Marine Water Column Ambient Monitoring Program: Wateryear 1992 Data Report

Final Report

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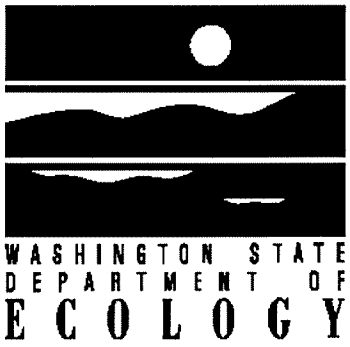

Marine Water Column Ambient Monitoring Program: Wateryear 1992 Data Report

Final Report

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ABSTRACT

The Marine Water Column Monitoring Program was initiated in 1967 to monitor ambient water quality conditions in Puget Sound, Grays Harbor, and Willapa Bay. Data are currently collected monthly as part of an ongoing, long-term monitoring component to the program. During Wateryear 1992 (October 1991 through September 1992), the Washington State Department of Ecology (Ecology) monitored water quality monthly at 24 stations in Puget Sound, five stations in Grays Harbor, and five stations in Willapa Bay. Of the 48 scheduled surveys for long-term monitoring, 42 were completed. The incomplete surveys were a result of inclement weather conditions which created poor sampling conditions (*i.e.*, low visibility and rough sea surface). Wateryear 1992 (WY 1992) was marked by warm and mild climatological conditions as a result of the well established El Nino event. Average surface water temperatures (all stations) in Puget Sound warmed earlier in the spring of WY 1992 than in the previous wateryear (1991), showing up to a 2 degree Celsius (°C) higher temperature over WY 1991. By summer, the difference in Puget Sound average surface temperatures between WY 1992 and WY 1991 was reduced to about 1°C, with WY 1992 being warmer. The 1992 surface temperatures in Grays Harbor were slightly above those seen in 1991 during the spring months, but were lower by about 3°C during the summer months. Willapa Bay average surface temperatures averaged 1°C cooler during the summer of 1992 compared to the summer of 1991. Whether these differences were specifically associated with the El Nino was not determined. Dissolved oxygen (D.O.) concentrations fell below 5.0 milligrams per liter (mg/L) at five Puget Sound stations during WY 1992. Two of these six stations were in lower Hood Canal, which experienced oxygen concentrations below 5.0 mg/L the majority of the year. Three of the stations were in North Puget Sound and only exceeded 5.0 mg/L in the late summer or early fall months. Eight Puget Sound stations and three coastal stations had fecal coliform bacteria counts above 14 organisms per 100 milliliters (mL) during WY 1992. Most of these stations also showed fecal coliform counts above 14 organisms/100 mL during the WY 1990 and WY 1991 programs. Of the 26 stations sampled for nutrients, 17 Puget Sound stations and four coastal stations indicated nutrient depletion (NO_2-NO_3 concentrations below 0.04 mg/L) during one or more station visits during WY 1992. At many of the stations, but not all, the nutrient concentrations appeared to be depleted earlier during WY 1992 than observed during WY 1991. Furthermore, two stations (one in Georgia Strait and one in Dana Passage) that did not show nutrient depletion in WY 1991, did show nutrient depletion during WY 1992. The WY 1992 quality assurance/quality control (QA/QC) assessment showed acceptable data quality for most parameters. Precision for nutrient and chlorophyll *a* parameters was better for laboratory split samples than for field replicate samples. Fecal coliform bacteria results showed poor precision for both laboratory splits and field duplicates. Consequently, all fecal coliform bacteria results should be interpreted with caution and/or assumed to be estimates at best.

INTRODUCTION

This data report was prepared as part of Ecology's Marine Water Column Monitoring Program. It is only intended to present the suite of marine water quality data collected monthly during WY 1992 (October 1991 through September 1992). Historical analyses of water quality trends at specific stations fell outside the scope of this report, though general comparisons between WY 1992 and WY 1991 results are discussed. Wateryear 1992 seasonal monitoring efforts are reported separately.

Marine Water Column Monitoring Program

The Marine Water Column Monitoring Program is designed to measure ambient water quality conditions in Puget Sound and the coastal estuaries (Janzen, 1992). It also is designed to monitor the cumulative effects of contamination and habitat degradation resulting from human activities. Many users of the data apply the monthly results to permitting tasks, assessments of ambient water quality conditions in various locations, annual patterns and variability in water quality, and regulatory listings of waterbodies that may be experiencing degradation due to natural or anthropogenic causes. Such marine water quality management activities for Puget Sound and the outer coastal estuaries can be implemented in part based on quantitative water quality information gathered from this monitoring program.

Monitoring Goals and Objectives

Ecology's goals for monitoring both Puget Sound and the coastal estuaries are to:

1) Characterize spatial and temporal patterns of ambient water quality conditions;

2) identify significant changes in key environmental indicators;

3) provide water quality information to support specific programs in Ecology, other agencies, and those programs identified in the Puget Sound Water Quality Management Plan;

4) determine the effectiveness of regulatory agencies in improving marine water quality through regulatory activities;

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

6) provide baseline water quality data to the public, managers, private institutions, and other data users.

The specific objectives for WY 1992 long-term monitoring included:

1) Continuing collection of long-term spatial and temporal water quality data in open basins and in embayments;

2) identifying water quality sensitive areas and possible emerging problems in embayments;

3) providing baseline data to water quality managers to help assess compliance with state and federal water quality regulations;

4) providing information to managers and environmental scientists to help describe the water quality dynamics of Puget Sound and the coastal waters; and

5) providing general water quality information to the public through data requests and reports.

Background

Ecology initiated its statewide marine water monitoring program in 1967. The original purpose of the program was to determine existing water quality conditions on a regular basis, and to identify spatial and temporal trends from the results. Many of the sampling sites were located near municipal and industrial discharges in order to measure the effectiveness of agency regulatory programs. During the program's 26 year history, sampling frequency and station location changes have been made to the original program to meet growing information needs.

Recently, state and federal agencies developed a comprehensive Puget Sound environmental protection program known as the Puget Sound Water Quality Management Plan [Puget Sound Water Quality Authority (PSWQA), 1988]. This management plan calls for many activities including coordinated information gathering.

In 1988, the Puget Sound Ambient Monitoring Program (PSAMP) was developed by a regional committee of environmental scientists known as the Monitoring Management Committee (MMC). This committee developed a specific task-oriented monitoring plan designed to guide comprehensive long-term monitoring in Puget Sound (MMC, 1988). The Marine Water Column Ambient Monitoring Plan (Janzen, 1992) was prepared by Ecology to describe in detail the marine water column monitoring portion of PSAMP and the coastal monitoring being conducted by Ecology.

METHODS

WY 1992 Long-term Monitoring Program

Twenty-four stations in Puget Sound (Figure 1), five stations in Grays Harbor (Figure 2), and five stations in Willapa Bay (Figure 2) were sampled monthly during WY 1992. Table 1 lists each station and station type (core, rotating, floating), the basin in which each station resided, the parameters sampled, and sampling depths.

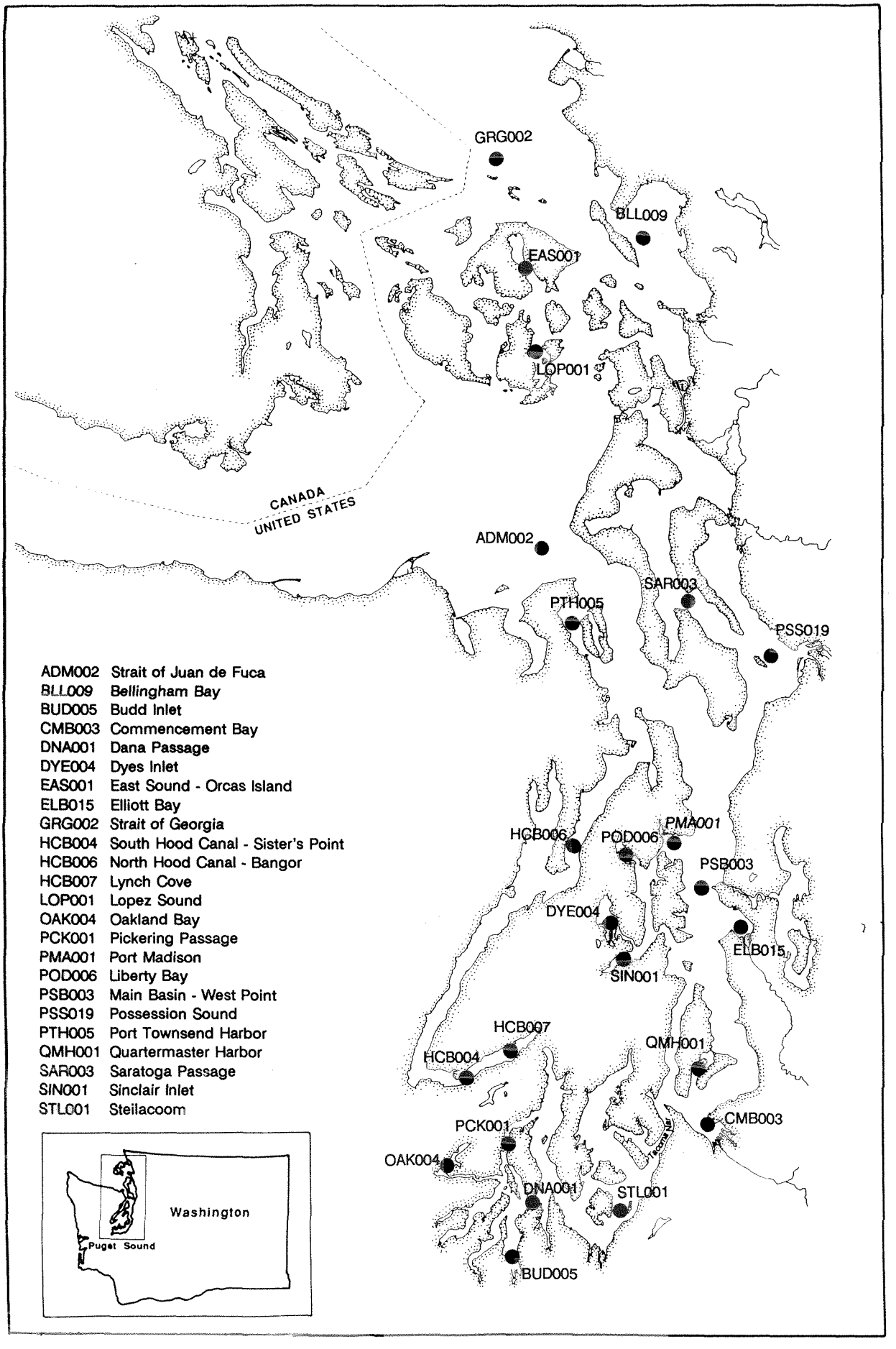

Figure 1. Long-term monitoring stations in Puget Sound for WY 1992.

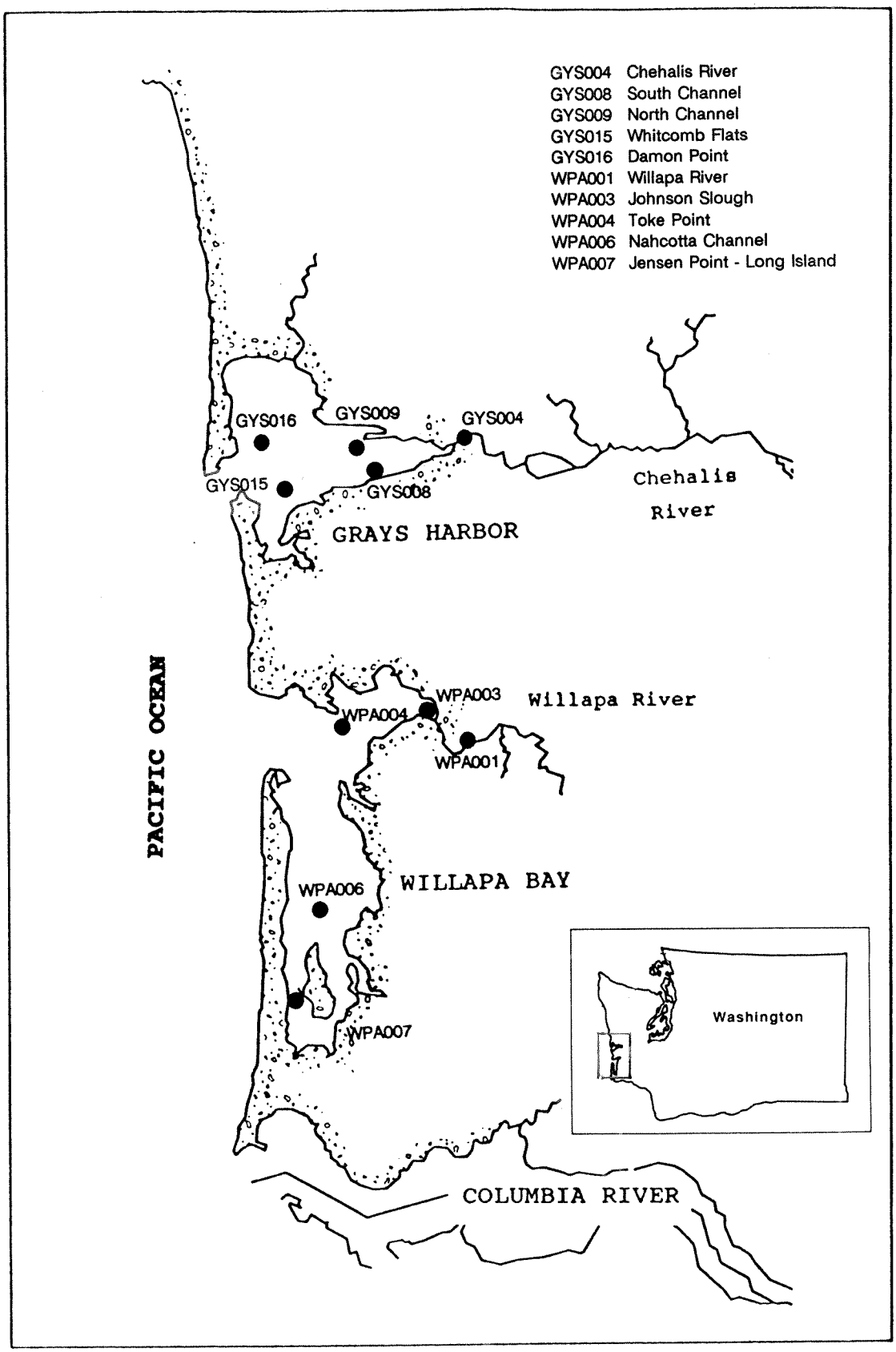

Figure 2. Long-term monitoring stations in Grays Harbor and Willapa Bay for WY 1992.

Table 1. Long-term marine monitoring station list for WY 1992. (C=Core Station, R=Rotating Station, F=Floating Station)

STATION		BASIN	PARAMETERS SAMPLED*	PARAMETER DEPTHS(meters)
PUGET SOUND				
GRG002	C	Strait of Georgia	All parameters	0, 10, 30
ADM002	C	Strait of Juan de Fuca	All parameters	0, 10, 30
BLL009	C	San Juan Island	All Parameters	0, 10
SAR003	C	Whidbey Basin	All parameters	0, 10, 30
PSS019	C	Whidbey Basin	All Parameters	0, 10, 30
PTH005	C	Admiralty Inlet	All Parameters	0, 10, 30
PSB003	C	PS Main Basin	All parameters	0, 10, 30
SIN001	C	PS Main Basin	All Parameters	0, 10
ELB015	C	PS Main Basin	All Parameters	0, 10
CMB003	C	PS Main Basin	All Parameters	0, 10, 30
OAK004	C	Southern Basin	All Parameters	0, 10
BUD005	C	Southern Basin	All Parameters	0, 10
DNA001	C	Southern Basin	All parameters	0, 10, 30
HCB004	C	Hood Canal Basin	All Parameters	0, 10, 30
HCB006	C	Hood Canal Basin	All parameters	0, 10, 30
DYE004	R	PS Main Basin	All Parameters	0, 10
POD006	R	PS Main Basin	All Parameters	0, 10
PMA001	R	PS Main Basin	All Parameters	0, 10
QMH001	R	PS Main Basin	All Parameters	0, 10
EAS001	R	San Juan Island	CTD and Secchi	
LOP001	R	San Juan Island	CTD and Secchi	
HCB007	R	Hood Canal Basin	CTD and Secchi	
PCK001	F	Southern Basin	CTD and Secchi	
STL001	F	Southern Basin	All Parameters	0, 10, 30
COASTAL ESTUARIES				
GYS004	C	Grays Harbor	CTD, Secchi, Nuts, Fec. Col.	0, 10
GYS008	C	Grays Harbor	All Parameters	0, 10
GYS016	C	Grays Harbor	All Parameters	0, 10
WPA004	C	Grays Harbor	All Parameters	0, 10
WPA006	C	Grays Harbor	All Parameters	0, 10
WPA001	C	Willapa Bay	CTD, Secchi, Nuts, Fec. Col.	0, 10
GYS009	R	Grays Harbor	CTD and Secchi	
GYS015	R	Grays Harbor	CTD and Secchi	
WPA007	R	Willapa Bay	CTD and Secchi	
WPA003	R	Willapa Bay	CTD and Secchi	

* All parameters include CTD profile, Secchi depth, dissolved nutrients (see text), chlorophyll *a* (0.5-m, 10-m only), and fecal coliform bacteria (0.1-m only).

All CTD casts were being conducted to 30-m prior to June 1992; starting in June 1992, profiles were conducted to the bottom (or 130-m).

Monitoring Approach

The Marine Water Column Ambient Monitoring Plan (Janzen, 1992) describes in detail three inter-related strategies for marine water column monitoring: long-term monitoring, seasonal monitoring, and solstice monitoring. With full implementation, all three strategies would be employed in Puget Sound, and both long-term and seasonal monitoring would be conducted in the coastal estuaries. In WY 1992, funding allowed the long-term monitoring strategy and two of the three planned seasonal monitoring studies to be conducted in the Puget Sound. Only the long-term monitoring strategy was conducted in the coastal estuaries.

The long-term monitoring strategy includes sampling at stations identified as core, rotating, and floating stations. Core stations are visited every month each year. Rotating stations, which are subdivided into three distinct regions in Puget Sound (north, central, and south), and subdivided into each of the two coastal estuaries, and are included in the monthly monitoring for one year, every third year. Floating stations are sampled every month for one year, but are not revisited on any set schedule.

Materials and Procedures

All sample collection methods followed the Recommended Protocols and Guidelines for Measuring Conventional Water Column Variables in Puget Sound (Puget Sound Estuary Program (PSEP), 1991). Sampling methods are also described in Janzen (1992). All water samples collected during the surveys, except D.O., were analyzed at Ecology's Manchester Environmental Laboratory. Analytical methods are described in Janzen (1992), the Laboratory User's Manual (Ecology, 1992) and the Manchester Quality Assurance Manual (Ecology, 1988). Sampling or analytical conventions that were different in WY 1992 from the previous wateryear are described below along with important information on sampling methodologies.

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.

A Sea-Bird Electronics Seacat® (model SBE-19) conductivity-temperature-with-depth (CTD) profiler was used for collecting continuous water column profile data. Parameters measured by the CTD included temperature, conductivity (used to compute salinity and density), pressure, pH, D.O., and light transmissivity. Both the conductivity and oxygen sensors were flushed continuously with sample water by a pump attached to and powered by the CTD. The CTD profiles at each station were conducted to 30 meters (m) depth through May 1992. In June, CTD sampling was conducted to the bottom of most stations. Sampling procedures followed the manufacturer's instructions (Sea-Bird Electronics, 1990), and are also described in Janzen (1992).

Secchi depth measurements were used to indicate water clarity and incident light penetration through the surface of the water column. Secchi measurements were taken at each station using a solid white, 30-centimeter (cm) disk. Values were recorded to the nearest tenth of a meter. A 20-cm solid white Secchi disk was used prior to WY 1992. Most researchers monitoring in coastal waters have employed a 30-cm disk, though 20-cm disks have also been used (Pickard and Emery, 1982; PSEP, 1991). At the stations where Secchi depth readings were higher (water clarity better), the larger disk allowed for easier depth determination. Surface glare and waves are considered the main source of variability in Secchi readings, rather than disk size. 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 for collecting reliable Secchi measurements, the reading was not recorded, or was recorded as an estimate.

A 1.2 liter (L) Niskin® bottle was manually deployed to collect water at 0.5-m, 10-m, and at 30-m. Ideally, sampling should occur above and below the pycnocline (the layer of rapidly changing density). Since our CTD was not set up to display real-time data, we were unable to always sample reliably above and below the pycnocline.

Samples for fecal coliform bacteria were collected just below the surface (0.1-m) using sterile glass sample bottles. Discrete water samples were collected for dissolved nutrients (total ammonia, nitrite, nitrite-nitrate, and orthophosphorus), and chlorophyll *a* (and phaeopigment) analysis using the Niskin® bottle. Conductivity and D.O. samples were also drawn at one or two stations during most surveys for comparison to CTD values.

The WY 1991 data quality assessment (Appendix H in Janzen and Eisner, 1993) indicated over 95 percent of the 1990-1991 nitrite results reported were below the detection limit. As a result, nitrite sampling was discontinued in May 1992 at all but three urban bay stations (BLL009, CMB003, and BUD005). Nitrite sample collection at the three urban sites was continued, since these are areas expected to show changes in nutrient concentrations over time. Thirty-meter chlorophyll *a* samples were also discontinued at this time based on recommendations given in the WY 1991 report (Janzen and Eisner, 1993). Analysis of the 30-m chlorophyll results showed consistently low values, and data indicated that the majority of the blooms were occurring well above 30-m.

Laboratory Procedures

Beginning in WY 1991, all nutrient samples were filtered (using 0.45 μm pore filters) upon arrival at the Manchester Laboratory (within 24 hours of collection). If immediate analysis was not possible, samples were frozen after being filtered. Results were reported as dissolved nutrients.

Chlorophyll *a* samples were filtered the day following the survey at Manchester Laboratory through May 1992. All chlorophyll *a* samples collected since have been filtered (using 0.70 μm pore glass fiber filters) at the end of the sampling day at the field office laboratory,

and the filters stored and frozen in glass centrifuge tubes. Fecal coliform bacteria samples were set up and incubated on the day following the survey, and were analyzed using the membrane filter method (APHA *et al.*, 1989).

The conductivity samples were analyzed using a CDM83® conductivity meter (Wheatstone bridge-type) made by Radiometer Copenhagen Analytical Instruments Division. A CDM304® immersion cell with a cell constant of 1.00 cm +/- 10% was interfaced with the meter to measure conductance. Standard Methods for measuring conductance were followed (APHA *et al.*, 1989).

Dissolved oxygen reference samples were collected in clean 300 milliliter (mL) glass stoppered bottles and analyzed using the modified Winkler method (APHA *et al.*, 1989). Since liquid chemicals were not allowed on the seaplane for safety reasons, powdered versions of the reagents were applied to the samples to bind the oxygen (Hach, 1989). These powdered reagents had the capability to accurately fix oxygen up 10 milligrams per liter (mg/L) in the water samples. The results from these oxygen samples were used to compare with the D.O. results from the CTD Beckman oxygen sensor, but were not reported in the database. Only reference sample results equal to or less than 10 mg/L were used in the sensor/reference sample comparisons (Bell and Janzen, 1993).

Data Management

Discrete water sample results from each WY 1992 station were entered into the Ambient Monitoring Database (AMS Database) (Ecology, 1992). Following quality assurance checks, these data were uploaded into STORET, a national environmental database managed by the United States Environmental Protection Agency (USEPA). Data were also uploaded into PC STORET, a PC version of the mainframe STORET.

CTD data were processed using SEASOFT Software® designed specifically for the Sea-Bird Electronic's CTD outputs. CTD data, with the proper calibration coefficients applied, were bin-averaged (an interpolation process that averages sub-groups of data) using half-meter bins. Profiles of salinity and density were derived using values of temperature, conductivity, and pressure. Further details on WY 1992 CTD processing procedures can be found in the CTD Data Acquisition Software Manual (Sea-Bird Electronics, Inc., 1992).

Discrete CTD data points from 0.5-m, 10-m, and 30-m were entered into the AMS Database, and stored and processed with the nutrient, chlorophyll *a*, fecal coliform bacteria, and Secchi depth results. These discrete CTD values were also uploaded into PC STORET. Complete CTD profile data were archived in hard-copy and on computer diskettes for subsequent data analysis and retrieval.

Quality Assurance/Quality Control Procedures

Laboratory Sample Analysis

Table 2 lists the WY 1992 quality assurance/quality control (QA/QC) objectives for Ecology's marine water column program. These objectives were different from PSAMP QA objectives in the following cases:

1) Ecology's reporting limit for nitrite was 0.01 mg/L, whereas PSAMP requests 0.005 mg/L;
2) Ecology's reporting limit for orthophosphate was 0.01 mg/L, whereas PSAMP requests 0.002 mg/L; and
3) Ecology's precision [relative standard deviation (RSD)] target for chlorophyll *a* was 20 percent, whereas PSAMP requests RSDs within 10 percent.

All other target objectives met or exceeded those listed in the PSAMP document (MMC, 1988).

Nutrient samples were analyzed in batches. Each batch run included analysis of two blank samples, five known concentration standards (analyzed once before the batch run, and once after), and one spiked sample. Both field quality assurance (QA) samples for nutrient analysis were split at the laboratory for separate analysis. A select number of chlorophyll *a* samples were split during filtering (split samples) and sent to the laboratory as blind samples. Field blank chlorophyll *a* samples using distilled water were also filtered and sent to the laboratory as blind samples. Pre- and post-method blanks using acetone were analyzed with the fluorometer during each batch analysis. Additional QA procedures for laboratory analyses and equipment calibration are described in Janzen (1992) and in Ecology (1988). Data qualifiers for laboratory results are given with the station data reports in Appendix A.

CTD Calibration Procedures

CTD calibration procedures are described in detail in Janzen (1992), and in the Seacat CTD Operator's Manual (Sea-Bird Electronics, Inc., 1990). Discrete water samples for conductivity and D.O. analyses were collected during surveys as QA checks on the CTD conductivity and oxygen sensors. Water sample results did not meet the same accuracies as CTD measurements, and therefore did not allow for direct calibration corrections to be made to the CTD data. However, these values were used to verify that the sensors were performing to the needed precision (salinity and D.O. within 8 percent). If a significant discrepancy existed, the data were flagged as estimated values. Annual Northwest Regional Calibration Center (NRCC) calibrations and routine in-house calibrations were used for calibration coefficient calculation. These coefficients were computed to an acceptable accuracy and applied during data processing. The NRCC calibrations were conducted annually on the CTD temperature and conductivity sensors, and biennially on the CTD pressure sensor. In-house calibrations were conducted monthly on the D.O. and pH sensors, and on the light transmissometer.

Table 2. Marine water column quality assurance/quality control objectives.

Analytical Parameters	Ecology's Reporting Units	Ecology's Reporting Limit	Relative Standard Deviation (RSD)
Laboratory Sample Parameters:			
Ammonia	mg/L†	0.01	10%
Nitrite	mg/L	0.01	10%
Nitrite-Nitrate	mg/L	0.01	10%
Orthophosphate	mg/L	0.01	10%
Chlorophyll & phaeopigments	µg/L	0.05	20%
Fecal Coliform	#/100 mL	1	20%
Conductivity	µmhos/cm @ 25°C	1	8%
CTD Parameters:			
Conductivity/ Salinity	ppt	0.01	8%
Temperature	(°C)	0.1	5%
pH	pH units	0.1	0.1 pH unit
Dissolved Oxygen	mg/L	0.1	8%
Light Transmissivity	% Light	0.1	5%

† PSAMP units µg-at/L can be computed with the following equations: ((mg/L X 1000) ÷ 14.01) for nitrogen; ((mg/L X 1000) ÷ 30.97)) for phosphorus.

In-Field Quality Assurance/Quality Control Procedures

During WY 1992, one station per survey was selected for field replicate water sample collection. Replicate surface samples (three separate samples) were collected at these same stations each month in WY 1992 rather than selecting stations randomly prior to each survey (as in WY 1991). A station was selected from each survey where positive results (above detection limits) were expected. A better estimate of the variability in nutrient, chlorophyll *a*, and fecal coliform bacteria parameters can be attained this way rather than collecting replicate samples at different stations each month, some of which measure below detection limit concentrations (Lombard, pers. comm., 1990). The procedure entailed the collection of triplicate water samples using three separate surface (0.5-m) bottle casts at each selected QA station. The replicates were sent to the laboratory as blind samples and analyzed for the full suite of dissolved nutrients and chlorophyll *a* (plus phaeopigment). Duplicate surface grab samples (at 0.1-m) for fecal coliform bacteria analysis were also collected at these pre-selected QA stations.

RESULTS

A total of 42 weekly monitoring surveys (of the 48 scheduled) were conducted during WY 1992. Thirty-four (of 36) were conducted in Puget Sound and eight (of 12) were conducted in the coastal estuaries of Grays Harbor and Willapa Bay. Fog and inclement weather were the reasons for some surveys not being completed. Consequently, most coastal surveys were restricted to late spring through early fall months when visibility and wind conditions permitted.

Wateryear 1992 was marked by warm and mild climatological conditions as a result of a well established El Nino event. Early warming of air temperatures was observed, and rainfall was about 21 percent below the 30-year normal, resulting in subsequent reduced freshwater and river discharge into the surrounding marine waters (Ashby, pers. comm., 1993).

Station Data Reports for WY 1992

Individual station data reports for WY 1992 are presented in Appendix A. These reports include discrete sample results for all parameters collected at the 0.5-m, 10-m, and 30-m depths.

Monthly Temperature/Salinity/Density Profiles for WY 1992 Stations

Appendix B contains all the CTD temperature (°C), salinity (parts per thousand), and density (sigma-t) profiles for each station visited during WY 1992. Note that from October 1991 through May 1992, profiles were conducted to 30-m or less at all stations. Beginning in June 1992, profiles were conducted to the bottom of most stations.

Surface Water Temperatures During WY 1991 and 1992 in Puget Sound

Compared to WY 1991, surface water temperatures in Puget Sound during WY 1992 averaged about 2°C warmer during winter months (January - February), and about 1°C warmer during the spring and summer months (March - July). By late summer (August) in WY 1992, average surface temperatures in Puget Sound (all stations) were similar to those measured during WY 1991, and by September, were cooler by about 1°C.

Surface Water Temperatures During WY 1991 and 1992 in the Coastal Estuaries

In contrast to Puget Sound, the coastal stations showed cooler average surface water temperatures during WY 1992 than in WY 1991. In the winter months (December and February), Grays Harbor average surface water temperatures (all stations) were higher by 0.5 to 1°C in WY 1992 as compared to WY 1991. Data were not available for all winter months, thus this observation could not be confirmed. By summer, however, the WY 1992 average temperatures were lower by about 3°C in Grays Harbor, and by 0.5 to 1°C in Willapa Bay. This pattern of lower WY 1992 surface temperatures for the outer coastal estuaries was observed through September, and may have been a result of reduced freshwater discharge into the bays, which resulted in cooler, oceanic waters dominating the bay.

Monthly Dissolved Oxygen/Light Transmissivity Profiles for WY 1992 Stations

Appendix C contains all the CTD D.O. (mg/L) and light transmissometer (percent light transmittance) profile results for each station visited during WY 1992. Light transmissometer values represent instantaneous light transmission throughout the water column and can be used to evaluate water column turbidity due to algal blooms and sediment plumes. Note that light transmissometer results were not available for May at all stations, and for June at most of the central Puget Sound stations. The transmissometer was being repaired, and therefore was not measuring with the CTD during this period.

Low Dissolved Oxygen Observed During WY 1992

Oxygen concentrations appeared to fall within normal expected ranges for WY 1992, though at certain times, the water quality standard's minimum threshold value of 7.0 mg/L for Class AA and A marine waters was exceeded. It is not uncommon for D.O. concentrations of marine waters to drop below 7.0 mg/L during summer and fall months due to natural causes, such as inflow of oceanic waters, reduced mixing, and less freshwater precipitation and runoff. When oxygen values fall below the water quality standards due to natural causes, the reduction is not considered a violation. Dissolved oxygen values, wheter natural or not, become a concern when values show persistently low concentrations (typically below 5.0 mg/L). The ability of marine life to survive may be impaired where D.O. concentrations are below 5 mg/L, and when concentrations drop below 3.0 mg/L, fish kills may result. Furthermore, benthic organisms may be affected if the oxygen concentrations in the near bottom waters do not get replaced by higher oxygenated waters.

Stations sampled in both WY 1991 and WY 1992 that had oxygen concentrations below 5.0 mg/L in WY 1991 (Janzen and Eisner, 1993), showed similar oxygen conditions during WY 1992 (Table 3). Furthermore, the months the stations exceeded this value were practically the same between years. Station HCB004 (South Hood Canal), however, did not experience oxygen concentrations below 5.0 mg/L year-round during WY 1992 as observed during WY 1991. Station EAS001 (East Sound, Orcas Island) had oxygen concentrations that fell below 5.0 mg/L in WY 1992, but no values below 5.0 mg/L were reported in WY 1991. This was likely because the WY 1992 values below 5.0 mg/L were collected at depths greater than those sampled during WY 1991. Oxygen profiles at each station visited during WY 1992 are included in Appendix C.

Fecal Coliform Bacteria Results for WY 1992

Fecal coliform bacteria samples were collected at 20 of the 24 Puget Sound stations and six of the 10 coastal stations. Eleven stations had fecal counts above 14 organisms/100 mL during WY 1992 (Table 4 lists the three highest counts for the stations that exceeded 14 organisms/100 mL one or more times). As seen in previous wateryears, counts above 14 organisms/100 mL occurred typically during the winter and spring months for Puget Sound, and year-round for the coastal stations (Janzen, 1992b; Janzen and Eisner, 1993).

Many of the core stations that exceeded 14 organisms/100 mL in WY 1990 and WY 1991, also exceeded 14 organisms/100 mL in 1992 including:

PSS019	Possession Sound (1990, 1991, 1992)
CMB003	Commencement Bay (1990, 1991, 1992)
PSB003	Puget Sound Main Basin (1991, 1992)
BUD005	Outer Budd Inlet (1990, 1991, 1992)
OAK004	Oakland Bay (1990, 1991, 1992)
GYS004	Chehalis River (1990, 1991, 1992)
GYS008	South Channel, Grays Harbor (1990, 1991, 1992)
WPA001	Willapa River (1990, 1991, 1992).

Due to the drier weather in the winter of WY 1992, it is possible that the fecal coliform results above 14 organisms/100 mL were less frequent than seen in the winter results from previous years. As discussed in the QA assessment (Appendix D), the fecal coliform results should be interpreted with caution due to the variability in both the laboratory and the field duplicate results. The WY 1991 report (Janzen and Eisner, 1993) further discusses the cautions to be considered while interpreting the monthly fecal coliform results.

Nutrient Depletion Observed During WY 1992

Nutrient depletion [defined as nitrite-nitrate (NO_2-NO_3) concentrations less than 0.04 mg/L] can indicate utilization of nutrients by algal populations (see Janzen and Eisner, 1993). During WY 1992, 20 of the 24 stations sampled in Puget Sound and six of the 10 coastal

Table 3. Stations with low dissolved oxygen concentrations (below 5.0 mg/L) and the months of occurrence during WY 1992.

Station	Month	DO (mg/L) (Surface - Bottom)
Hood Canal		
HCB004	October	11.7 - 1.4
{Major declines	November	8.9 - 4.0
~ 10-m}	December	8.9 - 3.7
	January	9.7 - 4.0
	May	10.5 - 3.5
	June	9.0 - 1.9
	July	9.6 - 2.3
	August	8.7 - 1.8
	September	9.3 - 0.3*
HCB006	October	7.8 - 5.0
HCB007	October	11.6 - 0.4*
{Declines occurred	November	10.7 - 2.5
between 5 and 10	December	7.2 - 3.4
meters}	January	10.0 - 3.3
	February	17.2 - 4.7
	March	11.1 - 3.9
	April	11.2 - 3.3
	May	10.0 - 1.6
	June	9.3 - 1.9
	July	8.7 - 1.0
	August	8.5 - 0.9*
	September	8.7 - 0.0*
North Puget Sound		
EAS001	July	10.3 - 1.7
	August	9.1 - 4.9
SAR003	October	14.1 - 5.0
	September	8.8 - 5.0
PSS019	September	8.3 - 4.4

* Values at 1.0 mg/L or below can not be reported with confident accuracy (+/- 0.1 mg/L).

Table 4. WY 1992 water column stations that exceeded a fecal coliform bacteria count of 14 organisms/100 mL one or more times.

Station	Highest Count	2nd Highest Count	3rd Highest Count
North Sound			
GRG002	21 (07 JAN 92)	NA	NA
PSS019	21 (23 MAR 92)	16 (20 APR 92)	15 (02 DEC 91)
Central Sound			
CMB003	20 (17 MAR 92)	16 (28 OCT 91)	NA
PSB003	15 (17 MAR 92)	NA	NA
SIN001	260 (09 DEC 91)	44 (01 JUN 92)	28 (28 OCT 91)
POD006	39 (01 JUN 92)	NA	NA
South Sound			
BUD005	21 (26 DEC 91)	NA	NA
OAK004	19 (26 DEC 91)	17 (22 JAN 92)	NA
Coastal			
GYS004*	400 (24 AUG 92)	> 200 (27 JUL 92)	37 (04 MAY 92)
GYS008*	340 (04 MAY 92)	> 200 (27 JUL 92)	74 (10 FEB 92)
WPA001*	30 (10 FEB 92)	28 (04 MAY 92)	22 (08 JUN 92)

NA = Less than 14 organisms/100 mL

* = Had more than three fecal coliform bacteria measurements above 14 organisms/100 mL.

stations were sampled for nutrient concentrations. In Puget Sound, 17 of the 20 stations showed nutrient depletion during one or more of the site visits (Table 5). In the coastal estuaries, three of the six stations showed nutrient depletion during one or more of the site visits (Table 5). It appeared that the nutrient depletion at many of these stations occurred earlier during WY 1992 than observed during WY 1991. This may have been due to the early warming which induced earlier algal blooms, but with monthly data, it is difficult to determine exactly why such a pattern was observed. At two stations in Puget Sound, nutrient depletion was not observed during 1991 but was observed during 1992. These two stations, GRG002 in Georgia Strait and DNA001 in Dana Passage, typically do not experience nutrient depletion as a result of vigorous mixing and flushing. Perhaps due to less freshwater discharge and calmer weather, the water column became more stable than seen during typical years at these two stations, allowing algal populations to flourish long enough to deplete the nutrients in the surface waters.

Quality Assurance/Quality Control

Quality assurance/quality control results for WY 1992 are presented in Appendix D. A summary of the laboratory and field QA/QC results is provided in Table 6. Nitrite-nitrate results near detection limit concentrations (0.01 to 0.10 mg/L) were notably less precise than results greater than 0.10 mg/L. The RSD objective (10 percent) was not met for 33 percent of the nitrite-nitrate laboratory duplicate results ranging between 0.01 to 0.10 mg/L.

Chlorophyll *a* showed the best precision for concentrations above 1.0 μg/L in both laboratory and field replicates. Values approaching detection limits of 0.5 μg/L showed slightly less precision (Table 5).

The RSD values for fecal coliform bacteria results from both laboratory splits and field replicates indicated poor precision. The majority (67 percent) of both the laboratory splits and field replicates measured below 2 organisms/100 mL, thus small deviations in counts (*i.e.*, 1 versus 2 organisms/100 mL) amongst sets of splits and replicates resulted in poor RSD values. Plots illustrating all the laboratory and field RSD results are included in Appendix D.

Table 5. WY 1992 stations, some of which were sampled during WY 1991, that showed nutrient depletion (NO_2-NO_3 concentrations below 0.04 mg/L). C = core stations; R = rotating stations; F = floating stations

Station		Month Depleted	Wateryears		Depth of Depletion (m)
			WY 1991	WY 1992	(WY 1992 only)
North Sound					
BLL009	C	October		X	0
		May		X	0, 10
		June	X	X	0
		July	X	X	0
		August	X	X	0
		September	X		
GRG002	C	June		X	0, 10
		July		X	0
PSS019	C	October		X	0
		April	X		
		May	X	X	0
		June	X	X	0
		July	X	X	0
		August	X	X	0
		September	X		
PTH005	C	June	NS	X	0
		August	NS	X	0
SAR003	C	October		X	0
		April	X		
		May	X	X	0
		June	X	X	0
		July	X	X	0
		August	X	X	0
		September	X		
Central Sound					
CMB003	C	March		X	0, 22
		May	X		
		June		X	0

NS=Not Sampled

Table 5. Continued.

Station		Month Depleted	Wateryears WY 1991	Wateryears WY 1992	Depth of Depletion (m) (WY 1992 only)
DYE004	R	May	NS	X	0
		June	NS	X	0
		August	NS	X	0, 10
		September	NS	X	0, 10
PMA001	R	August	NS	X	0
POD006	R	June	NS	X	0
		August	NS	X	0, 10
		September	NS	X	0, 10
PSB003	C	June		X	0
		July	X		
QMH001	R	April	NS	X	0
		June	NS	X	0, 10
		July	NS	X	0
		August	NS	X	0
SIN001	C	August	NS	X	0
		September	NS	X	0
South Sound					
BUD005	C	April		X	0
		May	X	X	0
		June	X	X	0
		July	X	X	0, 10
		August	X	X	0, 10
		September	X		
DNA001	C	August		X	0
OAK004	C	April		X	0, 5
		May	X	X	0
		June	X	X	0, 4
		July	X	X	0, 10
		August	X	X	0, 6
		September		X	0, 9

NS = Not Sampled

Table 5. Continued.

Station		Month Depleted	Wateryears WY 1991	WY 1992	Depth of Depletion (m) (WY 1992 only)
Hood Canal					
HCB004	C	October	NS	X	0
		February		X	0
		March	X	X	0
		April		X	0
		May	X	X	0, 10
		June	X	X	0
		July	X	X	0, 10
		August	X	X	0, 10
		September	X	X	0
HCB006	C	October		X	0
		February		X	0
		March	X		
		April	X		0
		May	X	X	0
		July	X		
		August	X		
Coastal					
GYS016	C	August		X	0
WPA001	C	June	X	X	0
WPA004	C	March	X	X	0, 10
		April	X	NS	
		May		X	0, 10
		June	X	X	0, 10
		July	X	X	0
		August		X	0, 10
		September		X	0, 10
WPA006	C	March	NS	X	0, 10
		April	NS	NS	
		May	NS	X	0, 10
		June	NS	X	0, 10
		July	NS	NS	
		August	NS	X	0, 10
		September	NS	NS	

NS = Not Sampled

Table 6. Relative standard deviation (RSDs) for each laboratory analyzed parameter for a) laboratory split samples (duplicate), and b) field replicate samples (three distinct samples) during WY 1992.

a. Laboratory Split Samples

Parameters	Percent Results w/Acceptable Precision
Fecal Coliform Bacteria	54% had RSDs < 20% error
Results less than 2 organisms/100 mL	56% had RSDs < 20% error
Results greater than 2 organisms/100 mL	50% had RSDs < 20% error
Orthophosphate	79% had RSDs < 10% error
Ammonia	81% had RSDs < 10% error
Nitrite-Nitrate	89% had RSDs < 10% error
Results 0.01-0.10 mg/L	67% had RSDs < 10% error
Results greater than 0.10 mg/L	95% had RSDs < 10% error
Chlorophyll *a*	95% had RSDs < 20% error
Results 0.05-1.0 μg/L	92% had RSDs < 20% error
Results greater than 1.0 μg/L	100% had RSDs < 20% error

b. Field Replicate Samples

Parameters	Percent Results w/Acceptable Precision
Fecal Coliform Bacteria	58% had RSDs < 20% error
Results less than 2 organisms/100 mL	73% had RSDs < 20% error
Results greater than 2 organisms/100 mL	27% had RSDs < 20% error
Orthophosphate	82% had RSDs < 10% error
Ammonia	67% had RSDs < 10% error
Nitrite-Nitrate	77% had RSDs < 10% error
Results 0.01-0.10 mg/L	0% had RSDs < 10% error *
Results greater than 0.10 mg/L	97% had RSDs < 10% error
Chlorophyll *a*	71% had RSDs < 20% error
Results 0.05-1.0 μg/L	63% had RSDs < 20% error
Results greater than 1.0 μg/L	100% had RSDs < 20% error

* All of the nitrite-nitrate results ranging from 0.01-0.10 mg/L had RSDs between 10-20% error.

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APPENDIX A

WY 1992 Marine Water Column Data Reports

ADM002
ADMIRALTY INLET NEAR PROTECTION ISLAND
48 11 15.0 122 50 30.0 2F000 Elev= 0 ft
53031 Washington Jefferson Co. PACIFIC NORTHWEST
PUGET SOUND (Quilcene/Snow-17) 131117
21540000 Reach=17110019 0.000 Drg= 0 sqmi
AMBNT/OCEAN/RMP

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/14	1110	000	10.5	6.6	72.8	7.7	75.7	1K	9.5	30.78	0.275	0.010K
	1120	010	10.4	6.6	72.1	7.7	81.9			30.90	0.290	0.010K
	1130	030	9.8	5.9	63.6	7.7	82.8			31.46	0.329	0.010K
91/12/02	1030	000	8.9	8.2	86.2	7.7	82.0	1	8.4	30.42	0.367	0.010K
	1040	010	8.8	8.1	84.9	7.7	81.0			30.47	0.369	0.010K
	1050	030	8.8	7.8	81.8	7.7	81.4			30.90	0.364	0.010K
92/01/07	1120	000	8.2	7.7	80.1	7.6	79.8	1	6.5	30.69	0.357	0.010K
	1130	010	8.2	7.6	79.6	7.6	79.3			30.75	0.355	0.010K
	1140	030	8.1	7.6	79.3	7.6	80.2			30.96	0.351	0.010K
92/03/23	1125	000	9.1	7.9	83.8	7.7	77.5	1K	6.5	30.47	0.232	0.010K
	1135	010	9.1	7.9	83.9	7.7	77.3			30.47	0.232	0.010K
	1145	023	9.1	7.9	84.1	7.8	77.1			30.48	0.234	0.010K
92/04/20	1350	000	9.8	8.3	89.4	7.8	79.2	1K	7.0	30.60	0.227	0.010K
	1355	010	9.6	8.2	87.7	7.8	78.2			30.75	0.228	0.010K
	1400	023	9.6	8.0	86.1	7.8	79.8			30.91	0.237	0.010K
92/05/27	1120	000	11.3	9.2	102.1	8.0		1K	7.4	30.28	0.166	
	1125	010	10.7	8.6	95.1	7.9				30.62	0.196	
	1130	022	10.8	8.5	93.7	7.9				30.85	0.204	
92/06/22	1110	000	12.5	7.8	88.4	7.8	77.2	1K	8.8	30.00	0.224	
	1120	010	10.8	7.2	79.5	7.8	77.0			30.56	0.248	
	1130	030	10.1	6.7	72.6	7.7	78.9			31.52	0.278	
92/07/28	1055	000	11.1	7.6	84.9	7.8	68.1	1	10.0	31.17	0.260	
	1100	010	10.8	7.3	80.8	7.8	78.7			31.28	0.263	
	1105	030	10.1	6.6	72.7	7.7	78.6			31.75	0.295	
92/08/17	1110	000	11.6	7.0	78.5	8.0	55.3	1K		31.03	0.242	
	1115	010	11.5	6.9	77.3	7.9	79.6			31.05	0.244	
	1120	030	10.6	6.1	67.9	7.9	81.0			31.58	0.258	
92/09/28	1115	000	10.8	6.0	66.8	7.7	81.7	1K	8.1	31.46	0.331	
	1125	010	10.6	5.9	65.2	7.7	79.8			31.54	0.266	
	1135	030	10.3	5.7	62.4	7.7	80.1			31.70	0.247	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/14	1110	000	0.017	0.065	426253	2.21	0.47
	1120	010	0.017	0.066	426254	1.67	0.62
	1130	030	0.014	0.070	426255	1.48	0.45
91/12/02	1030	000	0.010K	0.071	496253	0.18	0.16
	1040	010	0.010K	0.069	496254	0.15	0.12
	1050	030	0.010K	0.071	496255	0.15	0.19
92/01/07	1120	000	0.010K	0.074	26253	0.20	0.19
	1130	010	0.010K	0.076	26254	0.16	0.23
	1140	030	0.010K	0.074	26255	0.16	0.19
92/03/23	1125	000	0.010K	0.061	136253	0.48	0.29
	1135	010	0.010K	0.060	136254	0.52	0.44
	1145	023	0.010K	0.061	136255	0.59	0.39
92/04/20	1350	000	0.020	0.055	176253	0.68	0.27
	1355	010	0.018	0.054	176254	0.55	0.34
	1400	023	0.022	0.055	176255	0.65	0.39
92/05/27	1120	000	0.010K	0.036	226253	5.90	1.10
	1125	010	0.010K	0.040	226254	5.40	0.68
	1130	022	0.010K	0.046	226255		
92/06/22	1110	000	0.012	0.048	266253		
	1120	010	0.026	0.052	266254		
	1130	030	0.019	0.060	266255		
92/07/28	1055	000	0.019	0.057	316253	1.34J	1.19J
	1100	010	0.018	0.056	316254	2.90J	1.50J
	1105	030	0.018	0.061	316255		
92/08/17	1110	000	0.010K	0.055	346253	2.57J	0.76J
	1115	010	0.010K	0.054	346254	1.78J	1.11J
	1120	030	0.010K	0.056	346255		
92/09/28	1115	000	0.014	0.070	406253	0.86J	0.52J
	1125	010	0.012	0.058	406254	0.48J	0.95J
	1135	030	0.012	0.053	406255		

BLL009
BELLINGHAM BAY NR POINT FRANCES
48 41 10.0 122 35 54.0 1F 0 Elev= 0 ft
53073 Washington Whatcom Co. PACIFIC NORTHWEST
PUGET SOUND (Nooksack-01) 131101
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/14	1420	000	12.4	13.3	148.7	8.4	58.6	1K	2.5	27.83	0.010K	0.010K
	1430	010	10.7	7.5	81.7	7.9	77.3			30.11	0.178	0.010K
91/12/02	1235	000	8.0	8.9	91.5	7.7	61.6	2	3.0	28.80	0.389	0.010K
	1245	010	8.3	8.6	89.4	7.7	73.3			29.55	0.384	0.010K
92/01/07	1310	000	7.4	8.6	87.0	7.6	70.3	1K	4.4	29.57	0.374	0.010K
	1320	010	7.8	8.2	84.2	7.6	72.1			30.11	0.370	0.010K
92/03/23	1450	000	10.6	11.1	120.2	8.1	58.6	1K	3.5	28.75	0.049	0.010K
	1500	010	9.1	9.2	96.5	7.9	68.0			29.56	0.208	0.010K
92/04/20	1310	000	10.1	8.7	94.2	7.9	70.3	1K	2.5	29.60	0.161	0.010K
	1320	010	9.8	8.6	91.9	7.9	69.2			29.75	0.198	0.010K
92/05/27	1330	000	13.9	12.2	141.4	8.4		1K	3.5	28.72	0.010K	
	1335	010	11.8	9.6	107.7	8.1				29.21	0.010K	
92/06/22	1445	000	17.0	12.0	143.8	8.4	44.3	1K	3.5	23.19	0.010K	0.010K
	1455	010	13.1	10.1	116.0	8.2	58.2			28.49	0.077	0.010K
92/07/28	1410	000	16.9	10.8	132.4	8.3	74.9	1K	6.4	27.53	0.011	0.010K
	1415	010	12.6	8.1	92.0	8.0	68.2			29.31	0.166	0.010K
92/08/17	1240	000	17.0	10.1	123.5	8.4	78.6	1K		27.02	0.019	0.010K
	1245	010	14.4	9.1	106.6	8.2	78.8			28.78	0.080	0.010K
92/09/28	1510	000	14.0	8.2	90.8	8.0	40.5	6	2.5	20.40	0.174	
	1520	010	11.4	6.6	73.8	7.8	73.9			30.20	0.208	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/14	1420	000	0.010K	0.023	426259	16.30	1.79
	1430	010	0.016	0.053	426260	14.05	0.05K
91/12/02	1235	000	0.033	0.066	496259	0.41	0.18
	1245	010	0.026	0.070	496260	0.20	0.28
92/01/07	1310	000	0.012	0.074	26259	0.25	0.22
	1320	010	0.010K	0.074	26260	0.21	0.25
92/03/23	1450	000	0.014	0.014	136259	6.60	1.30
	1500	010	0.015	0.051	136260	1.50	0.48
92/04/20	1310	000	0.032	0.030	176259	0.97	0.27
	1320	010	0.028	0.047	176260	2.10	0.73
92/05/27	1330	000	0.010K	0.010K	226259	8.90	1.00

MORE DATES NEXT PAGE

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
92/05/27	1335	010	0.010K	0.010K	226260	10.70	1.70
92/06/22	1445	000	0.010K	0.010	266259		
	1455	010	0.010	0.030	266260		
92/07/28	1410	000	0.021	0.024	316259	2.66J	0.69J
	1415	010	0.034	0.047	316260	2.56J	1.84J
92/08/17	1240	000	0.012	0.022	346259	2.73J	0.51J
	1245	010	0.029	0.034	346260	1.66J	0.71J
92/09/28	1510	000	0.034	0.030	406259	0.52J	0.15J
	1520	010	0.021	0.051	406260	3.45J	1.31J

BUD005
BUDD INLET-OLYMPIA SHOAL AT HORN
47 05 32.0 122 55 01.0 2F 0 Elev= 0 ft
53067 Washington Thurston Co. PACIFIC NORTHWEST
PUGET SOUND (Deschutes-13) 131113
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/07	1315	000	15.0	6.9	82.4	7.8	75.3	1K	4.6	28.64	0.085	0.010
	1320	009	14.1	6.2	73.2	7.8	72.5			29.59	0.142	0.010K
91/11/25	1000	000	10.8	7.9	86.2	7.6	71.3		5.0	28.30	0.293	0.011
	1010	010	10.8	7.6	83.5	7.7	75.4			29.39	0.301	0.010K
91/12/26	1400	000	8.7	8.1	83.2	7.6	75.3	21	6.5	27.64	0.336	0.014
	1410	010	9.3	7.6	80.3	7.6	75.4			29.20	0.322	0.010K
92/01/22	0945	000	8.3	8.7	89.8	7.6	77.5	2	6.0	28.63	0.389	0.010K
	0955	010	8.6	8.2	85.2	7.6	73.1			29.07	0.390	0.010K
92/02/25	1530	000	11.1	9.4	98.3	7.6	53.6		3.0	20.71	0.488	0.010K
	1535	008	8.7	8.0	83.3	7.6	74.3			28.25		
92/02/27	1605	000	11.4	9.1	95.6	7.6	55.4		6.0	20.35	0.419	0.014
	1610	010	8.7	7.9	81.8	7.5	69.2			28.22	0.368	0.010K
92/03/17	1355	000	9.8	10.3	109.3	7.8	71.4		5.0	27.98	0.208	0.010
	1400	010	9.2	7.8	82.4	7.6	64.3			28.23	0.290	0.012
92/03/18	1340	000	10.8	12.6	135.5	8.0	61.1	1	3.8	26.72	0.131	0.012
	1350	010	9.2	8.0	83.7	7.6	63.1			28.23	0.289	0.010K
92/04/14	1345	000	12.0	17.3	191.6	8.3	63.0	1K	4.5	27.34	0.010K	0.010K
	1355	010	10.0	10.4	110.5	8.0	63.7			28.39	0.156	0.010K
92/05/18	0925	000	17.1	16.4	201.4	8.6		1K	4.0	26.56	0.010K	
	0935	010	11.8	9.3	103.6	8.0				28.56	0.085	
92/06/15	1520	000	18.3	11.3	143.6	8.3	56.8	1K	4.0	28.33	0.010K	
	1530	010	13.5	8.6	99.7	8.0	71.6			28.92	0.089	
92/07/14	1500	000	17.8	10.5	132.0	8.1	77.3	1	4.9	27.84	0.010K	
	1505	008	14.7	7.6	90.3	7.9	44.6			29.18	0.010K	
92/08/10	1545	000	19.1	14.1	181.3	8.6	69.5	1K	3.0	28.70	0.010K	0.010K
	1550	010	15.4	7.3	88.4	8.1	68.6			29.47	0.010K	0.010K
92/09/14	1500	000	15.6	8.7	105.0	8.0	70.3	1	5.5	29.58	0.072	0.010K
	1505	010	15.1	6.9	83.5	8.0	73.1			29.83	0.108	0.010K

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4-N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/07	1315	000	0.191	0.108	416314	5.66	0.08
	1320	009	0.101	0.079	416315	1.56	0.60
91/11/25	1000	000	0.072	0.072	486314		
	1010	010	0.039	0.070	486315		
91/12/26	1400	000	0.082	0.089	526314	1.60	0.42
	1410	010	0.014	0.082	526315	0.54	0.15
92/01/22	0945	000	0.034	0.087	46314	0.88	0.24
	0955	010	0.014	0.085	46315	0.89	0.24
92/02/25	1530	000	0.060	0.058	96314		
92/02/27	1605	000	0.077	0.073	96318	1.50	0.21
	1610	010	0.027	0.083	96319	0.95	0.56
92/03/17	1355	000	0.011	0.059	126341		
	1400	010	0.036	0.080	126342		
92/03/18	1340	000	0.019	0.042	126314	10.20	4.60
	1350	010	0.032	0.075	126315	6.60	2.00
92/04/14	1345	000	0.010K	0.010K	166314	7.40	0.05K
	1355	010	0.072	0.050	166315	12.50	0.54
92/05/18	0925	000	0.010K	0.010K	216314	2.60	0.16
	0935	010	0.036	0.049	216315	13.10	0.10
92/06/15	1520	000	0.010K	0.040	256314	4.70	0.47
	1530	010	0.188	0.072	256315	8.90	0.39
92/07/14	1500	000	0.010K	0.052	296314	1.35J	0.30J
	1505	008	0.022	0.059	296315	9.80J	0.49J
92/08/10	1545	000	0.010K	0.039	336314	1.49J	0.56J
	1550	010	0.018	0.058	336315	18.94J	5.52J
92/09/14	1500	000	0.039	0.091	386314	7.17J	1.60J
	1505	010	0.085	0.082	386315	4.89J	1.22J

CMB003
COMMENCEMENT BAY
47 17 26.0 122 26 56.0 2F 0 Elev= 0 ft
53053 Washington Pierce Co. PACIFIC NORTHWEST
PUGET SOUND (Puyallup/White-10) 131110
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/28	1400	000	11.0	7.8	84.9	7.8	70.1	16	6.0	28.42	0.224	0.010K
	1410	010	11.7	7.2	80.6	7.9	82.7			30.22	0.210	0.010K
	1420	029	11.6	6.7	75.5	7.8	82.6			30.39	0.232	0.010K
91/11/21	1410	000	10.3	7.6	82.2	7.7	65.5		5.0	28.72	0.340	0.010K
	1420	010	10.6	6.7	73.5	7.7	79.2			30.37	0.339	0.010K
	1430	030	10.5	6.5	71.4	7.7	80.2			30.56	0.339	0.010K
91/12/09	1315	000	9.1	9.2	92.0	7.7	50.1	8	2.5	21.04	0.348	0.010K
	1320	010	10.2	7.3	78.7	7.7	82.3			30.08	0.336	0.010K
	1325	030	10.3	7.0	76.2	7.7	83.2			30.28	0.335	0.010K
92/01/13	1425	000	8.9	7.8	80.7	7.6	77.2	3	7.5	27.73	0.357	0.010K
	1435	010	9.2	7.6	80.2	7.6	83.2			29.87	0.340	0.010K
	1445	030	9.2	7.4	78.6	7.6	83.2			30.00	0.339	0.010K
92/02/25	1450	000	9.5	7.5	77.5	7.6	66.7	1	7.5	24.79	0.394	0.010K
	1500	010	8.6	8.5	88.1	7.6	86.4			29.01	0.378	0.010K
	1510	021	8.6	8.4	87.4	7.6	86.7			29.21	0.375	0.010K
92/03/17	1310	000	9.3	8.6	89.4	7.6	75.7	20	10.0	26.60	0.010K	0.010K
	1320	010	9.0	8.4	88.3	7.6	87.5			28.78	0.313	0.010K
	1330	022	8.9	8.3	87.0	7.6	88.3			28.99	0.010K	0.010K
92/04/08	1430	000	9.8	9.0	94.4	7.7	67.2	3	8.5	26.19	0.340	0.010K
	1440	010	9.4	8.9	94.5	7.8	81.2			29.02		
	1450	030	9.1	8.3	87.4	7.8	82.1			29.20		
92/05/11	1500	000	11.5	10.3	112.8	8.0		1K	11.5	27.10	0.190	
	1510	010	10.7	10.1	110.1	8.0				29.15	0.203	
	1520	022	10.3	9.2	99.5	7.9				29.27	0.256	
92/06/01	1325	000	14.5					1	3.1	26.58	0.010K	
	1330	010	12.0							28.66	0.101	
	1335	030	11.0							28.80	0.180	
92/07/06	1530	000	15.5	10.1	111.5	8.1	6.4		1.7	14.76	0.184	0.010K
	1535	010	12.5	8.7	99.2	8.0	83.7			29.53	0.160	0.010K
	1540	030	12.2	8.4	94.8	8.0	85.5			29.67	0.190	0.010K
92/08/04	1510	000	14.9	9.7	113.8	8.0	57.5	1	3.0	27.22	0.157	0.010K
	1515	010	13.1	7.8	89.4	7.9	85.8			29.82	0.215	0.010K
	1535	030	12.9	7.4	85.4	7.9	87.0			29.94	0.224	0.010K
92/09/15	1445	000	14.1	7.7	90.1	7.9	66.8	1K	7.5	28.97	0.330	0.010K
	1450	010	13.3	6.5	75.6	7.9	82.4			30.14	0.247	0.010K
	1505	030	13.2	6.3	72.8	7.8	87.9			30.34	0.269	0.010K

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/28	1400	000	0.062	0.060	446336	1.50	0.36
	1410	010	0.013	0.062	446337	3.10	0.34
	1420	029	0.010K	0.064	446338	2.40	0.39
91/11/21	1410	000	0.010K	0.069	476336	0.29	0.16
	1420	010	0.010K	0.072	476337	0.18	0.11
	1430	030	0.010K	0.072	476338	0.18	0.11
91/12/09	1315	000	0.013	0.056	506336	0.25	0.15
	1320	010	0.010K	0.075	506337	0.15	0.05
	1325	030	0.010K	0.076	506338	0.08	0.05
92/01/13	1425	000	0.039	0.071	36336	0.28	0.11
	1435	010	0.010K	0.076	36337	0.20	0.08
	1445	030	0.010K	0.077	36338	0.12	0.10
92/02/25	1450	000	0.023	0.065	96336	0.78	0.22
	1500	010	0.015	0.083	96337	0.35	0.13
	1510	021	0.010K	0.083	96338		
92/03/17	1310	000	0.014	0.073	126336	0.78	0.27
	1320	010	0.021	0.074	126337	0.36	0.09
	1330	022	0.025	0.075	126338	0.11	0.06
92/04/08	1430	000	0.034	0.051	156336	0.75	0.10
92/05/11	1500	000	0.032	0.046	206336	1.40	0.29
	1510	010	0.035	0.051	206337	2.50	0.87
	1520	022	0.025	0.051	206338		
92/06/01	1325	000	0.010K	0.010K	236336	10.50	2.10
	1330	010	0.024	0.033	236337	12.50	1.60
	1335	030	0.023	0.047	236338		
92/07/06	1530	000	0.026	0.039	286336	4.91J	1.38J
	1535	010	0.059	0.049	286337	2.87J	0.67J
	1540	030	0.042	0.053	286338		
92/08/04	1510	000	0.012	0.050	326336	1.96J	0.55J
	1515	010	0.018	0.059	326337	1.82J	0.55J
	1535	030	0.010K	0.060	326338		
92/09/15	1445	000	0.098	0.080	386336	2.79J	0.15J
	1450	010	0.034	0.056	386337	1.49J	0.41J
	1505	030	0.027	0.059	386338		

DNA001
DANA PASSAGE NEAR BRISCO POINT
47 09 42.0 122 52 14.0 1F 0 Elev= 0 ft
53067 Washington Thurston Co. PACIFIC NORTHWEST
PUGET SOUND (Deschutes-13) 131113
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/07	1215	000	13.9	7.2	84.3	7.9	73.7	1K	5.3	29.59	0.155	0.010K
	1220	010	13.9	7.2	84.0	7.9	73.4			29.60	0.159	0.010K
	1225	029	13.8	7.1	83.2	7.9	73.5			29.61	0.159	0.010K
91/11/25	1115	000	10.8	7.6	82.8	7.7	74.5		5.0	29.49	0.308	0.010K
	1130	010	10.8	7.5	82.1	7.7	74.4			29.52	0.312	0.010K
	1140	030	10.8	7.4	81.0	7.7	73.6			29.62	0.307	0.010K
91/12/26	1250	000	9.3	7.7	81.6	7.6	73.4	2	5.1	29.20	0.316	0.010K
	1300	010	9.4	7.6	81.0	7.6	72.6			29.32	0.321	0.010K
	1310	030	9.4	7.6	80.3	7.6	72.0			29.33	0.319	0.010K
92/01/22	1045	000	8.6	8.2	85.0	7.6	71.8	1	4.9	29.19	0.378	0.010K
	1055	010	8.7	8.1	84.1	7.6	71.1			29.23	0.381	0.010K
	1105	030	8.6	8.0	83.5	7.6	71.5			29.19	0.380	0.010K
92/02/27	1510	000	9.6	8.5	89.5	7.6	77.5		6.5	27.26	0.372	0.010K
	1515	010	8.8	8.3	86.2	7.5	78.5			28.32	0.372	0.010K
	1520	022	8.8	8.3	85.8	7.5	78.7			28.45	0.375	0.010K
92/03/18	1235	000	9.5	9.2	96.8	7.7	72.7	1K	5.7	28.11	0.255	0.010K
	1245	010	9.4	9.1	95.8	7.7	72.9			28.16	0.259	0.010K
	1255	023	9.2	8.8	92.4	7.7	73.8			28.34	0.282	0.010K
92/04/14	1240	000	10.2	10.5	113.1	8.0	78.9	1K	7.0	28.37	0.165	0.010K
	1250	010	10.1	10.5	112.0	8.0	81.9			28.50	0.176	0.010K
	1300	022	9.7	9.6	102.6	7.9	77.7			28.67	0.209	0.010K
92/05/18	1015	000						1K	5.5		0.100	
	1025	010									0.102	
	1035	030									0.083	
92/06/15	1400	000	13.8	9.8	114.3	8.1	75.3	1K	7.5	28.89	0.091	
	1410	010	13.7	10.0	116.5	8.1	73.4			28.90	0.090	
	1420	030	13.7	10.0	116.2	8.1	71.6			28.91	0.086	
92/07/14	1340	000	15.6	10.1	121.4	8.2	74.5	2	8.2	29.06	0.062	
	1345	010	15.1	9.5	113.7	8.1	75.4			29.13	0.075	
	1350	030	13.9	8.6	100.4	8.0	74.5			29.35	0.126	
92/08/10	1420	000	17.0	15.4	191.1	8.7	61.5	1K	6.9	29.35	0.010K	
	1425	010	15.0	9.7	115.8	8.2	75.4			29.57	0.041	
	1430	030	14.2	8.0	94.2	8.1	74.3			29.70	0.112	
92/09/14	1350	000	14.9	8.1	97.6	8.0	72.4	1K	6.0	29.83	0.090	
	1355	010	14.9	8.1	96.7	8.0	72.4			29.83	0.090	
	1400	028	14.9	7.9	95.0	8.0	72.9			29.84	0.123	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/07	1215	000	0.029	0.070	416308	5.39	0.47
	1220	010	0.034	0.069	416309	3.68	0.76
	1225	029	0.039	0.068	416310	4.71	0.54
91/11/25	1115	000	0.029	0.071	486308		
	1130	010	0.025	0.062	486309		
	1140	030	0.025	0.070	486310		
91/12/26	1250	000	0.013	0.080	526308	0.52	0.14
	1300	010	0.012	0.081	526309	0.45	0.38
	1310	030	0.010K	0.081	526310	0.52	0.36
92/01/22	1045	000	0.010K	0.084	46308	0.61	0.28
	1055	010	0.010K	0.085	46309	0.53	0.34
	1105	030	0.010K	0.085	46310	0.57	0.42
92/02/27	1510	000	0.021	0.078	96308	1.10	0.19
	1515	010	0.010K	0.082	96309	0.69	0.25
	1520	022	0.010K	0.082	96310		
92/03/18	1235	000	0.013	0.067	126308	5.90	0.05K
	1245	010	0.011	0.068	126309	5.20	0.50
	1255	023	0.013	0.072	126310	3.60	0.20
92/04/14	1240	000	0.028	0.046	166308	4.10	0.66
	1250	010	0.027	0.047	166309	3.80	0.28
	1300	022	0.034	0.052	166310	3.70	0.33
92/05/18	1015	000	0.021	0.034	216308	9.40	0.17
	1025	010	0.020	0.035	216309	10.60	0.42
	1035	030	0.017	0.029	216310		
92/06/15	1400	000	0.031	0.051	256308	5.70	1.20
	1410	010	0.030	0.050	256309	8.00	0.64
	1420	030	0.028	0.050	256310		
92/07/14	1340	000	0.026	0.053	296308	5.97J	0.80J
	1345	010	0.039	0.054	296309	7.11J	1.07J
	1350	030	0.057	0.056	296310		
92/08/10	1420	000	0.010K	0.063	336308	47.37J	1.60J
	1425	010	0.010K	0.030	336309	5.30J	0.94J
	1430	030	0.029	0.049	336310		
92/09/14	1350	000	0.011	0.047	386308	8.09J	1.19J
	1355	010	0.010	0.041	386309	6.30J	1.92J
	1400	028	0.013	0.057	386310		

DYE004
DYES INLET NORTHEAST OF CHICO BAY
47 37 21.0 122 41 18.0 2F000 Elev= 0 ft
53035 Washington Kitsap Co. PACIFIC NORTHWEST
PUGET SOUND (Kitsap-15) 131115
21540000 Reach=17110019000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/28	1025	000	11.7	7.5	84.5	7.9	75.0	1K	4.9	30.07	0.155	0.010K
	1035	010	11.7	7.4	83.4	7.9	71.5			30.09	0.153	0.010K
91/11/21	1050	000	10.3	8.2	88.1	7.7	72.4		5.0	29.13	0.320	0.010K
	1100	010	10.5	7.7	83.8	7.7	72.9			29.66	0.315	0.010K
91/12/09	1025	000	9.5	8.3	88.3	7.7	75.7	5	5.5	29.39	0.332	0.010K
	1030	010	9.8	7.9	84.3	7.7	73.5			29.64	0.339	0.010K
92/01/13	1045	000	7.4	8.9	90.1	7.6	79.4	1K	8.3	28.50	0.355	0.010K
	1055	010	8.5	8.0	83.5	7.6	79.7			29.42	0.351	0.010K
92/02/25	1050	000	9.2	9.1	94.2	7.6	74.6	2	6.0	25.42	0.464	0.010K
	1100	010	8.6	8.4	87.2	7.6	80.6			28.26	0.373	0.010K
92/03/17	1015	000	10.1	8.8	94.4	7.7	72.0	1	5.3	28.05	0.269	0.010
	1025	010	9.7	8.4	88.8	7.6	74.6			28.34	0.282	0.011
92/04/08	1020	000	10.3	9.8	105.9	7.9	76.2	1K	7.5	28.56	0.284	0.010K
	1030	010	10.3	9.2	98.8	7.8	77.9			28.76	0.308	0.010K
92/05/11	1040	000	13.1	10.5	119.8	8.2		1K	10.3	28.75	0.038	
	1050	010	12.4	10.1	114.1	8.1				28.95	0.080	
92/06/01	1040	000	14.7	8.6	102.5	8.2		1K	4.0	29.14	0.023	
	1045	010	14.0	10.4	121.6	8.1				29.42	0.049	
92/07/06	1050	000	15.1	8.4	100.8	8.0	77.4		8.3	29.31	0.112	
	1055	010	15.0	8.3	99.4	8.0	76.6			29.33	0.108	
92/08/04	1045	000	16.7	13.0	161.2	8.4	71.9	1	5.0	29.62	0.010K	
	1050	010	15.8	11.7	142.5	8.2	66.9			29.68	0.010K	
92/09/15	1020	000	15.2	10.1	121.1	8.2	81.6	1K	8.5	30.02	0.010K	
	1025	010	14.9	9.1	109.4	8.1	80.6			30.06	0.041	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/28	1025	000	0.050	0.066	446322	1.40	1.20
	1035	010	0.049	0.065	446323	0.80	1.80
91/11/21	1050	000	0.042	0.070	476322	0.75	0.29
	1100	010	0.040	0.073	476323	0.68	0.47
91/12/09	1025	000	0.029	0.083	506322	0.73	0.24
	1030	010	0.025	0.081	506323	0.52	0.35
92/01/13	1045	000	0.022	0.078	36322	0.64	0.26
	1055	010	0.025	0.084	36323	0.53	0.29
92/02/25	1050	000	0.027	0.059	96322	0.77	0.15
	1100	010	0.025	0.082	96323	0.46	0.25

MORE DATES NEXT PAGE

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
92/03/17	1015	000	0.016	0.068	126322	2.60	0.74
	1025	010	0.030	0.074	126323	1.70	0.66
92/04/08	1020	000	0.019	0.063	156322	3.20	0.05
	1030	010	0.029	0.068	156323	2.90	0.13
92/05/11	1040	000	0.036	0.031	206322	1.10	0.06
	1050	010	0.050	0.038	206323	0.78	0.27
92/06/01	1040	000	0.015	0.029	236322	5.60	0.05K
	1045	010	0.047	0.041	236323	4.60	0.62
92/07/06	1050	000	0.067	0.056	286322	0.84J	0.85J
	1055	010	0.064	0.054	286323	1.77J	0.62J
92/08/04	1045	000	0.010K	0.051	326322	17.60J	2.82J
	1050	010	0.010K	0.050	326323	13.92J	1.05J
92/09/15	1020	000	0.097	0.049	386322	9.67J	1.53J
	1025	010	0.090	0.043	386323	5.03J	1.94J

EAS001
EAST SOUND AT ROSARIO POINT
48 38 35.0 122 52 56.0 2F000 Elev= 0 ft
53055 Washington San Juan Co. PACIFIC NORTHWEST
PUGET SOUND (San Juan-02) 131102
21540000 Reach=17110003000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/14	1320	000	11.1	9.0	99.9	7.9	66.6		5.0	30.24		
	1325	010	10.6	7.5	81.9	7.8	80.7			30.37		
91/12/02	1120	000	8.5	8.1	84.5	7.7	82.6		11.4	29.93		
	1125	010	8.5	8.3	86.4	7.7	84.9			30.29		
92/01/07	1215	000	7.3	9.1	92.8	7.7	85.3		10.0	30.23		
	1220	010	7.3	9.0	91.3	7.7	84.7			30.25		
92/03/23	1400	000	9.4	9.3	98.5	7.8	82.7		8.0	29.79		
	1410	010	9.0	9.0	94.5	7.7	78.9			29.97		
92/04/20	1105	000	11.2	12.5	138.9	8.3	76.2		4.5	29.85		
	1115	010	9.7	8.4	90.7	7.8	82.2			30.21		
92/05/27	1215	000	12.6	13.8	157.7	8.3			3.7	29.60		
	1220	010	12.4	11.3	128.0	8.2				29.84		
92/06/22	1340	000	15.6	14.3	173.9	8.4	47.6		6.0	29.91		
	1350	010	12.6	12.3	140.0	8.2	57.8			29.85		
92/07/28	1315	000	16.7	10.3	126.7	8.2	85.1		16.0	29.24		
	1320	010	12.1	8.0	90.7	7.9	83.6			29.85		
92/08/17	1205	000	13.6	9.1	106.5	8.2	82.8			29.86		
	1210	010	13.4	8.8	102.5	8.1	82.5			29.85		
92/09/28	1400	000	13.2	10.5	122.1	8.2	65.8		7.6	30.32		
	1405	010	11.3	6.4	71.1	7.7	79.8			30.62		

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L

ELB015
ELLIOTT BAY EAST OF DUWAMISH HEAD
47 34 48.0 122 22 06.0 2F000 Elev= 0 ft
53033 Washington King Co. PACIFIC NORTHWEST
PUGET SOUND (Duwamish/Green-09) 131109
21540000 Reach=17110019000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/28	1250	000	11.4	7.3	81.1	7.8	81.2	1	9.8	29.81	0.235	0.010
	1300	010	11.6	6.9	77.6	7.8	84.5			30.35	0.230	0.010K
91/11/21	1310	000	10.5	7.9	84.7	7.7	73.9		8.0	28.08	0.332	0.010K
	1320	010	10.8	7.4	81.0	7.7	85.5			30.32	0.327	0.010K
91/12/09	1215	000	9.6	8.5	88.6	7.7	63.1	12	6.5	26.95	0.339	0.010K
	1220	010	10.1	7.8	84.0	7.7	83.5			29.93	0.335	0.010K
92/01/13	1320	000	9.1	7.9	83.2	7.6	81.9	5	9.5	29.40	0.351	0.010K
	1330	010	9.2	7.8	82.7	7.6	83.4			29.91	0.343	0.010K
92/02/25	1350	000	9.1	9.3	93.3	7.5	66.5	9	4.5	22.44	0.461	0.010K
	1400	010	8.6	8.5	88.8	7.6	87.3			29.24	0.374	0.010K
92/03/17	1200	000	9.1	8.6	89.9	7.6	85.9	2	14.0	28.19	0.309	0.010K
	1210	010	9.0	8.4	88.0	7.6	87.3			28.73	0.306	0.010K
92/04/08	1300	000	9.8	8.7	92.7	7.8	80.7	5	12.0	28.11	0.369	0.010K
	1310	010	9.2	8.5	90.1	7.8	86.1			29.16		
92/05/11	1325	000	11.6	10.0	110.0	8.0		1	13.0	28.42	0.172	
	1335	010	10.7	9.9	107.4	8.0				29.17	0.188	
92/06/01	1235	000	12.5					1K	6.0	28.51	0.072	
	1240	010	12.0							28.80	0.153	
92/07/06	1425	000	13.4	8.6	99.0	8.0	75.7		13.0	28.22	0.180	
	1430	010	12.5	8.4	95.2	8.0	84.6			29.67	0.200	
92/08/04	1355	000	14.1	8.3	97.4	7.9	82.1	4	14.0	29.11	0.206	
	1400	010	13.2	7.8	89.7	7.9	86.3			29.94	0.215	
92/09/15	1325	000	13.7	7.2	84.3	7.9	74.7	1K	12.5	30.07	0.140	
	1335	010	13.5	6.8	79.4	7.9	85.5			30.27	0.251	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/28	1250	000	0.011	0.064	446332	0.90	0.13
	1300	010	0.010	0.064	446333	0.89	0.27
91/11/21	1310	000	0.010K	0.050	476332	0.42	0.13
	1320	010	0.010K	0.053	476333	0.20	0.08
91/12/09	1215	000	0.010K	0.069	506332	0.46	0.10
	1220	010	0.010K	0.075	506333	0.14	0.05
92/01/13	1320	000	0.010K	0.076	36332	0.23	0.11
	1330	010	0.010K	0.078	36333	0.20	0.07
92/02/25	1350	000	0.034	0.060	96332	0.28	0.24
	1400	010	0.010K	0.082	96333	0.51	0.16

MORE DATES NEXT PAGE

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
92/03/17	1200	000	0.017	0.072	126332	0.54	0.06
	1210	010	0.013	0.073	126333	0.43	0.17
92/04/08	1300	000	0.016	0.060	156332	0.54	0.06
92/05/11	1325	000	0.032	0.042	206332	1.20	0.36
	1335	010	0.030	0.049	206333	1.50	0.46
92/06/01	1235	000	0.018	0.028	236332	9.10	1.20
	1240	010	0.025	0.042	236333	3.40	0.60
92/07/06	1425	000	0.048	0.047	286332	1.45J	0.51J
	1430	010	0.045	0.052	286333	0.38J	0.23J
92/08/04	1355	000	0.010K	0.059	326332	1.66J	0.64J
	1400	010	0.010K	0.059	326333	2.03J	0.51J
92/09/15	1325	000	0.010K	0.026	386332	0.88J	0.29J
	1335	010	0.037	0.051	386333	1.50J	0.19J

GRG002
STRAIT OF GEORGIA NEAR PATOS ISLAND
48 48 30.0 122 57 10.0 2F000 Elev= 0 ft
53055 Washington San Juan Co. PACIFIC NORTHWEST
PUGET SOUND (San Juan-02) 131102
21540000 Reach=17110003 0.000 Drg= 0 sqmi
AMBNT/OCEAN/RMP

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/14	1340	000	11.5	7.9	87.6	7.9	74.1	1K	9.0	28.57	0.205	0.010K
	1350	010	10.8	6.8	74.6	7.8	82.8			29.44	0.260	0.010K
	1400	030	10.5	6.5	70.4	7.8	83.1			29.90	0.231	0.010K
91/12/02	1155	000	8.2	9.5	97.4	7.8	82.2	1K	14.0	28.07	0.338	0.010K
	1205	010	8.9	7.7	80.4	7.7	87.8			29.29	0.373	0.010K
	1215	030	8.9	7.3	76.3	7.7	86.5			29.65	0.379	0.010K
92/01/07	1235	000	7.1	9.2	90.8	7.6	79.0	21	6.0	26.85	0.391	0.010K
	1245	010	7.8	8.3	84.6	7.6	83.2			28.79	0.357	0.010K
	1255	030	8.0	7.8	80.2	7.6	81.7			29.70	0.362	0.010K
92/03/23	1415	000	9.4	11.4	118.6	8.1	57.2	1K	3.5	26.62	0.125	0.010K
	1425	010	8.9	9.7	101.1	7.9	74.9			29.12	0.215	0.010K
	1435	020	8.8	9.3	97.2	7.8	76.2			29.20	0.241	0.010K
92/04/20	1235	000	10.8	9.9	105.0	8.0	73.1	1K	5.4	25.05	0.178	0.010K
	1245	010	9.5	9.2	98.1	7.9	72.5			29.06	0.191	0.017
	1255	022	9.3	8.4	88.8	7.8	81.2			29.93	0.232	0.010K
92/05/27	1225	000	13.1	9.9	111.5	8.2		1K	8.5	25.14	0.082	
	1255	010	10.9	8.4	91.2	8.0				28.35	0.175	
	1300	021	10.5	8.1	87.4	7.9				28.85	0.242	
92/06/22	1405	000	19.3	9.8	116.5	8.3	38.4	1K	1.8	13.71	0.027	
	1415	010	15.5	9.5	112.8	8.2	80.3			26.01	0.024	
	1425	030	11.0	7.2	79.5	7.8	81.6			29.09	0.252	
92/07/28	1335	000	18.5	8.6	105.8	8.3	73.5	1K	10.0	21.97	0.010K	
	1340	010	11.6	7.4	82.4	7.8	82.4			29.24	0.217	
	1345	025	11.5	7.3	81.0	7.8	81.9			29.43	0.234	
92/09/28	1415	000	11.8	7.0	77.4	7.8	78.4		8.2	28.30	0.184	
	1425	010	11.1	6.1	67.7	7.8	83.1			29.59	0.254	
	1435	030	10.7	5.7	63.1	7.7	82.9			30.28	0.254	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4-N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/14	1340	000	0.011	0.046	426256	1.28	0.32
	1350	010	0.013	0.058	426257	1.39	0.78
	1400	030	0.014	0.052	426258	1.84	0.75
91/12/02	1155	000	0.010K	0.068	496256	0.38	0.10
	1205	010	0.010K	0.070	496257	0.11	0.07
	1215	030	0.010K	0.073	496258	0.11	0.09
92/01/07	1235	000	0.010K	0.052	26256	0.30	0.13
	1245	010	0.010K	0.073	26257	0.20	0.12
	1255	030	0.010K	0.073	26258	0.11	0.19
92/03/23	1415	000	0.010K	0.029	136256	15.30	2.80
	1425	010	0.010K	0.053	136257	6.50	0.07
	1435	020	0.010K	0.059	136258	1.80	0.28
92/04/20	1235	000	0.015	0.038	176256	1.10	0.33
	1245	010	0.013	0.041	176257	4.10	0.97
	1255	022	0.032	0.052	176258	0.50	0.46
92/05/27	1225	000	0.010K	0.018	226256	4.10	0.05K
	1255	010	0.010K	0.035	226257	2.40	0.34
	1300	021	0.010K	0.047	226258		
92/06/22	1405	000	0.010K	0.010K	266256		
	1415	010	0.010K	0.016	266257		
	1425	030	0.010K	0.053	266258		
92/07/28	1335	000	0.010K	0.016	316256	0.76J	0.24J
	1340	010	0.010K	0.048	316257	0.95J	0.54J
	1345	025	0.015	0.052	316258		
92/09/28	1415	000	0.010K	0.040	406256	1.14J	0.33J
	1425	010	0.010K	0.054	406257	1.02J	0.35J
	1435	030	0.010K	0.054	406258		

