Marine Environmental Update

NEPSSC

VOLUME FY98, NUMBER 3

SUMMER 1998

EPA Finalizes Guidelines For Ecological Risk Assessments

The Environmental Protection Agency's National Center for Environmental Assessment has developed guidelines to improve the quality of environmental risk assessment at the EPA while increasing the consistency of assessments among the Agency's program offices and regions. They were developed as part of an interoffice program by a Technical Panel of the Risk Assessment Forum. The guidelines draw from a wide range of source documents including peer-reviewed issue papers and case studies previously developed by EPA's Risk Assessment Forum. These guidelines replace and build on the 1992 *Framework for Ecological Risk Assessment* (EPA/630/R-92/001), and call for more detailed guidance in specific areas.

The process includes three phases: problem formulation, analysis, and risk characterization. A major theme of the guidelines is the interaction among risk assessors, risk managers, and interested parties at the beginning (planning and problem formulation) and end (risk characterization) of the risk assessment process. In problem formulation, the guidelines emphasize the complementary roles of risk assessors, risk managers, and interested parties in determining the scope and boundaries of the assessment, selecting ecological entities that will be the focus of the assessment, and ensuring that the product of the assessment will support environmental decision making. The risk characterization section discusses estimating, interpreting, and reporting risks

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and applies an ecological perspective to recent EPA policy encouraging clear, transparent, reasonable, and consistent risk characterizations. The guidelines emphasize that the interface between risk assessors, risk managers, and interested parties is critical for ensuring that the results of the assessment can be used to support a management decision.

The guidelines are internal guidance only for the EPA and serve to inform the public and the regulated community regarding the Agency's approach to ecological risk assessment. The electronic version will be accessible on the EPA National Center for Environmental Assessment home page on the Internet at http://www.epa.gov/ncea/. Copies of the guidelines will be available for inspection at EPA headquarters and regional libraries, through the U.S. Government Depository Library program, and for purchase from the National Technical Information Service (NTIS PB No. PB98-117849), Springfield, VA; telephone: (703) 487-4650, FAX: (703) 321-8547.

For further information, contact: Dr. Bill van der Schalie, National Center for Environmental Assessment-Washington Office (8623), U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460; telephone: (202) 564-3371; e-mail: eco-guidelines@epamail.epa.gov.

Federal Register, Volume 63, Number 93, May 14, 1998, pp. 26845-26924.

EPA Outlines Future WQC And Standards Strategy

The Environmental Protection Agency, Office of Science and Technology of the Office of Water announced a plan for working with the States and Tribes to enhance and improve the water quality criteria and standards program across the country. The *Water Quality Criteria and Standards Plan--Priorities for the Future* describes six new criteria and standards program initiatives that the EPA and the States and Tribes will take over the next decade. The plan presents a "vision" and strategy for meeting these important new initiatives and improvements. The plan will guide the EPA and the States and Tribes in the development and implementation of criteria and standards and will provide a basis for enhancements to the Total Maximum Daily Load (TMDL) program, National Pollutant Discharge Elimination System (NPDES) permitting, nonpoint source control, wetlands protection and other water resources management efforts.

The Office of Water will emphasize and focus on the following priority areas for the Criteria and Standards Program over the next decade:

1. Developing nutrient criteria and assessment methods to better protect aquatic life and human health;
2. Developing criteria for microbial pathogens to better protect human health during water recreation;

3. Completing the development of biological criteria as an improved basis for aquatic life protection;
4. Maintaining and strengthening the existing ambient water quality criteria for water and sediments;
5. Evaluating possible criteria initiatives for excessive sedimentation, flow alterations and wildlife;
6. Developing improved water quality modeling tools to better translate water quality standards into implementable control strategies; and
7. Ensuring implementation of these new initiatives and improvements by the States and Tribes in partnership with EPA.

More information can be found at http://www.epa.gov/OST/standards/planfs.html or by contacting: William F. Swietlik, U.S. Environmental Protection Agency - Office of Water, Office of Science and Technology, Health and Ecological Criteria Division (4304), 401 M Street SW, Washington, DC 20460, e-mail swietlik.william@epamail.epa.gov or Jennifer Wigal, U.S. Environmental Protection Agency - Office of Water, Office of Science and Technology, Standards and Applied Science Division (4305), 401 M Street SW, Washington, DC 20460, e-mail: wigal.jennifer@epamail.epa.gov.

U.S. EPA Office of Water. Water Quality Criteria and Standards Plan--Priorities for the Future, EPA-823-F-98-011, April, 1998.

EPA TMDL Committee Issues Draft Report

The Federal Advisory Committee on TMDLs under the Clean Water Act held their final meeting on May 4-6, 1998. The TMDL program has three main goals: (1) to restore impaired water bodies; (2) to implement these limits once established; and (3) to communicate with the public about these limits. The Committee considered the identification of impaired waters for which states must develop TMDLs. States normally use monitoring data to decide if a water body is impaired or not, but the Committee says that may not be comprehensive enough to provide adequate information and in some cases cannot address certain types of impairments like loss of habitat.

