CAPABILITIES AND REQUIREMENTS

3.1 USDA/NRCS Capabilities

The Rural Development Act of 1972, Public Law 92-419, Sec. 302, Title III (7 USC 1010a), August 30, 1972, authorized a land inventory and monitoring program, including studies and surveys of erosion, sediment damage, flood plain identification, and land-use changes and trends. The NRCS informs the USDA of the extent of short-duration natural phenomena that affect health, safety, and agricultural production. Reports document impacts of NRCS activities on resources and describe the event in quantitative terms, including amount of precipitation and surface-wind speeds.

The Watershed Protection and Flood Prevention Act (Public Law 83-566, Statute 606) authorizes the Secretary of Agriculture to cooperate with state and local governments in planning and conducting improvements for soil conservation and other purposes. The NRCS can prepare reports on the impact of serious storms on the installed project measures.

The Snow Survey and Water Supply Forecasting Program, administered by NRCS, is found in the Code of Federal Regulations: 7 CFR 612. NRCS is charged with the collection of snow data to develop monthly water supply forecasts from January through June in partnership with the NWS and with maintaining the data in a database and making it publically available. In partnership with other Federal, State, tribal, and local government agencies and utility companies, data are collected through a network of over 1,200 manual snow courses (measured monthly) and 752 automated SNOw TELemtry (SNOTEL) stations located throughout Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. SNOTEL stations located at high elevations throughout the mountainous west collect data year round on air temperature, precipitation, barometric pressure, wind speed and direction, relative humidity, snow depth, and snow water equivalent. This network is the only high elevation climate data collection network in the United States.

NRCS also operates the 150-station Soil Climate Analysis Network (SCAN). Automated SCAN stations are scattered across the United States and are located primarily on agricultural lands. These stations collect soil moisture and temperature data in addition to air temperature, precipitation, barometric pressure, wind speed and direction, relative humidity, solar radiation, and if appropriate, snow depth and snow water equivalent.

3.2 Department of Commerce Capabilities

3.2.1 NOAA Capabilities

NWS provides a continuous weather watch throughout the Americas and the Pacific, with lesser amounts of data collected globally. Data are gathered via remote sensing (e.g., satellite-based instruments, weather radar, and vertical sounders) as well as from in situ sensing (e.g., surface

observations). Observational and computational information is processed through computer-based models to produce numerical weather prediction and river forecast products, which are available to users globally.

NOS capabilities include the following:

- NOS provides products, services, and data. Examples include nautical charts, a framework for consistent geographic reference, and tidal and water-level monitoring
- NOS manages 14 national marine sanctuaries and one national monument and provides funding to coastal states to manage 27 national estuarine research reserves
- NOS participates in immediate response to hazardous spill events, damage assessment, and restoration activities
- NOS supports states in protecting resources and guiding economic development in coastal areas. NOS also supports training for state coastal managers participating in the program.
- NOS assesses, monitors, and predicts the consequences of natural and human-induced environmental hazards such as hurricanes, erosion, and sea-level rise.

CSC provides training modules on how to access, process, and use NOAA forecast and observation data in geospatial formats before, during, and after a storm. The primary audience for the training modules includes DHS/FEMA personnel, NOAA Incident Coordination Center (ICC) staff, and NOAA Homeland Security Operations Center (HSOC) staff for creation of situational awareness maps for decision briefings.

Other CSC capabilities include the following:

- Provides natural hazard vulnerability analysis and assistance on coastal zone management and building community resilience
- Supplies geospatial technology (e.g., geographic information system [GIS]) assistance and coastal inundation information, supports application of GIS and remote sensing data
- Performs ecosystem and damage assessments
- Provides technical assistance in recovering fisheries, restoring habitat, and rebuilding coastal communities
- Provides technical assistance for disaster response, recovery, and rebuilding efforts to include coastal resource management
- Planning process support (includes community participation process design and facilitation) and assistance with recovery project development

CO-OPS provides real-time water levels, currents, winds, and other oceanographic and meteorological measurements for major U.S. port areas. This infrastructure acquires and disseminates observations and predictions necessary to ensure secure, safe, efficient, and environmentally sound maritime commerce. The real-time tides information and current critical

infrastructure support national security, safe navigation, sustainable coastal communities, and disaster response. Real-time water levels and current information are essential to post-incident environmental impacts and waterway evacuation.