GYS004
GRAYS HBR-CHEHALIS R AT STRD OIL
46 58 41.0 123 47 00.0 2F 0 Elev= 0 ft
53027 Washington Grays Harbor Co. PACIFIC NORTHWEST
COASTAL (Lower Chehalis-22) 131222
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/STREAM

INDEX 1312099
MILES 0001.40 . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/12/30	1120	000	7.8	11.2	97.9	7.2	41.5		1.5	5.95	0.429	0.010K
	1130	010	8.4	10.0	97.2	7.5	2.3			18.74	0.235	0.010K
92/02/10	1010	000	7.9	7.8	67.2	6.9	19.6	28	1.0	2.97	0.577	0.010K
	1020	010	8.2	9.9	90.1	6.8	8.3			10.01		
92/03/30	1005	000	11.5	9.2	94.0	7.8	49.2	10	2.0	16.52	0.225	0.010K
	1015	010	11.1	8.4	91.0	7.9	13.1			26.07	0.122	0.010K
92/05/04	1000	000	13.3	8.8	84.8	6.9		37	1.5	0.09	0.345	
	1010	010	13.2	8.7	83.4	6.6				0.07	0.356	
92/06/08	1010	000	17.4	8.4	93.7	7.5	36.6	9	1.8	9.90	0.087	
	1020	010	16.3	7.7	88.8	7.6	27.4			18.65	0.167	
92/07/27	1120	000	18.9	7.0	83.9	7.4	11.3	200L	1.0	17.31	0.195	
	1125	010	18.7	6.9	83.5	7.5	4.4			19.24	0.189	
92/08/24	1400	000	18.2					400	1.8	17.73	0.130	
	1405	009	17.5							22.35	0.108	
92/09/22	1120	000	15.1	7.8	88.7	7.6	34.4	16X		22.01	0.226J	
	1125	010	14.4	7.4	85.9	7.7	22.9			25.41	0.155J	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/12/30	1120	000	0.032	0.019	16210	0.34	0.50
	1130	010	0.050	0.036	16211	1.30	2.90
92/02/10	1010	000	0.028	0.010K	76210	0.35	0.63
92/03/30	1005	000	0.052	0.019	146210	0.71	0.36
	1015	010	0.069	0.031	146211	1.50	1.10
92/05/04	1000	000	0.012	0.011	196210		
	1010	010	0.015	0.013	196211		
92/06/08	1010	000	0.010K	0.010K	246210		
	1020	010	0.051	0.040	246211		
92/07/27	1120	000	0.104	0.036	316210		
	1125	010	0.111	0.039	316211		
92/08/24	1400	000	0.056	0.022	356210		
	1405	009	0.069	0.023	356211		
92/09/22	1120	000	0.046	0.031	396210		
	1125	010	0.038	0.024	396211		

GYS008
GRAYS HARBOR AT MID SOUTH CHAN
46 56 15.0 123 54 43.0 2F 0 Elev= 0 ft
53027 Washington Grays Harbor Co. PACIFIC NORTHWEST
COASTAL (Lower Chehalis-22) 131222
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/12/30	1150	000	8.1	10.4	97.2	7.6	23.7		1.0	14.60	0.284	0.010K
	1200	006	8.3	10.1	98.3	7.8	16.1			20.16	0.202	0.010K
92/02/10	1050	000	8.6	7.2	68.3	7.6	15.6	74	1.0	14.78	0.364	0.010K
	1100	005	9.1	8.8	87.9	7.7	8.5			21.17	0.360	0.010K
92/03/30	1030	000	11.7	8.9	95.3	7.9	39.6	1K	1.8	23.75	0.116	0.010K
	1040	006	11.2	8.9	96.0	8.0	52.9			25.19	0.095	0.010K
92/05/04	1030	000	13.8	9.1	95.6	7.7		340X	0.7	12.93	0.173	
92/06/08	1040	000	16.3	7.9	91.6	7.7	11.8	20	1.0	19.92	0.121	
	1050	005	15.8	7.3	86.2	7.7	0.4			24.62	0.149	
92/07/27	1205	000	18.3	7.5	94.3	7.8	8.3	200L	0.5	25.58	0.178	
	1210	007	17.6	7.5	92.8	7.9	6.2			26.26	0.106	
92/08/24	1015	000	17.0					47	1.1	25.66	0.105	
	1020	005	16.5							26.51	0.078	
92/09/22	1200	000	15.9	8.3	98.4	7.8	26.8	5X	1.7	25.46	0.110J	
	1205	007	14.5	8.0	94.1	7.8	32.2			28.45	0.108J	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/12/30	1150	000	0.042	0.026	16212	0.78	0.63
	1200	006	0.034	0.031	16213	1.10	1.80
92/02/10	1050	000	0.042	0.028	76212	0.64	0.73
	1100	005	0.040	0.023	76213	0.58	0.65
92/03/30	1030	000	0.033	0.021	146212	0.79	0.44
	1040	006	0.017	0.021	146213	2.80	0.37
92/05/04	1030	000	0.059	0.022	196212		
92/06/08	1040	000	0.013	0.035	246212	11.10	0.82
	1050	005	0.025	0.039	246213	5.90	3.80
92/07/27	1205	000	0.044	0.049	316212		
	1210	007	0.034	0.035	316213		
92/08/24	1015	000	0.022	0.031	356212		
	1020	005	0.016	0.024	356213		
92/09/22	1200	000	0.011	0.027	396212		
	1205	007	0.010	0.027	396213		

GYS009
GRAYS HARBOR AT MOON IS REACH
46 57 53.0 123 56 54.0 2F 0 Elev= 0 ft
53027 Washington Grays Harbor Co. PACIFIC NORTHWEST
COASTAL (Lower Chehalis-22) 131222
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/12/30	1205	000	8.2	10.4	98.0	7.8	41.1		1.9	15.25		
	1215	010	8.7	9.8	98.5	7.9	23.6			23.83		
92/02/10	1110	000	8.7	9.7	92.7	7.7	21.3		1.0	16.23		
	1120	010	9.4	9.2	94.5	7.9	9.8			24.92		
92/03/30	1100	000	11.6	8.9	96.1	8.0	61.3		3.0	24.63		
	1110	010	10.8	8.2	89.7	8.0	49.4			28.95		
92/05/04	1055	000	13.9	9.4	97.4	7.6			1.0	9.14		
	1105	010	13.4	8.6	95.1	8.0				22.24		
92/06/08	1105	000	15.9	8.1	94.3	7.8	25.3		1.5	22.04		
	1115	010	14.0	7.3	84.9	7.8	22.5			29.10		
92/07/27	1155	000	16.9	7.7	95.2	7.9	30.2		1.5	27.87		
	1200	010	15.8	7.5	90.4	7.9	14.3			28.96		
92/09/22	1145	000	14.7	8.2	96.9	7.9	44.5		2.5	28.73		
	1150	010	13.5	7.9	91.9	7.8	44.5			30.39		

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L

GYS015
GRAYS HARBOR NR N WHITCOMB FLATS
46 55 23.0 124 04 32.0 1F 0 Elev= 0 ft
53027 Washington Grays Harbor Co. PACIFIC NORTHWEST
Columbia River below Yakima River 131022
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/ESTURY

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/12/30	1245	000	8.4	9.8	96.2	7.8	45.6		2.0	20.35		
	1255	009	8.8	9.6	97.2	7.9	53.5			24.76		
92/02/10	1200	000	8.9	13.1	117.0	7.9	36.4		1.0	4.74		
	1210	007	9.5	15.2	160.3	7.9	23.9			27.57		
92/03/30	1125	000	11.1	8.6	94.4	8.0	63.9		3.5	29.74		
	1130	010	10.8	9.3	102.3	8.1	59.4			30.96		
92/05/04	1135	000	14.4	8.8	99.1	8.0			1.5	21.97		
	1145	008	13.9	8.9	99.9	8.0				22.72		
92/06/08	1200	000	14.3	7.7	89.6	7.8	37.8		2.0	28.27		
	1210	010	13.0	7.3	84.2	7.8	44.6			30.30		
92/07/27	1305	000	9.9	6.2	67.9	7.7	63.0		3.5	33.00		
	1310	010	8.9	5.3	57.3	7.7	63.2			33.19		
92/09/22	1240	000	12.5	8.0	91.9	7.9	64.9		4.9	31.90		
	1245	009	10.2	6.4	70.7	7.8	61.5			33.01		

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L

GYS016
GRAYS HARBOR NEAR DAMON POINT
46 57 13.0 124 05 30.0 1F 0 Elev= 0 ft
53027 Washington Grays Harbor Co. PACIFIC NORTHWEST
Columbia River below Yakima River 131022
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/ESTURY

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/12/30	1225	000	8.2	9.9	96.9	7.9	44.7		2.0	20.90	0.153	0.010K
	1235	008	8.4	17.2	171.2	7.9	43.2			22.66	0.148	0.010K
92/02/10	1130	000	9.0	9.4	92.4	7.8	32.2	1	1.0	19.24	0.196	0.010K
	1140	006	9.0	9.0	89.9	7.9	27.7			22.12	0.187	0.010K
92/03/30	1115	000	11.2	9.2	101.2	8.1	66.2	1K	3.5	29.21	0.065	0.010K
	1120	004	10.8	8.6	94.2	8.0	61.1			29.66	0.079	0.010K
92/05/04	1110	000	14.2	8.7	98.4	8.0		1	1.5	21.98	0.059	
	1120	007	14.0	8.7	97.1	8.0				22.29	0.053	
92/06/08	1130	000	13.9	7.3	85.5	7.8	47.7	1K	2.4	30.67	0.158	
	1140	004	13.4	7.2	84.1	7.8	50.8			30.97	0.176	
92/07/27	1235	000	10.9	7.1	79.2	7.7	51.8	2	2.5	32.69	0.269	
	1240	005	10.2	6.4	70.6	7.7	41.8			32.87	0.282	
92/08/24	1050	000	14.9					1K	5.1	30.18	0.010K	
	1055	006	13.2							30.90	0.029	
92/09/22	1220	000	13.8	8.2	97.1	7.9	65.9	1K	4.3	31.26	0.064J	
	1225	008	11.2	7.8	88.5	7.9	65.5			32.73	0.086J	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/12/30	1225	000	0.032	0.029	16214	0.81	0.45
	1235	008	0.029	0.031	16215	1.00	0.88
92/02/10	1130	000	0.021	0.017	76214	1.10	0.65
	1140	006	0.022	0.023	76215	0.96	0.68
92/03/30	1115	000	0.010K	0.017	146214	2.20	0.31
	1120	004	0.010K	0.025	146215	3.30	0.19
92/05/04	1110	000	0.020	0.019	196214	2.70	0.61
	1120	007	0.019	0.018	196215	2.80	1.30
92/06/08	1130	000	0.012	0.034	246214	4.20	1.00
	1140	004	0.021	0.041	246215	4.50	1.90
92/07/27	1235	000	0.024	0.058	316214	3.80J	3.82J
	1240	005	0.033	0.059	316215	5.73J	4.49J
92/08/24	1050	000	0.010K	0.021	356214	4.80J	2.46J
	1055	006	0.021	0.026	356215	4.30J	2.21J
92/09/22	1220	000	0.013	0.026	396214	1.41J	1.05J

MORE DATES NEXT PAGE

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
92/09/22	1225	008	0.018	0.032	396215	5.18J	2.69J

HCB004
HOOD CANAL AT SISTERS POINT
47 21 23.0 123 01 25.0 2F 0 Elev= 0 ft
53045 Washington Mason Co. PACIFIC NORTHWEST
PUGET SOUND (Kitsap-15) 131115
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/07	1055	000	15.5	11.7	133.7	8.7	78.1	1K	4.6	20.28	0.010K	0.010K
	1100	010	10.0	2.0	21.8	7.3	75.2			29.71	0.403	0.010K
	1105	028	9.7	1.4	15.3	7.3	74.6			29.93	0.472	0.010K
91/11/25	1330	000	9.7	8.9	91.0	7.7	76.6		5.9	23.09	0.296	0.010K
	1340	010	10.6	4.3	46.5	7.5	80.8			30.25	0.386	0.010K
	1350	030	10.5	4.0	43.6	7.5	69.7			30.44	0.385	0.010K
91/12/26	1105	000	8.0	8.9	87.6	7.6	73.6	4	9.4	22.47	0.247	0.010K
	1115	010	10.2	4.8	52.5	7.4	82.7			29.79	0.321	0.010K
	1125	030	10.3	3.7	40.7	7.4	72.8			30.33	0.324	0.010K
92/01/22	1230	000	8.4	9.7	99.0	7.8	71.0	2	5.5	26.84	0.214	0.010K
	1240	010	10.1	4.7	50.5	7.4	79.4			30.13	0.363	0.010K
	1250	030	10.2	4.0	43.5	7.5	72.7			30.45	0.382	0.010K
92/02/27	1340	000	11.7	15.9	155.2	8.6	47.5		2.1	8.05	0.010K	0.010K
	1350	010	9.3	6.7	70.4	7.5	86.8			28.78	0.344	0.010K
	1400	022	9.6	5.2	55.4	7.4	80.6			29.63	0.360	0.010K
92/03/18	1105	000	11.1	11.2	111.2	8.3	67.8	1	5.0	13.04	0.010K	0.010K
	1115	010	9.5	7.1	75.2	7.6	82.0			28.38	0.174	0.010K
	1120	022	9.5	5.2	55.2	7.4	81.6			29.23	0.302	0.010K
92/04/14	1110	000	11.9	12.4	132.8	8.2	80.8	1K	6.0	22.27	0.010K	0.010K
	1120	010	9.7	5.8	61.9	7.5	84.6			29.28	0.296	0.010K
	1130	022	9.4	5.1	53.8	7.5	82.6			29.61	0.371	0.010K
92/05/18	1355	000	16.2	10.5	123.3	8.3		1	5.0	22.44	0.010K	
	1405	010	10.9	8.5	92.6	8.0				28.14	0.010K	
	1415	023	9.5	3.5	37.7	7.4				29.53	0.363	
92/06/15	1110	000	16.5	9.0	107.8	8.2	75.8	1K	6.5	24.11	0.010K	
	1120	010	11.5	8.3	91.4	7.9	69.3			28.74	0.054	
	1130	030	9.7	2.5	26.5	7.3	74.6			29.45	0.341	
92/07/14	1155	000	18.0	9.6	120.0	8.2	77.0	1K	7.5	26.72	0.010K	
	1200	010	13.6	9.7	112.2	8.3	40.9			28.39	0.010K	
	1205	030	9.6	2.3	24.6	7.3	71.7			29.56	0.365	
92/08/10	1050	000	18.4	8.7	110.0	8.3	63.2	1K	5.0	26.49	0.010K	
	1055	010	11.8	6.8	75.8	8.0	46.9			29.13	0.026	
	1100	030	9.7	2.1	22.5	7.3	75.5			29.65	0.234	
92/09/14	1100	000	15.0	9.3	110.0	8.1	63.1	1K	4.5	27.01	0.010K	
	1105	010	10.7	1.8	19.5	7.4	75.5			29.43	0.337	
	1110	030	9.7	0.3	3.7	7.2	74.4			29.81	0.499	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/07	1055	000	0.010K	0.017	416303	3.03	0.67
	1100	010	0.010K	0.126	416304	5.83	0.05K
	1105	028	0.010K	0.117	416305	1.53	0.88
91/11/25	1330	000	0.011	0.070	486303		
	1340	010	0.010K	0.088	486304		
	1350	030	0.010K	0.091	486305		
91/12/26	1105	000	0.010K	0.060	526303	2.40	0.74
	1115	010	0.010K	0.092	526304	0.71	0.14
	1125	030	0.010K	0.099	526305	0.13	0.11
92/01/22	1230	000	0.010K	0.053	46303	12.90	0.97
	1240	010	0.010K	0.088	46304	2.40	0.40
	1250	030	0.010K	0.090	46305	0.13	0.17
92/02/27	1340	000	0.010K	0.010K	96303	5.00	0.71
	1350	010	0.010K	0.085	96304	0.37	0.11
	1400	022	0.010K	0.095	96305	0.09	0.11
92/03/18	1105	000	0.010K	0.010K	126303	1.80	0.14
	1115	010	0.010K	0.054	126304	4.80	0.13
	1120	022	0.010K	0.093	126305	0.15	0.16
92/04/14	1110	000	0.010K	0.016	166303	1.20	0.30
	1120	010	0.030	0.079	166304	2.70	0.05K
	1130	022	0.010K	0.086	166305	0.29	0.11
92/05/18	1355	000	0.010K	0.010K	216303	0.94	0.13
	1405	010	0.023	0.018	216304	12.10	1.20
	1415	023	0.048	0.091	216305		
92/06/15	1110	000	0.010K	0.020	256303	1.10	0.12
	1120	010	0.010K	0.042	256304	8.10	0.13
	1130	030	0.079	0.106	256305		
92/07/14	1155	000	0.010K	0.030	296303	0.76J	0.15J
	1200	010	0.010K	0.037	296304	58.07J	2.94J
	1205	030	0.010K	0.089	296305		
92/08/10	1050	000	0.010K	0.028	336303	2.92J	1.14J
	1055	010	0.010K	0.062	336304	48.19J	4.94J
	1100	030	0.010K	0.059	336305		
92/09/14	1100	000	0.010K	0.024	386303	2.92J	1.65J
	1105	010	0.010K	0.090	386304	7.70J	2.57J
	1110	030	0.010K	0.107	386305		

HCB006
HOOD CANAL NEAR KING SPIT
47 44 52.0 122 43 49.0 2F 0 Elev= 0 ft
53035 Washington Kitsap Co. PACIFIC NORTHWEST
PUGET SOUND (Kitsap-15) 131115
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/STREAM

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/07	1020	000	13.8	7.8	89.2	8.3	67.1	1K	11.0	26.09	0.036	0.010K
	1025	010	12.8	7.2	82.0	8.0	82.7			28.34	0.306	0.010K
	1030	028	10.8	5.0	55.1	7.6	82.5			30.03	0.370	0.010K
91/11/25	1510	000	9.8	8.2	87.1	7.7	82.9		8.5	27.27	0.356	0.010K
	1520	010	9.8	7.0	74.6	7.6	80.3			29.90	0.373	0.010K
	1530	030	9.8	6.7	72.4	7.6	78.8			30.34	0.376	0.010K
91/12/26	1005	000	8.5	8.4	86.0	7.6	84.0	1K	8.5	27.46	0.291	0.010K
	1010	010	8.6	7.5	78.5	7.6	78.0			29.43	0.309	0.010K
	1015	028	8.6	7.3	76.1	7.6	75.9			29.97	0.317	0.010K
92/01/22	1315	000	8.5	9.0	93.1	7.7	79.1	2	6.0	29.01	0.324	0.010K
	1325	010	8.4	8.5	88.6	7.7	78.0			29.29	0.479	0.010K
	1335	030									0.362	0.010K
92/02/27	1255	000	9.7	15.7	162.8	8.4	53.6		3.1	24.54	0.010K	0.010K
	1305	010	8.6	8.7	90.3	7.6	80.0			28.84	0.300	0.010K
	1315	021	8.6	8.1	84.5	7.6	80.1			29.24	0.337	0.010K
92/03/18	1020	000	9.6	8.8	91.7	7.8	83.2	1K	11.0	25.99	0.179	0.010K
	1030	010	9.2	7.6	80.0	7.6	82.3			28.95	0.232	0.010K
	1040	022	9.1	7.0	73.3	7.6	81.9			29.44	0.278	0.010K
92/04/14	1020	000	11.1	11.7	126.6	8.2	78.3	1K	7.0	26.18	0.010K	0.010K
	1030	010	9.9	9.0	96.4	7.9	78.6			28.85	0.227	0.010K
	1040	017	9.6	8.0	85.3	7.8	79.5			29.59	0.271	0.010K
92/05/18	1155	000	15.4	11.1	132.0	8.3		1K	5.5	26.83	0.010K	
	1205	010	11.7	9.4	105.0	8.0				29.06	0.075	
	1215	020	11.5	9.1	101.0	8.0				29.16	0.236	
92/06/15	1015	000	14.3	8.6	100.7	8.1	75.3	1K	9.0	28.37	0.131	
	1025	010	11.5	7.0	77.4	7.8	76.6			29.69	0.276	
	1035	030	11.1	6.6	72.9	7.8	76.6			29.83	0.304	
92/07/14	1015	000	15.3	9.3	110.7	8.1	69.8	1	7.4	28.67	0.068	
	1020	010	12.0	6.7	74.8	7.9	77.0			29.83	0.221	
	1025	030	12.0	6.5	73.5	7.8	77.4			29.85	0.257	
92/08/10	1005	000	14.0	8.3	97.5	8.1	70.5	1K	7.4	29.29	0.111	
	1010	010	12.5	6.6	75.5	7.9	79.0			29.81	0.202	
	1020	030	11.4	5.4	60.5	7.7	80.3			30.15	0.262	
92/09/14	1000	000	13.2	7.6	88.2	7.9	71.7	1K	6.0	29.72	0.157	
	1005	010	12.5	5.9	67.7	7.8	78.4			30.06	0.208	
	1025	030	12.0	5.2	58.4	7.7	80.2			30.34	0.306	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/07	1020	000	0.010K	0.027	416300	1.15	0.83
	1025	010	0.010K	0.076	416301	0.86	0.23
	1030	028	0.010K	0.082	416302	0.42	0.21
91/11/25	1510	000	0.010K	0.075	486300		
	1520	010	0.010K	0.080	486301		
	1530	030	0.010K	0.077	486302		
91/12/26	1005	000	0.011	0.071	526300	0.58	0.15
	1010	010	0.010K	0.080	526301	0.33	0.19
	1015	028	0.010K	0.075	526302	0.24	0.19
92/01/22	1315	000	0.010K	0.065	46300	4.70	0.35
	1325	010	0.010K	0.070	46301	3.00	0.66
	1335	030	0.010K	0.069	46302	1.10	0.30
92/02/27	1255	000	0.010K	0.010K	96300	26.20	0.05K
	1305	010	0.010K	0.068	96301	2.50	0.60
	1315	021	0.010K	0.075	96302	0.37	0.23
92/03/18	1020	000	0.028	0.047	126300	0.56	0.05K
	1030	010	0.012	0.062	126301	0.56	0.14
	1040	022	0.010K	0.073	126302	0.20	0.11
92/04/14	1020	000	0.010K	0.017	166300	5.90	0.05K
	1030	010	0.016	0.055	166301	3.70	0.50
	1040	017	0.024	0.061	166302	0.80	0.20
92/05/18	1155	000	0.010K	0.010K	216300	1.50	0.12J
	1205	010	0.012	0.025	216301	10.80	0.15J
	1215	020	0.023	0.053	216302		
92/06/15	1015	000	0.010K	0.038	256300	1.40	0.19
	1025	010	0.020	0.062	256301	1.20	0.30
	1035	030	0.029	0.066	256302		
92/07/14	1015	000	0.010K	0.030	296300	4.82J	0.05K
	1020	010	0.014	0.054	296301	1.44J	0.41J
	1025	030	0.047	0.061	296302		
92/08/10	1005	000	0.010K	0.030	336300	1.75J	1.06J
	1010	010	0.010K	0.048	336301	0.56J	0.32J
	1020	030	0.010K	0.061	336302		
92/09/14	1000	000	0.031	0.041	386300	2.04J	0.80J
	1005	010	0.010K	0.047	386301	1.61J	0.81J
	1025	030	0.010K	0.071	386302		

HCB007
HOOD CANAL AT INNER LYNCH COVE
47 23 54.0 122 55 42.0 2F000 Elev= 0 ft
53045 Washington Mason Co. PACIFIC NORTHWEST
PUGET SOUND (Kitsap-15) 131115
21540000 Reach=17110018000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/07	1110	000	15.4	11.6	131.7	8.7	75.0		4.6	19.47		
	1115	010	10.4	2.2	23.7	7.3	75.1			29.49		
91/11/25	1315	000	8.9	10.7	104.9	7.8	70.9		4.5	18.45		
	1325	010	10.6	3.2	35.4	7.4	85.0			30.20		
91/12/26	1135	000	8.5	7.2	71.7	7.5	75.8		8.3	23.57		
	1145	010	10.3	3.5	38.1	7.3	84.7			29.86		
92/01/22	1215	000	8.0	10.0	100.5	7.8	67.4		4.5	26.13		
	1220	010	9.8	5.4	57.4	7.5	82.5			29.42		
92/02/27	1410	000	11.3	17.2	168.5	8.8	42.1		2.1	10.18		
	1420	010	9.3	7.0	73.6	7.4	88.0			28.47		
92/03/18	1130	000	11.6	11.1	111.8	8.3	63.2		4.2	13.17		
	1140	010	9.6	6.0	63.0	7.5	83.1			28.35		
92/04/14	1140	000	12.7	11.2	121.7	8.2	74.3		4.3	21.36		
	1150	010	9.7	4.4	47.0	7.5	84.6			29.31		
92/05/18	1425	000	17.4	10.0	120.3	8.3				22.37		
	1435	010	11.2	8.6	93.7	8.1				27.98		
92/06/15	1300	000	16.6	9.3	112.1	8.2	76.1		7.1	25.22		
	1310	010	11.9	8.2	91.1	8.1	50.1			28.48		
92/07/14	1220	000	20.0	8.7	112.2	8.2	77.0		8.5	26.11		
	1225	010	12.2	8.8	98.8	8.0	59.6			28.88		
92/08/10	1315	000	19.7	8.5	109.1	8.3	65.9		5.5	25.30		
	1320	010	10.2	2.0	21.5	7.7	82.3			29.45		
92/09/14	1130	000	16.1	8.7	104.4	8.1	60.6		3.8	26.30		
	1140	010	11.5	1.9	21.3	7.4	61.2			29.18		

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L

LOP001
LOPEZ ISLAND AT DECATUR ISLAND
48 38 35.0 122 52 56.0 2F000 Elev= 0 ft
53055 Washington San Juan Co. PACIFIC NORTHWEST
PUGET SOUND (San Juan-02) 131102
21540000 Reach=17110003000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/14	1145	000	11.0	7.3	81.1	7.8	80.1		7.5	30.39		
	1155	010	10.5	6.9	75.6	7.8	74.2			30.40		
91/12/02	1105	000	8.6	8.0	83.2	7.7	78.2		7.1	29.89		
	1115	010	8.6	8.0	84.2	7.7	74.3			30.12		
92/01/07	1200	000	7.8	8.2	84.0	7.6	74.0		5.0	30.42		
	1210	010	7.8	8.2	84.0	7.6	72.8			30.41		
92/03/23	1215	000	9.5	8.8	94.0	7.8	76.0		5.3	29.95		
	1225	008	9.0	8.7	91.3	7.8	67.4			29.96		
92/04/20	1050	000	9.8	8.7	93.1	7.8	78.5		6.1	30.27		
	1055	010	9.6	8.3	88.7	7.8	58.0			30.31		
92/05/27	1155	000	12.3	13.0	147.2	8.3			3.5	29.79		
	1200	010	10.9	8.9	97.7	8.0				29.86		
92/06/22	1320	000	13.2	11.1	128.4	8.1	61.8		4.5	29.68		
	1330	010	11.7	8.6	96.0	7.9	32.0			29.87		
92/07/28	1300	000	13.6	11.7	136.5	8.2	64.7		5.5	29.82		
	1305	010	12.1	9.1	102.3	8.0	58.3			29.97		
92/08/17	1150	000	13.4	8.1	93.4	8.1	81.4			29.24		
	1155	010	12.7	7.8	88.9	8.0	76.7			29.61		
92/09/28	1340	000	11.4	6.4	71.0	7.8	80.6		7.5	30.64		
	1350	010	11.0	6.5	71.4	7.8	77.7			30.72		

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L

OAK004
OAKLAND BAY NEAR EAGLE POINT
47 12 49.0 123 04 35.0 2F 0 Elev= 0 ft
53045 Washington Mason Co. PACIFIC NORTHWEST
PUGET SOUND (Kennedy/Goldsboro-14) 131114
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/07	1150	000	15.2	6.8	80.3	7.8	59.4	1K	3.0	27.74	0.142	0.010K
	1155	010	15.0	6.7	79.9	7.8	64.6			28.54	0.142	0.010K
91/11/25	1210	000	10.2	8.3	86.4	7.6	55.8		2.7	24.46	0.293	0.010K
	1225	008	10.4	7.9	84.2	7.6	28.4			27.62	0.294	0.010K
91/12/26	1230	000	8.4	8.4	84.0	7.6	59.1	19	3.5	24.57	0.321	0.010K
	1235	010	8.6	8.1	82.7	7.6	58.1			27.07	0.329	0.010K
92/01/22	1120	000	7.5	9.1	89.8	7.6	57.7	17	2.6	25.71	0.383	0.010K
	1130	010	7.7	8.8	88.2	7.6	54.4			26.86	0.382	0.010K
92/02/27	1450	000	10.0	9.4	94.8	7.5	62.9		5.0	19.08	0.315	0.010K
	1455	010	9.2	8.6	87.9	7.5	75.7			24.43	0.363	0.010K
92/03/18	1205	000	11.0	6.8	72.5	7.7	71.4	1K	5.1	23.74	0.221	0.010K
	1215	010	10.3	9.1	95.7	7.7	68.7			25.15	0.242	0.010K
92/04/14	1215	000	12.5	10.8	118.7	8.1	74.2	1	4.0	24.19	0.013	0.010K
	1220	005									0.036	0.010K
92/05/18	1505	000	17.1	10.0	121.7	8.2		1K	3.0	25.74	0.010K	
92/06/15	1340	000	17.8	8.5	105.0	8.0	67.3	1K	4.0	26.53	0.020	
	1350	004	16.3	9.4	114.2	8.1	58.9			27.65	0.015	
92/07/14	1255	000	19.4	8.2	104.7	8.0	66.8	1K	4.6	26.71	0.023	
	1300	010	18.1	8.9	111.8	8.1	68.2			27.89	0.010K	
92/08/10	1355	000	19.1	10.4	133.7	8.4	59.5	1	4.1	27.84	0.010K	
	1400	006	18.7	10.2	130.4	8.4	62.9			28.08	0.010K	
92/09/14	1320	000	16.3	9.1	111.0	8.1	61.9	1K	3.7	28.08	0.010K	
	1330	009	15.9	8.5	103.4	8.1	63.3			29.00	0.010K	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/07	1150	000	0.055	0.082	416306	2.59	1.21
	1155	010	0.050	0.079	416307	2.71	0.98
91/11/25	1210	000	0.074	0.069	486306		
	1225	008	0.068	0.073	486307		
91/12/26	1230	000	0.032	0.076	526306	1.70	0.50
	1235	010	0.028	0.080	526307	0.62	0.58
92/01/22	1120	000	0.023	0.073	46306	0.82	0.58
	1130	010	0.021	0.073	46307	0.61	0.57

MORE DATES NEXT PAGE

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
92/02/27	1450	000	0.027	0.059	96306	1.00	0.29
	1455	010	0.028	0.077	96307	0.77	0.31
92/03/18	1205	000	0.018	0.059	126306	1.00	0.21
	1215	010	0.018	0.061	126307	2.40	0.36
92/04/14	1215	000	0.011	0.024	166306	2.40	0.52
	1220	005	0.019	0.027	166307	7.70	0.38
92/05/18	1505	000	0.010K	0.026	216306	2.50	0.49
92/06/15	1340	000	0.033	0.066	256306	1.70	0.27
	1350	004	0.022	0.060	256307	10.20	0.75
92/07/14	1255	000	0.035	0.069	296306	2.72J	0.28J
	1300	010	0.017	0.073	296307	5.99J	1.61J
92/08/10	1355	000	0.010K	0.051	336306	8.10J	1.23J
	1400	006	0.010K	0.046	336307	6.71J	1.93J
92/09/14	1320	000	0.010K	0.033	386306	3.14J	1.37J
	1330	009	0.010K	0.052	386307	10.92J	2.98J

PCK001
PICKERING PASSAGE NR HARSTENE IS
47 14 55.0 122 55 25.0 2F 0 Elev= 0 ft
53045 Washington Mason Co. PACIFIC NORTHWEST
PUGET SOUND (Kennedy/Goldsboro-14) 131114
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/07	1130	000	14.5	7.1	83.9	7.9	66.5		4.8	29.31		
	1135	010	14.5	7.1	83.7	7.9	72.6			29.31		
91/11/25	1250	000	10.6	8.0	87.3	7.7	72.8		4.4	28.65		
	1255	010	10.7	7.9	85.7	7.7	72.5			28.86		
91/12/26	1205	000	9.0	8.0	83.4	7.6	70.1		4.6	28.53		
	1215	010	9.1	7.9	82.6	7.6	70.0			28.81		
92/01/22	1150	000	8.2	8.4	86.6	7.6	59.6		3.0	28.49		
	1200	010	8.2	8.4	86.4	7.6	59.7			28.49		
92/02/27	1430	000	10.0	8.2	87.1	7.5	80.0		6.5	26.59		
	1440	010	8.9	8.2	85.2	7.5	77.8			27.84		
92/03/18	1150	000	9.9	9.3	98.2	7.7	63.5		4.1	27.21		
	1155	010	9.8	9.2	97.0	7.7	68.7			27.39		
92/04/14	1155	000	10.9	10.9	117.7	8.1	75.8		5.3	27.52		
	1205	010	10.7	10.7	115.7	8.0	74.6			27.67		
92/05/18	1440	000	14.2	12.6	146.6	8.3			4.0	27.85		
	1450	010	14.2	12.5	146.0	8.3				27.88		
92/06/15	1320	000	15.7	9.9	119.5	8.1	72.1		6.0	28.25		
	1330	010	15.2	10.0	118.8	8.1	71.5			28.37		
92/07/14	1240	000	16.9	9.9	123.0	8.2	71.0		6.4	28.66		
	1245	010	16.7	9.7	119.9	8.2	71.3			28.74		
92/08/10	1330	000	17.0	11.0	137.3	8.4	66.8		4.5	29.14		
	1335	010	16.8	10.9	134.2	8.4	65.5			29.16		
92/09/14	1300	000	15.7	9.2	111.2	8.1	64.0		4.0	29.58		
	1305	010	15.6	9.0	109.6	8.1	63.0			29.58		

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L

PMA001
PORT MADISON SOUTH OF BUOY #65
47 44 06.0 122 32 00.0 2F000 Elev= 0 ft
53035 Washington Kitsap Co. PACIFIC NORTHWEST
PUGET SOUND (Kitsap-15) 131115
21540000 Reach=17110019000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/28	1200	000	11.2	7.4	82.2	7.8	77.2	1	7.0	30.38	0.208	0.010
	1210	010	11.2	7.3	81.7	7.8	75.8			30.39	0.208	0.010K
	1220	027	11.2	7.1	78.5	7.8	59.1			30.41	0.214	0.010K
91/11/21	1210	000	10.4	7.7	83.6	7.7	79.6		7.5	30.26	0.324	0.010K
	1220	010	10.5	7.1	78.2	7.7	79.9			30.44	0.334	0.010K
	1230	025	10.5	6.9	76.0	7.7	81.4			30.52	0.340	0.010K
91/12/09	1120	000	9.8	7.9	84.9	7.7	78.3	1	7.0	30.06	0.338	0.010K
	1125	010	9.8	7.9	84.3	7.7	78.8			30.06	0.339	0.010K
	1130	029	9.9	7.6	81.3	7.7	77.3			30.13	0.338	0.010K
92/01/13	1215	000	8.6	8.1	84.9	7.6	80.8	2	7.5	29.86	0.349	0.010K
	1225	010	8.6	8.0	84.0	7.6	80.9			29.87	0.349	0.010K
	1235	030	8.8	7.7	80.6	7.6	79.4			29.98	0.350	0.010K
92/02/25	1230	000	9.0	9.2	96.0	7.7	83.6	1K	8.5	28.59	0.356	0.010K
	1240	010	8.6	9.1	94.7	7.6	83.7			28.73	0.358	0.010K
	1250	020	8.6	9.0	93.1	7.6	83.7			28.80	0.364	0.010K
92/03/17	1100	000	9.4	9.1	95.2	7.8	83.9	1	10.0	27.88	0.208	0.010K
	1110	010	9.0	8.2	86.3	7.7	84.0			28.85	0.283	0.010K
	1115	022	8.8	7.8	81.5	7.6	77.6			29.19	0.301	0.010K
92/04/08	1150	000	9.5	9.0	95.8	7.8	74.1	1K	8.0	29.24	0.298	0.010K
	1200	010	9.4	8.9	94.5	7.8	78.5			29.26	0.304	0.010K
	1210	030	9.3	8.7	91.8	7.8	81.3			29.33	0.312	0.010K
92/05/11	1220	000	11.7	9.7	107.9	8.0		1K	11.5	28.93	0.137	
	1230	010	11.0	10.2	111.5	8.1				28.98	0.155	
	1240	020	10.2	8.5	91.7	7.9				29.37	0.192	
92/06/01	1130	000	15.2	7.8	93.0	8.1		1K	6.0	28.14	0.051	
	1135	010	12.8	9.9	113.1	8.0				29.39	0.091	
	1140	023	11.9	9.0	101.4	7.9				29.62	0.207	
92/07/06	1315	000	14.2	9.3	109.8	8.1	75.1		9.0	29.49	0.118	
	1320	010	13.4	8.4	97.2	8.0	78.1			29.60	0.158	
	1325	030	12.4	8.0	90.6	8.0	81.8			29.81	0.204	
92/08/04	1230	000	14.7	11.4	136.3	8.2	72.4	1K	3.5	29.91	0.039	
	1235	010	13.8	9.3	109.0	8.1	82.0			29.94	0.086	
	1240	030	12.9	7.2	82.6	7.9	76.8			30.09	0.229	
92/09/15	1210	000	13.8	7.6	88.9	7.9	84.4	1K	11.0	30.30	0.202	
	1215	010	13.6	7.1	83.2	7.9	84.5			30.32	0.199	
	1220	030	13.1	6.0	69.6	7.8	64.5			30.46	0.269	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/28	1200	000	0.026	0.065	446326	1.50	0.87
	1210	010	0.026	0.064	446327	1.60	0.66
	1220	027	0.029	0.066	446328	1.20	1.20
91/11/21	1210	000	0.015	0.070	476326	0.53	0.31
	1220	010	0.010K	0.069	476327	0.25	0.19
	1230	025	0.010K	0.069	476328	0.18	0.19
91/12/09	1120	000	0.010K	0.076	506326	0.38	0.35
	1125	010	0.010K	0.078	506327	0.27	0.19
	1130	029	0.010K	0.077	506328	0.24	0.26
92/01/13	1215	000	0.010K	0.077	36326	0.81	0.77
	1225	010	0.010K	0.078	36327	0.50	0.19
	1235	030	0.010K	0.076	36328	0.25	0.18
92/02/25	1230	000	0.010K	0.077	96326	1.40	0.26
	1240	010	0.010K	0.078	96327	1.10	0.23
	1250	020	0.010K	0.080	96328	0.32	0.18
92/03/17	1100	000	0.030	0.057	126326	0.69	0.86
	1110	010	0.015	0.072	126327	0.39	0.23
	1115	022	0.010K	0.074	126328	2.80	4.30
92/04/08	1150	000	0.020	0.063	156326	2.20	0.35
	1200	010	0.018	0.064	156327	2.50	0.13
	1210	030	0.018	0.064	156328	1.50	0.31
92/05/11	1220	000	0.036	0.042	206326	1.00	0.13
	1230	010	0.033	0.042	206327	2.30	0.34
	1240	020	0.036	0.049	206328		
92/06/01	1130	000	0.034	0.033	236326	3.20	0.29
	1135	010	0.042	0.041	236327	1.90	0.45
	1140	023	0.035	0.056	236328		
92/07/06	1315	000	0.014	0.042	286326	4.82J	1.31J
	1320	010	0.039	0.051	286327	2.50J	0.64J
	1325	030	0.048	0.056	286328		
92/08/04	1230	000	0.010K	0.052	326326	17.40J	2.89J
	1235	010	0.010K	0.049	326327	6.87J	0.86J
	1240	030	0.010K	0.060	326328		
92/09/15	1210	000	0.068	0.052	386326	1.66J	0.54J
	1215	010	0.063	0.052	386327	1.55J	0.36J
	1220	030	0.045	0.058	386328		

POD006
LIBERTY BAY AT VIRGINIA POINT
47 42 54.0 122 38 00.0 2F 0 Elev= 0 ft
53035 Washington Kitsap Co. PACIFIC NORTHWEST
PUGET SOUND (Kitsap-15) 131115
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/STREAM

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/28	1050	000	11.2	7.6	83.8	7.8	66.7	2	4.0	30.04	0.089	0.010K
	1100	009	11.3	7.5	83.8	7.9	66.5			30.08	0.101	0.010K
91/11/21	1110	000	9.9	8.3	89.2	7.7	66.1		3.5	29.14	0.266	0.012
	1120	007	10.1	8.1	87.3	7.7	67.5			29.58	0.275	0.010
91/12/09	1050	000	8.9	8.5	89.4	7.7	69.5	9	4.0	29.10	0.321	0.011
	1055	006	9.1	8.4	88.0	7.7	65.8			29.33	0.323	0.010K
92/01/13	1110	000	7.7	8.5	87.2	7.6	69.0	1	4.1	29.24	0.345	0.010K
	1120	008	7.8	8.4	85.6	7.6	66.3			29.29	0.345	0.010K
92/02/25	1115	000	9.2	8.9	92.5	7.6	72.1	1K	4.5	27.47	0.383	0.010K
	1125	007	8.6	8.4	87.3	7.6	75.4			28.46	0.375	0.010K
92/03/17	1040	000	10.5	8.9	95.7	7.7	63.2	10	4.5	27.48	0.235	0.011
	1050	007	9.8	8.4	89.6	7.7	66.9			28.21	0.243	0.011
92/04/08	1050	000	10.7	11.0	119.1	8.0	69.3	1K	5.0	28.62	0.170	0.010K
	1100	008	10.5	10.2	110.2	8.0	68.7			28.76	0.206	0.010K
92/05/11	1115	000	13.9	8.9	103.3	8.0		1K	4.6	28.84	0.055	
	1125	010	12.9	8.9	101.2	8.0				28.88	0.069	
92/06/01	1110	000	16.1	8.2	100.2	8.2		39	4.5	28.71	0.010K	
	1115	006	14.5	7.5	89.5	8.1				30.09	0.049	
92/07/06	1130	000	15.8	8.2	99.4	8.0	66.1		5.5	28.72	0.076	
	1135	007	14.9	7.7	92.4	8.0	68.2			29.35	0.094	
92/08/04	1115	000	17.0	11.5	143.1	8.3	64.7	1K	3.5	29.66	0.010K	
	1120	010	15.7	9.9	119.8	8.1	53.7			29.73	0.010K	
92/09/15	1045	000	14.8	9.6	115.2	8.1	53.5	3	2.9	30.09	0.010K	
	1050	006	14.8	9.3	111.2	8.1	54.5			30.09	0.010K	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/28	1050	000	0.078	0.065	446324	2.80J	2.20J
	1100	009	0.076	0.063	446325	2.00	0.79
91/11/21	1110	000	0.115	0.074	476324	1.00J	0.58J
	1120	007	0.087	0.075	476325	0.80	0.62
91/12/09	1050	000	0.084	0.084	506324	1.40	0.48
	1055	006	0.067	0.084	506325	0.71	0.53
92/01/13	1110	000	0.032	0.081	36324	1.90	0.29

MORE DATES NEXT PAGE

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
92/01/13	1120	008	0.035	0.080	36325	1.50	0.95
92/02/25	1115	000	0.033	0.076	96324	1.10	0.29
	1125	007	0.027	0.081	96325	0.50	0.30
92/03/17	1040	000	0.030	0.062	126324	1.20	2.50
	1050	007	0.044	0.061	126325	2.30	1.70
92/04/08	1050	000	0.014	0.044	156324	6.80	0.05K
	1100	008	0.028	0.052	156325	6.70	0.22
92/05/11	1115	000	0.104	0.048	206324	0.75	0.15
	1125	010	0.122	0.052	206325	0.45	0.69
92/06/01	1110	000	0.013	0.028	236324	1.90	0.22
	1115	006	0.065	0.044	236325	2.50	0.56
92/07/06	1130	000	0.074	0.060	286324	3.42J	0.91J
	1135	007	0.101	0.063	286325	1.21J	0.78J
92/08/04	1115	000	0.010K	0.053	326324	9.39J	1.05J
	1120	010	0.010K	0.053	326325	13.92J	2.05J
92/09/15	1045	000	0.023	0.033	386324	18.55J	1.72J
	1050	006	0.012	0.023	386325	14.47J	2.08J

PSB003
PUGET SOUND AT WEST POINT
47 39 36.0 122 26 30.0 2F 0 Elev= 0 ft
53033 Washington King Co. PACIFIC NORTHWEST
Puget Sound 131191
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/28	1225	000	11.1	7.5	83.2	7.8	82.7	2	10.5	29.98	0.231	0.010K
	1235	010	11.6	7.0	78.2	7.8	83.5			30.32	0.238	0.010K
	1245	030	11.6	6.9	76.7	7.8	83.3			30.33	0.244	0.010K
91/11/21	1240	000	10.5	7.6	82.9	7.7	82.6		9.5	30.12	0.331	0.010K
	1250	010	10.6	7.1	78.4	7.7	84.7			30.39	0.325	0.010K
	1300	030	10.5	6.9	75.4	7.7	84.3			30.50	0.341	0.010K
91/12/09	1150	000	9.7	8.5	90.1	7.7	69.1	10	6.5	27.83	0.340	0.010K
	1155	010	10.1	7.8	84.5	7.7	83.3			29.94	0.334	0.010K
	1200	030	10.1	7.7	83.5	7.7	83.8			29.97	0.336	0.010K
92/01/13	1250	000	8.8	8.5	88.5	7.6	82.6	1K	8.5	29.23	0.348	0.010K
	1300	010	9.1	7.8	82.8	7.6	82.8			29.87	0.342	0.010K
	1310	030	9.1	7.7	81.9	7.6	82.4			29.90	0.345	0.010K
92/02/25	1325	000	8.7	8.6	90.0	7.6	85.1	1K	9.5	29.21	0.375	0.010K
	1335	010	8.6	8.5	88.8	7.6	86.4			29.26	0.379	0.010K
	1345	019	8.6	8.5	88.5	7.6	86.5			29.29	0.376	0.010K
92/03/17	1130	000	9.1	8.6	89.9	7.6	84.2	15	10.0	28.05	0.296	0.010K
	1140	010	9.0	8.4	87.4	7.6	84.7			28.37	0.300	0.010K
	1150	022	8.9	8.1	85.0	7.6	84.8			28.97	0.304	0.010K
92/04/08	1220	000	9.5	9.1	96.6	7.8	84.0	1K	12.0	29.12	0.327	0.010K
	1230	010	9.2	8.6	90.5	7.8	83.8			29.21		
	1240	030	9.2	8.4	88.9	7.8	83.8			29.29		
92/05/11	1250	000	11.2	10.4	115.0	8.1		1K	9.0	28.96	0.190	
	1300	010	10.8	10.1	110.3	8.0				29.05	0.177	
	1310	023	10.6	9.7	105.7	8.0				29.17		
92/06/01	1200	000	13.2	8.8	100.9	8.1		1K		28.50	0.019	
	1205	010	11.7	10.5	116.8	8.1				29.49	0.180	
	1210	030	10.7	8.6	93.9	7.9				29.80	0.219	
92/07/06	1345	000	12.9	8.8	100.7	8.0	80.3		13.0	29.59	0.172	
	1350	010	12.5	8.4	95.2	8.0	82.7			29.68	0.180	
	1355	030	12.5	8.4	95.4	8.0	82.8			29.68	0.180	
92/08/04	1310	000	14.3	8.9	105.2	8.0	82.7	1K	14.0	29.75	0.169	
	1315	010	13.6	8.4	97.7	7.9	83.2			29.86	0.183	
	1320	030	13.0	7.5	86.0	7.9	84.4			29.96	0.237	
92/09/15	1245	000	13.7	7.1	82.6	7.9	83.1	1	10.5	29.05	0.129	
	1250	010	13.3	7.0	80.8	7.9	85.0			30.33	0.265	
	1255	030	13.1	6.4	73.7	7.8	84.9			30.37	0.267	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/28	1225	000	0.015	0.064	446329	0.73	0.12
	1235	010	0.010K	0.065	446330	1.00	0.30
	1245	030	0.035	0.071	446331	0.88	0.67
91/11/21	1240	000	0.010K	0.068	476329	0.24	0.20
	1250	010	0.010K	0.070	476330	0.11	0.09
	1300	030	0.010K	0.050	476331	0.11	0.15
91/12/09	1150	000	0.010K	0.071	506329	0.41	0.07
	1155	010	0.010K	0.075	506330	0.18	0.05
	1200	030	0.010K	0.078	506331	0.13	0.06
92/01/13	1250	000	0.010K	0.076	36329	0.31	0.09
	1300	010	0.037	0.084	36330	0.22	0.11
	1310	030	0.010K	0.078	36331	0.15	0.11
92/02/25	1325	000	0.010K	0.082	96329	0.36	0.10
	1335	010	0.010K	0.083	96330	0.26	0.13
	1345	019	0.010K	0.082	96331		
92/03/17	1130	000	0.017	0.071	126329	0.60	0.19
	1140	010	0.016	0.072	126330	0.43	0.30
	1150	022	0.013	0.074	126331	0.13	0.13
92/04/08	1220	000	0.013	0.067	156329	1.40	0.14
92/05/11	1250	000	0.158	0.055	206329	2.80	0.43
	1300	010	0.068	0.050	206330	2.60	0.47
	1310	023			206331	1.60	0.31
92/06/01	1200	000	0.010	0.016	236329	12.40	1.30
	1205	010	0.029	0.047	236330	4.70	0.61
	1210	030	0.024	0.053	236331		
92/07/06	1345	000	0.033	0.049	286329	3.22J	0.79J
	1350	010	0.041	0.052	286330	0.91J	0.40J
	1355	030	0.049	0.052	286331		
92/08/04	1310	000	0.010K	0.052	326329	3.36J	0.34J
	1315	010	0.010K	0.054	326330	3.36J	0.80J
	1320	030	0.010K	0.059	326331		
92/09/15	1245	000	0.010K	0.024	386329	1.36J	0.34J
	1250	010	0.074	0.062	386330	0.89J	0.25J
	1255	030	0.049	0.059	386331		

PSS019
POSSESSION SOUND OFF EAST GEDNEY ISLAND
48 00 40.0 122 18 00.0 2F 0 Elev= 0 ft
53061 Washington Snohomish Co. PACIFIC NORTHWEST
PUGET SOUND (Snohomish-07) 131107
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/14	1540	000	13.0	12.8	145.8	8.3	52.5	1K	3.5	28.03	0.010K	0.010K
	1550	010	11.6	7.0	77.6	7.8	85.0			29.83	0.273	0.010K
	1600	026	11.4	5.5	61.0	7.7	86.5			30.07	0.343	0.010K
91/12/02	1415	000	8.5	9.4	94.3	7.7	68.8	15	5.0	23.39	0.335	0.010K
	1425	010	10.2	6.9	75.1	7.7	81.6			29.47	0.346	0.010K
	1435	030	10.6	6.3	69.5	7.7	85.2			30.42	0.345	0.010K
92/01/07	1425	000	6.3	9.9	93.0	7.6	69.4	11	5.0	22.18	0.423	0.010K
	1435	010	9.5	7.2	76.1	7.6	84.3			29.45	0.338	0.010K
	1445	030	9.7	6.9	74.0	7.6	84.9			29.97	0.335	0.010K
92/03/23	1610	000	11.2	11.8	123.7	8.2	79.6	21	12.0	21.74	0.067	0.010K
	1620	010	9.1	9.0	94.5	7.8	87.9			28.45	0.245	0.010K
	1630	020	8.8	8.2	85.9	7.7	89.9			29.02	0.306	0.010K
92/04/20	1455	000	12.4	11.2	115.1	7.9	41.2	16	2.5	13.90	0.122	0.010K
	1505	010	9.7	8.8	93.5	7.8	83.7			28.41	0.218	0.010K
	1515	022	9.1	7.9	83.1	7.7	87.9			29.11	0.335	0.010K
92/05/27	1500	000	13.6	13.0	147.7	8.4		1K	3.5	26.03	0.010K	
	1505	010	10.7	8.5	92.8	7.9				29.12	0.230	
	1510	022	10.5	8.1	87.5	7.8				29.30	0.273	
92/06/22	1630	000	19.4	10.8	137.8	8.3	45.5	1K	3.0	25.01	0.012	
	1640	010	11.6	8.3	92.6	7.9	75.1			28.99	0.171	
	1650	025	10.8	7.3	79.8	7.7	84.5			29.37	0.302	
92/07/28	1600	000	17.3	12.2	149.7	8.3	47.1	1K	4.0	25.83	0.010K	
	1605	010	12.5	7.9	89.7	7.8	85.1			29.57	0.249	
	1610	030	11.2	6.8	75.5	7.7	85.2			29.62	0.330	
92/08/17	1420	000	18.2	10.4	131.5	8.4	64.2	1K		27.38	0.010K	
	1425	010	13.1	8.2	93.8	8.4	73.9			29.20	0.155	
	1430	030	11.7	5.7	63.9	7.8	83.7			29.87	0.301	
92/09/28	1645	000	13.4	8.3	92.8	7.9	63.3	13	4.3	24.14	0.135	
	1655	010	12.6	6.1	69.2	7.8	85.1			29.80	0.213	
	1705	030	12.6	5.5	62.7	7.7	86.0			30.26	0.312	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4-N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/14	1540	000	0.010K	0.027	426264	18.60	2.19
	1550	010	0.010K	0.068	426265	3.07	0.76
	1600	026	0.010K	0.076	426266	0.30	0.48
91/12/02	1415	000	0.031	0.061	496264	0.40	0.12
	1425	010	0.010K	0.075	496265	0.07	0.06
	1435	030	0.010K	0.076	496266	0.04	0.05
92/01/07	1425	000	0.027	0.044	26264	1.00	0.50
	1435	010	0.010K	0.076	26265	0.18	0.12
	1445	030	0.010K	0.079	26266	0.05K	0.05K
92/03/23	1610	000	0.021	0.019	136264	3.70	0.05K
	1620	010	0.022	0.064	136265	3.60	0.05K
	1630	020	0.015	0.075	136266	0.47	0.14
92/04/20	1455	000	0.019	0.017	176264	2.80	0.38
	1505	010	0.019	0.055	176265	2.10	0.54
	1515	022	0.010K	0.073	176266	0.15	0.13
92/05/27	1500	000	0.010K	0.010K	226264	12.10	0.05K
	1505	010	0.027	0.052	226265	0.76	0.20
	1510	022	0.012	0.056	226266		
92/06/22	1630	000	0.010K	0.011	266264		
	1640	010	0.010K	0.048	266265		
	1650	025	0.010K	0.066	266266		
92/07/28	1600	000	0.010K	0.020	316264	1.57J	0.90J
	1605	010	0.011	0.060	316265	0.52J	0.87J
	1610	030	0.010K	0.068	316266		
92/08/17	1420	000	0.015	0.019	346264	1.93J	0.79J
	1425	010	0.015	0.046	346265	0.89J	0.48J
	1430	030	0.017	0.066	346266		
92/09/28	1645	000	0.019	0.033	406264	0.75J	0.34J
	1655	010	0.010K	0.053	406265	0.45J	0.33J
	1705	030	0.010K	0.075	406266		

PTH005
PORT TOWNSEND HARBOR NR WALAN PT
48 05 00.0 122 45 48.0 2F 0 Elev= 0 ft
53031 Washington Jefferson Co. PACIFIC NORTHWEST
PUGET SOUND (Quilcene/Snow-17) 131117
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/STREAM

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/14	1020	000	11.0	7.8	86.9	7.8	75.8	1K	6.5	30.98	0.252	0.010K
	1030	010	10.5	7.0	77.1	7.8	78.5			31.13	0.250	0.010K
	1040	025	10.0	5.9	64.3	7.7	68.1			31.41	0.229	0.010K
91/12/02	0950	000	8.7	8.4	88.5	7.7	80.3	2	9.0	30.66	0.365	0.010K
	1000	010	8.7	8.3	87.1	7.7	80.6			30.67	0.362	0.010K
	1010	025	8.7	8.1	85.2	7.7	79.7			30.77	0.359	0.010K
92/01/07	1045	000	7.9	8.4	86.7	7.5	78.0	2	7.1	30.48	0.424	0.010K
	1055	010	7.7	8.4	86.6	7.6	80.0			30.65	0.419	0.010K
	1100	027	8.0	7.6	78.7	7.6	62.8			31.06	0.356	0.010K
92/03/23	1050	000	9.8	8.4	90.5	7.8	81.3	1K	8.0	30.15	0.214	0.010K
	1100	010	9.3	8.1	86.3	7.8	80.0			30.41	0.223	0.010K
	1110	022	9.1	7.7	82.1	7.7	67.1			30.76	0.227	0.010K
92/04/20	1005	000	10.1	9.3	101.4	7.9	79.0	1K	7.5	30.50	0.176	0.010K
	1010	010	9.8	8.5	91.8	7.9	79.8			30.75	0.203	0.010K
	1015	023	9.6	7.8	83.6	7.8	62.4			31.08	0.225	0.010K
92/05/27	1045	000	12.2	10.9	123.1	8.1		1K	4.3	29.95	0.053	
	1050	010	11.7	10.1	113.6	8.1				30.35	0.064	
	1055	022	10.6	8.2	89.8	7.9				30.64	0.211	
92/06/22	1015	000	14.7	15.1	181.3	8.4	33.6	1K	2.8	30.41	0.010K	
	1025	010	11.1	8.2	91.6	7.9	71.2			30.87	0.159	
	1035	025	10.7	6.4	71.1	7.7	49.2			31.06	0.219	
92/07/28	1020	000	13.2	9.9	114.4	8.0	66.0	1K	6.1	30.44	0.103	
	1025	010	12.4	9.5	108.7	8.0	63.9			30.69	0.144	
	1030	022	11.3	7.6	85.1	7.8	47.9			31.10	0.240	
92/08/17	1040	000	14.0	12.8	150.8	8.4	54.5	1K		30.91	0.010K	
	1045	010	12.0	8.2	93.6	8.1	74.4			31.12	0.132	
	1050	023	11.1	5.6	62.0	7.8	50.2			31.43	0.251	
92/09/28	1040	000	11.3	7.3	81.3	7.8	80.5	1K	9.5	31.31	0.217	
	1050	010	11.2	6.8	76.0	7.8	79.3			31.43	0.278	
	1100	022	10.4	5.8	63.5	7.7	81.4			31.77	0.340	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/14	1020	000	0.014	0.069	426250	7.10	1.11
	1030	010	0.014	0.066	426251	8.61	0.94
	1040	025	0.030	0.058	426252	1.43	0.05K
91/12/02	0950	000	0.010K	0.070	496250	0.31	0.17
	1000	010	0.010K	0.074	496251	0.26	0.20
	1010	025	0.010K	0.072	496252	0.22	0.22
92/01/07	1045	000	0.010K	0.063	26250	0.29	0.22
	1055	010	0.012	0.066	26251	0.34	0.24
	1100	027	0.011	0.077	26252	0.23	0.46
92/03/23	1050	000	0.010K	0.058	136250	0.78	0.08
	1100	010	0.010K	0.062	136251	0.91	0.17
	1110	022	0.010K	0.062	136252	0.45	0.40
92/04/20	1005	000	0.015	0.045	176250	3.40	0.18
	1010	010	0.024	0.053	176251	2.20	0.31
	1015	023	0.023	0.057	176252	0.66	0.53
92/05/27	1045	000	0.010K	0.022	226250	10.20	1.80
	1050	010	0.011	0.028	226251	11.30	2.60
	1055	022	0.022	0.049	226252		
92/06/22	1015	000	0.010K	0.010K	266250		
	1025	010	0.021	0.046	266251		
	1035	025	0.062	0.065	266252		
92/07/28	1020	000	0.015	0.036	316250	5.41J	1.70J
	1025	010	0.019	0.044	316251	12.38J	2.45J
	1030	022	0.044	0.065	316252		
92/08/17	1040	000	0.015	0.010K	346250	11.60J	2.20J
	1045	010	0.010K	0.033	346251	9.63J	1.27J
	1050	023	0.043	0.068	346252		
92/09/28	1040	000	0.012	0.050	406250	1.99J	0.52J
	1050	010	0.016	0.062	406251	1.81J	0.49J
	1100	022	0.017	0.073	406252		

QMH001
QUARTERMASTER HARBOR NEAR BUTTON
47 22 48.0 122 27 54.0 2F000 Elev= 0 ft
53033 Washington King Co. PACIFIC NORTHWEST
PUGET SOUND (Kitsap-15) 131115
21540000 Reach=17110019000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/28	1340	000	11.2	8.7	97.0	8.0	77.0	1K	7.6	30.06	0.122	0.010K
	1350	010	11.6	7.7	86.5	7.9	76.3			30.24	0.152	0.010K
91/11/21	1350	000	9.9	8.8	94.5	7.8	76.5		6.5	29.05	0.277	0.010K
	1400	010	10.6	7.1	77.4	7.7	77.9			30.16	0.328	0.010K
91/12/09	1255	000	9.5	6.4	67.9	7.8	72.8	3	5.0	27.90	0.333	0.010K
	1300	010	10.1	6.3	66.8	7.7	77.0			27.51	0.334	0.010K
92/01/13	1400	000	7.7	9.4	94.8	7.7	74.9	2	5.5	28.50	0.449	0.010K
	1410	010	9.1	7.7	81.4	7.6	76.9			29.83	0.341	0.010K
92/02/25	1425	000	9.6	9.4	99.6	7.7	84.4	1K	9.5	27.72	0.349	0.010K
	1435	010	8.6	8.5	88.6	7.6	85.6			29.16	0.373	0.010K
92/03/17	1230	000	10.0	11.0	116.3	7.9	70.9	1K	6.5	27.56	0.198	0.010K
	1240	010	9.1	7.8	82.1	7.6	76.9			28.93	0.278	0.010K
92/04/08	1415	000	11.1	13.0	142.6	8.3	68.3	1K	4.8	28.85	0.036	0.010K
	1425	010	9.7	10.1	107.3	8.0	72.2			28.99		
92/05/11	1435	000	12.2	10.9	122.1	8.1		1K	9.4	28.90	0.137	
	1445	010	11.1	10.3	113.6	8.1				29.09	0.145	
92/06/01	1310	000	17.5					1K	4.0	27.87	0.010K	
	1315	010	12.0							28.59	0.010K	
92/07/06	1505	000	15.2	12.1	144.5	8.3	64.6		5.0	28.49	0.016	
	1510	010	12.8	8.9	102.4	8.0	79.3			29.58	0.141	
92/08/04	1445	000	16.9	10.4	130.0	8.2	84.2	1K	11.0	29.70	0.011	
	1450	010	13.4	8.1	93.5	7.9	85.3			29.87	0.183	
92/09/15	1420	000	14.4	9.5	112.9	8.1	64.9	1K	5.0	30.14	0.070	
	1425	010	13.4	6.6	76.7	7.9	82.2			30.28	0.134	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/28	1340	000	0.019	0.056	446334	9.30	0.18
	1350	010	0.019	0.058	446335	8.00	0.45
91/11/21	1350	000	0.044	0.055	476334	1.50	0.38
	1400	010	0.010K	0.055	476335	0.34	0.20
91/12/09	1255	000	0.016	0.072	506334	0.75	0.22
	1300	010	0.010K	0.075	506335	0.22	0.17
92/01/13	1400	000	0.016	0.074	36334	2.50	0.77
	1410	010	0.010K	0.077	36335	0.40	0.26
92/02/25	1425	000	0.023	0.075	96334	0.63	0.16
	1435	010	0.010K	0.082	96335	0.44	0.11

MORE DATES NEXT PAGE

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4-N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
92/03/17	1230	000	0.010K	0.049	126334	5.20	0.53
	1240	010	0.035	0.069	126335		
92/04/08	1415	000	0.010K	0.028	156334	6.50	0.23
92/05/11	1435	000	0.029	0.036	206334	1.50	0.20
	1445	010	0.045	0.042	206335	1.30	0.70
92/06/01	1310	000	0.010K	0.010K	236334	1.40	0.55
	1315	010	0.038	0.042	236335	7.10	0.33
92/07/06	1505	000	0.010K	0.023	286334	6.14J	1.33J
	1510	010	0.038	0.050	286335	2.45J	0.48J
92/08/04	1445	000	0.010K	0.044	326334	0.99J	0.30J
	1450	010	0.011	0.060	326335	1.38J	0.81J
92/09/15	1420	000	0.042	0.046	386334	11.97J	2.14J
	1425	010	0.018	0.030	386335	1.24J	0.31J

SAR003
SARATOGA PASSAGE OFF EAST POINT
48 06 28.0 122 29 25.0 2F 0 Elev= 0 ft
53029 Washington Island Co. PACIFIC NORTHWEST
PUGET SOUND (Island-06) 131106
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/STREAM

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/14	1510	000	13.1	14.1	160.2	8.3	44.2	1K	2.4	27.63	0.010K	0.010K
	1520	010	11.7	7.3	81.5	7.9	83.4			29.42	0.266	0.010K
	1525	029	11.3	5.1	56.5	7.6	85.1			30.06	0.332	0.010K
91/12/02	1335	000	8.5	9.8	97.9	7.7	73.2	1	5.4	23.37	0.291	0.010K
	1345	010	10.3	6.5	69.8	7.6	83.0			28.57	0.316	0.010K
	1355	030	10.7	6.0	65.7	7.7	85.1			30.42	0.343	0.010K
92/01/07	1355	000	5.8	10.4	98.2	7.7	79.5	1K	9.0	23.81	0.366	0.010K
	1405	010	9.1	7.7	80.2	7.6	84.8			28.43	0.335	0.010K
	1415	030	10.1	6.2	66.7	7.6	79.1			30.17	0.336	0.010K
92/03/23	1540	000	11.5	10.1	107.7	8.0	88.7	1K	16.0	23.41	0.125	0.010K
	1550	010	9.0	8.4	88.2	7.7	90.4			28.59	0.242	0.010K
	1600	023	8.8	7.9	82.2	7.6	90.3			29.01	0.303	0.010K
92/04/20	1420	000	12.1	10.6	115.5	8.1	73.1	1K	6.0	23.82	0.096	0.010K
	1430	010	9.9	8.5	90.2	7.8	87.7			28.20	0.251	0.010K
	1440	023	9.1	7.2	76.2	7.6	87.8			29.03	0.323	0.010K
92/05/27	1430	000	14.4	12.5	145.3	8.4		1K	3.8	26.24	0.010K	
	1435	010	10.6	8.5	91.9	7.9				28.74	0.238	
	1440	023	10.3	7.9	84.9	7.8				29.21	0.286	
92/06/22	1545	000	18.5	13.1	162.0	8.5	40.0	1K	3.0	24.07	0.010K	
	1555	010	10.8	7.1	77.9	7.7	82.5			29.15	0.265	
	1605	030	10.5	6.8	74.0	7.6	83.2			29.34	0.321	
92/07/28	1520	000	17.0	13.2	160.2	8.4	46.2	1K	4.1	25.12	0.010K	
	1525	010	11.9	8.4	94.1	7.8	73.2			29.19	0.147	
	1530	030	11.2	6.3	70.0	7.6	78.6			29.78	0.299	
92/08/17	1330	000	17.3	13.5	165.3	8.6	43.8	1K		25.70	0.010K	
	1335	010	12.3	7.0	79.0	8.0	75.9			29.30	0.175	
	1340	030	11.6	5.4	60.5	7.8	84.0			29.73	0.299	
92/09/28	1600	000	13.1	8.8	101.2	8.0	74.5	1K	7.0	29.01	0.097	
	1610	010	12.7	6.8	77.4	7.9	81.0			29.51	0.201	
	1620	030	12.4	5.0	57.0	7.7	81.9			30.19	0.307	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/14	1510	000	0.010K	0.025	426261	29.30	2.20
	1520	010	0.010	0.072	426262	4.52	0.70
	1525	029	0.010K	0.078	426263	0.51	0.18
91/12/02	1335	000	0.038	0.065	496261	0.40	0.13
	1345	010	0.015	0.078	496262	0.10	0.14
	1355	030	0.010K	0.078	496263	0.04	0.06
92/01/07	1355	000	0.012	0.048	26261	0.59	0.30
	1405	010	0.010K	0.077	26262	0.43	0.20
	1415	030	0.010K	0.081	26263	0.05K	0.07
92/03/23	1540	000	0.023	0.036	136261	0.59	0.05K
	1550	010	0.027	0.067	136262	0.91	0.05K
	1600	023	0.017	0.078	136263	0.22	0.13
92/04/20	1420	000	0.016	0.031	176261	3.90	0.34
	1430	010	0.019	0.063	176262	0.78	0.51
	1440	023	0.011	0.073	176263	0.13	0.30
92/05/27	1430	000	0.010K	0.010K	226261	10.90	0.05K
	1435	010	0.015	0.053	226262	5.00	0.07J
	1440	023	0.010K	0.059	226263		
92/06/22	1545	000	0.010K	0.010	266261		
	1555	010	0.010K	0.061	266262		
	1605	030	0.010K	0.069	266263		
92/07/28	1520	000	0.010K	0.028	316261	4.27J	3.30J
	1525	010	0.010K	0.046	316262	5.32J	2.57J
	1530	030	0.010K	0.067	316263		
92/08/17	1330	000	0.016	0.010K	346261	1.21J	0.95J
	1335	010	0.014	0.039	346262	3.47J	2.05J
	1340	030	0.015	0.069	346263		
92/09/28	1600	000	0.010K	0.040	406261	6.37J	1.26J
	1610	010	0.013	0.065	406262	3.31J	1.60J
	1620	030	0.010K	0.080	406263		

SIN001
SINCLAIR INLET AT NAVAL SHPYARDS
47 32 58.0 122 38 32.0 2F 0 Elev= 0 ft
53035 Washington Kitsap Co. PACIFIC NORTHWEST
PUGET SOUND (Kitsap-15) 131115
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/28	1005	000	11.5	7.6	84.5	7.8	75.0	28	6.5	29.92	0.139	0.010K
	1015	010	11.8	7.2	81.2	7.8	76.0			30.11	0.163	0.010K
91/11/21	1020	000	10.2	7.8	84.3	7.7	77.0		6.5	29.64	0.327	0.010K
	1030	010	10.6	7.2	79.3	7.7	76.2			30.03	0.325	0.010K
91/12/09	1000	000	9.6	8.3	88.0	7.7	74.3	260J	6.5	29.04	0.339	0.010K
	1005	010	10.0	7.6	81.8	7.7	77.7			29.93	0.337	0.010K
92/01/13	1020	000	8.3	8.1	83.4	7.6	79.3	2	8.0	29.29	0.351	0.010K
	1030	010	8.7	7.8	81.9	7.6	80.8			29.61	0.350	0.010K
92/02/25	1030	000	9.2	8.9	92.5	7.6	82.4	3	7.0	27.42	0.372	0.010K
	1040	010	8.6	8.2	85.5	7.6	84.7			28.73	0.464	0.010K
92/03/17	0950	000	9.9	8.8	93.7	7.7	68.5	3	6.0	27.75	0.277	0.011
	1000	010	9.4	8.0	83.9	7.6	76.4			28.60	0.288	0.010K
92/04/08	0950	000	10.0	9.5	101.0	7.8	79.1	2	9.2	28.53	0.308	0.010K
	1000	010	9.9	9.0	96.1	7.8	80.6			28.89	0.321	0.010K
92/05/11	1015	000	12.2	9.8	109.5	8.0		1K	12.0	28.68	0.090	
	1025	010	12.1	9.8	110.3	8.1				28.98	0.124	
92/06/01	1015	000	15.4	8.2	96.6	8.1		44	7.0	25.76	0.051	
	1020	010	12.5	8.6	98.6	8.0				30.71	0.107	
92/07/06	1025	000	15.3	9.0	107.6	8.1	77.2		9.0	29.11	0.086	
	1030	010	14.2	8.1	95.0	8.0	75.0			29.46	0.118	
92/08/04	1015	000	16.6	14.0	172.4	8.4	45.1	2	2.5	29.38	0.010K	
	1020	010	14.7	9.4	112.4	8.1	66.4			29.77	0.055	
92/09/15	0955	000	14.7	10.6	126.6	8.2	81.9	3	8.0	29.97	0.010K	
	1000	010	14.5	8.5	100.6	8.0	83.1			30.11	0.080	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/28	1005	000	0.077	0.066	446320	2.30	0.44
	1015	010	0.050	0.070	446321	1.60	0.68
91/11/21	1020	000	0.044	0.071	476320	0.63	0.23
	1030	010	0.026	0.073	476321	1.20	0.38
91/12/09	1000	000	0.038	0.081	506320	0.43	0.27
	1005	010	0.025	0.080	506321	0.45	0.22
92/01/13	1020	000	0.060	0.085	36320	0.63	0.21

MORE DATES NEXT PAGE

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
92/01/13	1030	010	0.016	0.083	36321	0.38	0.15
92/02/25	1030	000	0.050	0.086	96320	0.57	0.20
	1040	010	0.023	0.064	96321	0.46	0.16
92/03/17	0950	000	0.089	0.085	126320	3.40	0.54
	1000	010	0.031	0.078	126321	1.10	0.42
92/04/08	0950	000	0.117	0.083	156320	1.50	0.32
	1000	010	0.032	0.073	156321	1.90	0.15
92/05/11	1015	000	0.119	0.060	206320	0.29	0.13
	1025	010	0.062	0.047	206321	0.64	0.21
92/06/01	1015	000	0.166	0.066	236320	0.08	1.70
	1020	010	0.089	0.061	236321	1.40	0.57
92/07/06	1025	000	0.056	0.051	286320	1.38J	0.54J
	1030	010	0.062	0.054	286321	1.28J	0.44J
92/08/04	1015	000	0.010K	0.050	326320	22.81J	4.22J
	1020	010	0.010K	0.053	326321	4.04J	1.23J
92/09/15	0955	000	0.250	0.057	386320	5.59J	1.55J
	1000	010	0.046	0.029	386321	2.14J	0.59J

STL001
STEILACOOM OFF CHAMBERS CREEK
47 11 06.0 122 36 36.0 2F000 Elev= 0 ft
53053 Washington Pierce Co. PACIFIC NORTHWEST
PUGET SOUND (Chambers/Clover-12) 131112
21540000 Reach=17110019000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/10/07	1235	000	13.1	7.2	82.5	7.9	80.6	1K	7.6	29.83	0.202	0.010K
	1240	010	13.0	7.1	81.5	7.9	80.1			29.86	0.207	0.010K
	1245	028	13.0	7.1	82.1	7.9	80.4			29.90	0.200	0.010K
91/11/25	1040	000	10.7	7.2	78.5	7.7	79.6		6.5	30.16	0.332	0.010K
	1050	010	10.6	7.1	77.3	7.7	78.7			30.18	0.331	0.010K
	1100	029	10.6	7.0	76.9	7.7	78.5			30.21	0.333	0.010K
91/12/26	1325	000	9.7	7.4	78.9	7.6	78.4	2	7.0	29.70	0.293	0.010K
	1335	010	9.7	7.3	78.3	7.6	78.7			29.74	0.312	0.010K
	1345	028	9.7	7.2	77.2	7.6	78.3			29.82	0.311	0.010K
92/01/22	1010	000	8.8	7.9	83.2	7.6	76.2	1	5.8	29.54	0.381	0.010K
	1020	010	8.8	7.9	82.3	7.6	75.8			29.57	0.382	0.010K
	1030	030	8.8	7.7	81.2	7.6	75.8			29.62	0.379	0.010K
92/02/27	1535	000	8.9	8.7	90.2	7.6	80.6		8.2	28.08	0.369	0.010K
	1540	010	8.7	8.5	88.7	7.6	82.0			28.51	0.371	0.010K
	1545	022	8.7	8.5	87.9	7.6	83.3			28.76	0.372	0.010K
92/03/18	1310	000	9.3	8.7	91.3	7.7	77.3	1K	8.5	28.25	0.296	0.010K
	1315	010	9.0	8.4	87.9	7.6	81.7			28.67	0.300	0.010K
	1325	022	9.0	8.4	87.8	7.6	81.9			28.71	0.302	0.010K
92/04/14	1310	000	10.4	9.4	101.3	7.8	84.4	1	9.5	28.24	0.262	0.010K
	1315	010	9.8	9.5	101.6	7.9	84.6			28.69	0.255	0.010K
	1320	022	9.6	9.2	97.9	7.8	84.2			28.82	0.263	0.010K
92/05/18	1105	000	11.6	10.1	112.0	8.0		1K	11.0	28.85	0.177	
	1115	010	11.2	9.7	107.2	7.9				28.96	0.188	
	1125	022	11.2	9.7	106.5	7.9				29.01	0.202	
92/06/15	1440	000	13.0	9.3	106.8	8.0	80.4	1K	11.5	29.06	0.156	
	1450	010	12.6	9.1	103.4	8.0	80.7			29.13	0.178	
	1500	030	12.4	8.9	101.1	8.0	81.7			29.16	0.187	
92/07/14	1405	000	14.5	8.9	105.7	8.0	80.4	1K	11.0	29.19	0.133	
	1410	010	13.7	8.9	103.5	8.0	80.7			29.34	0.133	
	1415	030	13.6	8.7	101.5	8.0	81.7			29.44	0.155	
92/08/10	1455	000	15.4	9.6	115.4	8.3	78.5	1K	9.0	29.45	0.128	
	1500	010	14.8	9.1	109.0	8.2	77.2			29.54	0.080	
	1520	030	14.4	8.5	100.8	8.1	80.0			29.64	0.113	
92/09/14	1420	000	14.1	7.4	87.2	7.9	81.2	1	9.6	30.04	0.189	
	1425	010	14.1	7.4	86.8	7.9	81.3			30.04	0.204	
	1435	030	14.0	7.2	84.2	7.9	81.7			30.05	0.101	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/10/07	1235	000	0.014	0.065	416311	2.27	0.66
	1240	010	0.014	0.065	416312	4.53	0.20
	1245	028	0.014	0.064	416313	5.80	0.05K
91/11/25	1040	000	0.010K	0.067	486311		
	1050	010	0.010K	0.067	486312		
	1100	029	0.010K	0.066	486313		
91/12/26	1325	000	0.010K	0.078	526311	0.22	0.11
	1335	010	0.010K	0.078	526312	0.20	0.14
	1345	028	0.010K	0.078	526313	0.20	0.12
92/01/22	1010	000	0.010K	0.083	46311	0.34	0.16
	1020	010	0.010K	0.083	46312	0.33	0.20
	1030	030	0.010K	0.082	46313	0.27	0.24
92/02/27	1535	000	0.010K	0.080	96311	0.54	0.15
	1540	010	0.010K	0.080	96312	0.65	0.15
	1545	022	0.010K	0.081	96313		
92/03/18	1310	000	0.010K	0.068	126311	1.30	0.15
	1315	010	0.010	0.075	126312	1.80	0.05K
	1325	022	0.010	0.076	126313	1.70	0.07
92/04/14	1310	000	0.020	0.056	166311	0.74	0.07
	1315	010	0.033	0.056	166312	2.30	0.25
	1320	022	0.023	0.058	166313	1.90	0.26
92/05/18	1105	000	0.020	0.041	216311	3.00	0.05K
	1115	010	0.023	0.045	216312	4.50	0.15J
	1125	022	0.025	0.048	216313		
92/06/15	1440	000	0.029	0.053	256311	3.90	0.49
	1450	010	0.034	0.054	256312	2.40J	0.63J
	1500	030	0.037	0.055	256313		
92/07/14	1405	000	0.029	0.051	296311	3.86J	0.47J
	1410	010	0.032	0.051	296312	4.82J	1.07J
	1415	030	0.040	0.052	296313		
92/08/10	1455	000	0.013	0.044	336311	3.30J	1.31J
	1500	010	0.010K	0.030	336312	3.34J	2.07J
	1520	030	0.010K	0.034	336313		
92/09/14	1420	000	0.010K	0.059	386311	3.40J	1.00J
	1425	010	0.010K	0.060	386312	4.08J	0.95J
	1435	030	0.010K	0.029	386313		

WPA001
WILLAPA RIVER AT RAYMOND
46 41 15.0 123 44 55.0 2F 0 Elev= 0 ft
53049 Washington Pacific Co. PACIFIC NORTHWEST
COASTAL (Willapa-24) 131224
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/STREAM

INDEX 1312137
MILES 0006.40 . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/12/30	1400	000	7.7	10.3	91.5	7.3	47.8		1.7	8.44	0.654	0.010K
	1410	008	7.7	10.1	91.0	7.3	24.3			10.65	0.392	0.010K
92/02/10	1505	000	8.4	13.4	117.4	7.3	43.1	30	1.8	2.93	0.624	0.010K
	1515	009	8.7	13.1	125.6	7.7	0.2			15.68	0.363	0.010K
92/03/30	1415	000	12.8	8.6	92.5	7.9	49.1	6	2.0	19.26	0.088	0.010K
	1425	008	12.3	8.8	94.9	8.0	13.4			21.32	0.066	0.010K
92/05/04	1525	000	16.5	9.6	102.5	7.4		28	1.5	6.11	0.317	
	1535	008	15.1	9.2	98.0	7.6				10.86	0.222	
92/06/08	1505	000	19.0	8.7	101.2	7.7	21.9	22	1.4	10.63	0.010K	
	1515	008	18.4	6.9	83.4	7.6	0.0			20.19	0.010K	
92/07/27	1600	000	20.8	7.1	90.0	7.6	20.8	22	1.0	20.68	0.058	
	1605	008	20.4	6.7	84.5	7.6	15.7			21.46	0.057	
92/08/24	1330	000	20.4					10	2.0	22.49	0.049	
	1335	009	19.2							24.81	0.047	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/12/30	1400	000	0.030	0.012	16220	0.73	0.59
	1410	008	0.035	0.017	16221	0.99	1.20
92/02/10	1505	000	0.021	0.011	76220	1.10	0.57
	1515	009	0.029	0.020	76221	3.60	9.10
92/03/30	1415	000	0.025	0.011	146220	2.30	0.43
	1425	008	0.025	0.012	146221	2.80	0.94
92/05/04	1525	000	0.035	0.011	196220		
	1535	008	0.025	0.011	196221		
92/06/08	1505	000	0.010K	0.025	246220		
	1515	008	0.014	0.010K	246221		
92/07/27	1600	000	0.035	0.026	316220		
	1605	008	0.046	0.027	316221		
92/08/24	1330	000	0.023	0.016	356220		
	1335	009	0.040	0.020	356221		

WPA003
WILLAPA RIVER AT JOHNSON SLOUGH
46 42 15.0 123 50 10.0 2F 0 Elev= 0 ft
53049 Washington Pacific Co. PACIFIC NORTHWEST
Washington Coast 131291
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/STREAM

INDEX 1312137
MILES 0000.40 . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
92/02/10	1450	000	9.2	13.2	119.4	7.8	36.2		1.5	5.32		
	1500	006	9.1	15.9	158.6	7.9	30.3			21.07		
92/03/30	1400	000	12.6	9.8	106.7	8.1	53.2		2.4	22.73		
	1410	006	11.8	9.4	102.1	8.1	47.5			25.29		
92/05/04	1510	000	16.0	8.9	101.6	8.0			1.4	19.12		
	1515	008	15.5	8.8	100.3	8.0				19.61		
92/06/08	1450	000	18.4	7.9	95.6	7.8	25.4		1.5	20.35		
92/07/27	1540	000	20.7	7.9	103.2	7.9	25.2		1.5	25.90		
	1545	008	19.3	7.5	95.8	8.0	35.1			27.46		

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L

WPA004
WILLAPA BAY AT TOKE POINT
46 41 13.0 123 58 20.0 2F 0 Elev= 0 ft
53049 Washington Pacific Co. PACIFIC NORTHWEST
COASTAL (Willapa-24) 131224
21540000 Reach= 0.000 Drg= 0 sqmi
AMBNT/OCEAN

INDEX
MILES . . . . . .

