CATALOG DOCUMENTATION
MAIA-ESTUARIES SUMMARY DATABASE
1997 and 1998 STATIONS
WATER COLUMN NUTRIENTS DATA: “NUTRNTS”

TABLE OF CONTENTS

1. DATASET IDENTIFICATION

1.1 Title of Catalog document
MAIA-Estuaries Summary Database
1997 and 1998 Stations
Water Column Nutrients Data

1.2 Authors of the Catalog entry
John Kiddon, U.S. EPA NHEERL-AED
Harry Buffum, OAO Corp.

1.3 Catalog revision date
April 30, 2000

1.4 Dataset name
NUTRNTS

1.5 Task Group
MAIA Estuaries

1.6 Dataset identification code
004

1.7 Version
001

1.8 Request for Acknowledgment
EMAP requests that all individuals who download EMAP data acknowledge the source of these data in any reports, papers, or presentations. If you publish these data, please include a statement similar to: "Some or all of the data described in this article were produced by the U. S. Environmental Protection Agency through its Environmental Monitoring and Assessment Program (EMAP)”.

2. INVESTIGATOR INFORMATION (for full addresses see Section 13)

2.1 Principal Investigators
John Paul, U.S. Environmental Protection Agency, NHEERL-Atlantic Ecology Division (AED)
Charles Strobel, U.S. Environmental Protection Agency, NHEERL-Atlantic Ecology Division (AED)

2.2 Sample Collection Investigators
Charles Strobel, U.S. Environmental Protection Agency, NHEERL-Atlantic Ecology Division (AED)
John Macauley, U.S. Environmental Protection Agency, Gulf Ecology Division (GED)
Jeffrey L. Hyland, National Oceanographic and Atmospheric Admin.-Carolinian Province (NOAA-DB)
Michelle Harmon, National Oceanographic and Atmospheric Admin.-Delaware Bay (NOAA-DB)
Carl Zimmerman, National Park Service (NPS)
Dan Dauer, Chesapeake Bay Program, Old Dominion University (CBP-ODU)
J. Ananda Ranasinghe, Chesapeake Bay Program, Versar, Inc. (CBP-VER)

2.3 Sample Processing Investigators
J. Ananda Ranasinghe, Chesapeake Bay Program, Versar, Inc. (CBP-VER)
Terry L. Wade, GERG, Texas A&M
Courtney T. Hackney, University of North Carolina at Wilmington

3. DATASET ABSTRACT

3.1 Abstract of the Dataset
The NUTRNTS data file reports the concentrations of nutrient-related constituents in the water column measured in MAIA estuaries during the summers of 1997 and 1998. Included are eight forms of *dissolved nutrients*: silicate, ammonium, nitrate plus nitrite, nitrite, orthophosphate, total dissolved nitrogen, total dissolved phosphorus, and dissolved organic carbon; and six *particulate analytes*: particulate phosphorus, particulate organic carbon, particulate organic nitrogen, total suspended solids, chlorophyll *a*, and phaeophytin. One record is presented for each sampling event. Generally, all analytes were measured in both the surface and bottom layers. At some shallow stations (designated with a QACODE = NUT-A), measurements were performed at only one intermediate water depth, and the results were reported identically in both surface and bottom layers. Concentration values that are smaller than the method detection limit are reported as described in Section 4.3.

3.2 Keywords for the Dataset
Estuarine water quality, dissolved and particulate nutrients, silicate, ammonium, nitrate, nitrite, orthophosphate, total dissolved nitrogen, total dissolved phosphorus, dissolved organic carbon, particulate phosphorus, particulate carbon, particulate nitrogen, total suspended solids, chlorophyll *a*, phaeophytin

4. OBJECTIVES AND INTRODUCTION

4.1 Program Objective
The main objectives of the MAIA-Estuaries program are: (1) to evaluate the ecological condition of the Mid-Atlantic estuaries by measuring key properties of the water, sediment, and the community of organisms; (2) to focus attention on small estuaries in order to develop better monitoring approaches for these critical systems; and (3) to develop partnerships among federal and state environmental organizations.

The Environmental Monitoring and Assessment Program (EMAP) is an EPA research and

monitoring program designed to provide unbiased assessments of the condition of selected resources over a wide region. A key feature of the program is a probabilistic sampling strategy that randomly selects sampling sites and assigns weighting factors based on area to all measured results. EMAP's strategy was adopted by the Mid-Atlantic Integrated Assessment (MAIA) program, which was designed to assess the conditions of the estuaries, forests, streams and lakes, and agricultural lands in the eight-state Mid-Atlantic region. This file contains data measured in MAIA estuaries during the Summers of 1997 and 1998. Samples were collected for water and sediment analyses primarily in 1997, with a few additional sites sampled in 1998. Fish samples were collected only in 1998. Several estuaries were designated as intensive sites and were sampled in greater detail (see STATIONS file).

