WaterISAC
Water Security Network

Webcast: Anticipating the Public's Questions during a Water Emergency

"Anticipating the Public's Questions during a Water Emergency" is designed to provide knowledge and training to the water sector and other stakeholders on best practices for communicating with the public during a water contamination event.

Webcast Date: July 18, 2012, 2pm EST.

Webcast length: 75 minutes.

Goals/Objectives
Upon successful completion of the webcast, participants will be able to identify key issues related to communicating with the public during a water emergency, implement crisis communication best practices, refer to communication planning tools and resources, and generally better prepare for communicating with the public during a drinking water emergency event.

Course materials
PowerPoint presentation attached.

Related materials
Executive Summary of the report by US EPA National Homeland Security Research Center *Anticipating the Public's Questions during a Water Emergency* (May 2012), attached.

Agenda
- Crisis communication study background
  - Previous research
- Current research study
- Findings and conclusions
- Resource and tool identification
  - *Anticipating the Public's Questions during a Water Emergency*
  - Message Development Tool
  - WaterISAC
  - EPA website
- Questions and answers

Presenters (see attached resumes)

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Water Infrastructure Protection Division
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About the Water Information Sharing and Analysis Center (WaterISAC)
WaterISAC's mission is to provide water and wastewater utilities and the federal, state, and local government agencies responsible for water security with the information and tools needed to prevent, detect, respond to, and recover from all hazards.

WaterISAC:

- The designated official communications/operations arm of the Water Sector Coordinating Council
- Authorized by the U.S. Congress
- Formed as a 501(c)(3) in 2002
- Overseen by a board of utility managers and state drinking water administrator
- The ***only*** centralized, real-time source for water sector security and emergency management information

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Anticipating the Public's Questions during a Water Emergency

Scott Minamyer and
Cynthia Yund, PhD

Office of Research and Development
National Homeland Security Research Center

WaterISAC Webcast
July 18, 2012

Acknowledgements

- City of Chicago Department of Water Management
- City of San Diego Public Utilities Department
- Charlotte-Mecklenburg Utilities
- Massachusetts Water Resources Authority
- Public Participants
- WaterISAC
- Association of Metropolitan Water Agencies
- Oak Ridge Institute for Science and Education (ORISE)
  - Dick Tardif
  - Kelli Martin
  - Mark Herring (Mark Herring Associates)

Objectives

Upon successful completion of the webcast, participants will be able to identify key issues related to communicating with the public during a water emergency, implement crisis communication best practices, refer to communication planning tools and resources, and generally better prepare for communicating with the public during a drinking water emergency event.

Presentation Outline

- Crisis communication study background
- Current research study
- Findings and conclusions
- Message Development Tool

Disclaimer

The United States Environmental Protection Agency, through its Office of Research and Development, funded and managed the research described here. It has been subjected to Agency's administrative review and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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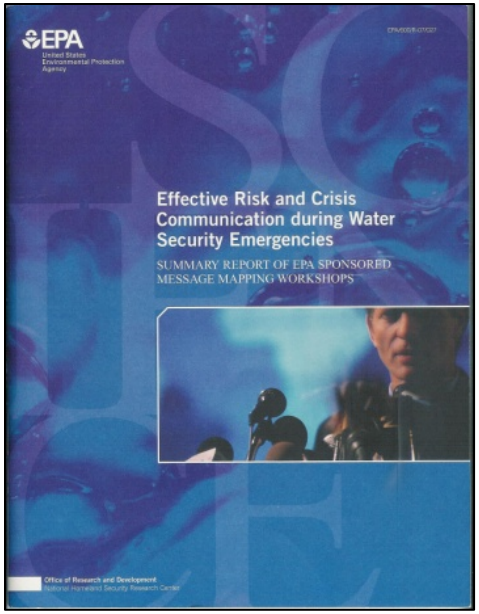
The Research Issue

- During water emergency, communication is critical to inform the public, reduce misinformation, and encourage appropriate behaviors
- Research shows that intuitions of technical experts regarding either what laypeople currently believe or what they need to know during a crisis are often strikingly different than what is actually the case
- Effective crisis communication must take into account such differences

Previous EPA Research

- Three workshops on Effective Crisis Communication during Water Security Emergencies
  - Facilitated by Dr. Vincent Covello, internationally recognized expert
  - Preparing effective messages to inform media and public during crisis events ahead of time
  - Supports crisis communication planning



