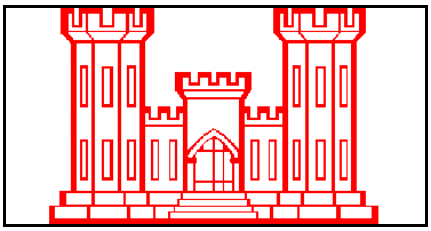

US Army Corps of Engineers
North Atlantic Division

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Annual Water Quality Management Report

January 2002

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NORTH ATLANTIC DIVISION
WATER QUALITY MANAGEMENT REPORT
(2001)

ABSTRACT

This water quality management report is prepared in accordance with the requirements of CECW-EH-W memo dated 3 November 1998. The report summarizes the activities of the North Atlantic Division's overall Water Quality Management Program. In general, Division water quality management goals are for projects to be in compliance with Federal and State Water Quality Standards and attainment of project purposes. Water quality enhancement has been attained for all projects in the NAD area.

Items included in this report are technical capabilities and responsibilities in the division and district offices, relationships between water quality and water control management activities, contracted workload, laboratory facilities, data management systems, training, coordination with other agencies, research and development needs, and special studies completed or required.

1. **Technical Capabilities and Staff**

A) NAD Office

Technical Engineering and Construction Division - Water Management Team

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Andrew Petallides	CENAD-MT-EC-W	Hydr Engr/Team Leader	(718)765-7085
Alfred K. Tai	CENAD-MT-EC-W	Hydraulic Engineer	(718)765-7098
Ralph LaMoglia	CENAD-MT-EC-W	Hydraulic Engineer	(718)765-7099

B) Philadelphia District.

a) Planning Division - Environmental Resources Branch (Reservoir Water Quality Unit)

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Jerry Pasquale	CENAP-PL-E	Biologist/Branch Chief	(215)656-6560
Gregory Wacik	CENAP-PL-E	Ecologist	(215)656-6561

b) Engineering Division - Hydrology and Hydraulics Branch

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
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Christine Tingle	CENAP-EN-H	Hydraulic Engineer	(215)656-6685
Yvette Boggs	CENAP-EC-H	Hydrologic Technician	215-656-6685

C) Baltimore District.

Water Control & Quality Section (Engineering Division), Geotechnical & Water Resources Branch.

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
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Don Lambrechts	CENAB-EN-GW	Hydraulic Engineer	(410)962-6770
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Ken Kulp	CENAB-EN-GW	Hydrologist	(410)962-6775
Doc Barlock	CENAB-EN-GW	Hydrologic Tech.	(410)962-5124
Debra Strickland	CENAB-EN-GW	Hydraulic Engineer	(410)962-5127

D) Norfolk District

Engineering, Construction, and Operations Division-- Engineering Services Branch, Hydraulics and Hydrology Section

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Larry Holland	CENAO-TS-EW	Hydraulic Engineer	(757) 441-7774
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William Siple	CENAO-CO-GL	Engineering Tech.	(540) 962-1138

E) New York District

Operations Division--CENANOP-SD

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Monte Greges	CENANOP-SD	Supv. Oceanographer	(212)264-5620
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Steven Knowles	CENANOP-SD	Oceanographer	(212)264-1853
Mike Harris	CENANOP-SD	Oceanographer	(212)264-1585
Beth Nash	CENANOP-SD	Oceanographer	(212)264-5622
Thomas Wyche	CENANOP-SD	Physical Lab Tech.	(212)264-1851
Linda Bussey	CENANOP-SD	Secretary	(212)264-2021

F) New England District

Water Management Section

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Charles Wener	CENAE-EP-GW	Hyd. Eng/Chief	(978) 318-8686
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Technical Missions Branch

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Bruce Williams	CENAE-CO-TM	Park Manager	(978) 318-8168

2. Relationship Between Water Quality and Water Control Management Activities

A) Philadelphia District.

Stratification monitoring was performed at four of five District Reservoirs - Blue Marsh, Beltzville, Prompton, and F.E. Walter to identify and monitor water quality conditions within each reservoir. Stratification monitoring at Blue Marsh and Beltzville Reservoirs was used to determine selective withdrawals for maintenance of downstream water temperatures. The Water Quality Contractor provides stratification reports directly to the Districts Hydrology and Hydraulics Branch. The relationships between water quality and water control management activities are periodically reviewed when a water quality or water control management concern arises.

B) Baltimore District

Water Control and Water Quality Management are both responsibilities of the Water Control and Quality Section, Geotechnical & Water Resources Branch, Engineering Division.

C) Norfolk District.

The Civil Works Section of the Engineering Branch, Technical Services Division, has overall responsibility for District Water Control Management and Water Quality Activities at the Gathright Dam and Lake Moomaw Project.

D) New York District.

NYD manages and studies water quality concerns which are primarily related to dredging and dredged material disposal operations associated with civil works projects, and secondarily related to various associated studies.

E) New England District.

New England District has no reservoirs with selective withdrawal capabilities. Water quality coordination is for the operation of NAE's reservoir projects and is required only for special operations such as past low-flow augmentation storage at Thomaston Dam.

3. Contracted Workload

A) NAD Office.

The Division office has had no contracted workload in the past and there is none planned in the immediate future.

B) Philadelphia District.

All water quality monitoring, other than stratification monitoring was performed through contract with VERSAR, Inc. of Columbia, Maryland.

C) Baltimore District.

Phytoplankton and zooplankton samples were collected from selected District reservoir projects to assist in evaluating their productivity, aquatic food-chain dynamics, and overall water quality. The samples were sent to Aquatic Analysts in Wilsonville, Oregon for identification, enumeration, calculation of biologic indices, and interpretation of the results.

D) Norfolk District.

For 2001, the District contracted with one commercial laboratory for the analysis of water samples obtained from the Gathright Dam and Lake Moomaw project by project personnel. The contract provides for the analysis of nutrients, iron and manganese, and bacteriological parameters.

E) New York District.

Bioassay/bioaccumulation testing along with other biological and chemical analyses are contracted out to commercial testing laboratories. Feasibility studies for alternatives to ocean disposal and for monitoring of the HARS have been contracted to private contractors and universities, Corps of Enginner Enginner Research and Development Center (CEERDC), and other Federal Agencies. Most contracts, IAO's, and Interagency Agreements are managed by CENANOP-SD staff.

E) New England District

All analytical work for the water quality program is contracted out to various companies including Alpha Analytical, Microbac, Biological Services, Eastern Analytical, Aquacheck Laboratory, Northeast Labs, Spectrum Analytical, and the Vermont State Laboratory.

4. Laboratory Facilities

A) NAD Office. None

B) Philadelphia District.

All Laboratory work associated with reservoir water quality samples was conducted at Blue Marsh Laboratory of Douglassville, Pennsylvania.

The State of Pennsylvania does not currently have sediment standards established. As

directed by the Philadelphia District, concentrations of priority pollutants in sediment samples are compared to identified reference literature sediment guidelines found in the following:

New Jersey Department of Environmental Protection. 1999. Cleanup standards for contaminated sites, N.J.A.C. 7: 26D. May 12, 1992. Trenton, New Jersey.

C) Baltimore District.

A laboratory facility is located in the Water Control and Quality Section at the City Crescent Building in Baltimore. This building was completed in 1993.

D) Norfolk District.

The Norfolk District has no laboratory facilities. For 2001, OLVER, INC., under contract with the Norfolk District, performed water quality analyses on samples from the Gathright Project.

Personnel from the Corps of Engineers, South Atlantic Division Laboratory inspected OLVER Inc. in January 1997 and concluded that the laboratory has the capabilities to satisfactorily perform the contracted tests and measurements.

E) New York District.

