Marine Debris Emergency Response Planning *in the* North-Central Gulf of Mexico

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MARINE DEBRIS EMERGENCY RESPONSE PLANNING IN THE NORTH-CENTRAL GULF OF MEXICO

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The Marine Debris Emergency Response Plan is a living document. We expect that accumulated experience and new policies will bring about changes to how marine debris removal is conducted. Every storm event will provide new lessons learned. We welcome any comments or suggestions you may have to improve the current version of the Marine Debris Emergency Response Plan. Please send your comments to:

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ACRONYMS AND DEFINITIONS

BOA	Basic Ordering Agreement
C&D	Construction and Demolition
DTON	Danger to Navigation
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESF	Emergency Support Function
ESI	Environmental Sensitivity Index
FEMA	Federal Emergency Management Agency
FTP	File Transfer Protocol
GIS	Geographic Information System
GOMMDP	NOAA Gulf of Mexico Marine Debris Project
GPS	Global Positioning System
GRASS	Geographic Resources Analysis Support System
ICS	Incident Command System
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
NEPA	National Environmental Policy Act
NMFS	NOAA National Marine Fisheries Service
NOAA	U.S. National Oceanic and Atmospheric Administration
NWP	Nationwide Permits
OCS	NOAA Office of Coast Survey
OR&R	NOAA Office of Response and Restoration
PW	Project Worksheet
QA/QC	Quality Analysis/Quality Control
RFP	Request for Proposals
SSC	NOAA Scientific Support Coordinator
SHPO	State Historic Preservation Office
TED	Turtle Exclusion Device
THPO	Tribal Historic Preservation Officer
USCG	U.S. Coast Guard
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
Insonify	To expose an area, or portion of seabed, to sonar energy
Removal	Includes removal and relocation

Introduction

Why Have a Marine Debris Emergency Response Plan?

Major storms such as Hurricanes Katrina and Rita are capable of inflicting severe damage on the coastal areas they impact, generating many thousands of cubic yards of debris and dispersing it on land, in canals and inshore waterways, in marshes and wetlands, and in offshore waters of the Gulf of Mexico. When deposited in coastal waters by the storm event, natural and human-made items become marine debris that can be invisible in the murky waters of the Gulf, making it difficult to locate, avoid, and remove.

Unfortunately, becoming submerged and invisible does not render the debris items harmless. Marine debris can damage boats and fishing gear, cripple fishing operations, and prevent commercial and recreational activities in the areas affected. Removal of marine debris in shipping channels is addressed by existing regulations, in order to open these vital transportation and commerce routes as quickly as possible. Presently, however, there is no established mechanism to plan for, survey, and remove marine debris in areas outside of major shipping and navigation channels, and no existing guidelines to facilitate such a process.

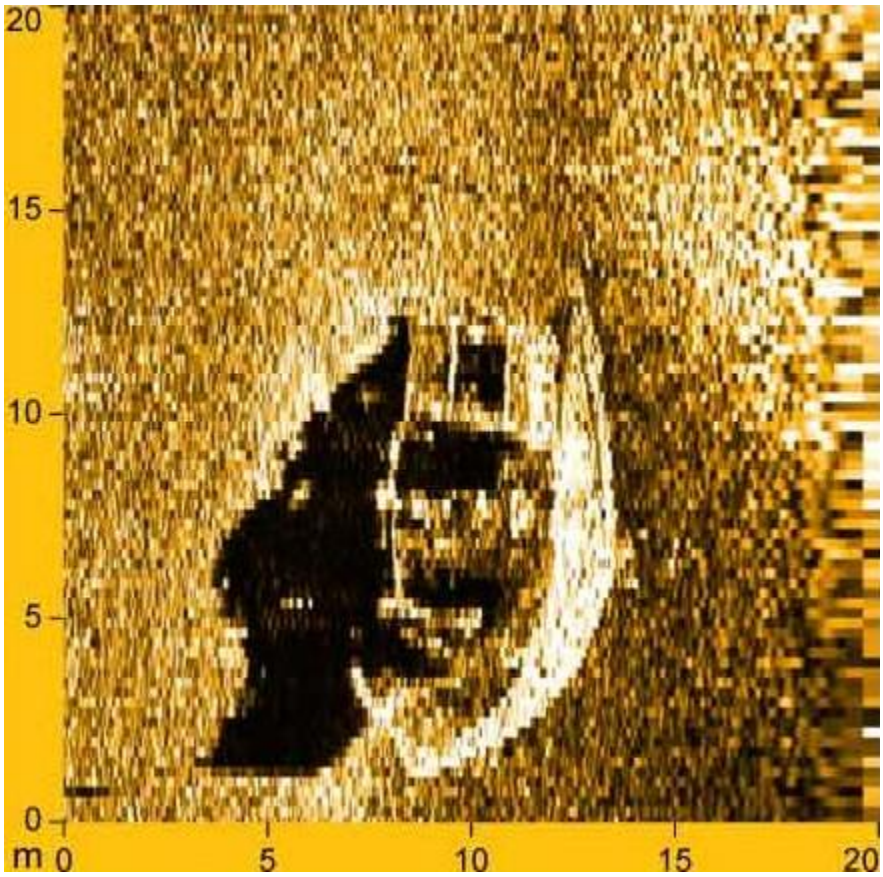


Figure 1. A side scan sonar image of a sunken vessel in Louisiana's coastal waters

The National Oceanic and Atmospheric Administration (NOAA) Gulf of Mexico Marine Debris Project (GOMMDP), funded by a U.S. Congressional supplemental appropriation to address post-Katrina and Rita marine debris in the fishing grounds of Alabama, Mississippi, and Louisiana, is the first major effort of its kind to conduct survey, mapping, analysis, and outreach to support debris removal in the Gulf of Mexico in areas outside of shipping channels. The project was managed by the NOAA Office of Response and Restoration (OR&R) and the Office of Coast Survey (OCS). As the project progressed, it became apparent to State managers that guidelines for addressing wide-scale marine debris dispersion in these areas on a scale similar to Katrina's are lacking and that documenting the experience and lessons learned from the offshore survey and removal after Hurricanes Katrina and Rita would be a useful and worthwhile effort. It saves time, money, and resources to have a plan in place and move quickly to deal with the marine debris problem, rather than try to generate a plan under the pressure of a major storm event.

This document is a response to the need identified by Gulf region stakeholders. Its goal is to assist in the planning, assessment, removal, and disposal or recycling of marine debris. It provides guidelines, information, and resources to deal with marine debris dispersion in marine areas outside of major shipping channels, and it incorporates experience and lessons learned from the post-Katrina and Rita marine debris survey and removal efforts. The document does not attempt to provide a fully detailed plan nor serve as a regulatory requirement. Rather, it is a simple, informal, and hopefully useful tool to assist managers at the Federal, State, and local levels to be better prepared to deal with marine debris the next time a powerful storm creates a major marine debris problem. Because the document is largely based on the experience and operations conducted in Alabama, Mississippi, and Louisiana following Hurricanes Katrina and Rita, it should apply only to these States—referred to as the north-central Gulf region—but the general approach may be a useful model for other coastal states and territories that anticipate significant marine debris events from storms and other natural disasters.

What Is Marine Debris?

NOAA defines marine debris as any persistent, manufactured, or processed solid material that is directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment. Marine debris includes a wide variety of objects (e.g., derelict fishing gear, lost vessel cargo, plastics) that pose a threat to the marine environment, human health, and/or navigation. After Hurricanes Katrina and Rita, natural items such as logs were also considered marine debris and eligible for removal if they posed hazard to navigation, fishing, and recreational boating. Items specifically placed in the Gulf either to restore oyster reefs or for other restoration purposes are obviously not considered marine debris.

Sources of storm-related marine debris are generally categorized as either land-based or ocean-based; the marine debris items dispersed into the Gulf of Mexico after a major storm are both. Land-based items can include any natural and man-made item present in the area: garbage dumpsters and trash cans, household contents, trees, lumber, steel beams, cars, and even bags full of coins from a nearby casino. Marine-based items include boats, docks, piers, boat houses, navigation buoys, and, principally in Louisiana, debris from offshore oil and gas platforms and infrastructure.

After the 2005 hurricanes in the Gulf of Mexico, marine debris removal was conducted in stages based on the following priorities:

- The first priority included federally defined navigation channels and waterways; debris removal to restore such waterways was overseen by the U.S. Army Corps of Engineers (USACE).
- The second priority included commercial infrastructures such as commercial waterways, marinas, and docks; debris removal in these areas was also overseen by the USACE.
- The third priority was to get the fishing and workboat fleet back in operation, which involved rebuilding the supporting infrastructure (docks, ice supply) and conducting vessel salvage; this operation was usually conducted jointly by the State and the U.S. Coast Guard (USCG).
- The fourth priority was restoring access to "commonly navigated public waterways;" debris removal in these areas after Katrina and Rita was conducted by the State and the USCG.

This report deals mostly with removal of marine debris of the fourth priority.

In the north-central Gulf region, side scan sonar surveys for marine debris generated by Hurricane Katrina revealed over 5,000 items within an area of 744 square nautical miles, approximately 40% of which were submerged by less than 5 feet. This survey was conducted nearshore, mostly in State waters. The debris may pose environmental and collision hazards to fishing and recreational vessels and fouling hazards to fishing gear, leading to vessel damage or loss, lost gear, and lost revenue for the fishers. This wide-scale dispersion of marine debris also impacted non-fishing marine business such as boat tours and had a major impact on recreational boating in the north-central Gulf region. The removal or relocation (henceforth referred to as removal) of marine debris was deemed necessary to return the affected areas to their normal uses.

Outline of this Report

This report consists of three main sections.

1. Planning Phase: Recommended tasks to be completed when planning for marine debris removal are outlined. This phase can be completed in advance of an event and, in fact, this is recommended.
2. Assessment Phase: Guidance is provided for conducting modeling analyses, side scan sonar surveys, public outreach, and information management.
3. Removal, Recycling, and Disposal Phase: Guidance is provided on removal methods, contracting, monitoring and verification requirements, recycling, and disposal.

Planning Phase

A number of tasks should be completed when planning for marine debris removal. Each of the following tasks is outlined below:

- Identify Funding and Agency Responsibilities
- Identify Triggers for Marine Debris Dispersion Assessment
- Identify Areas and/or Resources at Risk
- Develop Eligibility Guidelines
- Identify Permitting and Consultation Requirements
- Identify Resources for Assessment, Survey, and Information Dissemination
- Identify Resources for Removal
- Establish Removal Criteria

Identify Funding and Agency Responsibilities

Key questions to be answered:

- What will be the source of funds for marine debris removal?
- What agency will be the lead Federal agency?
- What agency will be the lead State agency?
- What will be the responsibilities of each?
- What will be the responsibilities of local government agencies?

In the three years after Hurricanes Katrina and Rita, there were multiple separate marine debris removal programs in the affected States, and in some cases, marine debris removal was conducted multiple times in the same water body. In part, this was due to differences in funding, eligibility, and authorization. When marine debris removal is funded under the Rover T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), FEMA reimburses the agencies for removal costs. Thus, FEMA has final say over which items are eligible for removal. By comparison, marine debris survey and removal operations that were funded by sources other than those related to the Stafford Act were more flexible to address marine debris removal to meet the public expectation that all marine debris that interferes with normal use of a waterbody is efficiently removed in a timely manner.

Experience during Hurricanes Katrina and Rita demonstrated the need for clear lines of authority and responsibility among Federal, State, and local agencies and non-governmental organizations. They all have important roles to play, and coordination among the groups is essential.

The lead Federal agency for marine debris removal should have experience in contract management, engineering, debris removal, and marine operations. For example, the USACE has been the lead agency for debris removal on land. They could potentially do likewise for inshore waterways and nearshore waters, while the USCG has the expertise to deal with damaged and/or abandoned vessels. After Hurricanes Katrina and Rita, the USCG was assigned both vessel and marine debris removal responsibilities. Responsibilities of the lead Federal agency can include:

- Develop and implement a project management program.
- Assign geographic areas of responsibility (i.e., who will take lead in for offshore, nearshore, inshore).
- Inspect waterways identified by the State to determine eligibility for marine debris removal.
- Make determination of the need for removal, in cooperation with other agencies.
- Contract for removal.
- Assure that all permits and consultations are completed and complied with.
- Assist in identification of vessel owners.
- Provide oversight and documentation of removal actions.

