CRUISE REPORT

HUDSON 93039

NEWFOUNDLAND BASIN

WOCE CONTROL VOLUME AR13

5 NOVEMBER - 16 DECEMBER, 1993

A. CRUISE NARRATIVE

1. Highlights

a. WOCE Designation: Control Volume 4,
Atlantic Repeat Hydrographic Section 13 (AR13)

b. Expedition Designation: Hudson 93039

c. Chief Scientist:
R. Allyn Clarke
Ocean Circulation Division
Physical and Chemical Sciences Branch
Department of Fisheries and Oceans
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, NS, Canada B2Y 2A4

FAX 902 426 7827
Omne R.Allyn.Clarke
Internet a_clarke@bionet.bio.dfo.ca

d. Ship: CSS Hudson

e. Ports of Call: November 8-15 BIO, Dartmouth, NS, Canada
December 1 BIO, Dartmouth, NS, Canada

f. Cruise Dates: November 15, 1993 to December 17, 1993

2. Cruise Summary Information

a. Cruise Track

A cruise track is included in Figure 1. The jogs in the track were the result of various storms which passed through the region interrupting the program. This map also shows the locations of the North Atlantic Current Meter Mooring Array (ACM6) set from Oceanus in August 1993.

The station positions are shown in Figure 2. Some station numbers are indicated for clarity. The various types of stations (float deployment - X, CTD with bottles - Δ or CTD - O) are indicated. The boundaries of the station occupation region are defined by 38-47 N and 38-50 W.

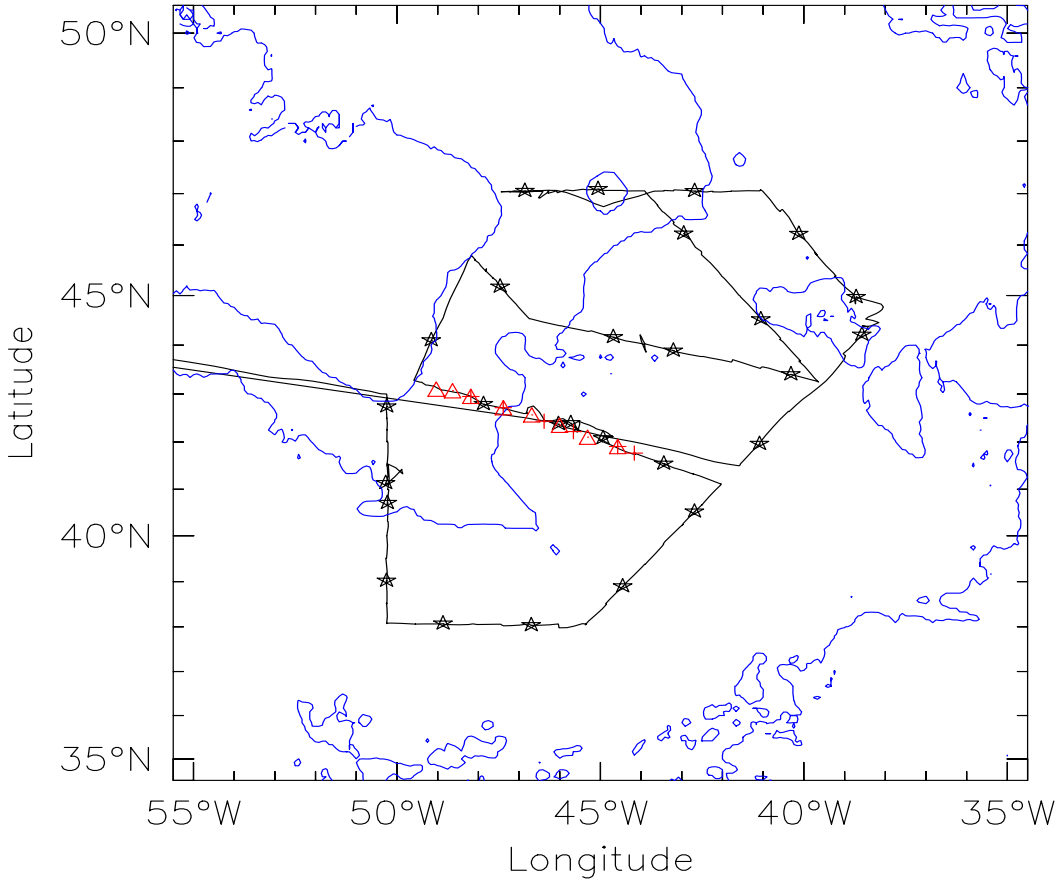

Figure 1. The study area and cruise track. The 200m and 4000m isobaths are also shown. The following symbols are used:

_ - midnight ship positions for each day in the study area. Symbol at the Tail of the Bank is on Nov. 17/93.

Δ - the North Atlantic Current Meter Mooring Array (ACM6) deployed in August/93.

+ - acoustic sound sources used by the RAFOS floats.

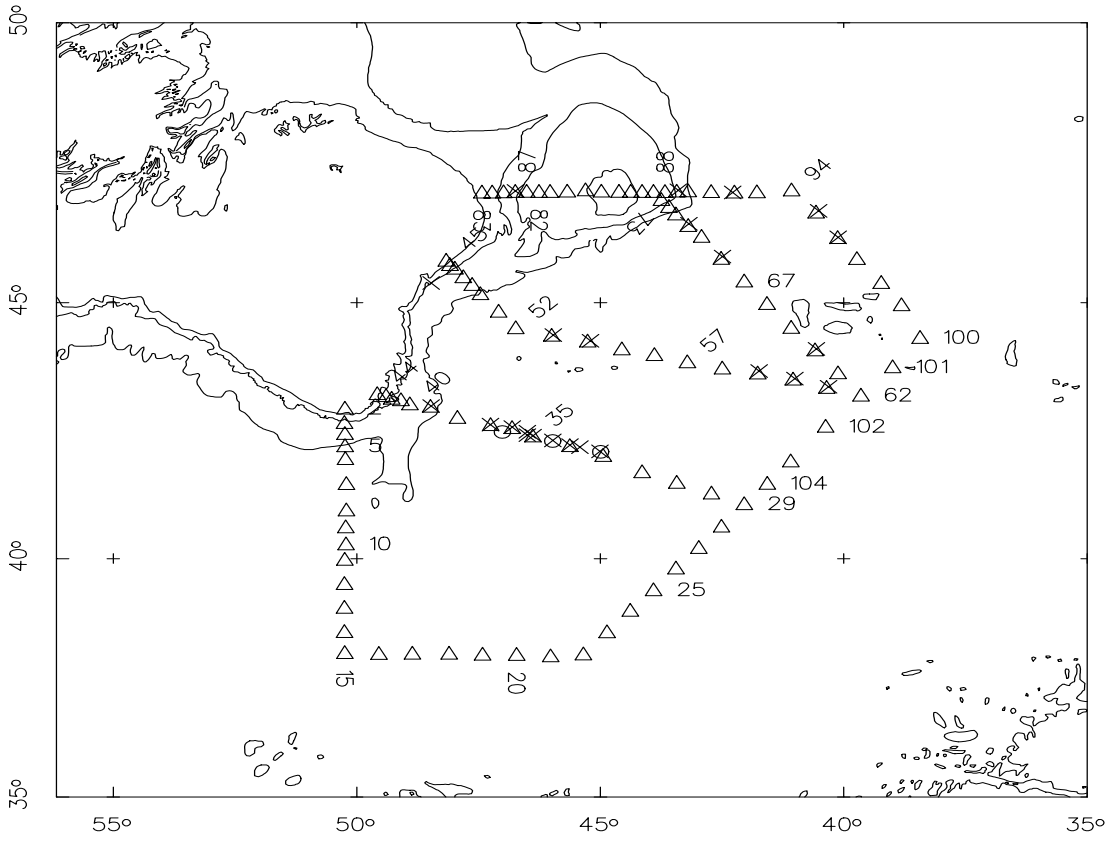

Figure 2. Detailed station locations. The 200m, 1000m and 3000m isobaths are also shown. The coastline of Newfoundland is shown in the upper left corner. The following symbols are used to identify station locations:

Δ - CTD casts with bottles

X - RAFOS float deployments

O - CTD casts with no bottles

b. Total Number of Stations Occupied

104	full depth CTD stations with up to 20 rosette samples analyzed for CFC's, carbon tetrachloride, methyl chloroform, total carbonate, alkalinity, oxygen, salinity and nutrients
3	2000 metre CTD stations without water sampling
41	RAFOS floats released
600	hours of Acoustic Doppler Current Profiler record
4400	kilometres of deep sea bathymetric sounding

c. Floats and Drifters deployed

A total of 41 RAFOS floats were released as planned on each of the four full transects of the North Atlantic Current and on a repeat transect on our homeward voyage from the eastern side of our working area. One float lost its weight on launch and failed to descend to its assigned density surface.

d. Moorings deployed or recovered

No moorings were deployed or recovered.

3. List of Principal Investigators

Name	Affiliation	Responsibility
Allyn Clarke	Physical and Chemical Sciences Bedford Institute of Oceanography a_clarke@bionet.bio.dfo.ca	CTD, salinity, shipboard ADCP
Peter Jones	Physical and Chemical Sciences Bedford Institute of Oceanography p_jones@bionet.bio.dfo.ca	oxygen, alkalinity, carbonate, nutrients, CFCs and halocarbons
Tom Rossby	Physical Oceanography University of Rhode Island tom@rafos.gso.uri.edu	RAFOS floats

4. Scientific Programme and Methods

a. Narrative

This was primarily a hydrographic survey involving a series of full depth CTD/Tracer stations spaced at 20 miles or less apart. The sections were selected to be either historical sections for which there were a number of earlier occupations or what we thought were TOPEX/POSEIDON ground paths. Unfortunately the program that we were using to predict the ground paths was in error and the actual sections occupied diverge markedly from the orbits, particularly in the north and east of the pattern.

The sections enclose four volumes of water. It is hoped that we can use the section data and the boxes to determine the splitting of the Gulf Stream, North Atlantic Current, Labrador Current and Deep Western Undercurrent within this topographically and dynamically complex region. Initial results indicate that this goal is achievable, at least in the three southernmost boxes. It was originally intended to split the southernmost box into two parts with a section crossing the Southeast Newfoundland ridge normally at a location at which the shallowest depth crossing the ridge would have been about 3100 metres. It was hoped that this section would reveal the Gulf Stream flowing eastward south of the ridge and the NA Current flowing to the west on the north side. Time lost due to weather prevented this final section, instead we reoccupied the central part of the mooring section in order to locate the core of the North Atlantic Current to set the final RAFOS floats.

The RAFOS float program is lead by Tom Rossby of the University of Rhode Island. The floats were set in and near the North Atlantic Current in order to map the lagrangian velocity fields on isopycnal surfaces in the upper pycnocline throughout the Newfoundland Basin.

5. Major Problems and Goals Not Achieved

An unexpected and long term design flaw in the rosette package itself allowed the bottles to be lifted from their pins as the package entered the water. The bottles would then fall onto their spigots, breaking them and were not repairable. This was corrected by strapping the bottles onto their bottom pins using cable ties but not before we had damaged many of our best bottles.

Many of the remaining bottles leaked; some consistently (these were replaced) and some intermittently. On many, the tops and bottoms failed to close properly and increasing the strength of the elastics or replacing the seals did not always help. We need to look critically at our bottle design over the winter.

There were problems with the firing of bottles when using Rosette #1 (model 1015-24, serial number 400). Subsequent laboratory testing revealed that the rosette would not fire properly in cold water. This rosette was used on stations 1 to 29 inclusive. The mechanical problem with the rosette was not repairable.

6. Other Incidents of Note

The hydraulics to open and close the hatch for the boom in the winch room have been destroyed. On several occasions when moving between stations, considerable spray and water entered this hatch when samples were being collected. This is a possible source of contamination of the samples as well as a discomfort to the sampling crew.

7. List of Cruise Participants

Name	Responsibility	Affiliation
Larry Bellefontaine	Watchkeeper	BIO
Gerry Boudreau	Computers/watchkeeper	BIO
Rick Boyce	Watchkeeper	BIO
Bruce Carson	CTD tech./salts	BIO
Allyn Clarke	Chief Scientist	BIO
Pierre Clement	Nutrients	BIO
Bob Gershey	CFC/Alkalinity/Carbonate	BDR Research
Mike Hingston	CFC/Alkalinity/Carbonate	BDR Research
Anthony Isenor	Data quality/watchkeeper	BIO
Peter Jones	Assistant Scientist	BIO
Francis Jordan	Watchkeeper	BIO
John Moffatt	Oxygens	BIO
Liam Petrie	Watchkeeper	BIO
Tom Rossby	RAFOS	URI
Clark Rowley	RAFOS/watchkeeper	URI
Ed Verge	Watchkeeper	BIO
Frank Zemlyak	CFC/Alkalinity/Carbonate	BIO

BIO Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, NS, CANADA B2Y 2A4

BDR BDR Research Ltd.
Box 652, Station 'M'
Halifax, N.S., Canada, B3J 2T3

B. UNDERWAY MEASUREMENTS

1. Navigation and Bathymetry — Anthony W. Isenor

The navigation system onboard CSS Hudson consists of a Trimble Navigation Loran-GPS 10X decoder and AGCNAV. The decoder receives the satellite fixes and decodes the signals to obtain latitude, longitude and time. The decoder signals are about 1 Hz. All navigation data are logged directly to a Micro VAX II. AGCNAV is a PC based display, and way-point setting software package developed at the Atlantic Geoscience Centre at BIO. The software runs on a PC and graphically indicates ship position, way-points, course, speed, etc.

The echo sounder system used for collecting bathymetric data consisted of a Universal Graphic Recorder model UGR-196C-11 connected to a hull mounted 12kHz transducer. The transducer beam width is 15 degrees. The sweep rate of the record was adjusted throughout the course of data collection to aid in identifying the bottom signal. The recorder was also linked to a clock, and thus could indicate 5 minute intervals on the sounder paper. The system was used to collect 10 minute bathymetric soundings during the occupation of AR13.

2. Acoustic Doppler Current Profiler — Murray Scotney

The Hudson was equipped with a hull mounted RDI acoustic doppler current profiler. The transducer (serial number 177) had SC ADCP electronics (serial number 172) converted for ship board use. Logging, using Transect software, was started on November 15, 1993 at 1830Z in Halifax Harbour (Bedford Basin). The configuration of the equipment results in a bin length of 8 metres and a total of 49 bins. The raw data are stored to disk and backed up every two days. Two days of logging creates about 30 Mbytes of data. The data are also averaged in real-time over 10 minute intervals and vertically over 8m bins. The first bin is centred at 18m, while the last is centred at 402m. ADCP logging was stopped on December 14, 1993 at 1817Z.

3. Thermosalinograph

No instrument was used.

4. XBT and XCTD

No XBT or XCTD probes were dropped.

5. Meteorological observations

Routine reporting of meteorological variables was carried out by the ship's crew.

6. Atmospheric Chemistry

There was no atmospheric chemistry programme.

C. HYDROGRAPHIC MEASUREMENTS - DESCRIPTIONS, TECHNIQUES AND CALIBRATIONS

1. CTD Measurements — Allyn Clarke and Anthony Isenor

a. Description of the Equipment and technique

The CTD measurements are made with a standard SEABIRD model 9Plus CTD (serial number 9P 5676-0249, BIO System #2) that is equipped with model 3-02/F temperature sensor (S/N 031376), model 4-02/0 conductivity sensor (S/N 041076), a paroscientific digiquartz model 410K-105 pressure sensor (S/N 49258) and model 13-02 dissolved oxygen sensor (S/N 130284). All but the pressure sensor are mounted in a duct through which a pump pulls sea water. Hence the water flow past the actual sensors is independent of the lowering rate; this simplifies the data processing considerably.

The Seabird CTD is mounted vertically within the BIO designed and built CTD/Rosette platform. This platform consists of a central 10 inch diameter aluminum tube which contains at its upper end a space to contain the sea unit for a General Oceanics Model 1015-24 bottle rosette unit and at its bottom end a smaller well that contains a General Oceanics model 6000 12 Khz pinger unit. The space between the central 6 inch diameter pinger well and the 10 inch outer tube is filled with lead and the bottom end of the tube is covered with a fibreglass nose cone that is acoustically transparent.

Two rosettes were used during this cruise. For stations 1 to 29 inclusive, BIO Rosette #1 (model 1015-24, serial number 400) was used. For station 30 to end, BIO Rosette #3 (model 1015-24, serial number 1348) was used. The rosette units were changed due to problems with mis-tripped bottles. Subsequent laboratory cold water tests of Rosette #1 indicated inconsistent firing of the bottle trip mechanism. The rosette was considered to be unrepairable and consequently discarded.

The CTD sea unit is held in a 6 inch diameter aluminum tube that is welded to the central tube. The CTD sensors are held in a heavy aluminum cage of approximately 6 inches in diameter which is welded to the opposite side. Around the mid point and the top of the central column are attached aluminum rings on which 20, 8 litre sampling bottles are attached. The number of bottles was set by the maximum diameter that we felt comfortable handling through the doors of our enclosed winch room on Hudson. The bottles are somewhat protected from damage by a metal band with a diameter a bit larger than the outer diameter of the bottles when they are mounted. This band is situated just below the bottom of the bottles.

The rosette bottles are of a BIO design that are now being made and manufactured by Brooke Ocean Technology, a local ocean engineering company. They differ from standard rosette bottles in that their tops and bottoms rotate about a horizontal axis to close. The energy to close the bottles is provided by stretching rubber tubing between the outside edges of the two lids along the outside surface of the bottle. This design has two advantages. First, the tubing is not inside the bottle either before or after the water sample has been captured. Second, the tubing is applied after the bottle is cocked in the rosette tripping mechanism and hence one doesn't have to fight the pull of the tubing when cocking the rosette.

b. Sampling Procedure and data processing techniques

The CTD is deployed with a lowering rate of 60 metres/min (40 metres/min in the upper 200 metres or deeper if the conditions are rough). It is recovered at a rate of 90 metres/min (40 metres/min when deeper than 4000 metres or when conditions are rough)

The CTD data is recorded onto disk by a 486 computer using SEABIRD SEASOFT Version 4.018 software. A screen display of temperature, oxygen and salinity profiles vs pressure are used to decide the depths at which bottles are to be tripped on the up cast. The bottles are tripped using the enable and fire buttons on the SEABIRD deck unit. During post-processing, the SEASAVE software stores 35 scans at each bottle trip within a separate file.

At the end of the station, all the data and header files associated with the station are transferred immediately via ethernet to a second 486 computer. The SEASAVE software is used on this second machine to create 1 and 2 dbar processed data files, an IGOSS TESAC message and a processed rosette trip file. All the raw and processed data files associated with the station are then transferred to the ship's MicroVax computer for archive and subsequent access and distribution to various users on the vessel. All TESAC messages are placed on the GTS after cruise completion.

The data processing takes the following steps:

DATCNV Converts the raw data to physical parameters.

SPLIT Splits the data into DOWN and UP cast.

WILDEDIT For every block of 12 scans, flags all scans whose pressure, temperature, conductivity and oxygen values differ from the mean by more than 2 standard deviations. Recomputes mean and

standard deviation from unflagged data then marks as bad all scans exceeding 4 standard deviations from these new values.

FILTER Low pass filter pressure and conductivity channels to time match parameters for salinity computation. Time constant used for conductivity is 0.045 seconds, for pressure 0.150 seconds.

LOOPEDIT Marks as bad, all cycles on the down trace for which the vertical velocity of the CTD unit is less than 0.1 metres/sec.

ALIGNCTD Aligns the temperature, conductivity and oxygen values relative to the pressure values accounting for the time delays in the system. Time offsets of 0.010 secs for conductivity, 0.000 secs for temperature and 3.000 secs for oxygen are used.

CELLTM A recursive filter used to remove the thermal mass effects from the conductivity data. Thermal anomaly amplitude and time constants of 0.0300 and 9.0000 were used.

DERIVE Computes oxygen values.

BINAVG Averages the down cast into 1 or 2 dbar pressure bins. (Note: The procedure to produce the 2 dbar averages takes about 5% of the total processing time).

DERIVE Computes salinity, potential temperature and $sigma_{theta}$.

c. Calibration data

The CTD calibrations used during this cruise were supplied by Seabird Electronics and are as follows:

Conductivity Sensor 041076 (All stations)

$$\text{Conductivity} = (af^m + bf^2 + c + dt)/[10(1-9.57(10^{-8})p)]$$

where f is the frequency
m = 4.1
p is pressure in dbars
t is the temperature

a = 2.21442246e-5
b = 5.67193159e-1
c = -4.19781901
d = -1.23661793e-4

Temperature Sensor 031376 (All stations)

$$T = 1/\{a + b[\ln(f_o/f)] + c[\ln^2[f_o/f] + d[\ln^3(f_o/f)]\} - 273.15$$

where ln indicates a natural logarithm
f is the frequency
a = 3.68093833e-3
b = 6.00726775e-4
c = 1.51819564e-5
d = 2.19535579e-6
f_o = 6482.31

Pressure Sensor 49258 (All stations)

$$\text{pressure} = c\,(1 - T_o^2/T^2)\,(1 - d[1 - T_o^2/T^2])$$

where T is the pressure period
$c = c_1 + c_2\,U + c_3\,U^2$
$d = d_1 + d_2\,U$
$T_o = T_1 + T_2\,U + T_3\,U^2 + T_4\,U^3 + T_5\,U^4$
U is the temperature
c_1 = -26446.08 psia
c_2 = -5.19681e-1 psia/deg C
c_3 = 8.16840e-3 psia/deg C^2
d_1 = 0.033189
d_2 = 0
T_1 = 30.78782 micro sec
T_2 = -5.31736e-4 micro sec/deg C
T_3 = 4.68447e-6 micro sec/deg C^2
T_4 = -4.55823e-10 micro sec/deg C^3
T_5 = 0

Oxygen Sensor 130284 (All Stations)

oxygen = A B C

where $A = \{Soc [oc + Tau\ d(oc)/dt] + Boc\}$
oc is the current from the oxygen sensor
d(oc)/dt is the time derivative of oc
Soc = 2.5328
Tau = 2.0
Boc = -0.0322
oc = Mv + b
m = 2.4528e-7
b = -3.9245e-9

B = OXYSAT(t,s)
t is temperature
s is salinity

$C = e^{\{tcor [T + wt (To-T)] + pcor\ p\}}$
e is natural log base
tcor = -0.033
pcor = 1.5e-4
p is the pressure
wt = 0.670
To oxygen sensor internal temperature
T is the water temperature, where T = kv + c
k = 8.9625
c = -6.9161
v is the oxygen temperature sensor voltage signal

d. Final Post-Cruise CTD Calibrations

d.1 Temperature Calibration Temperature Sensor 031376

Thermometer racks containing two protected digital deep sea thermometers and one unprotected mercury in glass thermometer were mounted on the deepest and the fourth from the deepest rosette bottle. The CTD watches were instructed to allow these bottles to sit at the selected depth for five minutes to allow the thermometers to equilibrate to the in-situ temperature. This practice was always followed with the deepest bottle; however, because of the rosette misfiring, the upper thermometers were frequently not provided with equilibration time. However, most readings were obtained from deep within the North Atlantic Deep Water where the temperature change over the previous five minutes would be only a few tenths of a degree. Nearly all of the thermometer values are between 2.3 and 2.8^{o}C.

Results from comparision with digital thermometers are as follows:

Serial Number	Number of Values	Thermometer - CTD Median
000T345	97	-0.0101 °C[1]
000T347	95	-0.0047 °C
000T348	82	-0.0050 °C[2]
000T354	90	-0.0054 °C

Notes:

1. Thermometers 000T345 and 000T347 were paired. The median of the difference T345-T347 was -0.0043 ^{o}C.

2. Thermometers 000T348 and 000T354 were paired. The median of the difference T348-T354 was 0.0001 ^{o}C.

Both the CTD and the digital thermometers were recalibrated during the winter of 93/94. The newer calibrations were used in correcting the thermometers. The CTD temperatures were based on the pre-cruise calibration.

The precruise (17/5/93) CTD calibration shows that the CTD is reading 0.0007^{o}C low in the temperature range -2 to 5, no offset in the range 10 to 15. The post cruise CTD calibration (18/1/94) has the CTD temperature low by 0.0009^{o}C in the temperature range -2 to 5, increasing to be low by 0.0017^{o}C in the range 20-25. The comparison with the digital thermometers indicates that the CTD is reading high by 0.006^{o}C. The results from the digital thermometers are inconsistent with the pre and post cruise calibration.

Final CTD temperature correction: CTD_T no correction applied

d.2 Pressure Calibration Pressure Sensor 49258

The median differences between the thermometric pressure and the CTD pressure are as follows:

Serial Number	Number of Values	Thermometer P - CTD Median
0011745	56	-6.4 dbars
0011749	23	-2.6 dbars

Given the precision of reading an unprotected thermometer (0.02°C) and the accuracy of its calibration compared with the magnitude of the reading, we are not certain whether either difference is significantly different from zero. All of these values were obtained for pressures between 4000 and 5400 dbars. Our calibration of the CTD pressure sensor in winter 93/94 indicates that at room temperature the pressure error is less than 0.84 dbars.

Final CTD pressure correction: CTD_P no correction applied

d.3 Salinity Calibration Conductivity Sensor 041076

The pre-cruise laboratory calibration (17/05/93) shows that the CTD salinities are low by 0.0025, 0.0045 and 0.0048 for bath temperatures of 2, 10 and 20°C respectively. The post-cruise calibration (18/01/94) shows the CTD salinities are low by 0.0047, 0.0083 and 0.0087 for bath temperatures again of 2, 10 and 20°C respectively. The median value from an analysis of the water sample - CTD salinity differences suggests that the CTD salinities are low by 0.0076. Because of leaking and mis-tripped rosette bottles, the scatter about this median is quite large.

On completion of the 1994 and 1995 cruises in the same area (18HU94030 and 18HU95003), we began looking at cruise to cruise differences in the deep water temperatures and salinities. By 1995 we had replaced our rosette bottles and were no longer plagued with problems with leaking and mis-tripped rosette bottles. Our 1995 CTD data set was well constrained by the rosette samples. We wished to use this data set as a guide to the calibration of the 1993 and 1994 cruises.