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Current Research Study

- USEPA's National Homeland Security Research Center conducted crisis communication study with the Oak Ridge Institute for Science and Education (ORISE)
- Objectives
  - Identify critical information needs of public during water emergency
  - Identify differences in perceptions between professional and public
  - Inform crisis communication planning

Current Research Study

- Information was collected from both drinking water professionals and water consumers across diverse geographical areas

Utility Professional Interviews

- Professional moderator guided one-hour discussions
  - Total of 24 interview sessions with a total of 38 professionals of various job classifications
    - Senior management (5)
    - Public information officers (6)
    - Emergency management (7)
    - Plant operations (8)
    - Field operations (7)
    - Call Center (1)
    - Other (4)
  - Senior management interviewed individually
  - Others interviewed in pairs

Professional Session Process

- Contamination scenario
  - Unfit for use/cause unknown
  - Intentional act/terrorist attack
- Professionals listed questions the public would want answered
- Indicated five they thought the public would need to have addressed immediately
- List of 400 questions generated

Public Sessions

- Data from the public were collected through focus groups
  - Professional moderator guided two-hour discussions
  - Four focus groups conducted in each city
  - Up to eight participants per group
  - Total of 113 respondents participated
  - Received a financial incentive

Public Session Process

- Rated severity of loss of municipal services, including water
- Contamination scenario
  - Reverse 9-1-1 emergency message
    - Water contaminated/Do not use
  - Expanded to intentional act
  - Event occurred in other community or state
- Listed 300 questions
- Indicated five most important

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Public Evaluation of Draft Messages

- Tested appropriateness and effectiveness of messages
- Reviewed draft messages for two scenarios
  - Pesticide contamination
  - Biological agent contamination
- Evaluated total of 20 messages
  - 12 messages evaluated by four groups
  - 7 messages evaluated by two groups
  - 1 message evaluated by one group

Example of Draft Message Tested

5-1: What can you tell us about the water contamination?	Participant Comments
We have confirmed the presence of a pesticide in the drinking water. • The pesticide is [insert name of pesticide], which is used for [insert use]. • Levels of the pesticide are above recommended drinking water standards. • The drinking water in the following locations has been affected [insert locations]. **An investigation is underway to determine the source and amount of the pesticide.** • We are taking samples and conducting tests throughout the system. • Public health and hospitals are tracking and treating those who are ill. • Law enforcement is investigating the cause. **Effective immediately, people should not use the water.** • People and pets should not drink the water. • People should not use the water to bathe, shower, or wash. • Alternative sources of drinking water will be made available at the following locations [insert locations and show map].	**Important Information** • Pretty good, had timeframe. • Effective immediately most important. • Keep water locations bullet. • Affected immediately should have been first response. • Second group very vague. • First will worry about health--is there something we can do to prevent. • Want to hear results of testing after time (show decreasing). • "Levels of drinking water" too vague, take out because we can't test. • Tell us not to drink first. **Change/Modification** • Narrowed down location, liked it. • Should be third, first, and second. • 1, 3, 2 as order. • Concerned that people would still drink if they say above water drinking standards, so say how far above recommended. Remove recommended. • Wouldn't warn us not to drink water if below level; eliminate bullet "above recommended level' -- sounds optional. **Questions** • Third bullet of first question: what if people can't get to locations for water? • What to do if you already drank water? • Is there food on store shelves that was prepared using the water? Ice? • How often are you going to give me updates? • How often are they testing water?

Results and Conclusions

Public Response to Water Disruption

- 75 percent ranked a 2-3 day disruption of service as severe situation
- Water uses clearly recognized
  - Drinking
  - Food preparation
  - Sewage disposal

"You can't live without water."

"Losing water – that's devastating."

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QUESTION SUMMARY

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General Question Categories for Both Professionals and Public

- Questions sorted into nine general categories
  - Details about the incident
  - Who has been affected
  - How the tap water can be used
  - Alternate sources of water
  - Actions consumers can take to purify water
  - Exposure to the contaminant
  - How to get additional information
  - Response and recovery

"If you can keep the…public informed…you can help the public manage the situation."

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Professional and Public Questions Mostly Similar

- Identification of the contaminant
- Expected duration of service disruption
- Who/what area was affected
- Consequences of exposure
- Prohibited and non prohibited uses of tap water
- Alternative water supplies

"As long as you're well informed, you're better off."