The lead Federal agency may follow the principles of the Incident Command System (ICS) in organizing a marine debris removal program, similar to how emergency response to oil and chemical spills is managed. Under this system, the Unified Command, consisting of the lead Federal and State agencies, manages the overall project. Support groups under the Unified Command address the following project components: Information Officer, Safety Officer, Local Agency Liaison Officer, Environmental Unit, Logistics Unit, Administration Unit, Finance Unit, Technical Specialists, Survey Team Leaders, Contract Coordination, and Planning Units for different work areas.

Incorporating environmental best practices is a critical part of marine debris removal. As an example, USCG will often ask NOAA to provide technical support during an emergency response. NOAA can provide a Scientific Support Coordinator (SSC) and a team of experts to provide technical and environmental support to the USCG during response activities. NOAA can also provide staff to operate the Environmental Unit, with responsibilities to address protection of sensitive resources, consultations, permit requirements, and related activities.

When the State takes the lead for marine debris removal, the lead State agency should have experience in contract management, engineering, debris removal, environmental regulation, and marine operations. If the State fishery agency is not the lead State agency, it should be involved in a support role, providing expertise and connections with fishing interests. Responsibilities of the lead State agency can include:

- Develop and implement a project management program.
- Solicit from internal agency sources, local agencies, the public, and others information with which to identify waterways, hazards, or objects requiring inspection for marine debris removal.
- Work with Federal and local authorities to implement a system for ranking or stratifying efforts for debris removal, based on pre-determined criteria such as those laid out in this report.
- Assist in identification and notification of vessel owners.
- Attempt to provide right of access or assist with entry to private property.
- Assure that all permits and consultations are completed and complied with.
- Provide oversight and documentation of removal actions.

Responsibilities of the local government agency can include:

- Identify waterways, hazards, or objects resulting from the storm and requiring inspection.
- Assist in identification and notification of vessel owners and other private property owners.
- Conduct marine debris removal actions in assigned areas.
- Identify temporary and permanent disposal areas.

Identify Triggers for Marine Debris Dispersion Assessment

Key questions to be answered:

- What kinds of events are likely to generate significant amounts of marine debris?
- What types of debris may be present?
- What areas are at risk?

Each storm event is unique and will likely generate unique quantities and patterns of marine debris dispersion. A synthesis of data collected by the GOMMDP suggests, however, that wide-scale marine and disruptive debris dispersion is likely to occur in areas with significant on-land or on-water human-built structures that meet the following criteria:

- Within 5 km of land or navigable waterways
- Wind speeds greater than 30 meters per second (67 mph)
- Storm surge heights greater than 2.5 meters (8.2 ft)

Identify Areas and/or Resources at Risk

Key questions to be answered:

- What resources and activities may be impacted by marine debris?
- Where are the locations of greatest potential impact?

Answers to these questions can be used to prioritize areas for surveys or removal activities. Often this kind of evaluation is conducted informally, based on the experience and knowledge of local resource managers. Alternatively, by using Geographic Information System (GIS) overlays of appropriate data layers, the process will be more transparent and produce a product that can provide the documentation needed to inform decision-makers and the public of the results.

The types of natural resources and activities, along with suggested sources of this information, that should be considered include:

- Fishing/shrimping grounds – May be obtained from NOAA National Marine Fisheries Service (NMFS), State fisheries agency, and Environmental Sensitivity Index (ESI) atlases produced by NOAA OR&R. However, traditional fishing grounds can cover extensive areas, so it may be important to prioritize based on fishery types

at greatest risk (e.g., shrimp and oyster) and highest-use areas (based on experience and knowledge of local resource managers and fishers).
- Oysters beds, seagrass beds, and other benthic habitats sensitive to disturbance during removal activities – May be obtained from State fisheries or natural resources agencies, NMFS, Gulf of Mexico Fisheries Management Council, Gulf States Marine Fisheries Commission habitat data, and ESI atlases.
- High-use recreational fishing areas such as artificial reefs – May be obtained from State agencies.

The ESI atlases will be valuable tools in identification of sensitive areas because they focus on areas of highest concentration or use of a resource. They represent compilations of resource data from multiple sources into one dataset.

Other factors to consider in identification of high-impact areas include:

- Human safety, such as areas adjacent to swimming beaches and high-use recreational fishing areas.
- Threat to endangered or protected species, such as an obstruction to migration or a threat of injury or death.
- Potential to impact sensitive, essential, or critical habitat.
- Potential for debris remobilization, such as areas adjacent to shorelines where wave action and currents can move debris around.
- Degree of use for vessel traffic, such as approaches to harbors and marinas.
- Significance of area for water-borne activities such as fishing, boating, commerce, oil field activities, and hunting.
- Water depth and typical vessel drafts.
- Concentration areas where there are clusters of debris.
- Aesthetics, where debris is visible from high-use shoreline areas, bridges, or other structures.
- Event-specific eligibility criteria.

Eligibility criteria will vary depending on the storm conditions. It is likely that written eligibility guidelines will not be available very soon after a storm. Furthermore, such guidelines are likely to evolve over time. Refer to the section entitled Develop Eligibility Guidelines for further discussion on this important topic.

Data on natural resources and other factors, as listed above, can be used to develop priorities for survey efforts using a set of criteria. These criteria may be developed before or after the storm event, and they should include how each criterion will be weighted for the purposes of evaluating and ranking individual debris removal activities. It may be possible to provide a simple ranking for each criterion (e.g., 1, 2, and 3 for high, medium, and low) and weight the different criteria appropriately. The assignment of ranks for each criterion may be somewhat subjective depending upon the perception of the persons doing the ranking. If detailed definitions of the ranks within each criterion are developed, the subjective nature of the ranking process should be minimized. Likewise, weighting the different criteria would be dependent upon a somewhat subjective evaluation of the relative importance of the different

criteria; however, some criteria have obvious greater importance than others. The process should provide a reasonable overall removal or relocation priority.

Develop Eligibility Guidelines

Key questions to be answered:

- What areas are eligible for evaluation and removal?
- What marine debris items are eligible for removal?

Under most conditions, marine debris removal will be conducted on "commonly navigated public waterways." Depending on the funding sources, such waterways may be defined as having a minimum depth and/or width, based on the draft or size of vessels using the waterway. Guidelines will be needed on whether private waterways, such as man-made canals, will be considered for removal.

Waterway access may also be a factor in determining feasibility, methods, and costs of removal. There will be minimum conditions under which removal vessels can operate.

Depending on the storm conditions, distance from shore may be a factor in determining survey areas. Also, items that are reported or identified beyond the expected distance from shore for a specific storm may not be eligible for removal.

Debris from damage to oil and gas infrastructure may require removal under different authorities. In Federal waters, the U.S. Minerals Management Service is responsible; in State waters, the designated state agency is responsible. To maximize efficiency, agreements should be made with the appropriate agencies for the rapid removal of debris items that are identified as oil and gas infrastructure.

Another issue to be addressed is removal of sediment that has buried marine debris items and has to be dredged during removal or blocked access to a waterway. Special permits are required for any dredging activities, and dredging is normally not part of marine debris removal operations. The State will have to compile information for sites requiring dredging and develop alternatives to evaluate and address them.

During the 2008 debris removal project in Louisiana, the USCG identified waterways containing eligible marine debris that did not warrant deployment of federally contracted equipment and personnel due to the paucity of debris or the specific characteristics (depth, access, length, etc.) of the waterway. For these areas, they recommended issuance of a FEMA Project Worksheet (PW) as a mechanism for the parish to pursue FEMA funds for removal of the relevant debris. The USCG used a suite of sign-off forms to document their decisions on each waterway surveyed. The forms included the following:

- Parish Closeout Checklist
- Waterway Case Not Mission Applicable Adjudication
- FEMA Project Worksheet Referral
- Federal Waterway Sign-off Sheet

Where eligibility is an issue, it is important to provide detailed documentation of the decisions made on whether or not a specific item or an entire waterbody is eligible for removal.

Identify Permitting and Consultation Requirements

Key questions to be answered:

- What permits are needed for survey and removal?
- What agencies at the local, State, and Federal levels should be consulted?

The following text comes from FEMA Debris Guide (FEMA 325, July 2007; http://www.fema.gov/government/grant/pa/demagde.shtm):

> The National Environmental Policy Act (NEPA) requires every Federal agency to follow a specific planning process to ensure that agency decision-makers and applicants have considered and the general public is fully informed about, with the opportunity to comment on, the environmental consequences of a Federally funded action. The review process required by NEPA is usually the vehicle through which FEMA addresses other environmental laws and regulations; however, FEMA is provided with statutory exclusions under Section 316 of the Stafford Act. These exclusions exempt certain actions from the NEPA review process and generally include debris removal, clearance of roads, and demolition of unsafe structures. If an action is not statutorily excluded, the appropriate level of NEPA review must be determined. FEMA makes the statutory exclusion determinations. Compliance with other individual laws such as the Endangered Species Act, the National Historic Preservation Act, the Clean Air Act, and the Clean Water Act is still required, even when a project is statutorily excluded from NEPA review.

The permitting and consultation requirements are listed below. It is important to have an expert responsible for permitting and consultations–someone who knows the requirements and will make sure that this part of the program does not result in significant delays.

State Resource Agencies

Depending on the State, marine debris removal activities may require the following permits from State agencies. Examples of needed permits include:

- Out-of-season fishing net use permit, if trawling is used as a removal method (as was done in Mississippi following Hurricane Katrina).
- Coastal Use Permit (e.g., Louisiana following Katrina and Rita): The purpose of the Coastal Use Permit process is to make certain that any activity affecting the Coastal Zone, such as a project that involves either dredging or filling, is performed in accordance with guidelines established in the Louisiana Coastal Resources Program. The Louisiana Department of Natural Resources (LDNR) will send the application to other agencies for their review. Examples include: Louisiana Department of Wildlife and Fisheries (LDWF) for activities in oyster beds; Louisiana Department of Environmental Quality (LDEQ) for water-quality certification and permitting of

staging areas; and State Historic Preservation Officer (SHPO) for cultural and historic resources.

State Historic Preservation Officer (SHPO)

Under Section 106 of the National Historic Preservation Act, Federal agencies are required to take into account the effects of their undertakings on historic properties. The responsible Federal agency first determines whether it has an undertaking that is a type of activity that could affect historic properties. Historic properties are properties that are included in the National Register of Historic Places or that meet the criteria for the National Register. If the activity could affect historic properties, the responsible Federal agency must identify the appropriate State Historic Preservation Officer/Tribal Historic Preservation Officer (SHPO/THPO) to consult with during the process. Marine debris removal activities have the potential to affect submerged historic properties such as shipwrecks, thus **consultation with the SHPO will be required**. Consultation with THPO will be required only when removal operations will take place in waters under Tribal government authority. Table 1 summarizes the consultation requirements and process.

Table 1. Consultation requirements with the SHPO for marine debris removal actions in the north-central Gulf region.

Regulation	Resource of Concern	Potential Requirements	Process
National Historic Preservation Act, Section 106	Submerged cultural and historic sites such as shipwrecks	May include: 1) use of a marine archaeologist to identify known and potential sites and set buffers (type-specific) to avoid them; 2) training of monitors in identification of artifacts; 3) a plan for how to address unanticipated discoveries during removal operations; and 4) implementation of remote sensing surveys (magnetometer, side scan sonar) to identify potential historic sites when working in high-sensitivity areas.	Contact the SHPO as early as possible to start the consultation process. The objective is to seek ways to avoid, minimize, or mitigate any potential adverse effects on cultural resources.

The SHPO should be contacted early in the process and provided information on the areas targeted for marine debris removal, descriptions of the removal methods for each area, and proposed mitigation methods to reduce potential impacts. The SHPO will provide information about known historic resources in the project area(s), along with any restrictions on data distribution. In some cases, the SHPO may require that a marine archaeologist be hired to review the new side scan sonar data collected as part of the project to confirm the location of known sites and identify potential new sites. When working in areas of high historical/archaeological sensitivity (for instance, where numerous shipwrecks of high preservation potential are reported to have historically occurred), it may be necessary to have agency representatives or experts on scene to direct the contractors away from the sensitive

areas, instead of providing the exact location of potential historical areas to marine debris removal contractors. During Katrina removal operations, buffers of 100 meters were established around known historic wreck locations. In shallow inland waterways with historical/archaeological sensitivity, there may be restrictions against disturbing the bottom by prop wash or by use of equipment on the barge to drag it closer to debris work areas.

There may be less concern over manual removal of debris in shallow water; however, removal operations that use cranes or grappling hooks in deeper water will have requirements such as those listed in Table 1, depending on the sensitivity of the area being worked. During marine debris removal, an archaeologist or monitor trained in maritime archaeology should be available to assess (within a relatively short period of time in order to avoid excessive delays in marine debris removal) any discovered material that may be historic vessel remains so as not to hinder or stall the debris removal process. Refresher training may be needed as monitors rotate out.