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/12/30	1305	000	8.4	9.8	97.6	7.9	49.2		2.1	23.76	0.142	0.010K
	1315	007	8.4	9.7	97.1	7.9	45.4			23.98	0.143	0.010K
92/02/10	1340	000	9.4	13.2	127.0	7.9	58.6	1	2.5	13.64	0.227	0.010K
	1350	010	9.5	9.9	101.9	7.9	59.5			24.29	0.192	0.010K
92/03/30	1255	000	11.8	9.7	107.1	8.1	70.7	1K	4.0	27.78	0.015	0.010K
	1305	010	11.5	9.6	105.6	8.1	66.5			27.93	0.016	0.010K
92/05/04	1315	000	14.8	9.0	104.0	8.1		1K	2.0	23.74	0.010K	
	1320	010	14.6	9.0	103.5	8.1				24.36	0.010K	
92/06/08	1325	000	16.4	8.4	101.8	8.0	39.2	1K	2.3	27.68	0.010K	
	1335	010	15.7	8.3	100.3	8.0	44.9			28.89	0.017	
92/07/27	1435	000	17.3	8.8	110.0	8.1	58.7	1K	3.0	29.85	0.016	
	1440	008	15.3	9.0	109.2	8.1	55.8			30.62	0.088	
92/08/24	1220	000	17.0					1K	5.0	29.09	0.010K	
	1225	010	16.0							29.02	0.010K	
92/09/22	1355	000	15.0	8.8	106.0	8.0	63.2	1K	3.3	31.48	0.010K	
	1400	010	14.5	8.8	105.8	8.0	58.6			31.49	0.010K	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/12/30	1305	000	0.026	0.030	16216	0.88	0.62
	1315	007	0.026	0.030	16217	0.91	0.55
92/02/10	1340	000	0.016	0.022	76216	1.30	0.45
	1350	010	0.015	0.021	76217	1.40	0.75
92/03/30	1255	000	0.010K	0.016	146216	4.10	0.05K
	1305	010	0.010K	0.017	146217	5.30	0.34
92/05/04	1315	000	0.010K	0.013	196216	3.70	0.47
	1320	010	0.010K	0.013	196217	4.20	1.30
92/06/08	1325	000	0.010K	0.018	246216	4.60	1.00
	1335	010	0.010K	0.022	246217	6.60	1.70
92/07/27	1435	000	0.013	0.032	316216	2.00J	1.06J
	1440	008	0.018	0.044	316217	5.20J	3.08J
92/08/24	1220	000	0.010K	0.022	356216	5.07J	1.50J
	1225	010	0.010K	0.016	356217	5.10J	2.18J
92/09/22	1355	000	0.011	0.028	396216	3.70J	2.65J

MORE DATES NEXT PAGE

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
92/09/22	1400	010	0.013	0.029	396217	3.80J	2.62J

WPA006
WILLAPA BAY AT NAHCOTTA CHANNEL
46 32 44.0 123 58 44.0 2F000 Elev= 0 ft
53049 Washington Pacific Co. PACIFIC NORTHWEST
COASTAL (Willapa-24) 131224
21540000 Reach=17100106000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
91/12/30	1330	000	7.6	10.2	98.6	7.8	50.6		2.0	21.78	0.169	0.010K
	1340	007	7.6	10.1	98.2	7.8	49.4			21.78	0.167	0.010K
92/02/10	1405	000	9.6	12.4	120.2	7.9	54.0	1K	2.4	14.10	0.183	0.010K
	1415	005	9.5	15.0	153.2	7.9	54.1			22.93	0.179	0.010K
92/03/30	1315	000	12.4	9.4	104.1	8.1	74.4	1K	5.0	25.76	0.010K	0.010K
	1325	010	12.3	9.5	104.7	8.1	72.5			26.28	0.010K	0.010K
92/05/04	1400	000	15.3	9.2	105.4	8.0		1	2.5	21.82	0.010K	
	1410	010	15.3	9.2	105.7	8.1				22.20	0.010K	
92/06/08	1350	000	16.9	8.0	97.2	8.0	56.3	1K	2.6	26.36	0.010K	
	1400	010	16.7	8.0	97.0	8.0	56.4			26.66	0.010K	
92/08/24	1245	000	18.0					1K	5.0	29.60	0.010K	
	1255	009	17.5							29.52	0.010K	

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L
91/12/30	1330	000	0.042	0.032	16218	1.10	0.57
	1340	007	0.041	0.031	16219	0.97	0.63
92/02/10	1405	000	0.020	0.023	76218	1.60	0.47
	1415	005	0.019	0.026	76219	1.60	0.53
92/03/30	1315	000	0.010K	0.016	146218	1.90	0.27
	1325	010	0.010K	0.014	146219	3.60	0.81
92/05/04	1400	000	0.010K	0.014	196218	3.60	0.37
	1410	010	0.010K	0.014	196219	3.40	0.48
92/06/08	1350	000	0.010K	0.033	246218	2.80	0.74
	1400	010	0.010K	0.026	246219	3.50	1.30
92/08/24	1245	000	0.010K	0.030	356218	3.68J	1.68J
	1255	009	0.010K	0.036	356219	4.49J	1.55J

WPA007
WILLAPA BAY NEAR LONG ISLAND
46 27 12.0 124 00 30.0 2F000 Elev= 0 ft
53049 Washington Pacific Co. PACIFIC NORTHWEST
COASTAL (Willapa-24) 131224
21540000 Reach=17100106000 0.000 Drg= 0 sqmi
AMBNT/OCEAN

DATE FROM TO	TIME	DEPTH METER	10 WATER TEMP CENT	300 DO MG/L	301 DO SATUR PERCENT	400 PH SU	74 TURB TRANS %	31616 FEC COLI MFM-FCBR /100ML	78 TRANSP SECCHI METERS	480 SALINITY PPTH	631 NO2&NO3 N-DISS MG/L	613 NO2-N DISS MG/L
92/02/10	1430	000	9.5	12.5	119.2	7.9	46.3		1.9	12.47		
	1440	009	9.4	10.2	102.3	7.9	45.1			20.53		
92/03/30	1330	000	13.0	9.5	105.2	8.1	68.7		4.0	23.53		
	1340	008	12.9	9.5	105.1	8.1	65.0			23.92		
92/05/04	1435	000	15.7	8.9	102.8	8.0			1.8	21.08		
	1445	010	15.7	8.9	102.9	8.0				21.08		
92/06/08	1420	000	17.5	8.1	99.1	8.0	48.1		2.5	25.14		
	1430	007	17.4	8.0	97.9	8.0	48.9			25.21		
92/07/27	1515	000	19.3	9.5	122.8	8.3	44.1		2.5	28.30		
	1520	007	18.7	8.5	108.2	8.2	33.1			28.53		

DATE FROM TO	TIME	DEPTH METER	608 NH3+NH4- N DISS MG/L	671 PHOS-DIS ORTHO MG/L P	8 LAB IDENT. NUMBER	32211 CHLRPHYL A UG/L CORRECTD	32218 PHEOPHTN A UG/L

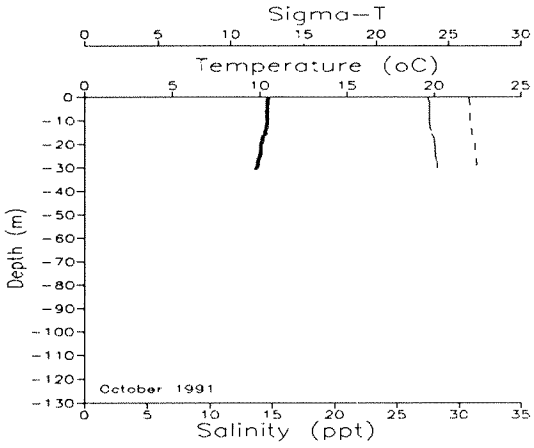
APPENDIX B

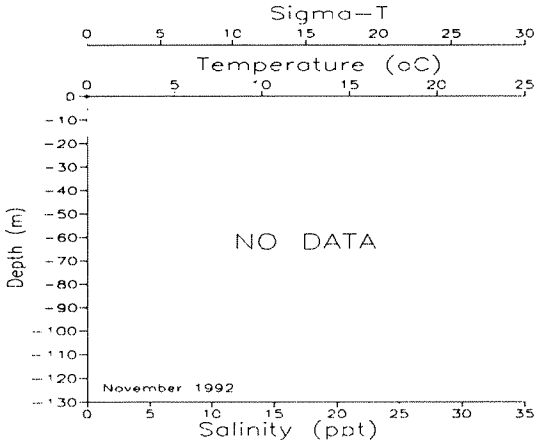
T/S/D Profiles for all WY 1992 Long-term Monitoring Stations

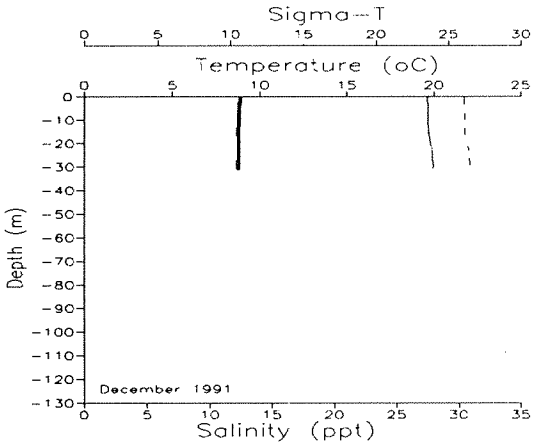
WATERYEAR 1992

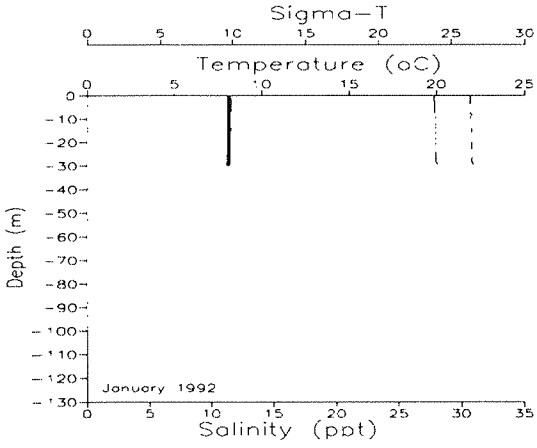
Part 1 of 2

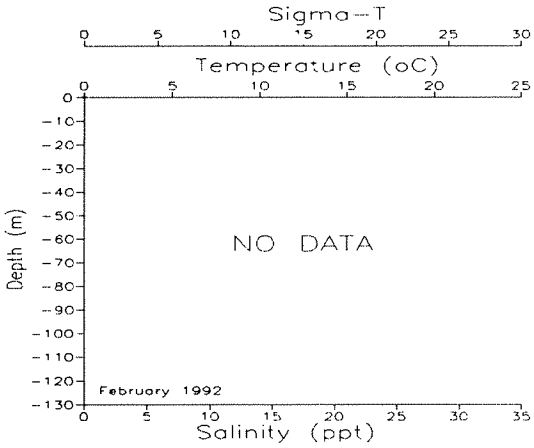
Straits of Juan de Fuca (Station ADM002)

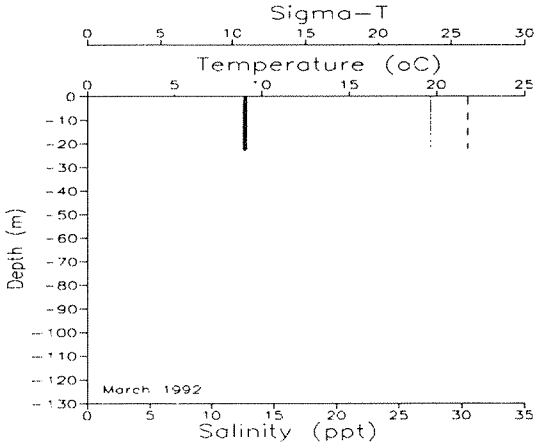










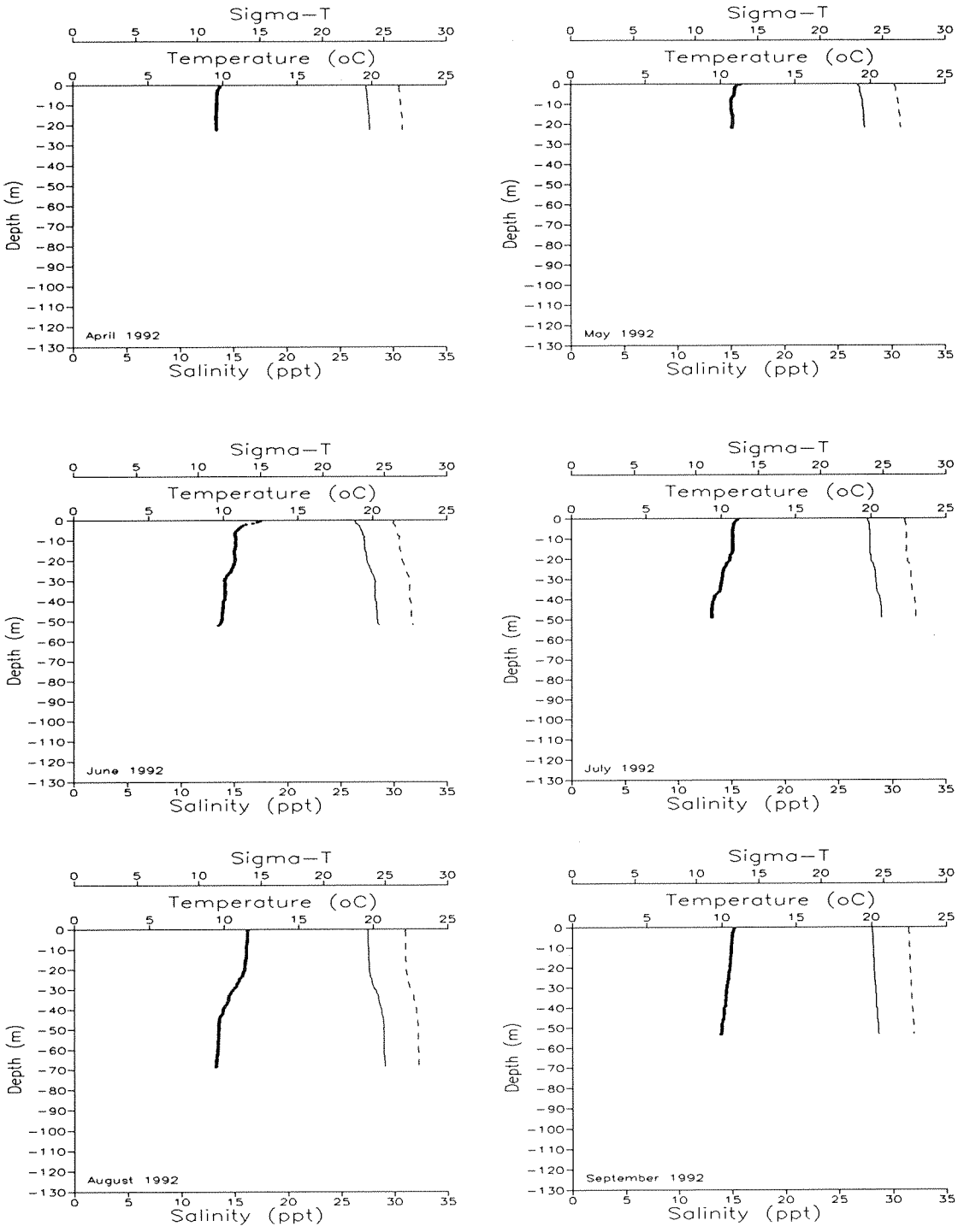


Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

WATERYEAR 1992

Part 2 of 2

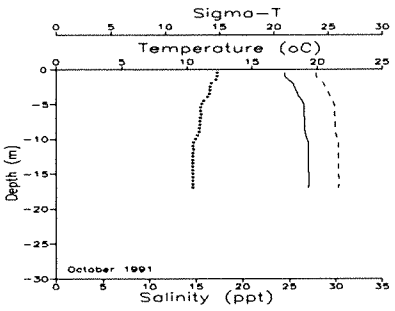
Straits of Juan de Fuca (Station ADM002)

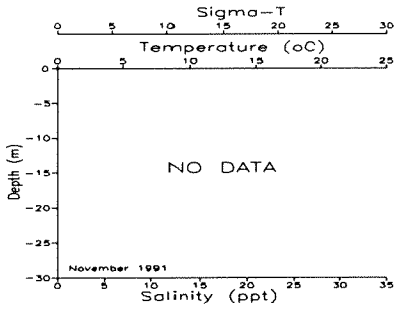


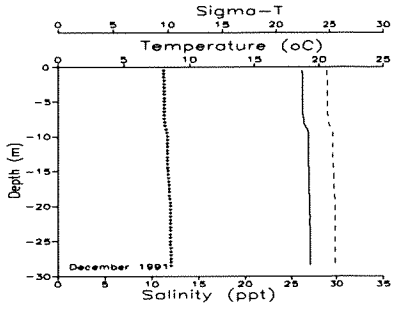
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

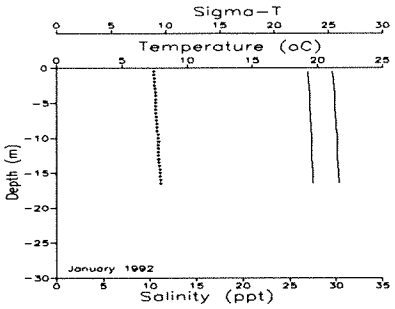
WATERYEAR 1992

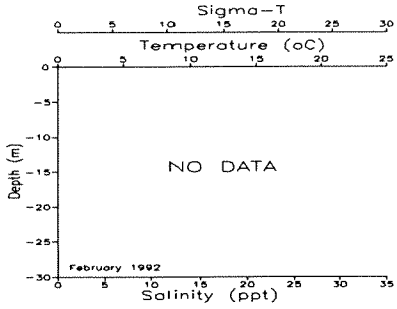
Bellingham Bay (Station BLL009)

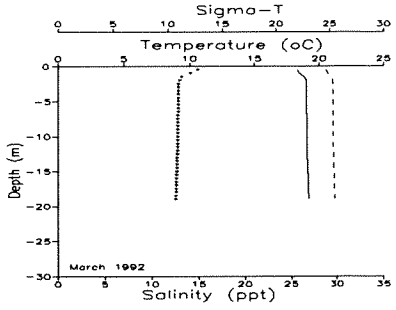


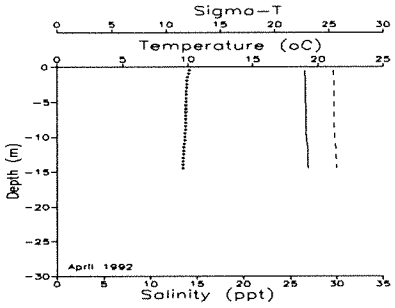


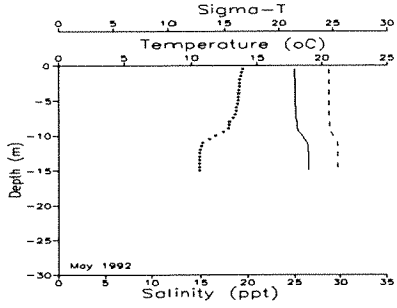


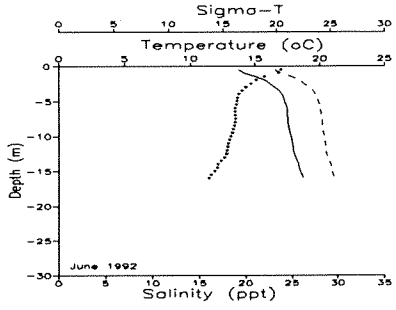


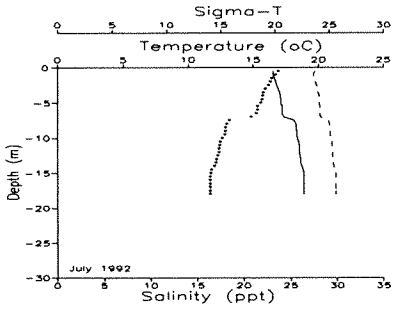


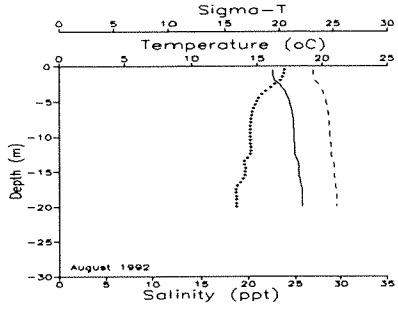


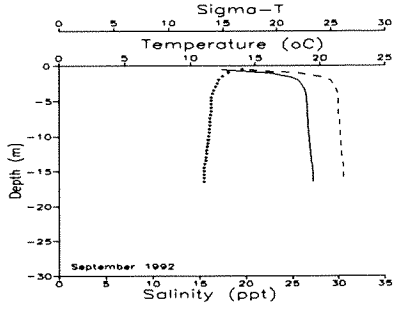








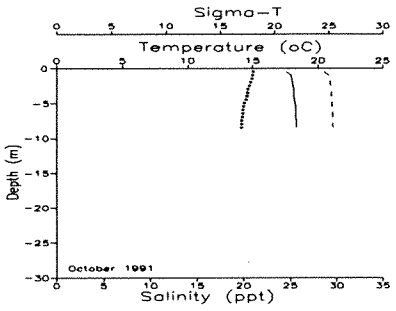


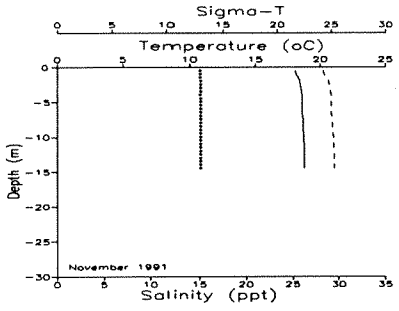


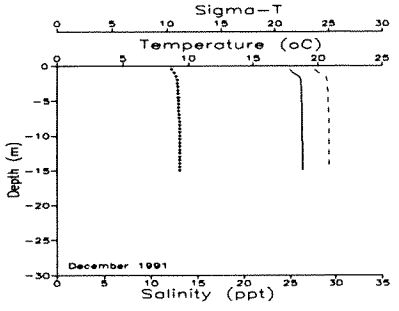
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

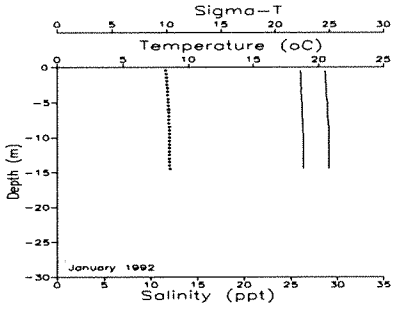
WATERYEAR 1992

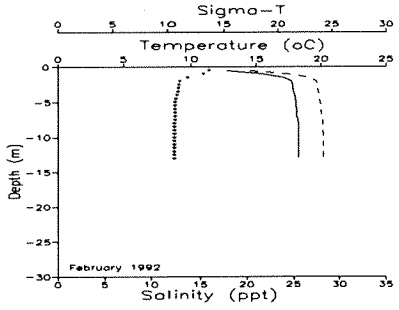
Budd Inlet (Station BUD005)

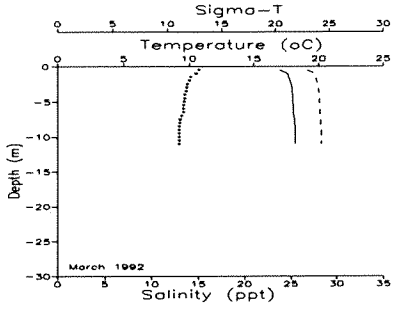


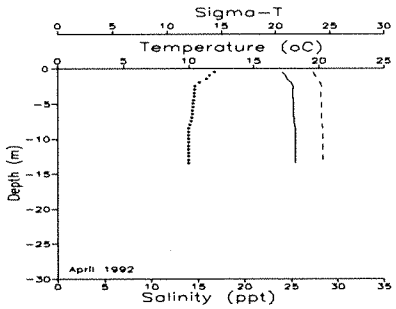


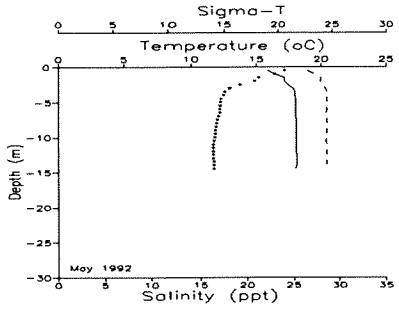


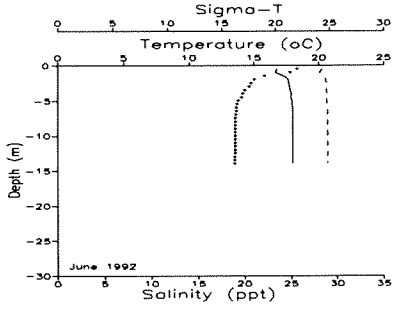


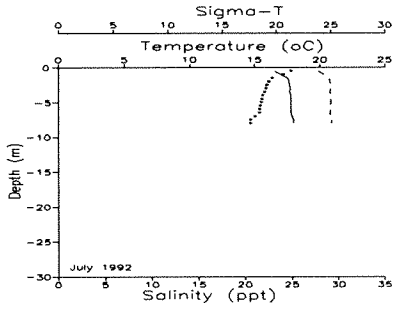


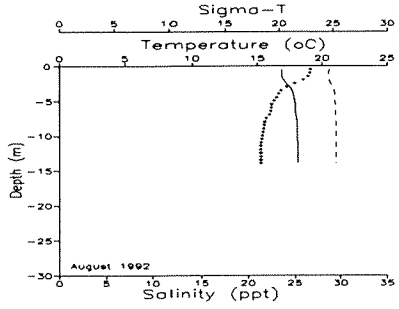


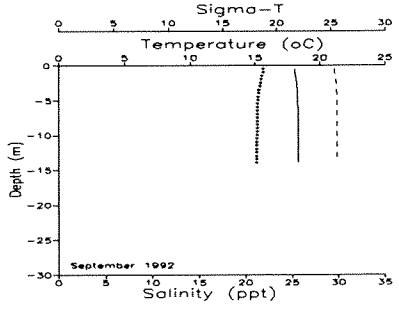










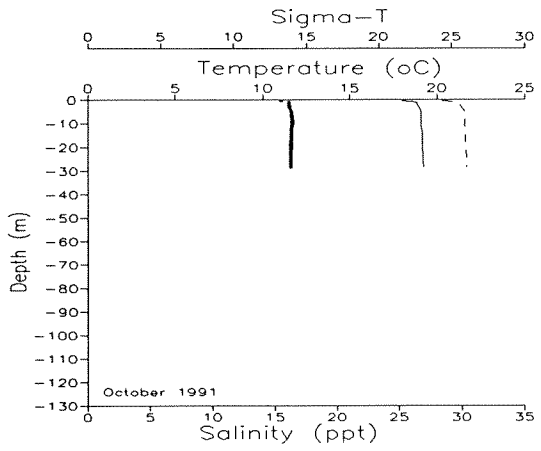


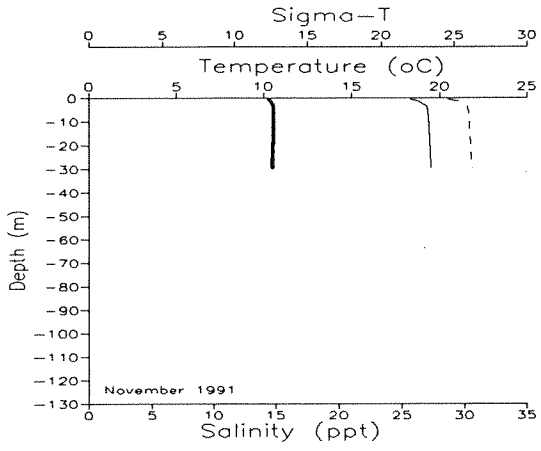
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

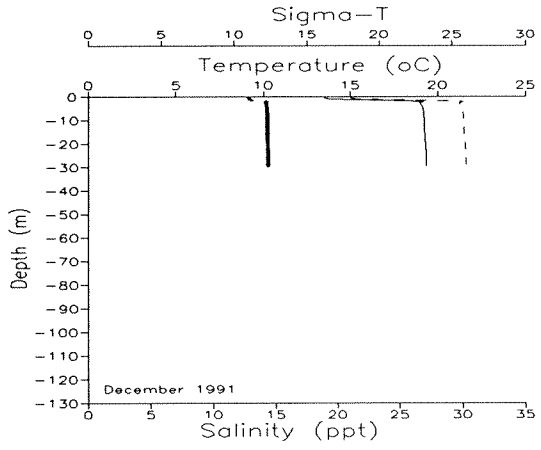
WATERYEAR 1992

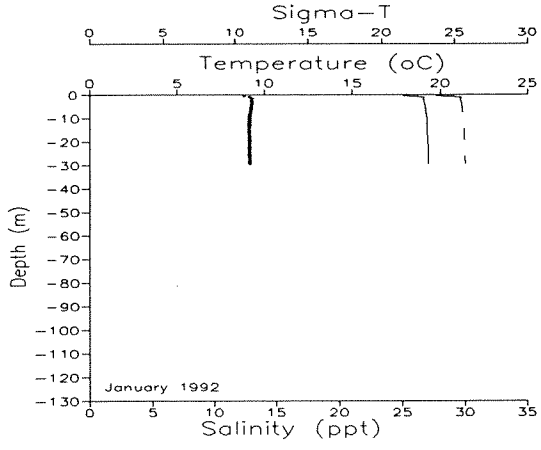
Part 1 of 2

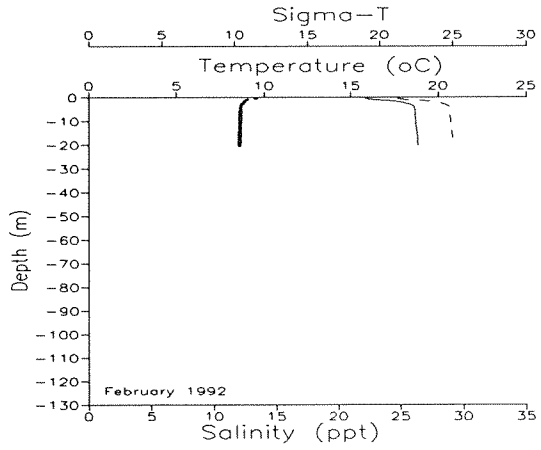
Commencement Bay - Browns Point (Station CMB003)

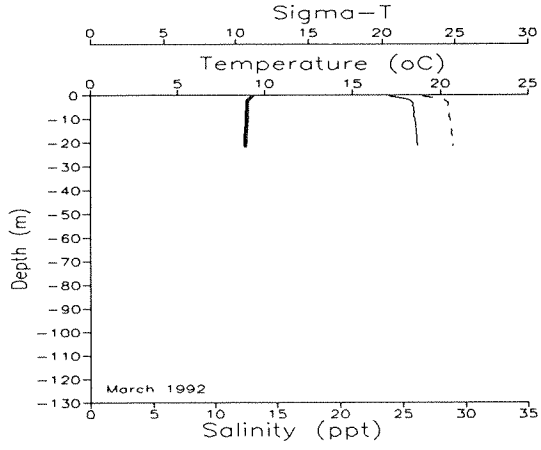










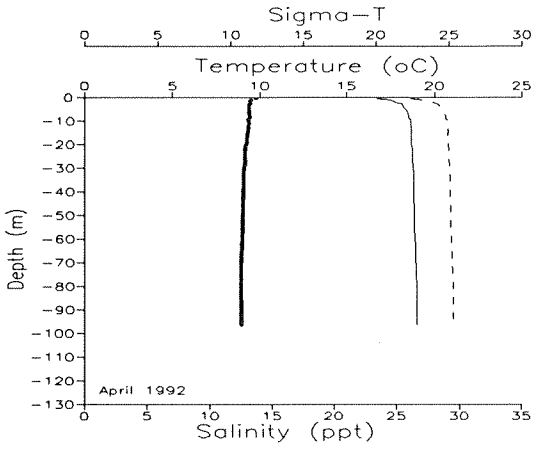


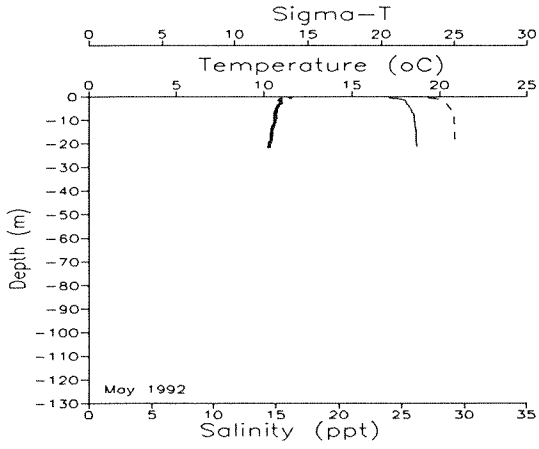
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

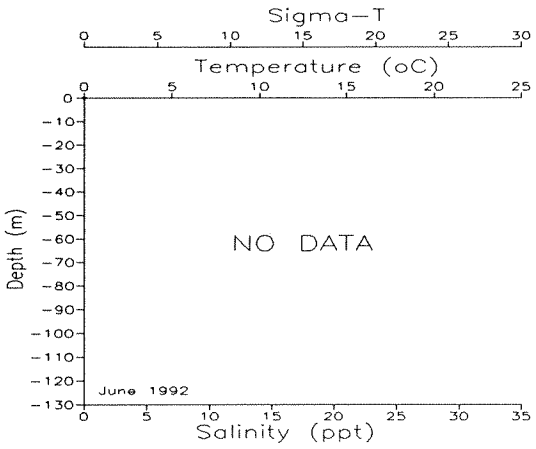
WATERYEAR 1992

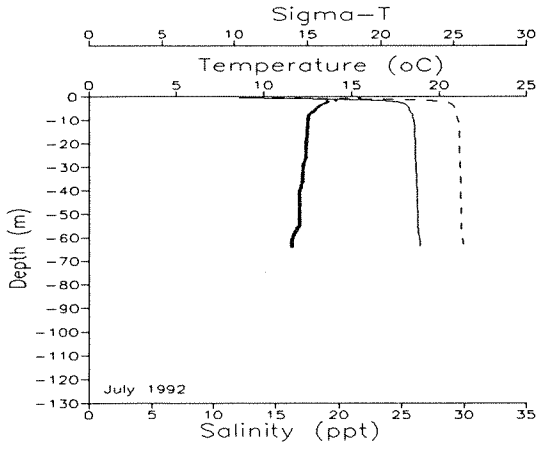
Part 2 of 2

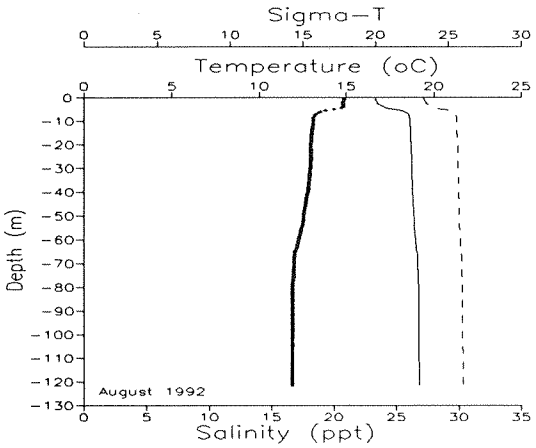
Commencement Bay - Browns Point (Station CMB003)

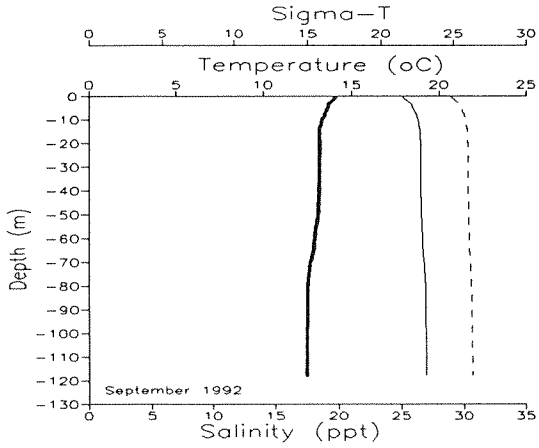










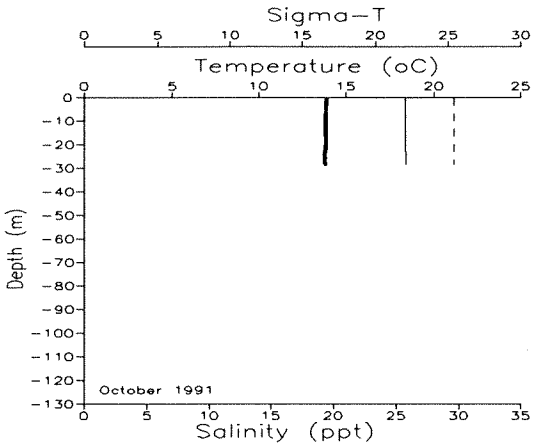


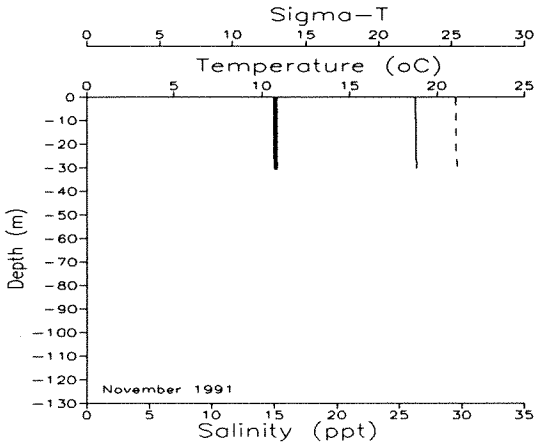
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

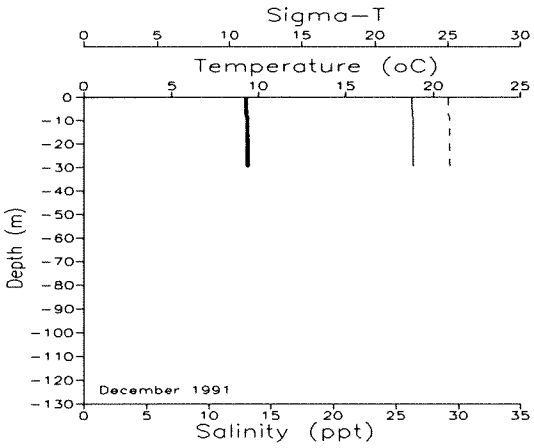
WATERYEAR 1992

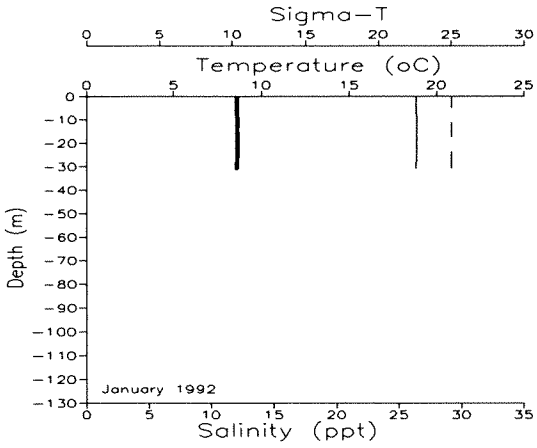
Part 1 of 2

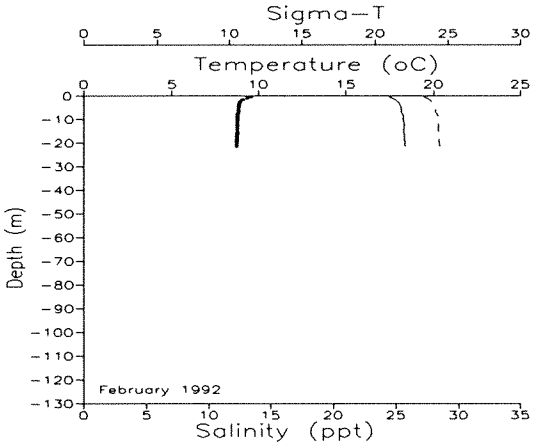
Dana Passage (Station DNA001)

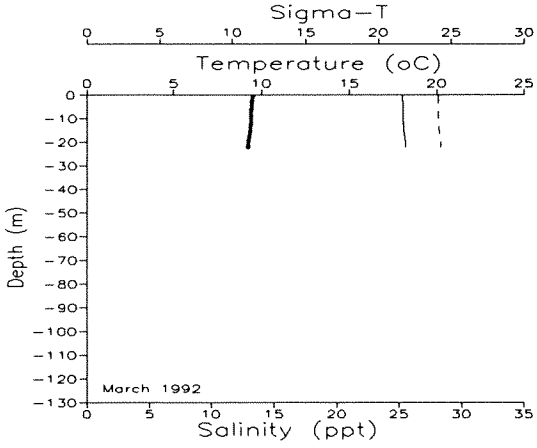










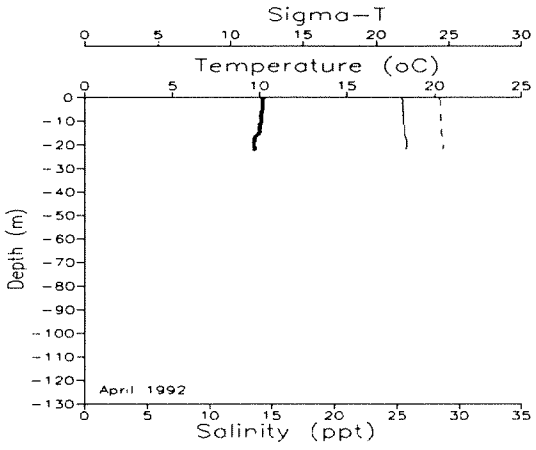


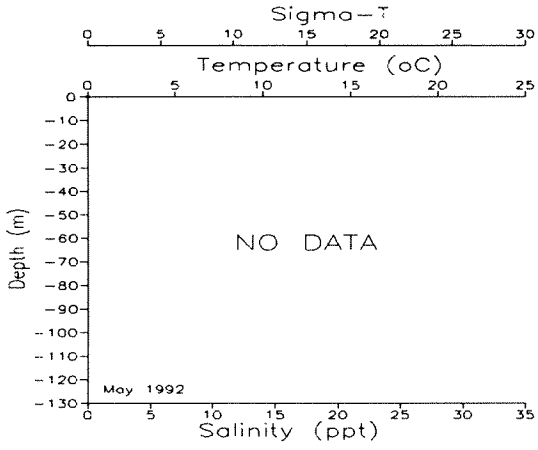
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

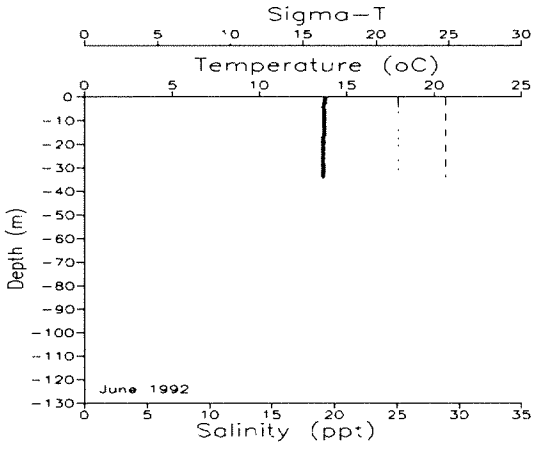
WATERYEAR 1992

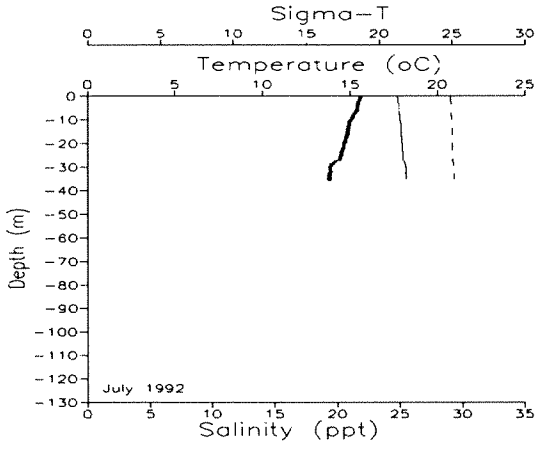
Part 2 of 2

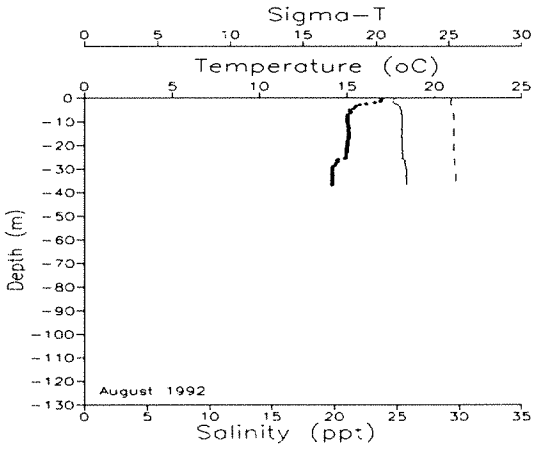
Dana Passage (Station DNA001)

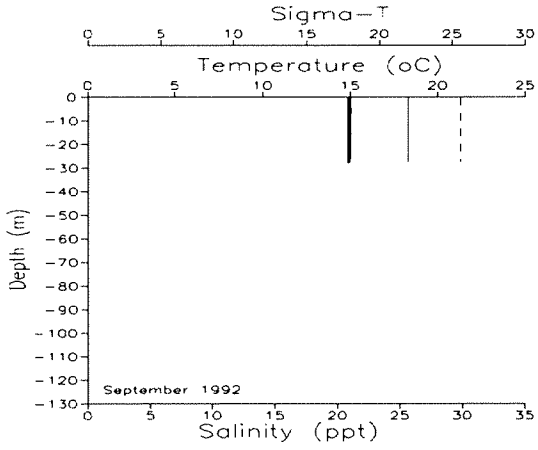










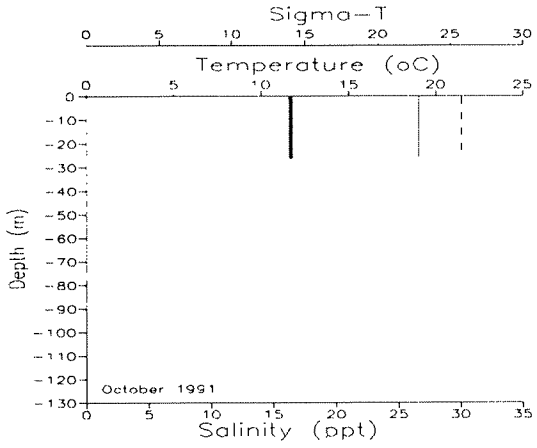


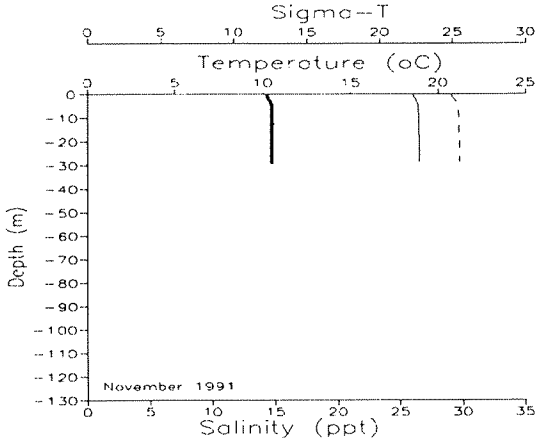
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

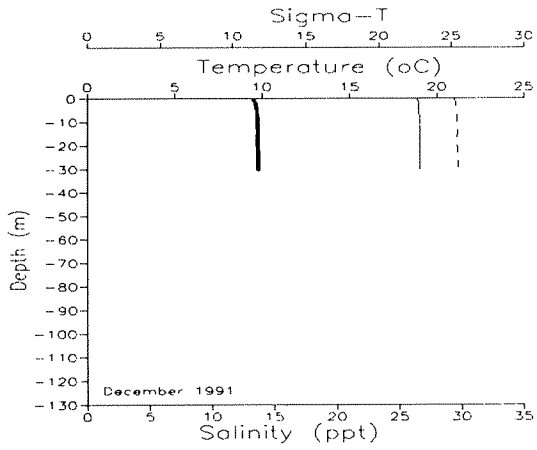
WATERYEAR 1992

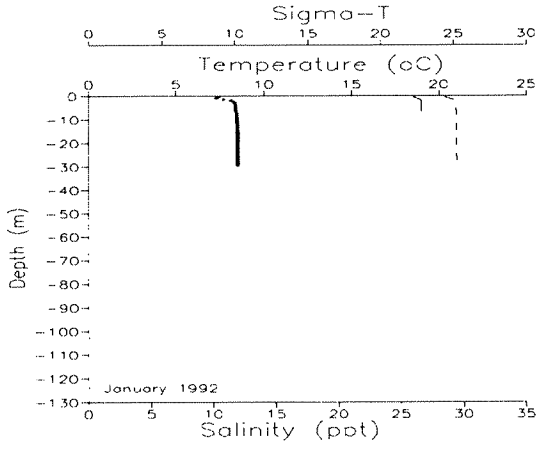
Part 1 of 2

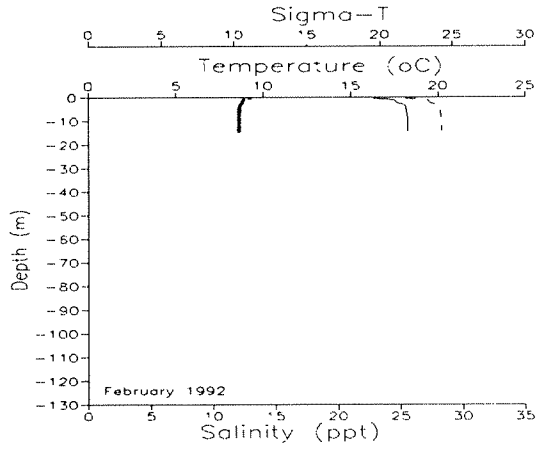
Dyes Inlet - NE Chico Bay (Station DYE004)

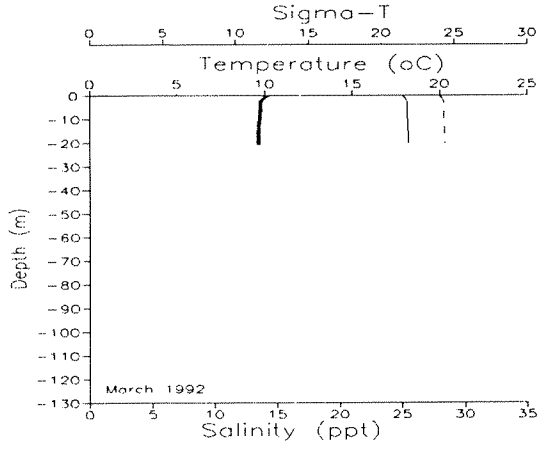










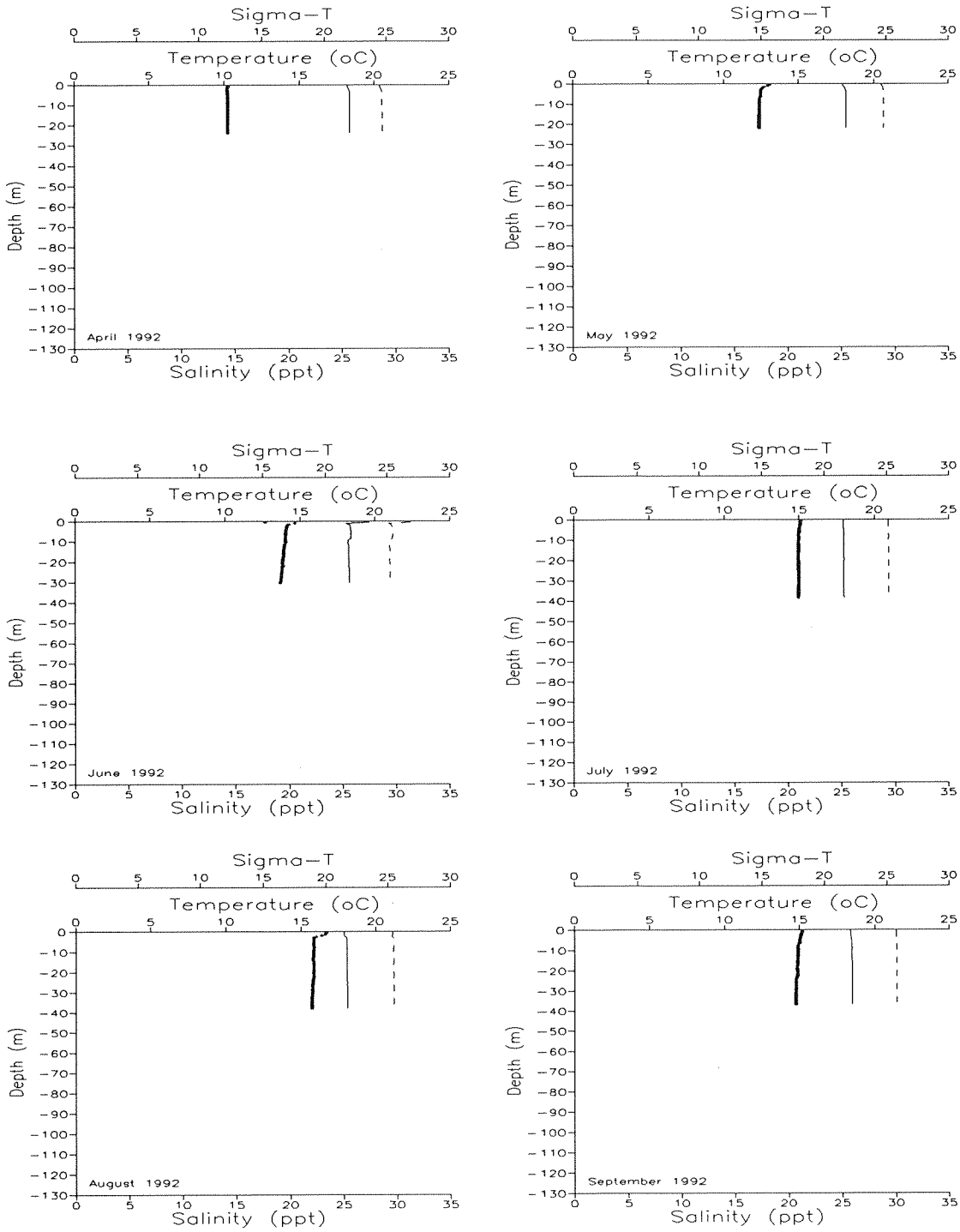


Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

WATERYEAR 1992

Part 2 of 2

Dyes Inlet - NE Chico Bay (Station DYE004)

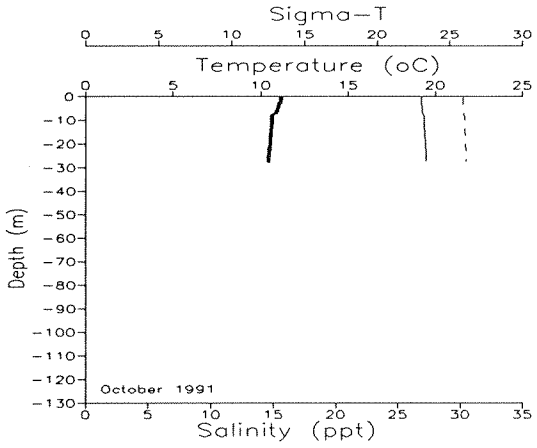


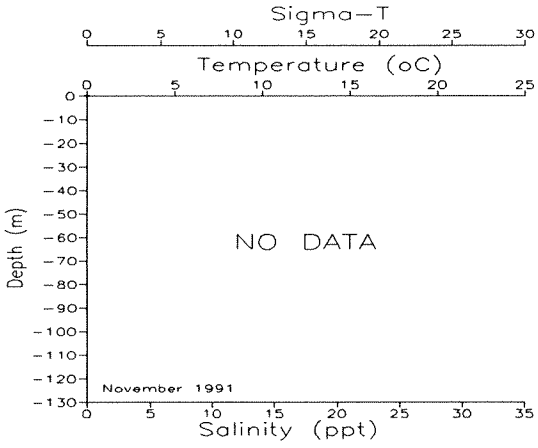
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

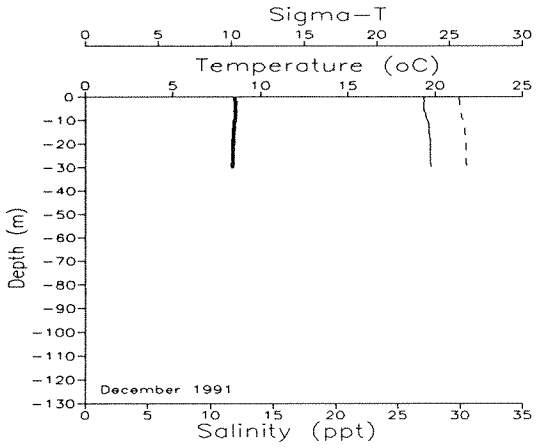
WATERYEAR 1992

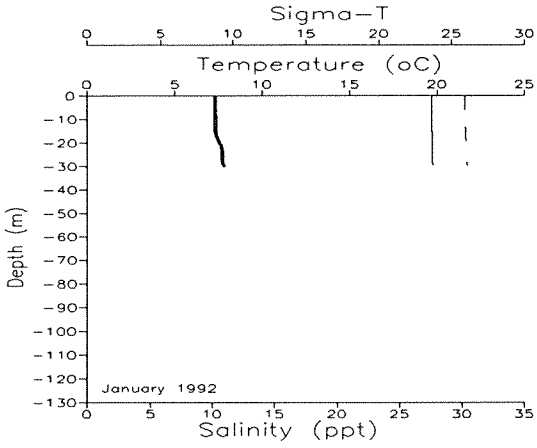
Part 1 of 2

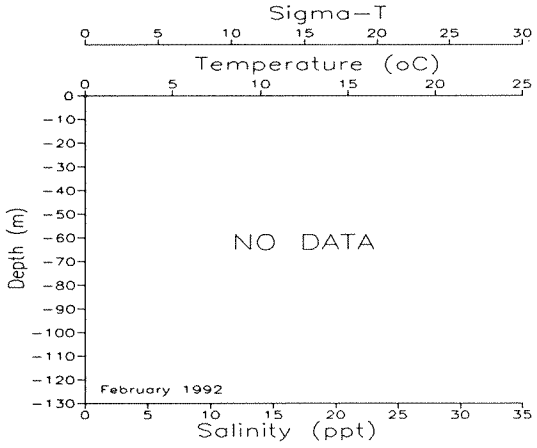
East Sound - Orcas Island (Station EAS001)

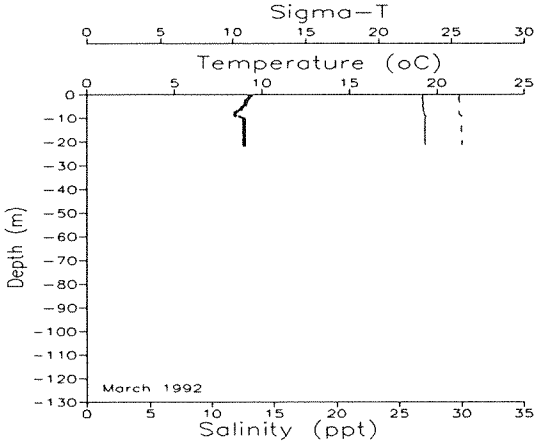










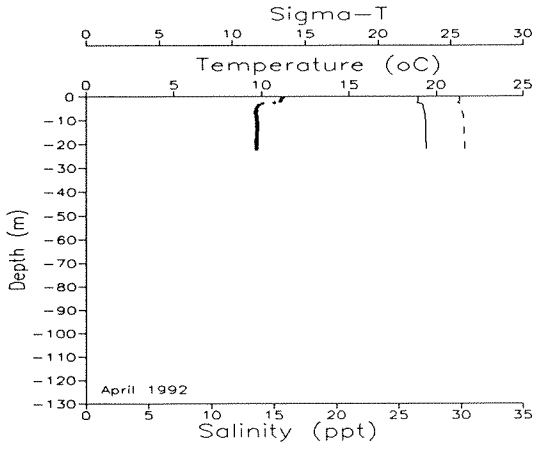


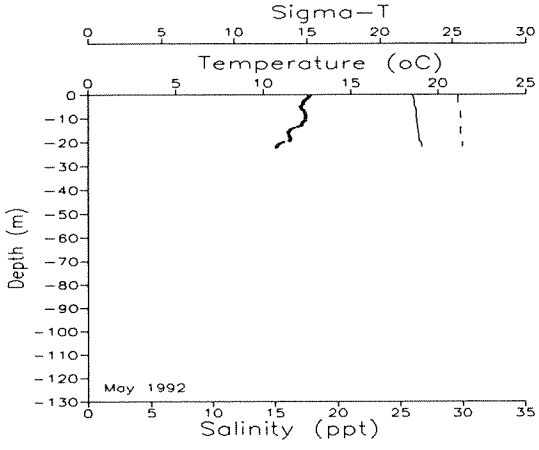
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

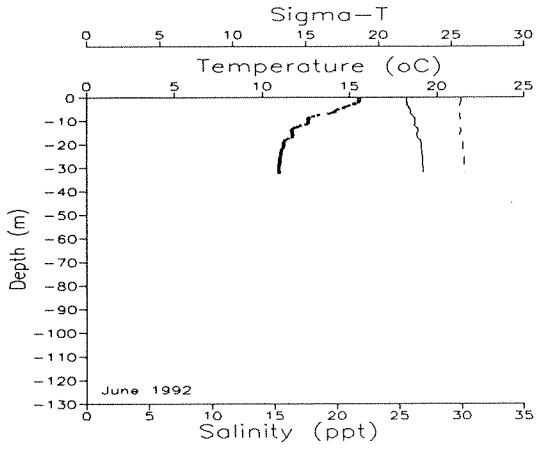
WATERYEAR 1992

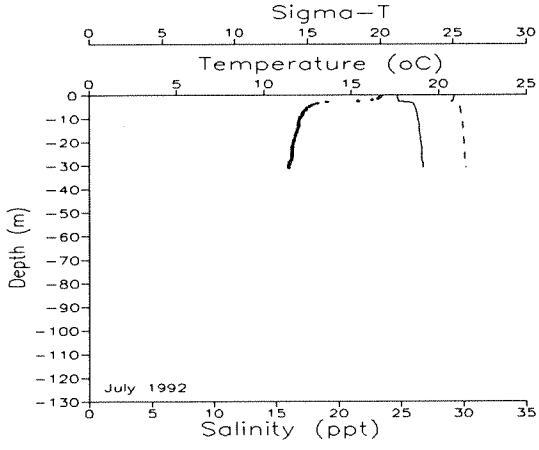
Part 2 of 2

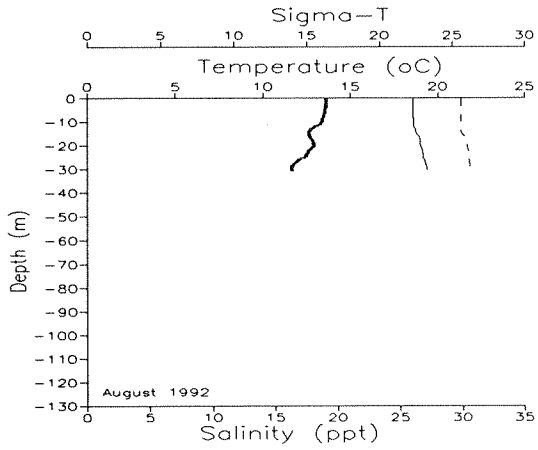
East Sound - Orcas Island (Station EAS001)

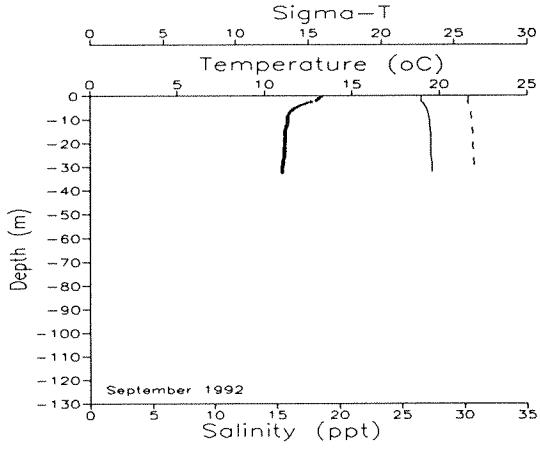










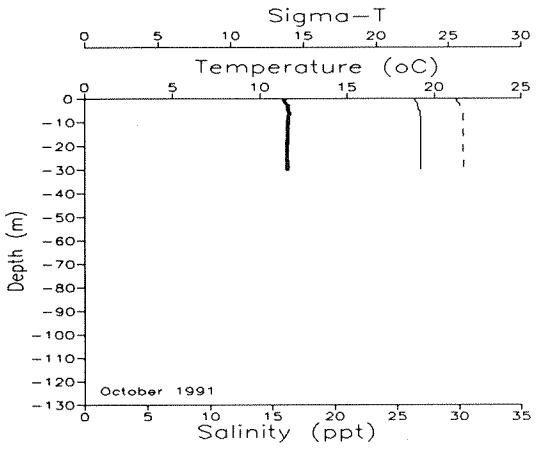


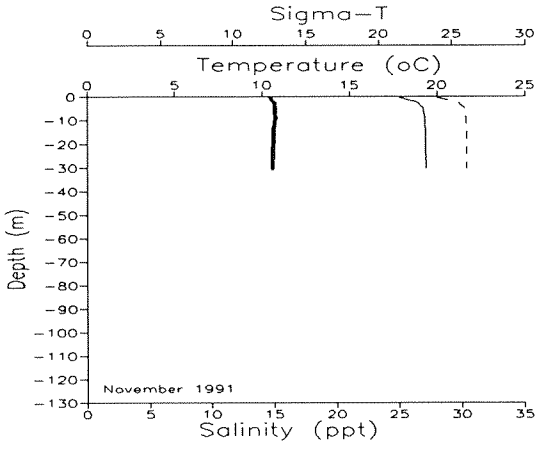
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

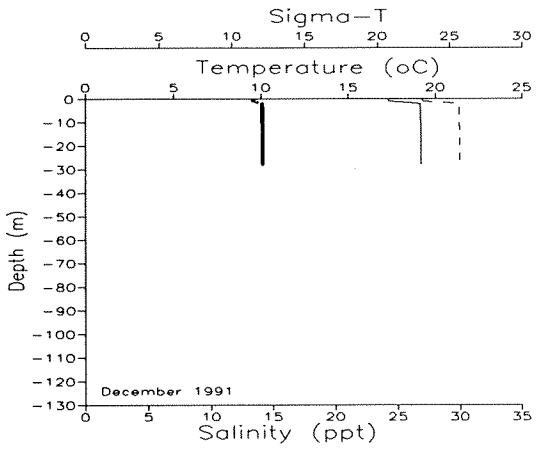
WATERYEAR 1992

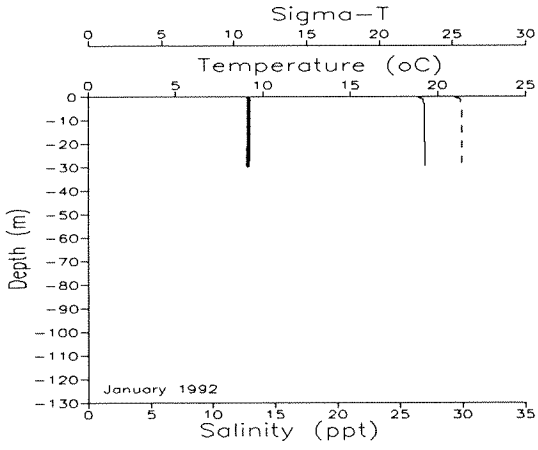
Part 1 of 2

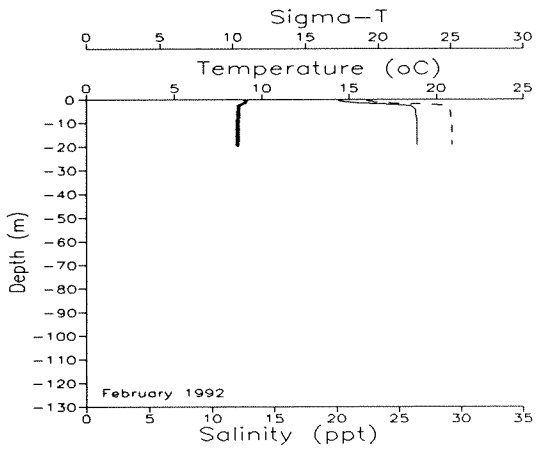
Elliott Bay - East Duwamish Head (Station ELB015)

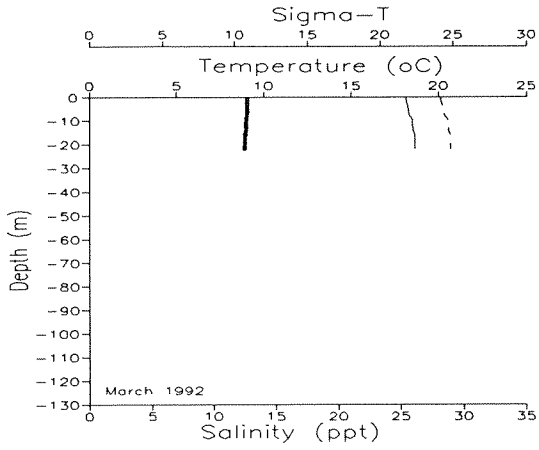










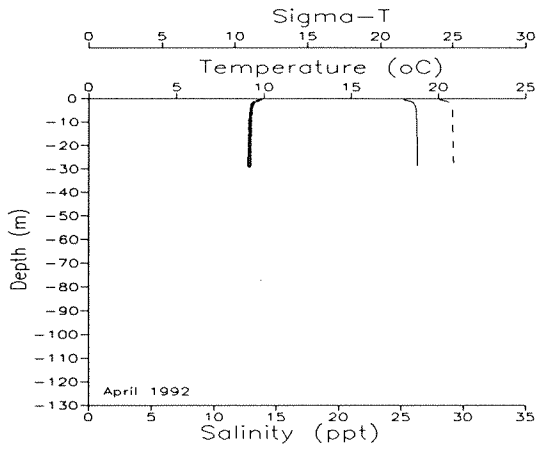


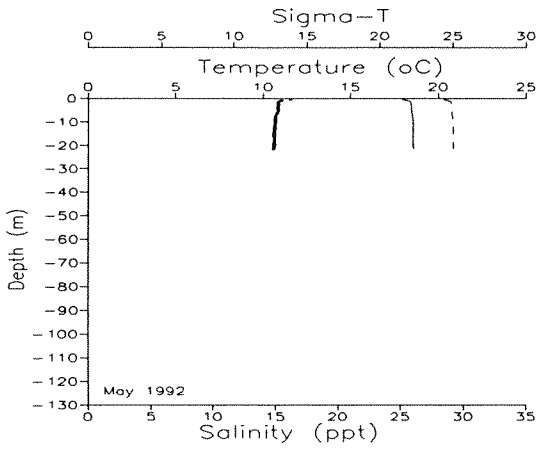
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

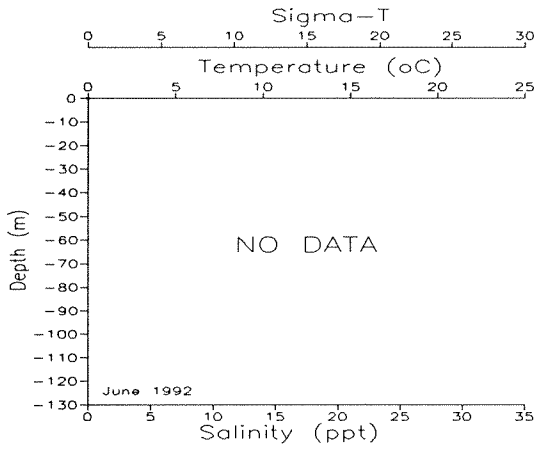
WATERYEAR 1992

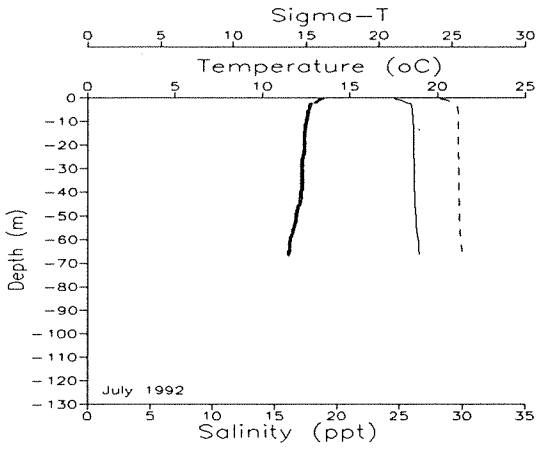
Part 2 of 2

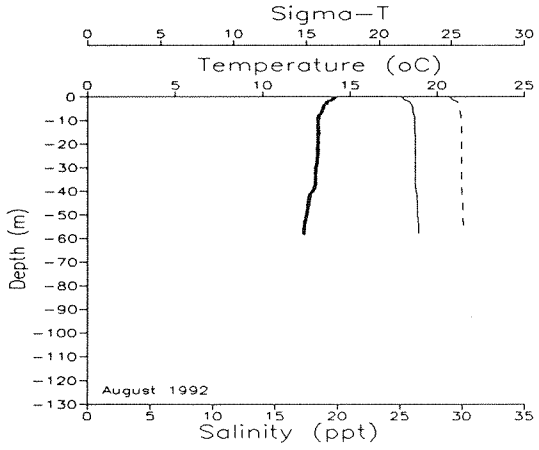
Elliott Bay - East Duwamish Head (Station ELB015)

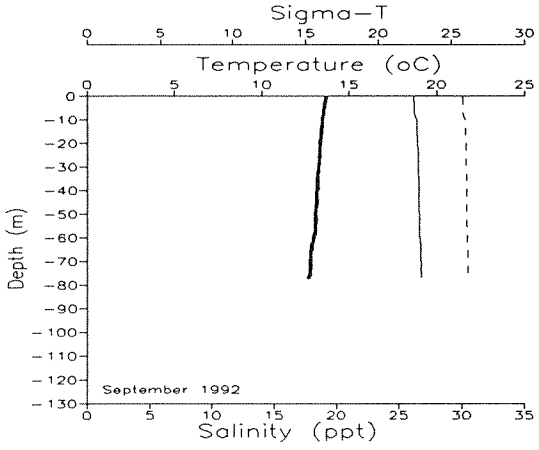










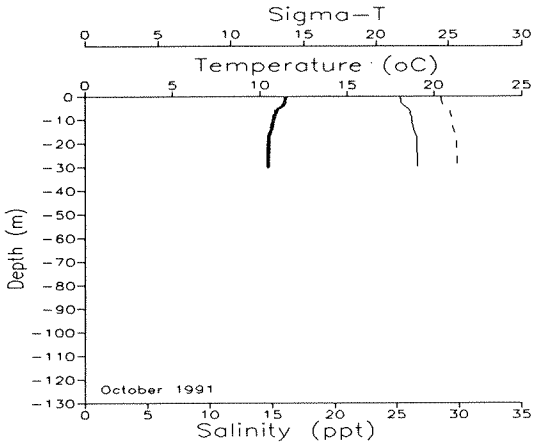


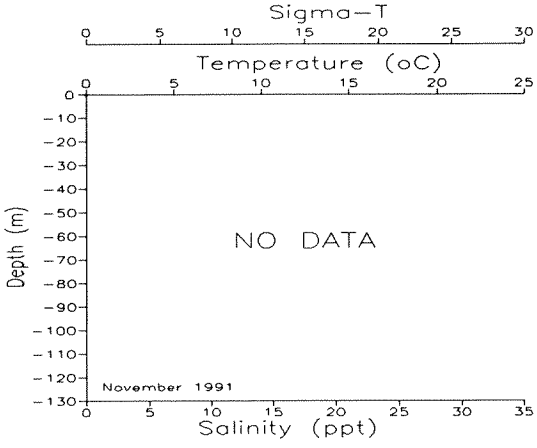
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

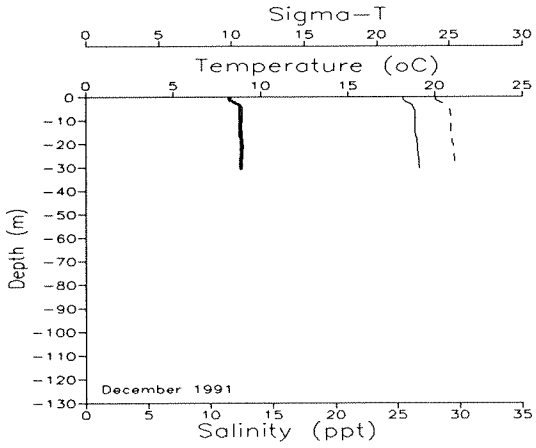
WATERYEAR 1992

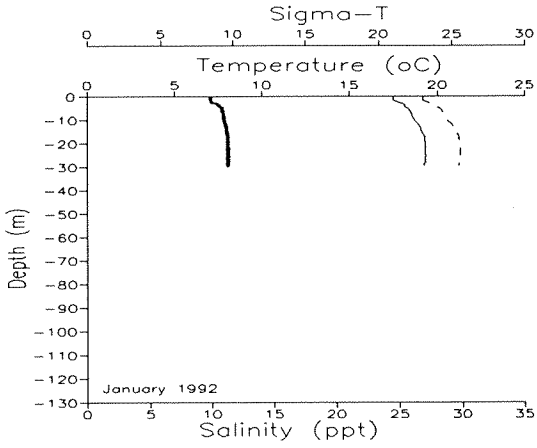
Part 1 of 2

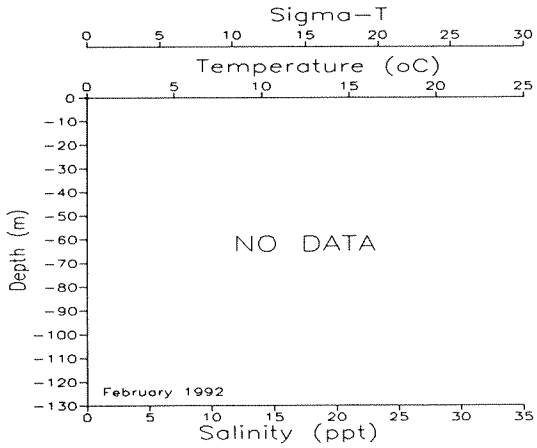
Georgia Strait - North of Patos Is. (Station GRG002)

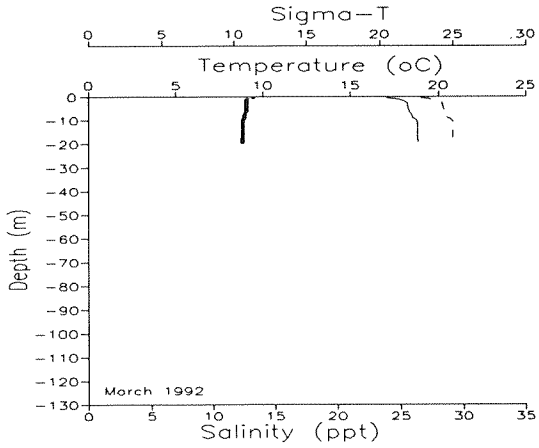










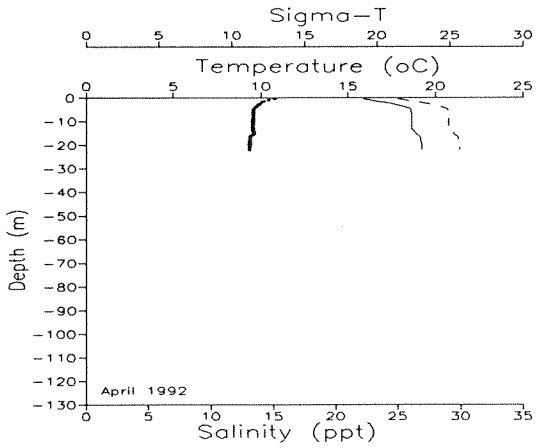


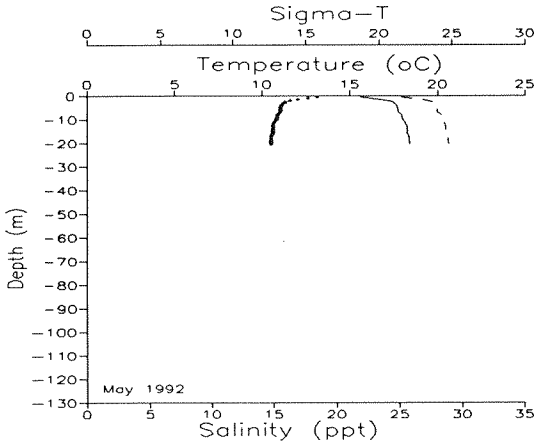
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

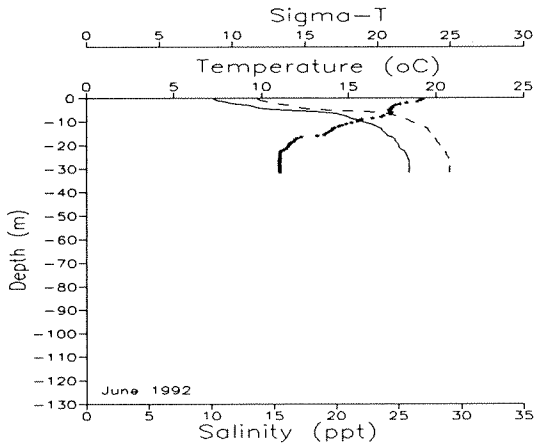
WATERYEAR 1992

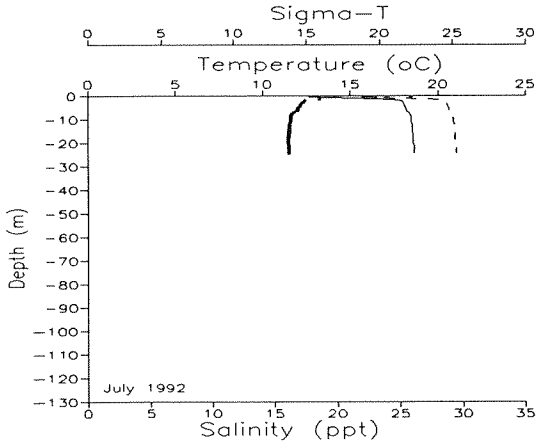
Part 2 of 2

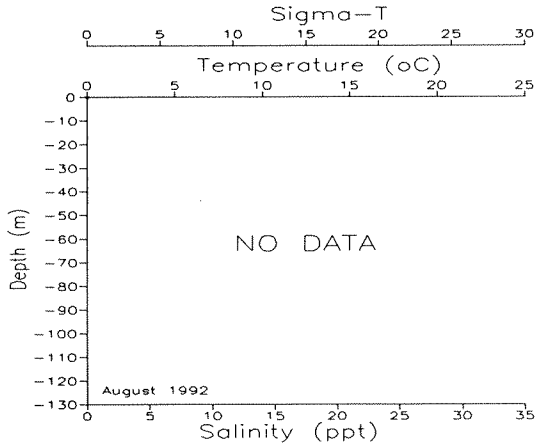
Georgia Strait - North of Patos Is. (Station GRG002)

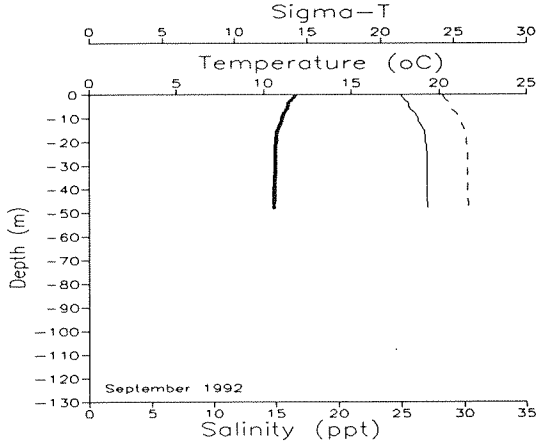








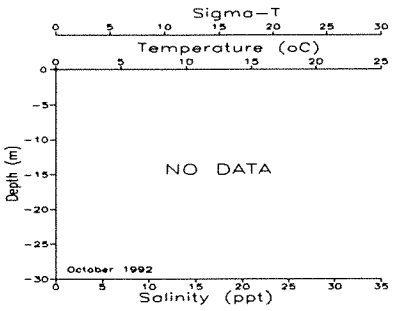


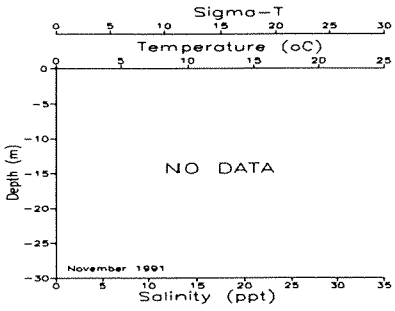


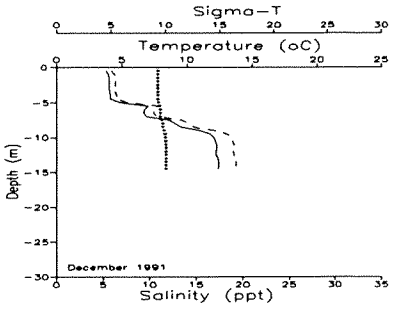
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

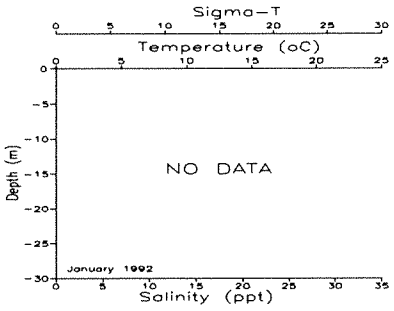
WATERYEAR 1992

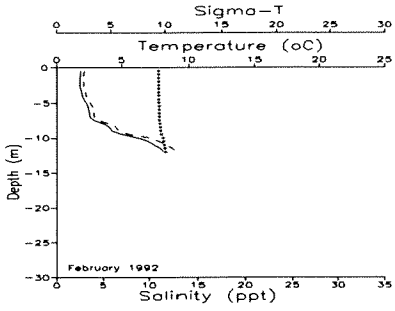
Gray's Harbor - Chehalis (Station GYS004)

