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Katrina's Wake

Arsenic-Laced Schools and Playgrounds Put New Orleans Children at Risk

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Executive Summary

When Hurricane Katrina tore through New Orleans in August 2005, the levee failures inundated the city—particularly its most vulnerable neighborhoods—with a hazardous sea of fuel, sewage, and chemicals. Floodwaters containing pathogens from raw sewage and toxic contaminants from oil spills, pesticides, and hazardous waste poured into neighborhood streets, leaving behind thick sediment inside homes, in parks, and on lawns. Two years after the storm, a team of researchers from NRDC, working in partnership with local community groups, has found that hazardous levels of arsenic are still present in the soil at several locations in New Orleans—including schools, playgrounds, and residential areas.

Testing of sediment in flooded areas of New Orleans in the months following Katrina by the United States Environmental Protection Agency (EPA) and NRDC identified high concentrations of arsenic, lead, and other contaminants in many areas of the city in significant excess of state and federal clean-up guidelines. Two years later, we have discovered that people are returning home to communities that have still not been adequately cleaned up. Soil sampling done by NRDC in March 2007 revealed that nearly 25 percent of the 35 New Orleans playgrounds and schoolyards tested two years after Katrina may be classified as arsenic "hot spots." Our data show six schools, two playgrounds, and four residential areas sitting on arsenic "hot spots," where levels of the toxic substance exceed EPA and Louisiana Department of Environmental Quality (LDEQ) clean-up guidelines (see Table 1).

Table 1: New Orleans Schools That Exceed Government Clean-up Levels for Arsenic

School*	Arsenic Level[2] (mg/kg)**	District
McDonogh Elementary (#42)	34.4	Mid-City
Dibert	22.8	Mid-City
Drew Elementary	20.3	Bywater/St.Claude
Craig Elementary	16.1	Mid-City
Medard H. Nelson Elementary School	12.4	Uptown/Carrollton
McMain Magnet Secondary School	12.6	Uptown/Carrollton

* *We only tested schools that were previously-flooded and open in March of 2007. Since then, many other previously-flooded schools have been opened and warrant additional sampling.*

** *Based on sampling done in March 2007.*

- Note: LDEQ arsenic clean-up guideline is 12 mg/kg.
- Note: Region 6 EPA arsenic soil cleanup level for residential areas is 0.39 mg/kg to protect against cancer.

Our testing has further shown that arsenic was not a problem in most locations prior to Katrina. NRDC's testing of archived, location-matched samples from 63 residential areas around the city showed that arsenic concentrations were low before the flooding, indicating that the floodwaters created a new arsenic problem. This finding is important because EPA and LDEQ have dismissed the high arsenic levels as probably present before the flooding, thus not triggering a legal authority for them to clean up the contamination now. We now know that the high arsenic levels are a new issue in many areas of New Orleans, not an old problem.

Arsenic may come from prior use of arsenic-based pesticides, trash incineration, leakage from industrial sites and the use of building materials pressure-treated with chromium-copper arsenate. Alternatively, the arsenic may have been in the sediment at the bottom of the canals and Lake Pontchartrain and distributed throughout the city with the floodwaters. Regardless of where the arsenic came from, the flooding spread it on the surface of the ground, where people can easily touch it, breathe it, or get it in their eyes and mouths. Children's tendency to put their hands in their mouths and play on the ground make them particularly vulnerable to contaminants in soil where they live, learn, and play.

Health Risks of Arsenic Exposure

Arsenic is toxic to humans and is known to cause cancer; no amount is considered fully safe. Many scientific studies, including numerous reviews by the National Academy of Sciences, have determined that arsenic can cause cancer of the bladder, skin and lungs; likely causes other cancers; and can cause a variety of other serious health problems, including birth defects, cardiovascular disease, skin abnormalities, anemia, and neurological disorders.

Other Health Concerns in the Aftermath of the Storm

In addition to toxic sediment, residents returning to the region have been exposed to other health threats:

- **Mold**, the product of heat, water, and natural organisms growing on walls and elsewhere, poses serious risks to air quality. When inhaled, mold spores can cause major allergy and asthma attacks, cough, hypersensitivity pneumonitis (a pneumonia-like illness), and even infections in people with weakened immune systems.

- **Fine particulate matter**—small particles of soot, dust, or dried-up sediment that penetrate deep into the lungs—has been linked to reduced lung function, coughing, wheezing, cardiac arrhythmia, stroke, lung cancer, and premature death. In New Orleans post-Katrina, the particulate matter in the air was unusually high in toxic heavy metals such as arsenic, chromium, and lead.

- **Contaminated drinking water** resulted from significant damage to the municipal water system and broken water mains. In the days immediately following the storm as many as 185 of the 683 drinking water facilities in the state were unable to provide clean, safe water to residents. In New Orleans, the storm ruptured more than 20,000 water pipes and there were published estimates of 100 million gallons of water per day leaking underground throughout the system during the months following the flooding.[1]

It is critical that officials on the local, state, and federal level work together to eliminate these health threats from post-Katrina New Orleans and to repair the heavily damaged infrastructure to make the city safe for returning residents.

> *"After Hurricane Katrina, it is just as important to test and clean up school yards as it is to provide text books to our children. School officials must understand that the important work of removing mold and repairing our school buildings after the storm must also include ensuring that our children are not exposed to arsenic and other toxic contaminants in school yards."*
>
> —Mary Joseph, Executive Director, Children's Defense Fund Louisiana, and Monique Harden, Co-Director, Advocates for Environmental Human Rights

Residents Still Wading in Debris and Waste

Hurricane Katrina left behind another, more visible reminder of the storm: an enormous quantity of debris, much of which has still not been cleaned up. The forces of Katrina and Rita combined to dump as much as 100 million cubic yards of debris into the region—enough garbage to fill the Superdome more than 55 times—much of it mixed with hazardous materials.[2] Although the Army Corps of Engineers, supervised by the Federal Emergency Management Agency (FEMA), has been largely responsible for cleaning up this debris, efforts have been slow and uncoordinated, and a great deal of debris remains in neighborhoods. It is critical that debris cleanup proceed with an eye toward a sustainable New Orleans. Measures must be taken to preserve the unique historical and social flavor of the city without creating new problems that will only add to the legacy of toxic pollution in the region.

Solutions for Charting a Safer Course for New Orleans

Our government must make New Orleans safe for returning residents and kids. We recommend a three-step plan for safely cleaning up schools, playgrounds, and communities in New Orleans. The EPA and LDEQ should protect residents by:

1. **Fully informing the public** of health risks, including access to treatment and information on exposure to toxins;

2. **Conducting additional sampling** at schools, playgrounds, and other "hot spots" where EPA and NRDC testing has shown high levels of arsenic or other contaminants in the soil, to determine the full scope of the contamination. Sampling should also be done at other locations around the city to make sure that other hot spots have not been missed, with particular attention to locations where there are sensitive populations, such as schools and playgrounds.

3. **Performing a site-specific assessment** after sampling to determine whether the contamination poses a health risk, especially to sensitive populations such as children.

4. **Working with local communities** to clean up all areas that have unsafe levels of contamination. Clean-up measures include removing the first 6 inches of topsoil, safely disposing of the contaminated soil, and then replacing it with 6 inches of fresh topsoil. The cost of doing this is relatively low. For an average-size single-family home, the cost of completing the remediation, including soil hazardous material disposal fees and equipment rental, is between $3,500-$5,000.

The city can also take steps to remove the mountains of debris left behind by the storm. Some strategies for effective debris management include:

- Practicing deconstruction, not demolition, by dismantling structures in a way that separates its component materials.

- Recycling, reusing, and composting.

- Emphasizing proper waste disposal by banning open burning, avoiding the construction of unnecessary new landfills, and using the proper procedures for removing hazardous debris.

- Establishing an effective process for debris management that includes plans for short- and long-term debris disposal.

Finally, the federal government has a role to play in helping New Orleans rebound from the storms. The 110th Congress can aid cleanup efforts by:

- Demanding that agencies charged with natural disaster responsibilities—FEMA, the EPA, and the Army Corps of Engineers—exercise their legal authority to conduct site-specific risk assessments in areas where EPA and independent sampling have identified toxic contamination and to execute comprehensive cleanup actions;

- Advocating for strengthening existing levees, closing the Mississippi River Gulf Outlet (MR GO), and restoring the coastal wetlands that can buffer against future storm damage;

- Demanding joint oversight hearings on reconstruction activities by the relevant federal agencies—and on agency plans for future natural disasters—by the appropriate congressional committees; and

- Investing in capacity building for community-based organizations in New Orleans working to rebuild in a manner that is green and sustainable.

Environmental Justice After the Storm

The images seared into our collective national memory from the days following Katrina are those of displaced victims waiting, often for days, to be rescued from the deadly storms that had engulfed New Orleans. The grim reality is that, more often than not, these victims were low income and people of color. Low-income communities and communities of color often bear the brunt of environmental health disasters; nowhere was this more evident than in post-Katrina New Orleans.