Federal Government Agencies

The only Federal agency that would issue a permit for marine debris removal activities is the USACE. Permits may be obtained under different permitting authorities. In the past, authorization for removal of debris was conducted under General Permits authorized by Section 10 of the Rivers and Harbors Act of 1899, which allow debris to be removed from any waterway for navigation, drainage, and/or pollution control. In some cases, Nationwide Permits (NWP) may be applicable, such as NWP 22 for removal of abandoned vessels.

Consultation with Federal resource agencies may be required under various Federal acts. The main concerns will be the requirements under Section 7 of the Endangered Species Act (ESA) and the requirements for consultation on Essential Fish Habitat (EFH) under the Magnuson Stevens Fisheries Conservation and Management Act. The Marine Mammal Protection Act does not require consultation, but it does prohibit "taking" of marine mammals, which is defined as to harass, hunt, capture, kill, or collect, or attempt to harass, hunt, capture, kill, or collect.

Under ESA, the responsibility of the lead Federal agency or lead State agency is outlined in the following questions:

Question 1: Are listed species or critical habitat present at planned debris removal sites?

If answer is NO: Then consultation is not necessary.

If answer is YES: Then consultation is necessary, and the agency must make an "Affect" determination.

Question 2: Did the agency determine that the project may affect a listed species or critical habitat?

If answer is NO: Then the agency has made a "No Effect" determination and consultation is not necessary.

If answer is YES: Then the agency must consult with the NMFS and/or USFWS.

*Question 3: Did the agency determine that the project may **adversely** affect a listed species or critical habitat?*

If answer is NO: Then the agency has made a "may affect, not likely to adversely affect" determination. Must conduct an Informal Consultation and get concurrence from NMFS and/or USFWS.

If answer is YES: Then the agency must initiate Formal Consultation with NMFS and/or USFWS.

During Informal Consultation under ESA, the lead Federal agency or lead State agency notifies NMFS and/or USFWS of the proposed activity and provides the following information:

- A description of the action
- A description of the area affected
- A description of any species or critical habitat that may be affected and how they will be affected
- Relevant reports, such as an Environmental Assessment or Biological Assessment
- Any other relevant information

NMFS and/or USFWS will review this information. If they concur, in writing, with the agency that the action is not likely to adversely affect a listed species or critical habitat, the consultation process ends. However, often marine debris removal actions "may" adversely affect ESA species; under these conditions, a Formal Consultation will be required. The formal consultation period can be up to 90 days, after which NMFS and/or USFWS have 45 days to prepare a Biological Opinion. The entire process could take up to 135 days; therefore, it is important to start the process early. If a Biological Opinion is prepared, it will include:

- The Opinion (jeopardy or non-jeopardy);
- Reasonable and Prudent Measures (non-discretionary measures to reduce take);
- Terms and Conditions (specific methods to accomplish each measure);
- Incidental Take Statement (exempts the agency or permittee from prohibitions of Section 9 of the ESA); and
- Specific language on the amount or extent of take permitted.

Under EFH rules, the lead agency (Federal or State) would notify NMFS of the proposed action and prepare for consultation an EFH Assessment of the impacts of the proposed action. An EFH Assessment includes: 1) a description of the proposed action; 2) an analysis of the effects, including cumulative effects, of the action on EFH, the managed species, and associated species by life history stage; 3) the Federal agency's views regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable. If NMFS determines that the activity may have an adverse effect on EFH, NMFS would develop EFH conservation recommendations for the activity. These recommendations could include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH. In past marine debris removal projects, conservation recommendations have included no trawling in seagrass and oyster beds (only point-pickup or manual removal); maximum trawl periods to protect sea turtles (30-45 minutes); specific mesh sizes for nets to allow fish, shrimp, and other bycatch

to escape; use of turtle exclusion devices (TEDs), and immediate release of all bycatch. Other issues of potential concern during an EFH Assessment include turbidity, sedimentation, releases of contaminants, and other disturbances to benthic habitats during debris removal. Information on the location of EFH can be obtained directly from NMFS via their website: http://www.nmfs.noaa.gov/habitat/habitatprotection/efh/index_c.htm

Tables 2 and 3 list the potential consultation requirements under ESA and EFH that marine debris removal actions may trigger with NMFS and/or USFWS.

Tribal Governments

Under NEPA, there is a requirement to consult with Tribal governments when the proposed action may impact their environmental and cultural resources. There may be a Tribal Historic Preservation Officer (THPO) who deals with preservation of tribal cultural resources, similar to the SHPO.

Fishing Community and Local Government Involvement

The fishing communities should be involved early in the planning process. Mechanisms need to be developed for them to report locations of marine debris, participate in setting removal priorities, and keep updated on the status of removal efforts. The regional State fishery biologists, who work regularly with the fishing community, can be valuable resources for liaising with the fishing communities and fishing organizations, soliciting their input, and listening to their feedback. The biologists would need a mechanism and resources (e.g., staff, database, mapping tools) to solicit, gather, and organize reports on marine debris hazard areas from the fishing communities and local groups. These data could then be used during prioritization of removal activities. Fishers will also be excellent resources to assist in debris removal because of their local knowledge of waterways, snag hazards, and boat operations.

Because marine debris could directly affect the livelihood of fishers, they will have a high level of interest in the status of removal efforts and contracting opportunities. Methods to inform the fishing communities about contracting opportunities and requirements include newspaper advertisements, radio announcements, and local meetings. There should be a place where interested fishers can register as being available for hire, and the list should be included in bid documents.

Table 2. Potential consultation requirements with NOAA for marine debris removal in the north-central Gulf region.

Regulation	Species of Concern	Potential Requirements	Process
Marine Mammal Protection Act	Whales – Generally do not occur in nearshore waters. Dolphins – Three species (bottlenose, Atlantic spotted, and Risso's) occur in nearshore waters.	Generally none because of the low likelihood of impact to marine mammals during nearshore debris removal activities.	No requirement to consult; only a prohibition against a take.

Endangered Species Act	Sea turtles in their swimming habitats – Five species (loggerhead, green, Kemp's ridley, hawksbill, and leatherback) may be present.	May require: 1) monitors who have training in sea turtle resuscitation, handling, tagging, and release; 2) maximum trawl time with nets of 30-45 minutes; and 3) use of TEDs with net trawling (which would remove tow time and monitor requirements).	Review and opinion process can take up to 135 days.
	Fish – Smalltooth sawfish (Florida only); Gulf sturgeon has designated critical habitat. NMFS consults on activities in marine critical habitats.	Generally none because of the low likelihood of impact during removal activities.	
Essential Fish Habitat	EFH designations mapped in the Gulf of Mexico of potential concern for nearshore debris removal include brown, pink, and white shrimp, blue crab, stone crab, gulf stone crab, grey snapper, spotted seatrout, red drum, and Spanish mackerel.	There may be restrictions on work in seagrass beds and oyster reefs depending upon the methods used for survey and removal.	Submit EFH Assessment as part of consultation and implement conservation recommendations.

Table 3. Potential consultation requirements with USFWS for marine debris removal in the north-central Gulf region.

Regulation	**Species of Concern**	**Potential Requirements**	**Process**
Endangered Species Act	West Indian manatee – May be present in summer months from Alabama to Texas. Sea turtles in their nesting habitats – Five species (loggerhead, green, Kemp's ridley, hawksbill, and leatherback) may be present.	Generally none because of the low likelihood of impact to manatees during removal activities. Generally none as long as removal actions do not disturb nesting beaches during the nesting season (April to September in Alabama and Mississippi).	USFWS has up to 135 days to respond with a formal consultation.

Identify Resources for Site Selection, Survey, and Information Dissemination

Modeling Marine Debris Distribution

Modeling marine debris distributions after a storm event could provide a rapid and relatively inexpensive way to estimate the locations of potential debris hotspots. While described in more detail in the section on the Assessment Phase, such models typically require GIS and statistical computing resources and access to the data used to predict hotspot locations, including the locations of storm-damaged infrastructure, wind speeds and directions, and storm surge information.

Hydrographic Survey Services

NOAA has the Federal responsibility to conduct hydrographic surveys to measure the depth and bottom configuration of water bodies, to produce the nation's nautical charts, and ensure safe navigation in the U.S. Exclusive Economic Zone, an area of 3.4 million square nautical miles that extends 200 nautical miles offshore from the coastline. In addition to depth and bottom configuration, the surveys also identify seafloor materials and features such as gravel, sand, mud, blocks, reefs, carbonate buildups, sediment waves, bars, crevices, cracks, caves, scarps, sink holes, bedrock outcrops (important for anchoring, dredging, and pipeline and cable routing), dredging areas, cables, pipelines, wrecks and obstructions, and fish habitats. Other items that can be found during such surveys include marine debris brought about by natural disasters.

Hydrographic surveys support a variety of activities such as port and harbor maintenance (dredging), coastal engineering (beach erosion and replenishment studies), coastal zone management, and offshore resource development. Hydrographic surveys are conducted primarily by ships using side scan sonar and multi-beam sonar.

Several companies within the private sector also provide hydrographic surveying services, which can include identification of marine debris locations after a natural disaster. During the post-Katrina and Rita survey and removal operations, private hydrographic survey crews, under contract to NOAA's Office of Coast Survey, completed marine debris surveys covering most of the State waters off the coasts of Alabama, Mississippi, and Louisiana in support of the Gulf of Mexico Marine Debris Project. Surveys for marine debris were also conducted by private firms on contract to the States of Alabama, Mississippi, and Louisiana, and the data used for marine debris removal.

Information Management

The requirements for information management to support marine debris surveys, prioritization, and removal activities will depend on the overall plan for data analysis and distribution. The following sections identify resources that can be used for analyzing data, generating maps, and posting the information products to the Internet.

Planning for Data Analysis

In general, data analysis after hydrographic surveys are complete involves sharing survey results with involved parties, storing survey results in digital databases, conducting quality analysis/quality control (QA/QC) of those databases, and creating and describing statistical

summaries of survey data. Ideally, data would be shared electronically; this could be accomplished directly via File Transfer Protocol (FTP), email, or physical media, or by establishing a shared online repository via FTP, Microsoft (MS) Sharepoint, or other private server. Data storage and QA/QC are best accomplished in a relational database, providing the ideal environment for storage of large volumes of tabular and binary data, as well as facilitating the querying of those data for QA/QC and interfacing with the statistical and GIS software packages required later in the process. Multiple commercial (e.g., MS Access, MS SQL Server, Oracle) or open-source (MySQL) relational database software packages provide the required functionality. Finally, GIS software will be required for portions of the data analysis process, such as production of debris density maps. A commercial (e.g., ESRI ArcGIS, InterGraph GeoMedia) or open-source (e.g., Geographic Resources Analysis Support System [GRASS]) GIS software package with required functionality will be required.

Planning for Map Generation

Data products that can be generated include static maps delivered digitally via the project website, tabular summaries, and a dynamic online Internet mapping service. As mentioned above, a robust GIS software package will be required that provides strong integration with the database being used to store survey data. Additionally, spatial data describing background map features such as shorelines, nautical charting data, and streets will need to be collected.

Website Hosting/Architecture/Interface

End-user needs and expectations will need to be determined very early in developing an information management program that involves distribution of the data to users via the Internet. If the GOMMDP website model is used as a starting point, an assessment must be made early on to ensure that the functions and format meet the needs of the next emergency response.

A critical lesson learned from the 2006-2007 GOMMDP website development is that establishing the hosting location and website address can be difficult and time-consuming. For some agencies, it can take a significant amount of time to establish an Internet address for the website. Getting consensus and agreement on a name, combined with the time required to register the name, proved to be a significant issue during the GOMMDP. One way to minimize this issue would be to maintain a “steady-state” website portal with a name relevant to marine debris. When a website is created for a new incident, that new site becomes immediately accessible by interested parties via a link to it. This steady-state portal would require virtually no maintenance support and could be readily accessed when needed.

Another factor to plan for is the use of the survey data by fishers and boaters. With wide use of electronic navigation systems even for small vessels, survey data could be readily made available to users, possibly by integration with global positioning system (GPS) mapping software so that end users could download current information to their on-board navigation systems.