Professional and Public Differences

- Professionals thought of uses besides residential
  - Medical care
  - Fire protection
  - Business uses
- Public focused more on
  - Time
  - Personal safety
  - Obtaining “safe” water

Questions Most Important to Public

- How long until tap water is “safe”?
- How do I obtain “safe” water?
- How dangerous is the contaminant?
- Who is affected?
- What can I do?
- Where do I get additional information?

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OBSERVATIONS

Importance of Identifying the Contaminant

- For professionals
  - Control
  - Remediation
  - Public health directives
- For the public
  - Personal safety
  - Personal protective actions to be taken

Public Reactions to Attack Scenario

- Terms like “attack” and “terrorism” carried significant negative connotations
- Strong emotional reaction
- Desire to know how their supply is being protected
- Public typically believed that
  - Likely point of attack will be source water (e.g., reservoir, river)
  - Contamination will spread throughout the system

“anger…panic…will there be others?”

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Pros and Cons of Using Terms Like "Attack"

- Benefits
  - Immediate, intense focus and attention
  - Possibly greater resolve to comply with directives
- Costs
  - Anxiety is likely to
    - Decrease the ability to assimilate information
    - Diminish trust in the utility

Perception of Public: "Safe" Water = Zero Contamination

- Public respondents demonstrated little knowledge of routine testing
  - The frequency of testing
  - The idea of maximum allowable levels

"You didn't figure this out until enough people got sick?"

Convincing the Public Water Is "Safe" Could be Tough

- Verification by multiple credible authorities
- Testing procedures are poorly understood
- Comparisons of test results to federal and state standards for safe drinking water might be helpful

Backing Up the Message

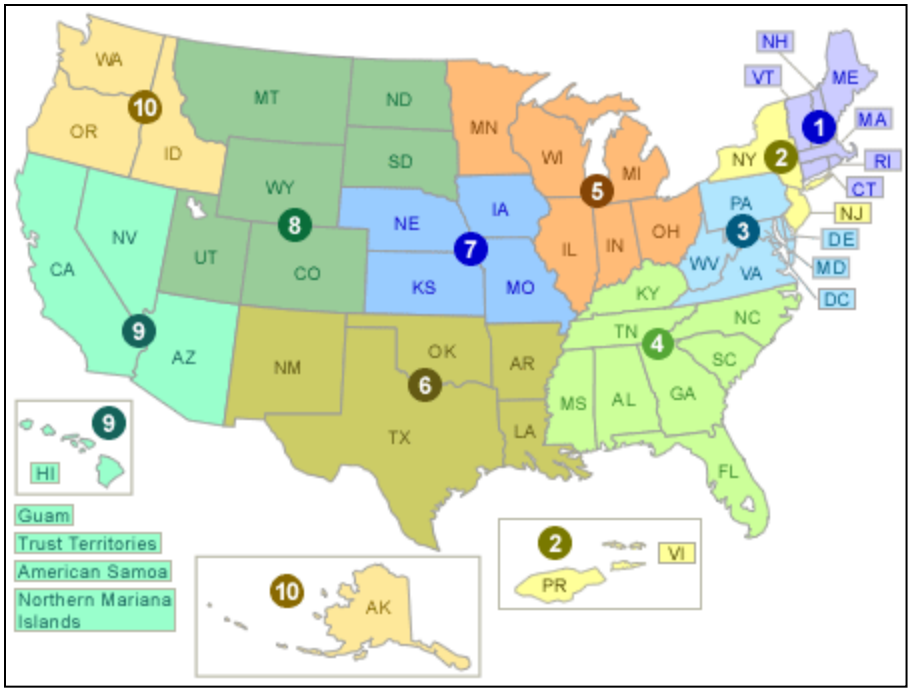
- Collaboration with public health agencies would be critical to affirm credibility of messages
- Elected officials important
  - Varied by location
- Clear presentation of extent of testing would be essential

Professional: "The health information must come from health officials."

Public: "I'd have to have someone come out, open the faucet, and drink it."

What If Attack Occurs Elsewhere?

- The public might expect multiple coordinated attacks
  - Assure the safety of local water supply
- Be prepared to address security issues



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Distribution Systems Difficult to Understand

- Complexity
- Ability to isolate portions of the system
- Alternative sources of water
- Extent and limitations of protection of water quality

Professional: "The public takes most of this for granted."

Public: "I don't know if I believe it could be that isolated."