OR&R responds to and mitigates the consequences of spills and other hazards that threaten coastal environments. It provides accurate, timely, and relevant scientific advice to organizations charged with responding to and mitigating the consequences of spills and other hazards that threaten coastal environments and communities. The hazardous materials (HAZMAT) scientific team provides key technical advice during spills of oil or hazardous materials in the coastal zone. To do this, the HAZMAT team is on call 24 hours a day, every day of the year. The HAZMAT team also responds to other technological and natural coastal hazards such as hurricanes and airplane crashes. HAZMAT carries out these functions under the National Response Plan and the National Oil and Hazardous Substances Pollution Contingency Plan. This group operates CAMEO (Computer Aided Management to Emergency Operations), a well-known NOAA software program that is in use at over 10,000 locations. CAMEO provides first responders and emergency planners with information to respond quickly to chemical accidents. OR&R provides on-scene Scientific Support Coordinators and supporting field teams and reach-back technical support and scientific guidance to assist in response and restoration efforts.

NGS. Through its CMP and ASP, NGS utilizes both contracted and in-house assets to conduct end-to-end aerial surveys. NGS collects near-infrared and color (red, green, blue; RGB) imagery at a nominal one-foot ground sample distance (GSD). In conjunction with the NMAO Aircraft Operations Center (AOC), NOAA dedicates one specially modified turbojet aircraft to the NGS CMP and ASP and has several other aircraft that can be used on an as-needed basis. NGS's current emergency response workflow enables imagery to be processed and available via the Internet within 12 hours of collection. The speed with which NOAA can respond to an event depends upon several factors, the least controllable of which is weather. The imagery provided include individual ortho-rectified RGB images in JPEG format. The resulting GSD after ortho-rectification is 0.5 m. Delivery of the full-resolution TIFF images is not feasible via the Worldwide Web due to bandwidth limitations, as individual images in TIFF format are over 150 MB each. Special requests for these products are addressed on a case-by-case basis.

3.2.2 NIST Capabilities

A well-equipped structural testing laboratory and computer facilities for modeling loads and structural response are maintained by the Materials and Construction Research Division of NIST. The division's capabilities for predicting and assessing wind effects on buildings and other structures include computer codes for the simulation of extreme wind speeds in atmospheric boundary layers. The division also maintains special equipment and supplies needed for the rapid deployment of investigative teams following major wind and earthquake disasters, structural collapses, and building fires.

The Process Measurement Division of the Chemical Science and Technology Laboratory within NIST maintains wind and water tunnels for fluid mechanics research. Of particular interest is the closed-return, low-speed, low-turbulence wind tunnel facility, which serves as the U.S. primary

standard for anemometer calibration. Interchangeable test sections allow calibrations at wind speeds of up to 67 ms^{-1} (149.87 mph). State-of-the-art flow visualization techniques, hot-wire anemometry, and laser-Doppler velocimetry are available in this laboratory.

3.3 DOD Capabilities

3.3.1 USACE

The ERDC, in cooperation with participating USACE district offices, can provide data on near-shore wave conditions, winds, and water levels; beach profiles; lidar topographic and bathymetric surveys; aerial photography/imagery; damage assessment to marinas, coastal projects and navigation channels and structures; morphological changes to beaches; and identification of high-water marks.

The Joint Airborne Lidar Bathymetry Technical Center of Expertise executes the USACE National Coastal Mapping Program (NCMP), which provides lidar elevation and imagery data to support regional and scale management activities. The data are collected with a unique in-house survey capability that collects lidar topographic elevations and lidar water depths, both with concurrent digital aerial photography and hyperspectral imagery, for land use and habitat characterization. This capability was used in the aftermath of the 2004 and 2005 hurricane seasons to provide elevation and imagery data for more than 2,000 miles of shoreline, in addition to the 3,500 miles collected as part of the NCMP since 2004.