In its draft report, the Committee recommends that the EPA issue guidance providing that States base their Section 303(d) Listing of Impairing Water Bodies on monitoring data meeting EPA quality assurance and quality control data collection and analysis protocols. This repesents a step backwards from the Committee's original proposal, which laid out a "high priority monitoring list" to address water bodies that may or may not have been included on the §303(d) listing based on insufficient or questionable data.

The high priority monitoring list would include:

- giving public notice of the water bodies listed on the high priority monitoring list;
- stricter scrutiny on all permit applications by states and tribes;
- encouraging stakeholders to supply data to the jurisdictional agency;
- dropping those water bodies that can be proven to be not harmful from the list and adding those which have proven to be harmful (if not already on the list);
- setting a timeline by which the questionable water body would be added to the list if monitoring was not conducted to prove otherwise; and
- granting a two year grace period approved by the EPA for those water bodies that require additional monitoring due to documentation difficulties.

As a State develops its TMDLs, there are seven components which must be considered:

- identifying a target level, based on the contaminant concentrations already existing in a particular body of water, which is in compliance with water quality standards;
- specifying how far off from the target level a particular area is and how much pollution reduction is necessary to meet the target;
- identifying sources that cause the impairment;
- allocating loads that show how the standards can be attained;
- writing an implementation plan for implementing control and /or restoration activities to eliminate impairment;
- creating a monitoring program to check that the TMDLs are kept; and
- deriving a process for revising the TMDLs to be included in the implementation plan.

The Committee also addressed the issue of other sources of water body impairment, like air deposition or impairment solely by nonpoint sources, in the assignment of water bodies to the §303(d) listing. The Committee will also consider whether or not to track separately water bodies that are not currently on the impaired water bodies list, but would be once pollution control requirements are implemented. Some on the Committee feel that they should follow the 1991 EPA guidance that allows these water bodies to stay off the list as long as the states have plans set for enforceable controls that are specific enough to the pollution problem and meet the standards. Others of the Committee feel that these questionable water bodies should default to the §303(d) listing if, after following a specific timetable for attainment for two years, they still do not meet the water quality standards. Currently states are given an 8-13 year time frame in which to develop the TMDLs, during which no new or additional discharges are allowed that will cause water quality standard exceedances.

The final report is expected in June. By the end of the year, the EPA is expected to propose a rule on the TMDL Program. More information can be found at: http://www.epa.gov/OWOW/tmdl/faca/toc.html. The

Marine Environmental Support Office will continue to follow developments on this subject and will provide information on the final report once it becomes available.

U.S. EPA Office of Water. Draft TMDL FACA Committee Report. March 2, 1998. Environment Reporter, Volume 29, Number 2, May 8, 1998, pp. 127-129.

EPA Releases Contaminated Sediment Management Strategy

On May 6, 1998, the Environmental Protection Agency announced its Contaminated Sediment Management Strategy, a work plan issued in support of EPA's regulatory and policy initiatives. The Contaminated Sediment Management Strategy describes the cross-program policy framework in which the EPA intends to promote consideration and reduction of ecological and human health risks posed by sediment contamination.

The strategy establishes four goals to manage the problem of contaminated sediment, and describes actions the EPA intends to take to accomplish those goals. The four goals are: (1) Prevent the volume of contaminated sediment from increasing; (2) reduce the volume of existing contaminated sediment; (3) ensure that sediment dredging and dredged material disposal are managed in an environmentally sound manner; and (4) develop scientifically sound sediment management tools for use in pollution prevention, source control, remediation, and dredged material management.

The Contaminated Sediment Management Strategy proposes that EPA program offices take the following actions.

Assessment

All EPA program offices intend to use standard sediment testing methods to determine whether sediments are contaminated. The Office of Water (OW) intends to use standard sediment toxicity and bioaccumulation test methods for monitoring, interpretation of narrative water quality standards, and dredged material disposal testing. The Office of Pesticide Programs (OPP) and the Office of Pollution Prevention and Toxics (OPPT) intend to use standard sediment toxicity tests to assess the toxicity of pesticides when registering or re-registering these chemicals for use and for evaluating new and existing chemicals under TSCA. The Office of Emergency and Remedial Response (OERR) intends to use standard sediment toxicity and bioaccumulation test methods for Superfund Remedial Investigation/ Feasibility Studies. The Office of Solid Waste (OSW) intends to use biological sediment toxicity test methods for site-specific risk assessments and monitoring at hazardous waste facilities.