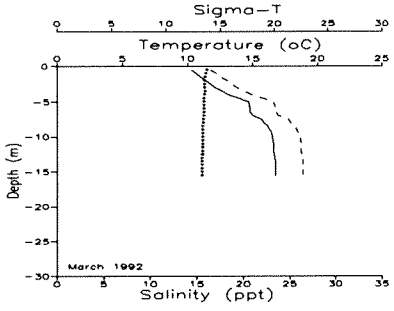


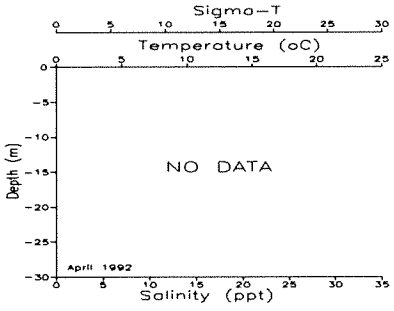


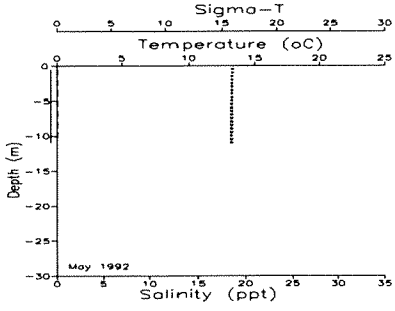


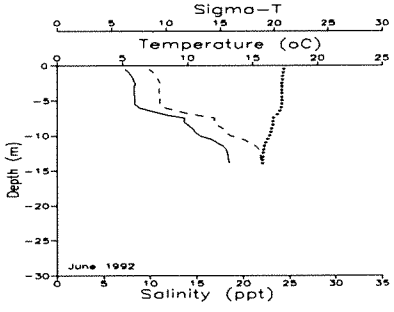


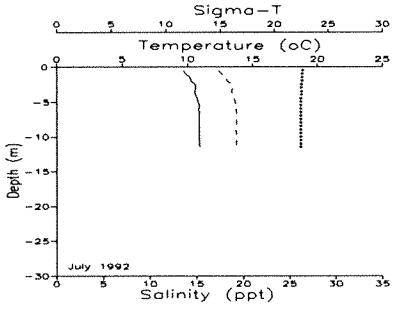


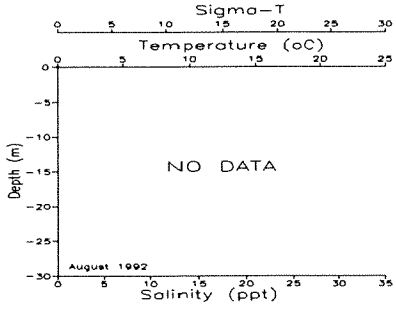


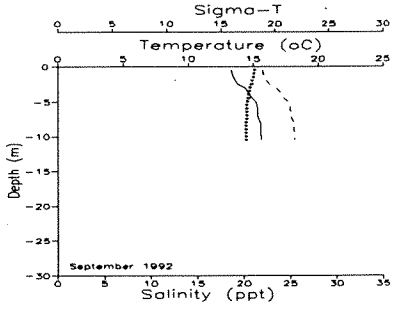








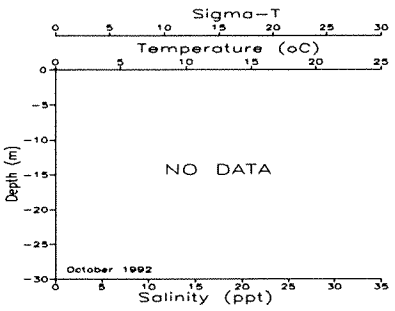


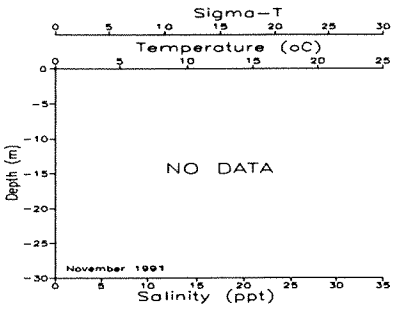


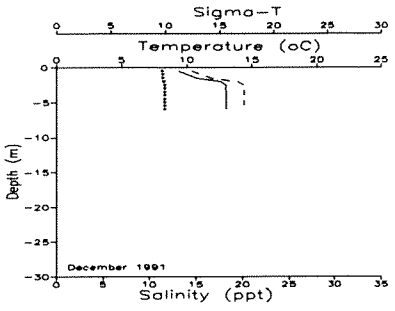
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

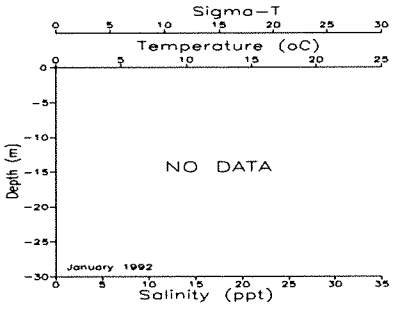
WATERYEAR 1992

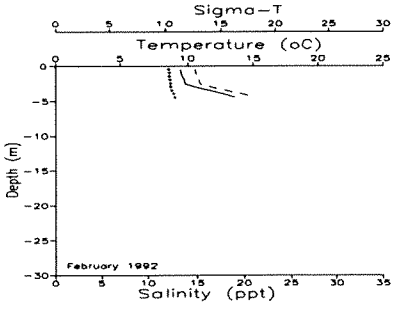
Gray's Harbor - South Channel (Station GYS008)

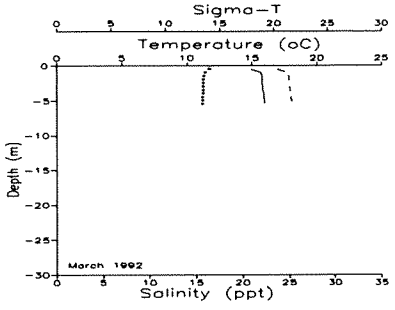


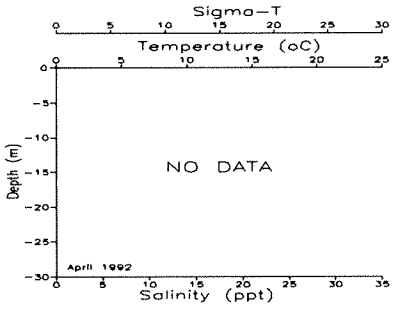


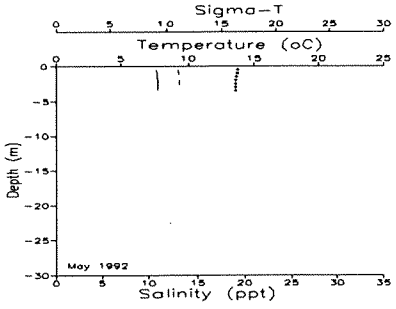


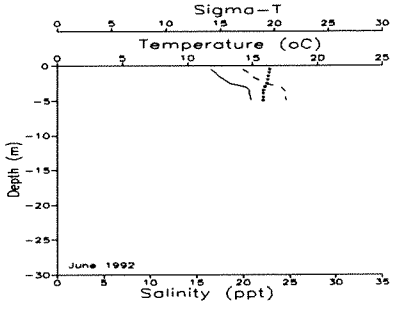


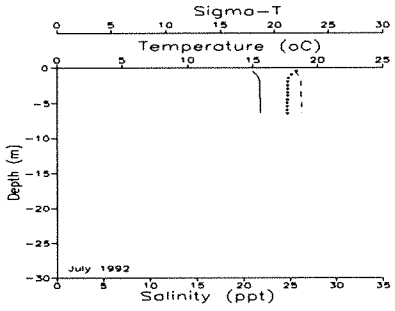


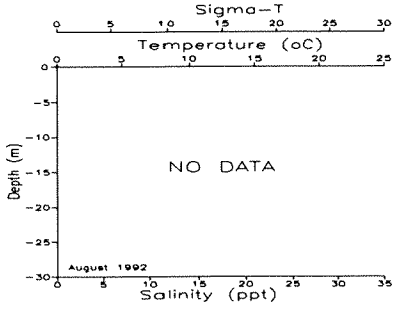


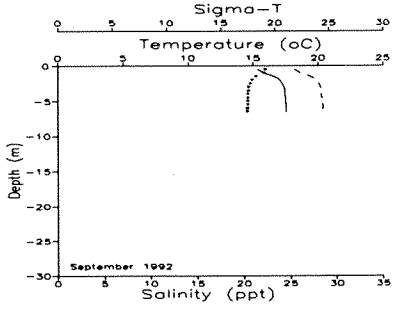








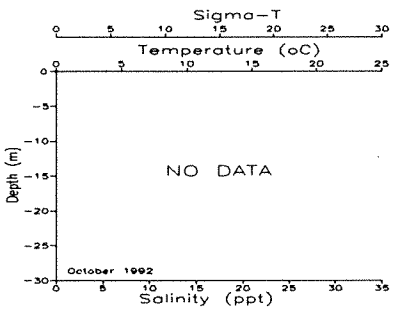


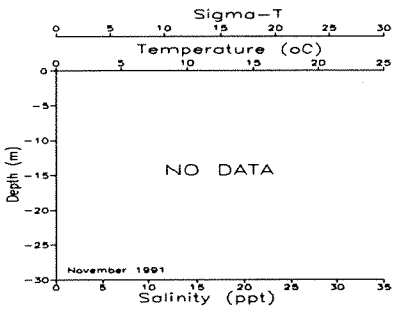


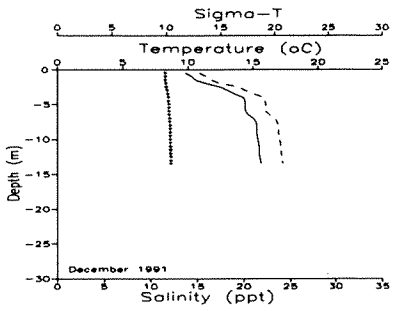
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

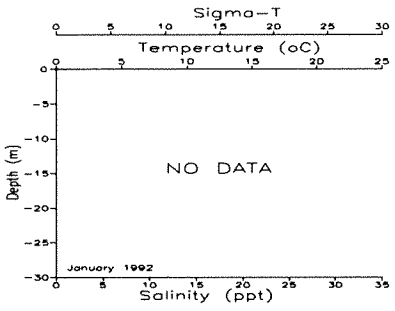
WATERYEAR 1992

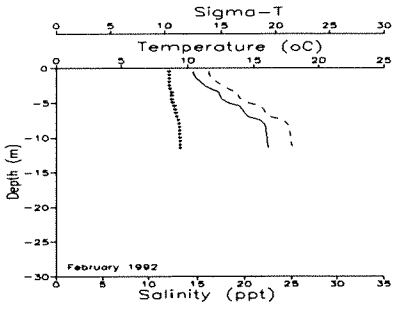
Gray's Harbor - North Channel (Station GYS009)

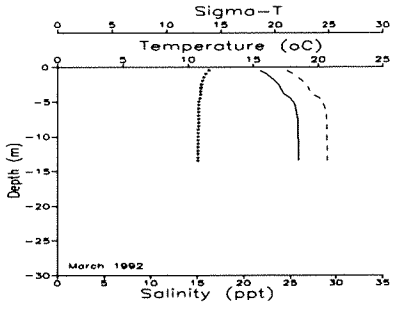


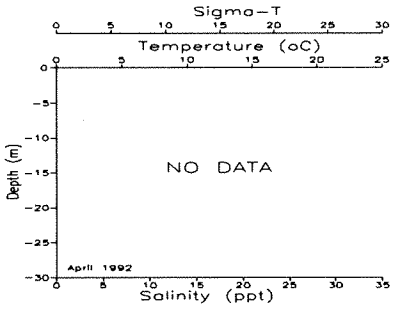


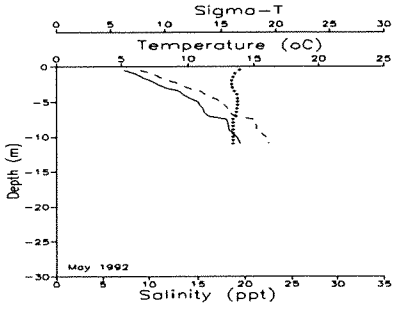


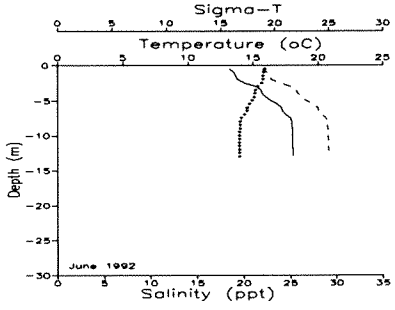


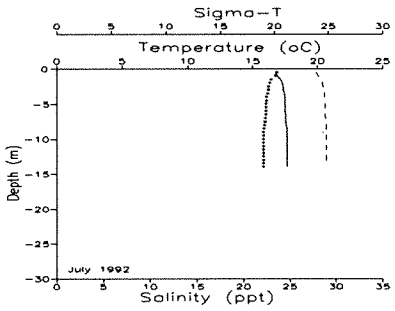


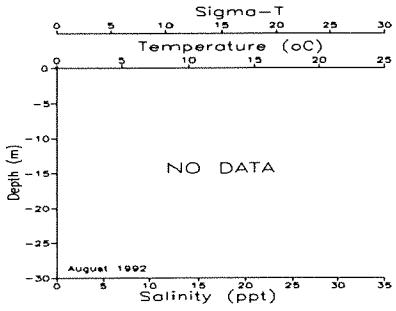


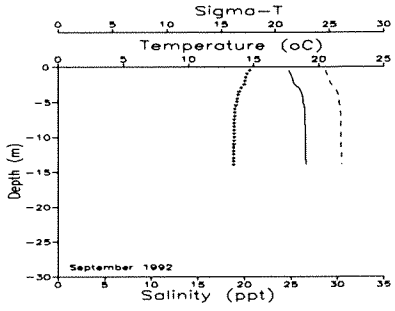








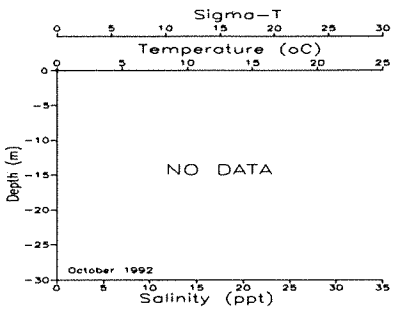


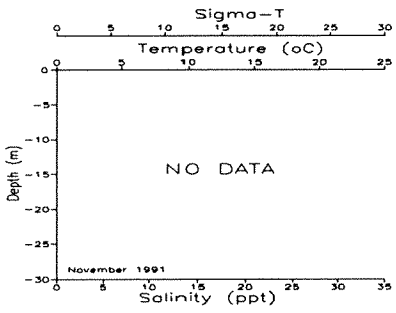


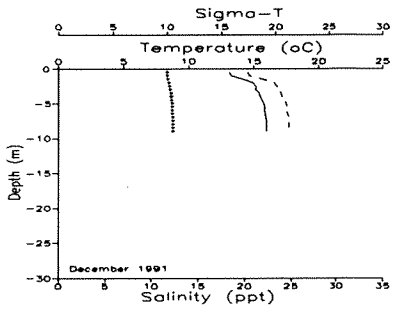
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

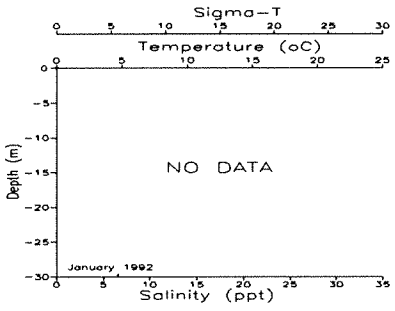
WATERYEAR 1992

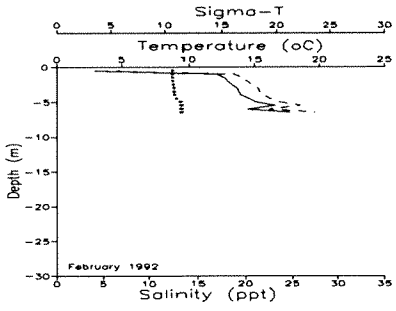
Gray's Harbor - N. Whitcomb Flats (Station GYS015)

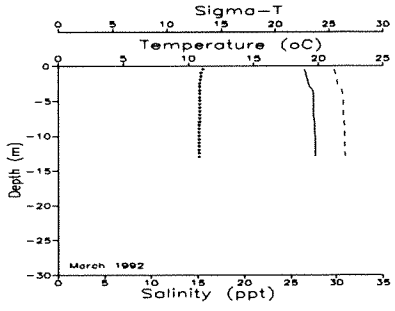


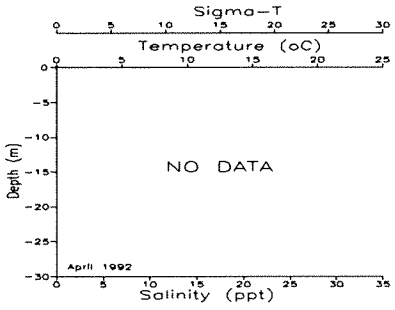


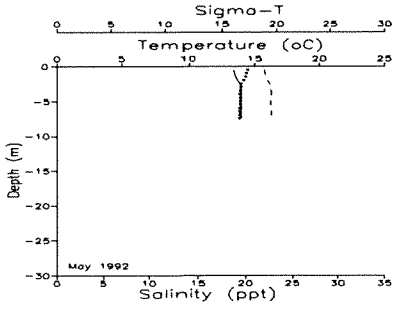


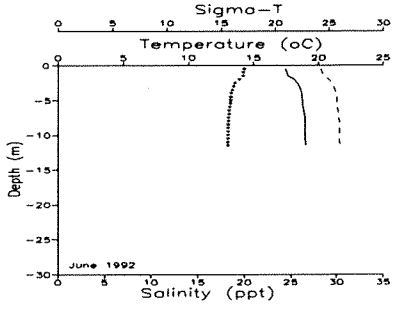


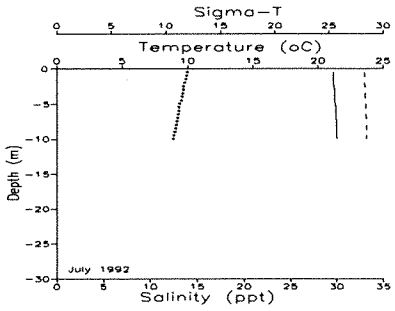


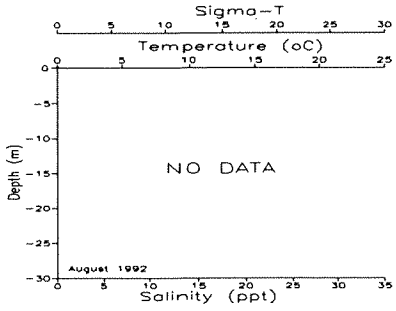


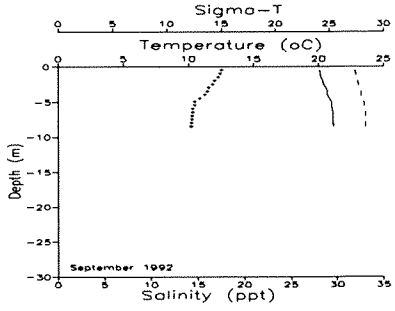








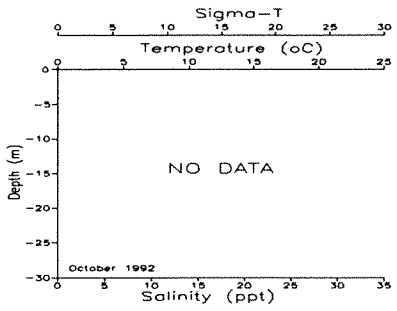


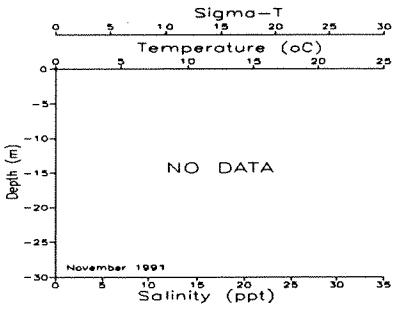


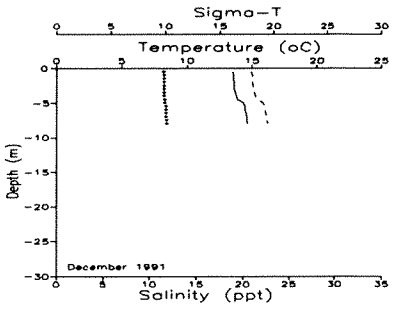
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

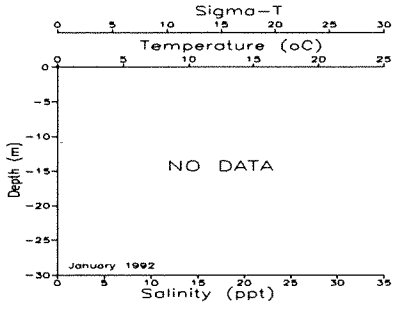
WATERYEAR 1992

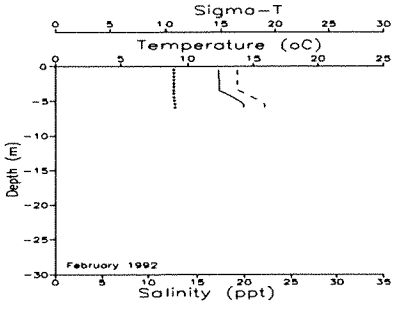
Gray's Harbor - Damon Point (Station GYS016)

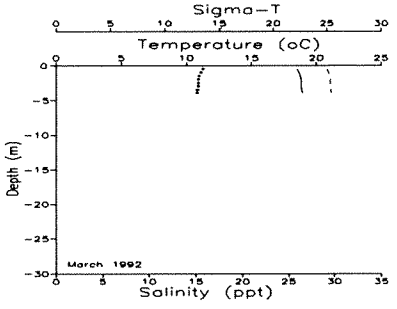


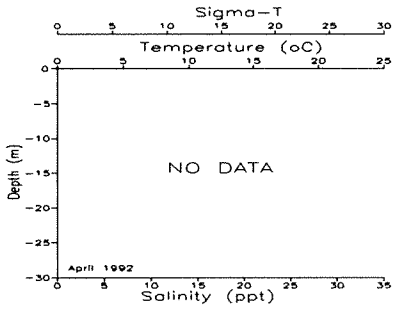


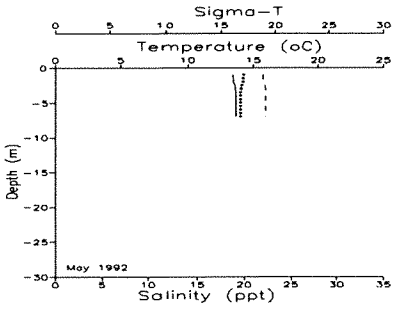


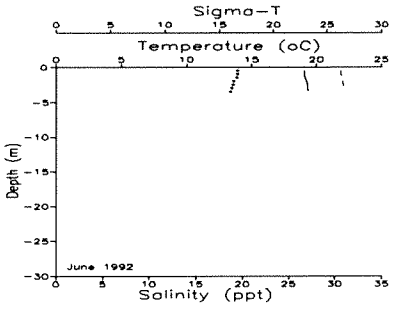


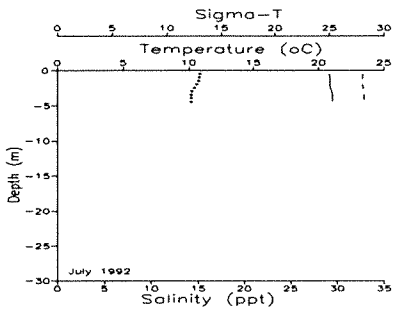


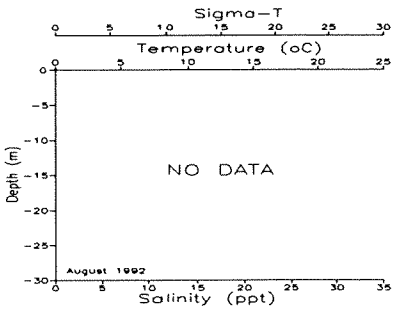


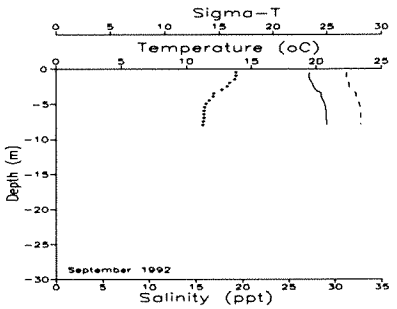










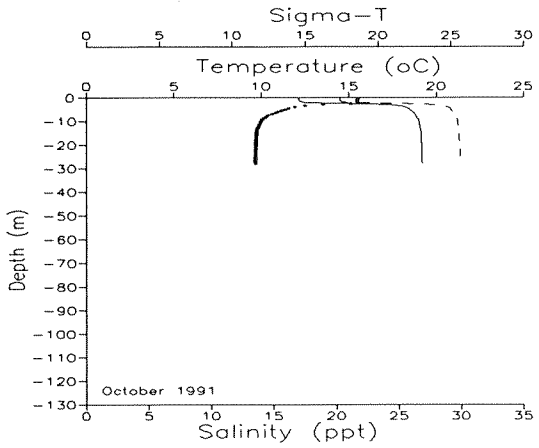


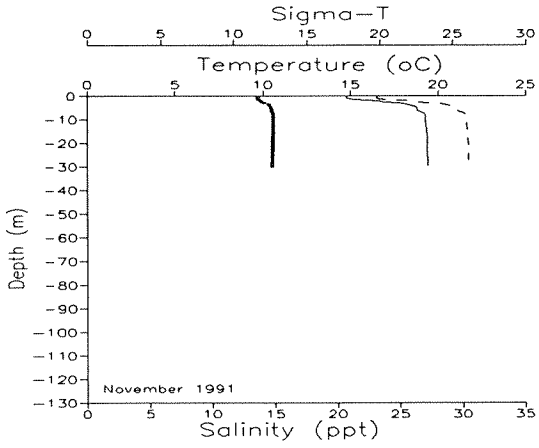
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

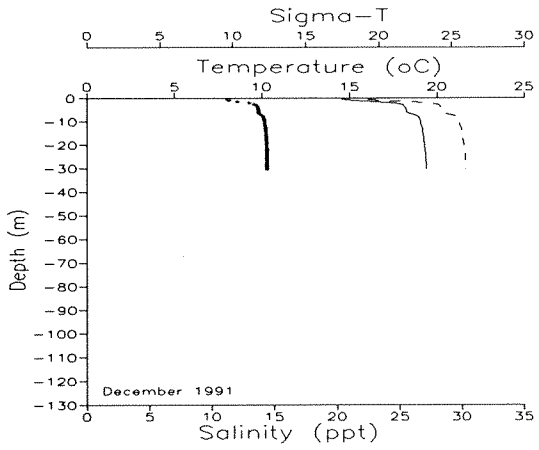
WATERYEAR 1992

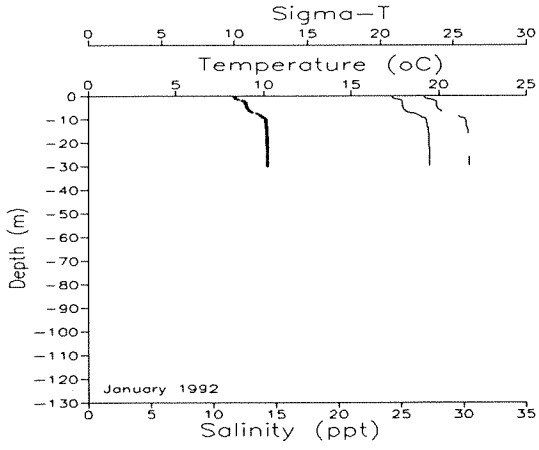
Part 1 of 2

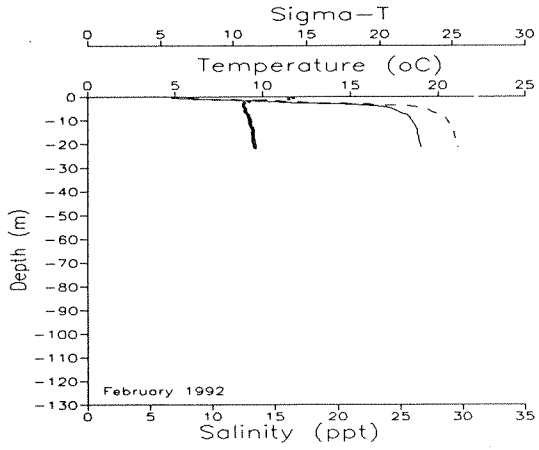
South Hood Canal at Sister's Point (Station HCB004)

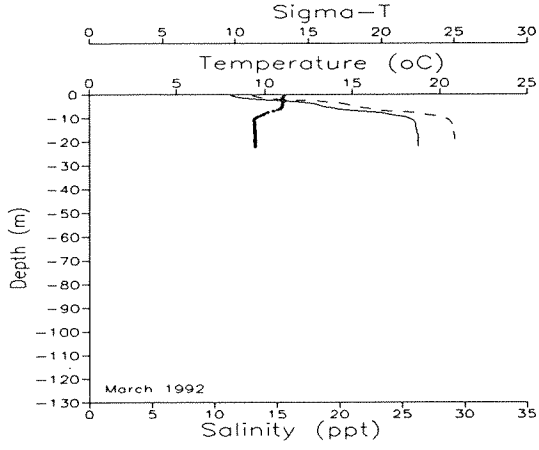










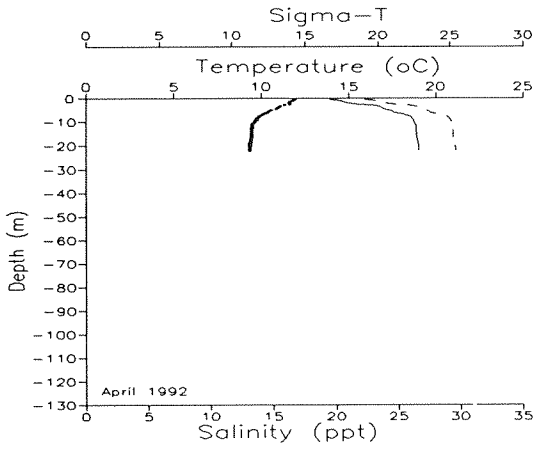


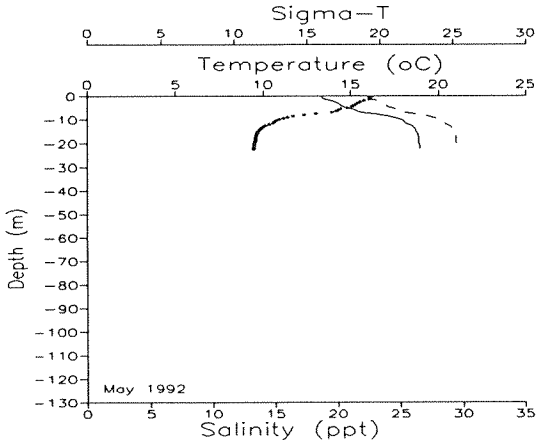
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

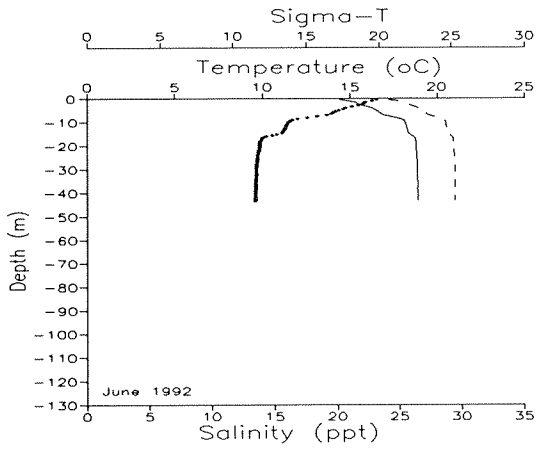
WATERYEAR 1992

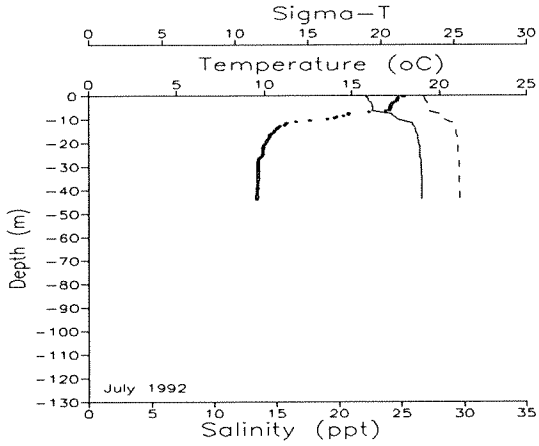
Part 2 of 2

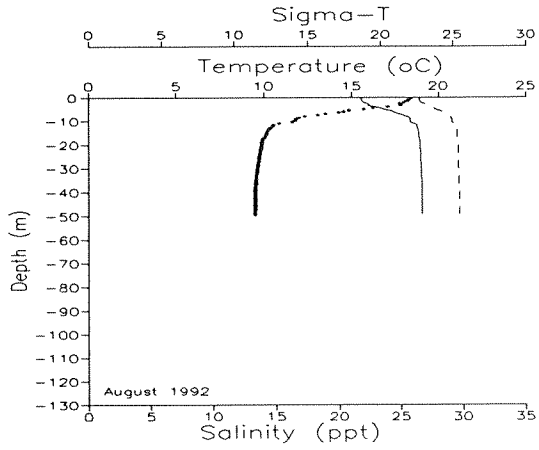
South Hood Canal at Sister's Point (Station HCB004)

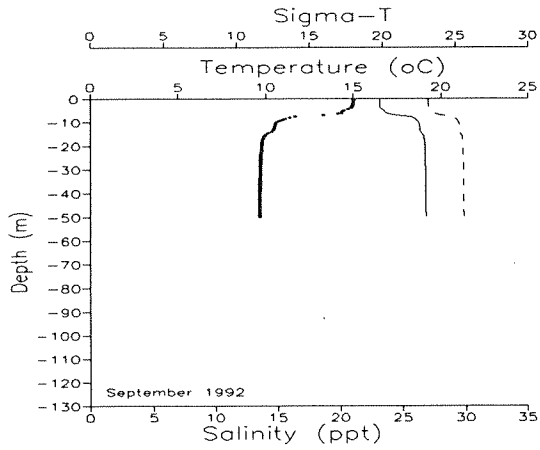










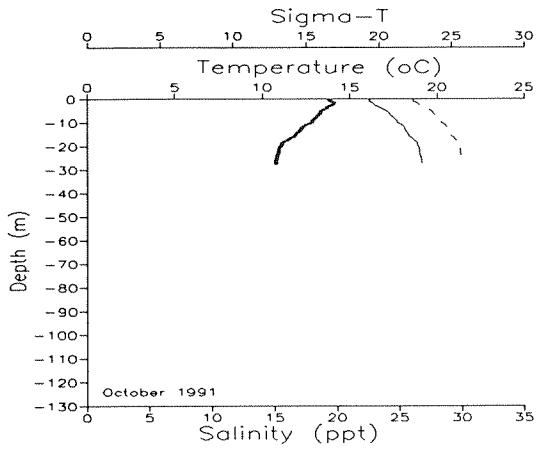


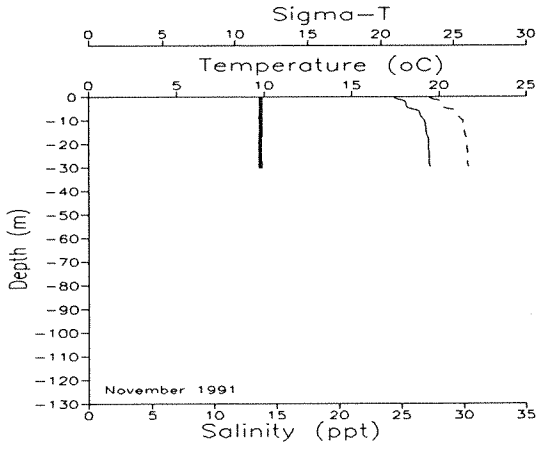
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

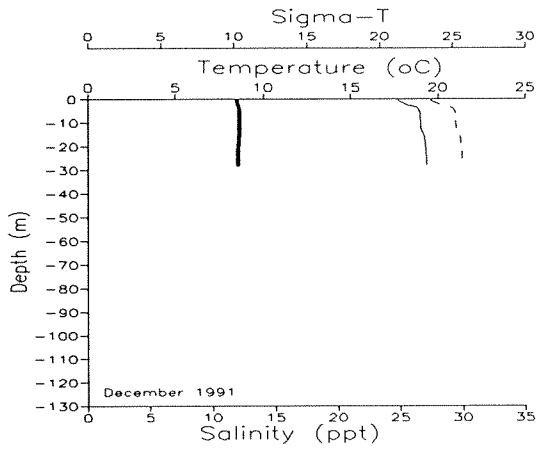
WATERYEAR 1992

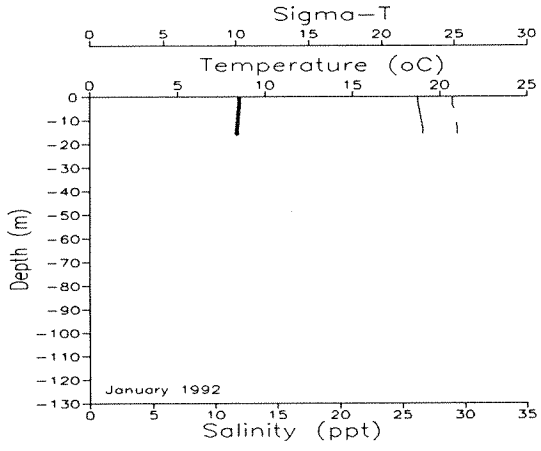
Part 1 of 2

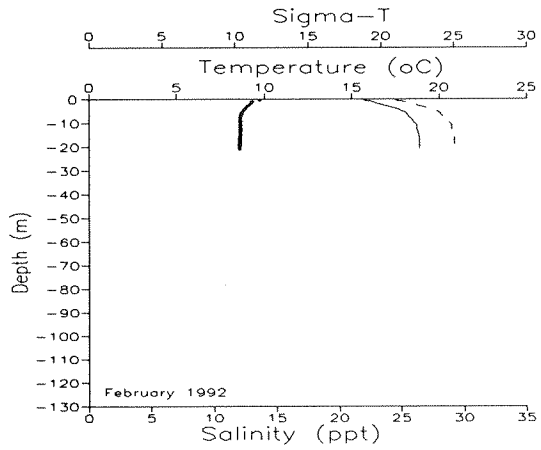
North Hood Canal - Bangor (Station HCB006)

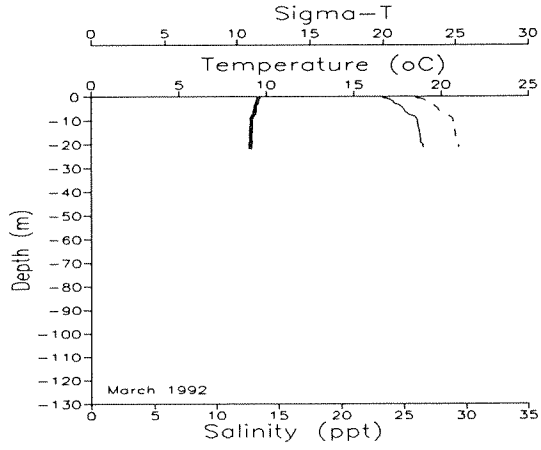










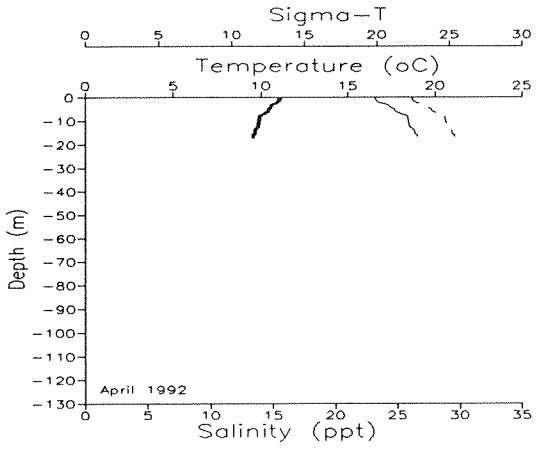


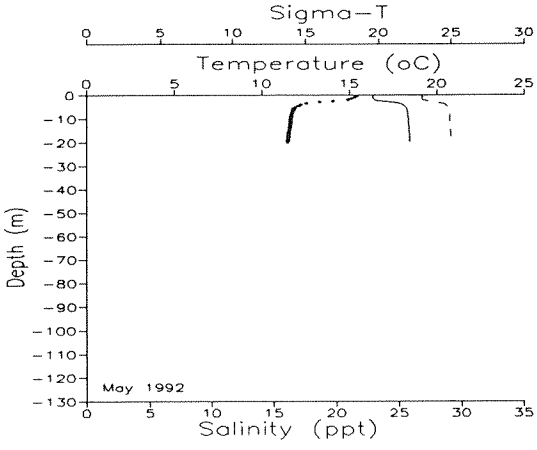
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

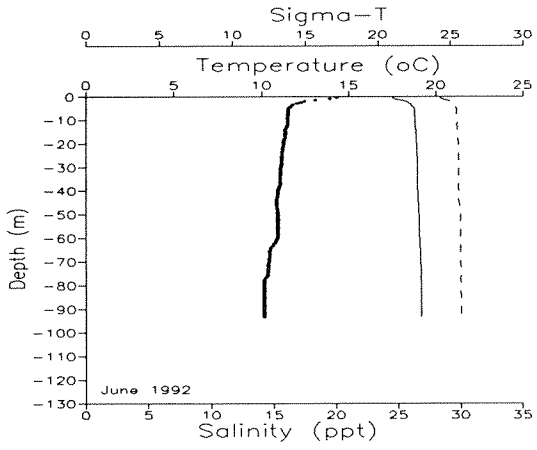
WATERYEAR 1992

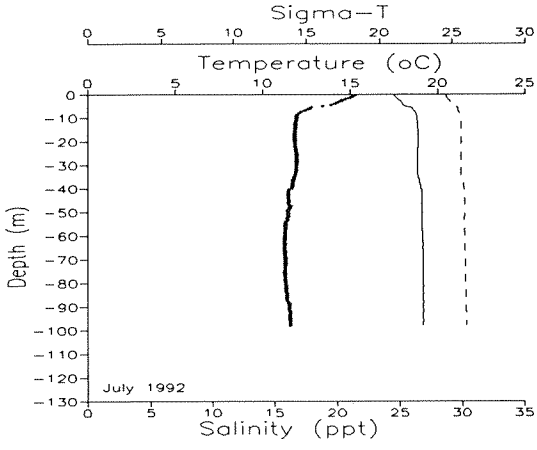
Part 2 of 2

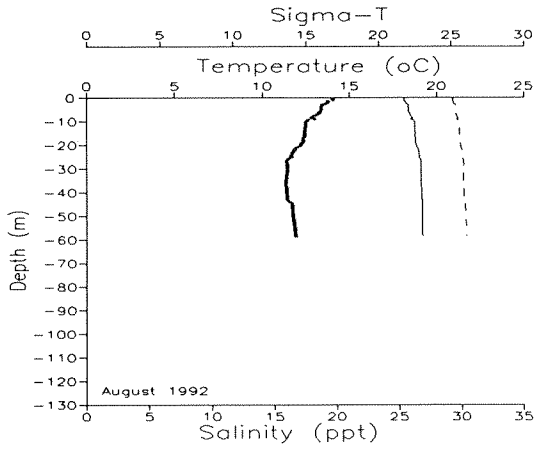
North Hood Canal - Bangor (Station HCB006)

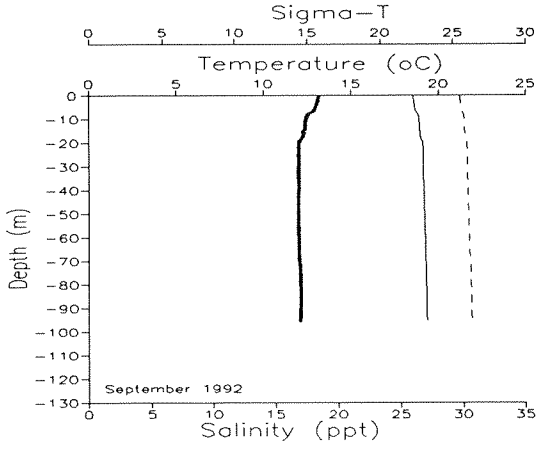








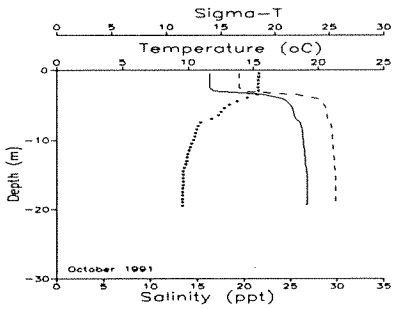


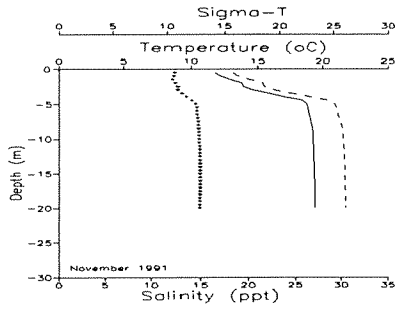


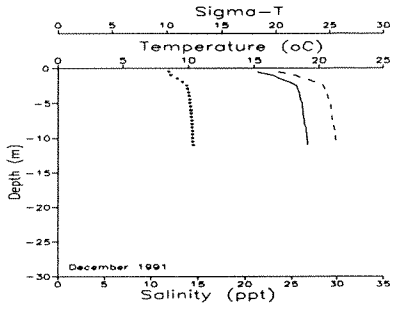
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

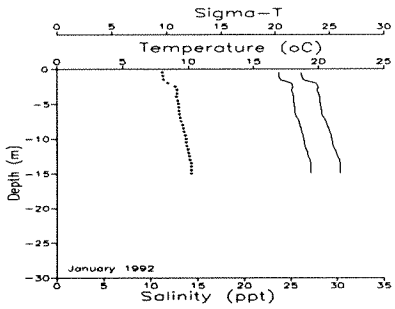
WATERYEAR 1992

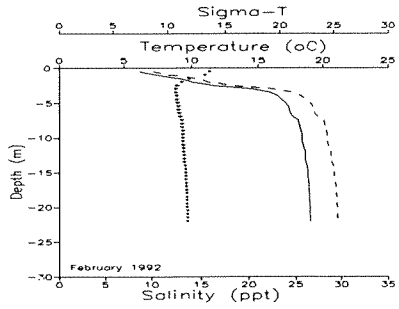
Lynch Cove (Station HCB007)

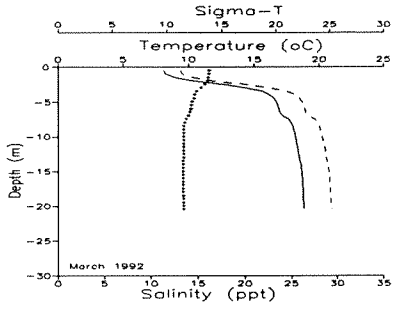


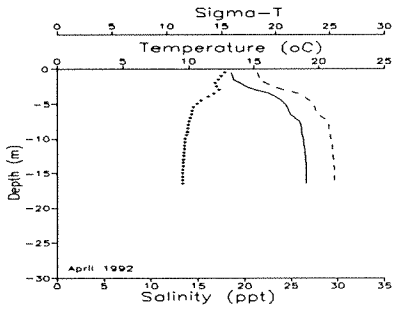


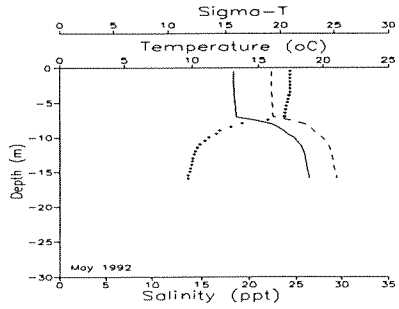


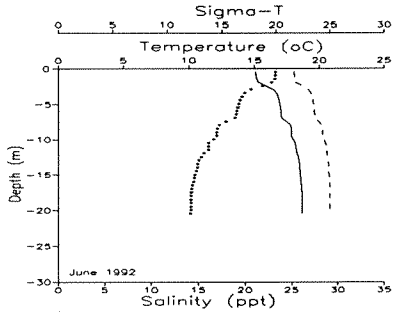


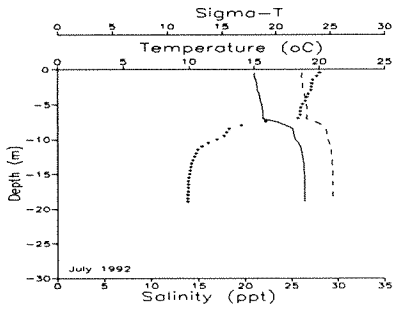


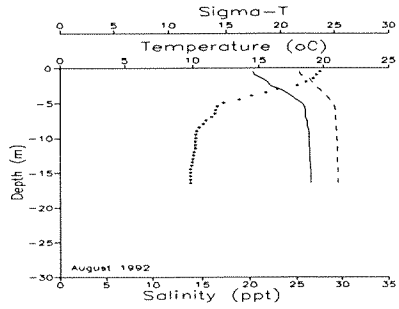


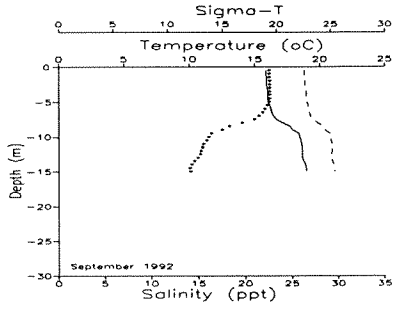








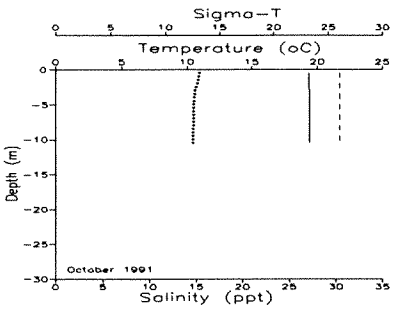


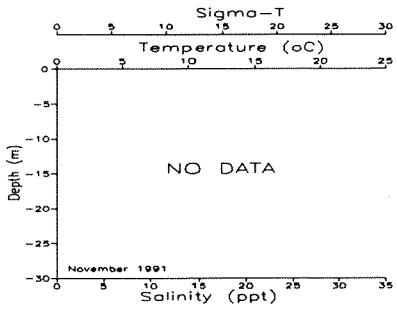


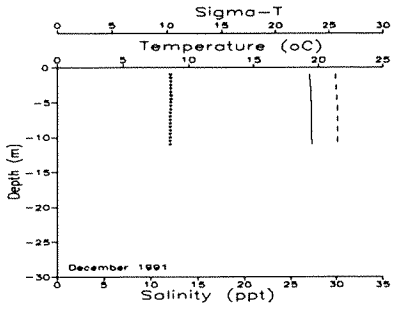
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

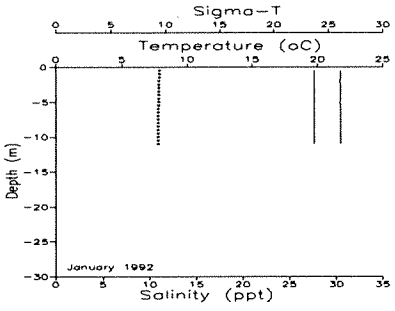
WATERYEAR 1992

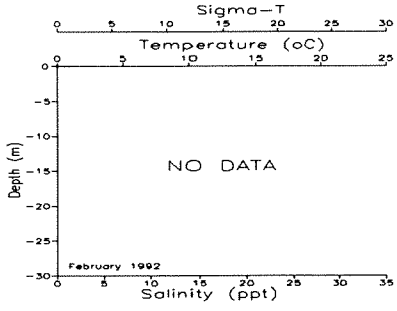
Lopez Sound - Lopez Island (Station LOP001)

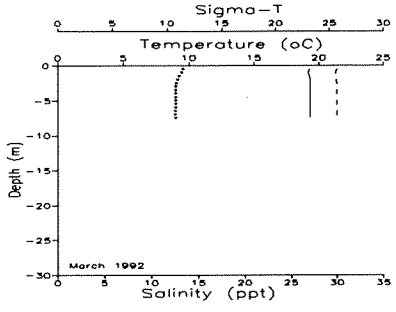


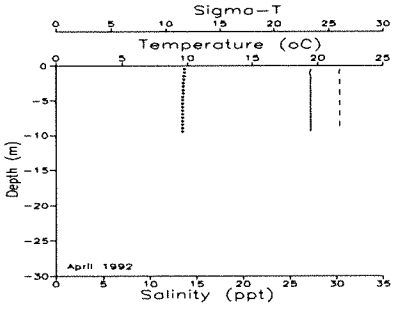


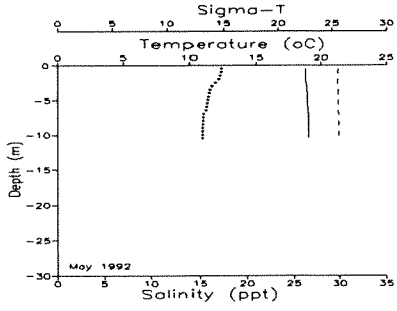


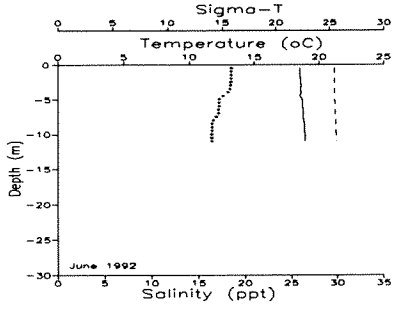


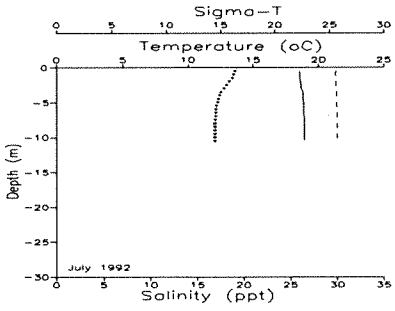


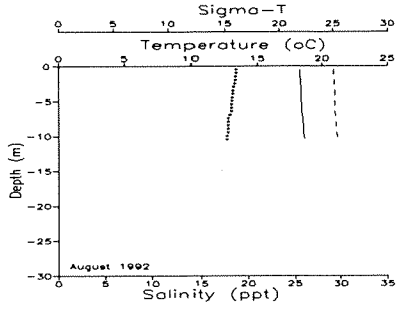


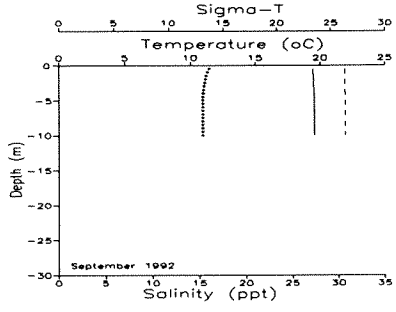








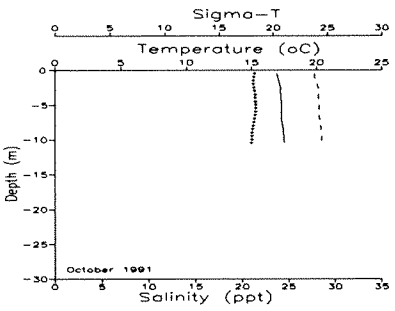


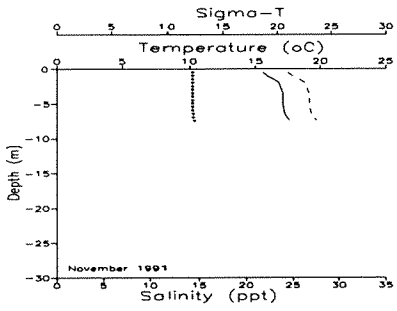


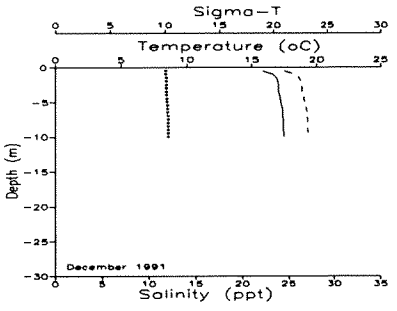
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

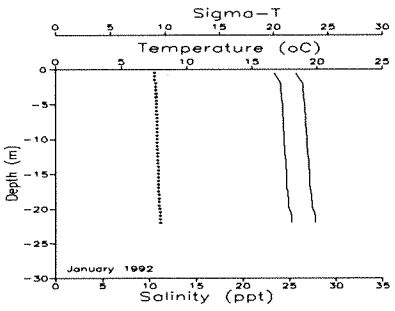
WATERYEAR 1992

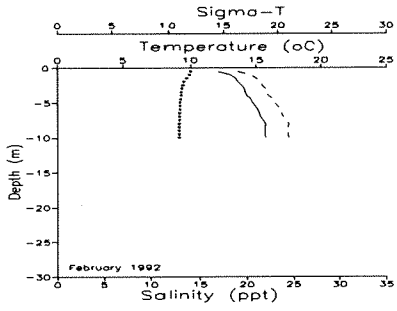
Oakland Bay (Station OAK004)

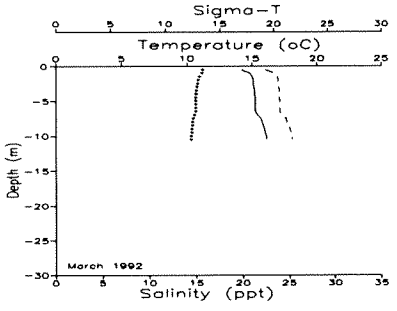


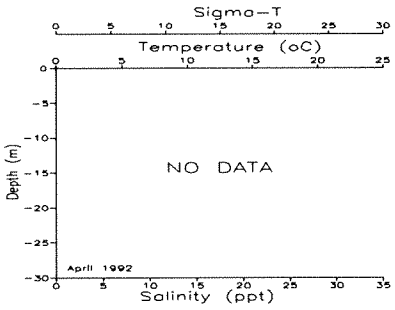


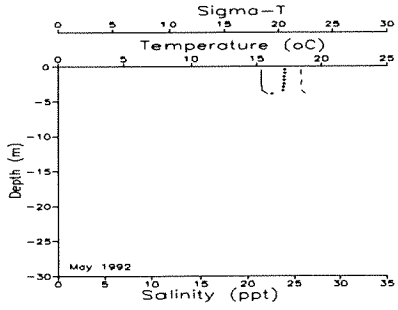


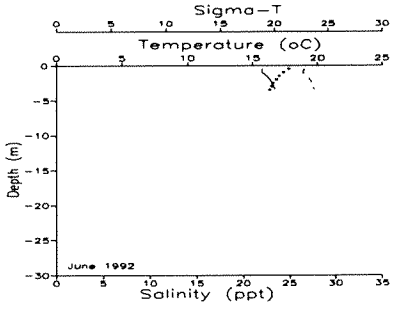


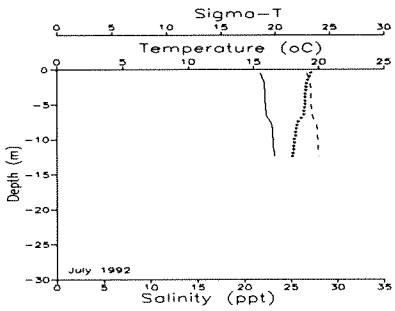


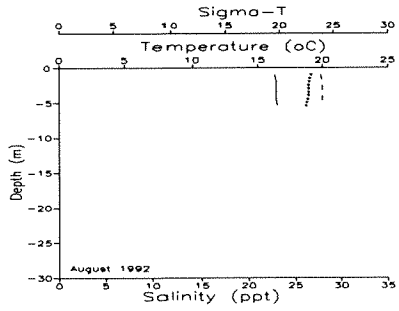


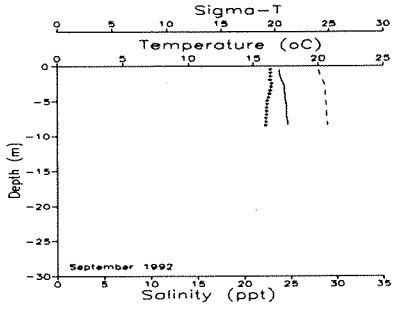








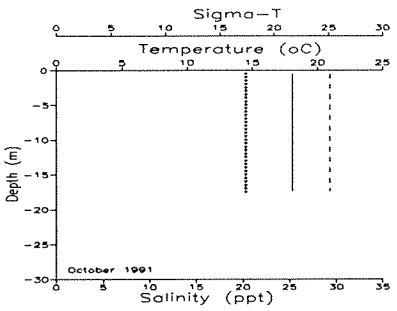


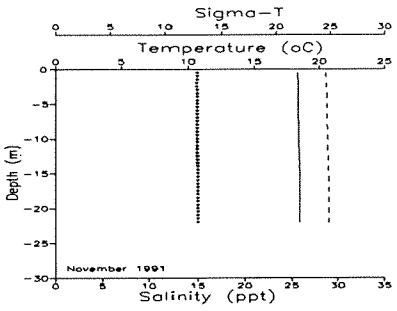


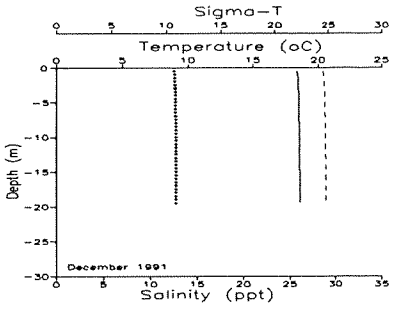
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

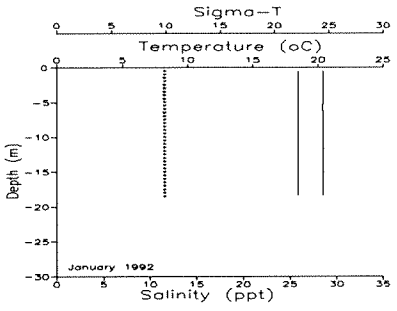
WATERYEAR 1992

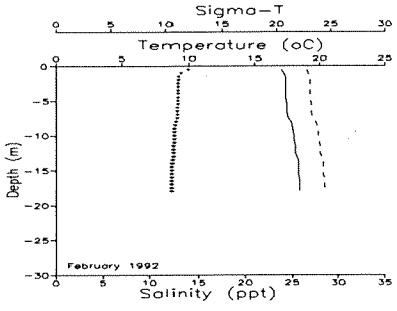
Pickering Passage (Station PCK001)

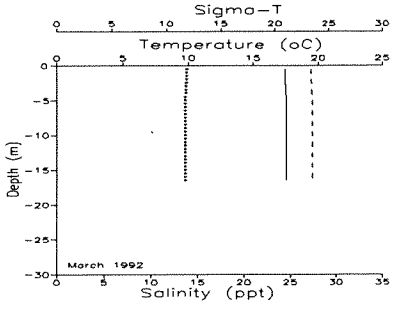


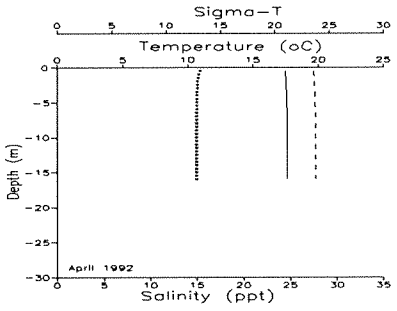


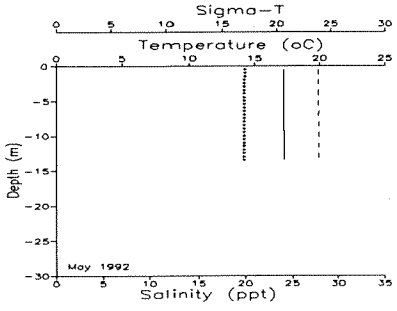


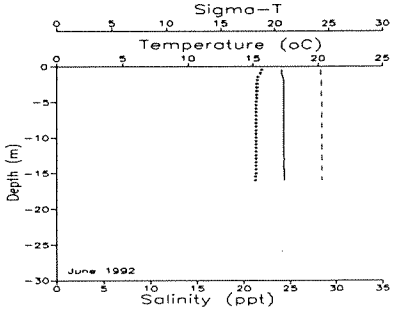


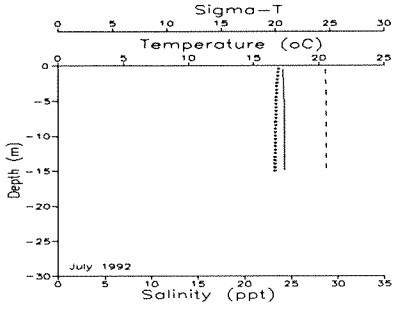


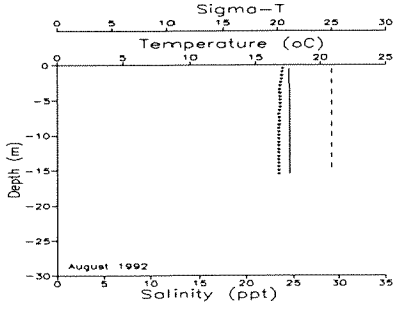


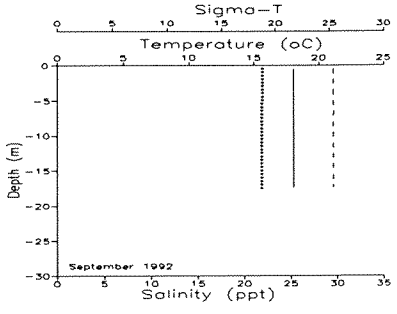








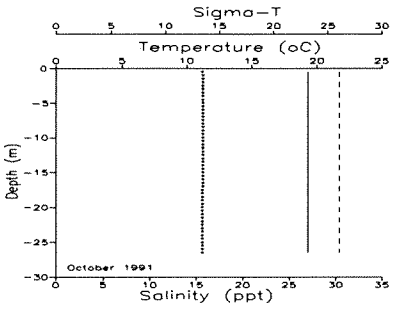


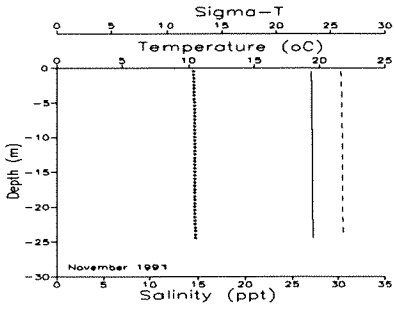


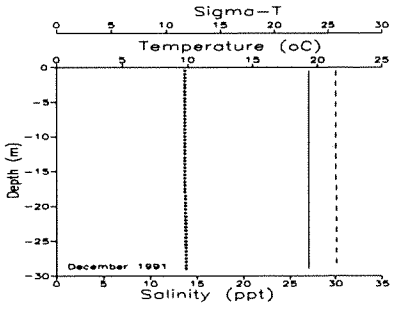
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

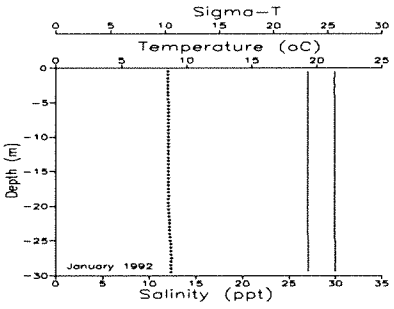
WATERYEAR 1992

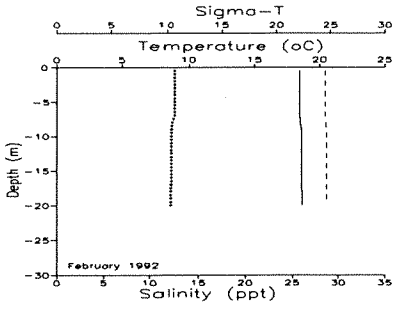
Port Madison (Station PMA001)

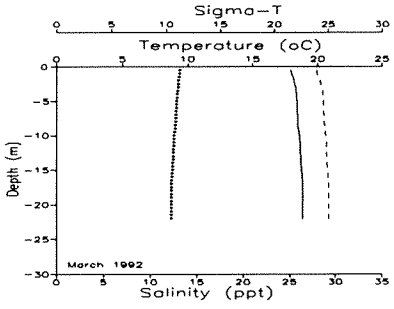


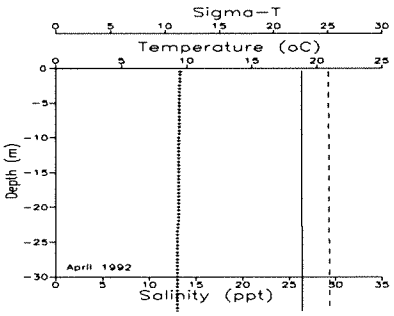


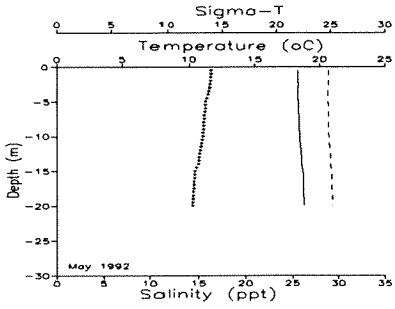


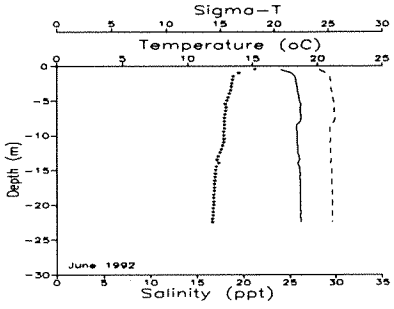


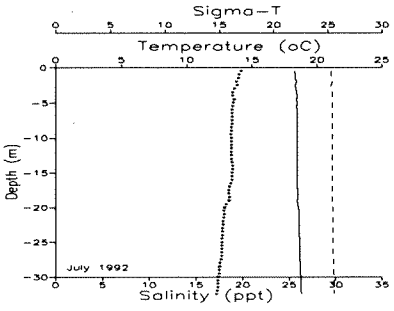


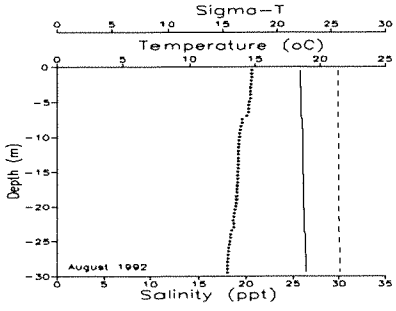


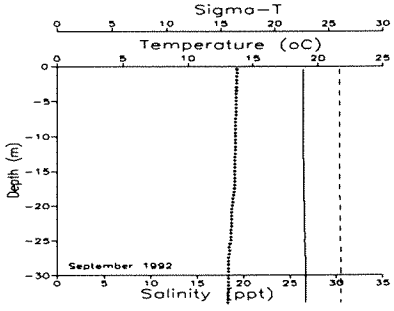








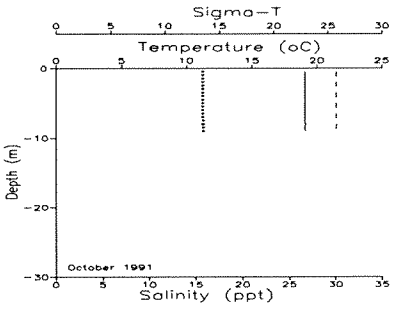


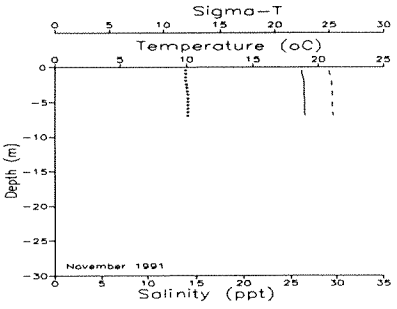


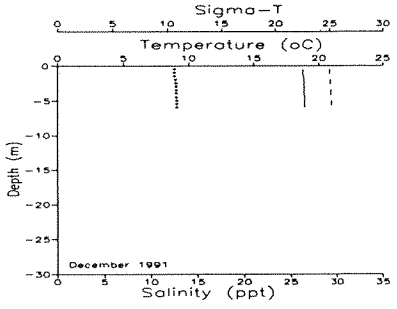
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

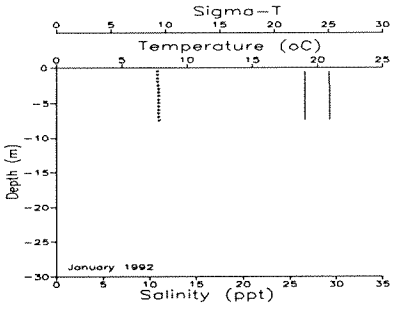
WATERYEAR 1992

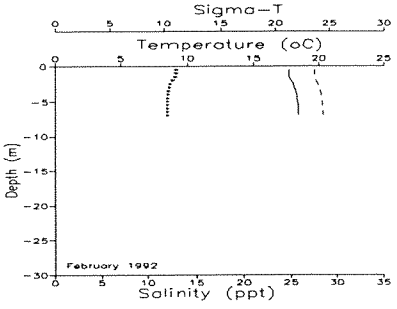
Pt. Orchard - Lib. Bay / Virg. Pt (Station POD006)

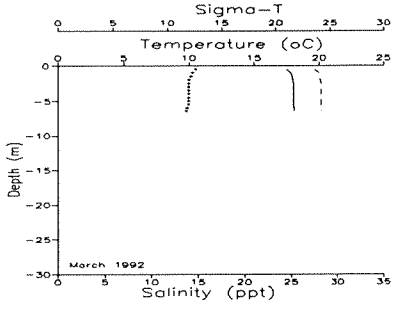


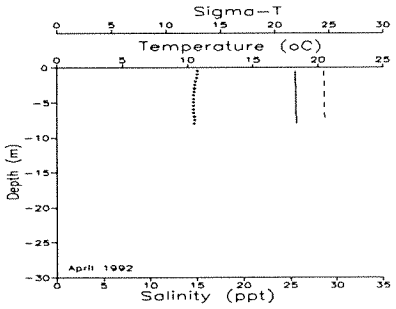


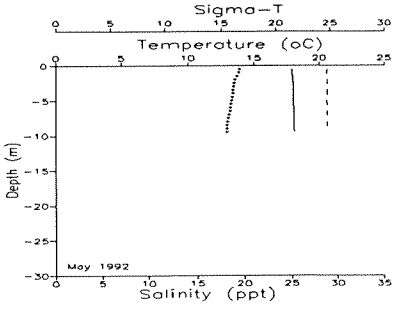


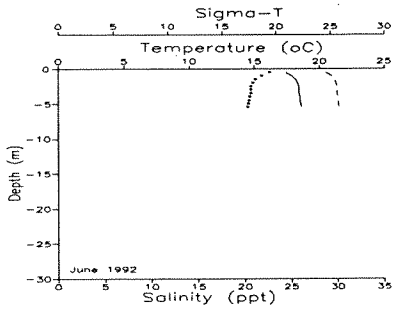


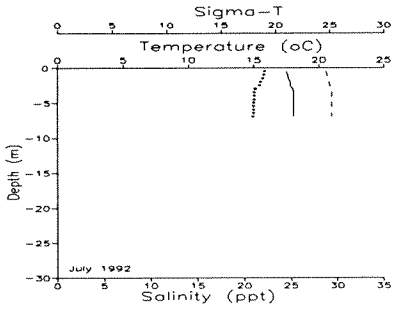


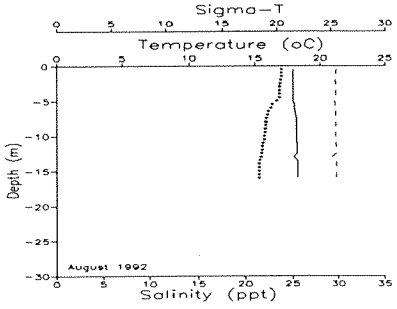


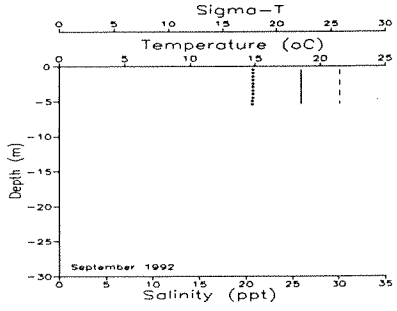










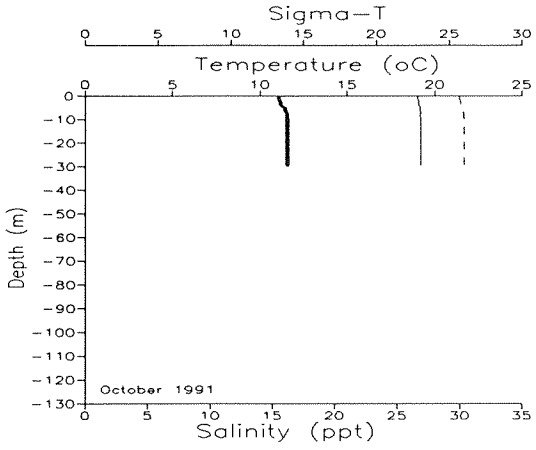


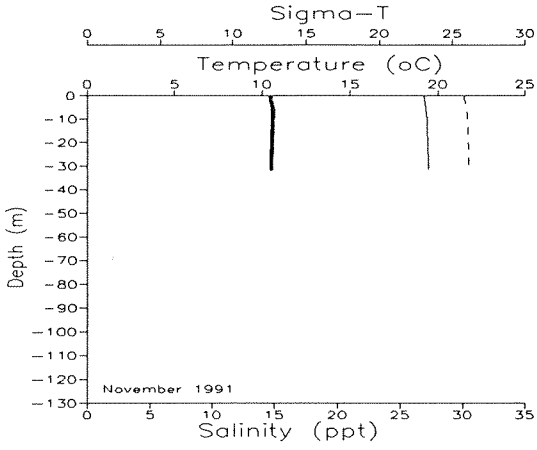
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

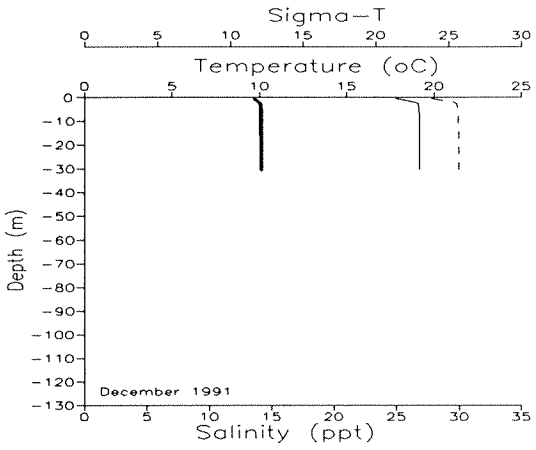
WATERYEAR 1992

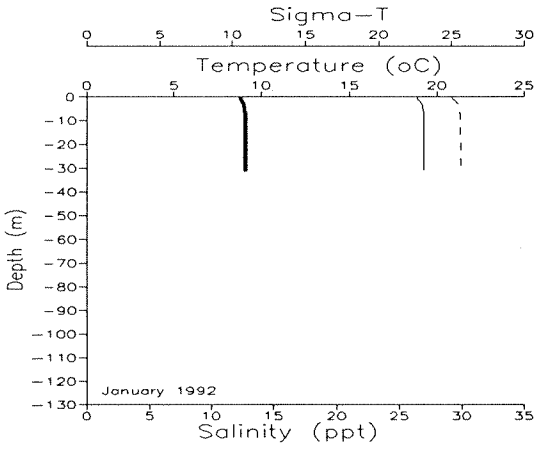
Part 1 of 2

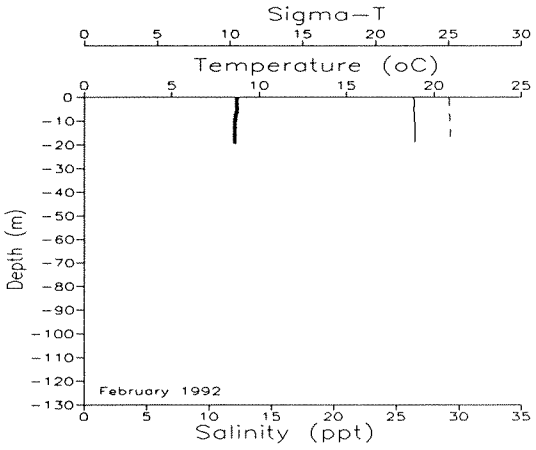
Puget Sound Main Basin - West Point (Station PSB003)

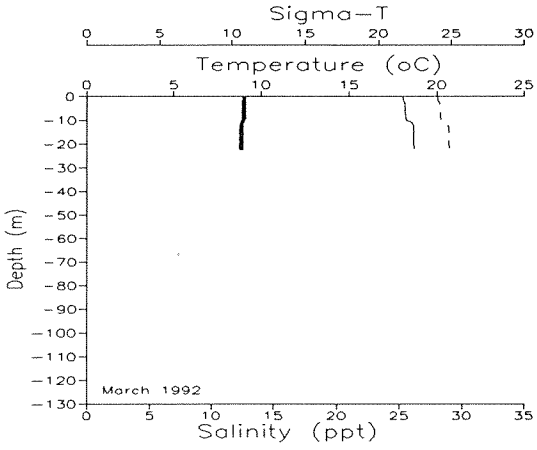










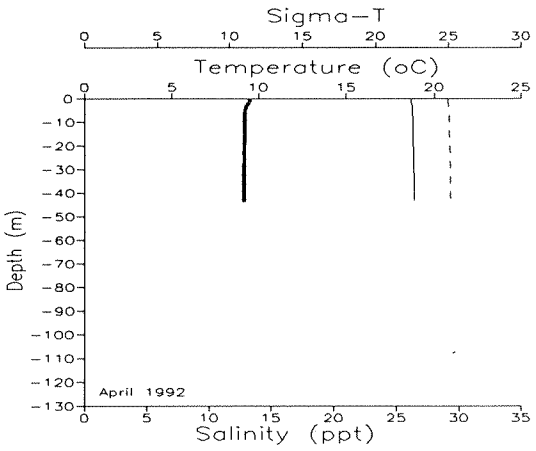


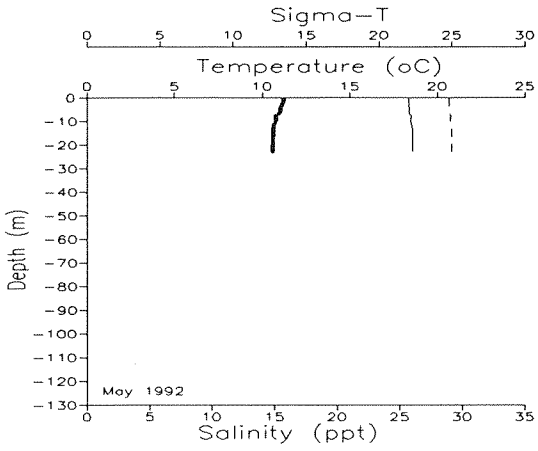
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

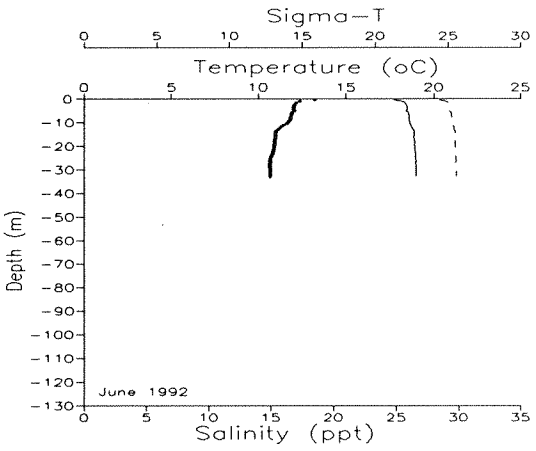
WATERYEAR 1992

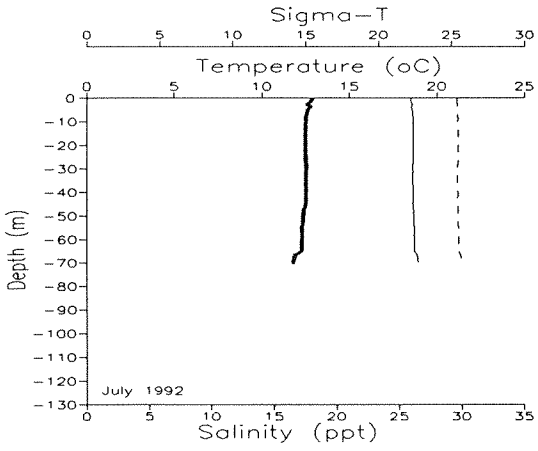
Part 2 of 2

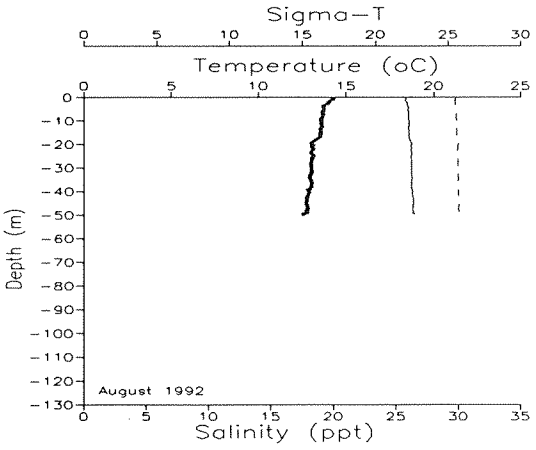
Puget Sound Main Basin - West Point (Station PSB003)

