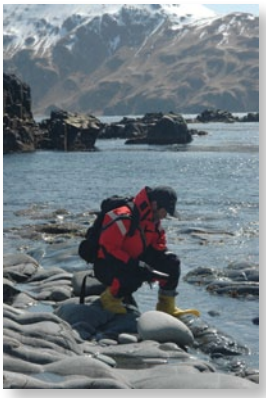
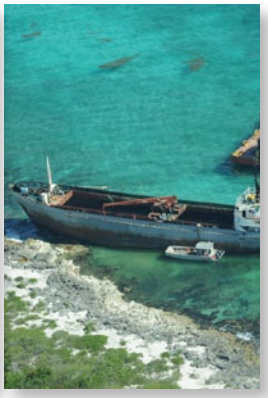
An FOSC's Guide to NOAA Scientific Support





Third edition, June 2015

U.S. DEPARTMENT OF COMMERCE • National Oceanic and Atmospheric Administration
National Ocean Service • Office of Response and Restoration • Emergency Response Division

DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Office of Response and Restoration
Emergency Response Division

Seattle, Washington, United States of America

ABOUT THIS GUIDE

Purpose

This booklet, "An FOSC's Guide to NOAA Scientific Support," is created to help the U.S. Coast Guard Federal On-Scene Coordinators (FOSCs) and their staff know the full scope of scientific support services available to them through NOAA. The guide is available for viewing or download at http://response.restoration.noaa.gov/foscguide.

We know that the Coast Guard shares our vision of a healthier environment for an improved quality of life wherever we may work. The Coast Guard consistently demonstrates its dedication to protecting lives, property, and the environment during responses to emergency incidents. It is the mission of the Emergency Response Division (ERD) of NOAA's Office of Response and Restoration (OR&R) to assist the Coast Guard in fulfilling its mission in the most environmentally beneficial manner possible.

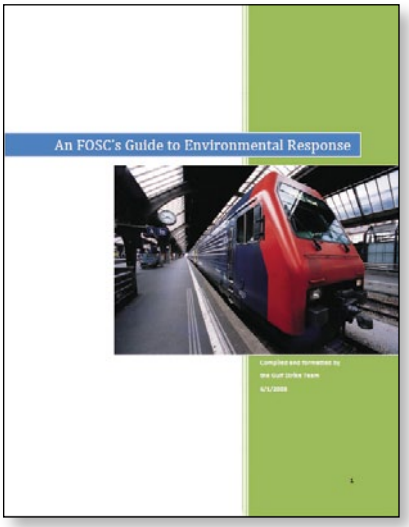
To that end, ERD will develop, communicate, and apply practical and credible science in preparing for and responding to risks and mitigating the consequences from spills and other hazards threatening coastal environments and communities.

ERD wishes to thank the Coast Guard for making us an integral part of its response efforts.

This guidebook is a product of the combined efforts of the entire ERD staff, and has been greatly improved by suggestions provided by experienced Coast Guard responders, including many great suggestions provided by the highly trained members of the National Strike Force (NSF).

Companion Guide

An excellent companion reference for environmental responses is "An FOSC's Guide to Environmental Response," compiled by the Gulf Strike Team in 2008. The guide is available at http://www.uscg.mil/hq/nsfweb/docs/FOSCGuidev07.pdf (PDF; 996 kb). The purpose of the U.S. Coast Guard (USCG) guide is to provide a ready resource for Coast Guard and Environmental Protection Agency (EPA) On-Scene Coordinators or their representatives for response to oil and hazardous substance emergency response operations. Where ap-



plicable, the USCG guide references the National Contingency Plan (NCP) and other appropriate guidance.

Using the NOAA FOSC Guide

The NOAA scientific support guide is provided in hard copy and electronic form.

- **Hard Copy** – This handy-sized guide is designed to keep at the duty station and with response gear. Use it when you don't have quick access to a computer.
- **Electronic Versions** – The electronic version is a PDF file available online at http://response.restoration.noaa.gov/foscguide and is more powerful than the hard copy. It links to the full text of a host of response-related materials.

Stay Updated on ERD Activities

Through NOAA OR&R, ERD uses social networking platforms to share information with its stakeholders and the public. You can get the latest updates on ERD's work with marine pollution by:

- Subscribing to our monthly newsletter (http://response.restoration.noaa.gov/about/subscribe-email-newsletter.html)
- Subscribing to our blog (http://usresponserestoration.wordpress.com)
- Following us on:
  - Facebook (https://www.facebook.com/noaaresponserestoration)
  - Twitter (https://twitter.com/noaacleancoasts)
  - Flickr (http://www.flickr.com/photos/noaa_response_restoration)

Questions or Comments

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Contents

1 THE SCIENTIFIC SUPPORT COORDINATOR AND TEAM

The primary responsibility of the Emergency Response Division (ERD) is environmental emergency response and as such, both its regional Scientific Support Coordinators (SSCs) and the Scientific Support Team (SST) respond to virtually every significant marine release in the country. In an industry where experience is critical, the NOAA team represents the most experienced organization in the federal government, and perhaps the world. The NOAA SSC should be seen not only as the FOSC's gateway to the entire SST, but as an experienced advisor and veteran of many large responses.

SSC Roles during a Response

Scientific Support Coordinators, per the National Contingency Plan (NCP), serve on the FOSC's staff and may, at the request of the FOSC, lead an SST and be responsible for providing scientific support for operational decisions and for coordinating on-scene scientific activity. Additionally, SSCs may be designated by the FOSC as the principal advisers for:

- Scientific issues.
- Communication with the academic scientific community.
- Communication with Natural Resource Trustee agencies (the "Trustees").
- Coordination of requests for assistance from state and federal agencies regarding scientific issues.

Working closely with the Environmental Unit (EU) Leader, the SSC leads a scientific team of technical specialists, serving in EU functions, such as trajectory, weather, aerial observation, resources at risk, toxicology, and Shoreline Cleanup and Assessment Technique (SCAT). SSCs are part of a collaborative federal team and when activated, have full access to all of NOAA's expansive resources, products, and services, such as weather, bathymetry and charting, satellite and aerial imagery, tide and current predictions, marine mammal and sea turtle expertise, ocean monitoring, information and data management and display, and specialized ocean science topics. Typical SSC response functions, at the request of the FOSC, may also include:

NOAA SSC discussing GNOME oil trajectory forecast display.

- Providing scientific support for operational decisions, such as the trade-offs for use of mechanical and alternative countermeasures, and cleanup endpoints.

- Coordinating on-scene scientific activity, such as field sampling and integrating ongoing academic environmental studies into response needs.
- Integrating expertise and facilitating scientists from governmental agencies, universities, community representatives, and industry to assist the FOSC in evaluating the hazards and potential effects of releases and in developing response strategies.
- Facilitating the FOSC/Unified Command's communication with the Lead Administrative Trustee (LAT) for natural resources to ensure coordination between damage assessment data collection efforts and data collected in support of response operations.
- Coordinating required emergency consultations for protected resources (such as threatened and endangered species, historic and cultural resources, sensitive habitats, etc.).
- Providing comprehensive situational awareness for government interests through NOAA's Common Operational Picture (COP), the Environmental Response Management Application (ERMA®).

National Weather Service – Tampa operations.

Always Available to the FOSC

The NOAA SSC and the Scientific Support Team are available to the FOSC 24 hours a day simply by calling the assigned SSC directly or the **ERD 24-hour duty phone – (206) 526-4911**.

Serving on the FOSC's Command Staff

The NOAA SSC is a technical advisor assigned directly to the FOSC, as specified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR §300.145). Though often seated with the Environmental Unit of a Unified Command to support and liaise with the overall response effort, the SSC has a primary responsibility as an FOSC advisor.

In May 2014, the Coast Guard released the third edition of the Incident Management Handbook (CG-IMH). The new edition includes further definition of SSC roles and responsibilities. The IMH is available online at **http://www.uscg.mil/hq/cg5/cg534/nsarc/2014%20USCG%20Incident%20Management%20Handbook%20%28English%29.pdf** (PDF; 5.4 mb).

Spill Response Cost Reimbursement

ERD and the National Pollution Funds Center (NPFC) have an agreement that establishes procedures for the reimbursement of NOAA scientific support services as requested or approved by the FOSC. The lead NOAA SSC is never directly reimbursed by the NPFC as he/she is a full-time response asset. However, the NOAA SST is reimbursable. The agreement is available at **http://www.uscg.mil/ccs/npfc/docs/PDFs/urg/App/NPFC_MOU_AppA_03.pdf** (PDF; 74 kb).

Support for the Coast Guard

NOAA generally assigns SSCs to the Coast Guard Districts in support of Sector planning and response needs. (See **Appendix 1** for a list of SSCs, their locations, and contact information.) SSCs may be augmented by additional SSCs in some areas. Each individual SSC is supported by a complete Scientific Support Team that includes expertise in:

EPA FOSC and Coast Guard District 8 and Sector Port Arthur, TX Command with NOAA SSC during Hurricane Ike response.

- Oil slick trajectory forecasting and monitoring.
- Pollutant transport forecasting.
- Environmental chemistry.
- Chemical hazard assessment.
- Weather forecasting through the National Weather Service (NWS).
- Health and safety.
- Information management.
- Resources at risk.
- Biological assessments.
- Environmental tradeoffs of cleanup strategies.
- Natural Resource Trustee issues.
- Navigation response emergency surveys, nautical charts, navigation products, hydrographic survey planning, and processing data.

See page 7 for a more complete listing of SST capabilities.

Support for the National Strike Force

ERD has developed close working relationships with the USCG National Strike Force, the USCG Incident Management Assistance Team (IMAT), and regional Strike Teams. You can learn more about these relationships by contacting the Strike Teams, the National Strike Force, or the IMAT.

Atlantic Strike Team
(609) 724-0008

Pacific Strike Team
(415) 883-3311

Gulf Strike Team
(251) 441-6601

National Strike Force
(800) 424-8802
http://www.uscg.mil/hq/nsfweb

Incident Management Assistance Team (IMAT)
(757) 448-5572
http://www.uscg.mil/lantarea/cgimat/

Support for other On-Scene Coordinators

NOAA SSC support, and the complete NOAA SST, may be available to other federal and state responders or RRT agencies if requested. NOAA SSCs are not currently assigned to EPA regional emergency response offices or other federal agencies.

Support for International Incident Planning and Responses

Over the last three decades, ERD has responded to approximately 35 international incidents, including:

- Sundarbans oil spill, Bangladesh 2014.
- M/T *Hebei Spirit*, Korea 2007.
- M/T *Solar I*, Philippines 2006.
- M/V *Prestige*, Spain 2002.
- T/V *Nahodka*, Japan 1997.
- T/V *Braer*, United Kingdom 1993.
- Arabian/Persian Gulf spills, Kuwait 1991.

For international incidents, the NOAA SSC and team often respond with the USCG Strike Team.

ERD has also participated in joint spill exercises or provided SOS (Science of Oil Spills) training and planning support for the following foreign governments when requested through the U.S. State Department:

Americas and Caribbean
British Virgin Islands
Canada
Dominican Republic
Gulf of Fonseca region
Honduras
Mexico
Panama

Africa
Egypt
Ghana
Gulf of Guinea region
Cameroon
Mozambique

Oceania
Australia
Micronesia

Europe
Bulgaria
Hungary
Malta
Portugal
Romania
Spain
Sweden
Ukraine

Eurasia
Bahrain
Cyprus
Israel
Persian (Arabian) Gulf
Republic of Georgia
Russia
Turkey

Asia
China
South Korea
Philippines
Vietnam

NOAA SSC deployed with the Pacific Strike Team during Guimaras oil spill in the Philippines.

Representatives of ERD and the International Tanker Owners Pollution Federation (ITOPF, based in London, England) have engaged in collaborative activities over a number of years, by visiting each other's locations to compare training activities, review technical reports, and highlight best management practices of each organization. Since ITOPF and ERD conduct very similar missions for different clients, each organization has learned much to approach complex environmental problems.

Since 2007, ERD has also trained, and participated in seminars and multi-agency oil and chemical spill exercises with the National Response Team (NRT) and the Panama Canal Authority. The purpose of this collaboration is to develop and refine procedures to better prepare for any significant pollution incidents within the Panama Canal. A Memorandum of Agreement between the NRT and the Panama Canal Authority provides the basis for this relationship.

ERD continues to participate in the meetings of the International Maritime Organization's (IMO) technical group on Oil Pollution Preparedness, Response and Co-operation/Hazardous and Noxious Substances (OPRC/HNS). The IMO is a specialized agency of the United Nations, and is responsible for improving maritime safety and security, and for preventing pollution from ships. The U.S. delegation to the OPRC/HNS technical group includes representatives from the U.S. Coast Guard and NOAA.

Since 2005, NOAA SSCs have provided training and participated in annual oil spill workshops and exercises in Bahrain for the U.S. Navy Central Command. These events have involved most of the nations in the Arabian/Persian Gulf through the ROPME agreement (Regional Organization for the Protection of the Marine Environment). In addition, ERD acts as the U.S. Navy Supervisor of Salvage's technical advisor for oil spills involving the U.S. Navy Fifth Fleet/Central Command (Arabian/Persian Gulf, Red Sea, Gulf of Oman).

Support for Special Incidents

NOAA science support is specialized for oil and chemical spills, but can also provide expertise and experience for "all hazards." The NOAA SSC experience can benefit an FOSC during emergency responses to natural disasters, ship groundings, significant national events, terrorist incidents, etc. For example, following the devastation from Hurricanes Katrina and Rita in 2005, NOAA SSTs played major roles in rescue support, response to the multiple large oil spills, chemical container location and cleanup, and debris removal.

Following the Tōhoku, Japan earthquake and tsunami in 2011, the NOAA Marine Debris Division (MDD) worked with ERD and other federal and state partners to model debris movement, detect and identify debris at sea, monitor shorelines for debris arrival, and provide guidance for debris removal. During the response to Post-tropical Cyclone Sandy in 2012, the MDD became part of the NOAA SST to deal with debris location, identification, and removal measures.

The SSC also frequently supports the National Strike Force during various significant national events and drills, typically producing air dispersion and waterborne chemical trajectory forecasting.

The SSC can coordinate with NOAA's Office of Coast Survey (OCS), who can provide high resolution bathymetry and cartography to help direct response resources to the areas impacted by a storm or emergency event. OCS has helped reopen navigation channels and ports after numerous hurricanes to re-establish marine commerce in an impacted region. In addition, similar activities have occurred in preparation for inaugurations and downed aircraft.

Building Scientific Consensus and Dealing with Uncertainty

All scientific information has inherent limitations and uncertainty, and the sciences used during incident response have an abundance of both. An important duty of the NOAA SSC is to understand and clearly communicate the limitations and uncertainty associated with field data, trajectory forecasts, and other technical information provided to the FOSC and Unified Command.

The SSC leverages in-house scientists, who have decades of response experience, with scientists from government, academia, and industry, with the goal of achieving consensus on technical issues affecting the response. Differing opinions within the scientific community are also communicated to the FOSC to ensure that decision-makers have the entire picture. By applying this method of interactive and inclusive scientific discourse, the FOSC receives high quality and objective scientific support with multi-partisan agreement.

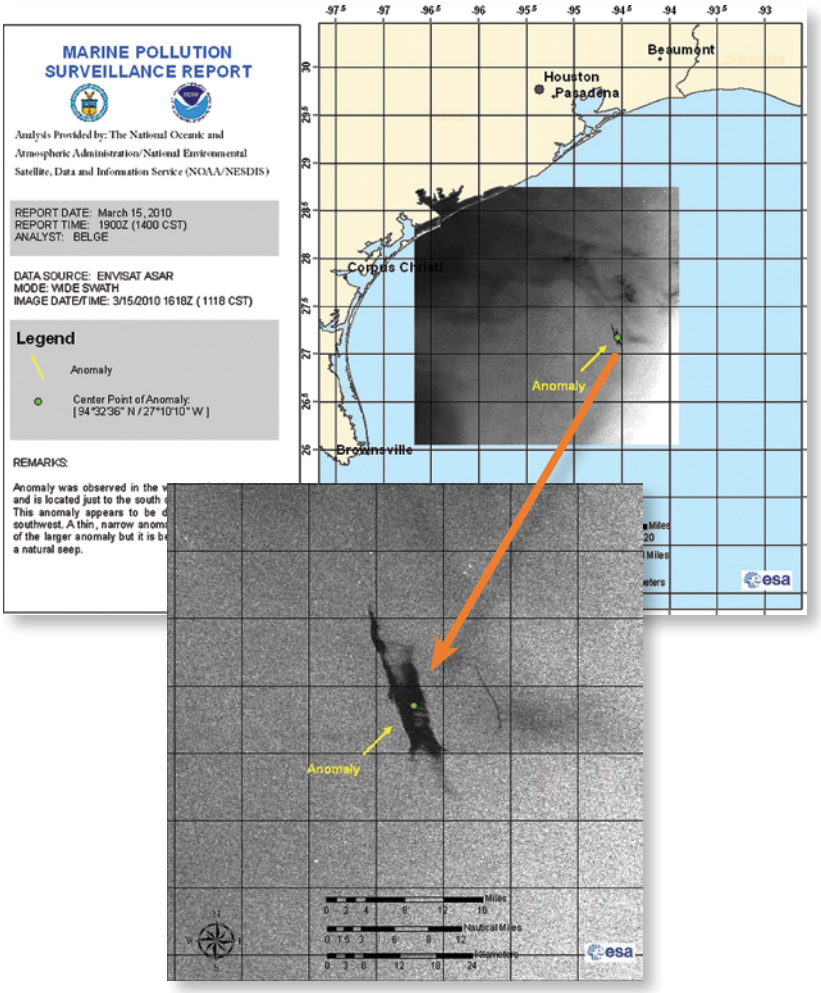
ERD Home Team in the Seattle "War Room" conferring on an incident response.