Identify Resources for Removal

Removal Contractors

Effective management of marine debris removal operations will require a general contractor who has experience in contract management, operation and interpretation of specialized equipment such as side scan sonar, and safe marine operations. It would be prudent to get a sense of the local and regional capabilities so that the program can be scaled accordingly. Otherwise, plans will be needed to expand the advertisement program when removal contractors are sought. It will be critical that any request for proposals (RFP) for contractors include references to the permits required, the parties responsible for obtaining them, and any other unique issues with the removal program. Public coordination meetings with potential contractors during the proposal development and pre-award phases of contract development will ensure that all potential contractors understand the issues involved in the award and are prepared to address them should they receive the contract.

Fishing Industry

The local fishing and charter industry may be able to provide some of the workers and vessels needed for removal. While some of the survey and removal effort will require use of vessels and equipment not normally associated with the fishing fleets, other aspects of the effort will benefit from the local expertise of the fishing communities in many ways. This arrangement can be beneficial both by providing displaced fishers work as well as by leveraging their local knowledge and skills. There will be pressure to use local fishers; thus it would be appropriate to develop an early list of those who are interested and meet the basic requirements. Issues associated with contracting are discussed under the section on Removal, Recycling, and Disposal.

Local fishermen have a better knowledge of the area being cleaned and the location of hangs in the area. Many of them have been fishing for many years and likely will meet the program requirements.

Government Entities

Under the Stafford Act, debris removal assistance during emergencies or major disasters is to be provided by the USACE or other Federal agencies. FEMA and/or the USACE will, if warranted, conduct the following post-event activities:

1. Activate, if not previously accomplished, Emergency Support Function 3 (ESF-3).
2. Deploy, if not previously accomplished, a team of debris experts to the FEMA Regional Response Coordination Center to initiate coordination and planning with the State.
3. Deploy, if not previously accomplished (and with State consent), debris experts to the State Emergency Operations Center to provide technical assistance and planning support on debris-related issues.
4. Assess the capabilities of affected State and local governments to effectively coordinate and manage debris removal operations, and identify those requiring Direct Federal Assistance.

5. Deploy, if not previously accomplished, Debris Planning and Response Teams to affected States.
6. Refine debris model results and participate in Rapid Needs Assessment process to define possible requirements for assistance.
7. Work with State agencies to establish intergovernmental Debris Management Team, as appropriate, to integrate and coordinate debris operations under all authorities and to further develop the operational debris management plan. ESF-3 Support Agencies and Advance Contract Initiative contractor(s) will be activated as appropriate to assist with planning and management efforts. The Advanced Contracting Initiative contract is structured to begin debris removal within 24 hours. There is a $100,000 requirements portion of the contract that allows the contractor to mobilize and begin work. Each task order under the Indefinite Delivery Indefinite Quantity portion of the contract has a minimum of $10,000 and a maximum of $10 million. There are four different formats available for each task order, which may be used as needed. The maximum amount available under the Advanced Contracting Initiative contract, including the requirements portion, is $30 million. In a large event, this will allow debris removal while other contracts, if required, are advertised and awarded. There is also the ability to submit a Justification and Approval to amend the contract to raise the award limit.
8. As required, provide Technical Assistance to State/local agencies developing their own debris management capabilities and contracts.
9. Commence debris removal operations under Direct Federal Assistance, when State and local governments lack the coordination and management capability, and following request, approval, and mission assignment.

Landfills and Recycling

Because disposal of marine debris items would likely be conducted at the same time as disposal of large amounts of land-based debris following major storm events, it will be very important to identify potential problems that could significantly increase the costs of marine debris disposal. Each State has its own requirements for the types of debris that can be accepted by different types of landfills. Space could become a problem. Debris must be identified as soon as possible as to type and possible hazardous materials, and should be sorted at the land-side retrieval site if possible, so that deliveries to disposal sites are acceptable at those sites.

Recycling should be considered to the fullest extent possible. Because of the many difficulties, both practical and regulatory, with recycling of marine debris following a major disaster, recycling will best be achieved by pre-planning efforts. Debris management plans should include a list of the types of debris materials that can be recycled, and what recycling companies within a set radius will take such materials when they are available. The plans could be used to identify end-use products that can be made from disaster debris, determine the market demand for each product, identify the product buyers, and, when feasible, secure the sales of those products prior to an event.

Assessment Phase

Unlike debris on land, marine debris is often not visible. If removal and disposal are to be attempted, a method of assessing the location and distribution of marine debris is required. Modeling, which is relatively inexpensive and expeditious, can provide estimates of the relative concentrations of marine debris items in different areas. Side scan sonar surveys or other hydrographic surveys can provide definite debris data, including location coordinates of marine debris items and their size, volume, and depth.

Modeling

A model to estimate the location of marine debris hotspots was developed for the Northeast Gulf of Mexico based on data collected by the GOMMDP.[1] Efforts are underway to generalize this model for other locations and storm events. The GOMMDP model is used to predict spatial differences in *relative* density of anthropogenic marine debris after a hurricane or other storm event by statistically relating those differences to other available data sets such as the location of damaged infrastructure, wind speeds, storm surges, distance to land, and water depth.

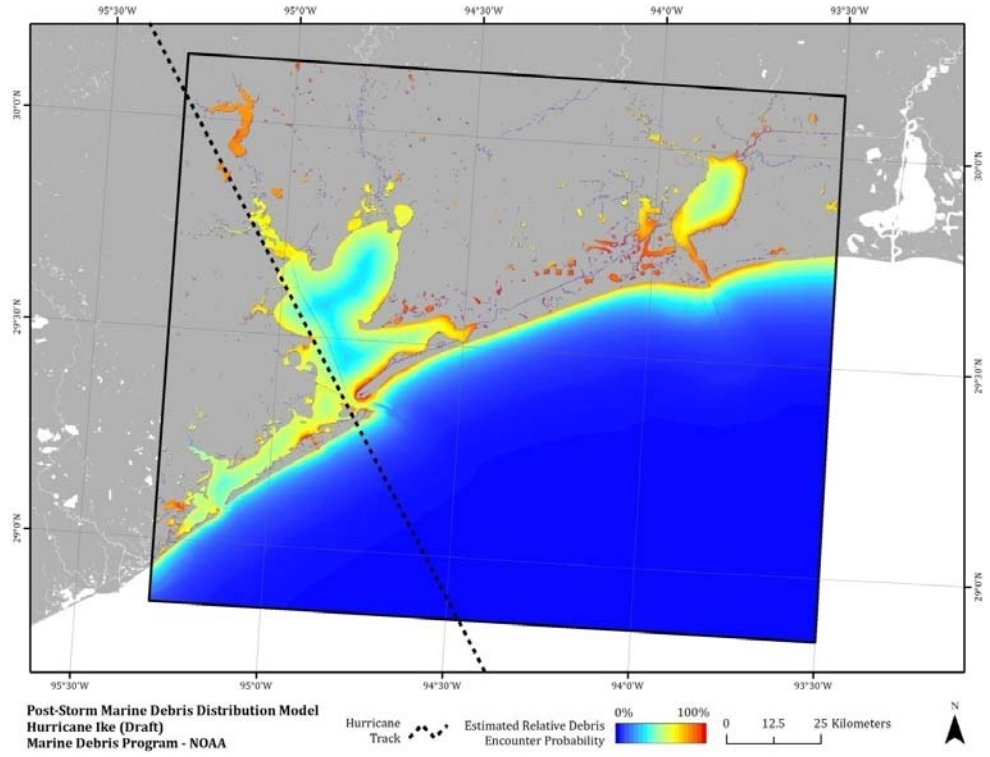


Figure 2: Hurricane Ike marine debris model output

It is possible that a marine debris distribution model might be formulated differently in the future, either by using a different statistical method or by using a physically based deterministic model. Nonetheless, output from any model could be used for assessment of

[1] Gulf of Mexico Marine Debris Project GOMMDP. 2008. Marine Debris Model Development - Draft. National Oceanic and Atmospheric Administration, Office of Response and Restoration, Marine Debris Program. 25 pp.

marine debris in one of two ways. Initially, such a model could be used, in concert with other criteria, to prioritize areas for subsequent hydrographic survey if resources for hydrographic surveys are limited. Alternatively, if verified and proven adequate, such a model could be used to actually guide removal efforts with limited hydrographic surveys of the full area, reducing costs for those surveys, and allowing more resources to be allocated toward debris removal. Using the results of marine debris distribution models to guide removal with limited hydrographic surveys is possible only if the point locations of individual debris items are not required for removal. Hydrographic surveys of the highest-priority areas could then be utilized to identify debris items for removal.

Hydrographic Survey

Survey Methods

Hydrographic surveying, when conducted in a systematic and well-documented manner, is the ideal way to assess the location of submerged marine debris. Survey methodologies utilize instruments that actually depict an image or model of the seafloor using sonar (sound navigation and ranging). Sonar uses sound waves to find and identify objects in the water and determine water depth.

Side scan sonar is a specialized sonar system for detecting objects on the seafloor. Like other sonar systems, a side scan sonar array transmits sound energy and analyzes the return signal (echo) that has bounced off the seafloor or other objects. In a side scan, the transmitted energy is formed into the shape of a fan that sweeps the seafloor from directly under the sonar apparatus to either side (Figure 1), typically to a distance of 100 meters. The strength of the return echo is continuously recorded creating a "picture" of the ocean bottom (Figure 2) where objects that protrude from the bottom create a dark image (strong return) and shadows from these objects are light areas (little or no return). For ease of viewing, the colors are inverted (Figure 3). While the shape of the seafloor and objects on it can be well depicted, most side scan systems cannot provide any depth information.

Multi-beam sonar systems emit sound waves from directly beneath a ship’s hull to produce fan-shaped coverage (a swath) of the sea floor. These systems measure and record the time elapsed between the emissions of the signal to the sea floor or object and back again. Multi-beam sonars produce a “swath” of soundings (i.e., depths) to provide full coverage of an area. See Figures 4 and 5 to compare the quality of images created using side scan sonar and multi-beam sonar.

Single-beam sonar systems are similar to multi-beam systems except they emit one beam of sound per ping directly beneath the vessel rather than an entire swath of pings (Figure 6). While this type of sonar does not provide as much coverage as the multi-beam, it is reliable and less affected by rough sea conditions and water-column noise.

In addition to providing a list of submerged debris, hydrographic surveyors can collect bathymetry data in conjunction with side scan data. Bathymetric data can be used to update nautical charts, which are the basis of all safe navigation.

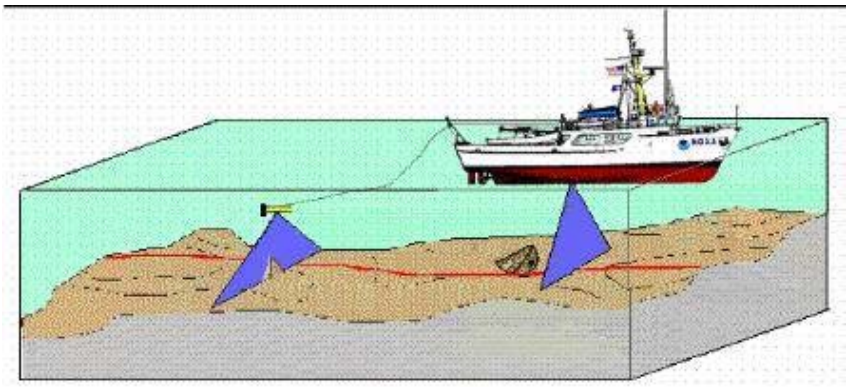


Figure 3. Towed side scan sonar array. Blue fans represent sound energy swaths transmitted from sonar array, either from the hull of the vessel or from a towfish.

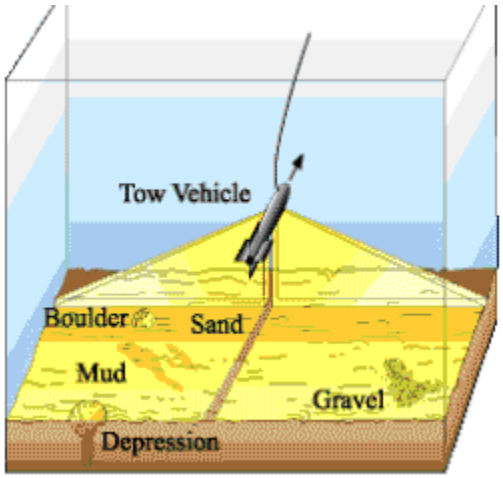


Figure 4. Side scan sonar overview. Side scan sonar can provide an overall picture of the area of interest. Operator management of the system and the data-gathering process greatly impacts the quality of the side scan sonar data. Survey vessel course, tow speed, towfish altitude above the seabed, frequency, and corresponding range will dictate the quality of the sonar image. The areas in yellow represent the area being insonified; however, the area directly under the towfish is known as the nadir, and this area is not insonified. In general, resolution is better close to the nadir where the footprint of the beam is narrow. Additionally, it may be possible to see textural characteristics from the raw output of the side scan sonar that may provide information about the seabed composition, such as rocks, sand, gravel, and mud.