Before the storm, low-income communities and communities of color in New Orleans were already dealing with more than their fair share of environmental burdens: A quarter of inner-city New Orleans children had enough lead in their blood to be classified as lead-poisoned, and at risk for learning disabilities and behavioral problems.[3]

Two years after the storm, not only are pollution problems in these neighborhoods exacerbated, but public services such as schools, day care centers, hospitals, and public utilities continue to function at lower levels than before the storm. Public housing is scarce, and other housing is more expensive than it once was. Some 114,000 people still live in temporary trailers. Many of the neighborhoods that remain virtually uninhabitable were once predominantly communities of color.

In those neighborhoods that are coming back, environmental agencies are using the fact that some New Orleans communities had poor environmental quality before the storm as an excuse not to clean up to levels that would adequately protect public health now. They say Katrina can't be blamed for the problem. But the reality is that even if the storm didn't discriminate, decisions not to address health threats that remain in low-income communities and communities of color do discriminate. Environmental justice requires that policy decisions, funding choices, and revitalization efforts include the voices of all New Orleans residents.

NRDC in Action: Responding to Katrina

In the aftermath of Hurricane Katrina, NRDC responded to the crisis by immediately sending to New Orleans a team of experts on public health and environmental protection. NRDC's field studies were among the first conducted in the city after the storm hit. We partnered with local groups to measure toxins, test for health hazards, and make sure that government support reached the city's neediest neighborhoods. We distributed information on proper cleanup techniques and helped residents to make sense of the EPA's inscrutable data on environmental hazards.

Two years after the storm, our work in New Orleans continues: NRDC scientists continue to take soil samples that expose dangerous chemicals in schoolyards, our policy experts are pushing the government to respond to residents' contamination concerns, and our advocates are working with local groups to make sure clean-ups take place.

CHAPTER 1

Hazards on the Playgrounds: NRDC Finds Elevated Levels of Arsenic in New Orleans Schoolyards

NRDC sampling two years after Hurricane Katrina shows that arsenic levels at some New Orleans schools and playgrounds today exceed LDEQ and EPA clean-up guidelines. Arsenic is a substance that can cause cancer, neurological damage and other chronic health problems, and is particularly harmful to children.[4]

In March 2007, NRDC researchers returned to New Orleans to test for ongoing evidence of arsenic in areas of concern such as schools, playgrounds, and residential areas where previous sampling conducted by EPA in 2005 and 2006 found high levels of arsenic. The team tested at 116 residential, elementary school, and playground sites in the city. The arsenic levels in these soil samples varied significantly. This is not surprising, as the contaminated sediment likely washed into low areas, against structures, or down storm drains, creating a patchy residue of contamination. Although only four of the 81 residential sites (5 percent) exceeded the government clean-up level in this most recent round of testing two years post-Katrina, some of these sites had very high levels. For example, a soil sample from a residential neighborhood in Mid-City contained a whopping 41 mg/kg of arsenic, and residential areas in New Orleans East contained arsenic concentrations of 23.6 and 30 mg/kg (see Table 2). These levels are two to three times higher than the government clean-up levels for arsenic. Remaining residential arsenic "hot spots" were identified in Mid-City, New Orleans East, and Lakeview. However, many other hot spots may be unidentified, since the scope of the sampling was limited.

Some Schoolyards and Playgrounds Are Arsenic "Hot Spots"

Schools and playgrounds showed some of the highest arsenic levels among the sites tested. Soil tested in playgrounds and schools in March 2007 shows that almost 25 percent of the 35 playgrounds and schoolyards tested may be arsenic "hot spots." Thirty percent of samples taken from schools and 13 percent of samples taken from playgrounds exceed the Louisiana and EPA clean-up level (see Table 3).

Table 2: Arsenic Hot Spots in New Orleans Today

District	Sampling Location	Arsenic Concentration (mg/kg)
Gentilly	Alexander Milne Playground	18
Gentilly	Schabel Playspot	19.3
Lakeview	Residential Neighborhood	14.3
Bywater/St. Claude	Drew Elem	20.3
Mid-City	Residential Neighborhood	41
Mid-City	Craig Elem	16.1
Mid-City	McDonogh Elem (#42)	34.4
Mid-City	Dibert Elem	22.8
New Orleans East	Residential Neighborhood	23.6
New Orleans East	Residential Neighborhood	30
Uptown/Carrollton	Medard H. Nelson Elementary School	12.4
Uptown/Carrollton	McMain Magnet Secondary School	12.6

** Sites where arsenic concentrations exceeded the clean-up level.*

Note: Based on sampling done in March 2007. LDEQ clean-up level = 12 mg/kg. Region 6 EPA arsenic soil clean-up level for residential areas is 0.39 mg/kg to protect against cancer.

Table 3: Present-Day Arsenic Levels in Some Parts of New Orleans

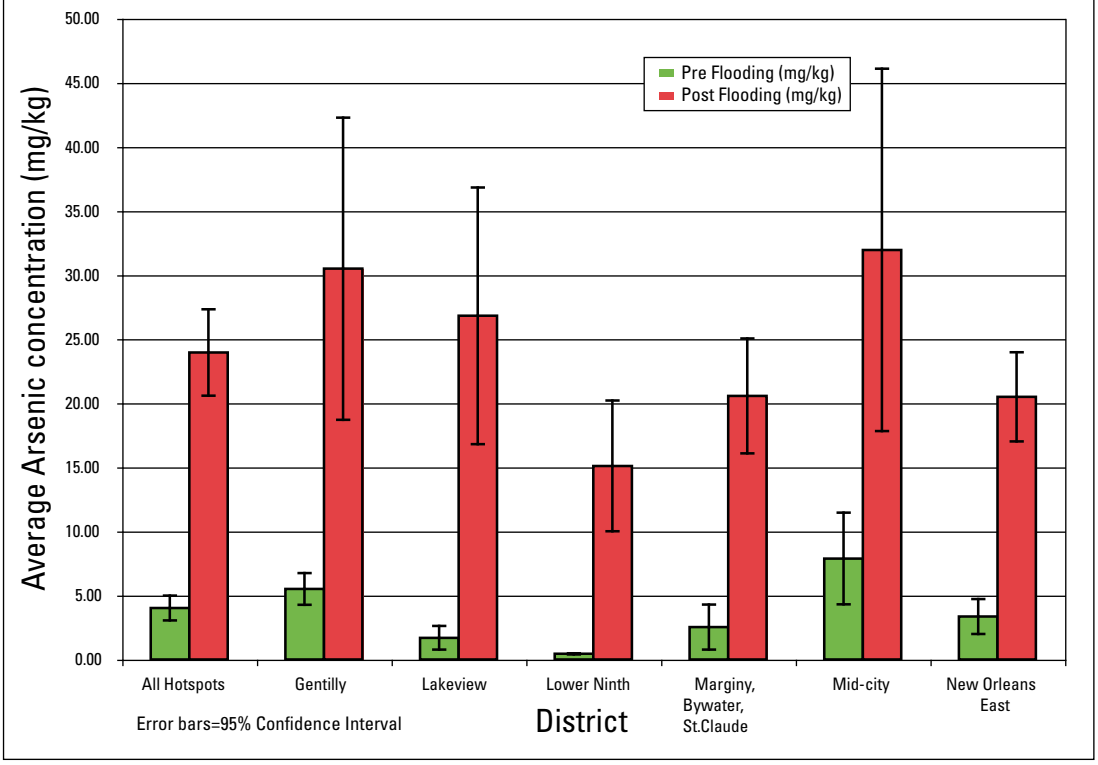
Sampling Location	Percent of sites sampled that were hot spots	Number of hot spots exceeding clean-up levels*	Average arsenic (mg/kg)	Minimum arsenic (mg/kg)	Maximum arsenic (mg/kg)	Number of sites sampled
Elementary/ Middle Schools	30%	6	6.9	0.40	34.4	20
Playgrounds	13%	2	6.8	0.45	19.3	15
Residential Neighborhood	5%	4	3.4	0.41	41	81
Total	10%	12	4.4	0.40	41	116

**Clean-up level = 12 mg/kg.*

Arsenic Contamination of Soils in New Orleans is a New Problem Since Katrina

In addition to studying current day levels of arsenic in New Orleans soils, NRDC also conducted additional testing to determine if New Orleans soils were high in arsenic before the flooding caused by Katrina. Archived soil samples collected by researchers at Xavier University in residential neighborhoods in the years before Katrina hit were tested for arsenic and the results were compared to the results of EPA testing at the same (or nearby) locations conducted immediately after the flooding. The levels of arsenic in the soil were consistently higher in the samples taken after the storm (see Figure 1). Out of 63 residential locations with elevated arsenic levels according to EPA tests in 2005-2006, only four sites had elevated arsenic pre-Katrina. The post-flood "hot spots" contained arsenic concentrations averaging 24 mg/kg, whereas pre-Katrina soil samples from matched locations averaged 4 mg/kg (see Table 4). In comparison, the LDEQ clean-up guideline is 12 mg/kg.