The partners in MAIA-Estuaries program are: (1) The U.S. Environmental Protection Agency (USEPA), including both the Atlantic Ecology Division (AED) and the Gulf Ecology Division (GED); (2) National Park Service (NPS) under their project "Maryland Coastal Bays Monitoring"; (3) National Oceanographic and Atmospheric Administration (NOAA) which conducted sampling both in the Delaware Bay (DB) under their "National Status and Trends Program" and in the Carolinian Province (CP); and (4) The Chesapeake Bay Program (CBP), which is a consortium of federal, state, and local governments and nongovernmental organizations. Each partner was responsible for collecting, processing, and reviewing data. The USEPA Atlantic Ecology Division was responsible for final assembly and review of all data. Laboratories contracted to process samples are specified by the parameter LABCODE included in all data files (Section 4.4). Details regarding use of partner and LABCODE information are presented in the EVENTS metadata file.

4.2 Dataset Objective

The NUTRNTS file reports the values of nutrients and related parameters measured in the surface and bottom layers of the water column in MAIA estuaries.

4.3 Background Discussion

The concentrations of nutrients, phytoplankton, and suspended solids have long been used to characterize water quality in estuaries. These parameters are especially helpful when trying to understand and manage the degraded state called eutrophication, a condition associated with an overabundance of nutrients and excessive growth of phytoplankton, epiphyton and macroalgae..

The NUTRNTS file contains the concentrations of 14 dissolved or particulate materials. Dissolved nutrients (silicate, ammonium, nitrate plus nitrite, nitrite and orthophosphate) refer to the inorganic constituents immediately available for phytoplankton growth. Total dissolved nutrients include both organic and inorganic forms of dissolved nutrients. Total particulate nutrients refer to organic and inorganic nutrients associated with particles, and represent nutrients which may become available for phytoplankton growth over extended time periods. Chlorophyll *a* and phaeophytin are pigments representative of different types of phytoplankton. Total suspended solids measures the concentration of all solid particles, including phytoplankton (both living and dead) and inert material such as sediment. All of these analytes were measured both in the surface and bottom layers of the water column. Conditions in the surface layer are important because they affect the potential for phytoplankton growth, and the bottom layer is monitored because it functions as a reservoir of nutrients and reflects conditions that may stress the benthic community.

The concentration of an analyte is reported in one of two formats in this file. **(1)** If the concentration is larger than the method detection level (MDL), the measured value is reported directly. **(2)** If the concentration is smaller than the MDL, the value is reported as zero and the value of the MDL is reported in an associated field. For example, if the measured concentration of nitrite in the bottom layer is smaller than the MDL, zero is reported for the parameter B_NO2 and the MDL is reported for the parameter B_NO2_D. In these cases, it is clear that the concentration of the analyte is small (approximately zero), although some users may prefer to substitute a finite value for the zero entry, *e.g.*, the MDL value, half the MDL value, *etc*.

4.4 Summary of Dataset Parameters

PARAMETER	LABEL
*STATION	Station Name
*EVNTDATE	Event Date
B_SI	Bottom Dissolved Silicate (mg/L as Si)
B_SI_D	Bottom Dissolved Silicate MDL (mg/L as Si)
B_NH4	Bottom Dissolved Ammonium (mg/L as N)
B_NH4_D	Bottom Dissolved Ammonium MDL (mg/L as N)
B_NO23	Bottom Dissolved Nitrite plus Nitrate (mg/L as N)
B_NO23_D	Bottom Dissolved Nitrite plus Nitrate MDL(mg/L as N)
B_NO2	Bottom Dissolved Nitrite (mg/L as N)
B_NO2_D	Bottom Dissolved Nitrite MDL (mg/L as N)
B_PON	Bottom Particulate Organic Nitrogen (mg/L as N)
B_PON_D	Bottom Particulate Organic Nitrogen MDL (mg/L as N)
B_TDN	Bottom Total Dissolved Nitrogen (mg/L as N)
B_TDN_D	Bottom Total Dissolved Nitrogen MDL (mg/L as N)
B_TDP	Bottom Dissolved Phosphorus (mg/L as P)
B_TDP_D	Bottom Dissolved Phosphorus MDL (mg/L as P)
B_PO4F	Bottom Dissolved Orthophosphate (mg/L as P)
B_PO4F_D	Bottom Dissolved Orthophosphate MDL (mg/L as P)
B_PHOS	Bottom Total Particulate Phosphorus (mg/L as P)
B_PHOS_D	Bottom Total Particulate Phosphorus MDL (mg/L as P)
B_DOC	Bottom Dissolved Organic Carbon (mg/L as C)
B_DOC_D	Bottom Dissolved Organic Carbon MDL (mg/L as C)
B_POC	Bottom Particulate Organic Carbon (mg/L as C)
B_POC_D	Bottom Particulate Organic Carbon MDL (mg/L as C)
B_TSS	Bottom Total Suspended Solids (mg/L)
B_TSS_D	Bottom Total Suspended Solids MDL (mg/L)
B_CHLA	Bottom Chlorophyll *a* (ug/L)
B_CHLA_D	Bottom Chlorophyll *a* MDL (ug/L)
B_PHAE	Bottom Phaeophytin (ug/L)
B_PHAE_D	Bottom Phaeophytin MDL (ug/L)
S_SI	Surface Dissolved Silicate (mg/L as Si)
S_SI_D	Surface Dissolved Silicate MDL (mg/L as Si)
S_NH4	Surface Dissolved Ammonium (mg/L as N)
S_NH4_D	Surface Dissolved Ammonium MDL (mg/L as N)
S_NO23	Surface Dissolved Nitrite plus Nitrate (mg/L as N)
S_NO23_D	Surface Dissolved Nitrite plus Nitrate MDL(mg/L as N)
S_NO2	Surface Dissolved Nitrite (mg/L as N)
S_NO2_D	Surface Dissolved Nitrite MDL (mg/L as N)
S_PON	Surface Particulate Organic Nitrogen (mg/L as N)
S_PON_D	Surface Particulate Organic Nitrogen MDL (mg/L as N)
S_TDN	Surface Total Dissolved Nitrogen (mg/L as N)
S_TDN_D	Surface Total Dissolved Nitrogen MDL (mg/L as N)
S_TDP	Surface Dissolved Phosphorus (mg/L as P)
S_TDP_D	Surface Dissolved Phosphorus MDL (mg/L as P)
S_PO4F	Surface Dissolved Orthophosphate (mg/L as P)