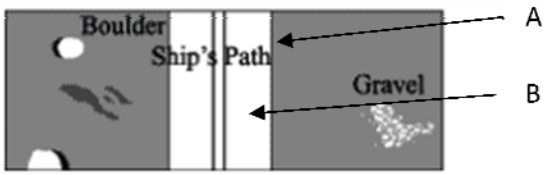


Figure 5. This image represents the display that operators will normally be able to see when collecting side scan sonar data. This display represents the sea bed as if viewed from above.

The two lines in the center are the trigger pulse, or the first sign of the outgoing acoustic pulse on the port (left) and starboard (right) channels. “A” is known as the first bottom return. The bottom is almost always a strong reflector, except for very soft bottoms. “B” is the white area between the outgoing pulses and the first bottom return, known as the water column. Regarding objects on the seafloor – a boulder or other debris will often present good reflectors on the bottom and can show up as white areas on the record (in this case the high backscatter is white). Because almost all of the acoustic energy from the sonar is typically reflected back from the target, there is little insonification just behind it (i.e., the dark crescent spot next to the boulder) – this is the acoustic shadow cast by the target. This area is displayed very dark on the side scan sonar record because almost no acoustic energy from the towfish reached it.

Figure 6. Side scan sonar image of a barge. There are many variables that affect the sonar data and how the resulting sonar records depict the seabed and various targets. Environmental conditions, such as wind, waves, currents, and density gradients from temperature or salinity changes, all influence the quality and interpretability of side scan sonar data.

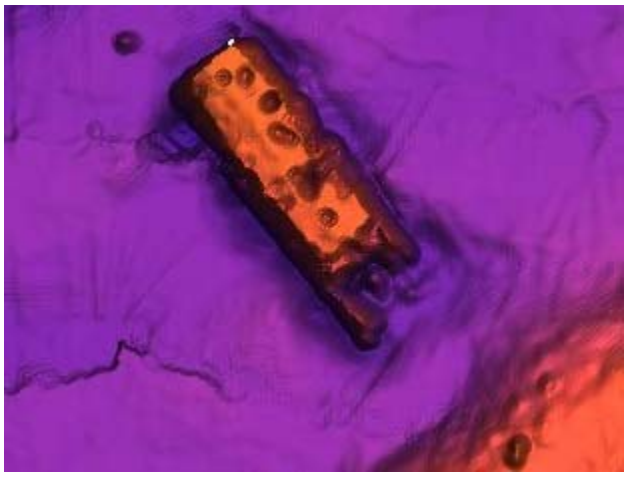


Figure 7. The same barge surveyed with multi-beam sonar. This image is different because, instead of a “picture” of the wreck, it is a digital terrain model created with multi-beam depth

data. Environmental conditions such as tide and sound speed can influence the quality and interpretability of multi-beam data.

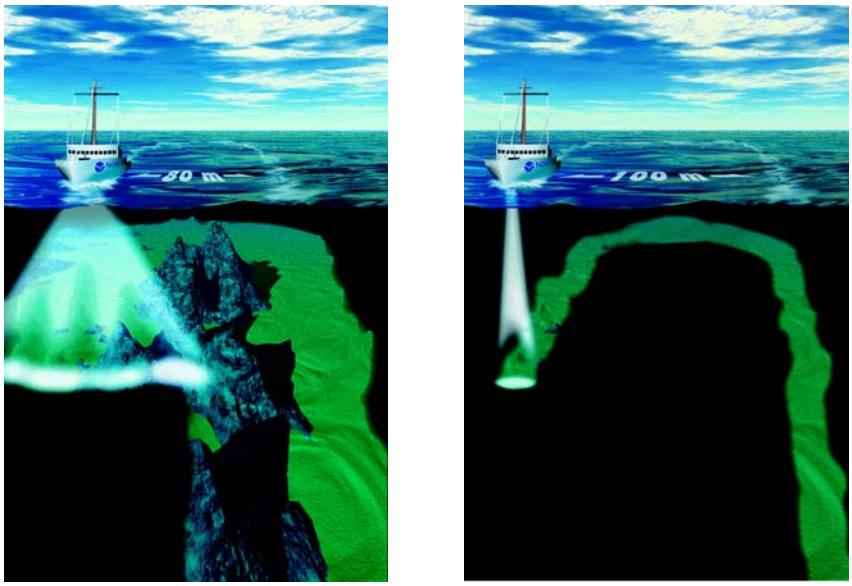


Figure 8. Multi-beam echosounder (left) and single-beam echosounder (right). The signal swath of the multi-beam sonar is broader than that of the single-beam; thus, the multi-beam signal provides greater seafloor coverage.

Survey Design and Planning

One of the most important aspects of survey design is to understand the requirements of the survey. While all of the tools explained above are useful, the purpose of the survey will determine the type of equipment that should or may be used, as well as how it is deployed. Additionally, it is important to keep in mind that resources are not infinite, so typically one will not be able to buy or contract out for a new system every time there is a different set of requirements. Therefore, it is also necessary to determine the capabilities and limitations of a given system and determine how it can be optimized to produce good results given system constraints.

The following considerations will assist in survey planning:

- Realize that the time required to complete the survey (and thus the cost) depends on the size and shape of the survey area as well as the requirements of the survey (e.g., coverage, accuracy).
- Evaluate the appropriate type of survey equipment system needed for the project (side scan, single-beam, multi-beam, or combination) and the associated cost/benefit of each system. See Table 4 for pros and cons of single beam, multi-beam, and side scan sonar.
- Have a general understanding of the distribution of major water mass boundaries during the survey. For example, divide the survey into small zones of similar water mass properties, rather than run more “efficient” lines that cross water mass boundaries, for data processing and interpretation reasons.
- Consider survey vessel limitations (water depth, only daylight operations, etc.).
- Consider general sea state, including swell direction, weather, and depth of area.

Table 4. Generalized pros and cons of the different hydrographic survey systems.

Side Scan Sonar	Single-Beam Sonar	Multi-Beam Sonar
Pros		
• Side scan sonar surveys are capable of providing accurate positions, dimensions, and images of marine debris over relatively wide swaths of bottom in a quick and cost effective manner. • May be hull-mounted in very shallow areas.	• Single beam sonar survey provides very accurate general bathymetry within the survey area. • Single beam sonar could give the depth of an object directly under the vessel. • It may be used in conjunction with side scan sonar. • Single beam data may be collected in a wider range of environmental conditions than side scan and multibeam sonars surveys.	• Multi-beam sonar survey could cover a larger area more efficiently than a single beam. • Provides very accurate least depth, position, and dimensions of submerged marine debris. • Data can be corrected for vessel motion and water column characteristics, allowing for multi-beam data to be collected in a wider range of environmental conditions than side scan sonar.
Cons		
• Side scan sonar cannot provide an accurate least depth, resulting in ambiguity concerning an object's danger to navigation. • Side scan sonar in shallow, nearshore environments is very susceptible to environmental conditions, such as vessel heave caused by waves, noise from waves, and temperature and salinity variations. • If towed, the side scan "towfish" may hit uncharted objects. • Hull-mounted side scan sonar restricts the ability to survey at a large range of depths.	• Due to its narrow swath, it is very difficult to determine an accurate least depth, position, or dimensions of an object using single beam sonar.	• In shallow, nearshore areas, bottom coverage swaths are narrow. A full bottom coverage survey of shallow areas would be expensive and require a significant amount of time. • Accurate and professional calibration is essential or significant errors may occur.

Types of Coverage

There are several techniques which, depending on the purpose of the side scan sonar or multi-beam survey, are useful in locating items on the seafloor. Search patterns usually are run as a series of parallel lines that ensure overlapping coverage of the sonar. In charting-quality side scan sonar surveys, the seafloor is insonified (exposed to the energy from the sonar array) two times. This approach allows objects to be verified with a second pass of the sonar; it is classified as 200% coverage of the seafloor. When only a single pass is run, the seafloor area is insonified once; it is classified as 100% coverage. When using a 100% coverage method, it can be difficult to validate the position and significance of objects on the seafloor. Examples of 200% and 100% coverage are presented below.

- **100% bottom coverage:** Conduct a single survey where the vessel track lines are separated by one-half the distance required for 100% coverage (Figure 7). This method does not fulfill NOAA's charting requirements for proof or disproof that an item is in a specific location, but can be an accepted method of debris identification for removal as well as post-removal verification.
- **200% bottom coverage (A):** Conduct two separate 100% coverage surveys where the vessel track lines during the second coverage split the difference between the track lines of the first coverage (Figure 8). Final track spacing is half that of 100%. This method fulfills NOAA's charting requirements for proof or disproof that an item is in a specific location on the seafloor.
- **200% bottom coverage (B):** Conduct two separate 100% coverage surveys in orthogonal directions (Figure 9). This technique may be advantageous when searching for small man-made objects on the bottom, as the bottom is insonified in different aspects and objects are viewed from two different sides.

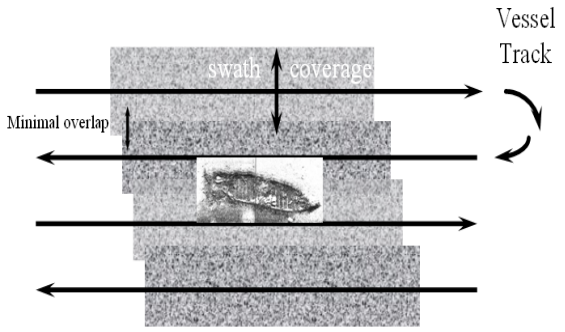


Figure 9. Survey track for 100% bottom coverage.

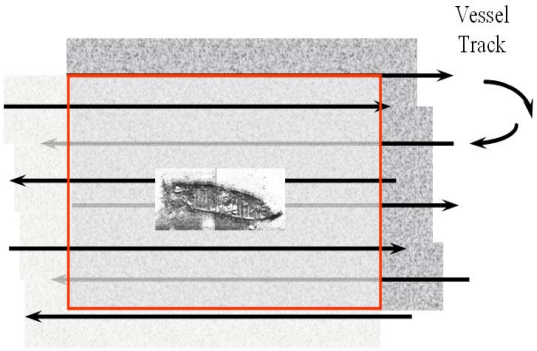


Figure 10. Survey track for 200% bottom coverage.

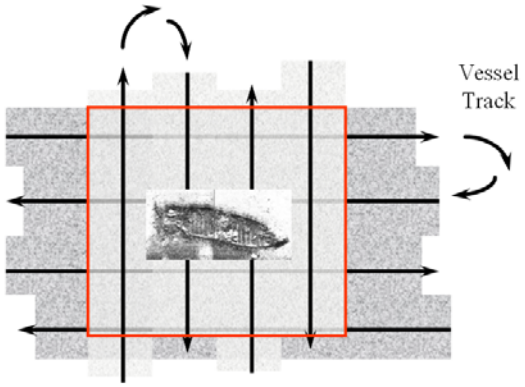


Figure 11. 200% orthogonal bottom coverage.

For the survey to meet NOAA's specifications for charting it must meet quality benchmarks which are further detailed in the *NOS Hydrographic Specifications and Deliverables* document and the *Field Procedures Manual*. These documents can be viewed at http://nauticalcharts.noaa.gov/hsd/specs/specs.htm and http://chartmaker.ncd.noaa.gov/hsd/FPM/FPM_MAR2007.pdf.

Survey Data Management

Marine debris data gathered by hydrographic survey methods are not readily usable for most purposes. A considerable amount of time must be spent analyzing imagery and depth information to determine the location, significance, and validity of targets detected with sonar. This information is then synthesized into more meaningful products such as maps or spreadsheets and relayed to the marine debris prioritization or removal team and other users.

Analysis of the targets provides density, size, and clearance information, all essential precursors for removal. Ideally, data presentation and analysis should be done by those who acquire it, as they are most familiar with the conditions in which it was collected. The time between the survey of the marine debris and its removal should be as short as possible. Often debris is transitory or neutrally buoyant and can be moved by currents, winds, other debris, marine traffic, or fishing nets. A practicable approach would be to make the survey and removal efforts operate in tandem; items are located with sonar, analyzed, and reported

quickly to the removal team so they can proceed with removal. The survey/removal tandem scenario is best executed by dividing a particular survey area into grids and having the survey and removal operations work methodically through them.

