Making the Most of Federal Deepwater Horizon Data for Human Health

November 17, 2010

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*** An agency acronym list can be found in Appendix A ***

Executive Summary:

On November 17, 2010, DHHS hosted an interagency meeting with several U.S. Federal Government agencies as a follow-up to the August 19, 2010 meeting http://www.niehs.nih.gov/about/od/programs/docs/meeting-summary-090310.pdf. The purpose of the meeting was to discuss opportunities for, and challenges to, more fully utilizing federal Deepwater Horizon (DWH) data for human health. Key areas of discussion included NIH's design of a longitudinal follow-up study of oil spill clean-up workers and volunteers (the GuLF Study); federal agency data collections; and ways to more fully use those data for research. Participants also discussed data and samples collected by their agencies, how these resources could be shared for research, and ideas to facilitate research in future disasters. The meeting concluded with foreseeable next steps.

NIEHS, NIH: Dr. Linda Birnbaum described NIH's October 29, 2010 funding opportunity (http://grants.nih.gov/grants/guide/rfa-files/RFA-ES-11-006.html) to create 3-4 consortia of university-community partnerships to address health concerns of Gulf residents, enhance capacity to respond to future disasters, and prevent or minimize their adverse health effects. NIH hopes to gain a better understanding of factors affecting human health as a consequence of DWH and establish the evidence base to inform recovery and strategies to promote health and well-being. Of particular interest are topics raised in the IOM meetings and Gulf communities: mental and behavioral health, exposure and biomonitoring, health of vulnerable populations, and community vulnerability and resilience. Successful applicants will receive up to five years' funding through a collaborative grant. A total of $5.3 million is available per year, $3.4 million of which is supported in FY 2011 by a contribution from BP to the NIH Gift Fund. NIH expects to make awards in June 2011. Dr. Birnbaum also discussed other NIEHS-funded Gulf research, namely a study to measure analytes in water and air samples; an outreach core to assess community needs; use of microbial communities to understand the degree of oil contamination; and development of a sensor system for volatile aromatic hydrocarbons. A joint NIH-NOAA project on mercury dynamics in fish pre- and post-DWH is also underway, and pre- and post-spill data are being shared between the agencies for analysis.

Dr. Dale Sandler next recapped the goals, outcomes, and design of the 55,000 person GuLF Study and provided updates since the August 17 meeting. The cohort of eligible workers and volunteers will be taken from approximately 130,000 individuals amassed from the NIOSH roster, BP's Petroleum Education Council's training list, parish training lists, and lists of federal workers. NIEHS will continue efforts to identify Vietnamese participants as well, since few have appeared on the rosters. Researchers

will report back to participants their BMI, glucose, urea, blood pressure, lung function, and certain other tests, and the agency is working with local and state health departments to develop the capacity to make healthcare referrals. The GuLF Study has undergone extensive scientific and public review via meeting participants, the IOM, a webinar, and an NIEHS scientific review process; the protocol has been revised to reflect these comments. In addition, the IOM will meet at least twice more to review the GuLF Study. In response to a question about the study's control population with regard to baseline data and comparing to oil industry workers more generally, Dr. Sandler noted that the control segment has been difficult to design and will consist largely of those who were trained but did not participate in the cleanup. Most comparisons will be within the study rather than with groups external to this sample.

NIOSH: Dr. Frank Hearl described NIOSH's health surveillance and health hazard evaluation (HHE) response to DWH. One of several efforts involved analyzing BP injury and illness data. In addition, upon request by an eligible entity, NIOSH will conduct an HHE to determine if workers are exposed to hazardous materials or harmful conditions. For DWH, NIOSH completed offshore and onshore HHEs at BP's request. Dr. Hearl next described specific data fields, qualifiers[1] important to the analysis, and limits of detection. NIOSH spreadsheets also indicate the analytical method applied to each sample, the HHE report in which it is described, and which worker ID the samples came from. For the specific example discussed, very few test results exceeded an exposure limit. When asked how NIOSH data might be integrated into exposure categories for the GuLF Study, NIEHS replied that a team is working on that. They hope to obtain and use information from BP on workers involved in specific tasks to generalize exposure in workers without measurements. Dr. Hearl also stated that NIOSH is working on the final HHE report. These reports fully describe the methodology for conducting HHEs so others can conduct HHE-like assessments of their own, potentially including collection of biospecimens. Dr. Hearl agreed that his PowerPoint presentation describing the NIOSH data would be useful to include on the NIOSH Web site, potentially with speaker annotations from his oral presentation that could make almost a tutorial of how to approach the data.

