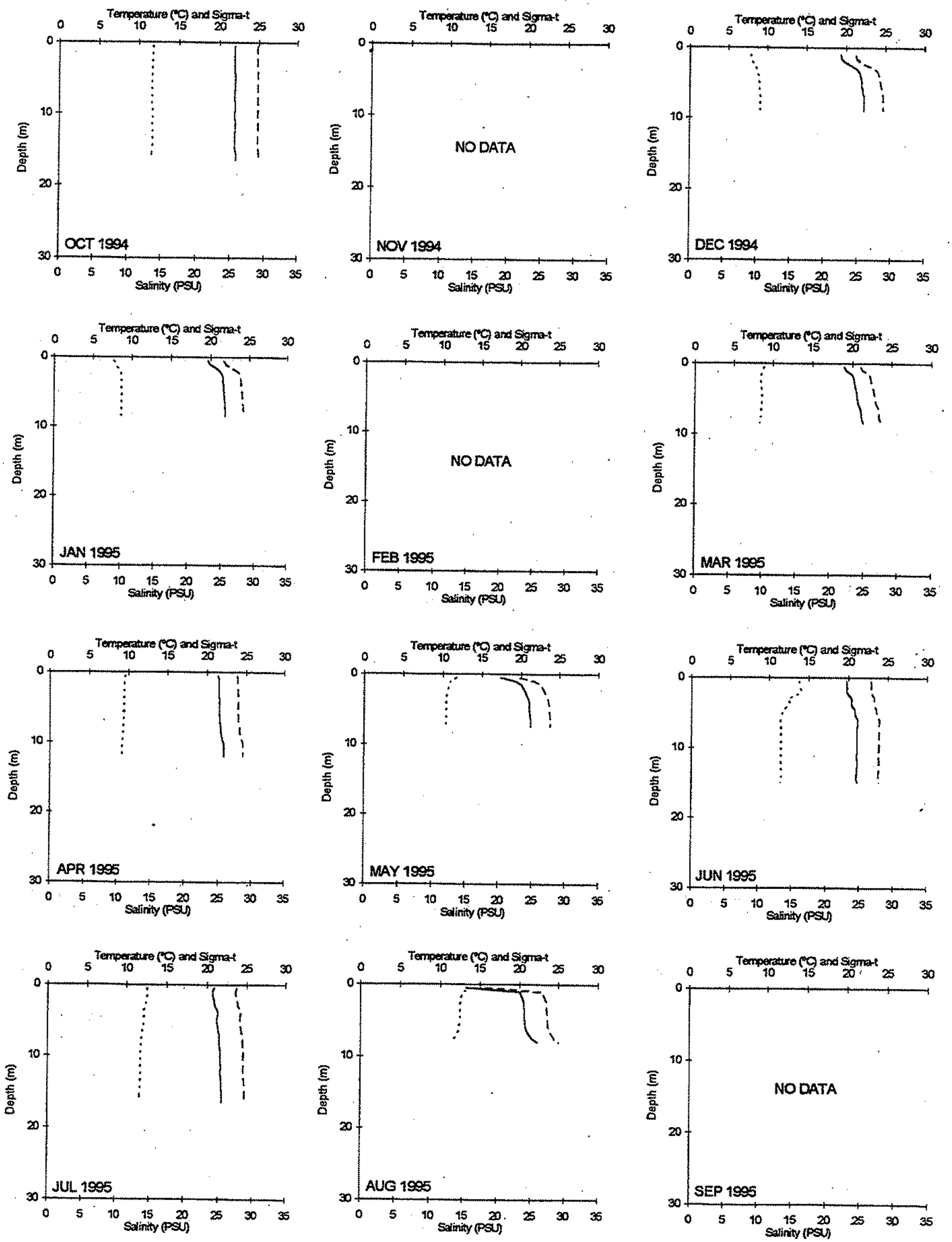
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Sinclair Inlet - Naval Shipyards SIN001



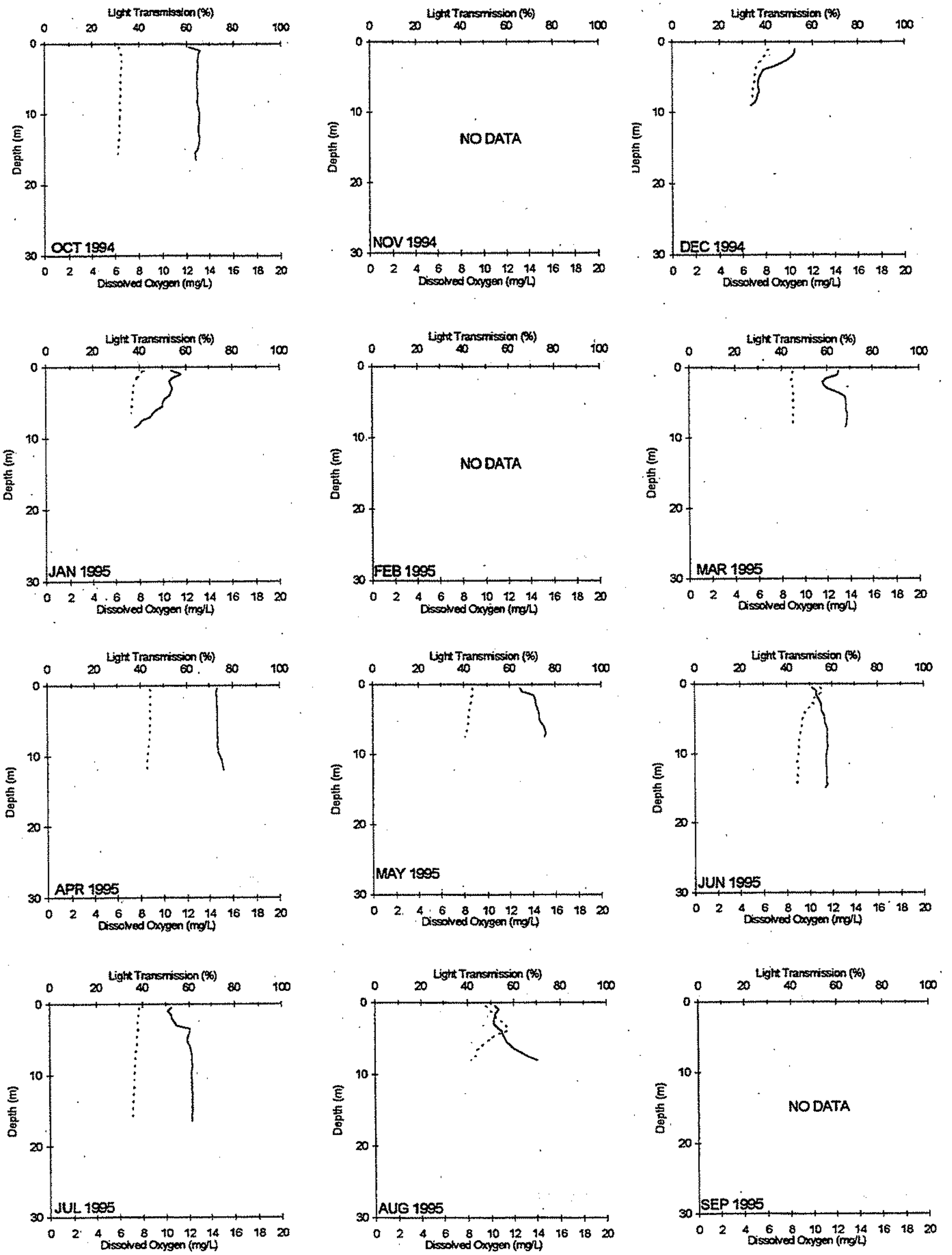
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

SKG001 Skagit Bay - Hope Island



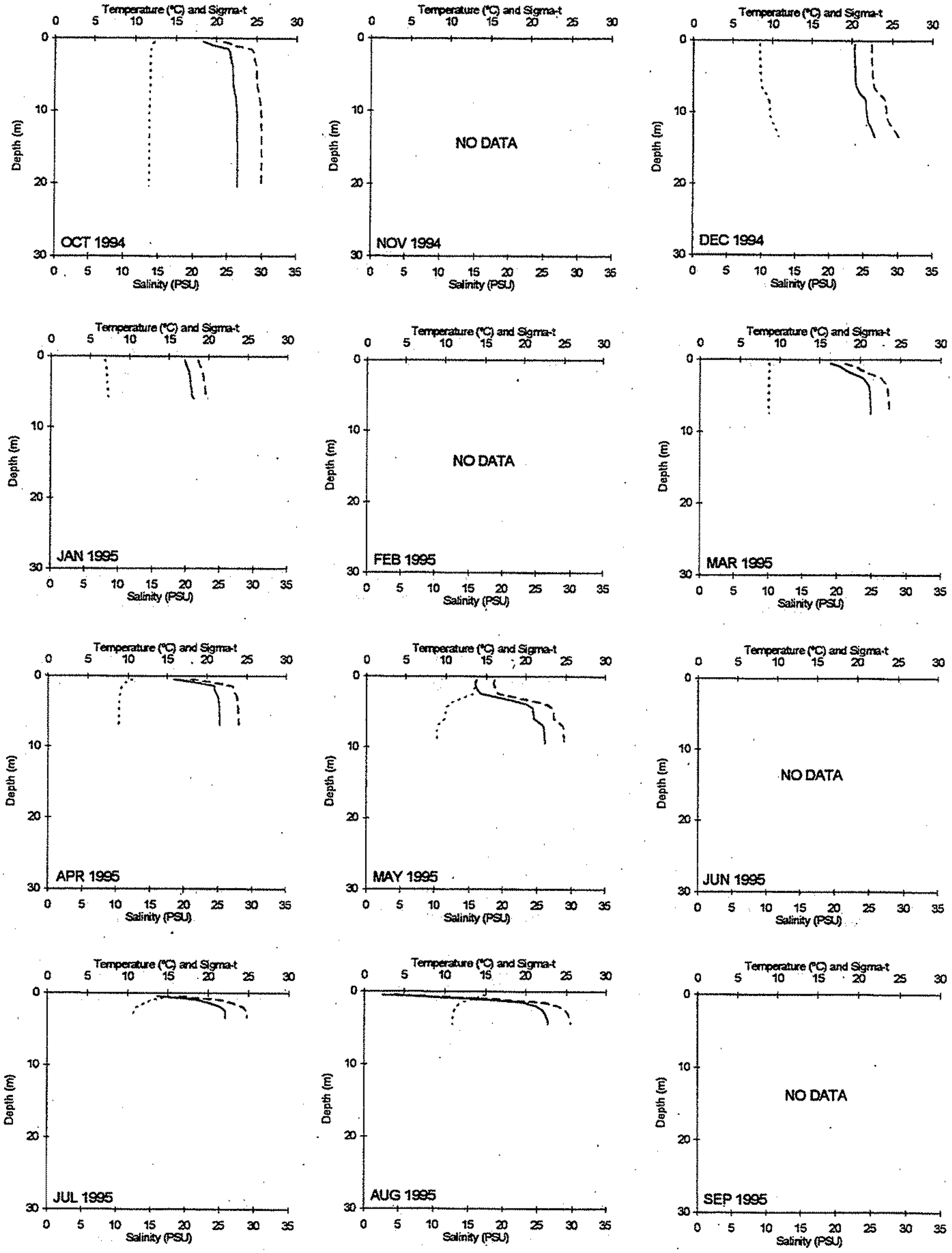
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Skagit Bay - Hope Island SKG001



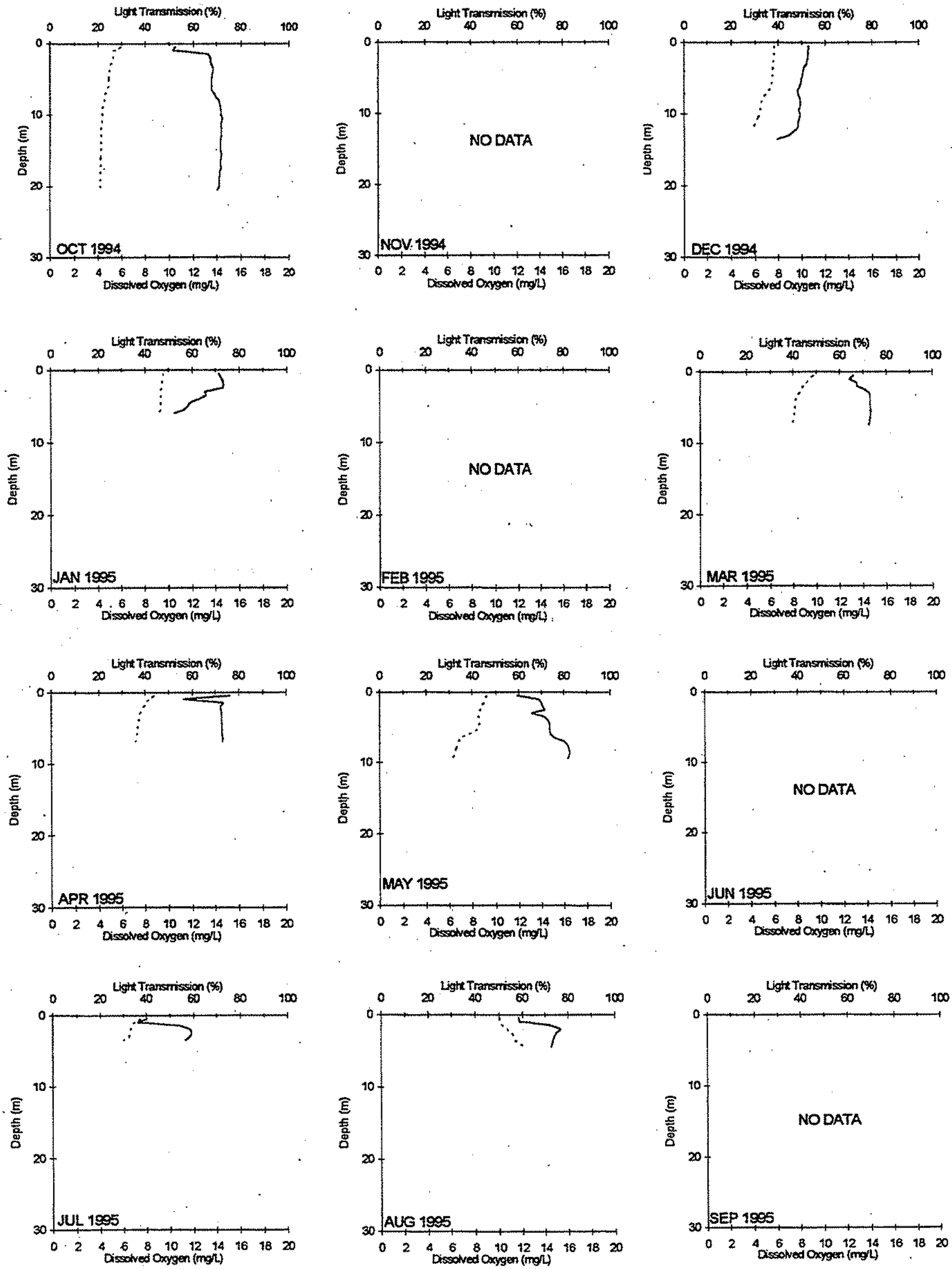
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

SKG003 Skagit Bay - Strawberry Point



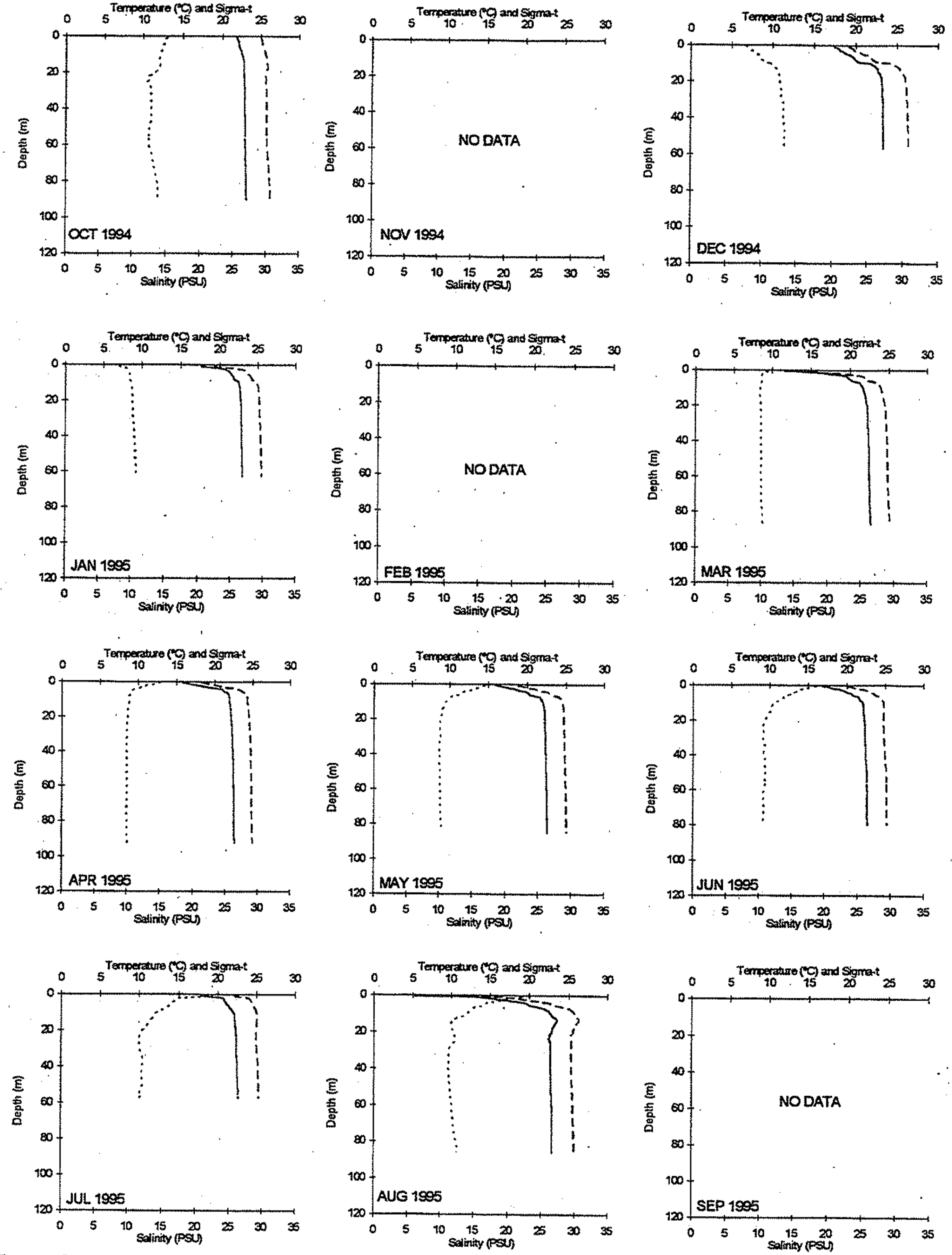
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Skagit Bay - Strawberry Point SKG003



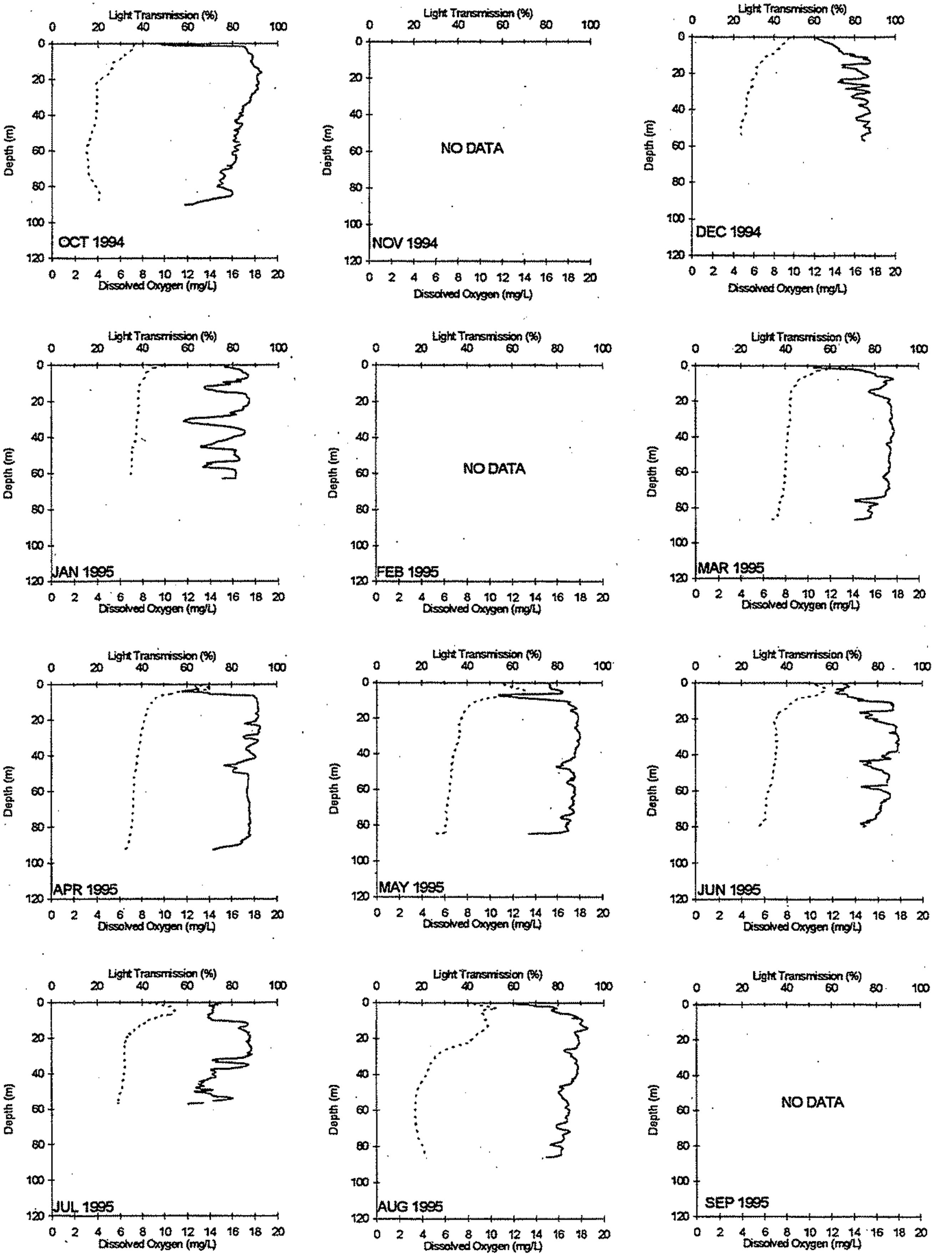
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

SUZ001 Port Susan - Kayak Point



Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

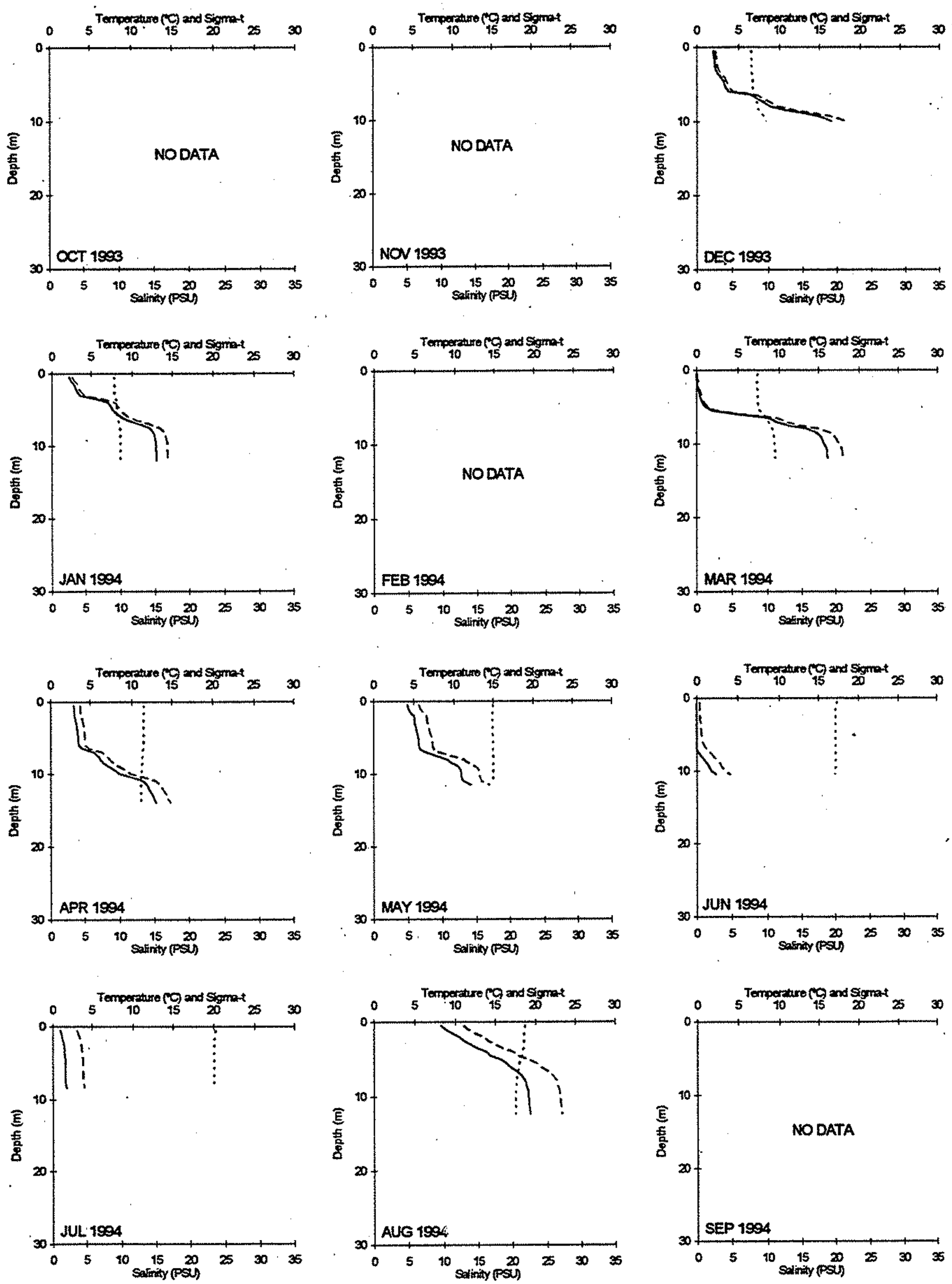
Port Susan - Kayak Point SUZ001



Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

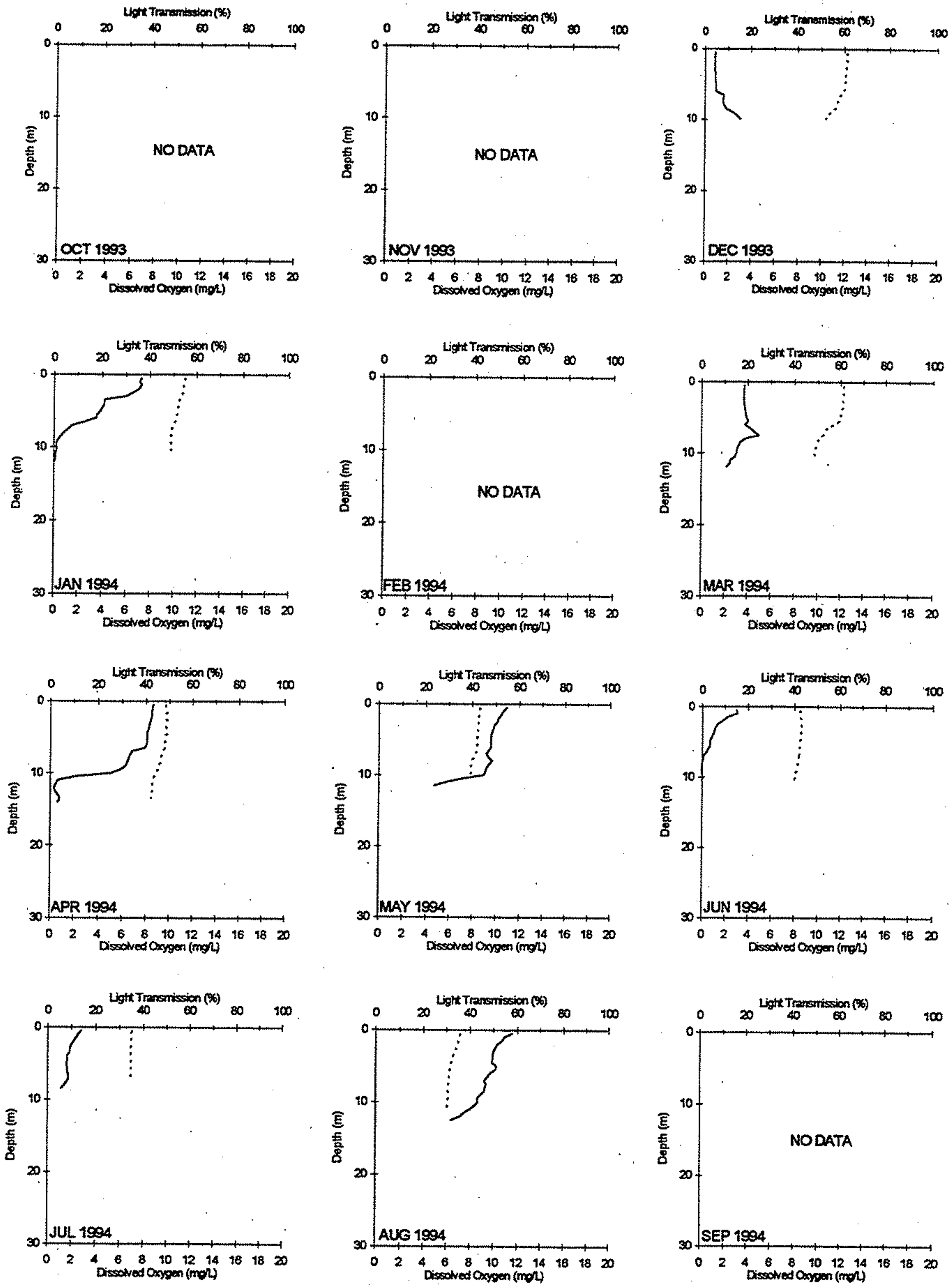
Grays Harbor and Willapa Bay stations

GYS004 Grays Harbor - Chehalis River



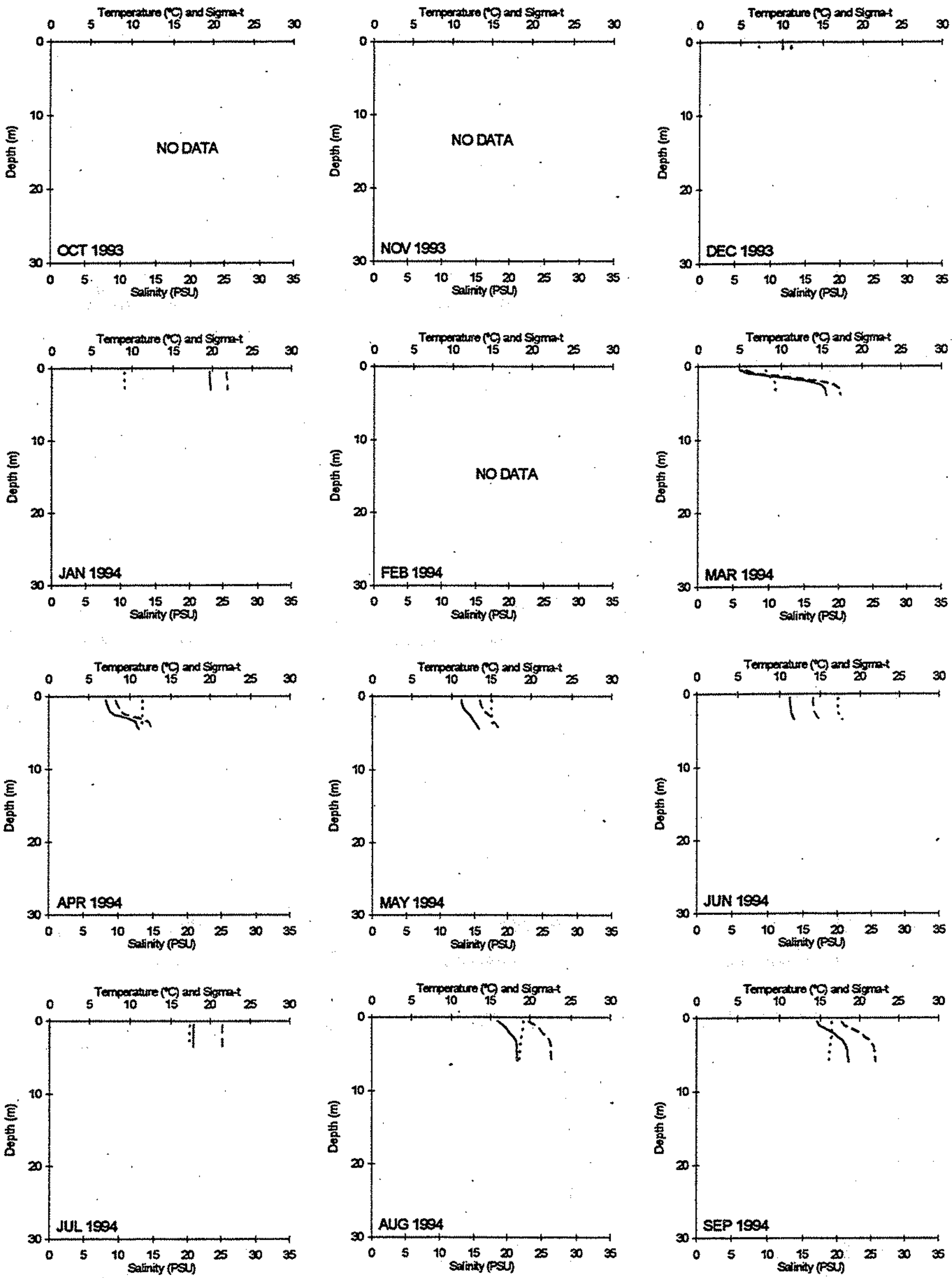
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - Chehalis River GYS004



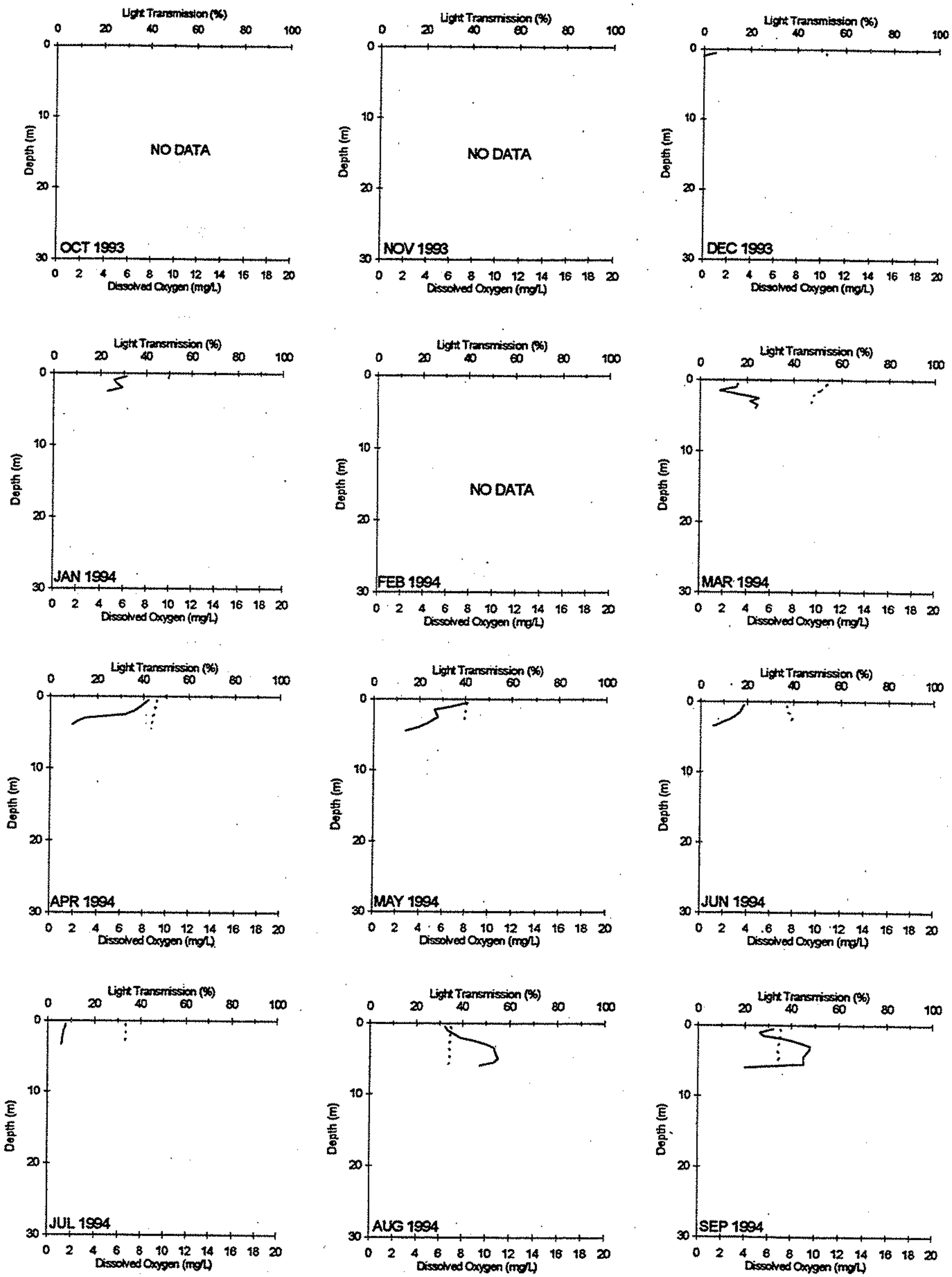
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GYS008 Grays Harbor - Mid-South Channel



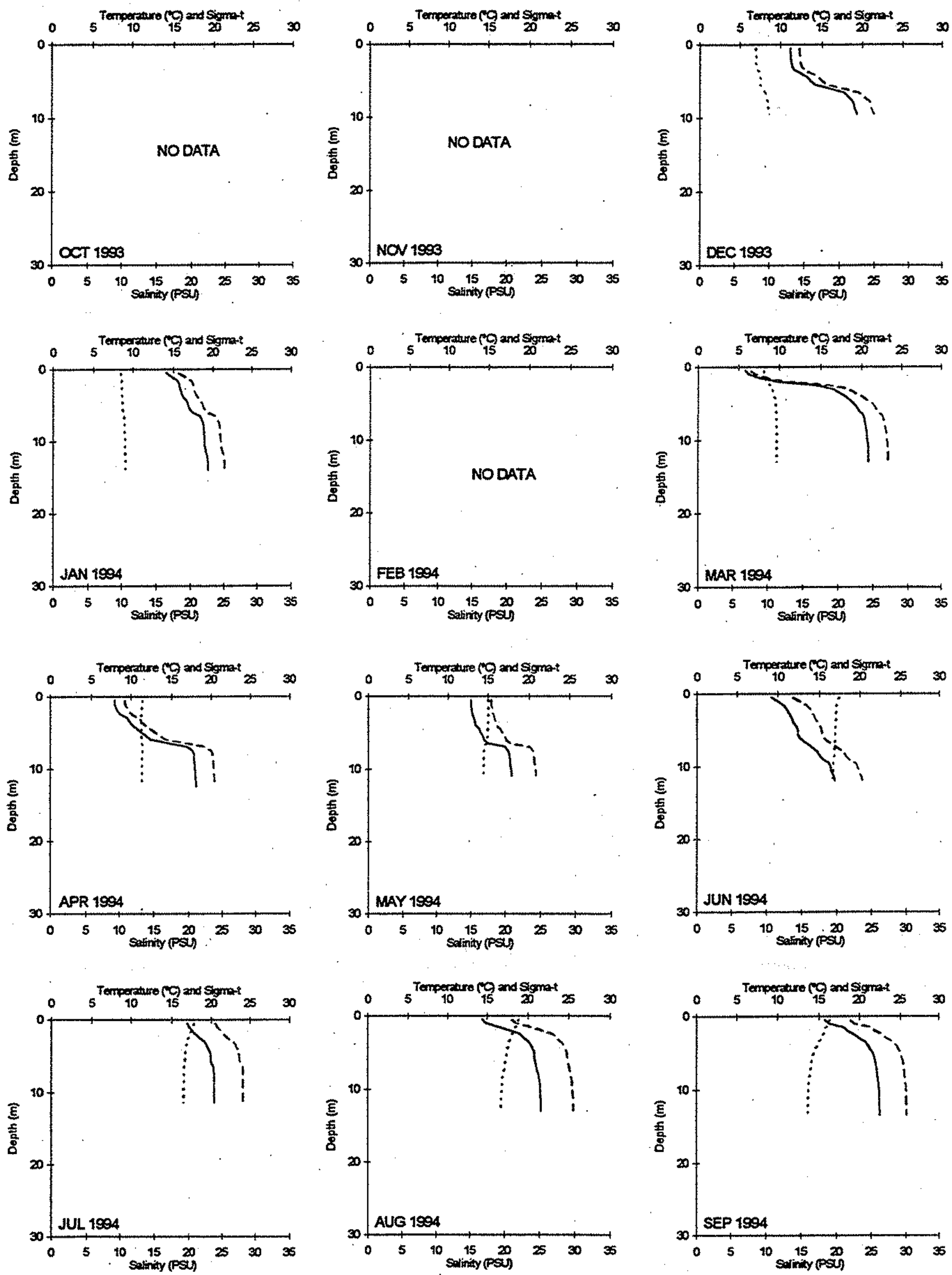
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - Mid-South Channel GYS008



