



Brian Pitt/R1/USEPA/US
06/06/2008 10:14 AM

To Samir Bukhari/R1/USEPA/US@EPA, David
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cc

bcc

Subject Fw: Fixed-Site Network

History:

This message has been replied to.

Information from RI DEM regarding the monitoring network established for Narragansett Bay.

----- Forwarded by Brian Pitt/R1/USEPA/US on 06/06/2008 10:13 AM -----



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V>

To Brian Pitt/R1/USEPA/US@EPA

cc

06/06/2008 09:50 AM

Subject FW: Fixed-Site Network

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-----Original Message-----

From: Sue Kiernan
Sent: Thursday, June 05, 2008 5:33 PM
To: Angelo Liberty
Subject: Fixed-Site Network

Regarding the status of the Narragansett Bay Fixed-Site Monitoring Network, I can provide the following background and information. The network is an interagency collaboration, coordinated by DEM, that involves the operation of 13-14 stations in Narragansett Bay by five entities: the DEM Office of Water Resources in collaboration with the URI-Graduate School of Oceanography, the Narragansett Bay National Estuarine Research Reserve (NBNERR), the Narragansett Bay Commission (NBC), and Roger

Williams University (RWU). Other partners are involved in data distribution. With support from the NOAA Bay Window Program as well as EPA, the network grew from three stations operated in the 1990's by researchers to nine by 2004. DEM added three stations in 2005 and another for the 2008 season. Within the network, NBC operates the two stations in the Providence and Seekonk Rivers; DEM-OWR with URI-GSO operate 8; URI-GSO maintains a site at its campus; NBNERR maintains two stations on Prudence Island and RWU operates one at its campus. The partners use common instrumentation (YSI). More description of the network and the available data are on the DEM website at: <http://www.dem.ri.gov/bart/stations.htm>

The State of Rhode Island, through DEM and its partners, has made a commitment to maintaining this network for the purposes of providing ambient water quality data deemed necessary to support management decision-making and improve our understanding of the Bay ecosystem. Certain stations have been located specifically to capture data in the region of the Bay where water quality improvements are expected to occur as a result of WWTF nutrient pollutant loading reductions. I expect the state to maintain data collection at these stations for the foreseeable future.

The fixed-site network is a recognized **key** component of the RI Water Monitoring Strategy (2005) which was developed by DEM in conjunction with the RI Environmental Monitoring Collaborative and the RI Bays, Rivers and Watersheds Coordination Team. These groups are charged by state statute to develop and implement a comprehensive environmental monitoring program. For more information: <http://www.dem.ri.gov/bayteam/documents/DEM%20Water%20Monitoring%20Strategy%202005-2010.pdf> and <http://www.dem.ri.gov/bayteam/index.htm> and <http://www.ci.uri.edu/RI BayTeam/default.html> and <http://www.ci.uri.edu/Projects/RI-Monitoring/default.html>

(The Coordination Team website was originally supported by URI but is in the process of being migrated to the DEM website. For information on the team, contact Ames Colt.)

Specifically, the Coordination Team voted in 2005 on statewide monitoring priorities and the fixed-site network was *ranked highest* .

[http://www.ci.uri.edu/RI BayTeam/Meetings/CTMeeting%20Summary2\(112305\).pdf](http://www.ci.uri.edu/RI BayTeam/Meetings/CTMeeting%20Summary2(112305).pdf)

In the state monitoring strategy, the network is acknowledged as essential to DEM with respect to assessing water quality conditions and applying the dissolved oxygen criteria as revised in 2006. DEM used the datasets generated from network in its 2008 assessment and reporting and as a result designated an additional 7.62 acres as impaired for hypoxia in the mid-bay region. See attached figure.

<<Potential 2008 Change to 303d.jpg>>

This monitoring program was identified initially as one of the top monitoring priorities during Coordination Team deliberations and has continued to be rated a priority in annual reviews of monitoring activities in the state.