In the southwest corner of our station array, the deep water T/S distributions are very tight within a given cruise. The deep water (>2500 dbars) T/S distribution (as measured by the CTD's) in the southwest corner of our array was 0.0051 less saline

in 1993 than in 1995. If we assume that this part of the ocean did not change over the 17 months separating the cruises, this suggests the CTD was reading 0.0051 low during this part of 93039. We then restricted ourselves to the same group of stations in the southwest corner and did a modal analysis of the rosette sample - CTD salinities for the samples deeper than 2500 dbars. This analysis suggested that the CTD salinity was 0.0056 low.

We then analyzed both the 1993 - 1995 CTD and the 1993 rosette samples - CTD differences as functions of station number or location, again restricting our attention to samples deeper than 2500 dbars. These analysis showed that the 1993 CTD was reading lower in salinity as time progressed; however, the scatter in the results from the individual stations were such that the changes could either be interpreted as a steady change over time or a couple of step changes followed by periods where the sensor remained steady. We ultimately decided to treat the change as steady as a function of station number. For any given station, the difference between a correction that would be estimated assuming this linear relation with station number and one assuming that the correction makes step changes and then stays constant for 30-40 stations is less than 0.001.

The CTD laboratory calibrations and the comparisons with the 1995 T/S distributions both suggest somewhat smaller corrections than the comparisons with the rosette samples. Virtually all the deep rosette samples will have been hauled through saltier upper waters and hence one might expect our leaking problems to result in the rosette samples being biassed high. Consequently we have chosen our final CTD salinity correction more consistent with the 1995 T/S distributions than the rosette samples. The final CTD calibration is:

corrected CTD salinity = uncorrected CTD salinity + 0.0049 + X * 0.000017

where X is the station number.

d.4 Oxygen Calibrations

We have no method of calibrating the oxygen sensors in the laboratory, therefore, we have to rely on fitting the CTD oxygen values to those obtained from the rosette samples. This exercise is made difficult because of the malfunctioning of the rosette itself and also because many of the bottles were not closing properly. In addition, the CTD oxygen values exhibit considerable hysteris between down and up cast.

As a first step in the calibration process, we scanned the 1 dbar down tracers to choose the appropriate level to match the level at which the rosette bottles were tripped on the up cast. The matching was done on the basis of locating the same in-

situ temperature within 50 dbars of the pressure of the rosette trip. This procedure does add an additional uncertainty into the process since the CTD can be sampling different water masses on the up cast as were sampled on the down. The resulting data set was scanned and all levels in which the difference between the rosette salinity sample and the corresponding CTD salinity from the down were removed. The 1 dbar down traces also contained levels near the surface for which the oxygen sensor had not yet stabilized. We removed all levels for which the down trace was at 25 dbars or less to remove this problem. The data was then examined using linear regressions.

Bottle oxygen - CTD oxygen (down trace) vs CTD Oxygen (down trace)

Oxygen (bot-down) = 0.5950 - (0.20269*oxygen down)

r = 0.77

Bottle oxygen - CTD oxygen (down trace) vs pressure (down trace)

Oxygen (bot-down) = -0.5054 - (.000067*pressure)

r = 0.35

Bottle oxygen - CTD oxygen (down trace) vs CTD Temperature (down trace)

Oxygen (bot-down) = -1.0365 + (0.04283*temperature down)

r = 0.70

When the regression against Oxygen is applied to the data, then 50% of the residual bottle - corrected oxygen lie between ±0.06. These residual differences were then further regressed against temperature to give:

Bottle oxygen - corrected CTD oxygen (down trace) vs CTD Temperature (down trace)

Oxygen (bot-corrected down) = -0.0321 + (0.00638*temperature)

r = 0.16

This regression has such a small r value that it does not seem wise to apply it. We will therefore correct oxygen by applying only the correction against itself.

Final CTD oxygen corrections: $CTD_{O2} = 0.79731 * CTD_{O2} + 0.5950$

(NOTE: calibration expressed as ml/l)

2. Salinity — Bruce Carson

a. Description of Equipment and Technique

Salinity samples are analyzed on one of two Guildline Autosal model 8400 salinometers. Samples are drawn in 150 ml medicine bottles. New caps, equipped with plastic liners, are placed on the sample bottles for each use.

The salinometer cell is filled and rinsed three times with sample water before readings are recorded. Two salinometer readings are recorded for every sample and standardization. If the values are fluctuating, more readings are taken.

b. Sampling Procedure and Data Processing Technique

Salinity samples are drawn into 150 ml medicine bottles after three rinses. The bottles are filled up to the shoulders and then capped with new caps with plastic liners.

Files for each separate run are prepared. These files consist of various metadata (date, cruise, lab temperature, geographic location, operator, etc.) and sample specific data such as the bath temperature, sample ID number, and average conductivity ratio. A PC based program computes the salinity using average conductivity ratio of the runs and the standard IAPSO formula. Any changes in the salinometer readings between successive standardizations is assumed to have occurred as a linear drift of the instrument. Thus, the program applies a correction to the ratios, which varies linearly with the samples analyzed. The salinity data is then placed in the water sample database.

c. Laboratory and Sample Temperatures

Full cases of samples are taken from the winch room to the GP lab where they are left for a period of at least 10 hours to equilibrate to laboratory temperature before being analyzed.

The baths in the two salinometers were kept at 21^{o}C and 24^{o}C. The salinometer which was just above the current laboratory temperature would be the one that was used for any given run of samples.

d. Replicate analysis

A duplicate salinity sample is drawn from one of the rosette bottles on every cast. Statistics of the duplicates are as follows. Statistics related to the difference in duplicate values was determined using the absolute value of the difference. The duplicate values are given in Table C.1.

Statistic	Value
Number of Duplicates	103
Minimum	0
Maximum	0.5821
Mean	0.0072
Median	0.0004
Standard Deviation	0.0576

Table C.1 Duplicate water sample salinity values.

Sample ID Number	Salinity	Sample ID Number	Salinity
130501	34.9554	130753	34.9422
130501	34.9559	130753	34.9424
130502	34.9564	130788	36.4813
130502	34.9571	130788	36.4814
130521	33.0892	130789	34.8844
130521	33.0894	130789	34.8847
130526	34.8654	130812	34.9524
130526	34.8656	130812	34.9542
130541	35.0071	130844	35.0774
130541	35.0073	130844	35.0776
130549	34.9185	130850	34.8897
130549	34.9207	130850	34.8900
130575	34.9034	130871	34.8995
130575	34.9062	130871	34.8996
130609	34.9077	130889	34.8816
130609	34.9101	130889	34.8816
130644	36.0734	130911	34.8854
130644	36.0734	130911	34.9011
130676	34.9431	130940	34.9499
130676	34.9437	130940	34.9503
130703	35.4246	130951	34.9102
130703	35.4259	130951	34.9107
130709	34.8886	130990	34.8915
130709	34.8887	130990	34.8916
130740	34.9694	131015	34.9366
130740	34.9698	131015	34.9368

Sample ID Number	Salinity	Sample ID Number	Salinity
131031	34.9048	131286	33.9684
131031	34.9050	131286	33.9687
131060	34.9523	131290	33.2231
131060	34.9523	131290	33.2232
131070	34.8995	131299	34.4532
131070	34.9006	131299	34.4538
131091	34.9089	131307	34.8539
131091	34.9093	131307	34.8541
131114	34.9509	131320	34.8569
131114	35.0222	131320	34.8573
131133	34.9546	131336	34.9053
131133	34.9552	131336	34.9055
131149	34.9078	131352	34.8662
131149	34.9079	131352	34.8664
131169	35.0347	131377	34.9224
131169	35.0365	131377	34.9225
131191	34.9143	131382	34.9034
131191	34.9165	131382	34.9041
131213	34.9371	131404	34.9051
131213	34.9375	131404	34.9058
131229	34.9160	131422	34.9052
131229	34.9162	131422	34.9077
131249	34.8761	131447	34.9186
131249	34.8764	131447	34.9197
131271	34.5481	131465	34.9556
131271	34.5495	131465	34.9596
131277	34.8056	131482	34.9162
131277	34.8061	131482	34.9162

Sample ID Number	Salinity	Sample ID Number	Salinity
131507	34.9091	131786	34.8715
131507	34.9147	131786	34.8727
131522	34.8960	131798	34.8525
131522	34.8966	131798	34.8525
131543	34.8993	131805	34.8721
131543	34.8996	131805	34.8721
131562	35.2404	131812	33.6998
131562	35.2409	131812	34.2819
131582	35.2050	131816	33.6846
131582	35.2085	131816	33.6846
131602	34.8988	131818	34.2560
131602	34.8994	131818	34.2566
131623	34.8969	131822	34.2690
131623	34.8969	131822	34.2692
131642	34.9054	131826	34.4869
131642	34.9055	131826	34.4871
131662	34.8982	131833	33.3330
131662	34.8986	131833	33.3332
131683	34.8968	131837	33.3054
131683	34.9004	131837	33.3056
131702	34.8964	131838	34.8368
131702	34.8964	131838	34.8372
131722	34.8974	131842	33.9604
131722	34.8974	131842	33.9612
131747	34.9217	131846	34.8726
131747	34.9221	131846	34.8730
131766	34.9249	131853	34.8843
131766	34.9250	131853	34.8856

Sample ID Number	Salinity
131859	34.8065
131859	34.8083
131869	33.3700
131869	33.3706
131875	34.0194
131875	34.0214
131877	34.8487
131877	34.8491
131888	34.9134
131888	34.9138
131921	34.8945
131921	34.8946
131941	34.8949
131941	34.8950
131961	34.8929
131961	34.8931

Sample ID Number	Salinity
131987	34.9346
131987	34.9348
132003	34.9115
132003	34.9119
132021	34.9000
132021	34.9004
132044	34.9253
132044	34.9256
132061	34.9020
132061	34.9026
132084	34.9535
132084	34.9537
132101	34.9340
132101	34.9344
132123	34.9045
132123	34.9045
132144	34.9203
132144	34.9231
132161	34.8951
132161	34.8955

e. Standards Used

The salinometer was standardized using IAPSO standard water, Batch P120, prepared on April 6, 1992. Standardization with a new ampoule was carried out at the beginning, middle and end of every 32 bottle case and at intermediate points during a case if instrument drift was suspected.

3. Oxygen **Pierre Clement**

a. Description of Equipment and Technique

The automated procedure to follow is based on the method developed by the Physical and Chemical Services Branch (PCS) of the Bedford Institute of Oceanography (BIO) (Levy et al. 1977).

The PCS procedure is a modified Winkler titration from Carritt and Carpenter (1966), using a whole bottle titration. In this method there is no starch indicator and a wetting agent (Wetting Agent A, BDR) is introduced to reduce bubble formation. The full description of the system and method can be found in Jones, et al. (1992).

In summary the automated titration system consists of an IBM PC linked to a Brinkmann PC800 colorimeter and a Metrohm 655 Multi-Dosimat Automatic Titrator. The PC talks to the peripherals through a Data Translation, DT2806 and three Data Translation DTX350s.

b. Sampling Procedure and Data Processing Technique

The sampling bottles are 125ml Iodine flasks with custom ground stoppers (Levy et al. 1977). The flasks volumes are determined gravimetrically. The matched flasks and stoppers are etched with Identification numbers and entered into the Oxygen program database.

For this cruise 8 litre Niskin bottles were used to obtain the original sample. Then, the oxygen subsamples are drawn through the bottles spigot with a latex or silicone tube attached so as to introduce the water to the bottom of the flask. Once the flow is started the flask is inverted to ensure that there is no air trapped in the tube, then the tube partially pinched to reduce the flow rate and the flask reoriented and filled to overflowing. The flow is allowed to continue until at least two to three volumes have run through then the flask slowly retracted with continuous low flow to ensure that no air gets trapped in the flask. The flask is then brought to the reagent station and one ml of the Alkaline Iodide and Manganous Chloride Reagents are added and the stoppers carefully inserted, again ensuring that no air gets into the flasks. The flasks are shaken then carried to the lab for analysis.

c. Replicate analysis

A duplicate oxygen sample is drawn from one of the rosette bottles on every cast. Statistics of the duplicates are as follows. Statistics related to the difference in duplicate values was determined using the absolute value of the difference. In total, 155 duplicate samples were drawn. Of these samples five (sample numbers 130711, 130733, 130743, 130754 and 130849) did not have a duplicate because one

or both values were missing or bad. The valid duplicate sample values are given in Table C.2.

Number of valid duplicates = 150
Median of [(absolute difference/sample mean concentration) * 100%] = 0.28 %

Statistic	Value (ml/l)	Value (μmoles/kg)
Minimum	0	0
Maximum	0.469	20.4
Mean	0.032	1.4
Median	0.018	0.8
Standard Deviation	0.062	2.7

Table C.2 Duplicate water sample oxygen values in μmoles/kg.

Sample ID Number	Oxygen (μmoles/kg)	Sample ID Number	Oxygen (μmoles/kg)
130503	180.8		
130503	180.8	130792	273.7
		130792	273.9
130522	317.5		
130522	318.4	130813	272.2
		130813	272.3
130525	291.6		
130525	292.0	130841	259.5
		130841	261.4
130538	291.7		
130538	292.3	130880	245.3
		130880	246.0
130557	257.6		
130557	259.4	130890	267.1
		130890	268.4
130574	269.5		
130574	270.1	130909	267.4
		130909	268.9
130599	268.0		
130599	268.5	130935	273.0
		130935	274.5
130611	272.2		
130611	272.4	130949	268.6
		130949	268.8
130644	170.7		
130644	170.7	130988	230.5
		130988	230.8
130659	248.4		
130659	248.5	130989	268.4
		130989	269.6
130673	273.4		
130673	273.6	131019	255.9
		131019	256.3
130689	265.8		
130689	265.9	131029	271.4
		131029	273.9
130786	208.8		
130786	208.8	131061	259.2

Sample ID Number	Oxygen (µmoles/kg)
131061	260.5
131071	278.8
131071	279.8
131092	271.1
131092	271.8
131106	225.2
131106	227.1
131109	272.0
131109	272.9
131127	227.0
131127	229.1
131133	274.1
131133	275.6
131141	248.9
131141	249.5
131152	272.2
131152	273.3
131165	144.4
131165	145.4
131170	288.0
131170	289.4
131180	268.1
131180	268.5
131189	262.6
131189	264.0
131199	276.9
131199	278.1

Sample ID Number	Oxygen (µmoles/kg)
131211	283.9
131211	284.5
131226	190.2
131226	190.7
131232	287.3
131232	287.3
131234	295.5
131234	297.2
131250	296.7
131250	297.0
131263	311.5
131263	312.0
131269	292.6
131269	292.8
131279	298.0
131279	299.6
131284	292.0
131284	294.1
131291	324.7
131291	324.7
131296	318.5
131296	319.0
131297	351.9
131297	353.0
131299	286.3
131299	287.3
131306	290.3
131306	291.6

Sample ID Number	Oxygen (µmoles/kg)	Sample ID Number	Oxygen (µmoles/kg)
131311	315.8	131452	296.5
131311	316.7	131452	297.0
131319	292.3	131460	183.3
131319	292.4	131460	183.7
131325	283.3	131462	280.1
131325	284.8	131462	281.7
131332	298.7	131464	280.2
131332	299.1	131464	297.8
131348	292.4	131485	269.0
131348	292.7	131485	269.0
131358	235.8	131487	281.8
131358	236.4	131487	282.4
131371	287.4	131506	275.5
131371	287.5	131506	279.1
131373	291.3	131516	272.1
131373	293.0	131516	273.5
131384	288.6	131523	282.2
131384	289.1	131523	283.9
131385	280.9	131524	282.1
131385	282.3	131524	283.5
131406	277.6	131525	270.1
131406	284.3	131525	270.6
131412	300.0	131553	283.1
131412	300.8	131553	284.6
131423	288.0	131556	213.6
131423	288.3	131556	214.0
131425	279.7	131563	281.5
131425	279.8	131563	281.5

Sample ID Number	Oxygen (µmoles/kg)
131564	222.1
131564	222.8
131588	280.4
131588	281.6
131594	225.6
131594	226.2
131605	282.8
131605	284.5
131607	279.0
131607	279.1
131623	283.0
131623	301.8
131633	286.7
131633	286.8
131643	280.5
131643	283.2
131644	200.4
131644	201.7
131663	280.1
131663	282.5
131673	281.2
131673	281.3
131686	267.3
131686	271.2
131696	238.1
131696	239.2
131703	280.7
131703	280.8

Sample ID Number	Oxygen (µmoles/kg)
131704	279.5
131704	280.2
131723	290.5
131723	290.9
131725	286.0
131725	286.3
131742	293.3
131742	294.6
131743	289.0
131743	289.1
131762	283.3
131762	283.5
131763	280.1
131763	281.6
131789	305.2
131789	306.5
131795	250.1
131795	252.4
131802	280.9
131802	281.5
131806	272.0
131806	272.9
131810	241.8
131810	244.0
131815	288.8
131815	288.8
131820	318.7
131820	319.8

Sample ID Number	Oxygen (µmoles/kg)	Sample ID Number	Oxygen (µmoles/kg)
131824	303.1	131902	287.1
131824	323.5	131902	287.4
131828	317.7	131924	283.5
131828	320.1	131924	284.8
131831	268.8	131934	290.5
131831	270.9	131934	292.4
131835	271.9	131943	282.9
131835	273.0	131943	284.8
131840	292.0	131944	282.7
131840	292.7	131944	283.0
131843	301.6	131965	282.2
131843	303.7	131965	282.8
131847	286.9	131970	294.5
131847	287.9	131970	295.7
131852	297.7	131984	281.0
131852	298.2	131984	282.1
131864	289.2	131989	284.0
131864	292.8	131989	284.3
131868	282.3	132001	285.5
131868	282.6	132001	286.5
131874	287.3	132002	285.1
131874	287.7	132002	285.8
131882	292.1	132026	279.9
131882	292.6	132026	281.2
131885	290.6	132036	239.0
131885	293.2	132036	240.4
131901	293.4		
131901	294.1		

Sample ID Number	Oxygen (µmoles/kg)	Sample ID Number	Oxygen (µmoles/kg)
132041	287.8		
132041	289.8		
132042	285.1		
132042	286.4		
132065	280.6		
132065	282.6		
132076	204.3		
132076	205.1		
132081	284.6		
132081	285.1		
132082	283.9		
132082	284.0		
132106	289.4		
132106	289.4		
132112	217.9		
132112	219.4		
132121	273.5		
132121	279.0		
132121	1602.6		
132122	278.0		
132122	278.5		
132141	282.3		
132141	284.7		
132142	280.2		
132142	280.5		
132165	280.1		
132165	280.6		
132175	184.0		
132175	184.5		

4. Nutrients — Pierre Clement

a. Description of Equipment and Technique

Nutrient concentrations are determined using a Technicon Autoanalyser II. The chemistries are standard Technicon (Silicate 186-72W, Phosphate 155-71W, Nitrate/Nitrite 158-71W) except for Phosphate which is modified by separating the Ascorbic Acid (4.0 gms/L) from the Mixed Reagent. This alteration is achieved by introducing the modified Mixed Reagent instead of water at the start of the sample stream at 0.23 ml/min. and the Ascorbic Acid is pumped into the stream between the two mixing coils at 0.32 ml/min..

b. Sampling Procedure and Data Processing Technique

Duplicate nutrient subsamples are drawn into 30 ml HDPE (Nalge) wide mouth sample bottles from 8 L Niskins. The bottles are 10% Hcl washed, rinsed once with tap water, three times with Super-Q and oven dried at >100 Degrees F.

A sample run includes six Working Standards run at the beginning and end. Duplicate Check Standards are run every 16 samples followed by blanks as a Baseline Check. These Standards are made up in 33 ppt NaCl (VWR,Analar grade) as is the wash water. The Standards are tested against CSK Solution Standards (Sagami Chemical Center, Japan).

Analog data is converted to digital, processed and statistics calculated by a Pascal 6.0 in house program (Logger) on a PC. Chart recordings, hard copy and disk copies of the data are kept for reference.

c. Replicate analysis

Duplicate samples are drawn from each rosette bottle on every cast. Statistics of the duplicates are as follows. All values are given in μ moles/kg. Statistics related to the difference in duplicate values was determined using the absolute value of the difference. Precision is determined based on the (standard deviation/mean concentration) * 100%. Duplicate values are given in Table C.3.

Statistic	Silicate	Phosphate	NO_2+NO_3
mean concentration	12.279	1.057	15.533
mean difference	0.146	0.016	0.150
median difference	0.066	0.010	0.111

standard deviation of difference	0.283	0.044	0.152
precision	2.30 %	4.163 %	0.978 %

130521	8.54	.95	7.09
130521	8.63	.95	7.26
130522	8.57	.93	6.86
130522	8.63	.96	6.99
130523	6.11	.79	4.96
130523	6.12	.84	4.92
130524	2.60	.50	1.34
130524	2.66	.54	1.36
130525	9.94	1.11	16.98
130525	10.02	1.13	16.69
130526	9.92	1.12	16.89
130526	9.94	1.12	17.07
130527	9.83	1.09	16.83
130527	9.86	1.10	16.89
130528	10.25	1.10	16.62
130528	10.33	1.13	16.91
130529	10.50	1.07	16.59
130529	10.73	1.08	16.27
130530	11.41	1.10	16.08
130530	11.45	1.12	16.17
130531	10.10	1.03	11.74
130531	10.12	1.03	11.78
130532	10.16	1.02	11.74
130532	10.55	1.04	11.53
130533	8.89	.98	8.39
130533	9.01	.97	8.28
130534	4.53	.63	3.18
130534	4.55	.64	3.11
130535	12.61	1.12	17.06
130535	13.01	1.12	16.72
130536	10.89	1.12	17.09
130536	10.93	1.12	16.89
130537	10.36	1.12	16.53
130537	10.56	1.09	16.51
130538	10.28	1.12	16.63
130538	10.28	1.10	16.70
130539	9.88	1.11	16.60
130539	9.97	1.11	16.93
130540	11.53	1.19	18.02
130540	11.68	1.18	18.28
130541	11.93	1.23	18.71
130541	11.97	1.20	18.61
130542	12.75	1.28	19.53
130542	12.79	1.31	19.31
130543	11.04	1.21	16.53
130543	11.05	1.16	16.59
130544	9.62	1.08	13.02
130544	9.69	1.08	13.01
130545	6.68	.85	10.31
130545	6.78	.88	10.49

Table C.3 Duplicate water sample values for silicate, phosphate and NO_2+NO_3, in μmoles/kg.

Sample ID Number	Silcate	Phosphate	NO2+NO3	Sample ID Number	Silcate	Phosphate	NO2+NO3
130546	1.74	.38	1.06				
130546	1.95	.37	1.14				
130547	1.57	.30	0.00				
130547	1.62	.31	0.00				
130549	15.94	1.12	16.65				
130549	16.06	1.07	16.47				
130550	16.25	1.20	17.46				
130550	16.50	1.20	17.20				
130551	16.87	1.21	17.98				
130551	17.01	1.23	18.12				
130552	16.09	1.20	18.26				
130552	16.11	1.25	18.13				
130553	16.00	1.18	18.07				
130553	16.02	1.20	17.80				
130554	12.64	1.15	17.36				
130554	12.91	1.15	17.96				
130555	11.95	1.16	17.61				
130555	12.20	1.16	17.79				
130556	11.74	1.18	17.95				
130556	11.86	1.16	18.12				
130557	11.77	1.19	18.15				
130557	11.90	1.18	18.39				
130558	11.80	1.19	18.27				
130558	11.89	1.19	18.25				
130559	12.19	1.23	18.77				
130559	12.27	1.24	18.88				

Sample ID Number	Silcate	Phosphate	NO2+NO3
130560	12.59	1.28	19.31
130560	12.73	1.29	19.94
130561	13.15	1.32	20.53
130561	13.32	1.32	20.42
130562	12.00	1.22	18.58
130562	12.05	1.20	18.45
130563	12.03	1.23	18.48
130563	12.14	1.24	18.55
130564	13.69	1.43	21.65
130564	13.90	1.41	22.32
130565	11.34	1.21	17.02
130565	11.54	1.23	17.13
130566	9.83	1.09	15.09
130566	9.84	1.10	15.09
130567	1.37	.30	0.00
130567	1.42	.28	0.00
130569	23.31	1.20	17.28
130569	23.38	1.17	17.34
130570	17.17	1.14	16.52
130570	17.30	1.13	16.45
130571	16.54	1.08	17.07
130571	16.68	1.09	17.19
130572	18.00	1.15	17.92
130572	18.11	1.15	18.12
130573	17.71	1.19	17.94
130573	17.91	1.17	18.04
130574	14.29	1.17	17.72
130574	14.47	1.19	17.72
130575	11.44	1.13	16.87
130575	11.45	1.11	17.31
130576	10.88	1.12	17.07
130576	11.06	1.14	17.27
130577	11.13	1.14	17.92
130577	11.25	1.15	17.99
130578	11.02	1.14	17.80
130578	11.04	1.17	18.03
130579	10.52	1.14	17.13
130579	10.54	1.12	17.49
130580	10.84	1.15	17.61
130580	10.95	1.15	17.56
130581	12.26	1.25	19.44
130581	12.62	1.24	19.36
130582	10.56	1.16	17.17
130582	10.65	1.16	17.29
130583	13.09	1.37	21.16
130583	13.16	1.37	21.21
130584	13.31	1.40	21.26
130584	13.38	1.38	21.05
130585	7.19	.97	15.50
130585	7.19	.98	15.55
130586	6.60	.90	9.41
130586	6.62	.90	9.44
130587	1.16	.33	0.00
130587	1.22	.30	0.00

Sample ID Number	Silcate	Phosphate	NO2+NO3
130588	1.19	.30	0.00
130588	1.27	.30	0.00
130589	21.55	1.24	18.64
130589	21.71	1.25	18.45
130590	19.19	1.24	19.07
130590	19.25	1.22	19.03
130591	17.01	1.24	18.85
130591	17.07	1.22	19.04
130593	18.37	1.31	20.17
130593	18.49	1.30	20.00
130594	13.92	1.25	19.45
130594	13.96	1.25	19.63
130595	13.50	1.25	19.56
130595	13.55	1.25	19.58
130596	12.08	1.21	19.61
130596	12.11	1.25	19.29
130598	2.31	.28	2.63
130598	2.42	.26	2.65
130599	10.71	1.19	17.88
130599	10.88	1.20	17.99
130600	10.68	1.20	17.77
130600	10.84	1.19	17.67
130602	14.10	1.54	23.02
130602	14.31	1.53	23.09
130603	14.11	1.55	22.95
130603	14.22	1.53	22.80
130604	11.26	1.44	21.90
130604	11.32	1.43	22.23