Intentional Biological Contamination More Concern than Pesticide

- Bacterium or virus is alive
- Remediation of a biological agent perceived as more difficult
- Pesticides less alarming
  - Ingested when eating fruit/vegetables
  - Used in homes

"Big difference…we eat pesticides."

"A biological agent will grow rather than be diluted."

"[Biological agent] automatic…sick, gut-wrenching feeling"

Doubts about Reverse-911 Call

- Efficiency questioned
  - Widespread unfamiliarity
  - Cell phones included?
  - Cell phones from out of area
- Public and professionals recognized need for multiple channels of communication

"[I thought] 'It's a hoax."

"How did you get my number?"

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PUBLIC EVALUATION OF DRAFT MESSAGES

Public Improved Draft Messages Tested

- Preference for
  - Directives (i.e., do/do not) rather than recommendations
  - Short concise sentences
  - Protective actions
  - Results rather than process
  - Sense of time/predictability

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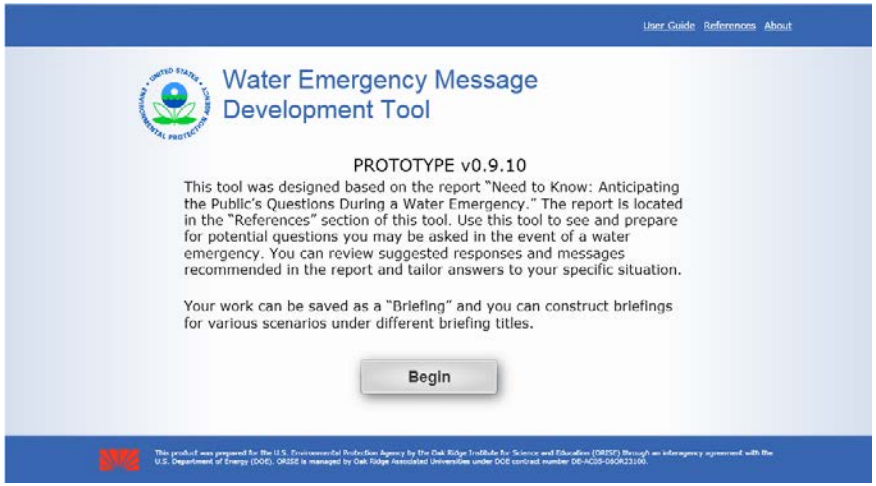
EPA MESSAGE DEVELOPMENT TOOL