Figure 1: Arsenic Contaminated Sediment from New Orleans Floodwaters Matched with Pre-flooding Soil



Government Has Been Unresponsive to Contamination Dangers

Despite potentially hazardous levels of arsenic in New Orleans soil, not one cleanup of contaminated sediment has been conducted by either the EPA or the LDEQ since Hurricane Katrina struck. Both agencies claim that the high arsenic levels existed before the hurricane, and therefore do not trigger any legal authority for them to clean up schoolyards and other contaminated areas (see Appendices C and D). However, NRDC's analysis of archived soil samples demonstrates that the arsenic discovered post-Katrina was generally not present before the storm. Responding to pressure from NRDC and community groups, on August 21, 2007, LDEQ performed sampling at four of the top six schools NRDC identified with high levels of arsenic. At the time of publication, the results were not yet made available.

Table 4: Arsenic Levels Pre- and Post-Flooding

District	Avg pre-flooding concentration	Avg post-flooding concentration	Avg increase post-flooding	Avg distance between matched samples(m)	Number of matched samples
Gentilly	5.5	30.5	25.0	108.3	8
Lakeview	1.7	26.8	25.1	101.2	9
Lower Ninth	0.4	15.1	14.7	93.8	2
Marigny, Bywater, St. Claude	2.5	20.6	18.1	163.4	8
Mid-City	7.9	32.0	24.1	154.7	9
New Orleans East	3.0	20.5	17.5	292.1	25
All Hot spots	3.9	24.0	20.1	195.0	63

> *"It is the government's responsibility to provide clean and healthy schools for our children, and it is their duty and moral obligation to help this city get back on its feet. It's time for government officials to quit passing the buck and do their job."*
>
> —Dr. Beverly Wright, Director of the Deep South Center for Environmental Justice

CHAPTER 2

Health Threats to New Orleans Residents: Pollution in the Air, Land, and Water

Years of environmental abuse in New Orleans did more than simply expose the region and its residents to the deadly winds and floodwaters of Hurricanes Katrina and Rita. Long-term neglect also made it possible for floodwaters to distribute a variety of health and safety hazards throughout the area. Floodwaters containing pathogens from raw sewage and toxic contaminants from oil spills, pesticides, and hazardous waste poured into neighborhood streets, leaving behind sediment inside homes, in parks and other public spaces, and on lawns. As the waters receded, mold grew abundantly in flooded buildings, contaminating both the indoor and the outdoor air with dangerously high levels of mold spores. The drying sediment blew in the air, creating another respiratory hazard for returning residents. Finally, contaminated drinking water from leaking sewer and water mains was an ongoing threat for many months.

In the years since Katrina and Rita, a number of organizations and agencies have tested the air, water, and soil in the areas affected by the storms. Among those collecting data were government agencies such as the U.S. Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC); a team of scientists dispatched by the Natural Resources Defense Council, joined by the Deep South Center for Environmental Justice, Louisiana Environmental Action Network, Holy Cross Neighborhood Association, and other local groups; and a team of testers

working for the Louisiana-based Subra Co. and Altamont Environmental, Inc. The results of these tests were remarkably consistent, showing a clear set of environmental concerns in the region.

History of Toxin-Laden Sediment

The floodwaters that inundated New Orleans carried a mixture of soil, sewage, and industrial contaminants.[5] When they receded, they left behind a layer of sediment up to 4 inches thick. Although some of the sediment has washed into storm drains, much of it has likely settled into the soil or accumulated along the sides of buildings. When activities disturb the sediment, these toxins can become airborne and inhaled by workers and residents. As families move back into these communities, children may be playing on contaminated soil for years to come.

The toxins spread throughout New Orleans likely came from multiple sources, including:

- storm-related releases and spills of petroleum, pesticides, and other chemicals;
- toxic sediment from lake and river bottoms stirred up by the storm;
- flooding of hazardous waste sites;
- household hazardous wastes, such as cleaning agents and home pesticides; and
- abandoned automobiles.

Testing by NRDC, the Subra Co., and the Environmental Protection Agency found sediment contaminated with lead, petroleum, pesticides, industrial chemicals, arsenic, and polycyclic aromatic hydrocarbons (PAHs). Health effects from long-term exposure to arsenic and the various toxins in sediment after the flooding include an increased risk of cancer, as well as neurological damage and other chronic health problems.[6]

The testing that has received the broadest attention was that done by the EPA. By and large, the EPA has reassured the public that the communities are safe. But NRDC's careful analysis of the EPA's data called into question the agency's assurances.

Specifically, NRDC analysis showed that most districts in New Orleans contained—and in some cases, still contain—concentrations of arsenic, lead, diesel fuel, or cancer-causing benzo(a)pyrene above levels that would normally trigger investigation and possible soil cleanup in the state of Louisiana. Some hot spots in residential neighborhoods had levels of contamination that are more than 100 times normal soil-cleanup levels. For example, at a location in Mid-City, the amount of arsenic in the soil following the storm was 200 times the federal health-based level of concern for soil in residential neighborhoods, and 6.5 times the Louisiana cleanup level for residential soil. Locations in Chalmette and in the St. Roch neighborhood had diesel fuel contamination more than 200 times the Louisiana soil-cleanup level. A hot spot for benzo(a)pyrene contamination was in Bywater, at the Agricultural Street Landfill, where the levels exceeded Louisiana soil-cleanup levels by a factor of more than 50.

Independent tests by NRDC and others also revealed that sediment contamination by certain substances, such as arsenic and diesel fuel, was widespread in a number of neighborhoods (Mid-City, Lakeview, New Orleans East, Uptown/Carrollton, the Garden District, Bywater, the Ninth Ward, and Gentilly). In all of these areas, arsenic and diesel fuel contaminants were found at levels that exceed the soil-cleanup guidelines for residential neighborhoods issued by the Louisiana Department of Environmental Quality (LDEQ) and the EPA.

Such sediment contamination poses a health hazard in both the short term and the long term. In the short term, residents and workers may be exposed to toxic materials by getting harmful particles on their hands or in their eyes and mouths, or by inhaling dust from airborne sediment at a cleanup site or elsewhere. Such exposures can cause coughing; irritation of the eyes, nose, and throat; and skin rashes. In the long term, families living in once-flooded neighborhoods may be at significant health risk from exposure to contaminated soil, unless the sediment is safely removed and replaced with clean soil.

NRDC analysis of EPA data collected in 2005-2006 turned up disturbing results about the level of contamination of four dangerous toxins in the greater New Orleans area:

- **Arsenic**—Ninety-five percent of the sediment samples collected by the EPA had levels of arsenic that could potentially pose a significant cancer risk, according to EPA guidelines. Thirty percent of samples could trigger cleanup under the weaker Louisiana guidelines. Arsenic is toxic to humans and is known to cause cancer; no amount is considered fully safe.[7]

- **Diesel fuel**—The levels of diesel fuel (measured as diesel-range organics) in 59 percent of the sediment samples collected by the EPA would potentially trigger soil cleanup under LDEQ guidelines. In Orleans Parish, this number reached 91 percent. Inhalation of the vapors released from diesel fuel can damage the kidneys, increase blood pressure, and decrease the ability of blood to clot.[8]

- **Benzo(a)pyrene**—Levels of the carcinogen benzo(a)pyrene were high enough in 43 percent of the sediment samples collected by the EPA to potentially trigger soil cleanup under LDEQ guidelines. Benzo(a)pyrene is one of several dangerous PAHs that can cause chromosome damage, cancer, and immune suppression and pose risks to normal fetal development.[9]

- **Lead**—Lead, which is known to affect brain development in children and believed to cause kidney problems[10] and reproductive disorders[11] in adults, was found at levels that could pose a serious health risk. Five percent of the sediment samples the EPA collected in the greater New Orleans area had levels of lead that would potentially trigger soil cleanup under LDEQ guidelines. However, in Orleans Parish, as much as 28 percent of samples taken had enough lead to be classifiable as hazardous waste according to EPA guidelines.

Mold

The combination of late-summer heat and floodwaters created the perfect mold-growing environment, and NRDC's testing in the months after the flooding revealed extremely high levels of mold spores in the air. Mold exposure can cause congestion, sneezing, runny or itchy nose, and throat irritation. More serious symptoms include major allergy and asthma attacks, cough, and hypersensitivity pneumonitis (a pneumonia like illness with symptoms including difficulty breathing and fevers). Some studies have shown that outdoor levels of mold spores are directly associated with childhood asthma attacks requiring a visit to an emergency room, and that these respiratory effects are present even where daily airborne spore counts are relatively low.[12] Mold also poses a special threat to immunosuppressed individuals.[13]

Children in New Orleans may be especially vulnerable to mold because of the city's very high asthma rate. One study indicated that "if a child lives long term in New Orleans, the chance is approximately 24 percent that the child will develop asthma over his or her early lifetime."[14] The combination of mold and asthma can prove deadly. According to one study, "the risk of death from asthma is 2.16 times higher if mold spore counts are greater than 1,000 spores per cubic meter." [15] In post-hurricane New Orleans, NRDC tests found that outdoor spore counts per cubic meter soared to more than 50,000 in some neighborhoods.