Sample ID Number	Silcate	Phosphate	NO2+NO3
130605	4.44	.72	11.68
130605	4.53	.70	11.80
130606	1.00	.16	.25
130606	1.08	.15	.36
130609	19.71	1.18	17.12
130609	19.75	1.18	17.42
130610	16.63	1.15	16.80
130610	17.26	1.15	16.92
130611	18.99	1.23	18.09
130611	19.19	1.23	18.01
130612	19.70	1.24	18.26
130612	19.85	1.29	18.31
130613	19.74	1.27	18.30
130613	19.77	1.28	18.63
130614	14.40	1.20	17.25
130614	14.65	1.20	17.40
130615	13.25	1.23	17.64
130615	13.46	1.23	17.57
130616	12.28	1.22	17.84
130616	12.32	1.21	18.08
130617	11.86	1.24	18.38
130617	12.04	1.23	18.21
130618	11.66	1.22	17.60
130618	11.68	1.19	17.80
130619	12.01	1.23	18.78
130619	12.14	1.22	18.85
130620	12.26	1.27	19.05
130620	12.35	1.27	19.38

Sample ID Number	Silcate	Phosphate	NO2+NO3
130621	12.50	1.31	19.47
130621	12.51	1.33	19.50
130622	13.25	1.42	21.15
130622	13.32	1.42	21.36
130623	14.52	1.54	23.72
130623	14.61	1.57	23.57
130624	14.70	1.57	23.67
130624	14.71	1.59	23.85
130625	6.63	.98	15.43
130625	6.64	.96	15.40
130626	2.55	.38	6.59
130626	2.59	.36	6.67
130627	1.18	0.00	.31
130627	1.19	0.00	.25
130628	1.19	.09	.25
130628	1.24	.09	.28
130629	20.28	1.14	16.83
130629	20.29	1.12	16.81
130630	16.84	1.11	16.43
130630	16.95	1.12	16.22
130631	16.68	1.16	16.92
130631	16.70	1.15	16.95
130632	17.39	1.18	18.04
130632	17.48	1.19	18.07
130633	15.64	1.22	17.81
130633	15.79	1.22	18.05
130634	12.46	1.12	17.16
130634	12.75	1.14	16.63

Sample ID Number	Silcate	Phosphate	NO2+NO3
130635	11.80	1.14	17.34
130635	11.86	1.17	17.54
130636	11.73	1.19	17.78
130636	11.88	1.16	17.91
130639	12.47	1.34	19.39
130639	12.52	1.30	19.63
130640	12.91	1.35	20.48
130640	13.00	1.38	20.21
130641	14.58	1.62	24.24
130641	14.58	1.60	24.09
130642	7.64	1.06	17.24
130642	7.77	1.07	17.30
130643	4.42	.68	11.58
130643	4.44	.70	11.58
130644	4.26	.69	11.07
130644	4.27	.67	11.19
130645	3.33	.47	7.41
130645	3.35	.46	7.43
130646	1.15	.09	.34
130646	1.28	0.00	.36
130647	1.12	0.00	.35
130647	1.13	0.00	.33
130649	19.79	1.13	16.41
130649	19.87	1.13	16.62
130650	23.28	1.19	17.32
130650	23.34	1.19	17.18
130651	21.34	1.19	17.11

Sample ID Number	Silcate	Phosphate	NO2+NO3
130651	21.45	1.17	17.25
130652	15.80	1.12	16.47
130652	15.83	1.13	16.44
130653	15.27	1.13	16.06
130653	15.32	1.12	16.32
130654	8.74	.87	13.26
130654	8.78	.89	13.26
130655	14.46	1.20	17.60
130655	14.55	1.18	17.61
130656	13.39	1.20	18.09
130656	13.40	1.20	17.95
130657	11.81	1.17	18.02
130657	11.83	1.21	17.84
130658	11.62	1.17	17.72
130658	11.68	1.20	17.63
130659	11.86	1.25	18.59
130659	11.90	1.25	18.73
130660	12.26	1.31	19.34
130660	12.45	1.32	19.23
130661	14.92	1.57	24.35
130661	14.99	1.57	24.34
130662	12.50	1.48	23.02
130662	12.60	1.44	23.15
130663	12.71	1.48	22.90
130663	12.77	1.48	23.00
130664	8.10	1.13	17.85
130664	8.14	1.14	18.03

Sample ID Number	Silcate	Phosphate	NO2+NO3
130665	1.36	.19	3.40
130665	1.38	.20	3.27
130666	1.45	.20	3.23
130666	1.51	.20	3.26
130667	1.11	.10	.62
130667	1.13	.09	.63
130668	1.20	.09	.64
130668	1.21	.10	.64
130669	35.71	1.43	20.01
130669	35.95	1.42	19.98
130670	34.01	1.43	19.97
130670	34.12	1.44	19.97
130671	16.77	1.20	17.62
130671	16.95	1.19	17.54
130672	15.90	1.22	17.85
130672	15.96	1.22	18.05
130673	18.43	1.20	17.65
130673	18.58	1.21	17.77
130674	2.18	.20	4.29
130674	2.30	.23	4.61
130676	11.93	1.19	18.34
130676	11.97	1.19	18.26
130678	10.86	1.21	19.18
130678	10.87	1.20	19.17
130679	12.94	1.33	20.82
130679	13.09	1.36	21.02
130680	14.64	1.61	25.02
130680	14.66	1.62	24.63

Sample ID Number	Silcate	Phosphate	NO2+NO3
130681	10.73	1.38	22.33
130681	10.81	1.36	21.89
130682	4.78	.72	12.99
130682	4.88	.73	12.82
130683	2.75	.39	8.03
130683	2.75	.41	8.28
130684	2.73	.37	8.05
130684	2.74	.37	8.08
130685	1.32	0.00	2.85
130685	1.47	0.00	2.82
130686	1.52	.09	3.11
130686	1.55	.10	3.08
130687	1.10	0.00	.26
130687	1.10	0.00	.36
130688	1.09	0.00	.26
130688	1.17	0.00	.28
130689	33.89	1.33	20.69
130689	33.97	1.31	20.55
130690	33.84	1.34	20.45
130690	34.03	1.35	20.46
130691	16.70	1.17	18.24
130691	16.76	1.19	18.05
130692	18.23	1.20	18.42
130692	18.28	1.21	18.37
130693	20.10	1.22	18.40
130693	20.27	1.20	18.51
130694	1.31	0.00	1.62
130694	1.40	0.00	1.76

Sample ID Number	Silcate	Phosphate	NO2+NO3
130695	15.00	1.19	18.06
130695	15.15	1.15	17.96
130696	12.97	1.16	17.93
130696	13.09	1.16	17.93
130697	12.07	1.19	18.25
130697	12.74	1.19	18.01
130698	12.10	1.29	20.23
130698	12.71	1.30	19.86
130699	11.04	1.18	18.20
130699	11.36	1.16	18.13
130700	12.08	1.31	20.08
130700	12.11	1.30	19.53
130701	13.81	1.52	23.11
130701	14.05	1.50	23.54
130702	10.67	1.39	21.34
130702	10.80	1.33	21.58
130703	11.05	1.33	21.85
130703	11.14	1.36	22.09
130704	4.51	.66	11.90
130704	4.63	.66	11.94
130705	1.78	.20	4.02
130705	1.80	.17	4.06
130706	1.46	.14	3.06
130706	1.50	.14	3.03
130707	1.04	0.00	0.00
130707	1.06	0.00	0.00
130708	1.05	0.00	0.00
130708	1.06	0.00	0.00

Sample ID Number	Silcate	Phosphate	NO2+NO3
130709	39.26	1.36	20.62
130709	39.57	1.41	20.91
130710	34.88	1.36	20.09
130710	34.96	1.35	19.94
130711	11.29	1.00	15.71
130711	11.30	1.00	16.02
130712	27.49	1.29	18.77
130712	27.55	1.30	18.81
130713	22.54	1.24	18.37
130713	22.62	1.27	18.46
130714	3.00	.34	5.70
130714	3.05	.32	5.78
130715	22.24	1.23	18.10
130715	22.36	1.21	18.44
130716	20.75	1.23	18.33
130716	20.81	1.22	18.23
130717	18.24	1.21	18.08
130717	18.38	1.20	18.52
130718	10.58	1.11	17.36
130718	10.62	1.13	17.86
130719	11.94	1.13	18.06
130719	12.02	1.13	18.06
130720	12.56	1.17	18.28
130720	12.74	1.16	18.24
130721	11.83	1.16	18.16
130721	12.34	1.18	18.22
130722	11.58	1.21	18.61

Sample ID Number	Silcate	Phosphate	NO2+NO3
130722	11.66	1.20	18.76
130723	12.69	1.32	20.49
130723	12.70	1.31	20.81
130724	11.52	1.38	21.68
130724	11.69	1.42	21.84
130725	3.44	.55	9.30
130725	3.51	.54	9.49
130726	1.47	.17	3.47
130726	1.50	.17	3.56
130727	.85	0.00	0.00
130727	.86	0.00	0.00
130728	.86	0.00	0.00
130728	.96	0.00	0.00
130729	38.65	1.35	20.33
130729	38.80	1.37	20.22
130730	33.82	1.41	19.63
130730	33.83	1.36	19.66
130731	18.98	1.15	16.69
130731	19.26	1.13	16.67
130732	27.74	1.28	18.52
130732	28.15	1.27	18.65
130733	26.19	1.25	18.11
130733	26.37	1.25	18.14
130734	9.79	1.02	15.39
130734	9.84	1.03	15.76
130735	20.54	1.22	17.98
130735	20.56	1.18	17.95
130736	19.17	1.21	18.21

Sample ID Number	Silcate	Phosphate	NO2+NO3
130736	19.26	1.21	18.15
130737	17.43	1.22	18.25
130737	17.45	1.22	18.25
130738	12.06	1.23	18.68
130738	12.27	1.24	18.76
130739	12.88	1.21	18.00
130739	12.97	1.22	18.20
130740	12.64	1.21	17.89
130740	12.66	1.19	17.94
130741	11.77	1.22	17.77
130741	11.84	1.21	17.79
130742	11.57	1.23	18.16
130742	11.70	1.22	18.07
130751	29.65	1.27	18.22
130751	29.78	1.28	18.60
130752	29.43	1.30	18.61
130752	29.50	1.33	18.69
130753	26.87	1.29	18.25
130753	27.24	1.27	18.34
130754	4.16	.56	8.79
130754	4.16	.57	8.83
130755	23.05	1.27	18.07
130755	23.12	1.29	18.20
130756	21.61	1.28	18.14
130756	21.80	1.27	18.36
130757	19.74	1.28	18.50
130757	19.82	1.27	18.17
130758	10.97	1.26	18.83
130758	11.12	1.31	18.60
130759	13.24	1.20	17.92
130759	13.38	1.20	17.94
130760	12.44	1.20	17.88
130760	12.60	1.21	17.95
130761	11.79	1.20	17.74
130761	11.84	1.21	17.96
130762	11.56	1.25	18.46
130762	11.59	1.24	18.42
130763	12.30	1.33	20.09
130763	12.33	1.35	19.92
130764	12.45	1.37	20.73
130764	12.63	1.39	20.30
130765	2.41	.34	6.72
130765	2.47	.34	6.59
130766	1.41	.12	3.41
130766	1.42	.13	3.43
130767	.77	0.00	0.00
130767	.77	0.00	0.00
130768	.77	0.00	0.00
130768	.80	0.00	0.00
130769	38.92	1.39	20.44
130769	39.10	1.39	20.63
130770	32.96	1.32	19.43
130770	33.34	1.34	19.66
130771	31.40	1.30	19.11
130771	31.43	1.32	18.99

Sample ID Number	Silcate	Phosphate	NO2+NO3
130772	22.63	1.25	18.08
130772	22.68	1.25	18.57
130773	28.15	1.26	18.52
130773	28.18	1.28	18.96
130774	1.97	.18	3.68
130774	2.10	.19	3.60
130775	21.89	1.22	18.14
130775	21.92	1.22	17.96
130776	21.56	1.27	18.33
130776	21.59	1.26	18.42
130777	18.36	1.22	18.43
130777	18.39	1.23	18.45
130778	18.52	1.23	18.45
130778	18.59	1.24	18.44
130779	10.45	1.00	15.63
130779	10.51	1.00	15.43
130780	12.22	1.20	17.68
130780	12.25	1.19	18.12
130781	11.77	1.19	18.23
130781	11.84	1.21	17.84
130782	11.68	1.26	18.78
130782	11.68	1.23	18.38
130783	11.61	1.18	18.07
130783	11.71	1.20	18.24
130784	9.86	1.24	19.18
130784	9.92	1.25	19.49
130785	4.07	.59	10.35
130785	4.11	.59	10.27

Sample ID Number	Silcate	Phosphate	NO2+NO3
130786	1.40	.15	3.57
130786	2.35	.14	3.56
130788	.84	0.00	0.00
130788	.87	0.00	0.00
130789	36.68	1.33	19.98
130789	36.72	1.34	19.85
130790	33.57	1.33	19.35
130790	34.17	1.34	19.30
130791	28.34	1.29	18.53
130791	28.45	1.28	18.55
130792	27.68	1.23	18.58
130792	27.92	1.24	18.70
130793	24.29	1.20	18.24
130793	24.44	1.24	18.07
130794	7.43	.92	14.75
130794	7.47	.91	14.72
130795	20.02	1.21	17.78
130795	20.13	1.21	17.80
130796	18.18	1.20	17.71
130796	18.22	1.19	18.12
130797	16.30	1.20	18.08
130797	16.33	1.19	17.86
130798	11.42	1.25	18.81
130798	11.49	1.25	18.75
130799	11.59	1.15	17.52
130799	11.72	1.17	17.64
130800	11.58	1.15	17.57

Sample ID Number	Silcate	Phosphate	NO2+NO3
130800	11.60	1.16	17.95
130801	11.50	1.19	18.08
130801	11.63	1.24	18.17
130802	12.17	1.29	19.13
130802	12.21	1.29	19.28
130803	12.65	1.37	20.62
130803	12.66	1.37	20.43
130804	12.90	1.41	20.55
130804	12.94	1.40	20.49
130805	13.69	1.53	22.95
130805	13.71	1.52	23.31
130806	4.14	.66	11.00
130806	4.14	.64	11.05
130807	1.33	.19	3.57
130807	1.38	.17	3.59
130809	36.31	1.34	19.65
130809	36.33	1.35	20.25
130810	28.84	1.25	18.86
130810	28.87	1.26	18.62
130811	29.72	1.28	19.08
130811	31.04	1.30	19.03
130812	24.56	1.24	18.18
130812	24.89	1.24	18.11
130813	25.03	1.24	18.01
130813	25.07	1.24	18.05
130814	6.47	.76	12.03
130814	6.60	.75	12.05
130815	21.32	1.21	17.79
130815	21.36	1.23	18.08
130816	19.08	1.21	18.20
130816	19.09	1.22	18.08
130817	16.70	1.18	17.66
130817	16.76	1.19	17.83
130818	11.44	1.20	18.30
130818	11.48	1.21	18.34
130819	12.37	1.17	17.68
130819	12.41	1.17	17.54
130820	11.90	1.18	17.91
130820	11.94	1.17	17.72
130821	11.31	1.19	17.91
130821	11.40	1.19	17.86
130822	11.47	1.21	18.48
130822	11.56	1.22	18.41
130823	12.94	1.36	20.50
130823	13.01	1.38	20.61
130824	8.54	1.16	18.00
130824	8.56	1.14	18.17
130825	1.92	.27	5.55
130825	2.03	.28	5.44
130826	.97	.09	1.79
130826	.99	.08	1.78
130827	1.07	0.00	.64
130827	1.08	0.00	.63
130828	1.07	0.00	.62
130828	1.08	0.00	.67

Sample ID Number	Silcate	Phosphate	NO2+NO3
130829	37.57	1.39	19.97
130829	37.83	1.38	19.90
130830	31.54	1.29	18.87
130830	31.62	1.31	18.95
130831	15.95	1.14	17.43
130831	16.01	1.14	17.23
130833	22.15	1.21	17.51
130833	22.18	1.20	17.20
130834	10.08	.89	13.33
130834	10.40	.91	13.64
130835	18.29	1.19	17.54
130835	18.31	1.20	17.71
130836	17.13	1.20	17.80
130836	17.18	1.20	17.75
130837	16.03	1.20	17.70
130837	16.10	1.20	17.83
130838	11.94	1.17	17.43
130838	11.97	1.17	17.31
130839	11.63	1.16	17.24
130839	11.64	1.16	17.11
130840	11.85	1.18	17.47
130840	11.88	1.19	17.56
130841	11.48	1.22	18.11
130841	11.52	1.21	17.83
130842	11.55	1.25	18.83
130842	11.61	1.23	18.91
130843	13.04	1.41	21.44
130843	13.29	1.42	21.25

Sample ID Number	Silcate	Phosphate	NO2+NO3
130844	13.50	1.51	22.73
130844	13.55	1.51	22.54
130845	4.00	.67	11.00
130845	4.03	.66	11.05
130846	1.24	.17	2.95
130846	1.27	.18	3.02
130847	1.01	0.00	.58
130847	1.03	0.00	.55
130848	1.04	0.00	.54
130848	1.04	0.00	.55
130849	38.22	1.41	20.28
130849	38.30	1.39	19.86
130850	35.00	1.36	19.92
130850	35.12	1.36	19.84
130851	30.62	1.33	19.08
130851	30.75	1.33	19.19
130852	29.14	1.31	18.63
130852	29.44	1.30	19.08
130853	28.47	1.27	18.87
130853	28.50	1.30	18.88
130854	15.27	.98	14.56
130854	15.44	.99	14.75
130855	22.12	1.25	18.14
130855	22.40	1.26	18.18
130856	19.70	1.25	18.27
130856	19.89	1.26	18.38
130857	17.97	1.19	17.97

Sample ID Number	Silcate	Phosphate	NO2+NO3
130857	18.13	1.23	18.13
130858	12.37	1.27	19.17
130858	12.47	1.28	19.17
130859	13.14	1.19	17.59
130859	13.29	1.20	17.58
130860	12.37	1.20	17.95
130860	12.49	1.21	17.68
130861	11.70	1.20	17.87
130861	11.74	1.20	18.15
130862	11.93	1.25	18.74
130862	12.18	1.25	18.55
130863	11.88	1.23	18.68
130863	12.03	1.23	18.95
130865	3.35	.52	9.34
130865	3.43	.54	9.31
130866	2.15	.29	5.84
130866	2.16	.30	5.81
130867	2.17	.29	5.82
130867	2.19	.30	5.89
130868	1.15	0.00	.45
130868	1.76	0.00	.47
130869	37.73	1.33	20.46
130869	37.75	1.37	20.32
130870	34.93	1.32	20.01
130870	34.98	1.34	19.95
130871	32.06	1.32	19.43
130871	32.80	1.32	19.51
130872	27.16	1.28	18.72
130872	27.37	1.29	18.81
130873	27.25	1.27	18.89
130873	27.81	1.28	18.88
130874	15.99	1.18	17.76
130874	16.04	1.16	17.56
130875	17.39	1.21	17.90
130875	17.39	1.21	17.86
130876	14.88	1.20	17.79
130876	15.02	1.19	17.77
130877	12.79	1.19	17.60
130877	12.80	1.18	17.57
130878	11.01	1.20	18.15
130878	11.17	1.19	18.21
130879	10.85	1.12	16.86
130879	11.04	1.11	17.19
130880	11.82	1.23	18.94
130880	11.86	1.23	18.63
130881	12.51	1.35	20.65
130881	12.55	1.33	20.44
130882	9.52	1.18	19.07
130882	9.70	1.19	19.23
130883	9.45	1.20	19.21
130883	9.52	1.19	19.30
130884	3.51	.55	9.31
130884	3.51	.57	9.31
130885	1.68	.24	4.42
130885	1.72	.24	4.40

Sample ID Number	Silcate	Phosphate	NO2+NO3
130886	1.64	.22	4.36
130886	1.67	.23	4.40
130887	1.29	.16	3.14
130887	1.32	.16	3.18
130888	1.09	0.00	.50
130888	1.09	0.00	.51
130889	39.94	1.38	20.93
130889	39.96	1.36	20.98
130890	37.11	1.36	20.21
130890	37.22	1.34	20.18
130891	32.54	1.32	19.63
130891	32.66	1.32	19.60
130892	31.22	1.31	19.41
130892	31.30	1.29	19.25
130893	28.31	1.27	18.82
130893	28.31	1.28	18.97
130894	22.43	1.24	18.47
130894	22.46	1.24	18.50
130895	22.22	1.24	18.31
130895	22.49	1.23	18.37
130896	19.69	1.23	18.20
130896	20.10	1.21	18.47
130897	18.13	1.21	18.17
130897	18.27	1.24	18.11
130898	10.11	1.09	17.78
130898	10.12	1.07	17.68
130899	11.22	1.04	16.23
130899	11.29	1.03	16.33

Sample ID Number	Silcate	Phosphate	NO2+NO3
130900	12.53	1.19	18.16
130900	12.55	1.16	18.24
130901	11.97	1.17	18.31
130901	11.98	1.17	18.46
130902	11.68	1.22	18.73
130902	11.70	1.22	18.82
130903	11.91	1.23	19.57
130903	11.94	1.27	19.40
130904	11.89	1.25	19.64
130904	11.92	1.25	19.62
130905	12.96	1.40	21.60
130905	13.01	1.39	21.41
130906	10.53	1.30	20.03
130906	10.81	1.31	20.31
130907	.59	.09	.35
130907	.61	.09	.44
130908	3.54	.55	9.34
130908	3.62	.55	9.47
130909	35.58	1.41	19.78
130909	35.84	1.38	19.77
130910	35.39	1.39	19.89
130910	35.41	1.39	19.98
130911	29.39	1.32	19.00
130911	29.51	1.33	19.05
130912	17.04	1.24	17.99
130912	17.24	1.24	18.00
130913	25.83	1.27	18.30
130913	25.92	1.28	18.42

Sample ID Number	Silcate	Phosphate	NO2+NO3
130914	20.95	1.24	18.07
130914	21.05	1.27	18.05
130915	18.95	1.27	17.97
130915	19.25	1.27	18.51
130916	17.03	1.25	17.90
130916	17.16	1.23	17.78
130917	14.76	1.23	17.36
130917	15.13	1.19	17.75
130918	12.73	1.19	17.73
130918	12.84	1.20	17.51
130919	11.18	1.14	17.23
130919	11.53	1.15	17.01
130920	11.47	1.20	18.04
130920	11.57	1.21	18.08
130921	11.43	1.22	18.62
130921	11.52	1.23	18.51
130922	11.73	1.27	19.56
130922	11.79	1.28	19.73
130923	11.74	1.38	20.97
130923	11.78	1.38	20.68
130924	11.72	1.38	20.82
130924	11.74	1.38	20.85
130925	4.42	.70	11.69
130925	4.46	.68	11.12
130926	2.70	.45	7.94
130926	2.70	.44	7.93
130927	.58	0.00	.55
130927	.58	0.00	.60
130929	35.42	1.40	19.56
130929	35.69	1.34	19.74
130930	33.71	1.34	19.60
130930	33.77	1.33	19.85
130931	31.15	1.31	19.31
130931	31.18	1.31	19.34
130932	25.68	1.26	18.98
130932	25.91	1.25	18.49
130933	24.90	1.26	18.51
130933	25.18	1.26	18.45
130934	22.90	1.24	18.23
130934	23.01	1.26	17.98
130935	20.08	1.23	17.83
130935	20.13	1.22	18.04
130936	18.00	1.21	17.96
130936	18.04	1.22	17.95
130937	15.93	1.21	17.88
130937	16.05	1.22	17.94
130938	12.73	1.15	17.28
130938	12.76	1.15	17.19
130939	11.06	1.11	16.59
130939	11.24	1.17	16.51
130940	11.65	1.18	18.04
130940	11.71	1.18	17.65
130941	11.61	1.21	18.47
130941	11.72	1.20	18.03

Sample ID Number	Silcate	Phosphate	NO2+NO3
130942	11.71	1.27	19.18
130942	11.80	1.22	19.36
130943	12.37	1.31	20.50
130943	12.38	1.33	20.48
130944	11.76	1.26	19.67
130944	11.99	1.28	19.59
130945	6.35	.91	14.81
130945	6.35	.89	14.88
130946	6.27	.91	14.80
130946	6.42	.92	14.95
130947	.66	0.00	.52
130947	.80	0.00	.42
130948	.62	0.00	.39
130948	.65	0.00	.41
130949	35.52	1.31	19.59
130949	35.59	1.36	19.56
130950	21.42	1.14	17.00
130950	21.42	1.17	16.92
130951	21.25	1.16	17.78
130951	21.30	1.16	17.53
130952	18.37	1.15	17.64
130952	19.26	1.15	17.56
130953	18.90	1.13	17.46
130953	18.97	1.15	17.36
130954	16.27	1.13	17.53
130954	16.60	1.15	17.41
130955	15.87	1.17	17.71
130955	16.10	1.17	17.56
130956	14.33	1.17	17.69
130956	14.41	1.18	17.62
130957	12.91	1.15	17.56
130957	13.01	1.14	17.45
130958	12.71	1.12	17.14
130958	12.71	1.16	17.12
130959	11.58	1.13	17.24
130959	11.61	1.12	17.30
130960	11.29	1.16	17.76
130960	11.29	1.15	17.71
130961	11.37	1.19	18.58
130961	11.42	1.19	18.07
130962	11.58	1.22	19.15
130962	11.64	1.24	18.81
130963	11.55	1.22	19.02
130963	11.61	1.23	19.25
130964	12.69	1.38	21.16
130964	12.72	1.38	21.02
130965	5.86	.83	13.67
130965	5.92	.82	13.82
130966	2.71	.44	7.81
130966	2.74	.46	7.81
130967	2.73	.44	7.86
130967	2.73	.44	7.88
130968	.62	0.00	.58
130968	.67	0.00	.63
130969	22.66	1.13	17.38
130969	23.01	1.17	17.28

