



OFFICE OF INSPECTOR GENERAL

Catalyst for Improving the Environment

Evaluation Report

Lessons Learned: EPA's Response to Hurricane Katrina

Report No. 2006-P-00033

September 14, 2006



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Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
EPA	U.S. Environmental Protection Agency
ESF	Emergency Support Function
LDEQ	Louisiana Department of Environmental Quality
MDEQ	Mississippi Department of Environmental Quality
NPDES	National Pollutant Discharge Elimination System
NRP	National Response Plan
OIG	Office of Inspector General
PCIE	President's Council on Integrity and Efficiency
RECAP	Risk Evaluation/Corrective Action Program
USACE	U.S. Army Corps of Engineers

Cover photo: Hurricane destruction in Biloxi, Mississippi, with water tower in background (EPA OIG staff photo).



At a Glance

Catalyst for Improving the Environment

Why We Did This Review

This review was conducted in conjunction with the President's Council on Integrity and Efficiency as part of its examination of relief efforts provided by the Federal Government in the aftermath of Hurricanes Katrina and Rita. Based on our prior reviews of the U.S. Environmental Protection Agency's (EPA's) response to Katrina, this report identifies lessons learned from the Katrina response. We also examined whether EPA followed its emergency response protocols, including those lessons learned from the World Trade Center collapse and the Agency's responsibilities as delineated in the National Response Plan, in responding to Katrina.

Background

On August 29, 2005, Hurricane Katrina made landfall on the Mississippi coast. Katrina devastated the Gulf Coast of Mississippi and Southeastern Louisiana, and caused extensive flooding in New Orleans and extensive damage to the environmental infrastructure in the region.

For further information, contact our Office of Congressional and Public Liaison at (202) 566-2391.

To view the full report, click on the following link:
www.epa.gov/oig/reports/2006/20060914-2006-P-00033.pdf

Lessons Learned: EPA's Response to Hurricane Katrina

What We Found

In our prior reports on EPA's response to Katrina, we reported that EPA, Mississippi, and Louisiana took extraordinary efforts to assess and restore public drinking water supplies after Hurricane Katrina, and that EPA provided timely and quality information to address wastewater and hazardous materials and debris concerns. EPA generally followed its emergency response protocols to ensure that environmental concerns were addressed. Further, the actions taken by EPA and the States in response to Hurricane Katrina generally improved upon the lessons learned from EPA's response to the World Trade Center collapse. EPA officials told us that planning and good working relationships with State officials were key factors in responding successfully to this emergency. While these efforts were generally successful, we identified three lessons learned.

- Coordination within EPA, with State and local officials, and with the U.S. Army Corps of Engineers (USACE) could have been better. In some instances, coordination problems resulted in duplicative work being completed by EPA and Louisiana officials. EPA Region 4 and USACE officials confirmed the need for more interaction between USACE and EPA before the next emergency.
- Initially, there were problems in New Orleans with the transport of drinking water in potentially hazardous tanker trucks. The Louisiana Department of Health and Hospitals, with assistance from EPA Region 6, established procedures, and EPA issued an administrative order to correct this situation in early October 2005. No adverse health effects were identified.
- State of Louisiana officials reported problems querying and verifying the quality of data in EPA's database used to collect floodwater results.

EPA Regions 4 and 6 have initiated actions to address the issues noted in this report for responding to future disasters.

What We Recommend

We recommend that the Assistant Administrators for the Office of Solid Waste and Emergency Response and Office of Water, as part of the Agency's efforts to address lessons learned from Katrina, ensure that the corrective actions discussed in this report are implemented. EPA generally agreed with our recommendation.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

September 14, 2006

MEMORANDUM

SUBJECT: Lessons Learned: EPA's Response to Hurricane Katrina
Report No. 2006-P-00033

TO: Susan Bodine
Assistant Administrator for Solid Waste and Emergency Response

Benjamin H. Grumbles
Assistant Administrator for Water

James I. Palmer, Jr.
Regional Administrator, EPA Region 4

Richard Greene
Regional Administrator, EPA Region 6

This is our final report on lessons learned during the U.S. Environmental Protection Agency's (EPA's) response to Hurricane Katrina. This evaluation contains findings that describe the problems the Office of Inspector General (OIG) has identified and corrective actions the OIG recommends. This evaluation report represents the opinion of the OIG and the findings contained in this report do not necessarily represent the final EPA position. Final determinations on matters in this evaluation report will be made by EPA managers in accordance with established resolution procedures.

The estimated cost of this report – calculated by multiplying the project's staff days by the applicable daily full cost billing rates in effect at the time – is \$59,440.

Action Required

EPA's response to our draft report, dated August 22, 2006, addresses our findings and recommendation. Therefore, in accordance with EPA Manual 2750, we are closing out this final report upon issuance. As outlined in EPA Manual 2750, Agency management is responsible for tracking implementation of the recommendation in its Management Tracking System. We have no objections to the further release of this report to the public. For your convenience, this report will be available at <http://www.epa.gov/oig>.

If you or your staff have any questions regarding this report, please contact Rick Beusse, Director for Program Evaluation, Air Issues, at (919) 541-5747 or beusse.rick@epa.gov; or Jim Hatfield, Assignment Manager, at (919) 541-1030 or hatfield.jim@epa.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Bill A. Roderick", written over a horizontal line.

Bill A. Roderick
Acting Inspector General

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Purpose

The President's Council on Integrity and Efficiency (PCIE), a group of Federal audit and investigative organizations, is conducting multiple audits, evaluations, and investigations of the Federal Government's response to Hurricane Katrina. This review was conducted in conjunction with the PCIE as part of its examination of relief efforts provided by the Federal Government in the aftermath of Hurricanes Katrina and Rita. As such, a copy of the report will be forwarded to the PCIE Homeland Security Working Group, which is coordinating Inspectors General reviews of this important subject. As a member of the PCIE, the EPA Office of Inspector General (OIG) conducted three separate evaluations related to EPA's response that resulted in four separate reports:

- **Drinking Water** - *EPA's and Mississippi's Efforts to Assess and Restore Public Drinking Water Supplies after Hurricane Katrina* (Report No. 2006-P-00011), February 14, 2006; and *EPA's and Louisiana's Efforts to Assess and Restore Public Drinking Water Supplies after Hurricane Katrina* (Report No. 2006-P-00014), March 7, 2006.
- **Wastewater** - *EPA Provided Quality and Timely Information Regarding Wastewater after Hurricane Katrina* (Report No. 2006-P-00018), March 28, 2006.
- **Hazardous Waste and Debris** - *EPA Provided Quality and Timely Information on Hurricane Katrina Hazardous Material Releases and Debris Management* (Report No. 2006-P-00023), May 2, 2006.