NOAA Scientific Support Team

Through the NOAA SSC, the FOSC can quickly access the myriad of resources available throughout NOAA. As the nation's premier oceanic and atmospheric science agency, NOAA can provide and coordinate a broad range of scientific resources during a response. Working closely with the SSC is an extensive team of scientists and technicians as both a home team (at ERD headquarters in Seattle and other offices), and the on-scene team. If necessary, the SSC assembles select ERD scientists on scene to form the core of an SST.

The **home team** typically includes:

- A weather team working with NWS Incident Meteorologists/Forecasters to provide incident-specific spot forecasts.
- Oceanographer-modelers running the computer models to generate trajectories, spill fate forecasts, and similar products.
- Chemist(s) to advise on the chemical reactivity, hazards, oil identification, and toxicology.
- Biologist(s) to assist with natural resource protection strategies.
- An industrial hygienist to provide health, safety, and toxicology consultation to the NOAA team and to consult with the Unified Command's Safety Officer.
- Information manager(s) who can provide remote support for data management and COP needs in small or large incidents.



National Environmental Satellite, Data, and Information Service (NESDIS) image and analysis indicating a surface anomaly, correctly identified as an oil slick 100 miles off the Texas coast.

The **on-scene team**, in addition to the SSC, often includes Information Management (IM) specialists, an overflight observer (usually part of the trajectory forecast team), and a biologist. The team may also include:

- Additional SSCs for longer duration and/or more complex incidents.
- Additional IM specialists to manage the intense data-flow generated by a response and to support planning and operations by presenting information as GIS maps, as large-format displays, and as a COP.

- Shoreline Cleanup Assessment Technique (SCAT) specialists to coordinate, lead, and conduct both aerial and ground level SCAT surveys, as well as manage and deliver to responders the large amount of data often produced.
- Sampling teams and supplies to collect source or environmental samples to support the response.
- Navigation managers, to provide emergency bathymetric surveys and data, using the Navigation Response Teams, to find and assess navigation hazards.
- Technical specialists (in special cases) in navigation, satellite data, aerial photography, specialized vessels, etc. from other NOAA offices.
- Natural Resource Damage Assessment (NRDA) specialists to quantify injury, share biological expertise, and coordinate response-Trustee issues within the ICS.

SCAT team calibration during the Mississippi River barge DM932 *response.*

All on-scene NOAA personnel become part of the NOAA SST and are coordinated by the NOAA SSC, the NOAA team leader. The SSC is responsible for the overall NOAA team safety and ensures full coordination of NOAA activities with the Unified Command.

NOAA SST members collecting oil samples.

Customized Science Support

By discussing the needs of the specific incident with the NOAA SSC, an FOSC will get science support tailored to the requirements of that particular incident in coordination with the local scientific and technical expertise available.

Importance of Information Management

Information, and the data used to create it, is critical to an effective incident response. The Incident Command needs the most up-to-date and accurate information possible. Additionally, in today's communications world, sharing information to local governments, stakeholders, and the public demonstrates transparency and instills trust. Both goals require a highly developed information management structure.

IM starts with field data generated and used by the Operations and Planning Sections of the response. This information feeds the directives in the Incident Action Plan (IAP). It is critical how information is managed, flows, and is displayed within the response structure and the IAP. Managing Critical Information Requirements (CIRs) are now included in the 2014 USCG Incident Management Handbook (IMH). CIRs help define how the IM process is run within the response.

NOAA, per the NCP, will provide the required IM skills and experience to an incident, at the request of the FOSC. NOAA ERD uses established methods to:

- Develop an Information Management Plan (IMP) with other response staff.
- Coordinate and create Geographic Information System (GIS) data.
- Manage a Common Operational Picture (COP), such as ERMA.
- Process and manage field data, including SCAT data, sampling, photography, and GPS data.
- Oversee the integrity of all response scientific data.

For more information, refer to Chapter 9: Information Management and GIS Support.

Marine debris on the beach at Kanapou Bay, Island of Kaho'olawe, HI, an area of very heavy accumulation.

Dealing with Marine Debris

At the request of the FOSC, the NOAA SSC will coordinate with OR&R's Marine Debris Division (MDD) to address marine debris-related issues, impacts, or concerns during a response. Marine debris can be both a chronic and acute issue and one that adds another element to incident response, especially following natural disasters such as hurricanes and tsunamis that can generate significant amounts of floating, submerged, and stranded debris. NOAA plays a leading role in national and international efforts to assess and address the impacts of marine debris through the MDD. The MDD has been active in multiple responses to acute debris events, providing scientific and operational support and guidance tailored to the operational needs and requests of impacted stakeholders:

Hurricanes Katrina & Rita – 2006

The MDD coordinated the Gulf of Mexico Marine Debris Project, working with NOAA OCS, ERD, USCG, EPA, FEMA, and the impacted states to survey and map debris caused by the hurricanes in over 1,500 square miles of Alabama, Mississippi, and Louisiana coastal waters. Over 7,000 individual objects were

detected, mapped, and shared through the project website at http://gulfofmexico.marinedebris.noaa.gov.

Japan Tsunami Marine Debris Response – 2011

The MDD responded to the debris caused by the Tōhoku earthquake of 2011, working with NOAA ERD to model debris movement; implement opportunistic and targeted efforts to detect and identify debris at sea; monitor for debris arrival on shore using standardized survey protocols; and provide guidance to organizations for removal of debris using best practices for safe handling.

Post-tropical Cyclone Sandy – 2012

Starting days after the storm struck, the MDD served as part of a NOAA-wide effort to respond to the impacts of Post-tropical Cyclone Sandy. Following the initial emergency response, the MDD worked with state and local agencies in impacted states to determine needs, coordinate debris response activities, and begin initial assessments of debris location, impacts, and potential removal measures based on model and remote sensing outputs.

In addition to acute debris response, described above, the MDD has developed a program committed to investigating and solving problems that stem from marine debris, through research, prevention, and reduction activities, in order to protect and conserve our nation's marine environment and ensure navigation safety. The MDD supports and works closely with partners across the U.S. to fulfill its mission, using these strategies to address marine debris:

- Facilitate, support, and conduct research and assessment of marine debris.
- Prevent and reduce the occurrence and impacts of marine debris.
- Develop, use, and disseminate tools and products to improve efforts to address marine debris.
- Encourage changes in behavior to address marine debris.

More information about the Marine Debris Division (MDD) is available at http://marinedebris.noaa.gov.

NOAA's Disaster Response Center

NOAA's Gulf of Mexico Disaster Response Center (DRC) is centrally located along the Gulf coast in Mobile, AL. The DRC establishes a regional NOAA presence and expands federal capacity to plan for and respond to hazards of all types. The DRC serves as a hub to bring together NOAA-wide resources to enhance preparedness, planning, and response for natural and human-caused disasters along the Gulf Coast.

The 15,200-square-foot, hardened facility is located above any storm surge or flooding threat and is designed to resist up to Category 5 hurricane winds. The DRC also has an interior F5 tornado shelter. The facility includes office space, training rooms, conferences rooms, and a large multifunction space which can

be used for large trainings, meetings, drills, or emergency response operations. In addition, a 3,500-square-foot, hardened storage building, known as the Boat Barn, allows for pre-disaster equipment staging and vessel storage.

For more information about the Disaster Response Center (DRC), please visit **http://response.restoration.noaa.gov/drc** or send email to **gomdrc@noaa.gov**.

Navigation Managers and Response Teams

NOAA's Navigation Managers, stationed in port areas along U.S. coasts and Great Lakes, work directly with pilots, mariners, port authorities, and recreational boaters to help identify navigation issues to promote safe and efficient navigation.

The Office of Coast Survey deploys six Navigation Response Teams (NRTs) to conduct long-term hydrographic surveys in critical navigation areas. NRTs remain on alert to respond to emergencies when needed.

The NRTs use trailer-able survey launches equipped with side-scan sonar. Some launches also have multibeam sonar to generate three-dimensional views of obstructions.

Limited Response-Science Field Studies

The NOAA SSC may recommend and coordinate some limited response-science field studies to learn more about which response methods are the most effective, as well as their long-term effects. The SST often refers to these limited and focused studies as "Small Science." These studies advance NOAA's ability to provide better informed science support to the FOSC.

RRT Science Integration and Coordination

The NOAA SSC for an area supports the Regional Response Team (RRT), providing leadership for the synthesis and integration of environmental information required for spill response decisions in support of the FOSC (§300.145(c)(4)). Frequently, the regional or neighboring region's SSC serves as either the primary or alternate RRT representative for the Department of Commerce (a role delegated to NOAA).

2 HISTORY OF NOAA'S SCIENTIFIC SUPPORT

Origin of the SSC and Scientific Support Team

No matter the size or location, oil and chemical spills can have far-reaching impacts on human and environmental health. Understanding the science of spills is an important component of an effective response. In almost 40 years of responding to spills, NOAA has provided scientific support for nearly 3,000 marine and inland oil and chemical spills, including many major international spills.

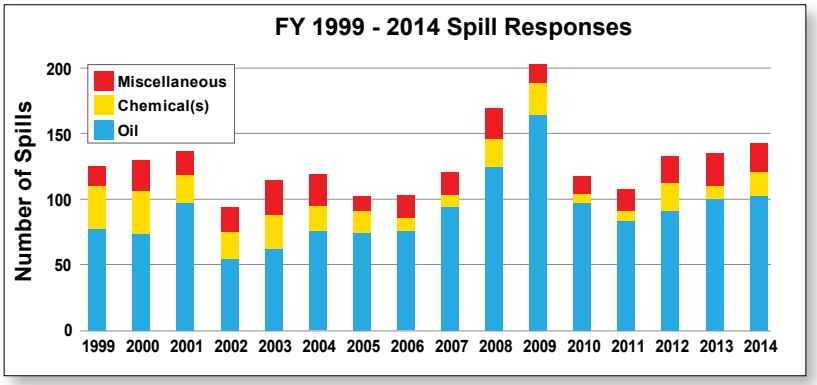
The concept of a scientific support function originated during the M/V *Argo Merchant* oil spill in Nantucket Sound, MA in 1976, when NOAA scientists arrived on scene to study the event and calibrate several models they had under development. At the time, the USCG was inundated with competing and often conflicting scientific requests and recommendations from the many nearby research institutions and from other federal and state agencies. At the request of the USCG, the NOAA scientists agreed to coordinate and focus regional academic inputs and models into operational documents and guidance for the FOSC. The team remained on scene as a government advisor to the FOSC for several weeks, conducting more field observations, including an important drift card study looking at the long-term fate of the oil at sea.

This informal science support proved invaluable, and the USCG and its National Strike Force began to rely on the team to coordinate the complex scientific issues that arose at spills. In 1977, NOAA formally established a Scientific Support Team to provide emergency spill response assistance to the Coast Guard and Environmental Protection Agency (EPA). Language establishing the Scientific Support Coordinator was added to the NCP in 1980. In 1994, in the wake of the T/V *Exxon Valdez* spill, the Oil Pollution Act of 1990 (OPA 90) further delineated the role of the SSC and the SST as a "Special Team" under the NCP.

Some of the nearly 3,000 oil spills and other incident responses for which NOAA OR&R provided scientific support.

NOAA's Advanced Scientific Support Team

The original idea from 1976 evolved into NOAA Hazmat, now the Emergency Response Division of the Office of Response and Restoration. Today's NOAA Scientific Support Team includes in-house response-oriented scientists and technicians with expertise in oceanography, biology, chemistry, geomorphology, natural resources, human health and safety, and information management, who all directly support the FOSC. The extended NOAA team can also include OR&R's Assessment and Restoration Division, Marine Debris Division, and further reach into NOAA's National Weather Service, National Marine Fisheries Service, Office of Coast Survey, and other program offices for data involving satellites, tides, river flow, storm surge, seafood safety, and more. The full NOAA Scientific Support Team represents a broad range of scientific disciplines and operational experience, having responded to most major U.S. spills and many major overseas incidents over the last four decades.



Number of incidents for which NOAA ERD has provided support, 1999 to 2014.

M/V Argo Merchant *grounded off Nantucket, 1976.*

T/V Exxon Valdez *grounded on Bligh Reef, Prince William Sound, AK, March 24, 1989.*

3 WHAT TO EXPECT FROM NOAA DURING A RESPONSE

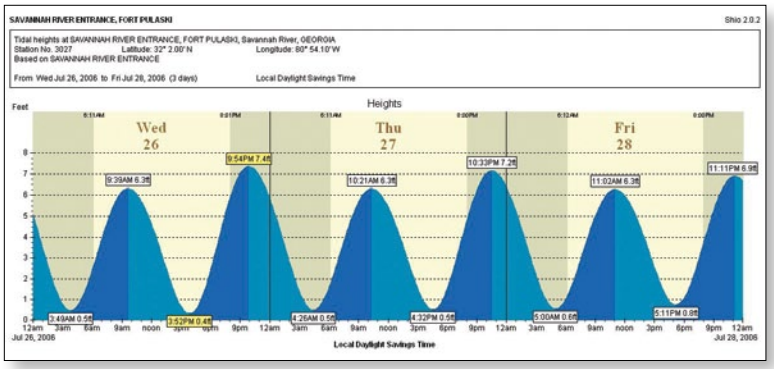
After the NOAA SSC is Contacted

Once the Coast Guard calls the SSC (or ERD Duty Officer*) for scientific support, the SSC then contacts the home team to provide several support products. The following list describes the products typically generated and the time frame in which they are usually available to the FOSC. All NOAA scientific support is customized per the support needs requested by the FOSC, through the assigned SSC. The following flow of products is typical. Some of the products discussed here are explained in detail later in the Guidebook.

For an Oil Spill or Threat of a Spill

Initial Response Products and Actions – The first hour

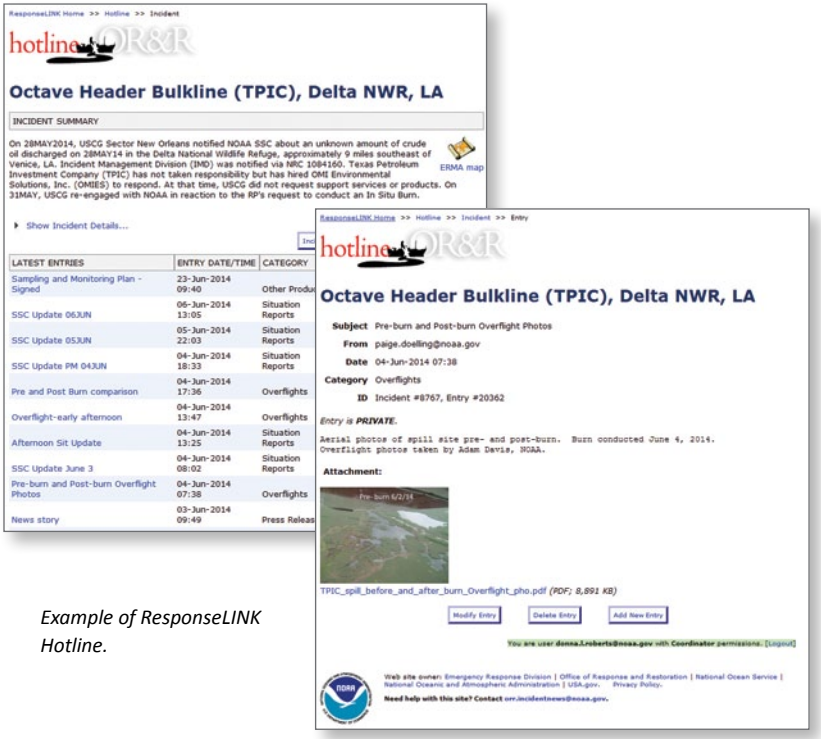
- Initial trajectory report prepared by the home team and provided to the FOSC through the SSC, with interpretation.
- Oil fate information provided through the SSC.
- Weather forecast (thereafter once or twice a day). The SSCs have direct 24-hour access to any and all NWS forecast offices around the country to provide real-time weather observations, site-specific spot forecasts, and decision support services.
- Incident location is placed in our Common Operational Picture (ERMA) for initial situational awareness.
- Tidal heights and currents (thereafter once a day or as needed).
- For inland spills, water level forecasts and river velocity estimates.



Example of tide graph.

* The ERD/Hazmat Duty Officer (HDO) is available 24 hours a day at (206) 526-4911. For calls after regular business hours (PST), the answering service will immediately contact the HDO. The caller should receive a return call within 30 minutes.

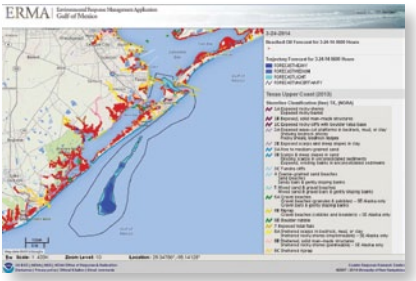
- Open “Hotline” on ResponseLINK (new postings added as needed and available). See Chapter 9 for more information about ResponseLINK and Hotline.
- Continue collecting and updating incident information.



Example of ResponseLINK Hotline.