Sample ID Number	Silcate	Phosphate	NO2+NO3
130970	23.60	1.15	17.39
130970	23.69	1.17	17.45
130971	21.98	1.17	17.31
130971	22.04	1.18	17.85
130972	14.63	1.16	17.72
130972	14.89	1.13	17.42
130973	17.71	1.16	17.21
130973	17.75	1.15	17.52
130974	16.24	1.16	17.29
130974	16.62	1.13	17.47
130975	16.59	1.16	18.29
130975	16.76	1.16	17.83
130976	14.78	1.16	17.62
130976	14.90	1.15	17.81
130977	12.86	1.13	17.55
130977	12.89	1.13	17.61
130978	9.46	1.01	15.90
130978	9.51	.99	15.75
130979	10.41	1.03	16.31
130979	10.44	1.05	16.57
130980	11.39	1.17	18.15
130980	11.40	1.17	18.00
130981	11.98	1.23	19.43
130981	12.00	1.23	19.38
130982	12.97	1.41	21.17
130982	13.07	1.37	21.37
130983	9.97	1.23	19.57
130983	10.12	1.26	20.01
130985	3.21	.53	8.70
130985	3.27	.50	8.81
130987	.64	.09	.51
130987	.68	0.00	.59
130988	.62	.12	1.19
130988	.63	.11	1.21
130989	30.70	1.31	18.83
130989	30.92	1.33	18.74
130990	32.58	1.34	19.18
130990	32.69	1.33	19.16
130991	29.85	1.32	19.38
130991	29.93	1.32	18.65
130992	24.82	1.25	18.04
130992	25.02	1.24	18.40
130993	26.31	1.27	18.69
130993	26.62	1.27	18.62
130994	19.66	1.20	18.01
130994	20.37	1.21	17.97
130995	19.23	1.23	18.10
130995	19.23	1.27	18.23
130996	14.44	1.17	17.33
130996	14.53	1.17	17.39
130997	13.10	1.13	17.38
130997	13.16	1.13	17.56
130998	6.08	.73	12.10
130998	6.10	.73	12.05

Sample ID Number	Silcate	Phosphate	NO2+NO3
130999	10.13	1.00	15.63
130999	10.32	1.02	15.45
131000	11.49	1.19	17.82
131000	11.52	1.18	17.83
131001	11.47	1.21	18.25
131001	11.60	1.20	18.29
131002	12.25	1.30	20.10
131002	12.29	1.32	19.67
131003	7.76	1.05	16.69
131003	7.94	1.03	16.55
131004	2.74	.43	7.46
131004	3.29	.41	7.47
131005	1.81	.25	5.31
131005	1.82	.25	5.21
131006	1.82	.25	5.42
131006	1.82	.25	5.27
131007	.75	0.00	1.12
131007	.77	0.00	1.13
131008	.75	0.00	1.12
131008	.75	0.00	1.12
131009	23.27	1.17	17.67
131009	23.31	1.17	17.65
131010	23.08	1.19	17.70
131010	23.27	1.18	17.72
131011	22.45	1.18	17.52
131011	22.59	1.18	17.37
131012	18.32	1.15	17.35
131012	18.46	1.15	16.95
131013	17.90	1.14	16.96
131013	18.09	1.16	17.08
131014	14.69	1.15	17.29
131014	14.69	1.15	17.30
131015	14.69	1.15	17.07
131015	14.94	1.15	17.04
131016	13.35	1.14	17.12
131016	13.35	1.14	17.10
131017	11.73	1.13	16.87
131017	11.73	1.13	16.85
131018	8.08	1.00	15.75
131018	8.14	1.02	15.97
131019	8.97	1.00	15.41
131019	9.04	1.00	15.49
131020	10.83	1.17	17.93
131020	10.92	1.18	17.97
131021	11.53	1.21	18.33
131021	11.53	1.21	18.20
131022	12.04	1.29	19.77
131022	12.09	1.28	19.26
131023	11.86	1.27	19.12
131023	11.88	1.28	19.51
131024	6.29	.91	14.56
131024	6.32	.87	14.42
131025	3.77	.60	10.10
131025	3.78	.60	10.07
131026	2.35	.37	6.83
131026	2.37	.38	6.92

Sample ID Number	Silcate	Phosphate	NO2+NO3
131027	.77	.08	1.20
131027	.77	.09	1.26
131028	.77	0.00	1.19
131028	.77	0.00	1.19
131029	19.35	1.14	16.92
131029	19.41	1.13	17.50
131030	23.71	1.21	17.76
131030	24.12	1.20	17.67
131031	24.47	1.22	17.94
131031	24.85	1.22	17.87
131032	17.93	1.15	16.92
131032	17.93	1.14	16.92
131033	20.92	1.18	17.33
131033	20.92	1.17	17.29
131034	17.26	1.21	17.31
131034	17.32	1.17	17.31
131035	15.62	1.17	17.58
131035	15.65	1.17	17.49
131036	13.76	1.15	17.28
131036	13.79	1.15	17.45
131037	12.70	1.15	17.22
131037	12.71	1.13	17.29
131038	10.13	1.17	18.05
131038	10.14	1.17	18.12
131039	9.89	1.07	16.66
131039	9.98	1.07	16.23
131040	10.91	1.20	17.83
131040	11.01	1.18	17.93
131041	11.11	1.22	18.39
131041	11.13	1.21	18.46
131042	12.91	1.40	21.30
131042	13.00	1.40	21.08
131043	12.95	1.38	20.63
131043	12.95	1.38	20.94
131044	8.51	1.15	17.58
131044	8.53	1.12	17.58
131045	1.93	.32	5.87
131045	1.97	.32	5.94
131046	1.95	.33	5.90
131046	1.96	.32	5.93
131047	.76	.11	1.16
131047	.77	.10	1.21
131048	.75	.10	1.17
131048	.76	.10	1.16
131049	21.87	1.22	16.94
131049	21.97	1.22	17.19
131050	22.85	1.27	17.50
131050	23.04	1.24	17.36
131051	22.99	1.25	17.77
131051	23.02	1.29	17.41
131052	19.18	1.39	17.10
131052	19.19	1.27	17.26
131053	19.53	1.28	17.21
131053	19.59	1.27	17.20
131054	18.02	1.30	17.22

Sample ID Number	Silcate	Phosphate	NO2+NO3
131054	18.07	1.29	17.22
131055	15.99	1.28	17.11
131055	16.08	1.27	17.24
131056	14.69	1.29	17.18
131056	14.81	1.29	17.57
131057	13.17	1.24	17.55
131057	13.24	1.24	17.39
131058	8.96	1.20	17.70
131058	8.97	1.19	17.56
131059	8.31	.99	14.40
131059	8.42	1.00	14.39
131060	11.37	1.26	17.94
131060	11.45	1.26	17.83
131061	11.30	1.29	18.37
131061	11.32	1.29	18.33
131062	12.22	1.36	19.44
131062	12.28	1.37	19.73
131063	12.46	1.49	21.47
131063	12.48	1.50	21.64
131064	6.94	1.11	15.61
131064	7.03	1.02	15.67
131065	2.87	.49	7.75
131065	2.88	.49	7.61
131066	1.96	.34	5.65
131066	1.99	.34	5.66
131067	1.16	.18	2.60
131067	1.16	.18	2.65
131068	.85	.11	1.20
131068	.86	.12	1.22
131069	19.06	1.21	17.16
131069	19.10	1.18	17.20
131070	23.73	1.26	17.84
131070	23.75	1.27	17.85
131071	20.57	1.24	17.58
131071	20.80	1.24	17.61
131072	13.17	1.23	17.68
131072	13.18	1.25	17.50
131073	15.72	1.19	17.02
131073	15.78	1.20	17.51
131074	14.46	1.24	17.49
131074	14.52	1.23	17.56
131075	15.57	1.24	17.21
131075	15.65	1.21	17.31
131076	14.10	1.26	17.40
131076	14.20	1.23	17.13
131077	12.24	1.21	16.98
131077	12.36	1.22	17.25
131078	12.17	1.35	19.63
131078	12.85	1.36	19.35
131079	11.41	1.27	18.17
131079	11.70	1.26	18.43
131080	11.35	1.23	17.72
131080	11.39	1.25	18.09
131081	11.48	1.25	18.28
131081	11.51	1.24	18.21
131082	11.88	1.32	19.32

Sample ID Number	Silcate	Phosphate	NO2+NO3
131082	11.95	1.31	19.24
131083	12.35	1.42	20.63
131083	12.37	1.40	20.82
131084	8.78	1.17	17.68
131084	8.79	1.19	17.52
131085	2.14	.38	5.79
131085	2.18	.38	5.85
131086	1.85	.32	5.33
131086	1.85	.32	5.27
131087	1.59	.25	4.40
131087	1.61	.26	4.38
131088	.81	.10	1.25
131088	.83	.12	1.28
131089	24.21	1.23	17.77
131089	24.26	1.23	17.85
131090	27.13	1.28	18.32
131090	27.13	1.28	18.54
131091	23.94	1.25	17.98
131091	24.01	1.24	18.13
131092	19.39	1.16	17.03
131092	19.62	1.18	17.09
131093	19.86	1.21	17.35
131093	19.91	1.21	17.44
131094	16.42	1.20	17.15
131094	16.46	1.18	17.22
131095	13.89	1.19	17.16
131095	14.01	1.19	17.04
131096	14.51	1.20	17.54
131096	14.59	1.20	17.42
131097	12.40	1.17	17.20
131097	12.46	1.16	16.96
131098	9.95	1.17	17.61
131098	10.01	1.17	17.48
131099	8.99	1.05	15.48
131099	9.00	1.04	15.46
131100	11.33	1.21	17.80
131100	11.38	1.22	17.69
131101	11.49	1.25	18.59
131101	11.56	1.25	18.27
131102	12.16	1.34	20.03
131102	12.19	1.33	19.79
131103	9.87	1.28	18.76
131103	9.89	1.28	18.88
131104	4.75	.74	11.68
131104	4.78	.76	11.84
131105	1.85	.31	4.89
131105	2.45	.31	4.85
131106	1.93	.32	5.18
131106	1.97	.31	5.21
131107	1.21	.20	3.12
131107	1.36	.20	3.14
131108	.74	.12	1.59
131108	1.04	.12	1.60
131109	16.19	1.24	17.06
131109	16.54	1.24	17.48

Sample ID Number	Silcate	Phosphate	NO2+NO3
131110	22.56	1.28	17.47
131110	22.66	1.26	17.47
131111	20.89	1.25	17.54
131111	21.12	1.27	17.41
131112	12.95	1.21	16.98
131112	14.29	1.20	17.45
131113	15.78	1.22	16.99
131113	16.86	1.22	17.10
131114	15.99	1.32	17.41
131114	16.06	1.33	17.43
131115	14.37	1.31	17.38
131115	15.13	1.34	17.45
131116	13.07	1.31	17.29
131116	13.15	1.28	17.36
131117	11.49	1.24	17.14
131117	11.55	1.24	17.20
131118	10.99	1.28	17.45
131118	12.75	1.27	18.52
131119	11.30	1.33	18.15
131119	11.31	1.31	17.91
131120	12.14	1.40	19.24
131120	12.22	1.39	19.37
131121	12.25	1.46	20.43
131121	13.24	1.47	20.43
131122	7.87	1.15	16.30
131122	7.92	1.16	16.20
131123	4.12	.71	10.17
131123	4.17	.73	10.30
131124	1.93	.36	5.02
131124	1.94	.35	4.98
131125	1.89	.32	4.93
131125	1.93	.32	5.08
131126	1.70	.28	4.77
131126	1.82	.29	4.77
131127	.92	.16	2.20
131127	.97	.16	2.29
131128	.92	.14	2.16
131128	.93	.15	2.21
131129	17.96	1.19	17.26
131129	17.98	1.19	17.11
131130	22.83	1.23	17.79
131130	23.26	1.24	17.57
131131	1.95	.32	5.71
131131	2.70	.33	5.73
131132	12.16	1.18	17.79
131132	12.74	1.16	17.56
131133	13.17	1.19	18.08
131133	13.20	1.22	18.05
131134	15.96	1.22	18.08
131134	16.02	1.21	17.81
131135	14.40	1.18	17.68
131135	14.74	1.18	17.95
131136	14.02	1.21	17.83
131136	14.05	1.21	18.10
131137	12.28	1.13	17.78
131137	12.55	1.16	17.62

Sample ID Number	Silcate	Phosphate	NO2+NO3
131138	11.59	1.17	17.80
131138	11.71	1.19	17.69
131139	11.29	1.22	17.55
131139	11.49	1.20	17.68
131140	11.34	1.23	18.13
131140	11.51	1.21	18.12
131141	11.52	1.24	18.43
131141	12.14	1.25	18.61
131142	12.12	1.31	18.90
131142	12.33	1.32	18.93
131143	12.28	1.41	20.01
131143	12.71	1.40	20.30
131144	10.08	1.28	19.24
131144	10.15	1.29	18.94
131145	5.10	.77	12.57
131145	5.13	.77	12.52
131146	2.34	.39	6.96
131146	2.53	.40	6.87
131147	1.50	.23	4.38
131147	1.57	.24	4.35
131148	.75	.11	1.57
131148	.81	.11	1.54
131149	22.44	1.19	18.07
131149	22.84	1.22	17.89
131150	23.88	1.22	17.88
131150	24.31	1.23	18.12
131151	19.59	1.20	17.67
131151	19.61	1.22	17.67

Sample ID Number	Silcate	Phosphate	NO2+NO3
131152	16.72	1.25	17.66
131152	16.80	1.20	18.55
131153	17.31	1.15	17.47
131153	17.80	1.16	17.81
131154	16.62	1.17	17.27
131154	17.10	1.20	17.40
131155	16.35	1.19	17.42
131155	17.17	1.19	17.71
131156	14.46	1.22	17.87
131156	14.51	1.21	17.82
131157	13.54	1.23	17.79
131157	14.37	1.20	17.96
131158	11.74	1.20	17.63
131158	11.86	1.22	17.75
131159	11.11	1.21	17.78
131159	11.24	1.19	18.09
131160	11.14	1.22	18.32
131160	11.24	1.23	18.51
131161	11.62	1.19	18.76
131161	11.63	1.22	18.89
131162	11.33	1.24	18.53
131162	11.40	1.23	19.03
131163	12.39	1.35	19.83
131163	12.41	1.33	19.83
131164	11.06	1.23	17.64
131164	11.79	1.22	17.86
131165	13.33	1.57	24.23
131165	13.38	1.57	23.77

Sample ID Number	Silcate	Phosphate	NO2+NO3
131166	5.45	.87	13.57
131166	5.47	.87	13.67
131167	1.07	.14	1.28
131167	1.11	.15	1.34
131168	1.01	.13	1.29
131168	1.05	.12	1.28
131169	11.92	1.54	18.63
131169	13.36	1.53	18.48
131170	18.55	1.48	16.83
131170	18.55	1.43	16.75
131171	17.73	1.45	16.87
131171	17.99	1.44	16.82
131172	13.85	1.43	17.31
131172	13.90	1.47	17.16
131173	15.38	1.54	17.44
131173	15.48	1.50	17.40
131174	17.76	1.49	17.59
131174	17.92	1.51	17.52
131175	16.04	1.49	17.50
131175	16.22	1.50	17.64
131176	14.86	1.52	17.80
131176	14.99	1.52	17.91
131177	12.77	1.40	17.56
131177	12.88	1.42	17.73
131178	11.47	1.44	17.18
131178	11.65	1.40	17.69
131179	11.94	1.46	17.74
131179	12.02	1.46	18.14

Sample ID Number	Silcate	Phosphate	NO2+NO3
131180	11.87	1.52	18.24
131180	13.49	1.49	18.14
131181	11.65	1.50	18.46
131181	11.87	1.49	18.27
131182	12.33	1.57	19.42
131182	12.41	1.59	19.45
131183	12.57	1.59	19.41
131183	13.34	1.59	19.39
131184	13.13	1.68	20.95
131184	13.18	1.69	21.11
131185	14.80	1.90	24.04
131185	14.95	1.86	24.31
131186	5.44	.93	12.42
131186	5.46	.92	12.54
131187	3.60	.68	8.97
131187	3.63	.67	8.97
131188	1.45	.21	1.19
131188	1.78	.22	1.30
131189	13.22	1.40	17.77
131189	13.28	1.39	17.93
131190	19.57	1.35	16.96
131190	19.59	1.33	16.67
131191	21.12	1.38	17.48
131191	21.14	1.38	17.50
131192	11.87	1.41	17.91
131192	12.01	1.44	18.18
131193	19.08	1.33	17.09

Sample ID Number	Silcate	Phosphate	NO2+NO3
131193	19.17	1.31	17.05
131194	16.24	1.29	16.71
131194	17.50	1.30	16.78
131195	16.23	1.34	16.91
131195	16.42	1.34	17.12
131196	16.50	1.38	17.60
131196	16.51	1.36	17.63
131197	15.15	1.34	17.43
131197	15.42	1.32	17.08
131198	14.17	1.34	17.96
131198	14.24	1.35	17.77
131199	13.24	1.33	17.80
131199	13.51	1.34	18.05
131200	11.47	1.30	17.46
131200	11.48	1.31	17.45
131201	11.86	1.37	18.29
131201	12.04	1.37	18.29
131202	11.88	1.43	18.34
131202	11.97	1.40	18.79
131203	11.88	1.40	18.06
131203	11.90	1.42	18.12
131204	12.81	1.53	20.33
131204	12.98	1.54	20.31
131205	14.52	1.76	23.08
131205	14.55	1.77	23.22
131206	13.47	1.75	23.47
131206	13.68	1.72	23.72
131207	4.41	.77	11.22
131207	4.42	.79	11.18
131209	11.58	1.39	17.95
131209	11.59	1.41	17.81
131210	18.20	1.29	16.75
131210	18.20	1.31	16.45
131211	15.49	1.30	16.24
131211	15.56	1.24	16.48
131212	12.06	1.34	17.17
131212	12.10	1.31	17.05
131213	15.54	1.42	17.43
131213	15.55	1.36	17.59
131214	14.62	1.31	17.36
131214	14.62	1.34	17.66
131215	12.19	1.29	17.15
131215	12.28	1.29	17.08
131216	11.50	1.29	17.14
131216	11.99	1.30	16.87
131217	11.31	1.28	17.31
131217	11.42	1.31	17.26
131218	11.17	1.25	17.43
131218	11.21	1.26	16.94
131219	13.04	1.28	17.79
131219	13.51	1.31	17.84
131220	10.79	1.28	17.54
131220	10.85	1.26	17.43
131221	11.29	1.31	17.65
131221	11.43	1.30	17.90
131222	11.97	1.36	18.43

Sample ID Number	Silcate	Phosphate	NO2+NO3
131222	12.02	1.37	18.68
131223	13.36	1.56	20.99
131223	13.51	1.52	21.05
131224	12.38	1.49	19.87
131224	12.64	1.47	20.18
131225	11.64	1.49	20.04
131225	11.80	1.51	20.10
131226	6.53	.97	14.37
131226	6.54	.96	14.23
131227	4.55	.77	11.52
131227	4.57	.77	11.49
131228	1.46	.23	1.56
131228	1.50	.23	1.62
131229	14.26	1.21	16.62
131229	14.46	1.20	16.92
131230	14.45	1.19	16.63
131230	14.46	1.21	16.69
131231	13.21	1.22	16.56
131231	13.27	1.19	16.62
131232	12.03	1.23	16.79
131232	12.12	1.24	16.80
131233	11.70	1.20	17.10
131233	11.73	1.21	17.07
131234	10.83	1.19	16.86
131234	10.90	1.19	16.76
131235	10.53	1.18	16.89
131235	10.55	1.20	16.93
131236	10.54	1.21	17.18
131236	10.58	1.20	16.96
131237	11.43	1.20	16.99
131237	12.87	1.20	17.12
131238	10.72	1.22	17.26
131238	10.83	1.21	17.18
131239	11.12	1.26	17.43
131239	11.16	1.26	17.71
131240	11.11	1.24	17.84
131240	11.30	1.24	17.72
131241	11.35	1.26	17.94
131241	11.49	1.28	18.13
131242	11.82	1.40	18.04
131242	11.87	1.26	18.54
131243	11.91	1.26	18.12
131243	12.12	1.28	18.51
131244	10.70	1.21	17.31
131244	11.15	1.22	17.58
131245	11.99	1.31	18.76
131245	12.29	1.35	18.63
131246	11.83	1.32	18.37
131246	11.92	1.35	17.99
131247	12.69	1.46	20.19
131247	12.69	1.45	20.19
131248	5.46	.76	9.35
131248	5.47	.83	9.27
131249	11.11	1.22	16.97
131249	11.39	1.17	17.05

Sample ID Number	Silcate	Phosphate	NO2+NO3
131250	11.18	1.27	16.73
131250	11.32	1.15	16.72
131251	10.86	1.16	16.69
131251	10.92	1.15	16.72
131252	10.83	1.17	16.88
131252	10.87	1.15	16.84
131253	11.00	1.17	16.94
131253	11.01	1.17	17.17
131254	10.44	1.16	16.80
131254	10.48	1.14	16.78
131255	10.21	1.15	16.78
131255	10.21	1.18	17.18
131256	10.11	1.16	17.32
131256	10.26	1.18	17.04
131257	10.01	1.17	17.39
131257	10.09	1.17	17.00
131258	9.89	1.28	17.12
131258	9.94	1.16	18.01
131259	9.43	1.16	17.14
131259	9.47	1.14	17.02
131260	9.65	1.17	16.83
131260	9.67	1.18	16.76
131261	6.67	.97	12.54
131261	7.09	.99	12.52
131262	1.51	.35	1.46
131262	1.63	.26	1.52
131263	1.40	.33	1.30
131263	1.48	.33	1.33
131264	10.08	1.23	16.98
131264	10.22	1.14	17.03
131265	9.97	1.12	16.92
131265	10.01	1.14	17.08
131266	9.77	1.25	16.56
131266	9.98	1.12	16.79
131267	10.03	1.13	16.76
131267	10.11	1.13	16.75
131268	9.70	1.14	16.86
131268	9.75	1.13	16.77
131269	9.28	1.11	16.50
131269	9.32	1.11	16.63
131270	9.13	1.10	16.13
131270	9.16	1.11	16.37
131271	9.05	1.08	15.22
131271	9.08	1.09	15.32
131272	4.66	.72	8.34
131272	4.73	.74	8.02
131273	1.80	.38	2.22
131273	1.81	.43	2.22
131274	9.98	1.19	14.81
131274	10.03	1.07	14.90
131275	10.04	1.13	16.67
131275	10.10	1.12	16.63
131276	10.15	1.10	16.81
131276	10.22	1.12	16.61
131277	10.54	1.12	16.74
131277	10.59	1.12	16.73

Sample ID Number	Silcate	Phosphate	NO2+NO3
131278	10.67	1.11	15.88
131278	10.74	1.11	15.82
131279	11.20	1.07	13.62
131279	11.49	1.09	13.64
131280	10.92	1.06	12.42
131280	10.92	1.05	12.41
131281	10.94	1.05	11.70
131281	11.01	1.05	11.77
131282	10.55	1.14	11.03
131282	10.59	1.04	10.92
131283	2.19	.50	2.74
131283	2.24	.43	2.77
131284	10.43	1.11	12.74
131284	10.46	1.05	12.72
131285	11.15	1.10	14.30
131285	11.23	1.09	14.13
131286	10.79	1.06	12.81
131286	10.87	1.07	12.90
131287	10.62	1.04	12.11
131287	10.70	1.09	12.02
131288	10.09	1.04	10.77
131288	10.16	1.05	10.84
131289	2.37	.53	2.55
131289	2.43	.47	2.65
131290	8.20	1.04	7.87
131290	8.51	.96	8.08
131291	7.61	.93	7.24
131291	7.63	.92	7.27

Sample ID Number	Silcate	Phosphate	NO2+NO3
131292	6.49	.82	5.88
131292	6.50	.83	5.95
131293	4.24	.67	3.82
131293	4.30	.64	3.92
131294	10.84	1.14	10.19
131294	10.85	1.08	10.32
131295	10.92	1.10	10.36
131295	10.95	1.10	10.16
131296	10.48	1.08	10.00
131296	10.53	1.09	10.04
131297	2.77	.62	3.37
131297	2.80	.55	3.36
131298	11.77	1.12	15.53
131298	11.82	1.22	15.38
131299	11.86	1.13	14.81
131299	11.87	1.12	14.79
131300	11.11	1.07	13.52
131300	11.16	1.09	13.37
131301	9.99	1.04	10.73
131301	10.00	1.04	10.76
131302	2.89	.60	2.91
131302	2.92	.58	2.99
131303	9.81	1.12	16.66
131303	9.89	1.18	16.40
131304	9.81	1.14	16.76
131304	10.02	1.14	16.79
131305	9.79	1.14	16.54
131305	9.87	1.14	16.62

Sample ID Number	Silcate	Phosphate	NO2+NO3
131306	9.97	1.23	16.22
131306	10.06	1.13	16.49
131307	10.34	1.14	16.52
131307	10.43	1.13	16.60
131308	10.53	1.13	16.29
131308	10.70	1.11	16.26
131309	10.75	1.10	16.23
131309	10.80	1.12	15.99
131310	9.60	1.09	15.04
131310	9.62	1.09	14.96
131311	8.36	.98	11.30
131311	8.48	.96	11.11
131312	2.38	.50	4.25
131312	2.39	.54	4.18
131313	11.18	1.16	17.09
131313	11.24	1.17	17.07
131314	11.21	1.20	17.22
131314	11.22	1.18	17.27
131315	10.09	1.15	17.23
131315	10.29	1.18	17.17
131316	9.55	1.16	16.79
131316	9.63	1.17	16.81
131317	10.12	1.18	17.31
131317	10.30	1.19	17.29
131318	9.99	1.18	17.47
131318	10.10	1.20	17.25
131319	9.66	1.20	17.63
131319	9.70	1.20	17.68
131320	9.40	1.19	17.28
131320	9.45	1.19	17.47
131321	9.05	1.18	16.88
131321	9.10	1.18	17.23
131322	8.28	1.15	16.16
131322	8.44	1.14	16.18
131323	6.45	1.01	13.10
131323	6.50	1.00	13.10
131324	1.61	.46	3.27
131324	1.65	.48	3.35
131325	13.34	1.17	16.87
131325	13.36	1.17	16.82
131326	13.46	1.18	17.19
131326	13.50	1.18	17.02
131327	12.76	1.19	17.42
131327	12.87	1.17	17.20
131328	12.52	1.18	17.30
131328	12.56	1.16	17.20
131329	11.95	1.14	17.00
131329	11.97	1.15	17.37
131330	11.08	1.16	17.18
131330	11.10	1.15	17.27
131331	10.41	1.16	16.93
131331	10.70	1.15	17.13
131332	10.24	1.15	17.04
131332	10.37	1.14	16.96
131333	10.35	1.16	17.28