4.4 Summary of Dataset Parameters, continued

PARAMETER	LABEL
S_PO4F_D	Surface Dissolved Orthophosphate MDL (mg/L as P)
S_PHOS	Surface Total Particulate Phosphorus (mg/L as P)
S_PHOS_D	Surface Total Particulate Phosphorus MDL (mg/L as P)
S_DOC	Surface Dissolved Organic Carbon (mg/L as C)
S_DOC_D	Surface Dissolved Organic Carbon MDL (mg/L as C)
S_POC	Surface Particulate Organic Carbon (mg/L as C)
S_POC_D	Surface Particulate Organic Carbon MDL (mg/L as C)
S_TSS	Surface Total Suspended Solids (mg/L)
S_TSS_D	Surface Total Suspended Solids MDL (mg/L)
S_CHLA	Surface Chlorophyll *a* (ug/L)
S_CHLA_D	Surface Chlorophyll *a* MDL (ug/L)
S_PHAE	Surface Phaeophytin (ug/L)
S_PHAE_D	Surface Phaeophytin MDL (ug/L)
LABCODE	Code indicating laboratory that processed samples
NUT-1	AED Contract with Chesapeake Bay Laboratories
NUT-2	Chesapeake Bay Program
NUT-3	DC Labs
NUT-4	GED Labs
QACODE	QA codes:
<blank>	No qualifications
NUT-A	A single mid-depth measurement is reported identically in both the surface and bottom layers
YEAR	Year of sampling
1997 or 1998	

* denotes parameters that should be used as key fields when merging data files

5. DATA ACQUISITION AND PROCESSING METHODS

5.1 Data Acquisition / Field Sampling

The sample collection methods used by USEPA field crews are described here. Significant variations by other MAIA partners are noted in Section 5.1.12. Details regarding MAIA partners are reported in the EVENTS data file.

5.1.1 Sampling Objective

Seawater was collected and filtered for use in the measurement of nutrient, phytoplankton and total suspended solids concentrations. Samples were collected in the surface and bottom layers of the water column, except at some shallow stations (water depth < 3m) where a single mid-depth sample was taken.

5.1.2 Sample Collection: Methods Summary

Seawater samples were collected from 1m below the surface and 1m above the bottom with a 5L Go-Flo® sampling bottle. At some shallow locations (water depth < 3m) only one mid-depth water sample was taken. Duplicate water samples from the same cast were filtered aboard ship with 0.7-micron glass-fiber filter pads (not all duplicates were analyzed). The filtered water and the filters were immediately frozen and analyzed within 28 days. At 6% of the stations, replicate field samples were taken from separate casts to evaluate the repeatability of the sampling procedure.

5.1.3 Beginning Sampling Dates
8 July 1997
13 July 1998

5.1.4 Ending Sampling Dates
8 October 1997
8 October 1998

5.1.5 Sampling Platform
Samples were collected from gasoline or diesel powered boats 18 to 133 feet in length

5.1.6 Sampling Equipment
5 L Go-Flo® sampling bottle

5.1.7 Manufacturer of Sampling Equipment
Not applicable

5.1.8 Key Variables
Not applicable

5.1.9 Sample Collection: Calibration
The sampling gear does not require calibration

5.1.10 Sample Collection: Quality Control
Duplicate field samples from independent casts were taken during 14 sampling events, representing about 6% of all events. All parameters were measured on these duplicates, and the measurement precision is reported in Section 9.3.

5.1.11 Sample Collection: References
Strobel, C.J. 1998. Environmental Monitoring and Assessment Program - Mid-Atlantic Integrated Assessment. Estuaries Component, Field Operations and Safety Manual. USEPA, Office of Research and Development, NHEERL-AED, Narragansett, RI. July 1998.