OSHA: Dr. Dean Lillquist described OSHA's activities in response to DWH, which involved ensuring workers had proper training and protection to avoid illness or injury. They also implemented an exposure assessment and sampling plan to identify and characterize onshore, near shore, and offshore exposures across 16 specific activities[2]. Once OSHA identified a potential hazard, they determined if a sampling and analytical method was available to characterize it. The agency analyzed over 2,000 personal and workplace samples, generating nearly 8,000 results. These data are in addition to approximately 400 samples taken by the USCG and corresponding 1,400 analyses. The OSHA spreadsheets and exposure matrix are available for download on their Web site (http://www.osha.gov/oilspills/index.html). When asked how OSHA and NIOSH coordinate their activities to ensure they are not duplicating measurements on the same people, Drs. Lillquist and Hearl noted the considerable coordination between their agencies and regular contact between their leadership. In addition, their sampling strategies were likely similar due to the thematic nature of the field. And some duplication may not be bad. Having a similar set of data for

[1] Several qualifiers were described. "N" means that the sample was below the limit of detection for the substance tested. "T" means the lab detected a noise level in the sample, which is 10 percent above background. "B" indicates that a sample faultily penetrated through to an area of the collection tube and could not be analyzed. "D" indicates the there was some manner of dilution that was needed to calculate the concentration.

[2] The 16 work activities are: Manual scraping; sump and pump/vacuum; manual removal of oil materials; low pressure flushing, manual sorbent application; manual cutting; in-situ burning; vacuum truck, vacuum pumps, portable skimmers; oil mop; recovery of oil from groundwater; marsh-non shore cleanup operations (SCAT); skimming; high pressure cleaning; manual removal of solid tar balls; onshore support; float support; and other.

comparison was reinforcing when deciding whether to lighten recommendations about personal protective equipment due to heat-induced injury. When asked if OSHA identified any questions worthy of future research, OSHA and NIOSH stated that their current role is to make data available for other researchers. Dr. Lillquist also responded to questions about follow-up testing for polycyclic aromatic hydrocarbons (PAHs) and testing for heavy metals, indicating that no additional PAH testing is planned, and heavy metals were not found during initial tests.

USCG: Drs. Jennifer Rusiecki and Erica Schwartz reported that the USCG had 34 DWH response locations and approximately 7,000 responders, although around 2,000 have not yet been captured by the check-in/check-out process. USCG tasks and missions involved 23 categories—some of which align with OSHA's categories. Using the Mobilization Readiness Tracking Tool (MRTT), the USCG can identify individuals who mobilized, the time and place of deployment, and their task(s). Another data source is the exit survey of responders, which is being administered to local units that may not be captured in the MRTT system. This effort may help identify individuals for the control group of the GuLF Study. The survey also asks individuals to report exposure to oil, dispersants, and other chemicals. In addition, the USCG has access to over 1.6 billion on-line medical records on military personnel and their families stored in the MDR data repository. The MDR links to the Defense Medical Surveillance System, which stores personnel data and information on hospitalizations, reportable diseases, outpatient data, health assessments, among other information. After the USCG identifies the responder cohort, they can link them to their health records and conduct medical surveillance. This cohort can also be compared to all other Coast Guard personnel and other members of the military. The USCG concluded by saying they are very interested in sharing their data and wish to obtain a longitudinal perspective on the long-term health of responders and have input on ways, and additional resources, to look at the USCG data as a whole.