See: <http://www.ci.uri.edu/Projects/RI-Monitoring/Docs/2008RIEMCReport.pdf>

On an annual basis, DEM secures a combination of federal and state funds to maintain its portion of the network. DEM continues to receive funding from the NOAA Bay Window Program, a unique partnership among NOAA-NMFS and DEM now in its 10th year, to conduct critical monitoring of Narragansett Bay to advance fisheries management and understanding of the bay ecology. DEM has also received state support via an allocation of funding from the Coordination Team to maintain the current level of effort. DEM has applied for and expects to be awarded federal funds to sustain the network through the 2009 season. See attached workplan.

<<BayWindow2008scoperev.doc>>

Looking ahead I would note that in June 2007, state law was changed to create to allow the Coordination Team to utilize funds to support its statutory purposes including improving monitoring. New fees were authorized which are expected to generate over \$400,000 annually with the first revenues remitted to the state later this year. This provides a potential source of on-going funds to support monitoring if needed, subject to Team approval.

NBC, NBNERR and URI all have maintained their stations continuously for seven years or longer and I expect that to continue as well.

If you have any additional questions, please let me know.

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Potential 2008 Change to 303d.jpg BayWindow2008scoperev.doc

Fixed-station Monitoring in Narragansett Bay – Bay Window Project

Principal Investigators:

Susan Kiernan, Rhode Island Department of Environmental Management (DEM-OWR)

In cooperation with:

University of Rhode Island –Graduate School of Oceanography (URI-GSO)

Narragansett Bay Commission (NBC)

Narragansett Bay National Estuarine Research Reserve (NBNERR)

Narragansett Bay Estuary Program (NBEP)

Roger Williams University (RWU)

(See attached list of specific collaborators)

Project Narrative - Fixed-station Monitoring in Narragansett Bay

A network of fixed-stations, capable of continuous measurements of water quality, has been established in Narragansett Bay via the collaboration of the following partners: the Rhode Island Department of Environmental Management, the University of Rhode Island –Graduate School of Oceanography (URI-GSO), the Narragansett Bay Commission (NBC- a regional wastewater system operator), the Narragansett Bay National Estuarine Research Reserve (NBNERR), and the Narragansett Bay Estuary Program. (See attached list of specific contacts.) Previously, Bay Window funding was instrumental in establishing the network as research initiative at URI-GSO beginning in 1999. Since that time, Bay Window funds, in combination with other funding sources, have been used to maintain and expand the network. Three stations were added in 2003-2004 and then again in 2005 under the oversight of Rhode Island Department of Environmental in collaboration with URI-GSO. The fixed-site monitoring network is a critical component of Rhode Island's overall monitoring strategy for estuarine waters.

The Rhode Island Department of Environmental Management (RIDEM) has assumed responsibility for coordination of the fixed-site network partners. Since 2004, the participating agencies have made a strong commitment to collaborate in a manner that ensures the comparability of data across stations and enhances the value of the resulting baseline data set over time. While separate entities own and maintain instrumentation at particular stations, they do so in accordance with established operational protocols reviewed and agreed upon by the partners as a group. Temperature, salinity, dissolved oxygen, pH and chlorophyll a are measured at each station. Joint training to promote consistency in field protocols took place in April 2004 and continues as needed. Written field protocols were adopted and a written quality assurance plan was finalized. Additionally, protocols have been developed to address data handling, review and editing. This has facilitated data-sharing and dissemination.

The goal of fixed-station monitoring component of the Bay Window Project is to provide critical data on water quality conditions in Narragansett Bay in an on-going manner to support improved management and protection of the Bay and its biological resources. For 2008-2009, the Bay Window project objectives include: (1) maintain regular data

collection from eight fixed-station monitoring locations in Narragansett Bay during the 2008 sampling season; (2) expand the fixed-station network by one sites in 2009; and (3) process and make available the data for the entire network on an annual basis; and (4) conduct data synthesis to enhance the use of data in estuarine protection and management programs.