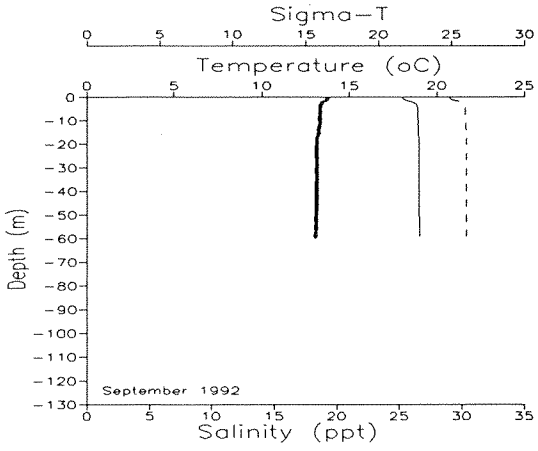










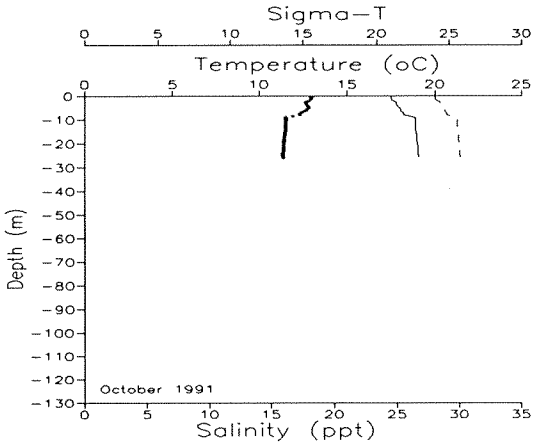


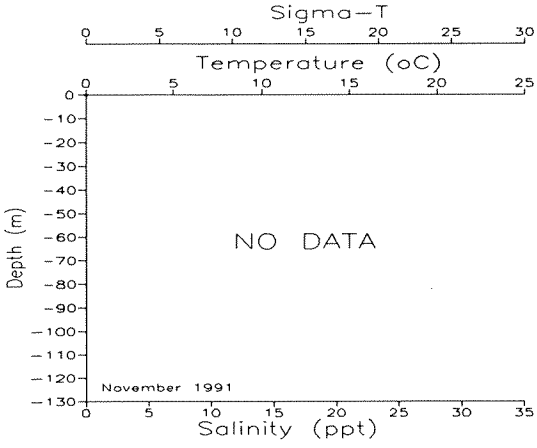
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

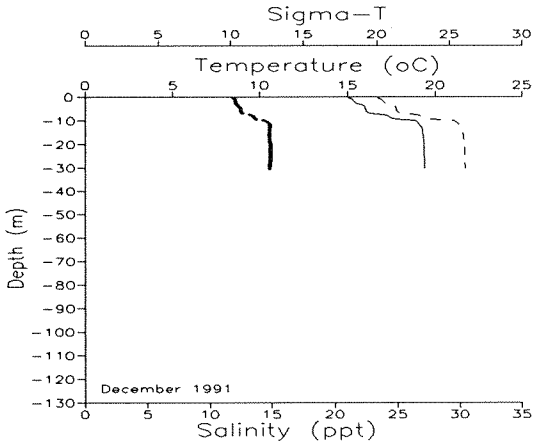
WATERYEAR 1992

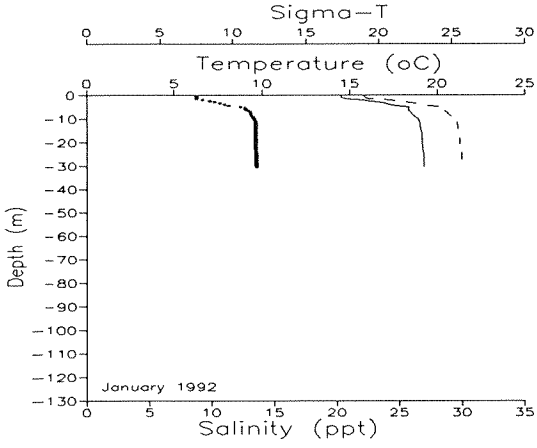
Part 1 of 2

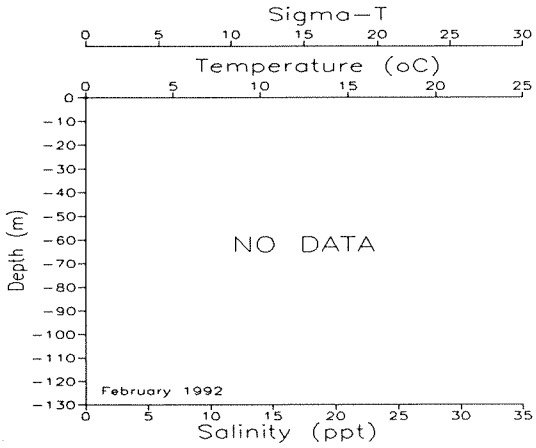
Possession Sound - Ged. Is. (Station PSS019)

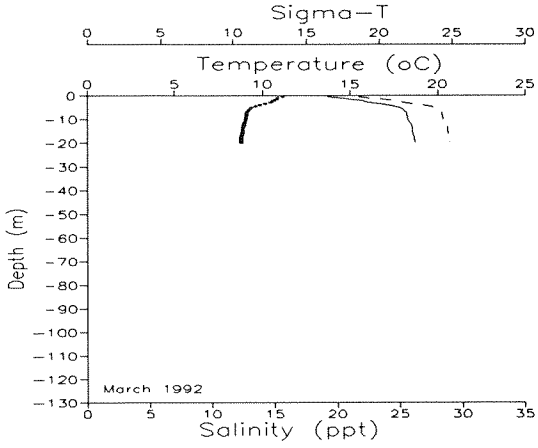










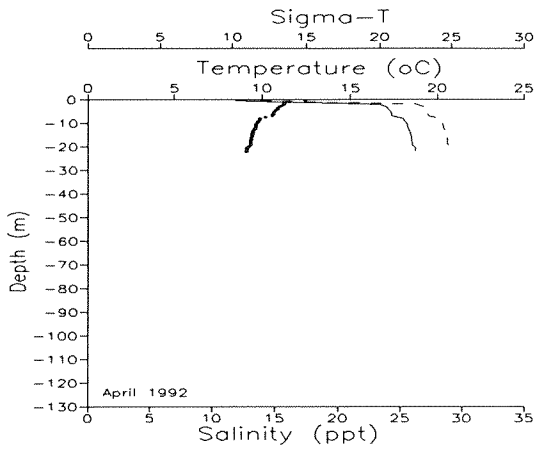


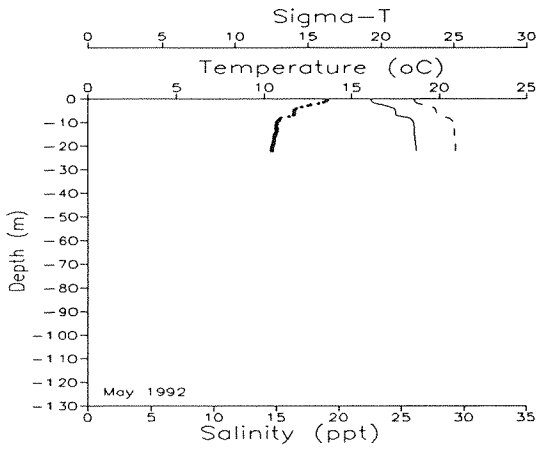
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

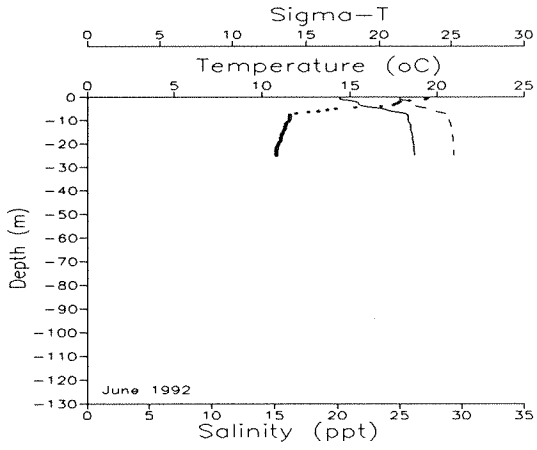
WATERYEAR 1992

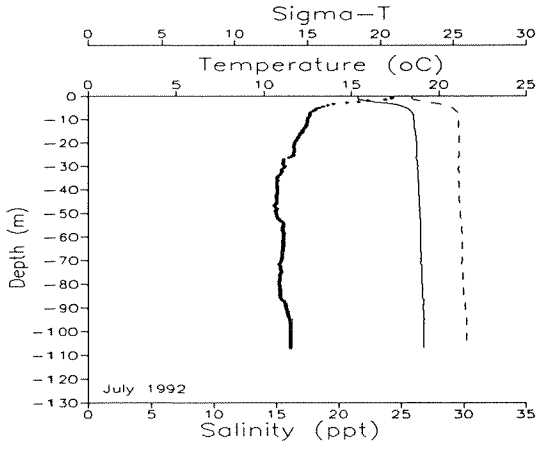
Part 2 of 2

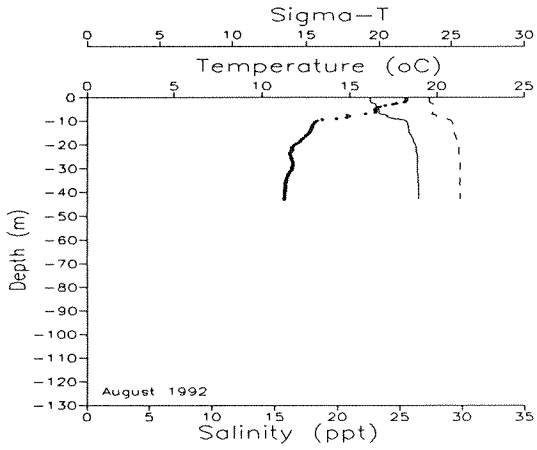
Possession Sound - Ged. Is. (Station PSS019)

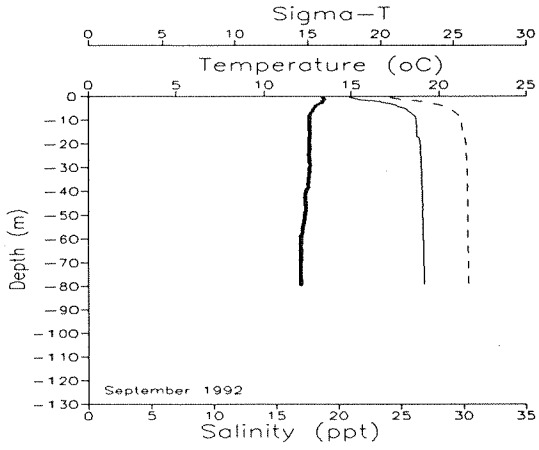








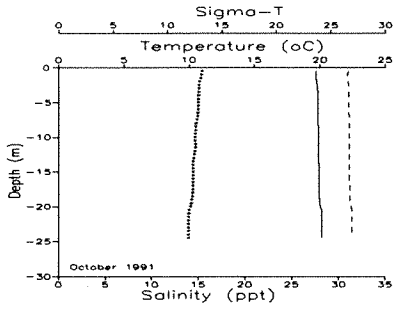


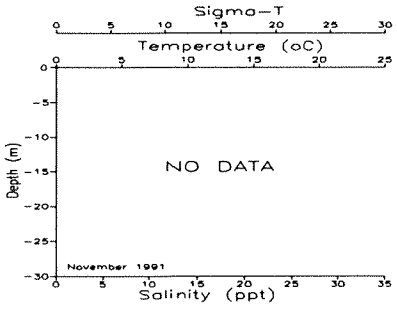


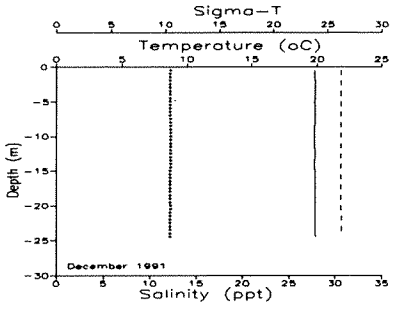
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

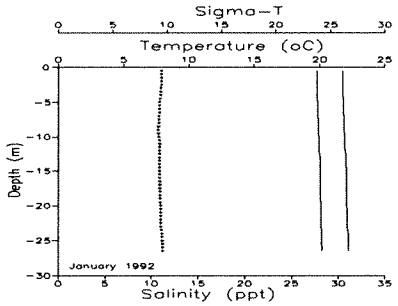
WATERYEAR 1992

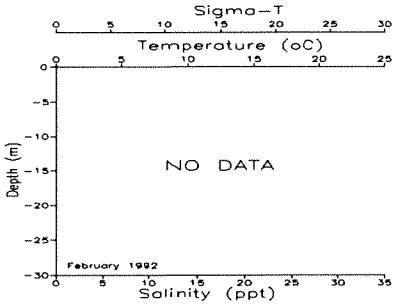
Port Townsend Harbor - Walan Pt. (Station PTH005)

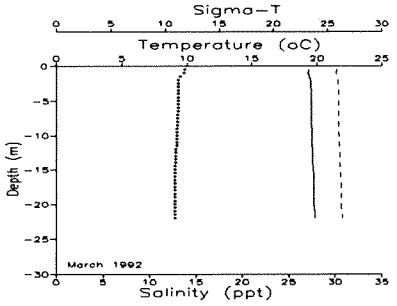


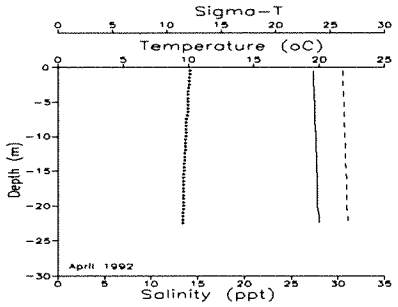


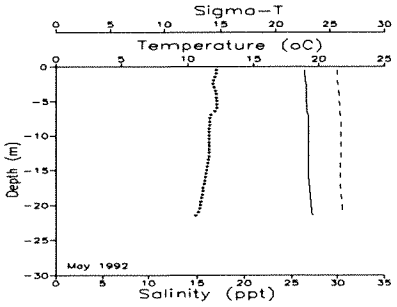


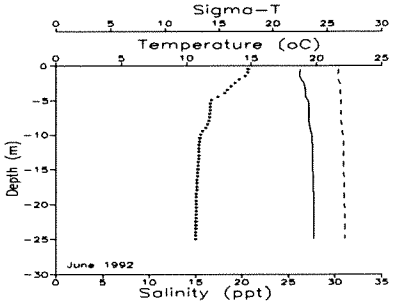


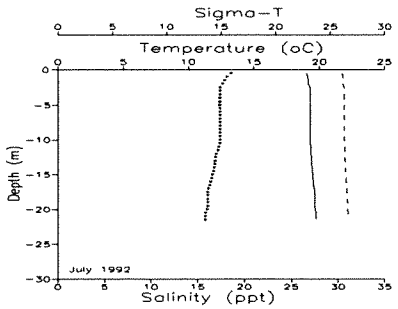


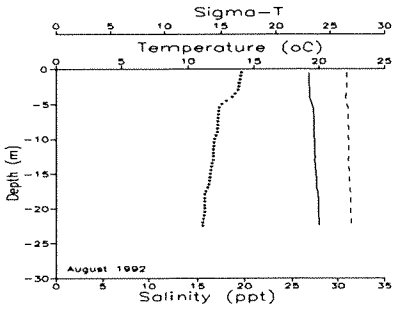


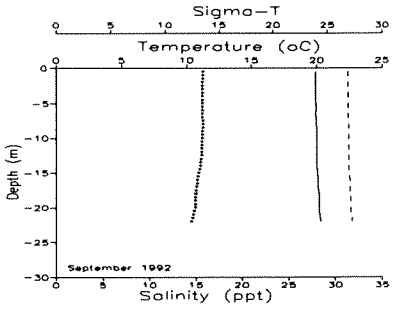








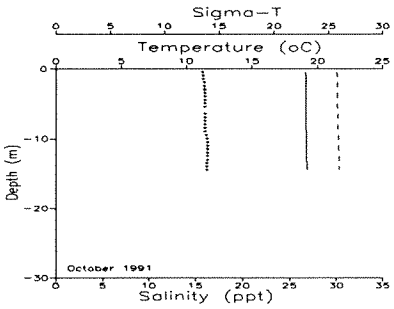


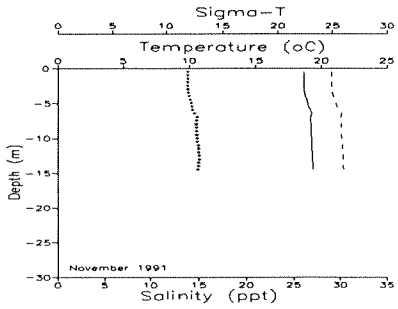


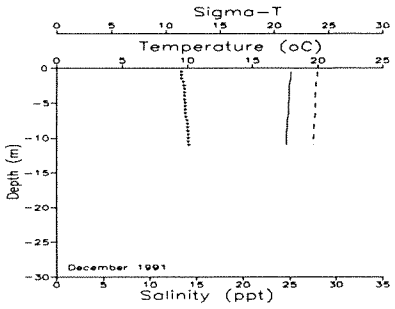
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

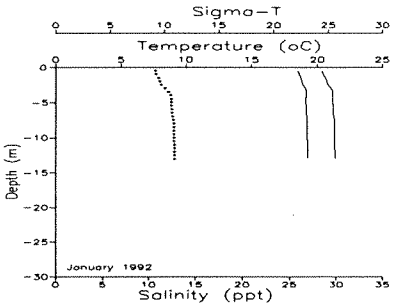
WATERYEAR 1992

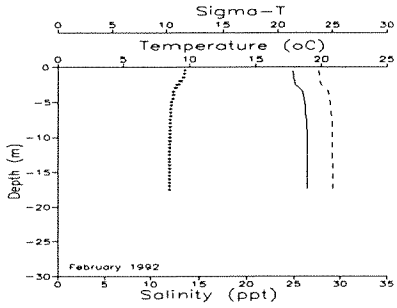
Quartermaster Harbor (Station QMH001)

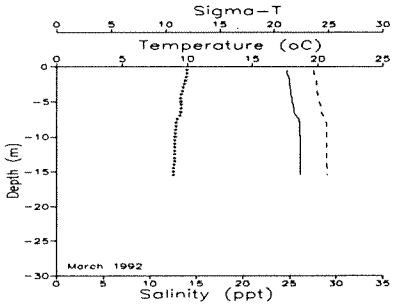


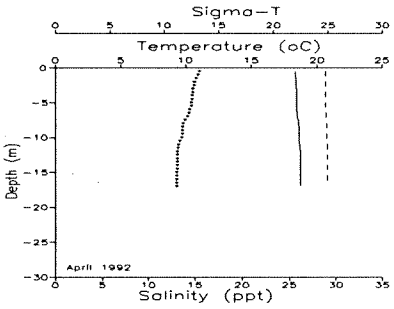


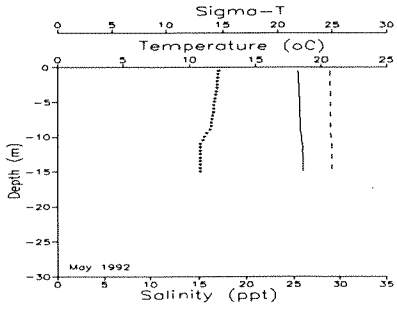


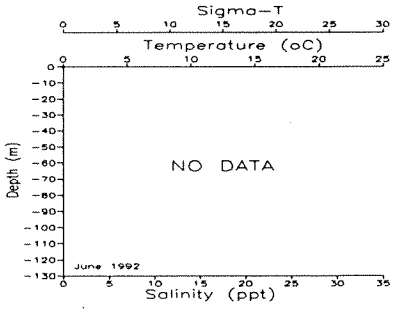


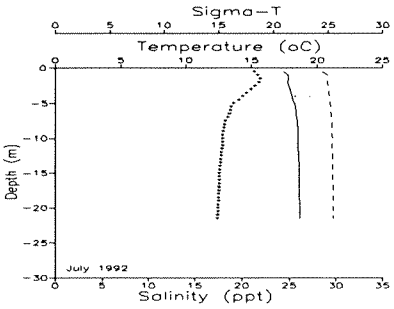


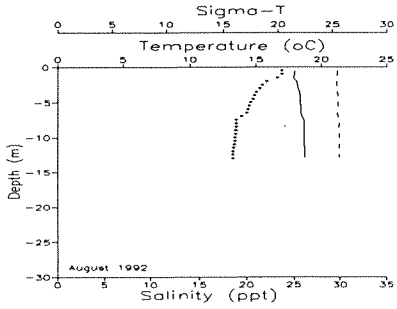


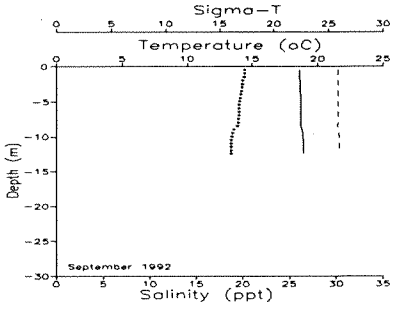










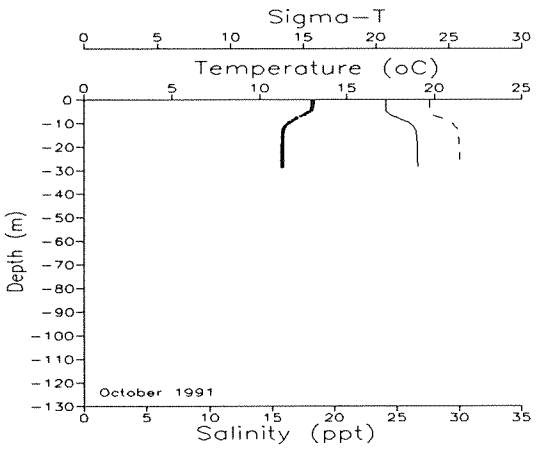


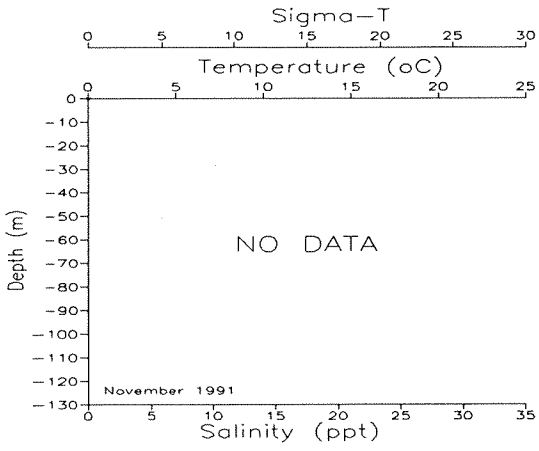
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

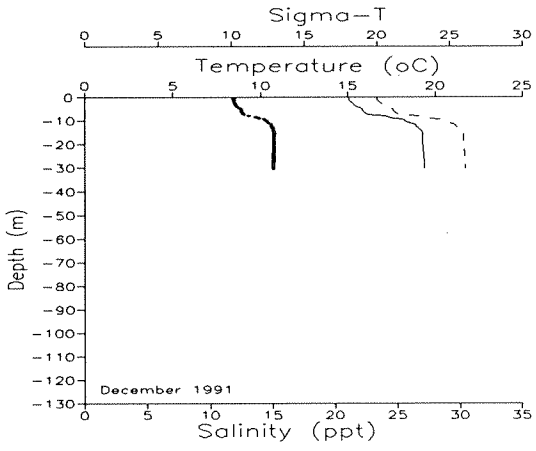
WATERYEAR 1992

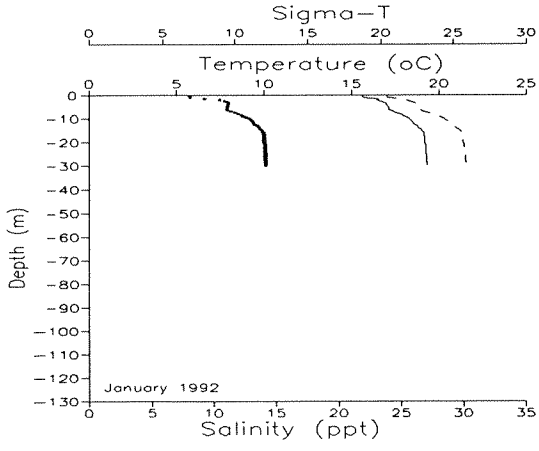
Part 1 of 2

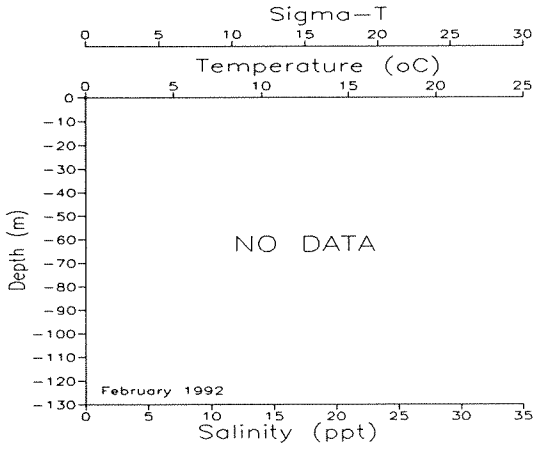
Saratoga Passage - East Point (Station SAR003)

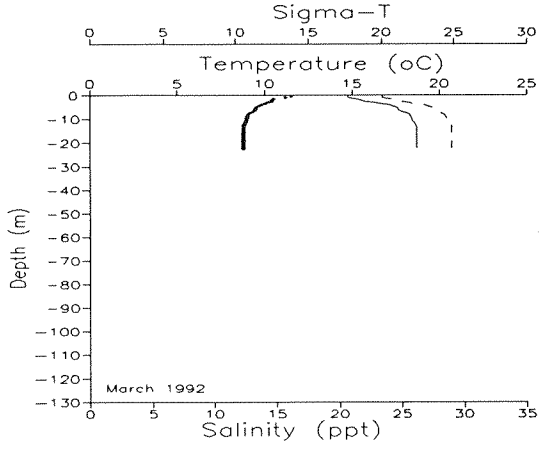










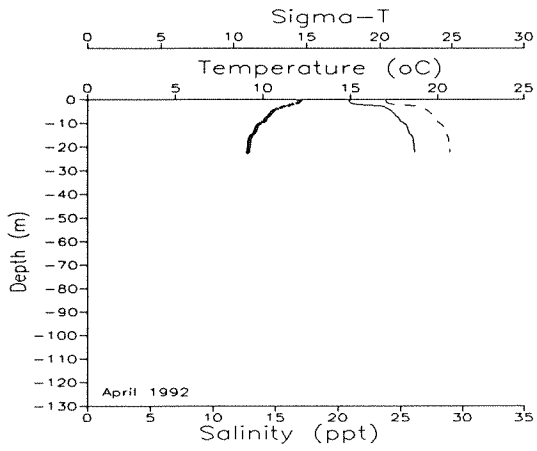


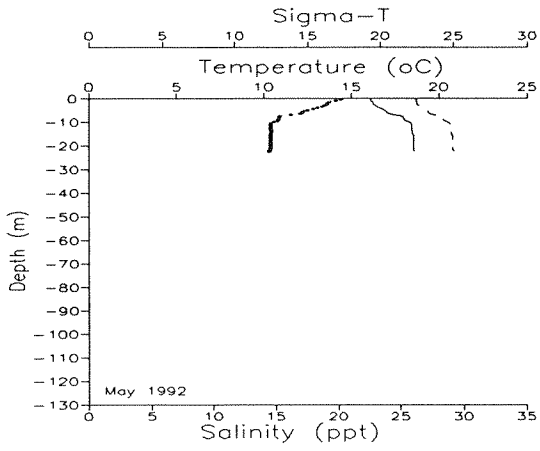
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

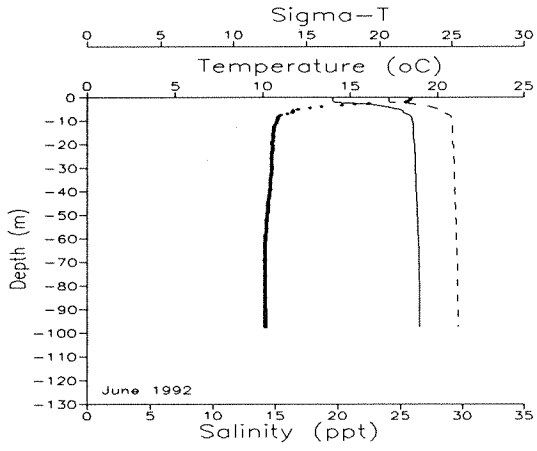
WATERYEAR 1992

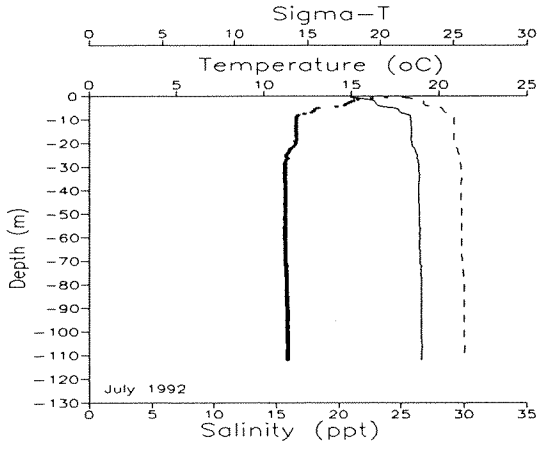
Part 2 of 2

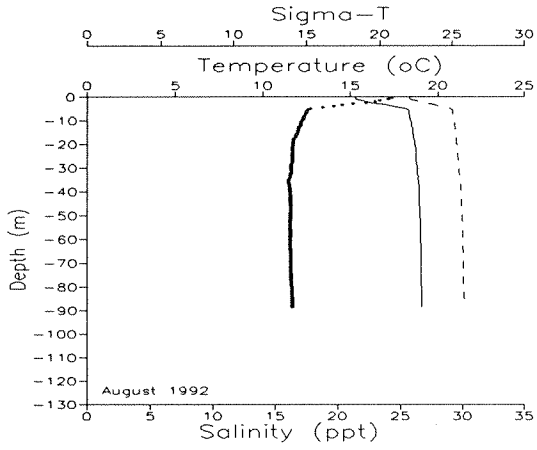
Saratoga Passage - East Point (Station SAR003)

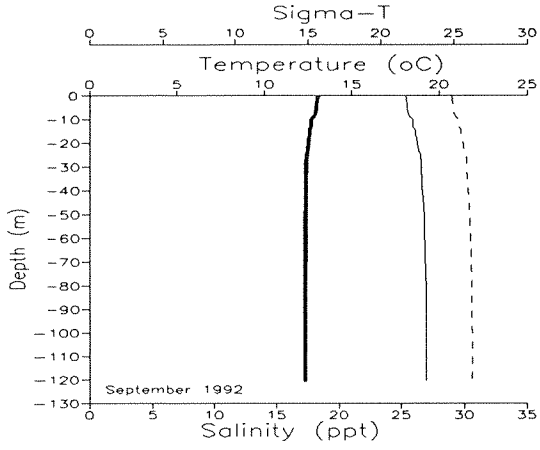








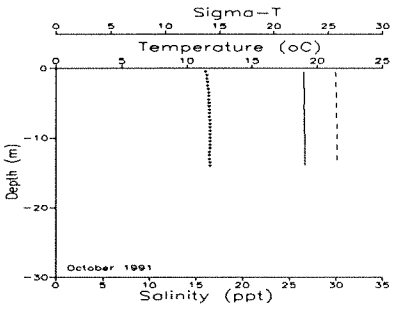


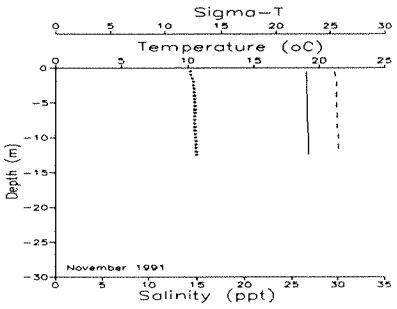


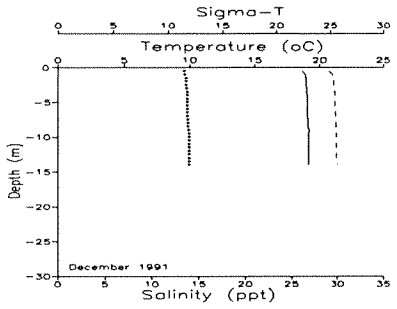
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

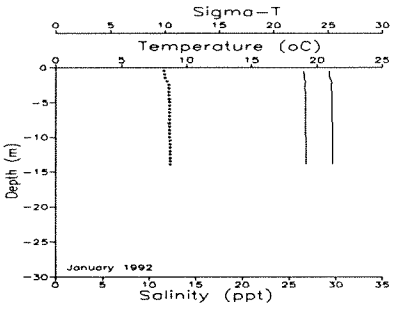
WATERYEAR 1992

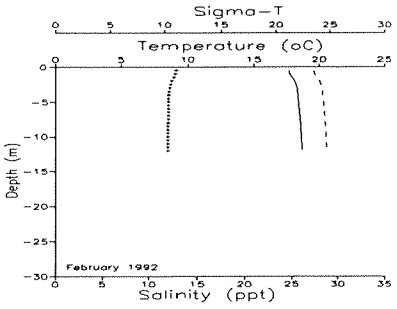
Sinclair Inlet (Station SIN001)

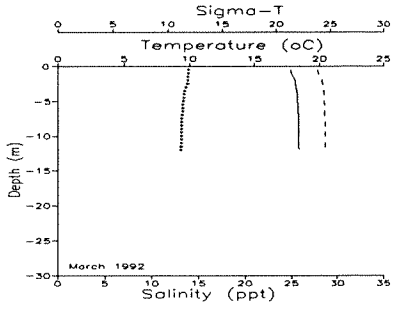


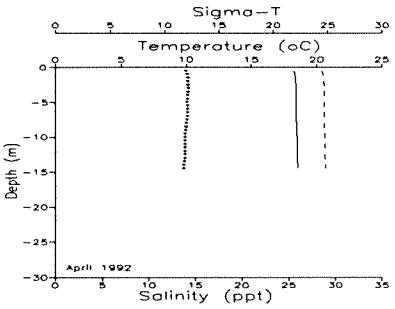


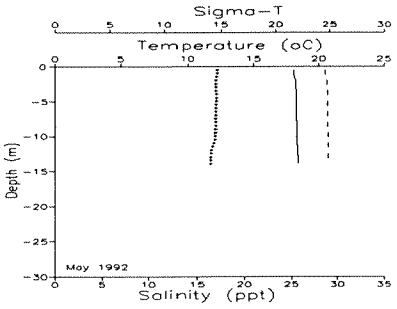


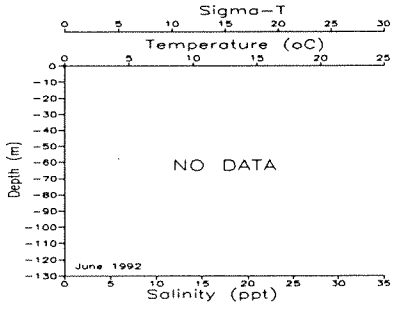


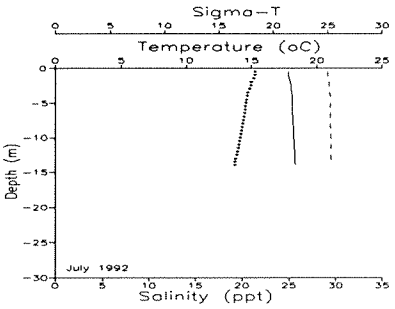


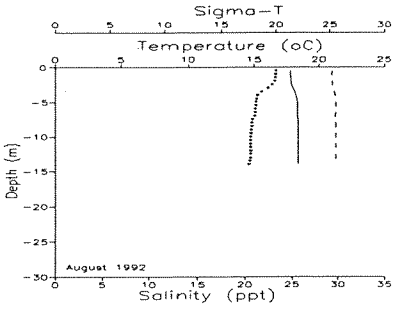


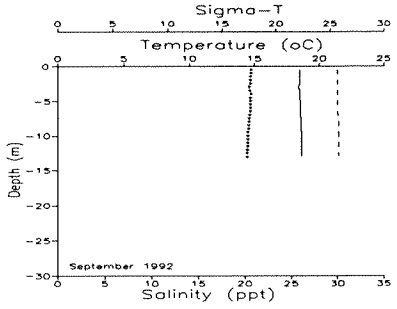










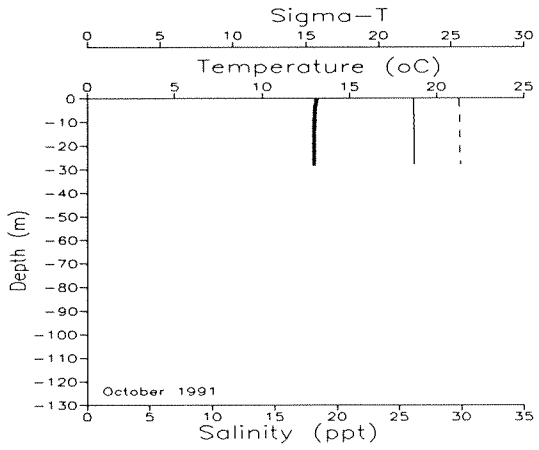


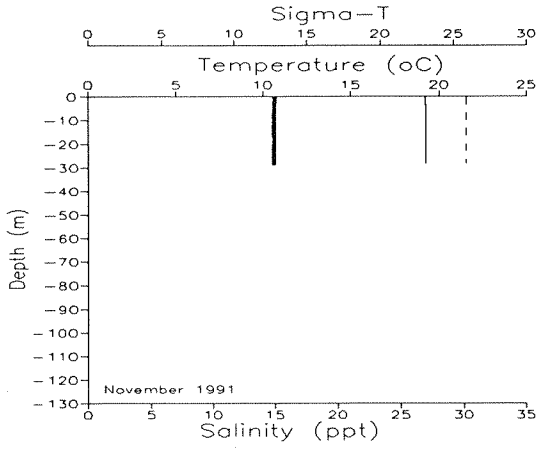
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

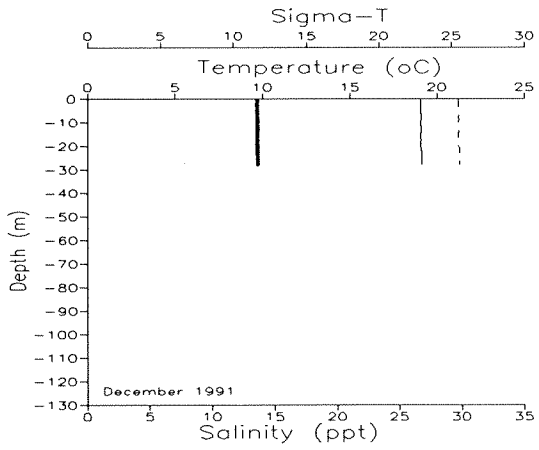
WATERYEAR 1992

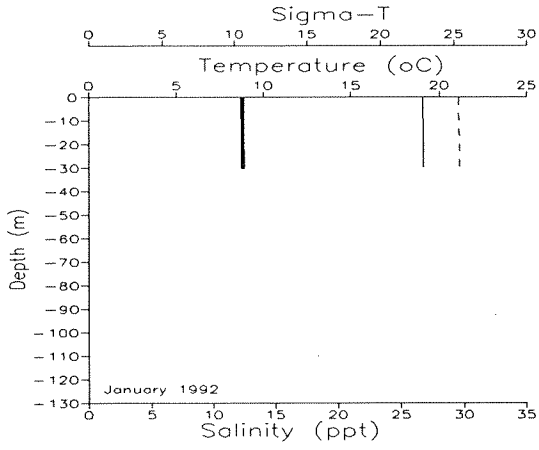
Part 1 of 2

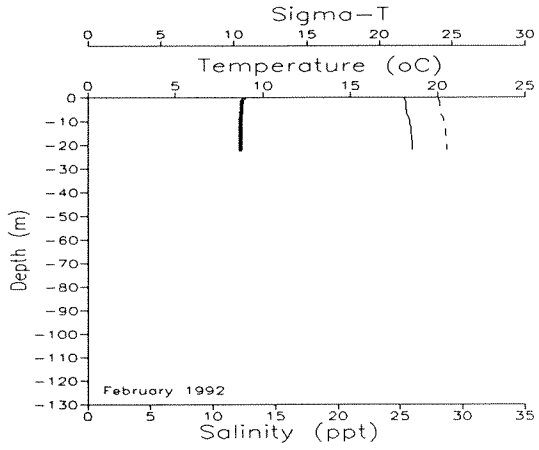
Steilacoom (Station STL001)

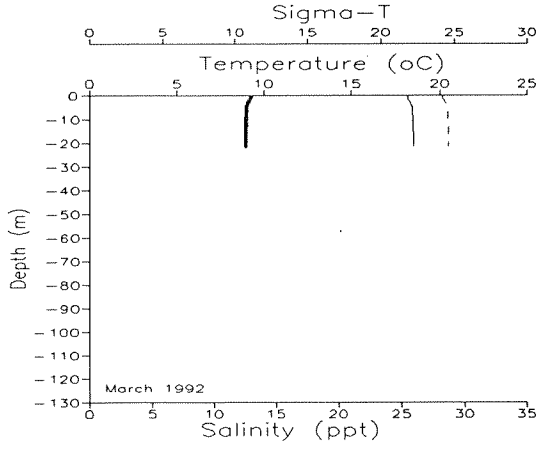










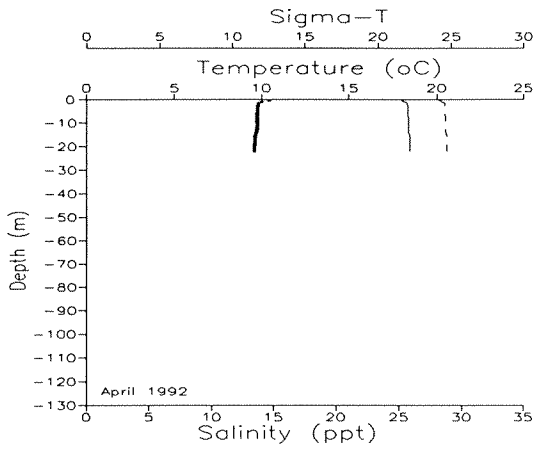


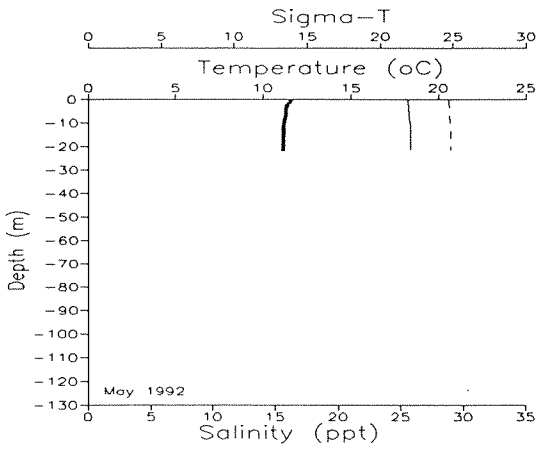
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

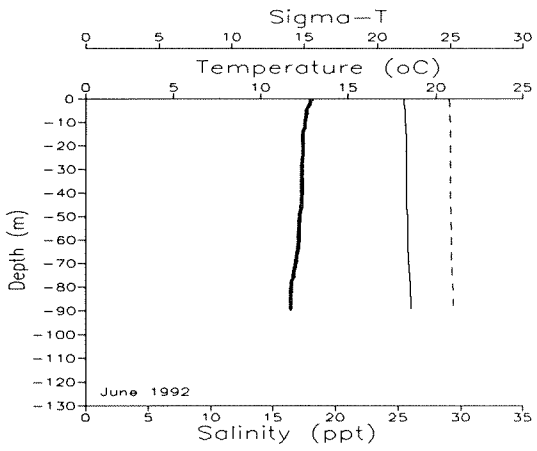
WATERYEAR 1992

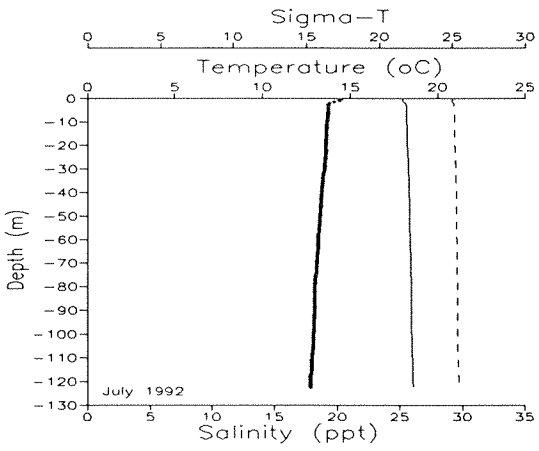
Part 2 of 2

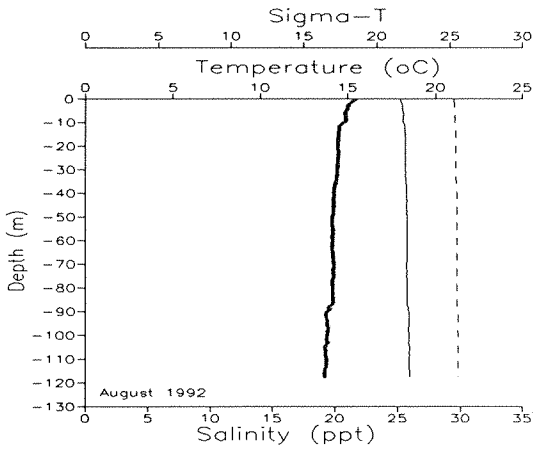
Steilacoom (Station STL001)

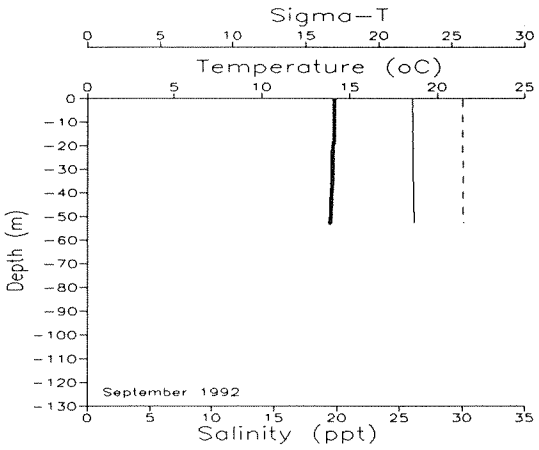








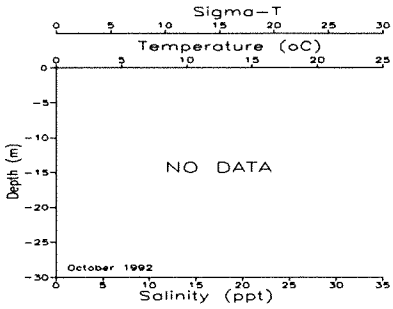


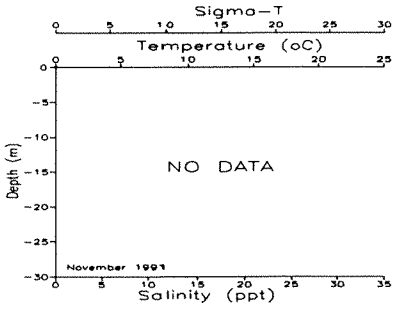


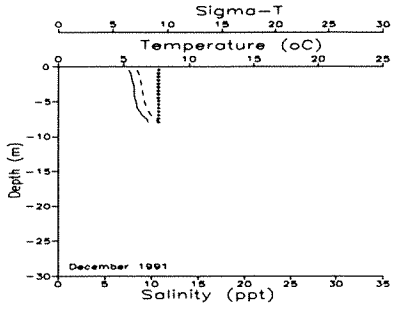
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

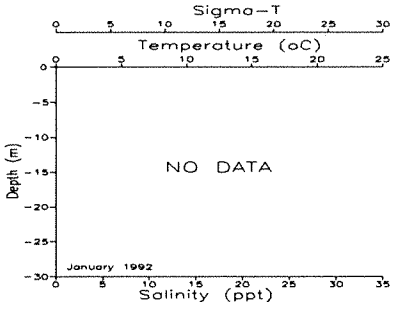
WATERYEAR 1992

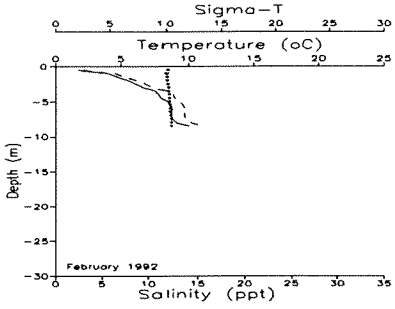
Willapa Bay - Willapa River (Station WPA001)

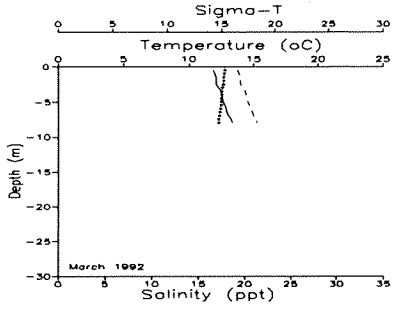


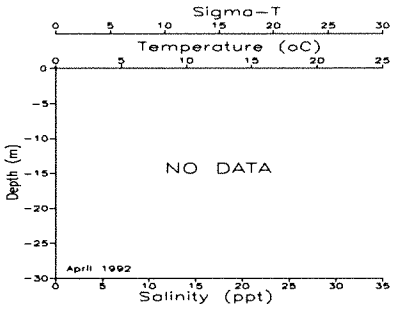


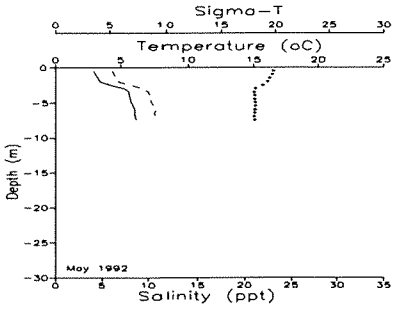


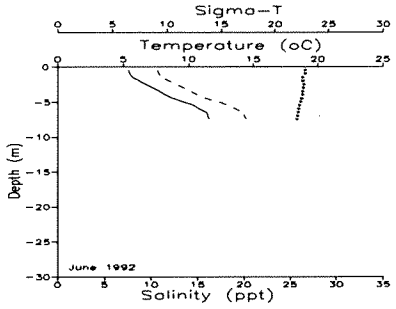


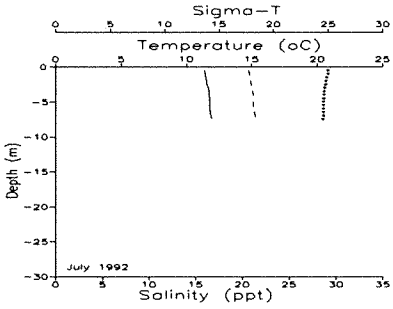


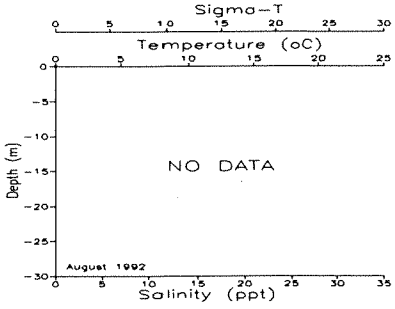


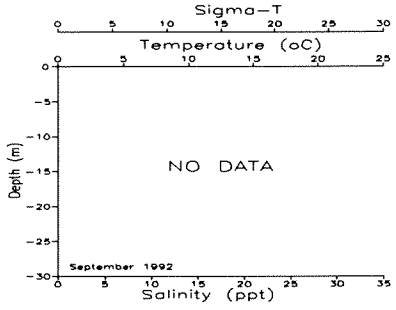








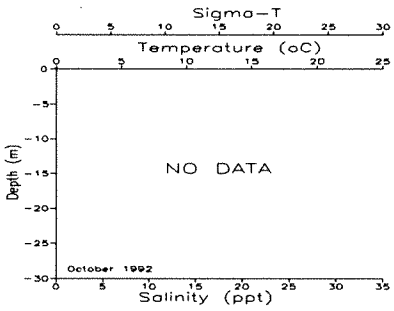


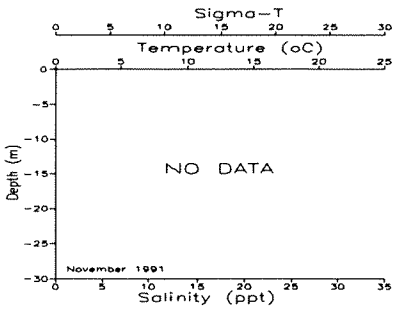


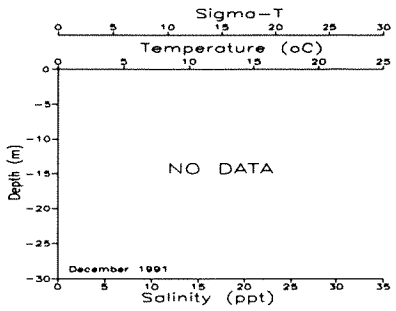
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

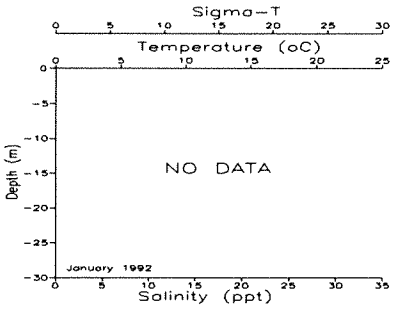
WATERYEAR 1992

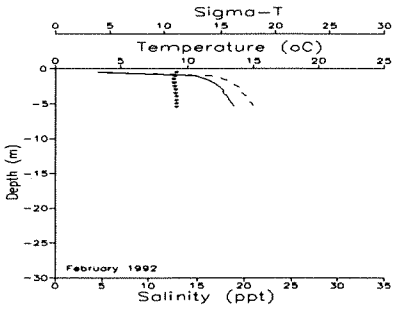
Willapa Bay - Johnson Slough (Station WPA003)

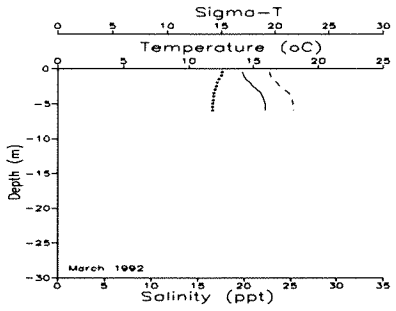


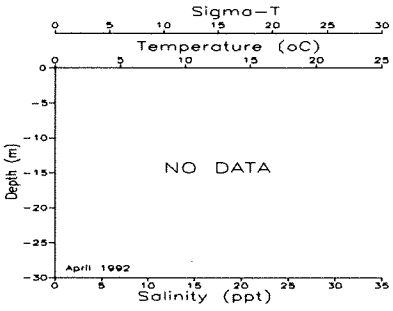


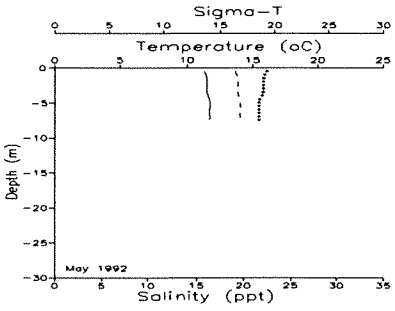


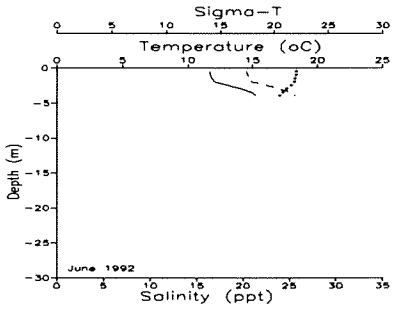


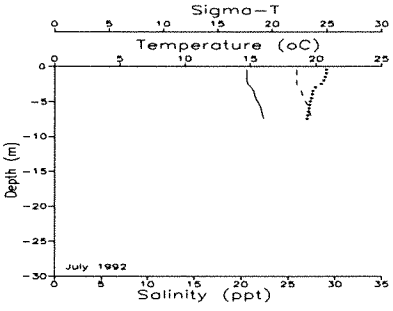


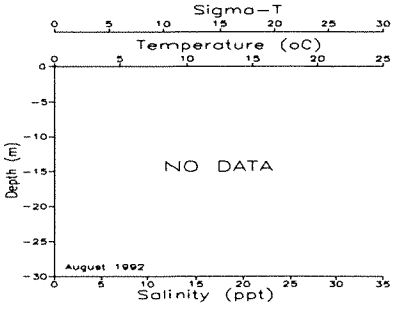


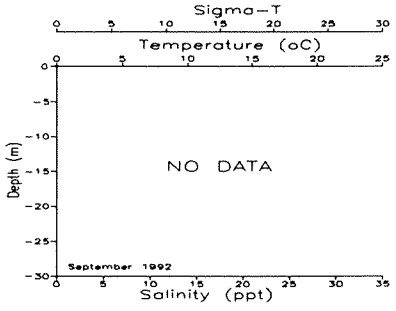








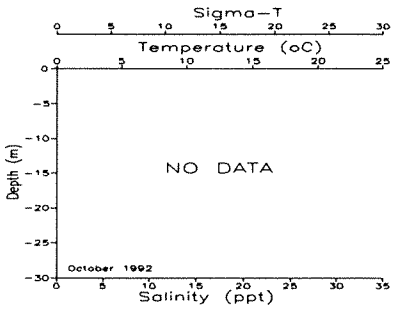


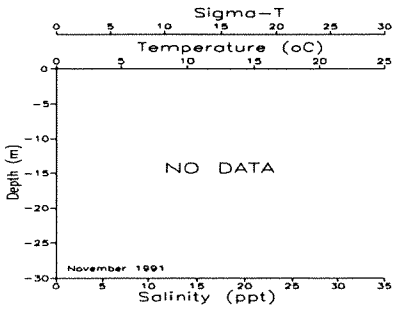


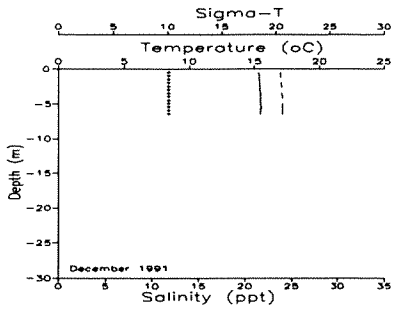
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

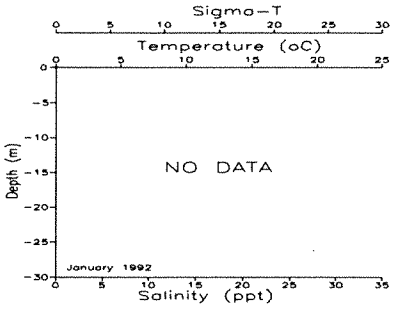
WATERYEAR 1992

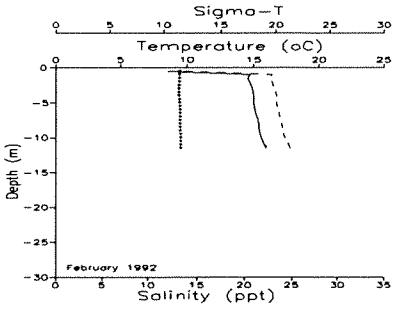
North Willapa Bay (Station WPA004)

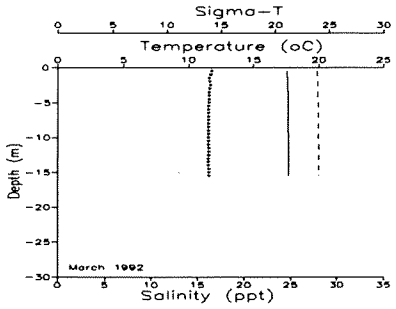


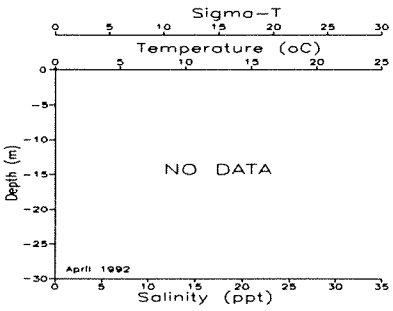


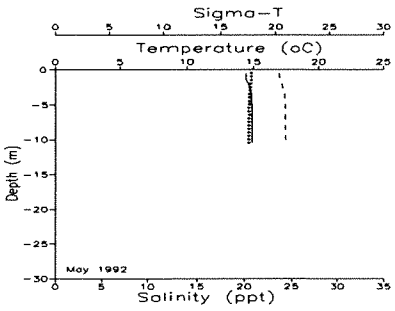


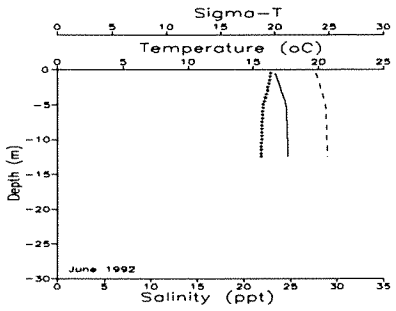


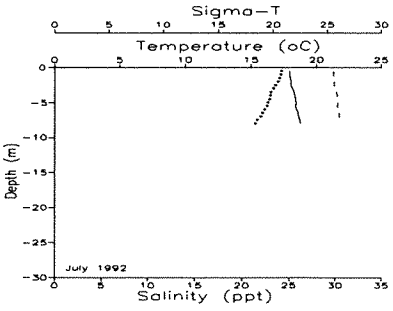


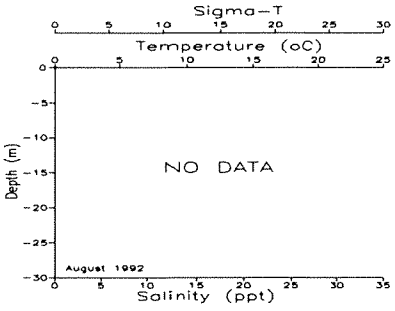


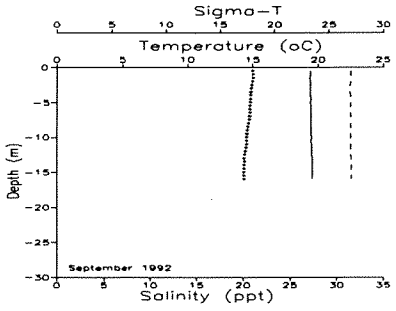








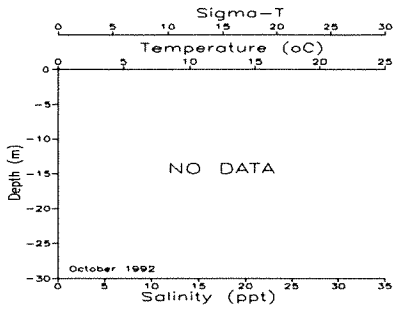


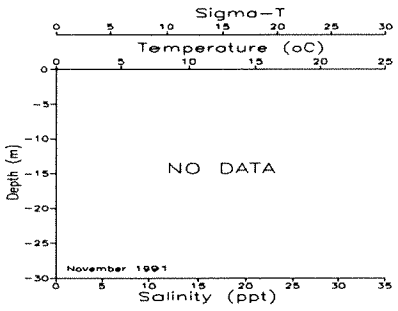


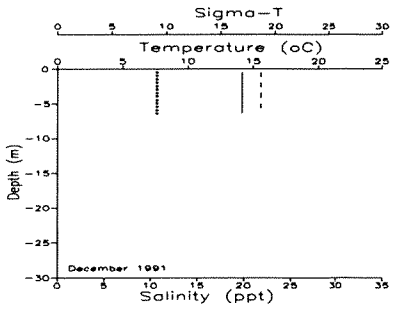
Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

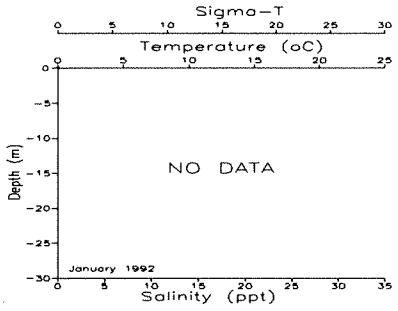
WATERYEAR 1992

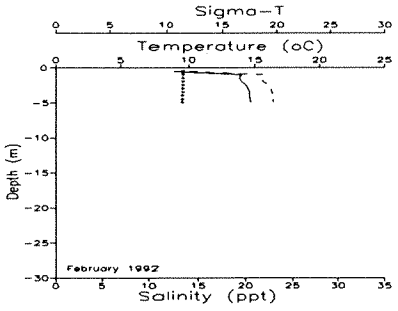
Willapa Bay - Nahcotta Channel (Station WPA006)

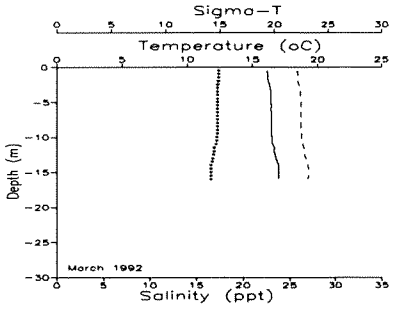


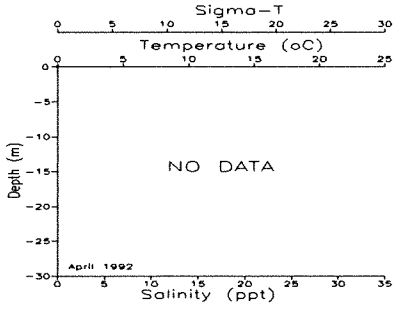


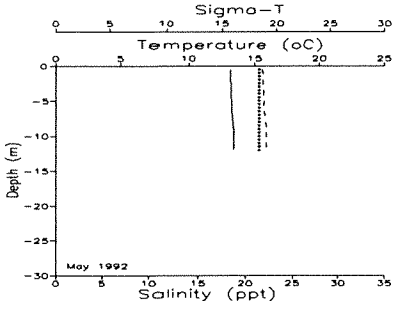


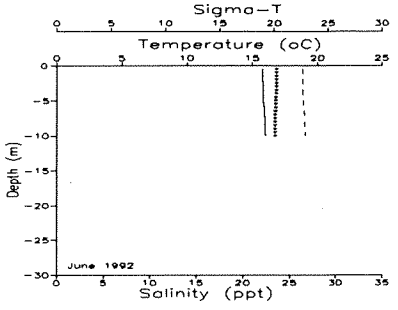


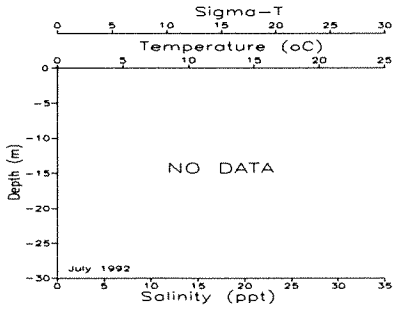


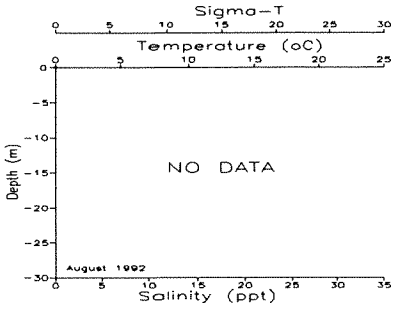


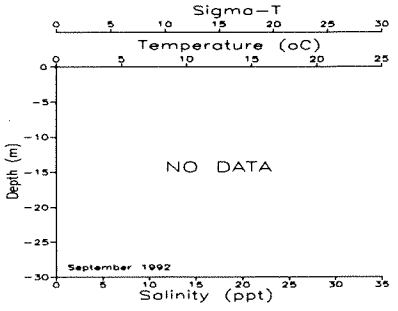








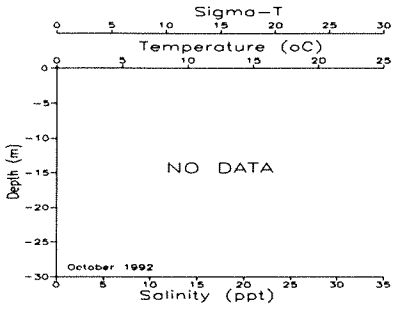


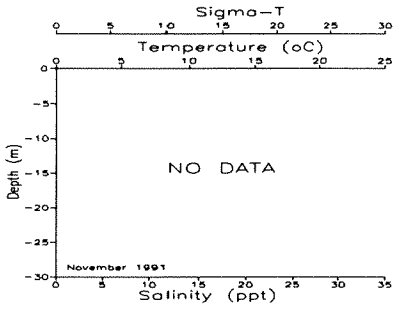


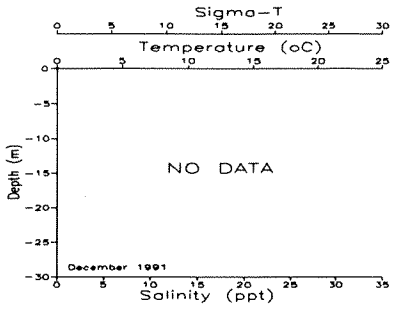
Key: Temperature = Dotted Line Salinity = Dashed Line Sigma-t = Solid Line

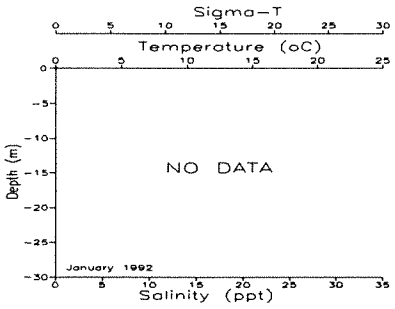
WATERYEAR 1992

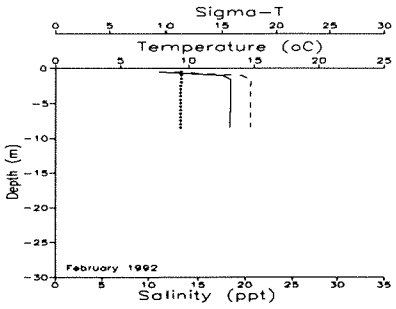
Willapa Bay - S. Jensen Pt. LI (Station WPA007)

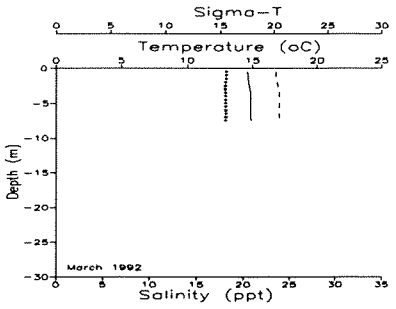


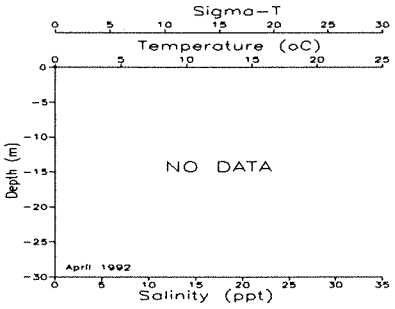


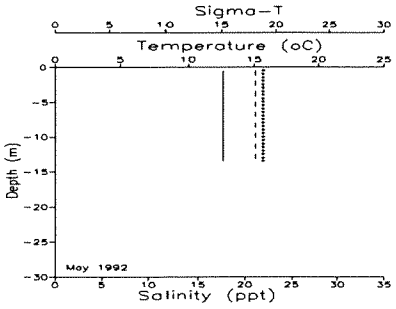


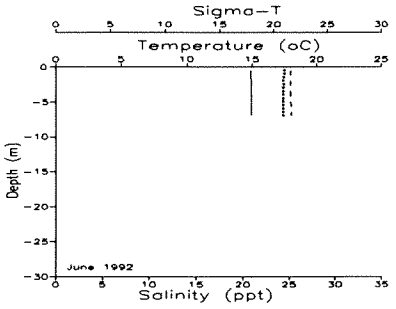


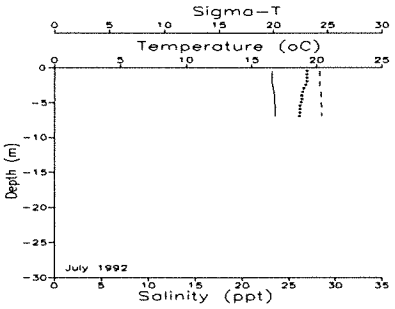


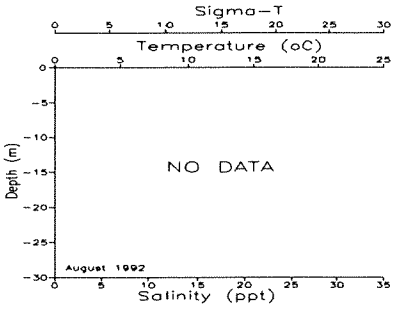


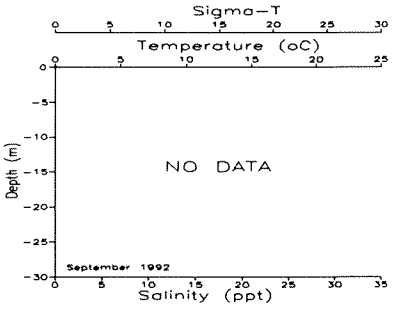












Key: **Temperature = Dotted Line** **Salinity = Dashed Line** **Sigma-t = Solid Line**

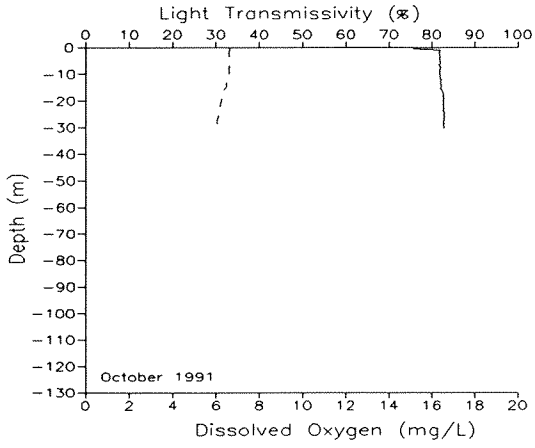
APPENDIX C

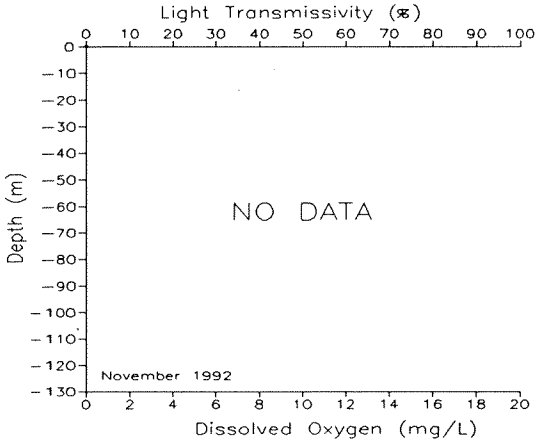
Dissolved Oxygen/Light Transmissivity Profiles
for all WY 1992 Long-term Monitoring Stations

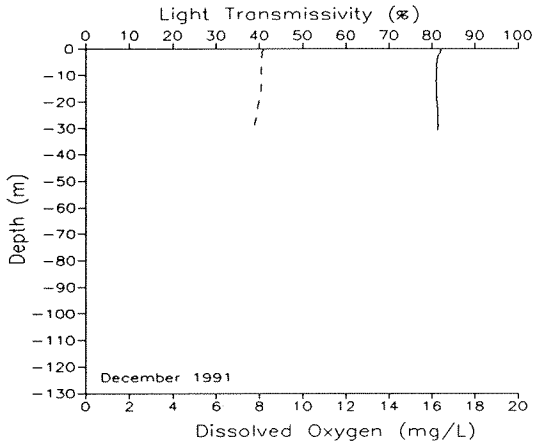
WATERYEAR 1991

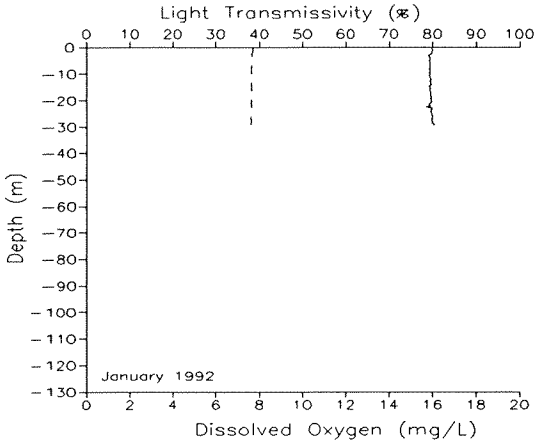
Part 1 of 2

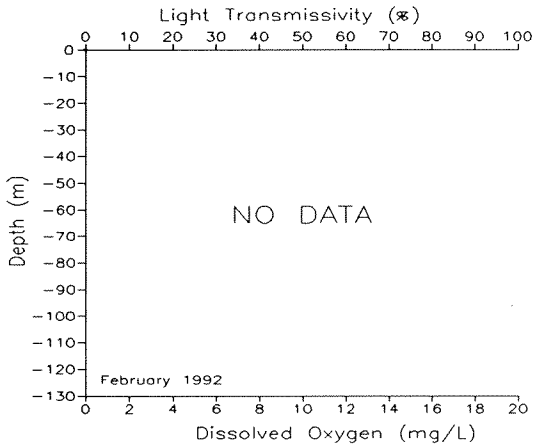
Straits of Juan de Fuca (Station ADM002)

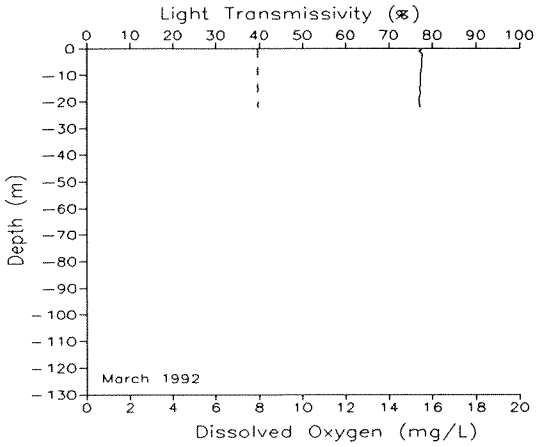










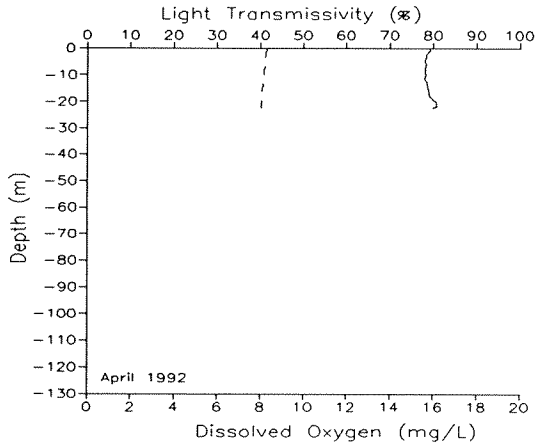


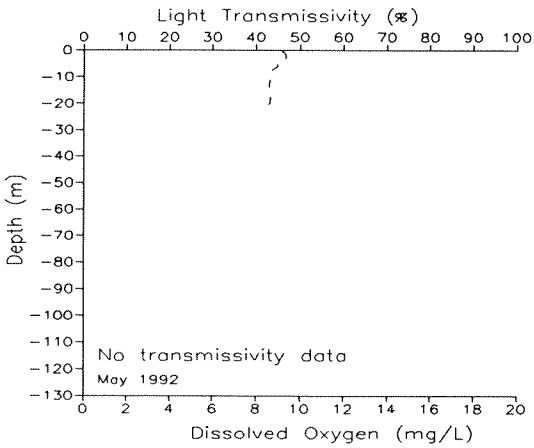
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

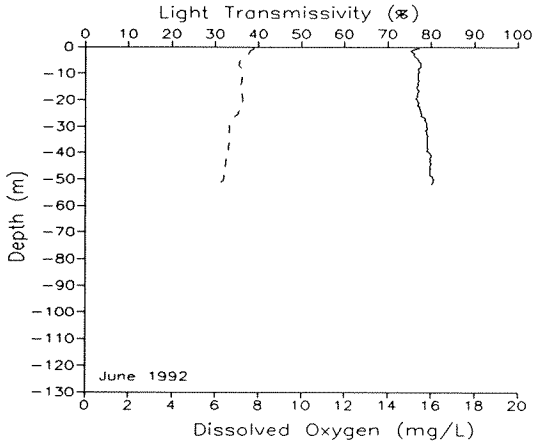
WATERYEAR 1991

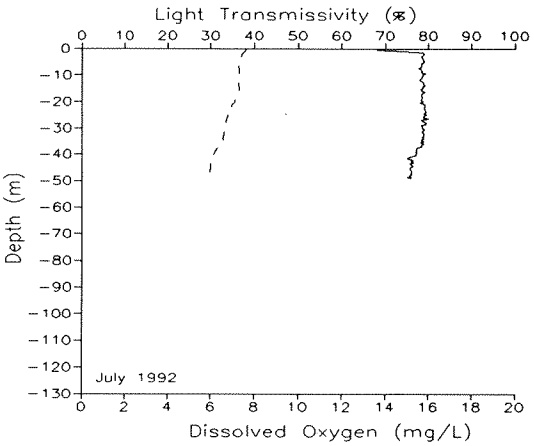
Part 2 of 2

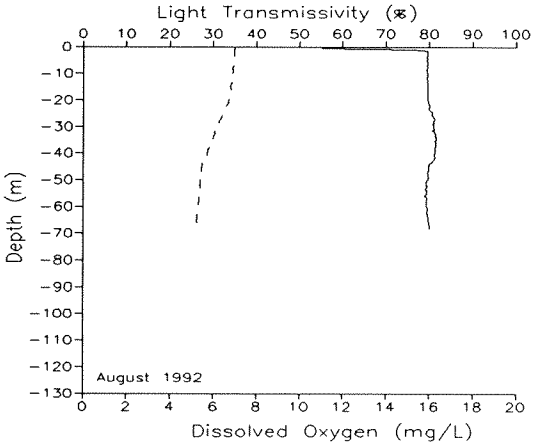
Straits of Juan de Fuca (Station ADM002)

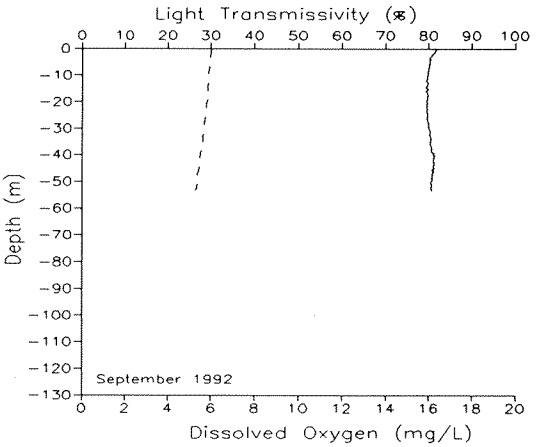








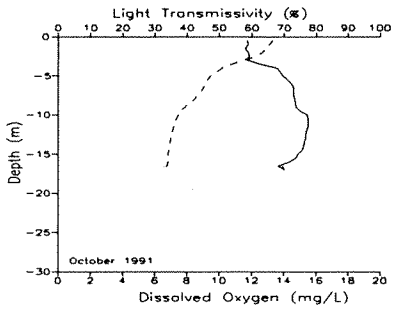


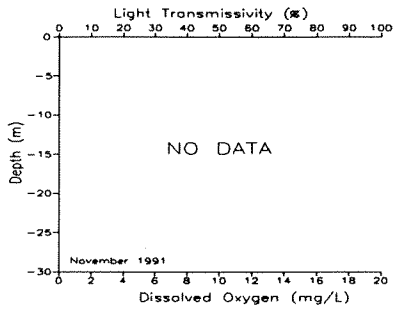


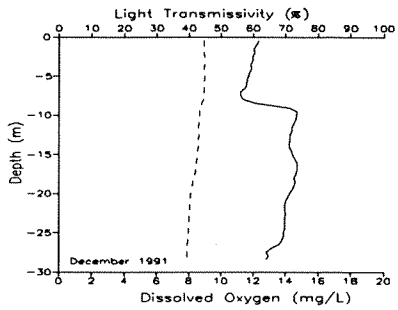
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