CENANOP-SD maintains a sampling and storage facility at Caven Point, New Jersey which is primarily used for preparation, limited testing and storage of dredged material and water samples. The facility contains state-of-the art equipment for sediment grain size analysis and refrigerated storage for sediment samples, including cores. Marine borer test boards, used in harborÄwide monitoring, are also prepared at this facility

F) New England District

Data had been stored on the Laboratory Information Management System (LIMS), and transferred to users in PC-compatible spreadsheets. In FY99 NAE purchased GIS\Key software for storing, retrieving, and analyzing water quality (and HTW) data. Use of GIS\Key began in FY00, but was discontinued at the end of the year because of the expense and Corps plans to ultimately switch to DASLER. We are currently storing data on spreadsheets until the eventual implementation of DASLER.

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5. Data Management Systems.

A) Philadephia District

VERSAR, Inc. submits annual individual reservoir water quality and database trend

analysis reports to CENAP-PL-E. The Contractor directly inputs individual reservoir data into the respective reservoir databases.

B) Baltimore District.

The Water Control Data System (WCDS) is implemented on the Baltimore District LAN and presently includes the following networked equipment:

a. Three UNIX workstations (two SUN SPARC ULTRA 1's and one SUN SPARC ULTRA 60).

b. Integral Systems DOMSAT Receive Station (Satellite dish, Comstream DOMSAT receiver, Gateway PC and a Dell PC).

c. HP Laser Jet 5M printer.

d. HP Scan Jet IIc desktop scanner.

In addition, two DELL Latitude laptop PC's are used for remote access to the WCDS, and real-time Doppler weather radar images are obtained via a DTN Weather server.

Significant FY 01 activities regarding the WCDS included the following:

a. Initiated migration to the Corps Water Management System (CWMS). Most of the data processing activities are now done on the Ultra 60 workstation using both DSS and Oracle databases.

b. Improved methods for displaying water control data and information, using both web server capabilities and CWMS Control and Visualization Interface (CAVI) capabilities.

c. Added SUN SPARC ULTRA 60 as the main WCDS server and retired the Sun SPARCstation 20 workstations.

d. Successfully tested the Continuity of Operations Plan (COOP) with CENAP in November 2001. The COOP was not used during FY 01.

e. Added a Dell PC running Linux to the DOMSAT Receive Station. The purpose is to run LRGS software for storing DOMSAT data as a backup to the Gateway PC running DRS software.

During FY 01, WCQS also actively participated in the on-going development of the new

Corps Water Management System (CWMS). The Baltimore District continued its efforts as one of four initial test sites for CWMS.

Significant CWMS accomplishments are listed below:

a. Loaded CWMS test version 3 (TV-3) on a WCQS workstation in April 01 and tested throughout the remainder of the FY.

b. Attended a working session at HEC in May 01 providing overview of CWMS capabilities and applications.

b. Received on-site training from HEC in September 01, including data acquisition, data visualization, and modeling components of CWMS.

c. Continued working with HEC to further develop and refine the CWMS prototype model for the Bald Eagle Creek watershed. The model was enhanced to include new capabilities provided in TV-3, and is being used as the sample watershed for CWMS deployment activities at all Corps districts.

d. Continued participating in the Corps Users Review Group (CURG) and in monthly conference calls with HQUSACE, HEC, and personnel from other Corps districts.

e. Conducted numerous CWMS demonstrations at request of HQUSACE and HEC. Separate demonstrations were provided for the following people:

Director of Civil Works (General Van Winkle), Corporate Information Officer (Will Berrios), senior Civil Works leaders at HQUSACE (Charlie Hess and Dwight Beranek), Baltimore District Engineer (Colonel Fiala), CWMS Advisory Group (AG), water control staff in other NAD districts, and a delegation visiting from Mozambique.

Significant DASLER accomplishments:

Data Management and Analysis System for Lakes, Estuaries, and Rivers (DASLER) is a Windows based program interface to an Access database containing physical, chemical, and biological water quality data. As the software was installed in FY 2000, the primary goal this year was to populate the database with current and historical physical/chemical field sampling data. All reservoirs have sampling data input for the year 2000. Some dams have data input as far back as 1989. Of the fourteen dams routinely visited during the sampling season, eight have between 8-11 years of data in DASLER. Almost all of the Chemung basin's data is in the database. A consulting firm's request for the last five years of data at Cowanesque was readily completed using DASLER.

Other significant accomplishments include work efforts that:

a. Changed the DASLER database software and that created new macros for spreadsheet conversion, effectively reducing the data transfer time into DASLER.

b. Created an Excel spreadsheet to track data input against field sampling history.

c. Maintained correspondence with program developer, Gerald Burnette, routinely to provide support for new update, DASLER Version 4. Expected in FY 2002, a significant modification in the new version will allow direct transfer of data from DASLER into EPA's STORET database.

d. Continued participation in the CE-DASLER Development Group, including review of the CE-DASLER Statement of Principle, which discusses COE management of CE-DASLER as a public domain product.

In addition, in FY 2002 CRREL is making CorpsView_WQ (CorpsView/Water Quality integrated decision support system) software available to this office for trial application. This software combines DASLER's environmental database, the water control data stored in HEC-DSS and a common map-oriented graphical interface. Coincidental access to both water quality and water control information allows water managers to consider a wide range of value-added information. For instance, watershed features potentially influencing observed water patterns in a reservoir can be visualized and reports can be generated that explicitly show relationships between project operations and water quality.

The Data Management and Analysis System for Lakes, Estuaries, and Rivers (DASLER) was installed in the Baltimore District in 2000 to manage and report water-quality data. This is a Windows based program interface to an Oracle database that is capable of supporting physical/chemical and biological data. The program is capable of generating a wide variety of plots and tabular reports. Water Control and Quality Section personnel have developed programs to convert data currently stored on spreadsheets and as ASCII files to the DASLER database.

C) Norfolk District.

All data is obtained, analyzed, reduced, and stored in digital format. The lake monitoring data is collected with a Hydrolab 5200A unit and stored on District personal computers.

D) New York District.

Sediment testing results for all analyzed projects are input into a network Oracle database. CENANOP-SD also maintains an up-to-date computerized summary of dredging and ocean disposal activities (federal channel and private applicant volumes dumped at the Mud Dump Site and HARS, dates of disposal, current permits). The GIS database is potentially useful for designating new or replacement ocean disposal sites and Borrow Pits, and as a

support tool for the New York Bight Monitoring and Modeling study. Software for evaluating bioassay, bioaccumulation and barge overflow data have been developed for CENANOP-SD and are being honed for use in all data compilation and review.

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E) New England District.

Water quality related training and conferences in WMS included the following. In December, Townsend Barker represented NAE at a conference on "Climate Change and Metro Boston Model Review" at Tufts University in Medford, Massachusetts. Nancy McNally and Katherine Miller attended the Western New England Conference on "New Developments in Pathogen Monitoring" on 30 May at the University of Massachusetts in Amherst. There was no other formal water quality-related training in FY01.

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6. Training

A) NAD Office.

No CENAD personnel were involved in water quality training during 2001.

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B) Philadelphia District.

Numerous conferences, college courses and meetings were attended that provided training in an informative setting and were directly related to operations of District Reservoirs. These include:
The Blue Marsh Reservoir Water Quality Meeting
The Beltzville Reservoir Water Quality Meeting
Stream and Reservoir Enhancement Workshop, Denver Colorado
Fish Ecology (College Course)
Benthic Macroinvertebrate Ecology (College Course)

C) Baltimore District.

The following are training courses taken by CENAB Water Control staff – FY01.

COURSE TITLE	NUMBER ATTENDING
Advanced Hydrologic Modeling	1
HEC-RAS	1
CWMS Workshop	3
CWMS On-site training	7
ORACLE Architecture and Administration	1
ORACLE Backup and Recovery	1
Motorboat Operators Course	3
Mid-Atlantic Water Pollution Biology Workshop	1
Water Sampling and Testing Procedures	1
Streambank & Channel Stabilization and Reservoir Water Quality Enhancement Techniques	1
Mid-career Retirement Planning	1
Professional Engineering Exam Review	1

D) Norfolk District.

No CENAO personnel were involved in water quality training during 2001.

E) New York District.

No CENAN personnel were involved in water quality training during 2001.

F) New England District.