Where appropriate, EPA program offices intend to use sediment quality criteria, when they are published, to assess contaminated sediment sites. All EPA programs conducting sediment monitoring intend to use

the criteria to interpret sediment chemistry data. Upon publication, the criteria may be used along with appropriate test endpoints from chronic sediment bioassays to interpret the narrative state water quality standard of "no toxics in toxic amounts." National Pollutant Discharge Elimination System (NPDES) permit limits would be based on applicable water quality standards which may include the State's narrative standard. The EPA intends to use the sediment criteria (as appropriate) with other information to make site-specific decisions concerning corrective action at hazardous waste facilities, and to assess Superfund sites. The EPA has begun to develop a more detailed *User's Guide for Multi-Program Implementation of Sediment Quality Criteria in Aquatic Ecosystems*, describing how the EPA's programs intend to use these criteria.

The EPA program offices intend to use the National Sediment Inventory (NSI) database as a screening-level assessment tool of sediment quality and sources of pollution. The NSI can be used by the various EPA program offices to identify sites for further assessment. The inventory can be used to: identify potentially contaminated sediment sites for consideration for remedial action; identify sites for further assessment that may be candidates for injunctive relief or supplemental enforcement projects; identify problem pesticides and toxic substances that may require further regulation or be evaluated for possible enforcement action; identify impaired waters for National Water Quality Inventory reports or possible development of Total Maximum Daily Loads; target watersheds for nonpoint source best management practices; and help select industries for effluent guidelines development.

Prevention

In order to regulate the use of pesticides that may accumulate to toxic levels in sediment, the EPA intends to propose that acute sediment toxicity tests be included in procedures required to support registration, re-registration, and special review of pesticides likely to sorb to sediment. In fiscal year 1996, the EPA proposed incorporating acute toxicity bioassays and spiking protocols into the Agency's pesticide assessment guidelines (40 CFR Part 158). To prevent other toxic substances from accumulating in sediment, the EPA also intends to propose incorporating acute sediment toxicity tests and sediment bioaccumulation tests into routine chemical review processes required under TSCA. In addition, the EPA intends to develop guidelines for design of new chemicals to reduce bioavailability and partitioning of toxic chemicals to sediment.

The EPA's Office of Enforcement and Compliance Assurance (OECA) plans to take action to prevent sediment contamination by negotiating, in appropriate cases of noncompliance with permits, enforceable settlement agreements to require source recycling and source reduction activities. The Office of Regulatory Enforcement within the OECA also intends to monitor the progress of Federal facilities toward the goal of halving toxic emissions by the year 1999 and plans to monitor the reporting of toxic releases to the public.

The OW and other EPA program offices intend to work with non-governmental organizations and the States to prevent point and nonpoint source contaminants from accumulating in sediments. The EPA intends to: (1) Promulgate new and revised technology-based effluent guidelines for industries that

discharge sediment contaminants; (2) encourage the States to use biological sediment test methods and sediment quality criteria to interpret the narrative standard of "no toxics in toxic amounts;" (3) encourage the States to develop Total Maximum Daily Loads for impaired watersheds specifying point and nonpoint source load reductions necessary to protect sediment quality; (4) use the NSI to identify point sources of sediment contaminants for potential permit compliance tracking after further evaluation using program-specific criteria to confirm sediment quality problems; (5) ensure that discharges from CERCLA sites and RCRA facilities subject to NPDES permits comply with future NPDES permit requirements to protect sediment quality; and (6) use the NSI to identify watersheds where technical assistance and grants could effectively be used to reduce nonpoint source loads of sediment contaminants.

Remediation

The OW, OERR, and OECA intend to use the NSI to help target sites for further study which may lead to enforcement action requiring contaminated sediment remediation. The EPA plans to use standard sediment toxicity, bioaccumulation tests, and site-specific field-based methods to identify potential sites for remediation, to assist in determining clean-up goals for contaminated sites, and to monitor the effectiveness of remedial actions. RCRA Corrective Action sites are generally determined by facilities seeking a RCRA permit, not by the program identifying contaminated areas, except in enforcement under 7003 orders.

Dredged Material Management

Guidance provided in future updates of the Strategy will facilitate the coordination of dredged material management activities among Federal agencies and non-governmental organizations.

Research

The EPA's Office of Research and Development (ORD), through its Environmental Monitoring and Assessment Program (EMAP), intends to continue to collect new chemical and biological data on sediment quality. These data would be included in the Agency's NSI. The ORD is developing new biological methods to assess the ecological and human health effects of sediment contaminants, chemical-specific sediment quality criteria, methods to conduct sediment toxicity identification evaluations and methods to identify bioaccumulative chemicals in sediment. The ORD intends to develop dredged material disposal fate and transport models, sediment wasteload allocation models, and technologies for remediation of contaminated sediment.

Outreach

The EPA plans to undertake a program of outreach and technology transfer to educate target audiences about contaminated sediment risk management. Target audiences would include: other Federal agencies, State and local agencies, the regulated community, the scientific community, environmental advocacy groups, the news media, and the general public. EPA plans to provide technical and non-technical

information to these audiences by developing a range of outreach products. Future updates to the Strategy will be reported in biennial updates of the National Sediment Quality Survey Report to Congress.