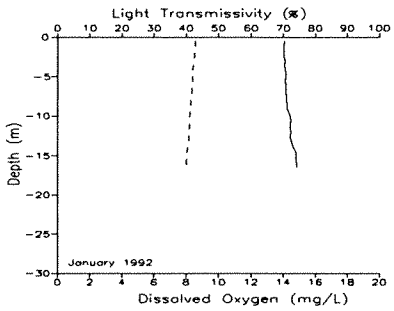
WATERYEAR 1992

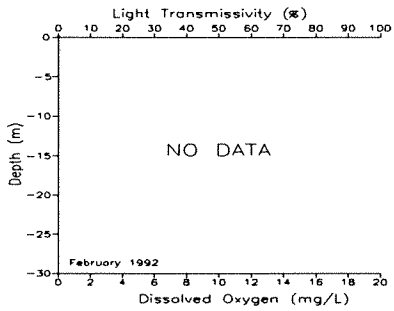
Bellingham Bay (Station BLL009)

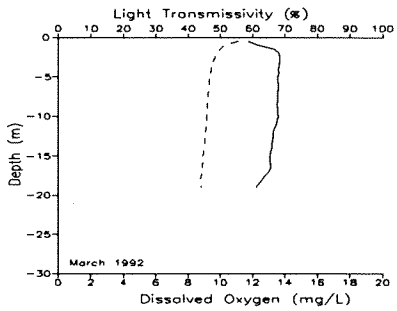


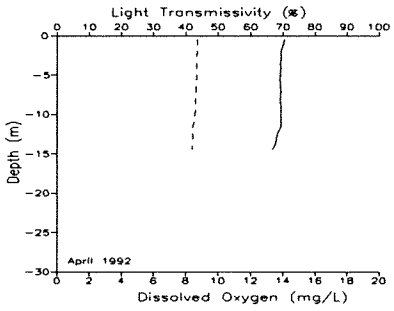


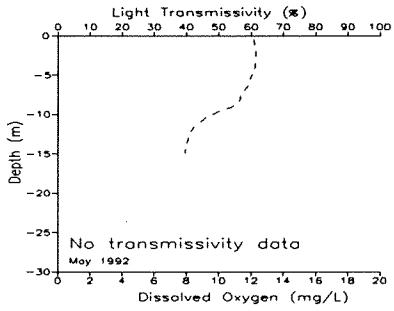


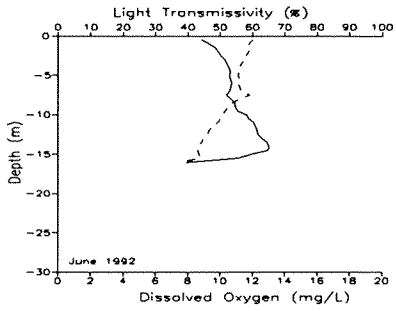


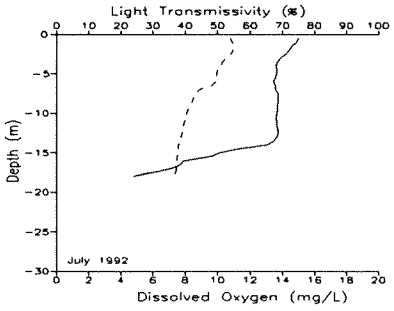


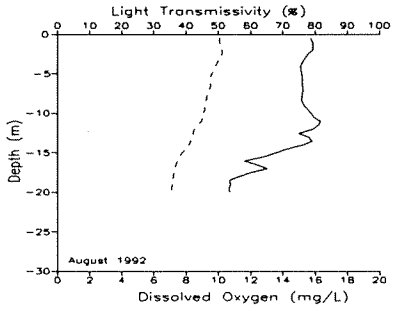


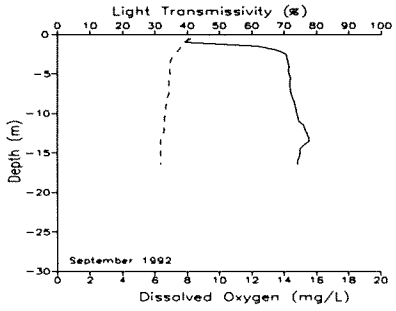








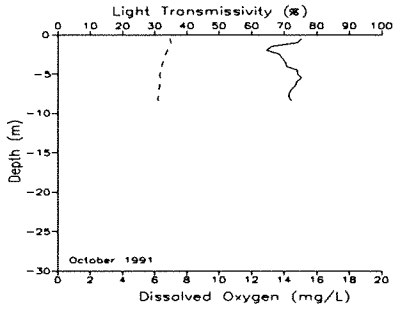


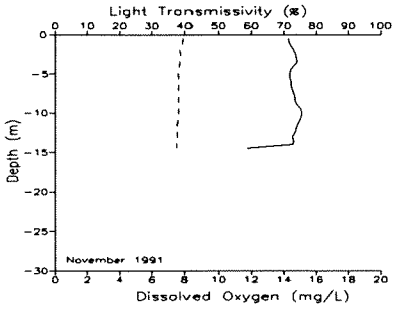


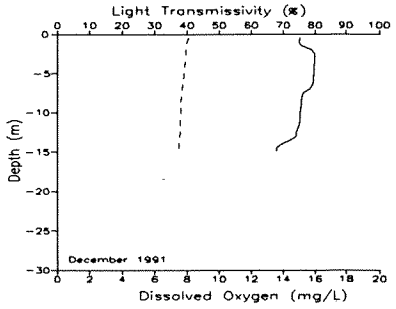
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

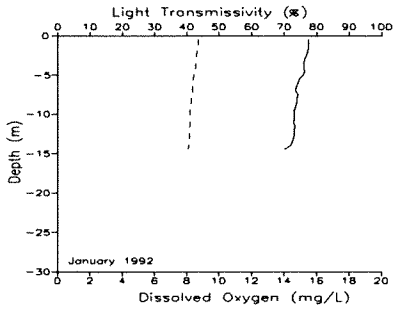
WATERYEAR 1992

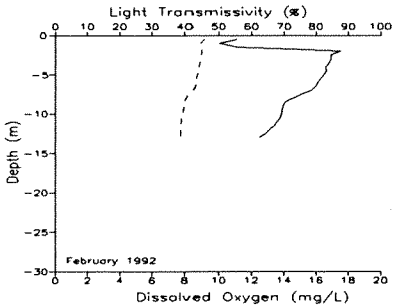
Budd Inlet (Station BUD005)

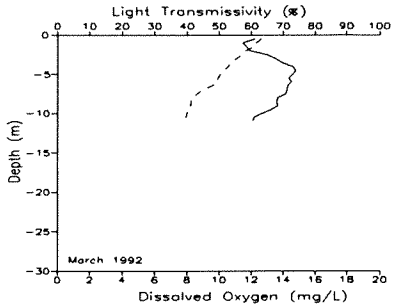


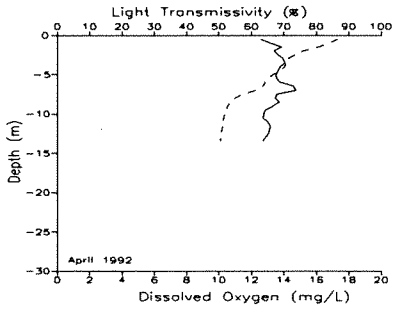


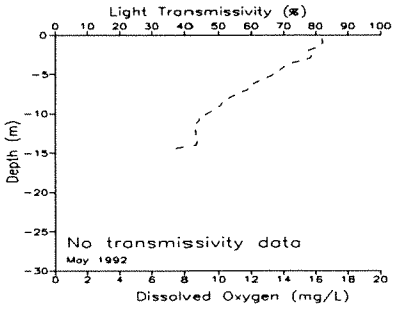


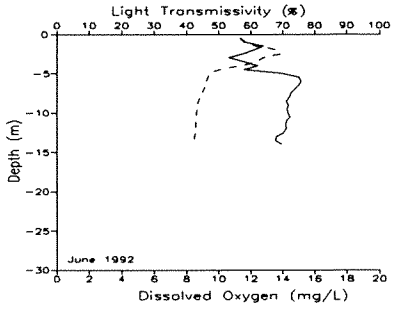


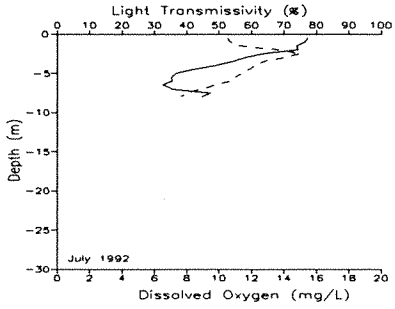


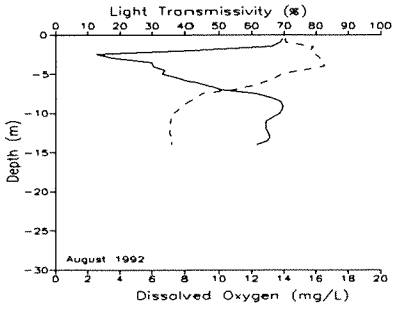


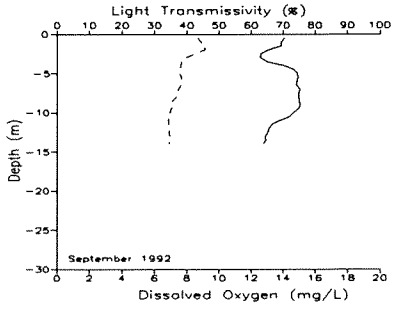










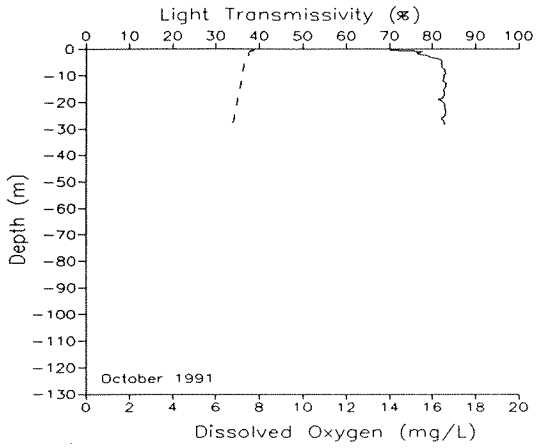


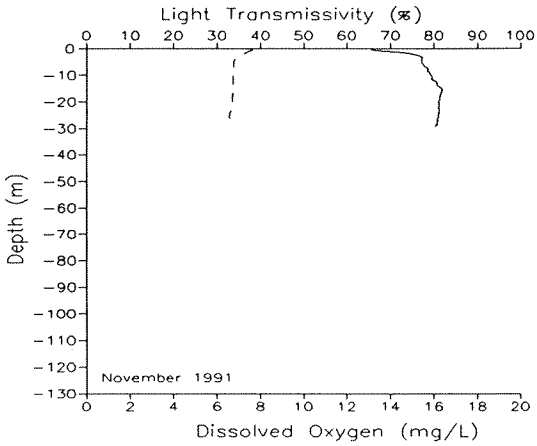
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

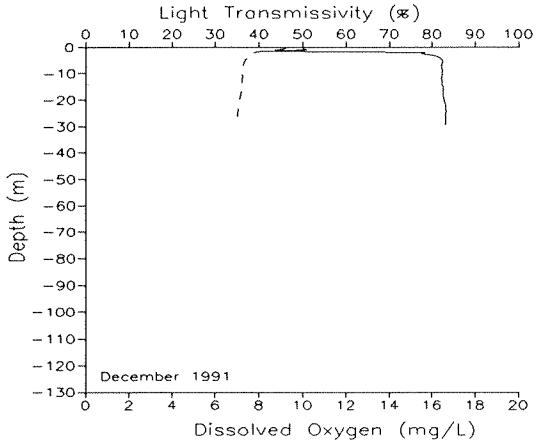
WATERYEAR 1991

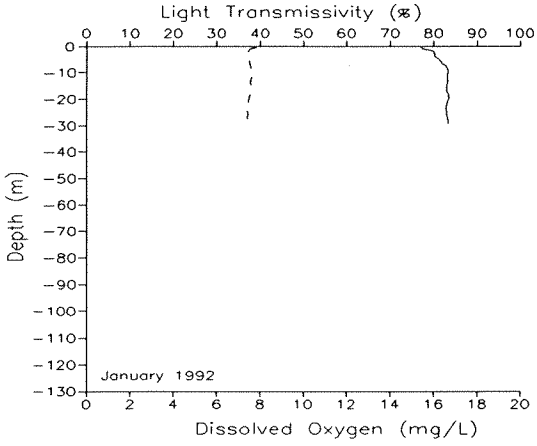
Part 1 of 2

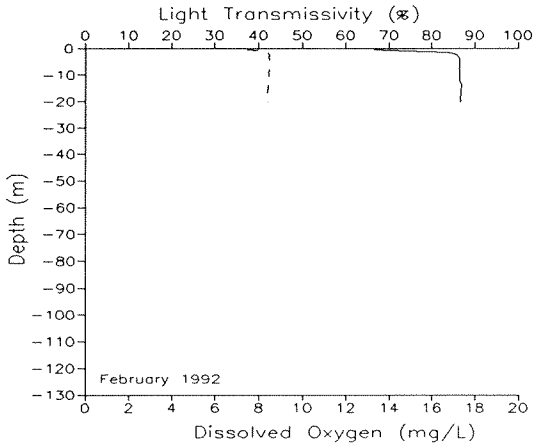
Commencement Bay - Browns Point (Station CMB003)

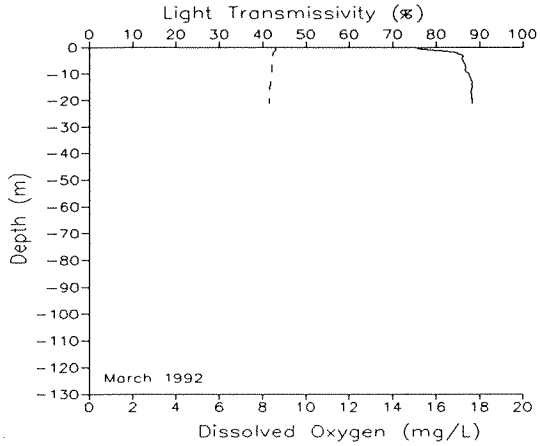










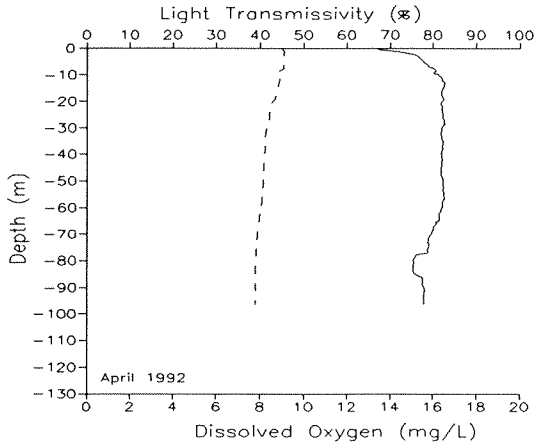


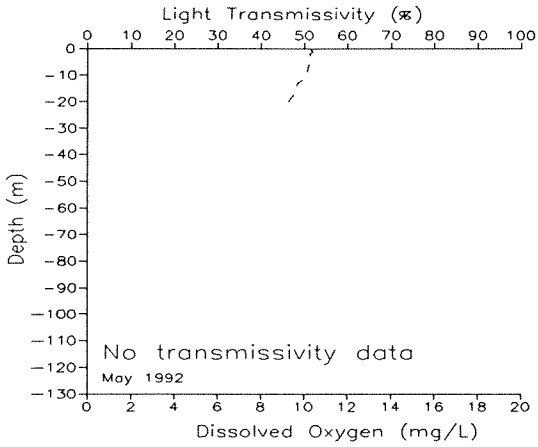
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

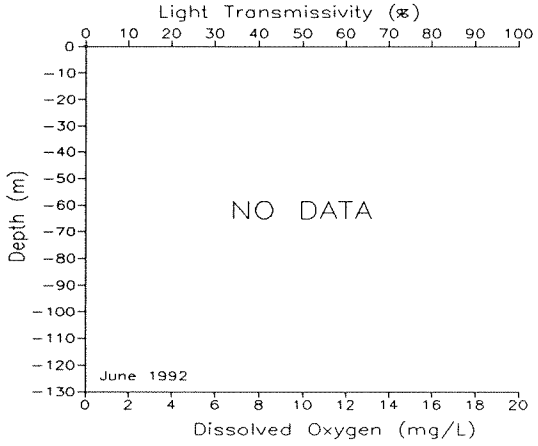
WATERYEAR 1991

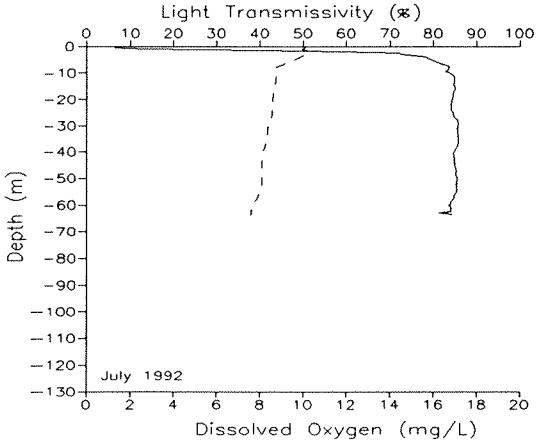
Part 2 of 2

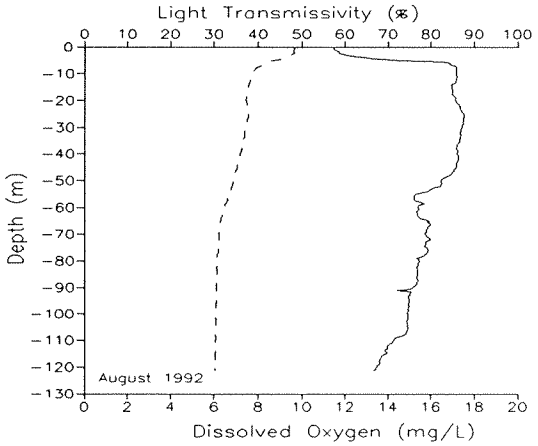
Commencement Bay - Browns Point (Station CMB003)

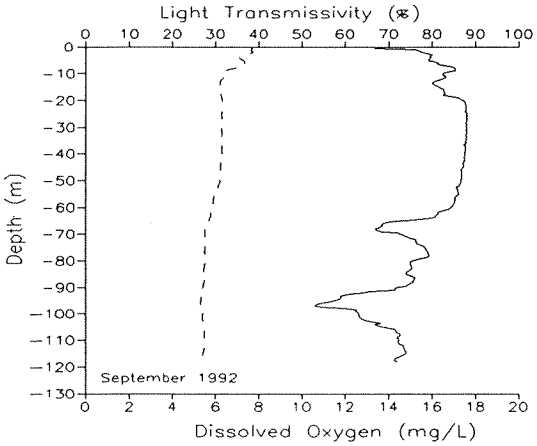










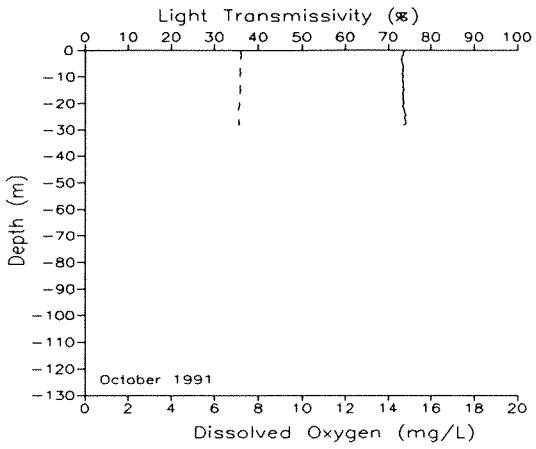


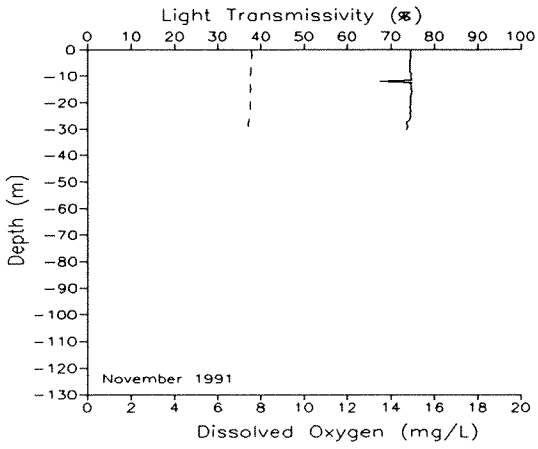
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

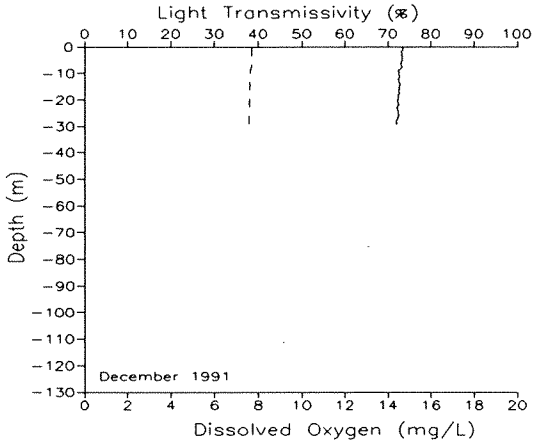
WATERYEAR 1991

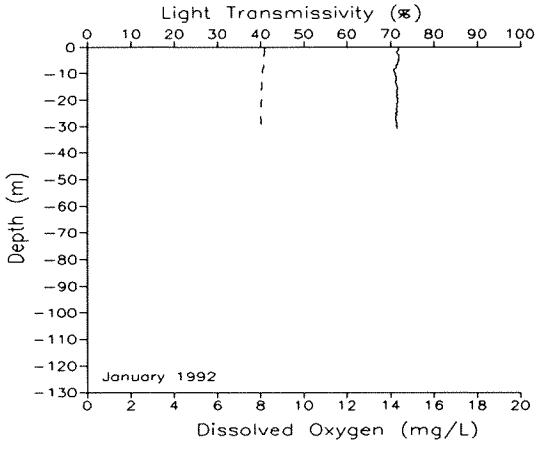
Part 1 of 2

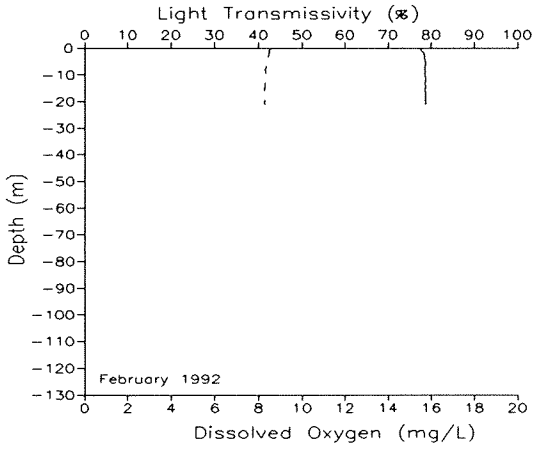
Dana Passage (Station DNA001)

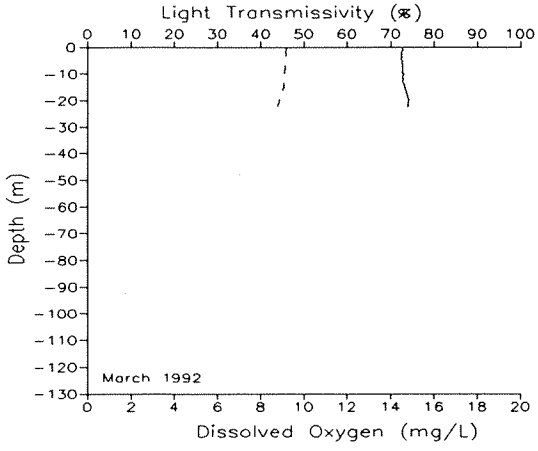










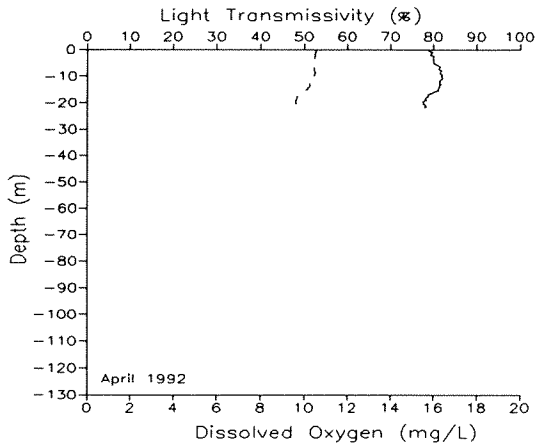


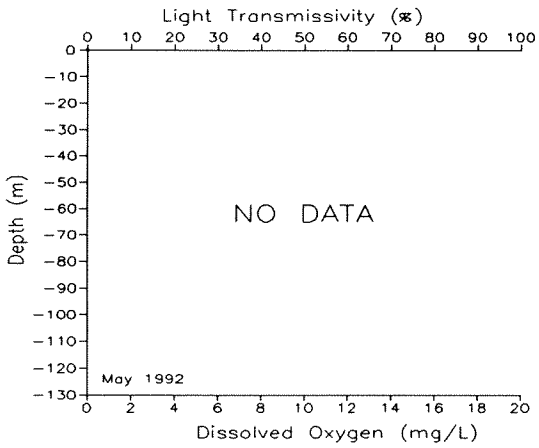
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

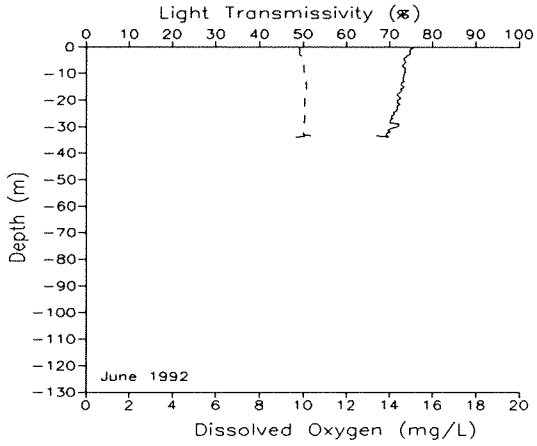
WATERYEAR 1991

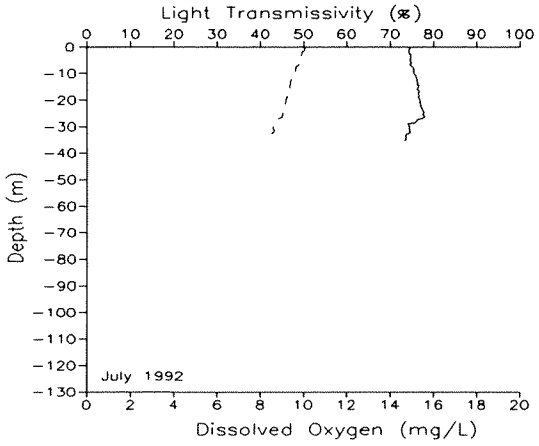
Part 2 of 2

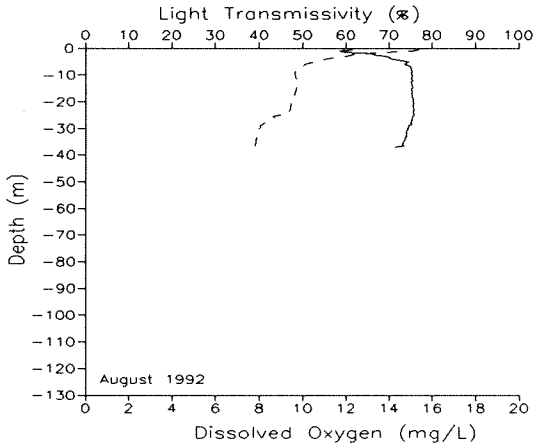
Dana Passage (Station DNA001)

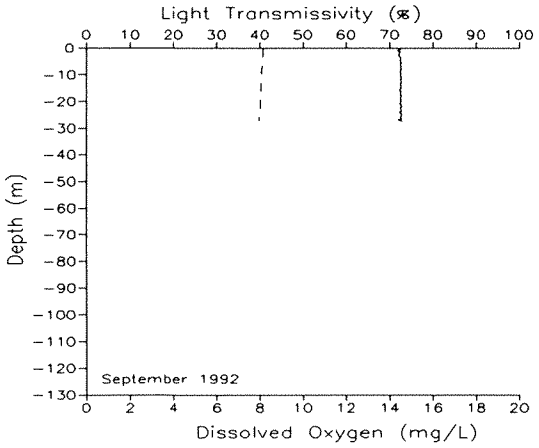










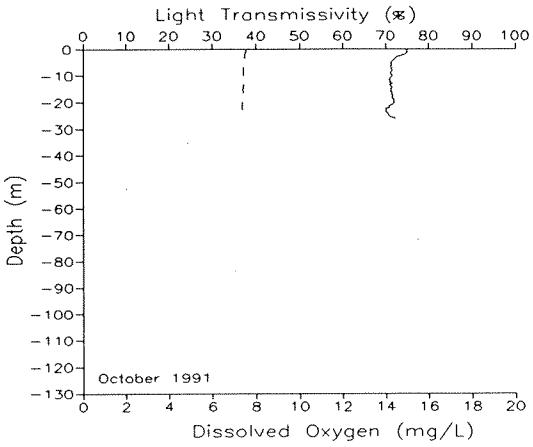


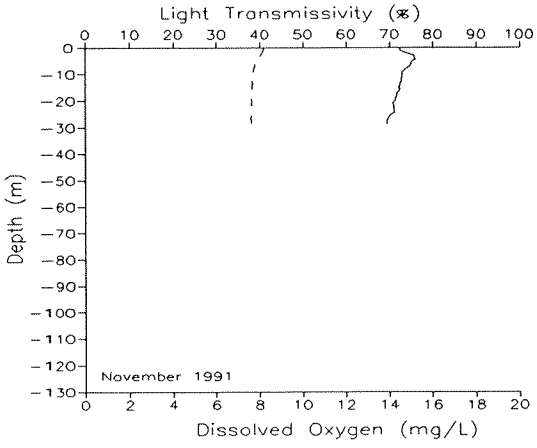
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

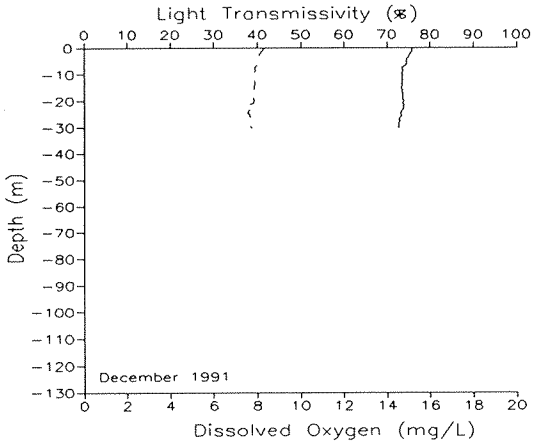
WATERYEAR 1991

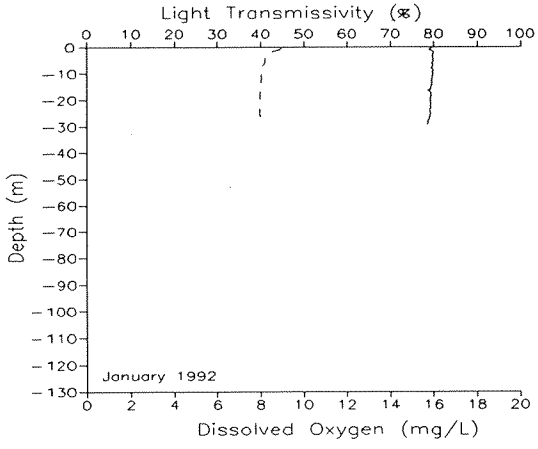
Part 1 of 2

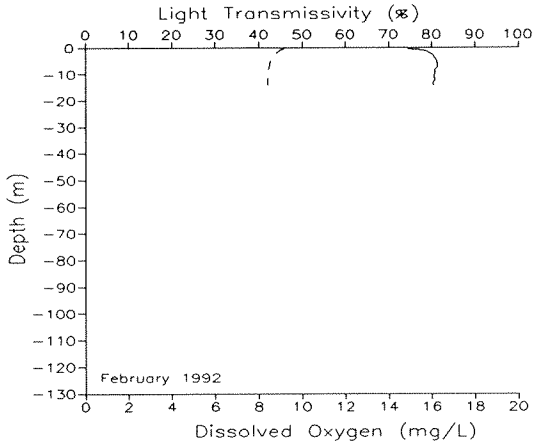
Dyes Inlet - NE Chico Bay (Station DYE004)

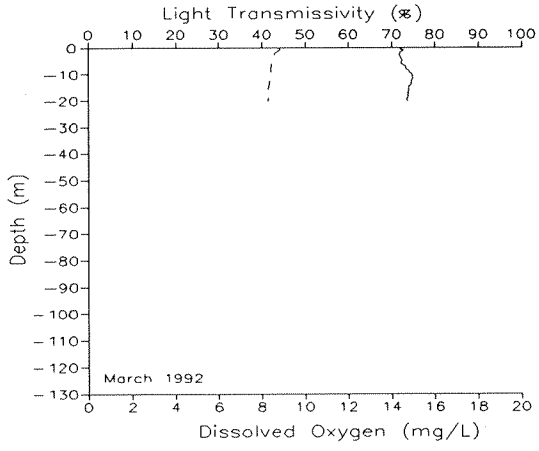










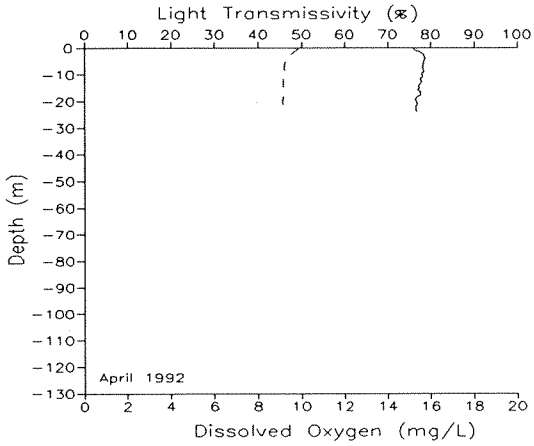


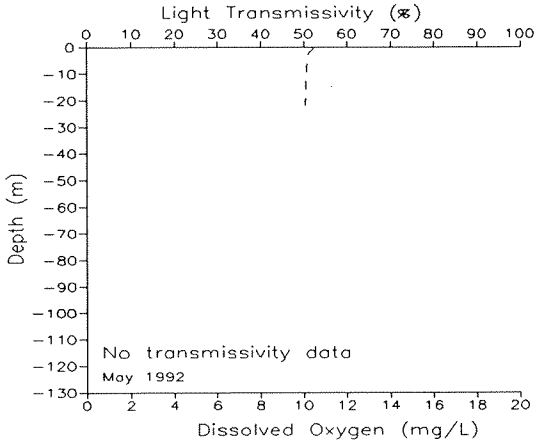
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

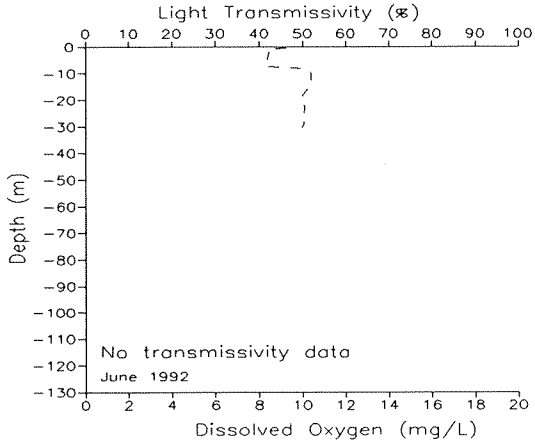
WATERYEAR 1991

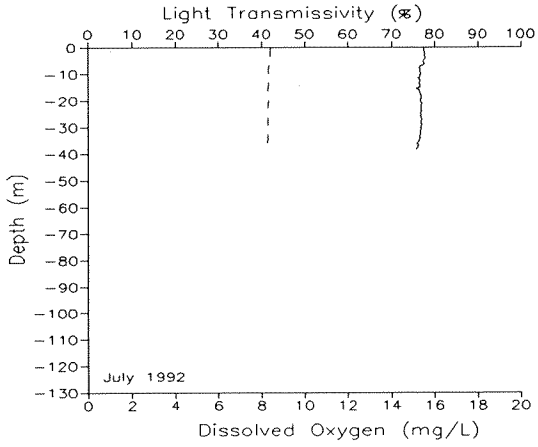
Part 2 of 2

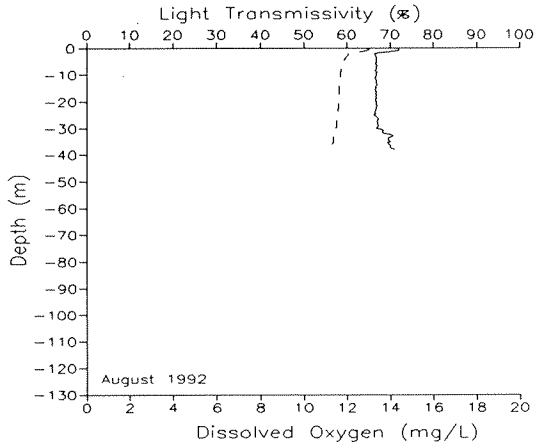
Dyes Inlet - NE Chico Bay (Station DYE004)

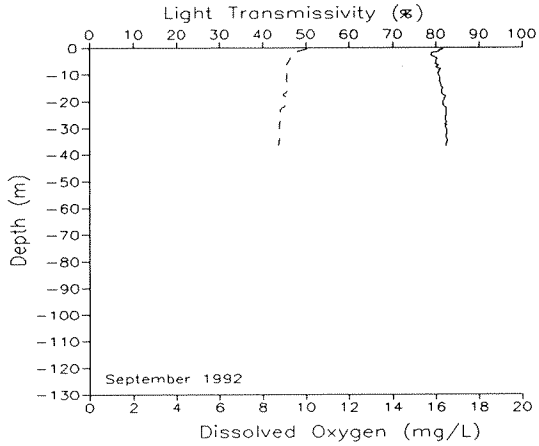










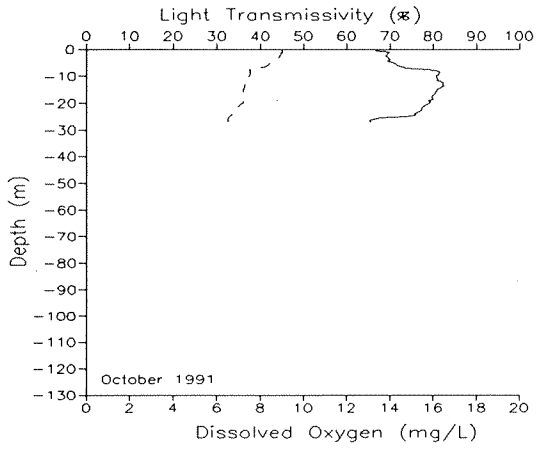


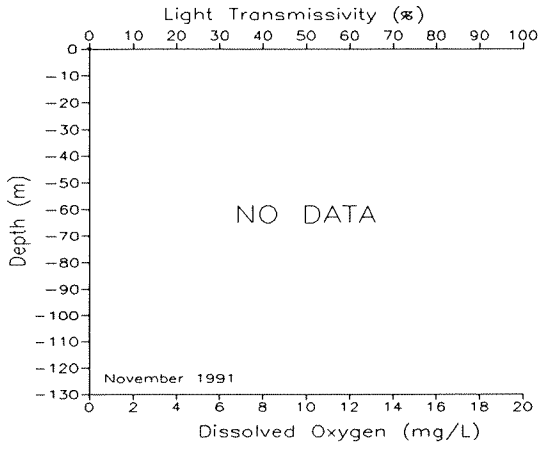
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

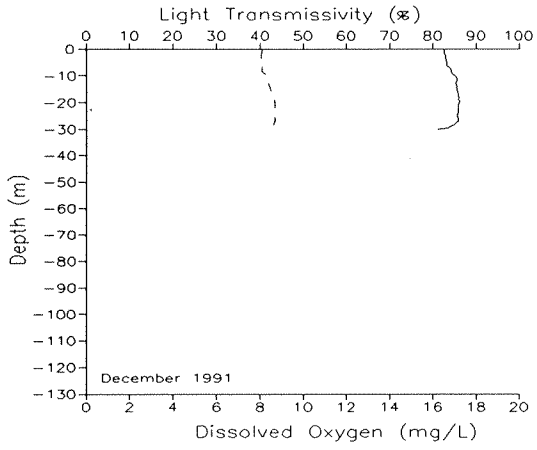
WATERYEAR 1991

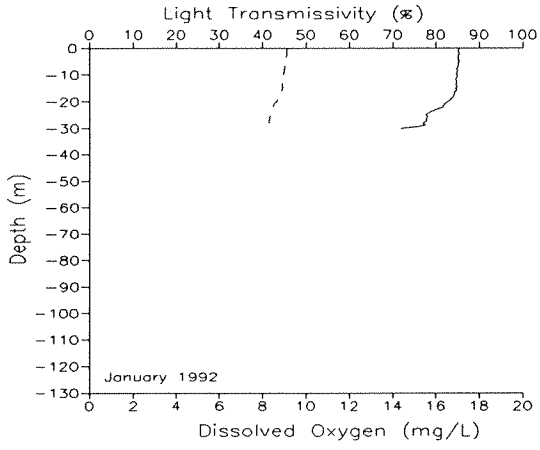
Part 1 of 2

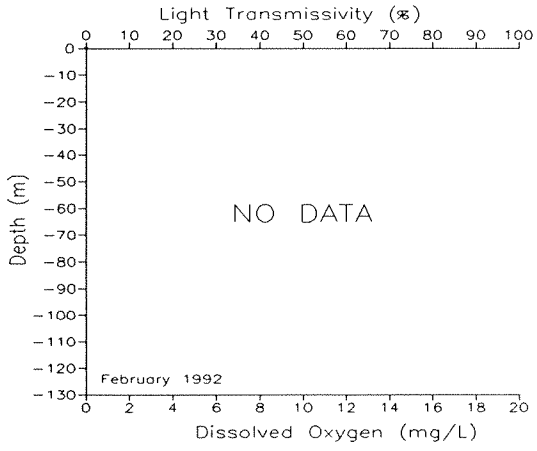
East Sound - Orcas Island (Station EAS001)

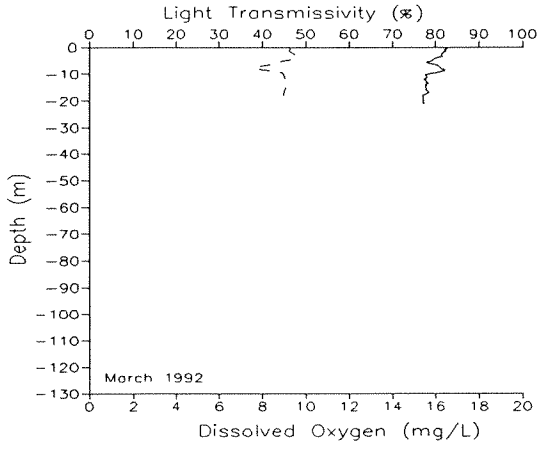










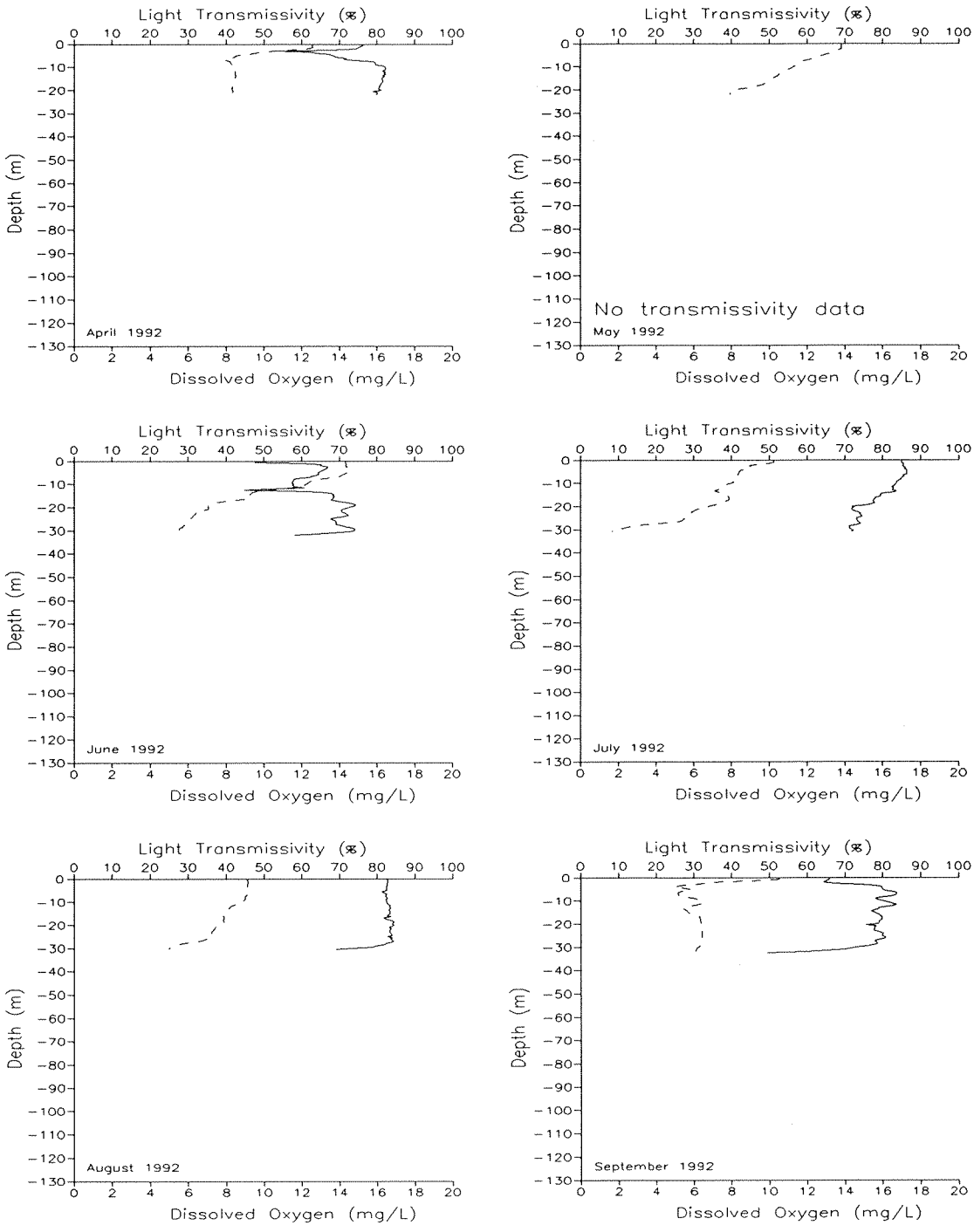


Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

WATERYEAR 1991

Part 2 of 2

East Sound - Orcas Island (Station EAS001)

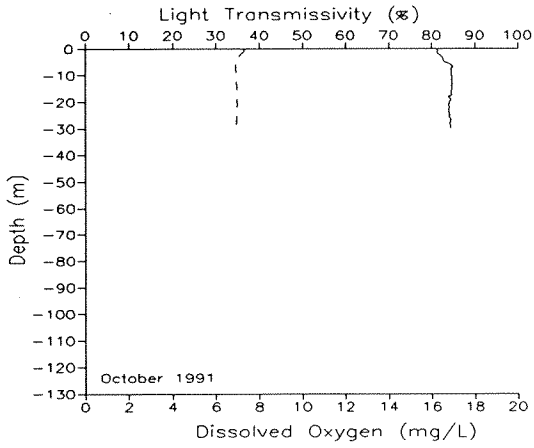


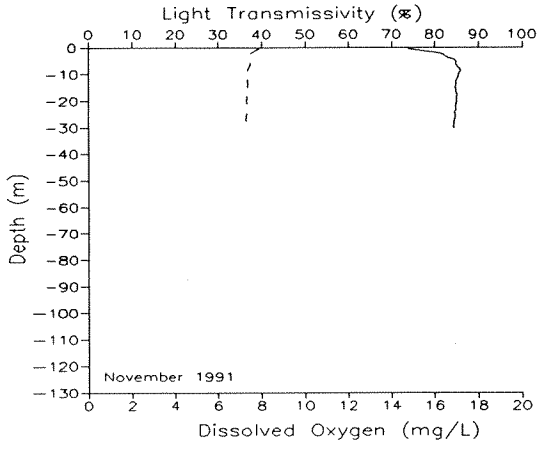
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

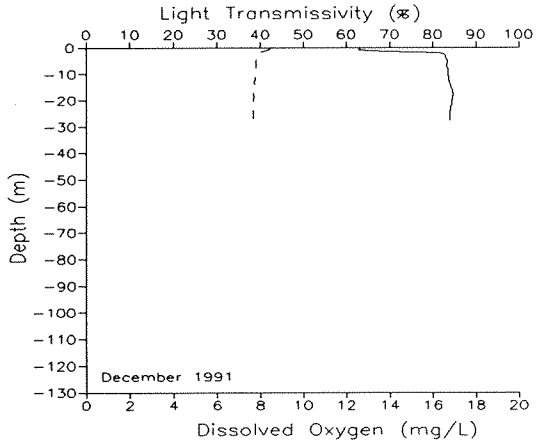
WATERYEAR 1991

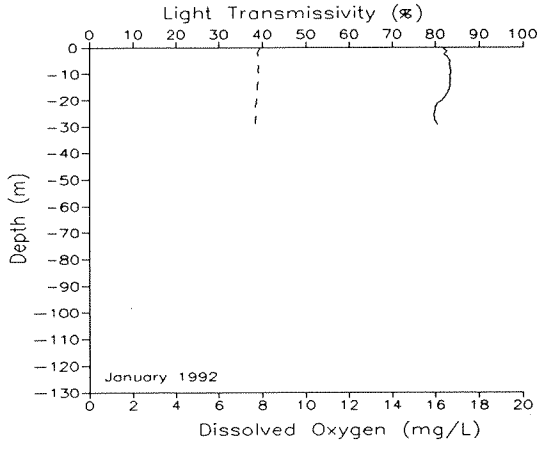
Part 1 of 2

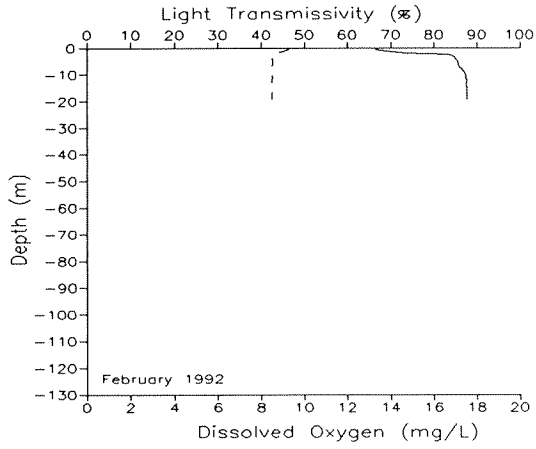
Elliott Bay - East Duwamish Head (Station ELB015)

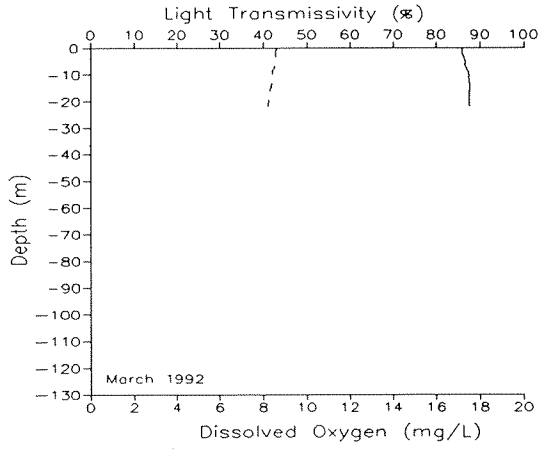










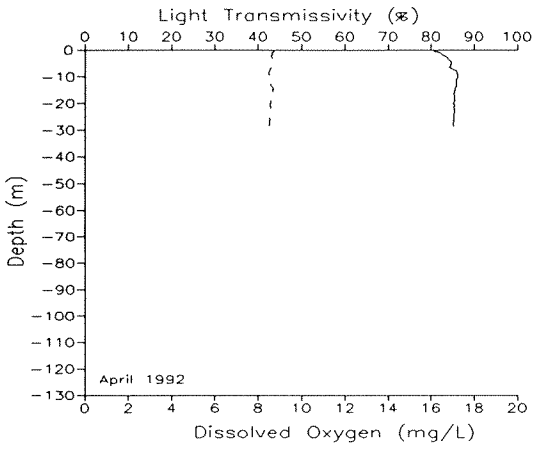


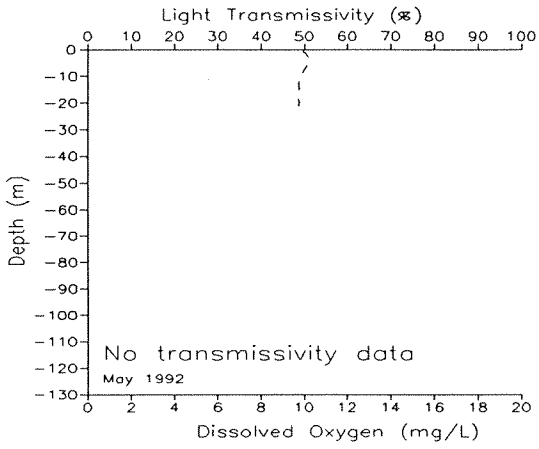
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

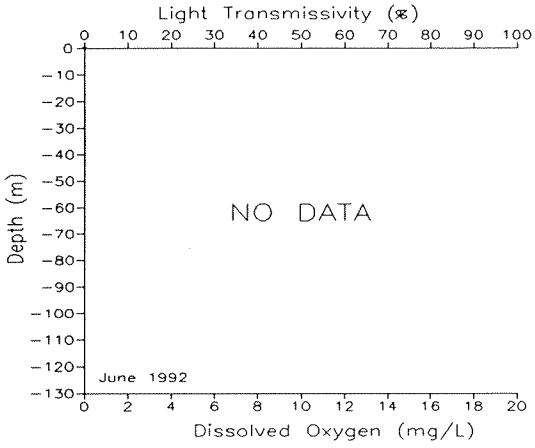
WATERYEAR 1991

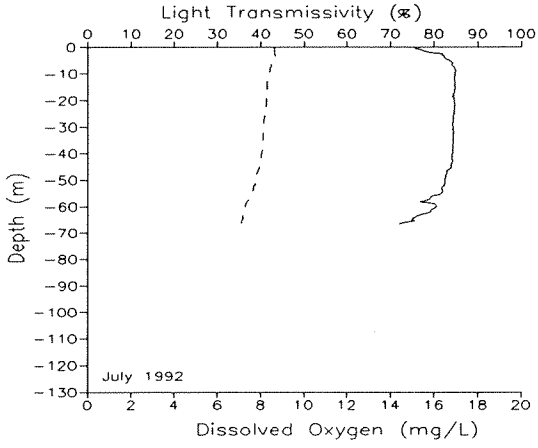
Part 2 of 2

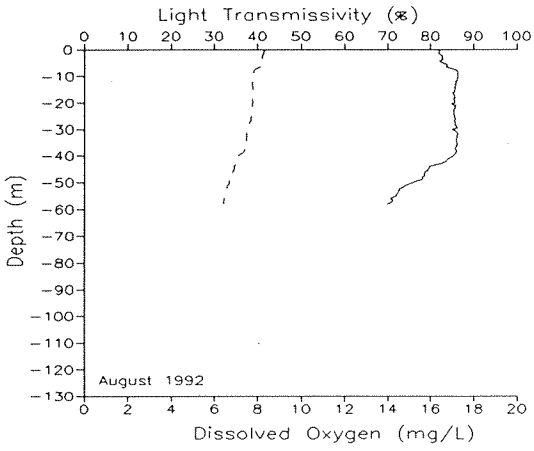
Elliott Bay - East Duwamish Head (Station ELB015)

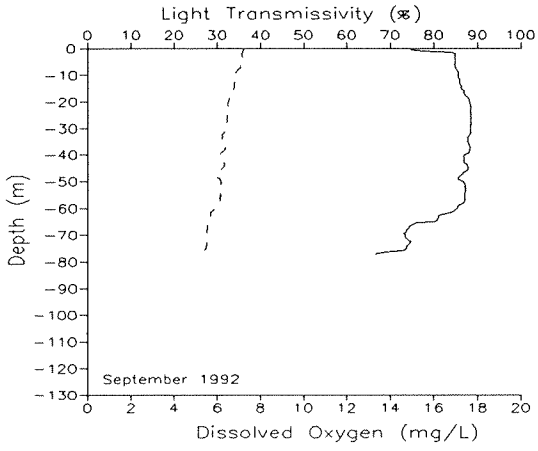










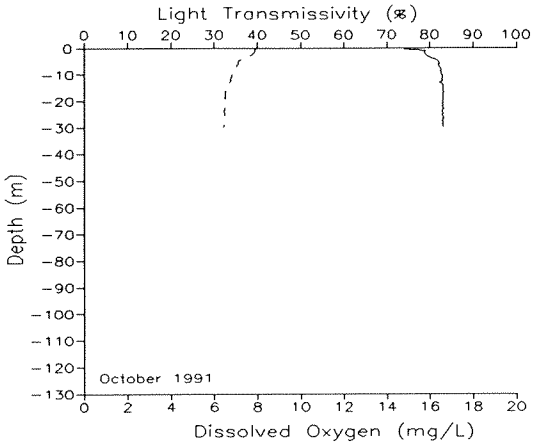


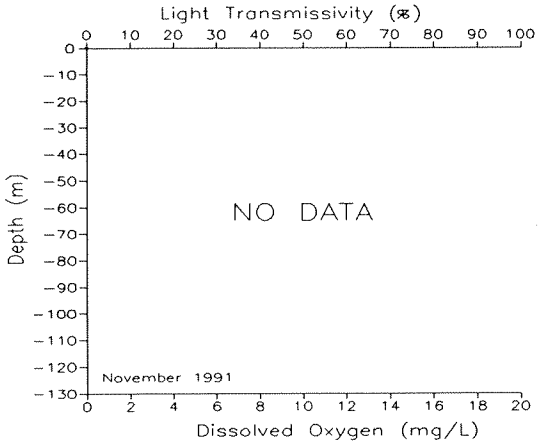
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

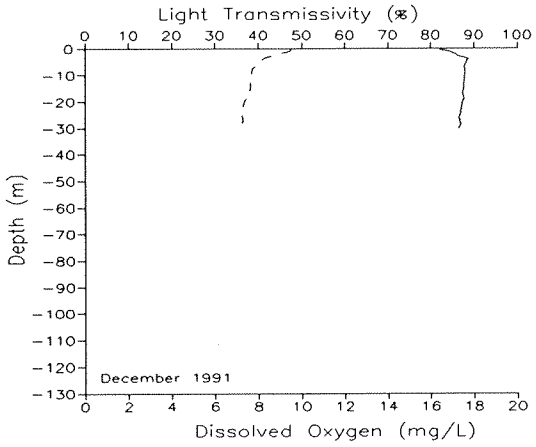
WATERYEAR 1991

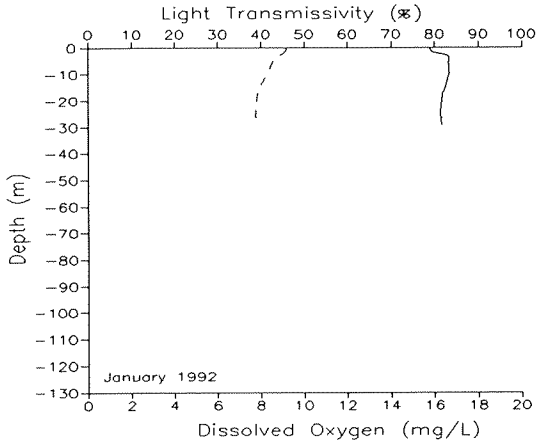
Part 1 of 2

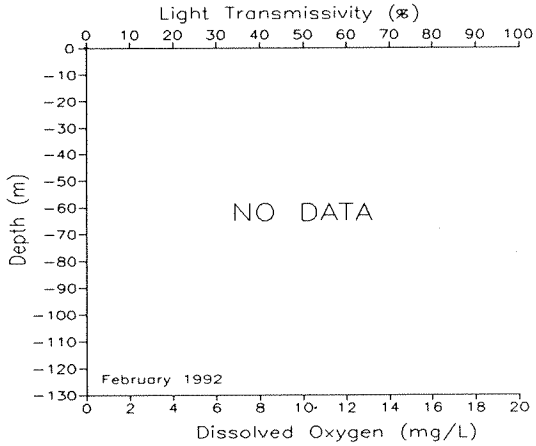
Georgia Strait - North of Patos Is. (Station GRG002)

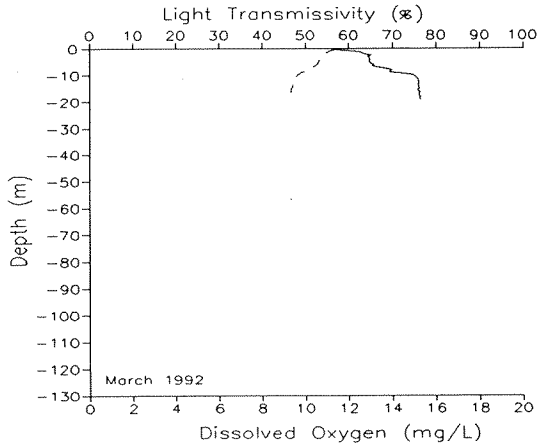










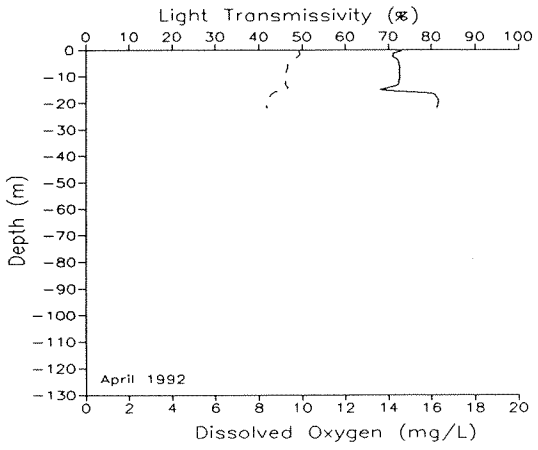


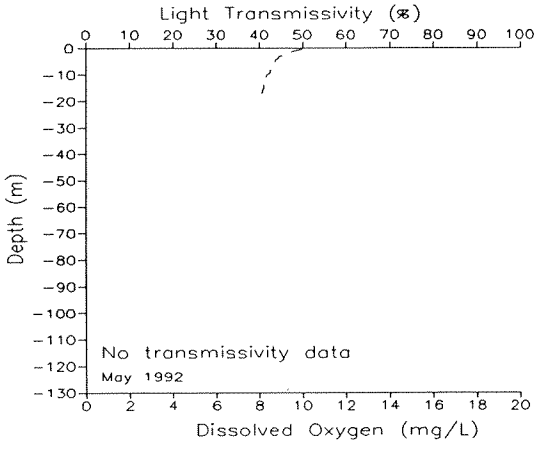
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

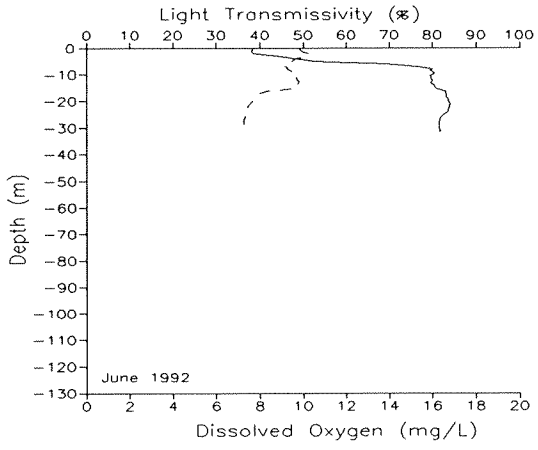
WATERYEAR 1991

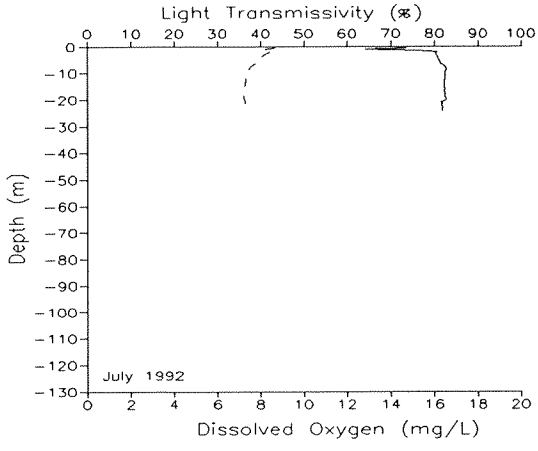
Part 2 of 2

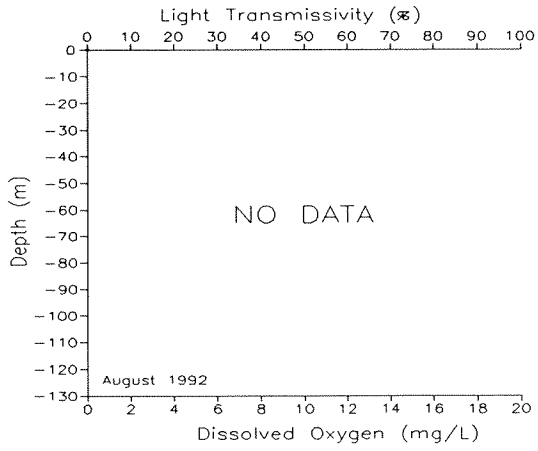
Georgia Strait - North of Patos Is. (Station GRG002)

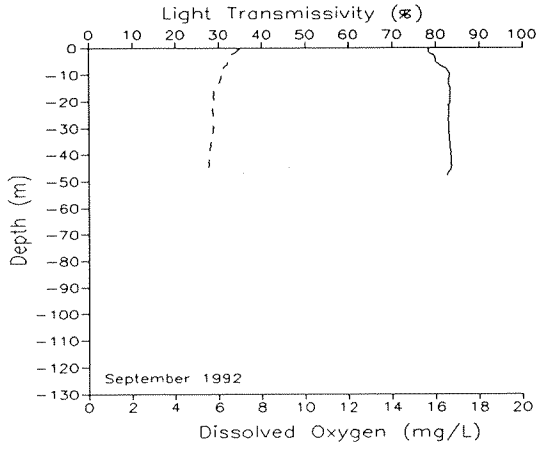








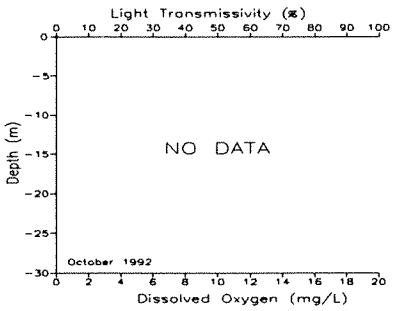


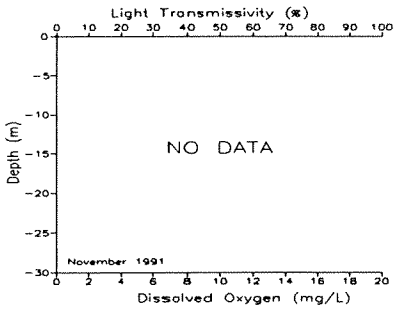


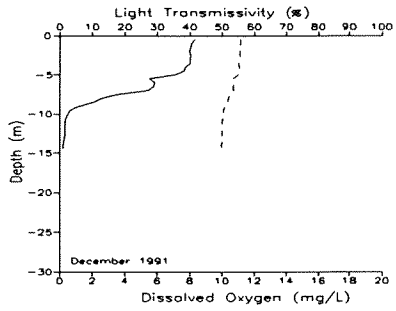
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

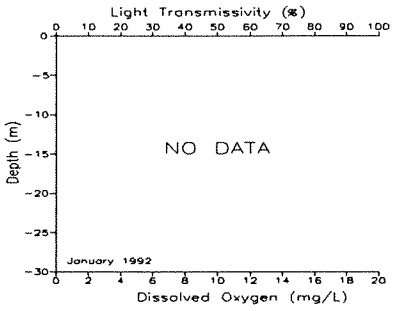
WATERYEAR 1992

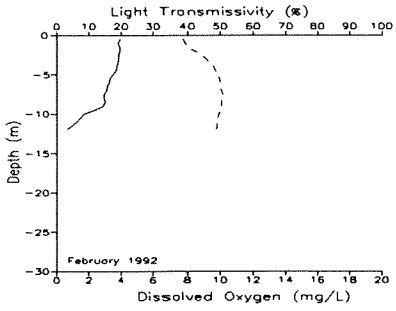
Gray's Harbor - Chehalis (Station GYS004)

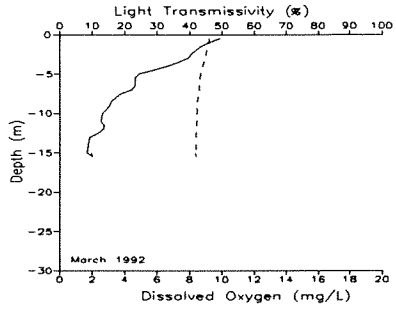


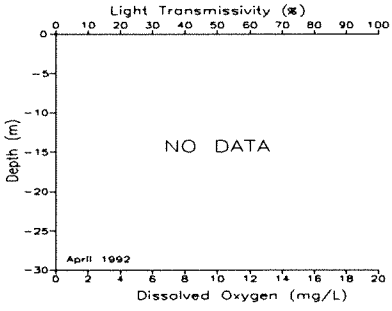


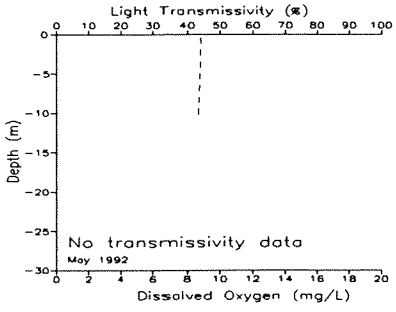


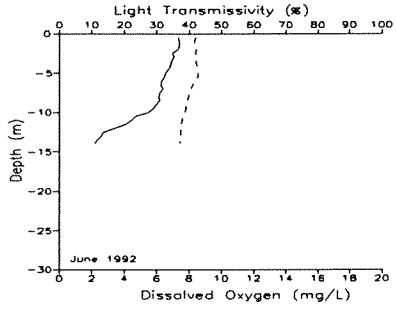


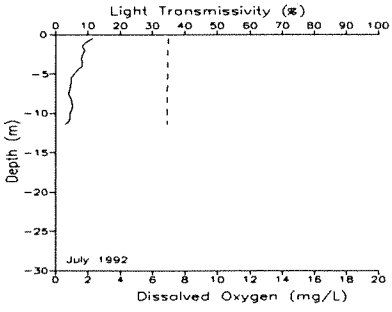


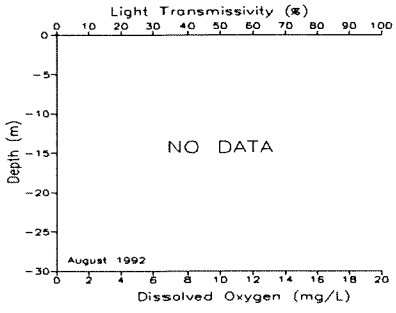


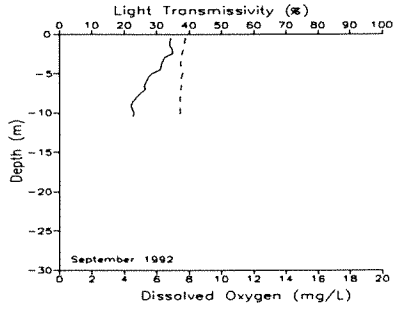








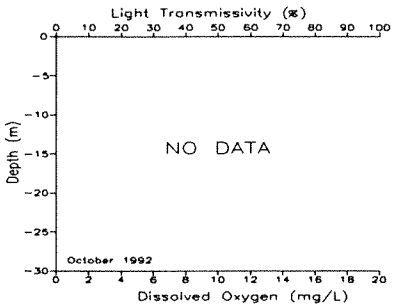


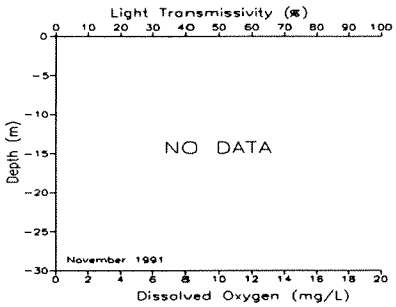


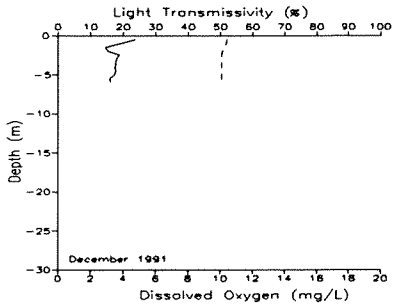
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

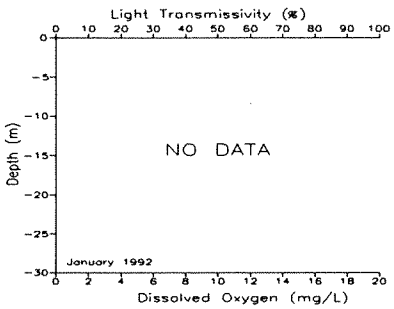
WATERYEAR 1992

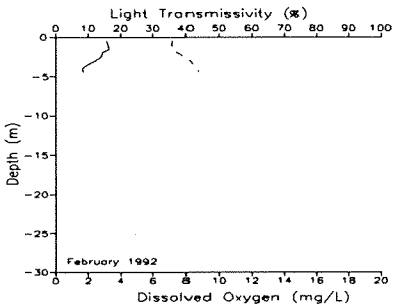
Gray's Harbor - South Channel (Station GYS008)

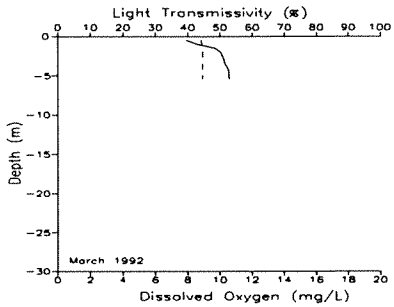


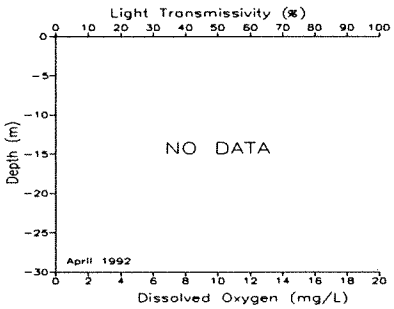


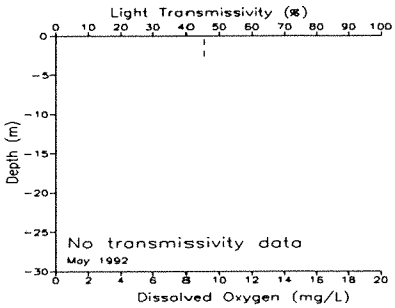


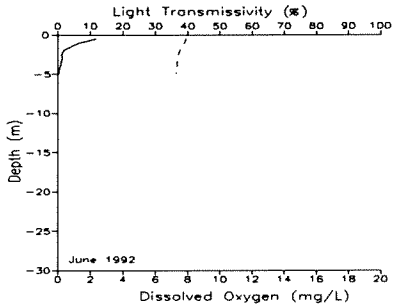


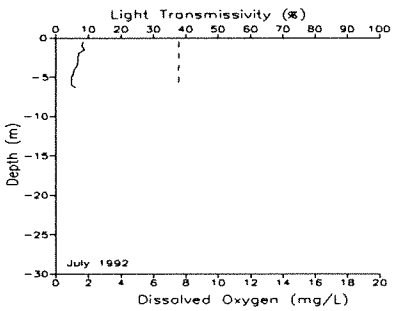


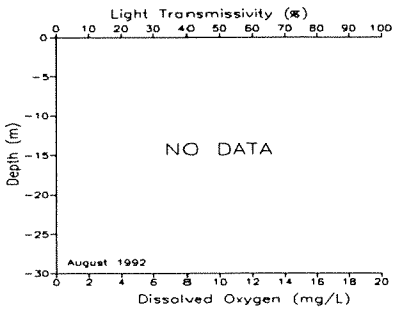


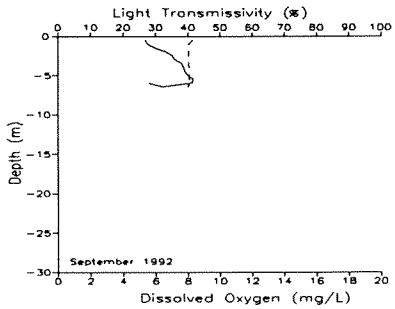








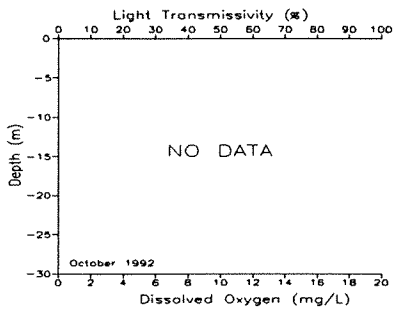


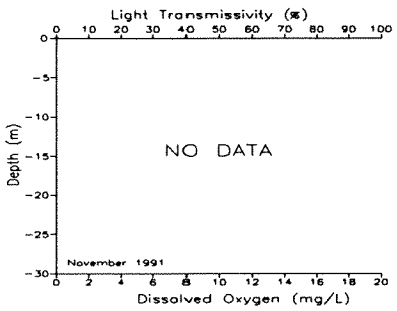


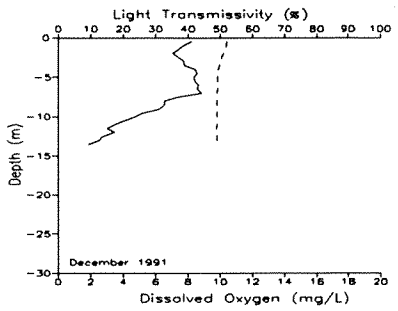
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

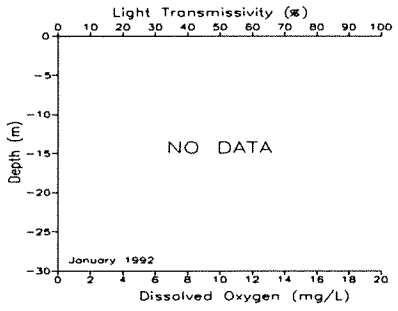
WATERYEAR 1992

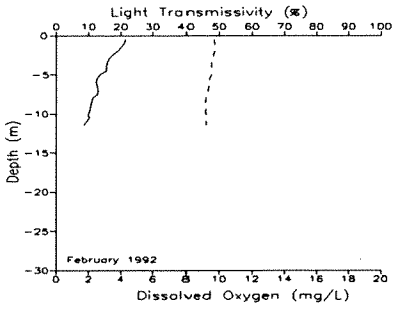
Gray's Harbor - North Channel (Station GYS009)

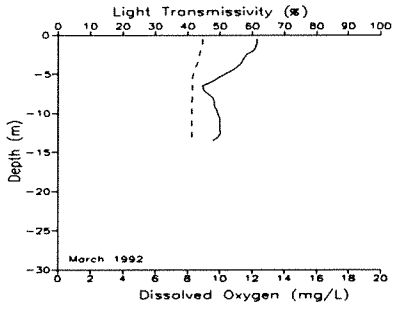


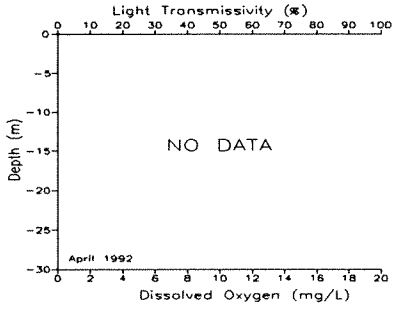


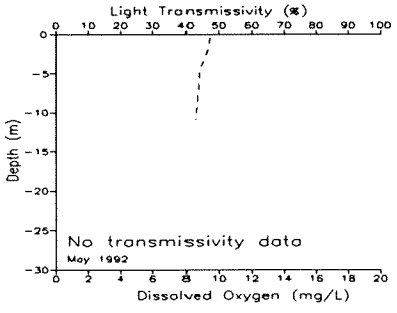


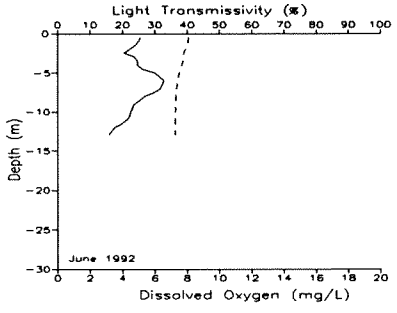


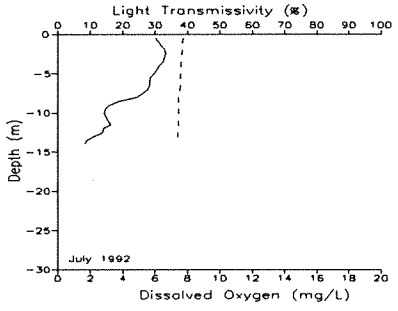


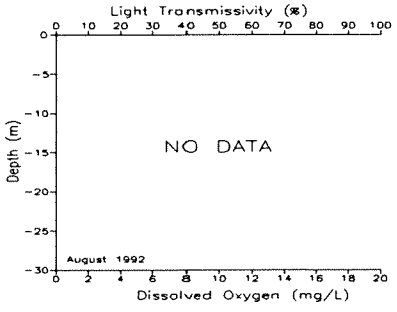


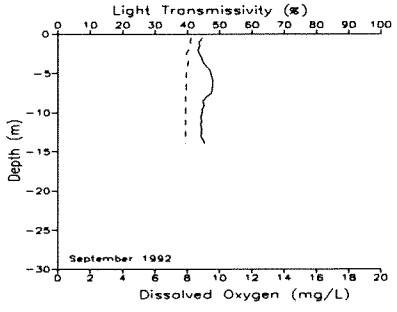








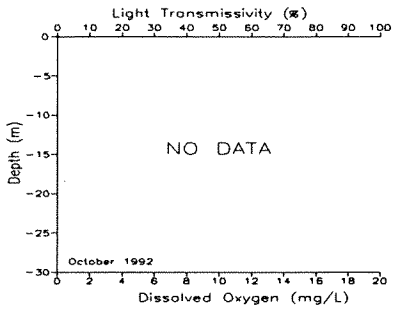


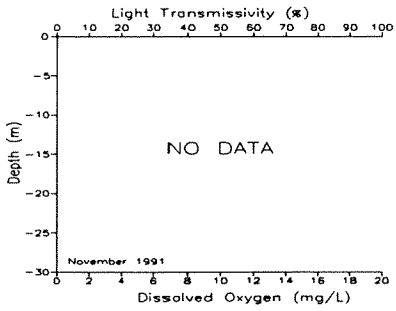


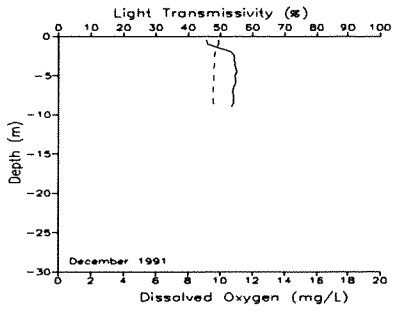
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

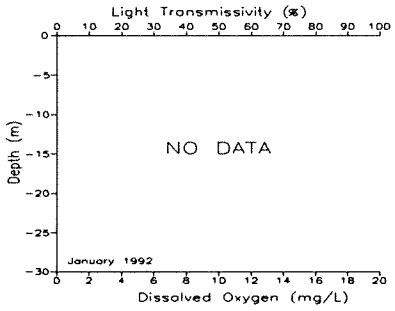
WATERYEAR 1992

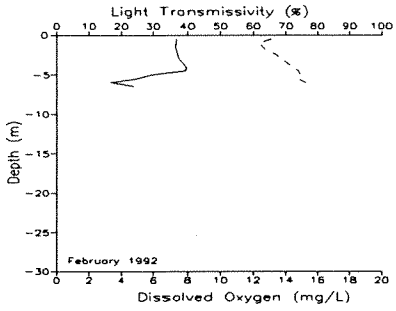
Gray's Harbor - N. Whitcomb Flats (Station GYS015)