The staff would benefit from attending seminars and courses which are geared towards the latest biological and chemical testing techniques and protocols, contaminant effects and data evaluation. State-of-the-art computer hardware and software courses offered by universities and training schools should be available to personnel, thus ensuring a staff capable of making software/hardware decisions during the management of scientific studies and Corps projects.

7. Interagency Coordination.

A) Philadelphia District.

Data on file with the District is made available to all that make the request. CENAP-PL-E

regularly sends annual reservoir water quality monitoring data to the Delaware River Basin Commission (DRBC), Pennsylvania Fish and Boat Commission, Western Berks Water Authority and Pennsylvania Department of Environmental Protection (PADEP). Results of the drinking water analyses are sent on a quarterly basis to the PADEP. Zebra mussel monitoring data sheets are sent on an annual basis to PADEP. Additional copies of reservoir Annual Water Quality Monitoring Reports are available to those who make the request.

The Philadelphia District presented various aspects of its water quality monitoring program and results to Federal, State, and local governments and private entities at the following venues:

The Blue Marsh Reservoir Water Quality Meeting
The Lehigh River Study Team Meeting (F.E. Walter and Beltzville Reservoir data)
Friends of Prompton Lake Meetings

B) Baltimore District.

The Baltimore District maintains contact with the Maryland Department of Natural Resources, Pennsylvania Department of Environmental Protection and Susquehanna River Basin Commission, providing them with information of water quality operations that may impact water quality in Corps lakes or downstream of projects. These notifications are made for any operation that deviates from the approved regulation plan and includes gate shutdowns for conduit inspections and lake drawdowns for maintenance.

Water Control and Quality Section also coordinates water quality activities with other agencies, including the Maryland Department of Freshwater Fisheries, the Susquehanna River Basin Zebra Mussel Monitoring Network, the Pennsylvania Fish & Boat Commission, the Chesapeake Watermans Association, and the Mineral County (WV) Parks & Recreation Commission.

C) Norfolk District.

Water quality efforts are coordinated with the state of Virginia, National Weather Service, U.S. Geological Survey, U.S. Forest Service, U.S. Fish and Wildlife, and EPA Region III.

D) New York District.

CENANOP-SD coordinates regularly with other state and federal regulatory and Scientific/technical agencies through regular meetings, letters and phone conversations. State agencies are contacted regularly to review private applicant and federal sampling and testing plans, and many concerns and questions are verbalized at Harbor Estuary Program (HEP) meetings where various tiers of involvement cover technical, management and policy information and eventual decisions.

A Remediation Workgroup (technically part of the HEP) reformed in late 2000 to review EPA Region 2's proposed technical evaluation framework for bioaccumulation data in our ocean disposal testing program was active throughout 2001.

E) New England District.

Data on file with the District is made available to all that request it. Results of drinking water analyses are sent to the appropriate State agencies within the prescribed timeframe. Beach analyses at New Hampshire projects are sent to the New Hampshire Department of Environmental Services monthly. In Massachusetts results from the beaches at Buffumville Lake and West Hill Dam are sent to the Charlton and Uxbridge Boards of Health, respectively. Beach data from projects in Connecticut are sent to the Department of Environmental Protection annually for inclusion in their 305(b) report. Water quality monitor data from the Town Brook tunnel is sent to Massachusetts monthly. NAE produces an Annual Water Quality Report in its own format, and copies are sent to State agencies in all 6 New England States, the U.S. EPA, and interested private organizations.

8. Research and Development Needs.

A) New York District

1. Capping effectiveness

1a. Problem: Define the effectiveness of capping procedures at isolating contaminated sediments.

1b. Product Desired: information and data on effects of layering caps; long term integrity of caps; effectiveness of different types of caps; suitability of final cap material.

1c. Assessment: will affect material which requires capping in a confined disposal facility or which may be eligible in the future for capping at an ocean disposal site; also helpful in assessing certain impacts of placing a remediation "cap" at the HARS.

1d. POC: Monte Greges, CENANOP-SD; 212- 264-5620

2. Dioxin Effects

2a. Problem: Refine understanding of dioxin effects and how to mitigate for its disposal.

2b. Product desired: establishment of realistic evaluative framework and scientifically based criteria for TCDD and other isomers; applicable decontamination technologies; effects of trophic transfer.

2c. Assessment: affects large volume of material proposed for dredging and disposal;

will have huge impact on all dredging in harbor; costs: $400,000 to 1.5 million.

2d. POC: Monte Greges, CENANOP-SD; 212-264-5620

3. Bioaccumulation

3a. Problem: Establish appropriate and defensible bioaccumulation criteria for use in the District's ocean disposal testing program.

3b. Product Desired: need valid lists of scientifically based criteria for all contaminants evaluated in our dredged material management program.

3c. Assessment: will affect all material proposed for placement at the HARS from the Port

3d. POC: Monte Greges, CENANOP-SD: 212-264-5620

B) Philadelphia District

1a. Problem - Bacteriological Contamination at the Reservoirs.

1b. Product Desired - A detailed evaluation of bacteriological water quality data taken at the reservoirs throughout the years in combination with an investigation into the current and past land uses is desired to assess contamination trends and locate point and non-point sources of pollution. A database was developed in 1996 using all historical reservoir data currently available. Fecal coliform data trends were also developed for the reservoirs.

1c. Assessment of Problem - Fecal coliform levels have periodically exceeded the limit throughout the years at various reservoir sites

1d. POC: Gregory Wacik, CENAP-PL-E: 215-656-6561

2a. Problem – Lehigh River water quality

2b. Product Desired – A watershed model to evaluate the water quality of the Lehigh River and the affect the F.E.Walter and Beltzville reservoir operations have on it.

2.c Assessment of Problem - Currently a cooperative effort amongst Federal, State, and private entities is in place to define water quality conditions in the Lehigh River.

2d. POC: Gregory Wacik, CENAP-PL-E: 215-656-6561

3.a Problem – Nutrient loading and algal biomass at Blue Marsh Reservoir

3.b Product Desired – An accurate assessment of individual sub-watershed loadings entering the reservoir so restoration efforts can focus on those watersheds with the highest nutrient loads.

3.c Assessment of Problem – Nutrient loading from the Blue Marsh and Prompton Reservoir watersheds is adversely affecting the water quality of the main reservoir bodies and subsequently downstream water quality.

3d. POC: Gregory Wacik, CENAP-PL-E: 215-656-6561

C) Baltimore District

Remedy gas supersaturation in stilling basin of Jennings Randolph Lake.

a. Problem - Gas supersaturation occurs when large releases are made, resulting in injuries or death to some fish species.
b. Product Desired - Recommendation for an economical solution.
c. Assessment of Problem - Problem occurs about 15-30 days per year. Cost of problem is unknown.
a. POC: Mr. Stan Brua, CENAB-EN-GW: 410- 962-4894.

D) New England District

a. Problem - Bacterial Contamination of Beaches after Rainstorms
b. Product Desired - Means to determine when to close and reopen beaches after rainstorms without having to wait one to two days for sampling results.
c. Assessment of Problem - High bacteria counts occur at beaches most often after it rains, but it takes one to two days to get sampling results; this delay can be even longer on weekends when demand for access to the beaches is highest. The result can be that beaches are open when they shouldn't be and closed unnecessarily. An administrative closure protocol based on past experience is needed.
NAE has been experimenting with closure protocols based on the past rainfall and bacteria records at the beach.
d. CENAE POC - Townsend Barker, CENAE-EP-EW: 978-318-8621.