NGB: MAJ Barbara Maher reported on the National Guard's (NG) response to DWH. As background, the Guard in this response was mobilized by Governors of the States, and that affects how they can operate and collect data. They are pre-positioned and are mostly residents of the states where a response is coordinated, making them possible candidates for the GuLF Study. The NG commonly trains and operates under Title 32 Duty Status, which coordinates domestic missions and is under state command, but Title 32 status places limitations on collecting longitudinal health information. Although states had the ability to call up approximately 17,000 Guardsmen from Gulf states, they did not activate that many. Soldiers and airmen worked for several weeks at a time from the booms, boats, the shoreline, and reconnaissance, and then returned to their homes in the Gulf. This may present challenges for looking at health effects related specifically to the response unless appropriate controls can be found. Civilian support teams were also deployed to conduct air and quality sampling. Before and after deployment, however, Guardsman may have had a pre- or post-deployment health assessment, depending on the state. The NG also administers an annual periodic health assessment, the most significant and consistent health record, which could provide baseline data. Additional data about responder health is available in Louisiana's Disease Non-Battle Injury or Illness (DNBI) repository. Data from DNBI as of October 29 indicated dermatologic and orthopedic-type issues predominating. MAJ Maher also contacted the states to inquire about line of duty injuries or illnesses. In addition to heat exposure and dehydration, states reported dermatologic situations and sinus complaints. Seizures were also reported in one state. Data sources available, which may not be electronic, include the annual periodic health assessments, pre- and post-deployment health assessments, and annual medical certificates. If the NG participates in the GuLF Study, they would like to learn about the resiliency of the Guard and how they handled responding to the incident and within their community. Participating in the study, however, would require approval from appropriate levels of NG command, including each state that deployed NG personnel.

CDC: Dr. Scott Deitchman discussed CDC's surveillance data and the Behavioral Risk Factor Surveillance System (BRFSS). CDC's immediate response involved coordinating and reviewing state-based surveillance data and national surveillance data from BioSense monitoring and National Poison

Data Systems. Data collection has trailed off in poison control centers since August 2010, and states stopped collecting DWH-specific data in October. CDC is also working toward deploying, by December 14, the 82-question BRFSS telephone survey across four Gulf states to identify the needs for and use of behavioral health services. BP funding supported BRFSS modifications. In response to a question about information captured by poison control centers and whether calls were linked to when oil reached the shore, Dr. Deitchman responded they would need to look into this.

SAMHSA: Dr. Eric Broderick described SAMHSA's efforts to respond to the spill. SAMHSA conducts an annual National Survey on Drug Use and Health (NSDUH) of individuals 12+ years of age across the United States. Data collection runs from January to December, and typically 68,000 individuals respond. $2 million of the funds SAMHSA received from BP will go toward expanding the NSDUH along 32 counties in the Gulf coast. Using baseline data prior to the spill, CDC can analyze questions about serious mental illness, depressions, suicidal thoughts, substance use, and treatment utilization to assess DWH impact. CDC will also issue, as part of their emergency response program, a series of grants in November 2010 to four Gulf states to develop the infrastructure to survey those who accessed mental health care within the state. Funding for these programs through BP is for one year, but continued funding from BP may be under consideration. In response to a question about reaching the less formal network of crisis counselors, Dr. Broderick responded that some BP funds have been used to begin a telephone crisis network. To date, there have been 400 to 500 calls, and they can be assessed.

NTP: Dr. Scott Masten stated that NTP was established to coordinate, strengthen and validate toxicology testing activities within the DHHS. As such, they are reviewing pertinent information about DWH monitoring and sampling, oil and dispersant toxicity, and oil weathering, among other things. NTP is also conducting analytical chemistry studies on source and weathered oil, with particular focus on metals and PAHs. Much of this work is expected to be complete by the third quarter of 2011. NTP is also developing a PAH toxicology research program, focusing on long-term research and data gaps discussed at an October 13 interagency Gulf Oil Spill toxicology workshop. They currently know a lot about health effects of some individual compounds present in oil but not enough to predict adverse health outcomes for exposed populations. Other needs include understanding more about exposure hazards to aid public health decision-making; identifying cross-agency, high priority questions to be addressed by toxicology studies; and considering which experimental toxicology studies would be useful for future spills. NTP also described other research programs being considered and noted their support for NIOSH dermal and inhalation studies in rodents. In response to a question about using a non-rodent, more Gulf-relevant animal model, such as an aquatic species for toxicology studies, EPA responded that they are developing a zebrafish model for toxicology, and NIEHS also uses a zebrafish model. FDA added that PAHs are of primary concern, and for this particular oil, many PAHs need to be evaluated toxicologically to develop reference doses. Having available this information for future spills would make those assessments much easier.