This memorandum addresses the fifth and final question of our drinking water evaluation – whether EPA followed its emergency response protocols, including those lessons learned from the World Trade Center collapse and its responsibilities as delineated in the National Response Plan (NRP), in responding to the Katrina disaster. Although this objective was not included in the scope of our other Katrina-related evaluations, this report includes relevant observations from those evaluations regarding our objective. In addition, this report presents lessons learned identified from all three Katrina-related evaluations.

Scope and Methodology

To assess whether EPA followed its emergency response protocols in responding to environmental concerns after Hurricane Katrina, we reviewed the NRP, EPA mission assignments, and recommendations related to lessons learned in the EPA OIG's World Trade Center evaluation report.¹ Lessons learned were identified through interviews with EPA, State, and local officials.

We compared EPA's drinking water-related activities in responding to Hurricane Katrina to the roles and responsibilities identified in the NRP and mission assignments, and to the lessons

¹ *EPA's Response to the World Trade Center Collapse: Challenges, Successes, and Areas for Improvement* (Report No. 2003-P-00012), August 21, 2003.

learned from the World Trade Center report response. We interviewed officials from EPA Region 4 (responsible for Mississippi) and Region 6 (responsible for Louisiana); the U.S. Army Corps of Engineers (USACE) in Vicksburg, Mississippi; the Louisiana State Department of Health and Hospitals; the Mississippi State Department of Health; and selected public drinking water systems in Louisiana and Mississippi.

We also reviewed the results of our Wastewater and Hazardous Waste and Debris evaluations for information and observations relevant to the question of whether EPA followed the NRP and addressed lessons learned from the World Trade Center collapse in those responses. Those results were based on interviews with officials from the Louisiana Department of Environmental Quality (LDEQ) and Mississippi Department of Environmental Quality (MDEQ). We visited impacted areas in Louisiana and Mississippi, including wastewater treatment facilities, landfill sites, and a Superfund site.

This report does not represent a comprehensive review of potential lessons learned during EPA's response to Katrina, but is based upon issues brought to our attention during our prior reviews. In addition, only our drinking water evaluation included the objective to review EPA's compliance with the NRP and lessons learned from the World Trade Center response; thus, our wastewater and hazardous waste and debris management evaluations were not designed to answer that objective.

We conducted our field work from October 2005 through March 2006. This evaluation was not conducted in accordance with *Government Auditing Standards*, issued by the Comptroller General of the United States, but instead was a compilation of evaluations that were generally conducted in accordance with *Government Auditing Standards*.

Lessons Learned

Our four prior reports on EPA's response to Katrina discussed examples where EPA's response was generally successful. For example, EPA drinking water officials and their State, water system, and third party counterparts in Louisiana and Mississippi took extraordinary efforts to ensure that public water service was restored. These systems were cleared from boil water notices only after the States determined the drinking water systems could provide the public with safe drinking water. In our wastewater evaluation report, we noted that EPA provided quality and timely information regarding wastewater to States, wastewater treatment officials, and the general public. Further, in handling hazardous material and debris, we noted that EPA coordinated with State, local, and other Federal government agencies to rapidly identify, prioritize, and assess the nature, magnitude, and impact of hazardous material releases. EPA also provided quality and timely information and actions regarding the management of hazardous and non-hazardous debris and waste.

Regional officials told us that the primary reasons the response to restoring drinking water supplies worked well were the good working relationships and collaborative planning between the State agencies and EPA regions prior to Hurricane Katrina. As a result of this planning, EPA staff were deployed to the impacted areas during the early stages of the hurricane response. This deployment included staff from other EPA regions who volunteered to assist State drinking

water programs. Other factors that contributed to an effective response included the use of common reporting protocols for tracking water system status, the deployment of EPA mobile laboratories and an EPA mobile command center, and the existence of protocols to notify the public about the boil water notices through various media outlets.

EPA followed its emergency response protocols, as delineated in the NRP, to address drinking water concerns. Further, many of the concerns raised in EPA's response to the collapse of the World Trade Center towers did not become significant issues in responding to Katrina. In some respects this can be attributed to the fact that EPA and States have experience in responding to hurricanes and have addressed lessons learned from those prior hurricanes. In our opinion, the importance placed on the lessons learned from the collapse of the World Trade Center towers by the EPA Administrator also helped EPA respond successfully to Hurricane Katrina. Key lessons learned from the World Trade Center response and how EPA's actions in responding to Katrina correspond with those lessons learned are described in Appendix A.

While EPA's response after Hurricane Katrina was generally successful, lessons were learned during this response indicating where actions could be taken to improve future response operations. We identified three such issues during our evaluation.

- Coordination within EPA, as well as EPA's coordination with State and local officials and the USACE, could have been better. In some instances, coordination problems resulted in duplicative work being completed by EPA and Louisiana officials.
- Initially, there were problems in New Orleans with the transport of drinking water in potentially hazardous tanker trucks. The Louisiana Department of Health and Hospitals, with assistance from EPA Region 6, established procedures and EPA issued an administrative order to correct this situation in early October 2005. No adverse health effects were identified.
- Louisiana officials experienced problems in querying data and in verifying the quality of data in EPA's database used to collect floodwater results. EPA Region 6 officials said that they have provided training and a Users Guide to State officials in order to correct this problem.

The following sections discuss in detail these three issues and EPA's efforts to address them.

Coordination within EPA and with Others

EPA officials told us that, in some instances, coordination could be improved for future disaster responses. Areas where coordination could be improved occurred with respect to both the drinking water and wastewater responses.

Drinking Water Response

EPA regional officials and USACE district officials informed us of coordination problems between the EPA and USACE at the beginning of the response.