Further information can be found at http://www.epa.gov/OST/cs/statref.html or by contacting: Jane M. Farris, U.S. EPA Risk Assessment and Management Branch, Office of Science and Technology, Mail Code 4305, 401 M Street SW, Washington, D.C. 20460, telephone: (202) 260-8897.

Federal Register, Volume 63, Number 86, May 6, 1998, pp. 25037-25040.
U.S. EPA Office of Water, Contaminated Sediment Management Strategy, EPA-823-F-98-004, April, 1998.
Environment Reporter, Volume 29, Number 2, May 8, 1998, pp. 130-131.

EPA Proposes Effluent Guidelines Plan

Proposed plans for developing new and revised effluent guidelines were announced by the EPA on May 28, 1998. The guidelines would regulate industrial discharges to surface waters and to publicly owned treatment works. The document is published under the authority of Section 304(m) of the Clean Water Act, 33 U.S.C. 1314(m), which requires the EPA to publish a biennial effluent guidelines plan. Potentially effected entities include:

- Industrial/Commercial
- Agriculture (Feedlots;Fish hatcheries; Farms)
- Federal government (Metal products and Machinery [including electroplating, metal finishing]; Landfills; Airports)
- State Government (Metal Products and Machinery [including electroplating, metal finishing]; Municipal Separate Storm Sewer Systems [Urban Storm Water]; Landfills; Airports)
- Local Government (Metal Products and Machinery [including electroplating, metal finishing]; Municipal Separate Storm Sewer Systems [Urban Storm Water]; Landfills; Airports).

The EPA has recently revised the Effluent Guidelines planning process based on its discussions with the Effluent Guidelines Task Force, which was created in 1992 to offer advice to the EPA Administrator on the long-term strategy for the effluent guidelines. The committee consists of members appointed by the Agency from industry, citizen groups, state and local government, the academic and scientific communities, and the EPA's Office of Research and Development. The Task Force has been focusing on alternative regulatory processes that would allow the EPA to promulgate effluent guidelines more rapidly and at lower cost to the government. The EPA will begin two rulemaking projects by December 1998, and begin two additional projects by December 1999.

The EPA is conducting a preliminary study of urban storm water discharges to explore how the Effluent Guidelines program can contribute to the Agency's efforts in implementing the national storm water program requirements under section 402(p) of the Clean Water Act. Discharges from municipal separate storm water sewer systems ("MS4") serving a population of 100,000 or more are subject to NPDES storm water permitting requirements at 40 CFR 122.21 and 122.26. The EPA recently published a proposed rule that would extend NPDES permit requirements to smaller MS4s in urbanized areas (63 FR 1536, January 9, 1998). The EPA is considering whether development of effluent guidelines regulations, or additional technical information and guidance on characterizing storm water discharges and evaluating the efficacy of controls would be useful to discharging facilities in complying with permit requirements.

The EPA intends that the study will include a summary of existing storm water resources on best management practices (BMPs), a description of adverse environmental impacts from storm water discharges, a summary of available methods for estimating the relationship between storm event size and bacteriological impacts, descriptions of types of regionally-appropriate storm water BMPs (both structural and non-structural) and how to measure their performance, cost and economic impact considerations, and a description of measurable goals that could be used to evaluate the effectiveness of storm water management controls. The Agency will complete a preliminary data summary by December 1998.

An Airport Deicing study began formally by the EPA in January 1998, with some site visits conducted as early as Summer 1997. The EPA is reviewing previously-collected data as well as information gathered through contacts with the trade associations representing various segments of the industry, environmental groups, manufacturers of deicing chemicals and vendors of deicing-related equipment and treatment technologies. Also, the Agency is planning to review airport storm water monitoring data that is collected under the Multi-Sector General Permit requirements. The Agency will be conducting site visits to airports of differing sizes and geographic locations. These visits will include airports that employ pollution prevention, on-site recycling or alternative deicing technologies. Specifically, the purposes of the site visits are:

- To gather basic information on a variety of deicing activities and to determine what factors affect deicing operations;
- To determine and evaluate the level of wastewater treatment for any collected deicing fluids;
- To gather information to characterize the raw, untreated effluent generated from any deicing operations in terms of pollutant concentrations, volumes and environmental impacts; and
- To gather information on new or innovative pollution prevention practices.

The EPA will examine the effectiveness of the current storm water permitting system and the comparative effectiveness of an effluent guideline approach for airport deicing activities. The EPA will also evaluate the status and trends of de-icing chemical use at airports, including the costs and cost-minimization opportunities of deicing material management, and the development and use of prevention

and treatment technologies will be evaluated. Wastewater characterization sampling visits are expected to be conducted next winter. The EPA will complete a preliminary data summary by December 1999.

The preliminary data summaries are not used directly as a basis for rulemaking; rather, they are used by the EPA to help determine which discharger categories most urgently require preparation of new or revised effluent guidelines. For further information contact: Eric Strassler, U.S. EPA Engineering and Analysis Division, telephone (202) 260-7150.