Kokkinakis, S.A., J.L. Hyland, and A. Robertson. 1994. Carolinian Demonstration Project - 1994 Field Operations Manual. Joint National Status and Trends/Environmental Monitoring and Assessment Program. NOAA/NOS/ORCA, Silver Spring, MD.

5.1.12 Sample Collection: Alternate Methods
No samples were collected for nutrient analysis at events designated for benthic analysis only. These events are identified by PARTNER codes = BNT-ODU, BNT-VERSAR, ODU and VERSAR. At stations with a PARTNER code = DC, samples were collected only for NH4, NO23, PO4F and TSS measurements in the surface layer (consult the EVENTS data file for PARTNER information). Samples for DOC measurements were collected only in 1998.

5.2 Data Preparation and Sample Processing
The processing methods used by USEPA contracts (LABCODE = NUT-1) are described here. Significant variations by other MAIA partners are noted in Section 5.2.6.

5.2.1 Sample Processing Objective
Water samples were analyzed to measure the concentrations of water column nutrients, suspended solids and phytoplankton pigments.

5.2.2 Sample Processing: Methods Summary

NH4, PO4, NO23, NO2, and Si were measured by analyzing filtered water with a segmented continuous flow analyzer (Technicon AutoAnalyzer II); they represent dissolved inorganic species

TDN and TDP were measured on filtered water samples that were first digested with alkaline persulfate, then analyzed with a Technicon AutoAnalyzer II; they represent dissolved organic and inorganic species

DOC was measured on filtered seawater with a Shimadzu 5050A TOC Analyzer

POC and PON were measured by analyzing filter pads with an Exeter Analytical CE-440 Elemental Analyzer; they represent organic material in particulates, but probably also includes carbonate

PHOS (total particulate phosphorus) was measured by combusting filter pads in a muffle furnace, followed by an acid digestion and analysis with a Technicon AutoAnalyzer II

TSS was measured by rinsing filters in deionized water to remove salts, then drying and weighing the filter pads

CHLA and PHAE pigments were extracted from filter with 90% acetone and measured with a Turner Design TD700 Fluorometer

These methods are described in detail in D'Elia, *et al.* (1997). At 14 stations (about 6% of all stations), replicate field samples were analyzed to evaluate the repeatability of the sampling procedure. Information regarding the precision of duplicate analyses is provided in Section 9.3.

5.2.3 Sample Processing: Calibration

Standard laboratory procedures were followed to assure analytical instruments were calibrated (D'Elia, *et al.* 1997). These procedures include constructing calibration curves, running quality control blanks and spikes, and routinely running standard reference materials.

5.2.4 Sample Processing: Quality Control

Approximately 5% of all filtered water samples were reanalyzed by the analytical laboratory to determine analytical repeatability of the analytical procedure. Another 5% of dissolved water samples were spiked with a known quantity of constituent and reanalyzed as a test for recovery efficience. For particulate constituents, 10% of all samples were reanalyzed (particulate samples cannot be spiked). Processing quality was considered acceptable if duplicate analyses were consistent within 10% and spiked analyses were as expected within 15%.

5.2.5 Sample Processing: References

D'Elia, C.F., Connor, E.E., Kaumeyer, N.L., Keefe, C.W., Wood, K.V., and Zimmermann, C.F. 1997. Nutrient Analytical Services Laboratory Standard Operating Procedures. Technical Report Series #158-97. Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, Solomons, MD. 77 pp.

5.2.6 Sample Processing: Alternate Methods

Not applicable

6. DATA ANALYSIS AND MANIPULATIONS

6.1 Name of New or Modified Values
Not applicable

6.2 Description of Data Manipulation
Analyte concentrations smaller than the method detection limit were reported as zero (Section 4.3).