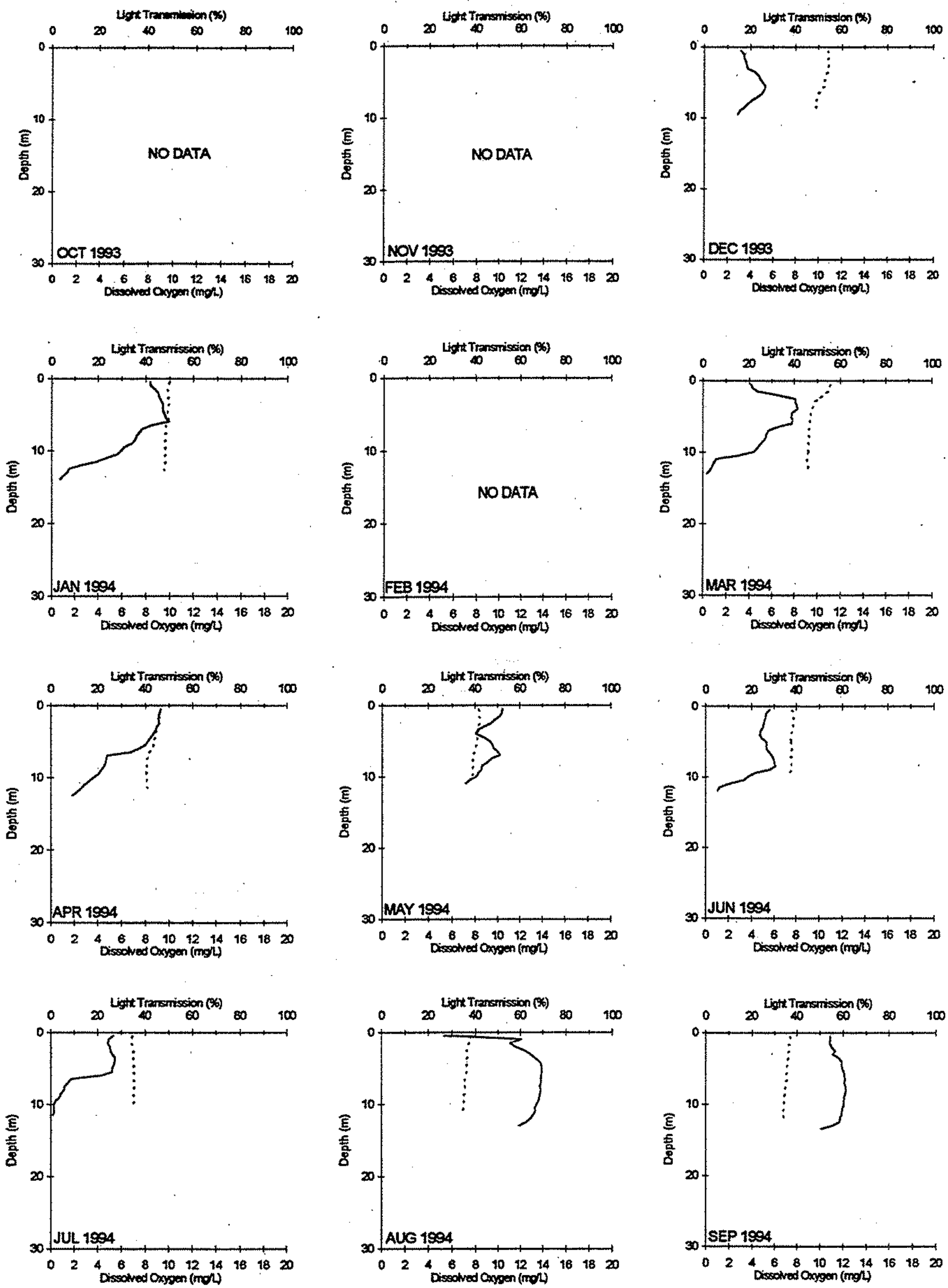
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GYS009 Grays Harbor - Moon Island Reach



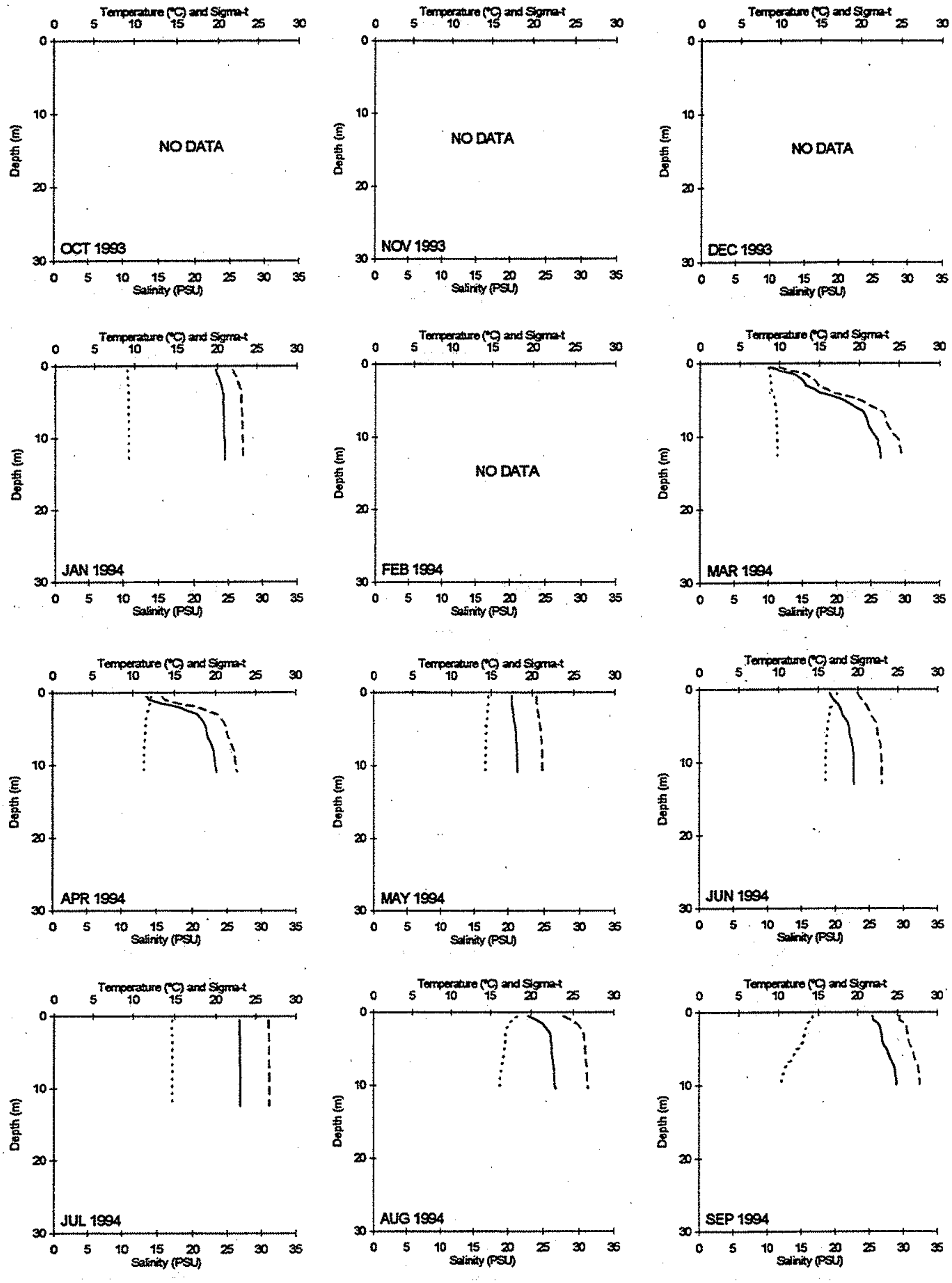
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - Moon Island Reach GYS009



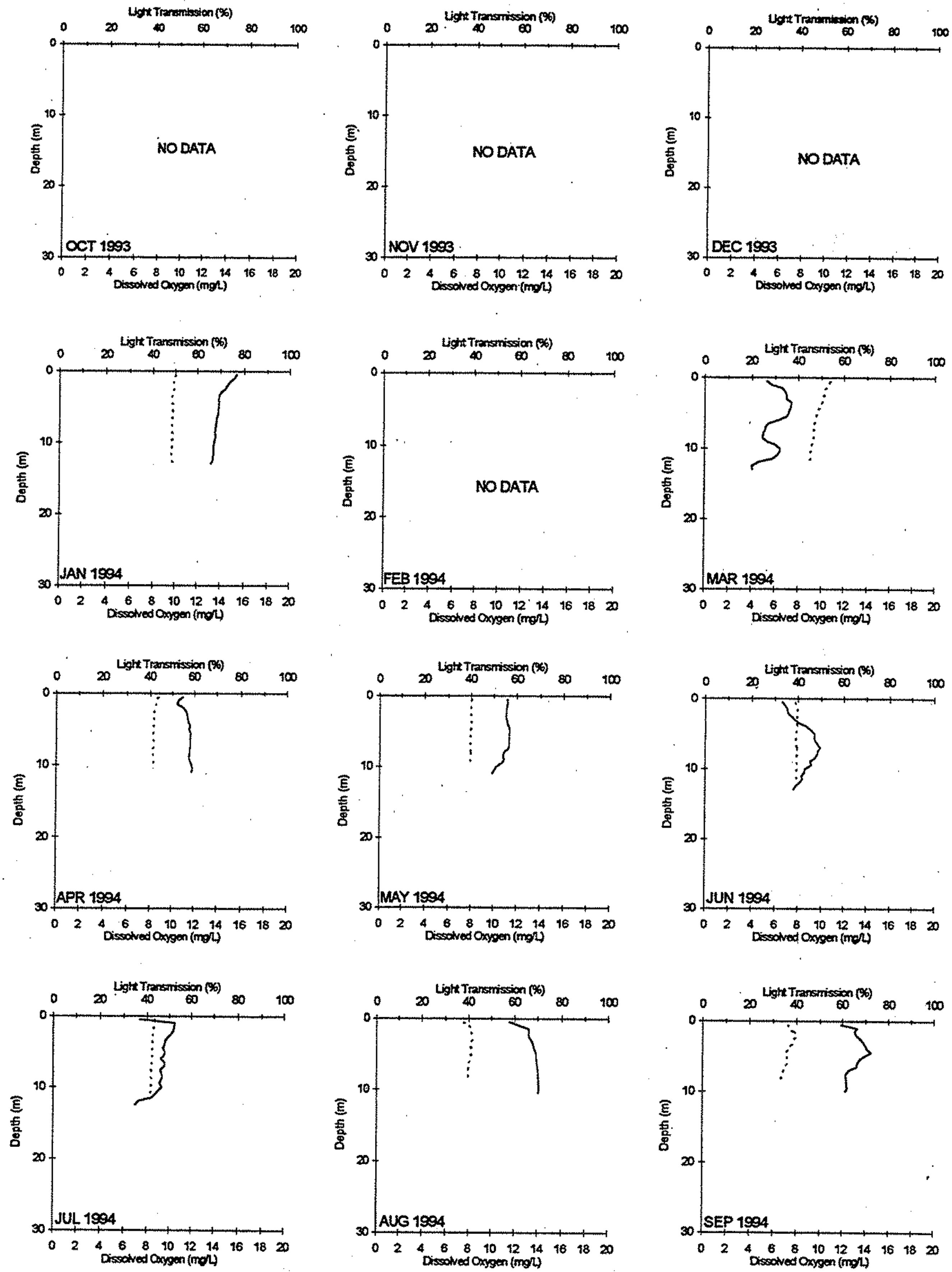
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GYS015 Grays Harbor - N. Whitcomb Flats



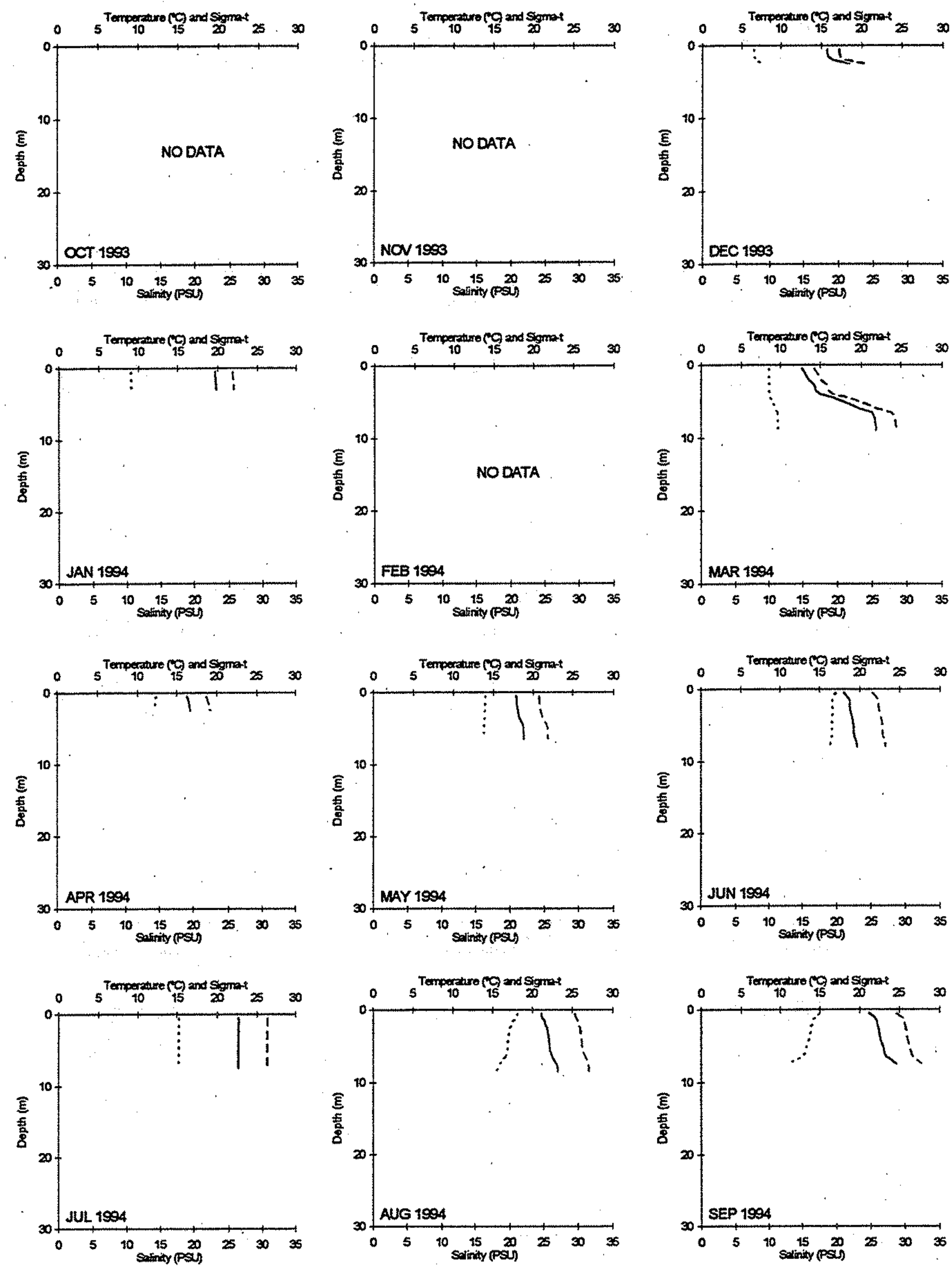
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - N. Whitcomb Flats GYS015



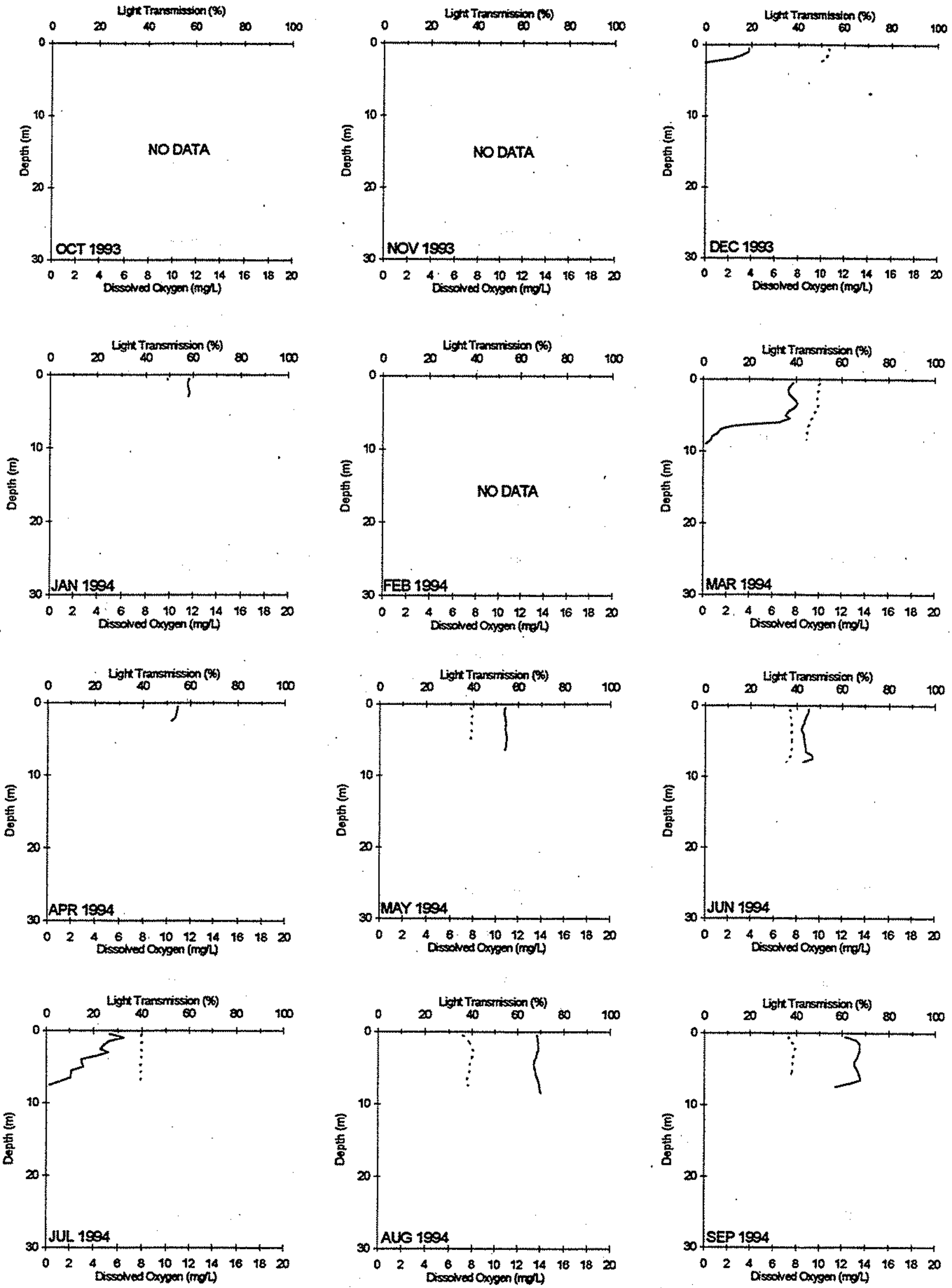
Legend: Light Transmission = Solid Line   Dissolved Oxygen = Dotted Line

GYS016 Grays Harbor - Damon Point



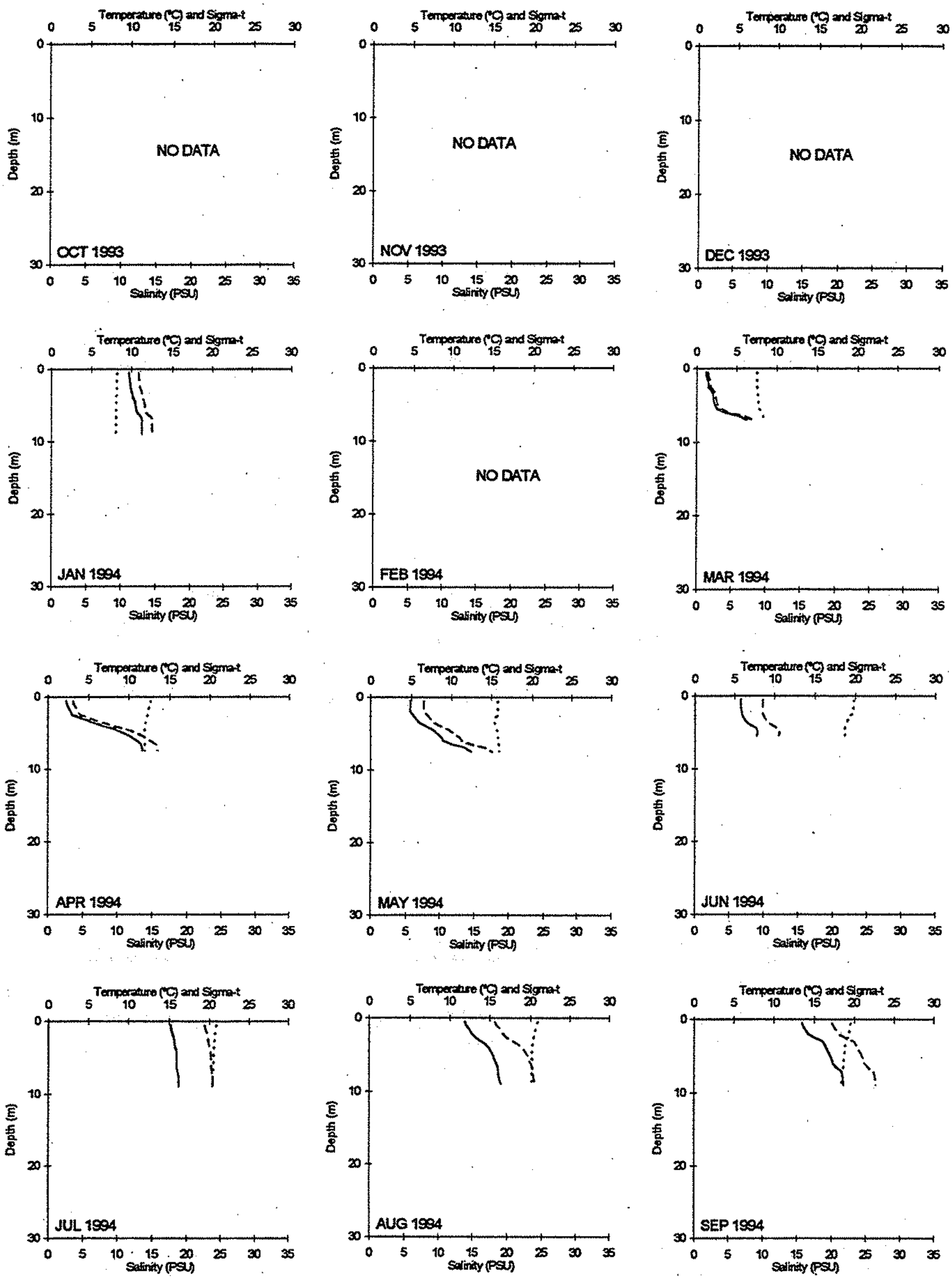
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - Damon Point GYS016



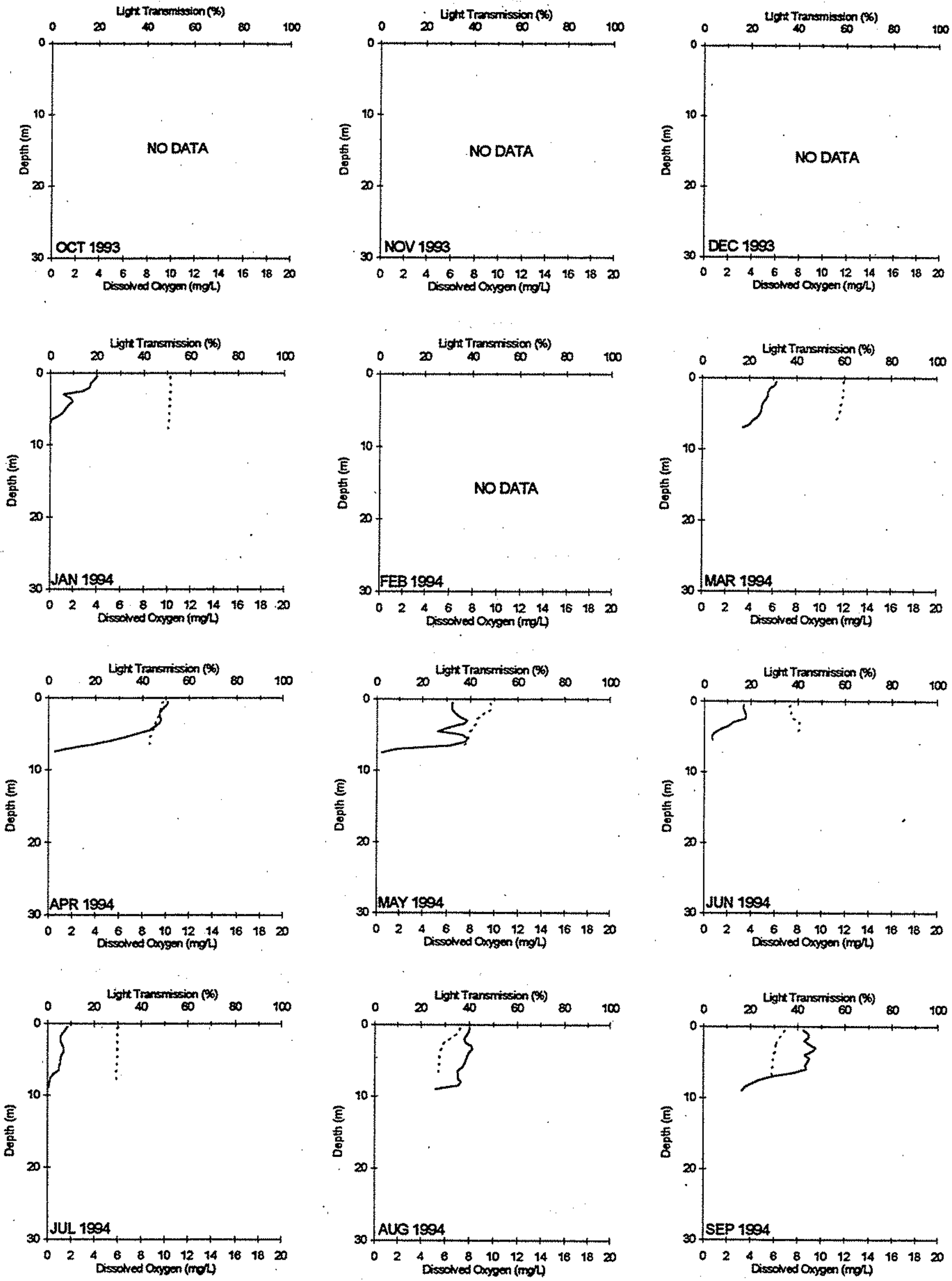
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

WPA001 Willapa Bay - Willapa River, Raymond



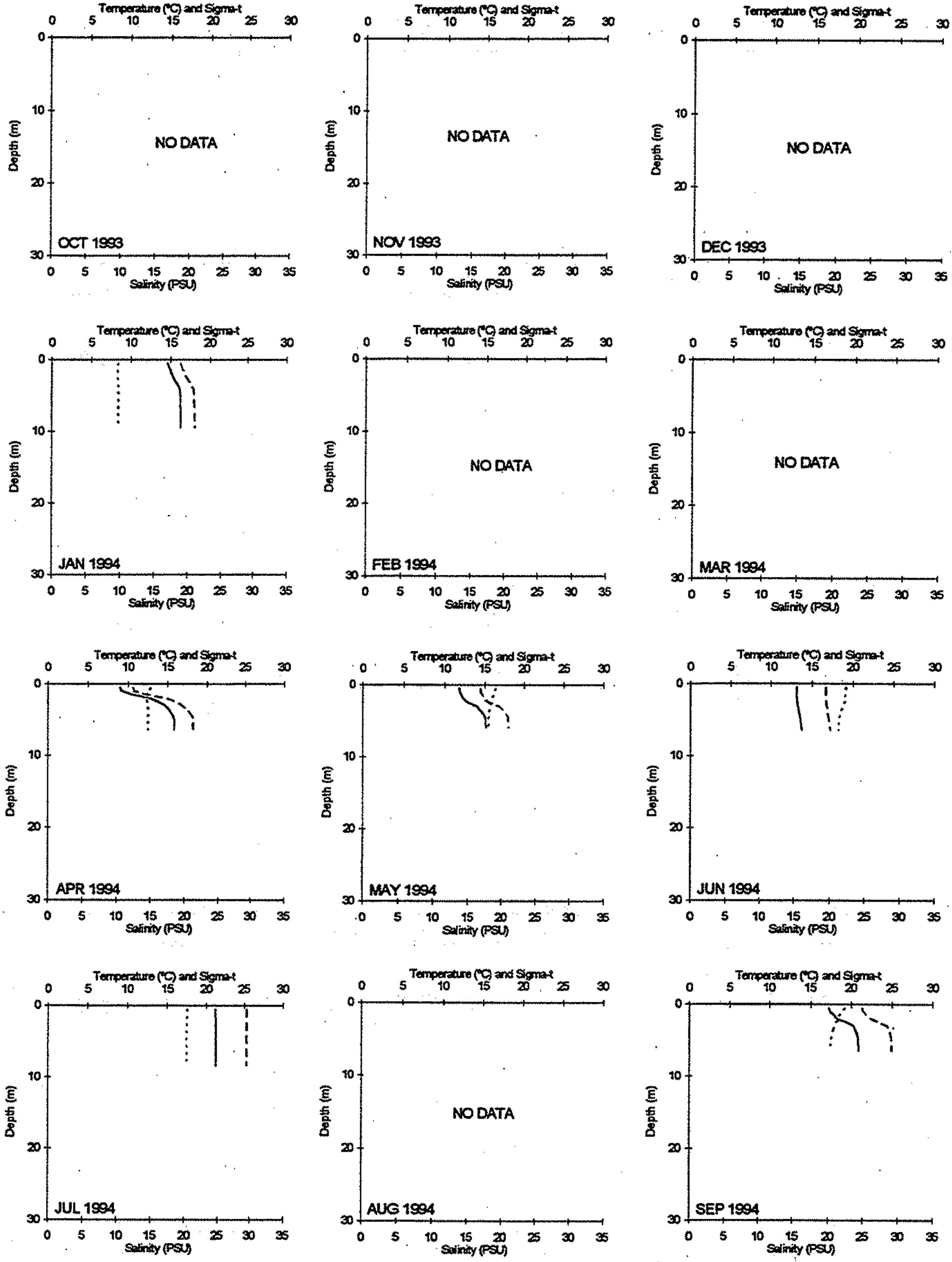
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Willapa River, Raymond WPA001



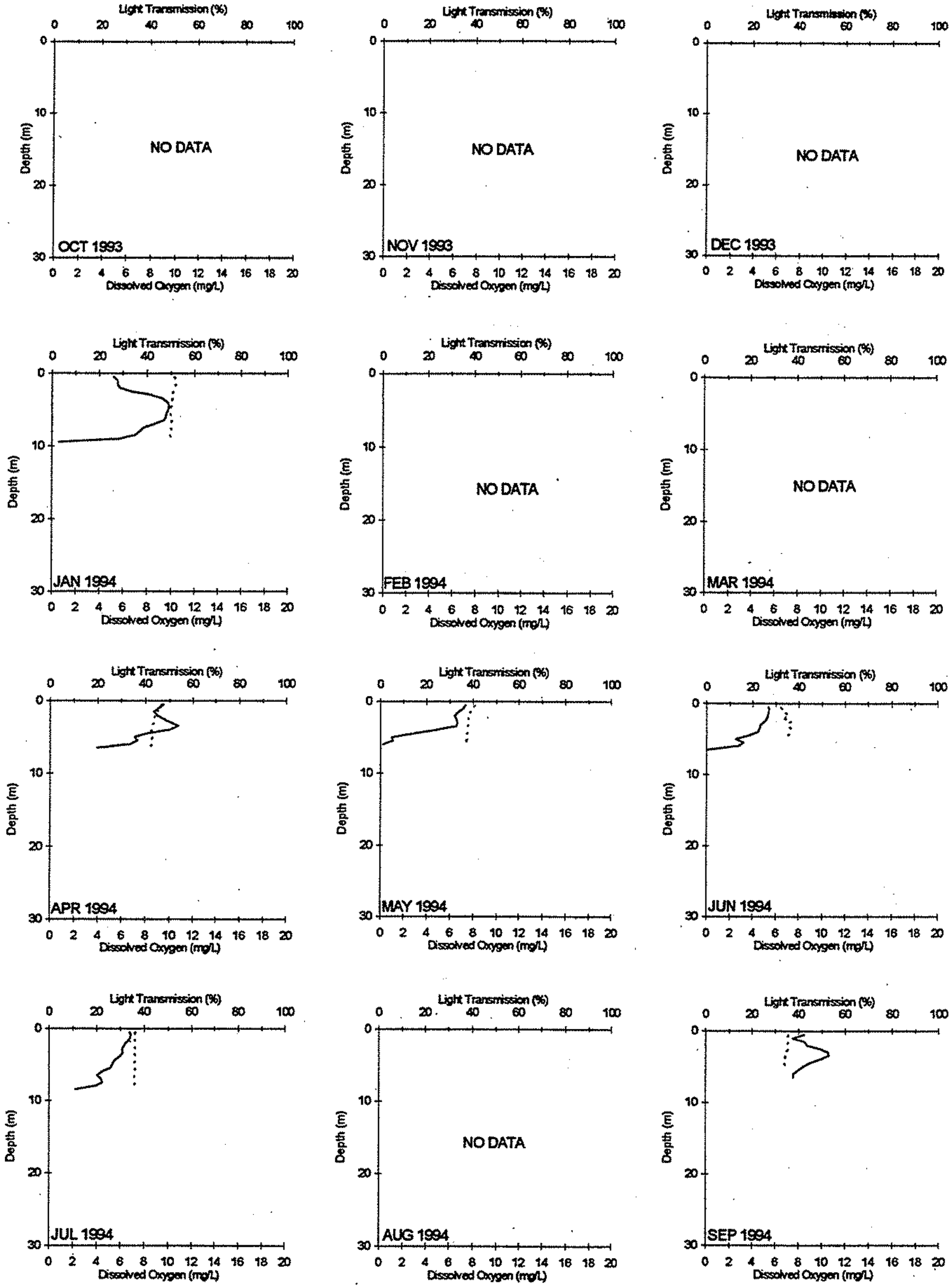
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

WPA003 Willapa Bay - Willapa River, Johnson Slough



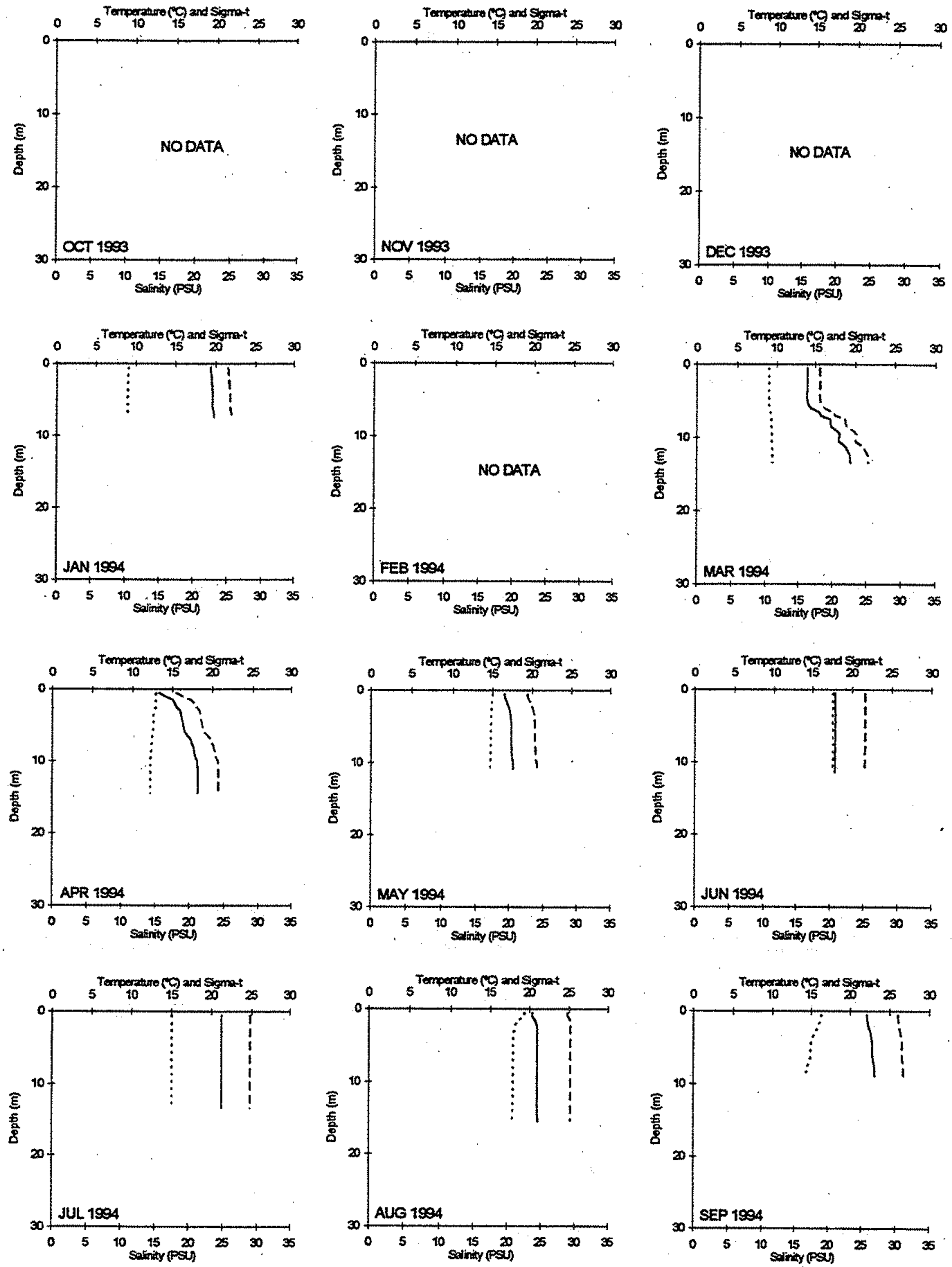
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Willapa River, Johnson Slough WPA003