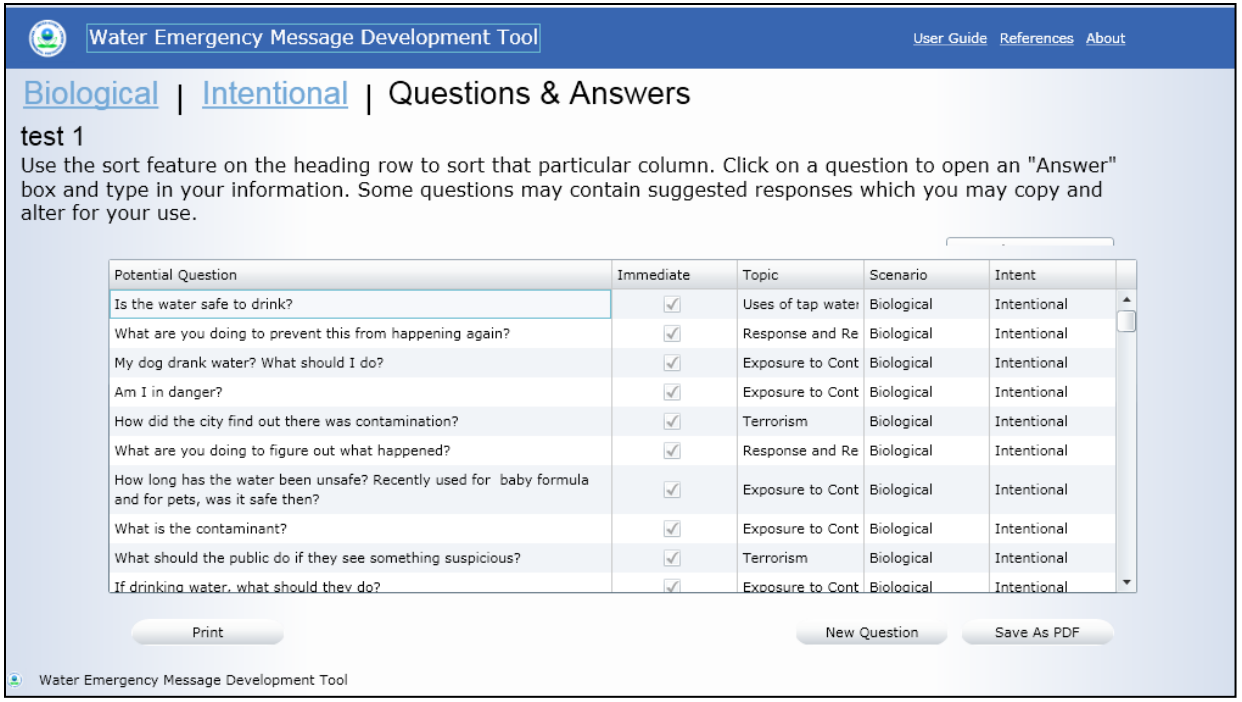
Message Development Tool



- Rapid organization of messages for utilities as part of crisis communication planning
- Incorporates study questions
- Includes some sample answers
- User-specific application
  - Build and save briefings
  - Add questions and answers

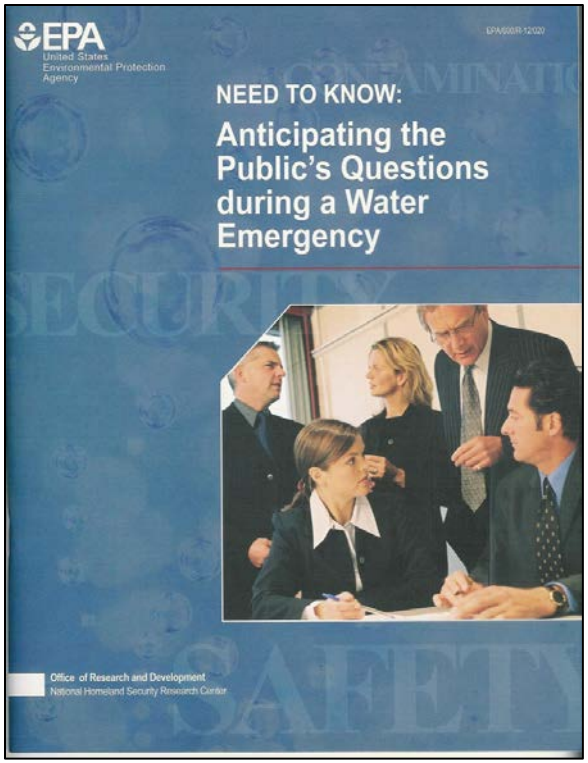
Message Development Tool Availability

- Web or CD
- Target availability September 2012



Report is Available

- Current crisis communication study is described in a report available on the NHSRC website and the WaterISAC
  - www.epa.gov/nhsrc
- For more information, contact
  - Scott Minamyer
    Water Infrastructure Protection Division
    minamyer.scott@epa.gov
  - Cynthia Yund, PhD
    Threat and Consequence Assessment Division
    yund.cynthia@epa.gov



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NEED TO KNOW:

Anticipating the Public's Questions during a Water Emergency

Office of Research and Development
National Homeland Security Research Center

Contents

Executive Summary

Since the events of September 11, 2001, improving the security of our nation's drinking water and wastewater infrastructure has been a high priority. As critical infrastructure, water systems can be subject to intentional attacks as well as unintentional contamination and must be protected. The U.S. Environmental Protection Agency (EPA) plays a critical role in this effort as the lead federal agency for water security.

This investigation was undertaken at the request of EPA to conduct research to: (1) compare public and drinking water professional personnel's assessments of critical information needs arising from the intentional contamination of a municipal water supply; and (2) obtain public evaluation of draft messages developed for such an occasion. The Oak Ridge Institute for Science and Education provided technical assistance.

Information was collected from both utility professionals and members of the public (water consumers) in four metropolitan areas in the United States (northeastern, southeastern, midwestern and western). Twenty-four one-hour discussions were held with a total of 38 drinking water utility professionals. Four two-hour focus groups with members of the general public who use the municipal water supply were conducted in each of the four study cities, with a total of 113 respondents participating.