Documentation of marine debris removal is essential. It may be appropriate to have a dedicated survey expert on the removal vessel to assist with finding the target and to document removal. This documentation serves as a tracking mechanism and as written confirmation of debris removed. It is also critical from a nautical charting perspective. When items are located using hydrographic survey methods, any item deemed navigationally significant is reported to NOAA and the USCG as a Danger to Navigation (DTON) and added to nautical charts.

Removal of debris that has been surveyed by NOAA and assessed as a significant hindrance to the safety of marine traffic must be accompanied by thorough documentation to ensure its removal from the survey database and if the item is charted, from a nautical chart. Proper debris documentation should include as much information about the removal as possible including:

- Date and time of removal;
- Any associated unique numeric identifier possibly assigned by the hydrographic surveyor;
- The latitude and longitude position of where the item was removed as acquired by GPS;
- A photo of the object once it has been removed;
- A side scan sonar image of the seafloor at the appropriate coordinates post-removal, proving a clear seafloor; and
- The name of the person or company conducting the removal.

This information should then be relayed to NOAA to ensure the item's removal from the nautical chart so that the most accurate seafloor is depicted.

Public Outreach

For small, remote, or local waterbodies, the public who use these waterbodies may be the best source of information on which to identify areas for marine debris removal. Public outreach should be multifaceted and can include:

- Website on which the public can submit information on waterbodies of concern and learn about ongoing activities. The degree of use will vary widely, but there will be spikes in reports after public meetings.
- Public meetings coordinated with local governments (e.g., drainage districts, county/parish government) and other stakeholder groups.
- Meetings with commercial fishers.

Based on past experience, it is better to have the public identify sections of waterways or areas for inspection rather than GPS coordinates of specific points. Fishers can provide the

coordinates of snags and hangs. Also, it is important to reach out to different local groups to make sure that interested parties have the opportunity to provide input.

Information Management

Raw survey data are not readily useable for most purposes. Such data need to be converted to static or interactive maps and analyzed to provide density, size, and clearance from the water surface. Only then does it become an essential precursor for removal.

Target Information

The surveyors can be asked to generate visual aids to assist in information management. Snapshots or thumbnails of each target can be generated and shown on summary sheets with other information on location, target dimensions, type, etc. Figure 10 shows an example from Vermillion Bay, Louisiana.

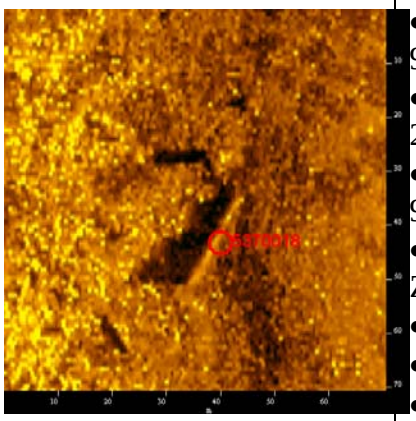
Target Image	Target Information	User-Entered Information
	**5370018** • Sonar Time at Target: 03/12/2008 18:46:07 • Click Position (Lat WGS84): 29.574245788 • Click Position (Lon WGS84): -91.710648956 • Click Position (Lat NAD27): 29.574031930 • Click Position (Lon NAD27): -91.710532752 • Map Proj: WGS 1984 UTM, Zone 15 North, Meter • Click Position (X): 624,887.75 • Click Position (Y): 3,272,303.47 • Acoustic Source File: C:\Program Files\Chesapeake Technology, Inc\SonarWizMAP\Data\LA\Vermilion\XTF\jason-0093.XTF • Range to Target: 18.01 Meters • Fish Height: 1.46 Meters	**Dimensions** Target Height = 0.3 Meters Target Length: 7.3 Meters Target Shadow: 4.7 Meters Target Width: 1.3 Meters Mag Anomaly: Avoidance Area: Classification 1: debris Classification 2: Area: Block: Description:

Figure 12. Example summary information for a target in Vermillion Bay, Louisiana (Sonar image and data: LDWF and Crowder Gulf).

It is important to determine early what types of data will be posted – text, file types (Word, Excel, PDFs, images, etc.); the method for posting of data to the site – whether this will be a

duty for anyone, a small group, or one person; and who will have access to the posted data. Site appearance and data-posting consistency are best achieved by one channel (one person or lead office). However, there are some benefits to redundancy and backup by spreading this task among more than one group.

The frequency of data posting and updates needs to be decided to determine the level of effort required to support the website. Will it vary? What are the relative volumes of data that will need to be processed?

Target Review

When several agencies are involved in a large marine debris survey and removal project that produces hundreds of targets, having a structured and well-designed target review process allows for input from all involved, and reliable tracking of the targets reviewed. During the offshore survey in Louisiana, when the State, FEMA, NOAA, and USCG were all involved in the survey and removal, a target review process was developed over several months, until it addressed all the elements needed.

In essence, the target review process (facilitated by NOAA) involved a series of meetings. First, FEMA and NOAA received the "batch" of targets in a Google Earth file (Figure 11), along with a spreadsheet listing all the targets and providing essential information about them. A meeting was held so FEMA could make a first eligibility determination on these targets. FEMA's initial decisions were tracked and the files were sent to the State. A second meeting was then held with the State, NOAA, and FEMA, so the State could question FEMA's determination and provide any comments and further questions it had. All decisions were recorded. A third meeting was then set up, this time with the State, FEMA, NOAA, and NOAA survey contractor, who provided multi-beam images of the target selected for additional review. These multi-beam images allowed for a nearly 3D view of the target, thus greatly assisting with the next determination: Eligible for removal, not eligible for removal, or (most often) requires further investigation by diving. The decisions were again recorded and sent to the USCG, which then coordinated with FEMA for diving or removal.

A more detailed, step-by-step list of the target review process is provided in Appendix 1.

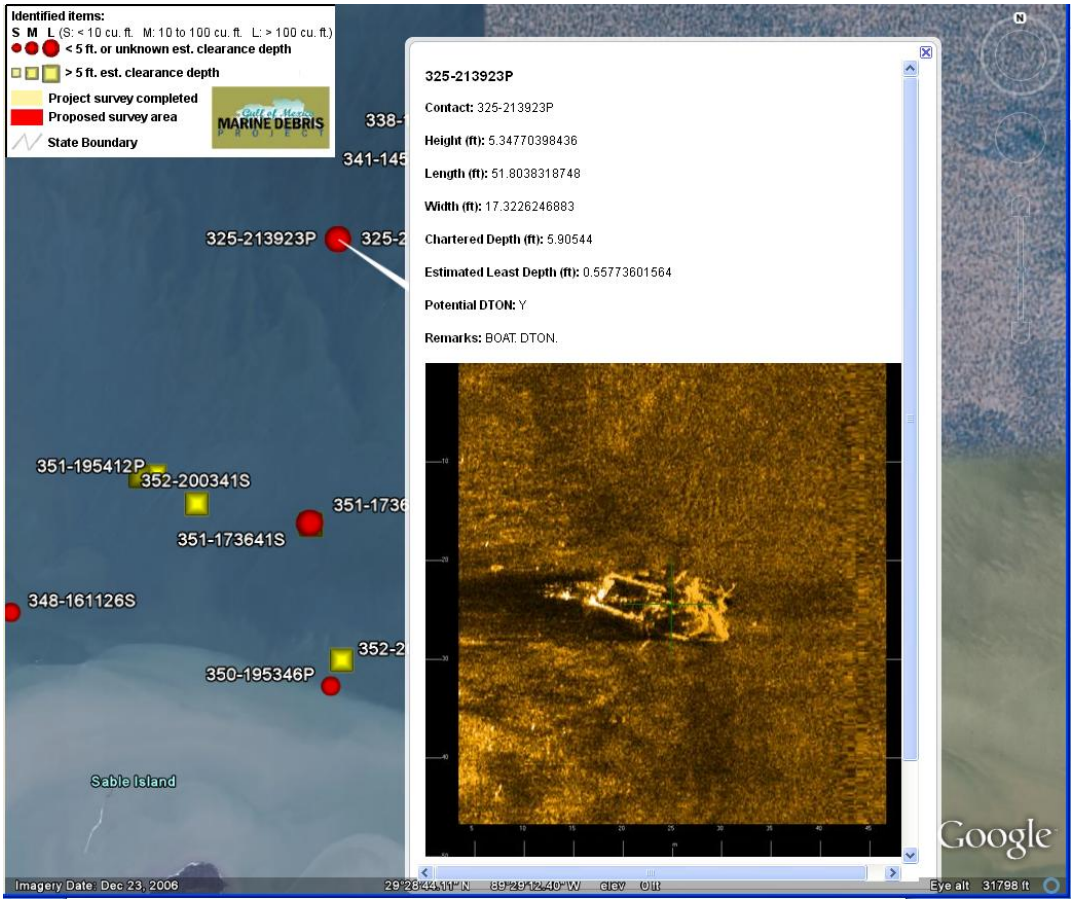


Figure 13. A side scan sonar image of a sunken vessel in a target review file. Image: NOAA

Assessment Phase Summary

There are different approaches or tracks that can be followed during marine debris assessments and removal, based on the method used to identify the locations of marine debris.

Track 1 starts with the use of side scan sonar surveys of the impacted areas where marine debris removal is being considered. The results of the side scan sonar survey are used to identify potential debris items, prioritize areas, determine removal eligibility and methods, and develop invitations for bid documents. This approach provides a complete and independent database of debris items.

Track 2 starts with the use of a marine debris prediction model to identify areas and preliminary estimates of debris volumes and quantities by region. Side scan sonar surveys are then conducted in selected areas, using statistical methods to select the areas for survey to allow testing and validation or refinement of the model results. If the model is shown to be valid, the model results can be used to generate the data to prioritize areas, determine removal methods, and develop bid documents. This option reduces the costs of the program in that not all areas have to be surveyed prior to developing the bid documents. The contractors obtain their own side scan survey data to locate individual items or clusters immediately prior to removal. Because of this, it will be important to get the side scan survey data from the contractors as part of the documentation.

Track 3 does not include any surveys or models; rather, areas are selected for marine debris removal based on visual assessments and local knowledge. This approach may be used in water bodies that are either too shallow or too small to allow survey vessel access. Thus, in the outline below, work would start with permitting (Step III of Track 1).

Track 1 - Use Side Scan Sonar Surveys to Locate Marine Debris

I. Side scan sonar surveys are used to identify marine debris locations and detailed data on location, number, size, etc., of items to be used for prioritizing, and then undertaking, removal activities.
   a. Timing is essential; location surveys must be coordinated effectively with removal activities.
   b. Obtain guidance on side scan sonar survey deliverables to meet project timelines (spreadsheets with data, images, and other required information).

II. Areas are prioritized for marine debris removal
   a. Identify and select prioritization factors
      i. Distance from shore (visible, human contact, habitation)
      ii. Importance to fishing community
      iii. Local boating traffic
      iv. Direct threat to human health and safety
      v. Others
   b. Determine if prioritization will be formal (using GIS overlays) or informal (expert opinion)
   c. Use standard criteria and be defensible.

III. Requirements for permits/compliance monitoring are developed (and who will be responsible for acquiring)
   a. Comply with Federal requirements for consultations
      i. Determine if a permit from the USACE is needed
      ii. Consult with NMFS/USFWS on ESA and EFH
   b. Consult with State requirements
      i. Consult with SHPO on cultural resources
      ii. Apply for State permits as needed (e.g., LA Coastal Use Permit, MS out-of-season net permit)
   c. Comply with stipulations
      i. Avoid sensitive areas (e.g., historic resources)
      ii. Implement mitigation methods to reduce impacts (e.g., manual removal only in oyster beds and seagrass habitats)
      iii. Conduct required training and prepare necessary documentation

IV. Bid packages are developed
   a. Select fixed-cost basis
      i. Cost/grid
      ii. Cost/cubic yard
   b. Generate bid documents
      i. Provide marine debris locations, size, volumes, etc. from the model
      ii. Require description of proposed removal methods for different types of debris (or specify general types of methods allowed)
      iii. Require description of methods for validation of removal (or specify validation methods)
      iv. Identify known or likely stipulations to protect sensitive resources
      v. Specify responsibilities for permitting, training, compliance monitoring, and reporting

vi. Specify data package deliverables, such as:
    1. Categories of items removed
    2. Location of items removed
    3. Documentation for proper disposal of items removed
    4. Removal confirmation by side scan sonar
    5. Delivery of all survey data acquired by the contractor to NOAA

V. Removal operations are conducted
   a. Allow contractor-specific methods for identification of items for removal
   b. Determine monitoring/oversight requirements
      i. Conditions where 100% monitoring is required
      ii. Conditions where spot checking is appropriate
   c. Verify removal
      i. By Contractor, as part of data package specs
      ii. Independent site verification, or post-removal survey (e.g., by a Federal or State agency, others under contract)
   d. Need process for agencies to review and sign-off

VI. Disposal and recycling are documented
   a. Comply with FEMA documentation requirements
   b. Comply with other documentation requirements (State, local)
   c. Emphasize recycling where feasible and advisable

Track 2 – Use a Marine Debris Prediction Model to Locate Marine Debris

I. A Marine Debris Prediction Model is used to identify areas and preliminary estimates of debris density
   a. Where appropriate, include oil and gas infrastructure as sources of debris
   b. Model output will typically consist of a map of variable debris encounter probabilities

II. Side scan sonar surveys of a small percentage of the total area are used to validate the model results
   a. Model validation data are best derived from multiple small surveys located across the span of predicted debris encounter probabilities, from high to low. A single survey of a large area could suffice if it covers a wide enough range of probabilities.
   b. Model validation data should be collected and delivered rapidly. Deliverables should include survey area boundaries and locations and attributes of identified debris items within those boundaries.