Next Products (as needed) – The next two to four hours

- Trajectory forecast map.
- Resources at risk (RAR) analysis.
- Toxicology information.
- As incident data are developed, they are placed in ERMA to provide an initial picture of response activity and potential impacts to environmental resources.
- Human health and safety consultation.
- Initial resource protection priorities recommendations.



An ERMA display of a trajectory estimate and ESI shoreline types.

The Remainder of Day One

- Discuss with FOSC future scientific support needs.
- If dispersant application, in situ burn, or other alternative countermeasures are being considered by the Command, the SSC will coordinate with natural resource managers and RRT representatives, and may assist the FOSC with convening an incident-specific RRT conference call. (This may occur earlier or later in the response, as appropriate.)
- If appropriate, the SSC responds on scene and arranges for additional on-scene SST personnel, which may include NWS Incident Meteorologists (IMets) or Emergency Response Specialists (ERSs).
- The SSC generally posts a daily incident summary to Hotline.

Days Two through the End of Response

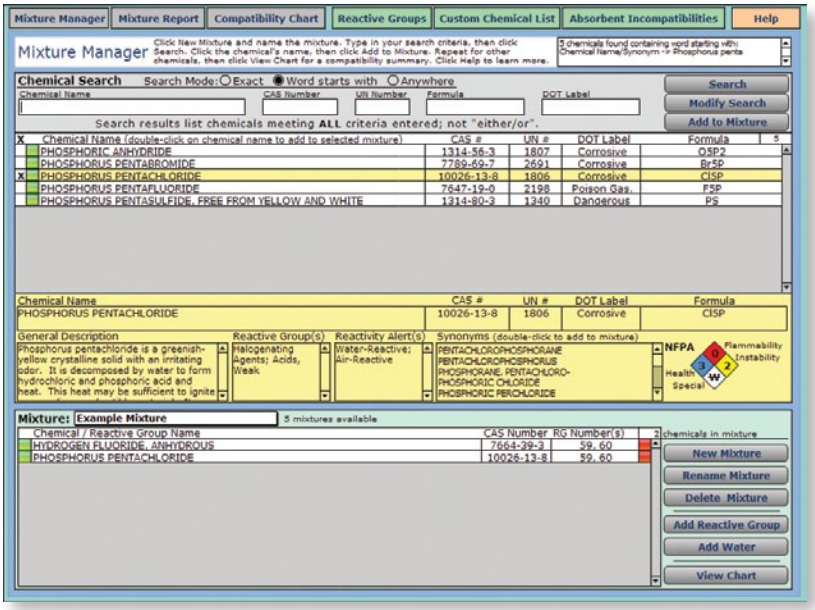
- Home team continues to generate weather forecasts, oil fate estimates, and trajectory forecasts, which are recalibrated daily from field observations, as requested by the FOSC through the SSC.
- Field-ready SST members requested should arrive and initiate field support by conducting initial aerial and/or ground level assessments. Data from overflights and field teams are critical for the oceanographers to recalibrate water levels, currents, winds, and trajectory predictions.
- On-scene information management personnel set up and begin producing response support products and managing response-generated data. Coordination begins with other data providers to ensure protocols are established, and an Information Management Plan is initiated.
- NWS IMets/ERSs can provide on-scene or remote weather forecasts, briefings, and updates as needed.
- If a public website for access to appropriate response information is desired, ERD can set up an IncidentNews site. (See Chapter 9 for more information about IncidentNews.)
- If source samples are obtained, they are shipped for product characterization analysis to support response decisions and for coordination with the USCG Marine Safety Lab on fingerprinting.
- Composition of the SST adjusts as dictated by the response needs.
- Following the active response phase of significant incidents, a post-incident data summary is prepared by NOAA for the FOSC.
- The SSC will assist the FOSC to initiate emergency consultations with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service ("The Services") regarding potential effects related to the Endangered Species Act Section 7, and for Essential Fish Habitat. Additional assistance will be provided to consult with the State Historic Preservation Officer and any Tribal interests, regarding the National Historic Preservation Act and any potential impacts to historic or cultural resources.

- The NOAA SST will facilitate coordination between the Natural Resource Damage Assessment (NRDA) activities and the Incident Command.

For a Chemical Incident

Initial Response Products – Usually within the first hour

- Initial hazard assessment.
- Health and safety consultation with FOSC, Unified Command Safety Officer, and local public safety officials.
- Open Hotline on ResponseLINK (new postings added as needed and available).
- Weather forecast (thereafter once or twice a day).
- Reactivity report for potential mixing of affected chemicals.
- Hazard mitigation priorities consultation.
- Chemical property and response information (from CAMEO).
- Air dispersion forecasts, including threat zone estimates. Plume trajectory forecasts are updated as needed for the duration of the incident.



Reactivity report from the Chemical Reactivity Worksheet, showing the results of mixing two hazardous chemicals.

Next Products (as needed) – The next two to four hours

- Pollutant transport forecast map (waterborne chemicals).
- Demographic information for potentially affected population and regulated facilities in the area (from census population data).
- Resources at risk (RAR) analysis.
- Toxicology.
- Additional human health and safety issue consultation with responders.
- Additional resource protection priorities.

Acid leaking from side of storage tank at chemical facility.

The Remainder of Day One

- Discuss with FOSC future scientific support needs.
- If appropriate, the SSC responds on scene and arranges for additional on-scene NOAA SST personnel, which may include NWS IMets/ERSs.
- The SSC generally posts a daily incident summary to Hotline.

Days Two through the End of Response

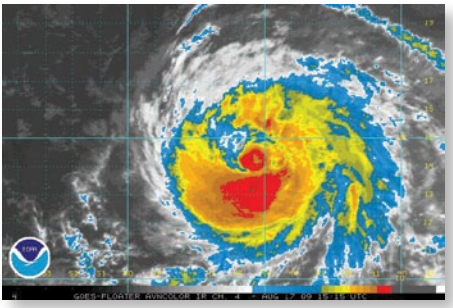
- Home team continues to generate weather forecasts, chemical fate projections, waterborne chemical trajectory forecasts, etc., as requested by the FOSC through the SSC.
- Requested field-ready SST members arrive and initiate field support by conducting initial field assessments.
- On-scene information management personnel set up and begin producing response support products and managing response-generated data.

- NWS IMets/ERSs can provide on-scene weather forecasts, briefings and updates as needed.
- If a public website for access to appropriate response information is desired, ERD can set up an IncidentNews site. (See **Chapter 9** for more information about IncidentNews.)
- If source samples are obtained, they are shipped for product characterization analysis to support response decisions.
- Composition of the SST adjusts, as dictated by the response needs.
- Following the active response phase of significant incidents, a post-incident data summary is prepared by ERD for the FOSC.

All Hazard Incident Support

For other types of incidents or events ("All Hazards" support), NOAA scientific support will have a similar structure and chronology to those described above, but will be specialized to the unique nature of that event. Examples of such incidents include hurricanes, tornadoes, earthquakes, tsunamis, vessel groundings, Right whale strike investigations, certain vessel and aircraft searches, nationally significant events such as political conventions, Superbowl events, and potential terrorist incidents.

NWS meteorologist providing weather briefing during 2012 Republican National Convention in Tampa, FL.



NOAA satellite image of Hurricane Bill in 2009.

4 NOAA SCIENTIFIC SUPPORT BETWEEN INCIDENTS

Between Incidents – Facilitating Readiness

In addition to supporting on-going incident responses, much of the support provided by the NOAA SSC and ERD is accomplished between incidents. While the SSCs are the individuals the FOSC works through, they represent an extensive team of experienced and talented emergency response scientists within ERD and other divisions of OR&R. The SSCs and other key ERD personnel participate in or arrange a host of response training, readiness, research and development, and leadership activities. These include local, regional, national, and international response community efforts, such as:

- Regional Response Team (RRT) and Area Committee leadership and science integration to prepare Regional and Area Contingency Plans. (See **Appendix 2** for the NOAA RRT representation by region.)
- Spill training coordination, exercise planning, and support during the exercise. (Contact your SSC for training or drill support.)
- Development and updating of the planning/response computer models, special tools for responders, and response "Job Aid" booklets. (See **Appendix 3** for a list and description of available job aids.)
- Development of response-related technical documents. (See **Appendix 9** for a list and description.)
- Coordination of response science training (e.g., Science of Oil Spills classes) by ERD. (See **Appendix 6** for ERD training opportunities.)
- Co-facilitation with the USCG of Ecological Risk Assessment (ERA) workshops, in which participants develop a consensus of the potential ecological risks of response options considered during spills. (See **Appendix 6** for more about ERA Workshops.)
- Training for Area Committees and RRTs on regional response data, Information Management Plan concepts, and COP tool (such as ERMA) and how these issues support planning for more effective response.
- Creation of supporting documentation (e.g., trajectories, resources at risk, weather), and participation in those exercises.
- In coordination with SSCs, the NWS participates in drills and exercises to maintain profi-

USCG National Strike Force and NOAA SSC participating in SMART training.

ciency. The NWS continues to train additional IMets/ERSs to provide enhanced decision support services.

- Creation of Environmental Sensitivity Index (ESI) maps. (See **Appendix 8** for more about ESI maps.)
- Alternative countermeasures review and approval, including leadership in developing and updating SMART dispersant and in situ burn (ISB) monitoring protocols and technology.

SSC Coordination with Coast Guard Districts and Sectors

SSCs spend much of their time between incidents building solid working relationships and coordinating with FOSCs and their staff within their assigned Coast Guard Districts. NWS also has a close working relationship with the Coast Guard. In this way, the NOAA SST maintains the ability to effectively communicate with and support the FOSC during an actual incident.

NOAA Leadership within the National Response Community

NOAA ERD personnel actively participate at the national level, maintaining key roles in such organizations as the National Response Team (NRT), the Interagency Coordinating Committee for Oil Pollution Research (ICCOPR), the Coastal Response Research Center (CRRC), and the International Oil Spill Conference (IOSC). In addition, ERD is a national leader in the field of oil and chemical incident response science.

Addressing Abandoned and Derelict Vessels

Abandoned and derelict vessels are a problem for many U.S. harbors, bays, and shorelines. Primary concerns include the presence of residual fuel oils and potential hazards to navigation. Additionally, these vessels may pose threats to natural resources by physically smothering and destroying sensitive marine habitat, entrapping and entangling wildlife, releasing toxic materials, or becoming a source of marine debris. Some vessels become illegal dumping sites for waste oils and other hazardous materials.

OR&R is working on this issue by:

- Researching to address abandoned vessel issues, including legal obstacles.
- Supporting the NRT to document removal, including best practices.
- Producing guidance for state and local governments.
- Developing databases of potentially polluting shipwrecks and abandoned vessels.
- Incorporating data on abandoned and derelict vessels and shipwrecks into ERMA.

A partially submerged, rusted-out vessel, which grounded and sank in the U.S. Virgin Islands in the late 70s, is located about 15 feet from sensitive seagrass habitat.

In addition to OR&R's work on abandoned and derelict vessels, NOAA is also conducting a risk assessment and prioritization of sunken wrecks in U.S. waters. NOAA maintains a database of shipwrecks, dump sites, navigational obstructions, underwater archaeological sites, and other underwater cultural resources. The Resources and Undersea Threats database includes approximately 20,000 shipwrecks in U.S. waters. This work is part of NOAA's Remediation of Underwater Legacy Environmental Threats (RULET) project.

On May 20, 2013, NOAA released the report, "Potentially Polluting Wrecks in U.S. Waters," available at **http://sanctuaries.noaa.gov/protect/ppw/**.

Research and Development of Response Science Tools

In addition to refining and updating ERD's existing array of response applications, guides, and tools, ERD scientists are constantly developing new ones. Currently, some of our tools, such as the new Chemical Aquatic Fate and Effects (CAFÉ) application, may only be available through the NOAA SSC since they are still being tested and refined.

The rapidly advancing fields of information communication and data processing provide both great opportunities and challenges for responders. Chemical incidents pose especially time-dependent support needs.

NOAA Field Team Readiness

All members of the NOAA SST who respond on scene are appropriately trained and equipped for the duties they will perform. To accomplish this, field personnel routinely train and update their skills with in-house and external training and certifications, including:

- OSHA/HAZWOPER - All field personnel are 40-hour certified and current.
- Incident Command System (ICS) - All ERD responders have completed at least IS-100, IS-200, IS-700, and IS-800 training, as well as having considerable on-scene experience. NOAA SSCs have also completed advanced ICS and USCG courses such as ICS-300, ICS-410 (Type 2 Incident Commander), and Crisis Management training. Higher level and specific position ICS trained personnel are available to fill specific science team functions.
- First aid/CPR - Field personnel are required to be current.
- Aircraft safety - NOAA SST responders have completed offshore survival and egress training, and carry an egress air supply when flying over water.
- Small boat operation and safety.
- General field operations, including use of GPS receivers, digital photography, satellite phones, etc.
- Cold climate trained and equipped when deployed to such climates.

- SCAT team member trained (SCAT leaders, coordinators, or trainers are available if needed).
- Aerial observation training, including SMART Tier 1 observation (for specific field responders).

NOAA SST members taking helicopter egress training.

USCG National Strike Force participating in SMART training.

Trajectory Forecasting – A Key Service

Trajectory forecasting, real-time tracking of oil and chemical spills, and air plume forecasts are critical services required by the FOSC and Unified Command. These services are central to good response planning to protect responders, communities, and the environment, and to maximize the effective use of expensive and scarce response resources.

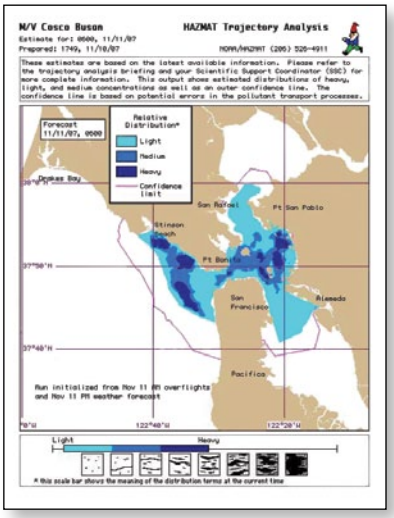
Oil Fate and Trajectory Forecasting

The goals of oil fate and trajectory forecasting are to predict oil weathering processes, such as evaporation and dispersion, and where the remainder of the oil will go and when. The computer tools used by NOAA to forecast weathering and trajectories include ADIOS to forecast weathering, and GNOME, in concert with hydrodynamic models and weather forecasts, to compute the transport. These NOAA models are discussed in more detail later in this section.

ERD has responded to more than 100 requests each year for incident trajectory forecast assistance and has over 35 years of spill experience evaluating real-time at-sea conditions, running trajectory models, and providing interpretation of model output. In consult with the NOAA SSC, this experience is available to assist the FOSC and Unified Command during an incident.

NOAA Modeling Expertise

NOAA ERD believes that experienced oceanographers and physicists are an integral part of making an accurate trajectory forecast. A variety of computer models help with the analysis of data, but the final product takes into account much more than a computer can provide. The trajectory product includes the training and intuition of the forecasting team in Seattle. This team communicates directly with NWS meteorologists to obtain the most reliable weather data and to understand the nuance in complex weather systems. The product is a result of the tactical overflights and satellite analyses, engagement with the academic



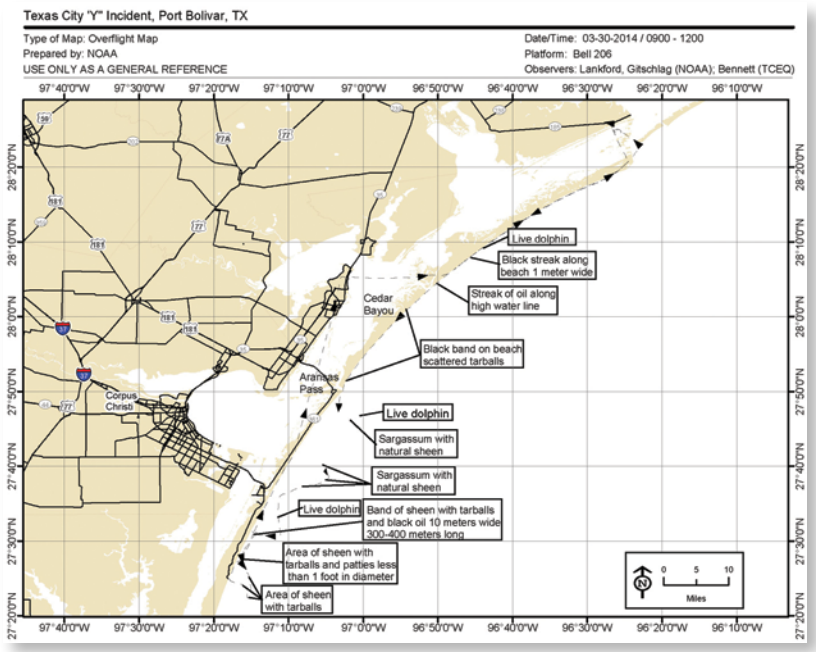
GNOME trajectory output for the M/V Cosco Busan *oil spill.*

community, and even local fishermen in order to glean the best inputs for the trajectory analysis. NOAA oceanographers also understand the limitations and uncertainties of their trajectory forecast, and communicate these to the FOSC through the SSC.

ERD observer conducting aerial overflight.

Aerial Observation and Spill Mapping

Aerial observations by NOAA's trained observers are used to collect critical field data used for spill planning and operations, as well as trajectory model calibration and verification. While helicopters are generally the preferred aircraft, conditions of the incident will dictate the aircraft used for operational overflights. The ERD team generally does not provide or hire aircraft, but requests available seat assignments through the ICS. The NOAA SST does provide field-ready, safety-trained, and experienced overflight observers. ERD's aerial observers work closely with our information management staff to rapidly and accurately convert the raw overflight observations to tactical planning information and maps for the Unified Command.