Findings from the utility professionals were as follows:

- PRO-1. Professionals generated a substantial list of questions which they thought might be asked by the public in the event of a contamination incident. This list went beyond questions raised by the public.
- PRO-2. Professionals identified several aspects of municipal water systems they thought likely to be misunderstood by the public.
- PRO-3. Professionals anticipated challenges in convincing the public that the water supply was once again safe following remediation.

Findings from the public were as follows:

- PUB-1. Members of the public recognized the importance of the city water supply.
- PUB-2. A number of respondents questioned the authenticity of a reverse 911 call used in a scenario with each group.
- PUB-3. Members of the public readily generated an extensive list of questions, similar to the list generated by professionals.
- PUB-4. The questions by the public most frequently cited by them as important focused on time until normal water service was restored, getting safe water, and personal safety.
- PUB-5. Public respondents perceived an intentional contamination involving a biological agent to be more alarming than one involving a pesticide.
- PUB-6. The term "attack" carried strong, negative, emotive connotations.
- PUB-7. There was widespread belief among public respondents that a return to "safe" water meant the level of a contaminant is zero.
- PUB-8. Public respondents offered a variety of suggestions for improving the messages tested.

Questions arising in response to a water-supply emergency were quite similar for professionals and the public, although there were some differences in emphases.

The detection and identification of the contaminant(s) used in an attack on a water supply form a critical information linkage for both the utility and the public. For the professionals, it is necessary for control, remediation, and public health protection. For the public it is a matter of maintaining personal safety and determining appropriate actions. Thus professionals and the public have the same high priority for somewhat different reasons.

There is the belief among some members of the public that water utilities frequently test for all possible contaminants. Water utilities may benefit from being transparent and proactive in educating consumers regarding testing procedures and their results.

Following an attack and remediation, convincing the public that their water supply is again safe poses substantial challenges. Professionals recognize that verification by multiple credible authorities will be required. Testing procedures are poorly understood by the public.

Most public respondents demonstrated little knowledge of reverse 911 call systems. Some questioned the veracity of the call put forth in the exercise. This can likely be diminished by including in the call message information addressing who is sending the message and where to go for confirmation, as well as utilization of multiple channels of communication.

If an intentional water contamination incident occurs elsewhere, water authorities must be prepared to address questions regarding security issues for their own systems. Consumers will be concerned that another attack is possible and will want to be assured of the safety of their water supply.

Using terms such as “terrorist” and “attack” tend to have some benefit in getting the attention of the public and increasing compliance with directives, but at a very high emotive cost. Limiting the use of these terms as much as possible is likely to be beneficial.

Future message development and refinement will benefit from attending to message features perceived by the public as positive -- such as being directive rather than providing “recommendations” and emphasizing protective actions.

Resume

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PROFESSIONAL EXPERIENCE

U.S. ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO

Nov 2006 — Present *Environmental Scientist— National Homeland Security Research Center, Water Infrastructure Protection Division.*

Responsible for developing and managing research projects to address critical chemical, biological, or radiological threats and vulnerabilities associated with water infrastructure; identify and test methods for sampling, analysis, treatment, and decontamination of water distribution systems; and determine appropriate methods of disposal of waste and contaminated media associated with decontamination of buildings and water systems. Manage scientific and engineering water infrastructure research projects in an interdisciplinary fashion involving technical and nontechnical colleagues from other EPA Laboratories, Divisions, and Offices, as well as other federal agencies, state agencies, industry, water sector professional organizations, and universities.

Serve as lead of the NHSRC-wide Water Sector Treatment and Decontamination Research Team initiated by the Water Infrastructure Protection Division Director. This technical team identifies and recommends research projects to NHSRC management for consideration in strategic planning in the areas of water treatment and infrastructure decontamination research.

Served a four-month detail as Water Infrastructure Protection Division's Acting Associate Director (2010). This included serving nearly one month as the Acting Division Director during the Acting Director's absence to attend executive training.

Occasionally represent NHSRC or the Division in technical and other conferences and meetings. Serve as Project Officer, Work Assignment Manager, or Task Order Manager for contractor support. This includes preparing and monitoring work assignments, acquisitions, cooperative agreements, grants, and interagency agreements related to water security research, risk communication, and technology transfer. Serve as co-lead in multiple NHSRC research activities related to crisis risk communication, including crisis communication planning and message development. Also serve as member of the NHSRC Security Team responsible for protecting classified information.