7. DATA DESCRIPTION

7.1 Description of Parameters

7.1.1 Components of the Dataset

VARIABLE	TYPE	LENGTH	LABEL
STATION	Char	10	Station Name
EVNTDATE	Num	8	Event Date
B_SI	Num	8	Bottom Dissolved Silicate (mg/L as Si)
B_SI_D	Num	8	Bottom Dissolved Silicate MDL (mg/L as Si)
B_NH4	Num	8	Bottom Dissolved Ammonium (mg/L as N)
B_NH4_D	Num	8	Bottom Dissolved Ammonium MDL (mg/L as N)
B_NO23	Num	8	Bottom Dissolved Nitrite plus Nitrate (mg/L as N)
B_NO23_D	Num	8	Bottom Dissolved Nitrite plus Nitrate MDL(mg/L as N)
B_NO2	Num	8	Bottom Dissolved Nitrite (mg/L as N)
B_NO2_D	Num	8	Bottom Dissolved Nitrite MDL (mg/L as N)
B_PON	Num	8	Bottom Particulate Organic Nitrogen (mg/L as N)
B_PON_D	Num	8	Bottom Particulate Organic Nitrogen MDL (mg/L as N)
B_TDN	Num	8	Bottom Total Dissolved Nitrogen (mg/L as N)
B_TDN_D	Num	8	Bottom Total Dissolved Nitrogen MDL (mg/L as N)
B_TDP	Num	8	Bottom Dissolved Phosphorus (mg/L as P)
B_TDP_D	Num	8	Bottom Dissolved Phosphorus MDL (mg/L as P)
B_PO4F	Num	8	Bottom Dissolved Orthophosphate (mg/L as P)
B_PO4F_D	Num	8	Bottom Dissolved Orthophosphate MDL (mg/L as P)
B_PHOS	Num	8	Bottom Total Particulate Phosphorus (mg/L as P)
B_PHOS_D	Num	8	Bottom Total Particulate Phosphorus MDL (mg/L as P)
B_DOC	Num	8	Bottom Dissolved Organic Carbon (mg/L as C)
B_DOC_D	Num	8	Bottom Dissolved Organic Carbon MDL (mg/L as C)
B_POC	Num	8	Bottom Particulate Organic Carbon (mg/L as C)
B_POC_D	Num	8	Bottom Particulate Organic Carbon MDL (mg/L as C)
B_TSS	Num	8	Bottom Total Suspended Solids (mg/L)
B_TSS_D	Num	8	Bottom Total Suspended Solids MDL (mg/L)
B_CHLA	Num	8	Bottom Chlorophyll *a* (ug/L)
B_CHLA_D	Num	8	Bottom Chlorophyll *a* MDL (ug/L)
B_PHAE	Num	8	Bottom Phaeophytin (ug/L)
B_PHAE_D	Num	8	Bottom Phaeophytin MDL (ug/L)
S_SI	Num	8	Surface Dissolved Silicate (mg/L as Si)
S_SI_D	Num	8	Surface Dissolved Silicate MDL (mg/L as Si)
S_NH4	Num	8	Surface Dissolved Ammonium (mg/L as N)
S_NH4_D	Num	8	Surface Dissolved Ammonium MDL (mg/L as N)
S_NO23	Num	8	Surface Dissolved Nitrite plus Nitrate (mg/L as N)
S_NO23_D	Num	8	Surface Dissolved Nitrite plus Nitrate MDL(mg/L as N)
S_NO2	Num	8	Surface Dissolved Nitrite (mg/L as N)

7.1.1 Components of the Dataset, continued

VARIABLE	TYPE	LENGTH	LABEL
S_NO2_D	Num	8	Surface Dissolved Nitrite MDL (mg/L as N)
S_PON	Num	8	Surface Particulate Organic Nitrogen (mg/L as N)
S_PON_D	Num	8	Surface Particulate Organic Nitrogen MDL (mg/L as N)
S_TDN	Num	8	Surface Total Dissolved Nitrogen (mg/L as N)
S_TDN_D	Num	8	Surface Total Dissolved Nitrogen MDL (mg/L as N)
S_TDP	Num	8	Surface Dissolved Phosphorus (mg/L as P)
S_TDP_D	Num	8	Surface Dissolved Phosphorus MDL (mg/L as P)
S_PO4F	Num	8	Surface Dissolved Orthophosphate (mg/L as P)
S_PO4F_D	Num	8	Surface Dissolved Orthophosphate MDL (mg/L as P)
S_PHOS	Num	8	Surface Total Particulate Phosphorus (mg/L as P)
S_PHOS_D	Num	8	Surface Total Particulate Phosphorus MDL (mg/L as P)
S_DOC	Num	8	Surface Dissolved Organic Carbon (mg/L as C)
S_DOC_D	Num	8	Surface Dissolved Organic Carbon MDL (mg/L as C)
S_POC	Num	8	Surface Particulate Organic Carbon (mg/L as C)
S_POC_D	Num	8	Surface Particulate Organic Carbon MDL (mg/L as C)
S_TSS	Num	8	Surface Total Suspended Solids (mg/L)
S_TSS_D	Num	8	Surface Total Suspended Solids MDL (mg/L)
S_CHLA	Num	8	Surface Chlorophyll *a* (ug/L)
S_CHLA_D	Num	8	Surface Chlorophyll *a* MDL (ug/L)
S_PHAE	Num	8	Surface Phaeophytin (ug/L)
S_PHAE_D	Num	8	Surface Phaeophytin MDL (ug/L)
QACODE	Char	5	QA Qualifier
LABCODE	Char	5	Contract/Lab Identifier
YEAR	Char	4	Year of Sampling

7.1.2 Precision of Reported Values

See Section 4.4. The values are accurate to no more than three significant digits; however more significant digits may be reported in the dataset because of formatting restrictions.