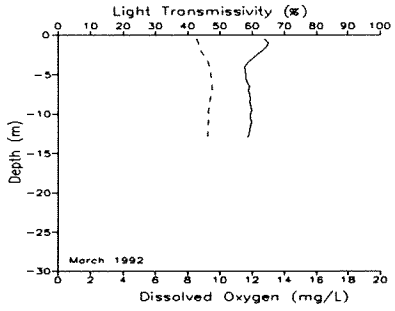


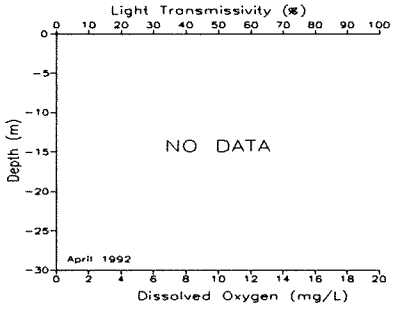


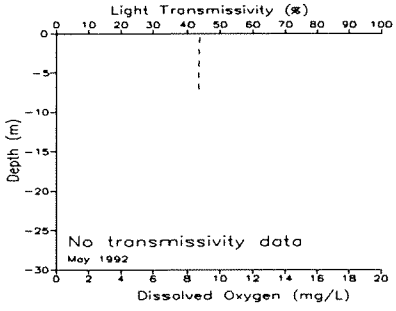


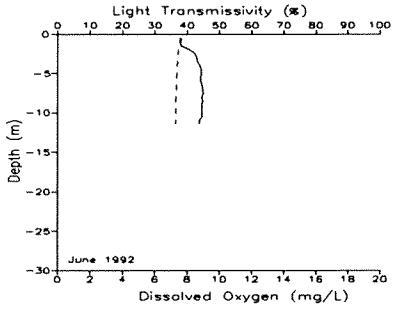


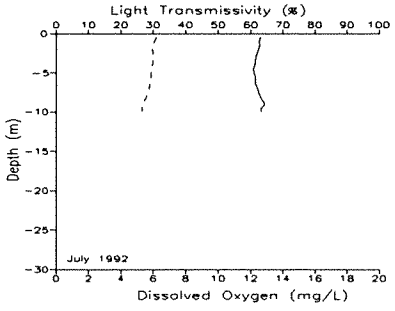


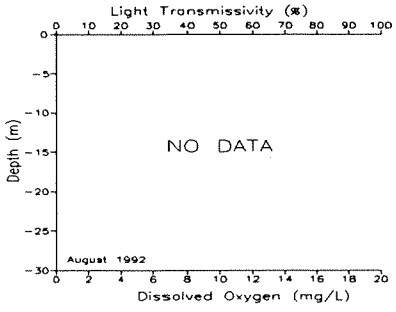


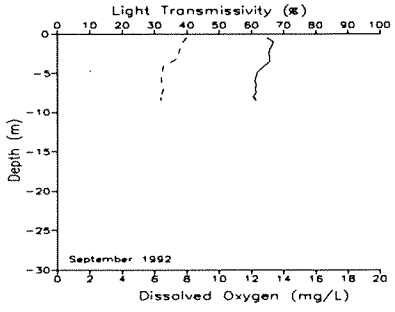








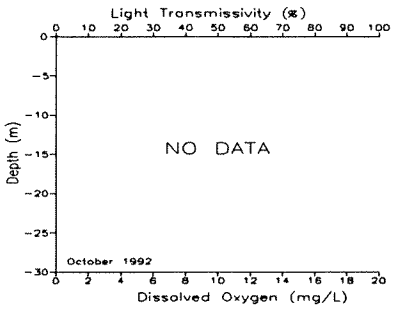


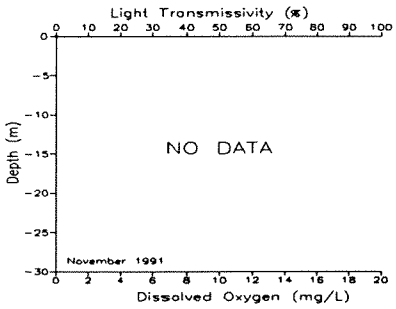


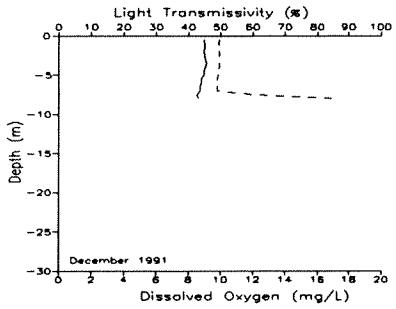
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

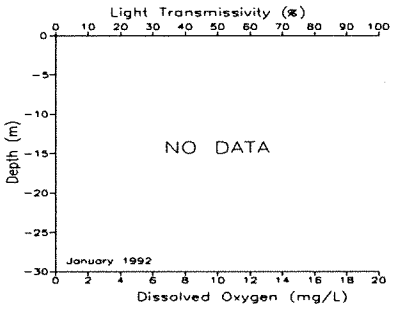
WATERYEAR 1992

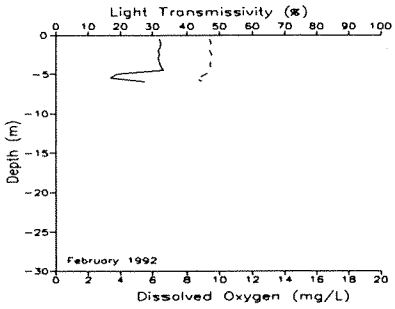
Gray's Harbor - Damon Point (Station GYS016)

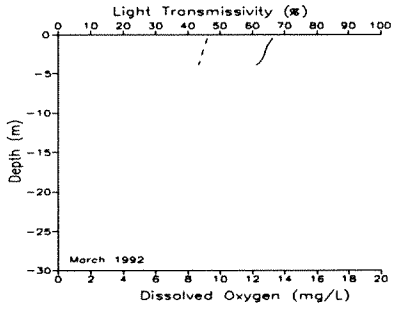


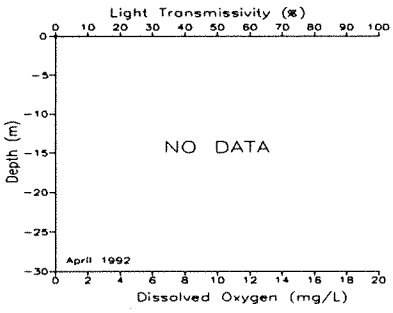


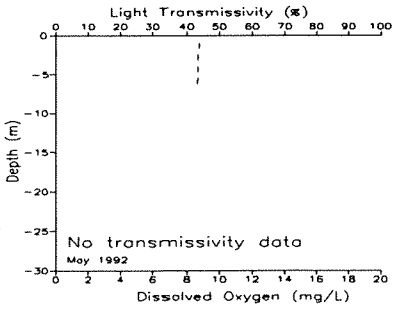


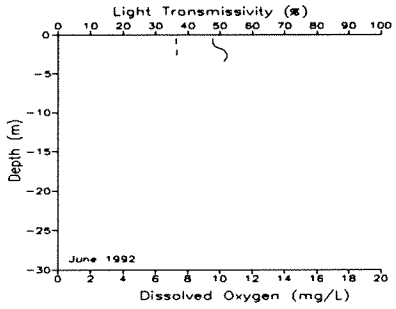


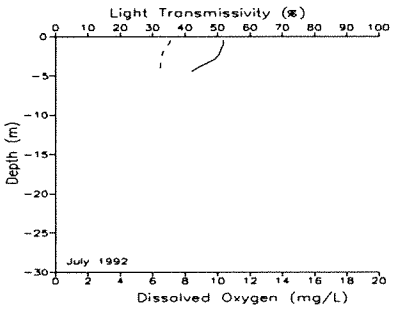


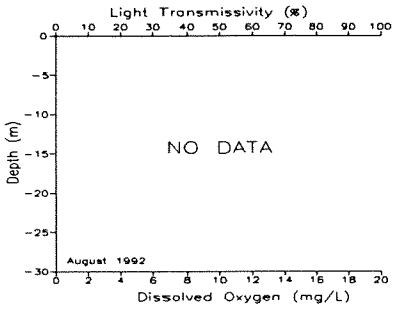


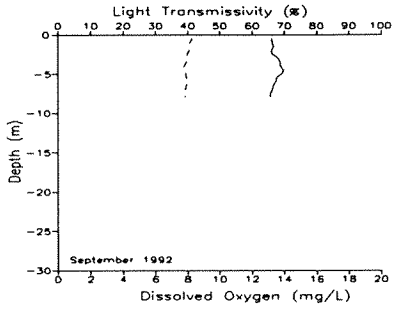










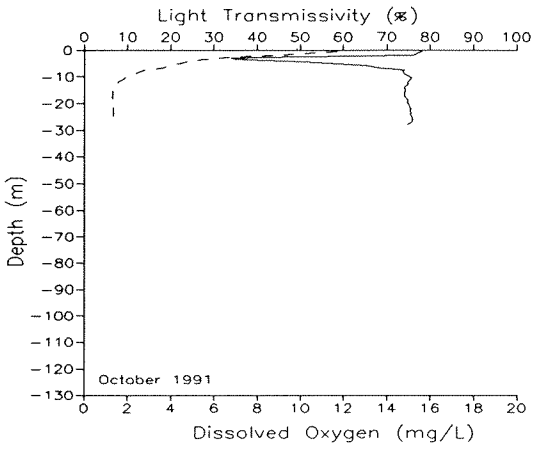


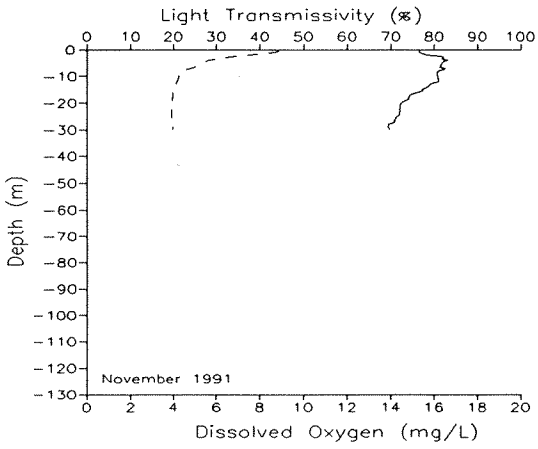
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

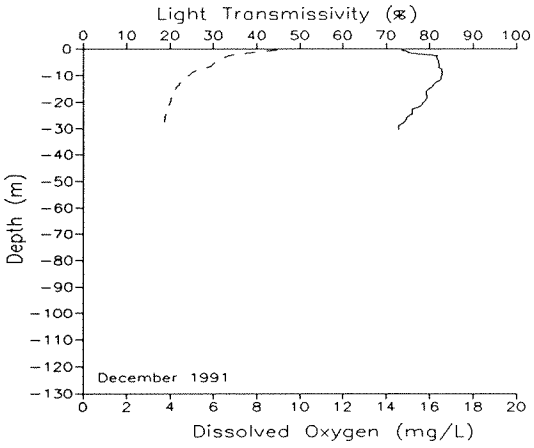
WATERYEAR 1991

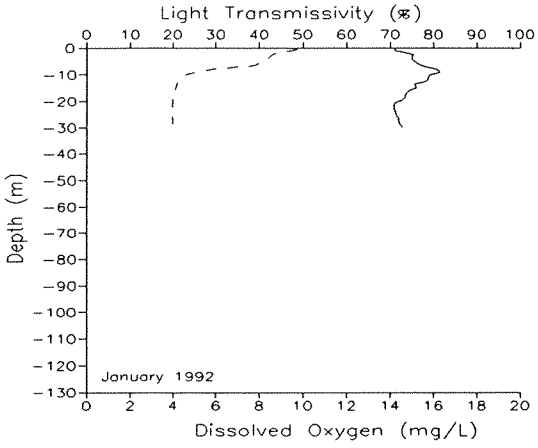
Part 1 of 2

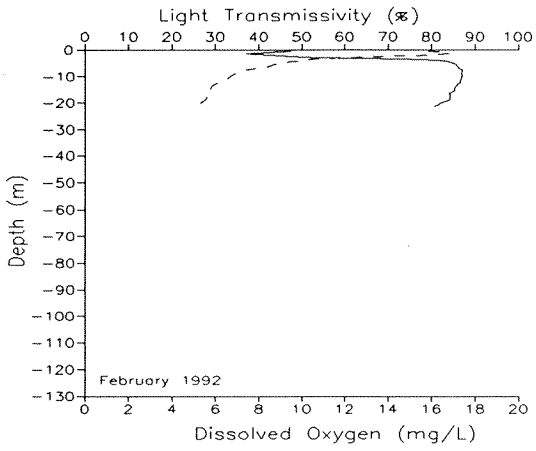
South Hood Canal at Sister's Point (Station HCB004)

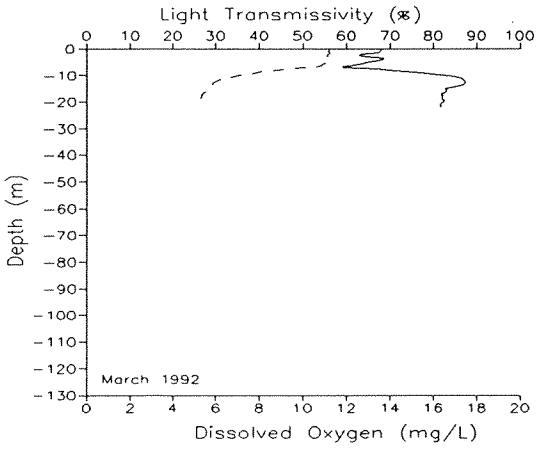










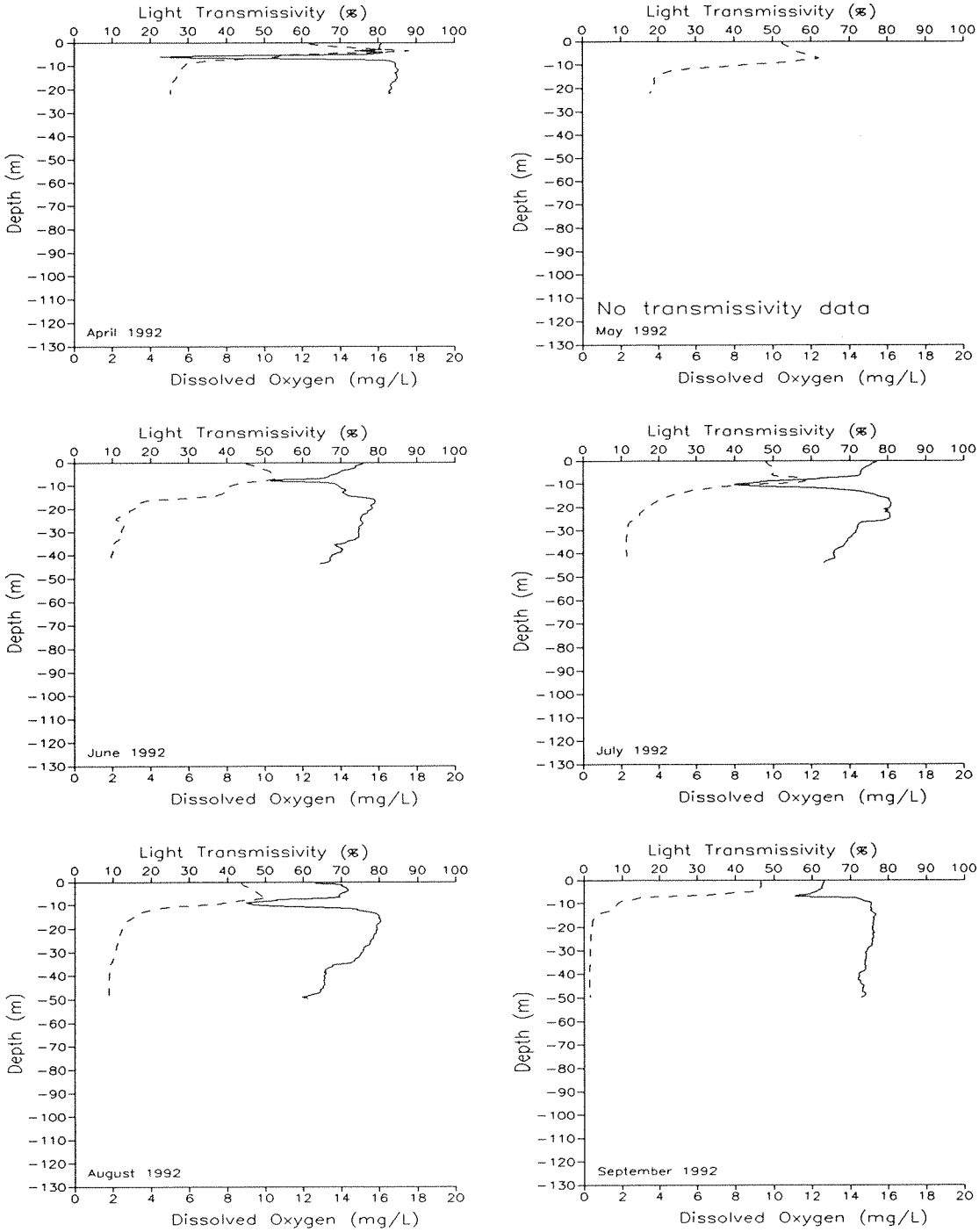


Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

WATERYEAR 1991

Part 2 of 2

South Hood Canal at Sister's Point (Station HCB004)

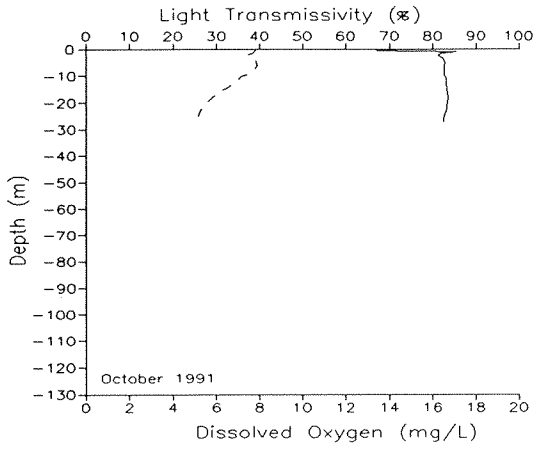


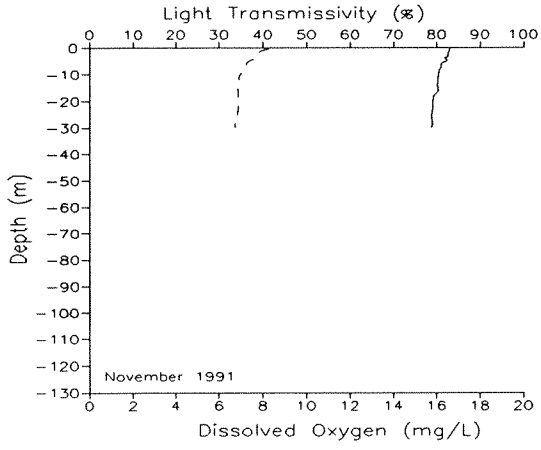
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

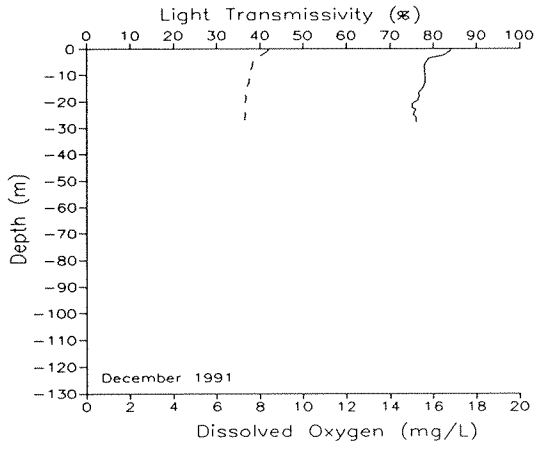
WATERYEAR 1991

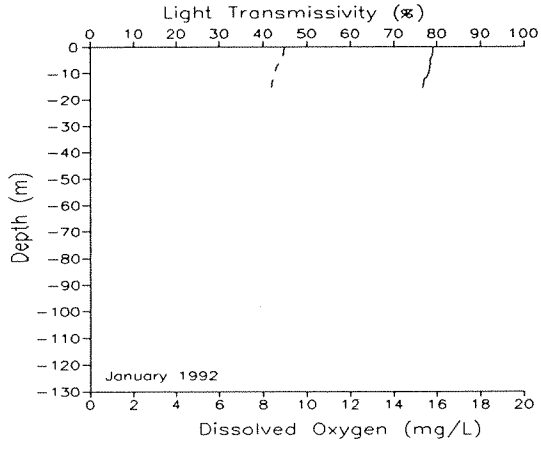
Part 1 of 2

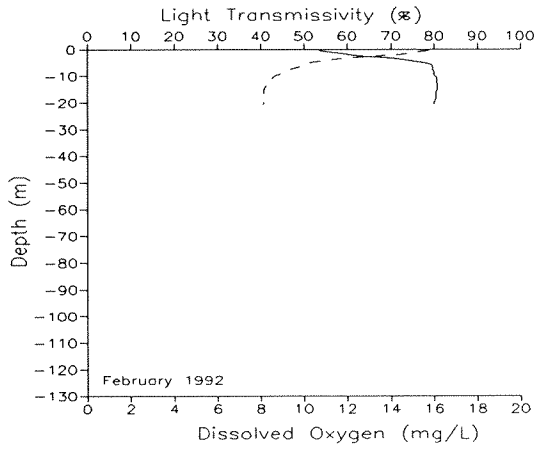
North Hood Canal - Bangor (Station HCB006)

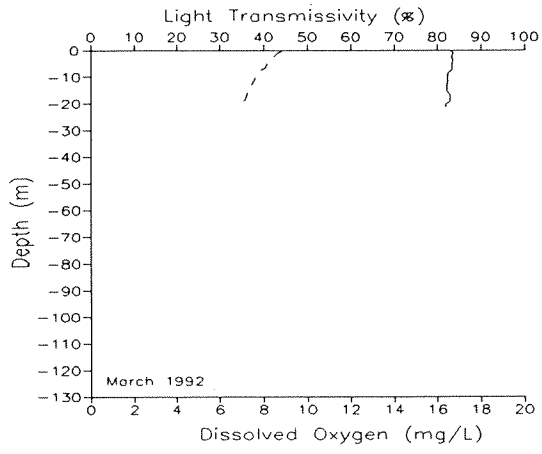










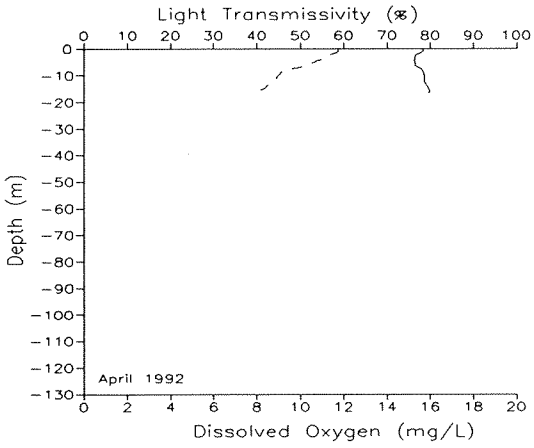


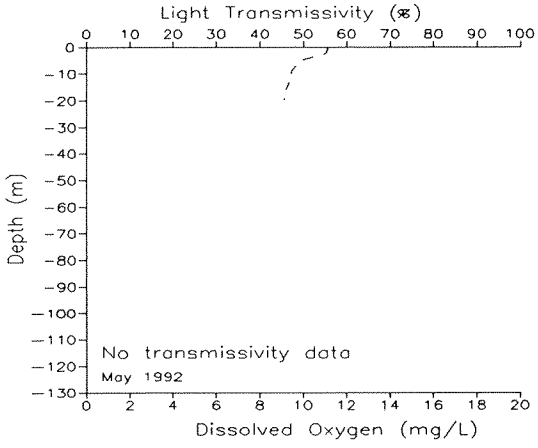
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

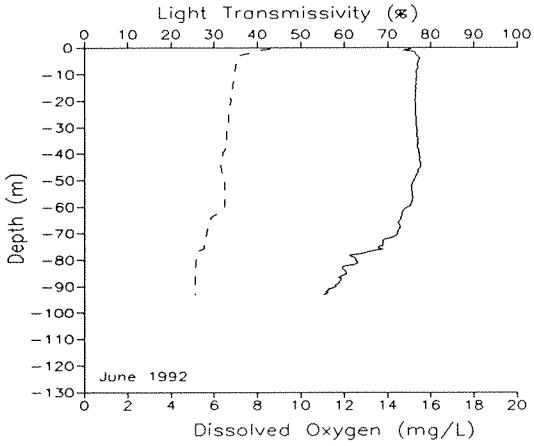
WATERYEAR 1991

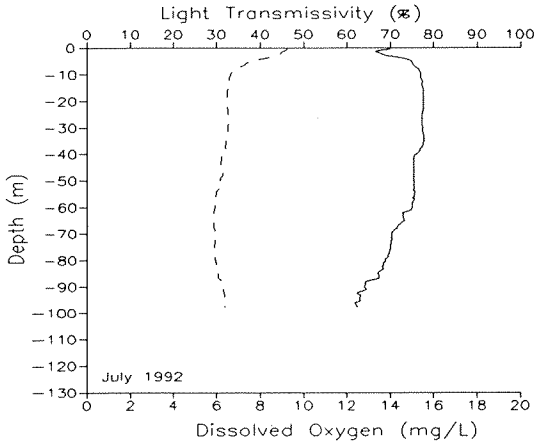
Part 2 of 2

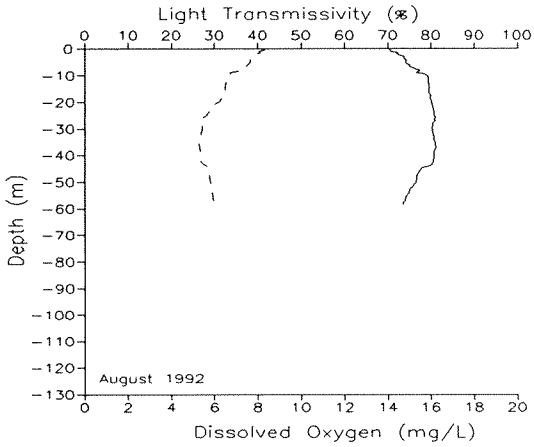
North Hood Canal - Bangor (Station HCB006)

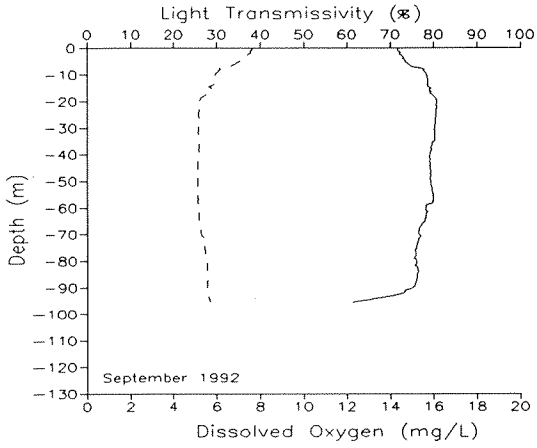








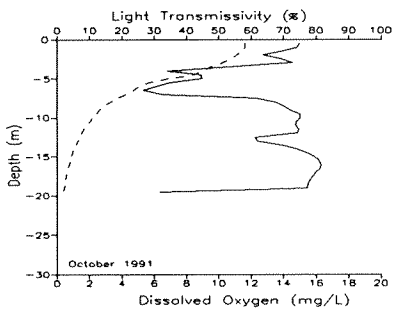


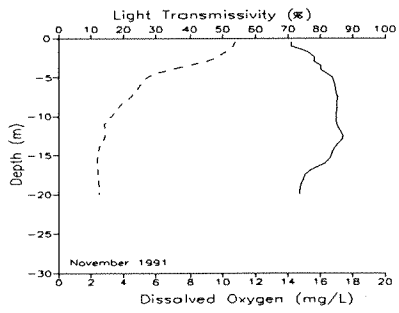


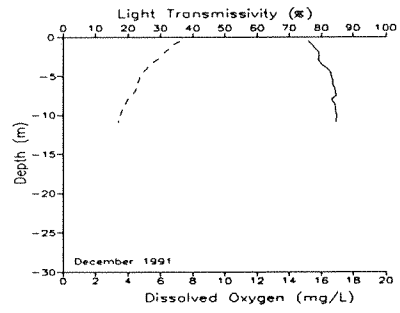
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

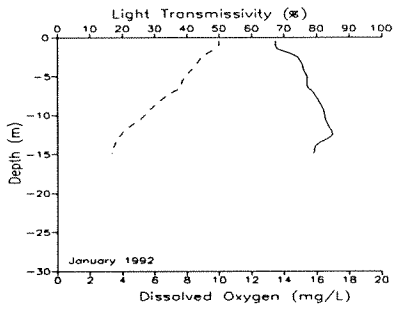
WATERYEAR 1992

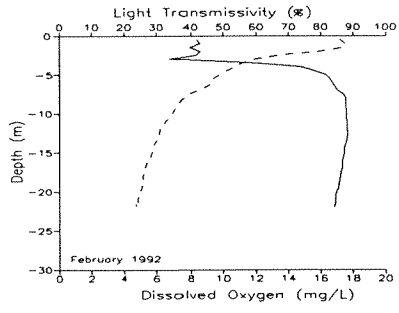
Lynch Cove (Station HCB007)

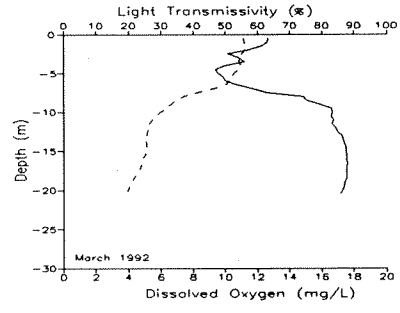


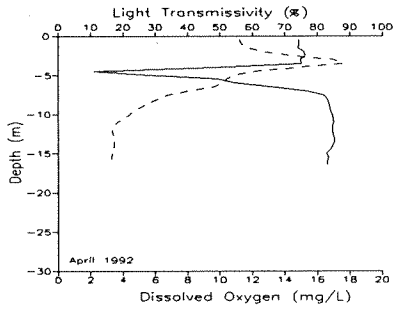


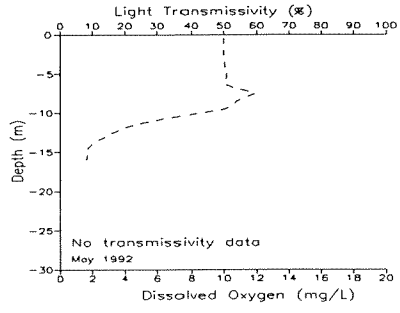


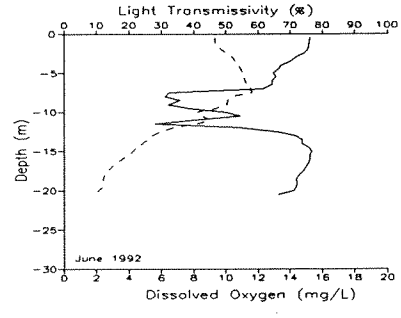


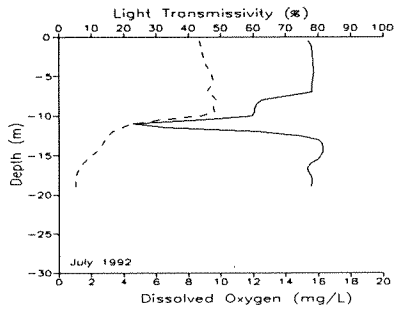


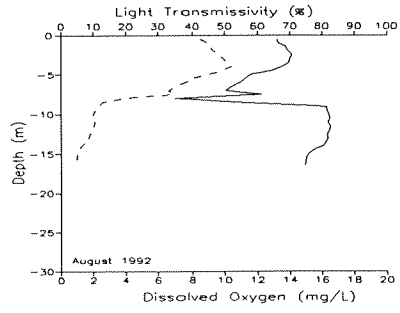


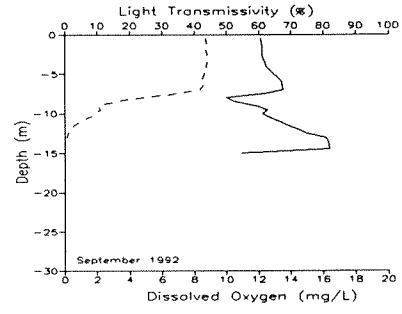








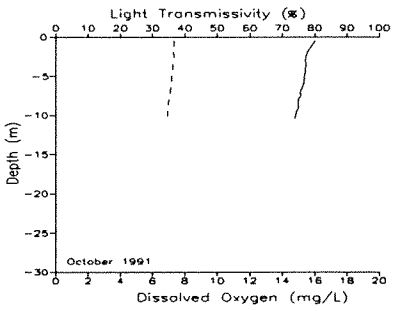


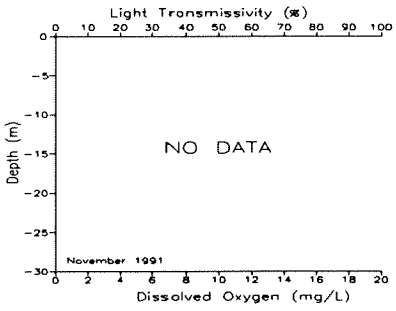


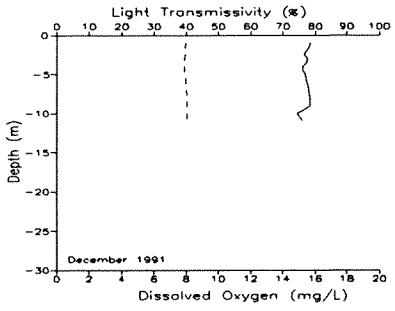
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

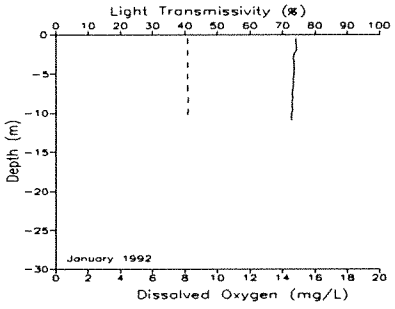
WATERYEAR 1992

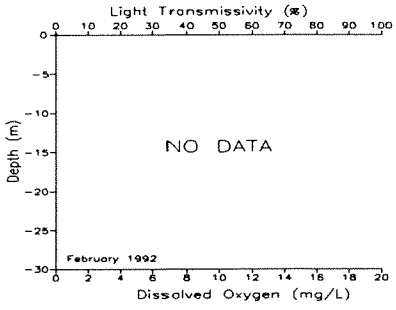
Lopez Sound - Lopez Island (Station LOP001)

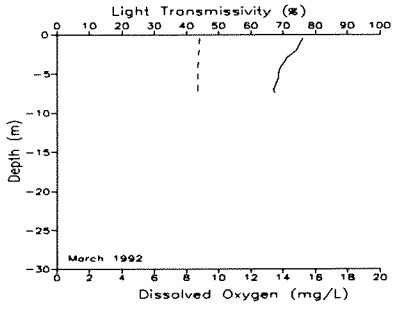


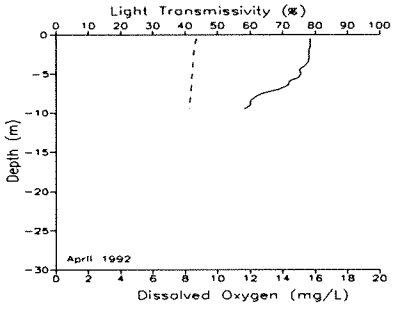


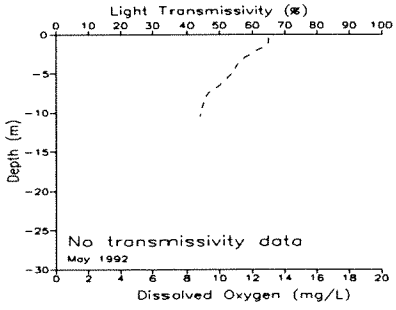


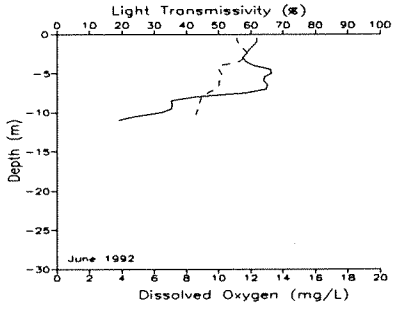


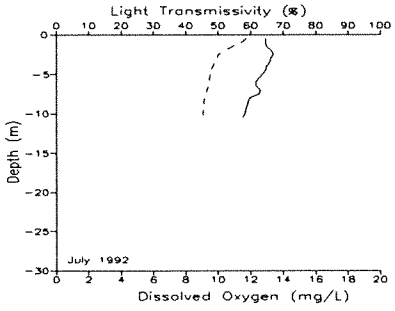


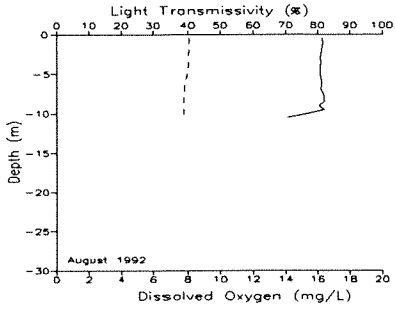


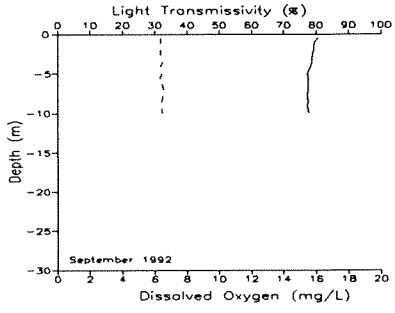








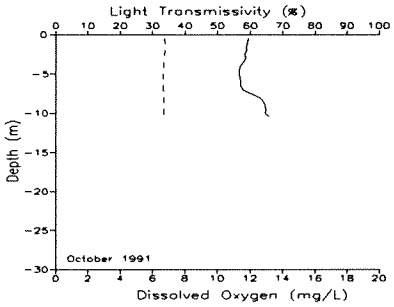


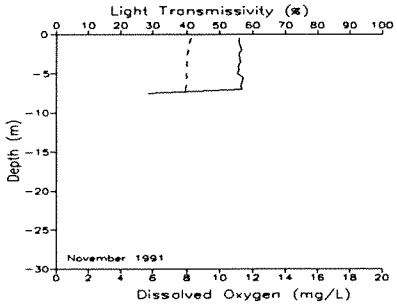


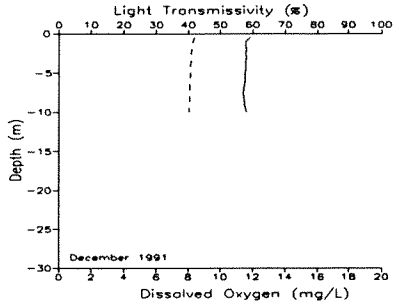
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

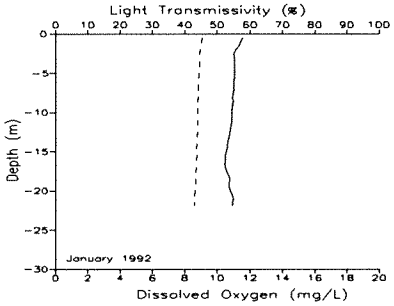
WATERYEAR 1992

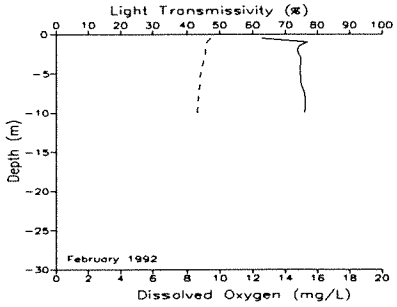
Oakland Bay (Station OAK004)

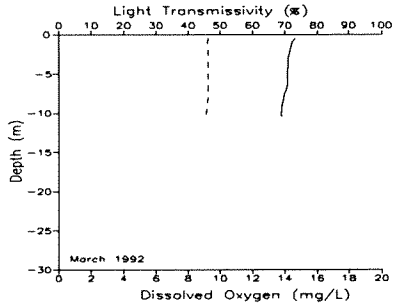


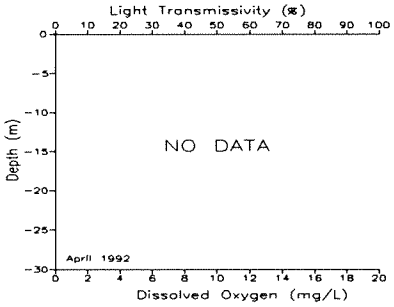


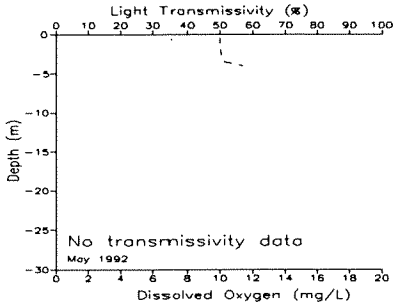


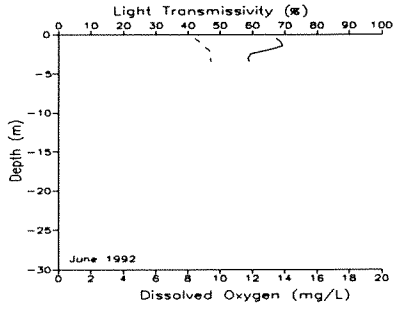


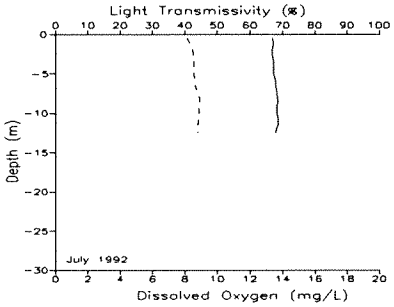


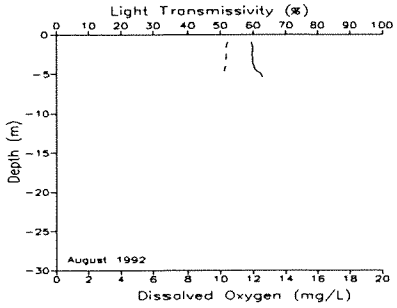


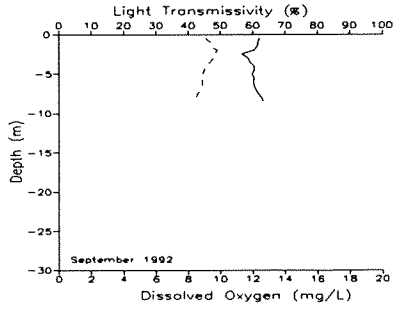








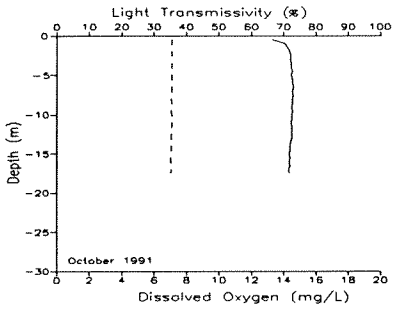


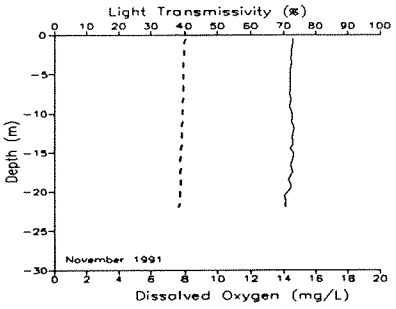


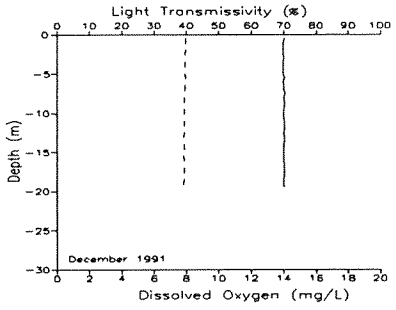
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

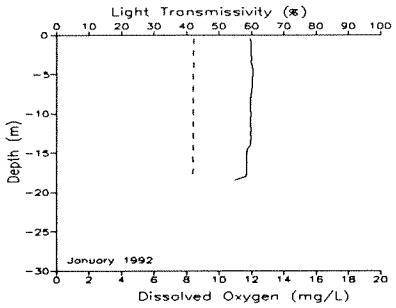
WATERYEAR 1992

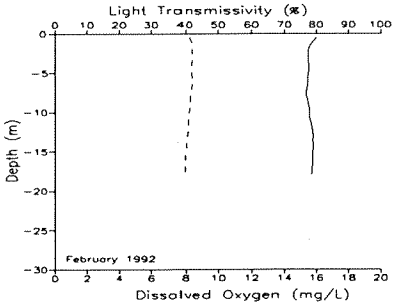
Pickering Passage (Station PCK001)

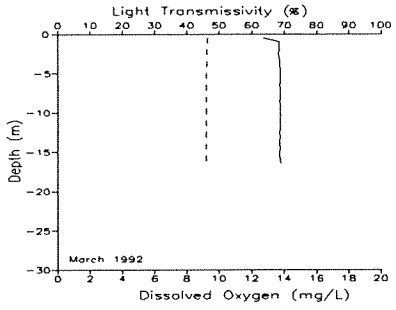


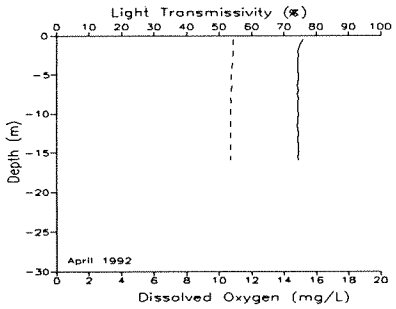


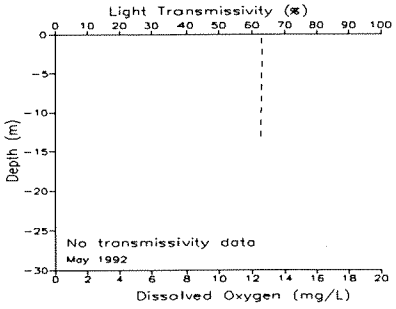


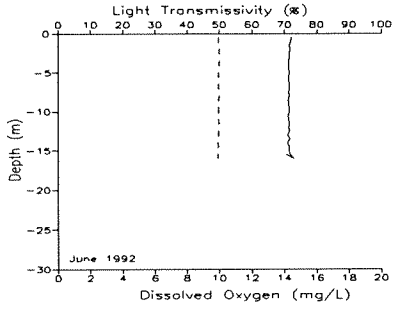


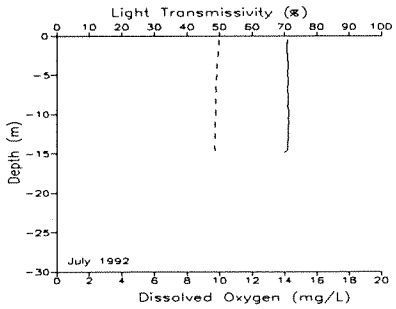


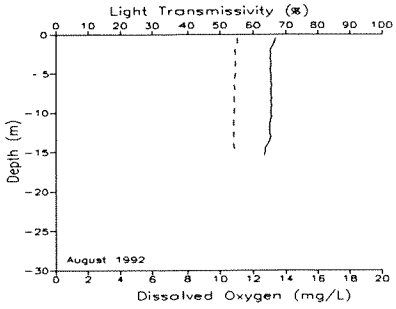


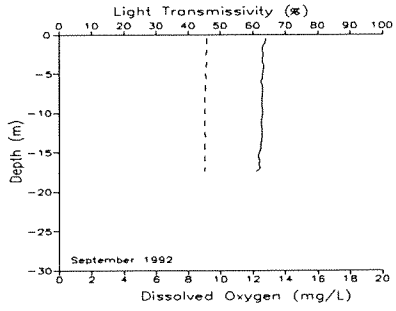








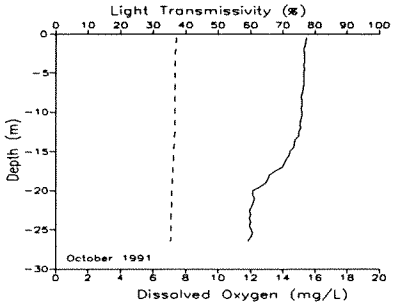


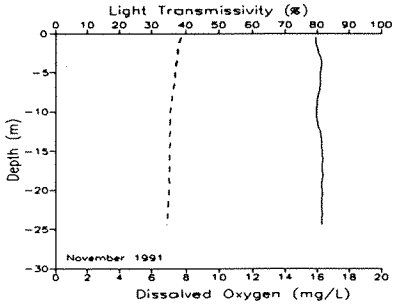


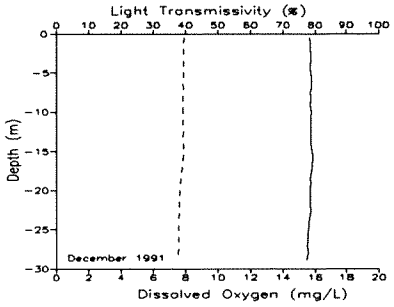
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

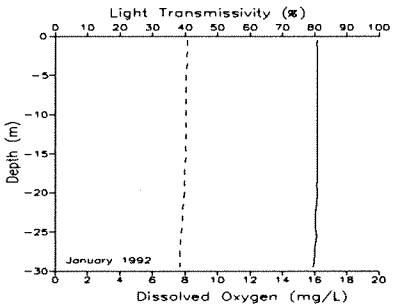
WATERYEAR 1992

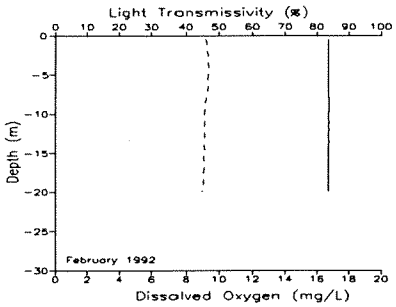
Port Madison (Station PMA001)

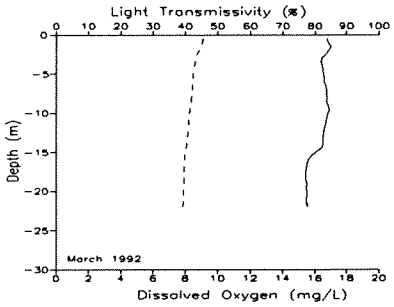


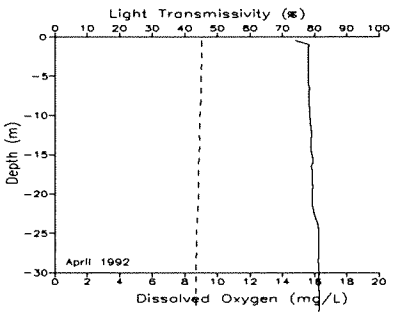


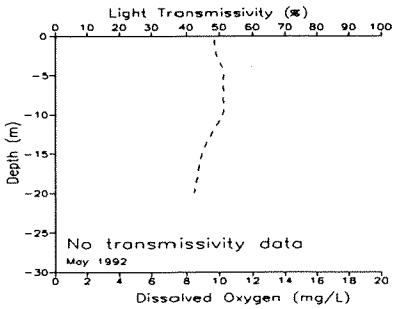


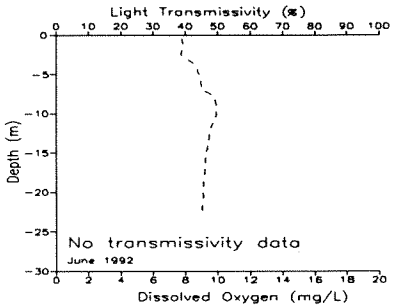


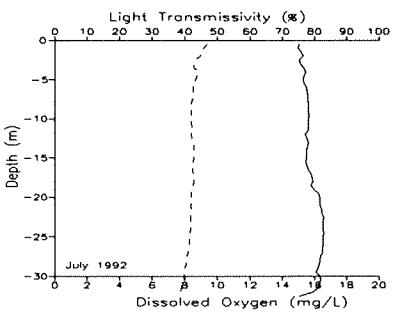


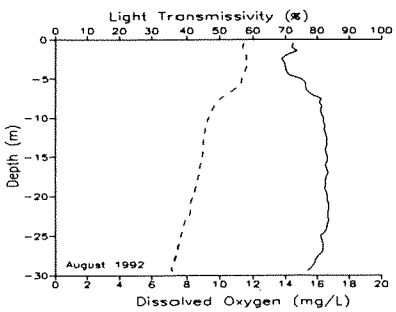


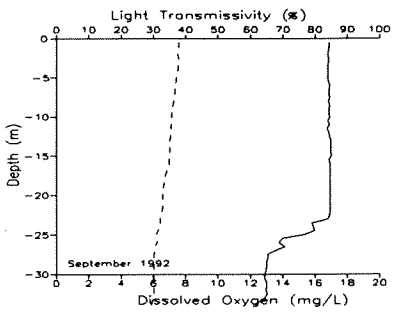








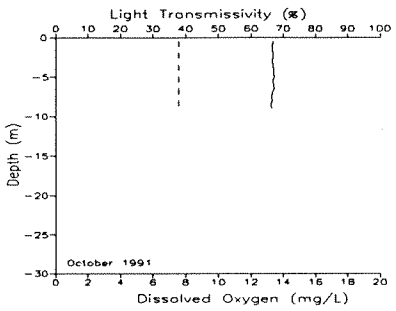


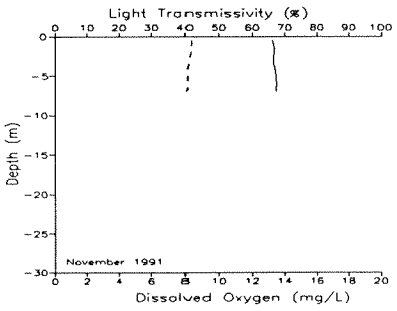


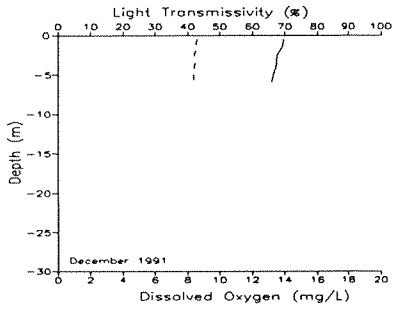
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

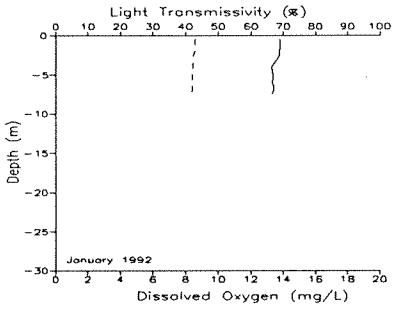
WATERYEAR 1992

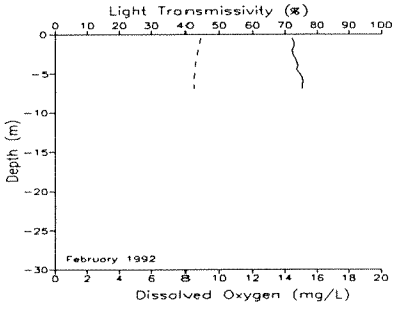
Pt. Orchard - Lib. Bay / Virg. Pt (Station POD006)

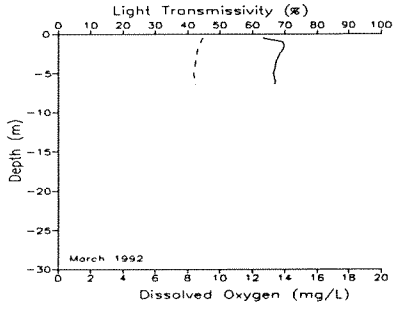


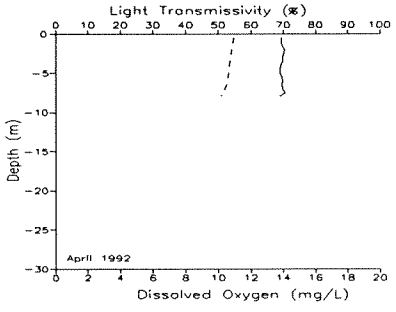


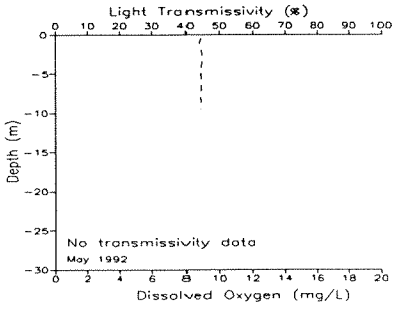


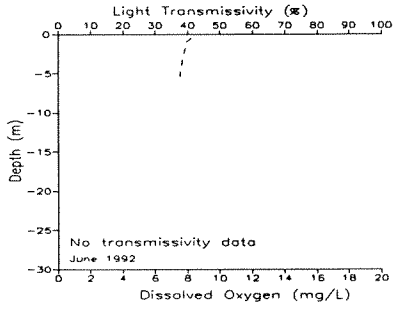


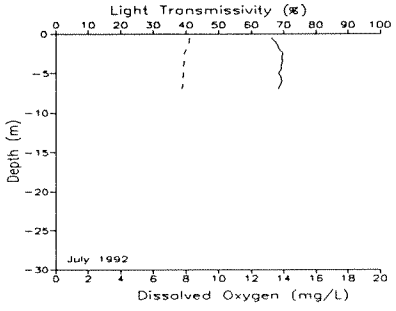


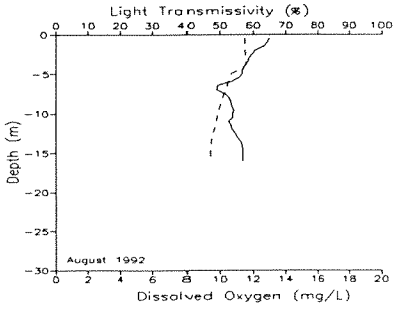


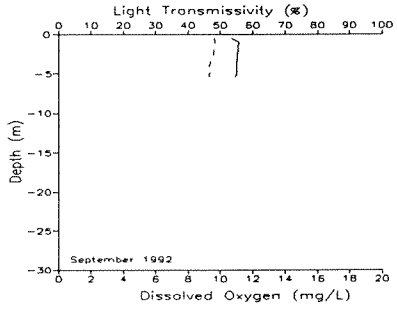










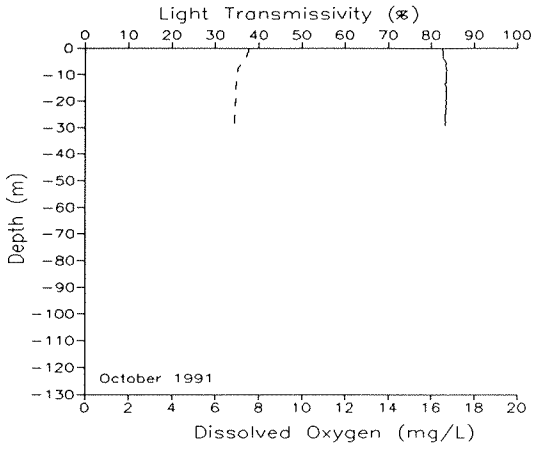


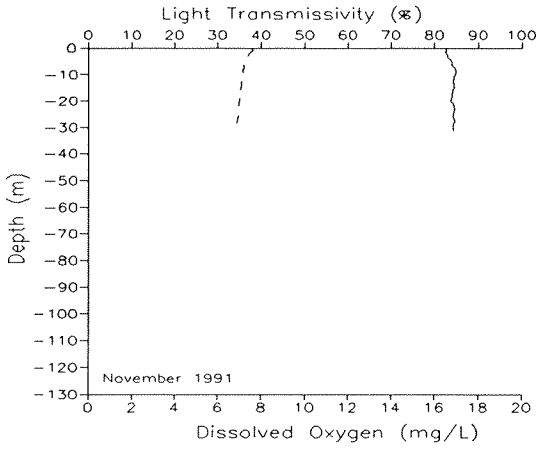
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

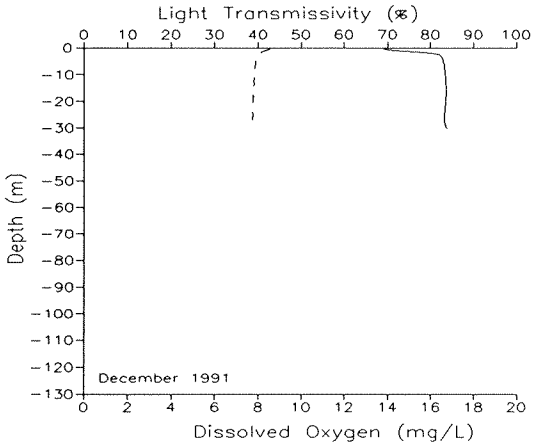
WATERYEAR 1991

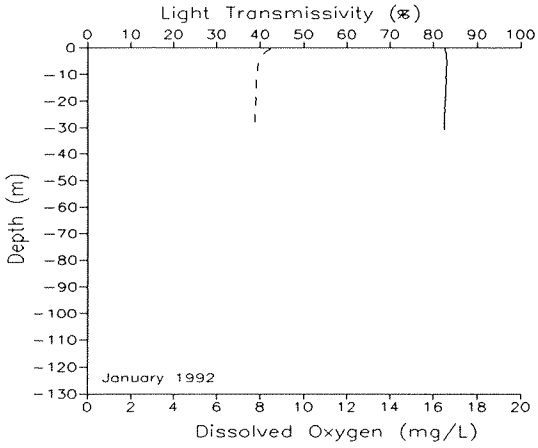
Part 1 of 2

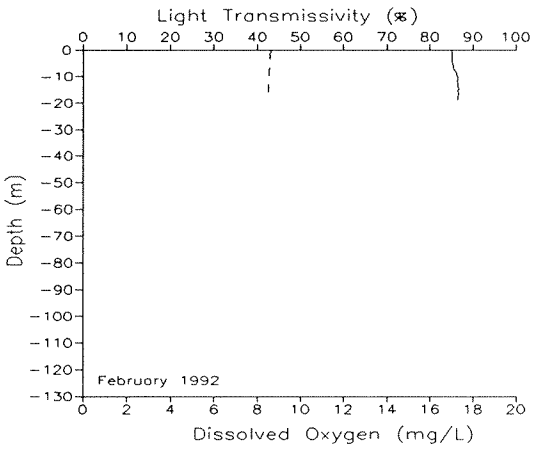
Puget Sound Main Basin - West Point (Station PSB003)

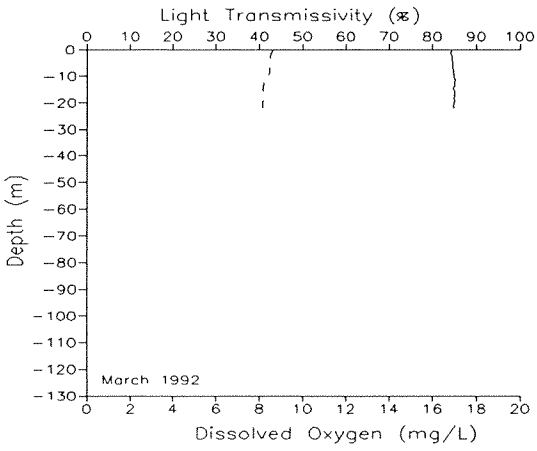










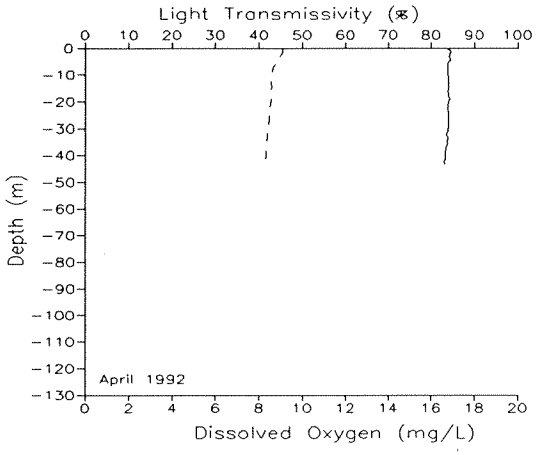


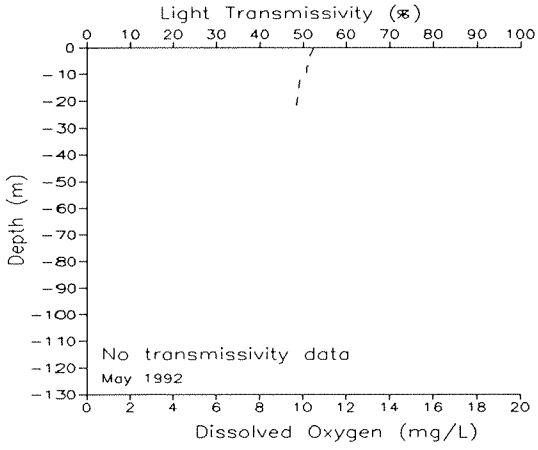
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

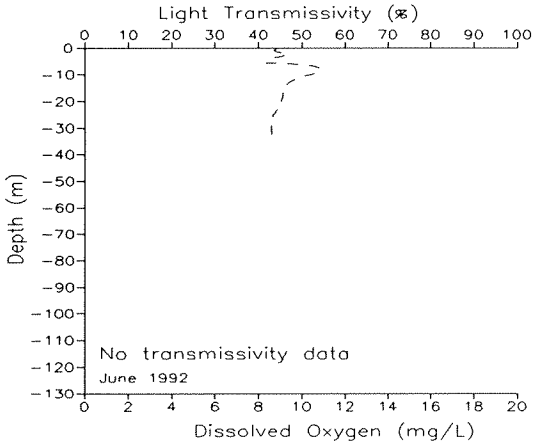
WATERYEAR 1991

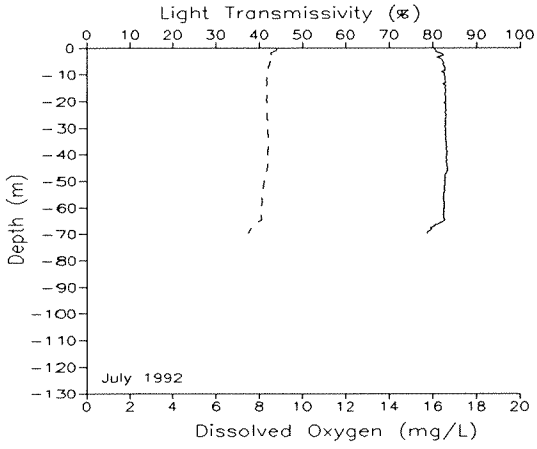
Part 2 of 2

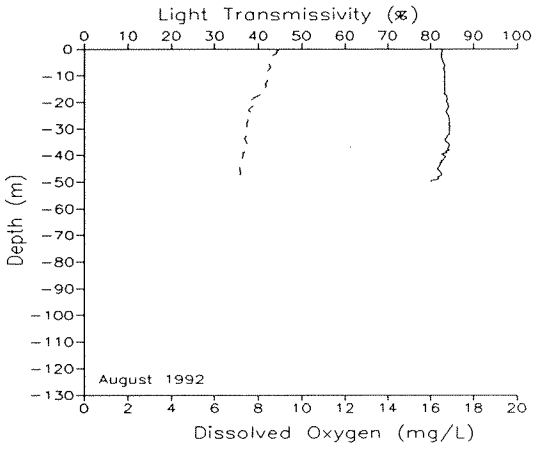
Main Basin Puget Sound - West Point (Station PSB003)

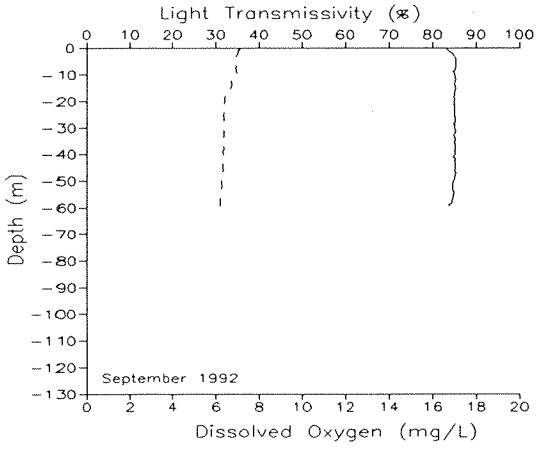










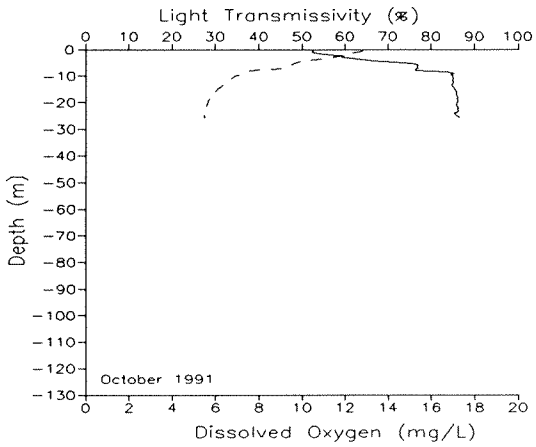


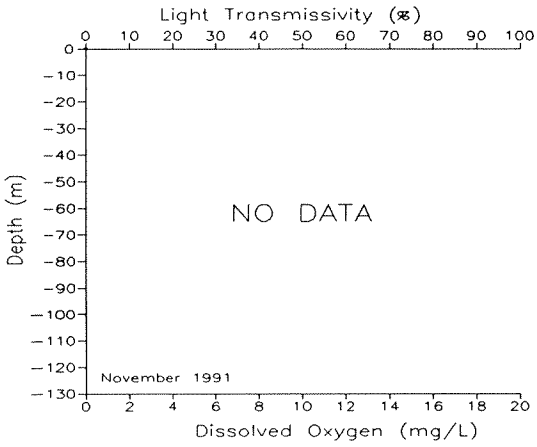
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

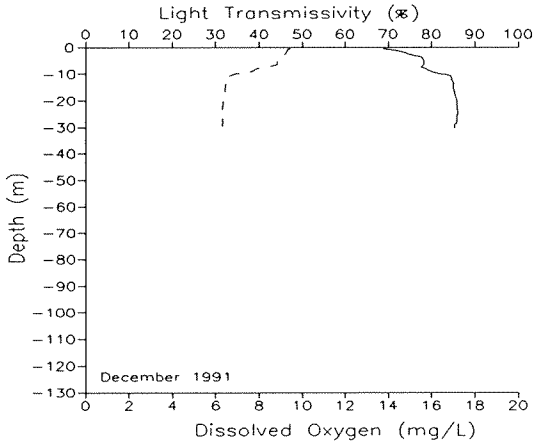
WATERYEAR 1991

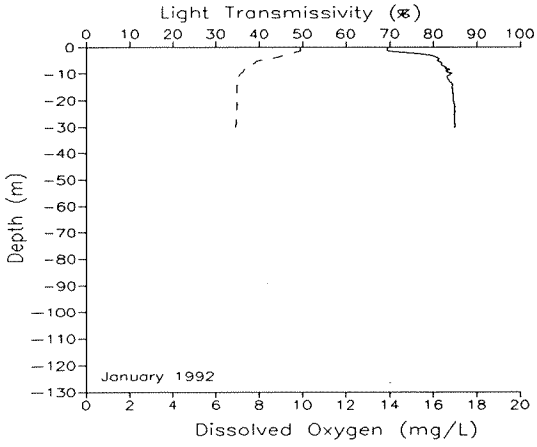
Part 1 of 2

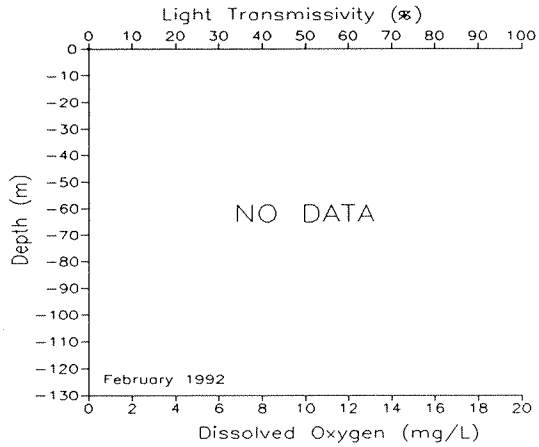
Possession Sound - Ged. Is. (Station PSS019)

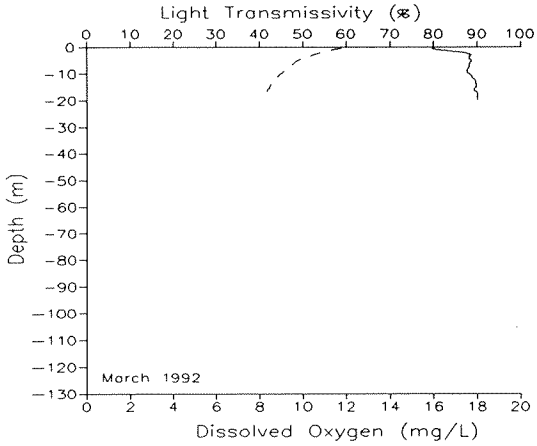










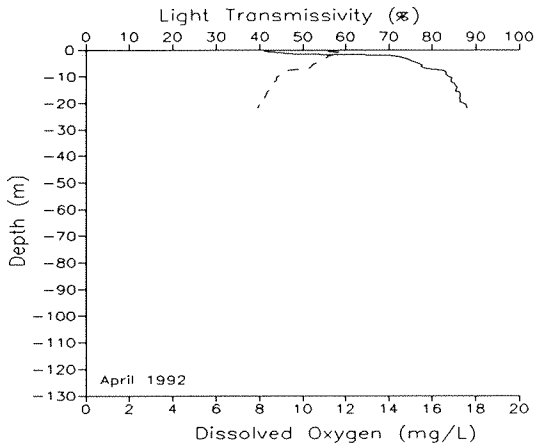


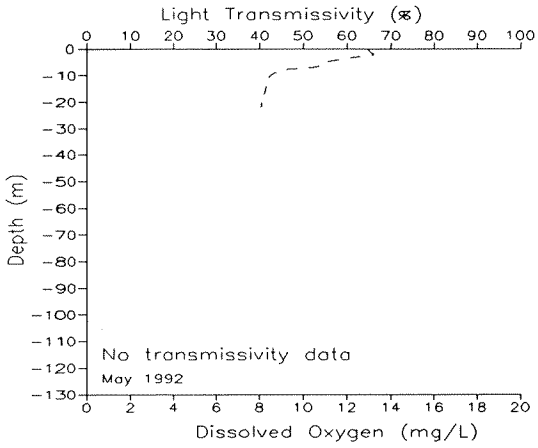
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

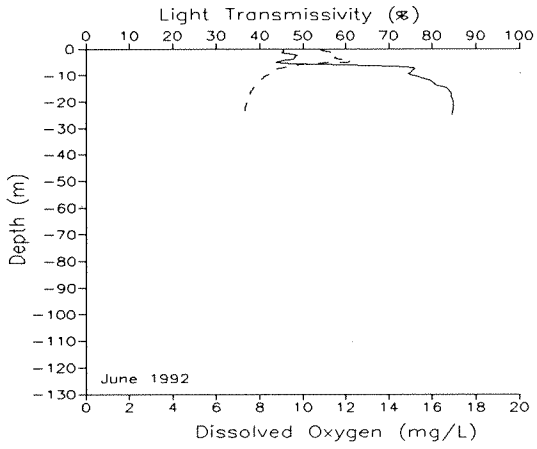
WATERYEAR 1991

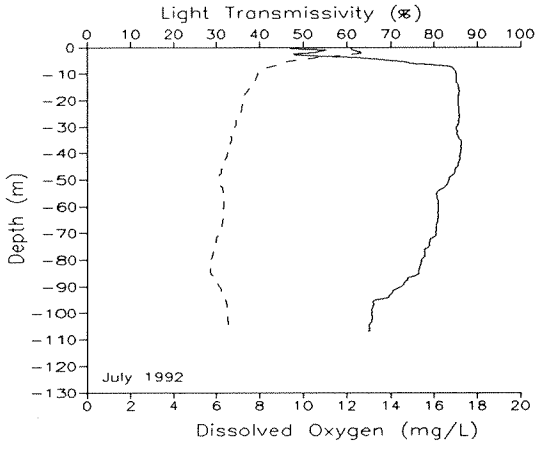
Part 2 of 2

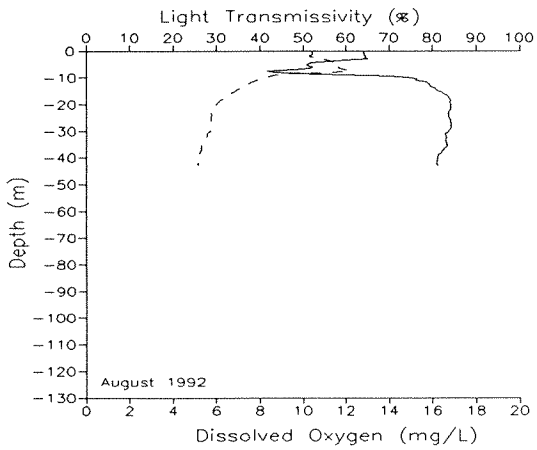
Possession Sound - Ged. Is. (Station PSS019)

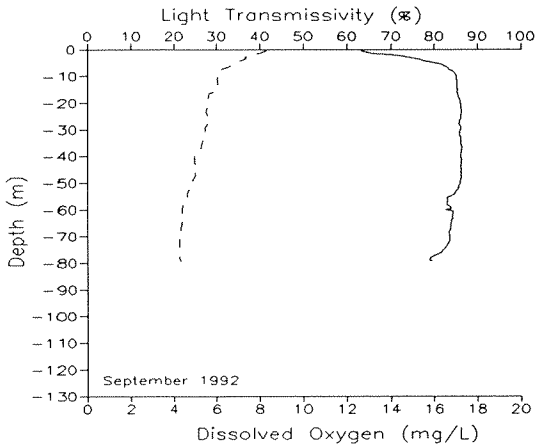








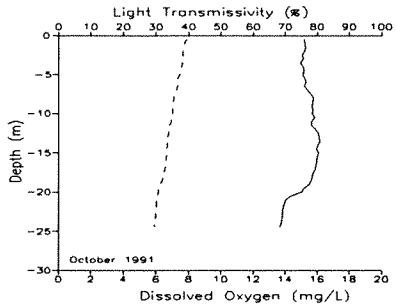


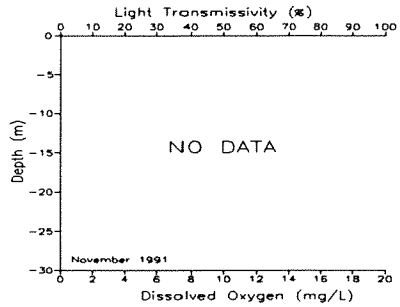


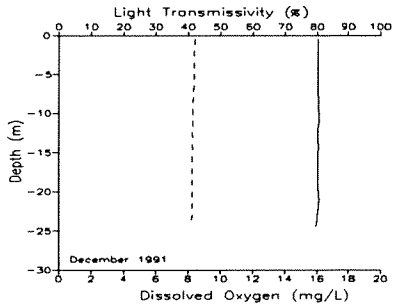
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

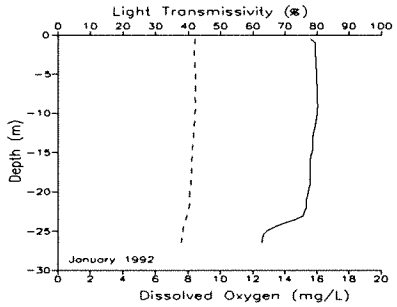
WATERYEAR 1992

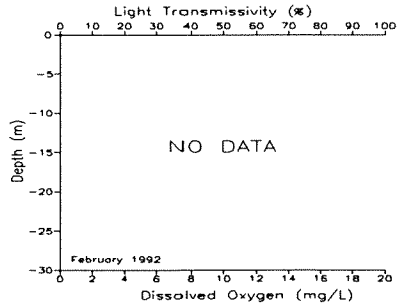
Port Townsend Harbor - Walan Pt. (Station PTH005)

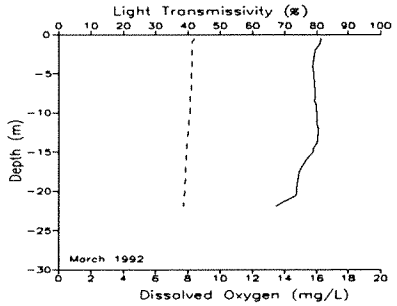


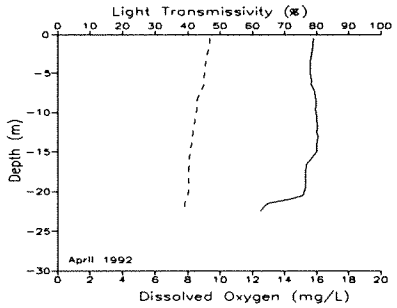


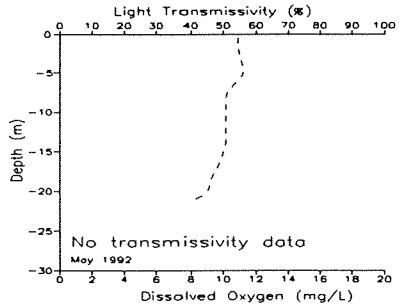


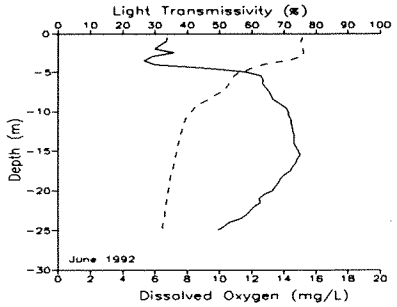


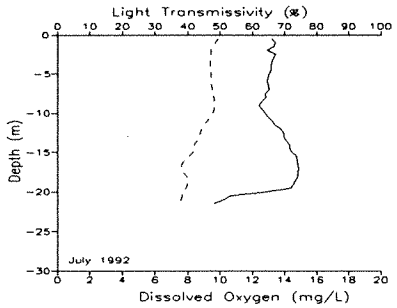


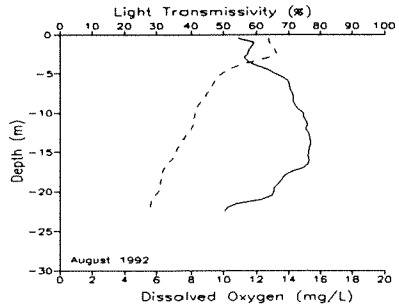


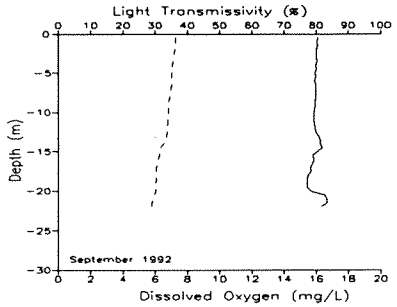








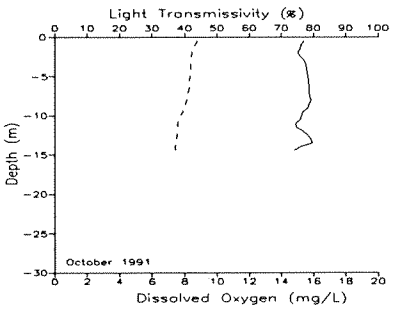


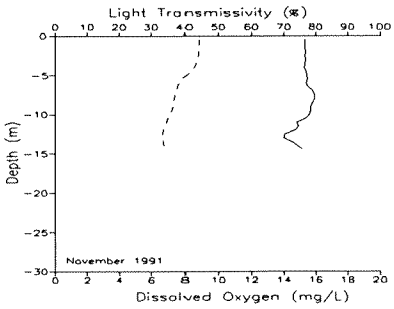


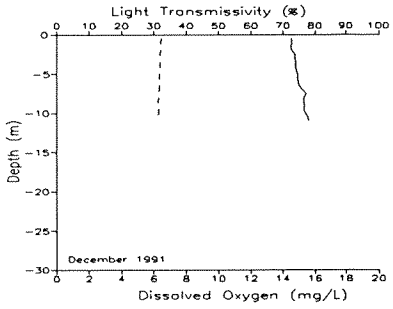
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

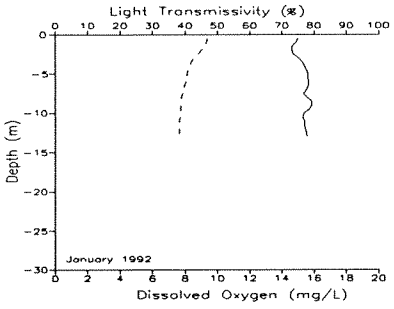
WATERYEAR 1992

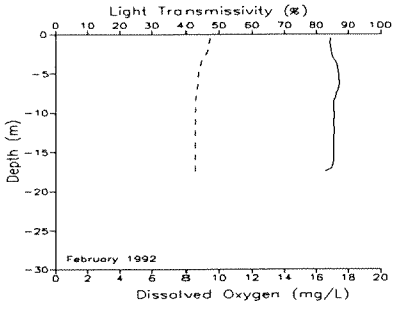
Quartermaster Harbor (Station QMH001)