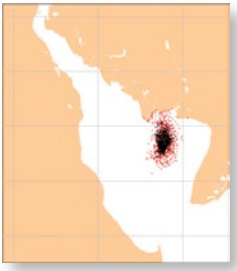


Overflight map produced during the Texas City "Y" incident, Port Bolivar, TX, 2014.

NOAA Oil Spill Models

NOAA ERD oceanographers running GNOME oil trajectory model.

Below is a summary of some of the more common response models used by the NOAA team. Detailed model information and instructions for free downloads are available in **Appendix 5**, and through our website, **http://response.restoration.noaa.gov**. A NOAA report "Hazmat Modeling Products for Spill Response and Planning" (2002) is also available at **http://archive.orr.noaa.gov/book_shelf/958_products.pdf** (PDF; 1.14 MB). The report describes in detail the modeling and simulation products that NOAA provides to help professional responders as well as the general public understand, plan for, and respond to oil and chemical spills.



GNOME output, depicting relative distribution of oil.

GNOME (General NOAA Operational Modeling Environment)

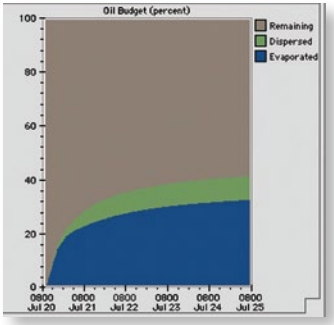
GNOME was developed by ERD to simulate the movement of a substance on or in the water. The GNOME model is the primary tool used by ERD to forecast the movement of oil for responders. NOAA strongly recommends that the FOSC and Unified Command, through the NOAA SSC, request that NOAA oceanographers provide the trajectory forecasts using GNOME. GNOME can also be used between incidents as a planning tool.

GOODS (GNOME Online Oceanographic Data Server)

GOODS is an online tool that helps GNOME users access base maps and publicly available ocean currents and winds from various models and data sources. GNOME users can then download the files in a format that can be read directly into GNOME (e.g., map files in BNA format; current and wind files in netCDF). ERD is continually updating the GOODS website as new data or forecasts are made available to share with the GNOME user community.

TAP (Trajectory Analysis Planner)

For spill contingency planning, ERD's TAP model provides a statistically based approach to help protect an area against likely oil spills. TAP is not designed to use during response to an actual spill, but provides an excellent approach to response planning, preparedness, and consequence analysis. Area spill committees can use it to help develop their Area Contingency Plan.



ADIOS oil fate graphical output.

ADIOS (Automated Data Inquiry for Oil Spills, ver. 2)

ADIOS estimates the evaporation, natural dispersion, and other weathering processes of oil in the ocean for up to the first five days after it is spilled. An easy to run model, ADIOS inputs include oil chemistry data from its large library of oil types, wind and sea state, and volume spilled over time. ADIOS outputs support decisions by the Unified Command by providing tables and graphs that show changes in the volume of oil left floating, and oil density and viscosity over time. The ADIOS weathering predictions help responders decide if and when skimmers or dispersants may be effective.

NOAA Chemical Incident Models

Chemical incidents require a particularly rapid and informed response to protect the public and responders. ERD, jointly with the Environmental Protection Agency (EPA), has developed the CAMEO (Computer-Aided Management of Emergency Operations) software suite to quickly provide accurate information to Incident Command. These programs are also important training and preparedness tools for first responders.

The **CAMEO** integrated suite of applications includes:

- CAMEO – Data management modules used to keep track of information (such as chemical inventories and contacts) and an interface for navigating between other programs in the CAMEO suite.
- CAMEO Chemicals – A database of hazardous chemicals—with physical properties, hazards, and response recommendations—and a tool for predicting how chemicals might react if mixed.
- ALOHA (Areal Locations of Hazardous Atmospheres) – An air dispersion model that estimates threat zones for chemical releases.
- MARPLOT (Mapping Application for Response, Planning, and Local Operational Tasks) – A simple mapping program, which can display ALOHA threat zones and CAMEO facilities.
- Chemical Reactivity Worksheet – Similar to CAMEO Chemicals, this program focuses solely on hazards, and allows users to add their own chemicals to the database.

Main CAMEO screen provides easy access to CAMEO data management modules and other parts of the CAMEO suite.

CAMEO Chemicals contains an extensive database, which includes response recommendations for thousands of hazardous chemicals. Chemical datasheets provide physical properties, health hazards, information about air and water hazards, and recommendations for firefighting, first aid, and spill response. UN/NA datasheets show where to find response information from the Emergency Response Guidebook and shipping information from the Hazardous Materials table (49 CFR 172.101). Users can also create a collection of chemicals and see what hazards might occur if those chemicals mixed. CAMEO Chemicals is available as a website (**http://cameochemicals.noaa.gov**), mobile website (**http://m.cameochemicals.noaa.gov**), and a downloadable program (**http://response.restoration.noaa.gov/cameochemicals**).

ALOHA is a short-range hazard modeling program that estimates threat zones for chemical releases that may result in toxic gas clouds, BLEVEs (Boiling Liquid Expanding Vapor Explosions), jet fires, vapor cloud explosions, and pool fires. ALOHA threat zones can be displayed in a variety of mapping programs, including MARPLOT, Google Maps, Google Earth, and ArcGIS (using the ALOHA Arc Tools available at **http://response.restoration.noaa.gov/aloha_arctools**). For chemical spills that exceed ALOHA's 10 km limit, the HYSPLIT/ALOHA model can be used for long-range dispersion modeling of toxic gas clouds. This new capability can be accessed through your SSC.

MARPLOT is a general-purpose mapping application that can be used to easily view and modify maps (including drawing new objects on the map). MARPLOT can display ALOHA threat zones, get population estimates, and link objects on a map to the CAMEO database.

Chemical Reactivity Worksheet (CRW) is a program that predicts potential reactive hazards (such as flammability, explosivity, and toxicity) posed by each chemical in the database. The program also predicts the hazards that might occur if multiple chemicals were mixed together. Much of the functionality of the reactivity worksheet is also available in CAMEO Chemicals, but only the CRW allows the user to create their own chemical records. The latest version of the CRW is also available for iPad.

Chemical Aquatic Fate and Effects Database (CAFÉ) is a chemical tool separate from the CAMEO suite. For chemical spills into an aquatic environment, CAFÉ can be used by the NOAA SSC and ERD scientists to predict the fate of spilled chemicals, and the effects they may have on those ecosystems. Information contained in CAFÉ includes:

- Important physical properties (e.g., flammability limits, density, water solubility) of over 40,000 chemicals.
- Model outputs for partitioning of the chemical and the water phase.

- The chemicals' evaporation and biodegradation rates.
- Analytical methods for analysis and ways in which the chemicals are used.
- Aquatic ecotoxicity data for over 4,000 chemicals including oils, dispersants, and chemically dispersed oils.
- Acute toxicity data for a wide variety of aquatic organisms (e.g., fish, crustaceans, mollusks).
- Short exposure estimates for rapid response.
- User-added toxicity data for comparison purposes.

An important feature of CAFÉ is its easy-to-use interface that allows the user to graph toxicity data quickly for presentation purposes during a spill event.

At this time, CAFÉ is only available for ERD use in support of responses, and not for public distribution.

CAFÉ plots toxicity data from a variety of species. The resulting Species Sensitivity Distribution curve represents toxicity endpoints (e.g., LC50, EC50, LOEC, NOEC) for exposure to a specific chemical or oil.

6 RESPONSE CHEMISTRY

Protection from Chemical Hazards – The Paramount Goal of Response

Fluorosilic acid incident, Braithwaite, LA.

In addition to chemical reactivity, trajectory, and air plume forecasting, the FOSC and Unified Command need fast and accurate chemical hazard information to protect responders and the public during a response. ERD therefore places a priority on providing a high level of chemical and toxicological support to the responders. Through the SSC, the chemistry team provides the expertise and information necessary to evaluate the chemical hazards associated with both chemical and oil spills and responses. These include detailed information on oil and chemical properties and composition, reactivity, and environmental interactions associated with the specifics of an incident. This information is used by the NOAA SSC to advise the FOSC and Unified Command on pollution movement, resources at risk, and possible routes of human or environmental exposure.

During a Chemical Incident

Through the SSC, the chemistry team:

- Provides concise chemical information, using sources such as the chemical datasheets in CAMEO Chemicals, which include response information, physical properties, and toxicity levels of concern.
- Can run various plume models for short- and long-distance trajectories, and simple and complex air dispersion scenarios.
- Evaluates how substances react in the environment.
- Indicates potential interactions among spilled chemicals.
- Warns about reaction by-products, such as toxic gases.
- Advises on possible mitigation options.
- Helps design sampling protocols for on-scene conditions.
- Identifies resources for sample analysis, if appropriate.
- Interprets and verifies analytical results.

Hazardous materials plume.

During an Oil Spill

Through the SSC, the chemistry team:

- Evaluates oil composition and properties.
- Coordinates with the USCG Marine Safety Lab.
- Predicts oil weathering rates and fates.
- Advises on the suitability of alternate countermeasures, such as burning, dispersion, bioremediation, or chemical application.
- Helps design sampling protocols for on-scene conditions.
- Identifies resources for sample analysis, if appropriate.
- Interprets and verifies analytical results.

Aircraft applying chemical oil dispersant over an oil discharge.

SMART (Special Monitoring of Applied Response Technologies)

SMART is a cooperatively designed monitoring program for in situ burning and dispersant application. ERD is actively involved at a national level in the SMART program, advising on research and development needs and training responders, such as the National Strike Force. This includes evaluation and training with the new dispersant monitoring system that uses the Turner Designs® C3 submersible fluorometer at the OHMSETT facility with the USCG National Strike Force. NOAA SSCs and the chemical team lead the work group that reviews SMART protocols and the monitoring system operating manuals. More information about SMART is available at **http://response.restoration.noaa.gov/sites/default/files/SMART_protocol.pdf** (PDF; 770 kb).

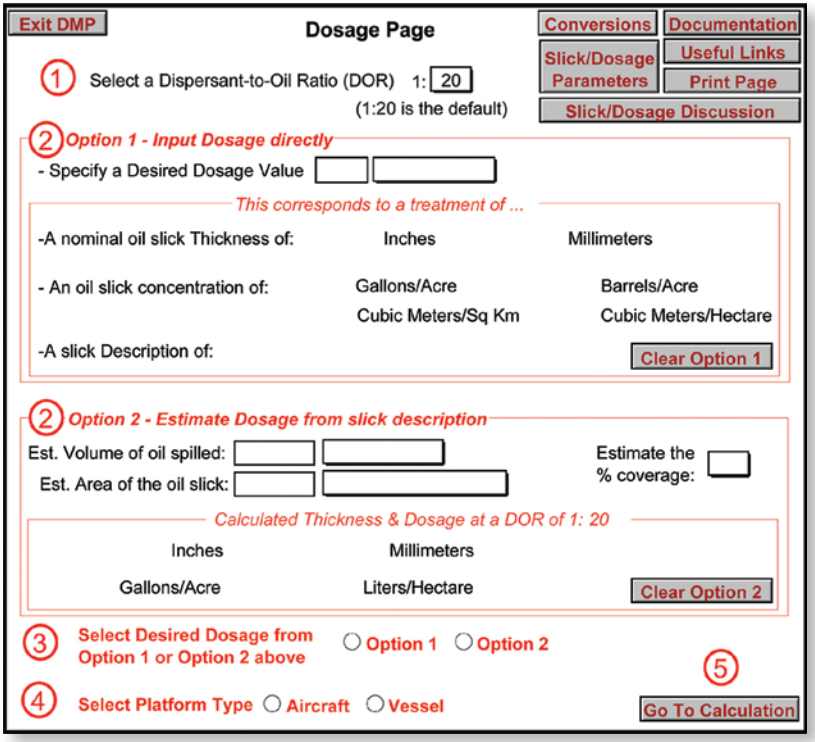
Dispersant Mission Planner, Version 2

The Dispersant Mission Planner, version 2 (DMP) is a tool that spill responders and planners can use to assess dispersant application system performance. DMP is an update to the Dispersant Mission Planner that was originally part of the Spill Tools software collection. Features include:

- Enabling Oil Spill Removal Organizations (OSROs) to evaluate Effective Daily Application Capacities (EDAC) for different dispersant application systems, using DMP's EDAC Mode. This allows OSROs to evaluate compliance with the dispersant application requirements in Coast Guard rules. (Effective September 30, 2009, the Coast Guard's rules for facility and vessel owners require dispersant capability. To demonstrate this capability, planholders need to make manual calculations of EDAC for each dispersant application platform they intend to use, or use DMP.)

- In operational mode, DMP provides general performance estimates for the application of dispersants involving a specified oil spill concentration, application platform, and scenario. It can be used to refine and optimize system configurations and to examine staging and logistical support.

Appendix 5 links to more information about DMP and download instructions.



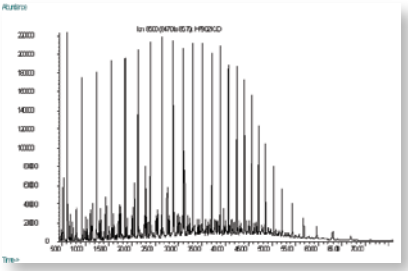
Dispersant Mission Planner 2 dosage page.

Chemistry Support Contract Laboratory

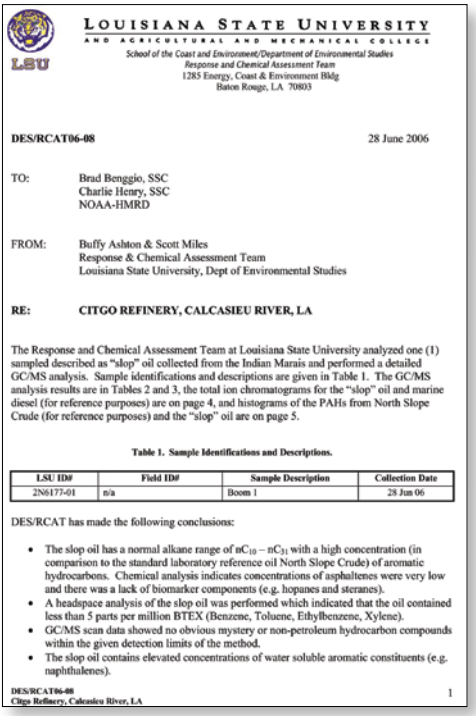
In addition to our in-house chemistry team, ERD contracts with an experienced analytical and consulting laboratory so that we can provide the highest level of chemistry support to the FOSC. Through the SSC, this laboratory capability provides the FOSC with overnight answers to critical questions about oil weathering, contamination sources, and chemical identities.

Unusual or Specific Chemical Hazard Assessment

Because every chemical release poses unique threats, the NOAA SST chemistry team has the special training and experience to deal with unusual and specific chemical hazards and analytical issues during spills. For example, through the NOAA SSC, the team can review and advise the FOSC on the suitability of specific state-of-the-art chemical or bioremediation response options, and any associated toxicological issues.



Oil sample chromatogram or "fingerprint" produced by the ERD chemistry team.



LOUISIANA STATE UNIVERSITY
AND AGRICULTURAL AND MECHANICAL COLLEGE

School of the Coast and Environment/Department of Environmental Studies
Response and Chemical Assessment Team
1285 Energy, Coast & Environment Bldg
Baton Rouge, LA 70803

DES/RCAT06-08 28 June 2006

TO: Brad Benggio, SSC
Charlie Henry, SSC
NOAA-HMRD

FROM: Buffy Ashton & Scott Miles
Response & Chemical Assessment Team
Louisiana State University, Dept of Environmental Studies

RE: CITGO REFINERY, CALCASIEU RIVER, LA

The Response and Chemical Assessment Team at Louisiana State University analyzed one (1) sampled described as "slop" oil collected from the Indian Marais and performed a detailed GC/MS analysis. Sample identifications and descriptions are given in Table 1. The GC/MS analysis results are in Tables 2 and 3, the total ion chromatograms for the "slop" oil and marine diesel (for reference purposes) are on page 4, and histograms of the PAHs from North Slope Crude (for reference purposes) and the "slop" oil are on page 5.

Table 1. Sample Identifications and Descriptions.

LSU ID#	Field ID#	Sample Description	Collection Date
2N6177-01	n/a	Boom 1	28 Jun 06

DES/RCAT has made the following conclusions:

- The slop oil has a normal alkane range of $nC_{10} - nC_{31}$ with a high concentration (in comparison to the standard laboratory reference oil North Slope Crude) of aromatic hydrocarbons. Chemical analysis indicates concentrations of asphaltenes were very low and there was a lack of biomarker components (e.g. hopanes and steranes).
- A headspace analysis of the slop oil was performed which indicated that the oil contained less than 5 parts per million BTEX (Benzene, Toluene, Ethylbenzene, Xylene).
- GC/MS scan data showed no obvious mystery or non-petroleum hydrocarbon compounds within the given detection limits of the method.
- The slop oil contains elevated concentrations of water soluble aromatic constituents (e.g. naphthalenes).

Example of Oil Chemistry Report.

Collaborating with Other Response Science Laboratories

The chemistry team often collaborates with other chemists and analytical laboratories, such as the U.S. Coast Guard Marine Safety Laboratory and the Occupational Safety and Health Administration (OSHA); chemists from academia and industry; and other experts to resolve problematic sample characterizations or special tasks associated with incident response.