Using standards established by the National Allergy Bureau, outdoor mold spore counts in most flooded neighborhoods, including New Orleans East, the Lower Ninth Ward, Bywater, Gentilly, Chalmette, Uptown/Carrollton, and Mid-City, were classified as "Very High," with estimated average daily levels of more than 50,000 spores per cubic meter. Levels in Lakeview were deemed "High." Such outdoor mold spore concentrations could easily trigger allergic or asthmatic reactions in sensitive people.

NRDC's testing of homes for indoor mold found that where moldy furniture, carpets, and drywall were still in place, mold readings were extremely high—so high, in fact, that these homes would be considered dangerous and uninhabitable by any definition. NRDC also tested homes that had been flooded and had then undergone some remediation, including

removal of contaminated furniture and carpets and removal of some drywall. In these homes, mold concentrations were lower, but still dangerously high. Tests of two homes that had been fully remediated, including removal of all furniture, carpets, and drywall down to the studs, as well as airing and mold treatment, found mold spore counts that very nearly matched the outdoor air.

Subsequent testing by other researchers has confirmed the high levels of airborne mold, and has also demonstrated endotoxin in the indoor air of flooded homes post-Katrina.[16] Endotoxin is a product of certain types of bacteria, and is a very potent cause of inflammatory reactions, especially of the respiratory system. There is a need for ongoing monitoring of the mold situation in residential neighborhoods of New Orleans. Unfortunately, the EPA and other agencies have failed to undertake ongoing monitoring, so New Orleans residents today have no way of knowing how high the mold counts are in their air.

Particulate Matter

Fine particulate matter—that is, very small particles of dust, soot, or sediment—has been linked in hundreds of studies to a long list of serious human health effects, including reduced lung function, coughing, wheezing, missed school and work days due to respiratory symptoms, increased use of asthma medications, cardiac arrhythmias, strokes, emergency room visits, hospital admissions, lung cancer, and premature death. Infants and children are especially sensitive to particulate matter pollution, as are people with asthma, the elderly, and people with preexisting heart or lung disease.

Particulate matter is a problem in many American cities, largely the result of cars, trucks, construction vehicles, and industrial facilities that burn fossil fuels. New Orleans faces a very specific challenge because floodwaters covered much of the city with sediment that carries a range of toxic substances. After the floodwaters receded, the sediment dried, and it was then kicked up into the air by wind or even by attempts to clean it. Once airborne, it easily could be inhaled.

NRDC samples of airborne particulate matter revealed high levels of lead, arsenic, and chromium. The concentrations of arsenic and chromium were far above EPA guideline values for air, and the concentration of lead was above EPA's air quality standard. Compared with monitored concentrations of lead from prior years in New Orleans, the concentrations were far higher in the aftermath of Katrina (October 2005). Separate testing in St. Bernard Parish conducted by the Louisiana Bucket Brigade found "arsenic, cadmium, and various benzene compounds…at levels that exceed EPA and the [Louisiana] Department of Environmental Quality (LDEQ) standards."[17] It is unlikely that the EPA standards for regular particulate matter were sufficient to protect against the unusual composition of the particles in the air in the New Orleans area. Unfortunately, there were no government warnings about disturbing or inhaling the sediment, and ongoing testing of the air quality has not been done to ascertain that the problem has resolved.

Damaged Drinking Water Systems

Another health challenge confronting the Gulf Coast is the provision of clean water to residents.[18] Louisiana estimated that it needed to rebuild 50 percent of affected sewage treatment plants at a cost of $38 billion.[19]

When water mains rupture, the pressure in nearby sections of the water system decreases significantly. The low water pressure can cause contaminants from outside the pipes to be sucked into the system. Contaminated soil, effluent from adjacent broken sewer mains, or petroleum spills can be pulled into the drinking water system through breaks in the pipes. As a result, even if the water leaving the treatment plant is safe to drink, it may become contaminated on the way to the tap.

In June 2006 the New Orleans water system was still losing 85 million gallons of water daily—more than two-thirds of the total leaving the city's treatment stations. By September 2006 the volume of water leaking out of the system was still estimated at 40 million to 50 million gallons per day.

In response to community concerns about potential contamination of the drinking water, NRDC lead a coalition of nonprofit, nongovernmental groups, that tested water in New Orleans on three separate occasions in June through October 2006. The testing focused on residual chlorine, bacterial contaminants, byproducts of disinfection, and parasites; five samples were also tested for a list of 170 chemical contaminants.

Sampling showed that the quality of the drinking water in most homes was fairly good. Testing for bacteria, molds, and yeasts did show that the heterotrophic plate count (HPC) was significantly elevated above the guideline level in three samples tested (10 percent). Although the EPA nonenforceable guideline limit is 500 colonies, these three samples tested at 1,700, 1,700, and 5,700 colonies.[20] The elevated HPC is an indicator of poor system maintenance but is not itself considered to be a direct health threat. Water systems with a layer of microbial material (known as biofilms) inside their pipes may have a high HPC count even in the presence of a disinfecting agent such as chlorine. The samples that tested high for HPC were located in Uptown/Carrollton and in Village de l'Est. Retesting at these three sites revealed lower HPC (4, 100, and 740 at the three sites). The persistently elevated HPC was in a FEMA trailer in Village de l'Est.

> *"The recovery of the city of New Orleans has been a demonstration of public will. Pulling together with neighbors and volunteers, residents have done what government has to do—rebuild and recover."*
>
> —Stephen Bradberry, Lead Organizer ACORN New Orleans and recipient of the 2005 Robert F. Kennedy Human Rights Award

None of the initial 30 tests were positive for total coliform, but one of the three retests was positive for total coliform. Total coliform is an indicator of certain types of bacteria in water. However, because coliform may be from a fecal or non-fecal source, the presence of total coliform alone is not a decisive indicator of the health risk of drinking water. However, one of the sites had elevated coliform bacteria on repeat testing. Coliform bacteria can be associated with intestinal illness, and are a potential cause for concern.

Although the results of the independent water tests do not demonstrate widespread contamination or clear health threats, the sampling was too limited to conclude that the water is safe at all times and in all locations in New Orleans. Many residents reported sporadic problems with low water pressure and unusual smell, color, or taste, so it is fairly likely that there are still remaining problems with the water system. More systematic testing throughout the system is necessary in order to assure residents that their water is safe to drink.

What Oil Spills and Toxic Chemical Pollution Mean for New Orleans Neighborhoods

According to the U.S. Coast Guard and the EPA, some 575 Katrina-related spills of petroleum or hazardous chemicals were reported in the aftermath of the storm. Ten major to medium oil spills have fouled the Mississippi River from Chalmette to Venice and west to Port Fourchon, releasing a total of nearly 8 million gallons of oil, and the Coast Guard estimates that the region endured approximately 134 minor spills of less than 10,000 gallons each (see Table 5). (By way of comparison, the *Exxon Valdez* disaster resulted in the release of 11 million gallons of oil.) The flood-affected area has some 2,200 underground fuel tanks, an unknown percentage of which ruptured in the storm.[21] Post-storm testing by local and national environmental groups, the EPA, and state officials confirmed that many formerly flooded areas were contaminated with pathogens and toxic chemicals, often at concentrations significantly higher than federal and even lax state safety guidelines. At most of these major oil spill sites, cleanup is ongoing.

Table 5: Ten Most Significant Louisiana Oil Spill Sites

Facility, Location	Spill (gallons)
Murphy Oil, Meraux	1,050,000
Chevron Empire Terminal, Buras	983,000
Bass Enterprises, Cox Bay	3,780,000
Shell, Pilottown	1,070,000
Dynegy, Venice	24,822
Sundown Energy West, Potash	13,440
Sundown Energy East, Potash	18,900
Bass Enterprises, Point a la Hache	461,538
Shell Pipeline Oil LP, Nairn	136,290
Chevron, Port Fourchon	53,000
TOTAL	**7,590,990**

Gert Town: A Community with a Legacy of Environmental Abuse

The New Orleans community of Gert Town, site of the former Thompson-Hayward pesticide blending and storage facility, highlights the problems associated with pre-storm contamination. Gert Town is a low-income area where the residents, overwhelmingly African-American, earn an average household income of less than $23,000. [22] At the edge of the community is a one-block plot where the Thompson-Hayward company began producing pesticides such as Agent Orange and DDT in 1941. Production stopped in the mid-1970s, but until the 1980s the company still used the facility as a warehouse for a number of dangerous pesticides, including aldrin, dieldren, chlordane, and DDT.