Sample ID Number	Silcate	Phosphate	NO2+NO3
131333	10.40	1.18	17.34
131334	10.72	1.18	17.64
131334	10.79	1.19	17.50
131335	10.70	1.17	17.61
131335	10.77	1.16	18.47
131336	11.08	1.21	17.71
131336	11.10	1.20	17.71
131337	10.91	1.17	18.08
131337	10.94	1.17	17.87
131338	11.12	1.19	18.32
131338	11.18	1.20	18.49
131339	11.40	1.21	18.60
131339	11.42	1.22	18.76
131340	11.40	1.26	18.73
131340	11.43	1.25	18.57
131341	11.67	1.29	18.79
131341	11.77	1.28	19.15
131342	8.05	1.05	13.72
131342	8.13	1.06	13.79
131343	1.93	.40	2.56
131343	2.18	.42	2.50
131344	1.68	.36	2.10
131344	1.72	.36	2.08
131345	15.47	1.13	17.20
131345	15.52	1.12	17.05
131346	14.85	1.11	17.12
131346	14.91	1.11	17.20
131347	13.85	1.11	17.10
131347	13.91	1.12	17.23
131348	11.53	1.13	17.52
131348	11.62	1.14	17.49
131349	11.12	1.12	17.20
131349	11.27	1.12	17.42
131350	10.65	1.12	17.58
131350	10.68	1.12	17.56
131351	10.48	1.15	17.39
131351	10.56	1.12	17.67
131352	10.55	1.25	17.65
131352	10.61	1.27	17.80
131353	10.83	1.12	17.85
131353	10.89	1.13	18.16
131354	11.40	1.17	18.56
131354	11.46	1.18	18.70
131355	11.10	1.18	18.44
131355	11.12	1.19	18.76
131356	11.58	1.21	18.88
131356	11.58	1.21	18.95
131357	11.74	1.23	18.96
131357	11.84	1.25	19.10
131358	11.80	1.27	18.89
131358	11.86	1.28	19.08
131359	8.81	1.09	15.59
131359	8.84	1.09	15.55
131360	2.12	.42	3.06
131360	2.14	.41	2.98

Sample ID Number	Silcate	Phosphate	NO2+NO3
131361	1.74	.34	1.97
131361	1.75	.34	1.87
131362	15.30	1.10	17.88
131362	15.38	1.10	17.72
131363	20.49	1.11	17.75
131363	20.57	1.12	17.84
131364	16.09	1.09	17.04
131364	16.43	1.15	17.17
131365	11.64	1.14	18.18
131365	11.65	1.17	18.35
131366	15.05	1.13	17.28
131366	15.08	1.12	17.19
131367	14.44	1.12	17.54
131367	14.45	1.14	17.50
131368	13.84	1.14	17.34
131368	14.03	1.15	17.54
131369	13.07	1.08	17.06
131369	13.22	1.09	17.61
131370	12.43	1.10	17.71
131370	12.48	1.11	17.59
131371	12.51	1.13	17.67
131371	12.54	1.11	17.58
131372	11.06	1.09	17.40
131372	11.13	1.10	17.42
131373	11.20	1.10	17.39
131373	11.25	1.11	17.48
131374	10.57	1.11	17.61
131374	10.82	1.11	17.68

Sample ID Number	Silcate	Phosphate	NO2+NO3
131375	10.98	1.14	17.79
131375	11.06	1.13	18.02
131376	11.23	1.17	18.07
131376	11.32	1.16	18.16
131377	11.13	1.14	18.07
131377	11.15	1.15	18.20
131378	11.18	1.18	18.47
131378	11.29	1.18	18.58
131379	11.43	1.22	18.69
131379	11.64	1.24	18.94
131380	9.43	1.13	16.15
131380	9.46	1.15	16.11
131381	2.41	.46	3.86
131381	2.44	.46	3.97
131382	16.30	1.12	16.96
131382	16.30	1.11	17.24
131383	20.98	1.15	17.68
131383	20.99	1.17	17.63
131384	14.17	1.09	16.67
131384	14.22	1.08	16.65
131385	11.32	1.12	17.29
131385	11.34	1.11	17.21
131386	12.84	1.09	16.89
131386	12.93	1.08	16.53
131387	12.71	1.09	16.68
131387	12.76	1.09	16.90
131388	12.73	1.10	17.19
131388	12.81	1.10	17.15

Sample ID Number	Silcate	Phosphate	NO2+NO3
131389	12.49	1.11	17.08
131389	12.61	1.11	17.37
131390	11.19	1.10	17.11
131390	11.23	1.10	17.17
131391	10.57	1.12	16.93
131391	10.59	1.09	17.10
131392	10.47	1.09	17.09
131392	10.67	1.11	16.95
131393	10.60	1.09	17.37
131393	10.66	1.10	17.02
131394	10.96	1.13	17.70
131394	11.01	1.13	17.77
131395	10.96	1.14	17.91
131395	11.01	1.14	17.98
131396	11.18	1.15	18.05
131396	11.23	1.17	18.22
131397	11.45	1.18	18.36
131397	11.57	1.18	18.40
131398	10.78	1.19	18.23
131398	10.80	1.18	18.01
131399	11.28	1.21	18.55
131399	11.34	1.22	18.26
131400	9.62	1.13	16.27
131400	9.67	1.13	16.09
131401	1.52	.30	1.49
131401	1.53	.30	1.59
131402	15.21	1.08	16.87
131402	15.23	1.05	16.63

Sample ID Number	Silcate	Phosphate	NO2+NO3
131403	16.95	1.08	16.66
131403	17.26	1.08	16.48
131404	15.97	1.08	16.81
131404	16.16	1.11	16.71
131405	11.71	1.14	17.86
131405	11.73	1.13	17.58
131406	10.80	1.16	17.17
131406	10.93	1.17	17.21
131407	13.35	1.15	17.32
131407	13.47	1.13	17.09
131408	12.73	1.15	17.39
131408	12.74	1.13	17.40
131409	11.08	1.08	16.32
131409	11.23	1.07	16.32
131410	10.94	1.09	16.44
131410	11.00	1.09	16.52
131411	10.75	1.09	16.53
131411	11.11	1.10	16.46
131412	9.64	1.15	16.02
131412	9.65	1.11	16.13
131413	9.61	1.11	16.08
131413	9.65	1.10	16.22
131414	9.66	1.10	16.18
131414	9.90	1.10	16.35
131415	9.98	1.20	16.82
131415	10.29	1.12	16.81
131416	10.03	1.14	17.09
131416	10.08	1.14	16.91

Sample ID Number	Silcate	Phosphate	NO2+NO3
131418	10.24	1.17	17.45
131418	10.40	1.16	17.40
131419	10.19	1.19	17.46
131419	10.28	1.19	17.45
131420	.96	.34	.74
131420	.96	.34	.91
131421	.91	.32	.75
131421	.97	.32	.77
131422	15.34	1.10	16.16
131422	15.35	1.11	16.29
131423	17.40	1.10	16.06
131423	17.42	1.13	15.97
131424	16.92	1.13	16.46
131424	17.05	1.15	16.43
131425	10.73	1.18	16.86
131425	10.88	1.14	16.62
131426	13.19	1.11	16.38
131426	13.27	1.12	16.37
131427	14.01	1.11	15.89
131427	14.06	1.11	15.97
131428	11.75	1.08	15.55
131428	11.76	1.09	15.60
131429	11.96	1.11	15.84
131429	12.00	1.10	15.83
131430	10.81	1.09	16.26
131430	10.85	1.11	16.05
131431	10.28	1.10	16.36
131431	10.38	1.12	16.37

Sample ID Number	Silcate	Phosphate	NO2+NO3
131432	9.86	1.13	16.35
131432	10.13	1.12	16.34
131433	10.04	1.12	16.42
131433	10.11	1.16	16.53
131434	9.74	1.11	16.72
131434	9.83	1.12	16.42
131435	9.79	1.13	16.90
131435	9.99	1.16	17.00
131436	10.32	1.23	17.41
131436	10.46	1.19	17.42
131437	10.10	1.19	17.19
131437	10.12	1.21	17.06
131438	11.37	1.30	18.57
131438	11.41	1.33	18.37
131439	11.83	1.39	19.86
131439	11.88	1.40	19.85
131440	10.65	1.36	19.40
131440	10.83	1.37	19.70
131441	4.80	.82	11.87
131441	4.80	.82	11.70
131442	17.49	1.09	15.54
131442	17.49	1.10	15.54
131443	19.30	1.13	15.87
131443	19.38	1.13	15.84
131444	17.78	1.13	15.99
131444	17.87	1.14	15.99
131445	10.74	1.15	16.56
131445	10.78	1.18	16.83

Sample ID Number	Silcate	Phosphate	NO2+NO3
131446	15.41	1.16	16.61
131446	15.52	1.18	16.79
131447	17.25	1.16	16.20
131447	17.39	1.16	16.27
131448	16.56	1.15	16.03
131448	16.62	1.15	16.14
131449	14.50	1.15	15.95
131449	14.61	1.15	15.96
131450	13.44	1.10	16.19
131450	13.56	1.10	16.45
131451	11.39	1.08	16.06
131451	11.47	1.08	16.17
131452	10.41	1.07	16.08
131452	10.42	1.08	15.82
131453	10.29	1.08	16.13
131453	10.31	1.09	16.15
131454	10.80	1.14	16.51
131454	10.90	1.13	16.57
131455	10.94	1.14	16.90
131455	10.97	1.14	17.11
131456	10.65	1.14	16.97
131456	10.77	1.13	17.04
131457	10.49	1.14	16.90
131457	10.53	1.14	16.83
131458	11.98	1.25	19.21
131458	12.07	1.24	18.69
131459	13.07	1.40	20.64
131459	13.11	1.40	19.51
131460	6.46	.89	14.26
131460	6.48	.90	14.09
131461	3.88	.63	10.24
131461	3.89	.63	10.31
131462	19.66	1.14	16.47
131462	19.78	1.13	16.31
131463	22.43	1.16	16.68
131463	22.49	1.16	16.96
131464	18.48	1.16	16.87
131464	18.51	1.15	16.85
131465	11.75	1.15	16.83
131465	11.75	1.16	17.45
131466	14.69	1.24	17.95
131466	14.72	1.24	18.00
131467	17.29	1.16	16.51
131467	17.35	1.14	16.53
131468	18.00	1.16	16.94
131468	18.06	1.14	16.55
131469	16.01	1.15	16.99
131469	16.11	1.15	16.60
131470	14.73	1.11	16.78
131470	14.81	1.12	16.92
131471	13.46	1.12	16.73
131471	13.51	1.15	17.41
131472	12.14	1.14	17.00
131472	12.17	1.15	16.78
131473	11.60	1.15	16.99

Sample ID Number	Silcate	Phosphate	NO2+NO3
131473	11.71	1.15	17.15
131474	11.26	1.15	17.16
131474	11.48	1.15	17.11
131475	11.19	1.16	17.44
131475	11.26	1.18	17.34
131476	11.37	1.19	17.49
131476	11.39	1.19	17.62
131477	11.43	1.21	18.32
131477	11.46	1.21	18.07
131478	12.25	1.27	19.20
131478	12.31	1.27	19.42
131479	10.97	1.28	18.41
131479	10.99	1.29	18.62
131480	6.49	.93	14.82
131480	6.54	.94	14.17
131481	1.44	.27	1.94
131481	1.45	.27	2.02
131482	16.87	1.15	17.37
131482	17.28	1.15	17.32
131483	22.68	1.16	17.24
131483	22.79	1.17	17.01
131484	21.53	1.17	16.82
131484	21.80	1.17	16.91
131485	11.23	1.15	17.26
131485	11.30	1.16	17.30
131486	16.94	1.16	17.80
131486	17.22	1.19	17.67
131487	20.95	1.15	17.20
131487	21.03	1.18	17.16
131488	18.79	1.16	17.00
131488	19.00	1.16	17.17
131489	16.77	1.15	16.97
131489	17.30	1.15	17.31
131490	15.16	1.14	16.93
131490	15.35	1.14	17.12
131491	13.96	1.16	16.81
131491	14.01	1.15	16.75
131492	11.94	1.11	16.71
131492	12.03	1.12	16.53
131493	11.58	1.13	16.85
131493	11.64	1.14	17.08
131494	11.10	1.11	16.86
131494	11.15	1.12	17.03
131495	11.09	1.15	17.19
131495	11.12	1.15	17.42
131496	11.04	1.16	17.70
131496	12.48	1.18	17.74
131497	11.26	1.18	17.92
131497	11.27	1.20	17.90
131498	12.07	1.27	18.74
131498	12.08	1.27	18.79
131499	11.77	1.32	19.18
131499	11.83	1.31	19.57
131500	1.27	.25	1.45
131500	1.30	.26	1.53
131501	1.25	.24	1.47

Sample ID Number	Silcate	Phosphate	NO2+NO3
131501	1.26	.23	1.46
131502	22.69	1.13	17.28
131502	22.70	1.15	17.11
131503	23.33	1.17	17.11
131503	23.76	1.17	17.60
131504	22.50	1.18	17.73
131504	25.37	1.17	17.69
131505	11.57	1.17	17.47
131505	11.63	1.18	17.59
131506	16.72	1.21	17.58
131506	16.86	1.20	17.55
131507	20.67	1.16	17.73
131507	20.73	1.18	17.18
131508	18.58	1.16	17.18
131508	18.60	1.17	17.29
131509	15.65	1.12	16.80
131509	15.72	1.14	16.91
131510	14.62	1.10	16.51
131510	14.94	1.11	16.99
131511	12.32	1.09	16.45
131511	12.36	1.12	16.76
131512	11.27	1.12	16.59
131512	11.97	1.11	16.63
131513	10.66	1.13	16.61
131513	10.69	1.12	16.49
131514	11.39	1.14	16.86
131514	11.44	1.13	16.88

Sample ID Number	Silcate	Phosphate	NO2+NO3
131515	11.32	1.14	17.25
131515	11.46	1.14	16.96
131516	11.20	1.17	17.74
131516	11.23	1.16	17.26
131517	8.54	.96	13.66
131517	8.85	.97	13.56
131518	11.38	1.19	18.03
131518	11.51	1.19	18.00
131519	12.54	1.31	19.37
131519	12.65	1.32	19.46
131520	3.67	.69	7.22
131520	3.71	.67	7.04
131521	1.37	.26	1.14
131521	1.38	.24	1.09
131522	22.50	1.16	17.13
131522	22.59	1.15	16.93
131523	23.62	1.17	17.30
131523	24.68	1.18	17.53
131524	17.89	1.18	17.42
131524	18.42	1.18	17.54
131525	11.35	1.17	17.03
131525	11.48	1.17	16.96
131526	18.04	1.15	17.48
131526	18.20	1.18	17.45
131527	17.21	1.16	16.60
131527	17.27	1.16	16.87
131528	17.49	1.15	16.87
131528	18.83	1.15	16.67

Sample ID Number	Silcate	Phosphate	NO2+NO3
131529	15.40	1.14	16.53
131529	15.51	1.13	16.48
131530	14.69	1.15	16.67
131530	15.17	1.17	16.62
131531	12.33	1.12	16.36
131531	12.42	1.11	16.23
131532	12.15	1.15	16.84
131532	12.31	1.14	16.56
131533	11.39	1.13	16.72
131533	11.57	1.15	16.74
131534	11.16	1.13	16.71
131534	11.87	1.11	16.71
131535	11.19	1.15	17.13
131535	11.20	1.17	16.97
131536	11.70	1.23	17.52
131536	12.15	1.22	17.87
131537	12.04	1.32	19.21
131537	12.49	1.33	19.00
131538	12.41	1.34	19.44
131538	13.12	1.34	19.37
131539	10.38	1.24	17.85
131539	10.57	1.24	17.85
131540	2.38	.42	4.46
131540	2.40	.41	4.60
131541	1.58	.26	2.12
131541	1.63	.27	2.15
131542	19.41	1.12	16.68
131542	19.57	1.12	16.78

Sample ID Number	Silcate	Phosphate	NO2+NO3
131543	23.34	1.16	16.93
131543	23.52	1.18	17.03
131544	19.13	1.13	17.06
131544	19.43	1.13	16.48
131545	11.31	1.19	17.97
131545	11.57	1.19	17.83
131546	11.85	1.16	16.63
131546	11.94	1.16	16.62
131547	12.14	1.18	17.12
131547	12.21	1.17	17.36
131548	15.86	1.15	16.48
131548	15.91	1.14	16.74
131549	14.37	1.16	16.66
131549	14.62	1.15	16.70
131550	13.39	1.13	16.39
131550	13.46	1.13	16.54
131551	11.70	1.12	16.74
131551	12.98	1.14	16.47
131552	10.57	1.12	16.59
131552	10.59	1.11	16.40
131553	10.92	1.14	16.80
131553	11.41	1.13	16.76
131554	11.60	1.19	17.22
131554	11.73	1.18	17.49
131555	12.05	1.25	18.27
131555	12.43	1.25	18.13
131556	12.48	1.32	18.88
131556	14.30	1.32	18.98

Sample ID Number	Silcate	Phosphate	NO2+NO3
131557	12.24	1.34	19.76
131557	12.27	1.38	19.43
131558	9.05	1.15	18.39
131558	9.06	1.12	18.55
131559	6.34	.88	14.21
131559	6.45	.87	14.36
131560	2.96	.43	7.31
131560	4.46	.43	7.41
131561	1.14	.12	1.17
131561	2.32	.12	1.20
131562	9.66	1.05	16.77
131562	9.68	1.04	16.84
131563	23.33	1.16	17.55
131563	26.44	1.16	17.59
131564	1.62	.19	2.94
131564	1.70	.18	3.20
131565	22.19	1.15	17.71
131565	22.22	1.16	17.16
131566	15.48	1.11	17.15
131566	15.75	1.09	17.15
131567	18.77	1.11	17.07
131567	18.81	1.15	17.18
131568	16.47	1.13	17.06
131568	16.77	1.11	16.86
131569	15.81	1.15	17.39
131569	15.93	1.14	17.51
131570	14.10	1.13	17.48
131570	14.30	1.14	17.37

Sample ID Number	Silcate	Phosphate	NO2+NO3
131571	12.29	1.10	16.95
131571	12.46	1.10	17.11
131572	11.42	1.12	17.10
131572	12.07	1.12	17.06
131573	11.21	1.13	17.22
131573	11.36	1.11	17.45
131574	11.41	1.10	17.34
131574	11.43	1.10	17.38
131575	11.14	1.14	17.52
131575	11.17	1.16	17.69
131576	12.64	1.31	19.72
131576	12.78	1.33	20.00
131577	11.92	1.33	20.62
131577	14.02	1.33	20.96
131578	6.13	.84	13.63
131578	6.21	.83	13.60
131579	2.78	.41	6.96
131579	2.82	.41	7.17
131580	1.67	.22	3.94
131580	1.76	.21	3.90
131581	.99	.09	1.26
131581	1.01	.10	1.28
131582	10.20	1.07	17.18
131582	10.22	1.10	16.95
131583	23.92	1.16	17.17
131583	24.00	1.14	17.21
131584	7.23	.84	13.40
131584	7.30	.83	13.45

Sample ID Number	Silcate	Phosphate	NO2+NO3
131585	23.73	1.18	17.28
131585	23.77	1.16	17.45
131586	18.00	1.16	17.24
131586	18.02	1.16	17.27
131587	15.53	1.11	16.52
131587	15.68	1.12	16.57
131588	14.50	1.11	16.37
131588	14.56	1.10	16.59
131589	13.38	1.12	16.99
131589	13.42	1.10	16.68
131590	11.93	1.09	16.69
131590	11.96	1.08	16.75
131591	11.21	1.10	17.00
131591	11.22	1.10	16.96
131592	11.10	1.12	17.17
131592	11.18	1.11	17.16
131593	11.09	1.15	17.53
131593	11.17	1.15	17.63
131594	12.27	1.25	19.30
131594	12.29	1.25	19.10
131595	12.31	1.30	19.99
131595	14.49	1.29	19.83
131596	10.69	1.24	18.42
131596	10.72	1.22	18.48
131597	6.30	.85	13.72
131597	6.38	.87	13.74
131598	3.73	.56	9.20
131598	4.43	.56	9.11

Sample ID Number	Silcate	Phosphate	NO2+NO3
131599	2.39	.36	6.39
131599	2.99	.36	6.37
131600	1.40	.19	3.55
131600	3.75	.19	3.54
131601	1.18	.14	1.51
131601	1.20	.15	1.55
131602	22.51	1.10	16.29
131602	22.69	1.11	16.14
131603	22.63	1.11	16.67
131603	22.67	1.12	16.28
131604	19.95	1.11	16.49
131604	20.16	1.11	16.40
131605	21.46	1.12	16.26
131605	21.57	1.14	16.49
131606	13.90	1.16	17.60
131606	13.91	1.18	17.70
131607	17.05	1.17	17.54
131607	17.09	1.18	17.39
131608	15.92	1.18	17.36
131608	15.98	1.17	17.30
131609	15.01	1.16	17.44
131609	15.07	1.17	17.33
131610	13.08	1.16	17.29
131610	13.12	1.15	17.30
131611	12.09	1.15	17.60
131611	12.16	1.16	17.37
131612	11.69	1.18	18.05

Sample ID Number	Silcate	Phosphate	NO2+NO3
131612	11.73	1.16	17.45
131613	10.93	1.18	17.51
131613	10.96	1.16	17.75
131614	11.32	1.12	18.23
131614	11.45	1.15	18.40
131615	11.86	1.22	19.11
131615	11.87	1.23	19.08
131616	12.80	1.32	20.23
131616	12.89	1.32	19.73
131617	5.13	.76	11.92
131617	5.39	.72	12.04
131618	5.03	.71	12.03
131618	5.07	.71	12.06
131619	2.70	.36	6.89
131619	2.70	.38	7.02
131620	1.25	0.00	1.57
131620	1.26	.09	1.71
131621	1.15	0.00	1.23
131621	1.23	0.00	1.22
131622	23.38	1.10	17.43
131622	23.45	1.16	17.51
131623	23.44	1.16	17.99
131623	23.46	1.17	17.80
131624	7.87	.85	13.71
131624	7.89	.86	13.89
131625	23.28	1.19	17.93
131625	23.35	1.18	17.83
131626	18.20	1.14	17.85
131626	18.35	1.15	17.35
131627	18.11	1.14	17.52
131627	18.16	1.13	17.79
131628	17.18	1.16	17.87
131628	17.23	1.16	17.82
131629	15.15	1.14	17.54
131629	15.32	1.14	17.64
131630	12.66	1.06	17.27
131630	12.86	1.10	17.30
131631	12.00	1.12	17.44
131631	12.14	1.12	17.39
131632	11.49	1.16	17.33
131632	11.53	1.12	17.29
131633	11.09	1.13	17.90
131633	11.18	1.13	17.54
131634	10.82	1.12	17.88
131634	10.83	1.14	18.10
131635	11.46	1.19	18.49
131635	11.63	1.19	18.65
131636	12.69	1.31	20.68
131636	12.71	1.32	20.91
131637	8.34	1.08	17.67
131637	8.39	1.08	17.82
131638	10.88	1.21	19.91
131638	11.03	1.26	20.11
131639	4.62	.67	11.28
131639	4.63	.68	11.36
131640	4.81	.70	12.63

Sample ID Number	Silcate	Phosphate	NO2+NO3
131640	4.86	.71	12.59
131641	1.23	.08	1.03
131641	1.28	.09	1.06
131642	22.54	1.12	17.87
131642	22.70	1.15	18.05
131643	22.53	1.18	18.21
131643	22.57	1.17	18.09
131644	11.70	1.26	19.93
131644	11.75	1.25	19.77
131645	17.42	1.15	17.52
131645	17.58	1.17	17.80
131646	15.39	1.15	17.41
131646	15.43	1.15	17.62
131647	14.21	1.14	17.64
131647	14.34	1.15	17.87
131648	12.73	1.15	17.55
131648	12.75	1.13	17.70
131649	11.08	1.11	17.22
131649	11.14	1.07	16.94
131650	11.66	1.14	17.57
131650	11.67	1.14	17.56
131651	10.80	1.13	17.30
131651	10.90	1.13	17.35
131652	10.94	1.14	17.52
131652	11.08	1.16	17.42
131653	10.63	1.16	17.38
131653	10.70	1.17	17.68
131654	11.51	1.21	18.59
131654	11.67	1.21	18.69
131655	12.30	1.27	19.58
131655	12.37	1.28	19.39
131656	12.53	1.38	20.67
131656	12.66	1.37	20.55
131657	12.68	1.35	22.23
131657	12.77	1.40	22.40
131658	10.39	1.26	20.16
131658	10.50	1.28	20.09
131659	6.81	.94	15.04
131659	6.88	.96	14.82
131660	4.46	.71	11.15
131660	4.53	.69	11.28
131661	1.56	.23	2.31
131661	1.59	.25	2.34
131662	19.74	1.09	16.73
131662	20.12	1.15	16.70
131663	23.17	1.20	17.45
131663	23.28	1.20	17.42
131664	21.96	1.17	17.84
131664	21.97	1.18	17.64
131665	21.27	1.13	17.02
131665	21.50	1.16	17.15
131666			
131666	15.63	1.16	17.68
131666	15.75	1.19	17.39
131667			
131667	18.00	1.16	17.45

Sample ID Number	Silcate	Phosphate	NO2+NO3
131667	18.05	1.17	17.34
131668	16.22	1.15	17.77
131668	16.37	1.16	17.17
131669	14.66	1.17	17.13
131669	14.74	1.15	17.08
131670	13.58	1.16	17.00
131670	13.59	1.16	16.90
131671	12.74	1.16	17.54
131671	12.95	1.15	17.51
131672	11.62	1.16	17.37
131672	11.79	1.17	16.97
131673	11.28	1.10	17.57
131673	11.32	1.13	17.48
131674	11.22	1.17	17.75
131674	11.32	1.17	17.82
131675	11.45	1.19	18.04
131675	11.51	1.20	17.97
131676	12.26	1.29	19.77
131676	12.48	1.30	19.27
131677	12.74	1.35	20.52
131677	12.78	1.35	20.83
131678	12.09	1.36	20.53
131678	12.29	1.37	20.48
131679	7.05	.99	15.23
131679	7.11	.99	15.29
131680	2.65	.46	6.88
131680	2.70	.48	7.05