E) Norfolk District

a. Problem - Metalimnetic Oxygen minima occuring within the reservoir. This problem frequently appears when releasing cooler water from lower port elevations.
b. Product(s) Desired: A widely applicable, user-friendly computer-based optimization scheme that integrates the combination of chemical, biological and physical (thermal) properties which can be used to minimize the negative impacts on reservoir water quality and tailwater quality.
c. Assessment of the problem: These problems usually occur annually in the late summer and can adversely impact both reservoir and downstream fisheries. No costs were developed since this scheme would be widely applicable for any project with multi-level intake towers.
d. POC – Mark Hudgins, CENAO – TS – EW: 757-441-7107

9. Special Studies.

A) Philadelphia District.

a. Priority Pollutant Testing - In accordance with the CECW-W letter dated 3 June 1983, subject: Reservoir Contamination of Corps Reservoirs, and the NADEN-TH letter dated 16 July 1984, subject: Reservoir Contaminants, CENAP initiated in 1984 a priority pollutant testing program to augment the normal water quality monitoring activities. The 1984 field sampling effort included all priority pollutants listed in the U.S. Environmental Protection Agency's Quality Criteria for Water (Red Book) and its amendments. In 1985, CENAP divided the priority pollutants into 3 groups - Group 1: Volatile Organics, PCBs, and Pesticides; Group 2: Metals and Acid Extractables; and Group 3: Base Neutrals, so that each group would be sampled alternately each year. Group 1 was sampled and analyzed for in July 2000.

b. Benthic Macroinvertebrate Assessments - A monitoring program to assess the benthic macroinvertebrate communities of streams flowing into and out of the reservoirs would help in establishing and comparing the ecological integrity of those surface flows. This data can be used to provide an ecological measure of fluctuating environmental conditions because communities integrate stresses over time. Because these biological communities reflect the overall ecological integrity of a system, the biosurvey results would directly assess the waterbodies status relative to the Clean Water Act. In addition, this data can help identify pollutant sources entering the reservoir.

The Pennsylvania Fish and Boat Commission, in cooperation with the Philadelphia District, has established a benthic macroinvertebrate sampling regime to monitor water releases from the District's F.E. Walter Reservoir in 1998 and 1999. This work was performed to help evaluate the potential impact water releases have on benthic macro-invertebrate communities and other species. The final report identified no statistically significant impacts to benthic macro-invertebrate communities as a result of white water release

c. Watershed Assessments - In addition to collecting streamflow and rainfall data, watershed assessments for each of the reservoirs should be performed in order to pinpoint contamination sources. The investigations would include current and past land uses within the watersheds.

A multi-agency effort at the local, state and federal level was established in 1995 to develop an Environmental Assessment for the Tulpehocken Creek Watershed, in which Blue Marsh Reservoir is located. Efforts to address pollution concerns in the watershed are ongoing.

Currently, there are federal and state government and private interests in developing a water quality and flow model of the Lehigh River. The Philadelphia Districts F.E.Walter and Beltzville Reservoirs are within the Lehigh River basin. Monies have been secured to begin collecting water quality and flow data for the Lehigh River. A sampling plan is being developed at this time.

d. Comprehensive Watershed Management Plans - The Final Watershed Protection Plan and Environmental Assessment report for Tulpehocken Creek completed in November 1997 described a plan for treating non-point source pollution to improve water quality and restore aquatic habitat and for improving practices to sustain agricultural productivity and profitability. Funding has since become available to the Berks County Conservancy to begin water quality improvements within the watershed. Numerous streambank restoration projects and agricultural best management practices have been implemented to date. Blue Marsh Reservoir water quality is expected to benefit from environmental restoration efforts undertaken in the watershed.

e. Past and Current Water Control/Quality Management of Federal Water Quality Storage in Multi Purpose Projects of the Philadelphia District.

Purpose –
Inclusion of Federal Water Quality Storage at Corps reservoir projects reflects the consideration required by Section 2 (b)(1) of the Federal Water Pollution Control Act Amendments of 1961 (20 June 1961). The legislative history of the provision indicates that water quality inflows and releases assist in meeting the Federal interest of "widespread general and nonexclusive benefits from such increases in low flow".

Present Delaware River Basin Commission Operating Protocols –
The DRBC's reservoir operating protocol and requested water quality releases are based on the judgement that flows below 400 cubic feet per second, dissolved oxygen below 4 mg/l and temperatures above 86 degrees Fahrenheit on the Schuylkill and Lehigh Rivers are detrimental to stream water quality. DRBC also uses reservoir releases from Beltzville and/or Blue Marsh reservoirs toward control of salinity in the estuary. These water releases, whether indicated for dissolved oxygen enhancement in the Schuylkill or Lehigh also provide added fresh water toward salinity repulsion in the estuary. At present DRBC uses a chloride water quality standard at Delaware River Mile 98 in the estuary.

Water Control Management Information Requirement –
Management of this Corps storage to produce the benefits intended is a Corps responsibility. Monitoring and recorded data is required to support both the basis for releases from Federal water quality storage and downstream water quality conditions resulting from water quality releases.

Future Action -
The District is working with DRBC, Philadelphia Electric Company, and United States

Geological Survey to collect, report and analyze appropriate monitoring information for use in Corps' reservoir regulation. Recent modeling by the U.S. Geological Survey indicates that the estuary chloride levels that may occur during drought may not be as serious a threat to current ground water supplies as previously estimated. Given this finding there is interest in the potential for reducing flow targets to reduce the frequency of declared drought warnings and emergencies. DRBC release protocols are likely to require reconsideration and revision.

f. Trend Monitoring at all Reservoirs - The database consisting of all water quality data must continue to be updated annually for all four-reservoir sites. In addition, the simple trend analyses developed for all the District Reservoirs should continue to be incorporated into the project summaries.

B) Baltimore District

1) Continue to evaluations of operating procedures continue at Jennings Randolph and Savage River Dam Project in the North Branch Potomac River, and the Tioga-Hammond Lakes project in the Chemung River Basin..

2) Continue to monitor gas supersaturation problem at the Jennings Randolph Lake project.

3) Continue to monitor Dust Alleviation Program at Foster J. Sayers Lake Project.

C) Norfolk District.

The District again prepared in the Spring of 2001 to identify a greenish-yellow organism that had appeared on the reservoir in the springs of 1984 and 1985 after the ice cover melted. However, once again in 2001, the reservoir neither froze nor was the aforementioned organism observed. The District is again prepared to attempt to identify this organism if it appears in the Spring of 2002.

D) New York District

CENAN was not involved in any special studies in 2001.

E) New England District.

a. Priority Pollutant Scans. In FY01 NAE completed a report on a priority pollutant scan at Franklin Falls Dam in New Hampshire. Sediment samples from this project were analyzed for metals, PCBs, pesticides, volatile and semi-volatile organic compounds, dioxins and furans, TOC, and grain size. Overall, levels of EPA priority pollutants were low and generally indicative of natural background conditions. Some contaminants were found in

concentrations high enough to have possible effects on sensitive benthic organisms, but these effects would be minor, and no substances were in high enough concentrations to pose a risk to humans or interfere with uses of the project or its waters. "Franklin Falls Dam, Pollutant Scan," November 2000 summarizes findings to date.

b. Hop Brook Lake Fisheries Report. Fisheries data collected in FY00 at Hop Brook Lake in Connecticut under the Lake-Watch program was analyzed in the spring of FY01. Although the sampling was limited such that only a "snapshot" of conditions was obtained, it revealed that there is a warm water fishery worthy of management efforts such as monitoring pool levels during largemouth bass spawning season and improvement of cover within the impoundment.

Chemical and biological samplings over the past three decades have consistently shown Hop Brook Lake to be a highly eutrophic warm water fishery habitat. The State of Connecticut has historically stocked rainbow and brown trout salmonids in the lake. As eutrophic conditions in the lake become intolerable for salmonids, they have been observed leaving the impoundment and moving upstream. Naturally reproducing populations of brook trout have been sampled in two of the inflows.