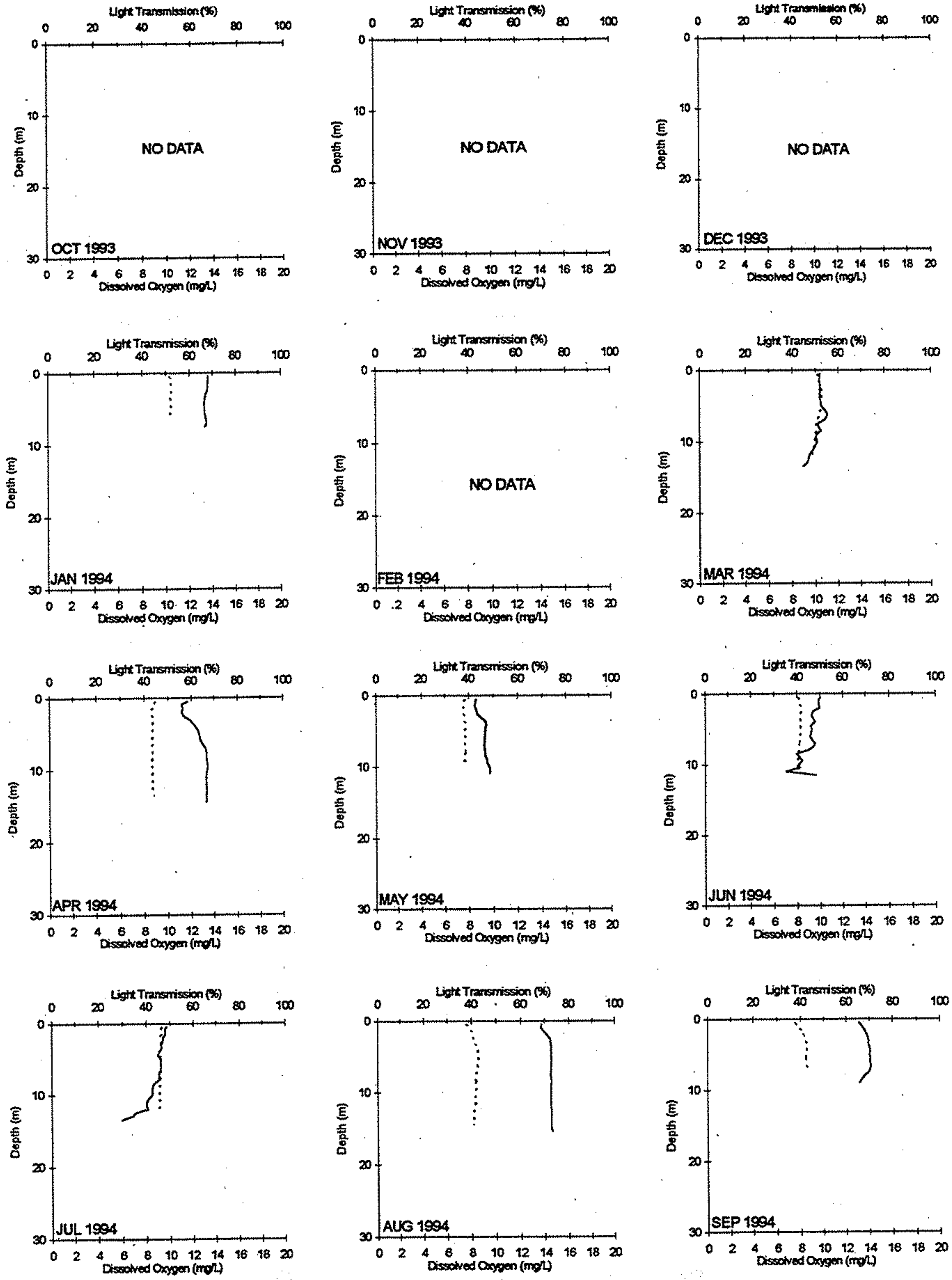
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

WPA004 Willapa Bay - Toke Point



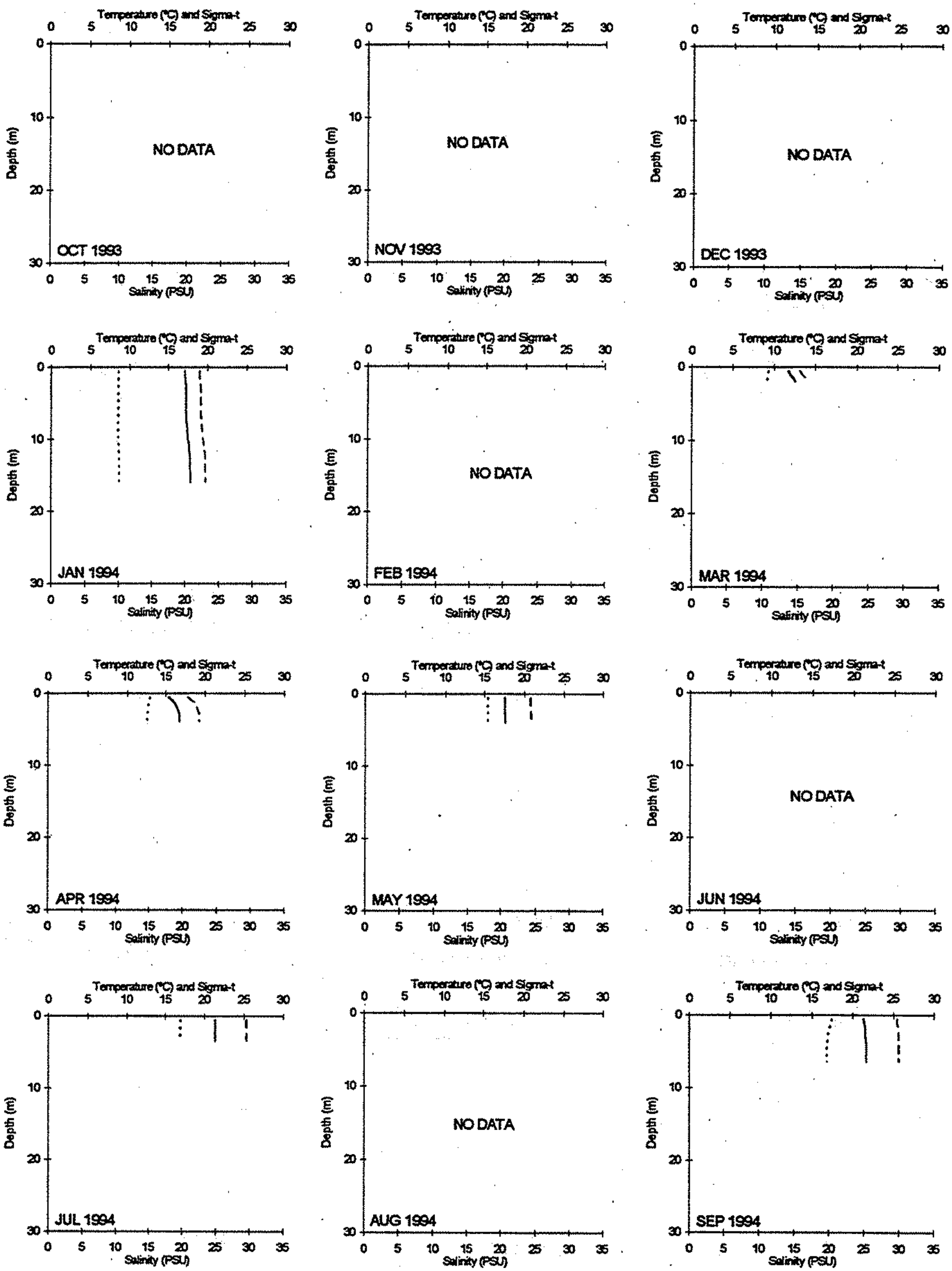
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Toke Point   WPA004



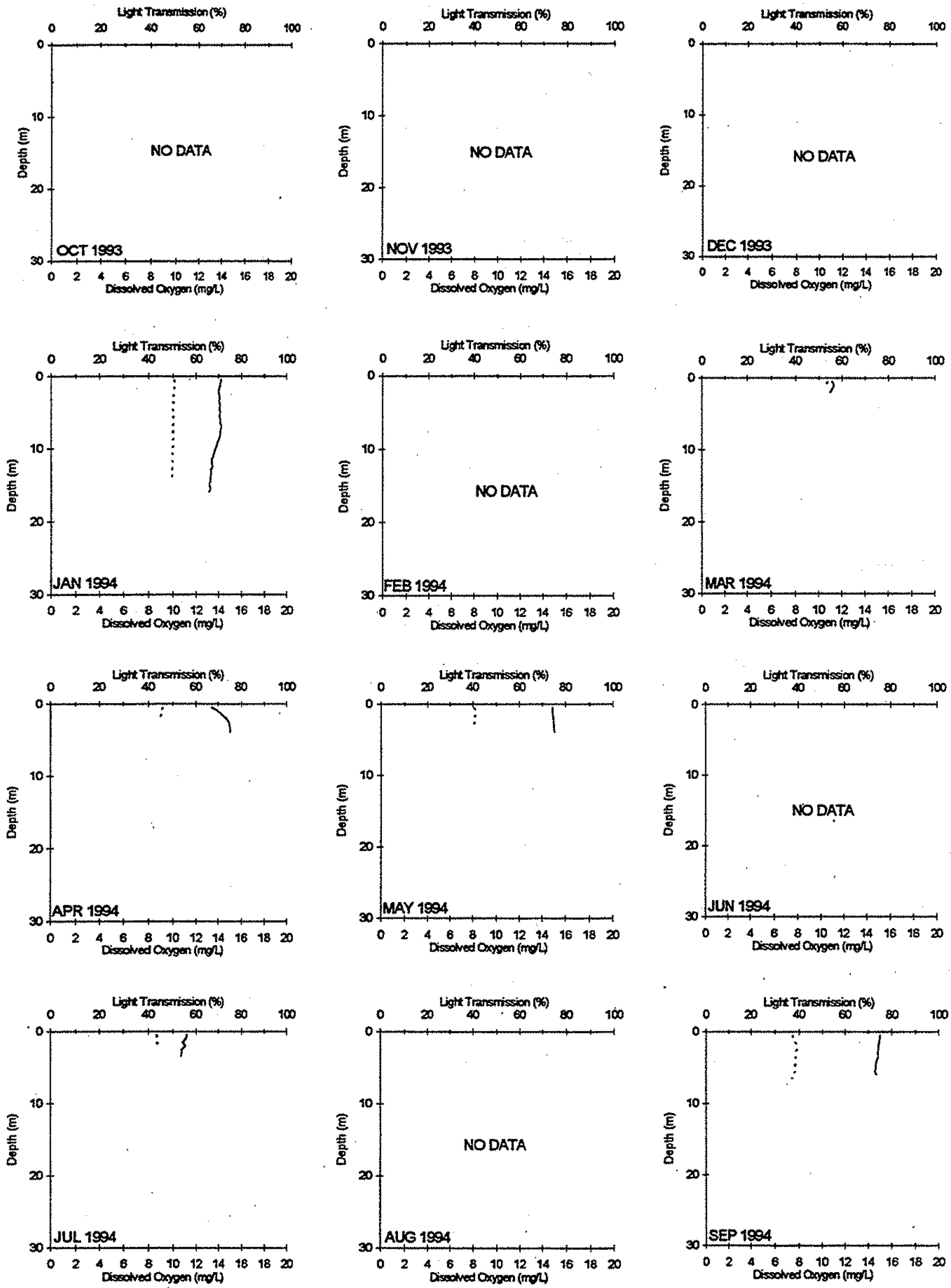
Legend: Light Transmission = Solid Line   Dissolved Oxygen = Dotted Line

WPA006 Willapa Bay - Nahcotta Channel



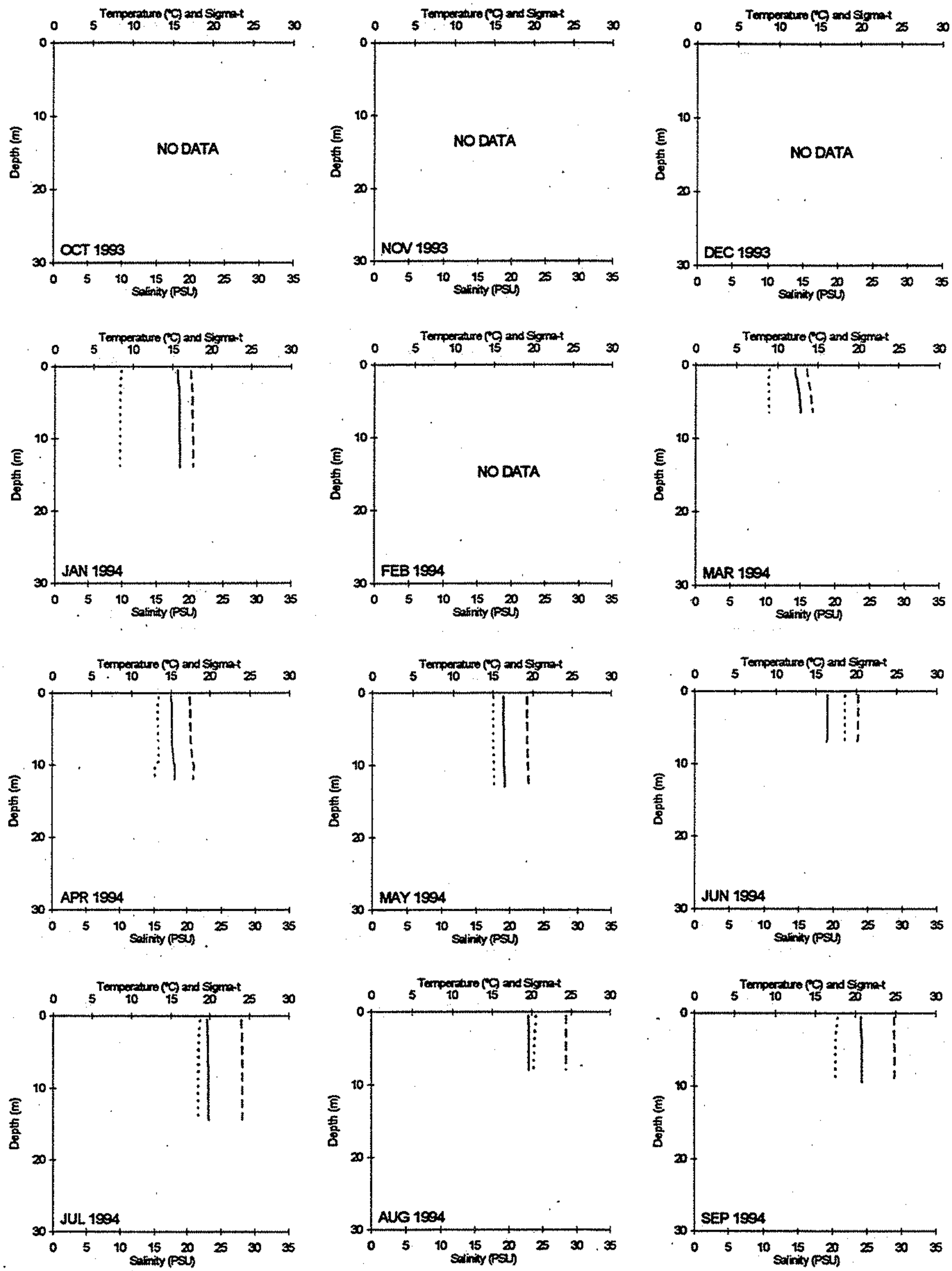
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Nahcotta Channel WPA006



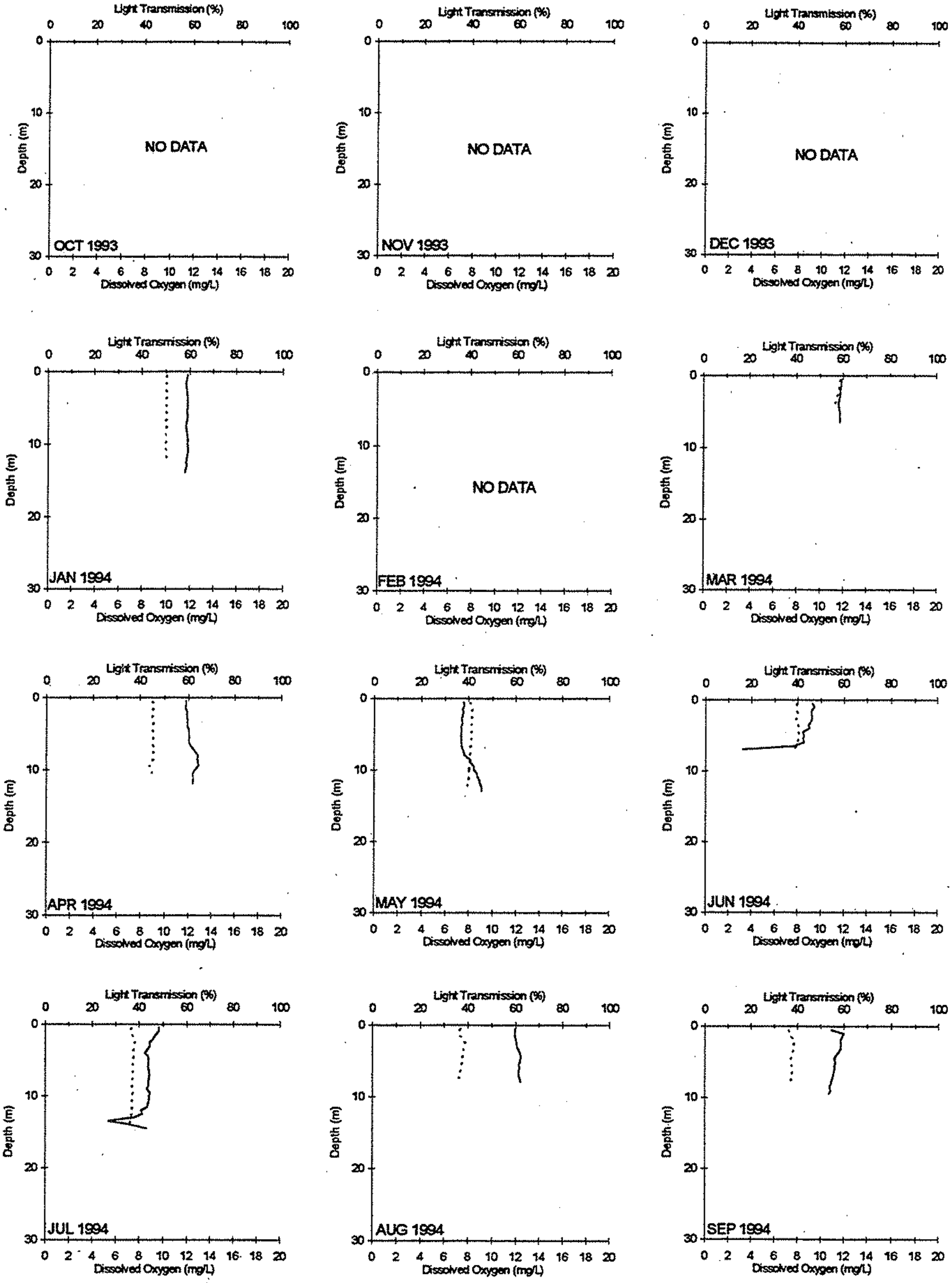
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

WPA007 Willapa Bay - Long Island, S. of Jensen Point



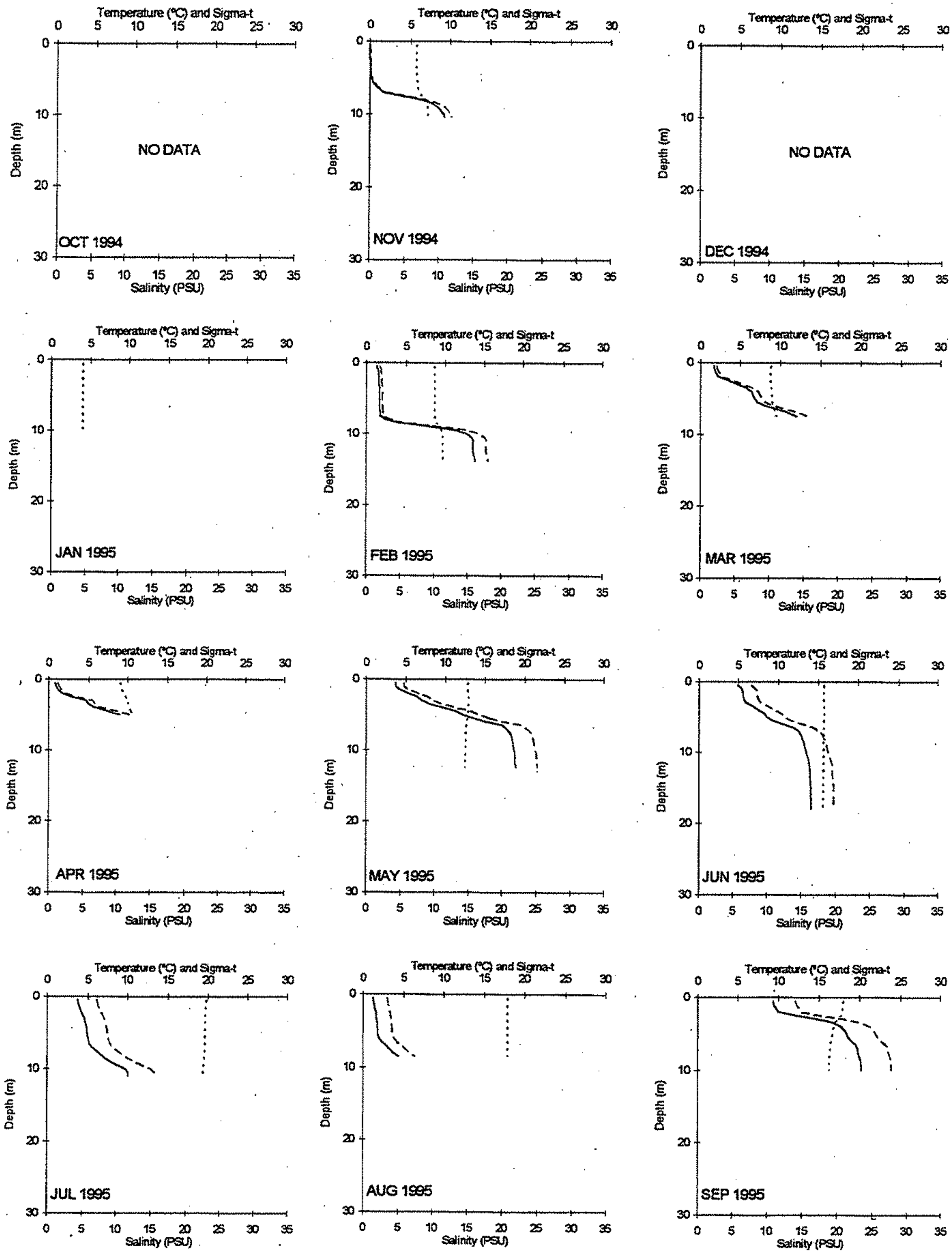
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Long Island, S. of Jensen Point WPA007



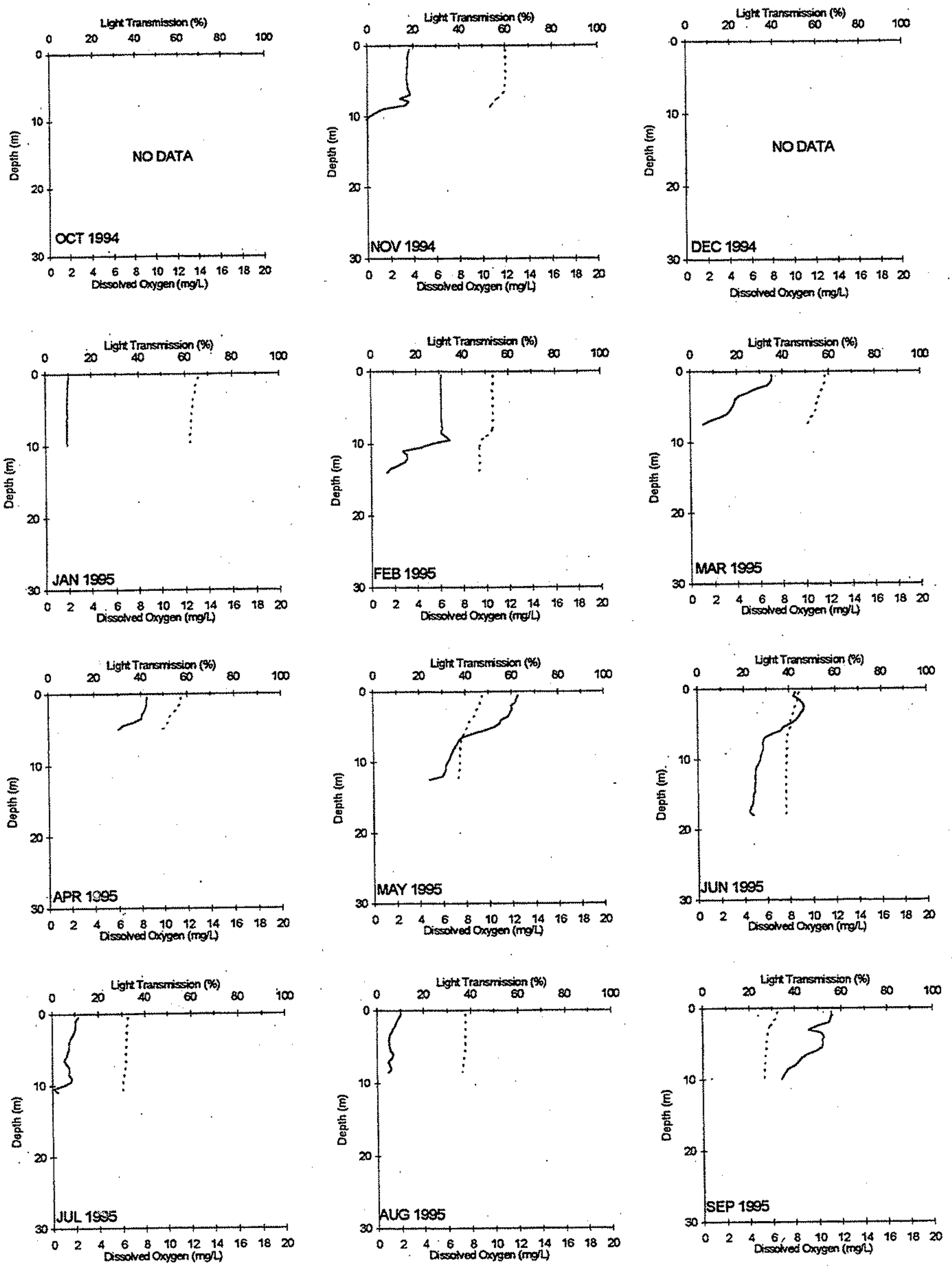
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GYS004 Grays Harbor - Chehalis River



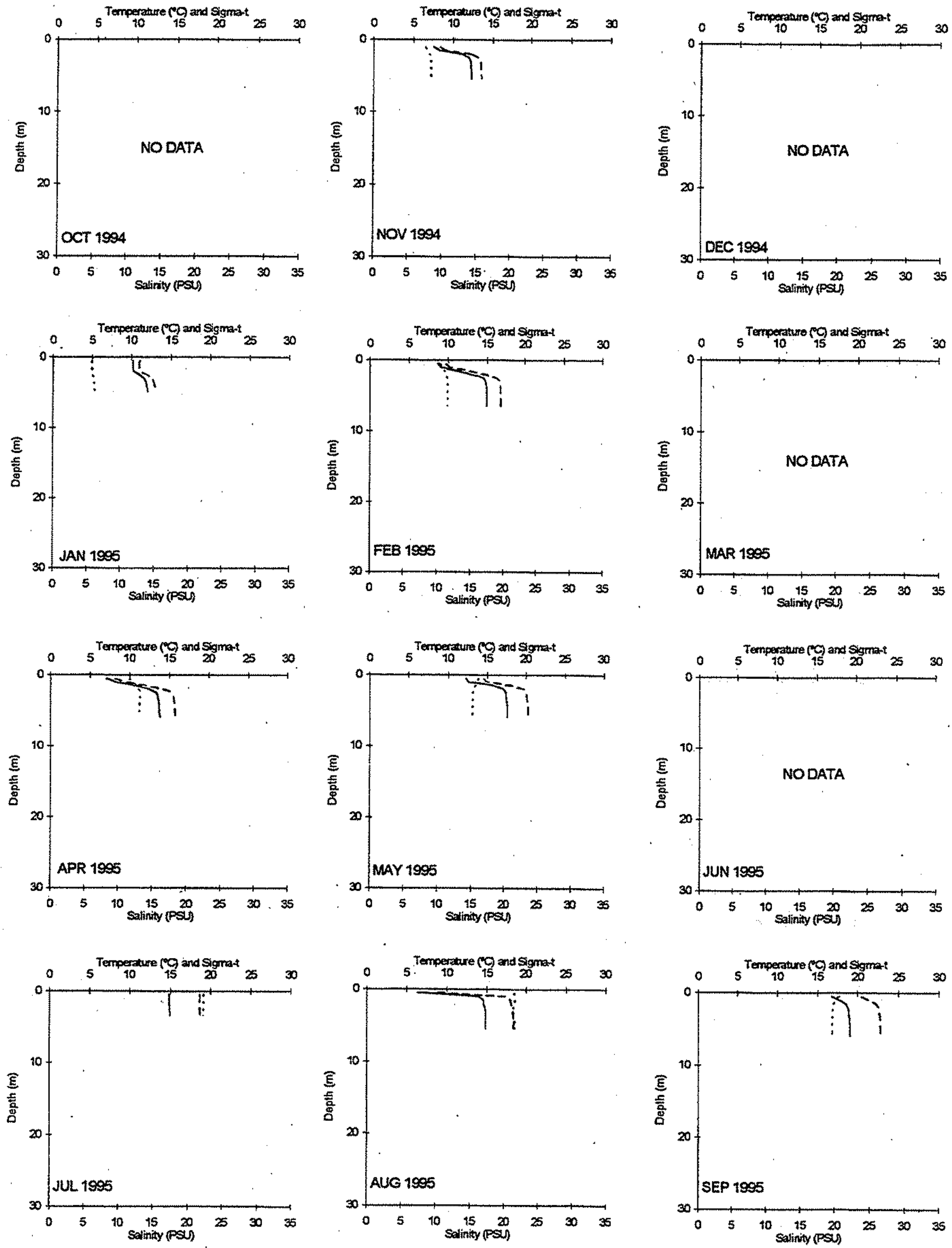
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - Chehalis River GYS004



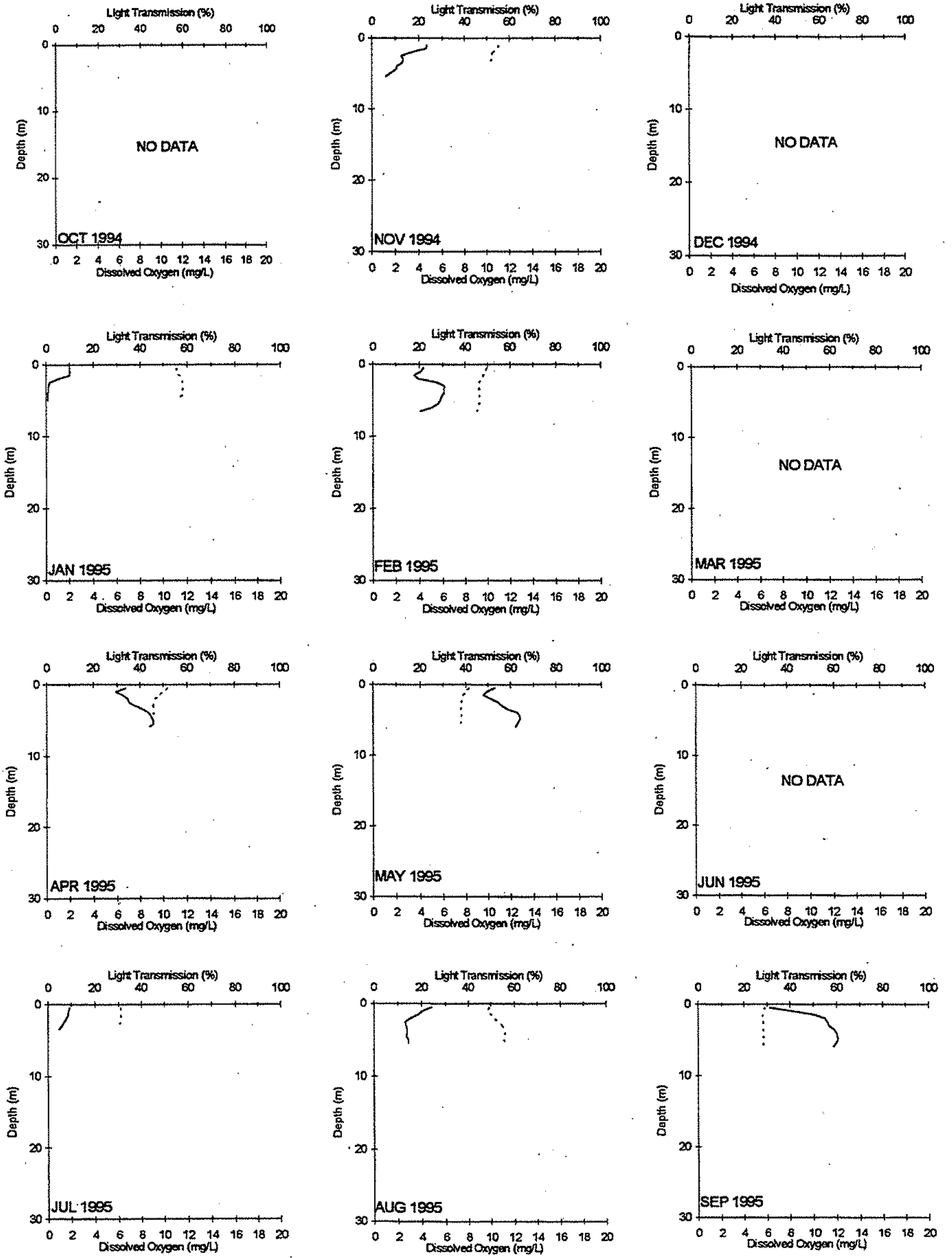
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GYS008 Grays Harbor - Mid-South Channel



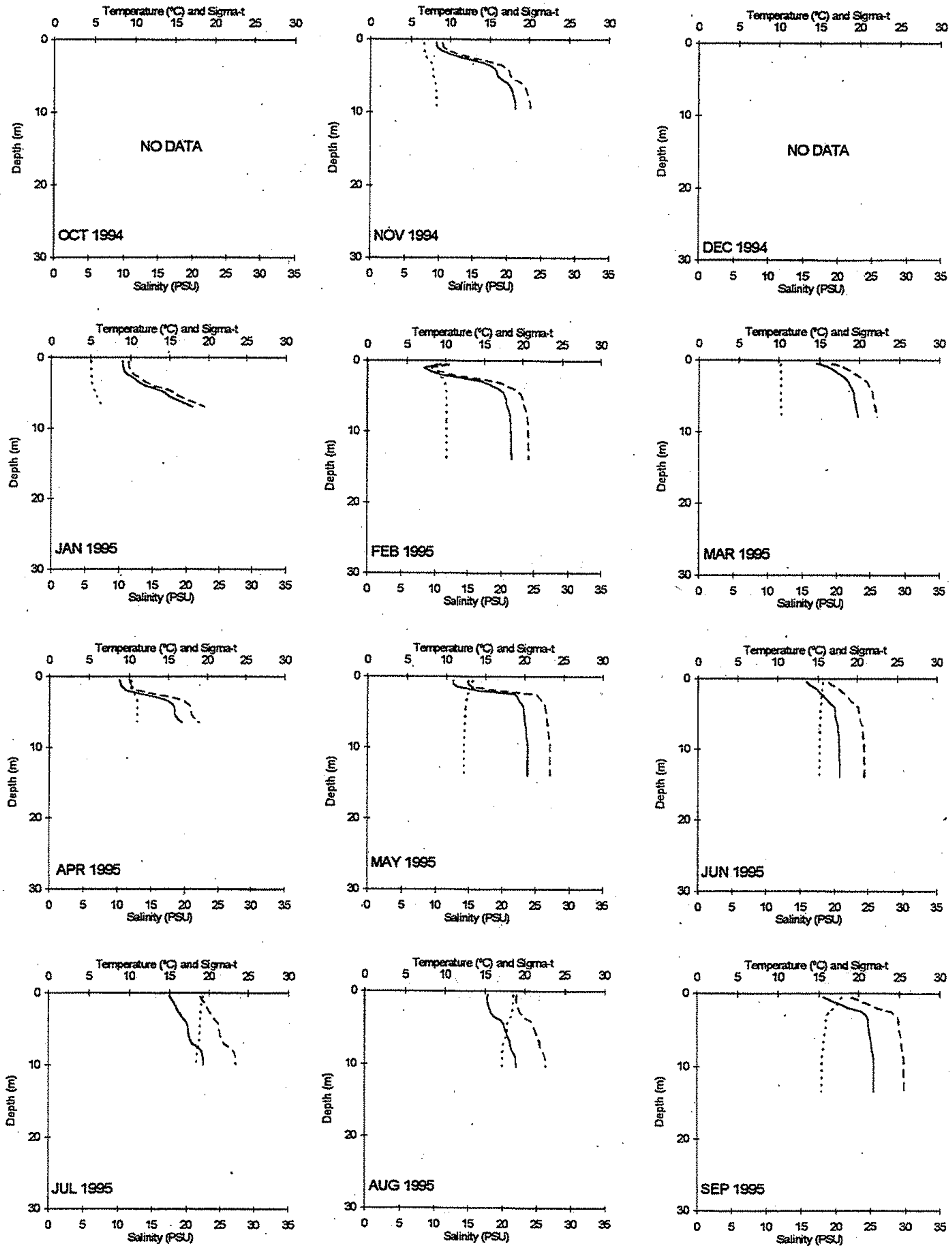
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - Mid-South Channel GYS008



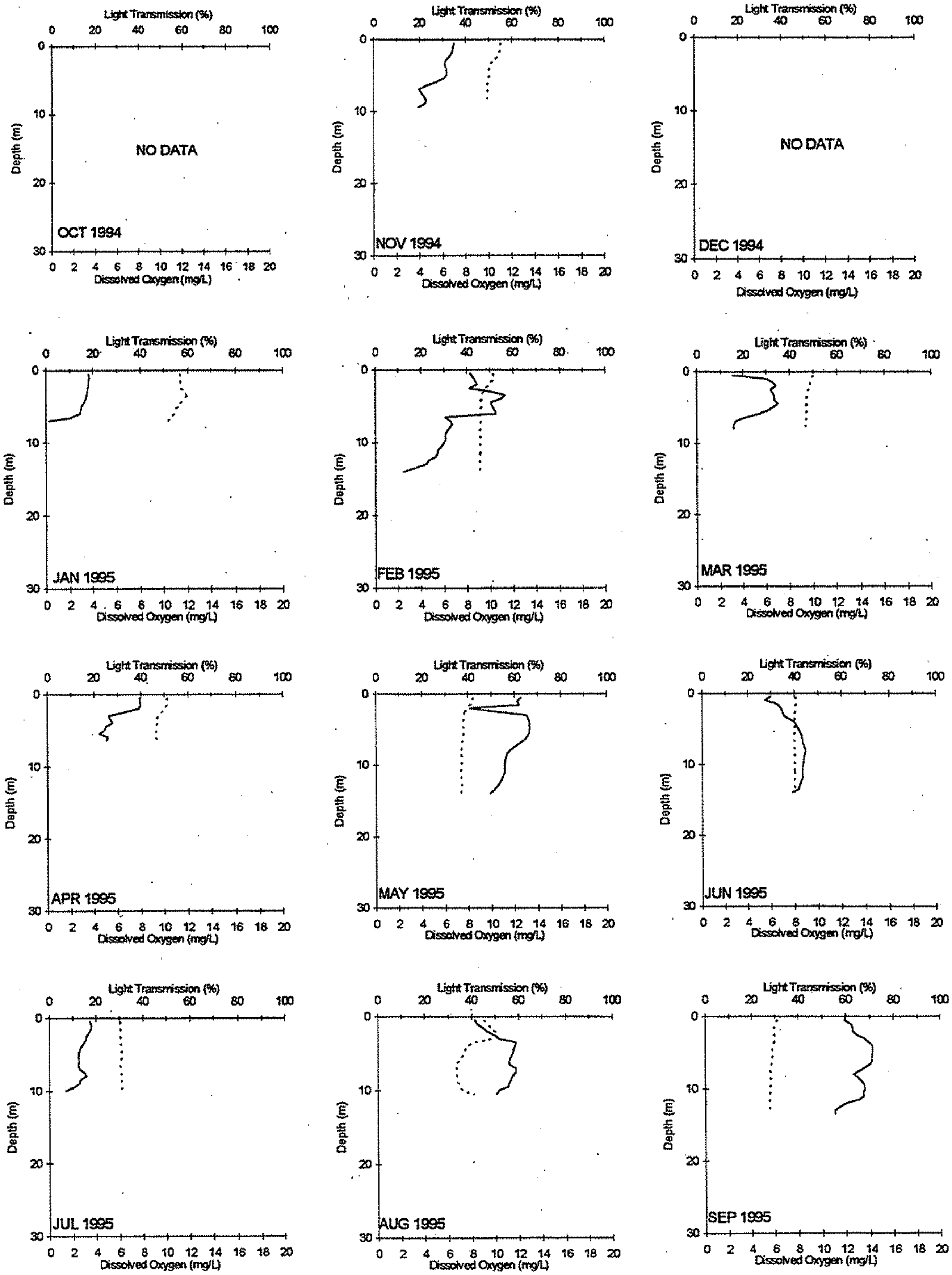
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GYS009 Grays Harbor - Moon Island Reach