Sample ID Number	Silcate	Phosphate	NO2+NO3
131681	1.43	.24	2.25
131681	1.45	.25	2.29
131682	22.09	1.18	17.44
131682	22.09	1.14	17.56
131683	23.12	1.18	17.85
131683	23.23	1.20	17.88
131684	17.71	1.27	18.12
131684	17.94	1.18	18.04
131685	22.58	1.44	18.31
131685	22.68	1.20	18.25
131686	15.85	1.31	18.42
131686	16.02	1.42	18.12
131687	19.23	1.17	18.02
131687	19.25	1.21	18.05
131688	16.86	1.19	17.97
131688	16.88	1.16	18.29
131689	15.05	1.15	18.28
131689	15.08	1.17	18.20
131690	13.66	1.12	18.28
131690	13.71	1.10	18.30
131691	12.47	1.12	18.17
131691	12.52	1.18	18.23
131692	11.81	1.15	18.66
131692	11.93	1.14	18.25
131693	11.32	1.17	18.80
131693	11.38	1.14	18.48
131694	11.48	1.20	19.16
131694	11.53	1.18	19.32

Sample ID Number	Silcate	Phosphate	NO2+NO3
131695	11.82	1.21	20.01
131695	11.88	1.36	19.83
131696	12.11	1.25	20.42
131696	12.21	1.27	20.42
131697	13.15	1.38	22.27
131697	13.29	1.38	22.39
131698	11.92	1.34	22.16
131698	12.02	1.31	22.33
131699	8.80	1.10	19.37
131699	8.88	1.11	19.29
131700	3.78	.57	10.38
131700	3.83	.58	10.52
131701	1.53	.21	2.64
131701	1.58	.22	2.72
131702	22.35	1.17	18.45
131702	22.44	1.12	19.78
131703	23.37	1.18	18.75
131703	23.39	1.17	18.85
131704	22.78	1.19	18.71
131704	22.90	1.18	18.90
131705	21.98	1.24	18.65
131705	22.03	1.20	19.11
131706	18.98	1.12	18.51
131706	19.06	1.10	18.45
131707	17.70	1.13	18.56
131707	17.75	1.16	18.59
131708	15.79	1.22	18.45
131708	15.87	1.14	18.32
131709	14.65	1.13	18.66
131709	14.73	1.14	18.42
131710	13.34	1.12	18.67
131710	13.36	1.23	18.42
131711	11.81	1.14	18.49
131711	12.01	1.14	18.56
131712	11.71	1.14	18.61
131712	12.20	1.18	18.58
131713	11.27	1.17	18.71
131713	11.41	1.14	18.57
131714	11.45	1.12	19.04
131714	11.59	1.15	19.19
131715	11.79	1.18	19.81
131715	11.79	1.17	20.12
131716	12.13	1.22	20.61
131716	12.20	1.30	20.39
131717	12.90	1.36	22.39
131717	13.10	1.42	22.38
131718	12.86	1.39	23.17
131718	12.89	1.41	23.22
131719	10.72	1.30	21.43
131719	10.78	1.26	21.20
131720	4.71	.71	12.59
131720	4.88	.72	12.70
131721	1.61	.23	3.00
131721	1.61	.25	3.10

Sample ID Number	Silcate	Phosphate	NO2+NO3
131722	15.09	1.01	16.63
131722	15.16	1.05	16.87
131723	16.72	1.06	17.38
131723	16.76	1.06	17.14
131724	18.01	1.11	17.90
131724	18.10	1.11	17.69
131725	17.27	1.12	17.98
131725	17.28	1.12	17.88
131726	14.47	1.12	17.95
131726	14.57	1.12	17.75
131727	16.86	1.15	18.01
131727	16.92	1.17	18.29
131728	12.59	1.09	17.48
131728	12.63	1.09	17.15
131729	11.51	1.10	17.60
131729	11.57	1.10	17.53
131730	10.36	1.06	17.71
131730	10.46	1.04	17.29
131731	10.04	1.08	17.73
131731	10.15	1.07	17.52
131732	11.38	1.13	18.23
131732	11.39	1.12	18.31
131733	11.45	1.13	18.24
131733	11.50	1.17	18.57
131734	11.20	1.14	18.51
131734	11.30	1.15	18.56
131735	11.35	1.18	19.27
131735	11.44	1.18	19.34
131736	11.71	1.27	19.48
131736	11.83	1.31	19.63
131737	11.90	1.25	20.24
131737	11.99	1.23	20.34
131738	11.82	1.18	20.07
131738	11.85	1.20	20.03
131739	12.54	1.34	21.76
131739	12.58	1.34	21.73
131740	6.89	.93	16.06
131740	6.98	.93	15.87
131741	1.76	.30	3.94
131741	1.84	.31	3.94
131742	14.47	1.01	16.51
131742	14.57	1.02	16.54
131743	17.26	1.08	17.07
131743	17.38	1.08	17.31
131744	17.74	1.10	17.39
131744	17.86	1.10	17.48
131745	14.96	1.09	16.79
131745	14.99	1.08	16.93
131746	14.31	1.05	17.46
131746	14.50	1.10	17.18
131747	13.18	1.06	17.29
131747	13.19	1.08	17.04
131748	12.24	1.08	17.02
131748	12.30	1.07	17.14

Sample ID Number	Silcate	Phosphate	NO2+NO3
131749	11.28	1.07	17.14
131749	11.31	1.07	17.46
131750	10.50	1.08	17.74
131750	10.61	1.07	17.23
131751	10.35	1.08	17.25
131751	10.52	1.07	17.14
131752	11.78	1.11	17.79
131752	11.93	1.13	18.30
131753	11.47	1.15	17.80
131753	11.75	1.12	18.30
131754	11.19	1.08	17.86
131754	11.27	1.12	18.56
131755	11.19	1.10	17.80
131755	11.28	1.15	18.34
131756	10.76	1.13	18.42
131756	11.06	1.14	18.64
131757	10.77	1.16	18.38
131757	10.93	1.17	18.61
131758	10.82	1.16	18.52
131758	10.93	1.18	18.52
131759	11.61	1.24	19.34
131759	11.85	1.26	19.54
131760	12.75	1.38	21.39
131760	12.77	1.37	21.40
131761	9.06	1.04	12.73
131761	9.12	1.02	12.74
131762	21.44	1.11	17.84
131762	21.72	1.13	17.91

Sample ID Number	Silcate	Phosphate	NO2+NO3
131763	22.79	1.16	18.04
131763	22.86	1.15	18.21
131764	20.87	1.14	17.73
131764	21.02	1.15	17.87
131765	16.07	1.14	17.49
131765	16.08	1.09	17.29
131766	15.22	1.12	17.38
131766	15.33	1.11	17.56
131767	14.40	1.11	17.48
131767	14.42	1.13	17.62
131768	12.71	1.11	17.47
131768	12.74	1.14	17.48
131769	11.41	1.09	17.37
131769	11.43	1.13	17.23
131770	10.73	1.05	16.93
131770	10.74	1.08	17.27
131771	10.12	1.09	17.11
131771	10.17	1.10	17.17
131772	10.48	1.11	17.42
131772	10.50	1.11	17.40
131773	10.64	1.12	17.92
131773	10.74	1.13	17.62
131774	10.92	1.13	17.75
131774	11.07	1.14	17.84
131775	10.56	1.15	18.04
131775	10.61	1.14	18.08
131776	10.68	1.15	18.04

Sample ID Number	Silcate	Phosphate	NO2+NO3
131776	10.70	1.15	18.13
131777	10.92	1.17	18.17
131777	11.02	1.17	17.95
131778	11.02	1.18	17.99
131778	11.03	1.20	18.07
131779	10.81	1.21	17.72
131779	10.83	1.21	17.78
131780	4.81	.68	8.02
131780	4.86	.69	8.03
131781	2.32	.40	3.13
131781	2.34	.39	3.18
131782	12.17	1.08	16.33
131782	12.25	1.09	16.62
131783	11.72	1.09	16.78
131783	11.75	1.10	16.75
131784	11.21	1.11	16.59
131784	11.31	1.10	16.71
131785	10.99	1.10	16.62
131785	11.32	1.12	16.78
131786	10.58	1.04	16.44
131786	10.63	1.08	16.73
131787	10.02	1.10	16.83
131787	10.03	1.14	16.92
131788	9.82	1.11	16.77
131788	9.95	1.12	16.63
131789	9.98	1.10	16.74
131789	9.99	1.13	16.70

Sample ID Number	Silcate	Phosphate	NO2+NO3
131790	9.94	1.14	16.71
131790	10.00	1.12	16.69
131791	10.07	1.13	17.21
131791	10.94	1.14	16.92
131792	10.23	1.15	17.56
131792	10.31	1.15	17.35
131793	10.70	1.19	18.04
131793	10.74	1.19	17.68
131794	11.33	1.22	18.31
131794	11.33	1.22	18.30
131795	11.21	1.23	18.21
131795	11.31	1.23	18.70
131796	2.30	.41	3.15
131796	2.31	.39	3.10
131797	11.09	1.12	17.09
131797	11.24	1.11	16.87
131798	10.59	1.12	16.72
131798	10.71	1.13	16.96
131799	10.68	1.15	17.03
131799	10.69	1.14	17.09
131800	10.42	1.15	17.07
131800	10.47	1.16	17.33
131801	9.86	1.13	17.43
131801	10.00	1.15	17.11
131802	9.79	1.13	17.10
131802	9.82	1.10	17.10
131803	7.49	1.01	14.48
131803	7.52	1.02	14.36

Sample ID Number	Silcate	Phosphate	NO2+NO3
131804	2.62	.48	4.42
131804	2.65	.48	4.39
131805	12.92	1.20	18.11
131805	12.98	1.19	18.08
131806	13.23	1.23	18.51
131806	13.23	1.23	18.58
131807	12.69	1.30	19.42
131807	12.71	1.32	19.46
131808	7.76	1.07	14.26
131808	7.76	1.06	14.52
131809	2.57	.49	4.53
131809	2.57	.50	4.51
131810	15.95	1.36	20.02
131810	16.00	1.40	20.04
131811	4.99	.76	8.15
131811	5.03	.75	8.08
131812	8.63	1.14	15.30
131812	8.77	1.19	15.70
131813	1.99	.46	3.03
131813	2.03	.48	3.14
131814	12.71	1.40	18.47
131814	13.02	1.32	18.54
131815	8.31	1.15	15.19
131815	8.32	1.21	15.18
131816	3.76	.77	7.91
131816	3.94	.77	7.86
131817	2.10	.50	3.38
131817	2.13	.48	3.36
131818	10.13	1.22	16.01
131818	10.20	1.20	16.99
131819	7.00	1.07	13.60
131819	7.03	1.07	13.63
131820	2.13	.53	3.60
131820	2.18	.48	3.73
131821	1.88	.44	2.81
131821	1.89	.43	2.79
131822	10.15	1.23	16.02
131822	10.34	1.21	16.01
131823	8.68	1.14	14.52
131823	8.74	1.17	14.67
131824	4.46	2.39	8.92
131824	5.22	.81	9.03
131825	1.89	.46	3.04
131825	1.95	.45	2.91
131826	11.46	1.33	17.40
131826	11.58	1.24	17.18
131827	7.49	1.07	13.68
131827	7.55	1.07	13.61
131828	2.10	.46	3.52
131828	2.17	.48	3.60
131829	1.92	.43	3.20
131829	1.98	.44	3.05
131830	12.86	1.31	18.32
131830	12.90	1.28	18.34

Sample ID Number	Silcate	Phosphate	NO2+NO3
131831	11.15	1.26	17.63
131831	11.17	1.23	17.47
131832	7.51	1.15	13.88
131832	7.58	1.15	14.32
131833	1.68	.41	2.55
131833	1.71	.42	2.61
131834	11.39	1.17	17.41
131834	11.76	1.22	17.53
131835	11.33	1.25	17.66
131835	11.42	1.25	17.52
131836	7.38	1.08	13.83
131836	7.42	1.06	14.12
131837	1.59	.37	2.19
131837	1.59	.40	2.28
131838	11.18	1.20	17.51
131838	11.22	1.19	17.49
131839	9.67	1.55	16.71
131839	9.73	1.18	16.89
131840	7.92	1.14	14.33
131840	7.92	1.16	14.35
131841	1.60	.40	2.21131841
1.63	.42	2.36	
131842	11.02	1.02	12.47
131842	11.04	1.04	12.48
131843	11.00	1.02	12.56
131843	11.05	1.04	12.68
131844	12.00	1.13	10.11
131844	12.16	1.12	10.06

Sample ID Number	Silcate	Phosphate	NO2+NO3
131845	3.36	.61	3.20
131845	3.39	.61	3.23
131846	10.21	1.10	16.23
131846	10.25	1.09	16.41
131847	10.07	1.08	16.31
131847	10.13	1.08	16.45
131848	10.95	1.10	15.96
131848	10.98	1.09	15.87
131849	12.15	1.11	15.31
131849	12.18	1.11	15.34
131851	11.23	1.10	16.07
131851	11.28	1.08	16.30
131852	10.09	1.21	16.76
131852	10.10	1.08	16.31
131853	9.63	1.09	16.74
131853	9.74	1.07	16.46
131854	9.57	1.09	16.44
131854	9.75	1.10	16.73
131855	8.52	1.06	15.71
131855	8.55	1.08	15.88
131856	6.15	.98	12.54
131856	6.16	.95	12.52
131857	2.55	.51	5.35
131857	2.60	.52	5.30
131858	1.99	.53	4.57
131858	2.01	.52	4.66
131859	8.97	1.05	16.07

Sample ID Number	Silcate	Phosphate	NO2+NO3
131859	8.97	1.09	16.17
131860	10.56	1.26	16.37
131860	10.72	1.09	16.44
131861	10.37	1.10	16.561
31861	10.38	1.09	16.62
131862	10.14	1.12	16.94
131862	10.16	1.11	16.66
131863	9.62	1.11	16.66
131863	9.63	1.09	16.45
131864	9.18	1.09	16.51
131864	9.40	1.09	16.48
131865	8.21	1.08	15.23
131865	8.30	1.05	15.27
131868	10.04	1.17	16.82
131868	10.07	1.13	16.87
131869	1.87	.40	2.79
131869	1.90	.39	2.84
131870	1.81	.39	2.69
131870	1.82	.38	2.72
131871	10.61	1.06	16.14
131871	10.64	1.08	16.25
131872	10.11	1.08	16.50
131872	10.14	1.08	16.48
131873	9.60	1.09	16.34
131873	9.65	1.09	16.55
131874	9.45	1.10	16.35
131874	9.53	1.11	16.72

Sample ID Number	Silcate	Phosphate	NO2+NO3
131875	6.50	.96	12.62
131875	6.54	.95	12.72
131876	2.65	.50	4.94
131876	2.68	.49	5.01
131877	9.87	1.08	16.16
131877	9.88	1.06	16.13
131878	9.76	1.07	16.47
131878	9.84	1.06	16.16
131879	10.10	1.09	16.73
131879	10.22	1.09	16.71
131880	9.76	1.08	16.46
131880	9.82	1.08	16.56
131881	9.65	1.08	16.42
131881	9.77	1.09	16.65
131882	9.27	1.09	16.241318
82	9.32	1.10	16.35
131883	8.04	1.04	14.70
131883	8.14	1.03	15.00
131884	2.49	.45	4.19
131884	2.51	.44	4.20
131885	12.65	1.03	15.43
131885	12.92	1.00	15.40
131886	4.64	.63	7.49
131886	4.70	.59	7.41
131887	12.49	1.05	15.87
131887	12.57	1.06	16.07
131888	11.62	1.08	16.48
131888	11.64	1.06	16.10

Sample ID Number	Silcate	Phosphate	NO2+NO3
131889	10.65	1.09	16.53
131889	10.68	1.07	16.95
131890	10.05	1.05	16.26
131890	10.71	1.08	16.55
131891	9.83	1.11	16.54
131891	9.96	1.10	16.78
131892	9.66	1.09	16.65
131892	9.72	1.09	16.52
131893	10.01	1.13	16.62
131893	10.14	1.07	16.97
131894	10.08	1.14	17.07
131894	10.13	1.12	17.12
131895	9.57	1.12	16.98
131895	9.67	1.08	17.14
131896	9.43	1.13	17.17
131896	9.76	1.07	16.91
131897	9.44	1.12	16.84
131897	9.49	1.10	16.69
131898	10.57	1.18	17.96
131898	10.65	1.16	17.91
131899	2.13	.39	3.29
131899	2.14	.38	3.36
131901	13.79	1.03	15.51
131901	13.84	1.02	15.40
131902	17.38	1.07	16.43
131902	17.49	1.04	16.51
131903	15.72	1.07	16.71
131903	15.82	1.07	16.40
131904	16.43	1.07	16.90
131904	16.45	1.07	16.62
131905	13.66	1.08	16.75
131905	13.72	1.07	16.75
131906	13.11	1.06	17.09
131906	13.11	1.08	16.76
131907	12.09	1.05	16.75
131907	12.16	1.07	16.91
131909	10.85	1.06	16.77
131909	10.86	1.08	17.50
131910	10.51	1.08	17.10
131910	10.60	1.08	16.76
131911	10.25	1.06	16.66
131911	10.30	1.06	16.79
131912	10.05	1.05	16.80
131912	10.12	1.07	16.73
131913	10.28	1.08	17.12
131913	10.54	1.09	16.79
131914	11.15	1.13	18.23
131914	11.27	1.14	17.65
131915	11.29	1.16	18.33
131915	11.31	1.18	18.16
131916	10.88	1.18	17.85
131916	10.95	1.19	17.98
131919	7.85	.98	12.99
131919	7.91	.96	13.07

Sample ID Number	Silcate	Phosphate	NO2+NO3
131920	1.90	.35	2.33
131920	1.93	.36	2.42
131921	13.86	1.01	15.42
131921	14.09	.99	15.23
131922	13.88	1.01	15.23
131922	13.94	1.02	15.32
131923	17.49	1.08	16.24
131923	17.72	1.07	16.34
131924	18.31	1.12	16.48
131924	18.32	1.11	16.35
131925	16.07	1.09	16.15
131925	16.39	1.09	16.50
131926	15.31	1.08	16.74
131926	15.33	1.09	16.45
131927	14.97	1.10	17.04
131927	15.08	1.10	16.71
131928	12.41	1.09	16.65
131928	12.56	1.10	16.70
131929	12.37	1.07	16.80
131929	12.44	1.10	16.64
131930	11.46	1.09	16.56
131930	11.47	1.07	16.72
131931	11.08	1.10	16.61
131931	11.11	1.09	16.66
131932	11.64	1.11	16.75
131932	11.73	1.10	16.62
131933	10.34	1.09	16.47
131933	10.42	1.09	16.50

Sample ID Number	Silcate	Phosphate	NO2+NO3
131934	10.32	1.10	16.48
131934	10.34	1.09	16.50
131935	10.98	1.12	17.38
131935	11.13	1.12	16.95
131936	7.46	.89	12.43
131936	7.56	.88	12.27
131937	10.88	1.13	17.65
131937	10.93	1.15	17.56
131938	10.51	1.13	17.50
131938	10.58	1.14	17.51
131939	10.17	1.15	16.98
131939	10.21	1.14	16.93
131940	1.84	.38	2.35
131940	1.85	.33	2.46
131941	13.57	1.03	14.87
131941	13.76	1.01	14.84
131942	14.71	1.03	15.21
131942	14.81	1.03	15.08
131943	18.79	1.10	16.30
131943	18.87	1.23	16.22
131944	19.32	1.11	16.28
131944	21.67	1.13	16.17
131945	16.36	1.08	16.10
131945	16.38	1.08	16.26
131946	14.57	1.07	16.14
131946	14.70	1.09	16.16
131947	13.01	1.08	16.08

Sample ID Number	Silcate	Phosphate	NO2+NO3
131947	13.15	1.09	15.79
131948	13.06	1.10	16.21
131948	13.07	1.11	16.15
131949	12.88	1.12	16.18
131949	12.95	1.12	16.32
131950	11.33	1.10	15.83
131950	11.52	1.10	15.95
131951	11.38	1.11	16.15
131951	11.42	1.10	16.15
131952	10.61	1.11	16.04
131952	10.67	1.10	15.91
131953	10.74	1.09	16.28
131953	10.79	1.08	16.23
131954	10.62	1.12	16.50
131954	10.65	1.10	16.59
131955	10.47	1.11	16.74
131955	10.51	1.11	16.66
131956	10.86	1.18	17.26
131956	11.81	1.18	17.20
131957	10.53	1.14	16.38
131957	10.57	1.15	16.59
131958	11.04	1.19	17.24
131958	11.05	1.19	17.42
131959	9.69	1.14	15.76
131959	9.70	1.15	16.03
131960	1.85	.35	2.45
131960	2.10	.36	2.37

Sample ID Number	Silcate	Phosphate	NO2+NO3
131961	13.53	1.03	15.29
131961	13.54	1.07	15.15
131962	15.34	1.07	15.86
131962	15.46	1.06	15.59
131963	17.58	1.12	16.54
131963	17.62	1.14	16.61
131964	11.09	1.19	17.42
131964	11.23	1.17	17.21
131965	16.94	1.13	17.18
131965	17.07	1.14	17.27
131966	15.73	1.12	16.97
131966	16.84	1.15	17.15
131967	13.53	1.10	16.92
131967	13.62	1.11	16.91
131968	12.57	1.12	16.85
131968	12.60	1.11	16.88
131969	11.84	1.14	17.30
131969	11.90	1.08	17.46
131970	10.89	1.08	17.24
131970	11.00	1.08	17.31
131971	10.60	1.08	17.40
131971	10.80	1.10	17.46
131972	10.65	1.12	17.80
131972	10.72	1.12	17.62
131973	10.92	1.13	18.45
131973	10.94	1.14	18.26
131974	11.26	1.16	19.01
131974	11.35	1.16	19.00

Sample ID Number	Silcate	Phosphate	NO2+NO3
131975	11.92	1.23	19.66
131975	11.97	1.21	19.65
131976	10.05	1.11	16.29
131976	10.27	1.09	16.54
131977	11.95	1.24	20.29
131977	11.95	1.28	20.40
131978	9.78	1.08	15.93
131978	9.84	1.06	16.04
131979	2.22	.36	2.94
131979	2.33	.34	2.99
131980	2.02	.33	1.98
131980	2.05	.34	1.93
131981	17.43	1.05	
17.21131981	17.58	1.08	17.06
131982	17.33	1.05	17.45
131982	17.47	1.06	17.47
131983	12.86	1.09	18.06
131983	13.06	1.12	18.37
131984	20.11	1.11	18.13
131984	20.46	1.12	18.17
131985	18.80	1.11	18.34
131985	18.90	1.10	18.42
131986	16.76	1.09	18.25
131986	16.78	1.15	18.29
131987	15.36	1.10	18.19
131987	15.38	1.09	18.13
131988	14.27	1.09	18.03

Sample ID Number	Silcate	Phosphate	NO2+NO3
131988	14.39	1.08	18.32
131989	12.40	1.08	18.30
131989	12.45	1.09	18.29
131990	11.04	1.11	17.60
131990	11.21	1.06	17.89
131991	11.51	1.07	17.95
131991	11.67	1.07	17.98
131992	11.42	1.10	18.66
131992	11.46	1.10	18.68
131993	11.37	1.12	18.86
131993	11.45	1.08	18.78
131994	11.51	1.15	19.24
131994	11.63	1.15	19.51
131995	12.13	1.20	20.13
131995	12.18	1.21	20.29
131996	11.18	1.11	18.89
131996	11.23	1.13	19.08
131997	13.12	1.32	22.96
131997	13.23	23.00	
131998	8.67	1.05	18.50
131998	8.69	1.10	18.80
131999	3.84	.54	10.00
131999	3.86	.52	10.12
132000	1.79	.21	3.48132000
1.83	.22	3.43	
132001	17.61	1.04	17.27
132001	17.62	1.04	16.86

Sample ID Number	Silcate	Phosphate	NO2+NO3
132002	20.10	1.08	17.73
132002	20.11	1.11	17.85
132003	19.51	1.08	17.70
132003	19.58	1.09	17.69
132004	16.66	1.03	16.94
132004	16.70	1.18	16.56
132005	17.54	1.07	17.38
132005	17.62	1.09	17.77
132006	15.42	1.07	17.49
132006	15.51	1.11	17.58
132007	13.88	1.06	18.11
132007	13.96	1.08	17.43
132008	12.59	1.07	17.63
132008	12.66	1.08	17.39
132009	11.38	1.06	17.27
132009	11.43	1.07	17.05
132010	11.03	1.07	17.51
132010	11.14	1.07	17.53
132011	10.70	1.07	17.54
132011	10.82	1.06	17.19
132012	11.12	1.12	17.87
132012	11.19	1.11	17.84
132013	11.32	1.15	18.65
132013	11.33	1.15	18.63
132014	11.82	1.21	19.43
132014	11.98	1.21	19.07
132015	11.30	1.23	19.21
132015	11.38	1.21	19.36

Sample ID Number	Silcate	Phosphate	NO2+NO3
132016	6.74	.85	14.40
132016	6.78	.84	14.32
132017	4.92	.68	11.49
132017	4.92	.70	11.58
132018	3.12	.45	7.76
132018	3.14	.46	7.65
132019	3.30	.48	8.35132019
4.44	.49	8.29	
132020	2.04	.28	4.76
132020	2.26	.29	4.71
132021	15.32	1.04	15.90
132021	15.52	1.00	15.79
132022	18.42	1.06	16.48
132022	18.46	1.05	16.35
132024	16.89	1.08	16.33
132024	18.10	1.08	16.48
132025	15.26	1.07	16.49
132025	16.05	1.06	16.36
132026	14.23	1.06	16.69
132026	14.26	1.09	16.43
132027	12.46	1.07	16.67
132027	12.56	1.07	16.54
132028	11.99	1.07	16.45
132028	12.08	1.06	16.46
132029	10.78	1.07	16.55
132029	10.82	1.08	16.25
132030	10.92	1.09	16.85