Using gill nets, seining, and electro-shocking, fish in the lake were collected and examined on one day in August 2000. A variety of fish species were observed including white sucker, blue gill, pumpkinseed, and black crappie, but it was the largemouth bass that were of most interest. The numbers, age structure, and general condition of the fish collected indicated that a healthy largemouth bass population lives in the lake. The largest fish were found in areas with the best cover, which indicates that improvements in cover could further improve the fishery. Additional more extensive sampling was recommended for FY02.

c. West Hill Beach Water Quality Problems. In 2001 Massachusetts went from a fecal coliform to an *E. coli* standard for beaches. Using this new standard, the beach at West Hill Dam in Northbridge began repeatedly failing to meet acceptable levels. Whether this was due to a coincidental change in the watershed or the new *E. coli* standard detecting problems that were previously missed, is not clear. The frequency of problems prompted NAE to begin intensively sampling in the upstream watershed to try to find a source or sources that might be correctable. The collected data will be compiled and analyzed with recommendations for action to be presented to the local boards of health. If the situation is not resolved, the present beach at West Hill Dam may have to be closed permanently.

d. Town Brook Tunnel Water Quality. The Water Quality Certificate issued by the Massachusetts DEP for the Town Brook tunnel requires water quality sampling and monthly reporting of results. The 4,000 foot long, deep rock tunnel is a key part of the Town Brook Local Protection Project, and it has sophisticated water quality controls built into it. It is a relief tunnel and only receives major inflows during storm events. Between storms, seawater can enter the tunnel through the outlet twice a day during high tides. The resulting mix of urban storm runoff with saltwater in an enclosed tunnel with minimal

flushing (between storms) could easily lead to anaerobic conditions and the generation of hydrogen sulfide. To prevent this, the tunnel has a system of flushing pipes connected by pumps to cascade aerators at the tunnel entrance and exit. In addition, air compressors are connected to diffusers to supply additional dissolved oxygen (DO) in an emergency. AWQM's measuring DO, pH, temperature, and conductivity are connected to these pumps. Every day at a little past midnight, the pumps come on to send water to the AWQM. If the DO is above 6.0 ppm, the system shuts down; however, if it is less than that, the pumps continue to run water over the aeration cascades for an hour when another reading is taken. This reading must be at least 6.5 ppm; otherwise, pumping and aeration continue with hourly checks until 6.5 ppm is achieved. This system can be remotely accessed by computer, and data can be retrieved or the system turned on or off at any time. Each month the previous month's data are retrieved and sent to the DEP.

Data from the tunnel's AWQM showed generally good to excellent DO conditions during FY01. There were no days in FY01 when the recorded DO was less than the required minimum of 6.0 ppm.

NAE will continue sending AWQM data to the DEP until the tunnel is turned over to the MDC. However, even after the transfer occurs, NAE will use the computer connection to keep an eye on water quality conditions.

e. Town Brook Smelt Spawning. Due to concerns about the Town Brook local protection project's potential to affect flows in smelt-spawning areas of Town Brook, a smelt conservation team was formed in 1998. This team had members from the Corps, City of Quincy, MDC, Massachusetts Division of Marine Fisheries, and U.S. National Marine Fisheries Service. In FY01, NAE investigated a sedimentation problem that was reducing flows in the spawning area, and made recommendations to the City of Quincy for removing the material.

f. Merrimack River Study. In FY01 Water Management Section began working with Planning's Special Studies Section to develop a scope of work for a major study of the Merrimack River basin. With a drainage area of over 5,000 square miles, the Merrimack River is one of the most important river systems in New England. Over the past several decades significant improvements have been made to the overall quality of the Merrimack River due to Federal, state, local community, and private investment in water pollution control facilities. However, there are remaining water quality, water quantity, fish and wildlife habitat, and flooding concerns.

The cities of Lowell and Haverhill, Massachusetts and Nashua and Manchester, New Hampshire, and the Greater Lawrence Sanitary District, Massachusetts are each currently working to develop and implement long-term combined sewer overflow (CSO) control plans in compliance with the Federal Clean Water Act. Collectively, potential required CSO-related improvements might cost as much as one billion dollars over the next 20 years. It is unclear that beneficial uses will be achieved even with CSO expenditures of this magnitude. The communities are concerned that decisions regarding potential CSO

mitigation are being mandated by State and Federal regulatory agencies without a clear understanding of all pollution sources to the river, the existing conditions in the river, and the benefits of the required mitigation. The communities believe it is important that decisions be based on good data and a scientific and engineering understanding of the river and watershed. Once this information is developed it can be used to guide decisions regarding CSO mitigation implementation.

To conduct this needed river assessment, the communities have formed an inter- municipal partnership to carry out the study. The Federal government, through the US Army Corps of Engineers water resources assessment authority, is providing financial and technical assistance.

Corps involvement in this study is authorized by Section 729 of WRDA of 1986 entitled "Study of Water Resources Needs of River Basins and Regions" as amended by Section 202 of WRDA 2000. In addition, directed funding for this effort was provided in the fiscal year 2000 Energy and Water Development Appropriation Bill.

The purpose of this study is to develop a watershed management plan that will guide investments to achieve conditions that support feasible beneficial uses. This will be accomplished by conducting a water resources and ecosystem restoration investigation of the Merrimack River.

The study will be conducted in several phases. Phase I efforts will be aimed at identifying the current and potential future uses of the river, assessing the existing water quality conditions, identifying and quantifying pollutant loads to the river, developing model(s) to evaluate the effects of all existing pollutant loads including non-point sources, evaluating various CSO and non-CSO abatement strategies, and completing an initial inventory of potential ecosystem restoration projects in the watershed. Phase II efforts will be determined following the results of Phase I and undertaken based on availability of non-federal and federal funding. At this time it is anticipated that Phase II efforts may focus on in-stream flow issues, possible testing for non-standard water quality parameters, more detailed analysis of abatement alternatives, and providing for preliminary assessment of ecosystem restoration projects identified in Phase I.

The initial scope of work will be finished in early FY02, and a contractor will be selected to begin work in calendar year 2002.

g. Osgood Pond Aquatic Ecosystem Restoration Study. Like many freshwater ponds in southern New Hampshire, Milford's Osgood Pond has experienced accelerated eutrophi-cation and sedimentation in the last 20 years due to increased development in its watershed. Sedimentation and siltation have reduced the average depth of this 15-acre pond to 2 to 3 feet, with the result that it is heavily overgrown with aquatic weeds. These weeds greatly reduce the quality of the waterfowl and fish habitat in the pond, as well as severely reducing its recreational use.

Under Section 206 authority, the Corps is investigating ways to restore the ecology and health of Osgood Pond. The major feature of the proposed restoration project is removing accumulated sediment to a depth adequate to restore open water habitat. Construction would include draw-down of the pond and excavation of the bottom material to an average depth of about 6 to 8 feet with deeper depths in the middle.

In FY01 Water Management Section collected and analyzed water quality and sediment samples from the pond. The current schedule calls for completing studies and beginning restoration work in FY02.

h. Restoration of Run Pond. Under section 206 authority, NAE is conducting a feasibility study to restore the ecology and health of Run Pond, a 9-acre coastal salt pond and its surrounding 31-acre salt marsh in Yarmouth, Massachusetts. Over twenty years ago when the town constructed a boat ramp and parking lot, they replaced the existing channel with a long culvert. This culvert has significantly less capacity than the old channel and restricts tidal flushing of the pond. The combination of reduced flushing and elevated nutrient loadings from surrounding residential neighborhoods has led to the growth of nuisance aquatic vegetation including extensive algal blooms. WMS performed numerical modeling of tidal flow into and out of the salt marsh in FY00, examining various culvert alternatives to improve tidal flushing. During FY01 WMS collected water quality samples to help evaluate dissolved oxygen and fecal coliform levels, and algal nutrient loads. Controlling sediment oxygen demand (SOD) is also important to restore the health of the pond, and WMS will be evaluating the effects of increased flushing on SOD. The current schedule calls for completing studies and starting construction in FY02.

i. Blackstone River Environmental Restoration Study. NAE is conducting a multiyear feasibility study for environmental restoration of the Blackstone River in Massachusetts. This historic watershed has been degraded by more than a century of industrial development. Key components of this study include an assessment of the threat from contaminated sediments, an inventory of environmental restoration opportunities, a determination of the role of impoundments on water quality and sediment resuspension, and an inventory of dams and their conditions.