Parameter	Description	Precision	Min	Max	units
*STATION	Station Name				
*EVNTDATE	Event Date				
B_SI	Bottom Dissolved Silicate	0.01	0.01	7	mg/L as Si
B_NH4	Bottom Dissolved Ammonium	0.001	0.001	0.535	mg/L as N
B_NO23	Bottom Dissolved Nitrite plus Nitrate	0.0001	0.0004	2.39	mg/L as N
B_NO2	Bottom Dissolved Nitrite	0.0001	0.0001	0.225	mg/L as N
B_PON	Bottom Particulate Organic Nitrogen	0.001	0.009	2.62	mg/L as N
B_TDN	Bottom Total Dissolved Nitrogen	0.001	0.015	2.61	mg/L as N
B_TDP	Bottom Dissolved Phosphorus	0.0001	0.0047	0.213	mg/L as P
B_PO4F	Bottom Dissolved Orthophosphate	0.0001	0.0003	0.267	mg/L as P
B_PHOS	Bottom Total Particulate Phosphorus	0.0001	0.0001	0.814	mg/L as P
B_DOC	Bottom Dissolved Organic Carbon	0.1	1.1	10.2	mg/L as C
B_POC	Bottom Particulate Organic Carbon	0.01	0.01	12.2	mg/L as C
B_TSS	Bottom Total Suspended Solids	0.1	0.8	312	mg/L as C

7.1.2 Precision of Reported Values, continued

Parameter	Description	Precision	Min	Max	units
B_CHLA	Bottom Chlorophyll *a*	0.1	0.7	225	ug/L
B_PHAE	Bottom Phaeophytin	0.1	0.1	50	ug/L
S_SI	Surface Dissolved Silicate	0.01	0.01	7.05	mg/L as Si
S_NH4	Surface Dissolved Ammonium	0.001	0.001	0.573	mg/L as N
S_NO23	Surface Dissolved Nitrite plus Nitrate	0.0001	0.0005	2.37	mg/L as N
S_NO2	Surface Dissolved Nitrite	0.0001	0.0005	0.155	mg/L as N
S_PON	Surface Particulate Organic Nitrogen	0.001	0.009	2.63	mg/L as N
S_TDN	Surface Total Dissolved Nitrogen	0.001	0.011	2.63	mg/L as N
S_TDP	Surface Dissolved Phosphorus	0.0001	0.0036	0.276	mg/L as P
S_PO4F	Surface Dissolved Orthophosphate	0.0001	0.0003	0.327	mg/L as P
S_PHOS	Surface Total Particulate Phosphorus	0.0001	0.0001	0.886	mg/L as P
S_DOC	Surface Dissolved Organic Carbon	0.1	1.5	10.5	mg/L as C
S_POC	Surface Particulate Organic Carbon	0.01	0.02	11.8	mg/L as C
S_TSS	Surface Total Suspended Solids	0.1	0.8	158	mg/L as C
S_CHLA	Surface Chlorophyll *a*	0.1	0.7	272	ug/L
S_PHAE	Surface Phaeophytin	0.1	0.1	31.9	ug/L

7.1.3 Minimum Value in Dataset
See Section 7.1.2

7.1.4 Maximum Value in Dataset
See Section 7.1.2

7.2 Data Record Example

7.2.1 Column Names for Example Records

STATION	EVNTDATE	B_SI	B_SI_D	B_NH4	B_NH4_D	B_NO23	B_NO23_D	B_NO2	B_NO2_D
MA97-0001	8/25/97	1.22	.	0.006	.	0.0027	.	0.0014	.
MA97-0003	8/26/97	2.34	.	0.008	.	0.0022	.	0.0020	.
MA97-0004	8/26/97	2.38	.	0.039	.	0.0063	.	0.0061	.

B_PON	B_PON_D	B_TDN	B_TDN_D	B_TDP	B_TDP_D	B_PO4F	B_PO4F_D	B_PHOS	B_PHOS_D
0.493	.	0.872	.	0.051	.	0.0180	.	0.0458	.
0.854	.	0.775	.	0.044	.	0.0084	.	0.0654	.
1.11	.	0.854	.	0.048	.	0.0088	.	0.0925	.

B_DOC	B_DOC_D	B_POC	B_POC_D	B_TSS	B_TSS_D	B_CHLA	B_CHLA_D	B_PHAE	B_PHAE_D
.	.	2.88	.	14.8	.	16.7	.	5.7	.
.	.	5.89	.	15.3	.	22.0	.	11.7	.
.	.	8.26	.	25.7	.	33.1	.	11.5	.

7.2.1 Column Names for Example Records, continued

S_SI	S_SI_D	S_NH4	S_NH4_D	S_NO23	S_NO23_D	S_NO2	S_NO2_D	S_PON	S_PON_D
1.22	.	0.006	.	0.0027	.	0.0014	.	0.493	.
2.34	.	0.008	.	0.0022	.	0.0020	.	0.854	.
2.38	.	0.039	.	0.0063	.	0.0061	.	1.11	.

S_TDN	S_TDN_D	S_TDP	S_TDP_D	S_PO4F	S_PO4F_D	S_PHOS	S_PHOS_D	S_DOC	S_DOC_D
0.872	.	0.051	.	0.0180	.	0.0458	.	.	.
0.775	.	0.044	.	0.0084	.	0.0654	.	.	.
0.854	.	0.048	.	0.0088	.	0.0925	.	.	.