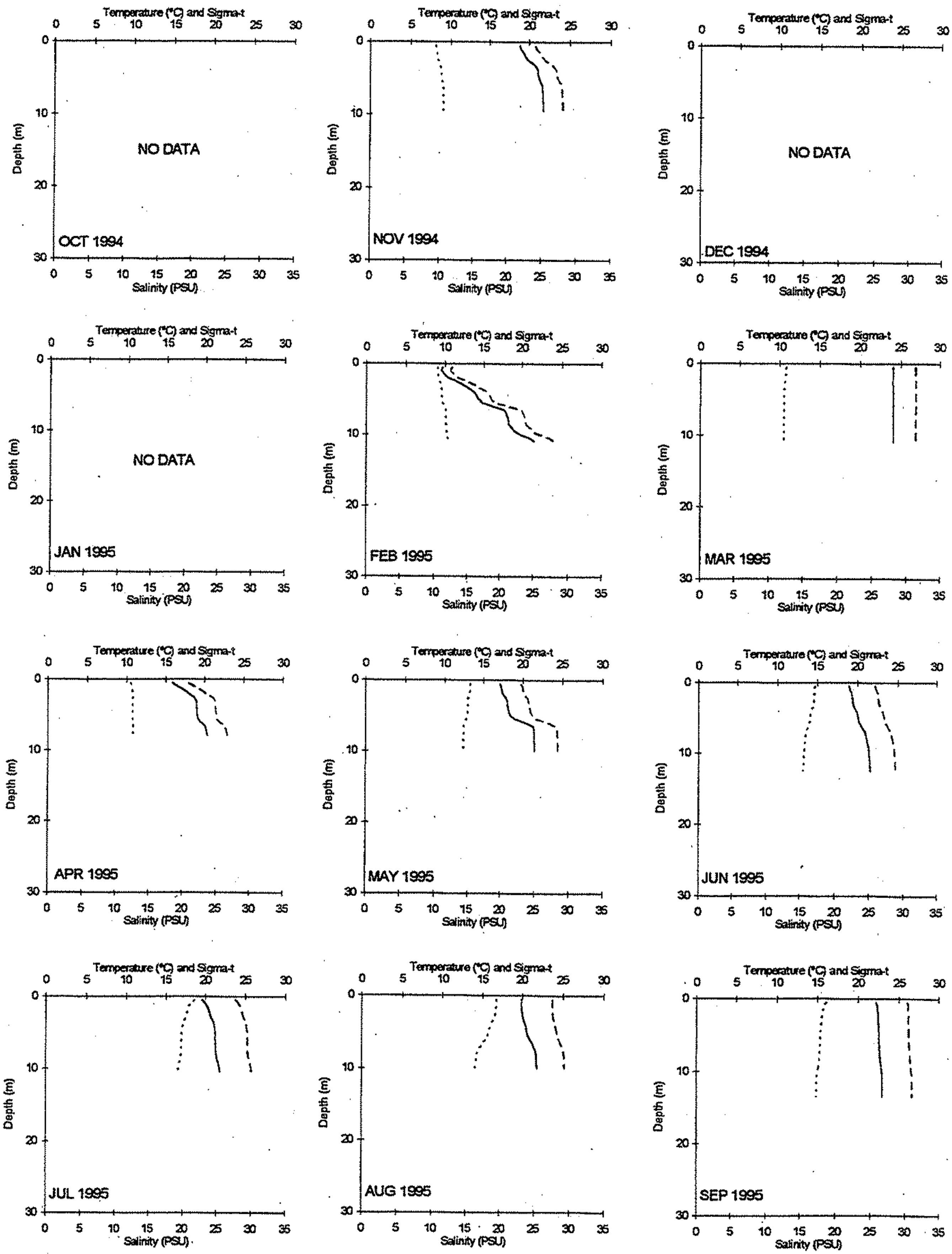
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - Moon Island Reach GYS009



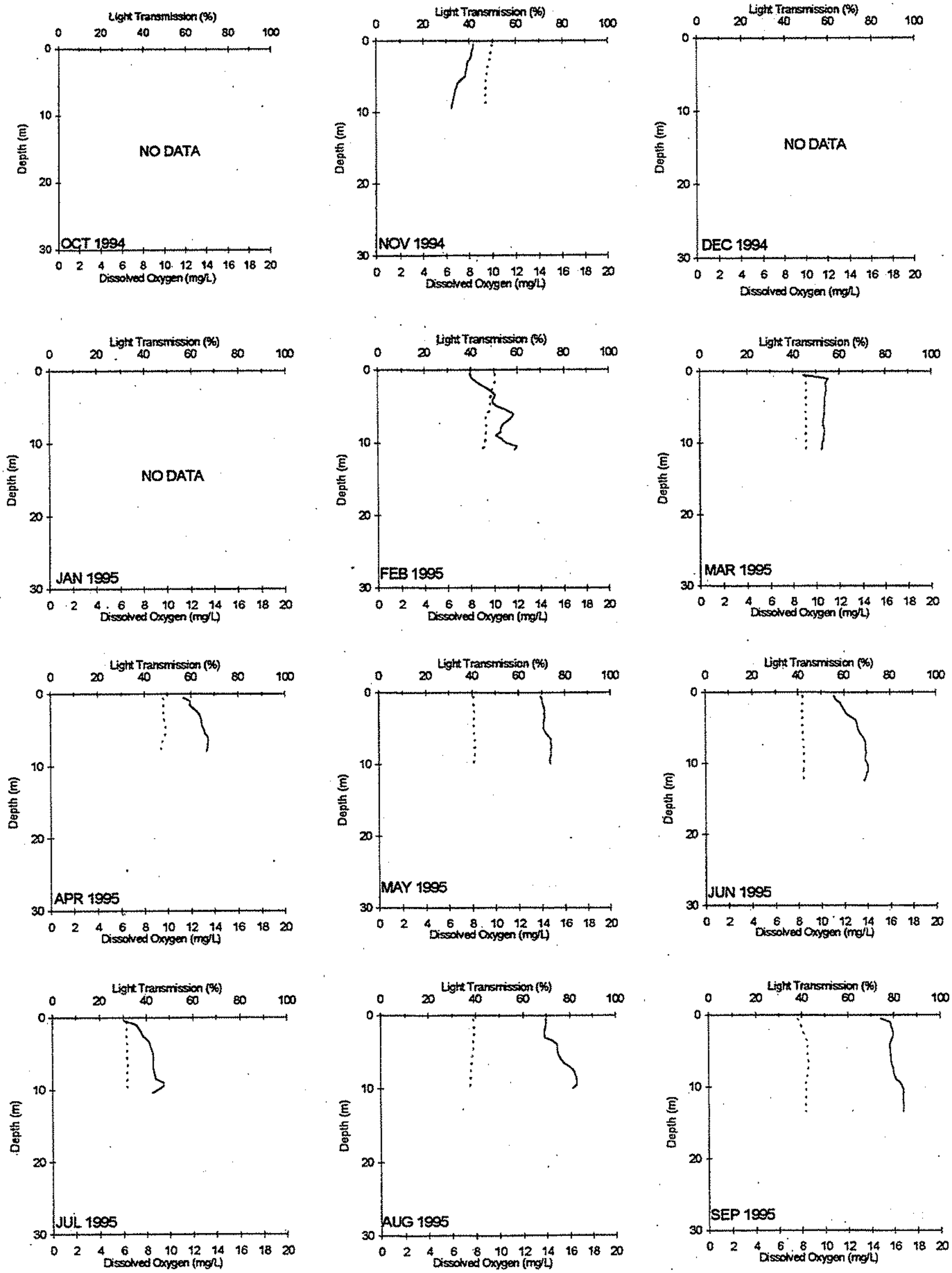
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GYS015 Grays Harbor - N. Whitcomb Flats



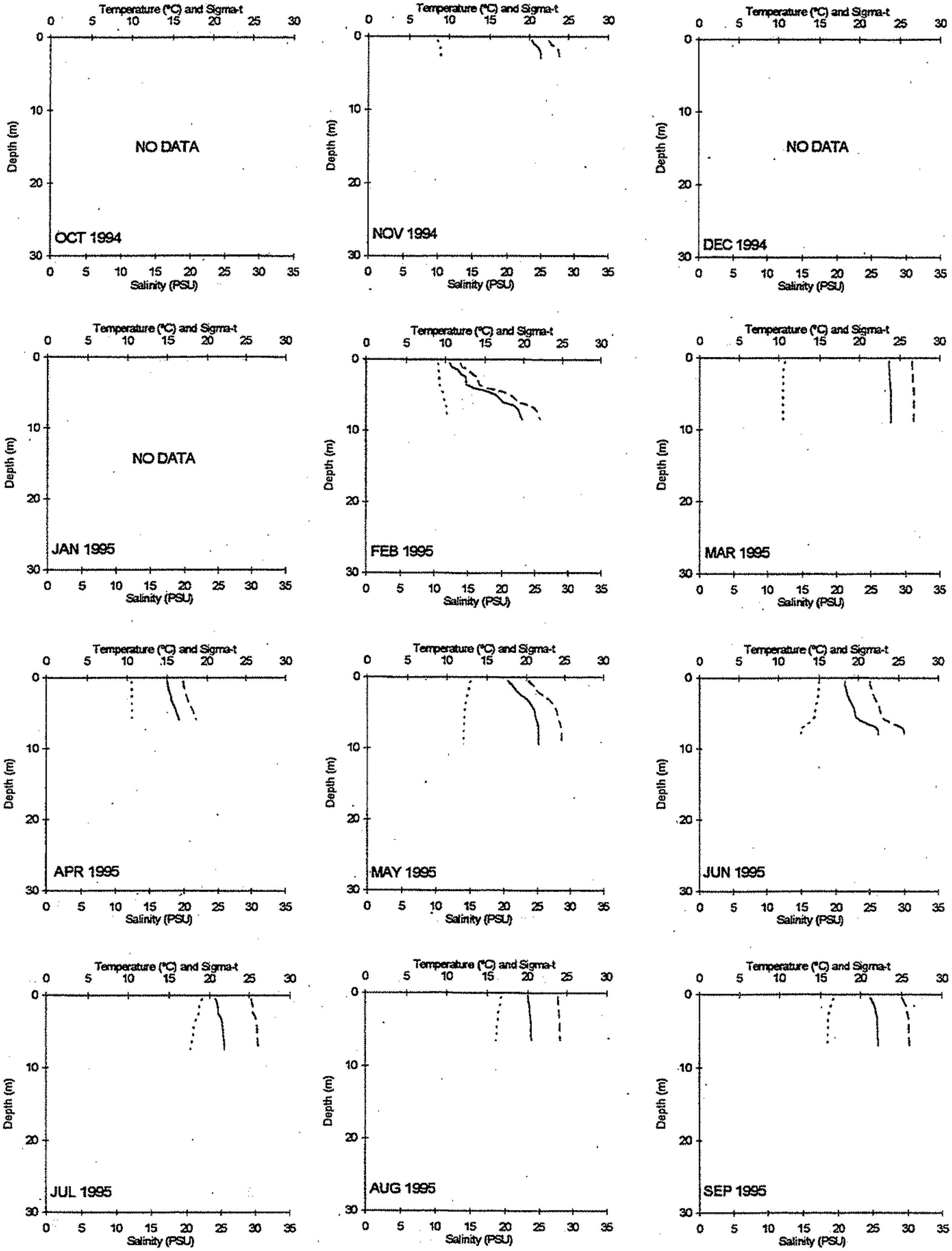
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - N. Whitcomb Flats GYS015



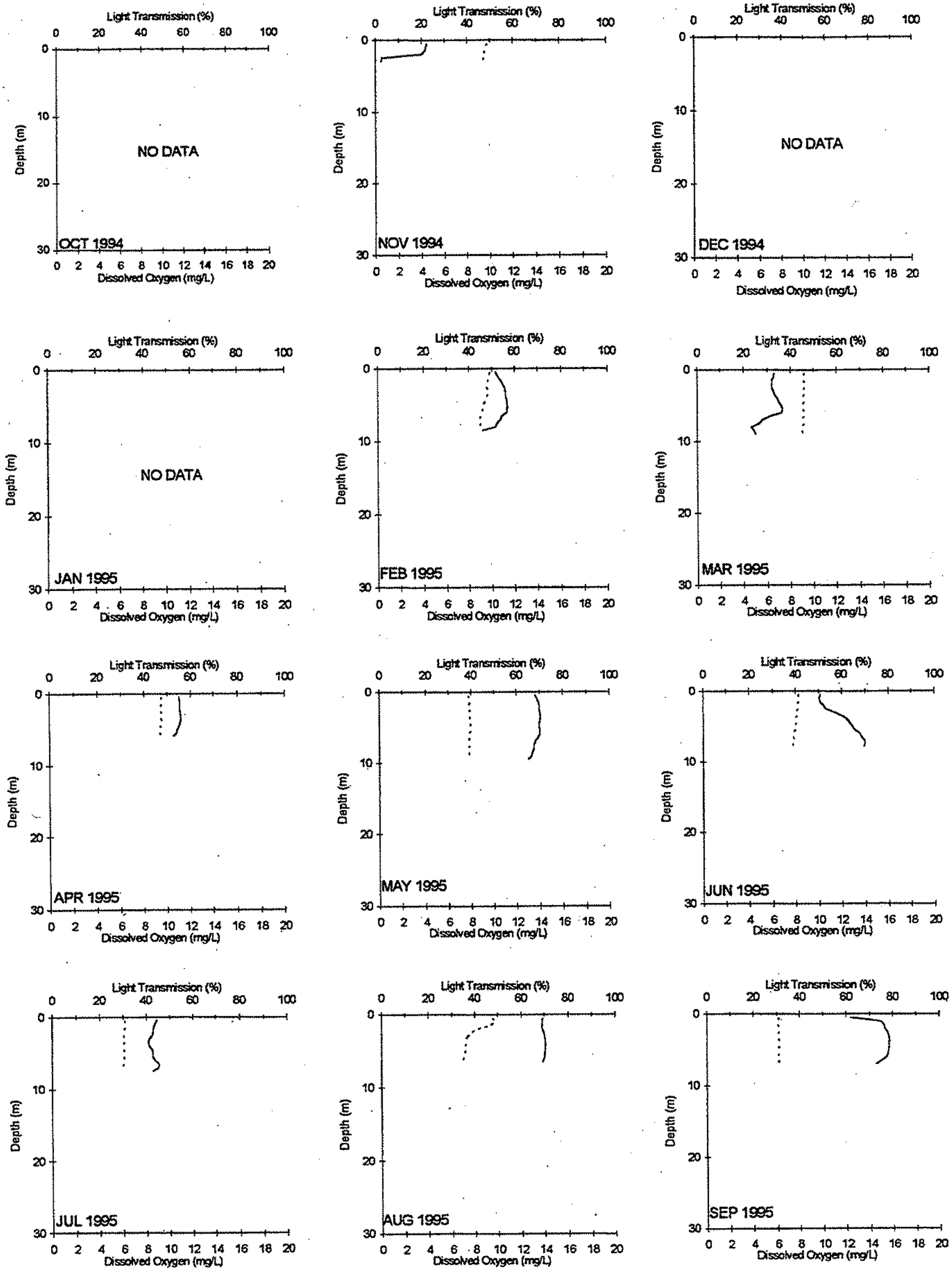
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

GYS016 Grays Harbor - Damon Point



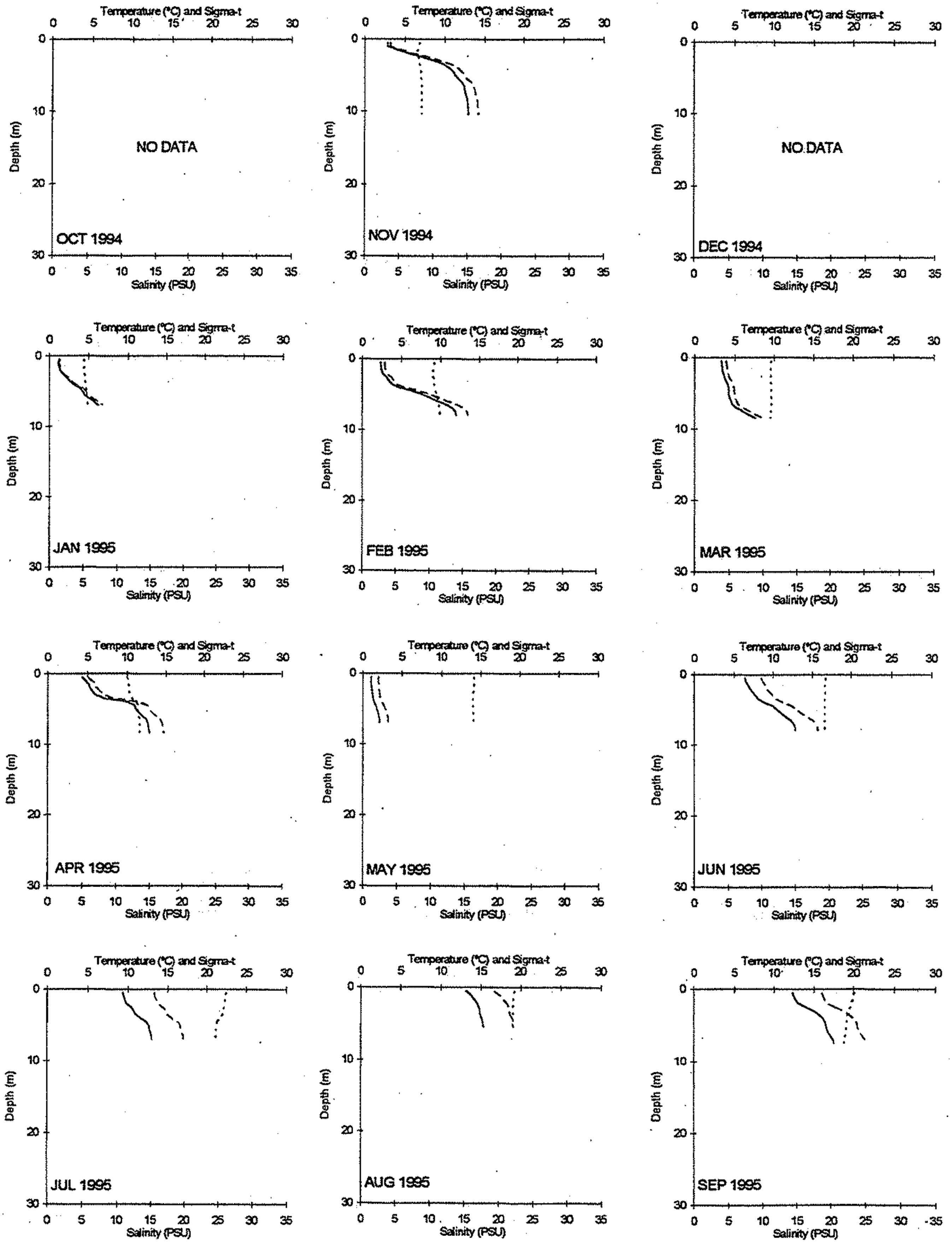
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Grays Harbor - Damon Point GYS016



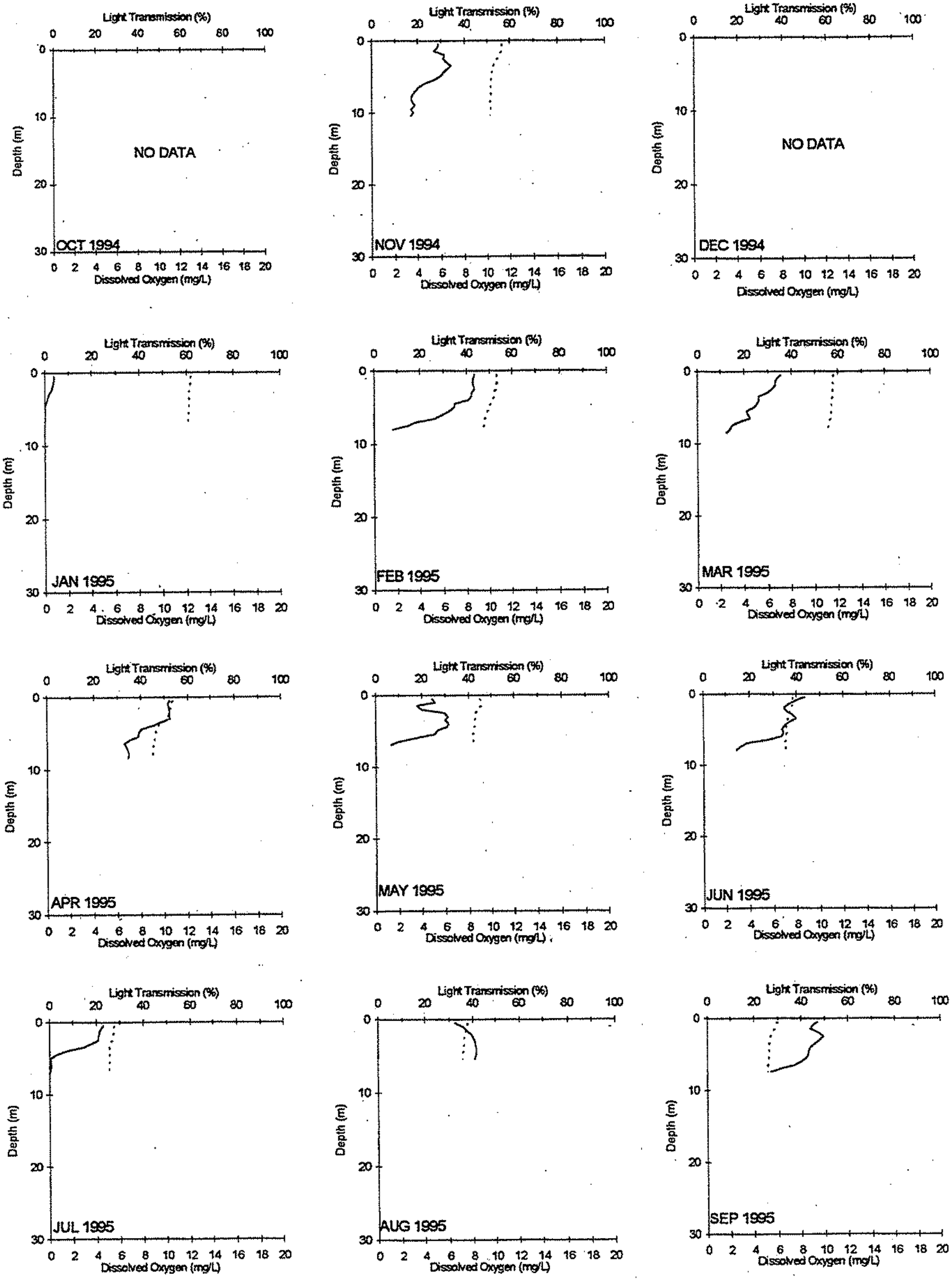
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

WPA001 Willapa Bay - Willapa River, Raymond



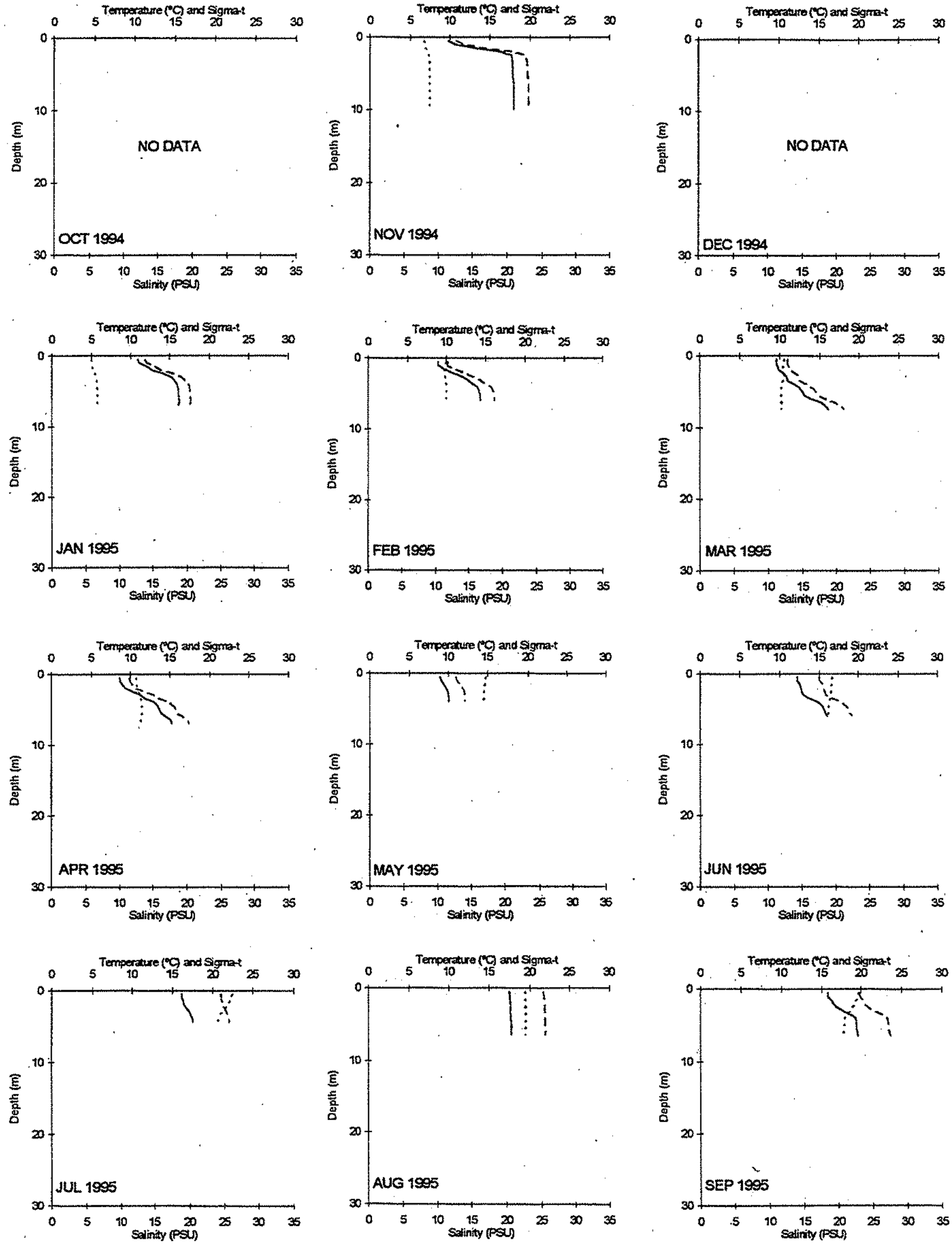
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Willapa River, Raymond WPA001



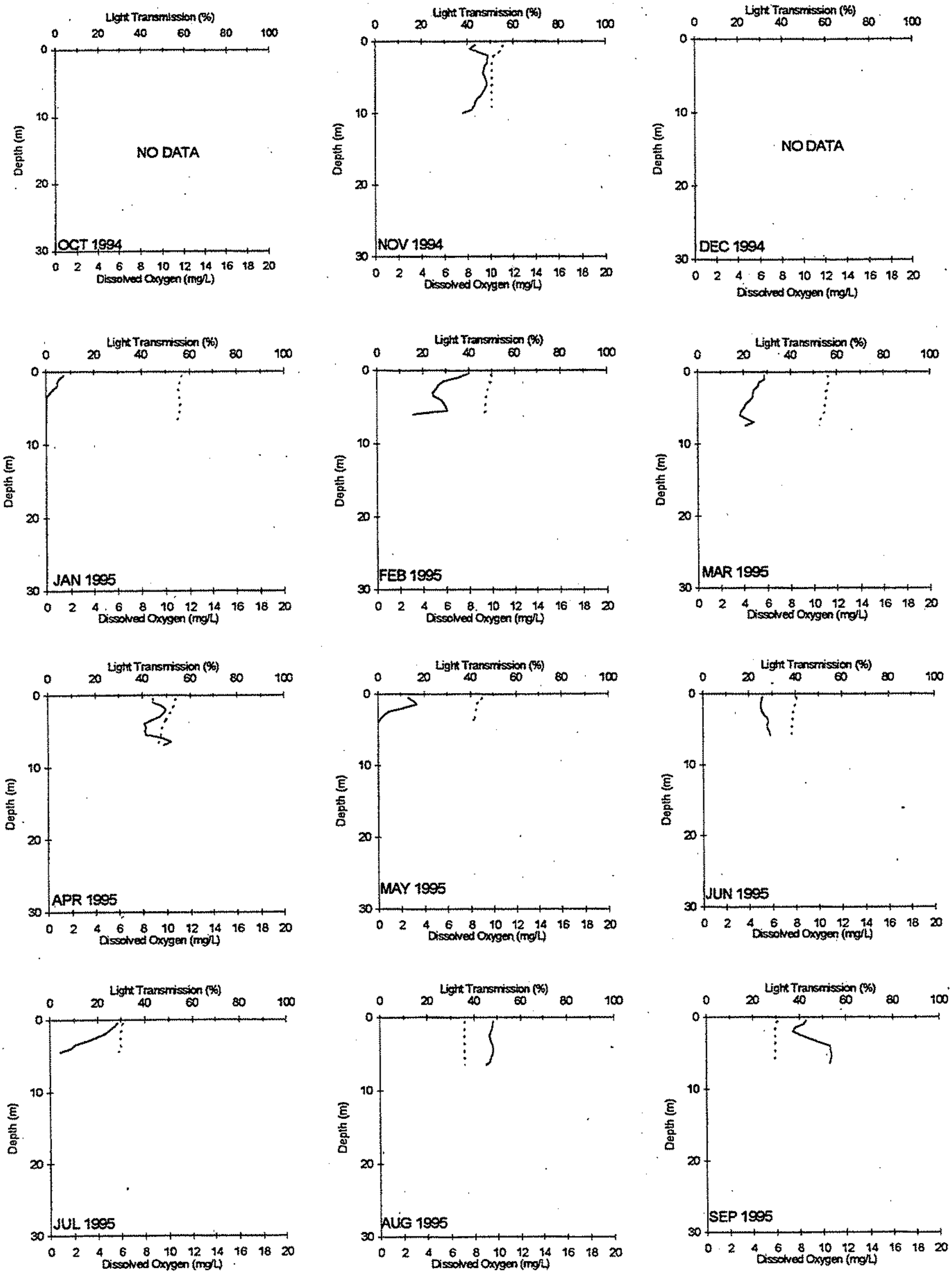
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

WPA003 Willapa Bay - Willapa River, Johnson Slough



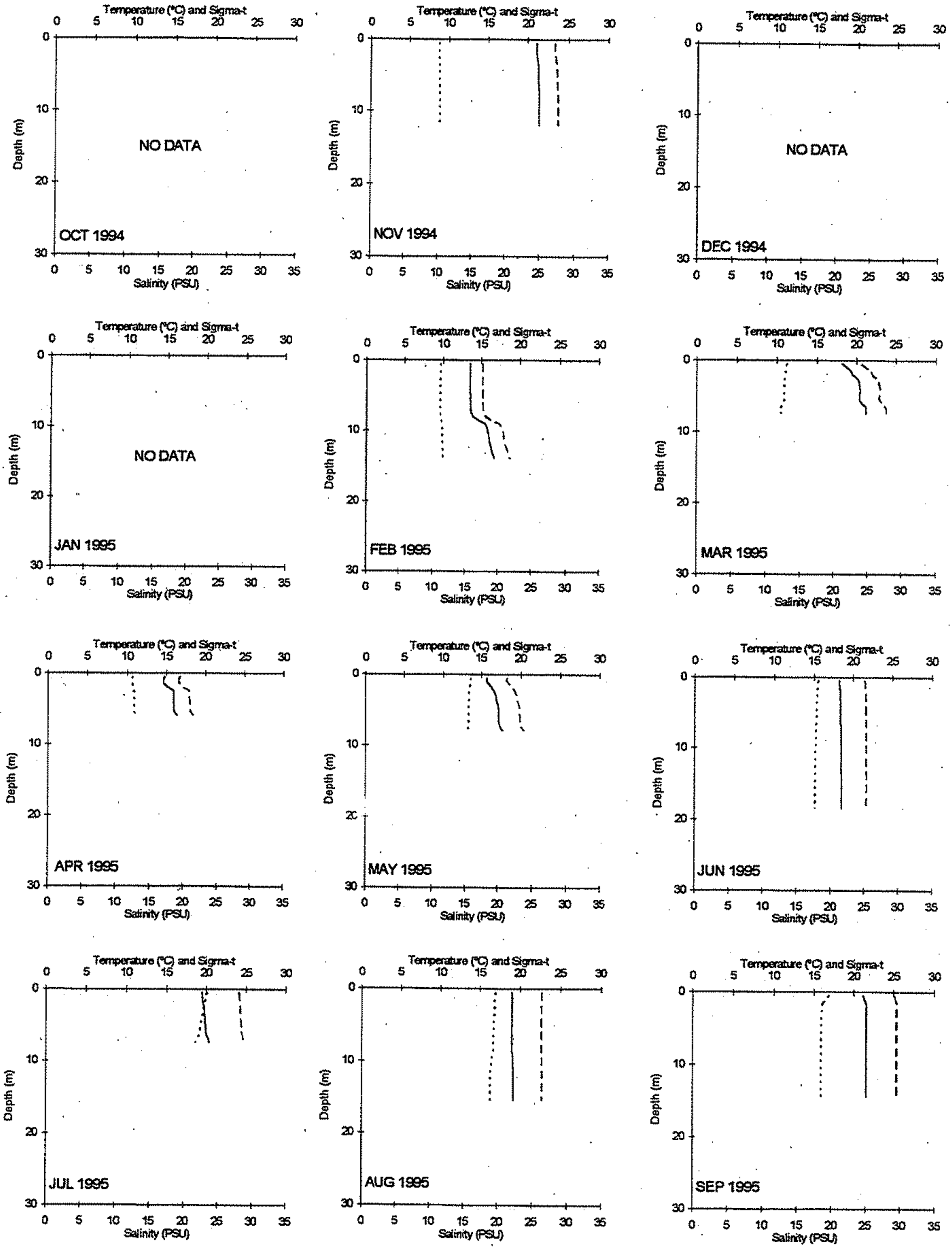
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Willapa River, Johnson Slough WPA003



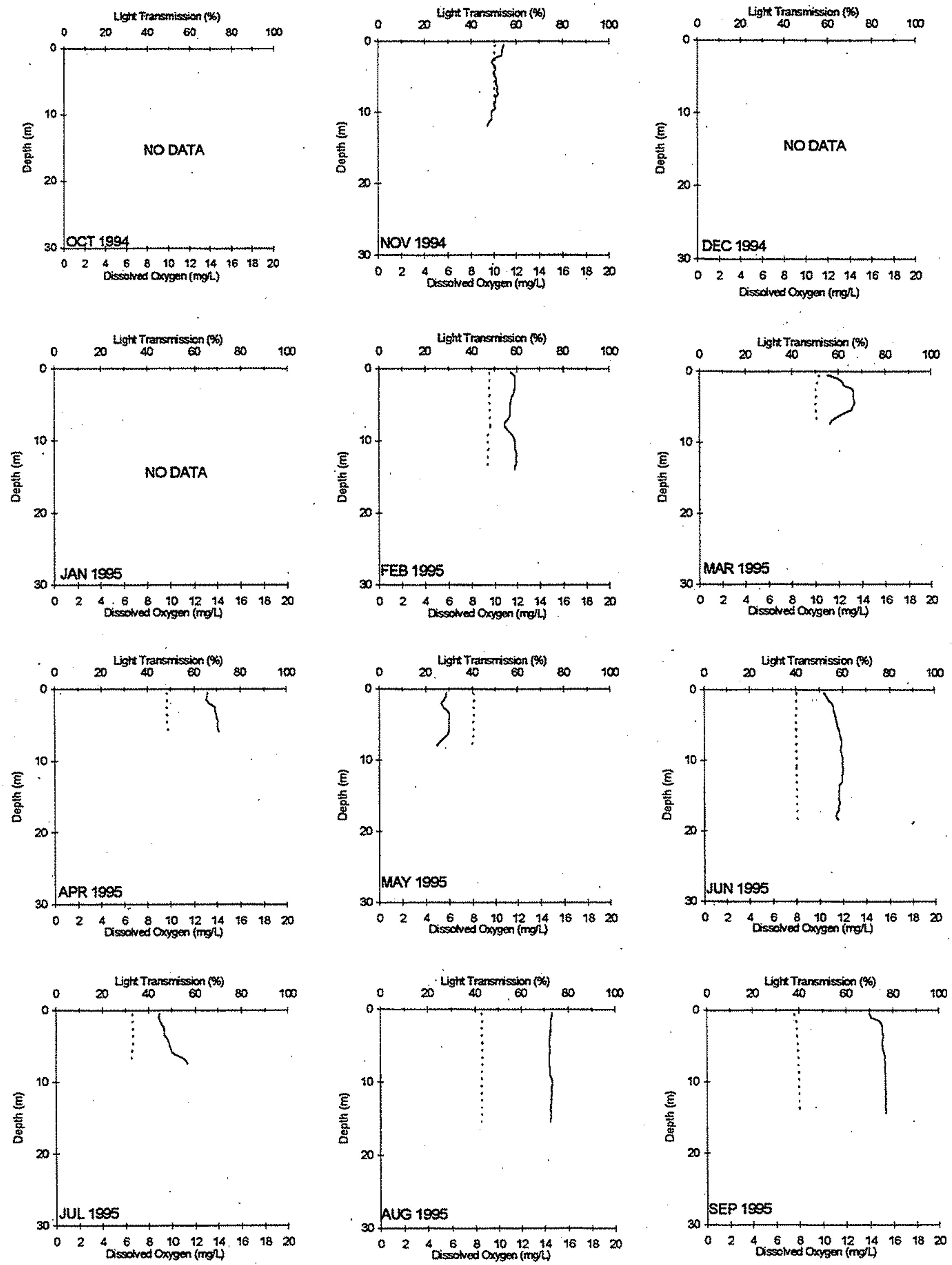
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