7 HEALTH AND SAFETY

NOAA Health and Safety Coordinator

The NOAA Health and Safety Coordinator, a Certified Industrial Hygienist, works with the NOAA SSC to ensure that all NOAA field personnel are fully safety trained and equipped for aircraft, boat, and remote field operations. In addition, if necessary, the NOAA Health and Safety Coordinator will work with local and Unified Command health and safety officials to provide the relevant expertise and information associated with oil and chemical releases.

Health and Safety Services Available

- Detailed information on allowable human exposure levels.
- Recommendations for personal protective gear for the incident, based on the specifics of a release.
- Evaluation of potential routes of human exposure.
- Consultation with OSHA, the Center for Disease Control, the Agency for Toxic Substances and Disease Registry, and similar agencies.
- Site safety plan design for NOAA SST personnel.
- Consultation with the Unified Command safety officer.
- Assistance in designing sampling protocols for on-scene conditions to meet OSHA requirements.
- Interpretation of analytical results.
- Review of specific response actions and tools for their human health and safety suitability (such as application of surface cleaning agents).
- Consultation with NOAA SST chemists and air modelers to design air monitoring strategies.

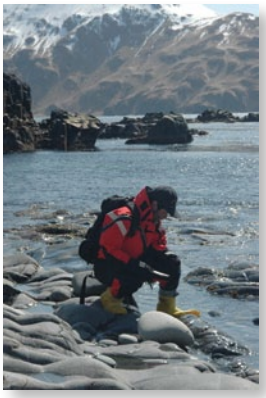
Chemical Incident Support

During chemical incidents, the NOAA Health and Safety Coordinator focuses on how substances can affect the incident responders, as well as an exposed population (whether by inhalation, absorption, or ingestion) and possible mitigation options following an incident.

Phosphoric acid spilling from phosphogypsum stack near Houston, TX.

In situ burn conducted as part of the response to the Octave Header Bulkline spill near Venice, LA, May 2013.

NWS IMet providing on-site weather support.



NOAA scientist assessing level of oiling on Alaskan beach.

Oil Spill Support

During oil spills, the NOAA Health and Safety Coordinator focuses on the health and safety aspects of the spill on the responders, and when applicable, on the public at large. The NOAA Health and Safety Coordinator assists in evaluating different cleanup methods, such as burning, dispersants, and skimming, and also considers effects associated with manual beach cleanup, including workers' exposure to oil agents, decontamination issues, and physical stresses, such as heat or cold. The direct link between SSCs and the NWS Forecast offices can provide decision-support information related to weather events (such as the proximity and early warning of active electrical storms) to exposed response personnel.

Unusual or Specific Hazard Analysis

The NOAA Health and Safety Coordinator has the expertise to provide guidance to deal with unusual and specific hazards during incidents.

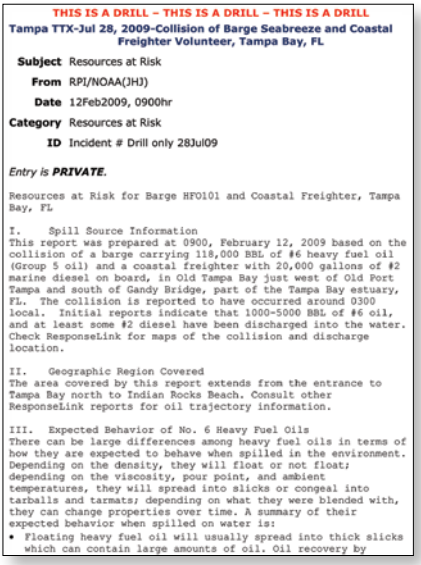
8 NATURAL RESOURCE PROTECTION

Minimizing Environmental Impact

Chief goals of spill response are to prevent, minimize, and mitigate impacts to the environment. The NOAA SST includes an impressive depth of expertise and experience in natural resource science, including: marine and aquatic biology, coastal geology, geochemistry, fisheries science, ecology, aquatic toxicology, fish and shellfish pathology, seafood safety, and environmental microbiology. NOAA's Office of Response and Restoration (OR&R) personnel have responded to oil and chemical spills throughout the world from the Arctic to the tropics. The team has the expertise to evaluate natural resource issues, solve unique issues, and apply thoughtful protection strategies to assist the FOSC in minimizing further environmental impacts.

Resources at Risk (RAR) Analysis

One of the first priorities of the SST is to provide a rapid analysis of the natural resources at risk (RAR) as a result of the incident. This RAR analysis mostly involves risk to sensitive biological resources, but also encompasses human-use resources (such as drinking or cooling water supplies and recreational areas), as well as cultural and historical resources. To properly protect the latter, the NOAA SSC actively coordinates with the State Historic Preservation Office (SHPO) for the affected state(s). Within hours of notification and collection of basic spill information, the SST can produce a brief written description of RAR in the spill area, along with properties of the spill product and how a spill may affect the environment. RAR information is used to complete the ICS-232 form, Resources at Risk Summary. See Appendix 4 for a list of ICS forms and how to access them online.



THIS IS A DRILL – THIS IS A DRILL – THIS IS A DRILL

Tampa TTX-Jul 28, 2009-Collision of Barge Seabreeze and Coastal Freighter Volunteer, Tampa Bay, FL

Subject Resources at Risk
From RPI/NOAA(JHJ)
Date 12Feb2009, 0900hr
Category Resources at Risk
ID Incident # Drill only 28Jul09

*Entry is **PRIVATE**.*

Resources at Risk for Barge HFO101 and Coastal Freighter, Tampa Bay, FL

I. Spill Source Information
This report was prepared at 0900, February 12, 2009 based on the collision of a barge carrying 118,000 BBL of #6 heavy fuel oil (Group 5 oil) and a coastal freighter with 20,000 gallons of #2 marine diesel on board, in Old Tampa Bay just west of Old Port Tampa and south of Gandy Bridge, part of the Tampa Bay estuary, FL. The collision is reported to have occurred around 0300 local. Initial reports indicate that 1000-5000 BBL of #6 oil, and at least some #2 diesel have been discharged into the water. Check ResponseLink for maps of the collision and discharge location.

II. Geographic Region Covered
The area covered by this report extends from the entrance to Tampa Bay north to Indian Rocks Beach. Consult other ResponseLink reports for oil trajectory information.

III. Expected Behavior of No. 6 Heavy Fuel Oils
There can be large differences among heavy fuel oils in terms of how they are expected to behave when spilled in the environment. Depending on the density, they will float or not float; depending on the viscosity, pour point, and ambient temperatures, they will spread into slicks or congeal into tarballs and tarmats; depending on what they were blended with, they can change properties over time. A summary of their expected behavior when spilled on water is:

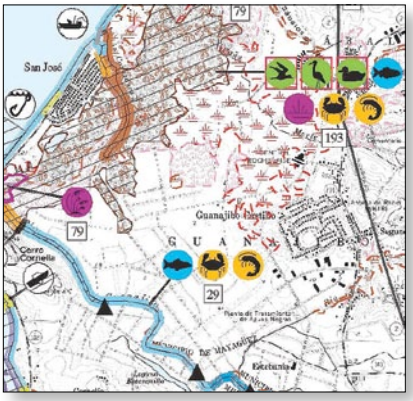
- Floating heavy fuel oil will usually spread into thick slicks which can contain large amounts of oil. Oil recovery by

Example of a resources at risk (RAR) analysis.

Best Management Practices for Resource Protection

In order to clearly communicate to response operations how to minimize adverse effects on natural resources during cleanup, the NOAA SSC may develop a concise Best Management Practices (BMP) document. The BMP contains detailed instructions to field observers and crew chiefs on how they can direct crews to accomplish cleanup objectives with the least injury to the environ-

ment. It also contains important Environmental Unit contact information in the event additional information is needed. The BMP is prepared in consult with all appropriate agency resource managers, using the practical experience and expertise of the SSC and the whole SST to allow the cleanup to proceed in an efficient, yet environmentally responsible manner.



Section of an Environmental Sensitivity Index (ESI) map.

The Role of Environmental Sensitivity Mapping

The primary tool for RAR analysis is the Environmental Sensitivity Index (ESI) maps. ESI maps help spill responders and planners identify vulnerable coastal locations before a spill happens, so that protection priorities can be established and cleanup strategies identified in advance. ERD has been producing ESI maps for over 35 years. During that time, the entire U.S. coastline (including Alaska, Hawaii, the Great Lakes, and all U.S. territories) has been mapped at least once. Some areas have been mapped up to three times in an effort to keep the maps current. Regional resource experts, including governmental, academic, private sector, and citizen environmental groups, provide valuable input into the ESI products. More information about ESI maps is available in **Appendix 8**.

Establishing Protection Priorities

Incident responders have limited response resources and time. Therefore, the FOSC and Unified Command must prioritize protection and cleanup strategies. This prioritizing must consider the vulnerability of the resource to injury and the relative importance of that resource to the community (either the ecological or human community), which is a subjective exercise and requires skillful arbitration between conflicting interests. The NOAA SSC often leads this discussion and strives for consensus among key stakeholders, such as state and local officials, trustees, resource managers, and nongovernmental organizations.

This arbitration and facilitation of stakeholders continues between responses. SSCs take a leadership role in Area Committees, working with resource stakeholders to determine protection priorities for each area to produce Geographic Response Plans for the Area Contingency Plans.

Shoreline Cleanup Assessment Technique (SCAT) Leadership

Shoreline Cleanup and Assessment Technique (SCAT) surveys are conducted to determine shoreline types and degree of oiling. This information is provided

to the Planning Section to help prioritize cleanup operations. As shoreline cleanup proceeds, SCAT is used to help determine cleanup termination endpoints. SCAT surveys are conducted by small field teams composed of members determined by the specific purpose of the surveys. NOAA SST field personnel are trained and experienced in planning, conducting, leading, training, and coordinating all aspects of SCAT surveys. Further, the NOAA SST members are skilled at coordinating, processing, and archiving the vast amount of SCAT data produced during a spill. The information can then be analyzed and summarized to facilitate the FOSC making informed decisions regarding cleanup operations and endpoints.

Additionally, ERD is an active leader nationally in reviewing and revising the SCAT process and providing SCAT training to Coast Guard, state, and local responders. ERD has produced several publications and products, such as the Shoreline Assessment Manual (updated in 2013), the Shoreline Assessment Job Aid, and Shoreline Assessment Forms. More information about these aids is available in **Appendix 3**.

Natural Resource Publications for Responders

ERD produces publications to assist responders in understanding the sensitive nature of several natural resources at risk from oil spills, and potential ways to deal with them. The current list of these publications includes:

- Oil Spills in Coral Reefs: Planning and Response Considerations.
- Oil and Sea Turtles: Biology, Planning, and Response.
- Oil Spills in Mangroves: Planning and Response Considerations.
- Oil Spills in Marshes: Planning and Response Considerations.
- Managing Seafood Safety after an Oil Spill.
- Guidance on Sensory Testing and Monitoring of Seafood for Presence of Petroleum Taint Following an Oil Spill.
- Characteristic Coastal Habitats: Choosing Spill Response Alternatives.

Appendix 9 provides additional information on each of the natural resource publications, including an internet link to access them. For information on other available response job aids, see **Appendix 3**.

Required Environmental Compliance Consultations

An FOSC directing a federal action, including pollution response, is required by the Endangered Species Act (ESA) Section 7 to consult with the Secretary of Interior/USFWS and/or Commerce/NMFS (National Marine Fisheries Service) if the federal action may affect ESA-listed species or their critical habitat. These agencies are collectively referred to as “The Services” for this process. Note that this requirement relates to the response actions, not the pollution itself. Similarly, the Magnuson-Stevens Fishery Conservation and Management Act that designates Essential Fish Habitat (EFH), requires consultation with the NMFS if the federal action may affect EFH.

Natural Resource Trustee recording shoreline oiling.

During these consultations, consideration should be given to potential effects to marine mammals protected by the Marine Mammal Protection Act (MMPA) or to sea turtle protection regulations, in addition to any provisions of the ESA.

A Memorandum of Agreement (MOA) was developed between USCG, EPA, DOI, and NOAA NMFS and NOS, effective in July 2001, establishing procedures for ESA Section 7 consultations. The agreement is available at **http://www.uscg.mil/ccs/npfc/docs/PDFs/urg/App/NPFC_MOU_AppA_03.pdf** (PDF, 74 kb).

Additional consultations are required if the response may affect archeological or historical resources protected under the National Historic Preservation Act of 1966 (NHPA), or Tribal resources. The NOAA SSC, in coordination with appropriate RRT representatives, may facilitate this required consultation.

Additional guidance on how to implement and improve the consultations continues to be made available from the USCG, NOAA, and DOI/USFWS. The NOAA SSC can help provide access to these documents and points of contacts, as well as to facilitate the process itself.

NOAA's Roles as Resource Manager and Trustee

NOAA has been delegated three natural resource Trustee roles that are relevant to response.

1. In National Marine Sanctuaries and National Estuarine Research Reserves, NOAA is the direct resource manager and is responsible for in-depth management of those resources on a year-round basis.
2. NOAA's Regional Response Team (RRT) representatives and alternates coordinate with all NOAA units and focus their concerns on resource questions related to emergency response efforts.
3. NOAA is a Trustee for Natural Resource Damage Assessment (NRDA). In this capacity, NOAA is responsible for quantifying injuries caused by the release (or potential release) and response actions, and securing comparable restoration to compensate the public.

NOAA's NRDA Trustee functions are carried out through a separate division of the Office of Response and Restoration (OR&R), Assessment and Restoration Division (ARD). The SSC coordinates the interaction and participation of ARD with the Unified Command.

Common Trustee Concerns and Activities during Response

Each Trustee role has characteristic concerns during the response:

NOAA Sanctuary or Reserve Manager (who may or may not be a Trustee; often part of the Environmental Unit (EU))

- Protection and cleanup of managed resources.
- Public access to managed lands, etc.

Resource Manager (Usually for specially protected species. Manager may or may not be a Trustee; often part of the EU)

- Protection of specially protected resources and critical habitat.
- Essential Fish Habitat protection (Magnusen-Stevens Fishery Conservation and Management Act), including consultations.

RRT Representatives (assigned by each agency)

- Environmental impact of response strategies.
- Incident-specific issues include: Port of Refuge, in situ burning, dispersant application, surface washing agents, and oil solidifiers.

NRDA (Agency Trustee representatives assigned to conduct NRDAs)

- Conducting a preliminary survey to determine if natural resources under Trustee jurisdiction are potentially affected.
- Co-Trustee and Trustee-Responsible Party (RP) NRDA discussions and coordination of data collection.
- Collecting ephemeral NRDA data and samples.
- Opening a dialog with the National Pollution Fund Center.
- Conducting detailed field assessments and overflights, when appropriate.
- NRDA data sharing with RPs and Unified Command.

Coordinating NRDA with Incident Response

OR&R's ARD is NOAA's lead in the NRDA. First, under the National Contingency Plan (NCP), the Natural Resource Trustees (the "Trustees") must coordinate NRDA actions with the Unified Command. However, the relationship of NRDA to the Unified Command and response efforts is often misunderstood. While in the past, NRDA activities were often poorly coordinated with response and occurred outside of the structure or control of the Unified Command, this is changing. Trustee representatives are skilled at determining the threats and injuries to natural resources under their agency jurisdiction. With improved coordination methodologies developed in recent years, both groups have benefited from better integration of the two processes during incidents. Under the NCP, the SSC may facilitate Natural Resource Trustee coordination and communication with the Unified Command. However, at more complex responses, NRDA liaisons, working closely with the Liaison Officer, and Planning and Operations Sections are deployed as the main conduit for effective information sharing.

Working with NRDA Trustees

Under the NCP, both the FOSC and the Trustees are responsible for protecting natural resources during an incident response (NCP, 40 CFR § 300.615). The NRDA Trustees must coordinate natural resource damage assessment and restoration (NRDAR or NRDA) actions with the Unified Command. NRDA liaisons, working closely with the Liaison Officer, and Planning and Operations Sections are the main conduit for effective information sharing. The SSC also facilitates Natural Resource Trustee coordination and communication with the Unified Command.

Separate NOAA NRDA Cost Accounting

All NRDA-related costs for NOAA are accounted for separately from response-related costs. NRDA costs are documented and recovered through agreements directly with the RP and/or the Oil Spill Liability Trust Fund. For all NOAA personnel, incident-related cost recovery is determined by the type of activity they are engaged in (i.e., they help achieve response objectives or NRDA objectives). Certain NOAA SST personnel are qualified to perform both types of activity.

9 INFORMATION/DATA MANAGEMENT AND DISPLAY

Planning and Operations Support

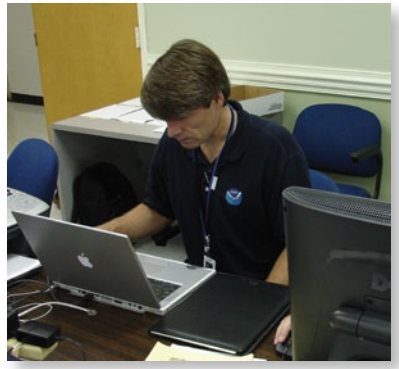
The primary objectives of Information Management are to:

- Assist the SSC and Environmental Unit Leader in development of Critical Information Requirements (CIRs) for scientific and environmental data.
- Maintain oversight of environmental and scientific data integrity on behalf of the FOSC.
- Support the Documentation Unit to ensure archiving processes for scientific data are maintained and accessible to the scientific community, trustee agencies, and the government in general. This is accomplished through close coordination among the response data creators from all federal, state, and industry offices.
- Produce information displays which provide a Common Operational Picture (COP) to facilitate informed operational decisions and planning.