USACE has lead responsibility for administering the NRP's Emergency Support Function (ESF)-3. This ESF provides Federal support to address public works and infrastructure damage, including public drinking water systems, in an emergency. EPA has a support role under this ESF.

EPA Region 6 officials said initial attempts to coordinate their drinking water-related work with the responsible USACE district were unsuccessful in part due to all of the parties' limited understanding of each other's roles in providing assistance under ESF-3. Region 4 officials noted the USACE district running the response in Mississippi was not aware of Region 4's scientific and engineering expertise in problem-solving for drinking water and wastewater facilities damaged by a hurricane. Consequently, EPA Region 4 officials had to aggressively assert themselves into the process.

A USACE district official confirmed that his organization was not fully aware of EPA's expertise and experience with drinking water systems prior to Hurricane Katrina. This person indicated the need for more interaction between USACE and EPA before the next emergency was a lesson learned. According to EPA Region 4, prior experience with hurricanes improves coordination. For example, Region 4 officials noted the region had established a good working relationship with the USACE district responsible for hurricane response activities in Florida, and that the Florida USACE district is fully aware of EPA's regional capabilities for assisting in drinking water system recovery.

We found no evidence that hurricane response activities were negatively impacted by these coordination issues. For example, EPA Regions 4 and 6 used ESF-10 to obtain the necessary funding to get their personnel into the field. According to EPA Region 4 officials, ESF-10 (which EPA leads and involves responding to Oil and Hazardous Materials emergencies) was modified after prior hurricanes to provide initial response funding to allow EPA to quickly assess drinking water conditions after a hurricane.

With respect to improving coordination with USACE, Region 6 told us that it plans to conduct a series of interagency planning meetings to establish coordination protocols under a Memorandum of Understanding with USACE. Similar efforts are also planned with the Federal Emergency Management Agency. In an effort to prepare for future events of national significance, Region 6 noted that there will be additional training for EPA Region 6 and State staff on the Incident Command System, the NRP, and ESF support functions. The February 2006 White House report, *The Federal Response to Hurricane Katrina: Lessons Learned*, also addressed this coordination issue, and recommends that agencies:

. . . develop integrated operational plans, procedures and capabilities for their support to the base NRP and all ESFs and Support Annexes.... Each primary department or Agency for each

ESF and support annex should develop a detailed operations plan on how they will become operational and coordinate with other annexes and ESF's during a major incident.

Region 4 officials concurred that there is a need for EPA to play a more direct role in responding with USACE to water issues under ESF-3, similar to what is currently done with the U.S. Coast Guard support to EPA under ESF-10. Region 4 suggested a coordinated EPA effort, including headquarters support, to work with USACE to address mission assignments and interagency agreements. As it has done in the past for other hurricanes, Region 4 has started a lessons learned review that it plans to share with other EPA regions.

Wastewater Response

From our review of wastewater issues, we found at times that parts of EPA were not communicating. We also found that EPA could coordinate its work better with the States and with local wastewater facilities. According to LDEQ officials, parts of EPA – Region 6 National Pollutant Discharge Elimination System (NPDES) Permits and Region 6 Water Enforcement Branches – were not always talking or working together, and had asked for similar information from the State instead of coordinating with each other to get the information. According to LDEQ officials, there was also some duplication of effort in collecting information on the status of wastewater treatment facilities. EPA was primarily calling wastewater treatment facilities and Louisiana to determine the status of facilities. Louisiana was visiting facilities and flying aerial reconnaissance to determine the status of wastewater treatment facilities. However, the two agencies did not coordinate their efforts.

According to Region 6 officials, the NPDES Permits and Water Enforcement Branches were jointly charged with putting together an assessment of the wastewater facilities in Louisiana. Region 6 noted that in the first few days there was a huge gap in the information available, and that staff were unable to contact the facilities themselves. As a result, EPA staff charged with getting the information utilized all the resources available to them, which included trying different points of contact. Region 6 officials believe these efforts may have led to some appearance of duplication of efforts. Region 6 officials further explained that within a week, as information became clearer, EPA assigned separate and specific followup tasks to personnel in the branches. Region 6 officials noted that both LDEQ and EPA had a statutory role in implementing the program. Both staffs were co-located in LDEQ offices in Baton Rouge, Louisiana, and staff freely shared information. With respect to both coordination issues discussed, Region 6 informed us that, to the extent there was any duplication of effort, it was only a result of an attempt to ensure that all wastewater facilities were reached, evaluated, and assisted as quickly as possible.

Communication is a key component of emergency response. In two instances brought to our attention, EPA visited two municipal wastewater facilities, asked if their facilities needed assistance, and were told that they needed generators. One facility never received the generators and the other received the generators too late to provide assistance. EPA officials informed us that they worked with USACE and Mississippi to develop a master list of needs that gave appropriate priority to water and wastewater services, and that the Army 249th Prime Power group that supports the USACE in providing generators for critical infrastructures used the master list. The EPA officials believe that the 249th power group used the master list to provide as timely service as possible to high and low priority facilities when scheduling daily site visits.

EPA regional officials concurred that coordination issues existed following Hurricane Katrina. EPA Region 4 and 6 officials said that they have been proactive in taking steps to improve coordination for potential future disasters. According to Region 4 officials, Region 4 has or will be doing the following:

- Providing training to senior officials on their roles and responsibilities in the incident command structure system;
- Ensuring that additional resources are available for future disasters;
- Establishing teams comprised of both drinking water and wastewater experts, which will be pre-deployed with the on-scene coordinators in future disasters;
- Working with public health specialists who play a prominent role in national emergency situations; and
- Working with its State partners to better document and define each agency's responsibilities and expectations for future disasters.

Region 6 officials said they have established a senior liaison position between Region 6 and Louisiana, defined roles and responsibilities between EPA and the States, and developed a DVD that addresses emergency response activities.

Use of Tanker Trucks to Transport Water

Trucks were used to supply New Orleans hotels with water while the public drinking water system was inoperable. This water was pumped into hotel plumbing systems for use and consumption by hotel guests. There were concerns with the safety and suitability of the trucks used to transport this water. In some instances, water intended for public use was transported in tanker trucks previously used in oil fields or other commercial activities.