WPA004 Willapa Bay - Toke Point



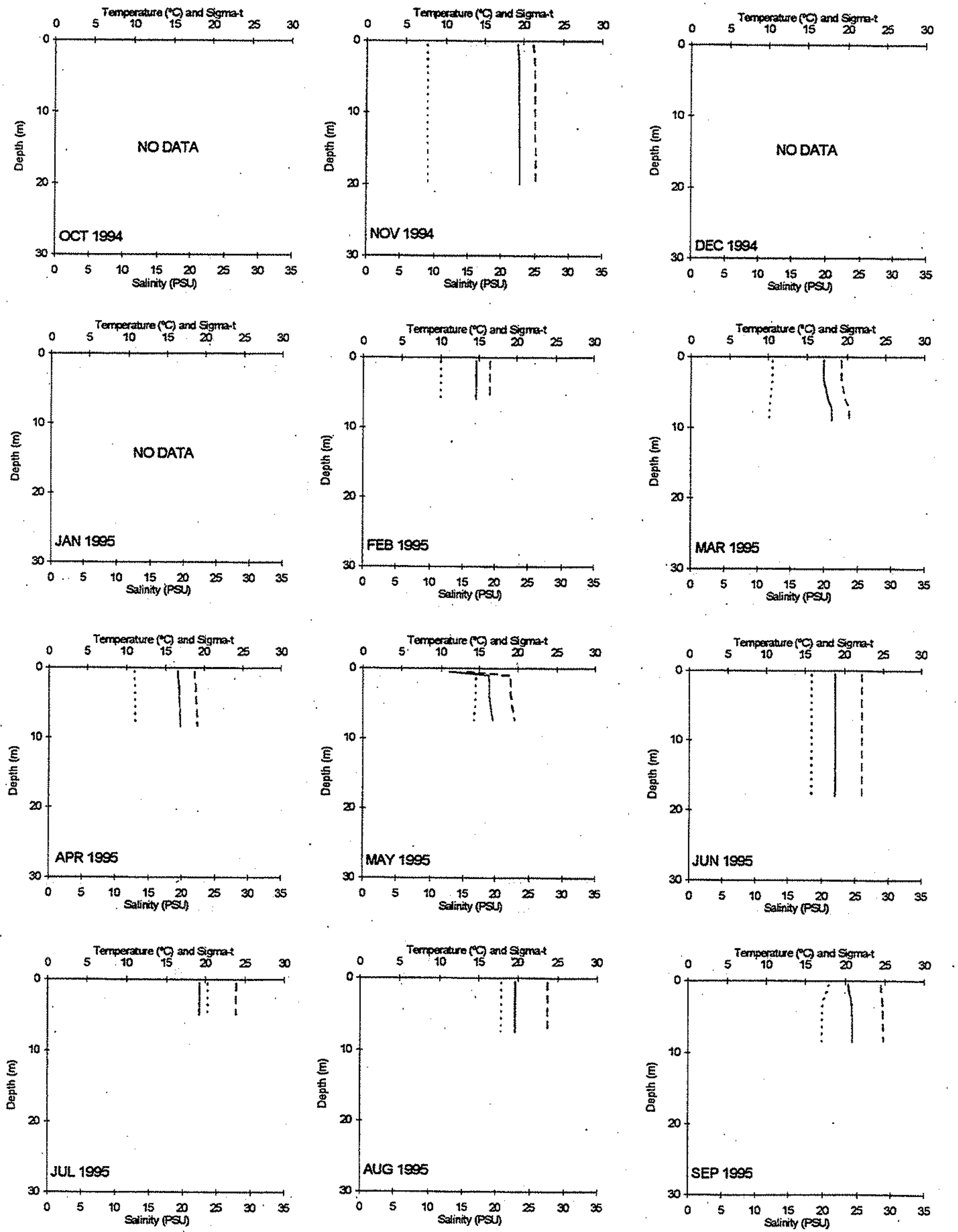
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Toke Point WPA004



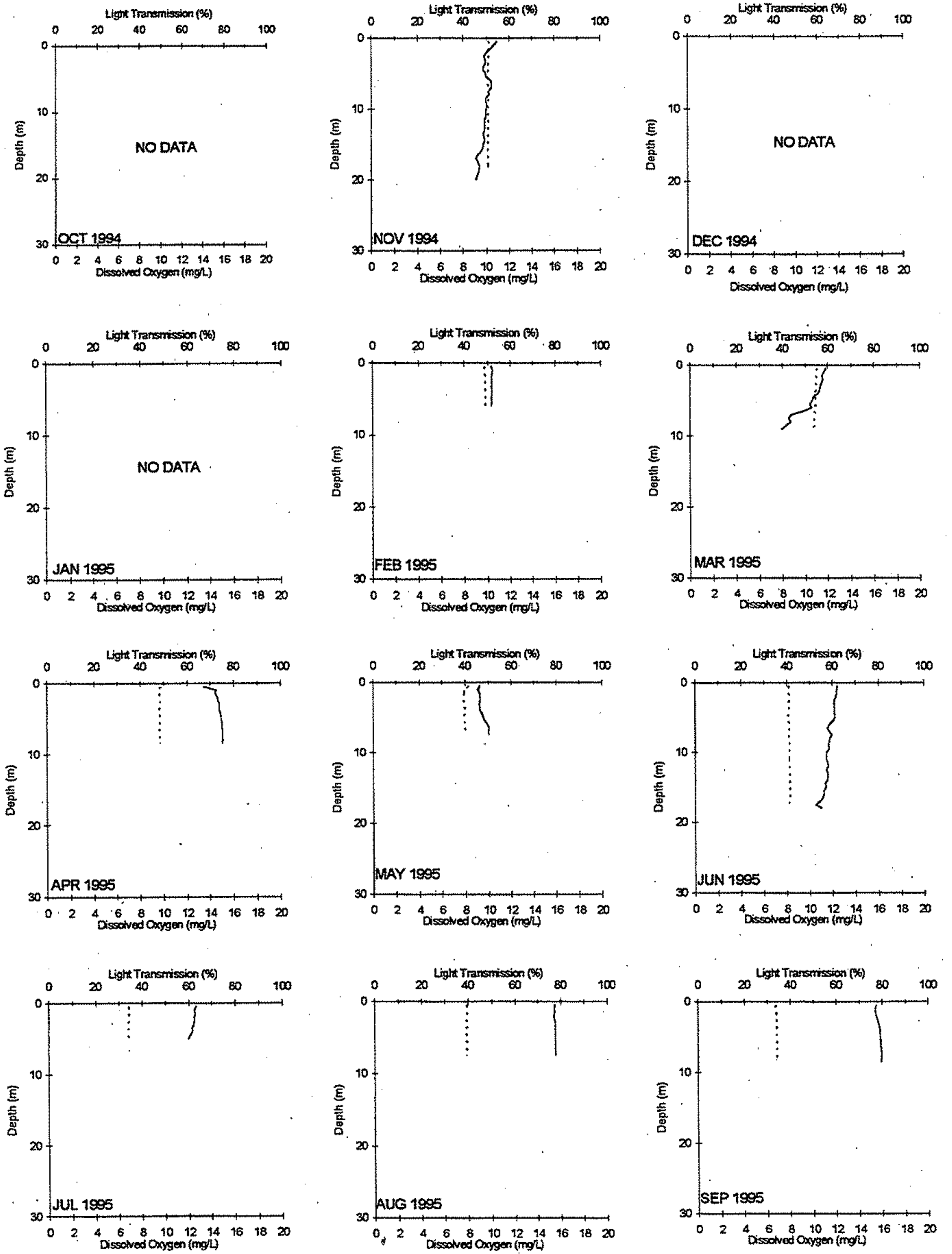
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

WPA006 Willapa Bay - Nahcotta Channel



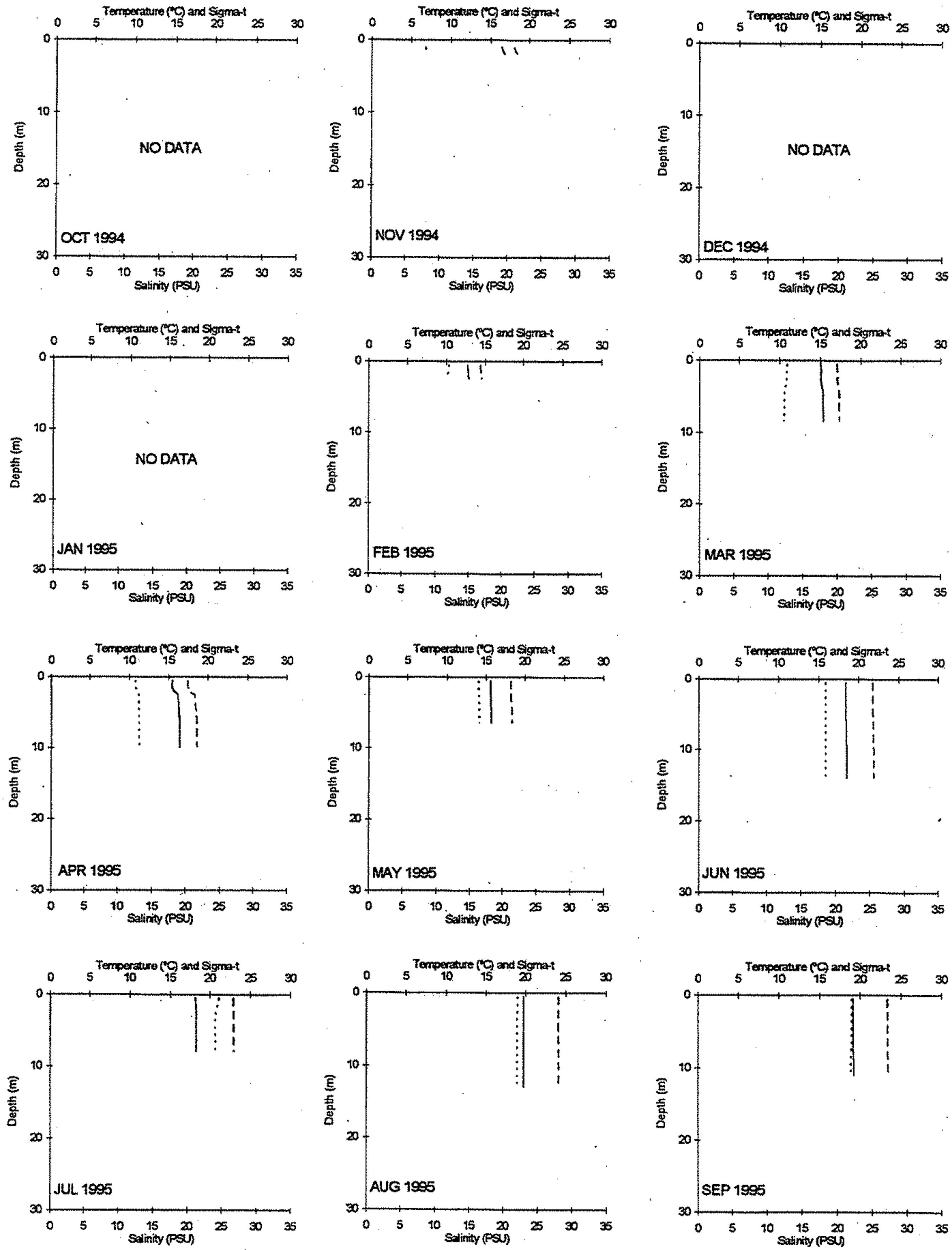
Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Nahcotta Channel WPA006



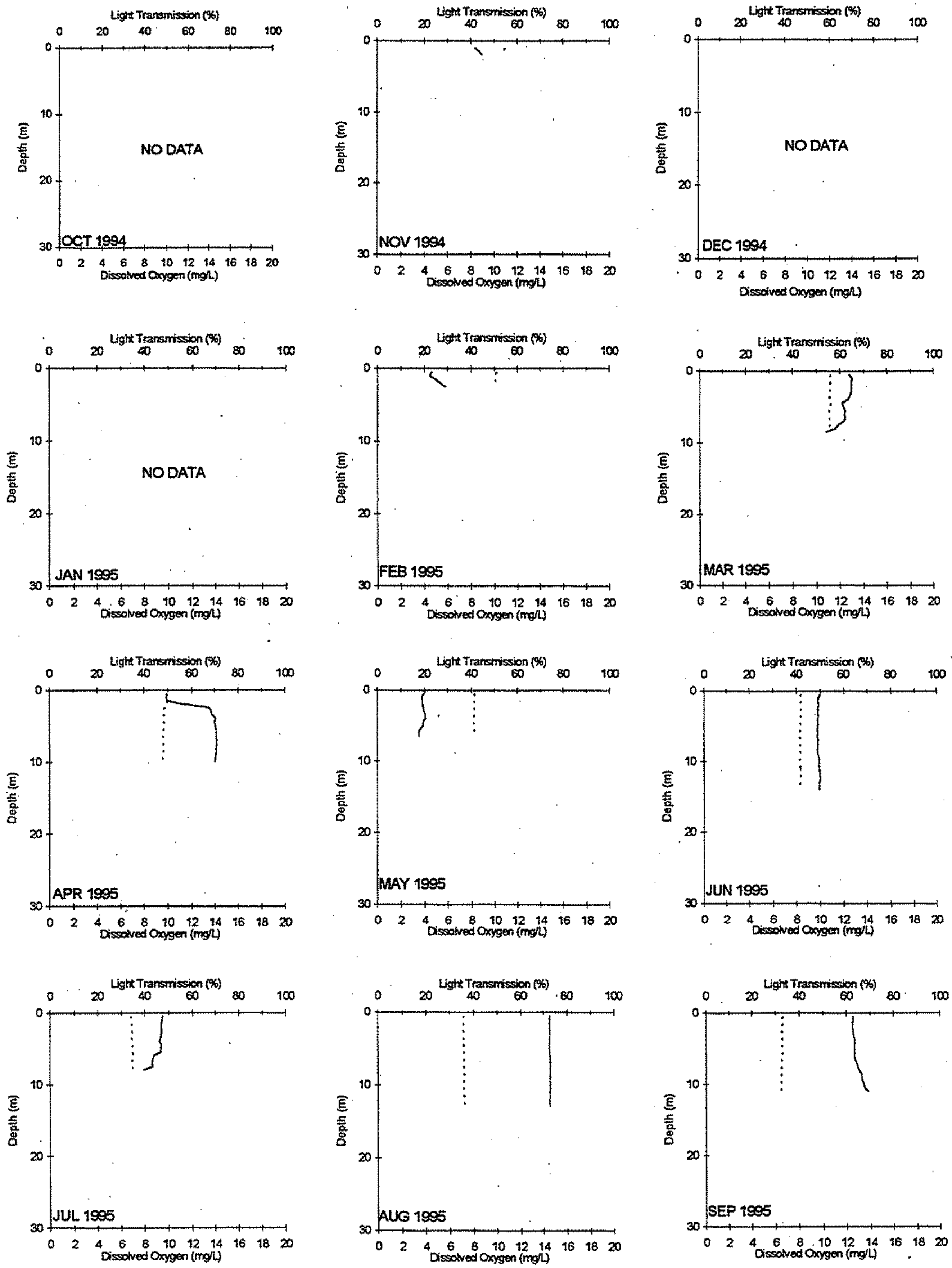
Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

WPA007 Willapa Bay - Long Island, S. of Jensen Point



Legend: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

Willapa Bay - Long Island, S. of Jensen Point WPA007



Legend: Light Transmission = Solid Line Dissolved Oxygen = Dotted Line

Appendix C

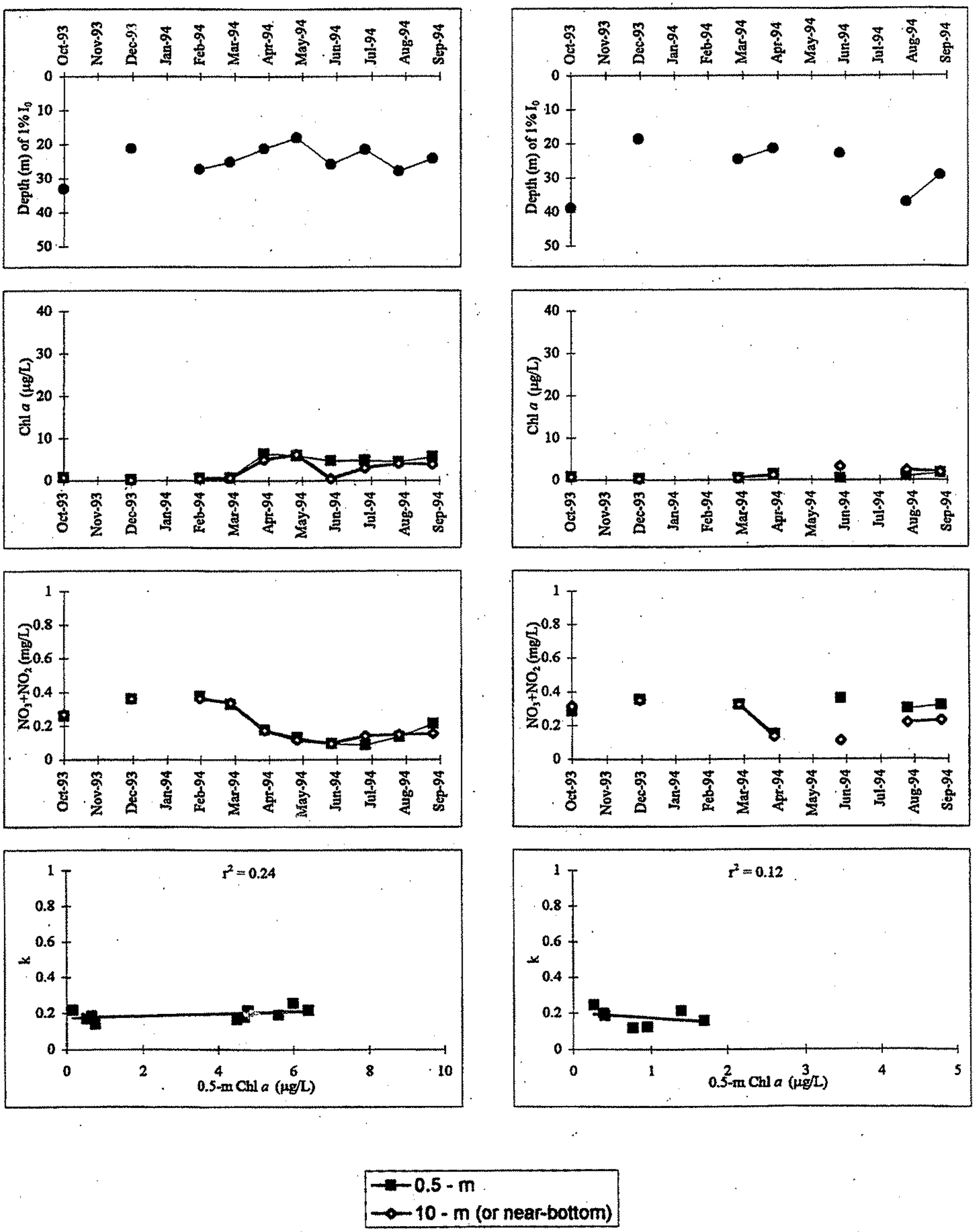
Seasonal plots of euphotic zone depth, chlorophyll *a*, nitrate+nitrite-N, and regressions of light extinction coefficient versus surface chlorophyll *a* concentration for WY 1994-95 data at:

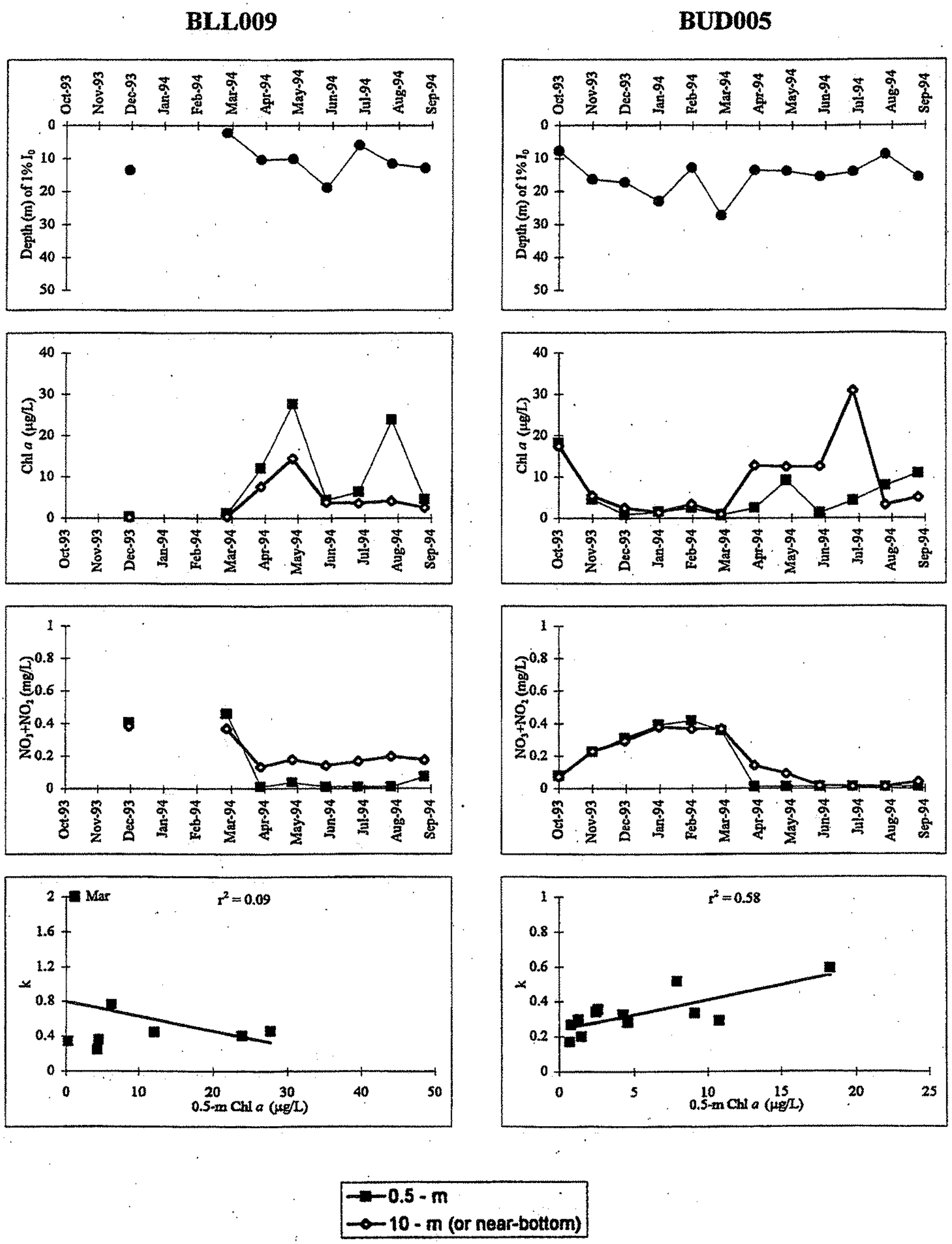
1) Puget Sound stations

2) Grays Harbor and Willapa Bay stations

Puget Sound stations

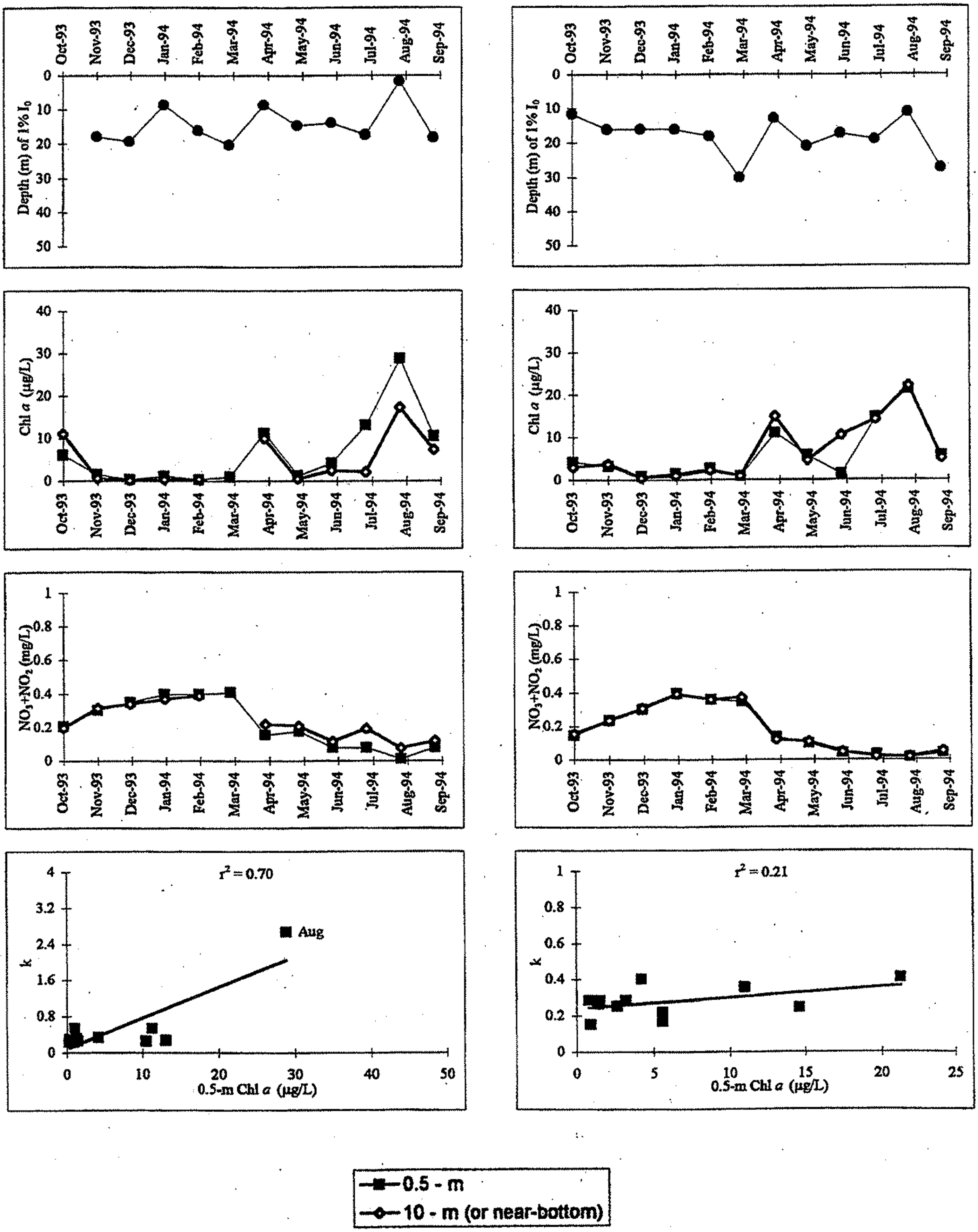
ADM001 **ADM002**



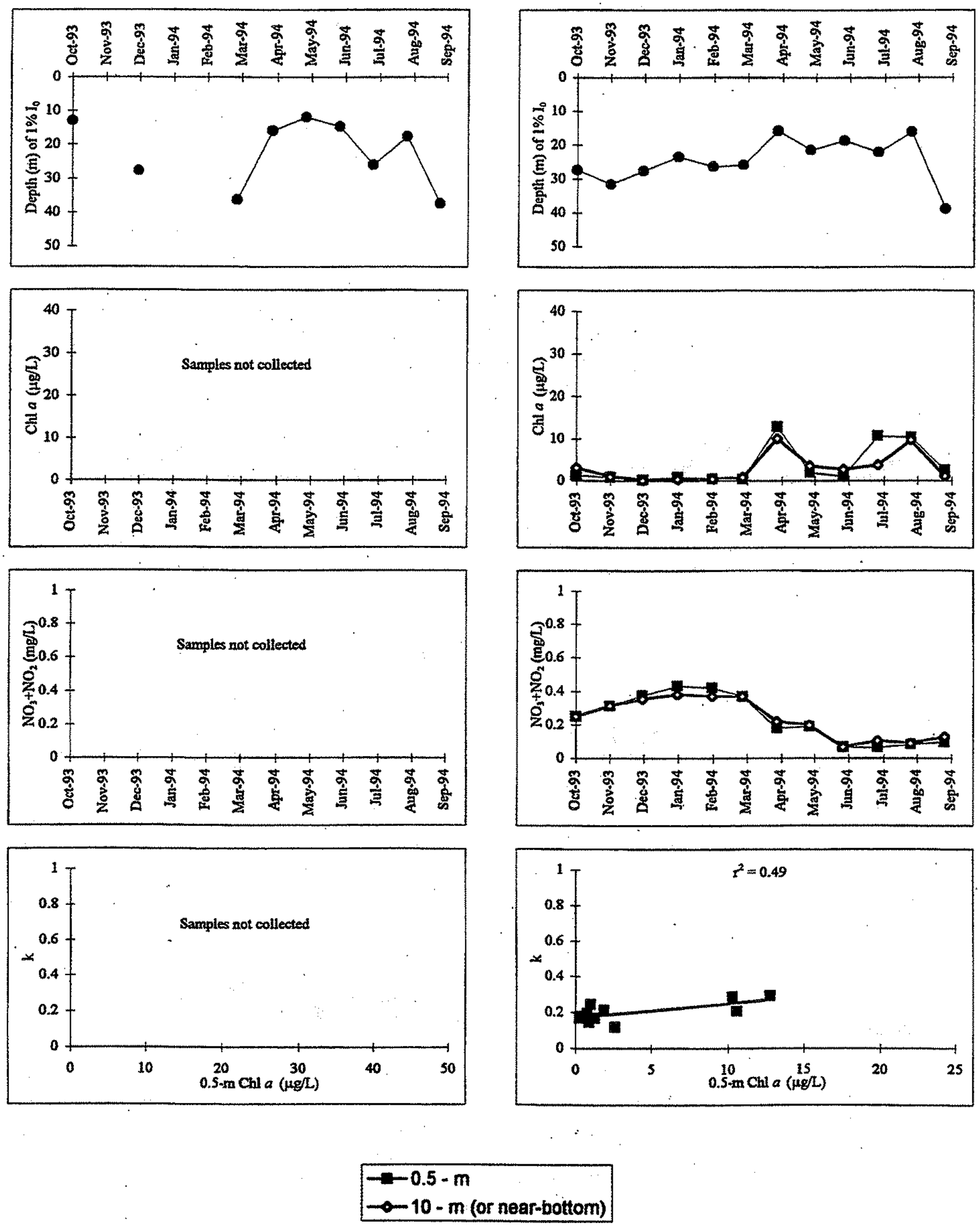


BLL009
BUD005
Oct-93
Nov-93
Dec-93
Jan-94
Feb-94
Mar-94
Apr-94
May-94
Jun-94
Jul-94
Aug-94
Sep-94
Depth (m) of 1% I_0
Chl a (µg/L)
NO_3+NO_2 (mg/L)
k
Mar
$r^2 = 0.09$
$r^2 = 0.58$
0.5-m Chl a (µg/L)
0.5 - m
10 - m (or near-bottom)