III. The Marine Debris Prediction Model is revised based on survey data
   a. Determine model output requirements
   b. Determine model report specifications to support bid package

IV. Areas are prioritized for marine debris removal
   a. Continue as for Track 1, beginning at Step II.

Track 3 – Use Visual Assessments and Local Knowledge to Locate Marine Debris

Local knowledge and visual assessment are used to identify marine debris locations and collect data on location, number, size, etc. Local resources may be state, county/parish, and local governments, and local residents including fishermen and boaters. A phone number to call in and report on marine debris or a website with on-line reporting features could be made available to facilitate reporting. The information should be compiled in a database, and serve could be used for prioritizing and subsequently undertaking marine debris removal.

For marine debris removal operations under Track 3, sections III through VI in Track 1 are applicable.

Removal, Recycling, and Disposal

Marine debris posing a threat to navigation, commercial activity, recreation, and natural resources may have to be removed. Surveys and analysis will provide the needed precursors for removal: debris location, size, eligibility, and information with which to develop a removal priority for each debris item.

Ideally, removal will quickly follow survey. The more time between completion of the survey and initiation of removal activities, the higher the chance that items will be moved or be buried *in situ*. These items will then remain in the system, with the potential to remain as a threat.

Removal Method Options

Removal can be performed by contractors, fishers, commercial boat operators, and possibly State or Federal government entities. Several removal methods are briefly described below.

Point Pick-up: The debris item is located, either visually or using a sonar system. Grappling hooks are used to lift smaller items out of the water onto the deck of a small removal vessel; a crane or backhoe on a barge is used to lift larger items out of the water (Figure 12). Divers can assist in verifying the debris type and size, attaching cables/ropes to items for winching on board vessels, and using lift bags if needed for sunken vessels and other large objects. Point pick-up is the preferred method because it avoids many potential environmental concerns and requirements associated with trawling or dragging grappling hooks over a large area. It is appropriate for removal of larger debris items in sensitive habitats such as seagrass beds and oyster beds, when items may be too big for manual removal. When working in these sensitive habitats, it is important that the items are lifted by winch or crane and not dragged across the sensitive habitat. Contractors may need to have large heavy-lift equipment available to handle larger items as they are identified.

Trawling with Nets: To use trawl nets for debris removal, the nets are dragged along the bottom, much the same as for commercial shrimp fishing. Usually, heavy-duty debris nets (4-inch mesh, #60 webbing or similar), are used to allow smaller fish and shellfish to escape.

In water depths greater than about 5 feet, boats can be double-rigged and cover a pull width of 40-80 feet depending on boat size and water depth. The start and end positions of the trawl are recorded using GPS. Depth control of debris nets is regulated by a system of “doors,” which are set and monitored by the boat captain. Each net is equipped with a heavy duty “tickler chain” that snags debris items that protrude above the seafloor. When the net is full, or at the maximum trawl duration, the net is pulled to the surface and the items emptied. The debris types and quantities are recorded and photographed. To start the next trawl, the captain navigates the boat to redeploy the nets with a slight overlap with the last end location to allow the nets to fully open. In shallow water, smaller vessels with single nets covering about 25 feet are used, following similar procedures. Parallel trawl track lines usually overlap by 50 percent to ensure complete coverage.

Figure 14. Marine debris removal methods. A. Crane on a barge picking up larger items. B. Large grappling device in a point-pickup removal. C. Small grappling hooks. D. Shallow-draft vessels transporting marine debris from creeks. Photograph credit: USCG and NOAA.

Trawling with nets is appropriate for smaller debris items and scattered debris fields. Use of this method may, however, trigger the need to use turtle exclusion devices and consult with Federal agencies about potential impacts to sea turtles, Gulf sturgeon, manatees, and Essential Fish Habitat.

Manual Removal: With manual removal, the debris item is located visually or by feel by teams (hand pickers) working in shallow water and using hand tools (rakes or hook poles) to remove the items. Recovered items are loaded onto small vessels and transported to the shoreline for sorting and disposal. This method is used in very shallow water close to shore (during the lowest low tides) and in sensitive habitats such as seagrass beds and oyster reefs.

Removal of Shoreline Debris: It may be most effective to consider removing certain types of shoreline debris from the water side during removal of wet marine debris from the water. Generally, this type of debris consists of vegetation and construction and demolition (C&D) items that lay partially in the water and partially on land. Although shoreline debris is generally removed under different authorities, there may be difficulties getting right of entry

from adjacent property owners to remove the debris from land. Also, water-side operations can reduce the risk of property damage during removal. Therefore, marine debris removal actions can include removal of debris on banks and shoreline within reach of the equipment being used. Guidelines will have to be developed on whether downed vegetation lying partially in the water is to be removed totally or partially.

Removal in Private Oyster Lease Areas: Leaseholders are generally contracted to perform sediment and debris removal in their private oyster lease areas for two reasons. It avoids potential liability issues, and it provides them compensation. Therefore, private oyster lease areas need to be identified and excluded from general removal contract assignments.

Contracting Issues

Depending on the available staffing resources for monitoring and oversight, it may be appropriate to issue contracts for small packages of work, distributed based on identified priorities. There will be a learning curve for the responsible agency, the contractors, and the local work force, so subsequent contracts can be improved over time. Furthermore, having multiple contractors can increase the number of local fishers working.

Use of Basic Ordering Agreements (BOA) is generally not recommended because they are designed for emergencies such as oil spills, and these contracts have costs based on time and materials, thus they are much more expensive than competitive, fixed-price contracts that are based on costs per cubic yard of collected debris or costs per area (grid) to be cleared. For Federal contracts, the RFPs are announced in FedBizOpps. For State contracts, each State will have its own process that includes advertisements in local papers for a minimum period of time.

Pre-bid conferences allow prospective proposers to obtain clarifications on the requirements and get answers to relevant questions. The RFP should include a period for submittal of questions prior to the pre-bid conference.

One key issue for the fishing community will be assistance in submitting bids and/or getting subcontracts from the successful bidders for marine debris removal. There may be minimum equipment requirements for deck space, winch size, vessel size, etc. There will be intense pressure to use local resources whenever possible. For years, commercial fishers have been pulling nets along the bottom and freeing themselves from snags. Furthermore, the fishing community has a vested interest in assuring that all marine debris is removed. In the past, agencies have required contractors to hire only boat captains with either a valid State resident commercial fishing license and reported landings in the previous one or two years, or a valid resident charter boat fishing guide or skiff license for the two consecutive license years immediately prior to performing the work. FEMA regulations require a minimum of 15% of the people on the contract be residents of the State in which the work is being conducted.

The RFP or bid request should require detailed descriptions of the proposed methods to identify targets, remove them, and verify removal. It should also specify the content and timing of delivery of data packages.

The contract should specify the documentation requirements for verifying complete coverage of the assigned removal areas and reporting on the ultimate disposition of all targets and removed debris. For each assigned removal area, vessel track plots should be submitted showing the actual areas covered, preferably as shapefiles or other GIS-readable files so the lead agency can track and report on progress to both the public and funding agencies. For each identified target, documentation should include the following:

1. Latitude and longitude of the target
2. Description of the target
3. Status of the target
    a. Removed
    b. Removed in part and rationale for partial removal
    c. Remains in place and rationale for leaving it in place (e.g., working crab pot, pipeline, wellhead, charted piling, vessel too large to remove with existing equipment)
    d. Target could not be located

Table 5 shows an example report from removal operations in Louisiana. Note that the report includes references to images of the targets that were left in place, to document the target type and rationale for not removing it.

The contract should also specify documentation that the removed debris has been properly disposed of, such as load tickets, transfer records, and sales receipts. Information on the location, amount, and types of debris removed will be useful to validate predictive models, measure program effectiveness, and support decision-making for future storms.

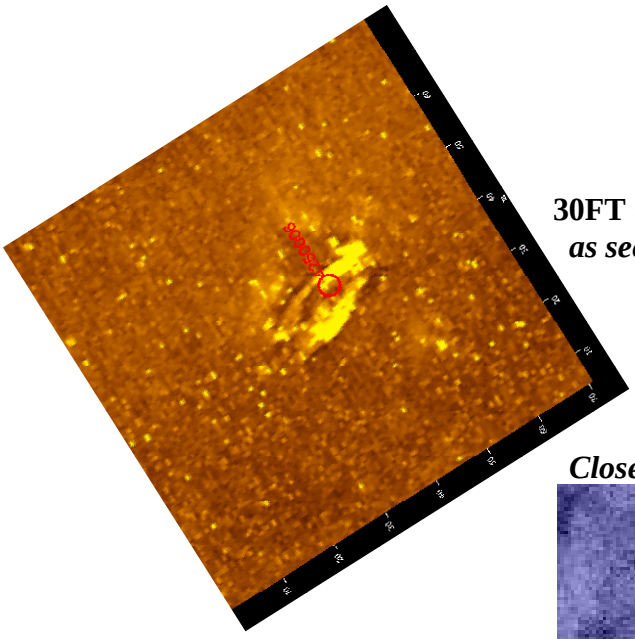
Where appropriate, detailed documentation of the target and its removal may be required. Figure 13 includes a series of images, showing the target sonar image identified during the initial assessment, the sonar image obtained during removal, and a photograph of the target being removed.

Categories for reporting debris types include:

- Wooden materials
- Metal materials
- Household items
- Boat and vessel components
- Tires
- Oilfield debris
- Vegetation
- Wrecks
- Other

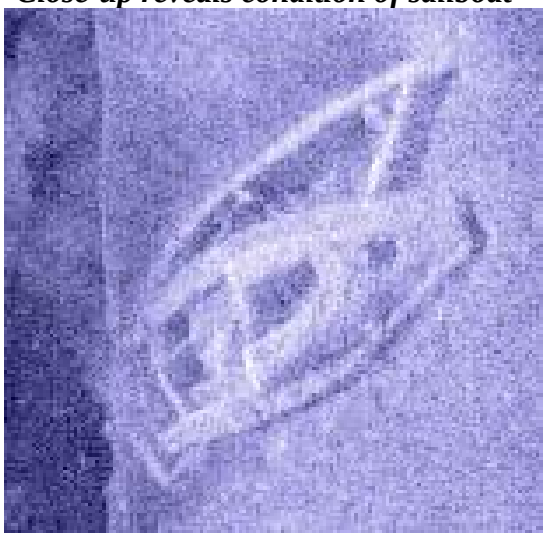
Table 5. Example documentation report from removal operations in Louisiana in 2008.

CONTACT	LAT	LON	LENGTH m	WIDTH m	DESCRIPTION	STATUS
LPM0444	30.14808	-89.74874	9.7	3.4	Chair	removed
LPM0445	30.16349	-89.74916	2.7	2.8	Crab Trap	removed
LPM0446	30.14934	-89.74862	3.9	0.7	tree, cart, siding	removed
LPM0447	30.16262	-89.74898	5.1	3.4	Siding, cloth	removed
LPM0448	30.16390	-89.74899	4.5	0.7	Crab Trap, House pipe	removed
LPM0449	30.15287	-89.74843	16.0	3.6	8000 gal Fuel Tank	removed
LPM0450	30.16439	-89.74865	6.4	1.6	VEHICLE	removed
LPM0451	30.15960	-89.74848	4.2	4.3	Tire for 18 wheeler	removed
LPM0452	30.16189	-89.74849	5.6	1.0	Piling, wire, tire, tree	removed
LPM0453	30.16426	-89.74854	4.3	0.9	metal roof, PVC pipe, lumber	removed
LPM0454	30.16424	-89.74844	4.0	1.1	Crab Trap, 150ft PVC pipe	removed
LPM0455	30.15908	-89.74820	6.4	2.9	Crab Trap, TV cable	removed
LPM0456	30.15874	-89.74811	5.3	4.4	small tree	removed



30FT Sailboat
as seen by high resolution side scan sonar

Close-up reveals condition of sailboat



Upper deck portion of sailboat

Figure 15. Images documenting target identification and removal.