EPA and the Louisiana Department of Health and Hospitals addressed the problem of improper water handling once it was discovered. Louisiana posted procedures to prevent potentially contaminated water trucks from delivering drinking water to hotels. At the request of the Louisiana Department of Health and Hospitals, EPA issued emergency administrative orders to the two companies involved in improper water transport. The order required both companies to

stop using non-food-grade trucks for transporting water. Both companies complied with the orders issued by EPA. In addition, EPA provided contract services to inspect trucks used to transport water for public consumption in New Orleans.

Mississippi officials told us they were only aware of one instance where a tanker truck was used to transport water. In this instance, trucks were used to provide water to a public hospital. Mississippi officials told us that the hospital was under a boil water notice at the time. In addition, Mississippi officials tested the water from inside the hospital and did not identify any concerns.

According to EPA Region 6 officials, the procedures developed by the Louisiana Department of Health and Hospitals for inspecting tanker trucks will be made available to other EPA regions and States. Additionally, Region 4 noted that it is developing procedures covering the emergency use of tanker trucks on tribal lands, where EPA Region 4 is responsible for administering the drinking water programs.

Problems Using EPA's SCRIBE Database

During emergencies such as Hurricane Katrina, there is an immediate need for decision makers at various levels of government to have reliable water quality data. One of the databases used by EPA to store floodwater data is the SCRIBE database.² EPA provided access to the data to officials at the State level and New Orleans parishes. However, Louisiana officials had trouble querying the database due to a lack of training and had trouble verifying the quality of data due to inconsistent data entry. Set protocols would address these types of issues.

EPA regional officials concurred that problems existed with querying SCRIBE. Region 6 officials said they have taken actions to correct these issues. This included querying the database on behalf of Louisiana until the issue was resolved to ensure Louisiana obtained the information it needed. This also included Region 6 providing training on the use of SCRIBE and making a SCRIBE user guide available to State officials.

Other Katrina Lessons Learned Reviews

EPA's Office of Solid Waste and Emergency Response is also conducting a "lessons learned" review. As part of this effort, the Office developed a database for recording lessons learned from the Katrina response. In addition, Congress has held testimony on lessons learned and the White House recently issued a lessons learned report in February 2006, *The Federal Response to Hurricane Katrina: Lessons Learned*. Congressional testimony and the White House report discussed the impact that damage to communication infrastructure had on the response.

EPA regional officials concurred that tremendous communication issues existed following Hurricane Katrina. Both Regions 4 and 6 indicated they have taken a number of steps to

² SCRIBE is a software tool to assist in managing environmental data. SCRIBE can electronically import sampling, observational, and field sampling data, including air, soil, water, and biota sampling, and can record the global positioning system coordinates for the location where a sample was obtained.

improve communication during future disasters, including upgrading the current telecommunications equipment, planning to deploy additional staff during the next disaster, and reevaluating current communication standard operating procedures.

Recommendation

2-1 We recommend that the Assistant Administrators for the Office of Solid Waste and Emergency Response and Office of Water, as part of the Agency's efforts to address lessons learned from Katrina, ensure that the corrective actions discussed in the report are implemented. Specifically, these planned corrective actions include:

- Conducting interagency meetings and establishing coordination protocols with the USACE;
- Conducting training for EPA Region 6 and State staff on the Incident Command System, the NRP, and ESF support functions;
- Sharing the procedures developed for handling tanker truck support of water in Louisiana with other EPA regions and States;
- Sharing the Region 4 Katrina Lessons Learned review with other regions; and
- Developing procedures for the appropriate use of emergency tanker trucks in tribal lands in Region 4.

Agency Response

The Agency agreed with the draft report's findings and recommendation and has initiated actions to implement the recommendation. With respect to coordinating emergency response efforts with USACE, EPA noted that it met with representatives from USACE to discuss emergency response roles. The USACE created new draft ESF-3 pre-scripted mission assignments that include language for activating EPA support representatives to the ESF-3 team, and for providing direct Federal and technical assistance to States and drinking water and wastewater utilities. EPA met with USACE and other ESF-3 support agencies on August 17, 2006 to discuss roles and capabilities. EPA also reported that Region 6 plans to provide Incident Command System and NRP training for all of the Region 6 Response Support Corps staff. In addition, EPA's Office of Water is sponsoring 24 workshops around the country to help drinking water and wastewater utilities, States, and regional EPA staff better understand and implement the Incident Command System. EPA also responded that Region 4 is finalizing its Katrina After Action Report and plans to distribute the final report to EPA Headquarters and regional offices in September 2006. Also, on August 31, 2006, EPA Region 6 distributed procedures for handling tanker truck support for drinking water to the other regions. Region 4 will work with the Office of Water to develop a tanker truck policy for tribal lands across the nation. The policy development is anticipated to begin in the fall of 2006.

OIG Comment

We believe that the actions taken and planned by EPA sufficiently address our recommendation.

Status of Recommendations and Potential Monetary Benefits

RECOMMENDATIONS						POTENTIAL MONETARY BENEFITS (In \$000s) ²	
Rec. No.	Page No.	Subject	Status ¹	Action Official	Planned Completion Date	Claimed Amount	Agreed To Amount
2-1	8	As part of the Agency's efforts to address lessons learned from Katrina, ensure that the corrective actions discussed in the report are implemented. Specifically, these planned corrective actions include. • Conducting interagency meetings and establishing coordination protocols with the USACE; • Conducting training for EPA Region 6 and State staff on the Incident Command System, the NRP, and ESF support functions; • Sharing the procedures developed for handling tanker truck support of water in Louisiana with other EPA regions and States; • Sharing the Region 4 Katrina Lessons Learned review with other regions; and • Developing procedures for the appropriate use of emergency tanker trucks in tribal lands in Region 4	O	Assistant Administrators for the Office of Solid Waste and Emergency Response and Office of Water			

¹ O = recommendation is open with agreed-to corrective actions pending;
C = recommendation is closed with all agreed-to actions completed;
U = recommendation is undecided with resolution efforts in progress

² Identification of potential monetary benefits was not an objective of this evaluation

Hurricane Katrina Response in Relation to Lessons Learned from the EPA OIG World Trade Center Report

The following sections describe key lessons learned based on our EPA OIG review of EPA's response following the attack and collapse of the World Trade Center towers in New York, and the applicability of these lessons learned in responding to environmental concerns after Hurricane Katrina. In general, many of the concerns raised in EPA's response to the collapse of the World Trade Center towers did not become an issue in responding to Katrina. This can likely be attributed to three factors: (1) some issues were not applicable to Katrina due to the uniqueness of the World Trade Center disaster; (2) for some issues that were applicable, EPA applied the lessons learned from the World Trade Center experience; and (3) unlike the World Trade disaster, EPA and States had experience in responding to prior hurricane disasters that helped prepare them to respond to Katrina. Each section below describes a key World Trade Center lessons learned, and how these concerns were handled, if applicable, with respect to the three major areas of the Katrina response we evaluated: drinking water, wastewater, and hazardous waste and debris management.