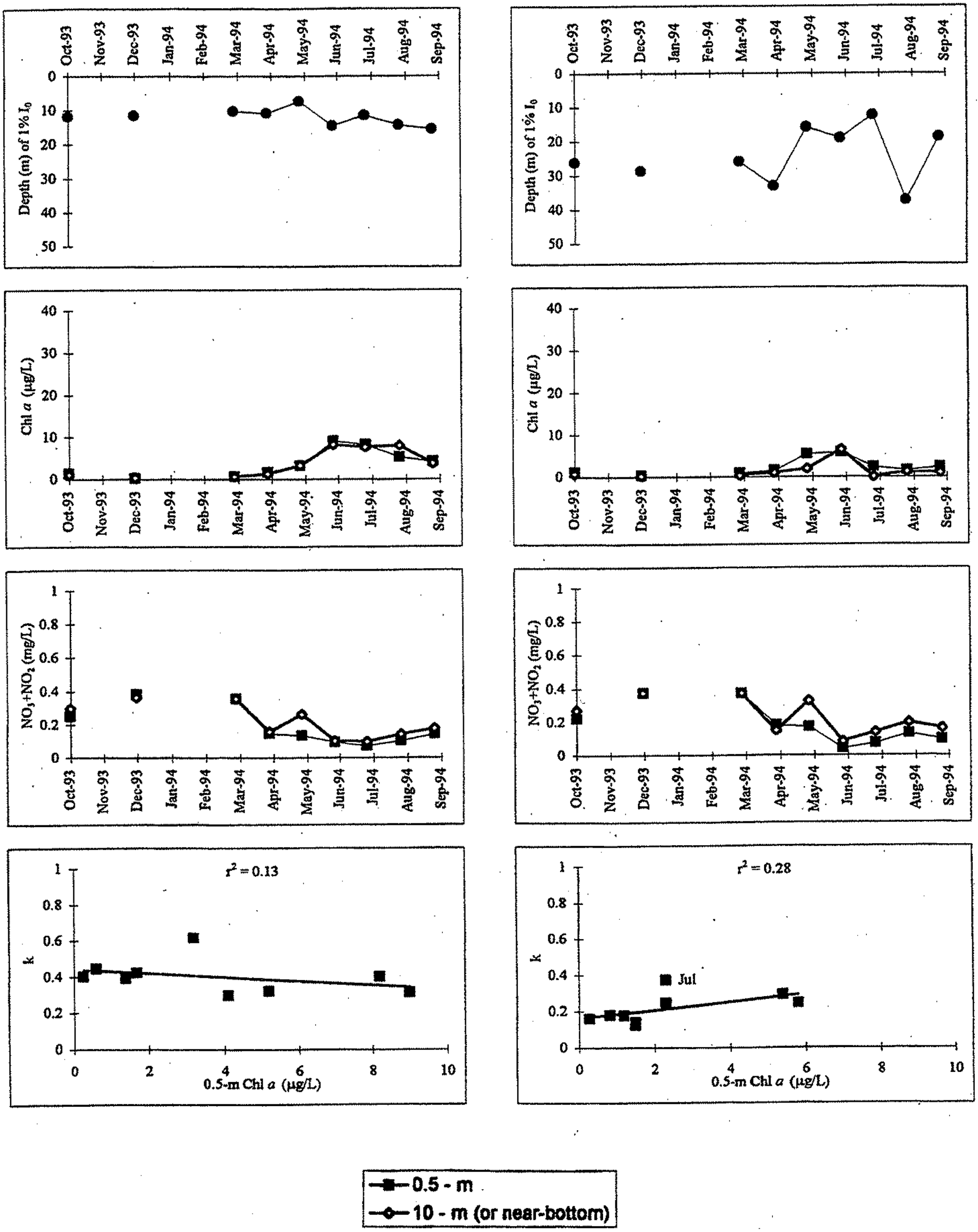
CMB003 **DNA001**



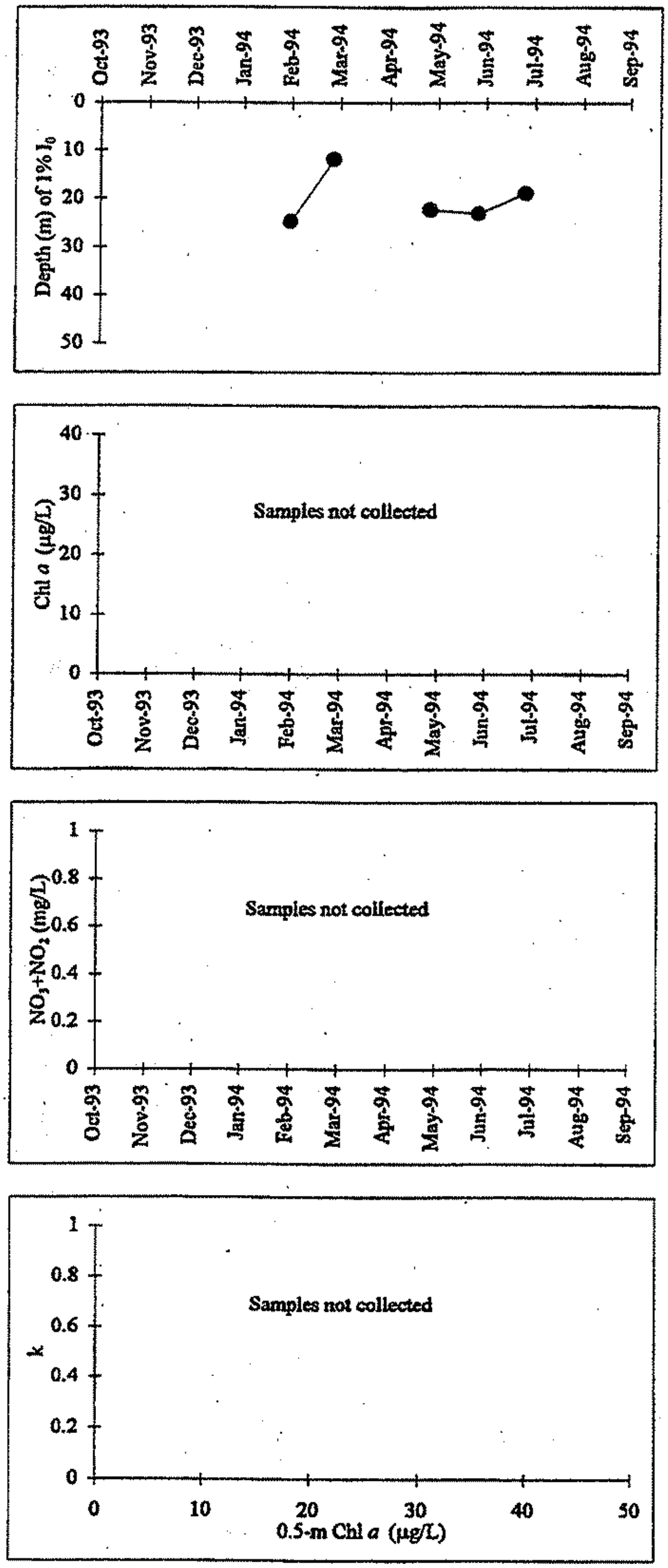
EAS001 **ELB015**



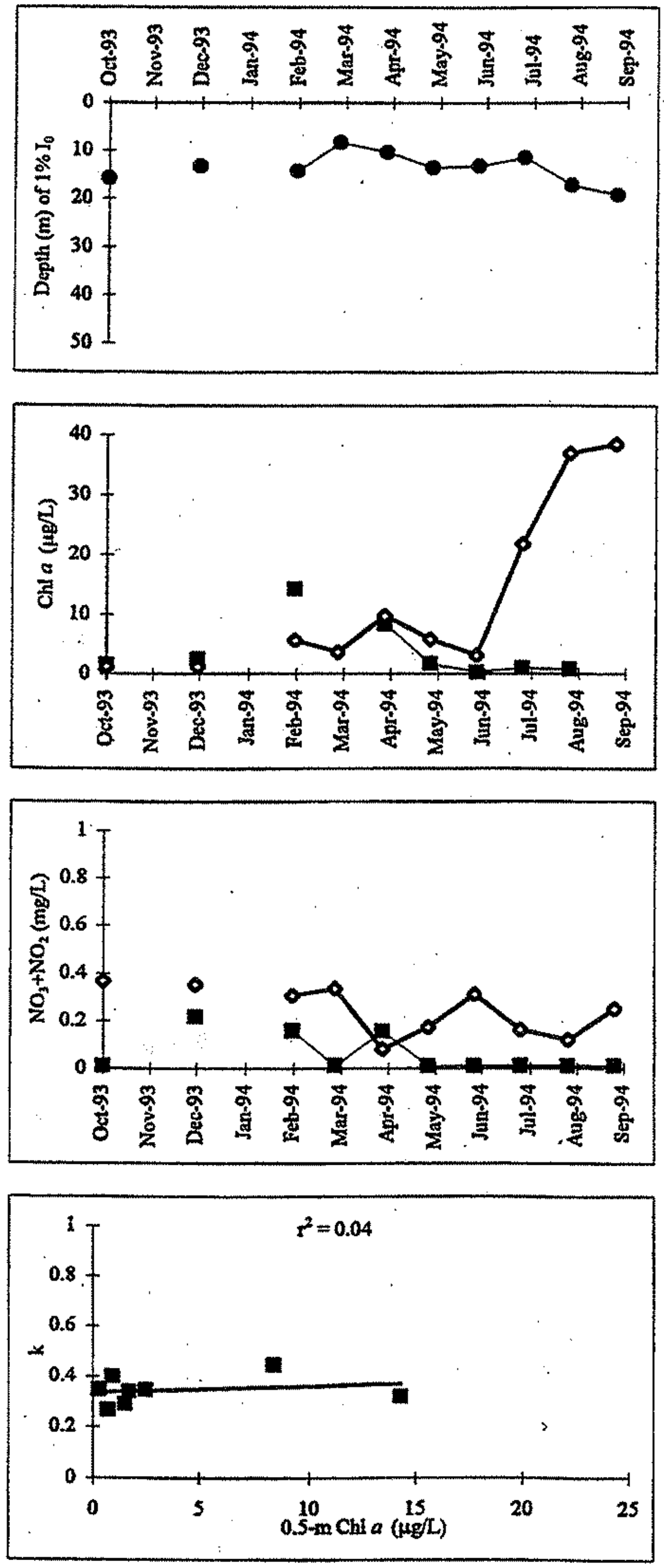
FID001 **GRG002**

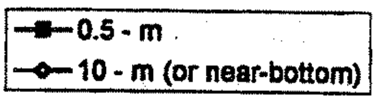


HCB003

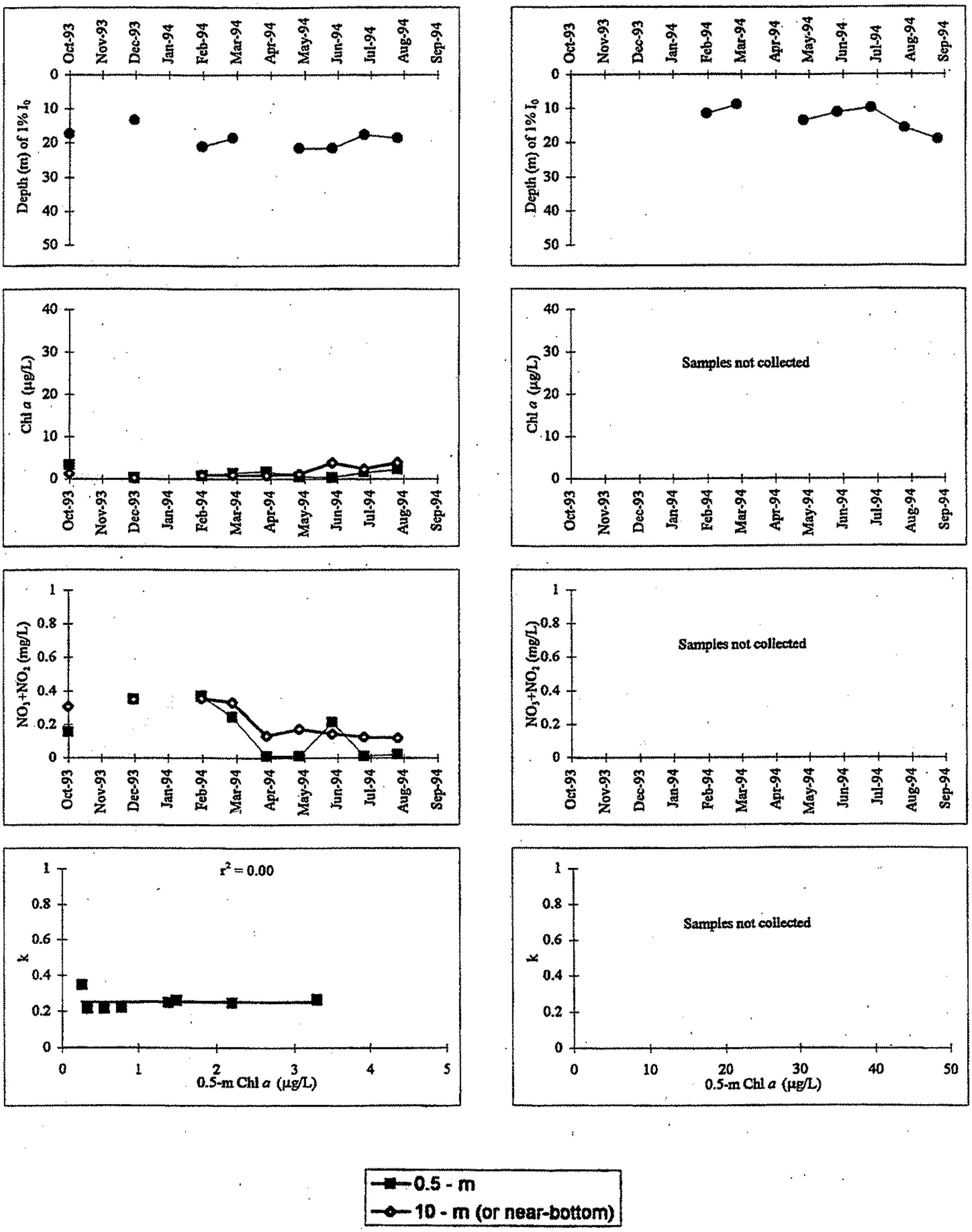


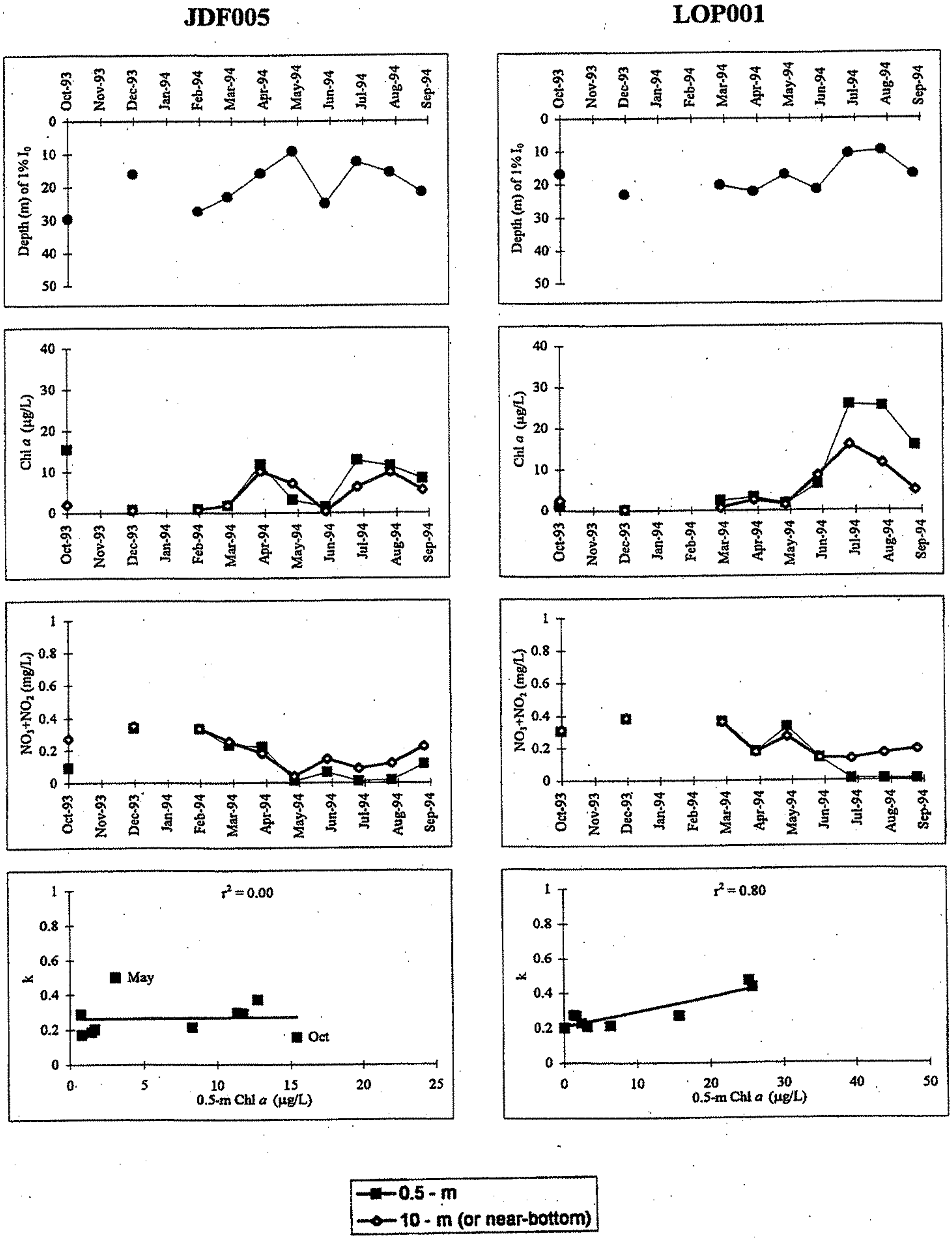
HCB004





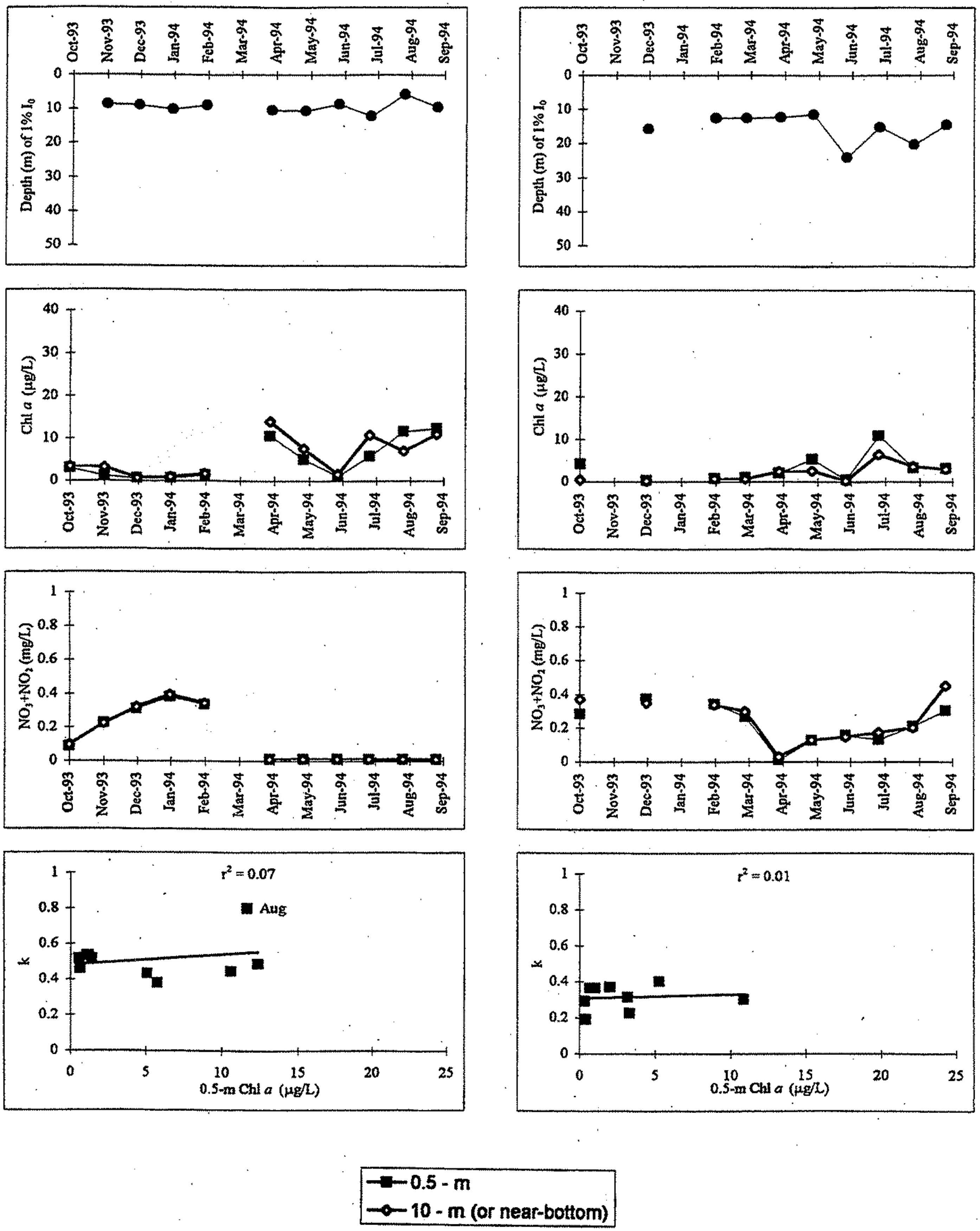
HCB006 HCB007



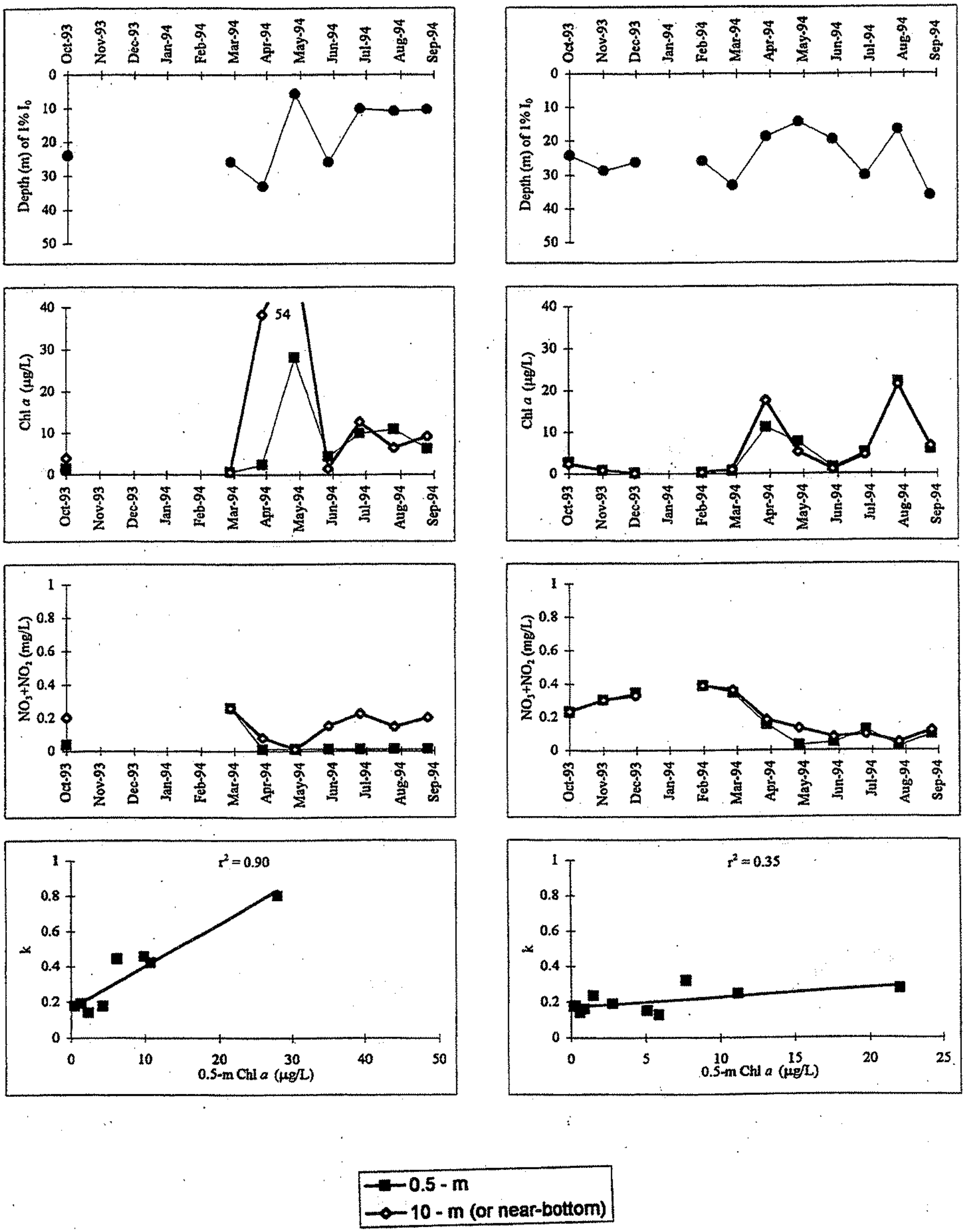


JDF005
LOP001
Depth (m) of 1% I0
Chl a (µg/L)
NO3+NO2 (mg/L)
k
Oct-93
Nov-93
Dec-93
Jan-94
Feb-94
Mar-94
Apr-94
May-94
Jun-94
Jul-94
Aug-94
Sep-94
r2 = 0.00
r2 = 0.80
May
Oct
0.5-m Chl a (µg/L)
0.5 - m
10 - m (or near-bottom)