S_POC	S_POC_D	S_TSS	S_TSS_D	S_CHLA	S_CHLA_D	S_PHAE	S_PHAE_D	QACODE	LABCODE
2.88	.	14.8	.	16.7	.	5.7	.	NUT-A	NUT-1
5.89	.	15.3	.	22.0	.	11.7	.	NUT-A	NUT-1
8.26	.	25.7	.	33.1	.	11.5	.	NUT-A	NUT-1

8. GEOGRAPHIC AND SPATIAL INFORMATION

8.1 Minimum Longitude (Westernmost)
-77.4339 decimal degrees

8.2 Maximum Longitude (Easternmost)
-74.7230 decimal degrees

8.3 Minimum Latitude (Southernmost)
34.8702 decimal degrees

8.4 Maximum Latitude (Northernmost)
40.1470 decimal degrees

8.5 Name of Region
MAIA estuary region, consisting of Delaware Bay, Chesapeake Bay, the Delmarva coastal bays, Albemarle-Pamlico Sound, and contiguous estuaries.

9. QUALITY CONTROL AND QUALITY ASSURANCE

9.1 Measurement Quality Objectives
The measurement quality objectives of the EMAP-Estuaries program specify accuracy and precision requirements of 10% for measured analytes (see Valente and Strobel, 1993).

9.2 Data Quality Assurance Procedures
QA procedures included running blanks, spiked samples, and standard reference materials with each batch of samples. Any batch failing to meet the specifications presented in Section 9.1 was reanalyzed or rejected.

9.3 Actual Measurement Quality
All of the data reported in this data file met the QA specifications listed in Section 9.1. As an illustration of the measurement, the repeatability of field replicates collected by USEPA field crews in 1997 (see Section 5.1.10) are reported below. For comparison, the methodological detection limits

(MDL) and two expressions of the range of values (within an estuary and over all estuaries) are listed. The data show that the field replicates are generally small compared differences evident within and among estuaries, *i.e.*, sampling precision is good.

Analyte	MDL (1)	Field Reps (2)	Stations by Estuary (3)	Range of All (4)	Units
Si	0.01	0.17	0.92	7.04	mg/L
NH4	0.003	0.016	0.070	0.55	mg/L
NO23	0.0002	0.072	0.42	2.37	mg/L
NO2	0.0002	0.0008	0.018	0.16	mg/L
PON	0.011	0.017	0.25	2.63	mg/L
TDN	0.02	0.11	0.41	2.01	mg/L
TDP	0.001	0.003	0.027	0.24	mg/L
PO4F	0.0006	0.002	0.026	0.26	mg/L
PHOS	0.001	0.004	0.040	0.31	mg/L
POC	0.06	0.16	1.3	11.8	mg/L
TSS	1.5	2.3	17.5	158	mg/L
CHLA	1.1	3.4	18.6	271	ug/L
PHAE	0.7	1.5	4.3	31.9	ug/L

(1) Detection Limits: 3X standard deviation of 7 lab reps; quoted by testing laboratory
(2) Field Reps: the average difference between field duplicates at 14 sites
(3) Stations by Estuary: standard deviation of all samples collected in an estuary (on avg, 10 samples)
(4) Range of All: maximum value - minimum value among all sites; range of all data

10. DATA ACCESS

10.1 Data Access Procedures
Data can be downloaded from the web

10.2 Data Access Restrictions
None

10.3 Data Access Contact Persons
John Paul, Principal Investigator
U.S. EPA NHEERL-AED
401-782-3037, 401-782-3099 (FAX), paul.john@epa.gov

Harry Buffum, Data Manager/ MAIA-Estuaries
U.S. EPA NHEERL-AED
401-782-3183, 401-782-3030 (FAX), buffum.harry@epa.gov

10.4 Dataset Format
ASCII (CSV) and SAS Export files

10.5 Information Concerning Anonymous FTP
Not available

10.6 Information Concerning WWW
See Section 10.1 for WWW access

10.7 EMAP CD-ROM Containing the Dataset
Data not available on CD-ROM

11. REFERENCES

D'Elia, C.F., Connor, E.E., Kaumeyer, N.L., Keefe, C.W., Wood, K.V., and Zimmermann, C.F. 1997. Nutrient Analytical Services Laboratory Standard Operating Procedures. Technical Report Series #158-97. Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, Solomons, MD. 77 pp.

Holland, A.F., ed. 1990. Near Coastal Program Plan for 1990: Estuaries. EPA 600/4-90/033. U.S. EPA, Office of Research and Development, NHEERL-AED, Narragansett, RI. November 1990.

Kokkinakis, S.A., Hyland, J.L., and Robertson, A. 1994. Carolinian Demonstration Project - 1994 Field Operations Manual. Joint National Status and Trends/Environmental Monitoring and Assessment Program. NOAA/NOS/ORCA, Silver Spring, MD.

Plumb, R.H. 1981. Procedures for Handling and Chemical Analysis of Sediment and Water Samples. Prepared for the U.S. Environmental Protection Agency/Corps of Engineers Technical Committee on Criteria for Dredge and Fill Material. Published by Environmental Laboratory, U.S. Army Waterways Experiment Station, Vicksburg, MS. Technical Report EPA/CE-81-1.