Background & State of Knowledge Concerning Hypoxia

The Narragansett Bay estuary, covering 416 square miles, is a vital natural resource for Rhode Island. It is considered generally well-mixed, but seasonal stratification occurs in the upper Bay and many embayments. (URI, 2005) Data collected by expanded monitoring in recent years is continuing to improve our understanding of hypoxia in Narragansett Bay and the many factors that contribute to its formation. In the warmer summer months, freshwater inflows typically create stratification that traps the deeper, more saline waters from its sources of oxygen at the surface. Stratification is influenced by tidal mixing, surface temperature, winds and freshwater flow. In stratified waters, the availability of plentiful nutrients in the upper Bay, primarily from WWTF discharges, fuels phytoplankton blooms. The resulting decay of the organic matter produced by phytoplankton blooms depletes dissolved oxygen creating hypoxia typically in the bottom waters. During years with high precipitation and river runoff, stratification and the resulting hypoxia intensifies, particularly in the Providence River. (Bergando, in press) The interaction of the diverse processes that influence hypoxia can be analyzed to explain particular events for the different geographic areas of the Bay. Less well understood is the precise response of the bay ecosystem as a whole to nutrient reductions underway. (URI, 2005) A comprehensive monitoring program, to which the Bay Window Program contributes substantially, needs to be continued to provide data to both evaluate progress in restoring conditions in Narragansett Bay and enhance our scientific understanding of its ecosystem functioning.

Prior monitoring efforts have documented that a large area of the upper Bay as well as the estuarine Providence River experience hypoxia. (Deacutis, C. F. et al, 2006, RIDEM, 1997) In 2003, fixed-station monitoring revealed that hypoxic waters were found all the way down Bay to Dutch Island in the lower West Passage (B. Sullivan personal communication with C. Oviatt). That same year, a massive fish kill in Greenwich Bay dramatically focused public attention on the problem of low dissolved oxygen. (RIDEM, 2003) Following this event, additional monitoring was targeted to better characterize this pollution problem and improve understanding of its impact on the Narragansett Bay. A Rhode Island Sea Grant symposium on the state of science regarding nutrients in Narragansett Bay produced the finding that recent efforts to map the distribution of dissolved oxygen during worst-case conditions revealed a more extensive pattern of distribution than previously known. (URI, 2005) In the recent NOAA assessment of nutrient enrichment in estuaries, review of targeted indicators characterized conditions in Narragansett Bay as having a high eutrophic expression. (NOAA, 2007)

Applying the Data to State Management Concerns

State managers are concerned with improving water quality, particularly in the upper Bay region, and restoring healthy aquatic habitat throughout the Bay in order to sustain its ecosystem. The fixed-station network has provided a time-series data set important to state managers and researchers striving to improve the understanding of water quality conditions, the factors that influence those conditions and their ecological impacts. The data is being used not just by state managers but also by researchers including the team involved in the NOAA Coastal Hypoxia Research Program (CHRP) project for Narragansett Bay. This project includes development of an ecological modeling capability applied to Narragansett Bay. Sufficient time-series information is now available to support improved assessments of water quality conditions. In November 2007, researchers summarized an analysis of data in poster presentation at the Estuarine Research Foundation conference in Providence, RI. The poster provided insights into the variable nature of the frequency and duration of hypoxia in different areas of the Bay. Sustaining and expanding this monitoring program is needed to both further define existing water quality conditions as well as track changes over time.

The data generated from the network is of immediate relevance to state management decision-making. The Department of Environmental Management and other parties have undertaken a number of actions aimed at reducing nutrient pollutant loadings to the Upper Bay. Wastewater treatment facilities are in the process of designing, constructing or operating facility improvements to implement a Rhode Island nutrient reduction strategy to begin to abate low oxygen conditions. By 2006, RIDEM documented that improvements at 8 WWTFs resulted in a 35% reduction in nitrogen loadings from the 11 RI facilities that contribute to the upper Bay based on current WWTF flows. (RIDEM, 2008) Additionally, EPA is in the process of issuing new permits to address nutrient reductions from WWTFs in the Massachusetts portion of the watershed contributing to the Providence and Seekonk Rivers and upper Bay. There is a clear need to continue an effective continuous ambient monitoring program to measure the effectiveness of the changes in wastewater treatment on the ambient conditions in both the upper Bay as well as the greater estuary ecosystem. Ambient water quality data, along with biological and other data, are needed by the state to evaluate and better understand the biological response of the bay ecosystem to the expected changes in nutrient pollutant loadings and potentially other stressors or conditions; e.g. temperature change over time. This need is acknowledged in the reports from the Governor's Commission on Narragansett Bay and its Watershed, in particular with the recommendations regarding monitoring. (GNBWPC, 2004)