Activities by WMS during FY01 included water quality and sediment sampling. This work, which is being conducted by contract, is intended to identify existing conditions and provide information for further calibration of a QUAL2E water quality model developed by the University of Rhode Island. In addition, the data will be used to further document water quality problems that may be corrected by projects identified as part of this study. It is currently planned that after completion of the sampling, the existing QUAL2E model will be modified and calibrated to incorporate this new data, along with other water quality data collected for this study.

This feasibility study is scheduled for completion in FY2004 and will include a single plan for restoration of the watershed. Likely components of this plan will include wetlands restoration or creation, stabilization or removal of dams, riparian buffer creation, sediment removal or capping, and bank stabilization.

j. SuAsCo TMDL. Under authority in the Section 22, Planning Assistance to the States program, NAE is assisting Massachusetts in developing total maximum daily loads (TMDL's) for the Assabet, Sudbury, and Concord River system (SuAsCo) in Massachusetts. As a result of water quality problems associated with eutrophication and other problems, the SuAsCo River system was placed on the state's Section 303(d) list, meaning it is not meeting water quality standards. Such waters are required to develop a TMDL allocation as a first step in water quality remediation. A TMDL allocation is an analysis establishing the maximum loadings that a water body may receive and still meet its water quality standards and support its designated uses. As part of a TMDL analysis, the total loadings from the watershed must be established. Computer modeling is then used to evaluate the effects of reductions in point and nonpoint source loadings, which then leads to recommendations for actions to reduce pollutant loadings.

NAE is conducting this study through contracts, initially to ENSR, with WMS performing technical reviews. Initial work began on the Assabet River, which joins with the Sudbury to form the Concord River. The Assabet is a slow moving river with numerous impoundments. It receives high levels of nitrogen and phosphorus resulting in the production of nuisance aquatic vegetation including algal mats and floating and rooted macrophytes, and is the most eutrophic of the three rivers in the SuAsCo system. Water quality data were collected in the river during FY99 and FY00, to document conditions and prepare a base for water quality modeling. A draft report prepared during FY01, "SuAsCo Watershed, Assabet River TMDL Study," summarized all available collected data on the river.

In FY01 data collection began on the Concord River and is scheduled to be completed in FY02. Data collection on the Sudbury River will begin later. Preliminary water quality modeling on the Assabet River began in FY01 and will be continued in FY02; however, NAE is only involved in the initial data-collection phase of this SuAsCo TMDL study.

k. Superfund Site Studies. Water quality concerns are a major part of Superfund projects. Contaminated soil and groundwater are the most commonly encountered problems. Because of ground water mobility, water quality can be both the most important and complicated aspect of cleanups. In FY01 WMS was involved in studies at Norwood, and Baird and McGuire Superfund sites, and in groundwater sampling as part of long-term monitoring of the cleanup of former military sites in Massachusetts and Rhode Island.

l. Potable Water Monitoring. NAE monitors 52 wells at 25 projects on a regular basis; 24 of these wells are registered as public water supplies and all of these meet the definitions of transient, non-community systems. The minimum amount of monitoring required to show that systems are in compliance with State and Federal standards is referred to as the "compliance" monitoring. NAE has found through experience that a higher level of monitoring is desirable at our wells than the absolute minimum of the compliance samples, but the State agencies do not consider the additional samples to have the regulatory importance of the compliance samples. For example, a finding of coliform

bacteria in a compliance sample will result in a boil order until a sufficient number of samples have come back clean. However, if coliforms are found in a sample that was not required as part of the compliance monitoring, the State will usually allow the well to be reopened after getting one clean sample, if the well has been chlorinated and flushed.

Analytical results from the compliance samples collected at public wells are sent to the appropriate State agencies, but different states have different requirements for reporting monitoring results. Massachusetts and New Hampshire require results be reported to them within 24 hours. Connecticut requires reporting of results by the ninth day of the following month, and Vermont does not require a report of results until the end of the year.

Three projects had wells that tested positive for coliform bacteria during 2001: Ball Mountain Lake in Vermont, Hopkinton Lake in New Hampshire, and West Thompson Lake in Connecticut. All were temporary problems.

Ball Mountain Lake had two wells that tested positive for coliform bacteria. The sample from the well at BM-DW-2, which serves a restroom at the recreation area, had a positive sample on 21 February, but resampling on the 28th showed the water was clean again. Samples from well BM-DW-3, which serves the Winhall Brook campground's north fountain, tested positive for coliforms on 29 and 31 May, but after chlorination and flushing, it tested clean on 4 June and for the rest of the year.

Hopkinton Lake had one bad sample collected during the year, but it was a compliance sample. On 31 May, the sample from H-DW-2, the well that serves the recreation areas, tested positive for coliforms, and as a result New Hampshire issued a boil order for water from the well. New Hampshire rescinded the order on 7 June after a sufficient number of repeat samples had tested okay.

At West Thompson Lake, a broken water pipe was discovered in the middle of May, right before the campground was set to be opened for the season. Water from this pipe was back-flowing into the storage tank. There was not enough time to repair it and chlorinate the system for 24 hours, so a boil order was issued to the campers. Samples from this well, WT-DW-3, tested clean throughout, however, and the boil order was lifted when the system was repaired. The well that services the project office, WT-DW-4, tested positive for coliforms on 12 September, but after chlorinating and flushing, the system tested clean on 17 September.

m. Beach Monitoring. NAE monitors swimming areas at 13 projects plus a potential swimming area at West Thompson Lake. Samples from beaches at Ball Mountain, Buffumville, Edward MacDowell, and Otter Brook Lakes failed to meet swimming standards on one day each, but the next and all subsequent samples collected at these projects met standards. The beach at Townshend Lake failed to meet standards once for, a three-day period in June, but then was okay for the rest of the season.

The beach at Hop Brook Lake had multiple failures as it often does. Beach samples had

unacceptable levels of *Enterococci* on 31 May, and 4 and 6 June, but tested okay on 11 June. Samples collected on 7, 9, 13, and 15 August failed to meet standards, but a sample collected on 21 August finally passed.

The beach at Northfield Brook Lake also had multiple failures. A sample failed to meet beach standards on 4 June, but a sample collected the following day was okay. On 7, 9, and 13 August samples again had unacceptable levels of Enterococci, but a sample collected on 15 August showed the beach meeting standards again.
At Union Village Dam, the beach continued to have frequent problems meeting standards as in has in other recent years. Samples collected on 29 May, 9 July, and 7 and 22 August did not meet standards. Because of the history of persistence of problems at this project, repeat samples are not always collected right after a bad count is observed, as is normally done at other NAE projects.

Samples collected from the beach at West Hill Dam had such frequency of exceedences of criteria that a special study of the watershed was performed to try to find the sources (see paragraph 8.c.).

West Thompson Lake does not have a beach due to a history of heavy algal blooms and high bacteria counts. However, water quality has been improving in recent years and the site of a possible future beach was monitored approximately monthly during the recreation season to observe its progress and the feasibility of opening it to swimming. During the 2001 recreation season, only one of five samples exceeded beach standards, and that sample – collected on 12 June – was only 13 percent higher than the allowable standard.

n. Changes in Massachusetts Beach Standards. The Massachusetts State Sanitary Code was revised as of April 2001 to include more stringent monitoring requirements for bathing beaches, and to change the indicator bacteria. These changes affect the Corps beaches at West Hill and Buffumville Lake. Because NAE had already been performing beach-rainfall studies, we did not expect that these new regulations would result in more frequent beach closings.

Under 105 CMR 445.000, at least weekly sampling of beaches is required during the bathing season, and resampling is required prior to reopening a beach after it was closed for any reason. Additional sampling and beach closures may be required after significant rainstorms. NAE had been sampling beaches every two weeks with additional sampling at certain beaches after rainstorms, but began weekly at Massachusetts projects in May 2001; however, no changes were planned for sampling after rainstorms.