In 1987 municipal workers discovered that sewers adjacent to the facility were contaminated with toxic components of dry-cleaning fluid. A state-ordered cleanup ensued, in which 75,000 gallons of toxic liquids and millions of pounds of soil were removed. However, an estimated 2,600 tons of herbicide-contaminated soil was left behind because no state would accept it for disposal. Outrage in the community surrounding the facility led to a protracted legal battle that resulted in a $51 million settlement.[23]

Hurricane Katrina brought a renewed pesticide threat to Gert Town when it flooded the community with six feet of water, prompting worries that the pesticide residue would spread. NRDC sampling done around the site and in the surrounding residential neighborhood in the immediate aftermath of the storm showed those worries to be well founded. Tests showed that the level of DDT and one of its breakdown products in the sediment exceeded the EPA soil-cleanup levels by about twofold. Two other organochlorine pesticides—dieldrin and heptachlor epoxide, a breakdown product of heptachlor—were also significantly in excess of the cleanup levels, with the dieldrin level nearly seven times higher.[24]

When floodwaters engulfed the facility, they carried away pesticides that had not been removed as part of the state-ordered cleanup in the 1980s, and then spread these pesticides throughout the surrounding area. These pesticides are so toxic and persistent in the environment—that is, they do not break down into safer components—that they have been banned for use in the United States for more than 25 years, and are now banned worldwide by international treaty.

Since Katrina, onsite but not offsite cleanup has been instituted at the Thompson-Haywood site.[25] Due to pressure by Advocates for Environmental Human Rights, on-site remediation was completed using excavation and off-site disposal in July 2007.

CHAPTER 3

A Mountain of Trash Left Behind

Hurricanes Katrina and Rita combined to deposit as much as 100 million cubic yards of debris in the New Orleans area, much of it mixed with hazardous chemicals.[26] This waste includes household items of every sort, garbage, unknown amounts of hazardous materials from both residential and commercial sources, white goods (such as household appliances), vehicles, electronics, vegetation, and demolition debris. Two years later, the task of cleaning up the enormous quantity of debris is far from finished.

As many as 350,000 automobiles and other vehicles were flooded and ruined by the storms. The gasoline and other toxic fluids in these vehicles—as much as three million gallons, by some estimates—pose a severe threat to returning residents.[27] After Katrina, sediment testing detected levels of diesel fuel contaminants that exceeded the national and state cleanup standards. Benzo(a)pyrene, a petroleum chemical that causes various cancers in animals[28] and is associated with lung cancer in humans,[29] was also detected above state cleanup levels. Petroleum-based substances degrade over time if they are exposed to heat and open air, but it is unclear how much contamination from gasoline and other toxic fuels remains below the surface, in the deeper soil and groundwater. Rather than assuming the contamination will take care of itself, it is imperative that public agencies continue monitoring the soil and groundwater to ensure the continued safety of the people and environment of New Orleans.

An unknown quantity of toxic materials from home garages and storage areas, such as pesticides, solvents, and cleaning agents, also found its way into flood waters. One of the most significant types of Katrina-related debris still in the area has yet to be addressed: the tens of thousands of flood-ruined structures, many of which are likely to contain hazardous materials such as lead, asbestos, household hazardous waste, and other toxins. Asbestos, a chemical linked to serious lung problems and cancer, was once a widely used building material in the South because of its resistance to extreme heat. As the rebuilding process continues, the release of airborne asbestos is a significant concern.

To date, the Army Corps of Engineers—under the supervision of FEMA and with input from the EPA and state environmental officials—has been largely responsible for addressing the massive debris problem. Waste management activities thus far have included modest efforts to separate white goods, vehicles (cars and boats), household hazardous waste, and vegetation from the large stream of hurricane-related debris. But these efforts have been slow and uncoordinated, and there has been little if any effort dedicated to developing a more comprehensive debris separation, reuse, recycling, and composting program, which could safely divert millions of tons of waste away from Louisiana landfills.[30]

Superfund and Other Hazardous Waste Sites

At least two Superfund sites in the New Orleans area were flooded by Katrina. The Agriculture Street Landfill held decades of municipal garbage and hazardous waste that contained lead, arsenic, dioxin, and carcinogenic hydrocarbons (see "Agriculture Street Landfill Seeps Toxins into Community"). The Southern Shipbuilding site in Slidell included pits and lagoons containing 35,000 cubic yards of sludge contaminated with cancer-causing polyaromatic hydrocarbons (PAHs) covering approximately eight acres. [31] Dozens of other hazardous waste sites in Louisiana, Mississippi, and Alabama were also in the path of Katrina and Rita. Data about their safety are still being collected.[32]

Agriculture Street Landfill Seeps Toxins into Community

The Agriculture Street Landfill in New Orleans was originally the site of a municipal dump dating back to the early 1900s. The city closed the 95-acre site in 1958, but reopened it seven years later for debris from 1965's Hurricane Betsy. Waste of all sorts was piled onto the site and burned for a period of six months before it was finally covered with ash and again closed.

In the 1970s, the site—which had once been sprayed with DDT—became home to an ill-conceived housing development.[33] The 390 housing units had approximately 1,000 residents, most low-income African-Americans.[34] In 1994, after years of lobbying by community leaders, the city built a fence around an undeveloped part of the landfill, removed contaminated soil from play areas on the site, and took steps to register the area as a Superfund site. The EPA ordered in 1998 that the site be cleaned of its toxic load of lead, arsenic, dioxin, and carcinogenic hydrocarbons.[35]

Then Katrina flooded the area, and subsequent testing by the EPA, NRDC, the Louisiana Environmental Action Network, Subra Company, and the *San Antonio News Express*, found dangerously elevated levels of PAHs, cancer-causing chemicals from soot and petroleum-based products.[36] NRDC's testers reported that leachate was visibly leaking from the landfill site, spreading across the street and onto the grounds of the local senior citizens' center. Tests of this oily-appearing leachate revealed the elevated levels of PAHs.[37]

With mountains of debris continuing to clog the city more than two years after the storms, it is critical that mismanagement of Katrina-related debris does not become the latest addition to the list of burdens being borne by the people of New Orleans.

CHAPTER 4

Storms Shine a Spotlight on Environmental Injustice

Hurricanes Katrina and Rita focused new attention on the deterioration and degradation of Louisiana's coastal landscapes and the toxic legacy of years of environmental abuse. The residents of southern Louisiana were hit hard, not just by the storms but also by the government's failure to prepare for and respond to their inevitable and devastating effects.[38] The grim reality is that the damage done by the storms might have been less severe were it not for years of careless and flagrant abuse of the environment.

Poor environmental policy decisions made long before Katrina combined with natural forces to create the worst disaster to befall an American city in decades. These institutional failures of environmental management and emergency response have left many residents struggling to rebuild their homes, livelihoods, and communities.[39] With the wealthier areas of the city largely situated on higher ground and insulated from the worst impacts, it is the poor and minority residents who have been hardest hit. More than a century of laws and policies steering African-Americans and the poor to low-lying, flood-prone areas left these disadvantaged communities exposed to the most severe storm damage. Louisiana also has a long history of state-sponsored incentives for industrial expansion that have resulted in a proliferation of polluting industries along the backyard fence lines of low-income communities and communities of color.[40] In Katrina's wake, these neighborhoods were devastated, depopulated, and contaminated—and remain so to this day.

Bad Environmental Policy Worsened the Disaster

As ferocious as the hurricanes were, the loss of life and property might not have been as profound but for a series of bad decisions made by government and business leaders in the decades preceding the storms. Many years of resource exploitation contributed to the scope of the disaster, first by robbing the area of some of its natural defenses against flooding, and second by introducing a host of hazardous substances into the floodwaters.

Diminished Wetlands Could Not Protect the Louisiana Coast

Years of poor government and industry stewardship destroyed much of the region's wetlands, depriving the area of more than a million acres of land that might have absorbed part of the storms' fury. Hurricane winds sent a surge of saltwater inland, flooding tens of thousands of acres of freshwater marsh. Much of the water became trapped inside levees designed to keep it out, where it mixed with oil spills and effluent from ruined houses, businesses, and sewage-treatment plants. The resulting ecological damage exacerbated an already severe environmental problem that had been decades in the making.

Healthy coastal wetlands provide critical habitat and food resources and act as natural buffers against hurricanes. Experts estimate that every 2.7 miles of coastal wetlands along the Gulf Coast reduces storm surge by about a foot.[41] But over the past 75 years, Louisiana has lost more than 1.2 million acres of its coastal wetlands.[42] That loss continues today at a rate of 24 square miles per year, with the hurricanes accelerating that loss.[43] Most of this wetlands loss has been caused by human intervention in the form of navigational channels, oil and gas infrastructure, and levees—particularly the building of levees on the Mississippi River for flood control and navigation purposes.[44] While these levees provided the needed flood protection, they also prevented vital land-building sediments and nutrients from replenishing and elevating deteriorating marshes. Instead of feeding into wetlands, sediment followed man-made channels into the Gulf of Mexico.