Given the changes proposed by the Environmental Protection Agency (EPA) with respect to the applicable water quality criteria for dissolved oxygen, the need for collecting data on a continuous basis is even more apparent. In 2006, the state water quality criteria was changed from a constant value of 5 –6 mg/l depending on water quality classification to a criteria that reflects both concentration and duration of exposure. The allowable exposure, measured in hours, is tied via modeling, to several biological impacts including recruitment losses of several species of fish and shellfish. RI DEM has begun applying

the new criteria and is using the continuous datasets from the fixed-station network in Narragansett Bay as the primary data source for assessing compliance with the criteria over an entire recruitment season. As a result, in 2008, an additional 7.62 square miles of Narragansett Bay were designated by RIDEM as impaired due to hypoxia.

Through electronic file sharing mechanisms, the DEM-Office of Water Resources will continue arrangements established in 2004 to provide direct access to downloaded data from critical stations in the upper Bay and Greenwich Bay in order to systematically track water quality conditions over the summer seasons of the project period. This is being done to support response preparedness in light of the significant fish kill in 2003. Additionally, summaries of data will be posted on the web via RIDEM Bay Assessment and Response Team description with links to URI Coastal Institute's website (www.narrabay.org). This will be coordinated with the other public outreach activities described in the Bay Window Project submitted by University of Rhode Island.

Long-term Expansion Plans for the Fixed-Site Network

As part of the Bay Window Program, a long-term plan for expansion of the fixed-station network partners was developed with input from researchers and representatives of major state water resource programs including water quality assessment, water quality restoration also known as Total Maximum Daily Loads (TMDLs), wastewater discharge permitting and marine fisheries. This expert group reached a general consensus regarding prioritizing the expansion of fixed-stations to enhance geographic coverage of the Bay. The design of network was developed after consideration of hydrodynamics, geomorphology, known pollution sources, siting constraints and other factors. Consistent with this plan, RIDEM has been phasing in the expansion of the network with the long-term goal being to eventually provide bay-wide coverage and a more complete characterization of Bay water quality. On an annual basis, the network partners and other experts re-evaluate the plan to confirm that planned new locations for fixed-stations have been selected in a manner that is most responsive to resource management and research needs. The RI Department of Environmental Management expects that new information from on-going hydrodynamic modeling efforts as well as various data synthesis and integration initiatives may influence the placement of stations over time. These include data synthesis initiated within the Bay Window Program, DEM/URI-GSO data analyses to apply the new dissolved oxygen criteria in Narragansett Bay, and the development of models in the Bay funded separately by NOAA (CHRP) and others. To date, the additions to the network have focused on the upper and mid bay where hypoxia is a known problem. Adding a second site in Greenwich Bay is planned for 2008. Other new sites currently under consideration include: the estuarine Sakonnet River to reduce a data gap, and one or more stations in the lower bay to reduce data gaps and provide data of interest to researchers developing models for the Bay. Existing and future locations are identified in the attached map and chart.

As appropriate, the operation of this network will be coordinated with larger monitoring efforts that are under development. Specifically, the continuation of this program is expected to support coastal monitoring objectives related to national water quality

monitoring strategies produced by NOAA, EPA and USGS. Additionally, the data is available to integrate with other monitoring activities planned under the International Ocean Observing System (IOOS) and its regional organizations.

Literature/References Cited

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- RI Department of Environmental Management (RIDEM). 2008. 2008 Integrated Water Quality Monitoring and Assessment Report. RIDEM, Providence. 65 p.