Massachusetts had been using fecal coliform bacteria as an indicator organism for bathing beach water quality, but the new regulations give a choice of monitoring fresh waters using *E. Coli* or *Enterococci*. NAE used *E. Coli*. because we could get plate counts in 24 hours, while it took 48 hours to get plate counts for *Enterococci*, and we have found that MPN results do not work well for monitoring beaches. EPA has recently approved a 24-

hour method for *Enterococci* plate counts, but we will continue to use *E. coli*. because we consider it the indicator organism of choice for monitoring freshwater beaches. In Massachusetts, single samples of *E. coli*. exceeding 235 per 100 ml, or a geometric mean of the most recent five samples exceeding 126 per 100 ml, shows that standards are exceeded and the beach must be closed until additional samples show that conditions have improved.

As required under these regulations, NAE reported beach results to the local health departments within the specified reporting times. Results from Buffumville Lake are reported to the Charlton Board of Health (BOH), while results from West Hill Dam are sent to the Uxbridge BOH. Uxbridge requires immediate verbal notification to BOH members when standards are exceeded, and verbal notification of all further counts until they return to acceptable levels.

We had some early difficulty in getting reliable results for *E. coli*. At the time the new regulations became effective, Massachusetts had not actually begun to certify labs for the analytical methods the new regulations required. The lab we needed to use was totally unfamiliar with the new methods and didn't even know where to get the necessary reagents. When they did get set-up and start performing *E. coli*. analyses, their initial results came back with no growths on the plates. After about 3 or 4 weeks of this, the lab began to refuse to perform additional *E. coli*. analyses, citing the expense of the reagents and quality control problems with results. Our senior field-sampling technician found them a less expensive source for reagents and connected them with an experienced Vermont lab for help with their procedures. Eventually they were able to give us satisfactory results, but while they were working through their problems, we had analyses performed by labs in other states.

Implementing these new regulations did not affect operations at Buffumville Lake, but the beach at West Hill Dam had significantly more days when it did not meet standards. This resulted in our initiating a study of bacteria levels in the watershed and the search for possible high sources.

o. <u>New Enterococci Test Approved</u>. In the spring of 2001, EPA approved a new 24-hour method for *Enterococci* counts using a membrane filter test. We used this new test (EPA method 1600) to improve our monitoring of beaches in Connecticut, which is the only state, in which we have swimming areas, that requires *Enterococci* testing.

Previously for sampling at Connecticut beaches we had the choice between a 24-hour most probable number (MPN) or a 48-hour membrane filter test. The problem with the MPN test was that it uses statistical analyses of the results of color changes in different dilutions of water sample to estimate the most probable number of bacteria present. This in itself might not be a problem except that the Connecticut standard is not more than 61 colonies per 100 ml, and MPN results typically come back as one of the following counts: <11, 36, 69, 160, or 230 colonies per 100 ml. This meant that counts below 61 would often get rounded up to 69 and the beach would be closed more often than necessary. The

old membrane filter test gave more precise numbers, but took two days, which again could mean that the beach could be closed longer than necessary.

The new test gives precise numbers in 24 hours, meaning there were fewer unnecessary beach closures. Additionally, the Project Manager had more confidence that a high count really warranted the hassle of closing the beach.

p. Algal Blooms. There are three NAE projects with histories of algal blooms – West Thompson, Hop Brook, and Northfield Brook Lakes, all of which are in Connecticut. Overall, algal blooms were less severe at NAE projects in FY01 than was typical in the past, mainly due to improvements at West Thompson Lake.

(1) West Thompson Lake. This project has long been plagued with severe algal blooms that generally begin in July turning the water green and forming dense slicks on the surface. Typically the blooms start with diatoms, then progress to green algae, and finally culminate in heavy growths of blue-green algae, often *Anacystis*. Upstream WWTP discharges, believed to be the source of the excess nutrients fueling these blooms, have been gradually upgrading their systems including nitrogen and phosphorus removal in recent years. As a consequence, water quality conditions have been gradually improving. During FY01 the project was bloom-free into the middle of August; however, by the third week the pool had dropped below the normal 15-foot stage, following a period of minimal rainfall, and a bloom appeared. By the fourth week of August the bloom was quite strong. Still, overall this was an encouraging improvement over conditions in previous years.

(2) Hop Brook Lake. This project has had varying degrees of problems with algal blooms over the years. The lake usually has a strong algae population that may border on bloom conditions but tends to be dispersed and not cause problems. However some years slicks form, and in the worst years the bloom can be so intensely heavy as to give the appearance that the lake was drained and refilled with green paint. In recent years blooms have generally not been much of a problem. In August of 2001 a bloom began to appear in a few spots on the lake. This condition lasted a couple of days, then a heavy rain occurred that flushed the lake, and no further signs of a bloom were noticed.

(3) Northfield Brook Lake. This project does not have a history of severe blooms, but has had occasional nuisance blooms. In August of 2001, algae formed a discrete bright green scum on the water for a several foot wide swath along the beach. A microscopic examination of this bloom was performed before heavy rains at the end of the month washed this bloom away and did not reappear during FY01.

Microscopic examination of a water sample collected from the edge of the beach on August 21, revealed brilliant green, spherical structures that were actually tightly wound chains of thousands of cells of blue-green alga cells of the genus *Anabaena*. This species is present where there are elevated levels of phosphate and nitrate, is an odor producer, and is an indication of poor quality water. This genus tends to dissipate or disappear beneath the surface under reduced light or nocturnal conditions and aggregate on the surface once

lighting increases. Increased lighting stimulates photosynthesis, and the oxygen fills the gas vacuoles and the cells rise to the surface forming the scum. This scum can be a bright green, almost chartreuse, resembling a spill of green paint on the water.

In addition to the negative aesthetic conditions of wading or swimming in this green slick, *Anabaena* is one of three genera of blue-green algae that are proven toxin formers. It can produce a compound under bloom conditions that is lethal to fish, birds and livestock, and can cause rashes, headaches, and stomach cramps among swimmers. Studies during the previous summer of 2000 indicated occasional phytoplankton bloom conditions, but the identified algae were not toxin producers and created only aesthetic problems. Blue-green algal blooms of *Anabaena* and other toxin producers have been observed at Hop Brook Lake, but their identification at Northfield Brook Lake is something new.

q. Fish Advisories. All NAE projects are included in some type of advisory on consumption of fish caught there, but none of these advisories are due to Corps activities, rather they are due to factors such as contaminated sediments or atmospheric deposition. Mercury is a particular problem, and there are statewide advisories for freshwater fish in all New England states except Rhode Island. This is part of a national problem, because the mercury originates in incinerators and coal-burning power plants and comes down with atmospheric deposition. In wetlands, the deposited inorganic mercury is microbiologically converted under anaerobic conditions to organic mercury, which is mobile in water and bioaccumulates in fish.

(1) Connecticut. Due to mercury contamination, there is a statewide advisory recommending that the general public limit consumption of all species except trout to no more than two meals per month. In addition, the advisory recommends that pregnant women, women planning to become pregnant within one year, and children under the age of 6 limit consumption of trout more than 15 inches in length to no more than two meals per month. There are no specific advisories for fish from the waters of any NAE projects in this state.

(2) Massachusetts. In Massachusetts, mercury contamination has prompted a statewide advisory recommending that pregnant women not consume freshwater fish caught in any river or lake. In addition there are the specific advisories affecting the following NAE projects.

Charles River Natural Valley Storage Project. The sections between the South Natick Dam and the Charles River Basin have an advisory for PCB contamination in carp. This recommendation is that the general population limit consumption of carp to two meals per month, and that children under 12 and pregnant and nursing mothers not eat any.