FDA: Dr. Robert Dickey introduced the FDA Web site (http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/ucm210970.htm) where methods used in their laboratories, raw data, and references they used are posted. FDA's principal role is in surveillance and inspections for seafood safety through their Hazard Analysis and Critical Control Point (HACCP) program. Once the DWH vessel sank, the agency mandated an increased level of surveillance and HACCP inspections along the Gulf to ensure they were not distributing fish from oil-contaminated areas. Working with NOAA and EPA, FDA also developed a levels of concern table. Particularly of interest are PAHs, and they chose a representative subset of PAHs of most concern (five non-cancer, eight cancer) to analyze against samples taken in federal and territorial waters. To date, no samples contain PAHs approaching the levels of concern in the table, which is consistent with results from OSHA and NIOSH, independent sampling and analysis by Gulf universities, and non-governmental organizations that collect and analyze their own data. FDA also expanded testing to include exposure to crude and weathered oil and dispersants in other seafood, crab,

oyster, and shrimp – none of which reached concerning levels. In the next 2-5 years, FDA will increase Gulf surveillance and HACCP inspections to assure that PAH residues are not in fish tissues. Analyses will also take into account background oil that naturally seeps into the Gulf. Dr. Dickey mentioned that the 30-year Mussel Watch program may also be valuable to the GuLF study in terms of pre- and post-spill seafood exposure. A key data need included data for assessing effectiveness of risk communications and reassurances about seafood safety.

EPA: Dr. Constance Haaser described EPA's role in DWH and environmental monitoring using air, water, and sediment. All data pertaining to analytes pertinent to oil and associated with published reports on the spill can be found on EPA's Web site. Other data will also be released after it is aligned with data standards used by NOAA, BP, and EPA. In addition to characterizing analytes, EPA conducted air monitoring in response to public concern about oil burning and odor reports, but they found nothing unusual for the Gulf region during that time of the year. They also completed pre- and post-impact water and sediment sampling, looking at PAHs; nickel and vanadium since these molecules are part of the oil molecule itself and other metals; and dispersant constituents such as sulfonic acid salt. BP's use of dispersant was a complicated issue for EPA and the USCG since it had not before been used in a subsurface setting and not in such copious quantities (15,000 gallons/day undersea). EPA also monitored soil and water along the coast for dispersant residuals, finding samples with low levels of sulfonic acid salt and others with low levels of propylene glycol, although it is hard to say if those actually resulted from the dispersant. No tests were positive when the same area was retested. One effort involved setting, and obtaining CDC agreement on, human health benchmarks due to lack of information on some PAHs and on whether to use dermal or ingestion exposure, or both. EPA tested approximately 1,200 samples for PAHs, metals, and dispersants. In general, few exceeded benchmark categories and levels of concern. When compared to pre-impact data, post-impact data showed very little difference. The importance of this finding is that, although there is oil in the water, the pre-impact data indicate that oil was present in the water before the spill. Another question is whether there is oil in the water column.

FWS, DOI: Dr. Robert Garbe and Mr. Kerry Lyons described employee health and information from the FWS response. In August, approximately 800 FWS personnel were in the Gulf region, conducting and supporting wildlife recovery on land, on boats, inland waterways, and near the shore. Today, the FWS has 72 personnel engaged in oil spill response and support, such as land cleanup. Wildlife recovery efforts, which ended in October, were undertaken for the Natural Resource Damage Assessment (NRDA) process. The recovery focused on large birds, resulting in: 2,079 live birds that were cleaned and released; 2,263 visibly oiled and dead birds; and 3,827 dead birds without visible oil. Bird carcasses are currently being held as evidence and cannot be used for research at this time. FWS did not collect fish as part of their recovery efforts because NOAA has jurisdiction over marine fish and those in brackish waters. FWS was also engaged in cleaning up oil debris from the affected Gulf states and served as Resource Advisors to direct the cleanup. The DOI also conducted personal exposure area sampling on their workers. In addition to concerns over heat stress and use of personal protective equipment, they found that the most significant, but quite limited, exposure was inhalation hazard on the boats due to poorly functioning outboard motors. Other analyses were unremarkable. Data are available at https://www.smis.doi.gov/smisaux/oilspillinfo.htm.

NOAA: Drs. Tracy Collier and Teri Rowles next discussed NOAA's broad responsibilities in responding to DWH. As the primary science support agency for the response, they undertook a long list of science actions, including assessing injury to resources and marine mammals and air quality data. With regard to air quality monitoring from vessels and aircraft, tests showed elevated levels of hydrocarbons above the spill site that also migrated toward shore as the wind blew. NOAA's response involved individuals mostly outside of the Gulf region, who worked on boats and around dispersants—some of whom might be a high-exposure group to include in the GuLF Study. Dr. Rowles next discussed NOAA's wildlife response, consisting of a rescue and rehabilitation effort, monitoring and determining cause of death, and