NCMP data support the quantification of economic, environmental, and engineering impacts of storms on the coastal zone. The data are delivered to the USACE coastal district in which they were collected and to the USGS Center for Coastal and Watershed Studies in St. Petersburg, Florida. The data are archived at the NOAA National Geophysical Data Center and USGS Earth Resources Observation and Science (EROS) Center. All of the data are available online through the NOAA Coastal Services Center Lidar Data Retrieval Tool. The data are also delivered on demand to any local, State, or Federal agency that requests them. In addition to this unique in-house system and capability, the Joint Center maintains surveying contracts to obtain lidar and imagery from industry based systems. In all cases, the Joint Center coordinates operational plans with Federal and State stakeholders, such as USGS, NOAA, FEMA, National Aeronautics and Space Administration (NASA), and others, to prevent duplication and to ensure the widest dissemination of data and resulting products.

3.3.2 USAF and CAP-USAF Auxiliary

The CAP, through a Memorandum of Understanding between the DOD and OFCM, provides light aircraft, aircrews, and communications in support of disaster impact assessment flights. The NWS frequently uses CAP flights to survey ice damming, glacier-dammed lakes, weak levees, remote reservoirs, and tornado tracks. The services that CAP provides are more cost-effective than other available aerial capabilities. The CAP National Operations Center often is able to provide a flight within 24 hours of the request. Any Federal or State agency may request a CAP mission through OFCM by filling out the request form at

http://www.ofcm.gov/wg-ndr-psda/index.htm and submitting it to nws.ofcm.cap@noaa.gov followed by a phone call to (301) 427-2002. The CAP forms are also included in Appendix F.

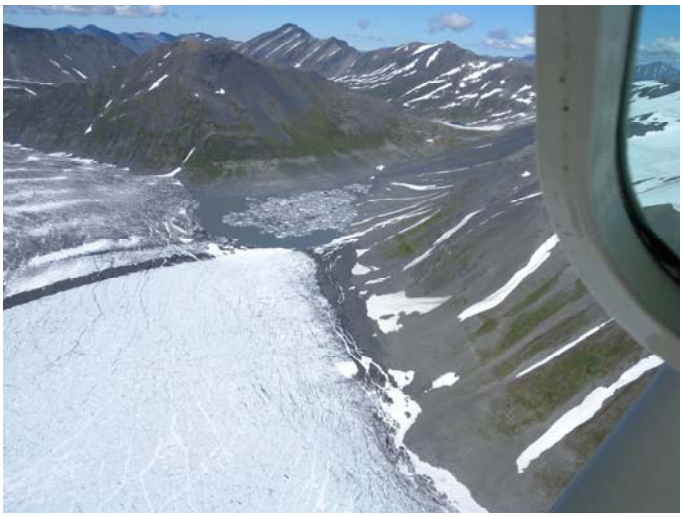

Photo taken by the Civil Air Patrol during an aerial survey of the Skilak Glacier dammed lake, August, 20, 2010. CAP aerial survey sorties are flown to assess and document water levels of glacier-dammed lakes and assess current hazard levels. Based on this photo, the Skilak lake level was determined to be low and not expected to release later in the year. Image courtesy Civil Air Patrol, Seward Squadron, Alaska Wing.

Funding for CAP must be provided on an annual basis by agencies that use CAP.

The 53 WRS conducts aerial reconnaissance of tropical and extratropical cyclones to provide meteorological data on the geographic position of the storms; central sea-level pressure; vertical profiles of pressure, temperature, dew-point temperature, and wind speed and direction from the surface to flight level; geopotential heights of designated pressure surfaces; and other relevant data.

3.4 DHS/FEMA Capabilities

When the President issues a disaster declaration for an event, FEMA establishes one or more Joint Field Offices (JFOs) to coordinate Federal disaster response and assistance. FEMA also employs a large contingent of temporary Disaster Assistance Employees when necessary, in addition to its authorized permanent staff.

The National Response Coordination Center is a multi-agency center than provides overall Federal response coordination. Photo courtesy DHS Office of Operations Coordination.

FEMA is organized into eight primary directorates; Logistics Management, Disaster Assistance, Disaster Operations, Grant Programs, National Preparedness, U.S. Fire Administration, National Continuity Programs, and Mitigation. The Mitigation Directorate, which includes the Federal Insurance Administration, coordinates Flood Insurance Studies for the National Flood Insurance Program and Hurricane Evacuation Studies

for the National Hurricane Program. The NRCC in Washington, D.C., assists in coordinating efforts among all Federal offices. ESF Coordinator positions within the NRCC are activated for exercises and emergencies. The ESF Coordinators may be of assistance to NPDIA efforts, and Appendix H includes an ESF Coordinator contact sheet. FEMA's website, www.fema.gov, includes the latest FEMA organization chart, as well as articles on FEMA and on Presidentially declared disasters.