Federal Register, Volume 63, Number 102, May 28, 1998, pp. 29203-29213.

Copper Chemistry, Toxicity And Bioavailability And Its Relationship To Regulation In The Marine Environment

The Environmental Sciences Division of the Space and Naval Warfare Systems Center, San Diego (SSC SD), hosted an ONR sponsored (6.2 Applied Research) Workshop on the Chemistry, Toxicity and Bioavailability of Copper in Marine and Estuarine Environments on June 3-4, 1997, at the Emerald Wyndham Hotel in San Diego, CA. The goal of the workshop was to clarify present scientific understanding of the nature, toxicity, and fate of copper in the marine environment in order to develop a better basis for future approaches to copper regulation. The objectives of the workshop were to bring Navy and regulatory representatives and scientific experts together to 1) define the current status and future direction of Cu regulations, 2) define problems and issues associated with the introduction of copper into the estuarine environment and 3) to discuss and evaluate the relationship between copper speciation, bioavailability and toxicity. Copper is a concern to the Navy because it is present in the water, sediment and biota adjacent to Naval facilities, and there are known past and present sources for this copper. The primary regulatory drivers for the Navy are the very low copper limitations for effluents in NPDES permits, and also the copper being found in Installation Restoration (Superfund) site investigations where cleanup is a possible requirement.

Although the copper workshop was highly focused and scientifically oriented, it concentrated on aspects of the problem that are relevant to Navy copper issues. An important and unique component to this first of two workshops, was the bringing together of scientists and Navy users with environmental regulators, so that a cross-discipline understanding of engineering compliance constraints, scientific issues, and regulatory standards could be achieved.

The workshop endeavored to discuss:

1. The identification of the various forms of copper in Navy-impacted marine environments that are measurable with the presently available technology. Also, identification of known and suspected relationships among the various forms of copper and the copper buffering capacity of estuarine environments;
2. The known physical/chemical/biological conditions that are conducive to the formation and presence of the various identifiable forms of copper; and
3. The relationships between the various species of copper and their toxicity to specific groups of organisms.

Twelve scientific presentations were made over the two days of the workshop, covering important chemical and biological aspects of copper in estuarine environments, beginning with its input from sources to its (final?) destination in the sediments and into marine organisms. The following topics were presented for discussion:

Analytical Chemistry of Copper in Seawater:

- Interactions of Copper with Estuarine Colloids
- Copper Speciation and Interactions with Biota
- Copper Bioavailability
- Effects of Copper on Marine Organisms

Science Group Presentations included:

1. Analytical Methods (A. Zirino, K. Bruland)
2. The Interaction of Copper with Estuarine Colloids (P. H. Santschi)
3. Copper Interactions With Biota (A.G. Lewis, J. Moffett and C. Dibacco/L. Levin)
4. Copper Bioavailability (J. Moffett, P. Paquin, L. Mayer)
5. The Gill Model
6. Cu Bioavailability In Sediments (P. Paquin, L. Mayer)
7. The Effects Of Copper On Marine Organisms (S. N. Luoma)
8. Assessing DNA Damage - The Comet Assay (S. Steinert/R. Streib Montee)
9. Copper Toxicity In Fishes (P. Weis)

After all the presentations were concluded, all the workshop participants were re-convened into either of two groups. Group (1) consisted of Navy users and regulators; group (2) was composed principally of scientists. The two groups met separately to draft a set of recommendations. It was possible to switch

from one group to another at will. At the end of these sessions, the recommendations were presented to all the attendees by Peter Seligman and Al Zirino, SSC SD, for final discussion.

Six main conclusions and recommendations were presented as follows:

- The legal release and disposal of copper or copper-laden effluents into estuarine waters poses a serious environmental, engineering and economic challenge to the Navy and the country in general. This is because EPA-mandated Water Quality Criteria (WQC) for copper effluents are at or very close to the ambient or "normal" concentrations of copper in many estuaries, which are at the low µg/L level. The treatment of copper-contaminated effluents to achieve such low levels, (even if they are technologically attainable), may be cost-prohibitive, and may not be warranted, since there is little, if any direct evidence in the natural environment of toxicity being caused by small increases in copper levels. The issue, however, is scientifically complex because effluents are dispersed, copper is complexed and rendered less toxic by natural organic matter, and because of the ability of organisms to adapt and fill niches vacated by more sensitive species. The issue is also beyond being a purely scientific question since it ultimately involves a value judgment as to what constitutes a baseline level and the degree of environmental alteration society is willing to accept in exchange for technological and economic benefits.
- The present EPA-mandated WQC justifiably fulfills their mission of protecting the environment, but do so from a relatively weak scientific basis and, most probably, are over-protective. This is because the WQC were obtained in laboratory tests, using pristine waters and based on total concentrations without any concern for copper speciation, which overwhelming scientific evidence shows to be instrumental in determining toxicity.
- At present, a large body of scientific data indicates that it is the concentration of the "free" or aqueous cupric ion species ($Cu(II)_{aq}$) which relates best, but not exclusively, to the toxicity of marine organisms. There is a good scientific basis for this being so, and it goes beyond the notion of a small quantity of copper (< 1% of total Cu) being very toxic. The activity or concentration of $Cu(II)_{aq}$ is a good measure of the availability and mobility of all the copper in the system and, therefore, would be expected to be highly correlated to its uptake by organisms and to its ultimate toxicity.
- Current trends in metal water quality criteria indirectly reflect current knowledge about the importance of speciation through a number of mechanisms such as the adaptation of "dissolved" copper concentrations rather than total recoverable copper and through the option of using Water Effects Ratios (WERs) which account, in part, for the $Cu(II)_{aq}$ sequestering capacity of dissolved organic and colloidal materials found in natural waters. However, such measures, do not take into account the temporal dynamics of $Cu(II)_{aq}$ and in reality cannot be substituted for the direct knowledge of the dynamics of $Cu(II)_{aq}$.
- Indeed, there is evidence in the literature that the ratio of free copper to total dissolved copper ($Cu(II)_{aq}/Cu_T$) may vary both temporally and spatially due to local mixing processes, adsorption on particulates and the ability of marine microorganisms to produce copper-sequestering

materials. It is also likely that the conditions under which standard toxicity tests are performed do not reflect accurately the $Cu(II)_{aq}/Cu_T$ ratio found in the natural environment. Therefore, in order to better relate WQC to natural conditions, a concerted effort should be made to understand how $Cu(II)_{aq}/Cu_T$ changes in the natural environment as well as during toxicity tests.

- Analytical techniques for the measurement of (at least) two of the many possible copper species, $Cu(II)_{aq}$ and Cu_T, should be standardized and "clean room" techniques should be used in both sampling and measurement, in order to provide unambiguous reference levels for the "user" community.

For further information, contact: Al Zirino, SPAWARSYSCEN D361, 53475 Strothe Road, San Diego, CA 92152-6310; telephone (619) 553-2794, DSN 553-2794; e-mail d361@spawar.navy.mil.

PAH And Copper Survey Of San Diego Bay

Water quality measurements were made throughout San Diego Bay in 1997 as part of the Navy's efforts to assess current environmental conditions in the bay. The water quality measurements focused on polynuclear aromatic hydrocarbons (PAH) and copper (Cu) concentrations, compounds that have been identified as chemical contaminants of concern by the San Diego Bay Interagency Water Quality Control Panel. The effort was designed to assess how recent changes in bilge water operations and the removal of creosote impregnated pier pilings at Naval Station, San Diego (NAVSTA), may have impacted the steady-state concentrations of these contaminants in the waters of San Diego Bay.

Measurements were made during two dry-weather surveys using unique capabilities of the Space and Naval Warfare Systems Center, San Diego, Environmental Sciences Division's Marine Environmental Survey Capability (MESC). Discrete samples collected for PAH and Cu were augmented with real-time, high spatial resolution surrogate measurements provided by MESC. In this way, MESC provided integrated, full bay coverage of contaminant levels as well as the hydrographic and general water quality conditions needed to characterize sources. For the most part, bay hydrographic conditions were consistent with historical measurements. The main exception was elevated suspended loads at the entrance to the bay and within Commercial Basin where dredging operations were underway. From a standpoint of assessing the impact of source reductions at NAVSTA, the bay was considered to be in steady-state.

Total PAH concentrations ranged from 35 to 200 $ng \cdot L^{-1}$ and 24 to 130 $ng \cdot L^{-1}$ on the two surveys. Concentrations increased moving into the bay, typically to maximum levels in the vicinity of NAVSTA. The source of PAH was predominantly derived from weathered creosote. An exception to this occurred at one NAVSTA site at which the source appeared to be derived from both weathered creosote and fuel product sources in roughly equal amounts. Dissolved Cu concentrations, measured only on one survey,

ranged from 0.41 to 4.18 $\mu g \cdot L^{-1}$. Concentrations which generally increased into the back bay were augmented with local increases in the vicinity of semi-enclosed basins and at NAVSTA.

From a regulatory perspective, nearly all the measured PAH were below EPA water quality criteria proposed for California. Only two stations at NAVSTA on the first survey had any analyte above the criteria. No PAH analytes surpassed criteria on the second survey. Nearly half the bay had Cu concentrations that surpassed the proposed limit of 3.1 $\mu g \cdot L^{-1}$.

Concentrations of PAH were the lowest measured in the bay in the last eight years. Recent PAH levels at NAVSTA sites compared with those measured historically are significantly lower by a factor of nine. Non-NAVSTA sites were also significantly lower by more than a factor of two. Based on the historical distribution of sources and source types, the reduction in PAH concentrations at NAVSTA sites, and perhaps the rest of the bay can be attributed directly to the change in operations at NAVSTA. While recent Cu concentrations were not statistically different from those measured historically at NAVSTA sites, the remainder of the bay had significantly lower concentrations. Operational changes at NAVSTA have not impacted Cu concentrations in the bay.