collecting necropsy samples for analysis. From April 30 – November 2, 108 dolphins and two whales died during the response; however, this year NOAA has found elevated numbers of mortality events among turtles, manatees, and dolphins. While turtle mortality has been linked to cold temperatures, it is unclear why dolphin strandings and mortality were elevated pre-spill. Dolphins will be used in live capture health assessments to test for reproductive and stress hormones, genetic analysis, heavy metals, and other tests. Early observations show that mousse appears to stay on dolphin skin for weeks or months, and dermatologic lesions are being found on dolphins. These are common in dolphins, however, and efforts will focus on whether the lesions might be caused by the oil. Hormone studies can identify pregnant dolphins that will be monitored long-term to determine if they give birth to live calves. These data will be compared against pre-spill data and other dolphin health studies. The agency has also tagged whales for follow-up research. NOAA provides data to the public via the web-based Environmental Response Management Application (or ERMA). ERMA is also used to provide data from other Federal Government agencies. All research discussed in this presentation has been funded by BP.

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Following the agency-specific discussions about response efforts to DWH, participants were asked to identify other data sets relevant to the discussion but not represented in the meeting. NIEHS mentioned that state and local health officials and their departments of environment and environmental quality and even some departments of emergency management have their own samples and data. BP also has extensive data available in spreadsheets and pdf files on its Web site, but they can be difficult to find and may be scientifically limiting because they lack critical data fields, such as limits of detection and sampling times. NIEHS has been working with BP to acquire data via a data sharing agreement. In addition, FDA mentioned that academic laboratories across the Gulf have been funded to collect data and study the ecological impact of the spill. The National Science Foundation (NSF) is another resource; NIEHS stated they have had a longstanding program with NSF related to oceans and health. NOAA also has an oceans and health program coordinated with NSF and NIEHS. In preparation for a February 2011 meeting with academia, it would be helpful to prepare specific questions or know what kinds of data agencies are interested in seeing. It would also be helpful to have an account of where all the BP research funding has gone to facilitate knowing where to look for data and leverage it in new or creative ways.

In terms of data sets and recruiting highly-exposed individuals, NIEHS inquired about whether data are available on those who may have had the highest exposures, such as the NOAA personnel directly exposed to aerially-released dispersants. OSHA responded that when they were apprised of a potential exposure, they took samples. They probably weren't able to capture everything if, for example, OSHA wasn't on the boat when an aircraft released dispersant. NOAA added that they likely have 100 or so workers who may be in the high end exposure group, and this information may be verified since they have information on who worked in specific areas on certain days. They also have geographical and spatial information on dispersant application. One of NIEHS' industrial hygienists also noted that just because an exposure measurement has not been taken directly does not mean exposure cannot be estimated using mathematical models based on chemical and physical properties. One item for follow-up may be working toward asking the NOAA responders to participate in the GuLF Study. With regard to recruiting Vietnamese fishermen, NIEHS noted that few appeared on the rosters, but they're an important group to include in the GuLF Study. One way of recruiting them might be through their children, many of whom have been active in advocating for their mental and physical health needs. Many children are also bilingual.

Participants next discussed opportunities for shared analyses by merging data sets. One barrier is the lack of common terminology the data, such as job descriptions, non-detect levels versus other limits of detection, and the like. One resource for data, http://restorethegulf.gov, has a considerable amount of data available from NOAA, EPA, and NIOSH, but data are not integrated. One challenge is adopting data standards across agencies because they can introduce subtle changes in the data. Another challenge might

be the meta-data, photographs, and documents associated with data. For purposes of this study, particular weak points traditionally involve descriptive data and determinants of exposure, which typically don't appear in data sets. Another concern with existing data is the lack of dermal and oral exposure assessments and methods to assess them. Addressing data storage, ownership, and access are also key. One suggestion is to house the data in a location where the storage infrastructure already exists (such as a library, possibly the National Library of Medicine) rather than starting from scratch. A good starting point might be to consider the data format for future needs and see if agencies can adapt their data to that format.