Also within the Mitigation Directorate, the Risk Reduction Division, Building Science Branch, in coordination with the JFO Mitigation Branch Director, may elect to deploy a Mitigation Assessment Team (MAT) following a disaster. The objectives of the MAT are to inspect buildings and infrastructure, conduct forensic engineering analyses to determine causes of structural failure and success, and recommend actions that State and local governments, the construction industry, and building code organizations can take to reduce future damages and protect lives and property in hazard areas.

3.5 DOI/USGS Capabilities

Streamflow Monitoring. Data on streamflow (the volume of water passing a specified point on a stream or other channel of moving watrer) are collected primarily by the USGS National Streamflow Information Program through the operation of some 7,500 streamgages and some 27,000 peak-flow-only sites. The streamgaging network is operated by 48 USGS water science centers, whose areas of operation usually correspond to State boundaries, through 160 field offices. Field offices are dispersed throughout the Nation and are strategically located near important rivers and streams. Real-time water-level and flow data for about 6,800 streamgages are available at http://waterdata.usgs.gov/nwis/rt. Interactive maps of the current National and State level flow conditions (relative to flooding or drought) are available at http://water.usgs.gov/waterwatch/. Maps and tables summarizing recent flooding conditions are available at http://water.usgs.gov/cgi-bin/wwdp.

Flood Measurements. Physical measurements of stream depth, width, and water velocities are used to compute flows. Although most flow measurements are made with conventional current meters, a large percentage of high-flow measurements are made by use of Acoustic Doppler Current Meters, which provide rapid and detailed depth, velocity, and flow data. These instruments are routinely deployed to streamgages, but can be used to collect unique data for a variety of situations such as dam— and in some cases levee—breaks or leakages. USGS personnel are often called upon to make emergency measurements of flow by NWS forecasters, USACE dam operators, and emergency management personnel to aid in the management and assessment of floods. Summaries of recent flood measurements (width, depth, velocities, etc.) by State and by streamgage are distributed at http://waterdata.usgs.gov/nwis/measurements.

Flood Forensics. When direct flow measurements are not possible due to short notice or the inaccessibility of the site, the USGS collects detailed high-water mark and steam cross-sectional data and applies hydraulic models to estimate the peak flows. Multiple high-water marks are collected upstream and downstream of constrictions such as bridges or culverts to establish detailed flood profiles for hydraulic models. Accurate determinations of the elevations of the

high-water marks are crucial to accurate determination of the flood flows: an elevation difference between high-water marks of just 0.10 feet could result in estimates that are much greater or lower than the actual flows. Hence, high-water marks are surveyed to within +/- 0.01 feet. Indirect flow measurements are computed and summarized in nonpublished reports that may be viewed at the relevant USGS State office. Contact information for these State offices is available at http://water.usgs.gov/district_chief.html.

Storm-Tide Monitoring. The USGS developed a mobile storm-tide network to provide detailed time-series data for selected hurricane landfalls. The network was first deployed to monitor the landfall of Hurricane Rita in Southwest Louisiana in September 2005. It generally consists of about 40 temporary water-level and barometric monitoring instruments. The instruments collect water levels at 30-second intervals before, during, and after surge floods. The instruments can be deployed to observe the interactions of floodwaters with engineered structures and with natural topographic features. Most of the storm-tide sensors log data for later analysis and use, but real-time units have been developed and deployed and could provide real-time on-site reconnaissance for selected facilities. Generally, the instruments can function unattended for 6-8 days. Real-time storm-surge data (for periods during and immediately after the storm) can be viewed by accessing storm-surge sites listed in State streamflow summary tables at webpages with a URL of the form "http://waterdata.usgs.gov/XX/nwis/rt" where "XX" refers to the 2-letter postal abbreviation for the State of interest. As data are corrected and finalized, they are published in online data series reports with ASCII character, tab-delimited or fixed-column formats at http://water.usgs.gov/osw/programs/storm_surge.html.