Risk Communication

In the World Trade Center evaluation report, we noted EPA did not communicate information that sufficiently characterized the health risk to the public, and its communications to the public were sometimes inconsistent with other EPA information. A combination of EPA employing the lessons learned from the World Trade Center response and the fact that some programs already had risk communication procedures in place for emergencies appear to have minimized this issue as an area of concern after Katrina.

Drinking Water

Based on our work in EPA Regions 4 and 6, and with selected public water systems in areas of Louisiana and Mississippi impacted by Hurricane Katrina, the public was provided with timely, accurate information about the quality of their drinking water and procedures (boil order notices) to minimize risks. For example, on August 31, 2005, less than 48 hours after Katrina made landfall, the Mississippi Department of Health issued a blanket boil water notice for all public water systems in the State's six most impacted counties, located in the coastal region. Similarly, by August 31, the Louisiana Department of Health and Hospitals had issued boil water orders for the 15 parishes affected by the hurricane. A boil water notice alerts the public and informs them to boil their water to prevent health impacts from drinking water potentially contaminated with bacteria. In accordance with its established procedures for issuing boil water notices, the Mississippi Department of Health and the Louisiana Department of Health and Hospitals issued boil water notices to radio and television stations and through daily press briefings, the States' Websites, and other methods.

EPA also provided information to the public regarding the treatment of drinking water. For example, according to EPA staff, 59,620 drinking water flyers were distributed in Louisiana parishes affected by the hurricane. Two publications related to drinking water protection, *What to Do after the Flood* and *Emergency Disinfection of Drinking Water*, were published in English, Spanish, and Vietnamese.

Wastewater

The damage to the wastewater treatment facilities and their collection systems resulted in the potential for people living in impacted communities to be exposed to raw sewage. Due to the risk of serious illness associated with exposure to raw sewage, local decisionmakers needed information to be able to evaluate the potential risk of exposure and take steps to protect their citizens. EPA did a good job supporting States and local communities in this function. The information that EPA provided to the public was augmented by significant efforts by other Federal agencies, State agencies, and the communities themselves. For example, on September 6, 2005, shortly after the hurricane hit, EPA and the U.S. Department of Health and Human Services issued a news release about the dangers of floodwater due to potentially elevated levels of contamination associated with raw sewage and other hazardous substances.

Many of EPA's news releases provided a daily update of the response activities. These daily updates emphasized the activities conducted each day and included summary information about the number of wastewater treatment facilities that had resumed operation.

Hazardous Waste and Debris Management

Based on our work in Regions 4 and 6, EPA coordinated with State, local, and other Federal government agencies to assess potential environmental and human health impacts from Hurricane Katrina. EPA also provided quality and timely information for determining risks and impacts in EPA's areas of responsibility and oversight.

EPA provided quality and timely information on sediment contamination to the States and other Federal decision makers for use in determining associated risk and impact assessment. As of February 2006, EPA, in coordination with LDEQ, had taken more than 800 sediment samples in the New Orleans area to determine the nature and type of contamination that may have impacted residential areas due to the migration of chemicals and other hazardous materials by floodwaters. While some samples exceeded LDEQ and EPA criteria, the majority of the chemicals detected were below levels of health concern. Sampling results were provided to the Federal Emergency Management Agency and to State and Federal health agencies – including the Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry (ATSDR), and Louisiana Department of Health and Hospitals – for risk and impact assessment and public notification. EPA promptly posted summaries of sediment sampling activities, test results, and safety precautions recommended by public health agencies on public Websites as they became available. Public service announcements were promptly issued

regarding precautions related to the now receded floodwaters and the cleanup of sediments. Additionally, EPA continues to post sediment sampling results to its Website as they become available.

EPA promptly identified, prioritized, and assessed all Superfund National Priorities List sites in the affected areas of Louisiana and Mississippi. EPA generally provided quality and timely information on the assessment process to the States, local agencies, and general public. EPA promptly posted assessment results, along with supporting validated analytical data, on the Agency's public Website.

EPA, the U.S. Coast Guard, and LDEQ worked together with local industries to assess, manage, and mitigate environmental damage resulting from oil spills in affected areas of Louisiana. There have been at least five major oil spills reported, each involving over 100,000 gallons, and one spill impacted a residential neighborhood. EPA is providing oversight of the residential cleanup as well as conducting independent sampling. EPA provided its sample results to ATSDR for evaluation and notification to the public. ATSDR concluded that short- and long-term exposures to sediments in the oil spill area do not pose a public health hazard. However, ATSDR recommended that returning residents should avoid direct contact with the oil contaminated sediments, as they may cause skin irritation. Sample results, activities performed, and recommendations for short-term protectiveness related to the Murphy Oil Spill are posted on EPA's public Website as the information becomes available.

Sampling for Environmental Contaminants

Two issues related to sampling were identified in the World Trade Center report. First, we recommended that EPA develop a sampling plan to assess environmental conditions after a large-scale disaster, and ensure adequate sampling for the contaminants of concern. Second, sampling results were not timely reported to the public. After the World Trade Center response, EPA officials said they would develop templates to enable them to report sampling data quicker. The lack of sampling plans was not an issue for the drinking water response, since these programs already had emergency response sampling plans in place as part of the program structure. For the wastewater and hazardous waste response, while EPA did not have pre-developed sampling plans in place, EPA developed quality assurance project plans for sampling these areas of concern and had these plans reviewed by EPA's Science Advisory Board.