This system of channels provides navigation for commerce as well as access to oil rigs and other industrial facilities, but during Katrina it became a "hurricane highway," allowing stormwater to sweep rapidly inland, bypassing marshland on a direct course toward New Orleans. A prime culprit was the Mississippi River Gulf Outlet (MR GO), a 76-mile shortcut from the Mississippi River to the Gulf of Mexico.[45] The construction and maintenance of this little-used navigation channel over the past 40 years has destroyed 20,000 acres of coastal land in St. Bernard Parish. It is believed to have channeled the Katrina storm surge into some of the most vulnerable areas of New Orleans and St. Bernard Parish.[46]

Oil and Gas Industry Pollution Opened the Door for Toxic Contamination

Over the years, environmentally disastrous choices were made to create and store toxic waste and to allow serious contamination of soils and underwater sediments in an area that annually faces the threat of severe hurricanes. These choices led to a commingling of toxic contamination and floodwaters that spread poisons throughout the region.

With its huge reserves of crude oil, Louisiana ranks fifth among the 50 states in oil production, generating about 4 percent of total U.S. crude oil.[47] The state has nearly 20,000 producing oil wells and a large network of crude oil pipelines, liquefied petroleum gas pipelines, and storage facilities. Louisiana is also home to two of the four U.S. Strategic Petroleum Reserve storage facilities, at West Hackberry in Cameron Parish and at Bayou Choctaw in Iberville Parish. The state's 19 petroleum refineries have a combined crude oil distillation capacity of nearly 2.8 million barrels per calendar day, second only to Texas.

The inevitable byproduct of these industries is hazardous waste, and Louisiana ranks second, again behind Texas, in the quantity of hazardous industrial waste generated. Calculated on a per capita basis, Louisiana actually leads the nation.[48] Rather than imposing and enforcing meaningful environmental standards, the state government has generally catered to industry, even going so far as to promote the state's southern bayous as a potential disposal area for other states' hazardous waste.[49]

Reconstructing New Orleans for the Future

The reconstruction of New Orleans and the surrounding areas must be informed by past mistakes, so decision makers can steer clear of the calamitous choices that exacerbated the damage done by the storms of 2005. Industry can and should return, but it must learn to do business in ways that do not subject the region to toxic waste or contaminated soils

and sediments. The water management infrastructure—including dams, levees, and channels—must be planned so that it no longer robs the region of its needed wetlands or funnels stormwater straight at the heart of New Orleans.

Importantly, rebuilding also presents a unique opportunity to build a modern and sustainable city, one that preserves New Orleans's unique architecture and spirit while leaving its citizens less vulnerable to environmental disaster. The new New Orleans should be a city where neighborhoods are separated from industry, so that there are no longer any low-income citizens living just beyond industrial fence lines, exposed to toxins with every breath they draw. It should be a place where transportation from home to work and back does not demand a daily overdose of air pollution.

The reconstruction process will take years; various stakeholders are still arguing over what areas of the city will be rebuilt and how the rebuilding will be done. Nearly two years after Katrina and Rita, little progress has been made on the long-term environmental and economic issues confronting the region. Its citizens deserve better. Policymakers, business leaders, and community officials must be willing to commit energy and resources to building a sustainable environment for Louisiana's coast, address serious public health questions, and create an efficient and effective disaster-preparedness system.

The EPA Fails to Protect the Health of New Orleans Residents

After Katrina, a natural disaster of unprecedented scope and scale, the affected communities looked to their local, state, and federal government for support and assistance. Communities not only sought immediate disaster response assistance but also guidance regarding whether it was safe to return home. Residents expected that if the government found toxic contamination, it would exercise its authority to the fullest extent to clean it up and protect residents. But the Environmental Protection Agency—the nation's primary body of expertise and regulatory enforcement authority for controlling and responding to environmental threats to public health—decided early on to punt its responsibility.

It did so in two major ways. First, the agency declared that it had no authority or responsibility to monitor or address indoor air pollution, claiming that the mold threat was an indoor air problem despite NRDC data demonstrating extremely high mold levels even in outdoor air in flooded areas.[50] Second, with regard to toxic sediment, the EPA deferred to local authorities—which often lacked the staff of environmental health experts and access to scientific resources available to the national agency—regardless of the fact that EPA had primary responsibility to protect citizens' health in the wake of the massive Katrina-related oil and hazardous chemical releases.

The EPA itself noted on its Katrina home page, "In emergency situations such as this, *EPA serves as the lead Agency* for the cleanup of hazardous materials."[51] But surprisingly, the EPA repeatedly stated after the hurricanes that it was not the agency's obligation to decide whether environmental conditions in New Orleans and other areas affected by toxins and oil pollution were so dangerous as to warrant continued quarantine or additional cleanup prior to general repopulation of the affected areas. In short, the EPA refused to make any explicit public statements about whether it was safe for the public to return to New Orleans and other hard-hit areas. This reluctance was especially puzzling in light of the staggering amount of the agency's own sampling data demonstrating significant toxic contamination.

It was not until August 17, 2006, a year after the hurricanes, that the EPA officially made the explicit public statement that "adverse health effects would not be expected from exposure to contaminated sediments from the previously flooded areas, provided people use common sense and good personal hygiene and safety practice."[52] When the announcement was finally made, an estimated 190,000 residents had already returned to previously flooded areas and were potentially already at risk.[53]

CHAPTER 5

Charting a New Course for New Orleans

Hurricane Katrina was one of the greatest disasters in the history of the United States. Now, two years after the storm tore through the city, we must ensure that our handling of the toxic chemicals and mountains of debris left behind by the storms does not compound this tragedy by passing on a toxic legacy for future generations. Expansive and systemized solutions will be needed to protect the long-term safety of residents rebuilding their city. This section outlines some first steps for rebuilding New Orleans.

Protecting Public Health

1. **Ensure safe and healthy schools for returning children.**
   Flood-damaged schools should be rebuilt in a manner that fully protects children's health. Rebuilt schools should be LEED-certified and incorporate guidelines developed by the Collaborative for High Performance Schools for the design of energy-efficient, healthy, comfortable, well-lit schools. Care should be taken to make design, engineering, and materials choices that prevent mold from growing indoors. The city also should guarantee that soil on school grounds is clean and safe by making sure it is tested and cleaned to at least the level of the most protective cleanup guidelines in the country.

2. **Remove contaminated sediments.**
   The city should immediately request that FEMA and the EPA remove contaminated sediment from New Orleans's communities and conduct further investigation and remediation of toxic hot spots.

3. **Monitor the air and water.**
   There is a need for ongoing monitoring of the air and water quality in New Orleans. In many cases, no data are available since 2006, yet we know that there were documented problems with mold, endotoxin, heavy-metal-contaminated particulate matter, and drinking water contamination. These findings need to be followed up to ensure they have resolved.

4. **Fully inform the public of health risks.**
   The city should ensure that state and federal agencies continue to fully assess health risks for residents returning to contaminated areas before making any official declarations that it is safe for them to do so.

5. **Initiate state legislative hearings on cleanup.**
   The city should request that the Louisiana legislature hold hearings on the sediment contamination health threat and the need for sediment cleanup/remediation. The city also should push for more public and legislative dialogue on the issues of rebuilding and debris and waste management.

6. **Give residents access to treatment for exposure to toxins.**
   The city should demand that the federal Public Health Service and Agency for Toxic Substances Disease Registry provide ongoing medical care and testing to residents exposed to toxins, as required by the Comprehensive Environmental Response, Compensation and Liability Act (section 104(i)(1)).

7. **Restore coastal wetlands.**
   Decades of industrial misuse and government-sponsored reengineering gone awry have almost completely destroyed the Gulf of Mexico's natural coastal barriers. The city should work with federal and state officials to ensure they adopt a major coastal wetland restoration program in the Louisiana Delta.

Ridding the City of Hazardous Waste and Debris

Tens of thousands of buildings will need to be demolished due to irreparable structural damage or because of the impact of petroleum spills, mold growth, and other contamination. This demolition process will generate an enormous quantity of debris, which is likely to contain hazardous materials such as lead, asbestos, household hazardous waste, and other toxins. Rebuilding the city will also generate significant quantities of construction debris, which will only add to the debris management burden.

The city must act now to adopt a forward-looking debris management strategy that complies with EPA requirements for "integrated waste management." The recommendations below, in addition to offering wiser debris management choices, suggest actions that will contribute meaningfully to New Orleans's economic recovery by creating jobs, generating marketable products for recovery/rebuilding efforts, and facilitating the development of an active marketplace for reconstruction materials.