1997 — 2006 *Environmental Scientist— National Risk Management Research Laboratory, Technology Transfer and Support Division, Technology Transfer Branch.*

Responsible for developing and managing multiple cross-organizational technology transfer projects in the areas of watershed management, ecosystem restoration, and stormwater management. Managed work assignments for contractor support in developing technology transfer products including conferences, workshops, exhibits, and reports.

Served as assistant to the Water Supply and Water Resources Division Director in her capacity as chairperson of the NRMRL Watershed Management Team. The mission of this multi-divisional team was to advise the Laboratory Director on how to better align pertinent laboratory research with a watershed approach and to develop associated Government Performance and Results Act (GPRA) goals.

Assisted NRMRL's Associate Director for Ecology in his capacity as co-chair of a major component of the Department of Defense Strategic Environmental Research and Development Program (SERDP). Represented EPA on behalf of the Associate Director in several SERDP Conservation Technology Thrust Area Working Group planning meetings and carried out *ad hoc* assignments, including developing two technical proposals.

Served as NRMRL representative on a multi-Office of Research and Development (ORD) laboratory team that developed a Stressor Identification Protocol widely used to identify causes of stress in aquatic ecosystems.

2003 — 2006 Provided technology transfer and information sharing support to the Water Infrastructure Protection Division of the National Homeland Security Research Center. Assigned to the Center for 40-80% of my work time. Managed the development of multiple projects in the areas of water system protection and risk communication. Contributed to strategic planning and

outreach to key stakeholder organizations, including other government agencies, water utilities, public health officials, and emergency response organizations.

1994 – 1997 *Technical Writer/Editor— National Risk Management Research Laboratory, Technology Transfer and Support Division, Technical Information Branch*

Helped design a series of widely distributed publications intended to highlight ORD environmental research accomplishments for non-technical audiences. Wrote or reviewed publications comprising the series. Performed various writing, administrative, and planning *ad hoc* assignments for Technology Transfer and Support Division (TTSD) management.

Served as leader of the NRMRL Internet Team, which developed an ORD-wide strategic plan for moving from a paper-based technical information distribution toward electronic dissemination primarily using the Internet. Served as a member of a team lead by ORD headquarters that developed a draft "Information Management Component" of the overall *Strategic Plan for the Office of Research and Development.*

1991 – 1994 *Document Management Branch Chief—Center for Environmental Research Information (CERI became TTSD with the reorganization of ORD in 1994)*

Supervised a federal staff of eight, including technical editor, desktop publishers, graphic artist, electronic bulletin board administrator, and a technical publications distribution staff (supervisor of distribution staff reported to me). Responsible for managing the desktop publishing, preparation of camera-ready copy, quality control, printing through the Government Printing Office, and distribution of ORD technical publications received from the various ORD laboratories and centers.

COMPUTER SCIENCES CORPORATION, DAYTON, OHIO

1987 – 1991 *Technical Documentation Manager*

Supervised a Technical Publications staff of 15. Responsible for the creation and production of a high volume of customer deliverable documents and manuals within contractually established deadlines, as well as various briefings, technical capability fact sheets, proposals, site announcements/bulletins, and a monthly CSC-Dayton newsletter.

Reported to the Manager of Technical Publications. Provided major input toward all department budgets, personnel issues, policies, and procedures.

DICONIX, A KODAK COMPANY, DAYTON, OHIO

Feb-Oct 1987 *Marketing Communications Specialist*

Selected to fill a newly created marketing communications position reporting to the Director of National Sales.

Effectively communicated various marketing/sales promotions and programs, product enhancements and new features, and other marketing/sales information to Diconix field sales executives, distributors, and customers. Wrote copy for letters, memos, and sales promotion/program announcements. Created, and wrote copy for product and pricing bulletins and product newsletters.

1984 – 1987 *Technical Writer*

Responsible for all aspects of writing and producing customer user and maintenance manuals for six major products, including computerized ink-jet printers, sophisticated mailing list processing system, and text/graphics work station.

Managed projects (manuals) produced for Diconix by outside contractors; responsible for negotiating costs, quality expectations, and completion schedules. Helped determine department budgets. Provided significant input toward the organization of Diconix technical publications and establishing a uniform style and format for Diconix manuals.