FY2008 Statement of Work

During 2008, this project work will involve the deployment, operation, maintenance and retrieval as needed of eight existing fixed-station monitoring stations in Narragansett Bay, including one new station to be established in mid-Greenwich Bay. Refer to map and chart of stations. This work will be coordinated by RIDEM with technical support from the University of Rhode Island Graduate School of Oceanography (URI-GSO). With all partners considered, this will bring the total of stations operated collectively to 14 in 2008. All stations will use YSI instrumentation to monitor surface and bottom temperature, salinity, pH, dissolved oxygen and chlorophyll (surface layer only) on a continuous basis. The instrumentation and parameters selected are consistent with the existing network and are needed to interpret and assess baseline water quality conditions over time. A quality assurance plan has been developed to govern field protocols and data handling. RIDEM expects expenditure of FY2008 funds to begin in the later half of the 2008 sampling season and continue for a minimum of 12 months.

In advance of the 2009 sampling season (May to October), Bay Window funding will be used to acquire additional equipment to sustain the existing network (replace or upgrade components) and establish one new fixed-station. The new location will be sited consistent with the long-term network plan that is reviewed and updated annually. However, as described earlier, new data synthesis and research results will be taken into account in finalizing specific locations.

While multiple agencies are engaged in field collection of data, RIDEM will continue to retain, via URI-GSO, a manager of the network to ensure its effective overall operation. The network operations also require an additional technical staff person and seasonal part-time support. DEM also contributes labor and operational support to maintain stations established previously via with Bay Window funding.

The network manager will also be responsible for facilitating coordination among the collaborating agencies. Deployment of stations is arranged in cooperation with the DEM Division of Fish & Wildlife- Marine Fisheries Section using the *R.V. John H. Chafee*. Station maintenance will occur every one- three weeks depending on the instrumentation (e.g. extended deployment sondes) and the conditions (e.g. biofouling) using boats provided by RIDEM (including NBNERR) or URI-GSO. The sampling season for all stations will be at minimum from late spring through fall. Stations vulnerable to ice damage are removed from service in the winter. Telemetry capabilities will be established or upgraded to facilitate monitoring from all critical stations.

The network manager will ensure initial synthesis of data for use in water resource programs and for public dissemination. Data from the network of fixed stations will be managed cooperatively with other partners and made available to contribute to on-going analyses of low oxygen events. DEM will ensure that data from the network is processed and compiled into a single dataset for the year that is made available for use by

resource managers and researchers via the RIDEM website. As mentioned above, the project will also provide initial data summaries for posting on the web, via the Narragansett Bay data portal, as part of the effort to communicate with the broader public on Bay water quality conditions.

Major project outputs will be: (1) preliminary data summaries posted on the web, and (2) compilation of edited data for the network.

Milestone Chart		
Task Number	Task Description	Schedule (Months)
1.	Operation of Fixed-Stations <ul style="list-style-type: none"> • Regular maintenance of stations • Respond to problems; e.g. biofouling, etc. • Data management with preliminary review of data weekly from critical stations; • Data summaries posted to web 	September – October 2008
2.	Retrieval of Stations <ul style="list-style-type: none"> • Removal of buoy stations for the winter • Secure/store equipment for off-season 	November 2008
3.	Data review and editing <ul style="list-style-type: none"> • Compilation and editing of data; • Coordinated review by partners of any issues with data. • Finalize data summary for 2006 and make available to the public 	November 2008-April 2009
4.	Planning for 2009 sampling season: <ul style="list-style-type: none"> • Finalization of new site selection; • Data management (2008 data set); • Purchase of new equipment; 	January 2009-March 2009
5.	Field preparations & deployment: <ul style="list-style-type: none"> • Equipment preparation, calibration etc. • Hiring seasonal staff; • Joint training of staff; • Deployment of 7 existing & one new station. 	April – May 2009
6.	Operation of Fixed-Stations <ul style="list-style-type: none"> • Regular maintenance of stations • Respond to problems; e.g. biofouling, etc. • Data management with preliminary review of data weekly from critical stations; Data summaries posted to web	May 2009 – Oct/Nov 2009*

(*) A few land-based locations may operate year-round subject to weather conditions.

Relative to the National Environmental Policy Act (NEPA), the water quality sampling proposed in this project is occurring throughout the Narragansett Bay estuary on a seasonal or year-round basis. The sampling methods will not pose any environmental risk to the species inhabiting Narragansett Bay. See NEPA Questionnaire for additional detail.