Birch Hill Dam. Due to PCB contamination there is an advisory that children under 12 and pregnant and nursing mothers not eat any fish and that all persons refrain from eating white sucker or brown bullhead taken from the Otter River within ½ mile of its confluence with the Millers. For the Millers River, there are advisories from Erving to Winchendon,

which includes the length of the river within the Birch Hill Dam project area. Based on mercury and PCB contamination, children under 12 and pregnant and nursing mothers should refrain from eating all species, and the general public should refrain from eating brook trout and American eel, and limit consumption of all other species to no more than two meals per month. For largemouth bass caught in Lake Dennison, there is an advisory based on mercury contamination that children under 12 and pregnant and nursing mothers not eat any and the general population limit consumption to two meals per month.

and Buffumville Lakes, but these caused no more than minor problems. Recreation areas at Otter Brook and Surry Mountain Lakes had major problems with geese in the past, but extensive efforts by Park Rangers to discourage geese from congregating there have been successful.

s. 303(d) Listings. Section 303(d) of the Clean Water Act requires States to list all waters that are not expected to achieve their designated use goals even after all appropriate and required water pollution control technologies have been applied. Waters that are presently not meeting fishable/swimmable goals, for example, because of point-source discharges that are not complying with their effluent limits, are not included on the 303(d) list. Those waters are expected to achieve water quality goals when the State takes compliance actions against the dischargers. However, waterbodies that do not or are not expected to meet water quality standards after all point-source discharges are achieving appropriate treatment must be included on the 303(d) list of impaired waters. The 303(d) list includes the reason for impairment, which may be one or more point sources such as industrial or sewage discharges, or nonpoint sources such as urban or agricultural runoff.

States are required to submit their 303(d) list in April of even-numbered years. The most recent data available was for 1998. The following is a summary of NAE projects situated on waters that are included in 303(d) lists for 1998. It should be noted that in some cases the amount of sampling involved was as little as one sample taken during a period that represent neither worst-case nor typical conditions. Consequently, a 303(d) listing should not be considered definitive proof that a problem exists nor should the absence of a parameter mean it is not a problem. Additionally, in some cases the listing of a parameter may be based on sampling by NAE, so the Corps should try not get caught in a feedback loop of assuming a problem exists because the state listed it, when the state listing may have been based on an NAE report.

(1) Connecticut. Parts of three NAE projects are on Connecticut's list: Hop Brook, Northfield Brook, and West Thompson Lakes. Eutrophication is part of the problem at each, and priority for TMDL development to deal with these problems is low.

West Thompson Lake is on the list for eutrophication and aesthetics, which are both related to chronic algal blooms. Sources are given as POTW's and agricultural nonpoint sources. Northfield Brook Lake is on the list for eutrophication and contact recreation because of excess nutrients and bacteria contributed by nonpoint sources. Hop Brook Lake is on the list for eutrophication and contact recreation because of excess nutrients and

bacteria contributed by stormwater, failed septic systems, and agriculture.

(2) Massachusetts. Parts of six NAE projects are on Massachusetts' list: Birch Hill Dam, Buffumville Lake, the Charles River Natural Valley Storage project, East Brimfield Lake, Tully Lake, and West Hill Dam. No indication is given as to when TMDL's might be developed to deal with these problems.

Birch Hill Dam has 4 bodies of water that are on the 303(d) list: the Millers River, Otter River, Priest Brook and Lake Dennison. The main concern is "priority organics," i.e. PCB contamination in the sediments from past unidentified upstream sources. The Millers and Otter Rivers are also listed for metals, pathogens, and nutrients; and the Otter River is further listed for habitat alterations, organic enrichment/low dissolved oxygen, and salinity/TDS/chlorides. Priest Brook is listed for metals as well as priority organics. Lake Dennison is not listed for priority organics but only for organic enrichment/low dissolved oxygen. NAE is continuing to study PCB contamination at this project.

Buffumville Lake, and East Brimfield Lake including Holland Pond are listed for noxious aquatic plants. These lakes were not included in the Massachusetts Clean Lakes Programs Projects, and priority for TMDL development is low. Portions of the Charles River Natural Valley Storage project are on the 303(d) list for a variety of pollutants including pathogens, nutrients, and metals. The East Branch of the Tully River including its length through the Tully Lake project area is on the list for metals and priority organics. Possible sources are not given.

The last 8.8 miles of the West River, including the segment that flows through West Hill Dam, are listed for salinity/TDS/chlorides, organic enrichment/low dissolved oxygen, pH, nutrients, and metals. However, this appears to be based on limited sampling that did not show large exceedences of criteria.

(3) New Hampshire. The Contoocook River, for about a one-mile stretch within upstream limits of the Hopkinton Lake project area, is the only body of water within the limits of an NAE project that is on New Hampshire's 303(d) list. It is listed for zinc, and although the source is unknown, the priority for TMDL development to deal with this problem is given as high.

(4) Vermont. Parts of three NAE projects are on Vermont's list: Ball Mountain and Townshend Lakes, and Union Village Dam. Priorities for developing TMDL's to deal with these problems are low, but acid-mine drainage at Union Village Dam is being examined through the Superfund program.

The West River between Ball Mountain and Townshend Lakes is listed for sediment. The priority for TMDL development to deal with this problem is low, and no potential sources of impairment are listed; however, problems with a gate at Ball Mountain Lake dam have allowed large amounts of sediment to be flushed into the river in the past. As part of a program to restore Atlantic salmon runs to the West River, the pool at Ball Mountain is

kept at the 25-foot stage in the spring to facilitate downstream migration. Because the watershed is flashy and the reservoir valley is steep at this low pool level, it is very difficult to maintain the 25-foot pool. However, if something goes wrong and the pool drops much below 25 feet, large amounts of the accumulated sediment behind the dam can be mobilized and washed downstream. NAE has installed an automatic gate control mechanism and is continuing to look at means to improve system reliability.

At Union Village Dam, the Ompompanoosuc River from Sawnee Bean Brook to the Corps beach area is on the list for pathogens. It is likely that Corps monitoring of the beach and attempts to involve the local and state authorities in the search for the sources of these pathogens, is what alerted Vermont to the problem and got this section of river on the 303(d) list. The priority for TMDL development to deal with this problem is low.

The West Branch of the Ompompanoosuc River, including its full length through the Union Village Dam project area, is on the list for metals and pH, due to runoff from the abandoned Elizabeth mine. Cleanup of the Elizabeth mine is now being studied under the Superfund program.

10. Water Quality Classification.

The water quality conditions in each project have been classified in accordance with the following criteria:

(1) Class I : (a) High Water Quality, &
(b) No Known Problems

(2) Class II: Generally Good Water Quality

(3) Class III : (a) Fair Water Quality &
(b) Requires Close Monitoring of Trends and Careful Examination of Problems

Following is a list of projects evaluated according to the above classifications.

	RESERVOIRS/LAKES		
CLASSIFICATION /DISTRICT	**I**	**II**	**III**
NAB	Savage Lake, MD.	Almond Lake, NY. Alvin R. Bush Lake, PA East Sidney Lake, NY Cowanesque Lake, PA Raystown Lake, PA F.J.Sayers Lake, PA Stillwater Lake, PA Whitney Point Lake, NY.	Aylesworth Creek Lake, PA Jenning Randolph Lake, WV Tioga-Hammond Lakes, PA Curwensville Lake, PA
NAE	Ball Mountain Lake, VT Blackwater Reservoir, NH North Springfield Lake, VT Franklin Falls Reservoir, NH Townshend Lake, VT Barre Falls Reservoir. MA Otter Brook Lake, NH Conant Brook Reservoir, MA Surry Mountain Lake, NH Hodges Village Reservoir, MA Knightville Reservoir, MA Edward MacDowell Lake, NH Black Rock Lake, CT Colebrook River Lake, CT Westville Lake, CT Hancock Brook Lake, CT Everett Lake, NH Mansfield Hollow Lake,CT Littleville Lake, MA	North Hartland Lake, VT Thomaston Reservoir, CT Hopkinton Lake, NH Buffumville Lake, MA Tully Lake, MA East Brimfield Lake, MA	Birch Hill Reservoir, MA Hop Brook Lake, CT Northfield Brook, CT Union Village Reservoir, VT West Thompson Lake, CT West Hill Reservoir, MA
NAO	NONE	Gathright Dam & Lake Moomaw	NONE
NAN	NONE	NONE	NONE
NAP	NONE	Prompton Lake F.E.Walter Reservoir	Beltzville Reservoir Blue Marsh Reservoir