Sample ID Number	Silcate	Phosphate	NO2+NO3
132030	10.97	1.08	16.80
132031	11.04	1.09	16.88
132031	11.13	1.09	16.86
132032	10.76	1.12	17.20
132032	10.89	1.12	16.97
132033	11.92	1.21	18.32
132033	12.05	1.22	18.76
132034	11.14	1.36	19.18
132034	11.28	1.37	19.42
132035	4.30	.70	10.35
132035	4.54	.71	10.35
132036	3.94	.64	9.84
132036	4.43	.65	9.58
132037	3.85	.67	10.56
132037	3.92	.67	10.29
132038	2.21	.38	5.58
132038	2.24	.40	5.80
132039	2.73	.45	7.17132039
2.80	.44	7.20	
132040	2.03	.32	4.41
132040	2.07	.31	4.41
132041	17.11	1.20	17.09
132041	17.40	1.20	17.00
132042	18.16	1.20	17.00
132042	18.28	1.22	17.26
132044	16.60	1.23	17.68
132044	16.63	1.23	17.61

Sample ID Number	Silcate	Phosphate	NO2+NO3
132045	14.85	1.22	17.35
132045	16.05	1.21	18.95
132046	14.01	1.21	17.71
132046	14.11	1.21	18.03
132047	13.11	1.22	18.06
132047	13.21	1.26	18.06
132048	11.76	1.24	18.11
132048	11.85	1.22	18.10
132049	11.15	1.23	18.14
132049	11.16	1.26	19.45
132050	10.95	1.24	17.85
132050	12.17	1.24	18.21
132051	11.03	1.23	18.58
132051	13.11	1.20	18.69
132052	11.54	1.27	19.17
132052	11.63	1.26	19.04
132053	12.34	1.39	20.41
132053	13.34	1.39	20.60
132054	11.28	1.33	19.32
132054	11.31	1.34	20.94
132055	11.86	1.41	20.88
132055	13.88	1.40	20.69
132056	10.35	1.33	20.34
132056	10.41	1.34	20.60
132057	5.30	.83	12.87
132057	5.36	.82	12.87
132058	3.27	.56	9.07
132058	3.39	.57	9.15

Sample ID Number	Silcate	Phosphate	NO2+NO3
132059	1.78	.31	4.44132059
	2.73	.31	4.40
132060	1.43	.25	3.61
132060	1.43	.25	3.60
132061	18.32	1.15	16.98
132061	18.40	1.15	16.87
132062	19.23	1.17	17.06
132062	19.23	1.17	17.16
132063	11.55	1.31	19.03
132063	11.87	1.28	19.14
132065	14.82	1.15	16.75
132065	14.97	1.15	17.02
132066	13.86	1.16	17.23
132066	13.88	1.16	16.95
132067	12.35	1.16	17.28
132067	12.99	1.17	16.99
132068	11.27	1.13	17.29
132068	11.30	1.14	17.17
132069	11.43	1.16	17.57
132069	11.43	1.18	17.91
132070	10.60	1.16	17.69
132070	10.65	1.18	17.75
132071	10.97	1.21	18.19
132071	11.34	1.32	18.20
132072	11.05	1.24	18.42
132072	11.18	1.22	18.22
132073	11.20	1.26	18.40
132073	11.21	1.27	18.43
132074	11.61	1.31	19.43
132074	11.62	1.31	19.26
132075	11.85	1.39	20.43
132075	11.88	1.38	20.59
132076	8.75	1.11	16.57
132076	8.78	1.14	16.71
132077	5.65	.85	13.07
132077	5.72	.84	12.79
132078	2.61	.47	6.58
132078	2.64	.48	6.55
132079	1.98	.35	4.72132079
	2.01	.35	4.72
132081	18.64	1.16	15.65
132081	18.68	1.17	15.78
132082	19.92	1.13	16.35
132082	19.96	1.12	16.19
132083	20.85	1.24	15.91
132083	20.99	1.21	15.94
132084	16.75	1.10	16.40
132084	17.03	1.11	16.55
132085	17.42	1.23	16.18
132085	17.64	1.22	15.84
132086	14.80	1.20	15.74
132086	14.92	1.19	15.95
132087	13.73	1.18	15.89
132087	13.78	1.21	16.14

Sample ID Number	Silcate	Phosphate	NO2+NO3
132088	12.35	1.20	16.58
132088	12.35	1.21	16.43
132089	11.30	1.16	16.42
132089	12.09	1.15	16.75
132090	11.10	1.16	16.86
132090	11.25	1.15	17.15
132091	11.06	1.17	16.92
132091	11.20	1.18	17.15
132092	11.30	1.20	17.28
132092	12.20	1.21	17.29
132093	11.72	1.24	17.74
132093	12.31	1.24	17.74
132094	12.05	1.32	18.80
132094	12.18	1.34	19.17
132095	11.30	1.30	18.61
132095	11.34	1.31	18.60
132096	9.11	1.17	16.47
132096	9.16	1.15	16.32
132097	6.61	.90	13.86
132097	6.61	.94	13.90
132098	5.66	.81	12.63
132098	8.80	.82	12.53
132099	2.32	.36	5.11
132099	2.65	.35	5.11
132100	2.18	.27	3.43
132100	3.21	.29	3.45
132101	13.47	1.29	16.36
132101	13.48	1.13	16.79
132102	12.93	1.15	15.74
132102	12.99	1.14	15.82
132103	12.07	1.14	16.40
132103	12.56	1.14	16.21
132104	11.20	1.11	16.10
132104	11.20	1.11	16.28
132105	10.70	1.10	15.83
132105	10.73	1.12	16.09
132106	10.65	1.14	16.42
132106	11.22	1.12	16.56
132107	10.83	1.15	16.67
132107	11.47	1.21	16.39
132108	11.35	1.18	16.59
132108	11.39	1.19	16.44
132109	10.98	1.20	16.63
132109	12.46	1.20	16.60
132110	11.51	1.26	17.92
132110	11.53	1.25	17.43
132112	12.33	1.32	19.02
132112	12.40	1.35	19.15
132113	12.21	1.37	19.79
132113	12.38	1.37	19.79
132114	11.06	1.25	19.25
132114	11.39	1.30	19.20
132115	7.40	.99	14.62
132115	8.88	1.00	14.71
132116	6.11	.85	12.83

Sample ID Number	Silcate	Phosphate	NO2+NO3
132116	6.13	.85	12.60
132117	3.56	.57	8.46
132117	3.57	.56	8.59
132118	2.10	.34	4.66
132118	2.10	.34	4.66
132119	2.84	.33	4.66132119
3.09	.33	4.66	
132120	1.91	.28	3.59
132120	4.50	.29	3.53
132121	24.76	1.22	17.03
132121	24.85	1.27	17.03
132122	25.77	1.30	17.31
132122	25.91	1.29	17.33
132123	24.30	1.27	17.16
132123	24.36	1.28	17.19
132124	12.17	1.14	15.70
132124	13.39	1.14	15.79
132125	18.86	1.24	16.76
132125	19.02	1.23	16.75
132126	16.63	1.23	16.80
132126	17.72	1.26	16.69
132127	14.95	1.23	16.51
132127	15.02	1.22	16.32
132128	14.20	1.23	16.59
132128	14.25	1.22	16.68
132129	11.73	1.18	16.41
132129	11.74	1.15	16.38

Sample ID Number	Silcate	Phosphate	NO2+NO3
132130	11.35	1.20	16.60
132130	11.43	1.20	16.44
132131	11.19	1.26	17.26
132131	11.93	1.24	17.74
132132	11.08	1.23	17.43
132132	11.73	1.23	17.46
132133	11.43	1.26	17.86
132133	11.49	1.28	17.87
132134	12.31	1.35	18.53
132134	13.77	1.36	18.78
132135	12.24	1.45	20.56
132135	12.26	1.46	20.31
132136	5.94	.90	13.37
132136	5.96	.92	13.51
132137	3.25	.54	8.34
132137	3.27	.53	8.32
132139	1.11	.19	2.66132139
1.20	.17	2.68	
132140	1.08	.13	1.84
132140	2.02	.13	1.86
132141	22.72	1.17	17.25
132141	22.92	1.22	17.39
132142	22.74	1.21	17.14
132142	22.95	1.23	17.37
132143	22.95	1.23	17.32
132143	23.81	1.23	17.29
132144	22.20	1.23	17.14
132144	22.24	1.23	17.34

Sample ID Number	Silcate	Phosphate	NO2+NO3
132145	22.02	1.26	17.64
132145	22.04	1.24	17.52
132146	17.97	1.18	17.00
132146	18.02	1.15	17.08
132147	18.54	1.20	17.36
132147	18.73	1.19	17.13
132148	16.53	1.18	17.39
132148	16.53	1.20	17.50
132149	14.59	1.20	17.47
132149	15.61	1.20	17.20
132150	12.99	1.18	16.79
132150	13.03	1.19	17.05
132151	10.89	1.18	17.09
132151	10.92	1.19	16.96
132152	11.25	1.19	17.18
132152	11.83	1.18	17.34
132153	11.06	1.20	17.44
132153	11.22	1.20	17.60
132154	11.32	1.20	17.94
132154	11.49	1.16	17.93
132155	11.79	1.28	18.96
132155	12.82	1.29	18.87
132156	11.63	1.36	19.85
132156	11.89	1.37	19.86
132157	5.04	.78	11.95
132157	5.16	.80	11.71
132158	2.67	.46	7.42132158
2.72	.47	7.46	
132159	.96	.17	2.10
132159	2.07	.17	2.09
132160	.99	.15	1.96
132160	1.85	.15	1.93
132161	26.11	1.19	17.65
132161	26.27	1.22	17.69
132162	27.29	1.24	17.78
132162	27.48	1.24	17.74
132163	22.83	1.19	16.96
132163	22.97	1.20	16.67
132164	22.07	1.18	16.64
132164	22.51	1.20	16.77
132165	20.44	1.19	17.02
132165	20.49	1.19	17.03
132166	16.80	1.16	16.56
132166	16.93	1.15	16.75
132167	16.53	1.17	16.61
132167	16.61	1.10	16.41
132168	14.88	1.21	16.63
132168	14.92	1.18	16.84
132169	13.84	1.17	16.98
132169	13.85	1.17	16.90

Sample ID Number	Silcate	Phosphate	NO2+NO3	Sample ID Number	Silcate	Phosphate	NO2+NO3
132170	12.57	1.16	16.84				
132170	12.69	1.16	16.64				
132171	11.79	1.16	16.53				
132171	11.96	1.16	16.51				
132172	11.33	1.17	16.81				
132172	11.36	1.16	16.74				
132173	11.35	1.20	17.45				
132173	11.40	1.21	17.37				
132174	11.60	1.24	18.16				
132174	11.69	1.24	18.06				
132175	12.07	1.35	19.78				
132175	12.30	1.30	19.62				
132176	8.14	1.10	16.47				
132176	8.17	1.11	16.64				
132177	4.29	.69	10.51132177				
4.36	.70	10.41					
132178	2.22	.40	5.87				
132178	2.64	.38	5.96				
132179	1.59	.26	3.97				
132179	1.60	.24	3.91				
132180	1.11	.16	1.95				
132180	1.13	.16	1.89				

5. Dissolved Inorganic Carbon in Seawater — Bob Gershey

a. Description of Equipment and Technique

The total dissolved inorganic carbon content of seawater is defined as the total concentration of carbonate ion, bicarbonate ion and unionized species of carbon dioxide. Before analysis, the sample is treated with acid to convert all ionized species

to the unionized form, which is then separated from the liquid phase and subsequently measured using a coulometric titration technique. This involves the reaction of carbon dioxide gas with a dimethysulfoxide solution of ethanoline to produce hydroxyethylcarbamic acid. The acidic solution is titrated with hydroxide ion formed by the electrolytic decomposition of water. The progress of the titration is followed through colorimetric measurement of the absorbance of a Ph indicator dye (thymolphthalein) in the ethanolamine solution.

A known volume of seawater is dispensed into a stripping chamber from a pipet of known volume and temperature controlled to within 0.4 _C. It is then acidified with ten percent its volume of an 8% solution of carbon dioxide-free phosphoric acid. The solution in stripped of carbon dioxide gas by bubbling with a stream of nitrogen gas directed through a glass frit. The carrier gas exiting the stripper passes through a magnesium perchlorate trap to remove water vapour and acidic water droplets.

The gas stream is then directed into the coulometric titrator where the total amount of carbon dioxide gas is quantified. The coulometer is calibrated in two ways. Calibration using gas loops is accomplished by filling stainless steel sample loops (1.5, 2.5 ml) with 99.995% carbon dioxide gas and injecting these into the coulometer. The temperature and pressure of the gas within the loops must be known to within 0.05 _C and 20 Pa respectively. Standard solutions of sodium carbonate are also used to calibrate the system. These samples are treated in the same manner as a seawater sample.

Values are reported in units of $\mu mol/kg^{-1}$. The overall precision of the analysis should be at least 1.5 $\mu mol/kg^{-1}$ for samples with concentrations in the range of 1800-2300 $\mu mol/kg^{-1}$.

b. Sampling Procedure and Data Processing Technique

Water samples are initially collected using a Niskin bottle or similar sampler. Samples for analysis of total inorganic carbon must be taken as soon as possible after recovery of the samples to minimize exchange of carbon dioxide gas with the head space in the sampler which will typically result in a loss of carbon dioxide. It is desirable that the samples be drawn before half the sampler is emptied and within ten minutes of recovery. Clean borosilicate glass bottles are rinsed twice with 30 - 50 ml of the sample. The bottle is then filled from the bottom using a length of vinyl tubing attached to the spigot of the sampler. The sample is overflowed by at least half of the volume of the bottle (typically 250 ml). A head space of 1% is left to allow for expansion without leakage. If samples are not to be analyzed within four to five hours, the samples are poisoned with 100 µl/250 ml of 50% saturated mercuric chloride

solution. The bottle is tightly sealed and stored preferably at the temperature of collection.

c. Replicate Analysis

In total, 120 duplicate carbonate measurements were obtain. The following is a statistical summary of the absolute value of the differences between duplicates. Table C.4 lists all duplicate measurements.

Statistic	Value
Number of Duplicates	120
Minimum	0 μmoles/kg
Maximum	612.2 μmoles/kg
Mean	18.2 μmoles/kg
Median	0.8 μmoles/kg
Standard Deviation	85.5 μmoles/kg

Table C.4 Duplicate water sample carbonate values in μmoles/kg.

Sample ID Number	Total Carbon	Sample ID Number	Total Carbon
130518	2215.3	130650	2167.7
130518	2216.8	130650	2168.1
130523	2101.1	130659	2164.0
130523	2101.8	130659	2165.2
130524	2059.0	130682	2132.5
130524	2059.7	130682	2156.6
130529	2157.6	130691	2156.2
130529	2157.6	130691	2158.7
130534	2076.6	130718	2156.8
130534	2077.3	130718	2159.3
130543	2157.9	130729	2185.8
130543	2159.0	130729	2186.8
130553	2159.4	130738	2165.2
130553	2160.5	130738	2165.2
130558	2163.6	130752	2171.3
130558	2164.9	130752	2173.5
130595	2156.8	130769	2183.9
130595	2158.7	130769	2185.9
130619	2165.9	130791	2173.5
130619	2166.5	130791	2174.2
130627	2034.9	130809	2183.0
130627	2036.7	130809	2183.5
130632	2161.8	130812	2168.8
130632	2163.0	130812	2169.4
130633	2156.7	130839	2156.6
130633	2156.9	130839	2157.7

Table C.4 Duplicate water sample carbonate values in μmoles/kg.

Sample ID Number	Total Carbon	Sample ID Number	Total Carbon
130866	2110.3		
130866	2110.5		
130892	2163.7		
130892	2182.5		
130896	2160.9		
130896	2161.9		
130911	2174.3		
130911	2174.7		
130916	2160.6		
130916	2161.1		
130921	2165.0		
130921	2166.2		
130977	2156.0		
130977	2156.5		
131009	2166.6		
131009	2170.4		
131012	2155.9		
131012	2159.2		
131022	2172.1		
131022	2172.3		
131030	1895.6		
131030	2167.2		
131040	2152.0		
131040	2162.6		
131049	1876.6		
131049	2488.8		
		131072	1906.6

Sample ID Number	Total Carbon
131072	2481.6
131090	2168.5
131090	2501.1
131112	2158.4
131112	2160.2
131139	2158.1
131139	2160.4
131148	2066.8
131148	2071.6
131154	2158.3
131154	2159.2
131154	2159.8
131171	2162.1
131171	2162.2
131175	2159.0
131175	2159.4
131190	2161.9
131190	2163.7
131228	2040.6
131228	2041.3
131230	2158.2
131230	2158.3
131255	2154.4
131255	2154.6
131268	2152.0
131268	2152.6
131280	2136.3
131280	2138.2
131285	2144.1
131285	2144.4
131292	2101.7
131292	2101.9
131295	2135.7
131295	2136.6
131300	2143.0
131300	2143.8
131304	2154.2
131304	2154.8
131331	2152.8
131331	2153.1
131343	2046.8
131343	2153.7
131389	2155.9
131389	2157.8
131404	2157.5
131404	2158.2
131407	2155.5
131407	2155.6
131452	2154.6
131452	2156.7
131463	2167.6
131463	2168.4
131486	2167.0
131486	2168.4
131491	2163.3

Sample ID Number	Total Carbon
131491	2166.0
131492	2158.7
131492	2165.1
131498	2171.1
131498	2171.4
131526	2163.7
131526	2163.8
131533	2155.8
131533	2156.1
131564	2080.2
131564	2081.2
131572	2154.6
131572	2156.8
131603	2164.5
131603	2165.3
131614	2157.7
131614	2158.3
131624	2132.3
131624	2135.0
131645	2159.7
131645	2160.3
131658	2169.1
131658	2169.6
131683	2165.9
131683	2166.1
131706	2161.3
131706	2161.6
131744	2159.6
131744	2160.9
131764	2159.1
131764	2159.9
131788	2148.4
131788	2150.0
131801	2150.5
131801	2150.9
131809	2070.3
131809	2070.5
131812	2140.4
131812	2141.3
131814	2172.6
131814	2173.7
131819	2126.5
131819	2133.7
131823	2136.8
131823	2141.0
131825	2048.4
131825	2048.4
131829	2043.9
131829	2052.6
131832	2133.7
131832	2133.7
131834	2161.0
131834	2162.0
131839	2153.3
131839	2153.5

Sample ID Number	Total Carbon
131845	2076.8
131845	2077.5
131849	2152.6
131849	2153.3
131854	2152.9
131854	2153.7
131861	2154.4
131861	2155.0
131869	2046.5
131869	2049.8
131872	2153.2
131872	2153.6
131881	2152.5
131881	2152.9
131886	2093.4
131886	2106.3
131901	2154.4
131901	2154.9
131968	2161.1
131968	2164.8
131991	2155.0
131991	2156.4
132001	2160.0
132001	2160.3
132003	2158.9
132003	2160.1
132006	2157.3
132006	2157.8
132044	2159.7
132044	2161.5
132069	2154.2
132069	2154.5
132083	2165.2
132083	2165.6
132111	2169.1
132111	2172.9
132124	2147.4
132124	2148.7
132135	2177.0
132135	2177.2
132143	2167.3
132143	2167.9
132158	2110.1
132158	2110.2
132171	2072.7
132171	2157.1
132178	2104.5
132178	2106.8

6. Alkalinity — Frank Zemlyak

a. Description of Equipment and Technique

Total alkalinity is determined using the Marine Chemistry automated titration system. Total alkalinity is determined using a potentiometric titration of the sea water sample using hydrochloric acid. Once the sample is connected to the system, the operation proceeds automatically, from the glass reaction vessel being rinsed and filled with the sea water sample, to the final calculations at the conclusion of the titration.

When the reaction vessel is filled, the semi-micro combination Ross electrode senses when the sample has come to equilibrium, the initial relative mvolt reading is then logged, at the same time, the cell temperature is also recorded. At this point, a rather large quantity of 0.2N hydrochloric acid, is added to the cell via a Metrohm E-655 Dosimat. The increase in volume is accommodated by the withdrawal, by a stepper motor via an Acme lead screw, of an internal glass piston. This large quantity of acid added titrates the sample beyond the carbonate endpoint, at this point, smaller aliquots (0.040mL) of acid are added until the sample has been titrated to and beyond the second inflection point. With each addition of acid the sample is allowed to come to equilibrium, the mvolt reading is logged. Thus, with these relative changes in the voltage in the cell, the endpoint is calculated by using a modified Gran function. Corrections to the final total alkalinity result are made by using the sample salinity, sample temperature and the nutrients, silicate and phosphate.

b. Sampling Procedure and Data Processing Technique

The 500 ml samples used for alkalinity analysis are collected from 8 L Niskin bottles in much the same fashion as oxygen samples. The samples were stored in a cold water bath whilst awaiting analysis.

7. CFC's — Mike Hingston

a. Description of Equipment and Technique

The analyses are carried out on two purge and trap systems developed at the Bedford Institute of Oceanography. The water samples are injected into the systems directly from the syringes. To ensure proper rinsing, at least two volumes of water is passed through the sample pipette before the actual sample volume. The samples are purged for 4 minutes with ultra high purity nitrogen at a flow rate of 60 ml/min. The components are trapped in Porapak-N trap which is cooled to a temperature of less

than 10_C. They are then desorbed by heating the trap up to at least 170_C. The contents of the trap are then passed through a 75m DB-624 megabore column.

b. Sampling Procedure and Data Processing Technique

All samples are collected directly from the Niskin bottles using 100 ml syringes. The syringes are rinsed three times before they are filled. To prevent contamination, the CFC samples are the first samples which are collected from the Niskin bottles. The samples are then stored in a water bath of continuously flowing surface sea water until analysis. Air samples from the winch room are taken periodically to ensure that it has not become contaminated. The analysis of the samples is always completed within 24 hours after they have been drawn.

c. Replicate analysis

In total, 179 duplicate CFC measurements were obtain. The following is a statistical summary, in pmoles/kg, of the absolute value of the differences between duplicates. Duplicates are taken at each station, with some of these being run on each system to ensure that the results are comparable. Duplicate measurements are given in Table C.5.

Statistic	CFC11	CFC12	CFC113	Methyl Chl.	Carbon Tet.
Number	179	179	179	179	179
Mean	0.151	0.161	0.026	0.774	0.225
Minimum	0	0	0	0	0
Maximum	0.991	1.042	0.367	5.481	2.798
Standard Deviation	0.203	0.180	0.053	0.921	0.387
Median	0.062	0.104	0.010	0.464	0.116

Table C.5 Duplicate CFC measurements in pmoles/kg.