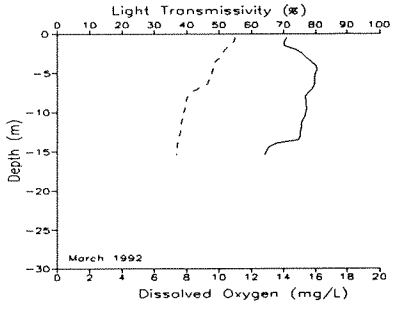


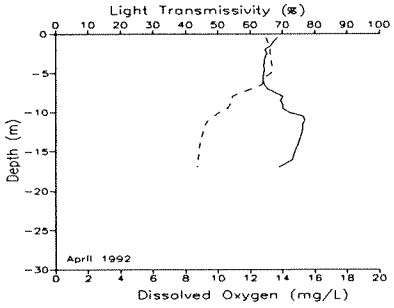


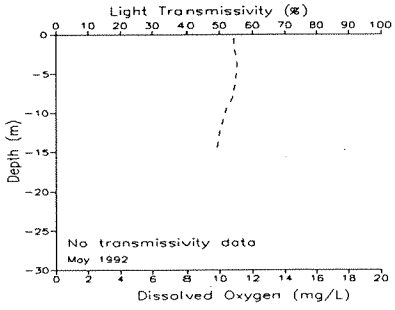


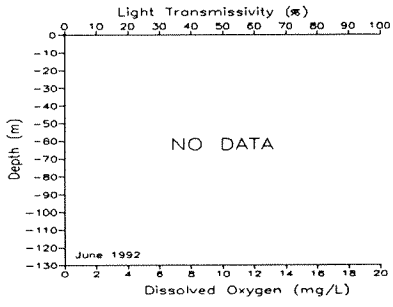


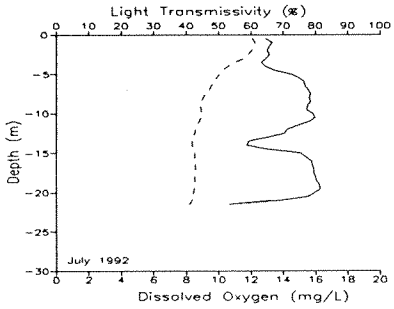


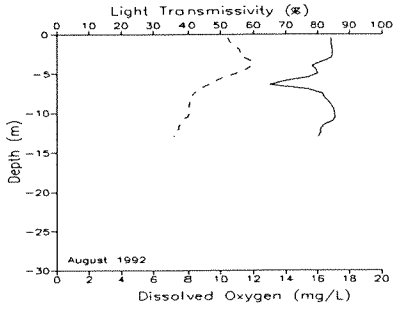


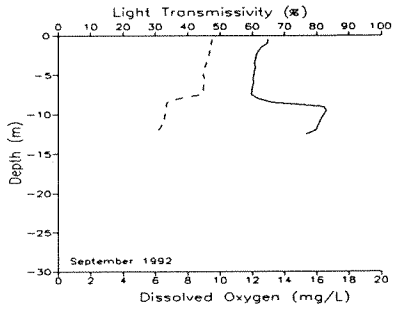










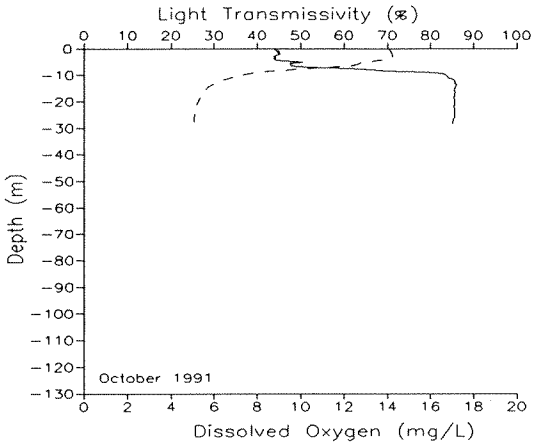


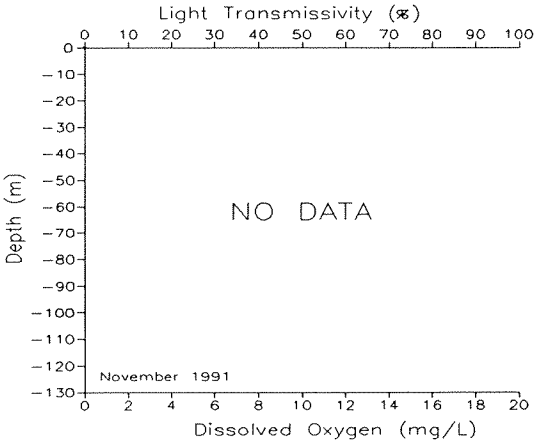
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

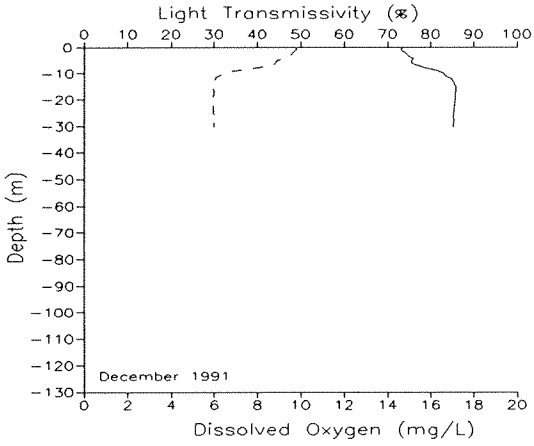
WATERYEAR 1991

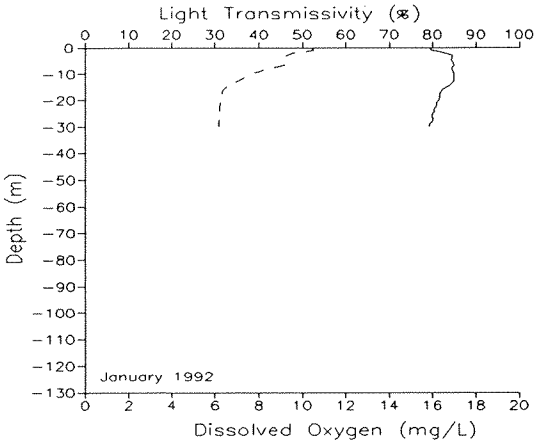
Part 1 of 2

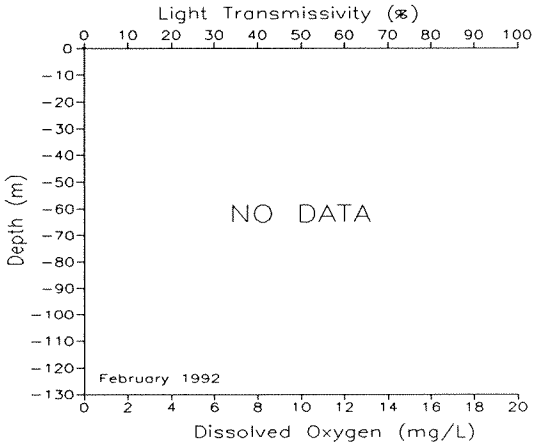
Saratoga Passage - East Point (Station SAR003)

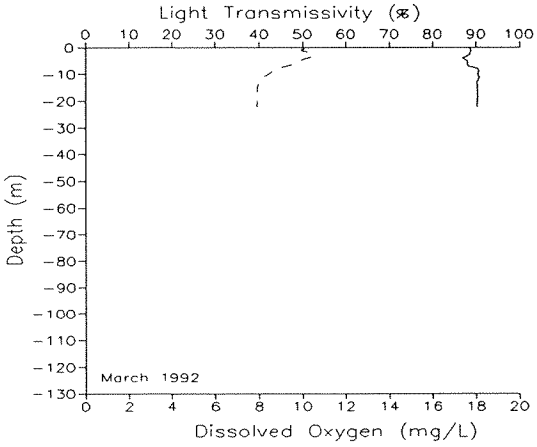










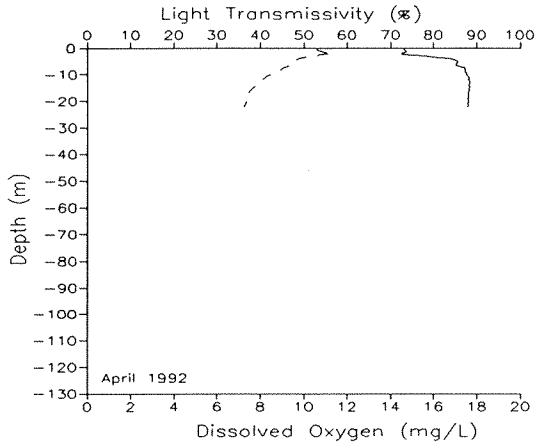


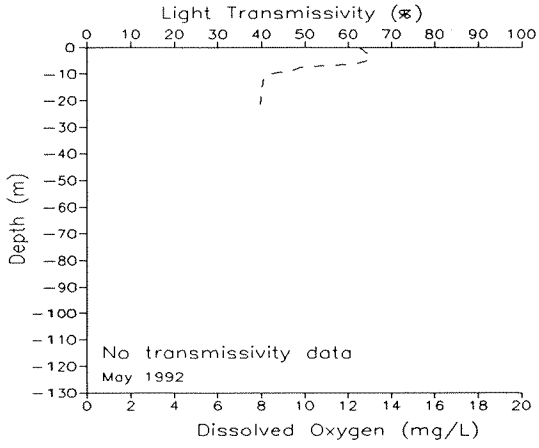
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

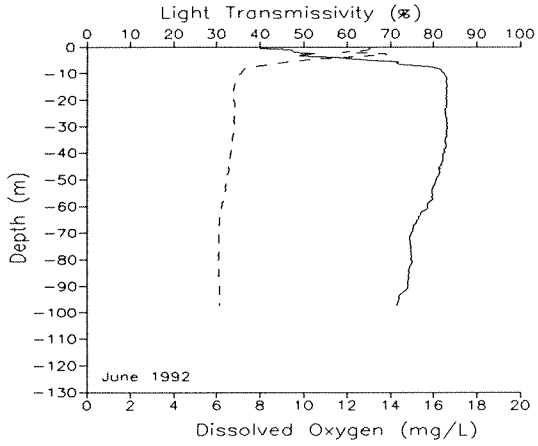
WATERYEAR 1991

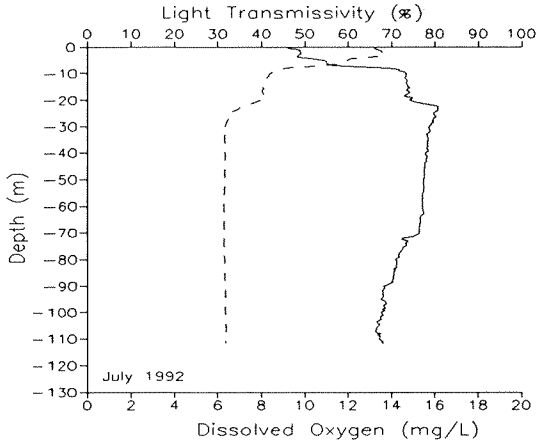
Part 2 of 2

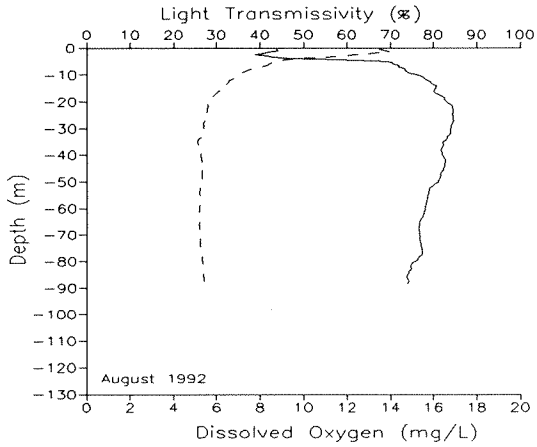
Saratoga Passage - East Point (Station SAR003)

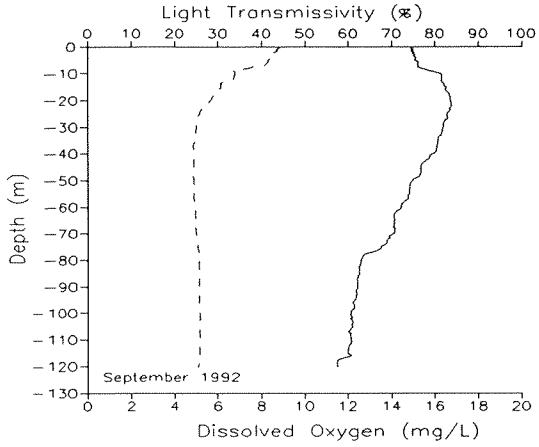








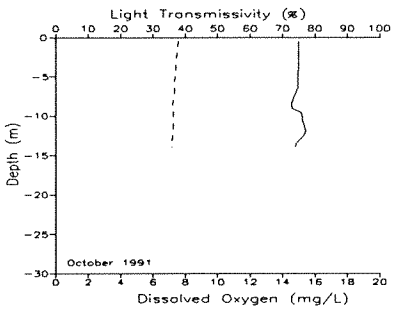


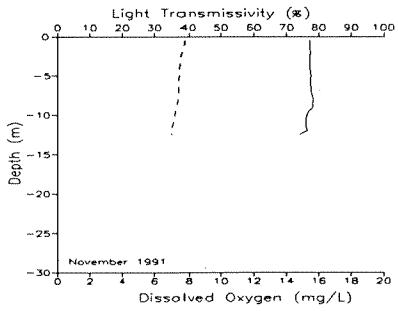


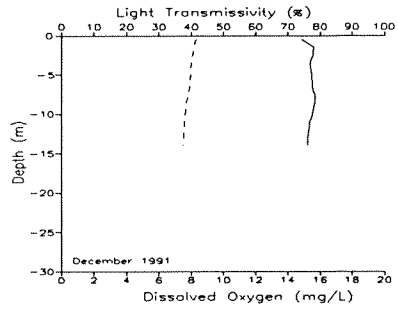
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

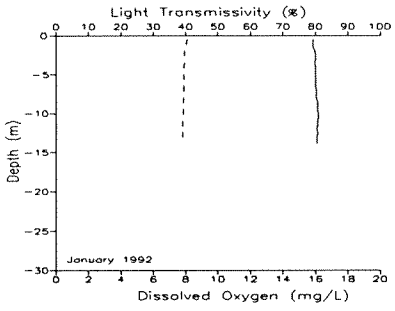
WATERYEAR 1992

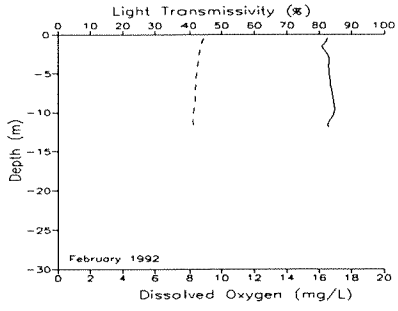
Sinclair Inlet (Station SIN001)

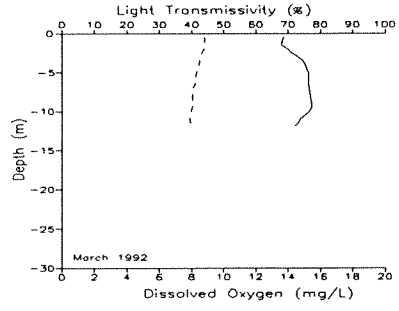


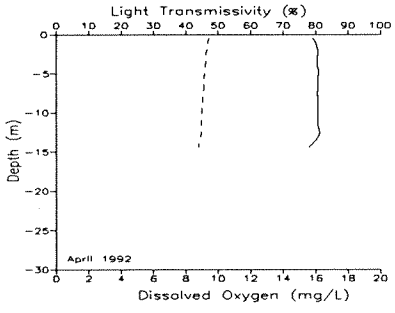


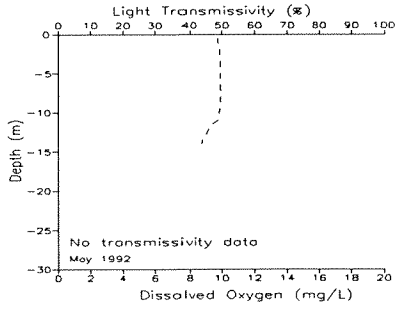


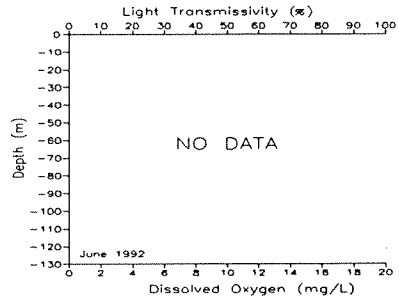


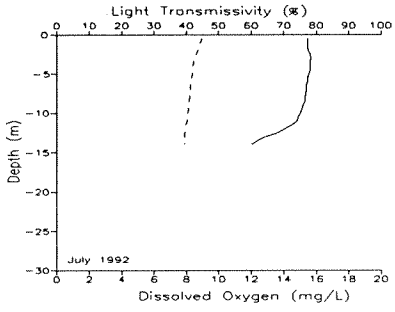


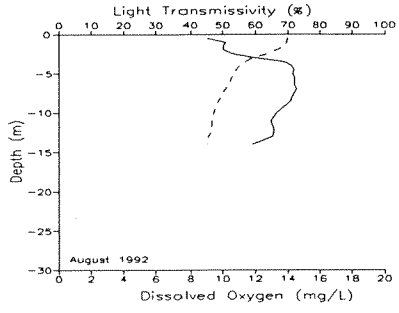


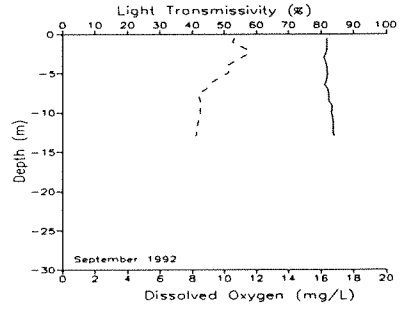










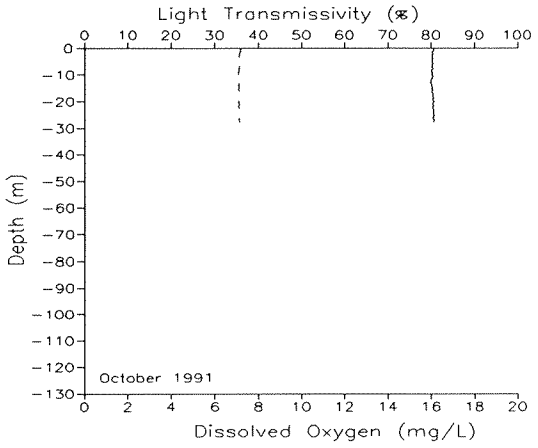


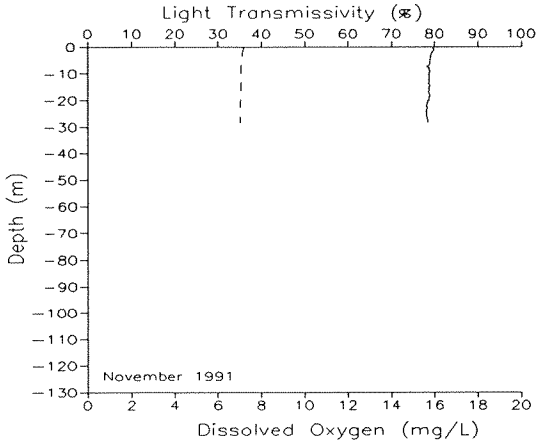
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

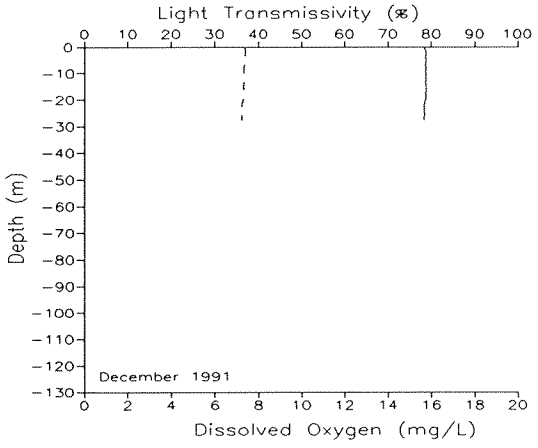
WATERYEAR 1991

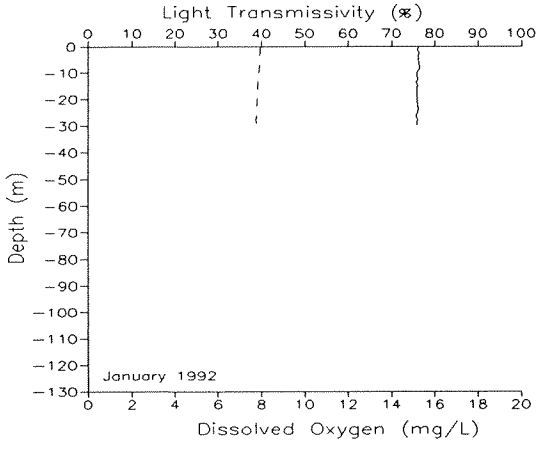
Part 1 of 2

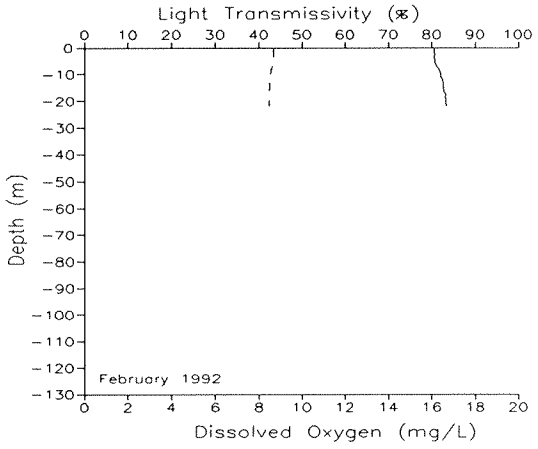
Steilacoom (Station STL001)

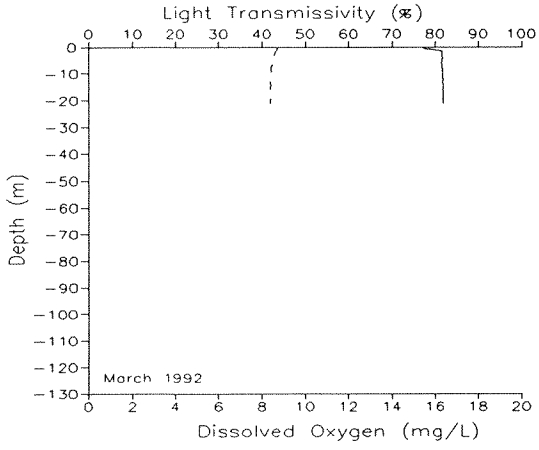










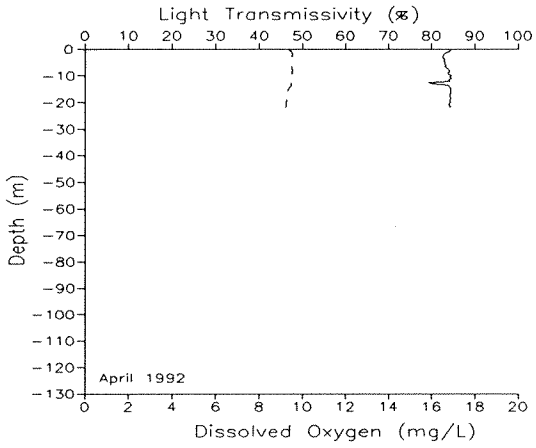


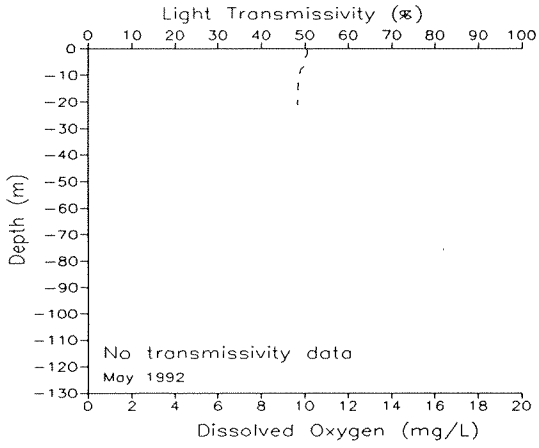
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

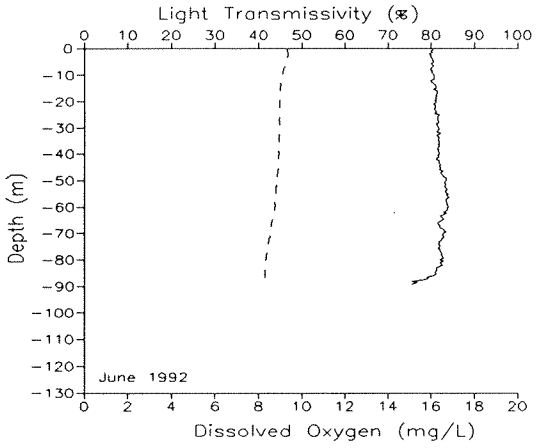
WATERYEAR 1991

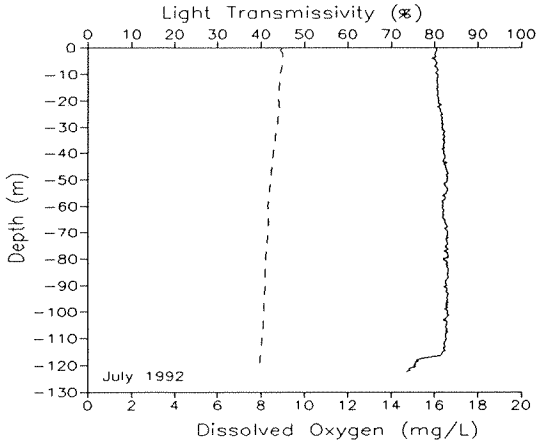
Part 2 of 2

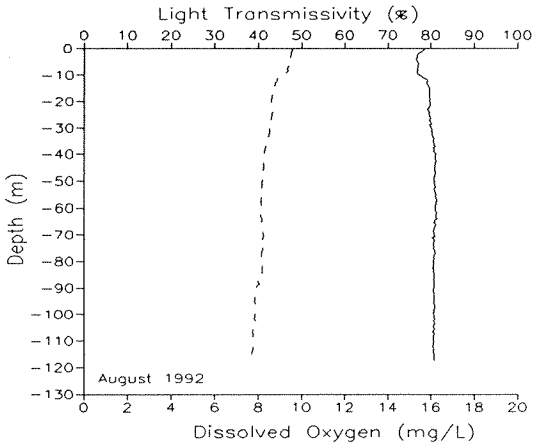
Steilacoom (Station STL001)

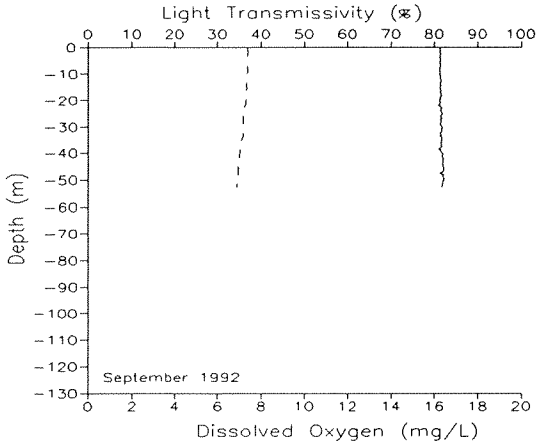








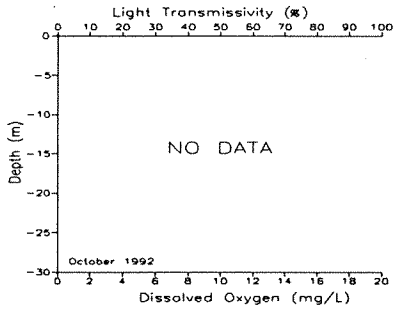


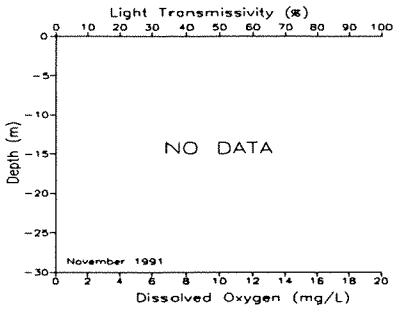


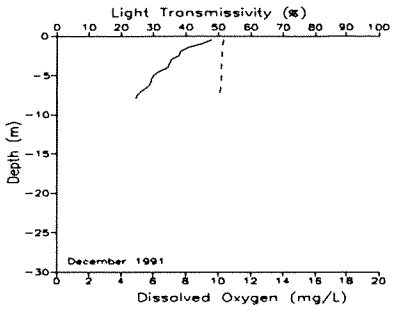
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

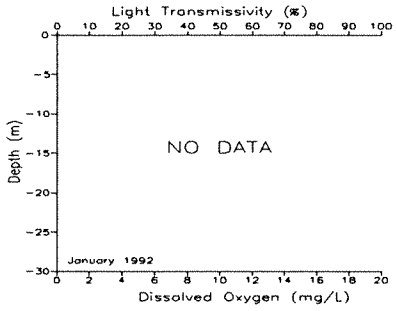
WATERYEAR 1992

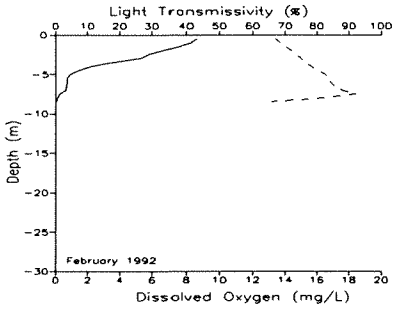
Willapa Bay - Willapa River (Station WPA001)

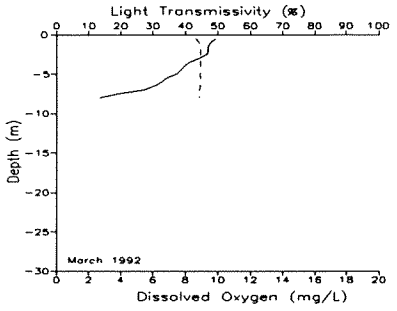


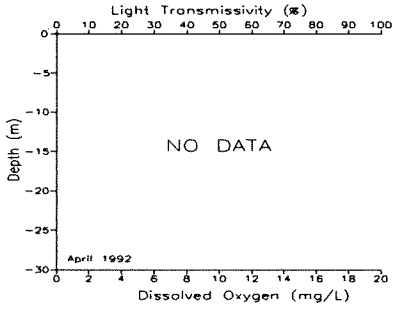


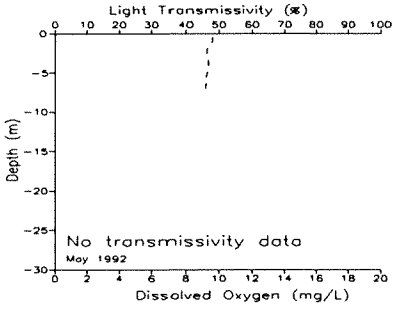


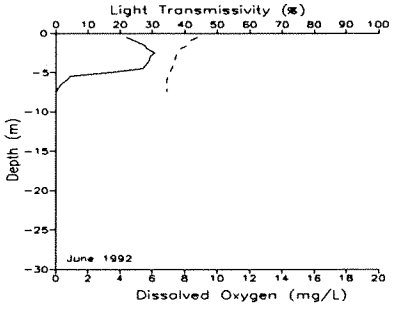


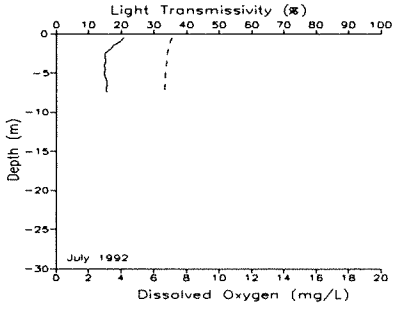


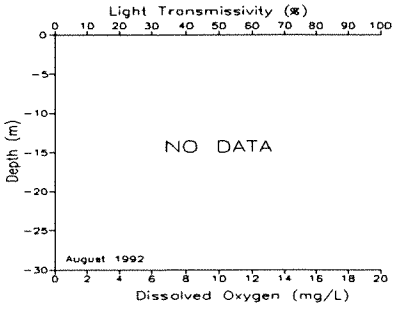


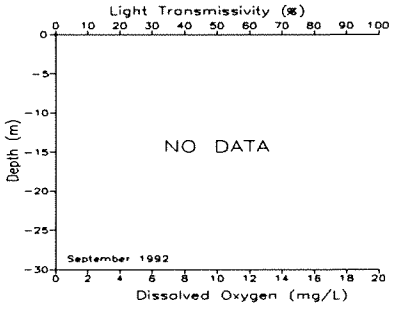








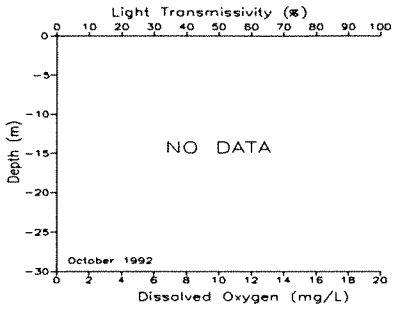


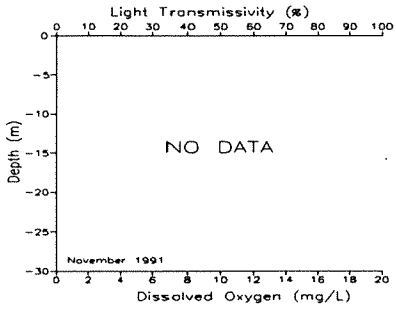


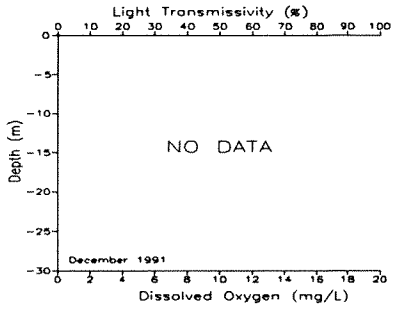
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

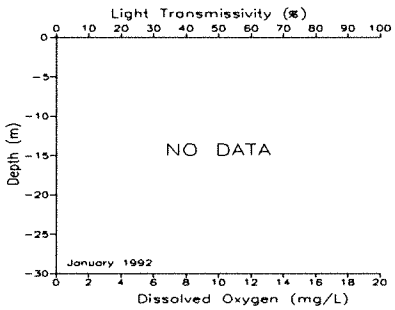
WATERYEAR 1992

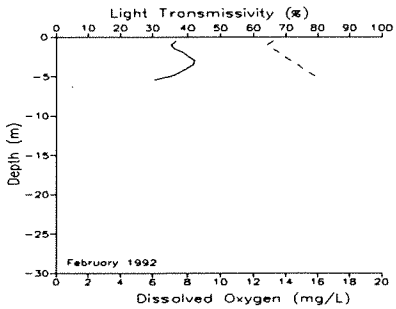
Willapa Bay - Johnson Slough (Station WPA003)

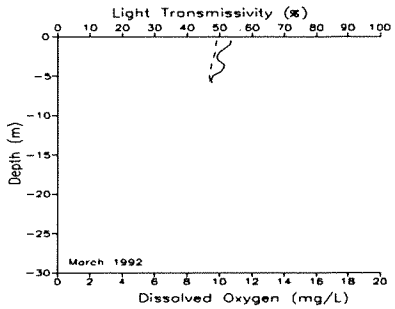


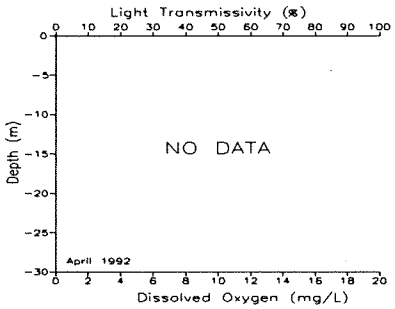


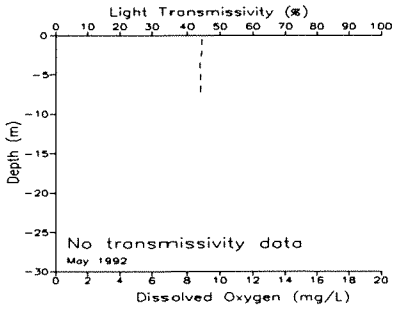


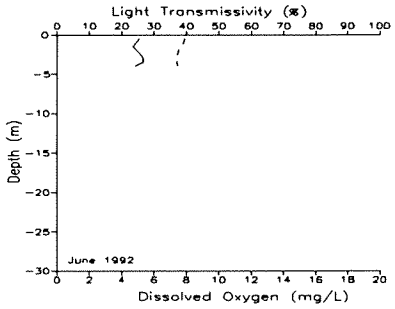


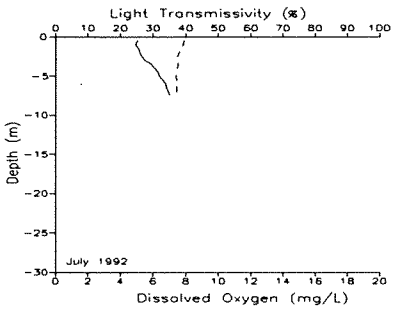


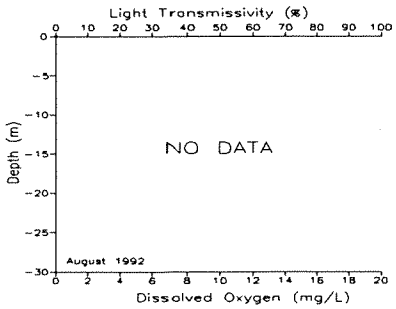


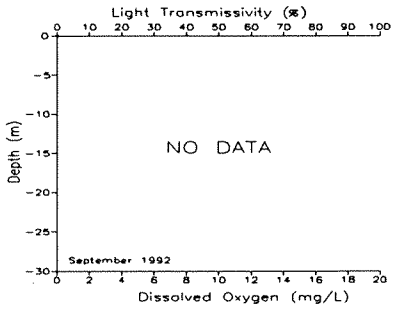








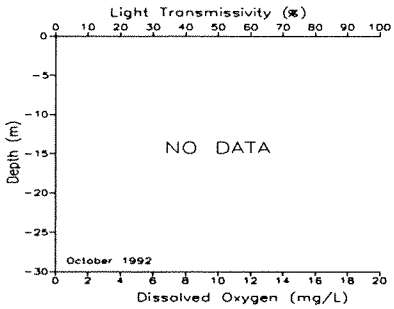


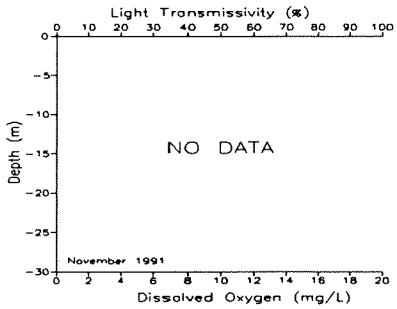


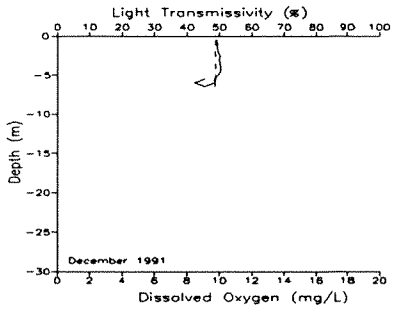
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

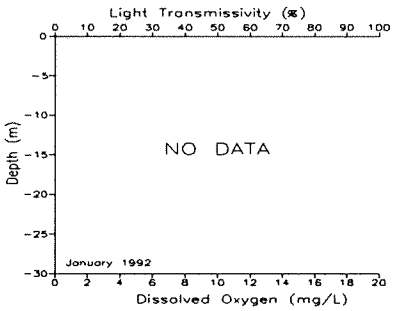
WATERYEAR 1992

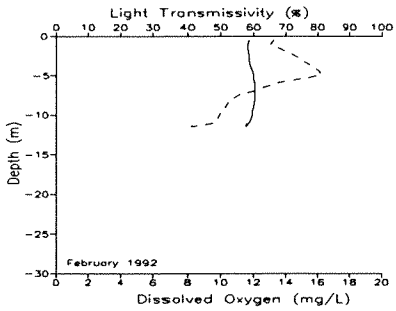
North Willapa Bay (Station WPA004)

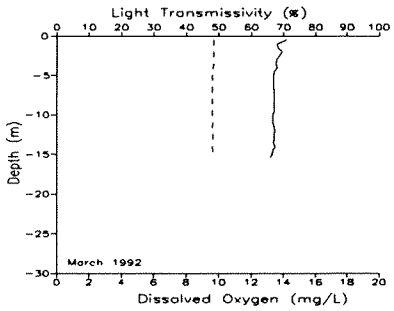


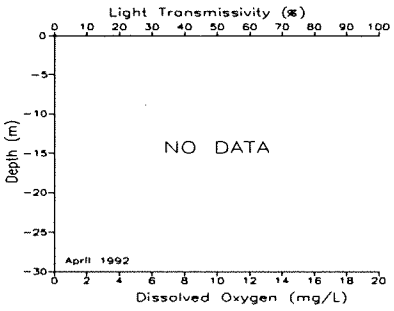


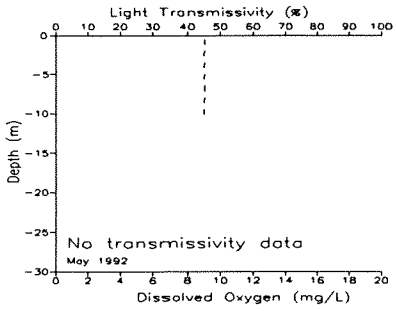


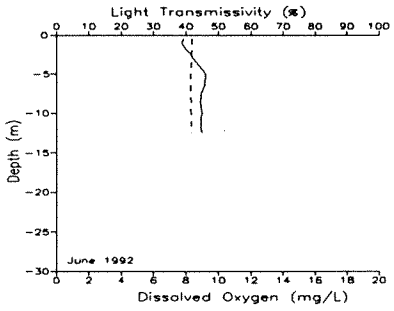


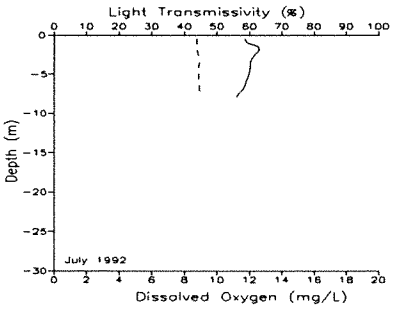


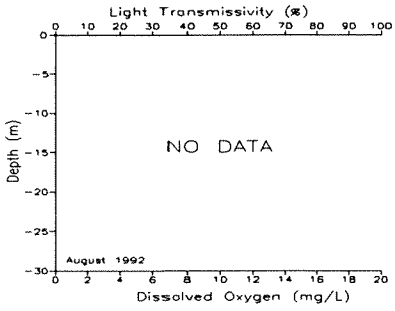


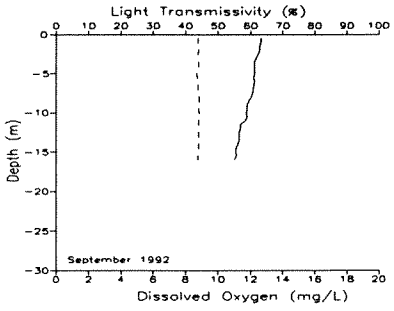








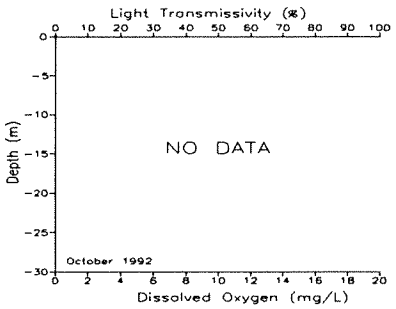


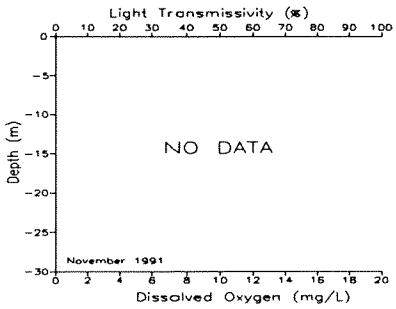


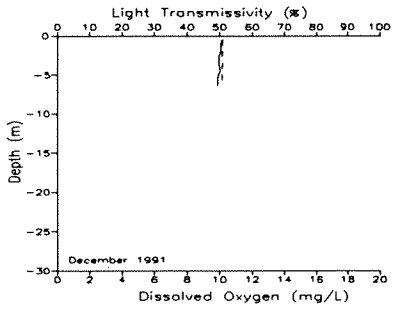
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

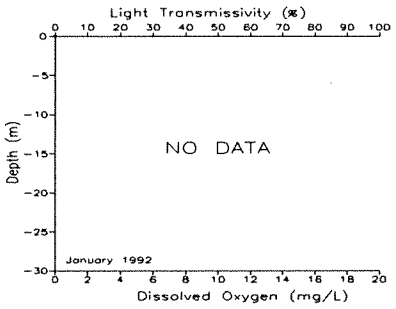
WATERYEAR 1992

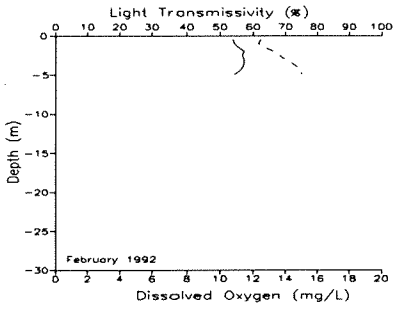
Willapa Bay - Nahcotta Channel (Station WPA006)

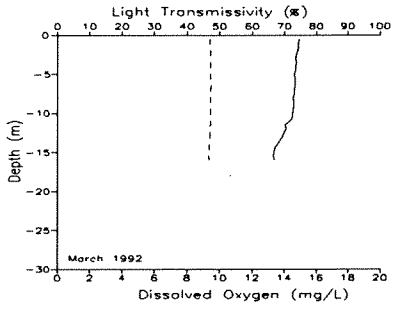


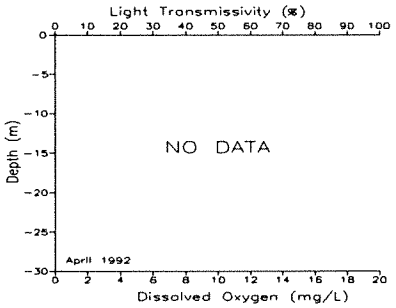


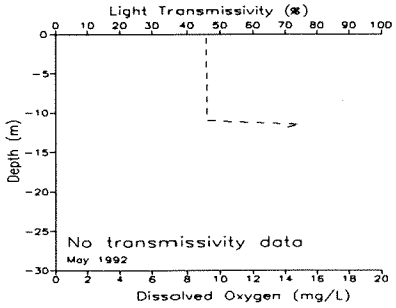


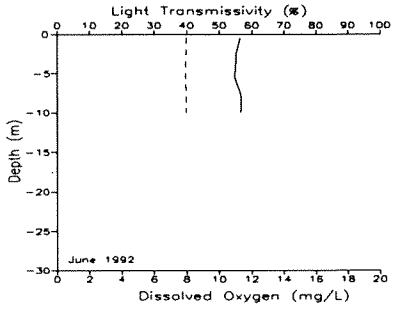


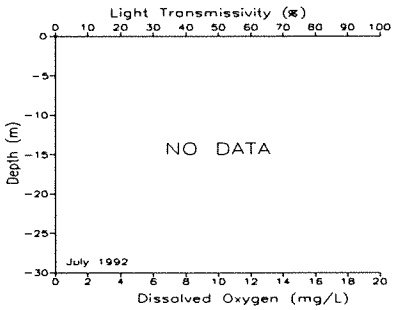


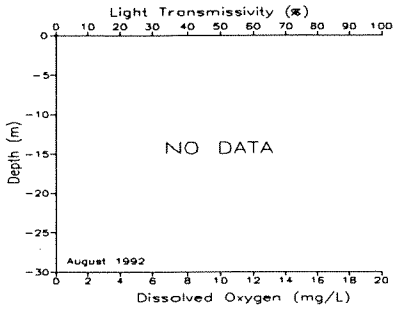


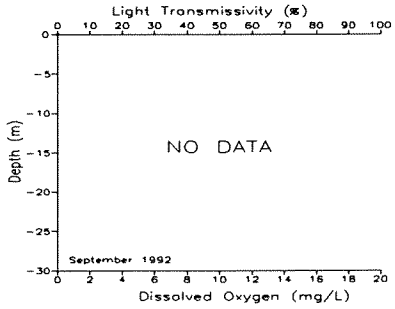








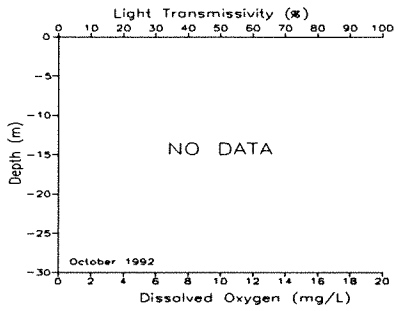


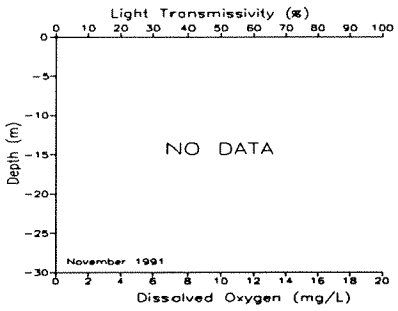


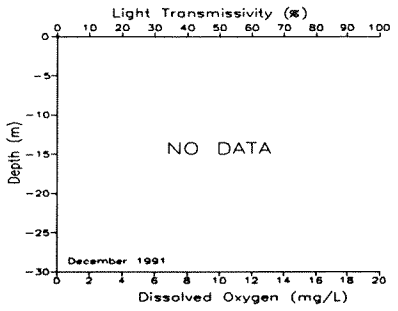
Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

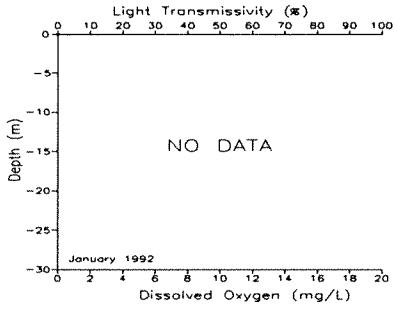
WATERYEAR 1992

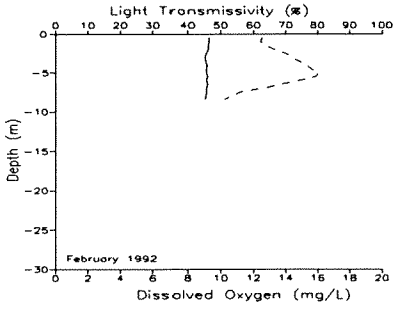
Willapa Bay - S. Jensen Pt. LI (Station WPA007)

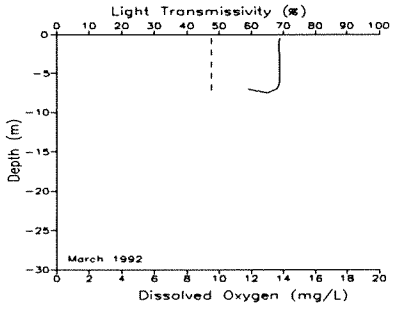


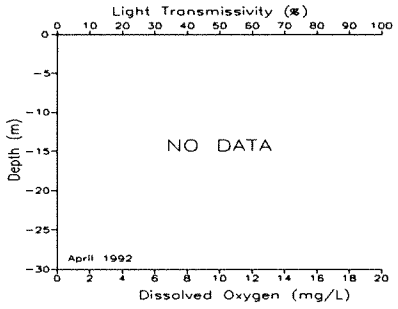


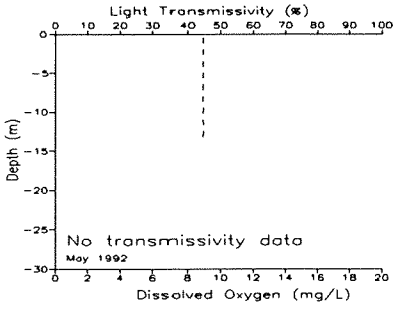


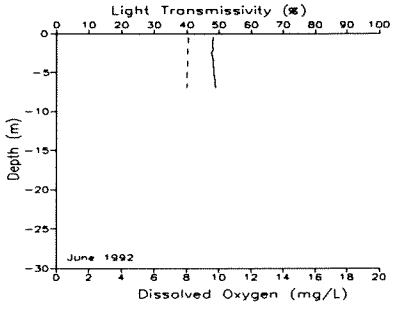


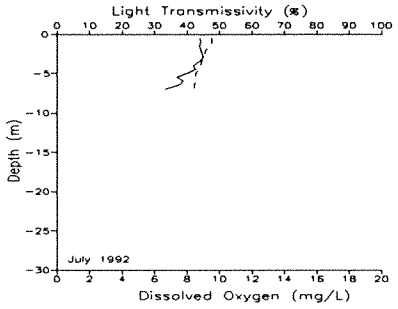


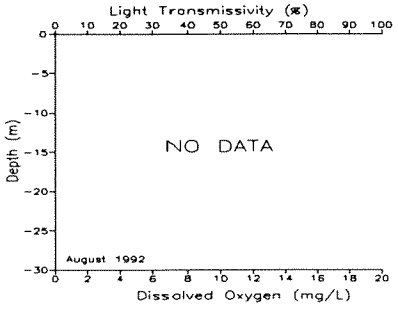


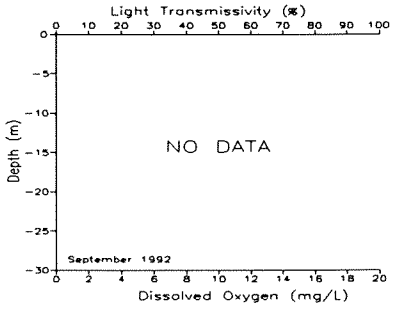












Key: Light Transmissivity = Solid Line Dissolved Oxygen = Dashed Line

APPENDIX D

1991-1992 Quality Assurance/Quality Control Assessment, Marine Water Column Monitoring Program

1991-1992 QUALITY ASSURANCE/QUALITY CONTROL ASSESSMENT MARINE WATER COLUMN MONITORING PROGRAM

by
Lisa Eisner
April 1993

Washington State Department of Ecology
Environmental Investigations and Laboratory Services Program
Ambient Monitoring Section
Olympia, Washington 98504-7710

INTRODUCTION

Quality assurance/quality control (QA/QC) procedures for Wateryear 1992 (October 1991 through September 1992) involved field replicate sampling (collecting samples from three separate bottle casts) and laboratory split sample (laboratory duplicates) analysis (splitting the chosen sample into two aliquots and conducting the analyses separately for each aliquot). Blanks, spiked samples and check standards (solutions of known concentrations) were also analyzed. The percent of data that fell below detection limits was also calculated for each parameter.

The parameters evaluated include fecal coliform bacteria, chlorophyll *a*, phaeopigments, dissolved orthophosphorous ($O\text{-}PO_4$), dissolved ammonia (NH_3), and dissolved nitrite-nitrate ($NO_2\text{-}NO_3$). The dissolved nitrite (NO_2) QA evaluation was limited since 95 percent (%) of the data were below detection limits (BDL).

METHODS

QA/QC procedures used in this assessment were the same as those conducted during Wateryear 1991 (Janzen and Eisner, 1993), except pooled standard deviation calculations were not performed. There were, however, four different QA/QC sampling and analysis methodologies performed during Wateryear 1992:

1. Field replicate samples were collected at the same stations each month instead of at randomly selected stations. This allowed better estimates of the variability in nutrient parameters because we could choose sites where we expected results to be above reporting limits. Randomly selecting stations results in a greater proportion of the data reported as BDL.

2. Field split sample collection (splitting the bottle cast into separate sample containers for individual analyses) was not conducted.

3. Beginning in June 1992, chlorophyll *a* samples were filtered by field staff at the end of the survey day as opposed to being filtered by laboratory staff the following day. This change in procedure provided more immediate sample preservation. Chlorophyll *a* and phaeopigment RSDs (relative standard deviations or coefficient of variance) were only calculated for laboratory filtered sample results (data from October 1991 through May 1992). There were too few chlorophyll *a* QA samples that were field filtered (data collected from June through September 1992) to effectively evaluate these RSD results.

4. Nitrite analysis was discontinued at all but three stations beginning May 1992 since 94% of the Wateryear 1991 data were BDL.

RESULTS AND DISCUSSION

Precision

The precision of QA/QC data was estimated by calculating the RSDs of field replicate and laboratory split (duplicate) sample results. The field replicate results provided an estimate of total variability due to both sampling and analytical procedures. The laboratory split sample results provided an estimate of analytical variability. BDL data for all parameters (excluding fecal coliform bacteria) were not included in the RSD evaluation. Detection limits were 0.01 milligrams per liter (mg/L) for nutrients and 0.05 micrograms per liter (μg/L) for chlorophyll *a* and phaeopigments. (Milligrams per meter cubed (mg/m^3) is equivalant to μg/L.) Table 1 shows the percent of data that fell within various RSD ranges. The target RSD ranges were based on the Ambient Marine Water Column Monitoring Plan (Janzen, 1992) and were 10% RSD for nutrients and 20% for fecal coliform bacteria, chlorophyll *a*, and phaeopigments. These ranges are shaded in Table 1.

Results from Table 1 indicated that laboratory split sample results had better estimated precision than field replicate sample results for NO_2-NO_3, NH_3, and chlorophyll *a*. Laboratory split and field replicate samples showed approximately the same estimated precision for O-PO_4 and fecal coliform bacteria results. Overall estimated precision for phaeopigment results appeared better for field replicate samples than for laboratory split samples if all data with RSDs less than 20% were considered. However, estimated precision for phaeopigment results appeared better for laboratory split samples than for field replicate samples when data with RSDs less than 10% were evaluated.

Estimated precision for all parameters was expected to be better for laboratory split samples than for field replicate samples since field replicate samples were influenced by both field

and laboratory variability. However, another factor affecting precision estimates is the number of sets of replicates used in the RSD calculation, since better precision is obtained as the number of sets of replicates increases (S. Lombard, pers. comm., 1993). For nutrients, chlorophyll *a* and phaeopigments, there were generally at least twice as many sets of laboratory splits as there were field replicates. Therefore, the difference between the estimates of total and analytical precision may be partially due to the fact that there were more sets of laboratory split samples than field replicate samples.

Fecal coliform bacteria data showed the poorest estimated precision for both laboratory split and field replicate results and should be interpreted with caution.

To determine if precision estimates were influenced by sample concentration, RSD values were plotted against parameter concentration for nutrients and chlorophyll *a* (Figures 1, 2, 3 and 4). Results showed estimated precision was generally worse for values closer to detection limits. Poor estimated precision at low parameter concentration was most pronounced for NO_2-NO_3, chlorophyll *a* and fecal coliform bacteria results. Therefore, RSD values for these three parameters were tabulated in two separate ranges (Table 2). (Note: Since the RSDs for fecal coliform bacteria were the same for many of the replicates, all the points plotted on top of each other, therefore, the graph for fecal coliform bacteria RSDs did not represent the results clearly, and therefore was not included.)

Results from Table 2 indicated that NO_2-NO_3 estimated precision was much better at concentrations above 0.10 mg/L for both field replicate and laboratory split samples. Chlorophyll *a* estimated precision was higher at values above 1.0 μg/L, particularly for field replicate samples. Fecal coliform bacteria RSD data were difficult to interpret, since at low concentrations, the RSD values were very large when there was a difference of only one or two organisms per 100 milliliters (org/100 mL).

Accuracy

Accuracy of the nutrient laboratory methods was estimated by evaluating results from check standard analyses. Check standards are control solutions of known concentration. Check standard results (Table 3) indicated good accuracy for all nutrient parameters. However, the range of the percent error was larger for the low (0.075 mg/L) check standard than for the high (0.500 mg/L) check standard. For Wateryear 1991, 90% of the ambient data fell below 0.041 mg/L for NH_3, 0.074 mg/L for O-PO_4, and 0.410 mg/L for NO_2-NO_3 (Eisner, memo to D. Thomson, 1991). For Wateryears 1991 and 1992, 94% and 95% (respectively) of the NO_2 ambient data fell below the detection limit of 0.01 mg/L. The lowest check standard concentration (0.075 mg/L) was much higher than typical marine NH_3 and NO_2 values, at the high end for typical marine O-PO_4 values, and at the mid to low end for typical marine NO_2-NO_3 values measured in the field. Therefore, the accuracy of laboratory methods for low concentration nutrient samples was difficult to determine.

Spiked Samples

Spiked sample results indicate the bias (systematic error) of procedures and instrumentation used in nutrient analyses. This analysis involves determining the concentration of a nutrient sample, then adding a spike (a control solution of known concentration) to the sample and determining the concentration again. The percent recovery was calculated by subtracting the nutrient sample concentration from the concentration of the nutrient and spike sample when analyzed together. This value was then divided by the spike concentration (D. Thomson, Personal Comm., 1993).

$$\frac{\text{(sample concentration + spike concentration) - sample concentration}}{\text{spike concentration}}$$

The spiked sample recovery results (Table 4) showed good average percent recovery for all parameters (within +/-30%). However, the range of percent recovery results for the NO_2-NO_3 spiked sample ran on September 22, 1992 was slightly above the accepted range of 70-130%, with a 146% recovery. NO_2-NO_3 sample results from the September 22, 1992 analyses could have a positive bias, therefore, the results were qualified as estimated values (J quality code).

Below Detection Limit (BDL) Data

Table 5 lists the percent of data for each parameter from Wateryear 1992 that fell below detection limits. NO_2 was discontinued at most stations beginning in May 1992 due to the majority of BDL results during Wateryear 1991 (Janzen and Eisner, 1993). NO_2 results during Wateryear 1992 (95.3% BDL) also supported this procedural change.

Chlorophyll *a* and Phaeopigment Data Correction

Negative phaeopigment results were discovered for a majority of the phaeopigment data collected during July, August, and September. These negative results were likely a result of incorrect fluorometer calibration coefficients applied to the data. Calibration coefficients obtained during a later fluorometer calibration were used to back calculate phaeopigment and chlorophyll *a* results form July through September 1992 and the data from this time period were flagged as estimates (J quality code). Phaeopigment and chlorophyll *a* results from this time period were not included in any of the RSD calculations conducted for this QA assessment.

Blanks

Typically, method blank results are used to zero the instrument throughout a batch of sample analyses. Average method blank results during Wateryear 1992 were low for all parameters (Table 6). However, as indicated by the range of method blank values (Table 6),

the detection limit values were approached and sometimes exceeded by individual blank results. There was one very high chlorophyll *a* laboratory post method blank result (1.414 µg/L, July 6, 1992). Chlorophyll *a* sample results analyzed on the same day as this high blank result should be used with caution since the instrument was not zeroed to blank values throughout the batch run. Sample results from this day have already been qualified as estimates due to the previously mentioned calibration error.

Blank results generally represent the "noise" of the instrument. High or very negative blank results (*i.e.*, a large amount of "noise") can significantly bias sample results, particularly for samples with low concentrations. However, there were too few blanks analyzed during nutrient analysis to determine the amount of "noise" to subtract from the sample data (S. Lombard, Personal Comm., 1993).

SUMMARY

Overall data quality of Wateryear 1992 was acceptable for most parameters. Precision for nutrient parameters was better for laboratory split samples than for field replicate samples, especially for NO_2-NO_3 and NH_3. Furthermore, estimated precision of NO_2-NO_3 laboratory and field sample results was better at concentrations above 0.10 mg/L. Chlorophyll *a* precision was best at concentrations above 1.0 µg/L, especially for field replicate samples. Fecal coliform bacteria RSD results showed poor precision for both laboratory splits and field duplicates, and thus should be interpreted with caution and/or assumed to be estimates at best.

The accuracy of the methods used to analyze nutrient samples appeared to be good for concentrations above 0.075 mg/L (the lowest check standard). However, the lowest check standard concentration used for nutrient analysis was much higher than the majority of NH_3, NO_2, and O-PO_4 concentrations measured in the field. Many of the NO_2-NO_3 values measured in the field were also lower than the lowest check standard concentration. Therefore, the accuracies of low concentration nutrient results could not be determined.

Chlorophyll *a* and phaeopigment data for July, August, and September 1992 were qualified as estimates since calibration coefficients from a much later calibration were used to calculate these results.

REFERENCES

Eisner, L.B., 1991. Memo to Dave Thomson at Manchester Laboratory. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program, Olympia, WA.

Janzen, C.D. and L.B. Eisner. 1993. Marine Water Column Ambient Monitoring Program: Annual Report for Wateryear 1991. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program, publication No. 93-13, Olympia, WA.

Janzen, C. D., 1992. Marine Water Column Ambient Monitoring Plan: Final Report. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program and the Puget Sound Water Quality Authority, Publication No. 92-23, Olympia, WA.

Lombard, S., 1993. Personal Communication. Washington State Department of Ecology, Quality Assurance Office. Manchester, WA.

Thomson, D., 1993. Personal Communication. Washington State Department of Ecology, Manchester Environmental Laboratory, Manchester, WA.

TABLES

Table 1. Relative Standard Deviation (RSD) for Nutrient, Chlorophyll a, Phaeopigment and Fecal Coliform Bacteria Results (WY 1992)

	NO2-NO3 (% total)		NH3 (% total)		O-PO4 (% total)	
RSD (%)	Field Rep	Lab Rep	Field Rep	Lab Rep	Field Rep	Lab Rep
0-10	77.1%	88.9%	66.7%	80.7%	81.6%	79.2%
10-20	22.9%	8.3%	29.6%	14.0%	15.8%	19.5%
20-30	0.0%	0.0%	3.7%	1.8%	0.0%	1.3%
30-40	0.0%	1.4%	0.0%	1.8%	2.6%	0.0%
40-50	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%
50-60	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
60-70	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
70-80	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%
80-90	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90-100	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
>100	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total #	35	72	27	57	38	77

	Chl a (% total)		Phaeo (% total)		Fecals - Includes BDL Data (% total)	
RSD (%)	Field Rep (Lab Filter)	Lab Rep (Lab Filter)	Field Rep (Lab Filter)	Lab Rep (Lab Filter)	Field Rep	Lab Rep
0-10	45.9%	73.4%	20.0%	44.3%	57.6%	45.9%
10-20	25.0%	21.9%	55.0%	19.7%	0.0%	8.1%
20-30	20.8%	4.7%	10.0%	13.1%	3.0%	8.1%
30-40	4.2%	0.0%	5.0%	9.8%	9.1%	2.7%
40-50	4.2%	0.0%	0.0%	3.3%	6.1%	8.1%
50-60	0.0%	0.0%	10.0%	3.3%	0.0%	0.0%
60-70	0.0%	0.0%	0.0%	4.9%	3.0%	2.7%
70-80	0.0%	0.0%	0.0%	0.0%	3.0%	10.8%
80-90	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90-100	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%
>100	0.0%	0.0%	0.0%	0.0%	18.2%	13.5%
Total #	24	64	20	61	33	37

Shaded Areas Indicate the Target RSD Range (Janzen, 1992) for Each Parameter

Below Detection Limit Data (BDL) for Nutrients, Chlorophyll and Phaeopigments Excluded

Chlorophyll and Phaeopigment Data from June through September 1992 Excluded

Table 2. Relative Standard Deviation (RSD) for NO2-NO3, Chlorophyll a, and Fecal Results (WY 92)				
Low and High Concentration Ranges Evaluated Separately				
NO2-NO3 (% total)	Field Rep		Lab Rep	
RSD (%)	Data < 0.10 mg/l	Data > 0.10 mg/l	Data < 0.10 mg/l	Data > 0.10 mg/l
0-10	0.0%	96.5%	66.7%	94.7%
10-20	100.0%	3.6%	20.0%	5.3%
20-30	0.0%	0.0%	0.0%	0.0%
30-40	0.0%	0.0%	6.7%	0.0%
40-50	0.0%	0.0%	6.7%	0.0%
50-60	0.0%	0.0%	0.0%	0.0%
60-70	0.0%	0.0%	0.0%	0.0%
70-80	0.0%	0.0%	0.0%	0.0%
80-90	0.0%	0.0%	0.0%	0.0%
90-100	0.0%	0.0%	0.0%	0.0%
>100	0.0%	0.0%	0.0%	0.0%
Total #	7	28	15	57
Chl a (% total)	Field Rep (Lab Filtered)		Lab Rep (Lab Filtered)	
RSD (%)	Data < 1.0 mg/m3	Data > 1.0 mg/m3	Data < 1.0 mg/m3	Data > 1.0 mg/m3
0-10	43.8%	66.7%	69.2%	80.0%
10-20	18.8%	33.3%	23.1%	20.0%
20-30	25.0%	0.0%	7.7%	0.0%
30-40	6.3%	0.0%	0.0%	0.0%
40-50	6.3%	0.0%	0.0%	0.0%
50-60	0.0%	0.0%	0.0%	0.0%
60-70	0.0%	0.0%	0.0%	0.0%
70-80	0.0%	0.0%	0.0%	0.0%
80-90	0.0%	0.0%	0.0%	0.0%
90-100	0.0%	0.0%	0.0%	0.0%
>100	0.0%	0.0%	0.0%	0.0%
Total #	16	6	39	25
Fecal (% total)	Field Rep		Lab Rep	
RSD (%)	Data < 2 org/100 ml	Data > 2 org/100 ml	Data < 2 org/100 ml	Data > 2 org/100 ml
0-10	72.7%	27.3%	56.0%	25.0%
10-20	0.0%	0.0%	0.0%	25.0%
20-30	0.0%	9.1%	0.0%	25.0%
30-40	0.0%	27.3%	0.0%	8.3%
40-50	0.0%	18.2%	8.0%	8.3%
50-60	0.0%	0.0%	0.0%	0.0%
60-70	0.0%	9.1%	0.0%	8.3%
70-80	4.5%	0.0%	16.0%	0.0%
80-90	0.0%	0.0%	0.0%	0.0%
90-100	0.0%	0.0%	0.0%	0.0%
>100	22.7%	9.1%	20.0%	0.0%
Total #	22	11	25	12
Shaded Areas Indicate the Target RSD Range (Janzen, 1992) for Each Parameter				
Below Detection Limit Data (BDL) for NO2-NO3 and Chlorophyll Excluded				
Chlorophyll Data from June through September 1992 Excluded				

Table 3. Evaluation of Nutrient Lab Check Standards (Solutions of Known Concentrations) - WY92					
				Average % Error	
	Check Standard	Average Value	Range of Values	(Ave-Stand)/Stand	Range of % Error
NO2-NO3 (mg/l)	0.500	0.501	0.440 to 0.542	0.26%	-8.48% to 11.94%
	0.075	0.077	0.068 to 0.097	2.80%	-29.60% to 8.80%
NH3 (mg/l)	0.500	0.494	0.440 to 0.521	-1.30%	-4.62% to 12.00%
	0.075	0.074	0.061 to 0.091	-1.87%	-21.33% to 19.33%
O-PO4 (mg/l)	0.500	0.501	0.454 to 0.567	0.22%	-13.36% to 9.30%
	0.075	0.074	0.054 to 0.086	-0.80%	-14.53% to 27.87%
NO2 (mg/l)	0.500	0.489	0.470 to 0.518	-2.22%	-3.66% to 6.10%
	0.075	0.073	0.061 to 0.080	-2.80%	-6.00% to 18.53%

Table 4. Evaluation of Laboratory Spiked Sample Recovery For All Nutrients (WY92)		
(Spiked Samples Are Nutrient Samples with Control Solutions Added)		
	Average % Recovery	Range of % Recovery
NO2-NO3	95.6%	69.9% to 146.0%
NH3	99.5%	87.2% to 121.1%
O-PO4	102.3%	86.6% to 114.2%
NO2	99.6%	82.0% to 110.2%
Range of Acceptable Recovery is 70-130%		

Table 5. Below Detection Limit (BDL) Data For Wateryear 1992							
	Fecals	NO2-NO3	NH3	O-PO4	NO2	Chlorophyll a	Phaeopigment
# BDL	132	77	260	20	364	2	24
Total	237	670	670	670	382	542	542
% BDL	55.7%	11.5%	38.8%	3.0%	95.3%	0.4%	4.4%
All data for all parameters were included in this assessment							
Includes chlorophyll and phaeopigment results from samples that were field filtered							
Includes negative phaeopigment results (reported as BDL)							

Table 6. Evaluation of Laboratory Blanks (WY92)				
		Average Blank Value	Range of Blank Values	Parameter Detection Limit
NO2-NO3 (mg/l)		0.0001	-0.0104 to 0.0081	0.01
NH3 (mg/l)		0.0007	-0.0098 to 0.0096	0.01
O-PO4 (mg/l)		0.0004	-0.0094 to 0.0077	0.01
NO2 (mg/l)		0.0002	-0.0081 to 0.0054	0.01
Chlorophyll (mg/m3)	Pre	-0.0006	-0.113 to 0.011	0.05
	Post	0.0727	-0.055 to 1.414	
Phaeopigment (mg/m3)	Pre	0.0298	-0.021 to 0.175	0.05
	Post	0.0359	-0.121 to 0.424	

FIGURES

Figure 1. Dissolved NO2-NO3 Concentration (mg/l) Vs RSD (%) for Field Replicate and Laboratory Split Samples During WY92

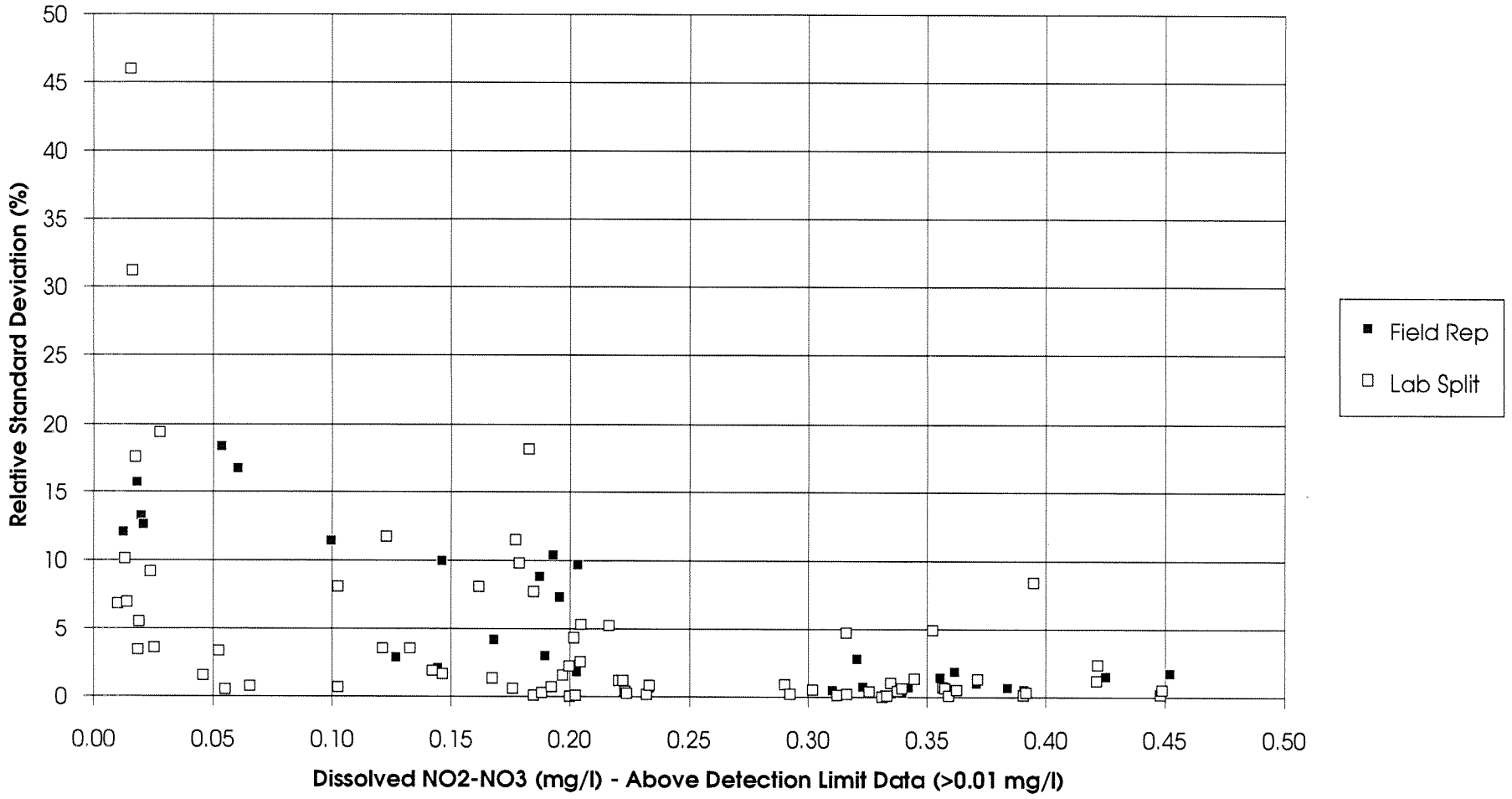


Figure 2. Dissolved NH3 Concentration (mg/l) Vs RSD (%) for Field Replicate and Laboratory Split Samples During WY92

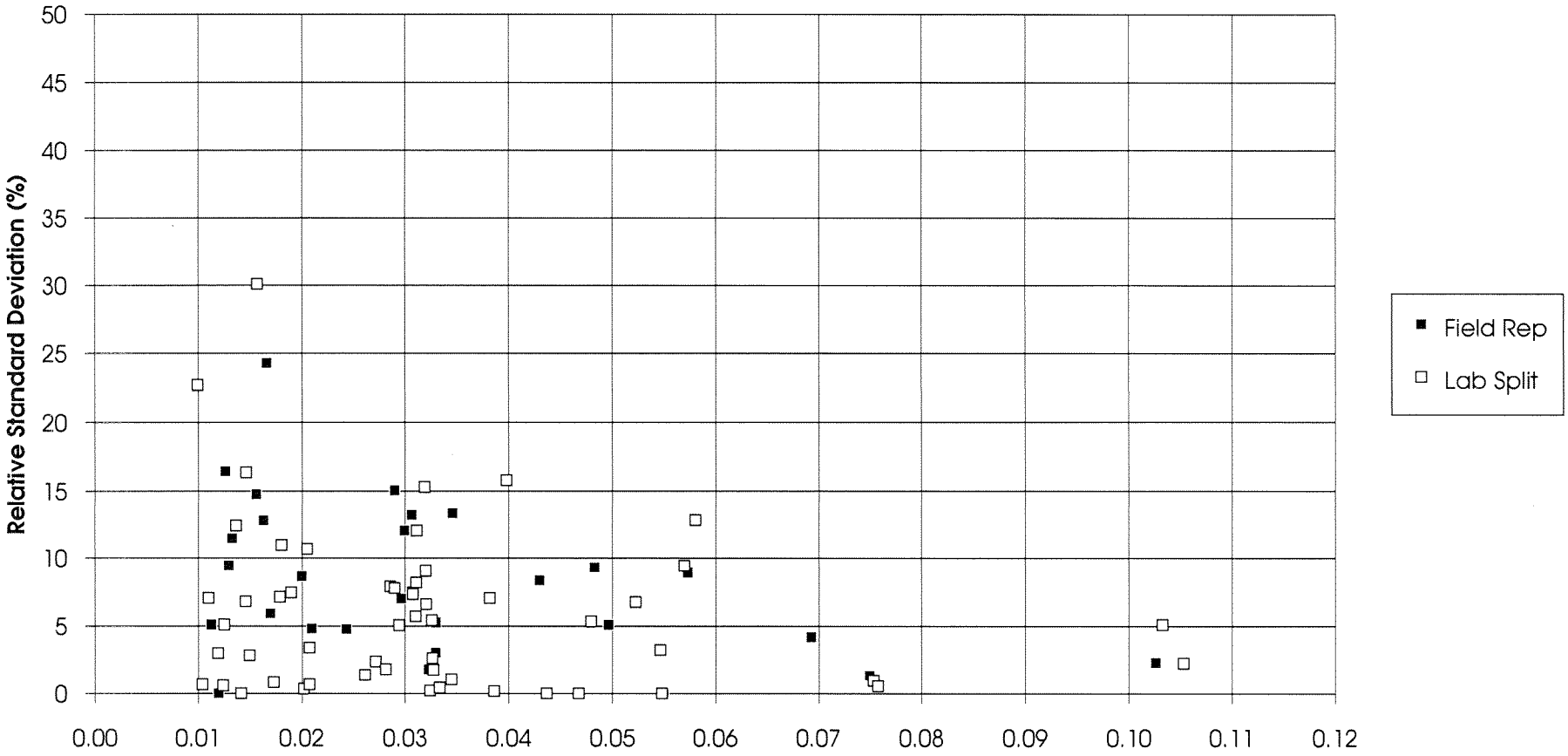


Figure 3. Dissolved O-PO4 Concentration (mg/l) Vs RSD (%) for Field Replicate and Laboratory Split Samples During WY92

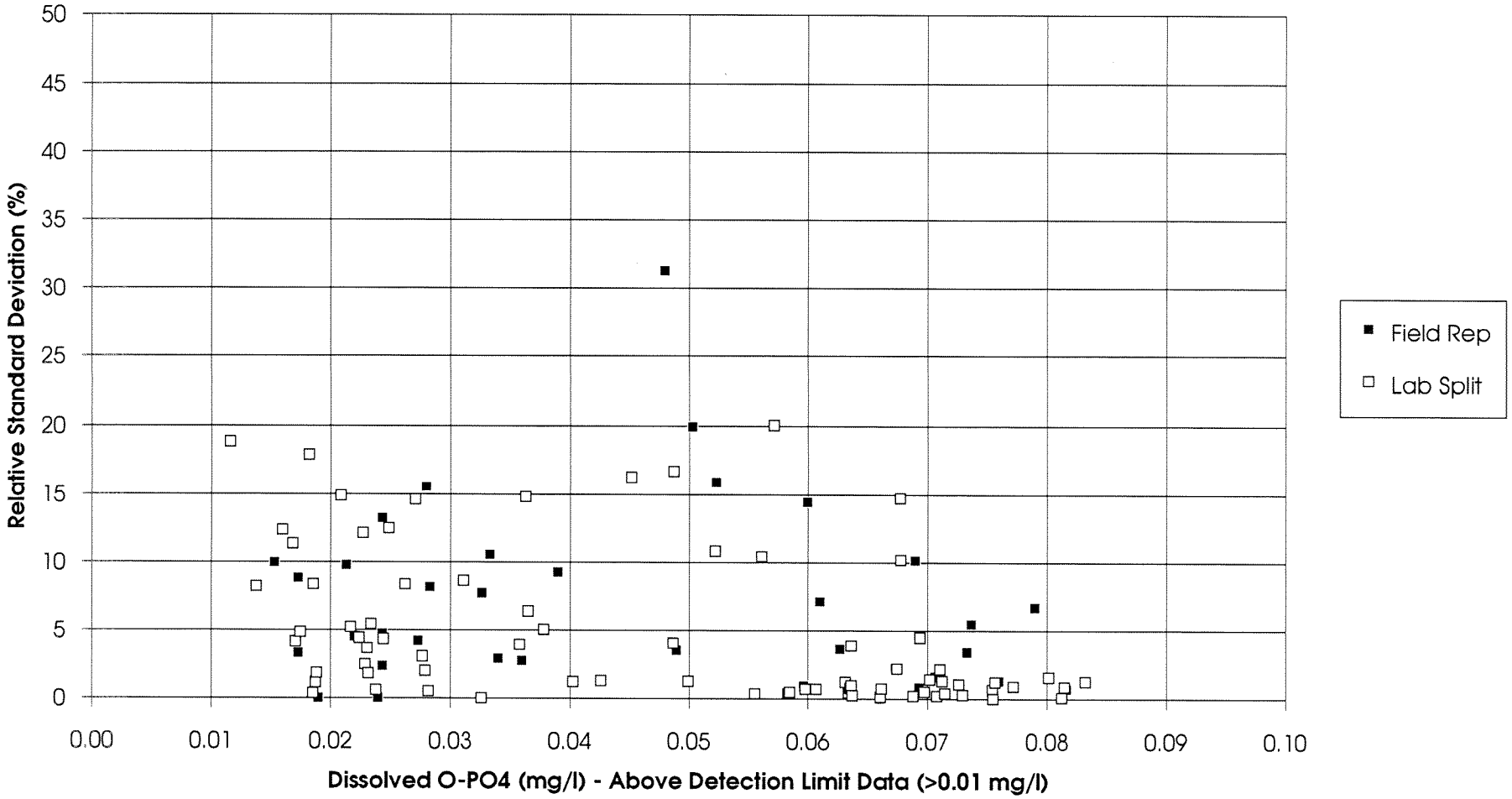


Figure 4. Chlorophyll a Concentration (mg/m3) Vs RSD (%) for Field Replicate and Laboratory Split Samples During WY92 - All Samples Lab Filtered