Monitoring/Verification Requirements

Removal activities must be monitored to minimize environmental impacts, ensure safety, and verify removal. Ideally, an independent surveyor would work closely with the removal operator and provide target identification and removal verification. Scanning sonar can be a valuable tool to support removal operations. They are portable and can be mounted within a marine tripod that is lowered to the seafloor, where it serves as a foundation for the sonar to work from. Once in place on the seafloor, the scanning sonar can rotate 360 degrees, identifying any debris within the sonar's range. Scanning sonars can be deployed at the work site to place anchors and/or spuds. Then they can be used to identify the exact location of the target and generate the documentation that all debris items at the site have been removed. They cannot, however, provide information on least depth of remaining items.

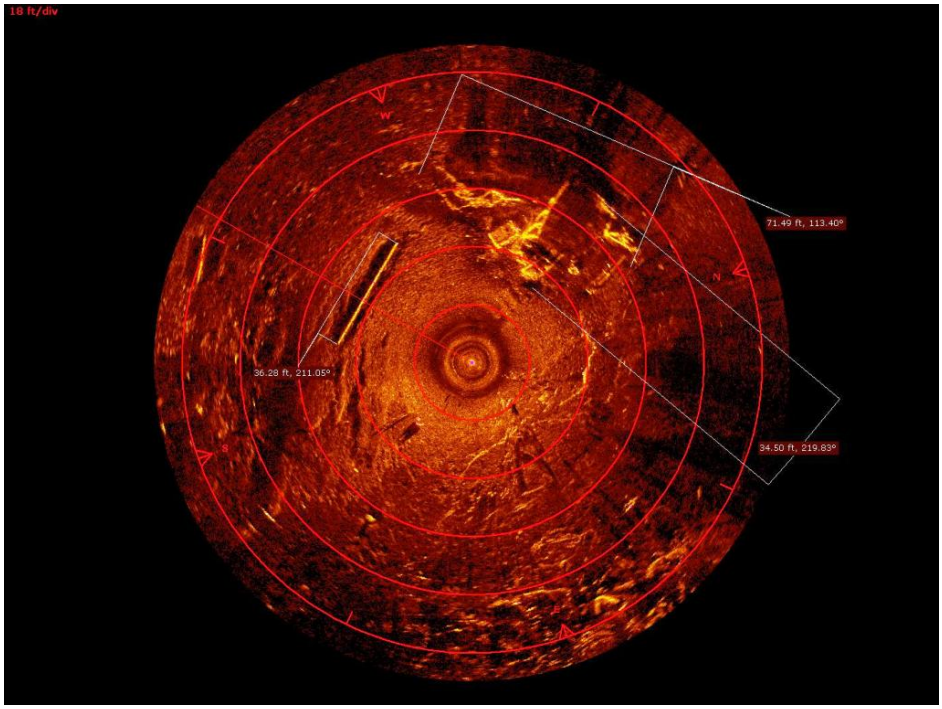


Figure 16. A scanning sonar image of debris near Belle Pass, Louisiana. Image: NOAA

A second option is for a post-removal side scan survey to take place, ideally no later than two weeks after the marine debris items have been removed. The purpose of this post-removal survey is to verify that all identified debris items have been removed. Ideally, an independent surveyor should conduct the final verification survey.

NOAA can be requested to do a post-survey by submitting an inquiry at the following website: http://ocsdata.ncd.noaa.gov/dr/inquiry.asp. (It should be noted that the more advance notice NOAA has for surveying a particular area, the more likely NOAA will be able to accommodate the request, provided funds are available.)

If the post-removal survey is outsourced to a vendor rather than NOAA, marine debris items that have been added to NOAA Charts (as obstructions or wrecks) can only be removed from the chart if NOAA hydrographic technical specifications are adhered to

(http://nauticalcharts.noaa.gov/hsd/specs/specs.htm). Survey data meeting the specifications in this document can be sent to:

Atlantic Hydrographic Branch
439 West York Street
Norfolk, VA 23510

If marine debris items have moved and are found during the post-removal survey, or new debris items are identified, the USCG should be notified if these items are a danger to navigation.

Disposal

FEMA requirements for marine debris disposal are minimal and include:

1. Hazardous materials (e.g., propane tanks, drums containing hazardous materials) must be sorted, properly handled, and disposed of in an appropriate manner.
2. White goods (e.g., refrigerators, stoves) are segregated, emptied of Freon or other regulated materials, and taken to a metal recycling facility.
3. All other debris (often C&D debris and vegetation) is disposed of in approved landfills.

States and local governments usually have regulations or ordinances on removal and disposal of personal property such as abandoned vehicles and vessels. If a vessel is salvageable, efforts are made to identify the owner and make arrangements for the owner to take possession. This requires careful handling of the vessels and may require temporary storage until the owner can take possession. Otherwise, the State can take the vessel and sell it. If the vessel is not salvageable and is eligible, it will be disposed of as marine debris.

Where much of the marine debris in an area consists of trees, guidelines should be developed that allow and encourage removal contractors to sell the trees (particularly cypress), give the trees away, or burn them under appropriate conditions. Disposal of natural vegetation in landfills should be minimized.

Past experience has shown that submerged marine debris is often not suitable for recycling. Immersion in salt water damages wood and corrodes metal. Buoyant drums and containers generally float and are stranded on land. Recycling has only been opportunistic. Nevertheless, it would be good to encourage recycling whenever feasible. Because of the many difficulties with recycling marine debris, both practical and regulatory, following a major disaster such as a hurricane, recycling will be best achieved through pre-planning efforts. FEMA offers these questions to consider in their Debris Management Guide, http://www.fema.gov/government/grant/pa/demagde.shtm#2:

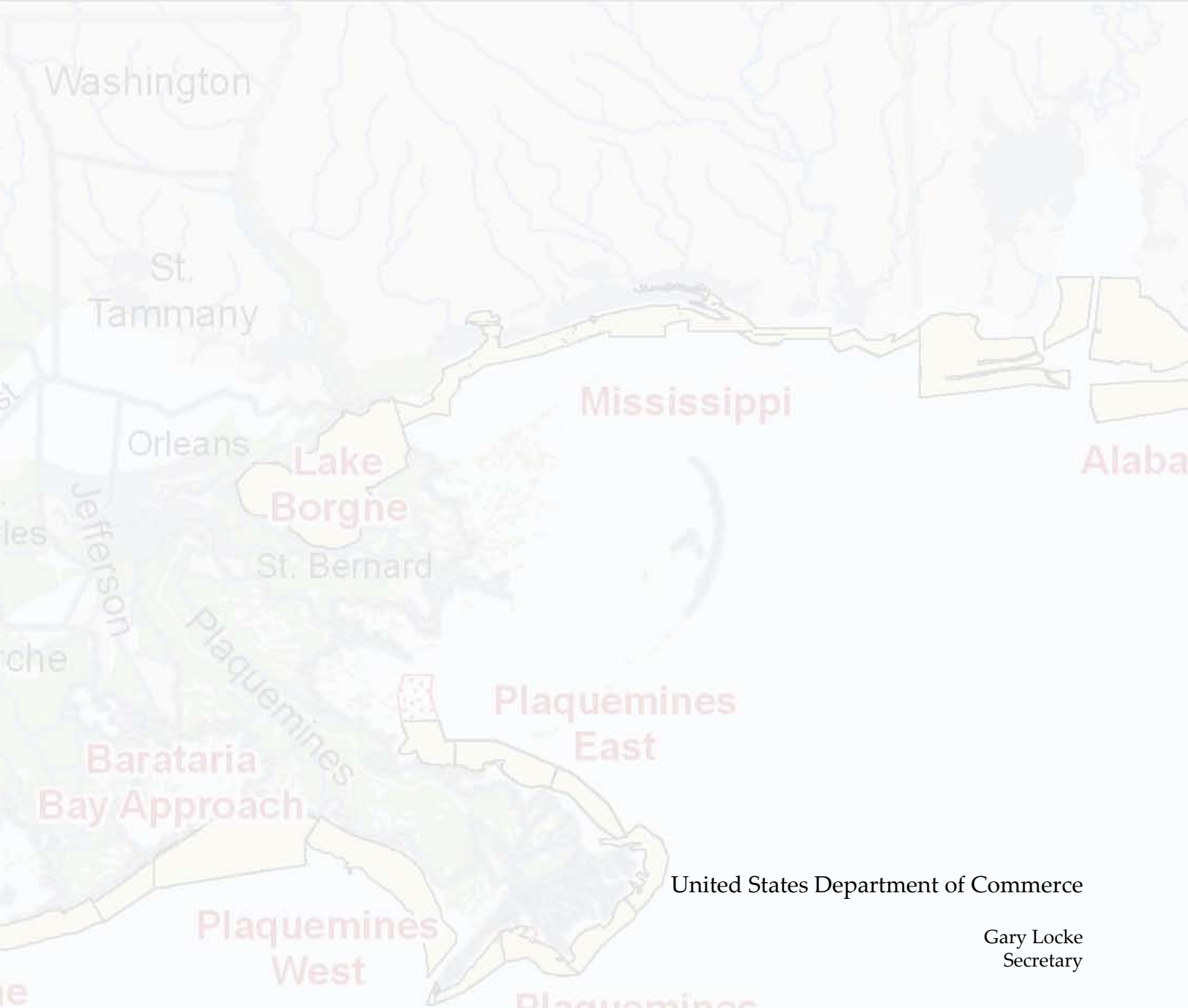
1. Do you have a strategy for debris reduction?
2. Do you currently have a recycling strategy? Is the jurisdiction considering a recycling strategy?

3. Which agency within your jurisdiction would be responsible for developing and implementing a recycling strategy?
4. What departments within the State, county, or your organization would be responsible for permitting burning or incineration operations?
5. What is your strategy for final disposition?

APPENDIX 1: Target Review Process during the Offshore Marine Debris Survey in Louisiana

When marine debris survey and removal involves several agencies, a process to review the targets identified by the hydrographic survey could go a long way to ensure proper input from all involved. Below is a succinct description of the process for the evaluation of targets encountered during the GOMMDP offshore surveys in Louisiana. The process was facilitated by NOAA, with FEMA, State agencies, and USCG all taking active roles.

1. Side scan survey performed.
2. Multi-beam survey performed.
3. Data consisting of target spreadsheet and imagery provided to NOAA Marine Debris Program (MDP) via Sharepoint.
4. MDP GIS team processes the data to Google Earth and generates an Excel spreadsheet formatted to assist with the review process.
5. MDP GIS team sends the Google Earth and Excel files to the MDP member on field rotation in the Gulf.
6. First Review Meeting: NOAA coordinates the initial target review meeting with FEMA. Target eligibility is determined and tracked.
7. Initial eligibility determination is sent by NOAA to the State. The data consist of the images in Google Earth and Excel files with FEMA initial eligibility determination.
8. Second Review Meeting: This meeting, attended by the State, NOAA, and FEMA, is for the State to present and discuss any questions on specific target eligibility determination. FEMA responds to questions, and NOAA tracks any changes to the initial eligibility decision.
9. Approved eligibility decisions are sent by MDP to the State, FEMA, and OCS to confirm the understanding of eligibility decisions, including any changes.
10. Multi-beam request: Multi-beam sonar images for targets eligible for further review are requested by the State and FEMA. NOAA sends the request to the survey contractor and OCS, and coordinates for the multi-beam review meeting with the survey contractor.
11. Final Review Meeting: This meeting, attended again by the State, FEMA, and NOAA, also includes the survey contractor who presents multi-beam images of the target. This review lead to a FEMA and State decision on the target: Remove without further investigation, investigate the target by diving, or render the target ineligible for removal.
12. Summary of Target Eligibility: NOAA summarizes and sends the final review meeting decisions to FEMA, the State, OCS, and USCG. USCG and FEMA coordinate diving or removal.



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