Rapid-Deployable Gages. Often data are needed at ungaged sites. To provide data at short notice, the USGS developed small, rapidly deployable streamgages that provide real-time water-level data. These devices are equipped with satellite transmitters for real-time transmissions and solar panels and batteries to extend the deployment indefinitely. Data from these gages are available at webpages with a URL of the form: "http://waterdata.usgs.gov/XX/nwis/rt" where "XX" refers to the 2-letter postal abbreviation for the State of interest.

The USGS has developed new rapidly deployable, mobile streamgages to provide short-term water-level data to critical areas lacking permanent streamgages. Image provided by USGS Office of Surface Water.

Flood Documentation. Personnel at the USGS Water Science Center are trained to flag and document high-water marks. USGS techniques differ from those more commonly used to develop flood-inundation maps. More effort is expended to flag multiple high-water marks needed to profile flood levels upstream and downstream of stream constrictions and the elevations are surveyed to within 0.01 feet to permit calibration of flood models. However, the USGS has assisted some flood documentation efforts

in which the USGS effort was limited to flagging so that others could level in elevations using more rapid, but less accurate, Global Positioning System (GPS) techniques. When the data are used by the USGS to construct flood maps, the data are available through USGS publications at http://pubs.er.usgs.gov/usgspubs/recentpubs.jsp.

Shoreline Change. Through the Coastal and Marine Geology Program, the USGS Geologic Division investigates the geologic impacts of extreme storms and hurricanes on the physical coastal environment. A major objective of these investigations is to improve the capability to predict coastal erosion and other coastal changes caused by extreme storms. To conduct these investigations, Geologic Division personnel employ aerial photography and oceanographic techniques, emerging technologies like airborne scanning laser (e.g., LIDAR), recently available declassified instruments and data, and a USGS network of tide and environmental sensors. State-of-the-art research vessels, GPS satellites, and side-scan survey and velocity measurement equipment are used to collect post-storm data. Images and data are available at http://coastal.er.usgs.gov/shoreline-change/.

3.6 DOT/FHWA Capabilities

The FHWA, though not a current participant in the NPDIA, is expected to become more involved in the future. While FHWA has no statutory requirements to acquire environmental data following significant storm events, it does work with State and local departments of transportation, which are building such capabilities for their areas of responsibility. These sites, which monitor parts of the highway system, could eventually be used in the storm event data acquisition process.

3.7 Capabilities of Affiliated Organizations

3.7.1 AAWE Capabilities

AAWE was originally established in 1966 as the Wind Engineering Research Council to promote and disseminate technical information in the research community. In 1983 the name was changed to American Association for Wind Engineering, and AAWE was incorporated as a nonprofit professional organization. The multidisciplinary field of wind engineering considers problems related to wind and associated water loads on buildings and structures, societal impact of winds, hurricane and tornado risk assessment, cost-benefit analysis, codes and standards, dispersion of urban and industrial pollution, wind energy, and urban aerodynamics.

Data observed using the Texas Tech StickNet system for wind, rain, relative humidity, and barometric pressure can be used in damage assessments. Photo courtesy Sarah Dillingham, Texas Tech University

Several of the AAWE partner institutions have a coordinated program to place robust and portable

weather monitors in the path of hurricanes at land fall. Louisiana State University and Texas Technological University have also been using before- and after-storm satellite imagery to assess storm damage and to develop algorithms and procedures to gather high volume and high quality performance assessment data that complement on-ground data collection efforts.

3.7.2 COPRI Capabilities

COPRI capabilities were under development at the time that this version of the NPDIA was undergoing final review.

3.7.3 DHC Capabilities

The CSWR, Oklahoma University, and the University of Alabama at Huntsville—all members of the DHC—have mobile radar capabilities that add to the data collection strength of mobile anemometer towers. The mobile radar equipment has the ability to give the hurricane windfield three-dimensional depth, which anemometers cannot do. These radars will assist in gathering offshore wind speed information, which is now only possible for locations just offshore. Radar data on the vertical windfield could give us a much better idea of the wind layers above the ground layer where the built environment is located.

Retrieving a shallow water wave monitor. Photo courtesy University of Notre Dame.