SHEFFIELD MEASUREMENT (FORMERLY THE BENDIX CORPORATION MEASUREMENT SYSTEMS DIVISION), DAYTON, OHIO

1983 – 1984 *Technical Publications Coordinator*

Sheffield disbanded its Technical Documentation Department and began using an outside contractor to produce customer manuals. I was selected to manage all aspects of producing customer manuals for the entire Division, including four major product lines comprised of sophisticated computerized and electronic metrology instrument and coordinate measurement systems.

Responsible for planning content and style of all manuals, formally presenting all projects to the contractor, and negotiating costs, quality expectations, and completion schedules.

1980 – 1983 *Technical Writer*

Researched, planned, organized, wrote, and edited new technical manuals that instructed operators and system administrators to effectively use the sophisticated computerized metrology instrument and coordinate measurement products manufactured and sold by the company.

THE HOBART CORPORATION, TROY, OHIO

1978 – 1980 *Technical Writer*

Researched, organized, and wrote internal engineering specifications and drafting standards. Directly interfaced with Development Engineering personnel to gather and/or clarify technical information needed to complete assignments.

EDUCATION

Master of Environmental Science, Miami University, Oxford, OH, June, 2001
Bachelor of Arts, Wright State University, Dayton, OH, June, 1978

EPA HONORS AND AWARDS

• Four Bronze Medals for Commendable Service

CYNTHIA BUEHLER YUND, PhD, RN

EDUCATION:

Institution and location	Degree	Year	Field of Study
The Ohio State University Columbus, Ohio	B.S.N.	1974	Nursing
University of Cincinnati Cincinnati, Ohio	M.S.N.	1980	Nursing
University of Cincinnati Cincinnati, Ohio	Ph.D.	1999	Environmental Health, Epidemiology

PROFESSIONAL EXPERIENCE:

2007-current *Environmental Health Scientist*
US EPA, ORD, NHSRC, TCAD
Cincinnati, Ohio

Main duties include: coordination and project management of various contracts and co operative agreements for the Environmental Protection Agency's National Homeland Security Research Center; creation of three tools for public health surveillance in a contamination warning system for the Office of Water's Water Security Initiative; studies on risk communication.

2000-2007 *Director of Epidemiology and Assessment*
Hamilton County General Health District
Cincinnati, Ohio

Main duties included: analysis, management, interpretation, and integration of databases pertaining to public health in Hamilton County (census data, Geographic Information System, vital statistics, communicable and chronic disease, surveillance systems, and biological and chemical data bases); provided technical advice on methods for evidence based programming; data collection, storage, retrieval, quality control and confidentiality issues; assisted in communicable disease field investigations; reports and presentations; and regional consultant on epidemiological issues. Supervisory management and budget responsibilities of three programs: vital statistics, communicable disease and epidemiology.

1996-1999 *Ph.D. Candidate*
University of Cincinnati
Department of Environmental Health, Division of Epidemiology
Cincinnati, Ohio

Main activities included: course work; graduate assistant and research; principle investigator for a longitudinal cohort research project identifying injury risk factors in youth soccer players; responsibilities included project design, creation of data collection forms, hiring, training and supervision of support staff, direct data collection, data entry, and complete data analysis.

1991-1995 *President, Owner*
Health Education Resources, Inc.
Cincinnati, Ohio

Responsibilities for all management duties as a licensed provider of continuing nursing education credits for the state of Ohio: development and implementation of programs for nurses and nurse aides working in home care and nursing homes; supervision of five contracted instructors; process and content review; evaluations; record keeping as mandated by the state Board of Nursing.

1983-1988 *Educational Nurse Specialist*
Cincinnati Children's Hospital Medical Center
Cincinnati, Ohio

Responsibilities for all nursing divisions throughout the hospital: development of policy and procedures; two week orientation for all new hires; CPR certification; development and implementation of a forty hour course for intensive care nursing certification; consultation for numerous educational programs; development of self directed learning modules; liaison to Public Relations and Child Health Departments.

1975-1978 *Assistant Head Nurse, Holden Newborn Intensive Care Unit*
University of Michigan Medical Center
Ann Arbor, Michigan

Duties included: direct supervision of fifty nurses; day to day operations of a twenty bed newborn intensive care unit; assigned and reviewed work; evaluated performance; interviewed job applicants; ensured staff adherence to unit policies and procedures; consulted on budget issues.

RESEARCH INTERESTS:

Research interests include the use of public health surveillance data in a water contamination event, human health factors for microbial risk assessment, creation of risk communication tools to be used in an environmental emergency, and decision science for risk management.