Synthesizing Information

An important Information Management (IM) team function is to synthesize critical information and facilitate its flow to the FOSC, and throughout the Unified Command system. This may include:

- Being a resource for Unified Command and Section Chiefs to enhance information flow and communication clarity.
- Ensuring federal oversight of response data so that no one entity controls access to the original data.
- Providing maps and information (electronic and paper) for the incident status boards and COP, in coordination with the Situation Unit.
- Providing the appropriate software and hardware tools and expertise to capture and display information.
- Producing briefing products and ERMA COP displays such as: on-water oil slick mapping based on overflights; maps of shoreline oiling showing extent and degree of exposure; shoreline cleanup progress reports; oil trajectories; resources at risk; water level information; updated bathymetric surveys; navigational hazards; and resources at risk.



OR&R Information Management technician supporting the Unified Command during a response drill.

Information Management Support

The IM team members are an integral part of the SST and promote efficient internal and external communication to support the many aspects of response operations. The IM team integrates on-scene data collection, data synthesis, information presentation, and data dissemination during all phases of an incident response. They also facilitate coordination among response data managers and developers to ensure federal oversight of all information collected. The IM team is managed by the NOAA SSC and is usually placed within the Situation or Environmental Unit within the Planning Section, but provides support to a number of different sections.

SCAT Data Management

A difficult but important job during larger and long-term responses is managing the intense flow and sheer volume of data generated by the SCAT process. SCAT data, its analysis, and presentation to the user is time-critical to response operations. Throughout the response, SCAT and other data generated also must be organized and safely archived as federal records, in concert with the Documentation Unit. The NOAA SST, including our highly experienced and skilled IM team, are trained to provide these valuable services.

ResponseLINK and IncidentNews – Data Sharing and Dissemination

For most incidents, ERD will start an incident "Hotline" on the restricted access internet-based ResponseLINK (**https://responselink.orr.noaa.gov**).

For NOAA staff, your ResponseLINK username is your NOAA email address, including the domain part (e.g., "john.smith@noaa.gov"). Your password is your email password. For non-NOAA staff (e.g., USCG and other appropriate agencies), ResponseLINK access may be provided for specific spill incidents. To request access or obtain more information, contact the ResponseLINK administrator at **orr.incidentnews@noaa.gov**.

The Hotline report facilitates the FOSC's ability to share current incident information with approved response personnel in other locations, such as RRT members, Natural Resource Trustees, response partners, and stakeholders. ResponseLINK allows the NOAA SST to assist the FOSC and the command staff in keeping decision-makers up to date on response activities. Because ResponseLINK has restricted access, posting information to it takes less clearance time. ResponseLINK is used to post:

- Incident notifications
- Daily status reports
- Coast Guard pollution or incident reports
- Overflight and other response maps
- Chemical analysis reports
- Trajectory maps and reports

- Resources at risk analyses
- Incident photos
- Spot weather forecasts

In addition to incident Hotlines, ResponseLINK also contains incident notifications received by the National Response Team, as well as Regional Response Team (RRT) information. The National Response Center (NRC) Notifications are only available to federal, state, and local government personnel. New NRC notifications are received every 30 minutes. They are displayed for 30 days and then deleted. ERD does not maintain a long-term archive of notifications.

In addition to ResponseLINK, information that is less sensitive or restricted in distribution may be posted to a publicly available website, IncidentNews.

The IncidentNews website at **http://incidentnews.noaa.gov** contains news, photos, and other information provided and approved by the Unified Command for specific spill incidents. It is important to note that the information on this site comes to ERD directly from the field and has not been confirmed. The information is posted on the site as it becomes available. The timing of updates depends on the nature of each spill and the resources available to post the material. The date and time of updates is noted on each page. During rapidly evolving events, the site might be updated several times per day. In the later phases of a response, the site might be updated once per week. IncidentNews features newsfeed subscriptions (Atom or RSS) for updates on new incidents as they happen.

For more information, contact the IncidentNews administrator at **orr.incidentnews@noaa.gov**.

ERMA geospatial situational awareness display.

Environmental Response Management Application (ERMA®)

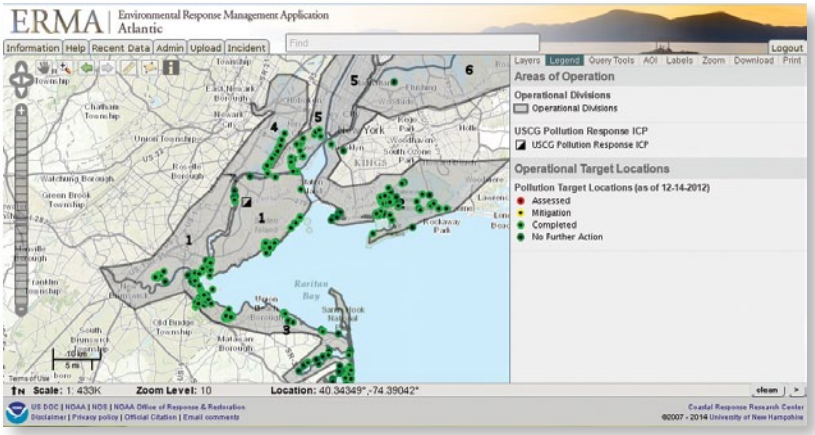
ERMA® is a Web-based Geographic Information System (GIS) tool designed to assist both emergency responders and environmental resource managers who deal with incidents that may adversely impact the environment. Because it does not require software to download, and each regional ERMA is operational 24/7, its information is easily accessed during planning phases as well as during incidents. Beyond response, ERMA also assists in resource management decisions regarding hazardous waste site evaluations and restoration planning.

ERMA brings together various types of information, providing a Common Operational Picture (COP) for all individuals involved in an incident response. Its features include:

- Available to both approved internal and external Command Post staff so that all federal and state agencies involved have access to the current situational information. Can also be used for public involvement once data are cleared by the Unified Command. Public data, such as weather, ESI, background contaminant data, etc., are available at any time without login credentials.
- Shows a complete daily picture of both environmental and operational data generated by the response.
- Ensures a federally-owned picture of the incident to instill public trust.
- Several levels of security access for both the users and data generated.
- Directly supports data sharing to all approved public and private entities from within the COP itself.
- Ensures response data retention after the incident has closed for potential long-term assessments.

ERMA is available for all U.S. coastlines, and has also been used internationally. ERMA was developed by NOAA and the University of New Hampshire through the Coastal Response Research Center. ERMA funding contributors include the U.S. EPA (Region II), the Bureau of Safety and Environmental Enforcement (BSEE), the Oil Spill Recovery Institute, and the U.S. Coast Guard.

More information about ERMA is available at **http://response.restoration.noaa.gov/erma**.



ERMA was the designated COP to provide situational awareness for the pollution response to Post-tropical Cyclone Sandy.

Post-Incident Data Summaries

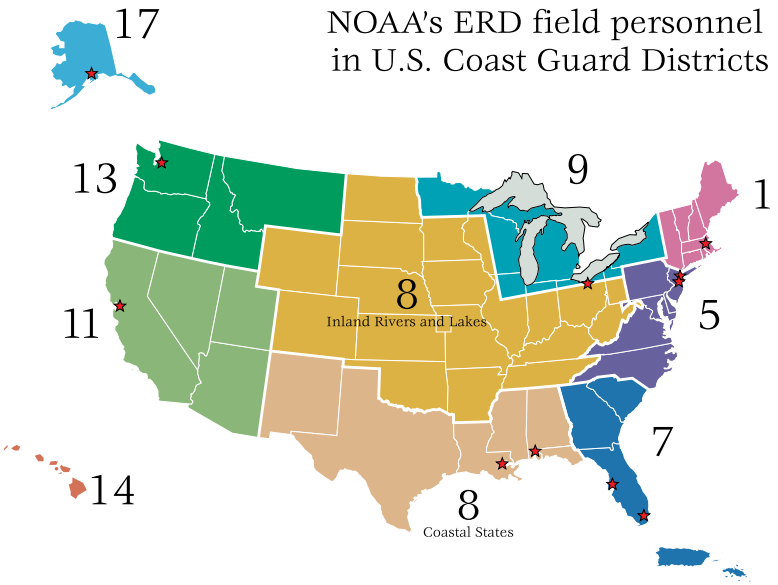
For significant incidents, the NOAA IM staff compiles a post-incident "Information Management Report" that is provided to the FOSC. This report contains all ERD overflight maps, Hotline reports, shoreline survey information, weather forecasts, official scientific recommendations, and other response-related reports, memorandum, and scientific information developed during the response. This report can greatly facilitate the FOSC's task of preparing the official FOSC after-action report.

Cover of the Information Management Report for the M/V Selendang Ayu *incident.*

APPENDIX 1

SCIENTIFIC SUPPORT COORDINATOR (SSC) CONTACT INFORMATION

The following map shows the location of NOAA's Emergency Response Division (ERD) field personnel. Most Scientific Support Coordinators (SSCs) are located in U.S. Coast Guard district offices.



District 1, except CT:
Steve Lehmann, NOAA SSC
10 George Street, Suite 220
Lowell, MA 01852
Office: (978) 654-6385
Cell: (617) 877-2806
Email: Steve.Lehmann@noaa.gov

District 1 South/District 5 North (Sectors LIS, NY, and DB)
Ed Levine, NOAA SSC
USCG Battery Park Building
1 South Street, Room 329
New York, NY 10004
Office: (212) 668-6428
Cell: (206) 849-9941
Email: Ed.Levine@noaa.gov

District 5 (south part, MD to NC):
Frank Csulak, NOAA SSC
74 Magruder Road
Highlands, NJ 07732
Office: (732) 872-3005
Cell: (732) 371-1005
Email: Frank.Csulak@noaa.gov

District 7:
Bradford Benggio, NOAA SSC
909 SE 1st Avenue, Room 714
Brickell Plaza Federal Building
Miami, FL 33131
Office: (305) 530-7931
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Email: Brad.Benggio@noaa.gov

District 7 & 8 Backup:
Adam Davis, NOAA SSC
NOAA Disaster Response Center
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District 8 Duty Phone:
(206) 375-5697
Email: Paige.Doelling@noaa.gov

District 8:
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NOAA Disaster Response Center
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Mobile, AL 36608
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Cell: (206) 549-7759
District 8 Duty Phone:
(206) 375-5697
Email: Adam.Davis@noaa.gov

District 8:
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District 8 Duty Phone:
(206) 375-5697
Email: Steven.J.Wall@noaa gov

District 9:
LT Greg Schweitzer, NOAA Corps Officer (SSC)
USCG Marine Safety Office
AJC Federal Building, Room 305
1240 East Ninth Street
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Cell: (206) 849-9918
Email: Gregory.Schweitzer@noaa.gov

District 11:
Jordan Stout, NOAA SSC
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Cell: (206) 321-3320
Email: Jordan.Stout@noaa.gov

Districts 13 and 14:
Ruth Yender, NOAA SSC
7600 Sand Point Way NE
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Districts 13 and 14:
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ERD Seattle Office:
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NOAA OR&R ERD
Regional Operations Chief
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Cell: (206) 459-8638
Email: John.Tarpley@noaa.gov

ERD Seattle Office:
Doug Helton
NOAA OR&R ERD
Incident Operations Coordinator
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Seattle, WA 98115
Office: (206) 526-4563
Cell: (206) 890-7760
Email: Doug.Helton@noaa.gov

Regional SSC Supervisors:

NOAA OR&R ERD
SSC Supervisor - West Coast
7600 Sand Point Way NE
Seattle, WA 98115
Office:
Cell:
Email:

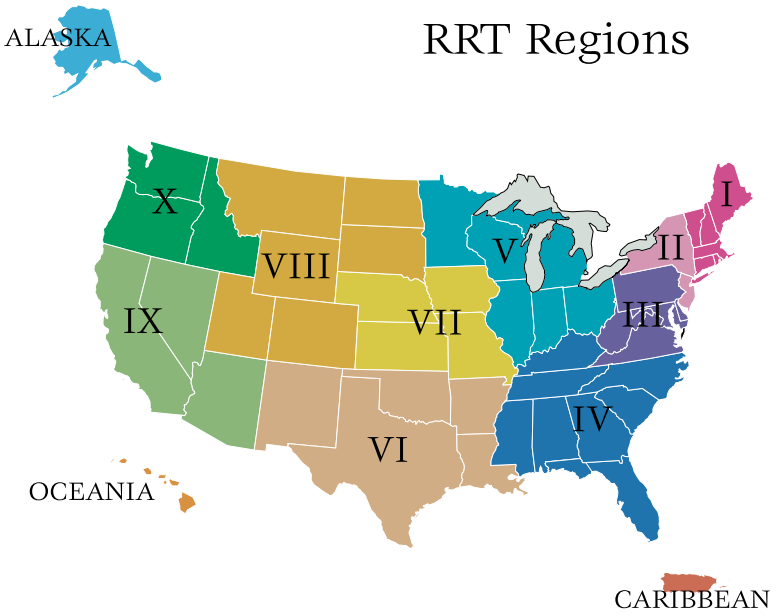
NOAA OR&R ERD
SSC Supervisor - East Coast
1305 East-West Highway
Silver Spring, MD 20910
Office:
Cell:
Email:

In the event an SSC cannot be reached, or for 24/7 emergency support, contact the ERD Duty Officer at (206) 526-4911.

APPENDIX 2

DOC/NOAA REGIONAL RESPONSE TEAM (RRT) REPRESENTATION

The following map shows the Regional Response Team (RRT) regions. The table below lists the NOAA primary and alternate representatives for each RRT region and their contact information.



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APPENDIX 3

NOAA's RESPONSE JOB AIDS AND RELATED PUBLICATIONS

NOAA's Job Aids and some related publications are listed in the following table. Some publications may no longer be available in print or are temporarily out of stock. However, PDF versions are available for downloading and may be printed from your computer.

Title/Web Link	Description	URL for PDF version	Order the publication
Trajectory Analysis Handbook en Español: Manual de Analisis de Trayectorias http://response.restoration.noaa.gov/trajanal_handbk	A flip booklet containing an overview of the physical processes that affect oil movement and behavior in the marine environment, along with a discussion of each process. Published in 2002.	http://response.restoration.noaa.gov/sites/default/files/Trajectory_Analysis_Handbook.pdf (PDF, 2.6M) en Español: http://response.restoration.noaa.gov/sites/default/files/Manual_Analisis_Trayectorias.pdf (PDF, 3.9M)	Not available at this time.
Related Publication: Questions and Answers: Spill Trajectory Analysis	A 1996 technical explanation of spill trajectory analysis and how it differs from oil spill trajectory modeling.	http://response.restoration.noaa.gov/sites/default/files/QA_Spill_Trajectory_Analysis.pdf (PDF, 260K)	Contact orr.library@noaa.gov.
Related Publication: Digital Distribution Standard for NOAA Trajectory Analysis Information	A 1996 technical description of a method for preparing a set of "minimum regret" trajectory model runs for use in trajectory analysis, and a standard digital file format for presenting the results.	http://response.restoration.noaa.gov/sites/default/files/ta_stand.pdf (PDF, 225K)	Contact orr.library@noaa.gov.
Open Water Oil Identification Job Aid for Aerial Observation en Español: Asistencia para la Identificación de Petróleo en Aguas Abiertas para observación aérea http://response.restoration.noaa.gov/jobaid/oil_id	A flip booklet with color photos of oil, to aid in oil slick identification. This aid was created to help responders perform efficient assessments and to use standard language to communicate findings effectively. Updated in 2007.	http://response.restoration.noaa.gov/sites/default/files/OWJA_2012.pdf (PDF, 2.5M)	http://response.restoration.noaa.gov/jobaid/orderform Spanish version by special order. Contact orr.library@noaa.gov.
Related Publication: Aerial Observations of Oil at Sea	1996 recommended procedures for assessing spilled oil from the air.	http://response.restoration.noaa.gov/sites/default/files/aerial-observations-oil-at-sea.pdf (PDF, 60K)	Contact orr.library@noaa.gov.