1. **Practice deconstruction, not demolition.**
   Instead of knocking a building down with heavy equipment and carting the resulting debris away as a mixed aggregate of solid waste, deconstruction involves deliberate dismantling of a structure to separate its component materials. The ability to effectively take advantage of building deconstruction requires development of a well-thought-out process for:
   - on-site deconstruction, separation, sorting, and diversion of debris materials;
   - transport of debris to temporary staging/sorting/distribution locations;
   - distribution of constituent materials to recycling facilities, construction or restoration projects, or other processors or end users; and
   - proper disposal of debris that cannot be otherwise salvaged for a useful purpose.

2. **Recycle, reuse, and compost.**
   A cleanup plan that emphasizes these three components would benefit the health of New Orleans's communities, reduce the need for landfill space, facilitate economic recovery, and allow the city to respond much more quickly (and more sensibly) to future disasters.
   An effective recycling plan must include, at minimum:
   - Recycling of aggregate (brick, masonry, etc.);
   - Recycling of metals (roofing materials, appliances, piping, wiring, etc.);
   - Recycling of nonmetal roofing materials;
   - Recycling of glass and ceramics;
   - Recycling of plastics;
   - Recycling (or reuse) of clean lumber; and
   - Composting of any suitable organic materials (including soils).

3. **Emphasize proper waste disposal.**
   New Orleans can ensure that its waste disposal process adequately protects the public by:
   - Identifying specific procedures and targets for removing hazardous components of the disaster debris (including household hazardous waste and asbestos);
   - Avoiding the creation of new landfills if possible;
   - Banning the use of open burning as a debris management strategy (including use of "air curtain incinerators");
   - Using appropriate types of landfill that consider the nature and characteristics of the waste;
   - Applying appropriate siting procedures, including meaningful public participation criteria and environmental justice principles for new landfills, if necessary; and
   - Planning to remediate existing landfills (such as the Chef Menteur landfill) that contain potentially harmful inappropriate wastes.

4. **Establish an effective process for debris management.**
   New Orleans must pursue a community-centered, public-private collaboration that is transparent and accountable. The city should join with the state of Louisiana and relevant federal agencies to form a multidisciplinary stakeholder task force whose mission is to help the city quickly develop short- and long-term recommendations for dealing with post-Katrina solid waste and debris.

Federal Cleanup Solutions: Recommendations for the 110th Congress

As the 110th Congress continues its work, we recommend the following actions:
Meetings with senior officials at the appropriate federal agencies charged with natural-disaster responsibilities—FEMA, the EPA, and the Army Corps of Engineers—to demand action on the above priorities, accountability for past problems, and proactive measures for future storm seasons.

Coordinated lobby days in Congress, with affected community members and environmental, civil rights, and faith groups supporting legislation to address wetlands restoration and action to assure the rebuilding and cleanup of the area, including homes, schools, and other buildings affected by the hurricanes.

A joint demand for oversight hearings on reconstruction activities by the relevant federal agencies, and on agency plans for handling future natural disasters, by the appropriate oversight committees in Congress.

Investment of additional organizational resources in the sustainable renewal and green revitalization of the Gulf region.The problems left behind by Hurricane Katrina are our nation's responsibility. It will take a sustained national effort to rebuild, revitalize, and realize a new, sustainable, and just New Orleans for the future.

Appendix A: Arsenic Sampling Methodology, March 2007

1. 85 residential locations in the City of New Orleans had concentrations of arsenic above the LDEQ clean-up guideline of 22 mg/kg in sediment according to EPA sampling conducted September 2005 through June 2006;

2. These locations were matched using GIS software to the closest soil sample collected pre-Katrina by Dr. Howard Mielke (Tulane-Xavier) and available in his soil archive;

3. 65 matched pre-flood samples were available, most within 400 meters of the original location. Twenty locations were not matched because there was insufficient archived sample or because the sampling points were close together and the matched location was a duplicate;

4. 65 stored soil samples were analyzed for arsenic using EPA method 6010b;

5. 118 residential, school, and playground sites in the City of New Orleans were sampled in March 2007 and analyzed for arsenic using EPA method 6010b;

6. 65 of these sampling locations were located within one block of sites where previous EPA sampling found elevated levels of arsenic;

7. Two samples were omitted from this analysis, resulting in 63 matched residential area samples and a total of 116 samples from March 2007.

Appendix B: EPA Legal Authorities and Obligations to Respond to Natural Disasters

The EPA's decision to defer to local agencies to make determinations of whether it was safe for residents to return to New Orleans appeared to undermine its own legal authority under such laws as the Clean Water Act (CWA); Resource Conservation and Recovery Act (RCRA); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund); and Oil Pollution Act (OPA). Moreover, under its own National Contingency Plan (NCP) regulations, the EPA carried the lead responsibility for evaluating and acting to remedy environmental health threats.

In particular, NCP regulations impose numerous obligations on the EPA to ensure that its response to releases of hazardous substances or oil protects exposed citizens. For example, the NCP requires that after an oil spill, "[d]efensive actions *shall* begin as soon as possible to prevent, minimize, or mitigate threat(s) to the public health or welfare of the United States or the environment."[54] Moreover, if "the discharge poses or may present a substantial threat to public health or welfare of the United States, the [EPA representative] *shall* direct all federal, state, or private actions to remove the discharge or to mitigate or prevent the threat of such a discharge, as appropriate."[55] Similarly, RCRA states that once the EPA knows of hazardous waste at any site that presents an "imminent and substantial endangerment to human health or the environment," then the EPA "*shall* provide immediate notice to the appropriate local government agencies" and "*shall* require notice of such endangerment to be promptly posted at the site where the waste is located."[56]

Under these laws, the EPA bears the lead responsibility for evaluating and acting to remedy environmental health threats. While it is clear that local and state authorities also share in the legal obligation to assure that local residents are protected from such environmental health threats, under federal law, when there is such a declared national emergency and a significant threat from hazardous substances and oil, the EPA bears the responsibility of being "the lead agency" for assuring public health protection from these environmental health threats.

The EPA has also often used its Superfund authorities and funding for hazardous waste removal actions and relocations of entire at-risk populations, but the Superfund is now largely bankrupt because Congress has ended the chemical and

oil industry fee that funded it. Consequently, all cleanup and relocation costs now must come directly from the EPA's budget, and ultimately from taxpayers. This has served as a political disincentive for the EPA to exercise its authority to order site cleanup and to protect residents from environmental hazards.

In addition to Superfund, each of the EPA's major statutes—such as the Safe Drinking Water Act (SDWA), RCRA, CWA—includes a plenary "imminent and substantial endangerment" provision. The provision allows the EPA to go to court and/or issue administrative orders to force essentially any action that the EPA believes is necessary to protect public health or the environment from an imminent and substantial endangerment due to a release or threatened release of hazardous chemicals or petroleum. The term "imminent and substantial endangerment" has been read by the courts very broadly to favor EPA intervention whenever there is a reasonable question about the safety to the public posed by toxic pollution. RCRA, for example, lets the EPA sue or issue orders to force action "as may be necessary" to protect the public from waste pollution. SDWA provides the EPA broad authority to issue orders or sue to force action to protect public health from possible contamination of water supplies or underground water. Similarly, CWA gives the EPA authority to respond to such endangerment by suing for actions "as may be necessary" to force anyone causing or contributing to pollution to take any action needed to protect public health or the environment.

The exercise of some of these powers is not unprecedented. In the past, the EPA has relocated people from contaminated homes, and it has sometimes even relocated entire communities (such as Times Beach, Missouri; the Love Canal in Niagara Falls, New York, public housing residents in Portsmouth, Virginia; and, more recently, a large number of pesticide-contaminated homes in Mississippi, Louisiana, and other states) due to hazardous substance contamination. EPA has also tested air quality inside private homes in the past. In 1994 the agency took samples in 9,000 houses in Ohio after a highly toxic pesticide was illegally sprayed in the community. The EPA eventually decontaminated 1,000 homes.[57] Yet in New Orleans, the EPA claimed it did not have the authority or responsibility to test for contamination inside homes or to decontaminate homes.

Taken together with numerous other legal authorities, it is clear that Congress intended that the EPA have the authority to take sweeping actions as lead agency in the case of such nationally declared emergencies to protect the people of New Orleans and other communities from toxic contamination.

EPA Failure to Exercise Legal Authorities

After the September 11 terrorist attacks on the World Trade Center, a lawsuit was brought against the EPA for its failure to act on its legal authorities to clean up environmental contamination at the site.[58] Throughout the litigation, the EPA denied that it had any explicit responsibility to act in response to the disaster. Specifically, the EPA argued that it was not required to act to protect workers or the public from environmental contaminants, but that it could do so voluntarily at its own discretion.[59] The statement, although shocking, was also extremely revealing regarding the EPA's reluctance to exercise the multitude of legal authorities it possessed to clean up and protect people from environmental contaminants in a time of disaster. The court found that in the case of the September 11 attacks and under the six provisions of the NCP that the plaintiffs relied on, the plaintiffs did not identify a mandatory duty to act under the provisions of the NCP. In other words, the court decided that residents do not have a legal right to force the EPA to use its authority. Instead, the EPA is free to decide when to act.