Sample ID Number	Freon 12	Freon 11	Freon 113	Methyl Chl.	Carbon Tet.
130506	.679	1.212	.071	4.007	1.217
130506	1.438	1.280	.047	5.898	1.676
130519	1.619	.144	5.094	1.407	
130519	.952	1.268	.063	5.672	1.657

Sample ID Number	Freon 12	Freon 11	Freon 113	Methyl Chl.	Carbon Tet.
130523	1.736	5.276	.112	9.594	
130523	2.352	4.696	.341	6.796	
130523	2.617	4.910	.337	6.972	
130528	1.594	3.886	.046	11.479	6.259
130528	2.495	3.498	.204	10.873	4.543
130528	2.637	3.431	.219	10.445	4.251
130537	1.290	3.045	.030	19.513	5.977
130537	1.586	2.798	.154	24.068	4.092
130549	.462	.870	.092	2.443	1.819
130549	.502	1.009	.063	2.433	1.637
130575	1.375	2.349		6.649	3.346
130575	1.449	2.599	.080	6.450	3.029
130575	1.828	2.336	.087	6.471	3.123
130603	.165	.756	.050	2.566	.937
130603	.340	.751	.032	2.817	.921
130603	.342	.766	.038	2.850	.907
130614	.255	1.073	.018	.521	1.120
130614	.323	.583	.023	.980	1.096
130614	.328	.109	.082	1.219	1.214
130643	.727	1.380	.036	1.715	.374
130643	.797	1.368	.044	1.872	.317
130643	.824	1.367	.041	1.934	.314
130658	.613	1.305	.042	3.613	2.160
130658	.667	1.128	.039	3.175	2.003
130672	.285	.584	.052	1.736	1.355
130672	.342	.768	.024	2.334	1.438
130672	.358	.591	.053	1.517	1.217
130695	.239	.477	.065	1.256	1.325
130695	.529	1.137	.041	1.312	1.028
130695	.818	1.245	.039	2.108	1.209

Sample ID Number	Freon 12	Freon 11	Freon 113	Methyl Chl.	Carbon Tet.
130726					
130726	1.206	2.052	.073	4.375	.813
130726	1.234	2.066	.082	4.151	.733
130775	.060	.295	0.000	.282	.887
130775	.088	.359	.023	1.498	.870
130775	.138	.380	.010	.823	.855
130803	.462	1.056	.032	2.871	1.285
130803	.565	1.082	.038	3.137	1.170
130818	.635	1.224	.089	3.665	1.849
130818	.644	1.177	.085	3.547	1.861
130818	.740	1.223	.048	2.914	1.619
130843	.513	1.094	.044	2.861	1.079
130843	.515	1.038	.037	3.148	1.350
130843	.527	1.096	.034	3.061	1.173
130858	.459	1.030	.027	2.758	1.524
130858	.484	1.013	.034	2.731	1.510
130858	.518	.994	.031	3.028	1.500
130906	.621	1.363	.054	3.948	1.095
130906	.640	1.450	.040	3.491	.906
130917	.296	.619	.048	1.518	1.355
130917	.323	1.277	.017	1.807	1.474
130917	.336	.645	.020	1.668	1.267
130938	.578	.989	.035	2.827	1.856
130938	.591	.971	.036	3.223	1.785
130938	.616	.973	.031	2.890	1.875
130961	.627	1.949		4.405	2.353
130961	.633	1.542	.064	3.806	2.317
130961	.703	1.531	.070	4.401	2.333
130975	.187	.487	.016	1.572	1.297
130975	.303	.585	.018	.287	1.057

Sample ID Number	Freon 12	Freon 11	Freon 113	Methyl Chl.	Carbon Tet.
130975	.330	.515	.173	1.539	1.173
131006	.827	1.799	.055	2.489	.422
131006	.890	1.945	.046	2.323	.340
131006	.921	1.855	.048	3.245	.630
131025	.975	1.851	.086	4.435	.808
131025	1.095	1.936		3.884	.709
131035	.211	1.270	.010	2.050	1.438
131035	.223	1.557	.012	2.203	1.338
131035	.364	.824	.021	1.581	1.354
131063	.472	.970	.028	3.047	.610
131063	.492	1.037	.046	3.512	.989
131063	.509	1.032	.033	3.248	.934
131085	1.243	2.082	.099	4.750	1.022
131085	1.571	2.090	.067	4.620	.808
131085	1.650	2.043	.101	4.822	1.080
131103	.925	1.520	.060	3.832	1.200
131103	1.037	1.494	.081	4.030	1.268
131103	1.089	1.481	.090	4.172	1.260
131115	.322	.574	.016	2.078	1.487
131115	.331	.611	.015	1.421	1.639
131115	.396	.514	.039	1.654	1.292
131138	.735	1.479	.051	4.372	2.698
131138	.764	1.467	.054	4.352	2.734
131138	.858	1.530	.053	4.011	2.783
131156	.688	.672	.018	1.148	1.586
131156	.688	.672	.018	1.148	1.586
131163	.334	.938	.029	2.969	1.371
131163	.514	.934	.027	2.339	1.498
131163	.571	.935	.029	1.793	1.414
131172	.443	1.149	.049	3.406	2.047

Sample ID Number	Freon 12	Freon 11	Freon 113	Methyl Chl.	Carbon Tet.
131172	.534	1.107	.402	3.541	1.969
131172	.671	1.166	.035	2.589	2.088
131218	1.118	2.339	.116	6.733	3.417
131218	1.146	2.175	.074	6.518	3.476
131242	.634	1.339	.048	3.811	2.230
131242	.847	1.458	.048	2.814	1.965
131261	2.324	4.887	.273	15.865	6.210
131261	2.366	4.893	.302	16.313	6.297
131294	2.520	5.130	.345	17.199	6.944
131294	2.750	4.745	.347	14.863	7.117
131300	2.102	4.263	.304	13.561	6.031
131300	2.235	4.561	.279	15.574	6.000
131307	1.580	3.658	.209	9.481	4.796
131307	1.609	4.125	.250	10.324	4.970
131307	1.835	3.658	.214	12.355	4.857
131342	2.081	4.097	.316	12.006	5.671
131342	2.197	4.418	.348	14.556	5.777
131348	1.063	2.278	.106	7.196	3.577
131348	1.387	2.241	.101	6.008	3.059
131348	1.534	2.230	.121	6.144	3.170
131363	.475	1.101	.035	3.667	2.149
131363	.501	1.266	.034	3.674	2.183
131363	.700	1.150	.050	3.627	1.967
131388	.666	1.276	.038	4.063	2.168
131388	1.091	2.158	.124	7.334	3.352
131394	1.098	1.946	.074	6.222	3.095
131394	1.112	2.300	.090	6.945	3.658
131394	1.438	1.997	.085	5.761	3.104
131431	.941	1.830	.075	6.148	3.122

Sample ID Number	Freon 12	Freon 11	Freon 113	Methyl Chl.	Carbon Tet.
131431	.963	1.839	.064	5.628	3.091
131431	1.104	1.772	.080	6.834	2.994
131456	1.122	2.492	.086	3.404	2.868
131456	1.153	2.933	.074	3.802	2.930
131476	.652	1.660	.069	5.204	2.436
131476	.918	1.699	.058	5.052	2.606
131476	1.061	1.760	.058	5.392	2.547
131501	1.567	2.970	.162	9.061	3.904
131501	1.580	3.003	.178	8.490	3.884
131519	.582	1.591	.068	4.488	1.801
131519	.633	1.686		5.773	2.062
131519	.754	1.712	.074	5.216	1.828
131548	.302	.682	.183	1.857	1.560
131548	.345	.944	.093	3.113	1.546
131548	.619	.954	.027	1.820	1.318
131581	1.102	2.008	.121	5.525	2.393
131581	1.305	2.089	.143	5.776	2.422
131614	.940	1.879	.073	6.046	3.022
131614	1.240	1.847	.060	5.751	3.158
131614	1.347	1.846	.071	5.504	2.972
131631	.951	1.793	.069	5.297	2.893
131631	1.032	1.742	.120	5.671	2.983
131631	1.123	1.621	.049	4.947	2.867
131659	.838	1.572	.048	3.585	.694
131659	.850	1.697	.076	4.625	.885
131677	.507	1.180	.032	3.866	1.490
131677	.558	1.172		4.223	1.488
131677	.785	1.174	.034	3.172	1.376
131688	.242	.673	0.000	1.570	1.464
131688	.577	.842	.028	2.353	1.443

Sample ID Number	Freon 12	Freon 11	Freon 113	Methyl Chl.	Carbon Tet.
131688	.708	.981	.011	1.892	1.329
131716	.765	1.821	.070	4.793	2.336
131716	.988	1.932	.093	5.261	2.480
131716	1.287	1.755	.053	4.355	2.172
131754	.789	1.509	.060	4.902	2.556
131754	.813	1.512	.059	4.363	2.409
131754	.909	1.781	.069	4.809	3.003
131765	.323	.902	0.000	5.187	1.737
131765	.562	.966	.021	10.000	1.682
131765	.593	.951	.034	7.009	1.650
131863	1.536	3.356	.185	13.104	4.659
131863	1.576	3.424	.192	13.141	5.052
131863	1.642	3.477	.208	13.774	5.165
131880	1.438	3.161	.167	13.686	5.041
131880	1.491	3.001	.158	10.011	4.227
131880	1.576	2.990	.152	10.725	4.386
131897	1.458	3.644	.215	12.373	5.217
131897	1.559	3.649	.211	11.828	5.157
131897	2.099	3.420	.198	10.235	4.645
131907	.755	1.527	.053	4.511	2.314
131907	.880	1.554	.051	4.919	2.599
131907	.885	1.472	.039	4.081	2.151
131933	1.022	2.614	.101	8.503	4.193
131933	1.420	2.422	.098	7.552	3.514
131984	.431	.935	.020	6.214	1.663
131984	.521	.840	.017	8.197	1.859
131984	.606	.860	.020	11.696	1.887
132015	.777	2.443	.222	5.353	1.579
132015	.940	1.676	.063	7.021	1.822
132026	.430	.885	.014	2.851	1.797
132026	.477	.946		3.161	1.655

Sample ID Number	Freon 12	Freon 11	Freon 113	Methyl Chl.	Carbon Tet.
132067	.585	1.205		3.674	2.113
132067	.597	1.182	.033	3.118	2.028
132067	.701	1.197	.040	3.433	2.112
132095	.279	.857	.032	2.682	1.079
132095	.740	1.605	.062	5.221	1.789
132095	.906	1.847	.094	5.351	1.887
132107	.801	1.910	.079	6.740	3.202
132107	.876	1.861		6.762	3.182
132107	1.147	1.998	.082	5.276	3.450
132124	.519	1.344	.050	7.196	1.875
132124	.522	1.317	.037	8.951	1.978
132124	.651	1.312	.045	9.415	2.004
132155	.479	1.169	.032	2.832	1.553
132155	.655	1.477	.030	4.168	1.672
132155	.656	1.694		4.614	1.609
132173	.661	1.326	.038	3.706	2.148
132173	.685	1.357	.037	4.819	2.359
132173	.766	1.305		4.788	2.137

d. Standards Used

Standardization is carried out using gas standards made up at Brookhaven National Laboratories. Standard volumes are corrected for lab temperature and pressure. Results are reported in units of pmol/kg of sea water. Clean air samples are also analyzed with each station, as a check on the standardization.

e. Calibrations

The standard values for F12, F11, and F113 were calibrated by Scripps according to their SIO93 scale in March of 1996. The CH_3CCl_3 was calibrated at BNL in 1995. The CCl_4 value is based on numerous air samples taken from 1993 to 1995 and based on the SIO93 atmospheric scale.

8. Reversing Thermometers — Anthony W. Isenor

a. Description of Equipment and Technique

Sensoren-Instrumente-Systeme digital reversing thermometers model RTM 4002 were used to verify CTD thermistor readings on most deep stations. The thermometers have a depth range of up to 10000 m. The pressure housing is made of a glass tube closed at the ends by metal stoppers. One end contains the platinum sensor and the other end is the battery compartment. The thermometers were placed on bottles 1 and 3 of the rosette, thus sampling temperature at the deepest and third deepest bottle trips.

The thermometers are placed in standard reversing thermometer racks on the Niskin bottles. Before deployment, a magnet is passed over the thermometers to clear the display and place the thermometer in sample mode. A new temperature will then be recorded upon reversal of the thermometer.

On the deepest stations, unprotected mercury in glass thermometers were also attached to the deepest and third deepest bottle trips. The following table lists the number of readings from each thermometer. Digital thermometers are indicated with a 'T' in the serial number.

Thermometer Ser. No.	Number of Readings
000T345	103
000T347	101
000T348	100
000T350	1
000T352	1
000T354	102
0011745	59
0011749	29

b. Sampling Procedure and Data Processing Technique

The thermometers indicate the temperature reading either via a digital display or column of mercury. The temperature is read and noted on log sheets. The readings are later digitized and calibrations applied using the water sample database system.

c. Calibration Data

The digital reversing thermometers were calibrated at BIO in February 1991 while the mercury thermometers were last calibrated in March 1968. The digital thermometers were calibrated after the cruise, in March 1994, and were found to have significant drift over this period. The March 1994 calibration also improved the thermometer intercomparison and therefore will be used for calibrations of this temperature dataset.

d. Replicate analysis

Temperatures between thermometers on the same rosette bottle were analyzed. In total, 213 duplicate temperature readings were obtain. Omitting 5 obvious outliers, we obtain the following statistical summary of the absolute value of the differences between duplicate measurements.

Statistic	Value
Number of Duplicates	208
Minimum	0 °C
Maximum	0.133 °C
Mean	0.004 °C
Median	0.003 °C
Standard Deviation	0.010 °C

Table C.6 Duplicate temperature measurements from thermometers.

Sample ID Number	Thermometer Ser. No.	Main Corrected Therm. Pressure
130501	000T345	6.490
130501	000T350	6.495
130501	000T354	6.493
130503	000T347	6.507
130503	000T348	6.509
130503	000T352	6.513
130521	000T345	.183
130521	000T354	.185
130523	000T347	1.743
130523	000T348	1.876

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
130525	000T345	3.612	
130525	000T354	3.609	
130535	000T345	3.612	
130535	000T354	3.609	
130537	000T347	3.656	
130537	000T348	3.602	
130549	000T345	2.651	
130549	000T354	2.657	
130551	000T347	3.222	
130551	000T348	3.220	
130569	000T345	2.152	
130569	000T354	2.158	
130571	000T347	2.731	
130571	000T348	2.730	
130589	000T345	2.291	
130589	000T354	2.294	
130591	000T347	2.738	
130591	000T348	2.738	
130609	000T345	2.251	
130609	000T354	2.255	
130611	000T347	2.755	
130611	000T348	2.756	
130629	000T345	2.215	
130629	000T354	2.218	
130631	000T347	2.858	
130631	000T348	2.855	
130649	000T345	2.215	
130649	000T354	2.218	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
130651	000T347	2.858	
130651	000T348	2.855	
130669	000T345	2.293	
130669	000T354	2.298	
130669	0011745	42.228	5403.0
130669	0011745	42.225	5402.6
130671	000T347	2.459	
130671	000T348	18.347	
130689	000T345	2.278	
130689	000T354	2.281	
130689	0011745	41.063	5248.6
130691	000T347	2.330	
130691	000T348	2.328	
130709	000T345	2.260	
130709	000T354	2.265	
130709	0011745	42.192	5402.7
130709	0011745	42.189	5402.3
130711	000T347	2.291	
130711	000T348	2.289	
130711	0011749	37.810	4810.2
130711	0011749	37.806	4809.8
130729	000T345	2.257	
130729	000T354	2.261	
130729	0011745	41.930	5367.9
130731	000T347	2.289	
130731	000T348	2.288	
130731	0011749	37.278	4738.9
130749	000T345	2.225	
130749	000T354	2.230	
130749	0011745	42.079	5392.2
130749	0011745	42.073	5391.3

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
130751	000T347	2.278	
130751	000T348	2.277	
130751	0011749	37.760	4805.3
130751	0011749	37.757	4804.9
130769	000T345	2.258	
130769	000T354	2.262	
130769	0011745	42.183	5401.7
130771	000T347	2.291	
130771	000T348	2.290	
130771	0011749	37.686	4793.5
130789	000T345	2.264	
130789	000T354	2.268	
130789	0011745	40.662	5196.5
130789	0011745	40.683	5199.3
130791	000T347	2.283	
130791	000T348	2.282	
130791	0011749	36.228	4598.3
130791	0011749	36.228	4598.3
130809	000T345	2.268	
130809	000T354	2.272	
130809	0011745	41.116	5257.0
130809	0011745	41.153	5261.9
130811	000T347	2.287	
130811	000T348	2.286	
130811	0011749	37.032	4706.0
130829	000T345	2.251	
130829	000T354	2.255	
130829	0011745	40.600	5189.9
130829	0011745	40.587	5188.1
130831	000T347	2.287	
130831	000T348	2.286	
130831	0011749	35.371	4482.2
130831	0011749	35.378	4483.2

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
130849	000T345	2.236	
130849	000T354	2.240	
130849	0011745	41.102	5259.4
130849	0011745	41.104	5259.7
130851	000T347	2.275	
130851	000T348	2.275	
130851	0011749	36.137	4587.0
130851	0011749	36.134	4586.6
130869	000T345	2.253	
130869	000T354	2.257	
130871	000T347	2.269	
130871	000T348	2.269	
130871	0011749		
130889	000T345	2.234	
130889	000T354	2.238	
130889	0011749	41.155	5267.6
130889	0011749	41.149	5266.9
130891	000T347	2.245	
130891	000T348	2.244	
130891	0011749	36.216	4601.8
130891	0011749	36.216	4601.8
130909	000T345	2.255	
130909	000T354	2.260	
130909	0011745	31.790	4002.7
130911	000T347	2.261	
130911	000T348	2.260	
130911	0011749		
130929	000T345	2.241	
130929	000T354	2.246	
130929	0011745	38.391	4893.9
130929	0011745	38.398	4894.9
130931	000T347	2.242	
130931	000T348	2.241	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
130949	000T345	2.184	
130949	000T354	2.188	
130949	0011745	36.077	4590.2
130951	000T347	2.315	
130951	000T348	2.314	
130969	000T345	2.244	
130969	000T354	2.248	
130969	0011745	36.104	4585.7
130969	0011745	36.109	4586.4
130971	000T347	2.369	
130971	000T348	2.368	
130989	000T345	2.255	
130989	000T354	2.260	
130989	0011745	37.633	4790.1
130991	000T347	2.269	
130991	000T348	2.268	
131009	000T345	2.305	
131009	000T354	2.308	
131011	000T347	2.367	
131011	000T348	2.367	
131029	000T345	2.297	
131029	000T354	2.302	
131029	0011745	38.402	4887.9
131029	0011745	38.388	4886.0
131031	000T347	2.338	
131031	000T348	2.337	
131049	000T345	2.300	
131049	000T354	2.303	
131049	0011745	39.231	4999.2
131049	0011745	39.252	5002.0

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131051	000T347	2.318	
131051	000T348	2.318	
131051	0011749	35.394	4481.0
131051	0011749	35.414	4483.8
131069	000T345	2.285	
131069	000T354	2.289	
131069	0011745	38.918	4959.0
131069	0011745	38.928	4960.4
131071	000T347	2.347	
131071	000T348	2.345	
131071	0011749	35.399	4477.9
131071	0011749	35.399	4477.9
131089	000T345	2.290	
131089	000T354	2.295	
131089	0011745	39.068	4978.4
131089	0011745	39.075	4979.4
131091	000T347	2.328	
131091	000T348	2.326	
131091	0011749	36.375	4612.0
131091	0011749	36.380	4612.7
131109	000T345	2.333	
131109	000T354	2.336	
131109	0011745		
131111	000T347	2.452	
131111	000T348	2.451	
131129	000T345	2.266	
131129	000T354	2.271	
131129	0011745	37.438	4762.3
131149	000T345	2.249	
131149	000T354	2.253	
131149	0011745	36.982	4703.4
131149	0011745	36.982	4703.4
131151	000T347	2.250	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131151	000T348	2.250	
131169	000T345	2.208	
131169	000T354	2.213	
131171	000T347	2.283	
131171	000T348	2.281	
131189	000T345	2.194	
131189	000T354	2.199	
131191	000T347	2.203	
131191	000T348	2.202	
131209	000T345	2.153	
131209	000T354	2.157	
131211	000T347	2.451	
131211	000T348	2.450	
131229	000T345	2.686	
131229	000T354	2.691	
131231	000T347	3.012	
131231	000T348	3.011	
131249	000T345	3.087	
131249	000T354	3.092	
131251	000T347	3.040	
131251	000T348	3.040	
131264	000T345	3.179	
131264	000T354	3.184	
131266	000T347	3.323	
131266	000T348	3.322	
131274	000T345	3.632	
131274	000T354	3.636	
131276	000T347	3.844	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131276	000T348	3.840	
131284	000T345	1.772	
131284	000T354	1.778	
131286	000T347	.515	
131286	000T348	.513	
131290	000T345	-.125	
131290	000T354	-.117	
131292	000T347	.891	
131292	000T348	.892	
131294	000T345	-1.167	
131294	000T354	-1.160	
131296	000T347	-1.174	
131296	000T348	-1.175	
131298	000T345	2.830	
131298	000T354	2.835	
131300	000T347	1.038	
131300	000T348	1.040	
131303	000T345	3.380	
131303	000T354	3.385	
131305	000T347	3.804	
131305	000T348	3.803	
131313	000T345	2.971	
131313	000T354	2.975	
131315	000T347	2.983	
131315	000T348	2.983	
131325	000T345	2.877	
131325	000T354	2.882	
131327	000T347	2.996	
131327	000T348	2.996	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131345	000T345	2.510	
131345	000T354	2.514	
131347	000T347	2.822	
131347	000T348	2.822	
131362	000T345	2.153	
131362	000T354	2.159	
131364	000T347	2.385	
131364	000T348	2.385	
131382	000T345	2.153	
131382	000T354	2.158	
131384	000T347	2.497	
131384	000T348	2.498	
131402	000T345	2.143	
131402	000T354	2.148	
131404	000T347	2.351	
131404	000T348	2.350	
131422	000T345	2.211	
131422	000T354	2.216	
131424	000T347	2.286	
131424	000T348	2.287	
131442	000T345	2.236	
131442	000T354	2.241	
131442	0011745	36.755	4674.4
131442	0011745	36.765	4675.8
131444	000T347	2.269	
131444	000T348	2.270	
131462	000T345	2.284	
131462	000T354	2.288	
131462	0011745	38.398	4889.2

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131464	000T347	2.279	
131464	000T348	2.279	
131464	0011749	35.377	4484.0
131482	000T345	2.298	
131482	000T354	2.303	
131484	000T347	2.289	
131484	000T348	2.288	
131502	000T345	2.295	
131502	000T347	2.299	
131502	0011745	38.480	4898.7
131502	0011745	38.479	4898.5
131504	000T348	2.293	
131504	000T354	2.291	
131504	0011749	35.437	4490.5
131504	0011749	35.437	4490.5
131522	000T345	2.281	
131522	000T347	2.286	
131522	0011745	37.678	4792.7
131522	0011745	37.689	4794.0
131524	000T348	2.281	
131524	000T354	2.281	
131542	000T345	2.289	
131542	000T347	2.293	
131542	0011745	37.680	4791.9
131542	0011745	37.680	4791.9
131544	000T348	2.316	
131544	000T354	2.314	
131562	000T345	2.295	
131562	000T347	2.298	
131562	0011745	38.307	4875.5
131562	0011745	38.307	4875.5

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131564	000T348	2.313	
131564	000T354	2.313	
131564	0011749	35.325	4472.4
131564	0011749	35.325	4472.4
131582	000T345	2.304	
131582	000T347	2.307	
131582	0011745	38.321	4876.1
131582	0011745	38.331	4877.5
131584	000T348	2.364	
131584	000T354	2.362	
131602	000T345	2.292	
131602	000T347	2.296	
131602	0011745	38.311	4876.4
131604	000T348	2.307	
131604	000T354	2.306	
131622	000T345	2.286	
131622	000T347	2.290	
131622	0011745	38.308	4876.7
131624	000T348	2.306	
131624	000T354	2.306	
131642	000T345	2.392	
131642	000T347	2.396	
131644	000T348	2.564	
131644	000T354	2.563	
131662	000T345	2.265	
131662	000T347	2.269	
131662	0011745	37.069	4712.9
131682	000T345	2.271	
131682	000T347	2.275	
131682	0011745	37.170	4725.7
131684	000T348	2.290	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131684	000T354	2.291	
131702	000T345	2.269	
131702	000T347	2.274	
131702	0011745	37.244	4735.8
131704	000T348	2.294	
131704	000T354	2.294	
131722	000T345	2.170	
131722	000T347	10.860	
131724	000T348	2.270	
131724	000T354	2.271	
131742	000T345	2.102	
131742	000T347	2.108	
131744	000T348	2.248	
131744	000T354	2.249	
131762	000T345	2.207	
131762	000T347	2.211	
131764	000T348	2.282	
131764	000T354	2.281	
131782	000T345	2.978	
131782	000T347	2.983	
131784	000T348	3.019	
131784	000T354	3.050	
131797	000T345	2.876	
131797	000T347	2.880	
131799	000T348	3.121	
131799	000T354	3.122	
131805	000T345	3.472	
131805	000T347	3.474	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131807	000T348	3.626	
131807	000T354	3.626	
131810	000T345	3.605	
131810	000T347	3.609	
131812	000T348	2.104	
131812	000T354	2.106	
131814	000T345	2.751	
131814	000T347	2.756	
131816	000T348	3.298	
131816	000T354	3.302	
131818	000T345	2.225	
131818	000T347	2.227	
131820	000T348	4.905	
131820	000T354	4.906	
131822	000T345	2.260	
131822	000T347	2.265	
131824	000T348	8.393	
131824	000T354	5.440	
131826	000T345	2.733	
131826	000T347	2.739	
131828	000T348	5.227	
131828	000T354	5.220	
131830	000T345	3.396	
131830	000T347	3.399	
131832	000T348	1.804	
131832	000T354	1.803	
131834	000T345	3.413	
131834	000T347	3.417	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131836	000T348	2.081	
131836	000T354	2.083	
131838	000T345	3.491	
131838	000T347	3.493	
131840	000T348	1.777	
131840	000T354	1.764	
131842	000T345	.295	
131842	000T347	.302	
131844	000T348	-1.269	
131844	000T354	-1.268	
131846	000T345	3.940	
131846	000T347	3.945	
131848	000T348	3.758	
131848	000T354	3.758	
131851	000T345	2.953	
131851	000T347	2.956	
131853	000T348	3.672	
131853	000T354	3.673	
131859	000T345	2.953	
131859	000T347	2.956	
131860	000T348	3.672	
131860	000T354	3.673	
131871	000T345	2.869	
131871	000T347	2.874	
131873	000T348	3.398	
131873	000T354	3.398	
131877	000T345	2.882	
131877	000T347	2.887	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
131879	000T348	3.031	
131879	000T354	3.033	
131885	000T345	2.288	
131885	000T347	2.293	
131887	000T348	5.517	
131887	000T354	2.958	
131901	000T345	2.055	
131901	000T347	2.061	
131903	000T348	2.305	
131903	000T354	2.305	
131921	000T345	2.094	
131921	000T347	2.099	
131923	000T348	2.223	
131923	000T354	2.223	
131941	000T345	2.103	
131941	000T347	2.108	
131943	000T348	2.224	
131943	000T354	2.225	
131961	000T345	2.136	
131961	000T347	2.141	
131961	0011745	35.806	4560.1
131961	0011745	35.803	4559.7
131963	000T348	2.273	
131963	000T354	2.271	
131981	000T345	2.234	
131981	000T347	2.238	
131981	0011745	36.008	4574.2
131983	000T348	2.305	
131983	000T354	2.301	
132001	000T345	2.259	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
132001	000T347	2.263	
132001	0011745	36.743	4669.8
132001	0011745	36.745	4670.1
132003	000T348	2.330	
132003	000T354	2.329	
132021	000T345	2.221	
132021	000T347	2.226	
132021	0011745	36.912	4697.6
132023	000T348	2.375	
132023	000T354	2.375	
132041	000T345	2.232	
132041	000T347	2.237	
132043	000T348	2.536	
132043	000T354	2.535	
132061	000T345	2.251	
132061	000T347	14.636	
132063	000T348	2.395	
132063	000T354	2.391	
132081	000T345	2.221	
132081	000T347	2.227	
132083	000T348	2.454	
132083	000T354	2.454	
132101	000T345	3.238	
132101	000T347	3.242	
132103	000T348	3.298	
132103	000T354	3.298	
132121	000T345	2.310	
132121	000T347	2.315	
132123	000T348	2.360	

Sample ID Number	Thermometer Ser. No.	Main Corrected	Therm. Pressure
132123	000T354	2.360	
132141	000T345	2.306	
132141	000T347	2.310	
132143	000T348	2.309	
132143	000T354	2.309	
132161	000T345	2.284	
132161	000T347	2.289	
132163	000T348	2.305	
132163	000T354	2.304	

E. REFERENCES

Carritt, D.E. and J.H. Carpenter. 1966. Comparison and Evaluation of Currently Employed Modifications of the Winkler Method for Determining Dissolved Oxygen in Seawater. A NASCO Report, Jour. Mar. Res., 24, 268-318.

Jones, E.P., F. Zemlyak and P. Stewart. 1992. Operating Manual for the Bedford Institute of Oceanography Automated Dissolved Oxygen Titration System. Can. Tech. Rep. of Hydrography and Ocean Sci. 138: iv+51p.

Levy, E.M., C.C. Cunningham, C.D.W. Conrad and J.D. Moffatt. 1977. The Determination of Dissolved Oxygen in Sea Water, Bedford Institute of Oceanography Report Series, BI-R-77-9, August 1977.