Title/Web Link	Description	URL for PDF version	Order the publication
DIspersant Application Observer Job Aid http://response.restoration.noaa.gov/jobaid/dispersant	A flip booklet with color photos to aid people who have completed training in dispersant application observation. Use it to refresh your memory on how to observe and identify dispersed and undispersed oil, describe oil characteristics, and report this information to decision-makers. Updated in 2007.	http://response.restoration.noaa.gov/sites/default/files/dispersant-application-observer-job-aid.pdf (PDF, 2M)	http://response.restoration.noaa.gov/jobaid/orderform
Related Publication: Dispersing Oil Near Shore in the California Current Region	A 2001 paper summarizing our current knowledge of dispersants, dispersing oil, the need for preapproval, methods used to simulate spill responses, and ecological risk assessment.	http://www.calcofi.org/publications/calcofireports/v42/Vol_42_Mearns_etal.pdf (PDF, 1.4M)	Contact orr.library@noaa.gov.
Shoreline Assessment Job Aid en Español: Guia para la Evaluacion del Litoral Costero http://response.restoration.noaa.gov/jobaid/shoreline	A flip booklet with color photos of surface oil distribution, oiling descriptors for thickness and type, sediment types, shoreline types, and cleanup methods to aid in the shoreline cleanup and assessment team (SCAT) process. Updated in 2007.	http://response.restoration.noaa.gov/sites/default/files/jobaid_shore_assess_aug2007.pdf (PDF, 2.9M)	http://response.restoration.noaa.gov/jobaid/orderform Spanish version by special order. Contactorr.library@noaa.gov.
Related Publication: Shoreline Assessment Manual	A manual outlining methods for conducting shoreline assessments and using the results to make cleanup decisions. Updated in 2013.	http://response.restoration.noaa.gov/sites/default/files/manual_shore_assess_aug2013.pdf (PDF, 14M)	Contact orr.library@noaa.gov.
Related Publication: Shoreline Assessment Forms http://response.restoration.noaa.gov/jobaid/shoreline_forms	Forms you can download, print out, and then use to record your observations during a shoreline survey following an oil spill. You can find more information about how to use the forms in the Shoreline Assessment Manual.	See the Web link for PDF versions of the Forms.	N/A

Title/Web Link	Description	URL for PDF version	Order the publication
Characteristic Coastal Habitats: Choosing Spill Response Alternatives en Español: Hábitats Costeros Característicos: Selección de Alternativas para Responder a Derrames de Petróleo http://response.restoration.noaa.gov/jobaid/coastalhab	A job aid that illustrates typical attributes of North American coastal habitats at risk from oil spills. The text describes each habitat and discusses how oil is likely to behave there, and considerations for treating oil. English version updated in 2010 and reprinted in 2013.	http://response.restoration.noaa.gov/sites/default/files/Characteristic_Coastal_Habitats.pdf (PDF, 5.1M) en Español: http://response.restoration.noaa.gov/sites/default/files/Habitats_Costeros_Caracteristicos.pdf (PDF, 3.8M)	Contact orr.library@noaa.gov. Spanish version by special order. Contact orr.library@noaa.gov.
Characteristics of Response Strategies: A Guide for Spill Response Planning in Marine Environments http://response.restoration.noaa.gov/jobaid/responsestrat	A job aid designed to help spill responders select appropriate response options to minimize environmental impacts when oil spills in coastal habitats. It is especially for people participating in cleanup assessment as part of Operations and Planning Units within the Incident Command System. Updated in 2010; reprinted in 2013.	http://response.restoration.noaa.gov/sites/default/files/Characteristics_Response_Strategies.pdf (PDF, 1.1M)	Contact orr.library@noaa.gov.
Introduction to Coastal Habitats and Biological Resources for Spill Response http://response.restoration.noaa.gov/jobaid/habitats_bio	A 1992 training manual covering physical, geological, and biological considerations relevant to oil spill response and cleanup.	http://response.restoration.noaa.gov/sites/default/files/Monterey.pdf (PDF, 10.7M)	Contact orr.library@noaa.gov.
Mechanical Protection Guidelines	A 1994 manual describing how to deploy booms, barriers, and other mechanical protection devices during a spill response.	http://response.restoration.noaa.gov/sites/default/files/mechanical-protection-guidelines.pdf (PDF, 1M)	Contact orr.library@noaa.gov.
Observers' Guide to Sea Ice http://response.restoration.noaa.gov/jobaid/seaice	A job aid for volunteers who report observations of ice conditions to authorities such as the U.S. Coast Guard. Updated in 2007.	http://response.restoration.noaa.gov/sites/default/files/Sea_Ice_Guide.pdf (PDF, 2.7M)	Contact orr.library@noaa.gov.

APPENDIX 4

INCIDENT RESPONSE FORMS

The U.S. Coast Guard developed Incident Command System (ICS) forms for all-risk/all-hazard situations and is the best source for downloading the forms. The Coast Guard forms are available in PDF and Microsoft Word/ Excel formats at **https://homeport.uscg.mil/mycg/portal/ep/browse.do?channelId=-17668**.

ERD offers the following non-CG ICS files for spill response:

- A free ICS forms database (for Windows and Mac) that allows you to edit, manage, and archive the ICS forms electronically on your computer. This product is no longer under active development by our office.
- A free FileMaker master file that you can use as an ICS form template and customize if you own a copy of the FileMaker software.

These files are available on OR&R's Web page, Electronic ICS Forms, **http://response.restoration.noaa.gov/icsforms**.

Form Number	Form Name	Purpose
N/A	IAP Cover Sheet	The Incident Action Plan (IAP) cover sheet provides a checklist of items that may be included in the action plan.
ICS 201-CG	Incident Briefing	The Incident Briefing form provides the Unified Command (and the Command and General Staffs assuming command of the incident) with basic information regarding the response situation and the resources allocated to the incident. It is also a permanent record of the initial incident response.
ICS 202-CG	Incident Objectives	The Incident Objectives form describes the basic incident strategy, control objectives, and provides weather, tide and current information, and safety considerations for use during the next operational period. The Attachments list at the bottom of the form also serves as a table of contents for the Incident Action Plan.
ICS 203-CG	Organization Assignment List	The Organization Assignment List provides ICS personnel with information on the units that are currently activated and the names of personnel staffing each position/unit. It is used to complete the Incident Organization Chart (ICS form 207-CG) which is posted on the Incident Command Post display. An actual organization will be event-specific. Not all positions need to be filled. The size of the organization is dependent on the magnitude of the incident and can be expanded or contracted as necessary.
ICS 204-CG	Assignment List	The Assignment List(s) informs Division and Group supervisors of incident assignments. Once the assignments are agreed to by the Unified Command and General Staff, the assignment information is given to the appropriate Divisions and Groups.
ICS 204a-CG	Assignment List Attachment	The Assignment List Attachment informs field personnel of specific incident assignment information. Once the Unified Command and General Staff agree to the Group / Division assignments, the specific assignment information is given to the appropriate Strike Team or Task Force Leaders.
ICS 205-CG	Incident Radio Communications Plan	The Incident Radio Communications Plan is a summary of information obtained from the Radio Requirements Worksheet (ICS form 216). Information from the Radio Communications Plan on frequency assignments is normally noted on the appropriate Assignment List (ICS form 204-CG).
ICS 205a-CG	Communications List	The Communications List records methods of contact for personnel on scene.
ICS 206-CG	Medical Plan	The Medical Plan provides information on incident medical aid stations, transportation services, hospitals, and medical emergency procedures.
ICS 207-CG	Incident Organization Chart	The Incident Organization Chart is used to indicate what ICS organizational elements are currently activated and the names of personnel staffing each element. An actual organization will be event-specific. Not all positions need to be filled. The size of the organization is dependent on the magnitude of the incident and can be expanded or contracted as necessary. Personnel responsible for managing organizational positions are listed in each box as appropriate.
ICS 208-CG	Site Safety and Health Plan	The Site Safety and Health Plan is designed for safety and health personnel that use the ICS. It is intended to meet the requirements of the Hazardous Waste Operations and Emergency Response regulation (Title 29, Code of Federal Regulations, Part 1910.120). Although primarily designed for oil and chemical spills, the plan can be used for all hazard situations.

Form Number	Form Name	Purpose
ICS 209-CG	Incident Status Summary	The Status Summary: 1. Is used by Situation Unit personnel for posting information on Status Boards. 2. Is duplicated and provided to Command Staff members, giving them basic information for planning for the next operational period. 3. Provides information to the Information Officer for preparing news media releases. 4. Summarizes incident information for local and off-site coordination centers.
ICS 209H-CG	Incident Status Summary: Hurricane	A Status Summary created for hurricane incidents.
ICS 211-CG	Check-In List	Personnel and equipment arriving at the incident can check in at various incident locations. Check-in consists of reporting specific information which is recorded on the form.
ICS 213	General Message	The General Message is used by: • Incident personnel to record incoming messages which cannot be orally transmitted to the intended recipients; • Command Post and other incident personnel to transmit messages to the Incident Communications Center for transmission via radio or telephone to the addressee; • Incident personnel to send any message or notification to incident personnel which requires a hard-copy delivery; • Incident personnel to place resource orders.
ICS 213RR-CG	Resource Request Message	This form is used by all incident personnel to request tactical and non-tactical resources.
ICS 214-CG	Unit Log	The Unit Log records details of unit activity, including strike team activity. These logs provide the basic reference from which to extract information for inclusion in any after-action report.
ICS 215-CG	Operational Planning Worksheet	This form communicates to the Resources Unit the resources needed as a result of decisions made during the Tactics and Planning meetings. The Worksheet is used by the Resources Unit to complete the Assignment List (ICS form 204-CG) and by the Logistics Section Chief for ordering resources. The worksheet may also be used by the Resources Unit Leader to complete the Assignment List Attachment(s) (ICS form 204a-CG), if the Operations and Planning Section Chiefs deem it necessary.
ICS 215a-CG	Incident Action Plan Safety Analysis	This form communicates to the Operations and Planning Section Chiefs safety and health issues identified by the Safety Officer. The Worksheet is used by the Planning section Chief to complete Operations briefings.
ICS 216	Radio Requirements Worksheet	The Radio Requirements Worksheet is used to develop the total number of personal portable radios required for each Division/Group and Branch. It provides a listing of all units assigned to each Division, and thus depicts the total incident radio needs.

Form Number	Form Name	Purpose
ICS 220-CG	Air Operations Summary	The Air Operations Summary provides the Air Operations Branch with the number, type, location, and specific assignments of aircraft.
ICS 221-CG	Demob. Check-Out	This form provides the Planning Section information on resource releases from the incident.
ICS 225-CG	Incident Personnel Performance Rating	This form gives supervisors the opportunity to evaluate subordinates on incident assignments.
ICS 230-CG	Daily Meeting Schedule	The Daily Meeting Schedule records information about the daily scheduled meeting activities.
ICS 232-CG	Resources at Risk Summary	The Resources at Risk Summary provides information about sites in the incident area which are sensitive due to environmental, archaeo-cultural, or socio-economic resources at risk, and identifies incident-specific priorities and issues. The information recorded here may be transferred to ICS form 232a-CG, which acts as a key to the Area Contingency Plan (ACP) or Geographic Response Plan (GRP) site numbers shown on the Situation Map.
ICS 232a-CG	ACP Site Index	If used, this form is posted next to the Situation Map, providing a key to the ACP/GRP sites shown on the map.
ICS 233-CG	Incident Open Action Tracker	The Tracker allows ICS personnel to monitor actions during the incident.
ICS 234-CG	Work Analysis Matrix	This form allows the Operations Section Chief to document an operation's objectives, strategies, tactics, and work assignments.
ICS 235-CG	Facility Needs Assessment Worksheet	This worksheet outlines the facility requirements for all ICS personnel.
ICS 237	Incident Mishap Reporting Record	This form is completed by the Safety Officer if an injury/mishap occurs.

APPENDIX 5

NOAA RESPONSE MODELS

Information about NOAA's oil and chemical response models, and instructions for downloading them, are available on the OR&R website. You can quickly access the oil spill response tools at **http://response.restoration.noaa.gov/oil-spill-response-tools** and the chemical spill response tools at **http://response.restoration.noaa.gov/chemical-spill-response-tools**.

Oil Spill Response Models and Tools

Oil Spill Models	Website Information
GNOME (General NOAA Operational Modeling Environment), oil trajectory model.	http://response.restoration.noaa.gov/gnome
GOODS (GNOME Online Oceanographic Data Server), an online tool that helps GNOME users access base maps, ocean currents, and winds.	http://response.restoration.noaa.gov/goods
TAP (Trajectory Analysis Planner), trajectory analysis software.	http://response.restoration.noaa.gov/tap
ADIOS (Automated Data Inquiry for Oil Spills), oil weathering model.	http://response.restoration.noaa.gov/adios
Spill Tools, a set of three programs designed for oil spill planners and responders: the Mechanical Equipment Calculator, the In Situ Burn Calculator, and the Dispersant Mission Planner.	http://response.restoration.noaa.gov/spilltools
DMP2 (Dispersant Mission Planner 2), a tool that helps spill responders assess dispersant application system performance.	http://response.restoration.noaa.gov/dmp2

Chemical Spill Response Models and Tools

Chemical Response Models	Website Information
CAMEO Software Suite, an integrated set of software modules designed to help first responders and emergency planners plan for and quickly respond to chemical accidents. The suite encompasses several programs, including CAMEO, ALOHA, and MARPLOT.	http://response.restoration.noaa.gov/cameosuite
CAMEO (Computer-Aided Management of Emergency Operations), a database application that allows emergency planners and responders to manage data about their community.	http://response.restoration.noaa.gov/cameofm
CAMEO Chemicals, a database of hazardous chemicals that can be used to get response recommendations and predict how chemicals might react if they were mixed together. CAMEO Chemicals is available online and as a downloadable program.	Online version: http://cameochemicals.noaa.gov Downloadable version: http://response.restoration.noaa.gov/cameochemicals
ALOHA (Areal Locations of Hazardous Atmospheres), a modeling program that estimates threat zones associated with hazardous chemical releases, including toxic gas clouds, fires, and explosions.	http://response.restoration.noaa.gov/aloha
MARPLOT (Mapping Application for Response, Planning, and Local Operational Tasks), a general purpose mapping program that makes it easy to quickly create, view, and modify maps.	http://response.restoration.noaa.gov/marplot
Chemical Reactivity Worksheet (CRW), a program you can use to find out about the reactivity of substances or mixtures of substances.	http://response.restoration.noaa.gov/crw

APPENDIX 6

NOAA RESPONSE TRAINING

NOAA OR&R offers classes, workshops, and self-study options to FOSCs and other spill response professionals in local, state, and federal governments and industry.

Classes/Workshops for Emergency Responders and Planners

Science of Oil Spills (SOS) Classes: OR&R's Science of Oil Spills (SOS) training builds skills in analyzing complex spill events and making risk-based decisions that maximize long-term environmental benefit. SOS classes are designed for new and mid-level spill responders and generally cover the following topics:

- Fate and behavior of oil spilled in the environment.
- An introduction to oil chemistry and toxicity.
- A review of basic spill response options for open water and shorelines.
- Spill case studies.
- Principles of ecological risk assessment.
- A field trip, offering an opportunity to practice/apply skills learned.
- An introduction to damage assessment techniques.
- Determining cleanup endpoints.

SOS classes are held annually, usually in the spring at NOAA's main campus in Seattle and in other locations on a rotating basis. Class sizes are limited to allow for personalized instruction. Each class includes three to four days of instruction. There is no tuition for the class; however, attendees are responsible for their own travel costs.

To learn when the next class is scheduled, see the Science of Oil Spills Web page (**http://response.restoration.noaa.gov/sos_classes**). You can also contact your District Scientific Support Coordinator or the NOAA ERD Training Coordinator (**orr.training@noaa.gov**) with any questions.

Specialty Training: In addition to SOS classes, NOAA offers training on an as-needed basis on topics such as Shoreline Cleanup and Assessment Technique (SCAT), overflight observation, trajectory modeling, Information Management and ERMA, and special response or resource topics. NOAA staff have also taught Short Courses on a variety of topics at the past three International Oil Spill Conferences.

New training in the Science of Chemical Releases (SOCR) is currently under development, with training scheduled to begin in early 2016.

CAMEO Training: Information about CAMEO training is available at **http://response.restoration.noaa.gov/cameotraining**. The EPA also lists CAMEO training events on its Calendar of Events page, **http://www2.epa.gov/cameo/cameotraining-and-events**.

Ecological Risk Assessment (ERA) Workshops: During oil spill responses, there is limited time to make decisions on response options. The decision to use chemical dispersants and/or in situ burning may be especially contentious, and both have only a limited "window of opportunity." To encourage discussion and consensus before a spill happens, the U.S. Coast Guard and OR&R have co-facilitated a series of Consensus Ecological Risk Assessment (ERA, or C-ERA) workshops. OR&R has co-facilitated about 20 ERAs since 1996, training over 500 participants.

During ERA workshops, participants learn a simplified risk assessment method that can be applied with minimal training. Workshop participants work in small groups and all together to develop a consensus of the potential ecological risk of the response options considered. Participants should include resource trustees, stakeholders from local, state, and federal agencies, and from NGOs. The following response options are typically analyzed:

- No response.
- Open-water mechanical cleanup (skimmers).
- In situ burning.
- Open-water dispersant application.
- Mechanical shoreline cleanup.

By basing assessment on a risk matrix and local information, each ERA workshop enables relatively quick, systematic comparison of response options that have ecological effects. By coming to consensus in this non-emergency setting, decision-makers may reach a faster consensus during an actual response.

For additional information, including ERA workshop reports and papers, visit the OR&R ERA Web page at **http://response.restoration.noaa.gov/era** or contact OR&R's ERA Specialist at **orr.era@noaa.gov**.

For more information about ERD training events, contact the Training Coordinator at **orr.training@noaa.gov**.

Self-study Resources for Emergency Responders and Planners

You can also build your knowledge of spill and chemical accident response on your own. The self-study section of OR&R's website (**http://response.restoration.noaa.gov/training_selfstudy**) provides links to some self-study resources to help you learn to use tools such as ALOHA, ESI maps, and GNOME. A recently added self-study resource is an online training module for aerial observation of oil.

Aerial Observation of Oil Spills: A new online training module provides a basic one-hour introduction to aerial observation of oil on water. Although designed for Coast Guard aircrews, other flight crew members may find this lesson useful, including those from Incident Management Divisions or the Coast Guard Auxiliary, commercial aircrews, and private pilots. Learn more and access the training at the page, Training: Aerial Observation of Oil Spills (**http://response.restoration.noaa.gov/aerialobs**).