Drinking Water

The adequacy of environmental sampling was not a concern in responding to drinking water issues after Katrina. To test for the presence of bacteria in drinking water, Mississippi and Louisiana generated a sampling plan that was patterned after the drinking water sampling requirements that already existed under the Total Coliform Rule. In addition, public drinking water supplies must comply with standards for almost 80 contaminants that address health risks from long-term exposure. These standards remain in force and local systems will continue to test for compliance with these standards, as they did before the hurricane, to ensure that public drinking water supplies are safe.

Public notification of sampling results was not a focus in responding to Hurricane Katrina drinking water issues because of the nature of drinking water sampling. The total coliform test provides a positive or negative result, indicating the presence (or absence) of bacteria; it is not a numerical result subject to interpretation on whether a health-based standard is exceeded. After Hurricane Katrina, if a positive result was obtained, the water system was not cleared from the boil water notice. Therefore, the results were not subject to interpretation as to what level was safe. While not provided with individual sampling results, the public was informed whether to continue boiling their water.

Wastewater

EPA played a major role in sampling floodwaters in New Orleans and coastal water in Mississippi for a variety of contaminants. LDEQ officials used water quality data collected by EPA to evaluate the potential health risks associated with short-term exposure to floodwaters for a variety of contaminants, including bacterial contamination from malfunctioning wastewater systems. Louisiana officials also used this data to make decisions regarding the level of protection required for rescue workers. Region 4, in cooperation with Mississippi, sampled its coastal waters for the presence of pollutants likely to be released as a result of flooding caused by Hurricane Katrina. EPA's Science Advisory Board commented on the Quality Assurance Project Plan.

Hazardous Waste and Debris Management

The adequacy of environmental sampling was not a concern in responding to hazardous waste and debris management issues after Katrina.

To assess sediment contamination, Region 6 focused its initial sampling toward characterizing the sediment to determine potential risks to first responders. On-going sampling and analysis is being conducted to address risk associated with long-term exposure. To help ensure reliable and quality sampling data, Region 6 developed an emergency response quality assurance sampling plan that includes screening levels, quality assurance measures, and data validation requirements. During the initial sampling period of September 10 – October 14, 2005, EPA and LDEQ collected sediment samples at more than 430 sites in the streets and public areas of Jefferson, Orleans, Plaquemines, and St. Bernard Parishes. EPA tested each of the samples for about 200 different pollutants, including volatile organic compounds, semi-volatile organic compounds, total metals, pesticides, and total petroleum hydrocarbons.

With respect to Superfund sites in Louisiana, Region 6, with assistance from the State, conducted initial NPL site assessments during September 2-9, 2005. EPA and LDEQ conducted further evaluation and sample activities (sediments, surface water, and groundwater) from September 13 through October 14, 2005, in accordance with site-specific operations and maintenance monitoring plans. EPA's conclusions regarding the potential impact of the hurricane on the sites were based on comparisons of post-hurricane data to past sample data collected during routine monitoring activities.

Region 6 received, evaluated, and promptly posted validated analytical data results on the Agency's public Website.

In Mississippi, MDEQ conducted initial NPL site assessments during September 7-8, 2005. EPA Region 4 conducted further evaluation and sampling activities from September 15 through October 14, 2005. Sampling activities were conducted in accordance with Region 4's *Quality Assurance Project Plan, Post-Katrina Site Evaluations, Southern and Coastal Alabama and Mississippi, October 2005*, which was developed according to EPA guidance for Quality Assurance Project Plans.

To address oil spills, EPA, working closely with LDEQ, is also overseeing ongoing sampling activities of residential and other properties, and is performing independent sampling activities in a residential neighborhood. As of March 13, 2006, EPA had collected 745 quality assurance/quality control split samples from 7,200 interior and exterior sediment samples gathered at 4,252 addresses by Murphy Oil (a site where a significant oil spill occurred adjacent to a residential neighborhood).

Monitoring Capabilities

Our World Trade Center report noted that monitoring immediately after the collapse of the World Trade Center towers was hampered by a lack of power, equipment, and analytical capacity. Lessons learned from the World Trade Center response appear to have helped in responding to monitoring concerns after Katrina. After the World Trade Center response, EPA expanded its mobile laboratory program. These mobile laboratories played a significant role in providing monitoring assistance to Louisiana and Mississippi after Katrina.

Drinking Water

Although the analytical capacity for Mississippi and Louisiana was diminished after Katrina, EPA Regions 4, 6, and 8 addressed this by providing mobile laboratories and staff to Mississippi and Louisiana to provide monitoring and analytical support for drinking water. Though Region 8 was not impacted, it provided a mobile laboratory.

Wastewater

From our limited review of wastewater facilities impacted by Katrina, we did not find any issues with Federal and State monitoring capabilities. EPA and the States conducted some preliminary water quality monitoring to assess impacts to the environment resulting from the hurricane.

EPA Region 4 and Mississippi conducted water quality monitoring to assess the impacts of Hurricane Katrina on the Gulf environment. A report was released on October 28, 2005, titled *Water Quality Study of Bays in Coastal Mississippi Water Quality Report*, documenting the results, which showed few detectable priority pollutant compounds on the impacted bays and rivers.

On December 6, 2005, EPA released a report assessing floodwaters in Louisiana, titled *Environmental Assessment Summary for Areas of Jefferson, Orleans, St. Bernard, and Plaquemines Parishes Flooded as a Result of Hurricane Katrina*. The assessment found that floodwater samples revealed elevated bacteria levels associated with untreated sewage. It also found that floodwaters no longer serve as a source of exposure to residents returning to impacted areas.

Wastewater treatment facility operators were required to conduct self-monitoring of effluent at wastewater treatment facilities under the State-operated NPDES programs in Louisiana and Mississippi. Facilities in Louisiana were expected to continue regular reporting of their effluent water quality, and facilities in Mississippi were given 30 days to resume monitoring and reporting.

Hazardous Waste and Debris Management

With respect to hazardous waste and debris management, we did not identify any issues with monitoring capabilities. EPA utilized its mobile equipment in the initial assessment period. Details of the monitoring activities are provided above.