Participants were also asked to discuss the integration of science into future research because experience from recent disaster responses indicates a need to engage in really short-term science. Is there a way to mobilize scientifically during disasters? Research needs identified by meeting participants included producing an inventory of oils from each of the different wells and providing profiles of each of them to be ready for potential leaks. This would also permit identifying the relevant PAHs and doing toxicology studies on them to develop risk assessments and measurement methodologies in advance. Identifying critical data needs and acquiring data on susceptible populations, such as levels of seafood consumption in Gulf-area children, could be difficult but would be invaluable. NIOSH, for example, has already initiated an approach to standardizing data collection for occupational emergencies. But thinking beyond another oil spill is also key to this exercise. One complicating factor is that each agency obtains data to fulfill its own mission and mandate, which may not include research, but it might be possible to collect information that's more useful to a larger number of agencies. A starting point could be to develop teams focusing on biospecimens, mental health, and other modules such as air, water, sediment, pulmonary function, dermal exposure, and the like. Potential rate limiting steps could, however, be the Institutional Review Board (IRB) process or OMB, but perhaps writing protocols in advance would reduce delays. Developing a set of questions to be answered may also save time. Another key to advancing a research response is having funding set aside to activate the system; there currently is no such system although OASPR is having conversations about budget preparedness. Finding a funding vehicle to expedite the acquisitions process would also be beneficial.

Should agencies wish to collect data during a response, they would need to get inserted into the incident command structure and establish where the activity fits into the bigger picture. During a disaster, everyone is in response mode and research might not be a priority. Academic communities, however, mobilize quickly, so having funding available for this purpose would seem prudent. NSF, for example, distributed $20 million in one month; NIEHS can also distribute funding in 90 days. And the National Institute of Mental Health, NIH has a mechanism for researchers to get their protocols quickly reviewed by an IRB. NIH administrative grant supplements are another possible option. The NGB noted that there is a parallel process underway in the military, called the Chemical, Biological, Radiological, Nuclear Explosive Enterprise (CBRNE). CBRNE is a common operating picture that will provide, at the time of response, scientific data, epidemiology, surveillance, and other information needed to respond on a real-time basis. There have also been discussions about bringing federal partners into this process.

The ongoing concern is that most activities seem to be from the response side, rather than research. The research component needs to be brought further forward to address it correctly and efficiently. ACF raised a possible way of doing this, that is, including initial research needs and mission assignments into the disaster response "playbooks", an effort that OASPR is positioned to undertake with partners. Making the case for integrating research data collection into response efforts, however, may take proper messaging to convey that the effort will help understand longer-term health effects. Another possible area of concern surrounds who has the ability and authority to respond; CDC, NIOSH and FEMA need to be invited in before responding. To the extent that new authorities might be needed for disaster response purposes, this topic is ripe for discussion since the authorization for pandemic hazards is approaching in 2012.

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The meeting concluded with a summary of next steps.

- Explore the possibility of a contract to merge datasets to make them more useful for research. If possible, it would be helpful to work with Todd Park, DHHS, and utilize experts in the National Library of Medicine for database architecture and a way of storing the data. A possible parallel approach could be to direct funding to researchers to start working with multiple datasets in cross-agency analyses.
- Convene a subgroup under ASPR leadership to develop a human health research strategy in disasters, including shelf-ready modular components, and design research implementation to be part of "prescriptive mission assignments" in standard procedures for disaster response. This group should also address issues of "budget or acquisition preparedness" to release research funding in rapid and effective ways.
- Reconvene this group when sufficient initial data from CDC and SAMHSA surveys and the GuLF study are available for presentation and review, probably in 6-9 months, and include grantees, academics, and other interested investigators.

Appendix A. Acronym List

ACF: Administration for Children and Families, DHHS

ASPR: Assistant Secretary for Preparedness and Response, DHHS

CDC: Centers for Disease Control and Prevention, DHHS

CMS: Centers for Medicare & Medicaid Services, DHHS

DHHS: Department of Health and Human Services

DHS: Department of Homeland Security

DOI: Department of the Interior

DOL: Department of Labor

EPA: Environmental Protection Agency

FDA: Food and Drug Administration, DHHS

FWS: U.S. Fish and Wildlife Service, DOI

NG: National Guard

NGB: National Guard Bureau

NIEHS: National Institute of Environmental Health Sciences, NIH, DHHS

NIH: National Institutes of Health, DHHS

NIOSH: National Institute for Occupational Safety and Health, CDC

NOAA: National Oceanic and Atmospheric Association, DOC

OASPR: Office of the Assistant Secretary for Preparedness and Response, DHHS

OSHA: Occupational Safety and Health Administration, DOL

SAMHSA: Substance Abuse and Mental Health Services Administration, DHHS

USCG: United States Coast Guard, DHS