The complete report, *Seawater Polynuclear Aromatic Hydrocarbons and Copper in San Diego Bay*, can be accessed at http://www.spawar.navy.mil/sti/publications/pubs/tr/1768/tr1768.pdf. For further information, contact Chuck Katz, SPAWARSYSCEN D362, 53475 Strothe Road, San Diego, CA 92152-6310; telephone (619) 553-2773, DSN 553-2773; e-mail d362@spawar.navy.mil.

Automated Oil Spill Detection System To Be Installed At PSNSY

Researchers at the Space and Naval Warfare Systems Center, San Diego, have completed development of an automated oil spill detection system for real-time monitoring of petroleum hydrocarbon contaminants in the marine environment (see *Marine Environmental Update*, Vol. FY97, No. 1). The Oil Spill Monitor and Alarm System (OSMAS) consists of an array of underwater sensors deployed just below the water surface near piers, pipelines, transfer points, storage vessels, or other areas of high spill risk. The sensors can detect floating product (surface sheen) from below the surface as well as detect emulsified or dissolved phase petroleum in the water column. Information corresponding to the amount of oil detected by each of the sensors is transmitted over a secure radio-frequency data link to a central base station computer for display, logging, analysis, and alarming. Statistically-based algorithms that "learn" normal background oil contaminant levels are used to determine whether a spill has occurred and serve to minimize the occurrence false alarms.

The system is designed to augment, and in some cases replace, human visual observation as the principal means of detecting spills. The primary intended use of the system is to protect marine facilities from accidental petroleum discharges by providing responding authorities with immediate notification of the occurrence of a leak or spill. By enhancing responders' ability to exercise timely countermeasures, early detection is expected to offer an effective means of minimizing the environmental and financial impact of a spill. Automated spill detection is particularly suited for use at night or during foul weather or choppy conditions when visual detection of oil on water is difficult or impossible.

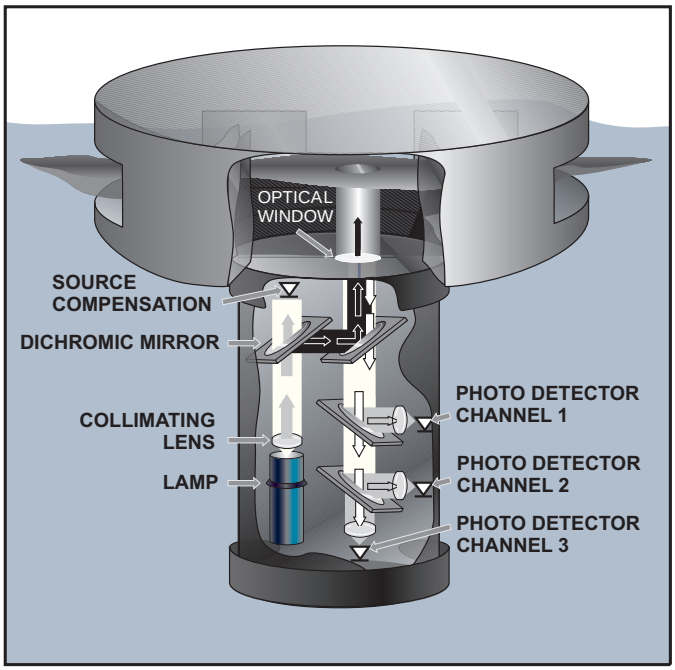

Diagram of the Oil Spill Monitor and Alarm System (OSMAS) POL (petroleum, oil, lubricants) sensor.

The first OSMAS system will be installed this summer at Puget Sound Naval Shipyard (PSNSY) as part of a jointly funded (Naval Facilities Engineering Command and PSNSY) demonstration of the system. The PSNSY system will include a telephonic alarm capability. An automated telephone call will notify responding authorities of a detected spill event via a synthesized voice or pager message, anywhere, 24 hours a day, seven days a week. Plans are also set for authorized personnel to be able to access the sensor data from PSNSY in near real-time through the World Wide Web.

For additional information on OSMAS contact: John Andrews, SPAWARSYSCEN D361, 53475 Strothe Road, San Diego, CA 92152-6325; telephone (619) 553-2794, DSN 553-2794; e-mail d3621@spawar.navy.mil or Jim McDonald, Puget Sound Naval Shipyard Code 106.33, Bldg 427, 2nd Floor, 1400 Farragut Avenue, Bremerton, WA 98314-5001, telephone (360) 476-1842, e-mail mcdonaldj@psns.navy.mil.