Short-Term Exposure Guidelines/Standards

This issue relates to the existence of guidelines for making public health protection decisions. In the World Trade Center report, we noted that short-term or acute standards or guidelines did not exist for some pollutants of concern, and thus had to be developed to address the health effects from exposure to the contaminants of concern. Lack of short-term exposure guidelines was not a significant concern in the Katrina response. While the World Trade Center response dealt with indoor contamination concerns from many pollutants without short-term exposure guidelines, short-term exposure guidelines were already in place as part of the overall program structures for drinking water and wastewater. In the case of hazardous waste, EPA and ATSDR used existing guidelines or developed exposure models based on current available toxicity information to determine associated risk.

Drinking Water

This was not a concern after Katrina since EPA had already established acute exposure standards for total coliform in 1989. Mississippi and Louisiana used the EPA total coliform standard and a modified testing regimen to test drinking water safety after Katrina.

Wastewater

With respect to wastewater, this was not a concern after Hurricane Katrina, as EPA had already established recommended levels of exposures to e-coli, a pollutant commonly found in untreated or partially treated wastewater.

Hazardous Waste and Debris Management

The existence of short-term exposure guidelines and standards was also not an issue with the response to hazardous wastes and the management of debris.

EPA and LDEQ compared levels of chemicals with ATSDR Minimum Risk Levels to the appropriate Minimum Risk Levels to determine risk. For those chemicals with no Minimum Risk Level, ATSDR developed exposure models based on current available toxicity information to determine associated risk. To determine short-term risk associated with the detected chemicals, EPA worked closely with ATSDR to determine appropriate exposure scenarios. EPA and ATSDR concluded that exposure during response activities to the low levels detected should not cause adverse health impacts as long as proper protective equipment is worn (e.g., gloves and safety glasses).

Following the initial sampling period for sediment contamination, EPA began addressing risks associated with long-term exposure. EPA and LDEQ compared results of samples collected after September 25, 2005, to LDEQ's *Risk Evaluation/Corrective Action Program (RECAP) Management Option 1 Soil Standards*. LDEQ's non-industrial RECAP Soil Standards are intended to be protective of long-term (i.e., 30-year) exposures to children and adults in a residential setting. Although the levels in some samples exceeded RECAP standards, they fell within a risk range of 1 in 1,000,000 to 1 in 10,000 risk of an individual developing cancer over a lifetime, from exposure to those concentrations. EPA has found this risk level acceptable in other contexts.

EPA's conclusions regarding potential impact of the hurricane on Superfund sites were based on a comparison of post-hurricane data to existing soils and sediment cleanup values defined for the site, or past sample data. In addition, the results in Mississippi were compared to *EPA Region 9 Preliminary Remediation Goals*³ and the Office of Water's *2004 National Recommended Water Quality Criteria*⁴ to determine whether site conditions might represent previously unrecognized risks to human health and the environment. Region 4 received, evaluated, and promptly posted validated analytical data results to the Agency's public Website.

The results of EPA's sampling activities for oil spills show that the primary contaminants detected include arsenic, polycyclic aromatic hydrocarbons, and diesel and oil range organic chemicals. EPA provided its sample results to ATSDR for evaluation and notification to the public. ATSDR concluded that short- and long-term exposures to sediments in the oil spill area do not pose a public health hazard. However, ATSDR recommended that returning residents should avoid direct contact with the oil contaminated sediments, as they may cause skin irritation. Sample results, activities

³ *EPA Region 9 Preliminary Remediation Goals* are risk-based concentrations based on long-term (i.e., 30-year) exposures to children and adults in a residential setting. The goals are intended to assist risk assessors and others in initial screening-level evaluations of environmental measurements.

⁴ This is a compilation of surface water quality criteria for the protection of aquatic life and human health for approximately 150 pollutants.

performed, and recommendations for short-term protectiveness are posted on EPA's public Website as the information becomes available.

Roles and Responsibilities

Our World Trade Center report noted that there were sometimes overlapping and confusing roles and responsibilities for the various organizations responding to the collapse of the towers. Responders' lack of understanding of roles did not appear to be a significant concern in responding to Katrina. We believe this is primarily because the three areas of the response we evaluated – drinking water, wastewater, and hazardous waste and debris management – are all programs in which management of the program, including responding to emergencies, has been delegated to the States by EPA.

Drinking Water

Except for some coordination issues with respect to EPA and USACE, as noted in this report, this was not an issue when assessing and restoring drinking water supplies after Katrina. Louisiana and Mississippi had previously been delegated responsibility for administering the drinking water systems in their States. EPA's delegation of drinking water primacy to the States clearly establishes that this delegation remains in force during emergencies. Accordingly, EPA fulfilled a support role in the Katrina response, and Louisiana and Mississippi maintained their delegated roles of administering the program. As noted in the previous Katrina drinking water reports, both States took steps to protect the public by issuing boil water notices and overseeing the recovery of water systems.

Wastewater

From our limited review of wastewater issues, we found at times that parts of EPA were not communicating. We also found that EPA could coordinate its work better with the States and local wastewater facilities. The communications issues we observed are detailed earlier in this report.

Hazardous Waste and Debris Management

We did not identify any coordination issues with the response to hazardous waste and the management of debris. Similar to drinking water, we found that Mississippi and Louisiana had previously been delegated responsibility for administering the Underground Storage Tanks programs in their States, including emergencies. As such, EPA fulfilled a support role in the Katrina response, while the States maintained their delegated roles of administering the program. Additionally, EPA primarily fulfilled a support role to the U.S. Coast Guard in response to oil spills. For Murphy Oil, one of the five major oil spills reported, the U.S. Coast Guard, with support from EPA, conducted initial response and assessment efforts. Subsequently, the Coast Guard and EPA split lead responsibilities for oversight of Murphy's cleanup activities at the site. The Coast Guard agreed to provide oversight of the removal of free oil in the canals, tank farm containment area, neighborhood streets, and storm drains. EPA agreed to provide

oversight of cleanup in residential areas accessible to the public (e.g., parks, school yards, roads, highway median strips, and sidewalks).