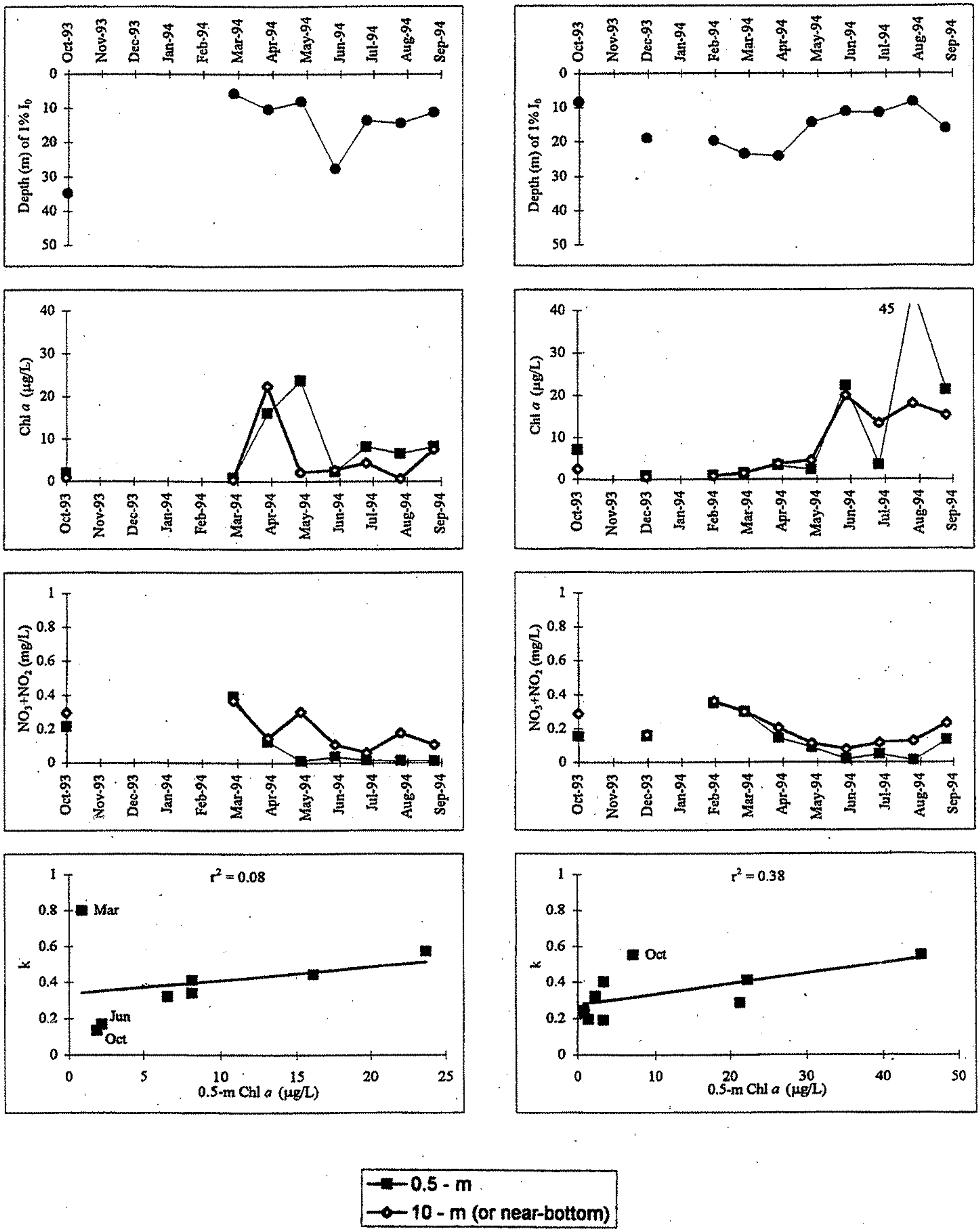
OAK004 **PAH008**



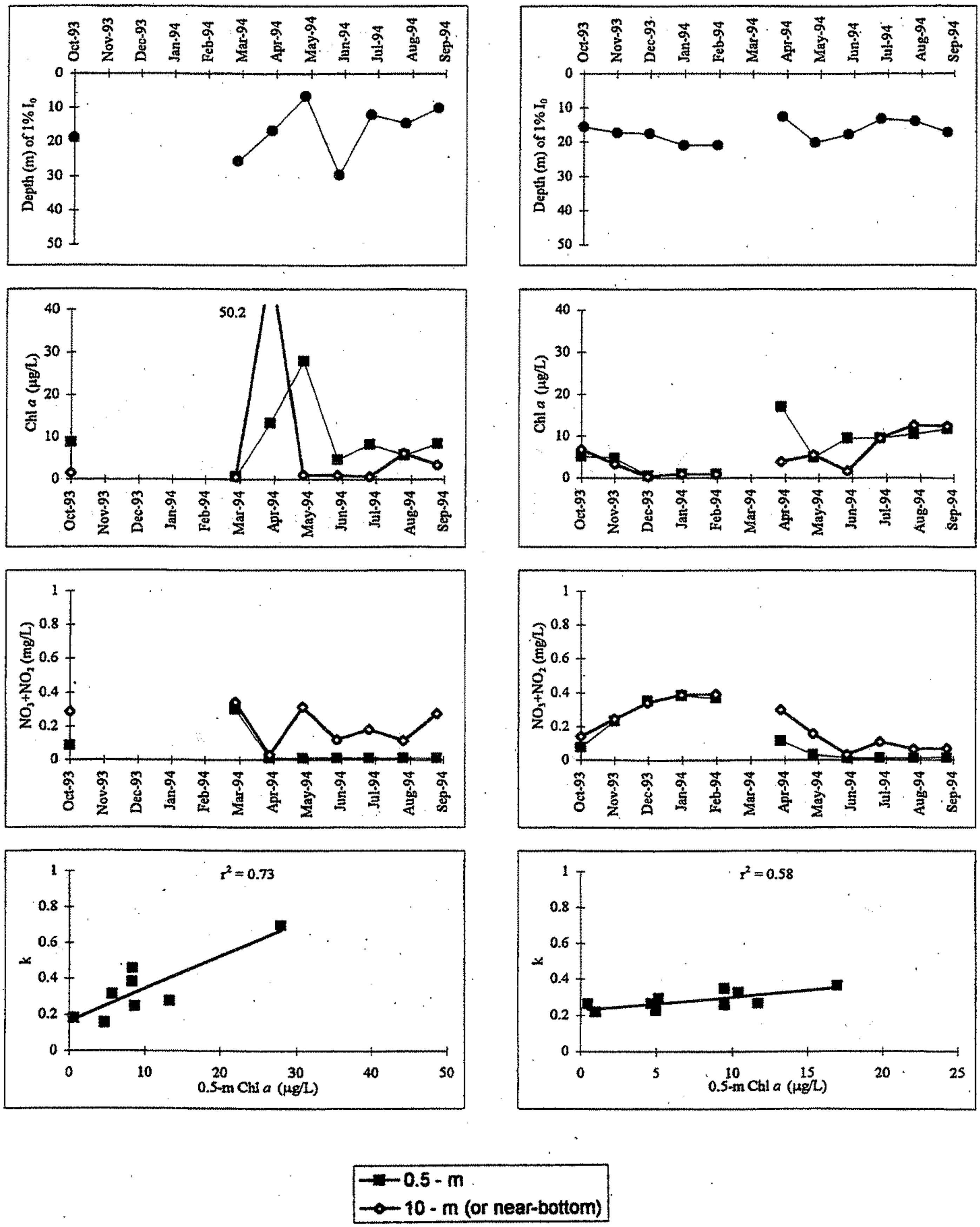
PNN001 **PSB003**



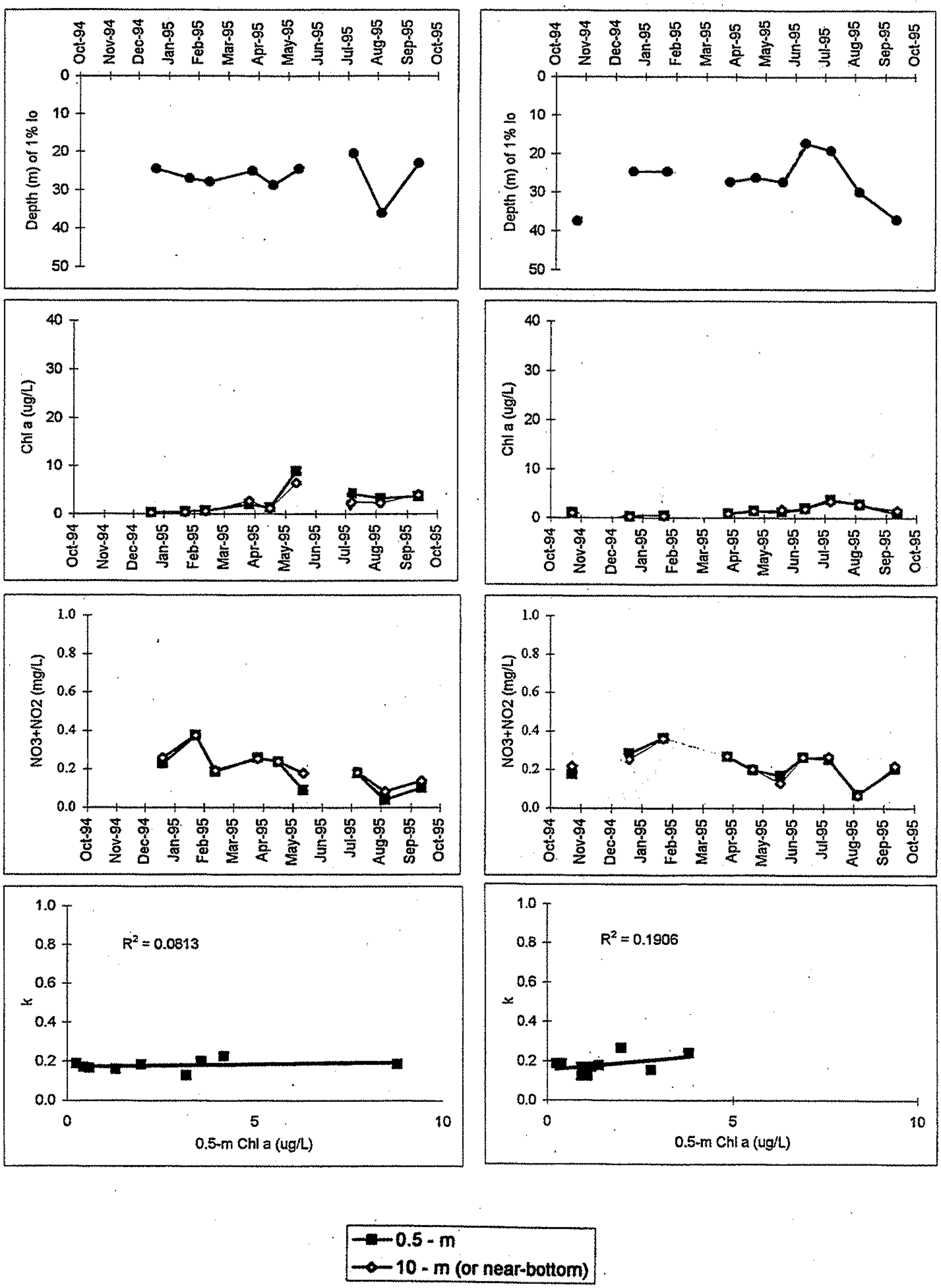
PSS019 **PTH005**



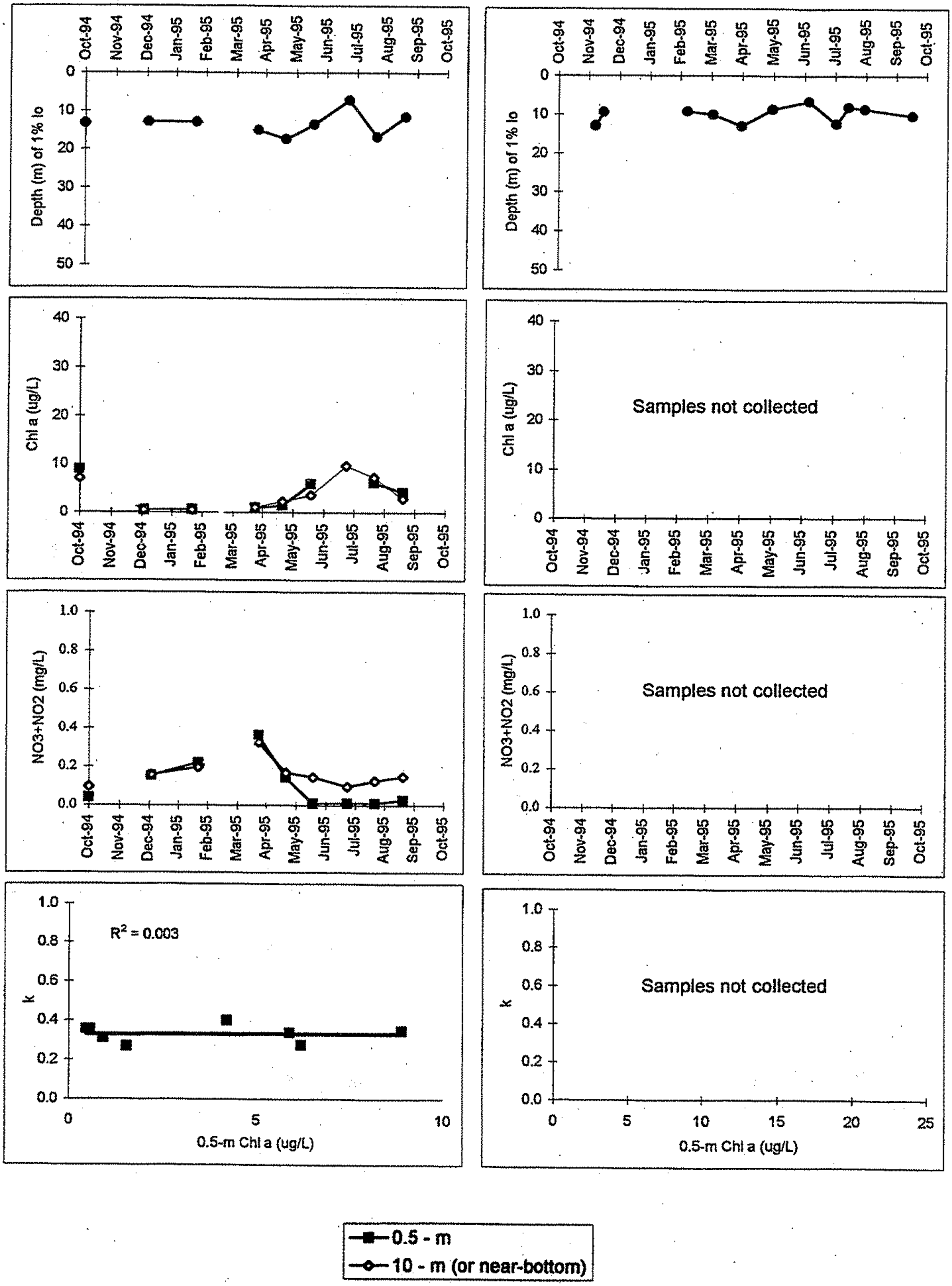
SAR003 **SIN001**



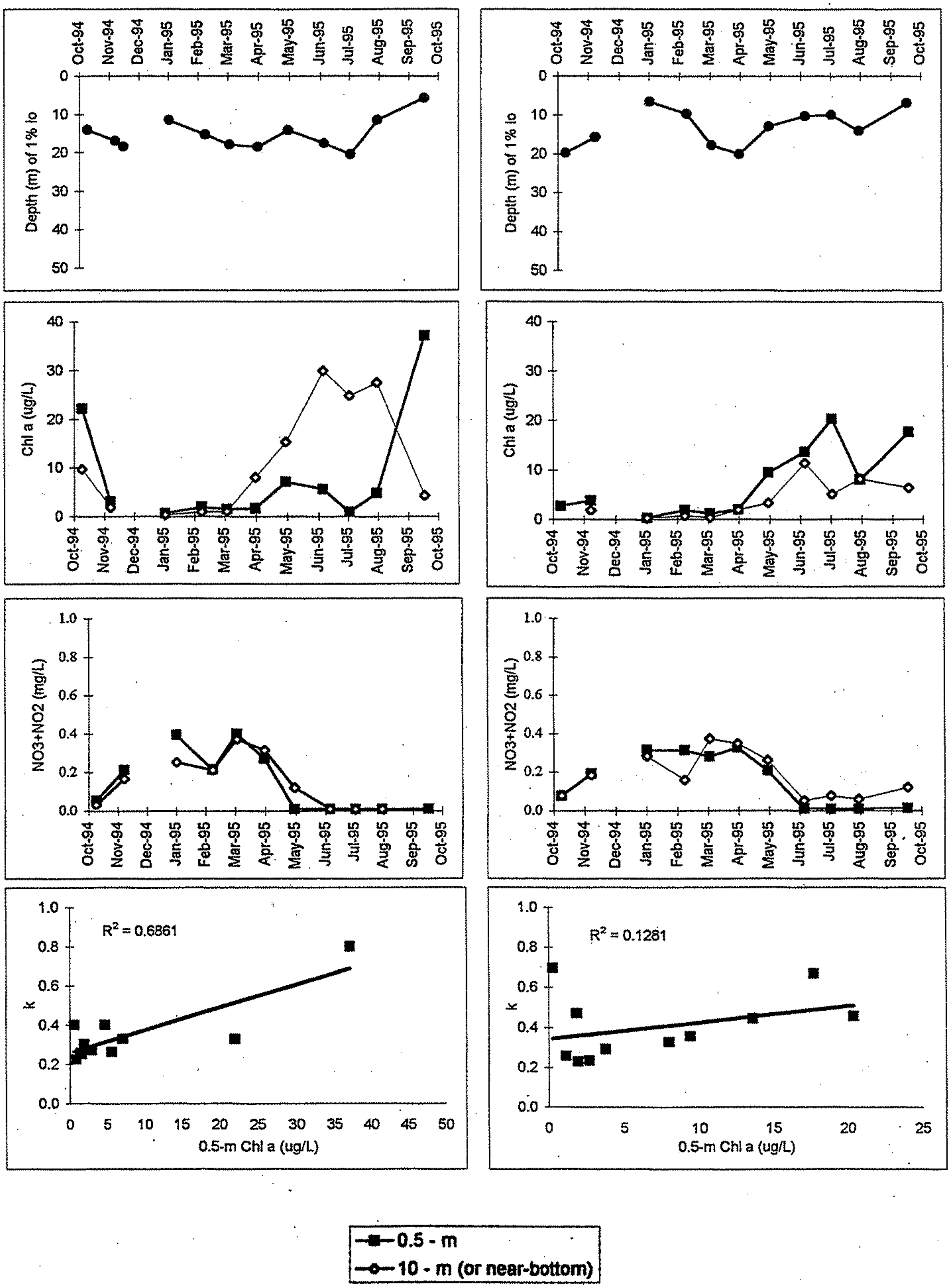
ADM001 ADM002



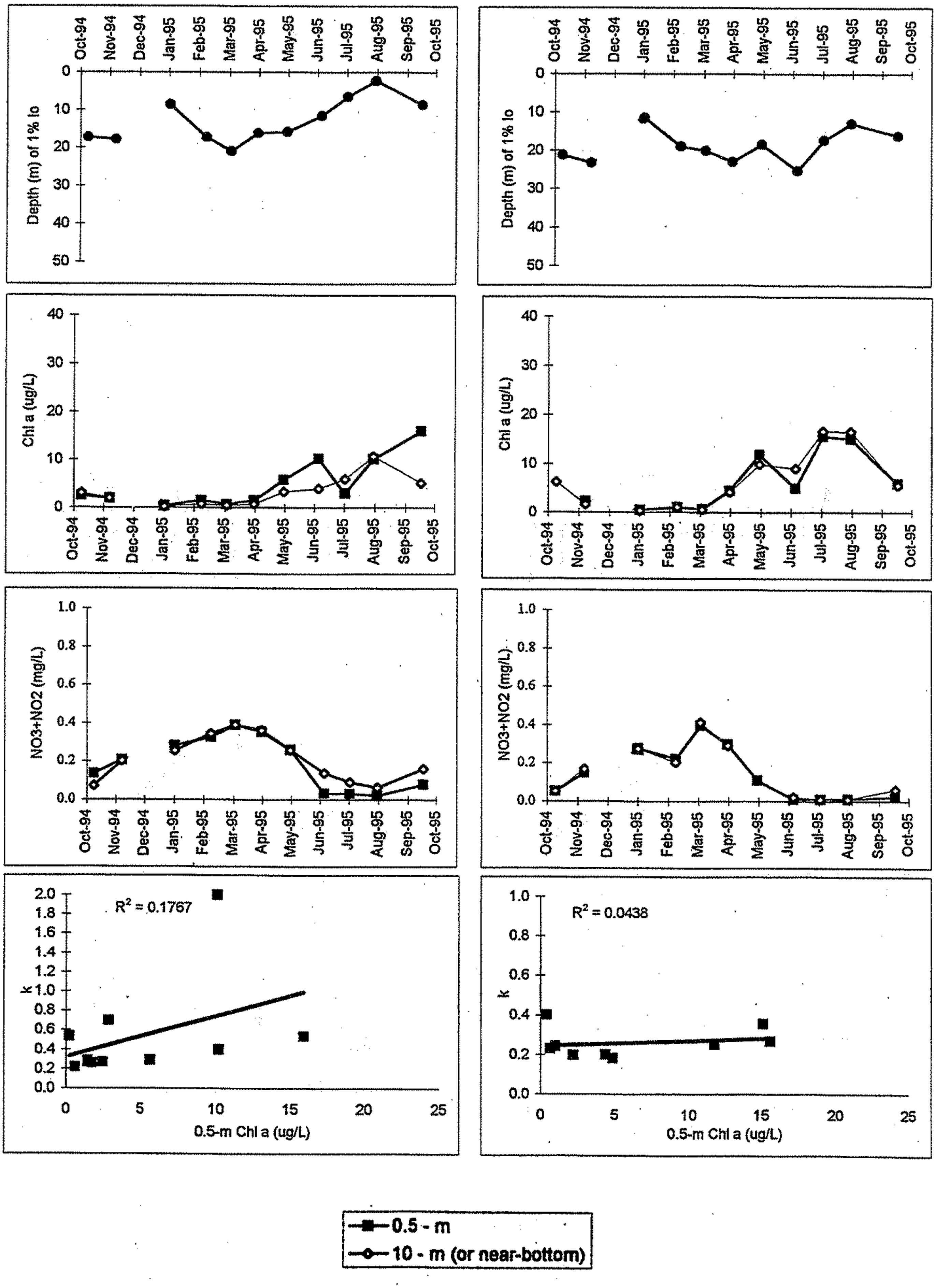
BLL009 **BUD002**

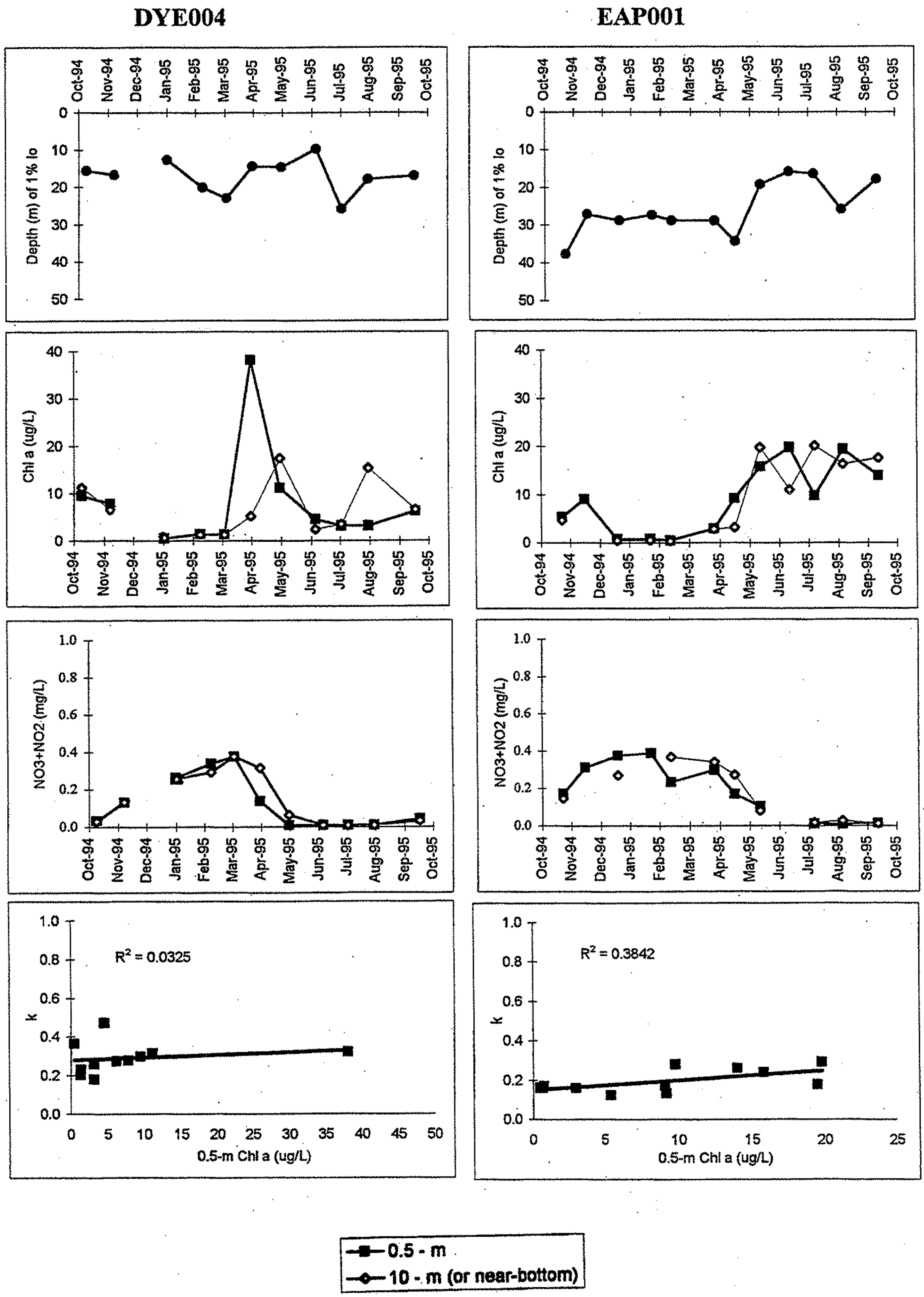


BUD005 **CMB003**



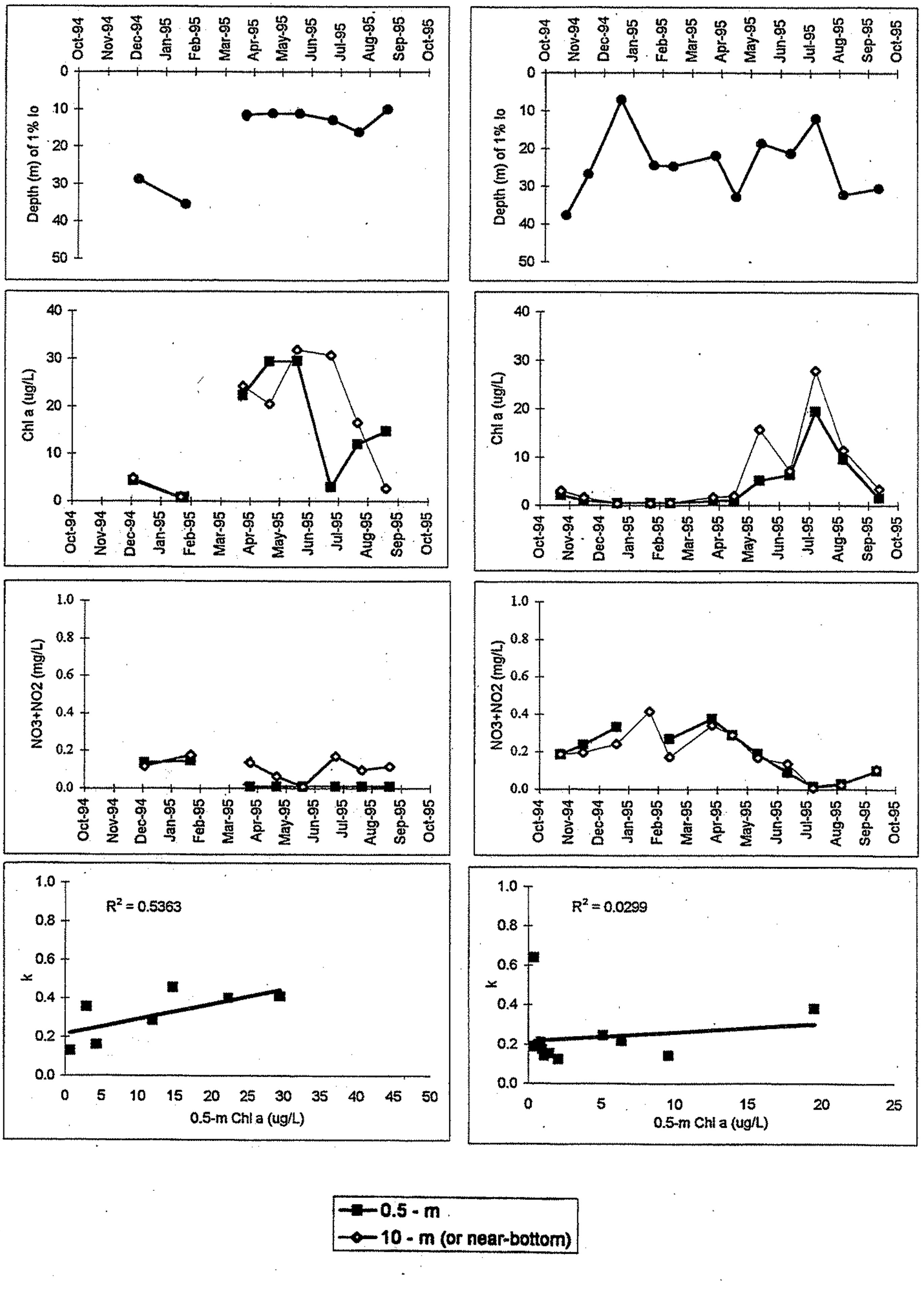
CMB006 **DNA001**



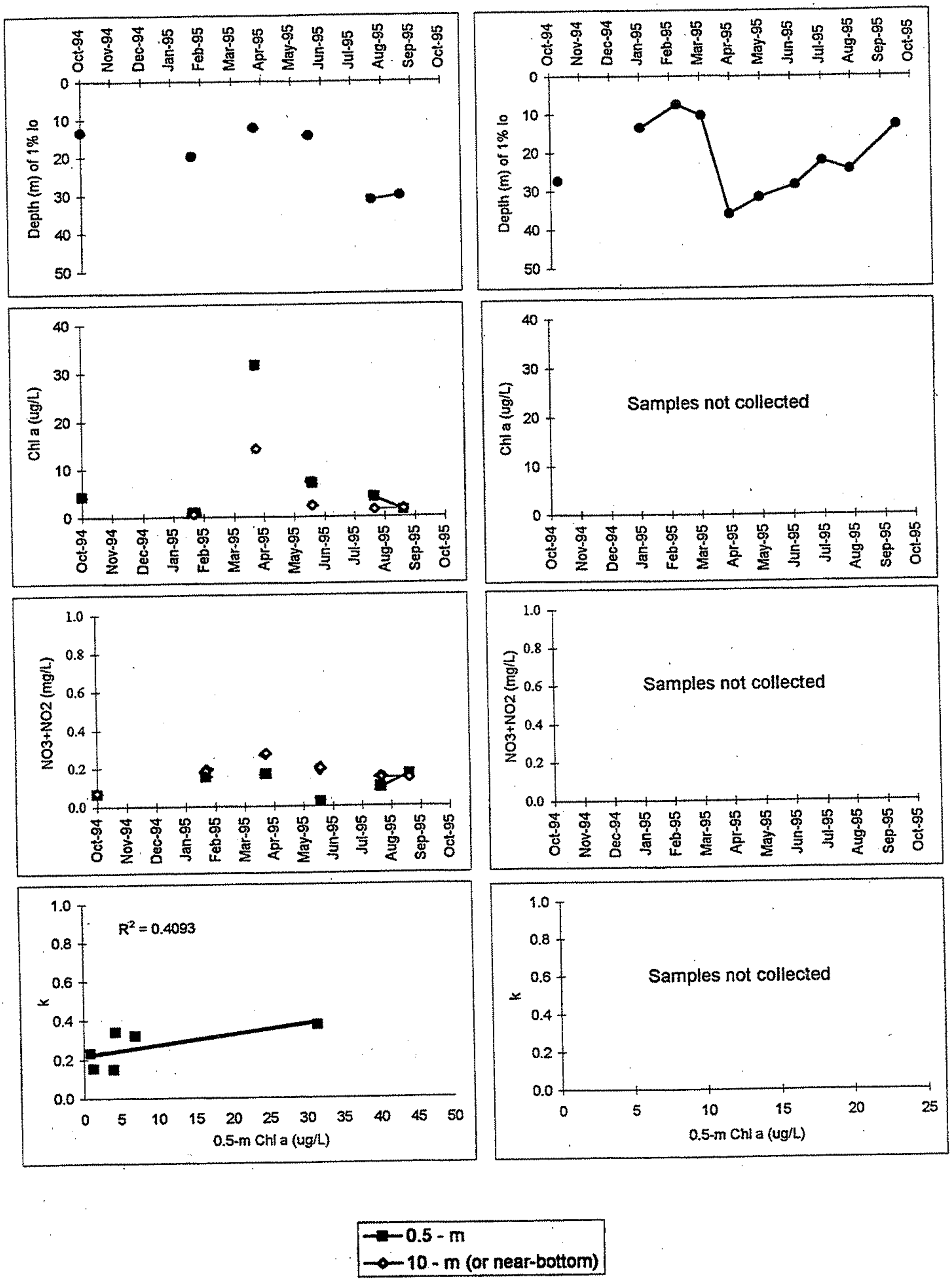


DYE004
EAP001
Depth (m) of 1% Io
Chl a (ug/L)
NO3+NO2 (mg/L)
k
R^2 = 0.0325
R^2 = 0.3842
0.5-m Chl a (ug/L)
Oct-94
Nov-94
Dec-94
Jan-95
Feb-95
Mar-95
Apr-95
May-95
Jun-95
Jul-95
Aug-95
Sep-95
Oct-95
0.5 - m
10 - m (or near-bottom)

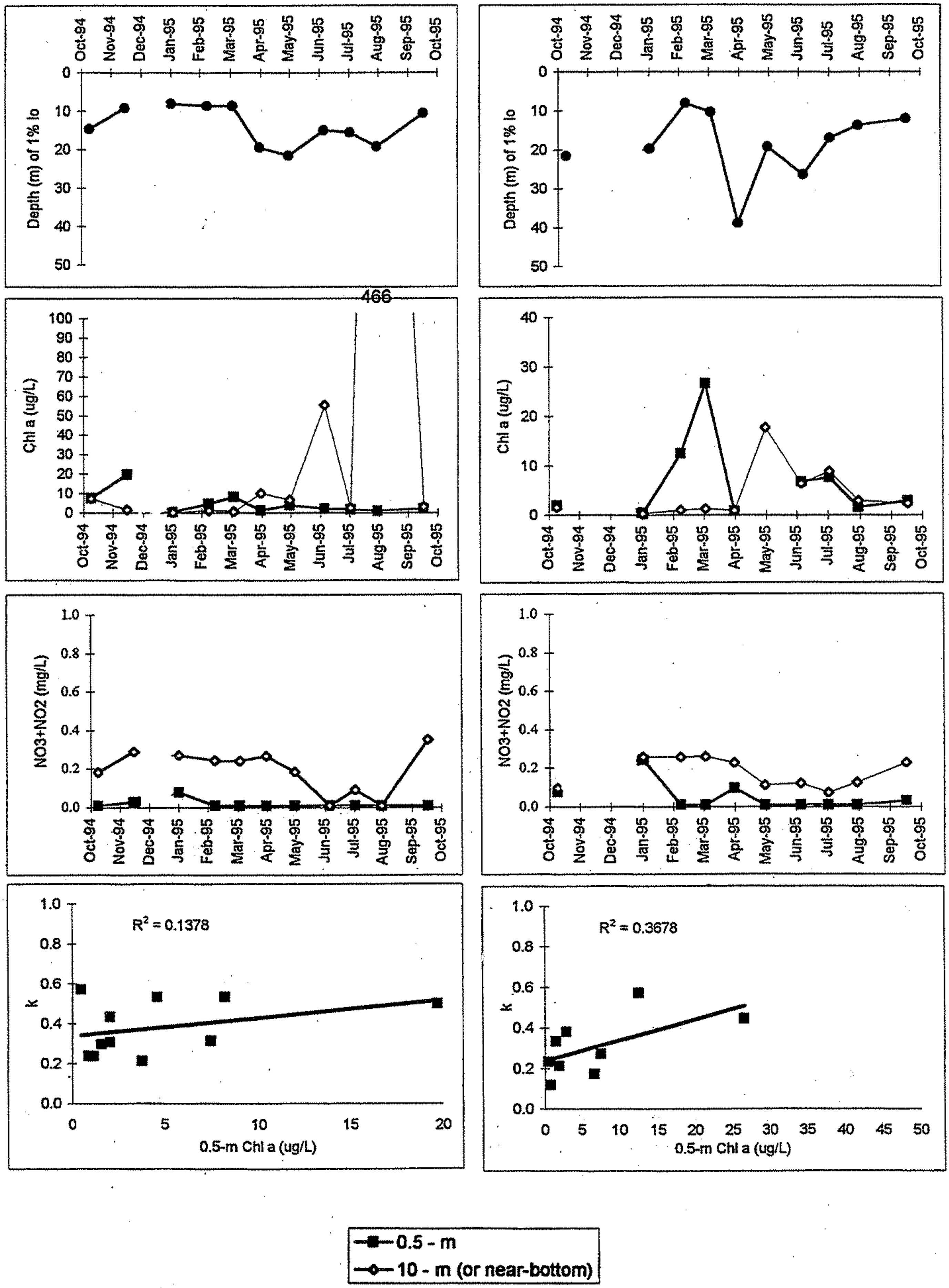
EAS001 **ELB015**



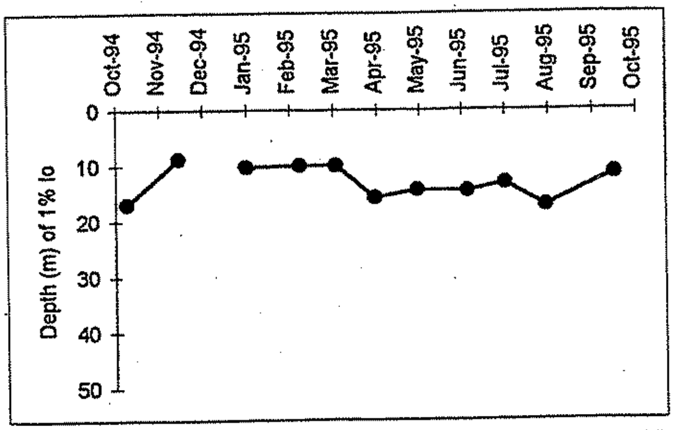
GRG002 **HCB003**

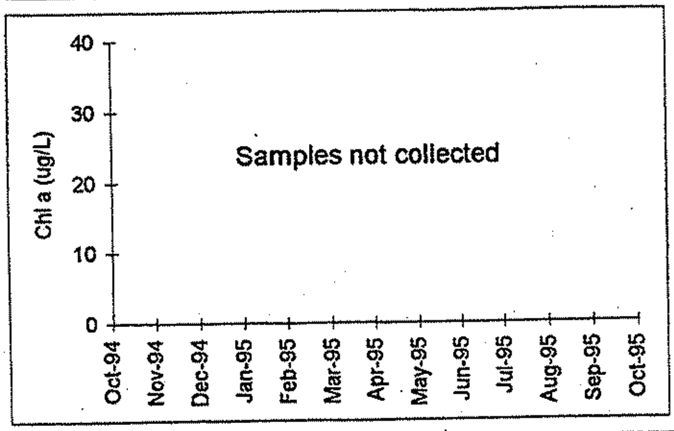


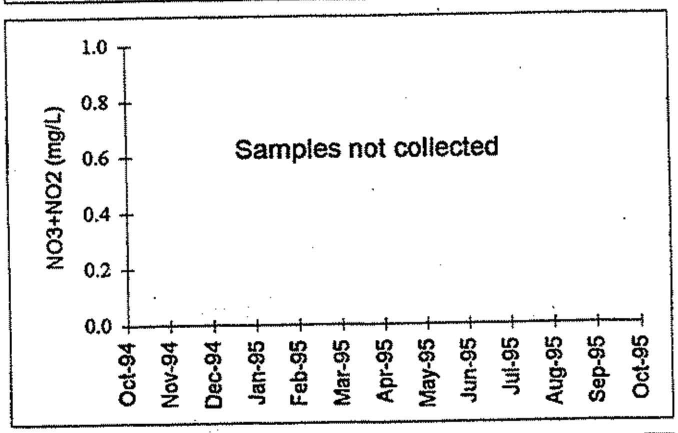
HCB004 **HCB006**

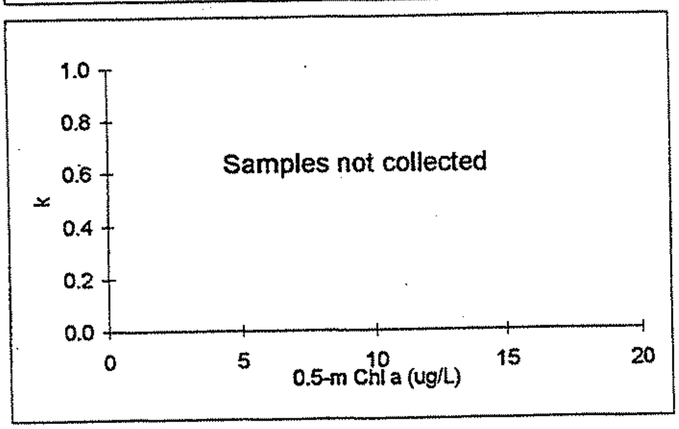


HCB007

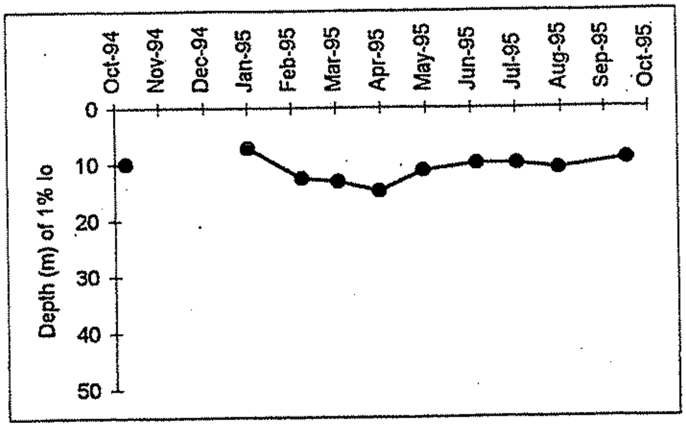


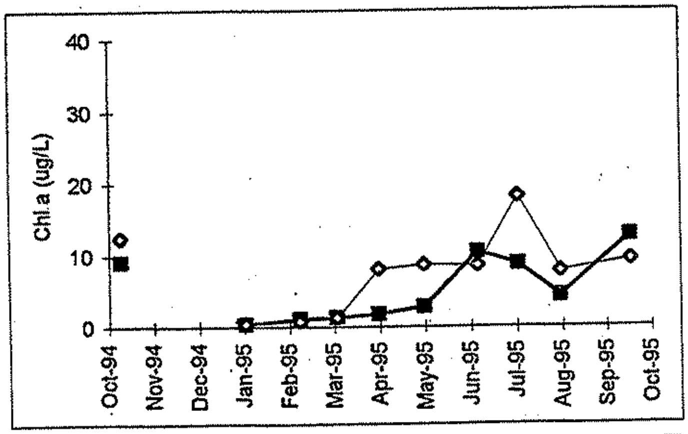


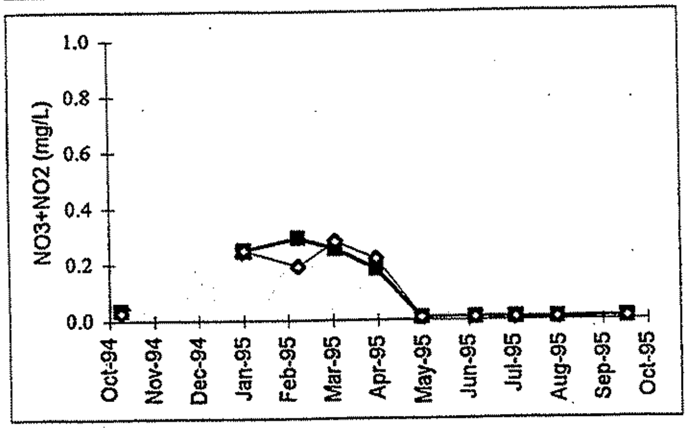


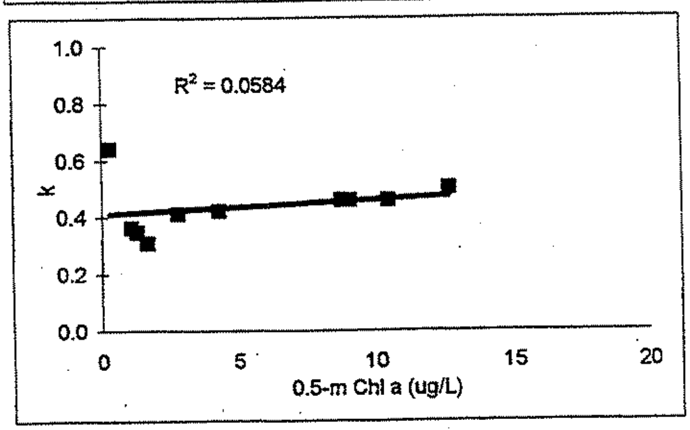


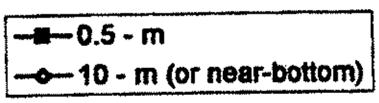
OAK004



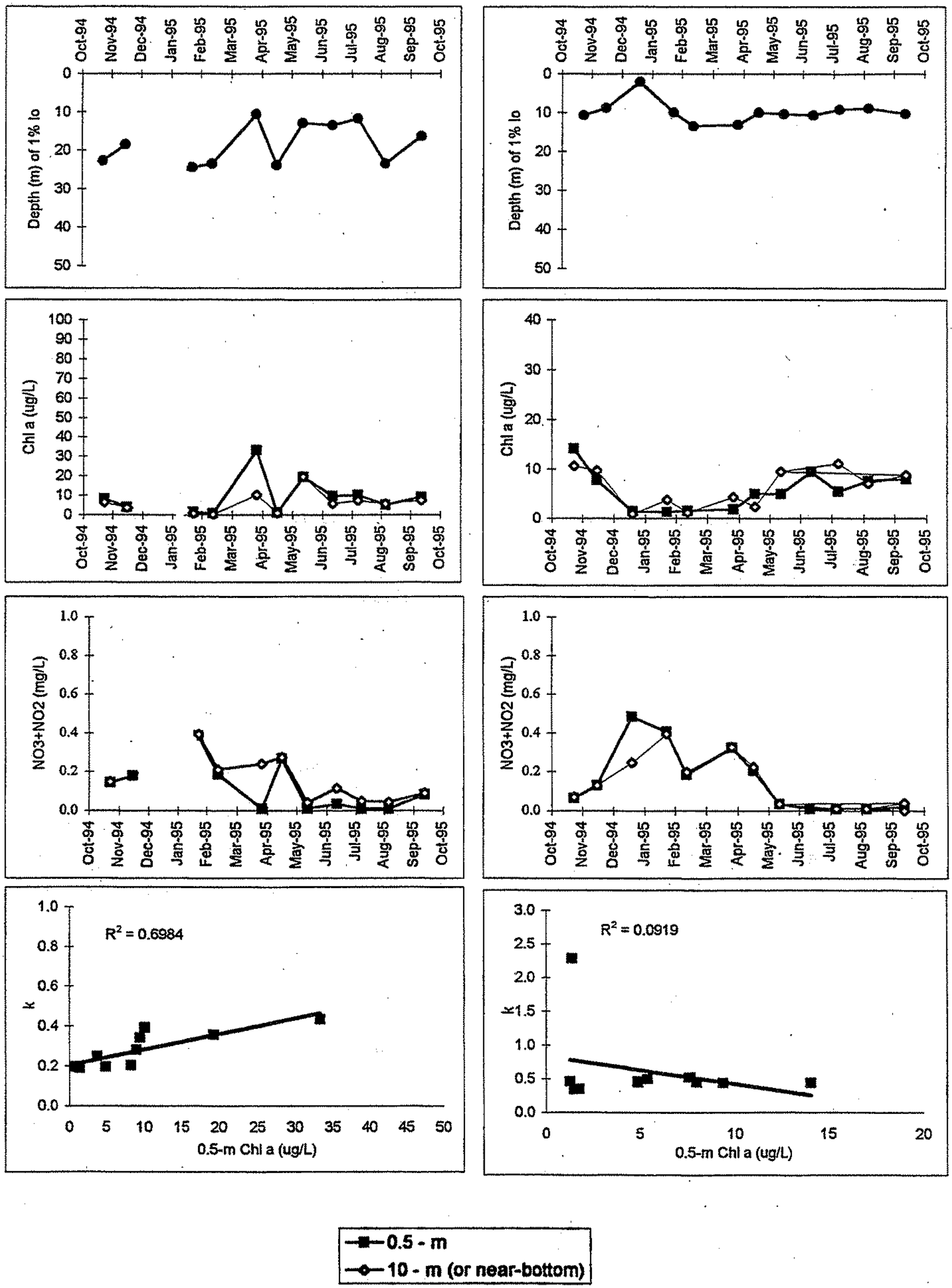


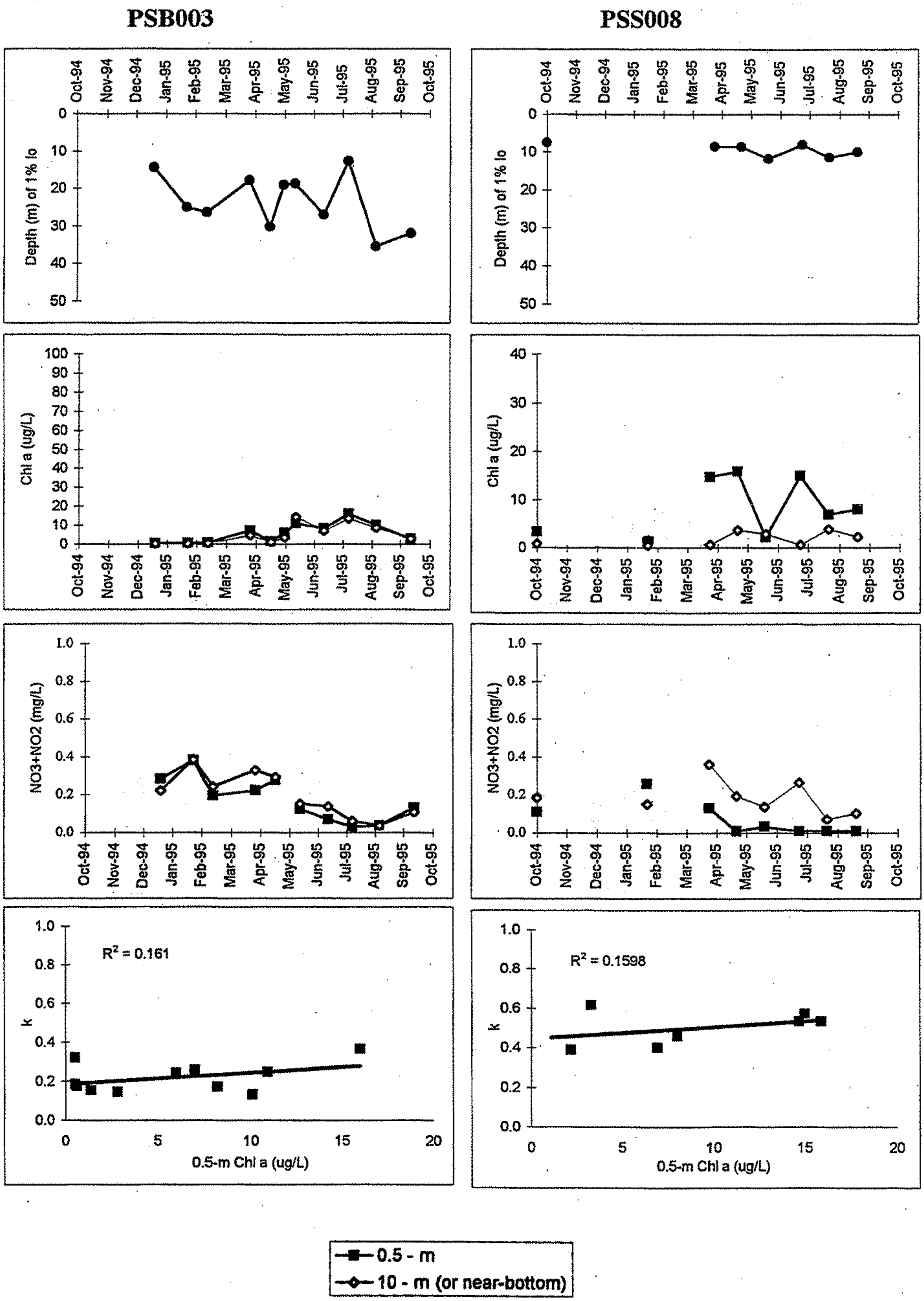




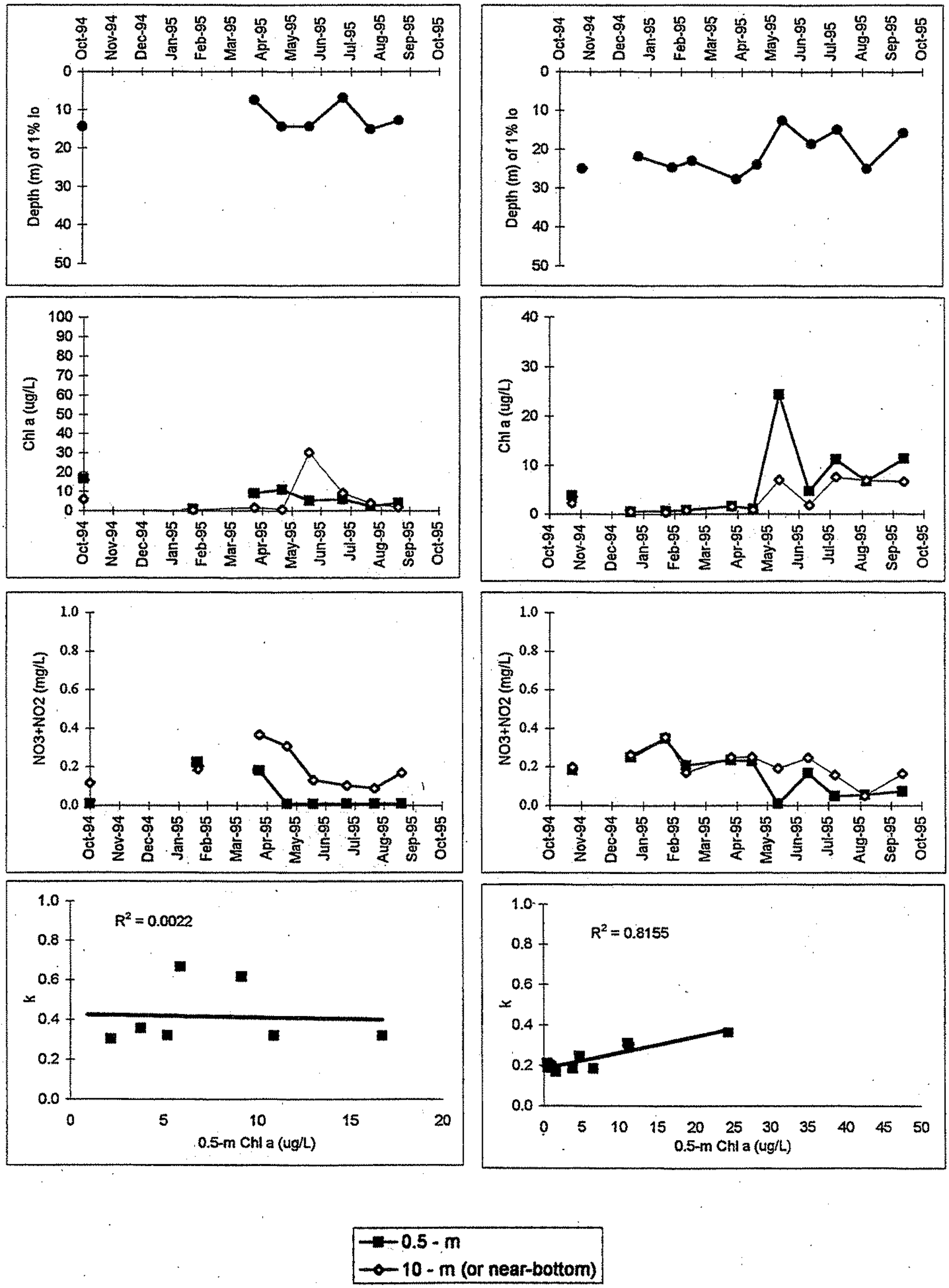


PMA001 **POD001**

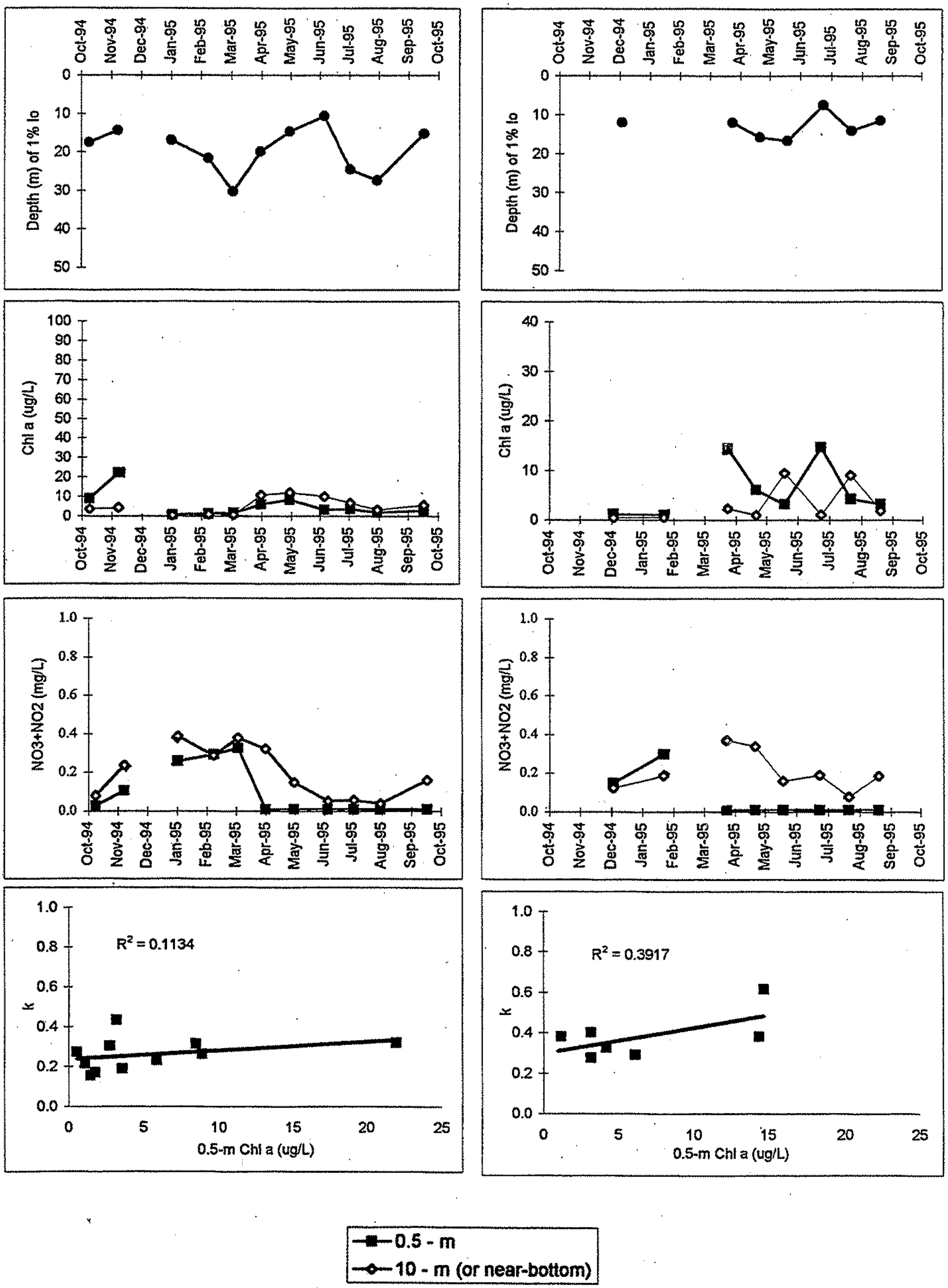



PSB003
PSS008
Depth (m) of 1% Io
Oct-94 Nov-94 Dec-94 Jan-95 Feb-95 Mar-95 Apr-95 May-95 Jun-95 Jul-95 Aug-95 Sep-95 Oct-95
Chl a (ug/L)
NO3+NO2 (mg/L)
k
R^2 = 0.161
R^2 = 0.1598
0.5-m Chl a (ug/L)
0.5 - m
10 - m (or near-bottom)