The September 11 litigation provides helpful insight into explaining why EPA chose not to exercise its legal authorities after Katrina. In the aftermath of September 11, it was clear that the EPA recognized it had the authority to protect workers and the public from toxic contaminants. Nonetheless, the agency bent to political pressure and failed to take charge of the cleanup, instead announcing to the public that everything was fine.

In the case of Katrina, with environmental ramifications on an even greater scale, the EPA was even more careful to avoid making statements regarding the safety of returning residents. At first, the EPA avoided making any formal declarations

regarding the safety of returning to previously flooded areas. However, at the same time, the agency released advisories recommending that residents take all precautions that one would take if there were significant toxic contamination.[60] The advisories ranged from recommending that people shower often, wash their hands regularly, change clothes often, and use washable doormats, to encouraging the use of respirators in previously flooded areas and avoiding activities that generate dust.[61]

The EPA's careful attempt to walk the line between saying it was "safe" and "unsafe" was clear early on. EPA's reluctance to issue firm guidance resulted in confusion among residents and relief workers who, as a result, may have exposed themselves to unnecessary risks. Shortly after the hurricanes, EPA Administrator Stephen Johnson responded to exactly this question by saying:[62]

> "Well, unfortunately it's not a yes or a no answer because, again, what we're seeing in the sediment area is that we're seeing some of those sediments highly contaminated with petroleum products and for those areas that have high contamination you really shouldn't be coming in contact with it. For those areas with very low contamination there's probably not a health consequence with but still prudent advice would be—common-sense advice would be to avoid exposure, take precaution."

By sending mixed signals that on one hand it was "safe" to return, but on the other hand people should significantly alter their normal daily behavior to guard against toxic exposure, EPA performed a grave disservice to returning residents by allowing them to be exposed to known environmental hazards. Furthermore, Johnson's admission that "high contamination" was a problem in some areas in New Orleans is troublesome in light of the agency's decision to not take any cleanup actions regarding the contaminated sediment.

In New York, the EPA's failure to act backfired—the agency is facing extensive criticism from New Yorkers who feel that the respiratory illnesses they developed subsequent to September 11 could have been avoided if EPA had disclosed the potential health threats of dust exposure at the site. The long-term health effects of exposure to post-Katrina conditions remain unknown. The EPA can show it learned from its experience after September 11 by stepping up to protect public health in post-Katrina New Orleans.

Appendix C: EPA Response to Community Coalition Letter on Schoolyards

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

JUL 26 2007

Mr. Albert Y. Huang
Natural Resources Defense Council
40 West 20th Street
New York, NY 10011

Dear Mr. Huang:

Thank you for your letter expressing concern over arsenic soil sampling data from Orleans Parish school grounds. We share your concern for the health and safety of the school children in the New Orleans area.

The United States Environmental Protection Agency (EPA) and Louisiana Department of Environmental Quality (LDEQ) conducted an unprecedented amount of sampling in the aftermath of Hurricanes Katrina and Rita. Over 1,800 sediment and soil samples were collected during four sampling phases. These samples were analyzed for over 200 organic and inorganic chemicals including arsenic. As the sample results became available, the data was compared to both LDEQ Risk Evaluation/Corrective Action Program (RECAP) and EPA's risk criteria based upon long-term (30 years) residential exposure assumptions. During the sampling conducted by EPA and LDEQ, the highest levels of arsenic were found at or near golf courses and are likely associated with the use of herbicides. In general, the sample results indicate that the sediments left behind by the flooding from the hurricanes are not expected to cause adverse health impacts to individuals, including children, returning to New Orleans.

EPA has worked with the LDEQ in reviewing the soil arsenic sample results that you provided to us. It appears that one soil sample was collected at each of 19 schools in the New Orleans area. The results from 17 of the 19 schools are below non-cancer health-based screening levels based upon long-term residential exposure assumption including children; the other two schools slightly exceeded the non-cancer screening level. Also the results from all 19 schools are within the excess lifetime cancer risk range of one in ten thousand to one in one million based upon long-term residential exposure assumptions. The results from 4 of the 19 schools exceeded the LDEQ background level for arsenic.

The arsenic sample results from Craig Elementary, Drew Elementary, Dilbert Elementary and McDonogh Elementary #42 Schools do not appear to be Katrina-related and are likely due to pre-Katrina activities, such as the application of herbicides and/or the use of chromated copper arsenate (CCA) treated play equipment and/or fencing. Regardless of the arsenic source, additional characterization appears to be warranted.

-1-

LDEQ has offered to contact school officials and has requested that they further investigae to determine if a release has occurred. LDEQ has offered their aid and assistance to these schools in performing this additional investigation. EPA is willing to provide LDEQ with assistance upon their request.

Again, EPA shares your concern for the wellbeing of the people of Louisiana. If you have any questions regarding this matter, please feel free to contact me.

Sincerely yours,

Pamela Phillips, Acting

Samuel Coleman, P.E.
Director
Superfund Division

cc: Byrce White, People's Environmental Center
Monique Harden, Advocates for Environmental Human Rights
Pam Dashiell, Holy Cross Neighborhood Association
Wilma Subra, Louisiana Environmental Action Network
Darryl Malek-Wiley, Sierra Club Louisiana
Beverly Wright, Deep South Center for Environmental Justice
Stephen L. Johnson, Administrator, USEPA
Mike D. McDaniel, Secretary, LDEQ

Appendix D: DEQ Response to Community Coalition Letter on Schoolyards

FROM : PHONE NO. : Jul. 12 2007 02:04PM P3
JUL-12-2007 13:02 P.02/03

DEPARTMENT OF ENVIRONMENTAL QUALITY

KATHLEEN BABINEAUX BLANCO
GOVERNOR

MIKE D. MCDANIEL, Ph.D
SECRETARY

July 9, 2007

Ms. Wilma Subra
Louisiana Environmental Action Network
P.O. Box 66323
Baton Rouge, LA 70896

Re: Notification of Arsenic Soil Sampling Data from Orleans Parish School Grounds
MDM-07-038

Dear Ms. Subra:

Thank you for your letter expressing concern over soil arsenic concentrations at specific schools in the New Orleans area. We share your concern for the health and safety of our citizens.

We have reviewed the soil arsenic sample results that you provided to us. It appears that one sample was collected at each of 19 schools in the New Orleans area. Results from 15 of the 19 schools are below health-based levels of concern and are consistent with background levels for Louisiana.

In your letter, you refer to previously flooded school yards and contaminated sediments, implying that these results are somehow the result of Hurricane Katrina. The sampling of New Orleans area soils after Hurricane Katrina was extensive. LDEQ and USEPA together collected more than 2000 sediment and soil samples in the impacted area. These samples were analyzed for arsenic and over 200 other metals and organic chemicals. As the sampling was completed, results were compared to conservative health-based screening levels for residential exposure developed by USEPA and LDEQ. It is important to keep in mind that health-based screening levels represent a level below which adverse health effects are not expected for healthy adults as well as sensitive subpopulations such as children. The USEPA and LDEQ sample results clearly indicate that soils and sediments left behind by the flooding did not negatively impact soils in the affected area and are not expected to cause any adverse health impacts to residents, including children, returning to New Orleans and surrounding parishes.

The sample results from Craig Elementary, Drew Elementary, the Dilbert School and McDonogh Elementary #42 do not appear to be Katrina-related and are likely due to pre-Katrina activities such as the application of herbicides and/or the use of CCA treated play equipment and fencing. Regardless of the source, if these concentrations or higher are present over the entire school yard, some type of remedial action would be warranted.

ENVIRONMENTAL ASSESSMENT

One sample result from a location is not sufficient to adequately characterize conditions at a site. LDEQ will contact school officials and request that they provide the Department with further investigation and site characterization to determine if a release has occurred and if remedial action is required. However, given the dire financial circumstances facing the Orleans Parish school system, LDEQ will offer our assistance to these schools and will aid in performing this additional site investigation upon request from school officials.

If you have any questions regarding this matter, please feel free to contact Mr. Tom Harris of my staff at (225) 219-3393.

Sincerely,

Mike D. McDaniel, Ph.D.
Secretary

tfh

c: Byrce White, People's Environmental Center
Monique Harden, Advocates for Environmental Human Rights
Pam Dashiell, Holy Cross Neighborhood Association
Al Huang, Natural Resources Defense Council
Darryl Malek-Wiley, Sierra Club Louisiana
Beverly Wright, Deep South Center for Environmental Justice
Stephen L. Johnson, Administrator, USEPA
Richard Greene, Administrator, USEPA Region 6
Tom Harris, LDEQ
Imaging Operations

Endnotes

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