Handling of Competing Concerns

This issue pertains to the existence of political or economic concerns that would potentially impact the information provided to the public. In the World Trade Center evaluation, it was noted that there were competing economic pressures to reopen lower Manhattan. While, according to media accounts, political and business leaders wanted to reopen New Orleans as soon as possible after Katrina, these desires did not appear to influence the health decisions we reviewed. In particular, EPA's public pronouncements regarding conditions in New Orleans expressed caution with respect to re-inhabiting the city. Competing concerns did not appear to be an issue for other locations we reviewed.

Drinking Water

While public officials desired to have New Orleans opened to the public as soon as possible after Hurricane Katrina, for the systems reviewed we did not find that the desire to reopen New Orleans to the public influenced the decisions made by officials responsible for deciding when to remove boil water notices for public water systems. We also did not identify any undue influences in removing boil water notices for Louisiana systems outside of New Orleans. In Mississippi, neither State officials nor local officials for the four systems reviewed told us of any attempts to influence removing boil water notices because of political or economic concerns.

Wastewater

Based on our limited review of wastewater facilities we visited in Mississippi and Louisiana, we did not find that political or economic concerns influenced the decisions made by wastewater officials responsible for determining when residents should be allowed to repopulate impacted areas.

Hazardous Waste and Debris Management

For the hazardous waste and debris management areas reviewed, we did not find that the desire to reopen New Orleans to the public influenced the decisions made by officials responsible for making public health and safety decisions. In Mississippi, we also did not see evidence of competing concerns influencing officials' decisions to allow residents to return to the locales we visited.

Agency Response

August 22, 2006

MEMORANDUM

SUBJECT: Response to the Draft Evaluation Report:
"Lessons Learned: EPA's Response to Hurricane Katrina"
Assignment No. 2006-001197

FROM: Susan Parker Bodine/s/
Assistant Administrator
Office of Solid Waste and Emergency Response

Benjamin H. Grumbles/s/
Assistant Administrator
Office of Water

TO: James L. Hatfield
Office of Inspector General

This memorandum is in response to the Office of Inspector General's (OIG's) draft Evaluation Report dated July, 21, 2006 "Lessons Learned: EPA's Response to Hurricane Katrina."

EPA manual 2750 requires the Agency to provide a written response to the findings and recommendations. This response has been coordinated with representatives from Regions 4 and 6. EPA concurs with the recommendations included within the report. Our specific responses to the corrective actions are provided in the Attachment.

EPA's Response to Hurricane Katrina has been a major undertaking, involving staff from across the country and at Headquarters. As you note in the draft report, EPA's response to Hurricane Katrina reflects that we did learn lessons from our response to the World Trade Center in 2001. Our response to Hurricane Katrina reflected the progress we have made in implementing an agency-wide National Approach to Response.

We would like to thank you for incorporating into the report considerations we presented to you following review of the discussion draft version. In particular, we appreciate your noting on page 4 regarding interaction with the U.S. Army Corps of Engineers: "We found no evidence that hurricane response activities were negatively impacted by these coordination issues." We suggest that this sentence could also be included in the first bullet of the "At a Glance" section of the report.

If you have questions, please contact Deborah Dietrich, Director of the Office of Emergency Management at 202-564-8600 or Nance Gelb, Deputy Director of the Office of Ground Water and Drinking Water at 202-564-3754.

Attachment

cc: Richard Greene, Regional Administrator, Region 6
Jimmy Palmer, Regional Administrator, Region 4

Attachment

Response to OIG Draft Evaluation Report “Lessons Learned: EPA’s Response to Hurricane Katrina”

Recommendation 2.1: We recommend that the Assistant Administrators for the Office of Solid Waste and Emergency Response and Office of Water, as part of the Agency’s efforts to address lessons learned from Katrina, ensure that the corrective actions discussed in the report are implemented. Specifically, these planned corrective actions include:

- Conducting interagency meetings and establishing coordination protocols with the U.S. Army Corps of Engineers (USACE).

Response: EPA met with representatives from USACE in May to discuss emergency response roles and responsibilities that pertain to drinking water and wastewater systems. USACE and EPA agreed that the USACE ESF-3 Standard Operating Procedures (SOP) guidance should include drinking water and wastewater system assessment and repair, and that additional mechanisms (such as pre-scripted Mission Assignments) should be identified to facilitate this mission. Following the meeting, USACE created new draft ESF-3 pre-scripted mission assignments that include language for activating EPA support representatives to the ESF-3 Team and for providing direct federal and technical assistance to states and drinking water and wastewater utilities. EPA will meet with USACE and other ESF #3 support agencies in August to discuss ESF-3 agency roles and capabilities and will continue to work with USACE to ensure that current ESF #3 SOPs can be appropriately updated and revised.

- Conducting training for EPA Region 6 and State staff on the Incident Command System (ICS), the National Response Plan (NRP) and ESF support functions.

Response: EPA Region 6 has plans underway to require and provide ICS 100/200 level training, as well as training on the National Response Plan for all of the Region 6 Response Support Corps Staff. EPA’s Office of Water is also sponsoring 24 1-day workshops around the country to help drinking water and wastewater utilities, states and regional EPA staff better understand ICS, how to implement ICS within emergency response plans (ERPs), and how to integrate with other first responders within an expanding ICS structure.

- Sharing the procedures developed for handling tanker truck support of water in Louisiana with other EPA Regions and States.

Response: Region 6 procedures for handling tanker truck support of water in Louisiana will be provided to other EPA Regions during the week of August 21, 2006.

- Sharing the Region 4 Katrina Lessons Learned review with other Regions.

Response: Region 4 is in the process of finalizing the Katrina After Action Report. It is anticipated to be completed in September 2006 and will be distributed to Headquarters and Regional Offices. Work on improvements identified in this process is already underway through

the Region 4 Regional Incident Coordination Team (RICT) and through participation on National Approach to Response (NAR) workgroups.

- Developing procedures for the appropriate use of emergency tanker trucks in tribal lands in Region 4.

Response: The Region 4 Water Management Division will work with the EPA Headquarters Office of Water to develop a policy on a nationwide basis for the application of this recommendation for all federally recognized tribal lands across the country. The policy development is anticipated to begin in the fall of 2006.

Distribution

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