The University of Florida (UF) manages the Florida Coastal Monitoring Program, a research program with the goal of characterizing the intensity and behavior of land-falling hurricanes with direct measurement of wind speed, wind direction, pressure, humidity and temperature at multiple ground level locations(10 meter) in the path of land fall via five portable weather monitoring platforms. Texas Tech University, Louisiana State University, and Clemson University also participate in this project with additional portable monitoring assets. Much of the data are relayed in real time to a public access web site and via direct push to researchers in NOAA's Hurricane Research Division. Since 1999, the high reliability of research-grade instrumentation and hurricane-hardened portable platforms has yielded the most dependable source of direct-measured overland ground-level wind data. Additional near-shore wave and surge monitoring assets have been developed by the University of Notre Dame to provide water elevation datasets that complement both the wind data collection as well as USGS surge monitoring efforts. UF and the University of Notre Dame retain faculty that lead the current state of the art in coastal process modeling, including hurricane surge and inland flooding from heavy rainfall. UF and Florida Institute of Technology also deploy pressure measurement packages on the roofs and walls of homes along the coast of Florida to directly monitor the wind pressure experienced by structural components during land-falling hurricanes. This work is a leading source of information for refining the next generation of wind load provisions for minimum building code standards.

UF also offers an extensive infrastructure of laboratory apparatus to evaluate structural performance characteristics in hurricane winds and wind driven rain. The full-scale hurricane

simulator at UF provides a means to develop and evaluate new construction methods as well as retrofit mitigation measures on existing building inventory. Home builders and product manufacturers work with the UF faculty to identify outstanding performance issues and identify cost effective and practical solutions to weaknesses in building performance.

During the process of equipment retrieval in the immediate aftermath of a land-falling hurricane, university teams provide an assessment of infrastructure damage prior to data-altering activities such as clean-up, blue-tarp, etc. In some circumstances (e.g., after Hurricane Charlie in 2004), UF and other university research groups remained in the field after equipment retrieval to conduct a more thorough quantitative building performance study.

3.8 Requirements

Table 3-1 outlines the disaster impact assessment requirements of each of the Federal agencies and affiliated organizations participating in the WG/DIAP.

Table 3-1 Disaster Impact Assessment Requirements

Fed. dept. or affiliated organization	Subentity	Disaster impact assessment requirements
USDA	NRCS	NRCS is typically required to make post-storm analyses to determine extent of damage to installed conservation measures so that they can be restored to pre-storm conditions.
DOC	NOAA/ NWS	NWS requires all available records that define the impact, extent, timing, and intensity of significant natural hazard episodes such as floods, tropical cyclones, extratropical cyclones, tornadoes and other severe convective events, katabatic winds, and tsunamis.
	NOAA/ NOS	to be determined
	NOAA/ CSC	CSC requires forecast data from NWS to develop before, during, and after forecast maps for the NOAA ICC and DHS/FEMA. In the past, this has been done on an as-needed basis, driven by mission assignment from FEMA before a land-falling storm.
	NOAA/ CO-OPS	CO-OPS requires all available NOAA-collected oceanographic and meteorological data (historical and real-time), predictions, nowcasts, forecasts, and high- water mark elevations.
	NOAA/ OR&R	to be determined
	NOAA/ NGS	NGS requires the geographic extent of the requested imagery, and those data necessary to conduct aerial survey operations, current aviation weather reports, and aviation weather forecasts to facilitate accurate data collection following an emergency.
DOC	NIST	In wind-related disasters, NIST needs all available records of wind speeds (from both ground stations and aircraft), barometric pressure measurements, and radar images from which to reconstruct the surface wind field are essential. Aerial photographs of sufficient resolution to show damage and debris distribution and extent of storm-surge effects are of considerable value. In the case of damage to major structures, detailed site studies, followed by structural analyses, are performed.
DOD	USAF/ CAP and 53 WRS	CAP and 53 WRS have no individual requirements for data.