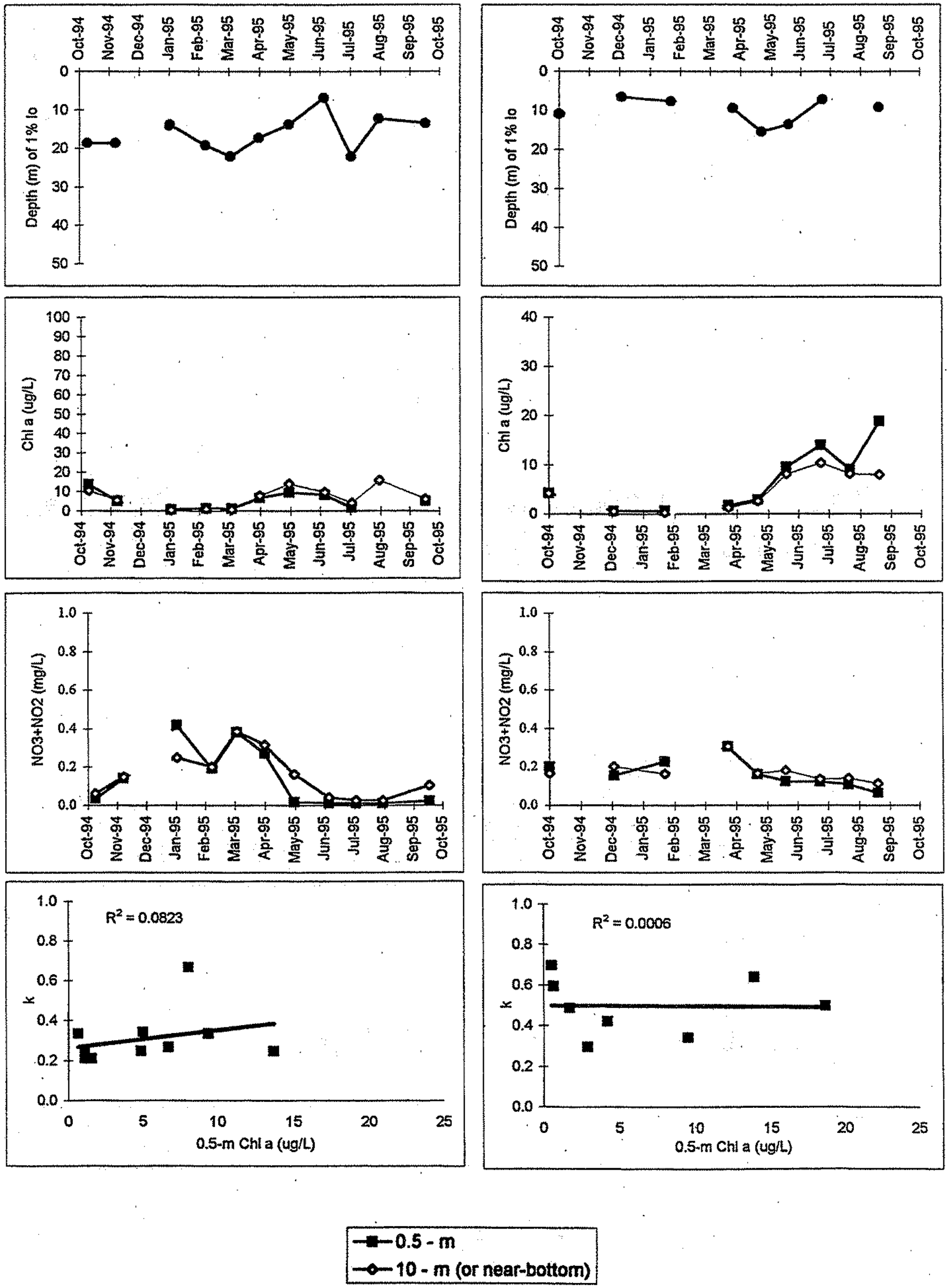
PSS019 **PTH005**



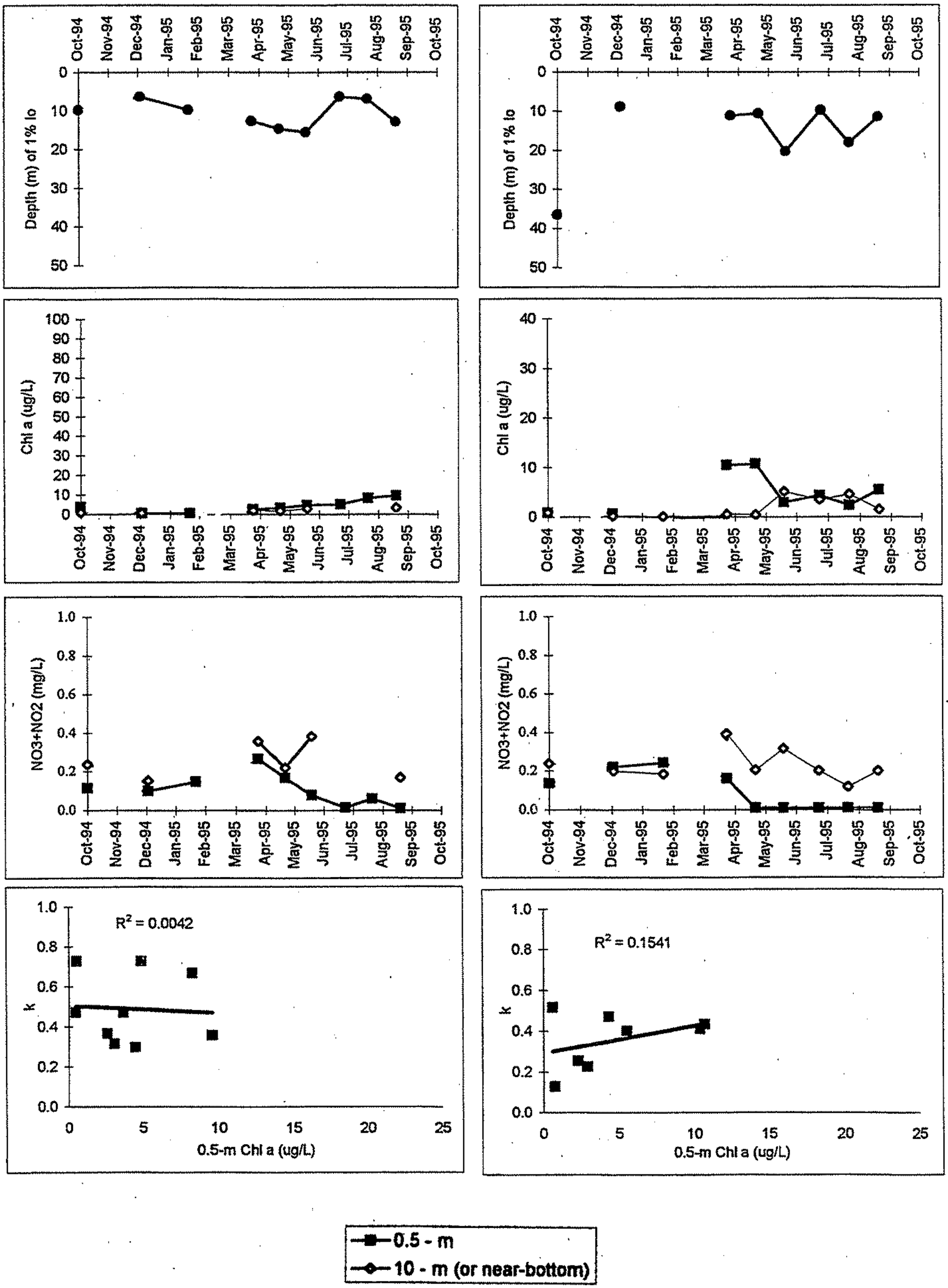
QMH001 SAR003



SIN001 SKG001

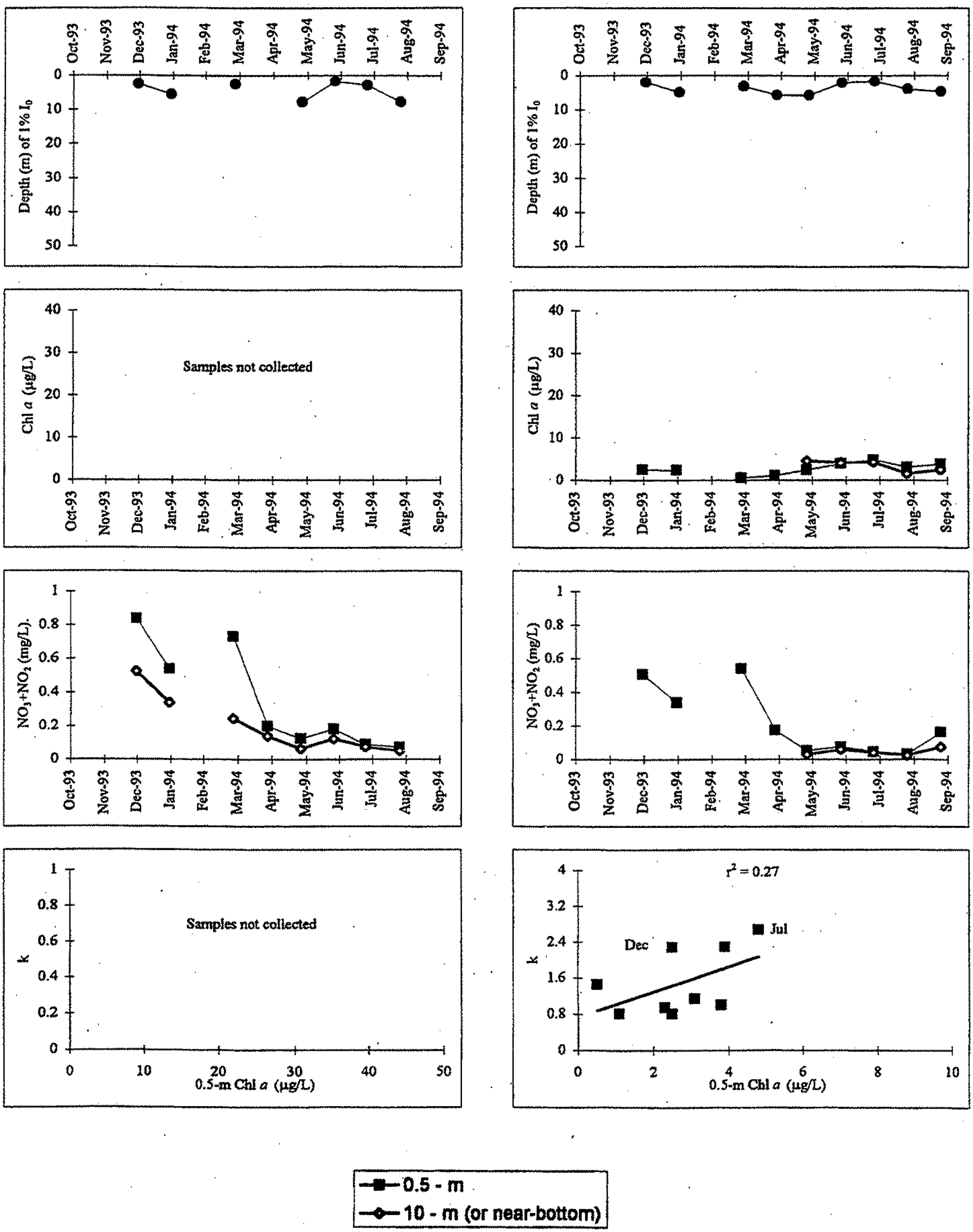


SKG003 SUZ001

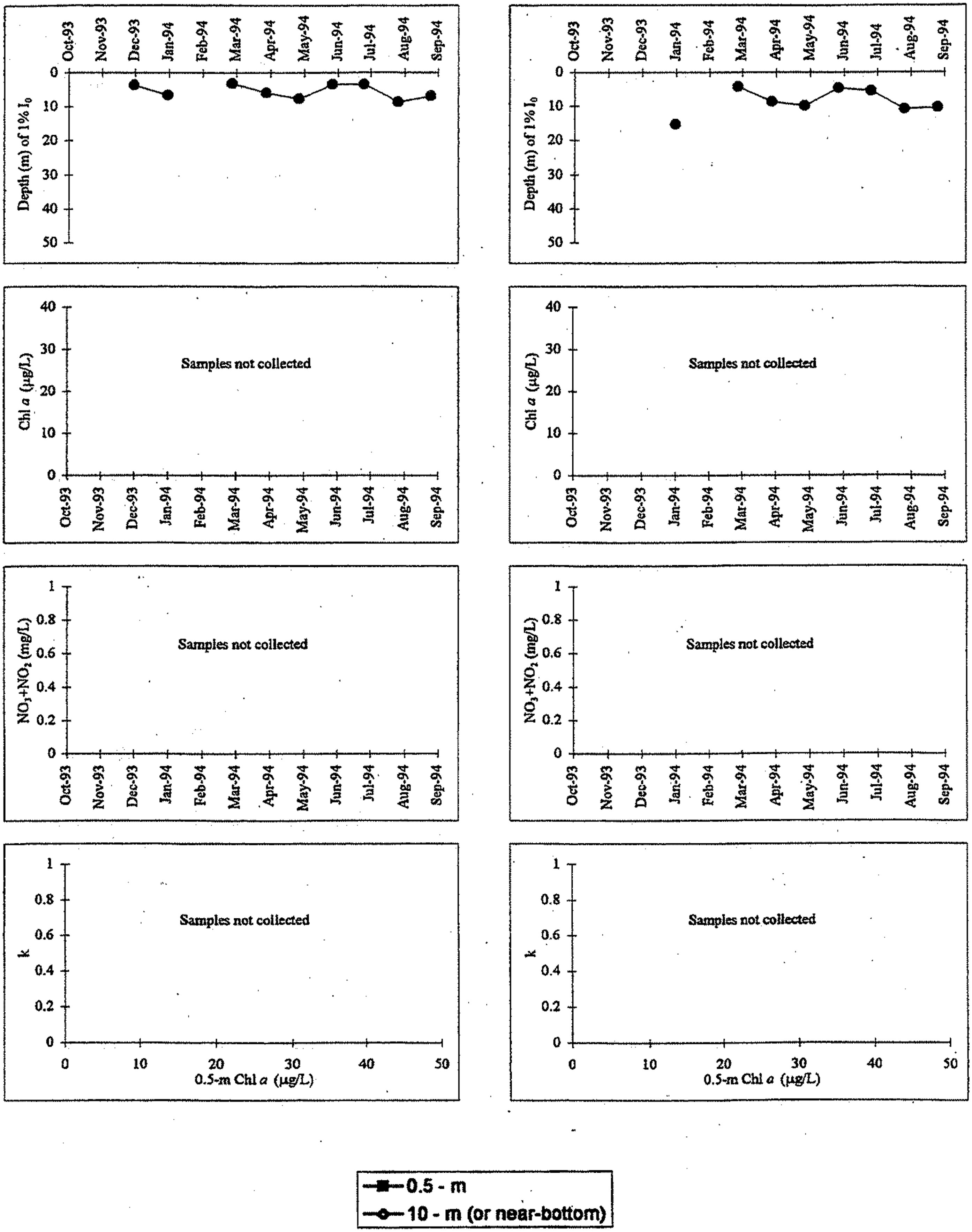


Grays Harbor and Willapa Bay stations

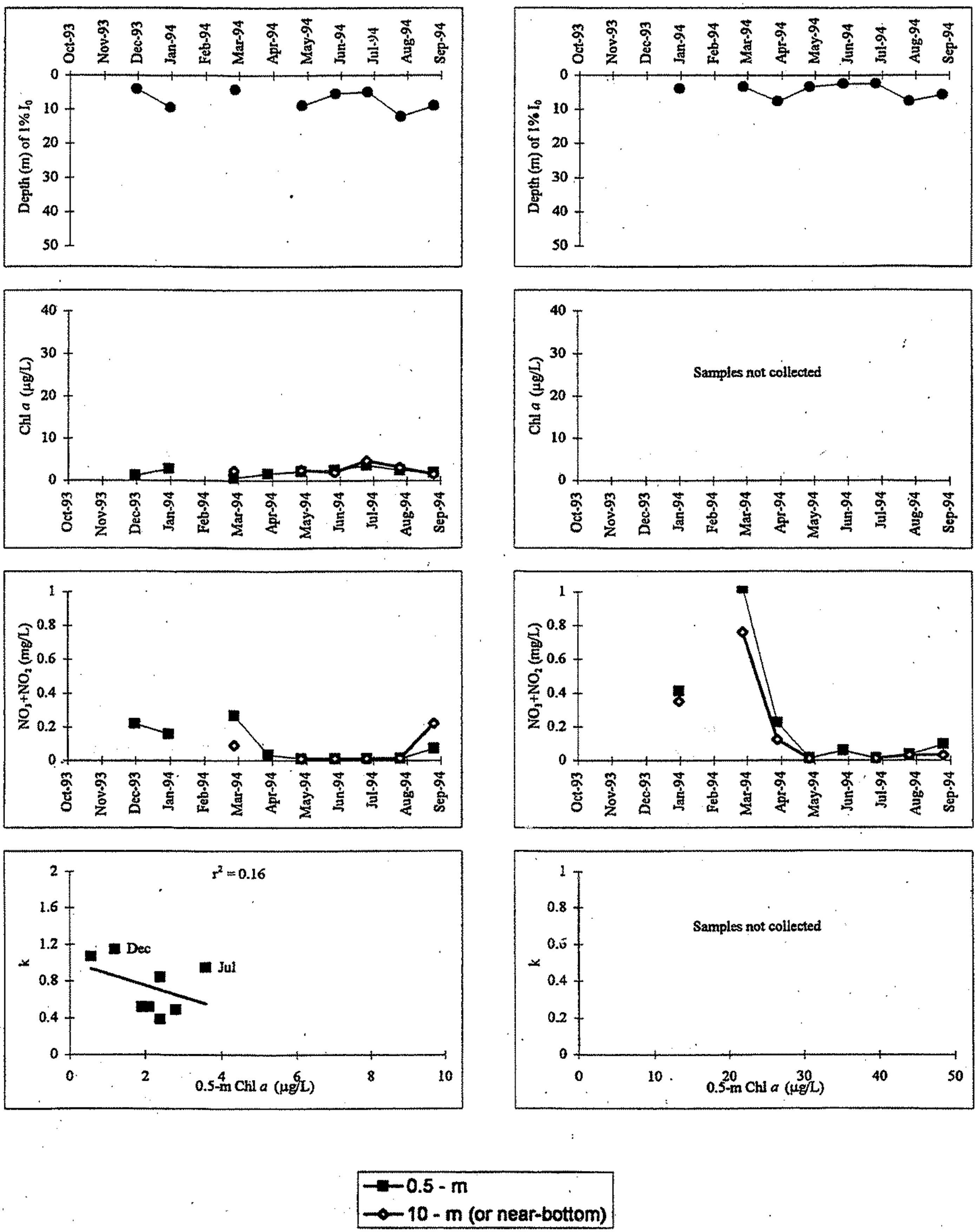
GYS004 GYS008



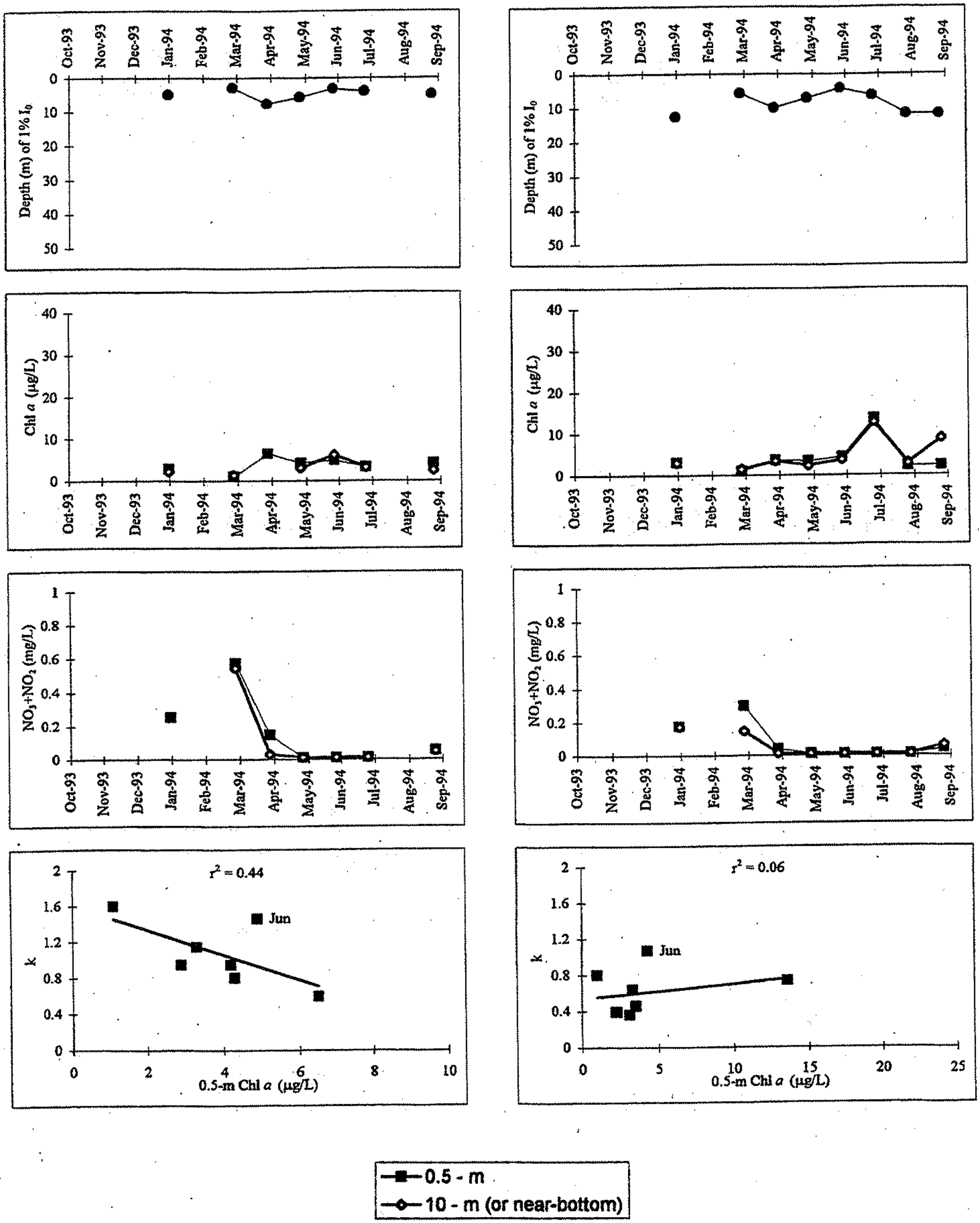
GYS009 GYS015



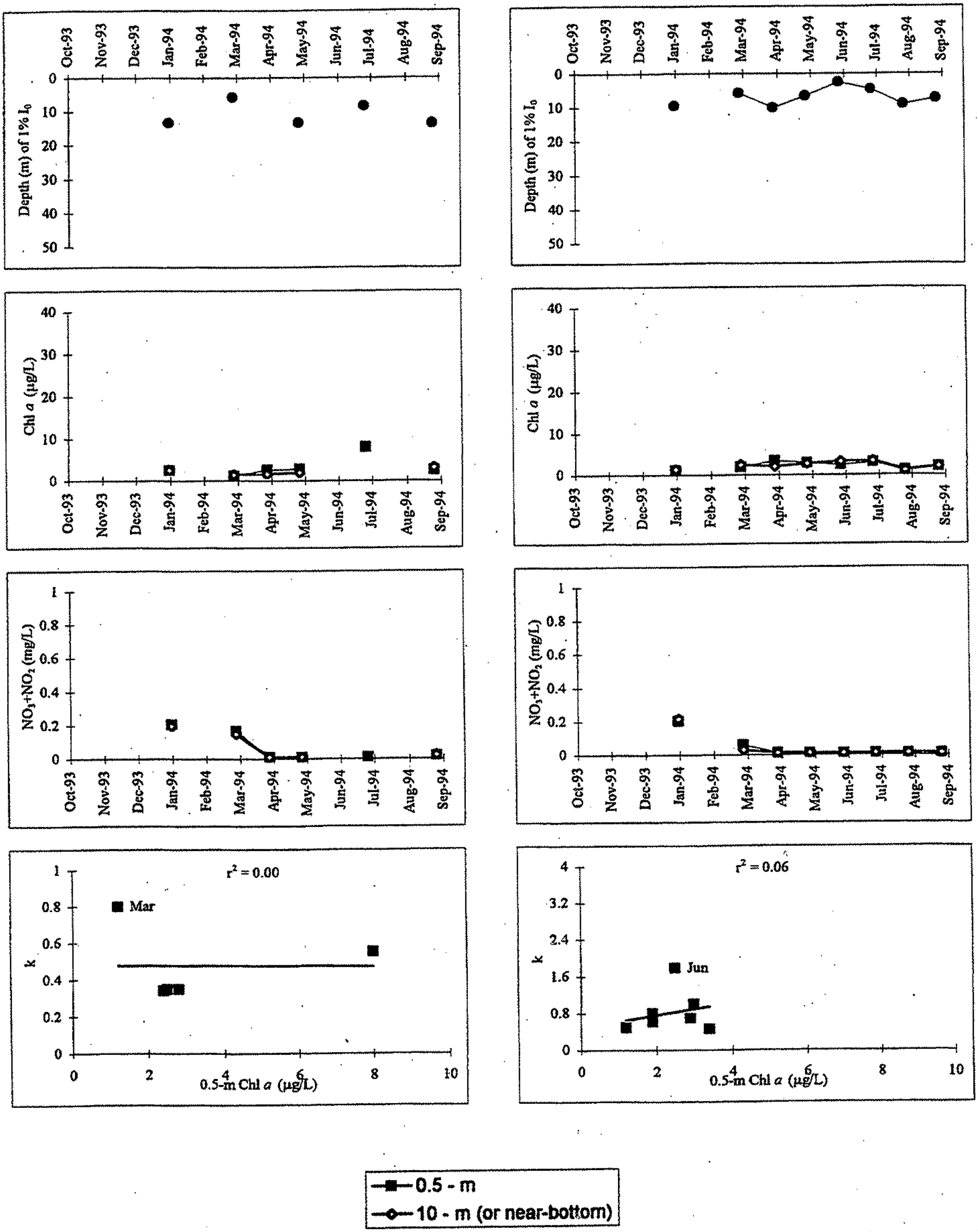
GYS016 **WPA001**



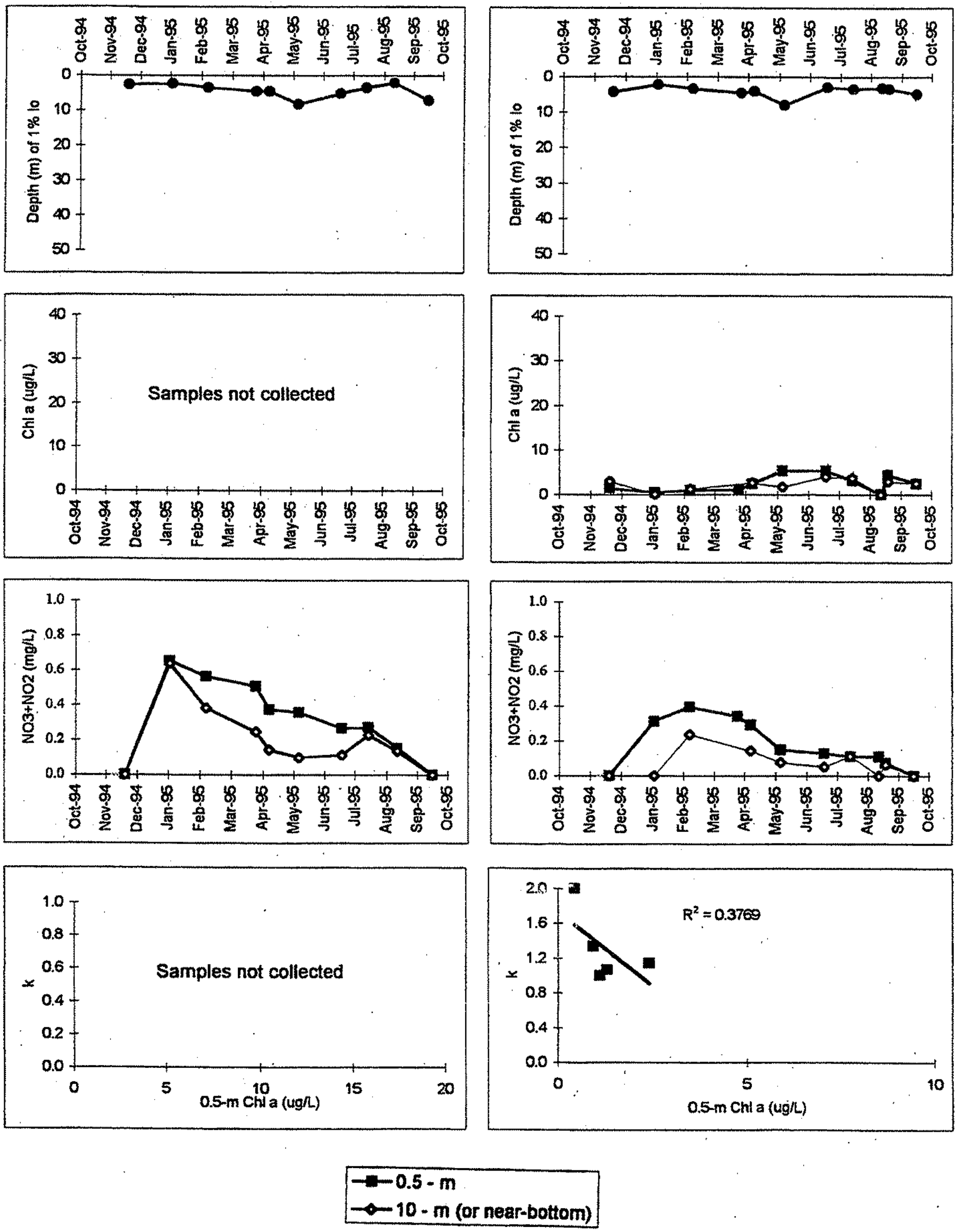
WPA003 **WPA004**



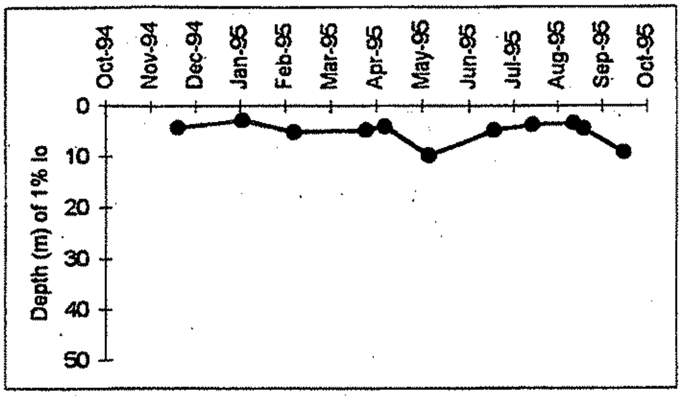
WPA006 **WPA007**

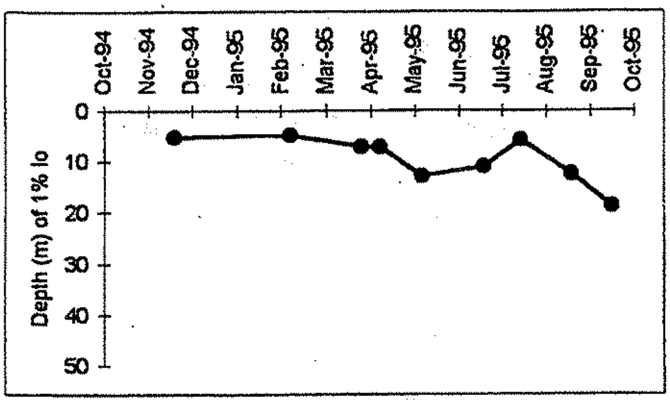


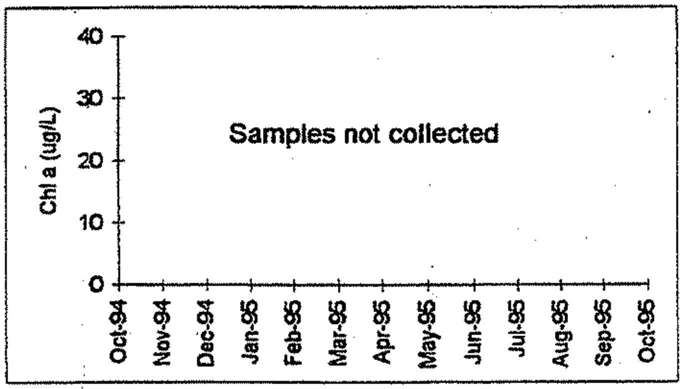
GYS004 **GYS008**

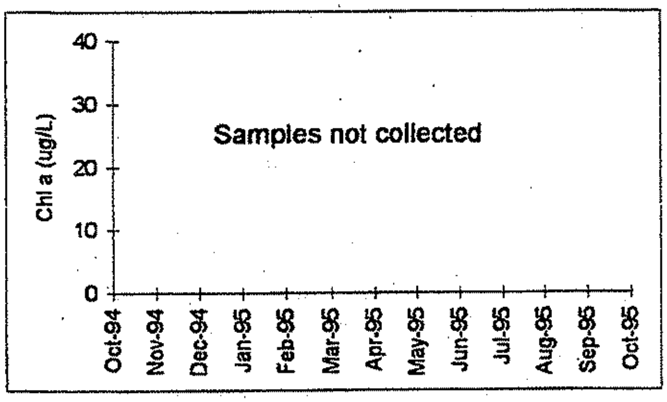


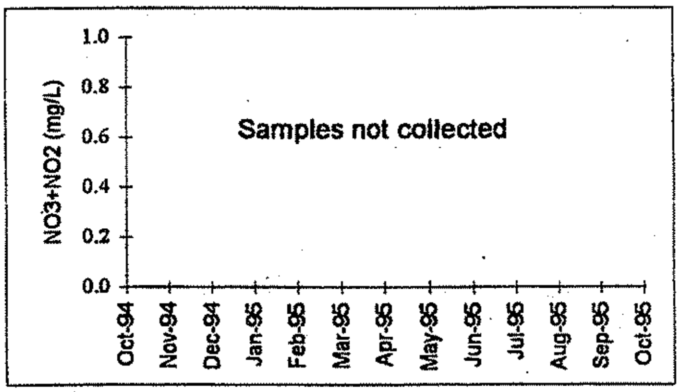
GYS009 **GYS015**

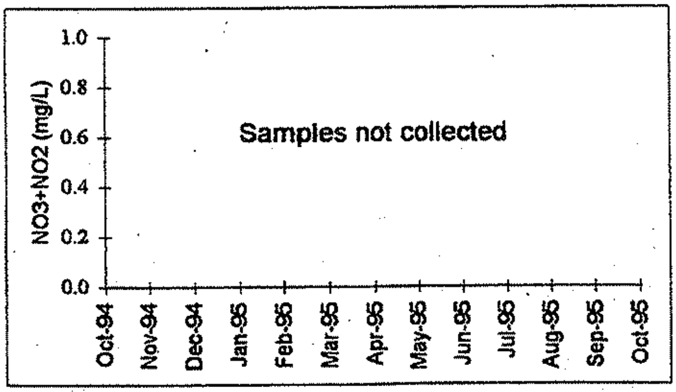


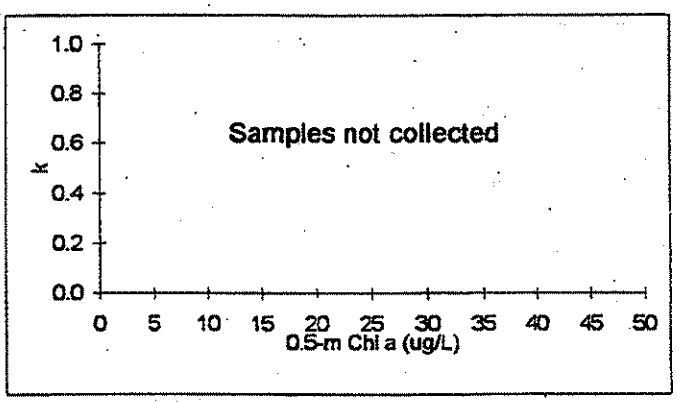


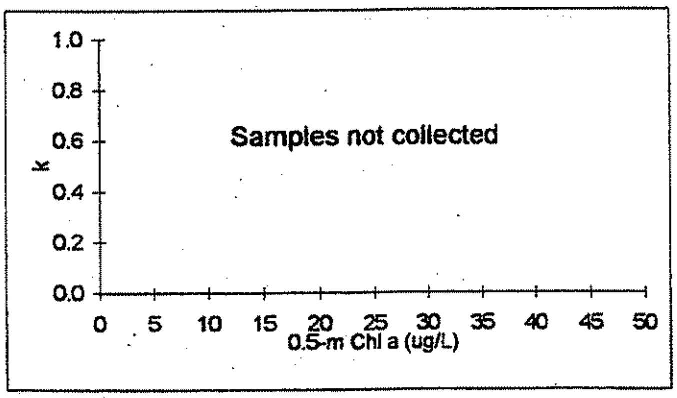






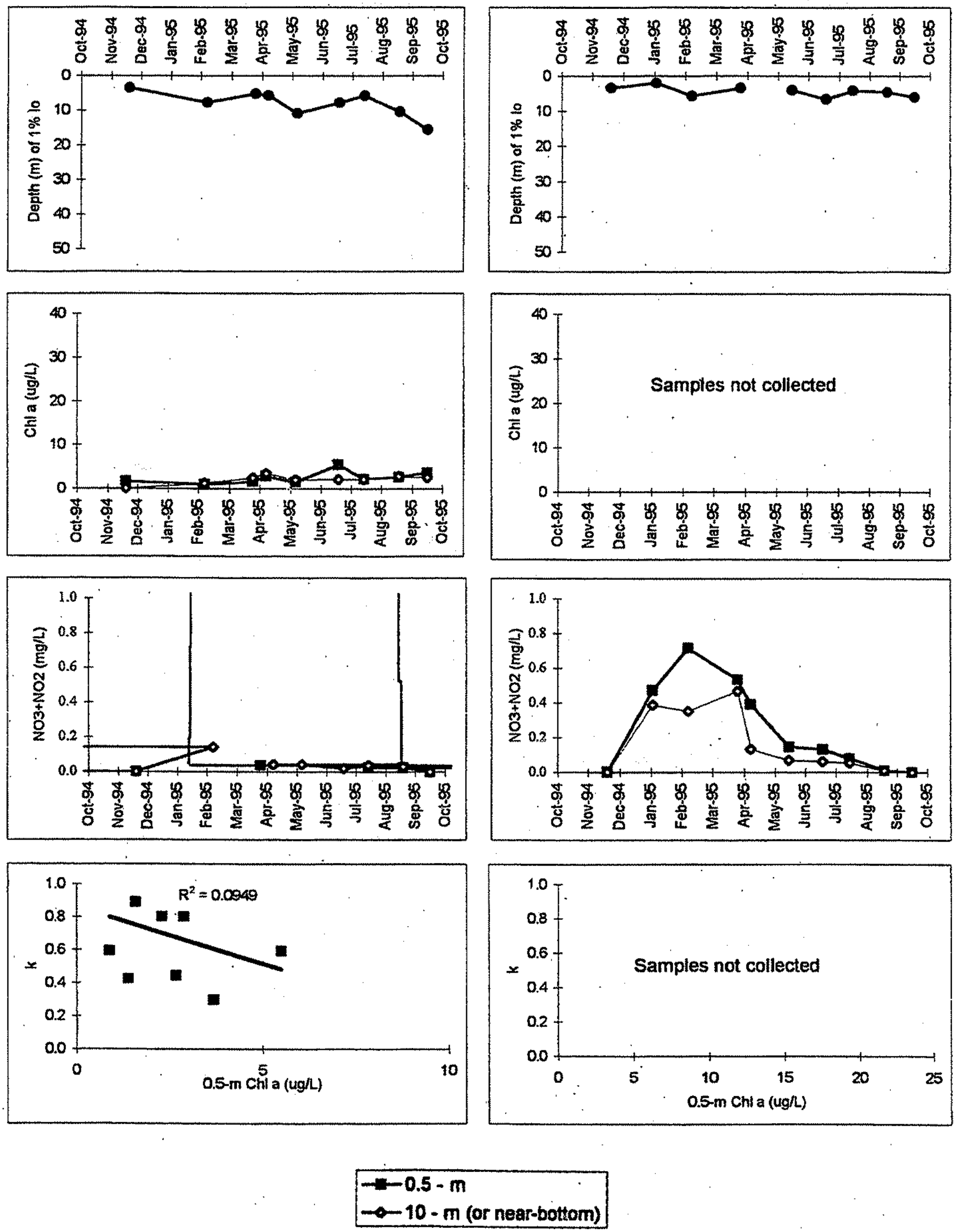




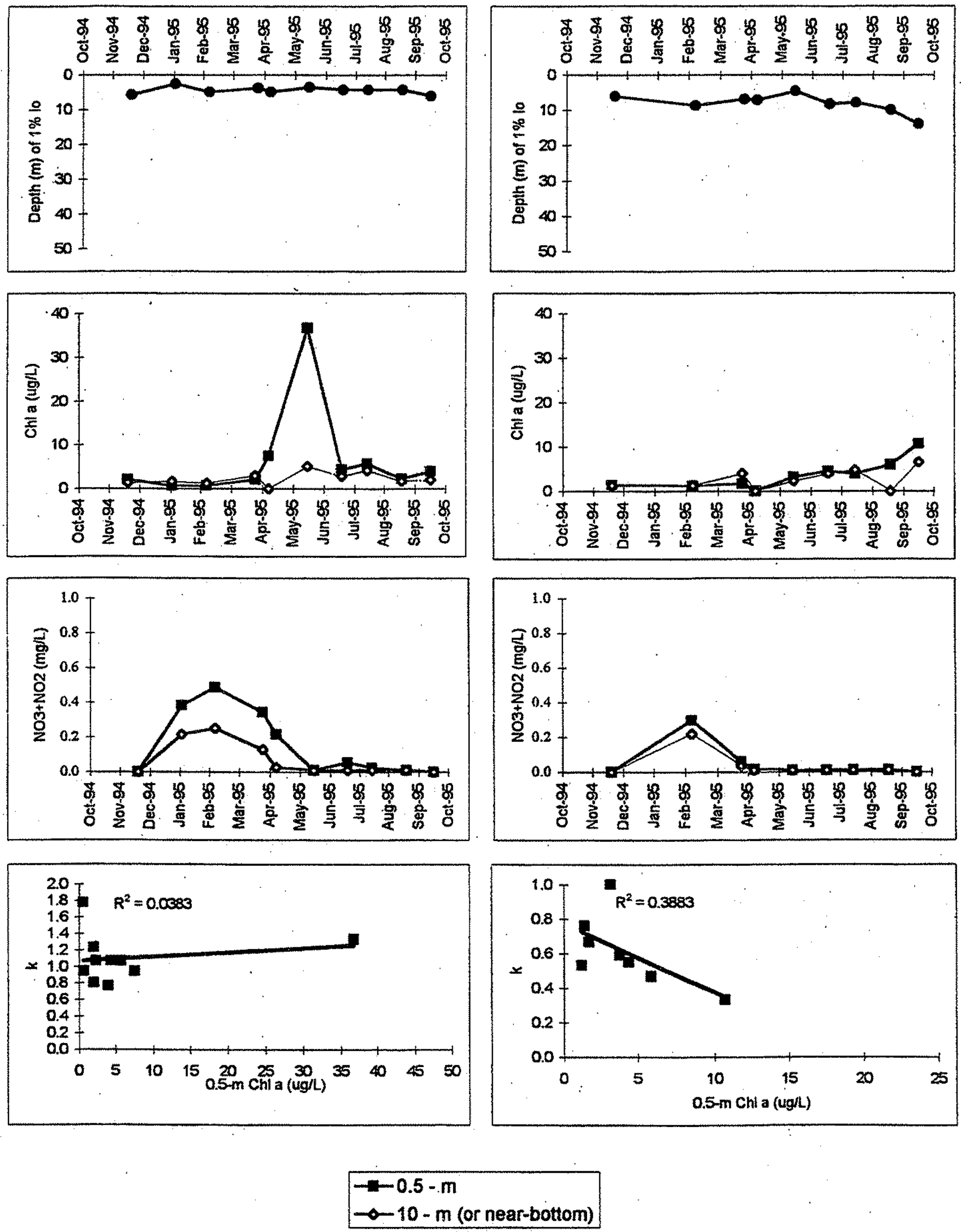


—■— 0.5 - m
—◇— 10 - m (or near-bottom)

GYS016 **WPA001**



WPA003 **WPA004**



WPA006 **WPA007**