Salonen, K. 1979. A versatile method for the rapid and accurate determination of carbon by high temperature combustion. Limnol. Oceanogr. 24: 1770-183.

Strobel, C.J. 1998. Environmental Monitoring and Assessment Program - Mid-Atlantic Integrated Assessment. Estuaries Component, Field Operations and Safety Manual. U.S. EPA, Office of Research and Development, NHEERL-AED, Narragansett, RI. Forthcoming.

Texas A & M University, Geochemical and Environmental Research Group. 1990. NOAA Status and Trends, Mussel Watch Program, Analytical Methods. Submitted to NOAA. Rockville (MD): U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Ocean Assessment Division.

U.S. EPA. 1995. Environmental Monitoring and Assessment Program (EMAP): Laboratory Methods Manual-Estuaries, Volume 1: Biological and Physical Analyses. U.S. Environmental Protection Agency, Office of Research and Development, Narragansett, RI. EPA/620/R-95/008.

Valente, R. and Strobel, C.J. 1993. Environmental Monitoring and Assessment Program- Estuaries: 1993 Virginian Province Quality Assurance Project Plan. U.S. EPA,NHEERL-AED, Narragansett, RI. May 1993

12. TABLE OF ACRONYMS

AED	Atlantic Ecology Division (USEPA)
CP	Carolinian Province
CBP	Chesapeake Bay Program
CTD	Conductivity, Temperature, and Depth
DB	Delaware Bay
EMAP	Environmental Monitoring and Assessment Program
EPA	U.S. Environmental Protection Agency
GED	Gulf Ecology Division (USEPA)

12. TABLE OF ACRONYMS, continued

GERG	Geochemical and Environmental Research Group
MAIA	Mid-Atlantic Integrated Assessment
mg/L	Milligrams per liter (same as part per million)
NHEERL	National Health and Environmental Effects Research Laboratory
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
ODU	Old Dominion University
QA/QC	Quality Assurance/Quality Control
TAMU	Texas A&M University
ug/L	Micrograms per liter (same as part per billion)
um	Micrometer
USEPA	United States Environmental Protection Agency
VER	Versar, Inc.
WWW	World Wide Web

13. PERSONNEL INFORMATION

Harry Buffum, Database Manager, OAO Corp.
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3183, 401-782-3030 (FAX), buffum.harry@epa.gov

Don Cobb, Chemist
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-9616, 401-782-3030 (FAX), cobb.donald@epa.gov

Dan Dauer, Dept. of Biological Sciences
Old Dominion University, Norfolk, VA 23529-0266
757-683-3595, 757-683-5283 (FAX), ddauer@odu.edu

Courtney T. Hackney, Dept. of Biological Sciences
University of North Carolina at Wilmington, Wilmington, NC 28403-3297
910-962-3759, hackney@uncwil.edu

Steve Hale, EMAP Information Manager
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3048, 401-782-3030 (FAX), hale.stephen@epa.gov

Michelle Harmon, Program Manager
NOAA/NOS
1305 East West Highway, 10200 SSMC4, Silver Spring, MD 20901-3281
301-713-3034 x619, 301-713-4388 (FAX), michelle.harmon@noaa.gov

Melissa M. Hughes, Data Librarian, EMAP-Estuaries
OAO Corp., U.S. EPA NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3184, 401-782-3030 (FAX), hughes.melissa@epa.gov

Jeffrey L. Hyland, Carolinian Province Manager
NOAA/NOS/ORCA/CMBAD, NOAA/EPA Joint Nat. Coastal Research and Monitoring Program
217 Fort Johnson Rd. (P.O. Box 12559), Charleston, SC 29422-2559
843-762-5415, 843-762-5110 (FAX), jeff.hyland@noaa.gov

John Kiddon, AED Oceanographer
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3044, 401-782-3030 (FAX), kiddon.john@epa.gov

Joe LiVolsi, AED QA Officer
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3163, 401-782-3030 (FAX), livolsi.joseph@epa.gov

John Macauley, Field Coordinator
U.S. Environmental Protection Agency, NHEERL-Gulf Ecology Division (GED)
One Sabine Island Drive, Gulf Breeze, FL 32561
850-934-9200, 850-934-9201 (FAX), macauley.john@epa.gov

John Paul, Principal Investigator
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3037, 401-782-3099 (FAX), paul.john@epa.gov

J. Ananda Ranasinghe, Program Manager
Versar, Inc.
9200 Rumsey Rd., Columbia, MD 21045-1934
410-964-9200, 410-964-5156 (FAX), ranasinghana@versar.com

Charles J. Strobel, Field Coordinator
U.S. Environmental Protection Agency, NHEERL-AED
27 Tarzwell Drive, Narragansett, RI 02882-1197
401-782-3180, 401-782-3030 (FAX), strobel.charles@epa.gov

Carl S. Zimmerman, Chief, Division of Resource Management
Assateague Island National Seashore
7206 National Seashore Lane, Berlin, MD 21811
410-641-1443 x213, 410-641-1099 (FAX), carl_zimmerman@nps.gov