Wastewater Technology Evaluation Test Bed Established At PSNSY

Scientists of the Space and Naval Warfare Systems Center, San Diego, (SSC SD) Environmental Sciences Division are providing technical support for the Wastewater Technology Evaluation and Research (WaTER) Project at Puget Sound Naval Shipyard. The purpose of the WaTER Project is to identify, test, and verify the performance of technologies, processes, sensors, and management practices used to recover, recycle, or treat waste waters such as industrial wastewater, shipboard bilge water, storm water, and other types of complex wastewater. The goal of the program is to identify and validate those technologies that will meet or exceed environmental regulatory criteria for the identified waste waters and, wherever possible, recover or recycle the water and other economically valuable materials. The validated wastewater technologies will then be available for transfer to interested DOD parties.

Puget Sound Naval Shipyard, Bremerton, Washington (U.S. Navy photograph).

The selection of the SSC SD Environmental Sciences Division by the Shipyard to provide technical support evolved from a recent project of the Marine Environmental Support Office (MESO) to develop a long-term, cost-effective, proactive strategy for marine environmental compliance at the Naval Shipyards funded by the Naval Sea Systems Command. The present task is to use ecological risk assessment and hydrodynamic modeling to provide a broad water quality baseline for Sinclair Inlet, and to better understand the Shipyard's influence on the estuarine environment relative to its pollutant inputs before and after implementation of any wastewater technologies, and relative to contributions from other dischargers in the Inlet. The work being performed will also serve to provide data that can be used to determine more realistic Total Maximum Daily Loadings (TMDLs) for the Inlet. TMDLs are contaminant-specific maximum allowable loadings to a water body that can be shown to cause no impairment to water quality or designated uses. In lieu of scientifically-defensible TMDLs, regulatory agencies will continue to use overly-conservative default values for effluent limitations, and NPDES permit compliance will remain difficult to achieve, resulting in costly diversion, collection and treatment schemes. Private sector facilities are confronted with the same problem.

A numerical hydrodynamic and transport model can be used as an effective tool in understanding, describing and predicting fate and transport of contaminants in Sinclair Inlet. The CH3D (Curvilinear

Hydrodynamics in Three Dimensions) model was chosen for application to Sinclair Inlet. CH3D is a mathematical 3D time-varying hydrodynamic model, which was developed by the Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS, for the Chesapeake Bay study. The CH3D model will be set up and calibrated with historical data from Puget Sound and Sinclair Inlet, and then validated with data collected during dry and wet season surveys performed by the R/V *Ecos* and its real-time dynamic mapping and processing system (Marine Environmental Survey Capability or MESC). The validated model's predictions will be described in terms of three observational periods:

- 0-5 days: mixing and dilution of contaminants entering the Inlet from Shipyard sources
- 30 days: relative contributions as determined from mean loadings from all sources.
- 6 months: seasonal variability considering major wind and rainfall differences.

Integrating the results from these three analyses, the model will then be used to predict scenarios for representative exposures and effects to estimate TMDLs for specific pollutants. To accomplish this, the best available spatial distribution of ecological receptors at risk will be overlaid with typical mass loading and model-derived dispersion estimates for selected contaminants of concern (COCs) into Sinclair Inlet. Using literature-based and scientifically-defensible concentrations for maximum exposures that do not elicit adverse effects, the relevancy of current effluent limitations and water quality standards will be examined. Finally, recommendations for maximum acceptable loadings (TMDLs) will be made for each COC.

To provide a database management framework for data generated by all WaTER Project participants, a data model and data reporting specifications are also being developed. This work, plus the associated Geographical Information System (GIS) efforts, will ensure that electronic data are easily retrievable and usable by interested parties long after the environmental measurements are taken.

For more information contact: Ron Gauthier, SPAWARSYSCEN D3621, 53475 Strothe Road, San Diego, CA 92152-6310; telephone (619) 553-5330, DSN 553-5330; e-mail meso@spawar.navy.mil.

Important Notice To Our Readers

Beginning with the Volume FY99, Number 1, Winter 1998 issue (scheduled for publication in December 1998), the *Marine Environmental Update* will only be distributed through the World Wide Web, in keeping with the Navy's policy to reduce paper usage and operational expenditures. As a service to our readers, a "printer-friendly" version of each issue will be available for download from the MESO WWW server, in addition to the regular on-line edition. The *Marine Environmental Update* can be accessed at: http://environ.spawar.navy.mil/Programs/MESO/Newsltr.

ABOUT THE *MARINE ENVIRONMENTAL UPDATE*

This newsletter is produced quarterly by the Marine Environmental Support Office (MESO), and is dedicated specifically to inform the Navy about marine environmental issues that may influence how the Navy conducts its operations. MESO is located at the Space and Naval Warfare Systems Center, San Diego, California. The mission of MESO is to provide Navy-wide technical and scientific support on marine environmental science, protection and compliance issues. This support covers a broad spectrum of activities, including routine requests for data and information, technical review and consultation, laboratory and field studies, comprehensive environmental assessments, and technology transfer. Significant developments in marine environmental law, policy, and scientific advancements will be included in the newsletter, along with references and points of contact for further information.

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