Table 3-1 Disaster Impact Assessment Requirements

Fed. dept. or affiliated organization	Subentity	Disaster impact assessment requirements
DOD	U.S. Army/ USACE	USACE requires environmental data to support the following missions: • Coastal—shore protection, beach preservation and restoration, coastal navigation, environmental and water quality monitoring • Estuarine— navigation, environmental and water quality monitoring • Riverine— inland navigation, flooding and stream bank erosion control, environmental and water quality monitoring • Reservoir control— reservoir level monitoring, catchment rate determination Any data that contribute to performance of these missions are of value. Types of data include: tropical and extratropical storm-surge water levels and waves; storm-generated coastal current and morphological changes from imagery and from topographic/ bathymetric surveys: estuarine tidal inundation: precipitation-generated estuarine inflow: riverine flooding events: and reservoir overtopping.
DHS	FEMA	Perishable storm data are needed to support FEMA's mission. Data include high-water marks in riverine and coastal-flooded areas; perishable wind-waterline and/or inland wind impact data. Reconnaissance data are required during or within 12-24 hours after a storm event; such data are obtained by radar, reconnaissance flights, satellites, and water-level gauges that transmit their data. Wind-waterline data— the line that distinguishes damages caused by water damage versus wind damage— has immediate application for insurance claims. FEMA also requires analyzed fields of maximum surface wind speeds caused by tornadoes, tropical storms, hurricanes, and winter storms. The information in these fields is typically derived from surface observations and available Doppler radar data. Water-level, wind-speed, and wind-waterline data have been used to prepare the Hazard Analysis section in Post-Storm Assessment reports following major hurricanes. Water-level and wind-speed data from recent tropical storms and hurricanes have been used by the Storm-Surge Group at the Tropical Prediction Center/National Hurricane Center to verify hurricane and winter-storm computer simulation and prediction models. These studies are sponsored by FEMA and are primarily used to verify the predicted maximum storm-surge heights derived from the NWS's Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model. SLOSH is used to make predictions of maximum storm-surge heights for classes of hurricanes striking a given coastal area. Information derived from SLOSH is used to identify vulnerable populations that must be evacuated and critical facilities that need to be protected from storm-surge flooding in coastal communities. These data will continue to be needed in future disasters to verify SLOSH model output and to support other FEMA mission requirements. Perishable, riverine, and coastal-flooding data are used by the National Flood Insurance Program to calibrate and verify hydrologic and hydraulic models used in Flood Insurance Studies to establish the one-percent chance base-flood elevations shown on Flood Insurance Rate Maps. Flooding information caused by tsunami events affecting the U.S. West Coast and Pacific islands is also needed to prepare tsunami hazard maps. Existing water-level data documenting such events are insufficient and are critically needed to verify computer models used for tsunami run-up predictions.
DOI	USGS	The operational needs of the USGS during pre- and post-storm activities include access to forecasts, flood reports, and warning statements issued by NWS; road condition and

Table 3-1 Disaster Impact Assessment Requirements

Fed. dept. or affiliated organization	Subentity	Disaster impact assessment requirements
		access reports issued by transportation officials, emergency management operation centers, and law enforcement agencies; and identification/authorization credentials needed to quickly access flooded area. Potential data needs from other agencies include aerial photography, field support with small aircraft (fixed wing and helicopter), and analytical model results of storm surge and waves. Photographs of streamgaging stations and bridge sites would be useful during and immediately after floods, when a survey and computation of discharge could be made after the flood. Riverine Flooding—The USGS requires assistance in the form of flood forecasts that include specific locations and timing. Photographs, bridge cross-section surveys, and information about timing, etc. obtained from local residents are often helpful forensic determinations. Land-falling Tropical Storms—The USGS requires assistance in the form of hurricane and surge forecasts that include specific locations and timing. Photographs, bridge cross-section surveys, and information about timing, etc. obtained from local residents are often helpful. The USGS will partner with other agencies in deploying devices and obtaining survey data and high-water marks.
DOT	FHWA	To be determined. (Although not a current participant, FHWA is expected to become more involved in the future)
AAWE		Given the breadth of potential services provided by AAWE members for extreme event investigations, specific data needs cannot be delineated. Typically the most pressing requirement will be logistics coordination, support for the data collection, and a supervisory authority to determine the specific data collection mission.
COPRI		To be determined.
DHC		The consortium has no specific data requirements, but it does recognize the need to establish a consistent framework for reporting collected field data. Coordination with NOAA Hurricane Research Division and NWS officials is essential for proper placement of portable monitoring assets.