ALOHA Example Scenarios: This document contains three step-by-step fictional ALOHA example scenarios. Download the example scenarios from the ALOHA Example Scenarios page (**http://response.restoration.noaa.gov/aloha-example-scenarios.html**).

ESI Training: Instructions and materials are available for an exercise in which you use Environmental Sensitivity Index (ESI) maps to plan a protection strategy for a coastline threatened by an oil spill. Learn more on the Web page, ESI Exercises (**http://response.restoration.noaa.gov/esi_exercises**).

GNOME User's Manual and Tour: The GNOME User's Manual and the Guided Tour (chapter 2) can help you learn to operate GNOME effectively. For more information, see the page, GNOME User's Manual and Tour (**http://response.restoration.noaa.gov/gnome_manual**).

APPENDIX 7

NATURAL RESOURCE DAMAGE ASSESSMENT (NRDA) DURING INCIDENT RESPONSE

The Natural Resource Damage Assessment (NRDA) process is often initiated by Trustee agencies during an incident response. The NRDA Trustees most often involved are NOAA, USFWS, and state Trustee agencies. There are a number of other NRDA Trustees, including Native American tribes and foreign countries, which may become involved when their resources are affected. Generally only the first phase of an NRDA, called Preassessment, is started during the response and is characterized by intensive ephemeral data collection and coordination among and between Trustees and RP representatives, as well as the FOSC and Unified Command.

The NOAA Scientific Support Team (SST) can greatly facilitate coordination between the FOSC and Unified Command and the NRDA Trustees.

Below are some relevant facts for responders concerning Trustees and NRDA:

- NRDA Trustees are specifically designated agencies or individuals under OPA/CERCLA. (See below for legal references)
- OPA (Oil Pollution Act) may be used to initiate an NRDA for oil spills or the threat of a spill.
- CERCLA (Combined Environmental Response, Compensation, & Liability Act) is used for chemical or combined oil/chemical spills.
- Trustees may initiate preassessment actions under the NRDA provisions of OPA, CERCLA, state laws, or if applicable, regulations for specially managed areas, such as marine sanctuaries or state and national parks.
- Under both OPA and CERCLA, there are implementing regulations for NRDAs.
- Preassessment, although initiated during the incident response, generally continues past the end of the active response.
- For NOAA, agency NRDA actions are directed through NOAA's Assessment and Restoration Division (ARD) of OR&R, rather than through the Emergency Response Division.
- NOAA, as a Trustee agency, strongly encourages cooperative Trustee-RP NRDA planning and data collection at the earliest opportunity during an incident response.
- NRDA Cost Accounting: All NRDA related costs (personnel or other expenses) are documented and recovered through a Trustee agreement with the RP, or specific authorization between a Federal Lead Administrative Trustee and the National Pollution Funds Center, or at a later time by the Trustees through the formal NRDA process. For NOAA SST personnel, cost recovery is determined by the type of activity (i.e., response-related or NRDA-related). Certain NOAA SST personnel are qualified to perform both types of activities.

- The NOAA Scientific Support Coordinator (SSC) is not responsible for directing NRDA actions, but is responsible for the overall NOAA team safety and coordination with response. In this way, the NOAA SSC retains the function as an objective science information coordinator serving the FOSC.

Additional NRDA Information

The NOAA Damage Assessment Remediation and Restoration Program (DARRP) website (**http://www.darrp.noaa.gov**) discusses the laws and regulations for conducting NRDA under CERCLA. Below are citations and links for some relevant NRDA laws and regulations.

OPA

Oil Pollution Act of 1990 (OPA), 33 U.S.C. §§2701, et seq.

- NOAA Damage Assessment, Remediation, and Restoration Program (DARRP): **http://www.darrp.noaa.gov/about/laws.html#OilPollution**

OPA NRDA Regulations, 15 C.F.R. Part 990

- U.S. Government Publishing Office: **http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title15/15cfr990_main_02.tpl**

CERCLA

Comprehensive Environmental Response, Compensation & Liability Act (CERCLA), 42 U.S.C. §§9601, et seq.

- NOAA Damage Assessment, Remediation, and Restoration Program (DARRP): **http://www.darrp.noaa.gov/about/laws.html#Comprehensive**

CERCLA NRDA Regulations, 43 C.F.R. Part 11

- U.S. Department of the Interior, Office of Environmental Policy and Compliance: **http://www.doi.gov/pmb/oepc/response/a13.cfm**

National Marine Sanctuaries

National Marine Sanctuaries Act, 16 U.S.C. §§1431, et seq.

- NOAA Damage Assessment, Remediation, and Restoration Program (DARRP): **http://www.darrp.noaa.gov/about/laws.html#National**

National Parks

Park System Resource Protection Act, 16 U.S.C. §19jj

- NOAA Damage Assessment, Remediation, and Restoration Program (DARRP): **http://www.darrp.noaa.gov/about/laws.html#Park**

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APPENDIX 8

ENVIRONMENTAL SENSITIVITY INDEX (ESI) MAPPING

The most widely used approach to mapping sensitive environments in the U.S. is NOAA's Environmental Sensitivity Index (ESI). ESIs use a standardized approach to compile information on shoreline sensitivity, and coastal biological and human-use resources. ESI maps are used to identify sensitive resources before a spill occurs in order to establish protection priorities and cleanup strategies in advance. This can significantly reduce the environmental consequences of spill and cleanup efforts.

Sensitive environment mapping is an integral part of spill planning. ESI maps are not an end in themselves, rather a starting point for prevention, planning, and response. The resource definitions in ESI maps provide guidance for developing Area Contingency Plans. NOAA manuals, such as the Mechanical Protection Guidelines, the Shoreline Assessment Manual, and the Shoreline Assessment Job Aid, are examples where the ESI definitions are the basis for effective, site-specific planning. (See **Appendix 3** for access to the above referenced manuals.)

ESI Data Formats

Hard Copy Maps – A limited number of hard copy ESI atlases are published. These hard bound, 11"x17" laminated maps are appropriate for a Command Post setting, but can be cumbersome in the field and are expensive to produce. Individual maps can be printed from the PDFs described below.

PDF Maps – ESI maps are also available in portable document format (PDF). This format allows users to print multiple copies of an area of interest or individual map pages at varying scales. In addition, the PDFs include links that allow users to navigate from the index page to the area of interest and from there to the "back of the map," where seasonality and species details are listed. The PDF version also includes the introduction pages containing representative photos with shoreline descriptions and response considerations.

Geodatabase – The ESI data are published in a geodatabase format along with an .mxd file that displays the data in ArcMap 9.2 or higher. The .mxd uses standardized ESI colors and symbology, and the relates to the data tables are preset. A number of ESI tools have been developed to ease searches and queries of the ESI data, as well as tools to summarize shoreline and biological impacts. More information and the latest versions of the tools are available at **http://response.restoration.noaa.gov/esi_toolbar**.

T&E Geodatabase – An additional ESI product, threatened and endangered species (T&E) geodatabases (subsets of the traditional ESI geodatabases), focus on species and habitats that were listed as threatened or endangered at the time of the atlas publication. A map document (.mxd) and layer files are also included.

Shapefile – The ESI data are also available are shapefiles, with the database tables in .dbf format.

How to Get ESI Data

On the OR&R website, ESI maps and data can be downloaded, viewed online, or ordered on DVD:

- Download ESIs: **http://response.restoration.noaa.gov/esi_download**
- View ESIs online: **http://response.restoration.noaa.gov/esi-online**
- Order ESIs: **http://response.restoration.noaa.gov/orderesi**

ESI Map Self-study

To learn more about using ESI maps for spill response, visit the ESI Exercises page at **http://response.restoration.noaa.gov/esi_exercises**. The exercise provided is especially useful for beginning ESI users and as an exercise for students, because it goes through the decision-making process and how ESI maps can be used to make more informed choices.

For additional information about ESI data:

- **http://response.restoration.noaa.gov/esi**
- **orr.esi@noaa.gov**
- (206) 526-6317

APPENDIX 9

NATURAL RESOURCE SPECIAL PUBLICATIONS

The following publications, related to natural resource management, are available in several formats from NOAA. For a print version of a publication, contact OR&R's Orders Specialist at orr.library@noaa.gov. To view a PDF or Web version of a publication, use the Web links below.

Publication	URL for Publication (PDF)	Web Information
Oil Spills in Coral Reefs: Planning & Response Considerations A 2001 report summarizing relevant research on coral reefs, written for anyone working in or planning for spill response in coral reef regions.	http://response.restoration.noaa.gov/sites/default/files/Oil_Spill_Coral.pdf (PDF, 1.1M)	http://response.restoration.noaa.gov/erdpub/coral_oil
Toxicity of Oil to Reef-Building Corals: a Spill Response Perspective A report that explores spill case histories, field studies, and experimental studies to assess the acute and chronic impacts of oil on coral.	http://response.restoration.noaa.gov/sites/default/files/Oil-Toxicity_Coral.pdf (PDF, 282K)	http://response.restoration.noaa.gov/erdpub/coral_tox
Oil and Sea Turtles: Biology, Planning, and Response A basic overview of sea turtle biology: summarizes what is known about the effects of oil on sea turtles, reviews potential response actions in the event of a release, and presents case histories from previous spills. (Published in 2003; reprinted in 2010)	http://response.restoration.noaa.gov/sites/default/files/Oil_Sea_Turtles.pdf (PDF, 2M)	http://response.restoration.noaa.gov/seaturtles
Oil Spills in Mangroves: Planning & Response Considerations A report summarizing current research on mangrove ecosystems for spill response decisionmakers. (Published in 2002; reprinted in 2010)	http://response.restoration.noaa.gov/sites/default/files/Oil_Spill_Mangrove.pdf (PDF, 1.5M)	http://response.restoration.noaa.gov/mangroves
Recovery of Mangrove Habitats at the Vesta Bella Spill Site A 1994 report describing chemistry and mangrove observations one year after the 1991 cleanup of the Vesta Bella oil spill.	http://response.restoration.noaa.gov/sites/default/files/Vesta_Bella_spill.pdf (PDF, 3.5M)	http://response.restoration.noaa.gov/mangroves
Managing Seafood Safety after an Oil Spill A 2002 guide to help seafood managers and other spill responders determine appropriate seafood management actions in response to a spill.	http://response.restoration.noaa.gov/sites/default/files/managing-seafood-safety-oil-spill.pdf (PDF, 1M)	http://response.restoration.noaa.gov/seafoodsafety

Publication	URL for Publication (PDF)	Web Information
Guidance on Sensory Testing and Monitoring of Seafood for Presence of Petroleum Taint Following an Oil Spill A 2001 guidance document describing how to conduct sensory testing on seafood suspected of petroleum taint.	http://response.restoration.noaa.gov/sites/default/files/guidance-sensory-testing.pdf (PDF, 1.7M)	http://response.restoration.noaa.gov/seafoodsafety
Oil Spills in Marshes: Planning and Response Considerations A 2013 report written to help spill responders and planners make appropriate decisions where fresh and salt marshes are at risk of oil spills.	http://response.restoration.noaa.gov/sites/default/files/Oil_Spills_in_Marshes.pdf (PDF, 4.8M)	http://response.restoration.noaa.gov/marshes
Responding to Oil Spills in Coastal Marshes: the Fine Line Between Help and Hindrance A 1995 report describing the advantages and disadvantages of seven cleanup methods of oiled marshes: natural degradation/no response; vacuum/pumping; low-pressure flush; vegetation cutting; burning; bioremediation; and sediment removal/replanting.	http://response.restoration.noaa.gov/sites/default/files/Coastal_Marshes_508.pdf (PDF, 102K)	http://response.restoration.noaa.gov/marshes

APPENDIX 10

UNIT CONVERSION TABLE

The following table provides conversions for standard units (length, mass, velocity, etc.) but also provides conversions for some of the lesser known units used in managing oil and chemical spills.

OR&R has also developed a simple desktop tool, NUCOS (NOAA Unit Converter for Oil Spills), that converts both standard units and units unique to spill response. For example, NUCOS converts the units for oil volume, viscosity, and density from the conversion list of the Dispersant Mission Planner 2 (**http://response.restoration.noaa.gov/dmp2**), a tool that helps spill responders assess dispersant application system performance. More information about NUCOS is available at **http://response.restoration.noaa.gov/nucos**.

IF YOU KNOW	MULTIPLY BY	TO FIND
LENGTH		
inches	2.540	centimeters
feet	30.480	centimeters
yards	0.914	meters
miles	1.609	kilometers
millimeters	0.039	inches
centimeters	0.393	inches
meters	3.280	feet
meters	1.093	yards
kilometers	0.621	miles
nautical miles	1.15	statute miles
nautical miles	1.85	kilometers
WEIGHT		
ounces	28.350	grams
pounds	0.453	kilograms
grams	0.035	ounces
kilograms	2.204	pounds
VOLUME		
fluid ounces	29.573	milliliters
pints	0.473	liters
quarts	0.946	liters
gallons (U.S.)	3.785	liters
milliliters	0.033	fluid ounces
liters	1.056	quarts
liters	0.264	gallons (U.S.)
AREA		
acres	4,047	$meters^2$
acres	43,560	$feet^2$
OIL SPILL CONVERSIONS		
barrels (oil)	42	gallons
tons (metric)	7.2±1.2	barrels
tons (metric)	~300	gallons
SPEED / VELOCITY		
knots	1.69	feet per second
knots	0.51	meters per second
knots	1.15	statute miles per hour

NOAA Scientific Support Coordinator (SSC) and Team Functions

Advisory
Principal science advisor to FOSC
Oil science and properties
Chemical sciences
Dispersant science/ monitoring (SMART)
Protected resource concerns
Chemical hazard assessment
Toxicity to wildlife and fish
Environmental best management practices
Environmental tradeoff analysis for ops
RAR analysis

Trajectory Forecasting
Oil slick trajectory forecasting
Oil slick location monitoring
Chemical transport forecasting
Air plume forecasting
WMD science issues

Weather, Tides & Currents
Custom spot weather forecasts
Tides and currents forecasts
Hazardous weather alerts
Coordination with National Hurricane Center
Hurricane evacuation threshold planning

Information Management & GIS
On-scene experienced IM team
Production of briefing materials
Production of operational maps
Information to Situation Unit
Establish and maintain photo database
Scientific information database
Provide common ops picture (ERMA®)

International Science Support
Experienced international team
SSC can travel with Strike Team

Health & Safety
Assist in safety plan development
Chemical and oil health effects
Chemical plume forecasting
Threat potential to water intakes

Scientific Team Coordination
General on-scene science coordination
Integration of external scientific expertise into UC
On-scene and remote support

SCAT Coordination
SCAT team coordination
SCAT field team leadership
SCAT team trustee representative
SCAT design and data management

Agency Coordination
Trustee issues and concerns
ESA consults for natural resources, EFH, NHPA, and Tribal
RRT science coordination
LAT integration into UC
Scientific consensus building
Access to all NOAA resources including NRTs

Overflight Observation
Trained overflight oil observers
Maps oil location, type, amount
HEEDs trained and equipped
Rapid data transfer to U
Training for overflight observers

ICS Positions and Roles
SSC serves on FOSC Command Staff
Technical specialists (weather, overflight, chemical, trajectory, GIS, information management, etc.)
SCAT coordination and data management

Glossary

ACP	Area Contingency Plan
ADIOS	Automated Data Inquiry for Oil Spills
ARD	Assessment and Restoration Division (within OR&R)
CAFÉ	Chemical Aquatic Fate and Effects Database
CAMEO	Computer-Aided Management of Emergency Operations
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CIR	Critical Information Requirement
COP	Common Operational Picture
CRRC	Coastal Response Research Center (at University of New Hampshire)
CRW	Chemical Reactivity Worksheet
DARRP	Damage Assessment Remediation and Restoration Program (within OR&R)
DOI	Department of the Interior
DRC	Gulf of Mexico Disaster Response Center (within OR&R)
EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
ERD	Emergency Response Division (within OR&R)
ERMA	Environmental Response Management Application
ERS	NWS Emergency Response Specialist
ESI	Environmental Sensitivity Index
EU	Environmental Unit
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
GNOME	General NOAA Operational Modeling Environment
GOODS	GNOME Online Oceanographic Data Server
GRP	Geographic Response Plan
HDO	Hazmat Duty Officer
HEEDS	Helicopter Emergency Egress Device
ICCOPR	Interagency Coordinating Committee for Oil Pollution Research
ICS	Incident Command System
IM	Information Management
IMAT	Incident Management Assistance Team
IMET	Incident Meteorologist
IMH	Incident Management Handbook
IMP	Information Management Plan
LAT	Lead Administrative Trustee
MDD	Marine Debris Division (within OR&R)
NCP	National Contingency Plan
NMFS	National Marine Fisheries Service (within NOAA)
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service (within NOAA)
NPFC	National Pollution Funds Center
NRDA	Natural Resource Damage Assessment
NRT	National Response Team
NWS	National Weather Service (within NOAA)
OCS	Office of Coast Survey (within NOAA/NOS)
OPA	Oil Pollution Act
OR&R	Office of Response and Restoration (within NOAA/NOS)
OSRO	Oil Spill Removal Organization
RAR	Resources at risk
RRT	Regional Response Team
SCAT	Shoreline Cleanup and Assessment Technique
SMART	Special Monitoring of Applied Response Technologies
SSC	Scientific Support Coordinator
SST	Scientific Support Team
SOS	Science of Oil Spills
TAP	Trajectory Analysis Planner
USFWS	U.S. Fish and Wildlife Service

U.S. DEPARTMENT OF COMMERCE

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